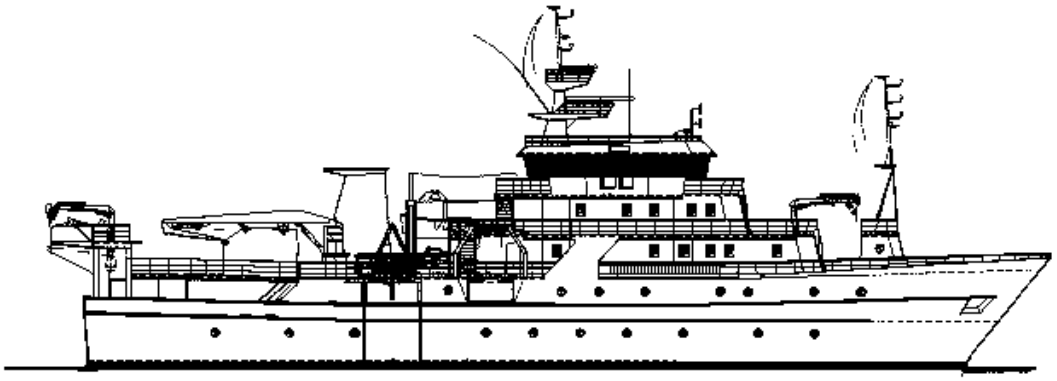

SURVEYS OF THE PELAGIC FISH RESOURCES OF GABON, CONGO, DRC, ANGOLA and NAMIBIA

Part I. GABON and CONGO

3 May – 13 May 2008

Institute of Marine Research
IMR
Bergen

Direction Générale de la Pêche
et de l'Aquaculture,
Libreville
Gabon

Ministére de l' Agriculture
de l'Elevage et de la Pêche

R.D.Congo

Direction Générale de la Pêche
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Part I. GABON and CONGO

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by

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Bergen, 2008

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION

1.1 Objectives

This survey is one of a series aimed at monitoring the pelagic fish resources of Gabon, Congo, Angola and northern Namibia, as agreed between the Food and Agriculture Organisation of the United Nations (FAO) and Institute of Marine Research in Norway (IMR). The program is funded and organised by the FAO under the program agreement "NORAD/FAO PROJECT GCP/INT/003/NOR". The goal of the program is to improve the understanding and knowledge in terms of the biology, ecology, population dynamics of the main species in relation to the environment and the whole ecosystem. Pelagic management decisions for 2009 may be based on the results obtained from this survey.

The specific objectives of the survey were the following:

- To estimate the abundance and to map the distribution of the main commercially important pelagic and semi-pelagic fish species in the region waters, including the two sardinella species *Sardinella aurita* and *S. maderensis,* the Cunene horse mackerel *Trachurus trecae* and other pelagic species.

- To map the general meteorological, hydrographical and biological conditions in the survey area by means of continuous recordings of weather data, CTD-casts (Temperature, Salinity and Oxygen), ADCP measurements (Acoustic Doppler Current Profiler) and plankton sampling along acoustical and hydrographical transect lines.

- to collect bottom sediment samples to map the benthic biodiversity in the region.

- On-the-job training for the local and regional participants on the main survey routines, including using the Nansis and Hydrobase software, scrutinizing acoustical data with the latest Norwegian post-processing system, Large Scale Survey System (LSSS), and producing acoustical biomass estimates.

1.2 Participation

The scientific staff consisted of:

From Direction Générale de la Pêche et de l'Aquaculture, Gabon:
Micheline SCHUMMER GNANDJI, Donatien LEYOKO and Jean de Dieu LEWEMBE

From Direction Générale de la Pêche et de l'Aquaculture, Congo:
Jean SAMBA, Claude Benoit ATSANGO and Romuald Tite AKENZE

From , Direction des peches. Ministere de l'agriculture et developpement rural, R.D. Congo:
Koffi MULUMBA

From IMR, Bergen:

Jens-Otto KRAKSTAD (Cruise leader), Magne OLSEN, Tore MØRK and Ole Sverre FOSSHEIM

From University of Bergen, Norway:
Cathrine STABEL HENRIKSEN

1.3 Narrative

The vessel left Port Gentil 3/5 11:30 GMT after a change of scientific crew. The vessel steamed north to the border between Equatorial Guinea and Gabon, where the coverage of Gabon started in the early morning the next day. The northern shelf to Cape Lopez was surveyed on parallel course tracks parallel to the coast 20 NM (nautical miles) apart. The vessel reached Cape Lopez on the 5/5 at midday GMT, and continued southwards covering the southern part of Gabon and Congo with transects 10 NM apart. The first transect in Congo was started in the afternoon on the 11th May. The last transect and the survey was completed at 13/5 around 9:00 GMT, However it was decided to conduct an environmental sampling line with Grab and CTD stations off Point Noire after returning to sea on the 14th. The vessel thereafter arrived in Pointe Noire at 15:00 the same day for a change of scientific crew. After leaving Point Noire on the 15th around 15:00 we continued the last environmental transect off Point Noire before the vessel steamed south to start the survey off Angola.

The acoustic transects generally covered a depth range of 20 - 500 m. The shallowest part of the shelf between N'zeto and the Congo River was partly inaccessible for trawling due to oil platforms and wells, this region was only partly covered.

Hydrographical profiles were made with CTD from surface down to the bottom depths at approximately each 60 nm coastline sailed. CTD stations were taken standard at 20. 50, 100 200, 500 and 1000 m. Additional stations were taken between these where the distance between standard ctd stations were long or where it was deemed necessary to capture hydrographical features. South of Cape Lopez CTD station were also taken at 20 m depth and 200 m depth at every 20 NM of costline sailed. Grab samples were taken irregularly at 200 m depth to supplement already existing samples from the area (generally covering the coast between 20-100 m depth).

1.4 Survey effort

Figure 1(a-c) shows the cruise tracks with fishing, plankton and hydrographic stations. sampling trawls, including the small and the mid-sized (15 m vertical opening) pelagic trawls and the demersal trawl (5 m), were used during the survey. Table 1 summarizes the survey effort by regions.

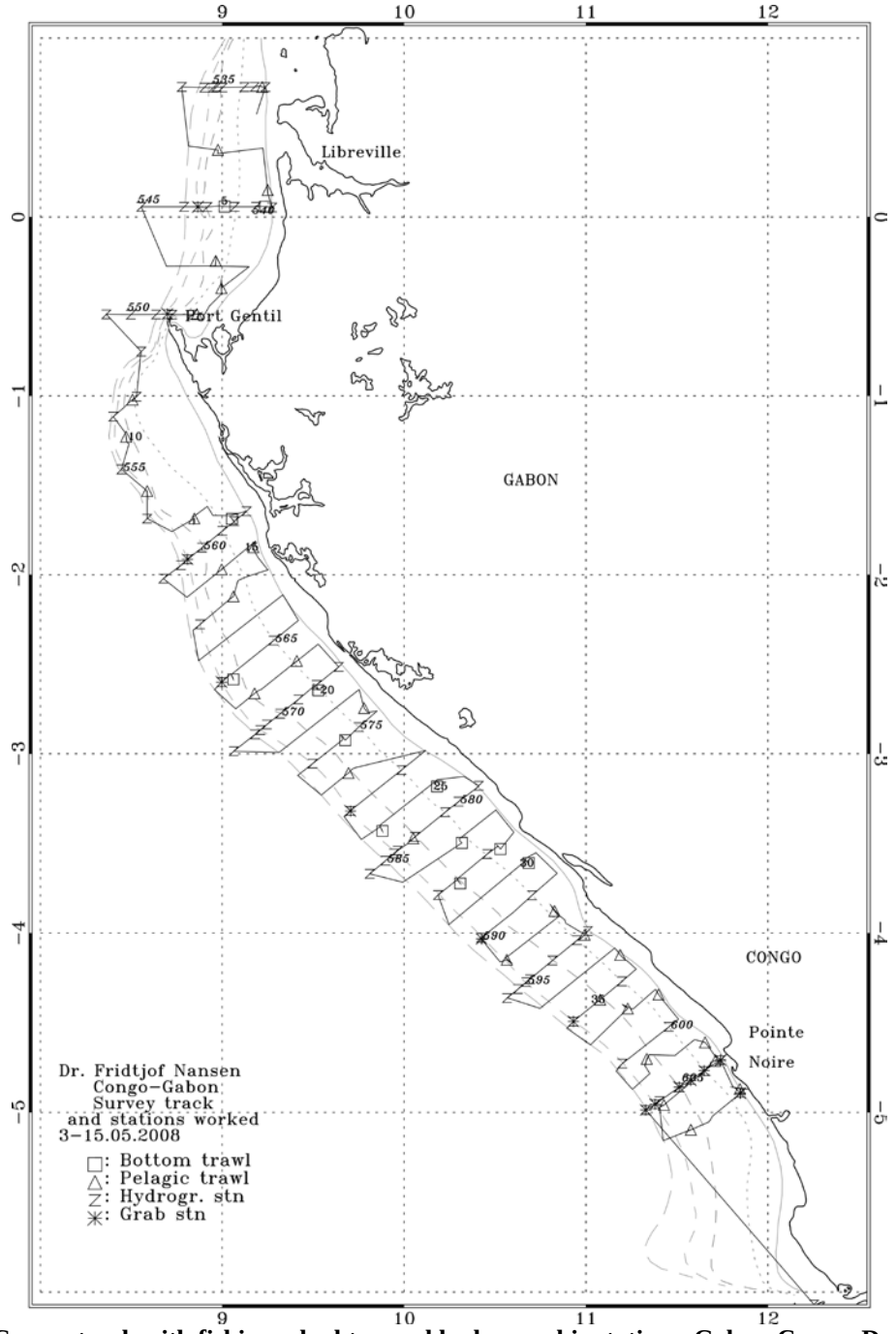


Figure 1.1. Course track with fishing, plankton and hydrographic stations, Gabon-Congo. Depth contours at 20, 50, 100, 200, and 500m.

Table 1.1 Surveyed area and total bottom trawl (BT) and pelagic trawl stations (PT), number of grab (G), plankton (P), hydrographic stations (CTD) and distance surveyed in NM by region.

Region	CTD	P	G	PT	BT	Log
Gabon N	23	0	2	6	2	336
Gabon S	44	1	4	15	10	1071
Congo	12	0	8	10	0	309
Total	79	1	14	31	12	1722

CHAPTER 2 METHODS

2.1 Hydrographic sampling

CTD
A Seabird 911+ CTD probe was used to obtain vertical profiles of the temperature, salinity and oxygen. Real time logging was carried out using the PC based Seabird Seasave software. CTD casts were conducted along the cruise track in transects at about 60 NM distance, and *ad hoc* as deemed necessary. The casts were stopped a few meters above the bottom, and at a maximum of 1500 m depth. The oxygen sensor has shown to be very stable, and no calibration was conducted during the survey

Attached to the CTD was also a Chelsea flourometer of the type Mk III Aquatrack. It measures chlorophyll A in microgrammes per liter with an uncertainty of 3%. Factory slope and offset was 0.921 and -0.02.

thermosalinograph
The SBE 21 Seacat thermosalinograph was running routinely during the survey, obtaining samples of sea surface salinity and relative temperature and fluorescence (5 m depth) every 10 sec. An attached in-line Turner Design SCUFA Fluorometer was continuously measuring Chlorophyll levels [RFU] at 5 m below the sea surface while underway during the entire cruise. The instrument was configured with a bright blue photodiode, a 420 nm Excitation filter and a 680 nm Emission filter. It was calibrated against the secondary orange standard dye. The maximum output was equivalent to 5Volt = 100%. It had a linear temperature compensation of 2.14%/°C

Current speed and direction measurements (ADCP)
A vessel-mounted Acoustic Doppler Current Profiler (VMADCP) from RD Instruments was run continuously during the survey in broadband mode shallower than about 400 m and in narrow band mode in deeper waters. The frequency of the VMADCP is 150 kHz, and data were averaged and stored in 3 m or 4 m vertical bins. All data were stored on files for post survey processing.

Meteorological observations
Meteorological data logged from the Norwegian Meteorological Institute (DNMI) meteorological station included air temperature, humidity, air pressure, wind direction and speed, and sea surface temperature (SST). All data were averaged by unit distance sailed (1 NM).

2.2 Sediment sampling

Sediment samples were taken by a van Veen grab with adjustable weight and a surface area of 0.1 m². The total volume of the grab was 21 litres. At each site, 5 grab samples were taken. Five were used for biological analysis, from three of these samples were taken for chemical analysis (metal and oil hydrocarbons) and grain size analysis.

On deck the volume of each sample was measured. Sediment was described, and colour was recorded, as well as anomalous odour and conspicuous taxonomic groups. Samples for biological analysis were sieved through sieves with mesh size 5 mm and 1 mm round holes. Material retained in the 1 mm sieves was placed in plastic containers where formalin and borax was added. Each sample was marked and stored on board in transport containers.

Samples for chemical analysis were taken through the hatches on top of the grab from the upper 0-1 cm of the sediment. To avoid contamination an ordinary table spoon was used when taking the sediment for hydrocarbon and grain size analyses, a plastic spoon was used when taken the sediment for metal analyses. The spoons were washed with seawater between each sample. Each sample was put into Rilsan plastic bags which were marked and immediately frozen to prevent evaporation of labile compounds. The samples were kept frozen until further analysis in the onshore laboratory.

Samples for TOM and grain size analyses were taken from the upper 0-5 cm of the sediment and put in separate plastic bag, marked and frozen immediately.

2.3 Fish sampling

A brief description of the fishing gear is provided in Annex I. All trawl catches were sampled for species composition by weights and numbers. Records of catch rates are given in Annex II. Total length (TL) frequencies were taken for the commercial pelagic species such as sardinella, horse mackerel, and various species of carangids and other pelagic fish.

Biological samples were obtained for sardinellas and horse mackerel. Total length (TL) and body weight were determined to the nearest 1 cm and 1 g below, respectively. Sex and reproductive stages were determined by means of macroscopic examination, scoring each fish according to the five-point classification scale first proposed by Holden and Raitt (1974) (Table 2).

Table 2.1. The five-point gonad maturity scale proposed for partial spawners by Holden and Raitt (1974). Additional information specific for Cunene horse mackerel (*Trachurus trecae*) as described by Dr. Isabel Afonso Dias during the 2001 survey in Angola are included (*bold Italic*)

Stage	Maturity status	Description
I	Immature	Ovary and testis lengths about 1/rd of body cavity length. Ovaries pinkish, translucent; testis whitish. Ova not visible to the naked eye. Ovary and testis quite narrow and have a tubular shape.
II	Maturing virgin and recovering spent	Ovary and testis about ½ length of body cavity length. Ovary pinkish, translucent; testis whitish, more or less symmetrical. Ova not visible to the naked eye. Ovary more opaque; small specks make gonad appear more granular. Testes develop lobules, hence loosing the tubular shape. Some recovering spent ovaries have conspicuous blood vessels.
III	Ripening	Ovary and testis about 2/3rds length of body cavity length. Ovary pinkish-yellow colour with granular appearance, testis whitish to creamy. No transparent ova visible. Milt can be seen inside testes when cut. Ovaries granular due to the presence of opaque oocytes. First time spawners have very swollen gonads. Ovaries that have spawned once lose consistency, but maintain the external appearance typical for this stage.
IV	Ripe	Ovary and testis from 2/3rds to full length of body cavity. Ovary orange-pink in colour with conspicuous superficial blood vessels. Large transparent, ripe ova visible. Testis whitish to creamy, soft. Ovaries jelly-like due to the presence of translucent oocytes. Gonads extrude oocytes or milt when gently pressed.
V	Spent	Ovary and testis shrunken to about ½ length of body cavity. Walls loose. Ovary may contain remnants of disintegrating opaque and ripe ova, darkened or translucent. Testis bloodshot and slack. Testes may have sperm remaining in the seminal duct. Pinkish areas appear in the periphery of the testes. Ovaries bloodshot and slack.

2.4 Acoustic sampling

Acoustic equipment

Acoustic data were recorded using a Simrad ER60 scientific echosounder equipped with keel-mounted transducers at nominal operating frequencies of 18, 38, 120 and 200 kHz. No calibration was conducted during the survey but a calibration of all frequencies is planed in Baia dos Elefantes during the pelagic survey off Angola.

Acoustic data were logged and post-processed using the latest acoustic data post-processing software, the Large Scale Survey System (LSSS) Version 1.13, which replaced the old BEI post-processing software that has been used on the vessel since 1990. The technical specifications and operational settings of the echosounders used during the survey are given in Annex IV.

Allocation of acoustic energy to species group

The acoustic data were scrutinized using the LSSS. Scatterers were displayed at 38 kHz. The mean 5 NM area backscattering coefficient s_A (m^2/NM^2) was allocated to a predefined set of species groups on the basis established echogram features. Acoustic groups and respective species are listed in Table 3. Ground truthing and estimation of mean length and weight were accomplished by means of targeted pelagic and demersal trawling.

Table 2.2 Allocation of acoustic densities to species groups. Note that for the groups sardinella, horse mackerel, big-eye grunt and pilchard all encountered species are listed, while only examples are listed for the remaining groups.

Group	Taxon	Species
Sardinella	Sardinella sp.	S. aurita S. maderensis
Horse mackerel	Trachurus sp.	T. trecae T. trachurus capensis
Pilchard	Sardinops	S. ocellatus
Big-eye grunt		Brachydeuterus auritus
Pelagic species 1	Clupeiformes$_1$	Ilisha Africana Etrumeus whiteheadi Engraulis encrasicolus
Pelagic species 2	Carangidae$_2$	Selene dorsalis Chloroscombrus chrysurus Decapterus rhonchus Seriola carpenteri
	Scombridae	Auxis thazard Sarda sarda Scomber japonicus
	Sphyraenidae	Sphyraena guachancho
	Others	Trichiurus lepturus Lepidopus caudatus
Other demersal species	Sparidae$_3$	Dentex angolensis D. macrophthalmus D. congoensis D. canariensis D. barnardi Pagellus bellottii Sparus caeruleostictus S. pagrus africanus
	Other taxii	Saurida brasiliensis Arioma bondi Pomadasys incisus Galeoides decadactylus
Mesopelagic species	Myctophidae$_3$	Diaphus dumerili
	Other mesopelagic fish	Trachinocephalus myops
Plankton	Calanoidae	Calanus sp.
	Euphausiidae	Meganyctiphanes sp.
	Other plankton	

$_1$: other than *Sardinops* sp.; $_2$: other than *Trachurus* sp.; $_3$: main taxon in group.

Estimation of biomass

The target strength (TS) function used to convert mean area backscattering coefficient s_A (m^2/NM^2) at 38 kHz to number of fish corresponds to:

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

or

$$C_F = \frac{10^{7.2}}{4\pi} \cdot L^{-2} \quad (2)$$

where C_F is the conversion factor from acoustic density to fish biomass and L is the mean total fish length. This target strength function was originally established for North Sea herring, but has later been attributed to clupeids in general (Foote *et al*., 1986; Foote, 1987).

No specific target strength relations presently are available for the species at hand, and equation (2) has therefore been applied consequently for all targeted species in this time series. The biomass was calculated by multiplying the number of fish by the expected length at weight, estimated by regressing the log-length (total) against total weight. Separate length-weight relationships were worked for each region (north, central, south), pooling all data within each region.

The boundaries of encountered fish aggregations (post strata) were determined by means of contouring within the inner and outer zero-value limits of the transect lines. The strata contours were digitised using Golden Software Didger software Version 3.0.7. Distribution plots and area calculations on the strata were carried out using IDL 6.1 for MS Windows. Sub-stratification was used to isolate areas of similar densities, using the following pre-defined, standard categories: 1: s_A = 0-300; 2: s_A = 301-1 000; 3: s_A = 1 001-3 000; 4: s_A > 3 001 (m^2/NM^2).

Mean 5-NM integrator values (s_A) computed along the transect lines were re-averaged for each stratum. The short spacing between the lines (7 NM) makes it impossible to exclude all between-transect values without removing some on-line contributions, particularly for sardinella on the inner shelf. The potential positive bias of including between-line values is likely smaller than the negative bias that would have been introduced by excluding high on-line contributions. This bias is also counteracted by the shallow distribution pattern (partly above the integration limit) and vessel avoidance behaviour of sardinella (Misund and Aglen, 1992). All estimates should consequently be considered as relative indices of abundance.

The overall length frequency distributions within strata were estimated by weighting the sample-distributions with the nearest valid 5 NM integrator value, or the average of two adjacent values. Target species of the same genus, i.e. *S. aurita* / *S. maderensis* and *T. trecae* / *T. trachurus capensis*, are not acoustically distinguishable, and the s_A values were therefore split according to the relative distributions of the two species in each length group. The total number of fish in each length group was estimated as:

$$\rho_i = \frac{< s_A > t_{i,j} \cdot u_i}{\sum_i \frac{u_i}{C_{Fi}}} \cdot A_s = \frac{10^{7.2} \cdot t_{i,j} \cdot u_i \cdot < s_A > \cdot A_s}{4\pi \sum_i u_i \cdot (L_i + 0.5)^2} \qquad (3)$$

where:

ρ_i	=	estimated number of fish in length group i
$<s_A>$	=	mean recorded area backscattering coefficient (m^2/NM^2)
$t_{i,j}$	=	proportion of species j in length group i
u_i	=	proportion of sampled fish in length group i
A_s	=	horizontal area of stratum s
C_{Fi}	=	conversion factor for length group i
L_i	=	length group i (nearest full cm below total length)
$L_i+0.5$	=	mean length in L_i.

CHAPTER 3 OCEANOGRAPHIC CONDITIONS

3.1 Surface distribution

The sea surface temperature (SST, 5 m depth) and the Sea Surface salinity, (SSS, 5 m depth) and Fluorescence (SSF, 5 m depth) were continuously recorded during the cruise. Figure 3.1, Figure 3.2 and Figure 3.3 shows the horizontal distribution of SST, SSS and SSF respectively for Gabon and Congo. The environmental data collected during this year's survey reflect that the survey were conducted approximately 1.5 months earlier than the previous surveys in the region.

Gabon
The SST in the northern part of Gabon ranged from more than 28°C (Max temp 29.2°C) in the northern and offshore part of this area while the area closest to Port Gentil had temperatures towards 27°C (Min. temperature). Average temperature was measured to 28.2°C. Temperatures were generally 1-3°C warmer than during the survey last year. No frontal zone was present in the area around Cape Lopez. During the surveys in 2004-2006 a frontal zone separating warm less saline tropical water from the Gulf of Guinea in the north from colder, saline water masses on the southern shelf of Gabon and Congo has been present in this area. Temperatures on the southern shelf of Gabon and Congo were generally warm with little difference between temperature measured north and south of Cape Lopez. Average temperatures in Gabon south of Cape Lopez were around 27.8°C, ranging from 26.4°C - 29.2°C. Temperatures were approximately 4-5°C warmer than during the previous surveys (2004-2007). No clear signs of upwelling as observed in many of the previous surveys were seen this year.

The SSS in the northern shelf of Gabon were ranging from 27.3 – 33.9 PSU, with an average of 30.2 PSU. Lowest salinity was found off Libreville. SSS was slightly lower than recorded last year probably because the survey was conducted in the middle of the rainy season. The survey area is influenced by discharge from many rivers. A gradual increase in salinity can be observed from Cape Lopez and southwards towards Iguela, where SSS reached 35 PSU inn offshore waters, and maximum salinity of 35.6 PSU was observed further south in inshore waters. The average SSS on the southern shelf of Gabon and Congo was 34.0 PSU. The observations this year differ from those during the previous four years surveys, particularly because of the lack of a strong front extending offshore off Cape Lopez where the SSS increased rapidly.

The SCUFA Fluorometer was continuously measuring Sea surface distribution of Chlorophyll levels off Gabon and Congo. These recordings were made first time during the survey in 2007. This year's recordings differed markedly from those. Recordings in northern Gabon were generally very variable, ranging between 0.010 µg/l and 0.020 µg/l. highest values were recorded midshelf, and closer to Cape Lopez. Last years recordings ranged from 0.020 µg/l – 0.060 µg/l with highest values around Cape Lopez. Further south values were stable around 0.012 µg/l continuing south to Point Noire. Last year values in this area very generally much higher with concentrations around 0.100 µg/l close to the coast, decreasing further offshore to 0.040 µg/l.

Congo

The sea surface temperature in Congo was generally similar to what was observed in Gabon, but with slightly decreasing water temperatures ranging from 29.1°C – 25.7°C with average of 27.6°C. Slightly cooler waters were observed close to the coast and the Cabinda area in Angola, probably as an effect of Cong River flow and turbulence. Temperature were generally The effect of the Congo river was visible in the whole of Congo but particularly in the offshore region. SSS ranged from 34 PSU to <32 PSU. It has been observed from several consecutive surveys that SSS increase slightly in inshore waters south of Point Noire. This is less visible this year, but it is suggested that the inner part of the shelf is a retention area where more saline waters are pushed up on the shelf due to the north and offshore flow of the Congo River.

The Sea surface distribution of Chlorophyll levels off Congo was stable around 0.012 µg/l. Last year large variability in fluorescence was observed in this area. Very high values >0.300 µg/l were observed in a small area off Madingo, and values >0.100 µg/l was observed inshore off Point Noire.

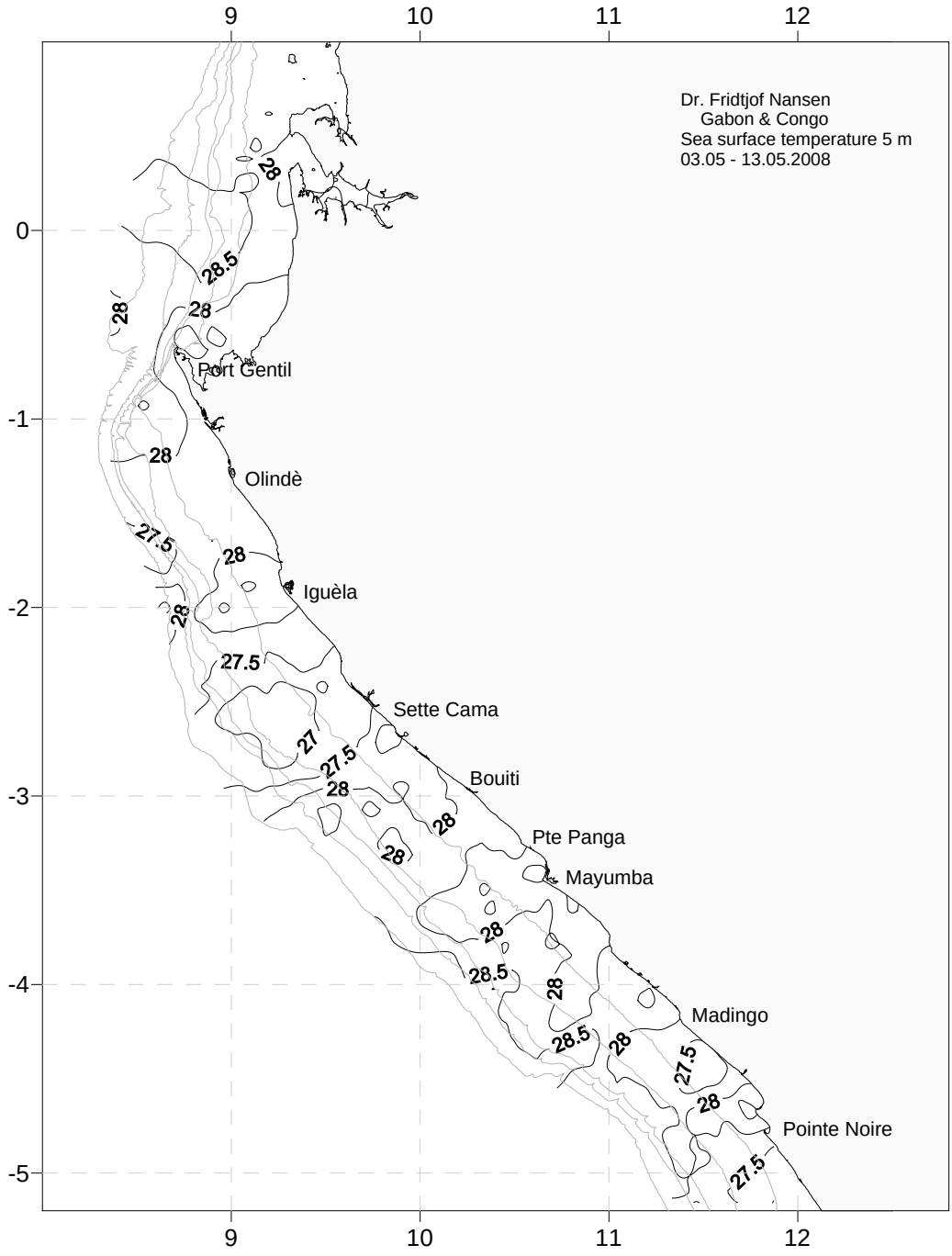


Figure 3.1 Horizontal distribution of SST off Gabon and Congo.

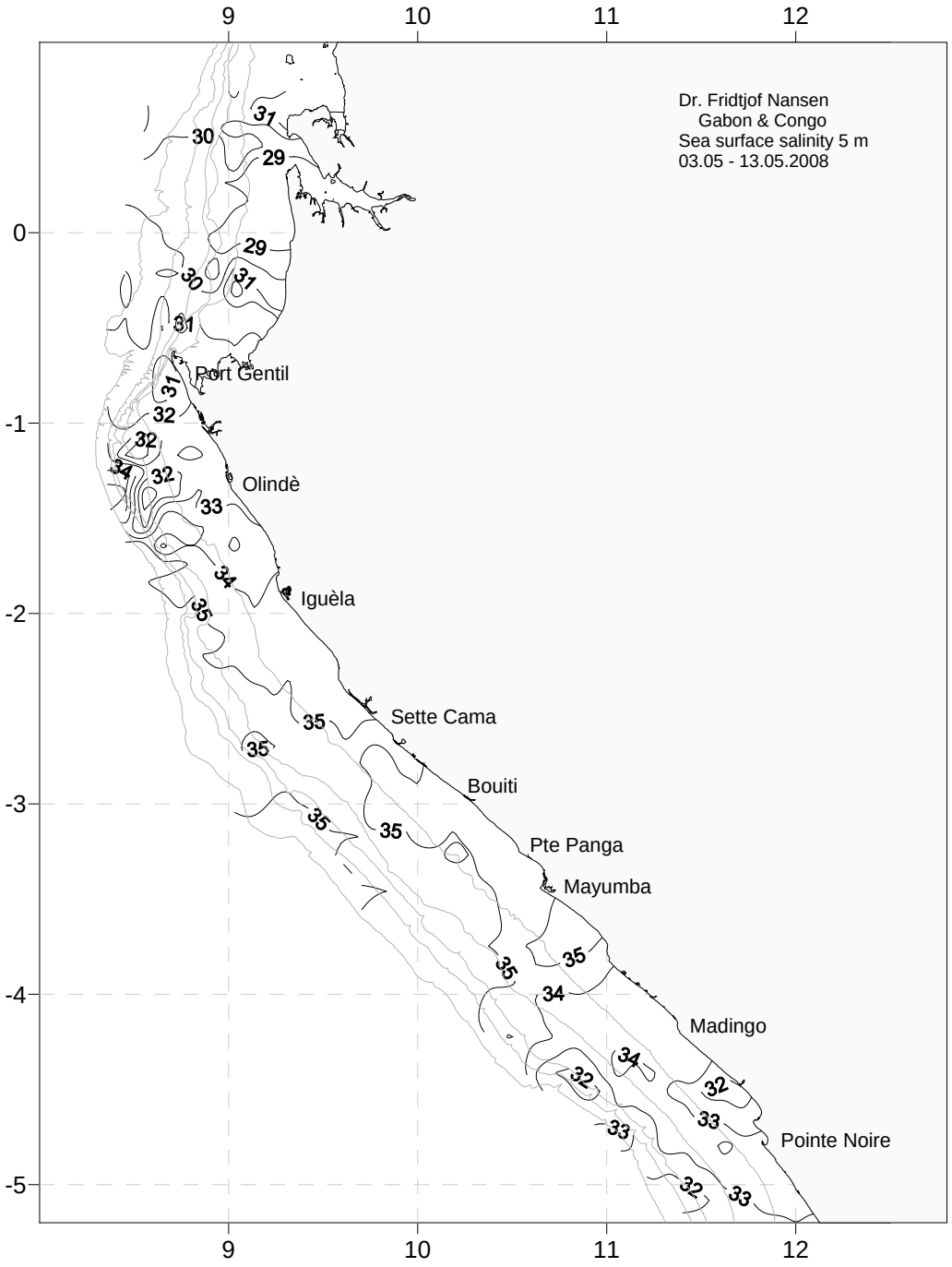


Figure 3.2 Horizontal distribution of SSS off Gabon and Congo.

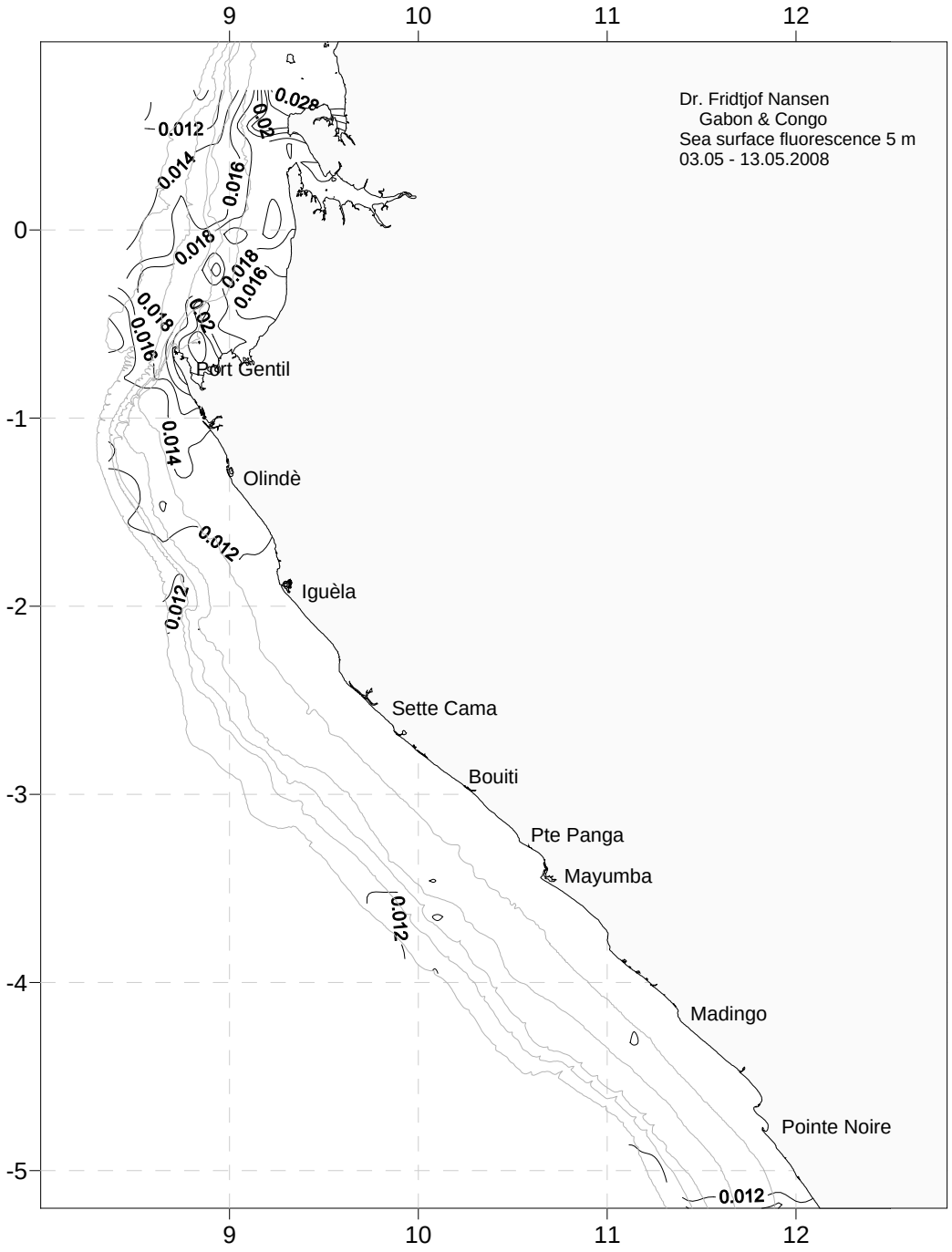


Figure 3.3 Horizontal distribution of SSF off Gabon and Congo.

3.2 Vertical sections

Figures 3.3 (a-h) shows the vertical distribution of temperature, salinity, dissolved oxygen and chlorophyll a as recorded on the hydrographic transects worked during the survey. The chlorophyll a censor is new for the year and no comparison is available from previous years. Data recorded are not directly comparable with recorded data on Sea Surface Fluorescence recordings depicted in Figure 3.3.

Gabon

Surface temperature at Corisco, Equator and Cape Lopez section was between 28 - 29°C. Isolines were generally parallel with depth and the upper 100 m was generally very warm with temperatures decreasing steadily to around 19°C at 100 m depth. Temperature decrease was more rapid in deeper waters and reached 8 °C at 500 m depth. The profiles south of Cape Lopez at Iguela, Sette Cama and Pointe Panga were all similar in appearance to those in the northern part of Gabon. They ranged from around 27°C – 28°C in the surface, declining to around 18°C at 100 m depth. The sections in southern Gabon showed considerably warmer waters than last year, also around 100 m depth with temperatures around 2°C warmer than last year. Temperature minimum around 8 C was found at 500 m depth as in previous years.

The salinity profiles showed very high fresh water influence on transects north of Cape Lopez. Surface values <30.0 PSU was recorded in the Corisco and Equator transects while the Cape Lopez profiles showed slightly less freshwater influence. For all three transects a rapid increase in salinity can be observed to around 50 m depth, and maximum salinity around 36.4 PSUwas observed from 50 m depth to 75 m depth. Salinity decreased in deeper waters to minimum values of 34.7 PSU around 500 m depth. South of Cape Lopez the freshwater influence in surface waters became less pronounced and the profiles were less stratified than north of Cape Lopez. The salinocline moved upwards and affected only the upper 25 m. lowest salinity offshore may indicate the presence of Congo river water. The maximum salinity layer also moved towards surface waters with maximum recordings of 36.1 – 36.2 PSU around 25-50 m depth. Minimum salinity of 34.7 PSU was found at 500 m depth

North of cape Lopez dissolved oxygen values decreased gradually from between 4.5 at the surface to 1.5 ml/l below 250 m depth, with about 3.5 ml/l oxygen at the thermocline. Further south surface values were similar to northern part of Gabon, but minimum Dissolved oxygen values decreased gradually from >4.5 ml/l in surface waters to 1.5 ml/l around 200 m depth increasing slightly again in deeper waters.

Measurements of chlorophyll a shows relatively higher recordings of chlorophyll a north of Cape Lopez than south. Large variability can be observed from section to section. A maximum chlorophyll layer at around 50 m depth extending from the shelf edge was particularly pronounced in the Corisco and Equator sections. The Cape Lopez section is similar but shows lower maximums values than further north. The Iguela and Pointe Panga section show similar maximums concentrations around 50 m depth, but the Iguela section also show very high concentrations in surface waters over the shelf edge. Further south the Sette Cama section shows lower chlorophyll a concentrations than sections both north and south. Highest concentrations can be found in offshore waters.

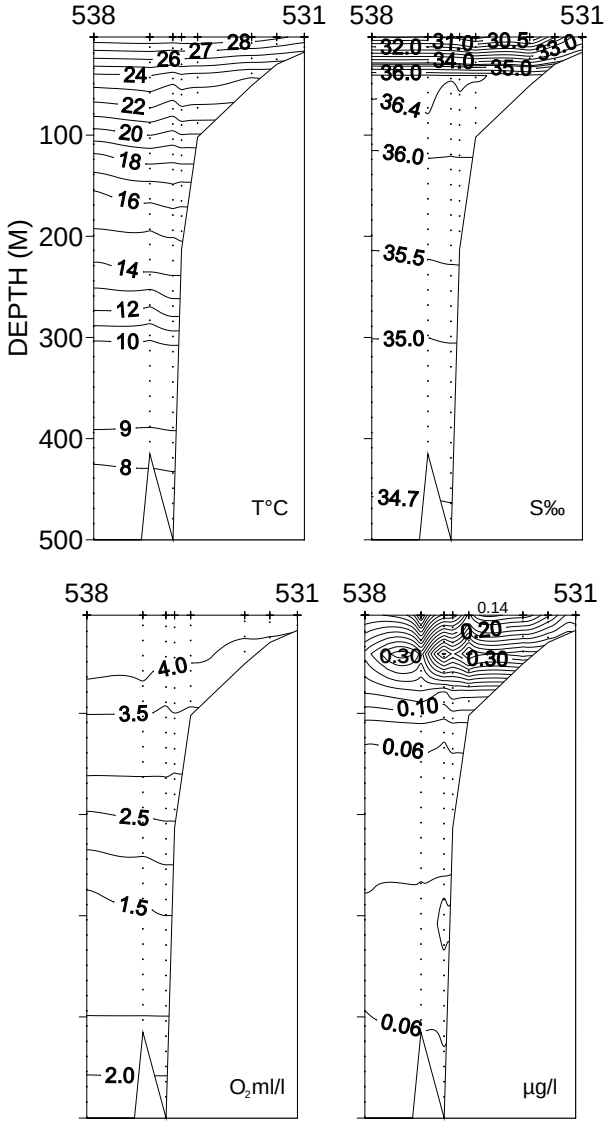
Congo

The temperature profile at Madingo showed surface temperatures around 28°C. Temperatures at 100 m were 19°C. At Pointe Noire surface temperatures were 27°C decreasing to 18°C at 100 m depth. Both profiles showed bottom temperatures at 500 m around 8°C. Temperature profiles were generally similar to those further north. Last year surface temperatures in the same area were around of 22 C- 23°C, and 16°C at 100 m depth. The salinity profile show influence from the Cong River with lower salinity offshore both at Madingo and Pointe Noire. The salinocline was present around 25 m at Madingo and at 10 m depth off Pointe Noire. Maximum salinity of 36.2 PSU (Madingo) and 36.0 PSU (Pointe Noire) was found below the salinocline to about 75 – 100 m depth. Salinity in the bottom waters around 500 m depth was around 34.7 PSU.

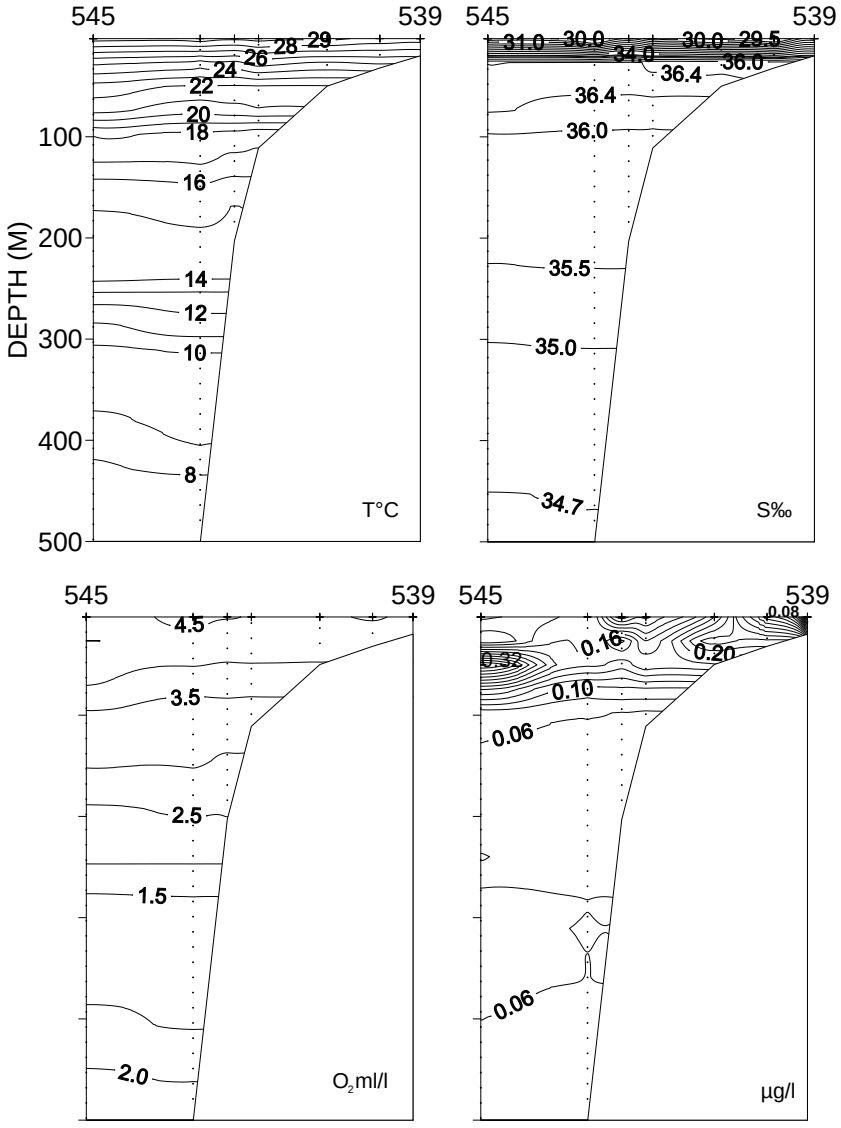
Dissolved oxygen at the surface at Madingo and Pointe Noire was around 4 ml/l, dropping to between 3 and 2 ml/l at 100 m depth. A body of water masses with < 1.5 ml/l oxygen was present in offshore waters at depths>200 m as also observed further north. Probably representing the Gabon – Congo undercurrent.

Measurements of chlorophyll a at the madingo transect shows highest concentrations around 25-50 m depth, and declining concentrations towards the surface and deeper waters. The Point Noire transect shows a more complicated picture with highest concentrations of chlorophyll a around the shelf break just below the surface. Another high-concentration area may be observed in surface waters at the costal end of the transect.

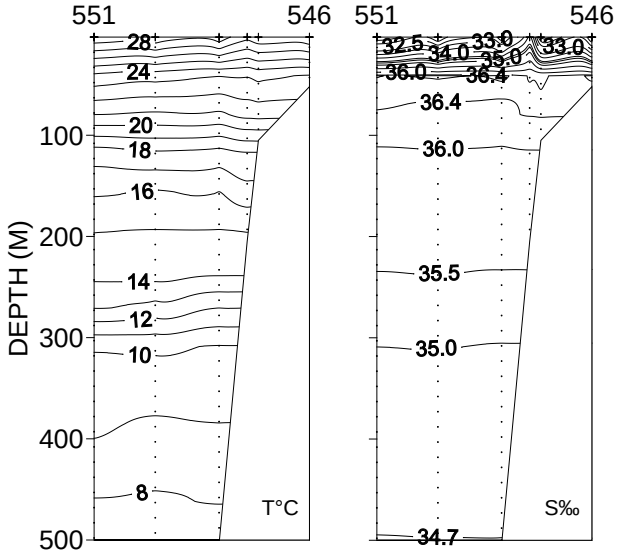
a. Corisco, Gabon

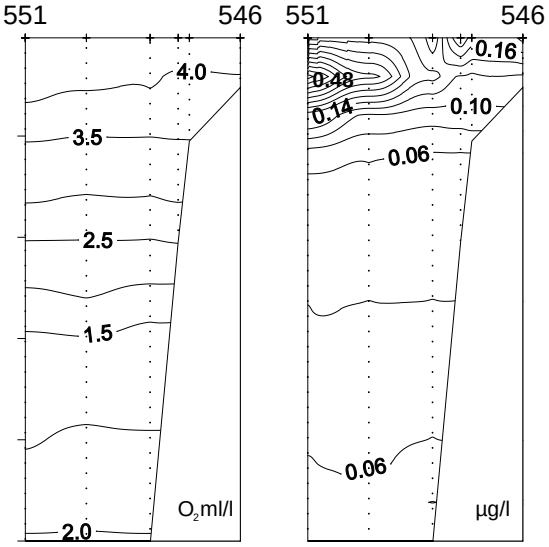


b. Equator



c. Cape Lopez




551
546
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3.5
2.5
1.5
2.0
O2ml/l
551
546
0.16
0.48
0.14
0.10
0.06
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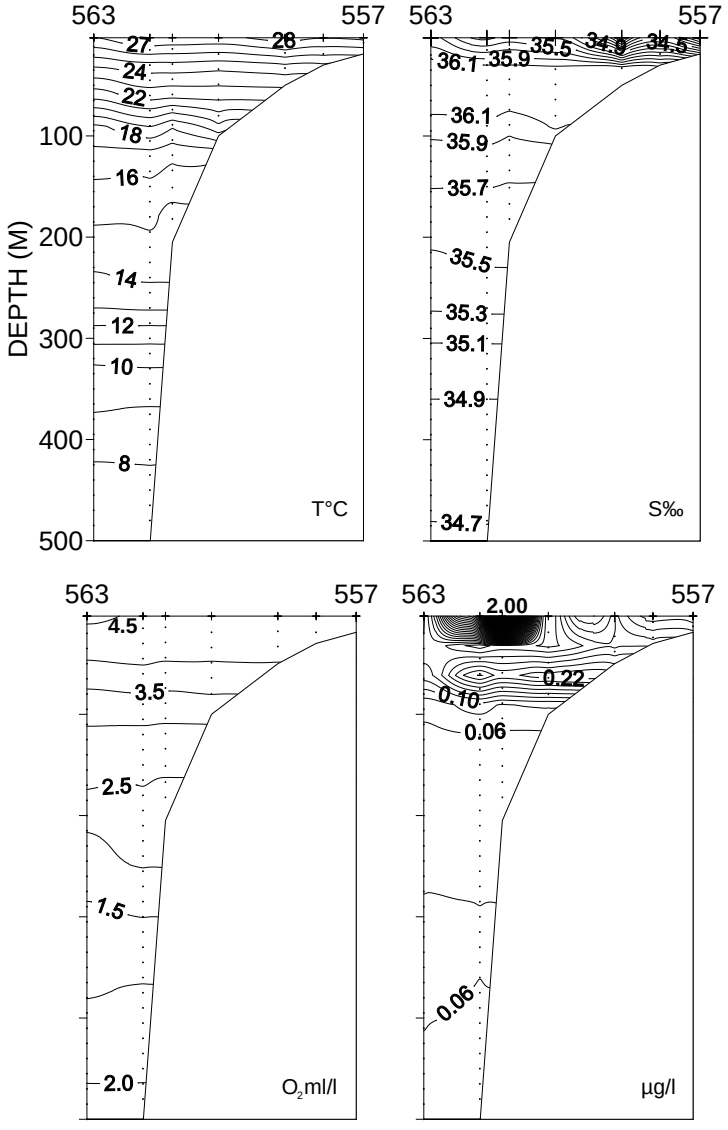
µg/l

d. Iguela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DEPTH (M)
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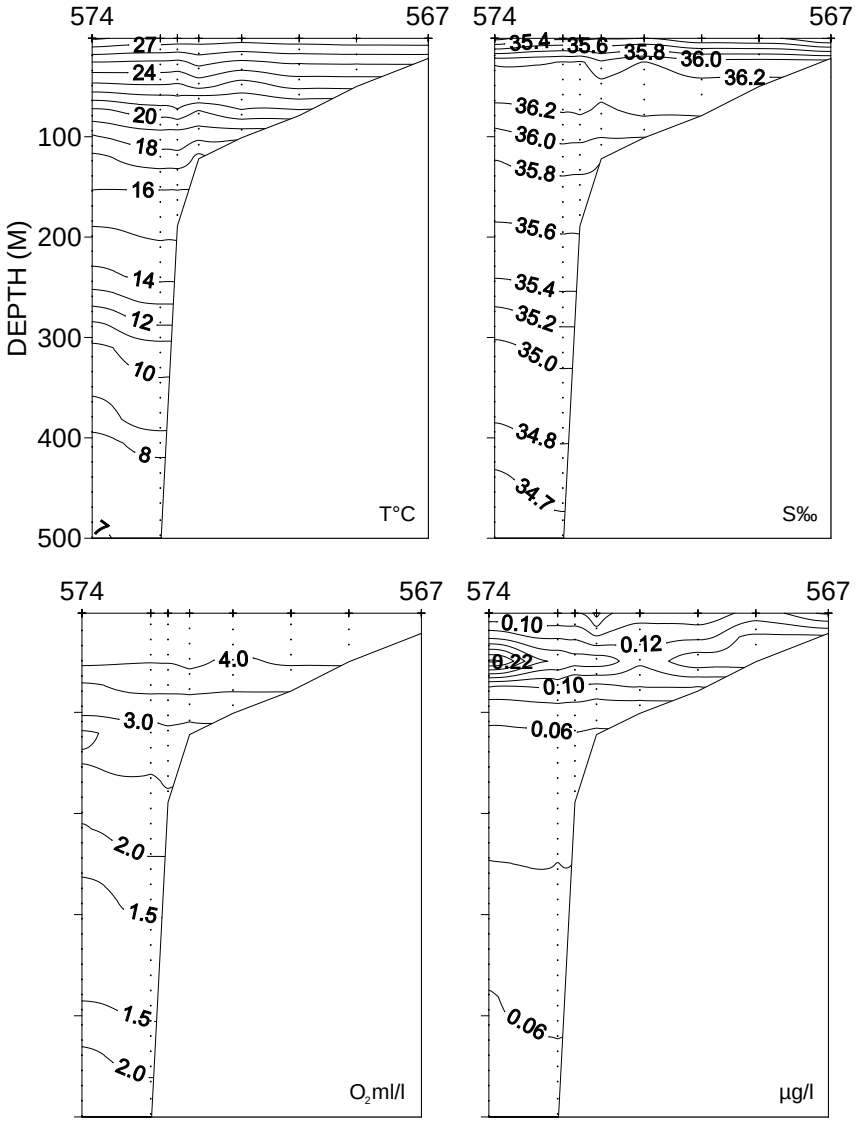
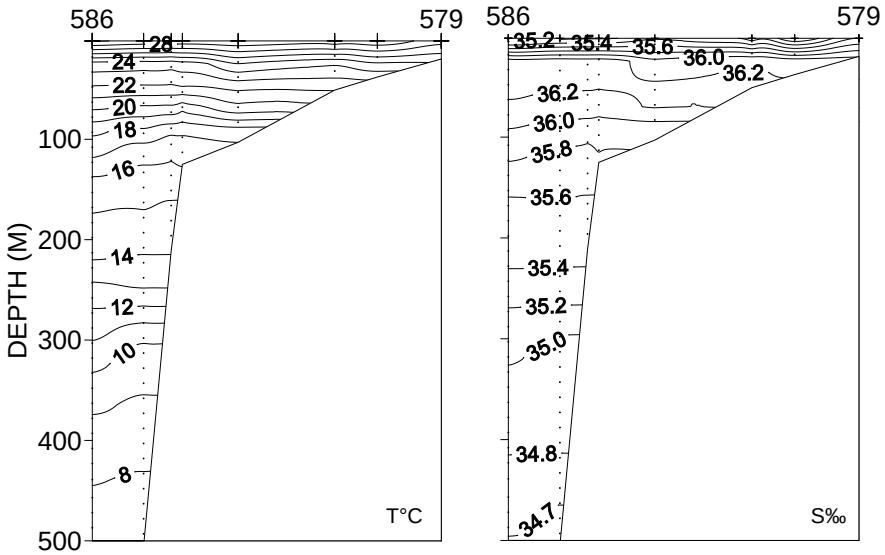
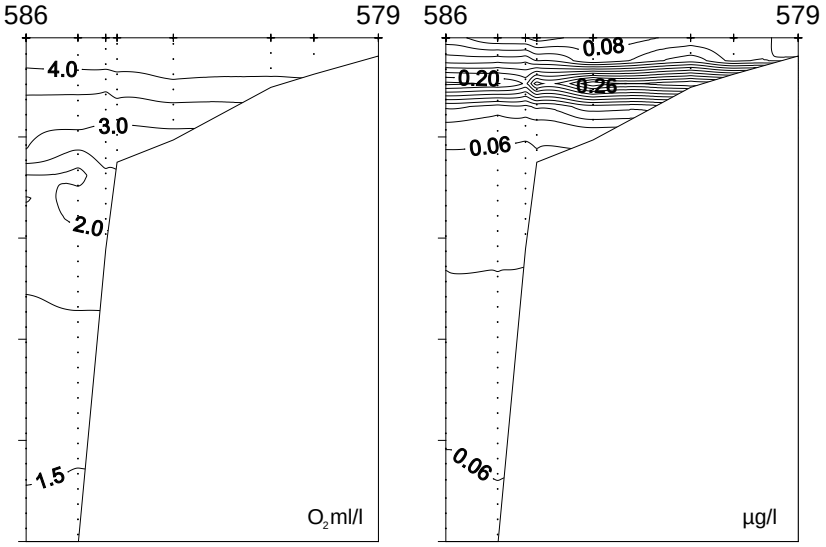
e. Sette Cama

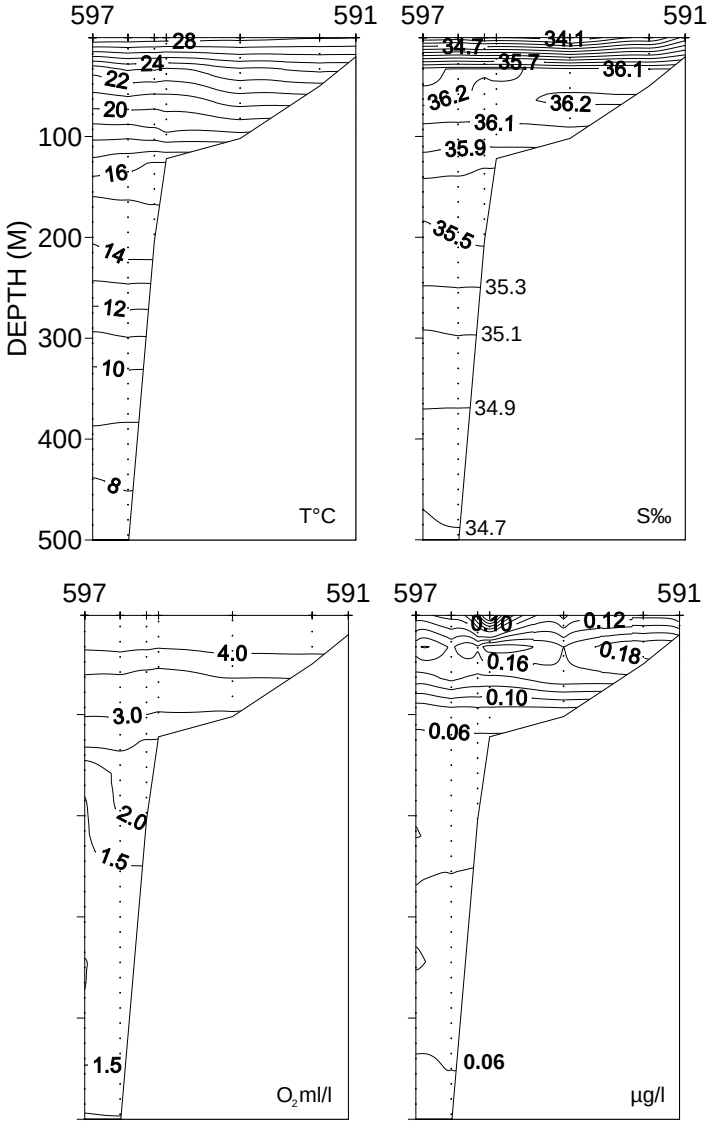


f. Pte. Panga





g. Madingo, Congo



h. Pointe Noire

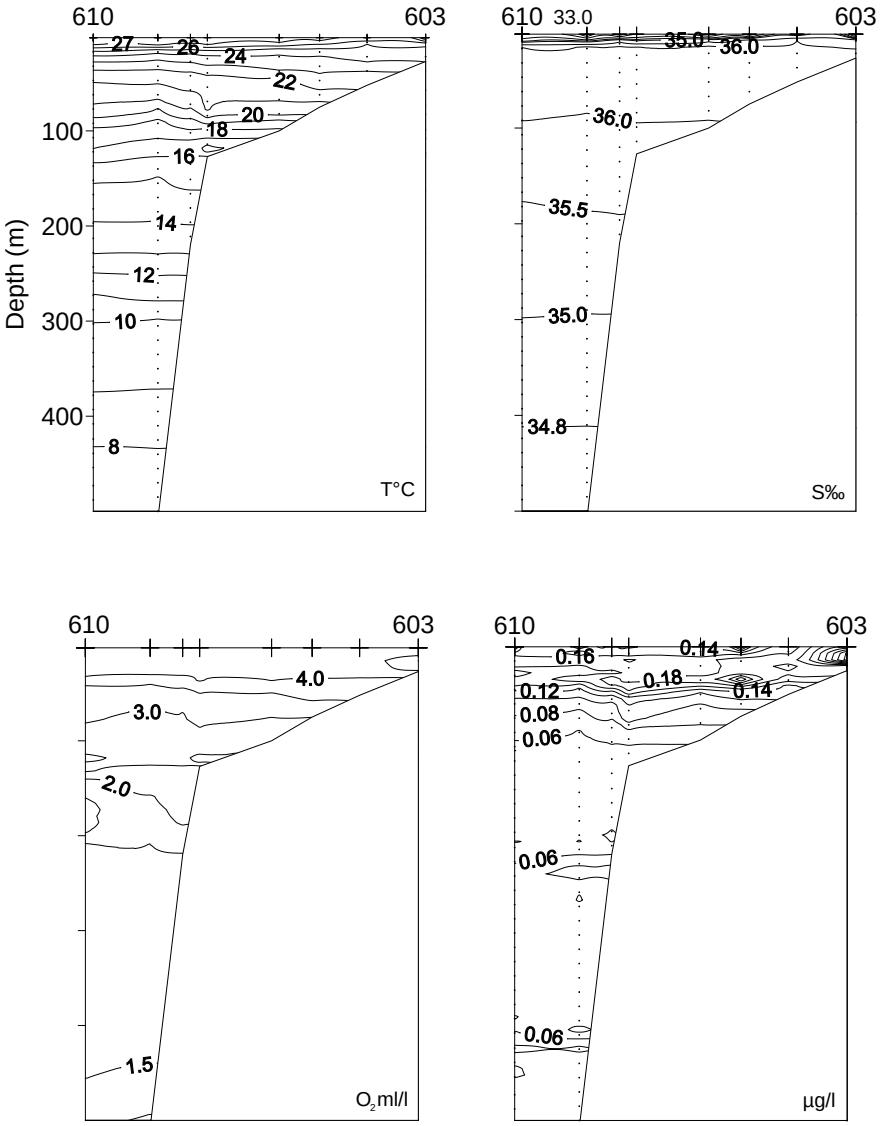


Figure 3.4. Vertical sections of temperature, salinity, oxygen and fluorescence in Gabon and Congo.

CHAPTER 4 DISTRIBUTION, SIZE COMPOSITION AND BIOMASS ESTIMATES

4.1 Gabon North of Cape Lopez

Generally both catch rates and the acoustic detections of all species of pelagic fish north of Cape Lopez were very low. Table 4.1 gives the catch rates in kg/h. Carangids were the most dominant pelagic group by catches followed by the clupeid species.

Sardinella
The sardinellas was distributed in an area between Libreville towards Port Gentil. The low density distribution was mainly between 50 m and 100 m depth, but stretching closer to the coast in the central part of the distribution area.

The *Sardinella aurita* was generally observed in deeper waters in this area while *Sardinella maderensis* were found closer to the coast. All together 4 of 8 trawl stations yielded small quantities of sardinella.

The size distribution of sardinella is depicted in Figure 4.1. The catches of *S. aurita* generally consisted of juvenile fish, with a modal peak around 11 cm. The *S. maderensis* had a wider size distribution and consisted of fish between 9 - 23 cm with a distribution peak around 18 cm. Only one trawl caught *S. maderensis* in this area.

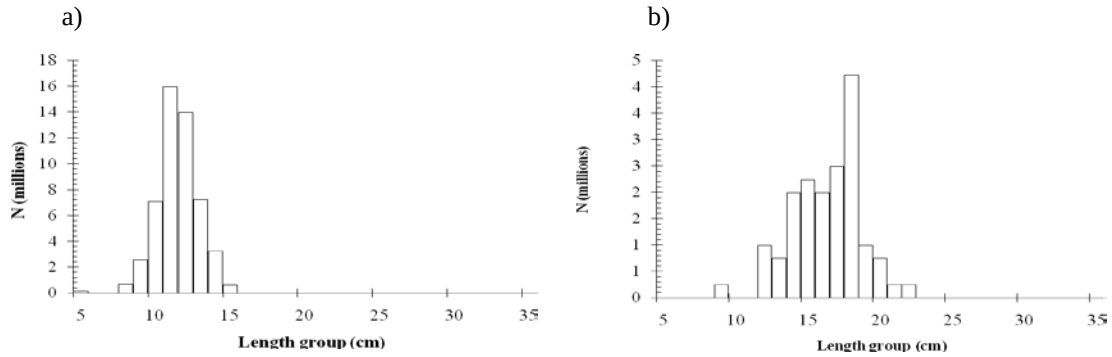


Figure 4.1. Total length distribution of a) *Sardinella aurita* and b) *S. maderensis* off the Northern part of Gabon

The biomass calculated in the northern part of Gabon was 9 hundred tons of *S. aurita* while the estimate of *S. maderensis* was 8 hundred tons.

Horse mackerel
Trachurus trecae was caught in three trawls in low numbers between the 50 and 100 m isobaths. The abundance was very low and no estimate was calculated.

P2

The Pelagic group PEL 2, consisting of carangids, scombrids, barracudas and hairtails, were distributed from the border between Gabon and Equatorial Guinea to Port Gentil more or less continuously between the shelf break at 100 m depth to the coast. A more offshore distribution was found in the northern end of the survey area of Libreville. In this are inshore border of distribution was between 20-50 m depth. The main species caught representing this group were *Chloroscombrus chrysurus, Caranx senegallus, Sphyraena guachancho,* and *Decapterus punctatus*. *Decapterus punctatus* was caught in 6 of the 8 trawls conducted and was the most frequently caught of these species. Except for one trawl, catches of P2 species were low in the area. Assuming an average total length of 23 cm for all the species and a measured condition factor of 0.88 the biomass of PEL 2 was estimated to about 14 000 tons.

Table 4.1. Catch rates in kg/h of main pelagic species in Gabon, North of Cape Lopez

Station	Gear depth	Clupeoids	Carangids	Scombrids	Hairtails	Barracuda	Other	Total
1	0	0	0	0	0	0	0	No Catch
2	35	0.4	5.8	0	0	4.6	1.2	12
3	18	0	1.3	0	0	0	0	1.3
4	27.5	91.7	1330	0	0	76.5	198.4	1696.6
5	68.5	8.6	42.9	0	0	3.2	779.1	833.8
6	27.5	7.8	10.5	0	0.2	0	1.6	20.1
7	9	0	106.3	0	0	1.4	2.9	110.6
8	18	0	4.5	1.5	0	0	9598.4	9604.3
9	0	7.1	8.8	6.7	0	2	1	25.6
Mean	22.6	12.8	167.8	0.9	0	9.7	1175.8	1367.1
Std dev		29.8	437.2	2.2	0.1	25.1	3168.8	3142.6

4.2 Gabon South of Cape Lopez

The region between Cape Lopez and the border to Congo also had lower than usual catch rates and acoustic detections of pelagic fish. Table 4.2 gives the catch rates in kg/h. Carangids were the most dominant pelagic group followed by the clupeid species closely followed by hairtails and barracudas.

Sardinellas

The sardinellas was distributed in many smaller low density patches covering the whole shelf between the closed area at Olindè until Madingo. The *Sardinella aurita* was generally observed in deeper waters in this area while *Sardinella maderensis* were found closer to the coast. All together 16 of the 24 trawl stations in the area contained Sardinellas.

The size distribution of sardinella is depicted in Figure 4.2.The catches of *S. aurita* generally consisted of juvenile fish, with a modal peaks around 9 cm and possibly 12 cm. The *S. maderensis* had a wider size distribution and consisted of fish between 5 - 26 cm. Modal peaks were observed at 6 cm, 12 cm and 22 cm.

The biomass of *S. aurita* estimated in the area was 18 000 tons while the estimated biomass of *S. maderensis* was 12 000 tons.

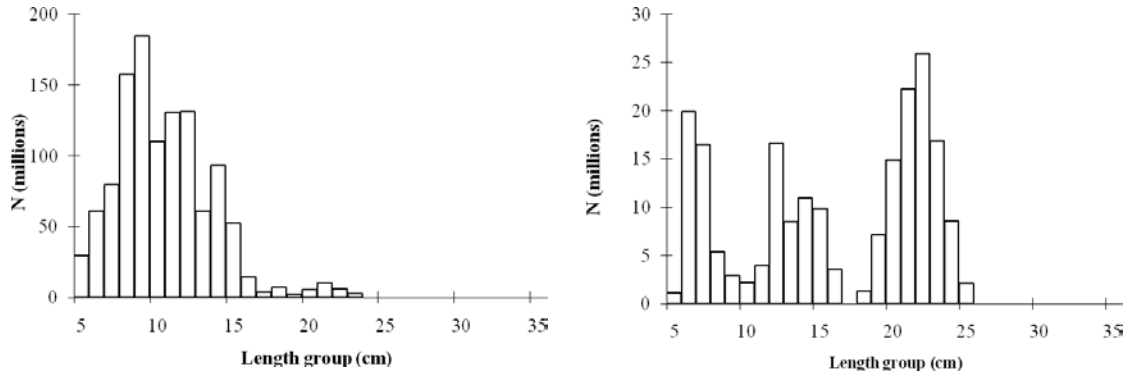


Figure 4.2. Total length distribution of a) *Sardinella aurita* and b) *S. maderensis* off the Southern part of Gabon

Horse mackerel

Horse mackerel, *Trachurus treace*, was found in a small area along the shelf break in the central and southern part of the southern Gabonese shelf. 5 of 24 trawls in this area contained *Trachurus treace*. The horse mackerel was generally caught with bottom trawl and mixed with other demersal species.

Size distribution of the *Trachurus treace* found in the area can be found in Figure 4.3. The length ranged from 13 cm to 23 cm with modal peaks around 15 cm and 18 cm.

The estimated biomass of the *Trachurus treace* in the area was 5 000 tons.

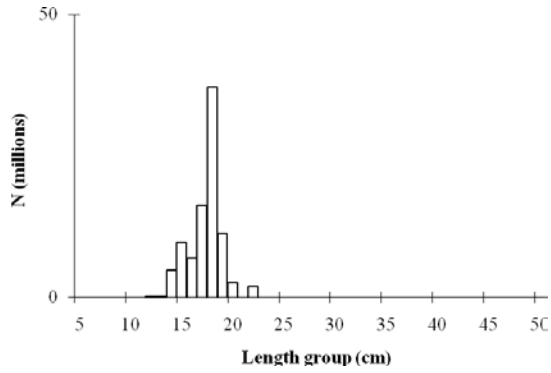


Figure 4.3. Length frequency of *Trachurus trecae* on the southern shelf of Gabon.

P2

The P2 species of fish found in the area was distributed along the coast between the closed area off Olinde to the border with Congo. The main species caught representing this group were *Chloroscombrus chrysurus, Trichiurus lepturus, Sphyraena guachancho, Decapterus punctatus* and *Alectis alexandrines*.

The biomass estimated in the area was based on an average fish size of 23 cm and average condition factor of 0.88 and was estimated to be 18 000 tons.

Table 4.2. Catch rates in kg/h of main pelagic species in Gabon, South of Cape Lopez to the border with Congo

Station	Gear depth	Clupeoids	Carangids	Scombrids	Hairtails	Barracuda	Other	Total
10	18	0	0	0	0	0	14.7	14.7
11	15	0	0	0	67.2	0	7.3	74.5
12	18	0.1	0	5.4	1.2	0	3.6	10.2
13	30.5	7.1	68.7	0	0	0	40.8	116.6
14	14	11.9	3.3	0	0	0	56	71.2
15	18	92.1	19.3	0	0	8.1	4114.8	4234.3
16	20	15.2	3.7	0.4	0	0	3.7	23.1
17	121.5	13.9	978.4	5.3	0	0	2334.3	3331.9
18	15	3.2	0.2	17.5	0	0.2	5.1	26.2
19	18	6	91.4	0	0	1.8	6.2	105.4
20	53	0.1	0.8	0	0	1.8	139.9	142.6
21	3.5	0	0	0	0	0	2.9	2.9
22	74.5	80.2	63.7	0	2.5	13	214.9	374.2
23	57.5	2	0.6	1.1	0	0	3.5	7.2
24	117	0	9.7	1.4	0	0	312.2	323.3
25	41.5	0.9	19	0	1.2	25.7	88	134.7
26	18	0	0.2	75.3	0	0	18.3	93.8
27	62.5	0	0.2	0	2.1	0	166	168.3
28	42.5	1.8	4.3	1.4	1.1	13.1	108.1	129.8
29	104.5	1	6.6	0.2	0	0.2	139.3	147.2
30	38.5	9.9	1.7	1	2.5	29.5	99.6	144.2
31	6	0	0	0	173.8	0	18.7	192.6
32	25	0	3.9	10.2	0	48.8	0	63
33	10	38.5	431.9	0	0	74.5	97.5	642.4
Mean	39.2	11.8	71.1	5	10.5	9	333.1	440.6
Std dev		24.5	212.7	15.5	37.4	18.6	931.9	1047.6

Special observations

Frequent observations of dead fish floating in the surface of one single species *Lagocephalus lagocephalus* was observed over a period of three days in an area from Cape Lopez to Sette Cama during the survey, infrequent observations were made south of this point. This species is caught both in demersal and pelagic trawl (also during this survey), slow moving, and generally found between the coast and 100 m depth. The observations were made in all depths from the coast to 1000 m depth. Samples of the dead fish, water and plankton samples were taken to investigate the phenomena. The fish were relatively fresh and decomposing had just started, indicating that they had died very recently. It is difficult to explain the phenomena that may be related either to the heavy oil exploration activity or possibly to the very high water temperature experienced in the area or other natural causes. No seismic activity was noticed in the area, and no visible pollution were observed. Dead *Lagocephalus lagocephalus* were also observed south of Sette Cama all the way into Angola. However the frequency of observations decreased drastically after Sette Cama. However, a new high concentration area was found on the second transect south of the Congo River at the border between the Congo River water and Angolan shelf water masses. Two CTD’s and water samples were taken also in this area.

During the previous surveys, when biomass of clupeids has been higher in this area, seabirds and marine mammals have been frequently observed on the southern shelf of Gabon. During this survey very few seabirds and no whales were observed in the region. Some dolphins were observed in offshore waters on the border with Congo. These observations also confirm our general observations of much lower than usual biomass in the area.

4.3 Congo

The region between the borders Gabon, Congo and Angola, Congo similar to the two other areas had lower than usual catch rates and acoustic detections of pelagic fish. Table 4.3 gives the catch rates in kg/h.

Sardinella
The sardinellas was distributed in one small low density and one larger medium density area on the coast of Congo. The distribution continued outside of the survey area to Cabinda in Angola. This area was unfortunately not covered during this year's survey because of new access regulations from the operating oil companies in the area. As in other parts of the region *Sardinella aurita* was generally observed in deeper waters in this area while *Sardinella maderensis* were found closer to the coast. All together 5 stations contained *S. maderensis* while 3 stations contained *S. aurita* of the 10 trawls conducted in total in this area.

The size distribution of sardinella is depicted in Figure 4.4.The catches of *S. aurita* generally consisted of adult fish fish, with a modal peaks around 29 cm. This differed from the areas further north that were dominated by juvenile fish. The *S. maderensis* had a wider size distribution and consisted of fish between 7 - 29 cm. Modal peaks were observed at 8 cm and 26 cm, with a possible cohort also indicated around 12 cm.

The biomass of sardinella was considerably higher than in Gabon this year. The biomass of *S. aurita* estimated in the area was 60 000 tons while the estimated biomass of *S. maderensis* was 50 000 tons.

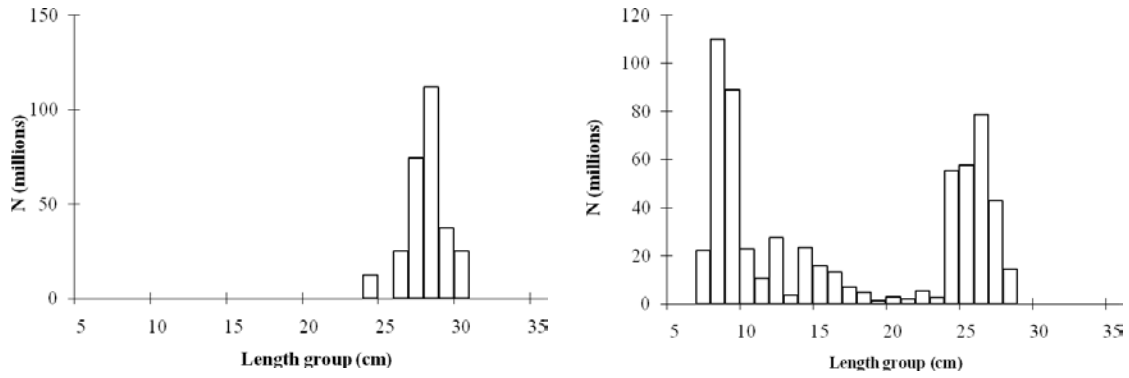


Figure 4.4. Total length distribution of a) *Sardinella aurita* and b) *S. maderensis* off the Southern part of Gabon

Other clupeids

Ilisha africana was caught in 4 trawl stations within the area the species were relatively frequent close to the coast. However, the abundance was low and no biomass estimate was calculated.

Horse mackerel

One station contained this species in this area, a small area offshore around 100 m depth had relatively good concentrations of *Trachurus trecae*. The species were mixed with sardinella and demersal species in the area. The total biomass was estimated to be 600 tons.

P2

The P2 species of fish were distributed across most of the territorial waters of Congo from the coast to approximately 100 m depth. The main species caught representing this group were *Chloroscombrus chrysurus, Sphyraena guachancho, Selene dorsalis and Trichiurus lepturus*

The biomass estimated in the area was based on an average fish size of 23 cm and average condition factor of 0.88 and was estimated to be 8 500 tons.

Table 4.3. Catch rates in kg/h of main pelagic species in the region in Congo

Station	Gear depth	Clupeoids	Carangids	Scombrids	Hairtails	Barracuda	Other	Total
34	5	56.8	6.2	0.9	0.6	5.7	0	70.1
35	5	0.4	0.8	0	0	1.9	7.2	10.3
36	10	0.6	0	0	0	0	1	1.6
37	10	45.2	209.2	0	1.3	14.6	15.6	285.8
38	10	0	0	0	0	0	0	0
39	10	25.5	84.7	10.8	6.2	258.2	146.7	532.1
40	10	70.3	343.5	6.4	18.7	7	28	473.9
41	5	0	1.4	13.4	1	0.4	34.4	50.7
42	10	8.3	7.8	0.4	7.4	2.8	22.4	49.2
43	10	1.2	0	0	0	0	0	1.2
Mean	8.5	20.8	65.4	3.2	3.5	29.1	25.5	147.5
Std dev	2.4	27.1	118.5	5.1	6	80.6	44.4	206

Special observations

Frequent observations of dolphins were made on offshore end of the transects of Congo. These were probably feeding on concentrations of mesopelagic fish observed in the area. Large concentrations of garbage, including plastic debris was found offshore in the area most affected by Congo River water.

Infrequent observations of dead *Lagocephalus lagocephalus* were made in the area.

CHAPTER 5 SUMMARY OF SURVEY RESULTS

The survey of Congo and Gabon were conducted from the 3 May – 13 May. During the survey the vessel covered a total of 1720 nm. 31 pelagic hauls and 12 demersal trawls were conducted. In addition to this 79 ctd's and 14 grab stations were conducted during the period. Material from grab stations will be analysed in Norway.

In the present survey the environmental conditions were characterized by stable conditions. Little wind was observed in the survey area and the conditions were favourable for acoustic abundance estimation. SST ranged from 29.2°C -25.1°C but was generally between 27°C and 28°C in the whole survey area. SSS were relatively low in both the northern and southern ends of the survey area while the central part of Gabon showed salinities around 35 PSU. The survey period was almost two months earlier than last years survey and this probably influenced our observations of SST and SSS to a great extent. Water masse were in general much warmer (~6°C) than last year.

The abundance of pelagic species in Gabon and Congo, particularly the sardinellas has been relatively high in resent years. Several areas in Congo and Gabon are restricted because of oil exploration activities, and particularly the area outside Olinde in Gabon is large and can possibly contain high abundance of pelagic fish. The area is omitted from the abundance calculations.

5.1 Sardinellas

Sardinellas was distributed in several small low density area across the entire region of Gabon and Congo from inshore of 20 m depth to offshore of 100 m (Figure 5.1). Concentrations increased in the southern part of the survey area. Typical schooling pattern of sardinella was observed less frequently than usual, partly because of the dominance of juvenile stages, but possibly also because of the warmer than usual sea water observed in the area. The two species showed typical separation in distribution with *S. aurita* generally found further offshore than the *S. maderensis.*

Figure 5.2 (a and b) shows the length frequency distribution of sardinellas. Last year there was a lack of signs of recruitment in catches of *S. aurita*, contrary to what has been observed previously in the area. This year again the main part of the fish is <15 cm, with a modal peak at 9 cm. Another modal peak can be observed for adult fish around 28 cm. The length distribution of *S. maderensis* shows four modal peaks at 8 cm, possibly at 14 cm, 22 cm and 27 cm. The relative cumulative biomass of sardinellas can be found in Figure 5.3. Juvenile *S. aurita* dominated in the survey area in numbers but in terms of biomass an adult cohort made so approximately 50% of the biomass was >27 cm. For *S. maderensis* 50% of the biomass <25 cm. Last year no juvenile *S. aurita* was found in the survey area, and 50 of the biomass was >28 cm. The situation was different for *S. maderensis* were 50% of the biomass was < 22 cm.

The biomass in Gabon and Congo was estimated to 80 thousand tonnes of *S. aurita* and 63 thousand tonnes of *S. maderensis.* Last year the biomass of sardinellas was estimated at 159 thousand tonnes all together. This consisted of 123 thousand tonnes of *S. aurita* and 35 thousand tonnes of *S. maderensis.* The two species showed slightly higher proportion of *S.maderensis* in the survey area this year than what was observed last year. 56% of the Sardinella was calculated to be *S. aurita*. The abundance of sardinellas has continued to decrease in the region from the estimate in 2005 that was the highest ever recorded.

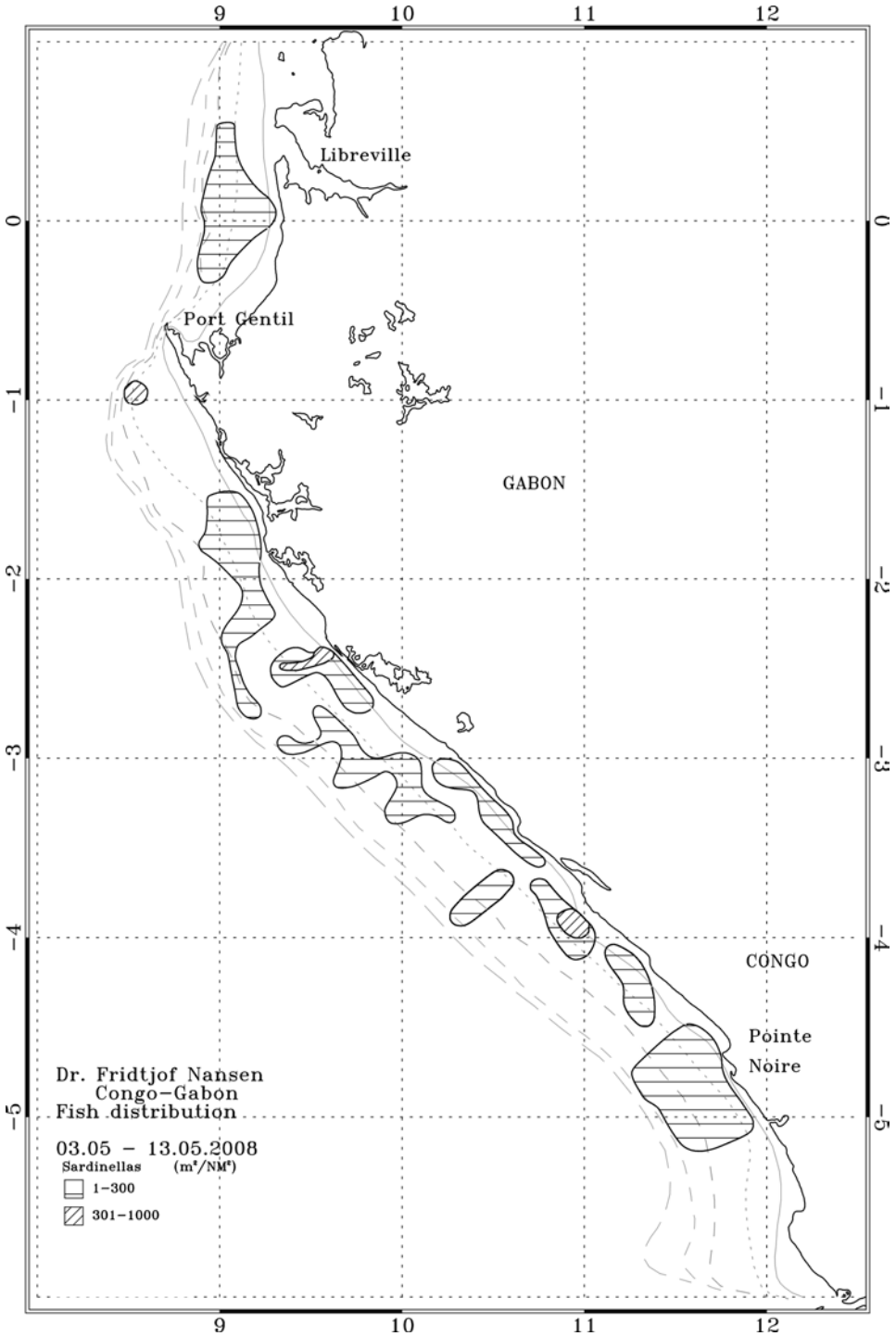


Figure 5.1. Distribution of sardinellas off Gabon and Congo.

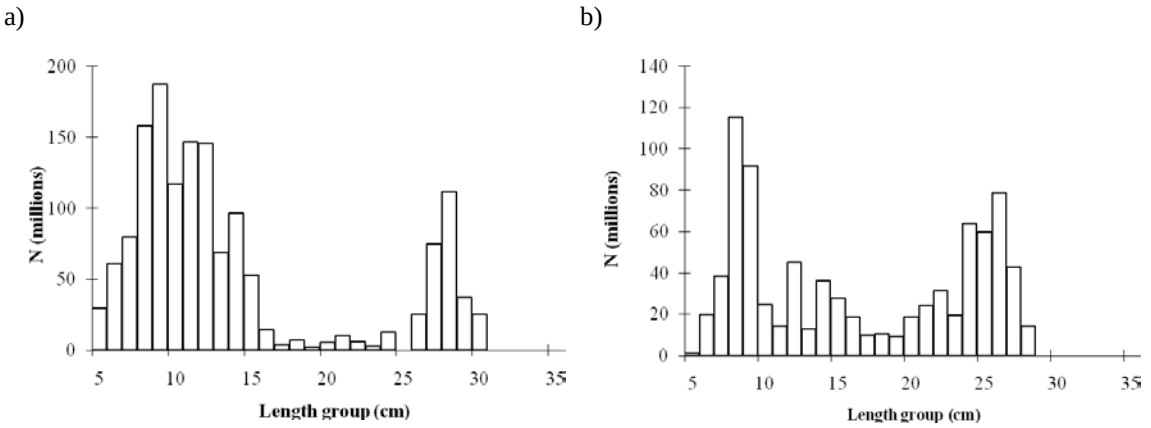


Figure 5.2. Total length distribution of a) *Sardinella aurita* and b) *S. maderensis* off Gabon and Congo

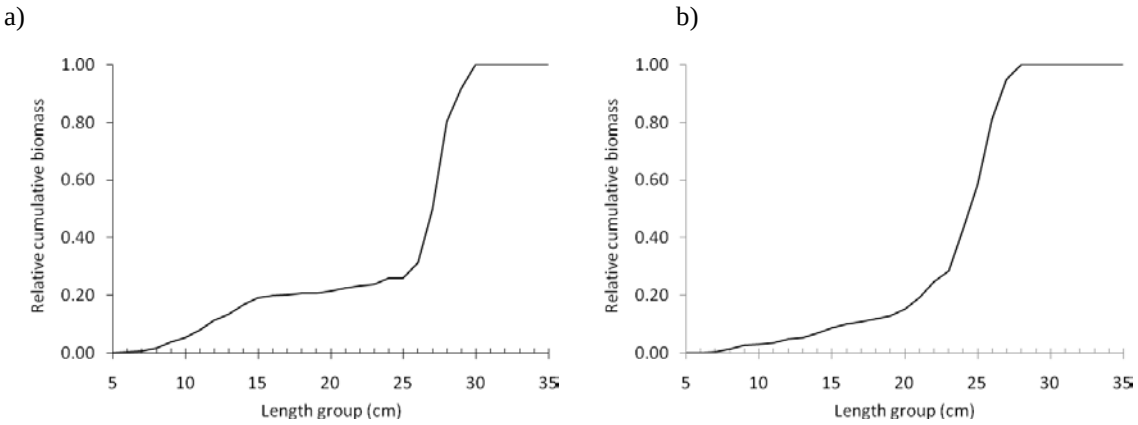


Figure 5.3. Relative cumulative biomass of a) *Sardinella aurita* and b) *S. maderensis* off Gabon and Congo

5.2 Other Clupeids

As last year some *Ilisha africana* was found inshore along the coast associated with brackish water areas. The abundance was low and no abundance estimate or distribution map was produced. No Anchovy, *Engraulis encrasicolus* was found in the survey area this year.

5.3 Trachurus trecae

The horse mackerel *Trachurus trecae* was distributed on the mid shelf mostly off southern Gabon and in Congo between 50 m and 100 m depth in five low density (s_A<300) areas (Figure 5.4), one small low density area off Congo is not shown on the illustration. The species were mainly observed on the shelf edge this year and mixed with other demersal species. It was generally found close to the bottom and acoustic species separation was difficult at times.

The length distribution (Figure 5.5 a) shows only one cohort of fish with a modal peak of 18 cm. Last year the length distribution contained fish of a wide size distribution from 11 cm to 26 cm with a modal peak of 15 cm.

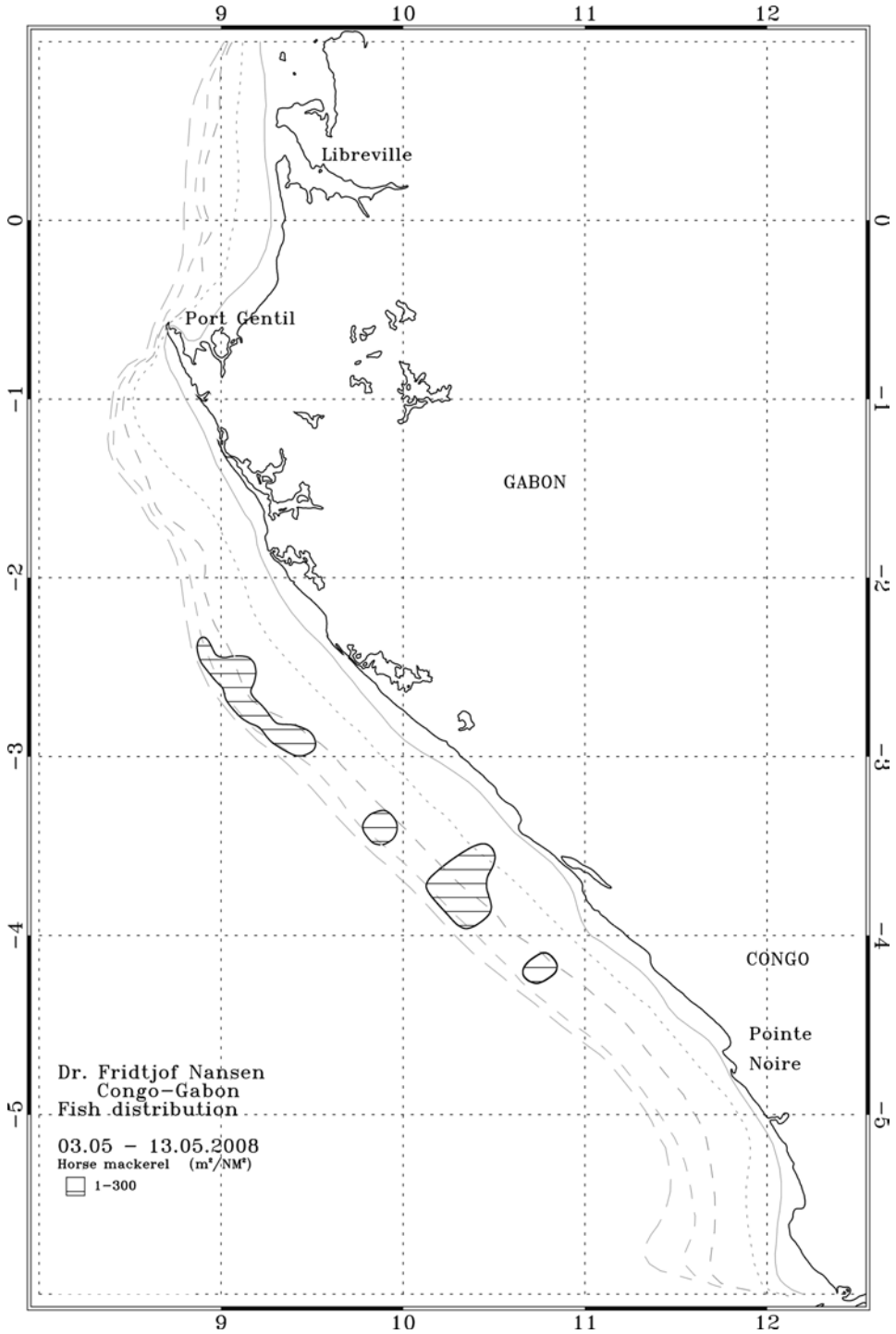


Figure 5.4 Distribution of *Trachurus trecae* off Gabon and Congo.

The cumulative biomass (Figure 5.5 b) reflects that only one cohort was present in the survey area. 50% of the biomass was >17 cm.

The total biomass of *Trachurus trecae* in the distribution area was 5.6 thousand tonnes. This is slightly more than the very low biomass of only 400 tonnes observed last year. The 2007 was the lowest estimate recorded in the region during the last five years. The biomass is still very low and no recruitment was observed this year, possibly because the survey was earlier than previous years.

a) b)

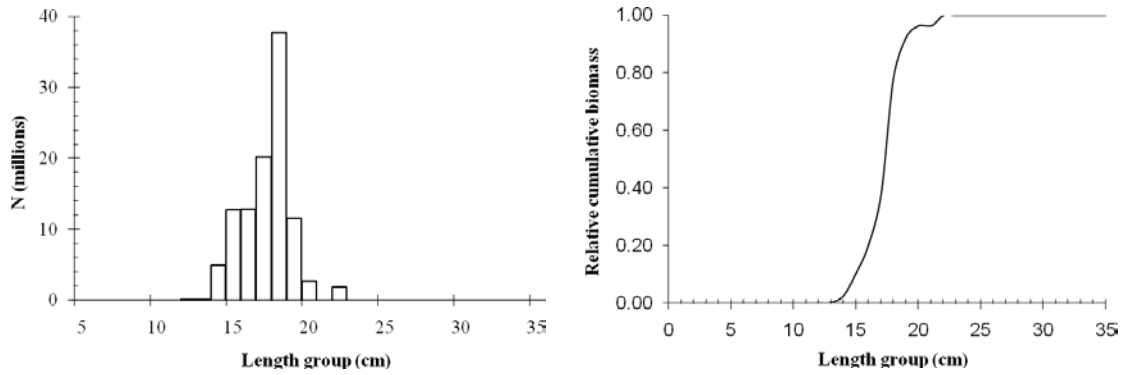


Figure 5.5. a) Total length distribution and b) Relative cumulative biomass of *Trachurus trecae* off Gabon and Congo

5.4 Other pelagic fish

The Pelagic group PEL 2 (carangids, scombrids, barracudas and hairtails) were more or less continues in Gabon and Congo, Figure 5.6. The main distribution extended from inside of the survey area to approximately 100 m depth in the whole survey area. The fish were generally scattered and density in the area was low (s_A<300). Catch rates were analysed for the regions Gabon, north and south of Cape Lopez, and Congo, Table 4.1,Table 4.2 andTable 4.3. The length distributions of the different species within this group are found in Annex II. Assuming an average total length of 23 cm for all the species and a measured condition factor of 0.88 the biomass of PEL 2 was estimated to 41 000 tons, of this 8 000 tons were found in Congo. Last year about 57 thousand tonnes of P2 was estimated in total. Of this 48 thousand tonnes was found in Gabon while 9 thousand tonnes were found in Congo.

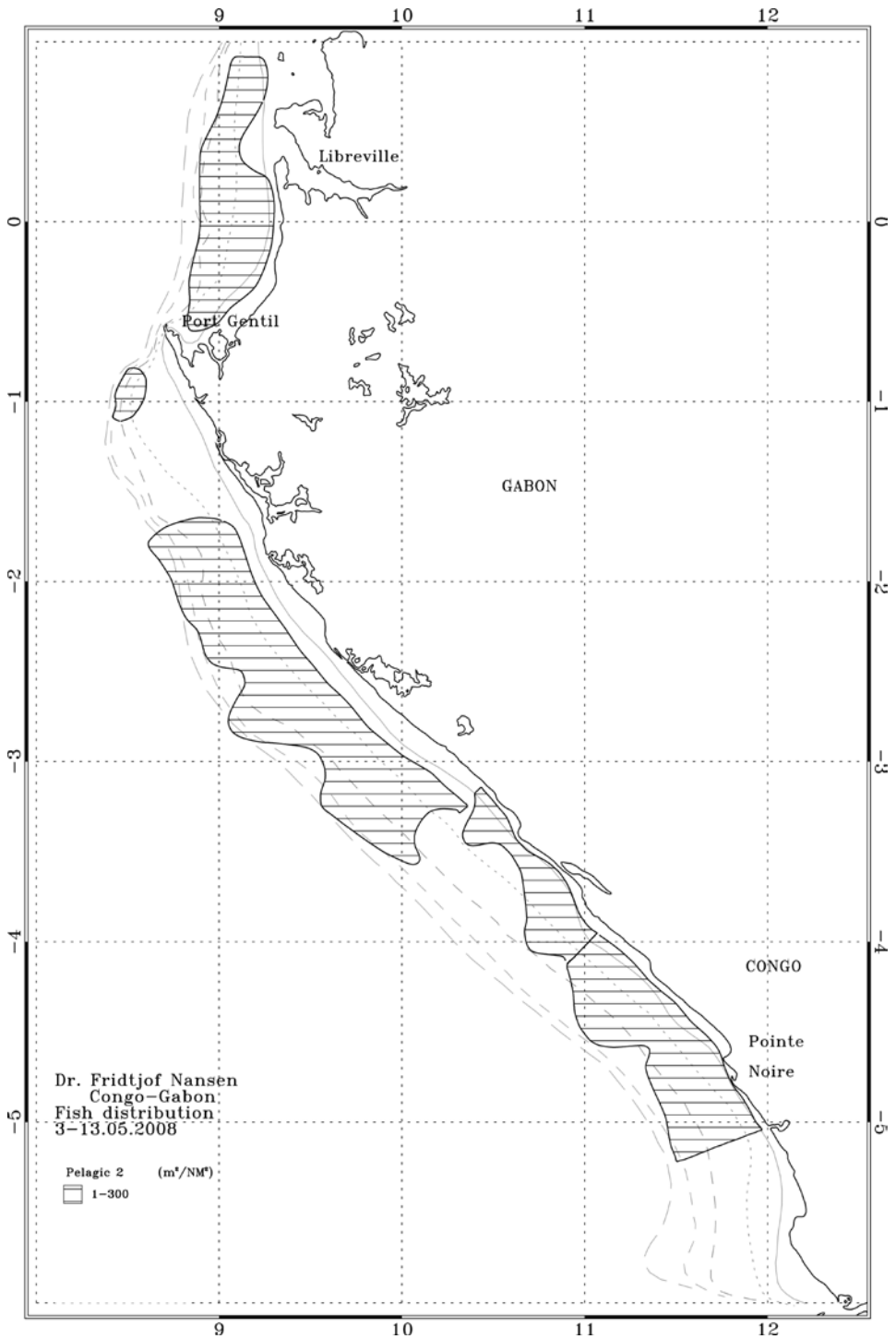


Figure 5.6 Distribution of PEL 2 species off Gabon and Congo.

Table 5.1 Summary table of biomass estimates for the main species groups and countries for the surveys conducted in 2004 -2007

Species group	Year	Congo	Gabon
Sardinella	2008	110 000	32 000
	2007	28 000	130 000
	2006	19 000	225 000
	2005	128 000	288 000
	2004	360 000*	
P1	2008	-	-
	2007	-	-
	2006	18 000	19 000
	2005	-	-
	2004	-	-
P2	2008	8 000	32 000
	2007	9 000	48 000
	2006	8 000	36 000
	2005	7 000	30 000
	2004	69 000*	
Horse mackerel	2008	600	5 000
	2007	-	400
	2006	1 000	7 000
	2005	4 000	11 000
	2004	11 000*	

- No biomass calculated because of low / no abundance

*Surveys of Congo and Gabon in 2004 also covered Cabinda in Angola

CHAPTER 6 RESUME DES RESULTATS DE CAMPAGE EN FRANCAIS

La campagne Gabon-Congo a été effectuée du 03 au 13 mai 2008. Au cours de cette campagne, le navire a couvert une distance de 1.720 mn avec 31 traits de chalut pélagique et 12 traits de chalut démersal auxquels s'ajoutent 79 stations hydrologiques CTD et 14 de prélèvement de sédiments. Les échantillons de sédiments prélevés dans les stations seront analysés en Norvège.
Durant cette campagne, les conditions de l'environnement étaient relativement stables. Un vent léger était observé, ce qui a facilité la réalisation des estimations acoustiques dans les conditions favorables. La température de surface - à 5 m de profondeur - (SST) variait entre 29.2°C – 25.1°C, mais elle était principalement stabilisée entre 27°C et 28°C dans l'ensemble de la zone couverte par la campagne. La salinité de surface - à 5 m de profondeur - (SSS) était relativement peu élevée entre les deux extrêmes nord et sud de l'aire couverte, alors que la partie centrale du Gabon présentait un taux de salinité autour de 35 pm . La campagne a eu lieu 2 mois plus tôt par rapport aux années précédentes. Et cela a certainement influencé nos observations sur la SST et la SSS sur une vaste étendue. La température de l'eau était en général plus élevée de 6°C par rapport à l'année dernière.
Les espèces pélagiques particulièrement les sardinelles étaient relativement moins abondantes par rapport aux années précédentes. Aussi, certaines zones sont interdites d'accès à cause de l'exploitation pétrolière. C'est le cas notamment de la zone hors d'Olinde, au Gabon, qui doit contenir probablement beaucoup d'espèces pélagiques. Cette zone a été exclue dans l'évaluation faite.

6.1 Sardinelles

Les sardinelles étaient distribuées à faible densité dans plusieurs petites zones à travers toute la région prospectée du Gabon au Congo. Et cela partant de 20 m de profondeur de la côte jusqu'à 100 m au large (Figure 5.1). Cependant, les concentrations augmentaient dans la partie sud de la zone de prospection. L'échantillon typique de sardinelles a été moins important que d'ordinaire. Cela à cause de la dominance des juvéniles, mais aussi et probablement à cause de la température élevée observée dans la région. Les deux espèces, Sardinella aurita rencontrée généralement plus en profondeur que S. maderensis, ont présenté une nette séparation dans la distribution.
La Figure 5.2 (a et b) montre la fréquence de taille dans la distribution des sardinelles. L'année précédente les signes de recrutement étaient absents dans les captures de Sardinella aurita, contrairement à ce qui avait été observé précédemment dans la région. Cette année encore, la part essentielle du poisson était composée d'individus inférieurs à 15 cm avec un mode de 9 cm. Un autre mode autour de 28 cm a pu être observé pour le poisson adulte. La distribution de taille de Sardinella maderensis indique quatre modes maximum de 8 cm, mais souvent de 14, 22 et 27 cm.
La biomasse relative cumulative des sardinelles peut être observée dans la Figure 5.3. Les juvéniles de Sardinella aurita ont dominé en nombre dans la zone prospectée, mais en terme de biomasse une cohorte d'adultes représentait approximativement 50 % avec un mode supérieur à 27 cm. Pour Sardinella maderensis, 50 % de la biomasse était inférieure à 25 cm. L'année dernière, les non juvéniles de Sardinella aurita étaient rencontrés dans la zone prospectée et 50 % de biomasse était supérieure à 28 cm. La situation était différente pour Sardinella maderensis dont 50 % de la biomasse était inférieure à 22 cm.

La biomasse au Gabon et au Congo a été estimée à 80.000 tonnes pour Sardinella aurita et à 63.000 tonnes pour Sardinella maderensis. L'année dernière, la biomasse des sardinelles était estimée dans l'ensemble à 159.000 tonnes, dont 123.000 tonnes de S. aurita contre 35.000 tonnes de S. maderensis. Cette année, par rapport à ce qui a été observé l'année dernière, les deux espèces ont présenté une proportion légèrement supérieure de S. maderensis dans la zone prospectée. 56 % de sardinelles estimées étaient S. aurita. L'abondance des sardinelles connaît une baisse dans région par rapport à 2005 qui avait connu le grand record.

6.2 Autres Clupeidés

Comme l'année dernière, quelques Ilisha africana associés aux autres espèces d'eau saumâtre étaient localisées près de la côte. L'abondance de ces espèces était faible et la distribution sur la carte peu représentative.
Cette année, aucun banc d'anchois (Engraulis encrasicolus) n'a été enregistré dans la zone prospectée.

6.3 Trachurus trecae

Un banc de chinchard (Trachurus trecae) a été localisé principalement dans la moitié sud du Gabon et au Congo dans les profondeurs situées entre 50m et 100m dans cinq zones à faible densité. La zone peu dense n'est pas illustrée. Cette année les espèces étaient principalement observées près de la côte, mélangées avec d'autres espèces démersales et plus souvent observées dans les fonds où la perception acoustique était difficile.
La distribution de taille (Fig 5.5a) indique seulement un seul groupe de poisson avec un maximum de mode de 18 cm. L'année dernière, la distribution de taille comprenait les poissons de dimension considérable dont la distribution variait entre 11 et 26 cm avec un mode maximum de 15 cm.
La biomasse cumulée (Fig 5.5b) démontre seulement la présence d'un seul groupe dans la zone prospectée. 50% de la biomasse était supérieure à 17cm.
La biomasse de Trachurus trecae dans la zone de distribution était de 5.600 tonnes ; ce qui est largement plus élevé que la biomasse de 400 tonnes observée l'année dernière.
L'année 2007 a connu le plus bas record des estimations dans la région par rapport aux cinq dernières années. La biomasse est encore très faible et l'absence des captures a été observée cette année probablement à cause de l'anticipation de la période de la campagne.

6.4 Autres poissons pélagiques

Le groupe des pélagiques PEL 2 (Carangidés, Scombridés, Sphyraenidés et Trichiuridés) a été plus ou moins constant au Gabon et au Congo (Figure 5.6). La principale distribution s'étend de l'intérieur de la zone jusqu'à approximativement 100 m de profondeur dans l'ensemble de la zone prospectée.
Le poisson était éparpillé avec une faible densité dans la zone prospectée (Sa < 300). Le taux de capture a été analysé pour les zones gabonaises au nord et au sud du Cap Lopez et au Congo (Tableau 4.1, Tableau 4.2 et Tableau 4.3). La distribution de taille des différentes espèces du groupe est illustrée en annexe II. En admettant une moyenne totale de taille de 23 cm pour toutes les espèces et le facteur de condition de mesure de 0,88 ; la biomasse de PEL 2 a été estimée à 41.000 tonnes dont 8.000 tonnes sont localisées au Congo. L'année dernière, environ 57.000 tonnes de P2 avaient été estimées au total, dont 48.000 tonnes étaient au Gabon et 9.000 tonnes seulement au Congo.

CHAPTER 7 REFERENCES

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ANNEX I Records of fishing stations

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 1
DATE :03.05.2008 GEAR TYPE: PT NO: 7 POSITION:Lat N 0°43.83
start stop duration Lon E 9°14.19
TIME :18:20:53 18:35:56 15.1 (min) Purpose : 1
LOG : 9550.03 9551.06 1.0 Region : 3300
FDEPTH: 0 0 Gear cond.: 8
BDEPTH: 18 23 Validity : 9
Towing dir: 0° Wire out : 0 m Speed : 4.1 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 2
DATE :04.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat N 0°22.54
start stop duration Lon E 8°58.60
TIME :03:14:48 03:44:15 29.5 (min) Purpose : 1
LOG : 9612.32 9613.55 1.2 Region : 3300
FDEPTH: 0 70 Gear cond.: 0
BDEPTH: 71 71 Validity : 0
Towing dir: 0° Wire out : 135 m Speed : 2.5 kn
Sorted : 0 Total catch: 5.91 Catch/hour: 12.05

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyraena guachancho	4.60	2	38.22	
Decapterus punctatus	3.34	436	27.74	3
Trachurus trecae	2.49	132	20.63	2
Ariomma bondi	1.10	71	9.13	
Sardinella aurita	0.39	24	3.21	1
Alloteuthis africana	0.12	104	1.01	
Dactylopterus volitans	0.00	2	0.03	
Hippocampus sp.	0.00	2	0.02	
Total	12.05		99.99	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 3
DATE :04.05.2008 GEAR TYPE: PT NO: 1 POSITION:Lat N 0°9.09
start stop duration Lon E 9°14.99
TIME :07:28:31 07:58:23 29.9 (min) Purpose : 1
LOG : 9645.84 9647.70 1.9 Region : 3300
FDEPTH: 18 18 Gear cond.: 0
BDEPTH: 25 26 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.7 kn
Sorted : 0 Total catch: 0.64 Catch/hour: 1.29

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caranx senegallus	1.29	2	100.00	
Total	1.29		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 4
DATE :04.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat N 0°3.45
start stop duration Lon E 9°14.14
TIME :09:49:07 10:07:26 18.3 (min) Purpose : 1
LOG : 9663.26 9664.35 1.1 Region : 3300
FDEPTH: 27 28 Gear cond.: 0
BDEPTH: 27 28 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.6 kn
Sorted : 152 Total catch: 518.31 Catch/hour: 1696.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	1236.46	25218	72.88	4
Sardinella maderensis	84.12	1869	4.96	5
Sphyraena guachancho	76.46	390	4.51	8
Brachydeuterus auritus	66.68	1326	3.93	
Galeoides decadactylus	60.65	556	3.58	
Caranx senegallus	50.74	101	2.99	
Sparus caeruleostictus *	24.26	177	1.43	
Pomadasys jubelini	20.92	56	1.23	
Caranx hippos	18.82	65	1.11	
Selar crumenophthalmus	14.89	111	0.88	7
Sepia officinalis hierredda	11.91	10	0.70	
Ilisha africana	7.56	268	0.45	
Selene dorsalis	5.47	121	0.32	6
Torpedo torpedo	4.78	10	0.28	
Caranx crysos	3.67	33	0.22	
Psettodes belcheri	2.88	10	0.17	
Dentex gibbosus	2.55	10	0.15	
Pseudupeneus prayensis	1.21	10	0.07	
Lutjanus fulgens	0.88	10	0.05	
Aluterus heudelotii	0.88	23	0.05	
Penaeus notialis	0.79	23	0.05	
Total	1696.60		100.0	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 5
DATE :04.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat N 0°3.54
start stop duration Lon E 9°0.73
TIME :12:38:58 12:59:23 20.4 (min) Purpose : 1
LOG : 9680.54 9681.57 1.0 Region : 3300
FDEPTH: 67 70 Gear cond.: 0
BDEPTH: 67 70 Validity : 0
Towing dir: 0° Wire out : 195 m Speed : 3.0 kn
Sorted : 0 Total catch: 283.62 Catch/hour: 833.77

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex congoensis	486.82	556	58.39	13
Priacanthus arenatus	153.45	4498	18.40	
Decapterus punctatus	41.01	2884	4.92	10
Dentex angolensis	40.66	300	4.88	12
Sepia officinalis hierredda	27.34	26	3.28	
Pseudupeneus prayensis	23.72	415	2.85	
Epinephelus aeneus	17.34	29	2.08	
Pagellus bellottii	16.93	326	2.03	9
Sardinella aurita	7.32	503	0.88	11
Pagrus caeruleostictus	3.44	9	0.41	
Sphyraena guachancho	3.17	9	0.38	
Chloroscombrus chrysurus	1.94	44	0.23	
Raja miraletus	1.85	9	0.22	
Alloteuthis africana	1.59	1235	0.19	
Fistularia petimba	1.56	24	0.19	
Balistes capriscus	1.32	3	0.16	
Lepidotrigla cadmani	1.29	47	0.16	
Sardinella maderensis	1.23	26	0.15	
Illex coindetii	0.62	9	0.07	
Penaeus notialis	0.62	9	0.07	
Sphoeroides marmoratus	0.35	18	0.04	
Monolene microstoma	0.09	26	0.01	
Isopod	0.09	26	0.01	
Total	833.77		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 6
DATE :04.05.2008 GEAR TYPE: PT NO: 1 POSITION:Lat S 0°14.71
start stop duration Lon E 8°57.87
TIME :23:18:16 23:49:20 31.1 (min) Purpose : 1
LOG : 9750.02 9751.23 1.2 Region : 3300
FDEPTH: 30 25 Gear cond.: 0
BDEPTH: 68 66 Validity : 0
Towing dir: 0° Wire out : 105 m Speed : 3.4 kn
Sorted : 0 Total catch: 10.40 Catch/hour: 20.09

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Decapterus punctatus	9.41	1028	46.83	15
Sardinella aurita	7.78	794	38.75	14
Trachurus trecae	1.10	68	5.48	16
Dactylopterus volitans	0.62	137	3.08	
Ariomma bondi	0.39	21	1.92	
Uroconger lepturus	0.23	10	1.15	
Lagocephalus laevigatus	0.21	2	1.06	
Trichiurus lepturus	0.17	2	0.87	
Priacanthus arenatus	0.15	17	0.77	
Saurida brasiliensis	0.02	6	0.10	
Total	20.09		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 7
DATE :05.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 0°23.84
start stop duration Lon E 8°59.73
TIME :03:35:24 04:05:07 29.7 (min) Purpose : 1
LOG : 9783.15 9784.89 1.7 Region : 3300
FDEPTH: 0 18 Gear cond.: 0
BDEPTH: 32 33 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 3.5 kn
Sorted : 0 Total catch: 54.76 Catch/hour: 110.59

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caranx senegallus	76.44	151	69.12	
Selar crumenophthalmus	18.48	172	16.71	
Decapterus punctatus	10.36	198	9.37	17
Priacanthus arenatus	2.32	18	2.10	
Sphyraena guachancho	1.41	4	1.28	
Caranx hippos	0.99	2	0.89	
Alloteuthis africana	0.20	343	0.18	
Illex coindetii	0.14	2	0.13	
Saurida brasiliensis	0.12	50	0.11	
Dactylopterus volitans	0.12	22	0.11	
Total	110.59		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 8
DATE :05.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 0°32.58
start stop duration Lon E 8°51.66
TIME :06:17:00 06:38:52 21.9 (min) Purpose : 1
LOG : 9803.65 9804.66 1.0 Region : 3300
FDEPTH: 18 18 Gear cond.: 0
BDEPTH: 44 39 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 2.8 kn
Sorted : 0 Total catch: 3502.37 Catch/hour: 9604.31

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	9597.81	105576	99.93	
Caranx senegallus	3.07	5	0.03	
Scomberomorus tritor	1.48	3	0.02	
Decapterus punctatus	0.85	22	0.01	
Trachurus trecae	0.55	5	0.01	
Balistes capriscus	0.55	3	0.01	
Total	9604.31		100.00	

R/V

"DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 9

DATE :05.05.2008 GEAR TYPE: PT NO: 5 POSITION:Lat S 1°1.25
start stop duration Lon E 8°30.41
TIME :18:08:00 18:38:20 30.3 (min) Purpose : 1
LOG : 9874.25 9875.93 1.7 Region : 3300
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 65 74 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 2.8 kn
Sorted : 0 Total catch: 12.94 Catch/hour: 25.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomberomorus tritor	6.73	2	26.28	
Selar crumenophthalmus	4.93	44	19.24	20
Sardinella maderensis	3.60	32	14.06	18
Sardinella aurita	3.50	42	13.68	19
Caranx crysos	2.10	10	8.19	
Sphyraena guachancho	2.00	14	7.81	22
Decapterus punctatus	1.78	30	6.96	21
Ariomma bondi	0.49	6	1.93	
Saurida brasiliensis	0.30	170	1.16	
Alloteuthis africana	0.14	28	0.54	
Priacanthus arenatus	0.04	2	0.15	
Total	25.60		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 10

DATE :05.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 1°13.70
start stop duration Lon E 8°28.29
TIME :20:55:26 21:25:59 30.6 (min) Purpose : 1
LOG : 9891.28 9892.86 1.6 Region : 3300
FDEPTH: 18 18 Gear cond.: 0
BDEPTH: 116 118 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 0 Total catch: 7.47 Catch/hour: 14.67

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Ariomma bondi	14.22	603	96.92	
Synagrops japonicus	0.45	43	3.08	
Total	14.67		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 11

DATE :06.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 1°31.92
start stop duration Lon E 8°35.22
TIME :00:20:41 00:45:41 25.0 (min) Purpose : 1
LOG : 9914.62 9916.14 1.5 Region : 3300
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 111 127 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
Sorted : 0 Total catch: 31.06 Catch/hour: 74.54

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	67.20	336	90.15	
Illex coindetii	4.49	48	6.02	
Ariomma bondi	1.30	38	1.74	
Lagocephalus lagocephalus	1.25	2	1.67	
Synagrops japonicus	0.31	31	0.42	
Total	74.54		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 12

DATE :06.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 1°41.12
start stop duration Lon E 8°50.80
TIME :04:35:27 05:05:09 29.7 (min) Purpose : 1
LOG : 9944.77 9946.73 2.0 Region : 3300
FDEPTH: 18 18 Gear cond.: 0
BDEPTH: 68 72 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 4.0 kn
Sorted : 0 Total catch: 5.04 Catch/hour: 10.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Euthynnus alletteratus	5.39	4	52.98	
Lagocephalus laevigatus	3.51	6	34.52	
Trichiurus lepturus	1.15	6	11.31	
Sardinella aurita	0.06	2	0.60	
Illex coindetii	0.04	10	0.40	
Selar crumenophthalmus	0.02	6	0.20	
Total	10.18		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 13

DATE :06.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 1°41.26
start stop duration Lon E 9°3.20
TIME :08:56:41 09:27:08 30.5 (min) Purpose : 1
LOG : 9979.54 9981.14 1.6 Region : 3300
FDEPTH: 31 30 Gear cond.: 0
BDEPTH: 31 30 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.2 kn
Sorted : 0 Total catch: 59.17 Catch/hour: 116.59

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	57.34	833	49.18	27
Brachydeuterus auritus	13.77	217	11.81	
Pagellus bellottii	12.12	138	10.39	
Sardinella maderensis	7.05	79	6.05	24
Decapterus rhonchus	5.26	16	4.51	23
Pseudupeneus prayensis	5.20	61	4.46	
Sepia officinalis hierredda	4.47	6	3.84	
Selar crumenophthalmus	3.29	81	2.82	26
Lagocephalus lagocephalus	2.98	6	2.55	
Caranx crysos	2.21	24	1.89	25
Selene dorsalis	0.63	8	0.54	
Lagocephalus laevigatus	0.55	4	0.47	
Trachinocephalus myops	0.53	8	0.46	
Penaeus notialis	0.33	6	0.29	
Eucinostomus melanopterus	0.32	6	0.27	
Pagrus caeruleostictus	0.26	6	0.22	
Galeoides decadactylus	0.10	2	0.08	
Syacium micrurum	0.06	8	0.05	
Bothus guibei	0.06	2	0.05	
SCYLLARIDAE	0.06	24	0.05	
Total	116.59		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 14

DATE :06.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 1°58.20
start stop duration Lon E 8°59.79
TIME :19:40:21 20:10:12 29.9 (min) Purpose : 1
LOG : 40.13 41.64 1.5 Region : 3300
FDEPTH: 14 14 Gear cond.: 0
BDEPTH: 67 61 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 0 Total catch: 35.42 Catch/hour: 71.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	53.25	725	74.82	28
Sardinella aurita	11.90	386	16.71	29
Decapterus punctatus	3.32	82	4.66	30
Lagocephalus lagocephalus	2.33	4	3.27	
Ariomma bondi	0.38	8	0.54	
Total	71.17		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 15

DATE :06.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 1°50.77
start stop duration Lon E 9°10.29
TIME :22:05:17 22:27:30 22.2 (min) Purpose : 1
LOG : 57.80 59.00 1.2 Region : 3300
FDEPTH: 18 18 Gear cond.: 0
BDEPTH: 26 27 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted :11702 Total catch: 1567.00 Catch/hour: 4233.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Galeoides decadactylus	3569.20	773	84.31	
Brachydeuterus auritus	438.13	11049	10.35	31
Sardinella maderensis	63.94	17811	1.51	34
Pomadasys jubelini	24.39	105	0.58	
Sardinella maderensis	23.23	267	0.55	32
Arius heudeloti	18.48	11	0.44	
Pseudotolithus senegalensis	12.10	11	0.29	
Penaeus notialis	11.78	419	0.28	
Pagellus bellottii	10.81	132	0.26	
Parapenaeopsis atlantica	8.75	176	0.21	
Chloroscombrus chrysurus	8.40	135	0.20	
Sphyraena guachancho	8.13	62	0.19	
Cymbium pepo	7.67	5	0.18	
Decapterus punctatus	4.67	300	0.11	
Sardinella aurita	3.84	103	0.09	33
Rhinobatos albomaculatus	3.46	5	0.08	
Decapterus rhonchus	3.03	35	0.07	
Monolene microstoma	1.81	30	0.04	
Calappa rubroguttata	1.70	14	0.04	
Caranx crysos	1.65	14	0.04	
Eucinostomus melanopterus	1.57	35	0.04	
Selene dorsalis	1.51	19	0.04	
Pomadasys incisus	1.27	5	0.03	
Aluterus heudelotii	1.16	5	0.03	
Ilisha africana	1.08	43	0.03	
Lagocephalus laevigatus	0.92	5	0.02	
Alloteuthis africana	0.43	22	0.01	
Pseudupeneus prayensis	0.35	5	0.01	
Dactylopterus volitans	0.30	5	0.01	
Penaeus kerathurus	0.30	5	0.01	
Octopus vulgaris	0.24	5	0.01	
Total	4234.31		100.03	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 16

DATE :07.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 2°7.23
start stop duration Lon E 9°3.72
TIME :01:22:09 01:51:02 28.9 (min) Purpose : 1
LOG : 83.47 85.01 1.5 Region : 3300
FDEPTH: 20 20 Gear cond.: 0
BDEPTH: 67 73 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 0 Total catch: 11.13 Catch/hour: 23.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	15.25	814	65.95	35
Decapterus punctatus	3.74	156	16.17	
Lagocephalus lagocephalus	1.33	2	5.75	
Sepia officinalis hierredda	1.12	6	4.85	
Saurida brasiliensis	0.60	162	2.61	
Brachydeuterus auritus	0.48	6	2.07	
Scomber japonicus	0.39	6	1.71	
Alloteuthis africana	0.12	91	0.54	
Citharus linguatula	0.06	2	0.27	
Bregmaceros sp.	0.02	2	0.09	
Total	23.12		100.00	

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DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 17
DATE :07.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 2°35.04
start stop duration Lon E 9°3.68
TIME :13:10:17 13:40:33 30.3 (min) Purpose : 1
LOG : 189.66 191.19 1.5 Region : 3300
FDEPTH: 121 122 Gear cond.: 0
BDEPTH: 121 122 Validity : 0
Towing dir: 0° Wire out : 340 m Speed : 3.0 kn
Sorted : 0 Total catch: 1679.84 Catch/hour: 3331.91

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex canariensis	1391.17	18934	41.75	
Trachurus trecae	976.46	16919	29.31	37
Spicara alta	528.71	6179	15.87	
Boops boops	217.43	3667	6.53	
Ariomma bondi	59.46	1190	1.78	
Mustelus mustelus	33.52	4	1.01	
Torpedo torpedo	27.09	65	0.81	
Dentex angolensis	22.79	65	0.68	
Sardinella aurita	13.86	561	0.42	36
Umbrina canariensis	10.57	34	0.32	
Fistularia petimba	9.58	34	0.29	
Priacanthus arenatus	8.25	99	0.25	
Lepidotrigla cadmani	8.25	133	0.25	
Raja miraletus	5.93	34	0.18	
Scomber japonicus	5.28	99	0.16	
Dactylopterus volitans	3.63	34	0.11	
Chelidonichthys gabonensis	3.63	34	0.11	
Scorpaena stephanica	3.33	4	0.10	
Decapterus punctatus	1.96	133	0.06	
Lepidotrigla carolae	0.99	34	0.03	
Total	3331.91		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 18
DATE :07.05.2008 GEAR TYPE: PT NO: 5 POSITION:Lat S 2°39.76
start stop duration Lon E 9°10.64
TIME :18:20:41 18:50:36 29.9 (min) Purpose : 1
LOG : 218.83 220.32 1.5 Region : 3300
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 93 90 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 0 Total catch: 13.05 Catch/hour: 26.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Auxis thazard	13.98	40	53.41	
Lagocephalus lagocephalus	4.91	10	18.77	
Euthynnus alletteratus	3.55	8	13.56	
Sardinella aurita	3.19	120	12.18	38
Sphyraena sphyraena	0.18	2	0.69	
Decapterus punctatus	0.18	6	0.69	
Loligo vulgaris	0.14	70	0.54	
Saurida brasiliensis	0.04	14	0.15	
Total	26.17		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 19
DATE :07.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 2°28.86
start stop duration Lon E 9°24.59
TIME :21:06:17 21:36:18 30.0 (min) Purpose : 1
LOG : 238.65 240.27 1.6 Region : 3300
FDEPTH: 18 18 Gear cond.: 0
BDEPTH: 46 52 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 0 Total catch: 52.73 Catch/hour: 105.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Alectis alexandrinus	82.47	36	78.23	
Decapterus punctatus	7.64	810	7.24	39
Sardinella aurita	6.00	498	5.69	40
Sphyraena guachancho	1.80	6	1.71	
Loligo vulgaris	1.72	538	1.63	
Decapterus rhonchus	1.30	6	1.23	
Saurida brasiliensis	1.14	740	1.08	
Lutjanus fulgens	1.08	2	1.02	
Brachydeuterus auritus	0.92	140	0.87	
Paronchelius stauchi	0.60	262	0.57	
Apsilus fuscus	0.34	2	0.32	
Priacanthus arenatus	0.16	4	0.15	
Alloteuthis africana	0.14	60	0.13	
Sphyraena sphyraena	0.04	4	0.04	
Pseudupeneus prayensis	0.04	6	0.04	
Echeneis naucrates	0.02	2	0.02	
Bregmaceros sp.	0.02	6	0.02	
Total	105.42		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 20
DATE :08.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 2°38.72
start stop duration Lon E 9°31.71
TIME :02:15:51 02:44:54 29.0 (min) Purpose : 1
LOG : 278.00 279.48 1.5 Region : 3300
FDEPTH: 53 53 Gear cond.: 0
BDEPTH: 53 53 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.1 kn
Sorted : 0 Total catch: 69.02 Catch/hour: 142.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagellus bellottii	53.72	4723	37.67	
Brachydeuterus auritus	22.62	5932	15.86	
Citharus linguatula	6.22	128	4.36	
Pseudupeneus prayensis	5.64	393	3.96	
Torpedo torpedo	4.96	19	3.48	
Lepidotrigla carolae	4.75	110	3.33	
Trachinus armatus	4.73	101	3.32	
Trachinocephalus myops	4.40	56	3.09	
Lagocephalus lagocephalus	3.84	6	2.69	
Saurida brasiliensis	3.53	1368	2.48	
Trachinus radiatus	3.20	8	2.25	
Cynoglossus canariensis	3.10	12	2.17	
Diodon holocanthus	2.91	37	2.04	
Cynoponticus ferox	2.48	41	1.74	
Syacium micrurum	2.05	671	1.43	
Dactylopterus volitans	1.94	143	1.36	
Chlorophthalmus atlanticus	1.90	165	1.33	
Sepia officinalis hierredda	1.90	83	1.33	
Sphyraena guachancho	1.78	10	1.25	
Bothus podas africanus	1.76	85	1.23	
Dicologoglossa hexophthalma	0.95	21	0.67	
Decapterus punctatus	0.79	58	0.55	41
Trachinus vipera	0.52	35	0.36	
Galeoides decadactylus	0.43	6	0.30	
Solenocera africana	0.37	731	0.26	
E C H I N O D E R M A T A	0.33	171	0.23	
Raja miraletus	0.29	4	0.20	
Balistes capriscus	0.27	2	0.19	
Squilla mantis	0.19	8	0.13	
Aluterus heudelotii	0.19	2	0.13	
Cepola pauciradiatus	0.17	19	0.12	
Octopus vulgaris	0.14	8	0.10	
Uranoscopus cadenati	0.12	10	0.09	
Scyllarus sp.	0.12	62	0.09	
Sardinella aurita	0.12	17	0.09	
Penaeus kerathurus	0.08	2	0.06	
Serranus accraensis	0.06	14	0.04	
C R A B S	0.02	17	0.01	
Xyrichtys novacula	0.02	6	0.01	
Total	142.62		100.01	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 21
DATE :08.05.2008 GEAR TYPE: PT NO: 7 POSITION:Lat S 2°44.69
start stop duration Lon E 9°46.82
TIME :13:21:45 13:51:38 29.9 (min) Purpose : 1
LOG : 371.78 373.60 1.8 Region : 3300
FDEPTH: 0 7 Gear cond.: 0
BDEPTH: 32 33 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
Sorted : 0 Total catch: 1.42 Catch/hour: 2.85

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Raja miraletus	1.69	4	59.15	
Dactylopterus volitans	1.16	6	40.85	
Total	2.85		100.00	

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"DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 22
DATE :08.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 2°55.41
start stop duration Lon E 9°40.59
TIME :16:34:15 17:04:05 29.8 (min) Purpose : 1
LOG : 393.59 395.08 1.5 Region : 3300
FDEPTH: 75 74 Gear cond.: 0
BDEPTH: 75 74 Validity : 0
Towing dir: 0° Wire out : 205 m Speed : 3.0 kn
Sorted : 0 Total catch: 186.05 Catch/hour: 374.22

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	79.95	5216	21.37	42
Umbrina canariensis	67.68	163	18.09	
Decapterus punctatus	63.66	5105	17.01	43
Lutjanus goreensis	24.34	32	6.50	
Pomadasys incisus	16.63	97	4.45	
Pagellus bellottii	13.19	117	3.53	
Sphyraena sphyraena	13.01	72	3.48	
Sepia officinalis hierredda	12.83	10	3.43	
Diodon holocanthus	8.35	2	2.23	
Dentex congoensis	8.27	14	2.21	
Fistularia petimba	6.13	26	1.64	
Sargocentron hastatus	4.51	30	1.20	
Boops boops	4.47	507	1.19	
Gymnura sp.	4.14	2	1.11	
Rhinobatos albomaculatus	3.92	2	1.05	
Chromis cadenati	3.62	111	0.97	
Epinephelus aeneus	2.57	4	0.69	
Trichiurus lepturus	2.49	4	0.67	
Antennarius sp.	2.49	2	0.67	
Balistes capriscus	2.45	2	0.66	
Pseudupeneus prayensis	2.41	74	0.64	
Dasyatis sp.	2.29	2	0.61	
Octopus vulgaris	2.25	2	0.60	
Pagrus caeruleostictus	2.23	4	0.60	
Torpedo torpedo	2.19	4	0.59	
Mustelus mustelus	2.15	2	0.58	
Raja miraletus	2.09	6	0.56	
Parapristipoma humile	1.97	2	0.53	
Aluterus monoceros	1.53	2	0.41	
Chelidonichthys gabonensis	1.29	14	0.34	
Pagrus auriga	1.13	2	0.30	
Dasyatis marmorata	1.11	2	0.30	
Aluterus heudelotii	1.11	4	0.30	
Scorpaena scrofa	1.05	12	0.28	
Citharus linguatula	0.76	24	0.20	
Zeus faber	0.60	4	0.16	
Brachydeuterus auritus	0.56	8	0.15	
Lagocephalus laevigatus	0.54	4	0.15	
Dactylopterus volitans	0.48	2	0.13	
Cynoglossus canariensis	0.42	2	0.11	
Chaetodon hoefleri	0.40	2	0.11	
Engraulis encrasicolus	0.24	28	0.06	
Chaetodon marcellae	0.20	8	0.05	
Chilomycterus spinosus mauret.	0.16	2	0.04	
Grammoplites gruveli	0.12	4	0.03	
Galeoides decadactylus	0.10	2	0.03	
Saurida brasiliensis	0.04	20	0.01	
Chaetodon robustus	0.04	2	0.01	
Total	374.22		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 23
DATE :08.05.2008 GEAR TYPE: PT NO: 2 POSITION:Lat S 3°6.42
start stop duration Lon E 9°41.66
TIME :21:53:07 22:23:21 30.2 (min) Purpose : 1
LOG : 438.61 440.41 1.8 Region : 3300
FDEPTH: 55 60 Gear cond.: 0
BDEPTH: 104 95 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
Sorted : 0 Total catch: 3.64 Catch/hour: 7.22

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sepia officinalis hierredda	2.42	4	33.52	
Sardinella aurita	2.02	119	28.02	44
Scomber japonicus	1.13	18	15.66	47
Decapterus punctatus	0.60	38	8.24	46
Ariomma bondi	0.50	32	6.87	45
Saurida brasiliensis	0.28	46	3.85	
Brachydeuterus auritus	0.22	2	3.02	
Illex coindetii	0.06	2	0.82	
Total	7.22		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 24
DATE :09.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 3°25.85
start stop duration Lon E 9°52.82
TIME :08:58:11 09:28:06 29.9 (min) Purpose : 1
LOG : 526.85 528.36 1.5 Region : 3300
FDEPTH: 117 117 Gear cond.: 0
BDEPTH: 117 117 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 3.0 kn
Sorted : 0 Total catch: 161.26 Catch/hour: 323.27

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex congoensis	146.74	1469	45.39	
Spicara alta	34.18	684	10.57	
Boops boops	28.27	565	8.74	
Mustelus mustelus	25.16	2	7.78	
Sepia officinalis hierredda	11.75	104	3.63	
Rhinobatos albomaculatus	10.73	4	3.32	
Heptranchias perlo	10.22	2	3.16	
Antennarius sp.	10.22	2	3.16	
Trachurus trecae	9.66	164	2.99	
Umbrina canariensis	7.50	22	2.32	
Squatina oculata	5.51	2	1.71	
Dentex angolensis	3.83	18	1.18	
Zeus faber	3.39	8	1.05	
Raja miraletus	2.81	6	0.87	
Scorpaena scrofa	2.73	4	0.84	
Chelidonichthys gabonensis	2.02	20	0.63	
Anthias anthias	2.02	42	0.63	
Sea cucumbers	1.52	6	0.47	
Scomber japonicus	1.40	32	0.43	48
Ariomma bondi	1.08	44	0.33	
Fistularia petimba	1.00	2	0.31	
Citharus linguatula	0.64	26	0.20	
Lepidotrigla carolae	0.48	14	0.15	
Antigonia capros	0.32	6	0.10	
OPHIDIIDAE	0.08	4	0.02	
Total	323.27		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 25
DATE :09.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 3°10.95
start stop duration Lon E 10°10.86
TIME :12:23:26 12:52:39 29.2 (min) Purpose : 1
LOG : 555.27 556.71 1.4 Region : 3300
FDEPTH: 42 41 Gear cond.: 0
BDEPTH: 42 41 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 0 Total catch: 65.62 Catch/hour: 134.74

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	16.06	78	11.92	
Pagellus bellottii	15.48	121	11.49	
Sphyraena guachancho	14.35	60	10.65	50
Brachydeuterus auritus	13.57	7357	10.07	
Sphyraena sphyraena	11.31	164	8.40	49
Galeoides decadactylus	11.19	47	8.31	
Pagrus caeruleostictus	10.62	25	7.88	
Drepane africana	9.38	8	6.96	
Paragaleus pectoralis	6.57	2	4.88	
Dentex canariensis	6.24	10	4.63	
Ephippion guttifer	4.23	2	3.14	
Balistes punctatus	2.03	2	1.51	
Caranx crysos	1.97	10	1.46	
Fistularia petimba	1.97	10	1.46	
Pseudupeneus prayensis	1.70	16	1.26	
Lutjanus fulgens	1.27	2	0.94	
Trichiurus lepturus	1.17	2	0.87	
Ilisha africana	0.90	31	0.67	
Pomadasys jubelini	0.90	2	0.67	
Cynoglossus canariensis	0.78	2	0.58	
Chilomycterus spinosus mauret.	0.47	2	0.35	
Decapterus rhonchus	0.41	2	0.30	
Chaetodon robustus	0.37	4	0.27	
Trachinus radiatus	0.37	2	0.27	
Citharus linguatula	0.35	2	0.26	
Alloteuthis africana	0.25	133	0.18	
Trachurus trecae	0.25	4	0.18	
Illex coindetii	0.14	2	0.11	
Decapterus punctatus	0.14	29	0.11	
Selar crumenophthalmus	0.14	2	0.11	
Aluterus heudelotii	0.06	2	0.05	
Squilla mantis	0.06	2	0.05	
Total	134.74		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 26
DATE :09.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 3°28.26
start stop duration Lon E 10°3.01
TIME :18:28:27 18:58:32 30.1 (min) Purpose : 1
LOG : 604.71 606.27 1.6 Region : 3300
FDEPTH: 18 18 Gear cond.: 0
BDEPTH: 106 114 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 0 Total catch: 47.02 Catch/hour: 93.79

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Auxis thazard	68.52	241	73.05	53
Saurida brasiliensis	12.47	3473	13.29	
Ariomma bondi	4.59	189	4.89	52
Euthynnus alletteratus	3.73	10	3.98	
Scomber japonicus	3.05	68	3.25	51
Lagocephalus lagocephalus	1.26	2	1.34	
Decapterus punctatus	0.18	10	0.19	
Total	93.79		100.00	

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"DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 27
DATE :10.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 3°29.83
start stop duration Lon E 10°19.06
TIME :02:20:49 02:39:55 19.1 (min) Purpose : 1
LOG : 665.68 666.66 1.0 Region : 3300
FDEPTH: 63 62 Gear cond.: 0
BDEPTH: 63 62 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.1 kn
Sorted : 0 Total catch: 53.59 Catch/hour: 168.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dasyatis centroura	26.70	13	15.86	
Squatina aculeata	24.82	3	14.74	
Rhinobatos albomaculatus	17.59	6	10.45	
Raja miraletus	16.21	44	9.63	
Pagellus bellottii	13.26	396	7.87	54
Torpedo torpedo	12.06	38	7.17	
Pseudupeneus prayensis	9.17	462	5.45	
Paraconger notialis	7.57	455	4.50	
Brachydeuterus auritus	4.90	188	2.91	
Grammoplites gruveli	4.65	465	2.76	
Pomadasys incisus	3.61	25	2.15	
Boops boops	3.17	471	1.88	
Monolene microstoma	3.05	1332	1.81	
Citharus linguatula	3.02	47	1.79	
Lagocephalus lagocephalus	2.92	6	1.74	
Cynoglossus canariensis	2.86	13	1.70	
NETTASTOMATIDAE	2.32	163	1.38	
Trichiurus lepturus	2.10	9	1.25	
Apogon apogonides	2.04	399	1.21	
Chelidonichthys sp.	1.32	13	0.78	
Sepia officinalis hierredda	1.19	19	0.71	
Saurida brasiliensis	1.01	273	0.60	
Aluterus heudelotii	0.50	3	0.30	
Solenocera africana	0.44	836	0.26	
Fistularia petimba	0.38	3	0.22	
Chilomycterus spinosus mauret.	0.38	6	0.22	
Dactylopterus volitans	0.28	22	0.17	
Trachinocephalus myops	0.25	3	0.15	
Decapterus punctatus	0.22	3	0.13	
Serranus accraensis	0.19	19	0.11	
Alloteuthis africana	0.09	60	0.06	
Trachinus pellegrini	0.03	6	0.02	
Monochirus hispidus	0.03	3	0.02	
Total	168.35		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 28
DATE :10.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 3°31.87
start stop duration Lon E 10°31.78
TIME :06:26:53 06:57:43 30.8 (min) Purpose : 1
LOG : 702.81 704.32 1.5 Region : 3300
FDEPTH: 42 43 Gear cond.: 0
BDEPTH: 42 43 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.9 kn
Sorted : 0 Total catch: 66.76 Catch/hour: 129.88

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Rhinobatos albomaculatus	14.88	6	11.46	
Pagrus auriga	13.93	6	10.72	
Sphyraena guachancho	13.07	387	10.07	
Brachydeuterus auritus	12.32	2163	9.48	
Pagellus bellottii	10.78	86	8.30	
Pomadasys incisus	8.93	47	6.88	
Dasyatis marmorata	6.71	2	5.17	
Dentex canariensis	5.29	6	4.07	
Pagrus caeruleostictus	4.65	4	3.58	
Galeoides decadactylus	4.49	66	3.46	
Portunus validus	3.19	6	2.46	
Plectorhinchus mediterraneus	3.05	2	2.35	
Octopus vulgaris	3.04	2	2.34	
Decapterus punctatus	2.63	270	2.02	56
Bodianus speciosus	2.51	6	1.93	
Pseudupeneus prayensis	2.51	45	1.93	
Umbrina canariensis	2.10	6	1.62	
Acanthurus monroviae	1.96	2	1.51	
Ilisha africana	1.65	60	1.27	58
Scomberomorus tritor	1.36	2	1.05	
Scyllarides herklotsii	1.13	2	0.87	
Trichiurus lepturus	1.11	8	0.85	
Lutjanus fulgens	1.01	4	0.78	
Dactylopterus volitans	0.86	4	0.66	
Sepia officinalis hierredda	0.70	2	0.54	
Raja miraletus	0.60	2	0.46	
Aluterus heudelotii	0.60	4	0.46	
Decapterus rhonchus	0.56	31	0.43	57
Pseudotolithus typus	0.54	2	0.42	
Rypticus saponaceus	0.53	4	0.40	
Chaetodon robustus	0.53	14	0.40	
Trachinus radiatus	0.43	2	0.33	
Selene dorsalis	0.43	6	0.33	
Caranx crysos	0.33	4	0.25	
Alectis alexandrinus	0.23	2	0.18	
Penaeus notialis	0.21	4	0.16	
Sardinella aurita	0.18	39	0.13	55
Pteroscion peli	0.14	2	0.10	
Selar crumenophthalmus	0.14	2	0.10	
Squilla mantis	0.10	4	0.07	
Grammoplites gruveli	0.10	12	0.07	
NETTASTOMATIDAE	0.06	6	0.04	
OPHICHTHIDAE	0.06	2	0.04	
Trachinus armatus	0.06	4	0.04	
SCYLLARIDAE	0.02	6	0.01	
Citharus linguatula	0.02	2	0.01	
Serranus accraensis	0.02	2	0.01	
Poroderma sp.	0.02	2	0.01	
Uranoscopus polli	0.02	2	0.01	
Trachinocephalus myops	0.00	2	0.00	
Total	129.79		99.93	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 29
DATE :10.05.2008 GEAR TYPE: BT NO: 22 POSITION:Lat S 3°43.40
start stop duration Lon E 10°18.49
TIME :09:39:03 10:02:53 23.8 (min) Purpose : 1
LOG : 726.64 727.82 1.2 Region : 3300
FDEPTH: 105 104 Gear cond.: 0
BDEPTH: 105 104 Validity : 0
Towing dir: 0° Wire out : 290 m Speed : 3.0 kn
Sorted : 0 Total catch: 58.45 Catch/hour: 147.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagellus bellottii	54.49	2478	37.02	
Sepia officinalis hierredda	26.31	166	17.88	
Spicara alta	14.78	3442	10.04	
Epinephelus aeneus	8.69	3	5.90	
Trachurus trecae	6.27	154	4.26	59
Boops boops	5.54	272	3.76	
Ariomma bondi	5.19	121	3.52	
Squatina oculata	3.90	3	2.65	
Fistularia petimba	2.82	5	1.92	
Saurida brasiliensis	2.74	609	1.86	
Dentex congoensis	2.37	18	1.61	
Lepidotrigla cadmani	1.91	86	1.30	
Scorpaena scrofa	1.79	3	1.21	
Dentex barnardi	1.76	3	1.20	
Scorpaena stephanica	1.74	3	1.18	
Sardinella aurita	0.96	91	0.65	60
Lepidotrigla carolae	0.86	13	0.58	
Dentex angolensis	0.78	3	0.53	
Pseudupeneus prayensis	0.60	13	0.41	
Citharus linguatula	0.60	13	0.41	
Illex coindetii	0.60	8	0.41	
Zeus faber	0.53	5	0.36	
Chaetodon robustus	0.50	3	0.34	
Chelidonichthys gabonensis	0.38	3	0.26	
Octopus vulgaris	0.38	3	0.26	
Decapterus punctatus	0.30	25	0.21	
Sphyraena sphyraena	0.20	3	0.14	
Scomber japonicus	0.18	5	0.12	
Total	147.17		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 30
DATE :10.05.2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 3°36.59
start stop duration Lon E 10°41.13
TIME :16:53:03 17:23:32 30.5 (min) Purpose : 1
LOG : 787.48 789.03 1.5 Region : 3300
FDEPTH: 38 39 Gear cond.: 0
BDEPTH: 38 39 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 0 Total catch: 73.26 Catch/hour: 144.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	29.91	1431	20.75	
Sphyraena guachancho	29.52	321	20.48	
Sepia officinalis hierredda	13.56	30	9.40	
Pseudotolithus typus	8.58	12	5.95	
Pagellus bellottii	8.17	67	5.66	
Galeoides decadactylus	7.91	130	5.49	
Ilisha africana	6.42	268	4.45	
Pseudupeneus prayensis	6.20	120	4.30	
Pteroscion peli	4.07	65	2.83	
Trachinocephalus myops	3.72	59	2.58	
Sardinella maderensis	3.31	189	2.29	61
Pomadasys jubelini	2.62	6	1.82	
Trichiurus lepturus	2.52	28	1.75	
Citharus linguatula	2.44	37	1.69	
Rhinobatos albomaculatus	2.26	2	1.57	
Portunus validus	2.03	4	1.41	
Chelidonichthys gabonensis	1.89	16	1.31	
Decapterus rhonchus	1.18	39	0.82	63
Cynoglossus canariensis	1.08	2	0.75	
Scomberomorus tritor	0.98	2	0.68	
Stromateus fiatola	0.94	2	0.66	
Trachinus vipera	0.67	16	0.46	
Diodon holocanthus	0.65	4	0.45	
Psettodes belcheri	0.59	2	0.41	
Bothus guibei	0.49	45	0.34	
Lagocephalus laevigatus	0.47	2	0.33	
Caranx crysos	0.35	4	0.25	
Penaeus notialis	0.33	20	0.23	
Penaeus kerathurus	0.33	24	0.23	
Grammoplites gruveli	0.26	30	0.18	
Uranoscopus polli	0.20	18	0.14	
Alectis alexandrinus	0.16	6	0.11	
Sardinella aurita	0.14	35	0.10	62
Stephanolepis hispidus	0.08	2	0.05	
Dactylopterus volitans	0.08	2	0.05	
Squilla mantis	0.06	2	0.04	
Total	144.17		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 31
DATE :11.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 4°8.97
start stop duration Lon E 10°33.86
TIME :02:33:08 03:02:39 29.5 (min) Purpose : 1
LOG : 858.78 860.34 1.6 Region : 3300
FDEPTH: 6 6 Gear cond.: 0
BDEPTH: 134 129 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 0 Total catch: 94.72 Catch/hour: 192.59

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	173.84	846	90.27	
Ariomma bondi	13.15	624	6.83	
Polymetme corythaeola	5.49	5166	2.85	
Saurida brasiliensis	0.06	10	0.03	
Illex coindetii	0.02	4	0.01	
Cubiceps gracilis	0.02	2	0.01	
Total	192.59		100.00	

"DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 32
DATE :11.05.2008 GEAR TYPE: PT NO: 5 POSITION:Lat S 3°52.62
start stop duration Lon E 10°49.62
TIME :06:28:32 06:50:42 22.2 (min) Purpose : 1
LOG : 888.83 889.98 1.1 Region : 3300
FDEPTH: 25 25 Gear cond.: 0
BDEPTH: 42 41 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 0 Total catch: 23.28 Catch/hour: 62.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyraena guachancho	48.83	68	77.53	64
Scomberomorus tritor	7.28	11	11.55	
Alectis alexandrinus	3.25	3	5.15	
Euthynnus alletteratus	2.89	3	4.60	
Selene dorsalis	0.70	3	1.12	
Echeneis naucrates	0.03	3	0.04	
Total	62.98		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 33
DATE :11.05.2008 GEAR TYPE: PT NO: 5 POSITION:Lat S 4°0.62
start stop duration Lon E 10°59.50
TIME :09:13:52 09:43:24 29.5 (min) Purpose : 1
LOG : 909.09 910.65 1.6 Region : 3300
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 31 42 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 0 Total catch: 316.16 Catch/hour: 642.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	428.21	8564	66.66	
Sphyraena guachancho	74.47	311	11.59	66
Brachydeuterus auritus	53.95	0	8.40	
Sardinella maderensis	30.29	542	4.72	65
Pseudotolithus typus	18.49	10	2.88	
Stromateus fiatola	16.32	39	2.54	
Ilisha africana	8.17	384	1.27	
Pomadasys jubelini	3.60	8	0.56	
Selene dorsalis	2.93	169	0.46	
Pteroscion peli	1.71	30	0.27	
Pomadasys peroteti	1.32	4	0.21	
Arius parkii	0.85	6	0.13	
Ariomma bondi	0.85	37	0.13	
Trachinotus ovatus	0.73	4	0.11	
Rhizoprionodon acutus	0.45	2	0.07	
Sardinella aurita	0.06	6	0.01	
Total	642.38		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 34
DATE :11.05.2008 GEAR TYPE: PT NO: 7 POSITION:Lat S 4°7.33
start stop duration Lon E 11°11.31
TIME :19:18:22 19:48:15 29.9 (min) Purpose : 1
LOG : 989.04 990.67 1.6 Region : 3400
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 25 27 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 0 Total catch: 34.93 Catch/hour: 70.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	51.49	683	73.43	67
Sphyraena guachancho	5.66	16	8.07	68
Selar crumenophthalmus	5.60	20	7.99	69
Ilisha africana	5.28	145	7.53	
Scomberomorus tritor	0.88	2	1.26	
Trichiurus lepturus	0.64	16	0.92	
Chloroscombrus chrysurus	0.38	8	0.54	
Selene dorsalis	0.18	2	0.26	
Total	70.12		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 35
DATE :11.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 4°22.29
start stop duration Lon E 11°4.66
TIME :22:19:47 22:50:04 30.3 (min) Purpose : 1
LOG : 1012.03 1013.90 1.9 Region : 3400
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 102 107 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
Sorted : 0 Total catch: 5.19 Catch/hour: 10.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida brasiliensis	6.28	2324	61.08	
Sphyraena sphyraena	1.90	36	18.50	
Ariomma bondi	0.73	22	7.13	
Sardinella aurita	0.44	12	4.24	
Selene dorsalis	0.44	2	4.24	
Chloroscombrus chrysurus	0.32	6	3.08	
Priacanthus arenatus	0.16	12	1.54	
Alloteuthis africana	0.02	30	0.19	
Total	10.28		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 36
DATE :12.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 4°25.26
start stop duration Lon E 11°13.77
TIME :04:54:51 05:24:14 29.4 (min) Purpose : 1
LOG : 1056.92 1058.40 1.5 Region : 3400
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 79 81 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 0 Total catch: 0.77 Catch/hour: 1.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	0.57	16	36.36	
Saurida brasiliensis	0.53	180	33.77	
Ariomma bondi	0.31	8	19.48	
Priacanthus arenatus	0.16	10	10.39	
Total	1.57		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 37
DATE :12.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 4°20.59
start stop duration Lon E 11°23.95
TIME :07:24:10 07:54:11 30.0 (min) Purpose : 1
LOG : 1075.79 1077.45 1.7 Region : 3400
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 25 26 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 89 Total catch: 143.00 Catch/hour: 285.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	203.38	4253	71.16	
Sardinella maderensis	41.89	1775	14.66	70
Brachydeuterus auritus	14.67	1577	5.13	
Sphyraena guachancho	14.55	50	5.09	
Selene dorsalis	5.78	288	2.02	
Ilisha africana	3.28	102	1.15	
Trichiurus lepturus	1.30	108	0.45	
Stromateus fiatola	0.92	4	0.32	
Alectis alexandrinus	0.03	6	0.01	
Total	285.80		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 38
DATE :12.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 4°42.09
start stop duration Lon E 11°20.04
TIME :14:23:45 14:51:40 27.9 (min) Purpose : 1
LOG : 1138.13 1139.60 1.5 Region : 3400
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 110 115 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 39
DATE :12.05.2008 GEAR TYPE: PT NO: 7 POSITION:Lat S 4°36.59
start stop duration Lon E 11°39.27
TIME :17:43:41 18:13:36 29.9 (min) Purpose : 1
LOG : 1165.03 1166.67 1.6 Region : 3400
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 26 25 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 0 Total catch: 265.34 Catch/hour: 532.10

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyraena guachancho	258.19	401	48.52	
Lutjanus goreensis	70.69	8	13.28	
Chaetodipterus lippei	58.66	124	11.02	
Chloroscombrus chrysurus	37.80	425	7.10	
Selene dorsalis	28.58	305	5.37	
Ilisha africana	24.06	1480	4.52	
Scomber japonicus	10.83	8	2.04	
Trachinotus goreensis	7.52	18	1.41	
Stromateus fiatola	6.64	10	1.25	
Trichiurus lepturus	6.18	96	1.16	
Hemicaranx bicolor	5.74	30	1.08	
Alectis alexandrinus	5.05	6	0.95	
Galeoides decadactylus	5.03	28	0.95	
Elops lacerta	4.33	10	0.81	
Sardinella maderensis	1.44	130	0.27	71
Sepiella ornata	0.66	134	0.12	
Parakuhlia macrophthalmus	0.42	8	0.08	
Brachydeuterus auritus	0.18	16	0.03	
Echeneis naucrates	0.10	8	0.02	
Total	532.10		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 40
DATE :12.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 4°42.75
start stop duration Lon E 11°42.65
TIME :19:15:29 19:45:25 29.9 (min) Purpose : 1
LOG : 1173.95 1175.57 1.6 Region : 3400
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 34 39 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 84 Total catch: 236.50 Catch/hour: 473.95

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	340.62	3597	71.87	
Ilisha africana	48.82	1904	10.30	
Sardinella maderensis	21.52	162	4.54	72
Stromateus fiatola	19.02	38	4.01	
Trichiurus lepturus	18.66	1998	3.94	
Sphyraena guachancho	6.97	22	1.47	
Scomberomorus tritor	6.43	10	1.36	
Pteroscion peli	4.09	160	0.86	
Brachydeuterus auritus	3.67	257	0.77	
Selene dorsalis	2.93	74	0.62	
Pentanemus quinquarius	0.52	10	0.11	
Penaeus notialis	0.40	6	0.08	
Parakuhlia macrophthalmus	0.20	6	0.04	
Sepiella ornata	0.10	22	0.02	
Total	473.95		100.00	

R/V

"DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 41
DATE :12.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 4°57.49
start stop duration Lon E 11°25.67
TIME :22:19:46 22:49:47 30.0 (min) Purpose : 1
LOG : 1197.11 1198.71 1.6 Region : 3400
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 125 155 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 0 Total catch: 25.35 Catch/hour: 50.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Polymetme corythaeola *	28.99	35268	57.20	
Euthynnus alletteratus	8.26	18	16.29	
Auxis thazard	5.18	12	10.22	
Saurida brasiliensis	2.78	638	5.48	
Illex coindetii	2.50	856	4.93	
Chloroscombrus chrysurus	1.44	12	2.84	
Trichiurus lepturus	1.00	190	1.97	
Sphyraena sphyraena	0.44	6	0.87	
Synagrops microlepis	0.10	14	0.20	
Total	50.68		100.00	

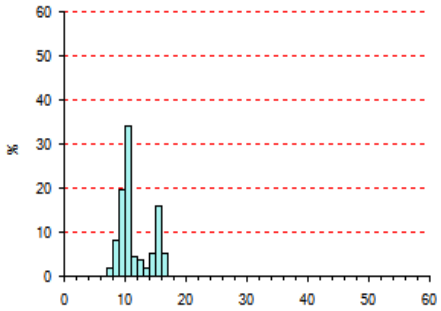
R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 42
DATE :13.05.2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 5°5.77
start stop duration Lon E 11°34.57
TIME :03:36:48 04:06:15 29.5 (min) Purpose : 1
LOG : 1227.92 1229.58 1.7 Region : 3400
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 110 113 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
Sorted : 0 Total catch: 24.14 Catch/hour: 49.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida brasiliensis	21.09	11925	42.87	
Sardinella aurita	8.27	47	16.82	73
Trachurus trecae	7.82	175	15.91	75
Trichiurus lepturus	7.44	128	15.12	
Sphyraena sphyraena	2.83	39	5.76	74
Illex coindetii	1.30	550	2.65	
Scomber japonicus	0.41	6	0.83	
Alloteuthis africana	0.02	8	0.04	
Total	49.18		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 43
DATE :13.05.2008 GEAR TYPE: PT NO: 7 POSITION:Lat N 0°0.00
start stop duration Lon E 0°0.00
TIME :08:16:20 08:47:13 30.9 (min) Purpose : 1
LOG : 1258.46 1261.11 2.7 Region : 3400
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 0 21 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 5.2 kn
Sorted : 0 Total catch: 0.64 Catch/hour: 1.24

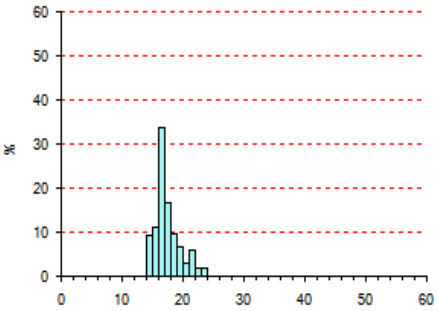
SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	1.22	8	98.44	
Lagocephalus laevigatus	0.02	2	1.56	
Total	1.24		100.00	

ANNEX II. Length frequencies of main species



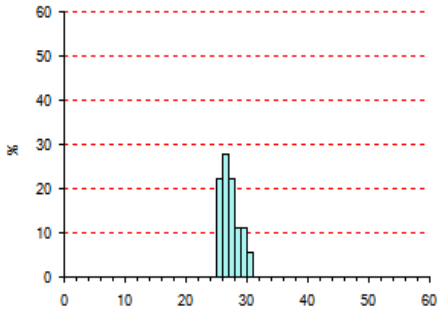
Ariomma bondi Gabon

Mean length = 11.60 N = 64



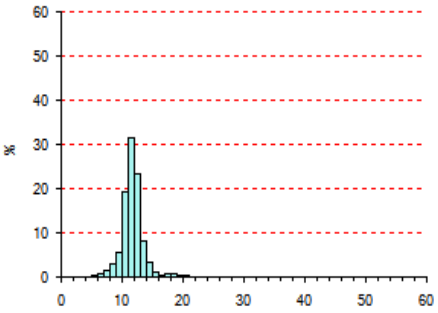
Chloroscombrus chrysurus Gabon

Mean length = 17.43 N = 91



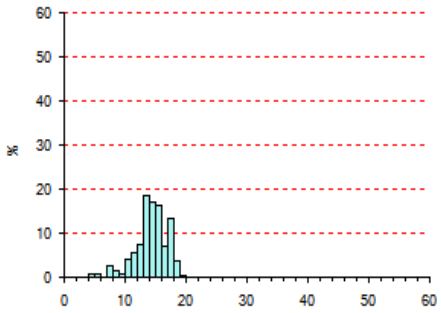
Auxis thazard Gabon

Mean length = 27.28 N = 18



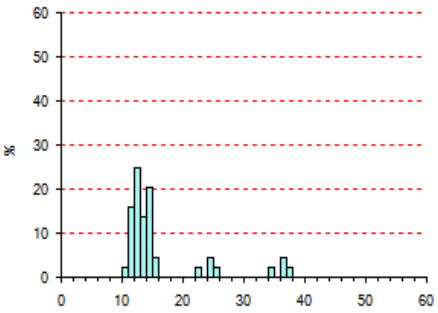
Decapterus punctatus Gabon

Mean length = 11.74 N = 724



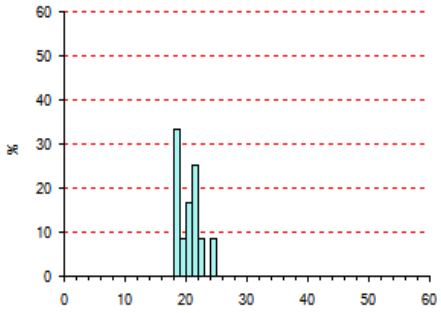
Brachydeuterus auritus Gabon

Mean length = 14.25 N = 176



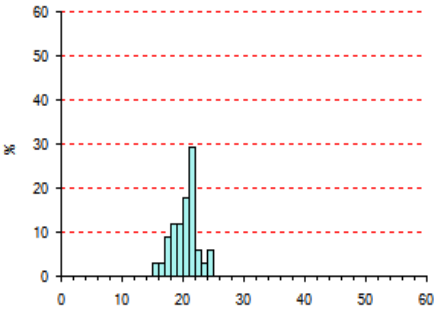
Decapterus rhonchus Gabon

Mean length = 16.23 N = 44



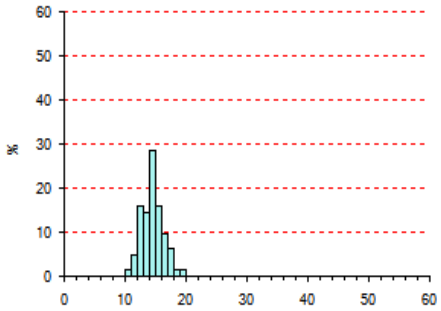
Caranx crysos Gabon

Mean length = 20.50 N = 12



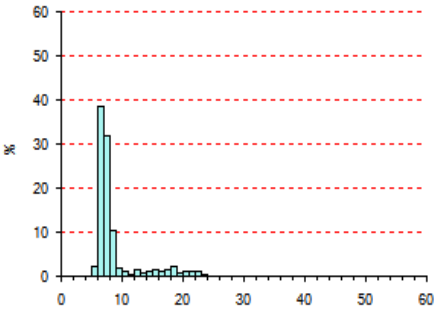
Dentex angolensis Gabon

Mean length = 20.35 N = 34



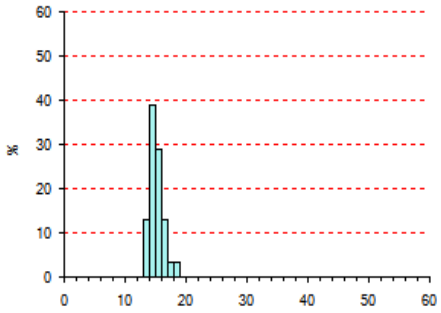
Dentex congoensis Gabon

Mean length = 14.52 N = 63



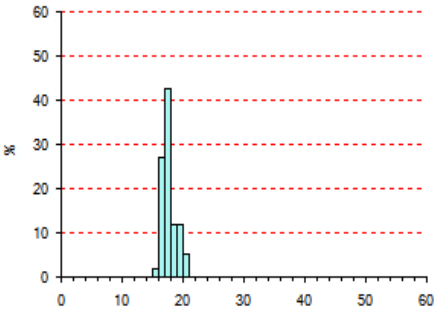
Sardinella maderensis Gabon

Mean length = 8.65 N = 472



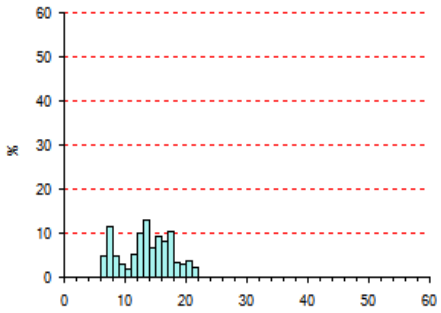
Ilisha africana Gabon

Mean length = 15.15 N = 31



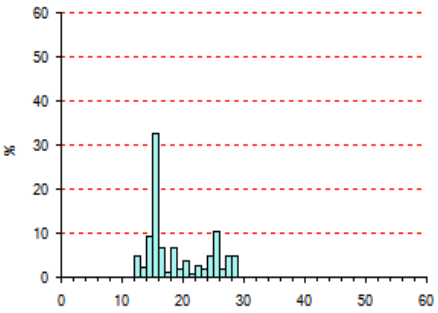
Scomber japonicus Gabon

Mean length = 17.70 N = 59



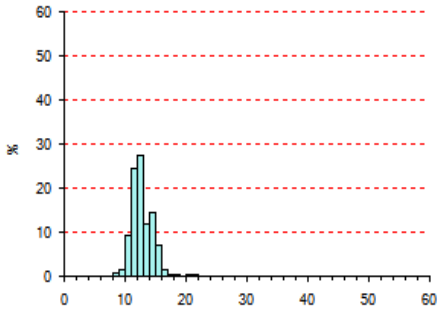
Pagellus bellottii Gabon

Mean length = 13.57 N = 95



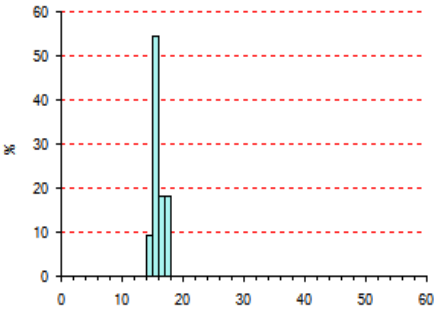
Selar crumenophthalmus Gabon

Mean length = 18.95 N = 62



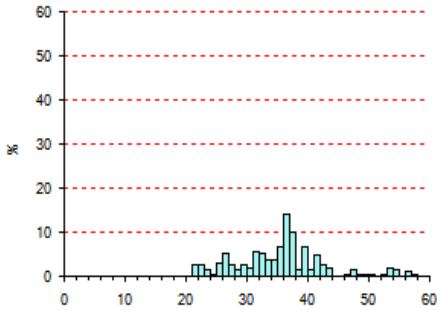
Sardinella aurita Gabon

Mean length = 12.79 N = 832



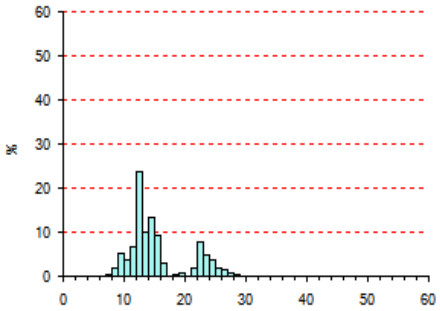
Selene dorsalis Gabon

Mean length = 15.95 N = 11



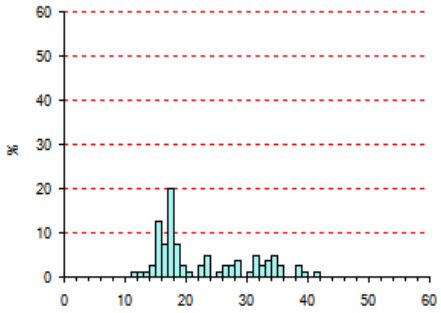
Sphyraena guachancho Gabon

Mean length = 35.74 N = 116



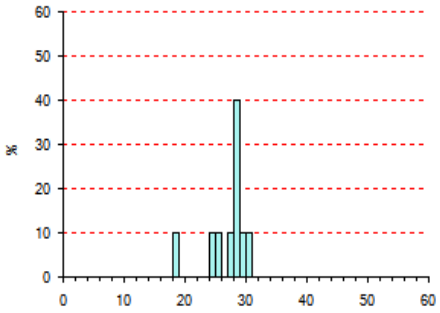
Sardinella maderensis Congo Brazaville

Mean length = 15.48 N = 268



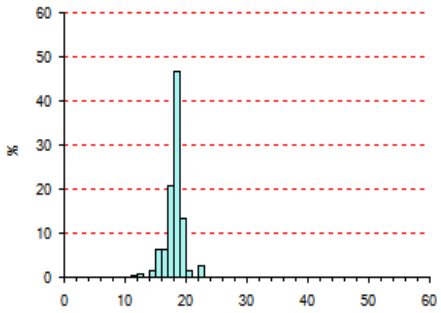
Sphyraena sphyraena Gabon

Mean length = 22.73 N = 80



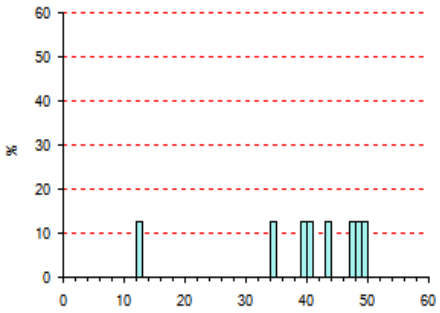
Selar crumenophthalmus Congo Brazaville

Mean length = 27.00 N = 10



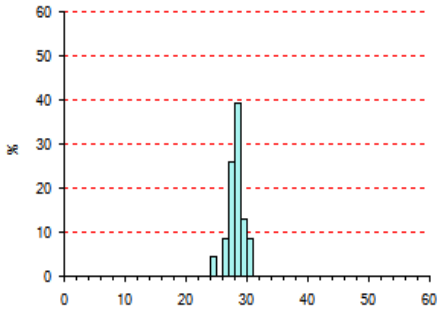
Trachurus trecae Gabon

Mean length = 18.10 N = 241



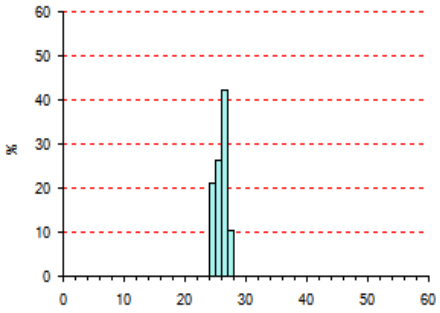
Sphyraena guachancho Congo Brazaville

Mean length = 39.50 N = 8



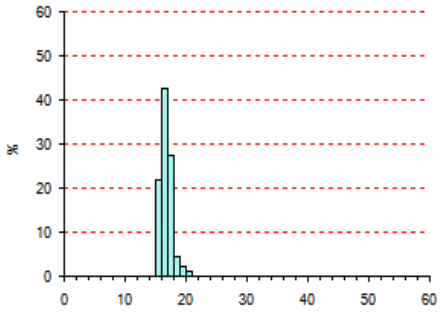
Sardinella aurita Congo Brazaville

Mean length = 28.20 N = 23



Sphyraena sphyraena Congo Brazaville

Mean length = 25.92 N = 19



Trachurus trecae Congo Brazaville

Mean length = 16.76 N = 87

ANNEX III BIOMASS AND NUMBER PER LENGTH GROUP

Sardinella aurita

Length group (cm)	N (millions)	W (1000 tons)
5	29	0.0
6	61	0.2
7	79	0.3
8	158	0.9
9	187	1.5
10	117	1.3
11	146	2.1
12	145	2.7
13	68	1.6
14	96	2.8
15	53	1.9
16	14	0.6
17	4	0.2
18	7	0.4
19	2	0.2
20	6	0.5
21	10	1.0
22	6	0.6
23	3	0.3
24	12	1.7
25		
26	25	4.3
27	75	14.6
28	112	24.3
29	37	9.0
30	25	6.6
31		
32		
33		
34		
35		
Sum	**1 480**	**79.6**

Sardinella maderensis

Length group (cm)	N (millions)	W (1000 tons)
5	1	0.0
6	20	0.1
7	38	0.2
8	115	0.7
9	92	0.8
10	25	0.3
11	14	0.2
12	45	0.9
13	13	0.3
14	36	1.1
15	28	1.0
16	19	0.8
17	10	0.5
18	10	0.6
19	9	0.7
20	19	1.6
21	24	2.3
22	31	3.5
23	19	2.4
24	64	9.1
25	60	9.6
26	79	14.2
27	43	8.7
28	14	3.2
29		
30		
31		
32		
33		
34		
35		
Sum	**829**	**62.6**

Horse mackerel

Length group (cm)	N (millions)	W (1000 tons)
5		
6		
7		
8		
9		
10		
11		
12	0	0.0
13	0	0.0
14	5	0.1
15	13	0.4
16	13	0.5
17	20	1.0
18	38	2.2
19	12	0.8
20	3	0.2
21		
22	2	0.2
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
Sum	**105.2**	**5.6**

Annex IV INSTRUMENTS AND FISHING GEAR USED

The Simrad ER-60/18, 38, 120 and 200 kHz scientific sounder was run during the survey only for observation of fish and bottom conditions.

Standard sphere calibrations were carried out using 38.1 mm diameter tungsten carbide sphere for 18, 38, 120 and 200 kHz. The calibrations took place 18.03.2008, Baia dos Elefantes. The details of the settings of the 38 kHz echo sounder where as follows:

Transceiver-2 menu (38 kHz)

Transducer depth	5.50 m
Absorbtion coeff.	8,7 dB/km
Pulse length	medium (1,024ms)
Bandwidth	2,43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
gain	25,04 dB
SA correction	-0,46 dB
Angle sensitivity	21.9
3 dB beamwidth	7,76º along ship
	7,86º athwardship
Alongship offset	-0.12º
Athwardship offset	0.06º

Bottom detection menu

Minimum level	-40 dB

Fishing gear
The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl". Trawls were used for identification of acoustic targets only.

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 trawl height was about 4.5 m and distance between wings during towing about 21 m. The sweeps are 40 m long. The trawl is equiped with a 12" rubber bobbins gear. New doors are 'Thyborøn' combi type, 7.41 m^2, 1720 kg. These have been in used onboard since 19.02.08.

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

ANNEX V BENTHOS SAMPLING

Dr. Fridtjof Nansen cruise 2008404 – Gabon & Congo

SEDIMENT SAMPLES
Number of grab stations: 14
Number of grab samples taken: 69
Number of jars for biological samples: 264

- Bulk sediment samples: 224 jars and flasks (volume 250 ml-1000 ml)
- Presorted samples: 40 flasks (volume 250 ml)

Sediment samples were collected with a Van Veen grab with a surface area of 0.1 m². The total volume of the grab was 21 litres. There were 5 replicates at each station except one (G3). Biological samples were collected from every replicate sample. Samples for analysis of hydrocarbons, heavy metals and sediment grain size were taken from the last three replicates at each station. The grab samples were taken from depths between 27 m and 503 m.

Biological samples were sieved through sieves with mesh size 0.5mm and 0.1mm. Animals that were easily spotted in the 0.5 mm fraction were put in 75% ETOH in a plastic flask. The 0.1 mm and 0.5 mm fractions from the first replicate sample from each station were fixated on 75% ETOH. The other replicate samples were fixed on borax and formalin. Each sample was marked and stored on board in transport containers.

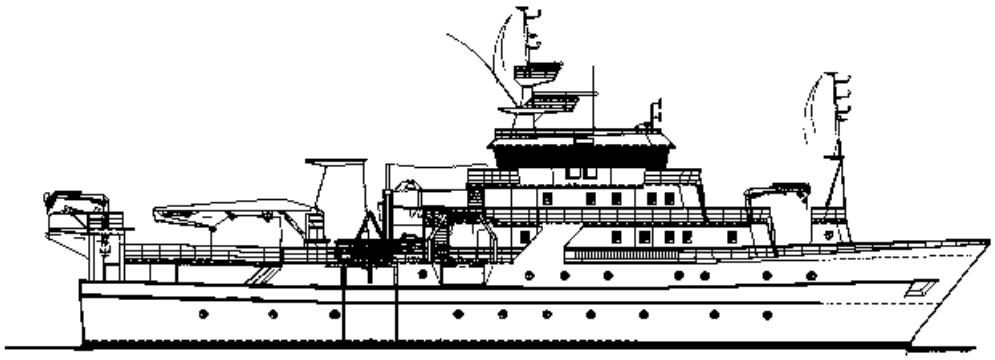
Samples for chemical analysis were collected from the upper 0-1 cm of the sediment. Samples for sediment grain size were taken from the upper 0-5 cm. The samples were taken through the hatches on top of the grab before the grab was opened. The samples for heavy metals (100 g) were collected with a plastic spoon to avoid contamination. The samples for hydrocarbons (300 g) and sediment grain size (100 g from each of the three replicates at each station) were taken with an ordinary teaspoon. The samples were put in to labelled Rilsan bags. The individual hydrocarbon and heavy metal samples at each station were put in to bigger plastic bags with a label inside. This was also done with the sediment grain sample. The samples were then put in the freezer and kept frozen until further analysis in an onshore laboratory.

TRAWL SAMPLES
Number of trawl stations: 43

- Pelagic trawls: 31
- Benthic trawls: 12

Number of jars for biological samples: 24 (volume 250 ml - 2000 ml according to specimens)

The benthic trawls were taken from depths between 27 m and 122 m.



SURVEYS OF THE FISH RESOURCES OF ANGOLA

Cruise Report No 2/2008

Survey of the pelagic resources
15 May – 2 July 2008

Institute of Marine Research
IMR
Bergen

Instituto Nacional de Investigação Pesqueira
INIP
Luanda

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Survey of the pelagic resources
15 May – 2 July 2008

by

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Angola

Bergen, 2008

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION

1.1 Objectives

This survey is one of a series aimed at monitoring the pelagic fish resources of Angola, as agreed with the Instituto Nacional de Investigação Pesqueira (INIP), Luanda and to improve the understanding and knowledge in terms of the biology, ecology, population dynamics of the main species in relation to the environment and the whole ecosystem. Pelagic management decisions for 2008 will be based on the results obtained from this survey.

The specific objectives of the survey were the following:

- To estimate the abundance and to map the distribution of the main commercially important pelagic and semi-pelagic fish species in Angolan waters, including the two sardinella species *Sardinella aurita* and *S. maderensis*, the Cunene horse mackerel *Trachurus trecae*, the Cape horse mackerel *Trachurus capensis* and other pelagic species.

- To collect gonads, stomachs and otoliths from both horse mackerel and sardinella species, and to collect depth stratified samples of zoo and phytoplankton in order to continue the studies on feeding biology, relating stomach contents to estimated zooplankton compositions and densities.

- To map the general meteorological, hydrographical and biological conditions in the survey area by means of continuous recordings of weather data, CTD-casts (Temperature, Salinity and Oxygen), ADCP measurements (Acoustic Doppler Current Profiler) and plankton sampling along acoustical and hydrographical transect lines.

- On-the-job training for the local and regional participants on the main survey routines, including using the Nansis and Hydrobase software, scrutinizing acoustical data with the latest Norwegian post-processing system, Large Scale Survey System (LSSS), and producing acoustical biomass estimates.

1.2 Participation

The scientific staff consisted of:

From INIP, Luanda:
António BARRADAS (Team leader, 15/5 – 30/5), Paulo CELSO (15/5 – 30/5), Maria SEBASTIÃO (15/5 – 30/5), Maura INÁCIO (15/5 – 30/5) and Manuel DOMINGOS (15/5 – 30/5), Filomena VAZ-VELHO (Team leader, 10/6 – 08/7), Henriette NSILULU (10/6 – 08/7), Paula FARIA (10/6 – 08/7), Francisco de ALMEIDA (10/6 – 08/7), Alberto FILOMENO (10/6 – 08/7) and Pedro PANZO (10/6 – 08/7).

From SNF, MiniPesca-Angola:
Henrique Luís LANDO (15/5 – 08/7)

From CIP-Namibe:
Quilanda FIDEl (15/5 – 30/5)

From R.Gabon:
Jean de Dieu LEWEMBE (15/5 – 30/5)

From R.D. Congo:
Koffi MULUMBA (15/5 – 30/5)

From R.Congo:
Jeam SAMBA (15/5 – 30/5)

From NatMIRC. Namibia
Martha Ntinda (10/6-8/7)

From IMR, Bergen:
Jens-Otto KRAKSTAD (Cruise leader, 15/5 - 31/5), Diana ZAERA (15/5 – 02/8), Andreas HEIDE (15/5 – 31/5), Jan Frode Wil HELMSEN (15/5 – 31/5), and Jarle KRISTIANSEN (15/5 – 02/8), Bjoern Erik AXELSEN (Cruise leader, (10/6 – 08/7)

From University of Bergen, Norway:
Cathrine STABEL HENRIKSEN

1.3 Narrative

The vessel departed Pointe Noire on the 14th May at 15:00 UTC. After completing the environmental transect off Point Noire with additional benthos samples to assist the environmental oil-fish survey, 2008403, the vessel steamed north to the border between Congo and Angola to start the Angolan pelagic survey. After receiving information on vessel security regulations in Cabinda from Malongo Security and consultations with INIP, it was decided to exclude Cabinda from this year's pelagic survey and start the survey off Congo River. The survey off Angola started north of Congo River on the 15th May in the afternoon. The survey area was divided into three regions:

(a) Congo River - North of Pta. das Palmerinhas (6°-9°S): ANGOLA NORTH;
(b) The region between 9°S and 13°S: ANGOLA CENTRAL;
(c) The region between 13°S and Cunene River (17°15'S): ANGOLA SOUTH.

The entire survey was covered in two legs; the first leg started in Pointe Noire and covered the survey area up to Ambriz whilst the second leg covered the rest of the survey area.

Due technical problems of the vessel the survey schedule was changed. The second leg started in Walvis Bay on the 10th June and steamed north to Pta das Palmerinhas to resume the survey. After 8 hours of steaming the vessel returned to Walvis Bay to disembark Vianda Filipe who was seriously ill. The Pta Palmerinhas monitoring transect started at 03h00 on the morning of Sunday the 15th June.

Calibration of the Simrad ER 60 Scientific echosounder (18, 38, 120, 200 kHz transducers) was done in Baía dos Elefantes (see below) on 23rd June.

A systematic survey track implemented in 2002 with equally spaced transect lines (6 nautical miles apart) perpendicular to the coast was followed during the survey. The Cabinda region was not included in this survey due to stricter enforcement of regulations implied by the oil companies in the area, which did not allow surveying the region without a 24hr written notice and an ISPS clearance before entering the area.

CTD sections that have been covered routinely over the past few years are included in the new, standardized survey grid. ADCP (Acoustic Doppler Current Profiler) recordings were logged continuously along the survey track. Additional CTD stations were added on most transects at bottom depths 50, 100 and 200 m. Samples of phytoplankton were collected on selected CTD stations during daytime. Zooplankton samples were obtained using *Hydrobios Multinet* plankton sampler near selected CTD locations.

The transects off Pta. das Palmerinhas, Lobito and Namibe were carried out in accordance with the standard monitoring transects run by INIP. This was somewhat different than the standard transects run by Dr. Fridtjof Nansen in earlier years, but it was decided by INIP that it was necessary to cover these transects in this manner to maintain their time series on these monitoring lines. The transects ended further off-shore and the distance between the stations were longer than the standard "Nansen" transects run earlier. These "new" transects were selected as the Angolan Monitoring Lines according to the regional requirements. They were updated and modified as follows: the first station located at 2.5 miles away from the coast, the second at 5 miles away from the first station and thereafter a spacing distance of 10 miles between the stations was used until reaching the isobaths of 2000 m. These principle avoids stations to be

close to each other, therefore reduce the number of stations and allowing having access to the information from deeper stations.

1.4 Survey effort

Figure 1(a-c) shows the cruise tracks with fishing, plankton and hydrographic stations for the Cabinda and northern region, central and southern regions of Angola. The sampling trawls, including the small and the mid-sized (15 m vertical opening) pelagic trawls and the demersal trawl (5 m), were used during the survey. Table 1 summarizes the survey effort by regions.

Table 1. Summary of survey effort by regions, including number of demersal (BT) and pelagic (PT) trawl hauls, CTD casts, Multinet stations (2-5 zooplankton samples per station) and distance surveyed (log).

Area	BT	PT	Total Trawls	CTD casts	Multinet stations	Log (NM)
Pta. Palmerinhas - Congo River	10	30	40	56	13	1472.96
Benguela - Pta. Palmerinhas	10	9	19	81	8	1449.09
Cunene River - Benguela	9	10	19	72	9	1102.36
Total	29	49	78	209	30	4024.41

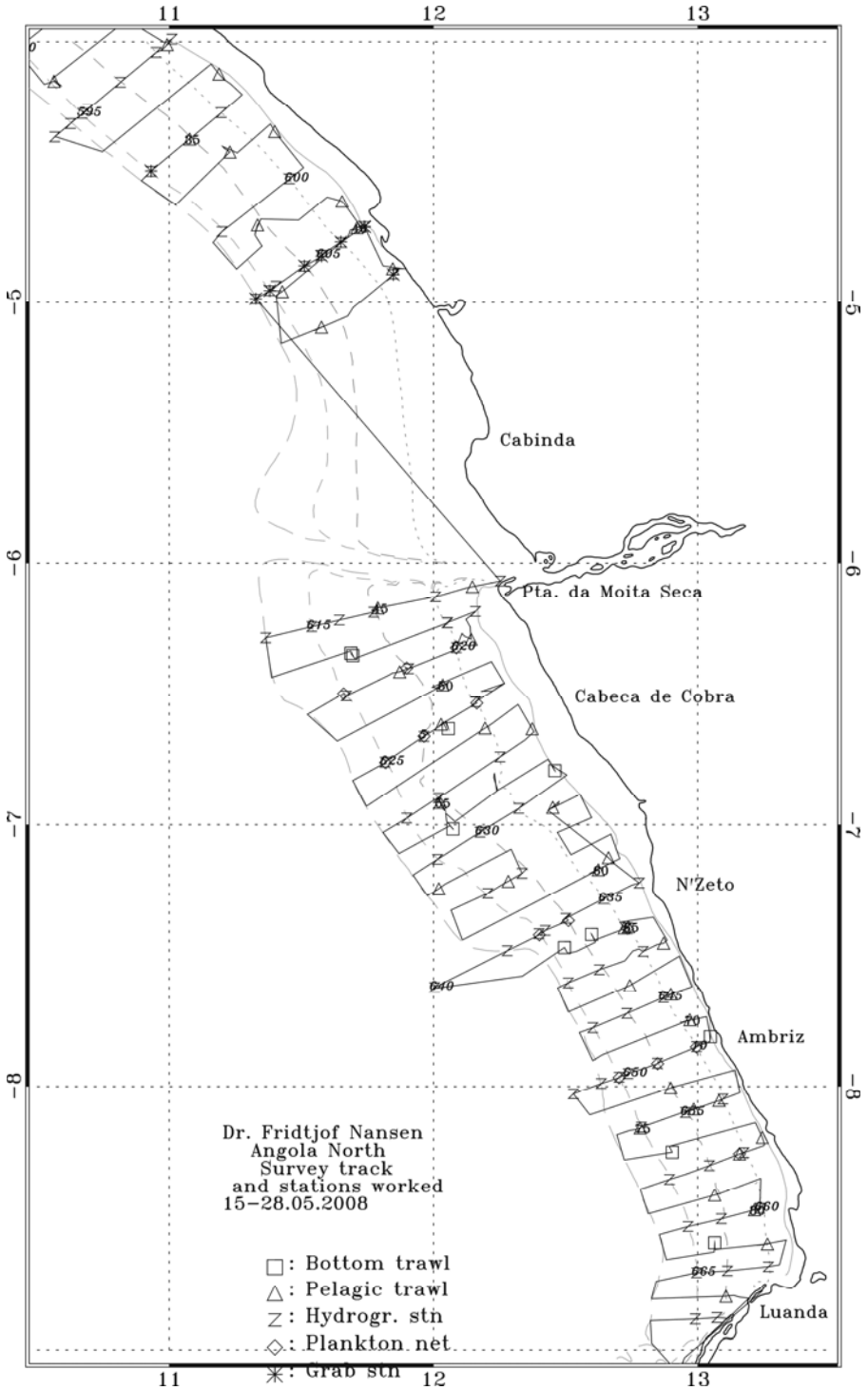


Figure 1a. Course track with fishing, plankton and hydrographic stations, Pta. das Palmerinhas- Congo River, including Cabinda. Depth contours at 20, 50, 100, 200, and 500m.

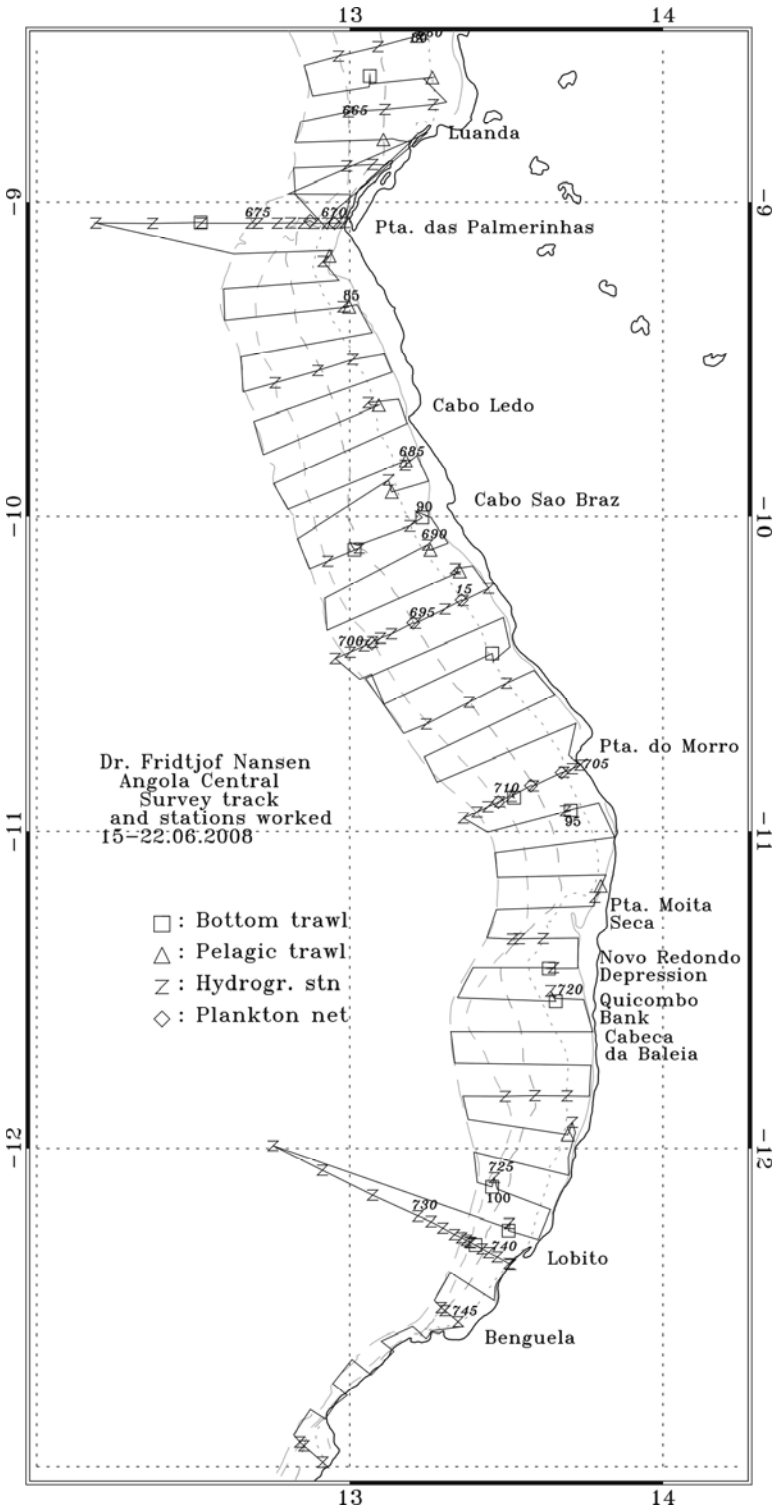


Figure 1b. Course track with fishing, plankton and hydrographic stations, Benguela -Pta. das Palmerinhas. Depth contours at 20, 50, 100, 200, and 500m.

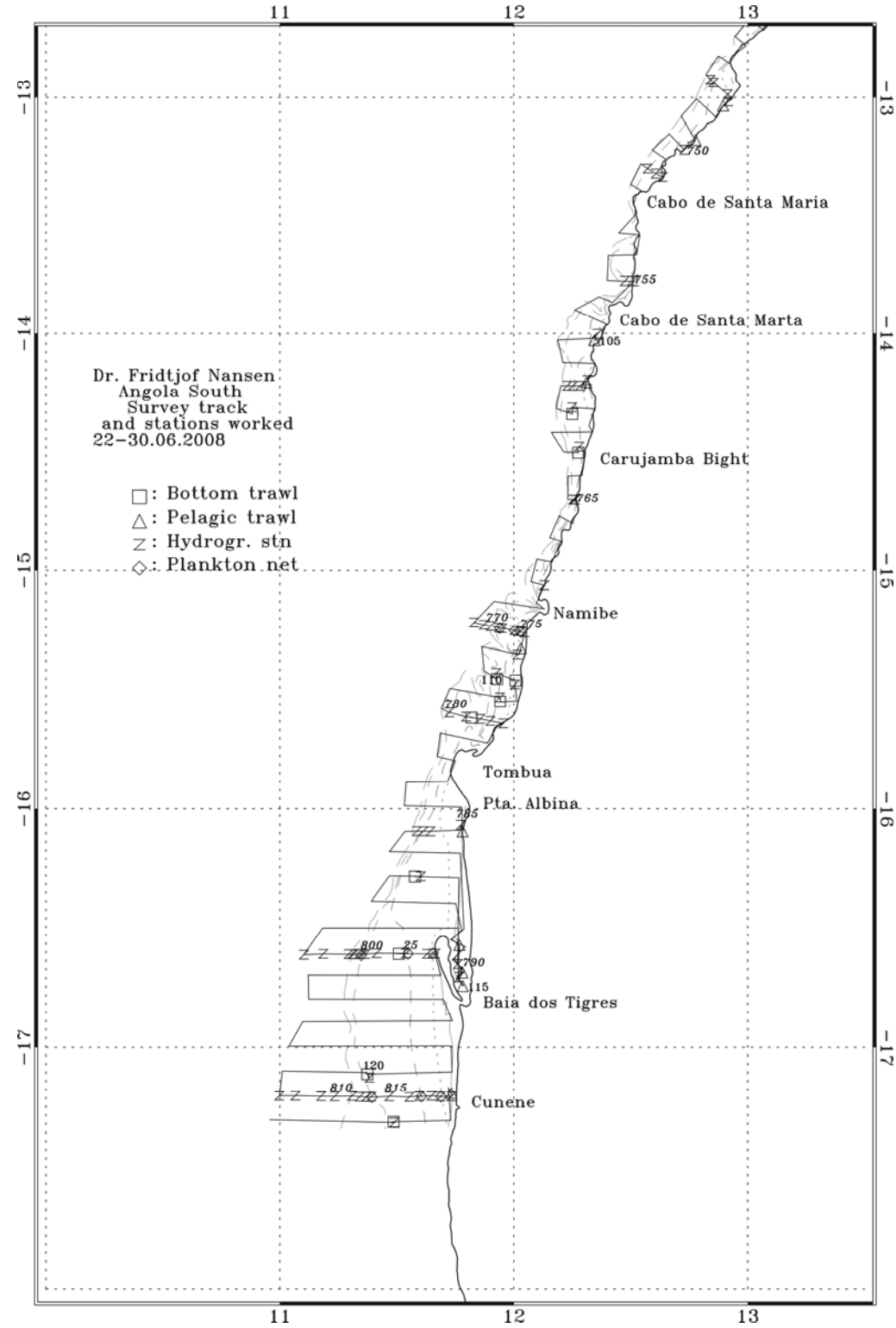


Figure 1c. Course track with fishing, plankton and hydrographic stations, Cunene-Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m.

CHAPTER 2 METHODS

2.1 Hydrographic sampling

CTD
A Seabird 911+ CTD probe was used to obtain vertical profiles of the temperature, salinity and oxygen. Real time logging was carried out using the PC based Seabird Seasave software. CTD casts were conducted along the cruise track in transects at about 60 NM distance, and *ad hoc* as deemed necessary. The casts were stopped a few meters above the bottom, and at a maximum of 1500 m depth. The oxygen sensor has shown to be very stable, and no calibration was conducted during the survey

Attached to the CTD was also a Chelsea flourometer of the type Mk III Aquatrack. It measures chlorophyll A in microgrammes per liter with an uncertainty of 3%. Factory slope and offset was 0.921 and -0.02.

Thermosalinograph
The SBE 21 Seacat thermosalinograph was running routinely during the survey, obtaining samples of sea surface salinity and relative temperature and fluorescence (5 m depth) every 10 sec. An attached in-line Turner Design SCUFA Fluorometer was continuously measuring Chlorophyll levels [RFU] at 5 m below the sea surface while underway during the entire cruise. The instrument was configured with a bright blue photodiode, a 420 nm Excitation filter and a 680 nm Emission filter. It was calibrated against the secondary orange standard dye. The maximum output was equivalent to 5Volt = 100%. It had a linear temperature compensation of 2.14%/°C

Current speed and direction measurements (ADCP)
A vessel-mounted Acoustic Doppler Current Profiler (VMADCP) from RD Instruments was run continuously during the survey in broadband mode shallower than about 400 m and in narrow band mode in deeper waters. The frequency of the VMADCP is 150 kHz, and data were averaged and stored in 3 m or 4 m vertical bins. All data were stored on files for post survey processing.

Meteorological observations
Meteorological data logged from the Norwegian Meteorological Institute (DNMI) meteorological station included air temperature, humidity, air pressure, wind direction and speed, and sea surface temperature (SST). All data were averaged by unit distance sailed (1 NM).

2.2 Fish sampling

A brief description of the fishing gear is provided in Annex I. All trawl catches were sampled for species composition by weights and numbers. Records of catch rates are given in Annex II. Total length (TL) frequencies were taken for the commercial pelagic species such as sardinella, horse mackerel, sardine, round herring, anchovy, *Brachydeuterus auritus* and demersal species mainly *Dentex spp*. Considering the ecosystem approach for sustainable management of marine resources, and the reported effects of jellyfish increases in other regions especially in the northern Benguela Current region, jellyfish measurements were introduced as part of the sampling routines.

Biological samples were obtained for sardinellas and horse mackerel. Total length (TL) and body weight were determined to the nearest 1 cm and 1 g below, respectively. Sex and reproductive stages were determined by means of macroscopic examination scoring each fish according to the six-point classification scale first proposed by INIP (2008) (Table 2).

Table 2. Adapted scale by INIP for the classification of maturity stage for both horse mackerel and sardinella in Angola (species for partial spawners)

Stage	Maturity stage	Description
I	Immature	Small gonads, do not occupy more than 1/3 of abdominal cavity length. Ovary pinkish; testis whitish. Ova not visible to naked eye
II	Maturing virgin and recovering spent	The gonads begin to develop, increasing substantially in size; about ½ length of the abdominal cavity. Gonads more opaque, small points visible to the naked eye (oocytes at the beginning of vitelogenese).The gonads in rest/recovery more flaccid with some more conspicuous blood than the gonads in development.
III	Mature. Before pre-spawning	At the beginning, oocyte more conspicuous giving the gonad a granular aspect. Ovary yellow-orange, testis creamy. Visible sperm in testis if open. Gonads quite swollen in the beginning of the reproduction period. Gonads that have spawned once lose consistency, but opaque oocytes present, and sperm in testis if cut. At the end of the stage is possible to find some translucent oocytes. Gonads occupy about 2/3 of abdominal cavity.
IV	Mature Pre-spawning	The gonads occupy about 2/3 of abdominal cavity. Ovaries orange in colour with visible blood vessels. Most oocytes translucent, testis creamy, flat and brilliant texture. The gonads stop flowing oocytes and sperm flows at low pressure.
V	Mature. In spawning	The gonads occupy about 2/3 or less of abdominal cavity. Ovaries orange in colour with the conspicuous blood vessels, blood stained mainly in one end. Most oocytes translucent; testis creamy, flat and brilliant texture. The gonads stop flowing oocytes and sperm flows at low pressure. Pinky stains at the end of gonad.
VI	Post-spawning	The gonads decrease in size and occupy about ½ or less, of abdominal cavity. Gonads flaccid and bloody. Ovary can contain remaining oocytes that were not emitted. Testis may have sperm remaining in the seminal duct. Pinkish areas in the whole extension of the gonad.

Stomach samples of horse mackerel and sardinella were collected for further analysis at INIP, Luanda. Feeding biology will be investigated in more detail at a later stage by relating the stomach contents to recorded availability of zooplankton. Gonads and otoliths were collected Otoliths were collected in order to establish the Age-length key for the species.

2.3 Plankton sampling

Zooplankton

The zooplankton sampling was conducted by means of HYDROBIOS Multinet (405 µm), at three depths, 50, 100 and 200 m, at predetermined positions along the survey track. Data from the flow meter was recorded electronically from the Mulinet receiver unit. A SCANMAR depth sensor gave real-time information of the depth. The nets were opened and closed remotely from the bridge of the vessel. The samples were preserved in formalin 4%.

2.4 Acoustic sampling

Acoustic equipment

Acoustic data were recorded using a Simrad ER60 scientific echosounder equipped with keel-mounted transducers at nominal operating frequencies of 18, 38, 120 and 200 kHz. Few locations along the Angolan coast are favourable for transceiver calibration (essentially Baía dos Tigres and Baía dos Elephantes), and the survey was therefore started without *a priori* calibration. All transceivers were calibrated in Baía dos Elephantes the 23rd of June.

Acoustic data were logged and post-processed using the latest acoustic data post-processing software, the Large Scale Survey System (LSSS) Version 1.13. The technical specifications and operational settings of the echosounder used during the survey are given in Annex I.

Allocation of acoustic energy to species group

The acoustic data were scrutinized using the LSSS version 1.3. Scatterers were displayed at 38 kHz. The mean 5 NM area backscattering coefficient s_A (m^2/NM^2) was allocated to a predefined set of species groups on the basis established echogram features. Acoustic groups and respective species are listed in Table 3. Ground truthing and estimation of mean length and weight were accomplished by means of targeted pelagic and demersal trawling.

Table 3. Allocation of acoustic densities to species groups. Note that for the groups sardinella, horse mackerel, big-eye grunt and pilchard all encountered species are listed, while only examples are listed for the remaining groups.

Group	Taxon	Species
Sardinella	*Sardinella* sp.	*S. aurita*
		S. maderensis
Horse mackerel	*Trachurus* sp.	*T. trecae*
		T. trachurus capensis
Pilchard	Sardinops	*S. ocellatus*
Big-eye grunt		*Brachydeuterus auritus*
Pelagic species 1	Clupeiformes$_1$	*Ilisha Africana*
		Etrumeus whiteheadi
		Engraulis encrasicolus
Pelagic species 2	Carangidae$_2$	*Selene dorsalis*
		Chloroscombrus chrysurus
		Decapterus rhonchus
		Seriola carpenteri
	Scombridae	*Auxis thazard*
		Sarda sarda
		Scomber japonicus
	Sphyraenidae	*Sphyraena guachancho*
	Others	*Trichiurus lepturus*
		Lepidopus caudatus
Other demersal species	Sparidae$_3$	*Dentex angolensis*
		D. macrophthalmus
		D. congoensis
		D. canariensis
		D. barnardi
		Pagellus bellottii
		Sparus caeruleostictus
		S. pagrus africanus
	Other taxii	*Saurida brasiliensis*
		Arioma bondi
		Pomadasys incisus
		Galeoides decadactylus
Mesopelagic species	Myctophidae$_3$	*Diaphus dumerili*
	Other mesopelagic fish	*Trachinocephalus myops*
Plankton	Calanoidae	*Calanus* sp.
	Euphausiidae	*Meganyctiphanes sp.*
	Other plankton	

$_1$: other than *Sardinops* sp.; $_2$: other than *Trachurus* sp.; $_3$: main taxon in group.

Estimation of biomass

The target strength (TS) function used to convert mean area backscattering coefficient s_A (m^2/NM^2) at 38 kHz to number of fish corresponds to:

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

or

$$C_F = \frac{10^{7.2}}{4\pi} \cdot L^{-2} \quad (2)$$

where C_F is the conversion factor from acoustic density to fish biomass and L is the mean total fish length. This target strength function was originally established for North Sea herring, but has later been attributed to clupeids in general (Foote *et al.*, 1986; Foote, 1987).

No specific target strength relations presently are available for the species at hand, and equation (2) has therefore been applied consequently for all targeted species in this time series. The biomass was calculated by multiplying the number of fish by the expected length at weight, estimated by regressing the log-length (total) against total weight. Separate length-weight relationships were worked for each region (north, central, south), pooling all data within each region.

The boundaries of encountered fish aggregations (post strata) were determined by means of contouring within the inner and outer zero-value limits of the transect lines. The strata contours were digitised using Golden Software Digger software Version 3.0.7. Distribution plots and area calculations on the strata were carried out using IDL 6.1 for MS Windows. Sub-stratification was used to isolate areas of similar densities, using the following pre-defined, standard categories: 1: s_A = 0-300; 2: s_A = 301-1 000; 3: s_A = 1 001-3 000; 4: s_A > 3 001 (m^2/NM^2).

Mean 5-NM integrator values (s_A) computed along the transect lines were re-averaged for each stratum. The short spacing between the lines (7 NM) makes it impossible to exclude all between-transect values without removing some on-line contributions, particularly for sardinella on the inner shelf. The potential positive bias of including between-line values is likely smaller than the negative bias that would have been introduced by excluding high on-line contributions. This bias is also counteracted by the shallow distribution pattern (partly above the integration limit) and vessel avoidance behaviour of sardinella (Misund and Aglen, 1992). All estimates should consequently be considered as relative indices of abundance.

The overall length frequency distributions within strata were estimated by weighting the sample-distributions with the nearest valid 5 NM integrator value, or the average of two adjacent values. Target species of the same genus, i.e. *S. aurita* / *S. maderensis* and *T. trecae* / *T. trachurus capensis*, are not acoustically distinguishable, and the s_A values were therefore split according to the relative distributions of the two species in each length group. The total number of fish in each length group was estimated as:

$$\rho_i = \frac{< s_A > t_{i,j} \cdot u_i}{\sum_i \frac{u_i}{C_{Fi}}} \cdot A_s = \frac{10^{7.2} \cdot t_{i,j} \cdot u_i \cdot < s_A > \cdot A_s}{4\pi \sum_i u_i \cdot (L_i + 0.5)^2} \qquad (3)$$

where:

ρ_i	=	estimated number of fish in length group i
$<s_A>$	=	mean recorded area backscattering coefficient (m^2/NM^2)
$t_{i,j}$	=	proportion of species j in length group i
u_i	=	proportion of sampled fish in length group i
A_s	=	horizontal area of stratum s
C_{Fi}	=	conversion factor for length group i
L_i	=	length group i (nearest full cm below total length)
L_i+0.5	=	mean length in L_i.

CHAPTER 3 OCEANOGRAPHIC CONDITIONS

3.1 Surface distribution

Northern Cabinda and the northern region

The wind observed in this region (**Figure 2a**) during this survey was moderate, with an average velocity of around 10 knots (5m/s) (**Figure 2a**). The dominant direction was from the south and southwest. Between N' Zeto and Cabeça de Cobra the predominantly wind was southerly (blowing northward) off Cabeça de Cobra and south-westerly off N' Zeto and the wind speed increased at about 20 knots (10m/s). South N'Zeto and between Ambriz and Luanda the average with direction became predominantly southeast near the coast and southwest off the coast with an area of wind relaxation blowing from the east north Luanda.

In the area of Cabinda the sea surface temperature ranged from 22 to 23.5 °C (**Figure 3a**), the isotherm of 22°C is oriented alongshore off Cabinda with a pocket of cooler water inshore at the mouth of Congo River. Lower values of salinity were found ranging from 27.0 to 34.5 psu (**Figure 3d**) due to the outflows of the Congo River moving northwards. Between Pta da Moita Seca and Cabeça de Cobra it was observed a salinity front with isolines in front line ranging from 33 to 35.5 psu: Alongside south of Congo River month up to Luanda there is a presence of cooler water (21°C) with predominance of salinity value (35.5 psu).

Central Region

In this region the wind was very variable both in strength and direction (**Figure 2b**). The strongest winds around 20 knots (10m/s) were registered north Benguela, between Lobito and Quicombo. In a sporadic manner between north of Quicombo and Pta das Palmeirinhas wind varied with an average of 10m/s. The predominant wind direction with the strong wind (> 10m/s) was southeast.

Narrow and parallel to the coast surface cooler sea water (21ºC) from south Benguela to Cabo São Braz (**Figure 3b**) shows presence of a tropical upwelling while perpendicular to the coast sea water temperature rapidly increased with a 3º degree gradient reaching 24ºC offshore. Unfortunately there is no salinity registration in the vicinity of Ponta das Palmeirinhas but is believed that as usually the lower values of salinity due the outflows of Cuanza River should have dominated the surrounding area. Between Benguela and Ponta do Morro the isoline of 36.0 psu is oriented alongshore and was observed a pocket of salinity with value of 35.8 psu south Caba São Braz-(**Figure 3e**).

Southern Region

The wind pattern in this region (**Figure 2c**) can be divided into two different spots; from north of Cunene and south of Namibe it was stronger (> 10km/s) and with less variation regarding its direction (**Figure 2c**), and the dominant direction was from the south. The remarkable west wind (blowing seaward) was observed between Baia dos Tigres and south of Pta Albina reaching 15-40 knots.

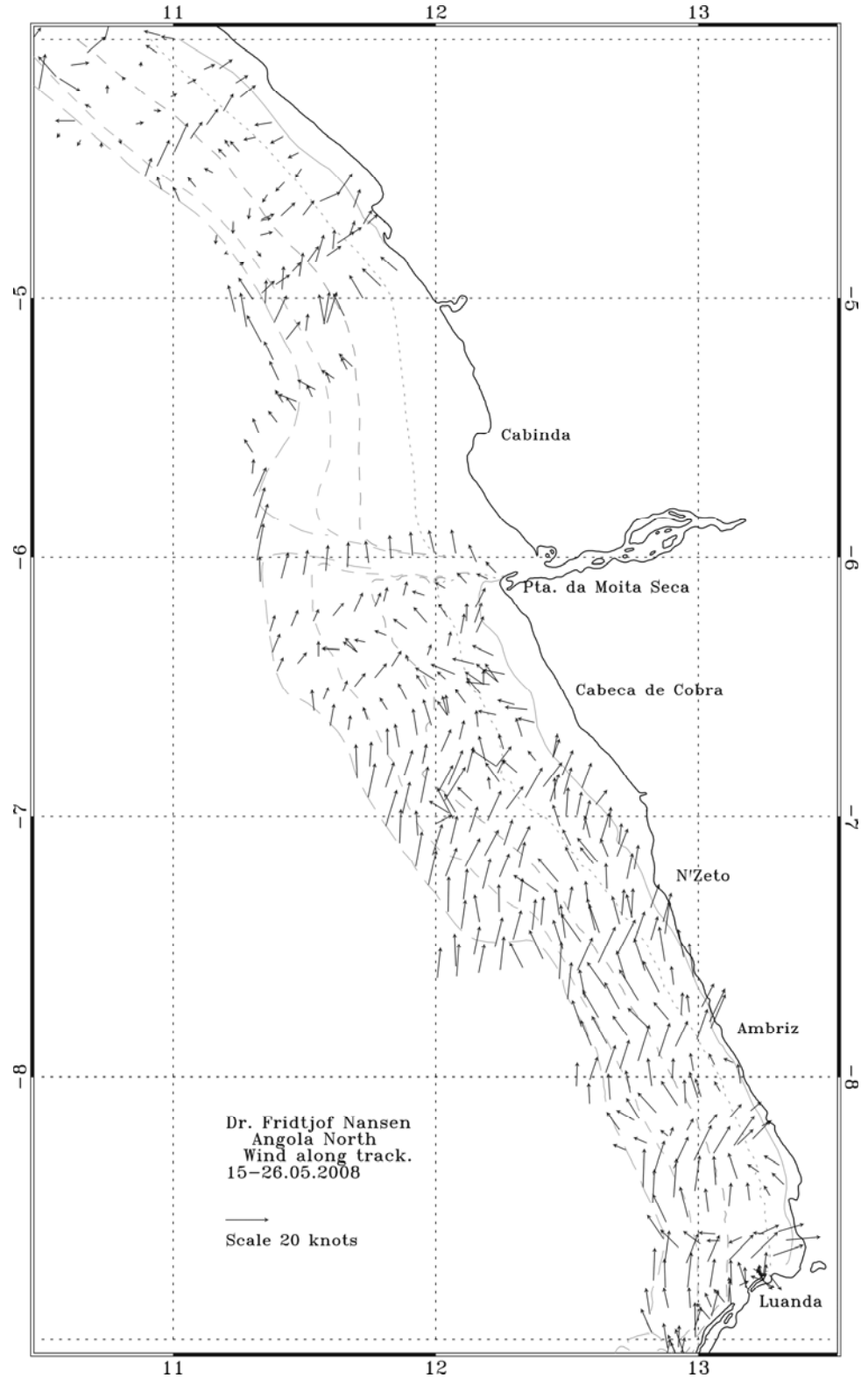


Figure 2a. Distribution of wind velocities along the survey track for the northern region, including Cabinda. Depth contours at 20, 50, 100, 200, and 500m.

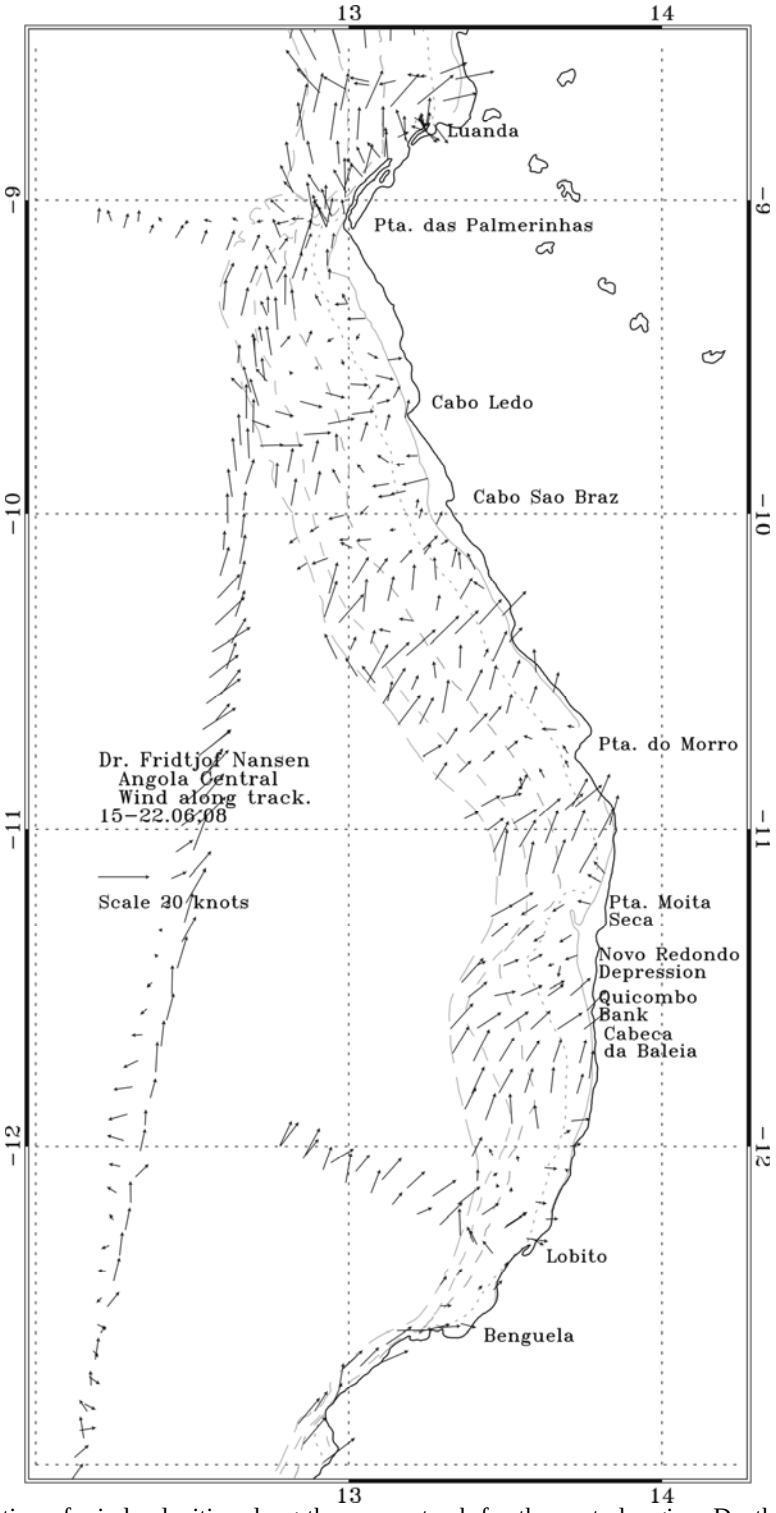


Figure 2b. Distribution of wind velocities along the survey track for the central region. Depth contours at 20, 50, 100, 200, and 500m.

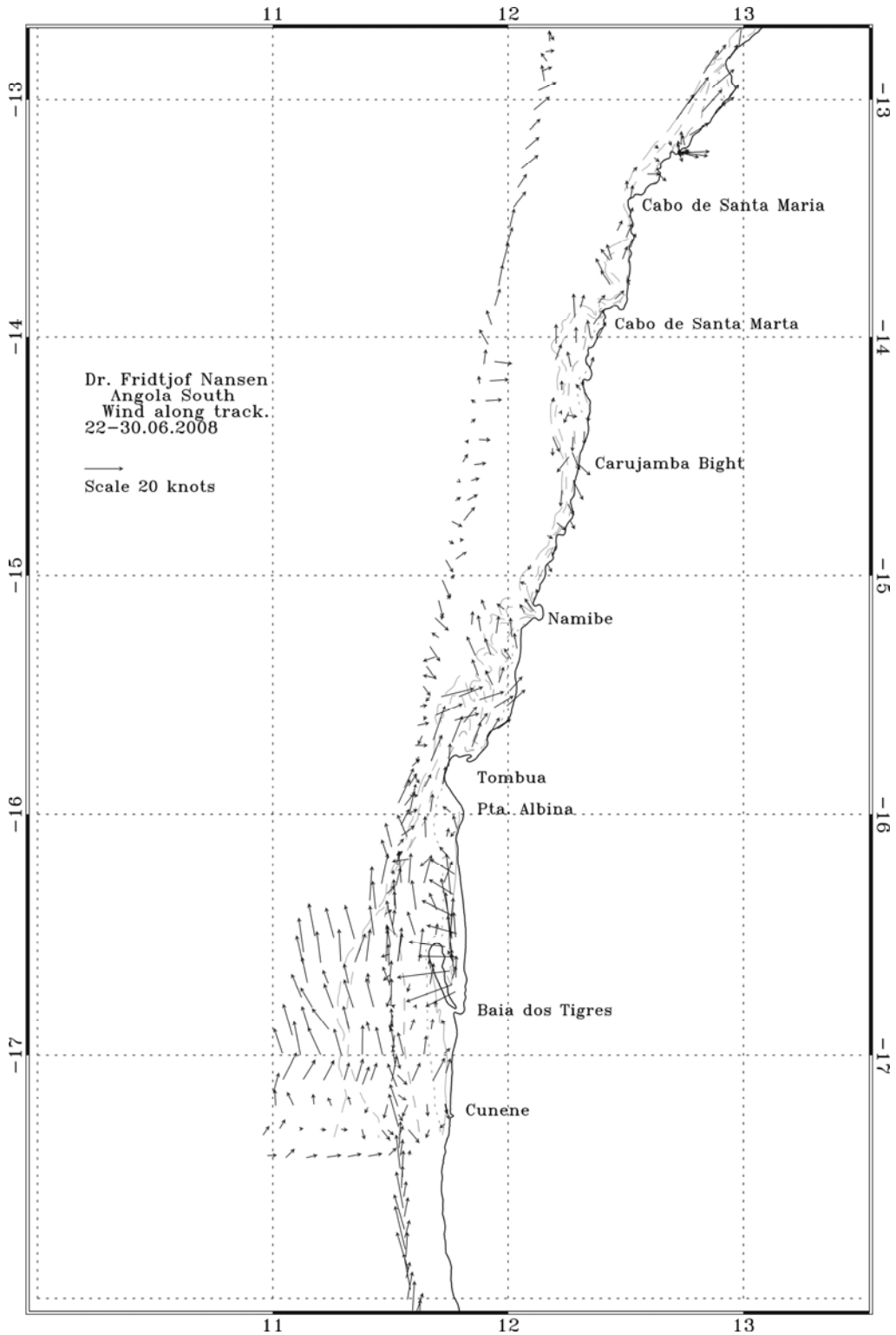


Figure 2c. Distribution of wind velocities along the survey track for the southern region. Depth contours at 10, 20, 50, 100, 200 and 500 m.

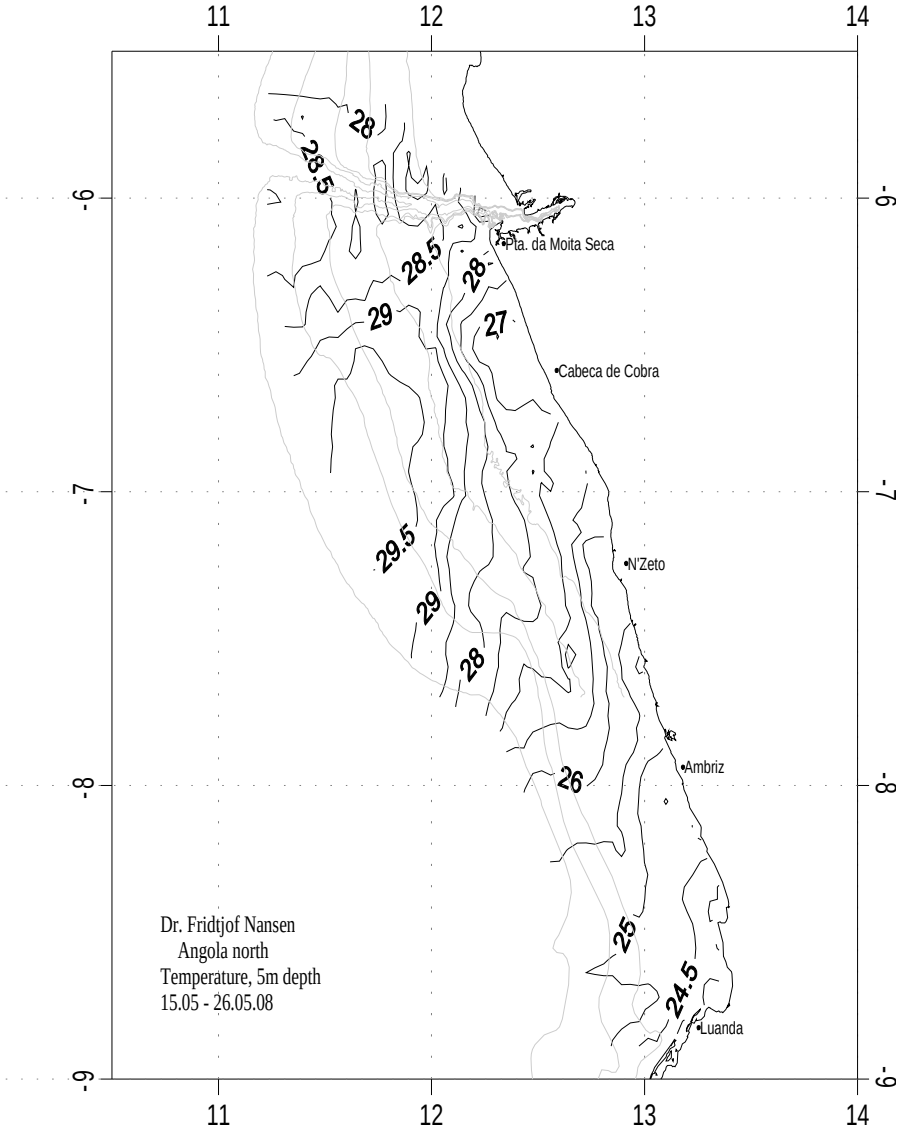


Figure 3a. Distribution of water temperatures at 5m depth in the northern region, including Cabinda. Depth contours at 20, 50, 100, 200, and 500m.

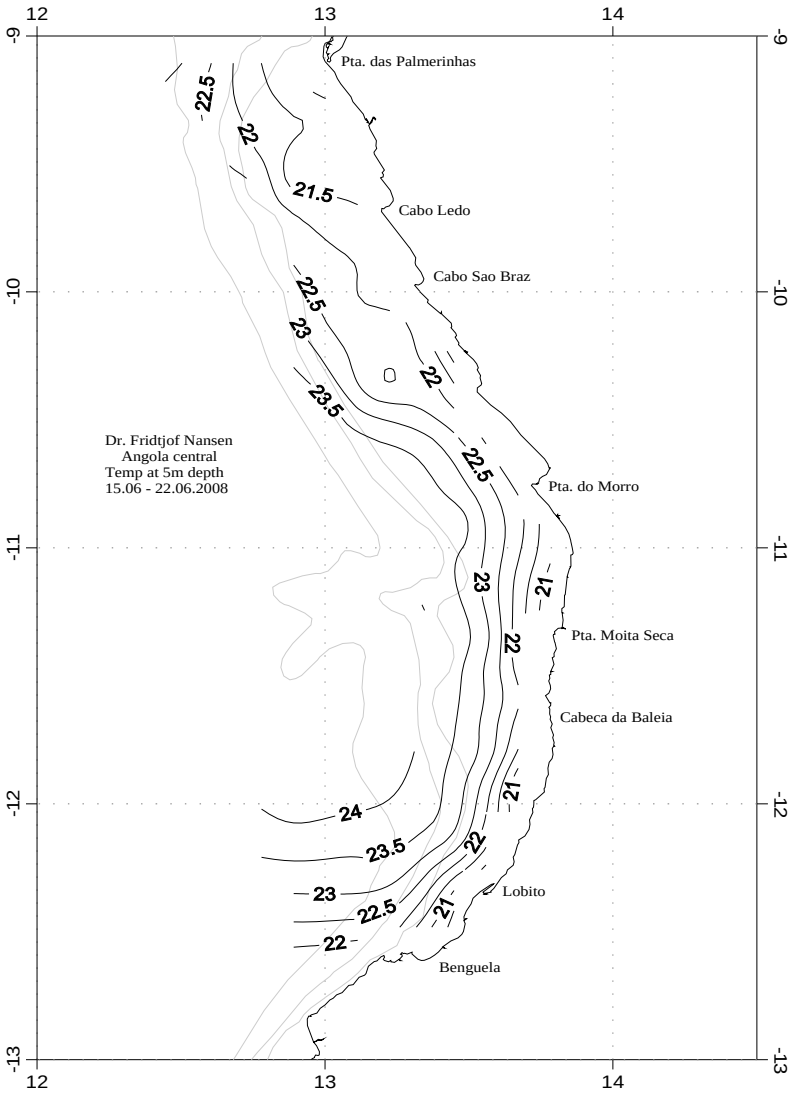


Figure 3b. Distribution of water temperatures at 5m depth in the central region. Depth contours at 20, 50, 100, 200, and 500m.

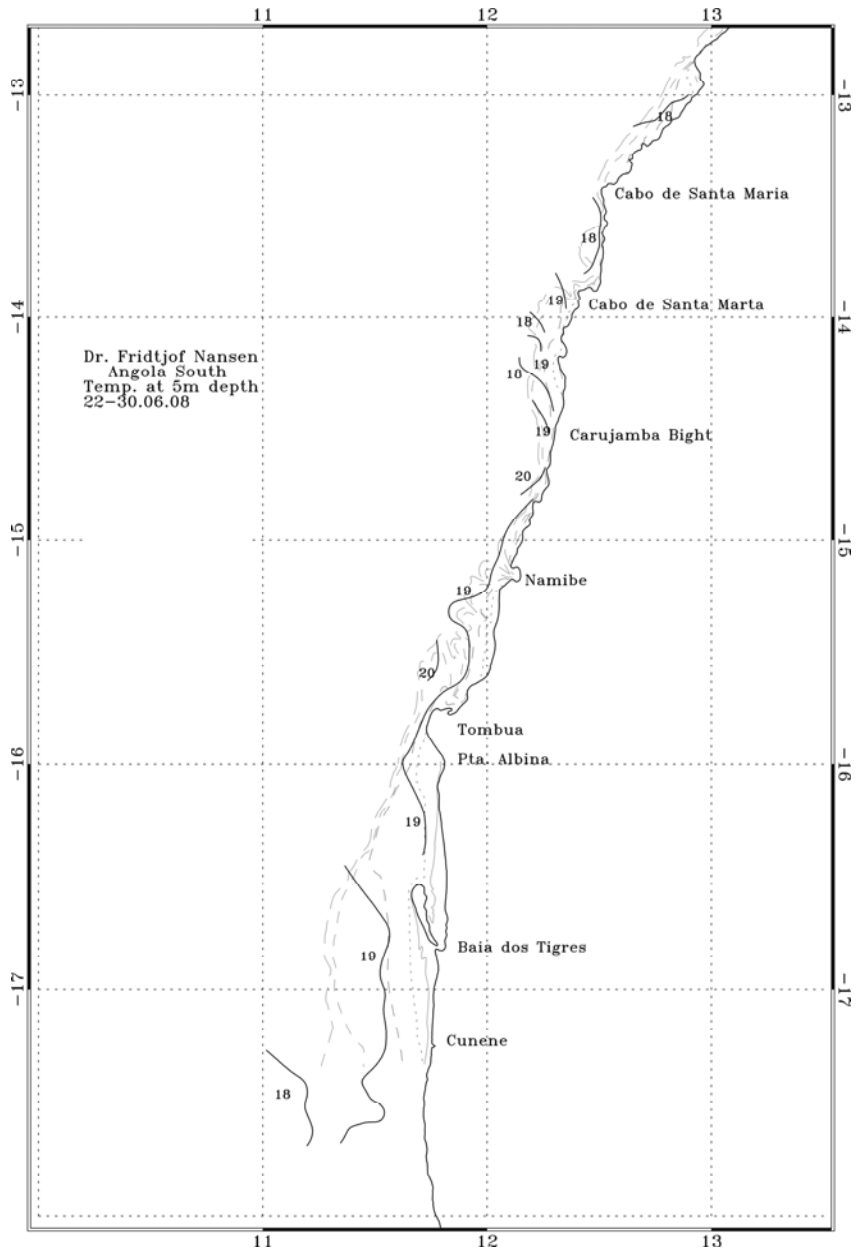


Figure 3c. Distribution of water temperatures at 5m depth in the southern region. Depth contours at 20, 50, 100, 200, and 500m.

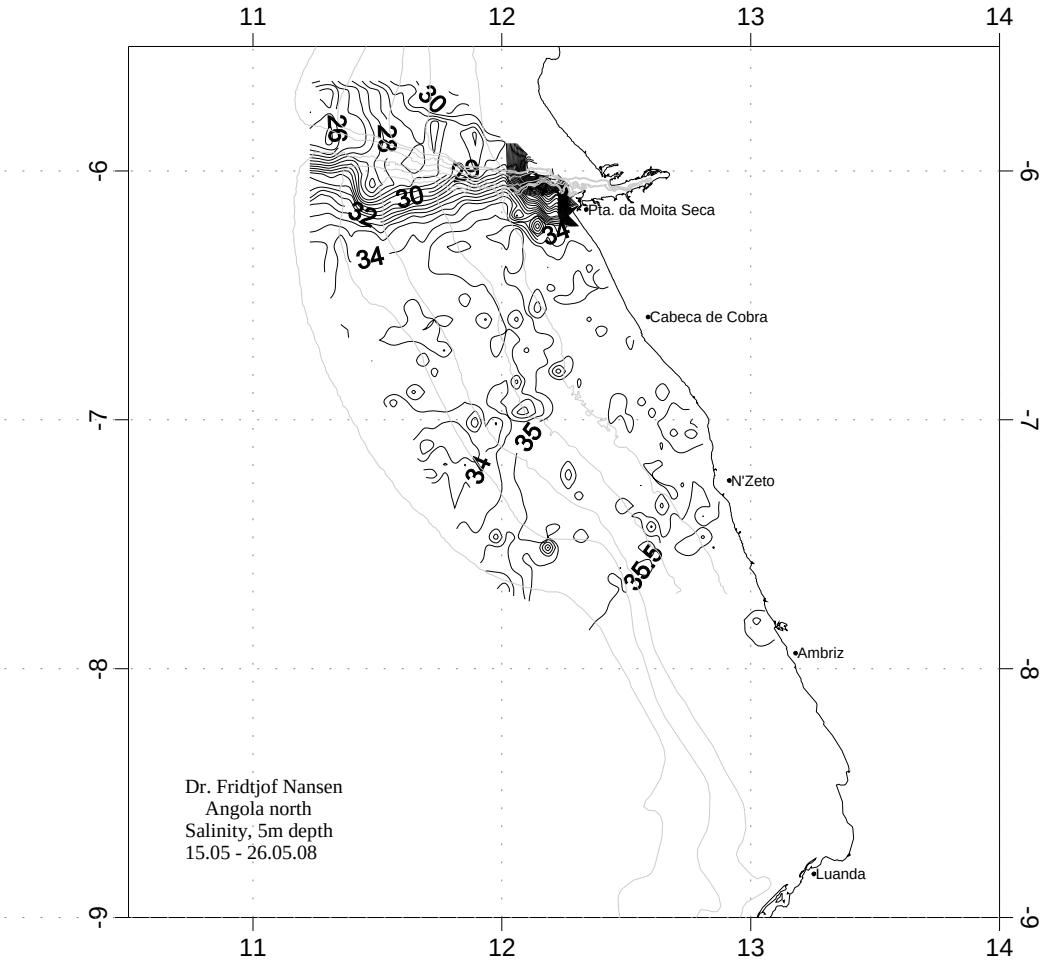


Figure 3d. Distribution of salinity at 5m depth in the northern region. Depth contours at 20, 50, 100, 200, and 500m.

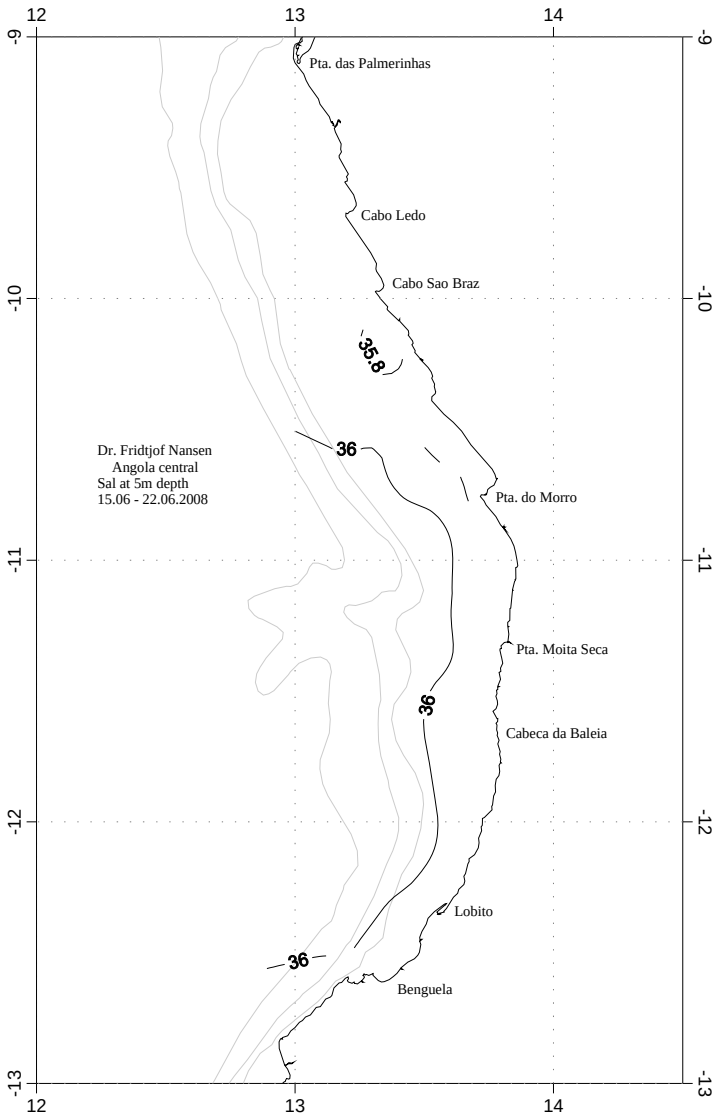


Figure 3e. Distribution of salinity at 5m depth in the central region. Depth contours at 20, 50, 100, 200, and 500m.

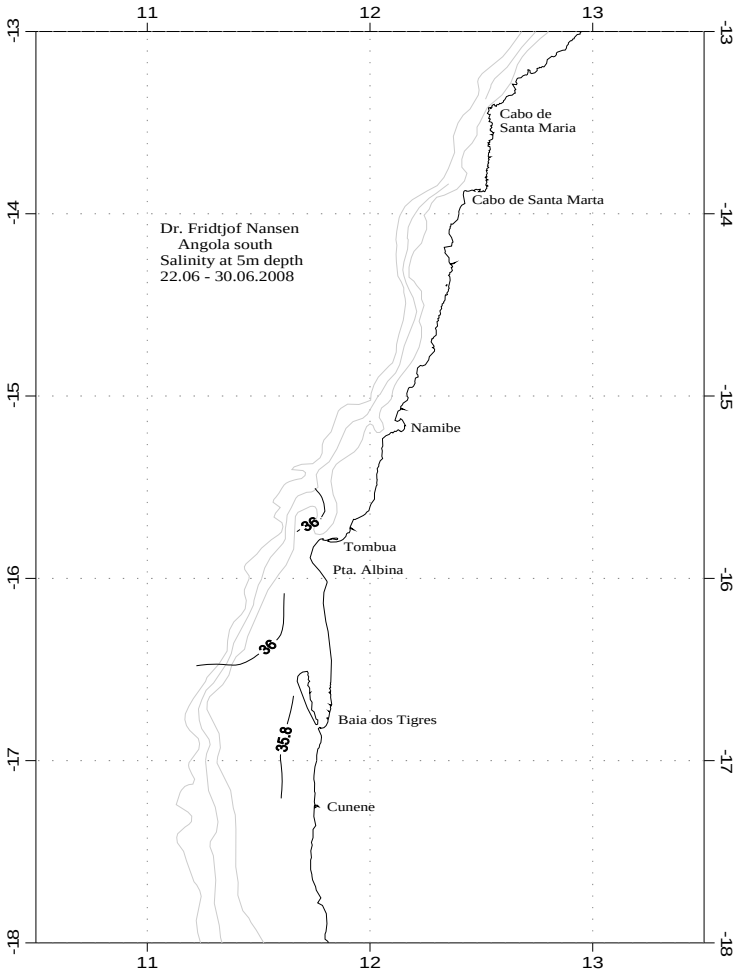


Figure 3f. Distribution of salinity at 5m depth in the southern region. Depth contours at 20, 50, 100, 200, and 500m.

3.2 Standard sections

Section off **Moita Seca** (Figure 4a). This section is located off the Congo River's mouth. Although the river discharge is reduced during this months (winter season), the plume of fresh water can be observed in the stations close to the coast and also at the station 949. At station 948 we can observe subsurface water welled up to the surface. Oxygen content is high at the surface (5ml/l), and appears to be similar to the one recorded last year in July. In this section, as in the next, the maximum temperature is found near the surface and decreases with depth.

In the sections of **N'zeto** (Figure 4b) and **Ambriz**, (Figure 4d) the distribution of oceanographic parameters is very similar in both sections, and indicates a weak upwelling.

Section off Pta de Palmerinhas (**Figure d**). The oceanographic conditions are similar to previous sections, except between 200-400 m depth from where water masses should have been affected by the internal waves. At surface the salinity was of 35,9 psu indicating an intense upwelling with both high temperature and oxygen values.

Sections off Cabo São Braz (**Figure e**) and Pta. do Morro (**Figure f**). The observed surface temperature close to the coast varied between 22-23ºC, the oxygen content between 3-4 ml/l and the salinity ranged between 35.2-35.3 psu. Were observed strong upwelling processes off section of Cabo São Braz between the surface and 400 m depth.

Section off Lobito **(Figure g).** The occurrence of tropical upwelling was observed with higher salinity values (35-36 psu). The temperature in the coastal area was similar to the sections off Pta das Palmeinhas and Pta do Morro ones.

The vertical sections of temperature, salinity and oxygen of the sections off Namibe (**Figure h**), off Baia dos Tigres (**Figure i**) and off Cunene River (**Figure j**) present similar oceanographic values. The predominance of both high salinity and oxygen values was observed at surface layer to 100 m depth. Off Cunene River surface water was cooler of -1ºC (18ºC) than the two previous.

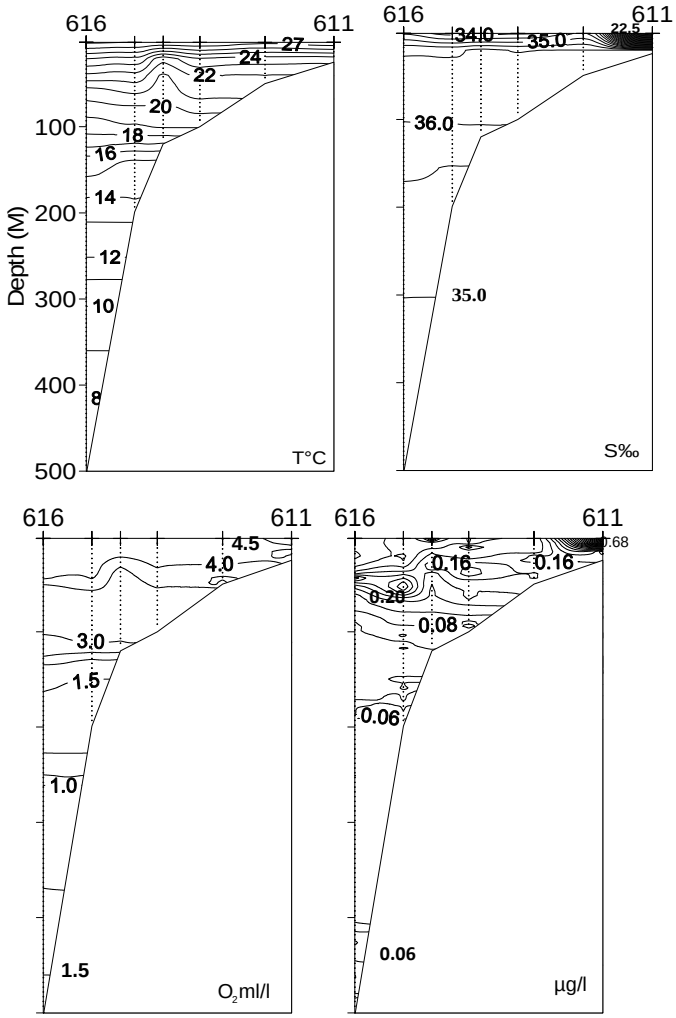


Figure 4b. Vertical sections of temperature, salinity and oxygen off Pta. da Moita Seca.

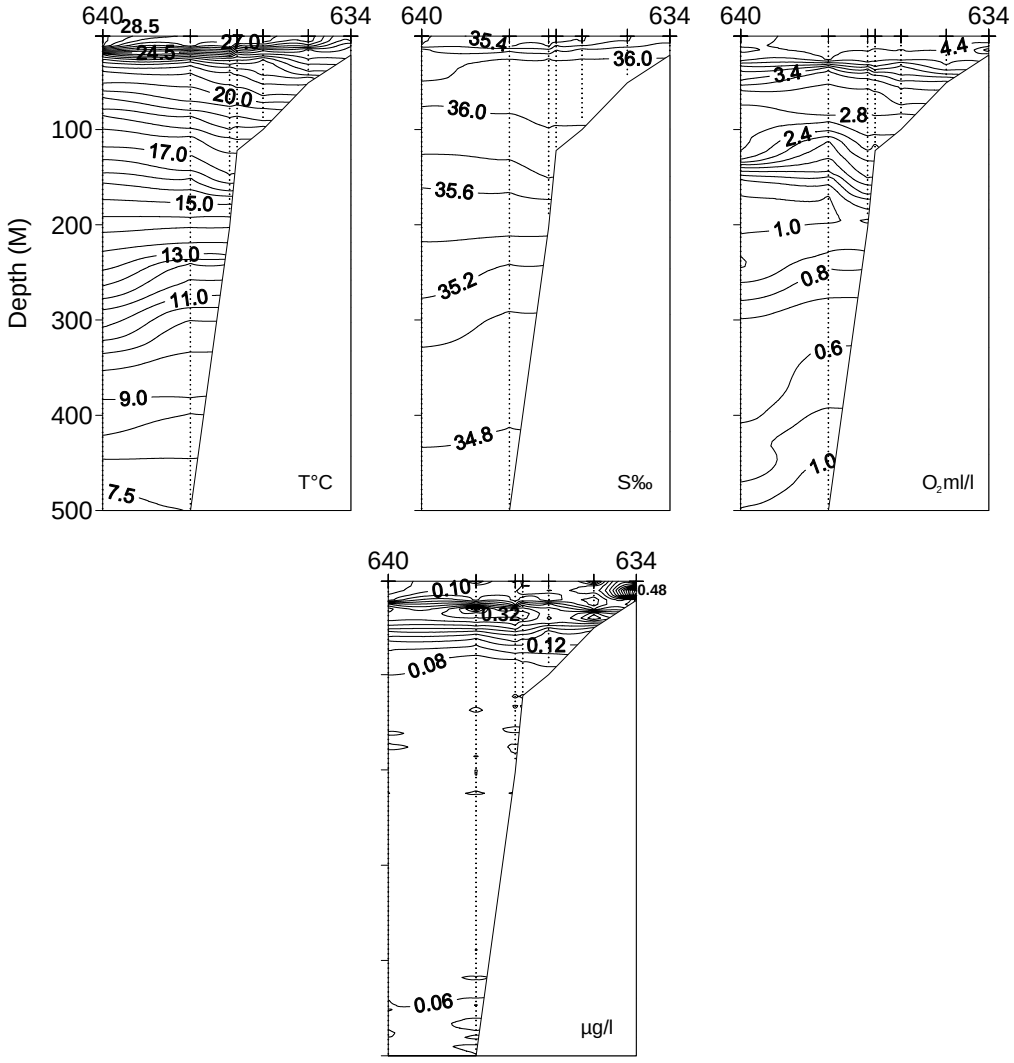


Figure 4c. Vertical sections of temperature, salinity and oxygen off N'zeto.

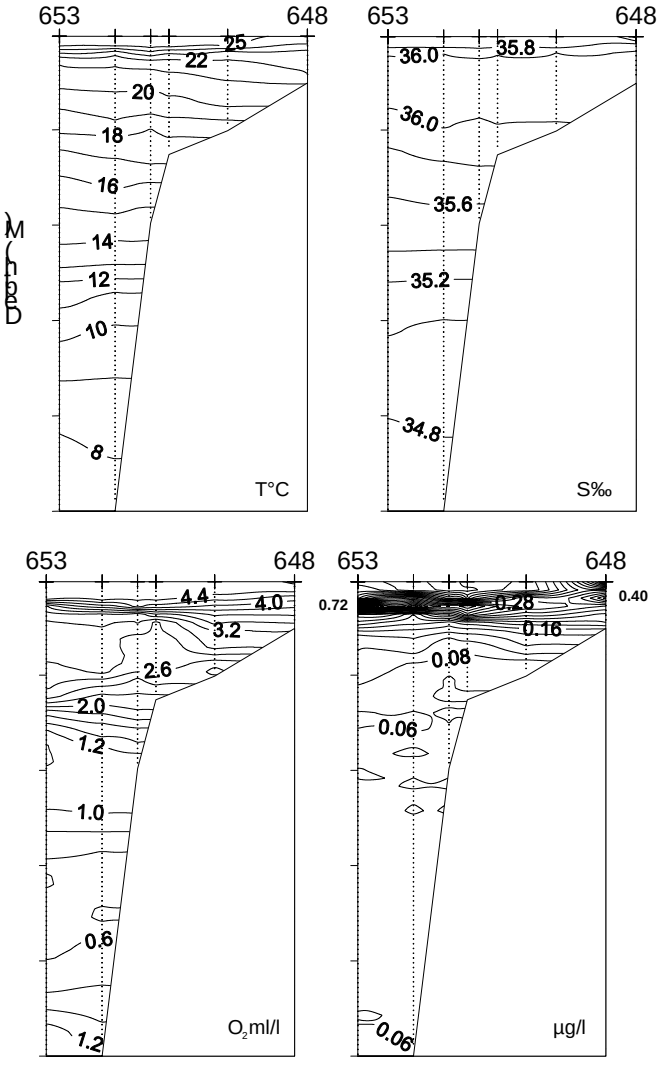


Figure 4d. Vertical sections of temperature, salinity and oxygen off Ambriz.

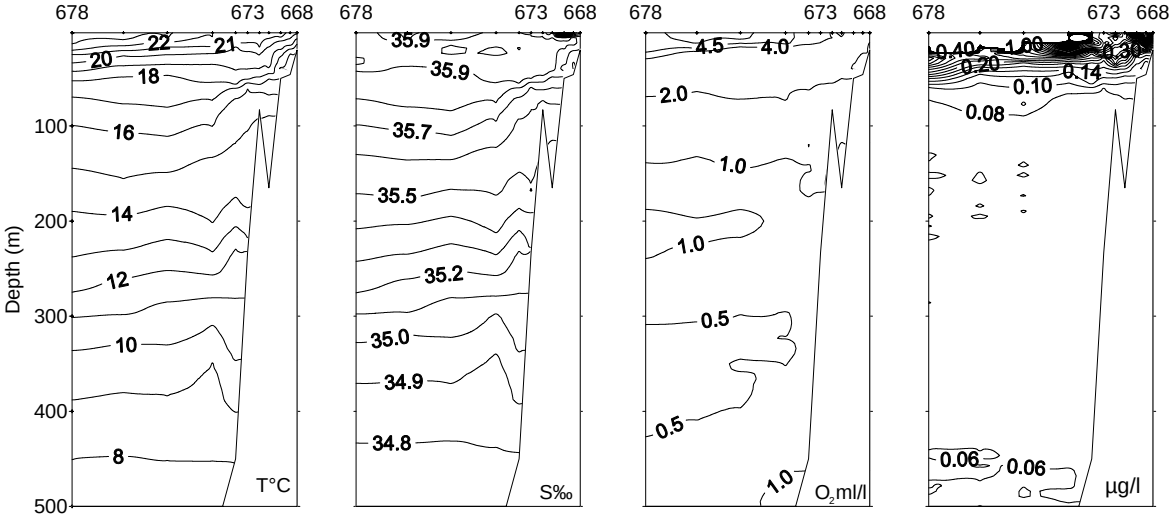


Figure 4e. Vertical sections of temperature, salinity and oxygen off Pta. Palmerinhas.

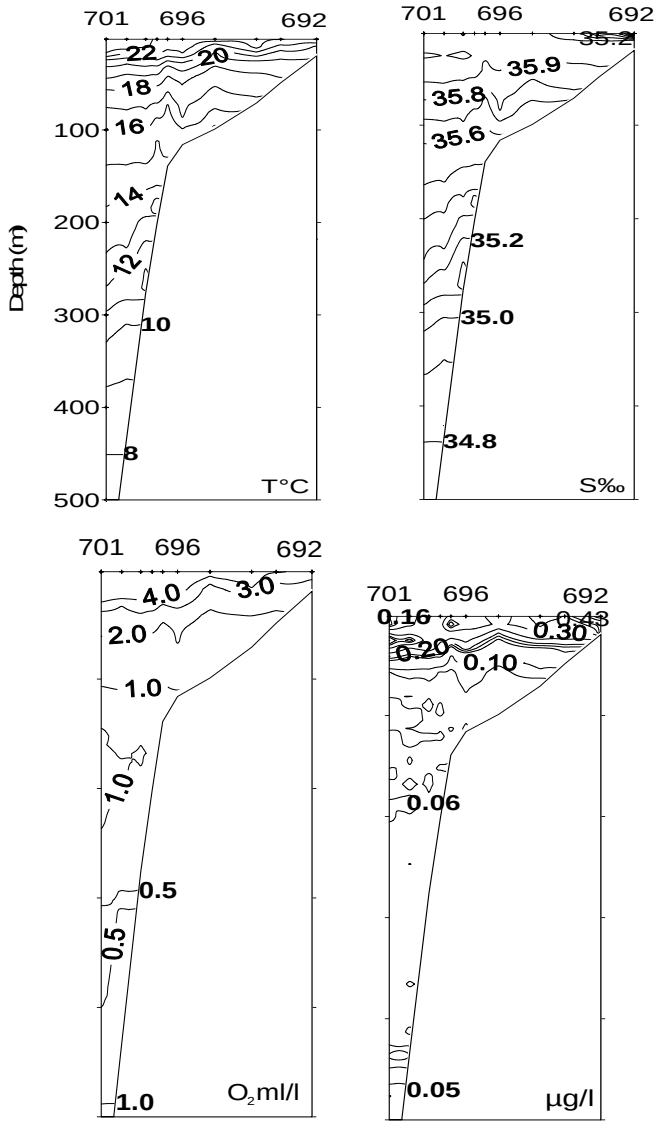


Figure 4f. Vertical sections of temperature, salinity and oxygen off south Cabo São Braz.

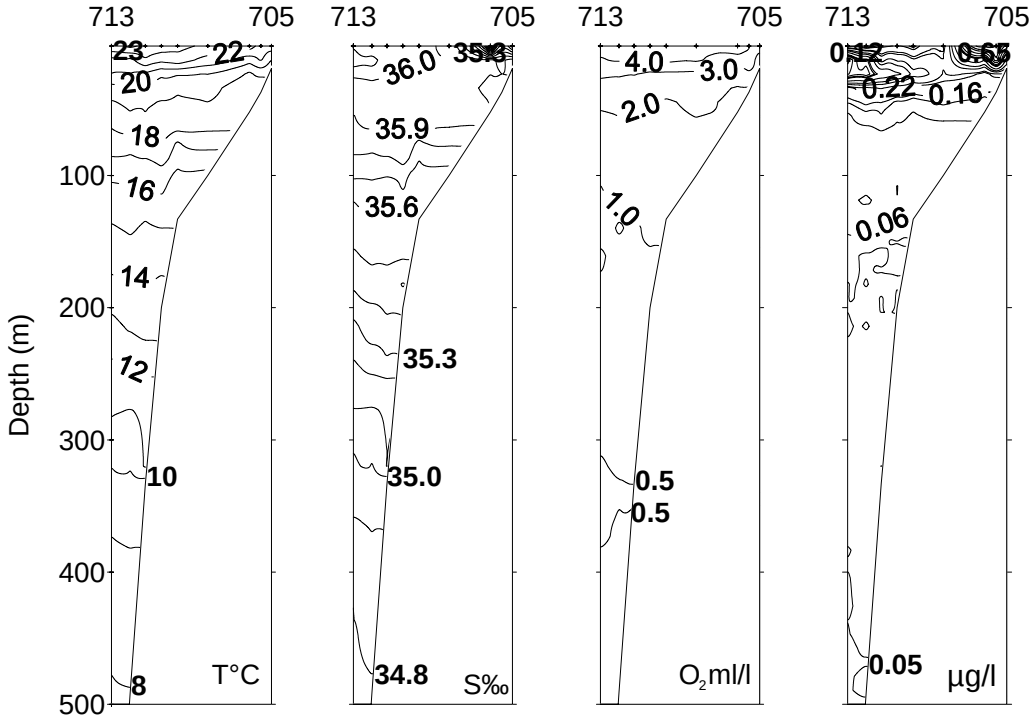


Figure 4g. Vertical sections of temperature salinity and oxygen off Pta. do Morro.

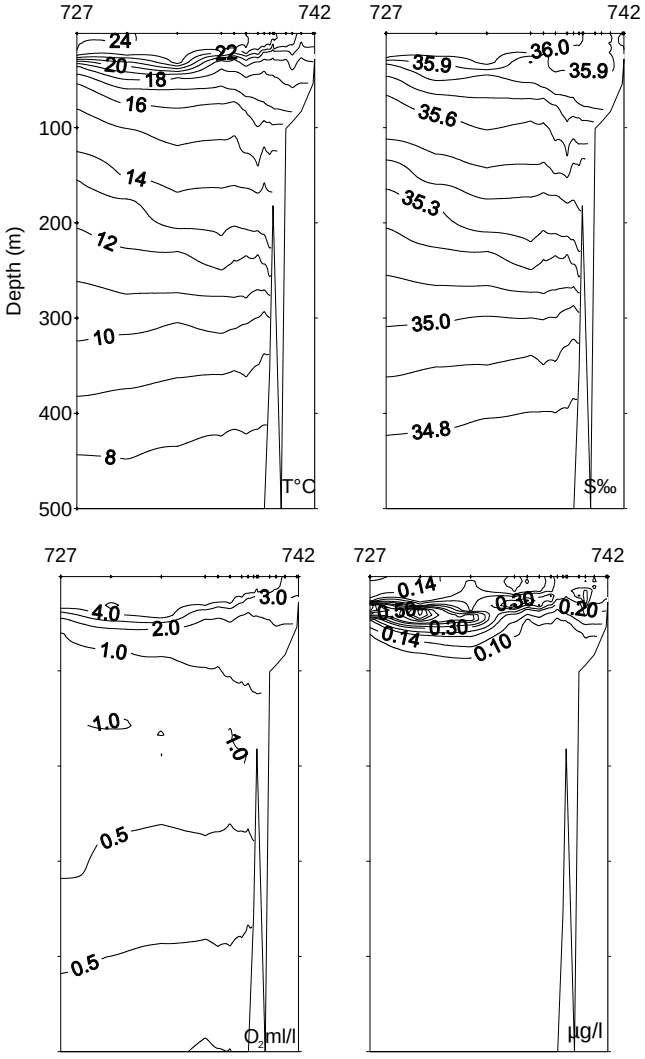


Figure 4h. Vertical sections of temperature salinity and oxygen off Lobito.

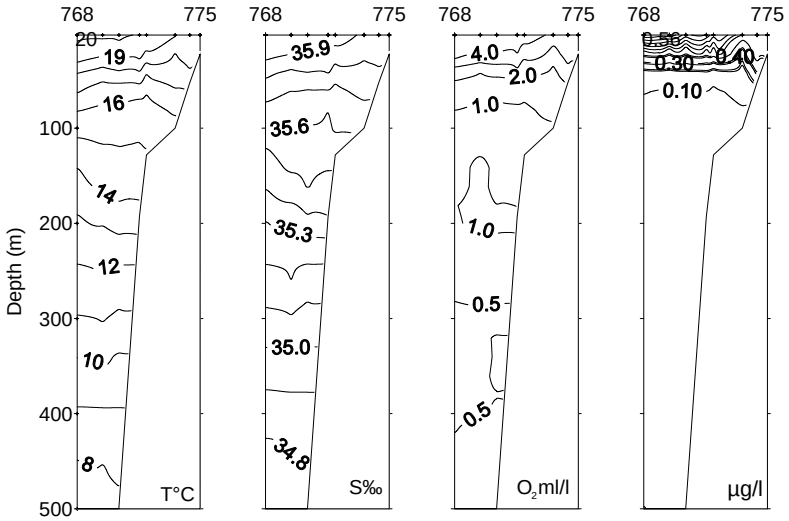


Figure 4i . Vertical sections of temperature salinity and oxygen off Namibe.

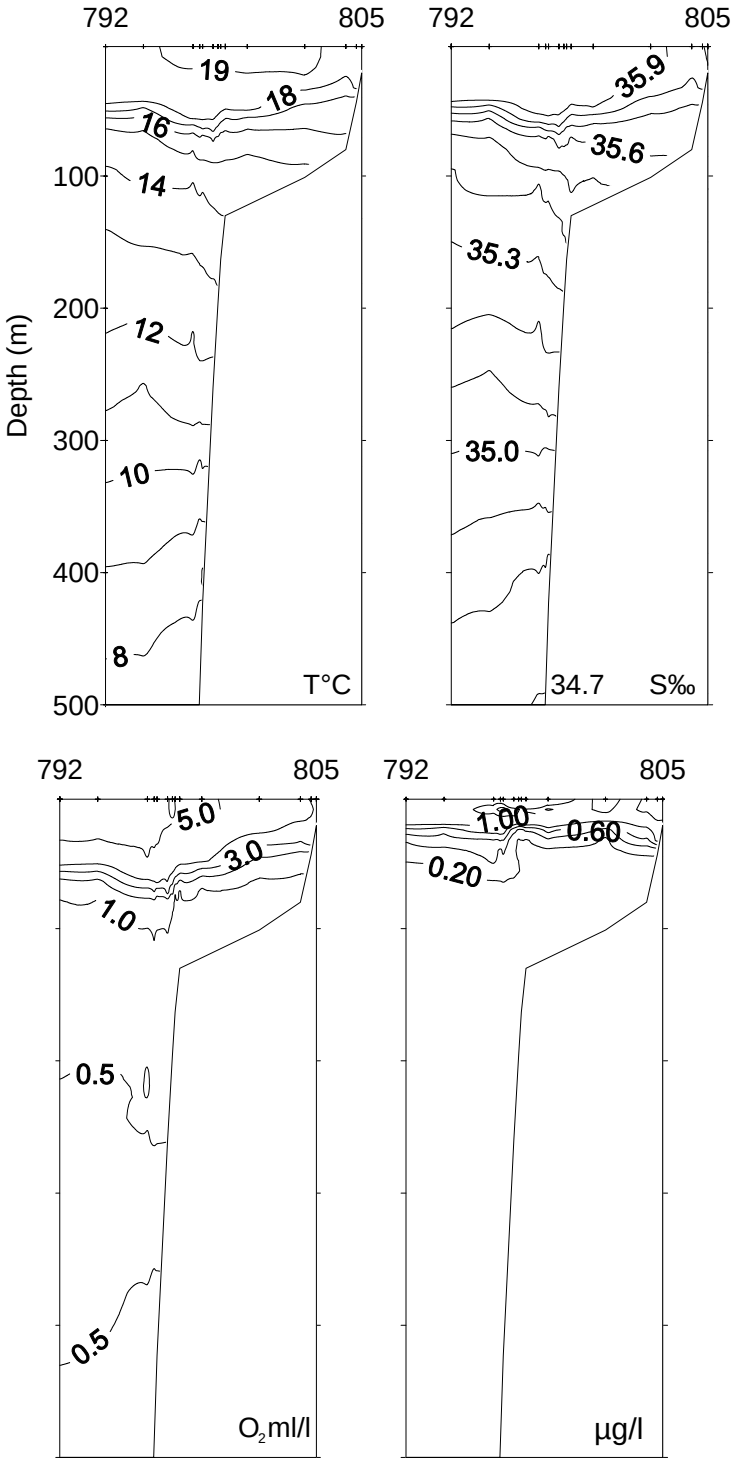


Figure 4j. Vertical sections of temperature salinity and oxygen off Baía dos Tigres.

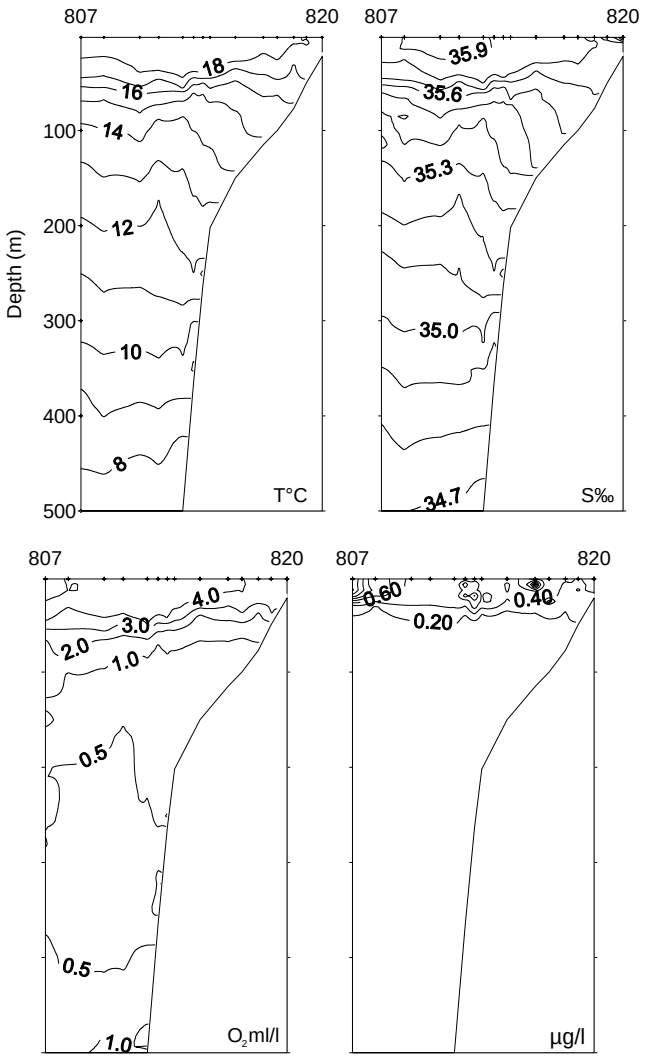


Figure 4k. Vertical sections of temperature salinity and oxygen off Cunene River.

CHAPTER 4 DISTRIBUTION, SIZE COMPOSITION AND BIOMASS

4.1 Congo River - Pta. das Palmerinhas

Sardinella

Both sardinella species, *Sardinella maderensis* and *S. aurita*, were found throughout the northern region (Figure 5). The distribution is continuous from Cabeça da Cobra up to Luanda. Areas with high-density aggregations (3 001<s_A<10 000 m^2/NM^2) were found at Congo river, north of Nzeto and north of Luanda (Figure 5). This distribution pattern is different from the 2007 pattern which was patchy with more small areas with high density.

Figure 6 (a and b) shows the length frequency distribution of sardinella. *S. maderensis* shows two well defined cohorts, peaking at 10 and 27 cm. The third cohort (15-20 cm) is not well defined, the same as observed during the 2007 survey. The length frequency distribution of *S. aurita* shows one clear cohort, with a modal peak at 30 cm. In 2007 the distribution pattern had two clear with modes at 27 and 32 cm. This means that the only cohort seen this year is most probably coming from the 27 cm cohort observed in 2007.

The estimated biomass for the two sardinella species was 186 000 tons, which is very close to the biomass estimate in 2007 (187 800 tons). *S. maderensis* contributed 103 000 tons towards the total biomass, while *S. aurita* 83 000 tons, similar to proportions observed in 2007.

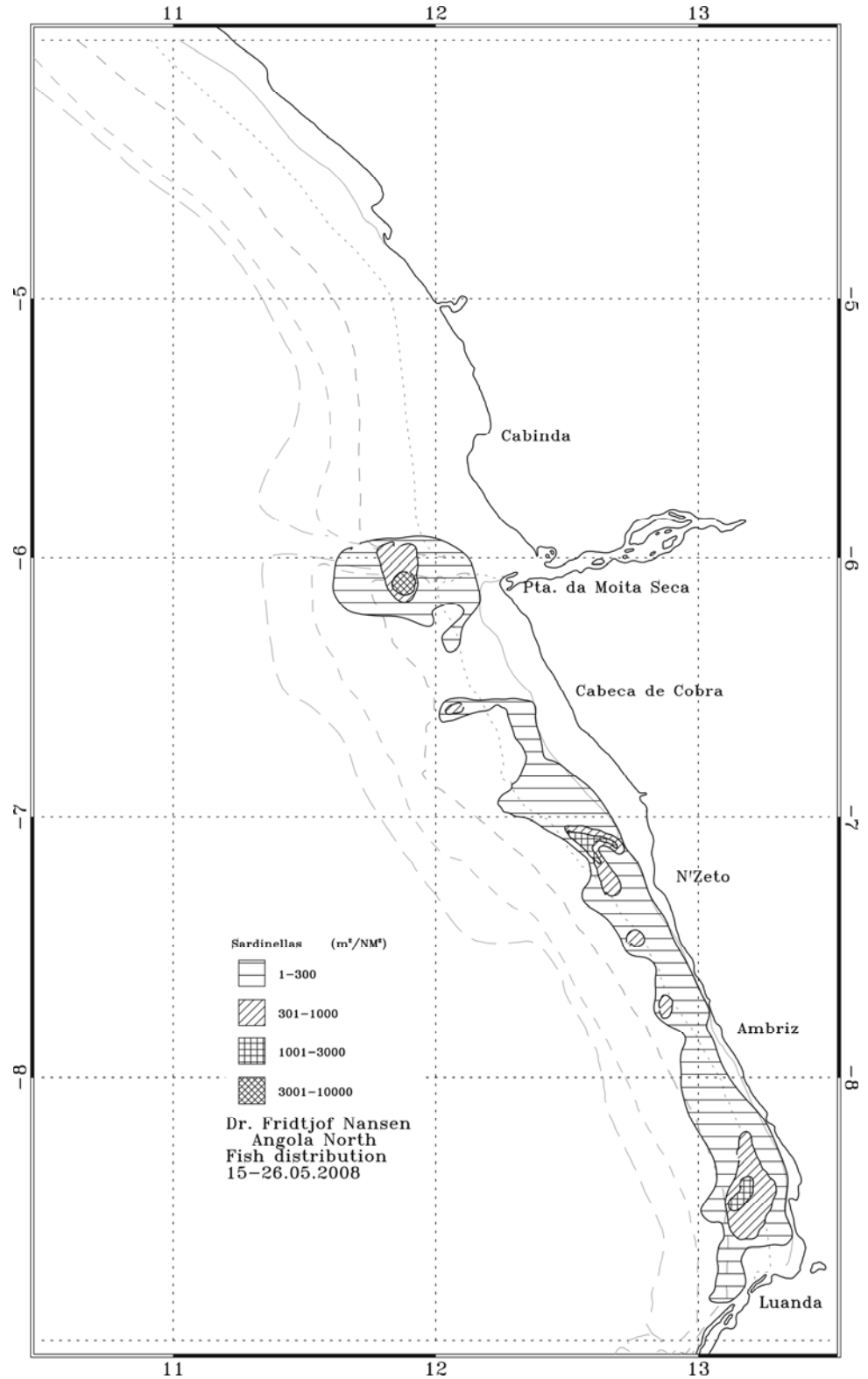
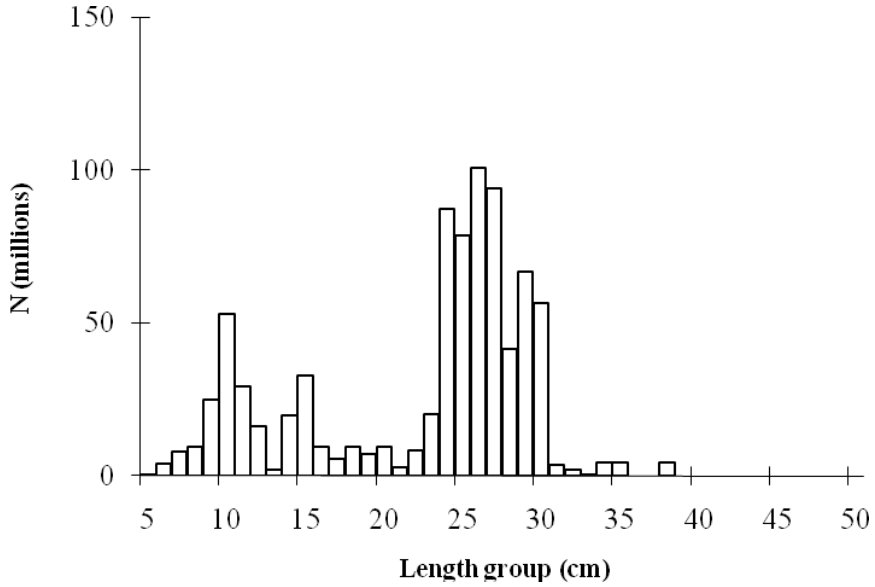


Figure 5. Distribution of *Sardinella* spp. Pta. das Palmerinhas-Congo River, including Cabinda. Depth contours at 20, 50, 100, 200, and 500m.

a) *Sardinella maderensi*



b) *Sardinella aurita*

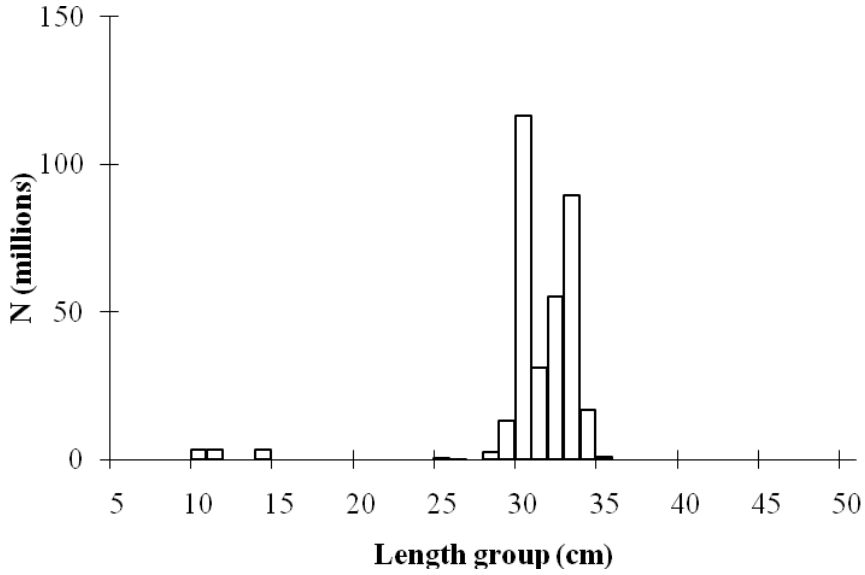


Figure 6. Total length distribution of *Sardinella maderensis* (a) and *S. aurita* (b), Pta. das Palmerinhas-Congo River.

Cunene horse mackerel

The Cunene horse mackerel, *T. trecae*, was found in two areas with very low-density($1< s_A<300$ m^2/NM^2), offshore of Pta. da Moita Seca and inshore of south of Ambriz (Figure 7).

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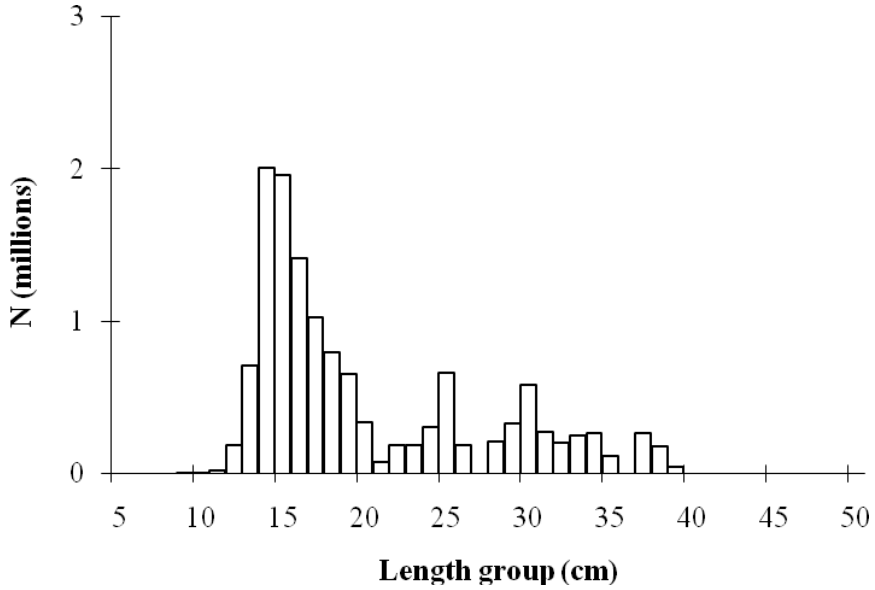


Figure 8 shows the length frequency distribution of Cunene horse mackerel for the region.

The distribution shows three well-defined cohorts at 15, 26 and 31 cm (TL) (Figure 8). However, the distribution was dominated by fish of < 20 cm and unlike the 2007 survey, this year no fish > 40 cm were found in this region. The distribution by depth strata shows that most of the fish >27 cm were found at depths less than 100m (Figure 9 a and b).

During this survey the acoustic densities were too low to yield a valid biomass estimate for *Trachurus trecae*. It is the first time this is happening since the beginning of the time series in 1985, and it should be taken as a clear indication that the stock is in a critical state.

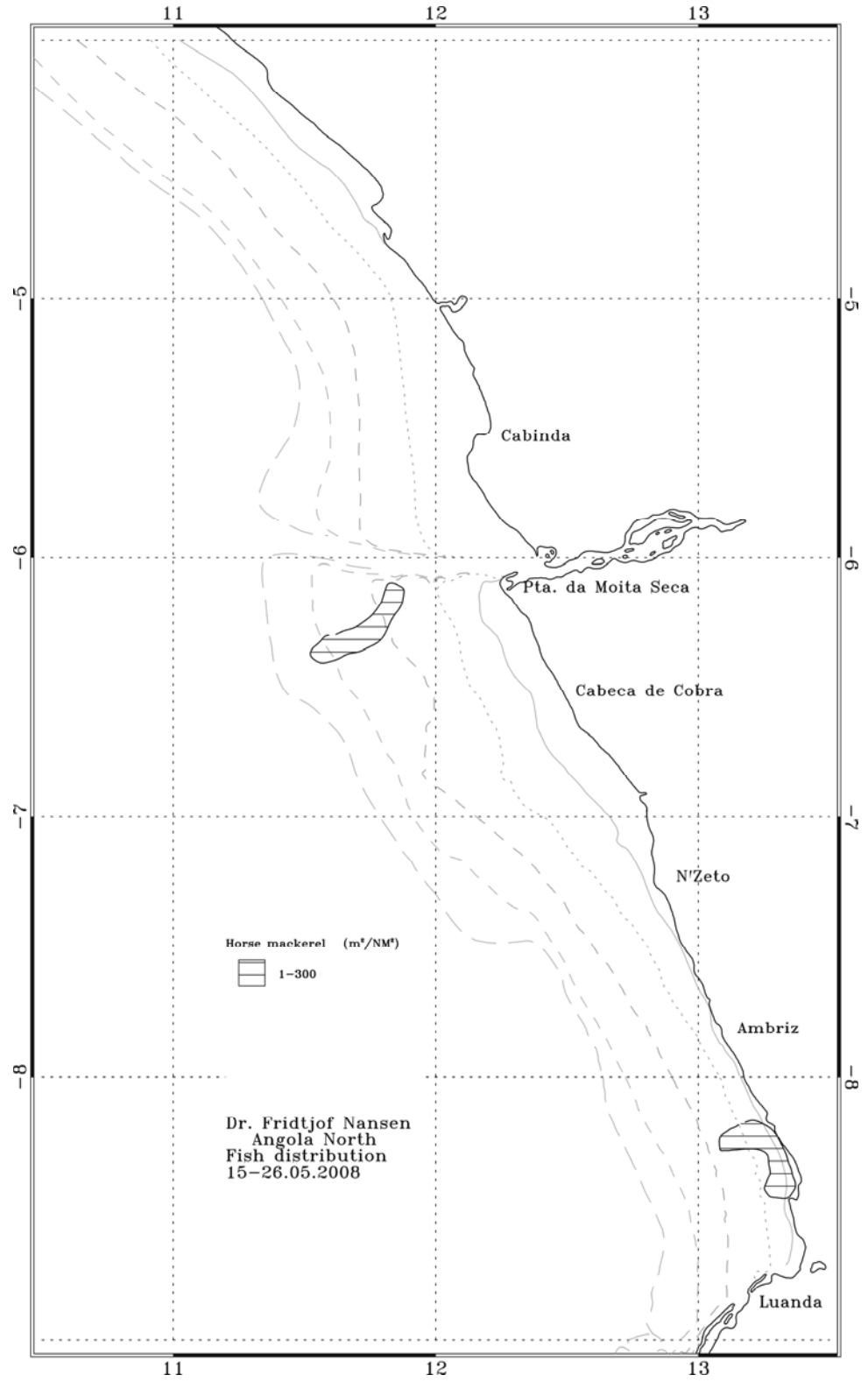


Figure 7. Total length distribution of Cunene horse mackerel (*Trachurus trecae*), Pta. das Palmerinhas-Congo River.

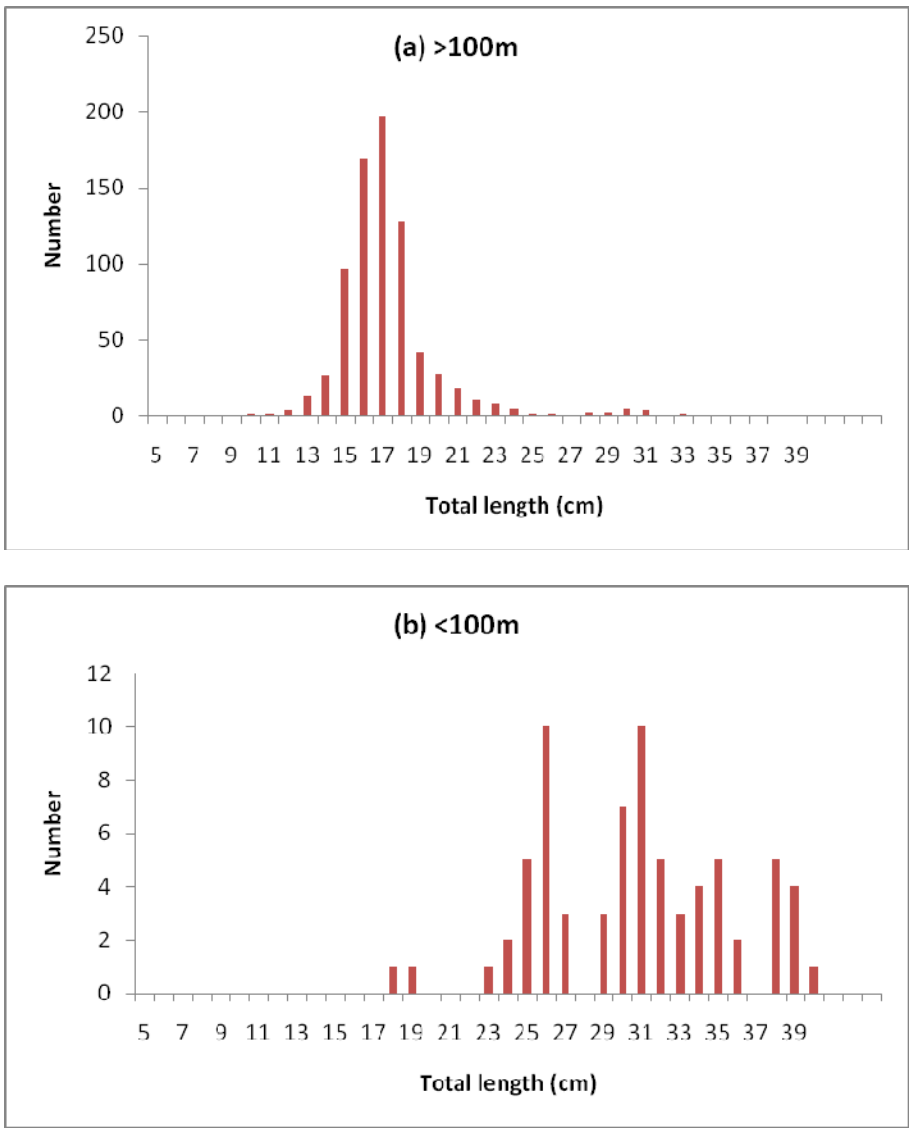


Figure 9. Length distribution of Cunene horse mackerel (*Trachurus trecae*) by depths stratum, Pta. das Palmerinhas-Congo River. a) depths >100 m and b) depths <100 m

Pelagic species Group 1

This group was not abundant enough to estimate its biomass in the region.

Pelagic species Group 2

This group was continuously distributed in low densities ($1<s_A<300$ m^2/NM^2) from Ponta da Moita Seca up to Luanda (Figure 10). The dominant species belongs to the Carangids group (Table 4) with *Decapterus rhonchus* and *Selene dorsalis* being the dominating species. The biomass was estimated at 48 000 tons, higher than the previous year's biomass.

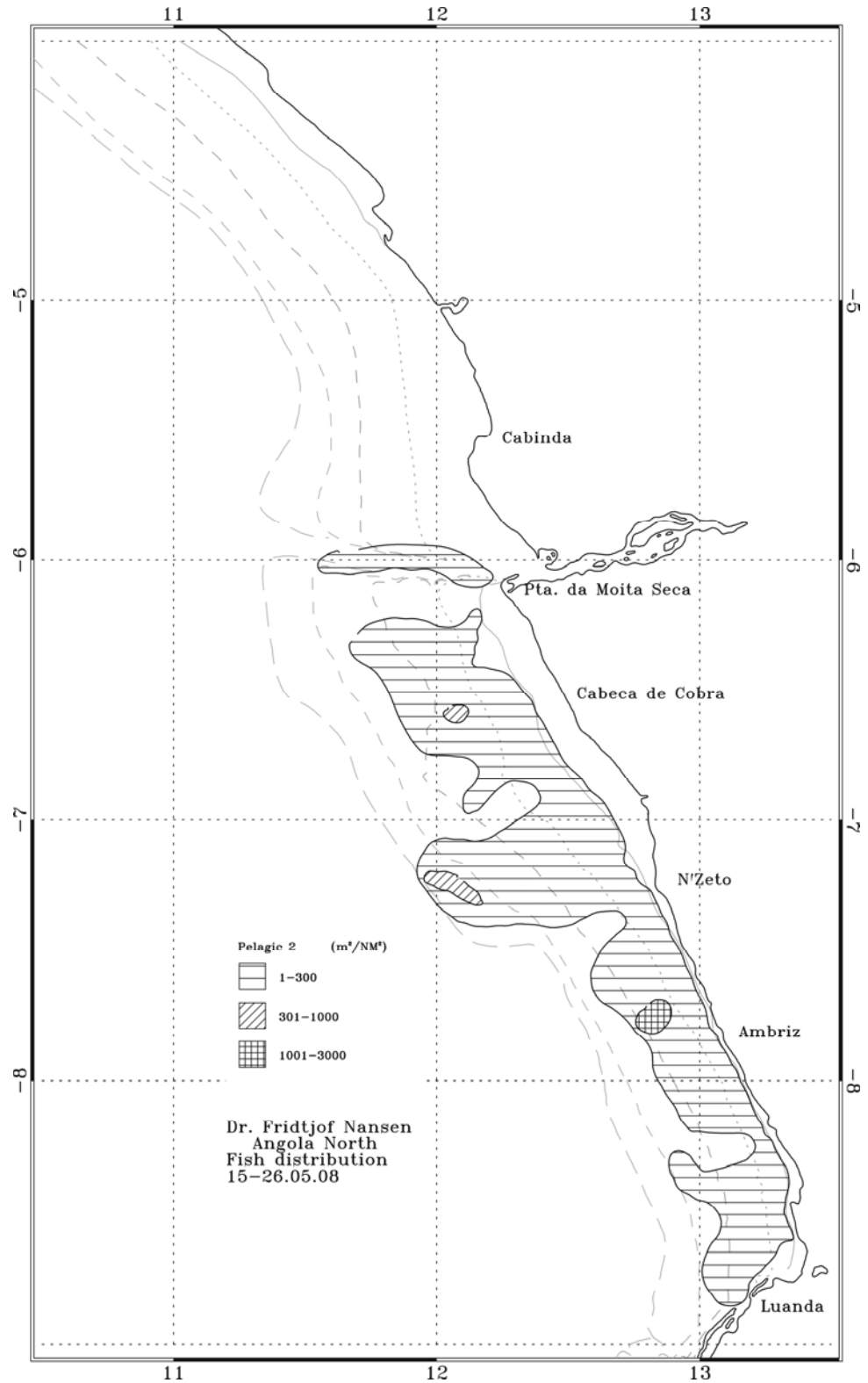


Figure 10. Distribution of Pelagic 2, Pta. das Palmerinhas-Congo River, including Cabinda. Depth contours at 20, 50, 100, 200 and 500m.

Table 4. Catch rates (kg/h) of the main groups of pelagic fish, Pta das Palmerinhas-Congo River, including Cabinda.

Station	Gear depth	Carangids	Scombrids	Hairtails	Barracuda	Engraulidae	Clupeids	Other	Total
44	5.0	14.0	42.0	47.0	37.3		12.1	1082.1	1234.5
45	2.5	7.7	0.8				3.9	4.1	16.6
46	122.0								0.0
47	122.0	100.6		2.0				335.3	438.0
48	5.0	69.2	12.0					53.8	135.1
49	5.0			13.4				0.3	13.7
50	10.0		1.0	40.2			1.1	0.2	42.5
51	10.0							2.8	2.8
52	82.0	122.3		13.5				91.8	227.6
53	10.0	1.8					5.0	46.3	53.1
54	5.0	28.9	51.2	1.3	120.6		37.9	95.1	334.9
55	10.0	3.6	0.0						3.6
56	114.5	20.8		7.1	0.9			265.7	294.4
57	22.0	12.8	3.5	0.4	1.4	12.0	11.8	101.3	143.2
58	10.0	0.0	43.6					306.4	350.1
59	5.0	41.0	14.5	17.1				2.4	75.0
60	21.0	24.9	6.7				2230.2		2261.8
61	19.0	197.3	1.6		10.7		79.6	8.3	297.5
62	10.0	71.1	5.0		11.0		89.1	499.2	675.3
63	115.5	3.1		20.3				101.8	125.2
64	85.0	2.6		1.4				161.8	165.8
65	5.0								0.0
66	10.0	3.8	2.9				36.8		43.5
67	10.0	48.8	5.3	1.8	15.7		13.0	115.9	200.5
68	10.0	3.9		9.8				1.9	15.6
69	10.0	45.3			370.3		143.6	90.7	649.8
70	10.0	5.7					73.3		78.9
71	21.5	54.6		29.5	3.4		50.1	348.0	485.6
72	5.0	15.8	15.6	182.9				6.0	220.4
73	5.0	137.4	24.8	11.8	4.2		371.3	76.3	625.9
74	67.5	157.7	12.0	153.6				17.1	340.4
75	135.0			1.3					1.3
76	119.5	53.3		178.7				61.7	293.6
77	5.0	1.3		66.0	1.0		30.9	48.9	148.0
78	10.0	1259.6		28.2	27.6		2677.9	823.4	4816.7
79	10.0	4.4	12.6	37.9				1.5	56.4
80	10.0	33.0		85.3	7.7	0.1	341.0	167.7	634.8
81	112.5	7.0		18.1				247.5	272.7
82	10.0	3.8	3.0		7.4		7.5	4.2	25.8
83	5.0	15.8	12.9	81.2	0.0		0.9	303.2	414.0
Mean	34.0	64.3	6.8	26.2	15.5	0.3	155.4	136.8	405.4
Std dev		199.7	12.7	47.6	60.9	1.9	542.6	228.3	824.2
%Catch		15.9	1.7	6.5	3.8	0.1	38.3	33.7	

4.2 Pta. das Palmerinhas - Benguela

Sardinella

The sardinella distribution in this region was continuous in low densities offshore and denser densities inshore (Figure 11). High-density patches (s_A>1000 m^2/NM^2) were found south of Cabo Sao Braz and Pta do Morro and north of Novo Redondo depression. The first two patches were found inshore whereas the latter was found offshore. This distribution pattern is different from what was found during the 2007 survey, where very high density aggregations were found north of Lobito in shallow waters.

Figure 12 shows the length distribution for *S. maderensis* (a) and *S. aurita* (b). The size distribution of *S. maderensis* shows three clear cohorts, peaking at 12,17 and 26 cm. The 12 cm cohort was dominating the length frequency. The length distribution for *S. aurita* shows one cohort with modal peaks at 26 cm. Last year the length frequency for this species consisted of two cohorts peaking at 21and 30 cm. However the 30cm cohort is not visible in this year's length frequency distribution. This can be attributed to a higher fishing mortality on this length group.

The sardinella biomass estimated for this region is 264 000 tons, almost 50% less than the biomass estimated in 2007 (483 000 tons). The proportions of the two sardinella species were similar, with *S. maderensis* contributing 141 000 tons and *S. aurita* 123 000 tons. The Current estimation falls within range of the biomass estimation for the last ten years, with an exception of 2007which was twice the rest of the time series.

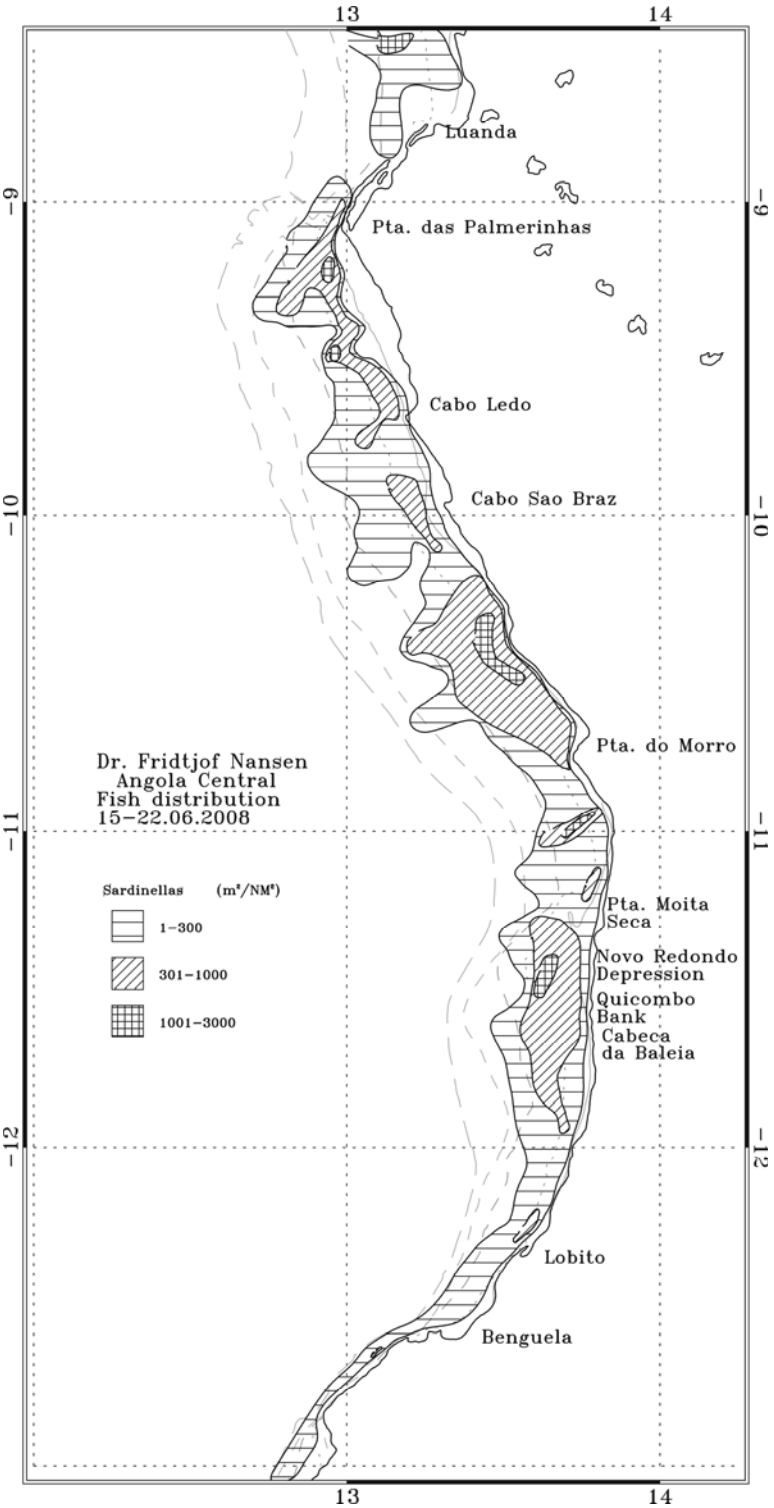
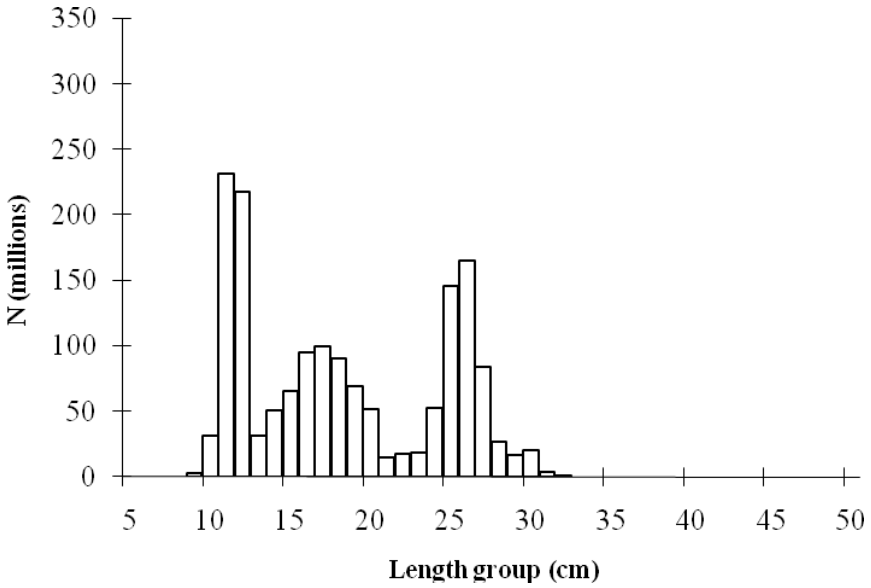


Figure 11. Distribution of *Sardinella* spp. Pta. das Palmerinhas- Benguela. Depth contours at 20, 50, 100 and 200 m.

a) *Sardinella maderensis*



b) *Sardinella aurita*

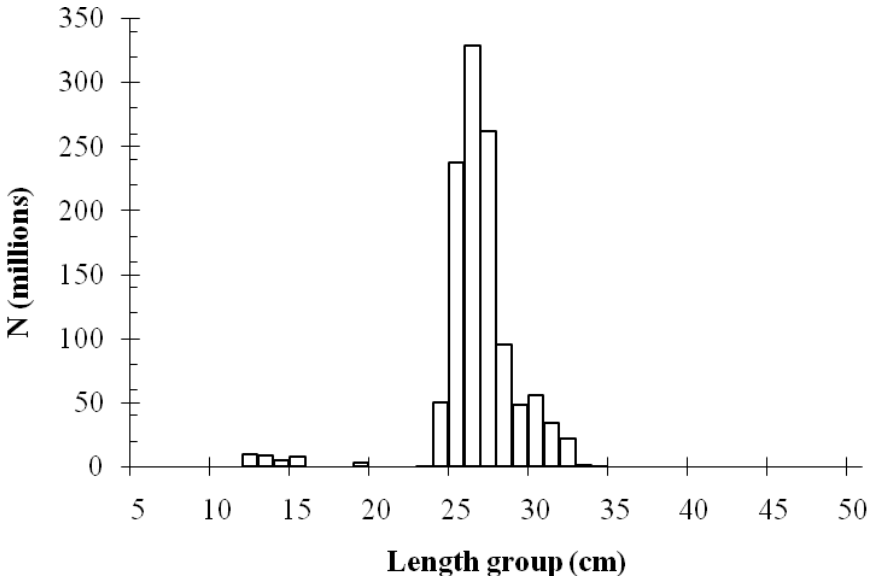


Figure 12. Total length distribution of *Sardinella maderensis* (a) and S. *aurita* (b). Pta. das Palmerinhas- Benguela.

Horse mackerel

From Pta.das Palmerinhas to Pta. do Morro, Cunene horse mackerel (*T. trecae)* distribution was patch with low densities ($1<s_A<300$ m^2/NM^2) (Figure 13). From Novo Redondo Depression up to north of Benguela the distribution was found continuous but at same density levels. This distribution pattern is very similar to that found during 2007 survey, however, more inshore.

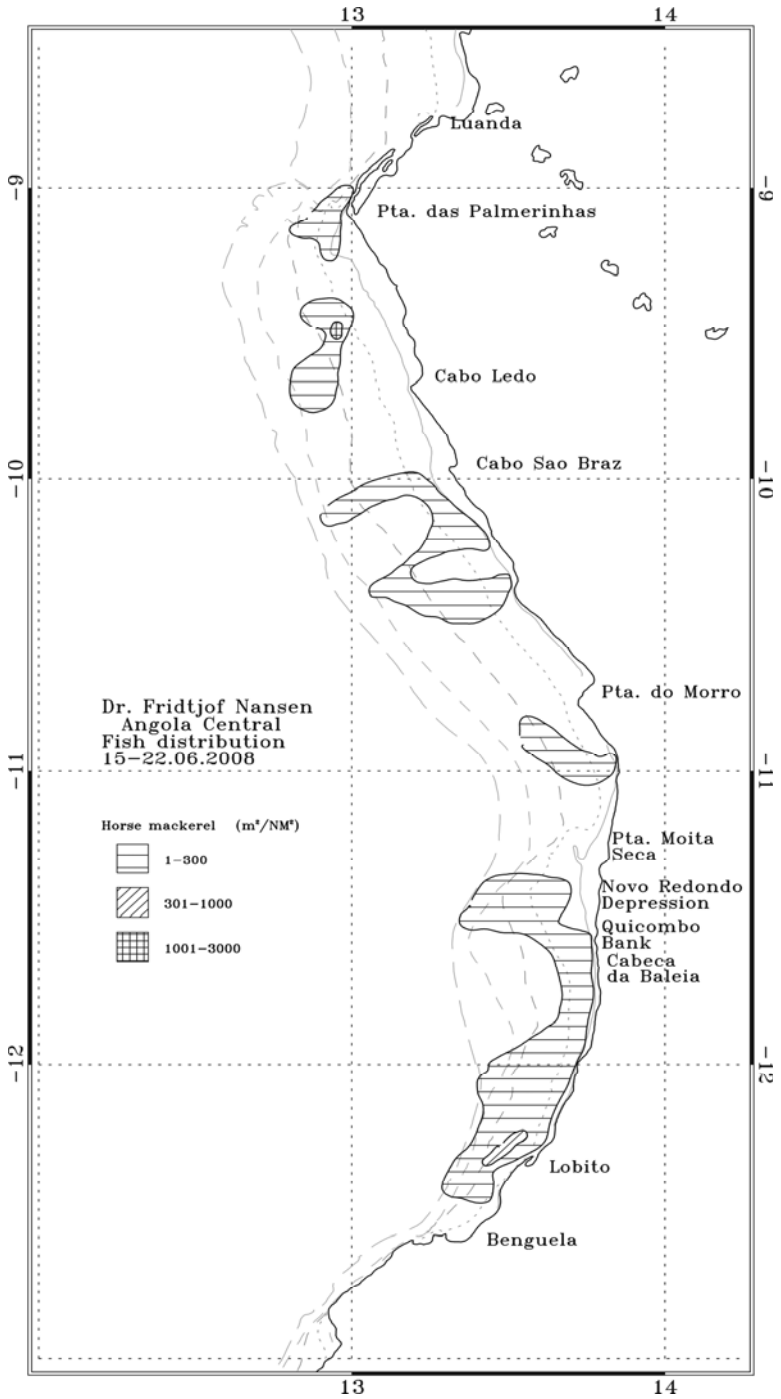


Figure 13. Distribution of horse mackerel (*Trachurus trecae*). Pta. das Palmerinhas- Benguela. Depth contours at 20, 50, 100, 200 and 500 m.

The total length distribution (Figure 14) of this species was very similar to 2007 distribution, with two well-defined cohorts with modes at 14 and 28 cm TL. However, this year the proportion of bigger fish (> 30 cm) is lower than what it was in 2007. This is an indication that the fishing mortality on this length group is still high. The length frequency distribution does not show the recruitment cohort (5-10 cm). This could be an indication of recruitment failure.

In this region the distribution of Cunene horse mackerel by depths shows that there is not depths preference by small fish as they were found at both depths strata (< 100 and >100 m) (Figure 15). The general pattern of distribution by depths strata is more continuous at the <100 m depth stratum, which could be a reflection of the survey effort (i.e. more trawls were conducted in that stratum) as determined by the acoustic densities.

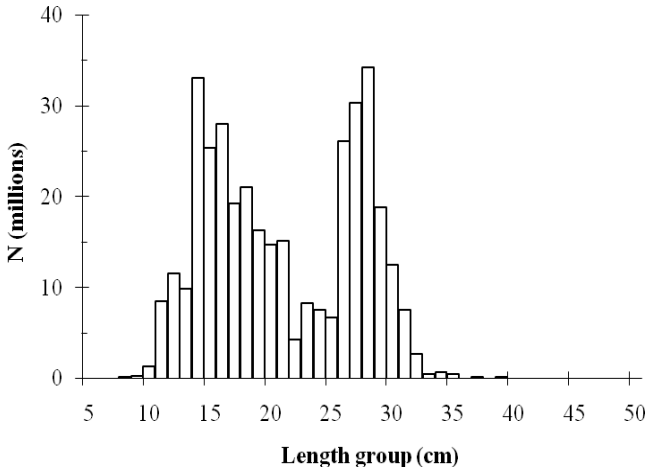


Figure 14. Total length distribution of horse mackerel (*Trachurus trecae*), Pta. das Palmerinhas - Benguela

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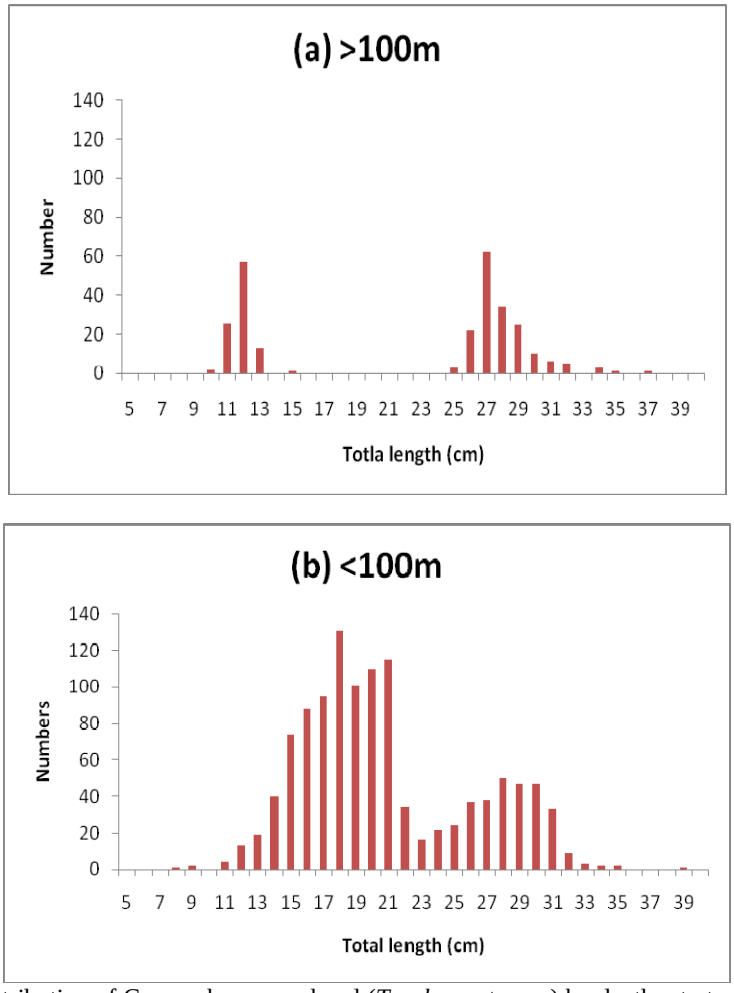


Figure 15. Length distribution of Cunene horse mackerel (*Trachurus trecae*) by depths stratum, Benguela - Pta. das Palmerinhas. a) depths >100m, and b) depths<100 m

The estimated biomass of the Cunene horse mackerel for the area was 40 000 tons, lower than the 2007 estimate (57 000 tons). The biomass is still at a very low level, with a clear sign of decrease since the last four years, being around 50% of the biomass estimated in 2004 (107 000 tons). The stock is dominated by fish >15 cm TL, but few individuals > 30cm.

Other pelagic species

Group 2

This group is patchily distributed in low densities ($1<s_A<300$ m^2/NM^2 (Figure 16). The most common species group was the Carangidae (Table 5), dominated by *Decapterus rhonchus*.

The biomass estimate, based on an average length of 25 cm and a condition factor equal to 0.01, was 30 000 tons, much lower than the previous year's estimation (113 000 tons).

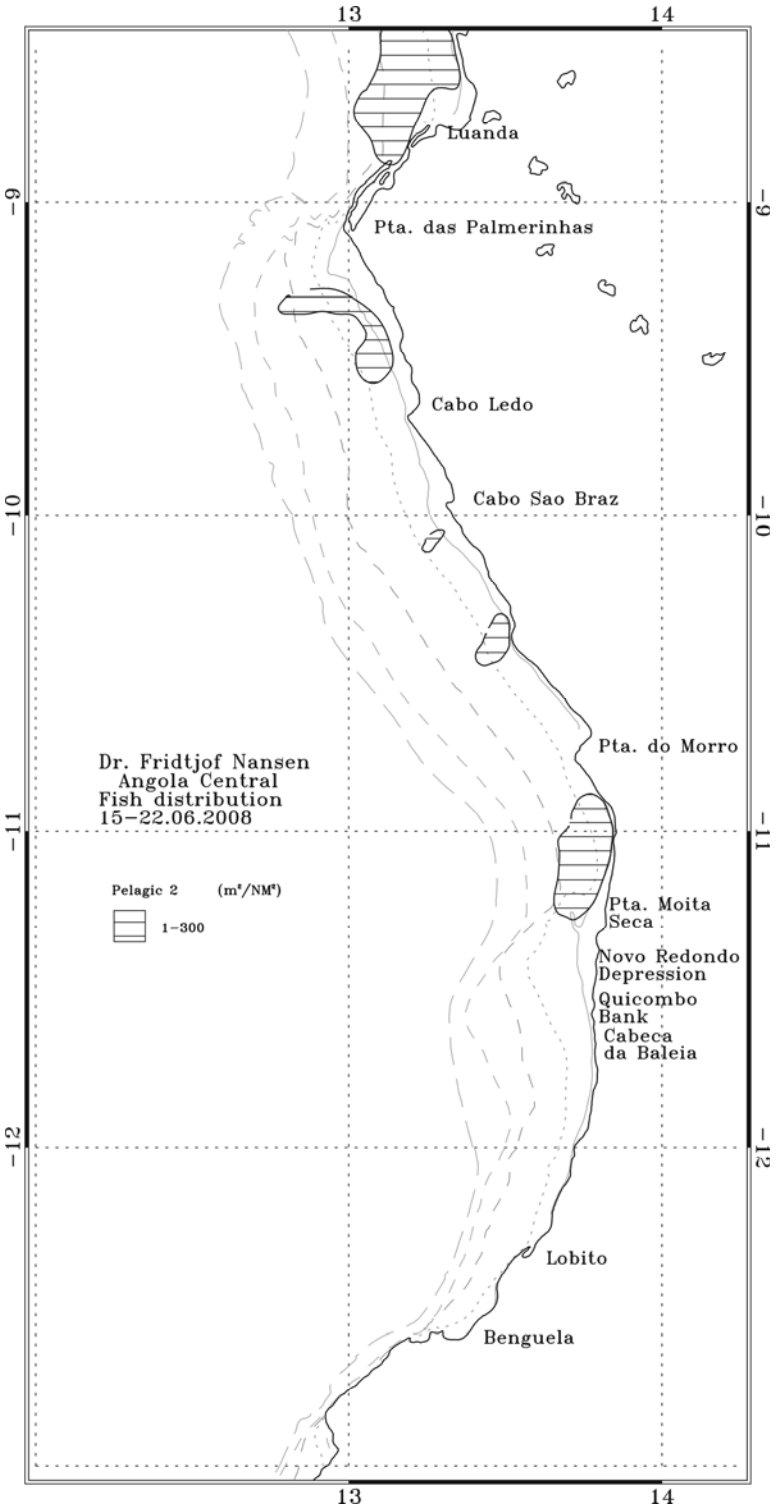

13
14
-9
-10
-11
-12
Luanda
Pta. das Palmerinhas
Cabo Ledo
Cabo Sao Braz
Pta. do Morro
Dr. Fridtjof Nansen
Angola Central
Fish distribution
15-22.06.2008
Pelagic 2 (m²/NM²)
1-300
Pta. Moita Seca
Novo Redondo Depression
Quicombo Bank
Cabeca da Baleia
Lobito
Benguela

Figure 16. Distribution of other pelagic species, group 2. Pta. das Palmerinhas- Benguela. Depth contours at 20, 50, 100, 200 and 500 m.

Table 5. Catch rates (kg/h) of the main groups of pelagic fish, Pta. das Palmerinhas- Benguela.

Station	Gear depth	Carangids	Scombrids	Hairtails	Barracuda	Engraulidae	Clupeids	Other	Total
84	10.0	67.3			0.5	1.3	910.6	700.5	1680.2
85	15.0	7.1					3.5	10.8	21.4
86	10.0	8.0			2.3		646.9	87.4	744.6
87	2.5	551.7		7.9	14.6		682.4	303.7	1560.3
88	22.0								
89	103.5	357.9		7.7				141.7	507.3
90	32.5	80.9		5.6	1.3		130.9	715.6	934.3
91	15.0	379.7		2.8	4.9		3238.5	7228.0	10853.8
92	2.5	292.6					938.5	668.6	1899.6
93	48.0	24.5		1.3	76.8			310.7	413.4
94	128.0			1.8				175.6	177.5
95	68.5	71.4					67.3	130.0	268.7
96	7.5			16.1	4.4		927.5	106.0	1053.9
97	39.0	960.0			3.3		457.0	383.3	1803.6
98	41.0	416.7			5.8			225.7	648.1
99	3.5	1244.1		10.2			1653.7	105.7	3013.7
100	109.0							345.8	345.8
101	87.5	371.9					2.8	156.7	531.4
102	105.5	830.3		3.2				323.5	1157.0
Mean	44.8	298.1		3.0	6.0	0.1	508.4	637.9	1453.4
Std dev		369.8		4.5	17.5	0.3	816.4	1610.7	2404.9
%Catch		15.4		0.2	0.7		33.9	67.0	

4.3 Benguela - Cunene

Sardinella

S. aurita is the only sardinella species found in this region. It was found in four confined to small patchy areas with low densities ($1< s_A<300$ m^2/NM^2). The Acoustics densities were too low to give a valid biomass estimate for this region

Horse mackerel

The distribution of horse mackerel in the southern region is almost continuous with low densities ($1< s_A<300$ m^2/NM^2) (Figure 17). However, few small areas with medium density ($301< s_A<1000 m^2/NM^2$) were found inside the Baía dos Tigres and between Namibe and Tombua. The dominant species found in this region was the Cunene horse mackerel (*T. trecae*).

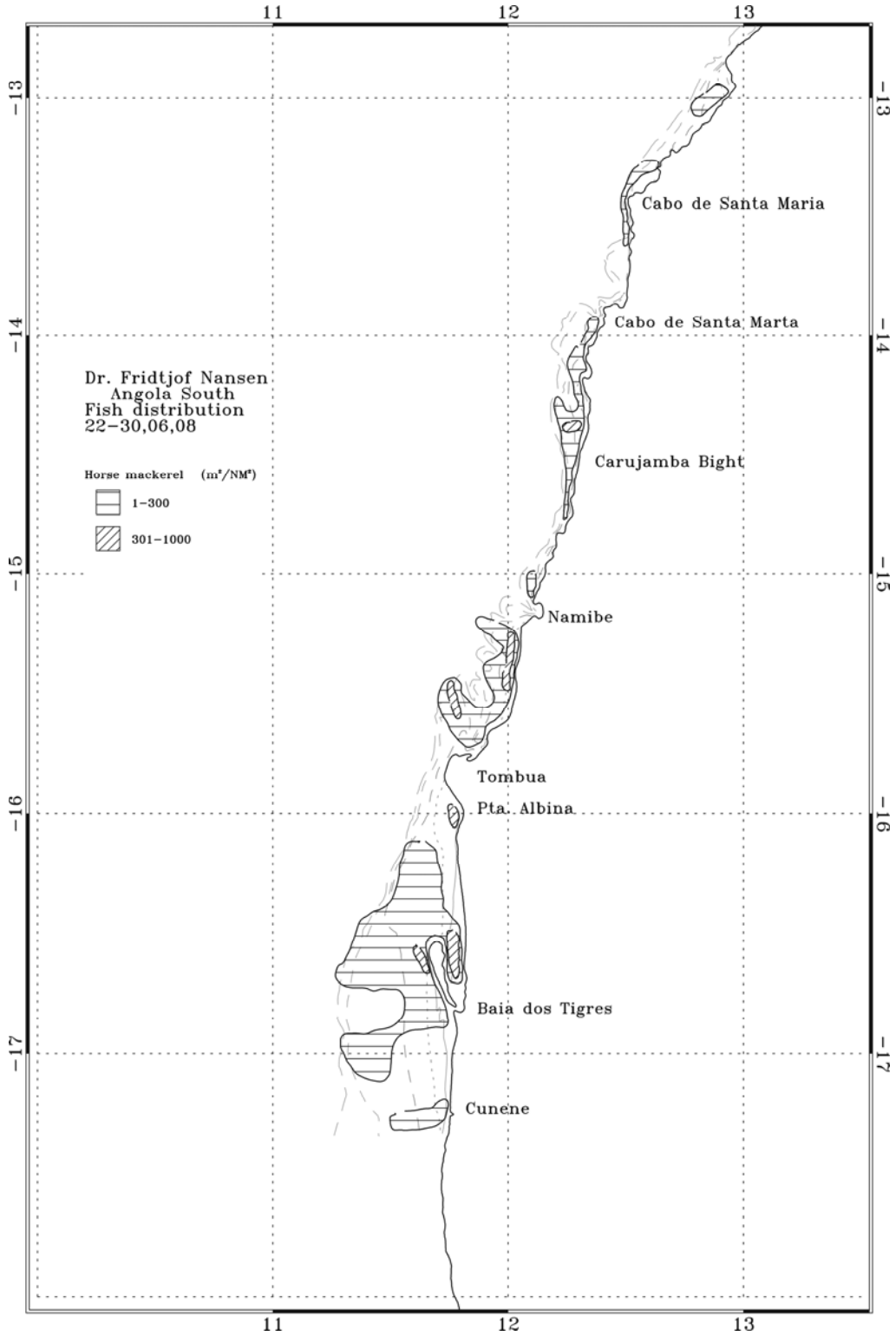
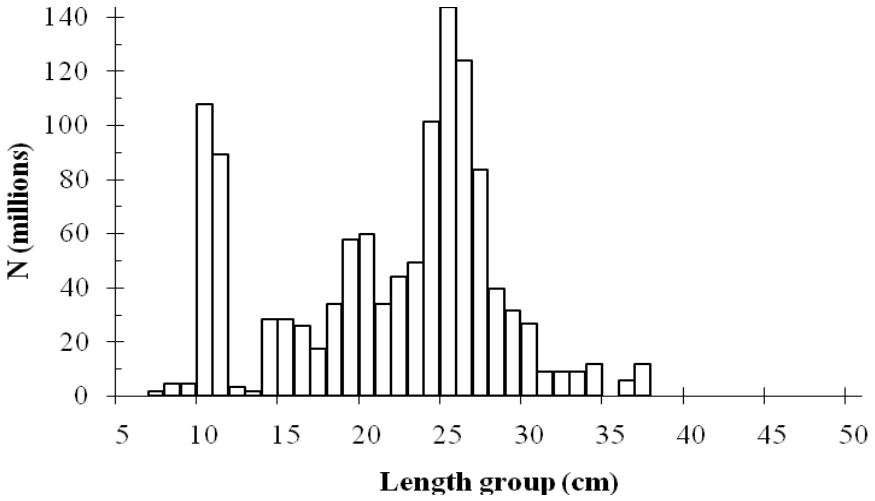


Figure 17. Distribution of horse mackerel. Cunene–Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m.

Figure 18 a shows the size distributions of Cunene horse mackerel, with three well-defined cohorts with modal peaks at 11, 21 and 26 cm. Compared to the size distribution from the 2007 survey higher proportion of fish >30 cm was found during this survey and the pattern was dominated by fish between 15 and 30 cm. The recruits cohort was found to be at more or less the same level with that of 2007.

T. capensis was only found at two stations, south of Namibe and south of Baía dos Tigres at depth strata of more than 100 m. The length frequency shows a unimodal distribution at 27 cm (figure 18 b).

a) *Trachurus trecae*



b) ***Trachurus trachurus capensis***

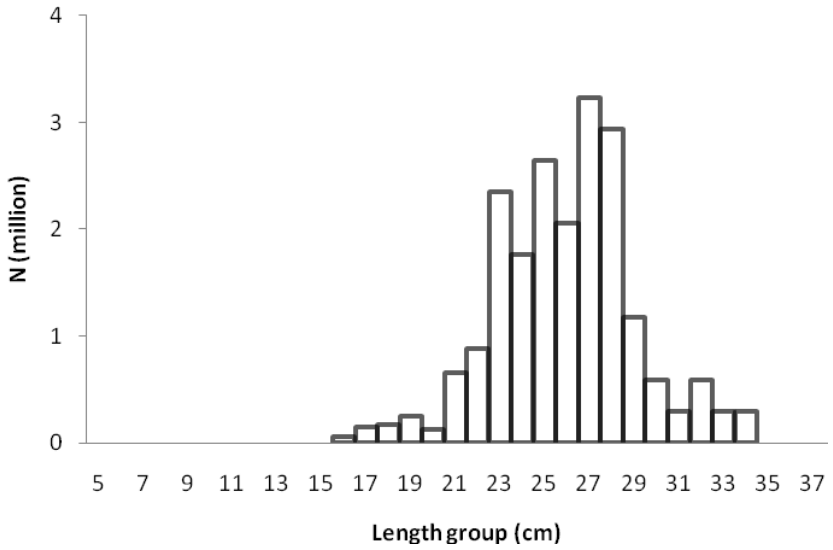


Figure 18 Total length distributions of (a) *Trachurus trecae* and (b) *Ttrachurus trachurus capensis* Benguela-Cunene.

The total estimated biomass for horse mackerel in the southern region was 33 000 tons, which is lower than the biomass estimate (147 700 tons) in the last year. The biomass of Cunene horse mackerel was estimated at around 29 000 tons and for Cape horse mackerel at around 3000 tons. This estimate is the lowest since the beginning of the time series in 1985.

Other species

Anchovy sardine and round herring were found around the area between Namibe and Cunene River .Sardine was only found at one station, around 17˚11'S at10 m fishing gear depth. The length frequency distribution ranged from 18 to 21cm, with modal peak at 20 cm TL.

Anchovy was found around Baia dos Tigres (16˚34'S), with a very high acoustic density. The size distribution ranged from 5 to 10cm, with modal peak at 8 cm TL.

Round herring was found at three station (15˚37'S, 16˚36'S, 16˚44'S). The length distribution was between 13-22cm, with a modal peak at 19cm.

No P2 species were found in this area, except for small amounts of hairtail.

CHAPTER 5 SUMMARY OF SURVEY RESULTS

5.1 Sardinella

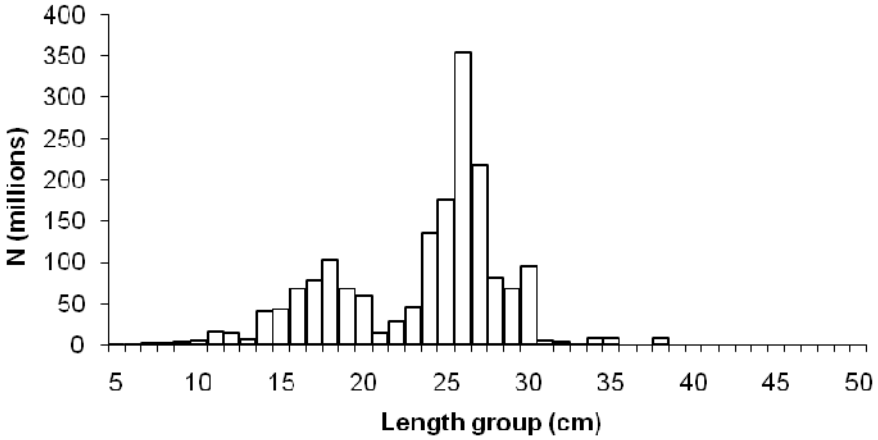
The total biomass estimate for sardinellas is 450 000 tons, which is around 30% lower than the biomass estimate in 2006 and 2007. However it is at same level as the 2001 estimate (434 000 tons). The relative biomass of the two Sardinella species was approximately at the same level (*S. madarensis* 54 %, *S. aurita* 46%).

The overall length frequency distribution of the two Sardinella species shows that *S. aurita* is dominated by the adult population, and no sign of recruitment was recorded in the Angolan waters (Figure 19 b) . For *S. maderensis*, two cohorts with modal peaks around 17 and 26 cm TL can be observed, with few fish < 10 cm TL, indicating a very weak recruitment for 2008 (Figure 19 a).

It is important to note that the level of biomass in Angola is dependent on recruitment in the Congo area. Results from the 2008 Gabon-Congo survey shows no recruitment for *S.aurita* and for *S. maderensis* further analysis of the time series for this region is necessary before drawing any conclusion on the impact of recruitment on the Angolan adult population.

Currently the biomass in Angola is dominated by fish > 15 cm TL, with a few *S. maderensis* juveniles.

(a)



(b)

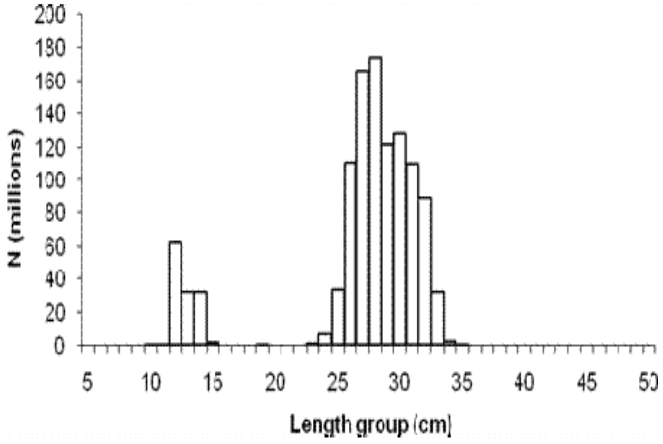


Figure 19 Overall length distribution of *S. maderensis* (a) and *S.aurita*.(b)

Table 7 Biomass estimates of sardinellas by regions and surveys (1 000 tons).

Survey	Cunene-Benguela	Palmerinhas-Benguela	Cabinda-Palmerinhas	Benguela-Cabinda	Cunene-Cabinda
1/85	25	20	80	300	325
2/85	110	190	180	370	480
3/85	0	70	190	260	260
4/85	0	200	110	310	310
1/86	10	140	110	250	260
2/86	10	130	130	260	270
1/89	40	200	60	260	300
2/89	20	40	130	170	190
3/89	40	100	60	160	200
1/91	?	180	120	300	300
2/91	?	68	154	222	222
1/92	?	119	161	280	280
1/94	*	410	100	510	
2/94	*	245	290	535	
1/95	*	140	24	164	
2/95	?	277	297	574	574
1/96	49	175	70	245	294
2/96	0	130	233	363	363
1/97	0	195	300†	495	495
1/98	75	389	79†	468	543
3/98	0	233	159†	392	392
2/99	0	228	135†	363	363
2/2000	0	179	174†	353	353
2/2001	0	257	177†	434	434
9/2002	0	165	178	343	343
8/2003	2	277	153†	430	432
8/2004	0	175	187†	262	362
8/2005	0	148	95	242	242
8/2006	20	244	366	610	630
6/2007	55	483	187	670	725
2008	-	264	186		450

* not surveyed
† surveyed from Congo River- Pta das Palmerinhas
- very low acoustic densities

5.2 Cunene horse mackerel

The Cunene horse mackerel stock was estimated at a total of 69 000 tons. This represents a 45% decrease from the 2007 estimates and it is the lowest estimate since the beginning of the time series 1985. More than 58% of the total biomass was estimated from the central region, i.e. Ponta das Palmerinhas to Benguela. There was no biomass estimate from the northern region (south of Congo river- Ponta das Palmerinhas) due to very low acoustic densities recorded. This

situation is observed for the first time and it is an indication that the Cunene horse mackerel stock is in a critical state. Greater proportions of the biomass are usually observed in the Benguela-Cunene region, however, this year's estimate is around 80% lower than the 2007 biomass estimate.

Even though a difference of two degrees was observed in the overall SST, this should have only resulted in a shift of the stock from one area to another, or into deeper waters. However, for this survey, transects went up to 500 m bottom depth and most of the fish were found at depths less than 100 m. This decrease in biomass seems to be more associated with high fishing mortality rather than environmental conditions.

The overall length distribution shows two well-defined cohorts with modal peaks10 and 25 cm (Figure 20). The third cohort which ranged between 14 and 22cm did not show a clear modal peak. Even at such very low biomass level, there is still an indication of a slightly strong recruitment which is maintaining the stock.

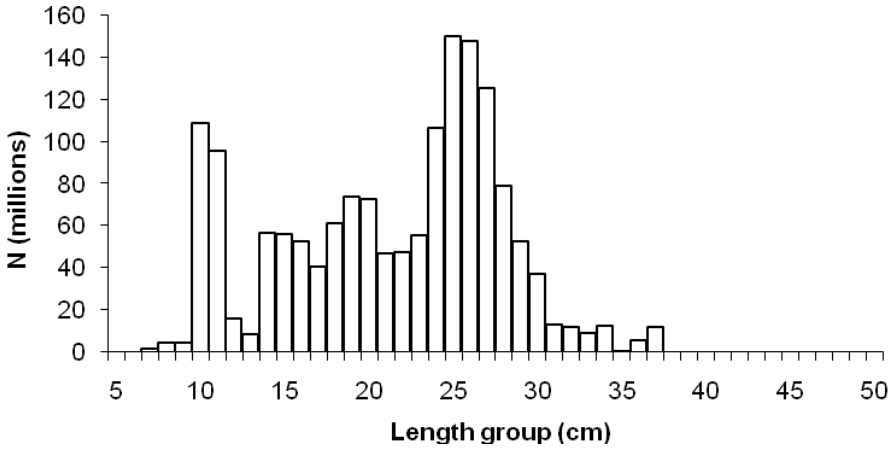


Figure 20 Overall length distribution in numbers of *T. trecae*.

Tabel 8 Biomass estimates of Cunene horse mackerel by regions and surveys (1 000 tons)

Survey	Cunene-Benguela	Palmerinhas-Benguela	Cabinda-Palmerinhas	Benguela-Cabinda	Cunene-Cabinda
1/85	30	195	40	235	265
3/85	50	90	40	130	180
4/85/86	100	125	20	145	245
1/89	35	55	40	95	130
3/89	170	40	35	75	245
1/91	100	80	20	100	200
2/91	100	70	30	100	200
1/92	98	86	80	166	264
1/94	*	238	1	239	
2/94	*	130	120	250	
1/95	*	?	84	84	
2/95	70	160	110	270	340
1/96	286	214	6	220	506
2/96	140	157	63	220	360
1/97	234	55	138†	193	427
1/98	163	58	18†	76	239
3/98	118	112	37†	149	267
2/99	124	129	68†	197	321
2/2000	92	178	63†	241	333
2/2001	64	22	3†	25	89
9/2002	118	13	31†	44	162
8/2003	120	34	12†	46	166
8/2004	32	107	90†	197	229
8/2005	102	57	21†	78	180
8/2006	45	77	31†	108	153
8/2007	73	57	27	84	154
8/ 2008	29	40	-		69

* not surveyed
† surveyed from Congo River- Pta das Palmerinhas
- very low acoustic densities

5.3 Conclusions

The total biomass estimate for sardinellas is 450 000 tons, which is around 30% lower than the biomass estimate in 2006 and 2007. However it is at same level as the 2001 estimate (434 000 tons). The relative biomass of the two Sardinella species was approximately at the same level (*S. madarensis* 54 %, *S. aurita* 46%).

The level of sardinella biomass in Angola is dependent on recruitment in the Congo area. Results from the 2008 Gabon-Congo survey shows no recruitment for *S.aurita* and for *S. Maderensis*. Further analysis of the time series for this region is necessary before drawing any conclusion on the impact of recruitment on the Angolan adult population

Compared to the biomass estimate of Cunene horse mackerel in 2007, the stock has declined drastically. The last three years the stock size has been estimated at around 150 000 tons thus making 2008 estimate the lowest since the beginning of the time series. This current level of biomass is very far from management biomass target reference of 500 000 tons. The level of recruitment has been constant for the past five year (around 100 million in numbers) which means that for that period environmental conditions were more or less stable. Based on that, the decline of the stock can not be attributed to changing environmental parameters, but rather on overfishing.

The recovery of the Cunene horse mackerel stock in Angolan waters requires strong management measures. From a biological perspective an effort reduction will be the main tool to achieve this goal.

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ANNEX VII Instruments and fishing gear used

The Simrad ER-60/18, 38, 120 and 200kHz scientific sounder was run during the survey only for observation of fish and bottom conditions.

Standard sphere calibrations were carried out using 38.1 mm diameter tungsten carbide sphere for 18, 38, 120 and 200 kHz. The calibrations took place 18.03.2008, Baia dos Elefantes. The details of the settings of the 38kHz echo sounder where as follows:

Transceiver-2 menu (38 kHz)

Transducer depth	5.50 m
Absorbtion coeff.	8,7 dB/km
Pulse length	medium (1,024ms)
Bandwidth	2,43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
gain	25,04 dB
SA correction	-0,46 dB
Angle sensitivity	21.9
3 dB beamwidth	7,76º along ship
	7,86º athwardship
Alongship offset	-0.12º
Athwardship offset	0.06º

Bottom detection menu Minimum level -40 dB

Fishing gear

The vessel has two different sized four-panel "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl". The two smallest pelagic trawls and the demersal trawl were used during the survey. The smallest pelagic trawl has 10-12 m vertical opening under normal operation, whereas the intermediate sized trawl has 15-18 m opening.

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 trawl height was about 4.5 m and distance between wings during towing about 21 m. The sweeps are 40 m long. The trawl is equiped with a 12" rubber bobbins gear. New doors are 'Thyborøn' combi type, 7.41 m^2, 1720 kg. These have been in used onboard since 19.02.08. During the present survey the door distance was kept nearly constant at about 50 m at all depths by the use of a 9.5 m strap between the wires at 120 m distance from the doors (normally applied at depths greater than 80 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 the trawl was equipped with a trawl eye that provides information about the trawl opening and the distance of the footrope to the bottom. A pressure sensor is used to show the depth on the headline. A catch sensor on the cod-end indicated the size of the catch.

ANNEX II. Records of fishing stations

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 44
DATE :15/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°5.44
start stop duration Lon E 12°8.83
TIME :23:16:43 23:45:16 28.6 (min) Purpose : 1
LOG : 1506.20 1507.69 1.5 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 30 32 Validity : 0
Towing dir: 0° Wire out : 122 m Speed : 3.1 kn
Sorted : 588 Total catch: 587.61 Catch/hour: 1234.47

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Manta birostris	1050.42	2	85.09	
Trichiurus lepturus	46.95	1279	3.80	
Scomberomorus tritor	42.02	38	3.40	76
Sphyraena sphyraena	37.29	11	3.02	
Selene dorsalis	14.01	78	1.14	
MYCTOPHIDAE	9.16	4735	0.74	
Sardinella maderensis	7.92	61	0.64	77
Sepia orbignyana	6.72	25	0.54	
Brachydeuterus auritus	5.99	282	0.49	
Ilisha africana	4.22	101	0.34	
Pseudotolithus senegalensis	3.24	4	0.26	
Galeoides decadactylus	3.03	74	0.25	
Echeneis naucrates	2.73	6	0.22	
Pentheroscion mbizi	0.53	11	0.04	
Remora remora	0.25	8	0.02	
Total	1234.47		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 45
DATE :16/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°10.39
start stop duration Lon E 11°47.37
TIME :02:35:37 03:04:51 29.2 (min) Purpose : 1
LOG : 1528.87 1530.41 1.6 Region : 4054
FDEPTH: 0 5 Gear cond.: 0
BDEPTH: 96 101 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 8 Total catch: 8.07 Catch/hour: 16.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	5.52	121	33.33	
Saurida brasiliensis	4.13	2416	24.91	
Sardinella aurita	3.92	16	23.67	78
Selar crumenophthalmus	2.22	8	13.38	
Euthynnus alletteratus	0.78	2	4.71	
Total	16.57		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 46
DATE :16/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 6°21.28
start stop duration Lon E 11°41.69
TIME :10:28:31 10:33:15 4.7 (min) Purpose : 1
LOG : 1589.96 1590.22 0.3 Region : 4054
FDEPTH: 122 122 Gear cond.: 7
BDEPTH: 122 122 Validity : 9
Towing dir: 0° Wire out : 320 m Speed : 3.3 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 47
DATE :16/05/2008 GEAR TYPE: BT NO: 0 POSITION:Lat S 6°20.75
start stop duration Lon E 11°41.28
TIME :11:00:25 11:30:12 29.8 (min) Purpose : 1
LOG : 1591.67 1593.13 1.5 Region : 4054
FDEPTH: 122 122 Gear cond.: 0
BDEPTH: 122 122 Validity : 0
Towing dir: 0° Wire out : 328 m Speed : 2.9 kn
Sorted : 109 Total catch: 217.38 Catch/hour: 437.97

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex congoensis	126.93	1970	28.98	81
Spicara alta	101.95	1019	23.28	82
Trachurus trecae	98.12	2124	22.40	79
Dentex angolensis	71.52	423	16.33	80
Chelidonichthys gabonensis	11.56	149	2.64	
Epinephelus aeneus	8.58	4	1.96	
Sepia orbignyana	3.22	28	0.74	83
Brotula barbata	2.86	4	0.65	
Selene dorsalis	2.50	8	0.57	
Raja miraletus	2.34	4	0.53	
Zeus faber	2.34	4	0.53	
Trichiurus lepturus	2.01	4	0.46	
Pterothrissus belloci	1.09	12	0.25	
Ariomma bondi	0.89	16	0.20	
Cynoponticus ferox	0.77	4	0.17	
Boops boops	0.73	8	0.17	
Citharus linguatula	0.32	20	0.07	
Todarodes sagittatus	0.20	8	0.05	
Monolene microstoma	0.04	4	0.01	
Total	437.97		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 48
DATE :16/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°17.55
start stop duration Lon E 12°8.57
TIME :16:59:25 17:29:03 29.6 (min) Purpose : 1
LOG : 1638.78 1640.52 1.7 Region : 4054
FDEPTH: 0 10 Gear cond.: 0
BDEPTH: 36 41 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
Sorted : 67 Total catch: 66.72 Catch/hour: 135.06

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	58.81	103	43.54	84
Stromateus fiatola	53.85	69	39.87	85
Scomberomorus tritor	9.96	14	7.37	86
Caranx crysos	8.77	10	6.49	
Euthynnus alletteratus	2.02	2	1.50	
Alectis alexandrinus	1.66	2	1.23	
Total	135.06		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 49
DATE :16/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°24.98
start stop duration Lon E 11°52.33
TIME :20:32:28 21:02:49 30.3 (min) Purpose : 1
LOG : 1660.58 1662.34 1.8 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 110 112 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
Sorted : 7 Total catch: 6.94 Catch/hour: 13.72

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	13.45	69	97.98	
Saurida brasiliensis	0.24	214	1.73	
Alloteuthis africana	0.02	2	0.14	
Bregmaceros sp.	0.02	24	0.14	
Total	13.72		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 50
DATE :17/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°27.99
start stop duration Lon E 12°2.13
TIME :04:18:04 04:48:08 30.1 (min) Purpose : 1
LOG : 1725.23 1727.01 1.8 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 84 93 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
Sorted : 21 Total catch: 21.32 Catch/hour: 42.53

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	40.19	148	94.51	
Sardinella aurita	1.14	4	2.67	87
Euthynnus alletteratus	0.98	2	2.30	88
Alloteuthis africana	0.18	72	0.42	
Saurida brasiliensis	0.04	34	0.09	
Total	42.53		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 51
DATE :18/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°37.02
start stop duration Lon E 12°1.73
TIME :12:05:51 12:31:45 25.9 (min) Purpose : 1
LOG : 1790.68 1791.99 1.3 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 87 84 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 1 Total catch: 1.19 Catch/hour: 2.76

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Echeneis naucrates	2.76	5	100.00	
Total	2.76		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 52
DATE :18/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 6°38.00
start stop duration Lon E 12°3.36
TIME :13:24:20 13:53:54 29.6 (min) Purpose : 1
LOG : 1796.52 1798.02 1.5 Region : 4054
FDEPTH: 81 83 Gear cond.: 0
BDEPTH: 81 83 Validity : 0
Towing dir: 0° Wire out : 230 m Speed : 3.0 kn
Sorted : 112 Total catch: 112.13 Catch/hour: 227.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	119.86	457	52.66	90
Pagellus bellottii	28.21	298	12.40	89
Lepidotrigla cadmani	22.23	272	9.77	
Sepia orbignyana	16.32	30	7.17	
Trichiurus lepturus	13.54	16	5.95	
Pseudupeneus prayensis	6.58	114	2.89	
Fistularia petimba	2.78	8	1.22	
Octopus vulgaris	2.56	2	1.12	
Umbrina canariensis	2.31	2	1.02	
Alloteuthis africana	2.15	1291	0.95	
Lagocephalus laevigatus	1.93	4	0.85	
Miracorvina angolensis	1.85	2	0.81	
Chloroscombrus chrysurus	1.85	10	0.81	91
Raja miraletus	1.26	2	0.55	
Dentex gibbosus	1.08	2	0.47	
Dentex congoensis	0.81	8	0.36	
Saurida brasiliensis	0.65	166	0.29	
Seriola carpenteri	0.57	2	0.25	
Zeus faber	0.57	2	0.25	
Boops boops	0.24	26	0.11	
Grammoplites gruveli	0.10	2	0.04	
Lophiodes kempi	0.06	2	0.03	
Todarodes angolensis	0.06	6	0.03	
Monolene microstoma	0.04	12	0.02	
Total	227.60		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 53
DATE :18/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°37.88
start stop duration Lon E 12°11.71
TIME :22:05:54 22:35:58 30.1 (min) Purpose : 1
LOG : 1865.57 1867.32 1.8 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 53 49 Validity : 3
Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
Sorted : 27 Total catch: 26.60 Catch/hour: 53.08

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lagocephalus laevigatus	43.00	30	81.02	
Sardinella maderensis	4.89	24	9.21	92
Lagocephalus lagocephalus	3.13	4	5.90	
Caranx crysos	1.78	2	3.35	
Alloteuthis africana	0.16	64	0.30	
Sardinella aurita	0.10	6	0.19	93
Decapterus punctatus	0.02	2	0.04	
Total	53.08		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 54
DATE :19/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°38.04
start stop duration Lon E 12°22.42
TIME :00:37:44 00:52:13 14.5 (min) Purpose : 1
LOG : 1882.81 1883.63 0.8 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 23 21 Validity : 3
Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
Sorted : 81 Total catch: 80.83 Catch/hour: 334.93

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyraena sphyraena	120.58	377	36.00	
Brachydeuterus auritus	81.63	4695	24.37	95
Scomberomorus tritor	51.17	41	15.28	94
Sardinella maderensis	19.39	1073	5.79	96
Chloroscombrus chrysurus	15.54	66	4.64	98
Ilisha africana	14.71	704	4.39	
Selene dorsalis	11.27	99	3.37	99
Galeoides decadactylus	7.75	228	2.31	
Sardinella aurita	3.81	12	1.14	97
Stromateus fiatola	2.36	4	0.71	
Uraspis helvola	2.07	8	0.62	
Eucinostomus melanopterus	1.37	4	0.41	
Trichiurus lepturus	1.28	17	0.38	
Sepia orbignyana	0.83	4	0.25	
Sepiella ornata	0.62	195	0.19	
Chaetodipterus goreensis	0.54	8	0.16	
Total	334.93		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 55
DATE :19/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°54.94
start stop duration Lon E 12°1.51
TIME :04:34:10 05:04:03 29.9 (min) Purpose : 1
LOG : 1911.58 1913.24 1.7 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 103 106 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 2 Total catch: 1.80 Catch/hour: 3.61

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caranx crysos	3.61	4	100.00	
Total	3.61		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 56
DATE :19/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 7°1.00
start stop duration Lon E 12°4.42
TIME :09:54:43 10:23:02 28.3 (min) Purpose : 1
LOG : 1955.67 1957.18 1.5 Region : 4054
FDEPTH: 115 114 Gear cond.: 9
BDEPTH: 115 114 Validity : 4
Towing dir: 0° Wire out : 330 m Speed : 3.2 kn
Sorted : 139 Total catch: 138.91 Catch/hour: 294.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex congoensis	130.98	1293	44.49	100
Dentex angolensis	68.88	538	23.40	101
Chelidonichthys gabonensis	49.28	392	16.74	
Trachurus trecae	20.77	379	7.05	102
Trichiurus lepturus	7.10	6	2.41	
Illex coindetii	5.43	312	1.84	
Priacanthus arenatus	4.13	8	1.40	
Brotula barbata	2.08	2	0.71	
Ariomma bondi	1.95	23	0.66	
Brachydeuterus auritus	1.02	8	0.35	
Sphyraena guachancho	0.87	2	0.30	
Citharus linguatula	0.85	21	0.29	
Uranoscopus cadenati	0.53	2	0.18	
Pagellus bellottii	0.25	2	0.09	
Sepia orbignyana	0.23	6	0.08	
Saurida brasiliensis	0.06	21	0.02	
Total	294.40		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 57
DATE :20/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 6°47.60
start stop duration Lon E 12°27.57
TIME :12:59:00 13:24:15 25.3 (min) Purpose : 1
LOG : 2011.46 2012.73 1.3 Region : 4054
FDEPTH: 22 22 Gear cond.: 0
BDEPTH: 22 22 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.0 kn
Sorted : 60 Total catch: 60.27 Catch/hour: 143.22

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Elops lacerta	22.57	55	15.76	112
Galeoides decadactylus	16.28	93	11.37	107
Arius parkii	14.02	19	9.79	
Engraulis encrasicolus	12.02	25754	8.40	
Ilisha africana	10.29	3436	7.18	
Pomadasys peroteti	9.50	12	6.64	109
Selene dorsalis	8.08	62	5.64	104
Dentex barnardi	6.04	36	4.21	103
Sepia orbignyana	5.58	10	3.90	
Dentex gibbosus	5.35	14	3.73	105
Pteroscion peli	5.18	71	3.62	
Chloroscombrus chrysurus	4.70	29	3.29	108
Scomberomorus tritor	3.49	7	2.44	110
Brachydeuterus auritus	3.33	226	2.32	106
Lithognathus mormyrus	2.69	2	1.87	
Epinephelus aeneus	2.30	2	1.61	
Pomadasys incisus	1.85	7	1.29	
Pseudupeneus prayensis	1.66	14	1.16	
Zanobatus shoenleinii	1.50	2	1.05	
Sardinella maderensis	1.47	71	1.03	111
Sphyraena guachancho	1.43	14	1.00	
Raja miraletus	1.35	2	0.95	
Portunus validus	0.43	2	0.30	
Panulirus regius	0.43	2	0.30	
Trichiurus lepturus	0.40	17	0.28	
Pseudotolithus senegalensis	0.33	2	0.23	
Trachinocephalus myops	0.31	2	0.22	
Chaetodipterus goreensis	0.24	2	0.17	
Pentanemus quinquarius	0.21	2	0.15	
Trachinocephalus myops	0.10	5	0.07	0
Alloteuthis africana	0.05	69	0.03	
Sepiella ornata	0.02	29	0.02	
Total	143.22		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 58
DATE :20/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°14.59
start stop duration Lon E 12°1.21
TIME :19:45:59 20:16:01 30.0 (min) Purpose : 1
LOG : 2066.72 2068.49 1.8 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 391 338 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
Sorted : 175 Total catch: 175.28 Catch/hour: 350.09

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyrna lewini	299.60	2	85.58	
Euthynnus alletteratus	43.64	40	12.47	113
MYCTOPHIDAE	6.09	5127	1.74	
Loligo vulgaris	0.74	326	0.21	
Trichiurus lepturus	0.02	22	0.01	
Total	350.09		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 59
DATE :20/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°12.90
start stop duration Lon E 12°16.98
TIME :23:35:36 00:04:19 28.7 (min) Purpose : 1
LOG : 2095.43 2096.86 1.4 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 128 139 Validity : 0
Towing dir: 0° Wire out : 122 m Speed : 3.0 kn
Sorted : 36 Total catch: 35.91 Catch/hour: 75.05

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	40.23	100	53.61	114
Trichiurus lepturus	17.14	79	22.83	
Euthynnus alletteratus	11.68	10	15.57	115
Auxis thazard	2.86	6	3.82	116
Lagocephalus lagocephalus	0.92	2	1.23	
Selar crumenophthalmus	0.73	2	0.97	
Loligo vulgaris	0.61	182	0.81	
MYCTOPHIDAE	0.61	328	0.81	
Todarodes angolensis	0.27	4	0.36	
Total	75.05		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 60
DATE :21/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°10.26
start stop duration Lon E 12°37.41
TIME :07:03:38 07:12:38 9.0 (min) Purpose : 1
LOG : 2156.30 2156.86 0.6 Region : 4054
FDEPTH: 21 21 Gear cond.: 0
BDEPTH: 41 44 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.7 kn
Sorted : 124 Total catch: 339.65 Catch/hour: 2261.82

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	1140.73	4468	50.43	117
Sardinella maderensis	1089.46	6613	48.17	118
Trachinotus ovatus	24.91	93	1.10	119
Euthynnus alletteratus	6.73	20	0.30	
Total	2261.82		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 61
DATE :21/05/2008 GEAR TYPE: PT NO: 1 POSITION:Lat S 6°56.07
start stop duration Lon E 12°27.08
TIME :15:37:37 15:56:36 19.0 (min) Purpose : 1
LOG : 2212.85 2214.21 1.4 Region : 4054
FDEPTH: 20 18 Gear cond.: 0
BDEPTH: 40 36 Validity : 0
Towing dir: 0° Wire out : 70 m Speed : 4.3 kn
Sorted : 94 Total catch: 94.16 Catch/hour: 297.50

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	138.39	1011	46.52	122
Sardinella maderensis	79.62	357	26.76	123
Hemicaranx bicolor	53.55	256	18.00	121
Sphyraena guachancho	10.74	22	3.61	125
Stromateus fiatola	8.28	13	2.78	124
Selene dorsalis	4.87	16	1.64	120
Scomberomorus tritor	1.58	3	0.53	
Alectis alexandrinus	0.47	3	0.16	
Total	297.50		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 62
DATE :21/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°7.52
start stop duration Lon E 12°39.74
TIME :18:46:25 19:16:16 29.9 (min) Purpose : 1
LOG : 2235.69 2237.46 1.8 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 32 29 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
Sorted : 114 Total catch: 335.98 Catch/hour: 675.34

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	280.40	5743	41.52	127
Sardinella maderensis	79.86	619	11.83	126
Chloroscombrus chrysurus	68.80	913	10.19	128
Galeoides decadactylus	51.68	720	7.65	
Pagellus bellottii	44.50	243	6.59	129
Epinephelus aeneus	30.35	6	4.49	
Pseudupeneus prayensis	15.36	123	2.27	
Dentex barnardi	12.44	60	1.84	130
Sepia orbignyana	11.60	22	1.72	
Sphyraena guachancho	10.95	44	1.62	132
Rhizoprionodon acutus	9.95	6	1.47	
Eucinostomus melanopterus	9.45	133	1.40	
Ilisha africana	7.20	165	1.07	
Stromateus fiatola	6.95	12	1.03	
Arius parkii	6.79	16	1.01	
Scomberomorus tritor	4.96	12	0.74	
Pomadasys incisus	3.98	22	0.59	
Pseudotolithus typus	3.44	12	0.51	
Pteroscion peli	2.97	28	0.44	
Pomadasys peroteti	2.77	12	0.41	
Sardinella aurita	2.05	12	0.30	
Penaeus kerathurus	1.97	56	0.29	
Dicologoglossa hexophthalma	1.93	16	0.29	
Decapterus rhonchus	1.71	50	0.25	131
Pegusa triophthalmus	0.98	6	0.15	
Panulirus regius	0.74	2	0.11	
Uranoscopus cadenati	0.60	6	0.09	
Decapterus punctatus	0.34	16	0.05	
Bothus podas africanus	0.28	6	0.04	
Selene dorsalis	0.28	12	0.04	
Penaeus notialis	0.02	4	0.00	
Total	675.34		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 63
DATE :22/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 7°28.20
start stop duration Lon E 12°29.75
TIME :09:04:41 09:34:45 30.1 (min) Purpose : 1
LOG : 2338.32 2339.84 1.5 Region : 4054
FDEPTH: 115 116 Gear cond.: 0
BDEPTH: 115 116 Validity : 0
Towing dir: 0° Wire out : 330 m Speed : 3.0 kn
Sorted : 63 Total catch: 62.73 Catch/hour: 125.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex angolensis	29.13	393	23.27	134
Dentex congoensis	27.74	241	22.16	135
Trichiurus lepturus	20.25	40	16.18	
Chelidonichthys gabonensis	15.76	144	12.59	
Spicara alta	6.39	389	5.10	
Citharus linguatula	4.61	160	3.68	
Zeus faber	4.31	12	3.44	
Trachurus trecae	3.09	40	2.47	133
Illex coindetii	2.69	196	2.15	
Sphoeroides pachgaster	2.63	4	2.10	
Lagocephalus lagocephalus	2.39	4	1.91	
Brotula barbata	2.25	2	1.80	
Lophiodes kempi	1.14	2	0.91	
Uranoscopus cadenati	1.00	4	0.80	
Saurida brasiliensis	0.52	82	0.41	
Chaetodon hoefleri	0.28	2	0.22	
Antennarius occidentalis	0.26	2	0.21	
Sepia orbignyana	0.24	6	0.19	
Boops boops	0.20	14	0.16	
Arnoglossus imperialis	0.16	22	0.13	
Pagellus bellottii	0.12	2	0.10	
Total	125.17		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 64
DATE :22/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 7°25.18
start stop duration Lon E 12°35.91
TIME :11:02:45 11:31:51 29.1 (min) Purpose : 1
LOG : 2350.66 2352.11 1.5 Region : 4054
FDEPTH: 84 86 Gear cond.: 0
BDEPTH: 84 86 Validity : 0
Towing dir: 0° Wire out : 280 m Speed : 3.0 kn
Sorted : 80 Total catch: 80.40 Catch/hour: 165.83

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex barnardi	49.71	151	29.98	138
Dentex congoensis	16.73	200	10.09	139
Octopus vulgaris	12.99	12	7.84	
Squatina oculata	12.48	2	7.52	
Pagrus caeruleostictus	12.07	12	7.28	136
Pagellus bellottii	11.67	35	7.04	137
Raja miraletus	7.22	10	4.35	
Fistularia petimba	6.60	25	3.98	
Alloteuthis africana	5.67	4408	3.42	
Dentex angolensis	5.53	25	3.33	
Zeus faber	5.34	17	3.22	
Lepidotrigla carolae	2.81	10	1.69	
Brotula barbata	2.68	4	1.62	
Selene dorsalis	2.56	6	1.54	
Sepia orbignyana	1.92	12	1.16	
Chelidonichthys gabonensis	1.86	8	1.12	
Umbrina canariensis	1.63	4	0.98	
Epinephelus aeneus	1.46	2	0.88	
Trichiurus lepturus	1.42	2	0.86	
Citharus linguatula	1.13	31	0.68	
Pseudupeneus prayensis	1.01	6	0.61	
Chaetodon hoefleri	0.99	6	0.60	
Saurida brasiliensis	0.19	85	0.11	
Arnoglossus imperialis	0.06	6	0.04	
Monolene microstoma	0.06	10	0.04	
Lophiodes kempi	0.04	2	0.02	
Total	165.83		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 65
DATE :22/05/2008 GEAR TYPE: PT NO: 1 POSITION:Lat S 7°23.41
start stop duration Lon E 12°44.27
TIME :13:28:50 13:40:14 11.4 (min) Purpose : 1
LOG : 2363.71 2364.40 0.7 Region : 4054
FDEPTH: 0 10 Gear cond.: 0
BDEPTH: 49 52 Validity : 0
Towing dir: 0° Wire out : 65 m Speed : 3.6 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 66
DATE :22/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°23.69
start stop duration Lon E 12°43.32
TIME :14:13:46 14:42:49 29.0 (min) Purpose : 1
LOG : 2366.79 2368.40 1.6 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 54 53 Validity : 0
Towing dir: 0° Wire out : 112 m Speed : 3.3 kn
Sorted : 21 Total catch: 21.06 Catch/hour: 43.53

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	34.31	112	78.82	140
Trachinotus ovatus	3.82	10	8.78	
Scomberomorus tritor	2.93	2	6.74	
Sardinella maderensis	2.46	8	5.65	141
Total	43.53		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 67
DATE :22/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°27.20
start stop duration Lon E 12°52.24
TIME :17:21:57 17:52:29 30.5 (min) Purpose : 1
LOG : 2389.45 2391.18 1.7 Region : 4054
FDEPTH: 10 10 Gear cond.: 8
BDEPTH: 29 35 Validity : 9
Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
Sorted : 10 Total catch: 102.04 Catch/hour: 200.54

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Stromateus fiatola	45.20	83	22.54	145
Chloroscombrus chrysurus	44.81	368	22.34	146
Sphyraena guachancho	15.72	35	7.84	143
Galeoides decadactylus	13.76	98	6.86	
Pseudotolithus senegalensis	11.01	22	5.49	144
Ilisha africana	10.91	572	5.44	
Epinephelus aeneus	7.57	2	3.77	
Pomadasys incisus	5.40	33	2.70	
Scomberomorus tritor	4.52	2	2.25	
Chaetodipterus lippei	4.50	12	2.24	
Sepia orbignyana	4.07	10	2.03	
Plectorhinchus mediterraneus	3.34	6	1.67	
Rhizoprionodon acutus	2.95	2	1.47	
Balistes punctatus	2.75	2	1.37	
Selene dorsalis	2.55	31	1.27	142
Cephalopholis taeniops	2.26	2	1.13	
Brachydeuterus auritus	2.08	145	1.04	
Arius parkii	2.08	8	1.04	
Sardinella aurita	2.04	8	1.02	147
Trichiurus lepturus	1.85	59	0.92	
Alectis alexandrinus	1.47	10	0.74	
Pseudupeneus prayensis	1.24	24	0.62	
Elops lacerta	1.20	2	0.60	
Pteroscion peli	1.12	22	0.56	
Argyrosomus hololepidotus	0.96	8	0.48	
Lutjanus dentatus	0.81	2	0.40	
Chaetodon hoefleri	0.75	6	0.37	
Euthynnus alletteratus	0.75	2	0.37	
Drepane africana	0.71	4	0.35	
Parakuhlia macrophthalmus	0.63	18	0.31	
Pentanemus quinquarius	0.45	6	0.23	
Dentex barnardi	0.39	10	0.20	
Pomadasys rogeri	0.33	2	0.17	
Penaeus notialis	0.16	12	0.08	
Serranus cabrilla	0.10	4	0.05	
Penaeus kerathurus	0.08	2	0.04	
Parapenaeopsis atlantica	0.02	8	0.01	
Total	200.54		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 68
DATE :23/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°36.94
start stop duration Lon E 12°44.59
TIME :00:31:18 01:00:12 28.9 (min) Purpose : 1
LOG : 2439.42 2440.97 1.6 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 86 79 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 8 Total catch: 7.51 Catch/hour: 15.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	9.76	37	62.58	
Caranx crysos	2.20	2	14.11	
Trachinotus ovatus	1.72	4	11.05	
Lagocephalus lagocephalus	1.29	2	8.26	
Alloteuthis africana	0.35	106	2.26	
Todarodes sagittatus	0.23	4	1.46	
Saurida brasiliensis	0.04	21	0.27	
Total	15.60		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 69
DATE :23/05/2008 GEAR TYPE: PT NO: 6 POSITION:Lat S 7°38.91
start stop duration Lon E 12°53.96
TIME :04:01:24 04:29:31 28.0 (min) Purpose : 1
LOG : 2463.45 2466.02 1.6 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 45 46 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 110 Total catch: 303.26 Catch/hour: 649.84

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyraena guachancho	370.29	600	56.98	148
Sardinella maderensis	126.21	626	19.42	149
Brachydeuterus auritus	73.65	737	11.33	153
Caranx senegallus	21.51	30	3.31	152
Sardinella aurita	17.38	64	2.67	150
Stromateus fiatola	15.56	30	2.39	151
Selene dorsalis	9.60	159	1.48	154
Alectis alexandrinus	6.73	13	1.04	
Chloroscombrus chrysurus	4.78	30	0.74	
Trachinotus ovatus	2.66	6	0.41	
Galeoides decadactylus	1.48	6	0.23	
Total	649.84		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 70
DATE :23/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°44.82
start stop duration Lon E 12°58.20
TIME :11:25:21 11:52:25 27.1 (min) Purpose : 1
LOG : 2520.21 2521.77 1.6 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 43 49 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
Sorted : 36 Total catch: 35.61 Catch/hour: 78.93

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	52.64	348	66.69	155
Sardinella aurita	20.61	89	26.12	174
Trachinotus ovatus	3.19	11	4.04	
Caranx crysos	2.48	2	3.15	
Total	78.93		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 71
DATE :23/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 7°48.67
start stop duration Lon E 13°2.88
TIME :13:46:06 13:59:27 13.4 (min) Purpose : 1
LOG : 2535.52 2536.22 0.7 Region : 4054
FDEPTH: 21 22 Gear cond.: 0
BDEPTH: 21 22 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.1 kn
Sorted : 108 Total catch: 108.05 Catch/hour: 485.62

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Galeoides decadactylus	115.96	467	23.88	156
Pseudotolithus senegalensis	71.01	220	14.62	157
Chloroscombrus chrysurus	54.61	593	11.24	158
JELLYFISH	50.79	13	10.46	
Ilisha africana	33.21	1267	6.84	
Trichiurus lepturus	29.48	252	6.07	
Arius parkii	27.51	135	5.66	
Pentanemus quinquarius	25.44	467	5.24	
Pteroscion peli	20.09	409	4.14	
Sardinella maderensis	12.22	373	2.52	159
Penaeus notialis	7.37	2130	1.52	
Eucinostomus melanopterus	6.38	76	1.31	
Brachydeuterus auritus	5.53	193	1.14	
Lagocephalus laevigatus	4.72	13	0.97	
Sardinella aurita	4.63	27	0.95	160
Pomadasys peroteti	4.00	31	0.82	
Panulirus regius	3.60	4	0.74	
Sphyraena guachancho	3.42	13	0.70	
Gymnura micrura	1.30	4	0.27	
Callinectes sp.	1.17	63	0.24	
Ephippion guttifer	1.08	4	0.22	
Cynoglossus canariensis	0.90	4	0.19	
Torpedo sp.	0.67	4	0.14	
Sepiella ornata	0.54	40	0.11	
Total	485.62		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 72
DATE :23/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°0.38
start stop duration Lon E 12°53.85
TIME :23:43:17 00:13:34 30.3 (min) Purpose : 1
LOG : 2602.63 2604.13 1.5 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 101 95 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 111 Total catch: 111.25 Catch/hour: 220.37

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	182.93	844	83.01	
Trachinotus ovatus	15.65	40	7.10	161
Scomberomorus tritor	9.51	4	4.31	
Euthynnus alletteratus	6.14	10	2.79	
Lagocephalus lagocephalus	2.93	4	1.33	
Brachydeuterus auritus	2.93	20	1.33	162
Alloteuthis africana	0.14	79	0.06	
Trachurus trecae	0.14	2	0.06	
Total	220.37		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 73
DATE :24/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°3.30
start stop duration Lon E 13°4.83
TIME :03:45:07 04:15:09 30.0 (min) Purpose : 1
LOG : 2628.13 2629.92 1.8 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 59 70 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
Sorted : 90 Total catch: 313.37 Catch/hour: 625.91

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	359.92	2583	57.50	163
Selene dorsalis	67.55	567	10.79	165
Brachydeuterus auritus	56.36	573	9.01	166
Alectis alexandrinus	30.78	86	4.92	168
Trachurus trecae	22.13	126	3.54	167
Rhizoprionodon acutus	19.97	4	3.19	
Scomberomorus tritor	15.82	20	2.53	170
Caranx crysos	13.70	20	2.19	
Trichiurus lepturus	11.78	12	1.88	
Sardinella aurita	11.40	60	1.82	164
Euthynnus alletteratus	9.03	20	1.44	169
Sphyraena guachancho	4.21	6	0.67	
Trachinotus ovatus	1.98	6	0.32	
Chloroscombrus chrysurus	1.26	6	0.20	
Total	625.91		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 74
DATE :24/05/2008 GEAR TYPE: PT NO: 1 POSITION:Lat S 8°5.21
start stop duration Lon E 12°59.07
TIME :05:59:45 06:17:17 17.5 (min) Purpose : 1
LOG : 2640.15 2641.35 1.2 Region : 4054
FDEPTH: 75 60 Gear cond.: 0
BDEPTH: 91 85 Validity : 0
Towing dir: 0° Wire out : 225 m Speed : 4.1 kn
Sorted : 100 Total catch: 99.50 Catch/hour: 340.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Decapterus rhonchus	156.84	151	46.08	171
Trichiurus lepturus	153.59	503	45.13	
Stromateus fiatola	14.71	24	4.32	172
Sarda sarda	7.70	3	2.26	173
Sepia orbignyana	2.43	3	0.71	
Auxis thazard	2.29	3	0.67	
Euthynnus alletteratus	1.98	3	0.58	
Chloroscombrus chrysurus	0.82	3	0.24	
Total	340.36		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 75
DATE :24/05/2008 GEAR TYPE: PT NO: 2 POSITION:Lat S 8°9.52
start stop duration Lon E 12°46.93
TIME :09:07:06 09:27:06 20.0 (min) Purpose : 1
LOG : 2661.38 2662.55 1.2 Region : 4054
FDEPTH: 140 130 Gear cond.: 0
BDEPTH: 223 281 Validity : 0
Towing dir: 0° Wire out : 400 m Speed : 3.5 kn
Sorted : 0 Total catch: 0.43 Catch/hour: 1.29

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	1.29	3	0.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 76
DATE :24/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 8°15.05
start stop duration Lon E 12°54.20
TIME :12:23:37 12:52:30 28.9 (min) Purpose : 1
LOG : 2686.48 2687.94 1.5 Region : 4054
FDEPTH: 120 119 Gear cond.: 0
BDEPTH: 120 119 Validity : 0
Towing dir: 0° Wire out : 340 m Speed : 3.0 kn
Sorted : 141 Total catch: 141.33 Catch/hour: 293.62

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	178.67	262	60.85	
Trachurus trecae	53.29	1257	18.15	175
Dentex angolensis	27.84	185	9.48	176
Dentex congoensis	9.95	187	3.39	177
Umbrina canariensis	5.40	17	1.84	
Octopus vulgaris	5.11	4	1.74	
Zeus faber	2.41	8	0.82	
Raja miraletus	2.39	4	0.81	
Todaropsis eblanae	2.33	139	0.79	
Uranoscopus polli	1.41	8	0.48	
Dentex barnardi	1.39	4	0.47	193
Boops boops	0.89	39	0.30	
Citharus linguatula	0.62	27	0.21	
Saurida brasiliensis	0.60	177	0.21	
Sphoeroides pachgaster	0.39	2	0.13	
Chelidonichthys gabonensis	0.29	2	0.10	
Chaetodon hoefleri	0.15	2	0.05	
Sepia orbignyana	0.15	4	0.05	
Anthias anthias	0.15	2	0.05	
Spicara alta	0.10	8	0.04	
Callinectes sp.	0.08	4	0.03	
Total	293.62		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 77
DATE :24/05/2008 GEAR TYPE: PT NO: 7 POSITION:Lat S 8°11.68
start stop duration Lon E 13°14.68
TIME :16:02:35 16:26:19 23.7 (min) Purpose : 1
LOG : 2713.34 2714.77 1.4 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 24 26 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.6 kn
Sorted : 59 Total catch: 58.56 Catch/hour: 148.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	65.96	943	44.57	
Ilisha africana	30.71	1102	20.75	181
Brachydeuterus auritus	25.53	437	17.25	179
Mobula sp.	17.06	3	11.53	
Stromateus fiatola	4.40	13	2.97	182
Raja miraletus	1.77	3	1.20	
Sphyraena guachancho	1.01	5	0.68	
Chloroscombrus chrysurus	0.73	8	0.50	
Alectis alexandrinus	0.53	20	0.36	178
Sardinella maderensis	0.20	13	0.14	180
Sepiella ornata	0.08	30	0.05	
Parakuhlia macrophthalmus	0.03	3	0.02	
Total	148.00		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 78
DATE :24/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°15.44
start stop duration Lon E 13°9.49
TIME :17:49:33 18:02:12 12.7 (min) Purpose : 1
LOG : 2723.63 2724.39 0.8 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 59 55 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 3.6 kn
Sorted : 146 Total catch: 1015.52 Catch/hour: 4816.70

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	2491.54	19380	51.73	186
Chloroscombrus chrysurus	801.11	6261	16.63	184
Mobula rochebrunei	664.03	5	13.79	
Trachurus trecae	280.32	882	5.82	185
Brachydeuterus auritus	159.37	1821	3.31	
Sardinella aurita	145.14	541	3.01	183
Selene dorsalis	140.87	1508	2.92	
Ilisha africana	41.26	683	0.86	
Trichiurus lepturus	28.17	28	0.58	
Sphyraena guachancho	27.60	57	0.57	
Decapterus rhonchus	15.08	28	0.31	
Caranx crysos	14.51	57	0.30	
Trachinotus ovatus	5.69	28	0.12	
Decapterus punctatus	1.99	28	0.04	
Total	4816.70		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 79
DATE :25/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°24.85
start stop duration Lon E 13°3.84
TIME :00:02:16 00:30:36 28.3 (min) Purpose : 1
LOG : 2772.87 2774.34 1.5 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 107 98 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.1 kn
Sorted : 27 Total catch: 26.64 Catch/hour: 56.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	37.91	152	67.19	
Euthynnus alletteratus	12.60	13	22.33	187
Trachinotus ovatus	3.54	6	6.27	
Alloteuthis africana	0.89	127	1.58	
Trachurus trecae	0.87	2	1.54	
Saurida brasiliensis	0.61	6	1.09	
Total	56.42		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 80
DATE :25/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°28.25
start stop duration Lon E 13°12.88
TIME :03:55:48 04:10:02 14.2 (min) Purpose : 1
LOG : 2801.71 2802.57 0.9 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 61 65 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
Sorted : 151 Total catch: 150.67 Catch/hour: 634.85

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Sardinella maderensis	232.16	1904 36.57	189
Brachydeuterus auritus	167.70	1302 26.42	190
Sardinella aurita	102.60	476 16.16	188
Trichiurus lepturus	85.32	147 13.44	
Trachurus trecae	24.90	84 3.92	191
Sphyraena guachancho	7.71	17 1.21	192
Ilisha africana	6.19	84 0.98	
Trachinotus ovatus	4.93	13 0.78	
Selene dorsalis	3.20	29 0.50	
Engraulis encrasicolus	0.13	8 0.02	
Total	634.85	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 81
DATE :25/05/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 8°35.83
start stop duration Lon E 13°3.84
TIME :09:37:18 10:07:33 30.3 (min) Purpose : 1
LOG : 2844.89 2846.40 1.5 Region : 4054
FDEPTH: 112 113 Gear cond.: 0
BDEPTH: 112 113 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 3.0 kn
Sorted : 10 Total catch: 137.47 Catch/hour: 272.67

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Brachydeuterus auritus	74.94	6393 27.48	
Dentex angolensis	39.07	169 14.33	195
Umbrina canariensis	28.36	79 10.40	197
Sepia orbignyana	21.42	65 7.86	
Trichiurus lepturus	18.15	54 6.66	
Brotula barbata	12.60	10 4.62	
Saurida brasiliensis	11.78	2967 4.32	
Argyrosomus hololepidotus	8.83	4 3.24	
Spicara alta	7.87	54 2.89	
Trachurus trecae	7.04	468 2.58	194
Alloteuthis africana	5.45	1843 2.00	
Zeus faber	4.40	18 1.61	
Octopus vulgaris	4.13	2 1.51	
Dentex macrophthalmus	3.81	8 1.40	196
Chaetodon hoefleri	3.17	22 1.16	
Fistularia petimba	3.07	8 1.13	
Pterothrissus belloci	2.50	16 0.92	
Scorpaena scrofa	2.24	6 0.82	
Dentex barnardi	2.22	6 0.81	
Citharus linguatula	1.86	52 0.68	
Torpedo torpedo	1.65	6 0.60	
Branchiostegus semifasciatus *	1.57	2 0.57	
Miracorvina angolensis	1.27	2 0.47	
Uranoscopus cadenati	1.07	4 0.39	
Boops boops	0.97	28 0.36	
Dentex congoensis	0.77	8 0.28	
Todarodes sagittatus	0.75	32 0.28	
Chelidonichthys gabonensis	0.60	4 0.22	
Scorpaena normani	0.58	2 0.21	
Atractoscion aequidens	0.52	2 0.19	
Total	272.67	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 82
DATE :25/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°36.10
start stop duration Lon E 13°15.82
TIME :12:01:34 12:31:54 30.3 (min) Purpose : 1
LOG : 2861.09 2862.74 1.6 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 50 60 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
Sorted : 13 Total catch: 13.05 Catch/hour: 25.82

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Sphyraena guachancho	7.36	6 28.51	
Sardinella aurita	5.04	16 19.54	198
Brachydeuterus auritus	4.19	49 16.25	201
Scomberomorus tritor	2.97	2 11.49	
Sardinella maderensis	2.43	12 9.43	199
Alectis alexandrinus	1.86	2 7.20	
Chloroscombrus chrysurus	1.03	6 3.98	200
Decapterus rhonchus	0.93	2 3.60	
Total	25.82	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 83
DATE :25/05/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°48.10
start stop duration Lon E 13°6.43
TIME :20:28:50 21:00:04 31.2 (min) Purpose : 1
LOG : 2926.88 2928.58 1.7 Region : 4054
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 100 91 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 47 Total catch: 215.50 Catch/hour: 414.02

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Mobula sp.	172.91	2 41.76	
Brachydeuterus auritus	127.99	993 30.91	202
Trichiurus lepturus	81.17	427 19.61	
Scomberomorus tritor	10.47	8 2.53	203
Selene dorsalis	10.32	58 2.49	205
Trachinotus ovatus	5.28	15 1.28	
Euthynnus alletteratus	2.44	2 0.59	204
Lagocephalus lagocephalus	2.29	4 0.55	
Sardinella maderensis	0.94	6 0.23	207
Trachurus trecae	0.21	4 0.05	206
Total	414.02	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 84
DATE :15/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 9°3.92
start stop duration Lon E 12°31.44
TIME :19:45:29 20:05:38 22.0 (min) Purpose : 1
LOG : 5070.45 5070.45 0.0 Region : 4040
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 10 10 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.0 kn
Sorted : 97 Total catch: 616.09 Catch/hour: 1680.25

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Sardinella maderensis	765.00	4846 45.53	208
Brachydeuterus auritus	681.55	7085 40.56	210
Sardinella aurita	115.36	687 6.87	209
Trachurus trecae	66.00	597 3.93	211
Ilisha africana	30.27	393 1.80	
Arius parkii	18.95	19 1.13	
Decapterus rhonchus	1.31	16 0.08	
Engraulis encrasicolus	1.31	278 0.08	
Sphyraena guachancho	0.49	16 0.03	
Total	1680.25	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 85
DATE :16/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 9°19.90
start stop duration Lon E 12°59.89
TIME :02:45:13 03:16:12 31.0 (min) Purpose : 1
LOG : 5198.79 5200.73 1.9 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 26 32 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.8 kn
Sorted : 11 Total catch: 11.06 Catch/hour: 21.43

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Decapterus rhonchus	7.09	58 33.09	213
Pomadasys rogeri	4.03	4 18.81	
Brachydeuterus auritus	3.72	25 17.36	212
Sardinella maderensis	2.96	12 13.83	214
JELLYFISH	1.92	10 8.95	
Pomadasys incisus	0.66	2 3.07	
Echeneis naucrates	0.52	2 2.44	
Sardinella aurita	0.52	8 2.44	215
Total	21.43	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 86
DATE :16/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 9°38.71
start stop duration Lon E 13°5.55
TIME :18:19:23 18:49:26 30.1 (min) Purpose : 1
LOG : 5335.47 5336.92 1.4 Region : 4040
FDEPTH: 0 20 Gear cond.: 0
BDEPTH: 44 52 Validity : 0
Towing dir: 0° Wire out : 137 m Speed : 2.9 kn
Sorted : 101 Total catch: 372.94 Catch/hour: 744.64

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Sardinella aurita	594.09	2314 79.78	216
Brachydeuterus auritus	77.27	783 10.38	219
Sardinella maderensis	52.83	280 7.09	217
Stromateus fiatola	8.35	8 1.12	
Trachurus trecae	7.97	64 1.07	218
Sphyraena guachancho	2.34	12 0.31	
Boops boops	1.80	86 0.24	
Total	744.64	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 87
DATE :17/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 9°49.27
start stop duration Lon E 13°10.72
TIME :02:33:10 02:54:16 21.1 (min) Purpose : 1
LOG : 5406.62 5407.76 1.1 Region : 4040
FDEPTH: 5 0 Gear cond.: 0
BDEPTH: 32 32 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.2 kn
Sorted : 96 Total catch: 548.43 Catch/hour: 1560.26

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Sardinella maderensis	458.92	12421 29.41	220
Decapterus rhonchus	376.22	3536 24.11	222
Sardinella aurita	198.66	1232 12.73	221
Brachydeuterus auritus	188.93	4623 12.11	223
Trachurus trecae	163.78	3923 10.50	224
Pomadasys peroteti	64.38	193 4.13	
Galeoides decadactylus	25.29	714 1.62	
Ilisha africana	24.81	469 1.59	
Selene dorsalis	11.66	211 0.75	
Trichiurus lepturus	7.94	193 0.51	
Sphyraena guachancho	7.80	31 0.50	
Eucinostomus melanopterus	7.62	162 0.49	
Sepia orbignyana	7.14	17 0.46	
Rhizoprionodon acutus	7.11	6 0.46	
Sphyraena sphyraena	6.80	179 0.44	
Epinephelus aeneus	3.19	3 0.20	
Total	1560.26	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 88
DATE :17/06/2008 GEAR TYPE: PT NO: 2 POSITION:Lat S 9°55.33
start stop duration Lon E 13°8.03
TIME :05:33:41 06:02:00 28.3 (min) Purpose : 1
LOG : 5426.97 5428.70 1.7 Region : 4040
FDEPTH: 0 44 Gear cond.: 0
BDEPTH: 59 59 Validity : 0
Towing dir: 0° Wire out : 78 m Speed : 3.7 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
N O C A T C H	0.00	0 0.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 89
DATE :17/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 10°6.24
start stop duration Lon E 13°0.89
TIME :11:20:21 11:53:02 32.7 (min) Purpose : 1
LOG : 5471.19 5472.85 1.7 Region : 4040
FDEPTH: 103 104 Gear cond.: 0
BDEPTH: 103 104 Validity : 0
Towing dir: 0° Wire out : 270 m Speed : 3.0 kn
Sorted : 81 Total catch: 276.31 Catch/hour: 507.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	322.40	1364	63.55	225
Trachurus trecae	35.45	1884	6.99	226
Boops boops	21.68	1315	4.27	
Trigla lyra	20.73	206	4.09	
Dentex angolensis	20.47	593	4.04	
Sepia orbignyana	15.15	84	2.99	
Citharus linguatula	8.85	218	1.74	
Pagellus bellottii	8.35	182	1.65	
Trichiurus lepturus	7.75	18	1.53	
Scorpaena normani	7.22	79	1.42	
Rhinobatos albomaculatus	6.98	4	1.38	
Squatina oculata	6.61	4	1.30	
Zeus faber	6.61	6	1.30	
Alloteuthis africana	4.90	1472	0.97	
Spicara alta	4.00	376	0.79	
Lagocephalus laevigatus	3.95	6	0.78	
Pseudupeneus prayensis	1.58	31	0.31	
Fistularia petimba	1.36	2	0.27	
Uranoscopus polli	1.21	6	0.24	
Chaetodon hoefleri	1.08	6	0.21	
Illex coindetii	0.84	61	0.17	
Saurida brasiliensis	0.13	13	0.03	
Total	507.30		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 90
DATE :17/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 10°0.19
start stop duration Lon E 13°13.89
TIME :14:08:41 14:39:17 30.6 (min) Purpose : 1
LOG : 5490.22 5491.90 1.7 Region : 4040
FDEPTH: 29 36 Gear cond.: 0
BDEPTH: 29 36 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.3 kn
Sorted : 155 Total catch: 476.65 Catch/hour: 934.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	494.54	8389	52.93	228
Ilisha africana	130.47	1939	13.96	
Galeoides decadactylus	97.77	541	10.46	
Trachurus trecae	59.39	1325	6.36	227
Pteroscion peli	45.77	751	4.90	
Pseudotolithus senegalensis	29.21	106	3.13	
Selene dorsalis	20.58	335	2.20	
Pomadasys incisus	19.62	176	2.10	
Ephippion guttifer	13.13	6	1.41	
Trichiurus lepturus	5.63	96	0.60	
Arius parkii	4.63	4	0.50	
Boops boops	3.74	33	0.40	
Cynoglossus senegalensis	2.20	2	0.23	
Penaeus notialis	2.06	33	0.22	
Sphyraena sphyraena	1.33	24	0.14	
Eucinostomus melanopterus	1.25	12	0.13	
Pomadasys jubelini	1.18	6	0.13	
Chloroscombrus chrysurus	0.96	6	0.10	
Cynoglossus canariensis	0.45	0	0.05	
Sardinella maderensis	0.39	6	0.04	
Total	934.30		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 91
DATE :17/06/2008 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°6.28
start stop duration Lon E 13°15.43
TIME :16:55:38 17:00:25 4.8 (min) Purpose : 1
LOG : 5509.85 5510.22 0.4 Region : 4040
FDEPTH: 0 30 Gear cond.: 0
BDEPTH: 40 39 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 4.6 kn
Sorted : 154 Total catch: 864.69 Catch/hour: 10853.85

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	6862.34	81866	63.22	229
Sardinella aurita	1895.40	9138	17.46	231
Sardinella maderensis	1343.10	11385	12.37	230
Trachurus trecae	379.71	3176	3.50	232
Carcharhinus brevipinna	161.92	38	1.49	
Pagellus bellottii	71.17	351	0.66	
Rhizoprionodon acutus	69.04	25	0.64	
Pomadasys incisus	63.51	276	0.59	
Sphyraena sphyraena	4.90	75	0.05	
Trichiurus lepturus	2.76	213	0.03	
Total	10853.85		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 92
DATE :17/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 10°10.47
start stop duration Lon E 13°21.07
TIME :23:47:54 00:08:21 20.5 (min) Purpose : 1
LOG : 5570.69 5571.86 1.2 Region : 4040
FDEPTH: 0 5 Gear cond.: 0
BDEPTH: 31 35 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.4 kn
Sorted : 103 Total catch: 647.46 Catch/hour: 1899.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	897.42	8743	47.24	234
Brachydeuterus auritus	621.07	5639	32.69	235
Trachurus trecae	280.02	4160	14.74	233
Ilisha africana	41.05	628	2.16	
Arius parkii	40.67	18	2.14	
Selene dorsalis	7.95	94	0.42	
Pomadasys peroteti	6.84	18	0.36	
Trachinotus ovatus	4.64	38	0.24	
Total	1899.64		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 93
DATE :18/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 10°26.04
start stop duration Lon E 13°27.31
TIME :12:27:19 12:57:46 30.5 (min) Purpose : 1
LOG : 5656.15 5657.67 1.5 Region : 4040
FDEPTH: 46 50 Gear cond.: 0
BDEPTH: 46 50 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 210 Total catch: 209.85 Catch/hour: 413.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	139.07	1540	33.64	237
Sphyraena guachancho	76.82	116	18.58	
Dentex barnardi	72.80	368	17.61	
Pagellus bellottii	43.99	290	10.64	
Trachurus trecae	22.36	258	5.41	236
Pseudupeneus prayensis	16.35	116	3.96	
Umbrina canariensis	7.88	22	1.91	
Pomadasys incisus	5.65	28	1.37	
Epinephelus aeneus	3.88	2	0.94	
Stromateus fiatola	3.74	4	0.91	
Sepia orbignyana	3.09	2	0.75	
Plectorhinchus mediterraneus	2.95	8	0.71	
Fistularia petimba	2.13	6	0.51	
Decapterus rhonchus	1.73	18	0.42	238
Zeus faber	1.69	6	0.41	
Lagocephalus laevigatus	1.52	2	0.37	
Raja miraletus	1.40	2	0.34	
Pagrus caeruleostictus	1.34	6	0.32	
Trichiurus lepturus	1.34	2	0.32	
Octopus sp.	1.30	2	0.31	
Torpedo torpedo	0.59	2	0.14	
Selene dorsalis	0.37	4	0.09	
Pontinus accraensis	0.35	6	0.09	
Boops boops	0.28	8	0.07	
Chaetodon hoefleri	0.24	4	0.06	
Citharus linguatula	0.22	6	0.05	
Grammoplites gruveli	0.18	6	0.04	
Alloteuthis africana	0.06	79	0.01	
Monolene microstoma	0.04	4	0.01	
Total	413.36		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 94
DATE :19/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 10°53.52
start stop duration Lon E 13°31.49
TIME :09:40:08 10:10:52 30.7 (min) Purpose : 1
LOG : 5838.16 5839.70 1.5 Region : 4040
FDEPTH: 129 127 Gear cond.: 0
BDEPTH: 129 127 Validity : 0
Towing dir: 0° Wire out : 340 m Speed : 3.0 kn
Sorted : 91 Total catch: 90.92 Catch/hour: 177.46

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex angolensis	86.76	347	48.89	
Dentex macrophthalmus	44.40	260	25.02	239
Grammoplites gruveli	6.60	88	3.72	
Raja miraletus	5.17	8	2.91	
Zeus faber	4.59	8	2.58	
Brotula barbata	4.16	4	2.34	
Loligo vulgaris	3.69	129	2.08	
Citharus linguatula	3.55	61	2.00	
Trigla lyra	3.36	20	1.89	
Branchiostegus semifasciatus *	3.03	2	1.70	
Uranoscopus polli	2.77	14	1.56	
Trichiurus lepturus	1.82	4	1.02	
Monolene microstoma	1.78	39	1.00	
Pterothrissus belloci	1.72	6	0.97	
Scorpaena normani	1.62	8	0.91	
Peristedion cataphractum	1.35	12	0.76	
Umbrina canariensis	1.11	2	0.63	
Total	177.46		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 95
DATE :19/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 10°56.00
start stop duration Lon E 13°42.34
TIME :16:12:59 16:37:38 24.7 (min) Purpose : 1
LOG : 5879.19 5880.44 1.3 Region : 4040
FDEPTH: 64 73 Gear cond.: 0
BDEPTH: 64 73 Validity : 0
Towing dir: 0° Wire out : 180 m Speed : 3.0 kn
Sorted : 110 Total catch: 110.41 Catch/hour: 268.75

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	71.44	630	26.58	241
Sardinella aurita	56.47	260	21.01	240
Sepia orbignyana	33.47	46	12.45	
Brachydeuterus auritus	17.65	124	6.57	243
Sardinella maderensis	10.83	49	4.03	242
Lagocephalus laevigatus	9.47	12	3.52	
Torpedo torpedo	8.76	19	3.26	
Raja miraletus	8.03	10	2.99	
Dentex barnardi	5.60	61	2.08	
Citharus linguatula	5.48	97	2.04	
Alloteuthis africana	5.38	346	2.00	
Brotula barbata	5.16	15	1.92	
Zeus faber	4.62	10	1.72	
Grammoplites gruveli	4.28	44	1.59	
Parapenaeus longirostris	3.31	321	1.23	
Loligo sp.	3.24	95	1.20	
Fistularia petimba	2.80	2	1.04	
Chaetodon hoefleri	2.29	7	0.85	
GOBIIDAE	2.19	124	0.82	
Pagellus bellottii	1.31	2	0.49	
Monolene microstoma	1.31	2	0.49	
Scorpaena normani	1.27	10	0.47	
Uranoscopus cadenati	1.22	2	0.45	
Pontinus accraensis	1.22	2	0.45	
Unidentified fish	1.02	5	0.38	
Dentex angolensis	0.92	2	0.34	
Total	268.75		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 96
DATE :20/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 11°10.18
start stop duration Lon E 13°48.10
TIME :00:12:36 00:25:29 12.9 (min) Purpose : 1
LOG : 5948.32 5949.10 0.8 Region : 4040
FDEPTH: 0 15 Gear cond.: 0
BDEPTH: 30 33 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.7 kn
Sorted : 96 Total catch: 226.42 Catch/hour: 1053.93

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	897.91	7238	85.20	244
Brachydeuterus auritus	75.50	2528	7.16	246
Sardinella aurita	22.81	107	2.16	245
Penaeus notialis	22.72	298	2.16	
Trichiurus lepturus	16.06	503	1.52	
Ilisha africana	6.75	172	0.64	
Sphyraena guachancho	4.38	65	0.42	
Pteroscion peli	3.86	116	0.37	
Pagellus bellottii	2.05	42	0.19	
Chilomycterus spinosus mauret.	1.91	9	0.18	
Total	1053.93		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 97
DATE :20/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 11°25.94
start stop duration Lon E 13°38.15
TIME :07:37:57 07:49:18 11.3 (min) Purpose : 1
LOG : 6006.75 6007.35 0.6 Region : 4040
FDEPTH: 40 38 Gear cond.: 0
BDEPTH: 40 38 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 135 Total catch: 340.88 Catch/hour: 1803.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	954.92	10259	52.95	247
Sardinella aurita	440.63	2487	24.43	248
Pagellus bellottii	121.64	1741	6.74	250
Pseudupeneus prayensis	108.57	836	6.02	
Lithognathus mormyrus	37.46	265	2.08	
Sepia orbignyana	30.69	32	1.70	
Octopus vulgaris	23.65	11	1.31	
Raja miraletus	20.42	32	1.13	
Sardinella maderensis	16.40	101	0.91	249
Ephippion guttifer	14.29	11	0.79	
Trachinus armatus	6.98	11	0.39	
Grammoplites gruveli	5.71	63	0.32	
Selene dorsalis	5.08	74	0.28	
Dentex barnardi	4.44	11	0.25	
Torpedo torpedo	3.86	5	0.21	
Sphyraena sphyraena	3.28	11	0.18	
Citharus linguatula	2.80	21	0.16	
Balistes vetula	1.90	5	0.11	
Monolene microstoma	0.85	5	0.05	
Total	1803.60		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 98
DATE :20/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 11°32.06
start stop duration Lon E 13°39.47
TIME :12:45:02 13:15:16 30.2 (min) Purpose : 1
LOG : 6051.00 6052.69 1.7 Region : 4040
FDEPTH: 40 42 Gear cond.: 0
BDEPTH: 40 42 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 142 Total catch: 326.65 Catch/hour: 648.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	416.67	2784	64.29	251
Pagellus bellottii	119.11	4946	18.38	
Pseudupeneus prayensis	70.04	688	10.81	
Dentex barnardi	12.78	127	1.97	
Octopus vulgaris	10.18	4	1.57	
Lithognathus mormyrus	6.39	24	0.99	
Sphyraena sphyraena	5.75	28	0.89	
Pomadasys incisus	1.71	10	0.26	
Raja miraletus	1.65	10	0.25	
Bothus podas africanus	1.41	10	0.22	
Plectorhinchus mediterraneus	0.91	4	0.14	
Chaetodon hoefleri	0.69	4	0.11	
Citharus linguatula	0.60	18	0.09	
Grammoplites gruveli	0.24	4	0.04	
Total	648.12		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 99
DATE :21/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 11°57.39
start stop duration Lon E 13°41.77
TIME :03:29:05 03:59:23 30.3 (min) Purpose : 1
LOG : 6180.08 6181.99 1.9 Region : 4040
FDEPTH: 0 7 Gear cond.: 0
BDEPTH: 39 40 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.8 kn
Sorted : 106 Total catch: 1522.43 Catch/hour: 3013.72

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	1568.23	9298	52.04	253
Trachurus trecae	1244.12	6210	41.28	252
Brachydeuterus auritus	91.69	1443	3.04	
Sardinella maderensis	67.94	4707	2.25	254
Ilisha africana	17.56	368	0.58	
Sepia orbignyana	14.00	12	0.46	
Trichiurus lepturus	10.17	170	0.34	
Total	3013.72		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 100
DATE :21/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 12°7.35
start stop duration Lon E 13°27.27
TIME :08:58:24 09:31:21 33.0 (min) Purpose : 1
LOG : 6225.28 6226.98 1.7 Region : 4040
FDEPTH: 110 108 Gear cond.: 0
BDEPTH: 110 108 Validity : 0
Towing dir: 0° Wire out : 290 m Speed : 3.1 kn
Sorted : 59 Total catch: 189.92 Catch/hour: 345.83

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex macrophthalmus	300.18	2039	86.80	255
Dentex angolensis	15.84	93	4.58	
Zenopsis conchifer	10.02	5	2.90	
Zeus faber	5.88	7	1.70	
Raja miraletus	4.86	7	1.41	
Pagellus bellottii	2.62	33	0.76	
Sepia officinalis hierredda	1.84	11	0.53	
Trigla lyra	1.80	16	0.52	
Octopus vulgaris	1.58	2	0.46	
Spicara alta	0.66	5	0.19	
Citharus linguatula	0.55	11	0.16	
Total	345.83		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 101
DATE :21/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 12°15.58
start stop duration Lon E 13°30.41
TIME :14:03:59 14:34:03 30.1 (min) Purpose : 1
LOG : 6259.70 6261.23 1.5 Region : 4040
FDEPTH: 86 89 Gear cond.: 0
BDEPTH: 86 89 Validity : 0
Towing dir: 0° Wire out : 235 m Speed : 3.1 kn
Sorted : 95 Total catch: 266.33 Catch/hour: 531.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	371.93	4535	69.99	256
Sepia orbignyana	18.56	8	3.49	
Trigla lyra	17.34	194	3.26	
Alloteuthis africana	15.34	5038	2.89	
Raja leopardus	14.39	6	2.71	
Raja miraletus	13.85	16	2.61	
Zeus faber	12.45	16	2.34	
Citharus linguatula	9.80	409	1.84	
Atractoscion aequidens	7.86	6	1.48	
Dentex barnardi	6.74	44	1.27	
Scorpaena normani	5.17	64	0.97	
Rhinobatos albomaculatus	5.07	6	0.95	
Boops boops	5.01	48	0.94	
Fistularia petimba	5.01	10	0.94	
Pseudupeneus prayensis	3.93	48	0.74	
Uranoscopus cadenati	2.75	6	0.52	
Sardinella maderensis	2.75	10	0.52	
Torpedo torpedo	2.21	10	0.42	
Pagellus bellottii	2.15	60	0.41	
Chaetodon hoefleri	2.10	10	0.39	
Dentex macrophthalmus	1.90	10	0.36	
Saurida brasiliensis	1.56	507	0.29	
Pomadasys incisus	1.40	6	0.26	
Uranoscopus polli	0.98	6	0.18	
Illex coindetii	0.70	10	0.13	
Dentex angolensis	0.48	10	0.09	
Total	531.42		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 102
DATE :22/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 12°18.29
start stop duration Lon E 13°24.08
TIME :07:37:15 07:57:53 20.6 (min) Purpose : 1
LOG : 6364.92 6366.04 1.1 Region : 4040
FDEPTH: 108 103 Gear cond.: 0
BDEPTH: 108 103 Validity : 0
Towing dir: 0° Wire out : 280 m Speed : 3.3 kn
Sorted : 118 Total catch: 397.62 Catch/hour: 1156.99

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	830.31	4795	71.76	257
Dentex macrophthalmus	174.47	1269	15.08	258
Trigla lyra	52.96	538	4.58	
Dentex angolensis	19.84	122	1.72	
Boops boops	19.20	189	1.66	
Zeus faber	14.64	9	1.27	
Lophius vaillanti	5.56	17	0.48	
Pagellus bellottii	5.30	67	0.46	
Brotula barbata	5.00	3	0.43	
Sepia orbignyana	4.77	26	0.41	
Citharus linguatula	4.16	93	0.36	
Chaetodon hoefleri	4.07	20	0.35	
Raja miraletus	4.07	9	0.35	
Trichiurus lepturus	3.23	6	0.28	
Branchiostegus semifasciatus *	3.14	3	0.27	
Pegusa lascaris	1.89	20	0.16	
Octopus vulgaris	1.51	3	0.13	
Scorpaena normani	1.43	9	0.12	
Illex coindetii	1.43	29	0.12	
Total	1156.99		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 103
DATE :22/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 13°2.06
start stop duration Lon E 12°53.67
TIME :21:09:29 21:29:15 19.8 (min) Purpose : 1
LOG : 6474.97 6476.07 1.1 Region : 4050
FDEPTH: 0 20 Gear cond.: 0
BDEPTH: 68 58 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.4 kn
Sorted : 90 Total catch: 90.37 Catch/hour: 274.26

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	176.63	574	64.40	260
Trachurus trecae	71.78	385	26.17	259
Trichiurus lepturus	17.75	106	6.47	
Engraulis encrasicolus	4.67	1402	1.70	
Sardinella aurita	3.25	12	1.18	
Synagrops microlepis	0.18	39	0.07	
Total	274.26		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 104
DATE :23/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 13°10.77
start stop duration Lon E 12°46.59
TIME :00:52:21 01:22:40 30.3 (min) Purpose : 1
LOG : 6502.41 6504.36 1.9 Region : 4050
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 64 93 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.8 kn
Sorted : 37 Total catch: 37.29 Catch/hour: 73.79

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	46.11	188	62.48	
Sardinella maderensis	14.54	87	19.71	261
J E L L Y F I S H	9.78	103	13.25	
Sphyrna zygaena	3.36	2	4.56	
Total	73.79		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 105
DATE :24/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 14°1.74
start stop duration Lon E 12°20.70
TIME :23:24:56 23:55:20 30.4 (min) Purpose : 1
LOG : 6638.97 6640.80 1.8 Region : 4050
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 53 63 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.6 kn
Sorted : 137 Total catch: 136.65 Catch/hour: 269.62

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	245.45	1405	91.04	262
Sardinella maderensis	15.59	673	5.78	263
Sphyrna zygaena	4.14	2	1.54	
Trichiurus lepturus	2.56	12	0.95	
Engraulis encrasicolus	0.99	176	0.37	
Scomber japonicus	0.69	2	0.26	
Sardinella aurita	0.20	8	0.07	
Total	269.62		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 106
DATE :25/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 14°12.36
start stop duration Lon E 12°18.58
TIME :03:40:10 04:11:12 31.0 (min) Purpose : 1
LOG : 6671.44 6673.42 2.0 Region : 4050
FDEPTH: 5 5 Gear cond.: 0
BDEPTH: 34 38 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.8 kn
Sorted : 83 Total catch: 82.69 Catch/hour: 159.94

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	35.20	149	22.01	264
Spondyliosoma cantharus	22.55	43	14.10	
Stromateus fiatola	20.70	23	12.94	
Diplodus sp.	13.35	29	8.34	
Sphyraena sphyraena	12.28	52	7.68	
SPARIDAE	9.67	39	6.05	
Sepia orbignyana	6.05	2	3.79	
J E L L Y F I S H	5.32	2	3.33	
Atractoscion aequidens	5.13	8	3.20	
Sphyrna zygaena	4.93	2	3.08	
Trichiurus lepturus	4.84	29	3.02	
Sardinella maderensis	3.87	286	2.42	265
Galeoides decadactylus	3.00	8	1.87	
Pomadasys jubelini	2.71	6	1.69	
Sarda sarda	2.42	2	1.51	
Lithognathus mormyrus	1.93	6	1.21	
Dentex barnardi	1.64	6	1.03	
Pomatomus saltatrix	1.55	4	0.97	
Boops boops	1.35	12	0.85	
Sardinella aurita	1.26	6	0.79	
Alloteuthis africana	0.19	190	0.12	
Total	159.94		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 107
DATE :25/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 14°20.43
start stop duration Lon E 12°14.99
TIME :07:39:58 08:07:40 27.7 (min) Purpose : 1
LOG : 6698.06 6699.56 1.5 Region : 4050
FDEPTH: 116 112 Gear cond.: 0
BDEPTH: 116 112 Validity : 0
Towing dir: 0° Wire out : 310 m Speed : 3.2 kn
Sorted : 167 Total catch: 166.62 Catch/hour: 361.04

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trigla lyra	75.41	639	20.89	
Dentex barnardi	40.52	93	11.22	
Dentex gibbosus	36.84	15	10.20	
Anthias anthias	36.51	351	10.11	
Dentex angolensis	35.43	128	9.81	267
Trichiurus lepturus	33.80	85	9.36	
Trachurus trecae	22.64	217	6.27	266
Zeus faber	17.88	26	4.95	
Squatina oculata	14.08	7	3.90	
Atractoscion aequidens	11.48	7	3.18	
Raja miraletus	6.37	9	1.76	
Lagocephalus laevigatus	5.76	26	1.60	
Scorpaena normani	5.14	11	1.42	
Brotula barbata	3.45	4	0.95	
Scyliorhinus cervigoni	3.03	2	0.84	
Sepia orbignyana	2.88	15	0.80	
Pagellus bellottii	2.38	28	0.66	
Spondyliosoma cantharus	1.93	2	0.53	
Citharus linguatula	1.82	65	0.50	
Octopus vulgaris	1.54	2	0.43	
Pagrus caeruleostictus	0.85	2	0.23	
Lophius vaillanti	0.65	2	0.18	
Loligo vulgaris	0.65	20	0.18	
Total	361.04		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 108
DATE :25/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 14°30.08
start stop duration Lon E 12°16.56
TIME :12:11:09 12:36:06 25.0 (min) Purpose : 1
LOG : 6734.82 6736.03 1.2 Region : 4050
FDEPTH: 114 117 Gear cond.: 0
BDEPTH: 114 117 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 2.9 kn
Sorted : 271 Total catch: 1479.12 Catch/hour: 3557.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	3130.27	21764	88.00	268
Dentex angolensis	127.26	481	3.58	
Dentex macrophthalmus	83.11	649	2.34	269
Trigla lyra	46.75	481	1.31	
Dentex barnardi	24.67	103	0.69	
Squatina oculata	22.85	10	0.64	
Pagellus bellottii	21.43	183	0.60	
Zeus faber	21.43	26	0.60	
Atractoscion aequidens	20.92	17	0.59	
Raja miraletus	18.83	26	0.53	
Torpedo marmorata	17.41	12	0.49	
Boops boops	8.44	53	0.24	
Chelidonichthys capensis	7.14	38	0.20	
Umbrina canariensis	6.49	26	0.18	
Total	3557.00		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 109
DATE :26/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 15°19.63
start stop duration Lon E 12°1.79
TIME :03:47:58 04:21:22 33.4 (min) Purpose : 1
LOG : 6842.55 6844.44 1.9 Region : 4050
FDEPTH: 0 10 Gear cond.: 0
BDEPTH: 36 46 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.4 kn
Sorted : 119 Total catch: 664.12 Catch/hour: 1193.03

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	891.81	5587	74.75	270
SPARIDAE	225.84	767	18.93	
Boops boops	48.18	363	4.04	
Spondyliosoma cantharus	20.01	70	1.68	
Diplodus sp.	4.92	11	0.41	
Sarda sarda	2.26	2	0.19	
Total	1193.03		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 110
DATE :26/06/2008 GEAR TYPE: BT NO: 1 POSITION:Lat S 15°27.30
start stop duration Lon E 11°55.70
TIME :07:20:19 07:40:20 20.0 (min) Purpose : 1
LOG : 6867.17 6868.29 1.1 Region : 4050
FDEPTH: 111 116 Gear cond.: 0
BDEPTH: 111 116 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 3.3 kn
Sorted : 129 Total catch: 679.97 Catch/hour: 2039.91

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1151.61	12918	56.45	271
Dentex macrophthalmus	401.58	3075	19.69	272
Atractoscion aequidens	117.75	99	5.77	273
Dentex angolensis	77.28	261	3.79	
Dentex barnardi	73.00	207	3.58	
Squatina oculata	50.10	12	2.46	
Squalus megalops	45.00	66	2.21	
Pagellus bellottii	35.88	180	1.76	
Myliobatis aquila	26.55	12	1.30	
Plesionika acanthurus	18.35	42	0.90	
Trigla lyra	17.66	111	0.87	
Zeus faber	14.58	21	0.71	
Umbrina canariensis	8.28	27	0.41	
Raja miraletus	2.28	3	0.11	
Total	2039.91		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 111
DATE :26/06/2008 GEAR TYPE: BT NO: 0 POSITION:Lat S 15°27.60
start stop duration Lon E 12°0.40
TIME :08:48:42 09:00:36 12.0 (min) Purpose : 1
LOG : 6874.71 6875.36 0.7 Region : 4050
FDEPTH: 36 38 Gear cond.: 0
BDEPTH: 36 38 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.3 kn
Sorted : 9 Total catch: 40.68 Catch/hour: 203.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagellus bellottii	111.25	615	54.70	
Dentex barnardi	42.75	745	21.02	
Lithognathus mormyrus	34.75	445	17.08	
Squatina oculata	8.50	5	4.18	
Pseudupeneus prayensis	6.15	45	3.02	
Total	203.40		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 112
DATE :26/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 15°32.97
start stop duration Lon E 11°56.48
TIME :10:34:13 10:43:58 9.8 (min) Purpose : 1
LOG : 6886.19 6886.79 0.6 Region : 4050
FDEPTH: 88 87 Gear cond.: 0
BDEPTH: 88 87 Validity : 0
Towing dir: 0° Wire out : 240 m Speed : 3.7 kn
Sorted : 112 Total catch: 638.18 Catch/hour: 3927.26

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	3327.26	26258	84.72	274
Pagellus bellottii	197.48	1655	5.03	
Squatina oculata	101.54	31	2.59	
Dentex barnardi	83.75	517	2.13	
Dentex macrophthalmus	59.63	1071	1.52	275
Plectorhinchus mediterraneus	55.51	37	1.41	
Lithognathus mormyrus	37.23	135	0.95	
Atractoscion aequidens	25.23	31	0.64	
Dentex gibbosus	14.46	37	0.37	
Trigla lyra	13.42	135	0.34	
Spondyliosoma cantharus	7.26	37	0.18	
Loligo vulgaris	4.49	68	0.11	
Total	3927.26		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 113
DATE :26/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 15°37.07
start stop duration Lon E 11°49.17
TIME :14:28:27 14:46:47 18.3 (min) Purpose : 1
LOG : 6915.33 6916.14 0.8 Region : 4050
FDEPTH: 110 109 Gear cond.: 0
BDEPTH: 110 109 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 2.7 kn
Sorted : 145 Total catch: 144.54 Catch/hour: 472.87

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	168.81	1312	35.70	276
Dentex macrophthalmus	96.02	658	20.31	278
Trachurus capensis	84.73	478	17.92	277
Spicara alta	40.08	209	8.48	
Dentex barnardi	22.74	128	4.81	
Zeus faber	12.92	26	2.73	
Etrumeus whiteheadi	12.92	216	2.73	279
Dentex gibbosus	10.76	3	2.28	
Spondyliosoma cantharus	6.84	16	1.45	
Pagellus bellottii	6.15	46	1.30	
Dentex angolensis	3.76	16	0.80	
Anthias anthias	3.47	43	0.73	
Atractoscion aequidens	3.24	3	0.68	
Sardinops ocellatus	0.43	3	0.09	
Total	472.87		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 114
DATE :27/06/2008 GEAR TYPE: PT NO: 7 POSITION:Lat S 16°5.54
start stop duration Lon E 11°46.85
TIME :00:39:32 01:09:08 29.6 (min) Purpose : 1
LOG : 6999.57 7001.26 1.7 Region : 4050
FDEPTH: 13 13 Gear cond.: 0
BDEPTH: 29 29 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.4 kn
Sorted : 133 Total catch: 961.78 Catch/hour: 1949.55

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1870.05	30464	95.92	280
J E L L Y F I S H	75.97	618	3.90	
Atractoscion aequidens	2.94	14	0.15	
Loligo vulgaris	0.59	45	0.03	
Total	1949.55		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 115
DATE :27/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°44.60
start stop duration Lon E 11°46.90
TIME :11:31:07 12:00:29 29.4 (min) Purpose : 1
LOG : 7085.42 7087.10 1.7 Region : 4050
FDEPTH: 7 7 Gear cond.: 0
BDEPTH: 15 17 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
Sorted : 93 Total catch: 603.85 Catch/hour: 1232.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	929.57	108616	75.43	281
Etrumeus whiteheadi	201.43	5253	16.35	282
Pomatomus saltatrix	74.57	708	6.05	
Trichiurus lepturus	7.84	296	0.64	
Scomber japonicus	7.59	65	0.62	
Pomadasys jubelini	3.98	78	0.32	
Stromateus fiatola	3.47	6	0.28	
Sphyrna lewini	2.86	2	0.23	
Selene dorsalis	0.65	296	0.05	
Sardinella maderensis	0.39	12	0.03	
Total	1232.35		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 116
DATE :27/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°41.19
start stop duration Lon E 11°46.74
TIME :12:54:03 13:26:46 32.7 (min) Purpose : 1
LOG : 7089.39 7091.42 2.0 Region : 4050
FDEPTH: 7 7 Gear cond.: 0
BDEPTH: 14 18 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
Sorted : 0 Total catch: 0.74 Catch/hour: 1.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Etrumeus whiteheadi	0.83	28	60.81	
Engraulis capensis	0.35	482	25.68	
Trachurus trecae	0.18	2	13.51	
Total	1.36		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 117
DATE :27/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 16°17.08
start stop duration Lon E 11°34.65
TIME :17:01:11 17:21:04 19.9 (min) Purpose : 1
LOG : 7125.99 7126.95 1.0 Region : 4050
FDEPTH: 82 80 Gear cond.: 0
BDEPTH: 82 80 Validity : 0
Towing dir: 0° Wire out : 220 m Speed : 2.9 kn
Sorted : 190 Total catch: 1795.60 Catch/hour: 5416.59

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	4091.49	44546	75.54	283
Dentex macrophthalmus	751.43	8166	13.87	284
Sepia orbignyana	239.61	199	4.42	
Atractoscion aequidens	70.89	142	1.31	
Trigla lyra	51.04	624	0.94	
Zeus faber	46.21	115	0.85	
Raja miraletus	41.12	57	0.76	
Todarodes angolensis	39.13	793	0.72	
Mustelus mustelus	24.13	27	0.45	
Pagellus bellottii	17.86	57	0.33	
Citharus linguatula	13.03	226	0.24	
Scomber japonicus	12.76	27	0.24	
Scorpaena normani	11.07	27	0.20	
Illex coindetii	6.82	169	0.13	
Total	5416.59		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 118
DATE :27/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°34.41
start stop duration Lon E 11°46.03
TIME :23:24:55 23:56:02 31.1 (min) Purpose : 1
LOG : 7178.27 7180.17 1.9 Region : 4050
FDEPTH: 13 13 Gear cond.: 0
BDEPTH: 19 20 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
Sorted : 86 Total catch: 128.34 Catch/hour: 247.52

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis capensis	158.53	52635	64.05	285
Trachurus trecae	44.40	3753	17.94	286
Myliobatis aquila	21.12	39	8.53	
Sepia orbignyana	9.18	27	3.71	
Sardinella aurita	4.22	405	1.71	287
J E L L Y F I S H	3.88	4	1.57	
Loligo vulgaris	2.93	150	1.18	
Mustelus mustelus	2.31	4	0.94	
Pagellus bellottii	0.35	33	0.14	
Dentex macrophthalmus	0.27	17	0.11	
Lagocephalus laevigatus	0.15	10	0.06	
Atractoscion aequidens	0.12	4	0.05	
Boops boops	0.06	6	0.02	
Total	247.52		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 119
DATE :28/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 16°36.59
start stop duration Lon E 11°30.51
TIME :14:55:05 15:10:16 15.2 (min) Purpose : 1
LOG : 7277.37 7278.19 0.8 Region : 4050
FDEPTH: 108 111 Gear cond.: 0
BDEPTH: 108 111 Validity : 0
Towing dir: 0° Wire out : 280 m Speed : 3.2 kn
Sorted : 155 Total catch: 1401.37 Catch/hour: 5539.01

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius capensis	2198.42	26822	39.69	289
Trachurus trecae	2105.93	25648	38.02	288
Dentex macrophthalmus	750.59	13126	13.55	290
Pterothrissus belloci	265.02	3379	4.78	
Zeus faber	68.30	213	1.23	
Trichiurus lepturus	44.82	640	0.81	
Loligo vulgaris	30.24	320	0.55	
Etrumeus whiteheadi	21.34	356	0.39	291
Chelidonichthys capensis	20.28	36	0.37	
Spondyliosoma cantharus	13.87	36	0.25	
Sepia orbignyana	13.79	16	0.25	
Umbrina canariensis	4.27	71	0.08	
Citharus linguatula	2.13	71	0.04	
Total	5539.01		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 120
DATE :29/06/2008 GEAR TYPE: BT NO: 6 POSITION:Lat S 17°6.60
start stop duration Lon E 11°22.45
TIME :13:57:21 14:18:14 20.9 (min) Purpose : 1
LOG : 7488.61 7489.73 1.1 Region : 4050
FDEPTH: 163 165 Gear cond.: 0
BDEPTH: 163 165 Validity : 0
Towing dir: 0° Wire out : 400 m Speed : 3.2 kn
Sorted : 181 Total catch: 1395.10 Catch/hour: 4010.83

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius capensis	2728.40	31279	68.03	294
Dentex macrophthalmus	522.43	3763	13.03	295
Trachurus trecae	388.52	5247	9.69	292
Trachurus capensis	260.12	4560	6.49	293
Pterothrissus belloci	44.50	555	1.11	
Zeus faber	25.47	112	0.64	
Chelidonichthys capensis	10.18	23	0.25	
Scorpaena normani	7.30	264	0.18	
Atractoscion aequidens	6.18	6	0.15	
Brotula barbata	5.55	23	0.14	
Trigla lyra	4.66	66	0.12	
Chlorophthalmus atlanticus	2.64	377	0.07	
Dicologoglossa cuneata	2.44	89	0.06	
Zenopsis conchifer	1.32	23	0.03	
Bembrops heterurus	0.66	23	0.02	
Syacium micrurum	0.43	23	0.01	
Total	4010.83		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2008404 STATION: 121
DATE :30/06/2008 GEAR TYPE: PT NO: 4 POSITION:Lat S 17°11.45
start stop duration Lon E 11°43.99
TIME :04:07:24 04:32:53 25.5 (min) Purpose : 1
LOG : 7566.72 7568.27 1.6 Region : 4050
FDEPTH: 13 13 Gear cond.: 0
BDEPTH: 24 28 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.6 kn
Sorted : 174 Total catch: 1393.60 Catch/hour: 3281.63

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinops ocellatus	2328.41	27278	70.95	298
Trachurus trecae	927.79	25639	28.27	297
Engraulis encrasicolus	19.22	885	0.59	299
Trichiurus lepturus	3.39	75	0.10	
Pomatomus saltatrix	2.83	19	0.09	
Total	3281.63		100.00	