

2007 SURVEYS OF THE FISH RESOURCES OF ANGOLA NO. 2

SURVEY OF THE PELAGIC RESOURCES

Cruise report No 6/2007

7 July – 10 August 2007

Institute of Marine Research – IMR
Bergen
Norway

Instituto Nacional de Investigação Pesqueira – INIP
Luanda
Angola

Bergen June 2008



THE EAF-NANSEN PROJECT

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

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

LE PROJET EAF-NANSEN

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

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

**NORAD - FAO PROJECT GCP/INT/003/NOR
BCLME**

**CRUISE REPORTS "DR. FRIDTJOF NANSEN"
EAF - N2007/6**

SURVEYS OF THE FISH RESOURCES OF ANGOLA

Cruise Report No 2/2007

**Survey of the pelagic resources
7 July – 10 August 2007**

by

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Bergen June 2008

The Programme has previously conducted the following demersal surveys in the area:

Area			Period
January 1985	-	June 1986	(6 surveys)
January 1989	-	December 1989	(3 surveys)
May 1991	-	September 1992	(3 surveys)
January 1994	-	August 2007	(17 surveys)

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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 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.
- To measure target strength (TS) of Angolan pelagic species.

1.2 Participation

The scientific staff consisted of:

From INIP, Luanda:

Nkosi LUYEYE (Team leader, 7/7 – 15/7), Paulo CELSO (7/7 – 15/7), João GOUVEIA EUSÉBIO DÍAS DOS SANTOS (7/7 – 15/7), Paula FARIA (7/7 – 15/7), Iris VILLAR (7/7 – 15/7), and Domingos PEDRO (7/7 – 15/7), Filomena VAZ-VELHO (Team leader, 17/7 – 10/8), António BARRADAS (17/7 – 10/8), Henriette LUTUBA NSILULU (17/7 – 10/8) and Pedro Panzo (17/7 – 10/8) .

From CIP, Benguela:

Antonio BUCO (7/7 – 15/7) and Enoque CANGANJO (7/7 – 10/8).

From CIP, Namibe:

Quilanda FIDEI (17/7- 10/8)

Eridson SAQUENIA (17/7- 10/8)

From , R.D. Congo:

Matthieu MONGOLU (7/7 – 10/7).

From NatMIRC, Namibia:

Martha UUMATI (17/7 – 10/8).

From IMR, Bergen:

Jens-Otto KRAKSTAD (Cruise leader, 7/7 - 15/7), Thor Egil JOHANSSON (7/7 – 10/8), Ole Sverre FOSSHEIM (7/7 – 10/8), Frank SPETLAND (7/7 – 15/7) Bjoern Erik AXELSEN (Cruise leader, (17/7 – 10/8), Magne OLSEN (17/7 – 10/8) and Hilikka NDJAULA (17/7 – 10/8)

1.3 Narrative

The vessel departed Pointe Noire 7th July at 13:30 UTC and steamed north to the border between Gabon and Congo where the survey started at 18:22 UTC the same day. The survey area was divided into four regions:

- (a) Congo - Cabinda (4°–5°S);
- (b) Congo River - North of Pta. das Palmerinhas (6°–9°S): ANGOLA NORTH;
- (c) the region between 9°S and 13°S: ANGOLA CENTRAL;
- (d) the region limited by the parallel of 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.

A systematic survey track implemented in 2002 with equally spaced transect lines perpendicular to the coast was followed for the duration of the survey in the above-mentioned region. In the Cabinda region, irregular transect distance was necessary due to density of oil platforms in the area. The rest of the surveyed area in Angola was covered with 7 nautical miles (NM) spaced transects perpendicular to the coast.

The acoustic transects generally covered a depth range of 20 - 500 m. At certain areas in the central region surveying was stopped at about 50 m depth due to extreme steepness of the shelf. The shallowest part of the shelf between N'zeto and the Congo River was partly inaccessible for trawling due to oil platforms and well therefore this region was only partly covered. On 14th July at 08:00 UTC the vessel docked in Luanda for crew and scientists change and departed on 17th July at 17:30 UTC. The vessel steamed to Ambriz to complete the cover of the northern region. Due to sickness of some crew members, the vessel called on Luanda for about 6 hours, the 23rd of July. The coverage of the Central region was completed on the 1st of August at 02:31 UTC. The vessel reached the Cunene River (17°15'S), end of the southern region, on 10th August at 05:00 UTC thus completed the Angolan survey.

Calibration of the Simrad ER 60 Scientific echosounder (18, 38, 120, 200 kHz transducers) was done in Baía dos Elefantes on 1st August.

In the southern region, due to bad weather conditions the transducer keel was lowered and at times the vessel anchored waiting for calmer weather to reduce losses of acoustic signals. However, during the anchor period target strength measurements were recorded which formed part of the target strength measurements done on 18th, 28th July and 16th of August.

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 200m. Samples of phytoplankton were collected on selected CTD stations during daytime. Zooplankton samples were obtained using *Hydrobios Multinet* plankton sampler near selected CTD locations.

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)
Cabinda - Congo	0	3	3	23	1	465.0
Pta. Palmerinhas - Congo River	5	12	17	82	17	1858.4
Benguela - Pta. Palmerinhas	15	30	45	85	24	896.0
Cunene River - Benguela	13	15	28	73	1	1052.3
Total	33	60	93	263	43	4271.7

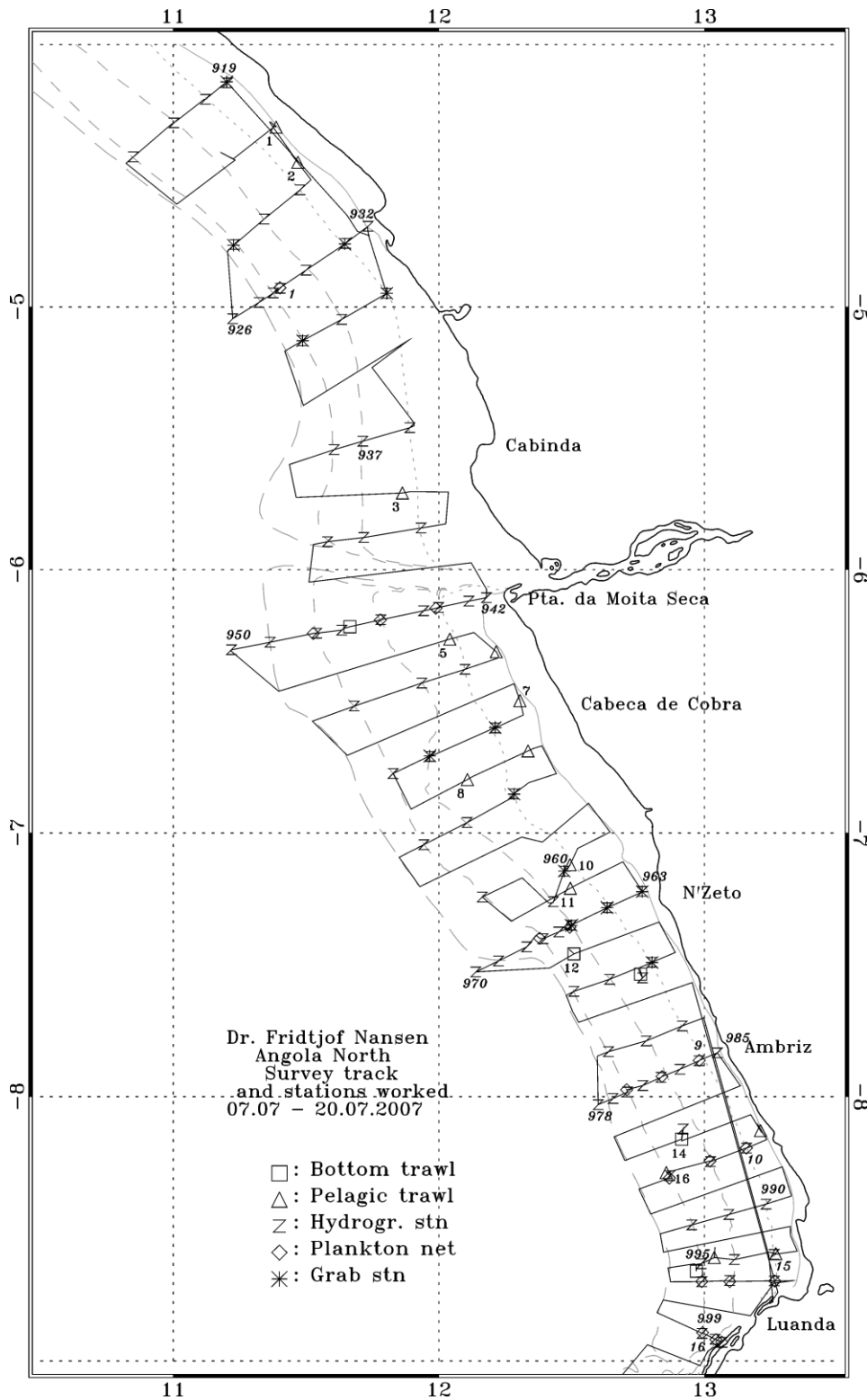


Figure 1a. Course track with fishing, plankton and hydrographic stations, Pta. das Palmerinhas- Congo River, including Cabinda. Depth contours at 20, 50, 100, 200, and 500m.

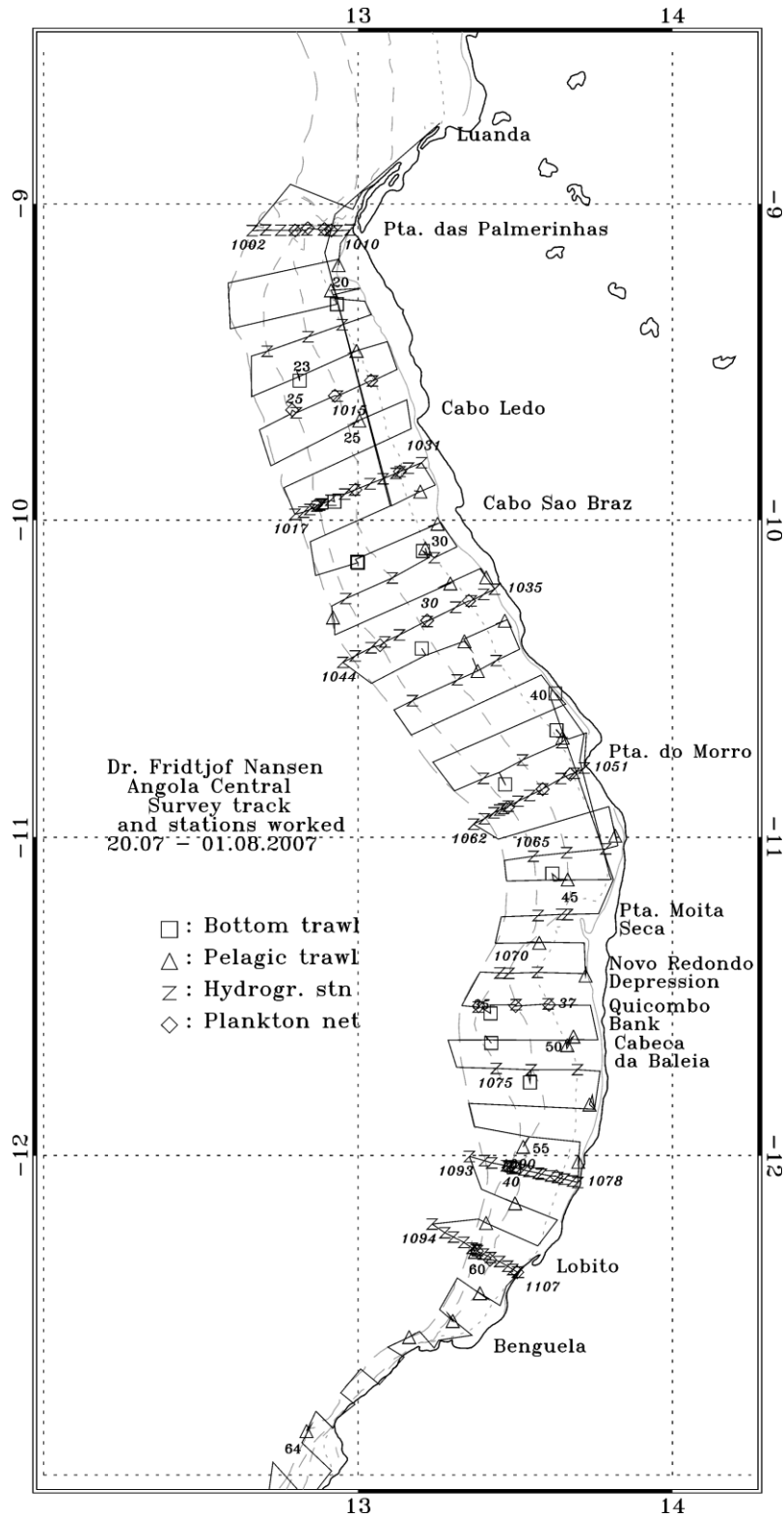


Figure 1b. Course track with fishing, plankton and hydrographic stations, Benguela -Pta. das Palmerinhas. Depth contours at 20, 50, 100, 200, and 500m.

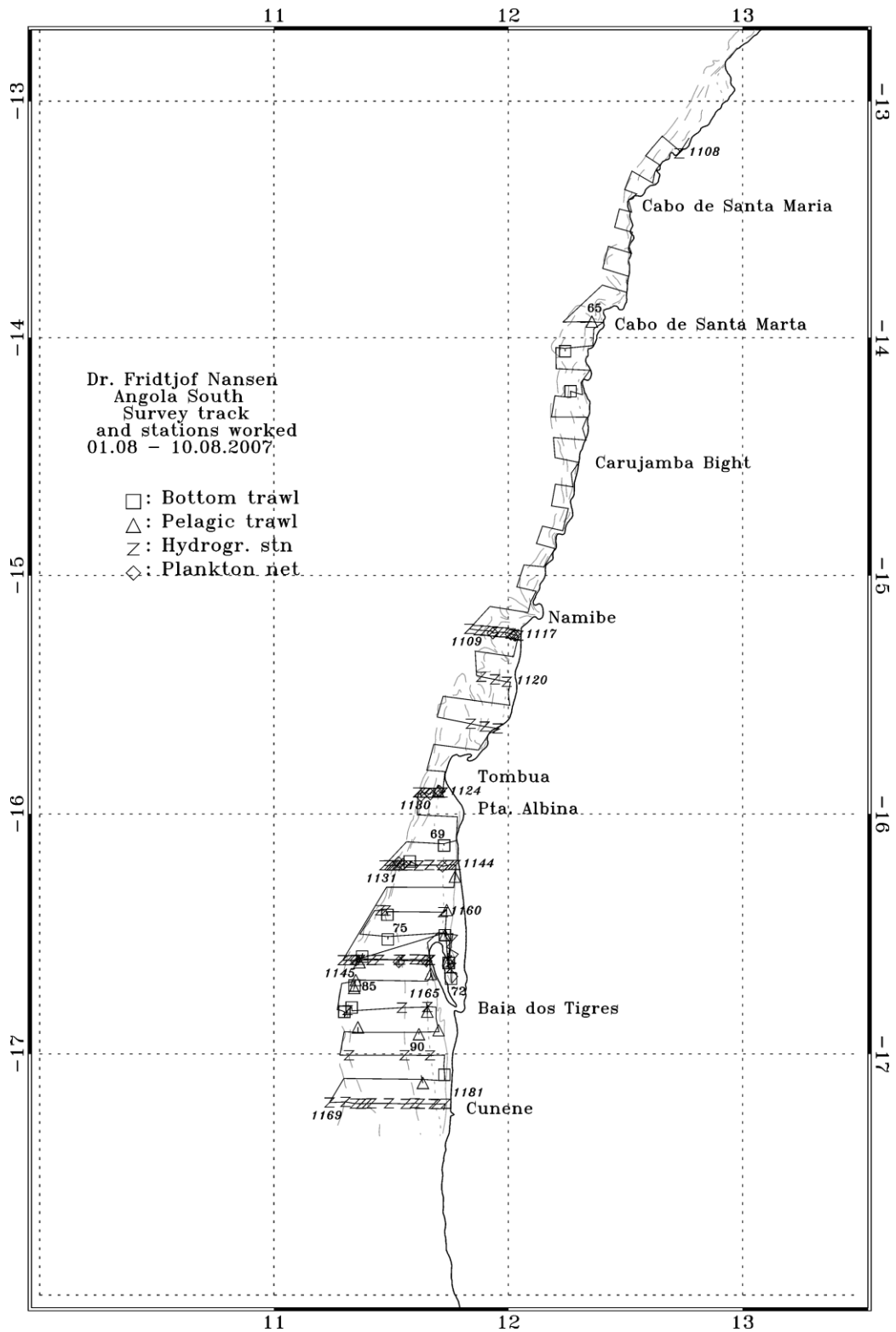


Figure 1c. Course track with fishing, plankton and hydrographic stations, Cunene-Benguela. Depth contours at 10, 20, 50, 100, 200 and 500m.

CHAPTER 2 METHODS

2.1 Hydrographic sampling

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 20 NM distance, and *ad hoc* as deemed necessary. The casts were stopped a few meters above the bottom, and at a maximum of 500 m depth.

Measurements were carried out on CTD stations and selected transects only, using the hull-borne Acoustic Doppler Profiler (ADCP). The ADCP was set to ping every 8 seconds, the depth bins were set to 8 m and the number of bins was 40. Data were averaged at 300 seconds intervals and stored on an IBM compatible PC using Transect v. 2.70 software.

Meteorological data logged from the Aanderaa meteorological station included wind direction and speed, air temperature, incident solar intensity and sea surface temperature (SST). All data were averaged by unit distance sailed (1 NM).

Continuous data on sea surface salinity (SSS) were recorded using a thermosalinograph SBE 21 Seacat.

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. 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 five-point classification scale first proposed by Holden and Raitt (1974) (Table 2).

Table 2. 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 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. <i>Ovary and testis quite narrow and have a tubular shape.</i>
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. <i>Ovary more opaque; small specks make gonad appear more granular. Testes develop lobules, hence losing the tubular shape. Some recovering spent ovaries have conspicuous blood vessels.</i>
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. <i>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.</i>
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. <i>Ovaries jelly-like due to the presence of translucent oocytes. Gonads extrude oocytes or milt when gently pressed.</i>
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. <i>Testes may have sperm remaining in the seminal duct. Pinkish areas appear in the periphery of the testes. Ovaries bloodshot and slack.</i>

Stomach samples of horse mackerel 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 for *ad-hoc* examination.

2.3 Plankton sampling

Zooplankton

The zooplankton sampling was conducted by means of HYDROBIOS Multinet, at three depths, 50, 100 and 200 m, at predetermined positions along the survey track. The nets (405 µm) were fitted with a flowmeter to estimate sample volume. 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 1th of August.

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 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	<i>Sardinella</i> sp.	<i>S. aurita</i> <i>S. maderensis</i>
Horse mackerel	<i>Trachurus</i> sp.	<i>T. trecae</i> <i>T. trachurus capensis</i>
Pilchard	Sardinops	<i>S. ocellatus</i>
Big-eye grunt		<i>Brachydeuterus auritus</i>
Pelagic species 1	Clupeiformes ₁	<i>Ilisha Africana</i> <i>Etrumeus whiteheadi</i> <i>Engraulis encrasicolus</i>
Pelagic species 2	Carangidae ₂	<i>Selene dorsalis</i> <i>Chloroscombrus chrysurus</i> <i>Decapterus rhonchus</i> <i>Seriola carpenteri</i>
	Scombridae	<i>Auxis thazard</i> <i>Sarda sarda</i> <i>Scomber japonicus</i>
	Sphyraenidae	<i>Sphyraena guachancho</i>
	Others	<i>Trichiurus lepturus</i> <i>Lepidopus caudatus</i>
Other demersal species	Sparidae ₃	<i>Dentex angolensis</i> <i>D. macrophthalmus</i> <i>D. congoensis</i> <i>D. canariensis</i> <i>D. barnardi</i> <i>Pagellus bellottii</i> <i>Sparus caeruleostictus</i> <i>S. pagrus africanus</i>
	Other taxii	<i>Saurida brasiliensis</i> <i>Arioma bondi</i> <i>Pomadasys incisus</i> <i>Galeoides decadactylus</i>
Mesopelagic species	Myctophidae ₃	<i>Diaphus dumerili</i>
	Other mesopelagic fish	<i>Trachinocephalus myops</i>
Plankton	Calanoidae	<i>Calanus</i> sp.
	Euphausiidae	<i>Meganyctiphanes</i> 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:

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

where:

- ρ_i = estimated number of fish in length group i
- $\langle s_A \rangle$ = 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 .

3.1 Surface distribution

Northern Cabinda and the northern region

The wind observed in this region 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 (Figure 4a) due to the outflows of the Congo River moving northwards. Between Pta da Moita Seca and Cabeça de Cobra it is observed a salinity front with isolines in front line ranging from 33 to 35.5. 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.

Central Region

In this region the wind was very variable both in strength and direction (Figure 2b). The strongest winds (around 20 knots) were registered south Benguela, between Lobito and Quicombo, near the coast of Pta do Morro and sporadically between north Pta do Morro and Pta das Palmerinhas. The predominant wind direction with the strong wind (> 10m/s) was southwest.

The surface water temperature registered higher values (+1°C) near shore than in the northern region, varying between 22°and 23°C offshore (with isotherm of 21°C in the area of Lobito) (Figure 3b). The lower values of salinity of 35.2- 35.4 found in vicinity of Pta. das Palmerinhas are due to outflows of Cuanza River (Figure 3e) The isoline of the 35.8 is oriented alongshore and pockets of salinity with a value of 35.6 are observed both around Lobito and Pta. do Morro (Figure 4b).

Southern Region

The wind in this region was stronger and with less variation regarding its direction (Figure 2c), and the dominant direction was from the south. Around Carujamba and Namibe the wind came from the south and speeds were at minimum. Three focus of strong wind were encountered: around and north Cabo de Sta. Marta with winds blowing SE, south Namibe and Tômbwa with south-westerly wind and around Baía dos Tigres and Cunene River's mouth where the wind had a more SE direction. In this later location the winds were very strong,

forcing the ship to suspend the Multinet work. The speeds registered in this area reached more than 40 knots.

The horizontal temperature (Figure 3c) registered lower values than in both previous regions, with values as low as 15° to 17°C between Baía dos Tigres and Cunene. As in the central region, the isohaline of 35.8 (Figure 4c) is orientated alongshore deflecting off Baía dos Tigres (35.6). The lowest salinity value (35.4) was found between Baía dos Tigres and Cunene River due to outflows of Cunene River.

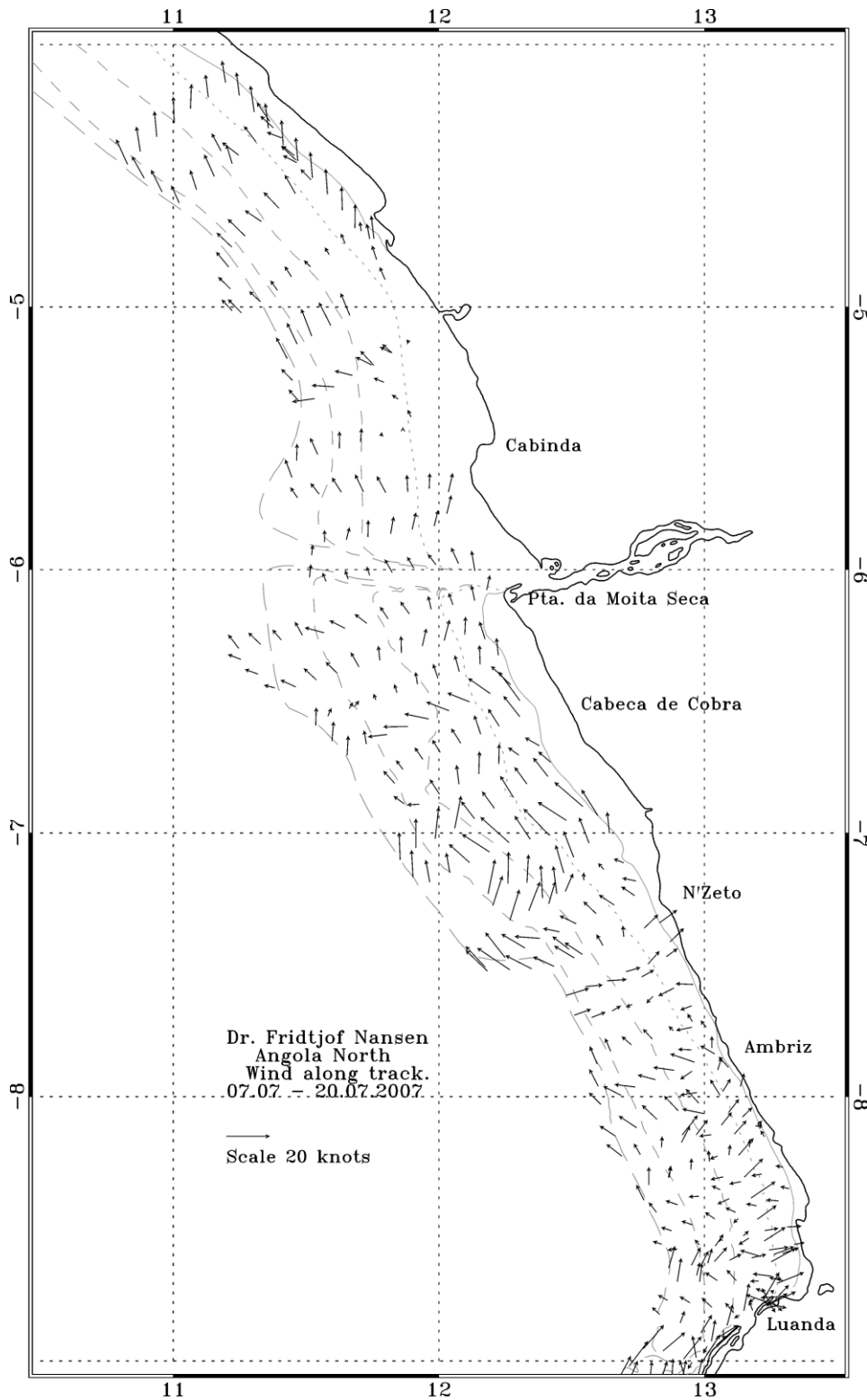


Figure 2a. Distribution of wind velocities along the survey track for the northern region, including Cabinda. Depth contours at 20, 50, 100, 200, and 500 m.

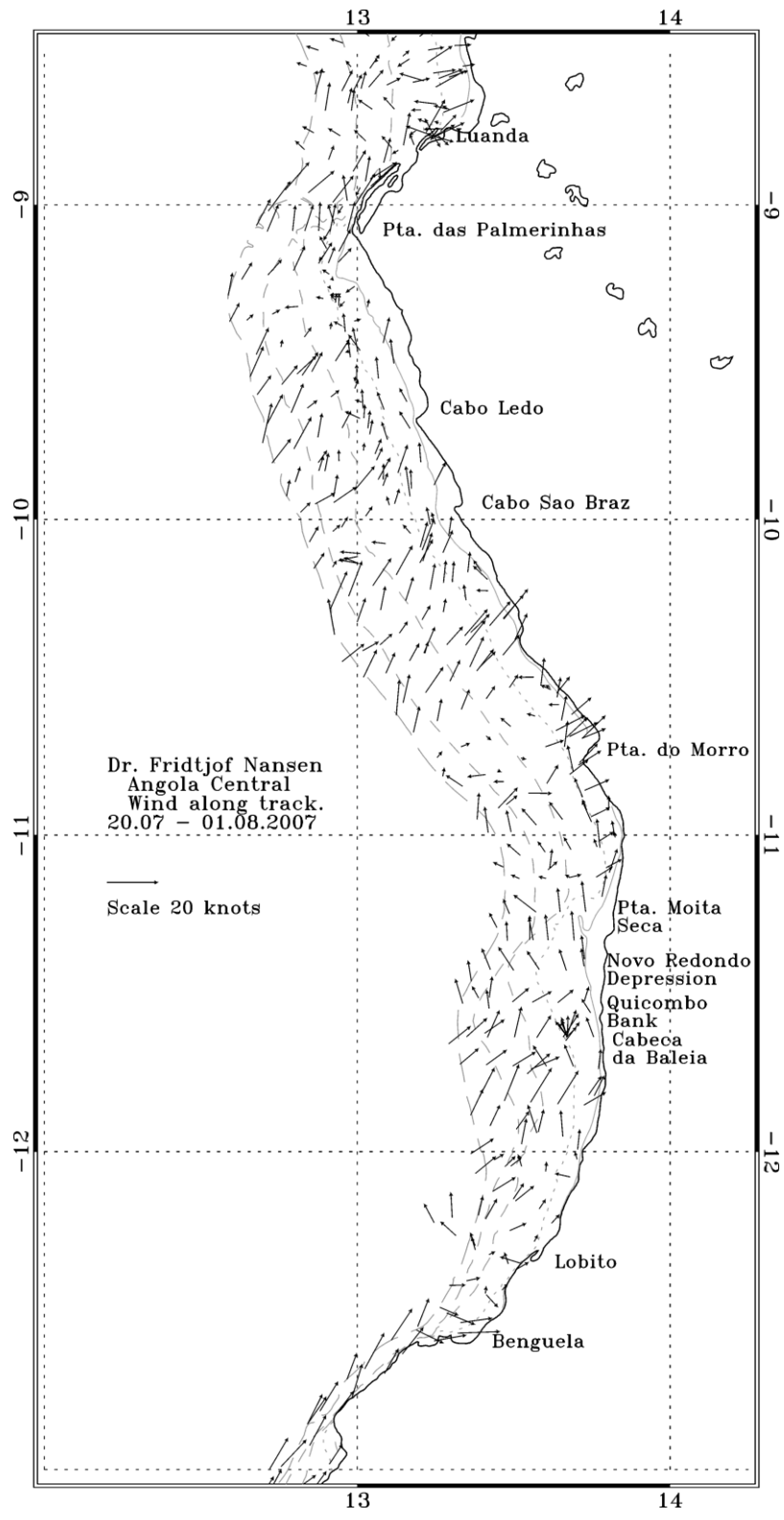


Figure 2b. Distribution of wind velocities along the survey track for the central region. Depth contours at 20, 50, 100, 200, and 500 m.

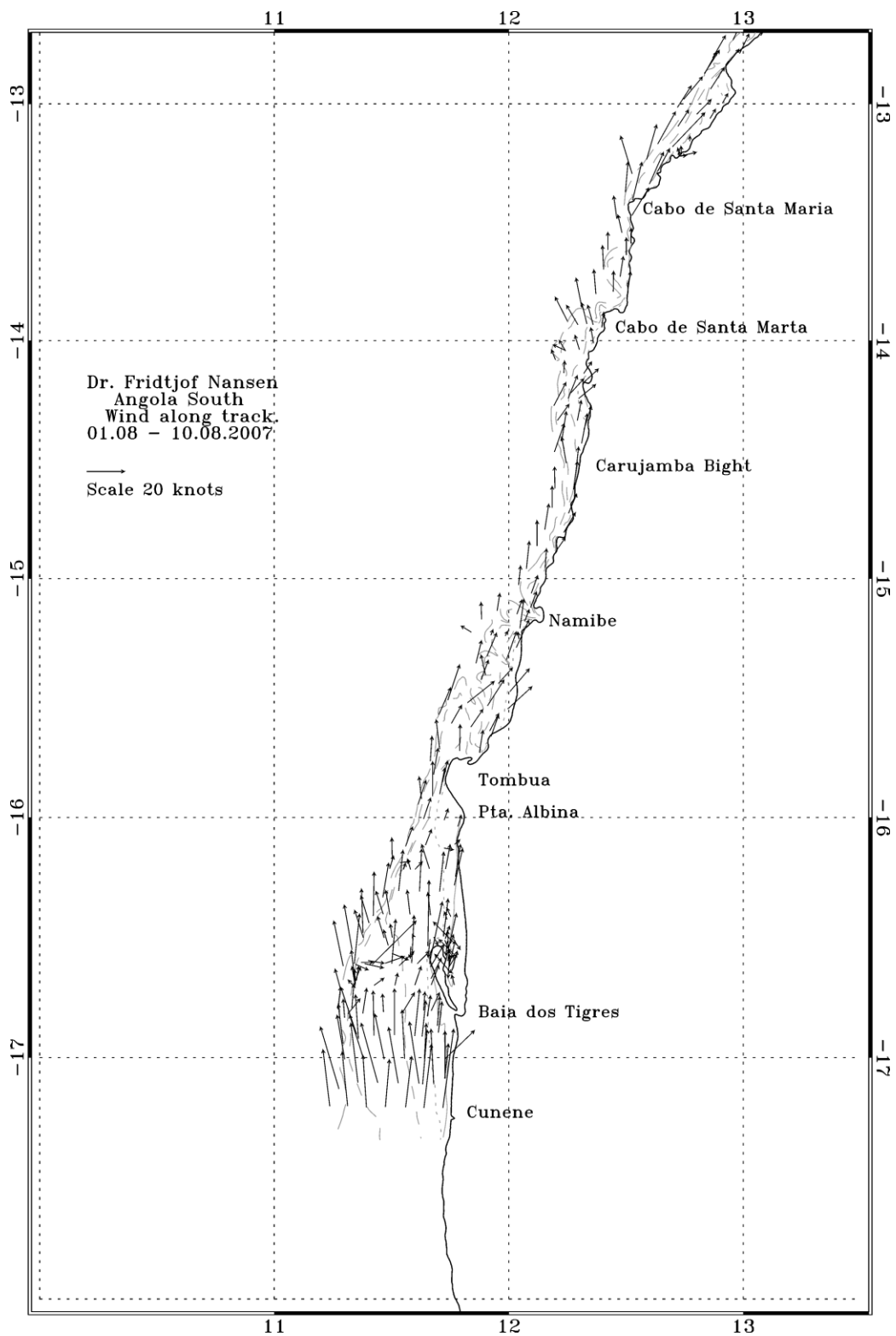


Figure 2c. Distribution of wind velocities along the survey track for the southern region. Depth contours at 10, 20, 50, 100, 200 and 500 m.

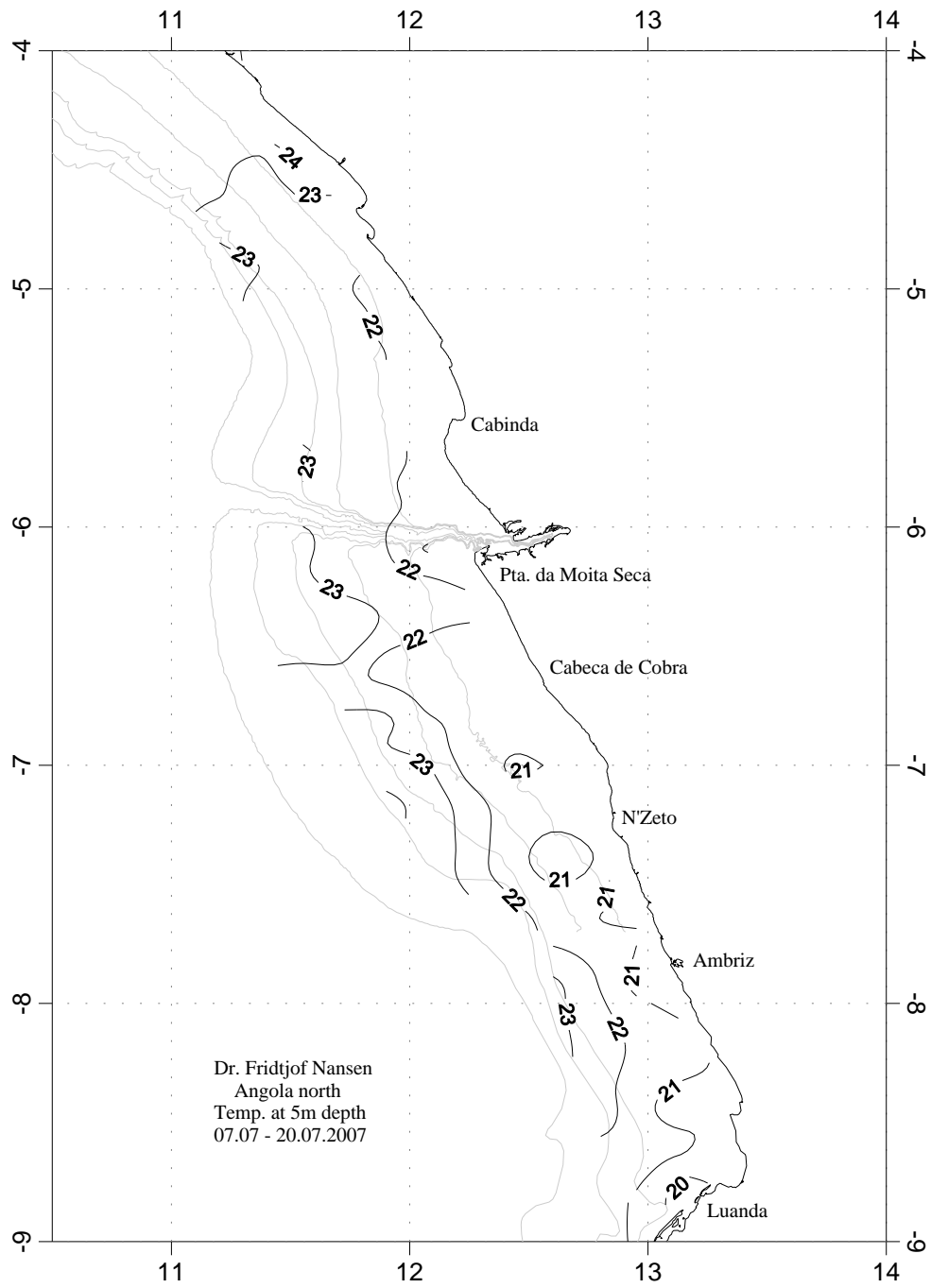


Figure 3a. Distribution of water temperatures at 5m depth in the northern region, including Cabinda. Depth contours at 20, 50, 100, 200, and 500 m.

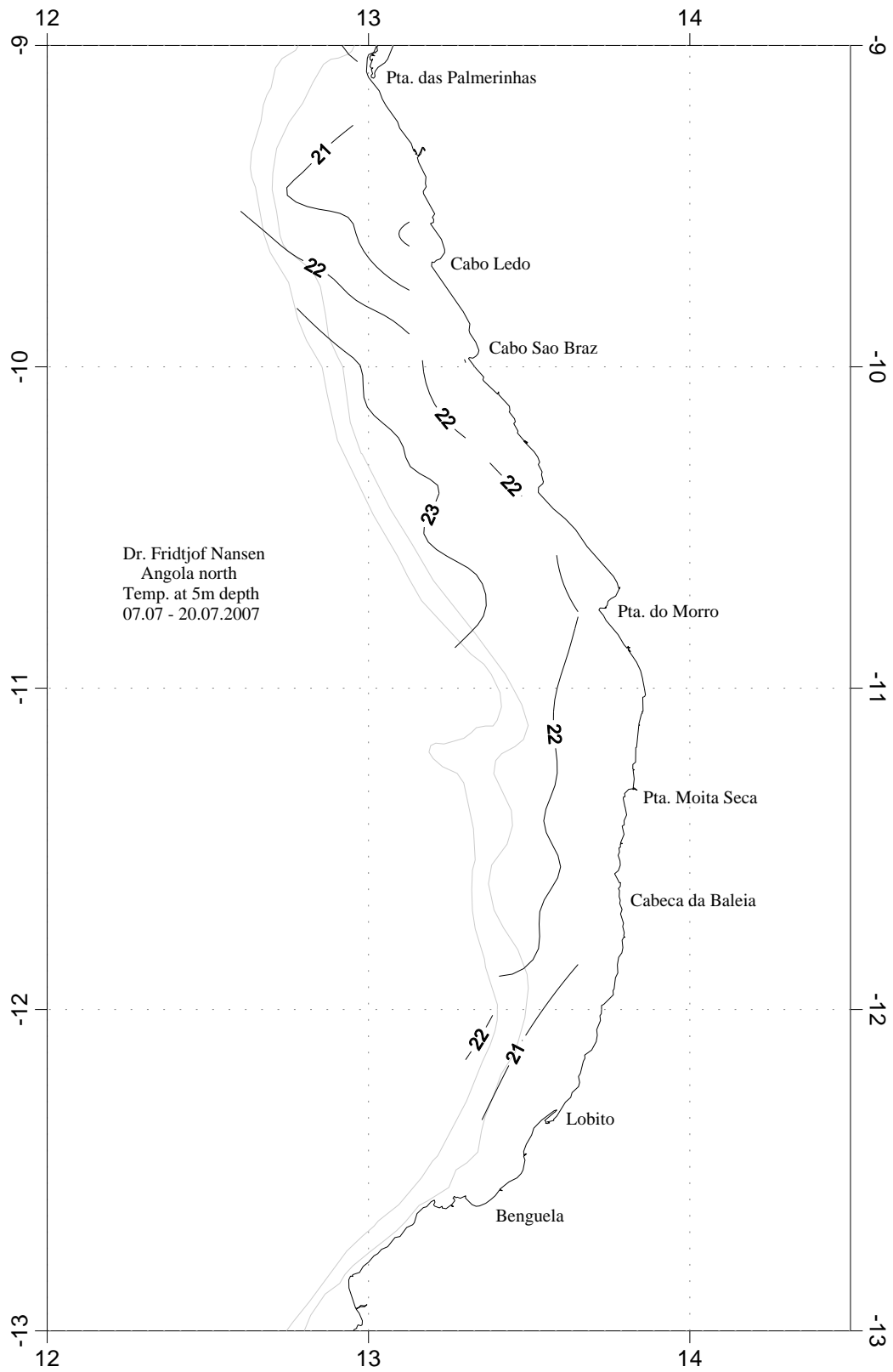


Figure 3b. Distribution of water temperatures at 5m depth in the central region. Depth contours at 20, 50, 100, 200, and 500 m.

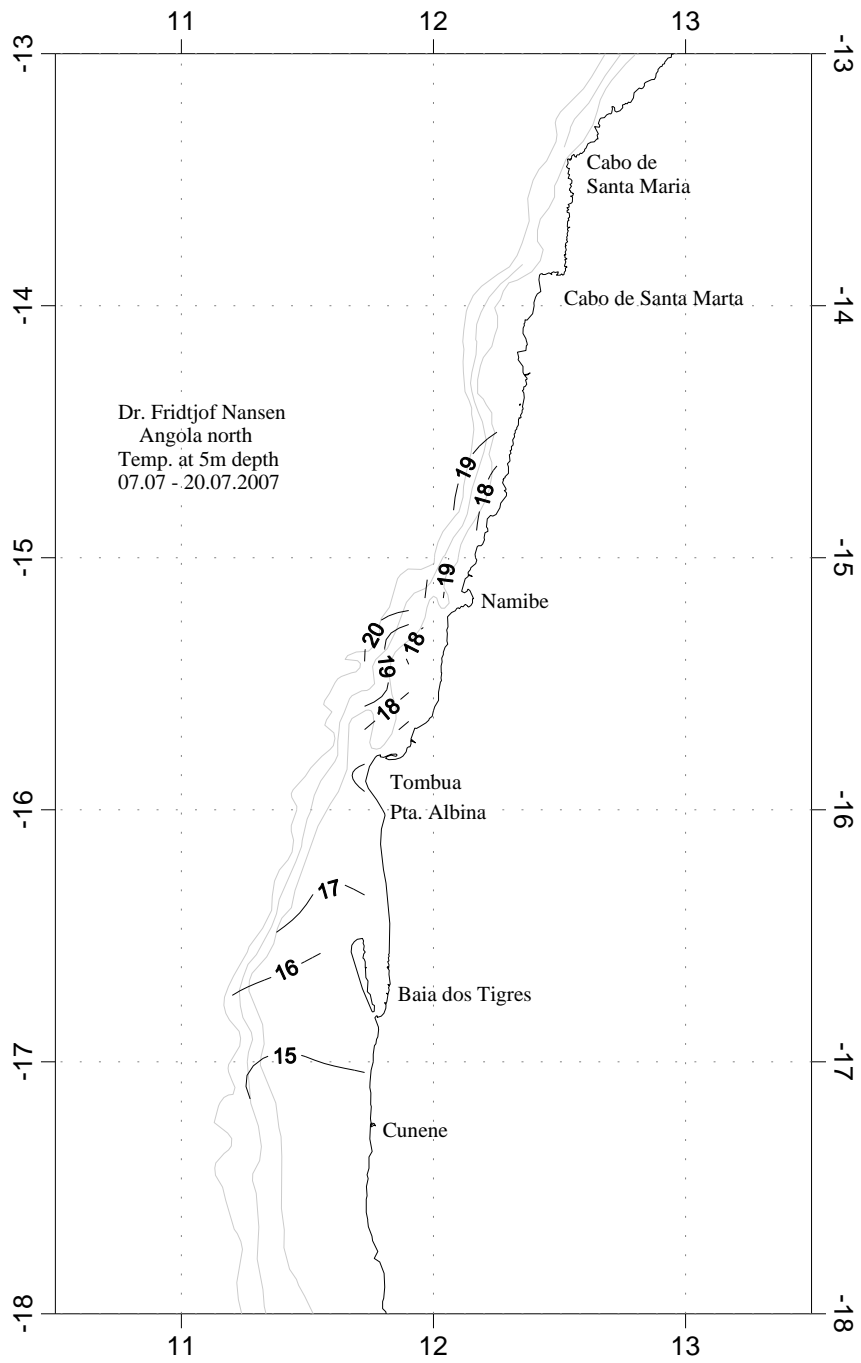


Figure 3c. Distribution of water temperatures at 5m depth in the southern region. Depth contours at 20, 50, 100, 200, and 500 m.

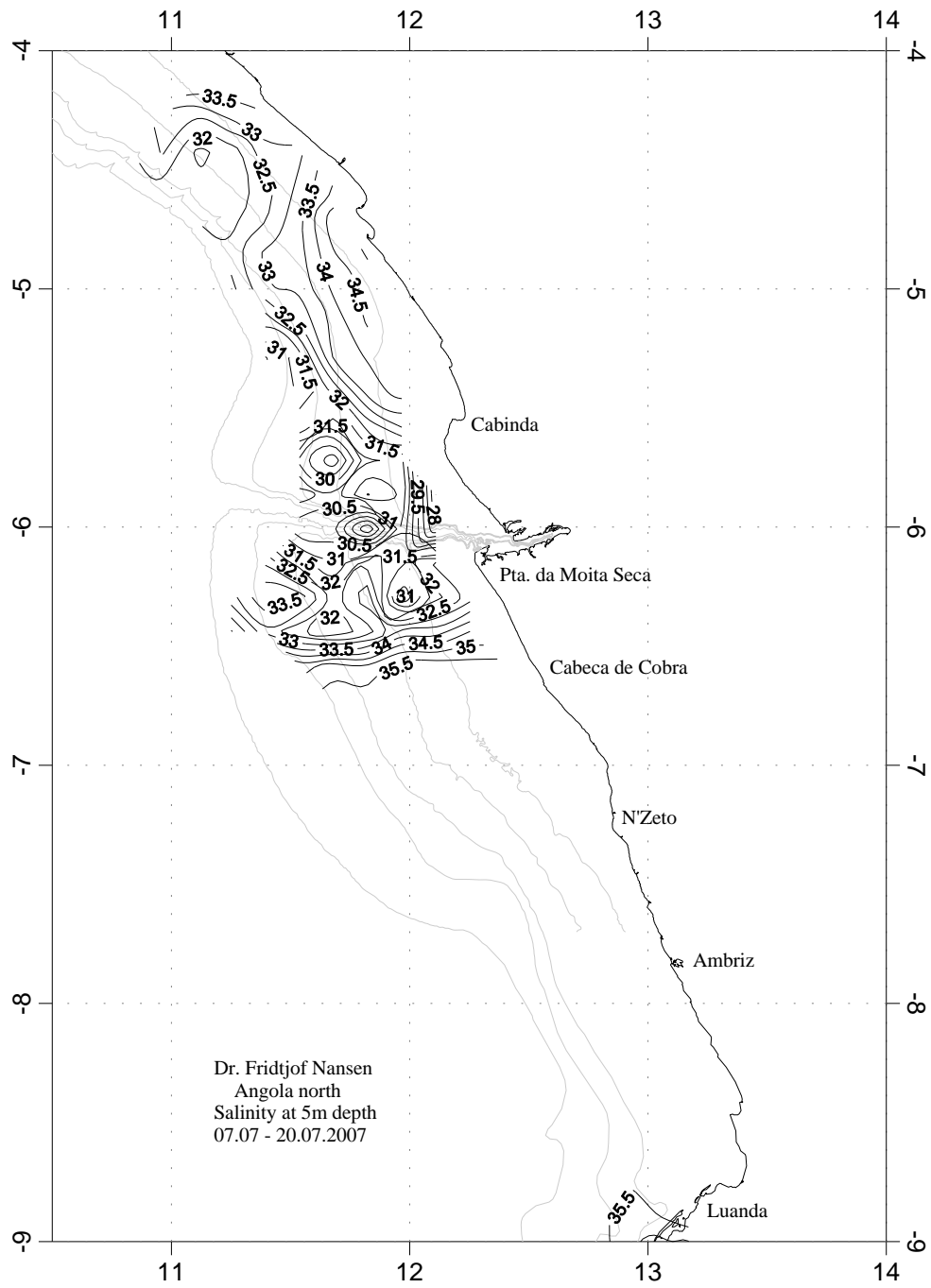


Figure 4a. Distribution of salinity at 5m depth in the northern region. Depth contours at 20, 50, 100, 200, and 500 m.

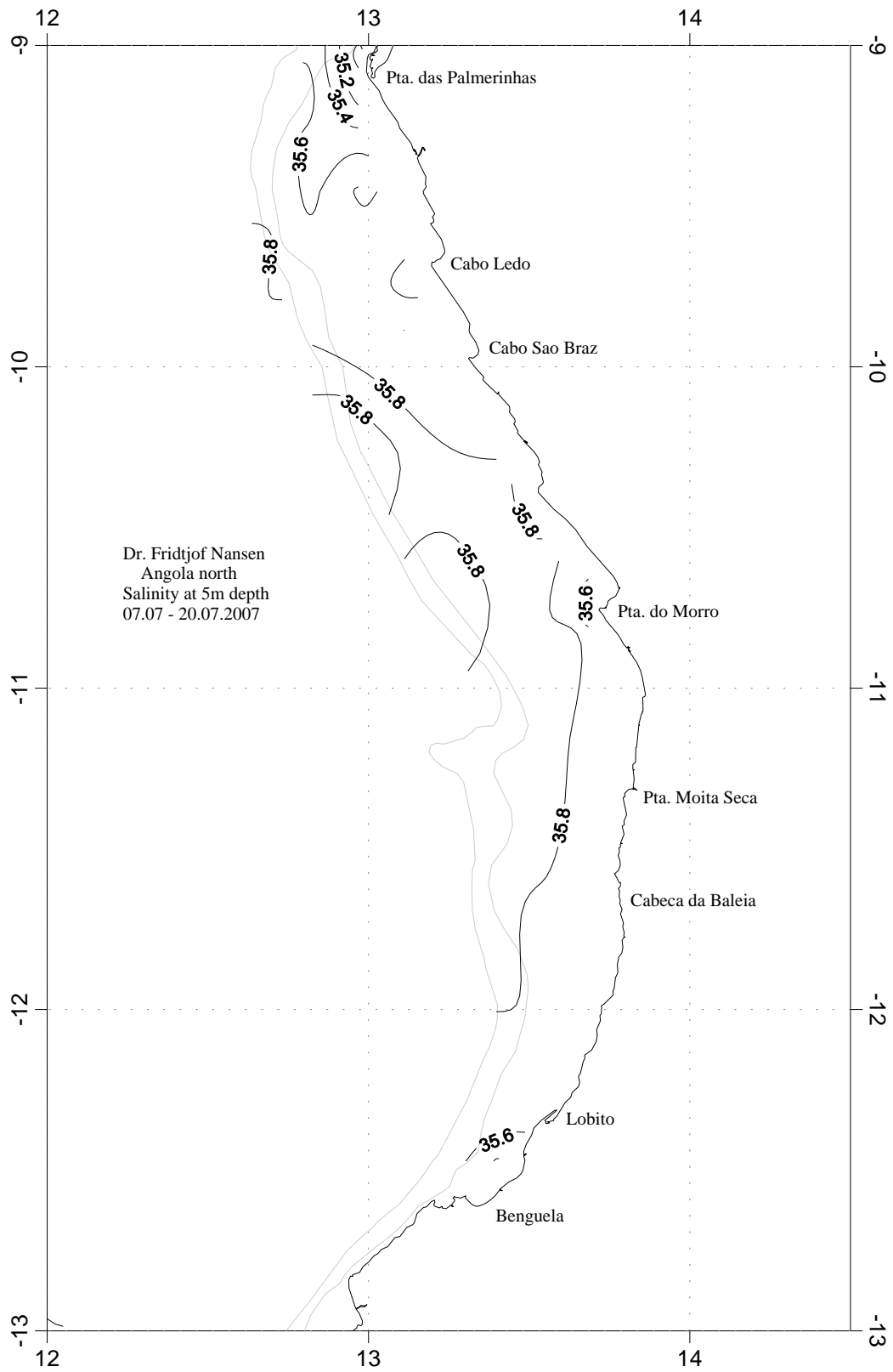


Figure 4b. Distribution of salinity at 5m depth in the central region. Depth contours at 20, 50, 100, 200, and 500m.

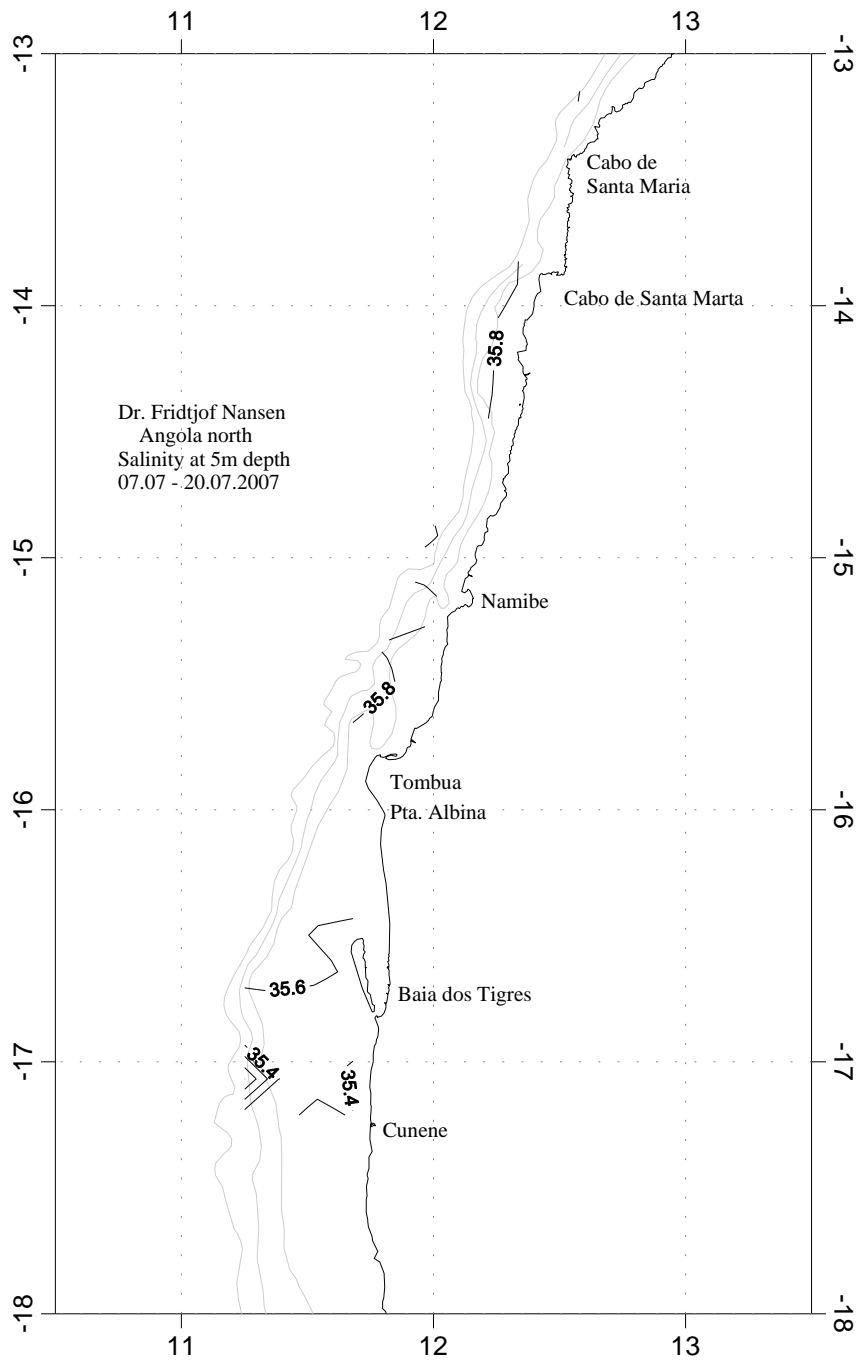


Figure 4c. Distribution of salinity at 5m depth in the southern region. Depth contours at 20, 50, 100, 200, and 500 m.

3.2 Standard sections

Section off **Pointe Noire** (Figure 5a). This section is located at the border between Congo and Angola. During the winter season the sea surface temperature is slightly high ranging from 20 to 22°C and decreases with depth. The salinity at the surface layer is about 34.2 and the oxygen content is high at the surface (4.5ml/l), while low oxygen waters (1ml/l) appear below 300 m depth.

Section off **Moita Seca** (Figure 5b). This section is located off the Congo River's mouth. Although the river discharge is reduced during these 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 5c) and **Ambriz**, (Figure 5d) the distribution of the oceanographic parameters is very similar in both sections, and indicates a weak upwelling.

Section off **Pta. of Palmerinhas** (Figure 5e). At stations 1006-1010 the salinity distribution shows lower values (35.3-35.5) at the surface than the previous sections. This may be due to the outflow of the Kwanza River. The sea surface temperature is slightly high (20-21°C) and oxygen content (5ml/l) as in the previous section. From this section southward the oxygen distribution reveals an offshore minimum at about 200-400 m.

Section off **Cabo Ledo** (Figure 5f) is located south off Kwanza River's mouth. Note the appearance of high salinity (35.8) and temperature (23-22°C). The elevation of the isolines indicates an ongoing upwelling process.

Section off **Cabo São Braz** (Figure 5g). The distribution of oceanographic parameters is very similar to the previous section. There is sign of a weak upwelling in this area.

Section off **Pta. do Morro** (Figure 5h) reveals a pattern similar to that observed off Pta. Palmeirinhas: a 100 m surface layer of constant temperatures raging from 16 to 22°C and salinity increasing offshore from 35.6 to 35.8 separated from the underlying oxygen-poor layers by a shallow pycnocline.

The Figures 5i and 5j show the vertical distributions of temperature, salinity and oxygen worked out off **Ponta do Egito** and **Lobito**. Oceanographic conditions in these two sections are very similar, with surface temperatures of 19-21°C, salinities of about 35.7-35.8 and levels of oxygen of 4-5 ml/l at the surface. There were weak signs of upwelling.

Section off **Namibe** (Figure 5k). The surface temperature shows lower values (19-20°C) than the previous sections, and gets cooler towards the coast. The layer of low oxygen (1ml/l) was found offshore around 200 m. The highest surface salinity (35.9) was found in this section.

Sections off **Pta. Albina** (Figure 5l), **Baía dos Tigres** (Figure 5m) and off **Cunene River** (Figure 5n) are located in the southern region from where we have observed lower surface temperatures than elsewhere, with values down to 14°C in the Cunene section. The influence

of Cunene River is shown in the surface salinity values (35.4). Low oxygen values appeared already below the 100-150 m off Pta Albina, Baía dos Tigres and Cunene.

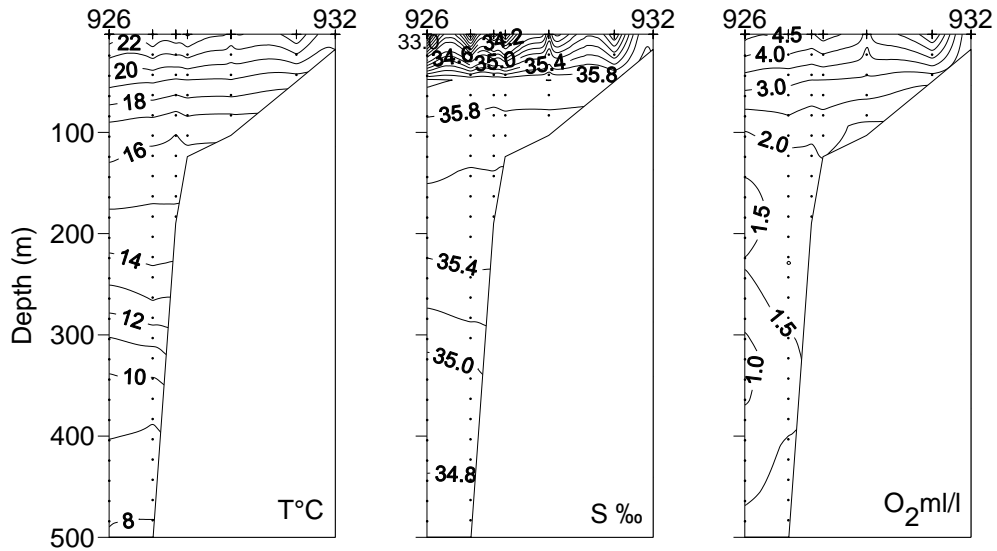


Figure 5a. Vertical sections of temperature, salinity and oxygen off Pointe Noire

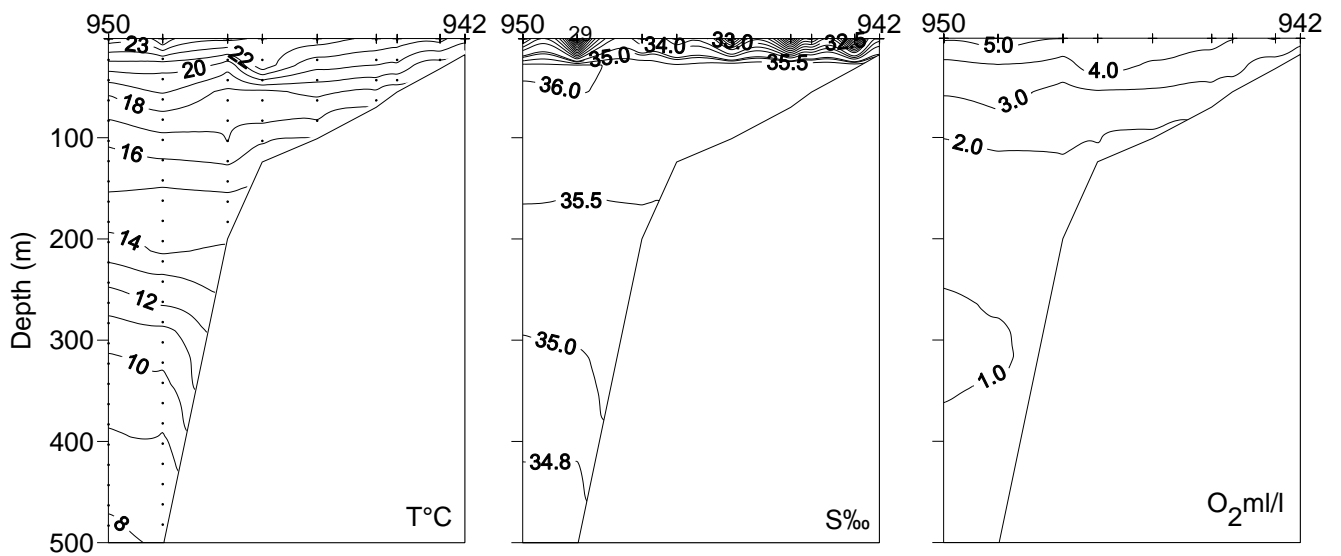


Figure 5b. Vertical sections of temperature, salinity and oxygen off Pta. da Moita Seca.

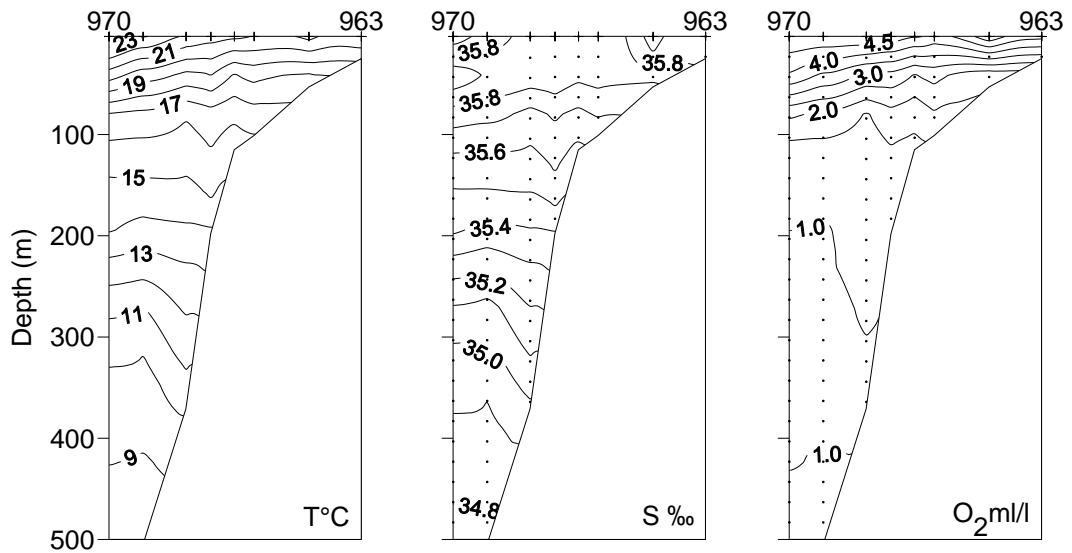


Figure 5c. Vertical sections of temperature, salinity and oxygen off N'zeto.

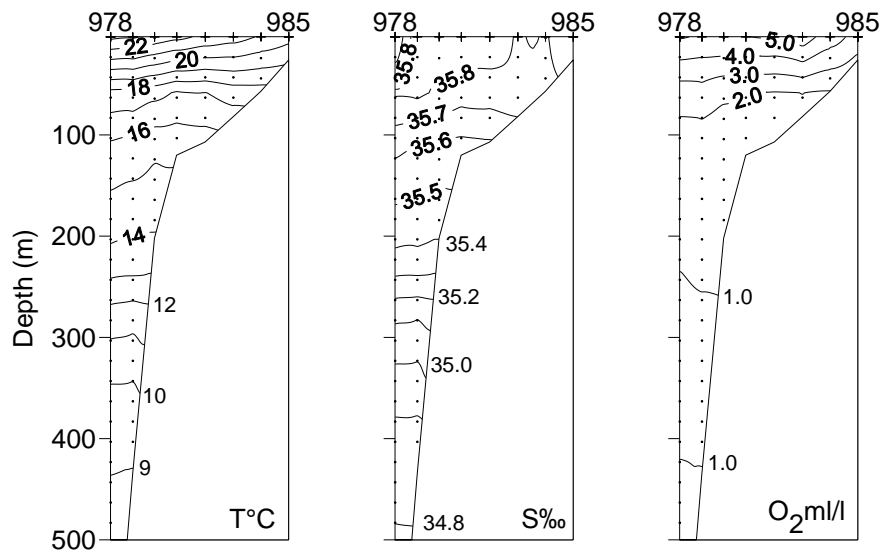


Figure 5d. Vertical sections of temperature, salinity and oxygen off Ambriz.

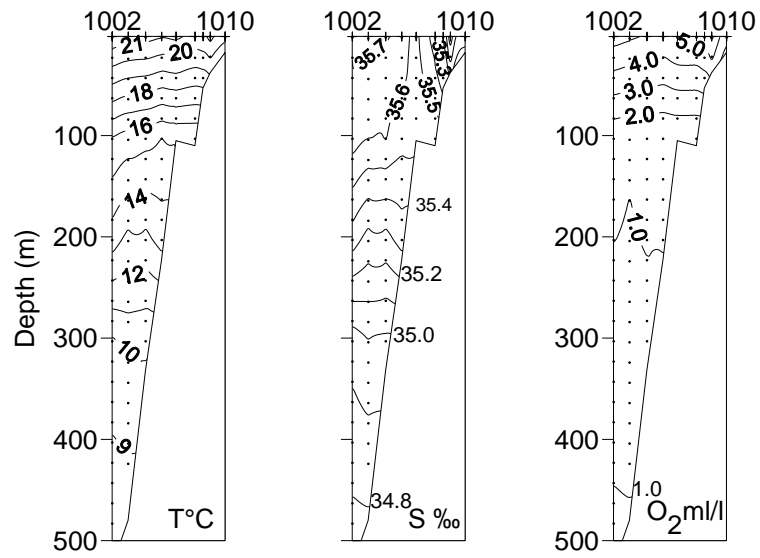


Figure 5e. Vertical sections of temperature, salinity and oxygen off Pta. Palmerinhas.

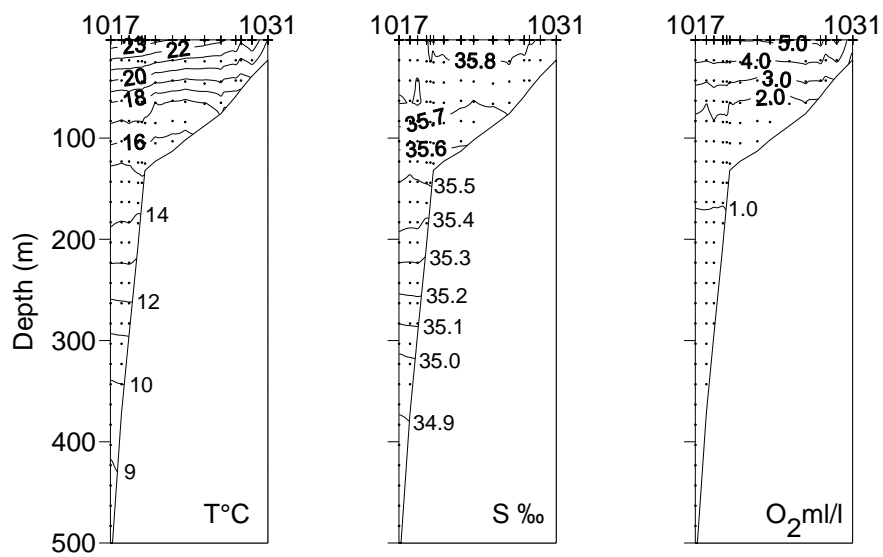


Figure 5f. Vertical sections of temperature, salinity and oxygen off Cabo Ledo.s

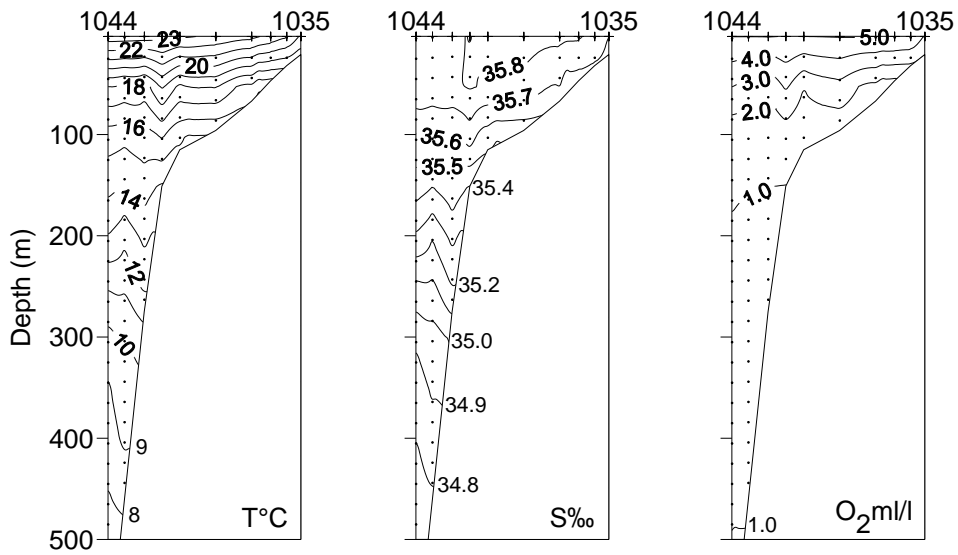


Figure 5g. Vertical sections of temperature, salinity and oxygen off south Cabo São Braz.

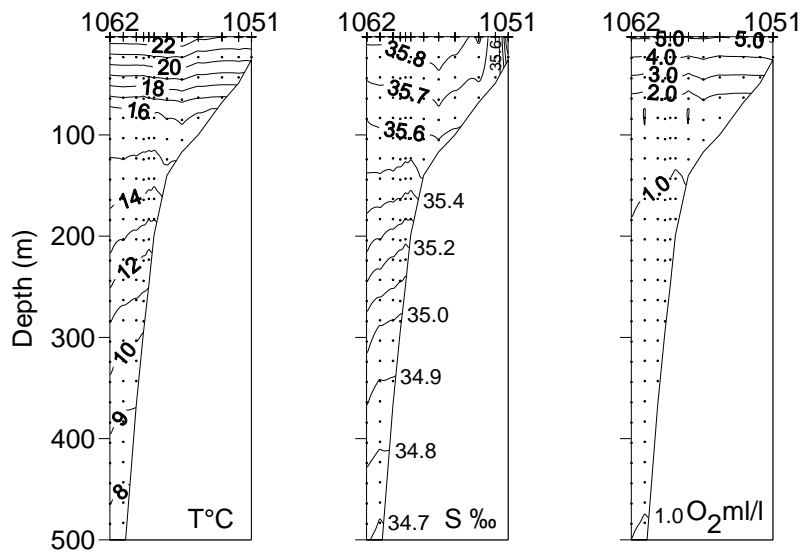


Figure 5h. Vertical sections of temperature salinity and oxygen off Pta. do Morro.

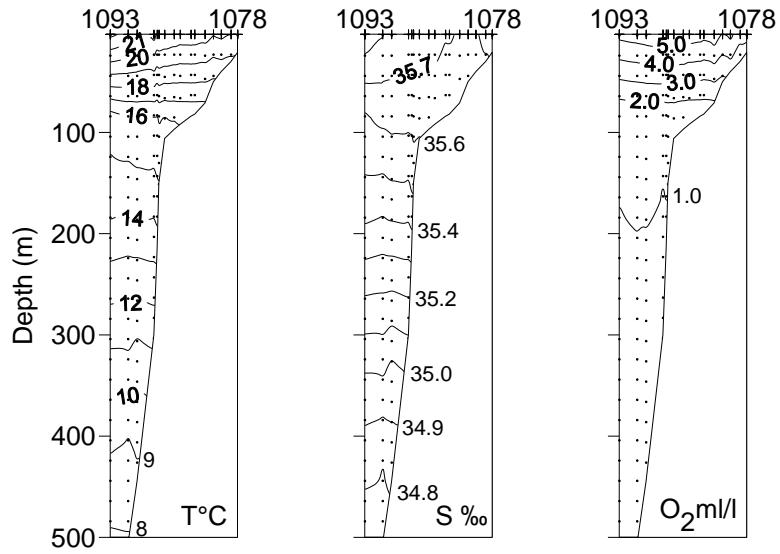


Figure 5i. Vertical sections of temperature salinity and oxygen off Egito.

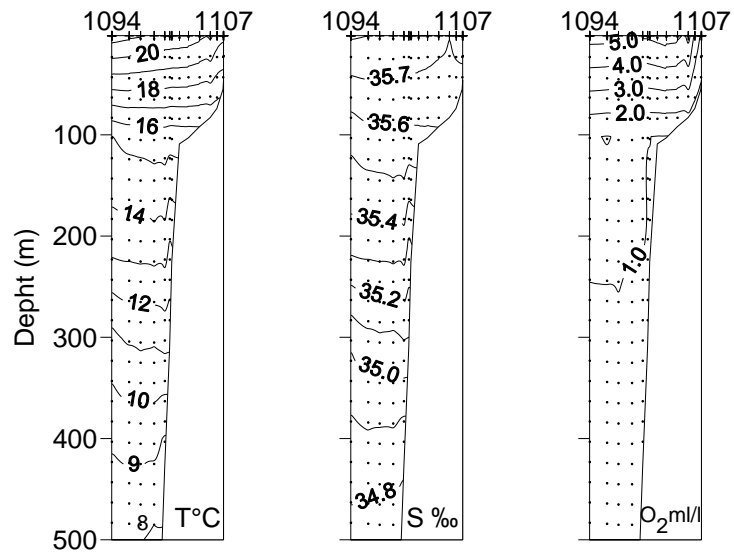


Figure 5j. Vertical sections of temperature salinity and oxygen off Lobito.

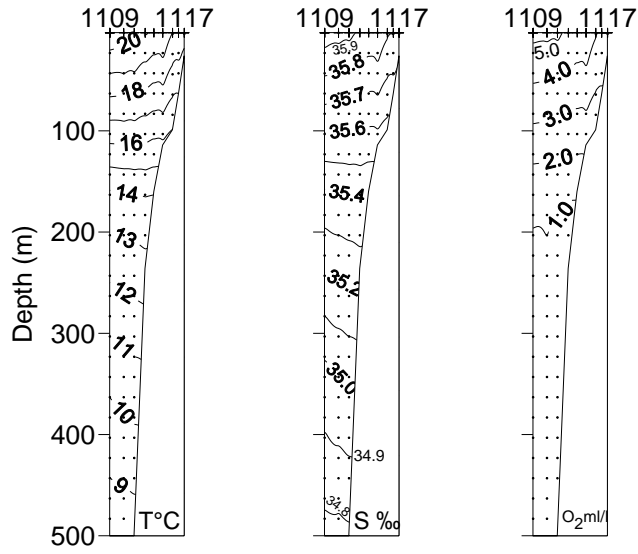


Figure 5k . Vertical sections of temperature salinity and oxygen off Namibe.

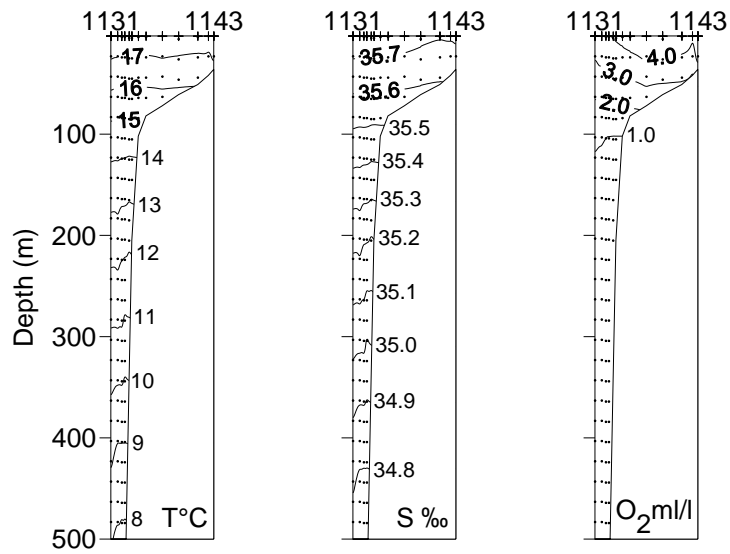


Figure 5l Vertical sections of temperature salinity and oxygen south off Pta. Albina.

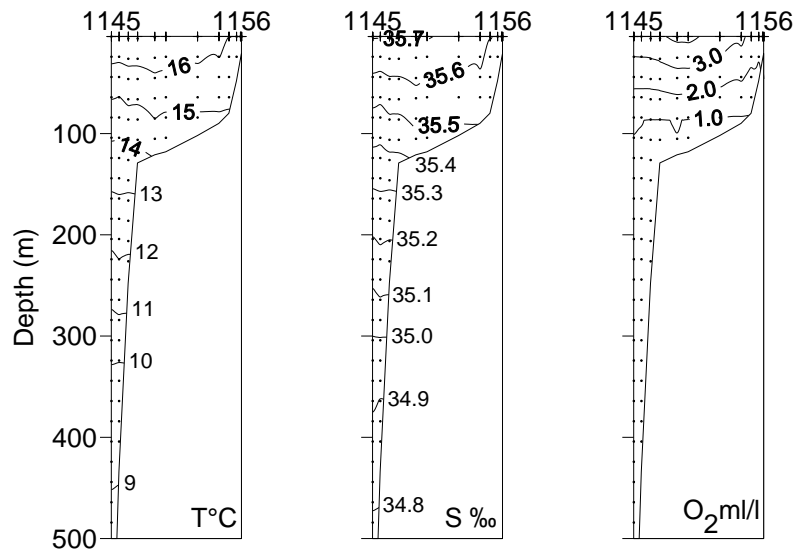


Figure 5m. Vertical sections of temperature salinity and oxygen off Baía dos Tigres.

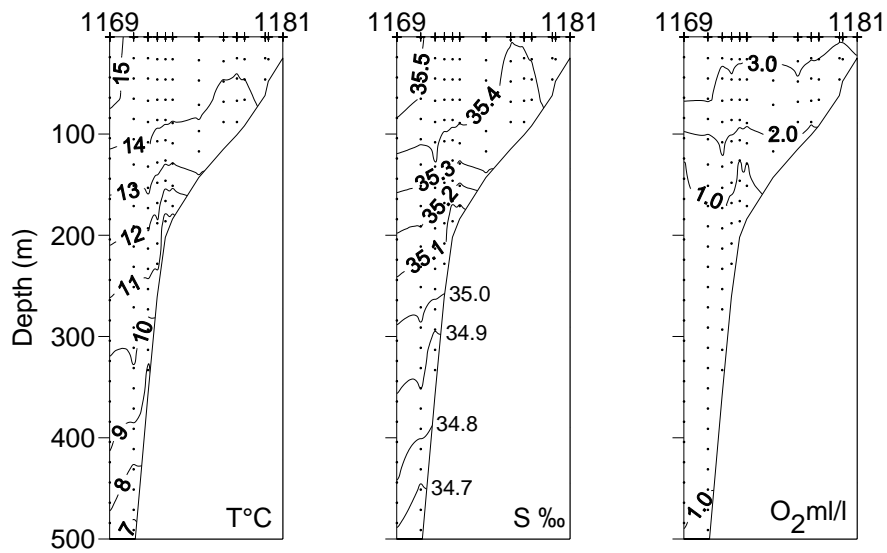


Figure 5n. Vertical sections of temperature salinity and oxygen off Cunene River.

CHAPTER 4 DISTRIBUTION, SIZE COMPOSITION AND BIOMASS ESTIMATES

4.1 Cabinda – Congo River (south of Pointe Noire)

Pelagic species 2 (PEL2)

We found only PEL2 in this region. This category includes members of the family Carangidae (other than *Trachurus* spp.), Scombridae, Sphyraenidae and Trichiuridae, both of shallow and deep waters. *Trichiurus lepturus* was by far the most common species caught, and it was found in a low-density-continuous distribution throughout the area up to the mouth of the Congo River ($1 < s_A < 300 \text{ m}^2/\text{NM}^2$). The biomass of PEL2 was estimated at 7 900 tons. Figure 11 shows the distribution of this group.

Several areas inside the survey region could not be accessed due to oil exploitation activities. As a consequence the area of Cabinda was only partly surveyed.

4.2 Congo River - Pta. das Palmerinhas

Sardinella

Both sardinella species, *Sardinella maderensis* and *S. aurita*, were found throughout the northern region (Figure 6). The distribution is almost continuous throughout the area. Compared with last year distribution, they were found more offshore and closer to the Congo River's mouth. We also found bigger areas of high density ($1\ 001 < s_A < 3\ 000 \text{ m}^2/\text{NM}^2$) off Cabeça de Cobra, north of N'zeto, and south of Ambriz.

Figure 7 shows the total length frequency distribution of *S. maderensis* and *S. aurita*. *S. maderensis* ranged from 5 to 34 cm in total length (TL), with two clear modal peaks at 7 and 27 cm. The juvenile cohort is mainly found north of Ambriz. The total length distribution for *S. aurita* consisted mostly of adult fish, ranging from 25 to 35 cm, and shows two moderate peaks at around 27 and 30 cm.

The estimated biomass for both sardinella species was 187 800 tons, lower than 2006 value (366 500 tons). *S. aurita* dominated the catches, contributing about 60% (107 000 tons) to the total estimated sardinella biomass. The estimated biomass for *S. maderensis* (80 800 tons) is also lower than 2006. For both species the biomass consisted of individuals larger than 25 cm TL.

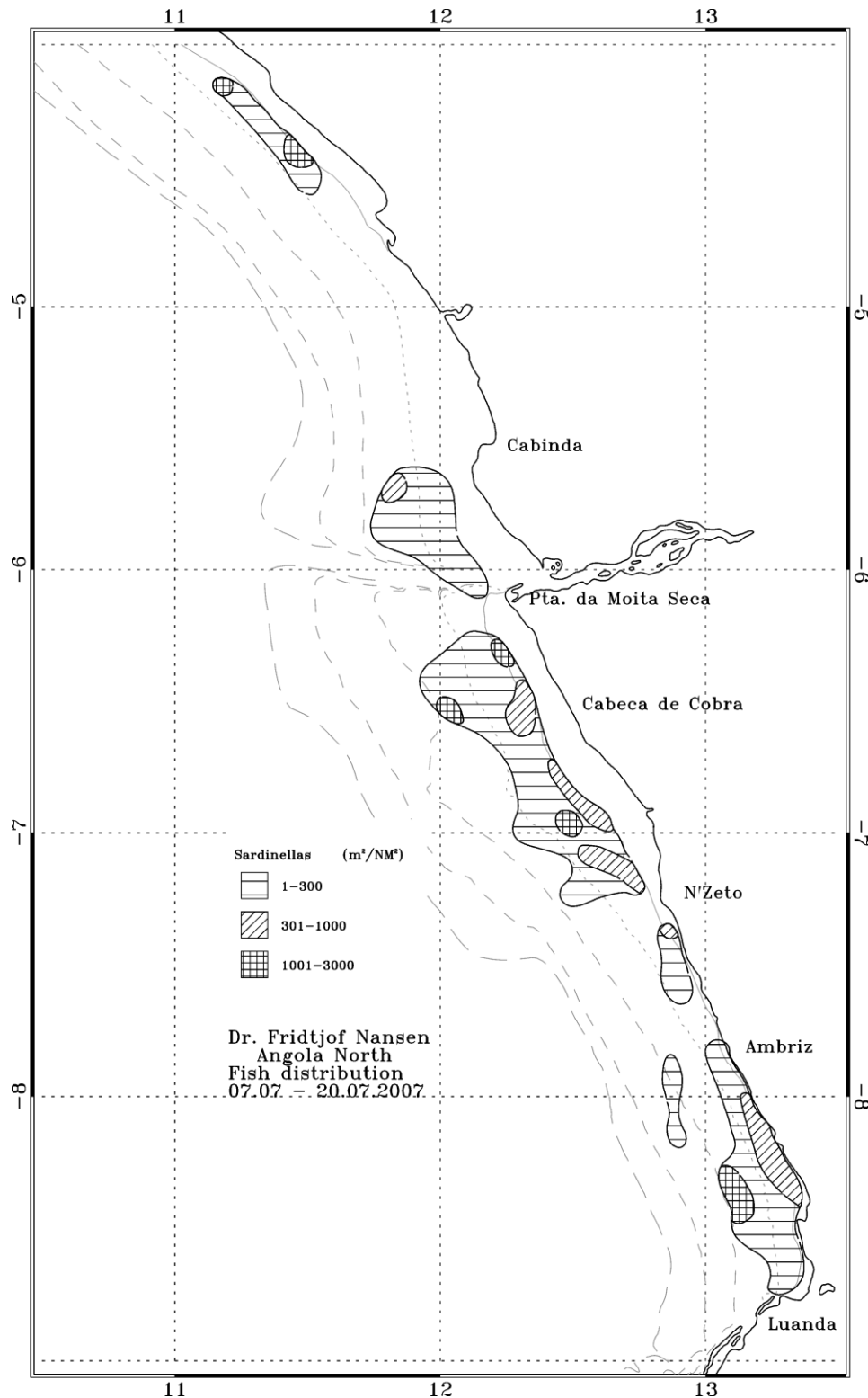
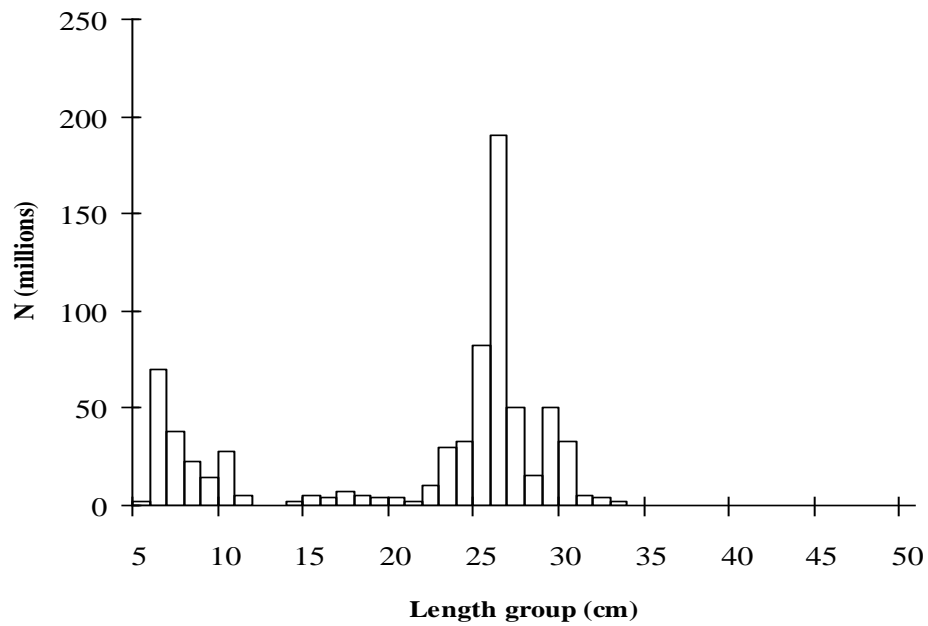


Figure 6. Distribution of *Sardinella* spp. Pta. das Palmerinhas-Congo River, including Cabinda. Depth contours at 20, 50, 100, 200, and 500 m.

a) *Sardinella maderensis*



b) *Sardinella aurita*

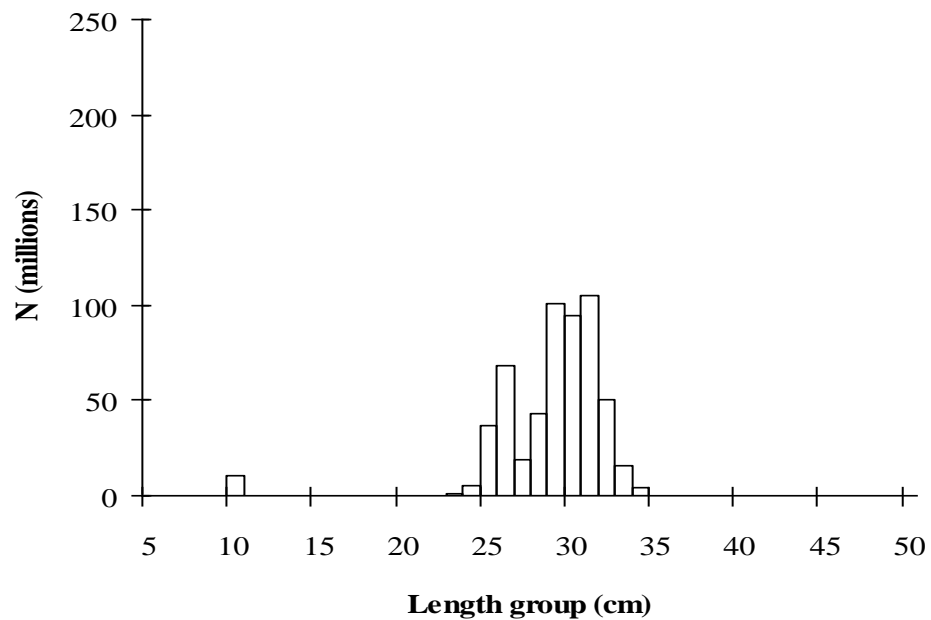


Figure 7. Total length distribution of *Sardinella maderensis* (a) and *S. aurita* (b), Pta. das Palmerinhas-Congo River.

Cunene horse mackerel

The Cunene horse mackerel, *T. trecae*, was found in low-density patches mostly with densities between $s_A < 300 \text{ m}^2/\text{NM}^2$ (Figure 8). However, south of Ambriz, a small area with a density of $s_A > 300 \text{ m}^2/\text{NM}^2$ was recorded.

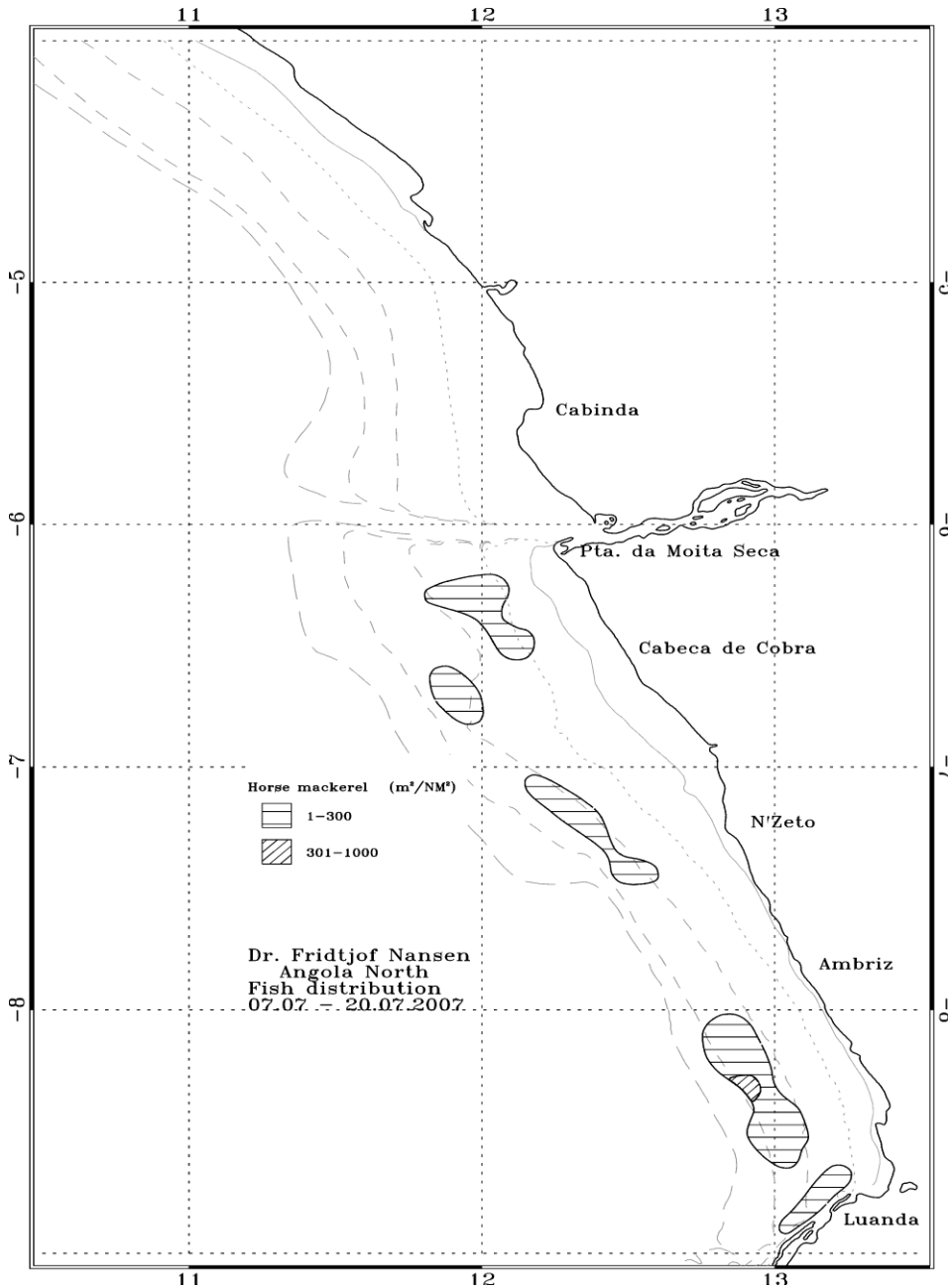


Figure 8 Distribution of Cunene horse mackerel, north region. Depth contours at 20, 50, 100 and 500 m.

The distribution shows two well-defined cohorts at 15 cm and 37 cm (TL) with the younger cohort of the previous year missing (Figure 9). Juvenile fish (TL < 21 cm) and the adults are found at depths greater than 100 meters (Fig. 10).

The estimated biomass of *T. trecae* was 27 300 tons, lower than 2006 (31 000) and consisted mainly of individuals larger than 30 cm TL (Figure 10).

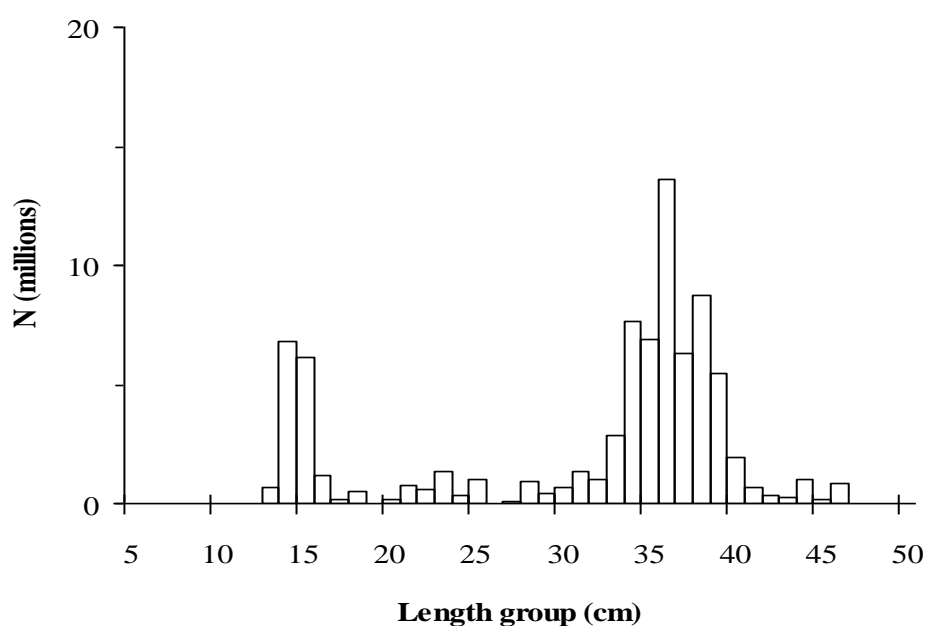


Figure 9. Total length distribution of Cunene horse mackerel (*Trachurus trecae*), Pta. das Palmerinhas-Congo River.

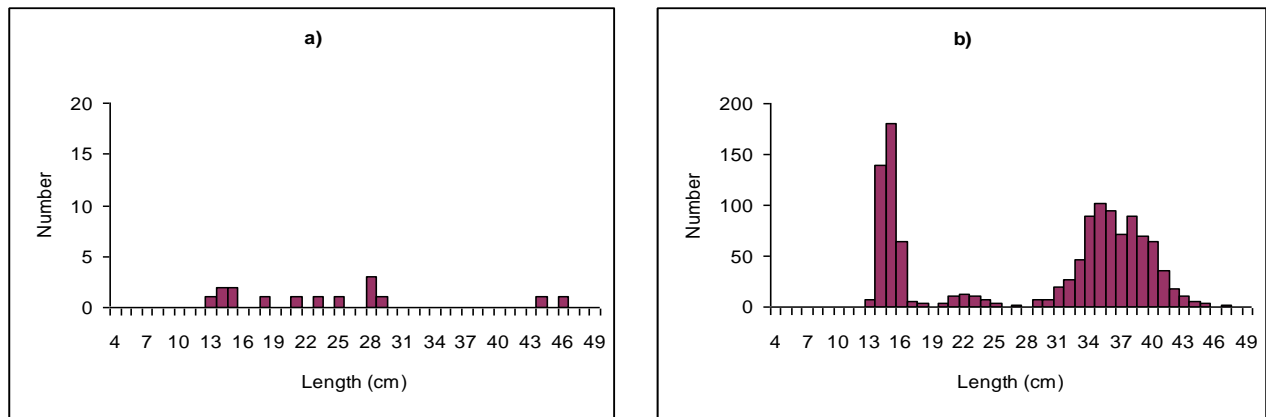


Figure 10. Length distribution of Cunene horse mackerel (*Trachurus trecae*) by depths stratum, Pta. das Palmerinhas-Congo River. a) depths >100 m and b) depths <100 m

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 from north of Cabinda to north of Luanda in low densities ($1 < s_A < 300 \text{ m}^2/\text{NM}^2$) (Figure 11). The dominant species belongs to the Carangids group (Table 4) with *Decapterus rhonchus* and *Selene dorsalis* as the dominating species. The biomass was estimated at 7 000 tons, which is lower than the previous year's biomass estimate (74 500 tons).

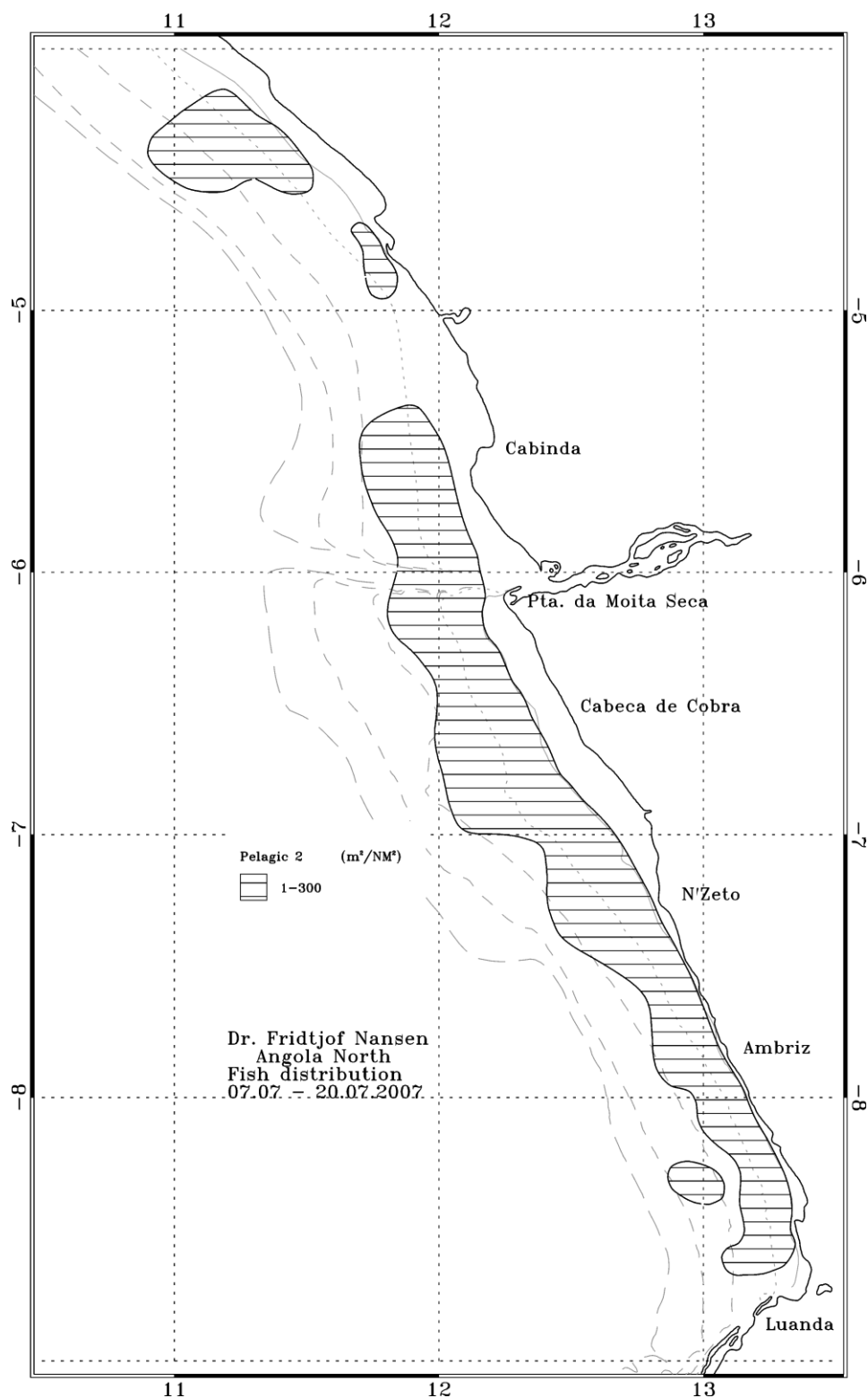


Figure 11. Distribution of Pelagic 2, Pta. das Palmerinhas-Congo River, including Cabinda. Depth contours at 20, 50, 100, 200 and 500 m.

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

Station	Depth	Carangids	Scombrids	Hairtails	Barracuda	Engraulida	Clupeids	Other	Total
3	10	11.9	0	5.6	0	0	46.9	10.7	75.1
4	121	15.5	0	0	0	0	0	268.4	283.9
5	10	0.3	0	2.6	0	0	0	0.9	3.8
6	0	21	0	2.9	84.4	0	133.4	68.9	310.7
7	10	116	0	0	8.9	0	24.2	4.7	153.8
8	10	23.2	25.7	27	0	0	0	7.9	83.9
9	10	0	0	0	1.8	0	3.2	8.7	13.6
10	10	0.9	3.3	0	0	0	0	0	4.2
11	10	81.7	14.6	10.8	0	0	0.5	7.9	115.6
12	115	212	0	9.6	0	0	0	328.9	550.5
13	70.5	165.5	0	3.8	0	0	0	114.6	283.9
14	118	145.8	0.9	4.7	0	0	0.4	358.1	510
15	0	0	0	132	47.4	1.2	1127.4	86.4	1394.4
16	15	459.4	111.7	172.7	0	0	0	179.9	923.8
17	15	0	0	0	0	0	33	422.6	455.6
18	10	429.3	0.9	12.6	0	0	16.2	0.5	459.5
Mean		105.2	9.8	24.0	8.9	0.1	86.6	116.8	351.4
Stdev		149.1	28.1	51.1	23.4	0.3	279.6	147.6	375.2
% Catch		29.9	2.8	6.8	2.5	0.0	24.6	33.2	

4.3 Pta. das Palmerinhas - Benguela

Sardinella

The sardinella was continuously distributed in this region showing lower densities offshore and denser densities inshore (Figure 12), with high-density patches ($s_A > 10\,000\text{ m}^2/\text{NM}^2$) at both Pta. do Morro and off north of Lobito.

Figure 13 shows the length distribution for (a) *S. maderensis* and (b) *S. aurita*. The size distribution of *S. maderensis* shows two clear cohorts, peaking at 16 and 28 cm. The one cohort consists of juvenile *S. maderensis* ranging from 7 to 19 cm, and an adult cohort ranging from 20 to 34 cm. The length distribution for *S. aurita* shows two modal peaks at 22 and 30 cm with only two adult cohorts.

The sardinella biomass estimated for this region is 483 000 tons, the highest biomass value within the available time series. The biomass of *S. maderensis* was estimated at 288 600 tons, which is double the biomass of the previous year; for *S. aurita* the estimated biomass was 194 400 tons, also double the biomass of 2006. Most of the biomass comprised individuals bigger than 25 cm TL for *S. maderensis* and bigger than 20 cm TL for *S. aurita* (Fig. 13).

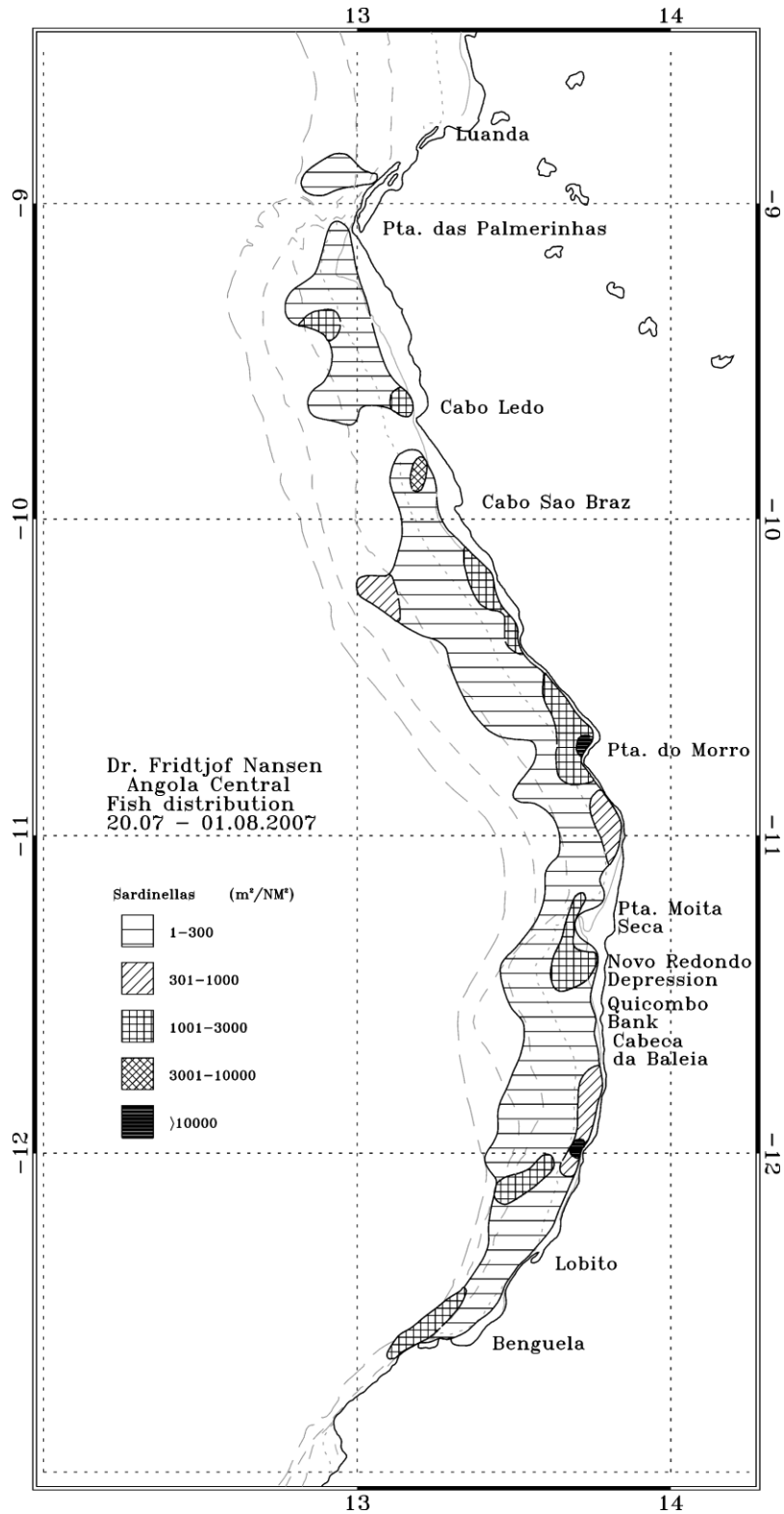
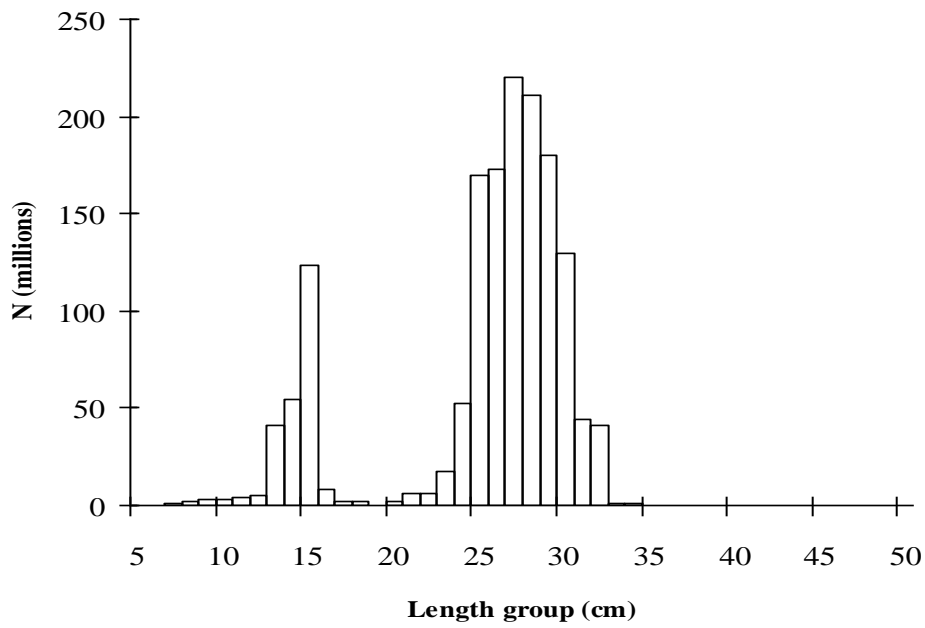


Figure 12. Distribution of *Sardinella* spp. Pta. das Palmerinhas- Benguela. Depth contours at 20, 50, 100 and 200 m.

a) *Sardinella maderensis*



b) *Sardinella aurita*

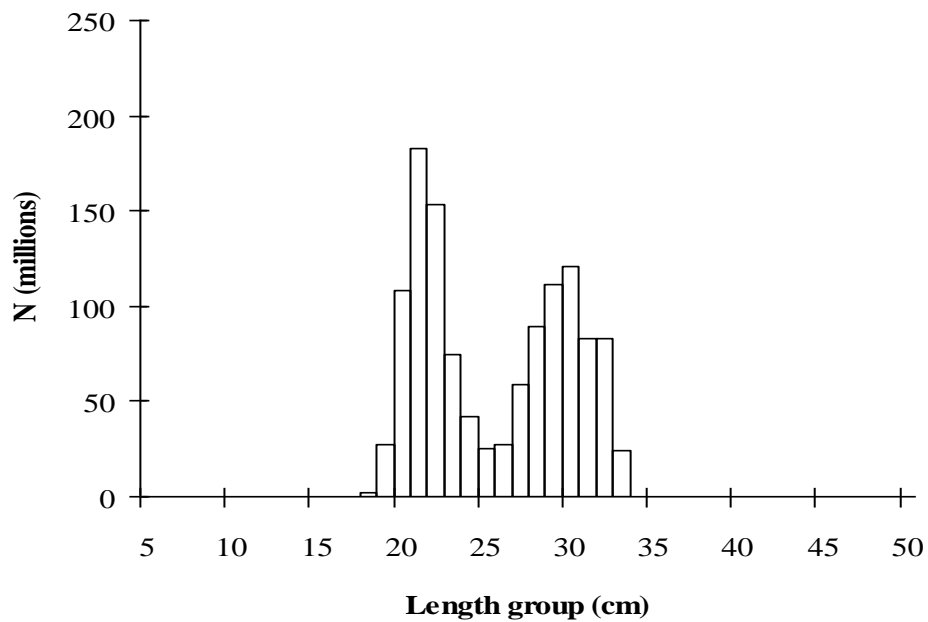


Figure 13. Total length distribution of (a) *Sardinella maderensis* and (b) *S. aurita*. Pta. das Palmerinhas-Benguela.

Horse mackerel

The Cunene horse mackerel, *T. trecae*, was found throughout this area at depths deeper than 20 m (Figure 14) although in low densities ($1 < s_A < 300 \text{ m}^2/\text{NM}^2$). A small dense patch ($3001 < s_A < 10000 \text{ m}^2/\text{NM}^2$) was observed offshore at Pta. do Morro. It appears to be a continuous distribution from north of Pta. Moita Seca to north of Benguela.

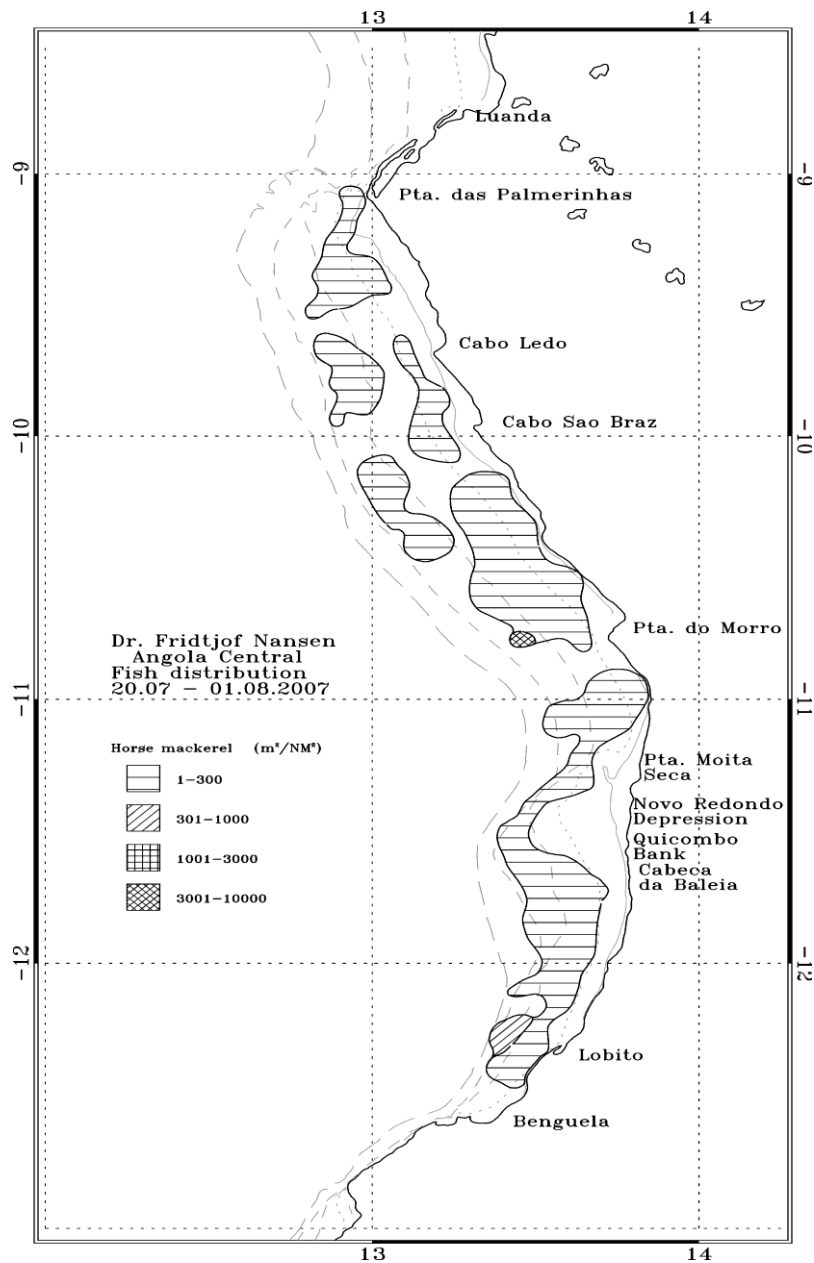


Figure 14. Distribution of horse mackerel (*Trachurus trecae*). Pta. das Palmerinhas- Benguela. Depth contours at 20, 50, 100, 200 and 500 m.

The total length distribution (Figure 15) of this species ranged from 10 to 42 cm and shows two well-defined cohorts with modes at 15 and 28 cm TL. In this region the distribution of Cunene horse mackerel by depths, shows that the juvenile fish (TL < 20cm) is found to school with the adults at depths greater than 100 meter (Figure 16) mainly in the area between Cabo Sao Braz and Pta. do Morro.

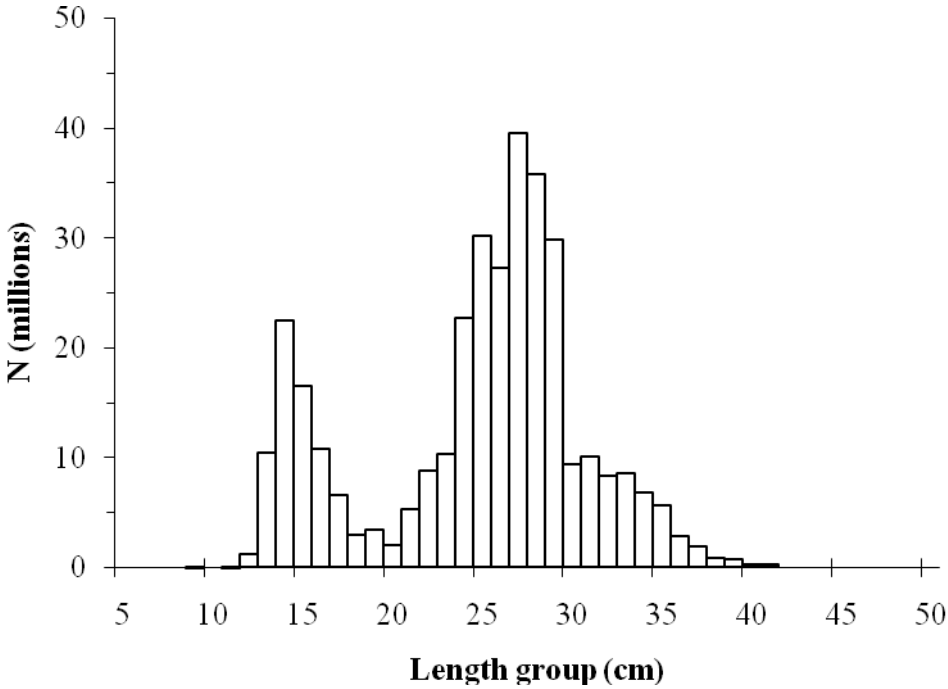


Figure 15. Total length distribution of horse mackerel (*Trachurus trecae*), Benguela - Pta. das Palmerinhas.

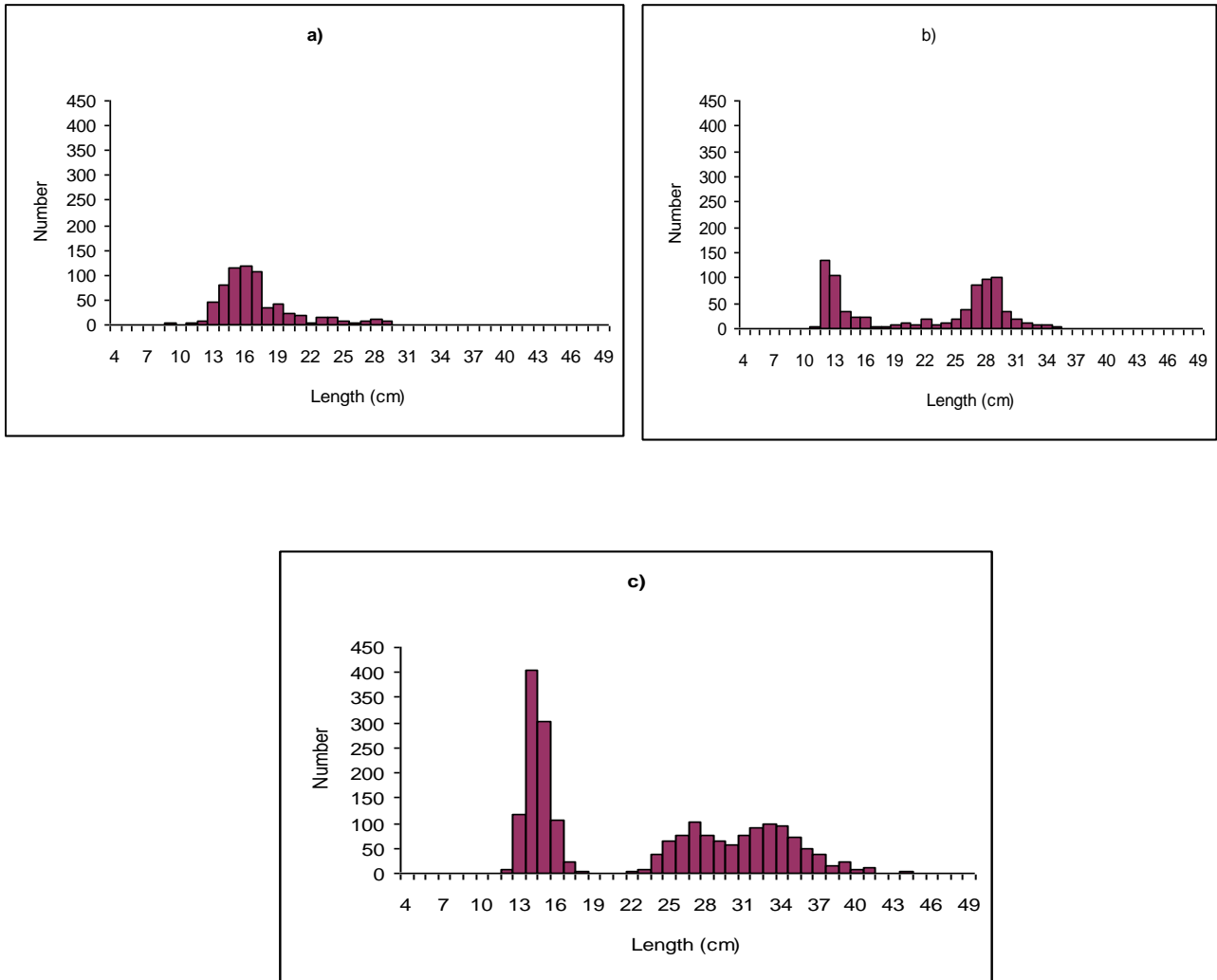


Figure 16. Length distribution of Cunene horse mackerel (*Trachurus trecae*) by depths stratum, Benguela - Pta. das Palmerinhas. a) depths >50 m, b) <50<100 m and c) >100m

The estimated biomass of the Cunene horse mackerel for the area was 54 100 tons, similar to the 2005 estimate (57 000 tons) but lower than 2006 (77 000 tons). The stock in this region was dominated by individuals >25 cm.

Other pelagic species

Group 2

This group is patchily distributed in low densities ($1 < s_A < 300 \text{ m}^2/\text{NM}^2$), with two areas of continuous distribution between north of Cabo Ledo to south of Cabo Sao Braz and north of Lobito to south of Benguela (Figure 17). The most common species group was the Carangidae (Table 5), dominated by *Decapterus rhonchus* and *Caranx sp.*

The biomass estimate, based on an average length of 25 cm and a condition factor equal to 0.01, was 38 000 tons, much lower than the previous year's estimation (113 000 tons).

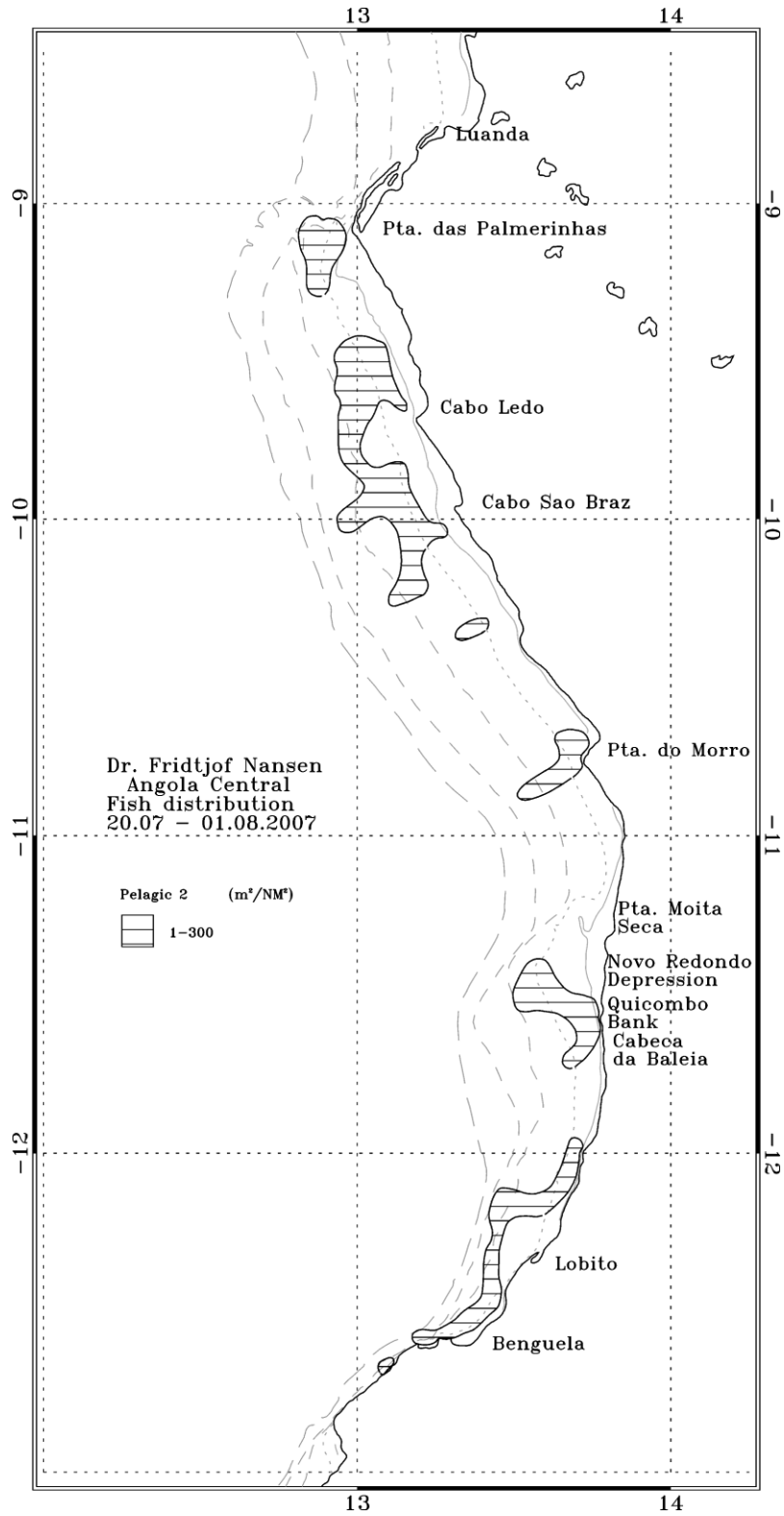


Figure 17. Distribution of other pelagic species, group 2. Pta. das Palmerinhas- Benguela. Depth contours at 20, 50, 100, 200 and 500 m.

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

Station	Depth	Carangids	Scombrids	Hairtails	Barracuda	Clupeids	Other	Total
19	251.5	0	0	2.5	0	0	406.1	408.6
20	13	51.9	0	22.8	5.6	820.1	38.3	938.6
21	47.5	190.5	0	6.1	0	0	2218.5	2415.2
22	5	72.5	0	0	0	1421.6	0	1494.1
23	132	857.5	0	34	0	1.3	474.4	1367.2
24	5	217.4	0	0	305.2	3326.1	182.3	4031.1
25	15	1056.4	0	14	0	0	59.9	1130.4
26	119	516	0	0	0	0	235.1	751.1
27	10	59.9	0	9.1	0.6	75.7	532.1	677.4
28	109.5	371.7	0	0	0	0	328.2	699.8
29	109.5	619.1	38.1	0	0	0	791.6	1448.8
30	10	0	0	0	0	663.4	2.1	665.5
31	60.5	94.8	0	0	1	0	190.6	286.4
32	10	0.4	0	0	0	42.8	0	43.3
33	35	0	0	0	0	0	437.3	437.3
34	10	70.5	1.6	4.7	0.5	132	28.5	237.8
35	10	73.4	0	9.9	5.2	702.7	1022.6	1813.7
36	110.5	39.8	0	7.1	0	0	184.2	231.1
37	30	0	3.4	0	0	2.6	0.4	6.5
38	15	26.3	0	5.7	1.7	453.3	45	531.9
39	37.5	82.9	0	2.6	0	214.5	153.9	453.9
40	23.5	2.3	0	6	4.2	31.5	617	661.1
41	140.5	623.5	0	129.6	0	0	257.2	1010.3
42	10	2.7	0	0	0	20.1	2.3	25.1
43	47.5	10.3	0	105.2	0	0	808.3	923.8
44	13	1.5	0	88.8	0	456.1	41.9	588.3
45	22.5	0	0	0	0	0	0	0
46	128.5	357.3	0	18.9	0	0	410.3	786.5
47	28	637.6	0	6.1	7	273.6	87	1011.3
48	12.5	0	0	0	27.6	11830.1	19.7	11877.4
49	123.5	64.3	0	0	0	0	339.2	403.4
50	15	30.2	0	20.2	0	1258.7	34.6	1343.7
51	30	1.1	0	10.1	3.4	15.5	47.9	78
52	139	10.9	0	85.7	0	0	55.6	152.2
53	111.5	357.1	0	8.2	0	0	438.3	803.5
54	10	0	0	2.9	0	5383.1	94.1	5480
55	15	6461.2	0	139.1	0	1156.9	0	7757.2
56	14	133.5	0	115.5	0	11735.1	372.5	12356.6
57	108.5	105.3	0	13.6	0	0	2016	2134.8
58	15	0	0	0	0	24.7	0.5	25.2
59	10	1192.2	0	470.1	0	91.3	291.1	2044.7
60	22.5	5.7	0	2.3	0	0	137.9	146
61	0	0	2.9	0	0	0	0.5	3.4
62	15	0	0	0	0	32.6	6.1	38.7
63	8	19.3	6.1	0	0	419.2	330.9	775.6
64	10	134.5	6.4	38.9	0	71.5	23.5	274.7
Mean		316.337	1.271739	29.99348	7.869565	883.8283	299.2065	1538.504
STDEV		971.0362	5.730839	76.0587	45.01879	2534.533	463.2268	
% catch		20.56133	0.082661	1.949522	0.511508	57.44724	19.44788	

Brachydeuterus auritus

This group was found in low densities ($1 < s_A < 300 \text{ m}^2/\text{NM}^2$) throughout of the region (Figure 18).

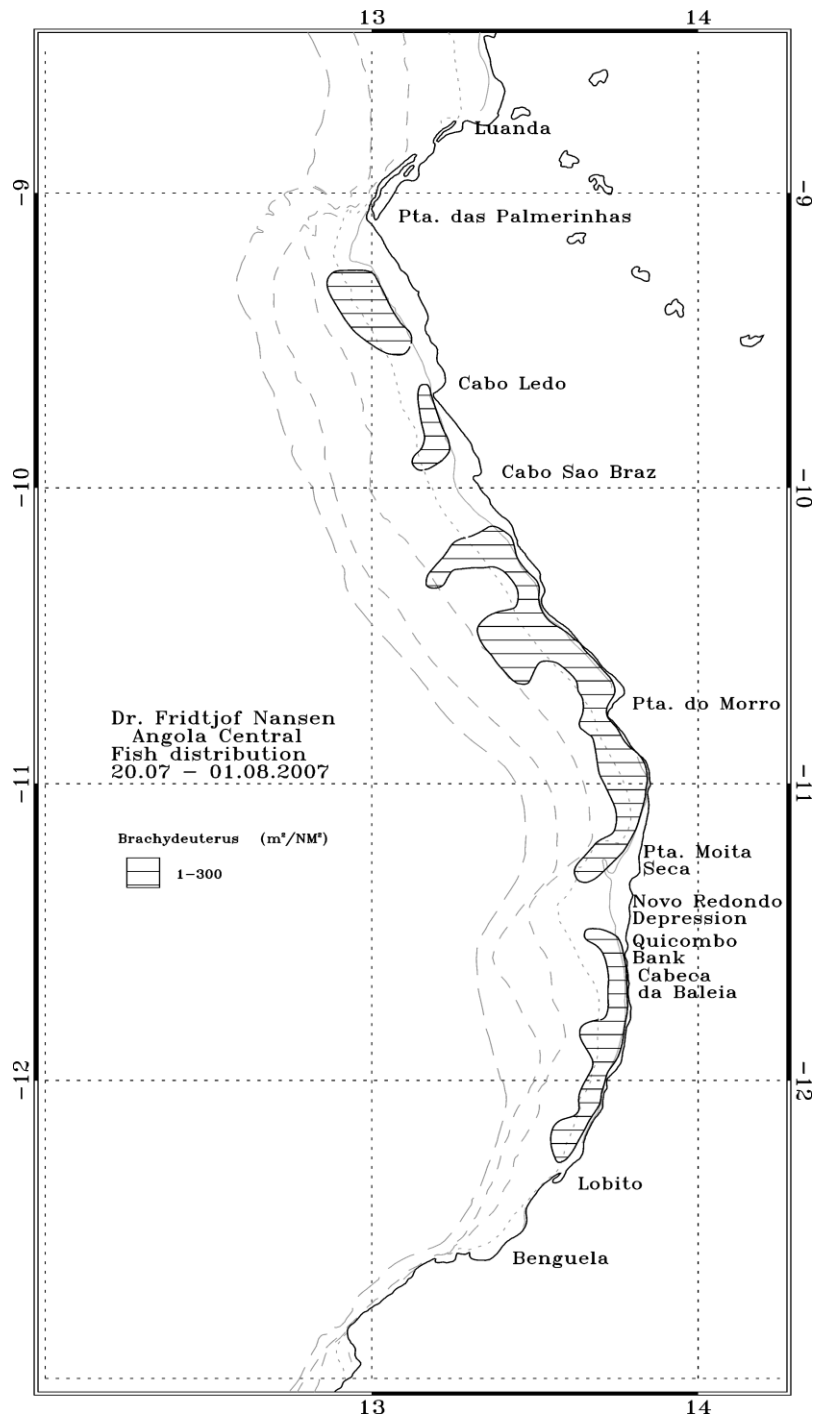


Figure 18. Distribution *Brachydeuterus auritus*. Pta. das Palmerinhas- Benguela. Depth contours at 20, 50, 100, 200 and 500 m.

The biomass estimate, based on an average length of 17cm and a condition factor equal to 0.01, was 13 866 tons.

4.4 Benguela - Cunene

Sardinella

S. aurita is the only sardinella species found in this region (Figure 19). It was found in confined small patchy areas. A dense patch ($3001 < s_A < 10\ 000\ \text{m}^2/\text{NM}^2$) was observed south off Pta. Albina.

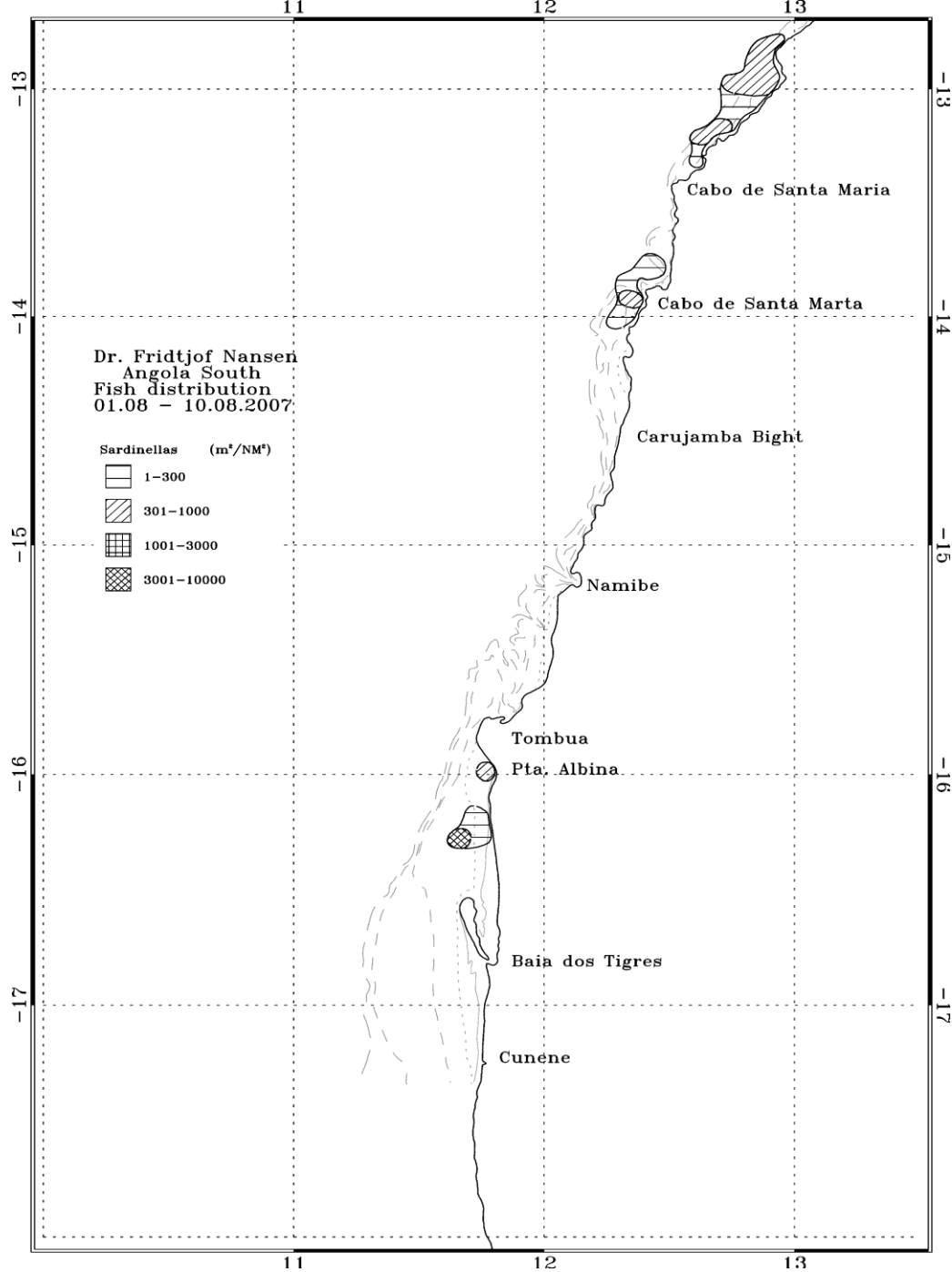


Figure 19. Distribution of *Sardinella*. Cunene–Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m.

The size distribution showed one cohort, ranging in size from 19 to 27 cm (Figure 20).

The estimated biomass for the sardinella (55 900 tons) increased by 73%, compared with the 20 000 tons of 2006.

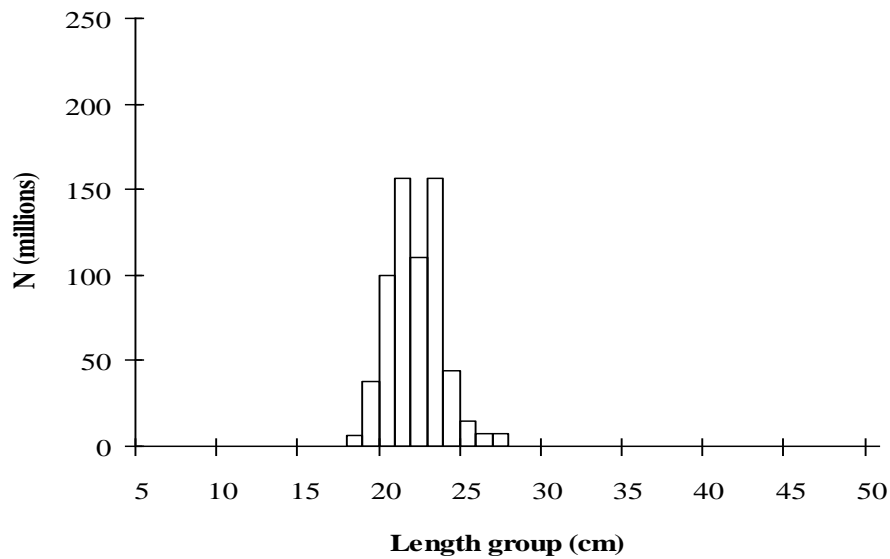


Figure 20. Distribution of *Sardinella aurita*. Cunene–Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m.

Horse mackerel

In the southern region the horse mackerel is found in abundance, dominating over other species in the region. Like in previous years, both species of horse mackerel were found: Cunene horse mackerel (*T. trecae*), a species that distributes in most of the Angolan continental shelf and the Cape horse mackerel (*T. capensis*) a species associated with the cold waters of the Benguela current. There seems to be a continuous distribution from south of Cabo de Santa Marta to the Cunene River with low densities ($1 < s_A < 300 \text{ m}^2/\text{NM}^2$) (Figure 21). However, around Baía dos Tigres, and at depths between 100 to 200 m, a dense patch ($s_A > 3000 \text{ m}^2/\text{NM}^2$) was found. In general, Cape horse mackerel was found dominating the slope area, while Cunene horse mackerel had a more inshore distribution.

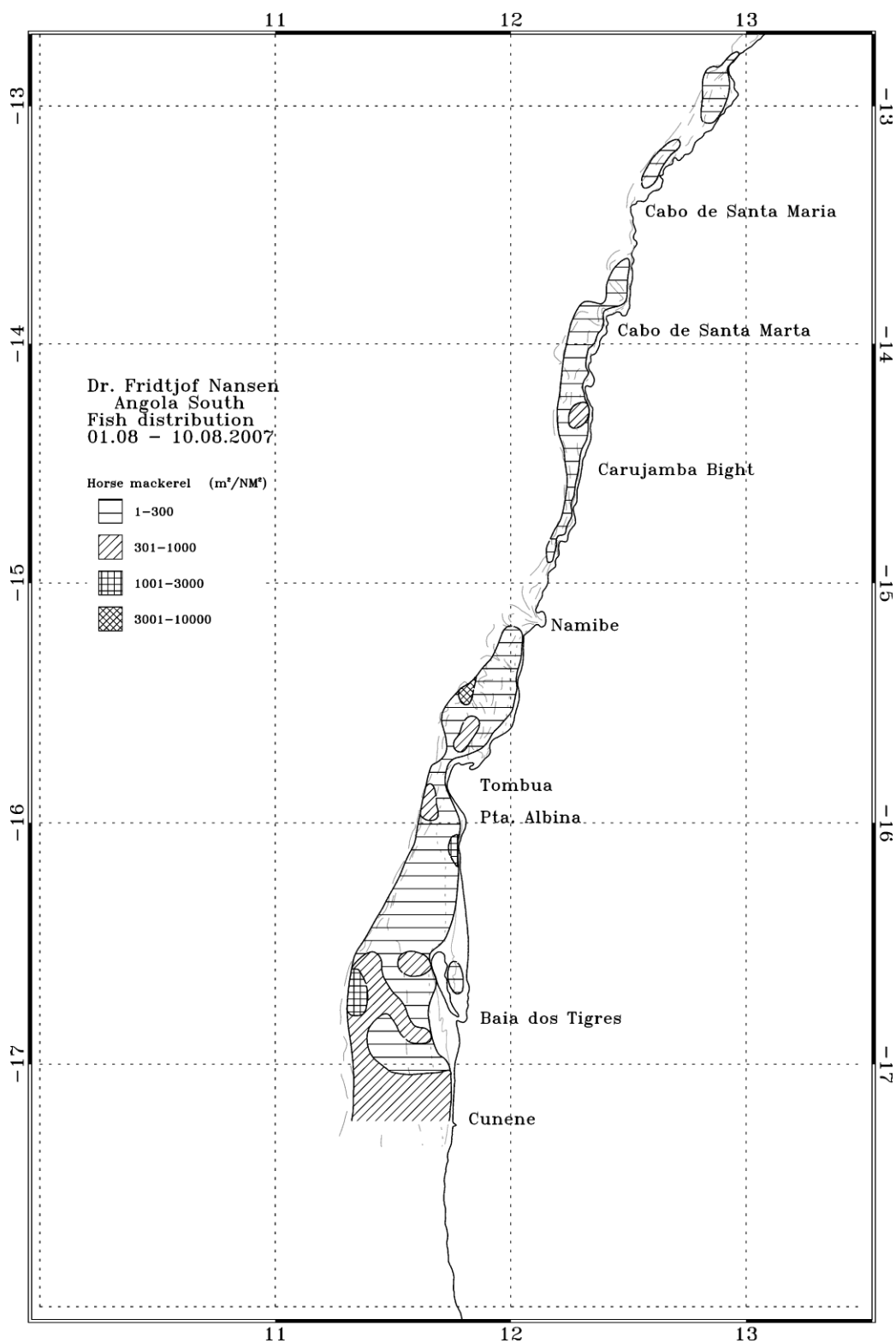
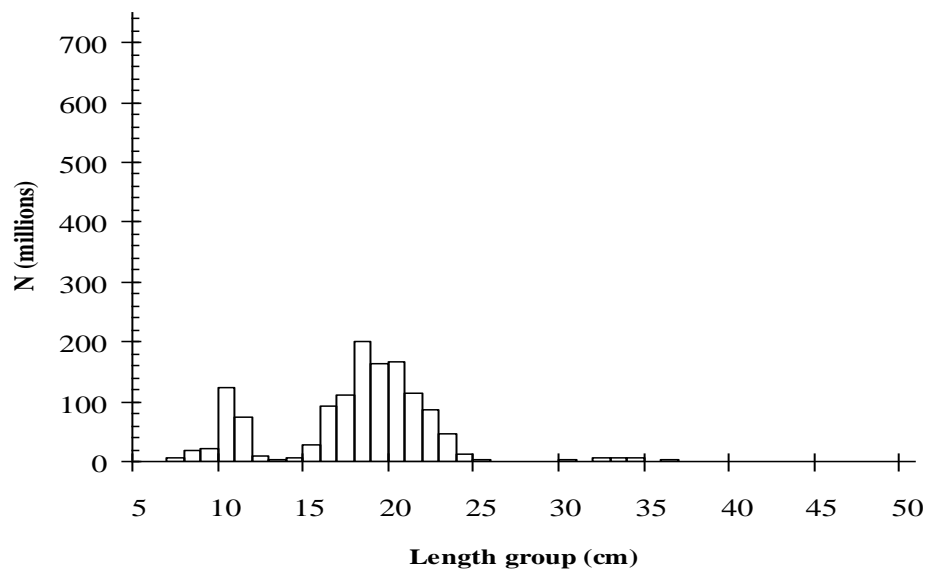


Figure 21. Distribution of horse mackerel. Cunene–Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m.

Figure 22 shows the size distributions of both horse mackerel species: (a) *Trachurus capensis* and, (b) *Trachurus trecae*. The length distributions of both species was dominated by juvenile fish smaller than 20cm. *T. capensis* showed two clear cohorts, with modal peaks at 11 and 19 cm. The average total length of *T. trecae* is 15cm and its length distribution showed three cohorts.

Trachurus trachurus capensis



b) *Trachurus trecae*

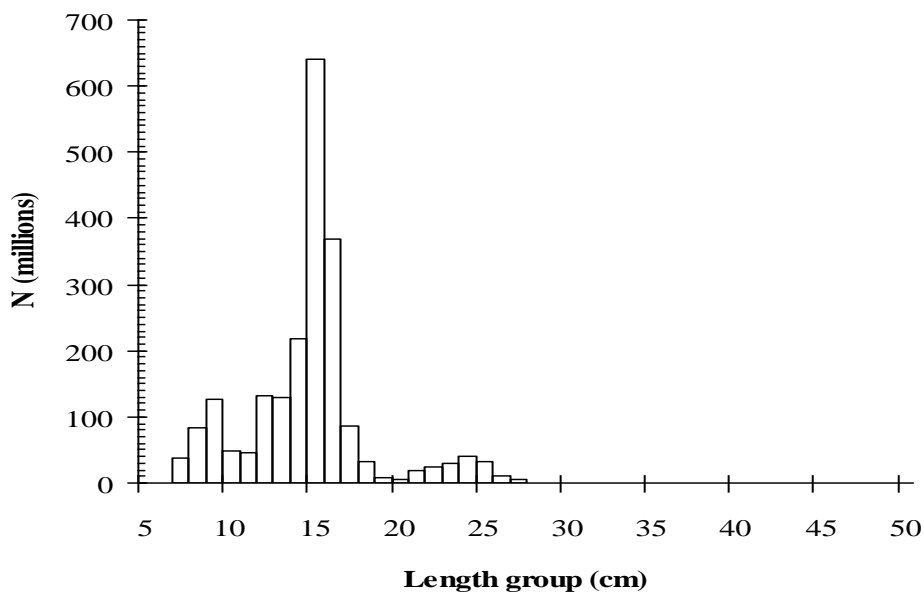


Figure 22 Total length distributions of (a) *Trachurus trachurus capensis* and (b) *T. trecae* (b), Benguela-Cunene.

The total estimated biomass for horse mackerel in the southern region was 147 700 tons, 50% higher than the one from 2006 (71 000 tons), with each species contributing with about 50% to the total estimated biomass. In comparisons to last year's biomass, there has been an increase of 62% (72 800 tons) for *T. trace* and of 75% (74 900 tons) for *T. capensis*.

Other species

Unlike the previous years, anchovy and sardine were found around the area between Baía dos Tigres and the Cunene (Figure 23). A high concentration spot of anchovy was found inside the bay with a density higher than 10 000 m²/NM². The sardine showed low abundance thus no biomass could be estimated.

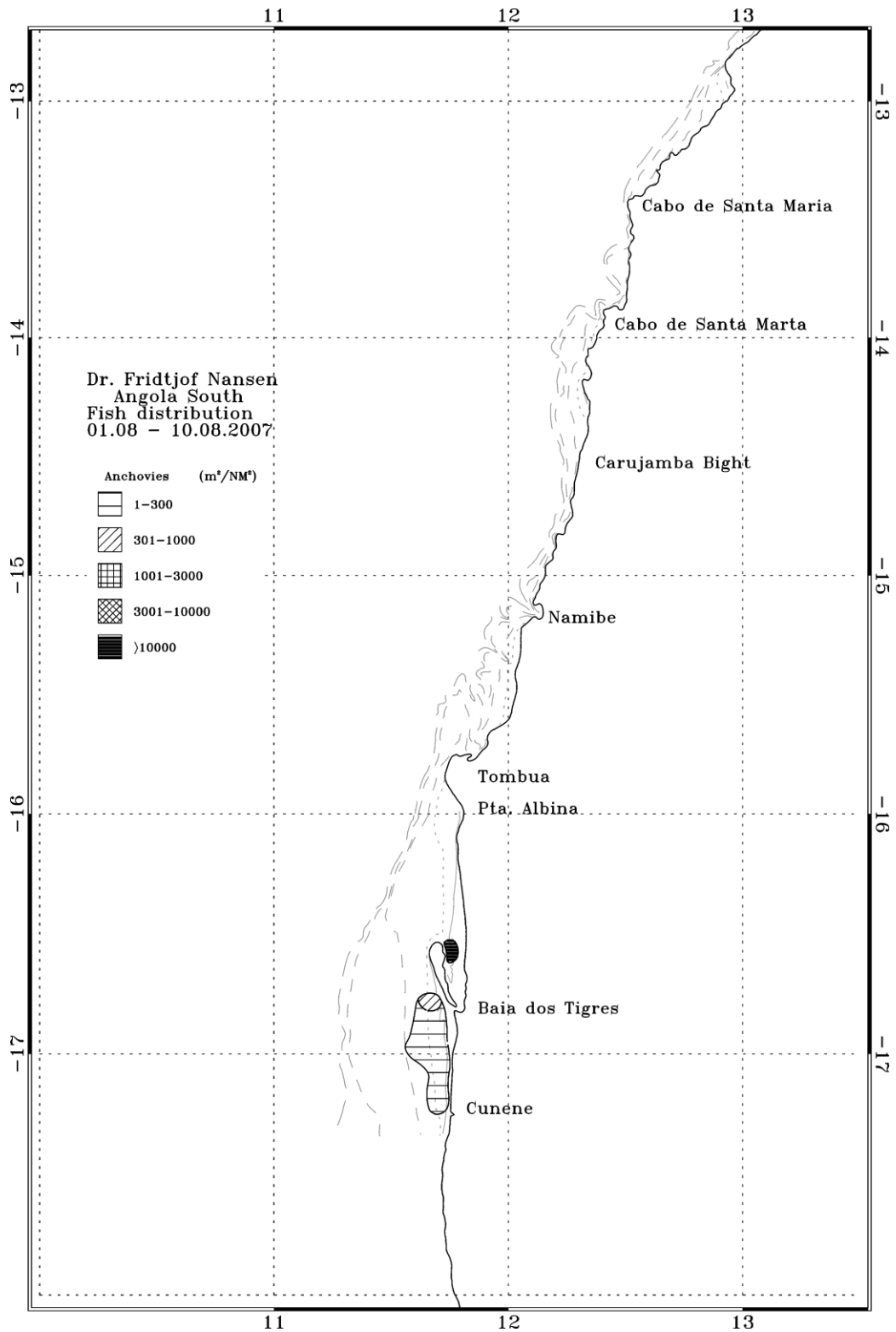


Figure 23. Distribution of Anchovies. Cunene–Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m.

CHAPTER 5 SUMMARY OF SURVEY RESULTS

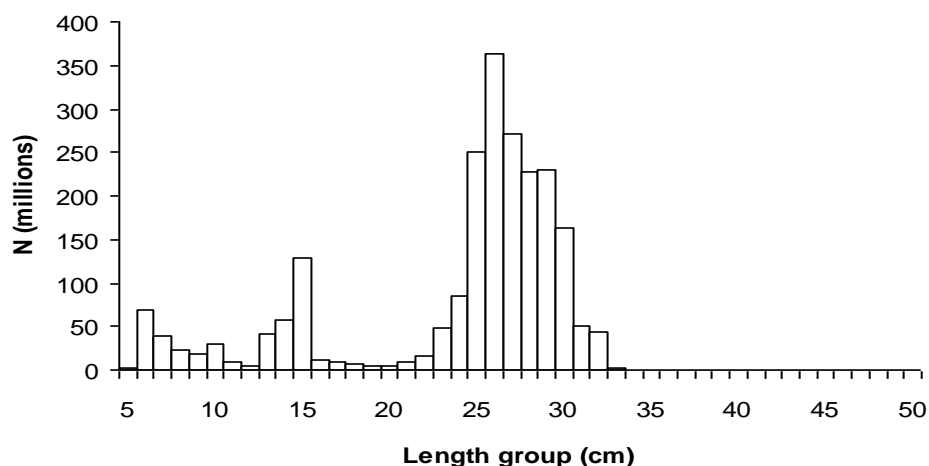
5.1 Sardinella

The total biomass estimate for sardinellas is 726 700 tons, which is the highest biomass recorded during the time series (Table 6). The increase can be attributed to changes in the behaviour pattern of the species: a slightly deeper (less surface schools) and more offshore distribution, making the sardinella more available for acoustic detection. Such changes are common and may be related to prevailing environmental conditions. During the present survey sardinella was found further south and more abundant than previous years.

The relative biomass of the two *Sardinella* species was somewhat different than in previous year. This year, the two species were estimated to be approximately at the same level (*S. aurita* 53 %, *S. maderensis* 47 %). The relative distribution was similar in the northern region (57 % *S. aurita*) and central region (46 %). However, only *S. aurita* was found in the southern region. Nevertheless, the contribution of each species has varied in the last years depending on the environmental conditions: in 2005 *S. aurita* contributed the most, while last year it was *S. maderensis*, this last species preferring warmer waters (>23°C) than the former one.

Figure 24 shows the overall length frequency distribution of the two *Sardinella* species. For *S. maderensis*, three cohorts with modal peaks around 6, 15 and 27 cm TL can be observed. New this year is the indication of some new recruits to the fishery (fig. 24a). However, no such indication of recruitment was found for *S. aurita* this year either. The distribution for this species shows two modal peaks at 21 and 30 cm TL (Fig. 24 b).

a) *S. maderensis*



b) *S. aurita*.

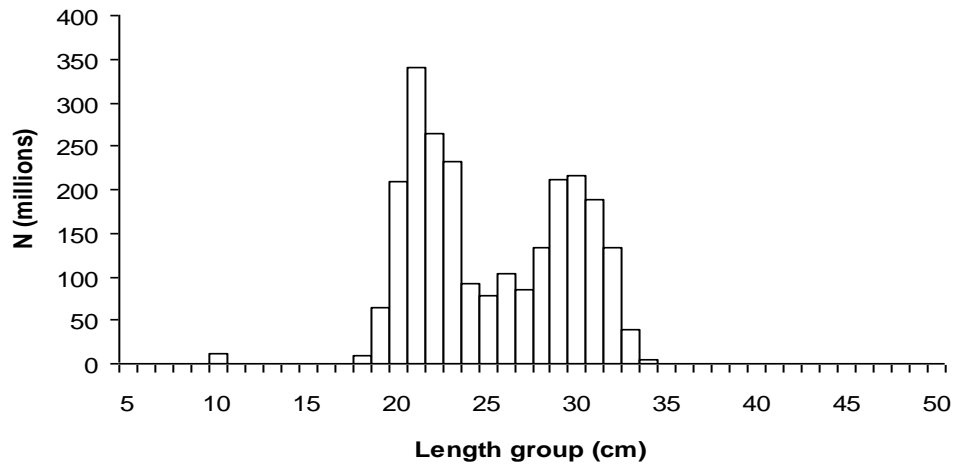


Figure 24 Overall length distribution in numbers for (a) *S. maderensis* and (b) *S. aurita*.

Table 6 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	220	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

* not surveyed

† surveyed from Congo River- Pta das Palmerinhas

5.2 Cunene horse mackerel

The total biomass of Cunene horse mackerel was estimated at 154 100 tons, which is very similar to the one estimated in 2006 (153 000 tons) (Table 7). This year's estimate is a result of an increase in the horse mackerel biomass in the south.

As in 2006, 90% of the total biomass in the southern region was dominated by juveniles, TL < 21 cm. For management purposes, this region must be considered as the main recruitment area for the Cunene horse mackerel. However, since juveniles and adults seem to be schooling

together, it is difficult to set up depth restrictions as management measure. In the northern and central regions the biomass comprised mostly adult population.

The overall length distribution shows that fish of all classes were represented, from the smallest of 8 cm TL to those bigger than 4035 cm TL. However, fish <20 cm TL dominates the distribution. From the size distribution, three clear cohorts can be distinguished, with modes at 8, 16, and 25 cm TL.

a) Overall length distribution of *T. trecae*.

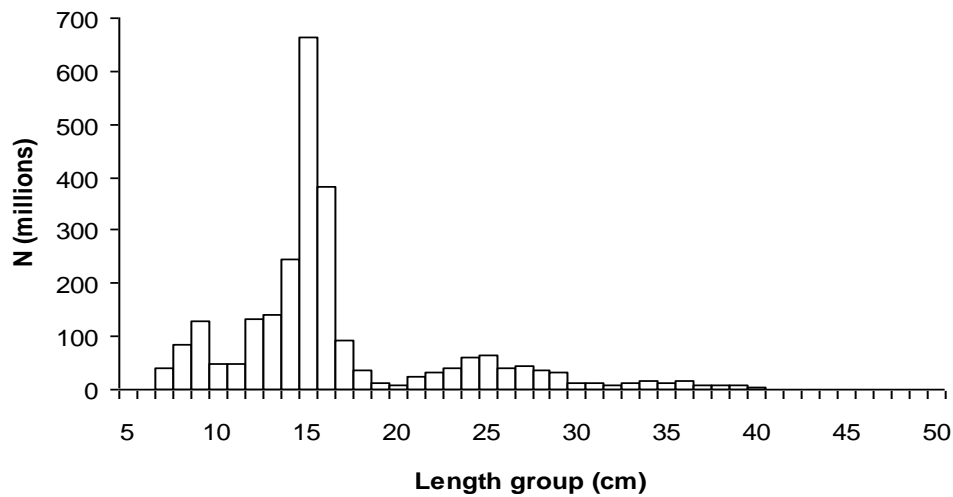


Figure 25 Overall length distribution in numbers of *T. trecae*.

Table 7 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

* not surveyed

† surveyed from Congo River- Pta. das Palmerinhas

5.3 Conclusions

In the present survey the environmental conditions were characterized by strong wind, especially in the southern region and different temperatures as compared with previous years. The range of temperatures encountered in the central and northern regions was 19° to 22°C, (last year: 21° to 25°C), while in the south and in the main area of horse mackerel distribution temperatures were higher (17° to 19°C) compared with 2006 (15° to 16°C).

From the acoustic records it seems that *Sardinella* has a more offshore distribution, which makes the resource more detectable acoustically. The total biomass estimate for sardinellas (726 700 tons) was higher than last year (630 000 tons). During this survey the *S. aurita* has distributed throughout the Angolan coast.

The proportion of biomass of the two species of *Sardinella* showed a different pattern throughout the Angolan coast. *S. aurita* dominates the northern, while *S. maderensis* dominates the central region (54 %)

The total biomass of horse mackerel was estimated at 232 000 tons. The Cunene horse mackerel stock was estimated at 154 000 tons, which is at the level of the biomass estimated in 2006. Cape horse mackerel was found only in the southern region with an estimate biomass of around 74 900 tons. However, the Cunene horse mackerel stock is still far from the levels of the 90's.

The overall length distribution of Cunene horse mackerel was still dominated by fish <30 cm TL. Comparing with last year's overall length distribution, we can notice a more even size distribution and a slight increase in the proportion of individuals >30 cm TL. This size increment is more evident in the north and central regions.

REFERENCES

- HOLDEN, M.J. and D.F.S. RAITT (Eds) 1974 — Manual of fisheries science. Part 2- Methods of resource investigation and their application. FAO Fish. Tech. Pap. **115**(1). 214p.
- MISUND, O. A. and A. AGLLEN 1992 — Swimming behaviour of fish schools in the North Sea during acoustic surveying and pelagic trawl sampling. *ICES J. Mar. Sci.* **49**: 3

ANNEX I Fishing gear used

5.4 Fishing gear

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

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm 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 equipped with a 12" rubber bobbins gear. The doors are of 'Thyborøn' combi type, 7.81 m², 1670 kg. 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 130 m distance from the doors (normally applied at depths greater than 80 m). At depths greater than 300 m the trawl was equipped with a tickler chain, which improves the catchability of bottom living and borrowing species, particularly shrimps.

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

ANNEX II Records of fishing station

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 1
 DATE :7/8/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 4°18.86
 Lon E 11°23.25
 TIME :5:10:31 AM5:41:37 AM31.1 (min)
 LOG : 7228.09 7229.64 1.6
 FDEPTH: 10 0
 BDEPTH: 22 23
 Towing dir: 0° Wire out : 120 m
 Sorted : 69 Total catch: 69.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Carcharhinus sp.	39.39	8	29.57	
Ilisha africana	36.28	973	27.24	4
Trichurus lepturus	20.94	199	15.72	
Sardinella aurita	11.29	62	8.48	1
Brachydeuterus auritus	10.61	270	7.97	3
Chloroscombrus chrysurus	7.33	160	5.51	2
Stromateus fiatola	3.55	12	2.67	
Sphyræna guachancho	2.43	8	1.83	
Pterostion peli	0.81	10	0.61	
Selene dorsalis	0.50	12	0.38	
Aristus varidens	0.06	8	0.04	
Total	133.20		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 2
 DATE :7/8/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 4°26.92
 Lon E 11°28.17
 TIME :7:29:52 AM8:02:00 AM32.1 (min)
 LOG : 7244.37 7246.54 2.2
 FDEPTH: 20 20
 BDEPTH: 33 30
 Towing dir: 0° Wire out : 120 m
 Sorted : 211 Total catch: 211.01

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Carcharhinus sp.	190.63	37	48.36	
Sardinella maderensis	101.25	919	25.69	7
Caranx hippos	63.33	35	16.07	5
Sardinella aurita	20.83	129	5.28	6
Sphyræna sphyraena	12.98	65	3.29	
Trachurus trecae	2.47	17	0.63	8
Ilisha africana	1.98	62	0.50	
Chloroscombrus chrysurus	0.43	6	0.11	
Selene dorsalis	0.28	2	0.07	
Total	394.17		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 3
 DATE :7/9/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 5°42.48
 Lon E 11°51.78
 TIME :6:00:11 PM6:30:53 PM30.7 (min)
 LOG : 7512.83 7514.57 1.7
 FDEPTH: 10 10
 BDEPTH: 61 55
 Towing dir: 0° Wire out : 130 m
 Sorted : 38 Total catch: 38.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	34.39	160	45.81	9
Sardinella aurita	12.50	100	16.66	10
Chloroscombrus chrysurus	11.23	166	14.97	
Micrororvina angolensis	10.16	508	13.53	
Trichurus lepturus	5.63	264	7.50	
Trachurus trecae	0.59	2	0.78	
Lagocephalus laevigatus	0.43	2	0.57	
Brachydeuterus auritus	0.08	4	0.10	
Selene dorsalis	0.06	10	0.08	
Total	75.06		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 4
 DATE :7/10/2007 GEAR TYPE: BT NO: 20 POSITION:Lat S 6°13.02
 Lon E 11°39.92
 TIME :9:41:44 AM10:11:19 AM29.6 (min)
 LOG : 7647.86 7649.34 1.5
 FDEPTH: 118 124
 BDEPTH: 118 124
 Towing dir: 0° Wire out : 330 m
 Sorted : 140 Total catch: 140.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex congongensis	136.36	1456	48.03	12
Dentex angolensis	48.97	280	17.25	13
Spicara alba	38.32	590	13.50	
Zeus faber	15.80	4	5.56	
Trachurus trecae	15.51	197	5.46	11
Lepidotrigla cadmani	11.86	201	4.18	
Brotula barbata	4.85	6	1.71	
Boops boops	2.35	34	0.83	
Ariomma bondi	2.33	36	0.82	
Raja miraletus	1.95	4	0.69	
Octopus vulgaris	1.93	4	0.68	
Sepia orbignyana	1.16	4	0.41	
Citharus linguatula	0.91	6	0.32	
Illex coindetii	0.91	8	0.32	
Monolele microstoma	0.71	12	0.25	
Total	283.92		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 5
 DATE :7/10/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°15.85
 Lon E 12°2.48
 TIME :8:14:52 PM8:44:11 PM29.3 (min)
 LOG : 7730.47 7731.97 1.5
 FDEPTH: 10 10
 BDEPTH: 56 51
 Towing dir: 0° Wire out : 120 m
 Sorted : 2 Total catch: 1.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichurus lepturus	2.58	4	68.11	
Saurida brasiliensis	0.49	266	12.97	
Trachurus trecae	0.31	10	8.11	14
Alloteuthis africana	0.14	37	3.78	
Brachydeuterus auritus	0.10	10	2.70	
Penaeus kerathurus	0.08	141	2.16	
Sepia officinalis hierredda	0.06	49	1.62	
Cynoponticus ferox	0.02	2	0.54	
Selene dorsalis	0.00	2	0.00	
Total	3.79		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 6
 DATE :7/10/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 6°18.72
 Lon E 12°12.98
 TIME :10:09:43 PM10:29:10 PM19.5 (min)
 LOG : 7743.09 7744.08 1.0
 FDEPTH: 0 0
 BDEPTH: 23 24
 Towing dir: 0° Wire out : 133 m
 Sorted : 101 Total catch: 100.71

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	84.22	731	27.11	16
Sphyræna afra	80.21	3	25.82	
Brachydeuterus auritus	68.79	592	22.14	
Sardinella aurita	32.39	142	10.43	15
Ilisha africana	16.81	466	5.41	
Hemirhamphus bifasciatus	16.44	130	5.29	
Sphyræna guachancho	4.16	43	1.34	
Trachurus trecae	3.24	19	1.04	17
Trichurus lepturus	2.93	15	0.94	
Alectis alexandrinus	0.59	3	0.19	
Caranx senegalensis	0.43	3	0.14	
Selene dorsalis	0.31	3	0.10	
Illex coindetii	0.09	3	0.03	
Penaeus notialis	0.06	3	0.02	
Total	310.67		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 7
 DATE :7/11/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 6°29.87
 Lon E 12°18.30
 TIME :9:46:57 AM10:26:17 AM39.3 (min)
 LOG : 7849.11 7851.16 2.1
 FDEPTH: 10 10
 BDEPTH: 27 28
 Towing dir: 0° Wire out : 120 m
 Sorted : 0 Total catch: 100.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	114.84	1389	74.65	
Sardinella maderensis	23.56	410	15.32	18
Sphyræna guachancho	8.92	41	5.80	
Stromateus fiatola	2.87	5	1.86	
Carcharhinus sp.	1.83	2	1.19	
Lichia amia	0.76	2	0.50	
Sardinella aurita	0.67	3	0.44	
Caranx senegalensis	0.38	3	0.25	
Total	153.84		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 8
 DATE :7/11/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°47.84
 Lon E 12°6.45
 TIME :6:46:32 PM7:16:44 PM30.2 (min)
 LOG : 7911.23 7912.73 1.5
 FDEPTH: 10 10
 BDEPTH: 10 79
 Towing dir: 0° Wire out : 130 m
 Sorted : 42 Total catch: 42.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichurus lepturus	27.02	32	32.20	
Euthynnus alletteratus	23.73	20	30.66	19
Trachinotus ovatus	23.25	52	27.70	
Saurida brasiliensis	4.73	1568	5.63	
Alloteuthis africana	3.00	1329	3.57	
Sepia orbignyana	0.12	26	0.14	
Penaeus kerathurus	0.08	203	0.09	
Total	83.92		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 9
 DATE :7/11/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 6°41.34
 Lon E 12°20.13
 TIME :8:53:08 PM9:22:50 PM29.7 (min)
 LOG : 7926.34 7927.82 1.5
 FDEPTH: 10 10
 BDEPTH: 31 26
 Towing dir: 0° Wire out : 137 m
 Sorted : 7 Total catch: 6.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	3.33	44	24.44	
Stromateus fiatola	3.31	4	24.30	
Sardinella maderensis	3.15	22	23.11	20
Sphyræna afra	1.82	4	13.33	
Pagellus bellottii	1.47	8	10.81	
Galeoides decadactylus	0.34	2	2.52	
Pseudupeneus prayensis	0.12	24	0.89	
Penaeus notialis	0.04	4	0.30	
Penaeus kerathurus	0.04	2	0.30	
Total	13.64		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 10
 DATE :7/12/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°7.25
 start stop duration Lon E 12°29.61
 TIME : 8:57:56 AM 11:28:17 AM 30.4 (min) Purpose : 1
 LOG : 8051.04 8052.63 1.6 Region : 4000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 54 59 Validity : 0
 Towing dir: 0° wire out : 120 m Speed : 3.1 kn
 Sorted : 0 Total catch: 2.13 Catch/hour: 4.21

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomberomorus tritor	3.26 2	77.46	
Trachinotus ovatus	0.95 2	22.54	
Total	4.21	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 11
 DATE :7/12/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 7°12.60
 start stop duration Lon E 12°29.68
 TIME : 6:32:12 PM 7:02:05 PM 29.9 (min) Purpose : 1
 LOG : 8105.46 8107.10 1.7 Region : 4000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 72 57 Validity : 0
 Towing dir: 0° wire out : 137 m Speed : 3.3 kn
 Sorted : 58 Total catch: 57.59 Catch/hour: 115.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Decapterus punctatus	57.51 118	49.75	22
Decapterus rhonchus	21.18 18	18.32	21
Trichiurus lepturus	10.84 24	9.38	
Scomberomorus tritor	9.33 4	8.07	
Scomber japonicus	3.47 4	3.00	
Saurida brasiliensis	2.91 1465	2.52	
Alloteuthis africana	2.43 1499	2.10	
Caranx crysos	2.09 2	1.81	
Lagocephalus laevigatus	1.97 4	1.70	
Euthynnus alletteratus	1.81 2	1.56	
Trachinotus ovatus	0.88 2	0.76	
Sardinella maderensis	0.54 2	0.47	
Penaeus kerathurus	0.34 693	0.30	
Pagellus bellottii	0.28 189	0.24	
Septia orbignyana	0.02 2	0.02	
Total	115.60	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 12
 DATE :7/13/2007 GEAR TYPE: PT NO: 20 POSITION:Lat S 7°27.53
 start stop duration Lon E 12°30.51
 TIME : 9:01:50 AM 9:31:36 AM 29.8 (min) Purpose : 1
 LOG : 8197.47 8199.00 1.5 Region : 4000
 FDEPTH: 114 116 Gear cond.: 0
 BDEPTH: 114 116 Validity : 0
 Towing dir: 0° wire out : 345 m Speed : 3.1 kn
 Sorted : 0 Total catch: 272.98 Catch/hour: 550.54

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	212.01 1974	38.51	23
Dentex congensis	125.12 1791	22.73	25
Dentex angolensis	83.01 541	15.08	26
Spicara alta	39.93 637	7.25	
Umbrina canariensis	29.53 198	5.36	24
Lepidotrigla cadmani	22.60 224	4.11	
Brotula barbata	9.87 10	1.79	
Trichiurus lepturus	9.63 10	1.75	
Atractoscion aequidens	8.18 4	1.49	
Illex coindetii	5.08 270	0.92	
Ephippion guttifer	1.60 4	0.29	
Scorpaena angolensis	1.45 14	0.26	
Citharus linguatula	1.02 34	0.18	
Chaetodon hoeferi	0.73 4	0.13	
Boops boops	0.39 10	0.07	
Septia orbignyana	0.34 4	0.06	
Saurida brasiliensis	0.05 4	0.01	
Total	550.54	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 13
 DATE :7/13/2007 GEAR TYPE: PT NO: 20 POSITION:Lat S 7°32.17
 start stop duration Lon E 12°45.54
 TIME : 4:04:43 PM 4:34:57 PM 30.2 (min) Purpose : 1
 LOG : 8244.64 8246.18 1.6 Region : 4000
 FDEPTH: 71 70 Gear cond.: 0
 BDEPTH: 71 70 Validity : 0
 Towing dir: 0° wire out : 210 m Speed : 3.1 kn
 Sorted : 143 Total catch: 142.98 Catch/hour: 283.88

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Selene dorsalis	113.57 252	40.01	
Decapterus rhonchus	48.25 40	17.00	29
Rhinobatos rhinobatos	23.73 6	8.36	
Pagellus bellottii	15.39 349	5.42	28
Rhinobatos albomaculatus	11.22 6	3.95	
Raja miraletus	10.92 14	3.85	
Septia officinalis hierredda	10.42 24	3.67	
Fistularia petimba	7.45 16	2.62	
Zeus faber	6.79 24	2.39	
Octopus vulgaris	6.45 6	2.27	
Raja alba	4.07 2	1.43	
Trichiurus lepturus	3.75 8	1.32	
Trachurus trecae	3.71 8	1.31	
Mustelus mustelus	3.59 2	1.27	27
Stromateus fiatola	2.98 4	1.05	
Illex coindetii	2.86 1539	1.01	
Torpedo torpedo	2.05 4	0.72	
Septia orbignyana	2.05 16	0.72	
Lepidotrigla cadmani	1.91 12	0.67	
Ephippion guttifer	1.75 2	0.62	
Saurida brasiliensis	0.42 129	0.15	
Pseudupeneus prayensis	0.22 2	0.08	
Grammolites gruvelli	0.16 2	0.06	
Syacium micrurum	0.10 16	0.03	
Citharus linguatula	0.10 2	0.03	
Total	283.88	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 14
 DATE :7/18/2007 GEAR TYPE: BT NO: 20 POSITION:Lat S 8°9.67
 start stop duration Lon E 12°54.83
 TIME : 3:02:28 PM 3:33:41 PM 31.2 (min) Purpose : 1
 LOG : 8581.21 8582.92 1.7 Region : 4000
 FDEPTH: 118 118 Gear cond.: 8
 BDEPTH: 118 118 Validity : 4
 Towing dir: 0° wire out : 290 m Speed : 3.3 kn
 Sorted : 0 Total catch: 265.29 Catch/hour: 510.01

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	135.44 310	26.56	30
Umbrina canariensis	105.54 306	20.69	32
Dentex angolensis	104.10 444	20.41	34
Anthias anthias	29.89 154	5.86	
Branchiostegus semifasciatus *	18.55 21	3.64	
Dentex macrophthalmus	16.23 33	3.18	33
Trigla lyra	15.23 104	2.99	
Atractoscion aequidens	13.36 8	2.62	
Squatina oculata	11.82 2	2.32	
Brotula barbata	10.48 12	2.05	
Trachurus trecae	10.34 279	2.03	31
Scorpaena scrofa	7.61 19	1.49	
Torpedo marmorata	5.75 4	1.13	
Trichiurus lepturus	4.73 10	0.93	
Chaetodon hoeferi	4.71 38	0.92	
Plectorhynchus mediterraneus	3.65 2	0.72	
Raja miraletus	3.31 4	0.65	
Dentex barnardi	2.48 8	0.49	
Zeus faber	1.56 4	0.31	
Scomber japonicus	0.94 2	0.18	
Scorpaena sp	0.81 4	0.16	
Citharus linguatula	0.67 13	0.13	
Uranoscopus cadenati	0.62 2	0.12	
Septia officinalis hierredda	0.60 4	0.12	
Sardinella aurita	0.42 2	0.08	
Parapandalus narval	0.39 100	0.06	
Loligo vulgaris	0.27 15	0.05	
Illex coindetii	0.25 31	0.05	
Todaropsis eblanae	0.19 10	0.04	
Saurida brasiliensis	0.17 33	0.03	
Total	510.01	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 15
 DATE :7/18/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°7.71
 start stop duration Lon E 13°12.62
 TIME : 6:49:01 PM 7:06:34 PM 17.5 (min) Purpose : 1
 LOG : 8609.59 8610.72 1.1 Region : 4000
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 23 23 Validity : 0
 Towing dir: 0° wire out : 120 m Speed : 3.8 kn
 Sorted : 67 Total catch: 407.63 Catch/hour: 1394.40

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardinella maderensis	796.35 5357	57.11	35
Ilisha africana	222.69 11432	15.97	36
Trichiurus lepturus	131.97 4228	9.46	
Sardinella maderensis	95.44 15106	6.84	38
Sphyræna guachancho	47.41 308	3.40	
Brachydeuterus auritus	37.35 2066	2.68	37
Stromateus fiatola	19.70 21	1.41	
Sardinella aurita	12.93 41	0.93	
Pteroscion pelli	12.31 123	0.88	
Ephippion guttifer	9.61 3	0.69	
Galeoides decadactylus	7.39 62	0.53	
Engraulis encrasicolus	1.23 616	0.09	
Total	1394.40	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 16
 DATE :7/19/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 8°17.25
 start stop duration Lon E 12°51.35
 TIME : 12:38:15 AM 12:49:04 AM 10.8 (min) Purpose : 1
 LOG : 8648.74 8649.23 0.5 Region : 4000
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 206 195 Validity : 0
 Towing dir: 0° wire out : 150 m Speed : 2.7 kn
 Sorted : 0 Total catch: 166.60 Catch/hour: 923.84

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	459.34 1081	49.73	40
MYCTOPHIDAE	179.94 212856	19.48	
Trichiurus lepturus	172.74 555	18.70	39
Scomber japonicus	111.74 244	12.09	41
Total	923.84	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 17
 DATE :7/19/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 8°35.67
 start stop duration Lon E 13°16.09
 TIME : 4:18:29 PM 4:48:23 PM 29.9 (min) Purpose : 1
 LOG : 8785.86 8787.55 1.7 Region : 4000
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 48 56 Validity : 0
 Towing dir: 0° wire out : 180 m Speed : 3.4 kn
 Sorted : 0 Total catch: 227.05 Catch/hour: 455.62

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Alopias superciliosus	401.34 2	88.09	
Sardinella aurita	33.01 146	7.25	42
Brachydeuterus auritus	21.17 120	4.65	43
Echeneis naucrates	0.10 2	0.02	
Total	455.62	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 18
 DATE :7/20/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°36.53
 start stop duration Lon E 13°2.20
 TIME : 7:20:08 PM 7:57:25 PM 37.3 (min) Purpose : 1
 LOG : 8805.42 8807.70 2.3 Region : 4000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 132 128 Validity : 0
 Towing dir: 0° wire out : 150 m Speed : 3.7 kn
 Sorted : 0 Total catch: 285.40 Catch/hour: 459.46

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	424.20 918	92.33	44
Sardinella aurita	12.65 23	2.75	45
Trichiurus lepturus	12.59 23	2.74	
Trachurus trecae	3.82 103	0.83	46
Sardinella maderensis	3.59 14	0.78	47
Trachinotus ovatus	1.27 3	0.28	
Scomber japonicus	0.87 2	0.19	
Synagrops microlepis	0.47 45	0.10	
Total	459.46	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 19
 DATE :/7/19/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 8°39.62
 start stop duration Lon E 12°58.16
 TIME :11:16:36 PM11:46:33 PM30.0 (min) Purpose : 1
 LOG : 8823.92 8825.48 1.6 Region : 4000
 FDEPTH: 250 253 Gear cond.: 0
 BDEPTH: 250 253 Validity : 0
 Towing dir: 0° wire out : 620 m Speed : 3.1 kn
 Sorted : 0 Total catch: 203.98 Catch/hour: 408.64

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 23
 DATE :/7/21/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 9°33.59
 start stop duration Lon E 12°48.85
 TIME :3:55:38 PM4:25:16 PM29.6 (min) Purpose : 1
 LOG : 9126.71 9128.36 1.7 Region : 4000
 FDEPTH: 132 132 Gear cond.: 0
 BDEPTH: 132 132 Validity : 0
 Towing dir: 0° wire out : 360 m Speed : 3.3 kn
 Sorted : 0 Total catch: 675.17 Catch/hour: 1367.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brotula barbata	145.84	118	35.69	50
Merluccius polli	101.97	321	24.95	49
Dentex angolensis	65.11	152	15.93	48
Squalus megalops	39.07	10	9.56	
Hoplostethus mediterraneus	30.25	46	7.40	
Bembrops heterurus	8.81	104	2.16	
Pterothrissus belloci	3.15	18	0.77	
Dentex macrophthalmus	2.96	6	0.73	
Trichiurus lepturus	2.54	4	0.62	
Torpedo torpedo	1.78	2	0.44	
Pontinus kuhlii	1.42	18	0.35	
Miracorvina angolensis	1.30	4	0.32	
Lepidotrigla cadmani	1.28	22	0.31	
Epigonus telescopus	0.84	8	0.21	
Physiculus sp.	0.64	6	0.16	
Mystriophis rostellatus	0.50	4	0.12	
Chlorophthalmus atlanticus	0.30	10	0.07	
Monolene microstoma	0.22	10	0.05	
Malacocephalus occidentalis	0.18	4	0.04	
Synagrops microlepis	0.16	24	0.04	
Parapanaeus longirostris	0.16	34	0.04	
Nezumia aequalis	0.08	4	0.02	
Haploblepharus edwardsii	0.06	2	0.01	
Total	408.64		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	857.48	1968	62.72	59
Dentex macrophthalmus	120.89	437	8.84	61
Umbirina canariensis	104.79	213	7.66	62
Dentex angolensis	92.93	237	6.80	60
Brotula barbata	69.56	55	5.09	
Trichiurus lepturus	34.02	30	2.49	
Pterothrissus belloci	17.25	91	1.26	
Zenopsis conchifer	14.03	6	1.03	
Raja miraletus	9.66	12	0.71	
Branchiostegus semifasciatus *	9.52	12	0.70	
Bembrops heterurus	8.75	97	0.64	
Scorpaena normani	6.38	24	0.47	
Monolene microstoma	4.13	134	0.30	
Uranoscopus polli	4.13	24	0.30	
Octopus vulgaris	3.95	6	0.29	
Trigla lyra	2.43	12	0.18	
Anthias anthias	1.88	18	0.14	
Lophiodes kempii	1.82	12	0.13	
Sardinella aurita	1.34	6	0.10	
Peristedion cataphractum	1.34	18	0.10	
Citharus linguatula	0.49	6	0.04	
Illex coindetii	0.30	6	0.02	
Parapanaeus longirostris	0.12	30	0.01	
Total	1367.20		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 20
 DATE :/7/20/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 9°11.61
 start stop duration Lon E 12°56.26
 TIME :11:29:35 PM11:57:05 PM27.5 (min) Purpose : 1
 LOG : 8992.34 8994.01 1.7 Region : 4000
 FDEPTH: 13 13 Gear cond.: 0
 BDEPTH: 20 22 Validity : 0
 Towing dir: 0° wire out : 180 m Speed : 3.6 kn
 Sorted : 165 Total catch: 430.20 Catch/hour: 938.62

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 24
 DATE :/7/21/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 9°27.90
 start stop duration Lon E 12°59.72
 TIME :6:20:54 PM6:40:35 PM19.7 (min) Purpose : 1
 LOG : 9143.87 9145.17 1.3 Region : 4000
 FDEPTH: 0 10 Gear cond.: 0
 BDEPTH: 52 54 Validity : 0
 Towing dir: 0° wire out : 150 m Speed : 4.0 kn
 Sorted : 0 Total catch: 1322.19 Catch/hour: 4031.07

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	524.44	3515	55.87	52
Sardinella aurita	248.18	1180	26.44	53
Ilisha africana	47.43	631	5.05	
Trachurus trecae	43.11	919	4.59	54
Brachydeuterus auritus	34.60	607	3.69	51
Trichiurus lepturus	22.76	1078	2.42	
Sphyræna sphyraena	5.61	107	0.60	
Decapterus rhonchus	5.11	63	0.54	
Selene dorsalis	2.73	46	0.29	
Synagrops microlepis	1.59	28	0.17	
Chloroscombrus chrysurus	0.96	11	0.10	
Pomadasy incisus	0.74	7	0.08	
Eucinostomus melanopterus	0.68	11	0.07	
Lepidotrigla cadmani	0.68	11	0.07	
Total	938.62		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	3249.60	12723	80.61	63
Sphyræna guachancho	305.18	595	7.57	
Brachydeuterus auritus	182.32	1942	4.52	65
Trachurus trecae	97.90	595	2.43	66
Caranx crysos	78.48	119	1.95	
Sardinella maderensis	76.52	317	1.90	64
Alectis alexandrinus	23.63	52	0.59	
Decapterus rhonchus	17.44	40	0.43	
Total	4031.07		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 21
 DATE :/7/21/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 9°19.06
 start stop duration Lon E 12°55.98
 TIME :6:34:30 AM7:03:07 AM28.6 (min) Purpose : 1
 LOG : 9053.43 9055.83 2.4 Region : 4000
 FDEPTH: 49 46 Gear cond.: 0
 BDEPTH: 49 46 Validity : 0
 Towing dir: 0° wire out : 160 m Speed : 5.0 kn
 Sorted : 118 Total catch: 1152.05 Catch/hour: 2415.20

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 25
 DATE :/7/22/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°41.13
 start stop duration Lon E 13°0.26
 TIME :4:23:18 AM4:44:14 AM20.9 (min) Purpose : 1
 LOG : 9219.15 9220.24 1.1 Region : 4000
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 89 96 Validity : 0
 Towing dir: 0° wire out : 150 m Speed : 3.1 kn
 Sorted : 92 Total catch: 394.31 Catch/hour: 1130.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	2078.78	25059	86.07	55
Trachurus trecae	126.12	1084	5.22	56
Selene dorsalis	57.23	860	2.37	
Pagellus bellottii	48.85	512	2.02	
Pseudotolithus typus	24.74	42	1.02	
Raja miraletus	14.32	21	0.59	
Septia officinalis hierredda	9.41	21	0.39	
Grammolites gruvelli	8.89	205	0.37	
Pomadasy incisus	6.96	42	0.29	
Umbirina canariensis	6.96	42	0.29	
Trichiurus lepturus	6.14	224	0.25	
Bothus sp.	5.93	42	0.25	
Dentex barnardi	5.72	42	0.24	
Zeus faber	4.70	21	0.19	
Chloroscombrus chrysurus	3.69	21	0.15	
Seiara crumenophthalmus	3.48	21	0.14	
Citharus linguatula	3.27	143	0.14	
Total	2415.20		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1024.36	4400	90.62	67
Brachydeuterus auritus	45.98	358	4.07	68
Trachurus trecae	16.02	396	1.42	69
Trichiurus lepturus	14.05	46	1.24	
Selene dorsalis	8.74	37	0.77	
Caranx hippos	7.28	11	0.64	
Illex coindetii	7.14	3796	0.63	
Saurida brasiliensis	6.79	1763	0.60	
Total	1130.37		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 22
 DATE :/7/21/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 9°16.42
 start stop duration Lon E 12°54.82
 TIME :8:43:10 AM9:12:28 AM29.3 (min) Purpose : 1
 LOG : 9068.92 9070.65 1.7 Region : 4000
 FDEPTH: 10 0 Gear cond.: 0
 BDEPTH: 46 47 Validity : 0
 Towing dir: 0° wire out : 150 m Speed : 3.5 kn
 Sorted : 100 Total catch: 729.61 Catch/hour: 1494.08

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 26
 DATE :/7/22/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 9°56.51
 start stop duration Lon E 12°55.50
 TIME :2:52:35 PM3:17:52 PM25.3 (min) Purpose : 1
 LOG : 9295.73 9297.23 1.5 Region : 4000
 FDEPTH: 119 119 Gear cond.: 0
 BDEPTH: 119 119 Validity : 0
 Towing dir: 0° wire out : 300 m Speed : 3.5 kn
 Sorted : 0 Total catch: 316.20 Catch/hour: 750.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	967.17	3692	64.73	57
Sardinella maderensis	454.40	2631	30.41	58
Caranx crysos	66.53	76	4.45	
Trachinotus ovatus	5.98	14	0.40	
Total	1494.08		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	515.98	13761	68.75	70
Anthias anthias	86.51	674	11.53	
Dentex angolensis	80.29	330	10.70	71
Boops boops	11.44	62	1.52	
Branchiostegus semifasciatus *	8.90	7	1.19	
Lepidotrigla cadmani	7.05	47	0.94	
Gephyroberyx darwini	6.88	5	0.92	
Dentex macrophthalmus	6.27	24	0.83	
Arctoscopus aequidens	4.15	2	0.55	
Erythrocles monodi	3.70	9	0.49	
Zeus faber	2.58	7	0.34	
Octopus vulgaris	2.30	2	0.31	
Scorpaena scrofa	1.80	2	0.24	
Pagellus bellottii	1.80	7	0.24	
Sphoeroides pachgaster	1.69	2	0.22	
Raja miraletus	1.64	2	0.22	
Dentex barnardi	1.64	7	0.22	
Septia orbignyana	1.40	17	0.19	
Arionomus bondi	1.33	17	0.18	
Citharus linguatula	1.09	17	0.15	
Spicara alta	0.95	5	0.13	
Uranoscopus cadenati	0.64	2	0.09	
Illex coindetii	0.62	31	0.08	
Loligo vulgaris	0.40	7	0.05	
Total	751.07		100.08	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 27
 DATE :7/22/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 9°54.59
 start stop duration Lon E 13°11.90
 TIME : 8:54:11 PM9:09:58 PM15.8 (min) Purpose : 1
 LOG : 9332.39 9333.53 1.1 Region : 4000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 32 38 Validity : 0
 Towing dir: 0° wire out : 160 m Speed : 4.3 kn
 Sorted : 60 Total catch: 178.15 Catch/hour: 677.38

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	521.29	17076	76.96	72
Sardinella maderensis	75.29	456	11.11	74
Trachurus trecae	58.75	1038	8.67	73
Trichurus lepturus	9.13	46	1.35	
Pagellus bellottii	5.13	34	0.76	
Pomadasyd incisus	4.56	23	0.67	
Selene dorsalis	1.14	8	0.17	
Pteroscion peli	0.57	11	0.08	
Penaeus notialis	0.57	11	0.08	
Sphyræna guachancho	0.57	11	0.08	
Ilisha africana	0.38	34	0.06	
Total		677.38	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 28
 DATE :7/24/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 10°8.06
 start stop duration Lon E 13°0.00
 TIME : 8:07:21 AM8:13:16 AM5.9 (min) Purpose : 1
 LOG : 9557.24 9557.56 0.3 Region : 4000
 FDEPTH: 109 110 Gear cond.: 8
 BDEPTH: 109 110 Validity : 4
 Towing dir: 0° wire out : 310 m Speed : 3.3 kn
 Sorted : 0 Total catch: 69.05 Catch/hour: 699.83

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Trachurus trecae	367.40	13145	52.50	75
Dentex congoensis	105.41	476	15.06	76
Lepidotrigla cadmani	81.59	1003	11.66	
Squatina oculata	72.47	41	10.35	
Scorpaena normani	22.40	274	3.20	
Citharus linguatula	11.45	517	1.64	
Uranoscopus cadenati	7.20	51	1.03	
Raja miraletus	7.09	10	1.01	
Trachurus trecae	4.06	10	0.61	
Dentex angolensis	3.95	20	0.56	
Sepia officinalis hierredda	3.14	41	0.45	
Octopus vulgaris	2.94	10	0.42	
Boops boops	2.23	30	0.32	
Monolene microstoma	1.82	71	0.26	
Microchirus frechkopi	1.82	20	0.26	
Illex coindetii	1.72	20	0.25	
Spicara alta	1.52	10	0.22	
Ariomma bondi	1.42	10	0.20	
Total		699.83	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 29
 DATE :7/24/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 10°7.91
 start stop duration Lon E 12°59.83
 TIME : 9:20:07 AM9:32:04 AM12.0 (min) Purpose : 1
 LOG : 9562.67 9563.22 0.6 Region : 4000
 FDEPTH: 109 110 Gear cond.: 3
 BDEPTH: 109 110 Validity : 3
 Towing dir: 0° wire out : 310 m Speed : 2.7 kn
 Sorted : 0 Total catch: 288.56 Catch/hour: 1448.84

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Trachurus trecae	619.08	22082	42.73	77
Dentex congoensis	271.13	3660	18.71	78
Lepidotrigla cadmani	256.07	2305	17.67	
Squatina oculata	85.86	30	5.93	
Raja miraletus	39.01	45	2.69	
Sarda sarda	38.11	30	2.63	
Lagocephalus laevigatus	24.25	45	1.67	
Torpedo torpedo	16.12	30	1.11	
Zeus faber	15.36	60	1.06	
Dentex angolensis	14.61	121	1.01	
Citharus linguatula	11.75	452	0.81	
Spicara alta	11.60	181	0.80	
Scorpaena normani	11.15	136	0.77	
Pagellus bellottii	9.19	75	0.63	
Sepia officinalis hierredda	8.74	60	0.60	
Sepia orbignyana	5.42	105	0.37	
Ariomma bondi	2.71	30	0.19	
Uranoscopus cadenati	2.51	30	0.17	
Microchirus frechkopi	2.11	45	0.15	
Pterothrissus belloci	1.36	15	0.09	
Boops boops	1.36	15	0.09	
Monolene microstoma	1.21	75	0.08	
Blennius normani	0.15	30	0.01	
Total		1448.84	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 30
 DATE :7/24/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 10°0.70
 start stop duration Lon E 13°15.17
 TIME : 11:51:14 AM12:16:59 PM25.8 (min) Purpose : 1
 LOG : 9582.05 9583.72 1.7 Region : 4000
 FDEPTH: 10 10 Gear cond.: 1
 BDEPTH: 21 34 Validity : 3
 Towing dir: 0° wire out : 150 m Speed : 3.9 kn
 Sorted : 143 Total catch: 285.60 Catch/hour: 665.48

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella aurita	623.07	2754	93.63	79
Sardinella maderensis	40.31	284	6.06	80
Lepidotrigla cadmani	2.10	14	0.32	
Total		665.48	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 31
 DATE :7/24/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 10°5.85
 start stop duration Lon E 13°12.39
 TIME : 2:40:04 PM3:10:12 PM30.1 (min) Purpose : 1
 LOG : 9602.04 9603.60 1.6 Region : 4000
 FDEPTH: 62 59 Gear cond.: 0
 BDEPTH: 62 59 Validity : 0
 Towing dir: 0° wire out : 165 m Speed : 3.1 kn
 Sorted : 0 Total catch: 143.75 Catch/hour: 286.25

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Trachurus trecae	52.57	0	18.37	82
Pagellus bellottii	46.30	0	16.17	81
Trachurus trecae	33.26	169	11.62	83
Lepidotrigla cadmani	32.76	0	11.44	
Squatina oculata	25.19	6	8.80	
Brachydeuterus auritus	14.94	133	5.22	
Zeus faber	14.06	20	4.91	
Raja miraletus	13.12	18	4.58	
Selene dorsalis	8.98	64	3.14	
Pseudupeneus prayensis	7.88	78	2.75	
Dentex barnardi	5.74	6	2.00	
Sepia orbignyana	4.28	38	1.50	
Alloteuthis africana	3.82	0	1.34	
Grammoplites gruvelli	3.15	78	1.10	
Torpedo marmorata	2.19	4	0.77	
Epinephelus aeneus	2.19	2	0.77	
FISTULARIIDAE	2.09	4	0.73	
Boops boops	1.69	14	0.59	
Citharus linguatula	1.63	84	0.57	
Umbriina canariensis	1.55	10	0.54	
Lepidotrigla carolae	1.53	44	0.54	
Serranus accraensis	1.37	26	0.48	
Brotila barbata	1.06	8	0.37	
Torpedo torpedo	1.00	2	0.35	
Dentex angolensis	0.98	26	0.34	
Sphyræna guachancho	0.98	4	0.34	
Octopus vulgaris	0.88	2	0.31	
Branchiostegus semifasciatus *	0.80	2	0.28	
Saurida brasiliensis	0.30	74	0.10	
Blennius normani	0.08	2	0.03	
Microchirus frechkopi	0.08	2	0.03	
Total		286.43	100.06	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 32
 DATE :7/24/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°5.32
 start stop duration Lon E 13°12.82
 TIME : 4:33:47 PM5:16:36 PM42.8 (min) Purpose : 1
 LOG : 9610.78 9612.90 2.1 Region : 4000
 FDEPTH: 10 10 Gear cond.: 1
 BDEPTH: 56 60 Validity : 3
 Towing dir: 0° wire out : 160 m Speed : 3.0 kn
 Sorted : 0 Total catch: 30.87 Catch/hour: 43.26

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella maderensis	41.34	213	95.56	84
Sardinella aurita	1.47	6	3.40	85
Trachinotus ovatus	0.45	1	1.04	
Total		43.26	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 33
 DATE :7/24/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°18.42
 start stop duration Lon E 12°55.23
 TIME : 8:20:57 PM8:30:59 PM10.0 (min) Purpose : 1
 LOG : 9636.47 9637.14 0.7 Region : 4000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 500 499 Validity : 0
 Towing dir: 0° wire out : 140 m Speed : 4.0 kn
 Sorted : 0 Total catch: 73.10 Catch/hour: 437.29

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	437.29	355472	100.00	
Total		437.29	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 34
 DATE :7/24/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 10°12.00
 start stop duration Lon E 13°17.62
 TIME : 11:38:37 PM12:10:12 AM31.6 (min) Purpose : 1
 LOG : 9665.65 9667.66 2.0 Region : 4000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 56 69 Validity : 0
 Towing dir: 0° wire out : 150 m Speed : 3.8 kn
 Sorted : 0 Total catch: 125.16 Catch/hour: 237.72

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella maderensis	128.96	741	54.25	88
Trachurus trecae	47.10	1335	19.81	86
Brachydeuterus auritus	25.26	334	10.63	
Selene dorsalis	23.36	205	9.83	
Trichurus lepturus	4.67	11	1.97	
Sardinella aurita	3.08	49	1.29	87
MYCTOPHIDAE	1.63	1383	0.69	
Sarda sarda	1.61	2	0.68	
Alloteuthis africana	0.99	368	0.42	
Saurida brasiliensis	0.49	125	0.21	
Sphyræna guachancho	0.47	2	0.20	
Bregmaceros atlanticus	0.11	53	0.05	
Total		237.76	100.02	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 35
 DATE :7/25/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 10°10.84
 TIME :1:55:36 AM2:25:55 AM30.3 (min) Lon E 13°24.49
 LOG : 9681.14 9683.15 2.0
 FDEPTH: 10 10
 BDEPTH: 22 21
 Towing dir: 0° wire out : 156 m
 Sorted : 0 Total catch: 916.85

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 40
 DATE :7/26/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 10°32.83
 TIME :3:49:33 AM4:08:54 AM19.4 (min) Lon E 13°37.66
 LOG : 9867.57 9868.70 1.1
 FDEPTH: 24 23
 BDEPTH: 24 23
 Towing dir: 0° wire out : 100 m
 Sorted : 0 Total catch: 213.21

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	862.51	19749	47.55	
Sardinella aurita	424.53	2309	23.41	91
Sardinella maderensis	169.93	3456	9.37	
Ilisha africana	106.13	1234	5.85	
Sepia orbignyana	88.19	71	4.86	
Galeoides decadactylus	69.55	1019	3.83	
Trachurus trecae	68.11	1822	3.76	89
Trichiurus lepturus	9.89	144	0.55	
Sphyræna guachancho	5.16	44	0.28	
Decapterus rhonchus	3.11	14	0.17	
Chloroscombrus chrysurus	2.29	14	0.13	
Ilisha africana	2.14	530	0.12	0
Lagocephalus laevigatus	0.87	14	0.05	
Penaeus notialis	0.85	14	0.05	
Eucinostomus melanopterus	0.57	14	0.03	
Total	1813.75		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	339.07	583	51.29	
Sepia orbignyana	94.88	93	14.35	
Galeoides decadactylus	73.02	1237	11.05	
Arius parkii	31.16	195	4.71	
Sardinella maderensis	29.95	195	4.53	104
Pteroscion pelli	24.09	1014	3.64	
Cynoglossus senegalensis	18.51	28	2.80	
Pomadasyus incisus	17.02	177	2.57	
Dicologlossa cuneata	7.81	158	1.18	
Trichiurus lepturus	6.05	186	0.91	
Pseudotolithus senegalensis	5.67	28	0.86	
Sphyræna guachancho	4.19	19	0.63	
Penaeus notialis	4.00	586	0.61	
Trachurus trecae	2.14	34	0.32	103
Sardinella aurita	1.58	447	0.24	
Torpedo sp.	1.30	9	0.20	
Penaeus kerathurus	0.47	6	0.07	
Alectis alexandrinus	0.19	9	0.03	
Total	661.12		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 36
 DATE :7/25/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 10°24.31
 TIME :12:13:44 PM12:43:31 PM29.8 (min) Lon E 13°12.17
 LOG : 9748.80 9750.27 1.5
 FDEPTH: 111 110
 BDEPTH: 111 110
 Towing dir: 0° wire out : 280 m
 Sorted : 0 Total catch: 114.68

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 41
 DATE :7/26/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 10°49.98
 TIME :10:11:34 AM10:41:47 AM30.2 (min) Lon E 13°28.09
 LOG : 9922.44 9923.84 1.4
 FDEPTH: 143 138
 BDEPTH: 143 138
 Towing dir: 0° wire out : 450 m
 Sorted : 149 Total catch: 509.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macropthalmus	113.23	81	49.01	93
Umbrina canariensis	40.80	169	17.66	
Trachurus trecae	39.79	1408	17.22	92
Spicara alta	10.68	151	4.62	
Trichiurus lepturus	7.05	10	3.05	
Dentex angolensis	5.14	60	2.22	
Lepidotrigla cadmani	4.57	46	1.98	
Dentex congoensis	2.68	28	1.16	
Zeus faber	1.61	6	0.70	
Boops boops	1.35	24	0.58	
Brotula barbata	1.25	2	0.54	
Scorpaena normani	1.15	24	0.50	
Lagocephalus laevigatus	0.83	4	0.36	
Citharus linguatula	0.60	22	0.26	
Todaropsis eblanae	0.14	8	0.06	
Microchirus frechskopi	0.12	2	0.05	
Sepia orbignyana	0.06	2	0.03	
Total	231.05		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	623.54	2024	61.72	105
Trichiurus lepturus	129.57	458	12.82	
Dentex macropthalmus	85.70	371	8.48	106
Dentex angolensis	75.24	290	7.45	107
Bembrops heterurus	18.28	310	1.81	
Torpedo marmorata	17.41	6	1.72	
Pterothrissus belloci	15.32	101	1.52	
Atractoscion aequidens	9.84	6	0.97	
Octopus vulgaris	6.83	4	0.68	
Monoleme microstoma	6.01	216	0.60	
Todaropsis eblanae	5.80	189	0.57	
Zeus faber	4.05	14	0.40	
Sepia orbignyana	3.65	20	0.36	
Lepidotrigla cadmani	3.10	20	0.31	
Uranoscopus cadenati	1.83	14	0.18	
Umbrina canariensis	1.63	6	0.16	
Peristedion cataphractum	0.81	14	0.08	
Citharus linguatula	0.62	6	0.06	
C R A B S	0.54	20	0.05	
Pontinus accraensis	0.54	6	0.05	
Total	1010.29		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 37
 DATE :7/25/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°22.93
 TIME :2:38:35 PM3:13:26 PM34.9 (min) Lon E 13°20.33
 LOG : 9764.00 9766.07 2.1
 FDEPTH: 0 60
 BDEPTH: 78 76
 Towing dir: 0° wire out : 180 m
 Sorted : 0 Total catch: 3.75

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 42
 DATE :7/26/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 10°41.16
 TIME :1:20:03 PM1:48:47 PM28.7 (min) Lon E 13°39.04
 LOG : 9943.71 9945.66 2.0
 FDEPTH: 47 47
 BDEPTH: 47 47
 Towing dir: 0° wire out : 150 m
 Sorted : 0 Total catch: 12.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sarda sarda	3.43	5	53.07	
Sardinella maderensis	2.62	12	40.53	94
J E L L Y F I S H	0.41	12	6.40	
Total	6.46		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	20.15	102	80.42	108
Trachinotus ovatus	2.65	13	10.58	
Mugil cephalus	2.13	2	8.50	
Sepia officinalis hierreda	0.13	6	0.50	
Total	25.05		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 38
 DATE :7/25/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°19.04
 TIME :5:05:11 PM5:35:05 PM29.9 (min) Lon E 13°28.02
 LOG : 9780.18 9781.99 1.8
 FDEPTH: 15 15
 BDEPTH: 27 36
 Towing dir: 0° wire out : 150 m
 Sorted : 0 Total catch: 265.05

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 43
 DATE :7/26/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 10°39.78
 TIME :2:22:21 PM2:53:51 PM31.5 (min) Lon E 13°37.89
 LOG : 9947.24 9948.88 1.6
 FDEPTH: 48 47
 BDEPTH: 48 47
 Towing dir: 0° wire out : 150 m
 Sorted : 0 Total catch: 485.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	435.81	3355	81.94	95
Brachydeuterus auritus	41.16	660	7.74	97
Trachurus trecae	25.36	720	4.77	98
Sardinella maderensis	15.69	110	2.95	96
Trichiurus lepturus	5.68	18	1.07	
Raja miraletus	2.65	4	0.50	
Ilisha africana	1.75	22	0.33	
Sphyræna guachancho	1.67	4	0.31	
Lagocephalus laevigatus	1.20	4	0.23	
Chloroscombrus chrysurus	0.90	4	0.17	
Total	531.87		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	493.81	11333	53.45	
Trichiurus lepturus	105.24	724	11.39	
Pomadasyus incisus	67.62	371	7.32	
Sepia orbignyana	62.86	105	6.80	
Raja miraletus	44.76	57	4.85	
Pagellus bellottii	38.19	229	4.13	109
Uranoscopus canariensis	18.86	105	2.04	
Gammoplites gruvelli	14.76	305	1.60	
Pteroscion pelli	13.24	114	1.43	
Mitracorvina angolensis	11.05	19	1.20	
Trachurus trecae	10.29	55	1.11	110
Citharus linguatula	9.14	314	0.99	
Dicologlossa cuneata	7.43	29	0.80	
Chelidonichthys gabonensis	6.67	48	0.72	
Torpedo torpedo	6.38	19	0.69	
Lagocephalus laevigatus	3.62	10	0.39	
Zeus faber	2.95	10	0.32	
Pterothrissus belloci	2.57	29	0.28	
Serranus accraensis	1.05	57	0.11	
Penaeus notialis	1.05	10	0.11	
Brotula barbata	0.86	10	0.09	
Squilla mantis	0.67	67	0.07	
Todaropsis eblanae	0.48	10	0.05	
Pontinus accraensis	0.29	10	0.03	
Total	923.81		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 39
 DATE :7/25/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°28.53
 TIME :8:29:58 PM9:00:57 PM31.0 (min) Lon E 13°22.85
 LOG : 9805.36 9807.04 1.8
 FDEPTH: 35 40
 BDEPTH: 81 79
 Towing dir: 0° wire out : 150 m
 Sorted : 0 Total catch: 234.34

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	213.62	999	47.07	99
Brachydeuterus auritus	153.39	1468	33.80	101
Trachurus trecae	78.24	387	17.24	100
Trachurus trecae	4.69	132	1.03	102
Trichiurus lepturus	2.56	8	0.56	
Sardinella aurita	0.85	4	0.19	
Saurida brasiliensis	0.31	81	0.07	
Boops boops	0.19	4	0.04	
Total	453.85		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 44
 DATE :7/27/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°59.69
 start stop duration Lon E 13°49.12
 TIME :2:49:36 AM3:07:57 AM18.4 (min) Purpose : 1
 LOG : 25.76 26.84 1.1 Region : 4000
 FDEPTH: 13 13 Gear cond.: 1
 BDEPTH: 35 33 Validity : 3
 Towing dir: 0° Wire out : 160 m Speed : 3.5 kn
 Sorted : 56 Total catch: 179.92 Catch/hour: 588.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	247.19	1677	42.02	112
Sardinella aurita	208.94	1089	35.52	113
Trichiurus lepturus	88.77	324	15.09	
Pomadasys peroteti	21.91	23	3.72	
Sepia orbignyana	11.80	7	2.01	
Brachydeuterus auritus	8.14	88	1.38	
Trachurus trecae	1.54	23	0.26	111
Total	588.29		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 45
 DATE :7/27/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°7.99
 start stop duration Lon E 13°40.02
 TIME :8:33:40 AM8:59:12 AM25.5 (min) Purpose : 1
 LOG : 70.73 72.57 1.8 Region : 4000
 FDEPTH: 24 21 Gear cond.: 3
 BDEPTH: 101 114 Validity : 9
 Towing dir: 0° Wire out : 125 m Speed : 4.3 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 46
 DATE :7/27/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 11°6.85
 start stop duration Lon E 13°37.09
 TIME :9:45:02 AM10:13:09 AM28.1 (min) Purpose : 1
 LOG : 76.72 78.14 1.4 Region : 4000
 FDEPTH: 129 128 Gear cond.: 1
 BDEPTH: 129 128 Validity : 3
 Towing dir: 0° Wire out : 400 m Speed : 3.0 kn
 Sorted : 49 Total catch: 368.73 Catch/hour: 786.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	357.27	1130	45.43	116
Dentex macrophthalmus	212.70	1105	27.04	115
Dentex angolensis	43.32	205	5.51	114
Saurida brasiliensis	39.46	47	5.02	
Uranoscopus cadenati	22.65	173	2.88	
Brotula barbata	18.98	21	2.41	
Trichiurus lepturus	18.94	38	2.41	
Pontinus accraensis	12.31	94	1.56	
Zeus faber	11.99	15	1.52	
Octopus vulgaris	11.20	11	1.42	
Pterothrissus belloci	7.51	55	0.95	
Raja alba	6.40	2	0.81	
Bemdrops heterurus	5.06	111	0.64	
Dentex barnardi	4.97	15	0.63	
Atractoscion aequidens	4.50	2	0.57	
Citharus linguatula	4.35	109	0.55	
Lepidotrigla cadmani	3.86	32	0.49	
Todaropsis eblanae	0.47	15	0.06	
Serranus sp.	0.32	23	0.04	
Parapenaeus longirostris	0.23	23	0.03	
Total	786.48		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 47
 DATE :7/28/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°19.92
 start stop duration Lon E 13°34.60
 TIME :2:06:51 AM2:31:51 AM25.0 (min) Purpose : 1
 LOG : 219.51 221.18 1.7 Region : 4000
 FDEPTH: 28 28 Gear cond.: 1
 BDEPTH: 53 120 Validity : 3
 Towing dir: 0° Wire out : 100 m Speed : 4.0 kn
 Sorted : 175 Total catch: 421.38 Catch/hour: 1011.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	636.19	3305	62.91	118
Sardinella maderensis	271.58	1406	26.85	117
MYCTOPHIDAE	74.02	40090	7.32	
Brachydeuterus auritus	10.20	110	1.01	
Sphyræna guachancho	7.03	24	0.70	
Trichiurus lepturus	6.10	17	0.60	
Sepia orbignyana	2.78	2	0.28	
Sardinella aurita	1.97	5	0.19	
Trachinotus ovatus	1.39	5	0.14	
Saurida brasiliensis	0.05	17	0.00	
Total	1011.31		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 48
 DATE :7/28/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°26.09
 start stop duration Lon E 13°43.46
 TIME :4:55:58 AM5:12:40 AM16.7 (min) Purpose : 1
 LOG : 239.79 240.90 1.1 Region : 4000
 FDEPTH: 15 10 Gear cond.: 0
 BDEPTH: 22 21 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 4.0 kn
 Sorted : 0 Total catch: 3307.86 Catch/hour: 11877.41

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	11798.56	135885	99.34	119
Sphyræna guachancho	27.61	133	0.23	
Sardinella maderensis	19.71	657	0.17	120
Brachydeuterus auritus	19.71	395	0.17	
Sardinops ocellatus	11.81	133	0.10	
Total	11877.41		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 49
 DATE :7/28/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 11°33.21
 start stop duration Lon E 13°25.30
 TIME :11:28:06 AM11:57:56 AM29.8 (min) Purpose : 1
 LOG : 282.74 284.29 1.6 Region : 4000
 FDEPTH: 124 123 Gear cond.: 1
 BDEPTH: 124 123 Validity : 3
 Towing dir: 0° Wire out : 300 m Speed : 3.1 kn
 Sorted : 54 Total catch: 200.58 Catch/hour: 403.45

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophthalmus	305.33	2003	75.68	121
Trachurus trecae	64.26	191	15.93	122
Lepidotrigla cadmani	8.15	97	2.02	
Dentex angolensis	6.64	48	1.65	
Branchiostegus semifasciatus *	3.20	4	0.79	
Sepia orbignyana	2.78	20	0.69	
Lagocephalus laevigatus	2.47	6	0.61	
Brotula barbata	2.43	2	0.60	
Pontinus accraensis	2.05	18	0.51	
Zeus faber	1.21	2	0.30	
Raja miraletus	0.99	4	0.24	
Peristedion cataphractum	0.91	6	0.22	
Pagellus bellottii	0.91	6	0.22	
Todaropsis eblanae	0.84	36	0.21	
Spicara alta	0.54	6	0.13	
Lophius varillanti	0.38	4	0.09	
Citharus linguatula	0.36	12	0.09	
Total	403.45		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 50
 DATE :7/29/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°39.21
 start stop duration Lon E 13°39.95
 TIME :12:03:30 AM12:30:07 AM26.6 (min) Purpose : 1
 LOG : 329.81 331.52 1.7 Region : 4000
 FDEPTH: 15 15 Gear cond.: 1
 BDEPTH: 55 41 Validity : 3
 Towing dir: 0° Wire out : 150 m Speed : 3.8 kn
 Sorted : 132 Total catch: 596.17 Catch/hour: 1343.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	1118.75	6868	83.26	124
Sardinella maderensis	139.97	1055	10.42	125
Brachydeuterus auritus	29.62	559	2.20	
Trachurus trecae	27.39	640	2.04	123
Trichiurus lepturus	20.20	133	1.50	
Sepia orbignyana	4.98	2	0.37	
Trachinotus ovatus	2.84	32	0.21	
Total	1343.73		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 51
 DATE :7/29/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°37.57
 start stop duration Lon E 13°41.12
 TIME :1:31:37 AM2:14:36 AM43.0 (min) Purpose : 1
 LOG : 333.78 336.60 2.8 Region : 4000
 FDEPTH: 30 30 Gear cond.: 1
 BDEPTH: 41 59 Validity : 3
 Towing dir: 0° Wire out : 100 m Speed : 3.9 kn
 Sorted : 0 Total catch: 55.87 Catch/hour: 77.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	33.64	613	43.14	
Sardinella aurita	14.03	100	17.99	127
Trichiurus lepturus	10.12	63	12.98	
Sepia orbignyana	8.22	8	10.54	
Pagellus bellottii	4.26	31	5.46	
Sphyræna guachancho	3.39	7	4.35	
Sardinella maderensis	1.47	11	1.88	128
Pomadasys incisus	1.40	10	1.79	
Trachurus trecae	1.10	28	1.41	126
Galeoides decadactylus	0.18	3	0.23	
Dactylopterus volitans	0.11	1	0.14	
Helicolenus dactylopterus	0.04	1	0.05	
Pigonus telescopus	0.03	7	0.04	
Total	77.98		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 52
 DATE :7/29/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 11°38.79
 start stop duration Lon E 13°25.44
 TIME :12:05:23 PM12:35:08 PM29.8 (min) Purpose : 1
 LOG : 366.39 367.94 1.6 Region : 4000
 FDEPTH: 140 138 Gear cond.: 1
 BDEPTH: 140 138 Validity : 3
 Towing dir: 0° Wire out : 340 m Speed : 3.1 kn
 Sorted : 0 Total catch: 75.47 Catch/hour: 152.21

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	85.71	147	56.31	
Dentex macrophthalmus	30.45	198	20.01	131
Trachurus trecae	10.87	22	7.14	130
Dentex angolensis	10.43	34	6.85	129
Lepidotrigla cadmani	6.57	58	4.32	
Branchiostegus semifasciatus *	2.90	4	1.91	
Todaropsis eblanae	2.18	71	1.43	
Citharus linguatula	1.71	48	1.13	
Pterothrissus belloci	1.07	10	0.70	
Sepia orbignyana	0.30	2	0.20	
Total	152.21		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 53
 DATE :7/29/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 11°46.24
 TIME :4:43:46 PM5:14:29 PM30.7 (min) Lon E 13°32.84
 LOG : 401.99 403.66 1.7
 FDEPTH: 112 111
 BDEPTH: 112 111
 Towing dir: 0° wire out : 300 m
 Sorted : 0 Total catch: 411.41

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	249.00	6502	30.99	133
Boops boops	214.20	1611	26.66	
Trachurus trecae	108.07	330	13.45	132
Dentex macrophtalmus	89.80	605	11.18	134
Umbrina canariensis	50.70	176	6.31	
Sepia orbignyana	19.04	14	2.37	
Pagellus bellottii	12.25	143	1.52	
Dentex angolensis	11.82	86	1.47	
Citharus linguatula	8.89	271	1.11	
Trichiurus lepturus	8.16	13	1.02	
Chelidonichthys gabonensis	5.37	61	0.67	
Pontinus accraensis	5.12	8	0.64	
Zeus faber	5.02	8	0.62	
Dentex barnardi	3.73	14	0.46	
Lagocephalus laevigatus	1.97	4	0.25	
Loligo vulgaris	1.93	104	0.24	
Chatrabrus melanurus	1.86	8	0.23	
Uranoscopus polli	1.68	8	0.21	
Torpedo torpedo	1.29	4	0.16	
Pterothrissus belloci	0.68	4	0.09	
Scorpaena normani	0.68	4	0.09	
Microchirus frechkopi	0.64	14	0.08	
Saurida brasiliensis	0.64	82	0.08	
Trigla lyra	0.47	4	0.06	
Illex coindetii	0.30	4	0.04	
Monolene microstoma	0.21	14	0.03	
Total	803.54		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 54
 DATE :7/29/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 11°50.39
 TIME :8:11:12 PM8:41:19 PM30.1 (min) Lon E 13°44.19
 LOG : 426.86 428.70 1.8
 FDEPTH: 10 10
 BDEPTH: 32 29
 Towing dir: 0° wire out : 140 m
 Sorted : 0 Total catch: 2750.97

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	5375.62	73606	98.09	135
Brachydeuterus auritus	94.08	2984	1.72	136
Sardinops ocellatus	4.58	58	0.08	
Ilisha africana	2.87	58	0.05	
Trichiurus lepturus	2.87	58	0.05	
Total	5480.02		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 55
 DATE :7/30/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°58.35
 TIME :3:05:20 AM3:20:48 AM15.5 (min) Lon E 13°31.53
 LOG : 479.10 480.06 1.0
 FDEPTH: 15 15
 BDEPTH: 112 108
 Towing dir: 0° wire out : 170 m
 Sorted : 123 Total catch: 2000.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	6461.15	38059	83.29	138
Sardinella maderensis	1156.95	5120	14.91	137
Trichiurus lepturus	139.08	632	1.79	
Total	7757.18		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 56
 DATE :7/30/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 12°11.17
 TIME :5:21:00 AM5:34:36 AM13.6 (min) Lon E 13°42.04
 LOG : 495.76 496.51 0.8
 FDEPTH: 14 14
 BDEPTH: 29 28
 Towing dir: 0° wire out : 140 m
 Sorted : 0 Total catch: 2800.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	11693.69	139699	94.63	139
Lobotes surinamensis	364.68	79	2.95	
Aleccis alexandrinus	131.21	79	1.06	
Trichiurus lepturus	115.54	468	0.94	
Ilisha africana	32.78	393	0.27	
Brachydeuterus auritus	7.81	154	0.06	
Sardinops ocellatus	6.26	79	0.05	
Trachurus trecae	2.34	79	0.02	
Sardinella maderensis	2.34	79	0.02	
Total	12356.65		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 57
 DATE :7/30/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 12°2.22
 TIME :11:31:27 AM11:51:37 AM20.2 (min) Lon E 13°29.75
 LOG : 522.48 523.60 1.1
 FDEPTH: 109 108
 BDEPTH: 109 108
 Towing dir: 0° wire out : 300 m
 Sorted : 120 Total catch: 718.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophtalmus	1317.44	11952	61.71	141
Boops boops	262.24	2658	12.28	
Spicara alta	199.80	1766	9.36	
Sepia orbignyana	135.58	161	6.35	
Trachurus trecae	105.25	1713	4.93	140
Dentex angolensis	45.67	214	2.14	142
Trichiurus lepturus	13.56	18	0.64	
Octopus vulgaris	12.13	18	0.57	
Pagellus bellottii	11.77	89	0.55	
Dentex barnardi	9.63	36	0.45	
Zeus faber	7.14	18	0.33	
Pagrus africanus	6.96	18	0.33	
Lepidotrigla cadmani	3.39	36	0.16	
Citharus linguatula	2.68	71	0.13	
Peristidion cataphractum	0.89	18	0.04	
Pontinus accraensis	0.71	18	0.03	
Total	2134.85		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 58
 DATE :7/30/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 12°8.98
 TIME :3:54:38 PM4:25:10 PM30.5 (min) Lon E 13°29.98
 LOG : 548.48 550.42 1.9
 FDEPTH: 15 15
 BDEPTH: 99 107
 Towing dir: 0° wire out : 170 m
 Sorted : 0 Total catch: 12.82

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	24.67	104	97.89	143
Lagocephalus laevigatus	0.53	6	2.11	
Total	25.20		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 59
 DATE :7/30/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 12°12.67
 TIME :7:49:14 PM7:55:00 PM5.8 (min) Lon E 13°24.44
 LOG : 579.90 580.28 0.4
 FDEPTH: 10 10
 BDEPTH: 164 114
 Towing dir: 0° wire out : 150 m
 Sorted : 0 Total catch: 195.95

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1192.17	4863	58.31	144
Trichiurus lepturus	470.09	1398	22.99	
MYCTOPHIDAE	291.13	404932	14.24	
Sardinella maderensis	91.30	365	4.47	145
Total	2044.70		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 60
 DATE :7/31/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 12°18.11
 TIME :1:07:12 AM1:36:44 AM29.5 (min) Lon E 13°22.32
 LOG : 603.69 605.68 2.0
 FDEPTH: 25 20
 BDEPTH: 347 461
 Towing dir: 0° wire out : 120 m
 Sorted : 0 Total catch: 71.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	137.91	163109	94.49	
Trachurus trecae	5.73	22	3.92	146
Trichiurus lepturus	2.32	4	1.59	
Total	145.96		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 61
 DATE :7/31/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 12°25.86
 TIME :9:45:36 AM10:15:17 AM29.7 (min) Lon E 13°23.26
 LOG : 641.12 642.92 1.8
 FDEPTH: 0 0
 BDEPTH: 98 72
 Towing dir: 0° wire out : 0 m
 Sorted : 0 Total catch: 1.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sarda sarda	2.24	2	65.68	
Auxis thazard	0.65	2	18.93	
Pagellus bellottii	0.42	2	12.43	
Lagocephalus laevigatus	0.08	4	2.37	
Trichiurus lepturus	0.02	2	0.59	
Total	3.42		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 62
 DATE :7/31/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 12°31.08
 TIME :12:30:14 PM1:00:46 PM30.5 (min) Lon E 13°18.09
 LOG : 661.98 663.93 2.0
 FDEPTH: 15 15
 BDEPTH: 102 353
 Towing dir: 0° wire out : 180 m
 Sorted : 0 Total catch: 19.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	32.62	183	84.35	147
Stromateus fiatola	5.99	10	15.50	
Sepia orbignyana	0.06	6	0.15	
Total	38.68		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 63
 DATE :7/31/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 12°34.11
 TIME :3:35:54 PM4:03:15 PM27.4 (min) Lon E 13°9.78
 LOG : 686.15 687.50 1.4
 FDEPTH: 8 8
 BDEPTH: 499 543
 Towing dir: 0° wire out : 180 m
 Sorted : 0 Total catch: 353.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Alopias superciliosus	329.07	2	42.43	
Sardinella aurita	261.39	1024	33.70	148
Sardinella maderensis	157.84	748	20.35	149
Trachurus trecae	19.31	86	2.49	150
Euthynnus alletteratus	6.14	2	0.79	
Pomatomus saltatrix	1.82	2	0.23	
Total	775.57		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 64
 DATE :7/31/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 12°51.76
 TIME :9:15:31 PM9:47:28 PM32.0 (min) Lon E 12°50.17
 LOG : 734.99 736.52 1.5
 FDEPTH: 10 10
 BDEPTH: 560 669
 Towing dir: 0° wire out : 120 m
 Sorted : 0 Total catch: 146.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	134.46	646	48.95	151
Sardinella maderensis	68.17	242	24.82	152
Trichiurus lepturus	38.87	141	14.15	
MYCTOPHIDAE	20.09	22188	7.31	
Sarda sarda	6.38	6	2.32	
Ommastrephes pteropus	3.42	4	1.24	
Sardinella aurita	3.31	13	1.20	153
Total	274.70		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 65
 DATE :8/3/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 13°55.88
 TIME :3:50:32 AM4:34:25 AM43.9 (min) Lon E 12°21.40
 LOG : 902.17 905.05 2.9
 FDEPTH: 60 60
 BDEPTH: 83 119
 Towing dir: 0° Wire out : 190 m
 Sorted : 0 Total catch: 43.61
 Purpose : 1
 Region : 4000
 Gear cond.: 0
 Validity : 0
 Speed : 3.9 kn
 Catch/hour: 59.63

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	51.75	410	86.79	154
Sphyrna lewini	4.58	1	7.68	
Spondyliosoma cantharus	1.27	3	2.13	
Trichurus lepturus	0.92	1	1.54	
Pomatomus saltatrix	0.78	1	1.31	
Sardinella aurita	0.33	3	0.55	
Total	59.63		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 66
 DATE :8/3/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 14°3.37
 TIME :7:42:32 AM7:57:05 AM14.6 (min) Lon E 12°14.55
 LOG : 931.23 931.93 0.7
 FDEPTH: 143 144
 BDEPTH: 143 144
 Towing dir: 0° Wire out : 430 m
 Sorted : 117 Total catch: 946.91
 Purpose : 1
 Region : 4000
 Gear cond.: 1
 Validity : 3
 Speed : 2.9 kn
 Catch/hour: 3904.78

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1733.61	12569	44.40	157
Dentex macrophthalmus	1657.73	16363	42.45	155
Zenopsis conchifer	108.21	12	2.77	
Dentex angolensis	89.73	297	2.30	156
Brotula barbata	70.27	33	1.80	
Boops boops	69.94	462	1.79	
Squalus megalops	42.23	99	1.08	
Raja straeleni	28.04	8	0.72	
Umbra canariensis	28.04	165	0.72	
Pagrus pagrus	19.79	33	0.21	
Chelidonichthys capensis	13.86	132	0.35	
Trigla lyra	12.21	99	0.31	
Atractoscion aequidens	8.70	8	0.22	
Scorpaena normani	6.60	33	0.17	
Sepia officinalis hierredda	6.60	33	0.17	
Pagellus bellottii	5.94	66	0.15	
Ommastrephes bartrami	3.30	33	0.08	
Total	3904.78		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 67
 DATE :8/3/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 14°13.52
 TIME :11:43:47 AM1:13:17 PM29.5 (min) Lon E 12°15.94
 LOG : 963.85 965.41 1.6
 FDEPTH: 85 86
 BDEPTH: 85 86
 Towing dir: 0° Wire out : 270 m
 Sorted : 174 Total catch: 606.23
 Purpose : 1
 Region : 4000
 Gear cond.: 1
 Validity : 3
 Speed : 3.2 kn
 Catch/hour: 1232.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	797.02	6415	64.66	161
Dentex barnardi	98.90	403	8.02	158
Spondyliosoma cantharus	80.70	287	6.55	
Squatina aculeata	67.46	18	5.47	
Pagellus bellottii	59.21	494	4.80	159
Lepidotrigla cadmani	39.42	403	3.20	
Sardinella aurita	19.46	175	1.58	160
Raja miraletus	16.00	18	1.30	
Dentex gibbosus	11.08	2	0.90	
Atractoscion aequidens	10.37	8	0.84	
Sepia orbignyana	6.89	24	0.56	
Zeus faber	6.57	12	0.53	
Plectorhinchus mediterraneus	4.94	2	0.40	
Alloteuthis africana	4.03	1157	0.33	
Pontinus accraensis	3.19	6	0.26	
Squalus megalops	2.81	2	0.23	
Sarda sarda	2.16	2	0.17	
Perulibatrachus elminensis	1.24	6	0.10	
Chaetodon hoefleri	1.18	6	0.10	
Total	1232.61		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 68
 DATE :8/4/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 15°54.13
 TIME :11:53:33 PM11:59:39 PM6.1 (min) Lon E 11°42.01
 LOG : 1244.38 1244.74 0.4
 FDEPTH: 5 5
 BDEPTH: 74 79
 Towing dir: 0° Wire out : 120 m
 Sorted : 90 Total catch: 868.23
 Purpose : 1
 Region : 4000
 Gear cond.: 1
 Validity : 3
 Speed : 3.6 kn
 Catch/hour: 8539.97

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	8205.64	242203	96.09	163
Scomber japonicus	275.70	5292	3.23	162
Trichurus lepturus	31.38	472	0.37	164
Etrumeus whiteheadi	19.87	374	0.23	164
Trachurus capensis	7.57	98	0.09	
Total	8539.97		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 69
 DATE :8/5/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°7.86
 TIME :6:34:20 AM6:43:35 AM7.3 (min) Lon E 11°43.56
 LOG : 1281.81 1282.22 0.4
 FDEPTH: 48 48
 BDEPTH: 48 48
 Towing dir: 0° Wire out : 140 m
 Sorted : 122 Total catch: 555.52
 Purpose : 1
 Region : 4000
 Gear cond.: 0
 Validity : 0
 Speed : 3.4 kn
 Catch/hour: 4597.41

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	4366.59	124874	94.98	165
Dentex macrophthalmus	69.27	2797	1.51	
Atractoscion aequidens	28.30	116	0.62	
Dasyatis marmorata	26.90	0	0.59	
Pagellus bellottii	19.37	339	0.42	
Carcharhinus leucas	14.48	8	0.32	
Loligo vulgaris	13.08	298	0.28	
Umbra canariensis	10.84	149	0.24	
Dicologlossa cuneata	10.84	712	0.24	
Spondyliosoma cantharus	7.45	190	0.16	
Sardinella aurita	7.12	74	0.15	
Scomber japonicus	5.96	8	0.13	
Sepia officinalis hierredda	5.21	116	0.11	
Dentex barnardi	3.72	74	0.08	
Pomadasyus incisus	2.98	41	0.06	
Trachinus armatus	1.90	74	0.04	
Trichurus lepturus	1.90	74	0.04	
Torpedo torpedo	1.49	41	0.03	
Total	4597.41		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 70

DATE :8/5/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°11.88
 TIME :2:51:54 PM3:10:59 PM19.1 (min) Lon E 11°34.77
 LOG : 1320.86 1321.89 1.0
 FDEPTH: 79 79
 BDEPTH: 79 79
 Towing dir: 0° Wire out : 200 m
 Sorted : 94 Total catch: 1130.87
 Purpose : 1
 Region : 4000
 Gear cond.: 0
 Validity : 0
 Speed : 3.2 kn
 Catch/hour: 3556.19

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	2056.60	39849	57.83	167
Dentex macrophthalmus	939.62	34604	26.42	168
Trachurus capensis	445.28	8642	12.52	166
Zeus faber	35.09	113	0.99	
Loligo vulgaris	23.40	75	0.66	
Chelidonichthys capensis	22.64	113	0.64	
Merluccius polli	16.60	38	0.47	
Mustelus mustelus	12.42	3	0.35	
Etrumeus whiteheadi	1.89	38	0.05	
Todarodes sagittatus	1.89	226	0.05	
Dicologlossa cuneata	0.75	38	0.02	
Total	3556.19		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 71
 DATE :8/5/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°15.72
 TIME :6:13:48 PM6:17:44 PM3.9 (min) Lon E 11°46.33
 LOG : 1339.13 1339.39 0.3
 FDEPTH: 7 7
 BDEPTH: 23 24
 Towing dir: 0° Wire out : 130 m
 Sorted : 99 Total catch: 1088.12
 Purpose : 1
 Region : 4000
 Gear cond.: 0
 Validity : 0
 Speed : 4.0 kn
 Catch/hour: 16612.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	16323.66	200519	98.26	169
Trachurus trecae	172.98	8733	1.04	170
Sardinops ocellatus	65.50	840	0.39	171
J E L L Y F I S H	47.02	168	0.28	
Etrumeus whiteheadi	3.36	168	0.02	
Total	16612.52		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 72
 DATE :8/6/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°41.22
 TIME :9:27:36 AM9:34:01 AM6.4 (min) Lon E 11°45.35
 LOG : 1439.07 1439.40 0.3
 FDEPTH: 22 22
 BDEPTH: 22 22
 Towing dir: 0° Wire out : 100 m
 Sorted : 92 Total catch: 252.33
 Purpose : 1
 Region : 4000
 Gear cond.: 1
 Validity : 3
 Speed : 3.1 kn
 Catch/hour: 2358.19

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1739.86	12065	73.78	172
Dicologlossa cuneata	184.21	11654	7.81	
Myliobatis aquila	135.05	75	5.73	
Arius parkii	71.68	252	3.04	
Trichurus lepturus	55.98	2804	2.37	
Atractoscion aequidens	38.32	533	1.62	
Sepia orbignyana	34.58	75	1.47	
Pomatomus saltatrix	22.71	280	0.96	
Raja miraletus	19.72	47	0.84	
Selene dorsalis	18.41	579	0.78	
Bothus sp.	8.58	907	0.36	
J E L L Y F I S H	7.57	47	0.32	
Stromateus fiatola	6.81	224	0.29	
Mustelus mustelus	6.64	9	0.28	
Penaeus notialis	4.04	178	0.17	
Lagocephalus laevigatus	1.77	28	0.07	
Etmopterus spinax	1.51	47	0.06	
Pteroscion pelli	0.50	28	0.02	
Pterothrissus belloci	0.25	47	0.01	
Total	2358.19		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 73
 DATE :8/7/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°37.30
 TIME :7:35:59 AM8:05:10 AM29.2 (min) Lon E 11°44.75
 LOG : 1456.21 1457.61 1.4
 FDEPTH: 25 25
 BDEPTH: 25 25
 Towing dir: 0° Wire out : 100 m
 Sorted : 0 Total catch: 24.55
 Purpose : 1
 Region : 4000
 Gear cond.: 1
 Validity : 3
 Speed : 2.9 kn
 Catch/hour: 50.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	18.09	2387	35.85	173
J E L L Y F I S H	13.90	64	27.54	
Dasyatis marmorata	5.92	4	11.73	
Scomber japonicus	5.00	101	9.90	174
Illex coindetii	2.12	158	4.20	
C R A B S	1.79	154	3.54	
Etrumeus whiteheadi	1.50	51	2.97	
Sepia orbignyana	0.76	8	1.51	
Spondyliosoma cantharus	0.35	2	0.69	
Gobiidae	0.27	64	0.53	
Dicologlossa cuneata	0.19	10	0.37	
Umbra canariensis	0.14	2	0.29	
Penaeus notialis	0.14	6	0.29	
Dentex macrophthalmus	0.14	4	0.29	
Trichurus lepturus	0.12	4	0.24	
Zeus faber	0.04	2	0.08	
Total	50.48		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 74
 DATE :8/7/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°30.41
 TIME :9:34:36 AM9:48:35 AM14.0 (min) Lon E 11°43.76
 LOG : 1469.05 1469.71 0.7
 FDEPTH: 37 38
 BDEPTH: 37 38
 Towing dir: 0° Wire out : 140 m
 Sorted : 68 Total catch: 350.55
 Purpose : 1
 Region : 4000
 Gear cond.: 1
 Validity : 3
 Speed : 2.8 kn
 Catch/hour: 1504.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1446.35	196438	96.13	175
Chelidonichthys capensis	15.92	73	1.06	
Dentex macrophthalmus	11.37	1052	0.76	
J E L L Y F I S H	10.00	17	0.66	
Spondyliosoma cantharus	8.41	52	0.56	
Illex coindetii	4.08	172	0.27	
Callappa sp.	3.00	43	0.20	
Raja miraletus	3.00	4	0.20	
Dentex gibbosus	1.07	43	0.07	
Sepia orbignyana	0.86	21	0.06	
Dentex barnardi	0.64	43	0.04	
Zeus faber	0.43	21	0.03	
Dentex angolensis	0.21	21	0.01	
Total	1505.36		100.06	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 75
 DATE :8/7/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°31.36
 start stop duration Lon E 11°29.16
 TIME :12:30:31 PM12:43:07 PM12.6 (min) Purpose : 1
 LOG : 1488.67 1489.33 0.7 Region : 4000
 FDEPTH: 108 106 Gear cond.: 1
 BDEPTH: 108 106 Validity : 3
 Towing dir: 0° Wire out : 300 m Speed : 3.1 kn
 Sorted : 98 Total catch: 1381.50 Catch/hour: 6573.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	4459.79	104565	67.85	177
Trachurus capensis	992.55	28063	15.10	178
Dentex macropthalmus	526.25	10810	8.01	176
Merluccius capensis	393.02	1066	5.98	
Trigla lyra	99.25	799	1.51	
Mustelus mustelus	16.65	5	0.25	
Sepia orbignyana	13.23	19	0.20	
Total	6500.75		98.90	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 76
 DATE :8/7/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°25.21
 start stop duration Lon E 11°29.03
 TIME :4:11:53 PM4:14:04 PM2.2 (min) Purpose : 1
 LOG : 1511.73 1511.88 0.1 Region : 4000
 FDEPTH: 97 98 Gear cond.: 0
 BDEPTH: 97 98 Validity : 0
 Towing dir: 0° Wire out : 250 m Speed : 4.0 kn
 Sorted : 0 Total catch: 121006.00 Catch/hour: 333044.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	30969.36	70927	0.93	180
Trachurus trecae	1940.09	39853	0.06	179
Dentex macropthalmus	300.55	3853	0.01	
Squalus megalops	63.03	358	0.00	
Trigla lyra	31.38	358	0.00	
Total	33304.40		1.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 77
 DATE :8/7/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°24.05
 start stop duration Lon E 11°44.24
 TIME :6:48:23 PM6:51:00 PM2.6 (min) Purpose : 1
 LOG : 1531.71 1531.89 0.2 Region : 4000
 FDEPTH: 10 10 Gear cond.: 1
 BDEPTH: 43 42 Validity : 3
 Towing dir: 0° Wire out : 150 m Speed : 4.1 kn
 Sorted : 65 Total catch: 457.27 Catch/hour: 10471.83

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	10284.73	990847	98.21	181
Trachurus capensis	131.45	7053	1.26	182
Etrumeus whiteheadi	24.27	618	0.23	
Sardinops ocellatus	12.82	160	0.12	
Scomber japonicus	9.16	206	0.09	
Merluccius capensis	3.21	160	0.03	
Boops boops	3.21	160	0.03	
Engraulis encrasicolus	2.98	206	0.03	
Total	10471.83		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 78
 DATE :8/7/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 16°30.28
 start stop duration Lon E 11°43.76
 TIME :7:58:58 PM8:23:49 PM24.9 (min) Purpose : 1
 LOG : 1539.04 1540.30 1.3 Region : 4000
 FDEPTH: 20 20 Gear cond.: 1
 BDEPTH: 37 34 Validity : 3
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 0 Total catch: 7.63 Catch/hour: 18.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	16.18	2105	87.81	183
J E L L Y F I S H	0.87	7	4.72	
Sepia orbignyana	0.36	2	1.97	
Dentex macropthalmus	0.31	24	1.70	
Atractoscion aequidens	0.22	5	1.18	
Trachurus capensis	0.12	5	0.66	
Gobiidae	0.12	77	0.66	
Scomber japonicus	0.12	2	0.66	
Bregmaceros sp.	0.02	5	0.13	
Selene dorsalis	0.02	2	0.13	
Fistularia petimba	0.02	2	0.13	
Pontinus accraensis	0.02	2	0.13	
Trigla lyra	0.02	7	0.13	
Total	18.42		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 79
 DATE :8/7/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 16°36.87
 start stop duration Lon E 11°44.77
 TIME :11:03:34 PM11:13:26 PM9.9 (min) Purpose : 1
 LOG : 1562.67 1563.39 0.7 Region : 4000
 FDEPTH: 5 5 Gear cond.: 1
 BDEPTH: 25 25 Validity : 3
 Towing dir: 0° Wire out : 100 m Speed : 4.3 kn
 Sorted : 0 Total catch: 63.94 Catch/hour: 388.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	368.39	73277	94.78	186
Trachurus trecae	14.04	2043	3.61	184
Sardinops ocellatus	4.13	766	1.06	185
Loligo vulgaris	1.09	116	0.28	
Sepia orbignyana	0.61	6	0.16	
Etrumeus whiteheadi	0.24	6	0.06	
Trachurus capensis	0.18	18	0.05	
Total	388.69		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 80
 DATE :8/8/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°37.14
 start stop duration Lon E 11°21.89
 TIME :11:55:33 AM12:34:47 PM39.2 (min) Purpose : 1
 LOG : 1602.11 1604.45 2.4 Region : 4000
 FDEPTH: 30 40 Gear cond.: 1
 BDEPTH: 132 127 Validity : 3
 Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
 Sorted : 0 Total catch: 68.88 Catch/hour: 105.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	88.53	1630	84.06	189
Scomber japonicus	13.76	226	13.07	188
Sardinops ocellatus	3.03	49	2.87	187
Total	105.32		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 81
 DATE :8/8/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°35.69
 start stop duration Lon E 11°22.59
 TIME :1:13:04 PM1:24:51 PM11.8 (min) Purpose : 1
 LOG : 1606.25 1606.84 0.6 Region : 4000
 FDEPTH: 126 128 Gear cond.: 1
 BDEPTH: 126 128 Validity : 3
 Towing dir: 0° Wire out : 370 m Speed : 3.0 kn
 Sorted : 117 Total catch: 877.31 Catch/hour: 4468.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	3703.55	77812	82.88	192
Zenopsis conchifer	269.34	458	6.03	
Dentex macropthalmus	198.29	2104	4.44	190
Merluccius capensis	102.02	382	2.28	
Squalus megalops	99.73	423	2.23	
Pterothrissus belloci	33.26	382	0.74	
Trachurus trecae	25.98	306	0.58	191
Trigla lyra	24.86	346	0.56	
Scomber japonicus	9.93	153	0.22	
Calappa pelii	1.53	41	0.03	
Total	4468.47		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 82
 DATE :8/8/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°40.05
 start stop duration Lon E 11°40.14
 TIME :5:48:16 PM5:57:35 PM9.3 (min) Purpose : 1
 LOG : 1637.83 1638.46 0.6 Region : 4000
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 28 31 Validity : 0
 Towing dir: 0° Wire out : 150 m Speed : 4.1 kn
 Sorted : 130 Total catch: 782.94 Catch/hour: 5045.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	4533.77	59704	89.89	193
Trachurus trecae	498.82	23510	9.89	194
J E L L Y F I S H	8.51	116	0.17	
Trichiurus lepturus	2.71	116	0.05	
Total	5045.80		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 83
 DATE :8/8/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°41.56
 start stop duration Lon E 11°20.92
 TIME :8:56:44 PM9:26:57 PM30.2 (min) Purpose : 1
 LOG : 1663.83 1665.67 1.8 Region : 4000
 FDEPTH: 100 120 Gear cond.: 1
 BDEPTH: 138 141 Validity : 3
 Towing dir: 0° Wire out : 300 m Speed : 3.7 kn
 Sorted : 0 Total catch: 404.56 Catch/hour: 803.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	763.24	12802	94.99	195
MYCTOPHIDAE	17.08	7037	2.13	
Mustelus mustelus	13.21	6	1.64	
Trigla lyra	4.01	8	0.50	
Raja wallacei	3.57	2	0.44	
Merluccius capensis	1.71	8	0.21	
Synagrops microlepis	0.68	44	0.09	
Total	803.50		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 84
 DATE :8/8/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°43.50
 start stop duration Lon E 11°20.52
 TIME :10:03:59 PM10:37:47 PM33.8 (min) Purpose : 1
 LOG : 1667.11 1669.17 2.1 Region : 4000
 FDEPTH: 10 10 Gear cond.: 1
 BDEPTH: 142 138 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 3.7 kn
 Sorted : 0 Total catch: 56.33 Catch/hour: 99.99

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	69.41	1255	69.41	196
MYCTOPHIDAE	20.45	17127	20.45	
Scomber japonicus	6.53	122	6.53	
Trachurus capensis	1.70	30	1.70	197
S H R I M P S	0.85	8350	0.85	
J E L L Y F I S H	0.76	87	0.76	
Trachurus trecae	0.18	2	0.18	
Scomberesox saurus	0.11	4	0.11	
Total	99.99		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 85
 DATE :8/9/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°42.96
 start stop duration Lon E 11°20.60
 TIME :7:43:19 AM8:08:59 AM25.7 (min) Purpose : 1
 LOG : 1681.52 1682.68 1.2 Region : 4000
 FDEPTH: 140 138 Gear cond.: 0
 BDEPTH: 140 138 Validity : 0
 Towing dir: 0° Wire out : 410 m Speed : 2.7 kn
 Sorted : 121 Total catch: 758.00 Catch/hour: 1771.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	1230.76	13996	69.47	198
Dentex macropthalmus	173.10	1650	9.77	
Squalus megalops	123.44	351	6.97	
Pterothrissus belloci	70.85	732	4.00	
Scorpaena normani	64.72	862	3.65	
Merluccius capensis	49.08	234	2.77	
Trigla lyra	30.97	189	1.75	
Chelidonichthys capensis	20.76	175	1.17	
Zeus faber	5.12	14	0.29	
Syacium micrurum	2.92	89	0.16	
Total	1771.72		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 86
 DATE :8/9/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°49.47
 start stop duration Lon E 11°18.02
 TIME :10:19:35 AM10:43:56 AM24.4 (min) Purpose : 2
 LOG : 1697.49 1698.76 1.3 Region : 4000
 FDEPTH: 346 318 Gear cond.: 0
 BDEPTH: 346 318 Validity : 4
 Towing dir: 0° Wire out : 950 m Speed : 3.1 kn
 Sorted : 100 Total catch: 2760.45 Catch/hour: 6801.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	2771.33	9248	40.74	
Pontinus accraensis	2115.06	26250	31.09	
Dentex macropthalmus	598.47	2449	8.80	200
Heptanchias perlo	527.06	136	7.75	
Laemonema laureysi	280.19	6052	4.12	
Pterothrissus belloci	278.83	1631	4.10	
Chlorophthalmus atlanticus	131.93	3536	1.94	
Nezumia sp.	48.29	1089	0.71	
Lophius vaillanti	29.92	69	0.44	
Trachurus capensis	14.05	54	0.21	199
Calappa pelii	2.72	69	0.04	
Trigla lyra	2.72	69	0.04	
Conger conger	0.68	136	0.01	
Parapenaeus longirostris	0.68	136	0.01	
Total	6801.94		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 87
 DATE :8/9/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 16°48.43
 start stop duration Lon E 11°19.91
 TIME :12:37:12 PM12:52:34 PM15.4 (min) Purpose : 1
 LOG : 1708.85 1709.66 0.8 Region : 4000
 FDEPTH: 145 146 Gear cond.: 1
 BDEPTH: 145 146 Validity : 3
 Towing dir: 0° Wire out : 420 m Speed : 3.1 kn
 Sorted : 89 Total catch: 739.78 Catch/hour: 2887.90

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus capensis	2065.57	71.52	201
Dentex macropthalmus	673.94	23.34	202
Pontinus accraensis	37.58	1.30	
Merluccius capensis	35.64	1.23	
Squalus megalops	21.38	0.74	
Pterothrissus belloci	20.41	0.71	
Citharus linguatula	14.26	0.49	
Scorpaena normani	10.69	0.37	
Trigla lyra	4.54	0.16	
Lepidotrigla cadmani	3.89	0.13	
Total	2887.90	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 88
 DATE :8/9/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°49.45
 start stop duration Lon E 11°39.25
 TIME :4:04:42 PM4:34:34 PM29.9 (min) Purpose : 1
 LOG : 1733.27 1735.27 2.0 Region : 4000
 FDEPTH: 30 30 Gear cond.: 1
 BDEPTH: 51 54 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 4.0 kn
 Sorted : 0 Total catch: 98.73 Catch/hour: 198.32

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Etrumeus whiteheadi	124.14	62.59	203
Trachurus trecae	27.42	13.83	205
Engraulis encrasicolus	19.52	9.85	204
Sardinops ocellatus	14.10	7.11	206
Scomber japonicus	6.45	3.25	207
Illex coindetii	5.66	2.86	
Trichurus lepturus	1.02	0.52	
Total	198.32	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 89
 DATE :8/9/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°54.11
 start stop duration Lon E 11°42.15
 TIME :6:07:43 PM6:13:58 PM6.3 (min) Purpose : 1
 LOG : 1746.48 1746.92 0.5 Region : 4000
 FDEPTH: 13 13 Gear cond.: 1
 BDEPTH: 22 22 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 4.3 kn
 Sorted : 0 Total catch: 83.47 Catch/hour: 801.31

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Engraulis encrasicolus	778.08	97.10	208
Trachurus trecae	22.94	2.86	209
Trichurus lepturus	0.29	0.04	
Total	801.31	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 90
 DATE :8/9/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°55.07
 start stop duration Lon E 11°37.14
 TIME :7:26:06 PM7:34:23 PM8.3 (min) Purpose : 1
 LOG : 1755.47 1755.96 0.5 Region : 4000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 76 76 Validity : 0
 Towing dir: 0° Wire out : 130 m Speed : 3.6 kn
 Sorted : 0 Total catch: 272.23 Catch/hour: 1972.68

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus trecae	1326.45	67.24	210
Engraulis encrasicolus	532.61	27.00	212
Trachurus capensis	69.49	3.52	211
Etrumeus whiteheadi	22.83	1.16	213
Sardinops ocellatus	21.30	1.08	214
Total	1972.68	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 91
 DATE :8/9/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°53.36
 start stop duration Lon E 11°21.48
 TIME :10:06:18 PM10:21:32 PM15.2 (min) Purpose : 1
 LOG : 1775.05 1776.06 1.0 Region : 4000
 FDEPTH: 80 80 Gear cond.: 1
 BDEPTH: 129 130 Validity : 3
 Towing dir: 0° Wire out : 250 m Speed : 4.0 kn
 Sorted : 56 Total catch: 196.53 Catch/hour: 774.25

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus capensis	774.25	100.00	215
Total	774.25	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 92
 DATE :8/10/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 17°5.19
 start stop duration Lon E 11°43.63
 TIME :4:43:24 AM5:13:25 AM30.0 (min) Purpose : 1
 LOG : 1823.84 1825.26 1.4 Region : 4000
 FDEPTH: 23 23 Gear cond.: 0
 BDEPTH: 23 23 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 2.8 kn
 Sorted : 53 Total catch: 183.74 Catch/hour: 367.36

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus trecae	159.45	43.40	216
Mustelus mustelus	66.64	18.14	
Galeichthys feliceps	31.35	8.53	
Callorhynchus capensis	18.75	5.11	
Rhinobatos albomaculatus	14.10	3.84	
Dicologlossa cuneata	12.60	3.43	
Myliobatis aquila	10.20	2.78	
Sphyrna lewini	9.10	2.48	
Atractoscion aequidens	5.46	1.49	
Torpedo torpedo	5.20	1.42	
Septa orbignyana	4.86	1.32	
Trichurus lepturus	4.50	1.22	
Raja miraletus	4.44	1.21	
J E L L Y F I S H	4.30	1.17	
Thyrsites atun	4.20	1.14	
Cynoglossus canariensis	3.30	0.90	
Torpedo marmorata	2.86	0.78	
Umbrina canariensis	1.70	0.46	
Loligo vulgaris	1.16	0.32	
Scyllorhinus stellaris	0.86	0.23	
Penaeus notialis	0.76	0.21	
Pomatopus saltatrix	0.70	0.19	
Trigla lyra	0.50	0.14	
Spondyliosoma cantharus	0.40	0.11	
Total	367.36	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 93
 DATE :8/11/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 17°7.25
 start stop duration Lon E 11°38.13
 TIME :6:22:57 AM6:51:16 AM28.3 (min) Purpose : 1
 LOG : 1832.37 1834.26 1.9 Region : 4000
 FDEPTH: 30 60 Gear cond.: 0
 BDEPTH: 77 78 Validity : 0
 Towing dir: 0° Wire out : 200 m Speed : 4.0 kn
 Sorted : 72 Total catch: 537.54 Catch/hour: 1139.26

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus capensis	944.99	82.95	217
Trachurus trecae	87.59	7.69	218
Engraulis encrasicolus	55.63	4.88	220
Sardinops ocellatus	40.23	3.53	219
Etrumeus whiteheadi	7.95	0.70	
Scomber japonicus	2.86	0.25	
Total	1139.26	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 94
 DATE :8/11/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 17°26.30
 start stop duration Lon E 11°39.40
 TIME :8:55:17 AM9:14:07 AM18.9 (min) Purpose : 1
 LOG : 1970.37 1971.55 1.2 Region : 5000
 FDEPTH: 66 66 Gear cond.: 0
 BDEPTH: 91 91 Validity : 0
 Towing dir: 0° Wire out : 220 m Speed : 3.8 kn
 Sorted : 0 Total catch: 821.79 Catch/hour: 2615.78

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Aequorea forskalea	1888.81	72.21	
Trachurus trecae	335.30	12.82	221
Chrysaora hyoscocella	125.19	4.79	
Sardinops ocellatus	89.32	3.41	223
Etrumeus whiteheadi	87.12	3.33	224
Dactylometra africana	47.59	1.82	
Trachurus capensis	42.46	1.62	222
Total	2615.78	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 95
 DATE :8/11/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 17°24.28
 start stop duration Lon E 11°39.70
 TIME :10:08:41 AM10:23:16 AM15.0 (min) Purpose : 1
 LOG : 1974.90 1975.94 1.0 Region : 5000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 86 86 Validity : 0
 Towing dir: 0° Wire out : 130 m Speed : 4.0 kn
 Sorted : 0 Total catch: 389.40 Catch/hour: 1557.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Sardinops ocellatus	1513.60	97.18	225
Chrysaora hyoscocella	42.00	2.70	
Aequorea forskalea	6.32	0.41	
Dactylometra africana	6.00	0.39	
Total	1567.92	100.66	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 96
 DATE :8/11/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 17°32.46
 start stop duration Lon E 11°33.06
 TIME :1:52:22 PM1:59:18 PM6.9 (min) Purpose : 1
 LOG : 2000.78 2001.16 0.4 Region : 5000
 FDEPTH: 149 150 Gear cond.: 0
 BDEPTH: 149 150 Validity : 0
 Towing dir: 0° Wire out : 400 m Speed : 3.3 kn
 Sorted : 0 Total catch: 1751.51 Catch/hour: 15142.74

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus capensis	9070.29	59.90	226
Aequorea forskalea	4053.72	26.77	
Dentex macropthalmus	1557.32	10.28	227
Merluccius capensis	449.05	2.97	
Pterothrissus belloci	11.93	0.08	
Total	15142.31	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 97
 DATE :8/11/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 17°39.27
 start stop duration Lon E 11°31.77
 TIME :7:04:44 PM7:28:20 PM23.6 (min) Purpose : 1
 LOG : 2039.79 2041.15 1.4 Region : 5000
 FDEPTH: 100 160 Gear cond.: 0
 BDEPTH: 169 166 Validity : 0
 Towing dir: 0° Wire out : 380 m Speed : 3.5 kn
 Sorted : 52 Total catch: 312.24 Catch/hour: 794.17

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Aequorea forskalea	582.20	73.31	
Trachurus capensis	195.34	24.60	228
Trigla lyra	14.35	1.81	
Zeus faber	1.37	0.17	
Parapenaeus longirostris	0.46	0.06	
GOBIDAE	0.31	0.04	
Synagrops microlepis	0.15	0.02	
Total	794.17	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 98
 DATE :8/12/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 17°44.63
 start stop duration Lon E 11°20.76
 TIME :1:19:48 AM1:49:31 AM29.7 (min) Purpose : 1
 LOG : 2083.72 2085.35 1.6 Region : 5000
 FDEPTH: 120 130 Gear cond.: 1
 BDEPTH: 424 304 Validity : 3
 Towing dir: 0° Wire out : 350 m Speed : 3.3 kn
 Sorted : 0 Total catch: 80.51 Catch/hour: 162.58

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Stomias boa boa	70.28	43.23	
Hopllostethus cadenati	52.10	32.05	
Plesionika martia	18.63	11.46	
J E L L Y F I S H	10.45	6.43	
S H R I M P S	4.09	2.52	
MYCTOPHIDAE	3.64	2.24	
Todarodes sagittatus	2.97	1.83	
Avocettina acuticeps	0.36	0.22	
PARALEPIDIDAE	0.06	0.04	
Total	162.58	100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 99
 DATE :8/12/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 17°50.99
 start stop duration Lon E 11°41.29
 TIME :6:07:58 AM6:17:01 AM9.1 (min) Purpose : 1
 LOG : 2116.43 2116.92 0.5 Region : 5000
 FDEPTH: 104 104 Gear cond.: 0
 BDEPTH: 104 104 Validity : 0
 Towing dir: 0° Wire out : 260 m Speed : 3.3 kn
 Sorted : 65 Total catch: 550.32 Catch/hour: 3648.53

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chrysaora hysoscella	1701.88	7386	46.65	
Trachurus capensis	1352.49	28349	37.07	229
Merluccius capensis	222.63	1352	6.10	
Aequorea forskalea	220.38	6875	6.04	
Dentex macropthalmus	43.96	1240	1.20	
Dactylometra africana	28.18	285	0.77	
Galeichthys feliceps	25.39	60	0.70	
Pterothrissus belloci	20.88	451	0.57	
Trigla lyra	12.99	60	0.36	
Dicologoglossa cuneata	10.74	451	0.29	
Umbrina canariensis	7.89	60	0.22	
GOBIIDAE	1.13	225	0.03	
Total	3648.53		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 100
 DATE :8/12/2007 GEAR TYPE: PT NO: 4 POSITION:Lat S 17°51.25
 start stop duration Lon E 11°44.60
 TIME :7:33:05 AM7:34:58 AM1.9 (min) Purpose : 1
 LOG : 2123.64 2123.73 0.1 Region : 5000
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 58 58 Validity : 0
 Towing dir: 0° Wire out : 130 m Speed : 2.7 kn
 Sorted : 32 Total catch: 712.58 Catch/hour: 22741.91

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chrysaora hysoscella	12743.62	178340	56.04	
Trachurus trecae	9373.40	0	41.22	230
Dactylometra africana	624.89	1404	2.75	
Total	22741.91		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 101
 DATE :8/12/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 17°58.48
 start stop duration Lon E 11°38.40
 TIME :9:46:00 AM9:49:36 AM3.6 (min) Purpose : 1
 LOG : 2140.07 2140.22 0.1 Region : 5000
 FDEPTH: 135 133 Gear cond.: 1
 BDEPTH: 135 133 Validity : 3
 Towing dir: 0° Wire out : 400 m Speed : 2.3 kn
 Sorted : 66 Total catch: 1392.93 Catch/hour: 23215.50

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Aequorea forskalea	20405.00	55967	87.89	
Chrysaora hysoscella	1820.00	6300	7.84	
Trachurus capensis	990.50	36050	4.27	231
Total	23215.50		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 102
 DATE :8/12/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 18°11.67
 start stop duration Lon E 11°41.22
 TIME :6:04:20 PM6:07:37 PM3.3 (min) Purpose : 1
 LOG : 2207.32 2207.55 0.2 Region : 5000
 FDEPTH: 100 80 Gear cond.: 0
 BDEPTH: 132 131 Validity : 0
 Towing dir: 0° Wire out : 230 m Speed : 4.0 kn
 Sorted : 70 Total catch: 245.12 Catch/hour: 4483.90

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Aequorea forskalea	3338.96	97445	74.47	
Chrysaora hysoscella	1088.41	6732	24.27	
Trachurus capensis	28.90	2305	0.64	232
Dactylometra africana	26.34	128	0.59	
Etrumeus whiteheadi	1.28	73	0.03	
Total	4483.90		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 103
 DATE :8/13/2007 GEAR TYPE: PT NO: 7 POSITION:Lat S 18°17.19
 start stop duration Lon E 11°52.68
 TIME :12:54:00 AM1:01:54 AM7.9 (min) Purpose : 1
 LOG : 2261.04 2261.52 0.5 Region : 5000
 FDEPTH: 0 0 Gear cond.: 1
 BDEPTH: 34 42 Validity : 3
 Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
 Sorted : 37 Total catch: 183.50 Catch/hour: 1393.67

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinops ocellatus	1137.34	125089	81.61	234
J E L L Y F I S H	253.29	1899	18.17	
Engraulis encrasicolus	1.52	266	0.11	233
Loligo sp.	0.76	38	0.05	
Trachurus trecae	0.38	38	0.03	
GOBIIDAE	0.38	38	0.03	
Total	1393.67		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 104
 DATE :8/13/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 18°25.26
 start stop duration Lon E 11°47.88
 TIME :3:31:03 AM3:35:01 AM4.0 (min) Purpose : 1
 LOG : 2281.12 2281.39 0.3 Region : 5000
 FDEPTH: 60 60 Gear cond.: 0
 BDEPTH: 134 133 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 4.0 kn
 Sorted : 36 Total catch: 398.97 Catch/hour: 6029.77

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Aequorea forskalea	5028.97	181874	83.40	
Chrysaora hysoscella	919.35	4655	15.25	
Dactylometra africana	73.15	332	1.21	
Trachurus capensis	4.99	665	0.08	
Etrumeus whiteheadi	3.32	665	0.06	
Total	6029.77		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 105
 DATE :8/13/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 18°34.19
 start stop duration Lon E 11°38.11
 TIME :9:49:41 AM9:52:20 AM2.7 (min) Purpose : 1
 LOG : 2329.88 2330.40 0.5 Region : 5000
 FDEPTH: 210 212 Gear cond.: 0
 BDEPTH: 210 212 Validity : 0
 Towing dir: 0° Wire out : 600 m Speed : 3.2 kn
 Sorted : 63 Total catch: 157.78 Catch/hour: 980.00

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chrysaora hysoscella	635.09	1758	64.81	
Merluccius capensis	183.23	702	18.70	
MYCTOPHIDAE	42.86	21646	4.37	
Pterothrissus belloci	42.55	497	4.34	
Dentex macropthalmus	35.09	236	3.58	
GOBIIDAE	23.79	2981	2.43	
Synagrops microlepis	10.56	1043	1.08	
Schedophilus pemarko	3.73	19	0.38	
Galeorhinus galeus	3.11	50	0.32	
Total	980.00		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 106
 DATE :8/13/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 18°32.60
 start stop duration Lon E 11°48.46
 TIME :12:22:20 PM12:29:13 PM6.9 (min) Purpose : 1
 LOG : 2344.68 2345.15 0.5 Region : 5000
 FDEPTH: 0 35 Gear cond.: 1
 BDEPTH: 144 144 Validity : 3
 Towing dir: 0° Wire out : 120 m Speed : 4.1 kn
 Sorted : 35 Total catch: 69.74 Catch/hour: 608.20

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Aequorea forskalea	449.13	5878	73.85	
Trachurus capensis	110.41	10256	18.15	236
Chrysaora hysoscella	29.65	506	4.88	
Etrumeus whiteheadi	19.01	802	3.13	235
Total	608.20		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 107
 DATE :8/13/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 18°31.92
 start stop duration Lon E 11°48.08
 TIME :1:06:59 PM1:23:19 PM16.3 (min) Purpose : 1
 LOG : 2347.07 2347.94 0.9 Region : 5000
 FDEPTH: 144 144 Gear cond.: 1
 BDEPTH: 144 144 Validity : 3
 Towing dir: 0° Wire out : 400 m Speed : 3.2 kn
 Sorted : 55 Total catch: 276.35 Catch/hour: 1014.75

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Trachurus capensis	442.47	9529	43.60	237
Chrysaora hysoscella	237.76	1065	23.43	
Aequorea forskalea	185.43	6628	18.27	
Pterothrissus belloci	108.69	661	10.71	
Merluccius capensis	24.97	4700	2.46	
Chelidonichthys capensis	7.53	18	0.74	
Dactylometra africana	6.24	18	0.62	
Gobius sp	1.65	55	0.16	
Total	1014.75		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007406 STATION: 108
 DATE :8/13/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 18°31.18
 start stop duration Lon E 11°57.91
 TIME :3:44:24 PM3:51:52 PM7.5 (min) Purpose : 1
 LOG : 2362.80 2363.33 0.5 Region : 5000
 FDEPTH: 40 40 Gear cond.: 1
 BDEPTH: 78 80 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 4.3 kn
 Sorted : 66 Total catch: 563.02 Catch/hour: 4528.31

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Aequorea forskalea	3530.83	102820	77.97	
Chrysaora hysoscella	912.63	8051	20.15	
Dactylometra africana	67.72	72	1.50	
Trachurus capensis	9.57	1576	0.21	238
Etrumeus whiteheadi	7.56	137	0.17	
Total	4528.31		100.00	

ANNEX III Acoustic Instruments

The Simrad EK-60/38kHz scientific sounder was run during the survey only for observation of fish and bottom conditions.

The details of the settings of the 38kHz echo sounder were as follows (Driftjournal 1. Kalibrering av referansekule, 06.10):

Transceiver-1 menu (38 kHz lowering keel)

Transducer depth	5.50 m
Absorbtion coeff.	8,7 dB/km
Pulse length	medium (1,02ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-20,6dB
SV transducer gain	25,87 dB
TS transducer gain	26,5 dB
Angle sensitivity	21.9
3 dB beamwidth	6.9° along ship 6.9° athwardship
Alongship offset	-0.11°
Athwardship offset	0.08°

Display menu

Echogram	1 (38 kHz)
Bottom range	15 m
Bottom range start	10 m
Sv colour min	-70 dB

Bottom detection menu Minimum level -40 dB