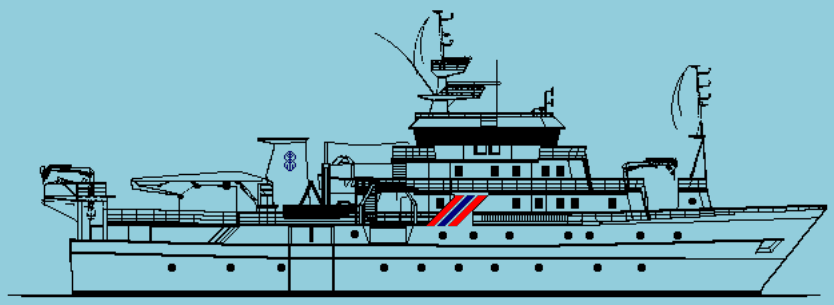

SURVEYS OF THE FISH RESOURCES OF ANGOLA

Cruise Report No 1/2014

Survey of the pelagic resources

03 February – 05 March 2014

Institute of Marine Research
IMR
Bergen

Instituto Nacional de Investigação Pesqueira
INIP
Luanda

Bergen 2014

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.

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by

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CHAPTER 1 INTRODUCTION

1.1 Objectives

This survey is part of the time series of the pelagic living resources, aiming at monitoring the pelagic fish resources of Angola. The first surveys of the pelagic resources were carried out in 1985, with surveys both during winter and summer. The next surveys were carried out in 1986 and 1989 (summer surveys), before the time series of the winter surveys commenced in 1991. With the exception of 1993 (no survey) and 1997 (summer survey only) the winter time series has been carried out without interruption from 1991-2011. In 2013, surveys were carried out both in the winter and summer seasons in order to investigate the intra-annual (seasonal variation) in the distribution and estimated abundance of the pelagic species. The same was done in 1985, 1995, 2011 and 2012. The same is planned for 2014.

The surveys are carried out on behalf of Instituto Nacional de Investigação Pesqueira (INIP), Luanda, who also staffs the vessel with a local co-cruise leader, as well as fisheries and oceanographic researchers. The IMR provides the IMR cruise leader, a survey technician and two instrument operators, according to the standard operating procedures, in accordance with the tri-partite agreement between NORAD, FAO and IMR, and with the MoU on the execution of the survey between INIP and FAO.

The surveys aim at improving the general knowledge of the biology, ecology and population dynamics of the main pelagic species in relation to the environment and the ecosystem as such. Acoustic echo integration is used to estimate stock abundance indices of the pelagic species. The survey estimates represent important information as basis for the recommendations of the Total Allowable Catch (TAC) of fish resources in Angola.

The specific objectives of the present survey were:

- To estimate the abundance and 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 *Sardinella maderensis*, the Cunene horse mackerel *Trachurus trecae* and the Cape horse mackerel *Trachurus capensis*.

- To collect depth-stratified samples of zoo- and phytoplankton in order to continue the studies on feeding biology including relating stomach content to estimated zooplankton composition and observed density.

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

- To observe and record sea birds and mammals in the surveyed area.

- On-the-job training of cruise participants on the main survey routines, including using the Nansis database and scrutinizing acoustical data using IMR the post-processing system, the Large Scale Survey System (LSSS).

1.2 Participation

The scientific staff consisted of:

From INIP, Luanda: António Barradas (Co-cruise leader), Miguel André, Marisa Macuéria, Joana Pinheiro, José da Silva, Sónia da Silva, Geraldina de A. Salvador José, António Buco and João Morais Domingos.

From IMR, Bergen: Reidar TORESEN (Cruise leader), Tore MØRK (16.02-09.03), Magne OLSEN, Jan Arne VÅGENES.

1.3 Narrative

The vessel departed from Walvis Bay on the 6th of February at 12:00 UTC and steamed northwards to the Cunene River where the survey started on the 7th of March. The survey area is divided into three standard regions:

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

The southern region was completed on the 15th of February. The coverage of Central region continued immediately and was completed on the 25th of February. The vessel continued with the Northern region until the 5th of March, and then made a call in Luanda for change of personnel.

1.4 Survey effort

Figures 1-3 shows the parallel acoustic transects with 5-6 nautical mile (NM) spacing with fishing, plankton and hydrographical stations for the Southern, Central and Northern regions of Angola. All sampling trawls, including the small (10 m vertical opening), the mid-sized (15 m vertical opening) pelagic trawls and the demersal trawl (5 m) (Annex VI), 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.

Area	BT	PT	Total Trawls	CTD	Multinet	Distance (NM)
Cunene River-Benguela	4	25	29	59	20	1146
Benguela -Pta. Palmerinhas	12	30	42	52	15	1028
Pta. Palmerinhas-Congo River	4	15	19	23	8	1420
Total	20	70	90	134	43	3594

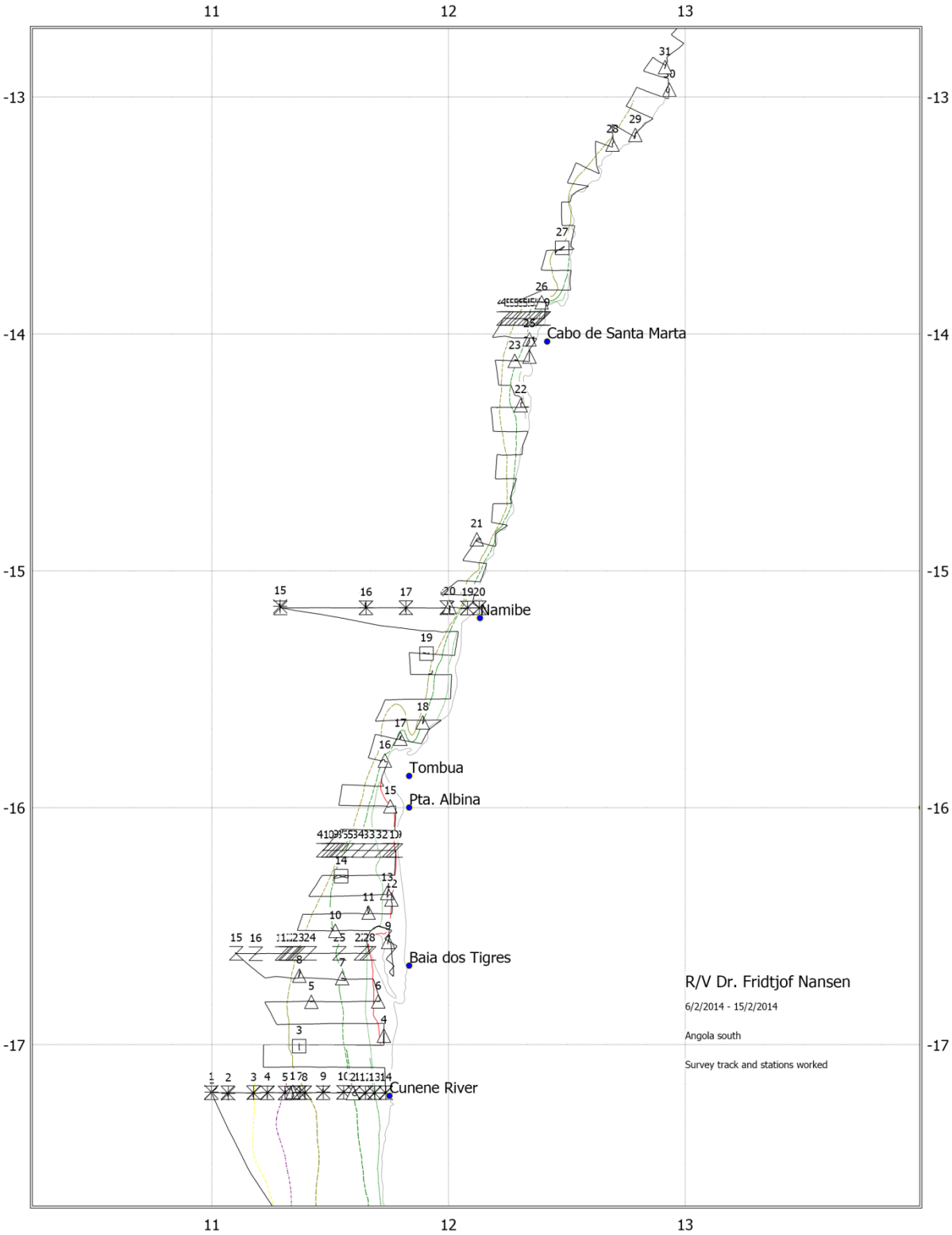


Figure 1 Course track with fishing, plankton and hydrographical stations, Cunene River – Benguela. Depth contours at 20, 50, 100, 200, and 500m

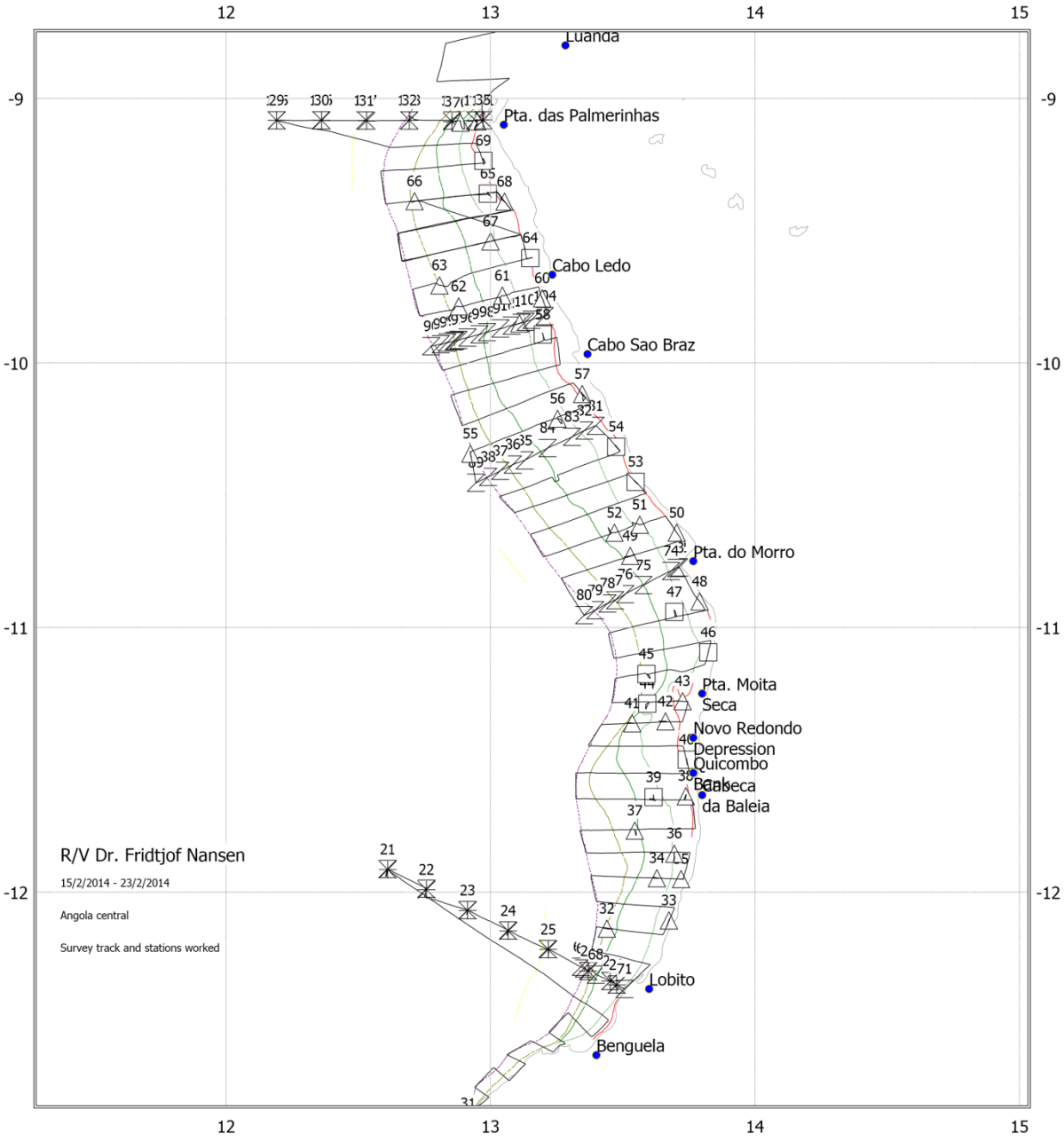


Figure 2 Course track with fishing, plankton and hydrographical stations, Benguela-Pta. das Palmerinhas. Depth contours at 20, 50, 100, 200, and 500m.

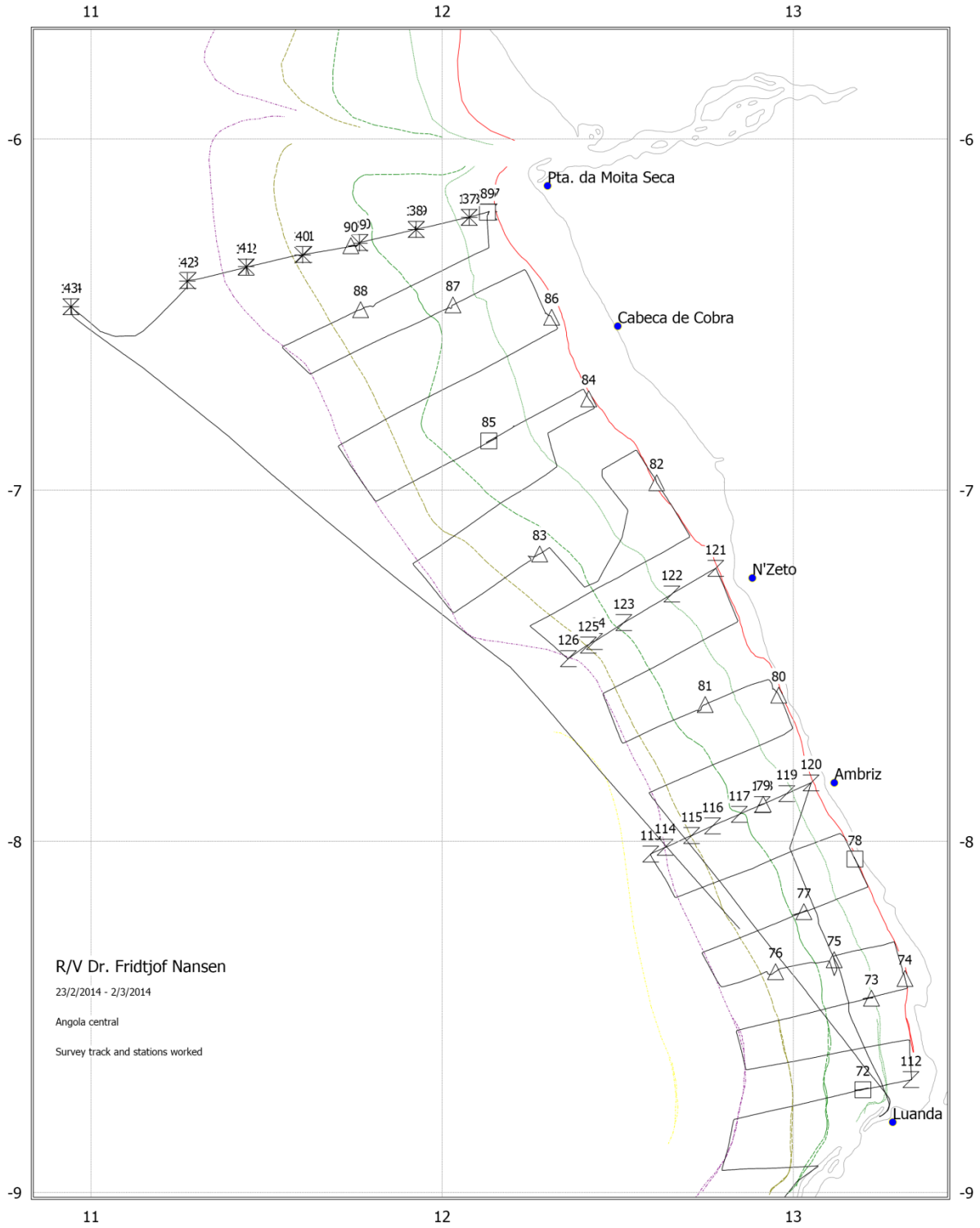


Figure 3 Course track with fishing, plankton and hydrographical stations, Pta. das Palmerinhas-Congo River. Depth contours at 20, 50, 100, 200, and 500m.

CHAPTER 2 SAMPLING AND ESTIMATION METHODS

2.1 Hydrographical sampling

CTD
A Seabird 911+ CTD probe was used to obtain vertical profiles of the temperature, salinity and oxygen. Real time logging was carried out using the PC based Seabird Seasave software. CTD casts were conducted at standard INIP transects and regional monitoring lines. The casts were stopped a few meters above the bottom.

Attached to the CTD was also a Chelsea fluorometer of the type Mk III Aquatracka. It measures chlorophyll A in microgram per litre with an uncertainty of 3%. Factory slope and offset was 0.00921 and -0.02.

Thermosalinograph

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

Current speed and direction measurements (ADCP)

The vessel-mounted Acoustic Doppler Current Profiler (VMADCP) from RD Instruments was used during the entire survey.

Meteorological observations

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

2.2 Fish sampling

A brief description of the fishing gear is provided in Annex VI. All trawl catches were sampled for species composition by weights and numbers. Records of catch rates are given in Annex I. Total length (TL) frequencies were taken for the commercial pelagic species such as the two species of sardinella and horse mackerel, anchovy (*Engraulis encrasicolus*), round herring (*Etrumeus whiteheadi*), scombrids, *Selene dorsalis*, *Chloroscombrus chrysurus*, big eye grunt (*Brachydeuterus auritus*) and a few demersal species, mainly *Dentex spp*. Total length frequency histograms of main pelagic species by region are shown in Annex II.

Biological samples were obtained for the two species of sardinella and horse mackerel, *Scomber japonicus, Sarda sarda, Selene dorsalis, Chloroscombrus chrysurus* and *Brachydeuterus auritus*. Total length (TL) and body weight were determined to the nearest 1 cm and 1 g below, respectively. For sardinella and horse mackerel these data were used to calculate length-weight relationships for the biomass estimates. Sex and reproductive stages were determined by means of macroscopic examination, scoring each fish according to the six-point classification scale used by INIP (Annex III).

2.3 Plankton sampling

Phytoplankton

Samples of phytoplankton were collected on monitoring lines using the CTD bottles at 5, 15, 25, 50 and 75 meter depth. The samples were preserved in 2% formalin.

Zooplankton

The zooplankton sampling was conducted by means of HYDROBIOS Multinet (180 µm), at five depth intervals, 0-25, 25-50,50-75,75-100 and 100-200 m, on monitoring lines. Data from the flow meter was recorded electronically from the Multinet receiver unit. A SCANMAR depth sensor gave real-time information of the depth. The nets were opened and closed remotely from the bridge of the vessel. The samples were preserved in 4% formalin.

2.4 Acoustic sampling

Acoustic equipment

Acoustic data were recorded using a Simrad ER60 scientific echo sounder equipped with keel-mounted transducers at nominal operating frequencies of 18, 38, 120 and 200 kHz. The technical specifications and operational settings of the echo sounder used during the survey are given in Annex VI.

Acoustic data were logged and post-processed using the latest acoustic data post-processing software, the Large Scale Survey System (LSSS) Version 1.61 (Korneliussen *et al*. 2006).

Allocation of acoustic energy to species group

The acoustic data were scrutinized using the LSSS version 1.61. Scatters were displayed at 38 kHz. The 5 nautical miles (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 Annex IV. The identification of and allocation of echo values to different species groups was based on visual scrutinization of echograms combined with information from targeted pelagic and demersal trawling.

Estimation of Echo Abundance

Mean area backscattering values (s_A values) was output from LSSS and used in the estimation of echo abundance for the three regions (south, central and north).

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 was:

$$TS = 20Log(L) - 72 \text{ (dB)}$$

This corresponds to a conversion factor:

$$CF = \frac{10^{-7.2}}{4\pi} \cdot L^{-2}$$

Or on a much simpler form:

$$CF = \frac{1.261218 \cdot 10^{6}}{\overline{L}^2}$$

The conversion factor is the multiplier transforming echo abundance into numbers of fish where $\overline{L}^2$ is the average of L^2 from the observed length distribution (and not the square of average *L*). The conversion factor is used as follows:

$$N = Echo\ abundance \cdot CF$$

The target strength parameters used 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 relation is available for the horse mackerel species, but it seems that using the same relationship as for clupeids is common. The chosen target strength parameters for horse mackerel should be considered conservative and there are indications that target strength of horse mackerel may be strongly dependent on depth.

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 NansisMapTool Version 1.7, and distribution plots and area calculations on the strata were carried out with the same software. Sub-stratification was used to isolate areas of similar densities, using the following pre-defined, standard categories with unit m^2/NM^2: 1: s_A = 0-300 (very scattered); 2: s_A = 301-1 000 (scattered); 3: s_A = 1 001-3 000 (dense); 4: s_A 3001-10 000 (very dense) and 5: s_A >10 000 (extremely dense).

Mean 5-NM integrator values (s_A) computed along the transect lines were re-averaged for each stratum using NansisMapTool. The short spacing between the lines (6-7 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 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 from each trawl hawl equally. Target species of the same genus, i.e. *S. aurita* / *S. maderensis* and *T. trecae* / *T. capensis*, are not acoustically distinguishable, and the s_A values were therefore split according to the relative distributions (in numbers) of the two species in the trawl catches in each stratum. The density of fish (number per square nautical mile) in each length group was estimated as:

$$\rho_i = S_A \cdot \frac{p_i}{\sum_{i=1}^{n} \frac{p_i}{C_{F_i}}}$$

where

ρ_i = density of fish in length group *i*

S_A = mean integrator value

p_i = proportion of fish in length group *i*

$\sum_{i=1}^{n} \frac{p_i}{C_{Fi}}$ = the relative back scattering cross section (m^2) of the length frequency sample of the target species, and

C_{fi} = reciprocal back scattering cross section (σ_{bs}^{-1}) of a fish in length group *i.*

The total number of fish in each stratum was then calculated by multiplying the density of fish with the area of the stratum. The biomass of fish was then calculated by multiplying the number of fish per length group within each stratum with the weight at length. All these calculations are done applying Excel spread sheets.

CHAPTER 3 OCEANOGRAPHIC CONDITIONS

3.1 Surface distribution

Wind, sea surface temperature (SST, 5m depth) and sea surface salinity (SSS, 5 depth) were continuously recorded during the survey. Figure 4 – 6 show the horizontal distribution of temperatures and salinity.

Southern region

The sea surface temperature values ranged from 17°C to 27.7°C. The minimum value of about 17°C was observed near the Cunene River area, probably due to the upwelling phenomenon occurrence and temperature increased gradually offshore wards. Similar patterns were observed in terms of salinity. The highest value gathered until now in Angolan waters (S>36.8) was found in Namibe-Pta Albina offshore band while values between 35.5 and 35.9 were recorded close to the coastal zone. The lowest salinity value (35.25) was found outside the Cunene river mouth. The shape of the isoline of temperature and salinity in Santa Marta and Namibe areas suggest the occurrence of zonal transport of sea surface water inshore wards. The Angola - Benguela Front Area (ABFA) seemed to be located between 16º00'-17º00S (Fig.4).

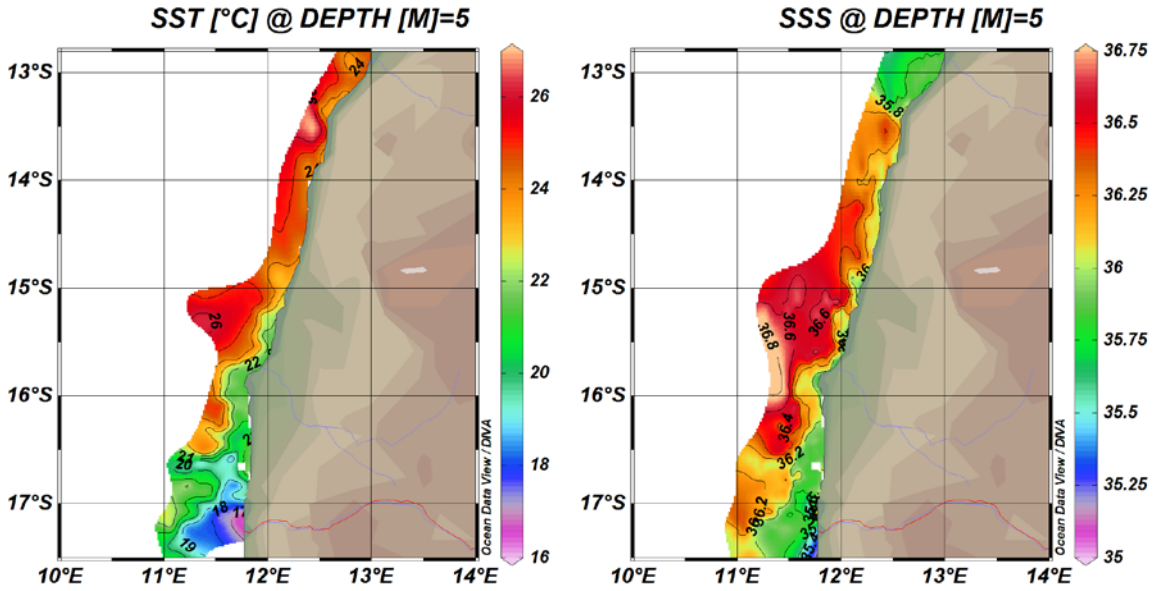


Figure 4 Distribution of water temperatures and salinity at 5m depth in the Southern region

Central region

The temperature values ranged from a minimum of 24º C to maximum of 29º C. In the Lobito section the temperature varied between 24-25 ° C inshore, where high values of salinity was observed (36), an indicator of coastal upwelling. North of 12º00S temperature varied between 26-27º C inshore and 28-29ºC offshore in the Ponta das Palmerinhas section. Some high salinity values (35.5) were observed between 12º00 -10º30S (Lobito and Pta. do Morro) inshore and offshore. Next to Ponta das Palmerinhas the salinity decreased gradually due to the large contribution of the Cuanza River (Fig.5).

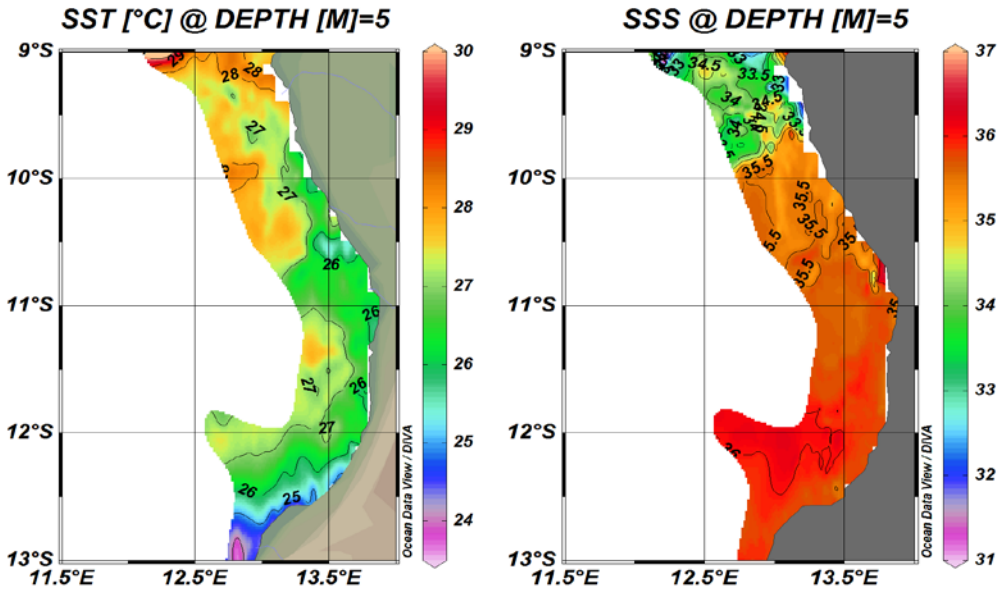


Figure 5 Distribution of water temperatures and salinity at 5m depth in the Central region.

Northern region

The temperature values ranged from a minimum of 27° C to a maximum of 30° C, and salinity content from a minimum of 18 to a maximum of 34.5 (Fig. 6). The presence of brackish water is mainly caused by the discharge of the Congo River, and its mouth and surroundings had a spherical like salinity distribution with salinity content of 18 inside, gradually increasing to 31.5 offshore. Warm water 29.5° C was observed near Ambriz and offshore at Ponta da Moita Seca.

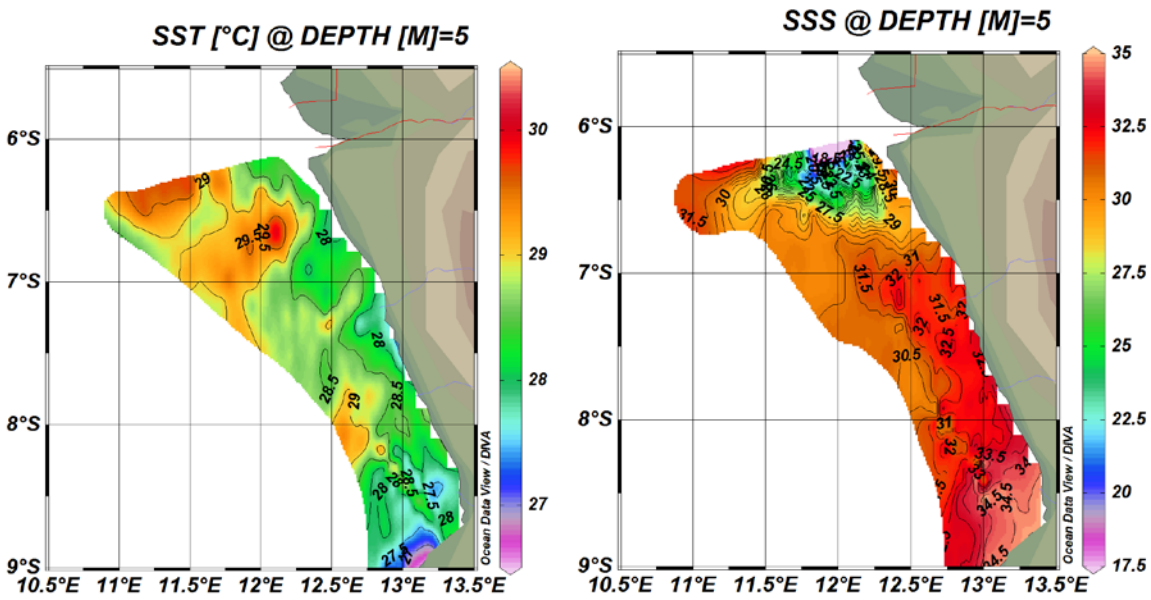


Figure 6 Distribution of water temperatures and salinity at 5m depth in the Northern region.

3.2 Standard monitoring sections

The vertical distribuition of temperature, salinity, oxygen and fluorescence in the Cunene section (Fig.7) show summer pattern variations. In the surface layer (0-100 m), high temperatures with values from 15 to 25°C were recorded showing tropical upwelling systems while below 300 m depth low temperatures with value around 10ºC predominated. The sea surface salinity ranged from 35.8 to 36.2 and the highest sea surface salinity (S≥36.2) occurred offshore. The oxygen concentrations in the upper layer (0-50 m) showed similar patterns as temperature and salinity. High oxygen contents (4-6ml/l) occurred offshore and near the coast low values (1-3ml/l) were recorded, probably due to the occurrence of upwelling. The minimum oxygen content was located between 200-500 m. In terms of fluorescence the major biological activity was recorded in the main continental shelf with values about 1-1.25 µg/l.

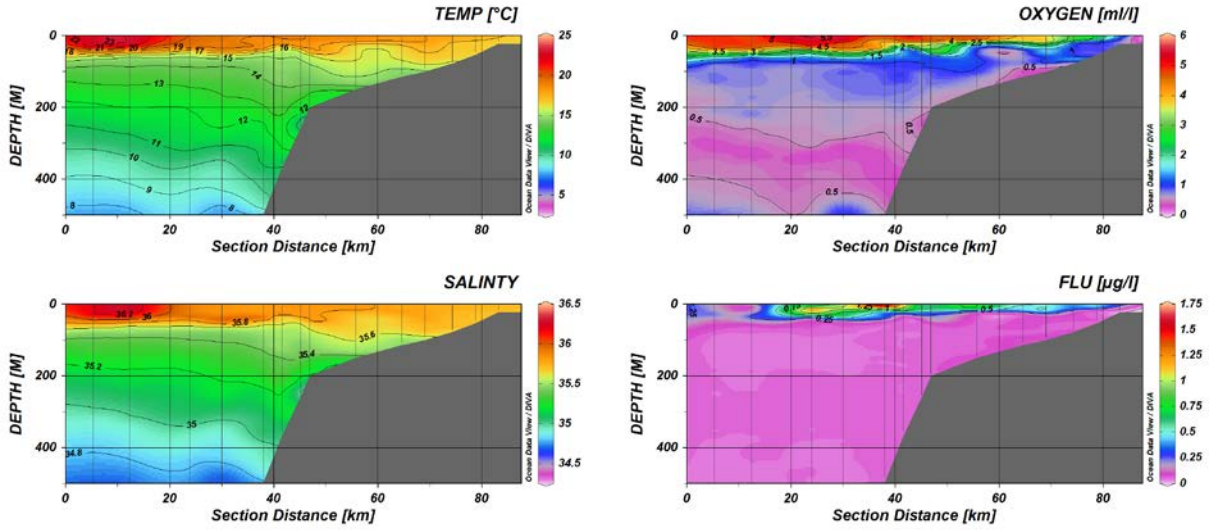


Figure 7 Vertical sections of temperature, salinity, oxygen and fluorescence off Cunene River.

In the Namibe section (Fig.8), no signal of upwelling were found because all oceanographic parameters seemed to be evenly distributed at subsurface layer. The entire continental shelf was dominated by high values of temperature, salinity and oxygen. The sea surface temperature ranged from 25-28ºC and decreased with depth. As observed in the previous sections the highest value of salinity (36) occurred along the continental shelf and also decreased with the depth. A pocket with high oxygen contents (≥5ml/l) was observed in the subsurface layer and the deficient oxygen content was located at the same layer as in previous sections. The peaks of fluorescence (1.25 mg/l) was observed close to the coastal zone and the major biological activity occurred within the subsurface layer.

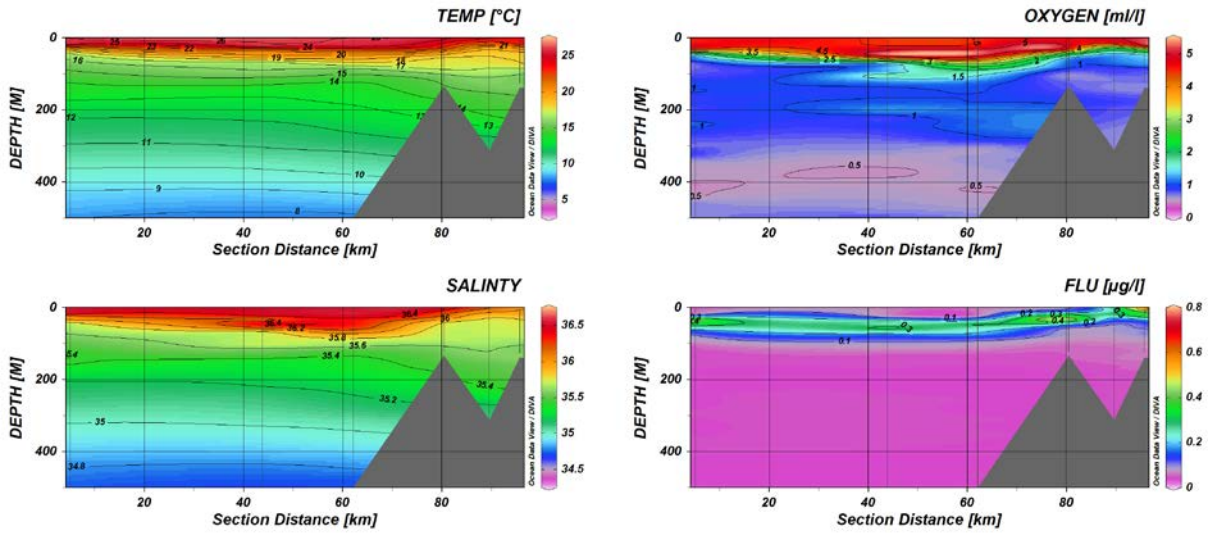


Figure 8 Vertical sections of temperature, salinity, oxygen and fluorescence off Namibe.

As observed in the Santa Marta section similar oceanographic conditions occurred in the Lobito section (Fig.9). Sea surface temperature ranged from 26ºC inshore to 28ºC offshore. The flat isolines of all oceanographic parameters reavel the absence of a mixing process in this area showing a stratification throughout the water column. The salinity showed the same pattern as observed in the temperature, - the highest value (>36) occurred offshore at the surface and gradually decreased with the depth (35.8-34.5). The oxygen content varied between 4 and 5.5 ml/l in surface waters and the minimum oxygen content (0.5ml/l) occurred at 380-430 m layer. The intensive biological activity characterized by fluorescence with value around 0.25 µg/l, occurred within the subsurface layer (10-50 m) while lower values (0.05 µg/l) were identified at surface and in the water column.

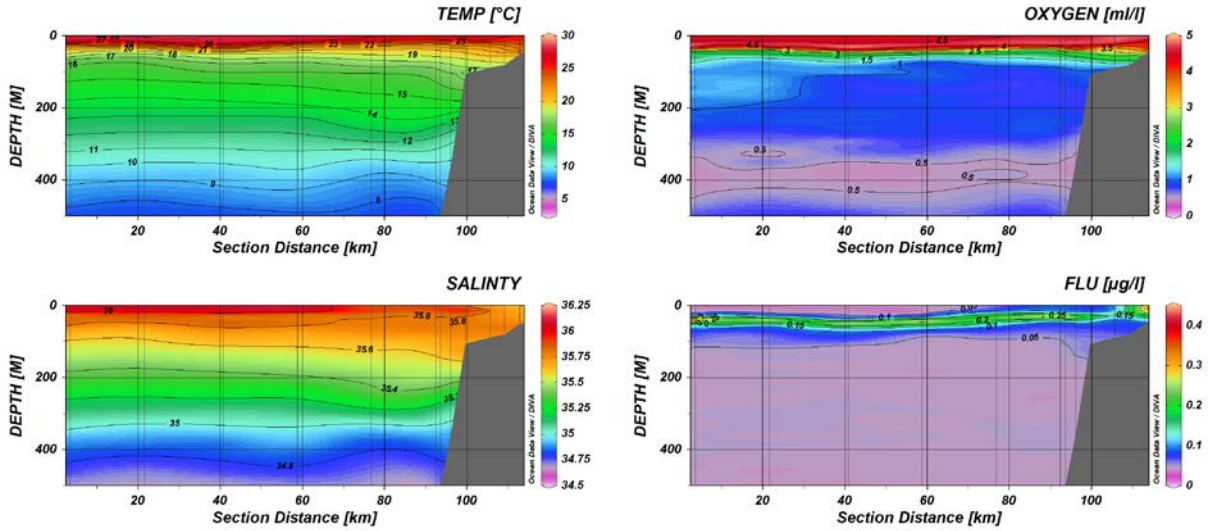


Figure 9. Vertical sections of temperature, salinity, oxygen and fluorescence off Lobito

In the section of Ponta das Palmerinhas (Fig.10), the surface layer 0-50 m was entirely covered by well stratified warm water (19-29ºC) both inshore and offshore. The salinity was not calculated at this section because there were same problems with the conductivity censor. High oxygen values (3.5-4.5 ml/l) were observed in the top layer 0-50 m and below 100 m depth the OMZ was evident. The fluorescence values (0.3-0.5µl/l) were higher near the coast than seawards, probably due to the Cuanza-River discharge nearby.

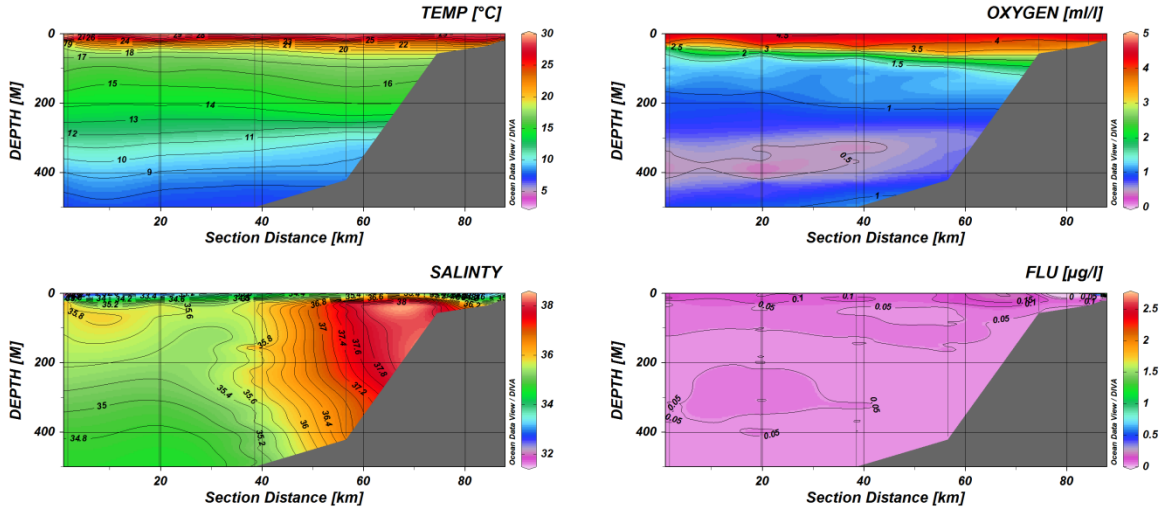


Figure 10. Vertical sections of temperature, salinity, oxygen and fluorescence off Pta. das Palmerinhas

In the Congo River section the temperature varied between 25 and 30° C, in the surface layer up to 25 m. Below this layer the temperature ranged between 23-15° C above 200 m, with a minimum of 10° C below 300 m depth. The salinity of the surface layer varied widely due to the discharge of Congo River water. Low values were observed near the mouth (18), and offshore the salinity increased with depth. The oxygen contents were high over the entire surface layer of water and varied between 4-5 ml/l and the OMZ was observed below 150 m depth. In terms of fluorescence, the intensity of the biological activity was recorded near the coast and peaks observed were between 0.1 - 0.5 µg/l.

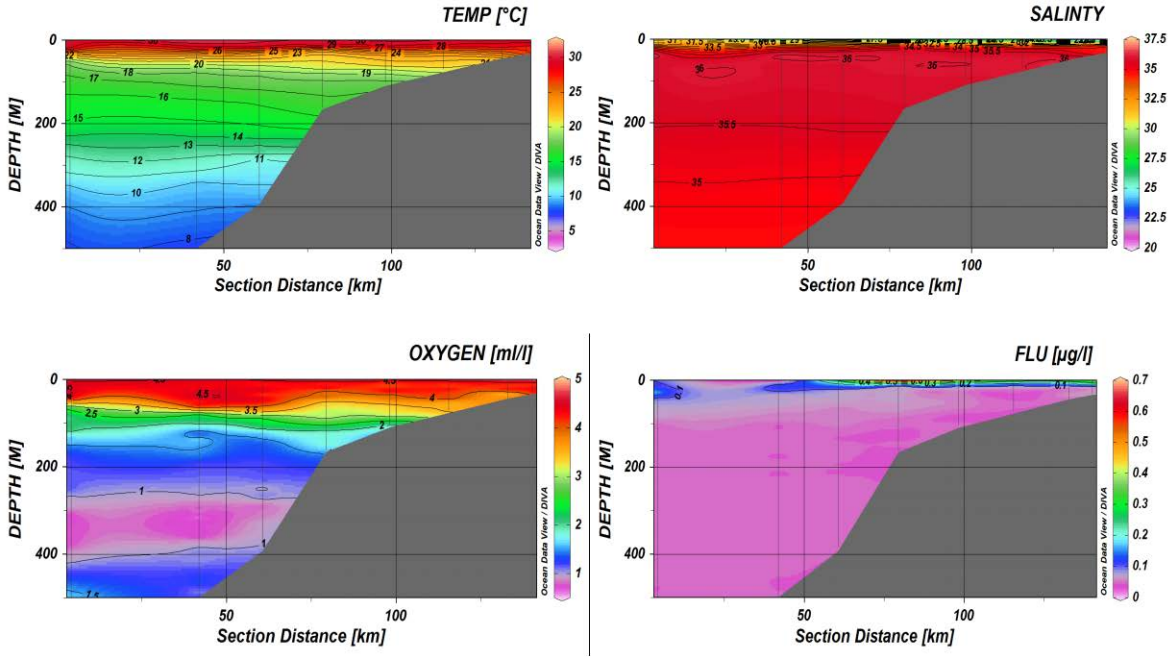


Figure 11. Vertical sections of temperature, salinity, oxygen and fluorescence off Pta. da Moita Seca

CHAPTER 4 DISTRIBUTION, SIZE COMPOSITION AND BIOMASS ESTIMATES

4.1 Cunene River-Benguela

Sardinella

Sardinella was observed in two main concentrations. One beginning north of Caboda Santa Marta and ending at Cabo de Santa Maria, while the other started some 40 nautical miles south of Elephante Bay and ended some 15 nautical miles north of Baia dos Elephantes. Most registrations were recorded inshore and were dominated by *Sardinella aurita*. Figure 13. The most dense concentrations were found about 10 nautical miles north of Caboda Santa Marta.

Sardinella maderensis did occur in only a very few trawl stations and in very low numbers. It was therefore not made any estimate of this species in this southern region of Angola.

S. aurita had a length distribution with a peak at around 17 cm (Figure 12). The length frequency of *S. maderensis* consisted of both juvenile and adult specimen, and was dominated of fish between 29 and 32 cm.

a) S. aurita

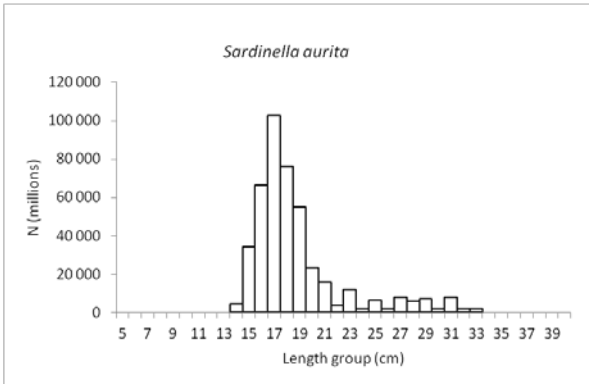


Figure 12. Total length distribution of Sardinella aurita.

The estimated total biomass for *Sardinella aurita* was 31 000 tonnes, which is considerable less than the biomass estimate in 2012 and 2013. (Annex V). No separate estimate of *S. maderensis* was made.

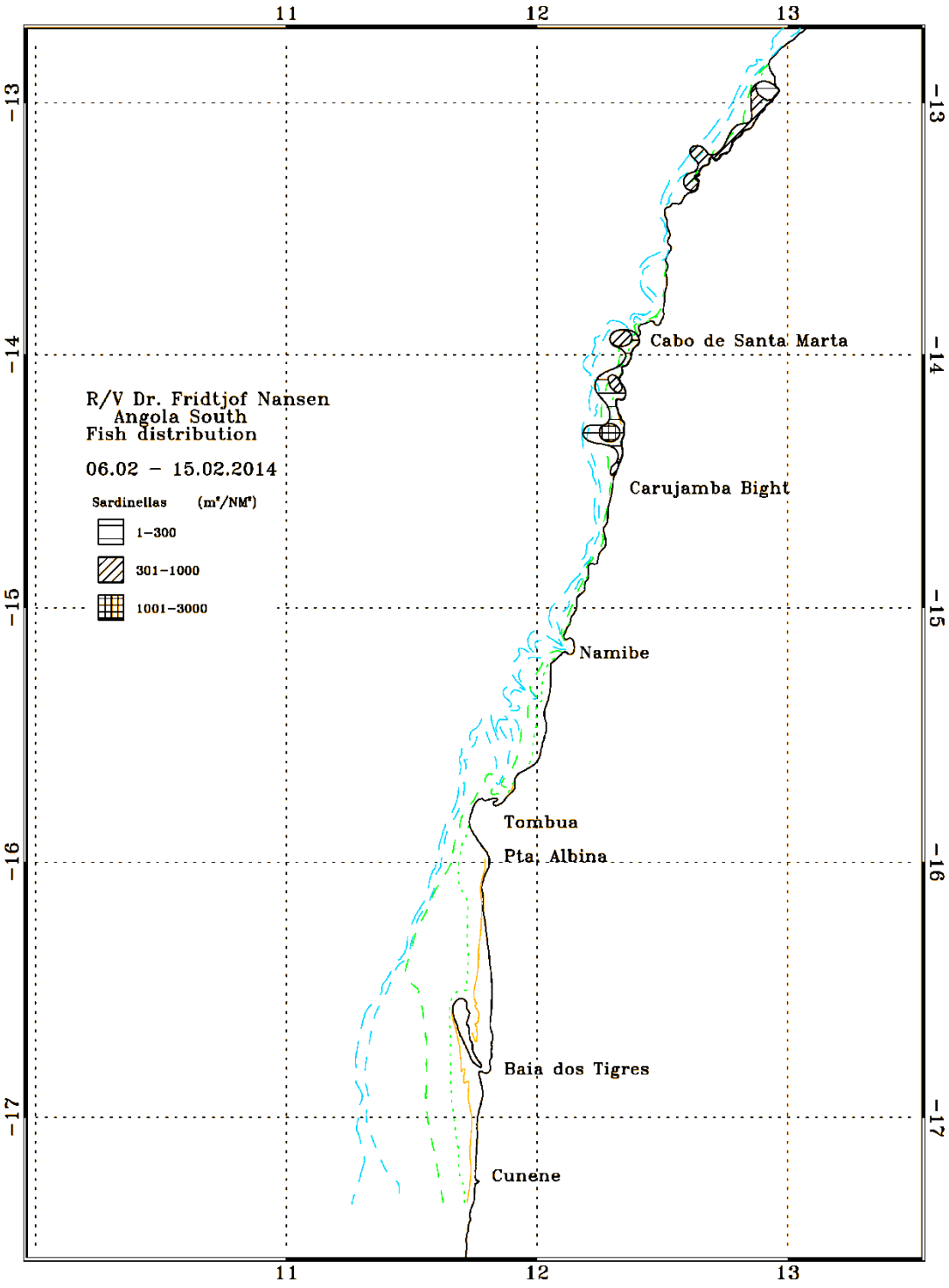


Figure 13. Distribution of *Sardinella* spp., Cunene River-Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m

Horse mackerel

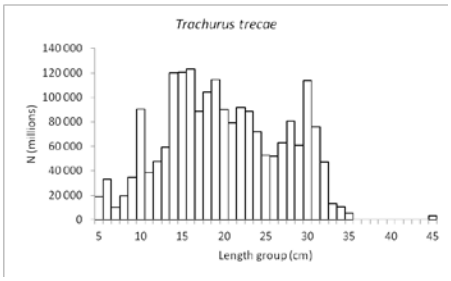
Cunene horse mackerel *Trachurus trecae* normally distributes over most of the Angolan continental shelf while the Cape horse mackerel *T. capensis* is associated with cold waters of the Benguela current. Like in previous surveys both species of horse mackerel were found in the area.

Cape horse mackerel was caught on six stations in the southern part of the region and was mainly observed in very scattered densities. Cunene horse mackerel was caught more frequently and in higher abundances all the way to Baia dos Elephantes. It was however mainly observed acoustically in very scattered distributions in patches over most of the region, with some denser registrations between Cunene River and Baia dos Tigres (Figure15). The registrations of horse mackerel were typically found as schools close to bottom on the shelf during daytime, lifting and dispersing during night. The mostdense schools were often found near the shelf break.

The size distribution of Cunene horse mackerel covered a wide size range (5-35 cm) (

Figure14). The size distribution shows modal lengths of 17 and 30 cm. Only a few fish below 10 cm were caught in the southern area. The Cape horse mackerel showed a narrower distribution with peaks at 11 and 17 cm.

a) Trachurus trecae



b) *T. capensis*

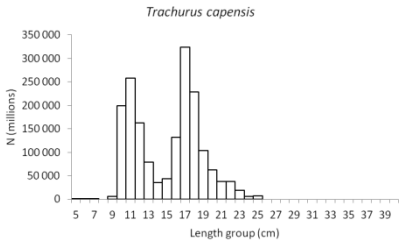


Figure 14. Total length distributions of Trachurus trecae and T. capensis Cunene River-Benguela.

In the southern area a sub sample of 634 *T. trecae* was taken for biological analysis. Maturity analysis showed that 48.4% of the fish were found maturing, 51,6% were immature and 27,6% were indeterminate. 24,2% of *T. capensis* were mature. The majority of the fish were found to be in the stages II and III in the virgin and pre-spawning status respectively, for both males and females, the latter most abundant (Figure 16). A minority of fish were found in the stages 2 and 3, maturing virgin and recovering. Annex III gives a description of the maturity stages.

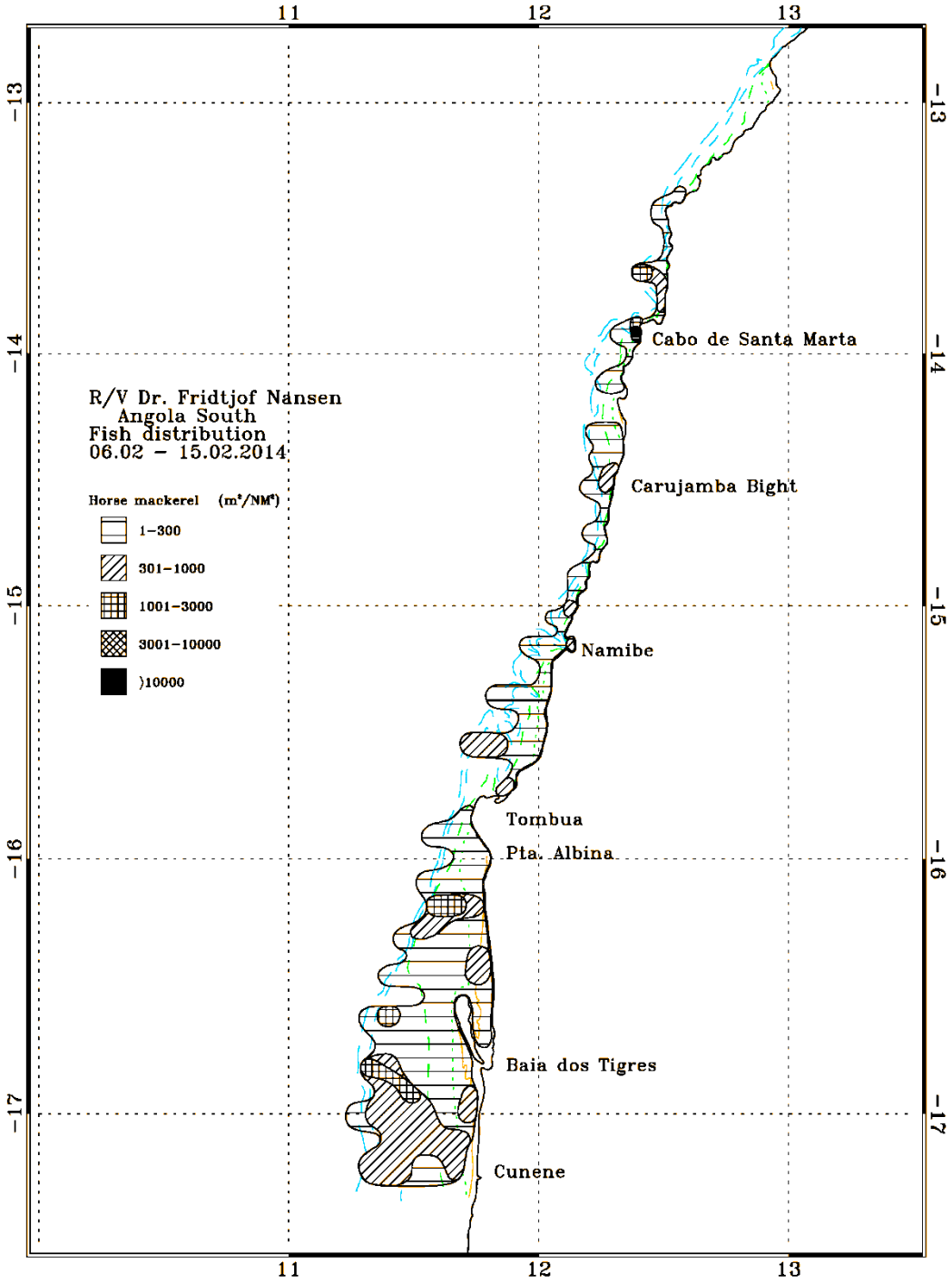


Figure 15. Distribution of Cunene horse mackerel, Benguela–Cunene. Depth contours at 10, 20, 50, 100, 200 and 500 m.

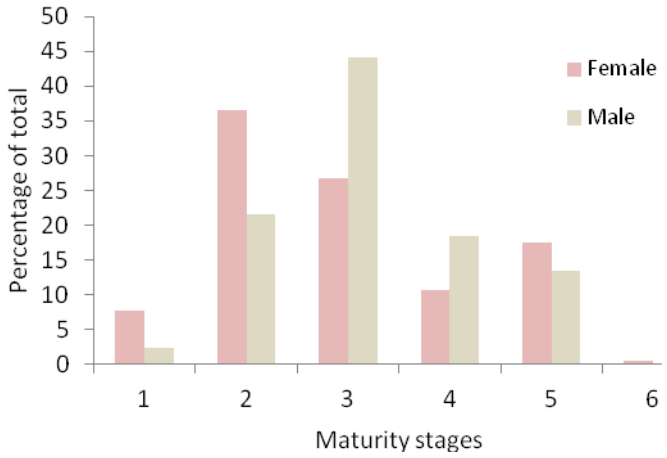


Figure 16. Distribution of maturity stages by sex for *Trachurus trecae* in the Southern region

The biomass for both horse mackerel was estimated at 275 000 tonnes which is considerably more than the biomass estimate last year in this season. The biomass of Cunene horse mackerel was estimated at 208 000 tonnes, (Annex V). The biomass of Cape horse mackerel was estimated at 67 000 tonnes.

Other species

Other clupeides and anchovy

Round herring (*Etrumeus whiteheadi*) and anchovy (*Engraulis encrasicolus*) were caught in low numbers on a couple of stations in the southern part of the region. Species belonging to the pelagic 1 group were observed in two aggregations, one between Cunene river and Iles dos Tigres and another one in Baia dos Tigres (Figure 17). The southernmost aggregation was quite dense with S_A – values of more than 9000. Trawl stations showed that the P1 was mainly represented by anchovy (*Engraulis encrasicolus*). The biomass of P1 was estimated to 79 thousand tonnes.

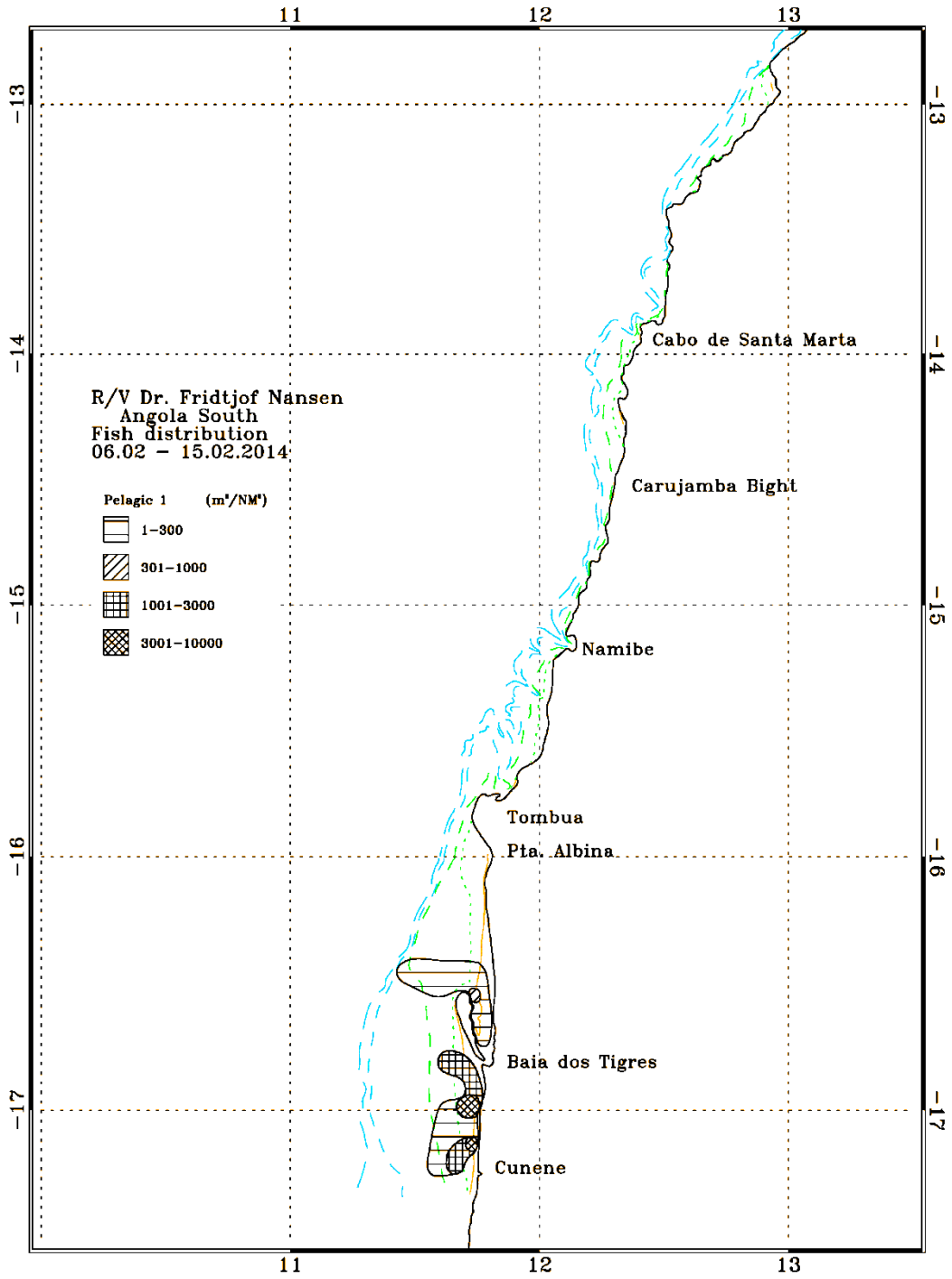


Figure 17. Distribution of Anchovy (Engraulis encrasicolus), Cunene River-Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m

Other carangids

Scombrids and carangids other than horse mackerel had a low occurrence in the trawl catches in the region, and only few barracudas and hairtails were caught. Species belonging to the pelagic 2 group were also observed in very scattered densities over mainly the southern part of the region (Figure 18). The biomass of this group of fish was estimated to 20 thousand tonnes.

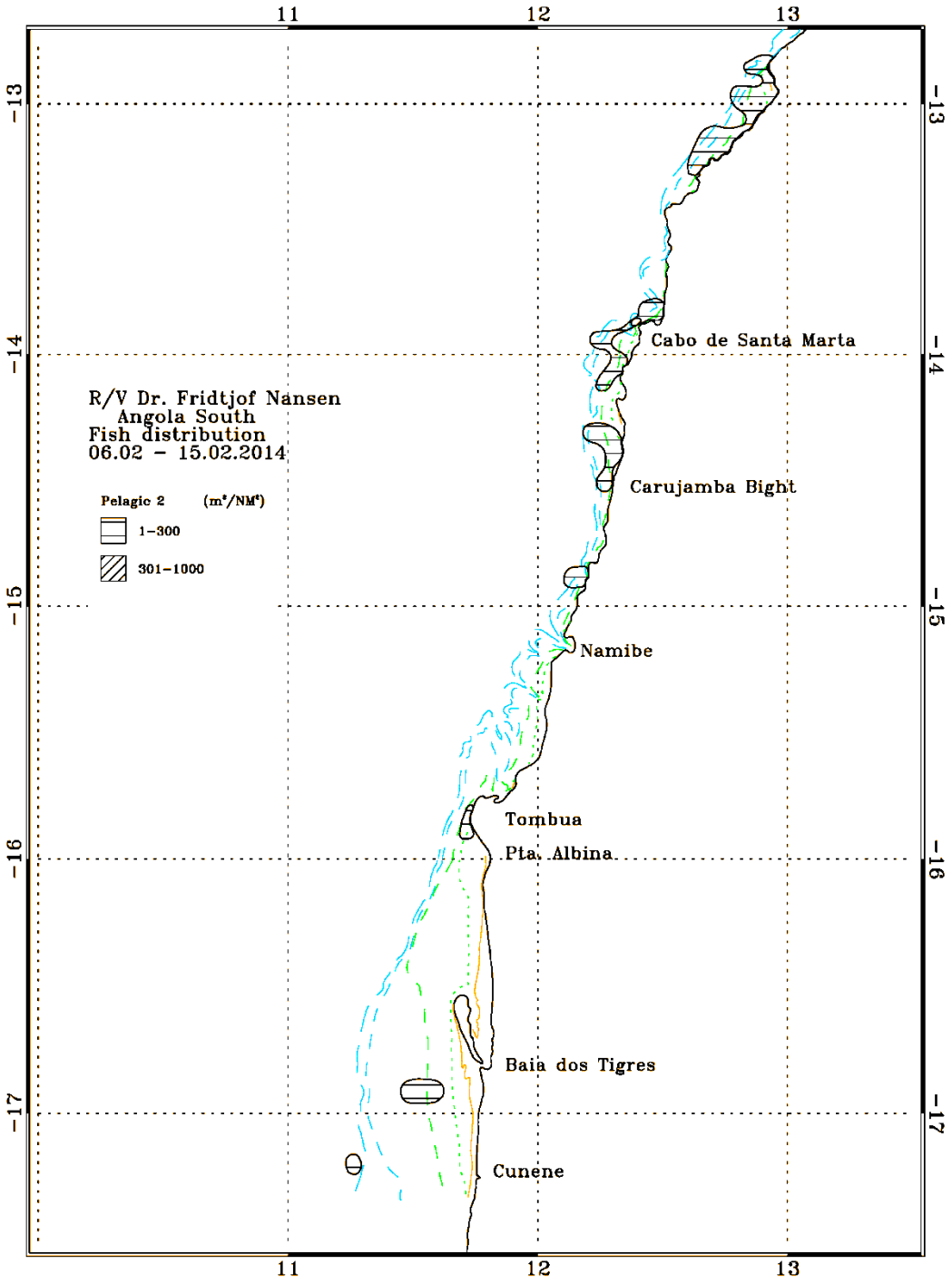


Figure 18. Distribution of other carangids., Cunene River-Benguela. Depth contours at 10, 20, 50, 100, 200 and 500 m

Table 2. Abundance estimates of pelagic fish, Cunene River – Benguela.

Trachurus capensis	*Trachurus trecae*	*Sardinella aurita*	*Sardinella maderensis*	*anchovy*	Other *carangids*
67	208	31	-	79	20

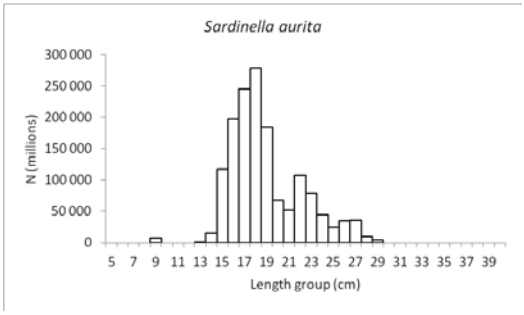
4.2 Benguela-Pta. das Palmerinhas

Sardinella

Like in previous summer surveys *sardinella* was found in most of the area with continuous distribution from north of Lobito to north of Cabo Ledo (Figure 20). The registrations showed a patchy pattern of very scattered, scattered, dense and very dense distributions.

The length distribution of *S. aurita* shows a peak at 18 cm (Figure 19). The length distribution of S. *maderensis* had peaks at 10, 17 and 29cm TL.

a) S. Aurita



b) *S. maderensis*

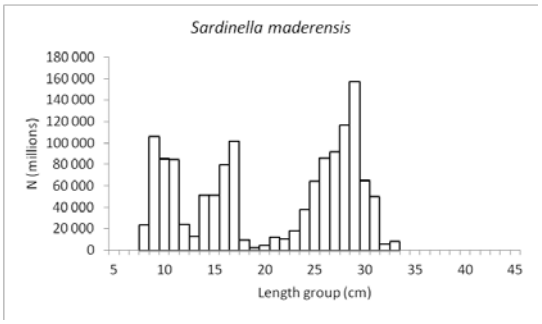


Figure 19. Total length distribution of Sardinella aurita and S. maderensis Benguela-Pta. das Palmerinhas.

The biomass for both sardinellas was estimated at 247 thousand tonnes, which is somewhat more than what was estimated in this area last year. (Annex V). *S. maderensis* was dominating, contributing 60% (149 000 tonnes) of the biomass, while S. *aurita is* contributed 40% (98 000 tonnes).

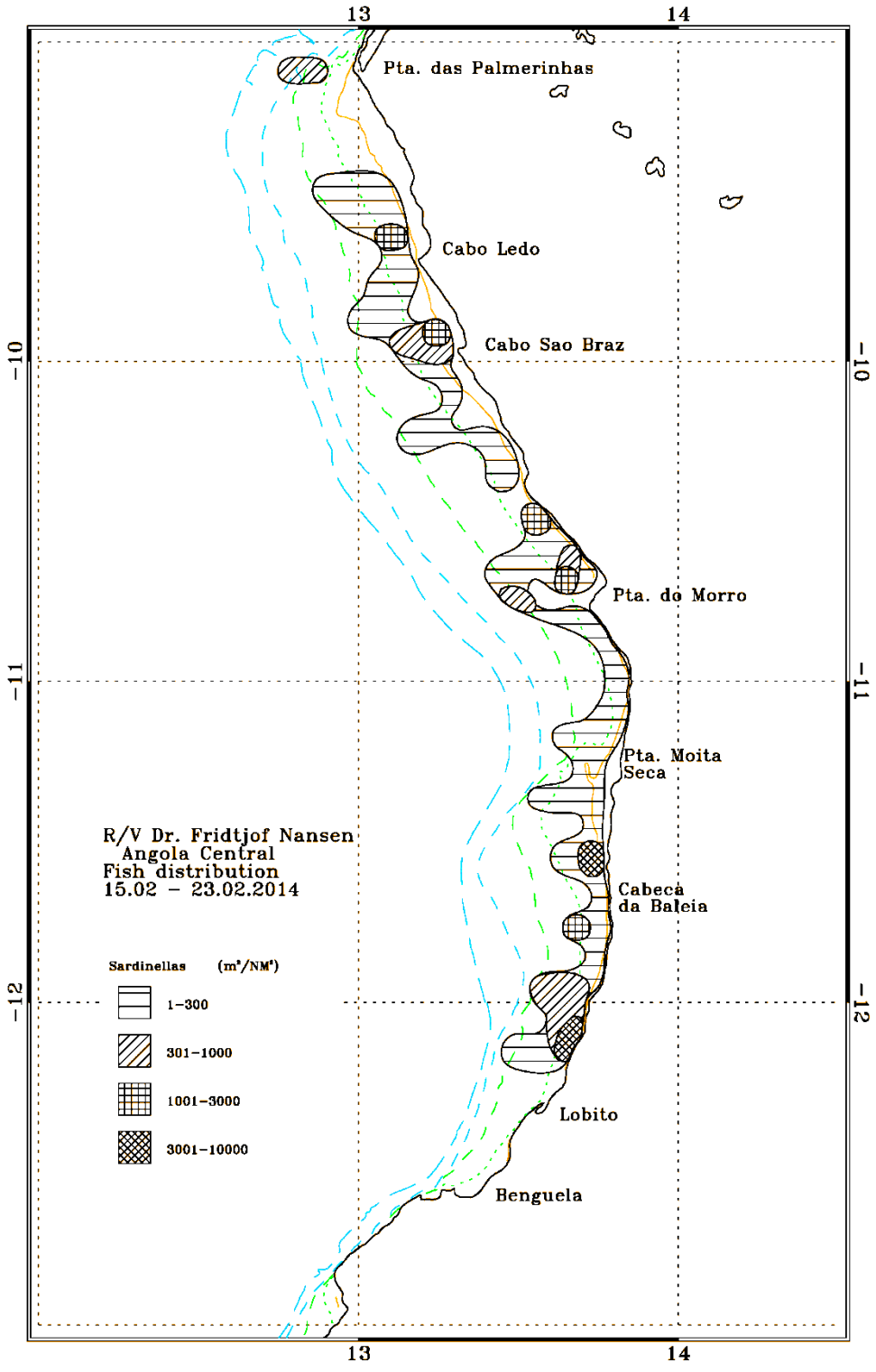


Figure 20. Distribution of *Sardinella* spp., Benguela-Pta. das Palmerinhas. Depth contours at 20, 50, 100 and 200 m.

Horse mackerel

The only species of horse mackerel found in this region was the Cunene horse mackerel (*T. trecae*). It was found between Benguela and Cabo Sao Braz in large, scattered patches (Figure 21). Some denser concentrations were recorded in the area off Pta. Moita Seca.

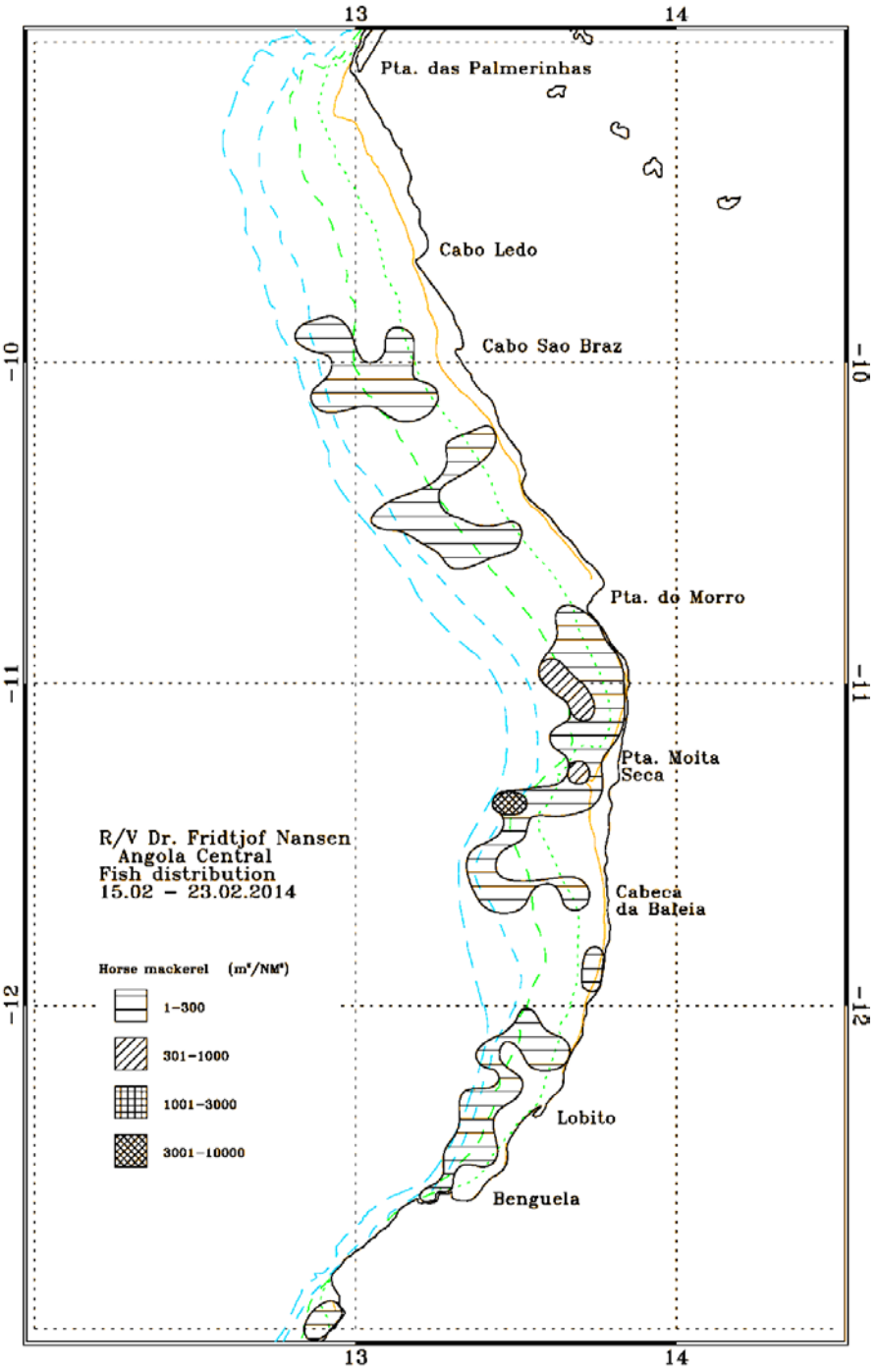


Figure 21. Distribution of Cunene horse mackerel (Trachurus trecae) Benguela-Pta. das Palmerinhas. Depth contours at 20, 50, 100 and 200 m.

Figure 22. shows the total length frequency distribution. Two peaks were found around 17 and 32 cm TL, which may represent different cohorts.

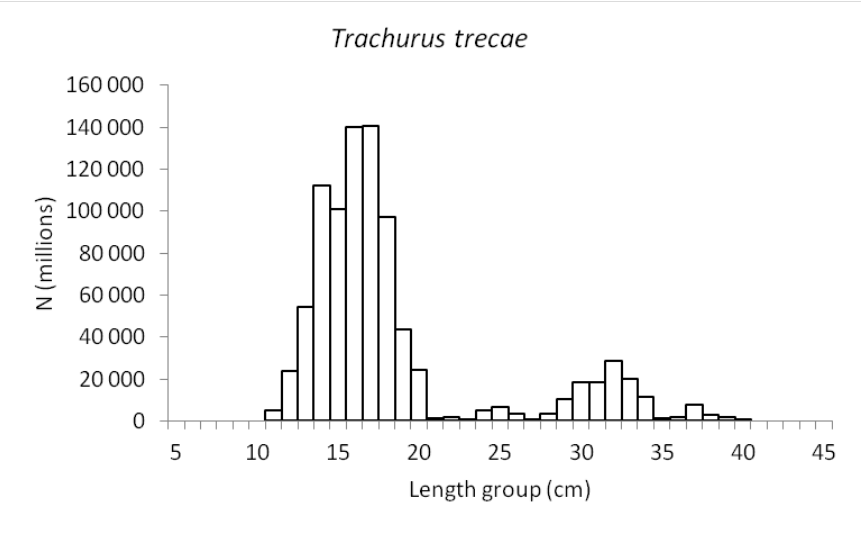


Figure 22. Length distribution of horse mackerel, Trachurus trecae, Benguela-Pta. das Palmerinhas

In 396 biological samples from the central area, 29% of the fish were found to be mature, 71 were immature of which 25 % were indeterminate. The majority of the fish were found in the stage I,II,III for both female and males, but for stage V most fish were females (Figure 23).

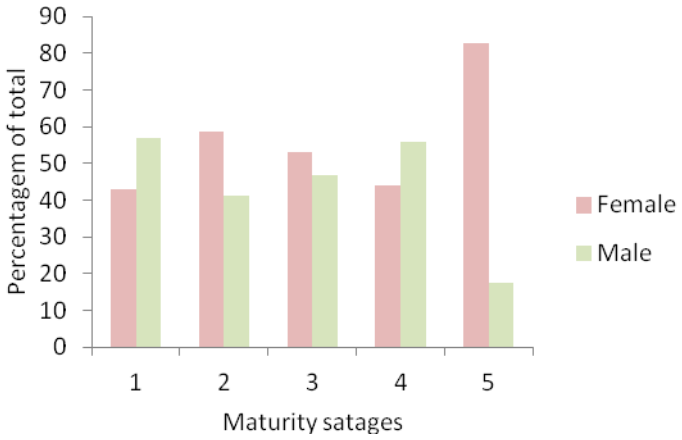


Figure 23. Distribution of maturity stages by sex for Trachurus trecae in the Central region.

The biomass of Cunene horse mackerel was estimated at 77 000 tonnes. This biomass is about the same as was estimated in this area at the same time last year (Annex V).

Other pelagic species

Species belonging to the pelagic 1 group were only observed scattered in low densities ($0 > s_A > 300$) between Pta. do Morro and Cabo Sao Braz and no biomass was estimated for this group.

Other carangids

Barracuda, carangids (mainly *Selene dorsalis* and *Chloroscombrus chrysurus*), hairtails and scombrids were recorded frequently in the region. Species belonging to the pelagic 2 group were observed in very scattered distributions over most of the Central region (Figure24). The biomass estimate, based on an average length of 30 cm and a condition factor equal to 0.01, was 110 000 tonnes. This is well above what was estimated winter 2011 and 2012 (about 50 000 tonnes).

Table 3. Abundance estimates of pelagic fish, Benguela – Pta. das Palmerinhas

Sardinella aurita	*Sardinella maderensis*	*Trachurus trecae*	*Other carangids*
98	149	77	110

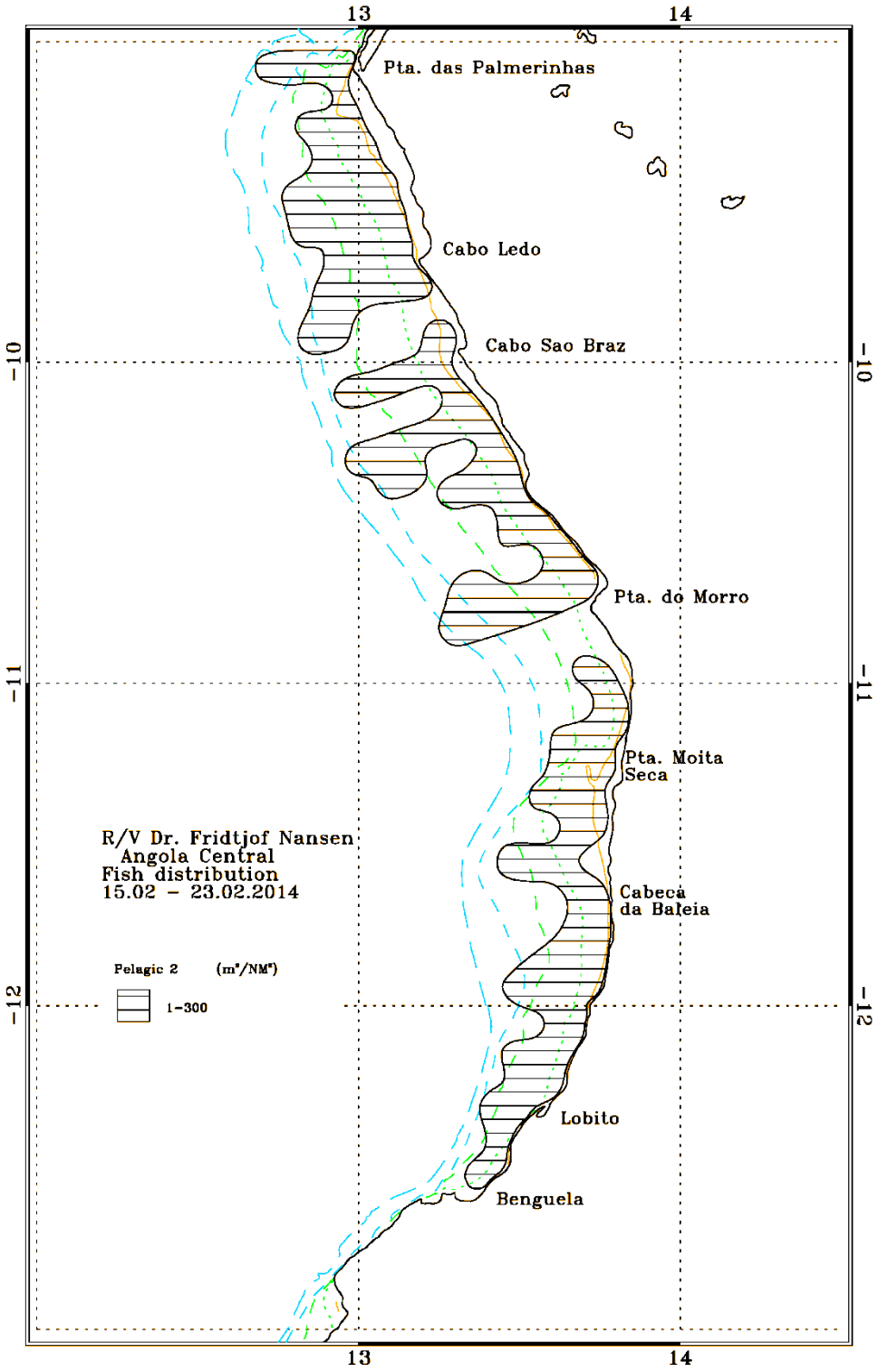


Figure 24. Distribution of other carangids Benguela-Pta. das Palmerinhas. Depth contours at 20, 50, 100 and 200 m

4.3 Pta. Palmerinhas - Congo River

Sardinella

Sardinella was found discrete from Luanda to Congo River in very scattered and dense distributions in north Luanda and Ambriz area (Figure 26).

For both species of sardinella the length distribution show peaks, for *S. aurita* at around 19 and 23 cm and for *S. maderensis* at around 16 cm (Figure 25).

a) S. aurita b) *S. maderensis*

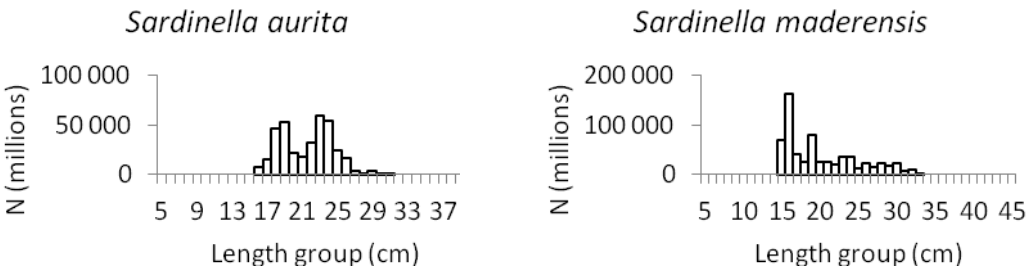


Figure 25. Length distribution of Sardinella aurita and S. maderensis Pta. das Palmerinhas-Congo River.

The estimated biomass for this region was 85 189 tonnes, with S. *aurita* representing around 44 % of the total biomass, while *S. maderensis* contributed with 56 %. The estimate is lower than the biomasses estimated in both 2013 surveys, but similar to the average over the two-three last years (Annex V).

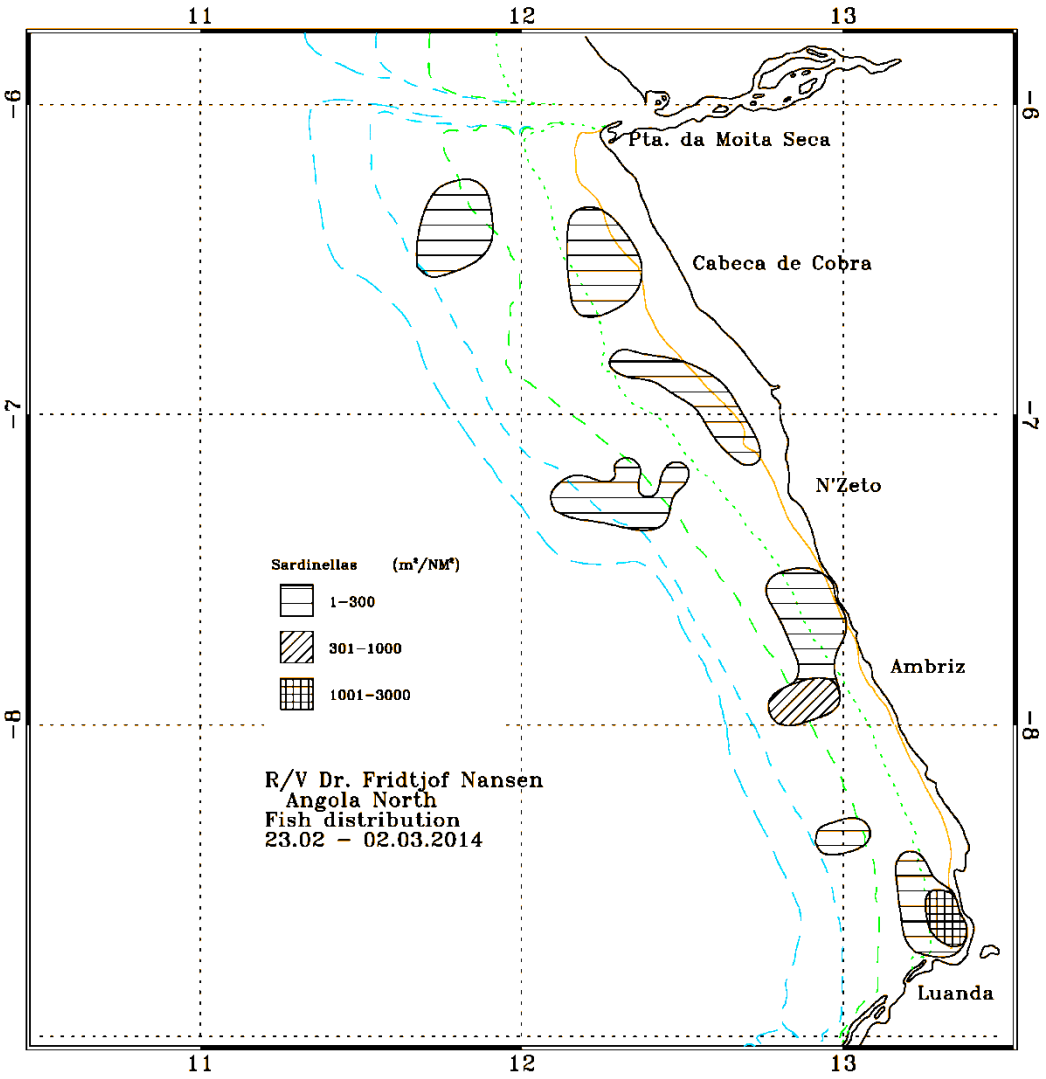


Figure 26. Distribution of Sardinella spp. Pta. das Palmerinhas-Congo River. Depth contours at 20, 50, 100, 200, and 500m.

Horse mackerel

In Northern region Cunene horse mackerel, *T. trecae*, was found offshore in low acoustics densities areas ($0<S_A<300$ m^2/NM^2) between Luanda and Cabeça da Cobra (Figure 29). The Cunene horse mackerel was primarily caught in bottom trawls and Pelagic trawls mixed with demersal species and other carangids (P2).

The size distribution of Cunene horse mackerel showed peak at about 12 cm (Figure 27).

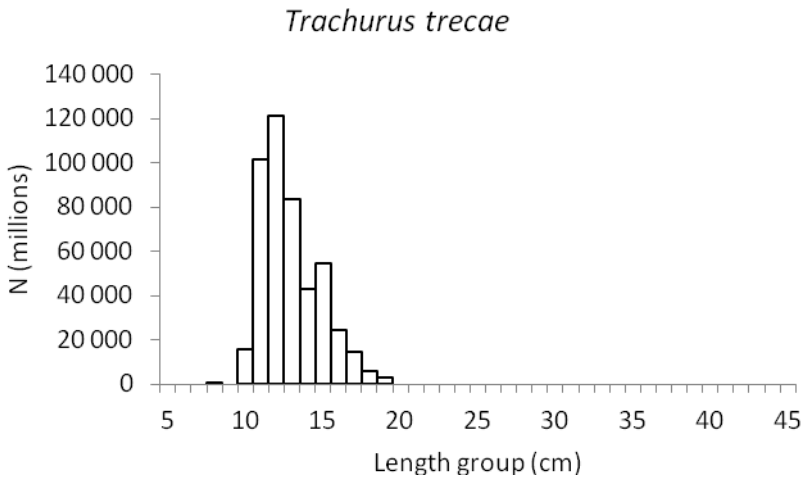


Figure 27. Total length frequency distribution of Trachurus trecae Pta. das Palmerinhas-Congo River

Of 159 T. Trecae analysed in the north region (Figure 28), 2% were found mature, (3 fish female in stage V) and 98% were immature. 77% of 98% immature were indeterminate. Large part of the fish was found in stages I (immature) and II (maturing virgin).

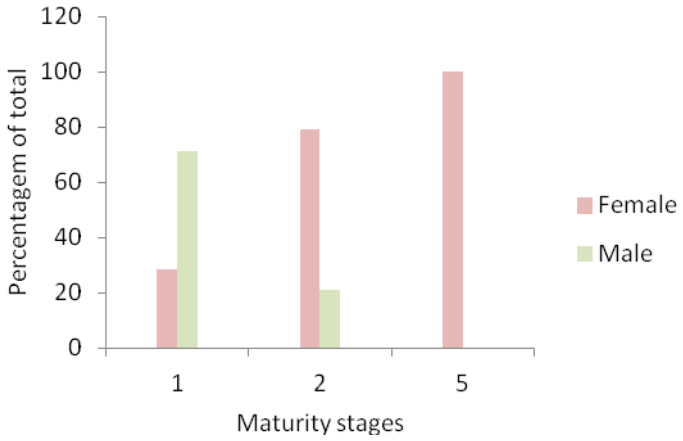


Figure 28. Distribution of maturity stages by sex for *Trachurus trecae* in the Northern region

The biomass of horse mackerel was estimated at 10 791 tonnes. This is at the same level as estimated in summer 2013 and the same as the average over the most recent years (Annex V).

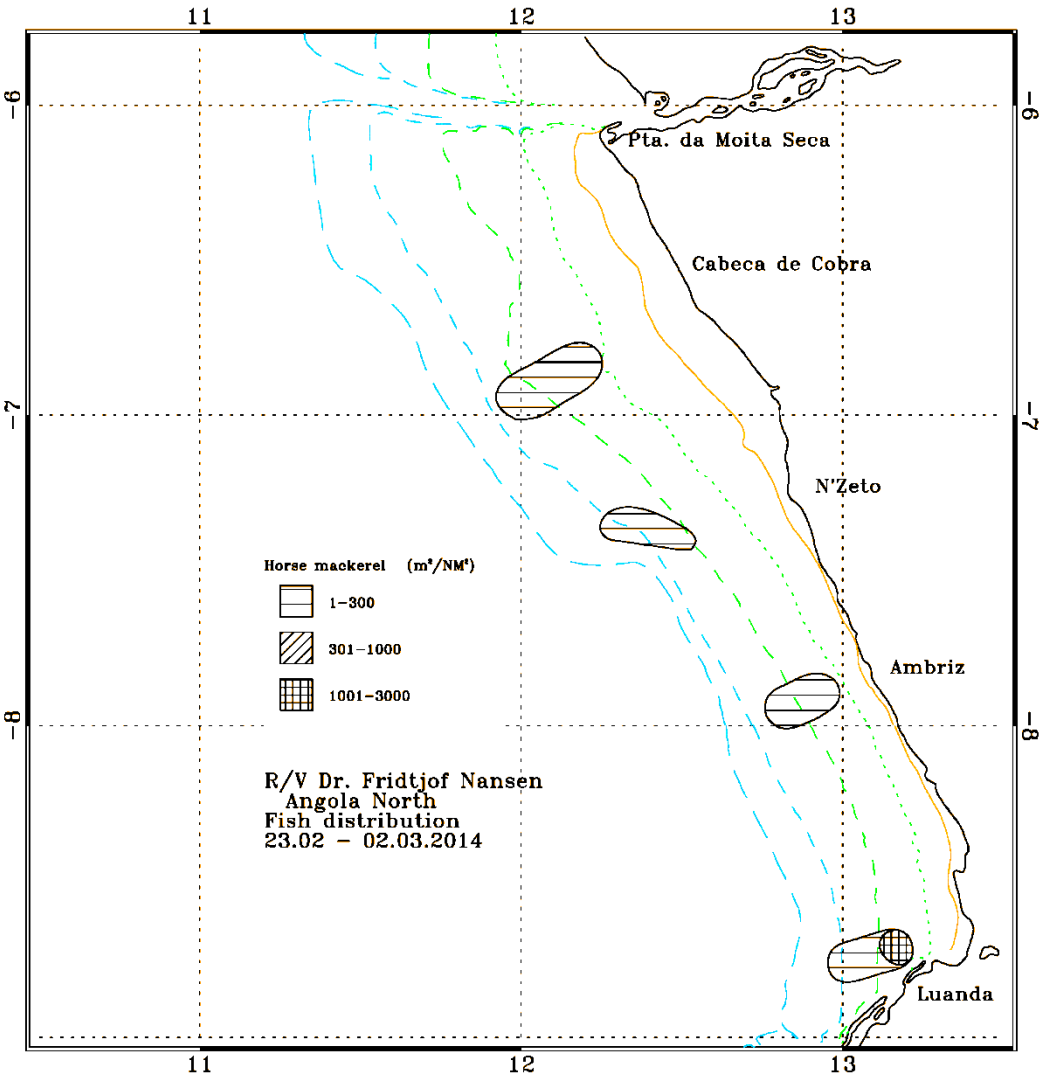


Figure 29. Distribution of *Trachurus trecae*, Pta. das Palmerinhas - Congo River. Depth contours at 20, 50, 100, 200, and 500m.

Other pelagic species

Barracuda, carangids (mainly *Selene dorsalis* and *Chloroscombrus chrysurus*), hairtails and scombrids were caught frequently in the region. Species belonging to the pelagic 2 group were observed in continues distributions from Luanda to south Ambriz and north of Ambriz to Congo River, with low density (S_A=1-300 m^2/NM^2) in two areas (Figure 30). The biomass estimate, based on an average length of 30 cm and a condition factor equal to 0.01, was 63 310 tonnes. This is somewhat lower than what was estimated summer 2013 (76 000 tonnes).

However, in other years/seasons very low estimates are obtained or no estimates have been made. In some years sardinella and horse mackerel may be allocated to the pelagic 1 and 2 group, respectively, in other years it may be the other way around. The biomass estimates of both pelagic 1 and 2 should therefore be regarded as unprecise.

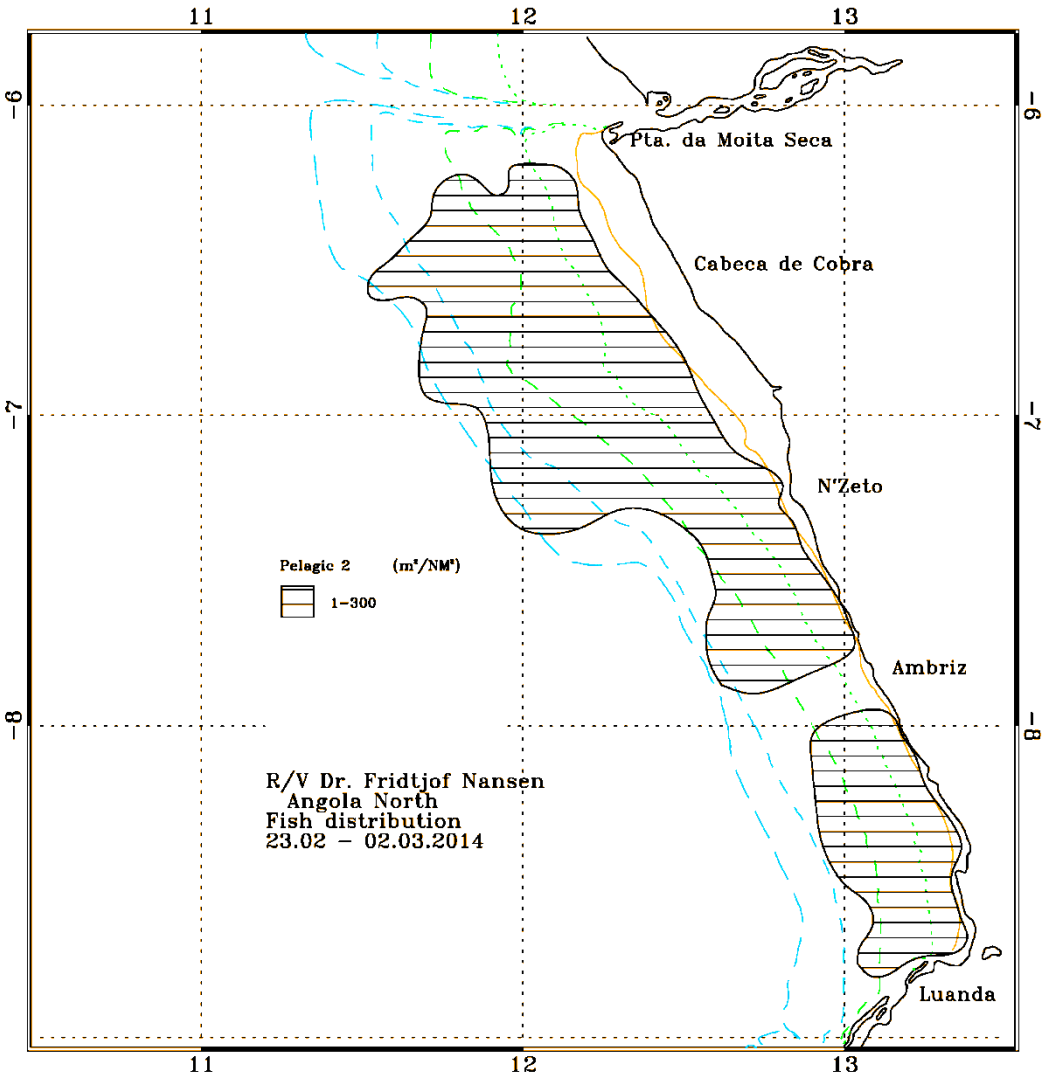


Figure 30. Distribution of other carangids. Pta. das Palmerinhas-Congo River. Depth contours at 20, 50, 100 and 200 m

Table 4. Abundance estimates of pelagic fish, Pta. Palmerinhas - Congo River

Sardinella aurita	*Sardinella maderensis*	*Trachurus trecae*	*Other carangids*
31	54	11	63

CHAPTER 5 SUMMARY OF SURVEY RESULTS

5.1 Sardinella

The estimated biomass of sardinella shows a cyclic fluctuating pattern throughout the time series (Figure 31). This is commonly found in pelagic species, usually reflecting actual changes in abundance but also variation in the availability of the surveyed populations, often caused by changes in the environmental conditions. The total biomass estimate for sardinellas was 363 468 tonnes (Table 5). This is considerably lower than the biomass estimated in summer 2013 (565 000 tonnes). However, the present result is at about the average level of the most recent years (Annex V).

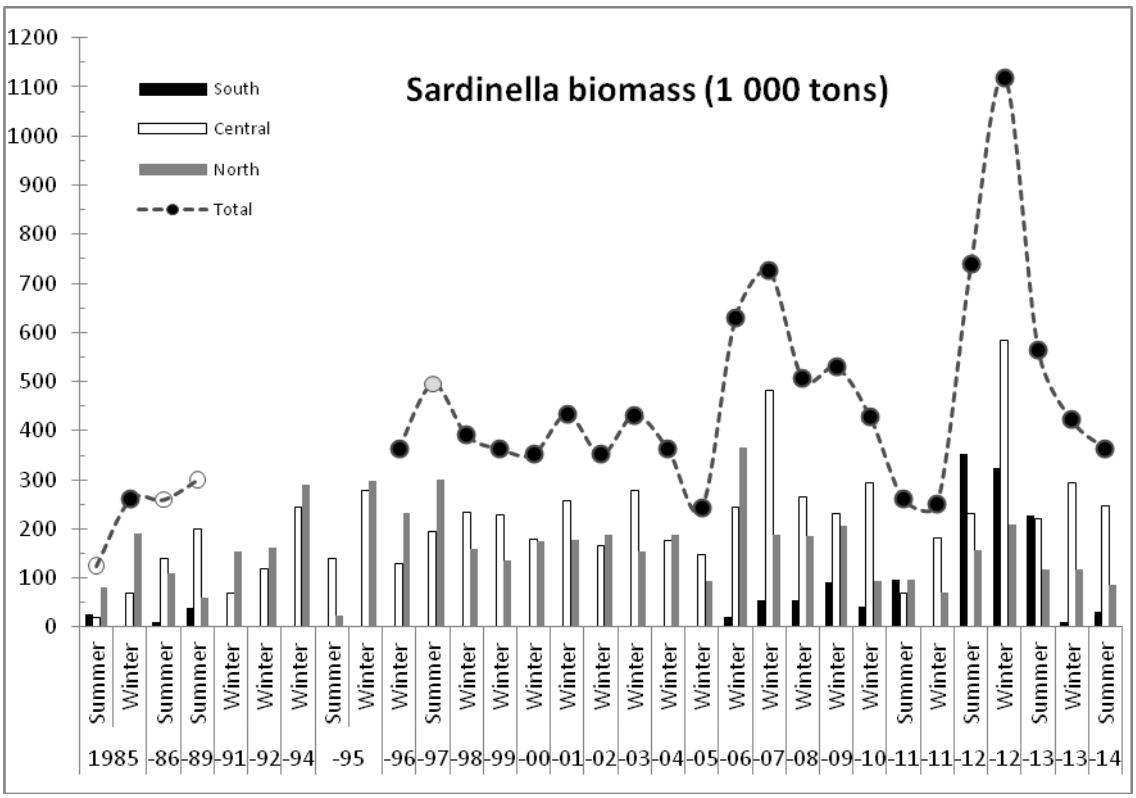


Figure 31. Biomass estimates of Sardinella by regions and surveys (1 000 tonnes).

The overall length frequency distributions of the two Sardinella species show both juvenile and adult cohorts (Figure). For *S. aurita,* the distribution shows peaks at about 17, and 28 cm TL. The distribution of *S. maderensis* shows peaks around 9, 16 and 29 cm total length.

a) S. aurita b) *S. maderensis*

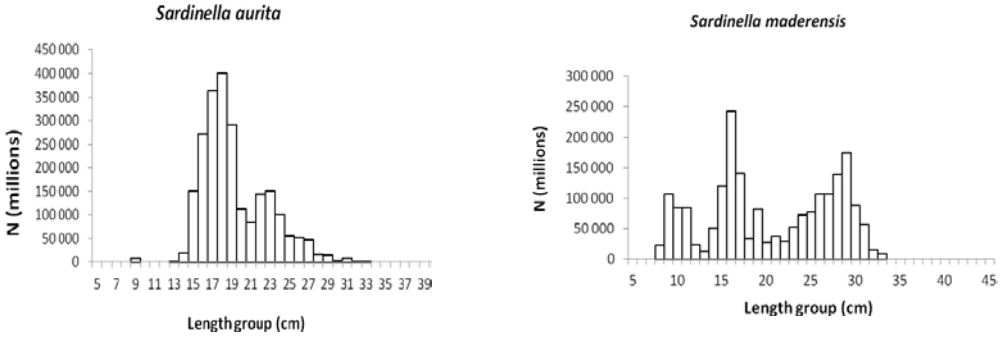


Figure 32. Overall total length distribution of S. aurita (a) and S. maderensis (b).

5.2 Cunene horse mackerel

The total biomass of Cunene horse mackerel was estimated at 295 488 tonnes (Table 5). This is considerable high than 2013 (138 000 tonnes) estimates in the summer (Figure 33), but at about the same level as found in many surveys during the 2000s (Annex V).

In previous surveys the bulk of the biomass has been found in the Southern region, while in the present survey about equal biomass estimates were obtained in the Southern regions. The biomass levels in the Northern region is still at a low level, contributing with only 10 791 tonnes (4%) to the total biomass.

The current Cunene horse mackerel biomass is very low compared with the reference year of 1996, when the biomass was estimated at around 360 000 tonnes for the winter survey.

The overall length frequency distributions of the horse mackerel species show low juvenile cohorts in *T. trecae* (Figure 34). The distribution of *T. trecae* shows peaks around 6, 16 and 30 total length. For *T. capensis*, the distribution shows peaks at 11 and 17 cm TL.

The total biomass of Cape horse mackerel was estimated 66 757 tonnes. This is considerable higher than found in previous surveys in the summer (7 000 tonnes).

The reported biomass levels should be considered with considerable caution. The estimates are relative indices rather than absolute estimates of abundance, and the cyclic variation pattern may be accentuated by changes in behaviour related to the environmental conditions. This variation is particularly evident in the Benguela Current frontal zone in the Southern region, where the cold Benguela meets the warm, subtropical Angola current.

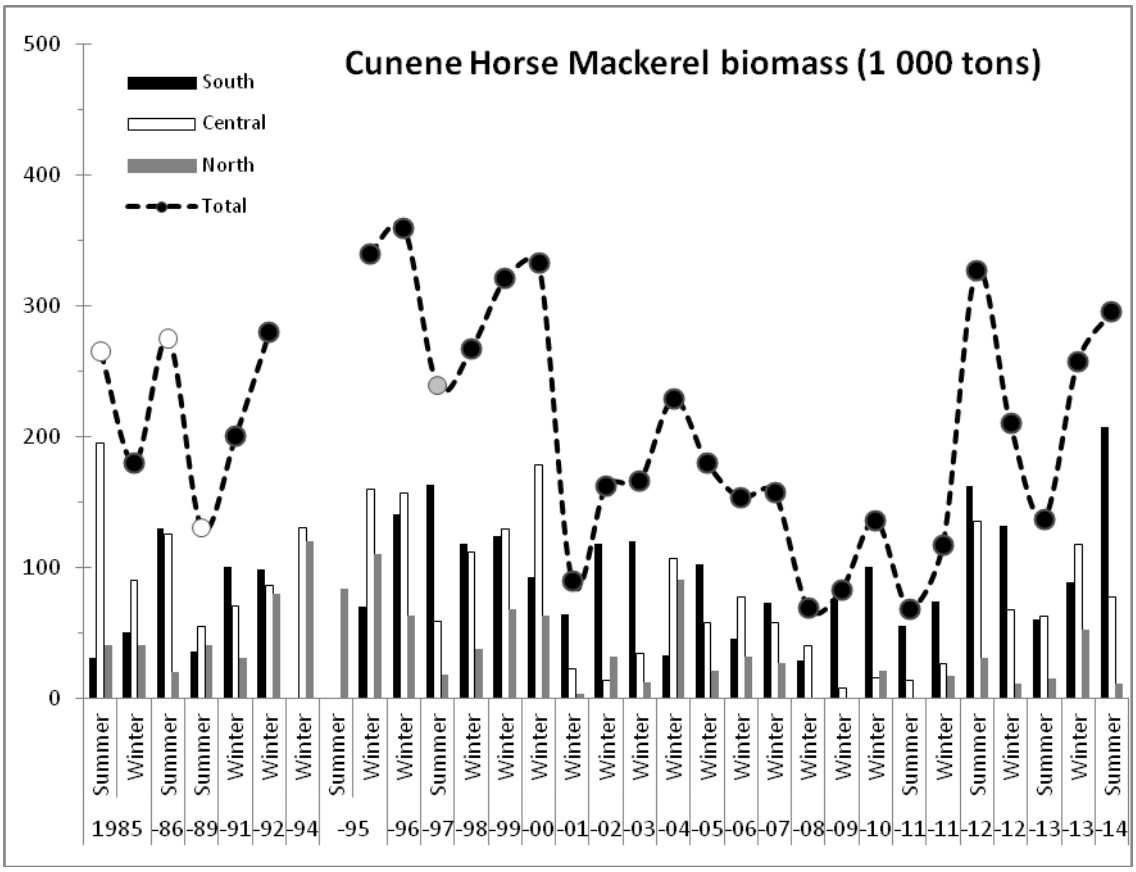


Figure 33. Biomass estimates of Cunene horse mackerel by regions and surveys (1 000 tonnes

a) T. trecae b) *T. capensis*

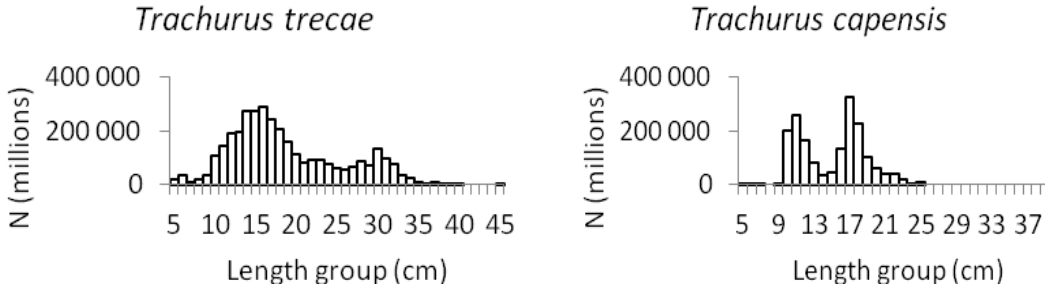


Figure 34. Overall total length distributions of T. trecae (a) and T. capensis (b)

Table 5. Total estimate of pelagic fish (thousand tonnes).

Trachurus capencis	***Trachurus trecae***	***Sardinella aurita***	***Sardinella maderensis***	**Other carangids**	**Other small pelagic fish**
67	295	160	203	193	79

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ANNEX I Records of fishing stations

R R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 1
DATE :08/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 17°11.97
start stop duration Lon E 11°20.44
TIME :18:43:42 19:00:02 16.3 (min) Purpose : 1
LOG : 1055.43 1056.16 0.7 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 368 363 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.7 kn
Sorted : 0 Total catch: 359.33 Catch/hour: 1320.26

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Trachurus capensis	1188.24	20745 90.00	1
MYCTOPHIDAE	95.90	33623 7.26	
Trachurus trecae	18.30	220 1.39	2
Trachipterus trachypterus	5.22	7 0.40	
Merluccius capensis	4.56	18 0.35	3
Illex coindetii	4.41	88 0.33	
Scomber japonicus	3.42	26 0.26	4
Synagrops microlepis	0.22	22 0.02	
Total	1320.26	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 2
DATE :09/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 17°12.26
start stop duration Lon E 11°35.77
TIME :01:14:40 01:39:44 25.1 (min) Purpose : 1
LOG : 1083.28 1084.52 1.2 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 101 98 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.0 kn
Sorted : 67 Total catch: 504.23 Catch/hour: 1206.77

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Trachurus capensis	828.03	26195 68.62	5
Engraulis encrasicolus	378.74	21269 31.38	6
Total	1206.77	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 3
DATE :09/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 17°0.35
start stop duration Lon E 11°22.09
TIME :10:01:38 10:08:14 6.6 (min) Purpose : 1
LOG : 1148.86 1149.23 0.4 Region : 4050
FDEPTH: 145 144 Gear cond.: 0
BDEPTH: 145 144 Validity : 0
Towing dir: 0° Wire out : 450 m Speed : 3.4 kn
Sorted : 122 Total catch: 1883.90 Catch/hour: 17126.36

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Trachurus capensis	11392.36	140800 66.52	8
Trachurus trecae	3014.36	29236 17.60	7
Merluccius capensis	1206.82	7645 7.05	
Trigla lyra	828.64	536 4.84	
Dentex macrophthalmus	371.45	4018 2.17	9
Scorpaena normani	89.82	936 0.52	
Zeus faber	76.36	400 0.45	
Chelidonichthys capensis	53.64	136 0.31	
Zenopsis conchifer	36.18	273 0.21	
Squalus megalops	21.45	36 0.13	
G A S T R O P O D S	18.73	2282 0.11	
Epinephelus marginatus	9.64	9 0.06	
Scyliorhinus capensis	6.91	9 0.04	
Total	17126.36	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 4
DATE :09/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°57.71
start stop duration Lon E 11°43.58
TIME :12:52:55 13:17:18 24.4 (min) Purpose : 1
LOG : 1174.30 1175.63 1.3 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 21 23 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.3 kn
Sorted : 0 Total catch: 29.08 Catch/hour: 71.57

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Chrysaora hysoscella	31.06	332 43.40	
J E L L Y F I S H	25.30	155 35.35	
Trachurus capensis	12.50	999 17.47	10
Etrumeus whiteheadi	1.70	103 2.37	11
Engraulis encrasicolus	0.57	30 0.79	12
G A S T R O P O D S	0.22	7 0.31	
Scomber japonicus	0.22	7 0.31	13
Total	71.57	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 5
DATE :09/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°49.13
start stop duration Lon E 11°25.20
TIME :18:35:22 18:38:13 2.9 (min) Purpose : 1
LOG : 1226.21 1226.38 0.2 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 125 126 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
Sorted : 0 Total catch: 337.87 Catch/hour: 7112.95

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Trachurus capensis	6924.21	142884 97.35	14
Trachurus trecae	188.74	2674 2.65	15
Total	7112.95	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 6
DATE :09/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 16°49.04
start stop duration Lon E 11°42.20
TIME :20:43:32 20:46:36 3.1 (min) Purpose : 1
LOG : 1244.51 1244.70 0.2 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 20 20 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.7 kn
Sorted : 0 Total catch: 232.12 Catch/hour: 4536.55

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
J E L L Y F I S H	4309.45	19837 94.99	
Engraulis encrasicolus	206.58	33674 4.55	16
Illex coindetii	8.21	274 0.18	
Trachurus trecae	4.10	3010 0.09	19
Sardinops sagax	4.10	410 0.09	18
Scomber japonicus	2.74	274 0.06	17
Etrumeus whiteheadi	1.37	137 0.03	
Total	4536.55	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 7
DATE :09/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°43.14
start stop duration Lon E 11°33.02
TIME :22:37:52 22:53:45 15.9 (min) Purpose : 1
LOG : 1259.88 1260.63 0.8 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 102 100 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.8 kn
Sorted : 0 Total catch: 72.65 Catch/hour: 274.67

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Trachurus trecae	251.30	4529 91.49	20
Erythrocles monodi	14.18	3244 5.16	
Sphyrna lewini	5.10	4 1.86	
Sepia officinalis	2.65	4 0.96	
Pomatomus saltatrix	1.40	4 0.51	
Lagocephalus laevigatus	0.04	4 0.01	
Total	274.67	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 8
DATE :10/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°42.52
start stop duration Lon E 11°22.14
TIME :00:14:42 00:32:27 17.8 (min) Purpose : 1
LOG : 1272.99 1273.88 0.9 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 128 128 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.0 kn
Sorted : 63 Total catch: 282.15 Catch/hour: 953.75

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Trachurus trecae	953.75	7819 100.00	21
Total	953.75	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 9
DATE :10/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 16°33.98
start stop duration Lon E 11°44.66
TIME :18:18:36 18:21:59 3.4 (min) Purpose : 1
LOG : 1372.85 1373.05 0.2 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 24 23 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.5 kn
Sorted : 0 Total catch: 259.98 Catch/hour: 4615.03

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
J E L L Y F I S H	3178.58	18391 68.87	
Engraulis encrasicolus	902.13	127189 19.55	24
Trachurus trecae	260.95	49456 5.65	23
Trachurus capensis	238.58	11308 5.17	22
Sepia officinalis	27.34	249 0.59	
Loligo vulgaris	6.21	870 0.13	
Etrumeus whiteheadi	1.24	124 0.03	
Total	4615.03	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 10
DATE :10/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 16°31.19
start stop duration Lon E 11°31.26
TIME :20:19:36 20:39:54 20.3 (min) Purpose : 1
LOG : 1389.71 1390.70 1.0 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 102 104 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.9 kn
Sorted : 0 Total catch: 1.46 Catch/hour: 4.32

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Etrumeus whiteheadi	2.90	41 67.12	26
Trachurus trecae	1.42	15 32.88	25
Total	4.32	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 11
DATE :10/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°26.56
start stop duration Lon E 11°39.72
TIME :23:55:10 00:20:27 25.3 (min) Purpose : 1
LOG : 1421.56 1422.85 1.3 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 76 76 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.0 kn
Sorted : 0 Total catch: 18.16 Catch/hour: 43.10

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Trachurus trecae	22.64	619 52.53	27
Engraulis encrasicolus	17.23	959 39.98	28
Loligo vulgaris	2.18	40 5.07	
Merluccius capensis	0.93	7 2.15	
Lagocephalus laevigatus	0.12	5 0.28	
Total	43.10	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 12
DATE :11/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°23.22
start stop duration Lon E 11°45.52
TIME :01:55:58 01:56:40 0.7 (min) Purpose : 1
LOG : 1434.53 1434.61 0.1 Region : 4050
FDEPTH: 10 0 Gear cond.: 0
BDEPTH: 23 23 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 7.3 kn
Sorted : 37 Total catch: 1381.77 Catch/hour: 118437.43

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	115598.57	602571	97.60	
Trachurus trecae	2790.86	111000	2.36	29
Sepia officinalis	48.00	86	0.04	
Total	118437.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 13
DATE :11/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 16°21.54
start stop duration Lon E 11°44.42
TIME :02:31:43 02:46:37 14.9 (min) Purpose : 1
LOG : 1438.55 1439.33 0.8 Region : 4050
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 43 40 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.1 kn
Sorted : 0 Total catch: 40.98 Catch/hour: 165.02

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	79.89	3954	48.41	30
J E L L Y F I S H	55.17	411	33.43	
Engraulis encrasicolus	13.29	761	8.05	31
Myliobatis aquila	6.68	8	4.05	
Sepia orbignyana	5.23	28	3.17	
Stromateus fiatola	3.10	4	1.88	
Loligo vulgaris	1.45	52	0.88	
Lagocephalus laevigatus	0.20	4	0.12	
Total	165.02		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 14
DATE :11/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 16°17.35
start stop duration Lon E 11°32.75
TIME :06:53:58 07:23:19 29.3 (min) Purpose : 1
LOG : 1475.28 1477.01 1.7 Region : 4050
FDEPTH: 84 89 Gear cond.: 0
BDEPTH: 84 89 Validity : 0
Towing dir: 0° Wire out : 240 m Speed : 3.5 kn
Sorted : 0 Total catch: 803.38 Catch/hour: 1642.90

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1249.02	8284	76.03	32
Dentex macrophthalmus	119.94	2542	7.30	33
Squalus megalops	69.64	117	4.24	
Chelidonichthys capensis	61.20	264	3.73	
G A S T R O P O D S	40.98	5804	2.49	
Dentex barnardi	30.95	88	1.88	35
Loligo vulgaris	23.03	88	1.40	
Sepia officinalis	15.48	35	0.94	
Atractoscion aequidens	7.16	59	0.44	34
Spondyliosoma cantharus	6.86	35	0.42	
Paracentrotus sp.	5.63	407	0.34	
Pagellus bellottii	5.45	35	0.33	
Trigla lyra	4.92	14	0.30	
Lagocephalus laevigatus	2.64	14	0.16	
Total	1642.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 15
DATE :11/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 15°59.66
start stop duration Lon E 11°45.23
TIME :18:02:42 18:12:27 9.8 (min) Purpose : 1
LOG : 1545.79 1546.29 0.5 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 24 26 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 0 Total catch: 87.13 Catch/hour: 536.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	332.18	2018	61.95	
Trachurus trecae	182.15	6375	33.97	36
Dasyatis marmorata	9.78	12	1.82	
Loligo vulgaris	5.85	166	1.09	
Pagellus bellottii	3.63	135	0.68	37
Spondyliosoma cantharus	2.58	80	0.48	
Total	536.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 16
DATE :11/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 15°48.08
start stop duration Lon E 11°43.86
TIME :21:59:30 22:21:48 22.3 (min) Purpose : 1
LOG : 1581.90 1583.07 1.2 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 83 99 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 0 Total catch: 84.73 Catch/hour: 227.97

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	200.85	76	88.10	
Trachurus trecae	24.43	433	10.72	38
Scomber japonicus	2.21	22	0.97	39
Synagrops microlepis	0.27	27	0.12	
Trichiurus lepturus	0.13	3	0.06	
Loligo vulgaris	0.08	3	0.04	
Total	227.97		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 17
DATE :12/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 15°42.50
start stop duration Lon E 11°47.76
TIME :00:18:11 00:25:54 7.7 (min) Purpose : 1
LOG : 1599.59 1599.98 0.4 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 72 82 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.0 kn
Sorted : 0 Total catch: 180.00 Catch/hour: 1398.96

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

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 18
DATE :12/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 15°38.38
start stop duration Lon E 11°53.46
TIME :02:42:30 02:57:35 15.1 (min) Purpose : 1
LOG : 1620.15 1620.85 0.7 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 101 107 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 2.7 kn
Sorted : 61 Total catch: 373.39 Catch/hour: 1485.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1465.78	23013	98.66	40
Sarda sarda	17.75	8	1.19	41
Trichiurus lepturus	2.11	20	0.14	
Total	1485.64		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 19
DATE :12/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 15°21.00
start stop duration Lon E 11°54.39
TIME :10:06:38 10:15:21 8.7 (min) Purpose : 1
LOG : 1686.55 1687.00 0.5 Region : 4050
FDEPTH: 122 126 Gear cond.: 0
BDEPTH: 122 126 Validity : 0
Towing dir: 0° Wire out : 320 m Speed : 3.1 kn
Sorted : 0 Total catch: 67.06 Catch/hour: 461.95

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Anthias anthias	194.60	1867	42.13	
Dentex macrophthalmus	175.25	1026	37.94	44
Squatina aculeata	28.17	14	6.10	
Dentex barnardi	26.59	124	5.76	43
Dentex angolensis	25.90	62	5.61	42
Scorpaena normani	3.10	28	0.67	
Lagocephalus laevigatus	2.55	7	0.55	
Pagellus bellottii	1.58	14	0.34	
B I V A L V E S	1.45	517	0.31	
G A S T R O P O D S	1.31	207	0.28	
Paracentrotus sp.	0.41	131	0.09	
Chelidonichthys capensis	0.00	0	0.00	
Total	460.92		99.78	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 20
DATE :13/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 15°9.17
start stop duration Lon E 12°0.22
TIME :02:58:54 03:47:41 48.8 (min) Purpose : 1
LOG : 1798.98 1801.94 3.0 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 129 130 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.6 kn
Sorted : 0 Total catch: 33.72 Catch/hour: 41.48

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	40.34	138	97.27	45
Lagocephalus laevigatus	0.89	1	2.14	
Scomber japonicus	0.25	1	0.59	
Total	41.48		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 21
DATE :13/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 14°52.01
start stop duration Lon E 12°7.15
TIME :10:26:57 10:44:09 17.2 (min) Purpose : 1
LOG : 1850.93 1851.77 0.8 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 809 740 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 2.9 kn
Sorted : 0 Total catch: 0.20 Catch/hour: 0.70

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	0.00	3	0.00	
Scomber japonicus	0.70	3	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 22
DATE :13/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 14°18.08
start stop duration Lon E 12°18.30
TIME :19:29:18 19:38:21 9.1 (min) Purpose : 1
LOG : 1935.23 1935.63 0.4 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 55 53 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.6 kn
Sorted : 0 Total catch: 207.97 Catch/hour: 1378.81

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	898.34	13631	65.15	49
Trachurus trecae	359.20	1909	26.05	46
Sarda sarda	64.31	46	4.66	47
Pomatomus saltatrix	23.27	33	1.69	
Atractoscion aequidens	18.17	33	1.32	50
Sardinella maderensis	6.10	80	0.44	48
Sphyraena guachancho	5.57	7	0.40	
Trachinotus ovatus	2.59	7	0.19	
Illex coindetii	0.66	557	0.05	
Pagellus bellottii	0.60	7	0.04	
Total	1378.81		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 23
DATE :13/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 14°6.84
start stop duration Lon E 12°16.78
TIME :22:07:28 22:16:31 9.1 (min) Purpose : 1
LOG : 1956.15 1956.63 0.5 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 97 95 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 0 Total catch: 33.38 Catch/hour: 221.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	97.46	1200	44.04	51
Sardinella aurita	96.13	1260	43.44	52
Scomber japonicus	15.18	99	6.86	53
Sarda sarda	8.88	7	4.01	
Trichiurus lepturus	2.85	13	1.29	
MYCTOPHIDAE	0.66	385	0.30	
Loligo vulgaris	0.13	13	0.06	
Total	221.30		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 24
DATE :13/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 14°5.74
start stop duration Lon E 12°20.48
TIME :23:19:24 23:43:57 24.6 (min) Purpose : 1
LOG : 1962.87 1963.96 1.1 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 32 36 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 2.7 kn
Sorted : 0 Total catch: 51.04 Catch/hour: 124.74

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	119.17	2055	95.53	54
Sardinella maderensis	4.30	15	3.45	55
Sphyraena guachancho	1.03	2	0.82	
Scomber japonicus	0.24	2	0.20	
Total	124.74		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 25
DATE :14/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 14°1.42
start stop duration Lon E 12°20.47
TIME :00:39:58 01:06:51 26.9 (min) Purpose : 1
LOG : 1970.13 1971.66 1.5 Region : 4050
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 63 72 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.4 kn
Sorted : 0 Total catch: 97.83 Catch/hour: 218.37

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	100.58	152	46.06	
Sarda sarda	41.03	27	18.79	58
Sardinella aurita	40.85	558	18.71	57
Trachurus trecae	25.89	170	11.86	56
Pomatomus saltatrix	4.60	2	2.11	
Scomber japonicus	4.04	11	1.85	59
Fistularia petimba	1.38	2	0.63	
Total	218.37		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 26
DATE :14/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 13°52.00
start stop duration Lon E 12°23.57
TIME :07:20:24 07:38:36 18.2 (min) Purpose : 1
LOG : 2007.40 2008.37 1.0 Region : 4050
FDEPTH: 60 70 Gear cond.: 0
BDEPTH: 97 84 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.2 kn
Sorted : 0 Total catch: 37.45 Catch/hour: 123.46

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	122.64	442	99.33	60
Scomber japonicus	0.82	3	0.67	61
Total	123.46		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 27
DATE :14/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 13°38.22
start stop duration Lon E 12°28.80
TIME :12:24:55 12:42:38 17.7 (min) Purpose : 1
LOG : 2052.53 2053.45 0.9 Region : 4050
FDEPTH: 140 124 Gear cond.: 0
BDEPTH: 140 124 Validity : 0
Towing dir: 0° Wire out : 310 m Speed : 3.1 kn
Sorted : 142 Total catch: 1317.86 Catch/hour: 4462.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex macrophthalmus	2959.98	34300	66.33	62
Boops boops	493.41	3054	11.06	
Zenopsis conchifer	360.10	748	8.07	
Scomber japonicus	155.15	1900	3.48	64
Erythrocles monodi	111.20	156	2.49	
Trachurus trecae	107.78	995	2.42	63
Scorpaena scrofa	78.83	156	1.77	
Brotula barbata	38.94	30	0.87	
Lagocephalus laevigatus	38.63	61	0.87	
Zeus faber	25.23	30	0.57	
Squatina aculeata	19.37	3	0.43	
Atractoscion aequidens	19.30	30	0.43	
Dentex angolensis	16.52	30	0.37	
Dentex barnardi	12.77	30	0.29	
Cruriraja parcomaculata	10.43	3	0.23	
Pontinus accraensis	9.65	61	0.22	
Chelidonichthys capensis	2.51	30	0.06	
Trigla lyra	2.51	30	0.06	
Total	4462.28		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 28
DATE :14/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 13°12.11
start stop duration Lon E 12°41.52
TIME :19:30:10 19:42:32 12.4 (min) Purpose : 1
LOG : 2114.44 2114.93 0.5 Region : 4050
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 108 107 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 2.4 kn
Sorted : 0 Total catch: 15.55 Catch/hour: 75.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	40.89	28428	54.21	
Scomber japonicus	12.76	175	16.91	65
Lagocephalus laevigatus	11.93	44	15.82	
Sardinella aurita	8.39	136	11.13	66
Synagrops microlepis	1.46	10	1.93	
Total	75.42		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 29
DATE :14/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 13°9.63
start stop duration Lon E 12°47.32
TIME :21:21:42 21:35:49 14.1 (min) Purpose : 1
LOG : 2128.67 2129.57 0.9 Region : 4050
FDEPTH: 20 30 Gear cond.: 0
BDEPTH: 61 47 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.8 kn
Sorted : 0 Total catch: 10.55 Catch/hour: 44.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	18.22	132	40.66	67
Pomadasys incisus	8.41	55	18.77	
Trichiurus lepturus	4.63	13	10.33	
Sardinella maderensis	4.16	17	9.29	68
Pseudupeneus prayensis	3.06	34	6.82	
Sardinella aurita	1.23	8	2.75	
Synagrops microlepis	1.23	204	2.75	
Bothus podas	0.89	21	1.99	
G A S T R O P O D S	0.81	127	1.80	
Pagellus bellottii	0.64	17	1.42	
Scorpaena normani	0.55	4	1.23	
Peristedion cataphractum	0.42	4	0.95	
Loligo vulgaris	0.30	47	0.66	
Boops boops	0.25	4	0.57	
Total	44.80		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 30
DATE :15/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 12°58.20
start stop duration Lon E 12°55.94
TIME :00:59:23 01:29:19 29.9 (min) Purpose : 1
LOG : 2161.14 2162.70 1.6 Region : 4040
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 33 43 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.1 kn
Sorted : 0 Total catch: 28.05 Catch/hour: 56.19

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	13.66	40	24.31	
Sardinella aurita	12.54	40	22.32	71
Sardinella maderensis	8.01	40	14.26	70
Trachurus trecae	7.97	70	14.19	69
Engraulis encrasicolus	4.79	357	8.52	72
Lagocephalus laevigatus	3.47	6	6.17	
Caranx rhonchus	2.86	8	5.10	
Galeoides decadactylus	1.28	6	2.28	
Sphyraena guachancho	1.18	4	2.10	
Trachinotus ovatus	0.42	4	0.75	
Total	56.19		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 31
DATE :15/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 12°52.48
start stop duration Lon E 12°54.90
TIME :03:39:25 04:10:50 31.4 (min) Purpose : 1
LOG : 2181.84 2183.43 1.6 Region : 4040
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 24 36 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.0 kn
Sorted : 0 Total catch: 173.65 Catch/hour: 331.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	211.09	1079	63.66	
Trachurus trecae	36.09	214	10.88	73
Pomadasys jubelini	31.20	95	9.41	
Stromateus fiatola	18.14	17	5.47	
Brachydeuterus auritus	11.19	176	3.37	74
Lithognathus mormyrus	6.57	15	1.98	
Lagocephalus laevigatus	3.74	8	1.13	
Sphyraena guachancho	3.70	59	1.12	
Selene dorsalis	2.04	6	0.62	
Galeoides decadactylus	1.87	13	0.56	
Balistes capriscus	1.70	2	0.51	
Pseudotolithus senegalensis	1.58	2	0.48	
Pomadasys incisus	1.15	6	0.35	
Sepia officinalis	0.86	2	0.26	
Eucinostomus melanopterus	0.67	8	0.20	
Total	331.60		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 32
DATE :16/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 12°8.31
start stop duration Lon E 12°26.38
TIME :13:28:43 13:33:02 4.3 (min) Purpose : 1
LOG : 2421.15 2421.38 0.2 Region : 4050
FDEPTH: 70 0 Gear cond.: 0
BDEPTH: 112 121 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.1 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 33
DATE :16/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 12°6.45
start stop duration Lon E 13°40.47
TIME :15:40:23 15:57:48 17.4 (min) Purpose : 1
LOG : 2439.58 2440.72 1.1 Region : 4050
FDEPTH: 15 25 Gear cond.: 0
BDEPTH: 31 30 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.9 kn
Sorted : 0 Total catch: 644.66 Catch/hour: 2220.41

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	1822.04	49175	82.06	78
Brachydeuterus auritus	129.23	3000	5.82	77
Pomadasys incisus	69.92	737	3.15	
Pomadasys peroteti	61.31	207	2.76	
Trachurus trecae	56.42	1047	2.54	75
Sphyraena guachancho	37.47	117	1.69	
Chloroscombrus chrysurus	7.82	14	0.35	76
Scomber japonicus	5.51	45	0.25	
Dicologoglossa cuneata	4.37	69	0.20	
Selene dorsalis	4.13	45	0.19	
Caranx rhonchus	3.69	28	0.17	
Pomadasys rogeri	3.20	28	0.14	
Bembrops heterurus	3.00	28	0.13	
Trichiurus lepturus	2.76	45	0.12	
Ilisha africana	2.76	45	0.12	
Pseudotolithus typus	2.62	10	0.12	
Galeoides decadactylus	2.31	28	0.10	
Umbrina canariensis	1.38	28	0.06	
Atractoscion aequidens	0.48	3	0.02	
Total	2220.41		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 34
DATE :16/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°56.87
start stop duration Lon E 13°37.72
TIME :20:36:35 20:46:28 9.9 (min) Purpose : 1
LOG : 2484.39 2484.95 0.6 Region : 4040
FDEPTH: 16 18 Gear cond.: 0
BDEPTH: 74 77 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.5 kn
Sorted : 0 Total catch: 101.08 Catch/hour: 613.85

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	485.83	4269	79.15	79
Sardinella maderensis	85.99	370	14.01	80
Scomber japonicus	27.75	146	4.52	81
Lagocephalus laevigatus	13.00	30	2.12	
Trachurus trecae	0.73	24	0.12	
Sphyraena guachancho	0.36	12	0.06	
Saurida brasiliensis	0.18	67	0.03	
Total	613.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 35
DATE :16/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 11°57.05
start stop duration Lon E 13°43.21
TIME :21:55:17 21:58:30 3.2 (min) Purpose : 1
LOG : 2492.71 2492.90 0.2 Region : 4040
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 27 29 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
Sorted : 0 Total catch: 86.49 Catch/hour: 1616.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	1576.07	40561	97.49	82
Chloroscombrus chrysurus	9.91	75	0.61	84
Sardinella maderensis	7.66	75	0.47	85
Sphyraena guachancho	6.73	19	0.42	
Ilisha africana	6.17	112	0.38	83
Eucinostomus melanopterus	3.74	56	0.23	
Trichiurus lepturus	2.62	19	0.16	
Scomber japonicus	2.06	19	0.13	
Brachydeuterus auritus	1.68	37	0.10	
Total	1616.64		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 36
DATE :16/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°51.33
start stop duration Lon E 13°41.67
TIME :23:24:52 23:49:45 24.9 (min) Purpose : 1
LOG : 2504.03 2505.26 1.2 Region : 4040
FDEPTH: 10 25 Gear cond.: 0
BDEPTH: 49 49 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 0 Total catch: 339.02 Catch/hour: 817.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	275.40	4975	33.69	87
Chloroscombrus chrysurus	228.62	1828	27.96	89
Lagocephalus laevigatus	135.29	205	16.55	
Sardinella maderensis	52.33	301	6.40	88
Trachurus trecae	46.83	183	5.73	86
Trichiurus lepturus	28.70	96	3.51	
Sphyraena sphyraena	22.67	48	2.77	
Selene dorsalis	14.47	84	1.77	
Brachydeuterus auritus	8.80	109	1.08	
Todarodes angolensis	4.46	1628	0.55	
Total	817.57		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 37
DATE :17/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°46.08
start stop duration Lon E 13°32.71
TIME :03:59:27 04:01:43 2.3 (min) Purpose : 1
LOG : 2545.09 2545.14 0.1 Region : 4040
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 112 112 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 1.3 kn
Sorted : 0 Total catch: 12.40 Catch/hour: 327.75

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida brasiliensis	180.53	79242	55.08	
Scomber japonicus	135.33	872	41.29	90
Trichiurus lepturus	11.89	26	3.63	
Total	327.75		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 38
DATE :17/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 11°38.28
start stop duration Lon E 13°44.30
TIME :07:07:49 07:12:19 4.5 (min) Purpose : 1
LOG : 2570.86 2571.14 0.3 Region : 4040
FDEPTH: 15 20 Gear cond.: 0
BDEPTH: 32 32 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.7 kn
Sorted : 0 Total catch: 10.50 Catch/hour: 140.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	92.27	773	65.90	91
Sardinella aurita	43.73	600	31.24	92
Sardinella maderensis	4.00	27	2.86	93
Total	140.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 39
DATE :17/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 11°38.49
start stop duration Lon E 13°36.99
TIME :08:30:12 08:41:58 11.8 (min) Purpose : 1
LOG : 2582.04 2582.72 0.7 Region : 4040
FDEPTH: 71 71 Gear cond.: 0
BDEPTH: 71 71 Validity : 0
Towing dir: 0° Wire out : 200 m Speed : 3.4 kn
Sorted : 0 Total catch: 20.74 Catch/hour: 105.73

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex angolensis	29.46	551	27.87	95
Alloteuthis africana	17.23	7478	16.30	
Trichiurus lepturus	10.25	15	9.69	
Sepia officinalis	7.24	15	6.85	
Citharus linguatula	5.71	245	5.40	
Lepidotrigla cadmani	5.66	56	5.35	
Octopus vulgaris	5.25	10	4.97	
Boops boops	4.94	46	4.68	
Trachurus trecae	3.93	15	3.71	94
Torpedo torpedo	3.31	5	3.13	
Pomadasys incisus	3.26	15	3.09	
Grammoplites gruveli	2.65	51	2.51	
Dentex congoensis	2.40	36	2.27	
Pagellus bellottii	1.38	5	1.30	
Brachydeuterus auritus	0.92	5	0.87	
Raja miraletus	0.71	5	0.68	
Serranus accraensis	0.71	10	0.68	
Saurida brasiliensis	0.46	71	0.43	
Lepidotrigla carolae	0.31	15	0.29	
Dentex angolensis	0.00	0	0.00	
Total	105.78		100.05	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 40
DATE :17/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 11°29.97
start stop duration Lon E 13°44.47
TIME :14:01:27 14:18:43 17.3 (min) Purpose : 1
LOG : 2635.31 2636.22 0.9 Region : 4040
FDEPTH: 22 22 Gear cond.: 0
BDEPTH: 22 22 Validity : 0
Towing dir: 0° Wire out : 70 m Speed : 3.1 kn
Sorted : 0 Total catch: 258.70 Catch/hour: 898.78

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyraena guachancho	181.81	942	20.23	
Pomadasys incisus	175.59	1386	19.54	
Lepidochelys olivacea	173.71	3	19.33	
Brachydeuterus auritus	107.53	17861	11.96	
Galeoides decadactylus	43.78	5010	4.87	
Drepane africana	41.97	76	4.67	
Pomadasys rogeri	35.12	3	3.91	
Rhinobatos albomaculatus	23.62	14	2.63	
Sardinella aurita	21.40	563	2.38	99
Chloroscombrus chrysurus	21.26	202	2.37	96
Trachinotus ovatus	15.39	17	1.71	
Sardinella maderensis	10.77	584	1.20	100
Umbrina canariensis	9.45	247	1.05	
Engraulis encrasicolus	6.77	959	0.75	101
Raja miraletus	4.55	14	0.51	
Scomberomorus tritor	3.09	3	0.34	
Arius parkii	2.99	7	0.33	
Pteroscion peli	2.85	76	0.32	
Selene dorsalis	2.33	281	0.26	98
Trachurus trecae	2.22	83	0.25	97
Pomadasys peroteti	2.05	7	0.23	
Chilomycterus spinosus mauretanicus	1.60	3	0.18	
Pseudotolithus senegalensis	1.53	7	0.17	
Selar crumenophthalmus	1.46	7	0.16	
Lagocephalus laevigatus	1.39	10	0.15	
Sepia officinalis	1.29	3	0.14	
Pagellus bellottii	0.97	63	0.11	
Grammoplites gruveli	0.80	17	0.09	
Torpedo torpedo	0.73	3	0.08	
Citharus linguatula	0.31	14	0.03	
Dicologoglossa cuneata	0.24	7	0.03	
Dentex barnardi	0.14	3	0.02	
Pseudupeneus prayensis	0.07	3	0.01	
Total	898.78		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 41
DATE :17/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 11°21.73
start stop duration Lon E 13°32.11
TIME :18:29:00 18:39:05 10.1 (min) Purpose : 1
LOG : 2675.32 2675.93 0.6 Region : 4040
FDEPTH: 30 0 Gear cond.: 0
BDEPTH: 52 58 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.7 kn
Sorted : 0 Total catch: 128.73 Catch/hour: 766.25

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	536.90	1554	70.07	102
Scomber japonicus	176.19	470	22.99	103
Sardinella maderensis	28.15	107	3.67	104
Promethichthys prometheus	8.99	107	1.17	
Atractoscion aequidens	8.93	6	1.17	
MYCTOPHIDAE	5.95	1952	0.78	
Sepia officinalis	1.13	6	0.15	
Total	766.25		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 42
DATE :17/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 11°21.30
start stop duration Lon E 13°39.67
TIME :19:58:10 20:15:39 17.5 (min) Purpose : 1
LOG : 2685.74 2686.69 0.9 Region : 4040
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 34 37 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.3 kn
Sorted : 0 Total catch: 123.28 Catch/hour: 423.16

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	110.11	1895	26.02	106
Lagocephalus laevigatus	96.93	137	22.91	
Eucinostomus melanopterus	49.84	508	11.78	
Brachydeuterus auritus	35.84	1895	8.47	
Sphyraena sphyraena	26.91	508	6.36	
Sardinella maderensis	23.75	233	5.61	107
Trachurus trecae	22.52	124	5.32	105
Selene dorsalis	20.73	110	4.90	109
Chloroscombrus chrysurus	11.81	96	2.79	108
Bregmaceros sp.	10.71	12185	2.53	
Pagellus bellottii	6.04	2087	1.43	
Sepia officinalis	2.75	14	0.65	
Alloteuthis africana	2.61	892	0.62	
Engraulis encrasicolus	1.65	206	0.39	
Pseudupeneus prayensis	0.55	233	0.13	
Saurida brasiliensis	0.41	151	0.10	
Total	423.16		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 43
DATE :17/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 11°16.75
start stop duration Lon E 13°43.54
TIME :21:42:28 21:58:39 16.2 (min) Purpose : 1
LOG : 2698.32 2699.34 1.0 Region : 4040
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 21 21 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.8 kn
Sorted : 0 Total catch: 42.67 Catch/hour: 158.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	82.84	1628	52.36	110
Sardinella aurita	30.78	727	19.45	111
Sardinella maderensis	18.84	308	11.91	112
Sphyraena sphyraena	14.68	59	9.28	
Raja miraletus	4.67	15	2.95	
Cypselurus naresii	3.26	7	2.06	
Scomber japonicus	2.67	26	1.69	113
Caranx rhonchus	0.30	15	0.19	
Boops boops	0.19	30	0.12	
Total	158.23		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 44
DATE :17/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 11°17.26
start stop duration Lon E 13°35.53
TIME :23:13:51 23:32:24 18.6 (min) Purpose : 1
LOG : 2706.40 2707.32 0.9 Region : 4040
FDEPTH: 114 63 Gear cond.: 0
BDEPTH: 114 63 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 0 Total catch: 16.98 Catch/hour: 54.92

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	38.43	285	69.96	114
Selar crumenophthalmus	6.47	16	11.78	
Euthynnus alletteratus	3.95	3	7.18	
Caranx crysos	2.56	3	4.65	
Brachydeuterus auritus	1.29	13	2.36	
Eucinostomus melanopterus	1.00	10	1.83	
Sphyraena guachancho	0.97	13	1.77	
Trichiurus lepturus	0.26	71	0.47	
Total	54.92		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 45
DATE :18/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 11°10.55
start stop duration Lon E 13°35.37
TIME :02:05:21 02:25:08 19.8 (min) Purpose : 1
LOG : 2730.36 2731.34 1.0 Region : 4040
FDEPTH: 165 150 Gear cond.: 0
BDEPTH: 165 150 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 46
DATE :18/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 11°5.66
start stop duration Lon E 13°49.37
TIME :04:22:44 04:30:36 7.9 (min) Purpose : 1
LOG : 2748.95 2749.44 0.5 Region : 4040
FDEPTH: 32 32 Gear cond.: 0
BDEPTH: 32 32 Validity : 0
Towing dir: 0° Wire out : 70 m Speed : 3.7 kn
Sorted : 0 Total catch: 21.04 Catch/hour: 160.41

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	62.82	3324	39.16	116
Trachurus trecae	49.25	1555	30.70	115
Chloroscombrus chrysurus	21.58	206	13.45	118
Sardinella aurita	17.53	557	10.93	117
Trichiurus lepturus	3.89	30	2.42	
Trachinotus ovatus	1.98	8	1.24	
Lagocephalus laevigatus	1.22	8	0.76	
Caranx rhonchus	0.91	53	0.57	
Selene dorsalis	0.76	15	0.48	
Scomber japonicus	0.46	38	0.29	
Total	160.41		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 47
DATE :18/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 10°56.47
start stop duration Lon E 13°41.71
TIME :09:36:22 09:49:20 13.0 (min) Purpose : 1
LOG : 2797.17 2797.82 0.6 Region : 4040
FDEPTH: 69 69 Gear cond.: 0
BDEPTH: 69 69 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.0 kn
Sorted : 0 Total catch: 321.21 Catch/hour: 1485.94

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
WASTE00	955.93	0	64.33	
Citharus linguatula	123.24	4330	8.29	
Dentex angolensis	97.01	958	6.53	121
Pterothrissus belloci	62.87	1540	4.23	
Bembrops sp.	31.23	167	2.10	
Gobidae sp. 'bars'	29.56	1332	1.99	
Sepia officinalis	29.56	749	1.99	
Pomadasys incisus	25.81	125	1.74	
Raja miraletus	23.32	42	1.57	
Pagellus bellottii	17.90	167	1.20	
Selene dorsalis	14.99	208	1.01	123
Dicologoglossa cuneata	12.91	42	0.87	
Sardinella maderensis	12.77	106	0.86	119
Scorpaena normani	7.49	167	0.50	
Lepidotrigla cadmani	7.49	42	0.50	
Brachydeuterus auritus	5.41	83	0.36	
Scorpaena stephanica	5.41	375	0.36	
Pythonichthys microphthalmus	4.16	42	0.28	
Trachurus trecae	4.07	51	0.27	120
Chelidonichthys capensis	3.75	291	0.25	
Brotula barbata	2.91	42	0.20	
Uroconger lepturus	2.91	42	0.20	
Dentex barnardi	2.50	42	0.17	
Saurida brasiliensis	1.25	125	0.08	
Penaeus notialis	0.83	291	0.06	
Squilla cadenati	0.42	42	0.03	
Sardinella aurita	0.23	9	0.02	122
Total	1485.94		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 48
DATE :18/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°54.08
start stop duration Lon E 13°47.43
TIME :11:15:34 11:34:50 19.3 (min) Purpose : 1
LOG : 2807.97 2809.07 1.1 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 31 33 Validity : 0
Towing dir: 0° Wire out : 75 m Speed : 3.4 kn
Sorted : 0 Total catch: 1.17 Catch/hour: 3.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	3.64	87	100.00	124
Total	3.64		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 49
DATE :18/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°43.76
start stop duration Lon E 13°31.69
TIME :20:01:53 20:16:16 14.4 (min) Purpose : 1
LOG : 2869.84 2870.78 0.9 Region : 4040
FDEPTH: 15 20 Gear cond.: 0
BDEPTH: 91 97 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.9 kn
Sorted : 0 Total catch: 51.37 Catch/hour: 214.34

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	165.31	910	77.13	125
Sardinella aurita	25.87	179	12.07	126
Brachydeuterus auritus	11.52	96	5.37	
Synagrops microlepis	3.00	659	1.40	
Saurida brasiliensis	2.96	655	1.38	
Bregmaceros sp.	2.67	2841	1.25	
Trichiurus lepturus	2.34	96	1.09	
Alloteuthis africana	0.67	321	0.31	
Total	214.34		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 50
DATE :18/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 10°38.51
start stop duration Lon E 13°42.25
TIME :22:10:55 22:20:51 9.9 (min) Purpose : 1
LOG : 2886.78 2887.39 0.6 Region : 4040
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 22 22 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.7 kn
Sorted : 0 Total catch: 37.03 Catch/hour: 223.75

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	146.47	538	65.46	
Eucinostomus melanopterus	20.00	332	8.94	
Galeoides decadactylus	15.71	181	7.02	
Trachurus trecae	14.08	363	6.29	127
Trichiurus lepturus	8.04	121	3.59	
Ilisha africana	7.01	145	3.13	129
Selene dorsalis	4.35	296	1.94	130
Chloroscombrus chrysurus	3.08	42	1.38	131
Sardinella maderensis	2.72	91	1.22	128
Arius parkii	1.27	6	0.57	
Sphyraena guachancho	0.66	36	0.30	
Sardinella aurita	0.36	6	0.16	
Total	223.75		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 51
DATE :18/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°36.71
start stop duration Lon E 13°33.83
TIME :23:42:38 00:07:38 25.0 (min) Purpose : 1
LOG : 2897.43 2898.74 1.3 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 51 55 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.1 kn
Sorted : 0 Total catch: 172.53 Catch/hour: 414.07

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella maderensis	132.48	934	31.99	132
Trichiurus lepturus	46.90	96	11.33	
Lagocephalus laevigatus	46.27	79	11.17	
Sardinella aurita	46.18	511	11.15	133
Brachydeuterus auritus	38.50	379	9.30	134
Chloroscombrus chrysurus	37.87	206	9.15	137
Sphyraena guachancho	24.19	108	5.84	
Trachurus trecae	19.39	173	4.68	136
Sarda sarda	7.99	10	1.93	135
Selene dorsalis	6.48	24	1.56	138
Loligo vulgaris	3.41	1284	0.82	
Trachinotus ovatus	3.36	12	0.81	
Engraulis encrasicolus	1.06	504	0.26	
Total	414.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 52
DATE :19/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°38.51
start stop duration Lon E 13°28.09
TIME :01:03:20 01:32:50 29.5 (min) Purpose : 1
LOG : 2904.51 2906.06 1.6 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 87 91 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
Sorted : 0 Total catch: 31.59 Catch/hour: 64.25

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	42.26	18376	65.78	
Sardinella aurita	17.69	173	27.54	139
Sardinella maderensis	3.36	18	5.22	140
Brachydeuterus auritus	0.94	8	1.46	141
Total	64.25		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 53
DATE :19/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 10°26.99
start stop duration Lon E 13°32.91
TIME :07:23:50 07:30:59 7.2 (min) Purpose : 1
LOG : 2961.88 2962.32 0.4 Region : 4040
FDEPTH: 21 21 Gear cond.: 0
BDEPTH: 21 21 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.7 kn
Sorted : 0 Total catch: 298.62 Catch/hour: 2505.90

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	959.16	5211	38.28	
Sardinella maderensis	901.01	96898	35.96	144
Sardinella aurita	253.01	5438	10.10	142
Galeoides decadactylus	178.24	2945	7.11	
Ilisha africana	40.78	1133	1.63	
Ephippion guttifer	40.78	8	1.63	
Sphyraena guachancho	36.25	604	1.45	
Pteroscion peli	21.15	378	0.84	
Alectis alexandrinus	15.02	8	0.60	
Selene dorsalis	14.35	982	0.57	143
Pomadasys incisus	13.59	302	0.54	
Galeorhinus galeus	12.59	8	0.50	
Trichiurus lepturus	6.04	151	0.24	
Pseudotolithus typus	5.20	17	0.21	
Scomberomorus tritor	4.62	8	0.18	
Lagocephalus laevigatus	2.43	8	0.10	
Eucinostomus melanopterus	1.68	8	0.07	
Total	2505.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 54
DATE :19/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 10°19.00
start stop duration Lon E 13°28.47
TIME :14:27:10 14:44:04 16.9 (min) Purpose : 1
LOG : 3030.81 3031.76 0.9 Region : 4040
FDEPTH: 25 24 Gear cond.: 0
BDEPTH: 25 24 Validity : 0
Towing dir: 0° Wire out : 75 m Speed : 3.4 kn
Sorted : 0 Total catch: 333.82 Catch/hour: 1185.16

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Ilisha africana	625.74	9561	52.80	148
Brachydeuterus auritus	104.38	1846	8.81	150
Galeoides decadactylus	79.88	320	6.74	
Pteroscion peli	63.55	1189	5.36	
Pseudotolithus senegalensis	49.17	249	4.15	
Sardinella maderensis	44.38	426	3.74	149
Stromateus fiatola	38.88	142	3.28	
Chloroscombrus chrysurus	31.24	355	2.64	147
Sepia officinalis	22.90	89	1.93	
Trichiurus lepturus	22.72	728	1.92	
Gymnura micrura	13.42	11	1.13	
Pomadasys peroteti	12.43	36	1.05	
Ephippion guttifer	12.21	7	1.03	
Sphyraena guachancho	12.07	89	1.02	
Selene dorsalis	11.54	266	0.97	146
Sardinella aurita	10.65	124	0.90	145
Panulirus regius	8.34	18	0.70	
Dicologoglossa cuneata	6.39	124	0.54	
Arius parkii	4.44	18	0.37	
Pseudotolithus typus	4.08	89	0.34	
Umbrina canariensis	3.20	53	0.27	
Penaeus notialis	1.42	89	0.12	
Trachurus trecae	1.42	36	0.12	
B I V A L V E S	0.71	178	0.06	
Total	1185.16		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 55
DATE :19/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°20.60
start stop duration Lon E 12°55.44
TIME :21:44:47 21:54:13 9.4 (min) Purpose : 1
LOG : 3077.79 3078.36 0.6 Region : 4040
FDEPTH: 35 45 Gear cond.: 0
BDEPTH: 498 499 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
Sorted : 0 Total catch: 11.19 Catch/hour: 71.12

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	54.92	79411	77.21	
J E L L Y F I S H	14.56	197	20.46	
Desmodema polystictum	1.08	6	1.52	
Cubiceps sp.	0.32	6	0.45	0
Todarodes sp.	0.25	19	0.36	
Total	71.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 56
DATE :20/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°12.66
start stop duration Lon E 13°15.19
TIME :00:26:17 00:51:40 25.4 (min) Purpose : 1
LOG : 3101.19 3102.52 1.3 Region : 4040
FDEPTH: 15 20 Gear cond.: 0
BDEPTH: 70 68 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.2 kn
Sorted : 0 Total catch: 215.15 Catch/hour: 508.63

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella maderensis	177.87	383	34.97	152
Sardinella aurita	101.99	390	20.05	154
Brachydeuterus auritus	80.14	752	15.76	155
Lagocephalus laevigatus	71.06	35	13.97	
Sphyraena guachancho	44.96	71	8.84	
Selene dorsalis	16.45	142	3.23	151
Trachurus trecae	13.10	248	2.57	153
Sepia officinalis	3.05	2	0.60	
Total	508.63		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 57
DATE :20/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 10°7.06
start stop duration Lon E 13°20.76
TIME :02:44:34 03:12:39 28.1 (min) Purpose : 1
LOG : 3116.99 3118.53 1.5 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 22 24 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.3 kn
Sorted : 0 Total catch: 209.16 Catch/hour: 446.76

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	317.58	4635	71.08	157
Galeoides decadactylus	24.76	263	5.54	
Pteroscion peli	20.93	323	4.69	
Ilisha africana	20.72	308	4.64	158
Pomadasys jubelini	18.39	135	4.12	
Chloroscombrus chrysurus	16.45	203	3.68	159
Eucinostomus melanopterus	14.89	203	3.33	
Trachurus trecae	3.37	83	0.76	156
Argyrosomus hololepidotus	2.99	9	0.67	
Arius parkii	2.03	9	0.45	
Sardinella maderensis	1.94	45	0.44	160
Penaeus notialis	1.43	38	0.32	
Lagocephalus laevigatus	1.28	9	0.29	
Total	446.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 58
DATE :20/02/14 GEAR TYPE: BT NO: 25 POSITION:Lat S 9°53.58
start stop duration Lon E 13°11.87
TIME :11:15:38 11:24:43 9.1 (min) Purpose : 1
LOG : 3194.26 3194.80 0.5 Region : 4040
FDEPTH: 30 30 Gear cond.: 0
BDEPTH: 30 30 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.5 kn
Sorted : 0 Total catch: 313.07 Catch/hour: 2068.74

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella aurita	1772.25	37163	85.67	163
Eucinostomus melanopterus	103.74	1322	5.01	
Chloroscombrus chrysurus	75.33	727	3.64	164
Sardinella maderensis	75.33	1057	3.64	162
Selene dorsalis	26.43	595	1.28	165
Trachurus trecae	10.37	244	0.50	161
Pseudotolithus senegalensis	5.29	7	0.26	
Total	2068.74		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 59
DATE :20/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°51.04
start stop duration Lon E 13°6.55
TIME :19:28:11 19:48:22 20.2 (min) Purpose : 1
LOG : 3247.90 3248.95 1.1 Region : 4040
FDEPTH: 30 30 Gear cond.: 0
BDEPTH: 68 72 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.3 kn
Sorted : 0 Total catch: 56.76 Catch/hour: 168.68

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella aurita	78.69	823	46.65	167
Sardinella maderensis	51.11	259	30.30	166
Brachydeuterus auritus	32.45	256	19.24	168
Scomber japonicus	3.27	15	1.94	169
Sphyraena guachancho	1.28	3	0.76	
Saurida brasiliensis	0.89	134	0.53	
Alloteuthis africana	0.42	196	0.25	
Pagellus bellottii	0.30	104	0.18	
Trachurus trecae	0.18	9	0.11	
Bregmaceros sp.	0.09	83	0.05	
Total	168.68		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 60
DATE :20/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 9°45.37
start stop duration Lon E 13°11.73
TIME :21:46:55 21:53:56 7.0 (min) Purpose : 1
LOG : 3255.86 3256.26 0.4 Region : 4040
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 24 24 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
Sorted : 0 Total catch: 97.37 Catch/hour: 832.22

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	635.90	11239	76.41	170
Galeoides decadactylus	60.00	735	7.21	
Ilisha africana	43.08	991	5.18	171
Eucinostomus melanopterus	32.31	427	3.88	
Chloroscombrus chrysurus	17.44	188	2.10	173
Sphyraena guachancho	10.60	34	1.27	
Arius parkii	8.97	9	1.08	
Trichiurus lepturus	5.98	51	0.72	
Selene dorsalis	4.96	188	0.60	172
Scomberomorus tritor	4.70	9	0.56	
Pteroscion peli	3.42	85	0.41	
Pomadasys incisus	2.39	17	0.29	
Lagocephalus laevigatus	1.79	9	0.22	
Penaeus kerathurus	0.43	9	0.05	
Penaeus notialis	0.26	9	0.03	
Total	832.22		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 61
DATE :20/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°44.74
start stop duration Lon E 13°2.68
TIME :23:18:41 23:48:54 30.2 (min) Purpose : 1
LOG : 3267.08 3268.52 1.4 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 81 85 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 2.9 kn
Sorted : 0 Total catch: 33.09 Catch/hour: 65.70

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Saurida brasiliensis	21.24	3433	32.34	
Brachydeuterus auritus	19.93	149	30.34	176
Lagocephalus laevigatus	12.39	14	18.86	
Sardinella maderensis	9.17	40	13.96	175
Trachurus trecae	1.49	64	2.27	174
Loligo vulgaris	1.27	103	1.93	
Sardinella aurita	0.20	2	0.30	
Total	65.70		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 62
DATE :21/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°47.19
start stop duration Lon E 12°52.78
TIME :01:20:24 01:44:31 24.1 (min) Purpose : 1
LOG : 3280.12 3281.26 1.1 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 124 152 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 2.8 kn
Sorted : 0 Total catch: 322.66 Catch/hour: 802.64

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Scomber japonicus	735.07	1838	91.58	177
Euthynnus alletteratus	61.79	162	7.70	178
Sarda sarda	4.33	2	0.54	
Selene dorsalis	1.44	2	0.18	
Total	802.64		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 63
DATE :21/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°42.40
start stop duration Lon E 12°48.39
TIME :04:04:54 04:26:55 22.0 (min) Purpose : 1
LOG : 3301.81 3302.91 1.1 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 220 196 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.0 kn
Sorted : 0 Total catch: 9.14 Catch/hour: 24.90

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Saurida brasiliensis	17.55	9572	70.46	
Synagrops microlepis	7.14	850	28.67	
Loligo vulgaris	0.22	3	0.88	
Total	24.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 64
DATE :21/02/14 GEAR TYPE: BT NO: 26 POSITION:Lat S 9°36.22
start stop duration Lon E 13°8.99
TIME :06:58:45 07:07:06 8.3 (min) Purpose : 1
LOG : 3324.39 3324.92 0.5 Region : 4040
FDEPTH: 24 27 Gear cond.: 0
BDEPTH: 24 27 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.8 kn
Sorted : 0 Total catch: 13.80 Catch/hour: 99.16

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sphyraena guachancho	83.78	129	84.49	
Caranx senegallus	6.11	7	6.16	
Sardinella maderensis	4.24	43	4.28	179
Brachydeuterus auritus	3.52	43	3.55	
Hemicaranx bicolor	1.51	7	1.52	
Total	99.16		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 65
DATE :21/02/14 GEAR TYPE: BT NO: 26 POSITION:Lat S 9°21.61
start stop duration Lon E 12°59.37
TIME :14:43:29 14:57:20 13.9 (min) Purpose : 1
LOG : 3397.98 3398.77 0.8 Region : 4040
FDEPTH: 32 31 Gear cond.: 0
BDEPTH: 32 31 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.4 kn
Sorted : 0 Total catch: 81.16 Catch/hour: 351.34

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Pagellus bellottii	216.80	1519	61.71	180
Chloroscombrus chrysurus	87.79	463	24.99	181
Pseudupeneus prayensis	26.45	165	7.53	
Balistes capriscus	8.44	13	2.40	
Lagocephalus laevigatus	6.06	13	1.72	
Alectis alexandrinus	5.19	4	1.48	
Trachinus radiatus	0.35	4	0.10	
Rypticus saponaceus	0.26	4	0.07	
Total	351.34		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 66
DATE :21/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°23.33
start stop duration Lon E 12°42.77
TIME :17:19:35 17:43:41 24.1 (min) Purpose : 1
LOG : 3418.47 3419.82 1.3 Region : 4040
FDEPTH: 80 0 Gear cond.: 0
BDEPTH: 172 147 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.3 kn
Sorted : 0 Total catch: 3.81 Catch/hour: 9.49

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	8.97	156	94.49	
Cephalopoda - juvenile	0.30	202	3.15	
J E L L Y F I S H	0.15	5	1.57	
Zenopsis conchifer, juvenile	0.07	2	0.79	
Total	9.49		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 67
DATE :21/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°32.43
start stop duration Lon E 12°59.99
TIME :21:11:31 21:27:26 15.9 (min) Purpose : 1
LOG : 3451.51 3452.45 0.9 Region : 4040
FDEPTH: 30 30 Gear cond.: 0
BDEPTH: 66 56 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.5 kn
Sorted : 0 Total catch: 20.22 Catch/hour: 76.21

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella maderensis	39.65	166	52.03	183
Pomadasys peroteti	10.48	11	13.75	
Trichiurus lepturus	4.03	11	5.29	
Sardinella aurita	4.03	26	5.29	184
Boops boops	2.83	75	3.71	
Alectis alexandrinus	2.60	4	3.41	
Saurida brasiliensis	2.41	475	3.17	
Caranx rhonchus	2.34	4	3.07	
Lagocephalus laevigatus	2.22	11	2.92	
Alloteuthis africana	1.92	1180	2.52	
Brachydeuterus auritus	1.55	11	2.03	
Trachurus trecae	0.75	26	0.99	182
Bregmaceros sp.	0.75	1093	0.99	
Pseudupeneus prayensis	0.26	11	0.35	
Shrimps, small, non comm.	0.15	381	0.20	
Synagrops microlepis	0.11	15	0.15	
Pagellus bellottii	0.08	8	0.10	
Erythrocles monodi	0.04	4	0.05	
Total	76.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 68
DATE :22/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°23.45
start stop duration Lon E 13°3.18
TIME :03:38:32 03:52:55 14.4 (min) Purpose : 1
LOG : 3509.28 3510.01 0.7 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 22 23 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.1 kn
Sorted : 0 Total catch: 8.54 Catch/hour: 35.61

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardinella maderensis	13.84	79	38.88	185
Hemicaranx bicolor	10.17	58	28.57	
Alectis alexandrinus	3.67	8	10.30	
Chloroscombrus chrysurus	3.17	21	8.90	186
Raja miraletus	1.83	4	5.15	
Brachydeuterus auritus	1.33	13	3.75	
Pomadasys incisus	0.92	4	2.58	
Ilisha africana	0.67	8	1.87	
Total	35.61		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 69
DATE :22/02/14 GEAR TYPE: BT NO: 26 POSITION:Lat S 9°14.13
start stop duration Lon E 12°58.34
TIME :10:21:20 10:32:40 11.3 (min) Purpose : 1
LOG : 3570.18 3570.84 0.7 Region : 4040
FDEPTH: 21 23 Gear cond.: 0
BDEPTH: 21 23 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.5 kn
Sorted : 0 Total catch: 207.15 Catch/hour: 1097.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	712.48	12122	64.95	193
Sardinella aurita	90.08	1335	8.21	187
Selene dorsalis	72.29	1853	6.59	190
Sphyraena guachancho	48.56	334	4.43	
Ilisha africana	34.47	927	3.14	192
Sardinella maderensis	32.25	445	2.94	189
Pteroscion peli	20.02	408	1.82	
Chloroscombrus chrysurus	18.91	185	1.72	191
Trachinotus goreensis	15.20	37	1.39	
Galeoides decadactylus	14.46	185	1.32	
Trachurus trecae	14.46	630	1.32	188
Pseudotolithus senegalensis	6.30	37	0.57	
Pseudupeneus prayensis	6.30	74	0.57	
Pomadasys incisus	3.71	74	0.34	
Rhinobatos albomaculatus	2.81	5	0.26	
Trichiurus lepturus	2.59	259	0.24	
Panulirus regius	1.22	5	0.11	
Penaeus notialis	0.53	5	0.05	
Caranx rhonchus	0.37	37	0.03	
Total	1097.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 70
DATE :23/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°5.53
start stop duration Lon E 12°53.17
TIME :01:04:16 01:24:27 20.2 (min) Purpose : 1
LOG : 3667.18 3668.30 1.1 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 59 56 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.3 kn
Sorted : 0 Total catch: 161.76 Catch/hour: 480.95

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	217.11	966	45.14	196
Selene dorsalis	143.46	919	29.83	194
Trichiurus lepturus	78.37	229	16.30	
Lagocephalus laevigatus	18.67	30	3.88	
Scomber japonicus	10.67	33	2.22	195
Sphyraena guachancho	5.05	6	1.05	
MYCTOPHIDAE	3.75	2141	0.78	
Trachinotus ovatus	3.12	12	0.65	
Brachydeuterus auritus	0.54	3	0.11	
Trachurus trecae	0.12	6	0.02	
Engraulis encrasicolus	0.09	15	0.02	
Total	480.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 71
DATE :23/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 9°5.23
start stop duration Lon E 12°56.96
TIME :03:33:26 04:00:08 26.7 (min) Purpose : 1
LOG : 3675.34 3676.97 1.6 Region : 4040
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 32 29 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.7 kn
Sorted : 0 Total catch: 2.70 Catch/hour: 6.07

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	3.35	27	55.19	197
Sardinella aurita	1.57	16	25.93	198
Selar crumenophthalmus	0.43	18	7.04	
Trachurus trecae	0.40	16	6.67	199
Boops boops	0.31	13	5.19	
Total	6.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 72
DATE :23/02/14 GEAR TYPE: BT NO: 26 POSITION:Lat S 8°42.42
start stop duration Lon E 13°11.88
TIME :12:14:14 12:28:39 14.4 (min) Purpose : 1
LOG : 3744.36 3745.17 0.8 Region : 4054
FDEPTH: 72 76 Gear cond.: 0
BDEPTH: 72 76 Validity : 0
Towing dir: 0° Wire out : 190 m Speed : 3.4 kn
Sorted : 0 Total catch: 299.93 Catch/hour: 1247.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	664.08	21595	53.21	200
Trachurus trecae	440.22	15645	35.27	202
Chloroscombrus chrysurus	44.94	374	3.60	201
Galeoides decadactylus	42.44	291	3.40	
Chaetodipterus sp.	15.40	83	1.23	
Atractoscion aequidens	14.15	42	1.13	
Pomadasys incisus	10.82	42	0.87	
Alectis alexandrinus	5.53	4	0.44	
Pagellus bellottii	4.99	42	0.40	
Grammoplites gruveli	3.33	42	0.27	
Thorogobius angolensis	2.08	125	0.17	
Total	1247.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 73
DATE :23/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 8°26.79
start stop duration Lon E 13°13.36
TIME :20:56:46 21:21:26 24.7 (min) Purpose : 1
LOG : 3821.83 3823.10 1.3 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 58 63 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.1 kn
Sorted : 154 Total catch: 1536.00 Catch/hour: 3737.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	3104.62	38905	83.07	205
Selene dorsalis	288.08	3017	7.71	208
Trichiurus lepturus	119.22	341	3.19	
Sardinella maderensis	83.70	925	2.24	203
Sardinella aurita	64.96	1046	1.74	204
Trachurus trecae	37.96	462	1.02	206
Ilisha africana	34.55	487	0.92	207
Brachydeuterus auritus	4.14	49	0.11	
Total	3737.23		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 74
DATE :23/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 8°23.43
start stop duration Lon E 13°19.08
TIME :22:38:34 22:51:07 12.6 (min) Purpose : 1
LOG : 3832.76 3833.39 0.6 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 25 26 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 0 Total catch: 13.45 Catch/hour: 64.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	15.30	263	23.79	212
Brachydeuterus auritus	13.77	669	21.41	211
Ilisha africana	12.00	316	18.66	209
Sphyraena guachancho	8.27	38	12.86	
Drepane africana	5.74	5	8.92	
Trichiurus lepturus	2.15	10	3.35	
Sardinella maderensis	1.63	43	2.53	210
Penaeus notialis	1.43	29	2.23	
Eucinostomus melanopterus	1.20	29	1.86	
Galeoides decadactylus	0.76	10	1.19	
Lagocephalus laevigatus	0.57	5	0.89	
Caranx rhonchus	0.53	10	0.82	
Sardinella aurita	0.48	14	0.74	
Selene dorsalis	0.43	14	0.67	
Pseudupeneus prayensis	0.05	5	0.07	
Total	64.30		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 75
DATE :24/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 8°20.24
start stop duration Lon E 13°6.97
TIME :00:55:04 01:06:14 11.2 (min) Purpose : 1
LOG : 3850.61 3851.24 0.6 Region : 4054
FDEPTH: 15 0 Gear cond.: 0
BDEPTH: 81 81 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.4 kn
Sorted : 0 Total catch: 134.36 Catch/hour: 722.37

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	493.55	2710	68.32	213
Sardinella aurita	119.14	774	16.49	216
Trichiurus lepturus	57.63	280	7.98	
Brachydeuterus auritus	18.49	215	2.56	214
Thyrsites atun	8.39	5	1.16	
Selene dorsalis	6.88	43	0.95	
Caranx crysos	6.88	5	0.95	
Ilisha africana	6.45	65	0.89	
Pomadasys jubelini	2.90	5	0.40	
Trachurus trecae	2.04	32	0.28	215
Total	722.37		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 76
DATE :24/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 8°22.25
start stop duration Lon E 12°56.96
TIME :03:07:55 03:35:40 27.8 (min) Purpose : 1
LOG : 3865.44 3866.89 1.4 Region : 4054
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 136 168 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.1 kn
Sorted : 0 Total catch: 20.61 Catch/hour: 44.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	35.24	74	79.09	
Sardinella maderensis	5.21	28	11.69	217
MICROSTOMATIDAE	2.29	1559	5.14	
Sardinella aurita	0.78	6	1.75	
Brachydeuterus auritus	0.71	4	1.60	
Scomberomorus tritor	0.32	4	0.73	
Total	44.56		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 77
DATE :24/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 8°12.03
start stop duration Lon E 13°1.80
TIME :07:25:27 07:59:08 33.7 (min) Purpose : 1
LOG : 3901.82 3903.55 1.7 Region : 4054
FDEPTH: 40 75 Gear cond.: 0
BDEPTH: 92 102 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.1 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 78
DATE :24/02/14 GEAR TYPE: BT NO: 26 POSITION:Lat S 8°3.02
start stop duration Lon E 13°10.52
TIME :10:15:31 10:35:41 20.2 (min) Purpose : 1
LOG : 3923.60 3924.81 1.2 Region : 4054
FDEPTH: 24 24 Gear cond.: 0
BDEPTH: 24 24 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.6 kn
Sorted : 0 Total catch: 1299.68 Catch/hour: 3866.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Argyrosomus hololepidotus	2156.07	268	55.77	
Ilisha africana	452.90	17560	11.71	218
Pomadasys jubelini	293.60	1740	7.59	
Brachydeuterus auritus	227.12	8032	5.87	220
Galeoides decadactylus	206.59	1026	5.34	
Pseudotolithus typus	204.81	312	5.30	
Alectis alexandrinus	84.57	202	2.19	
Chloroscombrus chrysurus	76.54	2677	1.98	219
Sphyraena guachancho	69.85	292	1.81	
Gymnura micrura	34.86	3	0.90	
Pteroscion peli	16.75	491	0.43	
Drepane africana	11.39	68	0.29	
Dicologoglossa cuneata	7.38	89	0.19	
Pomadasys incisus	6.25	24	0.16	
Eucinostomus melanopterus	5.15	89	0.13	
Penaeus notialis	4.91	68	0.13	
Dasyatis margarita	4.02	24	0.10	
Selene dorsalis	2.23	89	0.06	
Rhinobatos albomaculatus	1.19	3	0.03	
Total	3866.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 79
DATE :24/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 7°53.64
start stop duration Lon E 12°54.85
TIME :19:08:14 19:18:28 10.2 (min) Purpose : 1
LOG : 3992.18 3992.78 0.6 Region : 4054
FDEPTH: 18 24 Gear cond.: 0
BDEPTH: 80 82 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.5 kn
Sorted : 0 Total catch: 103.00 Catch/hour: 604.11

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	518.77	5460	85.87	221
Trachurus trecae	33.20	1554	5.50	223
Sardinella maderensis	17.71	100	2.93	222
Lagocephalus laevigatus	13.02	6	2.16	
Brachydeuterus auritus	7.62	94	1.26	224
Saurida brasiliensis	5.92	1613	0.98	
Scomber japonicus	4.40	35	0.73	225
Trichiurus lepturus	1.76	6	0.29	
Selene dorsalis	1.23	12	0.20	
Bregmaceros sp.	0.41	639	0.07	
Sepiella ornata	0.06	6	0.01	
Total	604.11		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 80
DATE :27/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 7°35.01
start stop duration Lon E 12°57.51
TIME :00:08:40 00:27:22 18.7 (min) Purpose : 1
LOG : 4169.07 4170.05 1.0 Region : 4054
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 25 27 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.1 kn
Sorted : 0 Total catch: 86.91 Catch/hour: 278.86

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	166.14	2281	59.58	226
Ilisha africana	53.71	1117	19.26	227
Sphyraena guachancho	18.77	58	6.73	
Chloroscombrus chrysurus	16.75	135	6.01	229
Brachydeuterus auritus	10.97	289	3.94	230
Galeoides decadactylus	6.16	58	2.21	
Selene dorsalis	4.24	67	1.52	228
Pomadasys incisus	1.35	10	0.48	
Penaeus notialis	0.48	58	0.17	
Eucinostomus melanopterus	0.29	10	0.10	
Total	278.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 81
DATE :27/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 7°36.63
start stop duration Lon E 12°44.95
TIME :02:09:02 02:32:45 23.7 (min) Purpose : 1
LOG : 4184.08 4185.25 1.2 Region : 4054
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 86 90 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 0 Total catch: 44.27 Catch/hour: 111.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lagocephalus laevigatus	95.62	134	85.39	
Sardinella aurita	15.20	129	13.58	231
Trachurus trecae	0.86	51	0.77	232
Scomber japonicus	0.30	5	0.27	
Total	111.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 82
DATE :27/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 6°58.73
start stop duration Lon E 12°36.64
TIME :17:50:12 17:55:11 5.0 (min) Purpose : 1
LOG : 4325.02 4325.29 0.3 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 24 23 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.2 kn
Sorted : 0 Total catch: 6.51 Catch/hour: 78.43

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	39.40	301	50.23	233
Scomberomorus tritor	28.80	12	36.71	
Drepane africana	6.02	12	7.68	
Boops boops	1.93	1036	2.46	
Caranx rhonchus	1.20	36	1.54	
Dentex barnardi	0.72	12	0.92	
HAEMULIDAE	0.12	12	0.15	
Apogon sp.	0.12	0	0.15	
Pseudupeneus prayensis	0.12	12	0.15	
Total	78.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 83
DATE :27/02/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 7°10.89
start stop duration Lon E 12°16.65
TIME :23:11:26 23:42:56 31.5 (min) Purpose : 1
LOG : 4373.38 4374.95 1.6 Region : 4054
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 122 128 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 0 Total catch: 32.85 Catch/hour: 62.55

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	27.00	124	43.17	234
Saurida brasiliensis	19.00	8289	30.38	
Trichiurus lepturus	7.85	23	12.54	
Trachurus trecae	5.18	326	8.28	236
Scomber japonicus	3.20	36	5.11	235
Sardinella aurita	0.32	2	0.52	
Total	62.55		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 84
DATE :28/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 6°44.38
start stop duration Lon E 12°25.03
TIME :07:41:52 08:01:01 19.1 (min) Purpose : 1
LOG : 4449.57 4450.65 1.1 Region : 4054
FDEPTH: 10 10 Gear cond.: 0
BDEPTH: 22 22 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
Sorted : 0 Total catch: 1.90 Catch/hour: 5.95

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Euthynnus alletteratus	3.54	3	59.47	
Scomberomorus tritor	2.41	3	40.53	
Total	5.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 85
DATE :28/02/14 GEAR TYPE: BT NO: 26 POSITION:Lat S 6°51.59
start stop duration Lon E 12°7.98
TIME :10:56:06 11:13:45 17.6 (min) Purpose : 1
LOG : 4471.17 4472.23 1.1 Region : 4054
FDEPTH: 84 82 Gear cond.: 0
BDEPTH: 84 82 Validity : 0
Towing dir: 0° Wire out : 215 m Speed : 3.6 kn
Sorted : 0 Total catch: 81.34 Catch/hour: 276.51

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagellus bellottii	72.68	741	26.28	238
Lagocephalus laevigatus	62.07	95	22.45	
Dentex congoensis	57.45	578	20.78	239
Mustelus mustelus	21.72	24	7.86	
Lepidotrigla cadmani	19.31	153	6.98	
Trachurus trecae	18.36	996	6.64	237
Octopus vulgaris	12.27	3	4.44	
Chelidonichthys gabonensis	4.76	31	1.72	
Fistularia petimba	3.74	10	1.35	
Chaetodon hoefleri	1.50	7	0.54	
Sparus sp.	0.99	3	0.36	
Citharus linguatula	0.71	27	0.26	
Loligo vulgaris	0.41	10	0.15	
Saurida brasiliensis	0.41	68	0.15	
Scorpaena normani	0.07	3	0.02	
Sepia orbignyana	0.03	7	0.01	
Geryon maritae	0.03	27	0.01	
Total	276.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 86
DATE :28/02/14 GEAR TYPE: PT NO: 7 POSITION:Lat S 6°30.47
start stop duration Lon E 12°18.69
TIME :19:26:34 19:45:25 18.9 (min) Purpose : 1
LOG : 4551.65 4552.65 1.0 Region : 4054
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 26 28 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.2 kn
Sorted : 0 Total catch: 2.06 Catch/hour: 6.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Ilisha africana	3.56	80	54.37	240
Sardinella maderensis	1.78	13	27.18	241
Brachydeuterus auritus	1.05	376	16.02	242
Caranx rhonchus	0.10	6	1.46	
Sphyraena guachancho	0.06	10	0.97	
Total	6.56		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 87
DATE :28/02/14 GEAR TYPE: PT NO: 4 POSITION:Lat S 6°28.34
start stop duration Lon E 12°1.84
TIME :22:23:20 22:41:18 18.0 (min) Purpose : 1
LOG : 4575.03 4575.94 0.9 Region : 4054
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 86 89 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.0 kn
Sorted : 0 Total catch: 9.19 Catch/hour: 30.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Alectis alexandrinus	11.02	13	35.91	
Saurida brasiliensis	9.62	3469	31.34	
Brachydeuterus auritus	3.17	40	10.34	244
Trachurus trecae	2.07	147	6.75	243
Trichiurus lepturus	1.94	7	6.31	
Lagocephalus laevigatus	1.94	3	6.31	
Sardinella aurita	0.73	3	2.39	
Scomber japonicus	0.20	3	0.65	
Total	30.68		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 88
DATE :01/03/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 6°29.17
start stop duration Lon E 11°46.05
TIME :03:33:23 04:04:15 30.9 (min) Purpose : 1
LOG : 4623.79 4625.47 1.7 Region : 4054
FDEPTH: 15 15 Gear cond.: 0
BDEPTH: 129 124 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.3 kn
Sorted : 0 Total catch: 168.90 Catch/hour: 328.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	243.07	472	74.04	
Sardinella maderensis	62.10	280	18.92	245
Selene dorsalis	7.89	19	2.40	246
Saurida brasiliensis	6.20	2142	1.89	
Priacanthus arenatus, juvenile	5.00	2233	1.52	
Lagocephalus laevigatus	2.82	4	0.86	
Sardinella aurita	1.21	6	0.37	247
Total	328.28		100.00	

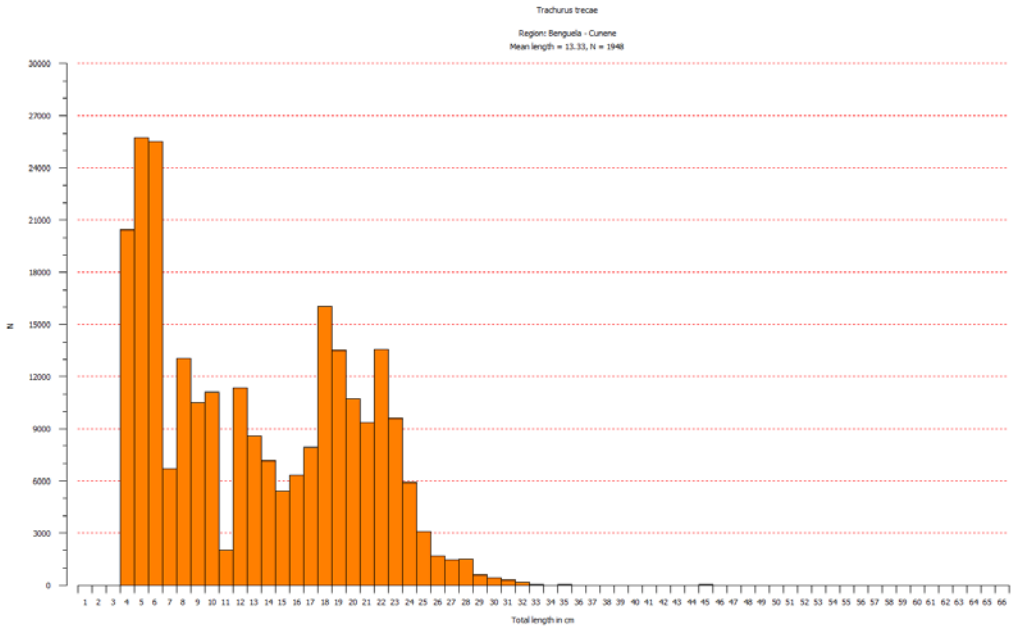
R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 89
DATE :01/03/14 GEAR TYPE: BT NO: 26 POSITION:Lat S 6°12.49
start stop duration Lon E 12°7.71
TIME :07:45:19 08:00:21 15.0 (min) Purpose : 1
LOG : 4655.76 4656.56 0.8 Region : 4054
FDEPTH: 35 38 Gear cond.: 0
BDEPTH: 35 38 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 0 Total catch: 434.88 Catch/hour: 1736.05

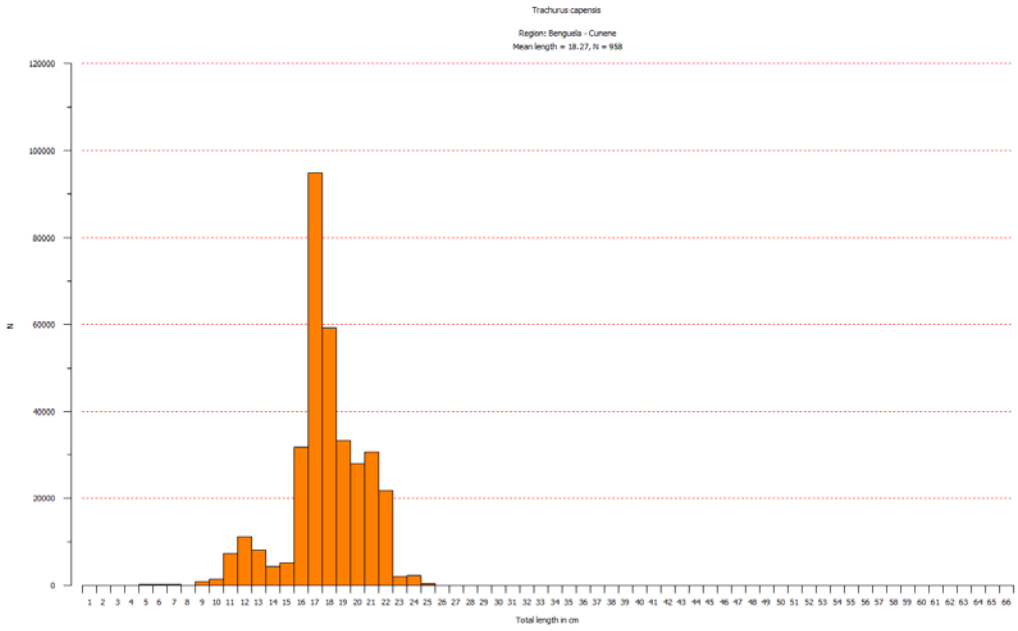
SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	1448.94	22355	83.46	248
Selene dorsalis	63.55	926	3.66	250
Pseudotolithus typus	58.12	96	3.35	
Ilisha africana	52.06	1182	3.00	249
Galeoides decadactylus	34.17	192	1.97	
Sphyraena guachancho	14.37	32	0.83	
Uranoscopus polli	11.82	160	0.68	
Chloroscombrus chrysurus	11.18	96	0.64	
Pagrus caeruleostictus	10.54	32	0.61	
Umbrina canariensis	7.66	64	0.44	
Cynoglossus senegalensis	7.35	32	0.42	
Pteroscion peli	4.79	415	0.28	
Penaeus notialis	3.83	192	0.22	
Calappa pelii	2.87	32	0.17	
Trachinocephalus myops	2.87	64	0.17	
Bregmaceros sp.	1.60	32	0.09	
Squilla mantis	0.32	4	0.02	
Total	1736.05		100.00	

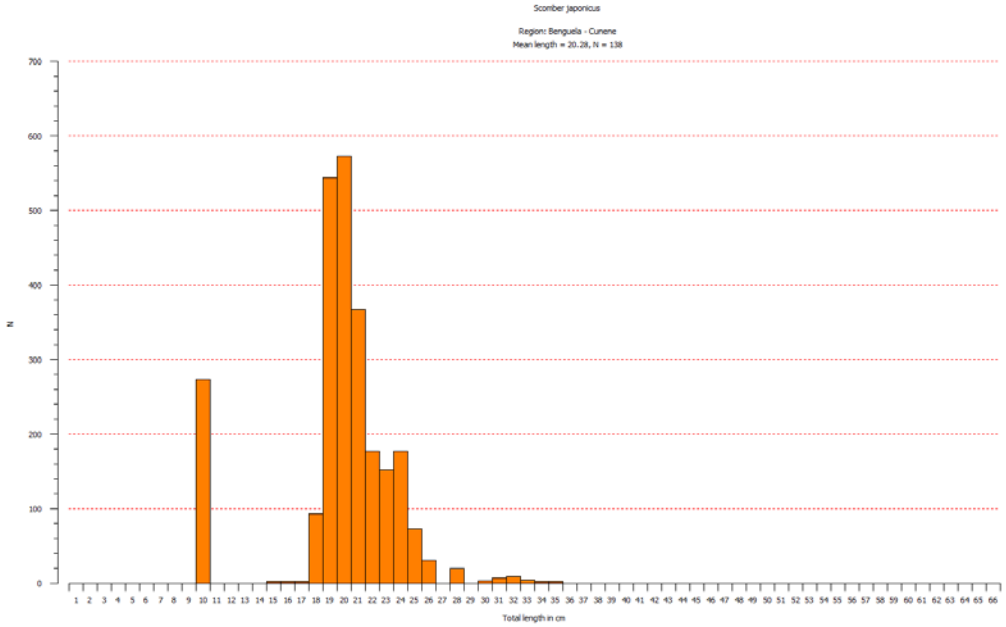
R/V Dr. Fridtjof Nansen SURVEY:2014401 STATION: 90
DATE :01/03/14 GEAR TYPE: PT NO: 1 POSITION:Lat S 6°18.21
start stop duration Lon E 11°44.40
TIME :12:15:03 12:28:11 13.1 (min) Purpose : 1
LOG : 4682.35 4683.07 0.7 Region : 4054
FDEPTH: 40 40 Gear cond.: 0
BDEPTH: 115 112 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

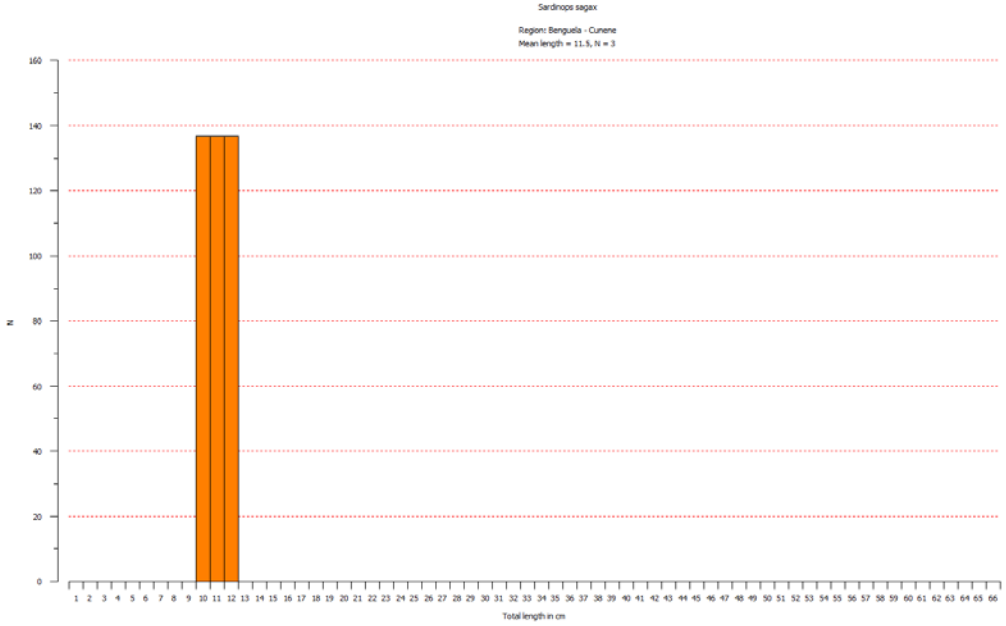
SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
N O C A T C H	0.00	0	0.00	

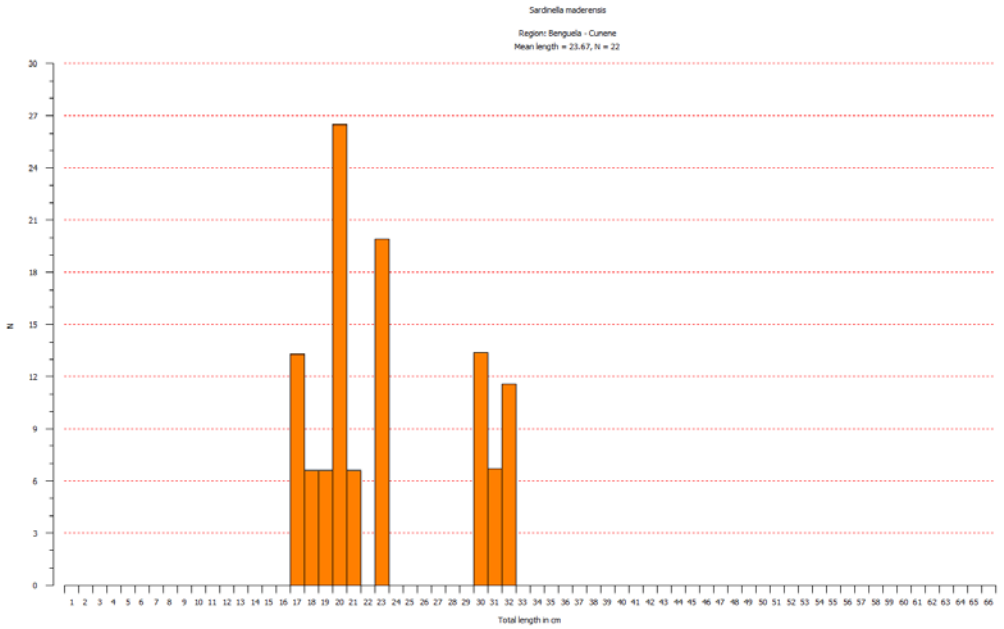
ANNEX II Length frequencies of main species

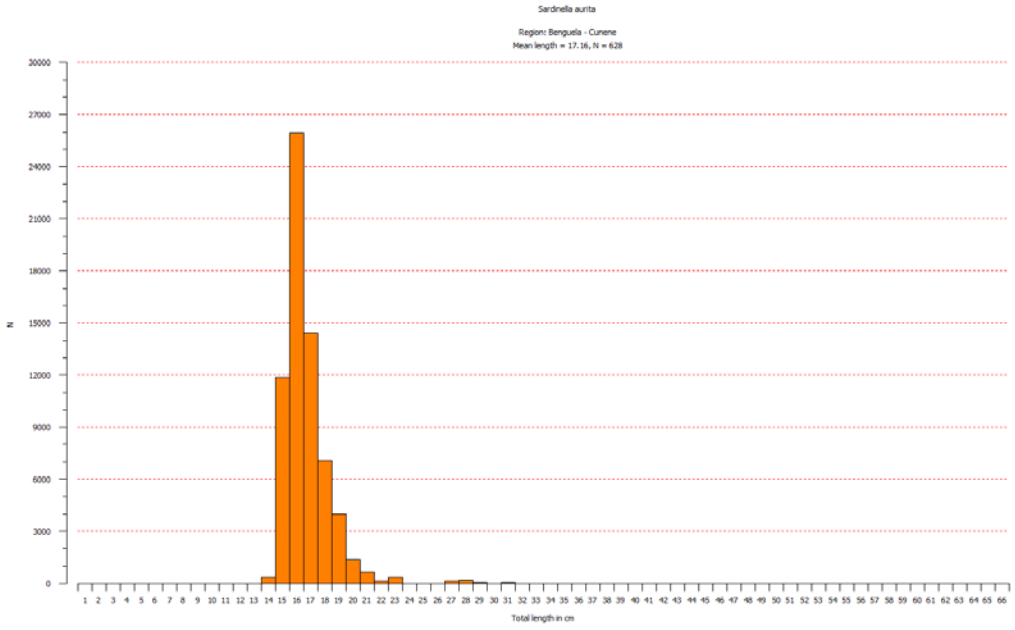


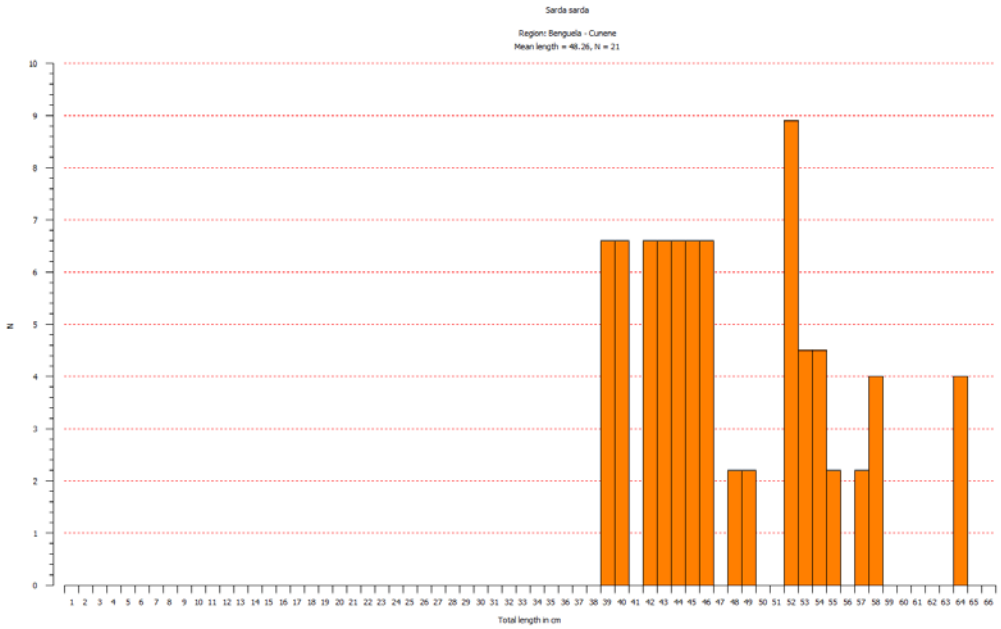


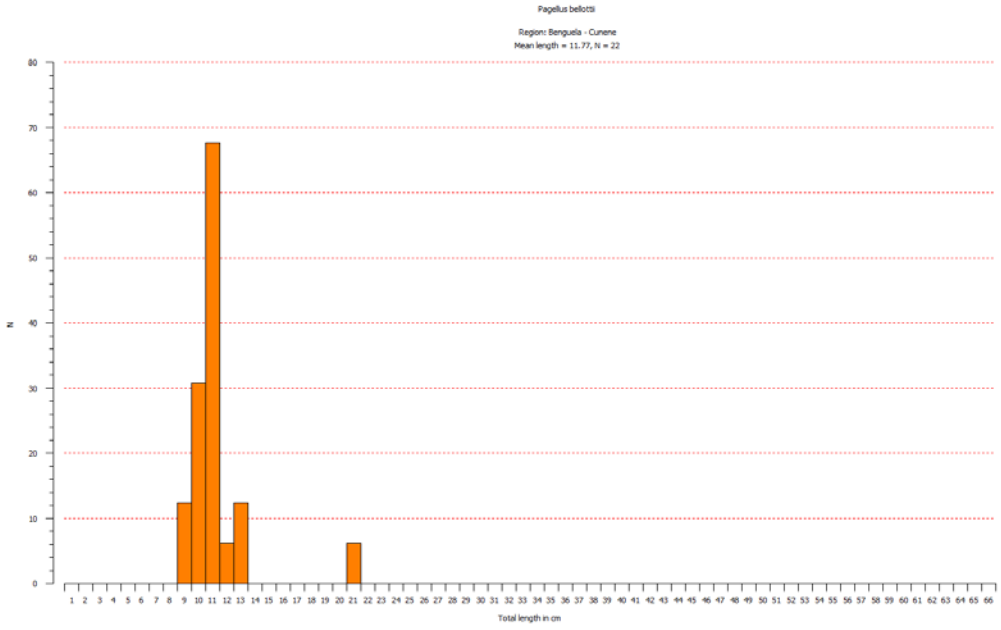

Scomber japonicus
Region: Benguela - Cunene
Mean length = 20.28, N = 138
N
Total length in cm

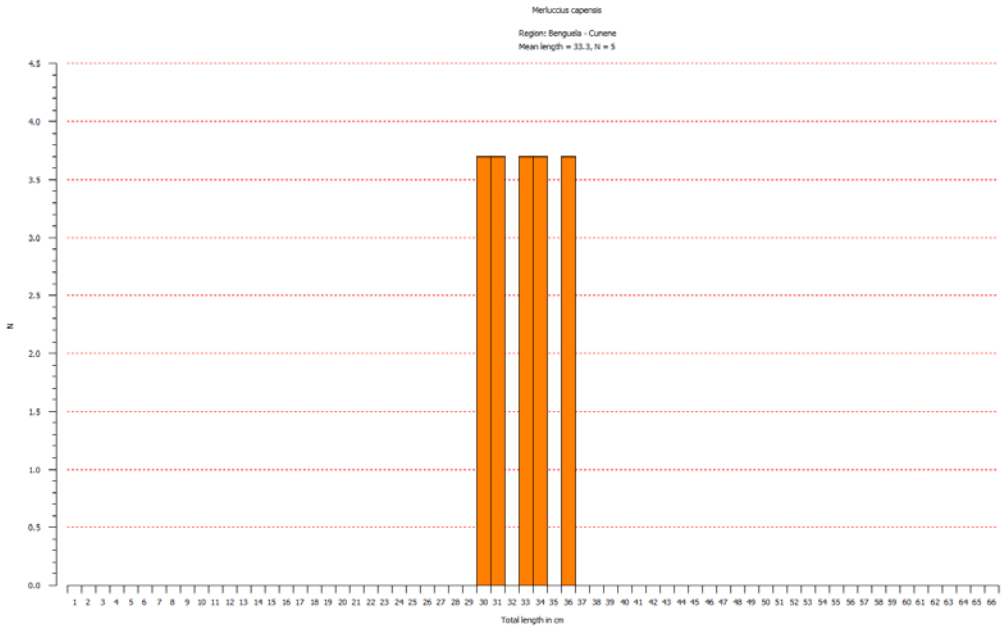

Sardinops sagax
Region: Benguela - Cunene
Mean length = 11.5, N = 3
N
Total length in cm

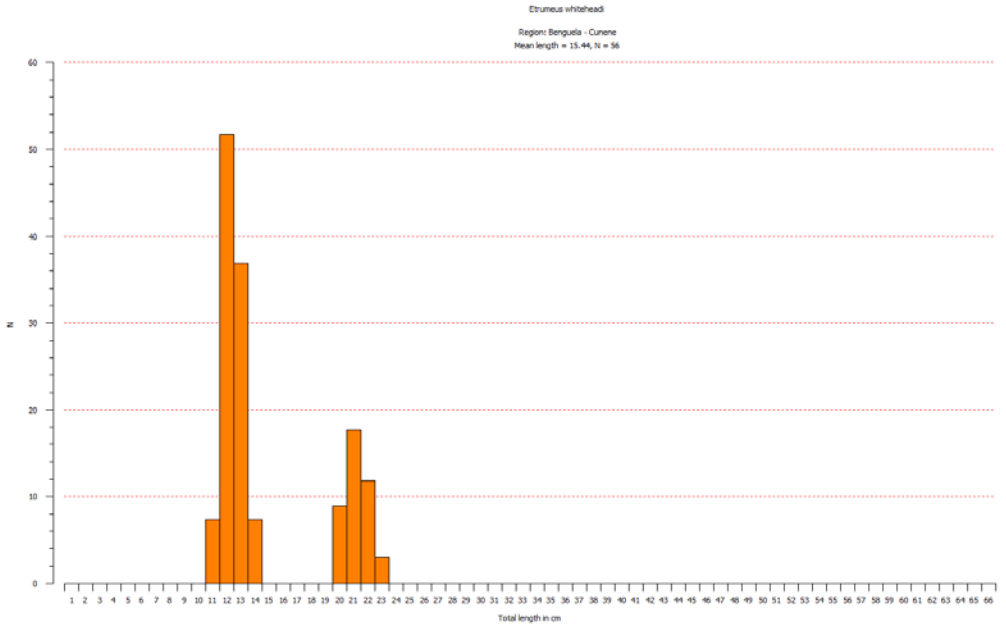

Sardinella maderensis
Region: Benguela - Cunene
Mean length = 23.67, N = 22
N
Total length in cm

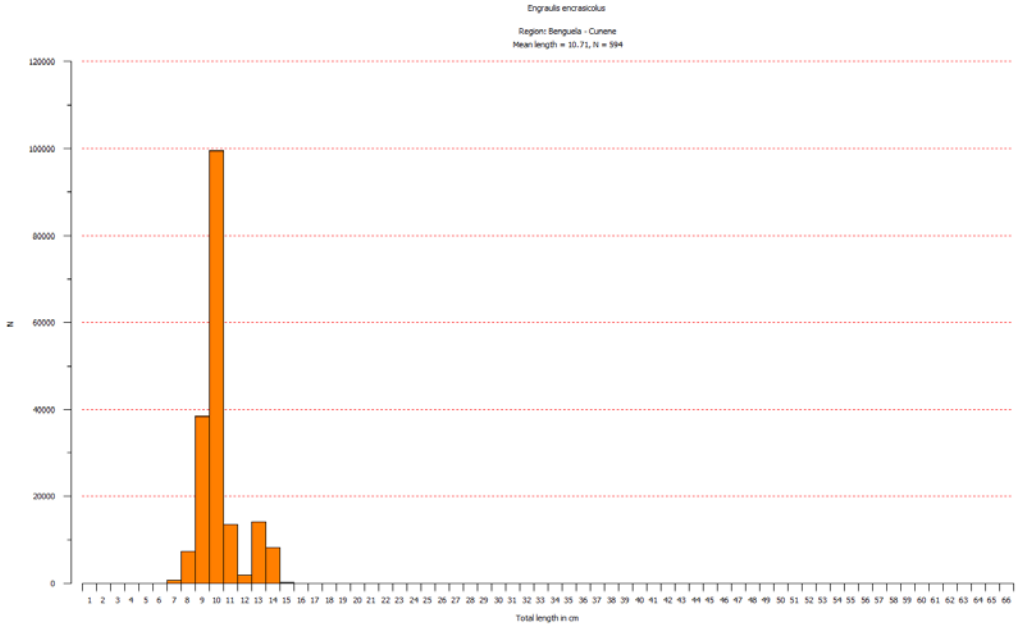

Sardinella aurita
Region: Benguela - Cunene
Mean length = 17.16, N = 628
N
Total length in cm

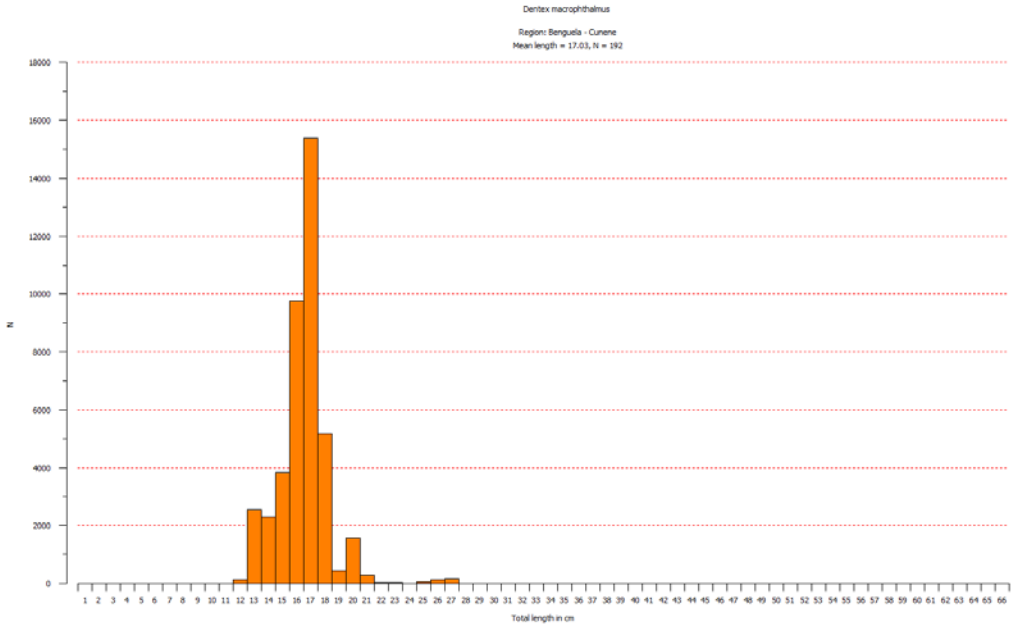

Sarda sarda
Region: Benguela - Cunene
Mean length = 48.26, N = 21
N
Total length in cm

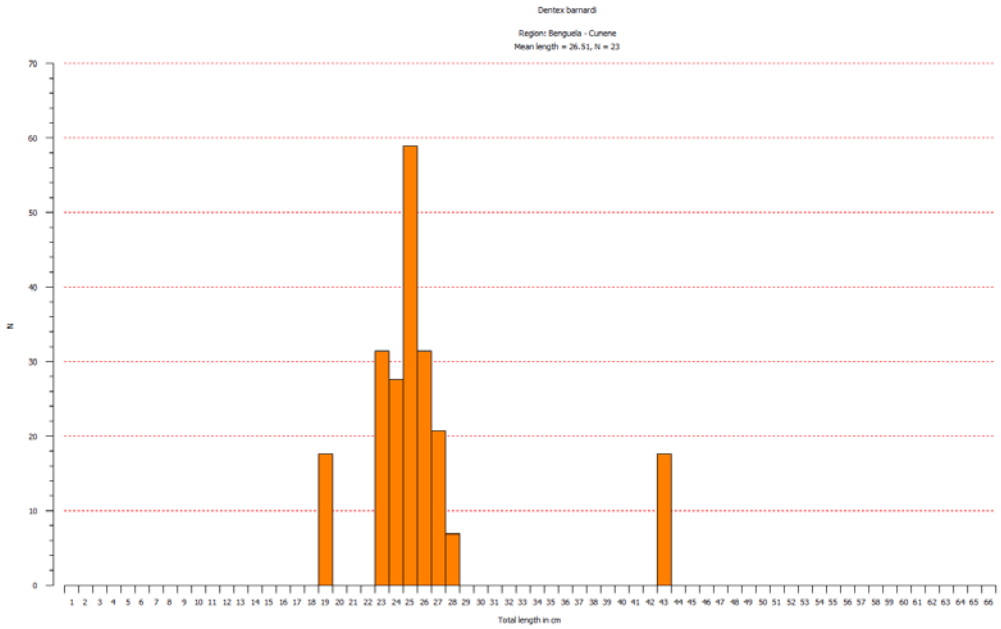

Pagellus bellottii
Region: Benguela - Cunene
Mean length = 11.77, N = 22
N
Total length in cm

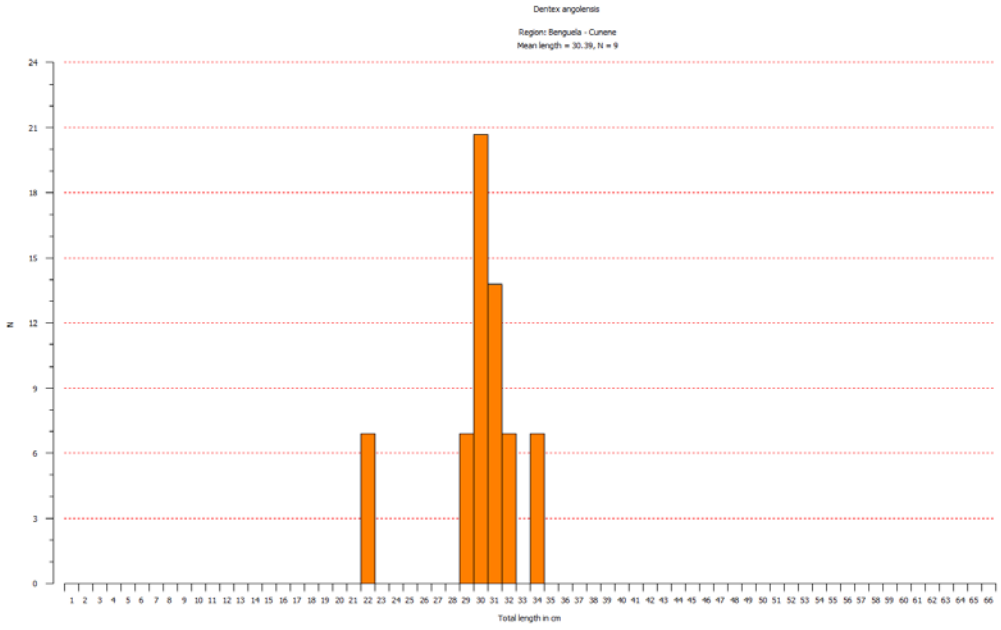

Merluccius capensis
Region: Benguela - Cunene
Mean length = 33.3, N = 5
N
Total length in cm

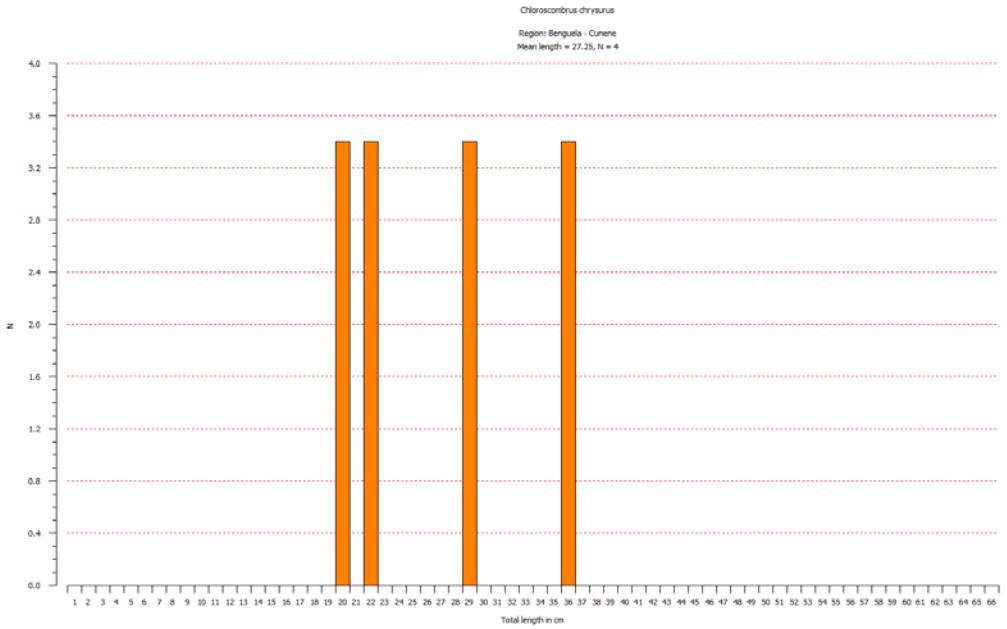

Etrumeus whiteheadi
Region: Benguela - Cunene
Mean length = 15.44, N = 56
N
Total length in cm

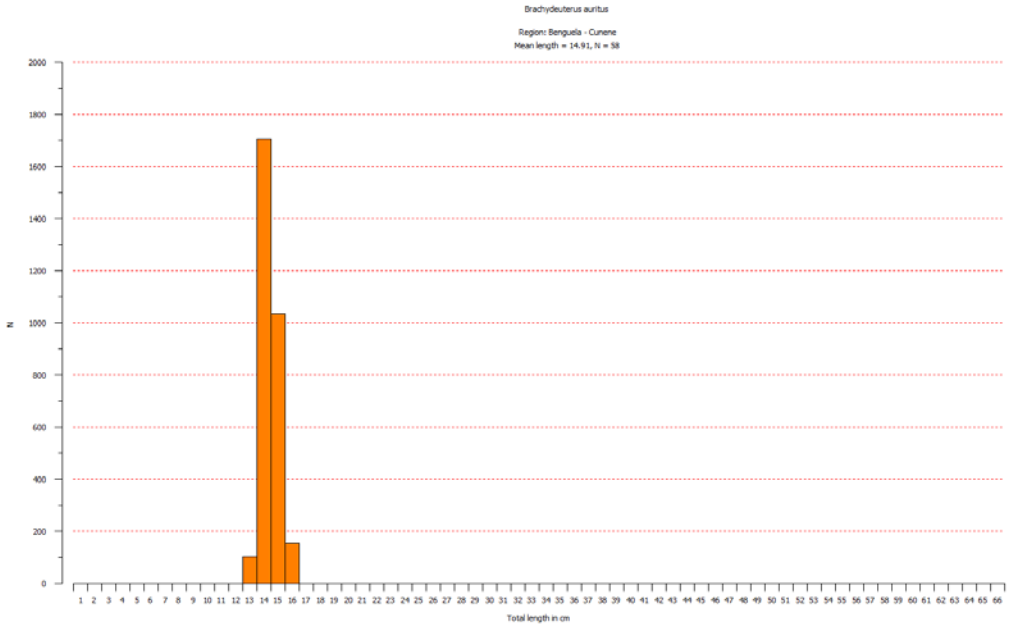

Engraulis encrasicolus
Region: Benguela - Cunene
Mean length = 10.71, N = 994
N
Total length in cm

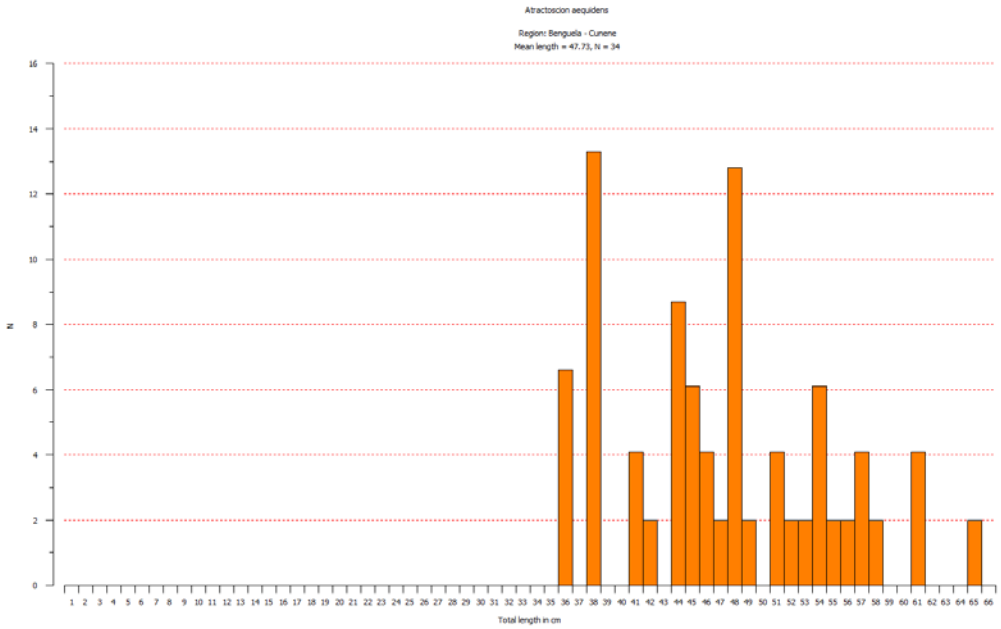

Dentex macrophthalmus
Region: Benguela - Cunene
Mean length = 17.03, N = 192
N
Total length in cm

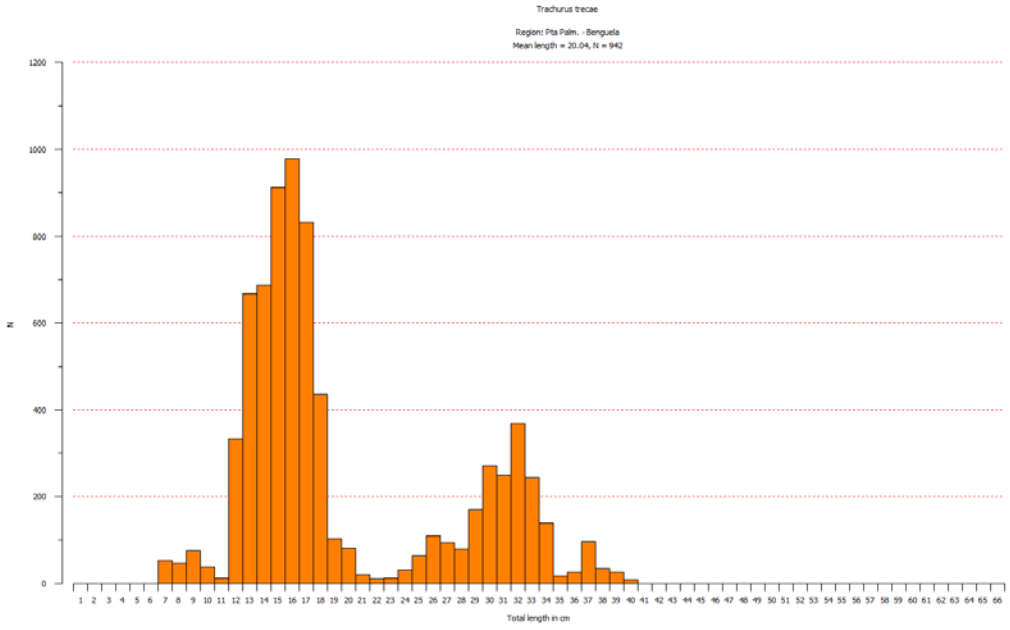

Dentex barnardi
Region: Benguela - Cunene
Mean length = 26.51, N = 23
N
Total length in cm

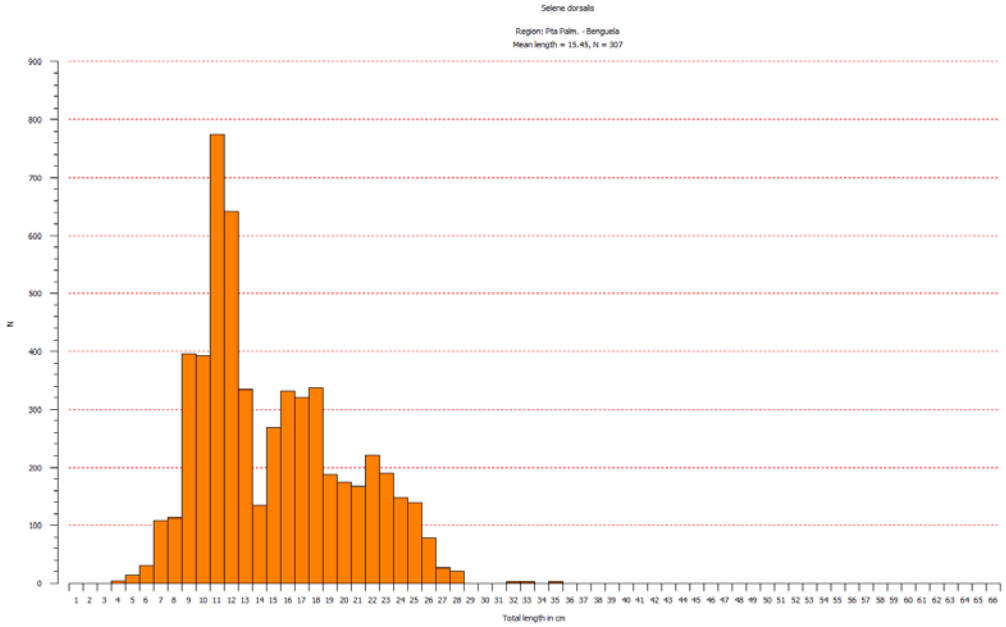

Dentex angolensis
Region: Benguela - Cunene
Mean length = 30.39, N = 9
N
Total length in cm

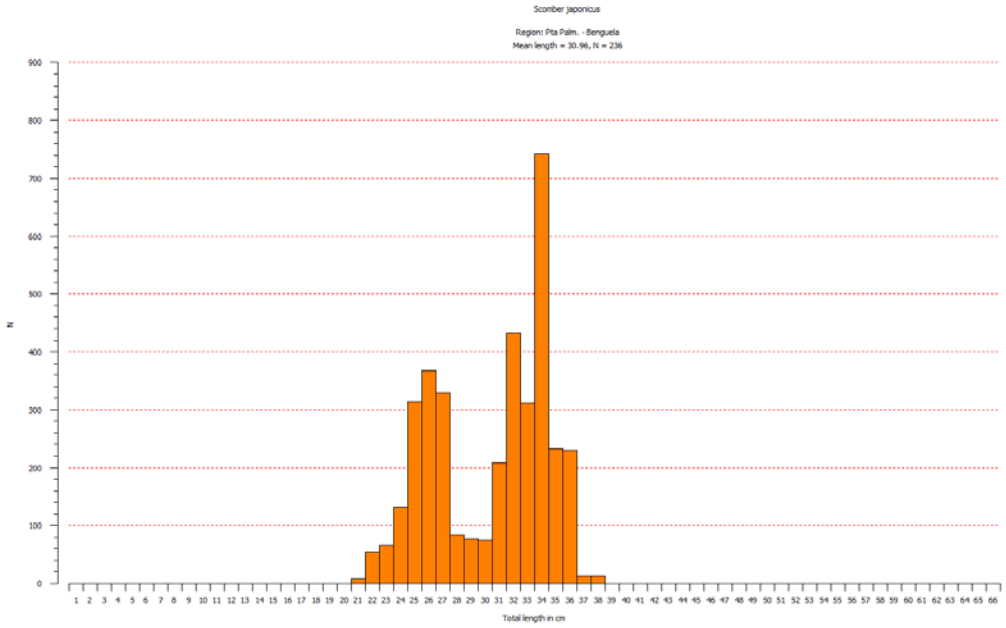

Chloroscombrus chrysurus
Region: Benguela - Cunene
Mean length = 27.25, N = 4
N
Total length in cm

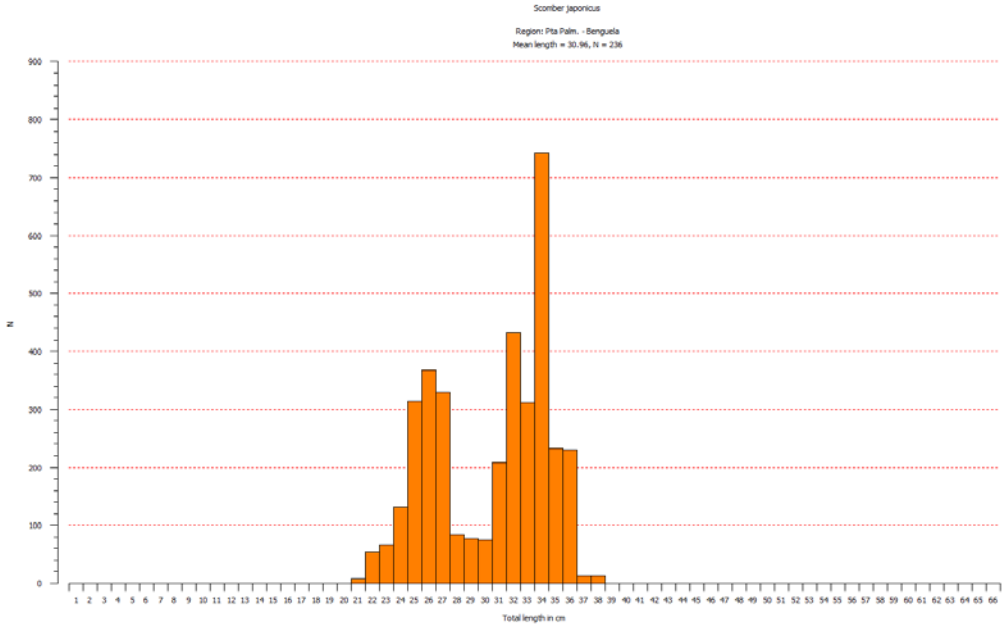

Brachydeuterus auritus
Region: Benguela - Cunene
Mean length = 14.91, N = 58
N
Total length in cm

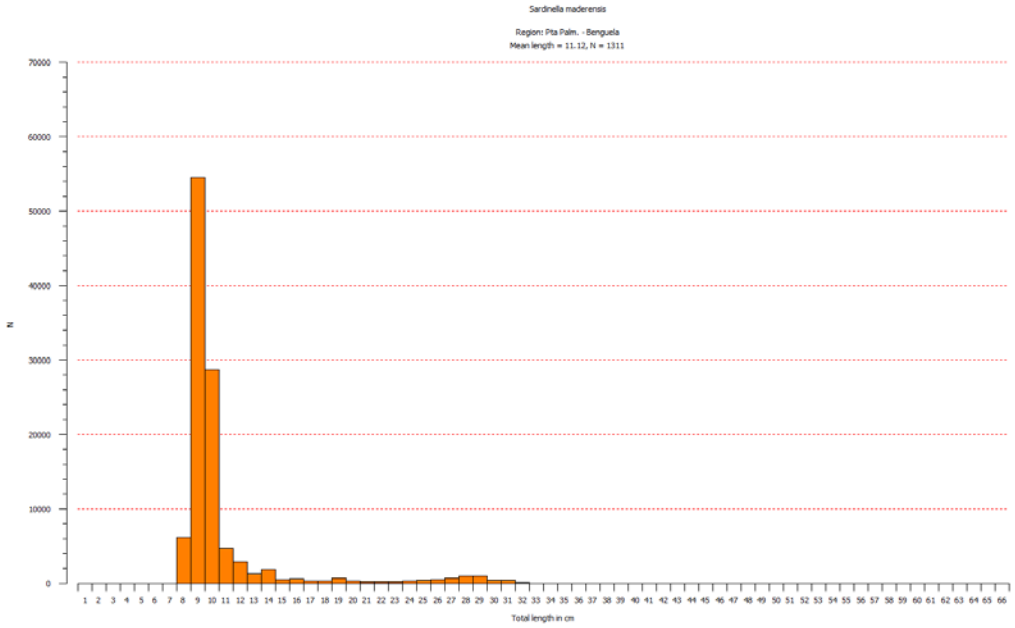

Atractoscion aequidens
Region: Benguela - Cunene
Mean length = 47.73, N = 34
N
Total length in cm

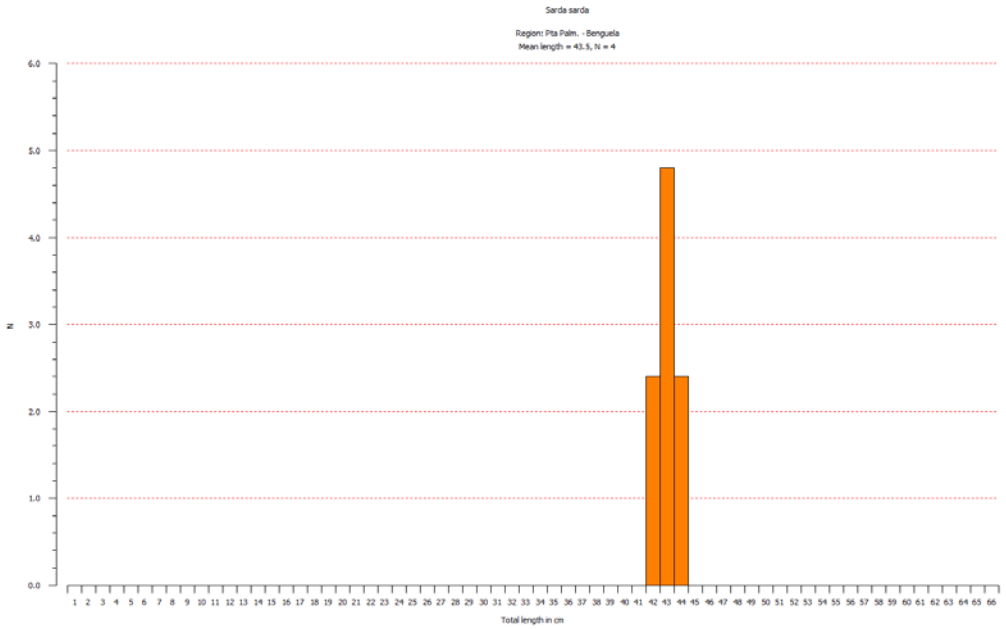

Trachurus trecae
Region: Pta Palm. - Benguela
Mean length = 20.04, N = 942
N
Total length in cm

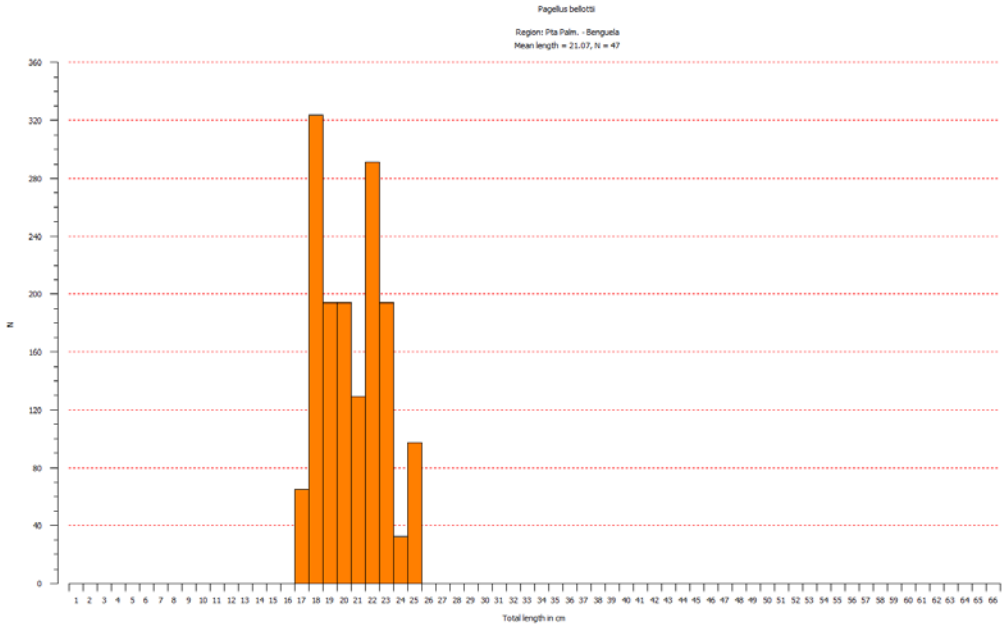

Selene dorsalis
Region: Pta Palm. - Benguela
Mean length = 15.45, N = 307
N
Total length in cm

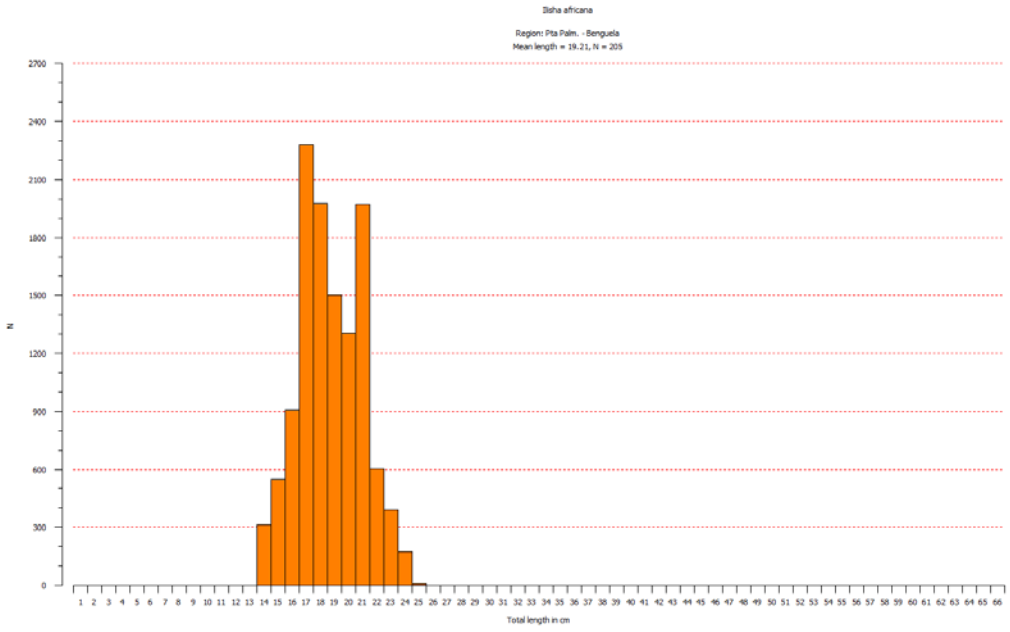

Scomber japonicus
Region: Pta Palm. - Benguela
Mean length = 30.96, N = 236
N
Total length in cm

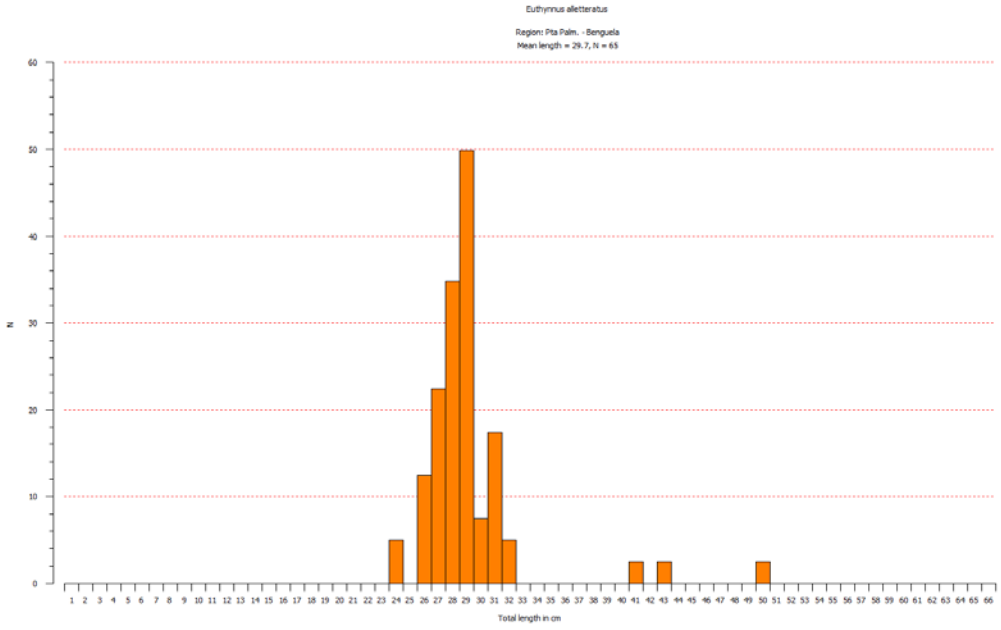

Scomber japonicus
Region: Pta Palm. - Benguela
Mean length = 30.96, N = 236
N
Total length in cm

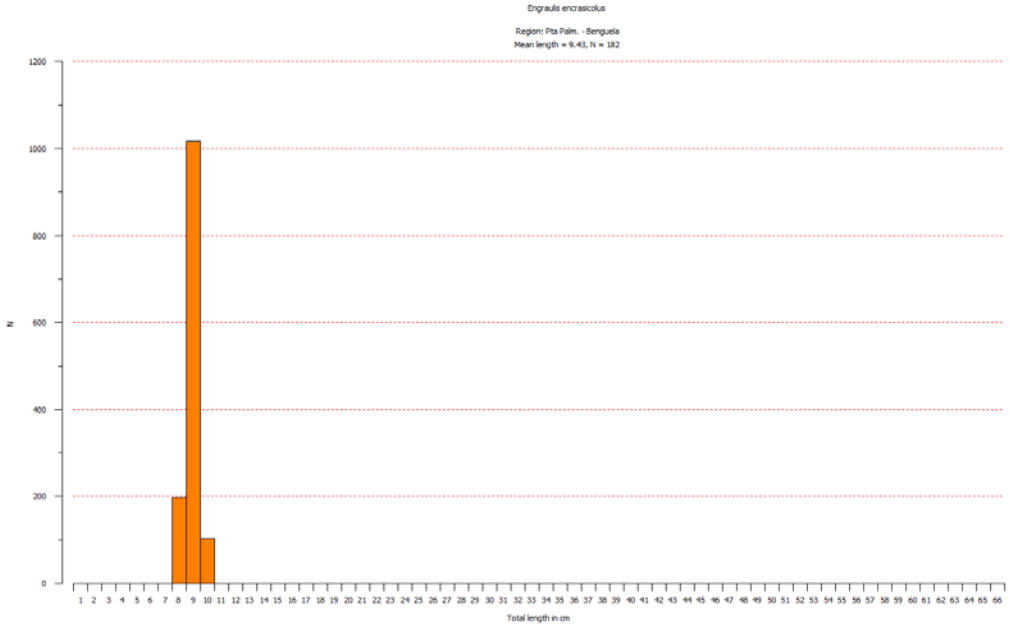

Sardinella maderensis
Region: Pta Palm. - Benguela
Mean length = 11.12, N = 1311
N
Total length in cm

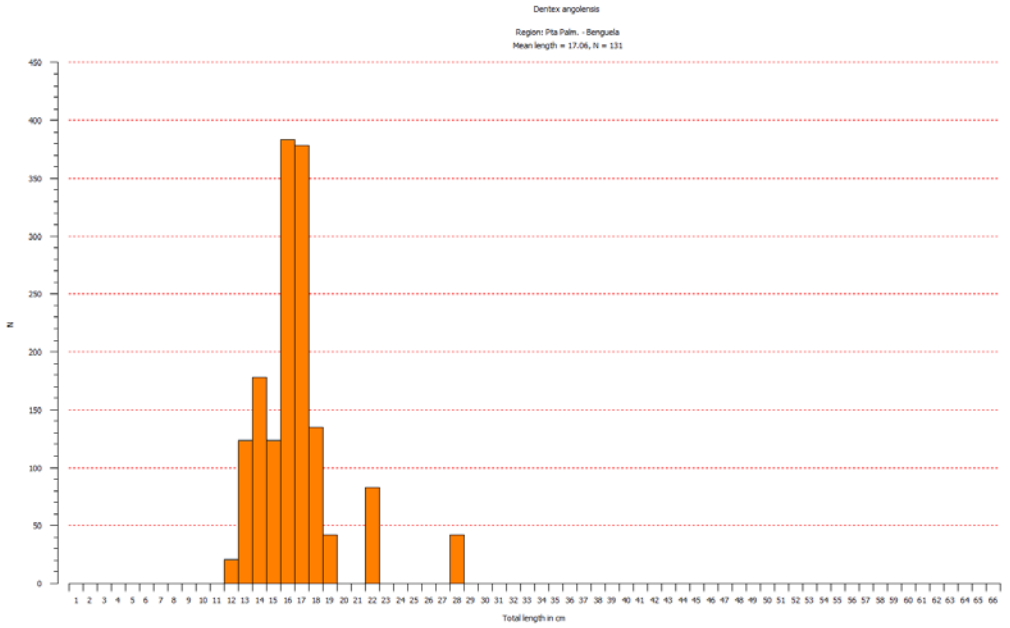

Sarda sarda
Region: Pta Palm. - Benguela
Mean length = 43.5, N = 4
N
Total length in cm

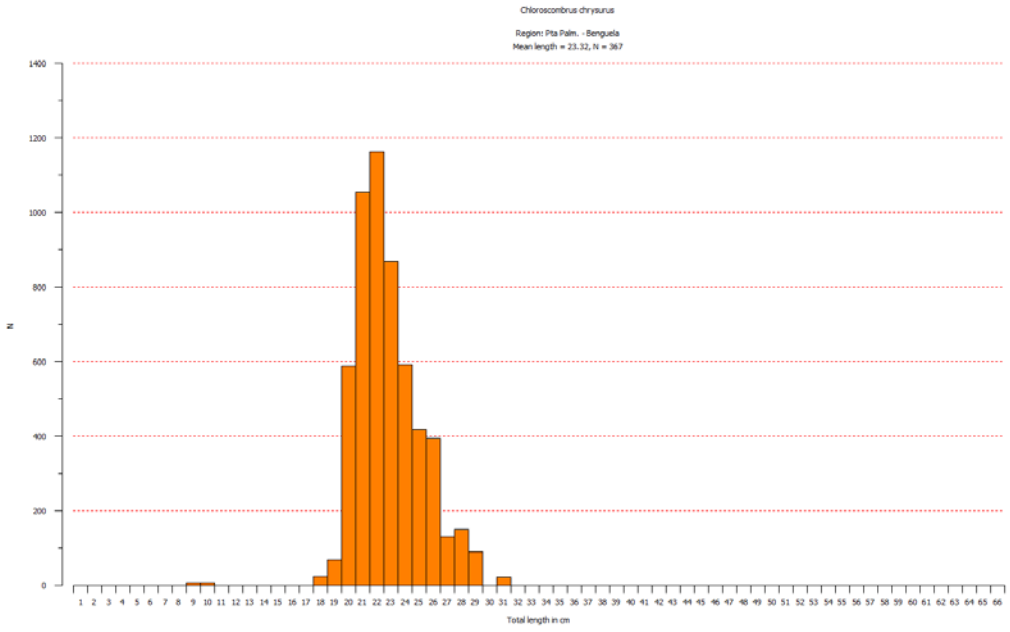

Pagellus bellottii
Region: Pta Palm. - Benguela
Mean length = 21.07, N = 47
N
Total length in cm

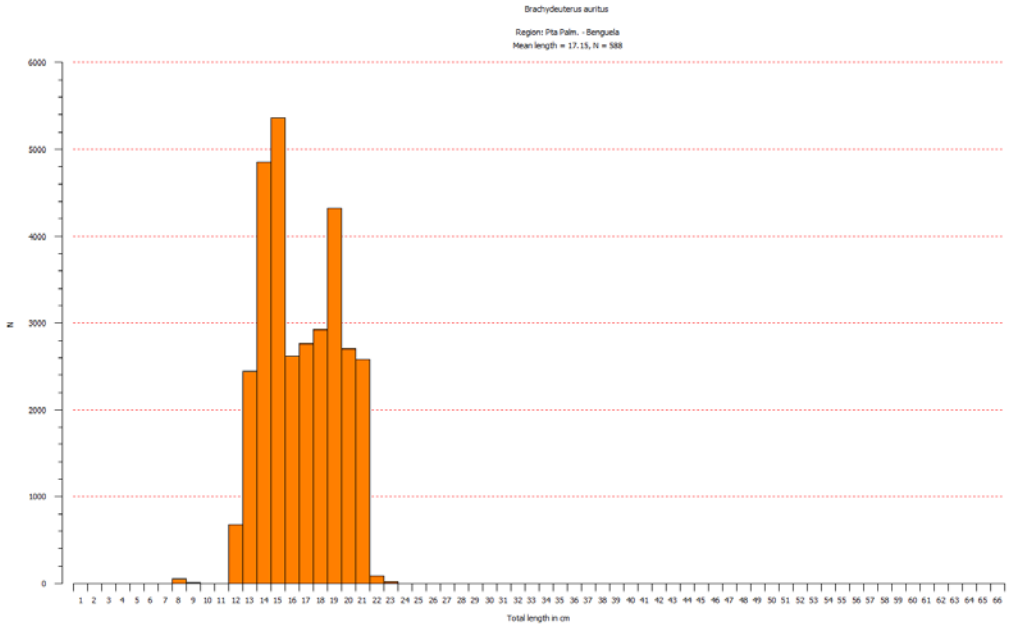

Ilisha africana
Region: Pta Palm. - Benguela
Mean length = 19.21, N = 205
N
Total length in cm

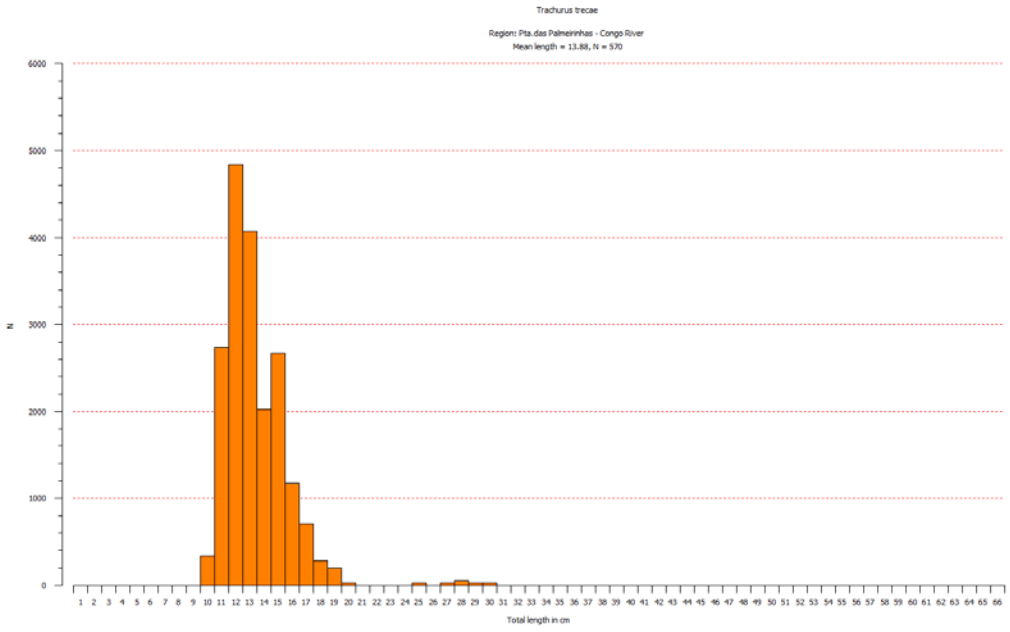

Euthynnus alletteratus
Region: Pta Palm. - Benguela
Mean length = 29.7, N = 65
N
Total length in cm

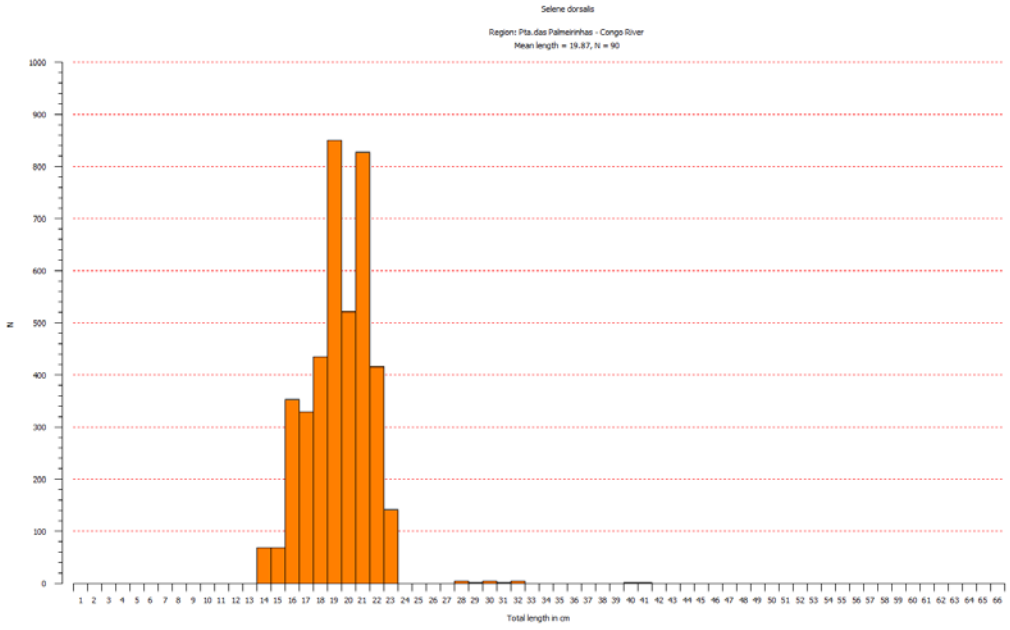

Engraulis encrasicolus
Region: Pta Palm. - Benguela
Mean length = 9.43, N = 182
N
Total length in cm

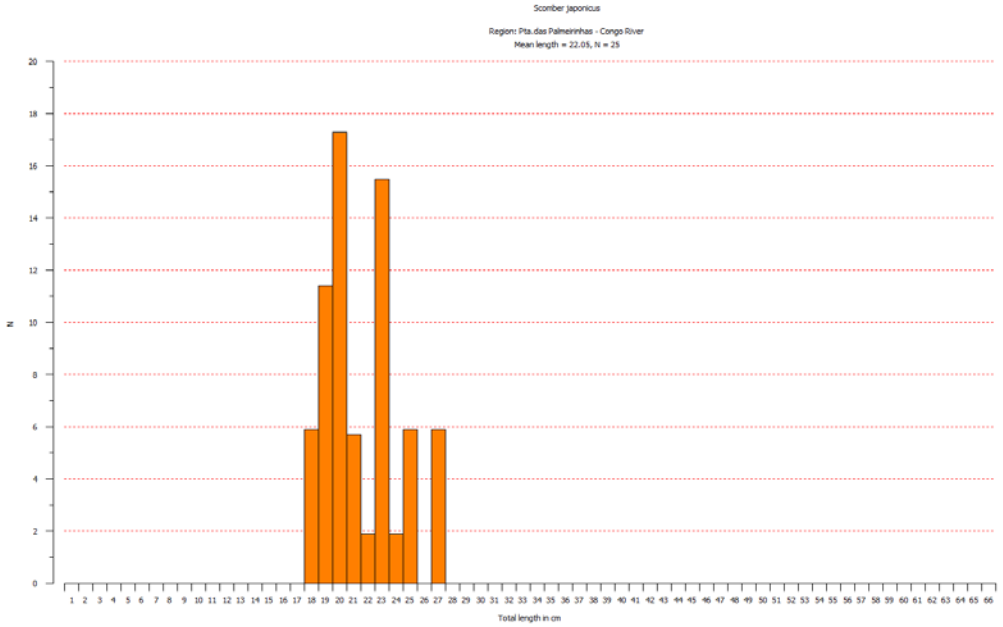

Dentex angolensis
Region: Pta Palm. - Benguela
Mean length = 17.06, N = 131
N
Total length in cm

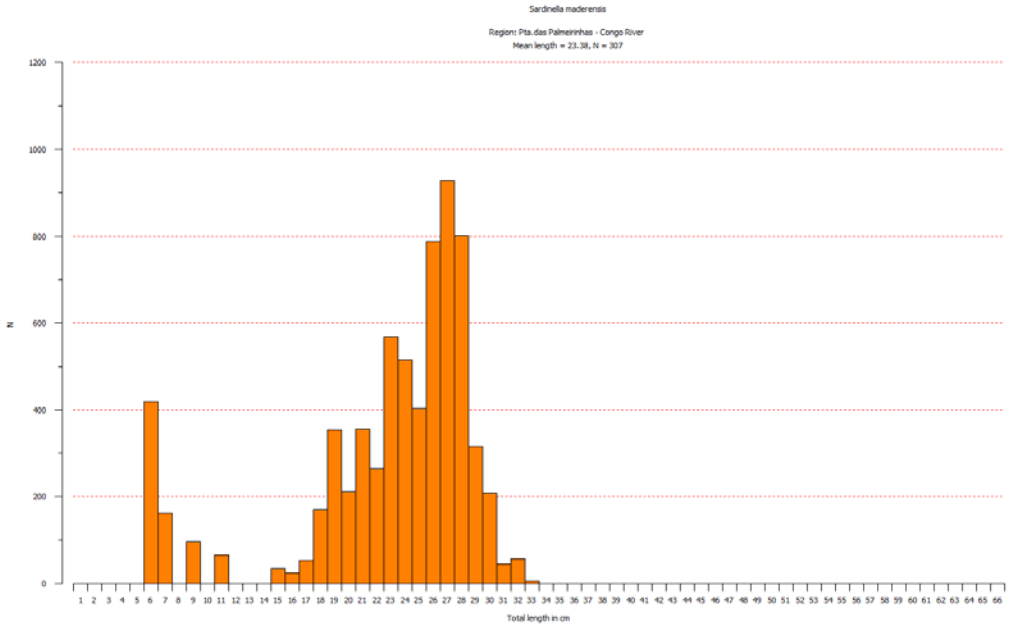

Chloroscombrus chrysurus
Region: Pta Palm. - Benguela
Mean length = 23.32, N = 367
N
Total length in cm

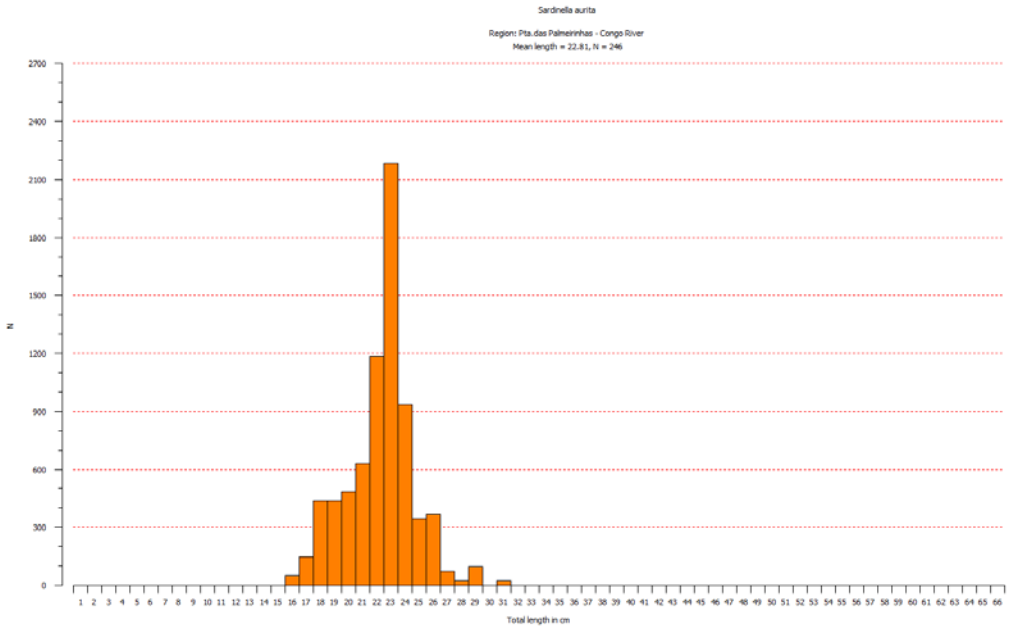

Brachydeuterus auritus
Region: Pta Palm. - Benguela
Mean length = 17.15, N = 588
N
Total length in cm

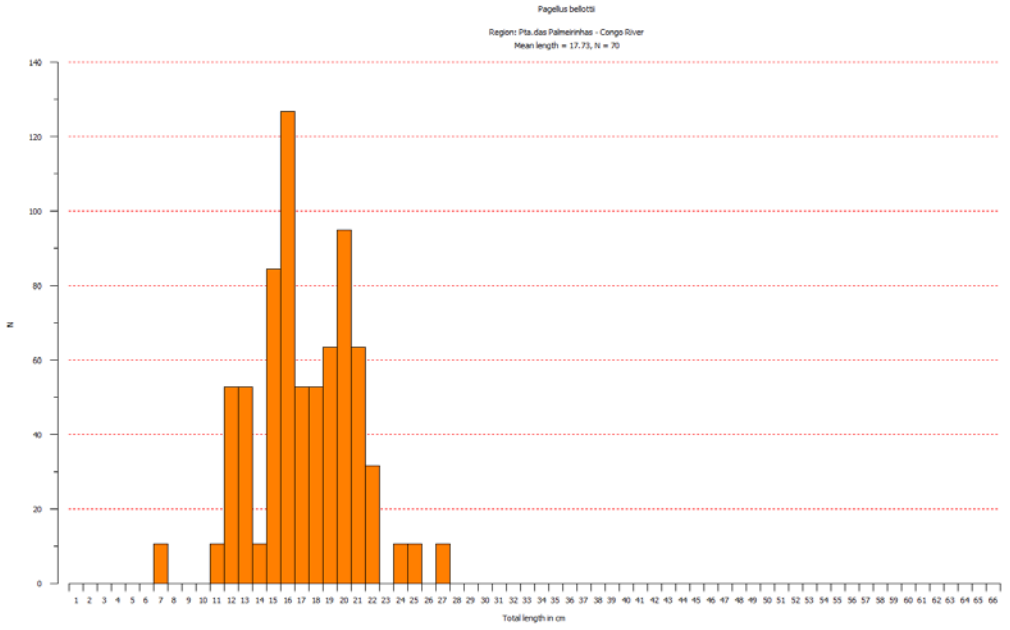

Trachurus trecae
Region: Pta.das Palmeirinhas - Congo River
Mean length = 13.88, N = 970
N
Total length in cm

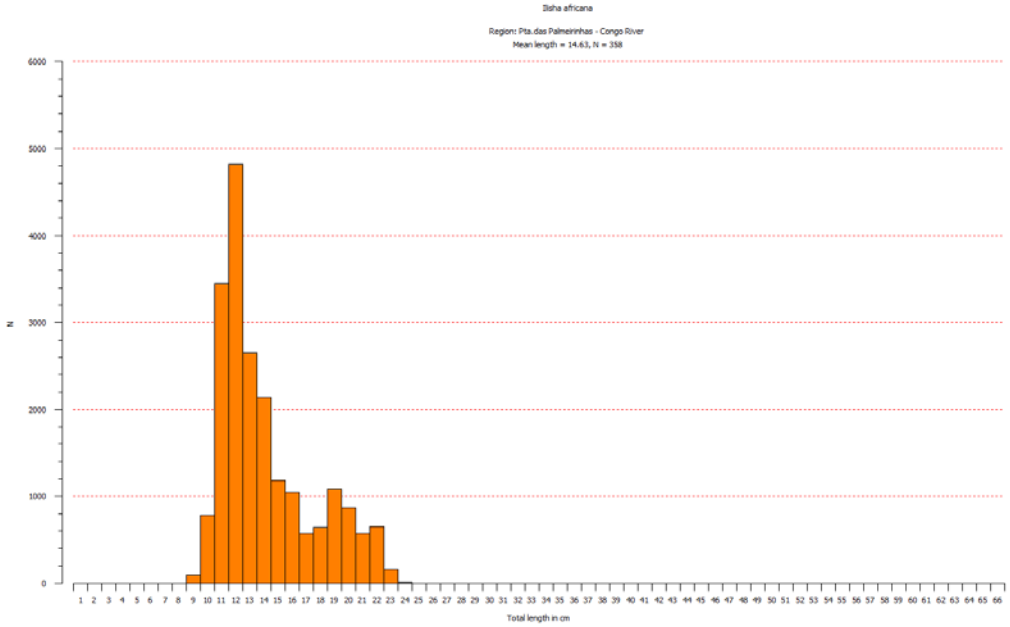

Selene dorsalis
Region: Pta.das Palmeirinhas - Congo River
Mean length = 19.87, N = 90
N
Total length in cm

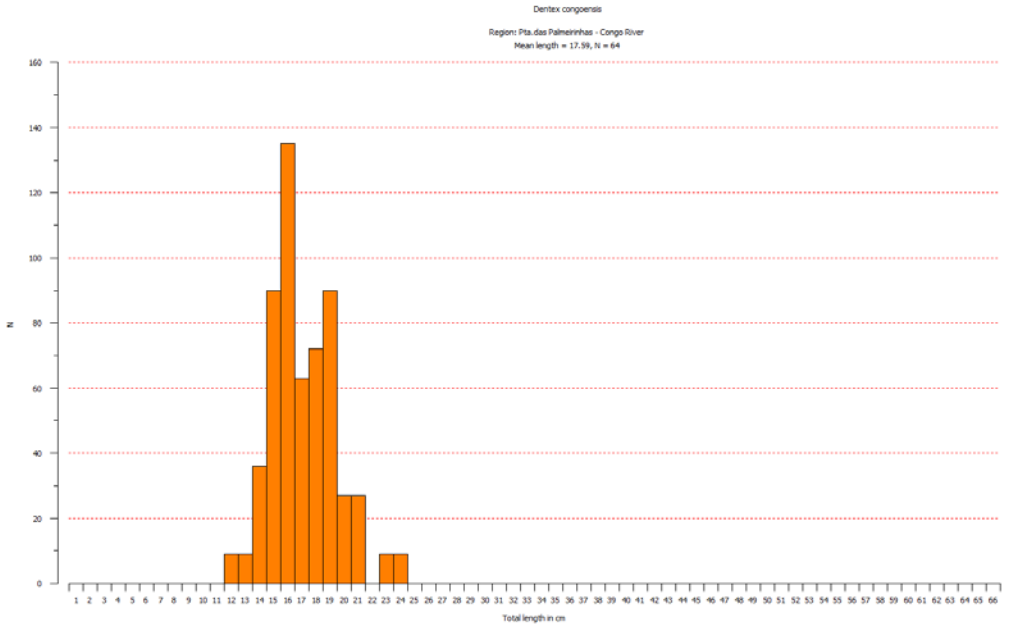

Scomber japonicus
Region: Pta.das Palmeirinhas - Congo River
Mean length = 22.05, N = 25
N
Total length in cm

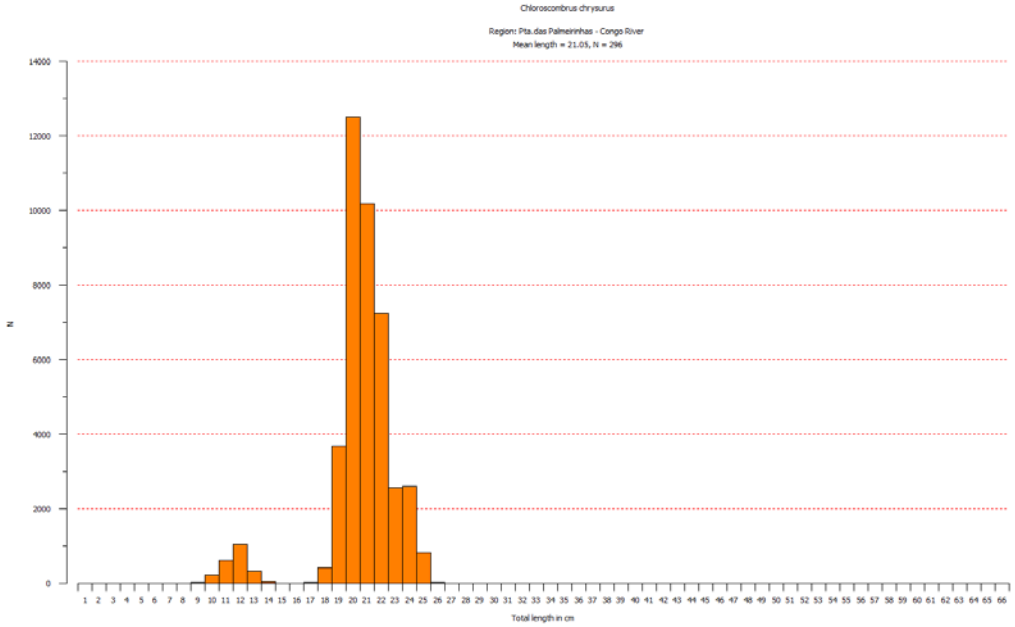

Sardinella maderensis
Region: Pta.das Palmeirinhas - Congo River
Mean length = 23.38, N = 307
N
Total length in cm

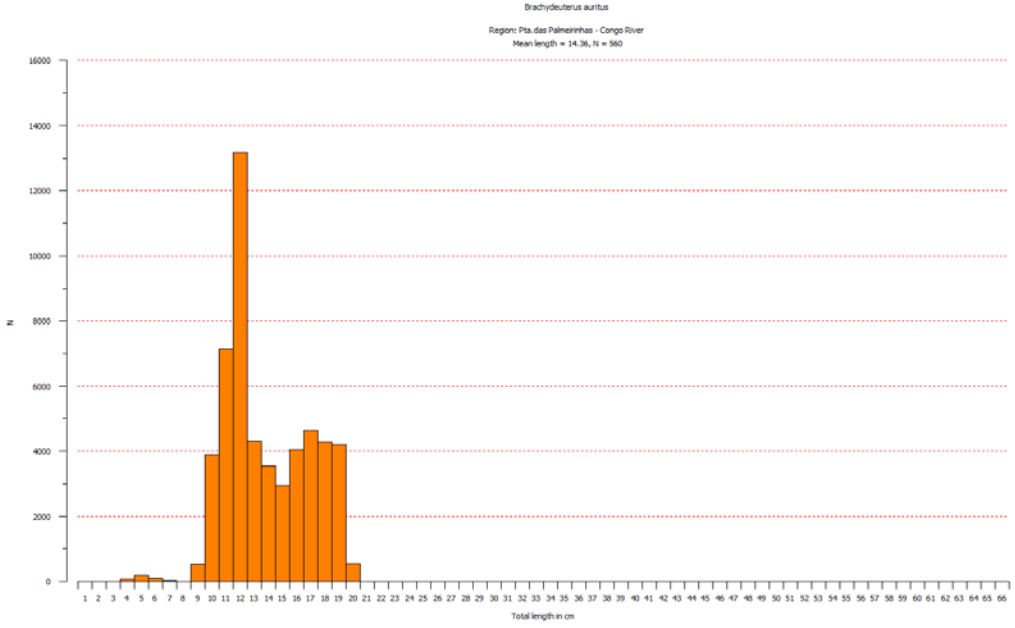

Sardinella aurita
Region: Pta.das Palmeirinhas - Congo River
Mean length = 22.81, N = 246
N
Total length in cm


Pagellus bellottii
Region: Pta.das Palmeirinhas - Congo River
Mean length = 17.73, N = 70
N
Total length in cm


Ilisha africana
Region: Pta.das Palmeirinhas - Congo River
Mean length = 14.63, N = 358
N
Total length in cm


Dentex congoensis
Region: Pta.das Palmeirinhas - Congo River
Mean length = 17.59, N = 64
N
Total length in cm


Chloroscombrus chrysurus
Region: Pta.das Palmeirinhas - Congo River
Mean length = 21.05, N = 296
N
Total length in cm


Brachydeuterus auritus
Region: Pta.das Palmeirinhas - Congo River
Mean length = 14.36, N = 560
N
Total length in cm

ANNEX III M**aturity stages for horse mackerel and sardinella**

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

ANNEX IV Allocation of acoustic densities to species groups.

Note that for the groups sardinella, horse mackerel, big-eye grunt and pilchard all encountered species are listed, while only examples are listed for the remaining groups.

Group	Taxon	Species
Sardinella	*Sardinella* sp.	*S. aurita*
		S. maderensis
Horse mackerel	*Trachurus* sp.	*T. trecae*
		T. trachurus capensis
Pilchard	Sardinops	*S. ocellatus*
Big-eye grunt		*Brachydeuterus auritus*
Pelagic species 1	Clupeiformes[1]	*Ilisha africana*
		Etrumeus whiteheadi
		Engraulis encrasicolus
Pelagic species 2	Carangidae[2]	*Selene dorsalis*
		Chloroscombrus chrysurus
		Decapterus rhonchus
		Seriola carpenteri
	Scombridae	*Auxis thazard*
		Sarda sarda
		Scomber japonicus
	Sphyraenidae	*Sphyraena guachancho*
	Others	*Trichiurus lepturus*
		Lepidopus caudatus
Other demersal species	Sparidae[3]	*Dentex angolensis*
		D. macrophthalmus
		D. congoensis
		D. canariensis
		D. barnardi
		Pagellus bellottii
		Sparus caeruleostictus
		S. pagrus africanus
	Other taxii	*Saurida brasiliensis*
		Arioma bondi
		Pomadasys incisus
		Galeoides decadactylus
Mesopelagic species	$Myctophidae_3$	*Diaphus dumerili*
	Other mesopelagic fish	*Trachinocephalus myops*
Plankton	Calanoidae	*Calanus* sp**.**
	Euphausiidae	*Meganyctiphanes sp.*
	Other plankton	

[1] other than *Sardinops* sp.; [2] other than *Trachurus* sp.; [3] main taxon in group.

Annex V Biomass of Sardinella and Cunene horse mackerel 1985-2014

Year	Season	Dates	Survey number	South **Cunene-Benguela**	Central **Palmerinhas-Benguela**	North **Cabinda-Palmerinhas**	Total **Cunene-Cabinda**
1985	Summer	28.01-26.02	1	25	20	80	125
	Winter	08.08-10.09	3	0	70	190	260
-86	Summer	22.01-10.03	1	10	140	110	260
-89	Summer	13.02-16.03	1	40	200	60	300
-91	Winter	06.08-18.09	2	?	68	154	
-92	Winter	05.08-22.09	1	?	119	161	
-94	Winter	02.08-17.08	ANG2	**	245	290	
-95	Summer	28.02-02.04	ANG1	**	140	24	
	Winter	10.08-20.09	ANG4	?	277	297	
-96	Winter	16.07-06.09	ANG2	0	130	233	363
-97	Summer	22.02-20.03	ANG1	0	195	300	495
-98	Winter	07.05-22.05	ANG3	0	233	159	392
-99	Winter	02.08-26.08	ANG2	0	228	135	363
-00	Winter	28.07-20.07	ANG2	0	179	174	353
-01	Winter	20.07-17.08	ANG2	0	257	177	434
-02	Winter	17.08-16.09	ANG2	0	165	187	352
-03	Winter	20.07-19.08	ANG2	2	277	153	432
-04	Winter	28.07-27.08	ANG2	0	175	187	362
-05	Winter	16.07-24.08	2005408	0	148	95	243
-06	Winter	21.07-21.08	2006408	20	244	366	630
-07	Winter	07.07-10.08	2007406	55	483	187	725
-08	Winter	15.05-02.07	2008404	56	264	186	506
-09	Winter	23.05-04.07	2009406	92	232	206	530
-10	Winter	18.06-11.08	2010406	43	293	93	429
-11	Summer	20.02-20.03	2011402	96	68	96	260
-11	Winter	18.07-16.08	2011408	0	181	71	252
-12	Summer	01.03-30.03	2012402	353	230	156	739
-12	Winter	26.08-06.10	2012405	325	584	210	1119
-13	Summer	16.02-17.03	2013402	226	222	117	565
-13	Winter	20.06-17.07	2013406	10	295	117	422
-14	Summer	04.02-03.03	2014401	31	247	85	363
	Average 06-14			109	279	157	545
	Average summer 2011-14			177	192	113	482
	Average winter 2010-14			95	338	123	556

1 Data error (Southern Region)
2 Southern Region not surveyed
3 Cabinda not surveyed

Cunene Horse Mackerel biomass (1 000 tons) estimated from acoustic indexes from surveys from 1985-2011.

Year	Season	Dates	Survey number	South Cunene-Benguela	Central Palmerinhas-Benguela	North Cabinda-Palmerinhas	Total Cunene-Cabinda	Remarks	x y R^2=0.683
1985	Summer	28.01-26.02	1	30	195	40	265		1
	Winter	08.08-10.09	3	50	90	40	180		2
-86	Summer	22.01-10.03	1	130	125	20	275		3
-89	Summer	13.02-16.03	1	35	55	40	130		4
-91	Winter	06.08-18.09	2	100	70	30	200		5
-92	Winter	05.08-22.09	1	98	86	80	280		6
-94	Winter	02.08-17.08	ANG2	**	130	120			7
-95	Summer	28.02-02.04	ANG1	**	?	84			8
	Winter	10.08-20.09	ANG4	70	160	110	340	Dates from logdata	9
-96	Winter	16.07-06.09	ANG2	140	157	63	360	Dates from logdata	10
-97	Summer	02.03-28.03	ANG1	163	58	18	239		11
-98	Winter	07.05-22.05	ANG3	118	112	37	267		12
-99	Winter	02.08-26.08	ANG2	124	129	68	321		13
-00	Winter	28.07-20.07	ANG2	92	178	63	333		14
-01	Winter	20.07-17.08	ANG2	64	22	3	89		15
-02	Winter	17.08-16.09	ANG2	118	13	31	162		16
-03	Winter	20.07-19.08	ANG2	120	34	12	166		17
-04	Winter	28.07-27.08	ANG2	32	107	90	229		18
-05	Winter	16.07-24.08	2005408	102	57	21	180		19
-06	Winter	21.07-21.08	2006408	45	77	31	153		20
-07	Winter	07.07-10.08	2007406	73	57	27	157		21
-08	Winter	15.05-02.07	2008404	29	40	0	69		22
-09	Winter	23.05-04.07	2009406	76	7	0	83		23
-10	Winter	18/06/2011	2010406	100	15	21	136		24
-11	Summer	20.02-20.03	2011402	55	13	0	68		25
-11	Winter	18.07-16.07	2011408	74	26	17	117		26
-12	Summer	01.03-30.03	2012402	162	135	30	327		27
-12	Winter	26.08-06.10	2012405	132	67	11	210		28
-13	Summer	16.02-17.03	2013402	60	62	15	137		29
-13	Winter	20.06-17.07	2013406	88	117	52	257		
-14	Summer	04.02-03.03	2014401	208	77	11	295		
	Average 06-12			92	58	18	167		
	Average summer 2011-13			121	72	14	207		
	Average winter 2010-12			99	56	25	180		

1 Data error (Central and Northern Regions)

2 Southern region not surveyed

3 Cabinda not surveyed

4 Fish density too low to estimate abundance (Northern Region)

5 Estimates reported together with previous report

ANNEX VI Instruments and fishing gear used

The Simrad ER-60/18, 38, and 120 kHz scientific sounder was run during the survey for fish observation and bottom conditions. Standard sphere calibrations were carried out in Kyunn Phi Lar, Myanmar, 14.12.2013 using 64 and 60 mm diameter copper spheres and 38.1 mm tungsten carbide sphere for 18, 38, 120 and 200kHz, respectively. The details of the settings of the 38 kHz echo sounder where as follows:

Transceiver-2 menu (38 kHz)

Transducer depth	5.50 m
Absorption coefficient (variable with conditions)	9.5 dB/km
Pulse length	medium (1,024ms)
Bandwidth	2.43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
Gain	26.13 dB
SA correction	-0.71 dB
Angle sensitivity	21.9
3 dB beam width	6.75º along ship 6.95º athwart ship
Along ship offset	0.11º
Athwart ship offset	0.05º

Bottom detection menu

Minimum level	-45 dB

Fishing gear

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

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm mesh size in the cod end with an inner net of 10 mm mesh size. The trawl height was about 4.5 m and distance between wings during towing about 21 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. New doors are 'Thyborøn' combi type, 7.41 m^2, 1720 kg. These have been in use onboard since 19.02.08.

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

ANNEX VII Seabirds and Marine Mammals distribution and patterns of abundance

AIMS

1. Make an inventory of seabird and marine mammal species present in the survey area in the summer season
2. Estimate relative density of the different seabird species along the transect lines
3. Analyze patterns of distribution and abundance in relation to oceanographic features and fish distribution
4. Record additional visual information on surface oceanographic features (slicks, water discoloration, flotsam lines) and fish (presence of pelagic sharks, surface aggregations of pelagic fish).

METHODS

Counts of seabird were made during daylight hours from the top-deck of the vessel, which offers excellent viewing conditions.

When possible, standard “10 minute counts” of the birds present around the vessel were affected while the vessel was steaming at constant speed and heading. During the count period, all bird detected were counted, discriminating between birds seen actively following the vessel (within an arc of 60º aft), birds flying and birds sitting or feeding. During the counts, scans binoculars were effected at least once every two minutes to detect inconspicuous species. Care was taken to count individual birds only once particularly for species prone to follow or circle the vessel and not to conduct 10 minute counts soon after a station or a trawl which have attracted birds to the vessel. This method was chosen in order to record all species seen including the scarce and rare species. The results of this method give a species specific index of abundance rather than absolute densities.

Additional “incidental observations” were made, between counts when scarce or unusual species were observed and while the vessel was on station or during trawling when standardized quantification of abundance was not possible. The time and duration of each observation and count was recorded with watch. Additional information on the age classes of some species was noted (albatrosses, gulls, cormorants and storm-petrels).

Sightings of Cape fur seals were recorded following the same format. Each cetacean sighting was recorded in a way similar to the "incidental sightings" of uncommon bird species above. A measure of effort was obtained by recording the periods of continuous observations (and relating them to the vessel route) to be modified by estimated sea state and visibility.

Fish schools visible at the surface were recorded following an estimated relative four-point scale: small (a few to 100 m2), medium (between 100 and 250 m2) large (between 250 and 500 m2) and very large (>500m2). Pelagic shark sighting were also recorded. Additional visual information as flotsam lines, slicks, water discoloration etc, was also logged in the same format as well as photographically documented.

RESULTS

A total of 298 "10 minutes counts" were affected between 4 February and 5 March. In addition, 138 incidental observations were logged, including 14 during Multinet sampling, 20 during CTD stations, and 16 during trawling.

Species accounts

The list species and numbers identified during the survey are given in the Table 1 for birds and seals.

Table 1. Seabird species and numbers of individuals identified during observation periods and in total (including incidental sightings). In the 10 minutes count periods (N=298) and Cape fur seal numbers are also given. Several tens of thousands of Cape cormorant roosting and feeding in Baia dos Tigres excluded.

Family	Species	Adult	Immature
Cheloniidae	*Lepidochelis olivacea*	10	1
Lariidae	*Larus dominicanus*	767	205
Oceanitiidae	*Oceanites oceanicus*	5	697
Octariidae	*Arctocephalus pusillus pusillus*	573	6
Pelicaniidae	*Pelecanus onocrotalus*	81	
Phalacrocoracidae	*Phalacrocorax africanus*	8	
	Phalacrocorax capensis	1086	
Procellariidae	*Diomedea chlororhynchos*	196	
	Diomedea melanophris	56	
	Diomedia chrysostoma	72	
	Procellaria aequinoctialis	110	
	Puffinus gravis	100	
	Puffinus griseus	9	
	Puffinus puffinus	153	
Stercorariidae	*Catharacta antarctica*	3	
	Stercorarious longicaudus	24	

	Stercorarious parasiticus	17	
	Stercorarious pomarinus	7	
	Stercorarious sp	6	
	Catharacta antarctica	1	
Sterniidae	*Sterna hirundo*	55	
	Sterna maxima	359	
	Sterna paradisea	6	
Suliidae	*Morus capensis*	2	
Geral		3706	909

***Diomedeidae*, Albatrosses:**

Three species of albatrosses were encountered, all migrants from the southern ocean. The Atlantic Yellow-nosed albatross *Thalassarche chlororhynchos,* Black-browed albatross *Thalassarche Melanophris* and Grey-headed albatross *Thalassarche chrysostoma* breeds at Gough Island and Tristan da Cunha group. They all were absent in the north of the Latitude 16º 30´S, during the survey. In this season, most individuals seen at close range were immature and juvenile birds,but the proportion of adults were smaller. Latitude 16º 30´S, probably constitutes the northernmost limit of the normal summer range of these species.

***Procellariidae*, Petrls and Shearwaters:**

Four species of this group sighted during the survey, the Manx shearwater (*Puffinus puffinus*) is a northern hemispher migrant; the Great shearwater (*Puffinus gravis*) is endemic to the Tristan and Gough group of Islands in the south Atlantic. The Sooty shearwater (*Puffinus griseus*) is migrant from the sub-Antarctic region of southern ocean.

13 sightings (of single and group birds) were made of the Manx shearwater (*P. puffinus*) between12º10´S and 10º 59´S. The other sightings were made at the north of 10ºS.

9 sightings of Great shearwater (*P.gravis*). The sightings were of single birds from north 12ºS until 9ºS.

The Sooty shearwater (*Puffinus griseus*), migrant from the sub-Antarctic. The sighting was of a single birds at north of 11ºS and other sightings at south 9ºS.

The White-chinned petrel (*Procellaria aequinoctialis*) only 110 records were made at north of 17ºS.

***Oceanitidae*, Storm-petrels:**

The Wilson´s storm petrel (*Oceanites oceanicus*) a migrant from the southern ocean. This species, most individuals seen were immature birds in present season. They were widespread and abundant but marked variations in densities. It was most abundant between 12ºS and south of 9ºS. This species is mainly a zooplankton surface-feeder and its association with

frontal zones a surface slicks is an indication of areas of zooplankton concentration at the surface.

***Sulidae,* Gannet:**

The Cape gannet (*Morus capensis*), proved to be the most abundant and widespread seabird during the survey, was seen only twice, one at 16ºS and other at north of 12ºS.

***Phalacrocoracidae,* Cormorants:**

Only two species were recorded during the survey, and only in coastal waters. The Cape cormorant (*Phalacrocorax capensis*) , an endemic species from the Benguela Current region. was observed only in the south (from about 16ºS) and becoming abundant around Baia dos Tigres. This species breeds and roosts in large number at Baia dos Tigres and feeding aggregations counting tens of thousand birds were observed in the bay as during previous years. Others two species of Cormorant are *Phalacrocorax lucidus* is suspected to breed at several locations in the southern region from Baia dos Tigres to 13º15´S without observetion, and another species is the Red cormorant, (*Phalacrocorax africanus,* more associated with fresh inland waters, was observed and recorded in Luanda bay.

***Pelicanidae*; Pelicans:**

Several birds were seen onshore on the southeastern part of the Island at Baia dos Tigres where this species probably breeds there. In the present survey, the Great-white pelican (*Pelicanus onocrotalus*) were sighting in Baia dos Tigres in groups and in Benguela, since Baia Farta until north of Lobito. During the previous surveys the species has been seen in the same areas as well as off several estuaries.

***Stercorariidae*, Skuas and Jaegers:**

Three species of Jaegers (*Stercorarius*) were recorded in extremely low numbers, the Pomarine jaeger (*Stercorarius pomarinus*), the Arctic jaeger (*Stercorarius parasiticus*) and (*Stercorarius longicaudus*), with 9, 12 and 5 records of single individuals respectively.All three species have been recorded in previous surveys and the low number of observations during the present survey is probably due the seasonality of migration of these northern hemisphere migrants. The Subantarctic skua, *Catharacta Antarctica* on the other hand, a visitor from the southern ocean, was slightly only twice at south of 16ºS.

***Laridae*, Gulls:**

The Kelp gull (*Larus dominicanus vetula*), is an endemic subspecies from Southern Africa and the Benguela system was widespread throughout the survey area. Kelp gull were abundante particularly inshore south of 16ºS.

***Sternidae,*Terns:**

One of the five tern species recorded, are palearctic migrant (*Sterna hirundo*), throughout the area but in much lower number than in some of the previous surveys; again probably the effect of an earlier date on the abundance of palearctic migrant.

The Royal tern (*Sterna maxima*) is a tropical species breeding in West Africa and dispersing to southern Angola in summer. During the survey were scarce at 17ºS, becoming regular at 16ºS and abundant from Latitudes 12ºS to 9º 13´S.

Marine mammals:

Cape fur seal: *Arctocephalus pusilus pusilus*:

Fur seals were distributed fairly uniformly in small numbers in the intire study area but were more frequent over the Latitudes 16ºS and 15ºS. Higher densities were found south of 15ºS and particularly near Baia dos Tigres which harbours a fairly large non-breeding colony.

Cetaceans;

The summary of the cetacean sightings made during this part of the survey is given in Table 2. The sightings of Bottlenose Dolphin (*Tursiops truncatus*) confirm the presence of this species in Angolan waters. They have been observed in previous surveys, which were the first confirmed records for this area. The presence of *Tursiops truncatus* in the area of Latitudes 12º, and 11ºS, is also a confirmation that the previous sightings of this species in these regions during previous surveys. This species is probably the most common small odontocete on the area of survey.

Table 2. Summary of cetacean sightings

Species	Number	Date	Latitude	Remarks
Balaenoptera musculus	1	9.2.14	-17º05´S	
Balaenoptera sp	1	9.2.14	-17º00´S	*B sp* probable *B. edin*
Balaenoptera musculus	1	9.2.14	-16º58´S	Large baleen whale
Megaptera novaeangliae	1	12.2.14	-15º20´S	Breaching
Balaenoptera edini	1	13.2.14	-14º29´S	Large baleen whale
Balaenoptera sp	1	15.2.14	-12º12´S	Small size (sub adult)
Megaptera novaeangliae	6	16.2.14	-12º13´S	Possiibly 3 cuples
Globicephala sp	15	16.2.14	-12º13´S	Large group

Megaptera novaeangliae	1	16.2.14	-12º08´S	1 Adult
Globicephala sp	17	17.2.14	-11º45´S	Assoc. with 10 *Tursops*
Megaptera novaeangliae	1	17.2.14	-11º34´S	Breaching
Balaenoptera edini	1	18.2.14	-11º06´S	Far about 400m
Megaptera novaeangliae	1	18.2.14	-10º58´S	Medium size
Megaptera novaeangliae	1	19.2.14	-10º30´S	
Tursiops truncates	7	9.2.14	-10º30´S	One group
Megaptera novaeangliae	3	0.2.14	-10º09´S	1 Female, 1 male 1young
Balaenoptera sp	1	22.2.14	-09º10´S	
Tursiops truncates	61	22.2.14	-09º10´S	Three groups
Tursiops truncates	7	28.2.24	-07º06´S	One group

Turtles:

The turtle sightings in area of survey were regular particularly Olive Ridley (*Lepidochelis olivacea*) turtles in approximately the same area, between 12º, 11º and 10ºS.

Patterns of abundance:

On a broad scale and according to seabird and marine mammal distribution observed during this survey, coastal Angolan waters can be divided in 5 distinct zones (the latitudinal limites given below are approximate and the description of the patterns only for late summer).

a) South of 16º 00´S

South of 16º00S, where during Summer normally the avifauna changes dramatically and is marked by a large increase in density of many subantatctic species, during this survey were sighting only Yellow-nosed albatross, Black-browed albatross, Grey-headed albatross, White-chinned petrel, Cape cormorant, Kelp gull and Royal tern. The marine mammals characteristic to the Benguela upwelling region are also present.

b) 16º 00´S to 14º 30´S

This area seems to constitute a transition zone with appearance at low density of some species more common further south, in this survey only Cape cormorant was observed.

c) 14º 30´S to 12º 30´S

This area is noticeable because of the general low densities of all seabird and is characterized by

- Lowest density of the four most abundant and widespread species. In present survey only Wilson´s Storm petrel and Kelp gull were observed.

- Presence of *Balaenoptera* edeni and Turtles

- Very low abundance of Cape fur seal to 14º30´S and absence to 14ºS.

d) 12º 30´ to 9º 30´S

This area is characterized at this time of the year by:

- Presence of the Sooty shearwater *Puffinus griseus* at low densities in deep water.

- Presence of the Manx shearwater *Puffinus puffinus* and Great shearwater *Puffinus gravis* most abundant and widespread between these Latitudes.

- Presence of the Royal tern *Sterna maxima* and Common tern *Sterna hirundo* in low densities.

- Presence of *Tursiops truncatus* and *Globicephala sp.* in low densities.

- Presence of *Megaptera novaeangliae* and Bryde´s whale, *Balaenoptera edeni*.

***e)* 9º 30´ to 6º 30´S**

This area correspond the north coastal region where except Luanda area, where some species were slighting and recorded, all other part, the species were scarce.