

**SURVEY OF THE PELAGIC FISH RESOURCES OFF
NORTH WEST AFRICA**

Part I

SENEGAL - THE GAMBIA

21 - 30 October 2015

Bergen, 2015



CRUISE REPORTS 'DR FRIDTJOF NANSEN'

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by

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CHAPTER 1 INTRODUCTION

1.1 Objective of the cruise

The general objectives of the survey were to estimate biomass and map the distribution of small pelagic fish stocks off NW Africa (between southern border of Senegal and Gibraltar) period of 50 days, in October - December 2015. For Senegal and The Gambia the agreed objectives were as follows:

- To map the distribution and estimate the biomass for the main small pelagic fish using hydro-acoustic methods. The species of interest were: sardinellas (*Sardinella aurita*) and (*Sardinella maderensis*), horse mackerel (*T. trecae*), false scad (*Decapterus rhonchus*), and anchovy (*Engraulis encrasicolus*).
- To identify and describe the size distribution of the target fish populations by midwater and bottom trawl sampling and process the catches by recording weight and number by species.
- Collect biological data and otoliths of the main target species, especially *Sardinella aurita*, *S. maderensis* and *T. trecae*.
- To sample standard hydrographical transects for temperature, salinity and oxygen at every degree latitude, at about 12°40'N, 13°40'N, 14°50'N and at 15°50'N.
- To train local participants in acoustic survey methodology including fish identification and sampling, scrutinizing of echograms, hydrographic sampling and abundance estimation.
- To do a comparison of acoustic performance by an intercalibration between the Senegalese R.V. "Itaf Deme" and R.V "Dr. Fridtjof Nansen".

The time allocated for this part of the survey, off Senegal and The Gambia, was 9 days.

1.2 Participation

Participating scientists were:

Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), Senegal:

Abdoulaye Sarre (Senegalese team leader), Madiabel Diop, Kamarel Bâ, Khalil Bodian and Alassane Dieng

Department of Fisheries (FD), The Gambia:

Salifu Ceesay (Gambian team leader), and Baboucarr Senghore

Institut Mauritanien de Recherches Océanographiques et des Pêches (CNROP), Mauritania:

Abdel Kérim Souleimane

Esther Wairimu and Cosmas Munga, Kenya

Institute of Marine Research (IMR), Norway:

Reidar Toresen (Cruise leader), Diana Zaera, Jan Frode Wilhelmsen and Inge Nymark

1.3 Narrative

The survey started on the 21/10-2015 from Dakar. The vessel departed at 14:30 GMT (GMT=Local time) and steamed south to start the survey at the border between Guinea Bissau and Senegal (240 degree on Cape Roxo, Casamance). “Dr. Fridtjof Nansen” started the coverage at 15 00 GMT, The southern border between Senegal and the Gambia (270° at 13°03’N) was reached on the 23/10 at 16:00, while the northern border of the Gambia (270° at 13°35’5’’N) was reached on the 24/10, at 21:00. Cape Vert was reached the 26/10 at 12:30, before the regular survey ended at St Louis at the border to Mauritania on the 28/10 at 04:00. Before returning to Dakar an inter calibration exercise between “Dr Fridtjof Nansen” and “Itaf Deme” was conducted, in the area south of Cape Vert on the 29/10. The course track and fishing stations are shown in Figure 1, while Table 1 show survey effort during the survey, including number of trawl stations and CTD casts.

During all surveys in the region a common survey design has been adopted with systematic parallel course tracks spaced 10 NM (nautical miles) apart, on average perpendicular to the cost line. To cover the whole distribution area of pelagic fish, the shelf was covered from the 15 m isobath and offshore to the 500 m isobath. Trawling was done irregularly, either to

identify echo registrations or to check ‘blindly’ if fish were mixed with the plankton in the upper layers of the water column. Pelagic trawl with floats was often used to catch fish close to the surface. A smaller pelagic trawl or the bottom trawl with floats was used for sampling pelagic fish in shallow waters (depth less than 25 m).

Four Cross shelf hydrographic profiles were carried out, at Casamance, off the Gambia, at Cape Vert and at St. Louis.

All data collected during the survey were made available to the participants.

Table 1. Summary of survey effort by regions, including number of demersal (BT) and pelagic (PT) trawl hauls, CTD casts, and distance surveyed (NM), disregarding the steaming from Cape Vert to Casamance and from St. Louis to Cape Vert (NM).

	BT	PT	Total trawls	CTD casts	NM sailed
Casamance	1	3	4	7	181
The Gambia	1	7	8	9	210
The Gambia – Cape Vert	1	5	6		270
Cape Vert -St Louis	2	9	11	12	354
Total	5	24	29	28	1015

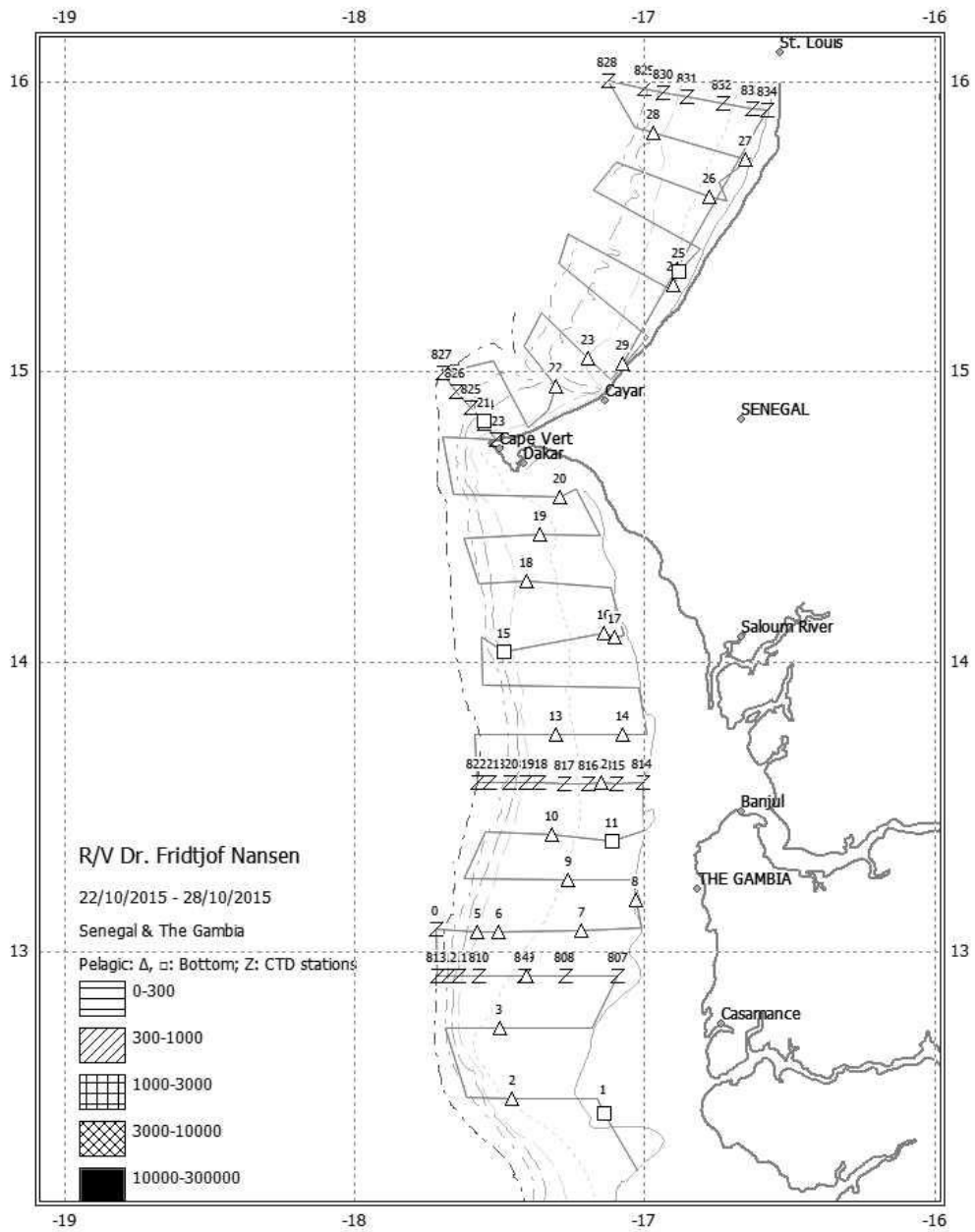


Figure 1. Course tracks with fishing and hydrographical stations; Casamance to St. Louis.

CHAPTER 2 METHODS

2.1 Environmental Data

A Seabird 911+ CTD probe was used to obtain vertical profiles of the temperature, salinity and oxygen. Real time logging was carried out using the PC based Seabird Seasave software. CTD casts were conducted along the cruise track in transects at Casamance, in the Gambia, at Cape Vert, and off St Louis. The casts were stopped a few meters above the bottom, and at a maximum of 500 m depth.

Sea surface salinity and relative temperature was continuously measured using a SBE 21 Seacat Thermosalinograph.

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

2.2 Biological sampling

Biological sampling of the fish was carried out using trawls. A pelagic trawl with floats was often used. A smaller pelagic trawl or the bottom trawl with floats was used for sampling the pelagic fish in shallow waters (depth less than 25 m). Annex II gives a description of the instruments and the fishing gear used. All catches were sampled for composition by weight and numbers of each species caught. Species identification was based on the FAO Species Guides. Length frequency distributions, by total fish length to the nearest cm below, of the selected target species were taken in all the stations where they were present. Individual weight measurements were taken regularly to estimate the condition factor in the length-weight relationship:

$$\bar{w} = \frac{cond}{100} \cdot L^3$$

The specific condition factors obtained from the samples and applied for this survey were: 0.96 for sardinellas and *Trachurus trecae*.

For the estimation of the biomass of carangids and associated species, an overall average length of 23 cm and a condition factor of 0.88 (to calculate the mean length of this length group) were applied. The target groups used for Senegal and The Gambia can be found in Table 2, while the complete records of fishing stations and catches are shown in Annex I.

Table 2. Allocation of acoustic densities to taxii. Note that for the groups of sardinella, horse mackerel, and sardine all encountered species are listed, while only examples are listed for the remaining groups.

Group	Taxon	Species
Sardinella	<i>Sardinella</i> sp.	<i>S. aurita</i> <i>S. maderensis</i>
Horse mackerel	<i>Trachurus</i> sp.	<i>T. trecae</i> <i>T. trachurus</i>
Sardine	<i>Sardinops</i>	<i>S. pilchardus</i>
Pelagic species 1	Clupeiformes ₁	<i>Ilisha africana</i> <i>Engraulis encrasicolus</i>
Pelagic species 2	Carangidae ₂	<i>Selene dorsalis</i> <i>Chloroscombrus chrysurus</i> <i>Decapterus rhonchus</i> <i>Alectis alexandrinus</i>
Little tuny	Scombridae	<i>Euthynnus alletteratus</i> <i>Sarda sarda</i> <i>Scomber japonicus</i>
	Sphyraenidae	<i>Sphyraena guachancho</i>
	Others	<i>Trichiurus lepturus</i> <i>Zeus faber</i>
Other demersal species	Sparidae ₃	<i>Dentex angolensis</i> <i>D. macrophthalmus</i> <i>D. congoensis</i> <i>D. canariensis</i> <i>D. barnardi</i> <i>Pagellus bellottii</i> <i>Sparus caeruleostictus</i> <i>S. pagrus africanus</i>
Big-eye grunt	Other taxii	<i>Pseudupeneus prayensis</i> <i>Brachydeuterus auritus</i> <i>Arioma bondi</i> <i>Pomadasys incisus</i> <i>Galeoides decadactylus</i>
Mesopelagic species	Myctophidae ₃ Other mesopelagic fish	
Plankton	Calanoidae	<i>Calanus</i> sp.
	Euphausiidae	<i>Meganyctiphanes</i> sp.
	Other plankton	

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

2.3 Acoustic sampling

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 survey was started without *a priori* calibration.

Acoustic data were logged and post-processed using the latest acoustic data post-processing software, the Large Scale Survey System (LSSS) Version 1.25. The technical specifications and operational settings of the echo sounder used during the survey are given in Annex II.

In cases where the target category of fish contains more than one species (sardinellas and *Trachurus trecae*), the mean s_A -value allocated to the category is divided between the species in the same ratio as their contribution to the mean back scattering strength in the length frequency samples.

The following target strength (TS) function was applied to convert s_A -values (mean integrator value for a given species or group of species in a specified area) to number of fish:

$$TS = 20 \log L - 72 \text{ dB}$$

Which can be converted (see Toresen *et al.* 1998 for details) to the area form (scattering cross sections of acoustic targets):

$$C_{Fi} = 1.26 \cdot 10^6 L^{-2}$$

where L is total length in 1 cm length group i and C_{Fi} (m^{-2}) is the reciprocal back scattering strength, or so-called fish conversion factor. In order to split and convert the allocated s_A -values (m^2/NM^2) to fish densities (numbers per length group per NM^2), the following formula was used:

$$\rho_i = s_A \cdot \frac{p_i}{\sum_{i=1}^n \frac{p_i}{C_{Fi}}}$$

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 integrator outputs were split in fish groups using a combination of behaviour pattern as deduced from echo diagrams, the LSSS analysis and catch composition as described below. The following groups were used for Senegal: 1) sardinellas, 2) horse mackerel, 3) carangids and associated species 4) demersal fish, 5) brachydeuterus, 6) mesopelagic fish and 7) plankton.

The above equations show that the conversion from s_A -values to number of fish is dependent on the length composition of the fish. It is therefore important to get representative length distributions from the stock in the whole distribution area.

When the size classes (of e.g. young fish and older fish) are well mixed, the various length distributions can be pooled together with equal importance. Otherwise, when the size classes are segregated, the total distribution area has to be post-stratified, according to the length distributions, and separate estimates are made for the regions containing fish with equal size.

For a region representing a distribution of a target-specie, the following basic data are needed for the estimation of abundance;

- 1) the average s_A -value for the region,
- 2) the surface (usually square nautical miles, NM^2), and
- 3) a representative length distribution of the fish in the region.

If the targeted fish is a mixture of more than one species, for example sardinellas, a representative distribution of the two, within the region, as shown in the trawl catches, are used. A length distribution representing the number of the two species for each catch will have to be calculated. Thereafter, these distributions have to be normalized to a unit number (usually 100) so they are equally weighted.

A systematic approach to a) divide the s_A -value between species in a category of fish (e.g. *Sardinella aurita* and *S. maderensis*) and b) produce pooled length distributions of a target species for use in the above equation and c) calculate the biomass estimates for a region, is obtained through the following procedure:

The samples of the species in the category (e.g. sardinellas) are respectively pooled together with equal importance (normalized).

The mean back scattering strength (ρ/s_A) of each length frequency distribution of the target species is calculated and summed. This is automatically done in the Excel spread-sheet made available for acoustic abundance estimation onboard RV “Dr. Fridtjof Nansen”, provided the data are punched in this sheet.

The mean s_A -value allocated to the category of fish in the region is divided between the species in the same ratio as their relative contribution to the mean back scattering strength of the length groups in the sample representing the region

The pooled length distribution is used, together with the mean s_A -value, to calculate the density (numbers per square NM) by length groups and species, using the above formula. The total number by length group in the area is obtained by multiplying each number by the area. The numbers are then converted to biomass using the estimated weight at length.

Intercalibration with “Itaf Deme”

During the survey the Senegalese research vessel “Itaf Deme” did an acoustic intercalibration with “Dr. Fridtjof Nansen”.

Two transects, each about 30 NM long, some 30 NM south of Dakar, were designed covering medium to large concentrations of pelagic fish. One research vessel (Itaf Deme) started the coverage, and the other (Dr Fridtjof Nansen) followed, 20 minutes after the first. Starting time and log were recorded onboard each vessel and the distance between vessels was kept constant during the experiment.

All data collected during the intercalibration will be analysed on land and a separate report will be produced on the exercise.

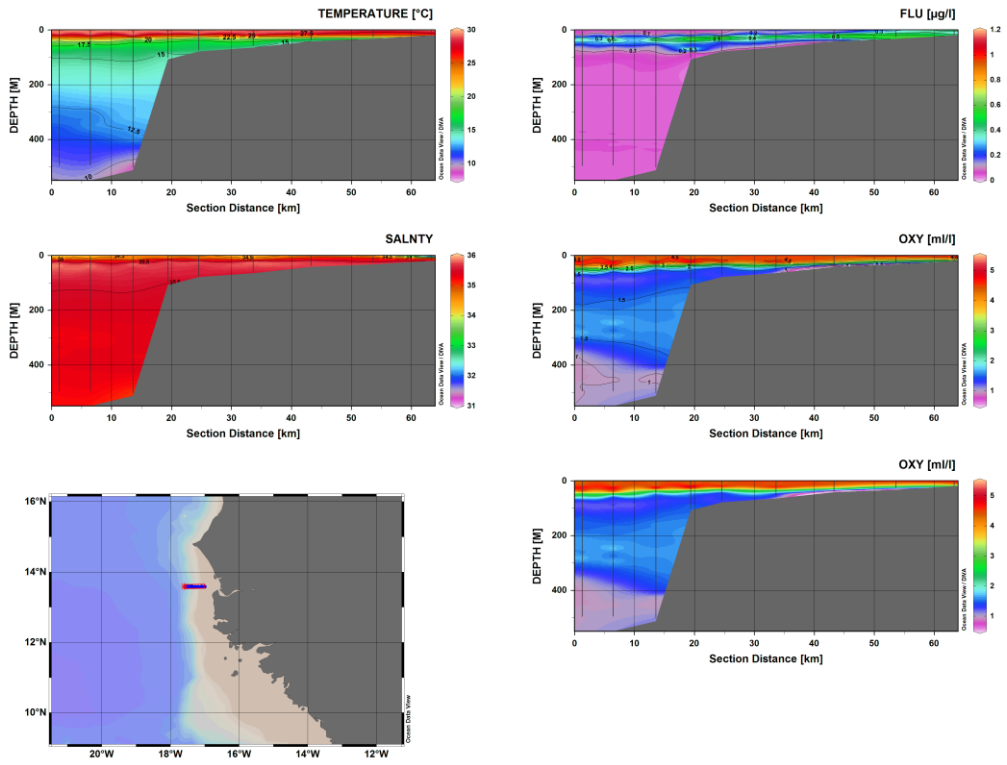
CHAPTER 3 SURVEY RESULTS

3.1 Hydrography

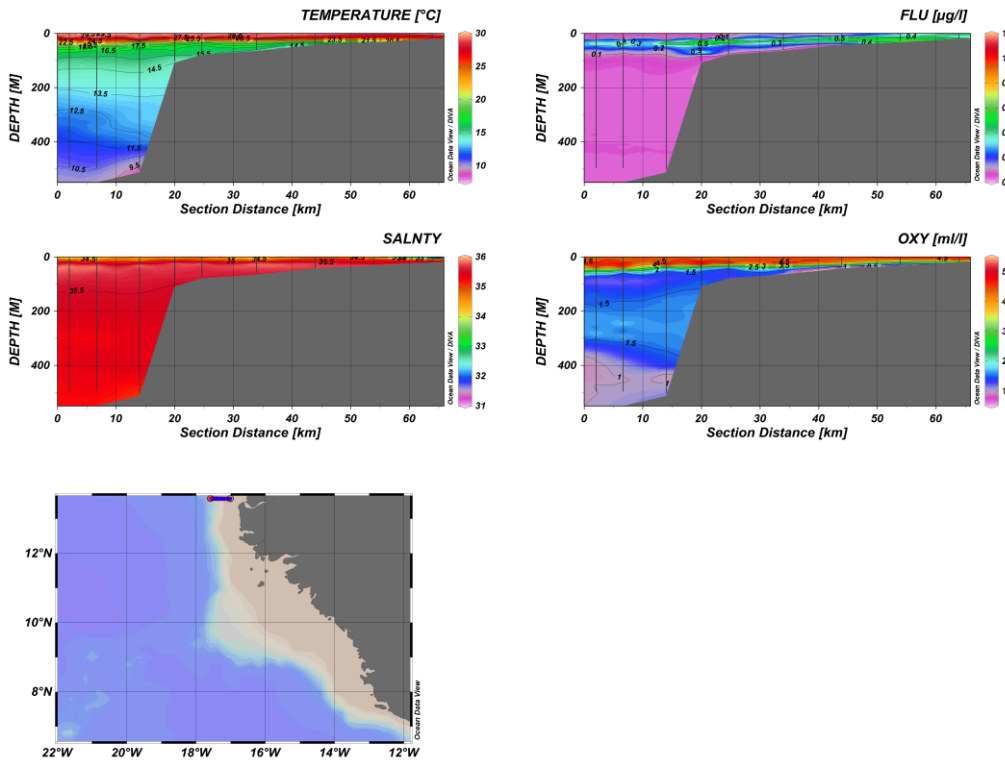
Hydrographical data was collected on fixed CTD stations to 500 m depth and from the Thermosalinograph and the Aanderaa weather station that continuously collect sea surface temperature, wind speed and direction, solar radiation, etc. during the survey.

Cross shelf hydrographical profiles

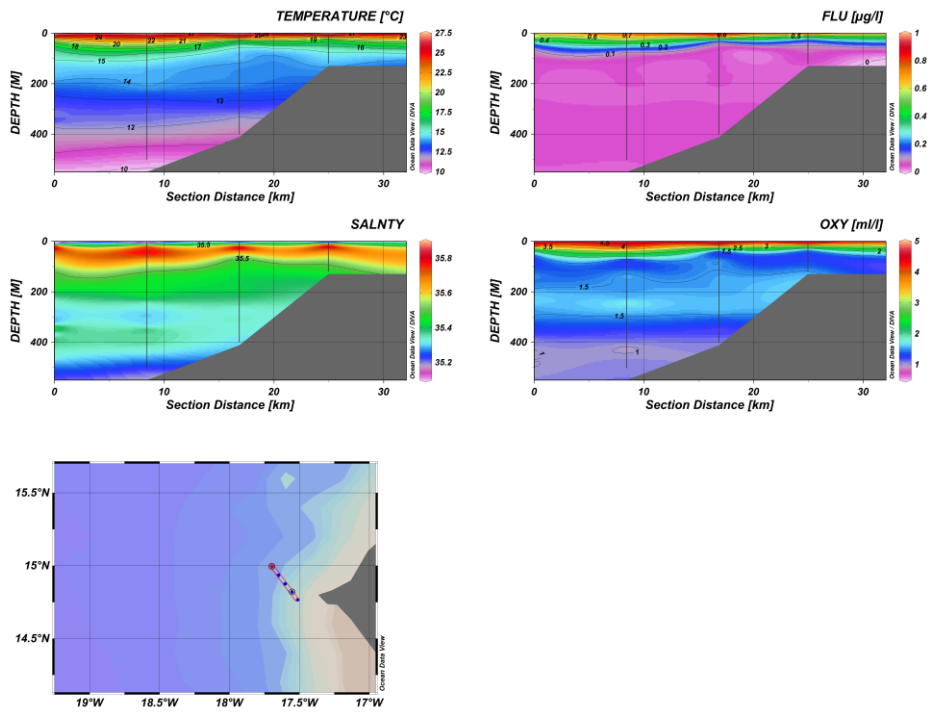
Figure 2 shows the distribution of temperature, salinity, oxygen and fluorescence from the four hydrographical transects collected during the survey. The surface water temperature was warm and this was especially pronounced in the area south of Cape Vert. Surface temperature in the area was around 29°C, with a thermocline at approximately 30 - 50 m depth. The salinity profiles illustrate low salinity water at the coast extending offshore, with surface salinity around 33 ‰ S off Casamance and the Gambia and increasing surface salinity north of Cape Vert. A pronounced salinocline corresponded with the thermocline at 30 - 50 m depth. The profile at St. Louis showed higher salinities and no clear salinocline illustrating intrusion of different water masses from the north. The water masses in the survey area was well oxygenated with oxygen concentrations in the surface layer >4 ml O₂/l.



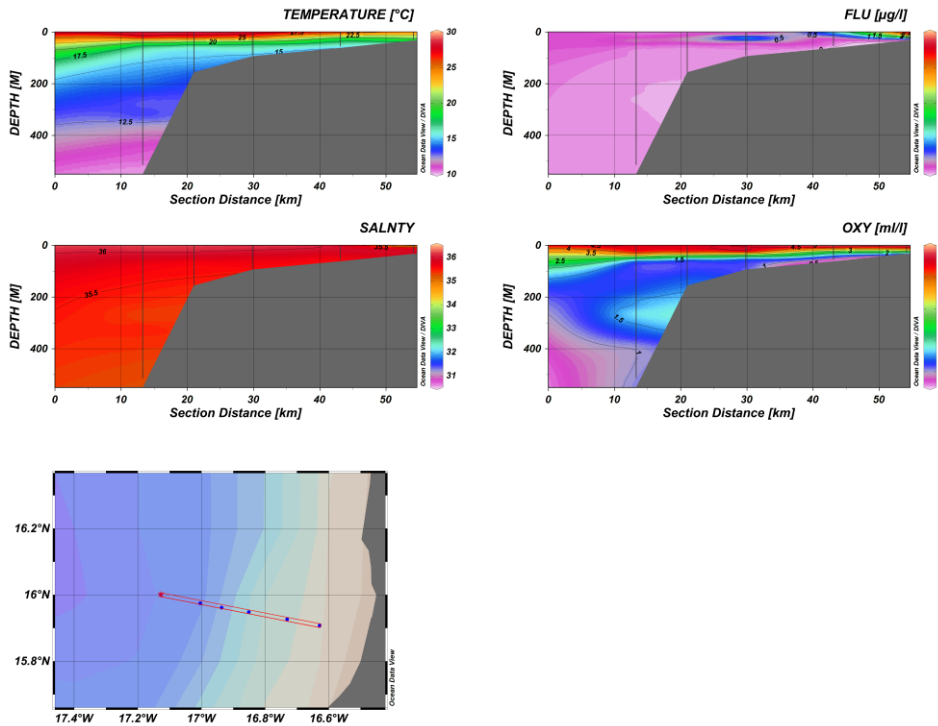
CASAMANCE 22/10



THE GAMBIA WEST 23/10



CAPE VERT 26/10



ST. LOUIS – SOUTH 28/10

Figure 2. Hydrographical profiles with distribution of temperature, salinity and oxygen off Casamance, The Gambia, Cape Vert, St. Louis - South

Sea surface temperature and salinity

Figure 3 illustrates the sea surface temperature at 5 m depth, Figure 4 shows the sea surface salinity at the same depth. The surface waters in the south of the survey area were dominated by water temperatures higher than 29°C, and up to 30°C close to the coast of the Gambia. North of Cape Vert the temperature stayed warm towards St. Louis were the temperature dropped, indicating intrusion of a cooler water body.

The sea surface salinity shows high variability. The general pattern shows low surface salinity inshore and in the southern part of the survey area, with an indication of low salinity waters (33.8‰) pushing northwards towards Cape Vert. At St. Louis a body of high salinity waters can be seen coming from the north, while north of Cayar Canyon a body of high salinity waters (35.2‰) is seen trapped inside warmer, less saline water masses.

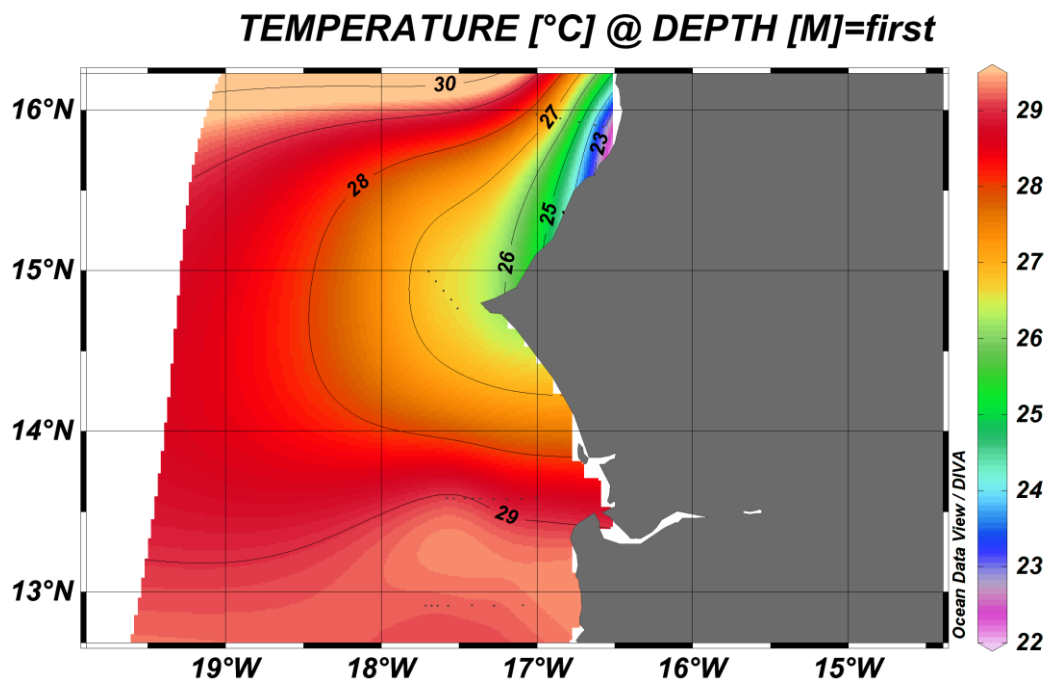


Figure 3. Sea surface temperature; Casamance to St. Louis.

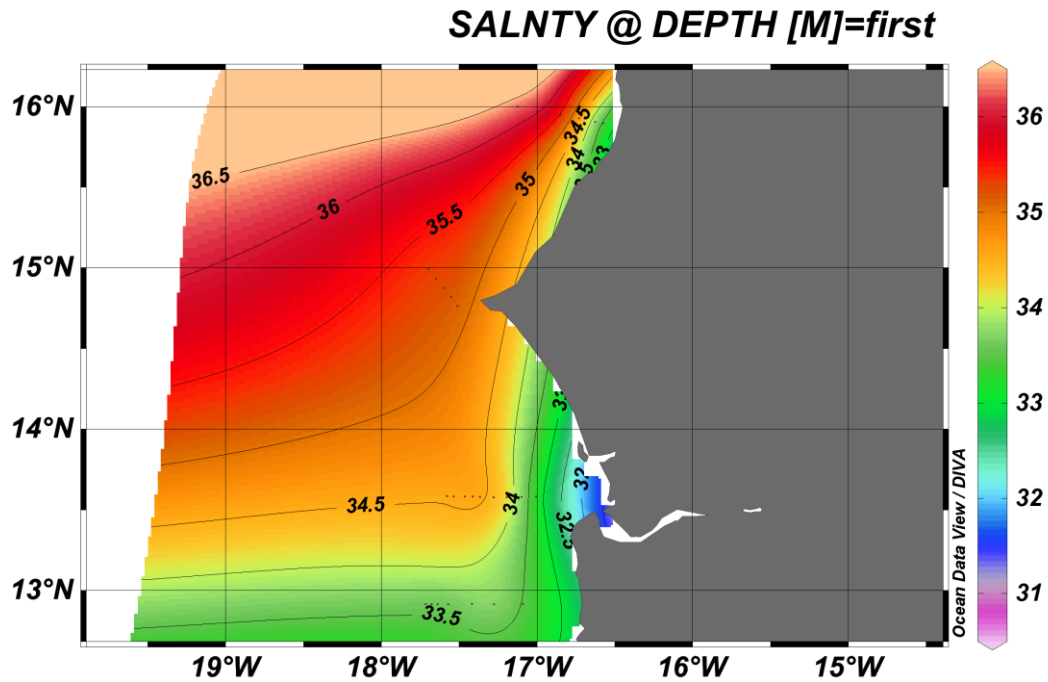


Figure 4. Sea surface salinity; Casamance to St. Louis.

3.2 The Casamance shelf

The main groups of pelagic fish encountered during the survey of Senegal and the Gambia illustrated with contoured acoustic densities are seen in Figure 5, Figure 6 and Figure 7.

Sardinella were found in low and medium density in shallow waters, mainly from the 50 m depth, continuing inshore of 20 m depth. The distribution of sardinella probably continued south of the survey area into Guinea Bissau, but the main concentrations were found in the north of Casamance with the highest density around the 20 m depth contour continuing into the Gambian waters, Figure 5. The region was dominated by *S. maderensis*. The modal size of *S. maderensis* was 24 cm. Estimated number and biomass by length-groups can be found in Annex IV. The total biomass of sardinellas in the area was estimated to be 115 thousand tonnes, all of it was flat sardinella, Table 3.

Horse mackerel, *Trachurus trecae* were found on the outer part of the shelf with very low density (Figure 6). The biomass was estimated to 13 thousand tonnes. The horse mackerel was found pelagic during night and close to bottom during daytime. The modal length was 27 cm.

Other pelagic fish (P2) were found covering large parts of the shelf, similar to what is experienced most years. In general both carangids other than horse mackerel, scombrids, hairtails and barracudas were found in the area. The most frequently found species in the catches were *Chloroscombrus chrysurus*, *Brachydeuterus auritus*, *Trichiurus lepturus*, *Decapterus punctatus*, *Selene dorsalis* and *Trachinotus ovatus*. The species were well mixed with the sardinellas where their distribution overlapped, Figure 7. The estimated biomass of this group of fish was 218 thousand tons.

Table 3. Casamance. Biomass estimates of pelagic fish, thousand tons.

<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerel	Carangids etc.
115	-	13	184

3.3 The Gambian shelf

The main distribution of sardinellas found in the Casamance area continued into the Gambian waters. In addition there was another distribution of sardinellas further north in the Gambia. The sardinellas were mainly confined inside of the 50 m isobat, with the main concentrations inside of 20 m bottom depth. Figure 5. Both species of sardinella was found in the area but with a dominance of *S. maderensis*. The total estimate of sardinellas in the Gambian waters during the survey was 131 thousand tonnes, Table 4. This comprised of 86 thousand tonnes of *S. maderensis* and 45 thousand tonnes of *S. aurita*. The modal lengths of *S. maderensis* was 12, 16 and 25 cm while *S. aurita* had a modal lengths of 13 and 27 cm. The estimated numbers and biomass by length-groups can be found in Annex IV.

Trachurus trecae was found on the shelf between 40 and 100 m depth, in a distribution area which was divided in two main parts, a northern and a southern distribution. The northern one extended in the north into the area south of Cape Vert, Figure 6. The densities were low to medium with an estimated biomass of 49 thousand tons, Table 4. The size distribution of horse mackerel in the area consisted of two modal peaks of 19 and at 23 cm.

Carangids and associated species were found in low to medium density widely distributed over the whole Gambian shelf, Figure 7. The catches of this group were dominated by

Chloroscombrus chrysurus, *Brachydeuterus auritus* and *Decapterus rhonchus*. The biomass was estimated at 220 thousand tonnes.

Table 4. The Gambia. Biomass estimates of pelagic fish, thousand tons.

<i>S. maderensis</i>	<i>S. aurita</i>	<i>Trachurus trecae</i>	Carangids etc.
86	45	49	220

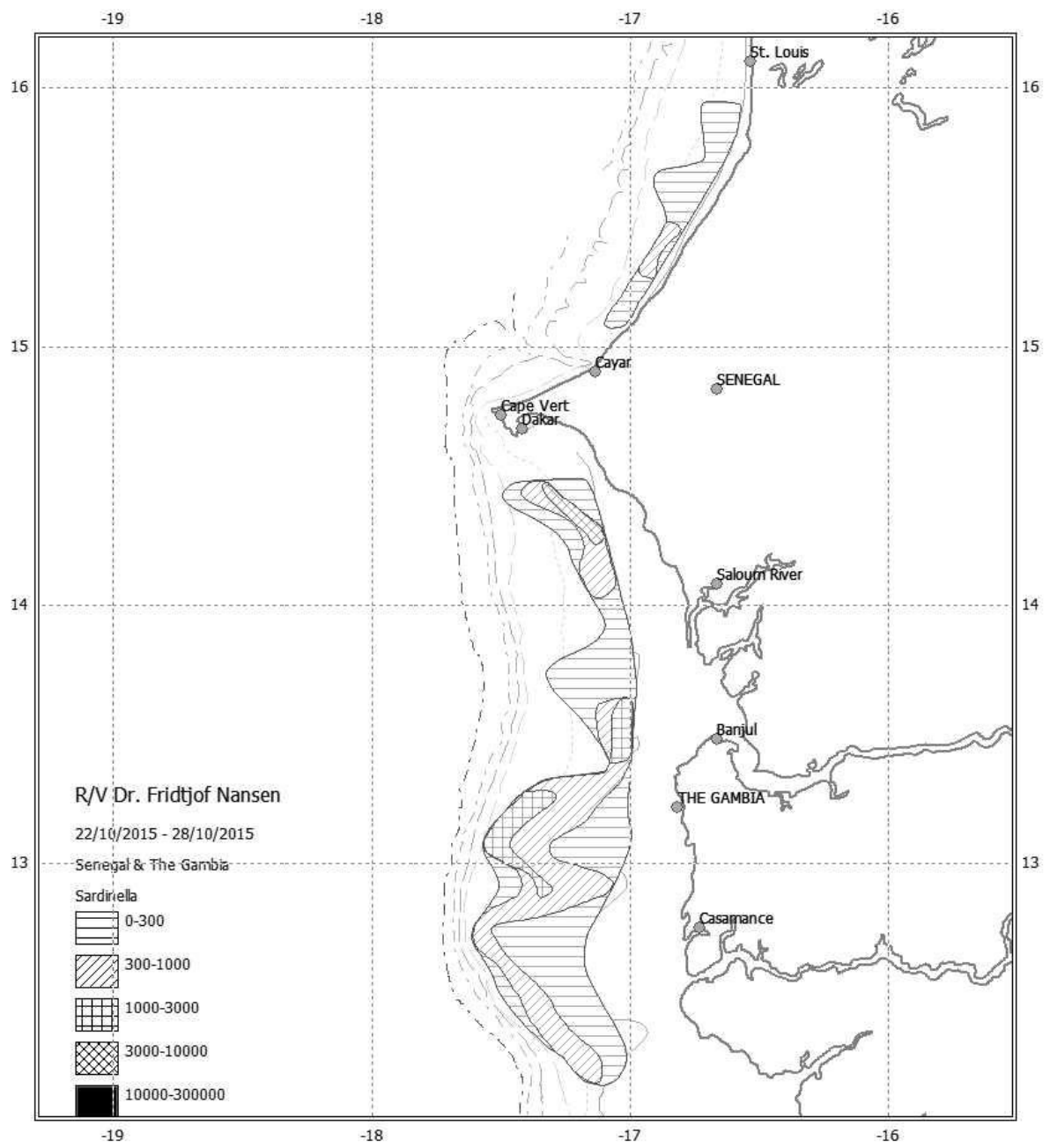


Figure 5. Distribution of sardinellas; Casamance to St. Louis.

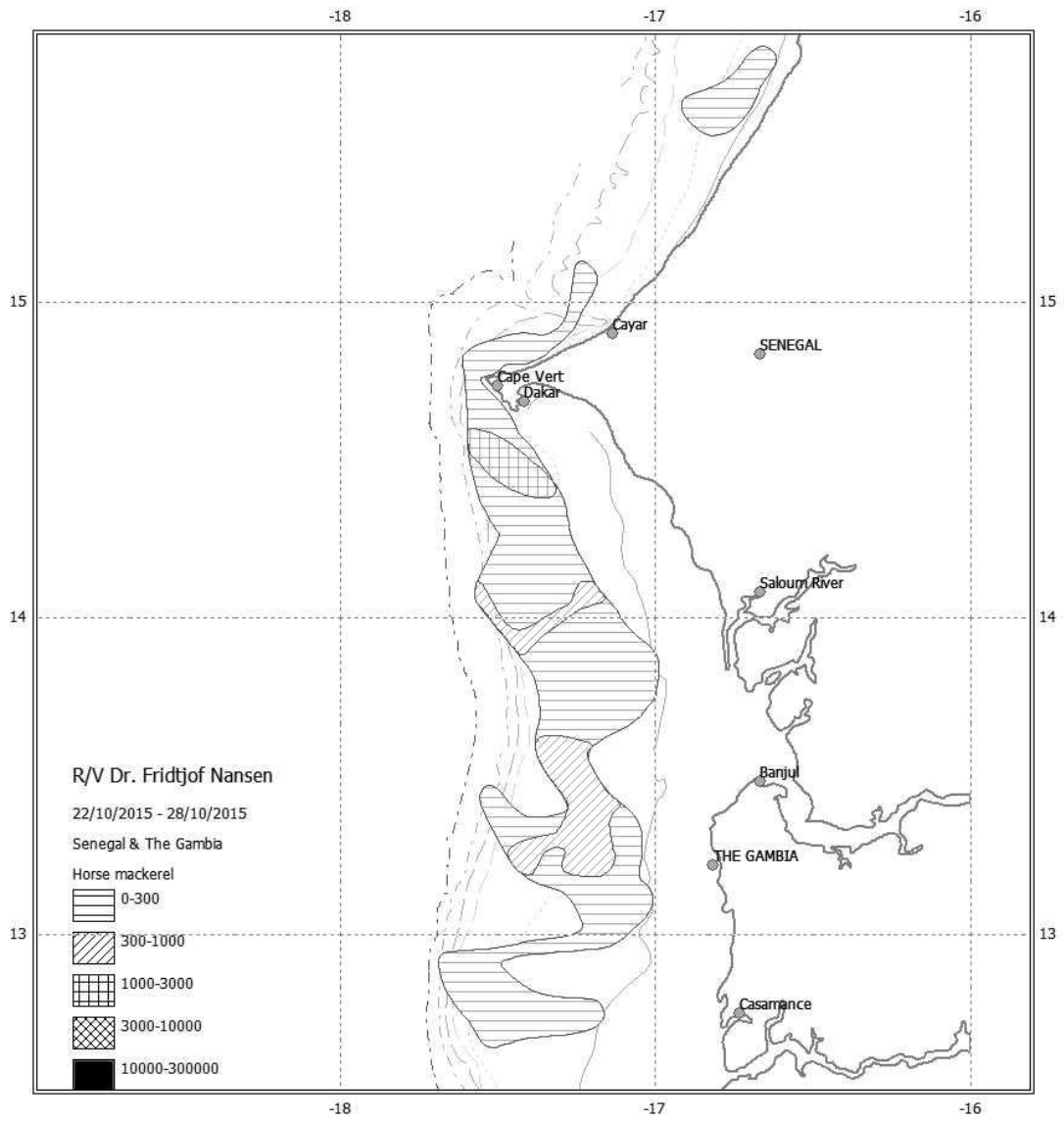


Figure 6. Distribution of *Trachurus trecae*; Casamance to St. Louis.

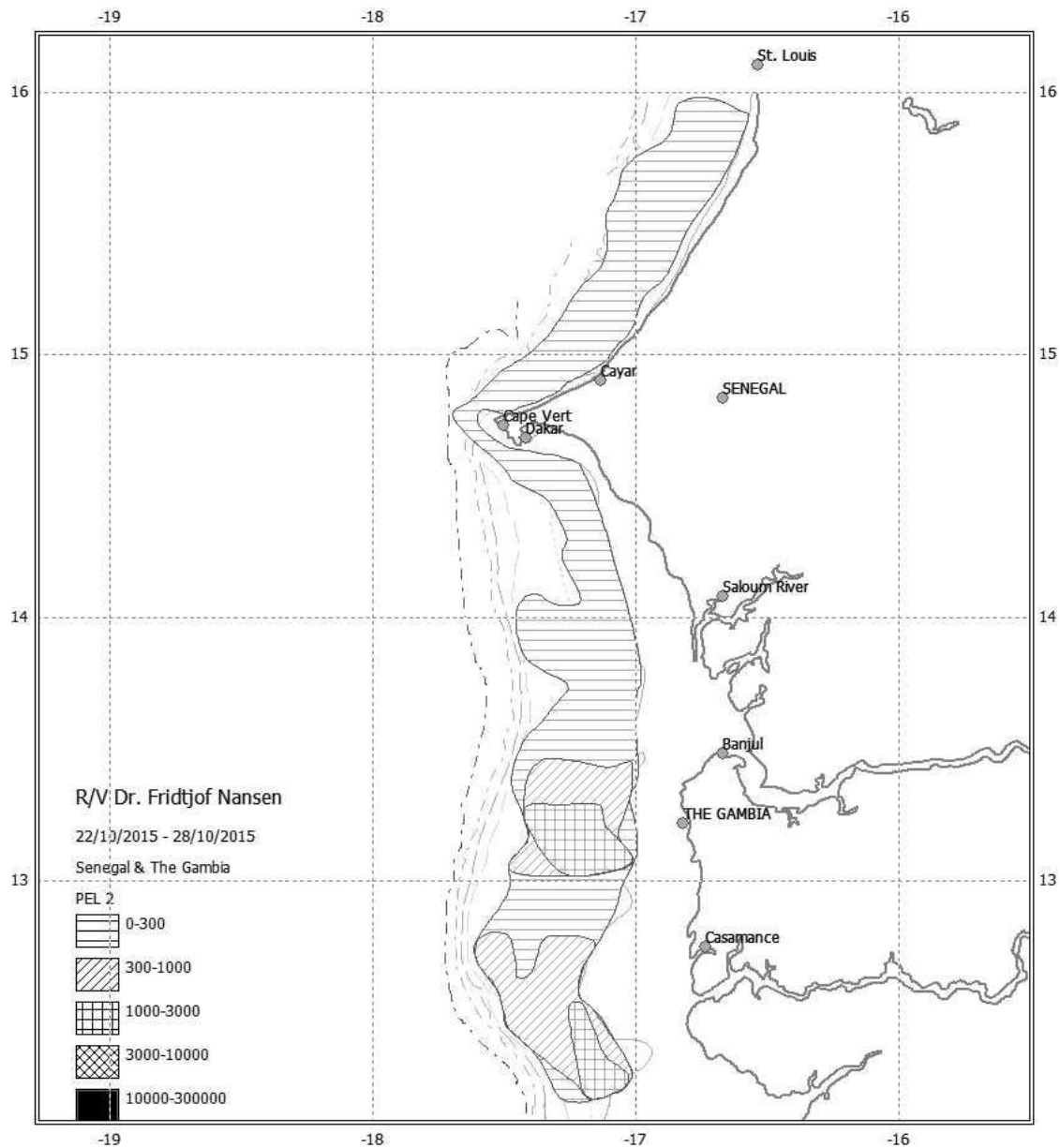


Figure 7. Distribution of carangids and associated species; Casamance to St. Louis

3.4 The Gambian border - Cape Vert

The area with medium density of sardinella in the Gambia continued northwards and widened to cover all the inner shelf some 10 NM south of Dakar, Figure 5. The distribution was mainly found inshore of 15 m bottom depth to between 50 and 100 m depth offshore. Table 5 shows the biomass estimates of the two sardinella species, *S. maderensis* was estimated at 39 thousand tonnes while 55 thousand tonnes of *S. aurita* was found.

Pooled length compositions of samples from *S. maderensis* showed modal peaks at 14 and 25 cm. *S. aurita* had a modal peak at 27 cm, and a juvenile cohort with a modal peak at 13 cm. Estimated number and biomass by length-groups are found in Annex IV.

The distribution of *Trachurus trecae* continued from the Gambia and north to outside Cape Vert. The distribution was along the outer shelf from around 100 m depth and continued inshore on the shelf to about 50 m depth, Figure 6. The total biomass was estimated at 74 thousand tonnes. The *Trachurus trecae* had two modal peaks in the area, one at 19 cm and one at 23 cm.

As in the other regions south of Cape Vert, carangids and associated pelagic species were distributed over most of the shelf from less than 20 m depth and offshore to between 50 and 100 m depth. The dominating species in the area were *Chloroscombrus chrysurus*, *Brachydeuterus auritus* and *Decapterus rhonchus*, Figure 7. The biomass of carangids and associated pelagic fish was estimated at about 23 thousand tonnes, Table 5.

Table 5. The Gambia border to Cape Vert. Biomass estimates of pelagic fish, thousand tons.

<i>S. maderensis</i>	<i>S. aurita</i>	<i>Trachurus trecae</i>	Carangids etc.
39	55	74	23

3.5 Cape Vert - St. Louis

Sardinellas were found in three areas north of Cape Vert. *S. aurita* were found in two small areas, the first south of Cayar canyon between 50 and 100 m depth and the second at 50 m depth further north. *S. maderensis* were found further north at St. Louis in a larger area between the coast and 50 m depth., Figure 5. The modal length of *S. aurita* in the area was 17 cm while the length distribution of *S. maderensis* had one modal peak at 9 cm, and one adult cohort with a modal peak at 26 cm. Few juvenile sardinella was found in the area. The biomass estimate of *S. aurita* was 23 thousand tonnes while *S. maderensis* was estimated at 10 thousand tonnes, Table 6.

Trachurus trecae were found in two low density areas, one small area around the inside of Cayar canyon between 100 and 50 m bottom depth, and one just off St. Louis continuing across the border to Mauritania from 100 to 50 m depth, Figure 6. The biomass of *Trachurus*

trecae was estimated at 2 thousand tonnes. *Trachurus trecae* in the region had three modal peaks, at 12 cm, 19 cm and 24 cm.

Two low density areas of Carangids and associated pelagic fish species were found between Cape Vert and St. Louis. One south of Cayar Canyon and one from north of Cayar to the border with Mauritania. The distribution was relatively wide, from 20 m depth and offshore to approximately 50 m depth. The dominant species in the catches were *Chloroscombrus chrysurus*, *Pomadasydys peroteti* and *Trichiurus lepturus* and the biomass was estimated to be 27 thousand tonnes.

Table 6. Cape Vert to St. Louis. Biomass estimates of pelagic fish, thousand tons.

<i>S. maderensis</i>	<i>S. aurita</i>	<i>Trachurus trecae</i>	Carangids etc.
10	23	2	27

CHAPTER 4 OVERVIEW AND SUMMARY OF RESULTS

The survey was conducted successfully from 21st to 30th October, covering a course track of approximately 1015 NM, excluding the steaming to, and from the survey area to Dakar. A total of 29 fishing stations and 28 CTD casts were established.

The hydrographical data showed a stable surface layer at approximately 30-50 m depth for the whole shelf south of Cape Vert. Warm low salinity surface waters characterized the surface water in the Casamance area and the Gambia. The low salinity can be attributed to discharge from the rivers in the area. The shelf from Cape Vert and north to St. Louis was warmer than usually during the October - November survey and intrusion of cold water from the north was only visible at St. Louis. The shelf was well oxygenated in the whole survey area.

Sardinellas were found in two large areas, between Casamance and St. Louis. The total biomass was estimated to be 373 thousand tonnes, and 33% of this was *S. aurita*. The major part of the stock, 81,3% of *S. aurita*, and 96% of *S. maderensis* respectively, were concentrated between Casamance and Cape Vert, Figure 5, and the distribution probably continued south of the survey area. Only minor concentrations of sardinella were found north of this. The division of biomass between length groups and species are dependent on representative trawl samples of the two species. Since sardinella show strong trawl avoidance some care should be taken when interpreting the results.

Trachurus trecae were found in one main area between Gambia and Cape Vert, and two smaller concentrations north of this at Cayar Canyon and St. Louis, Figure 6. The total estimate of *Trachurus trecae* was 138 thousand tonnes, of this 98,6% was found south of Cape Vert. No separate estimate was made for *Decapterus rhonchus*.

The distribution of 'P2's', other carangids and associated species, were distributed over most of the shelf in medium to high densities, Figure 7. The main species in the catches of this group consisted of *Chloroscombrus chrysurus*, *Brachydeuterus auritus*, *Decapterus rhonchus* and *Selene dorsalis*. The total biomass was estimated at approximately 454 thousand tonnes.

An overview of the acoustic estimates of biomass of the main groups of pelagic fish is shown in Table 7. The total biomass of sardinellas was thus 373 thousand tonnes, *Trachurus trecae* 138 thousand tonnes and of carangids and associated species 454 thousand tonnes.

Table 7. Summary of biomass estimates of pelagic fish, Senegal and the Gambia. thousand tonnes.

	<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerel	Carangids etc.
St. Louis-Cape Vert	10	23	2	27
Cape Vert - the Gambia	39	55	74	23
The Gambia	86	45	49	220
Casamance	115		13	184
Total	250	123	138	454

Table 8 lists biomass estimates of sardinellas and carangids (including *Trachurus trecae*) and associated species from the “Dr. Fridtjof Nansen” surveys of the shelf region. Large-scale latitudinal movements of pelagic fish between West Sahara and Guinea Bissau are well known, and in the summer the sardinellas should be concentrated in Senegal for spawning. Compared with the last November survey in Senegal and The Gambia in 2006, which gave 712 thousand tonnes, this survey found much less sardinella. The current survey estimate is significantly lower and is the lowest since 2000. The estimate of *Trachurus trecae* and other carangids is, on the other hand much higher than that of 2006, and is the highest on record during this time of the year. However, it is the other carangids which accounts for the larger part of the high number.

Table 8. Biomass estimates from previous 'Dr Fridtjof Nansen' surveys of Senegal - The Gambia shelf in thousand tons.

Survey:	Sardinellas	Carangids etc.*
AprMay-81	210	570
Sept -81	360	**
FebMar-82	40	90
NovDec-86	330	170
FebMar-92	1 530	690
NovDec-95	760	220
NovDec-96	230	530
NovDec-97	300	250
NovDec-98	390	340
NovDec-99	1 390	470
NovDec-00	300	540
JunJul-01	410	230
NovDec-01	430	480
JunJul-02	600	430
NovDec-02	910	260
JunJul-03	670	610
NovDec-03	597	319
NovDec-04	819	289
NovDec-05	828	231
NovDec-06	712	291
October-15	373	592

* *Trachurus trecae* and other carangids

** Not available

References

Toresen, R., Gjørseter, H., and Barros, P. 1998. The acoustic method as used in the abundance estimation of capelin (*Mallotus villosus* Müller) and herring (*Clupea harengus* Linné) in the Barents Sea. Fisheries Research 34 (1998) 27-37.

RESUME

La campagne a été conduite avec succès durant la période du 21 octobre au 30 novembre selon un parcours d'une longueur approximative de 1015 milles nautiques exclus les temps de route à partir de/et vers Dakar. Au total, 29 stations de pêche de contrôle ont été réalisées, 28 profiles CTD.

Les conditions hydrographiques ont révélé une couche de surface stable jusqu'à environ 30-50 m de fonds sur tout le plateau au sud du Cap Vert. De chaudes et faibles salinités ont caractérisé les eaux de surface dans la zone Casamance et en Gambie. La faible salinité peut être attribué à des apports d'eau douce des fleuves vers la mer. Le plateau du Cap Vert vers Saint Louis a été plus chaude que d'habitude durant la campagne d'octobre-novembre et les intrusions d'eaux froides venant du nord n'ont été visibles qu'à Saint Louis. Le plateau a été bien oxygéné sur toute l'aire prospectée.

Les sardinelles ont été rencontrées sur deux grands aires, entre la Casamance et Saint Louis. la côte entre le sud de Dakar et la Casamance où 95% de la biomasse a été trouvée. . La biomasse totale a été estimée à 373 milles tonnes dont 33% de *S. aurita*. L'essentiel du stock, 81,3% de *S. aurita*, et 96% of *S. maderensis* respectivement, étaient concentré entre la Casamance et le Cap Vert (Petite Côte). Figure 5, et la distribution continue probablement vers le sud de la zone prospectée. Les sardinelles ont été trouvées à l'état de traces au Nord. La répartition de la biomasse entre classes de tailles et espèces dépend d'échantillons de pêche représentatifs des deux espèces. Dès lors que les sardinelles sont dotées d'une forte capacité d'évitement du chalut, des précautions devraient être prises en interprétant les résultats.

Les chinchards ont été rencontrés sur une principale zone entre la frontière entre la Gambie et le Cap Vert, et deux zones de concentrations plus petites situées au nord dans la fosse de Kayar et St Louis, Figure 6. La biomasse totale des *Trachurus trecae* est évaluée à 138 milles tonnes, dont 98,6% au sud du Cap Vert. Aucune estimation séparée n'a été faite pour *Decapterus rhonchus*.

La distribution des 'P2', autres carangidés et espèces associées, a concerné toute le plateau en myennes et fortes densités, Figure 7. Les espèces principalement capturées ont été of *Chloroscombrus chrysurus*, *Brachydeuterus auritus*, *Decapterus rhonchus* et *Selene dorsalis*. La biomasse totale est estimée à 454 milles tonnes,.

Un recapitulatif des estimations acoustiques de biomasses des principaux groupes de poissons pélagiques est présenté au Table 7. Ainsi, la biomasse totale des sardinelles s'élève à 373 milles tonnes, celles de *Trachurus trecae* à 138 milles tonnes et les carangidés et espèces associées sont estimées à 454 milles tonnes.

ANNEX I Records of fishing stations

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 1
 DATE :22/10/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 12°26.48
 start stop duration Lon W 17°8.49
 TIME :19:05:02 19:39:46 34.7 (min) Purpose : 1
 LOG : 343.23 345.12 1.9 Region : 1300
 FDEPTH: 18 17 Gear cond.: 0
 BDEPTH: 18 17 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 167 Total catch: 334.54 Catch/hour: 577.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	381.46	3023	66.00	
Brachydeuterus auritus	146.16	1835	25.29	
Sardinella maderensis	22.60	245	3.91	1
Ilisha africana	13.06	1994	2.26	
Sphyræna guachancho	3.90	14	0.68	
Selar crumenophthalmus	2.97	7	0.51	
Selene dorsalis	1.90	14	0.33	
Caranx crysos	1.62	3	0.28	
Trachinotus ovatus	1.62	10	0.28	
Carlarius heudelotii	1.04	3	0.18	
Galeoides decadactylus	0.79	3	0.14	
Eucinostomus melanopterus	0.76	3	0.13	
Penaeus notialis	0.07	3	0.01	
Total	577.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 2
 DATE :22/10/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 12°29.75
 start stop duration Lon W 17°27.47
 TIME :23:22:24 23:45:53 23.5 (min) Purpose : 1
 LOG : 367.73 369.20 1.5 Region : 1300
 FDEPTH: 25 35 Gear cond.: 0
 BDEPTH: 47 49 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.8 kn
 Sorted : 96 Total catch: 95.76 Catch/hour: 244.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	167.94	1423	68.63	
Caranx rhonchus	38.18	82	15.60	2
Pomadasyus jubelini	17.53	36	7.16	
Sardinella maderensis	9.58	59	3.92	3
Selene dorsalis	8.23	69	3.36	
Chloroscombrus chrysurus	2.22	10	0.91	
Trichiurus lepturus	1.02	5	0.42	
Total	244.70		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 3
 DATE :22/10/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 12°44.00
 start stop duration Lon W 17°30.00
 TIME :04:21:41 04:51:20 29.6 (min) Purpose : 1
 LOG : 409.53 411.05 1.5 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 45 44 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
 Sorted : 0 Total catch: 110.22 Catch/hour: 223.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	120.20	838	53.89	
Brachydeuterus auritus	36.79	184	16.49	
Sardinella maderensis	20.44	132	9.16	4
Carlarius heudelotii	14.83	22	6.65	
Trachurus trecae	10.00	53	4.48	7
Selene dorsalis	8.46	71	3.79	
Trachinotus ovatus	4.17	16	1.87	
Caranx rhonchus	2.55	12	1.14	5
Scomber japonicus	1.84	6	0.83	6
Sphyræna guachancho	1.48	4	0.66	
Dactylopterus volitans	0.75	4	0.34	
Sardinella aurita	0.47	2	0.21	
Pomadasyus incisus	0.40	2	0.18	
Sepia officinalis	0.38	2	0.17	
Pseudupeneus prayensis	0.28	2	0.13	
Total	223.04		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 4
 DATE :23/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 12°55.02
 start stop duration Lon W 17°24.39
 TIME :10:46:50 11:46:11 59.4 (min) Purpose : 1
 LOG : 460.33 463.32 3.0 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 44 41 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
 Sorted : 22 Total catch: 21.94 Catch/hour: 22.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	21.37	55	96.35	
Euthynnus alletteratus	0.46	1	2.10	
Carlarius heudelotii	0.34	1	1.55	
Total	22.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 5
 DATE :23/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°4.02
 start stop duration Lon W 17°34.68
 TIME :17:20:27 17:52:19 31.9 (min) Purpose : 1
 LOG : 505.23 506.62 1.4 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 102 103 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.6 kn
 Sorted : 36 Total catch: 36.00 Catch/hour: 67.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SALPS	67.80	1446	100.00	
Total	67.80		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 6
 DATE :23/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°4.24
 start stop duration Lon W 17°30.27
 TIME :19:37:40 20:06:17 28.6 (min) Purpose : 1
 LOG : 518.08 519.58 1.5 Region : 1400
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 67 67 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
 Sorted : 233 Total catch: 989.23 Catch/hour: 2073.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	1849.69	4998	89.19	8
Sardinella maderensis	169.29	518	8.16	10
Scomber japonicus	27.71	134	1.34	9
Sphyræna sphyræna	13.27	44	0.64	
Euthynnus alletteratus	4.99	27	0.24	
Trachinotus ovatus	4.82	19	0.23	
Echeneis naucrates	2.22	8	0.11	
Loligo vulgaris	1.87	8	0.09	
Total	2073.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 7
 DATE :23/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°4.30
 start stop duration Lon W 17°13.21
 TIME :22:31:20 22:43:49 12.5 (min) Purpose : 1
 LOG : 538.02 538.74 0.7 Region : 1400
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 37 38 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 152 Total catch: 1262.67 Catch/hour: 6070.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	5195.10	64784	85.58	
Brachydeuterus auritus	568.13	5731	9.36	
Trachurus trecae	117.40	601	1.93	13
Sardinella maderensis	54.90	481	0.90	12
Pomadasys incisus	37.64	240	0.62	
Caranx rhonchus	27.64	159	0.46	11
Galeoides decadactylus	23.65	120	0.39	
Sphyræna guachancho	23.65	82	0.39	
Selene dorsalis	13.61	120	0.22	
Pagellus bellottii	8.80	38	0.14	
Total	6070.53		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 8
 DATE :24/10/15 GEAR TYPE: PT NO: 7 POSITION:Lat N 13°10.64
 start stop duration Lon W 17°1.79
 TIME :01:09:59 01:25:24 15.4 (min) Purpose : 1
 LOG : 559.49 560.27 0.8 Region : 1400
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 21 21 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 207 Total catch: 206.59 Catch/hour: 803.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	531.13	5432	66.07	
Brachydeuterus auritus	237.35	2529	29.53	
Sardinella maderensis	20.39	171	2.54	15
Alectis alexandrinus	5.80	16	0.72	
Carlaris heudelotii	2.76	19	0.34	
Caranx rhonchus	2.14	19	0.27	14
Pomadasys incisus	2.02	12	0.25	
Sardinella aurita	1.36	12	0.17	
Galeoides decadactylus	0.74	4	0.09	
Penaeus notialis	0.16	8	0.02	
Total	803.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 9
 DATE :24/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°14.77
 start stop duration Lon W 17°15.86
 TIME :03:28:33 03:58:29 29.9 (min) Purpose : 1
 LOG : 576.89 578.38 1.5 Region : 1400
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 48 50 Validity : 0
 Towing dir: 0° Wire out : 140 m Speed : 3.0 kn
 Sorted : 9 Total catch: 8.69 Catch/hour: 17.41

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	6.97	36	40.05	
Chloroscombrus chrysurus	2.99	32	17.15	
Sardinella maderensis	2.89	22	16.57	16
Trachurus trecae	1.60	10	9.21	
Sphyræna guachancho	0.78	2	4.49	
Scomber japonicus	0.70	4	4.03	
Brachydeuterus auritus	0.64	2	3.68	
Selene dorsalis	0.40	2	2.30	
Sardinella aurita, juvenile	0.22	206	1.27	
Auxis thazard thazard	0.18	2	1.04	
Sepia officinalis	0.04	2	0.23	
Total	17.41		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 10
 DATE :24/10/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 13°24.30
 start stop duration Lon W 17°19.19
 TIME :08:57:33 09:58:52 61.3 (min) Purpose : 1
 LOG : 624.04 627.01 3.0 Region : 1400
 FDEPTH: 30 50 Gear cond.: 0
 BDEPTH: 64 66 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.9 kn
 Sorted : 209 Total catch: 209.45 Catch/hour: 204.95

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SALPS	204.01	3335	99.54	
Trachinotus ovatus	0.85	4	0.42	
Engraulis encrasicolus	0.06	30	0.03	
Cynoponticus ferox, juvenile	0.01	1	0.00	
Priacanthus arenatus, juvenile	0.01	1	0.00	
Acanthurus - juvenile	0.00	5	0.00	
Total	204.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 11
 DATE :24/10/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°22.76
 start stop duration Lon W 17°6.65
 TIME :12:11:08 12:35:54 24.8 (min) Purpose : 1
 LOG : 645.73 647.03 1.3 Region : 1400
 FDEPTH: 34 34 Gear cond.: 0
 BDEPTH: 34 34 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 223 Total catch: 614.65 Catch/hour: 1488.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1136.05	6795	76.30	18
Brachydeuterus auritus	129.50	778	8.70	
Caranx rhonchus	125.89	312	8.46	17
Dactylopterus volitans	31.76	68	2.13	
Trichiurus lepturus	27.37	65	1.84	
Pagellus bellottii	20.18	187	1.36	
Carliarius heudelotii	15.38	27	1.03	
Chloroscombrus chrysurus	2.74	133	0.18	
Total	1488.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 12
 DATE :24/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°34.92
 start stop duration Lon W 17°8.94
 TIME :16:15:06 17:13:00 57.9 (min) Purpose : 1
 LOG : 674.02 677.49 3.5 Region : 1400
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 39 35 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
 Sorted : 54 Total catch: 54.39 Catch/hour: 56.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	38.03	104	67.48	
Chloroscombrus chrysurus	14.28	72	25.34	
Sardinella maderensis	1.70	8	3.02	20
Sardinella aurita	1.16	6	2.06	19
SALPS	0.85	37	1.51	
Caranx crysos	0.34	1	0.61	
Total	56.36		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 13
 DATE :25/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°44.86
 start stop duration Lon W 17°18.31
 TIME :00:38:03 00:58:35 20.5 (min) Purpose : 1
 LOG : 731.71 732.85 1.1 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 70 62 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.3 kn
 Sorted : 154 Total catch: 153.89 Catch/hour: 449.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SALPS	430.49	10010	95.72	
Trachurus trecae	10.38	170	2.31	23
Sardinella maderensis	4.24	23	0.94	21
Trachinotus ovatus	3.19	18	0.71	
Sardinella aurita	1.20	6	0.27	22
Chloroscombrus chrysurus	0.26	3	0.06	
Total	449.75		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 14
 DATE :25/10/15 GEAR TYPE: PT NO: 7 POSITION:Lat N 13°44.93
 start stop duration Lon W 17°4.61
 TIME :03:23:39 03:38:22 14.7 (min) Purpose : 1

LOG : 752.89 753.73 0.8 Region : 1300
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 31 29 Validity : 0
 Towing dir: 0° Wire out : 130 m Speed : 3.4 kn
 Sorted : 41 Total catch: 40.95 Catch/hour: 166.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	79.08	493	47.37	
Mustelus mustelus	30.29	33	18.14	
Sardinella maderensis	26.29	412	15.75	25
Sardinella aurita	11.94	94	7.16	24
Selene dorsalis	7.34	82	4.40	
Sphyræna guachancho	7.17	24	4.30	
Trachurus trecae	2.32	24	1.39	26
Trachinotus ovatus	1.39	4	0.83	
Pomadasys incisus	0.61	4	0.37	
Galeoides decadactylus	0.49	4	0.29	
Total	166.92		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 15
 DATE :25/10/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 14°2.15
 start stop duration Lon W 17°29.18
 TIME :10:56:13 11:26:26 30.2 (min) Purpose : 1
 LOG : 820.77 822.35 1.6 Region : 1300
 FDEPTH: 117 120 Gear cond.: 0
 BDEPTH: 117 120 Validity : 0
 Towing dir: 0° Wire out : 280 m Speed : 3.1 kn
 Sorted : 326 Total catch: 326.37 Catch/hour: 648.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Boops boops	562.46	7843	86.77	
Trachurus trecae	50.45	848	7.78	27
SALPS	6.89	131	1.06	
Antigonia capros	5.58	417	0.86	
Scomber japonicus	4.77	99	0.74	28
Brachydeuterus auritus	4.61	52	0.71	
Merluccius senegalensis	3.22	6	0.50	
Zeus faber	2.56	18	0.40	
Dentex angolensis	1.69	42	0.26	
G A S T R O P O D S	1.47	274	0.23	
Scorpaena scrofa	1.15	2	0.18	
Dentex macrophthalmus	1.05	26	0.16	
Trigla lyra	0.68	8	0.10	
Spherooides pachgaster	0.62	2	0.09	
Sea urchins (strong spines)	0.54	48	0.08	
Aulopus cadenati	0.36	2	0.06	
Capros aper	0.12	6	0.02	
Total	648.20		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 16
 DATE :25/10/15 GEAR TYPE: PT NO: 7 POSITION:Lat N 14°5.86
 start stop duration Lon W 17°8.52
 TIME :14:16:17 14:45:52 29.6 (min) Purpose : 1
 LOG : 848.60 850.49 1.9 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 30 31 Validity : 0
 Towing dir: 0° Wire out : 130 m Speed : 3.8 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 17
 DATE :25/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°5.17
 start stop duration Lon W 17°6.15
 TIME :15:42:55 16:31:32 48.6 (min) Purpose : 1
 LOG : 856.22 859.09 2.9 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 26 28 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 201 Total catch: 201.27 Catch/hour: 248.33

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	225.58	2390	90.84	
Sardinella aurita	10.94	53	4.41	29
Trachinotus ovatus	4.50	26	1.81	
Sardinella maderensis	3.22	20	1.30	30
Selene dorsalis	2.48	30	1.00	
Alectis alexandrinus	1.46	1	0.59	
Caranx rhonchus	0.10	1	0.04	31
Sepia officinalis	0.05	1	0.02	
Total	248.33		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 18
 DATE :25/10/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 14°16.60
 start stop duration Lon W 17°24.44
 TIME :20:29:25 21:04:37 35.2 (min) Purpose : 1
 LOG : 892.09 893.80 1.7 Region : 1300
 FDEPTH: 30 45 Gear cond.: 0
 BDEPTH: 83 77 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.9 kn
 Sorted : 90 Total catch: 89.50 Catch/hour: 152.56

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SALPS	89.83	1834	58.88	
Trachurus trecae	60.34	598	39.55	32
Scomber japonicus	1.82	12	1.20	33
Chloroscombrus chrysurus	0.36	3	0.23	
Saurida brasiliensis	0.14	22	0.09	
Selene dorsalis, juvenile	0.03	9	0.02	
Ariomma bondi, juvenile	0.03	2	0.02	
Total	152.56		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 19
 DATE :26/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°26.43
 start stop duration Lon W 17°21.62
 TIME :01:24:36 01:52:42 28.1 (min) Purpose : 1
 LOG : 931.33 932.94 1.6 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 64 55 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 226 Total catch: 1809.28 Catch/hour: 3864.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	3290.62	26555	85.15	37
SALPS	197.71	7314	5.12	
Sardinella maderensis	137.39	854	3.56	34
Sardinella aurita	94.33	530	2.44	35
Scomber japonicus	93.98	410	2.43	36
Sarda sarda	34.69	34	0.90	
Auxis thazard thazard	15.21	51	0.39	
Chloroscombrus chrysurus	0.68	103	0.02	
Total	3864.61		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 20
 DATE :26/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°34.14
 start stop duration Lon W 17°17.38
 TIME :08:08:08 08:53:58 45.8 (min) Purpose : 1
 LOG : 961.99 964.41 2.4 Region : 1300
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 35 34 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 10 Total catch: 10.28 Catch/hour: 13.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Rhizoprionodon acutus	6.11	5	45.43	
SALPS	3.51	76	26.07	
Alectis alexandrinus	3.33	7	24.71	
Dactylopterus volitans	0.47	1	3.50	
Acanthurus - juvenile	0.01	1	0.10	
Selene dorsalis	0.01	1	0.10	
Sepia officinalis	0.01	1	0.10	
Total	13.46		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 21
 DATE :26/10/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 14°49.82
 start stop duration Lon W 17°33.21
 TIME :15:29:08 15:59:54 30.8 (min) Purpose : 1
 LOG : 1021.02 1022.74 1.7 Region : 1300
 FDEPTH: 139 127 Gear cond.: 0
 BDEPTH: 139 127 Validity : 0
 Towing dir: 0° Wire out : 350 m Speed : 3.3 kn
 Sorted : 484 Total catch: 2946.64 Catch/hour: 5745.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Antigonia capros	4057.85	65932	70.62	
Capros aper	803.79	17243	13.99	
Boops boops	417.29	2584	7.26	
Ijimaia loppei	195.39	14	3.40	
Trachurus trecae	119.04	2855	2.07	38
Merluccius senegalensis	63.18	51	1.10	
Sphaeroides pachgaster	43.25	33	0.75	
Pontinus kuhlii	14.86	152	0.26	
Oxymotus centrina	7.60	2	0.13	
Pterothrissus belloci	7.59	68	0.13	
Echinocardium sp.	3.20	33	0.06	
Peristedion cataphractum	2.87	51	0.05	
Zeus faber	2.13	6	0.04	0
Chelidonichthys gabonensis	1.83	18	0.03	
Todarodes sagittatus	1.54	8	0.03	
Colloconger cadenati	0.99	18	0.02	
Raja miraletus	0.90	4	0.02	
Citharus linguatula	0.66	18	0.01	
Dentex angolensis	0.64	6	0.01	
Bembrops heterurus	0.51	4	0.01	
Ariomma bondi	0.31	2	0.01	
Holothuria scabra	0.21	2	0.00	
Zeus faber	0.08	2	0.00	
Scorpaena scrofa	0.06	2	0.00	
Arnoglossus imperialis	0.04	10	0.00	
Fishing gears	0.00	2	0.00	
Total	5745.80		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 22
 DATE :26/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°57.10
 start stop duration Lon W 17°18.36
 TIME :23:24:19 23:49:49 25.5 (min) Purpose : 1

LOG : 1079.49 1080.91 1.4 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 159 125 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 0 Total catch: 1619.70 Catch/hour: 3812.55
 SPECIES CATCH/HOUR % OF TOT. C SAMP

SPECIES	weight	numbers	CATCH/HOUR	% OF TOT. C	SAMP
Trichiurus lepturus	3764.54	40524	98.74		
SALPS	30.79	1017	0.81		
Mustelus mustelus	14.55	14	0.38		
Trachinotus ovatus	2.54	14	0.07		
Sepia officinalis	0.14	14	0.00		
Total	3812.55		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 23
 DATE :27/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°2.91
 start stop duration Lon W 17°11.60
 TIME :03:41:00 04:14:54 33.9 (min) Purpose : 1
 LOG : 1114.22 1116.00 1.8 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 100 98 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
 Sorted : 88 Total catch: 88.35 Catch/hour: 156.28
 SPECIES CATCH/HOUR % OF TOT. C SAMP

SPECIES	weight	numbers	CATCH/HOUR	% OF TOT. C	SAMP
Trichiurus lepturus	67.39	1702	43.12		
Brachydeuterus auritus	65.63	189	41.99		
SALPS	10.75	440	6.88		
Trachurus trecae	6.35	221	4.06		39
Ariomma bondi	2.25	28	1.44		
Chlorophthalmus atlanticus	1.34	210	0.86		
Sarda sarda	0.90	2	0.58		
Auxis thazard thazard	0.62	4	0.40		
Loligo vulgaris	0.48	4	0.31		
Scomber japonicus	0.34	2	0.22		40
Illex coindetii	0.12	5	0.08		
Sepia officinalis	0.11	4	0.07		
Total	156.28		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 24
 DATE :27/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°17.90
 start stop duration Lon W 16°54.09
 TIME :12:09:11 12:59:39 50.5 (min) Purpose : 1
 LOG : 1188.85 1191.86 3.0 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 37 42 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
 Sorted : 279 Total catch: 278.68 Catch/hour: 331.37
 SPECIES CATCH/HOUR % OF TOT. C SAMP

SPECIES	weight	numbers	CATCH/HOUR	% OF TOT. C	SAMP
Chloroscombrus chrysurus	178.60	1618	53.90		
Trachinotus ovatus	96.43	596	29.10		
Sardinella aurita	26.33	65	7.94		41
Alectis alexandrinus	11.77	7	3.55		
Sardinella maderensis	7.16	48	2.16		42
Brachydeuterus auritus	3.32	26	1.00		
Pomadasys perotaei	1.94	5	0.58		
Stromateus fiatola	1.76	2	0.53		
Lagocephalus laevigatus	1.46	2	0.44		
Caranx rhonchus	1.07	4	0.32		43
Selene dorsalis	0.62	14	0.19		
Sarda sarda	0.59	1	0.18		
Fistularia tabacaria	0.26	2	0.08		
Saurida brasiliensis	0.06	13	0.02		
Total	331.37		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 25
 DATE :27/10/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 15°20.82
 start stop duration Lon W 16°52.82
 TIME :14:02:25 14:19:19 16.9 (min) Purpose : 1
 LOG : 1199.29 1200.24 1.0 Region : 1300
 FDEPTH: 36 38 Gear cond.: 0
 BDEPTH: 36 38 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 91 Total catch: 90.87 Catch/hour: 322.61
 SPECIES CATCH/HOUR % OF TOT. C SAMP

SPECIES	weight	numbers	CATCH/HOUR	% OF TOT. C	SAMP
Jellyfish	207.34	43	64.27		
Brachydeuterus auritus	38.91	415	12.06		
Squatina oculata	26.91	4	8.34		
Pseudupeneus prayensis	8.98	85	2.78		
Umbriina canariensis	6.96	89	2.16		
Trichiurus lepturus	4.69	124	1.45		
Octopus vulgaris	3.51	21	1.09		
SALPS	3.34	78	1.03		
Citharus linguatula	3.34	121	1.03		
Raja miraletus	3.05	4	0.95		
Penaeus notialis	2.80	135	0.87		
Epinephelus aeneus	2.70	32	0.84		
Pentheroscion mbizi	2.20	32	0.68		
Selene dorsalis	1.88	53	0.58		
Pomadasys jubelini	1.49	4	0.46		
Carlarinus heudelotii	1.28	4	0.40		
Caranx rhonchus	1.24	4	0.39		44
Bembrops heterurus	0.67	18	0.21		
Torpedo torpedo	0.60	11	0.19		
Brotula barbata	0.25	4	0.08		
Sphyræna guachancho	0.21	7	0.07		
Blennius normani	0.14	78	0.04		
Antennarius striatus	0.11	4	0.03		
Fishing gears	0.00	4	0.00		
Total	322.61		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 26
 DATE :27/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°36.29
 start stop duration Lon W 16°46.62
 TIME :20:46:46 21:32:40 45.9 (min) Purpose : 1
 LOG : 1259.96 1262.26 2.3 Region : 1300
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 37 40 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
 Sorted : 362 Total catch: 1041.61 Catch/hour: 1361.58
 SPECIES CATCH/HOUR % OF TOT. C SAMP

SPECIES	weight	numbers	CATCH/HOUR	% OF TOT. C	SAMP
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Brachydeuterus auritus	707.84	6554	51.99
Pomadasys jubelini	401.57	549	29.49
Chloroscombrus chrysurus	99.78	988	7.33
Trichiurus lepturus	60.13	207	4.42
Trachinotus ovatus	20.67	226	1.52
Caranx rhonchus	20.44	56	1.50
Alectis alexandrinus	14.95	16	1.10
Trachurus trecae	12.63	102	0.93
Stromateus fiatola	7.56	8	0.55
Sardinella maderensis	5.59	176	0.41
Sarda sarda	2.52	4	0.19
Selene dorsalis	2.14	26	0.16
Sardinella aurita	1.92	12	0.14
Ilisha africana	1.62	16	0.12
Jellyfish	1.39	4	0.10
Selar crumenophthalmus	0.82	4	0.06
Total	1361.58		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 27
 DATE :28/10/15 GEAR TYPE: PT NO: 7 POSITION:Lat N 15°44.00
 start stop duration Lon W 16°39.04
 TIME :00:09:42 00:47:06 37.4 (min) Purpose : 1
 LOG : 1280.51 1282.58 2.1 Region : 1300
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 24 28 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 334 Total catch: 334.03 Catch/hour: 535.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	237.29	1729	44.29	
Trichiurus lepturus	166.72	935	31.12	
Stromateus fiatola	50.60	26	9.45	
Galeoides decadactylus	44.51	88	8.31	
Sardinella maderensis	14.34	824	2.68	49
Ilisha africana	6.34	99	1.18	
Pomadasys jubelini	3.79	11	0.71	
Selene dorsalis	2.79	21	0.52	
Selar crumenophthalmus	2.55	10	0.48	
Sphyræna guachancho	2.26	6	0.42	
Chloroscombrus chrysurus	1.75	13	0.33	
Raja miraletus	1.03	2	0.19	
Pomatomus saltatrix	0.74	2	0.14	
Sepia officinalis	0.63	2	0.12	
Lagocephalus laevigatus	0.34	2	0.06	
Alectis alexandrinus	0.08	2	0.01	
Total	535.73		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 28
 DATE :28/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°49.53
 start stop duration Lon W 16°58.22
 TIME :03:16:43 04:00:20 43.6 (min) Purpose : 1
 LOG : 1303.14 1305.66 2.5 Region : 1300
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 121 249 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 461 Total catch: 460.80 Catch/hour: 633.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SALPS	629.09	17752	99.25	
Scomber japonicus	2.63	28	0.41	50
Caranx rhonchus	0.81	1	0.13	51
Pomadasys rogeri	0.72	1	0.11	
Pomadasys jubelini	0.52	1	0.08	
Sepia officinalis	0.04	4	0.01	
Selene dorsalis	0.03	7	0.00	
Total	633.84		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 29
 DATE :28/10/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°1.81
 start stop duration Lon W 17°4.62
 TIME :19:26:15 19:37:23 11.1 (min) Purpose : 1
 LOG : 1420.68 1421.18 0.5 Region : 1300
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 38 32 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.7 kn
 Sorted : 380 Total catch: 742.48 Catch/hour: 4002.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	1581.78	4868	39.52	
Sardinella aurita	759.14	3094	18.97	55
Caranx rhonchus	541.51	2668	13.53	54
Trachurus trecae	457.14	3520	11.42	52
Pomadasys rogeri	373.80	237	9.34	
Sphyræna guachancho	190.84	248	4.77	
Sardinella maderensis	40.27	1935	1.01	53
Trichiurus lepturus	29.92	668	0.75	
Scomber japonicus	8.52	38	0.21	56
Selene dorsalis	5.18	49	0.13	
Pomadasys jubelini	4.47	16	0.11	
Alloteuthis africana	3.77	367	0.09	
JELLYFISH	3.23	5	0.08	
Boops boops	1.78	237	0.04	
Sepia officinalis	1.24	11	0.03	
Total	4002.59		100.00	

Annex II Description of instruments and fishing gear

Acoustic instruments

The Simrad EK60/18, 38, 120 and 200 kHz scientific sounder was run during the survey only for observation of fish and bottom conditions. No scrutinizing of the recordings was done. Last standard sphere calibrations was checked on the 07.07.2013 in Baía dos Elefantes using Cu-64, Cu-60, WC-38.1 and WC-38.1 spheres for 18, 38, 120 and 200 kHz, respectively. The details of the settings for the 38 kHz echo sounder were as follows:

Transceiver-2 menu (38 kHz)

Transducer depth	5,50 m
Absorbtion coeff.	9.6 dB/km
Pulse duration	medium (1,024ms)
Bandwidth	2.43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
gain	25,11 dB
SA correction	-0.60 dB
Angle sensitivity	21.9
3 dB beamwidth	7.43° along ship
	7.38° athwardship
Alongship offset	0.06°
Athwardship offset	0.04°

Bottom detection menu Minimum level -40 dB

Fishing gear

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

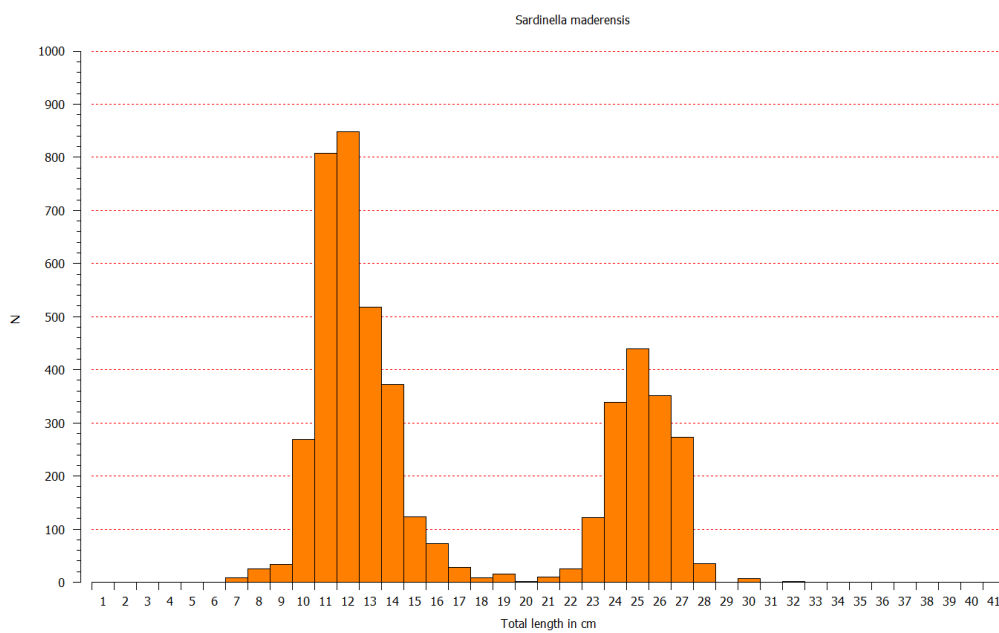
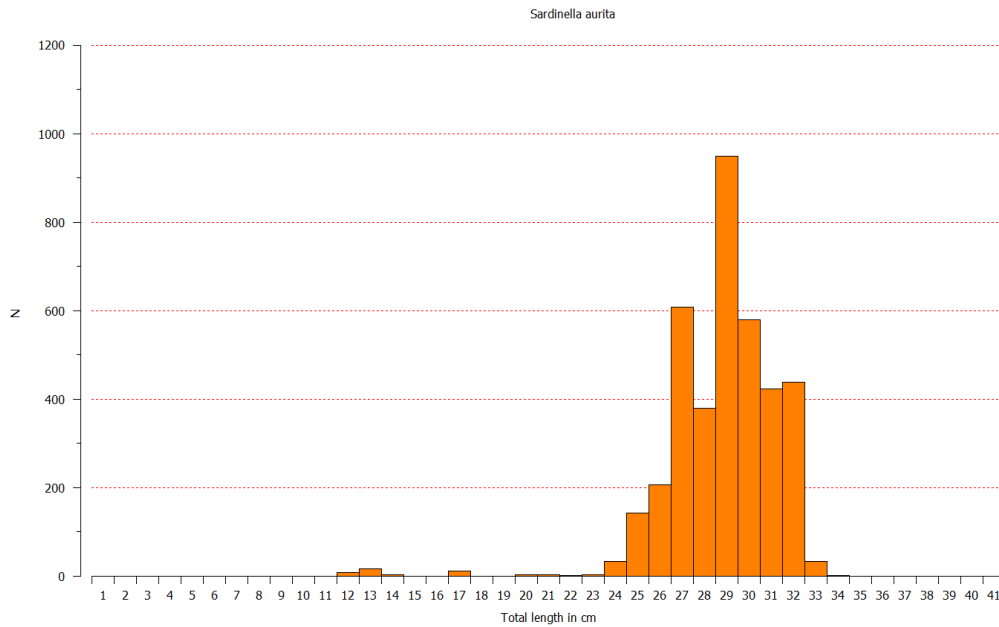
The bottom trawl has a 31 m headline and a 47 m footrope fitted with a 12" rubber bobbins gear. The codend has 20 mm meshes, and has an inner net with 10 mm mesh size. The vertical opening is about 5.5 m. The distance between the wing tips is about 18 m during towing. The sweeps are 40 m long. The trawl doors are 'Thyborøen' combi, 8 m² and weigh 2000 kg. The door spreading is about 45 m when using restraining rope. Trawling was conducted for species identification only and no restraining rope was therefore used during the survey.

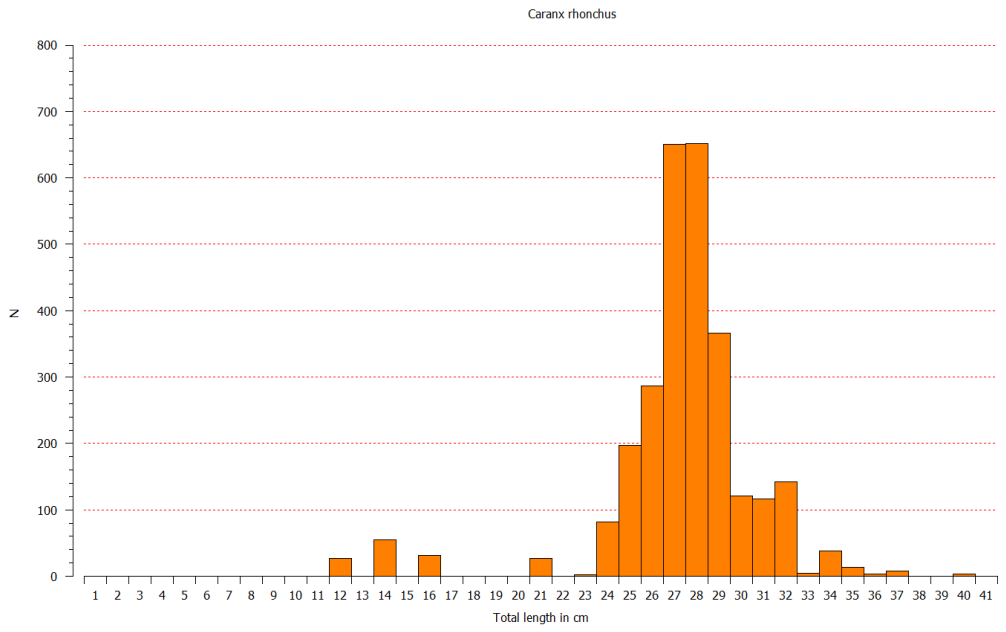
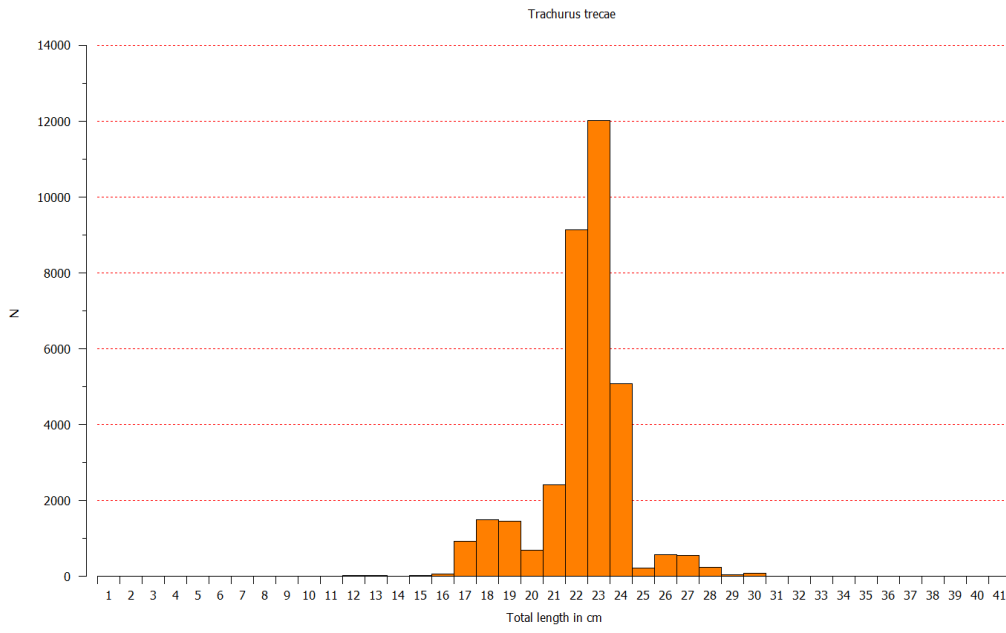
The SCANMAR system was used during all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their distance and a height sensor is fitted on the bottom trawl to measure the trawl opening and provide information on clearance and bottom contact.

The pelagic trawls are equipped with a trawl eye that provides information about the trawl opening and the distance of the footrope to the bottom. A pressure sensor is used to show the depth on the headline.

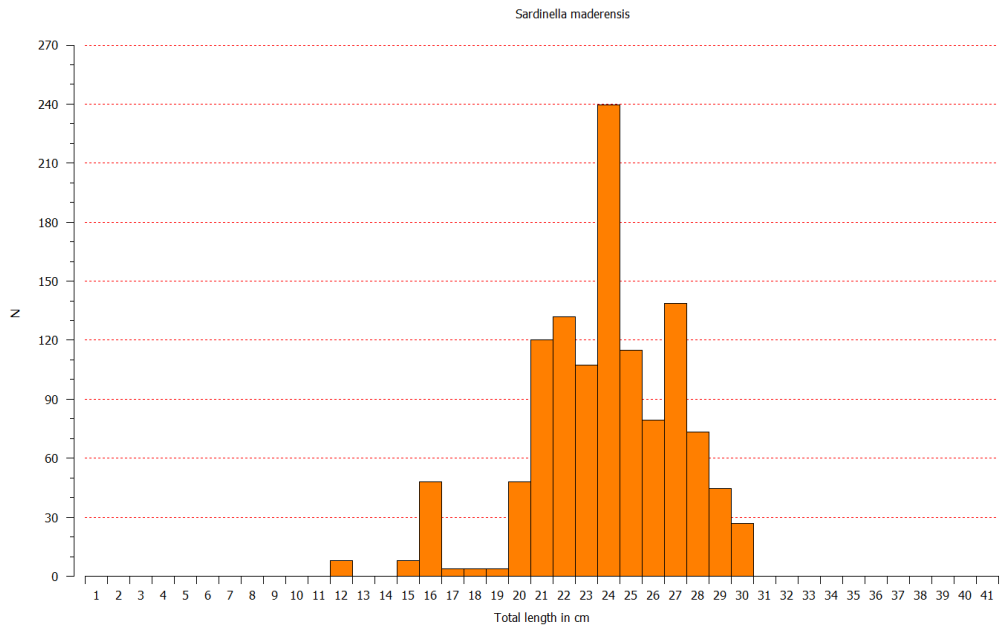
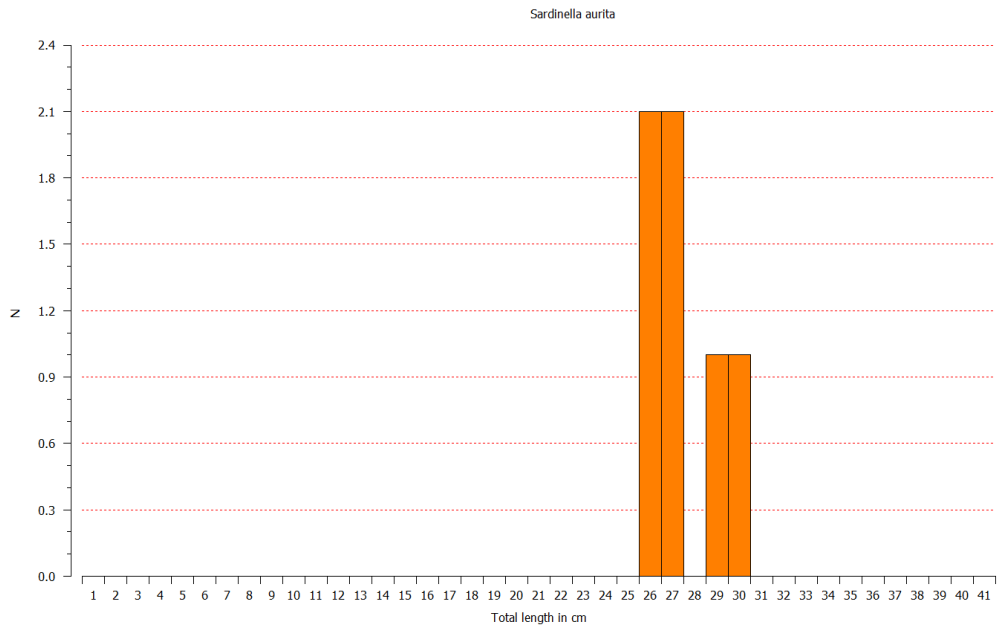
ANNEX III. Pooled length distributions by species, Senegal and The Gambia

Senegal

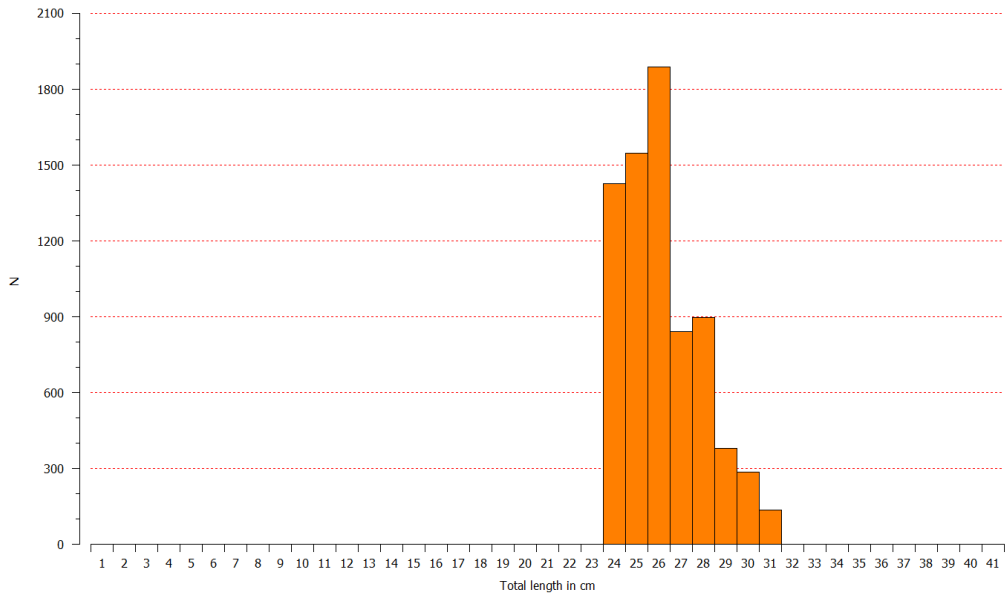




The Gambia



Trachurus trecae



ANNEX IV Estimated number and biomass by length-group and sectors

Round sardinella (*Sardinella aurita*)

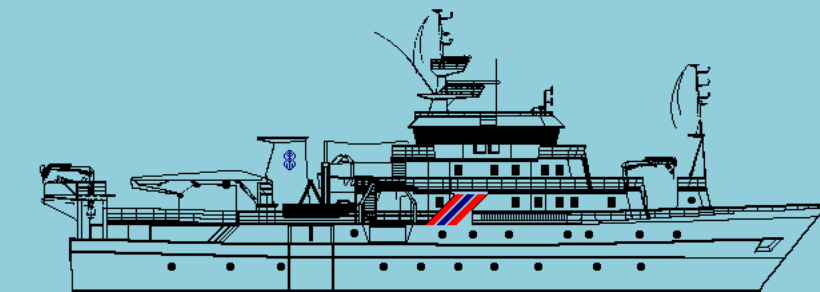
Number in millions						Biomass in 1 000 Tons					
Length (cm)	Casamance	The Gambia	Gambia-C. Vert	C. Vert-St-Louis	TOTAL	Length (cm)	Casamance	The Gambia	Gambia-C. Vert	C. Vert-St-Louis	TOTAL
5						5					
6						6					
7						7					
8						8					
9						9					
10						10					
11						11					
12		2	4		6	12		0.1	0.1		0.1
13		5	8		12	13		0.1	0.2		0.4
14		1	2		3	14		0.0	0.1		0.1
15						15					
16						16					
17		4	6		9	17		0.2	0.3		0.5
18						18					
19						19					
20		1	2		3	20		0.1	0.2		0.3
21				2	2	21				0.2	0.2
22				1	1	22				0.1	0.1
23		1	2		3	23		0.1	0.2		0.4
24			6		6	24			0.8		0.8
25		4	34		38	25		0.6	5.1		5.7
26		47	45	8	100	26		7.7	7.5	1.3	16.4
27		63	95	22	181	27		11.4	17.6	4.0	32.9
28		41	68	16	125	28		8.1	13.8	3.1	25.1
29		55	20	27	102	29		12.0	4.4	5.8	22.2
30		17	8	14	39	30		4.0	1.9	3.3	9.3
31			7	8	15	31			1.8	2.0	3.8
32		3	4	8	16	32		0.9	1.1	2.3	4.3
33				1	1	33				0.2	0.2
34				1	1	34				0.3	0.3
35						35					
36						36					
37						37					
38						38					
39						39					
40						40					
TOTAL		245	310	109	664	TOTAL		45.3	55.2	22.5	123.1

Flat sardinella (*Sardinella maderensis*)

Number in millions						Biomass in 1 000 Tons					
Length (cm)	Casamance	The Gambia	Gambia-C. Vert	C. Vert-St- Louis	TOTAL	Length (cm)	Casamance	The Gambia	Gambia-C. Vert	C. Vert-St- Louis	TOTAL
5				4	4	5				0.0	0.0
6				12	12	6				0.0	0.0
7				14	14	7				0.1	0.1
8				12	12	8				0.1	0.1
9				9	9	9				0.1	0.1
10		1	2	6	10	10				0.1	0.1
11		10	15	14	39	11		0.2	0.3	0.2	0.7
12		28	35	26	88	12		0.6	0.8	0.6	2.0
13		16	25	26	66	13		0.4	0.7	0.7	1.8
14		18	29	18	64	14		0.6	1.0	0.6	2.1
15		28	35	5	68	15		1.1	1.4	0.2	2.7
16		34	27	7	68	16		1.6	1.3	0.3	3.2
17		10	12	2	24	17		0.6	0.6	0.1	1.3
18		4	2	2	8	18		0.3	0.1	0.1	0.5
19		3		7	10	19		0.2		0.5	0.7
20	6	18			24	20	0.5	1.4			1.9
21	32	34		3	69	21	2.9	3.1		0.2	6.2
22	77	44	4	3	127	22	7.7	4.5	0.4	0.3	12.9
23	249	68	6		322	23	28.1	7.7	0.7		36.5
24	262	141	64	4	471	24	33.0	17.9	8.3	0.5	59.6
25	109	148	77	18	352	25	15.2	20.8	11.1	2.5	49.7
26	110	56	37	10	213	26	16.9	8.7	6.0	1.5	33.1
27	38	33	33	3	106	27	6.5	5.6	5.7	0.5	18.3
28	18	54	5	3	79	28	3.4	10.1	0.9	0.5	14.9
29		1			1	29		0.2			0.2
30	2	1			3	30	0.5	0.1			0.6
31						31					
32				1	1	32				0.2	0.2
33						33					
34						34					
35						35					
36						36					
37						37					
38						38					
39						39					
40						40					
TOTAL	903	747	407	205	2263	TOTAL	114.6	85.7	39.3	9.9	249.5

Cunene horse mackerel (*Trachurus trecae*)

Number in millions						Biomass in 1 000 Tons					
Length (cm)	Casamance	The Gambia	Gambia-C. Vert	C. Vert-St- Louis	TOTAL	Length (cm)	Casamance	The Gambia	Gambia-C. Vert	C. Vert-St- Louis	TOTAL
5				4	4	5				0.0	0.0
6				12	12	6				0.0	0.0
7				14	14	7				0.1	0.1
8				12	12	8				0.1	0.1
9				9	9	9				0.1	0.1
10		1	2	6	10	10				0.1	0.1
11		10	15	14	39	11		0.2	0.3	0.2	0.7
12		28	35	26	88	12		0.6	0.8	0.6	2.0
13		16	25	26	66	13		0.4	0.7	0.7	1.8
14		18	29	18	64	14		0.6	1.0	0.6	2.1
15		28	35	5	68	15		1.1	1.4	0.2	2.7
16		34	27	7	68	16		1.6	1.3	0.3	3.2
17		10	12	2	24	17		0.6	0.6	0.1	1.3
18		4	2	2	8	18		0.3	0.1	0.1	0.5
19		3		7	10	19		0.2		0.5	0.7
20	6	18			24	20	0.5	1.4			1.9
21	32	34		3	69	21	2.9	3.1		0.2	6.2
22	77	44	4	3	127	22	7.7	4.5	0.4	0.3	12.9
23	249	68	6		322	23	28.1	7.7	0.7		36.5
24	262	141	64	4	471	24	33.0	17.9	8.3	0.5	59.6
25	109	148	77	18	352	25	15.2	20.8	11.1	2.5	49.7
26	110	56	37	10	213	26	16.9	8.7	6.0	1.5	33.1
27	38	33	33	3	106	27	6.5	5.6	5.7	0.5	18.3
28	18	54	5	3	79	28	3.4	10.1	0.9	0.5	14.9
29		1			1	29		0.2			0.2
30	2	1			3	30	0.5	0.1			0.6
31						31					
32				1	1	32				0.2	0.2
33						33					
34						34					
35						35					
36						36					
37						37					
38						38					
39						39					
40						40					
TOTAL	903	747	407	205	2263	TOTAL	114.6	85.7	39.3	9.9	249.5



**SURVEY OF THE PELAGIC FISH RESOURCES OFF
NORTH WEST AFRICA**

Part II

MAURITANIA

31 October - 9 November 2015

Bergen, 2015



CRUISE REPORTS “DR FRIDTJOF NANSEN”

**SURVEY OF THE PELAGIC FISH RESOURCES OFF
NORTH WEST AFRICA**

Part II

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31 October - 9 November 2015

by

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CHAPTER 1 INTRODUCTION

1.1 Objective of the cruise

The general objectives of the survey were to estimate biomass and map the distribution of the small pelagic fish stocks off NW Africa (Morocco, Mauritania, Senegal and the Gambia) by hydro-acoustic methods and describe the hydrographic conditions there over a period of 50 days, in October-December 2015. For Mauritania the agreed objectives were as follows:

- To map the distribution and estimate the biomass for the main small pelagic fish using hydro-acoustic methods. The species of interest were: sardinellas (*Sardinella aurita*) and (*Sardinella maderensis*), sardine (*Sardina pilchardus*) horse mackerels (*Trachurus trachurus*) and (*T. trecae*), false scad (*Decapterus rhonchus*), and anchovy (*Engraulis encrasicolus*) and chub mackerel (*Scomber japonicus*).
- To identify and describe the size distribution of the target fish populations by midwater and bottom trawl sampling and process the catches by recording weight and number by species.
- Collect biological data and otoliths of the main target species, especially *Sardina pilchardus*, *Sardinella aurita*, *Sardinella maderensis* and *T. trecae*.
- To sample standard hydrographical transects for temperature, salinity and oxygen at every degree latitude, at about 17°00'N, 18°00'N, 19°00'N, 20°00'N and off Cape Blanc.
- To train local participants in acoustic survey methodology including fish identification and sampling, scrutinizing of echograms, acoustic abundance estimation and hydrographic sampling.

- To conduct an acoustic intercalibration with the Mauritanian research vessel “Al Awam”.

The time allocated for this part of the survey, off Mauritania, was 9 days.

1.2 Participation

Participating scientists were:

Institut Mauritanien de Recherches Océanographiques et des Pêches (IMROP), Mauritania:

Sid' Ahmed Hemed, Ba Lamba Mamadou, Gandéga Cheikhna (Team leader), Alioun Niang

Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), Senegal:

Madiabel Diop, Mamadou Ndiaye

Department of Fisheries (FD), The Gambia:

Baboucarr Senghore

Instituto Nacional de Investigação Pesqueira (INIP), Angola:

Domingas Nsaku

FAO, Rome, Italy:

Jessica Fuller

Institute of Marine Research (IMR), Norway:

Reidar Toresen (Cruise leader), Diana Zaera, Jan Frode Wilhelmsen and Inge Nymark

1.3 Narrative

The vessel departed from Dakar 12:00 UTC on the 31st October and steamed north to start the survey at the border between Senegal and Mauritania at St. Louis (16°00'N). The survey started off St. Louis at 08:00 UTC the next day. The vessel followed the standardized survey outline used in Mauritania with systematic parallel course tracks spaced about 10 NM

(nautical miles) apart, perpendicular to the depth isobaths. To cover the whole distribution area of pelagic fish, the shelf was covered from the 15 m isobath and offshore to the 500 m isobath. Trawling was done irregularly, either to identify echo registrations or to check ‘blindly’ if fish were mixed with the plankton in the upper layers of the water column. Pelagic trawl with floats was often used to catch fish close to the surface. A smaller pelagic trawl or the bottom trawl with floats was used for sampling pelagic fish in very shallow waters (depth less than 25 m).

The shelf and slope was covered from St. Louis at the border between Senegal and Mauritania to Cape Blanc. The vessel reached Cape Blanc and the end of the regular survey 7th November. The vessel then steamed to Nouakchott.

Course track and fishing stations are shown in Figure 1, while Table 1 show survey effort during the survey, including number of trawl stations and CTD casts. All data collected during the survey were made available to the participants.

Five transects with hydrographic profiles were carried out, at 17°00’ N, 18°00’N - at Nouakchott, 19°00’ - south of Cape Timiris, 20°00’N outside Banc D’arguin, and at 20°50’ N - Cape Blanc.

Table 1. Summary of survey effort by regions, including number of demersal (BT) and pelagic (PT) trawl hauls, CTD casts, and distance surveyed (log), disregarding the steaming from St. Louis to Cape Timiris Cape Timiris to Cape Blanc (NM sailed).

	BT	PT	Tot hauls	CTD	NM sailed
St Louis – Cape Timiris		17	17	19	785
Cape Timiris – Cap Blanc	1	7	8	6	440
Total	1	24	25	25	1227

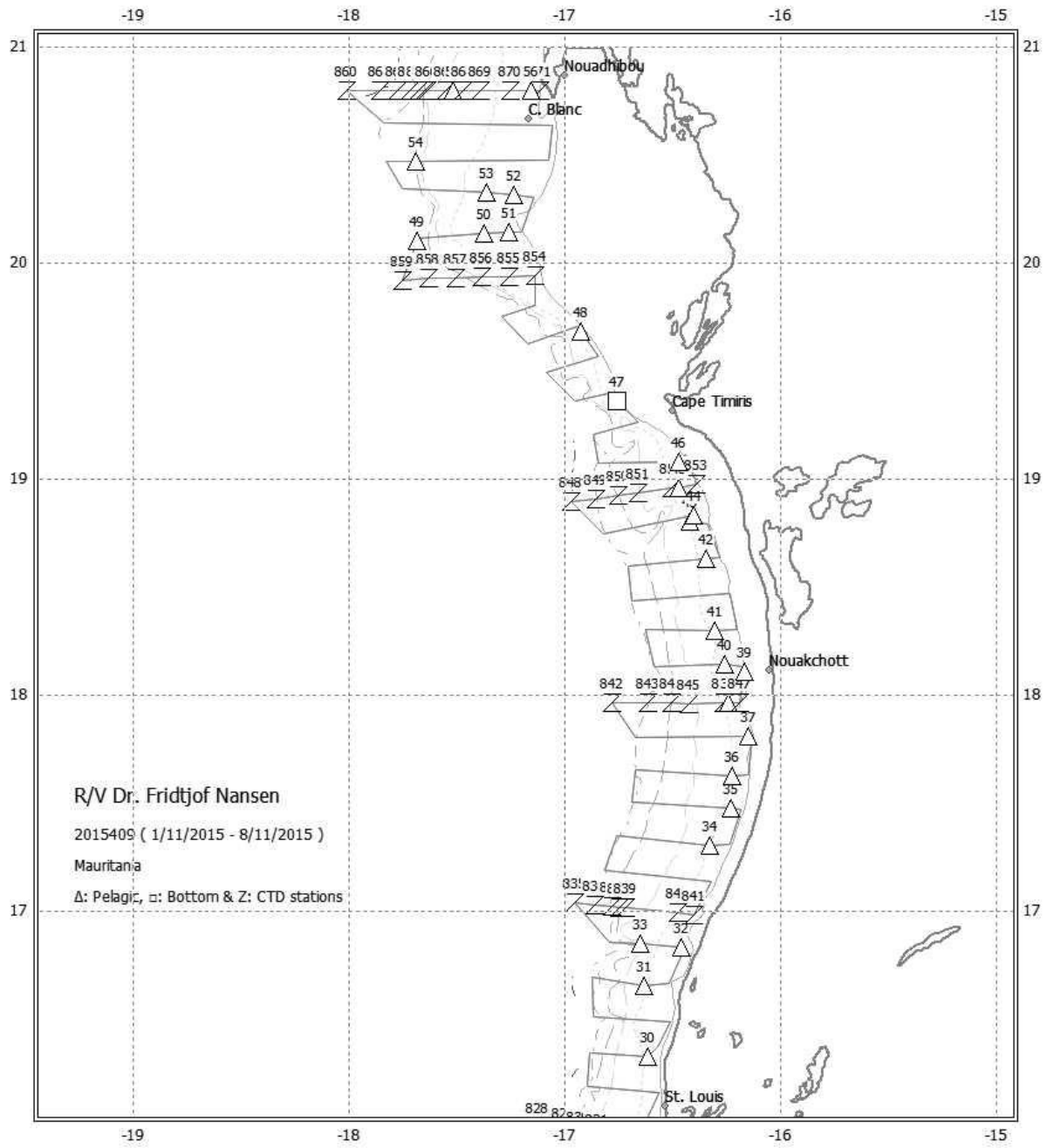


Figure 1. Course tracks with fishing and hydrographic stations; St. Louis to Cape Blanc

CHAPTER 2 METHODS

2.1 Environmental Data

A Seabird 911+ CTD probe was used to obtain vertical profiles of the temperature, salinity and oxygen. Real time logging was carried out using the PC based Seabird Seasave software. CTD casts were conducted along the cruise track in transects at about every one degree latitude. The casts were stopped a few meters above the bottom, and at a maximum of 500 m depth. Two water samples, one near the surface and the other near the bottom, were collected using *Niskin* bottles at stations corresponding to the standard profiles. The samples were analysed for dissolved oxygen using the Winkler method in order to calibrate the oxygen sensor. Salinity of water samples was used to calibrate the salinity sensor using the Guildline Portasal salinometer. The salinity sensor on the CTD was stable and it was not necessary to apply any correction factor.

A total of 48 samples were accepted for oxygen calibration . A linear regression of the Winkler determinations on the CTD values produced the correction:

$$O_{2\text{corrected}} = a \cdot O_{2\text{recorded}} + b \quad (1)$$

where $a = 0.952$ and $b = 0.2033$

Sea surface salinity and relative temperature was continuously measured using a SBE 21 Seacat Thermosalinograph.

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

2.2 Biological sampling

Biological sampling of the fish was carried out using trawls. A pelagic trawl with floats was often used. A smaller pelagic trawl or the bottom trawl with floats was used for sampling the pelagic fish in very shallow waters (depth less than 25 m). Annex II gives a description of the instruments and the fishing gear used. All catches were sampled for composition by weight and numbers of each species caught. Species identification was based on the FAO Species Guides. Length frequency distributions, by total fish length in cm, of the selected target species were taken in all the stations where they were present. Individual weight measurements were taken regularly to estimate the condition factor in the length-weight relationship:

$$\bar{w} = \frac{cond}{100} \cdot L^3$$

The specific condition factors obtained from the samples and applied for this survey were: 0.96 for sardinellas and horse mackerels.

For the estimation of the biomass of carangids and associated species, an overall average length of 23 cm and a condition factor of 0.88 (to calculate the mean length of this length group) were applied. The target groups used for Mauritania can be found in Table 2, while the complete records of fishing stations and catches are shown in Annex I.

Table 2. Allocation of acoustic densities to taxii. Note that for the groups of sardinella, horse mackerel, and pilchard all encountered species are listed, while only examples are listed for the remaining groups.

Group	Taxon	Species		
Sardinella	<i>Sardinella</i> sp.	<i>S. aurita</i> <i>S. maderensis</i>		
Horse mackerel	<i>Trachurus</i> sp.	<i>T. trecae</i> <i>T. trachurus</i>		
Sardine	Sardinops	<i>S. pilchardus</i>		
Pelagic species 1	Clupeiformes ₁	<i>Ilisha africana</i> <i>Engraulis encrasicolus</i>		
Pelagic species 2	Carangidae ₂	<i>Selene dorsalis</i> <i>Chloroscombrus chrysurus</i> <i>Decapterus rhonchus</i> <i>Alectis alexandrinus</i>		
Little tuny	Scombridae	<i>Euthynnus alletteratus</i> <i>Sarda sarda</i> <i>Scomber japonicus</i>		
		Sphyraenidae	<i>Sphyraena guachancho</i> <i>Trichiurus lepturus</i>	
	Others	<i>Zeus faber</i>		
	Other demersal species	Sparidae ₃	<i>Dentex angolensis</i> <i>D. macrophthalmus</i> <i>D. congoensis</i> <i>D. canariensis</i> <i>D. barnardi</i> <i>Pagellus bellottii</i> <i>Sparus caeruleostictus</i> <i>S. pagrus africanus</i>	
Big-eye grunt	Other taxii	<i>Pseudupeneus prayensis</i> <i>Brachydeuterus auritus</i> <i>Arioma bondi</i> <i>Pomadasys incisus</i> <i>Galeoides decadactylus</i>		
		Mesopelagic species	Myctophidae ₃ Other mesopelagic fish	
		Plankton	Calanoidae	<i>Calanus</i> sp.
			Euphausiidae	<i>Meganyctiphanes</i> sp.
			Other plankton	

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

2.3 Acoustic sampling

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 survey was started without *a priori* calibration. Acoustic data were logged and post-processed using the latest acoustic data post-processing software, the Large Scale Survey System (LSSS) Version 1.25. The technical specifications and operational settings of the echo sounder used during the survey are given in Annex II.

In cases where the target category of fish contains more than one species (sardinellas and horse mackerels), the mean s_A -value allocated to the category is divided between the species in the same ratio as their contribution to the mean back scattering strength in the length frequency samples.

The following target strength (TS) function was applied to convert s_A -values (mean integrator value for a given species or group of species in a specified area) to number of fish:

$$TS = 20 \log L - 72 \text{ dB}$$

Which can be converted (see Toresen *et al.* 1998 for details) to the area form (scattering cross sections of acoustic targets):

$$C_{Fi} = 1.26 \cdot 10^6 L^{-2}$$

where L is total length in 1 cm length group i and C_{Fi} (m^{-2}) is the reciprocal back scattering strength, or so-called fish conversion factor. In order to split and convert the allocated s_A -values (m^2/NM^2) to fish densities (numbers per length group per NM^2), the following formula was used:

$$\rho_i = s_A \cdot \frac{p_i}{\sum_{i=1}^n \frac{p_i}{C_{Fi}}}$$

were

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 integrator outputs were split in fish groups using a combination of behaviour pattern as deduced from echo diagrams, the LSSS analysis and catch composition as described below. The following groups were used for Senegal: 1) sardinellas, 2) horse mackerels, 3) carangids and associated species, and 4) demersal fish.

The above equations show that the conversion from s_A -values to number of fish is dependent on the length composition of the fish. It is therefore important to get representative length distributions from the stock in the whole distribution area.

When the size classes (of e.g. young fish and older fish) are well mixed, the various length distributions can be pooled together with equal importance. Otherwise, when the size classes are segregated, the total distribution area has to be post-stratified, according to the length distributions, and separate estimates are made for the regions containing fish with equal size.

For a region representing a distribution of a target-specie, the following basic data are needed for the estimation of abundance;

1) the average s_A -value for the region,

- 2) the surface (usually square nautical miles, NM²), and
- 3) a representative length distribution of the fish in the region.

If the targeted fish is a mixture of more than one species, for example sardinellas, a representative distribution of the two, within the region, as shown in the trawl catches, are used. A length distribution representing the number of the two species for each catch will have to be calculated. Thereafter, these distributions have to be normalized to a unit number (usually 100) so they are equally weighted.

A systematic approach to a) divide the s_A -value between species in a category of fish (e.g. *Sardinella aurita* and *S. maderensis*), b) produce pooled length distributions of a target species for use in the above equation and c) calculate the biomass estimates for a region, is obtained through the following procedure:

The samples of the species in the category (e.g. sardinellas) are respectively pooled together with equal importance (normalized).

The mean back scattering strength (ρ/s_A) of each length frequency distribution of the target species is calculated and summed. This is automatically done in the Excel spread-sheet made available for acoustic abundance estimation onboard RV “Dr. Fridtjof Nansen”, provided the data are punched in this sheet.

The mean s_A -value allocated to the category of fish in the region is divided between the species in the same ratio as their relative contribution to the mean back scattering strength of the length groups in the sample representing the region

The pooled length distribution is used, together with the mean s_A -value, to calculate the density (numbers per square NM) by length groups and species, using the above formula. The total number by length group in the area is obtained by multiplying each number by the area. The numbers are then converted to biomass using the estimated weight at length.

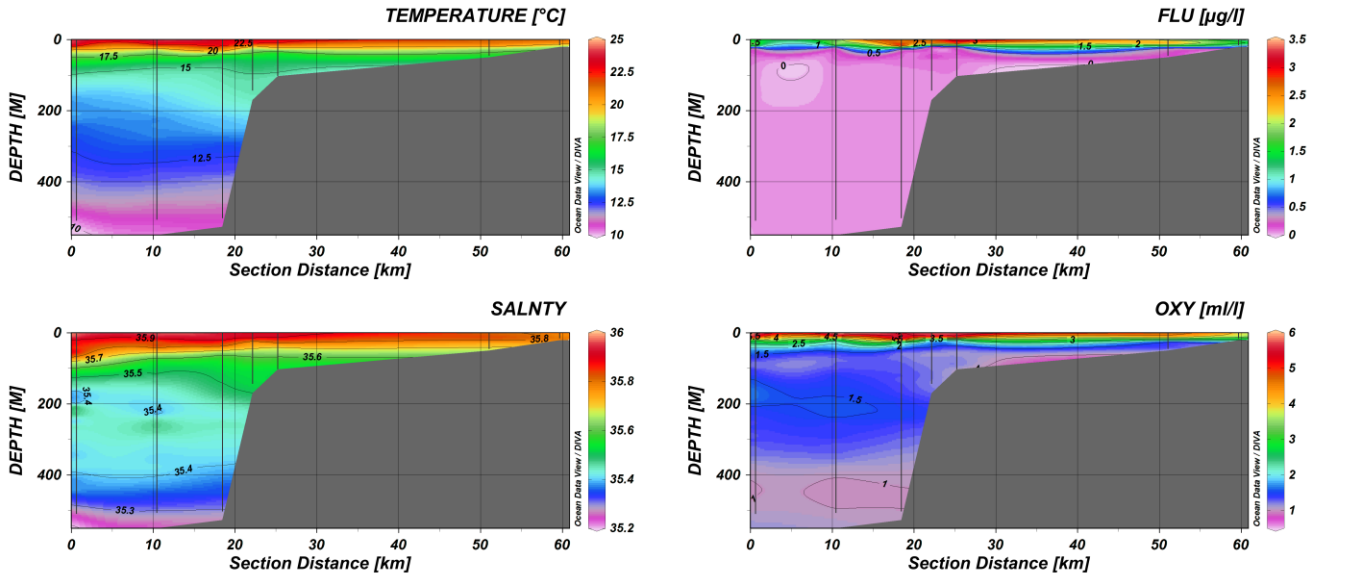
CHAPTER 3 SURVEY RESULTS

3.1 Hydrography

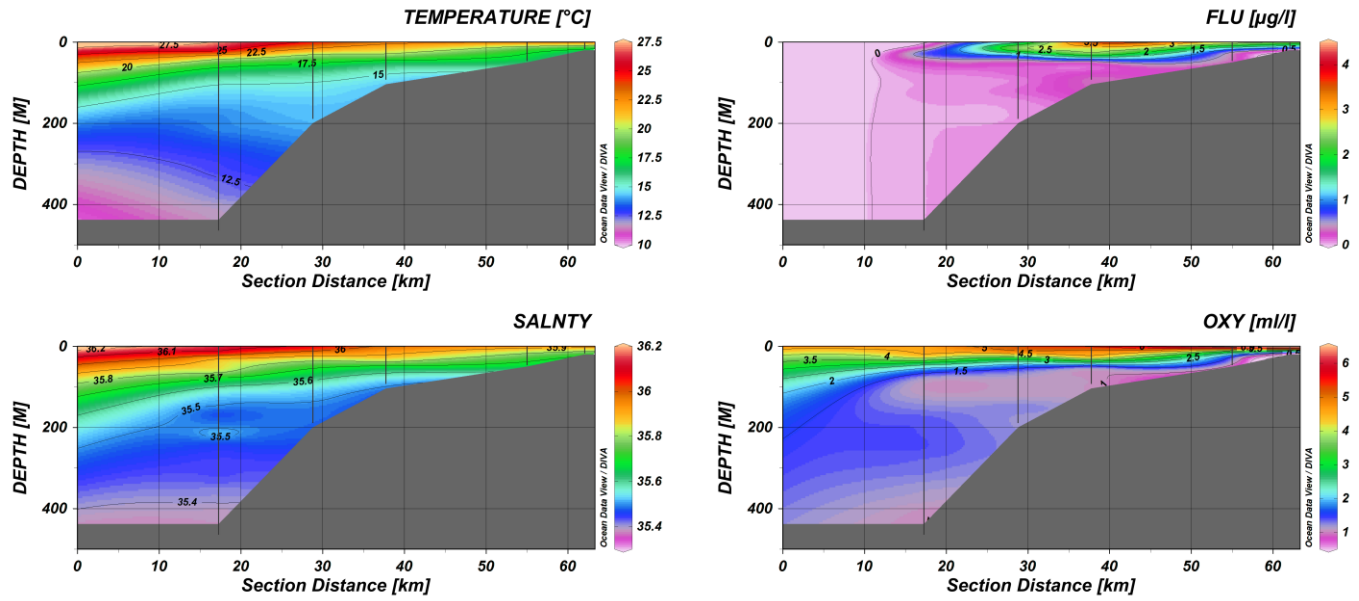
Hydrographical data was collected on fixed CTD stations to 500 m depth and from the Aanderaa weather station that continuously collect sea surface temperature, wind speed and direction, solar radiation etc. during the survey.

Cross shelf hydrographical profiles

Figure 2 shows the distribution of temperature, salinity and oxygen from the five hydrographical transects collected during the survey. Typically, the surface waters showed an increase in water temperature from the coast and offshore. A gradual decrease in water temperature characterises the upper 80 m of the water column. The decrease in water temperature was less rapid below this, with the lowest temperatures found along the bottom, temperatures around 10°C was measured at 500 m depth. No typical thermocline was present along the hydrographical transects. The water masses became colder and more mixed with a less defined thermocline northwards along the Mauritanian coast, with a surface temperature of 18°C offshore at Cape Blanc. The surface waters show relatively high salinity, around 36 ‰ in the offshore waters, with decreasing salinity towards the coast. More turbulent water masses are present in the northern part of the region around Cape Blanc. All the CTD transects show well oxygenated waters, with approximately 4-5 ml/l O₂ in the surface water, declining to 1-2 ml/l O₂ at approximately 70 m depth.



17°00'N



18°00'N

Nouakchott

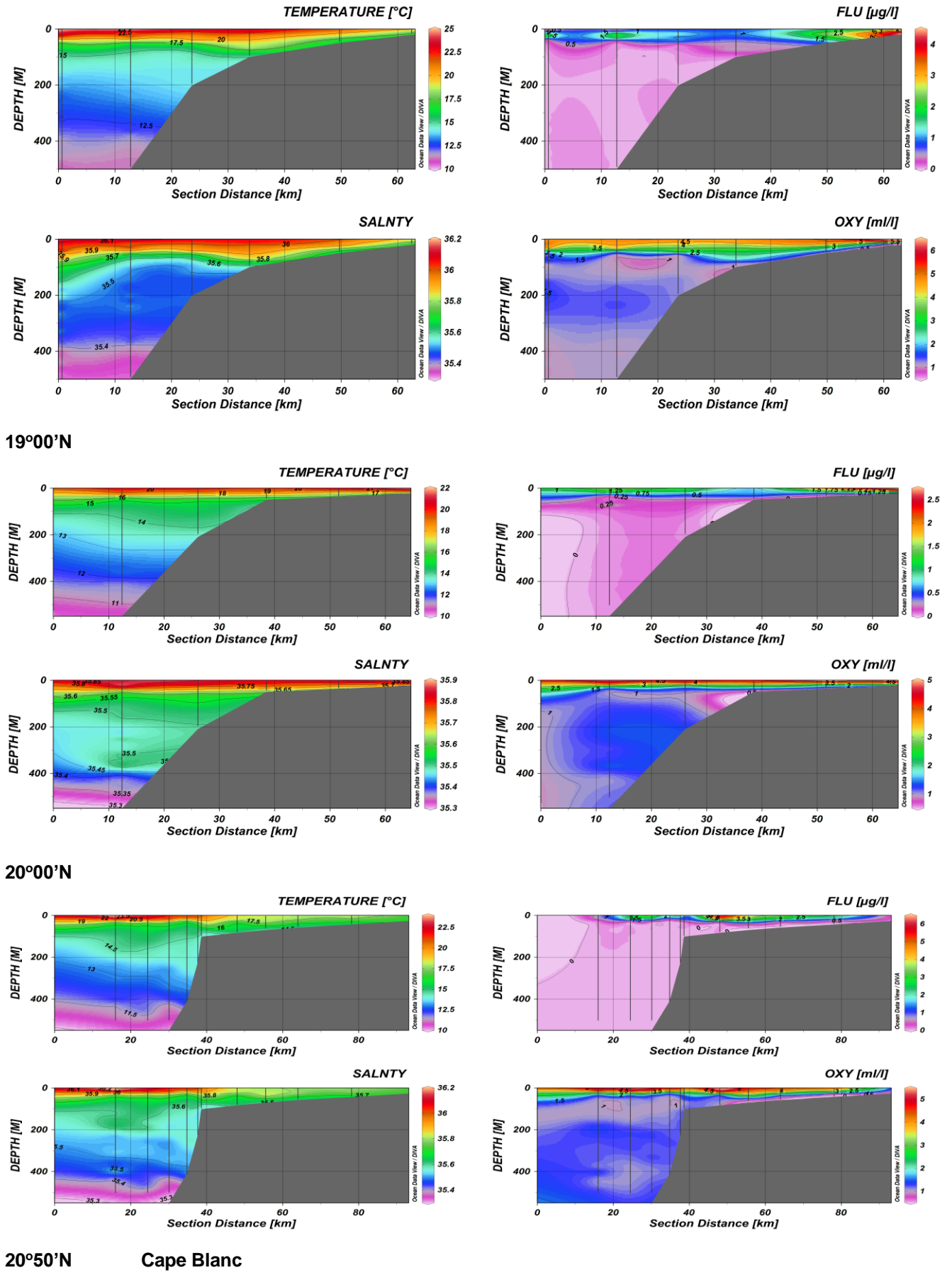


Figure 2. Hydrographical profiles with distribution of temperature, salinity and oxygen

Sea surface temperature and salinity

Figure 3 shows the sea surface temperature at 5 m of depth while Figure 4 shows the sea surface salinity at 5 m depth. Along the coast, on the shelf, the temperature was 20-21°C all the way from St Louis to about 20°N. The temperature isobaths were directed alongshore, with the coolest waters inshore and increasingly warmer temperature offshore, with a maximum of more than 26°C some 60 NM west of Nouakchott.. In the north of the survey area a body of colder waters as low as 18°C was intruding into the Mauritanian shelf. North of Cape Timiris, in the Banc d'Arguin area, the surface water was strongly influenced by the colder canary current waters from north. The surface temperature in this area was 16°C close to shore increasing gradually to 21°C some 60 NM offshore.

The sea surface salinity supports the picture seen from the sea surface temperature. Little variability in sea surface salinity is seen in the south of Cape Timiris and the salinity was stable inshore around 35.8‰. North of this a body of less saline waters are seen at Cape Blanc with salinity around 35.7‰ corresponding with the cold water masses from the Canary current coming from north of the survey area.

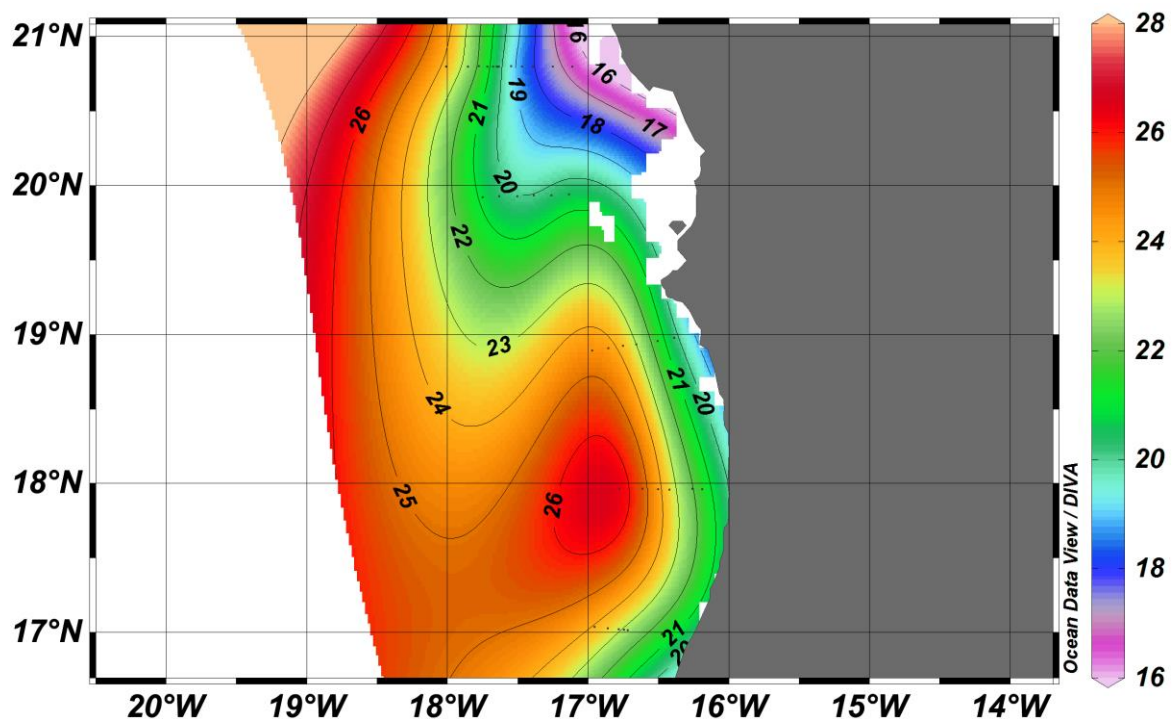


Figure 3. Sea surface temperature; St. Louis to Cape Blanc

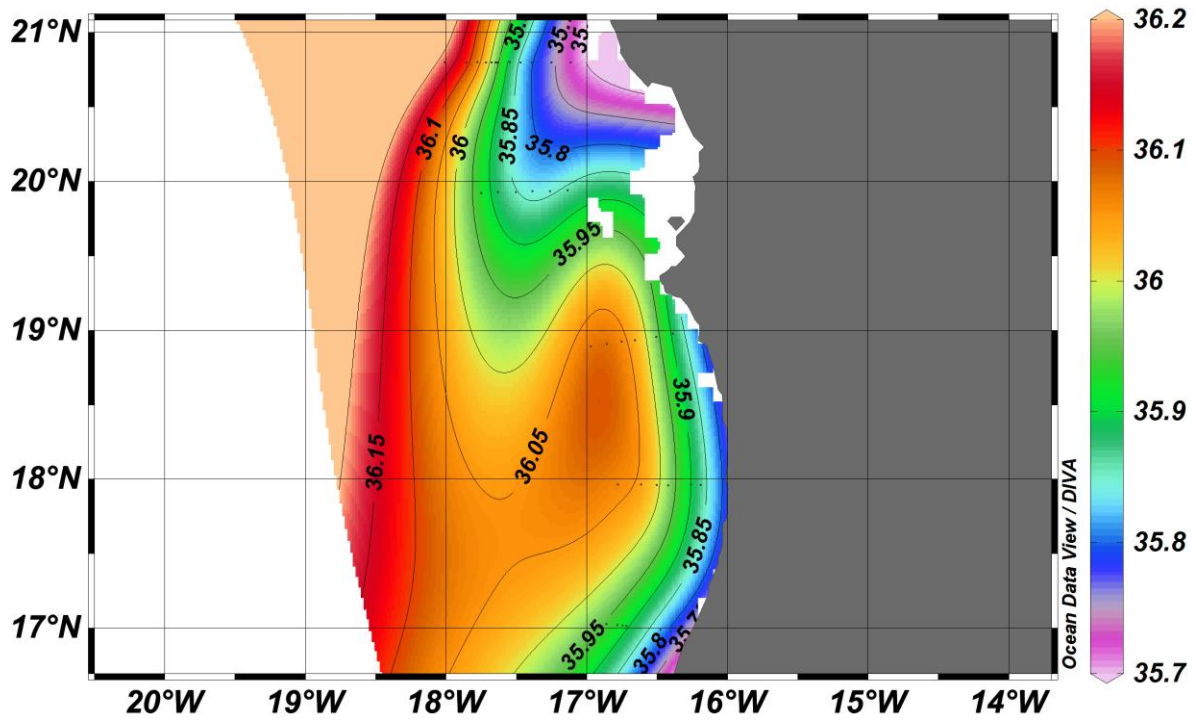


Figure 4. Sea surface salinity; St. Louis to Cape Blanc

3.2 St. Louis to Cape Timiris

The main groups of pelagic fish for the shelf of Mauritania illustrated with contoured acoustic densities are seen in Figure 5,

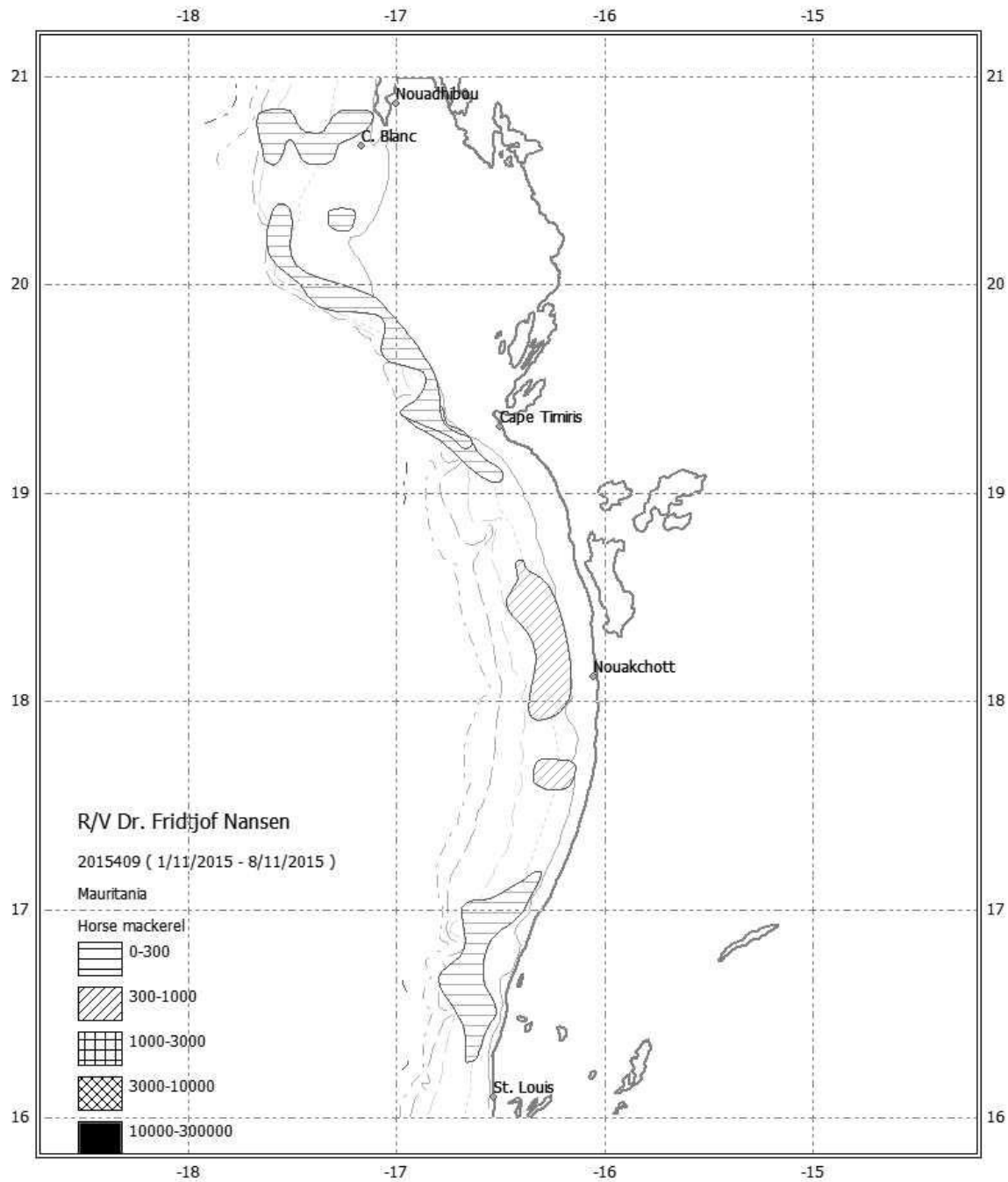


Figure 6 and Figure 7.

Sardinella was found in three distribution areas on the shelf between St. Louis and Cape Timiris Figure 5. One distribution area was found from St Louis stretching northwards along the coast to about 17° N. The second distribution was smaller, and was found between $17^{\circ} 25'$ N and $17^{\circ} 50'$ N. The third distribution was found north of Nouakchott and stretched to about 15 NM south of Cape Timiris. The sardinella were distributed inshore at depths from about 20-30 m. The density was relatively high within each of the three main distribution areas. Both species of sardinella were found in the area. The biomass of *S. aurita* was estimated to

be 106 thousand tonnes, while the biomass of *S. maderensis* was estimated at 423 thousand tonnes.

Three modal peaks at 17 cm, 28 cm and 34 cm total length was observed for *Sardinella maderensis*, and more than 99% of the biomass was >20 cm. The modal size groups of *S. aurita* was 31 cm. Estimated number and biomass by length-groups are in Annex IV. The total biomass of sardinellas in the area was estimated at 529 thousand tonnes, Table 3.

Trachurus trecae were found in four areas between St. Louis and Cape Timiris, mainly between 50 m and 200 m depth. The highest concentrations were generally found at the shelf break close to the bottom,

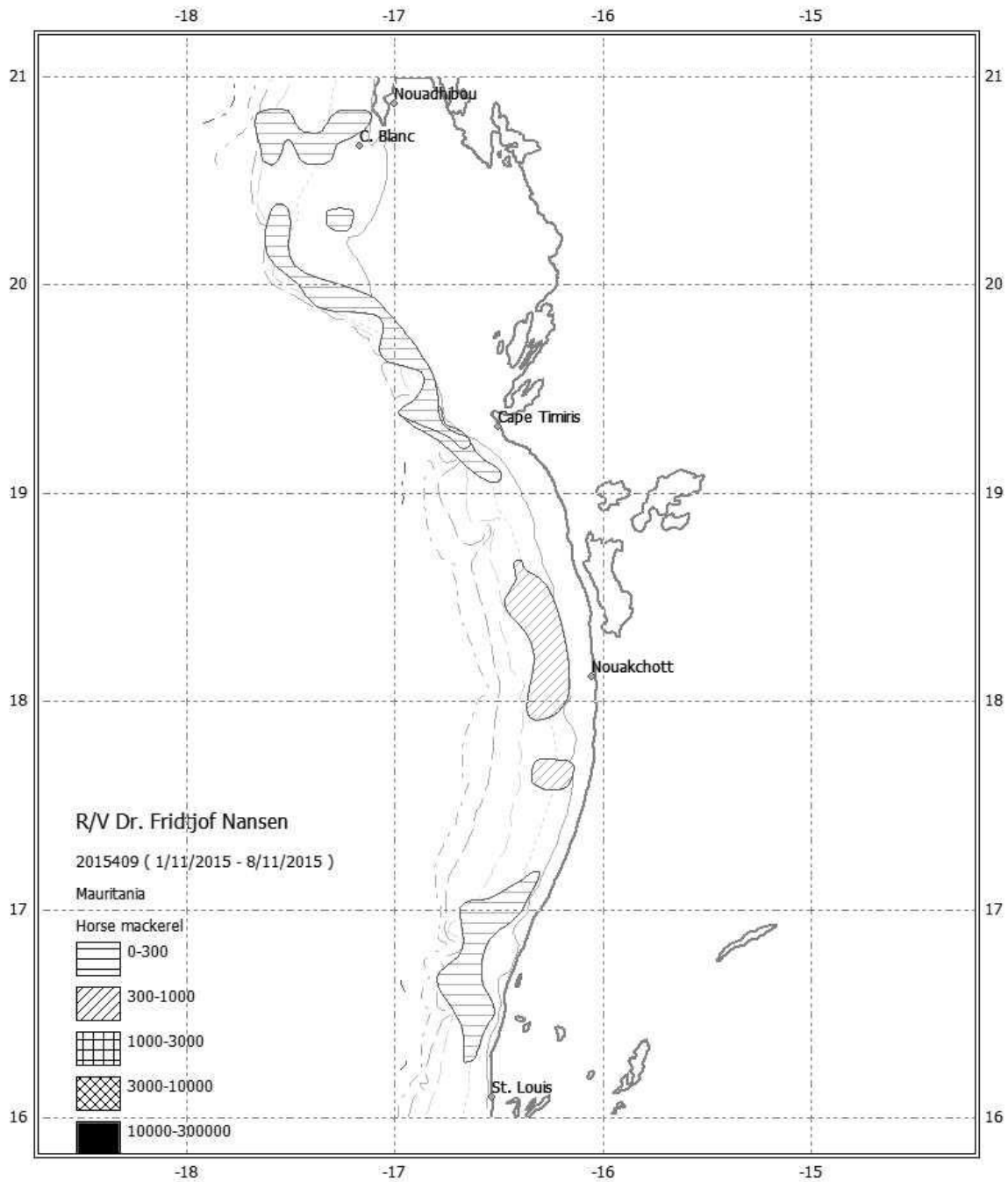


Figure 6. Horse mackerel was also occasionally found dispersed further inshore, mainly mixed with plankton and other pelagic species. A few catches of *Trachurus trachurus* were made offshore south of Cape Timiris. The biomass of *Trachurus trecae* in the area was estimated to be 186 thousand tonnes, while 4 thousand tonnes of *Trachurus trachurus* were found. No separate estimate of *Decapterus rhonchus* was made. The *Trachurus trecae* showed a modal peak, at 23 cm.

Other pelagic fish were found in low concentrations over large parts of the shelf. The main concentrations were between 50 and 20 m bottom depth, Figure 7. The P2's were rarely

distributed further offshore than the 100 m isobath. In general both carangids other than horse mackerel, scombrids, hairtails and barracudas were found in the area. The catches were dominated by *Decapterus rhonchus*, *Trichiurus lepturus*, *Brachydeuterus auritus*, and *Selene dorsalis*. The species were well mixed with the sardinellas and horse mackerel in the areas where their distribution overlapped. The estimated biomass of this group of fish was 227 thousand tonnes. This includes *Decapterus rhonchus* which often has been estimated separately. However it was not possible this year to distinguish this species from the rest of the Carangid species in the region.

Table 3. St.Louis – Cape Timiris. Biomass estimates of pelagic fish, thousand tonnes.

<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerels	Carangids etc.
423	106	190	227

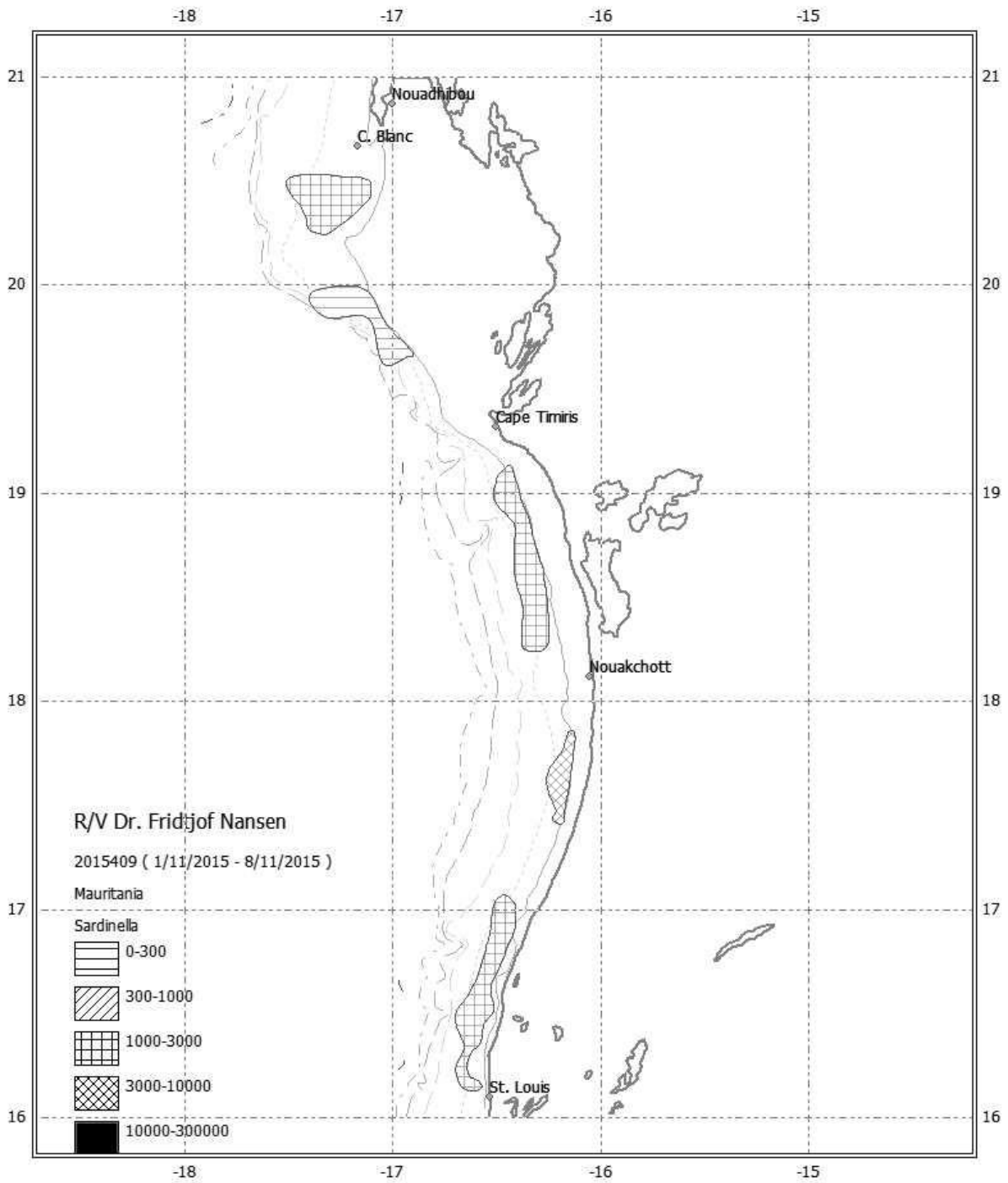


Figure 5. Distribution of sardinellas; St. Louis to Cape Blanc

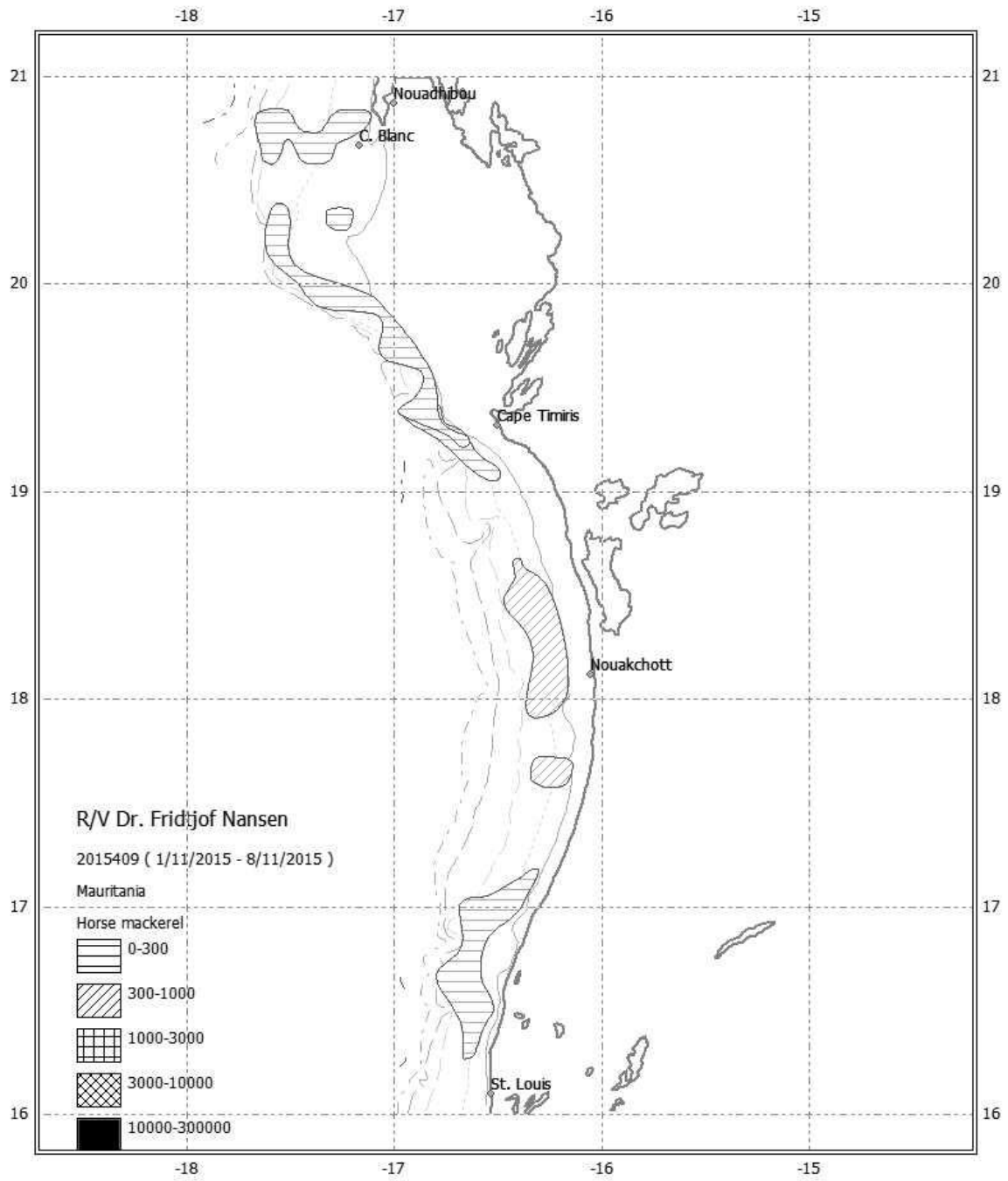


Figure 6. Horse mackerels; St. Louis to Cape Blanc

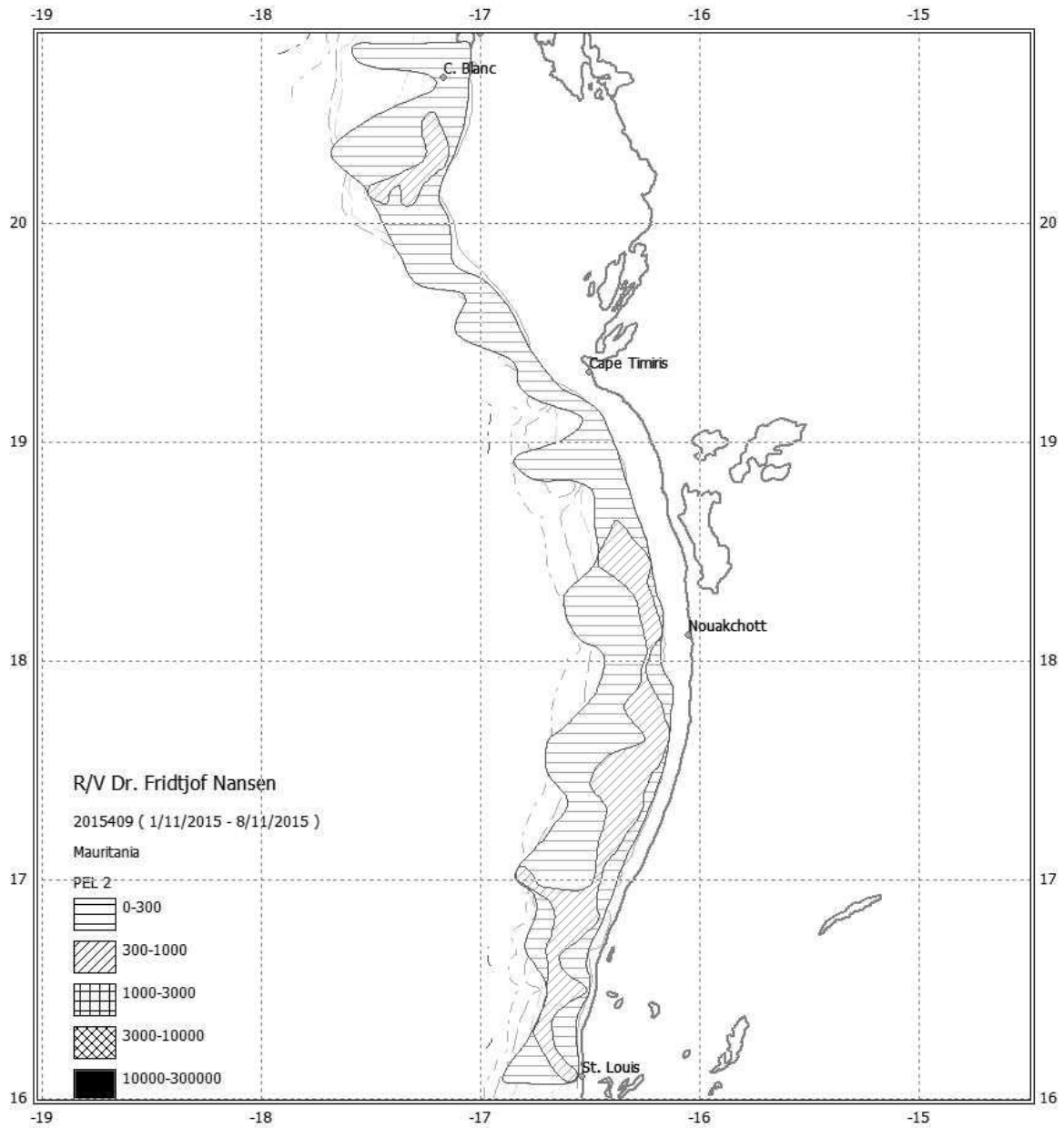


Figure 7. Carangids and associated species; St. Louis to Cape Blanc

3.3 Cape Timeris – Cape Blanc

Both species of sardinellas were found on the shelf at Cape Blanc from less than 20 m depth to the 50 m isobath, Figure 5. The sardinella were found in two concentrations, one some 30 NM north-west of Cape Timiris and the other some 15 NM south of Cape Blanc. The highest concentrations were found in the northernmost part of the area and inshore, and some sardinella was probably missed in the shallow part (<15 depth) of Banc D'arguin. The total

estimate of sardinellas between Cape Timiris and Cape Blanc during this survey was 39 thousand tonnes, Table 4. This comprised *S. maderensis* only. The sardinella was mostly small fish with modal length of 8 and 12 cm, hence the number is very high. The estimated number and biomass by length-groups are in Annex IV.

Anchovy (*Engraulis encrasicolus*) were found in one trawl catch at night south of Cape Blanc in shallow waters, <50 m depth. It was mixed with juvenile *Sardinella maderensis*. No attempt was made to estimate the biomass.

Sardine were also found in a limited sized area and appeared in two catches. No estimate was made.

Cunene horse mackerel was found all along the shelf, except for a smaller area at about 20°30' N where no horse mackerel were detected,

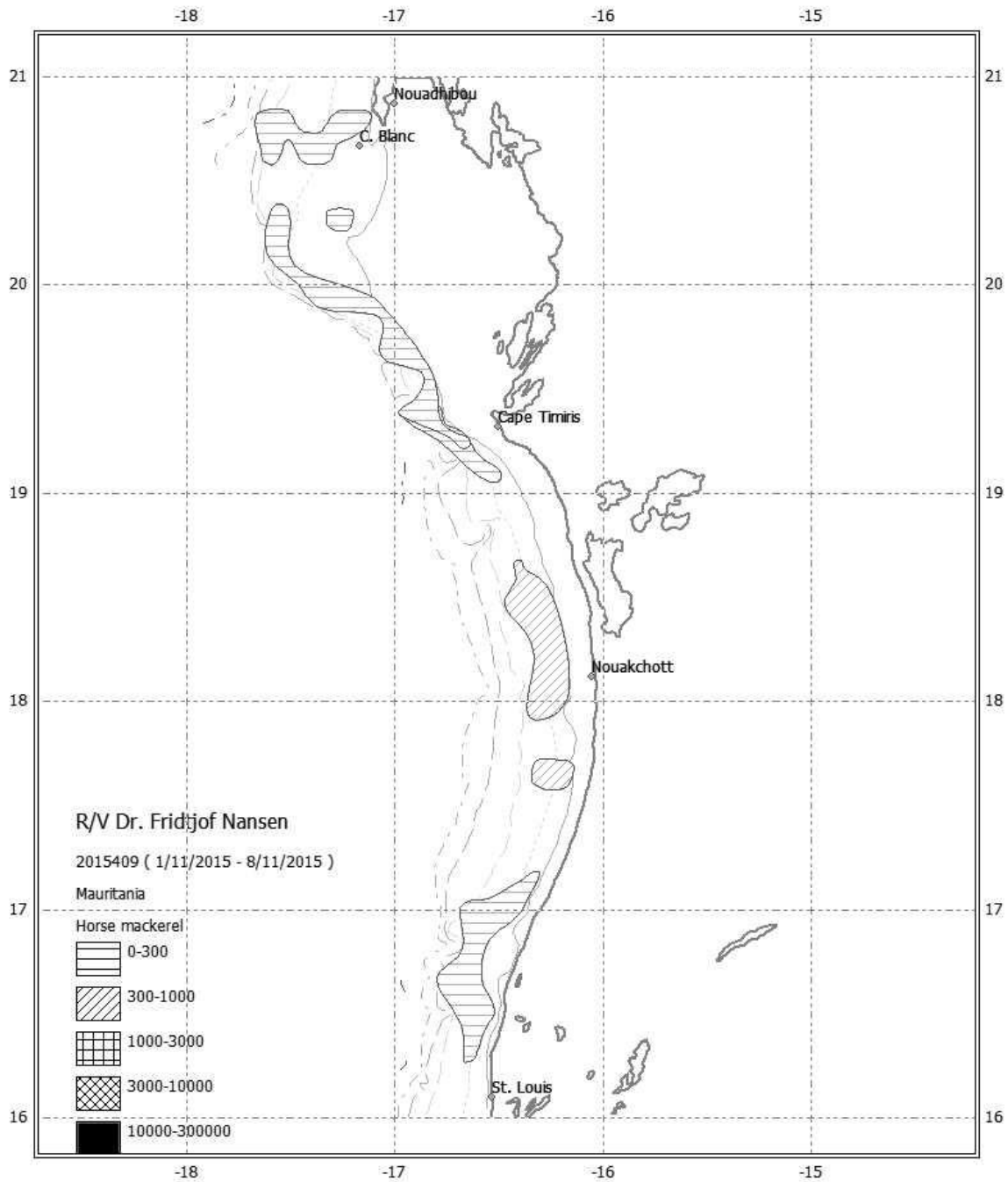


Figure 6. The species was thoroughly mixed with other pelagic species. The estimated biomass of horse mackerels in the area were 40 thousand tonnes, Table 4, with modal peaks of 12, 20 and 24 cm. The estimated number and biomass by length-groups can be found in Annex IV.

Carangids and associated species were found in low density across the shelf in the whole area between Cape Timiris and Cape Blanc, Figure 7. Hairtails, *Trichiurus lepturus*, dominated the group by weight, but *Decapterus rhonchus* and *Chloroscombrus chrysurus* were also frequent in the catches on the shelf. The biomass estimate of this group was 42 thousand tonnes, Table 4.

Table 4. Cape Timiris – Cape Blanc. Biomass estimates of pelagic fish, thousand tonnes.

<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerels	Carangids etc.
39	-	40	79

CHAPTER 4 OVERVIEW AND SUMMARY OF RESULTS

The survey was conducted successfully from 31st October to 9th November, covering a course track of approximately 1 227 NM. A total of 25 fishing stations and 25 CTD casts were established.

The hydrographical data showed normal surface temperatures over most of the Mauritanian shelf. Cold water (20 - 21°C) was present inshore of the survey area from St Louis to Cape Timiris, and off Cape Blanc the sea surface temperature was around 16°C, Figure 3. The southern part of Mauritania showed stable salinity levels around 35.7‰ while the cold water area around Cape Blanc had lower salinity levels around 35.5‰. The shelf was well oxygenated in the whole survey area.

Sardinellas were generally found in various areas along the shelf of Mauritania, mainly inshore, between 15 m depth and offshore to approximately 50 m bottom depth, Figure 5. Similar to earlier years in November the bulk of the biomass was dominated by *S. maderensis* (81%). The majority of the biomass of both species was found south of Cape Timiris. North of this, only 39 thousand tonnes of *S. maderensis*, were found, Table 5. However, division of biomass between the two species of sardinella relies entirely on trawl samples. Sardinella shows strong trawl avoidance and some care should therefore be taken when interpreting the results at species level. The concentration area of sardinella south of Cape Blanc was on the inner part of the shelf. It is probable that some sardinella was distributed on the large shelf area inside of 15 m bottom depth, and therefore not found during the survey.

Cunene horse mackerel were found in several low-density areas all along the coast of Mauritania. The main part of the distribution was between 50 and 100 m depth, but some Cunene horse mackerel was also found inshore of the 50 m isobath. Small concentrations of Atlantic horse mackerel started to mix with the Cunene horse mackerel, mainly on the outer part of the shelf and the shelf break in the northern part of Mauritania,

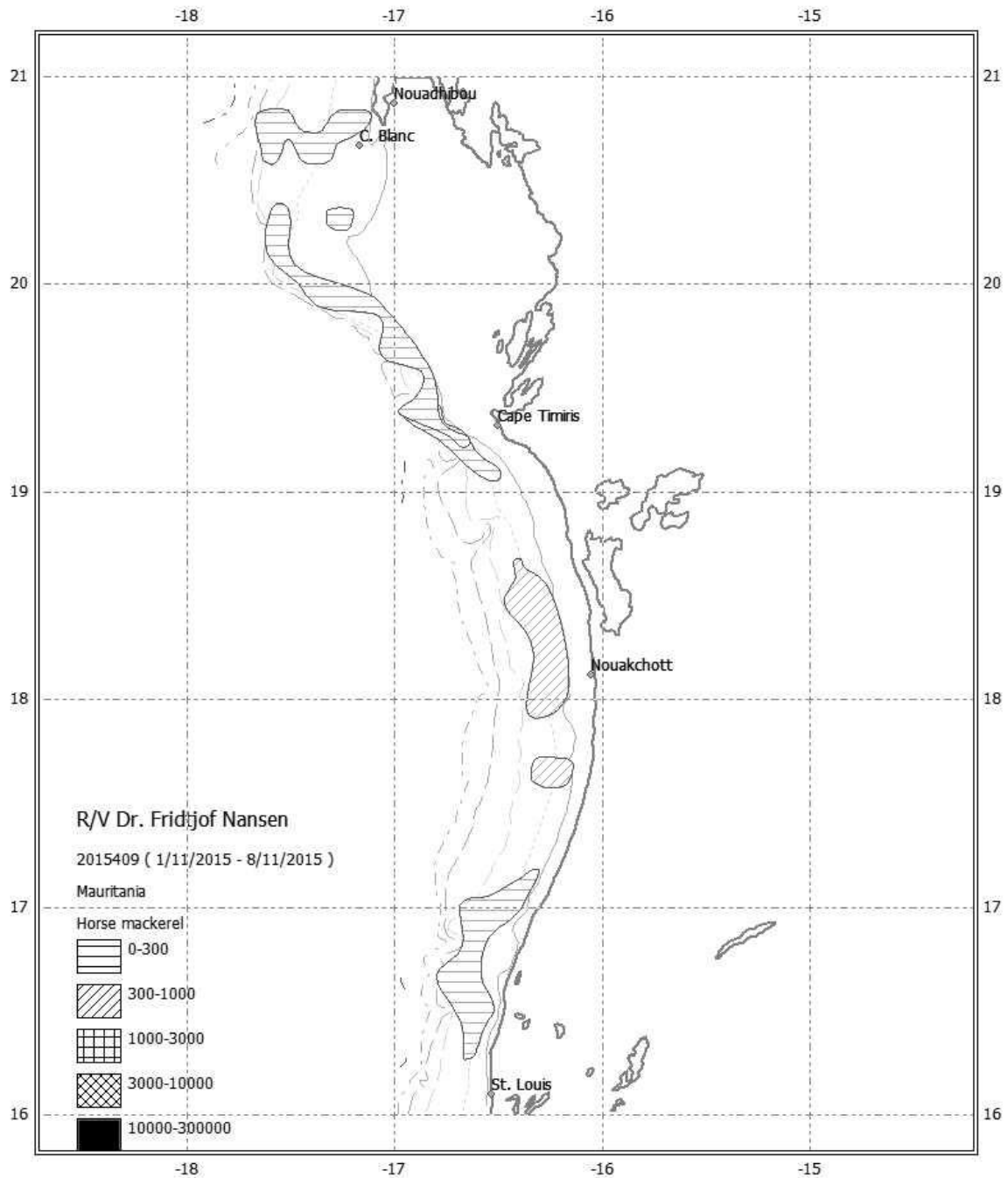


Figure 6. The total abundance estimate of *Cunene* horse mackerel was 226 thousand tonnes while the estimate of Atlantic horse mackerel was 4 thousand tonnes.

Other carangids and associated species were distributed over most of the shelf at rather low densities along the whole coast, Figure 7. The main species in the catches was *Trichiurus lepturus*, hairtails, while *Decapterus rhonchus* and *Brachydeuterus auritus* was frequently caught on the shelf south of Cape Timiris and *Decapterus rhonchus* and *Chloroscombrus chrysurus* dominated north of cape Timiris. The main groups of species in the catches can be

found in Annex I. The total biomass was estimated at approximately 306 thousand tonnes, of this 227 thousand tonnes were found south of Cape Timiris.

An overview of the acoustic estimates of biomass of the main groups of pelagic fish is shown in Table 5. The total biomass of sardinellas was thus 568 thousand tonnes, horse mackerels 230 thousand tonnes and of carangids and associated species 306 thousand tonnes. Note that *Decapterus rhonchus* has been included in the biomass of other Carangids (P2) as no biomass estimate was made for this group.

Table 5. Summary of biomass estimates of pelagic fish, Mauritania. thousand tonnes.

	<i>Sardinella maderensis</i>	<i>Sardinella aurita</i>	Horse mackerels	Carangids etc.
St. Louis – Cape Timiris	423	106	190	227
Cape Timiris – Cape Blanc	39		40	79
Total	462	106	230	306

For sardinellas, This year's estimate is substantially lower than the estimate in 2006 of 1,2 mill tonnes. The abundance of sardinella in Mauritanian waters increased immensely since the very low estimate in November 2002 were only 320 tonnes of sardinella were found.

The total estimate of carangids and associated species (including horse mackerel) was estimated at 536 thousand tonnes. This is high compared earlier estimates. There seems to be an inverse trend in the biomass estimates of these species (sardinellas and carangids), which may have connection with competition of food for pelagic fish in the region .

Table 6. Biomass estimates from 'Dr. Fridtjof Nansen' surveys of the Mauritanian shelf, thousand tonnes.

Survey:	Sardinellas	Carangids etc.
AprMay-81	20	370
Sept -81	75	*
FebMar -82	50	470
NovDec-86	300	540
FebMar-92	1 970	190
NovDec-95	1 780	190
NovDec-96	1 400	400
NovDec-97	1 200	660
NovDec-98	1 130	280
NovDec-99	740	560
NovDec-00	930	1 040
June -01	570	670
NovDec-01	230	370
June -02	930	1 130
NovDec-02	320	440
June - 03	890	620
Nov - 03	1 287	400
Nov - 04	1 548	231
Nov - 05	601	263
Nov - 06	1 219	207
Nov - 15	568	536

* Not available

RÉSUMÉ

La campagne a été effectuée avec succès du 03 au 13 novembre, couvrant un parcours d'approximativement 1386 miles nautiques. Au total, 36 stations de chalutages et 57 stations CTD ont été réalisés.

Les données hydrographiques ont mis en évidence que la température de surface a été plus chaude que la moyenne saisonnière sur la plupart du plateau continental. Une masse d'eau (20°C) était rencontrée uniquement dans la partie méridionale de la région prospectée autour du Cap Blanc, Figure 3. Cette partie en Mauritanie présente un niveau de salinité stable autour de 35.9‰ alors que la masse d'eau froide au niveau du Cap Blanc avait une faible salinité autour de 35.5‰. Le plateau était bien oxygéné dans l'ensemble de la zone prospectée.

Les sardinelles ont été généralement trouvées le long de l'ensemble du plateau continental entre 15 m et 50 m de profondeur, Figure 6. Comme en novembre 2004, la plupart de la biomasse a été dominée par *Sardinella maderensis* (86%). La majorité de la biomasse des deux espèces a été trouvée au Sud du Cap Timiris. Au Nord de celui-ci, uniquement 24000 tonnes et 91000 tonnes respectivement de *S. aurita* et *S. maderensis* ont été obtenus, Table 7. Cependant, la répartition des biomasses entre les deux espèces de sardinelles se base entièrement sur les échantillons de chalutage. Les sardinelles montrent un fort taux d'évitement et il est nécessaire d'en tenir compte dans l'interprétation des résultats au niveau des espèces. La zone de concentration des sardinelles au sud du Cap Blanc se situe dans la partie côtière du plateau continental. Il est probable que des sardinelles soient distribuées en grande proportion sur une partie du plateau continental dans une zone à l'intérieur de 15 m de profondeur, et par conséquent ne peuvent être prospectées par le navire.

La sardine a été trouvée dans les eaux côtières dans une zone limitée du Cap Timiris et avec une forte distribution autour de la zone du Cap Blanc s'étendant le long de la frontière. La sardine présente la même distribution que l'intrusion d'eaux froides venant du nord. La biomasse totale dans les eaux mauritaniennes a été estimée à 405 000 tonnes.

Le chinchard noir a été rencontré en faible densité dans plusieurs régions le long de la côte mauritanienne. La partie principale de la distribution était entre 50 et 100 m de profondeur, mais le chinchard noir a été aussi trouvé à l'intérieur de l'isobathe des 50 m de profondeur. Au début, les petites concentrations du chinchard européen ont été mélangées avec le chinchard noir, principalement dans la partie extérieure du plateau et du talus continental dans la partie méridionale de la Mauritanie, Figure 7. La biomasse totale estimée du chinchard noir était de 74 000 tonnes alors que celle du chinchard européen était de 9 000 tonnes.

Les carangides et espèces associées étaient distribués le long de l'ensemble de la côte sur la plupart du plateau à des densités plutôt faibles, Figure 9. Les principales espèces dans les captures sont *Trichiurus lepturus*, tandis que *Decapterus rhonchus* et *Brachydeuterus auritus* étaient fréquemment capturés au sud du plateau de la zone du Cap Timiris et *Decapterus rhonchus* et *Chloroscombrus chrysurus* dominant au nord du Cap Timiris. Les principaux groupes d'espèces dans les captures sont présentés dans le tableau 4. la biomasse totale est estimée à 69 000 tonnes dont 51 000 tonnes au Cap Timiris.

Une synthèse des estimations des biomasses acoustiques des principaux groupes d'espèces pélagiques est présentée dans le Tableau 7 et la distribution géographique et l'abondance des principales est présentée dans la figure 10. La biomasse totale des sardinelles était ainsi de 1548 000 tonnes, celle des chinchards est de 83 000 tonnes et celle des carangidés et espèces associées est de 148 000 tonnes. Il est à noter que le *Decapterus rhonchus* a été inclus dans la biomasse des autres carangidés (P2) à cause de l'absence d'estimation effectuée pour ce groupe.

References

Toresen, R., Gjørseter, H., and Barros, P. 1998. The acoustic method as used in the abundance estimation of capelin (*Mallotus villosus* Müller) and herring (*Clupea harengus* Linné) in the Barents Sea. Fisheries Research 34 (1998) 27-37.

MacLennan, D. N. and Simmons E. J. (1992). Fisheries Acoustics. Chapman and Hall.325p.

Annex I Records of fishing stations

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 30
 DATE :01/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 16°19.72
 start stop duration Lon W 16°36.98
 TIME :12:49:55 13:34:10 44.3 (min) Purpose : 1
 LOG : 1798.41 1800.91 2.5 Region : 1200
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 35 32 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 359 Total catch: 4083.43 Catch/hour: 5536.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	4439.74	41157	80.19	
Brachydeuterus auritus	937.88	270	16.94	
Caranx rhonchus	47.77	199	0.86	
57 Selene dorsalis	35.48	262	0.64	
63 Trachurus trecae	26.12	123	0.47	
58 Alectis alexandrinus	12.23	5	0.22	
Trachinotus ovatus	10.13	31	0.18	
59 Sphyrna lewini	7.54	1	0.14	
Sardinella maderensis	6.29	46	0.11	
60 Sphyrna guachancho	6.14	31	0.11	
62 Pagellus bellottii	4.14	31	0.07	
61 Rhizoprionodon acutus	3.39	1	0.06	
Total	5536.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 33
 DATE :02/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 16°51.07
 start stop duration Lon W 16°38.81
 TIME :01:12:13 01:42:36 30.4 (min) Purpose : 1
 LOG : 1896.22 1897.88 1.7 Region : 1200
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 86 81 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 146 Total catch: 146.14 Catch/hour: 288.62

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Benthosema fibulatum	130.74	65372	45.30	
Jellyfish	115.14	2893	39.89	
Synagrops microlepis	9.87	1452	3.42	
Stromateus fiatola	6.38	6	2.21	
Chloroscombrus chrysurus	4.48	26	1.55	
Brachydeuterus auritus	4.19	26	1.45	
Trachurus trachurus	3.24	61	1.12	
Trichiurus lepturus	2.51	107	0.87	
Trachurus trecae	2.23	69	0.77	70
Loligo vulgaris	2.05	107	0.71	
Lagocephalus laevigatus	1.78	10	0.62	
Scomber japonicus	1.42	12	0.49	71
Ilisha africana	1.30	16	0.45	
SALPS	1.28	2	0.44	
Carlarius heudelotii	0.79	2	0.27	
Sphyrna guachancho	0.67	6	0.23	
Caranx rhonchus	0.38	2	0.13	72
Saurida brasiliensis	0.12	8	0.04	
Priacanthus arenatus	0.02	2	0.01	
Selene dorsalis	0.02	4	0.01	
Total	288.62		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 31
 DATE :01/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 16°39.26
 start stop duration Lon W 16°38.04
 TIME :20:07:42 20:25:38 17.9 (min) Purpose : 1
 LOG : 1859.96 1860.84 0.9 Region : 1200
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 48 52 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.9 kn
 Sorted : 0 Total catch: 553.07 Catch/hour: 1850.77

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	1014.34	3550	54.81	
Caranx rhonchus	384.70	2386	20.79	
65 Trachurus trecae	258.20	2463	13.95	
64 Chloroscombrus chrysurus	58.69	218	3.17	
SALPS	47.69	0	2.58	
Alectis alexandrinus	40.02	50	2.16	
Jellyfish	16.06	0	0.87	
Sardinella maderensis	7.86	107	0.42	
66 Loligo vulgaris	4.74	97	0.26	
Selene dorsalis	4.34	40	0.23	
Trichiurus lepturus	3.53	17	0.19	
Balistes capricus	3.45	10	0.19	
Scomber japonicus	2.41	17	0.13	
Sphyrna guachancho	2.17	17	0.12	
Trachinotus ovatus	2.07	10	0.11	
Alloteuthis africana	0.48	258	0.03	
Total	1850.77		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 34
 DATE :02/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 17°18.39
 start stop duration Lon W 16°19.70
 TIME :17:22:20 18:00:08 37.8 (min) Purpose : 1
 LOG : 2031.25 2033.20 1.9 Region : 1200
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 49 48 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
 Sorted : 547 Total catch: 559.45 Catch/hour: 888.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Caranx rhonchus	567.86	2503	63.95	74
Brachydeuterus auritus	294.44	1032	33.16	
Alectis alexandrinus	11.52	8	1.30	
Trachurus trecae	6.35	63	0.71	75
Sarda sarda	5.14	3	0.58	
Campogramma glaycos	0.75	2	0.08	
Carlarius heudelotii	0.59	2	0.07	
Sphyrna guachancho	0.49	2	0.06	
Pagellus bellottii	0.40	2	0.04	
Trichiurus lepturus	0.30	2	0.03	
Fistularia petimba	0.17	3	0.02	
Total	888.02		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 35
 DATE :02/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 17°28.66
 start stop duration Lon W 16°13.71
 TIME :20:46:12 21:40:10 54.0 (min) Purpose : 1
 LOG : 2056.24 2059.19 3.0 Region : 1200
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 37 32 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 72 Total catch: 2408.64 Catch/hour: 2677.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	1131.62	7941	42.26	
Brachydeuterus auritus	612.86	6809	22.89	
Sardinella maderensis	369.76	1445	13.81	76
Caranx rhonchus	218.90	889	8.17	79
Trachurus trecae	128.85	556	4.81	77
Pomadoury incisus	55.21	297	2.06	
Selene dorsalis	44.36	556	1.66	
Sardinella aurita	43.71	185	1.63	78
Scomber japonicus	25.94	74	0.97	
Pagellus bellottii	17.04	74	0.64	
Sphyrna guachancho	14.45	38	0.54	
Dasyatis marmorata	7.78	37	0.29	
Brachydeuterus auritus, juvenile	7.34	1482	0.27	
Total	2677.82		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 32
 DATE :01/11/15 GEAR TYPE: PT NO: 7 POSITION:Lat N 16°49.80
 start stop duration Lon W 16°27.75
 TIME :23:06:30 23:35:21 28.9 (min) Purpose : 1
 LOG : 1881.98 1883.63 1.6 Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 23 22 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 310 Total catch: 619.08 Catch/hour: 1287.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	504.54	1065	39.19	
68 Brachydeuterus auritus	406.79	3128	31.60	
Caranx rhonchus	199.65	391	15.51	
67 Stromateus fiatola	80.86	46	6.28	
Galeoides decadactylus	17.05	129	1.32	
Chloroscombrus chrysurus	16.47	75	1.28	
Pomadoury rogeri	11.60	33	0.90	
Ilisha africana	11.15	266	0.87	
Carlarius heudelotii	10.65	15	0.83	
Trichiurus lepturus	9.61	71	0.75	
Balistes capricus	4.62	12	0.36	
Sardinella aurita	4.28	12	0.33	
69 Sepia officinalis	2.45	12	0.19	
Selene dorsalis	2.08	12	0.16	
Eucinostomus melanopterus	1.25	12	0.10	
Trachurus trecae	0.96	8	0.07	
73 SALPS	0.79	4	0.06	
Pagellus bellottii	0.75	8	0.06	
Pteroscion peli	0.75	8	0.06	
Sphyrna guachancho	0.71	8	0.05	
Alectis alexandrinus	0.46	4	0.04	
Penaeus notialis	0.04	4	0.00	
Total	1287.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 36
 DATE :03/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 17°37.66
 start stop duration Lon W 16°13.44
 TIME :04:29:39 04:46:38 17.0 (min) Purpose : 1
 LOG : 2122.07 2123.03 0.9 Region : 1200
 FDEPTH: 10 25 Gear cond.: 0
 BDEPTH: 44 45 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 0 Total catch: 140.53 Catch/hour: 496.57

SPECIES	CATCH/HOUR		% OF TOT. C
	weight	numbers	
Trachurus trecae	218.37	1466	43.98
Caranx rhonchus	192.58	1325	38.78
Scomber japonicus	17.49	71	3.52
Brachydeuterus auritus	15.02	106	3.02
Pagellus bellottii	14.24	64	2.87
Arius parkii	13.92	11	2.80
Sardinella maderensis	9.72	35	1.96
Sphyræna guachancho	8.59	14	1.73
Carliarius heudelotii	4.77	7	0.96
Trichiurus lepturus	1.87	4	0.38
Total	496.57		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 37
 DATE :03/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 17°48.48
 start stop duration Lon W 16°9.04
 TIME :07:59:47 08:42:50 43.1 (min) Purpose : 1
 LOG : 2141.60 2144.10 2.5 Region : 1200
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 24 26 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 0 Total catch: 936.77 Catch/hour: 1305.30

SPECIES	CATCH/HOUR		% OF TOT. C
	weight	numbers	
Pomadasys rogeri	433.21	291	33.19
Brachydeuterus auritus	291.22	2338	22.31
Pomadasys jubelini	205.18	265	15.72
Sphyræna guachancho	127.45	60	9.76
Chloroscombrus chrysurus	97.26	762	7.45
Caranx rhonchus	59.30	231	4.54
Lagocephalus laevigatus	28.50	11	2.18
Selene dorsalis	14.30	86	1.10
Alectis alexandrinus	13.66	6	1.05
Sardinella maderensis	10.98	40	0.84
Stromateus fiatola	5.78	7	0.44
Ballistes capriscus	5.06	7	0.39
Diplodus puntazzo	3.46	4	0.26
Mugil capurrii	1.92	1	0.15
Lithognathus mormyrus	1.66	3	0.13
Trachinotus ovatus	1.25	7	0.10
Pagellus bellottii	0.99	7	0.08
Campogramma glaycos	0.89	1	0.07
Sarda sarda	0.86	1	0.07
Spondyliosoma cantharus	0.65	1	0.05
Fistularia petimba	0.59	1	0.04
Arius parkii	0.42	1	0.03
Stephanolepis hispidus	0.38	1	0.03
Lolligo vulgaris	0.33	3	0.03
Fishing gears	0.00	1	0.00
Total	1305.30		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 38
 DATE :03/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 17°57.78
 start stop duration Lon W 16°14.57
 TIME :17:27:19 18:16:38 49.3 (min) Purpose : 1
 LOG : 2216.18 2218.99 2.8 Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 32 38 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 138 Total catch: 2213.76 Catch/hour: 2693.68

SPECIES	CATCH/HOUR		% OF TOT. C
	weight	numbers	
Trachurus trecae	2246.10	10104	83.38
Caranx rhonchus	385.48	2180	14.31
Lagocephalus laevigatus	27.65	19	1.03
Lolligo vulgaris	16.55	58	0.61
Scomber japonicus	11.68	58	0.43
Jellyfish	5.06	117	0.19
SALPS	1.17	39	0.04
Total	2693.68		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 39
 DATE :03/11/15 GEAR TYPE: PT NO: 0 POSITION:Lat N 18°6.41
 start stop duration Lon W 16°9.87
 TIME :20:19:36 20:43:35 24.0 (min) Purpose : 1
 LOG : 2232.38 2233.76 1.4 Region : 1200
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 19 22 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 0 Total catch: 986.17 Catch/hour: 2466.45

SPECIES	CATCH/HOUR		% OF TOT. C
	weight	numbers	
Brachydeuterus auritus	2081.24	7748	84.38
Caranx rhonchus	232.35	563	9.42
Pagellus bellottii	31.76	303	1.29
Arius parkii	24.76	68	1.00
Pagrus caeruleostictus	20.63	40	0.84
Pomadasys jubelini	19.76	40	0.80
Diplodus puntazzo	15.53	15	0.63

Plectorhynchus mediterraneus	8.25	40	0.33
Trachurus trecae	7.57	15	0.31
Dasyatis pastinaca	5.05	3	0.20
Boops boops	3.58	95	0.15
Dentex canariensis	3.30	55	0.13
Sardinella maderensis	3.03	15	0.12
Fomadasys incisus	2.25	15	0.09
Galeoides decadactylus	2.05	70	0.08
Halobatrachus didactylus	1.25	43	0.05
Penaeus notialis	1.25	15	0.05
Chaetodon hoefleri	1.23	15	0.05
Diplodus bellottii	0.95	15	0.04
Diplodus sargus	0.68	15	0.03
Total	2466.47		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 40
 DATE :03/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 18°8.50
 start stop duration Lon W 16°15.61
 TIME :21:54:55 22:31:37 36.7 (min) Purpose : 1
 LOG : 2241.73 2243.57 1.8 Region : 1200
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 38 34 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
 Sorted : 0 Total catch: 1013.46 Catch/hour: 1656.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1272.75	11465	76.82	92
Caranx rhonchus	169.06	858	10.20	93
Scomber japonicus	132.93	450	8.02	91
Illex coindetii	22.22	67	1.34	
Carliarius heudelotii	21.42	41	1.29	
Pomadasys incisus	19.90	82	1.20	
Brachydeuterus auritus	6.82	41	0.41	
Sphyræna guachancho	6.13	28	0.37	
Pagellus bellottii	3.40	41	0.21	
Sepia bertheloti	1.31	13	0.08	
Boops boops	0.95	13	0.06	
Total	1656.88		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 41
 DATE :04/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 18°17.93
 start stop duration Lon W 16°18.34
 TIME :04:05:17 04:38:47 33.5 (min) Purpose : 1
 LOG : 2294.61 2296.49 1.9 Region : 1200
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 46 30 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 246 Total catch: 245.88 Catch/hour: 440.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	108.20	234	24.59	98
Mola mola	107.40	2	24.40	
Pomadasys incisus	83.05	154	18.87	
Trichiurus lepturus	58.35	54	13.26	
Sardinella maderensis	28.46	63	6.47	97
Carliarius heudelotii	21.84	18	4.96	
Scomber japonicus	12.10	50	2.75	94
Trachurus trecae	7.98	238	1.81	96
Pagellus bellottii	3.13	29	0.71	
Brachydeuterus auritus	2.42	13	0.55	
Jellyfish	1.90	20	0.43	
Caranx rhonchus	1.52	9	0.35	95
Sepia officinalis	1.38	2	0.31	
Lolligo vulgaris	1.34	152	0.31	
Boops boops	0.30	21	0.07	
Sphyræna guachancho	0.23	2	0.05	
Sepia bertheloti	0.23	11	0.05	
Sphoeroides spengleri	0.09	7	0.02	
Fistularia tabacaria	0.05	9	0.01	
Chelidonichthys gaborensis	0.05	2	0.01	
Penaeus notialis	0.04	2	0.01	
Selene dorsalis	0.02	7	0.00	
Alloteuthis africana	0.02	4	0.00	
Total	440.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 42
 DATE :04/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 18°37.88
 start stop duration Lon W 16°20.64
 TIME :13:23:21 14:37:53 74.5 (min) Purpose : 1
 LOG : 2368.10 2372.26 4.2 Region : 1200
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 39 33 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 274 Total catch: 274.42 Catch/hour: 220.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Caranx rhonchus	118.87	212	53.82	99
SALPS	89.58	901	40.56	
Trachurus trecae	4.83	12	2.19	
Sardinella maderensis	2.15	8	0.97	101
Sardinella aurita	1.05	3	0.48	100
Dactylopterus volitans	0.91	1	0.41	
Carliarius heudelotii	0.82	2	0.37	
Trichiurus lepturus	0.80	2	0.36	
Sarda sarda	0.47	1	0.21	
Scomber japonicus	0.43	1	0.20	102
Campogramma glaycos	0.35	1	0.16	
Jellyfish	0.19	2	0.09	
Lagocephalus laevigatus	0.19	1	0.09	
Lolligo vulgaris	0.12	2	0.05	
Sepia officinalis	0.05	5	0.02	
Fistularia tabacaria	0.02	2	0.01	
Selene dorsalis	0.01	2	0.00	
Total	220.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 43
 DATE :04/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 18°48.18
 start stop duration Lon W 16°25.07
 TIME :16:40:52 17:22:38 41.8 (min) Purpose : 1
 LOG : 2389.84 2392.10 2.3 Region : 1200
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 42 33 Validity : 0

Towing dir: 0° Wire out : 0 m Speed : 3.3 kn
 Sorted : 148 Total catch: 148.16 Catch/hour: 212.92

SPECIES SAMP	CATCH/HOUR		% OF TOT. C
	weight	numbers	
Jellyfish	168.14	0	78.97
Caranx rhonchus	39.23	52	18.43
103 Trichiurus lepturus	2.53	4	1.19
Camogramma glaycos	1.71	3	0.80
104 Sardinella aurita	0.85	3	0.40
Sardinella maderensis	0.29	1	0.13
105 Loligo vulgaris	0.14	1	0.07
Sepia officinalis	0.03	1	0.01
Selene dorsalis, juvenile	0.00	14	0.00
Total	212.92		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 44
 DATE :04/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 18°49.86 Lon W 16°24.01
 start stop duration Purpose : 1
 LOG : 2400.80 2402.57 33.6 (min) Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 32 31 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 0 Total catch: 458.97 Catch/hour: 819.83
 SPECIES CATCH/HOUR % OF TOT. C
 SAMP weight numbers

Sardinella aurita	277.24	1059	33.82
108 Caranx rhonchus	197.18	459	24.05
107 Sardinella maderensis	113.27	243	13.82
109 Trachurus trecae	81.54	261	9.95
106 Diplodus puntazzo	67.52	46	8.24
Pomadasys incisus	51.14	130	6.24
Trichurus lepturus	15.90	34	1.94
Trachurus trachurus	7.56	107	0.92
113 Sarda sarda	2.75	2	0.34
110 Scomber japonicus	1.52	2	0.19
Campogramma glaycos	1.14	2	0.14
Penaeus notialis	0.93	27	0.11
Sphyræna guachancho	0.84	5	0.10
Sepia officinalis	0.80	5	0.10
Lagocephalus laevigatus	0.50	2	0.06
Total	819.83		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 45
 DATE :05/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 18°57.54 Lon W 16°28.19
 start stop duration Purpose : 1
 LOG : 2472.43 2475.28 2.9 Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 37 32 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 0 Total catch: 452.18 Catch/hour: 538.84
 SPECIES CATCH/HOUR % OF TOT. C
 SAMP weight numbers

115 Sardinella maderensis	232.25	1192	43.10
Jellyfish	116.78	0	21.67
Trachurus trecae	73.17	2650	13.58
114 Sardinella aurita	71.86	169	13.34
117 Arius parkii	14.06	7	2.61
Mugil capurrii	9.89	2	1.84
Trichurus lepturus	4.72	14	0.88
Uranoscopus albesca	4.05	2	0.75
Campogramma glaycos	3.91	5	0.73
Brachydeuterus auritus	3.81	19	0.71
Pomadasys incisus	2.62	10	0.49
Trachurus trachurus	0.95	26	0.18
116 Penaeus notialis	0.41	7	0.08
Loligo vulgaris	0.36	19	0.07
Total	538.84		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 46
 DATE :05/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 19°4.84 Lon W 16°28.23
 start stop duration Purpose : 1
 LOG : 2492.08 2495.90 3.8 Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 31 31 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 0 Total catch: 2208.63 Catch/hour: 1957.43
 SPECIES CATCH/HOUR % OF TOT. C
 SAMP weight numbers

120 Jellyfish	1772.53	0	90.55
Caranx rhonchus	79.76	191	4.07
Diplodus puntazzo	59.38	68	3.03
Sardinella maderensis	34.56	160	1.77
119 Sardinella aurita	4.30	9	0.22
118 Campogramma glaycos	4.03	4	0.21
Pomadasys rogeri	1.06	1	0.05
Sarda sarda	0.68	1	0.03
Trichurus lepturus	0.57	2	0.03
Pagellus bellottii	0.34	2	0.02
Lagocephalus laevigatus	0.13	1	0.01
Sepia officinalis	0.08	2	0.00
Total	1957.43		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 47
 DATE :05/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 19°21.83 Lon W 16°45.45
 start stop duration Purpose : 1
 LOG : 2546.91 2548.51 1.6 Region : 1200
 FDEPTH: 19 20 Gear cond.: 0
 BDEPTH: 19 20 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 0 Total catch: 878.62 Catch/hour: 1936.00
 SPECIES CATCH/HOUR % OF TOT. C
 SAMP weight numbers

Pomadasys incisus	738.38	2677	38.14
Diplodus puntazzo	282.26	258	14.58
Pagrus caeruleostictus	223.43	251	11.54
Epinephelus aeneus	154.24	71	7.97
Pagellus bellottii	144.11	663	7.44
Caranx rhonchus	103.78	258	5.36
121 Pseudupeneus prayensis	33.85	304	1.75
Plectorhynchus mediterraneus	33.85	93	1.75
Diplodus vulgaris	32.39	99	1.67
Epinephelus goreensis	28.89	31	1.49

Spondyliosoma cantharus 28.42 139 1.47
 Dentex canariensis 25.71 93 1.33
 Loligo vulgaris 22.01 66 1.14
 Cymbium marmoratum 15.86 2 0.82
 Pomadasys jubelini 14.28 33 0.74
 Dasysatis marmorata 12.78 2 0.66
 Jellyfish 11.70 13 0.60
 Halobatrachus didactylus 10.71 13 0.55
 Pagrus auriga 5.57 4 0.29
 Trachurus trecae 4.16 33 0.22
 Muraena helena 3.00 2 0.15
 Rhinobatos rhinobatos 2.47 2 0.13
 Raja miraletus 2.23 4 0.11
 Serranus scriba 0.59 4 0.03
 Chaetodon hoeferi 0.44 2 0.02
 Lagocephalus laevigatus 0.44 2 0.02
 Sepia officinalis 0.33 13 0.02
 Fistularia tabacaria 0.11 2 0.01
 Fishing gears 0.00 2 0.00
 Total 1936.00 100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 48
 DATE :05/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 19°40.96 Lon W 16°55.70
 start stop duration Purpose : 1
 LOG : 2597.95 2599.94 2.0 Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 35 36 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
 Sorted : 0 Total catch: 685.29 Catch/hour: 1225.20
 SPECIES CATCH/HOUR % OF TOT. C SAMP weight numbers

Trachurus trecae	643.09	36220	52.49	124
Jellyfish	228.11	0	18.62	
Trichurus lepturus	218.80	5943	17.86	
Sardina pilchardus	39.51	288	3.22	122
Sepia officinalis	35.99	86	2.94	
Loligo vulgaris	31.34	830	2.56	
Pagellus bellottii	9.70	54	0.79	
Sardinella maderensis	9.30	272	0.76	123
Arius parkii	2.79	9	0.23	
Scomber japonicus	2.23	9	0.18	
Brachydeuterus auritus, juvenile	1.79	163	0.15	
Chloroscombrus chrysurus	1.31	9	0.11	
Sphoeroides spengleri	0.72	9	0.06	
Engraulis encrasicolus	0.54	23	0.04	
Total	1225.20		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 49
 DATE :06/11/15 GEAR TYPE: PT NO: 2 POSITION:Lat N 20°6.09 Lon W 17°41.21
 start stop duration Purpose : 1
 LOG : 2693.34 2695.34 2.0 Region : 1200
 FDEPTH: 100 150 Gear cond.: 0
 BDEPTH: 606 748 Validity : 0
 Towing dir: 0° Wire out : 250 m Speed : 2.8 kn
 Sorted : 0 Total catch: 112.80 Catch/hour: 158.17
 SPECIES CATCH/HOUR % OF TOT. C SAMP weight numbers

Brama brama	149.61	132	94.59	
SALPS	8.55	60	5.41	
Unidentified crustacean	0.00	0	0.00	
Total	158.17		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 50
 DATE :06/11/15 GEAR TYPE: PT NO: 5 POSITION:Lat N 20°8.11 Lon W 17°22.30
 start stop duration Purpose : 1
 LOG : 2718.86 2722.30 3.4 Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 31 36 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 0 Total catch: 164.71 Catch/hour: 164.90
 SPECIES CATCH/HOUR % OF TOT. C SAMP weight numbers

Arius parkii	64.07	120	38.86	
Scomberomorus tritor	48.36	30	29.32	
SALPS	12.51	300	7.59	
Sarda sarda	12.01	3	7.29	
Alectis alexandrinus	11.86	11	7.19	
Euthynnus alletteratus	7.58	3	4.60	
Seriola carpenteri	4.56	3	2.76	
Pomadasys rogeri	1.44	1	0.87	
Pomadasys jubelini	1.40	1	0.85	
Zeus faber	1.10	1	0.67	
Total	164.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 51
 DATE :06/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 20°8.44 Lon W 17°15.64
 start stop duration Purpose : 1
 LOG : 2732.05 2735.22 3.2 Region : 1200
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 25 23 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 0 Total catch: 282.40 Catch/hour: 310.96
 SPECIES CATCH/HOUR % OF TOT. C SAMP weight numbers

Scomberomorus tritor	223.42	85	71.85	
Arius parkii	42.94	48	13.81	
SALPS	21.25	0	6.83	
Alectis alexandrinus	11.18	3	3.59	
Rhizoprionodon acutus	8.15	22	2.62	
Sepia officinalis	3.63	30	1.17	
Fistularia tabacaria	0.28	3	0.09	
Engraulis encrasicolus	0.03	8	0.01	
Gephyroberyx darwini	0.02	0	0.01	
Lagocephalus laevigatus	0.02	2	0.01	
Selene dorsalis	0.01	1	0.00	
Trachurus trecae	0.01	2	0.00	
Loligo vulgaris	0.01	1	0.00	
Total	310.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 52
 DATE :06/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 20°19.05 Lon W 17°14.13
 start stop duration Purpose : 1
 LOG : 2803.02 2803.22 13.3 (min)

LOG : 2757.66 2758.38 0.7 Region : 1200
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 29 29 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 0 Total catch: 514.46 Catch/hour: 2315.65

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Caranx rhonchus	1539.38	4501 66.48
126 Trachurus trecae	304.55	1683 13.15
125 Jellyfish	107.13	0 4.63
Arius parkii	68.87	117 2.97
Scomberomorus tritor	60.54	18 2.61
Sphyræna guachancho	55.18	135 2.38
Loligo vulgaris	54.91	302 2.37
Boops boops	54.91	9 2.37
Sepia officinalis	21.88	99 0.94
Trichiurus lepturus	19.08	819 0.82
SALPS	12.78	108 0.55
Rhizoprionodon acutus	4.68	14 0.20
Dasyatis marmorata	3.92	5 0.17
Engraulis encrasicolus	2.79	180 0.12
Sardinella maderensis	2.61	108 0.11
Pagellus bellottii	1.35	9 0.06
Diplodus bellottii	1.08	9 0.05
Total	2315.65	100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 53
 DATE :06/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 20°19.68
 start stop duration Lon W 17°21.63
 TIME :21:23:24 21:31:12 7.8 (min) Purpose : 1
 LOG : 2767.26 2767.70 0.4 Region : 1200
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 33 35 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 0 Total catch: 1542.42 Catch/hour: 11864.77

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Jellyfish	4749.69	0 40.03

Engraulis encrasicolus 4011.69 477492 33.81 127
 Sardinella maderensis 3103.38 323269 26.16 128
 Total 11864.77 100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 54
 DATE :07/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 20°28.15
 start stop duration Lon W 17°41.45
 TIME :02:15:24 02:30:22 15.0 (min) Purpose : 1
 LOG : 2811.65 2812.53 0.9 Region : 1200
 FDEPTH: 10 15 Gear cond.: 0
 BDEPTH: 224 253 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 0 Total catch: 373.86 Catch/hour: 1498.44

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Benthoosema fibulatum	1466.93	493178	97.90
Jellyfish	26.21	289	1.75
Trichiurus lepturus	4.81	192	0.32
Synagrops microlepis	0.48	24	0.03
Total	1498.44		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 54
 DATE :07/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 20°28.15
 start stop duration Lon W 17°41.45
 TIME :02:15:24 02:30:22 15.0 (min) Purpose : 1
 LOG : 2811.65 2812.53 0.9 Region : 1200
 FDEPTH: 10 15 Gear cond.: 0
 BDEPTH: 224 253 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 0 Total catch: 373.86 Catch/hour: 1498.44

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Benthoosema fibulatum	1466.93	493178	97.90
Jellyfish	26.21	289	1.75
Trichiurus lepturus	4.81	192	0.32
Synagrops microlepis	0.48	24	0.03
Total	1498.44		100.00

Annex II Description of instruments and fishing gear

Acoustic instruments

The Simrad ER-60/18, 38, 120 and 200 kHz scientific sounder was run during the survey only for observation of fish and bottom conditions. No scrutinizing of the recordings was done. Last standard sphere calibrations was checked on the 07.07.2013 in Baía dos Elefantes using Cu-64, Cu-60, WC-38.1 add WC-38.1 spheres for 18, 38, 120 and 200 kHz, respectively. The details of the settings for the 38 kHz echo sounder were as follows:

Transceiver-2 menu (38 kHz)

Transducer depth	5,50 m
Absorbtion coeff.	9.6 dB/km
Pulse duration	medium (1,024ms)
Bandwidth	2.43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
gain	25,11 dB
SA correction	-0.60 dB
Angle sensitivity	21.9
3 dB beamwidth	7.43° along ship
7.38° athwardship	
Alongship offset	0.06°
Athwardship offset	0.04°

Bottom detection menu Minimum level -40 dB

Fishing gear

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

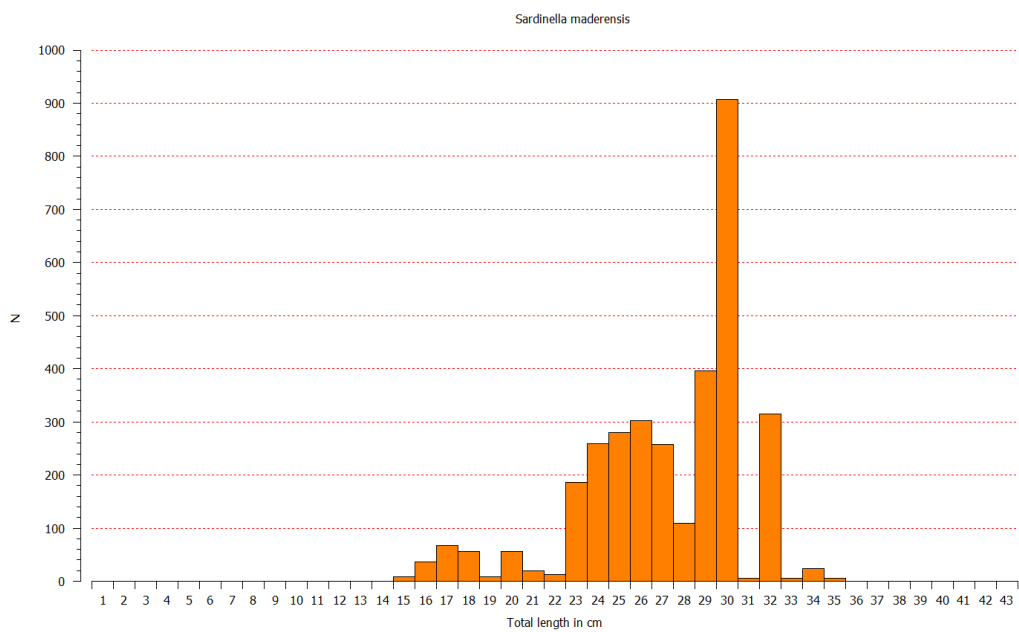
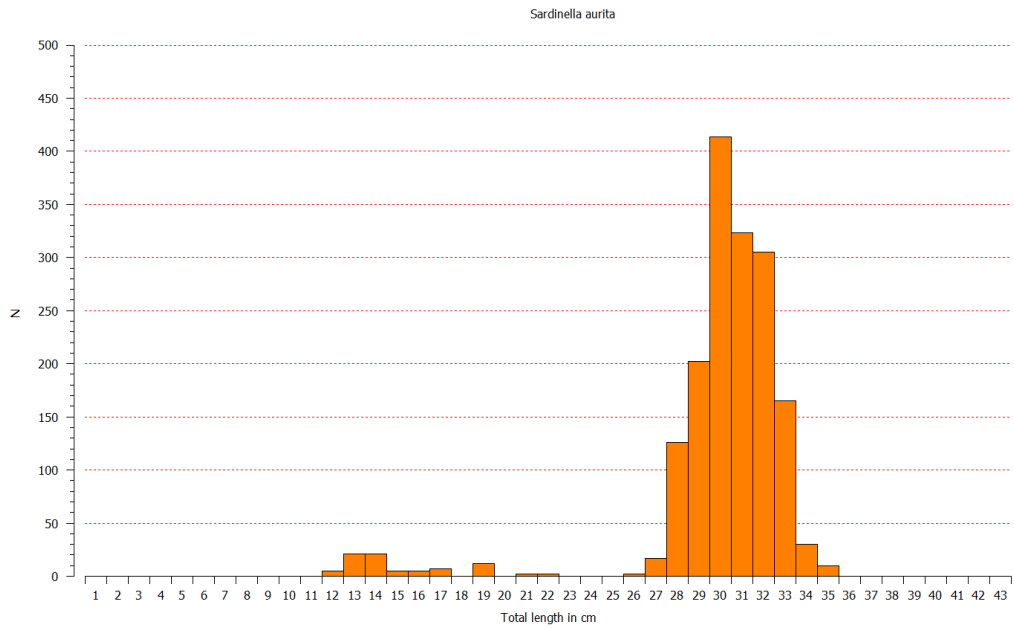
The bottom trawl has a 31 m headline and a 47 m footrope fitted with a 12" rubber bobbins gear. The codend has 20 mm meshes, and has an inner net with 10 mm mesh size. The vertical opening is about 5.5 m. The distance between the wing tips is about 18 m during towing. The sweeps are 40 m long. The trawl doors are 'Thyborøen' combi, 8 m² and weigh 2000 kg. The door spreading is about 45 m when using restraining rope. Trawling was conducted for species identification only and no restraining rope was therefore used during the survey.

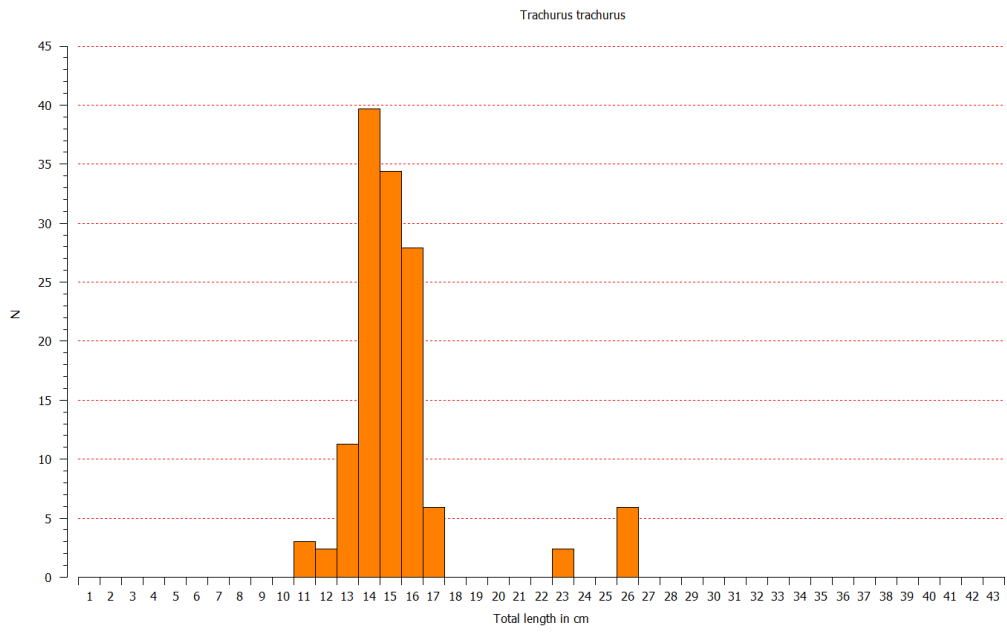
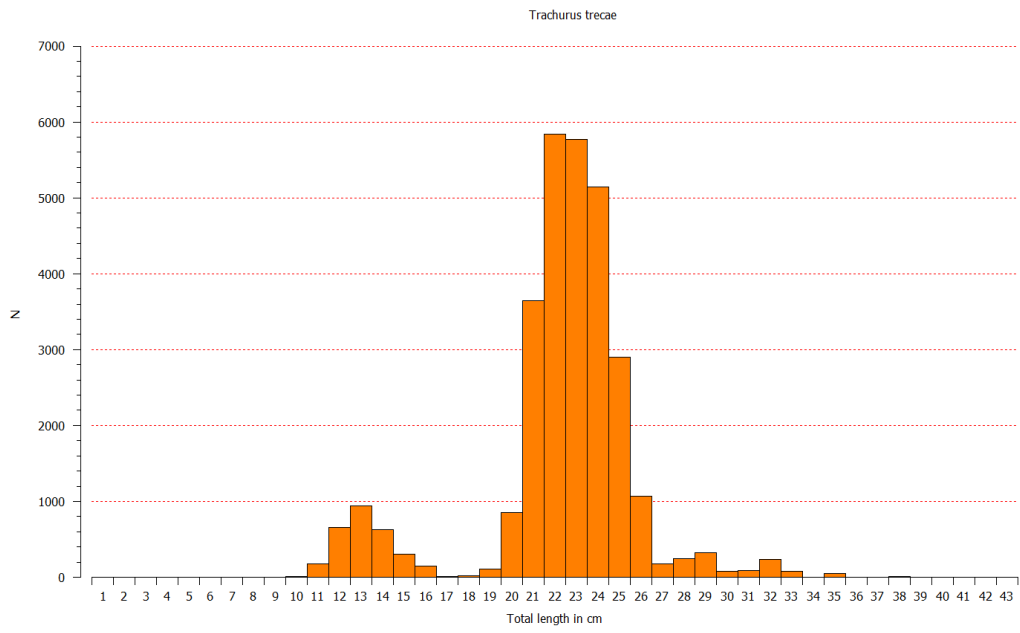
The SCANMAR system was used during all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their distance and a height sensor is fitted on the bottom trawl to measure the trawl opening and provide information on clearance and bottom contact.

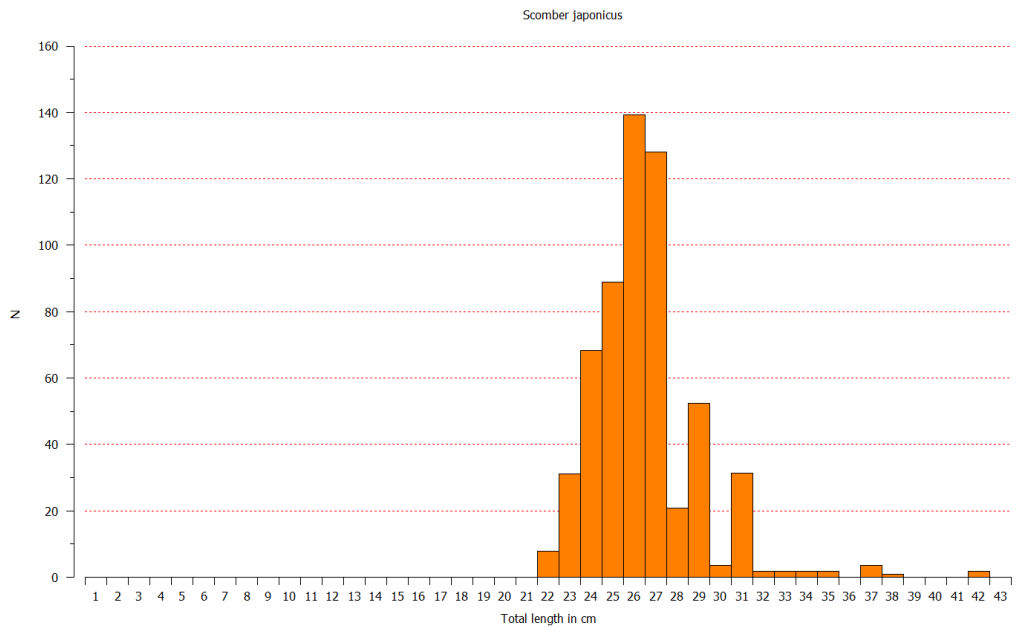
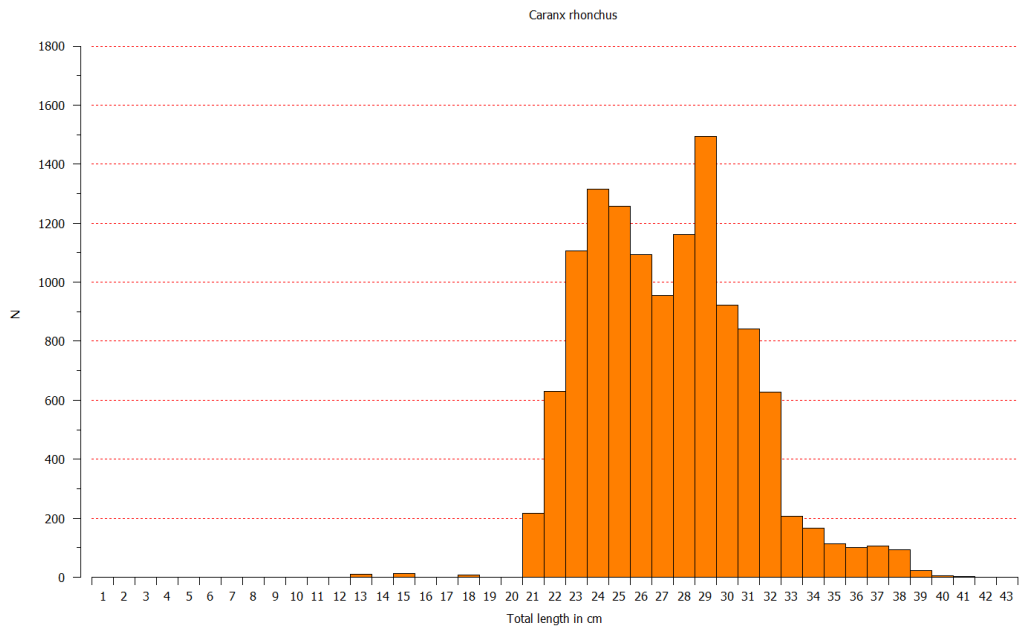
The pelagic trawls are equipped with a trawl eye that provides information about the trawl opening and the distance of the footrope to the bottom. A pressure sensor is used to show the depth on the headline.

Annex III Pooled length distributions by species, Mauritania

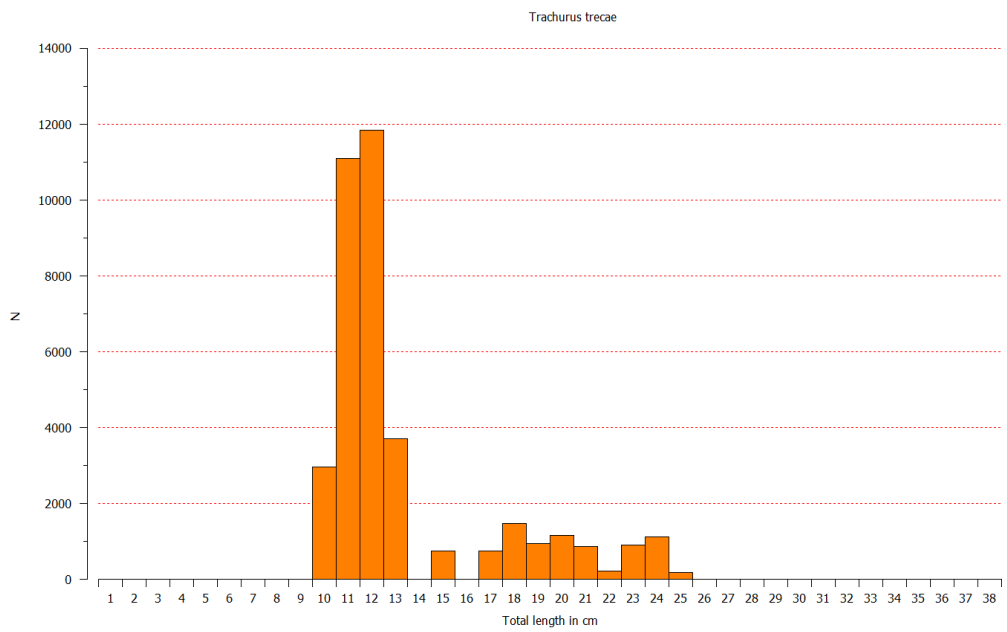
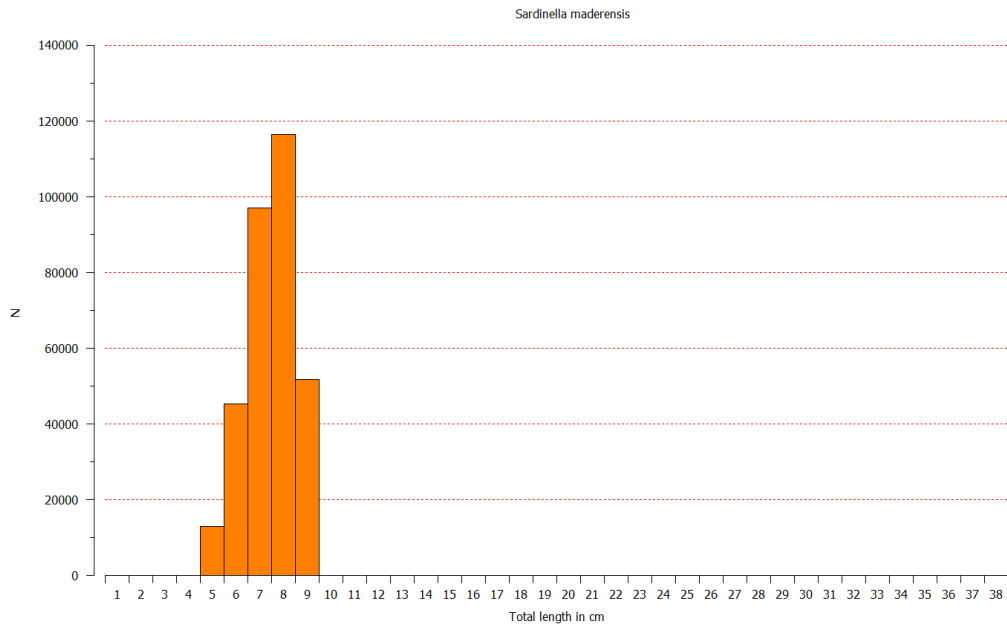
St. Louis to Cape Timiris

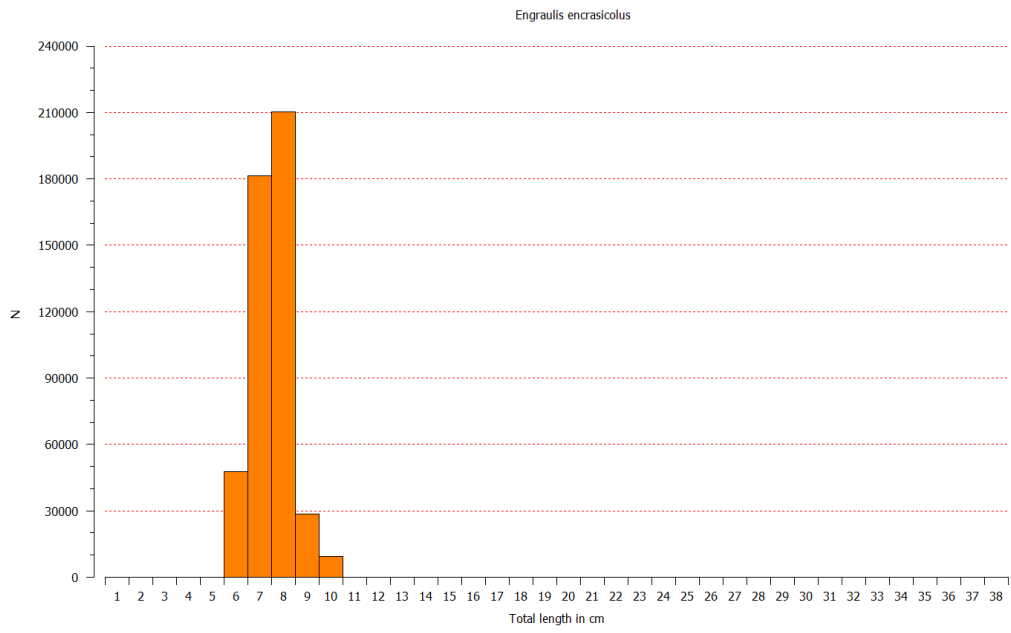
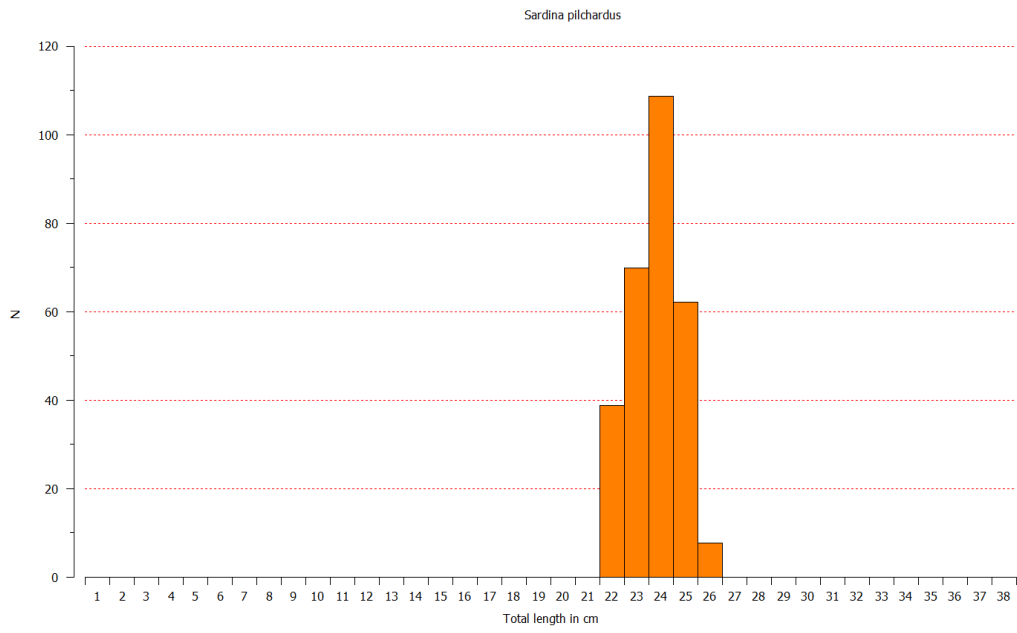




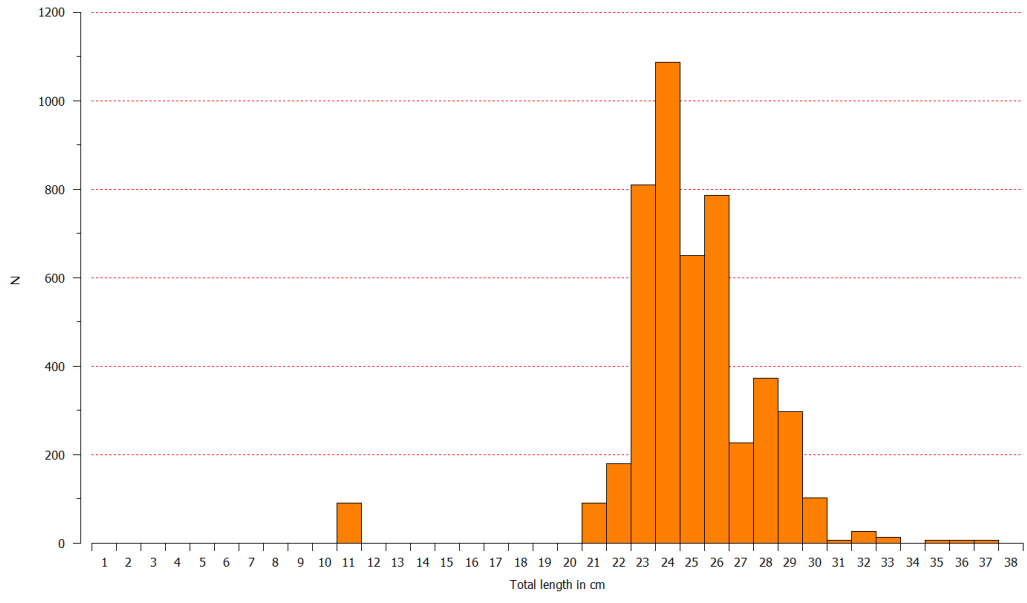


Cape Timiris to Cape Blanc





Caranx rhonchus



Annex IV Estimated number and biomass by length-group and sectors

Round sardinella (*Sardinella aurita*) November 2015

Numbers in millions

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5			
6			
7			
8			
9			
10			
11			
12	2		2
13	8		8
14	7		7
15	2		2
16	2		2
17	1		1
18			
19	4		4
20			
21			
22			
23			
24	1		1
25	1		1
26	1		1
27	3		3
28	12		12
29	22		22
30	66		66
31	79		79
32	63		63
33	22		22
34	42		42
35	1		1
36			
37			
38			
39			
40			
41			
42			
Total	339		339

Biomass in tonnes

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5			
6			
7			
8			
9			
10			
11			
12	0.0		0.0
13	0.2		0.2
14	0.2		0.2
15	0.1		0.1
16	0.1		0.1
17	0.1		0.1
18			
19	0.3		0.3
20			
21	0.0		0.0
22	0.0		0.0
23	0.0		0.0
24	0.1		0.1
25	0.2		0.2
26	0.3		0.3
27	0.6		0.6
28	2.9		2.9
29	5.8		5.8
30	19.5		19.5
31	25.6		25.6
32	22.5		22.5
33	8.5		8.5
34	18.1		18.1
35	0.7		0.7
36			
37			
38			
39			
40			
41			
42			
Total	105.8		105.8

Flat sardinella (*Sardinella maderensis*) November 2015

Numbers in millions

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5		249	249
6		870	870
7		1 864	1 864
8		2 237	2 237
9		994	994
10			0
11		5	5
12		60	60
13		35	35
14		25	25
15	35	10	45
16	71	10	81
17	291	15	306
18	73		73
19	35	10	45
20	73	5	78
21	2		2
22	35		35
23	15		15
24	40		40
25	62		62
26	252		252
27	186		186
28	360		360
29	151		151
30	295		295
31	49		49
32	85		85
33	24		24
34	101		101
35	6		6
36	3		3
37	3		3
38			0
39			0
40			0
41			0
42			0
Total	2 245	6 389	8 634

Biomass in tonnes

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5		0.4	0.4
6		2.4	2.4
7		7.9	7.9
8		13.8	13.8
9		8.5	8.5
10			0.0
11		0.1	0.1
12		1.2	1.2
13		0.9	0.9
14		0.7	0.7
15	1.3	0.4	1.7
16	3.1	0.4	3.5
17	15.1	0.8	15.9
18	4.4		4.4
19	2.5	0.7	3.2
20	6.0	0.4	6.4
21	0.2		0.2
22	3.8		3.8
23	1.9		1.9
24	5.6		5.6
25	9.8		9.8
26	44.5		44.5
27	36.6		36.6
28	78.9		78.9
29	36.7		36.7
30	78.8		78.8
31	14.4		14.4
32	27.5		27.5
33	8.6		8.6
34	38.9		38.9
35	2.3		2.3
36	1.2		1.2
37	1.4		1.4
38			0.0
39			0.0
40			0.0
41			0.0
42			0.0
Total	423.4	38.6	462.0

Cunene horse mackerel (*Trachurus trecae*) November 2015

Numbers in millions

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5			
6			
7			
8			
9			
10	9	14	23
11	66	53	119
12	60	57	117
13	34	18	52
14	44		44
15	14	4	18
16	21		21
17	5	4	9
18	12	7	19
19	32	44	76
20	48	85	133
21	101	28	129
22	142	41	183
23	215	36	251
24	147	77	224
25	87	33	120
26	26		26
27	2		2
28	7		7
29	23		23
30	4		4
31	9		9
32	2		2
33			0
34			0
35	169		169
36			0
37			0
38	0		0
39			0
40			
41			
42			
Total	1 279	501	1 780

Biomass in tonnes

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5			
6			
7			
8			
9			
10	0.1	0.1	0.2
11	0.9	0.7	1.6
12	1	1	2
13	0.7	0.4	1.1
14	1.2		1.2
15	0.5	0.1	0.6
16	0.8		0.8
17	0.2	0.2	0.4
18	0.7	0.4	1.1
19	2.2	3	5.2
20	3.8	6.7	10.5
21	9.2	2.6	11.8
22	15	4.3	19.3
23	25.9	4.4	30.3
24	20.2	10.6	30.8
25	13.5	5.1	18.6
26	4.5		4.5
27	0.3		0.3
28	1.5		1.5
29	5.7		5.7
30	1		1
31	2.7		2.7
32	0.7		0.7
33			0
34			0
35	73.6		73.6
36			0
37			0
38	0.2		0.2
39			
40			
41			
42			
Total	186.1	39.6	225.7

Atlantic horse mackerel (*Trachurus trachurus*) November 2015

Numbers in millions

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5			
6			
7			
8			
9			
10			
11	3		3
12	0		0
13	8		8
14	31		31
15	28		28
16	20		20
17	6		6
18			
19			
20			
21			
22			
23	0		0
24			
25			
26	6		6
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
Total	101		101

Biomass in tonnes

Length (cm)	St. Louis - C. Timiris	C. Timiris - C- Blanc	Total
5			
6			
7			
8			
9			
10			
11	0		0
12	0		0
13	0.2		0.2
14	0.8		0.8
15	0.9		0.9
16	0.8		0.8
17	0.3		0.3
18			
19			
20			
21			0
22	0		0
23			
24			
25			
26	1		1
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
Total	4		4

Annex V Regional Estimates, October – December 2004

October-December 2004: Sardine (*Sardina pilchardus*), number in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6		295.4					295.4
7		641.5					641.5
8		202.6					202.6
9	21.0	49.0					70.0
10	310.3	188.8					499.2
11	339.0	493.6					832.6
12	365.3	1,524.4					1,889.8
13	758.3	2,834.0					3,592.4
14	2,134.1	3,385.3					5,519.4
15	4,147.9	3,829.7					7,977.6
16	2,436.2	3,150.3					5,586.5
17	1,935.4	1,541.7					3,477.1
18	4,877.2	1,077.5					5,954.6
19	2,513.9	1,854.1					4,368.0
20	499.7	2,171.9					2,671.6
21	90.3	4,547.7					4,638.0
22	20.5	11,849.6					11,870.1
23	20.5	15,503.5					15,638.4
24	5.8	11,313.6					11,945.4
25		4,533.8					5,447.0
26	1.5	1,290.7					1,865.1
27		346.3					570.1
28		6.3					50.0
29							
30							
Total	20,476.8	72,631.4					95,602.2

October-December 2004: Sardine (*Sardina pilchardus*), biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6		665					665
7		2,219					2,219
8		1,020					1,020
9	147	345					492
10	2,946	1,793					4,738
11	4,228	6,156					10,384
12	5,851	24,415					30,266
13	15,299	57,177					72,476
14	53,350	84,627					137,977
15	126,660	116,942					243,602
16	89,739	116,042					205,780
17	85,054	67,755					152,809
18	253,219	55,943					309,161
19	152,851	112,732					265,582
20	35,301	153,433					188,734
21	7,355	370,616					377,971
22	1,914	1,106,790					1,108,704
23	2,186	1,649,857	13,309	937			1,666,289
24	701	1,364,314	83,060	5,310			1,453,386
25		616,449	138,890	6,467			761,806
26	222	196,961	96,704	5,645			299,532
27		59,050	42,894	1,802			103,746
28		1,189	9,390	334			10,913
29							
30							
Total	837,021	6,166,489	384,246	20,496			7,408,252

October-December 2004: Round sardinella (*Sardinella aurita*), number in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5						0.9	0.9
6			2.1			10.5	12.6
7		10.7	29.5			13.1	53.3
8		138.3	109.4			5.7	253.4
9		162.0	103.1			0.9	266.0
10		108.1	50.5				158.6
11		57.3	12.6		8.5		78.4
12		8.6					8.6
13		7.1			5.0	7.4	19.6
14		3.6			17.0	8.7	29.3
15		3.6		37.9	91.4	11.8	144.7
16				56.8	82.9	27.7	167.5
17		1.4		349.7	151.9	0.6	503.7
18		2.2		198.1	43.8		244.1
19				149.9	71.3		221.2
20		3.7	2.5	37.9	13.6		57.6
21		26.8	7.4	36.3	8.5		79.0
22		40.2	12.4			17.5	70.0
23		18.6	71.9			108.7	199.2
24		27.7	47.1	17.3		187.0	279.1
25		175.8	17.3	60.6		330.4	584.2
26		35.7		138.5		197.2	371.5
27		360.5		86.6		390.8	838.0
28		109.2		138.5		88.9	336.7
29		305.7	2.5	147.2		43.5	498.9
30		476.7		43.3		23.9	543.9
31		399.7		17.3			417.0
32		569.2					569.2
33		320.5					320.5
34		237.0				3.9	240.9
35		227.6					227.6
36		147.2					147.2
37		147.1					147.1
38		42.9					42.9
39		27.2					27.2
40							
41		6.7					6.7
42							
43							
44							
45							
46							
47							

48							
49							
50							
Total		4,208.7	468.3	1,516.0	494.0	1,479.1	8,166.2

October-December 2004: Round sardinella (*Sardinella aurita*), biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5						1	1
6			6			28	33
7			119			53	172
8		200	645			33	878
9		384	849			7	1,239
10		204	561				765
11		103	184		124		412
12		26					26
13					119	176	295
14					499	254	753
15				1,355	3,269	421	5,045
16				2,451	3,576	1,196	7,222
17		73		17,990	7,817	32	25,911
18		130		12,042	2,663		14,834
19				10,673	5,073		15,746
20		301	205	3,134	1,121		4,761
21		2,503	709	3,460	813		7,485
22		4,303	1,355			1,909	7,567
23		2,270	8,953			13,547	24,770
24		3,830	6,647	2,445		26,393	39,315
25		27,404	2,761	9,649		52,599	92,413
26		6,240		24,752		35,237	66,229
27		70,483		17,288		78,031	165,802
28		22,888		30,790		19,758	73,436
29		71,329	611	36,280		10,722	118,942
30		122,828		11,793		6,511	141,132
31		116,839		5,197			122,036
32		181,711					181,711
33		110,387					110,387
34		88,366				1,529	89,894
35		94,003					94,003
36		66,344					66,344
37		72,927					72,927
38		23,004					23,004
39		15,778					15,778
40							
41		4,532					4,532
42							
43							
44							
45							
46							

47							
48							
49							
50							
Total		1,109,390	23,606	189,298	25,073	248,437	1,595,804

October-December 2004: Flat sardinella (*Sardinella maderensis*), numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8					9.7		9.7
9					48.4		48.4
10			3.8		32.3		36.1
11			3.8		19.4		23.2
12							
13				8.6	6.5		15.1
14				17.2	6.5		23.7
15			2.5	8.6			11.1
16					9.7		9.7
17			15.0	8.6			23.6
18			7.6	8.6			16.2
19			49.0			16.2	65.3
20			90.6			52.8	143.3
21			83.6			225.9	309.5
22		6.1	192.5	8.6		507.2	714.4
23		17.9	140.6		9.7	799.1	967.3
24		156.7	96.2	32.3	38.8	840.6	1,164.6
25		355.2	45.1	86.1	53.0	454.4	993.8
26		307.9	30.4	437.2	65.9	270.8	1,112.2
27		513.0	22.9	446.9	35.5	268.4	1,286.7
28		518.7		475.1	13.6	80.0	1,087.4
29		539.1	6.4	189.5		3.7	738.6
30		286.5		225.5		27.6	539.6
31		68.0		260.2			328.2
32		63.5		549.6		16.5	629.6
33		55.6	0.1	688.4			744.1
34		21.4		456.8			478.2
35		24.4		248.6			273.1
36		11.5		75.2			86.7
37				23.1			23.1
38		2.9					2.9
39		2.9					2.9
40							
41							
42							
43							
44							
45							
46							

47							
48							
49							
50							
Total		2,951.4	790.1	4,254.7	348.8	3,563.3	11,908.4

October-December 2004: Flat sardinella (*Sardinella maderensis*), biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8					57		57
9					399		399
10			43		359		402
11			56		283		339
12							
13				203	153		356
14				504	189		693
15			90	308			398
16					418		418
17			771	443			1,214
18			459	523			982
19			3,489			1,156	4,646
20			7,491			4,365	11,855
21			7,978			21,554	29,532
22		672	21,052	942		55,462	78,127
23		2,258	17,512		1,207	99,557	120,534
24		22,352	13,585	4,554	5,471	118,681	164,645
25		57,126	7,186	13,699	8,431	72,339	158,781
26		55,060	5,437	78,108	11,770	48,377	198,752
27		102,813	4,565	89,227	7,093	53,583	257,280
28		113,111		105,572	3,014	17,781	239,478
29		122,200	1,566	46,707		907	171,380
30		62,398		61,432		7,506	131,337
31		9,181		78,071			87,252
32		12,209		181,116		5,449	198,774
33		8,753	38	248,440			257,231
34		81		180,078			180,159
35				106,790			106,790
36				35,091			35,091
37				11,709			11,709
38		1,629					1,629
39							
40							
41							
42							
43							
44							
45							
46							

47							
48							
49							
50							
Total		569,843	91,319	1,243,518	38,845	506,716	2,450,241

October-December 2004: Anchovy (*Engraulis encrasicolus*), numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6	12.7	9.8					22.5
7	25.4	259.7					285.1
8	146.3	565.6					711.9
9	366.9	4,239.4					4,606.3
10	487.8	2,868.3					3,356.1
11	1,380.3	676.5					2,056.7
12	1,127.4	219.0					1,346.4
13	227.7	7.2					235.0
14	22.9						22.9
15	4.4						4.4
16							
17	3.9						3.9
18	3.9						3.9
19							
20							
Total	3,809.7	8,845.6					12,655.3

Anchovy (*Engraulis encrasicolus*), biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6	19	15					33
7	58	592					649
8	485	1,876					2,361
9	1,699	19,628					21,327
10	3,049	17,930					20,980
11	11,336	5,556					16,892
12	11,891	2,310					14,201
13	3,026	96					3,122
14	377						377
15	88						88
16							
17	113						113
18	134						134
19							
20							
Total	32,275	48,002					80,276

October-December 2004: Atlantic horse mackerel (*Trachurus trachurus*), numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8							
9							
10							
11							
12							
13		2.5					2.5
14							
15	0.4						0.4
16	5.5	55.4					60.9
17	8.5	223.6					232.1
18	6.3	449.9					456.2
19	0.8	516.0					516.8
20	2.0	662.3					664.3
21	3.2	331.6					334.8
22	4.0	157.4					161.4
23	0.8	72.9	1.1				74.8
24	0.8	4.3	4.5				9.5
25		2.5	3.4				5.8
26		6.6	7.8				14.4
27			6.7				6.7
28			5.6				5.6
29			6.7				6.7
30	0.1		2.2				2.4
31							
32			2.2				2.2
33							
34							
35							
36	0.1			0.1			0.2
37	0.1						0.1
38				0.1			0.1
39				0.9			0.9
40	0.4			0.1			0.5
41	0.4			0.1			0.5
42	0.2						0.2
43							
44							
45							
46							

47							
48							
49							
50							
Total	33.5	2,484.9	40.3	1.4			2,560.0

October-December 2004: Atlantic horse mackerel (*Trachurus trachurus*), biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8							
9							
10							
11							
12							
13		51					51
14							
15	8						8
16	133	2,091					2,224
17	245	10,067					10,311
18	216	23,929					24,145
19	32	32,138					32,170
20	92	47,928					48,020
21	171	27,681					27,851
22	244	15,063					15,307
23	56	7,945	139				8,140
24	63	526	632				1,221
25		343	535				877
26		1,028	1,400				2,427
27			1,341				1,341
28			1,244				1,244
29			1,655				1,655
30	18		610				628
31							
32			738				738
33							
34							
35							
36	31			53			84
37	34						34
38				62			62
39				539			539
40	127			73			200
41	137			78			215
42	98						98
43							
44							
45							
46							

47							
48							
49							
50							
Total	1,703	168,788	8,293	805			179,590

October-December 2004: Cunene horse mackerel (*Trachurus trecae*), numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8							
9			10.3				10.3
10			12.8	5.9			18.7
11			214.2	35.5	11.8		261.5
12			272.3	59.0	18.1		349.3
13		44.1	167.4	70.2	13.9		295.6
14		115.3	24.1	58.3	16.8		214.5
15		49.1		56.1	3.9		109.0
16		103.7	10.3	39.0	1.1		154.1
17		463.4		0.8	2.2		466.5
18		785.8		3.8	9.0	3.2	801.8
19		959.3			17.8	1.6	978.7
20		1,067.2			10.0	14.6	1,091.7
21		953.9		2.5	6.6	37.6	1,000.6
22		683.1		5.0	5.1	84.6	777.7
23		542.6		22.5	5.3	164.3	734.8
24		201.8		20.0	16.1	108.7	346.5
25		172.4		8.8	10.9	43.7	235.7
26		109.8		10.2	12.8	14.4	147.1
27		136.7		1.3	4.6	4.4	147.1
28		207.3		0.1	3.7	3.3	214.5
29		41.4		0.2	1.8	1.7	45.1
30		46.6	0.3	0.9			47.9
31		25.9	0.7	0.8			27.4
32		10.4	0.3	1.5			12.2
33		5.2		0.6			5.8
34		5.2		0.7			5.9
35			1.1				1.1
36							
37							
38							
39			3.2	0.6			3.8
40			4.3	0.5			4.8
41			11.7	1.0			12.8
42			4.3	1.5			5.8
43			7.5	1.5			9.0
44			3.2	3.6			6.8
45			4.3	1.5			5.8
46				0.5			0.5

47			2.1				2.1
48							
49							
50							
Total		6,730.1	754.3	414.3	171.5	482.1	8,552.2

October-December 2004: Cunene horse mackerel (*Trachurus trecae*), biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8							
9			85				85
10			142	65			207
11			3,128	518	172		3,818
12			5,105	1,106	339		6,550
13		911	3,954	1,658	328		6,851
14		2,953	705	1,705	492		5,855
15		1,535		2,004	139		3,678
16		3,911	444	1,681	48		6,085
17		20,863		41	116		21,020
18		41,792		233	546	197	42,767
19		59,749			1,268	115	61,132
20		77,230			823	1,204	79,257
21		79,636		238	628	3,587	84,089
22		65,358		546	557	9,249	75,709
23		59,155		2,798	666	20,472	83,092
24		24,927		2,818	2,278	15,341	45,363
25		24,011		1,405	1,730	6,948	34,095
26		17,157		1,816	2,281	2,574	23,828
27		23,882		268	913	888	25,950
28		40,315		25	824	738	41,902
29		8,937		56	447	409	9,849
30		11,112	90	248			11,451
31		6,801	198	239			7,239
32		2,988	109	488			3,585
33		1,636		206			1,842
34		1,787		269			2,056
35			458				458
36							
37							
38							
39			1,894	368			2,262
40			2,722	324			3,046
41			8,055	698			8,752
42			3,146	1,124			4,270
43			5,903	1,205			7,108
44			2,708	3,011			5,719
45			3,860	1,379			5,239
46				491			491

47			2,196				2,196
48							
49							
50							
Total		576,645	44,903	29,031	14,595	61,722	726,896

October-December 2004: Chub mackerel (*Scomber japonicus*), numbers in millions

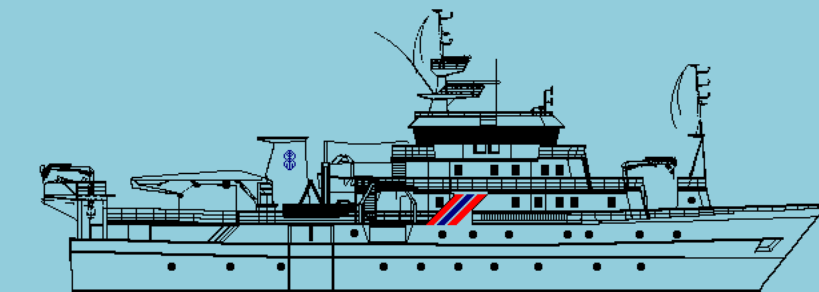
Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8							
9							
10							
11							
12		2.0					2.0
13	5.1	0.7					5.8
14	5.1	5.0					10.2
15	54.3	10.8					65.2
16	771.5	57.7					829.2
17	1,680.1	142.7					1,822.8
18	1,306.6	128.9					1,435.5
19	643.7	55.1					698.7
20	191.5	43.2					234.6
21	137.6	79.7					217.3
22	217.3	68.8					286.1
23	168.7	59.8					228.5
24	124.0	66.1					190.1
25	34.4	46.2					80.6
26	42.9	24.4					67.3
27	37.4	59.0					96.4
28	40.1	125.7					165.9
29	41.6	156.3					197.9
30	13.4	69.1					82.5
31	4.0	48.6					52.6
32		13.3					13.3
33	8.1	3.8					11.9
34		4.3					4.3
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							

47							
48							
49							
50							
Total	5,527.6	1,271.1					6,798.7

October-December 2004: Chub mackerel (*Scomber japonicus*), biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7							
8							
9							
10							
11							
12		32					32
13	106	15					121
14	131	129					260
15	1,700	338					2,038
16	29,112	2,175					31,288
17	75,636	6,423					82,059
18	69,492	6,857					76,349
19	40,090	3,430					43,520
20	13,856	3,123					16,979
21	11,488	6,656					18,144
22	20,791	6,582					27,373
23	18,390	6,518					24,908
24	15,320	8,161					23,481
25	4,798	6,431					11,229
26	6,713	3,808					10,521
27	6,530	10,313					16,843
28	7,799	24,452					32,251
29	8,976	33,699					42,675
30	3,196	16,471					19,667
31	1,059	12,756					13,815
32		3,823					3,823
33	2,548	1,212					3,760
34		1,498					1,498
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							

47							
48							
49							
50							
Total	337,731	164,904					502,635



**SURVEY OF THE PELAGIC FISH RESOURCES OFF
NORTH WEST AFRICA**

Part III

Cape Blanc- Larache

10 November - 11 December 2015

Bergen, 2015



CRUISE REPORTS “DR FRIDTJOF NANSEN”

**SURVEY OF THE PELAGIC FISH RESOURCES OFF
NORTH WEST AFRICA**

Part III

Cape Blanc- Larache

10 November - 11 December 2015

by

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Bergen, 2015

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CHAPTER 1. INTRODUCTION

1.1 Survey objectives

The specific objectives for the survey were, as for the previous pelagic surveys with Dr. Fridtjof Nansen in the region (until 2006):

- To map the distribution and estimate the biomass of the main small pelagic fish species using hydroacoustic methods. The species of interest were: sardine *Sardina pilchardus*, sardinellas *Sardinella aurita* and *S. maderensis*, chub mackerel *Scomber japonicus*, horse mackerel *Trachurus*, *T. trecae*, and anchovy *Engraulis encrasicolus*.
- To identify acoustic targets by midwater and bottom trawl sampling and process the catches by recording weight and number by species. For the target species, length frequencies are taken to describe the size distribution.
- To sample standard hydrographical transects for temperature, salinity and oxygen off Cape Blanc, Dakhla, Cape Bojador, Cape Juby, Cape Dra and Cape Ghir.

In addition:

- To intercalibrate with RV *Al Amir Moulay Abdallah* between Cape Blanc and Cape Juby.

The time allocated for this part of the survey was 27 working days.

1.2 Participation

Members of the scientific teams were:

Institut National de Recherche Halieutique (INRH), Morocco:

Salaheddine El Ayoubi (team leader), Abdallah Motiq, Said ait Taleb, Mustapha Bahadda.

Institut Mauritanien de Recherches Océanographiques et des Pêches (IMROP), Mauritania:

Yahya Elewa, Alioun Niang.

Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), Senegal:

Madiabel Diop.

Institute of Marine Research, Norway (IMR):

Elena Eriksen (cruise leader, until 24 November), Jens-Otto Krakstad (cruise leader, from 25 November), Diana Zaera-Perez (until 24 November), Magne Olsen (from 25 November), Jan Frode Wilhelmsen (until 24 November), Inge Nymark (until 24 November), Tore Mørk (from 25 November) and Ole Sverre Fossheim (from 25 November).

Food and Agriculture Organisation (FAO), Italy:

Deborah Catena (until 24 November)

Ivory Coast:

Constance Diaha (from 25 November)

Ministry of Fisheries and Marine Resources (MFMR), Namibia:

Vaino Shigwedha (until 24 November)

1.3 Narrative

Figures 1a-b shows the cruise track and the stations worked during the survey. The vessel departed from Nouakchott on 10 November, starting the sampling work off Cape Blanc. The survey proceeded with an acoustic sampling grid with a transect distance 10 NM apart, covering the shelf and slope down until about 500 m bottom depth (Figure 1a). The survey was interrupted with a call at Las Palmas 24-25 December for refuelling and crew change. The vessel departed from Las Palmas at 20:00 on the 25th November and the survey resumed on the following morning at 08:00 about 70 NM southwest off Cape Juby, and the sampling continued northwards with transects perpendicular to the coast. Cape Cantin was reached on the 6 December. The northern limit of the survey, Larache (between Rabat and Tangier), was reached on 11 December in the night before the vessel returned to Casablanca at 17:00 the same day for disembarking local scientists. The vessel then steamed to Las Palmas where she arrived on 14 December.

Intercalibration with the Moroccan research vessel *Al Amir Moulay Abdallah* was planned, but was not possible to carry out due bad weather in the period planned for the intercalibration.

Standard hydrographical sections were sampled at Cape Barbas, off Dakhla, off Lacraa at Cape Bojador, Cape Juby, Cape Dra and Cape Ghir, Cape Cantin, and Casablanca one additional CTD line was taken at the final transect of the survey south of Larache. Standard hydrographical section off Cape Blanc was taken during previous part of the survey.

The weather was generally favourable and put no serious constraints on the sampling work. Some rough weather conditions were experienced between Cape Bojador and Laayoune.

1.4 Survey effort

Altogether 153 trawl hauls were carried out to identify acoustic targets during the survey. 87 CTD casts were made along hydrographic transects to describe the water properties in the survey area. Table I show the survey effort during the survey. Annex I give the full details of the trawl stations.

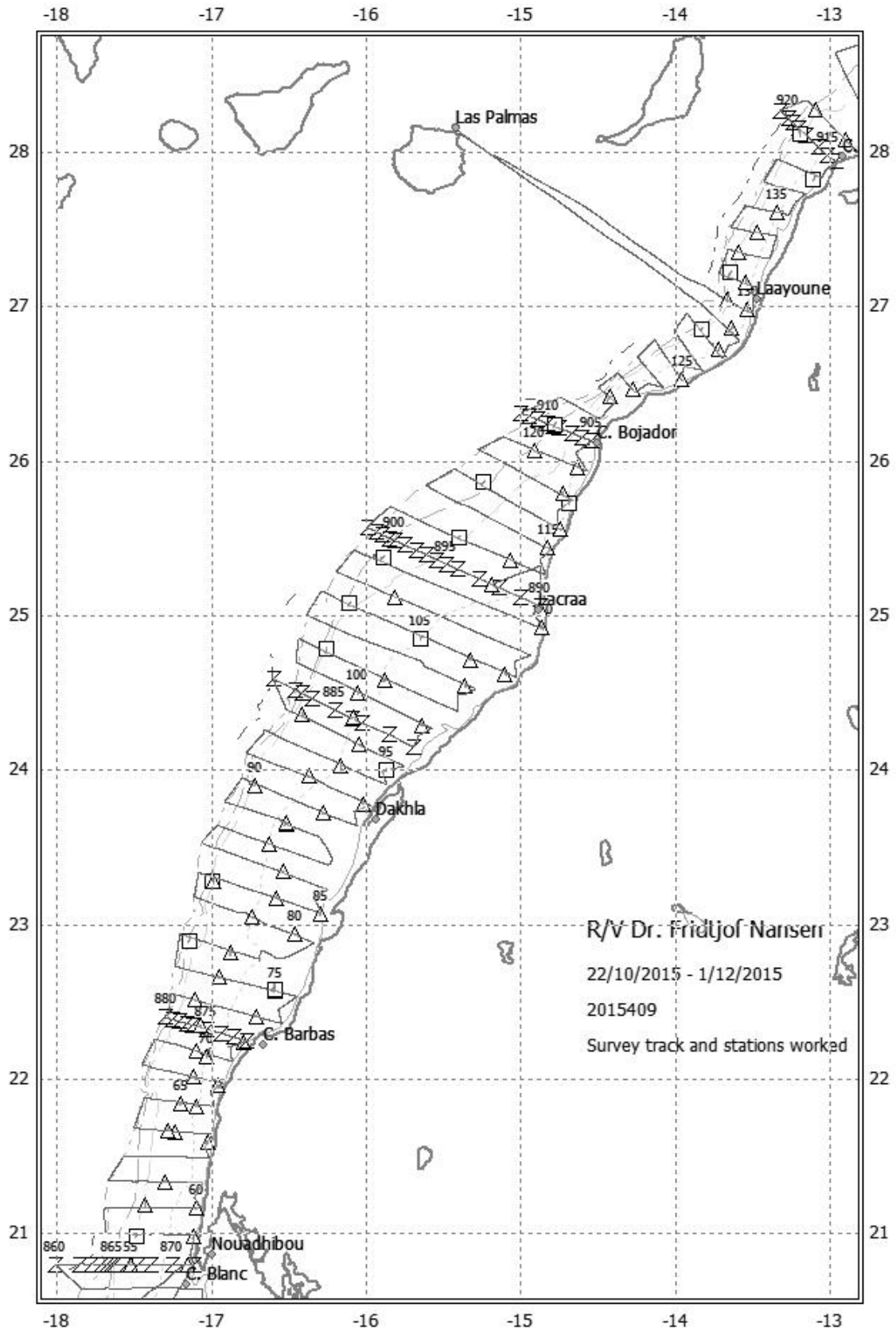


Figure 1a. Course track with fishing and hydrographic stations, Cape Blanc to Cape Juby. Depth contours at 20 m, 50 m, 100 m, 200 m and 500 m are indicated.

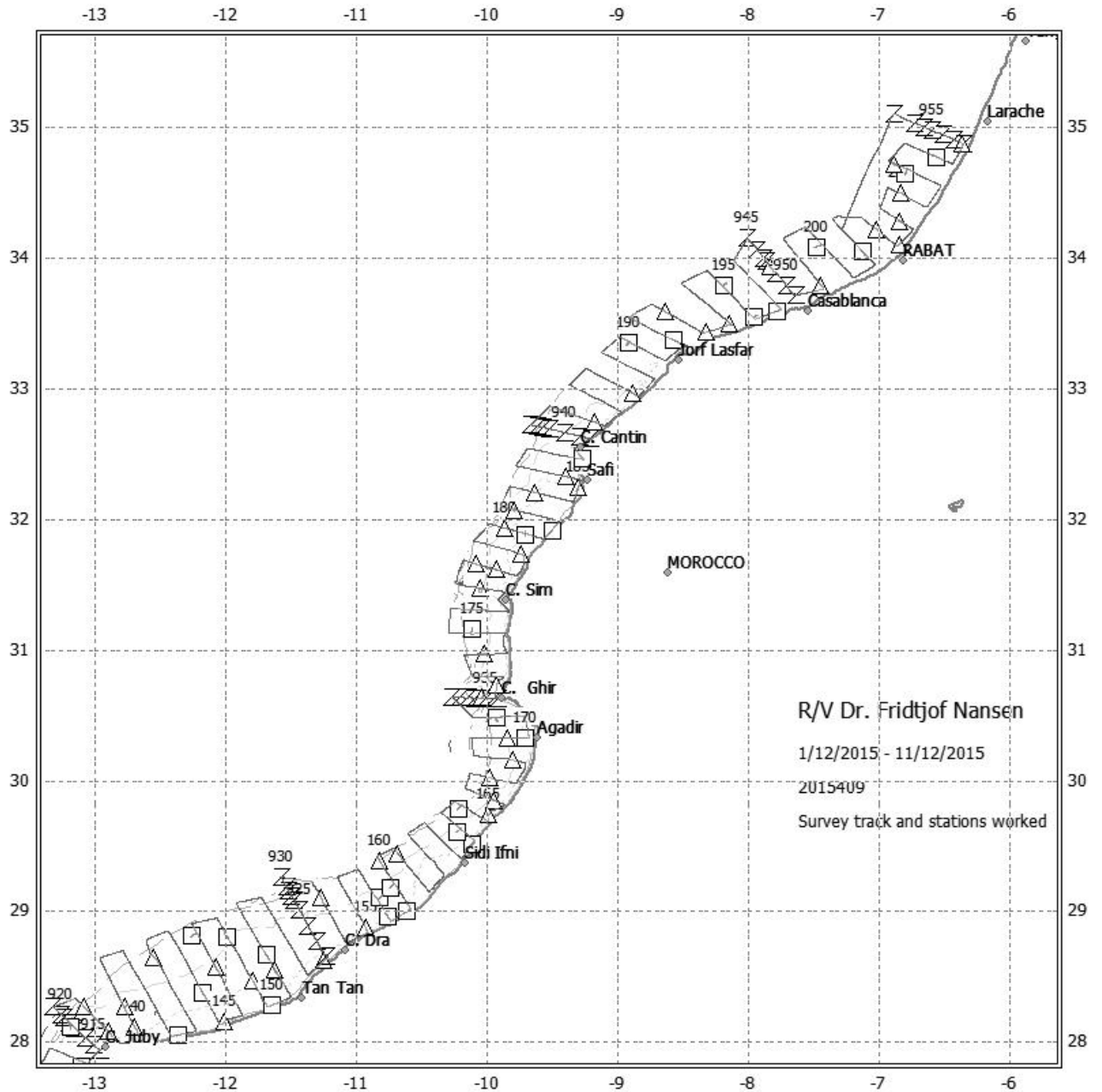


Figure 1b. Course track with fishing and hydrographic stations, Cape Juby to south of Larache. Depth contours as in Fig. 1a.

Table 1. Survey effort during the survey. BT-bottom trawl, PT- Pelagic trawl.

	BT	PT	Total trawls	CTD casts	Log (NM)
C. Juby - C. Blanc	15	63	78	45	2527
C. Cantin - C. Juby	21	32	53	28	2040
North of C. Cantin	9	13	22	14	820
Total	45	108	153	87	4567

CHAPTER 2. METHODS

2.1 Environmental Data

A Seabird 911+ CTD probe was used to obtain vertical profiles of the temperature, salinity, oxygen and Fluorescence. Real time logging was carried out using the PC based Seabird Seasave software. CTD casts were conducted on predefined environmental transects only, from the coast and offshore to between 1 000-1 500 m bottom depth. The casts were stopped a few meters above the bottom.

Sea surface salinity, chlorophyll, turbidity and relative temperature were continuously measured using a SBE 21 Seacat Thermosalinograph. The water inlet for the thermosalinograph is at 5 m depth. The turbidity data recorded turned out to be corrupted during the survey due to some pollution in the sensor.

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

Biological sampling

Biological sampling of the fish was carried out using pelagic or bottom trawls. In shallow water (<30 m) or at night when pelagic fish was close to the surface the pelagic trawl with floats or bottom trawl with floats was used for sampling. Annex II gives a description of the instruments and the fishing gear used. All catches were sampled for composition by weight and numbers of each species caught. Species identification was based on the FAO Species Guides. Length frequency distributions, by total fish length to the nearest cm below, of the selected target species were taken in all the stations where they were present. Individual weight measurements and biological information on sex, maturity, and stomach fullness was recorded for 30 fish of all target species. The length measurements were used to estimate the length-weight relationship used in the biomass calculations. These relationships can be found in Table 2:

The target groups used for this survey can be found below, while the complete records of fishing stations and catches are shown in Annex I.

Acoustic sampling

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 survey was started without *a priori* calibration. The last calibration was carried out earlier this year in Angola. Annex II gives the details of the acoustic settings used during the survey.

Acoustic data were logged and post-processed using the latest acoustic data post-processing software, the Large Scale Survey System (LSSS) Version 1.9. The technical specifications

and operational settings of the echo sounder used during the survey are given in Annex II.

In cases where the target category of fish contains more than one species (sardinellas and *Trachurus trecae*), the mean s_A -value allocated to the category is divided between the species in the same ratio as their contribution to the mean back scattering strength in the length frequency samples.

The following target strength (TS) function was applied to convert s_A -values (mean integrator value for a given species or group of species in a specified area) to number of fish:

$$TS = 20 \log L - 72 \text{ dB}$$

Which can be converted (see Toresen *et al.* 1998 for details) to the area form (scattering cross sections of acoustic targets):

$$C_{Fi} = 1.26 \cdot 10^6 \cdot L^{-2}$$

where L is total length in 1 cm length group i and C_{Fi} (m^{-2}) is the reciprocal back scattering strength, or so-called fish conversion factor. In order to split and convert the allocated s_A -values (m^2/NM^2) to fish densities (numbers per length group per NM^2), the following formula was used:

$$\rho_i = s_A \cdot \frac{p_i}{\sum_{i=1}^n \frac{p_i}{C_{Fi}}}$$

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 integrator outputs were split in fish groups using a combination of behaviour pattern as deduced from echo diagrams, the LSSS analysis and catch composition as described below.

The following target groups were used for Morocco:

1) Sardine (European pilchard *Sardina pilchardus*),

- 2) Sardinellas (flat sardinella *Sardinella maderensis* and round sardinella *S. aurita*),
- 3) Anchovy (European anchovy *Engraulis encrasicolus*),
- 4) Horse mackerels (Atlantic horse mackerel *Trachurus trachurus*, and Cunene horse mackerel *T. trecae*)
- 5) Mackerels (Atlantic chub mackerel, Former scientific name *Scomber japonicus*, new name *S. colias*)
- 6) Other pelagic scombrids, carangids and associated species (such as *Auxis* sp., *Caranx* sp. and hairtail *Trichiurus lepturus*), LSSS group PEL2
- 7) Other demersal species (such as Sparidae, Haemulidae and Merlucciidae).

The above equations show that the conversion from s_A -values to number of fish is dependent on the length composition of the fish. It is therefore important to get representative length distributions from the stock in the whole distribution area.

When the size classes (of e.g. young fish and older fish) are well mixed, the various length distributions can be pooled together with equal importance. Otherwise, when the size classes are segregated, the total distribution area has to be post-stratified, according to the length distributions, and separate estimates are made for the regions containing fish with equal size.

For a region representing a distribution of a target-specie, the following basic data are needed for the estimation of abundance;

- 1) The average s_A -value for the region,
- 2) The surface (usually square nautical miles, NM^2), and
- 3) A representative length distribution of the fish in the region.

If the targeted fish is a mixture of more than one species, for example sardinellas, a representative distribution of the two, within the region, as shown in the trawl catches, are used. A length distribution representing the number of the two species for each catch will have to be calculated. Thereafter, these distributions have to be normalized to a unit number (usually 100) so they are equally weighted.

A systematic approach to a) divide the s_A -value between species in a category of fish (e.g. *Sardinella aurita* and *S. maderensis*) and b) produce pooled length distributions of a target species for use in the above equation and c) calculate the biomass estimates for a region, is obtained through the following procedure:

- The samples of the species in the category (e.g. sardinellas) are respectively pooled together with equal importance (normalized).
- The mean back scattering strength (ρ/s_A) of each length frequency distribution of the target species is calculated and summed. This is automatically done in the Excel spread-sheet made available for acoustic abundance estimation on board RV “Dr. Fridtjof Nansen”, provided the data are punched in this sheet.

- The mean s_A -value allocated to the category of fish in the region is divided between the species in the same ratio as their relative contribution to the mean back scattering strength of the length groups in the sample representing the region
- The pooled length distribution is used, together with the mean s_A -value, to calculate the density (numbers per square NM) by length groups and species, using the above formula. The total number by length group in the area is obtained by multiplying each number by the area.
- The numbers are then converted to biomass using the estimated weight at length.

CHAPTER 3. SURVEY RESULTS

3.1 Hydrographic conditions

Hydrographical data was collected on fixed CTD stations, and continuously using the thermosalinograph and the WIMDA weather station.

Wind conditions

The wind conditions during the survey changed considerably from the south to north of the survey area with weakening winds northwards (Figure 2a and b). During the southern part of the survey there was strong wind coming from the north, and north-east off Cape Blanc. Wind speed exceeded 20 m/s. This ceased and between Cape Barbas and Dakhla were a few days with weak and variable wind patterns followed by strong winds from the north-west again between Dakhla and the call at Las Palmas, Wind speed exceeded 20 m/s. The wind pattern in this region was favourable for upwelling. After the call in Las Palmas the winds were generally weaker, typically around 10 m/s, but variable. Wind direction was mainly the same with winds from north-west, with shorter periods of changing wind direction. North of Cape Cantin wind speed was typically low < 5 m/s.

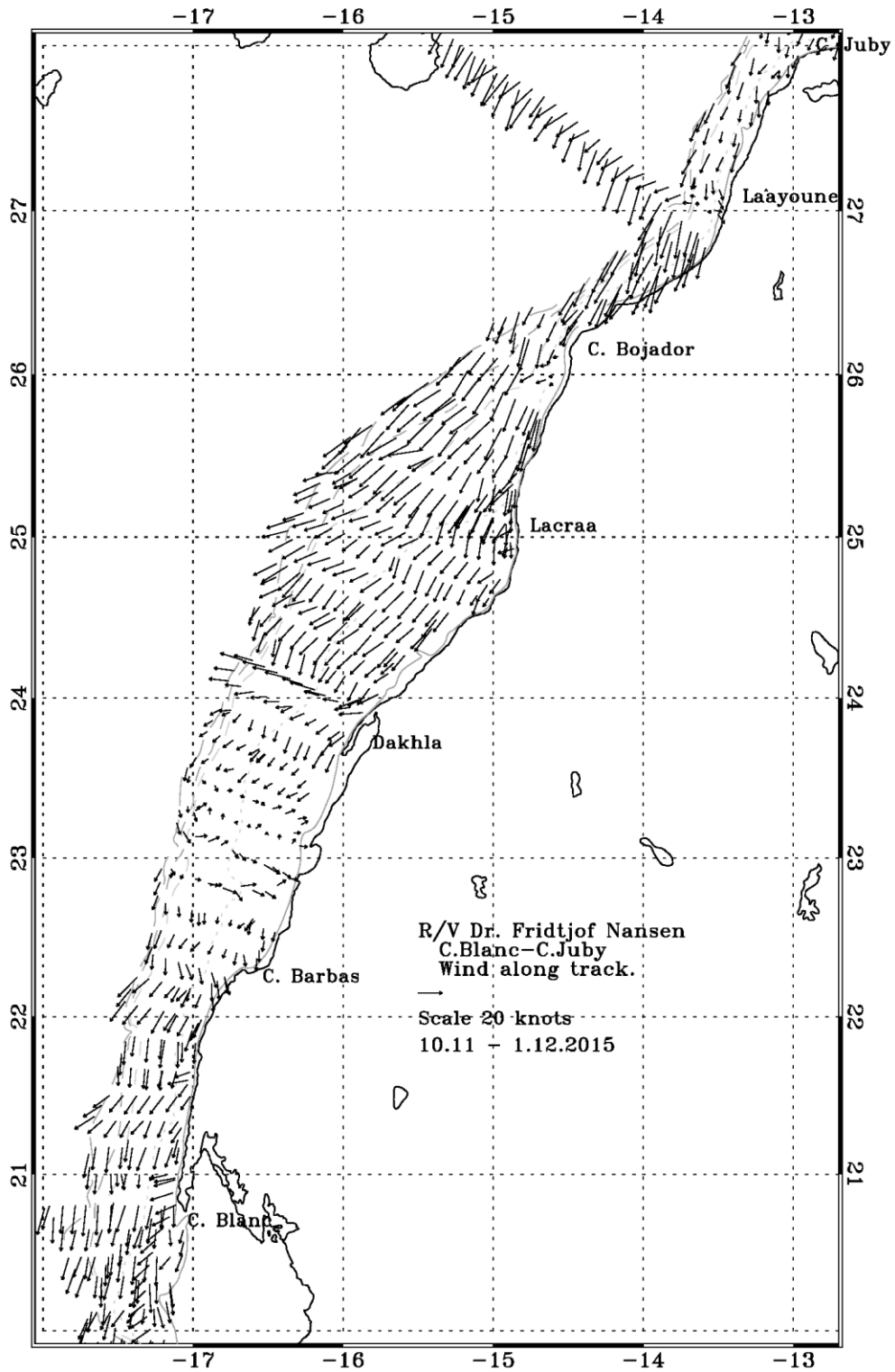


Figure 2a. Wind conditions along the survey, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

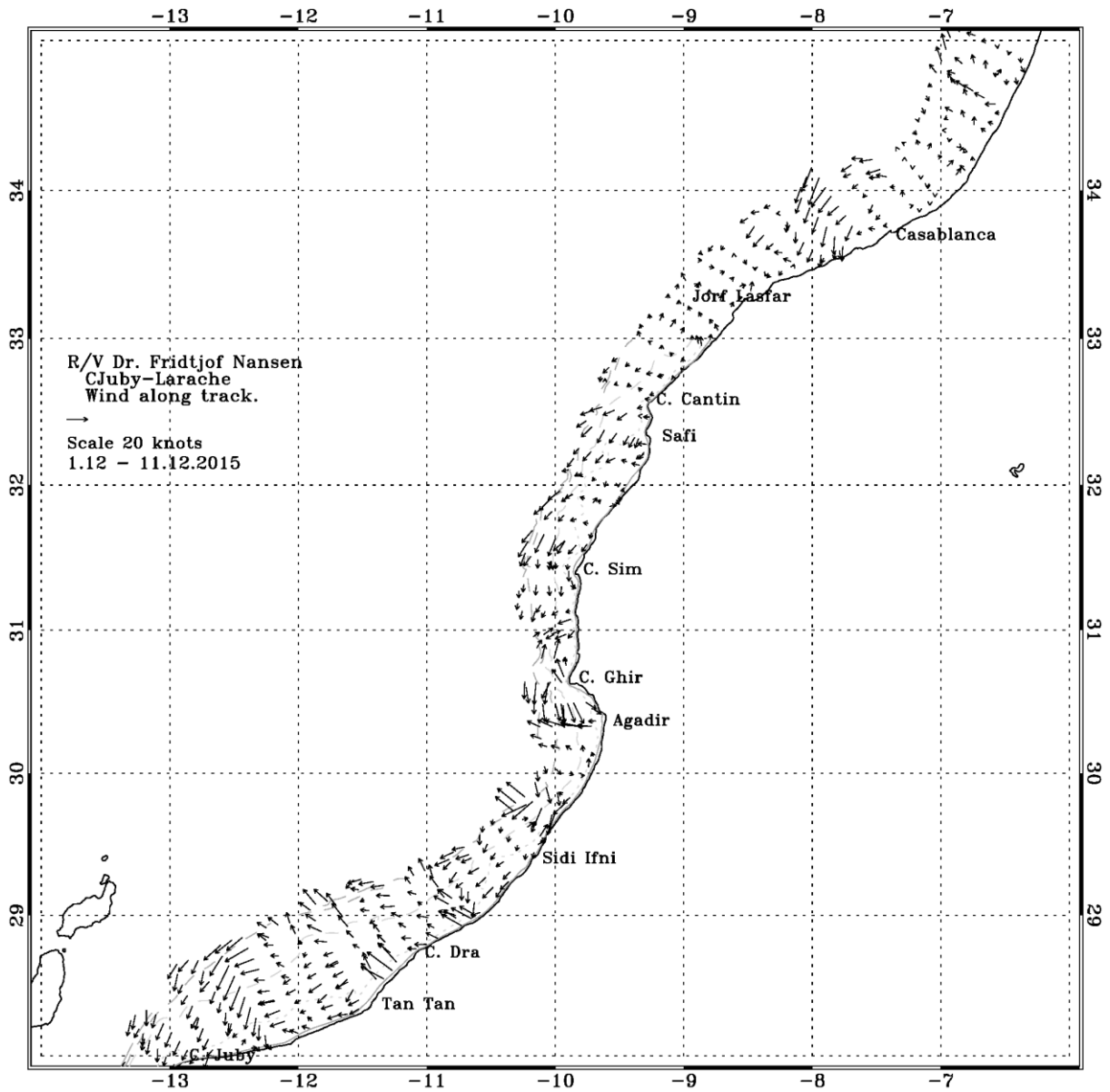


Figure 2b. Wind conditions along the survey, Cape Juby to south of Larache. Depth contours as in Fig. 1a.

Surface distribution

The horizontal distribution of temperature (SST), salinity (SSS) and fluorescence (SSF) recorded from the thermosalinograph at 5 m depth throughout the survey is depicted in Figure 3a-f. The data from the thermosalinograph was calibrated against the CTD to ensure comparable values.

Cape Blanc to Cape Juby

Environmental conditions in the survey area between Cape Blanc to Cape Juby are described in Figures 3a-c. The SST between Cape Blanc and Cape Juby show cold water close to the coast and considerably warmer off the shelf. This is particularly evident south of 22°N and in the region north of 25°N. Both areas show strong upwelling with temperatures as low as 17-18°C on the inner shelf and > 23° offshore. A storm hit the vessel while in the area north of 25° until Las Palmas. During that period the mixing depth increased and the frontal zone between the cold upwelled water on the shelf and the warmer water offshore was strengthened considerably. This is also evident in the Figure of SSS. The highest salinity of 36.8 was found in the area where the mixing depth was the deepest. In general, the waters were very saline with decreasing levels southward. In the south of Cape Blanc there are indications of water masses with a different origin than the main part of the region. The fluorescence plot shows a very abrupt change in primary production, illustrated by Sea surface fluorescence (SSF). South of 23°30'N the production was very high, reaching as much as 4 µg/l in patches, particularly inshore, while North of 23°30'N the production was considerably lower all the way to Cape Juby, rarely reaching above 0.5 µg/l.

North of Cape Juby to south of Larache

Environmental conditions in the survey area between Cape Blanc to Cape Juby are described in Figures 3d-f. Temperatures north of Cape Juby also showed relatively high variability. Generally, with warmest temperatures > 21°C offshore and in the south and cool water masses < 18 °C close to the coast particularly in the region south of Cape Cantin towards Agadir. The cooler water masses compared well with areas of highest primary production indicating upwelling. North of Cape Cantin conditions were more stable with little wind and less temperature difference found between inshore and offshore water masses. The salinity was typical for the conditions in the northern part of the CCLME ecosystem dominated by relatively high salinity >36.4 increasing offshore and in the southern part. Lower salinity was experienced particularly in the area between Cape Gir and Cape Sim due to stronger upwelling in this region. Primary production (SSF) was generally low with values < 0.5 µg/l offshore. High values were found inshore between Cape Juby- Tan Tan and particularly between Cape Gir and Cape Sim.

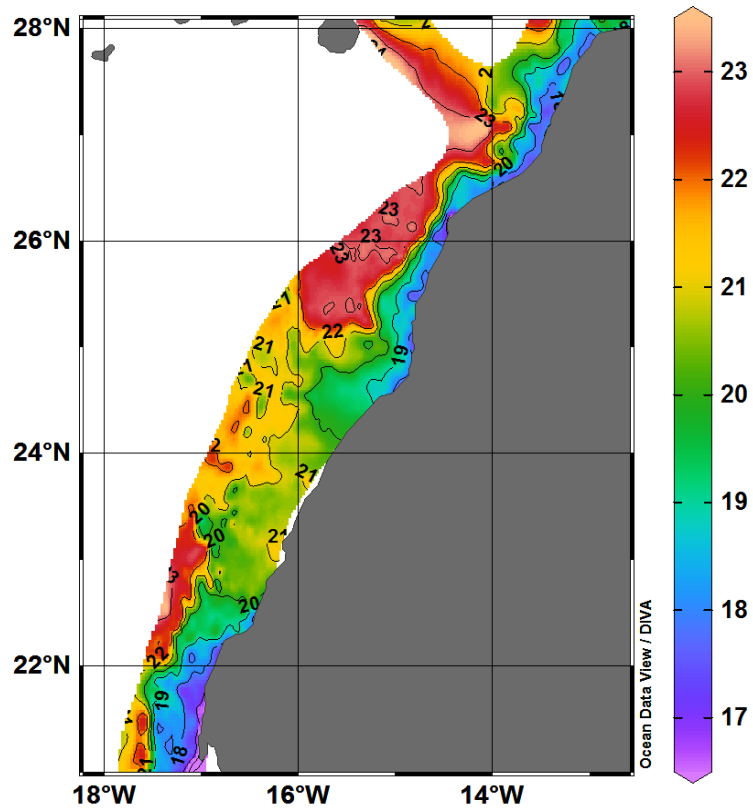


Figure 3a Sea surface temperature (at 5 m depth), Cape Blanc to Cape Juby.

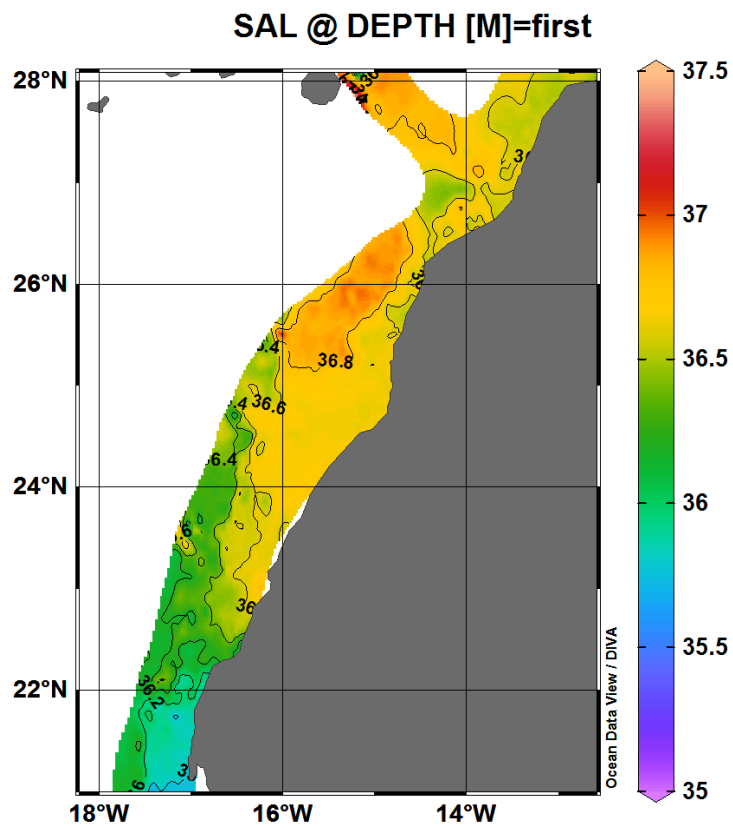


Figure 3b Sea surface salinity (at 5 m depth), Cape Blanc to Cape Juby.

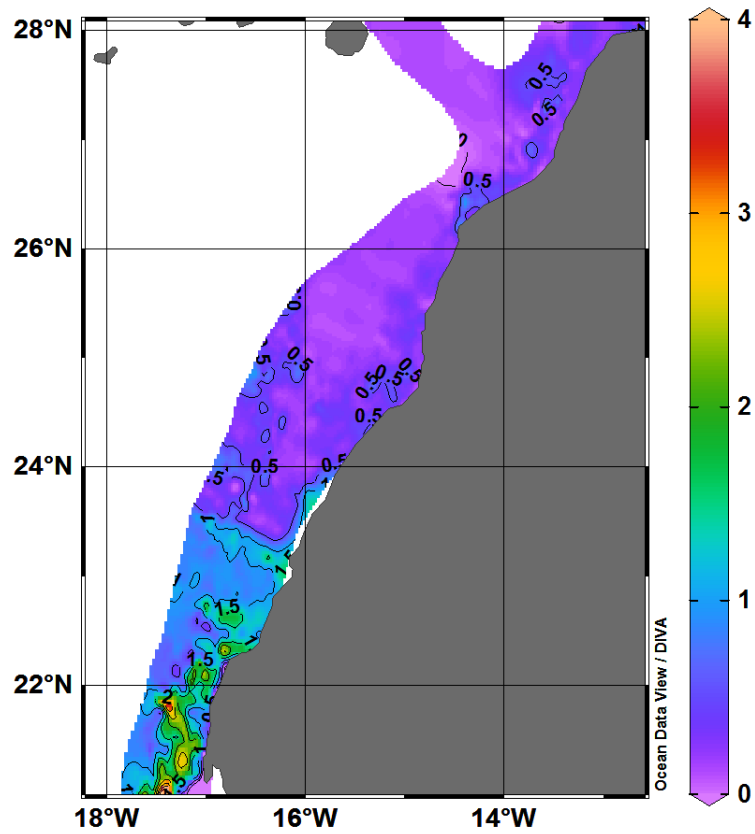


Figure 3c. Sea surface fluorescence (at 5 m depth), Cape Blanc to Cape Juby.

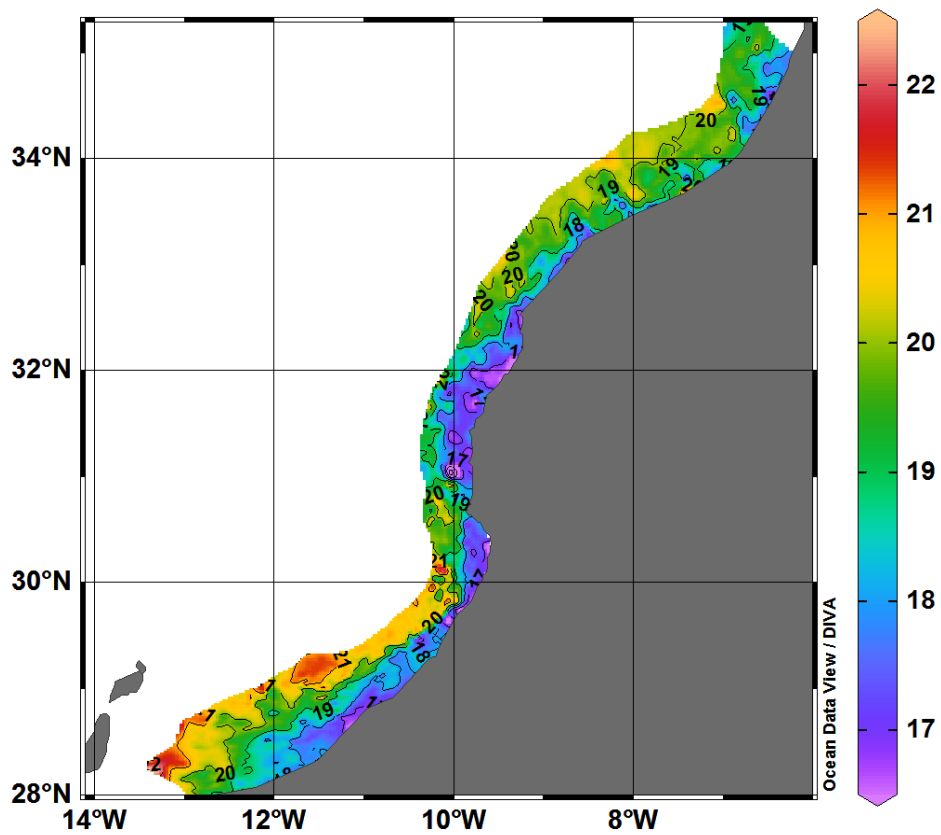


Figure 3d. Sea surface temperature (at 5 m depth), Cape Juby to south of Larache.

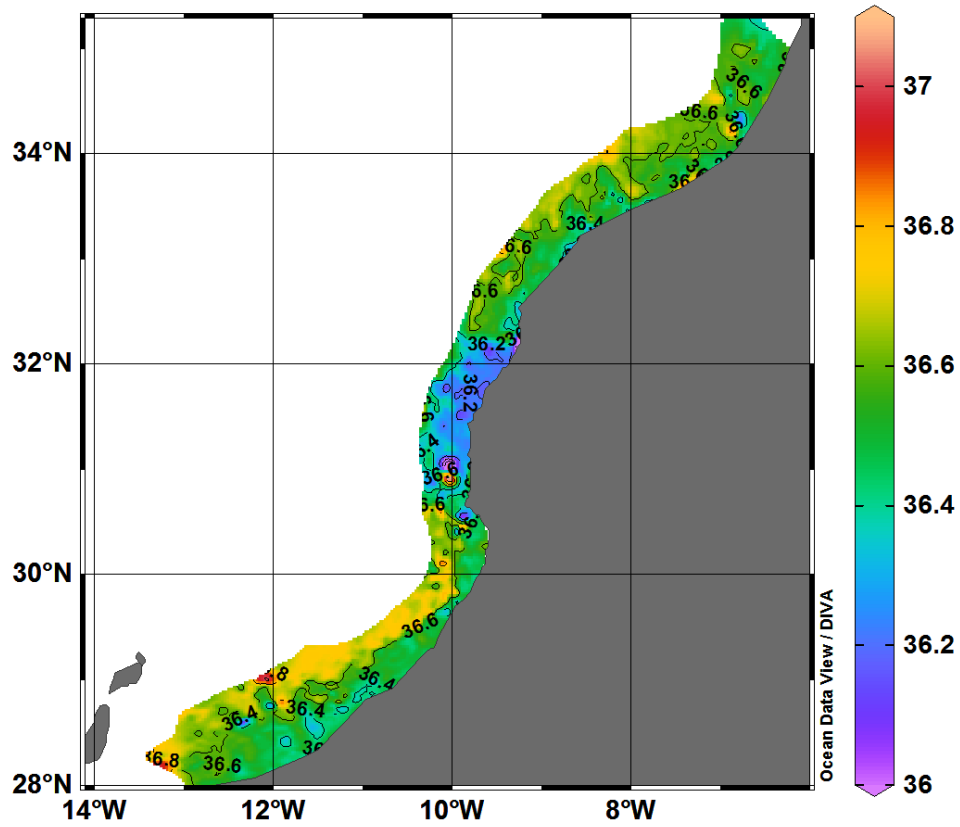


Figure 3e. Sea surface salinity (at 5 m depth), Cape Juby to south of Larache.

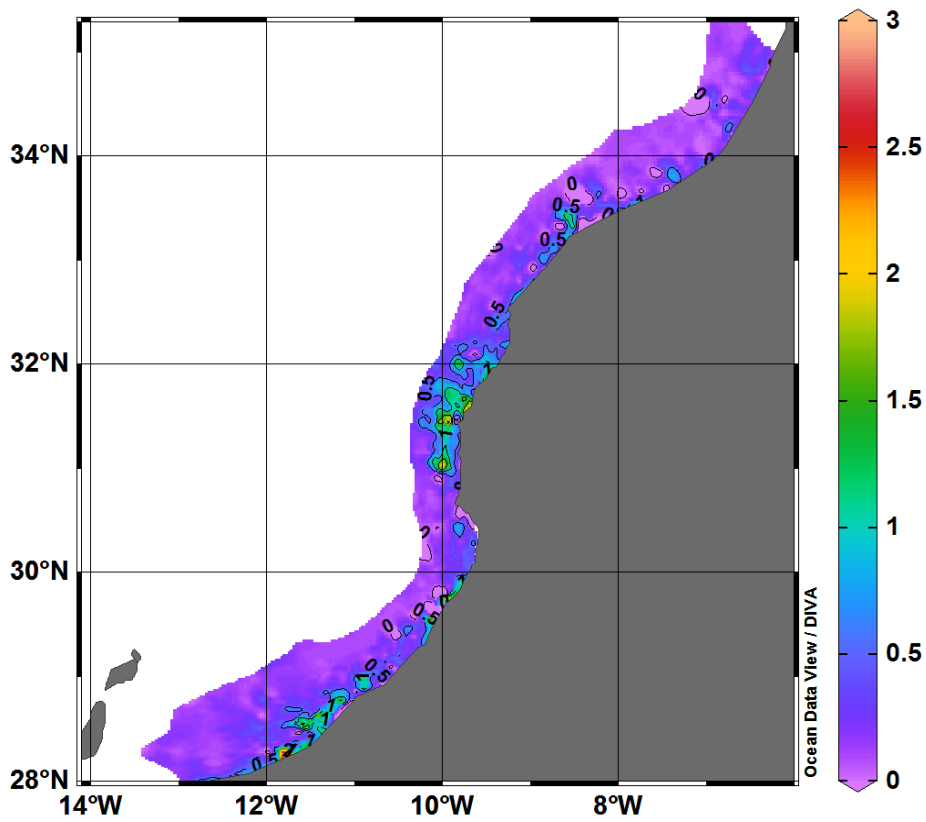


Figure 3f. Sea surface fluorescence (at 5 m depth), Cape Juby to south of Larache.

Cross shelf distribution from CTD

Cross shelf distribution of sea surface temperature, salinity, oxygen and fluorescence is shown in Figure 4 for all the hydrographic transect carried out as part of the survey. Note the expanded surface region on the y axis on all figures and the different colour scales on the different figures. CTD's before Cape Juby was taken to a maximum depth of 500 m while from Cape Juby all CTD's were taken to near bottom. Maximum depths plotted in the figures on the y-axis reflect this. As expected the general trend was decreasing temperature and increasing salinity in the water masses northwards. High fluorescence concentrations associated with the upwelling areas and generally good oxygen conditions in the water masses although very low oxygen values (<1 ml/l) are observed close to the bottom on the shelf.

Figure 4a shows the section off Cape Blanc. The temperature isobaths were directed alongshore with a thermocline at around 50 m depth. Strong upwelling with a clear separation of the surface water masses on shelf and off the shelf can be observed, with the coolest waters inshore ($<17^{\circ}\text{C}$) and warmer temperature offshore, with a maximum of more than 22.5°C . The salinity showed a similar trend as the temperature with highest values offshore and in the surface. Low oxygen values (<1 ml/l and saturation $<10\%$) were observed in the bottom waters on the shelf. The fluorescence values were highest in the upper 30 m. A maximum of $5\ \mu\text{g/l}$ on the outer shelf can be observed in the frontal zone between warm and cooler water masses.

Figure 4b shows the section off Cape Barbas. This section resembled the section off Cape Blanc. The temperature isobaths were directed alongshore, with the coolest waters inshore, a strong front and warmer temperature and a strong thermocline around 50 m depth offshore, with a maximum of more than 22.5°C . The salinity increased from the bottom (35.7) to surface with maximum values around 36.2. Low oxygen values (<1 ml/l and saturation $<10\%$) were observed in the bottom waters on the shelf while very high oxygen concentrations (>7 ml/l) were found in the surface waters. The fluorescence values were highest at the surface inshore with maximum $>2\ \mu\text{g/l}$. High concentrations ($>1\ \mu\text{g/l}$) were also found close to the bottom on the shelf.

Figure 4c shows section off Dakhla. The warmest water, 22°C was found offshore in the upper layer (0-50 m depth) decreasing to 20°C inshore. Cooler water was found on the shelf below the thermocline. The distribution of salinity was atypical compared with those transects further south. Highest salinity (36.6) was found inshore while off the shelf salinity decreased to >36.3 in the upper 50 m, and further to 36.1 in the shelf bottom waters. Oxygen concentrations were below 2 ml/l in the bottom shelf waters, considerably higher than further south. The fluorescence values were highest in the upper 50 m on the shelf edge with a peak $>1\ \mu\text{g/l}$ and close to the bottom inshore with maximum of $>0.8\ \mu\text{g/l}$.

Figure 4d shows the section off Lacraa. The warmest water of 23°C was distributed in the upper layer 50 meter offshore. Cool ($18-19^{\circ}\text{C}$) and mixed water masses were found inshore in the upper 100 m indicating strong upwelling. The salinity increased from the bottom to surface and was highest offshore in the upper layer (0-100 m) corresponding with the highest

water temperatures. The fluorescence values were in the mid water layers at the thermocline and in the mixed water masses inshore. Oxygen levels were generally high in the upper 200 m.

Figure 4e shows the hydrographic section off Cape Bojador. The conditions resemble those off Lacraa. The warmest water of 23-22°C was distributed in the mid water layer of 75-100 m offshore with cooler and mixed water masses (19°C) inshore indicating strong upwelling. Salinity levels increased from the bottom to surface with highest levels (>36.8) at upper layer of 0-100 m and offshore. The maximum fluorescence was observed at the thermocline offshore and with relatively low values, and with increasing intensity in the mixed and cooler water masses inshore, with maximum of 0.6 µg/l. Oxygen levels were generally high in the upper 200 m.

Figure 4f shows the section off Cape Juby. The CTD was taken down to a maximum depth of >1100 m at this depth temperature was 6.9°C. In the surface layer temperatures were highest offshore with 21°C while inshore the temperature decreased to 18°C, with signs of upwelling. A thermocline was present at 50 m depth where the temperature typically decreased from 20-17.5°. The highest salinity was found offshore corresponding with the maximum temperatures. The shelf had a very uniform salinity around 36.5, while off the shelf salinity decreased gradually to 35.2 at 1 000 m. Oxygen concentrations along the transect were relatively good with values around 5 ml/l in the surface water decreasing to <4 ml/l in bottom water close to the coast. Fluorescence concentrations on the shelf were highest in the surface waters, peaking at the thermocline with values around 0.8 µg/l as maximum.

Figure 4g shows the section off Cape Dra. The distribution of temperature was similar to what was found at Cape Juby although the surface warm water >21°C expanded over a larger area and covered the outer shelf. Upwelling was not very visible from the figure. Salinity was high, >36.6 offshore with slightly decreasing values inshore and into deeper waters. Oxygen concentrations were high (>5 ml/l) on the shelf with slightly decreasing values <3.5 ml/l in the bottom waters on the shelf. The fluorescence concentrations show a peak at the thermocline and increased concentrations in the upper 50 m of the water column around 0.5 µg/l, increasing towards the coast with high values (>2.5 µg/l) at the innermost CTD station of this transect.

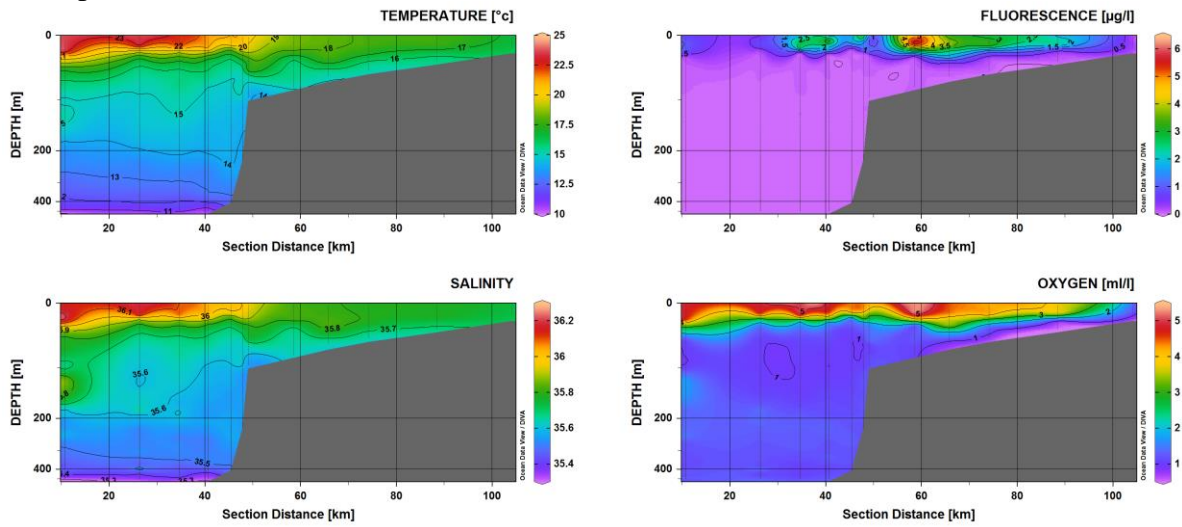
Figure 4h shows the section off Cape Ghir. The section show slightly lower temperatures compared with the sections further south with surface maximum at 20°C found in the middle of the transect. Bottom temperature on the shelf was around 16°C with an expanding area of cold water close to the coast. The surface salinity of 36.6 decreased to 36.3 on the bottom at the shelf, and further to about 35.7 at 500 m depth on the lower slope. Oxygen concentrations were generally good but decreased to <3 ml/l at the bottom close inshore. The fluorescence concentration had a maximum just above the thermocline at 50 m with a peak around 0.3 µg/l both inshore and off the shelf This maximum was considerably lower than at the transects further south.

Figure 4i shows the section off Cape Cantin. Temperature profile indicates relatively stable surface conditions with temperatures above 20°C. The thermocline is found at about 50 m depth offshore but is lifted towards the coast with cooler water masses close inshore. The temperature on the shelf edge and in bottom waters on the outer shelf is around 16°C while it decreases to 9°C in bottom waters at 1500 m depth. Salinity is stable above 36.4 in the upper 50 m offshore, while decreasing slightly inshore indicating some upwelling also in this area. Primary production is low offshore, highest at the thermocline and increases to above 0.6 µg/l fluorescence close to the coast. Oxygen concentrations are generally good. A minimum oxygen layer is found between 750 m – 1000 m depth, corresponding with salinity minimum around 35.6.

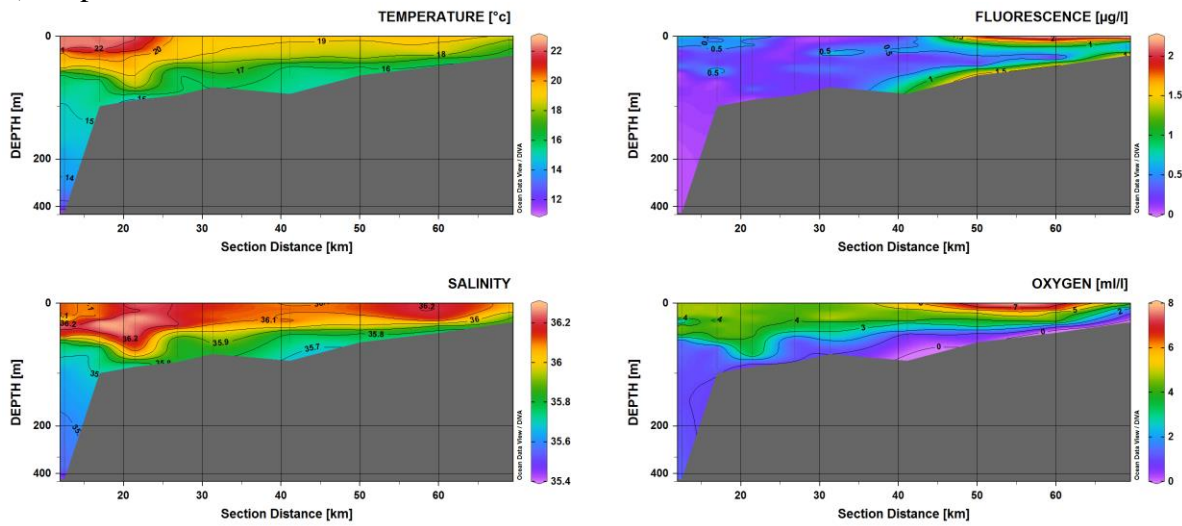
Figure 4j shows the section off Casablanca show even more stable surface conditions compared to the south. No upwelling is observed in this transect. Thermocline is relatively deep offshore > 50 m depth, becoming slightly shallower further inshore. Salinity is stable with surface values above 36.4. Primary production is peaking at the thermocline with increased values on the inner shelf with maximum > 0.4 µg/l. Oxygen concentrations in the water masses are generally good.

Figure 4k shows the section south of Larache is similar to the conditions off Casablanca with stable water masses. No clear signs of upwelling but with high primary production at the thermocline increasing close to the coast with maximum > 0.5 µg/l.

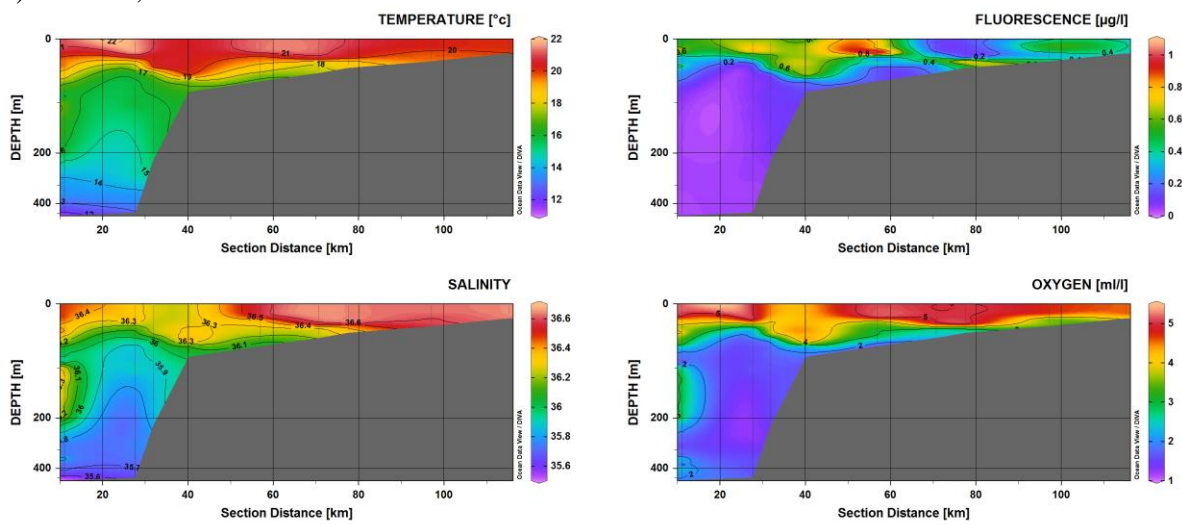
a) Cape Blanc, 7 - 8.11.2015



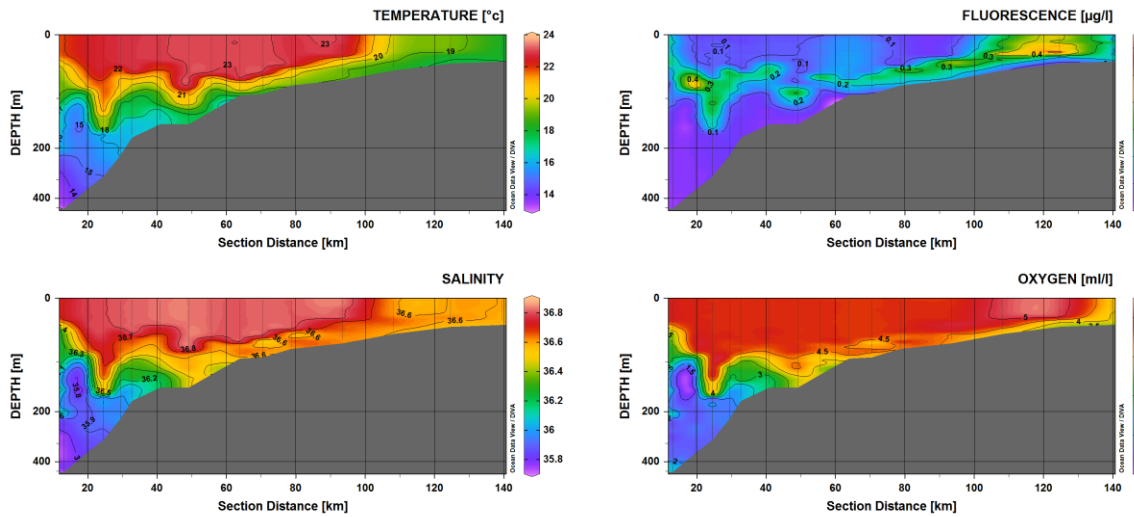
b) Cape Barbas, 12.11.2015



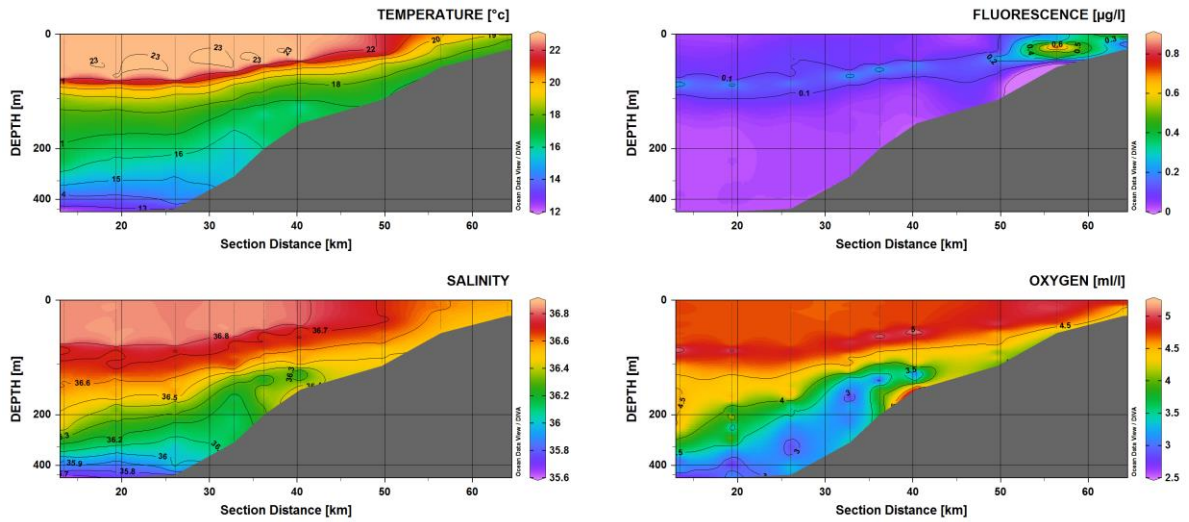
c) Dakhla, 16 - 17.11.2015



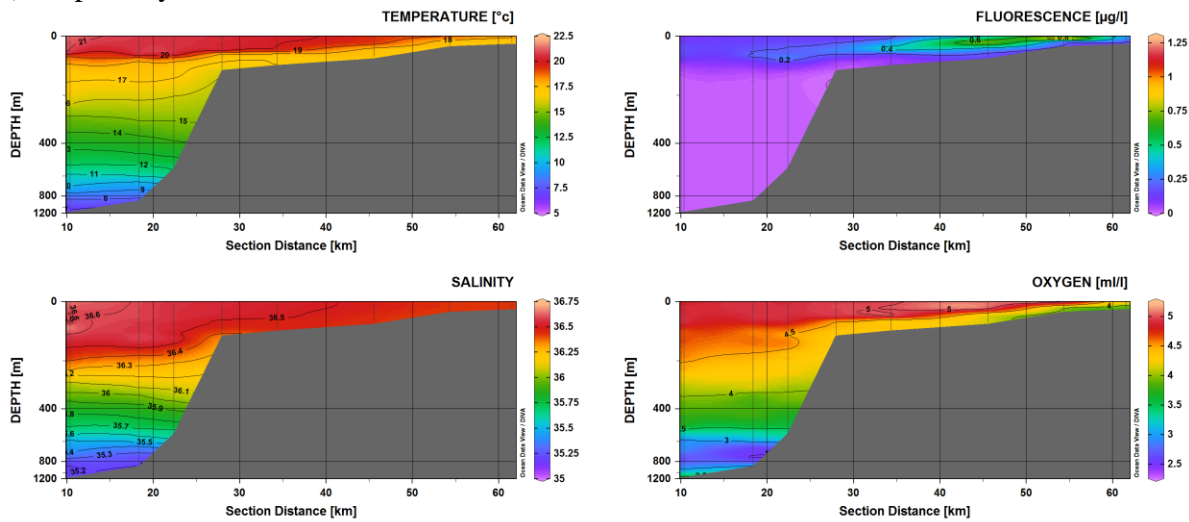
d) Lacraa, 19-20. 2015



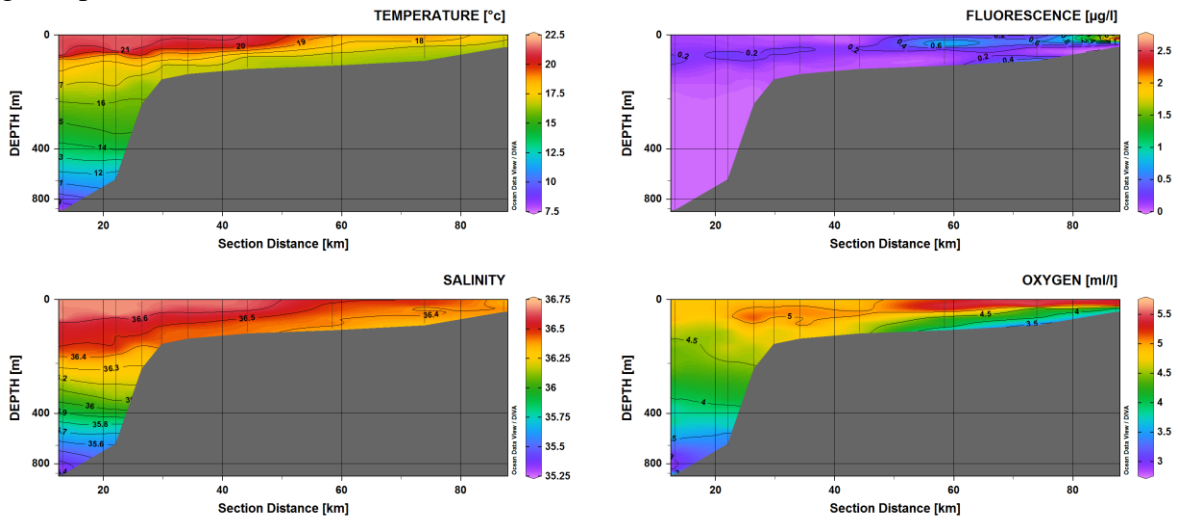
e) Cape Bojador – 22.11.2015



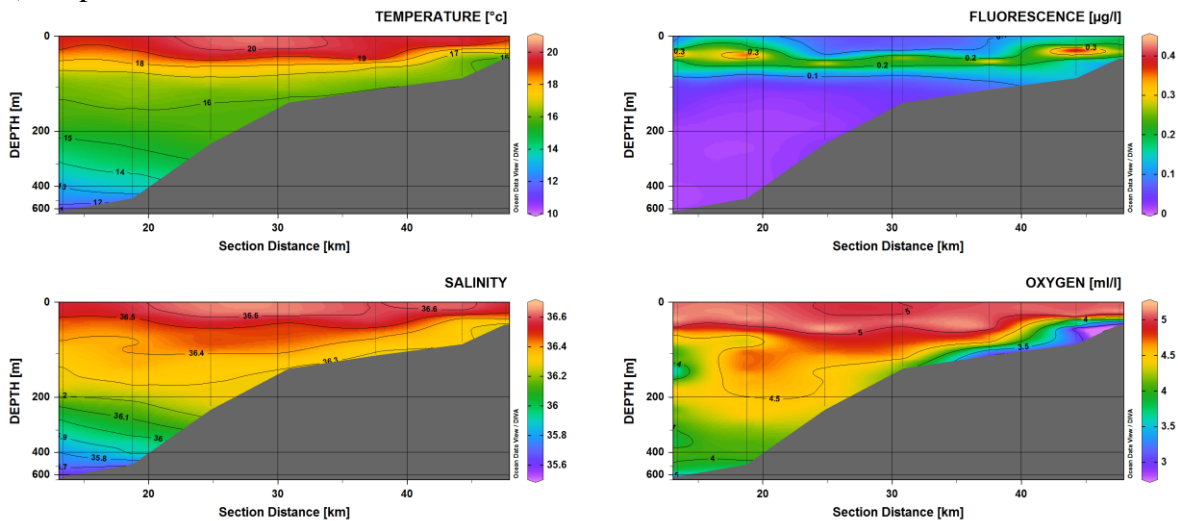
f) Cape Juby – 27.11.2015



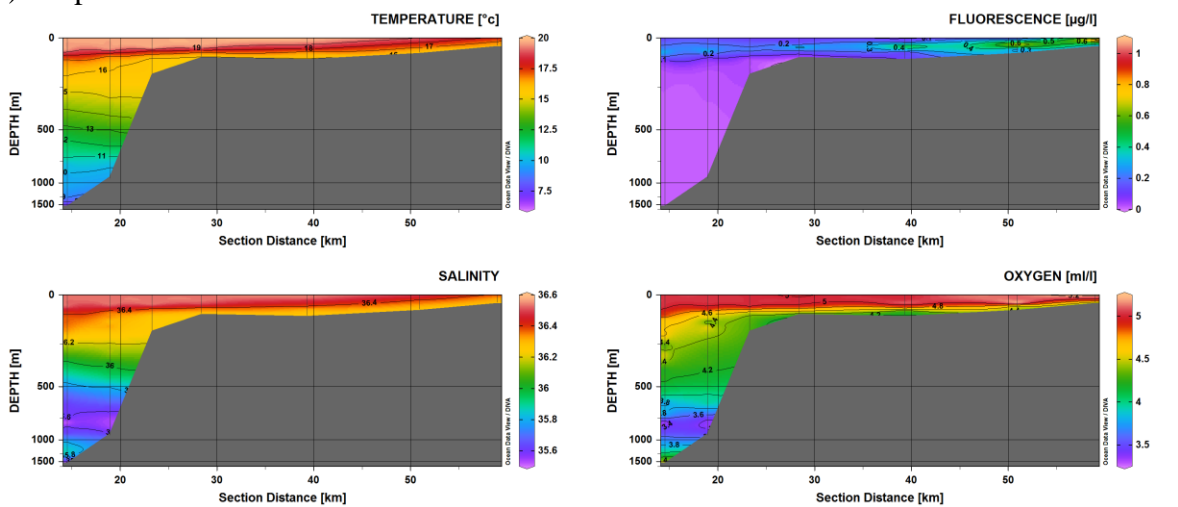
g) Cape Dra – 30.11.2015



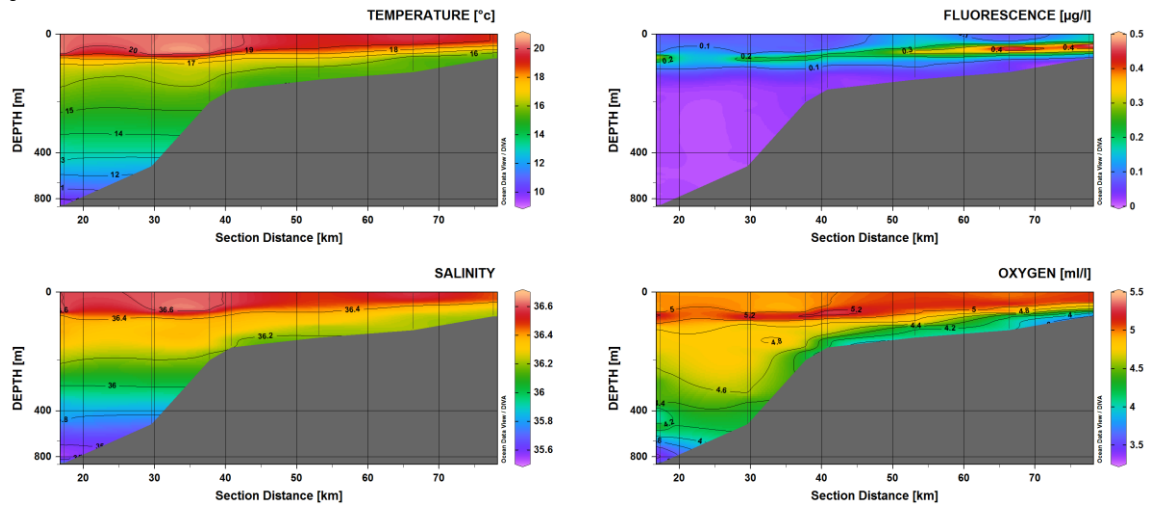
h) Cape Ghir – 03.12.2015



i) Cape Cantin 06.12.2015



j) Casablanca 09.12.2015



k) South of Larache 10.12.2015

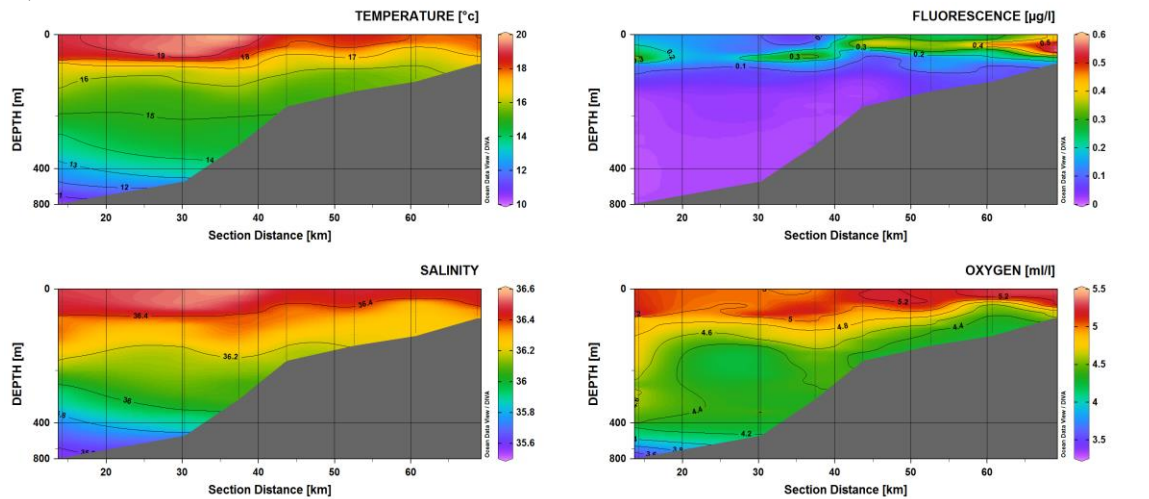


Figure 4. Hydrographic sections with distribution of temperature, salinity, oxygen and fluorescence. Note the expanded surface region between 0-200 m depth on the y- axis and different colour scales on the different Figures.

3.2 Distribution of pelagic fish

Cape Blanc to Cape Juby

Sardine, *Sardina pilchardus*, was found with variable density but almost without interruption between Cape Blanc and Cape Juby, Figure 5. The highest densities were found between Cape Barbas and Cape Bojador, and particularly a small area south of Cape Bojador had very high concentrations. The main distribution was found inshore of 50 m bottom depth however, in several areas the distribution extended over most of the shelf. The length distribution in the stock between Cape Blanc- Cape Bojador is shown in Figure 10a. A small cohort with peak around 17 cm can be seen together with a cohort with a modal peak at 20 cm. Older fish are not possible to separate in the Figure. Between Cape Bojador and Cape Juby the aggregations consisted of a mixture of young sardine with a modal peak around 11 cm together with older fish with a modal peak around 21 cm, a peak around 25 cm can also be observed, Figure 10b.

Sardinellas (*Sardinella aurita* and *S. maderensis*) formed a major low to medium density aggregation between Cape Blanc and 24°N at Dakhla consisting of both *S. aurita* and *S. maderensis*. Most of the sardinellas were found inshore of 50 m depth but with some schools extending into deeper water towards the shelf edge. Further north two small low density aggregation areas were found, one small aggregation of *S. maderensis* was found south of Lacraa while the northernmost distribution of *Sardinella*, consisting of *S. aurita* was found at Cape Bojador, Figure 6.

Anchovies (*Engraulis encrasicolus*) were found only in the southern part of this region around Cape Barbas. The fish was mainly confined inshore in water depths <50 m, and the density was medium to high. Further north in this region no anchovy was found before it again became abundant off Cape Juby and northwards, Figure 7.

Horse mackerels (*Trachurus trachurus* and *T. trecae*) were distributed from Cape Blanc in the south of the region to Laayoune. The mainly low density distribution typically covered the whole shelf, sometimes extending deeper than 150 m bottom depth, Figure 8. *Trachurus trecae* was abundant in the southern part of the region. It was mostly found inshore at <50 m bottom depth, with decreasing density north to Dakhla. *Trachurus trachurus* showed the opposite trend, as should be expected, with low densities south of Cape Barbas, and increasing catches northwards. Highest densities were typically found around 100 m depth.

Atlantic chub mackerel (Formerly called *Scomber japonicus*, new name *S. colias*) was recorded almost continuously covering most of the shelf between 150 - 20 m depth from Cape Blanc to Cape Juby, with the highest densities on the mid and outer shelf, Figure 9. Concentrations were highest off Dakhla and between Laayoune and Cape Bojador.

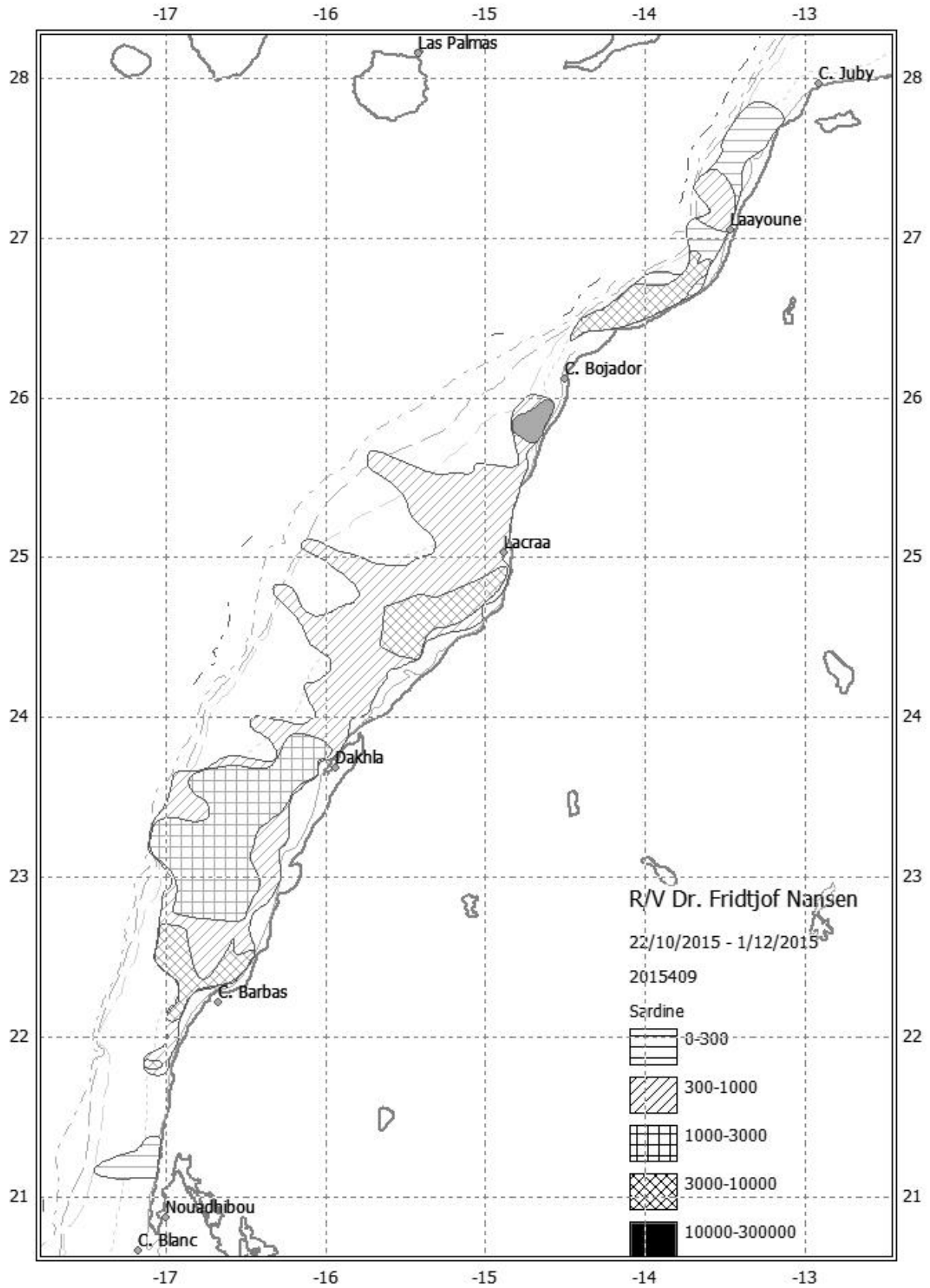


Figure 5. Distribution of sardine, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

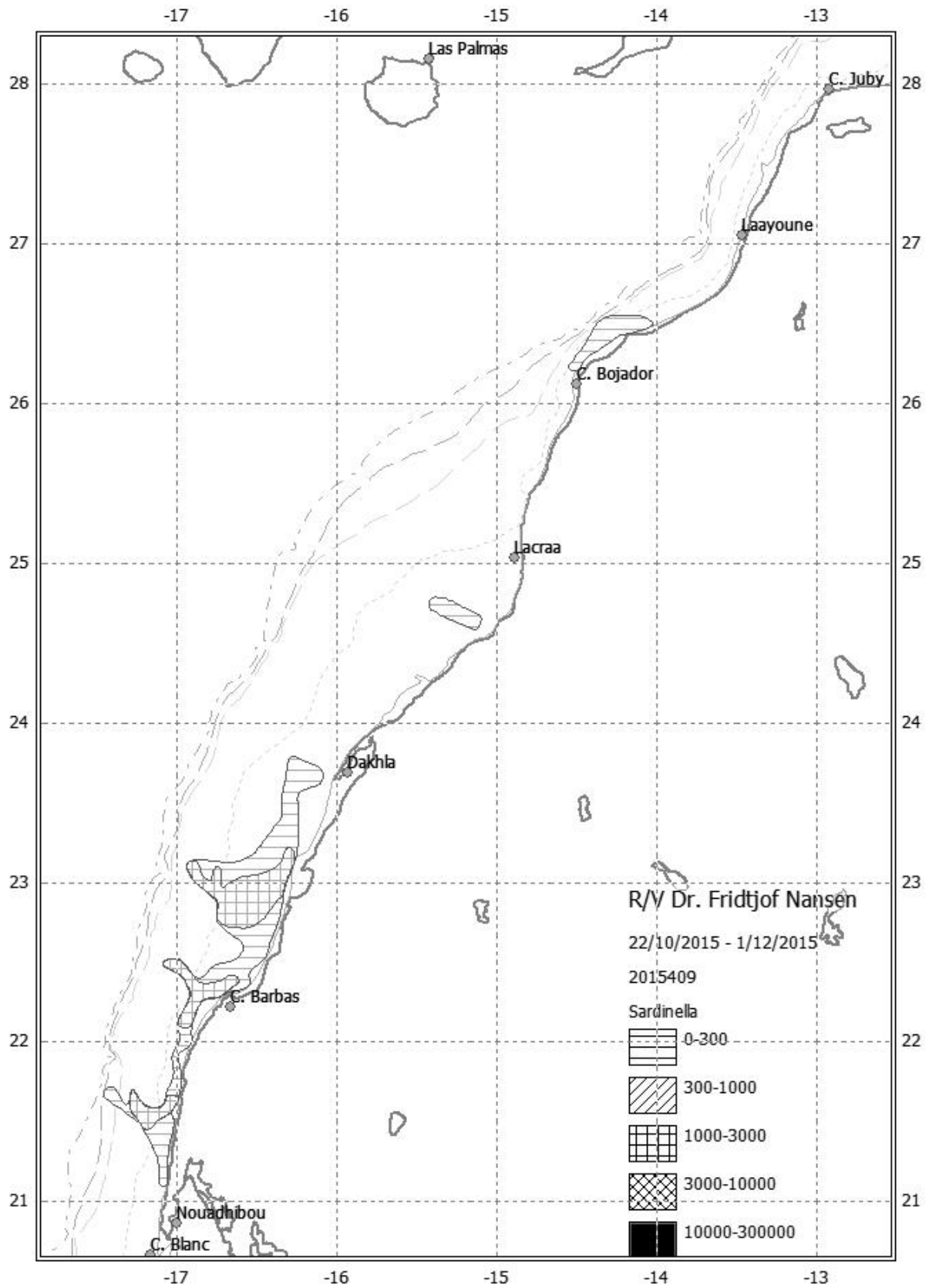


Figure 6. Distribution of sardinella, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

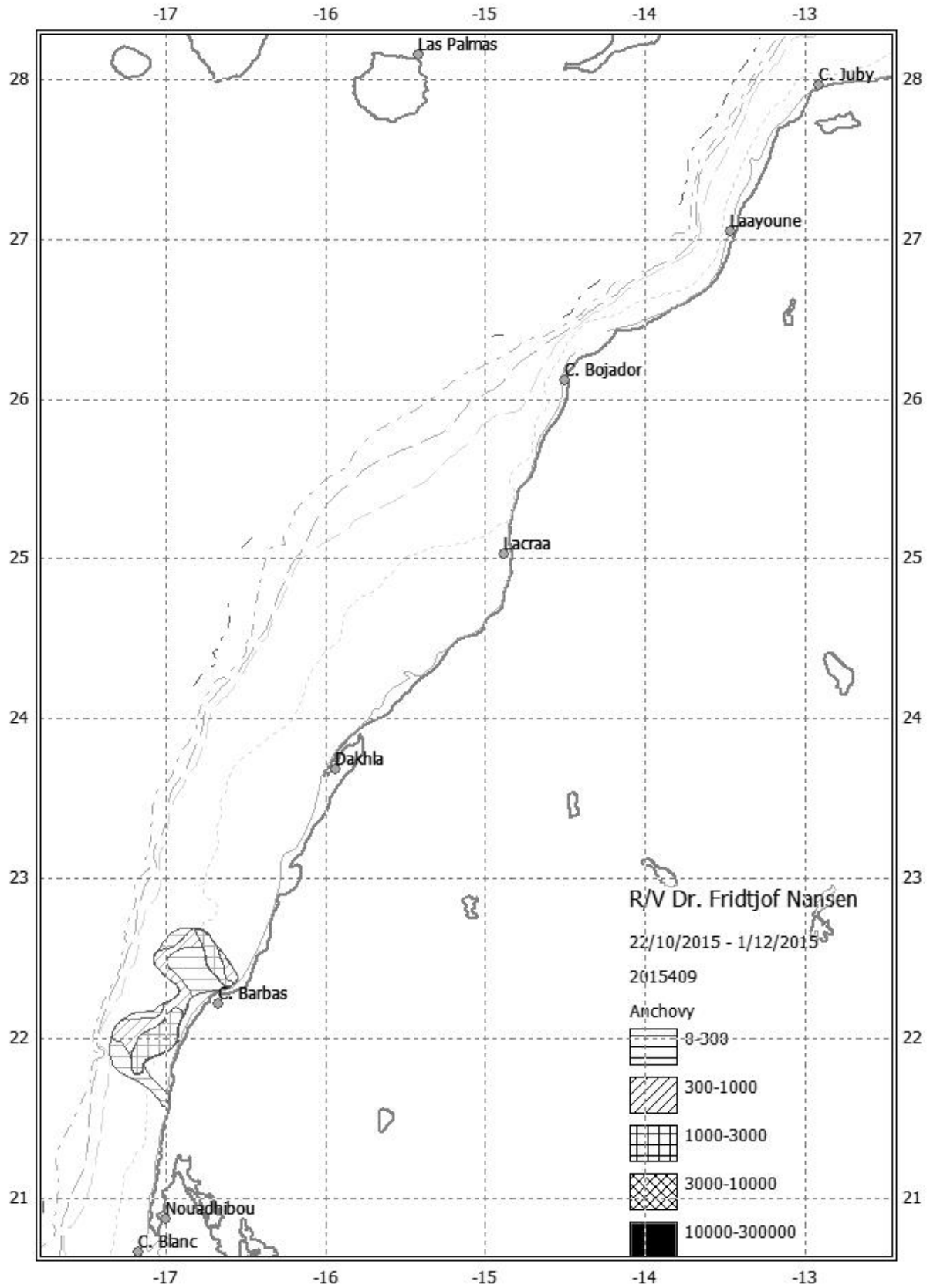


Figure 7. Distribution of anchovy, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

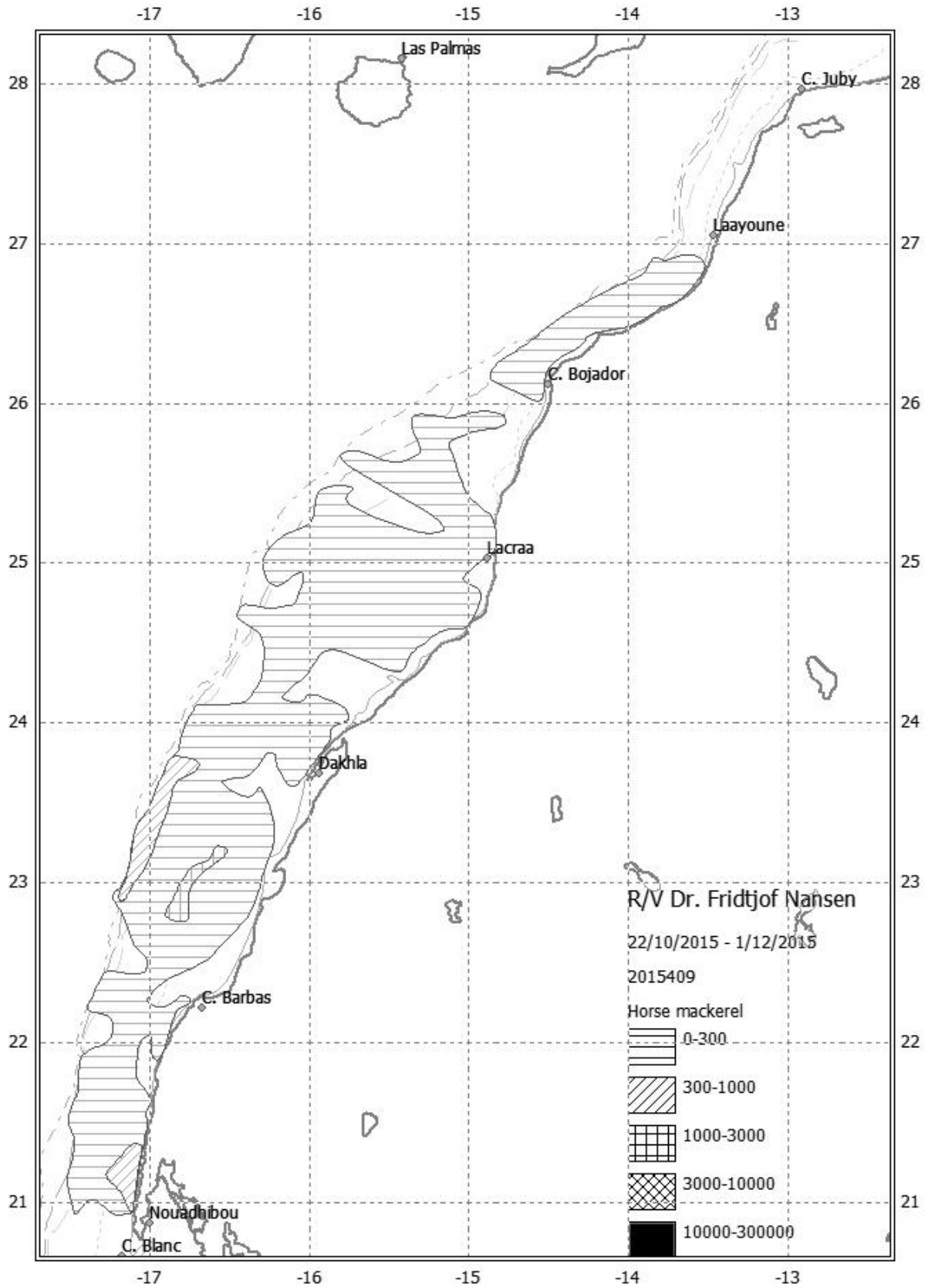


Figure 8. Distribution of horse mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

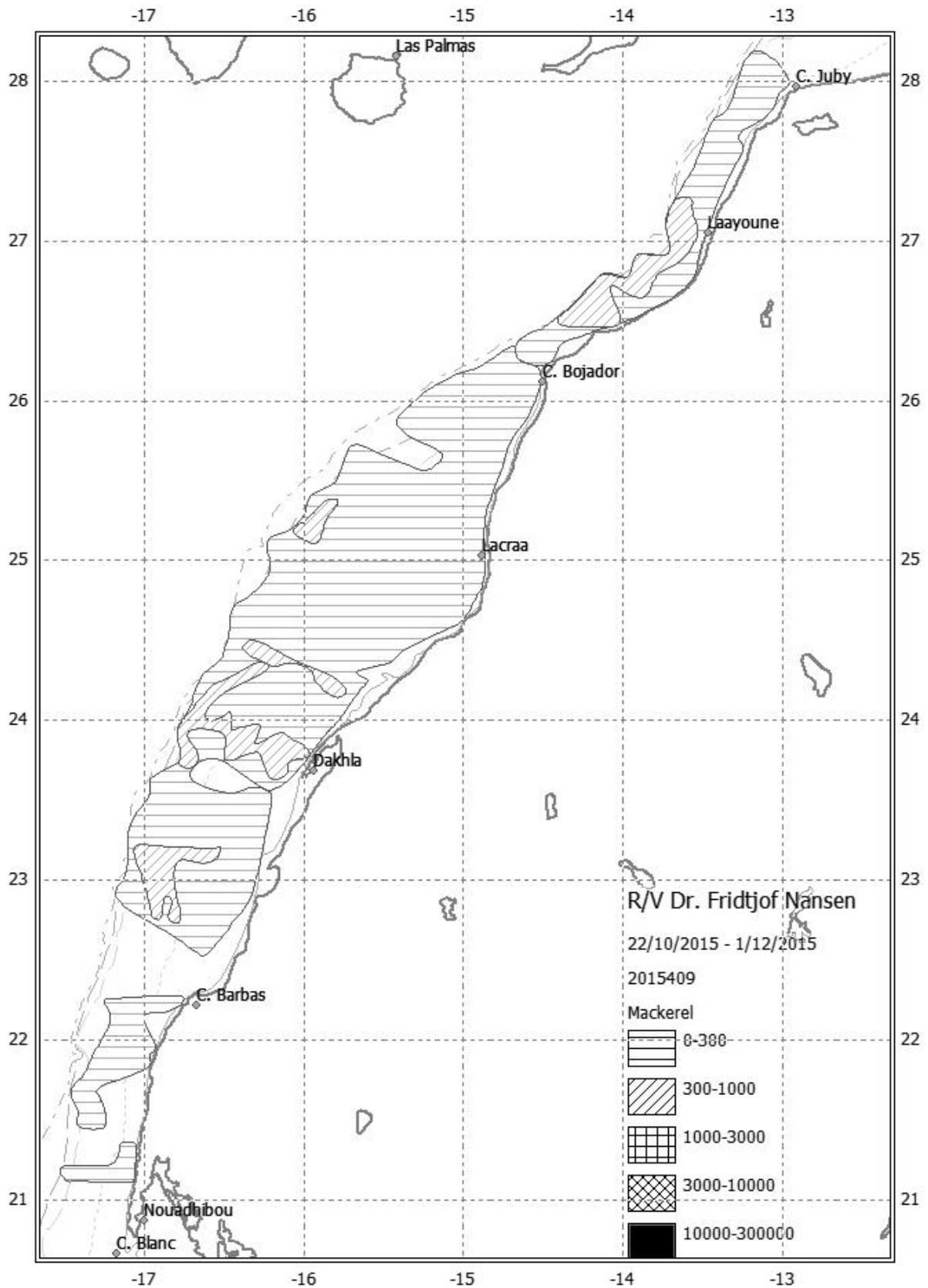


Figure 9. Distribution of chub mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

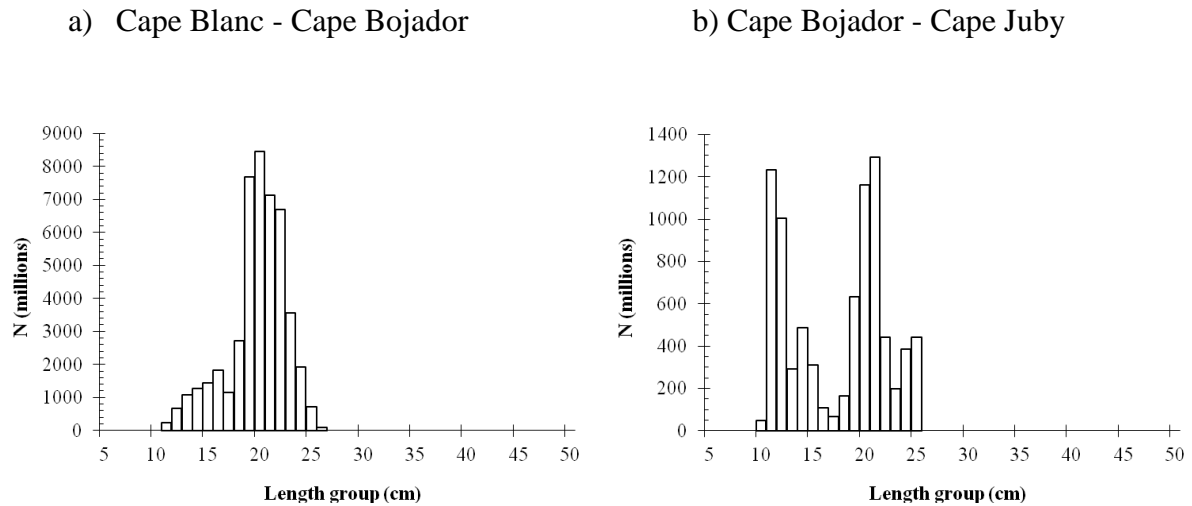


Figure 10. Length frequency distributions sardine Cape Blanc to Cape Juby.

Cape Juby to Cape Cantin

Sardine was recorded in a number of low and medium density areas between Cape Juby and Cape Cantin. High density areas of fish were found mainly inshore of 50 m depth both north and south of Cape Dra and south of cape Cantin, Figure 11. The aggregations consisted of fish with size between 8 - 22 cm. A modal peak at 14 cm can be observed, consisting of a cohort of juvenile fish, Figure 15.

Anchovy was distributed over a larger geographical area than typical, in general with highest concentrations close inshore and decreasing densities offshore to 50 m depth, sometimes also into deeper waters. The concentrations were low although with slightly higher concentrations close inshore off Cape Dra and North of Cape Sim, Figure 12. The fish ranged in size between 5-18 cm, with a modal peak at 11 cm.

Horse mackerels was distributed widely but with very low density along the shelf, typically with highest concentrations close inshore and offshore inside the shelf break, Figure 13. The distribution area overlapped with that of mackerel and at times the two groups were difficult to separate acoustically. The fish ranged in size from 11-42 cm, several modal peaks could be observed, at 12 cm, 14 cm, 19 cm, 25 cm and > 35 cm. The main part of the stock was below 23 cm.

Atlantic chub mackerel was found all along the coast from Cape Juby to south of Agadir, and in two small areas off Cape Gir and off Safi. The mackerel was generally in low densities, covering most of the shelf to > 100 m depth. Some few patches of slightly higher densities were found offshore north of Cape Dra and between Cape Juby and Tan Tan, Figure 14. The fish ranged in size between 13-32 cm with a main modal peak at 18 cm. Another modal peak can be observed around 31 cm.

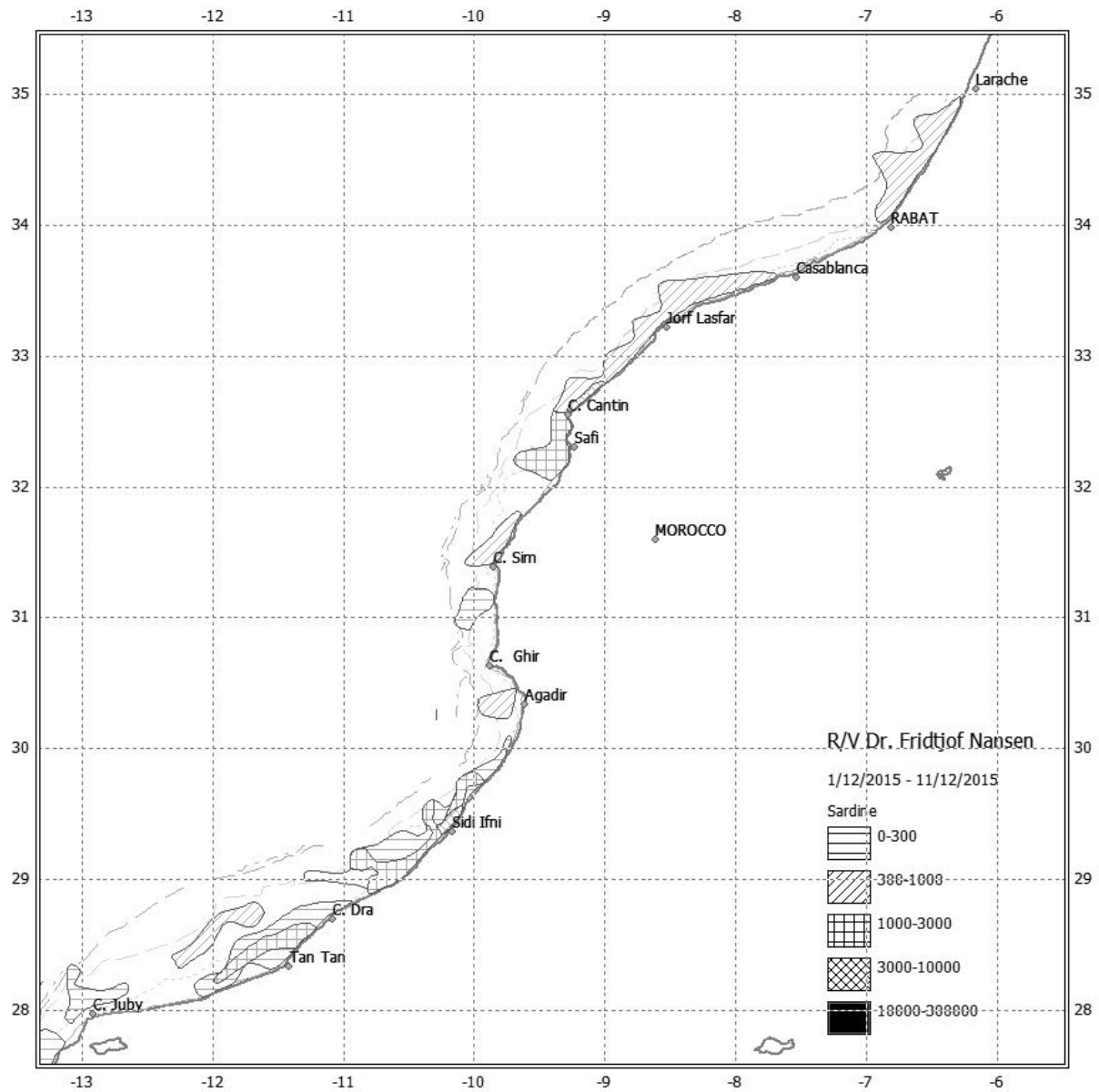


Figure 11. Distribution of sardine, Cape Juby to south of Larache. Depth contours as in Fig. 1a.

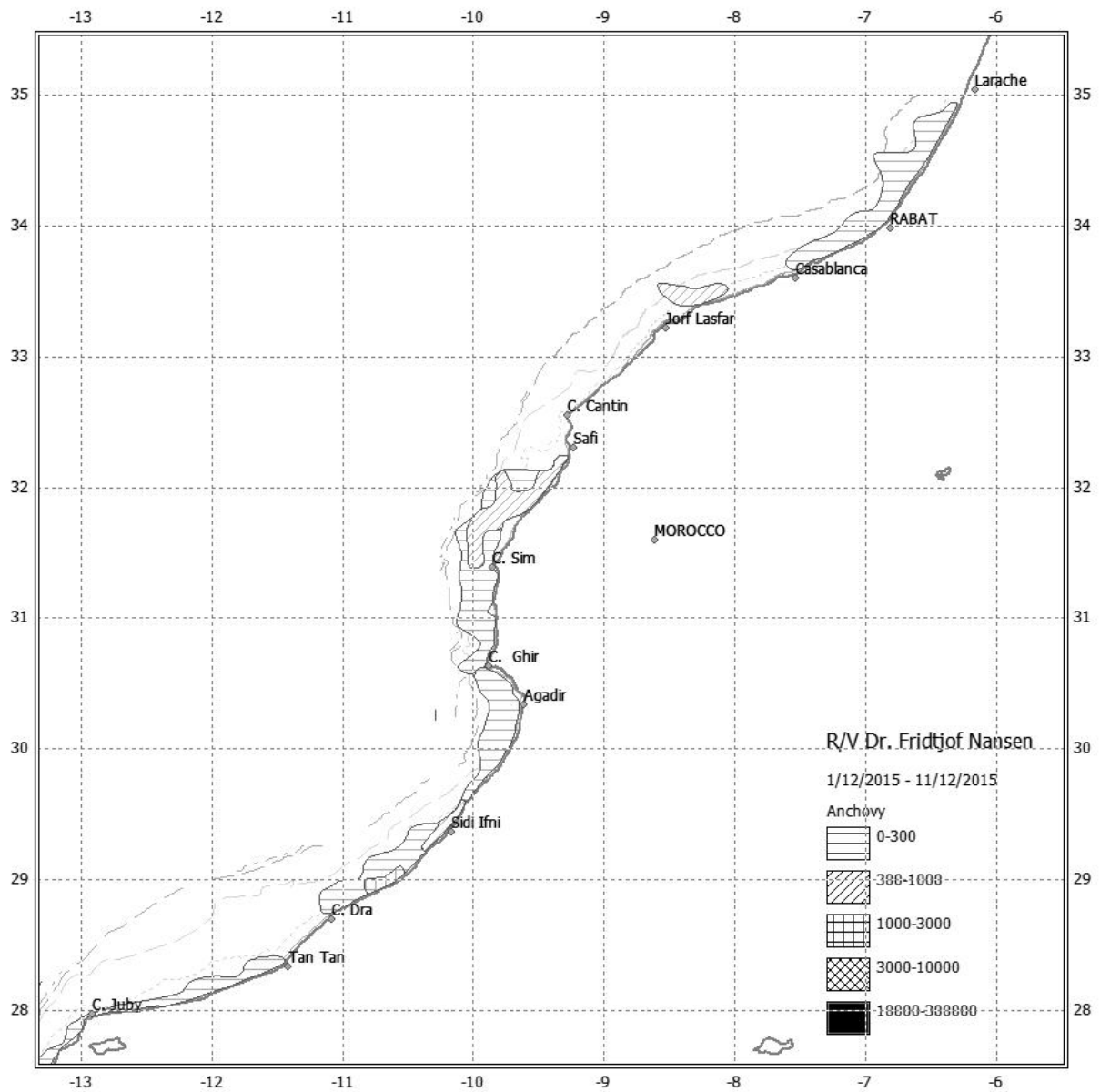


Figure 12. Distribution of anchovy, Cape Juby to south of Larache. Depth contours as in Fig. 1a.

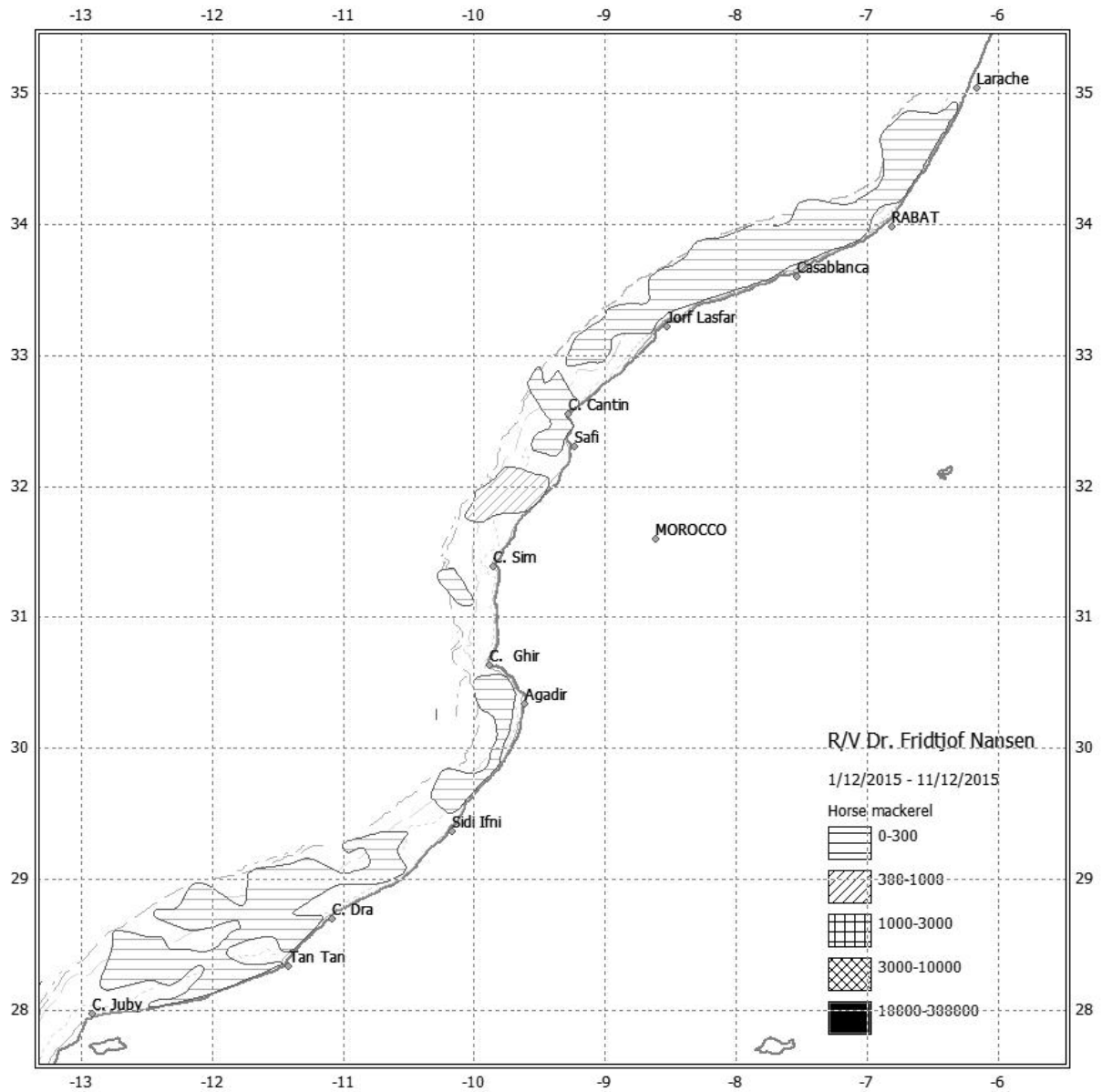


Figure 13. Distribution of Horse mackerel, Cape Juby to south of Larache. Depth contours as in Fig. 1a.

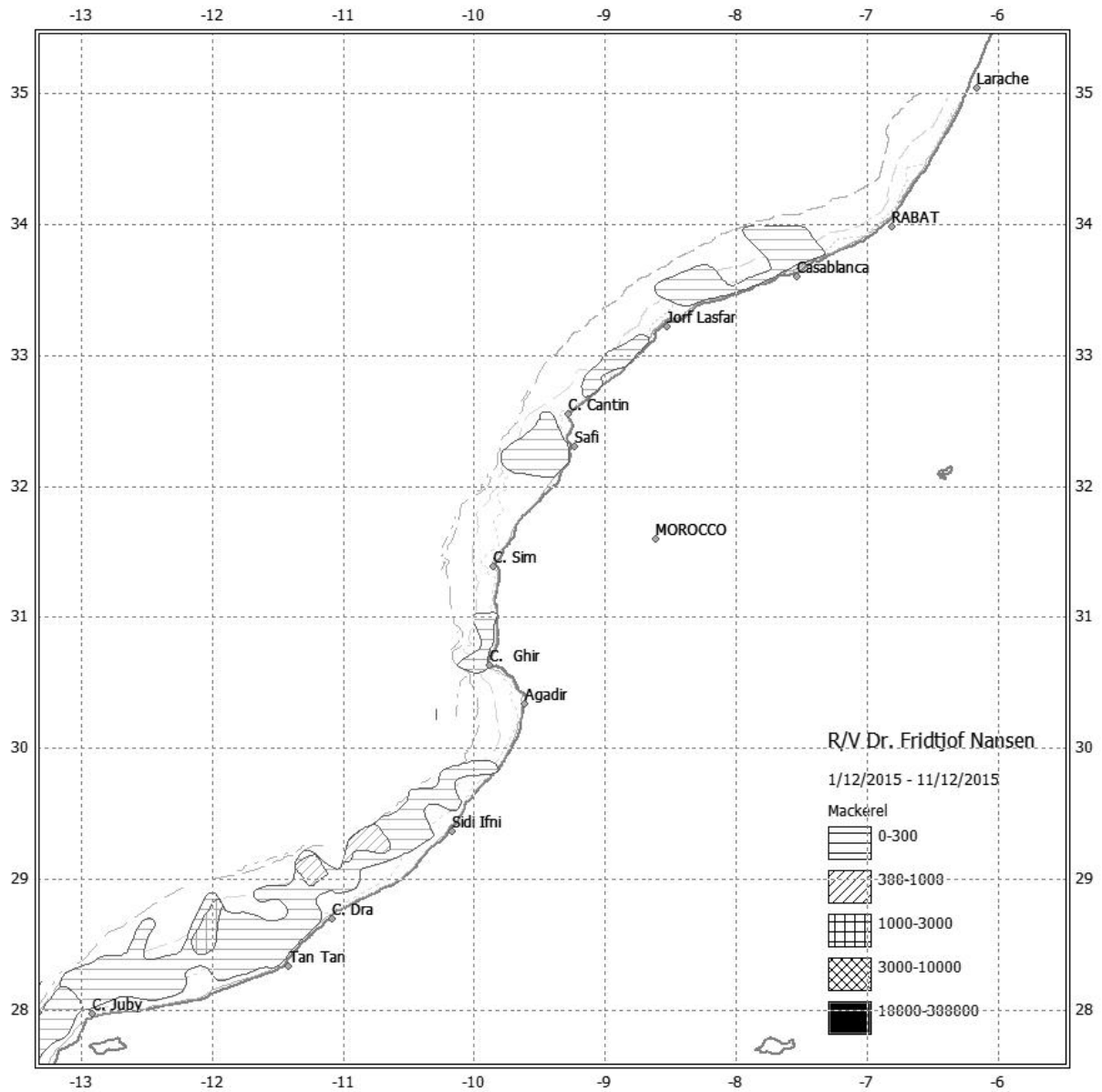


Figure 14. Distribution of chub mackerel, Cape Juby to south of Larache. Depth contours as in Fig. 1a.

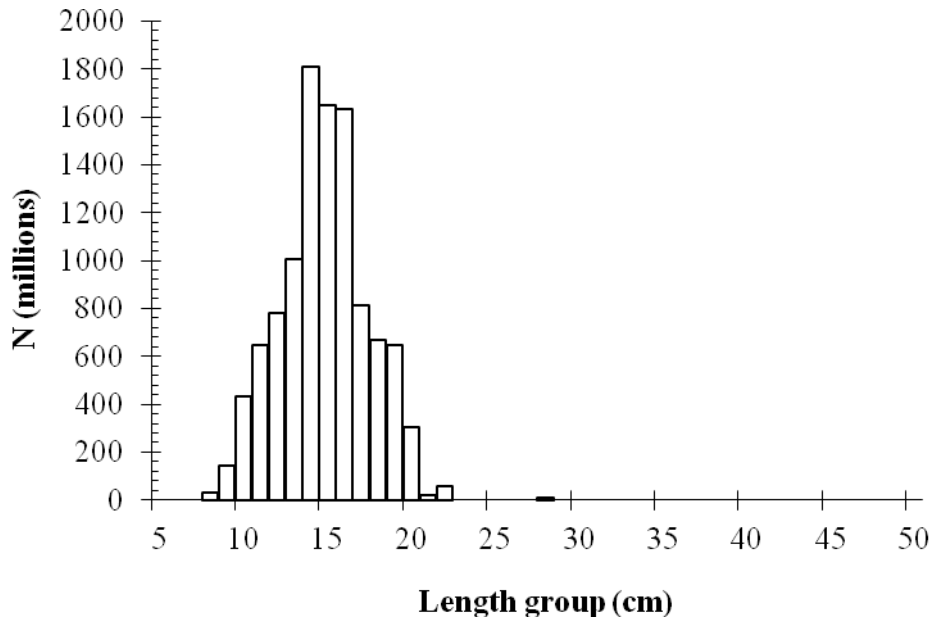


Figure 15. Length frequency distribution of Sardine Cape Jubu to Cape Cantin.

North of Cape Cantin

Typically, pelagic fish in the northern region was distributed in mixed schools, particularly inshore where all four target species had a tendency to occur together.

Sardine was relatively abundant on the northern shelf of Morocco with the main distribution area found in the southern part of the region, and with high densities close inshore of 50 m depth. Between Casablanca and Rabat no sardines were found before a new distribution area was found between Rabat and the northern limit of the survey area south of Larache, Figure 11.

Anchovy was found close to the coast with main densities inside of 50 m depth although occasional the distribution extended also over the outer shelf. The schools of Anchovy were typically mixed with sardine, and acoustic species separation was at times difficult, Figure 12.

Horse mackerels were found in a more or less continues low density band over the whole shelf between Cape Cantin and to Larache. The distribution extended from the coast where the fish schooled with other pelagic species and offshore typically to 150 m bottom depth. Somewhat lower concentrations were found mid-shelf, Figure 13.

The **Atlantic chub mackerel** was distributed over a wide area of the shelf in the northern region with low density. Two distribution areas in the southern and central part of this region can be observed on the map. However, mackerel was caught in the trawl also outside of these two areas although not detected acoustically. The fish caught were between 16 and 24 cm with a peak at 19 cm, Figure 14.

3.3 Biomass estimates

A summary on biomass estimates is given in Table 3 below. The size distribution of the various target species per region can be found in Annex III while detailed regional biomass estimates in number and weight by length groups from Senegal to Morocco are shown in Annex IV. Length - Weight relationships obtained from the biological samples and used in the biomass estimation are provided in Table 2 below.

Table 2. Length-weight relationships obtained from the biological samples of the target species collected during the survey. R^2 describes the quality of the “fit”.

	North of Cape Cantin	Cape Juby - Cape Catin	C. Blanc- Cape Juby
Sardine	$y = 0.0038x^{3.251}$ $R^2 = 0.940$	$y = 0.0046x^{3.201}$ $R^2 = 0.945$	$y = 0.0058x^{3.128}$ $R^2 = 0.977$
Anchovy	$y = 0.0031x^{3.265}$ $R^2 = 0.979$	$y = 0.0070x^{2.960}$ $R^2 = 0.949$	$y = 0.0077x^{2.931}$ $R^2 = 0.976$
Round sardinella	- -	- -	$y = 0.0061x^{3.129}$ $R^2 = 0.997$
Flat sardinella	- -	- -	$y = 0.014x^{2.881}$ $R^2 = 0.891$
Cunene horse mackerel	- -	- -	$y = 0.0143x^{2.853}$ $R^2 = 0.980$
Atlantic horse mackerel	$y = 0.0119x^{2.868}$ $R^2 = 0.983$	$y = 0.0131x^{2.835}$ $R^2 = 0.975$	$y = 0.0112x^{2.910}$ $R^2 = 0.972$
Atlantic Chub mackerel	$y = 0.0022x^{3.391}$ $R^2 = 0.951$	$y = 0.002x^{3.420}$ $R^2 = 0.973$	$y = 0.0017x^{3.483}$ $R^2 = 0.981$

Cape Blanc – Cape Bojador

The **sardines** were estimated to 3.5 million tonnes, which is slightly above the 3.3 million tonnes found in this area in 2006, but considerably lower than the years before 2006. Also very little sardine was found in Mauritania. The length distribution is earlier shown in Figure 10. The major share of the fish in terms of biomass consists of older fish. Compared with earlier years, the development in the “adult” part of the stock (i.e. fish >19cm) is:

Survey	Thousand tonnes	Million fish
November-December 1996	4 600	47 400
November-December 1997	240	2 900
November-December 1998	340	3 400
November-December 1999	1 000	11 500
November-December 2000	1 260	13 200
May-June 2001*	1 975	22 500
November-December 2001	3 200	32 000
May-June 2002*	2 100	21 400
November-December 2002	3 700	35 500
June 2003*	5 580	59 300
November-December 2003*	4 370	43 600
November-December 2004*	5 720	51 900
November- December 2005*	7 630	68 300
November- December 2006	3 130	27 600
November- December 2015	2 655	28 500

* Including sardine in Mauritania

The young fish (<20 cm) constitute above 18 billion fish and 39% of the numbers, and it seems that the recruitment to the stock is somewhat higher than the 10-14 billion fish estimated from 2006 and before, this is a positive sign and indicate that the stock may increase next year if conditions are otherwise favourable.

The **Sardinella** was estimated to be 547 thousand tonnes of which 392 thousand and 155 thousand tonnes was round and flat sardinella respectively, Annex IV. The main part of the fish is located between Cape Blanc and Dakhla. The recruitment to the round sardinella was estimated to 3.4 billion fish, or 37 thousand tonnes. No juvenile small flat sardinella were found in the area.

Anchovies were estimated to 86 thousand tonnes, corresponding to 9.6 billion fish. Most of fish were between 9-10 and 12-13 cm long. In 2006 and 2005 scattered recordings only made up 10-25 thousand tonnes, Annex IV.

The two species of **horse mackerel** combined was estimated to 394 thousand tonnes (Annex I), of which roughly 220 thousand tonnes and 174 thousand tonnes were Atlantic and Cunene horse mackerel respectively. The corresponding figures in 2006 were 40 and 270 thousand tonnes respectively. Young fish of Cunene horse mackerel and Atlantic horse mackerel (10-22 cm) constitute about 36% and 76% of the total abundance and gives some growth potential to the stock. The two species are also distributed south of Cape Blanc into Mauritania and Senegal, Annex IV gives the details of the total abundance.

Chub mackerel were estimated to about 422 tonnes, a steady increase in biomass from 150 thousand tonnes in 2005 through 330 thousand in 2006, Annex IV. Young fish of chub mackerel (11-19 cm) constitute about 72% of the total abundance and gives big growth potential to the stock. It should be noted that small mackerel are less swimming capacity than adults and thus easier to catch. Additionally, the chub mackerel has a small swimming bladder, and thus low target strength (TS). In lack of reliable target strength for chub mackerel, the TS for sardine have been applied in the estimates. The estimates are therefore probably solid underestimates, especially adult part of the stock.

Cape Bojador – Cape Juby

Sardinella or Cunene horse mackerel usually reach their northernmost area of distribution before Cape Bojador and no recordings were made of these species in this region.

Estimated **sardine** in this region is 490 thousand tonnes compared with 110 thousand tonnes in 2006. Also, as further south, a considerable proportion of the fish were juvenile. Of the 8.26 billion fish caught 52% was < 20 cm.

Some few **Atlantic horse mackerel** was found in the region. Altogether 19 thousand tonnes

Chub mackerel were estimated to about 130 thousand tonnes in this region. Young fish of chub mackerel (11-19 cm) constitute about 94% of the total abundance and 54% of the biomass, which is positive for future recruitment to the fishery.

Cape Juby – Cape Cantin

The **sardine** is estimated to 331 thousand tonnes, a considerable increase since 2006 where 90 thousand tonnes was found, but a considerable reduction compared with the 840 thousand tonnes estimated during the survey in December 2004. The abundance in numbers is about 10 billion fish compared with 2.5 billion and 15 billion respectively in 2006 and 2004. The main part of the biomass (91%) is made up of young fish < 20 cm length, Annex I.

Anchovies were estimated to 52 thousand tonnes. Compared with 16 thousand tonnes in 2006, and 32 thousand estimated in 2004. A total of 4.8 billion fish was estimated.

Atlantic horse mackerel was found in the region. Altogether 137 000 tonnes. In 2006 there was no estimate due to very low abundance. Of this the largest proportion of the fish found in this area was young. 1.95 billion, or 91% of the fish by abundance, was between 10-22 cm. In the far northern part of this region at Cape Cantin another horse mackerel (*Trachurus picturatus*) became present. The few individuals of this species found in the region are included in the horse mackerel estimate.

Chub mackerel was estimated to 161 thousand tonnes compared with 100 thousand tonnes in 2006 and 340 thousand tonnes in 2004. Young fish of chub mackerel (11-19 cm) constitute about 73% of the total abundance and 50% of the biomass. One should take note that these estimates should be treated as relative figures. The chub mackerel is probably grossly underestimated due to the low but uncertain target strength of the species.

North of Cape Cantin

This region has not been surveyed as part of the historic Dr. Fridtjof Nansen surveys. However, it is regularly surveyed as part of the Moroccan national pelagic surveys. The total abundance of fish in this region was considered relatively good taking into account that this region is considered to usually have low abundance of pelagic fish.

The **sardine** was estimated to 198 thousand tonnes. The abundance in numbers is about 4.8 billion fish. The main part of the biomass (84%) is made up of young fish < 20 cm length.

Anchovies were estimated to 20 thousand tonnes and 2.6 billion fish. The size distribution ranged between 2 cm – 16 cm with modal peaks at 9 cm and 14 cm.

Horse mackerel was relatively abundant in this region. Both *Trachurus trachurus* and *T. picturatus* was found. Altogether 40 thousand tonnes. Of this *T. trachurus* was the most abundant with an estimated biomass of 31 thousand tonnes and 560 million individuals. The size ranged from 13 cm to 32 cm. Several modal peaks could be observed, the most dominant at 16 cm, followed by a peak at 19 cm and then less pronounced at 28 cm. 89% of the fish was below 22 cm. The *T. picturatus* was estimated to have a biomass of 8.9 thousand tonnes and an abundance of 274 million individuals. The size range was the same as for *T. trachurus* with modal a peak at 14 cm.

Chub mackerel was estimated to 10 thousand tonnes and 161 million fish. The size ranged between 16 cm and 24 cm with a modal peak at 19 cm.

Table 3 Summary of biomass estimates of pelagic fish, thousand tonnes.

Region	Sardines	Round sardinella	Flat sardinella	Atlantic horse mackerel	Cunene horse mackerel	Chub mackerel	Anchovy
North of Cape Cantin	198	-	-	31	-	10	20
Cape Cantin- Cape Juby	336	-	-	135	-	159	52
Cape Juby- Cape Bojador	490	-	-	19	-	130	-
Cape Bojador- Cape Blanc	3 515	392	155	220	174	422	86
Totals	4563	392	155	405	174	721	158

CHAPTER 4. CONCLUDING REMARKS

4.1 Meteorological and hydrographic conditions

The survey area covered ranges from 21°N at Cape Blanc and the frontal zone that form the border between the northern and southern part of the CCLME region and to Larache in the north of Morocco at about 35°N. The southern part of this region is known for strong wind, strong upwelling and high primary production. This has also been observed this year with cold water masses inshore and corresponding high primary production. The central part of the region also showed clear signs of upwelling although with a lower intensity while the northern part of the survey area showed considerably more stable conditions with little upwelling observed, and primary production at the thermocline not reaching the surface waters. Of some concern is the very low oxygen values observed in bottom waters on the shelf on the two southernmost transects, observed at Cape Blanc and Cape Barbas. Oxygen values < 1 ml/l will force most fish species to move away, and spawning product will not be able to survive in such conditions. It is important to monitor this situation.

4.2 Fish abundance and distribution

Sardine was found from Cape Blanc in the southern region and all the way to the northernmost border of the survey at Larache. The total biomass was estimated to about 4.5 million tonnes. The fish was mainly found inshore but with distribution in to deeper waters >100 m depth in some areas. The densest and most extensive distribution was in the south between Cape Barbas and Cape Bojador where 3.5 million tonnes of sardine was found. Only insignificant quantities were found south of Cape Blanc in the preceding survey in Mauritania.

Sardinellas were recorded only between Cape Blanc – Dakhla, with a small patch slightly further north (south of Lacraa). The biomass was estimated to 550 thousand tonnes. Of this 392 thousand tonnes were *S. aurita* while 155 thousand tonnes were *S. maderensis*.

Anchovies were found within the whole survey region in well-defined areas. The distribution was mainly inshore in < 50 m water depth and associated with the areas of high primary production. A total of 158 thousand tonnes of anchovy was found, with the highest concentration of 86 thousand tonnes found south of Cape Barbas.

Horse mackerels were widely distributed but in low density concentrations during this survey, distribution was highest on the shelf edge typically inside of 150 m bottom depth and close inshore. The species was to a large extent mixed with other species making acoustic species separation difficult at times. The combined estimate of the two species of horse mackerel is 895 thousand tonnes of which 174 thousand tonnes were Cunene horse mackerel mainly found south of Dakhla, while 405 thousand tonnes are Atlantic horse mackerel. Some few *Trachurus picturatus* was found in the northernmost area with an overall estimate of 9 thousand tonnes.

Chub mackerel was widely distributed (mainly in low density concentrations) over most of the shelf and mostly throughout the survey area but with decreasing concentrations northwards. The abundance of the species is on a relatively high level compared with the historic Dr. Fridtjof Nansen surveys. The biomass index is 721 thousand tonnes of which 422 thousand tonnes are found between Cape Blanc and Cape Bojador. Only scattered fish was found north of Cape Cantin. It is likely that the methodology used during the Dr. Fridtjof Nansen survey underestimate the true abundance of this species due to the low target strength. The abundance estimates are only indexes and particularly interpretations of the mackerel index should be with some caution.

4.3 Trends 1995-2006, sardine

Starting from 2007 until 2004 local vessels have had the sole responsibility of carrying out the acoustic assessment work in the region. In Figure 16 the time series of sardine estimates during the autumn season from 2000 until this survey is illustrated. Data before 2007 and 2015 estimated from surveys with Dr. Fridtjof Nansen while the results between 2007 and 2014 are given from the acoustic surveys conducted on board the Moroccan R/V Al Amir Moulay Abdallah.

In the region from Cap Blanc to Cape Bojador, biomass levels of sardine showed a very large increase between 2000 and 2005 where the stock exceeded 5.8 million tonnes. Afterwards, the stock has undergone an obvious decline which persists until 2012, reaching a low biomass of 1.4 million tonnes. Finally, the resources of sardine have shown a good recovery the last few years which is confirmed by this survey estimates, revealing a biomass of 3.5 million tonnes.

In the region extending from Cape Bojador to Cape Cantin, fluctuations in the sardine stock are substantial, with especially two drastic falls. After a relatively stable period for the sardine stock between 2000 and 2004, the species had a severe decline where the biomass decreased from 1 270 thousand tonnes in 2004 to 200 thousand tonnes in 2006. Between 2007 and 2009, the stock of sardine had registered precarious recovery that ended in a huge fall carrying the biomass to the minimum of 94 thousand tonnes in 2010. Fortunately, the reconstitution of the stock of sardine has occurred gradually since 2011 due to high recruitment, low fishing pressure and favourable conditions of the environment. The biomass of sardine during this survey is estimated to 821 thousand tonnes, this result supports the recent stock recovery although it is slightly below the 2014 acoustic estimates.

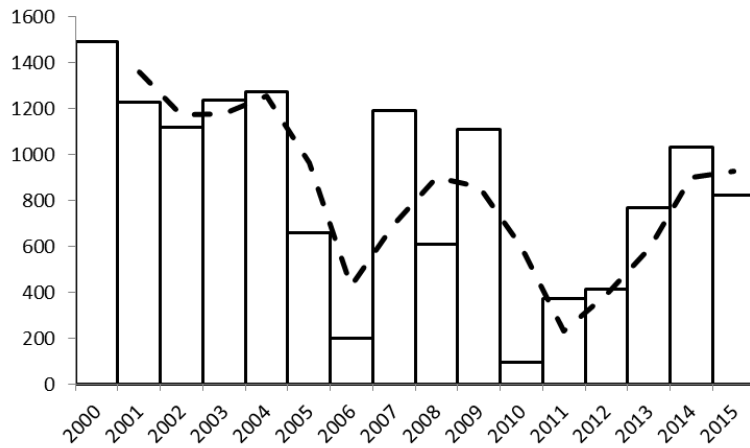
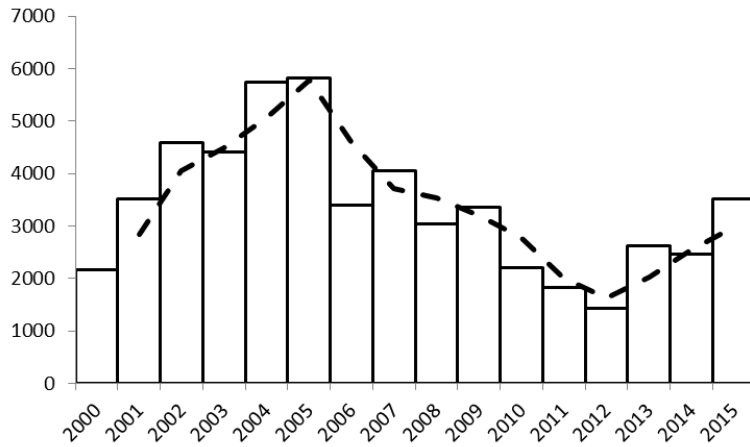


Figure 16. Trends in Sardine biomass between Cape Blanc and Cape Bojador (upper panel and between Cape Bojador and Cape Cantin (lower panel). The dashed lines show the 2 steps mobile means. Data from 2007-2014 are based on the surveys carried out with the Moroccan research vessel Al Amir Moulay Abdallah

CHAPTER 5. Résumé en français

Dans le cadre du programme EAF-Nansen et du projet CCLME, tous les deux exécutés par la FAO, une campagne régionale d'évaluation des stocks pélagiques a été réalisée à bord du navire de recherche Dr Fridtjof Nansen depuis le 21 octobre 2015 dans les Zones Economiques Exclusives du Sénégal, de la Gambie, de la Mauritanie et du Maroc. La 3ème partie de cette campagne régionale s'est déroulée au Maroc du 9 novembre au 12 décembre 2015, l'embarquement a eu lieu à Nouakchott en Mauritanie et le débarquement à Casablanca. Le navire Nansen s'est rendu en fin de campagne à Las Palmas le 14 décembre 2015.

La campagne de prospection des stocks des petits pélagiques de la 3ème partie a couvert la zone allant du Cap Blanc (21°N), zone frontale qui constitue la frontière entre le nord et le sud de la région du CCLME, et Larache au nord du Maroc (35°N environ).

5.1 Les conditions météorologiques et hydrographiques

La partie sud de cette région est connue par un vent fort, un upwelling important et une production primaire élevée. De même, la campagne cette année a révélé des masses d'eau côtières froides et de haute production primaire. La partie centrale de la région prospectée a également montré des résurgences d'upwelling avec une intensité plus faible tandis que la partie nord de la zone d'étude se caractérise par des conditions beaucoup plus stables avec peu de remontées d'eau et la production primaire à la thermocline n'atteint pas les eaux de surface. Les valeurs d'oxygène sont très faibles dans les eaux de fond sur le plateau de la zone sud, ces valeurs d'oxygène <1 ml / l observées aux deux radiales hydrologiques méridionales, au Cap Blanc et Cap Barbas, sont préoccupantes. De telles conditions d'oxygène obligeront la plupart des espèces de poissons à quitter la zone et les individus issus de la ponte ne seront pas en mesure de survivre dans ce milieu. Le suivi de cette situation s'avère nécessaire.

5.2 Des petits pélagiques

Les principales aires de concentration des petits pélagiques sont illustrées par la figure 19 avec des indications sur les biomasses. Les estimations des indices de biomasse sont également résumées dans le tableau 1.

La sardine a été retrouvée le long du littoral prospecté allant du Cap Blanc au sud jusqu'à la limite nord atteinte près de Larache. La biomasse totale a été estimée à environ 4,5 millions de tonnes. La sardine occupe principalement la frange côtière mais sa distribution s'étend à des profondeurs supérieures à 100m dans certaines zones. La plus dense et étendue distribution a été observée au sud entre Cap Barbas et Cap Bojador, où la sardine enregistre 3,5 millions de tonnes. Au sud du Cap Blanc, la biomasse de la sardine demeure très faible suivant la précédente campagne en Mauritanie.

Les sardinelles ont été rencontrées seulement entre Cap Blanc et Dakhla, avec une petite agrégation plus au nord (au sud de Lacraa). La biomasse totale a été estimée à 550 mille tonnes, dont 392 mille tonnes de sardinelles rondes et 155 mille tonnes de sardinelles plates.

L'anchois a été observé dans toute la région prospectée, à des zones bien définies. La distribution de l'espèce est surtout limitée dans les eaux côtières à moins de 50 m de profondeur se caractérisant par une forte production primaire. La biomasse des anchois est estimée à 158 mille, dont la plus forte concentration de 86 mille tonnes a été enregistrée au sud du Cap Barbas.

Les chinchards ont une large répartition, mais en faibles concentrations, la distribution est plus dense sur le bord du plateau, principalement à l'intérieur des fonds de 150 m et près de la côte. Les chinchards étaient souvent en mélange avec d'autres espèces, rendant difficile la discrimination acoustique dans certains cas. L'estimation de la biomasse des chinchards s'élève à 895 mille tonnes, elle est répartie entre le chinchard cunène restreint au sud de Dakhla avec 174 mille tonnes et le chinchard européen avec 405 mille tonnes. Le chinchard *T. picturatus* a été retrouvé dans la partie nord à seulement 9 mille tonnes.

Le maquereau est omniprésent, principalement à de faibles densités avec des concentrations décroissantes du sud au nord. L'abondance de l'espèce est à un niveau relativement élevé par rapport à la série des évaluations historiques du N/R Dr Fridtjof Nansen. L'indice de biomasse est estimé à 721 mille tonnes dont 422 mille tonnes sont trouvées entre Cap Blanc et Cap Bojador. Seulement des scombridés dispersés ont été détectés au nord du cap Cantin. Il est probable que la méthodologie utilisée au cours des campagnes du N/R Dr Fridtjof Nansen sous-estime la véritable abondance du maquereau en raison du faible pouvoir de réflexion «TS» de l'espèce. Les estimations de l'abondance sont représentées par des indices et leurs interprétations surtout pour le maquereau doivent être précautionneuse.

5.3 Tendances de la sardine 1995-2006

La figure 16 indique l'évolution des indices de biomasse de la sardine en saison d'automne suivant les résultats obtenus par le navire de recherche Fridtjof Nansen en 2015 ainsi que les années jusqu'en 2006, la série entre 2007 et 2014 est issue des campagnes réalisées à bord du N/R marocain Al Amir Moulay Abdallah. Au niveau de la région allant du Cap Blanc au Cap Bojador, les niveaux de biomasse de la sardine ont connu une augmentation très importante entre 2000 et 2005 où le stock sardinier a dépassé 5.8 millions tonnes. Le stock a subi par la suite une nette régression qui a persisté jusqu'en 2012 pour atteindre une faible biomasse de l'ordre de 1.4 millions tonnes. En fin, les ressources sardinières ont enregistré une reprise assez marquée et qui est confirmée par les évaluations de cette campagne révélant une biomasse de 3.5 millions tonnes.

Au niveau de la région s'étendant du Cap Bojador au Cap Cantin, les fluctuations du stock des pilchards sont plus conséquentes, avec notamment deux chutes drastiques du stock. Après une période relativement stable du stock sardinier entre 2000 et 2004, l'espèce a affiché un déclin sévère où la biomasse a passé de 1270 mille tonnes en 2004 à seulement 200 mille tonnes en 2006. Entre 2007 et 2009, le stock des pilchards a enregistré un redressement précaire qui s'est soldé par une chute énorme portant la biomasse à un minimum de 94 mille tonnes en 2010. Heureusement, la reconstitution du stock de la sardine a eu lieu graduellement depuis 2011 grâce à un fort recrutement, une faible pression de pêche et des conditions favorables du milieu. Les estimations de la biomasse de la sardine au cours de cette campagne sont de 821 mille tonnes, elles soutiennent le rétablissement du stock bien qu'elles restent légèrement en-dessous des évaluations de 2014.

ANNEX I RECORDS OF FISHING STATIONS

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 57
 DATE :10/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 20°59.06
 Lon W 17°6.81
 start stop duration Purpose : 1
 TIME :11:53:07 12:13:47 20.7 (min) Region : 1120
 LOG : 3394.57 3395.57 1.0 Gear cond.: 0
 FDEPTH: 5 5 Validity: 0
 BDEPTH: 30 32 Speed : 2.9 kn
 Towing dir: 0° Wire out : 110 m
 Sorted : 500 Total catch: 2000.00 Catch/hour: 5805.52

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Jellyfish	4979.96	0	85.78
Trachurus trecae	343.57	522	5.92
Caranx rhonchus	280.06	801	4.82
Diplodus bellottii	59.80	546	1.03
Diplodus vulgaris	32.63	70	0.56
Scomber japonicus	30.65	104	0.53
Campogramma glaycos	26.12	35	0.45
Sardinella aurita	17.88	58	0.31
Sarda sarda	15.67	23	0.27
Spondylosoma cantharus	6.98	12	0.12
Sparus aurata	5.46	12	0.09
Schedophilus pamarco	3.48	35	0.06
Sardinella maderensis	3.25	12	0.06
Total	5805.52	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 58
 DATE :10/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 20°58.83
 Lon W 17°29.38
 start stop duration Purpose : 1
 TIME :15:42:00 16:06:10 24.2 (min) Region : 1120
 LOG : 3426.05 3427.56 1.5 Gear cond.: 0
 FDEPTH: 95 94 Validity: 0
 BDEPTH: 95 94 Speed : 3.8 kn
 Towing dir: 0° Wire out : 0 m
 Sorted : 174 Total catch: 217.22 Catch/hour: 539.45

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	223.51	1920	41.43
Zeus faber	218.54	134	40.51
Arnoglossus imperialis	47.78	1438	8.86
Citharichthys stampflii	9.49	1031	1.76
Loligo vulgaris	8.29	149	1.54
Octopus vulgaris	7.55	17	1.40
Alloteuthis subulata	6.13	641	1.14
Synagrops microlepis	3.60	246	0.67
Dentex macrophthalmus	3.53	15	0.65
Scorpaena scrofa	3.28	37	0.61
Serranus africanus	2.61	15	0.48
Scomber japonicus	2.01	7	0.37
Serranus cabrilla	1.51	15	0.28
Bathynectes piperitus	0.97	75	0.18
Sarpa salpa	0.47	5	0.09
Pegusa lascaris	0.17	19	0.03
Total	539.45	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 59
 DATE :10/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 21°11.05
 Lon W 17°26.05
 start stop duration Purpose : 1
 TIME :20:08:08 20:45:08 37.0 (min) Region : 1120
 LOG : 3464.94 3466.82 1.9 Gear cond.: 0
 FDEPTH: 50 70 Validity: 0
 BDEPTH: 92 96 Speed : 3.1 kn
 Towing dir: 0° Wire out : 150 m
 Sorted : 0 Total catch: 19.92 Catch/hour: 32.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Synagrops microlepis	12.08	863	37.40
Trachurus trachurus	4.78	47	14.81
SALPS	4.22	50	13.05
Solenocera membranacea	3.23	2823	9.99
Trachurus trecae	2.68	21	8.28
Panturichthys mauritanicus	1.30	13	4.02
Coloconger cadenati	0.88	2	2.71
Bathynectes piperitus	0.84	117	2.61
Bentosema fibulatum	0.63	146	1.96
Scomber japonicus	0.52	2	1.61
Trichurus lepturus	0.44	2	1.39
Loligo vulgaris	0.24	11	0.75
Sepia bertheloti	0.18	49	0.55
Cepola pauciradiatus	0.15	2	0.45
Deltentostetus quadrimaculatus	0.06	62	0.20
Alloteuthis subulata	0.05	11	0.15
Saurida brasiliensis	0.03	11	0.10
Total	32.30	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 60
 DATE :10/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 21°10.20
 Lon W 17°5.99
 start stop duration Purpose : 1
 TIME :23:22:23 23:43:41 21.3 (min) Region : 1120
 LOG : 3489.18 3490.35 1.2 Gear cond.: 0
 FDEPTH: 10 10 Validity: 0
 BDEPTH: 38 39 Speed : 3.3 kn
 Towing dir: 0° Wire out : 110 m
 Sorted : 71 Total catch: 518.61 Catch/hour: 1460.87

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
JELLYFISH	915.49	0	62.67
Trachurus trecae	308.70	3634	21.13
Diplodus bellottii	45.63	499	3.12
Conger conger	29.72	3	2.03
Lepidopus caudatus	26.54	76	1.82
Torpedo marmorata	23.94	3	1.64
Pomadasy incisus	20.93	110	1.43
Umbrina canariensis	20.79	220	1.42
Sepia officinalis	20.39	130	1.40
Sardinella aurita	8.39	48	0.57
Caranx rhonchus	8.00	34	0.55
Pagellus erythrinus	7.92	42	0.54
Loligo vulgaris	6.96	6	0.48
Sardina pilchardus	5.61	48	0.38
Sarpa salpa	5.18	6	0.35
Scomber japonicus	2.73	14	0.19
Arius latiscutatus	1.97	48	0.13
Sepia orbignyana	1.49	20	0.10
Dicologlossa cuneata	0.48	6	0.03
Total	1460.87	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 61
 DATE :11/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 21°20.23
 Lon W 17°18.00
 start stop duration Purpose : 1
 TIME :03:01:09 03:21:18 20.1 (min) Region : 1120
 LOG : 3520.16 3521.41 1.3 Gear cond.: 0
 FDEPTH: 25 20 Validity: 0
 BDEPTH: 67 67 Speed : 3.7 kn
 Towing dir: 0° Wire out : 120 m
 Sorted : 13 Total catch: 13.48 Catch/hour: 40.14

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichurus lepturus	25.07	24	62.46
Trachurus trecae	6.91	63	17.21
Saurida brasiliensis	3.01	685	7.49
Sepia officinalis	2.00	24	4.97
Loligo vulgaris	1.58	143	3.93
Dentex macrophthalmus	0.51	131	1.26
Sepia orbignyana	0.39	18	0.96
Alloteuthis subulata	0.39	45	0.96
Deltentostetus quadrimaculatus	0.30	89	0.74
Total	40.14	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 62
 DATE :11/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 21°35.63
 Lon W 17°1.59
 start stop duration Purpose : 1
 TIME :10:18:08 11:05:37 46.5 (min) Region : 1120
 LOG : 3588.57 3591.29 2.7 Gear cond.: 0
 FDEPTH: 5 5 Validity: 0
 BDEPTH: 30 34 Speed : 3.5 kn
 Towing dir: 0° Wire out : 110 m
 Sorted : 0 Total catch: 494.50 Catch/hour: 638.20

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Campogramma glaycos	439.19	301	68.82
Sarda sarda	192.04	221	30.09
Spondylosoma cantharus	2.63	15	0.41
Caranx rhonchus	2.31	8	0.36
Dicentrarchus punctatus	1.01	3	0.17
Pagellus bellottii	0.46	3	0.06
Diplodus bellottii	0.31	1	0.05
Pomadasy incisus	0.19	1	0.03
Sardinella aurita	0.05	3	0.01
Total	638.20	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 63
 DATE :11/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 21°39.69
 Lon W 17°14.45
 start stop duration Purpose : 1
 TIME :13:20:49 13:47:11 26.4 (min) Region : 1120
 LOG : 3610.00 3611.51 1.5 Gear cond.: 0
 FDEPTH: 30 50 Validity: 0
 BDEPTH: 66 65 Speed : 3.4 kn
 Towing dir: 0° Wire out : 180 m
 Sorted : 21 Total catch: 20.87 Catch/hour: 47.50

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Spondylosoma cantharus	19.21	25	40.44
Trachurus trecae	16.25	48	34.21
Scomber japonicus	4.39	9	9.25
Loligo vulgaris	3.55	27	7.47
Umbrina canariensis	2.75	9	5.80
Pagellus erythrinus	0.75	2	1.58
Citharus linguatula	0.36	2	0.77
Alloteuthis subulata	0.20	5	0.43
Sepia officinalis	0.02	2	0.05
Total	47.50	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 64
 DATE :11/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 21°39.90
 Lon W 17°17.20
 start stop duration Purpose : 1
 TIME :14:49:39 14:59:14 9.6 (min) Region : 1120
 LOG : 3618.40 3619.03 0.6 Gear cond.: 0
 FDEPTH: 50 60 Validity: 0
 BDEPTH: 70 68 Speed : 4.0 kn
 Towing dir: 0° Wire out : 180 m
 Sorted : 6 Total catch: 5.63 Catch/hour: 35.26

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichurus lepturus	31.32	13	88.81
Loligo vulgaris	2.63	125	7.46
Scomber japonicus	0.88	13	2.49
Trachurus trecae	0.38	6	1.07
Alloteuthis subulata	0.06	6	0.18
Total	35.26	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 65
 DATE :11/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 21°50.29
 Lon W 17°11.74
 start stop duration Purpose : 1
 TIME :19:15:33 19:43:01 27.5 (min) Region : 1120
 LOG : 3658.81 3660.36 1.6 Gear cond.: 0
 FDEPTH: 10 10 Validity: 0
 BDEPTH: 63 66 Speed : 3.4 kn
 Towing dir: 0° Wire out : 110 m
 Sorted : 0 Total catch: 194.14 Catch/hour: 424.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	375.14	27495	88.47
Sarda sarda	32.33	11	7.62
Sepia bertheloti	5.96	201	1.41
Sepia officinalis	2.66	15	0.63
Loligo vulgaris	2.23	98	0.53
Trachurus trachurus	2.10	26	0.49
Deltentostetus quadrimaculatus	1.24	1127	0.29
Uranoscopus cadenati	0.96	4	0.23
Pagellus bellottii	0.59	256	0.14
Coloconger cadenati	0.26	2	0.06
Campogramma glaycos	0.26	124	0.06
Scomber japonicus	0.24	2	0.06
Zeus faber	0.07	7	0.02
Total	424.04	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 66
 DATE :11/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 21°49.55
 : start stop duration Lon W 17°56.61
 TIME :20:56:31 20:59:37 3.1 (min) Purpose : 1
 LOG : 3668.67 3668.84 0.2 Region : 1120
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 52 53 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.2 kn
 Sorted : 0 Total catch: 400.46 Catch/hour: 7750.84

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardina pilchardus	7315.16	106916	94.38	164
Campogramma glaycos	309.29	523	3.99	
Sarda sarda	43.74	58	0.56	
Trachurus trachurus	30.19	194	0.39	167
Scomber japonicus	22.55	58	0.29	165
Sardinella aurita	17.40	523	0.22	166
Sepia bertheloti	12.77	58	0.16	
Total	7751.11		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 67
 DATE :11/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 21°57.75
 : start stop duration Lon W 16°57.58
 TIME :23:13:04 23:35:12 22.1 (min) Purpose : 1
 LOG : 3686.63 3687.95 1.3 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 32 31 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
 Sorted : 134 Total catch: 600.00 Catch/hour: 1626.75

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Pomadasys incisus	1478.85	3807	90.91	
Scomber japonicus	72.93	521	4.48	157
Pagellus erythrinus	18.98	87	1.17	
Mugilidae sp.**	11.66	14	0.72	
Arius latiscutatus	8.43	14	0.52	
Caranx rhonchus	6.94	49	0.43	160
Pythoichthys micropthalmus	6.07	62	0.37	
Gymnura altavela	5.48	3	0.34	
Spondyliosoma cantharus	4.34	38	0.27	
Sardinella aurita	3.96	73	0.24	158
Uranoscopus scaber	3.31	5	0.20	
Trachurus trecae	2.98	38	0.18	159
Umbrina canariensis	1.46	3	0.09	
Scorpaena scrofa	1.36	14	0.08	
Total	1626.75		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 68
 DATE :12/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 22°1.03
 : start stop duration Lon W 17°6.78
 TIME :01:27:46 02:35:04 67.3 (min) Purpose : 1
 LOG : 3702.64 3706.90 4.3 Region : 1120
 FDEPTH: 40 35 Gear cond.: 0
 BDEPTH: 60° 58 Validity: 0
 Towing dir: 0° Wire out : 140 m Speed : 3.8 kn
 Sorted : 84 Total catch: 500.00 Catch/hour: 445.90

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	394.79	38936	88.54	
Pagellus erythrinus	45.94	172	10.30	
Loligo vulgaris	2.31	86	0.52	
Zeus faber	1.16	1	0.26	
Sepia officinalis	1.11	16	0.25	
Serranus cabrilla	0.37	5	0.08	
Panturichthys mauritanicus	0.21	1	0.05	
Total	445.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 69
 DATE :12/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 22°11.02
 : start stop duration Lon W 17°6.05
 TIME :08:22:58 08:58:46 35.8 (min) Purpose : 1
 LOG : 3758.61 3760.66 2.0 Region : 1120
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 61 59 Validity: 0
 Towing dir: 0° Wire out : 0 m Speed : 3.4 kn
 Sorted : 0 Total catch: 7.15 Catch/hour: 11.98

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Zeus faber	5.76	2	48.11	
Trachurus trachurus	2.21	15	18.46	169
Scomber japonicus	1.47	22	12.31	168
Pagellus bellottii	0.99	3	8.25	
Pyrosoma atlanticus	0.84	20	6.99	
Spondyliosoma cantharus	0.44	2	3.64	
Pomadasys incisus	0.27	2	2.24	
Total	11.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 70
 DATE :12/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 22°8.88
 : start stop duration Lon W 17°1.97
 TIME :10:01:53 10:53:17 51.4 (min) Purpose : 1
 LOG : 3766.78 3770.05 3.3 Region : 1120
 FDEPTH: 30 30 Gear cond.: 0
 BDEPTH: 51 50 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.8 kn
 Sorted : 16 Total catch: 16.40 Catch/hour: 19.15

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Spondyliosoma cantharus	9.34	20	48.78	
Engraulis encrasicolus	3.54	722	18.48	170
Sarda sarda	2.28	2	11.89	
Zeus faber	1.63	1	8.54	
Pyrosoma atlanticus	0.62	20	3.23	
Diplodus vulgaris	0.61	1	3.17	
Jellyfish	0.60	2	3.11	
Loligo vulgaris	0.36	13	1.89	
SALPS	0.09	1	0.49	
Sepia officinalis	0.06	1	0.30	
Sardina pilchardus	0.01	1	0.06	172
Sardinella aurita	0.01	1	0.06	171
Total	19.15		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 71
 DATE :12/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 22°14.39
 : start stop duration Lon W 16°47.63
 TIME :15:48:34 16:23:50 35.3 (min) Purpose : 1
 LOG : 3795.91 3798.06 2.1 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 29 29 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
 Sorted : 130 Total catch: 3500.00 Catch/hour: 5954.07

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Caranx rhonchus	3878.17	7596	65.13	173
Pomadasys incisus	1858.09	4119	31.21	
Scomber japonicus	107.97	504	1.81	175
Trachurus trecae	69.08	184	1.16	174
Campogramma glaycos	40.73	92	0.68	
Total	5954.05		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 72
 DATE :12/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 22°20.93
 : start stop duration Lon W 17°4.20
 TIME :19:40:37 19:56:47 16.2 (min) Purpose : 1
 LOG : 3819.91 3820.80 0.9 Region : 1120
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 61 62 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.3 kn
 Sorted : 0 Total catch: 29.91 Catch/hour: 110.98

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Trichiurus lepturus	60.85	22	54.83	
SALPS	44.12	2827	39.75	
Trachurus trachurus	3.90	67	3.51	180
Loligo vulgaris	1.11	63	1.00	
Sepia bertheloti	0.59	15	0.53	
Saurida brasiliensis	0.19	14	0.17	
Pyrosoma atlanticus	0.19	7	0.17	
Campogramma glaycos	0.04	19	0.03	
Total	110.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 73
 DATE :13/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 22°30.78
 : start stop duration Lon W 17°6.58
 TIME :00:28:02 01:25:59 57.9 (min) Purpose : 1
 LOG : 3853.01 3856.06 3.0 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 68 61 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 145 Total catch: 290.90 Catch/hour: 301.24

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Auxis thazard thazard	298.86	298	99.21	
Scomber japonicus	1.93	25	0.64	176
Loligo vulgaris	0.46	14	0.15	
Total	301.24		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 74
 DATE :13/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 22°24.26
 : start stop duration Lon W 16°42.63
 TIME :03:52:35 04:07:24 14.8 (min) Purpose : 1
 LOG : 3877.14 3877.97 0.8 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 41 42 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 135 Total catch: 415.20 Catch/hour: 1680.97

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardina pilchardus	773.68	32235	46.03	177
Pagellus erythrinus	403.24	668	23.99	
Engraulis encrasicolus	335.22	54061	19.94	178
Katsuwonus pelamis	80.77	24	4.80	
Arius latiscutatus	51.86	97	3.09	
Sardinella aurita	28.54	1518	1.70	179
Loligo vulgaris	5.83	304	0.35	
Sepia orbignyana	1.82	36	0.11	
Total	1680.97		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 75
 DATE :13/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 22°34.47
 : start stop duration Lon W 16°35.61
 TIME :08:13:46 08:40:20 26.6 (min) Purpose : 1
 LOG : 3913.87 3915.45 1.6 Region : 1120
 FDEPTH: 25 25 Gear cond.: 0
 BDEPTH: 39 40 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.6 kn
 Sorted : 0 Total catch: 4203.20 Catch/hour: 9491.60

SPECIES	weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardina pilchardus	9280.31	38498	97.77	181
Sardinella aurita	139.10	226	1.47	183
Campogramma glaycos	47.06	2	0.50	
Sardinella maderensis	25.08	99	0.26	182
Total	9491.55		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 76
 DATE :13/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 22°34.68
 start stop duration duration Lon W 16°35.64
 TIME :09:52:21 10:16:02 23.7 (min) Purpose : 1
 LOG : 3920.48 3921.80 1.3 Region : 1120
 FDEPTH: 40 40 Gear cond.: 0
 BDEPTH: 40 40 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 0 Total catch: 361.72 Catch/hour: 916.52

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	848.82	92.61	184
Loligo vulgaris	14.14	1.54	
Pomadasys inciscus	12.21	1.33	
Pagellus bellottii	8.61	0.94	
Scomber japonicus	8.21	0.90	185
Carliarius heudelotii	7.80	0.85	
Pegusa lascaris	7.75	0.85	
Trachurus trachurus	2.58	0.28	186
Umbrina canariensis	2.38	0.26	
Trachurus trecae	1.04	0.11	187
Merluccius senegalensis	1.01	0.11	
Dentex canariensis	0.81	0.09	
Scorpaena scrofa	0.43	0.05	
Octopus vulgaris	0.35	0.04	
Raja miraletus	0.25	0.03	
Engraulis encrasicolus	0.10	0.01	
Total	916.52	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 77
 DATE :13/11/15 GEAR TYPE: BT NO: 4 POSITION:Lat N 22°39.83
 start stop duration duration Lon W 16°57.19
 TIME :13:04:21 13:36:56 32.6 (min) Purpose : 1
 LOG : 3945.95 3947.93 2.0 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 60 60 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
 Sorted : 0 Total catch: 0.18 Catch/hour: 0.33

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	0.17	50.00	188
Panturichthys mauritanicus	0.17	50.00	
Total	0.33	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 78
 DATE :13/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 22°53.87
 start stop duration duration Lon W 17°8.88
 TIME :17:30:34 18:00:35 30.0 (min) Purpose : 1
 LOG : 3984.51 3986.26 1.8 Region : 1120
 FDEPTH: 245 244 Gear cond.: 0
 BDEPTH: 245 244 Validity : 0
 Towing dir: 0° Wire out : 600 m Speed : 3.5 kn
 Sorted : 0 Total catch: 249.80 Catch/hour: 499.27

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	122.92	24.62	199
Merluccius senegalensis	98.93	19.82	
Synagrops microlepis	66.56	13.33	
Zenopsis conchifer	65.16	13.05	
Todarodes sagittatus	46.57	9.33	
Plesionika heterocarpus	23.38	4.68	
Helicolenus dactylopterus	21.53	4.31	
Benthoesema fibulatum	16.19	3.24	
Arius parkii	6.36	1.27	
Scomber japonicus	5.94	1.19	198
Chlorophthalmus atlanticus	5.64	1.13	
Dentex angolensis	3.78	0.76	
Raja miraletus	3.54	0.71	
Pomadasys inciscus	2.76	0.55	
Dentex maroccanus	2.34	0.47	
SALPS	2.22	0.44	
Gnathopis mystax	1.98	0.40	
Peristodion cataphractum	1.75	0.35	
Scylliorhinus canicula	1.02	0.20	
Sepia officinalis	0.42	0.08	
Malacocephalus occidentalis	0.22	0.04	
Capros aper	0.18	0.04	
Macrorhamphosus scolopax	0.11	0.02	0
Total	499.27	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 79
 DATE :13/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 22°49.07
 start stop duration duration Lon W 16°52.40
 TIME :20:20:08 20:26:22 6.2 (min) Purpose : 1
 LOG : 4004.45 4004.80 0.3 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 59 59 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.3 kn
 Sorted : 0 Total catch: 1126.51 Catch/hour: 10849.21

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	9905.30	91.30	200
Scomber japonicus	752.17	6.93	201
Trachurus trachurus	191.75	1.77	202
Total	10849.21	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 80
 DATE :14/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 22°56.28
 start stop duration duration Lon W 16°27.66
 TIME :01:41:07 01:49:47 8.7 (min) Purpose : 1
 LOG : 4053.22 4053.70 0.5 Region : 1120
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 28 30 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 3.3 kn
 Sorted : 187 Total catch: 1743.28 Catch/hour: 12064.22

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardinella aurita	8987.89	74.50	192
Sardina pilchardus	2608.24	21.62	190
Trachurus trecae	313.84	2.60	189
Scomber japonicus	73.22	0.61	191
Pomadasys inciscus	33.36	0.28	
Dasyatis pastinaca	17.58	0.15	
Pagellus erythrinus	15.02	0.12	
Loligo vulgaris	15.02	0.12	
Total	12064.15	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 81
 DATE :14/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°2.88
 start stop duration duration Lon W 16°44.14
 TIME :04:01:37 04:17:12 15.6 (min) Purpose : 1
 LOG : 4072.00 4072.92 0.9 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 50 52 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
 Sorted : 135 Total catch: 359.87 Catch/hour: 1385.89

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	1202.58	86.77	193
Sardinella maderensis	57.30	4.13	195
Trachurus trachurus	57.00	4.11	196
Scomber japonicus	29.38	2.12	197
Sardinella aurita	18.29	1.32	194
Loligo vulgaris	16.02	1.16	
Dentex maroccanus	2.66	0.19	
Sepia officinalis	2.66	0.19	
Total	1385.89	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 82
 DATE :14/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 23°16.86
 start stop duration duration Lon W 16°59.65
 TIME :08:44:58 09:03:45 18.8 (min) Purpose : 1
 LOG : 4113.66 4114.77 1.1 Region : 1120
 FDEPTH: 99 99 Gear cond.: 0
 BDEPTH: 99 99 Validity : 0
 Towing dir: 0° Wire out : 270 m Speed : 3.5 kn
 Sorted : 0 Total catch: 2651.78 Catch/hour: 8472.14

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Macrorhamphosus scolopax	7065.81	83.40	
Trachurus trachurus	997.03	11.77	205
Dentex maroccanus	119.81	1.41	
Scomber japonicus	91.05	1.07	203
SALPS	40.06	0.47	
Zeus faber	39.68	0.47	
Sardina pilchardus	29.14	0.34	204
Loligo vulgaris	28.21	0.33	
Pagellus bellottii	20.93	0.25	
Sphoeroides pachgaster	19.71	0.23	
Lepidopus caudatus	19.11	0.23	
Pagellus acarne	1.34	0.02	0
Gnathopis mystax	0.26	0.00	
Total	8472.14	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 83
 DATE :14/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 23°17.04
 start stop duration duration Lon W 16°59.00
 TIME :10:11:12 10:22:50 11.6 (min) Purpose : 1
 LOG : 4117.87 4118.47 0.6 Region : 1120
 FDEPTH: 60 80 Gear cond.: 0
 BDEPTH: 94 95 Validity : 0
 Towing dir: 0° Wire out : 0 m Speed : 3.1 kn
 Sorted : 0 Total catch: 5365.38 Catch/hour: 27656.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	13917.53	227067	50.32
Sardina pilchardus	9108.25	73505	32.93
Macrorhamphosus scolopax	3675.26	290186	13.29
Scomber japonicus	859.69	20773	3.11
Sardinella aurita	95.88	160	0.35
Total	27656.60	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 84
 DATE :14/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°10.25
 start stop duration duration Lon W 16°34.70
 TIME :13:37:01 13:46:30 9.5 (min) Purpose : 1
 LOG : 4146.10 4146.65 0.6 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 37 38 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 143 Total catch: 2500.00 Catch/hour: 15822.78

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	15822.78	209335	100.00
Total	15822.78	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 85
 DATE :14/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°4.13
 start stop duration duration Lon W 16°17.62
 TIME :16:02:10 16:07:06 4.9 (min) Purpose : 1
 LOG : 4165.02 4165.33 0.3 (min) Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 25 26 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
 Sorted : 153 Total catch: 508.43 Catch/hour: 6200.37

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardinella aurita	5061.22	10317	81.63
Caranx rhonchus	497.07	2610	8.02
Sardinella maderensis	289.15	2195	4.66
Trachurus trecae	123.41	744	1.99
Campogramma glaycos	50.12	85	0.81
Sardina pilchardus	37.56	85	0.61
Scomber japonicus	23.17	207	0.37
Trachinotus teraia	20.24	122	0.33
Pomadasys inciscus	14.02	37	0.23
Pagellus bellottii	13.41	49	0.22
Sepia officinalis	13.29	37	0.21
Sphyræna quachancho	12.93	24	0.21
Spondyliosoma cantharus	12.44	37	0.20
Diplodus bellottii	9.15	37	0.15
Pagellus erythrinus	8.90	24	0.14
Sardina aurita	7.32	12	0.12
Pomatomus saltatrix	6.95	12	0.11
Total	6200.37	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 86
 DATE :14/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°20.89
 start stop duration Lon W 16°32.35
 TIME :19:45:42 19:52:58 7.3 (min) Purpose : 1
 LOG : 4197.22 4197.65 0.4 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 38 38 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
 Sorted : 0 Total catch: 258.66 Catch/hour: 2134.75

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	1927.10	90.27	220
Scomber japonicus	157.63	7.38	221
Trachurus trachurus	27.24	1.28	222
Sepia officinalis	8.58	0.40	
Pagellus bellottii	7.51	0.35	
Spondyllosoma cantharus	3.88	0.18	
Caranx rhonchus	2.06	0.10	223
Pagellus acarne	0.74	0.03	
Total	2134.75	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 87
 DATE :15/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°31.30
 start stop duration Lon W 16°37.40
 TIME :02:28:13 02:38:30 10.3 (min) Purpose : 1
 LOG : 4258.31 4258.91 0.6 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 42 42 Validity : 0
 Towing dir: 102° Wire out : 120 m Speed : 3.6 kn
 Sorted : 102 Total catch: 255.78 Catch/hour: 1492.85

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	1434.63	96.10	217
Trachurus trachurus	42.02	2.81	219
Scomber japonicus	9.63	0.65	218
Sepia orbignyana	6.27	0.42	
Loligo vulgaris	0.29	0.02	
Total	1492.85	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 88
 DATE :15/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 23°39.30
 start stop duration Lon W 16°31.00
 TIME :08:11:46 08:27:27 15.7 (min) Purpose : 1
 LOG : 4309.65 4310.58 0.9 Region : 1120
 FDEPTH: 30 35 Gear cond.: 0
 BDEPTH: 41 44 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
 Sorted : 0 Total catch: 5.59 Catch/hour: 21.39

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Spondyllosoma cantharus	18.48	86.40	
Diplodus vulgaris	2.07	9.66	
Boops boops	0.65	3.04	
Trachinus draco	0.19	0.89	
Total	21.39	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 89
 DATE :15/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 23°39.57
 start stop duration Lon W 16°30.78
 TIME :09:43:10 10:34:45 51.6 (min) Purpose : 1
 LOG : 4319.10 4321.93 2.8 Region : 1120
 FDEPTH: 30 30 Gear cond.: 0
 BDEPTH: 42 47 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.3 kn
 Sorted : 0 Total catch: 2225.25 Catch/hour: 2589.01

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	2589.01	100.00	224
Total	2589.01	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 90
 DATE :15/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 23°54.19
 start stop duration Lon W 16°43.30
 TIME :14:40:23 15:29:55 49.5 (min) Purpose : 1
 LOG : 4359.66 4362.71 3.0 Region : 1120
 FDEPTH: 50 80 Gear cond.: 0
 BDEPTH: 81 101 Validity : 0
 Towing dir: 0° Wire out : 210 m Speed : 3.7 kn
 Sorted : 116 Total catch: 868.35 Catch/hour: 1051.91

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Scomber japonicus	1051.18	99.93	225
Trachurus trachurus	0.73	0.07	226
Total	1051.91	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 91
 DATE :15/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°43.25
 start stop duration Lon W 16°16.41
 TIME :18:55:49 19:03:00 7.2 (min) Purpose : 1
 LOG : 4392.09 4392.53 0.4 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 39 33 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
 Sorted : 0 Total catch: 563.76 Catch/hour: 4711.09

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	3786.77	80.38	228
Scomber japonicus	902.51	19.16	227
Loligo vulgaris	9.78	0.21	
Sarda sarda	8.11	0.17	
Spondyllosoma cantharus	2.01	0.04	
Pagellus bellottii	1.09	0.02	
Sardinella aurita	0.84	0.02	
Total	4711.09	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 92
 DATE :15/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°46.89
 start stop duration Lon W 16°1.35
 TIME :22:30:45 22:40:50 10.1 (min) Purpose : 1
 LOG : 4421.44 4422.02 0.6 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 27 27 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 0 Total catch: 185.28 Catch/hour: 1102.86

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	517.86	46.96	231
Scomber japonicus	287.50	24.3	229
Pagellus bellottii	132.44	12.01	0
Trachurus trachurus	88.81	8.05	230
Pomadasy inciscus	40.89	3.71	
Arius parkii	16.07	1.46	
Diplodus bellottii	12.02	1.09	
Sepia officinalis	3.57	0.32	
Campogramma glaycos	1.61	0.15	
Loligo vulgaris	1.13	0.10	
Scomberesox saurus	0.54	0.05	
Pagellus bellottii	0.24	0.02	
Sepia berthelotii	0.18	0.02	
Total	1102.86	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 93
 DATE :16/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 23°57.74
 start stop duration Lon W 16°22.17
 TIME :01:25:59 01:46:22 20.4 (min) Purpose : 1
 LOG : 4445.56 4446.70 1.1 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 61 60 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 121 Total catch: 422.81 Catch/hour: 1244.78

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Scomber japonicus	1052.68	84.57	232
Sardina pilchardus	186.01	14.94	233
Loligo vulgaris	3.92	0.31	
Pomadasy inciscus	1.65	0.13	
Spondyllosoma cantharus	0.53	0.04	
Total	1244.78	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 94
 DATE :16/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 24°2.03
 start stop duration Lon W 16°9.88
 TIME :09:19:46 09:44:29 24.7 (min) Purpose : 1
 LOG : 4515.94 4517.45 1.5 Region : 1120
 FDEPTH: 30 35 Gear cond.: 0
 BDEPTH: 44 44 Validity : 0
 Towing dir: 0° Wire out : 0 m Speed : 3.7 kn
 Sorted : 0 Total catch: 68.41 Catch/hour: 166.11

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Spondyllosoma cantharus	136.22	82.01	
Trachurus trecae	23.31	14.03	234
Trachurus trachurus	5.68	3.42	236
Scomber japonicus	0.90	0.54	235
Total	166.11	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 95
 DATE :16/11/15 GEAR TYPE: PT NO: 26 POSITION:Lat N 24°0.29
 start stop duration Lon W 15°52.35
 TIME :12:49:50 12:56:59 7.2 (min) Purpose : 1
 LOG : 4544.75 4545.19 0.4 Region : 1120
 FDEPTH: 27 26 Gear cond.: 0
 BDEPTH: 27 26 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 3.7 kn
 Sorted : 80 Total catch: 199.83 Catch/hour: 1676.90

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Diplodus bellottii	829.34	49.46	
Pomadasy inciscus	287.08	17.12	
Scomber japonicus	128.31	7.65	237
Caranx rhonchus	80.81	4.82	239
Trachurus trachurus	75.94	4.53	240
Diplodus vulgaris	71.33	4.25	
Spondyllosoma cantharus	45.48	2.71	
Plectorhinchus mediterraneus	43.47	2.59	
Campogramma glaycos	32.22	1.92	
Sardina pilchardus	25.43	1.52	238
Loligo vulgaris	21.65	1.29	
Pagellus bellottii	20.73	1.24	
Raja undulata	10.91	0.65	
Serranus cabrilla	4.20	0.25	
Total	1676.90	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 96
 DATE :16/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 24°9.91
 start stop duration Lon W 16°2.59
 TIME :16:11:24 16:33:31 22.1 (min) Purpose : 1
 LOG : 4573.80 4575.15 1.4 Region : 1120
 FDEPTH: 30 30 Gear cond.: 0
 BDEPTH: 41 42 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.6 kn
 Sorted : 157 Total catch: 1500.01 Catch/hour: 4068.74

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	3875.37	95.25	241
Scomber japonicus	192.59	4.73	242
Engraulis encrasicolus	0.79	0.02	
Total	4068.74	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 97
 DATE :16/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°21.95
 start stop duration Lon W 16°24.85
 TIME :19:24:05 19:46:12 22.1 (min) Purpose : 1
 LOG : 4598.03 4599.18 1.1 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 80 76 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.1 kn
 Sorted : 0 Total catch: 547.06 Catch/hour: 1483.89

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	817.41	27429	55.09	244	
Scomber japonicus	663.61	20308	44.72	243	
Sepia officinalis	2.55	3	0.17		
SALPS	0.22	8	0.01		
Loligo vulgaris	0.11	3	0.01		
Total	1483.89		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 98
 DATE :17/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°20.73
 start stop duration Lon W 16°4.85
 TIME :03:05:25 03:36:58 31.6 (min) Purpose : 1
 LOG : 4652.70 4654.63 1.9 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 51 49 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
 Sorted : 120 Total catch: 119.57 Catch/hour: 227.39

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sarda sarda	121.05	82	53.23		
Scomber japonicus	98.23	2286	43.20	245	
Auxis thazard thazard	4.41	8	1.94		
Campogramma glaycos	2.72	4	1.20		
Trachinotus ovatus	0.61	2	0.27		
Trachurus trercae	0.38	2	0.17	246	
Total	227.39		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 99
 DATE :17/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°17.04
 start stop duration Lon W 15°38.56
 TIME :08:30:57 09:11:38 40.7 (min) Purpose : 1
 LOG : 4692.32 4694.64 2.3 Region : 1120
 FDEPTH: 24 24 Gear cond.: 0
 BDEPTH: 24 24 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 0 Total catch: 5.18 Catch/hour: 7.64

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Scomberesox saurus	7.52	90	98.46		
Seriola dumerilli	0.12	1	1.54		
Total	7.64		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 100
 DATE :17/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 24°29.91
 start stop duration Lon W 16°3.05
 TIME :12:17:26 12:29:19 11.9 (min) Purpose : 1
 LOG : 4722.10 4722.88 0.8 Region : 1120
 FDEPTH: 25 35 Gear cond.: 0
 BDEPTH: 57 56 Validity: 0
 Towing dir: 0° Wire out : 140 m Speed : 3.9 kn
 Sorted : 51 Total catch: 153.59 Catch/hour: 775.71

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	692.78	1414	89.31	247	
Scomber japonicus	50.00	439	6.45	248	
Trachinus draco	29.34	162	3.78		
Campogramma glaycos	3.59	5	0.46		
Total	775.71		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 101
 DATE :17/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 24°47.23
 start stop duration Lon W 16°15.52
 TIME :17:38:10 18:06:24 28.2 (min) Purpose : 1
 LOG : 4771.12 4772.58 1.5 Region : 1120
 FDEPTH: 99 95 Gear cond.: 0
 BDEPTH: 99 95 Validity: 0
 Towing dir: 0° Wire out : 250 m Speed : 3.1 kn
 Sorted : 0 Total catch: 228.50 Catch/hour: 485.66

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	282.68	7365	58.20	250	
Zeus faber	91.39	38	18.82		
Sphoeroides pachgaster	41.45	32	8.53		
Trachurus trachurus	17.11	261	3.52	249	
Dentex maroccanus	14.13	366	2.91		
Aspitrigla obscura	12.50	98	2.57		
Pagellus acarne	6.46	38	1.33		
Loligo vulgaris	6.03	0	1.24		
Plectorhinchus mediterraneus	4.46	2	0.92		
Raja miraletus	3.15	4	0.65		
Pagellus bellottii	2.23	9	0.46		
Pagrus pagrus	2.02	2	0.42		
Merluccius senegalensis	1.30	2	0.27		
Trachinus draco	0.74	9	0.15		
Alloteuthis subulata	0.02	2	0.00	0	
Total	485.66		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 102
 DATE :17/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°34.73
 start stop duration Lon W 15°52.86
 TIME :21:15:52 21:18:31 2.6 (min) Purpose : 1
 LOG : 4798.90 4799.07 0.2 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 48 47 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.8 kn
 Sorted : 0 Total catch: 234.80 Catch/hour: 5316.23

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	5252.83	68196	98.81	251	
Scomber japonicus	63.40	1766	1.19	252	
Total	5316.23		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 103
 DATE :18/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°32.69
 start stop duration Lon W 15°21.53
 TIME :02:47:15 02:52:06 4.8 (min) Purpose : 1
 LOG : 4846.91 4847.19 0.3 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 28 28 Validity: 0
 Towing dir: 0° Wire out : 80 m Speed : 3.3 kn
 Sorted : 93 Total catch: 93.28 Catch/hour: 1153.98

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	1122.68	9761	97.29	253	
Scomber japonicus	21.28	285	1.84	254	
Diplodus bellottii	5.57	62	0.48		
Pomadasyus incisus	2.10	12	0.18		
Spondyllosoma cantharus	1.61	37	0.14		
Trachurus trachurus	0.74	12	0.06	255	
Total	1153.98		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 104
 DATE :18/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 25°4.78
 start stop duration Lon W 16°6.60
 TIME :12:16:49 12:26:56 10.1 (min) Purpose : 1
 LOG : 4933.18 4933.74 0.6 Region : 1120
 FDEPTH: 101 102 Gear cond.: 0
 BDEPTH: 101 102 Validity: 0
 Towing dir: 0° Wire out : 280 m Speed : 3.4 kn
 Sorted : 110 Total catch: 883.45 Catch/hour: 5237.85

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	4950.59	151393	94.52	256	
Sphoeroides pachgaster	159.96	47	3.05		
Pagellus erythrinus	64.57	243	1.23		
Pagellus acarne	38.06	243	0.73		
Zeus faber	11.62	12	0.22		
Chelidonichthys lucerna	5.81	95	0.11		
Trachurus trachurus	3.85	47	0.07	257	
Aspitrigla obscura	1.96	47	0.04		
Sardina pilchardus	1.42	47	0.03	258	
Total	5237.85		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 105
 DATE :18/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 24°50.97
 start stop duration Lon W 15°39.12
 TIME :16:02:02 16:24:22 22.3 (min) Purpose : 1
 LOG : 4965.02 4966.18 1.2 Region : 1120
 FDEPTH: 50 50 Gear cond.: 0
 BDEPTH: 50 50 Validity: 0
 Towing dir: 0° Wire out : 150 m Speed : 3.1 kn
 Sorted : 98 Total catch: 342.51 Catch/hour: 920.31

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Pagellus acarne	373.38	3523	40.57		
Trachurus trachurus	261.36	2528	28.40	260	
Scomber japonicus	229.76	5103	24.97	259	
Pagellus erythrinus	23.08	191	2.51		
Spondyllosoma cantharus	21.93	202	2.38		
Loligo vulgaris	6.48	56	0.70		
Sardina pilchardus	2.02	97	0.22	261	
Diplodus bellottii	1.53	11	0.17		
Aspitrigla obscura	0.78	11	0.08		
Total	920.31		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 106
 DATE :18/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°42.98
 start stop duration Lon W 15°19.29
 TIME :18:50:26 19:07:14 16.8 (min) Purpose : 1
 LOG : 4986.36 4987.36 1.0 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 33 34 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
 Sorted : 0 Total catch: 1394.72 Catch/hour: 4981.14

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	4764.29	49121	95.65	265	
Scomber japonicus	139.64	2875	2.80	263	
Sardinella maderensis	72.29	246	1.45	262	
Trachurus trachurus	4.93	82	0.10	264	
Total	4981.14		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 107
 DATE :18/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°37.29
 start stop duration Lon W 15°6.10
 TIME :21:21:29 21:41:04 19.6 (min) Purpose : 1
 LOG : 5004.95 5006.06 1.1 Region : 1120
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 25 25 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 0 Total catch: 1294.67 Catch/hour: 3967.32

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	3418.28	36757	86.16	266	
Scomber japonicus	496.18	0	12.51	267	
Diplodus bellottii	25.37	211	0.64		
Pomadasyus incisus	11.98	70	0.30		
Campogramma glaycos	7.05	37	0.18		
Spondyllosoma cantharus	4.23	37	0.11		
Trachurus trachurus	2.82	37	0.07		
Loligo vulgaris	1.41	37	0.04		
Total	3967.32		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 108
 DATE :19/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 25°7.25
 start stop duration Lon W 15°48.73
 TIME :04:55:25 05:30:40 35.3 (min) Purpose : 1
 LOG : 5075.57 5077.60 2.0 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 82 88 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 0 Total catch: 110.70 Catch/hour: 188.43

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	187.23	5200	99.37	269	
Loligo vulgaris	1.19	5	0.63		
Total	188.43		100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 109
 DATE :19/11/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 25°22.87
 start stop duration duration Lon W 15°53.33
 TIME :11:23:47 11:37:20 13.6 (min) Purpose : 1
 LOG : 5127.22 5127.92 0.7 Region : 1120
 FDEPTH: 148 149 Gear cond.: 0
 BDEPTH: 148 149 Validity: 0
 Towing dir: 0° Wire out : 380 m Speed : 3.1 kn
 Sorted : 142 Total catch: 2500.00 Catch/hour: 11070.11

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	8547.28	270469	77.21	270
Trachurus trachurus	1648.56	26382	14.89	271
Macrorhamphosus scolopax	316.12	15379	2.86	
Zeus faber	284.15	314	2.57	
Dentex macropthalmus	125.67	1718	1.14	
Merluccius senegalensis	75.72	80	0.68	
Sphoeroides pachgaster	38.26	80	0.35	
Mullus surmuletus	34.36	80	0.31	
Total	11070.11		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 110
 DATE :19/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 24°55.53
 start stop duration duration Lon W 14°51.71
 TIME :18:51:02 18:51:39 0.6 (min) Purpose : 1
 LOG : 5194.17 5194.21 0.0 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 41 42 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.9 kn
 Sorted : 0 Total catch: 5000.11 Catch/hour: 483881.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	483840.00	4719581	99.99	
Scomber japonicus	41.61	97	0.01	273
Total	483881.61		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 111
 DATE :19/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 25°12.17
 start stop duration duration Lon W 15°10.97
 TIME :23:11:51 23:37:25 25.6 (min) Purpose : 1
 LOG : 5226.13 5227.54 1.4 Region : 1120
 FDEPTH: 30 40 Gear cond.: 0
 BDEPTH: 60 57 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.3 kn
 Sorted : 285 Total catch: 323.36 Catch/hour: 758.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex gibbosus	483.85	202	63.77	
Spondyliosoma cantharus	146.19	573	19.27	
Diplodus vulgaris	98.55	347	12.99	
Scomber japonicus	9.97	153	1.31	274
Sparus aurata	6.85	7	0.90	
Trachurus trachurus	5.61	26	0.74	275
Loligo vulgaris	76.98	5	0.39	
Plectorhinchus mediterraneus	2.63	5	0.35	
Boops boops	1.17	500	0.15	
Pagellus acarne	0.96	5	0.13	
Total	758.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 112
 DATE :20/11/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 25°30.61
 start stop duration duration Lon W 15°24.04
 TIME :12:39:51 12:46:33 6.7 (min) Purpose : 1
 LOG : 5323.64 5324.07 0.4 Region : 1120
 FDEPTH: 144 144 Gear cond.: 0
 BDEPTH: 144 144 Validity: 0
 Towing dir: 0° Wire out : 0 m Speed : 3.9 kn
 Sorted : 85 Total catch: 1200.00 Catch/hour: 10746.27

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	10373.37	355227	96.53	
Trachurus trachurus	96.99	2015	0.90	277
Macrorhamphosus scolopax	88.21	2391	0.82	
Pagellus acarne	76.84	501	0.71	
Sphoeroides pachgaster	57.94	125	0.54	
Sardina pilchardus	30.27	1263	0.28	278
Dentex maroccanus	22.66	627	0.21	
Total	10746.27		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 113
 DATE :20/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 25°21.70
 start stop duration duration Lon W 15°4.02
 TIME :15:13:20 15:53:42 40.4 (min) Purpose : 1
 LOG : 5344.98 5347.12 2.1 Region : 1120
 FDEPTH: 40 50 Gear cond.: 0
 BDEPTH: 68 66 Validity: 0
 Towing dir: 0° Wire out : 150 m Speed : 3.2 kn
 Sorted : 107 Total catch: 107.01 Catch/hour: 159.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pagellus acarne	147.32	617	92.63	
Trachurus trachurus	11.34	132	7.13	279
Pomadasys incisus	0.24	1	0.15	
Scomber japonicus	0.15	1	0.09	280
Total	159.04		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 114
 DATE :20/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 25°2.88
 start stop duration duration Lon W 14°52.29
 TIME :19:23:11 19:37:02 13.8 (min) Purpose : 1
 LOG : 5379.96 5380.74 0.8 Region : 1120
 FDEPTH: 30 30 Gear cond.: 0
 BDEPTH: 40 41 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 0 Total catch: 117.90 Catch/hour: 510.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	224.84	2794	44.02	282
Scomber japonicus	223.54	5454	43.77	283
Pomadasys incisus	18.41	139	3.60	
Diplodus vulgaris	14.34	82	2.81	
Diplodus bellottii	7.97	121	1.56	
Trachurus trachurus	6.93	95	1.36	281
Pagellus erythrinus	6.02	26	1.18	
Spondyliosoma cantharus	5.68	46	1.11	
Pagellus acarne	2.73	13	0.53	
Plastic	0.30	4	0.06	
Total	510.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 115
 DATE :21/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 25°26.48
 start stop duration duration Lon W 14°49.89
 TIME :01:09:31 01:29:28 19.9 (min) Purpose : 1
 LOG : 5429.57 5430.64 1.1 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 38 55 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.2 kn
 Sorted : 110 Total catch: 110.30 Catch/hour: 331.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	321.35	3444	96.87	284
Scomber japonicus	4.48	87	1.35	285
Camogramma glaycos	3.64	6	1.10	
Scomber scombrus	0.90	6	0.27	286
Diplodus vulgaris	0.84	3	0.25	
Loligo vulgaris	0.51	15	0.15	
Total	331.73		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 116
 DATE :21/11/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 25°51.81
 start stop duration duration Lon W 15°14.34
 TIME :09:56:41 10:17:41 21.0 (min) Purpose : 1
 LOG : 5503.86 5504.91 1.1 Region : 1120
 FDEPTH: 217 216 Gear cond.: 0
 BDEPTH: 217 216 Validity: 0
 Towing dir: 0° Wire out : 550 m Speed : 3.0 kn
 Sorted : 0 Total catch: 3485.83 Catch/hour: 9959.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	9007.31	334814	90.44	288
Trachurus trachurus	740.14	12649	7.43	287
Macrorhamphosus scolopax	148.91	1049	1.50	
Dentex maroccanus	56.17	1077	0.57	
Antigonia capros	5.37	89	0.05	
Merluccius senegalensis	1.26	3	0.01	
Total	9959.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 117
 DATE :21/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 25°33.78
 start stop duration duration Lon W 14°44.90
 TIME :14:16:55 14:47:15 30.3 (min) Purpose : 1
 LOG : 5538.86 5540.45 1.6 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 44 44 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 24 Total catch: 46.88 Catch/hour: 46.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	46.88	198	100.00	289
Total	46.88		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 118
 DATE :21/11/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 25°43.46
 start stop duration duration Lon W 14°41.33
 TIME :16:36:24 17:03:13 26.8 (min) Purpose : 1
 LOG : 5554.93 5556.31 1.4 Region : 1120
 FDEPTH: 30 29 Gear cond.: 0
 BDEPTH: 30 29 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.1 kn
 Sorted : 138 Total catch: 1605.53 Catch/hour: 3591.79

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	2105.06	21051	58.61	
Pomadasys incisus	469.53	4826	13.07	
Scomber japonicus	378.23	2870	10.53	290
Pagellus erythrinus	275.44	23503	7.67	
Trachurus trachurus	163.02	3105	4.54	291
Sardina pilchardus	77.20	808	2.15	292
Pagellus bellottii	62.33	365	1.74	
Caranx rhonchus	23.74	27	0.66	
Loligo vulgaris	23.20	783	0.65	
Dentex gibbosus	5.46	27	0.15	
Merluccius senegalensis	4.43	27	0.12	
Spondyliosoma cantharus	4.16	104	0.12	
Total	3591.79		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 119
 DATE :21/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 25°47.79
 start stop duration duration Lon W 14°43.64
 TIME :18:40:47 18:43:35 2.8 (min) Purpose : 1
 LOG : 5566.13 5566.30 0.2 Region : 1120
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 76 76 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.6 kn
 Sorted : 46 Total catch: 2898.00 Catch/hour: 62100.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	62100.00	422550	100.00	
Total	62100.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 120
 DATE :22/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 26°4.19
 start stop duration duration Lon W 14°54.71
 TIME :01:17:08 01:37:14 20.1 (min) Purpose : 1
 LOG : 5623.81 5625.05 1.2 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 176 158 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
 Sorted : 21 Total catch: 20.50 Catch/hour: 61.19

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	61.19	2418	100.00	295
Total	61.19		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 121
 DATE :22/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 25°57.60
 start stop duration duration Lon W 14°37.75
 TIME :03:28:09 04:07:09 39.0 (min) Purpose : 1
 LOG : 5641.89 5644.27 2.4 Region : 1120
 FDEPTH: 20 20 Gear cond.: 0
 BDEPTH: 55 49 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.7 kn
 Sorted : 77 Total catch: 115.41 Catch/hour: 177.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	160.34	1637	90.33	296
Scomber japonicus	15.58	215	8.78	297
Diplodus bellottii	1.14	17	0.64	
Merluccius senegalensis	0.37	3	0.21	
Loligo vulgaris	0.08	14	0.04	
Engraulis encrasicolus	0.00	3	0.00	
Total	177.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 122
 DATE :22/11/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 26°14.22
 start stop duration duration Lon W 14°46.84
 TIME :09:01:33 09:18:31 17.0 (min) Purpose : 1
 LOG : 5679.27 5680.15 0.9 Region : 1120
 FDEPTH: 200 195 Gear cond.: 0
 BDEPTH: 200 195 Validity: 0
 Towing dir: 0° Wire out : 550 m Speed : 3.1 kn
 Sorted : 85 Total catch: 2630.19 Catch/hour: 9299.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	7672.36	318403	82.50	298
Trachurus trachurus	651.05	9034	7.00	299
Pagellus acarne	422.51	2521	4.54	
Dentex maroccanus	252.09	3836	2.71	
Macrorhamphosus scolopax	131.53	5371	1.41	
Zeus faber	104.12	110	1.12	
Trachurus picturatus	58.09	986	0.62	300
Boops boops	7.67	110	0.08	
Waste General	0.00	0	0.00	
Total	9299.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 123
 DATE :22/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 26°25.02
 start stop duration duration Lon W 14°25.40
 TIME :16:59:53 17:24:35 24.7 (min) Purpose : 1
 LOG : 5738.30 5739.90 1.6 Region : 1120
 FDEPTH: 20 25 Gear cond.: 0
 BDEPTH: 36 35 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.9 kn
 Sorted : 170 Total catch: 170.16 Catch/hour: 7367.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Spondyliosoma cantharus	372.87	3989	90.21	
Campogramma glaycos	22.23	34	5.38	
Scomber japonicus	14.66	27	2.82	301
Diplodus puntazzo	2.23	2	0.54	
Trachurus trachurus	1.87	7	0.45	303
Sardinella aurita	1.80	5	0.43	302
Diplodus vulgaris	0.68	2	0.16	
Total	413.34		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 124
 DATE :22/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 26°28.03
 start stop duration duration Lon W 14°16.49
 TIME :20:51:09 20:58:22 7.2 (min) Purpose : 1
 LOG : 5765.66 5766.05 0.4 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 41 41 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.2 kn
 Sorted : 156 Total catch: 886.54 Catch/hour: 7367.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	5926.54	39507	80.44	304
Spondyliosoma cantharus	1048.84	5036	14.24	
Scomber japonicus	150.00	3341	2.04	305
Boops boops	94.07	1978	1.28	
Scomber scombrus	55.57	91	0.75	308
Trachurus trachurus	38.98	141	0.53	307
Campogramma glaycos	29.17	33	0.40	
Sardinella aurita	14.54	42	0.20	306
Dentex maroccanus	9.81	50	0.13	
Total	7367.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 125
 DATE :23/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 26°31.88
 start stop duration duration Lon W 13°57.70
 TIME :03:50:43 03:53:26 2.7 (min) Purpose : 1
 LOG : 5822.40 5822.56 0.2 Region : 1120
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 30 31 Validity: 0
 Towing dir: 0° Wire out : 80 m Speed : 3.5 kn
 Sorted : 93 Total catch: 139.81 Catch/hour: 3084.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2761.99	215779	89.56	309
Trachurus trachurus	123.97	441	4.02	310
Campogramma glaycos	47.21	66	1.53	
Diplodus vulgaris	37.28	199	1.21	
Pomatomus saltatrix	28.46	22	0.92	
Diplodus bellottii	26.47	794	0.86	
Argyrosomus regius	22.50	44	0.73	
Loligo vulgaris	20.07	44	0.65	
Scomber japonicus	7.28	22	0.24	311
Diplodus puntazzo	5.29	22	0.17	
Aspitrigla obscura	3.53	44	0.11	
Total	3084.04		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 126
 DATE :23/11/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 26°51.23
 start stop duration duration Lon W 13°49.94
 TIME :10:05:14 10:13:20 8.1 (min) Purpose : 1
 LOG : 5870.60 5871.04 0.4 Region : 1120
 FDEPTH: 102 100 Gear cond.: 0
 BDEPTH: 102 100 Validity: 0
 Towing dir: 0° Wire out : 250 m Speed : 3.2 kn
 Sorted : 54 Total catch: 270.79 Catch/hour: 2005.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	1962.96	66778	97.86	313
Boops boops	17.78	296	0.89	
Aspitrigla obscura	8.15	74	0.41	
Dentex maroccanus	5.48	156	0.27	
Trachurus trachurus	5.19	111	0.26	312
Spondyliosoma cantharus	3.78	22	0.19	
Pagellus acarne	2.52	7	0.13	
Total	2005.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 127
 DATE :23/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 26°43.54
 start stop duration duration Lon W 13°43.10
 TIME :12:12:58 12:25:04 12.1 (min) Purpose : 1
 LOG : 5886.09 5886.89 0.8 Region : 1120
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 53 54 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.9 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 128
 DATE :23/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 26°51.76
 start stop duration duration Lon W 13°38.26
 TIME :15:19:16 15:40:55 21.6 (min) Purpose : 1
 LOG : 5910.09 5911.48 1.4 Region : 1120
 FDEPTH: 30 40 Gear cond.: 0
 BDEPTH: 65 65 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.9 kn
 Sorted : 77 Total catch: 459.60 Catch/hour: 1273.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1273.72	15764	100.00	314
Total	1273.72		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 129
 DATE :26/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 27°3.06
 start stop duration duration Lon W 13°40.06
 TIME :09:01:53 09:40:58 39.1 (min) Purpose : 1
 LOG : 6155.81 6157.97 2.2 Region : 1120
 FDEPTH: 75 95 Gear cond.: 0
 BDEPTH: 102 97 Validity: 0
 Towing dir: 0° Wire out : 260 m Speed : 3.3 kn
 Sorted : 11 Total catch: 10.99 Catch/hour: 16.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Mola mola	14.70	5	87.17	
Scomber japonicus	1.78	58	10.56	315
Sardina pilchardus	0.32	6	1.91	316
Echeneis naucrates	0.06	2	0.36	
Total	16.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 130
 DATE :26/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 26°58.76
 start stop duration duration Lon W 13°32.06
 TIME :11:22:17 11:48:15 26.0 (min) Purpose : 1
 LOG : 6170.68 6172.08 1.4 Region : 1120
 FDEPTH: 25 25 Gear cond.: 0
 BDEPTH: 52 51 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.2 kn
 Sorted : 54 Total catch: 321.06 Catch/hour: 741.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	645.98	22193	87.09	317
Sardina pilchardus	95.79	3174	12.91	318
Total	741.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 131
 DATE :26/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 27°9.32
 start stop duration duration Lon W 13°32.42
 TIME :14:17:39 14:47:16 29.6 (min) Purpose : 1
 LOG : 6191.47 6193.07 1.6 Region : 1120
 FDEPTH: 24 24 Gear cond.: 0
 BDEPTH: 71 71 Validity: 0
 Towing dir: 0° Wire out : 115 m Speed : 3.3 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 132
 DATE :26/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 27°13.22
 start stop duration duration Lon W 13°38.64
 TIME :16:34:58 17:04:15 29.3 (min) Purpose : 1
 LOG : 6206.60 6208.15 1.6 Region : 1120
 FDEPTH: 103 102 Gear cond.: 0
 BDEPTH: 103 102 Validity: 0
 Towing dir: 103° Wire out : 280 m Speed : 3.2 kn
 Sorted : 47 Total catch: 141.68 Catch/hour: 290.33

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Scomber japonicus	209.02	8465	71.99	319
Dentex macrocephalus	31.84	775	10.97	
Pagellus acarne	21.21	111	7.31	
Lepidopus caudatus	11.25	277	3.87	
Sardina pilchardus	5.35	160	1.84	320
Trachurus trachurus	2.77	55	0.95	321
Octopus vulgaris	2.75	2	0.95	
Aspidrigla obscura	2.58	2	0.89	
Antigonia capros	0.86	111	0.30	
Holothuria scabra	0.84	2	0.29	
Boops boops	0.80	12	0.28	
Echelus myrus	0.45	2	0.16	
Pegusa lascaris	0.18	25	0.06	
Merluccius senegalensis	0.13	2	0.06	
Loligo vulgaris	0.14	2	0.05	
Zeus faber	0.10	2	0.04	
Total	290.33	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 133
 DATE :26/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 27°21.18
 start stop duration duration Lon W 13°35.35
 TIME :19:16:02 19:45:57 29.9 (min) Purpose : 1
 LOG : 6226.35 6228.15 1.8 Region : 1120
 FDEPTH: 12 14 Gear cond.: 0
 BDEPTH: 96 83 Validity: 0
 Towing dir: 0° Wire out : 80 m Speed : 3.6 kn
 Sorted : 81 Total catch: 81.30 Catch/hour: 163.03

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Sardina pilchardus	163.03	7245	100.00	322
Total	163.03	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 134
 DATE :26/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 27°28.71
 start stop duration duration Lon W 13°28.26
 TIME :22:36:58 23:03:32 26.6 (min) Purpose : 1
 LOG : 6252.95 6254.55 1.6 Region : 1120
 FDEPTH: 14 15 Gear cond.: 0
 BDEPTH: 78 94 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.6 kn
 Sorted : 129 Total catch: 1098.20 Catch/hour: 2479.94

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Sardina pilchardus	2408.92	119275	97.14	323
Scomber japonicus	71.02	3685	2.86	324
Total	2479.94	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 135
 DATE :27/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 27°36.58
 start stop duration duration Lon W 13°20.70
 TIME :02:23:19 02:51:58 28.6 (min) Purpose : 1
 LOG : 6283.11 6284.73 1.6 Region : 1100
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 60 48 Validity: 0
 Towing dir: 0° Wire out : 80 m Speed : 3.4 kn
 Sorted : 153 Total catch: 152.90 Catch/hour: 320.21

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Campogramma glaycos	270.79	174	84.57	
Scomber japonicus	49.42	1740	15.43	325
Total	320.21	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 136
 DATE :27/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 27°49.26
 start stop duration duration Lon W 13°6.36
 TIME :09:21:11 09:48:43 27.5 (min) Purpose : 1
 LOG : 6341.37 6342.91 1.5 Region : 1100
 FDEPTH: 32 32 Gear cond.: 0
 BDEPTH: 32 32 Validity: 0
 Towing dir: 0° Wire out : 95 m Speed : 3.4 kn
 Sorted : 86 Total catch: 227.03 Catch/hour: 494.79

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Engraulis encrasicolus	150.38	19789	30.39	326
Diplodus bellottii	149.84	3995	30.28	
Lesueurigobius sanzi	128.04	28910	25.88	
Sardina pilchardus	14.60	1282	2.95	327
Trachurus trachurus	8.66	257	1.75	328
Merluccius senegalensis	8.28	46	1.67	
Trisopterus luscus	7.95	301	1.61	
Campogramma glaycos	6.19	9	1.25	
Dasyatis centroura	5.34	2	1.08	
Umbra canariensis	3.49	28	0.70	
Pomadasyus incisus	3.16	33	0.64	
Sepia officinalis	2.55	7	0.52	
Pagrus auriga	1.70	2	0.34	
Alloteuthis subulata	1.20	170	0.24	0
Diplodus vulgaris	0.93	7	0.19	
Loligo vulgaris	0.87	2	0.18	
Squilla mantis	0.76	15	0.15	
Boops boops	0.49	11	0.10	
Torpedo nobiliana	0.13	2	0.03	
Cepola macrophthalma	0.09	2	0.02	
Scorpaena scrofa	0.07	2	0.01	
Serranus cabrilla	0.04	2	0.01	
Dicologlossa cuneata	0.02	2	0.00	
Total	494.79	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 137
 DATE :27/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 28°6.89
 start stop duration duration Lon W 13°11.69
 TIME :14:41:52 14:53:52 12.0 (min) Purpose : 1
 LOG : 6377.52 6378.15 0.6 Region : 1100
 FDEPTH: 109 109 Gear cond.: 0
 BDEPTH: 109 109 Validity: 0
 Towing dir: 0° Wire out : 280 m Speed : 3.2 kn
 Sorted : 98 Total catch: 637.66 Catch/hour: 3188.32

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Scomber japonicus	3103.75	110470	97.35	329
Dentex macrocephalus	42.90	390	1.35	
Trachurus trachurus	17.22	100	0.54	330
Spondyliosa cantharus	10.72	65	0.34	
Merluccius senegalensis	7.55	10	0.24	
Macrorhamphosus scolopax	4.88	390	0.15	
Boops boops	1.30	35	0.04	
Total	3188.33	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 138
 DATE :27/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°16.69
 start stop duration duration Lon W 13°5.50
 TIME :19:34:37 20:03:50 29.2 (min) Purpose : 1
 LOG : 6404.44 6406.11 1.7 Region : 1100
 FDEPTH: 20 20 Gear cond.: 0
 BDEPTH: 111 106 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 55 Total catch: 165.30 Catch/hour: 339.43

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Sardina pilchardus	189.12	3622	55.72	332
Scomber japonicus	150.31	5988	44.28	331
Total	339.43	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 139
 DATE :27/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°5.05
 start stop duration duration Lon W 12°54.13
 TIME :21:50:09 22:17:32 27.4 (min) Purpose : 1
 LOG : 6419.78 6421.45 1.7 Region : 1100
 FDEPTH: 25 25 Gear cond.: 0
 BDEPTH: 61 61 Validity: 0
 Towing dir: 0° Wire out : 120 m Speed : 3.7 kn
 Sorted : 32 Total catch: 127.88 Catch/hour: 280.23

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Scomber japonicus	264.72	5575	94.46	333
Sardina pilchardus	14.02	342	5.00	334
Trachurus trachurus	1.49	35	0.53	335
Total	280.23	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 140
 DATE :28/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°7.05
 start stop duration duration Lon W 12°41.92
 TIME :00:55:20 01:23:39 28.3 (min) Purpose : 1
 LOG : 6442.88 6444.31 1.4 Region : 1100
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 55 57 Validity: 0
 Towing dir: 0° Wire out : 95 m Speed : 3.0 kn
 Sorted : 10 Total catch: 10.35 Catch/hour: 21.93

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Scomber japonicus	21.82	538	99.52	337
Loligo vulgaris	0.11	8	0.48	
Total	21.93	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 141
 DATE :28/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°16.36
 start stop duration duration Lon W 12°46.39
 TIME :02:44:34 03:12:50 28.3 (min) Purpose : 1
 LOG : 6453.23 6454.78 1.6 Region : 1100
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 89 90 Validity: 0
 Towing dir: 0° Wire out : 90 m Speed : 3.3 kn
 Sorted : 2 Total catch: 1.55 Catch/hour: 3.29

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Scomber japonicus	3.10	112	94.19	336
SALPS	0.19	2	5.81	
Total	3.29	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 142
 DATE :28/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 28°3.44
 start stop duration duration Lon W 12°22.02
 TIME :13:12:59 13:32:48 19.8 (min) Purpose : 1
 LOG : 6544.28 6545.14 0.9 Region : 1100
 FDEPTH: 27 25 Gear cond.: 0
 BDEPTH: 27 25 Validity: 0
 Towing dir: 0° Wire out : 95 m Speed : 2.6 kn
 Sorted : 0 Total catch: 21.62 Catch/hour: 65.45

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Umbra canariensis	28.55	130	43.62	
Halobatrachus didactylus	12.11	36	18.50	
Palaemon sp.	5.15	2059	7.86	
Trisopterus luscus	4.06	79	6.20	
Argyrosomus regius	3.78	24	5.78	
Trachurus trachurus	2.66	39	4.07	
Engraulis encrasicolus	2.54	460	3.89	
Scorpaena scrofa	1.30	45	1.99	
Campogramma glaycos	1.18	9	1.80	
Sepia officinalis	1.09	3	1.67	
Merluccius senegalensis	0.70	27	1.06	
Pomadasyus incisus	0.67	9	1.02	
Umbra canariensis, juvenile	0.48	345	0.74	
Diplodus bellottii	0.36	6	0.56	
Penaeus kerathurus	0.33	3	0.51	
Phycis blennoides	0.24	3	0.37	
Alloteuthis subulata	0.18	21	0.28	
Serranus africanus	0.03	97	0.05	
Rossia macrosomia	0.03	30	0.05	
Total	65.45	100.00		

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 143
 DATE :28/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°39.16
 start stop duration duration Lon W 12°33.22
 TIME :19:32:15 20:02:17 30.0 (min) Purpose : 1
 LOG : 6593.94 6595.68 1.7 Region : 1100
 FDEPTH: 25 25 Gear cond.: 0
 BDEPTH: 113 138 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.5 kn
 Sorted : 36 Total catch: 35.60 Catch/hour: 71.13

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Scomber japonicus	71.13	2404	100.00
Total	71.13	100.00	339

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 144
 DATE :29/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 28°22.48
 start stop duration duration Lon W 12°10.61
 TIME :01:47:40 02:16:35 28.9 (min) Purpose : 1
 LOG : 6645.76 6647.23 1.5 Region : 1100
 FDEPTH: 56 59 Gear cond.: 0
 BDEPTH: 56 59 Validity : 0
 Towing dir: 0° Wire out : 145 m Speed : 3.1 kn
 Sorted : 52 Total catch: 410.02 Catch/hour: 850.66

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Diplodus vulgaris	488.59	3299	57.44
Pagellus acarne	99.27	1012	11.67
Trachurus trachurus	88.54	1183	10.41
Dentex maroccanus	46.68	311	5.49
Loligo vulgaris	30.91	50	3.63
Pagellus erythrinus	27.22	124	3.20
Scomber japonicus	21.01	622	2.47
Aspitrigla obscura	11.66	109	1.37
Spondyliosoma cantharus	11.35	124	1.33
Campogramma glaycos	9.50	12	1.12
Plectorhinchus mediterraneus	7.61	17	0.90
Scorpaena scrofa	2.53	6	0.30
Dentex gibbosus	1.68	2	0.20
Pseudupeneus prayensis	1.60	10	0.19
Trachinus draco	1.35	2	0.16
Boops boops	1.08	31	0.13
Zeus faber	0.08	2	0.01
Total	850.66	100.00	341

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 145
 DATE :29/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°9.43
 start stop duration duration Lon W 12°0.60
 TIME :04:48:18 05:15:28 27.2 (min) Purpose : 1
 LOG : 6667.53 6669.02 1.5 Region : 1100
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 29 32 Validity : 0
 Towing dir: 0° Wire out : 70 m Speed : 3.3 kn
 Sorted : 26 Total catch: 94.04 Catch/hour: 207.67

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Sardina pilchardus	92.75	3728	44.66
Trachurus trachurus	74.20	954	35.73
Engraulis encrasicolus	19.87	2208	9.57
Scomber japonicus	7.46	88	3.59
Campogramma glaycos	3.97	18	1.91
Diplodus bellottii	3.27	44	1.57
Trachinotus ovatus	2.30	11	1.11
SALPS	1.50	9	0.72
Pomatomus saltatrix	0.93	2	0.45
Alloteuthis subulata	0.53	88	0.26
Merluccius senegalensis	0.46	2	0.22
Sardinella aurita	0.42	2	0.20
Total	207.67	100.00	344

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 146
 DATE :29/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°34.53
 start stop duration duration Lon W 12°4.82
 TIME :08:51:21 09:47:08 55.8 (min) Purpose : 1
 LOG : 6701.25 6704.52 3.3 Region : 1100
 FDEPTH: 80 90 Gear cond.: 0
 BDEPTH: 89 91 Validity : 0
 Towing dir: 0° Wire out : 260 m Speed : 3.5 kn
 Sorted : 30 Total catch: 121.60 Catch/hour: 130.80

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Scomber japonicus	117.89	3231	90.13
Sardina pilchardus	12.91	452	9.87
Total	130.80	100.00	347

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 147
 DATE :29/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 28°48.75
 start stop duration duration Lon W 12°15.68
 TIME :12:21:00 12:50:35 29.6 (min) Purpose : 1
 LOG : 6725.39 6726.94 1.6 Region : 1100
 FDEPTH: 113 116 Gear cond.: 0
 BDEPTH: 113 116 Validity : 0
 Towing dir: 0° Wire out : 280 m Speed : 3.2 kn
 Sorted : 19 Total catch: 19.19 Catch/hour: 38.92

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Zeus faber	11.66	14	29.96
Trachinus draco	6.86	8	17.61
Dentex maroccanus	5.44	39	13.97
Raja miraletus	4.02	4	10.32
Rostroraja alba	2.80	2	7.19
Pagellus erythrinus	1.99	8	5.11
Cheilodichthys lucerna	1.81	10	4.64
Peristedion cataphractum	1.50	4	3.86
Loligo vulgaris	1.44	4	3.70
Aspitrigla obscura	0.85	8	2.19
Serranus cabrilla	0.41	4	1.04
Capros aper	0.10	10	0.26
Alloteuthis subulata	0.06	12	0.16
Total	38.92	100.00	361

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 148
 DATE :29/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 28°48.15
 start stop duration duration Lon W 11°59.70
 TIME :16:07:20 16:39:53 32.5 (min) Purpose : 1
 LOG : 6754.16 6755.90 1.7 Region : 1100
 FDEPTH: 115 120 Gear cond.: 0
 BDEPTH: 115 120 Validity : 0
 Towing dir: 0° Wire out : 290 m Speed : 3.2 kn
 Sorted : 0 Total catch: 395.16 Catch/hour: 728.41

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus trachurus	601.29	7910	82.55
Pagellus acarne	42.45	271	5.83
Scomber japonicus	24.90	697	3.42
Zeus faber	17.51	7	2.40
Sphoeroides pachgaster	11.71	17	1.61
Boops boops	11.10	284	1.52
Raja miraletus	6.80	15	0.93
Cheilodichthys lucerna	3.35	142	0.46
Loligo vulgaris	2.71	13	0.37
Merluccius senegalensis	2.32	26	0.32
Antigonia capros	2.19	271	0.30
Dentex maroccanus	2.06	52	0.28
Total	728.41	100.00	348

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 149
 DATE :29/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°28.22
 start stop duration duration Lon W 11°47.66
 TIME :19:27:00 19:56:26 29.4 (min) Purpose : 1
 LOG : 6780.94 6782.63 1.7 Region : 1100
 FDEPTH: 20 20 Gear cond.: 0
 BDEPTH: 54 52 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.4 kn
 Sorted : 30 Total catch: 118.08 Catch/hour: 240.73

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Sardina pilchardus	234.86	4689	97.56
Engraulis encrasicolus	5.55	253	2.30
Scomber japonicus	0.33	8	0.14
Total	240.73	100.00	351

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 150
 DATE :29/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 28°17.22
 start stop duration duration Lon W 11°38.62
 TIME :21:46:48 22:14:50 28.0 (min) Purpose : 1
 LOG : 6796.44 6797.95 1.5 Region : 1100
 FDEPTH: 28 28 Gear cond.: 0
 BDEPTH: 28 28 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.2 kn
 Sorted : 40 Total catch: 40.47 Catch/hour: 86.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus trachurus	40.87	882	47.20
Engraulis encrasicolus	22.55	2424	26.04
Scomber japonicus	15.81	165	18.26
Sardina pilchardus	4.17	73	4.82
Diplodus bellottii	1.50	116	1.73
Loligo vulgaris	0.60	2	0.69
Pomatomus saltatrix	0.60	2	0.69
Raja miraletus	0.34	2	0.40
Alloteuthis subulata	0.15	53	0.17
Total	86.60	100.00	353

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 151
 DATE :30/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°33.18
 start stop duration duration Lon W 11°37.79
 TIME :01:12:09 01:41:21 29.2 (min) Purpose : 1
 LOG : 6821.23 6822.70 1.5 Region : 1100
 FDEPTH: 25 25 Gear cond.: 0
 BDEPTH: 60 60 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.0 kn
 Sorted : 59 Total catch: 59.40 Catch/hour: 122.01

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Sardina pilchardus	121.19	3728	99.33
Engraulis encrasicolus	0.43	29	0.35
Scomber japonicus	0.39	0	0.32
Total	122.01	100.00	358

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 152
 DATE :30/11/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 28°40.00
 start stop duration duration Lon W 11°41.40
 TIME :03:14:14 03:42:02 27.8 (min) Purpose : 1
 LOG : 6834.40 6835.88 1.5 Region : 1100
 FDEPTH: 68 67 Gear cond.: 0
 BDEPTH: 68 67 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 3.2 kn
 Sorted : 28 Total catch: 341.96 Catch/hour: 738.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
Trachurus trachurus	306.26	4629	41.50
Diplodus vulgaris	161.44	926	21.87
Pagellus acarne	71.22	594	9.65
Scomber japonicus	68.85	1876	9.33
Zeus faber	43.17	15	5.85
Dentex maroccanus	23.03	142	3.12
Pseudupeneus prayensis	18.04	95	2.44
Loligo vulgaris	15.11	84	2.05
Pagellus erythrinus	11.87	47	1.61
Mola mola	6.26	2	0.85
Trisopterus luscus	4.75	47	0.64
Torpedo marmorata	4.21	2	0.57
Echelus myrus	1.79	2	0.24
Scorpaena elongata	1.58	4	0.21
Sepia officinalis	0.47	71	0.06
Total	738.04	100.00	360

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 153
 DATE :30/11/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°37.47
 start stop duration duration Lon W 11°15.27
 TIME :13:12:08 13:41:27 29.3 (min) Purpose : 1
 LOG : 6924.33 6926.14 1.8 Region : 1100
 FDEPTH: 15 15 Gear cond.: 0
 BDEPTH: 30 33 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.7 kn
 Sorted : 3 Total catch: 2.57 Catch/hour: 5.26

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Campogramma glaycos	4.79 6	91.05	
Scomber japonicus	0.37 4	7.00	362
Pegusa lascaris	0.10 2	1.95	
Total	5.26	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 154
 DATE :30/11/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 29°6.50
 start stop duration duration Lon W 11°16.48
 TIME :23:03:26 23:33:29 30.1 (min) Purpose : 1
 LOG : 6990.10 6991.78 1.7 Region : 1100
 FDEPTH: 20 20 Gear cond.: 0
 BDEPTH: 113 115 Validity : 0
 Towing dir: 110° Wire out : 110 m Speed : 3.4 kn
 Sorted : 7 Total catch: 6.90 Catch/hour: 13.78

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomber japonicus	13.78 290	100.00	363
Total	13.78	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 155
 DATE :01/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 28°52.46
 start stop duration duration Lon W 10°55.78
 TIME :03:28:24 03:56:45 28.4 (min) Purpose : 1
 LOG : 7025.64 7027.26 1.6 Region : 1100
 FDEPTH: 25 25 Gear cond.: 0
 BDEPTH: 60 69 Validity : 0
 Towing dir: 0° Wire out : 95 m Speed : 3.4 kn
 Sorted : 20 Total catch: 20.39 Catch/hour: 43.15

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	25.61 4254	59.34	366
Campogramma glaycos	12.91 11	29.92	364
Sardina pilchardus	2.96 174	6.87	366
Scomber japonicus	0.74 17	1.72	365
Alloteuthis subulata	0.49 87	1.13	
Rossia macrosomia	0.32 152	0.74	
Merluccius senegalensis	0.08 2	0.20	
Loligo vulgaris	0.04 17	0.10	
Total	43.15	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 156
 DATE :01/12/15 GEAR TYPE: PT NO: 26 POSITION:Lat N 29°6.33
 start stop duration duration Lon W 10°49.23
 TIME :09:27:43 09:57:45 30.0 (min) Purpose : 1
 LOG : 7077.77 7079.51 1.7 Region : 1100
 FDEPTH: 88 85 Gear cond.: 0
 BDEPTH: 88 85 Validity : 0
 Towing dir: 0° Wire out : 260 m Speed : 3.5 kn
 Sorted : 93 Total catch: 865.20 Catch/hour: 1728.67

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomber japonicus	1368.77 25399	79.18	367
Sardina pilchardus	8.21 2759	5.10	369
Merluccius senegalensis	69.56 503	4.02	
Engraulis encrasicolus	66.20 4494	3.83	370
Campogramma glaycos	39.35 38	2.28	
Trachurus trachurus	29.46 448	1.70	368
Pagellus acarne	24.43 112	1.41	
Loligo vulgaris	17.90 354	1.04	
Diplodus vulgaris	12.68 56	0.73	
Chelidonichthys lucerna	7.46 56	0.43	
Mullus surmuletus	2.80 94	0.16	
Alloteuthis subulata	0.93 318	0.05	
Trisopterus luscus	0.93 18	0.05	
Total	1728.68	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 157
 DATE :01/12/15 GEAR TYPE: PT NO: 26 POSITION:Lat N 28°57.83
 start stop duration duration Lon W 10°45.83
 TIME :11:37:40 11:57:21 19.7 (min) Purpose : 1
 LOG : 7092.91 7094.06 1.1 Region : 1100
 FDEPTH: 57 58 Gear cond.: 0
 BDEPTH: 57 58 Validity : 0
 Towing dir: 0° Wire out : 170 m Speed : 3.5 kn
 Sorted : 60 Total catch: 360.90 Catch/hour: 1100.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	653.05 69476	59.35	371
Sardina pilchardus	329.27 13335	29.93	372
Trachurus trachurus	28.54 567	2.59	373
Umbrina canariensis	25.24 110	2.29	
Trisopterus luscus	19.21 348	1.75	
Dasyatis centroura	10.79 3	0.98	
Pagellus acarne	8.23 37	0.75	
Diplodus vulgaris	7.63 37	0.70	
Pomadasy incisus	3.66 37	0.33	
Chelidonichthys lucerna	3.29 18	0.30	
Loligo vulgaris	3.11 18	0.28	
Scomber japonicus	2.56 37	0.23	374
Alloteuthis subulata	1.65 293	0.15	
Scorpaena scrofa	1.10 18	0.15	
Diplodus bellottii	1.10 18	0.10	
Pegusa lascaris	0.37 18	0.03	
Phycis blennoides	0.18 18	0.02	
Eledonella sp.	0.18 3	0.02	
Rossia macrosomia	0.18 55	0.02	
Trachinus draco	0.18 18	0.02	
Palaemon sp.	0.18 18	0.02	
Total	1100.30	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 158
 DATE :01/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 29°0.21
 start stop duration duration Lon W 10°36.63
 TIME :13:46:56 14:10:02 23.1 (min) Purpose : 1
 LOG : 7108.61 7109.98 1.4 Region : 1100
 FDEPTH: 31 32 Gear cond.: 0
 BDEPTH: 31 32 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 3.6 kn
 Sorted : 26 Total catch: 80.10 Catch/hour: 208.14

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	105.24 8162	50.56	376
Engraulis encrasicolus	50.44 0	24.23	377
Diplodus bellottii	19.26 281	9.25	
Umbrina canariensis, juvenile	8.73 125	4.19	
Pomadasy incisus	8.65 86	4.16	
Pomatomus saltatrix	4.78 3	2.30	
Trachurus trachurus	3.04 86	1.46	375
Campogramma glaycos	1.82 3	0.87	
Alloteuthis subulata	1.48 374	0.71	
Penaeus kerathurus	1.07 26	0.51	
Merluccius senegalensis	0.88 10	0.42	
Trisopterus luscus	0.78 31	0.37	
Diplodus vulgaris	0.70 8	0.34	
Argyrosomus regius	0.65 5	0.31	
Pegusa lascaris	0.23 8	0.11	
Boops boops	0.23 8	0.11	
Phycis blennoides	0.08 23	0.04	
Pseudupeneus prayensis	0.08 8	0.04	
Total	208.14	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 159
 DATE :01/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 29°11.11
 start stop duration duration Lon W 10°44.38
 TIME :16:32:26 17:04:36 32.2 (min) Purpose : 1
 LOG : 7130.78 7132.67 1.9 Region : 1100
 FDEPTH: 89 88 Gear cond.: 0
 BDEPTH: 89 88 Validity : 0
 Towing dir: 0° Wire out : 260 m Speed : 3.5 kn
 Sorted : 26 Total catch: 445.47 Catch/hour: 830.84

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	491.45 16931	59.15	378
Scomber japonicus	176.92 3741	21.29	379
Engraulis encrasicolus	95.44 6722	11.43	380
Trachurus trachurus	58.97 1554	7.10	381
Pagellus acarne	3.11 9	0.37	
Diplodus vulgaris	2.52 13	0.30	
Trisopterus luscus	0.86 22	0.10	
Merluccius senegalensis	0.50 4	0.06	
Aspitrigla obscura	0.47 6	0.06	
Chelidonichthys lucerna	0.37 2	0.04	
Dentex macracanthus	0.21 2	0.02	
Alloteuthis subulata	0.02 11	0.00	
Total	830.84	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 160
 DATE :01/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 29°23.50
 start stop duration duration Lon W 10°49.47
 TIME :18:52:51 19:03:50 11.0 (min) Purpose : 1
 LOG : 7146.39 7147.02 0.6 Region : 1100
 FDEPTH: 140 125 Gear cond.: 0
 BDEPTH: 142 127 Validity : 0
 Towing dir: 0° Wire out : 340 m Speed : 3.5 kn
 Sorted : 42 Total catch: 41.67 Catch/hour: 227.70

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomber japonicus	171.04 2235	75.11	382
Mola mola	46.56 16	20.45	
Trachurus trachurus	8.14 126	3.58	383
Zeus faber	1.97 5	0.86	
Total	227.70	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 161
 DATE :01/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 29°26.70
 start stop duration duration Lon W 10°41.07
 TIME :21:18:24 21:38:24 20.0 (min) Purpose : 1
 LOG : 7164.00 7165.20 1.2 Region : 1100
 FDEPTH: 120 118 Gear cond.: 0
 BDEPTH: 121 119 Validity : 0
 Towing dir: 0° Wire out : 240 m Speed : 3.6 kn
 Sorted : 53 Total catch: 52.82 Catch/hour: 158.45

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Mola mola	128.40 42	81.04	
Scomber japonicus	20.10 405	12.69	384
Sphaeroides pachaster	8.58 9	5.42	
Sardina pilchardus	1.32 24	0.83	385
Remora remora	0.05 6	0.03	
Total	158.45	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 162
 DATE :02/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 29°31.17
 start stop duration duration Lon W 10°6.95
 TIME :08:12:55 08:33:00 20.1 (min) Purpose : 1
 LOG : 7261.91 7263.01 1.1 Region : 1100
 FDEPTH: 36 35 Gear cond.: 0
 BDEPTH: 36 35 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 3.3 kn
 Sorted : 34 Total catch: 134.42 Catch/hour: 401.65

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	334.66 15493	83.32	386
Engraulis encrasicolus	65.38 8716	16.28	387
Diplodus bellottii	0.84 12	0.21	
Scomber japonicus	0.78 6	0.19	388
Total	401.65	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 163
 DATE :02/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 29°36.68
 start stop duration Lon W 10°13.77
 TIME :10:35:40 11:05:42 30.0 (min) Purpose : 1
 LOG : 7278.05 7279.81 1.8 Region : 1100
 FDEPTH: 78 80 Gear cond.: 0
 BDEPTH: 78 80 Validity : 0
 Towing dir: 0° Wire out : 220 m Speed : 3.5 kn
 Sorted : 58 Total catch: 406.09 Catch/hour: 811.37

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Scomber japonicus	395.10	48.70	389
Sardina pilchardus	198.88	24.51	390
Pagellus acarne	97.90	12.07	
Trachurus trachurus	68.95	8.50	391
Pagellus erythrinus	38.74	4.77	
Mola mola	3.54	0.44	
Diplodus vulgaris	3.08	0.38	
Merluccius senegalensis	2.66	0.33	
Dentex maroccanus	2.52	0.31	
Total	811.37	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 164
 DATE :02/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 29°47.33
 start stop duration Lon W 10°13.17
 TIME :14:09:04 14:40:02 31.0 (min) Purpose : 1
 LOG : 7305.49 7307.24 1.8 Region : 1100
 FDEPTH: 140 151 Gear cond.: 0
 BDEPTH: 140 151 Validity : 0
 Towing dir: 0° Wire out : 350 m Speed : 3.4 kn
 Sorted : 33 Total catch: 168.24 Catch/hour: 325.94

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Scomber japonicus	266.39	81.73	392
Trachurus trachurus	49.79	15.28	393
Mola mola	5.50	1.69	
Pagellus acarne	3.33	1.02	
Merluccius senegalensis	0.68	0.21	
Dentex maroccanus	0.25	0.08	
Total	325.94	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 165
 DATE :02/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 29°44.71
 start stop duration Lon W 9°59.28
 TIME :17:12:31 17:39:49 27.3 (min) Purpose : 1
 LOG : 7325.15 7326.69 1.5 Region : 1100
 FDEPTH: 40 40 Gear cond.: 0
 BDEPTH: 65 61 Validity : 0
 Towing dir: 0° Wire out : 130 m Speed : 3.4 kn
 Sorted : 17 Total catch: 17.26 Catch/hour: 37.93

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	23.19	61.12	395
Mola mola	12.00	31.63	
Engraulis encrasicolus	1.30	3.42	396
Sardina pilchardus	1.12	2.95	394
Alloteuthis subulata	0.22	0.58	
Sepia officinalis	0.11	0.29	
Total	37.93	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 166
 DATE :02/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 29°51.05
 start stop duration Lon W 9°56.95
 TIME :19:38:15 19:56:39 18.4 (min) Purpose : 1
 LOG : 7340.89 7342.03 1.1 Region : 1100
 FDEPTH: 15 22 Gear cond.: 0
 BDEPTH: 91 80 Validity : 0
 Towing dir: 0° Wire out : 80 m Speed : 3.7 kn
 Sorted : 4 Total catch: 3.92 Catch/hour: 12.78

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	12.52	97.96	397
Scomber japonicus	0.26	2.04	398
Total	12.78	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 167
 DATE :03/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 30°1.54
 start stop duration Lon W 9°59.02
 TIME :23:19:42 00:10:05 49.0 (min) Purpose : 1
 LOG : 7371.48 7374.51 3.0 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 120 120 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 2.8 kn
 Sorted : 22 Total catch: 22.33 Catch/hour: 27.34

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Engraulis encrasicolus	23.88	87.33	399
Mola mola	3.01	11.02	
Sepioida rondeleti	0.22	0.81	
Myctophid sp. B	0.12	0.45	
Sphoeroides pachgaster	0.07	0.27	
Alloteuthis subulata	0.02	0.09	
Holothuria spp.	0.01	0.04	
Total	27.34	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 168
 DATE :03/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 30°9.54
 start stop duration Lon W 9°48.30
 TIME :03:00:39 03:32:21 31.7 (min) Purpose : 1
 LOG : 7397.31 7399.23 1.9 Region : 1100
 FDEPTH: 33 23 Gear cond.: 0
 BDEPTH: 97 104 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.6 kn
 Sorted : 48 Total catch: 48.40 Catch/hour: 91.61

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Engraulis encrasicolus	91.61	100.00	400
Total	91.61	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 169
 DATE :03/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 30°19.81
 start stop duration Lon W 9°50.86
 TIME :08:40:40 09:07:30 27.0 (min) Purpose : 1
 LOG : 7444.44 7445.10 1.3 Region : 1100
 FDEPTH: 83 85 Gear cond.: 0
 BDEPTH: 102 100 Validity : 0
 Towing dir: 0° Wire out : 230 m Speed : 3.1 kn
 Sorted : 42 Total catch: 41.66 Catch/hour: 92.58

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	45.67	49.33	401
Sardina pilchardus	20.67	22.32	402
Macrorhamphosus scolopax	20.22	21.84	
Lepidopus caudatus	4.56	4.92	
Scomber japonicus	0.96	1.03	403
Merluccius senegalensis	0.31	0.34	
Engraulis encrasicolus	0.20	0.22	404
Total	92.58	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 170
 DATE :03/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 30°19.74
 start stop duration Lon W 9°42.50
 TIME :10:27:26 10:57:33 30.1 (min) Purpose : 1
 LOG : 7453.19 7454.91 1.7 Region : 1100
 FDEPTH: 60 75 Gear cond.: 0
 BDEPTH: 60 75 Validity : 0
 Towing dir: 0° Wire out : 200 m Speed : 3.4 kn
 Sorted : 59 Total catch: 165.15 Catch/hour: 328.98

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	123.80	37.63	405
Trachurus trachurus	88.19	26.81	406
Engraulis encrasicolus	41.29	12.55	408
Trisopterus luscus	30.56	9.29	
Merluccius senegalensis	26.08	7.93	
Octopus vulgaris	5.12	1.56	
Alloteuthis subulata	4.98	1.51	
Scomber japonicus	4.26	1.27	407
Scorpaena scrofa	1.93	0.59	
Loligo vulgaris	1.35	0.41	
Chelidonichthys lucerna	0.68	0.21	
Sepia officinalis	0.42	0.13	
Boops boops	0.32	0.10	
Total	328.98	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 171
 DATE :03/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 30°29.19
 start stop duration Lon W 9°55.46
 TIME :15:15:48 15:44:38 28.8 (min) Purpose : 1
 LOG : 7492.86 7494.31 1.4 Region : 1100
 FDEPTH: 121 107 Gear cond.: 0
 BDEPTH: 121 107 Validity : 0
 Towing dir: 0° Wire out : 300 m Speed : 3.0 kn
 Sorted : 23 Total catch: 23.22 Catch/hour: 48.31

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Parapenaeus longirostris	19.56	40.48	
Trisopterus luscus	12.07	24.98	
Engraulis encrasicolus	7.53	15.59	409
Merluccius merluccius	2.81	5.81	
Lesueurigobius sanzi	2.56	5.30	
Trachurus trachurus	2.18	4.52	410
Alloteuthis subulata	0.67	1.38	
Eledone cirrhosa**	0.33	0.69	
Paracallionymus costatus	0.23	0.47	
Lepidopus caudatus	0.17	0.34	
Conger conger	0.08	0.17	
Pegusa lascaris	0.04	0.09	
Citharus linguatula	0.04	0.09	
Sepia officinalis	0.02	0.04	
Sepioida rondeleti	0.02	0.04	
Total	48.31	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 172
 DATE :03/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 30°38.62
 start stop duration Lon W 10°2.35
 TIME :21:23:06 21:53:16 30.2 (min) Purpose : 1
 LOG : 7532.27 7533.67 1.4 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 113 99 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 2.8 kn
 Sorted : 15 Total catch: 14.68 Catch/hour: 29.19

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Engraulis encrasicolus	20.27	69.41	411
Scomber japonicus	7.30	25.00	412
Sardina pilchardus	1.63	5.59	413
Total	29.19	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 173
 DATE :04/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 30°44.35
 start stop duration Lon W 9°55.42
 TIME :00:27:10 00:56:34 29.4 (min) Purpose : 1
 LOG : 7549.98 7551.69 1.7 Region : 1100
 FDEPTH: 25 25 Gear cond.: 0
 BDEPTH: 69 68 Validity : 0
 Towing dir: 0° Wire out : 95 m Speed : 3.5 kn
 Sorted : 6 Total catch: 5.68 Catch/hour: 11.59

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Engraulis encrasicolus	9.59	82.75	414
Sardina pilchardus	0.80	6.87	416
Scomber japonicus	0.65	5.63	415
Alloteuthis subulata	0.55	4.75	
Total	11.59	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 174
 DATE :04/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 30°58.29
 start stop duration duration Lon W 10°11.56
 TIME :04:54:52 05:24:10 29.3 (min) Purpose : 1
 LOG : 7585.92 7587.63 1.7 Region : 1100
 FDEPTH: 30 20 Gear cond.: 0
 BDEPTH: 107 101 Validity: 0
 Towing dir: 0° Wire out : 85 m Speed : 3.5 kn
 Sorted : 33 Total catch: 33.13 Catch/hour: 67.84

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	37.88 2650	55.84	417
Sardina pilchardus	28.26 1010	41.65	418
Trachurus trachurus	1.09 2	1.60	420
Scomber japonicus	0.61 12	0.91	419
Total	67.84	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 175
 DATE :04/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 31°9.66
 start stop duration duration Lon W 10°7.01
 TIME :09:52:31 10:22:45 30.2 (min) Purpose : 1
 LOG : 7627.26 7628.82 1.6 Region : 1100
 FDEPTH: 129 134 Gear cond.: 0
 BDEPTH: 129 134 Validity: 0
 Towing dir: 0° Wire out : 310 m Speed : 3.1 kn
 Sorted : 152 Total catch: 175.67 Catch/hour: 348.66

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Zeus faber	149.55 91	42.89	
Pagellus acarne	79.39 435	22.77	
Trachurus trachurus	62.12 462	17.82	421
Merluccius merluccius	9.24 127	2.65	
Macrorhamphosus scolopax	8.10 337	2.32	
Capros aper	7.43 550	2.13	
Raja miraletus	6.41 10	1.84	
Anthias anthias**	6.26 256	1.79	
Pagrus pagrus	5.87 2	1.68	
Mullus surmuletus	4.21 16	1.21	
Scorpaena elongata	3.02 8	0.87	
Octopus vulgaris	2.80 4	0.80	
Trisopterus luscus	2.37 4	0.68	
Callanthias ruber**	0.83 42	0.24	
Peristedion cataphractum	0.65 2	0.19	
Micromesistius poutassou	0.22 10	0.06	
Lepidopus caudatus	0.19 4	0.05	
Total	348.66	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 176
 DATE :04/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 31°28.29
 start stop duration duration Lon W 10°3.32
 TIME :18:42:58 19:13:16 30.3 (min) Purpose : 1
 LOG : 7703.11 7704.64 1.5 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 130 109 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 71 Total catch: 212.69 Catch/hour: 421.17

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	306.06 22503	72.67	423
Sardina pilchardus	102.48 2994	24.33	422
Scomber japonicus	10.28 166	2.44	424
Trachurus trachurus	1.84 4	0.44	425
Merluccius merluccius	0.51 6	0.12	
Total	421.17	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 177
 DATE :04/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 31°39.54
 start stop duration duration Lon W 10°5.12
 TIME :22:55:26 23:25:35 30.1 (min) Purpose : 1
 LOG : 7736.18 7737.63 1.4 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 145 131 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 2.9 kn
 Sorted : 2 Total catch: 1.51 Catch/hour: 3.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	1.21 66	40.40	427
Conger conger	0.80 2	26.49	426
Scomber japonicus	0.76 12	25.17	428
Sardina pilchardus	0.12 2	3.97	
Myctophid sp. B	0.12 10	3.97	
Total	3.00	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 178
 DATE :05/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 31°37.01
 start stop duration duration Lon W 9°55.82
 TIME :00:40:53 01:10:02 29.1 (min) Purpose : 1
 LOG : 7746.31 7748.04 1.7 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 88 91 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.6 kn
 Sorted : 33 Total catch: 98.55 Catch/hour: 202.92

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	196.43 22324	96.80	429
Sardina pilchardus	3.34 130	1.64	430
Trachinotus ovatus	1.85 6	0.91	
Merluccius senegalensis	1.30 19	0.64	
Total	202.92	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 179
 DATE :05/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 31°44.04
 start stop duration duration Lon W 9°44.36
 TIME :03:50:04 04:18:19 28.3 (min) Purpose : 1
 LOG : 7770.56 7772.20 1.6 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 35 37 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.5 kn
 Sorted : 35 Total catch: 139.95 Catch/hour: 297.13

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	289.60 10344	97.46	432
Alloteuthis subulata	6.20 2386	2.09	
Trachinotus ovatus	1.17 4	0.39	
Merluccius senegalensis	0.17 2	0.06	
Total	297.13	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 180
 DATE :05/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 31°56.20
 start stop duration duration Lon W 9°52.17
 TIME :08:43:27 08:54:45 11.3 (min) Purpose : 1
 LOG : 7809.02 7809.57 0.6 Region : 1100
 FDEPTH: 35 88 Gear cond.: 0
 BDEPTH: 85 111 Validity: 0
 Towing dir: 0° Wire out : 200 m Speed : 2.9 kn
 Sorted : 79 Total catch: 78.83 Catch/hour: 418.57

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trachurus	402.48 3589	96.16	433
Scomber japonicus	9.29 159	2.22	434
Merluccius merluccius	4.25 5	1.01	
Sardinella maderensis	2.39 5	0.57	436
Engraulis encrasicolus	0.16 5	0.04	435
Total	418.57	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 181
 DATE :05/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 31°52.86
 start stop duration duration Lon W 9°42.38
 TIME :10:24:23 10:54:30 30.1 (min) Purpose : 1
 LOG : 7821.12 7822.65 1.5 Region : 1100
 FDEPTH: 46 46 Gear cond.: 0
 BDEPTH: 46 46 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.1 kn
 Sorted : 114 Total catch: 142.48 Catch/hour: 283.82

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Pagellus acarne	148.53 631	52.33	
Trachurus trachurus	58.17 574	20.49	437
Rostroraja alba	31.27 20	11.02	
Scomber japonicus	24.90 127	8.77	438
Pegusa lascaris	9.44 28	3.33	
Psetta maxima	3.13 2	1.10	
Campogramma glaycos	1.97 2	0.69	
Zeus faber	1.81 2	0.64	
Mullus surmuletus	1.59 34	0.56	
Loligo vulgaris	1.33 16	0.47	
Pegusa lascaris	0.80 6	0.28	
Trachinus draco	0.64 6	0.22	
Arnoglossus imperialis	0.25 6	0.09	
Total	283.84	100.01	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 182
 DATE :05/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 31°55.11
 start stop duration duration Lon W 9°30.31
 TIME :12:46:34 13:14:51 28.3 (min) Purpose : 1
 LOG : 7838.30 7839.85 1.6 Region : 1100
 FDEPTH: 24 22 Gear cond.: 0
 BDEPTH: 24 22 Validity: 0
 Towing dir: 0° Wire out : 70 m Speed : 3.3 kn
 Sorted : 18 Total catch: 76.82 Catch/hour: 162.98

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trachurus	99.29 4846	60.92	439
Engraulis encrasicolus	43.45 3810	26.66	440
Sardina pilchardus	4.84 373	2.97	442
SALPS	4.82 2	2.95	
Campogramma glaycos	2.40 28	1.47	
Palaemon sp.	1.44 662	0.89	
Alloteuthis subulata	1.19 543	0.73	
Pagellus acarne	1.04 6	0.64	
Cymbium marmoratum	0.95 2	0.59	
Scomber japonicus	0.93 25	0.57	441
Pegusa lascaris	0.68 8	0.42	
Diplodus bellottii	0.51 204	0.31	
Chelidonichthys lucerna	0.42 2	0.26	
Liocarcinus corrugatus	0.25 25	0.16	
Unidentified fish	0.17 8	0.10	
Rostroraja alba	0.17 8	0.10	
Synathias sp.	0.17 42	0.10	
Trisopterus luscus	0.17 8	0.10	
Lesueurigobius sanzi	0.08 17	0.05	
Total	162.98	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 183
 DATE :05/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 32°4.27
 start stop duration duration Lon W 9°47.36
 TIME :16:41:42 16:59:44 18.0 (min) Purpose : 1
 LOG : 7867.43 7868.50 1.1 Region : 1100
 FDEPTH: 75 75 Gear cond.: 0
 BDEPTH: 88 90 Validity: 0
 Towing dir: 0° Wire out : 215 m Speed : 3.6 kn
 Sorted : 28 Total catch: 440.80 Catch/hour: 1466.89

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trachurus	841.26 18689	57.35	444
Scomber japonicus	415.31 7135	28.31	445
Trachurus picturatus	152.28 5165	10.38	443
Sardina pilchardus	41.53 958	2.83	446
Pagellus acarne	8.52 53	0.58	
Merluccius merluccius	7.99 213	0.54	
Total	1466.89	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 184
 DATE :05/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 32°12.38
 start stop duration duration Lon W 9°37.97
 TIME :20:16:23 20:46:25 30.0 (min) Purpose : 1
 LOG : 7895.82 7897.30 1.5 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 51 65 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 2.9 kn
 Sorted : 60 Total catch: 210.25 Catch/hour: 419.93

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomber japonicus	335.55 8411	79.91	447
Sardina pilchardus	29.29 651	6.98	450
Trachurus trachurus	25.94 433	6.18	448
Trachurus picturatus	22.09 310	5.26	449
Boops boops	7.06 182	1.68	
Total	419.93	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 185
 DATE :05/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 32°14.77
 start stop duration Lon W 9°18.05
 TIME :23:33:27 00:04:57 31.5 (min) Purpose : 1
 LOG : 7919.63 7921.22 1.6 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 37 37 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 37 Total catch: 288.57 Catch/hour: 549.66

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	357.33 21693	65.01	454
Engraulis encrasicolus	75.47 6415	13.73	451
SALPS	45.14 4	8.21	
Trachurus trachurus	31.33 760	5.70	452
Scomber japonicus	23.33 267	4.25	453
Liza aurata	7.81 15	1.42	
Conger conger	5.90 6	1.07	
Diplodus bellottii	2.40 13	0.44	
Alloteuthis subulata	0.93 107	0.17	
Total	549.66	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 186
 DATE :06/12/15 GEAR TYPE: BT NO: 1 POSITION:Lat N 32°19.65
 start stop duration Lon W 9°23.81
 TIME :02:04:11 02:33:33 29.4 (min) Purpose : 1
 LOG : 7935.30 7936.88 1.6 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 50 48 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 64 Total catch: 64.30 Catch/hour: 131.36

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomber japonicus	66.39 938	50.54	458
Sardina pilchardus	59.86 1095	45.57	457
Engraulis encrasicolus	1.96 176	1.49	455
Trachurus trachurus	1.94 35	1.48	456
Alloteuthis subulata	1.21 298	0.92	
Total	131.36	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 187
 DATE :06/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 32°28.21
 start stop duration Lon W 9°16.36
 TIME :08:41:23 09:12:08 30.8 (min) Purpose : 1
 LOG : 7991.39 7993.11 1.7 Region : 1100
 FDEPTH: 39 45 Gear cond.: 0
 BDEPTH: 39 45 Validity : 0
 Towing dir: 0° Wire out : 115 m Speed : 3.4 kn
 Sorted : 55 Total catch: 167.43 Catch/hour: 326.69

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trachurus	147.51 4390	45.15	459
Sardina pilchardus	92.14 2248	28.20	460
Diplodus bellottii	54.79 1183	16.77	
Trisopterus luscus	10.24 252	3.14	
Scomber scombrus	5.50 29	1.68	462
Engraulis encrasicolus	3.51 304	1.08	463
Alloteuthis subulata	3.40 1458	1.04	
Liza aurata	3.28 8	1.00	
Scomber japonicus	2.11 35	0.65	
Merluccius merluccius	1.81 12	0.56	461
Boops boops	1.29 18	0.39	
Sepia officinalis	0.59 2	0.18	
Rostroraja alba	0.29 6	0.09	
Paracallionymus costatus	0.18 6	0.05	
Pegusa lascaris	0.06 12	0.02	
Total	326.69	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 188
 DATE :06/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 32°44.78
 start stop duration Lon W 9°10.91
 TIME :18:42:12 19:10:29 28.3 (min) Purpose : 1
 LOG : 8061.32 8062.75 1.4 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 82 92 Validity : 0
 Towing dir: 0° Wire out : 115 m Speed : 3.0 kn
 Sorted : 35 Total catch: 174.05 Catch/hour: 369.01

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	329.68 5746	89.34	464
Scomber japonicus	37.53 742	10.17	465
Engraulis encrasicolus	1.80 138	0.49	466
Total	369.01	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 189
 DATE :07/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 32°57.69
 start stop duration Lon W 8°52.79
 TIME :03:21:40 03:51:52 30.2 (min) Purpose : 1
 LOG : 8135.66 8137.39 1.7 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 53 85 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.4 kn
 Sorted : 32 Total catch: 189.84 Catch/hour: 377.17

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	37.35 6389	89.44	467
Scomber japonicus	39.81 763	10.56	468
Total	377.17	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 190
 DATE :07/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 33°21.24
 start stop duration Lon W 8°54.93
 TIME :09:54:19 10:24:31 30.2 (min) Purpose : 1
 LOG : 8191.06 8192.55 1.5 Region : 1100
 FDEPTH: 162 162 Gear cond.: 0
 BDEPTH: 162 162 Validity : 0
 Towing dir: 0° Wire out : 410 m Speed : 2.9 kn
 Sorted : 30 Total catch: 60.91 Catch/hour: 121.02

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sphoeroides pachgaster	76.82 89	63.48	
Trachurus picturatus	19.44 451	16.06	469
Octopus vulgaris	5.07 4	4.19	
Zeus faber	4.93 4	4.07	
Pagellus acarne	3.62 14	2.99	
Merluccius merluccius	3.40 24	2.81	
Rostroraja alba	2.78 6	2.30	
Trachurus trachurus	0.16 16	0.14	471
Capros aper	1.06 105	0.87	
Scomber japonicus	0.96 34	0.79	470
Raja clavata	0.62 2	0.51	
Raja miraletus	0.50 2	0.41	
Todarodes sagittatus	0.36 4	0.30	
Antigonia sp.	0.16 14	0.14	
Sepia orbignyana	0.10 2	0.08	
Macrorhamphosus scolopax	0.07 14	0.05	
Total	121.02	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 191
 DATE :07/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 33°22.23
 start stop duration Lon W 8°34.26
 TIME :14:35:38 15:04:34 28.9 (min) Purpose : 1
 LOG : 8228.97 8230.44 1.5 Region : 1100
 FDEPTH: 72 66 Gear cond.: 0
 BDEPTH: 72 66 Validity : 0
 Towing dir: 0° Wire out : 190 m Speed : 3.0 kn
 Sorted : 10 Total catch: 10.41 Catch/hour: 21.59

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Conger conger	4.85 27	22.48	
Palaeon sp.	3.53 751	16.33	
Merluccius merluccius	2.84 141	13.16	
Trachurus trachurus	2.65 62	12.30	472
Trisopterus luscus	2.20 85	10.18	
Squilla mantis	1.45 75	6.72	
Liocarcinus corrugatus	1.04 89	4.80	
Alloteuthis subulata	0.54 195	2.50	
Sardina pilchardus	0.52 8	2.40	473
Citharus linguatula	0.39 39	1.83	
Solenocera sp.	0.23 100	1.06	
Pegusa lascaris	0.23 0	1.06	
Deltentostetus quadrimaculatus	0.23 6	1.06	
Sepia officinalis	0.21 4	0.96	
Trachinus draco	0.21 2	0.96	
Unidentified fish	0.19 25	0.86	
Cepala macrophthalma	0.15 4	0.67	
Sepia officinalis juvenile	0.08 25	0.38	
Scomber japonicus	0.06 2	0.29	474
Total	21.59	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 192
 DATE :07/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 33°35.29
 start stop duration Lon W 8°38.01
 TIME :19:39:02 20:09:06 30.1 (min) Purpose : 1
 LOG : 8269.69 8271.22 1.5 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 162 138 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 36 Total catch: 181.85 Catch/hour: 362.85

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Scomber japonicus	357.17 7393	98.43	475
Trachurus picturatus	5.69 299	1.57	476
Total	362.85	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 193
 DATE :07/12/15 GEAR TYPE: PT NO: 4 POSITION:Lat N 33°25.89
 start stop duration Lon W 8°19.43
 TIME :23:00:21 23:03:21 3.0 (min) Purpose : 1
 LOG : 8291.47 8291.53 0.1 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 31 30 Validity : 4
 Towing dir: 0° Wire out : 110 m Speed : 7.8 kn
 Sorted : 13 Total catch: 13.06 Catch/hour: 261.20

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	104.80 69160	40.12	481
Sardina pilchardus	43.60 2080	16.69	478
Spondyliosoma cantharus	29.80 200	11.41	
Boops boops	28.60 1220	10.95	
Trachurus trachurus	25.40 880	9.72	480
Scomber japonicus	23.00 400	8.81	479
Diplodus vulgaris	4.60 40	1.76	
Diplodus bellottii	0.80 20	0.31	
Trachurus picturatus	0.60 20	0.23	477
Total	261.20	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 194
 DATE :08/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 33°30.06
 start stop duration Lon W 8°8.70
 TIME :02:58:48 03:29:19 30.5 (min) Purpose : 1
 LOG : 8304.39 8306.10 1.7 Region : 1100
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 37 54 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.4 kn
 Sorted : 32 Total catch: 106.16 Catch/hour: 208.77

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardina pilchardus	168.14 4820	80.54	484
Liza aurata	14.75 39	7.06	
Scomber japonicus	11.62 124	5.57	482
Engraulis encrasicolus	4.60 903	2.20	485
Trachurus trachurus	3.42 83	1.64	483
Diplodus vulgaris	2.48 22	1.19	
Sepia bertheloti	2.18 2	1.05	
Alloteuthis subulata	0.88 667	0.42	
Scomber scombrus	0.59 2	0.28	486
Belone belone gracilis	0.10 2	0.05	
Total	208.77	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 195
 DATE :08/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 33°47.60
 : start stop duration Lon W 8°11.28
 TIME :08:36:08 09:05:57 29.8 (min) Purpose : 1
 LOG : 8351.49 8353.02 1.5 Region : 1100
 FDEPTH: 141 144 Gear cond.: 0
 BDEPTH: 141 144 Validity: 0
 Towing dir: 0° Wire out : 350 m Speed : 3.1 kn
 Sorted : 38 Total catch: 122.80 Catch/hour: 247.08

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus picturatus	86.92	35.18	488
Trachurus trachurus	52.31	21.17	487
Capros aper	18.91	7.65	
Merluccius merluccius	15.01	6.07	
Trisopterus luscus	14.49	5.86	
Octopus vulgaris	12.31	4.98	
Raja clavata	6.98	2.83	
Scorpaena scrofa	6.86	2.78	
Zeus faber	5.43	2.20	
Mullus surmuletus	5.09	2.06	
Anthias anthias**	3.62	1.47	
Sardina pilchardus	3.62	1.47	489
Scomber japonicus	3.52	1.43	490
Alloteuthis subulata	3.27	1.32	
Parapenaeus longirostris	2.82	1.14	
Pagellus acarne	1.71	0.69	
Loligo vulgaris	1.06	0.43	
Torpedo marmorata	1.03	0.42	
Dentex angolensis	0.82	0.33	
Macrorhamphosus scolopax	0.80	0.33	
Conger conger	0.28	0.11	
Pegusa lascaris	0.10	0.04	
Sepia orbignyana	0.10	0.04	
Total	247.08	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 196
 DATE :08/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 33°32.99
 : start stop duration Lon W 7°57.44
 TIME :11:41:46 12:11:19 29.6 (min) Purpose : 1
 LOG : 8374.46 8375.98 1.5 Region : 1100
 FDEPTH: 39 41 Gear cond.: 0
 BDEPTH: 39 41 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.1 kn
 Sorted : 30 Total catch: 65.35 Catch/hour: 132.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	27.60	20.81	492
Boops boops	25.97	19.59	
Sardina pilchardus	17.61	13.28	491
Diplodus bellottii	16.80	12.67	
Pagrus auratus	9.48	7.15	
Diplodus vulgaris	8.04	6.06	
Trisopterus luscus	7.18	5.42	
Alloteuthis subulata	7.06	5.33	
Pomadasys incisus	3.73	2.82	
Liza aurata	2.60	1.95	
Diplodus cervinus cervinus	2.46	1.85	
Pagellus acarne	2.27	1.71	
Umbrina canariensis	1.18	0.89	
Trachinus draco	0.32	0.24	
Scorpaena scrofa	0.16	0.12	
Penaeus kerathurus	0.10	0.08	
Unidentified fish	0.04	0.03	
Total	132.60	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 197
 DATE :08/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 33°35.66
 : start stop duration Lon W 7°46.77
 TIME :14:02:43 14:13:36 10.9 (min) Purpose : 1
 LOG : 8390.56 8391.15 0.6 Region : 1100
 FDEPTH: 36 36 Gear cond.: 0
 BDEPTH: 36 37 Validity: 0
 Towing dir: 0° Wire out : 56 m Speed : 3.3 kn
 Sorted : 24 Total catch: 23.72 Catch/hour: 130.81

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	94.96	72.60	494
Trachurus trachurus	13.68	10.46	493
Boops boops	7.67	5.86	
Diplodus vulgaris	4.19	3.20	
Alloteuthis subulata	2.81	2.15	
Loligo vulgaris	1.76	1.35	
Liza aurata	1.60	1.22	
Engraulis encrasicolus	1.32	1.01	495
Diplodus bellottii	0.88	0.67	
Pomadasys incisus	0.77	0.59	
Merluccius merluccius	0.61	0.46	
Trachinus draco	0.55	0.42	
Total	130.81	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 198
 DATE :08/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 33°55.91
 : start stop duration Lon W 7°49.95
 TIME :22:32:01 23:01:57 29.9 (min) Purpose : 1
 LOG : 8453.02 8454.51 1.5 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 138 137 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 52 Total catch: 51.68 Catch/hour: 103.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Scomber japonicus	57.53	55.53	496
Trachurus picturatus	43.70	42.18	497
Sardina pilchardus	1.54	1.49	499
Engraulis encrasicolus	0.82	0.79	498
Total	103.60	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 199
 DATE :09/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 33°47.47
 : start stop duration Lon W 7°26.58
 TIME :03:46:44 04:19:11 32.5 (min) Purpose : 1
 LOG : 8483.13 8484.92 1.8 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 75 86 Validity: 0
 Towing dir: 0° Wire out : 100 m Speed : 3.3 kn
 Sorted : 49 Total catch: 151.99 Catch/hour: 281.03

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Engraulis encrasicolus	216.33	76.98	500
Sardina pilchardus	55.47	19.74	501
Mola mola	8.36	2.97	
Alloteuthis subulata	0.78	0.28	
Merluccius merluccius	0.09	0.03	
Total	281.03	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 200
 DATE :09/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 34°5.16
 : start stop duration Lon W 7°28.82
 TIME :09:50:26 10:20:32 30.1 (min) Purpose : 1
 LOG : 8532.72 8534.30 1.6 Region : 1100
 FDEPTH: 153 157 Gear cond.: 0
 BDEPTH: 153 157 Validity: 0
 Towing dir: 0° Wire out : 400 m Speed : 3.2 kn
 Sorted : 33 Total catch: 70.95 Catch/hour: 141.44

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	60.10	42.49	502
Pagellus acarne	20.85	14.74	
Trachurus picturatus	13.57	9.60	503
Merluccius merluccius	6.62	4.68	
Trisopterus luscus	5.68	4.02	
Octopus vulgaris	5.62	3.97	
Zeus faber	5.53	3.91	
Scomber japonicus	5.11	3.61	504
Parapenaeus longirostris	3.65	2.58	
Phycis blennioides	2.59	1.83	
Loligo vulgaris	2.53	1.79	
Alloteuthis subulata	1.81	1.28	
Capros aper	1.52	1.08	
Macrorhamphosus scolopax	1.47	1.04	
Sardina pilchardus	1.11	0.78	505
Pagrus pagrus	1.04	0.74	
Anthias anthias**	0.99	0.70	
Mullus surmuletus	0.46	0.32	
Conger conger	0.46	0.32	
Callanthias ruber**	0.33	0.23	
Chelidonichthys lucerna	0.18	0.13	
Todarodes sagittatus	0.16	0.11	
Lepidopus caudatus	0.06	0.04	
Total	141.44	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 201
 DATE :09/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 34°2.87
 : start stop duration Lon W 7°7.28
 TIME :14:45:54 15:16:00 30.1 (min) Purpose : 1
 LOG : 8574.13 8575.62 1.5 Region : 1100
 FDEPTH: 123 116 Gear cond.: 0
 BDEPTH: 123 116 Validity: 0
 Towing dir: 0° Wire out : 330 m Speed : 3.0 kn
 Sorted : 34 Total catch: 33.99 Catch/hour: 67.73

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trachurus	29.89	44.13	507
Trisopterus luscus	7.73	11.42	
Merluccius merluccius	6.56	9.68	
Pagellus acarne	4.82	7.12	
Parapenaeus longirostris	3.35	4.94	
Micromesistius poutassou	2.75	4.06	
Loligo vulgaris	2.69	3.97	
Chelidonichthys lucerna	1.69	2.50	
Engraulis encrasicolus	1.43	2.12	506
Antigonia capros	1.14	1.68	
Zeus faber	1.12	1.65	
Alloteuthis subulata	0.98	1.44	
Scorpaena scrofa	0.92	1.35	
Conger conger	0.92	1.35	
Citharus linguatula	0.34	0.50	
Eledone sp.	0.32	0.47	
Lesueurigobius sanzi	0.30	0.44	0
Sepia officinalis	0.30	0.44	
Squilla mantis	0.20	0.29	
Paracallionymus costatus	0.16	0.24	0
Arnoglossus imperialis	0.06	0.09	
Paramola cuvieri	0.04	0.06	
Liocarcinus corrugatus	0.04	0.06	
Total	67.73	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 202
 DATE :09/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 34°13.26
 : start stop duration Lon W 7°1.17
 TIME :20:00:09 20:30:14 30.1 (min) Purpose : 1
 LOG : 8616.18 8617.72 1.5 Region : 1100
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 144 137 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.1 kn
 Sorted : 16 Total catch: 16.12 Catch/hour: 32.15

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Dasyatis sp.	25.93	80.65	
Scomber japonicus	3.87	12.03	508
Sardina pilchardus	1.32	4.09	509
Engraulis encrasicolus	0.74	2.30	511
Naucrates ductor	0.16	0.50	
Trachurus picturatus	0.14	0.43	510
Total	32.15	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 203
 DATE :09/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 34°6.30
 start stop duration Lon W 6°50.55
 TIME :22:01:06 22:31:31 30.4 (min) Purpose : 1
 LOG : 8628.75 8630.35 1.6 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 76 74 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 37 Total catch: 110.37 Catch/hour: 217.76

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	146.20	5165	67.14 512
Engraulis encrasicolus	48.36	4519	22.21 513
Alloteuthis subulata	12.25	6126	5.63
Trachurus trachurus	3.79	213	1.74 515
Scomber japonicus	3.08	77	1.41 514
Trachurus picturatus	2.72	118	1.25 516
Merluccius merluccius	1.36	24	0.63
Total	217.76	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 204
 DATE :10/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 34°16.69
 start stop duration Lon W 6°50.24
 TIME :00:32:38 01:01:20 28.7 (min) Purpose : 1
 LOG : 8645.68 8647.30 1.6 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 106 80 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.4 kn
 Sorted : 34 Total catch: 375.02 Catch/hour: 784.29

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus picturatus	356.57	15298	45.46 517
Engraulis encrasicolus	215.32	25328	27.45 519
Sardina pilchardus	154.13	4923	19.65 520
Scomber japonicus	55.21	1472	7.04 518
Merluccius merluccius	2.13	138	0.27
Alloteuthis subulata	0.92	23	0.12
Total	784.29	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 205
 DATE :10/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 34°29.82
 start stop duration Lon W 6°49.84
 TIME :04:29:07 04:59:13 30.1 (min) Purpose : 1
 LOG : 8675.38 8676.88 1.5 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 134 120 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
 Sorted : 26 Total catch: 51.82 Catch/hour: 103.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Engraulis encrasicolus	47.84	5438	46.31 522
Sardina pilchardus	46.25	2029	44.77 523
Trachurus trachurus	4.23	120	4.09 524
Scomber japonicus	2.39	40	2.32 521
Trachurus picturatus	1.59	76	1.54 525
Merluccius merluccius	0.56	4	0.54
Alloteuthis subulata	0.44	84	0.42
Total	103.30	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 206
 DATE :10/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 34°38.85
 start stop duration Lon W 6°47.72
 TIME :09:31:07 10:01:22 30.3 (min) Purpose : 1
 LOG : 8716.64 8718.24 1.6 Region : 1100
 FDEPTH: 137 137 Gear cond.: 0
 BDEPTH: 137 137 Validity : 0
 Towing dir: 0° Wire out : 350 m Speed : 3.2 kn
 Sorted : 13 Total catch: 12.85 Catch/hour: 25.49

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Merluccius merluccius	8.09	476	31.75
Micromesistius poutassou	3.79	91	14.86
Parapenaeus longirostris	3.09	662	12.14
Alloteuthis subulata	3.00	528	11.75
Parapandalus narval	1.71	113	6.69
Conger conger	0.97	10	3.81
Eledone cirrhosa**	0.67	4	2.65
Lesueurigobius sanzi	0.63	173	2.49
Sepia officinalis	0.60	69	2.33
Engraulis encrasicolus	0.56	54	2.18 527
Trachurus picturatus	0.46	16	1.79 526
Trisopterus luscus	0.44	6	1.71
Scomber japonicus	0.38	4	1.48 528
Squilla mantis	0.32	6	1.25
Mullus surmuletus	0.26	4	1.01
Liocarcinus sp	0.18	2	0.70
Sepioida rondeleti	0.16	14	0.62
Sepia orbignyana	0.12	2	0.47
Cepola macrophthalma	0.08	14	0.31
Total	25.49	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 207
 DATE :10/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 34°43.24
 start stop duration Lon W 6°52.96
 TIME :11:21:05 11:51:15 30.2 (min) Purpose : 1
 LOG : 8726.64 8728.09 1.4 Region : 1100
 FDEPTH: 210 210 Gear cond.: 0
 BDEPTH: 281 209 Validity : 0
 Towing dir: 0° Wire out : 480 m Speed : 2.9 kn
 Sorted : 5 Total catch: 4.54 Catch/hour: 9.02

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Micromesistius poutassou	5.97	191	66.15
Mauriliculus muelleri	2.23	2005	24.70
Merluccius merluccius	0.34	10	3.75
Scomber japonicus	0.28	2	3.09 529
Pasiphaea sivado	0.16	72	1.76
MYCTOPHIDAE	0.04	4	0.44
Rossia macrosomia	0.01	2	0.07
Symbolophorus sp.	0.00	2	0.04
Total	9.02	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 208
 DATE :10/12/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 34°46.47
 start stop duration Lon W 6°33.75
 TIME :15:33:09 16:02:56 29.8 (min) Purpose : 1
 LOG : 8758.93 8760.50 1.6 Region : 1100
 FDEPTH: 121 128 Gear cond.: 0
 BDEPTH: 121 128 Validity : 0
 Towing dir: 0° Wire out : 310 m Speed : 3.2 kn
 Sorted : 25 Total catch: 24.65 Catch/hour: 49.66

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Merluccius merluccius	16.36	788	32.94
Micromesistius poutassou	15.51	411	31.24
Parapenaeus longirostris	3.51	574	7.06
Alloteuthis subulata	2.70	492	5.44
Engraulis encrasicolus	2.62	242	5.27 530
Phycis blennoides	2.42	24	4.87
Eledone sp.	1.25	4	2.52
Lesueurigobius sanzi	1.21	421	2.43
Parapandalus narval	0.62	264	1.26
Trachurus picturatus	0.42	6	0.85 531
Chelidonichthys lucerna	0.42	4	0.85
Antigonia capros	0.40	10	0.81
Mullus surmuletus	0.32	4	0.65
Squilla mantis	0.30	10	0.61
Sardina pilchardus	0.30	2	0.61 532
Liocarcinus corrugatus	0.22	4	0.45
Citharus linguatula	0.20	4	0.41
Paracallionymus costatus	0.16	2	0.32
Sepia bertheloti	0.16	12	0.32
Lepidopus caudatus	0.16	8	0.32
Scorpaena scrofa	0.14	2	0.28
Cepola macrophthalma	0.10	2	0.20
Loligo vulgaris	0.08	2	0.16
Zeus faber	0.06	2	0.12
Total	49.66	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015409 STATION: 209
 DATE :10/12/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 34°52.50
 start stop duration Lon W 6°21.53
 TIME :18:44:10 19:14:23 30.2 (min) Purpose : 1
 LOG : 8780.84 8782.22 1.4 Region : 1100
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 75 91 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.7 kn
 Sorted : 29 Total catch: 87.33 Catch/hour: 173.45

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	128.58	3760	74.13 536
Engraulis encrasicolus	24.55	3611	14.15 537
Scomber japonicus	18.65	322	10.75 533
Trachurus picturatus	1.55	101	0.89 534
Trachurus trachurus	0.12	12	0.07 535
Total	173.45	100.00	

ANNEX II DESCRIPTION OF INSTRUMENTS AND FISHING GEAR

Acoustic instruments

The Simrad ER-60/18, 38, 120 and 200 kHz scientific sounder was run during the survey. Scrutinizing was done in LSSS using the data from the 38 kHz transducer. Last standard sphere calibrations was checked on the 21.02.2015 in Baía dos Elefantes using Cu-64, Cu-60, WC-38.1 add WC-38.1 spheres for 18, 38, 120 and 200 kHz, respectively. The details of the settings for the 38 kHz echo sounder were as follows:

Transceiver-2 menu (38 kHz)

Transducer depth	5,50 m - 8 m
Absorbtion coeff.	9.6 dB/km
Pulse duration	medium (1,024ms)
Bandwidth	2.43 kHz
Max power	2000 Watt
2-way beam angle	-20,6dB
gain	25,11 dB
SA correction	-0.60 dB
Angle sensitivity	21.9
3 dB beamwidth	7.43° along ship
7.38° athwardship	7.38 athwart ship
Alongship offset	0.06°
Athwardship offset	0.04°

Bottom detection menu Minimum level -50 dB

Fishing gear

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

The bottom trawl has a 31 m headline and a 47 m footrope fitted with a 12" rubber bobbins gear. The codend has 20 mm meshes, and has an inner net with 10 mm mesh size. The vertical opening is about 5.5 m. The distance between the wing tips is about 18 m during towing. The sweeps are 40 m long. The trawl doors are 'Thyborøen' combi, 8 m² and weigh 2000 kg. The door spreading is about 45 m when using restraining rope. Trawling was conducted for species identification only and no restraining rope was therefore used during the survey.

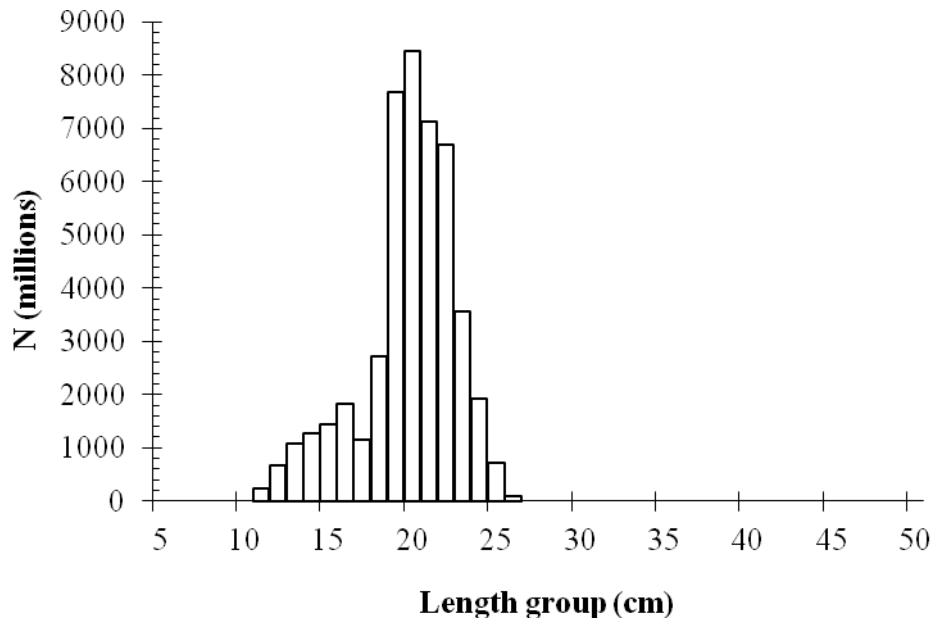
The SCANMAR system was used during all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their inter-distance and angle, while a height sensor is fitted on the bottom trawl to measure the trawl opening and provide information on clearance and bottom contact.

The pelagic trawls are equipped with a trawl eye that provides information about the trawl opening and the distance of the footrope to the bottom. A pressure sensor is used to show the depth on the headline.

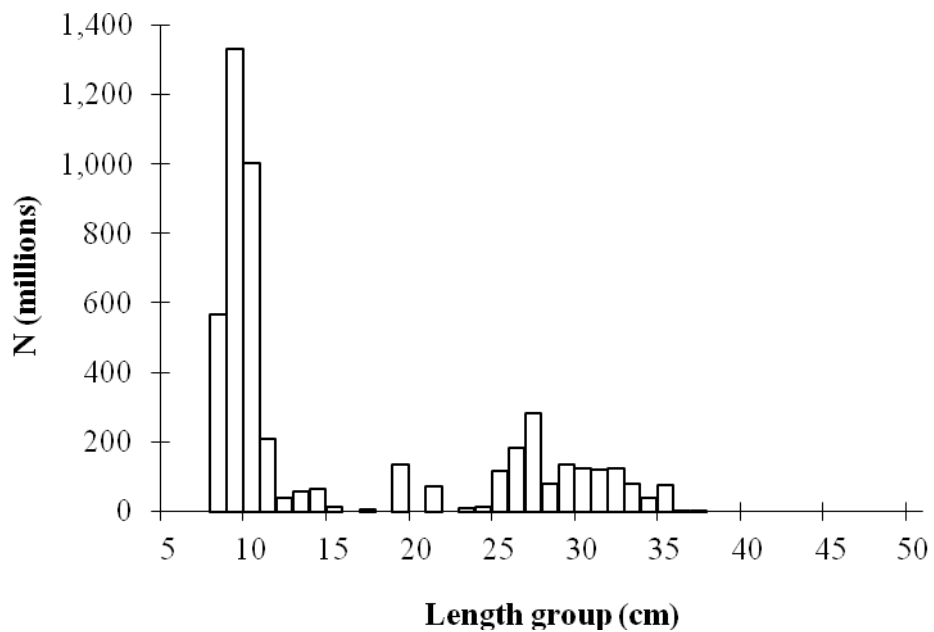
ANNEX III LENGTH DISTRIBUTIONS BY SPECIES AND REGION

C. Blanc-C. Bojador

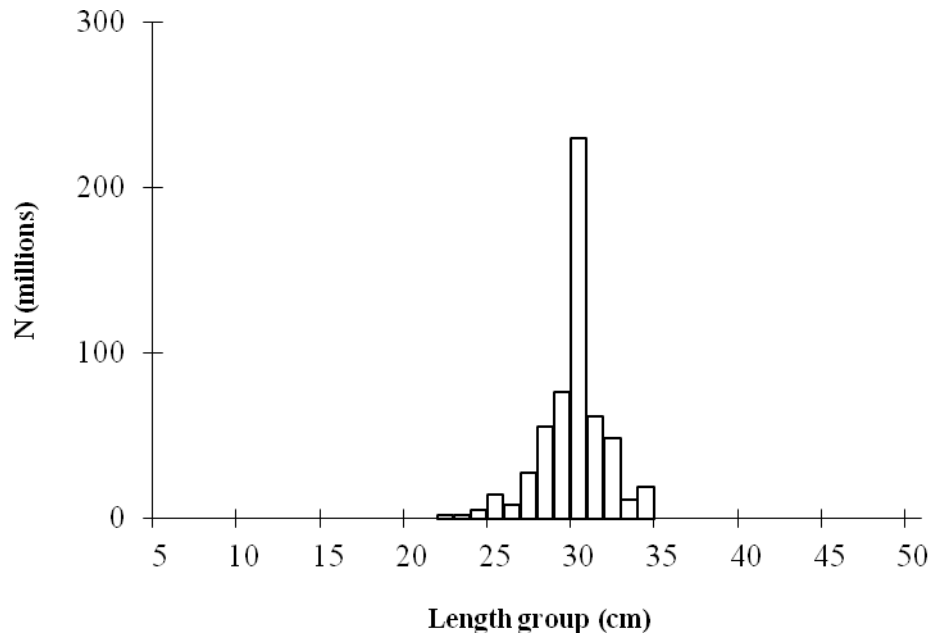
sardine



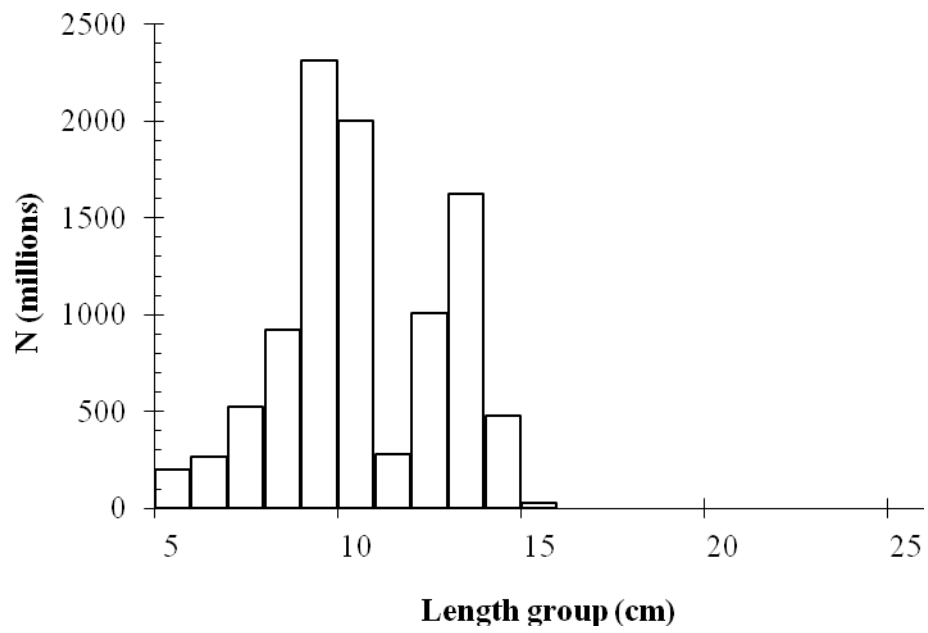
Sardinella aurita



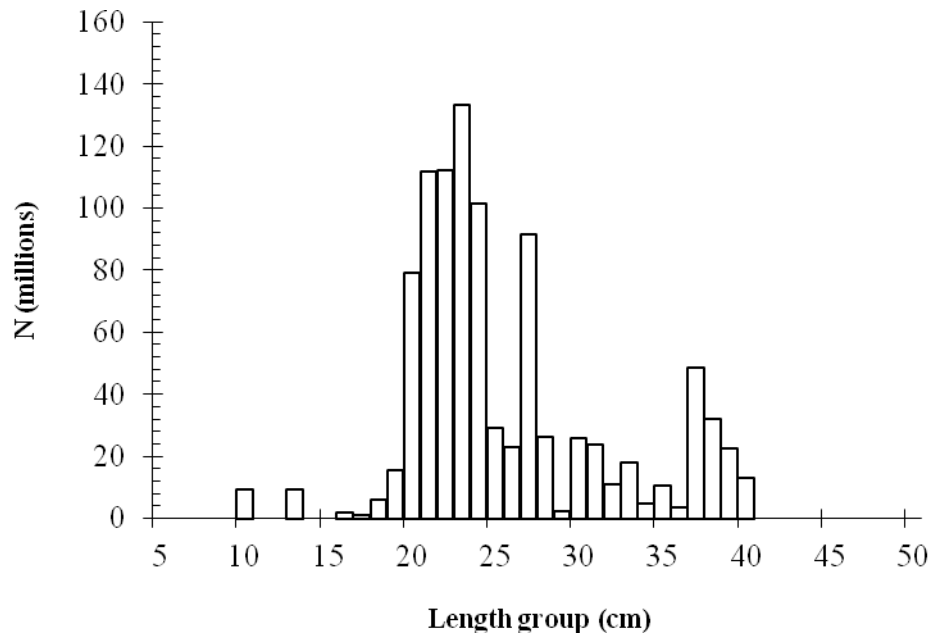
Sardinella maderensis



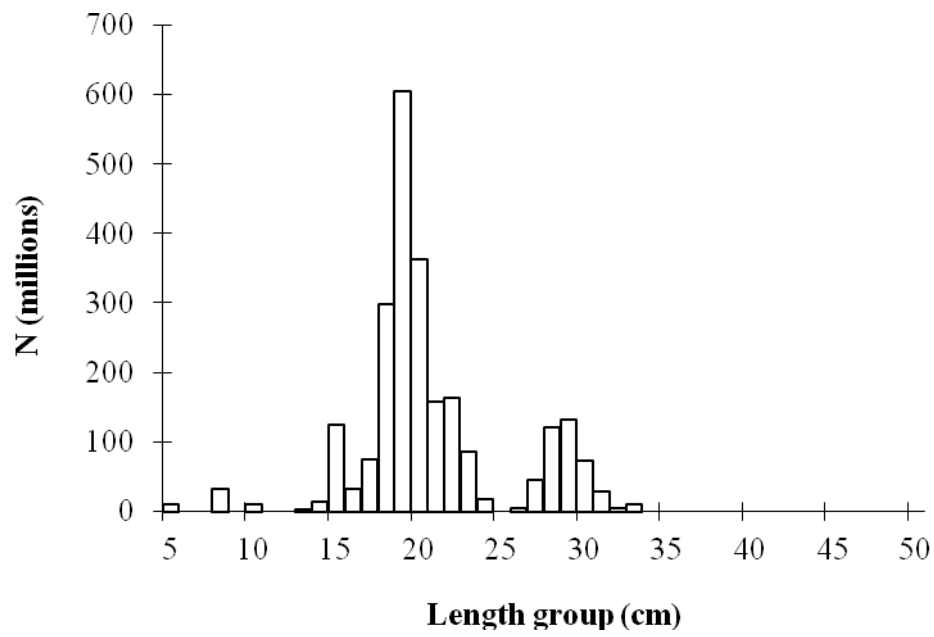
Anchovies



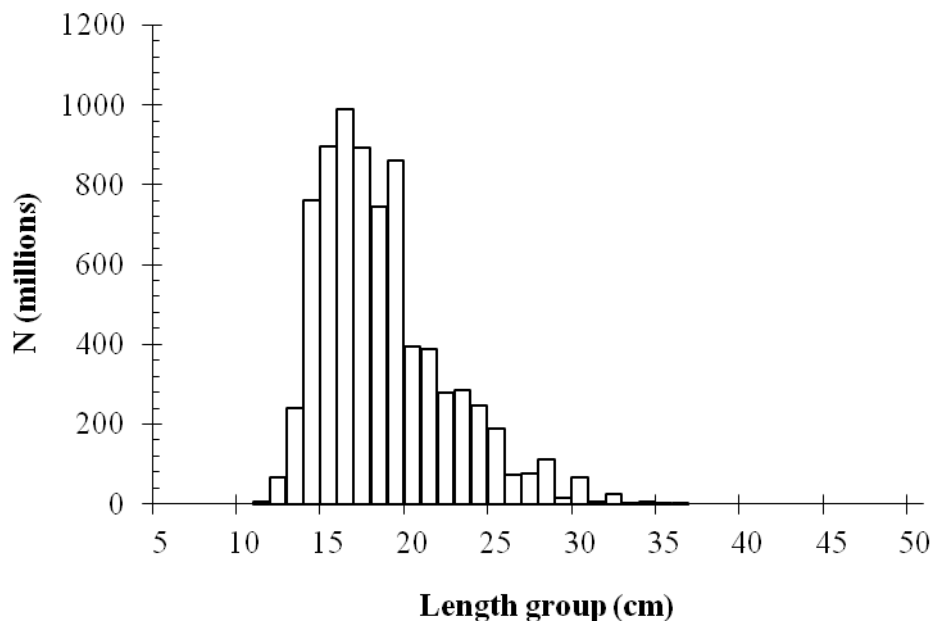
Trachurus trecae



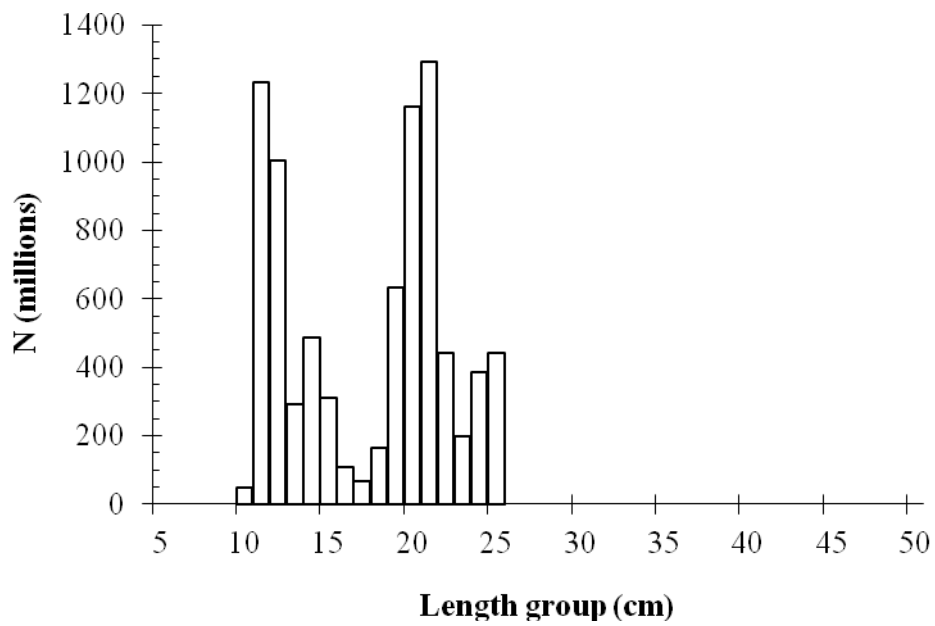
Trachurus trachurus



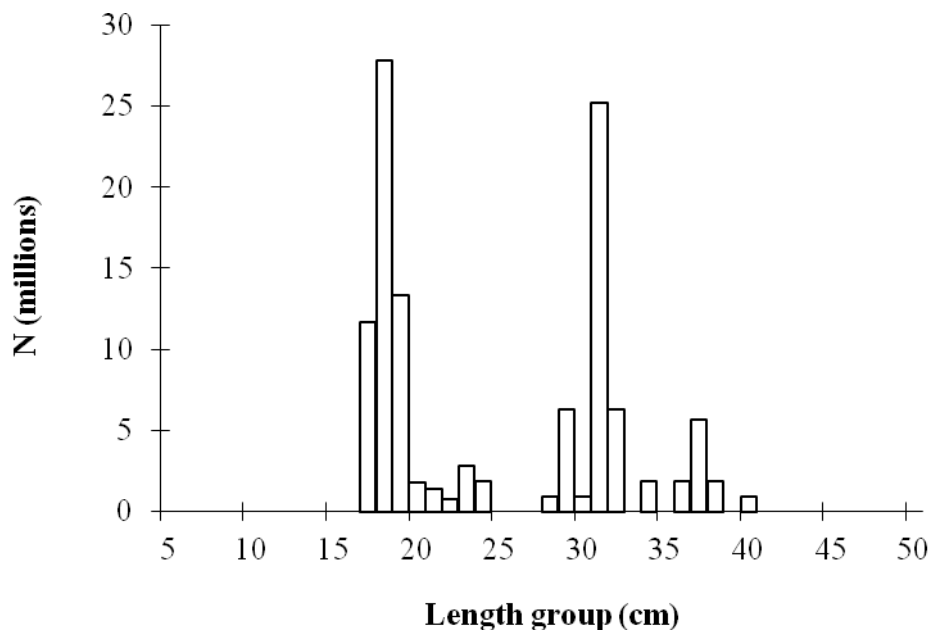
Chub mackerel



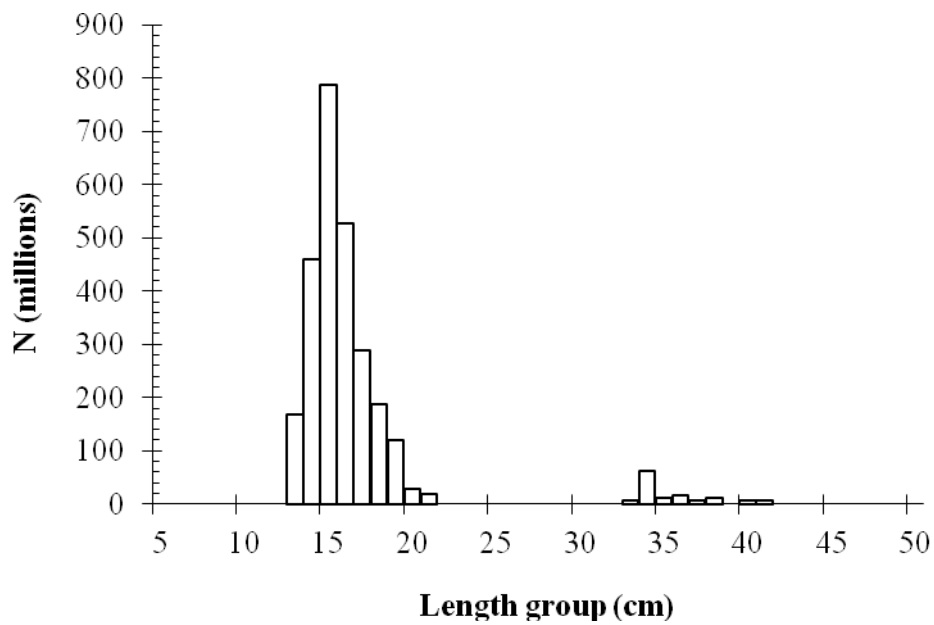
Cape Bojador - Cape Juby sardine



Trachurus trachurus

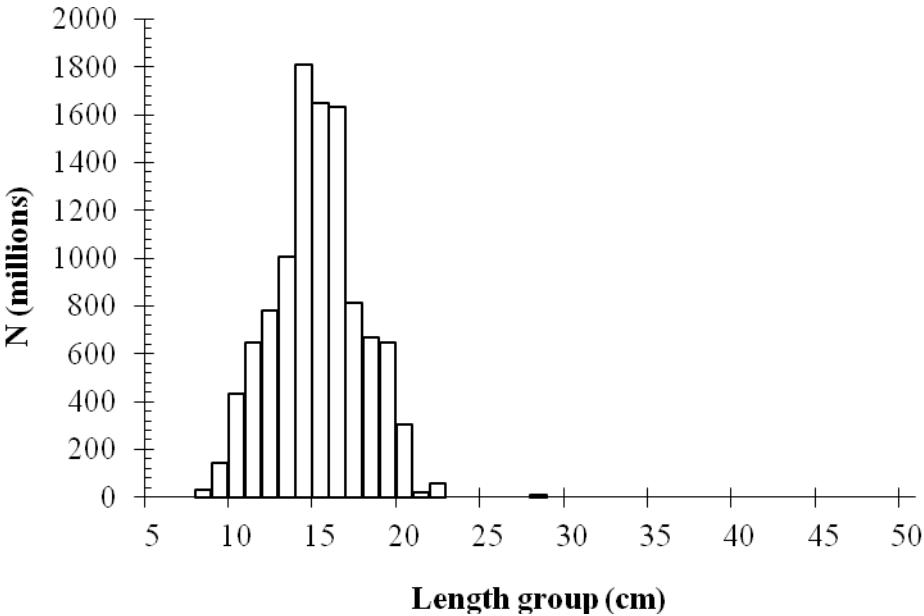


Atlantic Chub mackerel

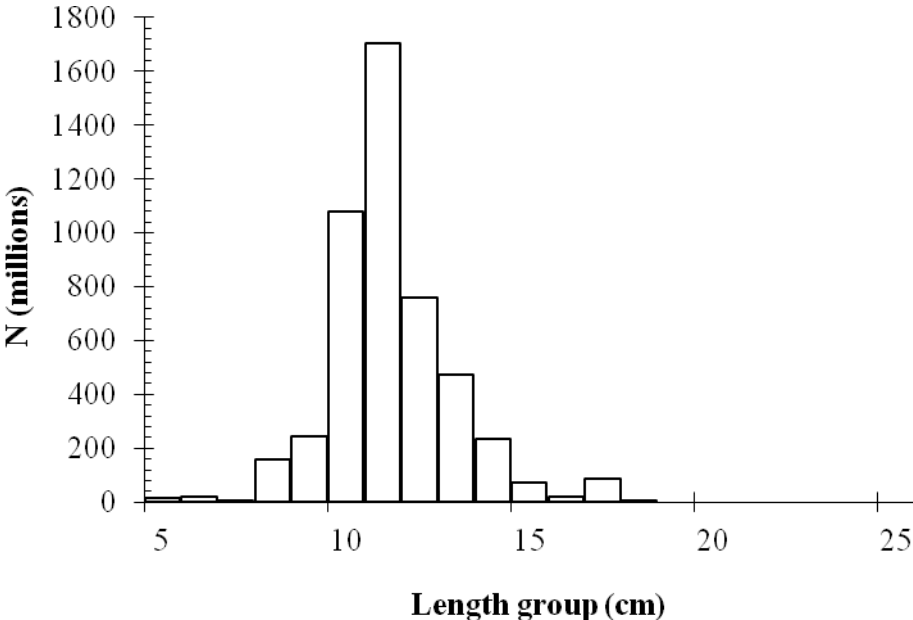


Cape Juby - Cape Cantin

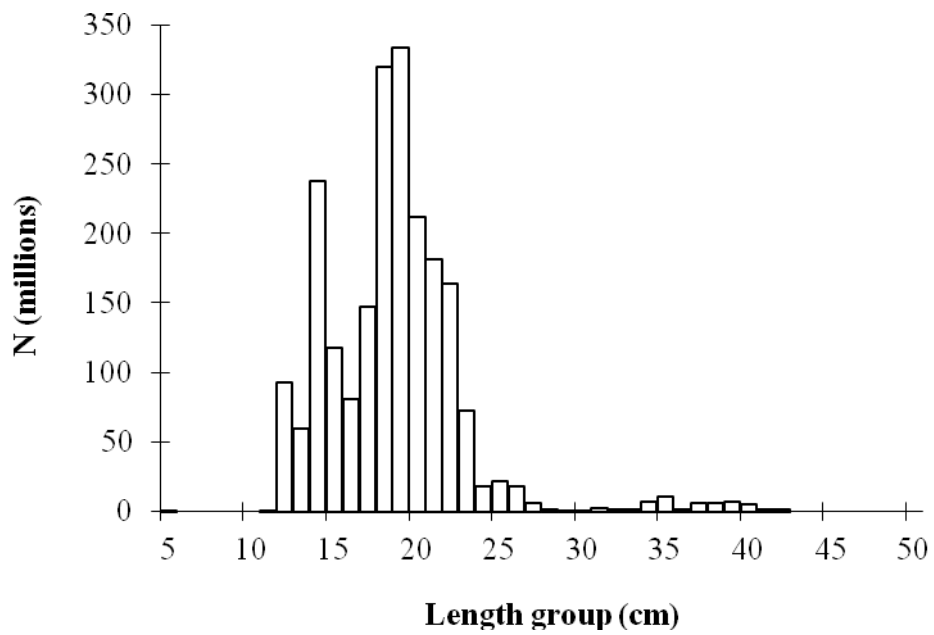
sardine



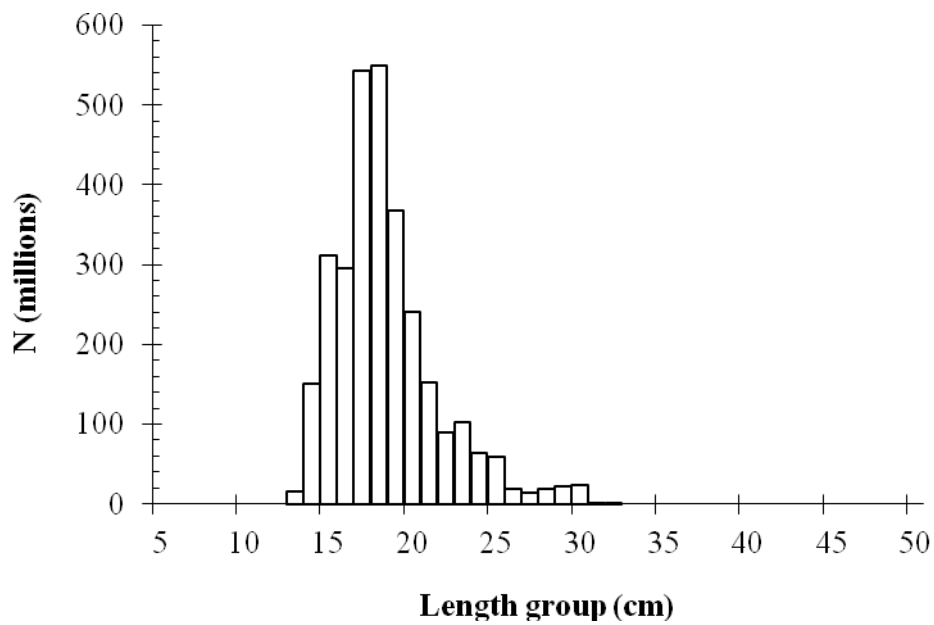
Anchovies



Trachurus trachurus

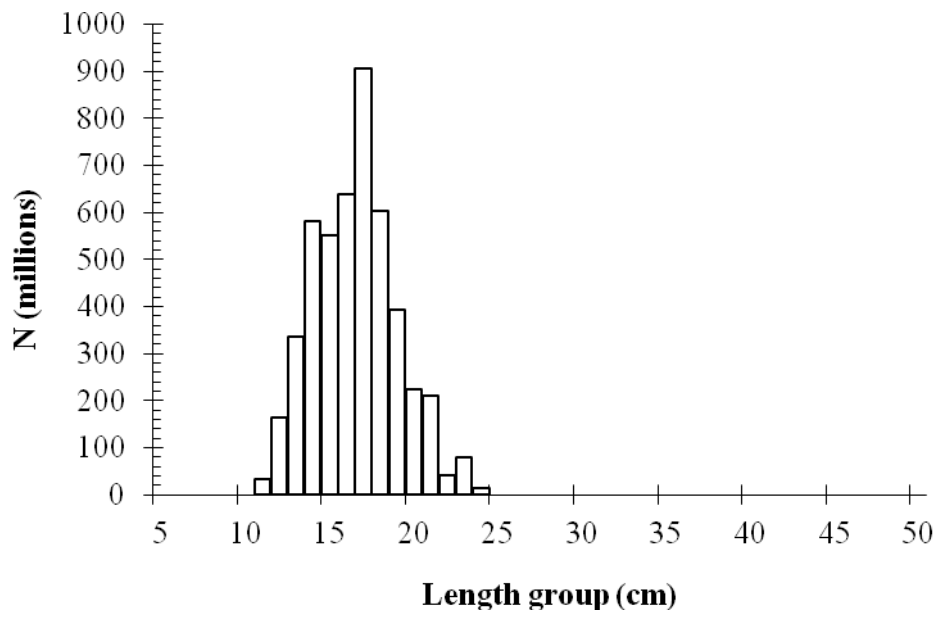


Atlantic Chub mackerel

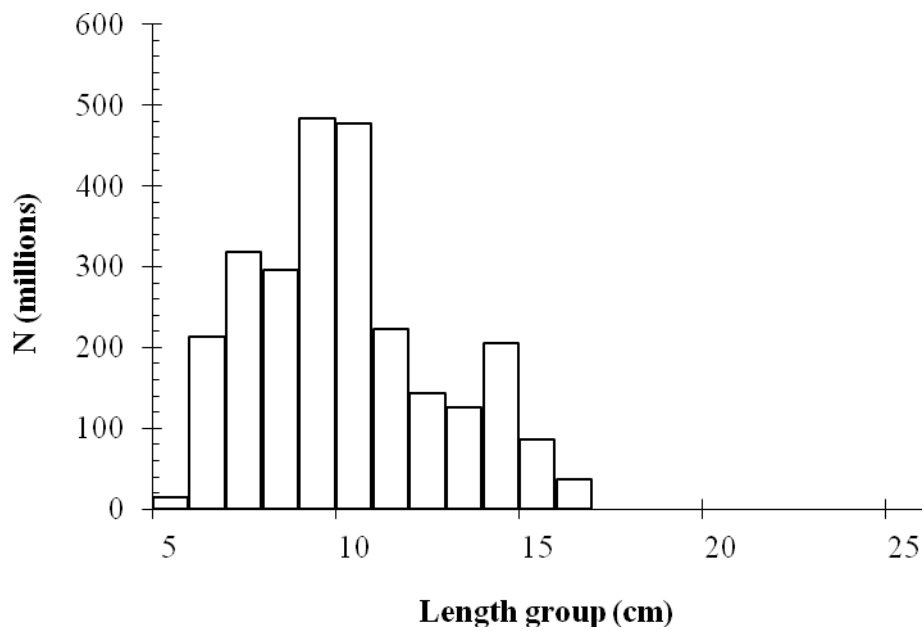


North of Cape Cantin

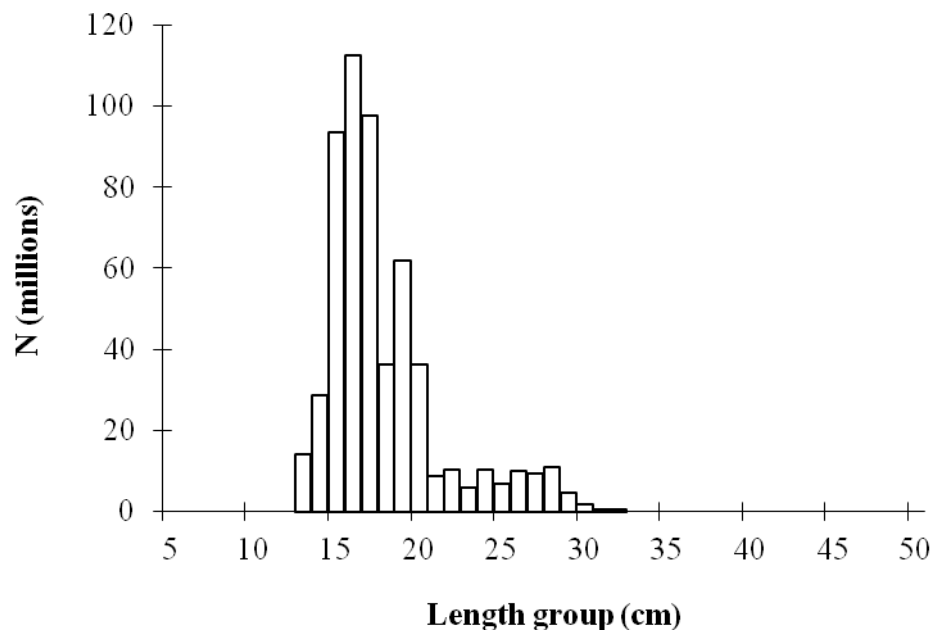
sardine



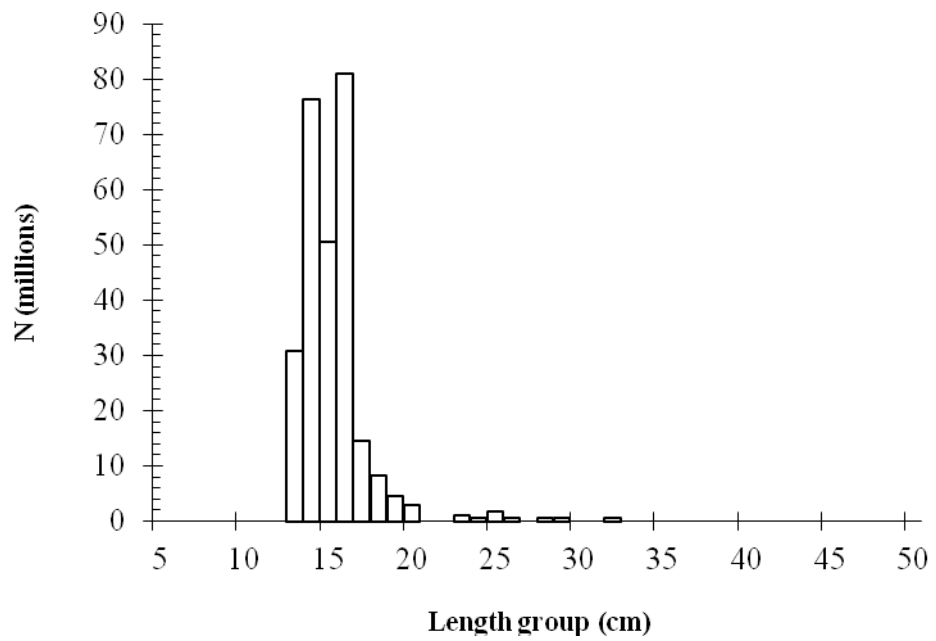
Anchovies



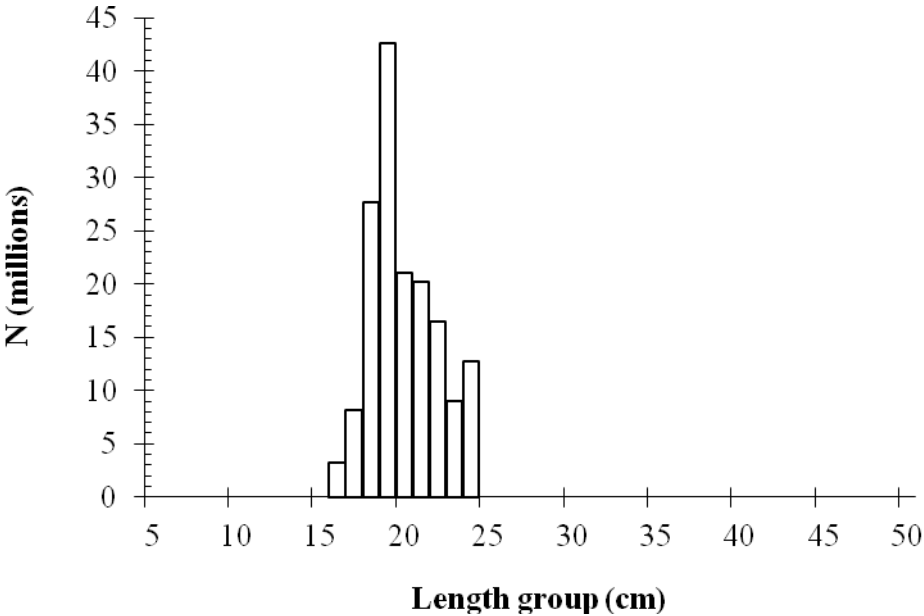
Trachurus trachurus



T. picuratus



Atlantic Chub mackerel



ANNEX IV REGIONAL ESTIMATES

ABUNDANCE

Sardinella aurita, Numbers in millions

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	TOTAL
5							0
6							0
7							0
8					566		566
9					1331		1331
10					1001		1001
11					209		209
12	6		2		37		45
13	12		8		57		78
14	3		7		63		74
15			2		12		14
16			2				2
17	9		1		6		17
18							0
19			4		134		138
20	3						3
21		2			73		75
22		1					1
23	3				8		11
24	6		1		13		20
25	38		1		118		157
26	92	8	1		181		282
27	158	22	3		283		467
28	109	16	12		80		217
29	75	27	22		136		260
30	25	14	66		122		228
31	7	8	79		121		215
32	7	8	63		125		204
33		1	22		78		101
34		1	42		39		82
35			1		77		78
36					4		4
37					4		4
38							0
39							0
40							0
TOTAL	555	109	339	0	4878	0	5881

Sardinella maderensis, Numbers in millions

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	TOTAL
5		4		249			253
6		12		870			882
7		14		1864			1878
8		12		2237			2249
9		9		994			1003
10	3	6					10
11	25	14		5			44
12	62	26		60			148
13	41	26		35			101
14	47	18		25			89
15	62	5	35	10			113
16	61	7	71	10			149
17	22	2	291	15			330
18	6	2	73				81
19	3	7	35	10			55
20	24		73	5			102
21	66	3	2				71
22	124	3	35		2		164
23	322		15		2		339
24	467	4	40		5		515
25	334	18	62		14		428
26	203	10	252		8		473
27	104	3	186		27		320
28	77	3	360		55		494
29	1		151		76		228
30	3		295		229		527
31			49		62		111
32		1	85		48		134
33			24		11		35
34			101		19		120
35			6				6
36			3				3
37			3				3
38							0
39							0
40							0
TOTAL	2058	205	2247	6389	559	0	11458

Trachurus trecae, Numbers in millions

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	TOTAL
5				4			4
6							0
7							0
8							0
9							0
10			9	14	9		33
11			66	54			120
12		1	60	57			117
13		1	34	18	9		62
14	4		44				48
15			14	4			18
16	6	1	21		2		30
17	90	2	5	4	1		101
18	132	2	12	9	6		162
19	177	3	32	28	15		255
20	60	2	48	52	79		241
21	118	2	101	20	112		353
22	170	2	142	31	112		457
23	185	1	215	42	133		577
24	196		147	71	101		515
25	99	1	87	38	29		254
26	52	2	26	7	23		110
27	37	1	2	3	91		135
28	30	1	7	3	26		67
29	10		23	2	2		37
30	5		4	1	26		35
31	3		9		24		36
32			2		11		13
33					18		18
34					5		5
35			169		11		180
36					4		4
37					49		49
38					32		32
39					23		23
40					13		13
TOTAL	1374	20	1279	461	967	0	4101

Trachurus trachurus, Numbers in millions

Length (cm)	Casamance-C-Vert	C. Vert-St. Louis	St- Louis-C. Timiris	C. Timiris-C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5					11	1		12
6								0
7								0
8					33			33
9								0
10					11			11
11			3			0		3
12						93		93
13			8		2	60	14	84
14			31		14	237	29	311
15			28		125	117	94	364
16			20		32	81	112	245
17			6		87	148	98	338
18					326	319	36	681
19				3	618	333	62	1017
20				7	364	212	36	619
21				1	159	182	9	351
22				3	163	164	10	341
23				3	89	72	6	170
24				6	20	18	10	54
25				3		22	7	32
26			6		5	18	10	39
27					44	6	9	60
28					123	1	11	135
29					138	0	5	143
30					74	0	2	76
31					53	2	1	56
32					11	1	1	13
33					9	1		11
34					2	7		9
35						10		10
36					2	1		3
37					6	6		12
38					2	6		8
39						7		7
40					1	5		6
41						1		1
42						1		1
TOTAL	0	0	102	26	2524	2133	560	5346

Sardina pilchardus, Numbers in millions

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc- C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5								0
6								0
7								0
8						30		30
9						141		141
10					46	433		479
11					1479	647	33	2158
12					1679	783	163	2625
13					1364	1006	335	2704
14					1762	1811	580	4153
15					1756	1646	550	3952
16					1920	1633	639	4192
17					1211	810	905	2926
18					2881	668	604	4154
19					8326	645	393	9364
20					9610	302	225	10136
21					8414	19	210	8643
22					7142	58	40	7240
23					3749		80	3829
24					2305		13	2318
25					1153			1153
26					80			80
27								0
28						9		9
29								0
30								0
TOTAL	0	0	0	0	54876	10639	4771	70286

Scomber japonicus, Numbers in millions

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc- C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5								0
6								0
7								0
8								0
9								0
10								0
11					4			4
12					68			68
13					410	16		426
14					1220	151		1370
15					1682	312		1994
16					1518	296	3	1817
17					1183	542	8	1733
18					931	550	28	1509
19					981	367	43	1391
20					421	240	21	682
21					408	153	20	581
22					277	89	16	383
23					287	103	9	398
24					248	64	13	324
25					188	59		247
26					72	20		92
27					77	14		90
28					112	20		132
29					14	23		37
30					66	24		90
31					5	2		6
32					23	1		24
33					9			9
34					68			68
35					14			14
36					20			20
37					6			6
38					11			11
39								0
40					6			6
41					6			6
42								0
43								0
44								0
45								0
TOTAL	0	0	0	0	10334	3043	161	13538

Engraulis encrasicolus, Numbers in millions

Length (cm)	Casamance-C-Vert	C. Vert-St. Louis	St- Louis-C. Timiris	C. Timiris-C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5					198	13	15	226
6				780	263	19	214	1276
7				2966	525	5	318	3814
8				3434	924	156	295	4810
9				468	2311	244	484	3507
10				156	2000	1081	477	3714
11					282	1705	223	2210
12					1009	758	143	1911
13					1623	473	126	2222
14					480	234	205	920
15					30	72	86	188
16						18	36	54
17						85		85
18						2		2
19								0
20								0
21								0
22								0
23								0
24								0
25								0
TOTAL	0	0	0	7805	9646	4866	2623	24939

BIOMASS

Sardinella aurita, Biomass in thousand tonnes

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	TOTAL
5							0
6							0
7							0
8					2.8		3
9					9.3		9
10					9.6		10
11					2.7		3
12	0.1				0.6		1
13	0.4		0.2		1.2		2
14	0.1		0.2		1.7		2
15			0.1		0.4		0
16			0.1				0
17	0.5		0.1		0.3		1
18							0
19			0.3		8.9		9
20	0.3						0
21		0.2			6.6		7
22		0.1					0
23	0.4				1.0		1
24	0.8		0.1		1.8		3
25	5.7		0.2		18.1		24
26	15.2	1.3	0.3		31.4		48
27	28.9	4.0	0.6		55.1		89
28	21.9	3.1	2.9		17.4		45
29	16.4	5.8	5.8		33.0		61
30	6.0	3.3	19.5		32.9		62
31	1.8	2.0	25.6		35.9		65
32	2.0	2.3	22.5		41.1		68
33		0.2	8.5		28.3		37
34		0.3	18.1		15.4		34
35			0.7		33.2		34
36					1.8		2
37					1.9		2
38							0
39							0
40							0
TOTAL	100.6	22.5	105.8	0.0	392.2	0.0	621.2

Sardinella maderensis, Biomass in thousand tonnes

Length (cm)	Casamance- C-Vert	C. Vert- St- Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	TOTAL
5		0.0		0.4	0.0		0.4
6		0.0		2.4	0.0		2.4
7		0.1		7.9	0.0		8.0
8		0.1		13.8	0.0		13.9
9		0.1		8.5	0.0		8.6
10		0.1			0.0		0.1
11	0.5	0.2		0.1	0.0		0.8
12	1.4	0.6		1.2	0.0		3.2
13	1.1	0.7		0.9	0.0		2.7
14	1.6	0.6		0.7	0.0		2.8
15	2.5	0.2	1.3	0.4	0.0		4.4
16	2.8	0.3	3.1	0.4	0.0		6.7
17	1.2	0.1	15.1	0.8	0.0		17.2
18	0.4	0.1	4.4		0.0		4.9
19	0.2	0.5	2.5	0.7	0.0		3.9
20	1.9		6	0.47	0.0		8.4
21	6.0	0.2	0.2		0.0		6.4
22	12.6	0.3	3.8		0.2		16.9
23	36.5		1.9		0.2		38.6
24	59.2	0.5	5.6		0.7		65.9
25	47.1	2.5	9.8		2.4		61.9
26	31.5	1.5	44.5		1.5		79.1
27	17.8	0.5	36.6		5.7		60.6
28	14.4	0.5	78.9		12.7		106.5
29	0.2		36.7		19.4		56.3
30	0.6		78.8		64.5		143.9
31			14.4		19.1		33.5
32		0.2	27.5		16.3		44.0
33			8.6		4.2		12.8
34			38.9		7.6		46.5
35			2.3		0.0		2.3
36			1.2				1.2
37			1.4				1.4
38							0.0
39							0.0
40							0.0
TOTAL	239.6	9.9	423.5	38.7	154.5	0.0	866.2

Trachurus trecae, Biomass in thousand tonnes

Length (cm)	Casamance- C-Vert	C. Vert- St- Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	TOTAL
5				0.0			0.0
6							0.0
7							0.0
8							0.0
9							0.0
10			0.1	0.1	0.1		0.4
11			0.9	0.7			1.6
12		0.0	1	1.0			2.0
13		0.0	0.7	0.4	0.2		1.3
14	0.1		1.2				1.3
15			0.5	0.1			0.6
16	0.2	0.0	0.8		0.1		1.1
17	4.0	0.1	0.2	0.2	0.1		4.5
18	6.9	0.1	0.7	0.5	0.4		8.6
19	10.9	0.2	2.2	1.9	1.1		16.2
20	4.3	0.1	3.8	4.1	6.2		18.6
21	9.7	0.1	9.2	1.9	10.1		31.0
22	15.8	0.2	15	3.2	11.6		45.8
23	19.2	0.1	25.9	5.1	15.6		65.8
24	23.0		20.2	9.8	13.3		66.4
25	13.5	0.1	13.5	5.9	4.3		37.2
26	8.0	0.2	4.5	1.3	3.8		17.8
27	6.6	0.2	0.3	0.6	16.7		24.4
28	5.9	0.1	1.5	0.6	5.3		13.4
29	2.1		5.7	0.5	0.5		8.8
30	1.1		1	0.2	6.3		8.6
31	0.8		2.7		6.4		9.9
32			0.7		3.2		3.9
33					5.7		5.7
34					1.7		1.7
35			73.6		4.0		77.6
36					1.5		1.5
37			0.2		21.6		21.8
38					15.3		15.3
39					11.6		11.6
40					7.2		7.2
TOTAL	132.0	1.7	186.1	38.0	173.8	0.0	531.6

Trachurus trachurus, Biomass in thousand tonnes

Length (cm)	Casamance- C-Vert	C. Vert- St- Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5					0.0	0.0		0
6								0
7								0
8					0.2			0
9								0
10					0.1			0
11						0.0		0
12						1.6		2
13			0.2		0.1	1.3	0.3	2
14			0.8		0.4	6.1	0.7	8
15			0.9		4.1	3.6	2.9	11
16			0.8		1.2	3.0	4.1	9
17			0.3		4.0	6.5	4.3	15
18					17.8	16.4	1.8	36
19				0.2	39.3	19.8	3.7	63
20				0.5	26.8	14.5	2.5	44
21				0.1	13.4	14.3	0.7	29
22				0.4	15.8	14.6	0.9	32
23				0.3	9.7	7.3	0.6	18
24				0.8	2.4	2.0	1.2	6
25				0.4		2.8	0.9	4
26			1		0.7	2.6	1.4	6
27					7.7	1.0	1.5	10
28					23.5	0.2	1.9	26
29					29.2	0.1	0.9	30
30					17.2	0.1	0.4	18
31					13.6	0.5	0.1	14
32					3.1	0.3	0.2	4
33					2.9	0.3		3
34					0.6	2.1		3
35						3.4		3
36					0.7	0.4		1
37					2.4	2.2		5
38					0.9	2.6		3
39						3.2		3
40					0.5	2.4		3
41						0.6		1
42						0.6		1
TOTAL	0	0	4	2.8401	238.1593	136.4	31.0481	412

Sardina pilchardus, Biomass in thousand tonnes

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5								0
6								0
7								0
8						0.1		0
9						0.9		1
10					0.4	3.7		4
11					18.1	7.4	0.4	26
12					26.6	11.7	2.3	41
13					27.5	19.2	6.0	53
14					44.3	43.5	13.1	101
15					54.4	48.9	15.5	119
16					72.3	59.3	22.1	154
17					54.8	35.5	37.8	128
18					155.0	35.0	30.2	220
19					527.8	40.0	23.3	591
20					712.0	21.9	15.7	750
21					723.3	1.6	17.2	742
22					707.5	5.7	3.8	717
23					425.3		8.7	434
24					297.7		1.7	299
25					168.8			169
26					13.2			13
27								0
28						1.8		2
29								0
30								0
TOTAL	0	0	0	0	4029	336	198	4563

Scomber japonicus, Biomass in thousand tonnes

Length (cm)	Casamance- C-Vert	C. Vert- St- Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5								0
6								0
7								0
8								0
9								0
10								0
11					0.1			0
12					2.7			3
13					21.6	0.2		22
14					85.5	2.8		88
15					153.6	7.3		161
16					177.7	8.6	0.1	186
17					174.9	19.4	0.3	195
18					171.8	23.7	1.2	197
19					223.1	19.0	2.2	244
20					116.7	14.7	1.3	133
21					136.7	11.0	1.5	149
22					111.3	7.5	1.4	120
23					136.8	10.1	0.9	148
24					139.4	7.2	1.4	148
25					124.3	7.6		132
26					55.7	2.9		59
27					68.5	2.3		71
28					115.3	3.7		119
29					16.6	4.8		21
30					88.2	5.8		94
31					7.1	0.5		8
32					40.5	0.3		41
33					16.8			17
34					149.8			150
35					35.1			35
36					54.8			55
37					17.3			17
38					38.5			39
39								0
40					23.6			24
41					26.0			26
42								0
43								0
44								0
45								0
TOTAL	0	0	0	0	2530	159	10	2700

Engraulis encrasicolus, Biomass in thousand tonnes

Length (cm)	Casamance- C-Vert	C. Vert- St. Louis	St- Louis- C. Timiris	C. Timiris- C. Blanc	C. Blanc-C. Juby	C. Juby-C. Cantin	North of C. Cantin	TOTAL
5					0.2	0.0	0.0	0.3
6				1.5	0.5	0.0	0.3	2.3
7				8.4	1.5	0.0	0.7	10.6
8				14.0	3.8	0.6	1.0	19.4
9				2.6	13.1	1.3	2.3	19.4
10				1.2	15.2	7.9	3.2	27.5
11					2.8	16.4	2.0	21.2
12					12.8	9.3	1.7	23.7
13					25.7	7.3	1.9	34.9
14					9.4	4.4	3.9	17.8
15					0.7	1.7	2.1	4.4
16						0.5	1.1	1.5
17						2.8		2.8
18						0.1		0.1
19								0.0
20								0.0
21								0.0
22								0.0
23								0.0
24								0.0
25								0.0
TOTAL	0.0	0.0	0.0	27.7	85.6	52.4	20.2	185.8

Annex V Regional summary of results

The survey was carried out from the border between Senegal and Guinea in the south to Larache in the north of Morocco, from 21st October -11 December 2015. The cruise was divided in several legs and with three separate cruise reports covering the three main regions of the surveys, Senegal and The Gambia, Mauritania and the coast from Cape Blanc to northern Morocco.

Hydrographic conditions

South of Cape Vert a stable surface layer at approximately 30-50 m depth was observed over the whole shelf. Warm (~29°C), low salinity surface waters characterized Casamance and The Gambia, gradually becoming more saline and cooler towards the north. The low salinity can be attributed to discharge from local rivers. Low primary production was observed across this region and low oxygen <1 ml/l was observed on the bottom along the shelf from The Gambia and south. The shelf north of Cape Vert was warmer than usually during October - November and intrusion of cold water from the north was only visible from St. Louis and northwards. This cold water thong (20-21°C) was present close to the coast to Cape Timiris corresponding with patch but high primary production. Increasing SST and SSS was observed offshore. Offshore water masses were generally hot and saline in the whole southern region. Cape blanc is separating the southern, warmer part and the northern cooler part of the Canary Current Large Marine Ecosystem. Off Cape Blanc and northwards upwelling was the dominant feature with increasing wind and decreasing SST around 17°C, corresponding with decreasing salinity and high primary production. This upwelling was of variable intensity and decreased northwards. The Northern part of the survey area in Morocco showed considerably more stable conditions with little upwelling observed, and primary production at the thermocline not reaching the surface waters. Of some concern is the very low oxygen values observed in bottom waters on the shelf particularly at Cape Blanc and Cape Barbas but also on some transects further south. Oxygen values < 1 ml/l will force most fish species to move away, and spawning product will not be able to survive in such conditions. This situation should be monitored.

Fish abundance and distribution

Sardinella

The total biomass estimate of Sardinella in North West Africa during the survey was 1,48 million tonnes. Of this 621 thousand tonnes were *S. aurita* and 866 thousand tonnes were *S. maderensis*. In Senegal and The Gambia the sardinella biomass was estimated to be 373 thousand tonnes. The two species (*S. aurita* and *S. maderensis*) were found mainly between Casamance and Cape Vert, and 33% was *S. aurita*. The major part of the stock was concentrated between Casamance and Cape Vert and the distribution probably continued south of the survey area. Further north in Mauritania the total biomass of sardinella was 568 thousand tonnes. Both species were widely distributed to Cape Timiris, mainly inshore of 50 m bottom depth, probably also closer to the coast than covered by the vessel. Between Cape Timiris and Cape Blanc only *S. maderensis* was found. Similar to earlier years in November

the bulk of the biomass in Mauritania consisted of *S. maderensis* (81%). North of Cape Blanc both species were found, and the biomass was estimated to be 550 thousand tonnes. The distribution continued mainly to Dakhla, with a small patch found slightly further north (south of Lacraa). Of this 392 thousand tonnes were *S. aurita* while 155 thousand tonnes were *S. maderensis*. The current survey estimate is the lowest since 2000. The division of biomass between length groups and species are dependent on representative trawl samples of the two species. Since sardinella show strong trawl avoidance some care should be taken when interpreting the results.

Sardine were mainly found from Cape Blanc and all the way to the northernmost border of the survey at Larache. The total biomass was estimated to about 4.5 million tonnes. The fish was mainly found inshore but with distribution in to deeper waters >100 m depth in some areas. The densest and most extensive distribution was in the south between Cape Barbas and Cape Bojador where 3.5 million tonnes of sardine was found.

The distribution of **Anchovies** started immediately south of Cape Blanc and continued northward in well-defined areas to northern Morocco. The stock was found mainly inshore in < 50 m water depth and associated with the areas of high primary production. A total of 158 thousand tonnes of anchovy was found, with the highest concentration of 86 thousand tonnes found south of Cape Barbas.

Trachurus spp The total biomass estimate of Horse mackerel in North West Africa during the survey was 944 thousand tonnes. Of this 532 thousand tonnes were *Trachurus trecae* while 412 thousand tonnes were *T. trachurus*. In Senegal and The Gambia the estimate of *Trachurus trecae* was 138 thousand tonnes, of this 98,6% was found south of Cape Vert. The distribution was mainly in one main area between Gambia and Cape Vert, and two smaller concentrations north of this at Cayar Canyon and St. Louis. In Mauritania the total abundance estimate of Cunene horse mackerel was 224 thousand tonnes. The species was found in several low-density areas all along the coast, with main distribution between 50 and 100 m depth although some were also found inshore of this. North of Mauritania the distribution of *Trachurus trecae* continued until the northern limit of the survey. The estimate was 174 thousand tonnes. Small concentrations of Atlantic horse mackerel started to mix with the Cunene horse mackerel north of St. Louis, and the biomass was estimated to 7 thousand tonnes in Mauritania. The species was mainly found on the outer shelf and the shelf break with increasing densities northwards. North of Cape Blanc 405 thousand tonnes of Atlantic horse mackerel was found. The specie was widely distributed but in low density concentrations. Highest densities were found on the shelf edge typically inside of 150 m bottom depth and close inshore. The two species of horse mackerel were at times mixed with other species making acoustic species separation difficult. Some few *Trachurus picturatus* was found in the northernmost area with an overall estimate of 9 thousand tonnes.

Chub mackerel was found north of Cape Blanc. The biomass index was 721 thousand tonnes of which 422 thousand tonnes was found south of Cape Bojador. The species was widely distributed in mainly low density concentrations over most of the shelf but with decreasing concentrations northwards. The abundance of the species is on a relatively high level compared with the historic Dr. Fridtjof Nansen surveys. Only scattered fish was found north of Cape Cantin. It is likely that the methodology used during the Dr. Fridtjof Nansen survey underestimate the true abundance of this species due to the low target strength. The abundance estimates are only indexes and particularly interpretations of the mackerel index should be done with some caution.

P2

The distribution of 'P2's', other carangids and associated species, were distributed over most of the shelf in medium to high densities in the southern sub system, but with decreasing densities towards Cape Blanc. The total biomass in Senegal and The Gambia was estimated at approximately 454 thousand tonnes. In Mauritania the total biomass was estimated at approximately 306 thousand tonnes, of this 227 thousand tonnes were found south of Cape Timiris. North of Cape Blanc no fish was allocated to this species category due to the decreasing presence of this species complex. Note that *Caranx rhonchus* (previously *Decapterus rhonchus*) is included in the estimate of P2 in 2015. This inflates the estimate somewhat when compared with previous surveys as this species has been treated separately in the abundance estimates in several previous surveys with Dr. Fridtjof Nansen.