

CRUISE REPORTS 'DR FRIDTJOF NANSEN'

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

Part I

**SENEGAL - THE GAMBIA
25 October - 3 November 2004**

by

Jens-Otto Krakstad*

Serigne Sylla**

Juldah Jallow ***

and

Magne Olsen*

*Institute of Marine Research
P.O. Box 1870 Nordnes
N-5817 Bergen, Norway

**Centre de Recherches Océanographiques de Dakar-Thiaroye
Dakar, Senegal

***Department of Fisheries
Banjul, The Gambia

**Institute of Marine Research
Bergen, 2005**

TABLE OF CONTENTS

CHAPTER 1	INTRODUCTION	4
1.1	Objective of the cruise	4
1.2	Participation	5
1.3	Narrative	5
CHAPTER 2	METHODS	8
2.1	Environmental data	8
2.2	Biological sampling	9
2.3	Acoustic sampling	10
2.4	Parallel survey with R.V. Itaf Deme	13
CHAPTER 3	SURVEY RESULTS	14
3.1	Hydrography	14
3.2	The Casamance shelf	21
3.3	The Gambian shelf	22
3.4	The Gambian border - Cape Vert	27
3.5	Cape Vert - St. Louis	28
3.6	Parallel trawl survey	29
CHAPTER 4	OVERVIEW AND SUMMARY OF RESULTS	30
Annex I	Records of fishing stations	
Annex II	Description of instruments and fishing gear	
Annex III	Pooled length distributions by species	
Annex IV	Estimated number and biomass by length-group and sectors	
Annex V	Regional estimates	

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 (Morocco, Mauritania, Senegal and the Gambia) by hydro-acoustic methods and describe the hydrographic conditions in the region over a period of 50 days, in November-December 2005. 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 15°50'N and additionally at the 50 m and 200 m isobath every 20 NM.
- To train local participants in acoustic survey methodology including fish identification and sampling, scrutinizing of echograms, hydrographic sampling and abundance estimation.
- Conduct a parallel survey with the Senegalese R.V. "Itaf Deme". This includes inter-calibration experiments and comparisons of trawl catches.

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:

Serigne Sylla (Senegalese team leader), Moise Biagui, Amadou Fallou Niang And Ibra Fall

Department of Fisheries (FD), The Gambia:

Juldah Jallow (Gambian team leader), Sabena Mendy And Abdoulie Njie

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

Ibra Diallo

Institut National de Recherche Halieutique (INRH), Morocco:

Lahcen Aboubdelah

Centre National des Sciences Halieutique de Boussoura (CNSHB), Guinea:

Amadou I Bah

Institute of Marine Research (IMR), Norway:

Jens-Otto Krakstad (Cruise Leader), Magne Olsen, Thor Egil Johannson and Ole Sverre Fossheim

1.3 Narrative

The survey was supposed to start on the 30/10-2005 from Dakar, but the vessel only left port at 12:30 GMT (GMT=local time) on the 31/10 due to technical problems. The survey started at the border between Guinea Bissau and Senegal (240 degree on Cape Roxo, Casamance) at 02:00 the following morning. The Senegalese research vessel "Itaf Deme" started the survey simultaneously from a position 1 nm south of "Dr. Fridtjof Nansen". The southern border between Senegal and the Gambia (270° at 13°03'N) was reached on the 2/11 at 03:45, while the northern border of the Gambia (270° at 13°35'5''N) was reached on the 1/11, at 23:00. A large detour was taken outside the Saloum River because an international naval exercise blocked our regular survey track. Cape Vert was reached on the 5/11 at 21:00, before the regular survey ended at St Louis at the border to Mauritania on the 7/11 at 21:00. Returning to Dakar an intercalibration exercise was conducted before the vessel returned to port in Dakar on the 8/11 at 15:00. The course track and fishing stations are shown in Figure 1, while

Table 1 shows survey effort during the survey, including number of trawl stations and CTD casts.

During all surveys in the region a common strategy has been adapted with systematic parallel course tracks spaced 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 shallow waters (depth less than 25 m).

Four Crossshelf hydrographic transects were carried out, at Casamance, off the Gambia, at Cape Vert and at St. Louis – south.

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 (log), disregarding the steaming from Cape Vert to Casamance and from St. Louis to Cape Vert (log).

Area	BT	PT	Total trawls	CTD casts	Log (NM)
Casamance to St. Louis	14	24	38	48	1550

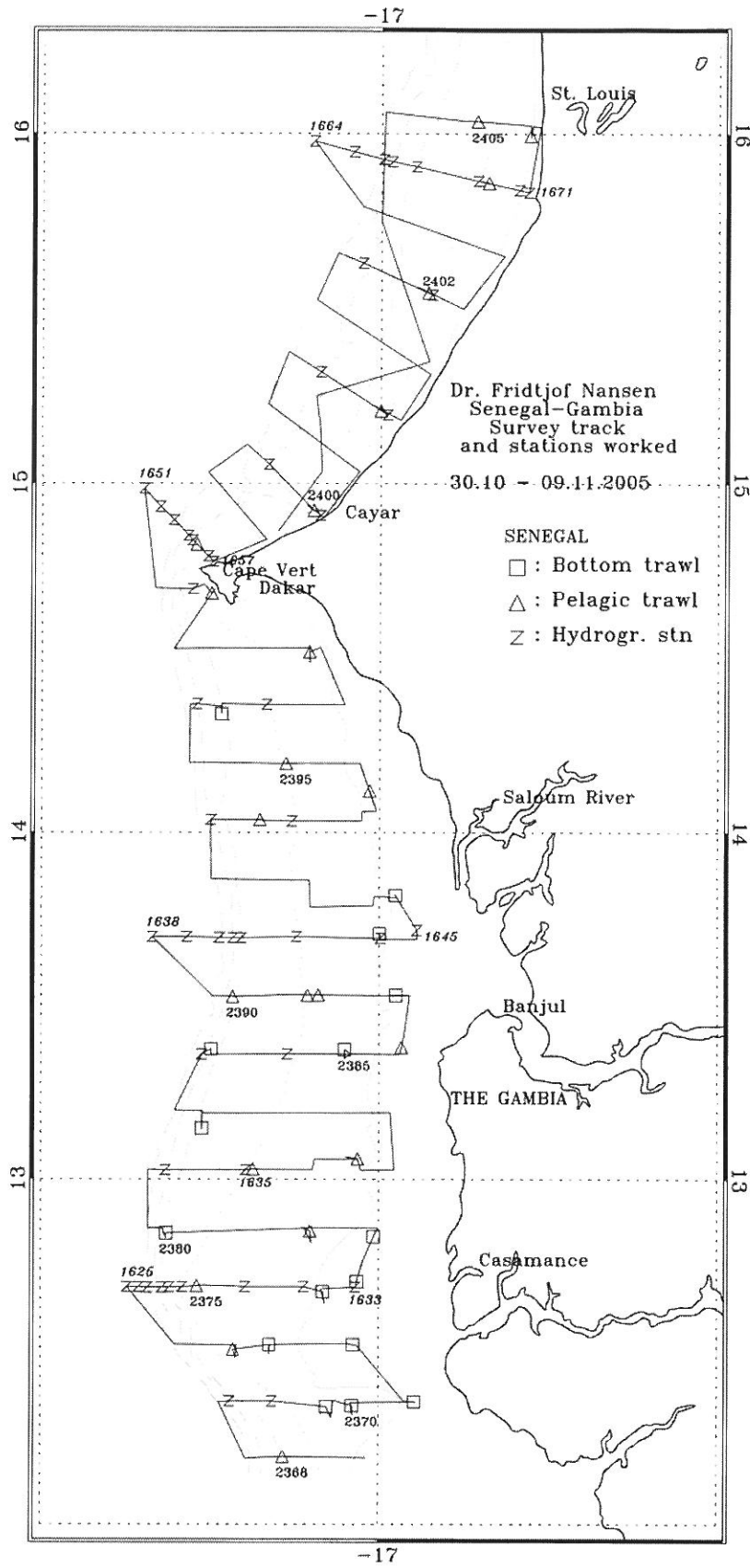


Figure 1. Course tracks with fishing and hydrographical stations; Casamance to St. Louis.

CHAPTER 2 METHODS

2.1 Environmental Data

CTD-profiling

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 and at fixed stations every 50 m and 200 m depth every 20 NM. 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 one 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.

The oxygen sensor was calibrated during the survey. A total of 20 samples were accepted for oxygen calibration. A linear regression of the Winkler determinations on the CTD values produced the correction:

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

were $a=1.0504$ and $b=-0.0581$

Meteorological observations

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).

Thermosalinograph

The SBE 21 Seacat thermosalinograph was running routinely during the survey. Obtaining samples of sea surface salinity and relative temperature (5 m depth) every 10 sec during the survey.

Current speed and direction measurements (ADCP)

The ship-born Acoustic Doppler Current Profiler (ADCP) from RD Instruments was running throughout the survey. The ADCP was set to external trigger, triggered by the EK 500 system. The depth cell interval set to 3 m and the number of cells was set to 120.

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 in cm, of the selected target species were recorded at 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	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>
	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

A SIMRAD EK500 Echosounder was used with the settings as shown in Annex II. The Bergen Integrator (BEI) was used for analysis and allocation of the integrated s_A -values to the individual specified target groups by 5 NM intervals. The allocation of values to target groups was based on a combination of a visual scrutiny of the behaviour pattern as deduced from echo diagrams, the BEI analysis, and the catch compositions.

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 BEI analysis and catch composition as described below. The following groups were used for Senegal: 1) sardinellas, 2) horse mackerel, 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, 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.

2.4 Parallel survey with R.V. “Itaf Deme”

During the survey the Senegalese research vessel “Itaf Deme” did a parallel survey with “Dr. Fridtjof Nansen”. As part of this, parallel trawl hauls were conducted with regular intervals, as well as acoustic intercalibration between the vessels. The strategy for the intercalibration followed the recommendations by MacLennan and Simmons (1992).

One research vessel placed itself 0.5 NM behind and 0.5 NM to the side of the other vessel that took the lead. The distance between the vessels were chosen so that the vessels could stay as close together as possible without disturbing each other’s acoustic recordings. 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 parallel survey and intercalibration will be analysed on land and a separate report will be produced from the exercise.

CHAPTER 3 SURVEY RESULTS

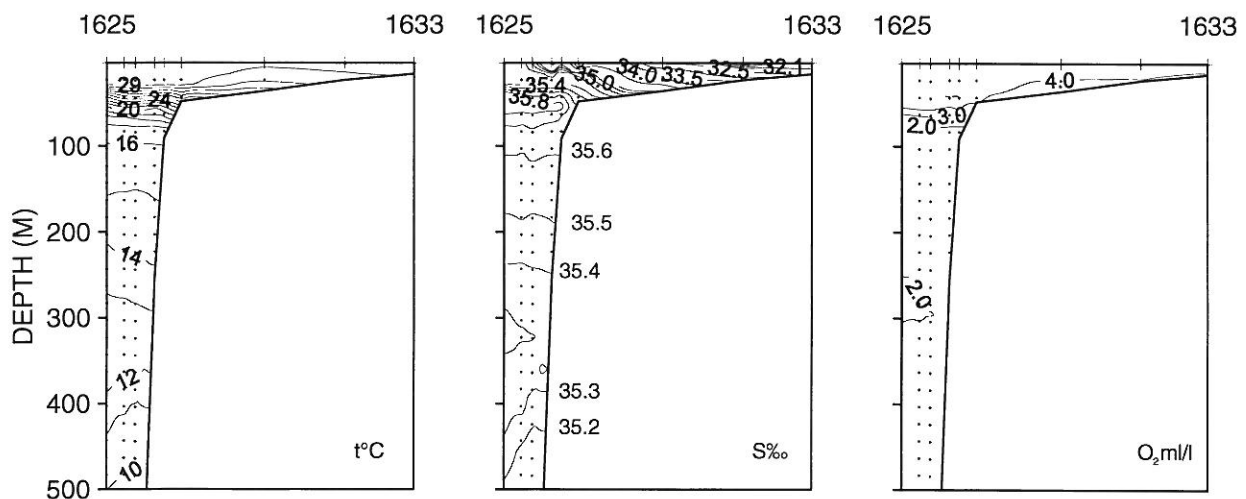
3.1 Hydrography

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.

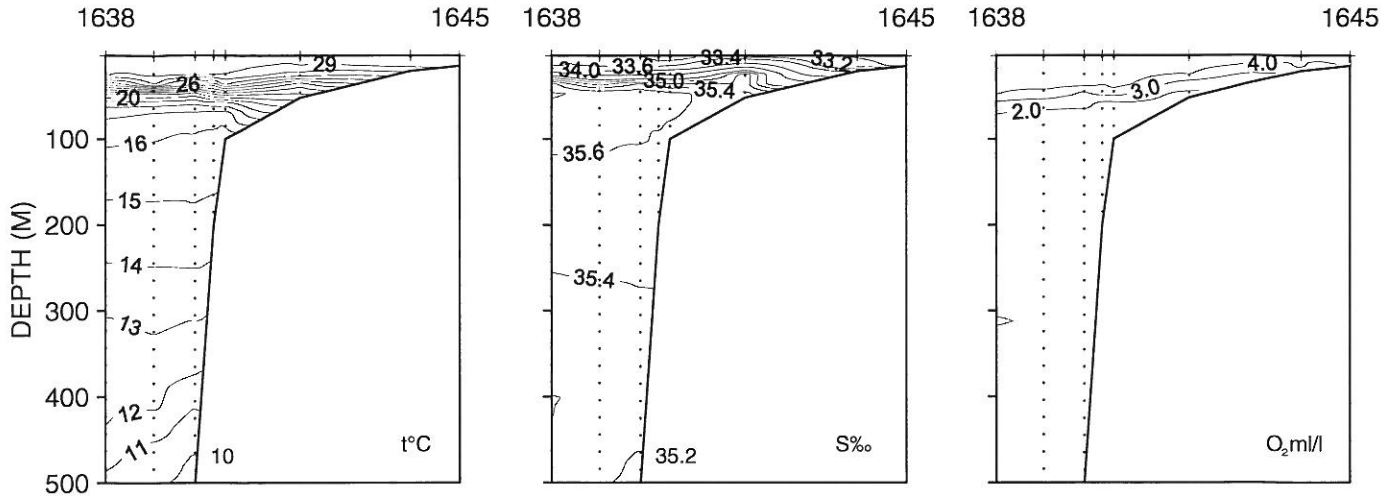
Cross shelf hydrographical profiles

Figure 2 shows the distribution of temperature, salinity and oxygen from the four hydrographical transects collected during the survey. The situation was similar to last year. The temperature layers were clearly stratified, with warm surface waters and a thermocline around 30-50 m depth. And minimum temperature of 11°C was observed around 500 m depth. Slightly more mixed conditions were experienced inshore at St. Louis. The salinity profiles showed strong influence of freshwater inshore, particularly in the Casamance area and off St. Louis. Maximum salinities were experienced at the shelf break around 100 m depth, with maximum salinities between 35.6 ‰ to 35.8 ‰. Salinity around 500 m was around 35.2 ‰. The water masses in the survey area was well oxygenated with oxygen concentrations in the surface layer >4 ml O₂/l decreasing to 2.0 ml/l oxygen between 50 – 100 m depth.

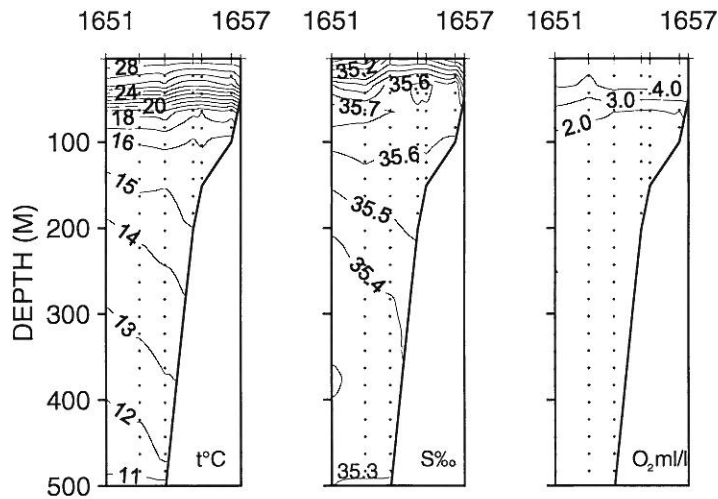
CASAMANCE



THE GAMBIA WEST



CAPE VERT



ST. LOUIS - SOUTH

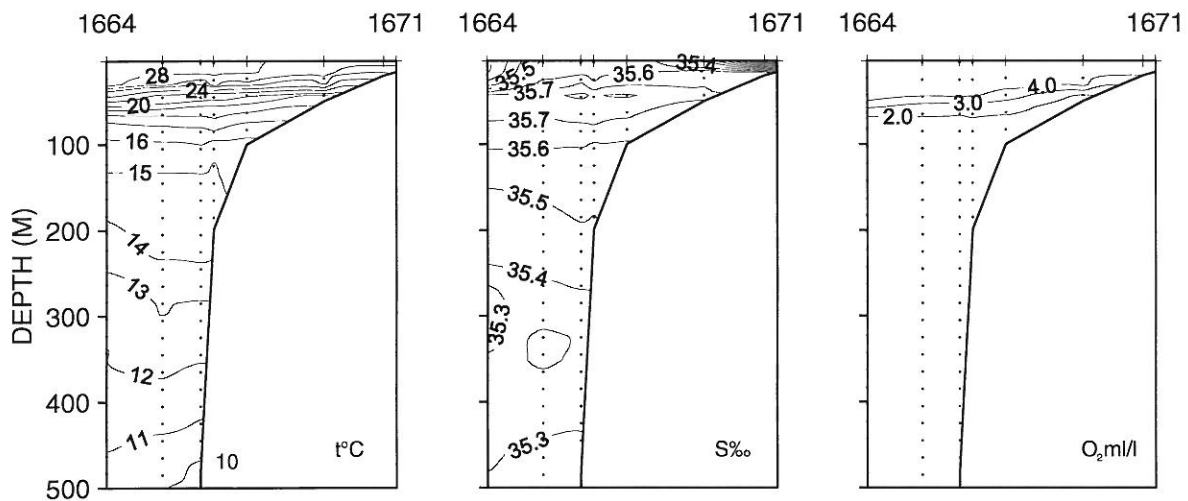


Figure 2. Hydrographical profiles with distribution of temperature, salinity and oxygen off Casamance, 13°40'N - The Gambia, c) Cape Vert, St. Louis - South

Along shelf profiles

Along shelf profiles of temperature, salinity and oxygen was created from the 200 m depth CTD stations collected at every 20 NM during the survey. Only the temperature plots are shown in Figure 3. The figures show the relatively high sea surface temperature especially in the area between St. Louis and Cape Vert (29°C), and the intrusion of cooler water masses at St. Louis.

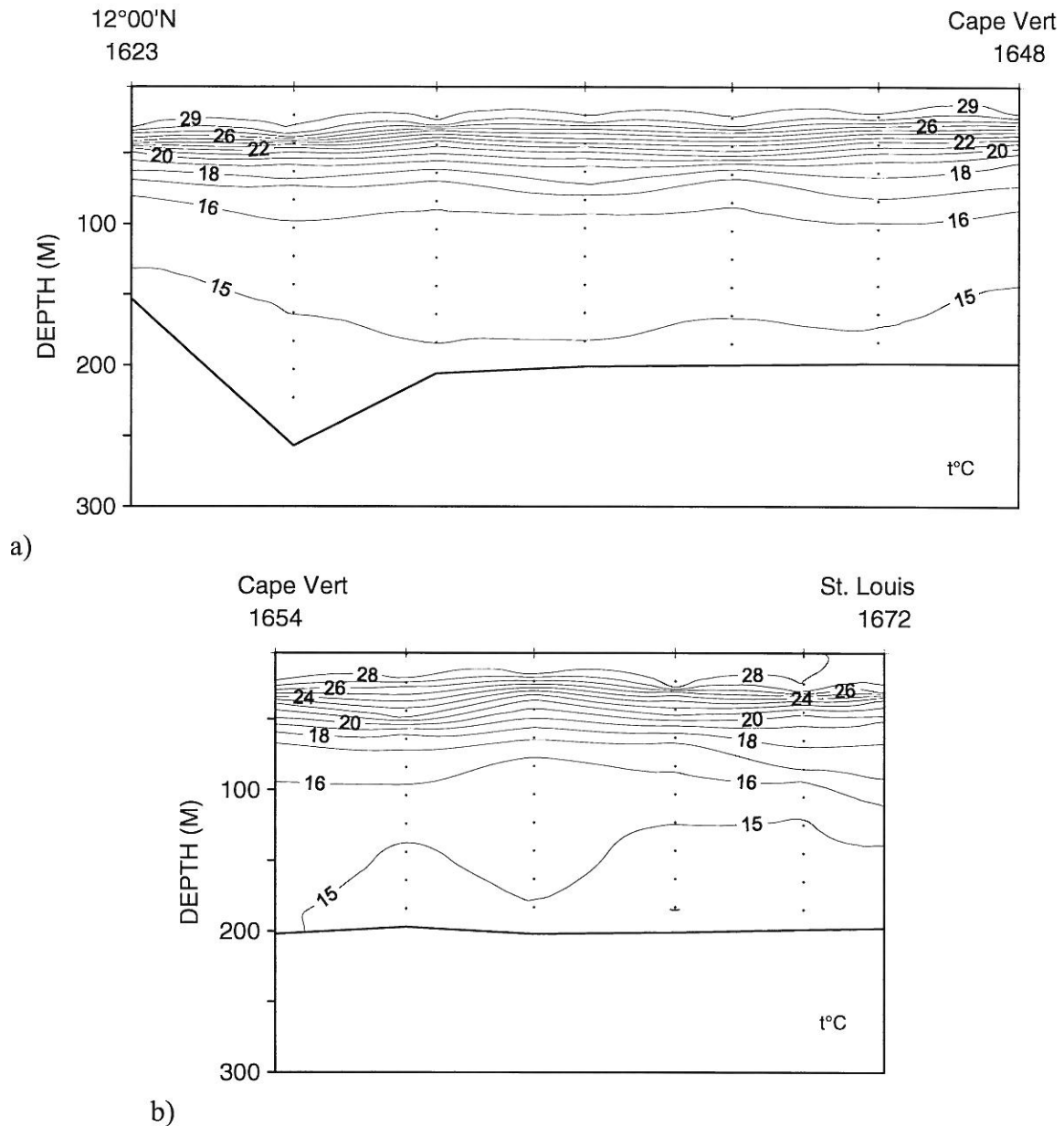


Figure 3. Alongshelf temperature at 200 m depth from a) Casamance to Cape Vert b) Cape Vert to St. Lois.

Sea surface temperature, salinity and wind direction

Figure 4 illustrates the sea surface temperature at 5 m depth, Figure 5 shows the sea surface salinity at the same depth, while Figure 6 shows the wind direction and wind speed during the survey of Senegal and the Gambia.

The sea surface temperature in south of Dakar to Casamance was dominated by water masses warmer than 29°C. The warmest water masses were found along the coast (30°C) extending offshore in three large filaments with water temperatures >29.5°C. North of Cape Vert temperatures dropped slightly to 28.5°C. In the northernmost part of the survey area and inshore along the coast from St. Louis cooler water masses were experienced with temperatures down to 27.5°C outside St. Louis. Last year was warmer than normal, particularly in the northern part of Senegal. This year similar temperatures to what was observed in 2004 were experienced.

The Casamance shelf was dominated by relatively low salinity, typically around 31.0‰ – 32.0‰. A large frontal zone separating the less saline shelf water from the more saline water masses offshore was observed at the shelf break, maximum salinity in this area was 34.4‰. Further north a gradual increase in salinity is observed between The Gambia and Cape Vert. The salinity at Cape Vert is around 34.4‰. In the northern part of the survey area salinity between 34.6 and 34.8 is observed. Except at St. Louis where local river discharge reduces the salinity to <34‰. Offshore from St. Louis an intrusion of more saline water masses from the north can be observed, with salinity >35‰. Compared to last year more rain has been experienced in the survey area and shelf salinity is thus less than normal.

Little wind was experienced in the area on the Casamance shelf, and the wind direction was shifty. The wind increased around Cape Vert to an average of approximately 21 - 22 knots for the rest of the survey period. The dominant wind direction in this region was from the north and generally conditions were similar to last year. The conditions were favourable for acoustic surveying throughout the survey.

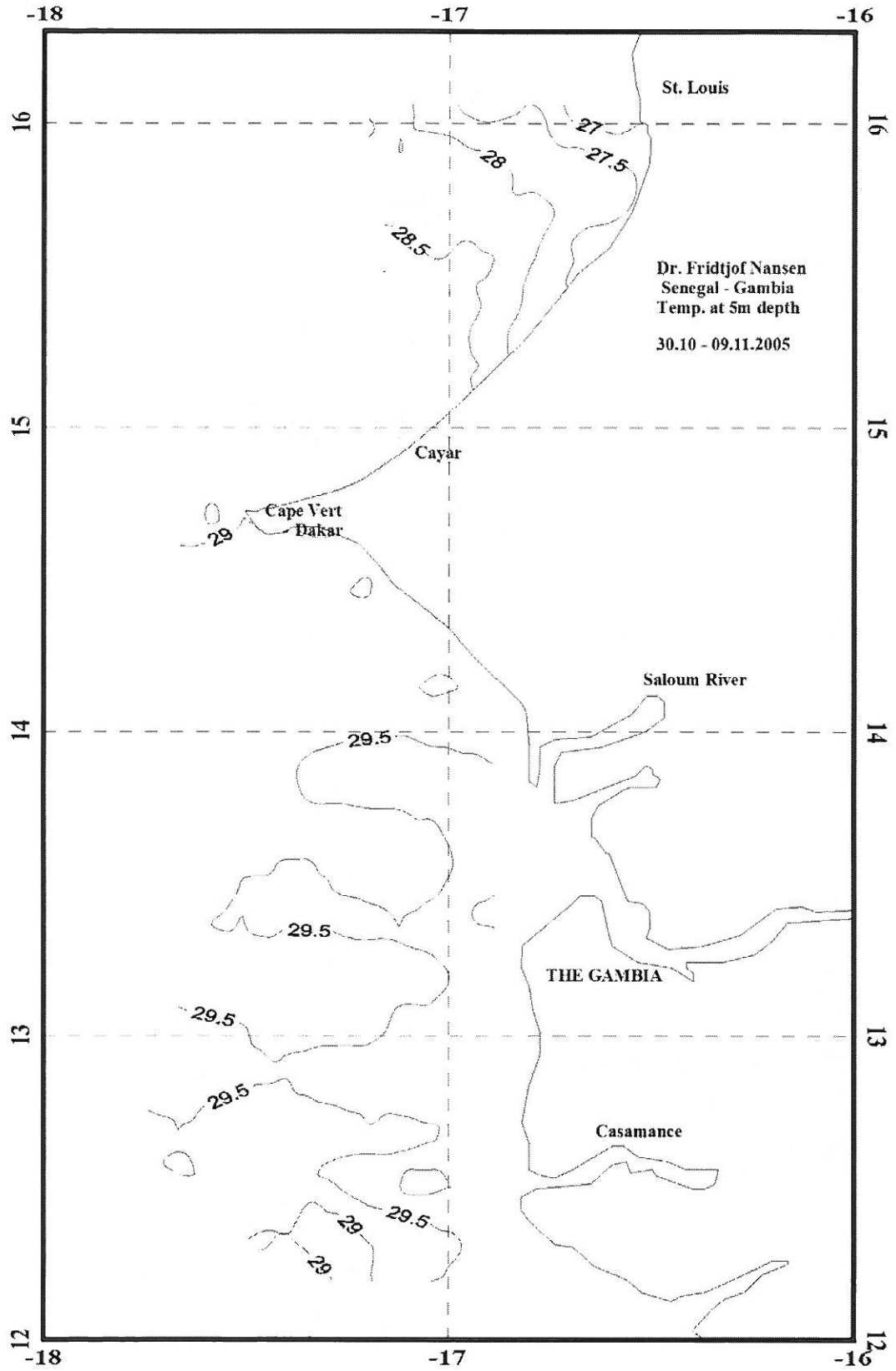


Figure 4. Sea surface temperature; Casamance to St. Louis.

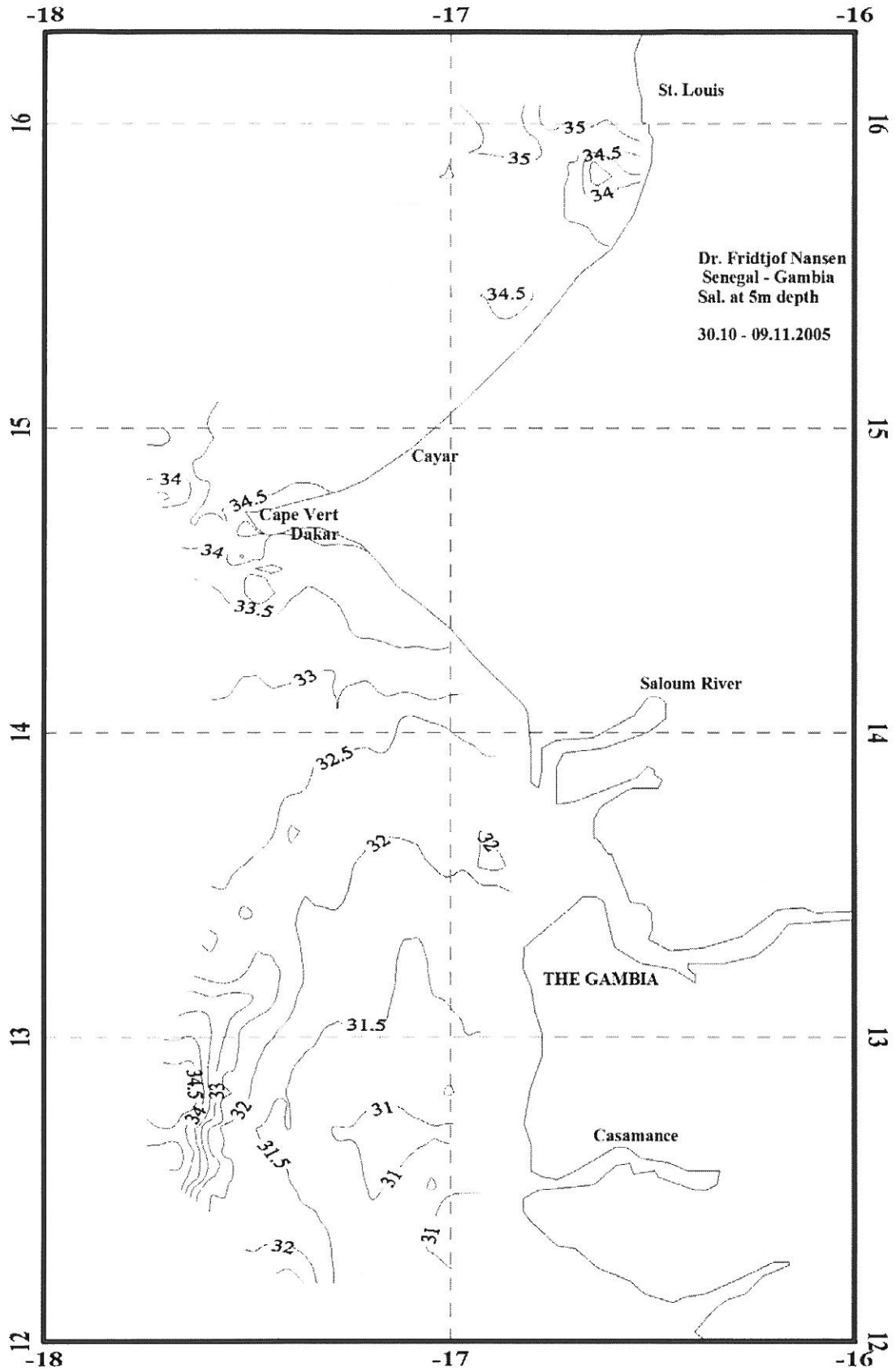


Figure 5. Sea surface salinity; Casamance to St. Louis.

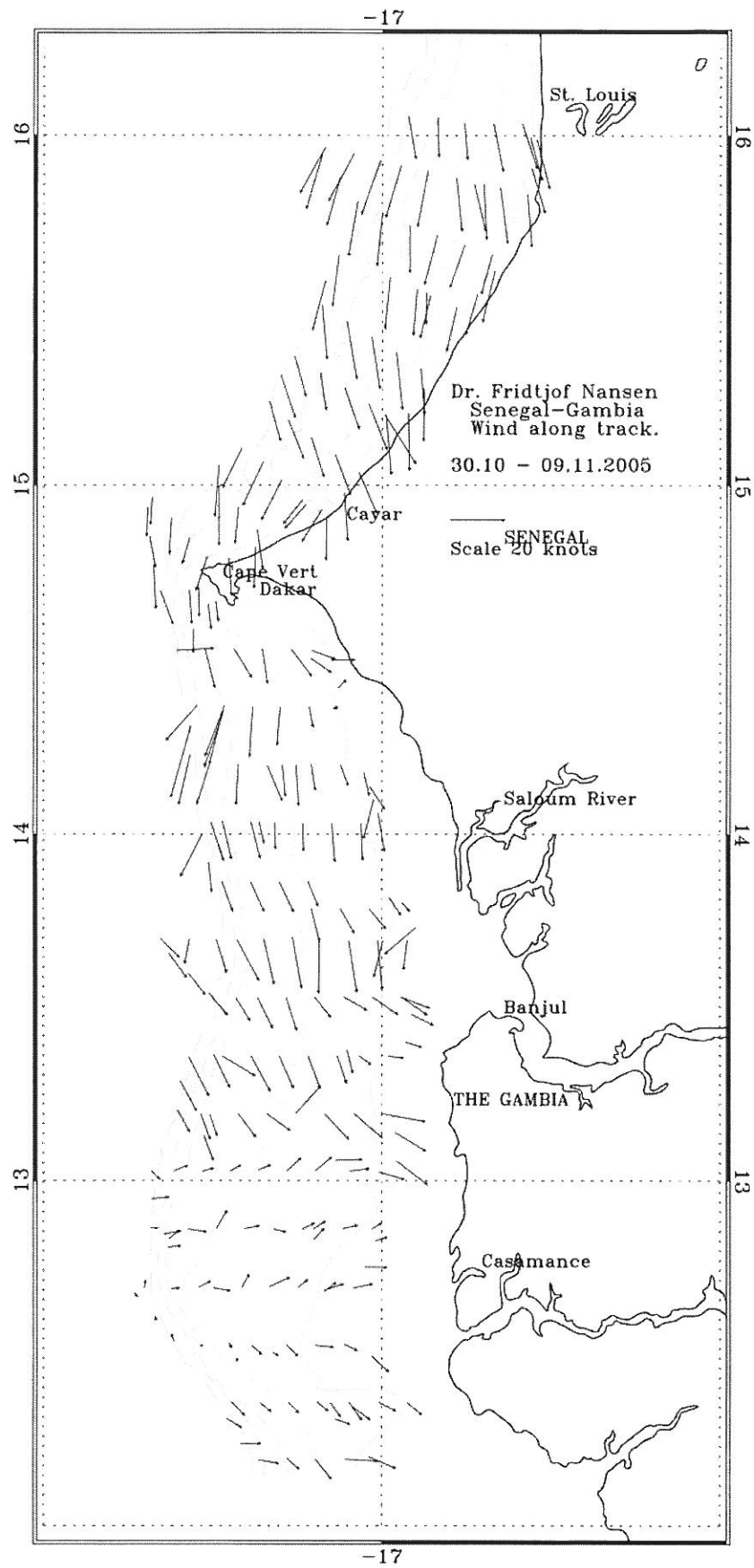


Figure 6. Wind speed and direction; Casamance to St. Louis.

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 7, Figure 8 and Figure 9.

The distribution of pelagic fish on the Casamance shelf reflected the low salinity shelf water. The shelf was abundant with clupeid fish also this year. *Ilisha africana* was particularly frequent in trawl catches close to the coast on the southern part of the shelf, anchovy, *Engraulis encrasicolus* were also found in one trawl catch in the same area. However, abundance estimates were only calculated for the sardinella species.

The distribution of sardinella was mainly inshore of 20 m depth in the southern part of Casamance, extending further offshore towards the 50 m isobath further north on the shelf. Dense concentrations were found around the 20 m isobath. A break in the sardinella concentrations was found in the southern part of the survey area, and there was no continuity in registration into Guinea Bissau. Figure 7. The region was dominated by *S. maderensis*, and *Sardinella aurita* only contributed approximately 9% to the biomass.

Two modal peaks of *Sardinella aurita* were found in the area, one at 24 cm, and one at 27 cm (total length) while the modal size of *S. maderensis* was 23 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 220 thousand tons, Table 3. Of this 19 thousand tons were *S. aurita*, while 201 thousand tons were *S. maderensis*. Last year the total biomass of sardinellas in the area was estimated to be 366 thousand tons, of this 32% were *S. aurita*.

Like the two previous years, no *Trachurus trecae* were found in the Casamance area. *Decapterus rhonchus* were found in low concentrations on the shelf break and inside of the 20 m isobath in the northern part of the Casamance area. The biomass of *Decapterus rhonchus* was 3.3 tons, and the average length in the area 28 cm.

Other pelagic fish (P2) were covering large parts of the shelf, similar to what is experienced most years. In general both carangids, other than horse mackerel and *Decapterus rhonchus*, scombrids, hairtails and barracudas were found in the area,

Table 4. The most frequently found species in the catches were *Chloroscombrus chrysurus*, *Alectis alexandrinus*, *Trichiurus Lepturus*, *Sphyraena guachancho* and *Scomberomorus tritor*. The species were well mixed with the sardinellas where their distribution overlapped, Figure 9. The estimated biomass of this group of fish was 59 thousand tons compared with 58000 tonnes last year.

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

<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerel	Carangids etc.
201	19	3.	59

Table 4. Catch by stations sorted by groups (in kg/hour)

Station	Fishing Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
2368	0	0.4	0.1	1.9	0.6	12.6	11.3	27
2369	27	66.6	9.2	3.4	5.1	18.2	321.1	424
2370	27	383.5	302.1	5.2	37.3	8.4	1118.9	1855
2371	17	54.6	340.1	4.1	19.7	1.4	385.6	805
2372	15	21.6	52.3	1.9	12.0	2.8	448.7	539
2373	25	50.3	15.1	0	3.1	2.3	624.3	695
2374	10	2.9	225.3	10.4	0	39.7	131.0	409
2375	0	-	-	-	-	-	-	No Catch
2376	19	161.4	40.0	0.8	7.9	0.6	773.7	984
2377	16	44.9	116.5	1.4	8.2	4.8	143.8	320
2378	18	160.6	428.6	7.3	16.4	10.1	143.8	767
2379	10	-	-	-	-	-	-	No Catch
2380	79	0	7.7	0	0	0	69.1	77
2381	10	30.4	8.0	0	0	0.5	3.2	42
Mean	19.5	81.4	128.7	3.0	9.2	8.4	347.9	579
% Catch		14.1	22.2	0.5	1.6	1.5	60.1	100

3.3 The Gambian shelf

The distribution of sardinellas from the Casamance area continued into the Gambian waters with dense to very dense concentrations from 15-30 m bottom depth, especially in the northern part of the survey area, and scattered concentrations offshore between 50 and 100 m isobath. Figure 4. Both species of sardinella was found across the whole distribution area, with no clear depth separation between the species, but with *S. maderensis*, dominating in biomass by 72%. The total estimate of sardinellas in the Gambian waters during the survey was 261 thousand tons, Table 5. This comprised of 188 thousand tons of *S. maderensis* and 73 thousand tons of *S. aurita*. Last year a total of 128 thousand tons sardinella were found in this region, and 16% of this were *S. aurita*. The modal length of *S. maderensis* was 24 cm while catches of *S. aurita* in the area showed three modal peaks at 21 cm, 24 cm and 27 cm. The estimated numbers and biomass by length-groups can be found in Annex IV.

Trachurus trecae was found on the shelf break at 100 m depth extending inshore across the 50 m isobath. The distribution area continues with the distribution of *Decapterus rhonchus* at the Casamance shelf, Figure 8. The densities were low with an estimated biomass of 0.8 thousand tons of *Trachurus trecae*, and 3.6 thousand tons of *Decapterus rhonchus* Table 5. The size distribution of horse mackerel in the area consisted of one modal peaks at 23 cm. Last year 29 thousand tons were found in this area.

Carangids and associated species were found in low to medium density widely distributed over the whole Gambian shelf, Figure 9. The catches of this group were dominated by *Chloroscombrus chrysurus*. The biomass was estimated at 55.8 thousand tons.

Table 5. The Gambia. Biomass estimates of pelagic fish, thousand tons.

<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerel	Carangids etc.
188	73	4	19

Table 6. Catch by stations sorted by groups (in kg/hour)

Station	Fishing Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	Total
2382	10	290.4	439.3	0	0	0	107.1	837
2383	95	0	0	0	0	0	7.86	8
2384	110	0	29.47	0	0	0	1154.53	1184
2385	32	3.2	460.38	0	0	20.08	669.86	1154
2386	5	1061.5	846.17	0.81	4.8	3.39	83.67	2000
2387	10	175.51	70.03	0	4.3	5.75	34	290
2388	5	-	-	-	-	-	-	No Catch
2389	5	17.57	17.78	0	0	1.7	21.2	58
2390	25	41.14	8.16	0	0	0.42	71.24	121
Mean		198.7	233.9	0.1	1.1	3.9	268.7	706
% Catch		28.1	33.1	0.0	0.2	0.6	38.0	100

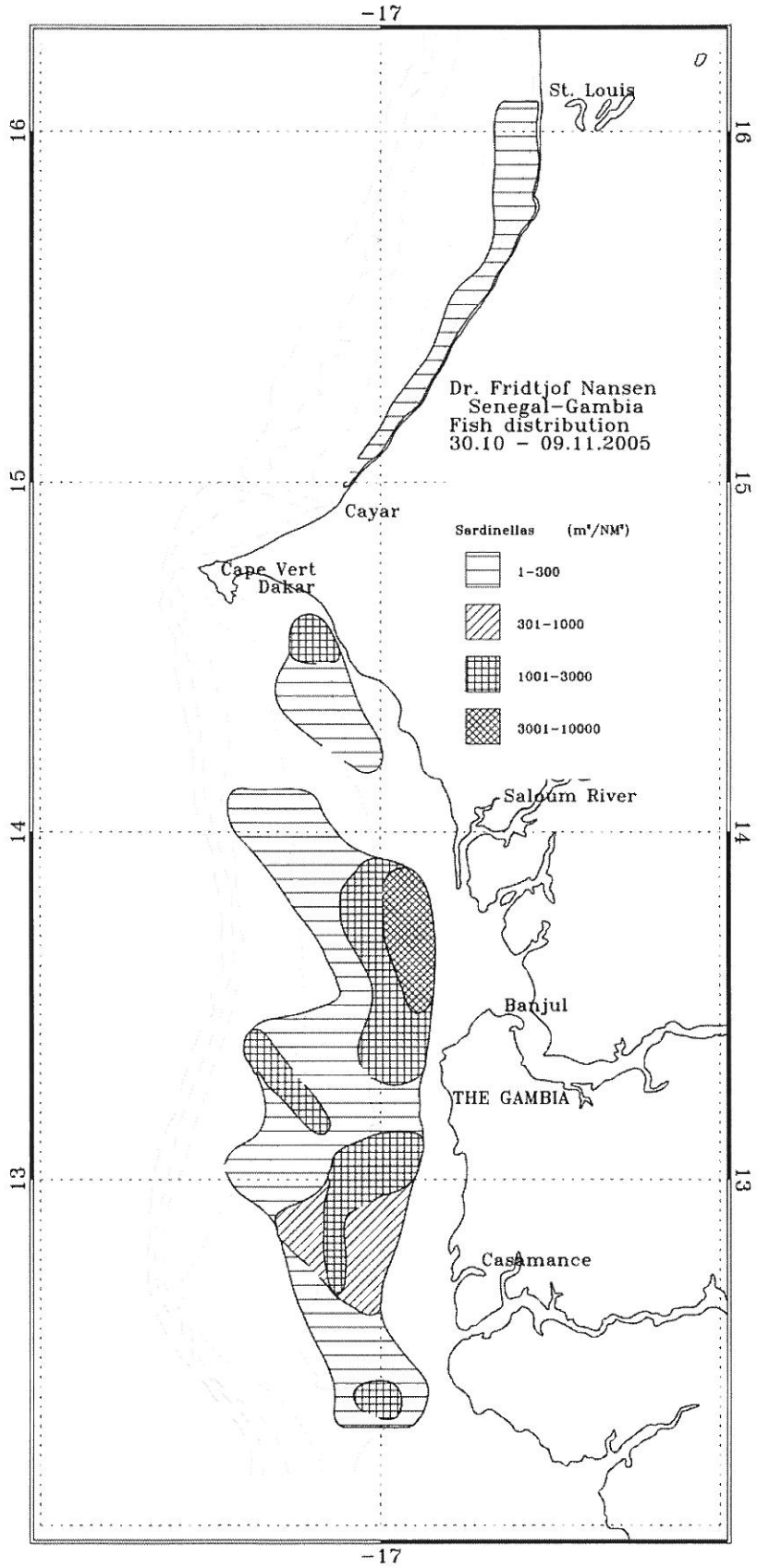


Figure 7. Distribution of sardinellas; Casamance to St. Louis.

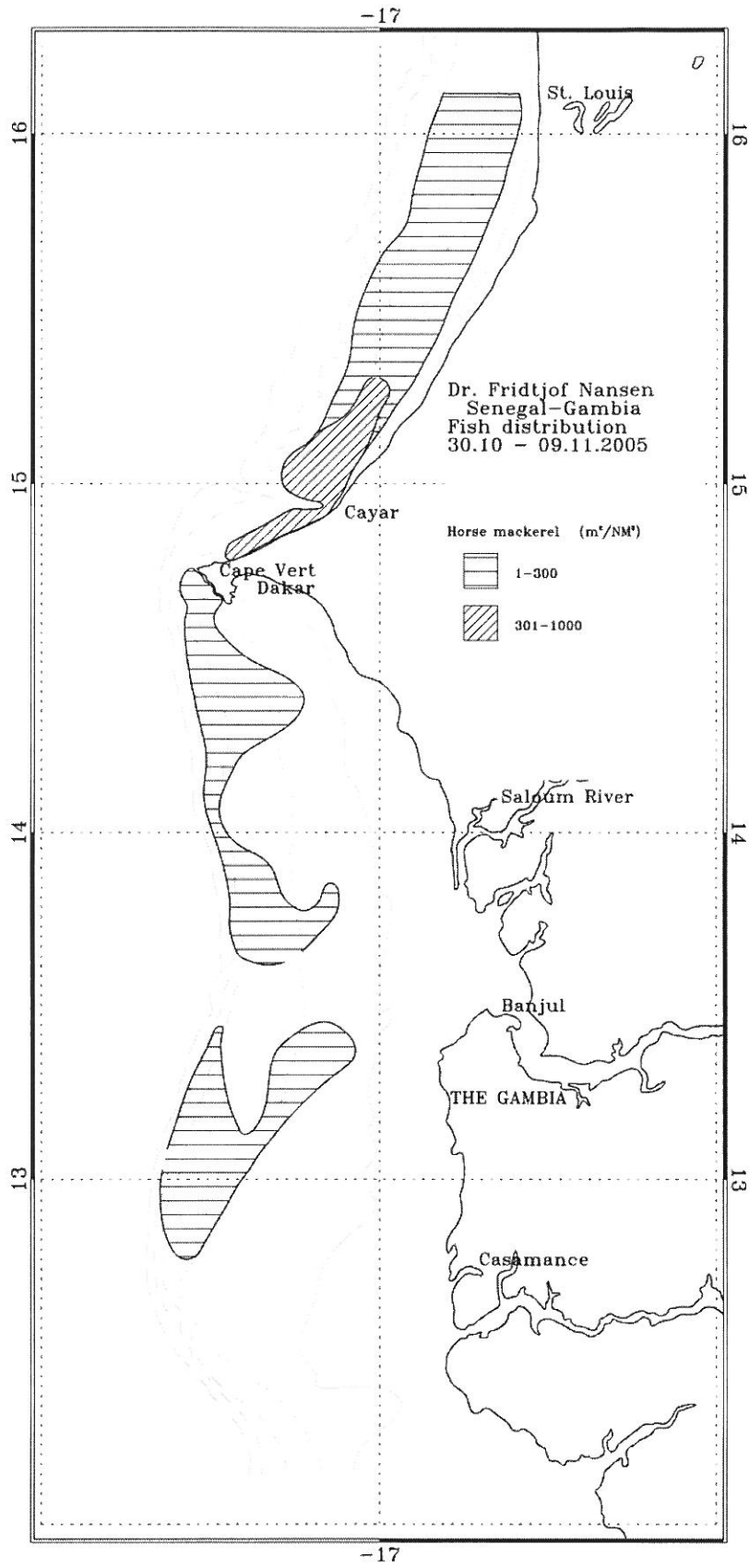


Figure 8. Distribution of *Trachurus trecae*; Casamance to St. Louis.

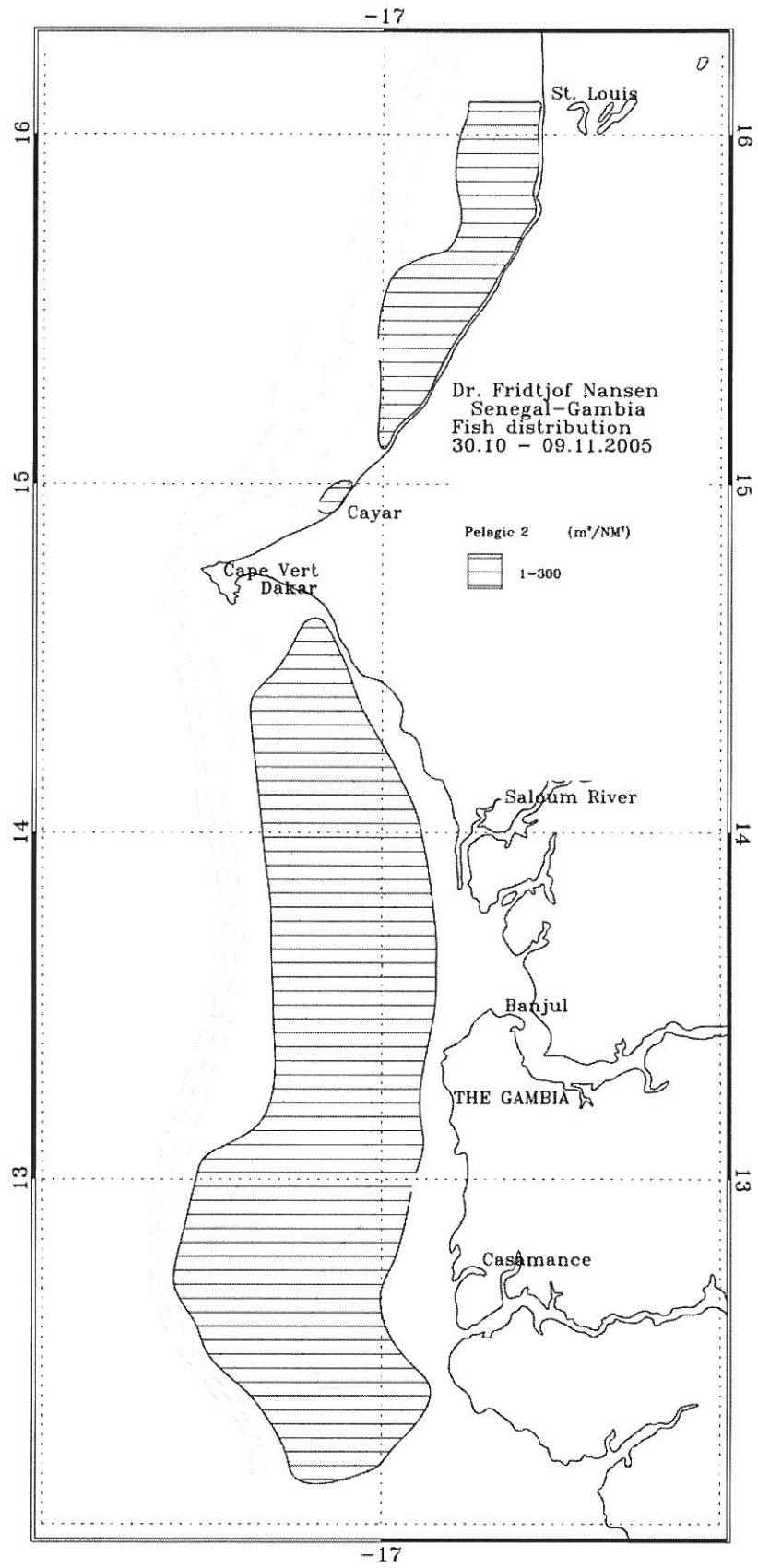


Figure 9. Distribution of carangids and associated species; Casamance to St. Louis

3.4 The Gambian border - Cape Vert

Sardinella was distributed in two areas between The Gambian border and Cape Vert. Very dense concentrations were found inshore around the 20 m isobath extending across the border from The Gambia to north of the Saloum River entrance. Scattered concentrations were found offshore to 80 m depth, and northwards from this area. Another distribution area with scattered sardinella was found north of this with dense concentrations in the northernmost part of the region at around 20 m depth, Figure 7. Table 7 shows the biomass estimates of the two sardinella species, *S. aurita* was the most dominant contributing 56% of the total biomass of 339 thousand tons. *S. maderensis* was estimated at 148 thousand tons while 191 thousand tons of *S. aurita* was found. Last year 262 thousand tons of Sardinella was found in the region, of this *S. maderensis* contributed with 59%.

Pooled length compositions of samples from *S. maderensis* showed a modal peaks at 24 cm, while the *S. aurita* had modal peaks at 21 cm, 24 cm and 27 cm. Estimated number and biomass by length-groups are found in Annex IV.

Trachurus trecae was found from the Gambian border to Cape Vert around the 100 m isobath extending inshore to <50 m bottom depth and mixing with *Decapterus rhonchus* in its distribution area. The distribution is similar to what has previously been observed at this time of the year, but the density was lower than usual, Figure 8. The total biomass was estimated at 12 thousand tons, of this *Trachurus trecae* contributed with 7 thousand tonnes and *Decapterus rhonchus* with 6 thousand tons, compared with 33 thousand tonnes of horse mackerels last year. The distribution of *Trachurus trecae* showed four modal peaks in the area, at 11, 18, 24 and 27 cm, while the *Decapterus rhonchus* showed two modal peaks, at 23 and 28 cm.

As during previous years 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 from this group in the area were *Chloroscombrus chrysurus*, *Scomber japonicus* and *Sphyraena guachancho*, Figure 6 and Table 8. The carangids and associated pelagic fish species were very scattered in the region, and the biomass was estimated at about 26 thousand tonnes, Table 7, compared to the 79 thousand tons estimated last year.

Table 7. 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.
148	191	12	26

Table 8. Catch by stations sorted by groups (in kg/hour)

Station	Fishing							Total
	Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other	
2391	21	37.2	31.08	0	0	23.75	76.2	168
2392	16	59.46	87.18	0	0	0	542.64	689
2393	40	2839.76	30.53	266.43	0	0	0	3137
2394	10	0	164.8	1.02	0	5	115.18	286
2395	28	419.76	1772.04	0	0	15.46	72.72	2280
2396	105	0	69.09	0	0	0	163.2	232
2397	10	1.8	0	0	0	0	0	2
2398	22	9.67	30.71	0	0	1.84	78.44	121
Mean	31.5	421.0	273.2	33.4	0.0	5.8	131.0	864
% Catch		48.7	31.6	3.9	0.0	0.7	15.2	100

3.5 Cape Vert - St. Louis

Sardinellas were very scattered in the region between Cape Vert and St. Louis. Small concentration of *S. maderensis* only were found in a narrow band along the 20 m isobath, Figure 7. No *S. aurita* was found in the region. The modal length of *S. maderensis* in the area was 26 cm and the biomass estimate was 8 thousand tons, Table 9. Last year 25 thousand tons of *S. aurita* was found in this region together with 39 thousand tons of *S. maderensis*.

Scattered concentrations of *Trachurus trecae* were found in one continuous region from south of the Cayar canyon to St. Louis, with slightly higher concentrations in the southern part of the area around Cayar. The distribution extended from approximately 100 m depth to between 50 and 20 m bottom depth. *Decapterus rhonchus* was found mixed with the *Trachurus trecae* in the same region but with a more shallow distribution. *Trachurus trecae* in the region had four modal peaks, at 11 cm, 22 cm, 26 cm and 31 cm. No length frequencies from *Decapterus rhonchus* were obtained from the area so the biomass for this species were based on the average length from the number and weight in the trawl catches. The biomass of *Trachurus trecae* was thus estimated to be 73 thousand tonnes, while *D. rhonchus* was found to be 24 thousand tons. Last year the biomass of horse mackerels in this area were estimated

to be 15 thousand tonnes. The increase may possibly be attributed to local changes in distribution pattern and shift of fish northwards.

A low density region of Carangids and associated pelagic fish species were found from North of the Cayar Canyon at 20 m depth, extending offshore across the 50 m isobath further north. The dominant species in the catches were *Chloroscombrus chrysurus* and *Trichiurus lepturus* and the biomass was estimated to be 11 thousand tons compared with 20 thousand tons in 2004.

Table 9. Cape Vert to St. Louis. Biomass estimates of pelagic fish, thousand tons.

<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerels	Carangids etc.
8	-	97	11

Table 10. Catch by stations sorted by groups (in kg/hour)

Station	Fishing Depth	Clupeids	Carangids	Scombrids	Hairtails	Barracuda	Other	Total
2399	0	0	10.02	0	0	0	8.1	18
2400	75	-	-	-	-	-	-	No Catch
2401	30	0.2	464.92	1.4	0	1.92	168.64	637
2402	33	0	443.02	0	6.9	4	424.02	878
2403	33	0.36	283.26	0	0.42	0	3.26	287
2404	10	63.22	309.6	8.74	54.04	2.01	263.18	701
2405	30	1.97	67	0	17.42	0.14	115	202
Mean	30.1	11.0	263.0	1.7	13.1	1.3	173.4	464
% Catch		2.4	56.7	0.4	2.8	0.3	37.4	100

3.6 Parallel trawl survey

The parallel trawl survey was conducted successfully. During the whole survey of Senegal the Itaf Deme followed the course track of "Dr. Fridtjof Nansen". As part of the parallel trawl survey several rounds of intercalibration and comparative trawl hauls between the vessels were conducted successfully. The data from the parallel survey will be analysed later and presented in a separate report. Due to a problem with the hydraulic system onboard Dr. Fridtjof Nansen it was not possible to conduct parallel trawling on the shelf outside Dakar as was planned at the beginning of the survey.

CHAPTER 4 OVERVIEW AND SUMMARY OF RESULTS

The survey was conducted successfully from 30th October to 9th November, covering a course track of approximately 1550 NM, including the steaming to and from the survey area to Dakar. A total of 38 fishing stations and 48 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. The situation was similar to what was observed last year, but the low shelf salinity was even more pronounced due to heavy rain in the region.

The main concentration area for sardinella was the Casamance shelf and The Gambian coast, 83% of all the sardinella in the survey area was found in this region. Two other concentration areas were found north of this, between Saloum River and Dakar, and in a narrow band along the coast between Cayar and St. Louis. The main concentrations in all three areas were found along the 20 m isobath. The total biomass was estimated to be 828 thousand tons, and 33% of this was *S. aurita*, Figure 7. As usual *S. aurita* was more predominant in deeper and more saline waters than *S. maderensis*. 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.

Horse mackerels including the false scad *Decapterus rhonchus* were found in two areas along the shelf break at 100 m depth between the southern border of The Gambia and Cape Vert. The distribution extended inshore beyond the 50 m isobath in some parts of the southern shelf. The main distribution area of the horse mackerel was the northern shelf of Senegal between the Cayar Canyon and St. Louis, Figure 8. *Trachurus trecae* dominated along the shelf edge in the whole distribution area, while *Decapterus rhonchus* became more abundant inshore, and particularly on the southern shelf. The total estimate of *Trachurus trecae* was 81 thousand tonnes, or 69% of the total, while the biomass of the *Decapterus rhonchus* was estimated to be 36 thousand tons. 90% of the *Trachurus trecae* was found north of Cape Vert. A larger proportion of *Decapterus rhonchus* was found on the southern shelf, but 67% of the estimate biomass was still found north of Cape Vert.

The ‘P2’s’, other carangids and associated species, were distributed over most of the shelf in low densities, Figure 9. The main species in the catches of this group consisted of *Chloroscombrus chrysurus*, *Sphyraena guachancho*, *Trichiurus Lepturus* and *Selene dorsalis*. The total biomass of this group was estimated at approximately 115 thousand tons. The species in this group was mixed with dense concentrations of plankton, other pelagic fish species and in particular the *Brachydeuterus auritus*. Thus, division on acoustic energy on different targets in these groups must be done with care.

An overview of the acoustic estimates of biomass of the main groups of pelagic fish is shown in Table 11, and the geographical distribution and abundance of main species can be found in Figure 10. The total biomass of sardinellas was thus 828 thousand tonnes, horse mackerels 116 thousand tons and of carangids and associated species 115 thousand tons.

Table 11. Summary of biomass estimates of pelagic fish, Senegal and the Gambia. Values in tonnes.

	<i>S. maderensis</i>	<i>S. aurita</i>	Horse mackerel	Carangids etc.
St. Louis-Cape Vert	8	-	97	11
Cape Vert - the Gambia	148	191	12	26
The Gambia	188	73	4	19
Casamance	201	19	3.	59
Total	545	283	116	115

Table 12 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. The biomass estimate of sardinella from this year is almost exactly the same as last year, and fits well within the time series of increasing sardinella abundance since 1996. The species distribution and species composition of the two species were also similar to last year. The estimate of *Trachurus trecae* from this year, 81 thousand tons, is only slightly higher than the 76 thousand tons estimated last year. *Decapterus rhonchus* was included in the P2 estimate estimated last year, but due to requests from the region it has now been separated again. The biomass estimate of this species was 36 thousand tons. The total estimate of carangids and associated species was estimated at 115 thousand tons. This is much lower than the 212 thousand tons found during the October – November survey last year, and is possibly an underestimate of the biomass of this group due to the frequent mix of fish from this group with large concentrations of *Brachydeuterus auritus* and plankton in the survey area.

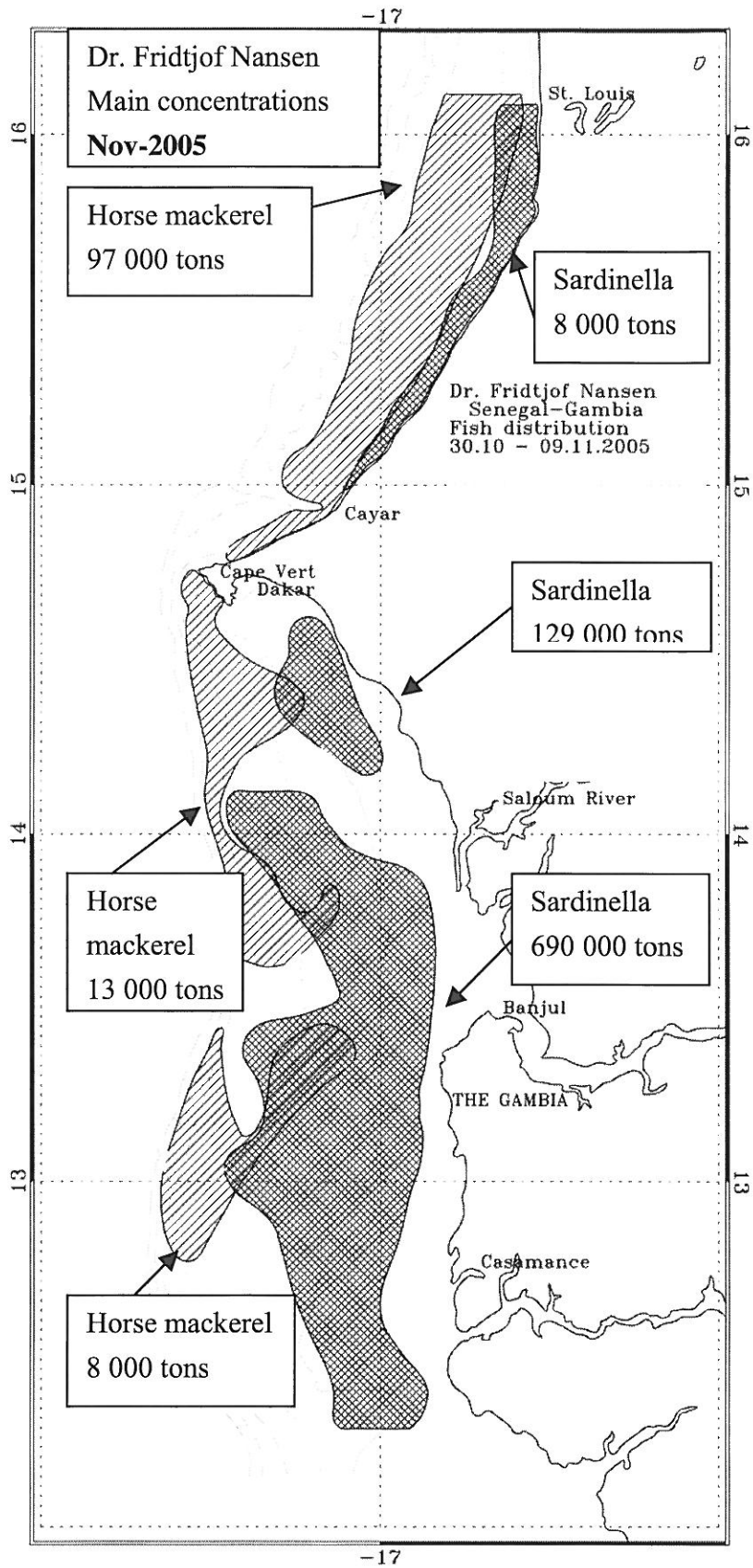


Figure 10. Major pelagic fish concentrations with estimated biomass (tonnes), Senegal and The Gambia.

Table 12. 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

* *Trachurus trecae* and other carangids

** Not available

References

Toresen, R., Gjøsæter, 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.

RÉSUMÉ

La campagne a été conduite avec succès durant la période du 30 octobre au 9 novembre selon un parcours d'une longueur approximative de 1550 milles nautiques incluant les temps de route à partir de/et vers Dakar. Au total, 48 stations de pêche de contrôle ont été réalisées.

Les données hydrographiques révèlent une stabilité de la température des eaux de surface autour des 30-50 m de profondeur, pour toute la zone au sud de Dakar. Les eaux de surface en Casamance et en Gambie se caractérisent par une température relativement élevée et une faible salinité. La côte du Cap-Vert au Nord de St-Louis a été plus chaude que d'habitude à la même époque et l'influence des eaux froides du nord n'apparaît qu'à partir de St-Louis. Les eaux étaient dans l'ensemble bien oxygénées sur toute l'étendue couverte. La situation en présence est similaire à celle observée l'année dernière, mais la faiblesse de la salinité est plus prononcée due aux fortes pluies enregistrées cette année,

Les sardinelles ont été rencontrées principalement dans sur la côte en Casamance et en Gambie, ou 83% du total des sardinelles durant cette campagne a été trouvée. Deux autres zones de concentration ont été rencontrées au nord de la Gambie, entre le fleuve Saloum et Dakar, et sur une étroite bande le long de la côte entre Cayar et St Louis. L'essentiel des concentrations sur les trois principales zones ont été trouvées le long de l'isobathe des 20 mètres. La biomasse totale a été estimée à 828 milles tonnes, dont 33% de *S. aurita*. Comme très souvent observé, la *S. aurita* a été en général rencontrée dans les eaux plus profondes et plus salées que la *S. maderensis*. La répartition de la biomasse en classes de tailles et espèces dépendent des échantillons représentatifs des deux espèces lors des opérations de pêche. Du moment que la sardinelle présente un fort taux d'évitement à l'approche du chalut, ces résultats doivent être interprétés avec précautions.

Les chinchards, aussi bien le noir que le jaune *Decapterus rhonchus*, ont été rencontrés essentiellement dans deux zones longeant la limite du plateau continentale sur l'isobathe des 100 mètres, l'une au sud de la Gambie et l'autre sur la Petite Côte. Leur distribution s'étend vers la côte jusqu'à l'isobathe des 50 mètres sur quelques parties de la côte. La principale zone de concentration a été la côte Nord entre le canyon de Cayar et St. Louis, Figure 8. Le *Trachurus trecae* a été plus abondant au large dans toute la région, tandis que le *Decapterus rhonchus* est plutôt abondant sur la côte, en particulier sur la côte sud.. La biomasse totale des *Trachurus trecae* est évaluée à 81 milles tonnes, soit 69% de la biomasse totale, tandis que la biomasse des *Decapterus rhonchus* est évaluée à 36 milles tonnes.. 90% des *Trachurus trecae* ont été trouvés au nord de Dakar. Une proportion plus importante de *Decapterus rhonchus* a été trouvée sur la côte sud , mais 67% de la biomasse estimée reste concentrée au nord de Dakar.

Les autres carangidés et espèces associées sont régulièrement distribués sur toute la côte avec des densités relativement faibles, figure 9. Les espèces principalement capturées ont été *Chloroscombrus chrysurus*, *Sphyraena guachancho*, *Trichiurus Lepturus* and *Selene dorsalis*. La biomasse totale est estimée à 115 milles tonnes. Les espèces dans ce groupe ont été mélangées avec du plancton très dense, et avec d'autres espèces pélagiques en particulier le *Brachydeuterus auritus*. Par conséquent, l'allocation des valeurs d'intégration aux différents groupes doit être entreprise avec beaucoup d'attention.

Le tableau 11 ci-dessous résume la biomasse pour chaque groupe de pélagiques ; la répartition géographique et l'abondance de ces espèces sont présentées en figure 10. Ainsi, la biomasse totale des sardinelles s'élève à 818 milles tonnes, celles de chinchards à 116 milles tonnes et les carangidés et espèces associées sont estimées à 115 milles tonnes

Le tableau 12 récapitule les biomasses totales estimées depuis 1981 par le N/O Dr Fridtjof Nansen; il s'agit de l'ensemble des sardinelles, chinchards, carangidés et associées sur les cotes sénégalaises

Il est maintenant bien connu de l'existence dans la sous région de flux migratoires à grande échelle de poissons pélagiques entre le Sahara de l'Ouest et la Guinée Bissau, et le repli des sardinelles vers le Sénégal en période chaude pour assurer la reproduction. La biomasse estimée pour les sardinelles cette campagne est presque identique à celle trouvée l'année dernière à la même période, et s'inscrit bien dans la série ascendante des biomasses trouvées pour les sardinelles depuis 1996. La distribution et la composition des espèces pour les deux sardinelles sont également similaires à celles de l'année dernière. Le *Decapterus rhonchus* a été inclus dans les P2 dans les estimations de l'année dernière, mais sur demande des scientifiques de la sous région, il a été séparé à nouveau . La biomasse estimée pour cette espèce a été de 36 milles tonnes, Les carangidés et autres espèces associées ont été estimés à 115 milles tonnes. Ceci est nettement inférieur aux 212 milles tonnes trouvées en octobre-novembre de l'année dernière, et pourrait être due à une sous-estimation de ce groupe compte tenu du mélange fréquent de ces espèces avec les fortes concentrations de *Brachydeuterus auritus* et de plancton dans la zone.

Annex I Records of fishing stations

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2368
 DATE: 1/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1212
 start stop duration Long W 1717
 TIME :03:47:04 04:17:10 30 (min) Purpose code: 1
 LOG :4448.23 4450.11 1.86 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 95 123 Validity code:
 Towing dir: 269° Wire out: 150 m Speed: 40 kn*10
 Sorted: Kg Total catch: 13.53 CATCH/HOUR: 27.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sphyraena guachancho	12.64	44	46.71	3903
Saurida brasiliensis	4.80	784	17.74	
Bregmaceros sp.	3.56	1236	13.16	
Euthynnus alletteratus	1.94	4	7.17	
Rhizoprionodon acutus	1.82	2	6.73	
Echeneis naucrates	0.74	4	2.73	
Trichiurus lepturus	0.64	78	2.37	
Engraulis encrasicolus	0.38	94	1.40	3904
Priacanthus arenatus	0.18	34	0.67	
Alloteuthis africana	0.14	42	0.52	
NOMEIDAE	0.08	18	0.30	
Decapterus punctatus	0.08	2	0.30	
Selene dorsalis, juveniles	0.06	16	0.22	
Total	27.06		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2369
 DATE: 1/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1221
 start stop duration Long W 1709
 TIME :08:41:35 09:12:07 31 (min) Purpose code: 1
 LOG :4485.68 4487.46 1.77 Area code : 4
 FDEPTH: 25 29 GearCond.code:
 BDEPTH: 25 29 Validity code:
 Towing dir: 157° Wire out: 155 m Speed: 32 kn*10
 Sorted: 35 Kg Total catch: 219.93 CATCH/HOUR: 425.67

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	104.61	209	24.58	
Brachydeuterus auritus	97.90	1376	23.00	
Ilisha africana	66.29	15006	15.57	
Rhizoprionodon acutus	26.32	6	6.18	
Pomadasys jubelini	25.01	39	5.88	3906
Arius parkii	24.00	35	5.64	
Galeoides decadactylus	19.41	157	4.56	3907
Sphyraena guachancho	18.15	45	4.26	3905
Eucinostomus melanopterus	7.66	70	1.80	
Alectis alexandrinus	5.26	8	1.24	
Arius laticutatus	5.13	4	1.21	
Trichiurus lepturus	5.05	792	1.19	
Callinectes pallidus	4.61	15	1.08	
Scomberomorus tritor	3.41	6	0.80	
Pomadasys peroteti	2.90	6	0.68	
Selene dorsalis	1.66	174	0.39	
Chloroscombrus chrysurus	1.39	17	0.33	
Drepane africana	1.05	17	0.25	
Caranx senegallus	0.91	2	0.21	
Albula vulpes	0.87	2	0.20	
Penaeus notialis	0.54	25	0.13	
Lagocephalus lagocephalus	0.45	2	0.11	
Dasyatis margarita	0.43	2	0.10	
Sardinella maderensis	0.35	8	0.08	
Pteroscion peli	0.25	10	0.06	
Total	423.61		99.53	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2370
 DATE: 1/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1221
 start stop duration Long W 1705
 TIME :10:54:41 11:16:48 22 (min) Purpose code: 1
 LOG :4499.91 4501.25 1.33 Area code : 4
 FDEPTH: 26 28 GearCond.code:
 BDEPTH: 26 28 Validity code:
 Towing dir: 175° Wire out: 155 m Speed: 35 kn*10
 Sorted: 35 Kg Total catch: 680.28 CATCH/HOUR: 1855.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	426.98	8084	23.01	
Ilisha africana	383.45	38345	20.67	
Chloroscombrus chrysurus	269.45	3537	14.52	
Arius parkii	216.08	777	11.65	
Pteroscion peli	202.61	13835	10.92	
J E L L Y F I S H	109.34	259	5.89	
Pomadasys jubelini	67.31	90	3.63	3908
Trichiurus lepturus	37.31	3316	2.01	
Pseudotolithus senegalensis	33.27	155	1.79	
Selene dorsalis, juveniles	32.65	725	1.76	
Galeoides decadactylus	31.17	466	1.68	
Parapenaeopsis atlantica	16.58	6120	0.89	
Pentanemus quinquarius	15.55	52	0.84	
Sphyraena guachancho	8.40	22	0.45	
Scomberomorus tritor	5.15	8	0.28	
Total	1855.30		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2371
 DATE: 1/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1221
 start stop duration Long W 1654
 TIME :13:01:31 13:31:15 30 (min) Purpose code: 1
 LOG :4516.19 4517.88 1.69 Area code : 4
 FDEPTH: 16 18 GearCond.code:
 BDEPTH: 16 18 Validity code:
 Towing dir: 270° Wire out: 120 m Speed: 30 kn*10
 Sorted: 31 Kg Total catch: 402.71 CATCH/HOUR: 805.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	336.00	6552	41.72	
Arius parkii	54.72	2544	6.79	
Ilisha africana	52.16	2952	6.48	
Galeoides decadactylus	51.84	696	6.44	
Pseudotolithus senegalensis	36.24	912	4.50	
Sea urchins (strong spines)	35.28	3816	4.38	
Pteroscion peli	35.28	936	4.38	
J E L L Y F I S H	34.24	1200	4.25	
Synagrops microlepis	25.68	264	3.19	
Brachydeuterus auritus	24.72	432	3.07	
Rhinoptera marginata	20.36	18	2.53	
Trichiurus lepturus	19.68	912	2.44	
Dasyatis margarita	19.56	42	2.43	
Stromateus fiatola	11.28	48	1.40	
Pentanemus quinquarius	9.60	168	1.19	
Pseudotolithus typus	7.44	72	0.92	
Gymnura altavela	6.68	6	0.83	
Scomberomorus tritor	4.08	4	0.51	
Penaeus notialis	3.84	1440	0.48	
Caranx crysos	3.60	24	0.45	
Mustelus mustelus	3.32	6	0.41	
Pisodonophis semicinctus	2.84	16	0.35	
C R A B S	2.64	120	0.33	
Sardinella maderensis	2.48	30	0.31	3909
Sphyraena guachancho	1.38	6	0.17	
Selene dorsalis	0.48	24	0.06	
Total	805.42		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2372
 DATE: 1/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1231
 start stop duration Long W 1705
 TIME :15:57:52 16:27:39 30 (min) Purpose code: 1
 LOG :4530.93 4532.32 1.45 Area code : 4
 FDEPTH: 14 15 GearCond.code:
 BDEPTH: 14 15 Validity code:
 Towing dir: 270ø Wire out: 120 m Speed: 30 kn*10

Sorted: 24 Kg Total catch: 270.38 CATCH/HOUR: 540.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Arius parkii	150.72	320	27.87	
Pomadasys jubelini	102.32	134	18.92	3911
Brachydeuterus auritus	60.80	912	11.24	
Chloroscombrus chrysurus	50.88	848	9.41	
Galeoides decadactylus	32.00	256	5.92	
Pseudolithus senegalensis	28.40	86	5.25	3912
Pteroscion peli	23.84	416	4.41	
Pomadasys peroteti	16.16	32	2.99	3910
Ilisha africana	14.08	1200	2.60	
Trichiurus lepturus	12.00	368	2.22	
J E L L Y F I S H	9.28	80	1.72	
Penaeus notialis	7.52	1920	1.39	
Sardinella maderensis	7.52	64	1.39	
Dasyatis margarita	5.84	20	1.08	
Pisodonophis semicinctus	5.20	16	0.96	
Pentanemus quinquarius	3.20	64	0.59	
Sphyræna guachancho	2.82	8	0.52	
C R A B S	2.56	128	0.47	
Scomberomorus tritor	1.90	6	0.35	
Selene dorsalis	1.44	96	0.27	
Rhinoptera marginata	0.68	2	0.13	
Penaeus monodon	0.20	2	0.04	
Total	539.36		99.74	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2373
 DATE: 1/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1231
 start stop duration Long W 1720
 TIME :18:51:44 19:21:11 29 (min) Purpose code: 1
 LOG :4546.01 4547.40 1.38 Area code : 4
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 25 25 Validity code:
 Towing dir: 180ø Wire out: 140 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 335.93 CATCH/HOUR: 695.03

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Galeoides decadactylus	176.11	2714	25.34	
J E L L Y F I S H	127.12	513	18.29	
Brachydeuterus auritus	99.97	18803	14.38	
Eucinostomus melanopterus	65.21	877	9.38	
Ilisha africana	49.16	745	7.07	3913
Arius parkii	22.68	199	3.26	
Pomadasys jubelini	18.95	33	2.73	3914
Pteroscion peli	17.71	166	2.55	
Lethrinus atlanticus	14.59	2	2.10	
Pagrus caeruleostictus	14.28	46	2.05	
Alectis alexandrinus	10.92	21	1.57	
Chilomycterus reticulatus	9.89	2	1.42	
Drepane africana	8.32	37	1.20	
Pseudolithus senegalensis	8.21	21	1.18	3915
Dasyatis marmorata	6.00	8	0.86	
Acanthurus monroviae	4.74	6	0.68	
Cynoponticus ferox	4.30	19	0.62	
Fistularia tabacaria	4.06	8	0.58	
Chloroscombrus chrysurus	3.81	33	0.55	
Albula vulpes	3.10	6	0.45	
Trichiurus lepturus	3.08	12	0.44	
Sepia officinalis hierreda	2.73	6	0.39	
Sphyræna guachancho	2.30	8	0.33	
Pseudupeneus prayensis	2.15	21	0.31	
Rhizoprionodon acutus	1.84	2	0.26	
Zanobatus shoeneleini	1.49	2	0.21	
Lutjanus goreensis	1.47	2	0.21	
Lutjanus fulgens	1.43	8	0.21	
Chaetodon hoeferi	1.22	8	0.18	
Sardinella aurita	1.16	215	0.17	
Torpedo nobiliana	1.12	2	0.16	
Penaeus kerathurus	0.99	348	0.14	
Elops lacerta	0.93	2	0.13	
Plectorhinchus mediterraneus	0.91	4	0.13	
Uranoscopus polli	0.77	4	0.11	
Syacium micrurum	0.66	4	0.09	
Epinephelus goreensis	0.56	2	0.08	
Selene dorsalis juveniles	0.33	166	0.05	
Psettodes belcheri	0.33	2	0.05	
Parapenaeopsis atlantica	0.17	116	0.02	
Paronchelius stauchi	0.17	50	0.02	
Fistularia petimba	0.10	2	0.01	
Total	695.04		99.96	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2374
 DATE: 1/11/05 GEAR TYPE: FT No: 1 POSITION:Lat N 1230
 start stop duration Long W 1726
 TIME :20:42:30 21:11:05 29 (min) Purpose code: 1
 LOG :4556.64 4558.14 1.44 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 39 43 Validity code:
 Towing dir: 180ø Wire out: 140 m Speed: 32 kn*10

Sorted: Kg Total catch: 197.84 CATCH/HOUR: 409.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Alectis alexandrinus	184.14	395	44.99	3917
Sphyræna guachancho	39.68	261	9.69	
Brachydeuterus auritus	36.79	343	8.99	
Galeoides decadactylus	31.94	48	7.80	
Selene dorsalis	29.01	168	7.09	
Rhizoprionodon acutus	25.22	14	6.16	
Pomadasys jubelini	21.23	48	5.19	3916
Scomberomorus tritor	9.19	12	2.25	
Arius parkii	7.37	12	1.80	
Sphyrna couardi	6.97	4	1.70	
Trachinotus goreensis	4.59	10	1.12	
Selar crumenophthalmus	3.91	14	0.96	
Sardinella maderensis	2.94	14	0.72	
Caranx crysos	2.23	4	0.54	
Uraspis secunda	1.37	2	0.33	
Euthynnus alletteratus	1.24	2	0.30	
Stromateus fiatola	0.93	2	0.23	
Echeneis naucrates	0.58	4	0.14	
Total	409.33		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2375
 DATE: 2/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1241
 start stop duration Long W 1732
 TIME :03:44:57 04:05:22 20 (min) Purpose code: 1
 LOG :4598.09 4599.17 1.04 Area code : 4
 FDEPTH: 0 0 GearCond.code: 9
 BDEPTH: 45 43 Validity code: 9
 Towing dir: 90ø Wire out: 150 m Speed: 40 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2376
 DATE: 2/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1241
 start stop duration Long W 1710
 TIME :08:05:25 08:37:20 32 (min) Purpose code: 1
 LOG :4623.39 4625.12 1.71 Area code : 4
 FDEPTH: 19 19 GearCond.code: 9
 BDEPTH: 19 19 Validity code: 9
 Towing dir: 170ø Wire out: 150 m Speed: 32 kn*10

Sorted: 33 Kg Total catch: 525.00 CATCH/HOUR: 984.38

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 Arius parkii 259.35 3964 26.35
 Brachydeuterus auritus 251.48 5723 25.55
 Ilisha africana 155.14 29295 15.76
 Pomadasys jubelini 102.38 281 10.40 3918
 Galeoides decadactylus 55.13 315 5.60
 Pteroscion pelli 36.75 473 3.73
 Chloroscombrus chrysurus 35.70 499 3.63
 Pseudotolithus senegalensis 23.81 315 2.42
 Elops lacerta 13.13 53 1.33
 Dasyatis margarita 11.81 26 1.20
 Trichiurus lepturus 7.88 604 0.80
 Sepiella ornata 6.30 53 0.64
 Sardinella maderensis 6.30 53 0.64
 J E L L Y F I S H 4.20 26 0.43
 Stromateus fiatola 3.94 8 0.40
 Alectis alexandrinus 3.26 2 0.33
 Parapanaeopsis atlantica 2.89 1155 0.29
 Rhizoprionodon acutus 1.52 2 0.15
 Selene dorsalis, juveniles 1.05 26 0.11
 Scomberomorus tritor 0.81 2 0.08
 Sphyræna guachancho 0.58 2 0.06
 Sepia officinalis hierredda 0.56 2 0.06
 Cynoglossus monodi 0.26 26 0.03
 Penaeus monodon 0.17 2 0.02
 Total 984.40 100.01

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2377
 DATE: 2/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1242
 start stop duration Long W 1704
 TIME :10:10:53 10:40:17 29 (min) Purpose code: 1
 LOG :4635.12 4636.64 1.50 Area code : 4
 FDEPTH: 16 16 GearCond.code: 9
 BDEPTH: 16 16 Validity code: 9
 Towing dir: 12ø Wire out: 130 m Speed: 32 kn*10

Sorted: 32 Kg Total catch: 154.51 CATCH/HOUR: 319.68

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 Brachydeuterus auritus 121.99 1457 38.16 3920
 Chloroscombrus chrysurus 113.54 1630 35.52
 Ilisha africana 26.90 3724 8.41 3921
 Sardinella maderensis 18.04 149 5.64 3919
 Pomadasys jubelini 9.31 23 2.91 3922
 Trichiurus lepturus 8.23 97 2.57
 Arius parkii 5.65 33 1.77
 Sphyræna guachancho 4.84 14 1.51
 Galeoides decadactylus 2.81 8 0.88
 Ehippion guttifer 2.75 2 0.86
 Selene dorsalis 1.74 116 0.54
 Scomberomorus tritor 1.41 4 0.44
 Decapterus rhonchus 1.18 4 0.37
 Rhizoprionodon acutus 1.03 2 0.32
 Penaeus notialis 0.17 17 0.05
 Sepiella ornata 0.08 8 0.03
 Total 319.67 99.98

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2378
 DATE: 2/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1250
 start stop duration Long W 1701
 TIME :11:44:26 12:14:55 30 (min) Purpose code: 1
 LOG :4643.49 4645.15 1.64 Area code : 4
 FDEPTH: 18 18 GearCond.code: 9
 BDEPTH: 18 18 Validity code: 9
 Towing dir: 24ø Wire out: 150 m Speed: 40 kn*10
 Sorted: 34 Kg Total catch: 383.38 CATCH/HOUR: 766.76

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 Chloroscombrus chrysurus 422.28 8514 55.07 3925
 Sardinella maderensis 103.50 954 13.50 3924
 Brachydeuterus auritus 67.14 864 8.76
 Pomadasys peroteti 56.24 120 7.33 3927
 Sardinella aurita 55.80 378 7.28 3923
 Trichiurus lepturus 16.38 72 2.14
 Pomadasys jubelini 13.02 26 1.70 3926
 Sphyræna guachancho 10.12 22 1.32
 Scomberomorus tritor 7.30 10 0.95
 Rhizoprionodon acutus 5.52 2 0.72
 Decapterus rhonchus 3.38 12 0.44
 Alectis alexandrinus 2.94 4 0.38
 Pomadasys rogeri 1.88 2 0.25
 Ilisha africana 1.26 36 0.16
 Total 766.76 100.00

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2379
 DATE: 2/11/05 GEAR TYPE: PT No: 7 POSITION:Lat N 1251
 start stop duration Long W 1712
 TIME :14:15:29 14:45:15 30 (min) Purpose code: 1
 LOG :4661.62 4663.57 1.95 Area code : 4
 FDEPTH: 10 10 GearCond.code: 9
 BDEPTH: 27 25 Validity code: 9
 Towing dir: 180ø Wire out: 150 m Speed: 40 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2380
 DATE: 2/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1251
 start stop duration Long W 1738
 TIME :19:13:33 19:25:12 12 (min) Purpose code: 1
 LOG :4702.18 4702.83 0.64 Area code : 4
 FDEPTH: 80 78 GearCond.code:
 BDEPTH: 80 78 Validity code:
 Towing dir: 182ø Wire out: 250 m Speed: 32 kn*10

Sorted: Kg Total catch: 15.34 CATCH/HOUR: 76.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scorpaena angolensis	15.35	305	20.01	
Chelidonichthys gabonensis	11.85	270	15.45	
Decapterus rhonchus	7.65	45	9.97	3929
Liocarcinus corrugatus	6.85	1040	8.93	
Dicologlossa cuneata	6.25	80	8.15	
Pagellus bellottii	5.65	220	7.37	3928
Priacanthus arenatus	3.05	40	3.98	
Raja miraletus	3.00	10	3.91	
Sphoeroides marmoratus	2.50	55	3.26	
Sphoeroides pachgaster	2.30	20	3.00	
Citharus linguatula	2.05	75	2.67	
Ariomma bondi	1.65	45	2.15	
Saurida brasiliensis	1.65	290	2.15	
Arnoglossus imperialis	1.15	185	1.50	
Fistularia petimba	1.05	5	1.37	
Uranoscopus polli	1.05	15	1.37	
Sepia sp.	0.95	40	1.24	
Pentheroscion mbizi	0.75	5	0.98	
Trachinus armatus	0.65	15	0.85	
Microchirus variegatus	0.45	30	0.59	
Setarches guentheri	0.30	20	0.39	
Squilla mantis	0.30	5	0.39	
OPHIDIIDAE	0.25	20	0.33	
Total	76.70		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2381
 DATE: 2/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1302
 start stop duration Long W 1723
 TIME :23:23:22 23:53:14 30 (min) Purpose code: 1
 LOG :4737.41 4739.11 1.67 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 47 43 Validity code:
 Towing dir: 90ø Wire out: 140 m Speed: 32 kn*10

Sorted: Kg Total catch: 21.06 CATCH/HOUR: 42.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	10.44	280	72.27	3931
Decapterus rhonchus	4.52	18	10.73	3930
Brachydeuterus auritus	3.16	30	7.50	
Selar crumenophthalmus	1.32	4	3.13	
Caranx crysos	1.12	4	2.66	
Chloroscombrus chrysurus	0.62	4	1.47	
Sphyaena guachancho	0.48	2	1.14	
Alectis alexandrinus	0.36	2	0.85	
Decapterus punctatus	0.10	4	0.24	
Total	42.12		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2382
 DATE: 3/11/05 GEAR TYPE: PT No: 7 POSITION:Lat N 1304
 start stop duration Long W 1704
 TIME :02:14:44 02:34:29 20 (min) Purpose code: 1
 LOG :4758.57 4759.89 1.29 Area code : 5
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 23 25 Validity code:
 Towing dir: 270ø Wire out: 140 m Speed: 35 kn*10

Sorted: 23 Kg Total catch: 278.92 CATCH/HOUR: 836.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	438.48	3096	52.40	3933
Sardinella maderensis	274.32	3240	32.78	
Brachydeuterus auritus	94.32	1368	11.27	
Sardinella aurita	16.08	141	1.92	3932
Eucinostomus melanopterus	7.92	108	0.95	
Pomadasy jubelini	4.86	18	0.58	
Alectis alexandrinus	0.57	3	0.07	
Selene dorsalis	0.15	3	0.02	
Decapterus rhonchus juv	0.06	9	0.01	
Total	836.76		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2383
 DATE: 3/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1309
 start stop duration Long W 1732
 TIME :08:55:59 09:20:48 25 (min) Purpose code: 1
 LOG :4818.86 4820.23 1.36 Area code : 5
 FDEPTH: 93 97 GearCond.code: 4
 BDEPTH: 93 97 Validity code:
 Towing dir: 360ø Wire out: 300 m Speed: 32 kn*10

Sorted: Kg Total catch: 3.28 CATCH/HOUR: 7.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Fistularia petimba	3.89	14	49.43	
Pagellus bellottii	2.11	34	26.81	3934
Zeus faber	0.53	5	6.73	
Dentex angolensis	0.43	10	5.46	
Brachydeuterus auritus	0.24	2	3.05	
Illex coindetii	0.17	2	2.16	
Dentex congoensis	0.12	5	1.52	
Dicologlossa hexophthalma	0.12	2	1.52	
Arnoglossus imperialis	0.12	10	1.52	
Sepia officinalis hierredda	0.07	5	0.89	
Saurida brasiliensis	0.02	2	0.25	
Priacanthus arenatus	0.02	2	0.25	
Lepidotrigla carolae	0.02	2	0.25	
Total	7.86		99.84	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2384
 DATE: 3/11/05 GEAR TYPE: 00 No: POSITION:Lat N 1323
 start stop duration Long W 1730
 TIME :13:01:30 13:19:37 18 (min) Purpose code: 1
 LOG :4845.03 4845.97 0.93 Area code : 5
 FDEPTH: 110 109 GearCond.code:
 BDEPTH: 110 109 Validity code:
 Towing dir: 180ø Wire out: 350 m Speed: 30 kn*10

Sorted: 87 Kg Total catch: 355.08 CATCH/HOUR: 1183.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex angolensis	499.73	2853	42.22	3935
Boops boops	464.27	4427	39.23	3937
Dentex macrophthalmus	97.87	547	8.27	
Trachurus trecae	29.47	200	2.49	3936
Scorpaena scrofa	25.87	40	2.19	
Erythrocles monodi	23.07	93	1.95	
Plectorhinchus mediterraneus	18.33	3	1.55	
Zeus faber	8.93	27	0.75	
Aulopus cadenati	6.00	27	0.51	
Leptocharias smithii	4.73	3	0.40	
Capros aper	4.40	133	0.37	
Branchiostegus semifasciatus	0.53	3	0.04	
Anthias anthias	0.40	53	0.03	
Syacium micrurum	0.40	27	0.03	
Total	1184.00		100.03	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2385
 DATE: 3/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1322
 start stop duration Long W 1706
 TIME :16:57:50 17:27:53 30 (min) Purpose code: 1
 LOG :4873.59 4875.11 1.53 Area code : 5
 FDEPTH: 32 32 GearCond.code:
 BDEPTH: 32 32 Validity code:
 Towing dir: 180ø Wire out: 150 m Speed: 30 kn*10

Sorted: 86 Kg Total catch: 576.76 CATCH/HOUR: 1153.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	440.00	6090	38.14	3938
Chloroscombrus chrysurus	410.66	6000	35.60	3943
Pomadasys incisus	81.60	600	7.07	3942
Pagrus caeruleostictus	42.80	174	3.71	3939
Decapterus rhonchus	28.66	346	2.48	3941
Pomadasys jubelini	24.00	40	2.08	
Pseudupeneus prayensis	21.74	120	1.88	3940
Selene dorsalis	21.06	254	1.83	
Sphyræna guachancho	15.86	54	1.37	
Priacanthus arenatus	13.46	40	1.17	
Galeoides decadactylus	11.46	80	0.99	
Balistes punctatus	10.80	14	0.94	
Pagellus bellottii	4.94	26	0.43	
Plectorhinchus mediterraneus	4.66	26	0.40	
Eucinostomus melanopterus	4.40	40	0.38	
Sphyræna afra	4.22	2	0.37	
Sardinella aurita	3.20	26	0.28	
Paraconger notialis	2.40	14	0.21	
Epinephelus goreensis	2.40	14	0.21	
Sea cucumbers	2.26	14	0.20	
Syacium micrurum	1.74	14	0.15	
Serranus scriba	1.20	14	0.10	
Total	1153.52		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2386
 DATE: 3/11/05 GEAR TYPE: PT No: 7 POSITION:Lat N 1323
 start stop duration Long W 1656
 TIME :18:59:30 19:30:14 31 (min) Purpose code: 1
 LOG :4886.82 4888.70 1.87 Area code : 5
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 17 17 Validity code:
 Towing dir: 10ø Wire out: 150 m Speed: 33 kn*10

Sorted: 71 Kg Total catch: 1033.33 CATCH/HOUR: 1999.99

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	943.35	8026	47.17	3947
Chloroscombrus chrysurus	840.25	13246	42.01	3945
Sardinella aurita	94.01	701	4.70	3946
Brachydeuterus auritus	44.61	869	2.23	
Ilisha africana	23.85	1740	1.19	
Galeoides decadactylus	19.92	588	1.00	
Pomadasys jubelini	8.28	35	0.41	3944
Selene dorsalis	5.32	83	0.27	
Trichiurus lepturus	4.80	19	0.24	
Sepia officinalis hierredda	4.20	56	0.21	
Sphyræna guachancho	3.39	10	0.17	
Penaeus notialis	3.29	225	0.16	
Rhizoprionodon acutus	2.73	4	0.14	
Scomberomorus tritor	0.81	2	0.04	
Caranx hippos	0.56	27	0.03	
Arius parkii	0.54	2	0.03	
Ethmalosa fimbriata	0.29	2	0.01	
Drepane africana	0.08	2		
Alectis alexandrinus	0.04	2		
Callinectes pallidus	0.02	2		
Total	2000.34		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2387
 DATE: 3/11/05 GEAR TYPE: PT No: 7 POSITION:Lat N 1332
 start stop duration Long W 1657
 TIME :21:04:42 21:29:00 24 (min) Purpose code: 1
 LOG :4899.87 4901.27 1.38 Area code : 5
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 21 21 Validity code:
 Towing dir: 90ø Wire out: 150 m Speed: 32 kn*10

Sorted: 33 Kg Total catch: 115.82 CATCH/HOUR: 289.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	107.40	923	37.09	3950
Sardinella aurita	55.50	375	19.17	3949
Chloroscombrus chrysurus	42.00	758	14.51	3952
Brachydeuterus auritus	29.18	998	10.08	3948
Decapterus rhonchus	15.95	75	5.51	3951
Ilisha africana	11.93	450	4.12	
Sphyræna guachancho	5.75	33	1.99	
Trachinotus goreensis	5.38	15	1.86	
Trichiurus lepturus	4.30	15	1.49	
Selene dorsalis	3.60	60	1.24	
Alectis alexandrinus	3.10	23	1.07	
Galeoides decadactylus	1.73	45	0.60	
Pomadasys jubelini	1.08	5	0.37	
Ethmalosa fimbriata	0.68	3	0.23	
Arius latiscutatus	0.65	3	0.22	
Callinectes pallidus	0.60	5	0.21	
Penaeus notialis	0.48	23	0.17	
Hemiramphus brasiliensis	0.15	3	0.05	
Echeneis naucrates	0.13	3	0.04	
Total	289.59		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2388
 DATE: 3/11/05 GEAR TYPE: PT No: 7 POSITION:Lat N 1332
 start stop duration Long W 1711
 TIME :23:24:01 23:32:03 8 (min) Purpose code: 1
 LOG :4916.95 4917.35 0.37 Area code : 5
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 43 43 Validity code: 9
 Towing dir: 270ø Wire out: 150 m Speed: 32 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2389
 DATE: 4/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1332
 start stop duration Long W 1713
 TIME :23:58:04 00:28:36 31 (min) Purpose code: 1
 LOG :4918.90 4920.66 1.73 Area code : 5
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 49 54 Validity code:
 Towing dir: 270ø Wire out: 140 m Speed: 35 kn*10

Sorted: Kg Total catch: 30.09 CATCH/HOUR: 58.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	21.10	257	36.23	3955
Sardinella maderensis	15.60	126	26.79	3953
Selar crumenophthalmus	14.79	54	25.39	3956
Sardinella aurita	1.97	17	3.38	3954
Sphyræna guachancho	1.70	6	2.92	
Selene dorsalis	1.32	14	2.27	
Chloroscombrus chrysurus	1.32	17	2.27	
Trachinotus ovatus	0.35	2	0.60	
Echeneis naucrates	0.10	2	0.17	
Total	58.25		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2390
 DATE: 4/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1332
 start stop duration Long W 1726
 TIME :02:10:45 02:40:28 30 (min) Purpose code: 1
 LOG :4933.36 4935.24 1.88 Area code : 5
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 103 92 Validity code:
 Towing dir: 90ø Wire out: 140 m Speed: 35 kn*10

Sorted: Kg Total catch: 60.48 CATCH/HOUR: 120.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	39.80	374	32.90	3958
Brachydeuterus auritus	35.08	360	29.00	3957
MYCTOPHIDAE	30.40	14874	25.13	
Priacanthus arenatus	3.88	582	3.21	
Selene dorsalis	2.40	14	1.98	
Selar crumenophthalmus	1.74	8	1.44	
Ariomma bondi	1.72	118	1.42	
Decapterus rhonchus	1.64	8	1.36	
Caranx crysos	1.38	2	1.14	
Sardinella maderensis	1.34	10	1.11	
Trachurus trecae, juvenile	0.72	80	0.60	
Sphyræna guachancho	0.42	2	0.35	
Trachinotus ovatus	0.28	2	0.23	
Promethichthys prometheus	0.16	8	0.13	
Total		120.96	100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2391
 DATE: 4/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1342
 start stop duration Long W 1700
 TIME :11:26:02 11:44:33 19 (min) Purpose code: 1
 LOG :5002.06 5003.04 0.96 Area code : 4
 FDEPTH: 21 21 GearCond.code:
 BDEPTH: 21 21 Validity code:
 Towing dir: 90ø Wire out: 110 m Speed: 33 kn*10

Sorted: 21 Kg Total catch: 53.27 CATCH/HOUR: 168.22

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	35.43	291	21.06	3960
Chloroscombrus chrysurus	28.93	461	17.20	3961
Pagrus caeruleostictus	23.87	95	14.19	3962
Sphyræna afra	23.75	3	14.12	
Brachydeuterus auritus	20.27	221	12.05	3959
Galeoides decadactylus	7.20	51	4.28	
Raja miraletus	4.61	6	2.74	
Epinephelus aeneus	4.58	6	2.72	
Sepia officinalis hierredda	4.20	6	2.50	
Pomadasys incisus	4.11	25	2.44	
Pomadasys jubelini	2.72	6	1.62	
Selene dorsalis	2.15	19	1.28	
Acanthurus monroviae	2.02	6	1.20	
Sardinella aurita	1.77	6	1.05	
Pagellus bellottii	1.39	6	0.83	
Solea senegalensis	0.76	6	0.45	
Chaetodipterus goreensis	0.47	6	0.28	
Total		168.23	100.01	

D

R. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2392
 DATE: 4/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1349
 start stop duration Long W 1657
 TIME :14:06:33 14:16:20 10 (min) Purpose code: 1
 LOG :5020.22 5020.68 0.44 Area code : 4
 FDEPTH: 16 16 GearCond.code:
 BDEPTH: 16 16 Validity code:
 Towing dir: 150ø Wire out: 110 m Speed: 30 kn*10

Sorted: 24 Kg Total catch: 114.88 CATCH/HOUR: 689.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	446.40	5520	64.76	
Chloroscombrus chrysurus	79.92	2760	11.59	3965
Sardinella maderensis	56.04	462	8.13	3963
Pagrus caeruleostictus	37.74	240	5.48	3964
Pomadasys incisus	20.16	192	2.92	
Brachydeuterus auritus	15.12	168	2.19	
Eucinostomus melanopterus	9.36	168	1.36	
Elops lacerta	7.56	18	1.10	
Decapterus rhonchus	3.60	96	0.52	
Sardinella aurita	3.42	24	0.50	
Galeoides decadactylus	3.12	72	0.45	
Alectis alexandrinus	3.12	12	0.45	
Bhiphion guttifer	1.68	24	0.24	
Epinephelus aeneus	1.50	6	0.22	
Selene dorsalis	0.54	12	0.08	
Total		689.28	99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2393
 DATE: 4/11/05 GEAR TYPE: PT No: 2 POSITION:Lat N 1402
 start stop duration Long W 1721
 TIME :21:20:44 21:37:28 17 (min) Purpose code: 1
 LOG :5087.61 5088.62 1.00 Area code : 4
 FDEPTH: 40 40 GearCond.code:
 BDEPTH: 68 75 Validity code:
 Towing dir: 270ø Wire out: 150 m Speed: 35 kn*10

Sorted: 66 Kg Total catch: 888.74 CATCH/HOUR: 3136.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	2839.76	19585	90.53	3966
Scomber japonicus	258.74	1002	8.25	3967
Decapterus rhonchus	15.74	95	0.50	
Trachurus trecae	14.79	145	0.47	
Sarda sarda	7.69	7	0.25	
Total		3136.72	100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2394
 DATE: 5/11/05 GEAR TYPE: PT No: 7 POSITION:Lat N 1407
 start stop duration Long W 1702
 TIME :01:42:23 02:12:16 30 (min) Purpose code: 1
 LOG :5119.12 5121.19 2.08 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 17 16 Validity code:
 Towing dir: 160ø Wire out: 140 m Speed: 35 kn*10

Sorted: 26 Kg Total catch: 143.00 CATCH/HOUR: 286.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	150.40	1580	52.59	3970
Brachydeuterus auritus	69.00	700	24.13	3968
Eucinostomus melanopterus	23.00	370	8.04	
Pomadasys peroteti	11.20	30	3.92	3969
Decapterus rhonchus	9.50	100	3.32	
Pomadasys incisus	6.10	40	2.13	
Sphyræna guachancho	5.00	12	1.75	
Selene dorsalis	4.90	60	1.71	
Galeoides decadactylus	1.88	4	0.66	
Chaetodipterus goreensis	1.54	4	0.54	
Raja miraletus	1.52	4	0.53	
Scomberomorus tritor	1.02	2	0.36	
Penaeus notialis	0.50	30	0.17	
Dactylopterus volitans	0.44	2	0.15	
Total		286.00	100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2395
 DATE: 5/11/05 GEAR TYPE: PT No: 2 POSITION:Lat N 1412
 start stop duration Long W 1717
 TIME :04:53:35 05:23:21 30 (min) Purpose code: 1
 LOG :5143.99 5145.85 1.84 Area code : 4
 FDEPTH: 30 25 GearCond.code:
 BDEPTH: 46 42 Validity code:
 Towing dir: 90ø Wire out: 120 m Speed: 40 kn*10

Sorted: 90 Kg Total catch: 1043.96 CATCH/HOUR: 2087.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	1450.46	16888	69.47	3974
Sardinella aurita	210.18	1670	10.07	3971
Sardinella maderensis	174.22	1206	8.34	3972
Decapterus rhonchus	158.22	1182	7.58	3973
Brachydeuterus auritus	38.74	440	1.86	
Sphyræna guachancho	14.14	46	0.68	
Pomadasys incisus	12.52	92	0.60	
Trachurus trecae	7.18	46	0.34	
Priacanthus arenatus	5.80	22	0.28	
Plectorhynchus mediterraneus	4.86	22	0.23	
Selene dorsalis	3.48	22	0.17	
Decapterus punctatus	3.48	116	0.17	
Chelidonichthys gabonensis	2.32	22	0.11	
Dactylopterus volitans	2.32	46	0.11	
Total	2087.92		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2396
 DATE: 5/11/05 GEAR TYPE: BT No:15 POSITION:Lat N 1420
 start stop duration Long W 1728
 TIME :11:07:39 11:33:14 26 (min) Purpose code: 1
 LOG :5190.31 5190.31 Area code : 4
 FDEPTH: 105 105 GearCond.code:
 BDEPTH: 105 105 Validity code:
 Towing dir: 360ø Wire out: 360 m Speed: 32 kn*10

Sorted: 33 Kg Total catch: 100.66 CATCH/HOUR: 232.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex angolensis	125.86	1398	54.18	3975
Trachurus trecae	69.09	312	29.74	3976
Boops boops	13.71	312	5.90	
Sepia officinalis hierredda	4.57	2	1.97	
Scorpaena stephanica	4.36	14	1.88	
Arnoglossus imperialis	3.95	498	1.70	
Dentex macrophthalmus	3.81	76	1.64	
Priacanthus arenatus	3.32	478	1.43	
Merluccius senegalensis	1.94	2	0.84	
Chaetodon hoefleri	0.76	7	0.33	
Citharus linguatula	0.48	14	0.21	
SYNGNATHIDAE	0.35	7	0.15	
Serranus africana	0.09	7	0.04	
Total	232.29		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2397
 DATE: 5/11/05 GEAR TYPE: PT No: 4 POSITION:Lat N 1431
 start stop duration Long W 1713
 TIME :15:40:05 16:04:02 24 (min) Purpose code: 1
 LOG :5228.59 5230.40 1.81 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 30 31 Validity code:
 Towing dir: 180ø Wire out: 120 m Speed: 45 kn*10

Sorted: Kg Total catch: 0.72 CATCH/HOUR: 1.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	1.80	8	100.00	
Total	1.80		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2398
 DATE: 5/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1441
 start stop duration Long W 1730
 TIME :20:32:05 20:58:59 27 (min) Purpose code: 1
 LOG :5274.32 5276.28 1.94 Area code : 4
 FDEPTH: 22 22 GearCond.code:
 BDEPTH: 38 37 Validity code:
 Towing dir: 340ø Wire out: 130 m Speed:420 kn*10

Sorted: 1 Kg Total catch: 54.26 CATCH/HOUR: 120.58

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pomadasys jubelini	52.22	113	43.31	3977
Decapterus rhonchus	11.87	33	9.84	3978
Trachurus trecae	11.64	109	9.65	3979
Pomadasys rogeri	10.09	7	8.37	
Sardinella maderensis - Juv.	9.67	2856	8.02	
Dactylopterus volitans	5.69	16	4.72	
Selar crumenophthalmus	4.58	18	3.80	
Decapterus punctatus juv.	2.13	78	1.77	3980
Rhizoprionodon acutus	2.07	2	1.72	
Sphyræna guachancho	1.84	7	1.53	
Brachydeuterus auritus Juv.	1.67	611	1.38	
Lithognathus mormyrus	1.47	4	1.22	
Alloteuthis africana	1.44	544	1.19	
Pomadasys incisus	1.07	7	0.89	
Brachydeuterus auritus	0.73	4	0.61	
Sepia officinalis hierredda	0.64	2	0.53	
Chelidonichthys gabonensis	0.44	2	0.36	
Penaeus notialis	0.42	38	0.35	
Caranx hippos	0.38	2	0.32	
Loligo vulgaris	0.29	2	0.24	
Eucinostomus melanopterus	0.18	2	0.15	
Selene dorsalis, juveniles	0.11	11	0.09	
Rypticus saponaceus	0.02	2	0.02	
Total	120.66		100.08	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2399
 DATE: 6/11/05 GEAR TYPE: PT No: 4 POSITION:Lat N 1450
 start stop duration Long W 1733
 TIME :04:04:33 04:34:20 30 (min) Purpose code: 1
 LOG :5320.52 5322.54 2.01 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 132 114 Validity code:
 Towing dir: 135ø Wire out: 150 m Speed: 40 kn*10

Sorted: Kg Total catch: 9.06 CATCH/HOUR: 18.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae, juvenile	6.84	436	37.75	3981
Priacanthus arenatus	3.62	430	19.98	
Caranx crysos	3.14	72	17.33	3982
Lagocephalus laevigatus	3.14	10	17.33	
Dactylopterus volitans	1.24	6	6.84	
Illex coindetii	0.10	2	0.55	
Elagatis bipinnulata	0.04	2	0.22	
Total	18.12		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2400
 DATE: 6/11/05 GEAR TYPE: PT No: 2 POSITION:Lat N 1455
 start stop duration Long W 1712
 TIME :11:06:30 11:38:24 32 (min) Purpose code: 1
 LOG :5380.39 5382.46 1.60 Area code : 4
 FDEPTH: 70 80 GearCond.code:
 BDEPTH: 98 219 Validity code:
 Towing dir: 275ø Wire out: 320 m Speed: 40 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2401
 DATE: 6/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1512
 start stop duration Long W 1700
 TIME :18:58:47 19:13:46 15 (min) Purpose code: 1
 LOG :5448.61 5449.69 1.07 Area code : 4
 FDEPTH: 25 35 GearCond.code:
 BDEPTH: 67 78 Validity code:
 Towing dir: 320ø Wire out: 200 m Speed: 42 kn*10

Sorted: 64 Kg Total catch: 159.25 CATCH/HOUR: 637.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	365.40	2408	57.36	3983
Brachydeuterus auritus	163.60	1528	25.68	3984
Selene dorsalis	60.92	1160	9.56	3986
Chloroscombrus chrysurus	27.08	288	4.25	3985
Decapterus rhonchus	11.32	48	1.78	
Boops boops	3.92	28	0.62	
Sphyræna guachancho	1.92	28	0.30	
Scomber japonicus	1.40	8	0.22	
Loligo vulgaris	0.60	4	0.09	
Lagocephalus laevisgatus	0.52	8	0.08	
Sardinella maderensis	0.20	8	0.03	
Caranx crysos	0.20	8	0.03	
Total	637.08		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2402
 DATE: 7/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1533
 start stop duration Long W 1652
 TIME :02:30:27 03:00:15 30 (min) Purpose code: 1
 LOG :5517.43 5519.30 1.85 Area code : 4
 FDEPTH: 30 35 GearCond.code:
 BDEPTH: 56 71 Validity code:
 Towing dir: 294ø Wire out: 150 m Speed: 35 kn*10

Sorted: 28 Kg Total catch: 438.92 CATCH/HOUR: 877.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	411.10	3600	46.83	3984
Trachurus trecae	385.20	2610	43.88	3986
Alectis alexandrinus	29.92	26	3.41	3985
Chloroscombrus chrysurus	21.30	240	2.43	
Stromateus fiatola	11.96	14	1.36	
Trichiurus lepturus	6.90	60	0.79	
Selene dorsalis	6.60	90	0.75	
Sphyræna sphyraena	4.00	8	0.46	
Loligo vulgaris	0.96	2	0.11	
Total	877.94		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2403
 DATE: 7/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1552
 start stop duration Long W 1641
 TIME :14:31:47 15:01:44 30 (min) Purpose code: 1
 LOG :5615.41 5617.40 1.97 Area code : 4
 FDEPTH: 30 35 GearCond.code:
 BDEPTH: 41 50 Validity code:
 Towing dir: 284ø Wire out: 160 m Speed: 35 kn*10

Sorted: Kg Total catch: 143.65 CATCH/HOUR: 287.30

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	140.40	860	48.87	3987
Selene dorsalis	70.44	590	24.52	3988
Trachurus trecae	68.68	318	23.91	3989
Decapterus rhonchus	3.74	2	1.30	
Brachydeuterus auritus	1.70	14	0.59	
Lagocephalus laevisgatus	0.92	4	0.32	
Loligo vulgaris	0.64	2	0.22	
Trichiurus lepturus	0.42	2	0.15	
Sardinella aurita	0.36	2	0.13	
Total	287.30		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2404
 DATE: 7/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1600
 start stop duration Long W 1634
 TIME :18:27:14 18:55:09 28 (min) Purpose code: 1
 LOG :5644.52 5646.27 1.44 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 21 21 Validity code:
 Towing dir: 6ø Wire out: 130 m Speed: 38 kn*10

Sorted: 28 Kg Total catch: 327.04 CATCH/HOUR: 700.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	227.79	1843	32.50	3991
J E L L Y F I S H	186.21	879	26.57	
Trichiurus lepturus	54.04	41	7.71	
Ilisha africana	50.79	3943	7.25	
Selene dorsalis	49.07	279	7.00	3994
Caranx senegallus	32.74	88	4.67	3990
Galeoides decadactylus	25.93	193	3.70	
Pentanemus quinquarius	21.00	386	3.00	
Sardinella maderensis	12.43	64	1.77	3992
Brachydeuterus auritus	9.43	129	1.35	
Scomber japonicus	8.74	4	1.25	
Pseudotolithus senegalensis	5.79	107	0.83	
Pseudotolithus typus	4.50	21	0.64	
Drepane africana	3.43	43	0.49	
Pteroscion peli	3.21	43	0.46	
Pomadasys jubelini	2.01	2	0.29	
Sphyræna guachancho	2.01	2	0.29	
Lagocephalus laevisgatus	1.05	4	0.15	
Penaeus notialis	0.36	4	0.05	
Pomadasys peroteti	0.26	19	0.04	3993
Total	700.79		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2405
 DATE: 7/11/05 GEAR TYPE: PT No: 1 POSITION:Lat N 1602
 start stop duration Long W 1643
 TIME :20:10:55 20:41:27 31 (min) Purpose code: 1
 LOG :5655.76 5658.01 2.22 Area code : 4
 FDEPTH: 25 35 GearCond.code:
 BDEPTH: 67 81 Validity code:
 Towing dir: 273ø Wire out: 160 m Speed: 42 kn*10

Sorted: 104 Kg Total catch: 104.23 CATCH/HOUR: 201.74

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	86.75	724	43.00	3995
Trachurus trecae	39.45	315	19.55	3996
Chloroscombrus chrysurus	27.68	135	13.72	3997
J E L L Y F I S H	18.95	48	9.39	
Trichiurus lepturus	17.42	228	8.63	
Sardinella aurita	3.95	25	1.96	
Decapterus rhonchus	2.85	8	1.41	
Sardinella maderensis	1.97	10	0.98	
Penaeus notialis	0.77	62	0.38	
Fistularia petimba	0.64	2	0.32	
Dactylopterus volitans	0.27	2	0.13	
Loligo vulgaris	0.25	2	0.12	
Pentanemus quinquarius	0.21	4	0.10	
Sphyræna guachancho	0.14	2	0.07	
Saurida brasiliensis	0.14	31	0.07	
Todarodes sagittatus	0.12	2	0.06	
Arius parkii	0.12	2	0.06	
Pseudupeneus prayensis	0.06	2	0.03	
Priacanthus arenatus	0.02	4	0.01	
Total	201.76		99.99	

Annex II Description of instruments and fishing gear

The Simrad EK-500, 38 kHz scientific echosounder was used for abundance estimation during the survey, in addition data from the 18 kHz, 120 kHz and 200 kHz transducers were recorded for possible future multifrequency target identification. The Bergen Echo Integrator system (BEI) recorded the hydroacoustic data and was used to scrutinize the acoustic records, and to allocate integrator data to fish species. All raw data were stored to tape and brought back to IMR for storing.

The details of the settings of the echosounders were as follows:

Transceiver 1 menu

Transducer depth	5.5 m
Absorption coeff.	10 dB/km
Pulse length	medium (1ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-21.0 dB
SV transducer gain	26.91dB
TS transducer gain	27.05
Angle sensitivity	21.9
3 dB beamwidth along.	7.0
3 dB beamwidth athw.	6.9
Alongship offset	0.01
Athwardship offset	0.02

Transceiver 2 menu

Transducer depth	5.5 m
Absorption coeff.	38 dB/km
Pulse length	long (1ms)
Bandwidth	narrow
Max power	1000 Watt
2-way beam angle	-20.6 dB
SV transducer gain	25.95dB
TS transducer gain	26.00dB
Angle sensitivity	21.0
3 dB beamwidth along.	7.2
3 dB beamwidth athw.	7.0
Alongship offset	0.10
Athwardship offset	-0.06

Transceiver 3 menu

Transducer depth	5.5 m
Absorption coeff.	3 dB/km
Pulse length	short (0.7ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-17.2 dB
SV transducer gain	23.87dB
TS transducer gain	23.82B
Angle sensitivity	13.9
3 dB beamwidth along.	10.9
3 dB beamwidth athw.	10.7
Alongship offset	0.04
Athwardship offset	0.09

Transceiver 4 menu (default settings used)

Transducer depth	5.5 m
Absorption coeff.	53 dB/km
Pulse length	Long
Bandwidth	Narrow
Max power	1000 Watt
2-way beam angle	-20.5 dB
SV transducer gain	23.84 dB
TS transducer gain	24.8 dB
Angle sensitivity	0.0
3 dB beamwidth along.	0.0°
3 dB beamwidth athw.	0.0°
Alongship offset	- 0.00°
Athwardship offset	0.00°

Display menu

Echogram	1
Bottom range	15 m
Bottom range start	10 m
TVG	20 log R
Sv colour min -	67 dB
TS Colour minimum	-50 dB

Printer- menu

Range	0-50, 0-100, 0-150, 0-250 or 0-500 m
TVG	20 log R
Sv colour min	-63 dB

Bottom detection menu

Minimum level	-50 dB
---------------	--------

Calibration

A calibration of the acoustic equipment was conducted during the acoustic survey of the small pelagic resources off Angola in August 2005.

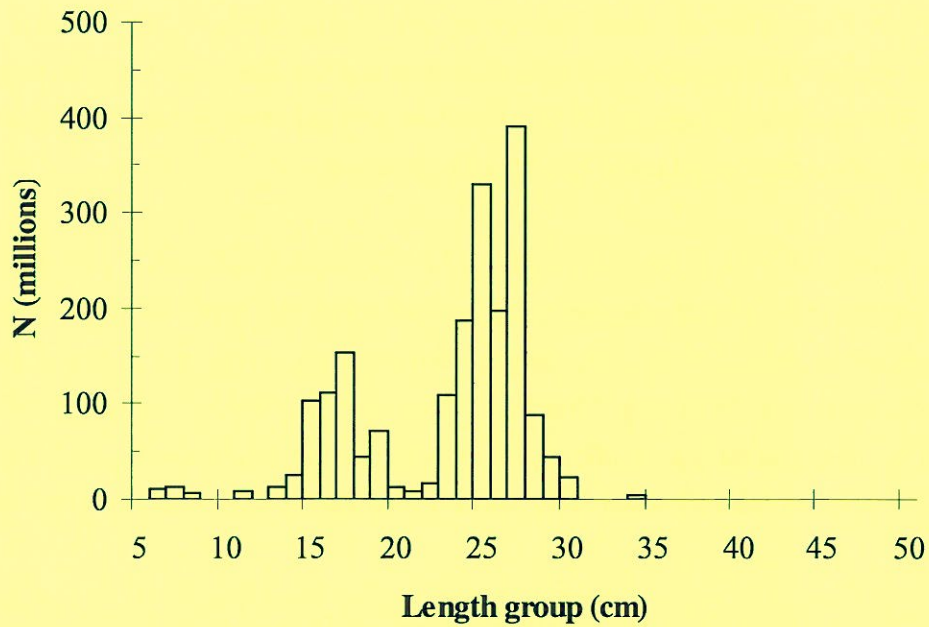
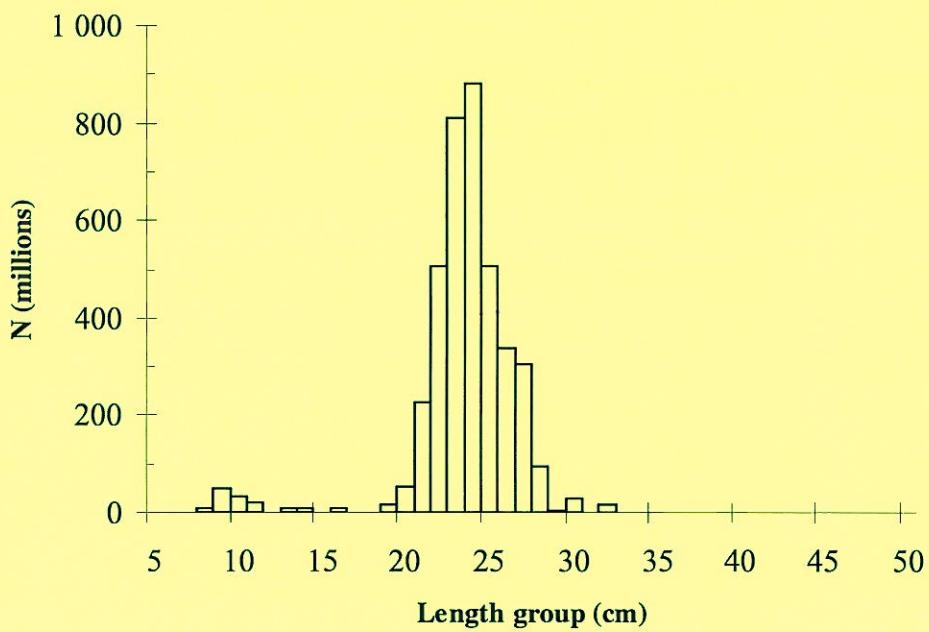
Fishing gear

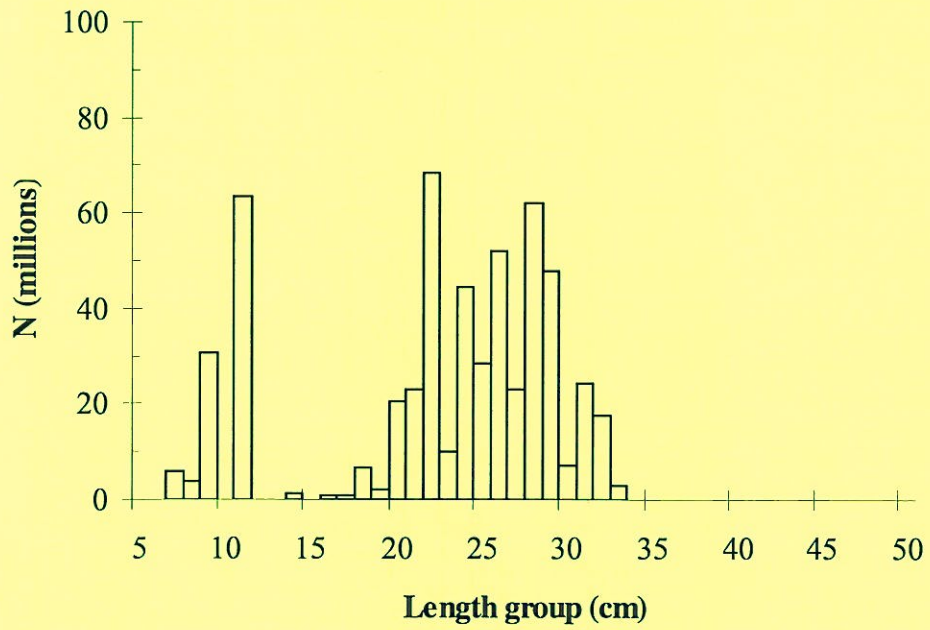
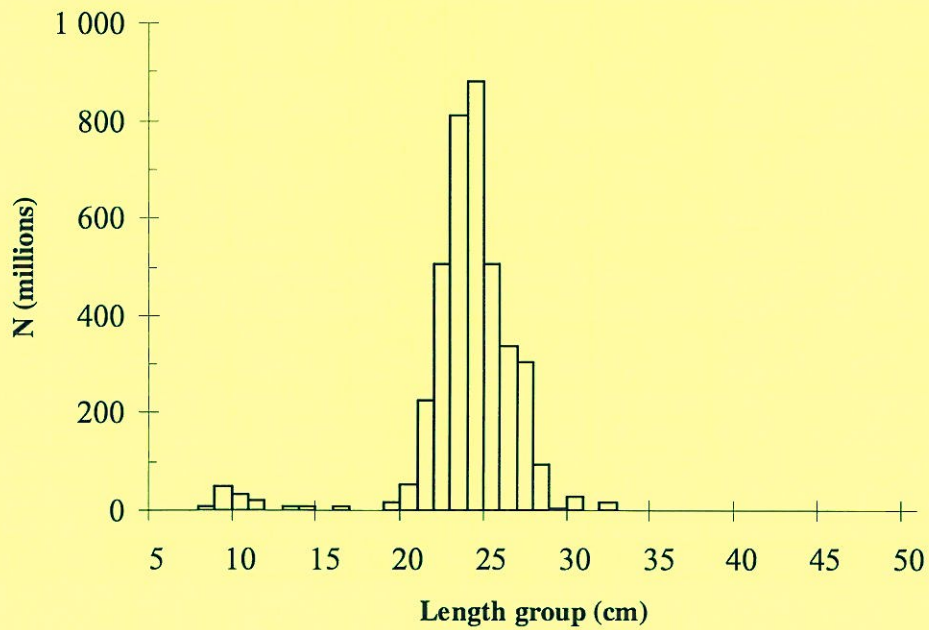
The vessel has three different sized four-panel 'Åkrahamn' pelagic trawls and one 'Gisund super bottom trawl'. The two smallest pelagic trawls and the demersal trawl were used during the survey. The smallest pelagic trawl has 10-12 m vertical opening under normal operation, whereas the intermediate sized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

The bottom trawl has a 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*Sardinella aurita* October – November 2005*Sardinella maderensis* October – November 2005

Trachurus trecae October – November 2005*Decapterus rhouchus* October – November 2005

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

Round sardinella (*Sardinella aurita*): October-November 2005

Numbers in millions						Biomass in 1000 tonnes					
Length cm	St. Louis- C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL	Length cm	St. Louis- C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL
5						5					
6						6					
7						7					
8						8					
9						9					
10						10					
11						11					
12						12					
13						13					
14						14					
15						15					
16						16					
17						17					
18						18					
19						19					
20						20					
21		103.5	159.6	6.5	269.7	21		9.9	15.2	0.6	25.7
22		88.9	107.5	1.0	197.4	22		9.7	11.8	0.1	21.6
23		183.0	118.9	17.8	319.7	23		22.8	14.8	2.2	39.8
24		416.0	134.1	67.4	617.5	24		58.7	18.9	9.5	87.2
25		62.2	15.6		77.9	25		9.9	2.5		12.4
26		73.0	10.3	0.3	83.7	26		13.0	1.8	0.1	14.9
27		128.2	21.2	25.7	175.1	27		25.6	4.2	5.1	35.0
28		67.2	13.2		80.4	28		14.9	2.9		17.9
29		84.5	1.2	5.1	90.9	29		20.8	0.3	1.3	22.4
30		19.3			19.3	30		5.3			5.3
31						31					
32						32					
33						33					
34						34					
35						35					
36						36					
37						37					
38						38					
39						39					
40						40					
41						41					
42						42					
43						43					
44						44					
45						45					
46						46					
47						47					
48						48					
49						49					
50						50					
Total		1 225.8	581.7	123.9	1 931.4	Total		191	73	19	282

Flat sardinella (*Sardinella maderensis*): October-November 2005

Numbers in millions						Biomass in 1000 tonnes					
Length cm	St. C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL	Length cm	St. C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL
5						5					
6						6					
7						7					
8						8					
9						9					
10						10					
11						11					
12						12					
13						13					
14				59.5	59.5	14				1.7	1.7
15		4.8	9.6		14.4	15		0.2	0.3		0.5
16				6.3	6.3	16				0.3	0.3
17			8.5		8.5	17			0.4		0.4
18				91.8	91.8	18				5.6	5.6
19		4.8	9.6	6.3	20.8	19		0.3	0.7	0.5	1.5
20						20					
21		46.7	73.3	537.2	657.2	21		4.5	7.0	51.2	62.7
22		144.7	53.0	268.9	466.7	22		15.8	5.8	29.4	51.0
23	4.4	186.8	405.2	365.3	961.7	23	0.5	23.3	50.5	45.5	119.8
24	0.9	413.3	467.8	256.2	1 138.1	24	0.1	58.3	66.0	36.2	160.7
25		91.5	189.0	126.9	407.4	25		14.6	30.1	20.2	64.9
26	12.3	60.6	111.6	39.1	223.6	26	2.2	10.8	19.9	7.0	40.0
27	7.9	88.4	35.9	16.7	148.8	27	1.6	17.6	7.2	3.3	29.7
28	9.6	5.3			15.0	28	2.1	1.2			3.3
29	7.0	5.3			12.3	29	1.7	1.3			3.0
30						30					
31						31					
32						32					
33						33					
34						34					
35						35					
36						36					
37						37					
38						38					
39						39					
40						40					
41						41					
42						42					
43						43					
44						44					
45						45					
46						46					
47						47					
48						48					
49						49					
50						50					
Total	42.1	1 052.3	1 363.6	1 774.3	4 232.4	Total	8	148	188	201	545

Cunene horse mackerel (*Trachurus trecae*): October-November 2005

Numbers in millions						Biomass in tonnes					
Length cm	St. Louis- C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL	Length cm	St. Louis- C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL
5						5					
6						6					
7	5.7				5.7	7	0.0				0.0
8	3.8				3.8	8	0.0				0.0
9	30.7				30.7	9	0.3				0.3
10						10					
11	57.5	6.1			63.6	11	0.8	0.1			0.9
12						12					
13						13					
14		1.3			1.3	14		0.0			0.0
15						15					
16		0.7			0.7	16		0.0			0.0
17		0.7			0.7	17		0.0			0.0
18		6.7			6.7	18		0.4			0.4
19		2.0			2.0	19		0.1			0.1
20	18.8	1.8			20.6	20	1.6	0.1			1.7
21	16.1	7.2			23.2	21	1.5	0.7			2.2
22	60.1	8.0	0.4		68.5	22	6.6	0.9	0.0		7.5
23	7.5	2.4			10.0	23	0.9	0.3			1.2
24	22.8	18.0	3.9		44.7	24	3.2	2.5	0.5		6.3
25	28.7				28.7	25	4.6				4.6
26	51.7	0.6			52.3	26	9.2	0.1			9.3
27	16.4	6.0	0.7		23.1	27	3.3	1.2	0.1		4.6
28	62.0				62.0	28	13.8				13.8
29	45.5	2.1	0.4		47.9	29	11.2	0.5	0.1		11.8
30	7.3				7.3	30	2.0				2.0
31	24.6				24.6	31	7.4				7.4
32	17.8				17.8	32	5.9				5.9
33	3.1				3.1	33	1.1				1.1
34						34					
35						35					
36						36					
37						37					
38						38					
39						39					
40						40					
41						41					
42						42					
43						43					
44						44					
45						45					
46						46					
47						47					
48						48					
49						49					
50						50					
Total	480.1	63.5	5.3		548.9	Total	73	7	1		81

False scad (*Decapterus rhonchus*): October-November 2005

Numbers in millions						Biomass in tonnes					
Length cm	St. Louis- C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL	Length cm	St. Louis- C. Vert	C. Vert- Gambia	The Gambia	Casa- mance	TOTAL
5						5					
6						6					
7						7					
8						8					
9						9					
10						10					
11						11					
12						12					
13						13					
14						14					
15			0.4		0.4	15			0.0		0.0
16			1.6	1.0	2.6	16			0.1	0.0	0.1
17			1.8		1.8	17			0.1		0.1
18		0.8	0.2		1.0	18		0.0	0.0		0.1
19		0.8	1.8	2.0	4.5	19		0.1	0.1	0.1	0.3
20		0.8			0.8	20		0.1			0.1
21			0.6	1.0	1.6	21			0.1	0.1	0.2
22		3.1	0.2		3.3	22		0.3	0.0		0.4
23		4.6	1.0	1.0	6.6	23		0.6	0.1	0.1	0.8
24		5.4			5.4	24		0.8			0.8
25		0.8	1.9	2.0	4.6	25		0.1	0.3	0.3	0.7
26		1.5	1.3	2.0	4.9	26		0.3	0.2	0.4	0.9
27	24.4	1.5	1.7	2.0	29.6	27	4.9	0.3	0.3	0.4	5.9
28	49.9	3.4	3.9	4.0	61.2	28	11.1	0.8	0.9	0.9	13.6
29	26.5	0.4	1.8	1.0	29.7	29	6.5	0.1	0.5	0.2	7.3
30	1.0		1.1		2.1	30	0.3		0.3		0.6
31	0.6	0.8	0.4		1.7	31	0.2	0.2	0.1		0.5
32	1.2		1.2	2.0	4.4	32	0.4		0.4	0.7	1.4
33	0.6	0.4			1.0	33	0.2	0.1			0.3
34		1.8	0.2		2.0	34		0.7	0.1		0.8
35		1.1			1.1	35		0.5			0.5
36		0.7			0.7	36		0.3			0.3
37		0.4			0.4	37		0.2			0.2
38		0.4			0.4	38		0.2			0.2
39						39					
40						40					
41						41					
42						42					
43						43					
44						44					
45						45					
46						46					
47						47					
48						48					
49						49					
50						50					
Total	104.3	28.3	21.1	17.9	171.5	Total	23.6	5.6	3.6	3.3	36.0

Annex V Regional Estimates, October – December 2004

October-November 2005: 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		18.3					18.3
6		101.9					101.9
7		350.3					350.3
8		1,631.1					1,631.1
9		1,379.4					1,379.4
10		653.5					653.5
11		1,049.9	2.9				1,052.8
12		1,356.8	6.5				1,363.3
13		1,628.6	5.2				1,633.8
14		1,265.6	13.4				1,279.0
15		663.4	0.9				664.2
16		68.6	0.4				69.1
17		28.6					28.6
18		683.0					683.0
19		3,187.0					3,187.0
20		7,300.5					7,300.5
21		9,536.1	19.6	20.5			9,576.2
22		11,811.4	175.1	102.5			12,089.1
23		12,081.0	965.4	492.2			13,538.6
24		9,257.3	2,013.3	1,353.6			12,624.2
25		3,450.9	2,388.6	1,415.1			7,254.6
26		912.6	1,148.0	1,421.1			3,481.7
27		287.8	374.1	1,652.8			2,314.6
28			77.3				77.3
29							
30							
Total	N.A.	68,703.6	7,190.5	6,457.8			82,351.9

October-November 2005: 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		25					25
6		229					229
7		1,212					1,212
8		8,214					8,214
9		9,698					9,698
10		6,203					6,203
11		13,093	43				13,136
12		21,730	121				21,851
13		32,857	122				32,979
14		31,639	392				32,031
15		20,256	31				20,287
16		2,528	19				2,547
17		1,257					1,257
18		35,460					35,460
19		193,774					193,774
20		515,737					515,737
21		777,142	1,867	1,957			780,966
22		1,103,226	19,152	11,213			1,133,591
23		1,285,642	120,277	61,323			1,467,242
24		1,116,344	284,234	191,096			1,591,674
25		469,212	380,217	225,258			1,074,687
26		139,254	205,086	253,889			598,230
27		49,073	74,682	329,975			453,730
28			17,176				17,176
29							
30							
Total	N.A.	5,833,805	1,103,419	1,074,711			8,011,935

October-November 2005: 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							
6							
7		291.2	386.8	90.6			768.6
8		441.8	174.6				616.4
9		150.6	440.7	16.2			607.5
10		10.0	234.2				244.2
11		10.0	95.8	3.2			109.1
12			41.5				41.5
13		29.0	25.4				54.4
14		90.7	353.0				443.7
15		200.8	29.9				230.7
16		167.3	314.8				482.1
17		317.7	13.1				330.8
18		167.3	30.5				197.8
19		74.0	10.2				84.2
20		23.9	6.8				30.7
21		21.3	5.1	0.7		269.7	296.8
22		3.9	5.1	1.5		197.4	207.9
23		39.5		0.7		319.7	359.9
24		119.4	6.8	0.1		617.5	743.8
25		214.5	15.2	0.3		77.9	307.9
26		348.9	35.6	0.1		83.7	468.2
27		264.9	30.5	1.2		175.1	471.7
28		97.1	22.0	3.1		80.4	202.6
29		51.0	15.2	8.3		90.9	165.3
30		47.4	3.4	6.3		19.3	76.4
31		6.6	3.4	1.6			11.6
32		86.9		0.4			87.3
33		54.7					54.7
34		71.8					71.8
35		115.7					115.7
36		36.7					36.7
37		67.8					67.8
38		9.2					9.2
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	3,631.9	2,299.5	134.4		1,931.4	7,997.2

October-November 2005: 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							
6							
7		1,155	1,566	367			3,088
8		2,551	1,029				3,580
9		1,214	3,627	133			4,974
10		109	2,603				2,712
11		144	1,399	47			1,590
12			778				778
13		671	600				1,271
14		2,599	10,332				12,931
15		7,028	1,070				8,099
16		7,064	13,578				20,641
17		16,006	673				16,679
18		9,956	1,856				11,812
19		5,146	723				5,869
20		1,901	560				2,461
21		1,974	485	71		25,727	28,257
22		321	555	162		21,586	22,625
23		4,717		92		39,826	44,636
24		16,450	956	18		87,177	104,601
25		33,402	2,425	41		12,394	48,263
26		60,972	6,352	23		14,945	82,291
27		51,795	6,084	237		34,964	93,081
28		21,133	4,891	695		17,860	44,579
29		12,301	3,755	2,033		22,391	40,481
30		12,634	922	1,723		5,265	20,544
31		1,936	1,016	477			3,429
32		28,052		128			28,180
33		19,340					19,340
34		27,727					27,727
35		48,668					48,668
36		16,773					16,773
37		33,616					33,616
38		4,921					4,921
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	452,272	67,837	6,247		282,137	808,494

October-November 2005: 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				5.9			5.9
6				82.8			82.8
7				78.6			78.6
8				44.3			44.3
9			0.5	5.1			5.6
10				0.5			0.5
11							
12			23.5				23.5
13							
14			19.6	59.5		59.5	138.6
15			23.5			14.4	37.9
16			15.6	55.3		6.3	77.3
17			19.6			8.5	28.1
18			9.6	16.4		91.8	117.8
19			3.9			20.8	24.7
20			27.4				27.4
21			84.1	7.2		657.2	748.5
22			96.7	10.8		466.7	574.2
23		14.0	134.0	112.7	4.4	957.3	1,222.4
24		147.2	70.2	17.7	0.9	1,137.2	1,373.2
25		129.8	63.3	53.3		407.4	653.8
26		198.2	218.2	427.0	12.3	211.3	1,067.0
27		236.7	175.1	172.7	7.9	141.0	733.4
28		9.1	224.5	274.6	9.6	5.3	523.1
29		60.4	51.7	71.4	7.0	5.3	195.8
30		17.0	4.4	74.9			96.3
31		1.5	34.0	52.5			87.9
32			11.3	45.7			57.0
33		3.0	32.7	23.5			59.2
34				24.9			24.9
35				10.8			10.8
36							
37				10.8			10.8
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	816.8	1,343.2	1,739.0	42.1	4,190.3	8,131.4

October-November 2005: 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				9			9
6				218			218
7				319			319
8				261			261
9			4	42			46
10				6			6
11							
12			440				440
13							
14			572	1,743		1,742	4,057
15			839			517	1,356
16			675	2,384		274	3,333
17			1,006			440	1,446
18			582	994		5,582	7,158
19			278			1,480	1,759
20			2,265				2,265
21			8,020	690		62,703	71,413
22			10,570	1,184		51,031	62,786
23		1,759	16,700	14,042	546	119,270	152,317
24		20,999	9,905	2,501	124	160,552	194,081
25		20,867	10,078	8,482		64,850	104,278
26		35,765	38,975	76,292	2,193	37,757	190,983
27		47,721	34,963	34,485	1,576	28,141	146,886
28		2,018	49,880	61,021	2,144	1,183	116,245
29		15,038	12,738	17,597	1,729	1,312	48,414
30		4,670	1,206	20,410			26,286
31		452	10,195	15,745			26,393
32			3,733	15,067			18,800
33		1,092	11,817	8,480			21,389
34				9,826			9,826
35				4,624			4,624
36							
37				5,449			5,449
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	150,383	225,442	301,873	8,311	536,833	1,222,842

October-November 2005: 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		478.0					478.0
6		2,090.0		11.6			2,101.7
7		791.3		407.2			1,198.5
8		1,120.5		116.4			1,236.9
9		154.5		1,012.3			1,166.8
10				465.4			465.4
11				2,815.8			2,815.8
12				2,024.6			2,024.6
13				128.0			128.0
14							
15							
16							
17							
18							
19							
20							
Total	N.A.	4,634.3		6,981.4			11,615.7

October-November 2005: 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		429					429
6		3,099		31			3,130
7		1,803		1,649			3,452
8		3,716		686			4,402
9		715		8,332			9,047
10				5,172			5,172
11				41,112			41,112
12				37,961			37,961
13				3,023			3,023
14							
15							
16							
17							
18							
19							
20							
Total	N.A.	9,763		97,967			107,730

October-November 2005: 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		29.5					29.5
10		249.2					249.2
11		481.7					481.7
12		587.4					587.4
13		431.3					431.3
14		225.9					225.9
15		219.9					219.9
16		224.6					224.6
17		96.3					96.3
18		112.3					112.3
19		239.6					239.6
20		280.0					280.0
21		237.0					237.0
22		198.8					198.8
23		32.1					32.1
24		20.8					20.8
25		1.0					1.0
26		1.5					1.5
27		2.0					2.0
28		0.5					0.5
29		2.5					2.5
30		1.5					1.5
31		2.5					2.5
32		4.1					4.1
33		2.0					2.0
34		3.6					3.6
35		0.5					0.5
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	3,688.2					3,688.2

October-November 2005: 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		212					212
10		2,423					2,423
11		6,154					6,154
12		9,637					9,637
13		8,913					8,913
14		5,786					5,786
15		6,880					6,880
16		8,474					8,474
17		4,333					4,333
18		5,972					5,972
19		14,926					14,926
20		20,261					20,261
21		19,782					19,782
22		19,025					19,025
23		3,495					3,495
24		2,568					2,568
25		141					141
26		238					238
27		355					355
28		99					99
29		547					547
30		363					363
31		666					666
32		1,171					1,171
33		641					641
34		1,225					1,225
35		191					191
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	144,481					144,481

October-November 2005: 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					5.7		5.7
8				3.8	3.8		7.7
9		22.3	22.4	8.6	30.7		84.0
10		162.5	19.3	145.1			327.0
11		2,655.0	366.6	185.3	57.5	6.1	3,270.4
12		3,525.3	191.8	153.0			3,870.1
13		1,142.2	45.3	78.1			1,265.6
14		582.3	52.1	243.5		1.3	879.2
15		46.5	7.6	25.9			80.0
16		39.3	5.5	16.7		0.7	62.2
17				7.4		0.7	8.1
18		88.4	0.1	5.3		6.7	100.6
19		84.4				2.0	86.4
20		628.9			18.8	1.8	649.5
21		743.9	0.0	3.8	16.1	7.2	770.9
22		675.7	4.3		60.1	8.3	748.5
23		1,279.3	4.6		7.5	2.4	1,293.9
24		678.6	0.0		22.8	21.9	723.3
25		633.9	0.0		28.7		662.6
26		549.5	0.0	0.4	51.7	0.6	602.2
27		149.3	14.7		16.4	6.7	187.1
28		321.0	17.8	0.0	62.0		400.8
29		409.6	14.9	1.1	45.5	2.5	473.6
30		178.6	21.3	0.0	7.3		207.3
31		123.5	8.7	1.1	24.6		157.9
32		44.6	6.4	3.9	17.8		72.7
33			5.9	6.5	3.1		15.5
34		7.4	0.5	0.0			8.0
35				7.6			7.6
36			0.3	4.9			5.2
37			5.3	10.8			16.2
38			0.3	3.9			4.2
39			1.0	2.2			3.2
40			4.7	11.5			16.2
41			15.6	4.9			20.6
42			15.3				15.3
43			17.7				17.7
44			5.0				5.0
45			4.3	1.1			5.4
46			4.3	3.8			8.2
47							
48							
49				3.8			3.8
50							
Total	N.A.	14,772.3	883.8	944.0	480.1	68.8	17,149.0

October-November 2005: 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					23		23
8				23	23		45
9		161	184	71	252		668
10		1,580	215	1,613			3,408
11		33,919	5,353	2,705	839	89	42,904
12		57,837	3,597	2,868			64,302
13		23,607	1,070	1,844			26,521
14		14,912	1,524	7,127		37	23,600
15		1,454	272	925			2,651
16		1,483	239	718		29	2,469
17				380		35	415
18		4,704	9	322		410	5,445
19		5,256				144	5,401
20		45,514			1,554	146	47,213
21		62,100	0	365	1,533	683	64,681
22		64,651	475		6,575	912	72,614
23		139,467	578		936	304	141,285
24		83,823	1		3,223	3,086	90,133
25		88,286	1		4,575		92,862
26		85,904	2	67	9,231	105	95,309
27		26,088	2,926		3,267	1,337	33,618
28		62,418	3,948	0	13,786		80,152
29		88,339	3,673	267	11,205	608	104,093
30		42,564	5,806	4	1,997		50,370
31		32,436	2,620	330	7,371		42,757
32		12,875	2,116	1,272	5,859		22,122
33			2,132	2,354	1,126		5,612
34		2,567	202	7			2,776
35				3,262			3,262
36			120	2,302			2,422
37			2,693	5,485			8,179
38			180	2,112			2,292
39			582	1,284			1,866
40			2,975	7,351			10,325
41			10,727	3,381			14,108
42			11,279				11,279
43			13,967				13,967
44			4,223				4,223
45			3,922	979			4,901
46			4,186	3,707			7,893
47							
48							
49				4,472			4,472
50							
Total	N.A.	981,943	91,794	57,598	73,376	7,924	1,212,636

October-November 2005: False scad (*Caranx rhonchus*), 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				2.8			2.8
10							
11				2.8			2.8
12							
13							
14				30.9			30.9
15				7.5		0.4	7.9
16				15.4		2.6	18.0
17				12.3		1.8	14.1
18				14.0		1.0	15.0
19				3.8		4.5	8.4
20				1.6		0.8	2.3
21				54.0		1.6	55.6
22				20.3		3.3	23.5
23				77.1		6.6	83.7
24				26.4		5.4	31.8
25				9.3		4.6	13.9
26				57.3		4.9	62.2
27				18.0	24.4	5.2	47.6
28				29.2	49.9	11.3	90.4
29				5.4	26.5	3.2	35.1
30				3.1	1.0	1.1	5.2
31				1.7	0.6	1.1	3.5
32					1.2	3.2	4.4
33					0.6	0.4	1.0
34						2.0	2.0
35						1.1	1.1
36						0.7	0.7
37						0.4	0.4
38						0.4	0.4
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.			393.0	104.3	67.2	564.5

October-November 2005: False scad (*Caranx rhonchus*), 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				23			23
10							
11				41			41
12							
13							
14				904			904
15				268		14	282
16				666		112	778
17				634		94	728
18				853		59	912
19				272		323	595
20				129		63	192
21				5,151		151	5,302
22				2,218		357	2,575
23				9,609		819	10,428
24				3,734		756	4,489
25				1,480		736	2,216
26				10,238		869	11,107
27				3,589	4,877	1,041	9,508
28				6,484	11,086	2,520	20,090
29				1,327	6,528	786	8,641
30				850	281	287	1,417
31				516	182	343	1,040
32					399	1,041	1,440
33					218	128	347
34						770	770
35						458	458
36						332	332
37						180	180
38						195	195
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.			48,985	23,571	12,434	84,990

October-November 2005: 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		11.7					11.7
11		341.2					341.2
12		1,082.1					1,082.1
13		1,208.1					1,208.1
14		405.7					405.7
15		224.3					224.3
16		208.0					208.0
17		412.4					412.4
18		398.8					398.8
19		278.3					278.3
20		474.3					474.3
21		239.2					239.2
22		135.5					135.5
23		76.8					76.8
24		68.3					68.3
25		63.4					63.4
26		20.1					20.1
27		4.0					4.0
28		2.3					2.3
29		4.1					4.1
30							
31							
32							
33							
34							
35		14.3					14.3
36							
37		14.3					14.3
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	5,687.2					5,687.2

October-November 2005: 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		114					114
11		4,359					4,359
12		17,753					17,753
13		24,969					24,969
14		10,390					10,390
15		7,015					7,015
16		7,849					7,849
17		18,568					18,568
18		21,211					21,211
19		17,331					17,331
20		34,321					34,321
21		19,966					19,966
22		12,967					12,967
23		8,377					8,377
24		8,440					8,440
25		8,832					8,832
26		3,139					3,139
27		697					697
28		447					447
29		890					890
30							
31							
32							
33							
34							
35		5,361					5,361
36							
37		6,320					6,320
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.	239,314					239,314

October-November 2005: 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					5.7		5.7
9				3.8	3.8		7.7
10		22.3	22.4	8.6	30.7		84.0
11		162.5	19.3	145.1			327.0
12		2,655.0	366.6	185.3	57.5	6.1	3,270.4
13		3,525.3	191.8	153.0			3,870.1
14		1,142.2	45.3	78.1			1,265.6
15		582.3	52.1	243.5		1.3	879.2
16		46.5	7.6	25.9			80.0
17		39.3	5.5	16.7		0.7	62.2
18				7.4		0.7	8.1
19		88.4	0.1	5.3		6.7	100.6
20		84.4				2.0	86.4
21		628.9			18.8	1.8	649.5
22		743.9	0.0	3.8	16.1	7.2	770.9
23		675.7	4.3		60.1	8.3	748.5
24		1,279.3	4.6		7.5	2.4	1,293.9
25		678.6	0.0		22.8	21.9	723.3
26		633.9	0.0		28.7		662.6
27		549.5	0.0	0.4	51.7	0.6	602.2
28		149.3	14.7		16.4	6.7	187.1
29		321.0	17.8	0.0	62.0		400.8
30		409.6	14.9	1.1	45.5	2.5	473.6
31		178.6	21.3	0.0	7.3		207.3
32		123.5	8.7	1.1	24.6		157.9
33		44.6	6.4	3.9	17.8		72.7
34			5.9	6.5	3.1		15.5
35		7.4	0.5	0.0			8.0
36				7.6			7.6
37			0.3	4.9			5.2
38			5.3	10.8			16.2
39			0.3	3.9			4.2
40			1.0	2.2			3.2
41			4.7	11.5			16.2
42			15.6	4.9			20.6
43			15.3				15.3
44			17.7				17.7
45			5.0				5.0
46			4.3	1.1			5.4
47			4.3	3.8			8.2
48							
49				3.8			3.8
50							
Total	N.A.	14,772.3	883.8	944.0	480.1	68.8	17,149.0

October-November 2005: Cunene horse mackerel (*Trachurus trecae*), biomass in tonnes

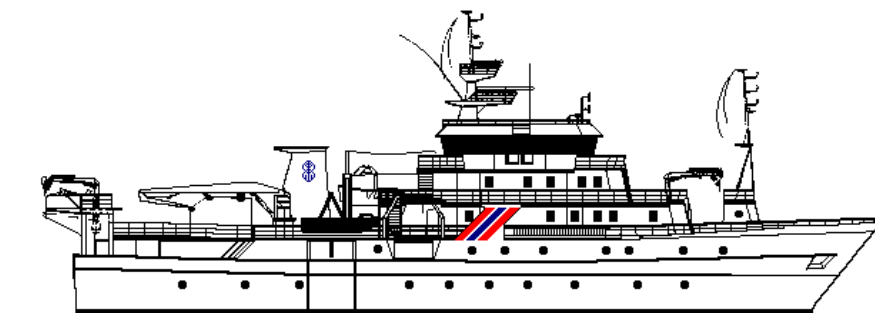
Length cm	C. Cantin- C. Juby	C. Juby- C. Blanc	C. Blanc- C. Timiris	C. Timiris- St. Louis	St. Louis- C. Vert	C. Vert- Casamance	TOTAL
5							
6							
7					23		23
8				23	23		45
9		161	184	71	252		668
10		1,580	215	1,613			3,408
11		33,919	5,353	2,705	839	89	42,904
12		57,837	3,597	2,868			64,302
13		23,607	1,070	1,844			26,521
14		14,912	1,524	7,127		37	23,600
15		1,454	272	925			2,651
16		1,483	239	718		29	2,469
17				380		35	415
18		4,704	9	322		410	5,445
19		5,256				144	5,401
20		45,514			1,554	146	47,213
21		62,100	0	365	1,533	683	64,681
22		64,651	475		6,575	912	72,614
23		139,467	578		936	304	141,285
24		83,823	1		3,223	3,086	90,133
25		88,286	1		4,575		92,862
26		85,904	2	67	9,231	105	95,309
27		26,088	2,926		3,267	1,337	33,618
28		62,418	3,948	0	13,786		80,152
29		88,339	3,673	267	11,205	608	104,093
30		42,564	5,806	4	1,997		50,370
31		32,436	2,620	330	7,371		42,757
32		12,875	2,116	1,272	5,859		22,122
33			2,132	2,354	1,126		5,612
34		2,567	202	7			2,776
35				3,262			3,262
36			120	2,302			2,422
37			2,693	5,485			8,179
38			180	2,112			2,292
39			582	1,284			1,866
40			2,975	7,351			10,325
41			10,727	3,381			14,108
42			11,279				11,279
43			13,967				13,967
44			4,223				4,223
45			3,922	979			4,901
46			4,186	3,707			7,893
47							
48							
49				4,472			4,472
50							
Total	N.A.	981,943	91,794	57,598	73,376	7,924	1,212,636

October-November 2005: False scad (*Caranx rhonchus*), 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				2.8			2.8
10							
11				2.8			2.8
12							
13							
14				30.9			30.9
15				7.5		0.4	7.9
16				15.4		2.6	18.0
17				12.3		1.8	14.1
18				14.0		1.0	15.0
19				3.8		4.5	8.4
20				1.6		0.8	2.3
21				54.0		1.6	55.6
22				20.3		3.3	23.5
23				77.1		6.6	83.7
24				26.4		5.4	31.8
25				9.3		4.6	13.9
26				57.3		4.9	62.2
27				18.0	24.4	5.2	47.6
28				29.2	49.9	11.3	90.4
29				5.4	26.5	3.2	35.1
30				3.1	1.0	1.1	5.2
31				1.7	0.6	1.1	3.5
32					1.2	3.2	4.4
33					0.6	0.4	1.0
34						2.0	2.0
35						1.1	1.1
36						0.7	0.7
37						0.4	0.4
38						0.4	0.4
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.			393.0	104.3	67.2	564.5

October-November 2005: False scad (*Caranx rhonchus*), 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				23			23
10							
11				41			41
12							
13							
14				904			904
15				268		14	282
16				666		112	778
17				634		94	728
18				853		59	912
19				272		323	595
20				129		63	192
21				5,151		151	5,302
22				2,218		357	2,575
23				9,609		819	10,428
24				3,734		756	4,489
25				1,480		736	2,216
26				10,238		869	11,107
27				3,589	4,877	1,041	9,508
28				6,484	11,086	2,520	20,090
29				1,327	6,528	786	8,641
30				850	281	287	1,417
31				516	182	343	1,040
32					399	1,041	1,440
33					218	128	347
34						770	770
35						458	458
36						332	332
37						180	180
38						195	195
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
Total	N.A.			48,985	23,571	12,434	84,990



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

Part II

MAURITANIA

3 November - 13 November 2004

**Institut Mauritanien de Recherches Océanographiques et des Pêches
Nouadhibou, Mauritania**

**Institute of Marine Research
Bergen, Norway**

CRUISE REPORTS “DR FRIDTJOF NANSEN”

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

Part II

MAURITANIA

3 November - 13 November 2004

by

Jens-Otto Krakstad*

Magne Olsen*

and

Abdoulaye Wagué**

*Institute of Marine Research

P.O. Box 1870 Nordnes

N-5817 Bergen, Norway

** Institut Mauritanien de Recherches Océanographiques et des Pêches

Nouadhibou, Mauritania

Institute of Marine Research

Bergen, 2004

TABLE OF CONTENTS

CHAPTER 1	INTRODUCTION	4
1.1	Objective of the cruise	4
1.2	Participation	5
1.3	Narrative	5
CHAPTER 2	METHODS	8
2.1	Environmental data	8
2.2	Biological sampling	8
2.3	Acoustic sampling	10
2.4	Parallel survey with R.V. “Al Awam”	13
CHAPTER 3	SURVEY RESULTS	14
3.1	Hydrography	14
3.2	St. Louis to Cape Timiris	21
3.3	Cape Timiris – Cape Blanc	28
3.4	Parallel trawl survey	29
CHAPTER 4	OVERVIEW AND SUMMARY OF RESULTS	30
Annex I	Records of fishing stations	
Annex II	Description of the instruments and the fishing gear	
Annex III	Pooled length distributions by species and region	
Annex IV	Estimated number and biomass by length-groups and sectors	
Annex V	Regional estimates	

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 November-December 2003. 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 a parallel survey with the Mauritanian research vessel Al Awam. This will include intercalibration and parallel trawling.

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:

Mamadou Sall Diallo, Abdoulaye Wagué (Team leader) , Jemal Ould Abed, Ibra Diallo

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

Abdoulaye Sarre

Department of Fisheries (FD), The Gambia:

Juldah Jallow

Institut National de Recherche Halieutique (INRH), Morocco:

Salaheddine Al Ayoubi

Institute of Marine Research (IMR), Norway:

Jens-Otto Krakstad (Cruise leader), Magne Olsen, Tore Mørk and Jan Frode Wilhelmsen

1.3 Narrative

The vessel departed from Dakar 18:00 GMT on the 03rd November 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 07:00 GMT the next day together with the local Mauritanian R.V. "Al Awam". Both vessels 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 11th November 18:30 GMT. The vessel then steamed to Nouakchott where the survey was completed on the 13th November at 17:00 GMT.

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 Cape Vert to St. Louis and from Cape Blanc to Nouakchott (log).

Area	BT	PT	Total trawls	CTD casts	Log (nm)
St. Louis to Cape Blanc	14	22	36	57	1386

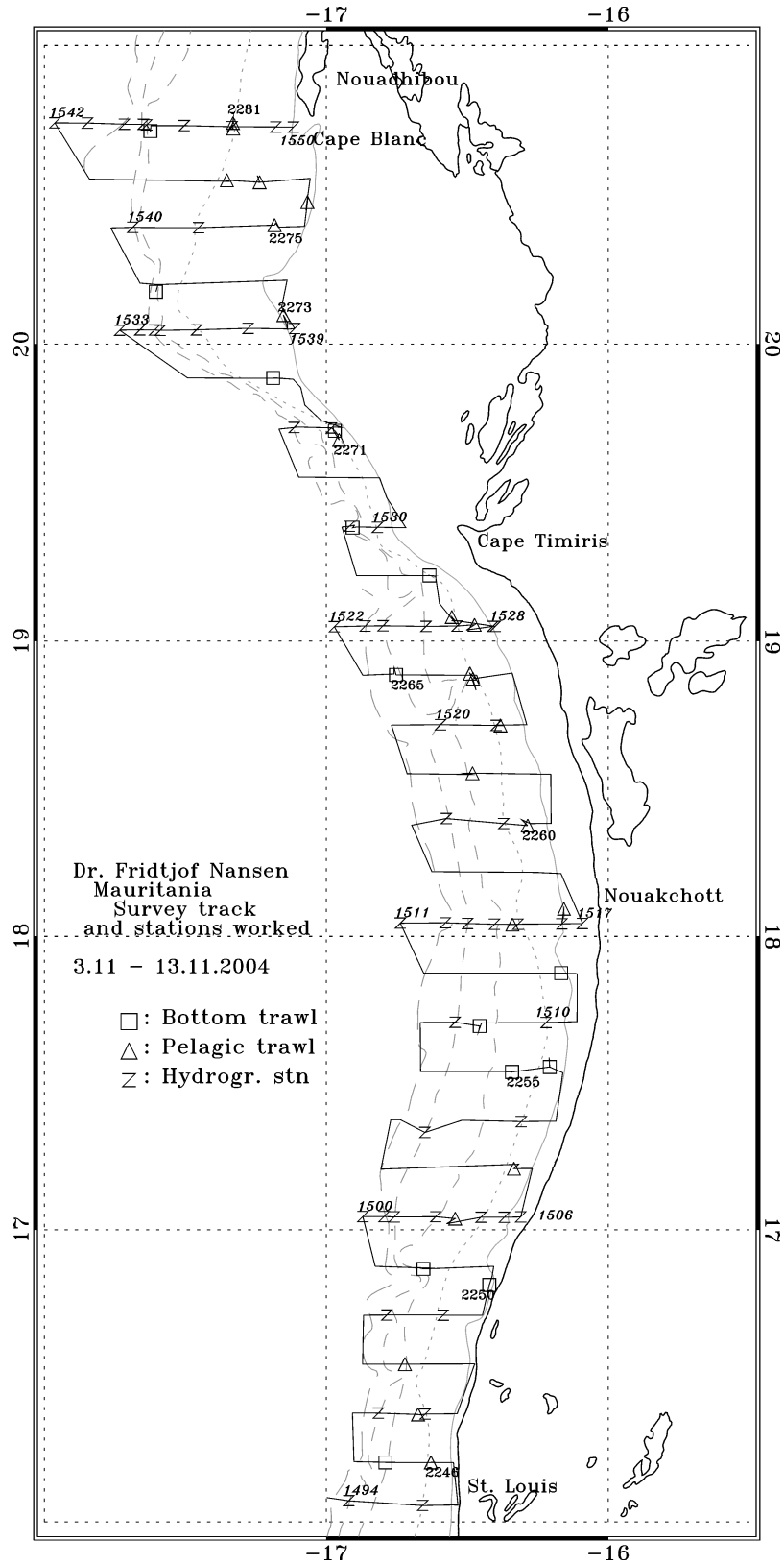


Figure 1. Course tracks with fishing and hydrographic stations; St. Louis to Cape Blanc

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 at 15 m - 20 m, 50 m, 100 m, 200 m, 500 m, 750 m and 1000 m bottom depth, and at fixed stations every 50 m and 200 m depth every 20 NM. 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 22 samples were accepted for oxygen calibration on 26th October 2004. A linear regression of the Winkler determinations on the CTD values produced the correction:

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

were $a=1.2498$ and $b=-0.0622$

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>
	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

A SIMRAD EK500 Echosounder was used with the settings as shown in Annex II. All four frequencies 18 kHz, 38 kHz, 120 kHz and 200 kHz were logged. All abundance estimation was based on data from the 38 kHz transducer. The Bergen Integrator (BEI) was used for analysis and allocation of the integrated s_A -values to the individual specified target groups by 5 NM intervals. The allocation of values to target groups was based on a combination of a visual scrutiny of the behaviour pattern as deduced from echo diagrams, the BEI analysis, and the catch compositions.

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 BEI 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, 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*), 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.

2.4 Parallel survey with R.V. “Al Awam”

During the survey the Mauritanian research vessel “Al Awam” did a parallel survey with “Dr. Fridtjof Nansen”. As part of this, parallel trawl hauls were conducted with regular intervals, as well as acoustic intercalibration between the vessels. The strategy for the intercalibration followed the recommendations by MacLennan and Simmons (1992).

One of the research vessels placed itself 0.5 NM behind and 0.5 NM to the side of the vessel that took the lead. The distance between the vessels were chosen so that the vessels could stay as close together as possible without disturbing each other’s acoustic recordings. 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 parallel survey and intercalibration will be analysed on land and a separate report will be produced on the exercise.

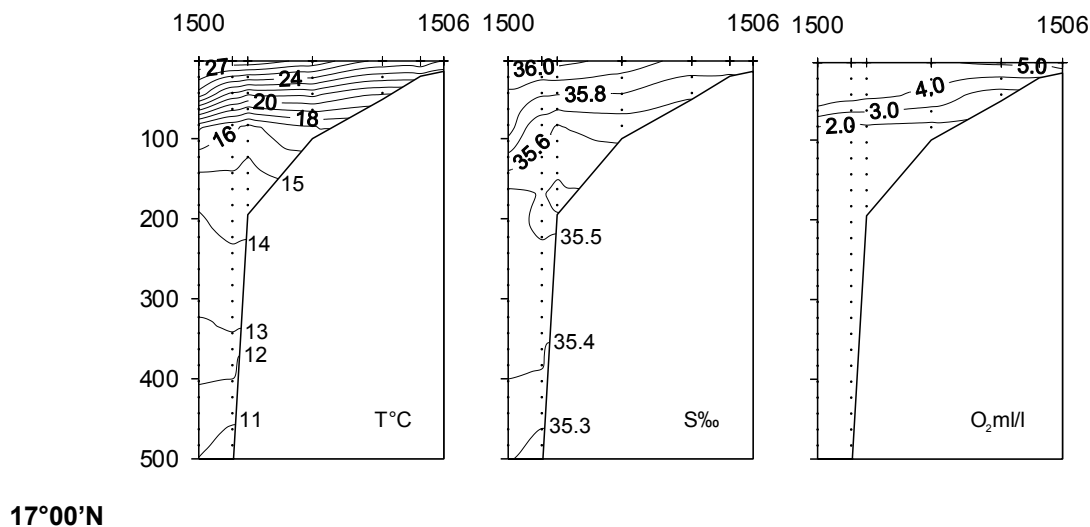
CHAPTER 3 SURVEY RESULTS

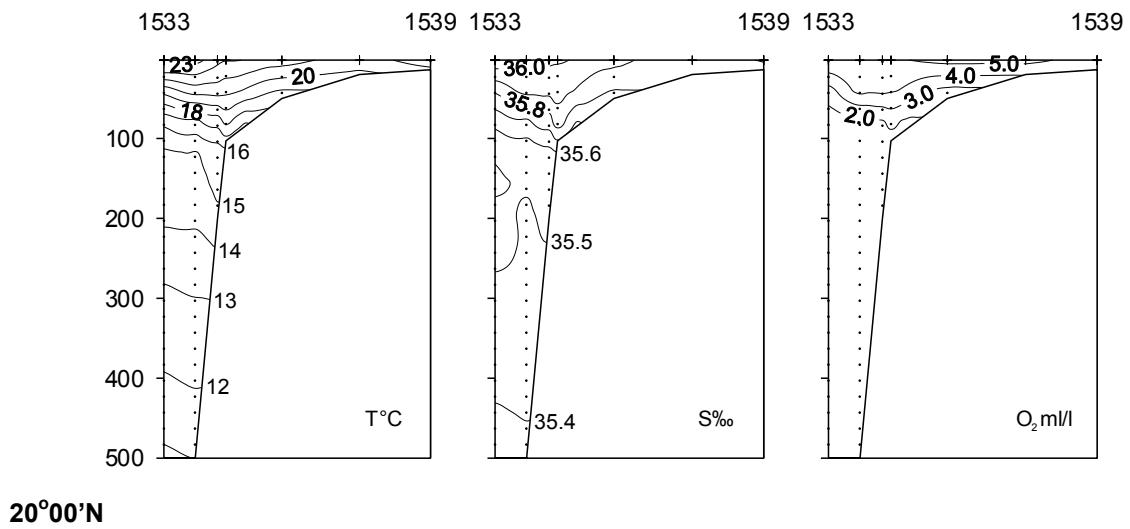
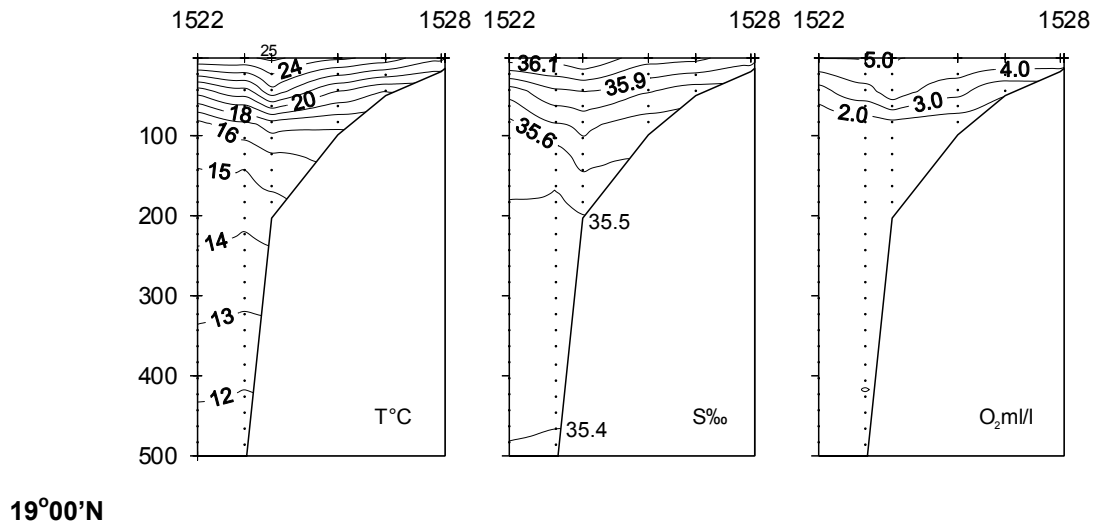
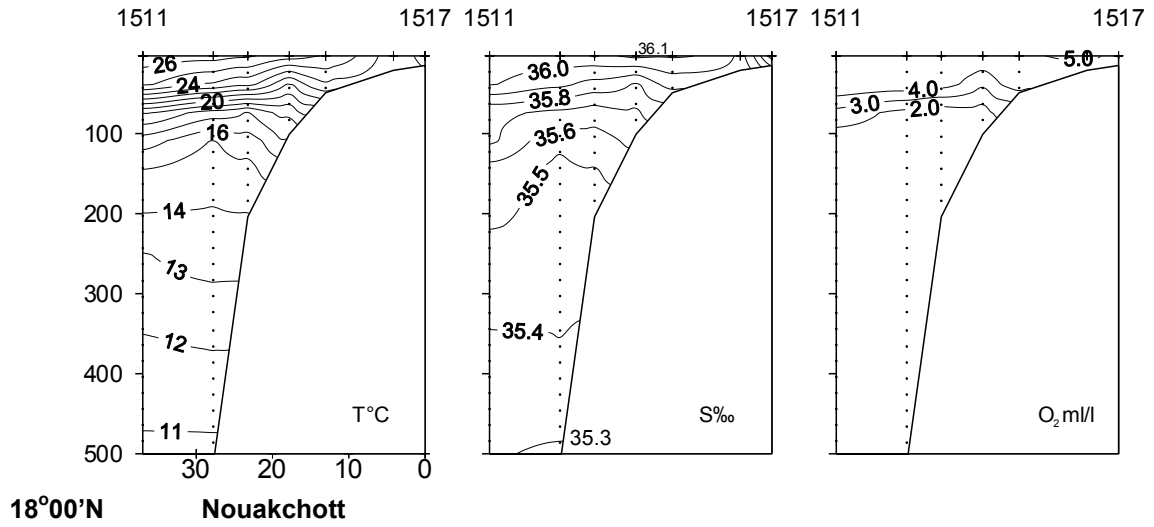
3.1 Hydrography

Hydrographical data was collected on fixed CTD stations to 500 m depth and from the 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 11°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 23°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 5 ml/l O₂ in the surface water, declining to 2 ml/l O₂ at approximately 70 m depth.





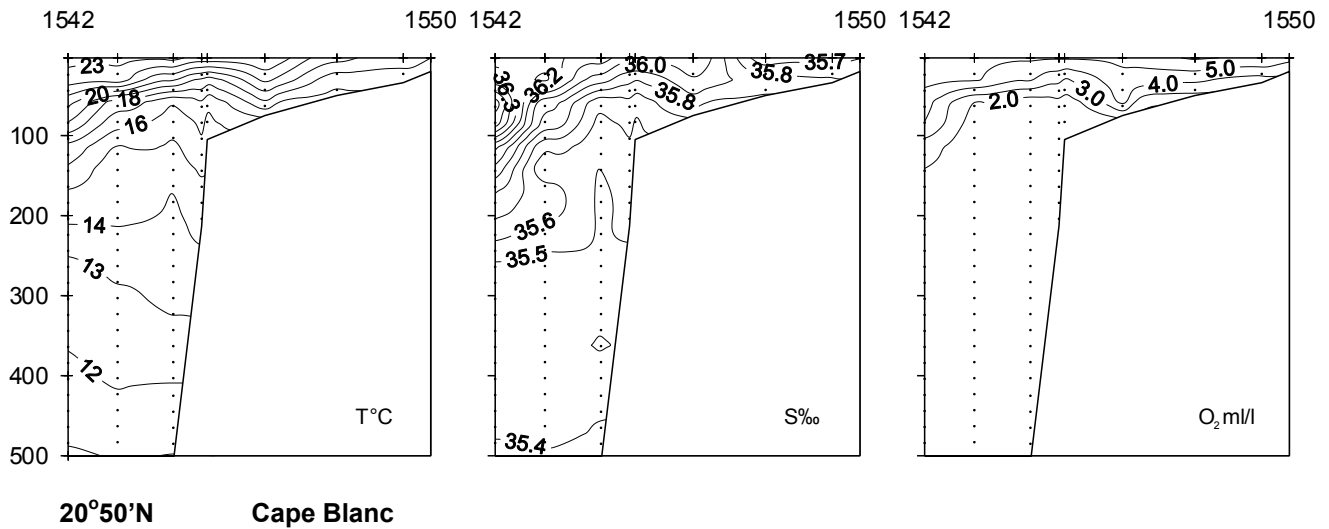


Figure 2. Hydrographical profiles with distribution of temperature, salinity and oxygen

Sea surface temperature and wind direction

Figure 3 shows the sea surface temperature at 5 m of depth while Figure 4 shows the sea surface salinity at 5 m depth. The southern part of Mauritania was characterized by relatively warm waters. The temperature isobaths were directed alongshore, with the coolest waters inshore and increasingly warmer temperature offshore, with a maximum of more than 27°C. North of Nouakchott temperature isobaths were running across shelf and a frontal zone is visible. However the waters are more turbulent again at Cape Timiris and warmer offshore water masses were brought into the shelf. In the north of the survey area a body of colder waters as low as 20°C was intruding into the Mauritanian shelf. And temperatures dropped with up to three degrees in less than 50 m surface distance at the border between the cold costal waters and offshore water masses. Water masses in the whole survey area were generally much warmer than last year, and cold water masses (20°C) were only present in the northern part of the survey area.

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 around 35.9‰. North of this a body of less saline waters are seen at Cape Blanc with salinity around 35.5‰ corresponding with the cold water masses from the Canary current coming from north of the survey area.

Figure 5 show the wind direction and wind speed during the survey of Mauritania. The wind came from north and northwest in the southern part of the survey area. North of Nouakchott and around Cape Timiris more variable winds were experienced, with the wind direction often coming from northeast turning to southeast. Wind direction should be favourable for

upwelling in this area. At Cape Blanc the wind was stable from a northerly direction. The conditions were favourable for acoustic surveying throughout the survey.

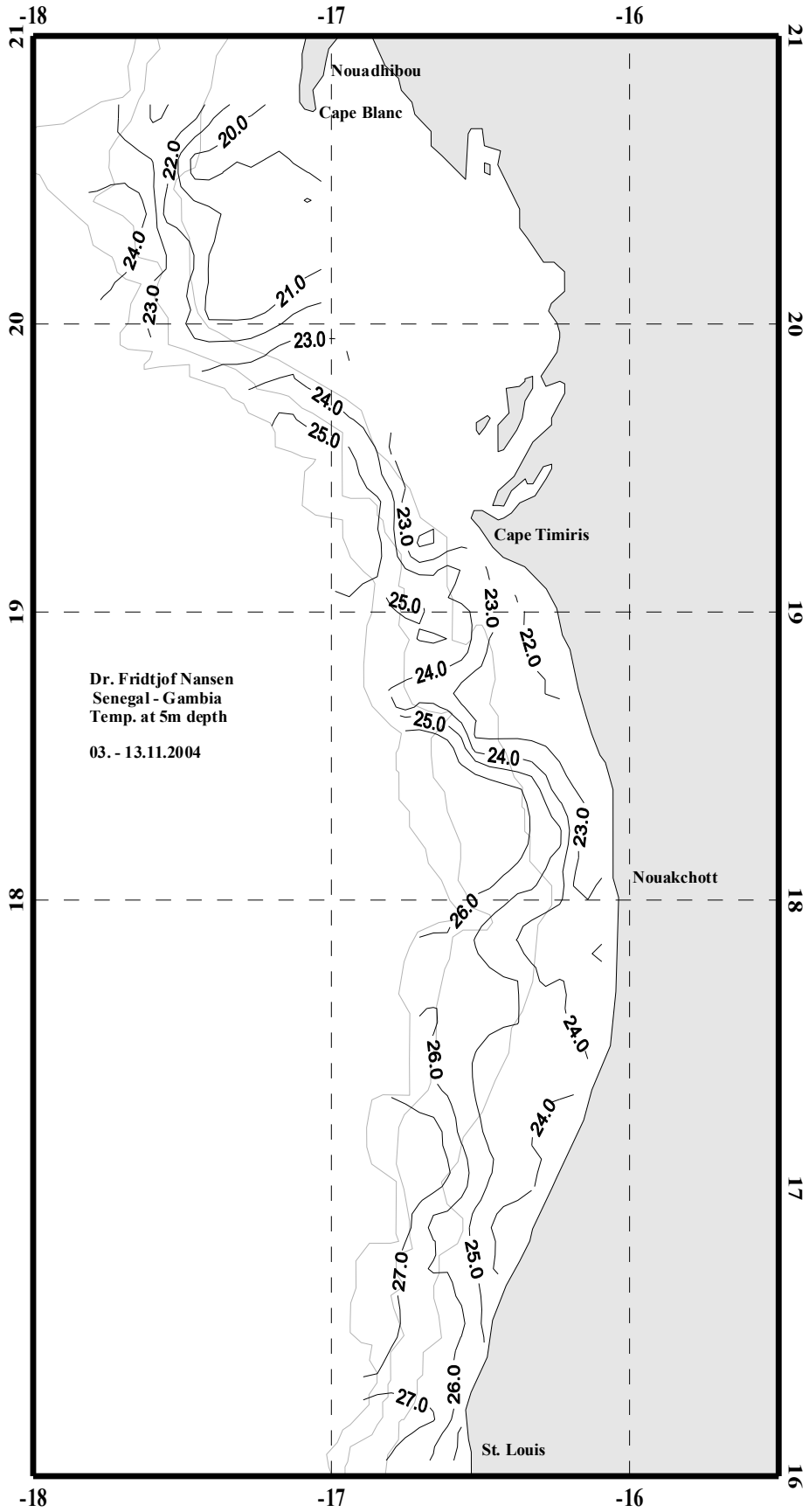


Figure 3. Sea surface temperature; St. Louis to Cape Blanc

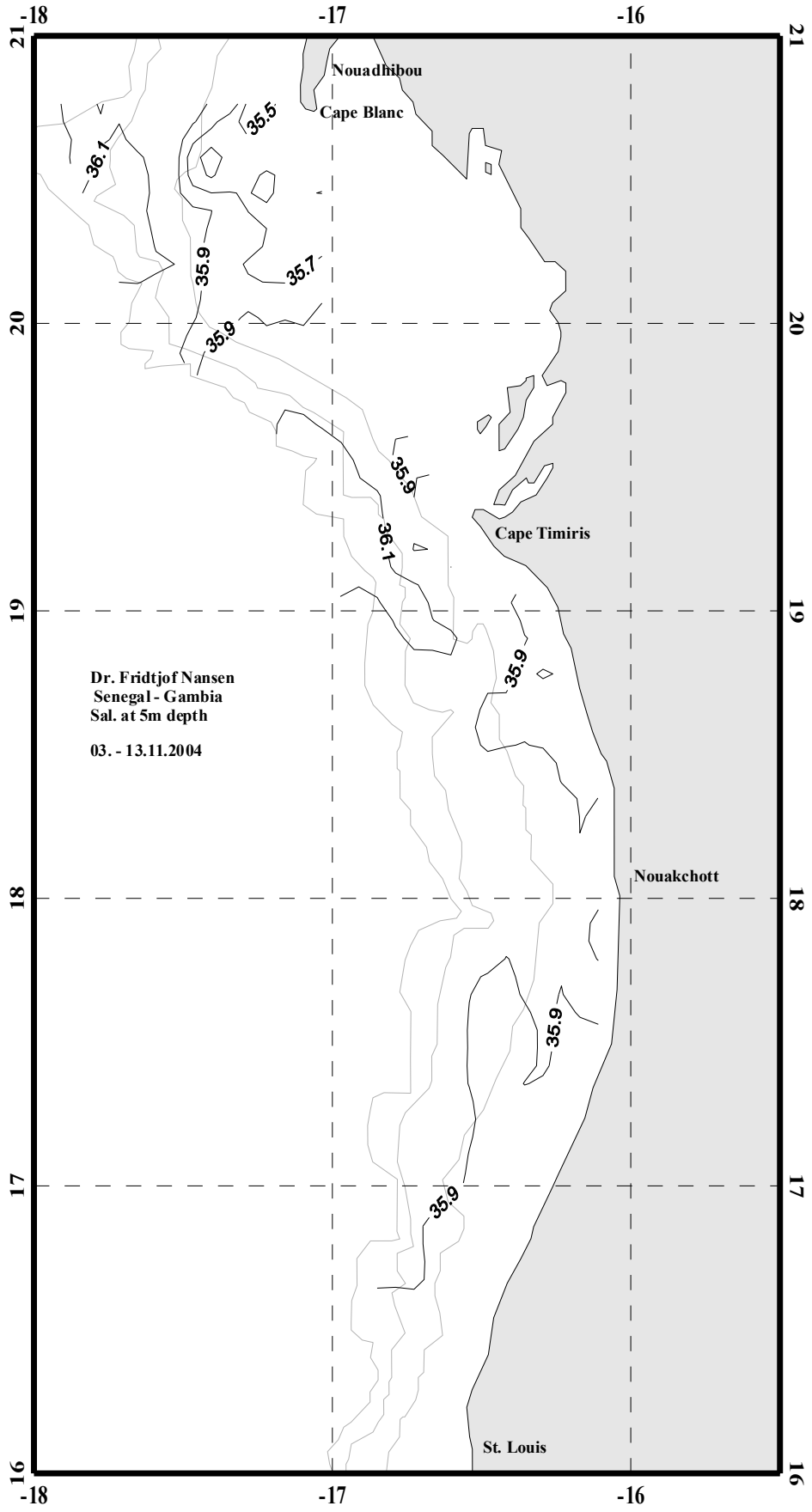


Figure 4. Sea surface salinity; St. Louis to Cape Blanc

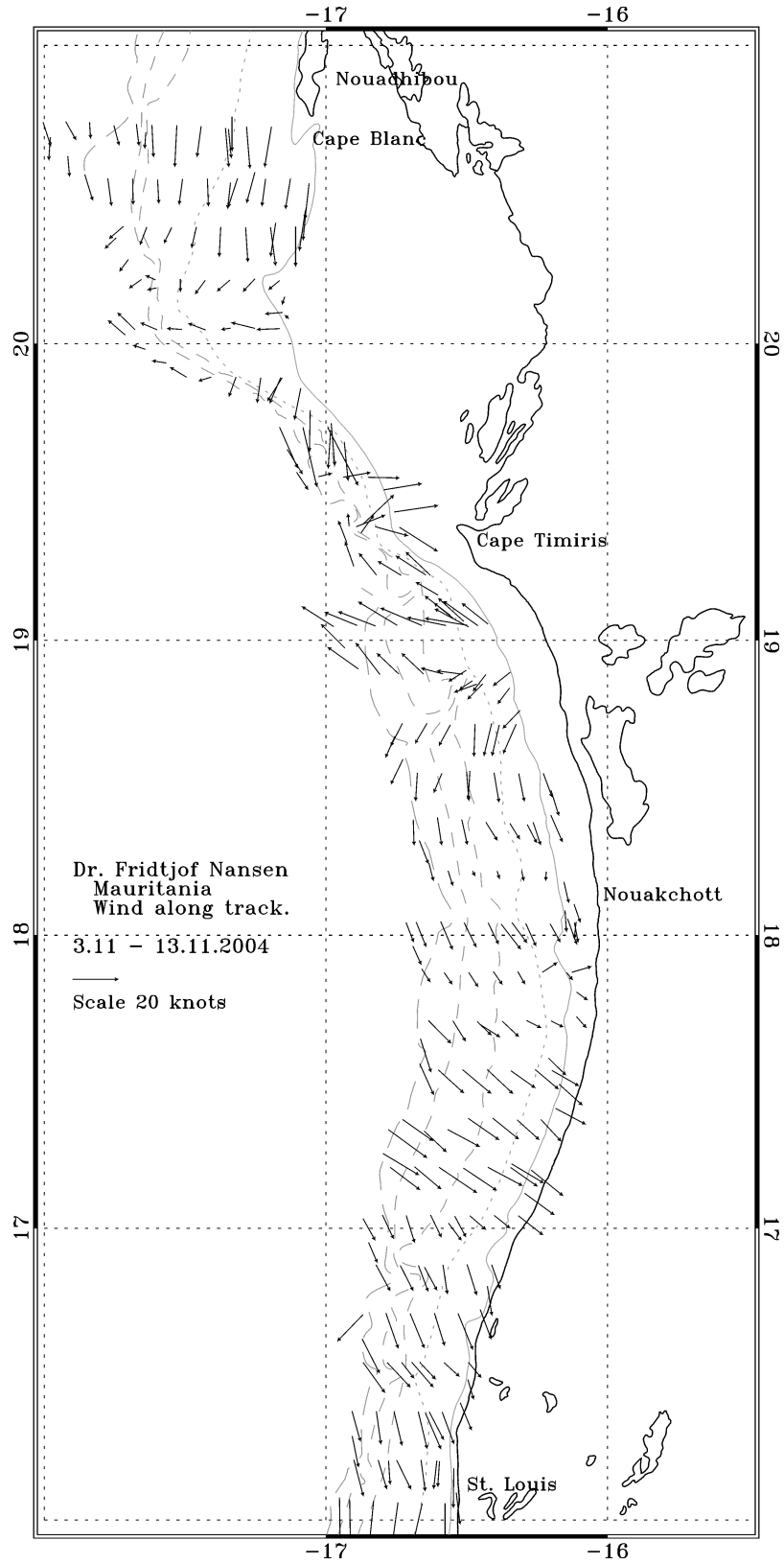


Figure 5. Wind speed and direction; St. Louis to Cape Blanc

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 6, Figure 7, Figure 8 and Figure 9.

Sardinella was found in two large distribution areas on the shelf between St. Louis and Cape Timiris, extending northwards into Banc D'arguin. The density was variable within each of the two main distribution areas, mainly with high to medium densities, and with low densities at the edge between the two main distribution areas. The sardinella was mainly distributed between the 15 m depth and offshore to more than 50 m depth, with highest concentrations found around 20–30 m depth, Figure 6. Both species of sardinella were found in the area. The biomass of *S. aurita* was estimated to be 189 thousand tons, while the biomass of *S. maderensis* was estimated at 1 244 thousand tons.

Three modal peaks at 14 cm, 28 cm and 33 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* were 17 cm, 26 cm and 29 cm. Estimated number and biomass by length-groups are in Annex IV. The total biomass of sardinellas in the area was estimated at 1433 thousand tonnes, Table 3.

Trachurus trecae were found in five low-density 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 7. 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 29 thousand tons, while 0.8 thousand tons of *Trachurus trachurus* were found. No separate estimate of *Decapterus rhonchus* was made. The *Trachurus trecae* showed two modal peaks, at 13 cm and 23 cm roughly corresponding to one and three year old fish.

One catch of sardine (*Sardina pilchardus*) were made in shallow waters south of Cape Timiris. The modal length of the sardine in the catch was 25 cm. A few schools were found concentrated in this area, and the abundance was estimated to be 20 thousand tonnes.

Anchovy (*Engraulis encrasicolus*) were not found south of Cape Timiris

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 9. 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, Table 4. 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 106 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>	<i>Sardina pilchardus</i>	Horse mackerels	Carangids etc.
1244	189	20	29.8	106

Table 4. Catch by stations sorted by groups (in kg/hour) St. Louis – Cape Blanc

STA	TDEP	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other
2246	18	266.1	121.6	20.2	0.0	5.6	181.1
2247	98	19.8	470.5	0.0	0.0	0.0	117.3
2248	19	605.3	141.7	0.0	29.4	8.7	73.7
2249	18	37.8	1827.0	0.0	31.6	0.0	4.1
2250	20	296.5	131.8	0.0	66.3	0.7	1779.1
2251	85	0.0	38.1	0.0	3.9	0.0	29.0
2252	28	14.9	27.9	0.0	11.8	0.0	1.0
2253	19	0.0	48.8	0.0	5.0	1.2	1595.1
2254	38	0.0	26.3	0.0	0.0	1.5	329.7
2255	79	12.3	226.4	0.0	364.0	0.0	2135.9
2256	119	0.0	125.3	0.0	111.3	0.0	193.4
2257	22	0.0	46.4	0.0	0.0	0.0	1799.7
2258	19	19.0	5.0	0.0	83.3	0.0	54.0
2259	10	8.9	91.6	0.0	3.1	0.0	101.3
2260	10	304.2	54.8	6.2	0.0	0.0	91.5
2261	5	0.0	161.0	0.0	294.9	0.0	189.1
2262	17	0.0	35.8	0.0	14.5	0.0	645.3
2263	28	1.1	0.5	0.0	0.0	0.0	0.0
2264	23	26.6	22.1	0.0	0.0	0.0	0.0
2265	223	0.0	35.2	0.0	85.8	0.0	2493.5
2266	10	1664.9	187.7	0.0	2.5	0.0	38.2
2267	25	77.8	39.8	28.1	30.9	0.0	8.2
2268	65	0.0	0.0	0.0	73.9	0.0	591.2
Mean	43.4	145.9	168.0	2.4	52.7	0.8	541.4

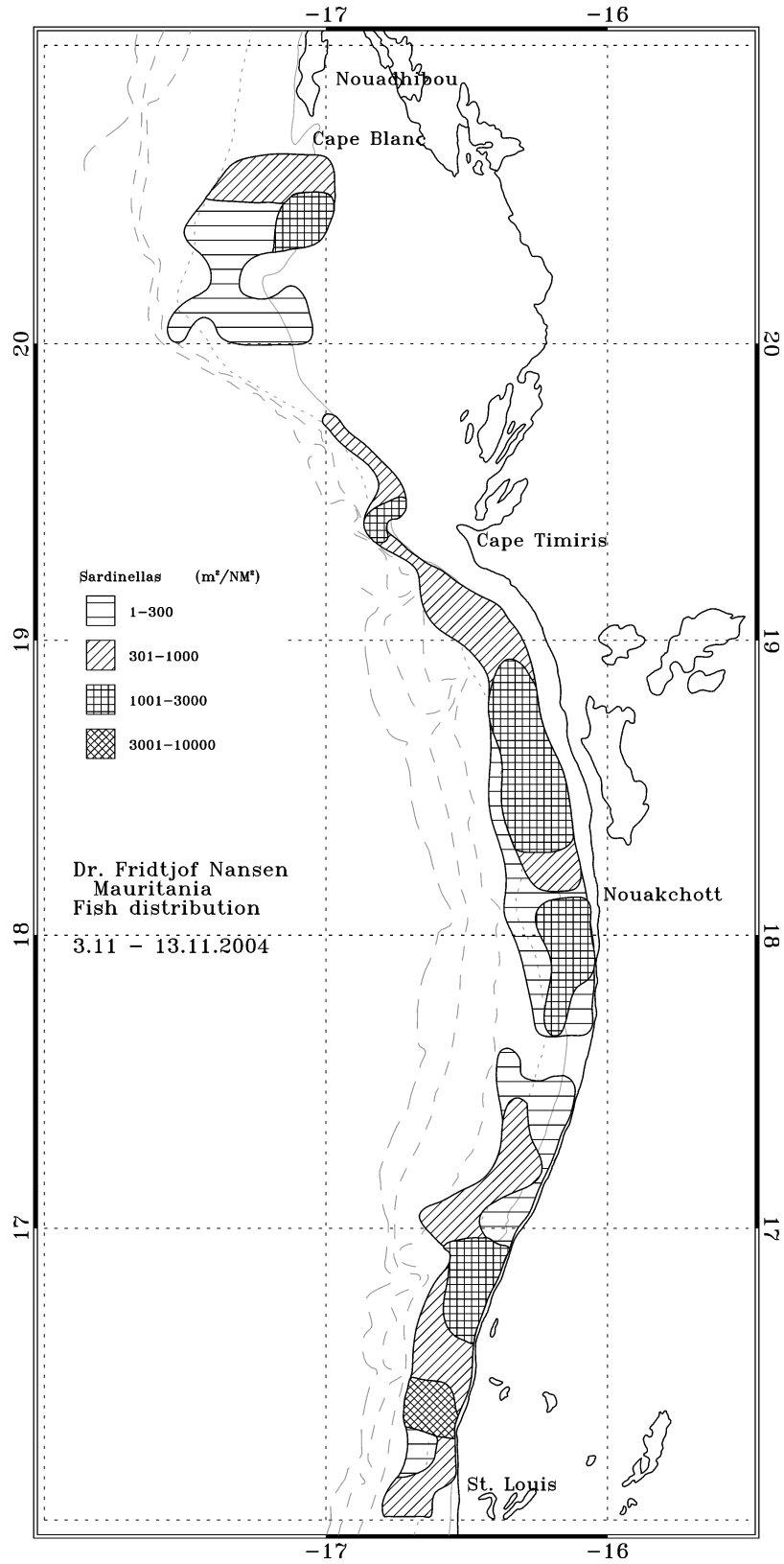


Figure 6. Distribution of sardinellas; St. Louis to Cape Blanc

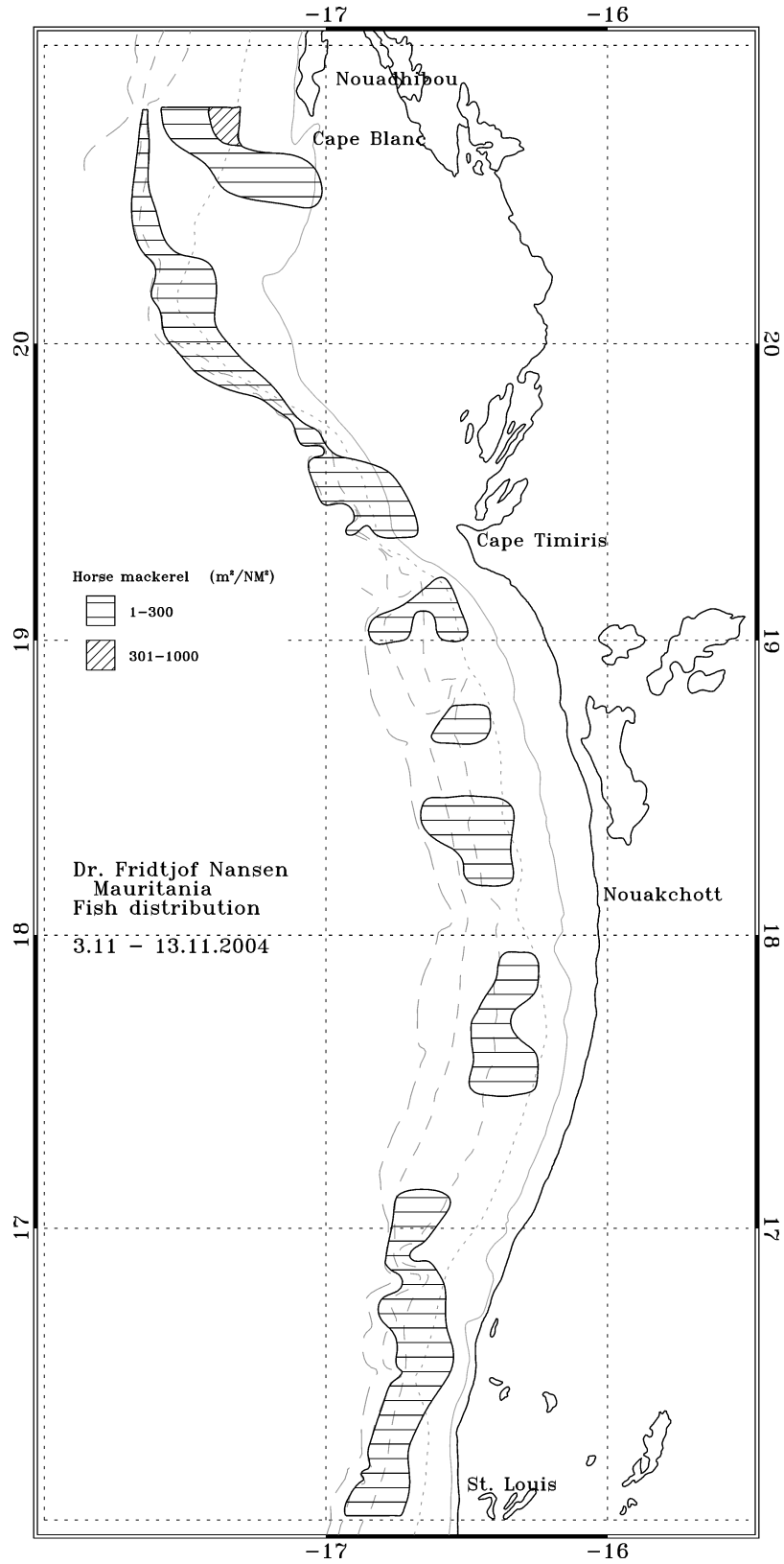


Figure 7. Horse mackerels; St. Louis to Cape Blanc

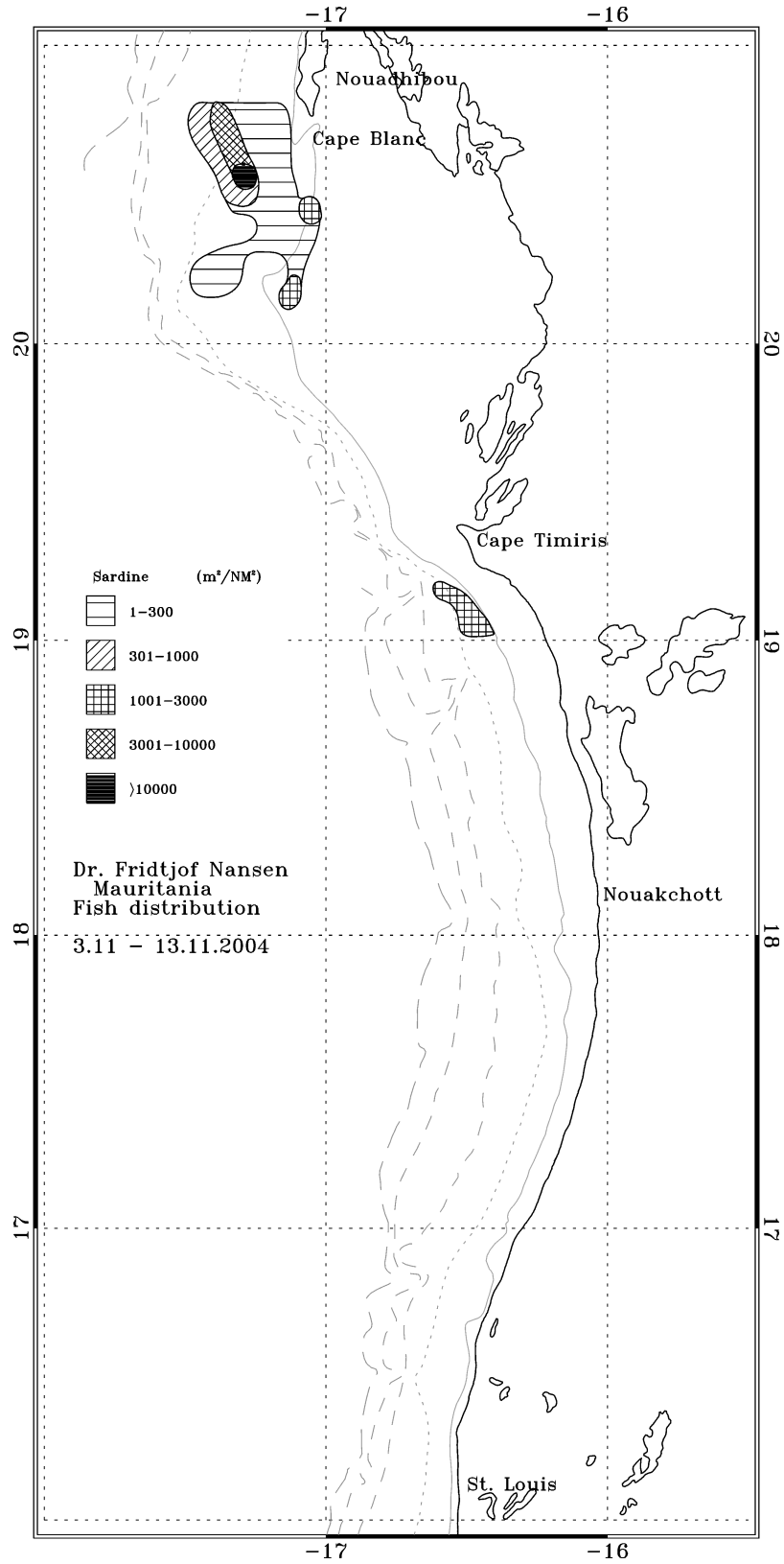


Figure 8. Sardine, St. Louis to Cape Blanc

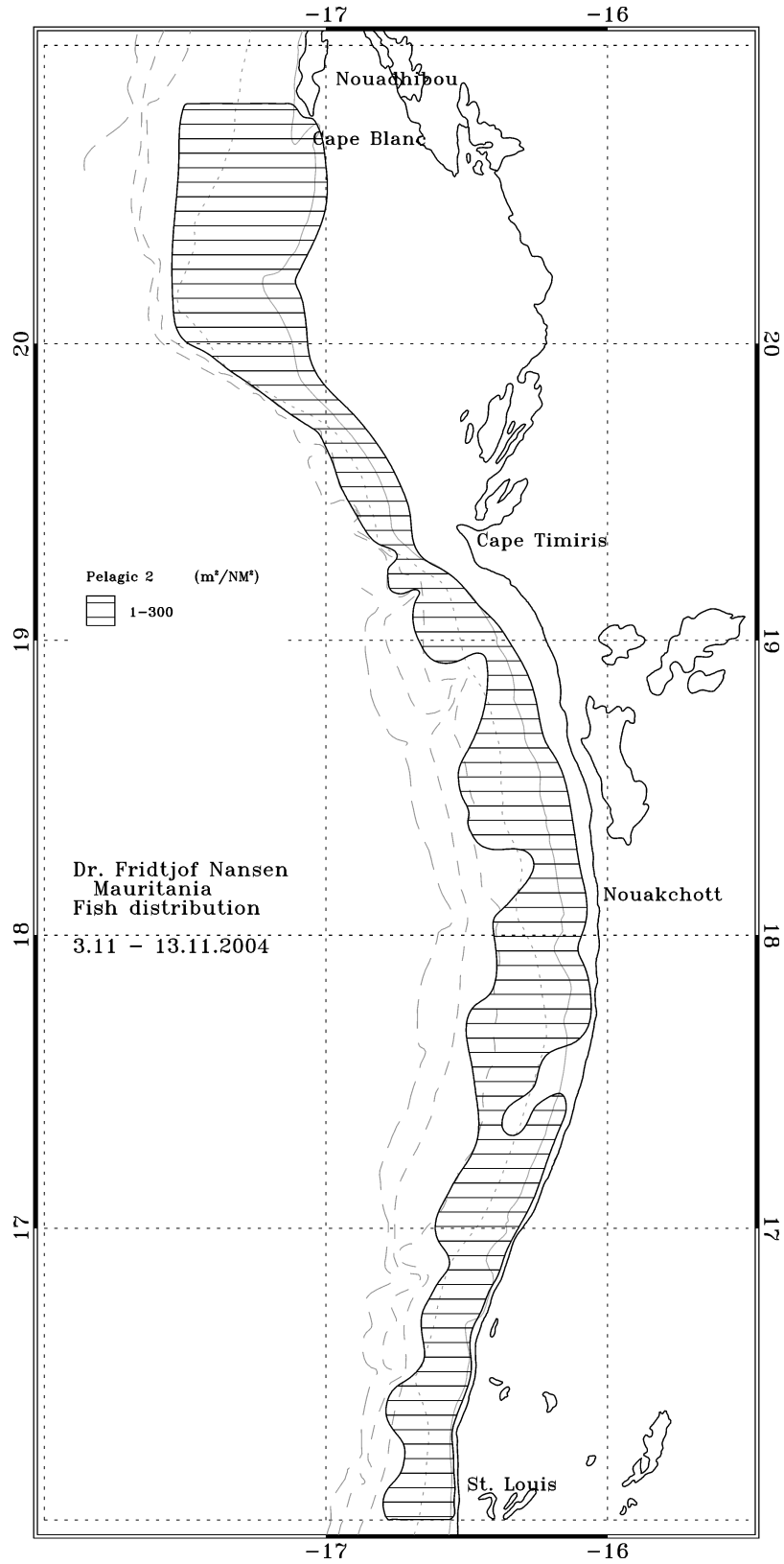


Figure 9. Carangids and associated species; St. Louis to Cape Blanc

3.3 Cape Timiris – 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 6. 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 115 thousand tons, Table 5. This comprised of 91 thousand tons of *S. maderensis* and 24 thousand tons of *S. aurita*. Similar to last year, mainly adults of *S. maderensis* were found in the area, with one modal peak visible at 22 cm. The *S. aurita* in the area showed two modal peaks at 8 cm and 23 cm. The estimated number and biomass by length-groups are in Annex IV.

Sardine (*Sardina pilchardus*) was found in high- very high concentrations south of Cape Blanc, extending northwards. Highest concentrations were found around 50 m depth, Figure 8. The biomass of sardine in this area was estimated to be 384 thousand tons, Table 5. This consisted of one cohort with adult fish, with a modal peak at 25 cm.

Anchovy (*Engraulis encrasicolus*) were found in two trawl samples at night south of Cape Blanc in shallow waters, <50 m depth. No attempt was made to estimate the biomass.

Cunene and Atlantic horse mackerel was found mixed in one area from Cape Blanc and southwards on the shelf and shelf break to Cape Timiris around 100 m depth, while another area inshore off Cape Blanc consisted of Cunene horse mackerel only, Figure 7. *Decapterus rhonchus* was found further north than usual due to the warmer than normal water conditions. The species was thoroughly mixed with other pelagic species, hence no separate estimate was made and the biomass included as part of the P2. The estimated biomass of horse mackerels in the area were 53 thousand tons, Table 5. The biomass estimate comprised of 45 thousand tons of *Trachurus trecae* and eight thousand tons of *T. trachurus*. The biomass of *T. trecae* consisted mainly of juveniles, with a modal peak of 12 cm, while *T. trachurus* in the area showed a modal peak at 26 cm. Some few adult *T. trecae* with a modal peak around 41 cm was also found on the shelf break. 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 9. 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 tons, Table 5.

Table 5. Cape Timiris – Cape Blanc. Biomass estimates of pelagic fish, thousand tons.

<i>S. maderensis</i>	<i>S. aurita</i>	<i>Sardina pilchardus</i>	Horse mackerels	Carangids etc.
91	24	384	53	42

Table 6. Catch by stations sorted by groups (in kg/hour) Cape Timiris – Cape Blanc

STA	TDEP	Clupeids	Carangids	Scombrids	Hairtails	Barracudas	Other
2269	98	0.0	1799.3	0.0	45.1	0.0	1122.6
2270	50	97.5	411.1	0.0	678.6	0.0	2327.0
2271	10	23.7	1089.3	3.4	222.0	0.0	39.1
2272	26	41.3	9.6	0.0	0.0	0.0	952.6
2273	10	174.4	741.9	0.0	0.0	82.8	76.5
2274	99	0.0	60.6	0.0	247.8	0.0	711.8
2275	10	2182.1	211.3	0.0	0.0	0.0	2809.4
2276	10	3422.5	114.5	0.0	0.0	0.0	1886.8
2277	19	399.5	9.0	0.0	0.0	0.0	3.6
2278	10	3263.7	3.0	0.0	16.8	0.0	28.2
2279	98	0.0	0.8	0.0	2.7	0.0	334.6
2280	10	0.0	0.0	9.9	0.0	0.0	750.0
2281	10	8.8	0.0	0.0	0.0	0.0	65.7
Mean	35.4	739.5	342.3	1.0	93.3	6.4	854.4

3.4 Parallel trawl survey

The parallel trawl survey was conducted successfully. During the survey of Mauritania the R.V. “Al Awam” followed the same course track as R.V. “Dr. Fridtjof Nansen”. As part of the parallel trawl survey several rounds of intercalibration were conducted successfully. The data from the parallel survey will be analysed later and presented in a separate report.

CHAPTER 4 OVERVIEW AND SUMMARY OF RESULTS

The survey was conducted successfully from 3rd to 13th November, covering a course track of approximately 1 386 NM. A total of 36 fishing stations and 57 CTD casts were established.

The hydrographical data showed warmer than usual surface temperatures over most of the Mauritanian shelf. Cold water (20°C) was only present in the northernmost part of the survey area around Cape Blanc, Figure 3. The southern part of Mauritania showed stable salinity levels around 35.9‰ 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 along the whole shelf of Mauritania, between 15 m depth and offshore to approximately 50 m bottom depth, Figure 6. Similar to last year in November the bulk of the biomass was dominated by *S. maderensis* (86%). The majority of the biomass of both species was found south of Cape Timiris. North of this, only 24 thousand and 91 thousand tons of *S. aurita* and *S. maderensis* respectively, were found, Table 7. 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.

Sardine were found inshore in shallow waters in a small area at Cape Timiris, and in a larger distribution around the border area at Cape Blanc, extending across the border and following roughly the same distribution as the cold water intrusion from the north. The total biomass in Mauritanian waters were estimated to be 405 thousand tons

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 7. The total abundance estimate of Cunene horse mackerel was 74 thousand tons while the estimate of Atlantic horse mackerel was 9 thousand tons.

Other carangids and associated species were distributed over most of the shelf at rather low densities along the whole coast, Figure 9. 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 Table 4. The total biomass was estimated at approximately 69 thousand tons, of this 51 thousand tons 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 7, and the geographical distribution and abundance of main species is in Figure 10. The total biomass of sardinellas was thus 1 548 thousand tons, horse mackerels 83 thousand tons and of carangids and associated species 148 thousand tons. Note that *Decapterus rhonchus* has been included in the biomass of other Carangids (P2) as no biomass estimate was made for this group.

Table 7. Summary of biomass estimates of pelagic fish, Mauritania. thousand tons.

	<i>Sardinella maderensis</i>	<i>Sardinella aurita</i>	<i>Sardina pilchardus</i>	Horse mackerels	Carangids etc.
St. Louis – Cape Timiris	1244	189	20	30	106
Cape Timiris – Cape Blanc	91	24	384	53	42
Total	1335	213	404	83	148

The abundance of sardinella in Mauritanian waters has increased immensely since the very low estimate in November 2002 were only 320 tons of sardinella were found. This year's estimate is the highest since November 1995. The large increase in the biomass of sardinella may also explain the decrease in the biomass of horse mackerels and some of the other carangid species. The abundance of Cunene horse mackerel in particular is lower than it has been in many years.

The total estimate of carangids and associated species (including horse mackerel) was estimated at 231 thousand tons. This is low compared to last years estimate. There seems to be a downward trend in the biomass estimates of these species, which may have connection with the large increase of sardinella species in the region.

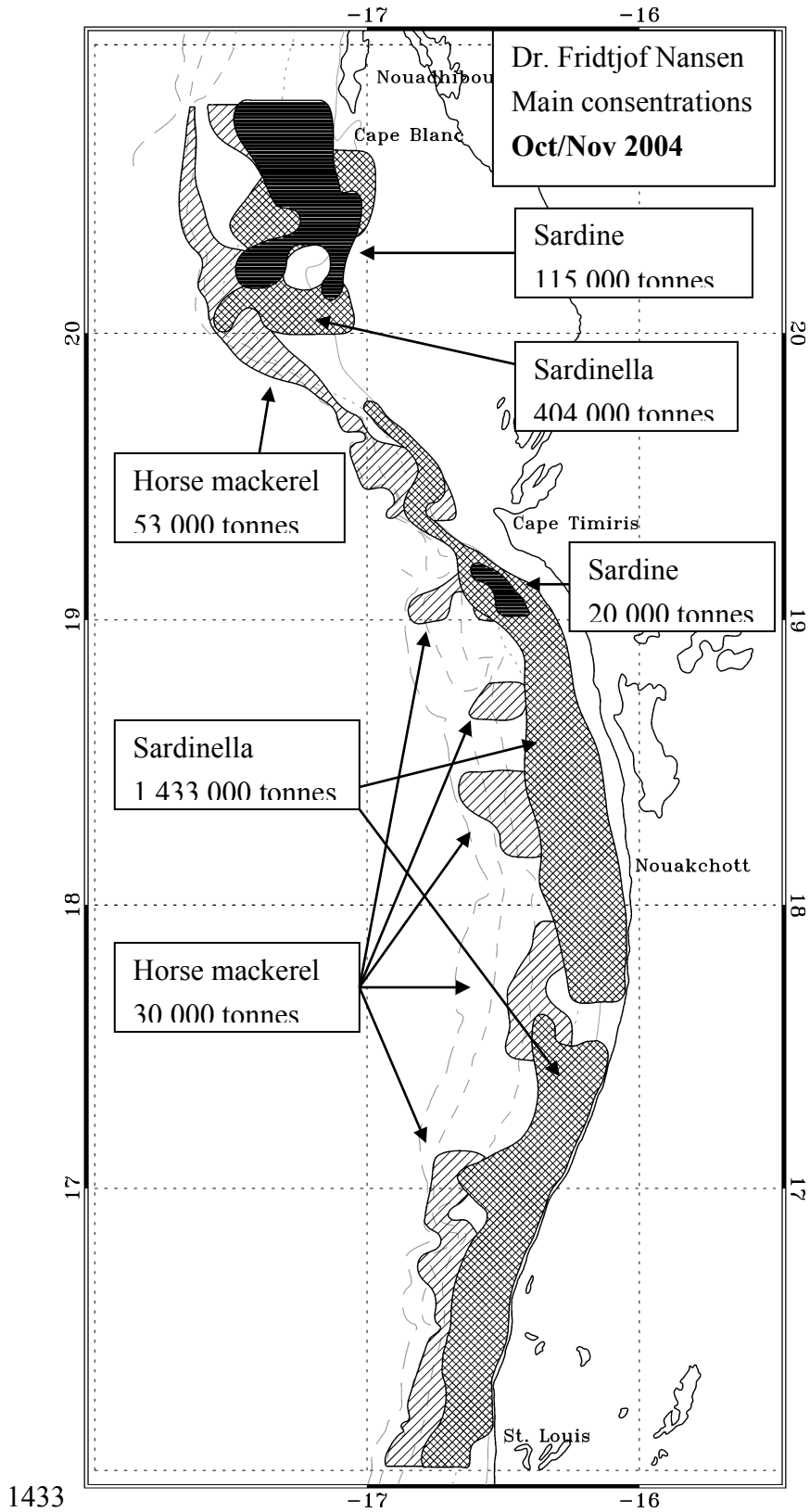


Figure 10. Major pelagic fish concentrations with estimated biomass (tonnes), Mauritania.

Table 8. Biomass estimates from 'Dr. Fridtjof Nansen' surveys of the Mauritanian shelf, thousand tons.

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

* 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.

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

Annex I. Records of fishing stations

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2246
 DATE: 4/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1612
 start stop duration Long W 1638
 TIME :12:44:00 13:07:24 23 (min) Purpose code: 1
 LOG :8028.11 8029.64 1.52 Area code : 3
 FDEPTH: 20 15 GearCond.code:
 BDEPTH: 47 37 Validity code:
 Towing dir: 90ø Wire out: 105 m Speed: 38 kn*10
 Sorted: 82 Kg Total catch: 227.90 CATCH/HOUR: 594.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	231.39	1372	38.92	3737
Rhizoprionodon acutus	91.57	76	15.40	
Chloroscombrus chrysurus	55.04	6274	9.26	
Selene dorsalis	48.52	762	8.16	
Stromateus fiatola	32.87	52	5.53	
Brachydeuterus auritus	29.48	389	4.96	
Sardinella maderensis	22.17	219	3.73	3738
Sphyrna lewini	18.26	13	3.07	
Alectis alexandrinus	18.00	34	3.03	
Ilisha africana	12.55	136	2.11	
Scomberomorus tritor	11.74	16	1.97	
Sarda sarda	8.48	16	1.43	
Pomadasy peroteti	6.52	83	1.10	
Sphyrna sphyraena	3.89	16	0.65	
Sepia officinalis hierredda	2.35	3	0.40	
Sphyrna guachancho	1.70	34	0.29	
Total	594.53		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2247
 DATE: 4/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1612
 start stop duration Long W 1647
 TIME :15:03:52 15:34:29 31 (min) Purpose code: 1
 LOG :8044.23 8045.85 1.62 Area code : 3
 FDEPTH: 101 94 GearCond.code:
 BDEPTH: 101 94 Validity code:
 Towing dir: 90ø Wire out: 340 m Speed: 31 kn*10
 Sorted: 28 Kg Total catch: 313.92 CATCH/HOUR: 607.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	470.52	18735	77.44	3739
Boops boops	22.78	1725	3.75	
Merluccius senegalensis	20.65	43	3.40	
Loligo vulgaris	20.01	85	3.29	
Sardinella aurita	19.80	341	3.26	
Zeus faber	17.88	170	2.94	
Illex coindetii	9.79	319	1.61	
Lagocephalus laevigatus	8.94	64	1.47	
Octopus vulgaris	6.77	10	1.11	
Pagellus bellottii	3.19	319	0.53	
GALATHEIDAE	2.77	532	0.46	
Todaropsis eblanae	2.34	106	0.39	
Syacium micrurum	0.85	21	0.14	
Alloteuthis africana	0.64	106	0.11	
GOBIIDAE	0.43	43	0.07	
Sepiella ornata	0.21	21	0.03	
Total	607.57		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2248
 DATE: 4/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1622
 start stop duration Long W 1640
 TIME :20:08:59 20:18:48 10 (min) Purpose code: 1
 LOG :8082.53 8083.15 0.60 Area code : 3
 FDEPTH: 20 17 GearCond.code:
 BDEPTH: 63 59 Validity code:
 Towing dir: 90ø Wire out: 150 m Speed: 41 kn*10
 Sorted: 65 Kg Total catch: 143.13 CATCH/HOUR: 858.78

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	604.50	3030	70.39	3740
Selene dorsalis	74.28	1188	8.65	
Trachurus trecae	54.30	408	6.32	3741
Brachydeuterus auritus	53.88	438	6.27	
Trichiurus lepturus	29.40	300	3.42	
Rhizoprionodon acutus	13.38	6	1.56	
Chloroscombrus chrysurus	11.58	78	1.35	
Sphyrna sphyraena	8.70	90	1.01	
Dentex canariensis	3.60	18	0.42	
Sepia bertheloti	1.98	90	0.23	
Decapterus rhonchus	1.50	18	0.17	
Pseudupeneus prayensis	0.90	18	0.10	
Sardinella maderensis - Juv.	0.78	48	0.09	
Total	858.78		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2249
 DATE: 5/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1632
 start stop duration Long W 1643
 TIME :01:42:50 02:12:57 30 (min) Purpose code:
 LOG :8125.54 8127.58 2.01 Area code : 3
 FDEPTH: 20 16 GearCond.code: 1
 BDEPTH: 60 52 Validity code:
 Towing dir: 90ø Wire out: 105 m Speed: 40 kn*10
 Sorted: 44 Kg Total catch: 950.26 CATCH/HOUR: 1900.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	1827.00	60410	96.13	3742
Sardinella aurita	37.80	630	1.99	
Trichiurus lepturus	31.60	170	1.66	
Loligo vulgaris	2.02	16	0.11	
Arius parkii	1.86	2	0.10	
Lagocephalus laevigatus	0.24	2	0.01	
Total	1900.52		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2250
 DATE: 5/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1649
 start stop duration Long W 1625
 TIME :08:26:11 08:54:47 29 (min) Purpose code: 1
 LOG :8180.68 8182.50 1.82 Area code : 3
 FDEPTH: 19 21 GearCond.code:
 BDEPTH: 19 21 Validity code:
 Towing dir: 170 Wire out: 120 m Speed: 37 kn*10

Sorted: 59 Kg Total catch: 1099.25 CATCH/HOUR: 2274.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	407.34	3441	17.91	
Sparus caeruleostictus *	353.01	1486	15.52	
Ilisha africana	277.34	6337	12.19	
Galeoides decadactylus	215.07	1883	9.46	
Drepane africana	162.93	254	7.16	
Arius parkii	121.30	579	5.33	
Pomadasys jubelini	104.28	652	4.59	
Decapterus rhonchus	72.41	399	3.18	
Trichiurus lepturus	66.25	327	2.91	
Rhinoptera marginata	64.45	21	2.83	
Pteroscion peli	63.00	906	2.77	
Leptocharias smithii	45.99	72	2.02	
Pseudotolithus senegalensis	43.10	37	1.90	
Chloroscombrus chrysurus	42.37	979	1.86	
Pomadasys peroteti	42.37	327	1.86	
Pomadasys rogeri	38.03	37	1.67	
Brachydeuterus auritus	32.59	724	1.43	
Pomadasys incisus	27.17	182	1.19	
Sardinella maderensis	19.20	290	0.84	
Lagocephalus laevigatus	17.03	37	0.75	
Lithognathus mormyrus	15.58	37	0.69	
Selene dorsalis	13.41	1196	0.59	
Eucinostomus melanopterus	8.32	72	0.37	
Pseudotolithus brachygnathus	6.52	37	0.29	
Diplodus bellottii	4.72	37	0.21	
Caranx crysos	3.62	37	0.16	
Umbrina canariensis	2.54	37	0.11	
Fistularia tabacaria	2.30	2	0.10	
Penaeus notialis	1.10	37	0.05	
Sphyræna sphyraena	0.72	37	0.03	
Pseudupeneus prayensis	0.37	37	0.02	
Total	2274.43		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2251
 DATE: 5/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1652
 start stop duration Long W 1639
 TIME :11:17:10 11:47:01 30 (min) Purpose code: 1
 LOG :8201.17 8202.98 1.78 Area code : 3
 FDEPTH: 89 80 GearCond.code:
 BDEPTH: 89 80 Validity code:
 Towing dir: 900 Wire out: 280 m Speed: 36 kn*10

Sorted: 35 Kg Total catch: 35.48 CATCH/HOUR: 70.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	26.30	1340	37.06	3743
Loligo vulgaris	12.62	96	17.78	
Decapterus rhonchus	11.80	18	16.63	3744
Zeus faber	4.98	12	7.02	
GALATHEIDAE	4.88	1538	6.88	
Trichiurus lepturus	3.86	6	5.44	
Arius parkii	2.84	10	4.00	
Illex coindetii	1.20	12	1.69	
Merluccius senegalensis	0.88	2	1.24	
Todaropsis eblanae	0.54	108	0.76	
Dentex angolensis	0.50	10	0.70	
Pagellus bellottii	0.26	24	0.37	
Boops boops	0.18	12	0.25	
Portunus validus	0.08	20	0.11	
Blennius normani	0.08	2	0.11	
Sphyræna guachancho	0.04	2	0.06	
Total	71.04		100.10	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2252
 DATE: 5/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1702
 start stop duration Long W 1633
 TIME :18:10:35 18:39:58 29 (min) Purpose code: 1
 LOG :8246.57 8248.60 2.00 Area code : 3
 FDEPTH: 25 30 GearCond.code:
 BDEPTH: 80 86 Validity code:
 Towing dir: 2700 Wire out: 155 m Speed: 410 kn*10

Sorted: Kg Total catch: 26.88 CATCH/HOUR: 55.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	14.86	89	26.72	3746
Sardinella maderensis	14.86	74	26.72	3745
Trichiurus lepturus	11.83	70	21.27	
Chloroscombrus chrysurus	8.92	43	16.04	
Trachinotus ovatus	4.14	12	7.44	
Brachydeuterus auritus	0.66	4	1.19	
Illex coindetii	0.35	6	0.63	
Total	55.62		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2253
 DATE: 5/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 1713
 start stop duration Long W 1620
 TIME :23:00:02 23:31:49 32 (min) Purpose code:
 LOG :8281.37 8283.06 1.34 Area code : 3
 FDEPTH: 15 22 GearCond.code: 1
 BDEPTH: 39 36 Validity code:
 Towing dir: 900 Wire out: 190 m Speed: 37 kn*10

Sorted: 69 Kg Total catch: 880.00 CATCH/HOUR: 1650.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	1256.63	10864	76.16	
Pagellus bellottii	120.38	984	7.30	
Pomadasys incisus	52.13	294	3.16	
Pomadasys peroteti	48.75	131	2.95	
Pagellus acarne	41.25	294	2.50	
Arius parkii	36.38	98	2.20	
Alectis alexandrinus	25.50	28	1.55	
Chelidonichthys gabonensis	22.97	229	1.39	
Decapterus rhonchus	21.94	98	1.33	
Galeoides decadactylus	10.13	98	0.61	
Trichiurus lepturus	5.04	26	0.31	
Loligo vulgaris	2.46	9	0.15	
Sepia officinalis hierredda	2.16	2	0.13	
Fistularia petimba	1.50	6	0.09	
Selene dorsalis	1.31	32	0.08	
Sphyræna guachancho	1.22	2	0.07	
Penaeus notialis	0.32	32	0.02	
Total	1650.07		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2254
 DATE: 6/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1733
 start stop duration Long W 1612
 TIME :09:26:53 09:56:08 29 (min) Purpose code: 1
 LOG :8371.76 8373.67 1.89 Area code : 3
 FDEPTH: 37 38 GearCond.code:
 BDEPTH: 37 38 Validity code:
 Towing dir: 30 Wire out: 130 m Speed: 32 kn*10

Sorted: 54 Kg Total catch: 172.75 CATCH/HOUR: 357.41

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sparus caeruleostictus *	131.07	319	36.67	
Pagellus bellottii	45.62	232	12.76	
Plectorhynchus mediterraneus	38.23	87	10.70	
Loligo vulgaris	32.59	95	9.12	
Diplodus puntazzo	30.85	29	8.63	
Decapterus rhonchus	26.28	153	7.35	3747
Pomadasys incisus	14.83	87	4.15	
Diplodus sargus *	11.73	14	3.28	
Epinephelus aeneus	11.17	2	3.13	
Pomadasys rogeri	5.30	6	1.48	
J E L L Y F I S H	4.28	23	1.20	
Sphoeroides cutaneus	2.90	6	0.81	
Sphyræna sphyraena	1.45	6	0.41	
Epinephelus goreensis	1.12	2	0.31	
Total	357.42		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2255
 DATE: 6/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1732
 start stop duration Long W 1620

TIME :11:25:16 11:58:10 33 (min) Purpose code: 1
 LOG :8384.92 8386.83 1.77 Area code : 3
 FDEPTH: 72 85 GearCond.code:
 BDEPTH: 72 85 Validity code:
 Towing dir: 270ø Wire out: 250 m Speed: 32 kn*10
 Sorted: 57 Kg Total catch: 1506.25 CATCH/HOUR: 2738.64

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2257
 DATE: 6/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1753
 start stop duration Long W 1610
 TIME :20:56:45 21:11:27 15 (min) Purpose code: 1
 LOG :8464.41 8465.34 0.93 Area code : 3
 FDEPTH: 24 19 GearCond.code:
 BDEPTH: 24 19 Validity code:
 Towing dir: 90ø Wire out: 105 m Speed: 37 kn*10
 Sorted: 56 Kg Total catch: 461.52 CATCH/HOUR: 1846.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	2127.27	851	77.68	
Trichiurus lepturus	364.00	2175	13.29	
Decapterus rhonchus	224.55	898	8.20	3748
Sardinella maderensis	12.29	47	0.45	
Pagellus bellottii	3.31	331	0.12	
Zeus faber	2.89	5	0.11	
Trachurus trecae	1.89	189	0.07	
Diplodus puntazzo	1.55	2	0.06	
Boops boops	0.47	142	0.02	
Loligo vulgaris	0.42	4	0.02	
Total	2738.64		100.02	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Galeoides decadactylus	622.40	5056	33.71	
Pomadasys incisus	254.40	2208	13.78	
Pseudupeneus prayensis	208.64	672	11.30	
Pomadasys jubelini	125.12	320	6.78	
Sparus caeruleostictus *	94.40	288	5.11	
Pomadasys peroteti	89.60	128	4.85	
Brachydeuterus auritus	88.64	896	4.80	
Pagellus bellottii	81.92	736	4.44	
Leptocharias smithii	56.00	96	3.03	
Dentex canariensis	44.48	448	2.41	
Decapterus rhonchus	44.16	416	2.39	
Boops boops	40.64	352	2.20	
Diplodus bellottii	40.32	1056	2.18	
Arius parkii	28.80	224	1.56	
Rhinobatos rhinobatos	10.56	8	0.57	
Pisodonophis semicinctus	4.48	16	0.24	
Penaeus kerathurus	3.20	192	0.17	
Liocarcinus corrugatus	2.56	224	0.14	
Penaeus notialis	2.24	64	0.12	
Selene dorsalis	2.24	128	0.12	
Sphoeroides spengleri	0.64	32	0.03	
Syacium micrurum	0.64	32	0.03	
Total	1846.08		99.96	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2256
 DATE: 6/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1742
 start stop duration Long W 1627
 TIME :16:28:56 16:49:03 20 (min) Purpose code: 1
 LOG :8427.15 8428.12 0.96 Area code : 3
 FDEPTH: 119 118 GearCond.code:
 BDEPTH: 119 118 Validity code:
 Towing dir: 190ø Wire out: 380 m Speed: 30 kn*10
 Sorted: Kg Total catch: 143.33 CATCH/HOUR: 429.99

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2258
 DATE: 7/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1802
 start stop duration Long W 1620
 TIME :05:01:07 05:01:13 22 (min) Purpose code: 1
 LOG :8533.59 8535.02 1.41 Area code : 3
 FDEPTH: 20 18 GearCond.code:
 BDEPTH: 78 84 Validity code:
 Towing dir: 270ø Wire out: 110 m Speed: 38 kn*10
 Sorted: 59 Kg Total catch: 59.11 CATCH/HOUR: 161.21

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Synagrops microlepis	139.65	14211	32.48	
Trichiurus lepturus	111.30	522	25.88	
Trachurus trecae, juvenile	63.90	2607	14.86	3749
Trachurus trecae	42.00	534	9.77	3750
Portunus validus	19.08	2328	4.44	
Decapterus rhonchus	18.12	87	4.21	3751
Merluccius senegalensis	14.43	96	3.36	
Zeus faber	6.60	39	1.53	
Octopus vulgaris	4.29	9	1.00	
Pteroscion peli	3.84	57	0.89	
Gobius sp	1.32	165	0.31	
Trachurus trachurus	1.23	48	0.29	
GALATHEIDAE *	0.96	360	0.22	
Boops boops	0.81	72	0.19	
Dentex macrophthalmus	0.63	3	0.15	
Helicolenus dactylopterus	0.54	105	0.13	
Illex coindetii	0.48	12	0.11	
Zenopsis conchifer	0.39	6	0.09	
Grammolites gruvelli	0.15	3	0.03	
Chlorophthalmus atlanticus	0.15	6	0.03	
Blennius sp.	0.09	3	0.02	
Capros aper	0.03	6	0.01	
Total	429.99		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	83.32	461	51.68	
J E L L Y F I S H	51.41	25	31.89	
Sardinella maderensis	17.73	93	11.00	3753
Trachurus trecae, juvenile	4.96	251	3.08	3752
Mugil capurrii	2.54	3	1.58	
Sardinella aurita	1.23	5	0.76	
Boops boops	0.03	3	0.02	
Total	161.22		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2259
 DATE: 7/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 1806
 start stop duration Long W 1609
 TIME :08:58:38 09:29:24 31 (min) Purpose code: 1
 LOG :8560.27 8562.31 1.72 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 19 19 Validity code:
 Towing dir: 150ø Wire out: 230 m Speed: 42 kn*10

Sorted: Kg Total catch: 105.85 CATCH/HOUR: 204.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	79.94	621	39.02	
J E L L Y F I S H	64.26	21	31.37	
Pomadasy incisus	18.19	166	8.88	
Sardinella maderensis	7.92	48	3.87	3754
Decapterus rhonchus	6.19	29	3.02	3755
Arius parkii	4.63	35	2.26	
Sphyrna lewini	4.41	2	2.15	
Ballistes capriscus	3.48	2	1.70	
Trichiurus lepturus	3.10	6	1.51	
Sparus caeruleostictus *	3.10	10	1.51	
Rhizoprionodon acutus	2.71	4	1.32	
Alectis alexandrinus	2.54	41	1.24	
Selene dorsalis	1.59	10	0.78	
Sardinella aurita	0.99	4	0.48	
Campogramma glaycos	0.72	2	0.35	
Trachurus trecae	0.54	4	0.26	
Plectorhinchus mediterraneus	0.50	2	0.24	
Caranx crysos	0.08	10	0.04	
Total	204.89		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2260
 DATE: 7/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 1823
 start stop duration Long W 1617
 TIME :18:30:56 19:03:01 32 (min) Purpose code: 1
 LOG :8641.07 8643.04 1.71 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 34 39 Validity code:
 Towing dir: 270ø Wire out: 200 m Speed: 40 kn*10

Sorted: 68 Kg Total catch: 243.53 CATCH/HOUR: 456.62

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	222.15	1050	48.65	3756
Sardinella maderensis	82.03	381	17.96	3757
Decapterus rhonchus	45.73	334	10.01	3758
UNIDENTIFIED FISH	35.36	2612	7.74	
J E L L Y F I S H	32.16	13	7.04	
Brachydeuterus auritus	13.59	92	2.98	
Chloroscombrus chrysurus	6.04	39	1.32	
Pagellus bellottii	5.25	39	1.15	
Loligo vulgaris	3.90	6	0.85	
Scomber japonicus	3.41	6	0.75	
Alectis alexandrinus	3.00	2	0.66	
Euthynnus alletteratus	2.76	6	0.60	
Pomadasy incisus	1.24	6	0.27	
Total	456.62		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2261
 DATE: 7/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1833
 start stop duration Long W 1629
 TIME :22:45:32 23:16:55 31 (min) Purpose code: 1
 LOG :8675.53 8677.52 1.75 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 81 111 Validity code:
 Towing dir: 280ø Wire out: 210 m Speed: 40 kn*10

Sorted: 60 Kg Total catch: 333.22 CATCH/HOUR: 644.94

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	294.87	1384	45.72	
Campogramma glaycos	160.95	478	24.96	
MYCTOPHIDAE	132.21	859384	20.50	
J E L L Y F I S H	50.88	43	7.89	
Synagrops microlepis	2.98	414	0.46	
Mugil cephalus	2.52	2	0.39	
Sepia officinalis hierredda	0.52	43	0.08	
Total	644.93		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2262
 DATE: 8/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1843
 start stop duration Long W 1623

TIME :05:10:56 05:28:31 18 (min) Purpose code: 1
 LOG :8727.96 8729.08 1.11 Area code : 3
 FDEPTH: 17 17 GearCond.code:
 BDEPTH: 42 54 Validity code:
 Towing dir: 270ø Wire out: 100 m Speed: 38 kn*10
 Sorted: 41 Kg Total catch: 208.70 CATCH/HOUR: 695.67

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	643.33	717	92.48	
Trachinotus ovatus	20.00	83	2.87	
Trachurus trecae	15.83	450	2.28	
Trichiurus lepturus	14.50	50	2.08	
Bothus podas africanus	1.67	217	0.24	
Sepia elegans	0.33	17	0.05	
Total	695.66		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2263
 DATE: 8/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 1852
 start stop duration Long W 1629
 TIME :09:16:27 09:55:03 39 (min) Purpose code: 1
 LOG :8760.38 8762.85 2.37 Area code : 3
 FDEPTH: 25 30 GearCond.code:
 BDEPTH: 54 63 Validity code:
 Towing dir: 170ø Wire out: 95 m Speed: 40 kn*10

Sorted: Kg Total catch: 0.97 CATCH/HOUR: 1.49

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	1.05	3	70.47	
Decapterus rhonchus	0.45	2	30.20	
Total	1.50		100.67	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2264
 DATE: 8/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1853
 start stop duration Long W 1629
 TIME :11:12:44 11:57:06 44 (min) Purpose code:
 LOG :8772.27 8775.38 2.60 Area code : 3
 FDEPTH: 25 20 GearCond.code: 1
 BDEPTH: 56 49 Validity code:
 Towing dir: 100ø Wire out: 105 m Speed: 42 kn*10

Sorted: 35 Kg Total catch: 35.73 CATCH/HOUR: 48.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	26.59	87	54.58	3760
Decapterus rhonchus	19.84	80	40.72	3759
Campogramma glaycos	2.29	4	4.70	
Total	48.72		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2265
 DATE: 8/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1853
 start stop duration Long W 1645
 TIME :14:42:24 15:12:31 30 (min) Purpose code: 1
 LOG :8797.40 8798.90 1.48 Area code : 3
 FDEPTH: 223 222 GearCond.code:
 BDEPTH: 223 222 Validity code:
 Towing dir: 340ø Wire out: 650 m Speed: 30 kn*10
 Sorted: 58 Kg Total catch: 1307.25 CATCH/HOUR: 2614.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Helicolenus dactylopterus	1718.20	25564	65.72	
Merluccius polli	299.64		11.46	
Chlorophthalmus atlanticus	256.96	15092	9.83	
Trichiurus lepturus	85.80	132	3.28	
Pontinus accraensis	57.64	484	2.20	
Pteroscion peli	46.64	264	1.78	
Merluccius senegalensis	30.80	44	1.18	
Parapenaeus longirostris	24.20	4224	0.93	
Trachurus trecae	23.40	86	0.90	3761
Synagrops microlepis	21.56	1804	0.82	
Raja straeleni	17.10	12	0.65	
Malacocephalus occidentalis	15.40	440	0.59	
Trachurus trachurus	11.82	24	0.45	3762
Mystriophis rostellatus	2.70	4	0.10	
Gephyroberyx darwini	2.20	44	0.08	
Capros aper	0.44	44	0.02	
Total	2614.50		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2267
 DATE: 9/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1905
 start stop duration Long W 1633
 TIME :01:36:02 02:00:14 24 (min) Purpose code:
 LOG :8873.40 8874.92 1.49 Area code : 3
 FDEPTH: 25 25 GearCond.code: 1
 BDEPTH: 56 53 Validity code:
 Towing dir: 140ø Wire out: 110 m Speed: 37 kn*10
 Sorted: 74 Kg Total catch: 73.85 CATCH/HOUR: 184.63

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	74.75	240	40.49	3766
Trichiurus lepturus	30.85	128	16.71	
Auxis thazard	28.05	85	15.19	
Campogramma glaycos	23.50	40	12.73	
Trachurus trecae, juvenile	7.28	393	3.94	3767
Trachurus trecae	4.68	25	2.53	
Decapterus rhonchus	4.30	15	2.33	
Sepia bertheloti	3.60	10	1.95	
Mugil cephalus	2.88	3	1.56	
Sardinella aurita	2.35	5	1.27	
Alloteuthis africana	1.00	383	0.54	
Engraulis encrasicolus	0.68	50	0.37	
Boops boops	0.35	20	0.19	
OCTOPOTEUTHIDAE	0.15	3	0.08	
Sepia orbignyana	0.15	8	0.08	
Saurida brasiliensis	0.08	43	0.04	
Total	184.65		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2266
 DATE: 8/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 1903
 start stop duration Long W 1628
 TIME :22:21:10 22:51:32 30 (min) Purpose code: 1
 LOG :8852.74 8854.75 1.95 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 33 39 Validity code:
 Towing dir: 270ø Wire out: 210 m Speed: 40 kn*10
 Sorted: 55 Kg Total catch: 946.67 CATCH/HOUR: 1893.34

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1664.30	9758	87.90	3763
Decapterus rhonchus	99.96	476	5.28	3765
Decapterus rhonchus juv	87.72	3060	4.63	3764
Pagellus bellottii	13.60	136	0.72	
Diplodus puntazzo	10.02	10	0.53	
Pomadasys incisus	5.44	34	0.29	
Sepia officinalis hierredda	5.10	4	0.27	
Trichiurus lepturus	2.54	6	0.13	
Loligo vulgaris	2.02	6	0.11	
Penaeus notialis	1.70	34	0.09	
Sardinella maderensis	0.60	2	0.03	
Boops boops	0.34	34	0.02	
Total	1893.34		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2268
 DATE: 9/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1913
 start stop duration Long W 1638
 TIME :04:00:20 04:13:13 13 (min) Purpose code: 1
 LOG :8891.19 8891.85 0.64 Area code : 3
 FDEPTH: 67 63 GearCond.code:
 BDEPTH: 67 63 Validity code:
 Towing dir: 90ø Wire out: 200 m Speed: 31 kn*10
 Sorted: 56 Kg Total catch: 144.09 CATCH/HOUR: 665.03

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pagellus bellottii	391.15	2063	58.82	
J E L Y F I S H	130.15	102	19.57	
Trichiurus lepturus	73.85	992	11.10	
GOBIIDAE	15.32	6794	2.30	
Pteroscion peli	14.31	600	2.15	
Brachydeuterus auritus	10.85	1292	1.63	
OPHICHTHIDAE	9.92	5	1.49	
Penaeus notialis	7.15	563	1.08	
Arnoglossus imperialis	3.46	286	0.52	
Sepia bertheloti	2.63	92	0.40	
Diplodus vulgaris	2.08	5	0.31	
Umbrina canariensis	1.15	5	0.17	
Syacium micrurum	0.78	9	0.12	
Chelidonicthys gabonensis	0.69	5	0.10	
Penaeus kerathurus	0.55	23	0.08	
Boops boops	0.55	23	0.08	
Sphoeroides spengleri	0.42	5	0.06	
Total	665.01		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2269
 DATE: 9/11/04 GEAR TYPE: BT No: 8 POSITION:Lat N 1923
 start stop duration Long W 1654
 TIME :09:13:25 09:44:19 31 (min) Purpose code: 1
 LOG :8933.38 8935.10 0.86 Area code : 3
 FDEPTH: 103 93 GearCond.code:
 BDEPTH: 103 93 Validity code:
 Towing dir: 170ø Wire out: 350 m Speed: 37 kn*10

Sorted: 85 Kg Total catch: 1532.91 CATCH/HOUR: 2966.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trachurus	1737.35	7250	58.56	3768
Dentex congcoensis	459.99	1777	15.50	
Umbrina canariensis	226.74	546	7.64	
Dentex macrophthalmus	129.95	484	4.38	
Spicara alta	90.62	546	3.05	
Scorpaena scrofa	73.86	135	2.49	
Zeus faber	68.73	68	2.32	
Trachurus trecae	61.90	238	2.09	
Trichiurus lepturus	45.14	135	1.52	
Hyperoglyphe moselii	43.94	8	1.48	
Lagocephalus laevigatus	25.65	33	0.86	
Pagellus bellottii	3.08	33	0.10	
Total	2966.95		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2270
 DATE: 9/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 1943
 start stop duration Long W 1658
 TIME :17:28:25 17:46:44 18 (min) Purpose code: 1
 LOG :8996.76 8997.73 0.95 Area code : 3
 FDEPTH: 49 50 GearCond.code:
 BDEPTH: 49 50 Validity code:
 Towing dir: 145ø Wire out: 180 m Speed: 31 kn*10

Sorted: 52 Kg Total catch: 1054.26 CATCH/HOUR: 3514.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Boops boops	2112.50	36660	60.11	
Trichiurus lepturus	678.60	33540	19.31	
Trachurus trecae	330.20	18387	9.40	3769
Sardinella maderensis	97.50	780	2.77	
Chloroscombrus chrysurus	72.80	650	2.07	
Leptocharias smithii	58.33	27	1.66	
Penaeus notialis	45.50	2210	1.29	
Dicologlossa cuneata	24.70	780	0.70	
Citharus linguatula	22.10	650	0.63	
GOBIIDAE	11.70	1430	0.33	
Sepia bertheloti	10.40	260	0.30	
Sphoeroides spengleri	10.40	130	0.30	
Decapterus rhonchus	8.10	17	0.23	
Pseudotolithus senegalensis	7.80	130	0.22	
Squilla mantis	6.50	130	0.18	
Syacium micrurum	5.20	130	0.15	
Cymbium pepo	5.03	3	0.14	
Umbrina canariensis	2.60	260	0.07	
C R A B S	1.93	63	0.05	
Torpedo torpedo	1.47	3	0.04	
Mystriophis rostellatus	0.83	3	0.02	
Total	3514.19		99.97	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2271
 DATE: 9/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 1941
 start stop duration Long W 1657
 TIME :18:50:05 19:27:39 38 (min) Purpose code: 1
 LOG :9001.31 9003.64 2.16 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 54 53 Validity code:
 Towing dir: 330ø Wire out: 205 m Speed: 38 kn*10

Sorted: 44 Kg Total catch: 872.42 CATCH/HOUR: 1377.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	1026.00	8790	74.48	
Trichiurus lepturus	222.00	1290	16.12	
Decapterus rhonchus	38.10	210	2.77	
Trachurus trecae, juvenile	25.20	1260	1.83	3770
Sardinella maderensis	23.70	120	1.72	
PARALEPIDIDAE	23.53	13	1.71	
Penaeus notialis	10.50	480	0.76	
Euthynnus alletteratus	3.41	3	0.25	
Lagocephalus laevigatus	2.94	2	0.21	
Leptocharias smithii	2.13	2	0.15	
Total	1377.51		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2272
 DATE: 9/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 1953
 start stop duration Long W 1711
 TIME :22:31:53 23:02:40 31 (min) Purpose code: 1
 LOG :9028.10 9029.99 1.86 Area code : 3
 FDEPTH: 27 25 GearCond.code:
 BDEPTH: 27 25 Validity code:
 Towing dir: 90ø Wire out: 120 m Speed: 37 kn*10

Sorted: 57 Kg Total catch: 519.18 CATCH/HOUR: 1004.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Arius parkii	694.16	2055	69.08	
Pomadasys incisus	90.75	749	9.03	
Engraulis encrasicolus	40.94	6445	4.07	3771
Galeoides decadactylus	33.27	557	3.31	
Raja undulata/picta	31.01	17	3.09	
Pagellus bellottii	23.86	366	2.37	
Rhizoprionodon acutus	19.16	17	1.91	
Pomadasys rogeri	13.06	17	1.30	
Dasyatis marmorata	12.54	17	1.25	
Decapterus rhonchus	9.58	52	0.95	
Argyrosomus regius	6.27	17	0.62	
Dicologlossa cuneata	4.88	87	0.49	
Sepia officinalis hierredda	4.18	17	0.42	
Squilla mantis	3.31	87	0.33	
Halobatrachus didactylus	3.14	17	0.31	
Halobatrachus didactylus	3.14	17	0.31	
Octopus vulgaris	2.73	2	0.27	
Cymbium sp.	2.09	17	0.21	
Sepia bertheloti	1.74	35	0.17	
Sphoeroides spengleri	1.57	35	0.16	
C R A B S	0.70	35	0.07	
Penaeus kerathurus	0.70	52	0.07	
Microchirus boscanion	0.35	35	0.03	
Sardinella aurita	0.35	52	0.03	
Total	1003.48		99.85	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2273
 DATE:10/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2006
 start stop duration Long W 1709
 TIME :08:21:22 08:51:54 31 (min) Purpose code: 1
 LOG :9107.86 9109.73 1.75 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 22 23 Validity code:
 Towing dir: 165ø Wire out: 230 m Speed: 39 kn*10

Sorted: 55 Kg Total catch: 555.70 CATCH/HOUR: 1075.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	732.19	7568	68.08	
Sardinella maderensis	174.39	1587	16.21	3772
Sphyræna sphyræna	82.84	387	7.70	
Stromateus fiatola	51.48	97	4.79	
Arius parkii	5.81	19	0.54	
Sepia officinalis hierredda	5.42	19	0.50	
Decapterus rhonchus	4.84	19	0.45	
Selene dorsalis	4.84	6	0.45	
Spondyliosoma cantharus	4.65	19	0.43	
Pomatomus saltatrix	3.68	4	0.34	
Brachydeuterus auritus	2.13	19	0.20	
Rhizoprionodon acutus	1.84	2	0.17	
Leptocharias smithii	1.45	2	0.13	
Total	1075.56		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2274
 DATE:10/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2011
 start stop duration Long W 1736
 TIME :13:49:52 14:19:37 30 (min) Purpose code: 1
 LOG :9154.31 9155.82 1.50 Area code : 3
 FDEPTH: 104 94 GearCond.code:
 BDEPTH: 104 94 Validity code:
 Towing dir: 10ø Wire out: 320 m Speed: 30 kn*10

Sorted: 30 Kg Total catch: 510.09 CATCH/HOUR: 1020.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pteroscion peli	323.00	9894	31.66	
Trichiurus lepturus	247.80	1156	24.29	
GALATHEIDAE *	138.00	47532	13.53	
Synagrops microlepis	137.00	13702	13.43	
Trachurus trecae	40.90	78	4.01	3773
Chloroscombrus chrysurus	19.72	204	1.93	
Octopus vulgaris	16.40	34	1.61	
Solenocera africana	14.28	1700	1.40	
Merluccius polli	13.26	272	1.30	
Scorpaena scrofa	9.18	68	0.90	
Liocarcinus corrugatus	8.84	1020	0.87	
Serranus africana	6.46	68	0.63	
Brotula barbata	5.48	20	0.54	
Zeus faber	5.44	34	0.53	
Helicolenus dactylopterus	5.10	680	0.50	
GOBIIDAE	4.76	442	0.47	
Branchiostegus semifasciatus	4.50	10	0.44	
Capros aper	4.42	1122	0.43	
Parapenaeus longirostris	3.74	816	0.37	
Pontinus accraensis	3.06	102	0.30	
Zenopsis conchifer	2.04	34	0.20	
Symphurus normani	2.04	272	0.20	
Sepia bertheloti	1.36	374	0.13	
Chlorophthalmus atlanticus	1.02	68	0.10	
Arnoglossus imperialis	1.02	68	0.10	
'Spider crab'	0.68	578	0.07	
Laemonema laureysi	0.68	34	0.07	
Total	1020.18		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2275
 DATE:10/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2024
 start stop duration Long W 1711
 TIME :20:48:04 20:54:43 7 (min) Purpose code: 1
 LOG :9209.47 9209.92 0.43 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 29 27 Validity code:
 Towing dir: 30ø Wire out: 240 m Speed: 44 kn*10

Sorted: 40 Kg Total catch: 606.99 CATCH/HOUR: 5202.77

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	2404.29	17777	46.21	
Sardinella aurita - Juveniles	1375.54	211286	26.44	3775
Sardinella maderensis	642.60	5100	12.35	3774
Stromateus fiatola	375.94	437	7.23	
Decapterus rhonchus juv	154.46	6703	2.97	3777
Engraulis encrasicolus	80.14	7577	1.54	3776
Campogramma glaycos	49.54	146	0.95	
Sardinella aurita	45.94	266	0.88	
Sardina pilchardus	37.89	1311	0.73	
Diplodus bellottii	17.49	146	0.34	
Loligo vulgaris	11.66	291	0.22	
Trachurus trecae, juvenile	7.29	2331	0.14	
Total	5202.78		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2276
 DATE:10/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2029
 start stop duration Long W 1704
 TIME :22:38:33 22:53:44 15 (min) Purpose code: 1
 LOG :9223.35 9224.34 0.97 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 22 21 Validity code:
 Towing dir: 190ø Wire out: 260 m Speed: 40 kn*10

Sorted: 50 Kg Total catch: 1355.94 CATCH/HOUR: 5423.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	2494.80	6588	46.00	3779
Diplodus bellottii	1420.20	13500	26.18	
Sardinella aurita	927.72	6912	17.10	3778
Stromateus fiatola	225.72	216	4.16	
Arius parkii	118.80	324	2.19	
Pagellus bellottii	85.32	1404	1.57	
Decapterus rhonchus juv	63.72	2484	1.17	3780
Trachurus trecae	29.16	324	0.54	
Pomadasys incisus	27.00	108	0.50	
Decapterus rhonchus	21.60	108	0.40	
Loligo vulgaris	9.72	108	0.18	
Total	5423.76		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2277
 DATE:11/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2033
 start stop duration Long W 1714
 TIME :01:04:35 01:24:49 20 (min) Purpose code: 1
 LOG :9242.83 9244.22 1.40 Area code : 3
 FDEPTH: 22 15 GearCond.code:
 BDEPTH: 38 39 Validity code:
 Towing dir: ø Wire out: 100 m Speed: 40 kn*10

Sorted: 27 Kg Total catch: 137.35 CATCH/HOUR: 412.05

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	399.00	2445	96.83	3781
Trachurus trecae	8.85	90	2.15	
Pagellus bellottii	1.95	135	0.47	
Sepia bertheloti	1.20	15	0.29	
Loligo vulgaris	0.45	15	0.11	
Engraulis encrasicolus	0.45	15	0.11	
Selene dorsalis	0.15	15	0.04	
Total	412.05		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2278
 DATE:11/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2033
 start stop duration Long W 1721
 TIME :02:46:26 02:54:40 8 (min) Purpose code:
 LOG :9254.02 9254.43 0.40 Area code : 3
 FDEPTH: 10 10 GearCond.code: 1
 BDEPTH: 45 44 Validity code:
 Towing dir: 90ø Wire out: 180 m Speed: 30 kn*10

Sorted: 55 Kg Total catch: 441.56 CATCH/HOUR: 3311.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	3112.50	17400	93.98	3782
Sardinella maderensis	142.20	1260	4.29	3783
BELONIDAE	28.20	240	0.85	
Trichiurus lepturus	16.80	60	0.51	
Sardinella aurita	9.00	60	0.27	
Trachurus trercae	3.00	60	0.09	
Total	3311.70		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2279
 DATE:11/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2043
 start stop duration Long W 1737
 TIME :12:02:58 12:24:20 21 (min) Purpose code: 1
 LOG :9327.61 9328.70 1.07 Area code : 3
 FDEPTH: 98 98 GearCond.code:
 BDEPTH: 98 98 Validity code:
 Towing dir: 40ø Wire out: 320 m Speed: 30 kn*10

Sorted: 26 Kg Total catch: 118.33 CATCH/HOUR: 338.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Synagrops microlepis	137.17	10183	40.57	
Liocarcinus corrugatus	62.60	5309	18.52	
GALATHEIDAE *	52.20	10889	15.44	
Solenocera africana	27.37	15569	8.10	
Helicolenus dactylopterus	18.63	2249	5.51	
Chlorophthalmus atlanticus	13.37	1054	3.95	
Capros aper	9.89	1286	2.93	
Lagocephalus laevigatus	5.00	11	1.48	
Pteroscion peli	3.60	129	1.06	
Trichiurus lepturus	2.69	11	0.80	
Merluccius polli	1.91	37	0.56	
Zeus faber	1.54	11	0.46	
Trachurus trachurus	0.77	26	0.23	
Pagellus bellottii	0.63	11	0.19	

Scyllarides herklotsii	0.26	51	0.08
Sepiella ornata	0.11	11	0.03
Illex coindetii	0.11	37	0.03
Todarodes sagittatus	0.11	26	0.03
Symphurus normani	0.11	37	0.03
Total	338.07		100.00

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2280
 DATE:11/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2043
 start stop duration Long W 1720
 TIME :15:00:33 15:00:50 14 (min) Purpose code: 1
 LOG :9349.07 9349.97 0.88 Area code : 3
 FDEPTH: 10 10 GearCond.code: 1
 BDEPTH: 44 55 Validity code:
 Towing dir: 270ø Wire out: 160 m Speed: 40 kn*10

Sorted: 5 Kg Total catch: 177.30 CATCH/HOUR: 759.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	750.00	3677	98.70	
Scomber japonicus	9.86	30	1.30	3784
Total	759.86		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:2281
 DATE:11/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 2044
 start stop duration Long W 1720
 TIME :16:29:35 16:47:40 18 (min) Purpose code: 1
 LOG :9353.61 9354.63 0.98 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 49 49 Validity code:
 Towing dir: ø Wire out: 160 m Speed: 35 kn*10

Sorted: 22 Kg Total catch: 22.35 CATCH/HOUR: 74.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	65.67	407	88.15	
Sardinella aurita	5.67	13	7.61	
Sardinella maderensis	3.17	10	4.26	
Total	74.51		100.02	

Annex III Instruments and fishing gear used

The Simrad EK-500, 38kHz scientific echosounder was used for abundance estimation during the survey, in addition data from the 18 kHz, 120 kHz and 200 kHz transducers were recorded for possible future multifrequency target identification. The Bergen Echo Integrator system (BEI) recorded the hydroacoustic data and was used to scrutinize the acoustic records, and to allocate integrator data to fish species. All raw data were stored to tape and brought back to IMR for storing.

The details of the settings of the echosounders were as follows:

Transceiver 1 menu

Transducer depth	5.5 m
Absorption coeff.	10 dB/km
Pulse length	medium (1ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-21.0 dB
SV transducer gain	27.17dB
TS transducer gain	29.96
Angle sensitivity	21.9
3 dB beamwidth along.	7.3
3 dB beamwidth athw.	7.0
Alongship offset	0.05
Athwardship offset	0.04

Transceiver 2 menu

Transducer depth	5.5 m
Absorption coeff.	38 dB/km
Pulse length	long (1ms)
Bandwidth	narrow
Max power	1000 Watt
2-way beam angle	-20.6 dB
SV transducer gain	25.96B
TS transducer gain	25.95dB
Angle sensitivity	21.0
3 dB beamwidth along.	7.4
3 dB beamwidth athw.	7.2
Alongship offset	0.24
Athwardship offset	0.04

Transceiver 3 menu

Transducer depth	5.5 m
Absorption coeff.	3 dB/km
Pulse length	short (0.7ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-17.2 dB
SV transducer gain	23.75dB
TS transducer gain	23.36B
Angle sensitivity	13.9
3 dB beamwidth along.	10.8
3 dB beamwidth athw.	10.8
Alongship offset	0.06
Athwardship offset	-004

Transceiver 4 menu

Transducer depth	5.5 m
Absorption coeff.	53 dB/km
Pulse length	Long
Bandwidth	Narrow
Max power	1000 Watt
2-way beam angle	-20.5 dB
SV transducer gain	24.18 dB
TS transducer gain	24.80 dB
Angle sensitivity	0.0
3 dB beamwidth along.	0.0°
3 dB beamwidth athw.	0.0°
Alongship offset	- 0.00°
Athwardship offset	0.00°

Display menu

Echogram	1
Bottom range	10 m
Bottom range start	10 m
TVG	20 log R
Sv colour min -	65 dB
TS Colour minimum	-65 dB

Printer- menu

Range	0-50, 0-100, 0-150, 0-250 or 0-500 m
TVG	20 log R
Sv colour min	-67 dB

Bottom detection menu

Minimum level	-40 dB
---------------	--------

Calibration

A calibration of the acoustic equipment was conducted during the survey in Angola in August 2004.

Fishing gear

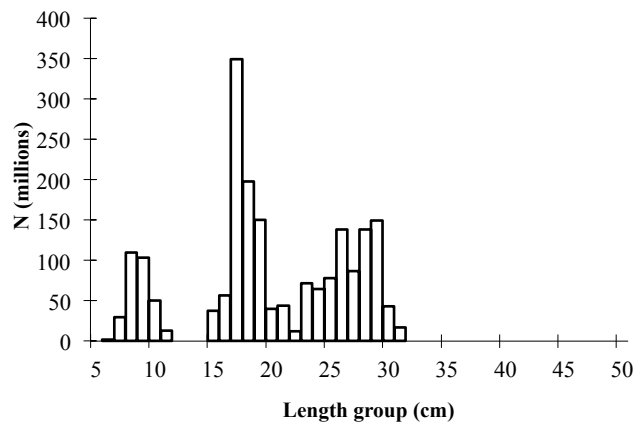
The vessel has three different sized four-panel 'Åkrahamn' pelagic trawls and one 'Gisund super bottom trawl'. The two smallest pelagic trawls and the demersal trawl were used during the survey. The smallest pelagic trawl has 10-12 m vertical opening under normal operation, whereas the intermediate sized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

The bottom trawl has a 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.

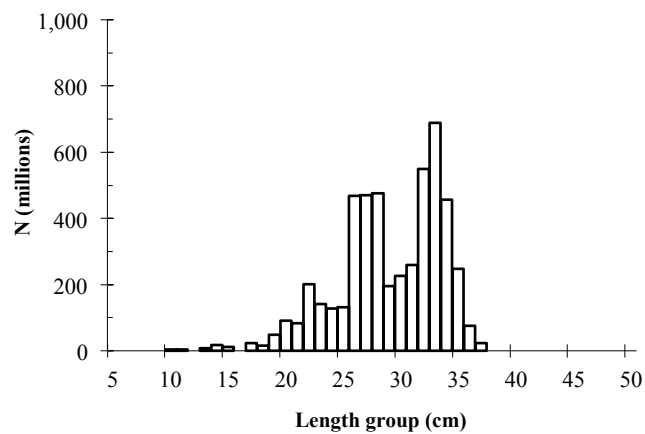
The SCANMAR system was used during all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their distance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

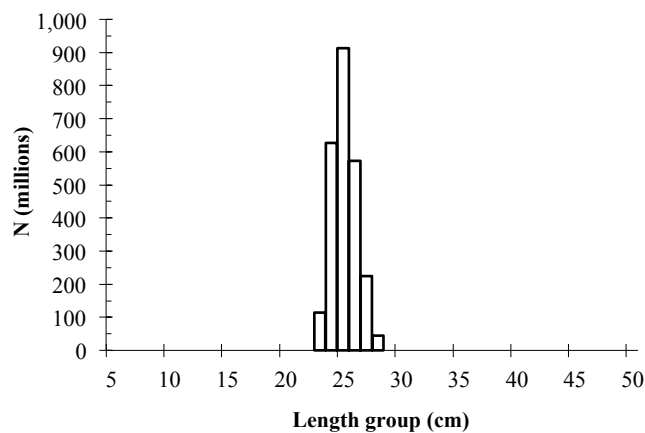
Annex III. Pooled length distribution by species and region



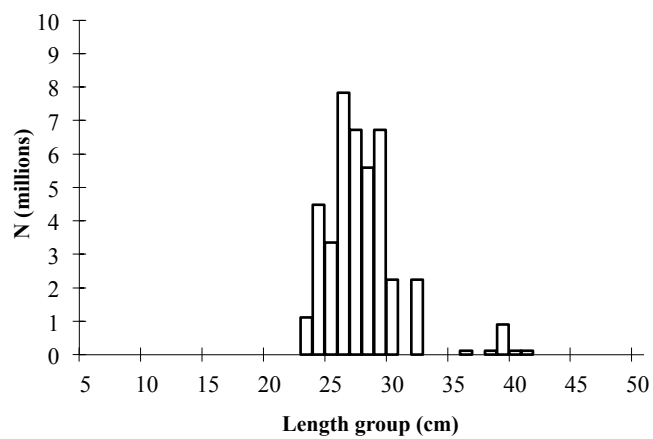
S. aurita (*Sardinella aurita*) November 2004



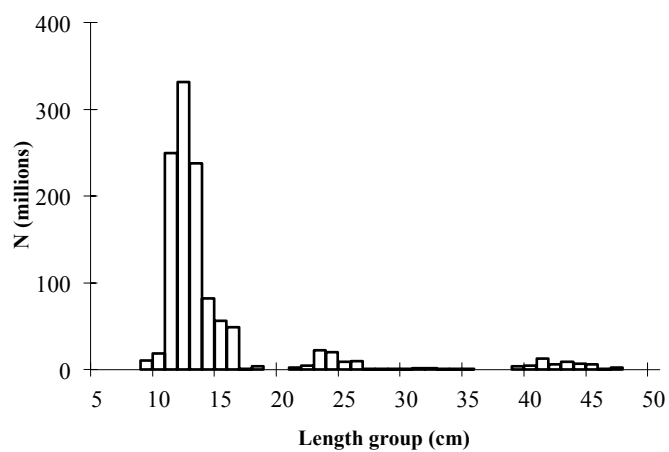
S. maderensis (*Sardinella maderensis*) November 2004



Sardine (*Sardina pilchardus*) November 2004



Atlantic horse mackerel (*Trachurus trachurus*) November 2004



Cunene horse mackerel (*Trachurus trecae*) November 2004

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

Round sardinella (*Sardinella aurita*) November 2004

Numbers in millions

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6		2.1	2.1
7		29.5	29.5
8		109.4	109.4
9		103.1	103.1
10		50.5	50.5
11		12.6	12.6
12			
13			
14			
15	37.9		37.9
16	56.8		56.8
17	349.7		349.7
18	198.1		198.1
19	149.9		149.9
20	37.9	2.5	40.4
21	36.3	7.4	43.7
22		12.4	12.4
23		71.9	71.9
24	17.3	47.1	64.4
25	60.6	17.3	78.0
26	138.5		138.5
27	86.6		86.6
28	138.5		138.5
29	147.2	2.5	149.7
30	43.3		43.3
31	17.3		17.3
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
Total	1 516.0	468.3	1 984.3

Biomass in tons

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6		6	6
7		119	119
8		645	645
9		849	849
10		561	561
11		184	184
12			
13			
14			
15	1 355		1 355
16	2 451		2 451
17	17 990		17 990
18	12 042		12 042
19	10 673		10 673
20	3 134	205	3 339
21	3 460	709	4 169
22		1 355	1 355
23		8 953	8 953
24	2 445	6 647	9 092
25	9 649	2 761	12 410
26	24 752		24 752
27	17 288		17 288
28	30 790		30 790
29	36 280	611	36 891
30	11 793		11 793
31	5 197		5 197
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
Total	189 298	23 606	212 904

Flat sardinella (*Sardinella maderensis*) November 2004

Numbers in millions

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5.0			
6.0			
7.0			
8.0			
9.0			
10.0		3.8	3.8
11.0		3.8	3.8
12.0			
13.0	8.6		8.6
14.0	17.2		17.2
15.0	8.6	2.5	11.1
16.0			
17.0	8.6	15.0	23.6
18.0	8.6	7.6	16.2
19.0		49.0	49.0
20.0		90.6	90.6
21.0		83.6	83.6
22.0	8.6	192.5	201.1
23.0		140.6	140.6
24.0	32.3	96.2	128.5
25.0	86.1	45.1	131.2
26.0	437.2	30.4	467.6
27.0	446.9	22.9	469.8
28.0	475.1		475.1
29.0	189.5	6.4	195.9
30.0	225.5		225.5
31.0	260.2		260.2
32.0	549.6		549.6
33.0	688.4	0.1	688.5
34.0	456.8		456.8
35.0	248.6		248.6
36.0	75.2		75.2
37.0	23.1		23.1
38.0			
39.0			
40.0			
41.0			
42.0			
43.0			
44.0			
45.0			
46.0			
47.0			
48.0			
49.0			
50.0			
Total	4 254.7	790.1	5 044.9

Biomass in tons

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6			
7			
8			
9			
10		43	43
11		56	56
12			
13	203		203
14	504		504
15	308	90	398
16			
17	443	771	1 214
18	523	459	982
19		3 489	3 489
20		7 491	7 491
21		7 978	7 978
22	942	21 052	21 994
23		17 512	17 512
24	4 554	13 585	18 140
25	13 699	7 186	20 885
26	78 108	5 437	83 545
27	89 227	4 565	93 792
28	105 572		105 572
29	46 707	1 566	48 273
30	61 432		61 432
31	78 071		78 071
32	181 116		181 116
33	248 440	38	248 478
34	180 078		180 078
35	106 790		106 790
36	35 091		35 091
37	11 709		11 709
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
Total	1243 518	91 319	1334 836

Sardine (*Sardina pilchardus*) November 2004

Numbers in millions

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			
14.0			
15.0			
16.0			
17.0			
18.0			
19.0			
20.0			
21.0			
22.0			
23.0	7.5	106.8	114.3
24.0	37.6	588.3	625.9
25.0	40.6	872.5	913.2
26.0	31.6	541.3	572.9
27.0	9.0	214.8	223.9
28.0	1.5	42.3	43.8
29.0			
30.0			
31.0			
32.0			
33.0			
34.0			
35.0			
36.0			
37.0			
38.0			
39.0			
40.0			
41.0			
42.0			
43.0			
44.0			
45.0			
46.0			
47.0			
48.0			
49.0			
50.0			
Total	127.9	2 366.1	2 494.0

Biomass in tons

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23	937	13 309	14 246
24	5 310	83 060	88 370
25	6 467	138 890	145 357
26	5 645	96 704	102 348
27	1 802	42 894	44 696
28	334	9 390	9 724
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
Total	20 496	384 246	404 742

Cunene horse mackerel (*Trachurus trecae*) November 2004

Numbers in millions

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6			
7			
8			
9		10.3	10.3
10	5.9	12.8	18.7
11	35.5	214.2	249.7
12	59.0	272.3	331.3
13	70.2	167.4	237.6
14	58.3	24.1	82.3
15	56.1		56.1
16	39.0	10.3	49.3
17	0.8		0.8
18	3.8		3.8
19			
20			
21	2.5		2.5
22	5.0		5.0
23	22.5		22.5
24	20.0		20.0
25	8.8		8.8
26	10.2		10.2
27	1.3		1.3
28	0.1		0.1
29	0.2		0.2
30	0.9	0.3	1.2
31	0.8	0.7	1.5
32	1.5	0.3	1.8
33	0.6		0.6
34	0.7		0.7
35		1.1	1.1
36			
37			
38			
39	0.6	3.2	3.8
40	0.5	4.3	4.8
41	1.0	11.7	12.8
42	1.5	4.3	5.8
43	1.5	7.5	9.0
44	3.6	3.2	6.8
45	1.5	4.3	5.8
46	0.5		0.5
47		2.1	2.1
48			
49			
50			
Total	414.3	754.3	1 168.6

Biomass in tons

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6			
7			
8			
9		85	85
10	65	142	207
11	518	3 128	3 646
12	1 106	5 105	6 211
13	1 658	3 954	5 612
14	1 705	705	2 410
15	2 004		2 004
16	1 681	444	2 125
17	41		41
18	233		233
19			
20			
21	238		238
22	546		546
23	2 798		2 798
24	2 818		2 818
25	1 405		1 405
26	1 816		1 816
27	268		268
28	25		25
29	56		56
30	248	90	338
31	239	198	438
32	488	109	597
33	206		206
34	269		269
35		458	458
36			
37			
38			
39	368	1 894	2 262
40	324	2 722	3 046
41	698	8 055	8 752
42	1 124	3 146	4 270
43	1 205	5 903	7 108
44	3 011	2 708	5 719
45	1 379	3 860	5 239
46	491		491
47		2 196	2 196
48			
49			
50			
Total	29 031	44 903	73 934

Atlantic horse mackerel (*Trachurus trachurus*) November 2004

Numbers in millions

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23		1.1	1.1
24		4.5	4.5
25		3.4	3.4
26		7.8	7.8
27		6.7	6.7
28		5.6	5.6
29		6.7	6.7
30		2.2	2.2
31			
32		2.2	2.2
33			
34			
35			
36	0.1		0.1
37			
38	0.1		0.1
39	0.9		0.9
40	0.1		0.1
41	0.1		0.1
42			
43			
44			
45			
46			
47			
48			
49			
50			
Total	1.4	40.3	41.7

Biomass in tons

Length cm	St. Louis - Cape Timiris	Cape Timiris - Cape Blanc	TOTAL
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23		139	139
24		632	632
25		535	535
26		1 400	1 400
27		1 341	1 341
28		1 244	1 244
29		1 655	1 655
30		610	610
31			
32		738	738
33			
34			
35			
36	53		53
37			
38	62		62
39	539		539
40	73		73
41	78		78
42			
43			
44			
45			
46			
47			
48			
49			
50			
Total	805	8 293	9 099

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	106.8	7.5			15,638.4
24	5.8	11,313.6	588.3	37.6			11,945.4
25		4,533.8	872.5	40.6			5,447.0
26	1.5	1,290.7	541.3	31.6			1,865.1
27		346.3	214.8	9.0			570.1
28		6.3	42.3	1.5			50.0
29							
30							
Total	20,476.8	72,631.4	2,366.1	127.9			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

CRUISE REPORT "DR FRIDTJOF NANSEN"

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

Part III

**Cape Blanc – Cape Bojador
14 November - 13 December 2004**

by

Tore Strømme *
Hammou El Habouz **
Marek Ostrowski *
and
Oddgeir Alvheim *

* Institute of Marine Research
P.O.Box 1870 Nordnes
N-5817 Bergen, Norway

** Institut National de Recherche Halieutique
Casablanca, Morocco

**Institute of Marine Research
Bergen, 2004**

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION.....	1
1.1 Survey objectives.....	1
1.2 Participation	1
1.3 Narrative	2
1.4 Methods.....	5
CHAPTER 2 SURVEY RESULTS.....	10
2.1 Hydrographic conditions.....	10
2.2 Distribution of pelagic fish on the shelf from Cape Blanc to Cape Juby	25
2.3 Distribution of pelagic fish on the shelf from Cape Juby to Cape Cantin	31
2.4 Biomass estimates	35
CHAPTER 3 CONCLUDING REMARKS.....	38
ANNEX I Biomass and number by length	
ANNEX II Records of fishing stations	
ANNEX III Instruments and fishing gear used	
ANNEX IV Regional estimates	

CHAPTER 1 INTRODUCTION

1.1 Survey objectives

The specific objectives for the survey were, as for the previous surveys:

- 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*, *S. maderensis*, chub mackerel *Scomber japonicus*, horse mackerel *Trachurus 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 collect otoliths of sardine and sardinella, and training in age determination.
- 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 Juby and Cape Cantin.

The time allocated for this part of the survey was 25 working days.

1.2 Participation

Members of the scientific teams were:

Institut National de Recherche Halieutique, Morocco:

Hammou EL HABOUZ (team leader), Lahcen ABOUABDELLAH, Ahmed EL YOUSOUFI, Salaheddine EL AYOUBI and Rachid ERROUAGUI.

Institut Mauritanien de Recherches Océanographiques et des Pêches (IMROP), Mauritania:
Cheikh Tidjane DIOP.

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

From IEO, Tenerife, Spain:

Maria Teresa GARCIA SANTAMARIA (until 27 November).

Institute of Marine Research, Norway (IMR):

Oddgeir ALVHEIM (cruise leader), John DALEN (until 27 November), Thor Egil JOHANSSON (from 27 November), Tore MØRK, Marek OSTROWSKI and Jan Frode WILHELMSEN (until 27 November).

1.3 Narrative

Figures 1a-b show the cruise track and the stations worked during the survey. The vessel departed from Nouakchott on 14 November, starting the sampling work 10 nautical miles (NM) north off Cape Blanc. The hydrographic transect off Cape Blanc was worked on 11 November in the Mauritanian part of the survey. The survey proceeded northwards to about 20 NM northeast off Cape Bojador with an acoustic sampling grid with a transect distance 10 NM apart, covering the shelf and slope down until about 200 m bottom depth (Figure 1a). The survey was interrupted with a call at Las Palmas 26-28 November for refuelling. The survey resumed about 50 NM south off Laayoune in the late evening of 28 November. The sampling continued northwards in a zigzag pattern towards Cape Juby. Northwards from Cape Juby the inner shelf between Cape Juby and 30°N was covered with a zigzag pattern, while the outer shelf was covered with a more open grid, (Figure 1b).

Intercalibration with the Moroccan research vessel *Al Amir Moulay Abdallah* started about 10 NM east off Cape Juby on 1 December. The two vessels worked in tandem from Cape Juby to Cape Cantin. From 20 NM south off Agadir the survey proceeded northwards with a survey track perpendicular to the coast, transecting the whole shelf. The northern limit of the survey, off Cape Cantin, was reached on 8 December. The vessel called on Agadir on 9 and 10 December for disembarking local scientists and change of crew. The vessel then steamed to Las Palmas where she arrived on 12 December.

Standard hydrographical sections were sampled at Cape Blanc, Cape Barbas, off Dakhla, at Cape Bojador, Cape Juby, Cape Dra and Cape Ghir. Two alongshore-hydrographical sections were worked in bottom depths of 50 and 200 m between Cape Blanc and Lacraa. In addition a hydrographical section was worked off Lacraa.

The weather was favourable and put no constraints on the sampling work.

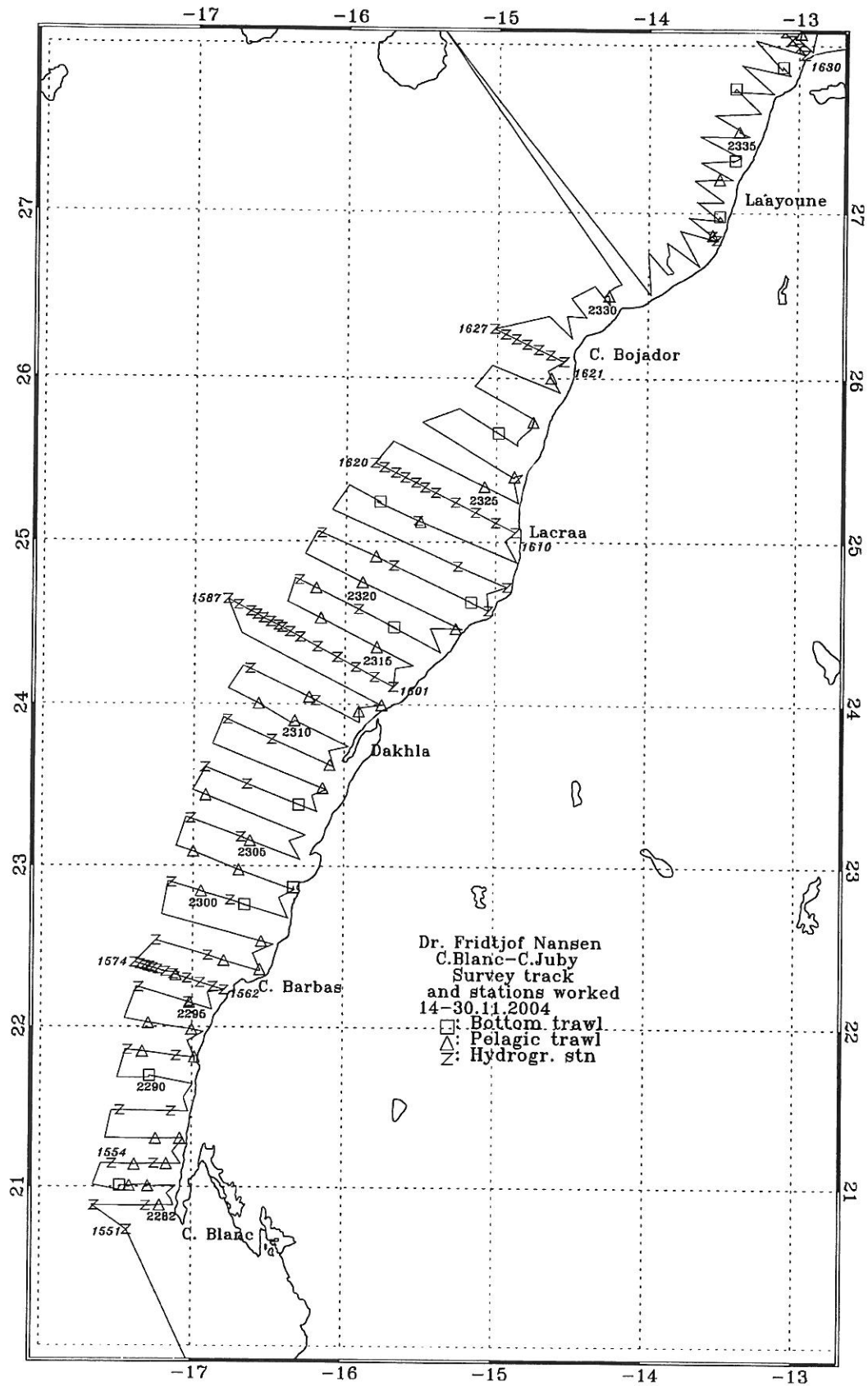


Figure 1a. Course track with fishing and hydrographic stations, Cape Blanc to Cape Juby. Depth contours at 20 m, 50 m, 100 m, 200 m and 500 m are indicated.

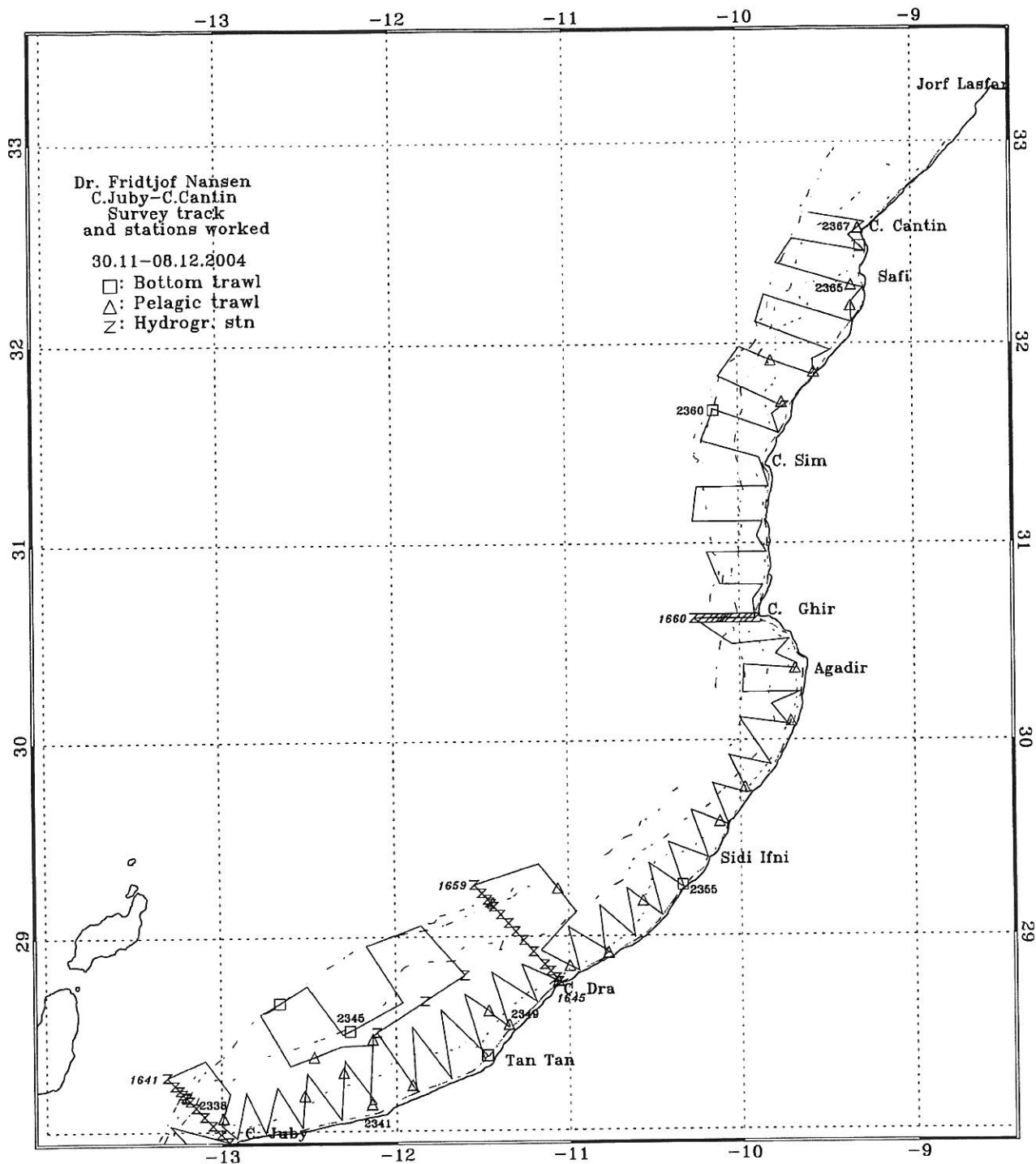


Figure 1b. Course track with fishing and hydrographic stations, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

1.4 Methods

The cruise followed the standard methods established for the regional surveys:

Environmental Data

Meteorological observations including wind direction and speed, air temperature, solar radiation and sea surface temperature (SST) were automatically logged and recorded with position and bottom depth every nautical mile sailed using an Aanderaa meteorological station. Sea surface salinity (SSS) was obtained by means of a Seabird 21 thermosalinograph measuring the engine intake water from a depth of 5 meters. The raw salinity data, which this instrument stores at a high sampling rate of one data cycle per second were prior to the analysis reduced to 0.5 nautical mile spatial averages. Vertical profiles of temperature, salinity and oxygen were recorded with a Seabird 911+ CTD probe. Real time plotting and logging was done using the customised Seabird Seasave software installed on a PC. The profiles were in general taken down to a few meters above the bottom. In deep stations, however, data logging was interrupted at 500 m. Niskin bottles were triggered for water samples, one near the surface and one near the bottom, in order to calibrate the oxygen and salinity sensors. The water samples were analysed for dissolved oxygen using the Winkler method, and for salinity using a Guildline Portasal salinometer mod. 8410.

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. The complete records of fishing stations are shown in Annex I. Sardine otoliths were collected and preserved for later reading ashore. Some readings of the otoliths were carried out during the survey.

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*, Cunene horse mackerel *T. trecae* and also including false scad *Caranx rhonchus*),
- 5) Mackerels (chub mackerel *Scomber japonicus*)

- 6) Other pelagic scombrids, carangids and associated species (such as *Auxis* sp., *Caranx* sp. and largehead hairtail *Trichiurus lepturus*), BEI group PEL2
- 7) Other demersal species (such as Sparidae, Haemulidae and Merluccidae).

Acoustic Sampling

A SIMRAD EK500 Echosounder was used and the echograms were stored on both paper and files. The acoustic biomass estimates were based on the integration technique. The Bergen Integrator (BEI) was used for analysis and allocation of the integrated s_A -values (average area back scattering coefficient in m^2/NM) to the individual specified target groups, usually by 5 NM intervals. Where bottom detection was poor and where fish schools were located very close to the bottom, the bottom echo was sealed off from the fish registrations by manual contouring. The splitting and allocation of the integrator outputs (s_A -values) was based on a combination of a visual scrutiny of species characteristics as deduced from echo diagrams, the BEI analysis, and the catch compositions.

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 relative contribution to the mean back scattering strength in the length frequency samples.

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

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

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

$$C_{Fi} = 1.26 \cdot 10^6 \cdot L_i^{-2} \quad (2)$$

where L_i is total length in 1 cm length group i and C_{Fi} (m^2) is the reciprocal back scattering cross section, 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:

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

where

- ρ_i = density (n/NM^2) of fish in length group i
- s_A = mean integrator value (m^2/NM^2)
- 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

For $TS = 20 \log L - 72$ the formula can further simplified into:

$$\rho_i = 1261217 \cdot \frac{n_i}{s_A \sum_{i=\min}^{\max} n_i l_i^2} \quad (4)$$

where s_A = mean integrator value of a species within an aggregation area, in m^2/NM^2

n_i = frequency count of length group i in a pooled representative sample from the distribution area.

l_i = mid length of fish in length group i .

The constant 1261217 incorporates the offset constant -72 in equation (1). For other TS relationships the equation constant becomes as in box. The table is presented to facilitate a recalculation in case more accurate TS measurements are provided in the future:

TS constant	Equation constant
-74	1998895
-73	1587779
-72	1261217
-71	1001821
-70	795774
-69	632106
-68	502099

Using equation (4), the pooled length distribution is used together with the mean s_A -value to calculate the density by length groups for each observed area with fish aggregations. The total number, by length groups, in an area is obtained by multiplying the densities with the distribution area. Areas were calculated on the maps by using a digital planimeter (Tamaya Planix 7).

The number of fish was converted to biomass by length group using the estimated weight at length from the length-weight relationship:

$$\bar{w} = \frac{cond}{100} * L^3 \quad (3)$$

The specific condition factors obtained from the samples and applied for this survey were: 0.82 for sardine, 0.94 for *S. aurita*, 0.97 for *S. maderensis*, 0.54 for *Engraulis encrasicolus* and 0.84 for horse mackerel and chub mackerel.

Finally the total biomass estimate is obtained by summing the biomass by length group and areas within each sector of the survey.

Equations (1), (2) and (3) show that the conversion from s_A -value to number of fish is dependent on the length composition of the fish. In general there are many problems associated with getting representative length distributions when the various size classes mix with varying proportions between neighbouring stations. When the size classes are well and homogeneously mixed in an area, the various length distributions are pooled together with equal importance. In areas where fish size-groups are well segregated, separate estimates are made for each group. Otherwise, when the size distribution varies from sample to sample, a weighting factor is applied that takes into account the density at the location. In most cases, the mean acoustic density at the location of the sample is the most representative index of this fish density.

For the estimation of the biomass of target group 3) carangids and associated species, an overall average length of 23 cm and a condition factor of 0.88 (to calculate mean weight of this length group) were applied.

A systematic approach to a) produce pooled length distributions of a target species for use in the above equation and b) calculate the biomass estimates for a region, are obtained through the following procedure:

- Each trawl station gets an integrator value as a density index for the sampling site.
- Representative length distributions are selected from all the collected samples of a fish aggregation.
- The mean back scattering strength of a fish in each of these length frequency distributions is calculated.
- The selected length distributions are then pooled using the ratio between the allocated s_A -value and the mean back scattering strength as the weighting factor. (If the size distribution is geographically uniform the three steps mentioned above can be skipped and the samples are pooled together with equal importance.)
- The pooled length distribution is used together with the mean s_A -value to calculate the biomass in numbers by length groups, for each area in the map, using formula (4) above. Numbers are converted to weight using the condition factor of the species. This can be calculated from the length samples where the total weight of the sample is recorded, or from individual biological samples.
- Biomass is calculated as the product of the density and the area of the aggregation, and finally the area-related biomass values in a region are summed together.

The necessary calculations are done in spreadsheets after the scientist has completed the two first steps in the above list manually.

All data on fishing stations and fish length sampling were made available to the participants from the local research institutes on diskettes.

CHAPTER 2 SURVEY RESULTS

2.1 Hydrographic conditions

Wind conditions

The wind conditions encountered during this survey were within the calmest ever experienced during the Dr. Fridtjof Nansen surveys in the region. According to the long-term climatic trend for this region, late November and December would be characterized by a change in the wind pattern between the south and the north. To the south of Cape Juby, the conditions would be characterised by an increase in the average wind speed and in the duration of the north-easterly wind events related to the trades. To the north of Cape Juby, the winter period of trade winds relaxation would be expected with fewer and shorter wind events from variable directions. The conditions experienced during this survey were the reverse to such pattern and, climatologically, were more typical to the late October situation. The calmer wind conditions, shorter duration of events, more variable wind directions were experienced south of Cape Juby, while in the north a moderate but persistently northerly wind had prevailed during the survey period.

The summary of the wind conditions is shown in Figures 2. From Cape Blanc to Dakhla (Figure 2a) the dominant wind directions were between north and east with each wind event lasting no more than a day. The average wind speed stayed within the limit of 5 to 6 m/s. A more persistent north-easterly wind event took place from the 20 to 24 November, when the ship was surveying the region enclosed between the Dakhla and Lacraa hydrographic lines (Figure 1). In this case, the average wind speed was 9.5 m/s. On 25 November in the morning, when surveying south of Cape Bojador, the vessel was hit by a strong easterly wind associated to a Sahara Dust event. The average wind speed increased to 11 m/s. The horizontal visibility diminished to few hundreds meters and beyond that distance a yellowish wall of dust was erected and obscured the view. The air temperature arose from 20 to above 25 °C. The ship's deck was invaded by numerous, 10-centimeter long red-coloured grasshoppers of the locust kind, blown from Sahara with the easterly wind. This situation persisted until the next day, when the ship left the survey area for refuelling in Las Palmas. Away from the coast the visibility has returned, but the strong easterly wind had persisted throughout the whole journey to Las Palmas. Upon the return to the survey region, from Cape Bojador and Cape Juby, the dominant wind direction turned to southwest with the average wind speed in the range of 7-8 m/s.

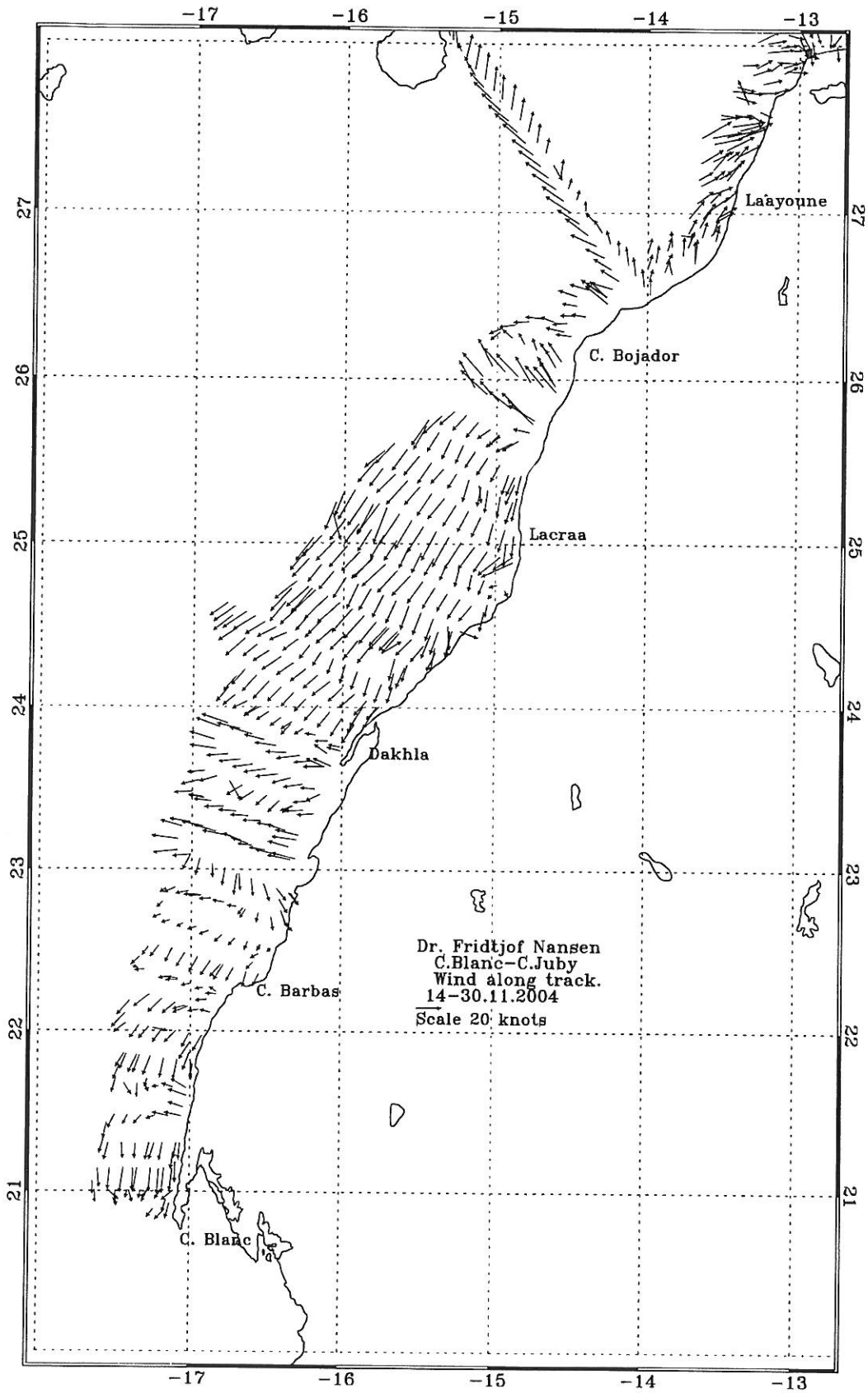


Figure 2a. Wind conditions along the survey, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

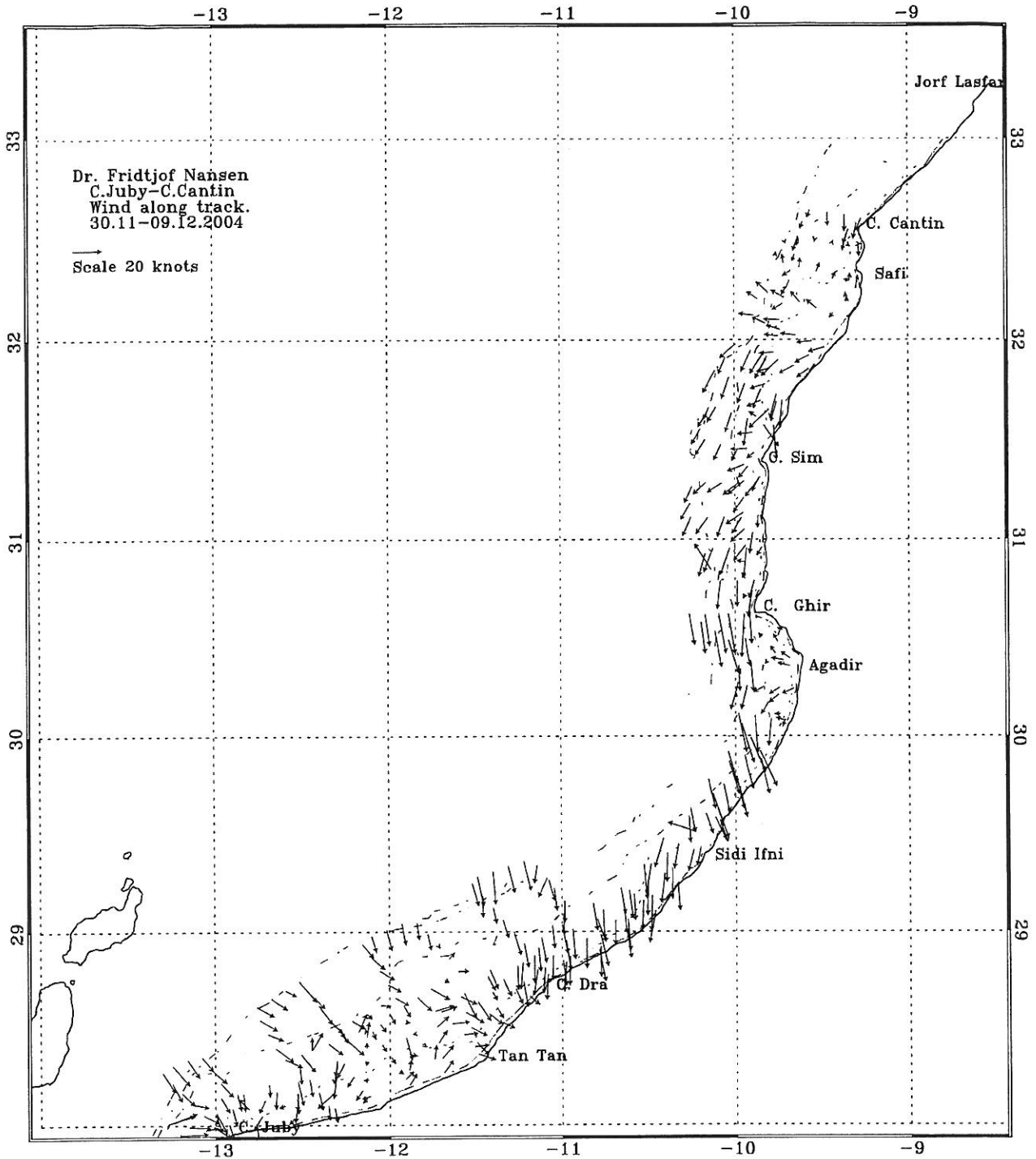


Figure 2b. Wind conditions along the survey, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

The wind between Cape Juby and Cape Dra was weak to moderate, predominantly from the northwest (Figure 2b). Despite of the weak wind, the ocean surface was subjected to a strong swell arriving from the north. The similar swell conditions have been observed frequently in the past surveys to occur along this section of the coast independently of the local wind. It may be hypothesized that the swell is in this region a permanent phenomenon, caused by the fact that the Tan Tan coast forms the main barrier to the north-south ocean circulation, which dominates the

regional hydrography. It would be useful to investigate how this persistence of the swell affects the distributions pelagic fish.

It is known (also from this survey data) that the pelagic fish in this region aggregate close to the coast, thus inshore of the shoaling point of the swell wave train. It is possible that the alongshore currents generated by the breaking swell contribute significantly to the patterns of concentration transport and retention that fish is subjected to along this section of the coast.

To the north of Cape Dra, the wind speed increased to about 9 m/s, directed from the north. These conditions persisted for the next two days (the 5 and 6 December) until the survey reached Cape Ghir. From Cape Ghir northwards, the wind speed subsided, but its dominant northerly direction remained unchanged to the latitude 32° N (Figure 2 b).

Hydrography of the shallow waters including upwelling conditions.

The introduction of the new instrument aboard *Dr. Fridtjof Nansen* to measure sea surface salinity (see Section 1.4) opened new possibilities to determine hydrographic boundaries on the shelf. By combining the sea surface temperature data (SST) with SSS it is possible now to track extents of shallow-water masses, which often determine natural ecological boundaries of pelagic habitats.

Figure 3a demonstrates the distribution of SST in the southern region. Figure 3b, represents the SSS data for the same region. From these figures, one can clearly identify the two major upwelling cell in the area, Cape Blanc, which is located approximately between the latitudes 20°30' and 22° N and Lacraa located between 24°30' and 25°15' N.

Off Cape Blanc, the temperature at the surface was below 18 °C and the salinity dropped below 35.8. This range of values manifested the presence of the subsurface South Atlantic Central Water (SACW) in the upwelled water. The hydrographic line occupied along the 50-meter isobath (Figure 5b) clearly demonstrates the vertical structure of the Cape Blanc upwelling cells in the alongshore direction. The maximum uplift of the bottom waters was located at 22 °N, based on the position of the peak in the elevation of the oxygen distribution. The alongshore extent was about one degree of latitude, as inferred from the shape of the 19 °C isotherm. A sharp hydrographic front just to the south of Cape Barbas, clearly seen on the salinity distribution, separated the upwelling domain from the warmer and more saline water masses of the north. Notice that the location of Cape Blanc upwelling cell as inferred from the hydrographic data matches well the region of co-occurrence of the two major pelagic fish: the sardine and sardinellas obtained from acoustic survey data (Figure 6 and Figure 7).

Off Lacraa, the sea surface temperature, as in the case of Cape Blank, decreased near the coast to less than 18 °C. Salinity displayed a strong cross-shelf gradient, but its inshore value of 36.4 psu was much higher than that observed off Cape Blanc. The higher salinity attributes the origin of the coastal water to North Atlantic Central Water (NACW), a much poorer in nutrients and more saturated with oxygen water mass than SACW. A striking feature of the vertical structure in this region was absence of the vertical stratification of the water column. The two hydrographic lines obtained in this region, off Dakhla (Figure 4c) and Lacraa (Figure 4d) demonstrate that the upwelling fronts were located far away from the coast. The inner shelf waters were entirely mixed, exhibiting a constant temperature, salinity and oxygen from the surface to the bottom. The typical coastal upwelling structure, whereby the water mass near the coast is connected to its shelf-break source through an upsloping bottom layer of a cold and less saline water was not observed. This raises the question about the source of the water masses observed inshore off Lacraa in Figure 3a and 3b. If these waters were brought there by an upwelling event, it must have occurred prior to the survey. However, our survey data suggest for an existence of a perennial coastal current flowing along the coast between Cape Bojador and Lacraa that might be an alternative source bringing the water masses to this coastal region.

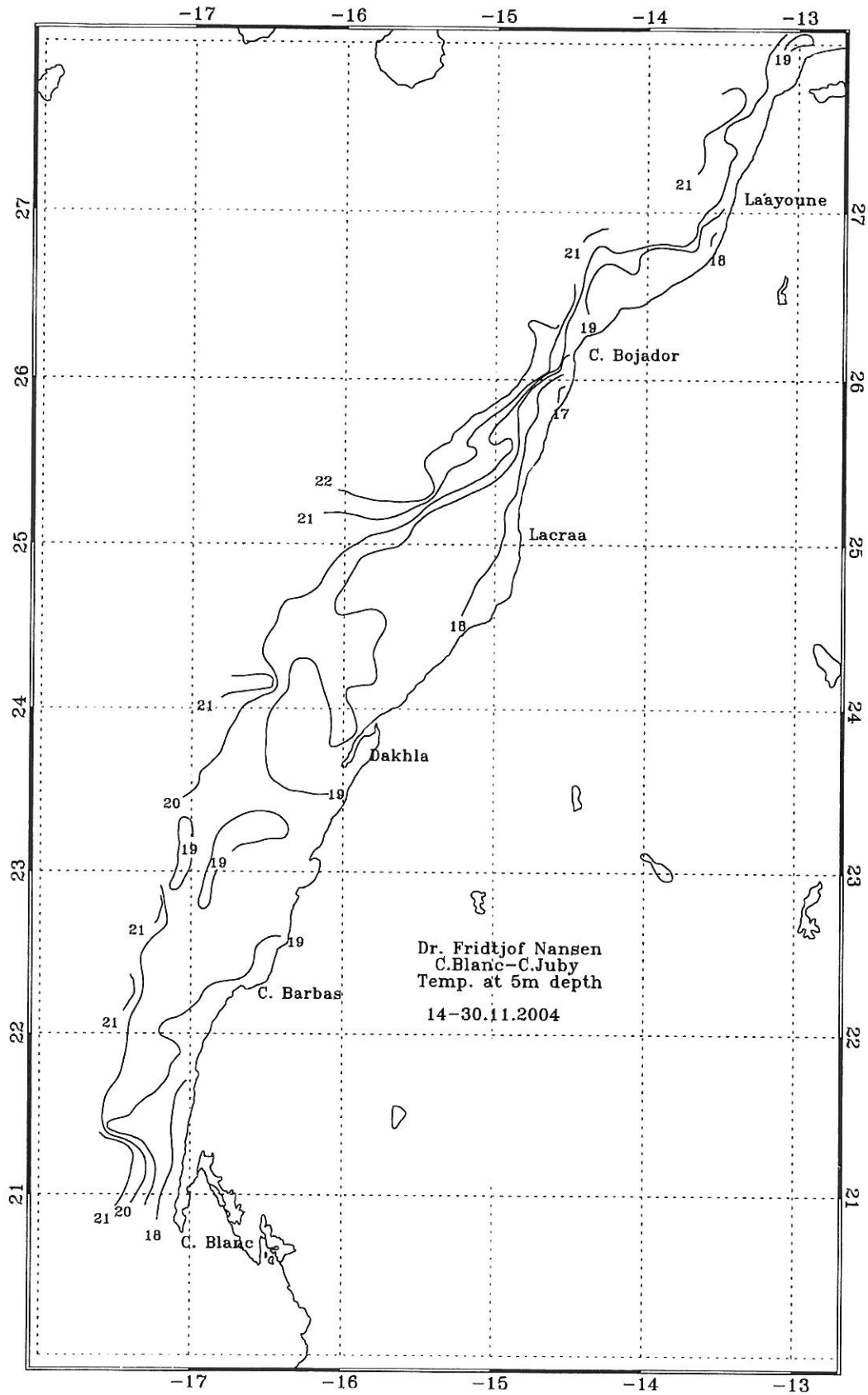


Figure 3a Sea surface temperature (at 5 m depth), Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

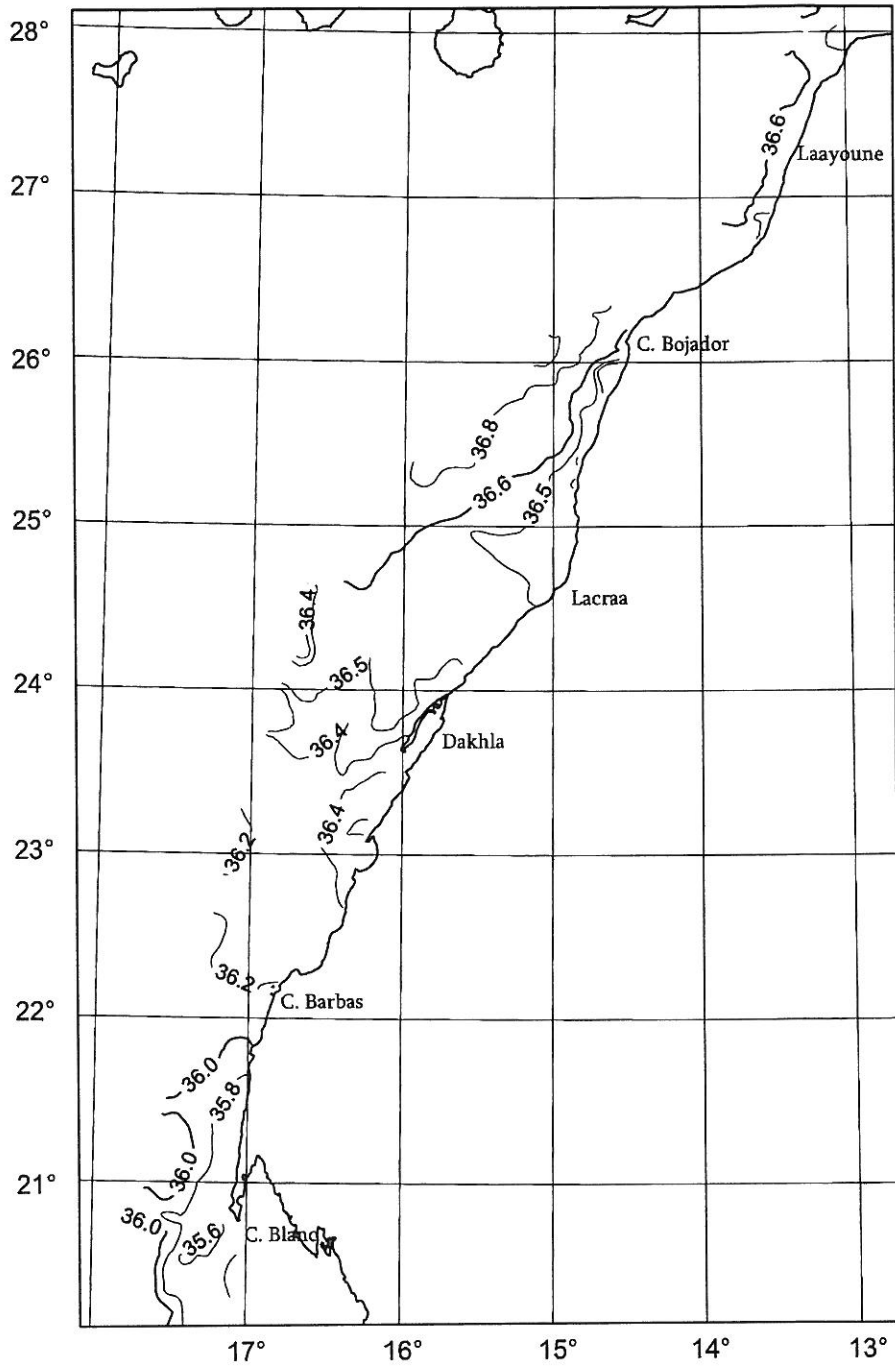


Figure 3b Sea surface salinity (at 5 m depth), Cape Blanc to Cape Juby.

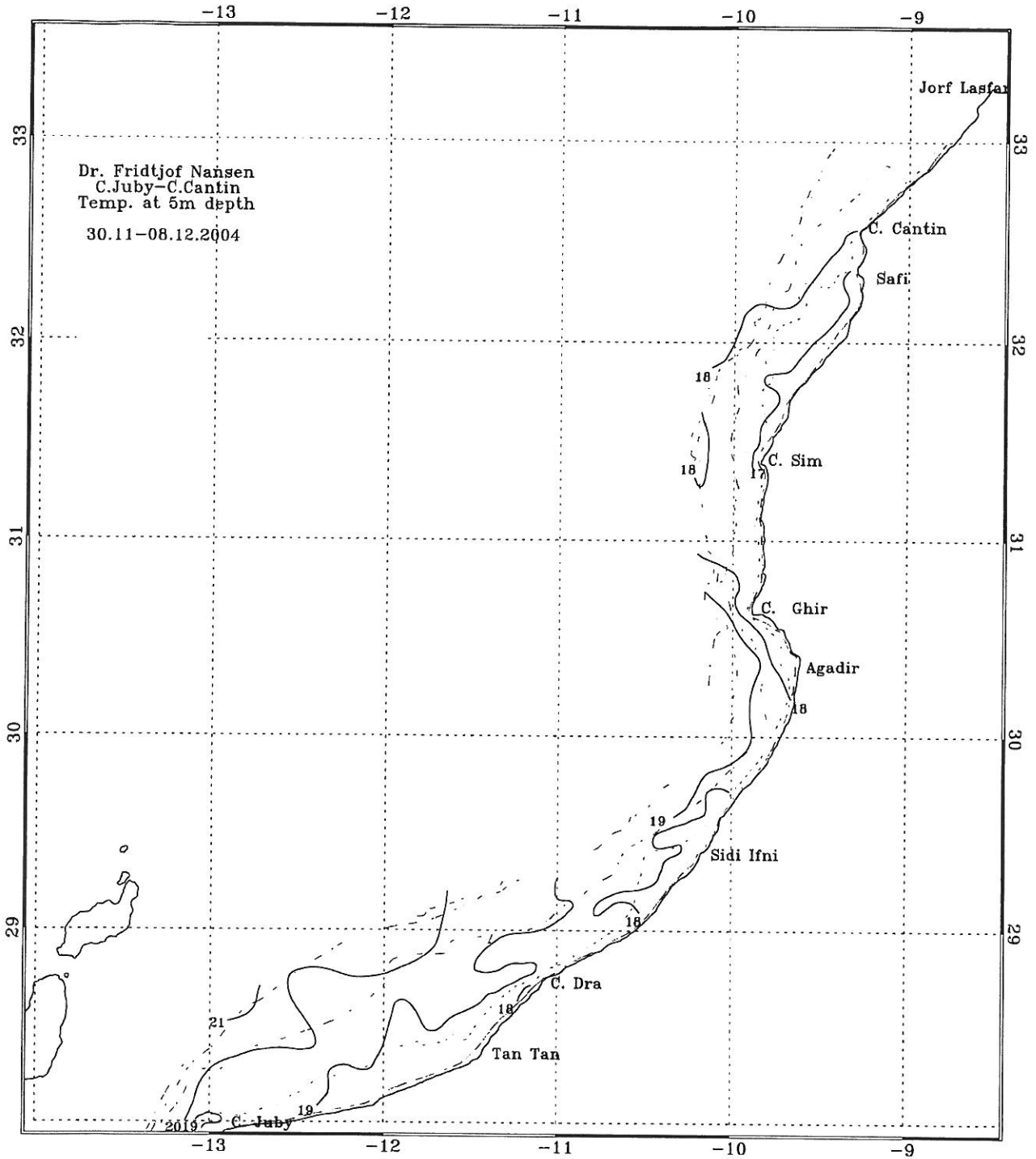


Figure 3c. Sea surface temperature (at 5 m depth), Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

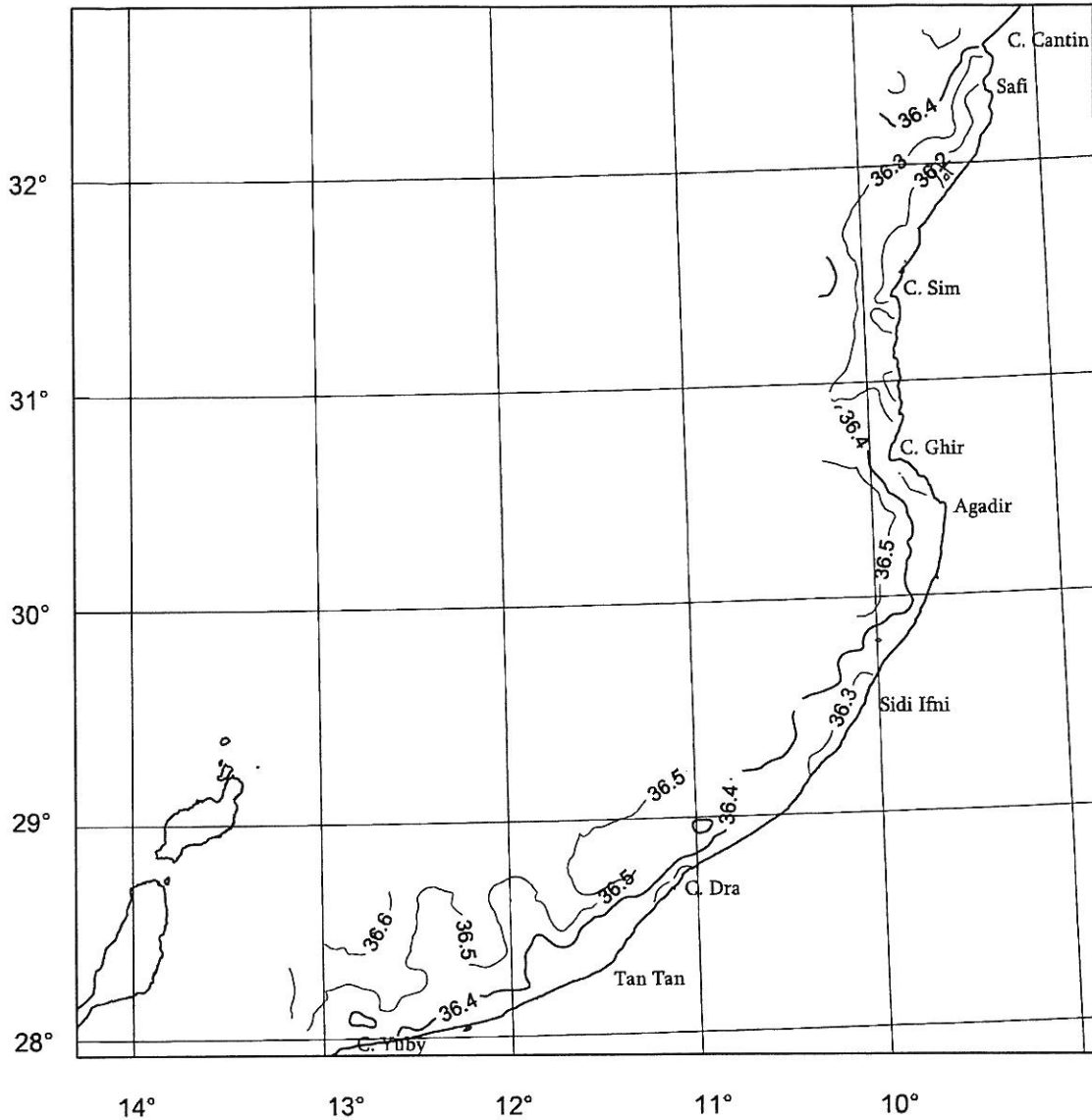
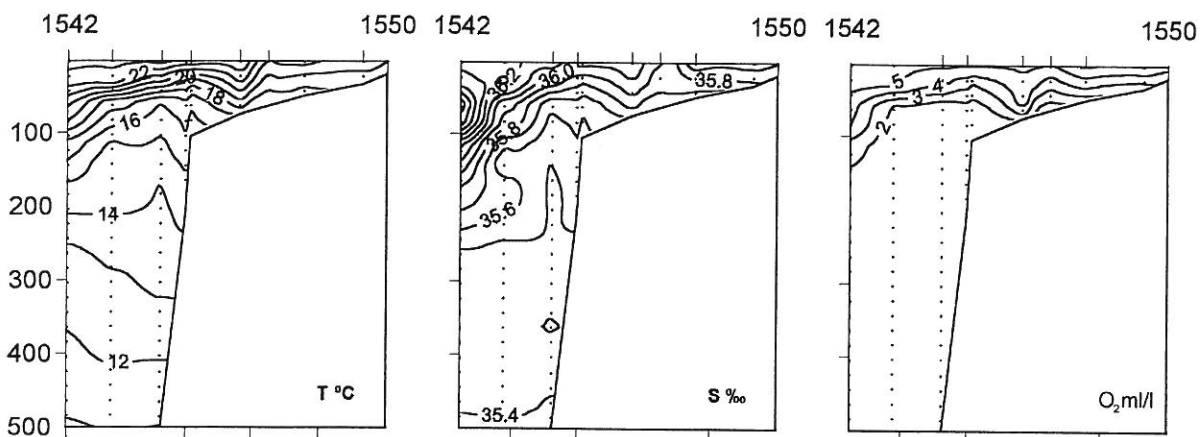


Figure 3d. Sea surface temperature (at 5 m depth), Cape Juby to Cape Cantin.

The acoustic current profiler measurements done during the earlier surveys had revealed a southward alongshore flow to the north of Lacraa and south of Cape Bojador with velocities 0.5 m/s that did not depend on the local wind. The hydrographic data from past surveys made in this region indicate that the absence of the vertical stratification for the depths shallower than 50-60 meter is the typical feature for this shelf. In addition, both the survey data and satellite imagery identify a large warm body of surface waters located just offshore of Cape Bojador, which is characterized by the highest annual SST in the entire Canary Current coastal region. (This feature is also clearly seen in the distributions shown in Figure 3a and 3b). The cross-shelf density gradient associated to this water mass could be a driving force to sustain a perennial current, located close to the coast, responsible for the transport of the cold and low salinity water masses from the north to the Lacraa coastal region. The persistence and variations of such a current would be important to the life-cycles of the sardine, the dominant stock in this region.

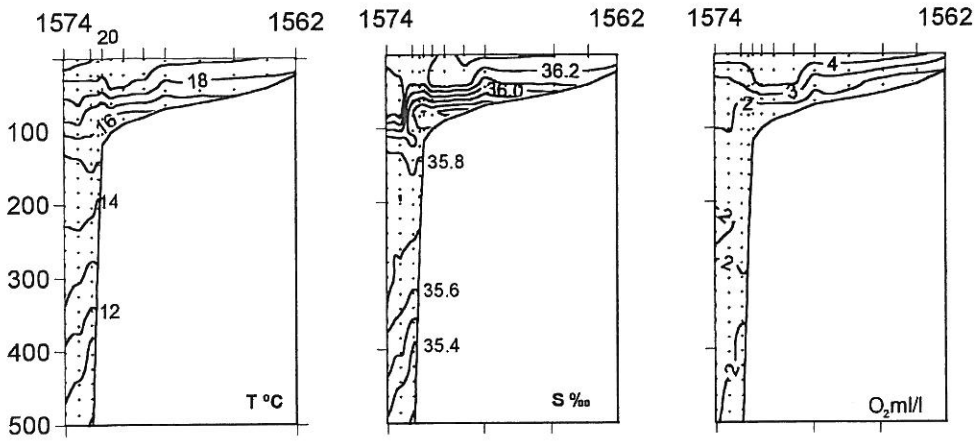
The distribution of the sea surface temperature and salinity obtained in the northern region (Figure 3c and 3d), indicated only one large area with a strong upwelling signature, which was located between Cape Sim and Safi. The temperature in this upwelling centre was less than 17 °C and salinity was less than 36.2. The observed upwelling signature did not coincide with the local wind, which was weak during the passage of the surveying vessel. Notice that the height of the upwelling season in this region falls to the summer. Hence, the encounter of such a large and active upwelling cell during the survey period may be treated as an anomaly, which contributes to the notion, expressed earlier in this report, that during 2004 the survey region has experienced a prolonged summer period. Another, a much smaller upwelling cell was found off Sidi Ifni. Within this cell, the observed temperature and salinity were below 18 °C and 36.3, respectively. The rest of the coast in the northern region displayed weak offshore SST and SSS gradients, with the temperature between 18 and 19 °C and salinity between 36.3 and 36.4 near the coast. The maximum offshore temperature > 21°C and salinity > 36.6 °C was recorded at the seaward end of the Cape Juby hydrographic line.

From the hydrographic data collected on the shelf in the northern region (Figure 4f-h), the vertical structure observed off Cape Dra merits a special attention. The bottom topography in that area is characterized by a rapid descent from the coastline to a depth of 60 meters and a relatively flat deep shelf that underlies it. The CTD data from this deep portion has revealed a 10-meter thick near-bottom layer characterized by a rapid drop in oxygen values below 4 ml/l on average and below 3 ml/l at station 1647. The observed values were below these observed in the deep slope waters, hence there is a supposition that the near-bottom low oxygen layer has emerged in the recent period, caused an increased decay of organic matter and poor ventilation of the bottom layer. Further investigation will be necessary to establish whether the process was transient or if it indicates a more permanent change of the coastal environment off Cape Dra.

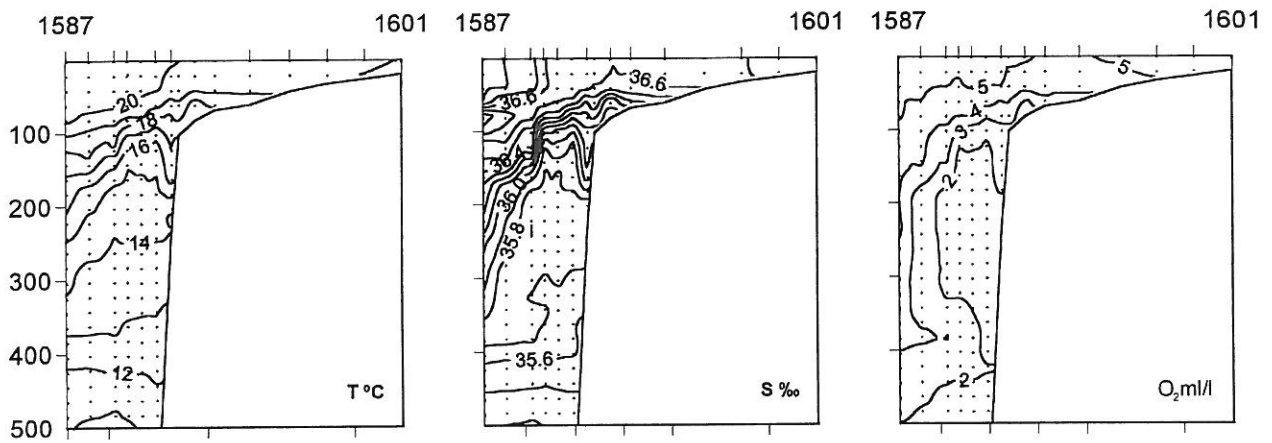


a) Cape Blanc – 11.11.2004

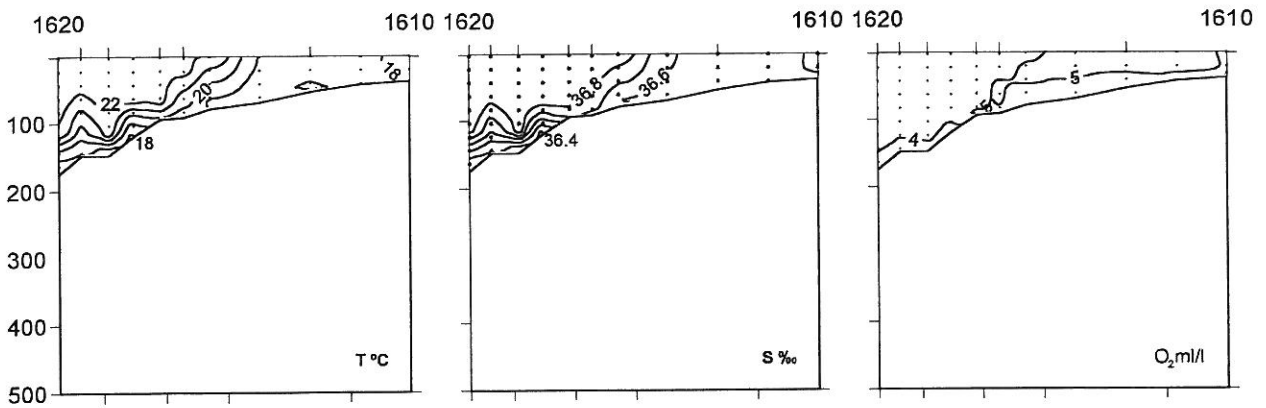
Figure 4. Hydrographic sections with distribution of temperature, salinity and oxygen.



b) Cape Barbas – 17.11.2004

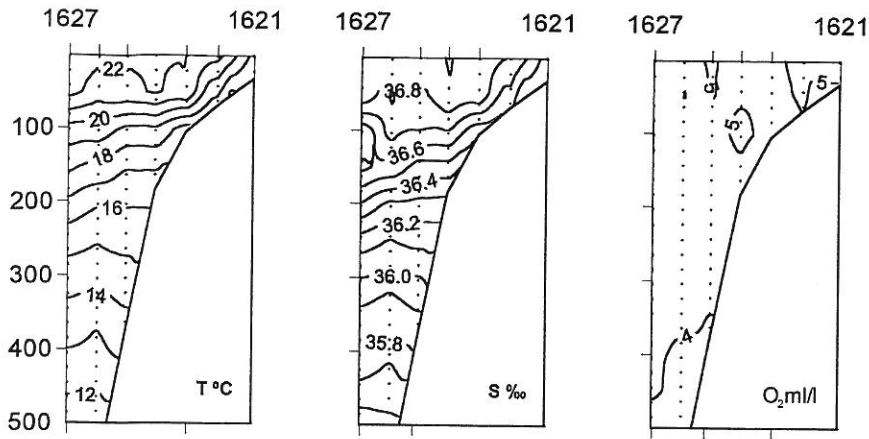


c) Dakhla – 21.11.2004

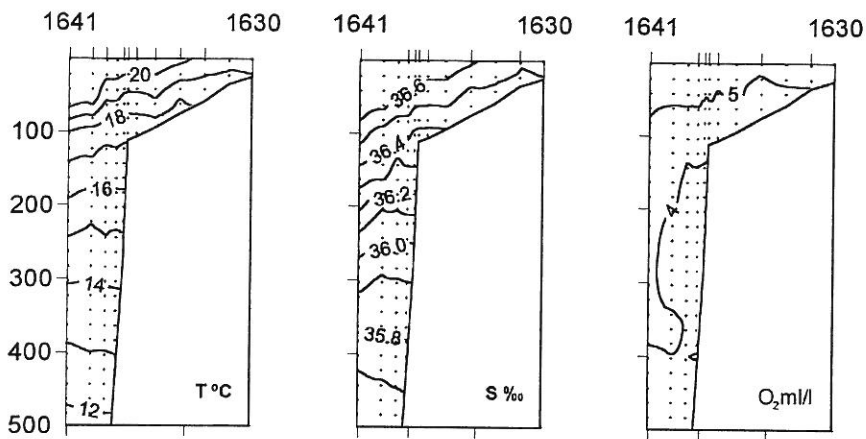


d) Lacraa – 24.11.2004

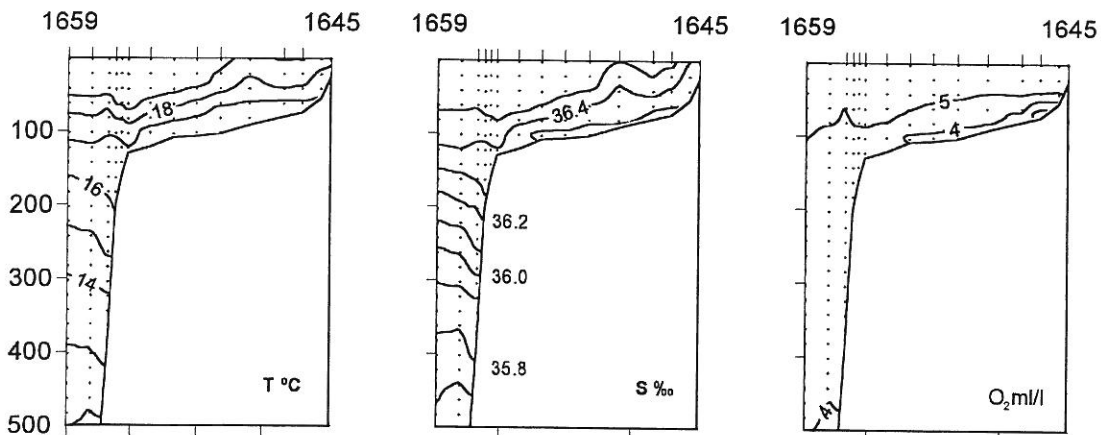
Figure 4. (continued)



e) Cape Bojador – 25.11.2004

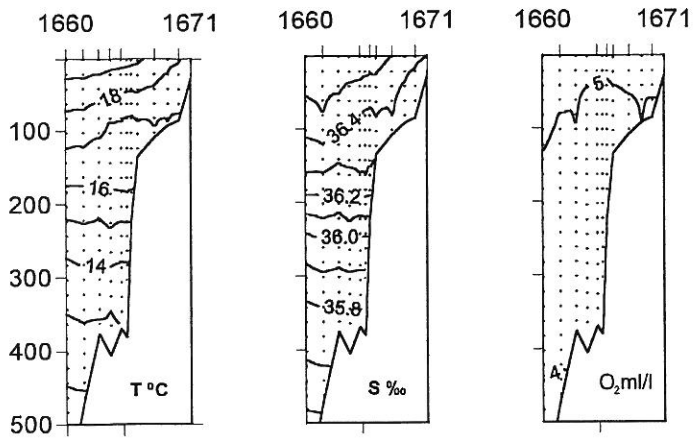


f) Cape Juby – 30.11-01.12.2004



g) Cape Dra – 04.12.2004

Figure 4. (continued)



h) Cape Ghir – 06.12.2004

Figure 4. (continued)

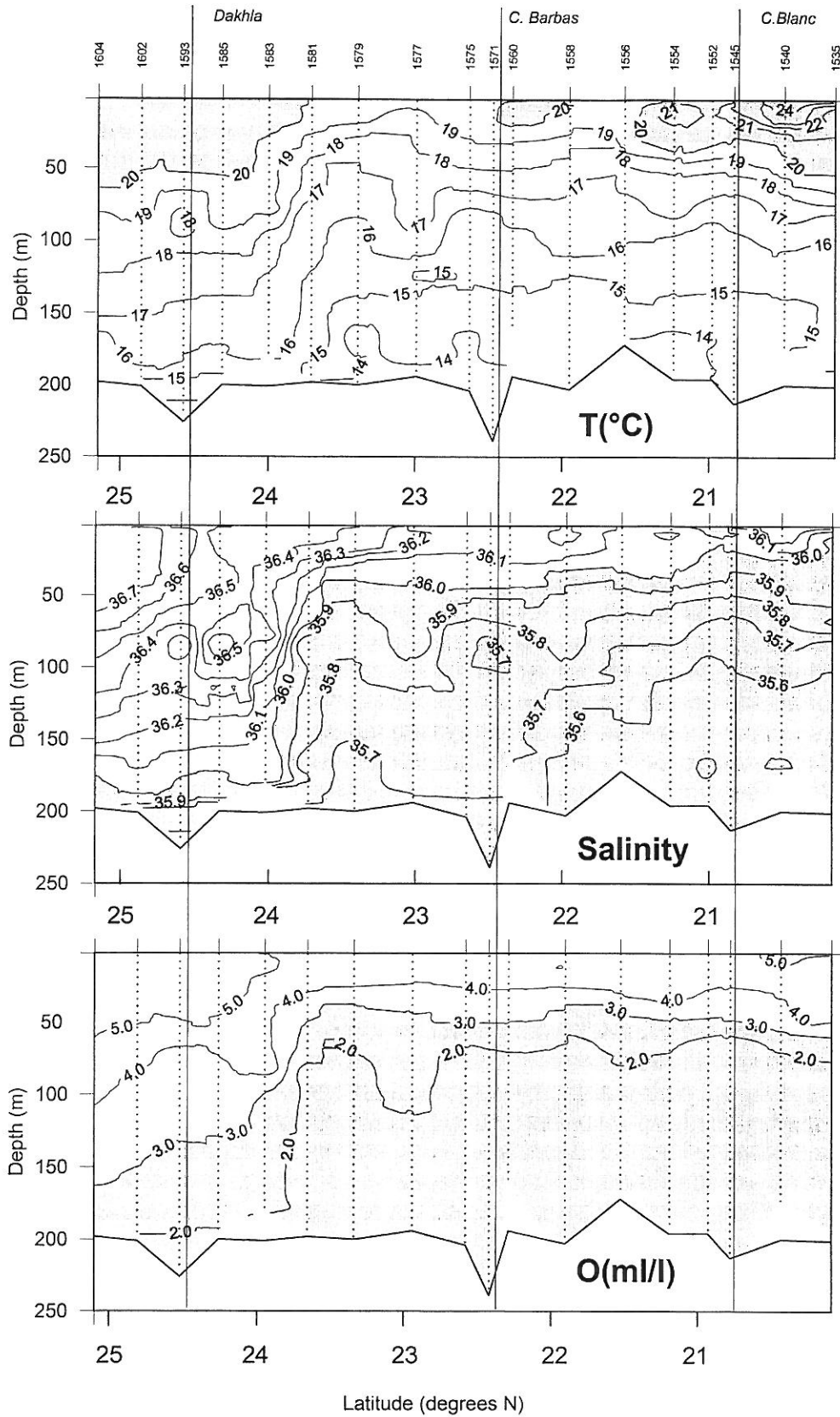


Figure 5 a. Distribution of temperature, salinity and oxygen along 200 depth contour between 21 and 25°N.

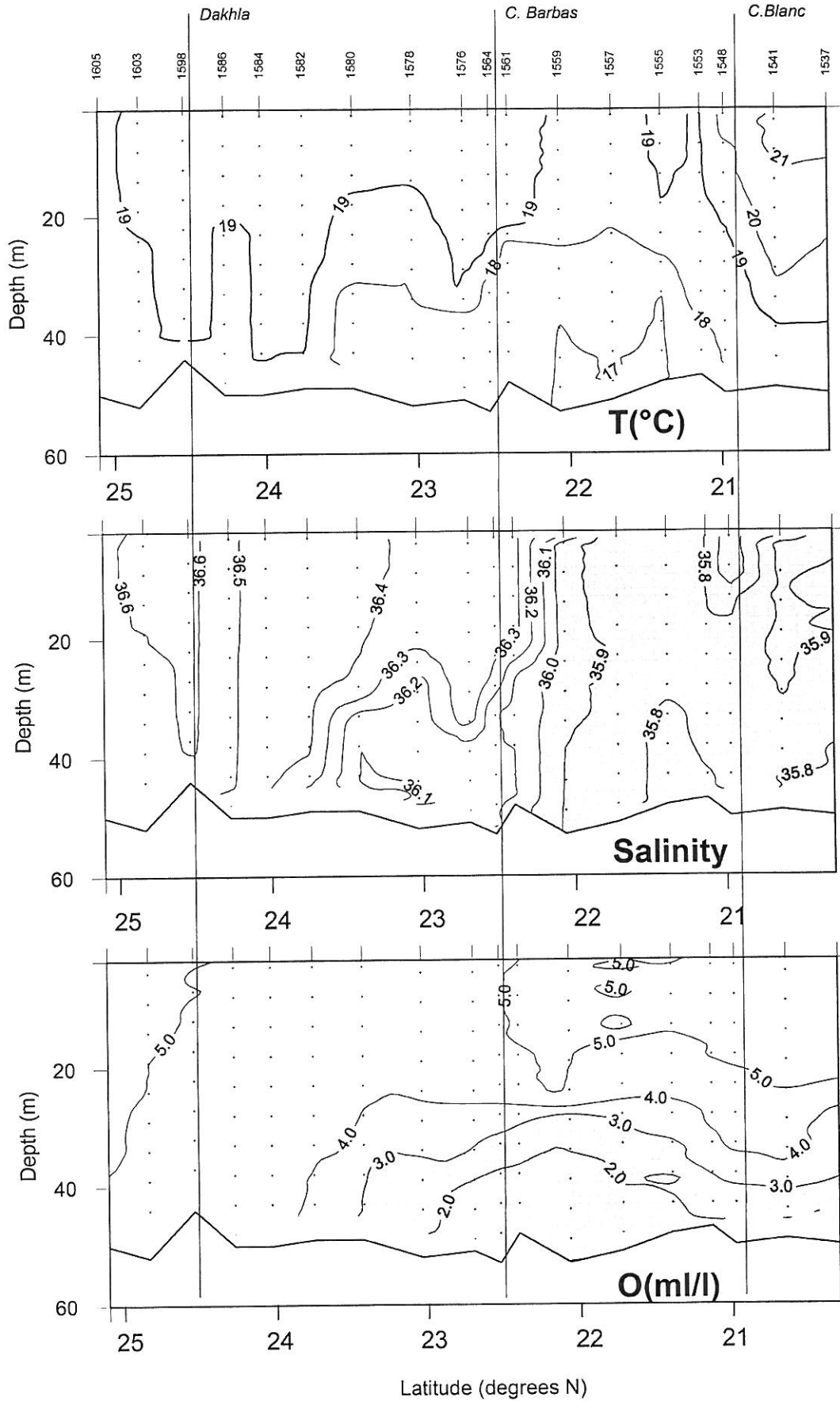


Figure 5 b. Distribution of temperature, salinity and oxygen along 50 m depth contour between 21 and 25°N.

2.2 Distribution of pelagic fish on the shelf from Cape Blanc to Cape Juby.

Figures 6 to 10 show the distribution of the main groups of pelagic fish by contoured acoustic densities.

Sardine, *Sardina pilchardus*, was found almost without interruption between Cape Blanc and Cape Juby, Figure 6. The density of sardine between Cape Blanc and Cape Barbas was higher compared to November 2003. The aggregations between Cape Barbas and Lacraa are covering most of the shelf. In previous years only patches of sardine were found around Cape Bojador, while during this survey it was found in a continuous coastal belt northwards to Cape Juby. Many fishing vessels were active with floating gillnets from about 40 NM south off Cape Bojador to about 30 NM north off the cape. Juvenile sardine was recorded at a very low level south off Cape Bojador, Figure 11a. Between Cape Bojador and Cape Juby it was recorded in high abundance close to the shore. These aggregations consisted mainly of young fish, Figure 11b.

Sardinellas (*Sardinella aurita* and *S. maderensis*) formed a major aggregation between Cape Blanc and Cape Barbas. Further north scattered recordings of sardinella were observed near Dakhla and between Lacraa and Cape Bojador, Figure 7. The aggregation between Lacraa and Cape Bojador was consisting mainly of *S. maderensis*.

Anchovies (*Engraulis encrasicolus*) were only found between Cape Blanc and Dakhla, and near Laayoune, Figure 8.

Horse mackerels (*Trachurus trachurus* and *T. trecae*) were common between Cape Blanc and Cape Barbas, with high densities on the shelf north of Cape Blanc, Figure 9. These aggregations were mainly consisting of *T. trecae*. Further north, between Dakhla and Cape Bojador, the horse mackerel were found on the outer shelf and were mainly made up of *T. trachurus*. Horse mackerel were also recorded Laayoune and Cape Juby, but only at low densities, Figure 9.

Chub mackerel (*Scomber japonicus*) was recorded almost continuously from 23°N to Cape Juby and was mainly hit at low densities, Figure 10.

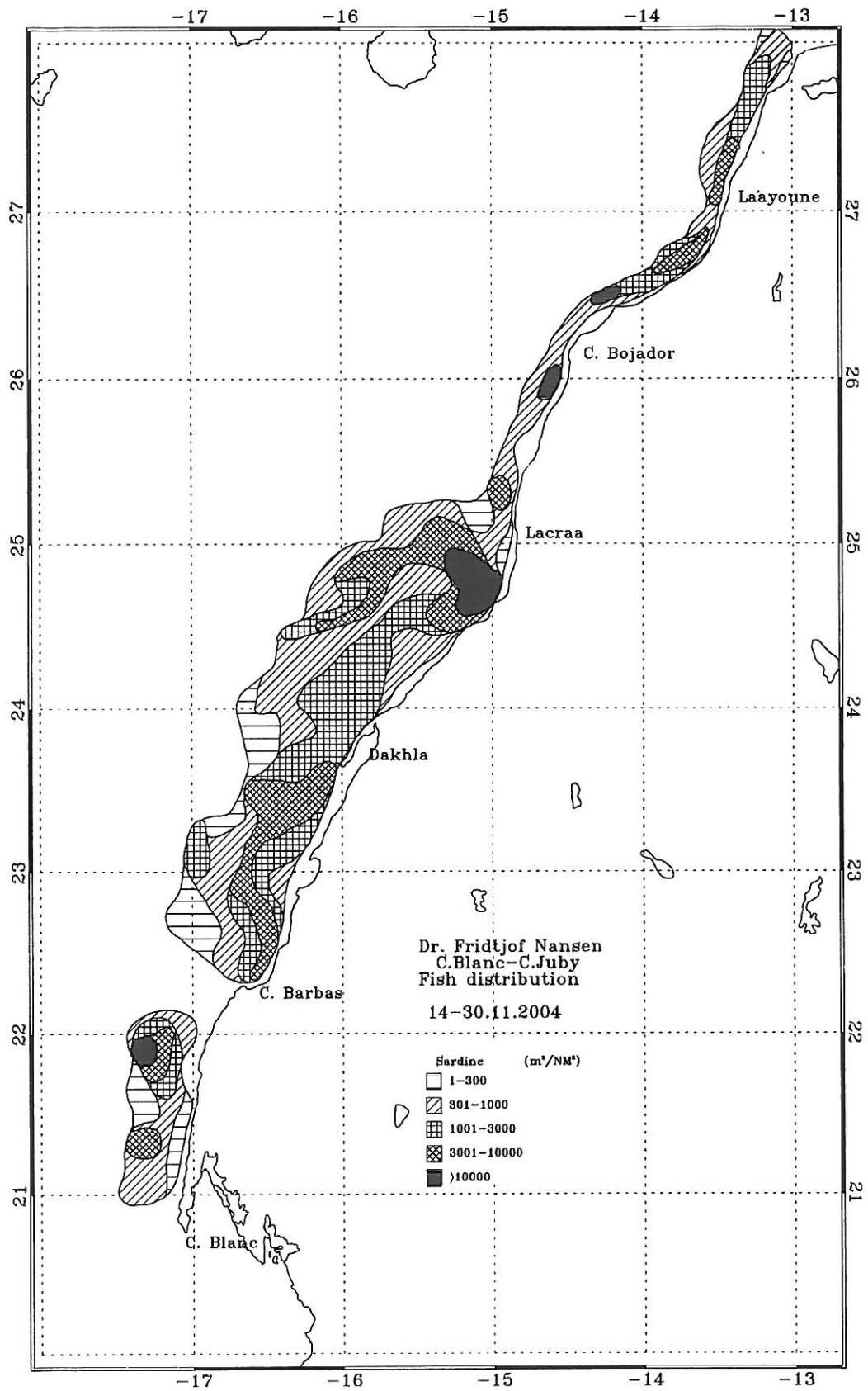


Figure 6. Distribution of sardine, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

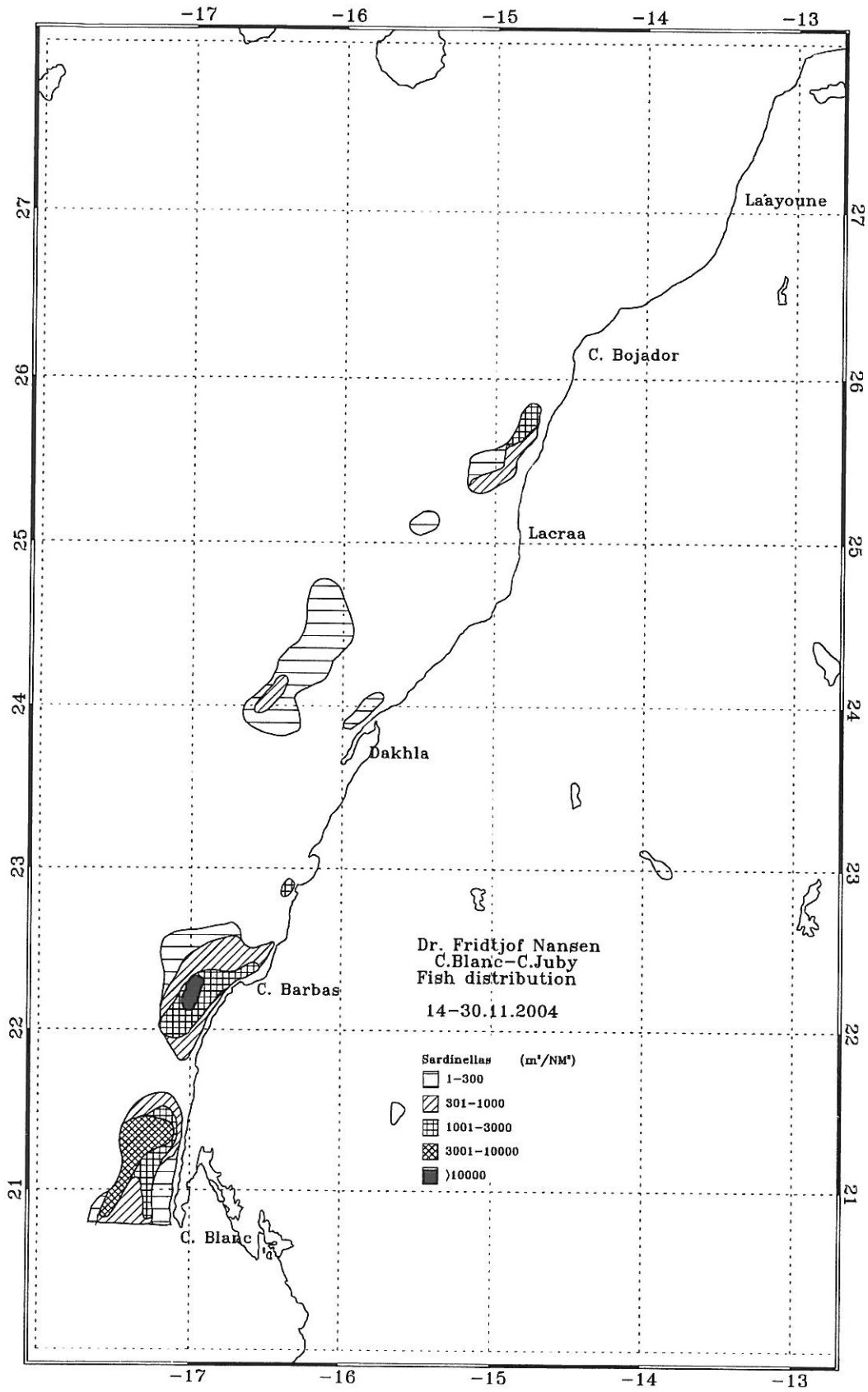


Figure 7. Distribution of sardinella, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

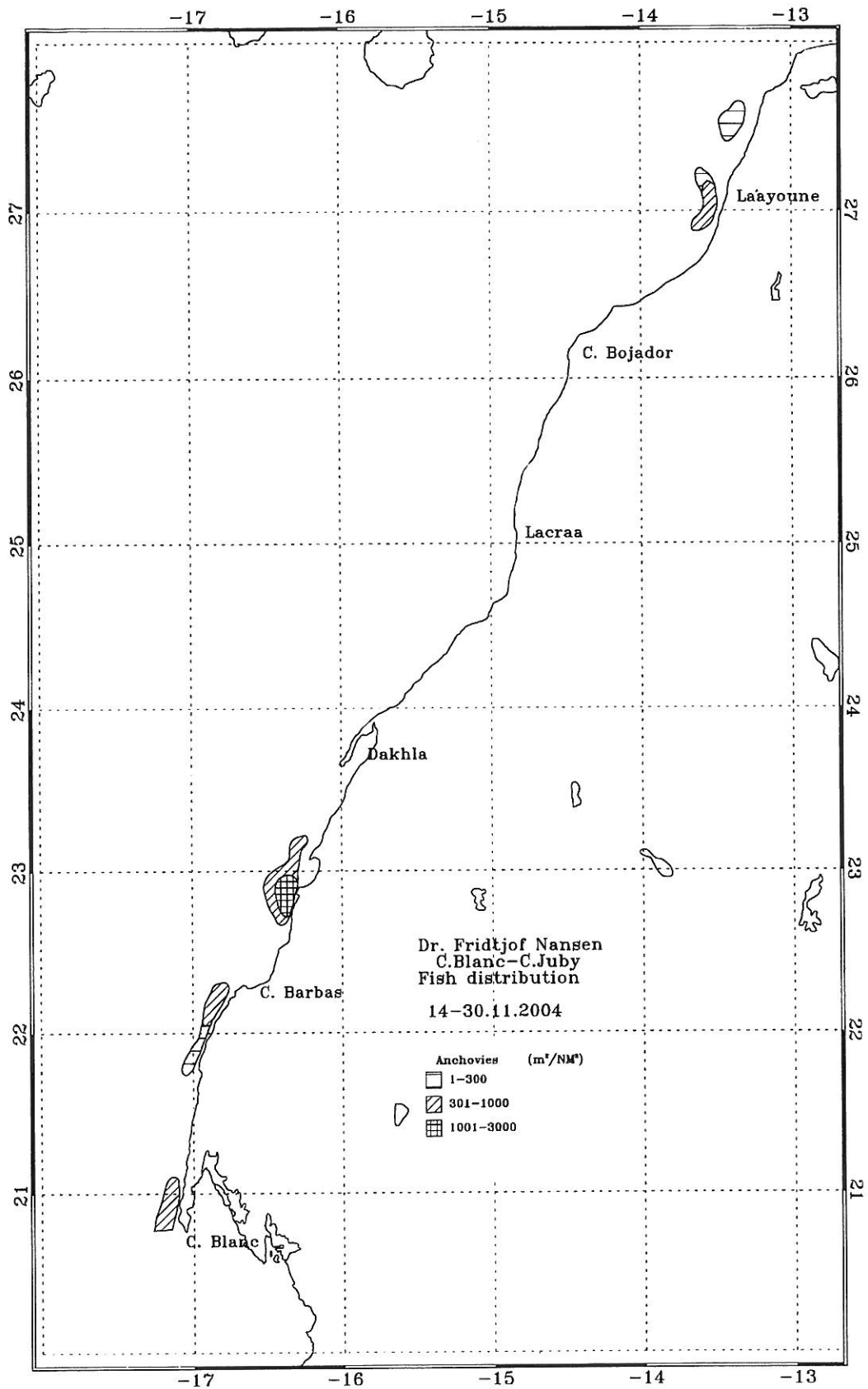


Figure 8. Distribution of anchovy, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

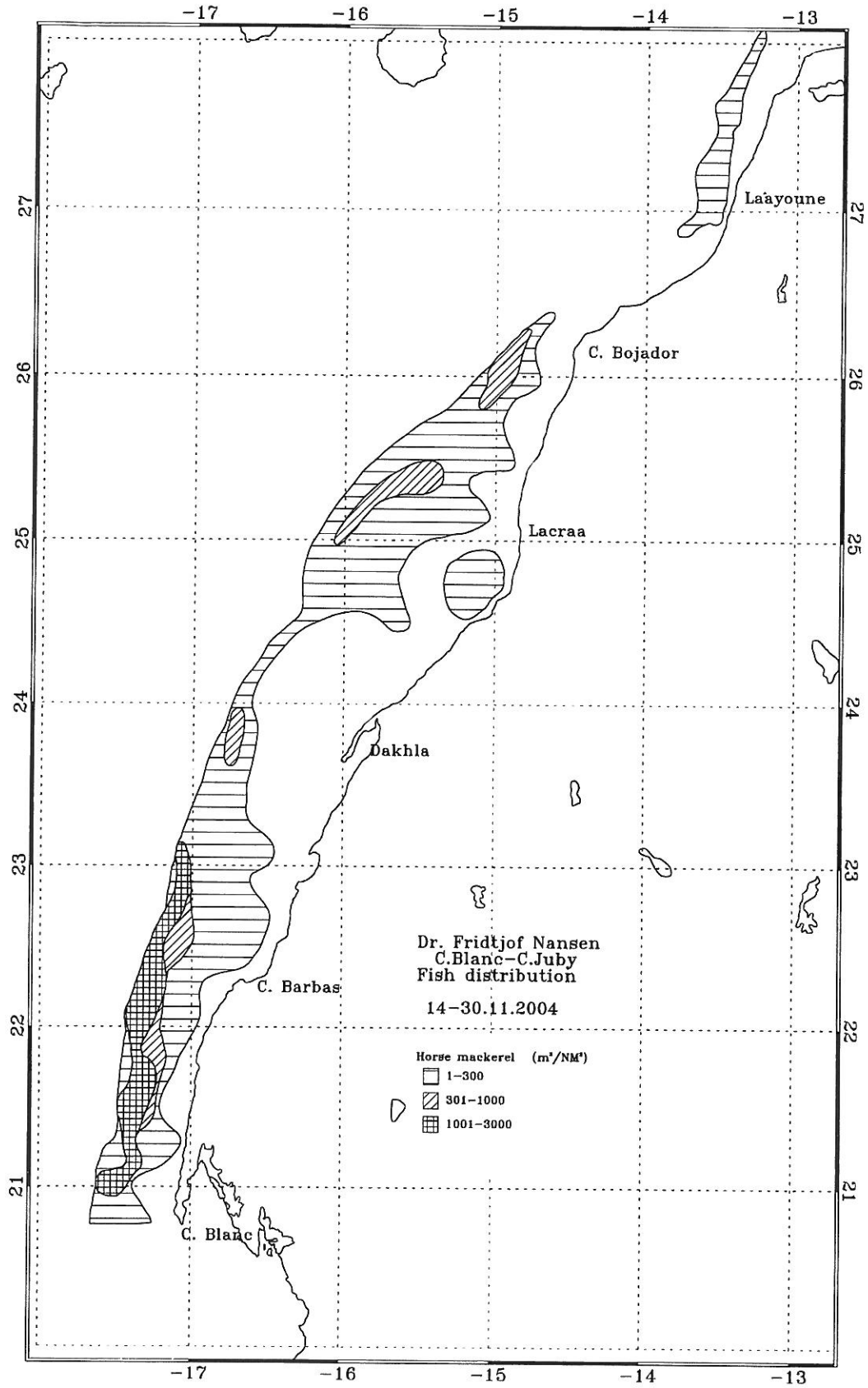


Figure 9. Distribution of horse mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

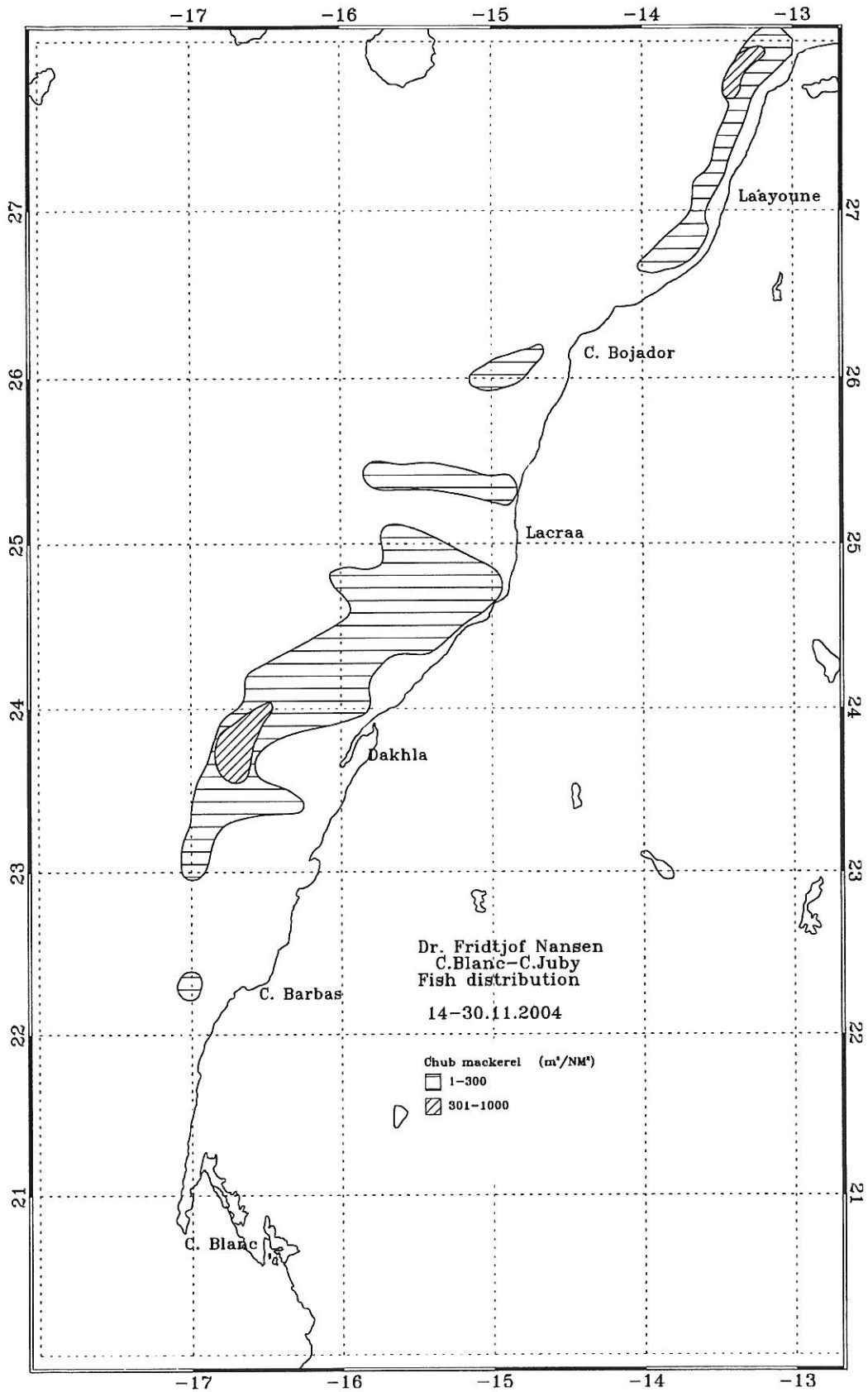


Figure 10. Distribution of chub mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

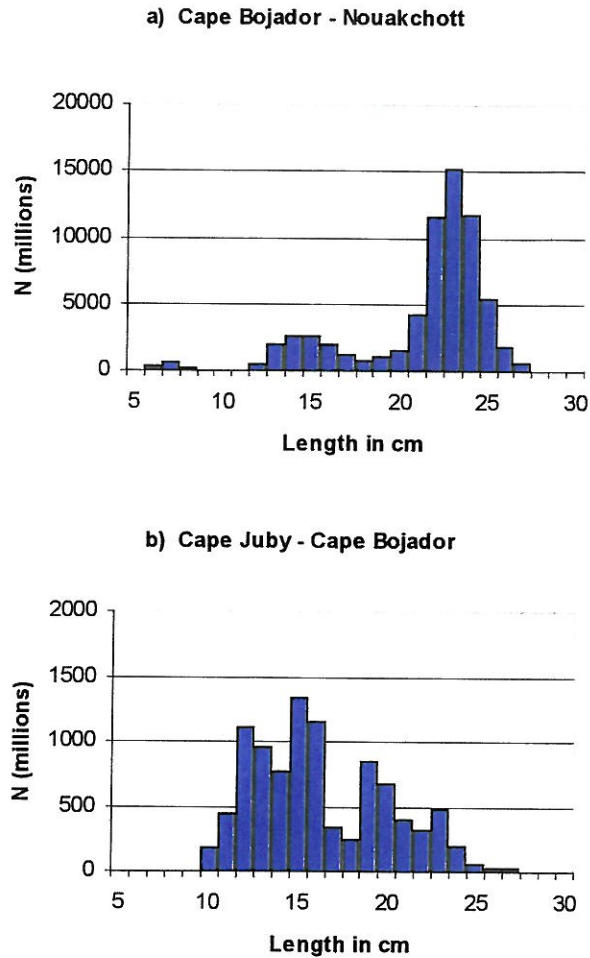


Figure 11. Length frequency distributions sardine Cape Timiris to Cape Juby.

2.3 Distribution of pelagic fish on the shelf from Cape Juby to Cape Cantin.

Sardine was recorded in the coastal area from Cape Juby to Cape Ghir, Figure 12. The highest densities of sardine were observed between Tan Tan and Sidi Ifni. Between Cape Ghir and Cape Sim no sardine were found. Patches with high densities were found between Cape Sim and Cape Cantin. The aggregations consist mainly of two young cohorts with modes around 15 and 18 cm, Figure 15.

Anchovy was mostly found in a few low-level patches, the densest near Sidi Ifni, Figure 13.

Chub mackerel was found all along the coast from Cape Juby to Cape Cantin, generally in low densities, Figure 14. Denser patches were found between Cape Juby and Tan Tan, near Sidi Ifni and on the outer shelf between Cape Sim and Safi.

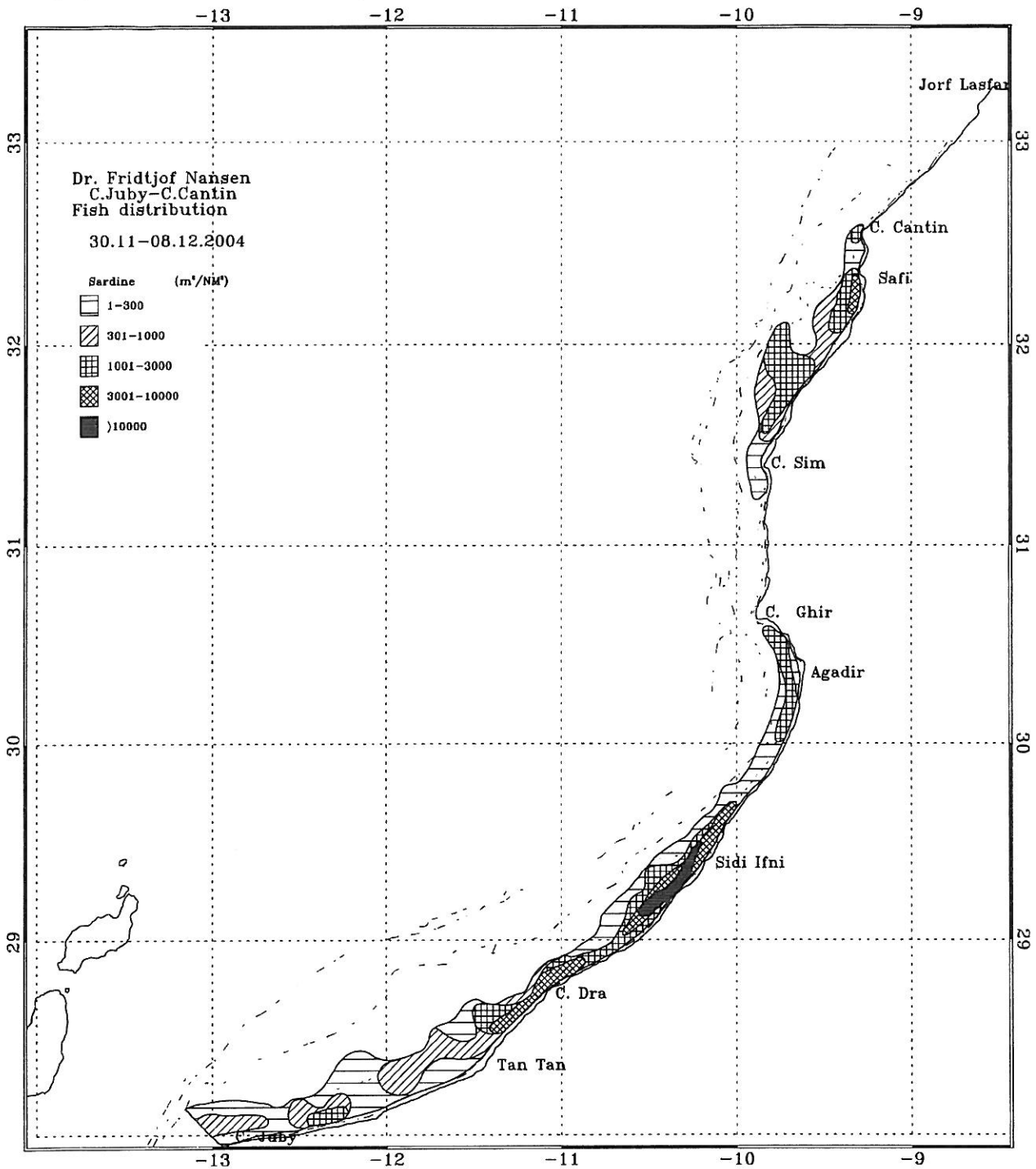


Figure 12. Distribution of sardine, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

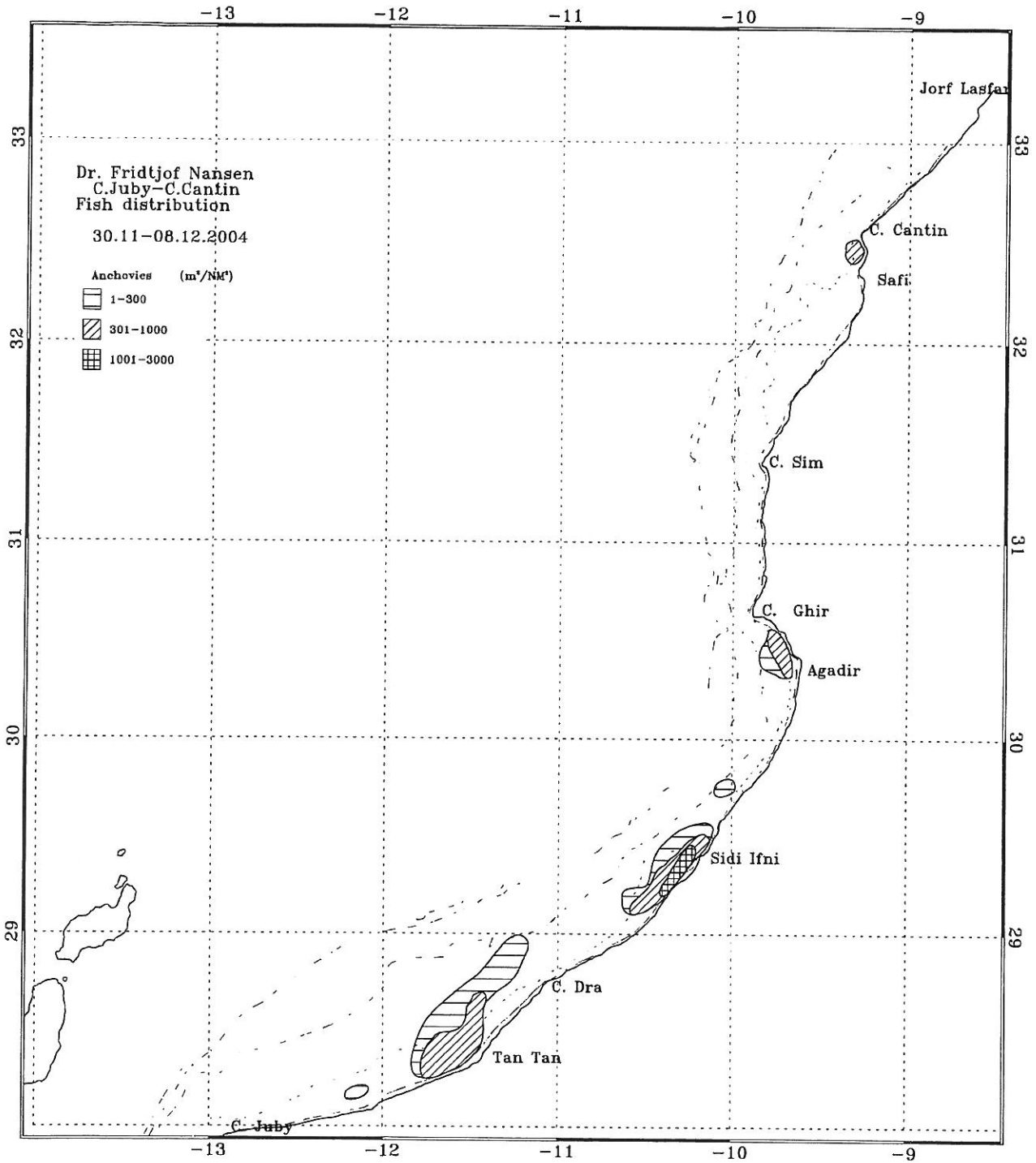


Figure 13. Distribution of anchovy, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

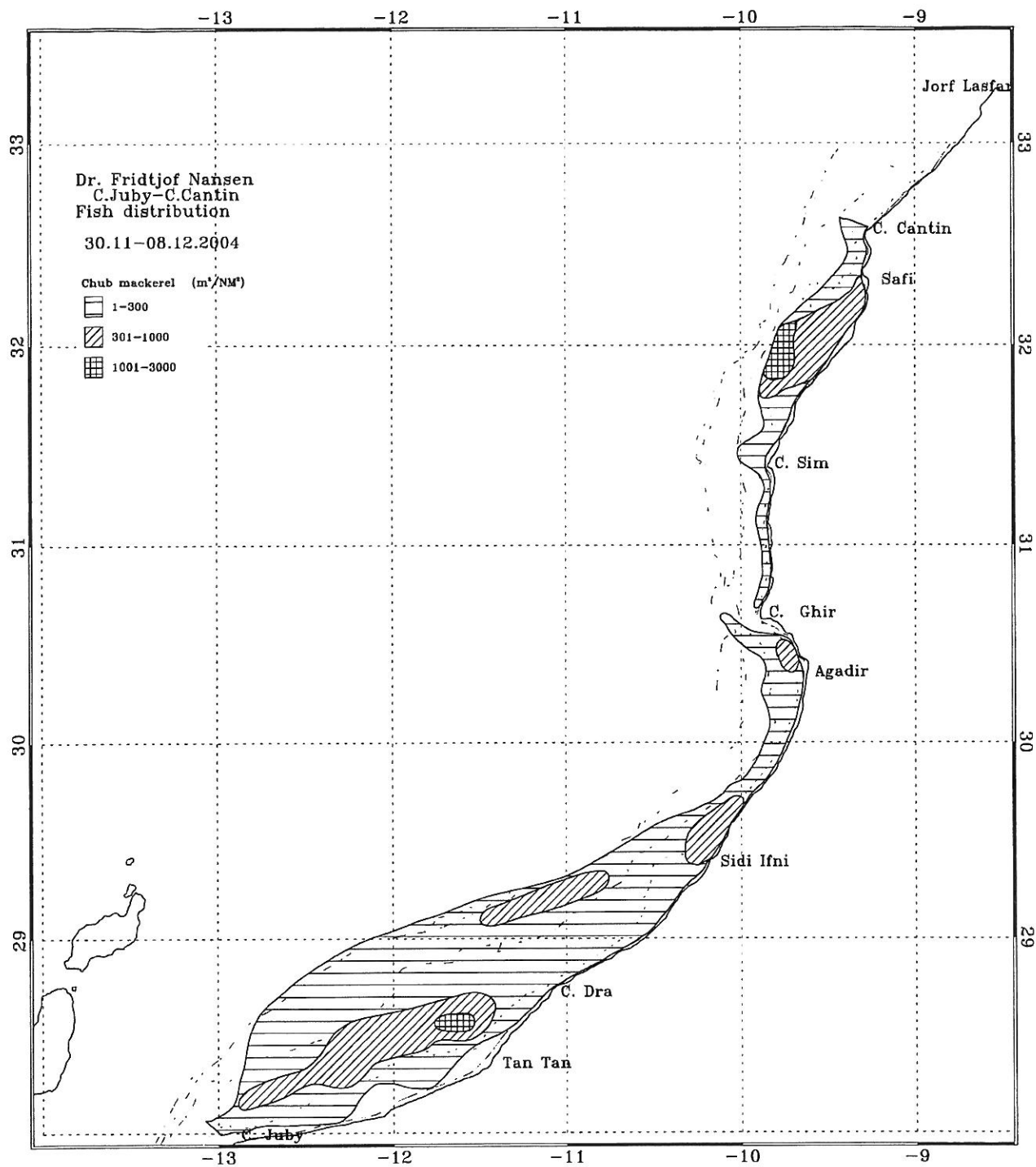


Figure 14. Distribution of chub mackerel, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

Recordings of horse mackerel were very few and scattered.

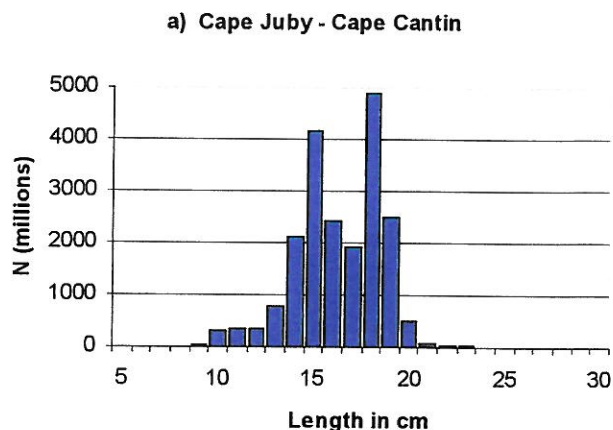


Figure 15. Length frequency distribution of sardine Cape Juby to Cape Cantin.

2.4 Biomass estimates

A summary on biomass estimates is given in Table 1 below. More detailed biomass estimates in number and weight by length groups are shown in Annex I.

Cape Blanc – Cape Bojador

The **sardine** was estimated to 5.7 million tonnes, which is higher than the 4.4 million tonnes one year earlier, but similar to the estimate in June 2003. If the sardine in Mauritania in November is included, the biomass of the southern stock is estimated to 6.1 million tonnes. The length distribution is earlier shown in Figure 11. 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

* Including sardine in Mauritania

The strong increase in the adult stock, which has been observed during the later years, seems now to have come to a halt. This may be an indication that the adult stock is close to the carrying capacity of the ecosystem. At present, the recruitment to the stock appears very low. The young fish (<20 cm), including the fish in Mauritanian waters, constitute only of about 14 billion fish, compared to 7 billion the previous year.

Sardinella was estimated to roughly 1.7 million tonnes of which 1.1 and 0.6 million are round and flat sardinella respectively, Annex I. The main part of the fish is located between Cape Blanc and Cape Barbas and seems to constitute most of the regional stock of round sardinella, but only 23% of the flat variety. In the preceding survey in Senegal and Mauritania 2.4 million tonnes of sardinella were estimated south of Cape Blanc, see Annex IV.

Anchovies were estimated to 43 thousand tonnes, while the previous year the very scattered recordings only made up 18 thousand tonnes, Annex I.

The two species of **horse mackerel** combined was estimated to 0.74 million tonnes (Annex I), of which roughly 160 thousand tonnes and 580 thousand tonnes were Atlantic and Cunene horse mackerel respectively. The corresponding figures last year were 300 and 850 thousand tonnes respectively. Young fish of Cunene horse mackerel (11-22 cm) are estimated to about 300 thousand tonnes and gives some growth potential to the stock. The species are also distributed south of Cape Blanc into Mauritania and Senegal and estimated to 160 thousand tonnes, Annex IV.

Chub mackerel were estimated to about 150 thousand tonnes, a reduction from the 320 thousand tonnes estimated last year, Annex I. It should be noted that the chub mackerel has a small swimming bladder, and thus low target strength (TS). In lack of measured target strength, the TS for sardine has been applied in the estimates, which will produce an underestimate estimate.

Cape Bojador – Cape Juby

Estimated **sardine** in this region is 430 thousand tonnes compared to 330 thousand tonnes last year, 220 thousand tonnes in 2002 and 330 thousand tonnes in 2001.

Cape Juby – Cape Cantin

The **sardine** is estimated to 840 thousand tonnes, about 180 thousand tonnes higher than the estimate one year earlier. The abundance in numbers is about 20 billion compared to the 18 billion in 2003. The main part of the biomass (94%) is made up of young fish less than 19 cm length, Annex I.

Anchovies were estimated to only 32 thousand tonnes, a considerable increase from the 8 thousand estimated a year earlier, and about the same as in 2002.

Chub mackerel estimates have been increasing gradually since 2000. The estimate this year is 340 thousand tonnes, while the estimates in 2003 and 2002 were 210 thousand tonnes and 20 thousand tonnes respectively. One should take note that these estimates should be treated as relative figures. The chub mackerel is probably considerable under-estimated due to the low and uncertain target strength of the species.

Table 1 Summary of biomass estimates of pelagic fish, thousand tonnes.

Region	Sardines	Round sardinella	Flat sardinella	Atlantic horse mackerel	Cunene horse mackerel	Chub mackerel	Anchovy
Cape Cantin- Cape Juby	840	-	-	2	-	340	32
Cape Juby- Cape Bojador	430	-	-	6	-	15	5
Cape Bojador- Cape Blanc	5 740	1 110	570	162	580	150	43
Totals	7 000	1 110	570	170	580	505	80

CHAPTER 3 CONCLUDING REMARKS

Meteorological and hydrographic conditions during this survey indicated a prolonged summer condition, which climatologically would be more typical to late October/early November. Winds were generally calm and from variable directions, and surface waters appeared to be warmer than in the same period during the last survey years.

Figure 16 gives a general overview on the major aggregations of pelagic fish with rounded biomass figures. The biomass estimates are also summarised in Table 1.

The **sardine** in the southern region has normal distribution pattern with the adults off Dakhla and the juveniles and adults south of Cape Barbas. The biomass of sardine between Cape Blanc and Cape Bojador seems to have increased from 4.4 million tonnes in 2003 to 5.7 million tonnes during the last survey. The biomass has stayed on a high level, in the range 4-6 million tonnes, since 2002. 420 thousand tonnes of the present stock is juvenile fish. In addition 400 thousand tonnes of adult sardine is found in Mauritanian waters (one patch south off Cape Blanc and a smaller between Cape Timiris and Nouakchott. Sardine in the region Cape Bojador-Cape Juby is estimated to 430 thousands tonnes, about 100 thousand tonnes more than one year earlier. Further north, the stock between Cape Juby and Cape Cantin is estimated to 840 thousands tonnes, about 25% higher than last year. Recruitment seems to be normal. Most of the fish is of young size with good growth potential.

Sardinellas were mainly recorded in the Cape Blanc and Cape Barbas area, but were also found near Dakhla and south off Cape Bojador. The biomass was estimated to 1.1 million tonnes, ABOUT 40% of the entire regional stock.

Anchovies were only estimated to 80 thousand tonnes between Cape Blanc and Cape Cantin, and seem to be on a very low level.

Horse mackerels were forming dense aggregations from Cape Blanc to north off Cape Barbas and were else found in scattered patches in the whole survey area. The combined estimate of the two species of horse mackerel is 747 thousand tonnes of which 580 thousand tonnes is Cunene horse mackerel south of Cape Barbas. There is a high presence of juvenile fish. The Cunene horse mackerel seems to be growing in abundance lately.

Chub mackerel is on a relatively high level, about the same level as last year. The biomass index is 165 thousand between Cape Blanc and Cape Juby, and 340 thousand between Cape Juby and Cape Cantin,

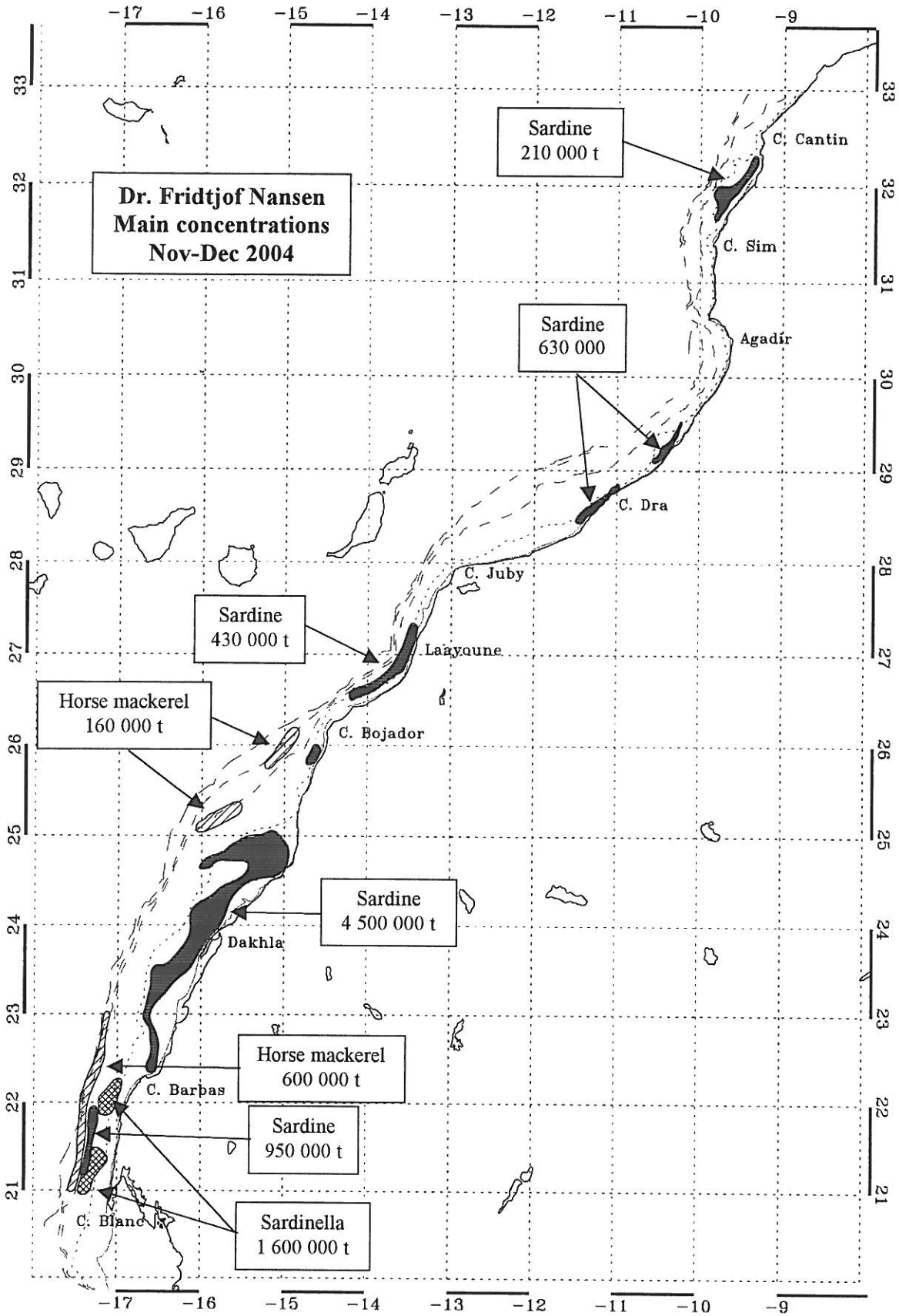


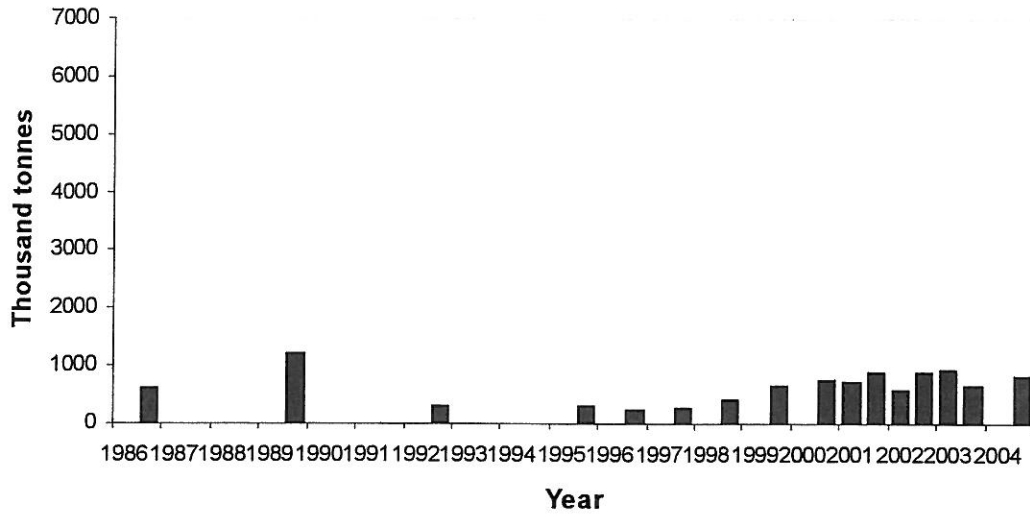
Figure 16. Map of the major pelagic fish concentrations with estimated abundance (tonnes), Cape Blanc to Cape Cantin.

Trends 1995-2004, sardine

Figure 17 shows the biomass estimates of sardine compared with results from previous *Dr. Fridtjof Nansen* surveys. Figure 18 shows the biomass figures 1995-2004 by length classes. Both figures display that the stock between Cape Blanc and Cape Juby has now fully recovered from its sudden collapse in 1997. It is reasonable to include the recordings south of Cape Blanc as they belong to the same unit stock and most of the year stays north of Cape Blanc. The stock seems recently to fluctuate around 5 million tonnes, a figure also close to the maximum of the pre-1997 years. This level seems close to the carrying capacity of the system. The abundance of juveniles in the size range 13-18 cm is remarkably low in the last two surveys, in contrast to three years earlier.

Small fish, less than 20 cm, continue to dominate the central stock between Cape Juby and Safi. The level of the stock seems to have increased since November 2003.

Cape Cantin - Cape Juby



Cape Juby - Cape Blanc

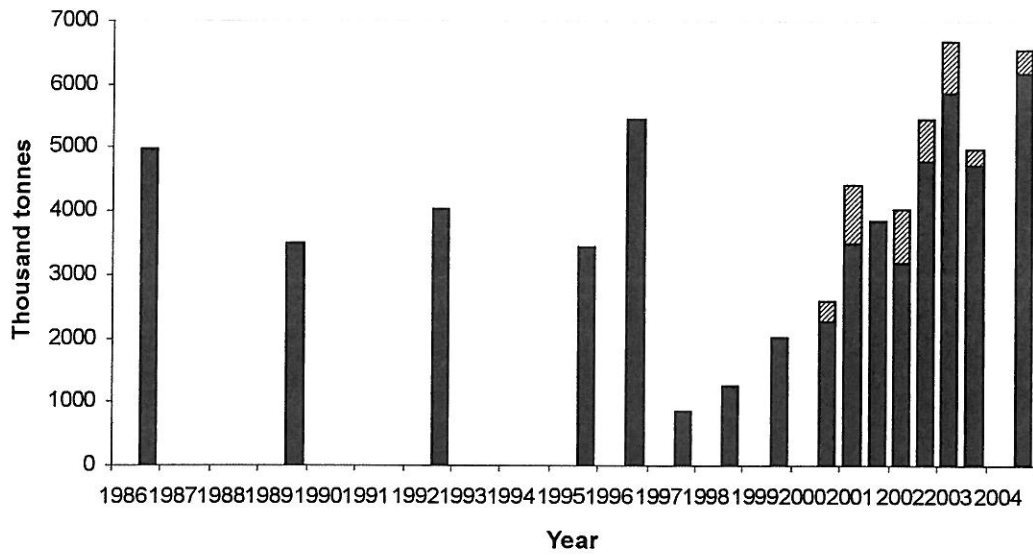


Figure 17. Sardine biomass estimates Cape Cantin-Cape Juby and Cape Juby-Cape Blanc. Sardine south off Cape Blanc hatched. *Dr. Fridtjof Nansen* 1986-2004.

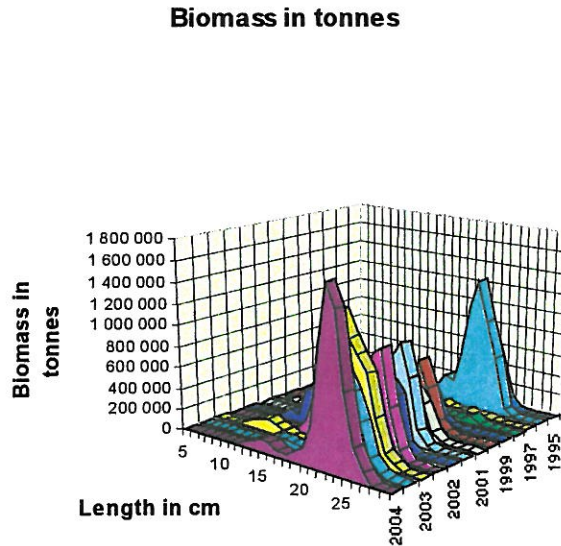
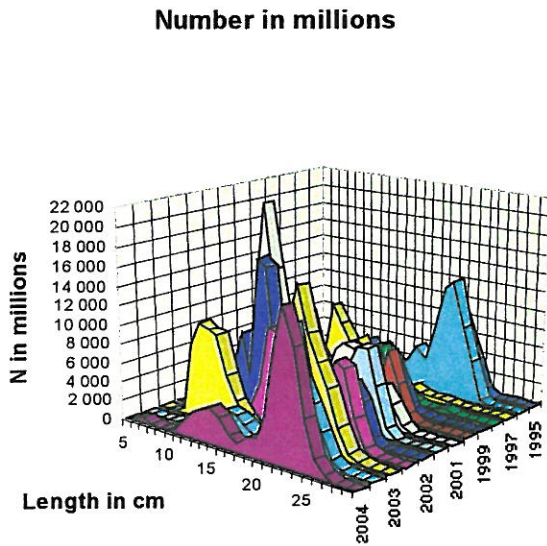
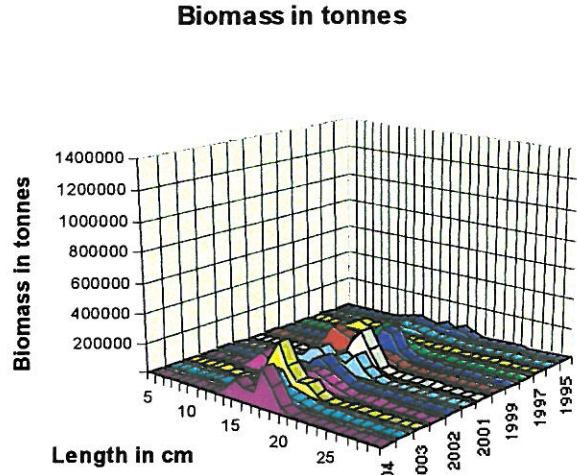
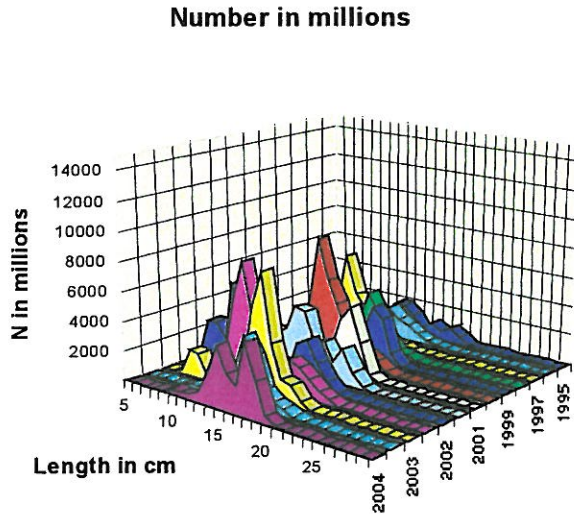


Figure 18. Numbers and biomass by length class, 1995-2004. Cape Juby - Cape Cantin (top) and Cape Blanc - Cape Juby (bottom).

Annex I Biomass and number by fish length class

Sardine (*Sardina pilchardus*), November - December 2004

Numbers in millions

Length cm	C. Cantin- C. Ghir	C. Ghir- C. Juby	C. Juby- C. Bojador	C. Bojador C. Blanc	TOTAL
5					
6				295	295
7				641	641
8				203	203
9	4	17	7	42	70
10	11	300	180	8	499
11	22	317	447	47	833
12	99	266	1,109	416	1,890
13	252	506	947	1,887	3,592
14	345	1,789	774	2,611	5,519
15	743	3,405	1,343	2,487	7,978
16	348	2,088	1,148	2,002	5,586
17	425	1,510	331	1,211	3,477
18	1,340	3,537	251	826	5,955
19	818	1,696	839	1,015	4,368
20	239	260	681	1,491	2,672
21	50	41	401	4,146	4,638
22		20	321	11,529	11,870
23	3	17	480	15,023	15,524
24		6	201	11,113	11,319
25			66	4,468	4,534
26		1	29	1,262	1,292
27			23	323	346
28				6	6
29					
30					
Total	4,698	15,779	9,579	63,053	93,108

Biomass in tonnes

Length cm	C. Cantin- C. Ghir	C. Ghir- C. Juby	C. Juby- C. Bojador	C. Bojador C. Blanc	TOTAL
5					
6				665	665
7				2,219	2,219
8				1,020	1,020
9	25	122	48	297	492
10	102	2,843	1,713	80	4,738
11	269	3,959	5,576	580	10,384
12	1,585	4,266	17,758	6,657	30,266
13	5,093	10,206	19,114	38,063	72,476
14	8,619	44,730	19,349	65,278	137,977
15	22,679	103,981	40,995	75,947	243,602
16	12,822	76,917	42,279	73,763	205,780
17	18,675	66,379	14,550	53,205	152,809
18	69,584	183,635	13,035	42,907	309,161
19	49,732	103,118	51,018	61,714	265,582
20	16,908	18,393	48,135	105,299	188,734
21	4,037	3,318	32,708	337,908	377,971
22		1,914	29,944	1,076,846	1,108,704
23	329	1,857	51,097	1,598,761	1,652,043
24		701	24,206	1,340,108	1,365,016
25			9,000	607,449	616,449
26		222	4,420	192,541	197,183
27			3,963	55,087	59,050
28				1,189	1,189
29					
30					
Total	210,460	626,562	428,907	5,737,583	7,003,511

Annex I continued

Round sardinella (*Sardinella aurita*), November - December 2004

Numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	TOTAL
5				
6				
7			10.7	10.7
8			138.3	138.3
9			162.0	162.0
10			108.1	108.1
11			57.3	57.3
12			8.6	8.6
13			7.1	7.1
14			3.6	3.6
15			3.6	3.6
16				
17			1.4	1.4
18			2.2	2.2
19				
20			3.7	3.7
21			26.8	26.8
22			40.2	40.2
23			18.6	18.6
24			27.7	27.7
25			175.8	175.8
26			35.7	35.7
27			360.5	360.5
28			109.2	109.2
29			305.7	305.7
30			476.7	476.7
31			399.7	399.7
32			569.2	569.2
33			320.5	320.5
34			237.0	237.0
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	4,208.7

Biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	TOTAL
5				
6				
7				
8			200	200
9			384	384
10			204	204
11			103	103
12			26	26
13				
14				
15				
16				
17			73	73
18			130	130
19				
20			301	301
21			2,503	2,503
22			4,303	4,303
23			2,270	2,270
24			3,830	3,830
25			27,404	27,404
26			6,240	6,240
27			70,483	70,483
28			22,888	22,888
29			71,329	71,329
30			122,828	122,828
31			116,839	116,839
32			181,711	181,711
33			110,387	110,387
34			88,366	88,366
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	1,109,390

Annex I continued

Flat sardinella (*Sardinella maderensis*), November - December 2004

Numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	TOTAL
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22			6.1	6.1
23			17.9	17.9
24			156.7	156.7
25			355.2	355.2
26			307.9	307.9
27			513.0	513.0
28			518.7	518.7
29			539.1	539.1
30			286.5	286.5
31			68.0	68.0
32			63.5	63.5
33			55.6	55.6
34			21.4	21.4
35			24.4	24.4
36			11.5	11.5
37				
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	2,951.4

Biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	TOTAL
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22			672	672
23			2,258	2,258
24			22,352	22,352
25			57,126	57,126
26			55,060	55,060
27			102,813	102,813
28			113,111	113,111
29			122,200	122,200
30			62,398	62,398
31			9,181	9,181
32			12,209	12,209
33			8,753	8,753
34			81	81
35				
36				
37				
38			1,629	1,629
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
Total			569,843	569,843

Annex I continued

Anchovy (*Engraulis encrasicolus*), November - December 2004

Numbers in millions

Length cm	C. Cantin- C. Ghir	C. Ghir- C. Juby	C. Juby- C. Bojador	C. Bojador C. Blanc	TOTAL
5					
6		12.7		9.8	22.5
7		25.4	4.1	255.6	285.1
8		146.3	32.8	532.8	711.9
9		366.9	194.4	4,045.1	4,606.3
10		487.8	183.0	2,685.3	3,356.1
11	7.3	1,372.9	260.9	415.6	2,056.7
12	26.3	1,101.1	72.1	146.9	1,346.4
13	81.8	145.9	7.2		235.0
14	19.0	3.9			22.9
15	4.4				4.4
16					
17		3.9			3.9
18		3.9			3.9
19					
20					
Total	138.8	3,670.9	754.4	8,091.2	12,655.3

Biomass in tonnes

Length cm	C. Cantin- C. Ghir	C. Ghir- C. Juby	C. Juby- C. Bojador	C. Bojador C. Blanc	TOTAL
5					
6		19		15	33
7		58	9	582	649
8		485	109	1,767	2,361
9		1,699	900	18,728	21,327
10		3,049	1,144	16,786	20,980
11	60	11,276	2,143	3,413	16,892
12	277	11,613	760	1,550	14,201
13	1,087	1,939	96		3,122
14	313	64			377
15	88				88
16					
17		113			113
18		134			134
19					
20					
Total	1,825	30,449	5,161	42,841	80,276

Annex I continued

Atlantic horse mackerel (*Trachurus trachurus*), November - December 2004

Numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	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	3.3	512.7	516.8
20	2.0	11.9	650.4	664.3
21	3.2	32.4	299.2	334.8
22	4.0	18.5	138.9	161.4
23	0.8	4.0	68.9	73.7
24	0.8	0.7	3.6	5.1
25		0.7	1.8	2.5
26			6.6	6.6
27				
28				
29				
30	0.1			0.1
31				
32				
33				
34				
35				
36	0.1			0.1
37	0.1			0.1
38				
39				
40	0.4			0.4
41	0.4			0.4
42	0.2			0.2
43				
44				
45				
46				
47				
48				
49				
50				
Total	33.5	71.3	2,413.5	2,518.3

Biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	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	206	31,933	32,170
20	92	860	47,067	48,020
21	171	2,702	24,979	27,851
22	244	1,770	13,293	15,307
23	56	432	7,513	8,000
24	63	82	444	589
25		92	251	343
26			1,028	1,028
27				
28				
29				
30	18			18
31				
32				
33				
34				
35				
36	31			31
37	34			34
38				
39				
40	127			127
41	137			137
42	98			98
43				
44				
45				
46				
47				
48				
49				
50				
Total	1,703	6,144	162,644	170,491

Annex I continued

Cunene horse mackerel (*Trachurus trecae*), November - December 2004

Numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	TOTAL
5				
6				
7				
8				
9				
10				
11				
12				
13			44.1	44.1
14			115.3	115.3
15			49.1	49.1
16			103.7	103.7
17			463.4	463.4
18			785.8	785.8
19			959.3	959.3
20			1,067.2	1,067.2
21			953.9	953.9
22			683.1	683.1
23			542.6	542.6
24			201.8	201.8
25			172.4	172.4
26			109.8	109.8
27			136.7	136.7
28			207.3	207.3
29			41.4	41.4
30			46.6	46.6
31			25.9	25.9
32			10.4	10.4
33			5.2	5.2
34			5.2	5.2
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
Total			6,730.1	6,730.1

Biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	TOTAL
5				
6				
7				
8				
9				
10				
11				
12				
13			911	911
14			2,953	2,953
15			1,535	1,535
16			3,911	3,911
17			20,863	20,863
18			41,792	41,792
19			59,749	59,749
20			77,230	77,230
21			79,636	79,636
22			65,358	65,358
23			59,155	59,155
24			24,927	24,927
25			24,011	24,011
26			17,157	17,157
27			23,882	23,882
28			40,315	40,315
29			8,937	8,937
30			11,112	11,112
31			6,801	6,801
32			2,988	2,988
33			1,636	1,636
34			1,787	1,787
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
Total			576,645	576,645

Annex I continued

Chub mackerel (*Scomber japonicus*), November - December 2004

Numbers in millions

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	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	44.6	13.0	829.2
17	1,680.1	129.6	13.0	1,822.8
18	1,306.6	98.5	30.4	1,435.5
19	643.7	17.6	37.5	698.7
20	191.5	5.8	37.4	234.6
21	137.6	2.7	77.0	217.3
22	217.3	2.6	66.2	286.1
23	168.7	4.5	55.3	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	324.5	946.7	6,798.7

Biomass in tonnes

Length cm	C. Cantin- C. Juby	C. Juby- C. Bojador	C. Bojador- C. Blanc	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	1,684	492	31,288
17	75,636	5,836	587	82,059
18	69,492	5,239	1,617	76,349
19	40,090	1,094	2,336	43,520
20	13,856	418	2,705	16,979
21	11,488	224	6,432	18,144
22	20,791	246	6,337	27,373
23	18,390	494	6,023	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	15,751	149,153	502,635

Annex II Records of fishing stations

PROJECT STATION:2282

DATE:15/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2053
 start stop duration Long W 1713
 TIME :07:18:01 07:34:20 16 (min) Purpose code: 1
 LOG :9812.33 9813.54 1.15 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 42 43 Validity code:
 Towing dir: 270ø Wire out: 120 m Speed: 40 kn*10

Sorted: 2 Kg Total catch: 2.32 CATCH/HOUR: 8.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	4.69	34	53.91	3785
Zeus faber	3.94	4	45.29	
Engraulis encrasicolus	0.08	4	0.92	
Total	8.71		100.12	

PROJECT STATION:2287

DATE:15/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2109
 start stop duration Long W 1710
 TIME :21:48:29 22:09:29 21 (min) Purpose code: 1
 LOG :9926.10 9927.60 1.48 Area code : 2
 FDEPTH: 15 15 GearCond.code:
 BDEPTH: 42 46 Validity code:
 Towing dir: 270ø Wire out: 140 m Speed: 44 kn*10

Sorted: 73 Kg Total catch: 73.29 CATCH/HOUR: 209.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	80.86	391	38.62	3793
Sardinella maderensis	66.14	263	31.59	3797
Sardina pilchardus	47.43	537	22.65	3795
Trachurus trecae	11.54	160	5.51	3794
Decapterus rhonchus	2.00	11	0.96	
Engraulis encrasicolus	0.86	103	0.41	3796
Sepia officinalis hierreda	0.57	3	0.27	
Total	209.40		100.01	

PROJECT STATION:2283

DATE:15/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2100
 start stop duration Long W 1717
 TIME :11:44:32 12:09:35 25 (min) Purpose code: 1
 LOG :9848.20 9849.82 1.47 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 53 46 Validity code:
 Towing dir: 90ø Wire out: 133 m Speed: 40 kn*10

Sorted: 58 Kg Total catch: 1220.10 CATCH/HOUR: 2928.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2807.28	22025	95.87	3786
Sardinella aurita	109.87	454	3.75	3787
Sardinella maderensis	11.09	50	0.38	
Total	2928.24		100.00	

PROJECT STATION:2288

DATE:16/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2118
 start stop duration Long W 1705
 TIME :01:00:02 01:13:01 13 (min) Purpose code: 1
 LOG :9953.35 9954.29 0.93 Area code : 2
 FDEPTH: 15 20 GearCond.code:
 BDEPTH: 34 40 Validity code:
 Towing dir: ø Wire out: 120 m Speed: 40 kn*10

Sorted: 28 Kg Total catch: 804.44 CATCH/HOUR: 3712.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	3385.85	11372	91.19	3798
Sardinella maderensis	156.37	775	4.21	
Trachurus trecae	69.78	1034	1.88	
Diplodus vulgaris	51.69	517	1.39	
Sardina pilchardus	46.52	2197	1.25	
Engraulis encrasicolus	2.58	258	0.07	
Total	3712.79		99.99	

PROJECT STATION:2284

DATE:15/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2101
 start stop duration Long W 1725
 TIME :13:43:36 14:00:01 16 (min) Purpose code: 1
 LOG :9861.73 9862.85 1.10 Area code : 2
 FDEPTH: 16 15 GearCond.code:
 BDEPTH: 74 65 Validity code:
 Towing dir: 90ø Wire out: 125 m Speed: 40 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION:2289

DATE:16/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2118
 start stop duration Long W 1714
 TIME :02:26:23 02:41:58 16 (min) Purpose code: 1
 LOG :9963.65 9964.67 1.00 Area code : 2
 FDEPTH: 20 30 GearCond.code:
 BDEPTH: 56 56 Validity code:
 Towing dir: 270ø Wire out: 130 m Speed: 40 kn*10

Sorted: 29 Kg Total catch: 436.35 CATCH/HOUR: 1636.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	821.25	3206	50.19	3800
Sardina pilchardus	781.88	6694	47.78	3799
Sardinella maderensis	33.19	169	2.03	
Total	1636.32		100.00	

PROJECT STATION:2285

DATE:15/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2101
 start stop duration Long W 1728
 TIME :15:13:34 15:43:20 30 (min) Purpose code: 1
 LOG :9871.99 9873.72 1.72 Area code : 2
 FDEPTH: 92 88 GearCond.code:
 BDEPTH: 92 88 Validity code:
 Towing dir: 190ø Wire out: 290 m Speed: 30 kn*10

Sorted: 55 Kg Total catch: 1838.71 CATCH/HOUR: 3677.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	2956.80	23100	80.40	3788
Plesionika edwardsii	225.72	205656	6.14	
Capros aper	215.82	23562	5.87	
GOBIIDAE	178.20	30030	4.85	
Pagellus bellottii	42.24	3432	1.15	
Loligo vulgaris	21.12	132	0.57	
Dentex macrophthalmus	17.16	132	0.47	
Octopus vulgaris	11.52	18	0.31	
Scyllorhinus canicula	4.92	10	0.13	
Cepola pauciradiatus	2.64	66	0.07	
Zenopsis conchifer	0.64	2	0.02	
Zeus faber	0.64	6	0.02	
Total	3677.42		100.00	

PROJECT STATION:2290

DATE:16/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2142
 start stop duration Long W 1717
 TIME :12:23:08 12:39:18 16 (min) Purpose code: 1
 LOG :59.24 60.03 0.79 Area code : 2
 FDEPTH: 70 70 GearCond.code:
 BDEPTH: 70 70 Validity code:
 Towing dir: 190ø Wire out: 250 m Speed: 30 kn*10

Sorted: 25 Kg Total catch: 1609.35 CATCH/HOUR: 6035.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	4264.31	62370	70.66	3801
Trachurus trachurus	1606.50	22680	26.62	3802
Sardina pilchardus	122.85	945	2.04	
Pagellus bellottii	21.04	79	0.35	
Loligo vulgaris	9.00	30	0.15	
Zeus faber	6.00	8	0.10	
Octopus vulgaris	5.36	15	0.09	
Total	6035.06		100.01	

PROJECT STATION:2286

DATE:15/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2108
 start stop duration Long W 1723
 TIME :19:40:14 19:44:22 4 (min) Purpose code: 1
 LOG :9909.51 9909.77 0.25 Area code : 2
 FDEPTH: 30 30 GearCond.code:
 BDEPTH: 80 81 Validity code:
 Towing dir: 270ø Wire out: 140 m Speed: 40 kn*10

Sorted: 27 Kg Total catch: 27.12 CATCH/HOUR: 406.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	313.50	1485	77.06	3789
Trachurus trecae	33.45	345	8.22	3791
Sardinella aurita	31.50	150	7.74	3792
Sardina pilchardus	28.20	180	6.93	3790
Scomber japonicus	0.15	30	0.04	
Total	406.80		99.99	

PROJECT STATION:2291

DATE:16/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2151
 start stop duration Long W 1720
 TIME :16:41:00 17:02:05 21 (min) Purpose code: 1
 LOG :95.44 97.06 1.61 Area code : 2
 FDEPTH: 15 20 GearCond.code:
 BDEPTH: 68 104 Validity code:
 Towing dir: 276ø Wire out: 120 m Speed: 40 kn*10

Sorted: 28 Kg Total catch: 1428.50 CATCH/HOUR: 4081.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	4028.57	39000	98.70	3803
Sardinella aurita	35.71	286	0.87	
Scomber japonicus	17.14	143	0.42	
Total	4081.42		99.99	

PROJECT STATION:2292
 DATE:16/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2149
 start stop duration Long W 1659
 TIME :19:55:48 20:12:29 17 (min) Purpose code: 1
 LOG : 122.85 123.87 1.01 Area code : 2
 FDEPTH: 5 5 GearCond.code: 1
 BDEPTH: 20 21 Validity code:
 Towing dir: 190ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 33 Kg Total catch: 838.60 CATCH/HOUR: 2959.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L Y F I S H	1411.76	10542	47.70	
Decapterus rhonchus	547.06	2954	18.48	3805
Sardinella aurita	443.36	1189	14.98	3806
Chloroscombrus chrysurus	308.82	2248	10.43	
Engraulis encrasicolus	86.47	22147	2.92	3807
Trachinotus ovatus	58.59	176	1.98	
Trachurus trecae	40.13	441	1.36	
Stromateus fiatola	20.93	28	0.71	
Sardina pilchardus	18.07	6176	0.61	3808
Loligo vulgaris	10.76	138	0.36	
Argyrosomus regius	4.62	7	0.16	
Sepia bertheloti	3.53	42	0.12	
Scomber japonicus	1.87	7	0.06	
Citharus linguatula	1.31	42	0.04	
Dicentrarchus labrax	1.31	4	0.04	
Trachurus trachurus	0.88	42	0.03	
Belone svetovidovi *	0.28	4	0.01	
Total	2959.75		99.99	

PROJECT STATION:2297
 DATE:17/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2225
 start stop duration Long W 1648
 TIME :20:56:40 21:14:22 18 (min) Purpose code: 1
 LOG : 320.50 321.76 1.24 Area code : 2
 FDEPTH: 15 15 GearCond.code: 1
 BDEPTH: 42 46 Validity code:
 Towing dir: 280ø Wire out: 120 m Speed: 43 kn*10
 Sorted: 64 Kg Total catch: 867.11 CATCH/HOUR: 2890.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1462.33	14130	50.59	3819
Sardinella maderensis	508.33	3193	17.59	3818
Trichiurus lepturus	336.33	143	11.64	
Sardinella aurita	294.67	900	10.19	3820
Trachurus trecae	266.33	2340	9.21	3821
Decapterus rhonchus	9.00	43	0.31	
Trigla lyra	7.63	43	0.26	
Sepia officinalis hierredda	2.40	13	0.08	
Loligo vulgaris	1.80	763	0.06	
Engraulis encrasicolus	1.33	133	0.05	
Pomatomus saltatrix	0.20	43	0.01	
Total	2890.35		99.99	

PROJECT STATION:2293
 DATE:16/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2159
 start stop duration Long W 1700
 TIME :22:25:48 22:45:29 20 (min) Purpose code: 1
 LOG : 143.69 144.84 1.14 Area code : 2
 FDEPTH: 5 5 GearCond.code: 1
 BDEPTH: 38 41 Validity code:
 Towing dir: 280ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 56 Kg Total catch: 733.69 CATCH/HOUR: 2201.07

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	1462.50	4563	66.44	3809
Sardina pilchardus	436.80	4173	19.84	3810
Trachurus trecae	276.90	4836	12.58	3811
Decapterus rhonchus	15.21	78	0.69	
Pagellus erythrinus	6.63	78	0.30	
Loligo vulgaris	3.03	21	0.14	
Total	2201.07		99.99	

PROJECT STATION:2298
 DATE:17/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2222
 start stop duration Long W 1633
 TIME :23:10:16 23:21:50 12 (min) Purpose code: 1
 LOG : 339.52 340.18 0.66 Area code : 2
 FDEPTH: 5 5 GearCond.code: 1
 BDEPTH: 24 25 Validity code:
 Towing dir: 340ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 57 Kg Total catch: 569.90 CATCH/HOUR: 2849.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2150.00	84465	75.45	3822
Sardinella aurita	665.00	2050	23.34	3823
Decapterus rhonchus	22.50	100	0.79	
Loligo vulgaris	12.00	200	0.42	
Total	2849.50		100.00	

PROJECT STATION:2294
 DATE:17/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2201
 start stop duration Long W 1717
 TIME :00:45:44 01:15:37 30 (min) Purpose code: 1
 LOG : 161.48 163.46 1.96 Area code : 2
 FDEPTH: 35 35 GearCond.code: 1
 BDEPTH: 70 66 Validity code:
 Towing dir: 100ø Wire out: 150 m Speed: 40 kn*10
 Sorted: 25 Kg Total catch: 103.12 CATCH/HOUR: 206.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	152.00	1520	73.70	3812
Trachurus trecae	49.20	992	23.86	3813
Scomber japonicus	3.28	24	1.59	
Sardinella maderensis	1.76	8	0.85	
Total	206.24		100.00	

PROJECT STATION:2299
 DATE:18/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2232
 start stop duration Long W 1632
 TIME :01:35:27 01:55:11 20 (min) Purpose code: 1
 LOG : 360.25 361.45 1.18 Area code : 2
 FDEPTH: 20 20 GearCond.code: 1
 BDEPTH: 34 33 Validity code:
 Towing dir: 105ø Wire out: 100 m Speed: 40 kn*10
 Sorted: 28 Kg Total catch: 876.06 CATCH/HOUR: 2628.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2473.80	24366	94.13	3822
Trachurus trecae	84.63	1116	3.22	
Dentex canariensis	69.75	186	2.65	
Total	2628.18		100.00	

PROJECT STATION:2295
 DATE:17/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2209
 start stop duration Long W 1701
 TIME :06:35:52 06:48:40 13 (min) Purpose code: 1
 LOG : 211.50 212.40 0.89 Area code : 2
 FDEPTH: 20 20 GearCond.code: 1
 BDEPTH: 40 51 Validity code:
 Towing dir: 290ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 50 Kg Total catch: 125.26 CATCH/HOUR: 578.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	268.25	2954	46.40	3814
Sardinella maderensis	181.71	1085	31.43	3815
Spondyliosoma cantharus	94.29	498	16.31	
Boops boops	11.54	138	2.00	
Diplodus puntazzo	9.32	23	1.61	
Scomber japonicus	6.32	23	1.09	
Trachurus trachurus	4.75	37	0.82	
SPAPS03	1.94	9	0.34	
Total	578.12		100.00	

PROJECT STATION:2300
 DATE:18/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2251
 start stop duration Long W 1657
 TIME :08:49:22 09:05:38 16 (min) Purpose code: 1
 LOG : 430.40 431.51 1.01 Area code : 2
 FDEPTH: 30 30 GearCond.code: 1
 BDEPTH: 60 68 Validity code:
 Towing dir: 288ø Wire out: 140 m Speed: 40 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION:2296
 DATE:17/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2219
 start stop duration Long W 1707
 TIME :12:05:16 12:35:26 30 (min) Purpose code: 1
 LOG : 257.69 259.83 1.66 Area code : 2
 FDEPTH: 15 15 GearCond.code: 1
 BDEPTH: 63 62 Validity code:
 Towing dir: 16ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 28 Kg Total catch: 28.80 CATCH/HOUR: 57.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	49.20	254	85.42	3816
Sardinella maderensis	7.90	40	13.72	3817
Pagellus bellottii	0.50	2	0.87	
Total	57.60		100.01	

PROJECT STATION:2301
 DATE:18/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2246
 start stop duration Long W 1639
 TIME :11:53:20 12:25:49 32 (min) Purpose code: 1
 LOG : 454.03 455.55 1.52 Area code : 2
 FDEPTH: 49 50 GearCond.code: 1
 BDEPTH: 49 50 Validity code:
 Towing dir: 285ø Wire out: 100 m Speed: 30 kn*10
 Sorted: 27 Kg Total catch: 162.27 CATCH/HOUR: 304.26

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pomadasys incisus	57.66	244	18.95	
Trachurus trecae	56.44	600	18.55	3824
Sardina pilchardus	49.22	469	16.18	3823
Decapterus rhonchus	40.13	178	13.19	
Pagellus bellottii	35.81	234	11.77	
Spondyliosoma cantharus	19.41	66	6.38	
Gymnura altavela	13.31	2	4.37	
Octopus vulgaris	11.25	9	3.70	
Mustelus mustelus	6.73	4	2.21	
Sepia officinalis hierredda	4.95	13	1.63	
Scyliorhinus canicula	2.25	4	0.74	
Diplodus puntazzo	2.21	2	0.73	
Trachurus trachurus	1.59	19	0.52	
Loligo vulgaris	1.33	11	0.44	
Mullus surmuletus	0.84	19	0.28	
Dicologlossa cuneata	0.75	9	0.25	
Citharus linguatula	0.38	9	0.12	
Total	304.26		100.01	

PROJECT STATION:2302
 DATE:18/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2252
 start stop duration Long W 1620
 TIME :16:09:23 16:25:47 16 (min) Purpose code: 1
 LOG : 492.04 492.91 0.85 Area code : 2
 FDEPTH: 22 21 GearCond.code:
 BDEPTH: 22 21 Validity code:
 Towing dir: 185ø Wire out: 100 m Speed: 30 kn*10
 Sorted: 40 Kg Total catch: 1292.16 CATCH/HOUR: 4845.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	1778.40	117760	36.70	3825
Sardinella aurita	894.00	154680	18.45	3826
Dasyatis pastinaca	450.00	120	9.29	
Raja montagui	318.00	120	6.56	
Raja miraletus	244.80	360	5.05	
Decapterus rhonchus	237.38	1080	4.90	
Campogramma glaycos	229.20	720	4.73	
Arius parkii	206.40	480	4.26	
Diplodus bellottii	190.80	4800	3.94	
Stromateus fiatola	81.60	120	1.68	
URAHROS	78.00	120	1.61	
Pomadasy inciscus	61.20	240	1.26	
Pagellus bellottii	28.80	120	0.59	
Chloroscombrus chrysurus	24.00	120	0.50	
Sardina pilchardus	22.80	1920	0.47	
Total	4845.38		99.99	

PROJECT STATION:2307
 DATE:19/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2323
 start stop duration Long W 1618
 TIME :17:30:27 18:01:11 31 (min) Purpose code: 1
 LOG : 727.44 729.04 1.58 Area code : 2
 FDEPTH: 28 29 GearCond.code:
 BDEPTH: 28 29 Validity code:
 Towing dir: 291ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 59 Kg Total catch: 1061.33 CATCH/HOUR: 2054.19

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	487.74	5237	23.74	
Plectorhynchus mediterraneus	456.19	515	22.21	
Sardina pilchardus	428.52	4761	20.86	3832
Scomber japonicus	287.61	1666	14.00	3833
Trachurus trecae	168.58	2133	8.21	3831
Trachurus trachurus	52.84	594	2.57	
Pomadasy inciscus	38.32	1626	1.87	
Diplodus vulgaris	32.90	159	1.60	
Spondylisoma cantharus	18.25	594	0.89	
Pagellus erythrinus	16.66	79	0.81	
Raja undulata	16.55	6	0.81	
Dentex canariensis	12.70	79	0.62	
Loligo vulgaris	12.70	79	0.62	
Octopus vulgaris	12.39	17	0.60	
Boops boops	10.65	118	0.52	
Trachinus arenatus	1.59	39	0.08	
Total	2054.19		100.01	

PROJECT STATION:2303
 DATE:18/11/04 GEAR TYPE: PT No: 4 POSITION:Lat N 2259
 start stop duration Long W 1642
 TIME :19:06:50 19:10:35 4 (min) Purpose code: 1
 LOG : 517.39 517.63 0.23 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 45 45 Validity code:
 Towing dir: 107ø Wire out: 125 m Speed: 40 kn*10
 Sorted: 99 Kg Total catch: 5257.00 CATCH/HOUR: 78855.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	76680.00	697785	97.24	3827
Sardinella maderensis	1230.00	7200	1.56	
Scomber japonicus	945.00	4800	1.20	
Total	78855.00		100.00	

PROJECT STATION:2308
 DATE:19/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2329
 start stop duration Long W 1609
 TIME :20:24:42 20:41:30 17 (min) Purpose code: 1
 LOG : 751.82 752.84 0.99 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 28 29 Validity code:
 Towing dir: 290ø Wire out: 120 m Speed: 35 kn*10
 Sorted: 32 Kg Total catch: 1764.00 CATCH/HOUR: 6225.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	6225.88	63642	100.00	3834
Total	6225.88		100.00	

PROJECT STATION:2304
 DATE:18/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2305
 start stop duration Long W 1700
 TIME :21:34:17 21:53:56 20 (min) Purpose code: 1
 LOG : 539.48 540.80 1.34 Area code : 2
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 85 82 Validity code:
 Towing dir: 106ø Wire out: 230 m Speed: 40 kn*10
 Sorted: 20 Kg Total catch: 20.01 CATCH/HOUR: 60.03

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	30.15	288	50.22	3828
Trachurus trachurus	26.43	486	44.03	3829
Sphoeroides pachgaater	1.56	6	2.60	
MYCTOPHIDAE	1.26	348	2.10	
Lepidotrigla sp.	0.63	78	1.05	
Total	60.03		100.00	

PROJECT STATION:2309
 DATE:20/11/04 GEAR TYPE: PT No: 4 POSITION:Lat N 2338
 start stop duration Long W 1606
 TIME :07:01:53 07:13:57 12 (min) Purpose code: 1
 LOG : 852.19 853.20 1.00 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 25 27 Validity code:
 Towing dir: 290ø Wire out: 120 m Speed: 45 kn*10
 Sorted: 35 Kg Total catch: 2366.40 CATCH/HOUR: 11832.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	11832.10	126140	100.00	3835
Total	11832.10		100.00	

PROJECT STATION:2305
 DATE:19/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2310
 start stop duration Long W 1637
 TIME :03:07:52 03:17:36 10 (min) Purpose code: 1
 LOG : 588.81 589.53 0.72 Area code : 2
 FDEPTH: 15 15 GearCond.code:
 BDEPTH: 34 36 Validity code:
 Towing dir: 290ø Wire out: 110 m Speed: 45 kn*10
 Sorted: 29 Kg Total catch: 923.80 CATCH/HOUR: 5542.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	5492.58	55986	99.09	3830
Trachurus trecae	50.22	744	0.91	
Total	5542.80		100.00	

PROJECT STATION:2310
 DATE:20/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 2354
 start stop duration Long W 1620
 TIME :11:40:07 11:58:55 19 (min) Purpose code: 1
 LOG : 895.87 897.17 1.29 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 50 50 Validity code:
 Towing dir: 200ø Wire out: 120 m Speed: 44 kn*10
 Sorted: 29 Kg Total catch: 356.40 CATCH/HOUR: 1125.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	558.95	1743	49.66	3836
Sardina pilchardus	524.08	4661	46.57	3837
Scomber japonicus	37.89	341	3.37	
Trachinus vipera	4.55	114	0.40	
Total	1125.47		100.00	

PROJECT STATION:2306
 DATE:19/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 2326
 start stop duration Long W 1655
 TIME :11:04:51 11:25:54 21 (min) Purpose code: 1
 LOG : 669.02 670.45 1.42 Area code : 2
 FDEPTH: 65 65 GearCond.code:
 BDEPTH: 91 86 Validity code:
 Towing dir: 17ø Wire out: 270 m Speed: 44 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION:2311
 DATE:20/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 2400
 start stop duration Long W 1634
 TIME :14:05:18 14:33:20 28 (min) Purpose code: 1
 LOG : 915.31 917.01 1.55 Area code : 2
 FDEPTH: 30 40 GearCond.code:
 BDEPTH: 66 69 Validity code:
 Towing dir: 110ø Wire out: 150 m Speed: 40 kn*10
 Sorted: 33 Kg Total catch: 232.75 CATCH/HOUR: 498.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	305.10	8760	61.17	3838
Sardinella aurita	151.05	1650	30.29	3840
Scomber japonicus	42.60	525	8.54	3839
Total	498.75		100.00	

PROJECT STATION:2312
 DATE:20/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2403
 start stop duration Long W 1614
 TIME :19:59:36 20:11:42 12 (min) Purpose code: 1
 LOG : 969.58 970.42 0.82 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 56 54 Validity code:
 Towing dir: 116ø Wire out: 120 m Speed: 43 kn*10
 Sorted: 57 Kg Total catch: 485.07 CATCH/HOUR: 2425.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2036.50	22970	83.97	3841
Scomber japonicus	388.85	3525	16.03	3842
Total	2425.35		100.00	

PROJECT STATION:2313
 DATE:20/11/04 GEAR TYPE: PT No: 4 POSITION:Lat N 2357 Long W 1554
 start stop duration Purpose code: 1
 TIME :22:50:19 23:08:40 18 (min) Area code : 2
 LOG : 994.50 995.68 1.18 GearCond.code:
 FDEPTH: 5 5 Validity code:
 BDEPTH: 27 28
 Towing dir: 359ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 33 Kg Total catch: 1740.94 CATCH/HOUR: 5803.13

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	5564.00	53687	95.88	3843
Diplodus bellottii	88.33	1213	1.52	
Sardinella aurita	72.80	1387	1.25	
Campogramma glaycos	39.87	173	0.69	
Scomber japonicus	36.40	173	0.63	
Engraulis encrasicolus	1.73	347	0.03	
Total	5803.13		100.00	

PROJECT STATION:2314
 DATE:21/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2400 Long W 1545
 start stop duration Purpose code: 1
 TIME :00:38:25 00:49:12 11 (min) Area code : 2
 LOG :1006.59 1007.30 0.68 GearCond.code:
 FDEPTH: 10 10 Validity code:
 BDEPTH: 21 22
 Towing dir: 280ø Wire out: 100 m Speed: 40 kn*10
 Sorted: 31 Kg Total catch: 682.22 CATCH/HOUR: 3721.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2808.00	39960	75.46	3844
Diplodus bellottii	468.00	10560	12.58	
Sardinella aurita	146.40	18360	3.93	3845
Plectorhynchus mediterraneus	96.00	120	2.58	
Scomber japonicus	80.40	360	2.16	
Pomadasys incisus	45.60	360	1.23	
Pagrus auriga	26.40	120	0.71	
Pagellus bellottii	20.40	120	0.55	
Diplodus vulgaris	18.00	120	0.48	
Aspitrigla obscura	12.00	120	0.32	
Total	3721.20		100.00	

PROJECT STATION:2315
 DATE:21/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2421 Long W 1548
 start stop duration Purpose code: 1
 TIME :21:38:29 21:43:32 5 (min) Area code : 2
 LOG :1181.93 1182.24 0.31 GearCond.code:
 FDEPTH: 5 5 Validity code:
 BDEPTH: 35 35
 Towing dir: 297ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 66 Kg Total catch: 2370.70 CATCH/HOUR: 28448.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	27967.20	461700	98.31	3846
Scomber japonicus	178.00	1344	1.33	
Pagellus erythrinus	103.20	444	0.36	
Total	28448.40		100.00	

PROJECT STATION:2316
 DATE:22/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2432 Long W 1610
 start stop duration Purpose code: 1
 TIME :00:18:01 00:35:24 17 (min) Area code : 2
 LOG :1206.16 1207.38 1.21 GearCond.code:
 FDEPTH: 15 15 Validity code:
 BDEPTH: 67 66
 Towing dir: 117ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 31 Kg Total catch: 815.36 CATCH/HOUR: 2877.74

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2633.65	49920	91.52	3847
Sardinella maderensis	137.65	642	4.78	
Sardinella aurita	106.45	918	3.70	
Total	2877.75		100.00	

PROJECT STATION:2317
 DATE:22/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2443 Long W 1612
 start stop duration Purpose code: 1
 TIME :04:41:09 05:13:09 32 (min) Area code : 2
 LOG :1242.91 1245.24 2.30 GearCond.code:
 FDEPTH: 25 25 Validity code:
 BDEPTH: 76 83
 Towing dir: 286ø Wire out: 140 m Speed: 40 kn*10
 Sorted: 2 Kg Total catch: 2.82 CATCH/HOUR: 5.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	5.01	184	94.71	3848
Sardinella aurita	0.28	6	5.29	
Total	5.29		100.00	

PROJECT STATION:2318
 DATE:22/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2429 Long W 1541
 start stop duration Purpose code: 1
 TIME :09:29:59 10:10:22 40 (min) Area code : 2
 LOG :1285.98 1288.07 2.08 GearCond.code:
 FDEPTH: 33 33 Validity code:
 BDEPTH: 33 33
 Towing dir: 116ø Wire out: 140 m Speed: 30 kn*10
 Sorted: 59 Kg Total catch: 1046.10 CATCH/HOUR: 1569.15

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	631.05	6950	40.22	
Sardina pilchardus	492.60	4845	31.39	3849
Scomber japonicus	130.35	773	8.31	3850
Trachurus trachurus	93.75	1437	5.97	3852
Trachurus trecae	72.60	1011	4.63	3851
Pomadasys incisus	70.50	399	4.49	
Pagellus erythrinus	54.32	399	3.46	
Spondyliosoma cantharus	6.39	107	0.41	
Pagellus acarne	5.33	80	0.34	
Mullus barbatus	4.26	53	0.27	
Loligo vulgaris	3.39	17	0.22	
Zeus faber	2.70	2	0.17	
Raja undulata	1.67	2	0.11	
Raja sp.	0.26	2	0.02	
Total	1569.17		100.01	

PROJECT STATION:2319
 DATE:22/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2428 Long W 1516
 start stop duration Purpose code: 1
 TIME :14:36:50 15:06:19 29 (min) Area code : 2
 LOG :1331.34 1333.33 1.97 GearCond.code:
 FDEPTH: 10 10 Validity code:
 BDEPTH: 22 22
 Towing dir: 270ø Wire out: 100 m Speed: 40 kn*10
 Sorted: 57 Kg Total catch: 948.51 CATCH/HOUR: 1962.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1075.35	13041	54.80	3853
Diplodus bellottii	699.83	11299	35.66	
Scomber japonicus	153.27	648	7.81	3854
Spondyliosoma cantharus	13.66	273	0.70	
Pomadasys incisus	7.16	68	0.36	
Diplodus puntazzo	3.62	2	0.18	
Trachurus trachurus	3.41	33	0.17	
Loligo vulgaris	3.08	4	0.16	
Diplodus vulgaris	3.06	33	0.16	
Total	1962.44		100.00	

PROJECT STATION:2320
 DATE:22/11/04 GEAR TYPE: PT No: 4 POSITION:Lat N 2445 Long W 1553
 start stop duration Purpose code: 1
 TIME :19:47:08 19:54:50 8 (min) Area code : 2
 LOG :1379.00 1379.43 0.41 GearCond.code:
 FDEPTH: 5 5 Validity code:
 BDEPTH: 61 62
 Towing dir: 295ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 33 Kg Total catch: 996.00 CATCH/HOUR: 7470.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	7470.00	94238	100.00	3855
Total	7470.00		100.00	

PROJECT STATION:2321
 DATE:23/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2455 Long W 1548
 start stop duration Purpose code: 1
 TIME :02:24:16 02:35:37 11 (min) Area code : 2
 LOG :1437.45 1438.33 0.86 GearCond.code:
 FDEPTH: 15 15 Validity code:
 BDEPTH: 66 68
 Towing dir: 295ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 29 Kg Total catch: 266.40 CATCH/HOUR: 1453.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1453.09	23760	100.00	3856
Total	1453.09		100.00	

PROJECT STATION:2322
 DATE:23/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2438 Long W 1510
 start stop duration Purpose code: 1
 TIME :06:57:03 07:13:25 16 (min) Area code : 2
 LOG :1479.49 1480.24 0.84 GearCond.code:
 FDEPTH: 26 26 Validity code:
 BDEPTH: 26 26
 Towing dir: 115ø Wire out: 120 m Speed: 30 kn*10
 Sorted: 61 Kg Total catch: 613.80 CATCH/HOUR: 2301.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	1068.75	16013	46.43	
Scomber japonicus	470.63	2850	20.45	3858
Sardina pilchardus	262.88	2400	11.42	3857
Trachurus trachurus	230.63	2963	10.02	3859
Pagellus erythrinus	145.50	863	6.32	
Pomadasys incisus	55.50	150	2.41	
Cymbium marmoratum	31.88	4	1.39	
Loligo vulgaris	16.13	113	0.70	
Spondyliosoma cantharus	10.50	75	0.46	
Pagellus acarne	9.38	75	0.41	
Total	2301.78		100.01	

PROJECT STATION:2323
 DATE:23/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2515 Long W 1547
 start stop duration
 TIME :19:12:26 19:34:59 23 (min) Purpose code: 1
 LOG :1597.49 1598.82 1.32 Area code : 2
 FDEPTH: 97 99 GearCond.code:
 BDEPTH: 97 99 Validity code:
 Towing dir: 295ø Wire out: 320 m Speed: kn*10

Sorted: 23 Kg Total catch: 65.40 CATCH/HOUR: 170.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trachurus	114.78	1826	67.28	3860
Pagellus acarne	37.57	162	22.02	
Trigla lyra	5.71	89	3.35	
Scomber japonicus	3.50	52	2.05	
Scyllorhinus canicula	2.87	8	1.68	
Dentex maroccanus	2.48	57	1.45	
Trachinus arenatus	2.11	37	1.24	
Dentex macrophthalmus	1.30	44	0.76	
Sepia orbignyana	0.16	16	0.09	
Total	170.48		99.92	

PROJECT STATION:2324
 DATE:23/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2507 Long W 1530
 start stop duration
 TIME :21:53:27 22:00:35 7 (min) Purpose code: 1
 LOG :1618.18 1618.70 0.51 Area code : 2
 FDEPTH: 15 15 GearCond.code:
 BDEPTH: 72 70 Validity code:
 Towing dir: 115ø Wire out: 120 m Speed: 45 kn*10

Sorted: 60 Kg Total catch: 666.12 CATCH/HOUR: 5709.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	5675.00	65246	99.41	3861
Sardinella maderensis	33.60	103	0.59	
Total	5709.60		100.00	

PROJECT STATION:2325
 DATE:24/11/04 GEAR TYPE: PT No: 2 POSITION:Lat N 2520 Long W 1505
 start stop duration
 TIME :14:54:14 15:25:23 31 (min) Purpose code: 1
 LOG :1777.80 1780.02 2.19 Area code : 2
 FDEPTH: 20 35 GearCond.code:
 BDEPTH: 68 70 Validity code:
 Towing dir: 295ø Wire out: 120 m Speed: 40 kn*10

Sorted: 15 Kg Total catch: 15.07 CATCH/HOUR: 29.17

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	17.13	58	58.72	3863
Sardinella maderensis	11.46	52	39.29	3862
Sardina pilchardus	0.33	2	1.13	
Scomber japonicus	0.25	2	0.86	
Total	29.17		100.00	

PROJECT STATION:2326
 DATE:24/11/04 GEAR TYPE: PT No: 4 POSITION:Lat N 2524 Long W 1453
 start stop duration
 TIME :19:21:39 19:30:42 9 (min) Purpose code: 1
 LOG :1815.33 1816.00 0.66 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 60 59 Validity code:
 Towing dir: 180ø Wire out: 120 m Speed: 40 kn*10

Sorted: 20 Kg Total catch: 208.54 CATCH/HOUR: 1390.27

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichurus lepturus	1093.33	480	78.64	
Sardina pilchardus	198.67	2560	14.29	3864
Sardinella maderensis	79.00	267	5.68	3865
Scomber japonicus	17.07	87	1.23	3866
Sardinella aurita	2.20	7	0.16	
Total	1390.27		100.00	

PROJECT STATION:2327
 DATE:25/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2540 Long W 1459
 start stop duration
 TIME :02:48:42 03:18:23 30 (min) Purpose code: 1
 LOG :1890.14 1891.69 1.55 Area code : 2
 FDEPTH: 91 91 GearCond.code:
 BDEPTH: 91 91 Validity code:
 Towing dir: 302ø Wire out: 290 m Speed: 30 kn*10

Sorted: 28 Kg Total catch: 28.02 CATCH/HOUR: 56.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex maroccanus	13.88	74	24.77	
Pagellus acarne	11.32	56	20.20	
Zeus faber	10.30	4	18.38	
Aspitrigla obscura	8.76	102	15.63	
Balistes sp.	6.94	14	12.38	
Umbrina canariensis	1.78	4	3.18	
Trachurus trachurus	1.06	12	1.89	
Pagellus erythrinus	0.88	2	1.57	
Solea vulgaris	0.46	8	0.82	
Scomber japonicus	0.34	6	0.61	
Mullus surmuletus	0.32	2	0.57	
Total	56.04		100.00	

PROJECT STATION:2328
 DATE:25/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2544 Long W 1445
 start stop duration
 TIME :05:52:45 06:10:48 18 (min) Purpose code: 1
 LOG :1914.76 1916.11 1.34 Area code : 2
 FDEPTH: 15 15 GearCond.code:
 BDEPTH: 67 72 Validity code:
 Towing dir: 200ø Wire out: 120 m Speed: 44 kn*10

Sorted: 76 Kg Total catch: 191.30 CATCH/HOUR: 637.67

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	338.00	1453	53.01	3867
Trichurus lepturus	263.33	143	41.30	
Sardina pilchardus	36.33	330	5.70	3868
Total	637.66		100.01	

PROJECT STATION:2329
 DATE:25/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2600 Long W 1438
 start stop duration
 TIME :13:45:14 14:11:15 26 (min) Purpose code: 1
 LOG :1989.28 1991.00 1.71 Area code : 2
 FDEPTH: 15 35 GearCond.code:
 BDEPTH: 62 54 Validity code:
 Towing dir: 156ø Wire out: 120 m Speed: 40 kn*10

Sorted: 29 Kg Total catch: 473.48 CATCH/HOUR: 1092.65

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1091.08	10855	99.86	3869
Trachurus trachurus	1.57	12	0.14	
Total	1092.65		100.00	

PROJECT STATION:2330
 DATE:26/11/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2630 Long W 1416
 start stop duration
 TIME :04:00:42 04:17:20 17 (min) Purpose code: 1
 LOG :2113.97 2114.97 0.99 Area code : 2
 FDEPTH: 35 30 GearCond.code:
 BDEPTH: 47 40 Validity code:
 Towing dir: 265ø Wire out: 180 m Speed: 35 kn*10

Sorted: 60 Kg Total catch: 2248.60 CATCH/HOUR: 7936.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	6503.82	136560	81.95	3870
Spondyliosoma cantharus	568.84	3148	7.17	
Pagellus acarne	333.53	1666	4.20	
Pomadasys incisus	163.06	1666	2.05	
Umbrina canariensis	114.88	184	1.45	
Lithognathus mormyrus	92.65	184	1.17	
Pagellus bellottii	61.13	184	0.77	
Diplodus vulgaris	35.19	184	0.44	
Trachurus trachurus	33.35	371	0.42	
Boops boops	20.36	371	0.26	
Zeus faber	9.42	4	0.12	
Total	7936.23		100.00	

PROJECT STATION:2331
 DATE:29/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2652 Long W 1334
 start stop duration
 TIME :11:02:09 11:21:21 19 (min) Purpose code: 1
 LOG :2458.38 2459.60 1.15 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 52 50 Validity code:
 Towing dir: 192ø Wire out: 140 m Speed: 40 kn*10

Sorted: 62 Kg Total catch: 685.23 CATCH/HOUR: 2163.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2155.26	35327	99.60	3871
Mola mola	5.15	3	0.24	
Scomber japonicus	3.47	69	0.16	
Total	2163.88		100.00	

PROJECT STATION:2332
 DATE:29/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2659 Long W 1331
 start stop duration
 TIME :14:43:33 15:13:21 30 (min) Purpose code: 1
 LOG :2490.81 2492.33 1.51 Area code : 2
 FDEPTH: 42 47 GearCond.code:
 BDEPTH: 42 47 Validity code:
 Towing dir: 195ø Wire out: 170 m Speed: 30 kn*10

Sorted: 37 Kg Total catch: 557.00 CATCH/HOUR: 1114.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	493.60	27540	44.31	3873
Engraulis encrasicolus	384.00	70260	34.47	3872
Pomadasys incisus	58.20	480	5.22	
Diplodus vulgaris	40.20	630	3.61	
Diplodus cervinus cervinus	31.20	30	2.80	
Trachurus trecae	25.20	300	2.26	
Liza aurata	18.30	30	1.64	
Loligo vulgaris	13.80	30	1.24	
Pagellus acarne	12.00	30	1.08	
Merluccius merluccius	6.90	30	0.62	
Myliobatis aquila	6.02	2	0.54	
Conger conger	5.30	28	0.48	
Scomber japonicus	5.10	90	0.46	
Diplodus vulgaris	4.80	30	0.43	
Alloteuthis africana	4.58	2	0.41	
GOBIIDAE	2.10	330	0.19	
Alloteuthis subulata	1.50	30	0.13	
Scomber scombrus	0.88	2	0.08	
Citharus linguatula	0.30	30	0.03	
Total	1113.98		100.00	

PROJECT STATION:2333
 DATE:29/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2712 Long W 1332
 start stop duration
 TIME :19:46:45 19:59:02 12 (min) Purpose code: 1
 LOG :2537.52 2538.40 0.85 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 68 70 Validity code:
 Towing dir: 270ø Wire out: 120 m Speed: 44 kn*10

Sorted: 31 Kg Total catch: 79.76 CATCH/HOUR: 398.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	292.80	8420	73.42	3874
Engraulis encrasicolus	104.85	13620	26.29	3875
Scomber japonicus	1.15	40	0.29	
Total	398.80		100.00	

PROJECT STATION:2334
 DATE:29/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2719 Long W 1325
 start stop duration
 TIME :23:29:22 23:43:57 15 (min) Purpose code: 1
 LOG :2572.50 2573.26 0.74 Area code : 2
 FDEPTH: 28 32 GearCond.code:
 BDEPTH: 28 32 Validity code:
 Towing dir: 249ø Wire out: 120 m Speed: 30 kn*10
 Sorted: 69 Kg Total catch: 521.30 CATCH/HOUR: 2085.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	675.20	15628	32.38	
Sardina pilchardus	666.00	15000	31.94	3841
Pomadasy incisus	210.00	2580	10.07	
Sarpa salpa	147.20	508	7.06	
Cymbium sp.	57.20	28	2.74	
Maja squinado	48.60	28	2.33	
Sepia officinalis hierredda	43.60	28	2.09	
Diplodus vulgaris	42.40	240	2.03	
Pagellus bellottii	35.08	480	1.68	
Pagellus acarne	29.40	660	1.41	
Loligo vulgaris	19.20	28	0.92	
Boops boops	16.40	448	0.79	
Trigla lyra	16.20	452	0.78	
Scomber japonicus	12.80	24	0.61	
Trachurus trachurus	10.20	360	0.49	
Conger conger	9.20	28	0.44	
Octopus vulgaris	7.48	28	0.36	
Pegusa lascaris	6.00	28	0.29	
Trisopterus luscus	5.20	88	0.25	
Trachinus arenatus	5.20	28	0.25	
Dentex maroccanus	4.40	452	0.21	
Mullus surmuletus	3.60	28	0.17	
Scorpaena scrofa	3.60	28	0.17	
Spondyliosoma cantharus	3.60	28	0.17	
Alloteuthis subulata	3.00	600	0.14	
Microchirus sp.	2.08	120	0.10	
Sepia bertheloti	2.08	28	0.10	
Solea sp	0.28	28	0.01	
Total	2085.20		99.98	

PROJECT STATION:2335
 DATE:30/11/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2729 Long W 1324
 start stop duration
 TIME :04:25:25 04:37:14 12 (min) Purpose code: 1
 LOG :2617.45 2618.27 0.81 Area code :
 FDEPTH: 30 30 GearCond.code:
 BDEPTH: 53 54 Validity code:
 Towing dir: 15ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 59 Kg Total catch: 417.12 CATCH/HOUR: 2085.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1660.00	52745	79.59	3843
Scomber japonicus	364.00	9450	17.45	3842
Engraulis encrasicolus	60.55	6090	2.90	3844
Alloteuthis subulata	1.05	280	0.05	
Total	2085.60		99.99	

PROJECT STATION:2336
 DATE:30/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2745 Long W 1325
 start stop duration
 TIME :09:19:58 09:48:07 28 (min) Purpose code: 1
 LOG :2663.77 2665.18 1.40 Area code : 2
 FDEPTH: 107 106 GearCond.code:
 BDEPTH: 107 106 Validity code:
 Towing dir: 230ø Wire out: 350 m Speed: 30 kn*10
 Sorted: 63 Kg Total catch: 1921.06 CATCH/HOUR: 4116.56

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	2936.14	68559	71.33	3845
Trachurus trachurus	631.67	8297	15.34	3846
Pagellus acarne	294.34	1166	7.15	
Dentex macrocephalmus	128.96	1239	3.13	
Pagellus erythrinus	68.49	146	1.66	
Sphoeroides pachgaster	20.40	146	0.50	
Spondyliosoma cantharus	18.94	73	0.46	
Loligo vulgaris	9.90	11	0.24	
Octopus vulgaris	4.80	2	0.12	
Sardina pilchardus	2.19	73	0.05	
Zeus faber	0.73	73	0.02	
Total	4116.56		100.00	

PROJECT STATION:2337
 DATE:30/11/04 GEAR TYPE: BT No:15 POSITION:Lat N 2752 Long W 1306
 start stop duration
 TIME :15:42:22 16:02:12 20 (min) Purpose code: 1
 LOG :2722.76 2723.78 1.01 Area code : 2
 FDEPTH: 45 45 GearCond.code:
 BDEPTH: 45 45 Validity code:
 Towing dir: 20ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 36 Kg Total catch: 949.11 CATCH/HOUR: 2847.33

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2550.00	153660	89.56	3848
Scomber japonicus	191.10	4290	6.71	3847
Pomadasy incisus	48.30	324	1.70	
Pagellus acarne	17.16	78	0.60	
Pagellus bellottii	17.16	78	0.60	
Spondyliosoma cantharus	10.92	78	0.38	
Diplodus bellottii	6.24	78	0.22	
Octopus vulgaris	3.63	6	0.13	
Argyrosomus regius	1.11	3	0.04	
Loligo vulgaris	0.78	390	0.03	
Diplodus vulgaris	0.63	3	0.02	
Conger conger	0.30	3	0.01	
Total	2847.33		100.00	

PROJECT STATION:2338
 DATE: 1/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2804 Long W 1259
 start stop duration
 TIME :04:36:22 04:46:42 10 (min) Purpose code: 1
 LOG :2822.79 2823.60 0.80 Area code : 1
 FDEPTH: 15 15 GearCond.code:
 BDEPTH: 52 49 Validity code:
 Towing dir: 15ø Wire out: 120 m Speed: 45 kn*10
 Sorted: 29 Kg Total catch: 173.64 CATCH/HOUR: 1041.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1033.20	27288	99.17	3849
Diplodus bellottii	4.68	36	0.45	
Scomber japonicus	3.60	108	0.35	
Engraulis encrasicolus	0.36	36	0.03	
Total	1041.84		100.00	

PROJECT STATION:2339
 DATE: 1/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2811 Long W 1232
 start stop duration
 TIME :13:13:43 13:44:07 30 (min) Purpose code: 1
 LOG :2904.40 2906.41 1.99 Area code : 1
 FDEPTH: 30 35 GearCond.code:
 BDEPTH: 54 51 Validity code:
 Towing dir: 184ø Wire out: 150 m Speed: 45 kn*10
 Sorted: 8 Kg Total catch: 8.42 CATCH/HOUR: 16.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	14.60	146	86.70	3850
Pagellus acarne	1.60	6	9.50	
Spondyliosoma cantharus	0.64	4	3.80	
Total	16.84		100.00	

PROJECT STATION:2340
 DATE: 1/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2818 Long W 1218
 start stop duration
 TIME :19:05:09 19:18:28 13 (min) Purpose code: 1
 LOG :2952.14 2953.07 0.93 Area code : 2
 FDEPTH: 30 30 GearCond.code:
 BDEPTH: 52 53 Validity code:
 Towing dir: 188ø Wire out: 140 m Speed: 44 kn*10
 Sorted: 29 Kg Total catch: 605.33 CATCH/HOUR: 2793.83

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	2460.00	44280	88.05	3851
Sardina pilchardus	327.37	6148	11.72	3852
Mugil cephalus	6.46	5	0.23	
Total	2793.83		100.00	

PROJECT STATION:2341
 DATE: 1/12/04 GEAR TYPE: PT No: 4 POSITION:Lat N 2808 Long W 1209
 start stop duration
 TIME :22:24:15 22:34:44 10 (min) Purpose code: 1
 LOG :2977.58 2978.22 0.62 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 33 34 Validity code:
 Towing dir: 270ø Wire out: 120 m Speed: 42 kn*10
 Sorted: 28 Kg Total catch: 61.94 CATCH/HOUR: 371.64

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	319.20	11328	85.89	3853
Trachinotus ovatus	25.08	42	6.75	
Engraulis encrasicolus	23.40	3828	6.30	3854
Alloteuthis subulata	3.96	732	1.07	
Total	371.64		100.01	

PROJECT STATION:2342
 DATE: 2/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2828 Long W 1208
 start stop duration
 TIME :01:38:17 02:04:16 26 (min) Purpose code: 1
 LOG :3002.83 3004.51 1.68 Area code : 2
 FDEPTH: 50 45 GearCond.code:
 BDEPTH: 75 59 Validity code:
 Towing dir: 180ø Wire out: 180 m Speed: 45 kn*10
 Sorted: 31 Kg Total catch: 207.49 CATCH/HOUR: 478.82

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	380.58	7745	79.48	3855
Sardina pilchardus	94.66	1696	19.77	3855
Spondyliosoma cantharus	2.35	9	0.49	
Trachinotus ovatus	1.22	2	0.25	
Total	478.81		99.99	

PROJECT STATION:2343
 DATE: 2/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2823 Long W 1229
 start stop duration
 TIME :05:18:28 05:44:31 26 (min) Purpose code: 1
 LOG :3030.37 3032.06 1.68 Area code : 2
 FDEPTH: 40 45 GearCond.code:
 BDEPTH: 77 70 Validity code:
 Towing dir: 68ø Wire out: 180 m Speed: 40 kn*10
 Sorted: 31 Kg Total catch: 120.60 CATCH/HOUR: 278.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	156.92	1362	56.38	3857
Spondyliosoma cantharus	99.46	565	35.74	
Camogramma glaycos	11.42	7	4.10	
Pomatomus saltatrix	7.96	7	2.86	
Boops boops	2.54	12	0.91	
Total	278.30		99.99	

PROJECT STATION:2344
 DATE: 2/12/04 GEAR TYPE: BT No:15 POSITION:Lat N 2840
 start stop duration Long W 1240
 TIME :09:53:07 10:22:46 30 (min) Purpose code: 1
 LOG :3067.63 3069.10 1.46 Area code : 2
 FDEPTH: 207 204 GearCond.code:
 BDEPTH: 207 204 Validity code:
 Towing dir: 58ø Wire out: 640 m Speed: 30 kn*10
 Sorted: 28 Kg Total catch: 319.84 CATCH/HOUR: 639.68

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Scomber japonicus	433.20	8976	67.72 3858
Dentex macrophthalmus	79.92	840	12.49
Macrorhamphosus scolopax	69.12	6912	10.81
Todarodes sagittatus	38.64	216	6.04
Trachurus trachurus	13.92	168	2.18
Sphoeroides pachgaster	3.20	8	0.50
Raja miraletus	1.68	24	0.26
Total	639.68	100.00	

PROJECT STATION:2349
 DATE: 3/12/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2833
 start stop duration Long W 1121
 TIME :02:07:54 20:23:21 15 (min) Purpose code: 1
 LOG :3367.95 3368.73 0.76 Area code : 1
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 29 32 Validity code:
 Towing dir: 34ø Wire out: 130 m Speed: 30 kn*10
 Sorted: 36 Kg Total catch: 143.74 CATCH/HOUR: 574.96

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardina pilchardus	530.40	15520	92.25 3868
Scomber japonicus	43.52	976	7.57 3869
Pomadasy incisus	0.56	4	0.10
Diplodus bellottii	0.28	4	0.05
Trachurus trachurus	0.20	4	0.03
Total	574.96	100.00	

PROJECT STATION:2345
 DATE: 2/12/04 GEAR TYPE: BT No:15 POSITION:Lat N 2831
 start stop duration Long W 1216
 TIME :13:50:18 14:20:12 30 (min) Purpose code: 1
 LOG :3100.20 3101.67 1.45 Area code : 1
 FDEPTH: 99 100 GearCond.code:
 BDEPTH: 99 100 Validity code:
 Towing dir: 241ø Wire out: 320 m Speed: 30 kn*10
 Sorted: 30 Kg Total catch: 847.68 CATCH/HOUR: 1695.36

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Scomber japonicus	1610.00	50008	94.97 3859
Sepia officinalis hierredda	20.72	56	1.22
Pagellus bellottii	14.56	56	0.86
Engraulis encrasicolus	12.32	560	0.73 3860
Dentex angolensis	8.96	56	0.53
Trachurus trachurus	7.28	56	0.43
Sardina pilchardus	5.60	168	0.33
Pagellus erythrinus	4.66	4	0.27
Sphoeroides pachgaster	3.42	4	0.20
Lepidotrigla sp.	3.36	112	0.20
Citharus linguatula	2.80	224	0.17
Macrorhamphosus scolopax	1.68	56	0.10
Total	1695.36	100.01	

PROJECT STATION:2350
 DATE: 4/12/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2846
 start stop duration Long W 1104
 TIME :02:44:25 03:15:48 31 (min) Purpose code: 1
 LOG :3427.56 3429.66 2.07 Area code : 1
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 34 63 Validity code:
 Towing dir: 294ø Wire out: 150 m Speed: 40 kn*10
 Sorted: 33 Kg Total catch: 98.46 CATCH/HOUR: 190.57

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardina pilchardus	188.59	3989	98.96 3870
Scomber japonicus	1.97	58	1.03
Total	190.56	99.99	

PROJECT STATION:2351
 DATE: 4/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2915
 start stop duration Long W 1104
 TIME :13:58:02 14:28:17 30 (min) Purpose code: 1
 LOG :3505.79 3507.41 1.69 Area code : 1
 FDEPTH: 120 120 GearCond.code:
 BDEPTH: 140 154 Validity code:
 Towing dir: 324ø Wire out: 350 m Speed: 35 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION:2346
 DATE: 3/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2814
 start stop duration Long W 1154
 TIME :05:24:20 05:37:59 14 (min) Purpose code: 1
 LOG :3236.75 3237.72 0.96 Area code : 2
 FDEPTH: 20 25 GearCond.code:
 BDEPTH: 39 41 Validity code:
 Towing dir: 320ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 57 Kg Total catch: 114.51 CATCH/HOUR: 490.76

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardina pilchardus	414.00	6669	84.36 3861
Scomber japonicus	73.80	1243	15.04 3862
Engraulis encrasicolus	1.89	154	0.39
Pagellus acarne	1.07	4	0.22
Total	490.76	100.01	

PROJECT STATION:2352
 DATE: 4/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2851
 start stop duration Long W 1100
 TIME :18:42:29 18:59:23 17 (min) Purpose code: 1
 LOG :3547.17 3548.31 0.93 Area code : 1
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 65 70 Validity code:
 Towing dir: 300ø Wire out: 130 m Speed: 40 kn*10
 Sorted: 29 Kg Total catch: 183.04 CATCH/HOUR: 646.02

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardina pilchardus	460.59	11986	71.30 3871
Scomber japonicus	164.12	4108	25.40 3872
Trachurus trachurus	12.21	18	1.89
Merluccius merluccius	4.87	4	0.75
Engraulis encrasicolus	4.24	381	0.66
Total	646.03	100.00	

PROJECT STATION:2347
 DATE: 3/12/04 GEAR TYPE: BT No:15 POSITION:Lat N 2823
 start stop duration Long W 1128
 TIME :14:41:55 15:11:55 30 (min) Purpose code: 1
 LOG :3325.66 3327.20 1.53 Area code : 1
 FDEPTH: 23 22 GearCond.code:
 BDEPTH: 23 22 Validity code:
 Towing dir: 220ø Wire out: 120 m Speed: 30 kn*10
 Sorted: 40 Kg Total catch: 835.95 CATCH/HOUR: 1671.90

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Engraulis encrasicolus	715.20	106134	42.78 3864
Sardina pilchardus	324.60	12264	19.42 3863
Diplodus bellottii	286.02	3864	17.11
Pomadasy incisus	277.62	3234	16.61
Scomber japonicus	27.30	294	1.63
Camogramma glaycos	12.60	42	0.75
Loligo vulgaris	11.76	588	0.70
Pagellus acarne	9.24	252	0.55
Mullus surmuletus	2.52	42	0.15
Argyrosomus regius	2.10	42	0.13
Alloteuthis subulata	2.10	252	0.13
S H R I M P S	0.42	42	0.03
Citharus linguatula	0.42	42	0.03
Total	1671.90	100.02	

PROJECT STATION:2353
 DATE: 4/12/04 GEAR TYPE: PT No: 7 POSITION:Lat N 2855
 start stop duration Long W 1046
 TIME :23:00:19 23:22:36 22 (min) Purpose code: 1
 LOG :3584.38 3585.62 1.22 Area code : 1
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 33 32 Validity code:
 Towing dir: 250ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 64 Kg Total catch: 129.30 CATCH/HOUR: 352.64

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardina pilchardus	340.04	7587	96.43 3873
Scomber japonicus	10.75	185	3.05 3874
Trachinotus ovatus	1.75	5	0.50
Belone belone gracilis	0.11	3	0.03
Total	352.65	100.01	

PROJECT STATION:2348
 DATE: 3/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2827
 start stop duration Long W 1128
 TIME :18:37:21 18:55:58 19 (min) Purpose code: 1
 LOG :3358.72 3360.03 1.30 Area code : 1
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 66 65 Validity code:
 Towing dir: 127ø Wire out: 140 m Speed: 40 kn*10
 Sorted: 31 Kg Total catch: 115.33 CATCH/HOUR: 364.20

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Engraulis encrasicolus	253.20	25320	69.52 3865
Scomber japonicus	61.61	1734	16.92 3867
Sardina pilchardus	49.36	1585	13.55 3866
Total	364.17	99.99	

PROJECT STATION:2354
 DATE: 5/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2911
 start stop duration Long W 1034
 TIME :05:13:23 05:28:21 15 (min) Purpose code: 1
 LOG :3641.04 3642.14 1.09 Area code : 1
 FDEPTH: 15 18 GearCond.code:
 BDEPTH: 51 60 Validity code:
 Towing dir: 308ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 30 Kg Total catch: 67.00 CATCH/HOUR: 268.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardina pilchardus	214.00	4744	79.85 3875
Engraulis encrasicolus	23.52	2264	8.78 3876
Trachurus trecae	22.32	28	8.33
Scomber japonicus	8.16	168	3.04
Total	268.00	100.00	

PROJECT STATION:2355
 DATE: 5/12/04 GEAR TYPE: BT No:15 POSITION:Lat N 2916 Long W 1020
 start stop duration
 TIME :09:47:41 10:23:43 36 (min) Purpose code: 1
 LOG :3682.82 3684.79 1.95 Area code : 1
 FDEPTH: 30 38 GearCond.code:
 BDEPTH: 30 38 Validity code:
 Towing dir: 342ø Wire out: 120 m Speed: 30 kn*10
 Sorted: 29 Kg Total catch: 422.76 CATCH/HOUR: 704.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	542.27	13043	76.96	3877
Scomber japonicus	64.87	1727	9.21	3879
Engraulis encrasicolus	59.27	6020	8.41	3878
Diplodus bellottii	21.93	210	3.11	
Diplodus vulgaris	6.77	23	0.96	
Raja montagui	5.37	2	0.76	
Pagellus acarne	2.10	47	0.30	
Sepia orbignyana	0.93	2	0.13	
Trachinus draco	0.47	23	0.07	
Merluccius merluccius	0.37	2	0.05	
Octopus vulgaris	0.27	2	0.04	
Total	704.62		100.00	

PROJECT STATION:2356
 DATE: 5/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 2935 Long W 1007
 start stop duration
 TIME :16:03:25 16:13:06 10 (min) Purpose code: 1
 LOG :3737.36 3738.09 0.72 Area code : 1
 FDEPTH: 15 14 GearCond.code:
 BDEPTH: 52 57 Validity code:
 Towing dir: 292ø Wire out: 120 m Speed: 45 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION:2357
 DATE: 5/12/04 GEAR TYPE: PT No: 5 POSITION:Lat N 2946 Long W 958
 start stop duration
 TIME :19:50:03 20:10:17 20 (min) Purpose code: 1
 LOG :3769.60 3770.87 1.27 Area code : 1
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 59 68 Validity code:
 Towing dir: 345ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 32 Kg Total catch: 98.22 CATCH/HOUR: 294.66

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	133.65	603	45.36	
Scomber japonicus	90.54	2133	30.73	3881
Engraulis encrasicolus	34.74	3024	11.79	3882
Sardina pilchardus	34.74	729	11.79	3880
Belone belone gracilis	0.99	18	0.34	
Total	294.66		100.01	

PROJECT STATION:2358
 DATE: 6/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 3006 Long W 942
 start stop duration
 TIME :02:50:36 03:10:28 20 (min) Purpose code: 1
 LOG :3830.86 3832.42 1.54 Area code : 1
 FDEPTH: 10 20 GearCond.code:
 BDEPTH: 36 37 Validity code:
 Towing dir: 200ø Wire out: 120 m Speed: 45 kn*10
 Sorted: 54 Kg Total catch: 54.21 CATCH/HOUR: 162.63

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	160.50	4770	98.69	3883
Pomadasys incisus	1.71	6	1.05	
Sardinella aurita	0.39	36	0.24	
C R A B S	0.03	3	0.02	
Total	162.63		100.00	

PROJECT STATION:2359
 DATE: 6/12/04 GEAR TYPE: PT No: 4 POSITION:Lat N 3022 Long W 941
 start stop duration
 TIME :09:49:44 10:03:02 13 (min) Purpose code: 1
 LOG :3896.50 3897.33 0.87 Area code : 1
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 29 31 Validity code:
 Towing dir: 200ø Wire out: 120 m Speed: 40 kn*10
 Sorted: 29 Kg Total catch: 74.16 CATCH/HOUR: 342.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	248.08	7509	72.48	3884
Scomber japonicus	93.92	1985	27.44	3885
Trigla lyra	0.28	5	0.08	
Total	342.28		100.00	

PROJECT STATION:2360
 DATE: 7/12/04 GEAR TYPE: BT No:15 POSITION:Lat N 3140 Long W 1009
 start stop duration
 TIME :11:38:16 11:52:50 15 (min) Purpose code: 1
 LOG :4126.60 4127.27 0.66 Area code : 1
 FDEPTH: 159 156 GearCond.code:
 BDEPTH: 159 156 Validity code:
 Towing dir: 217ø Wire out: 500 m Speed: 30 kn*10
 Sorted: 102 Kg Total catch: 109.73 CATCH/HOUR: 438.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pagellus bogaraveo	96.80	236	22.05	
Callanthias ruber	84.72	3612	15.30	
Lepidopus caudatus	66.00	288	15.04	
Capros aper	34.32	312	7.82	
Zeus faber	34.04	32	7.76	
Trachurus trachurus	23.32	44	5.31	3886
Pagellus acarne	20.12	52	4.58	
Zenopsis conchifer	16.12	32	3.67	
GADIDAE	14.84	12	3.38	
Macrorhamphosus scolopax	9.64	488	2.20	
Mola mola	8.96	4	2.04	
Merluccius merluccius	7.88	8	1.80	
Pagrus pagrus	5.04	4	1.15	
Scorpaena notata	4.68	4	1.07	
Mullus surmuletus	3.36	8	0.77	
Anthias anthias	3.32	248	0.76	
Dentex macropthalmus	2.64	12	0.60	
Sphoeroides pachgaster	2.64	4	0.60	
Todarodes sagittatus	0.48	8	0.11	
Total	438.92		100.01	

PROJECT STATION:2361
 DATE: 7/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 3143 Long W 945
 start stop duration
 TIME :16:02:00 16:16:27 14 (min) Purpose code: 1
 LOG :4165.89 4167.01 1.11 Area code : 1
 FDEPTH: 15 20 GearCond.code:
 BDEPTH: 35 31 Validity code:
 Towing dir: 200ø Wire out: 120 m Speed: 45 kn*10
 Sorted: 32 Kg Total catch: 380.44 CATCH/HOUR: 1630.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1457.14	28491	89.37	3887
Scomber japonicus	165.09	3086	10.13	3888
Trachurus trachurus	5.66	103	0.35	
Boops boops	1.54	51	0.09	
Engraulis encrasicolus	1.03	51	0.06	
Total	1630.46		100.00	

PROJECT STATION:2362
 DATE: 7/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 3155 Long W 949
 start stop duration
 TIME :21:06:43 21:24:17 18 (min) Purpose code: 1
 LOG :4214.30 4215.60 1.28 Area code : 1
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 46 50 Validity code:
 Towing dir: 291ø Wire out: 120 m Speed: 45 kn*10
 Sorted: 32 Kg Total catch: 407.67 CATCH/HOUR: 1358.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	760.40	22417	55.96	3889
Scomber japonicus	593.73	13623	43.69	3890
Zeus faber	4.77	3	0.35	
Total	1358.90		100.00	

PROJECT STATION:2363
 DATE: 7/12/04 GEAR TYPE: PT No: 7 POSITION:Lat N 3152 Long W 934
 start stop duration
 TIME :23:23:31 23:29:40 6 (min) Purpose code: 1
 LOG :4232.48 4232.80 0.31 Area code : 1
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 24 23 Validity code:
 Towing dir: 50ø Wire out: 120 m Speed: 30 kn*10
 Sorted: 20 Kg Total catch: 201.50 CATCH/HOUR: 2015.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	1438.00	42000	71.36	3891
Sardina pilchardus	562.00	18500	27.89	3892
Engraulis encrasicolus	3.00	100	0.15	
Trachurus trachurus	3.00	100	0.15	
Macrorhamphosus scolopax	0.90	400	0.04	
Total	2006.90		99.59	

PROJECT STATION:2364
 DATE: 8/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 3211 Long W 921
 start stop duration
 TIME :07:06:53 07:20:14 13 (min) Purpose code: 1
 LOG :4308.53 4309.53 1.00 Area code : 1
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 39 38 Validity code:
 Towing dir: 176ø Wire out: 120 m Speed: 30 kn*10
 Sorted: 56 Kg Total catch: 56.80 CATCH/HOUR: 262.15

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	231.91	4906	89.23	3893
Scomber japonicus	23.82	628	9.09	3894
Engraulis encrasicolus	2.35	314	0.90	
Mugil cephalus	2.08	5	0.79	
Total	262.16		100.01	

PROJECT STATION:2365
 DATE: 8/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 3218
 start stop duration Long W 921
 TIME :09:13:42 09:27:19 14 (min) Purpose code: 1
 LOG :4324.23 4325.17 0.92 Area code : 1
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 45 43 Validity code:
 Towing dir: 25ø Wire out: 130 m Speed: 44 kn*10
 Sorted: 30 Kg Total catch: 330.00 CATCH/HOUR: 1414.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1393.54	21677	98.53	3895
Scomber japonicus	13.67	236	0.97	
Engraulis encrasicolus	7.07	424	0.50	
Total	1414.28		100.00	

PROJECT STATION:2366
 DATE: 8/12/04 GEAR TYPE: BT No:15 POSITION:Lat N 3229
 start stop duration Long W 918
 TIME :15:28:48 15:58:33 30 (min) Purpose code: 1
 LOG :4384.09 4385.62 1.52 Area code : 1
 FDEPTH: 43 38 GearCond.code:
 BDEPTH: 43 38 Validity code:
 Towing dir: 137ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 37 Kg Total catch: 256.29 CATCH/HOUR: 512.58

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	150.92	9366	29.44	3897
Trachurus trachurus	109.90	2496	21.44	3899
Sardina pilchardus	102.90	3038	20.07	3896
Scomber japonicus	53.06	1456	10.35	3898
Trisopterus luscus	50.40	1456	9.83	
OMMASTREPHIDAE	14.00	4018	2.73	
Pagellus acarne	10.08	56	1.97	
MUGILIDAE	6.02	14	1.17	
Maja squinado	4.48	4	0.87	
Conger conger	2.28	8	0.44	
Liocarcinus sp	1.26	112	0.25	
Diplodus bellottii	1.26	70	0.25	
Zeus faber	1.18	6	0.23	
Dicologlossa hexophthalma	1.12	56	0.22	
Cymbium cymbium	1.00	2	0.20	
Parapandalus narval	0.84	182	0.16	
Squilla mantis	0.84	14	0.16	
Merluccius merluccius	0.48	2	0.09	
Sicyonia sp.	0.28	28	0.05	
Palaemon sp.	0.28	28	0.05	
Total	512.58		99.97	

PROJECT STATION:2367
 DATE: 8/12/04 GEAR TYPE: PT No: 1 POSITION:Lat N 3234
 start stop duration Long W 918
 TIME :17:32:38 17:50:00 17 (min) Purpose code: 1
 LOG :4398.18 4399.63 1.45 Area code : 1
 FDEPTH: 20 25 GearCond.code:
 BDEPTH: 47 38 Validity code:
 Towing dir: 235ø Wire out: 130 m Speed: 45 kn*10
 Sorted: 35 Kg Total catch: 1546.16 CATCH/HOUR: 5457.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	3122.96	53732	57.23	3900
Scomber japonicus	1292.05	31854	23.68	3901
Trachurus trachurus	732.99	10405	13.43	3902
Boops boops	309.04	2951	5.66	
Total	5457.04		100.00	

Annex III Instruments and fishing gear used

The Simrad EK-500, 38kHz scientific echosounder was used for abundance estimation during the survey, in addition data from the 18 kHz, 120 kHz and 200 kHz transducers were recorded for possible future multifrequency target identification. The Bergen Echo Integrator system (BEI) recorded the hydroacoustic data and was used to scrutinize the acoustic records, and to allocate integrator data to fish species. All raw data were stored to tape and brought back to IMR for storing.

The details of the settings of the echosounders were as follows:

Transceiver 1 menu

Transducer depth	5.5 m
Absorption coeff.	10 dB/km
Pulse length	medium (1ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-21.0 dB
SV transducer gain	27.17dB
TS transducer gain	29.96
Angle sensitivity	21.9
3 dB beamwidth along.	7.3
3 dB beamwidth athw.	7.0
Alongship offset	0.05
Athwardship offset	0.04

Transceiver 2 menu

Transducer depth	5.5 m
Absorption coeff.	38 dB/km
Pulse length	long (1ms)
Bandwidth	narrow
Max power	1000 Watt
2-way beam angle	-20.6 dB
SV transducer gain	25.96B
TS transducer gain	25.95dB
Angle sensitivity	21.0
3 dB beamwidth along.	7.4
3 dB beamwidth athw.	7.2
Alongship offset	0.24
Athwardship offset	0.04

Transceiver 3 menu

Transducer depth	5.5 m
Absorption coeff.	3 dB/km
Pulse length	short (0.7ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-17.2 dB
SV transducer gain	23.75dB
TS transducer gain	23.36B
Angle sensitivity	13.9
3 dB beamwidth along.	10.8
3 dB beamwidth athw.	10.8
Alongship offset	0.06
Athwardship offset	-004

Transceiver 4 menu

Transducer depth	5.5 m
Absorption coeff.	53 dB/km
Pulse length	Long
Bandwidth	Narrow
Max power	1000 Watt
2-way beam angle	-20.5 dB
SV transducer gain	24.18 dB
TS transducer gain	24.80 dB
Angle sensitivity	0.0
3 dB beamwidth along.	0.0°
3 dB beamwidth athw.	0.0°
Alongship offset	0.00°
Athwardship offset	0.00°

Display menu

Echogram	1
Bottom range	10 m
Bottom range start	10 m
TVG	20 log R
Sv colour min -	65 dB
TS Colour minimum	-65 dB

Printer- menu

Range	0-50, 0-100, 0-150, 0-250 or 0-500 m
TVG	20 log R
Sv colour min	-67 dB

Bottom detection menu

Minimum level	-40 dB
---------------	--------

Calibration

A calibration of the acoustic equipment was conducted during the survey in Angola in August 2004.

Fishing gear

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

The bottom trawl has a 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 IV 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	106.8	7.5			15,638.4
24	5.8	11,313.6	588.3	37.6			11,945.4
25		4,533.8	872.5	40.6			5,447.0
26	1.5	1,290.7	541.3	31.6			1,865.1
27		346.3	214.8	9.0			570.1
28		6.3	42.3	1.5			50.0
29							
30							
Total	20,476.8	72,631.4	2,366.1	127.9			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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

Annex IV continued

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

