

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

**Cruise Report No 12/2000
Part I SENEGAL - THE GAMBIA
29 October - 09 November 2000**

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CHAPTER 1 INTRODUCTION

1.1 Objective of the cruise

The general objectives were to estimate the 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 there over a period of 50 days, in October-December 2000. For Senegal and The Gambia the agreed objectives were:

- To map the distribution and estimate the biomass for the main small pelagic fish using hydroacoustic methods. The species of interest were: sardinella *Sardinella aurita*, *Sardinella maderensis*, horse mackerel *Trachurus trachurus* and *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.
- To sample standard hydrographical transects for temperature, salinity and oxygen at about 13°35' N and 14°50' N.

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

1.2 Participation

Members of the scientific teams were:

Centre de Recherches Océanographiques de Dakar-Thiaroy, Senegal:
Abdoulaye SARRE, Ibrahima SOW, Mamadou SANE and Madiabel DIOP

Department of Fisheries, The Gambia:
Ousmann Mass JOBE, Solomon TAMOH and Juldah JALLOW,

Centre National de Recherches Océanographiques et des Pêches, Mauritania:
Sall MAMADOU

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1.3 Narrative

The course tracks with the fishing and hydrographical stations are shown in Figure 1.

The survey started off Casamance on October the 29 with systematic parallel course tracks spaced about 10 NM (nautical miles) apart. 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. In the latter case, 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). The shelf was covered up to St. Louis before a call was made on Dakar on November 9, to let participants from the Gambia and Senegal disembark and scientists from Mauritania come onboard.

The hydrographic profile off The Gambia was carried out on November 1 and that off Cape Vert on November 3.

1.4 Methods

Environmental Data

Surface temperature and meteorological data from a weather station were logged automatically and recorded with position and bottom depth every nautical mile sailed.

Hydrographic profiles were collected with a CTD sonde and temperature, salinity, and pressure (depth) were logged by the Seabird Software. From these data series, records were selected from standard depths and presented in figures.

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:

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

The specific condition factors obtained from the samples and applied for this survey were: 0.86 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.

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

The complete records of fishing stations are shown in Annex I.

The following target groups were used for Senegal:

- 1) sardinellas (flat sardinella *Sardinella maderensis* and round sardinella *S. aurita*),
- 2) horse mackerels (Atlantic horse mackerel *Thrachurus trecae*, round scad *Decapterus punctatus*, and false scad *Decapterus rhonchus*),
- 3) other pelagic carangids and associated species (Atlantic bumper *Chloroscombrus chrysurus*, African lookdown *Selene dorsalis*, chub mackerel *Scomber japonicus*, largehead hairtail *Trichiurus lepturus*, and barracudas *Sphyraena* spp.),
- 4) other demersal species (such as bigeye grunt *Brachydeuterus auritus*, Sparidae and Haemulidae), and
- 5) other clupeids such as West African ilisha *Ilisha africana*.

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 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):

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

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

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

where

ρ_i = density of fish in length group i

S_A = mean integrator value

p_i = proportion of fish in length group i

$\sum_{i=1}^n \frac{P_i}{C_{Fi}}$ = the relative back scattering cross section (m^2) of the length frequency

sample of the target species, and

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

The integrator outputs were split in fish groups using a combination of behaviour pattern as deduced from echo diagrams, the 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_{λ} -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.

A systematic approach to a) divide the s_{λ} -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). A sample of 60 flat sardinella in one sample will have equal importance to 30 fish in another sample and not the double weight in accordance with the number of fish in the sample.
- The mean back scattering strength (ρ/s_{λ}) of each length frequency distribution of the target species is calculated and summed. This is automatically done if the length distributions are punched into the Excel spread-sheet prepared for the estimation of the abundance of fish.
- The mean s_{λ} -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 (also automatically done in the Excel spread-sheet given that the s_{λ} - value for the region is punched into the sheet).

- The pooled length distribution is used, together with the mean s_{λ} -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. (This is done in the Excel spread-sheet, given that the area of the region is punched into the sheet).
- The numbers are converted to biomass using the estimated weight at length. (Done in the Excel sheet if the condition factor is punched).

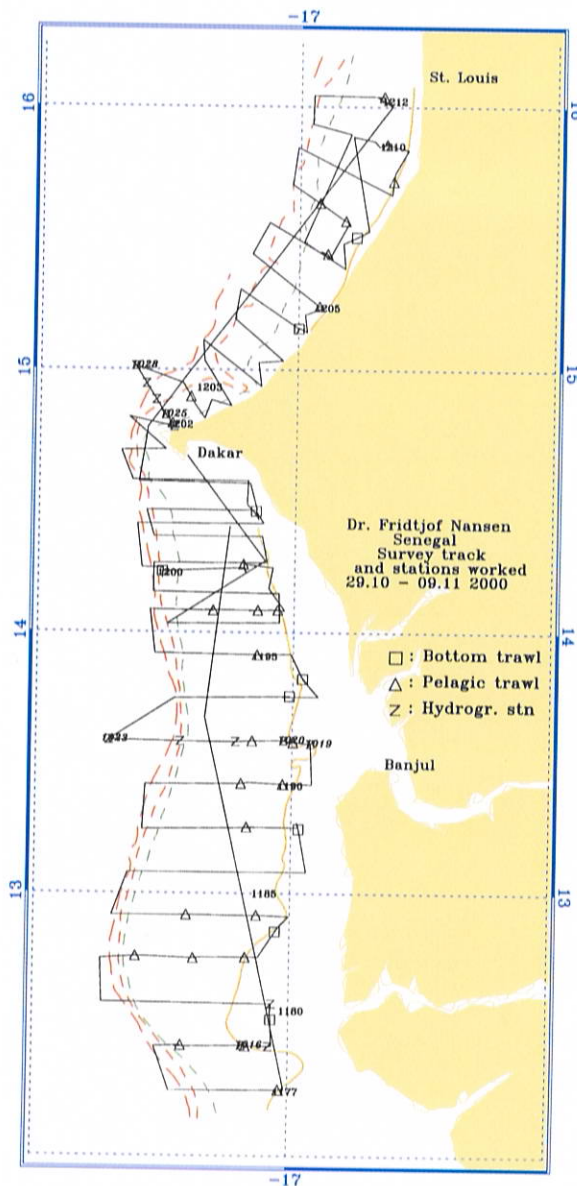
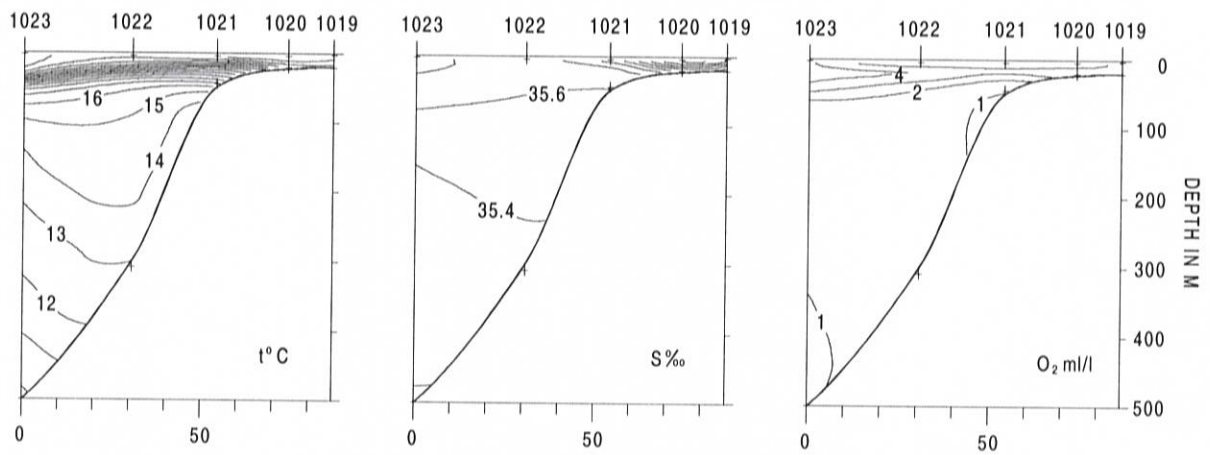


Figure 1 Course tracks with fishing and hydrographic stations; Casamance to St. Louis.

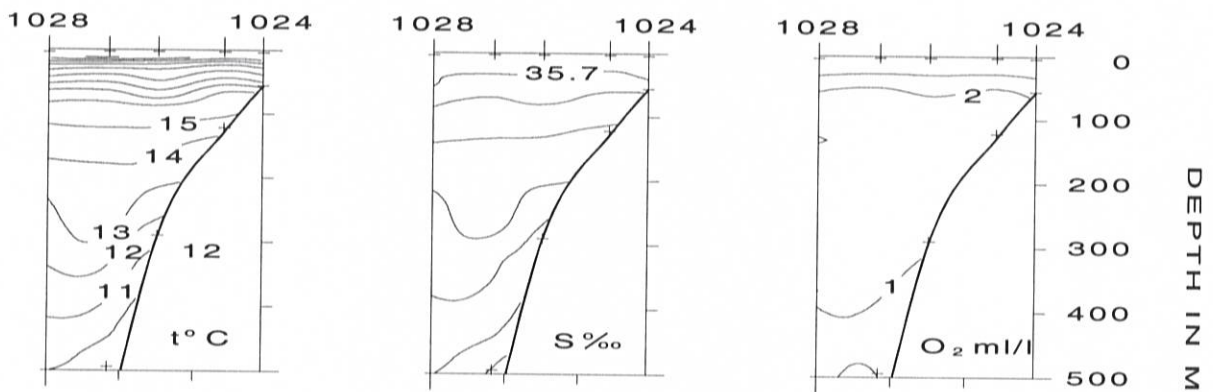
CHAPTER 2 SURVEY RESULTS

2.1 Hydrography

Figure 2 shows the distribution of temperature, salinity and oxygen in the two profiles and Figure 3 the sea surface temperature at 5 m of depth.



CAPE VERT 03.11 2000



THE GAMBIA - WEST 01.11 2000

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

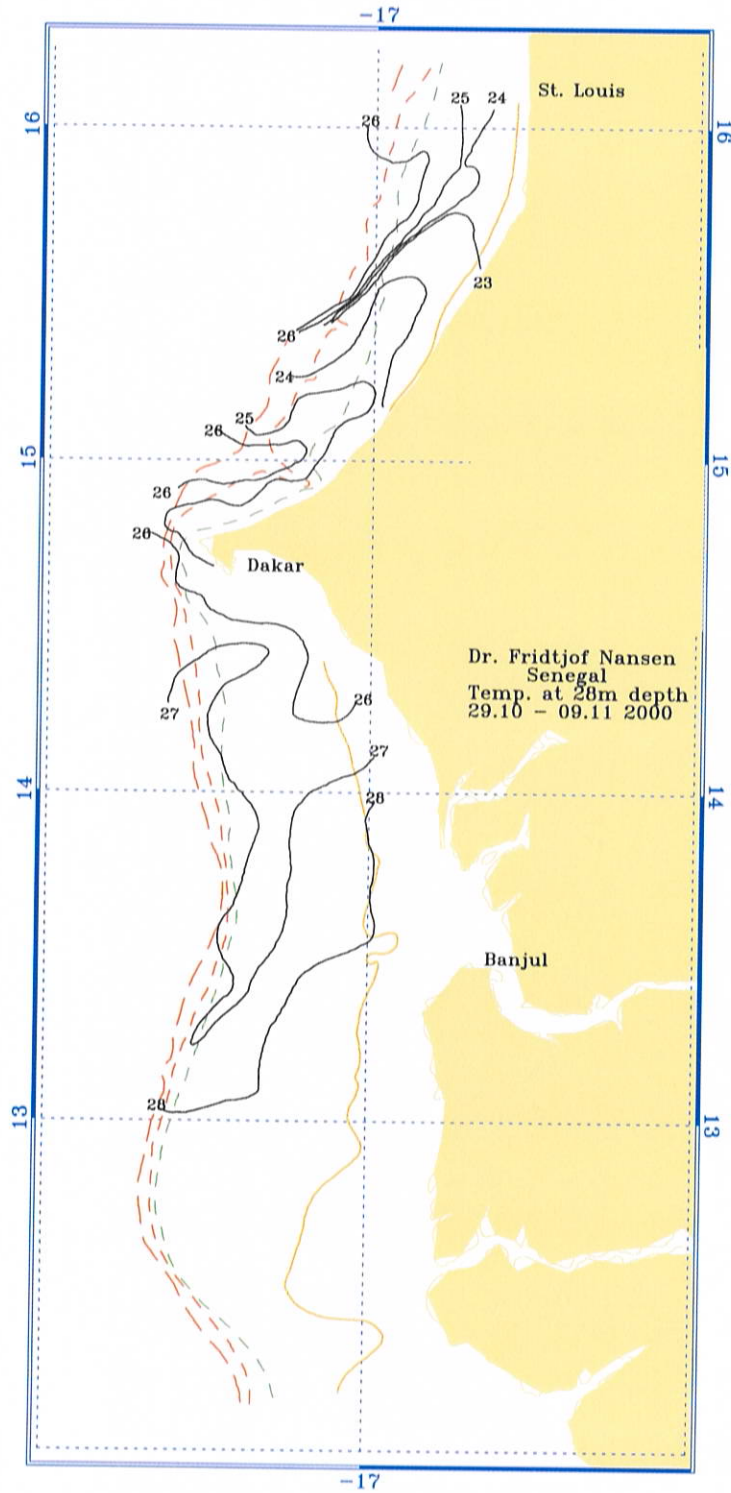


Figure 3 Sea surface temperature; Casamance to St. Louis.

The distribution of surface temperature and the profile The Gambia-West show that there was a stable surface layer with a temperature of 27-28°C over the whole shelf south of Dakar. North of Cape Vert there was a trend of decreasing temperature towards the shore, with a decline from 26°C over the entire shelf just north of Cape Vert to 24°C close to the shore off St. Louis.

2.2 The Casamance shelf

Figures 4, 5 and 6 show the distributions of the main groups of pelagic fish by contoured acoustic densities for the whole shelf of Senegal and The Gambia.

Off the Casamance coast, about 20-30 NM north-west of the river mouth, there was a school area of sardinella of medium and high density in shallow waters, mostly inside the 25 m depth line (Figure 4). The samples from this aggregation were predominantly (88%) *Sardinella maderensis*. The modal size was 24 cm (total length). The size composition is shown in Annex III and the stock length compositions by numbers and weight in Annex IV. The total biomass of sardinellas in the area was estimated at 95 000 tonnes (Table 1).

A distribution area of horse mackerels at low density was found some 20-40 NM off the coast (Figure 5). The fish in this area was mainly large sized scad, *Decapterus* sp. with a modal length of 30 cm. The total biomass of horse mackerels in the area was 24 000 tonnes, of which 95 % were scad.

Other pelagic fish were found in various densities, and over a wider area than the sardinellas, see Figure 6. The trawl samples indicated that these consisted of bumper, lookdown, barracudas, two-colour jack and hairtails, with the bumper as the dominating species. The estimated biomass of this group of fish was 82 000 tonnes.

Table 1. Casamance. Biomass estimates of pelagic fish, 1 000 tonnes.

Flat sardinella 84	Round sardinella 11	Horse mackerels 24	Carangids etc 82
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2.3 The Gambian shelf

The school area of sardinella found inshore off Casamance continued northwards off The Gambia (Figure 4). The highest concentrations were recorded as a medium density area some 20 NM off the coast. The samples showed a 70% dominance of flat sardinella (*Sardinella maderensis*) with a smaller proportion of round sardinella (*S. aurita*). The pooled length composition of the flat sardinella had a mode of 23 cm, see Annex III. The stock length compositions by numbers and weight are shown in Annex IV.

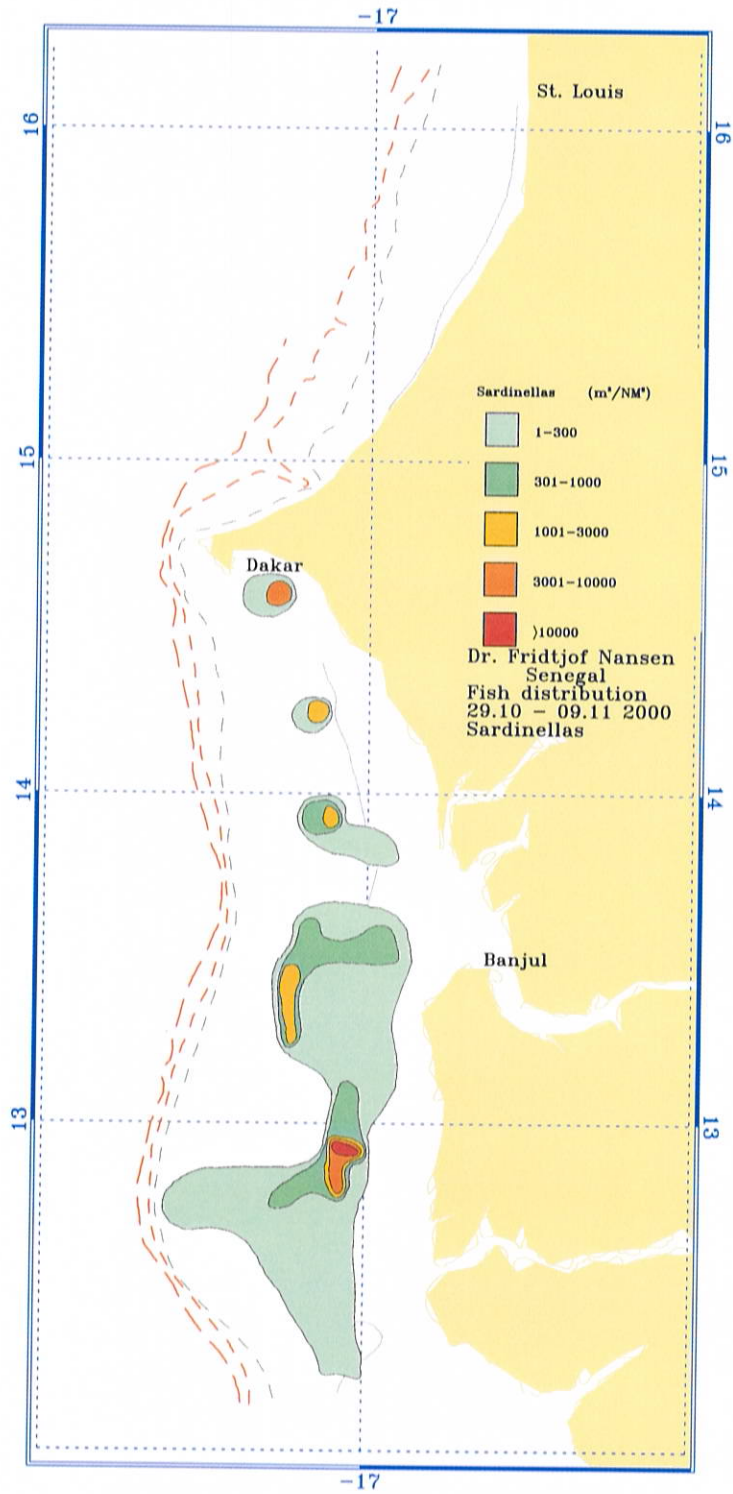


Figure 4 Distribution of sardinellas; Casamance to St. Louis.

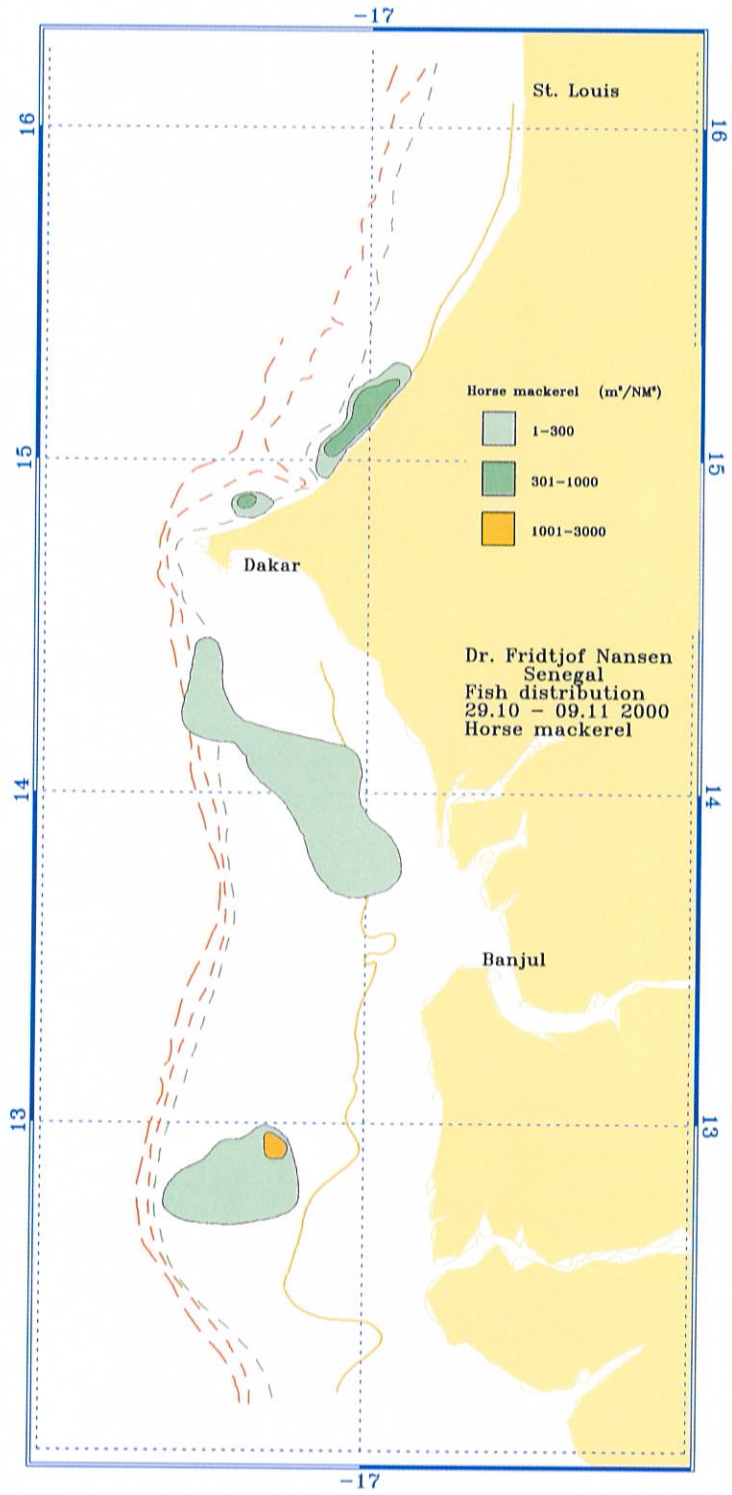


Figure 5 Horse mackerels; Casamance to St. Louis.

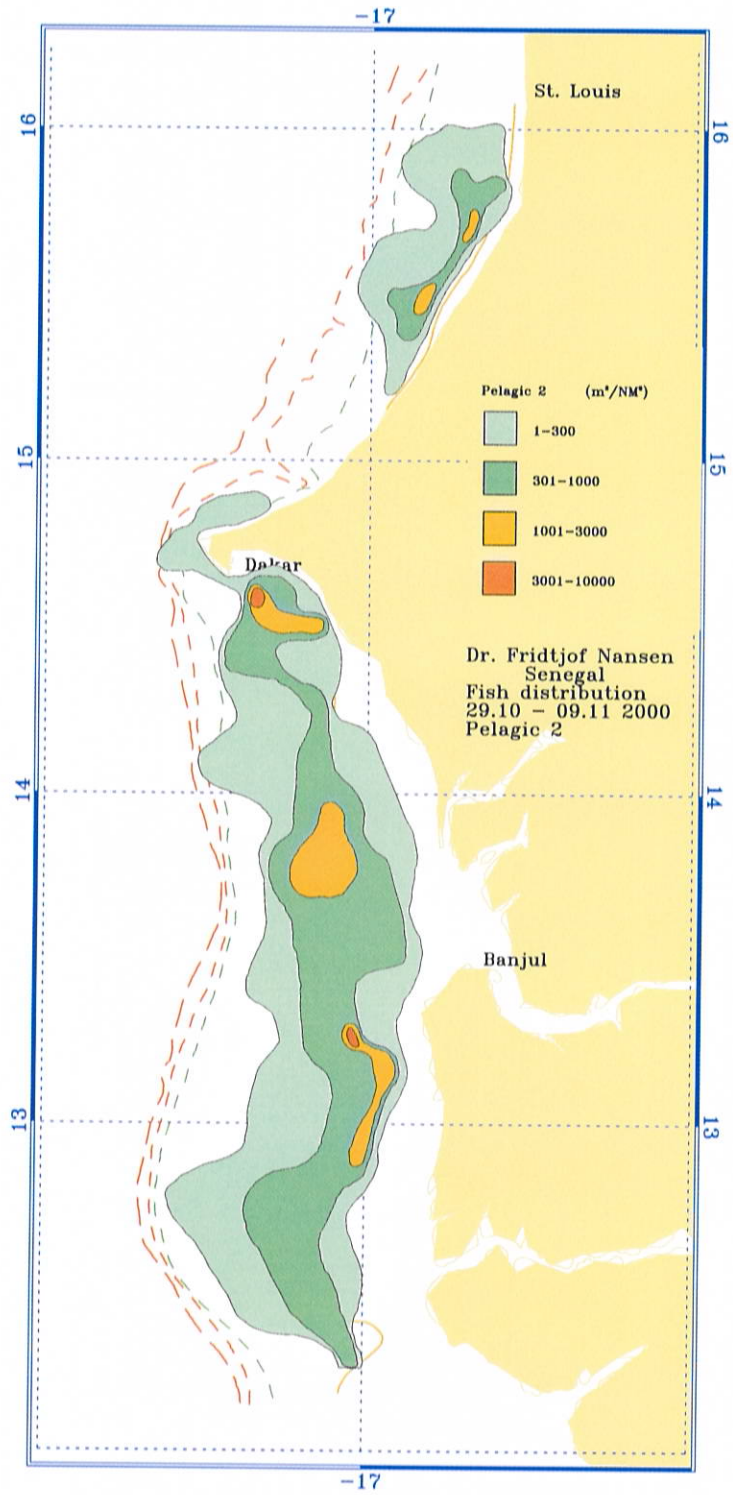


Figure 6. Carangids and associated species; Casamance to St. Louis

Table 2 shows that the biomass estimates of the sardinellas amounted to 73 000 tonnes, of which 52 000 tonnes were flat sardinella.

Horse mackerels were absent from the area (Figure 5).

Carangids and associated species were found widely distributed over the inner shelf (Figure 6). Catches of this group consisted mainly of bumper, African lookdown and barracudas. The biomass was estimated at 140 000 tonnes.

Table 2. The Gambia. Biomass estimates of pelagic fish, 1 000 tonnes.

Flat sardinella 52	Round sardinella 21	Horse mackerels -	Carangids etc. 140
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2.4 The Gambian border - Cape Vert

Three smaller concentrations of sardinella were found in this area; one some 20 NM west of the outlet of the Saloum River, another some 15 NM west of Pointe Sarène, and the third about 10 NM south-east of Dakar (Figure 4). The greatest densities were found between 25 and 40 m depth. Table 3 shows the biomass estimates for the two sardinella species that summed up to 102 000 tonnes. Flat sardinella dominated the estimated biomass in the area by 83%.

Pooled length compositions of samples showed that both flat and round sardinella had modal lengths of 25 cm, see Annex III. Stock size compositions by numbers and weight are shown in Annex IV.

The horse mackerels in this area had a wide and scattered distribution from off the outlet of the Saloum River to some 10 NM south of Dakar (Figure 5). The total biomass was estimated at some 17 000 tonnes of which 83% were scad (*Decapterus* sp.). The modal length of the scad in this area was 29 cm.

Also here, the carangids and associated pelagic fish, were distributed over most of the area with the highest concentrations outside the Saloum River, see Figure 5. Again, bumper was caught in most of the trawl samples. The biomass of the carangids and associated pelagic fish was estimated at about 210 000 tonnes (Table 3).

Table 3. The Gambia border to Cape Vert. Biomass estimates of pelagic fish, 1 000 tonnes.

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
85	17	17	210

2.5 Cape Vert - St. Louis

On this part of the shelf no sardinella were found (Figure 4).

Horse mackerel were found in two areas, a small one north of Dakar and a somewhat larger distribution area stretching from Cayar to Bono (Figure 5). The aggregations were found close to shore in medium densities. The total biomass was estimated at 10 000 tonnes, with a 70% dominance of scad (*Decapterus* sp.). The modal length of the Atlantic horse mackerel (*Trachurus trecae*) was 24 cm, while that of scad was 29 cm.

Carangids and associated pelagic fish were mainly found in low densities around Cape Vert and in a wider area, with higher densities stretching from Bonor to St. Louis. (Figure 6). The catches consisted also here of bumper, African lookdown and hairtails. The biomass estimate was 57 000 tonnes.

Table 4. Cape Verte to St. Louis. Biomass estimates of pelagic fish, 1 000 tonnes.

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
-	-	10	57

CHAPTER 3 OVERVIEW AND SUMMARY OF RESULTS

The survey was conducted successfully in the period October 29 to November 9 with a course track of about 1 500 NM and 36 fishing stations.

The hydrographical data showed a stable surface layer for the whole shelf in the south, but with declining surface temperatures towards the coast from about Dakar northwards.

Pelagic fish

Sardinellas were found in a continuous belt along the inshore shelf from Casamance in the south to Banjul (Figure 4). High densities were found in the northern part of Casamance and south of Dakar. Flat sardinella dominated in all areas. Sardinella were absent from the area between Cape Vert and St. Louis.

Horse mackerels were found in scattered concentrations off Casamance, from Saloum River to Dakar, and in a smaller area, close to shore, north of Dakar (Figure 5).

South of Cape Vert, the distribution of carangids and associated species formed a band along the coast, on the inner shelf, mainly inside the isobath of 50 m (Figure 5). The catches of this group consisted of bumper, barracudas and hairtails.

An overview of the acoustic estimates of biomass of the main groups of pelagic fish is shown in Table 5. The total biomass of sardinellas was thus 270 000 tonnes, horse mackerels – 51 000 tonnes and of carangids and associated species - 489 000 tonnes.

Table 5. Summary of biomass estimates of pelagic fish, Senegal and The Gambia. 1 000 tonnes.

	Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
St. Louis-Cape Vert	-	-	10	57
Cape Vert-Gambia	85	17	17	210
Gambia	52	21	-	140
Casamance	84	11	24	82
Total	221	49	51	489

Table 6 lists biomass estimates of sardinellas and carangids (including the horse mackerels) and associated species from the 'Dr. Fridtjof Nansen' surveys of this shelf region. Large-scale latitudinal movements of pelagic fish between West Sahara and Guinea Bissau are well known and November is still, normally, within the season of northern distribution. Compared with the November-December 96 and 97 surveys the estimate of 270 000 tonnes of

sardinellas from the current survey is in line. The carangid estimate of 489 000 tonnes is at the level of the estimate in 1999 and is the highest since 1996.

Table 6. Biomass estimates from previous 'Dr Fridtjof Nansen' surveys of the Senegal-The Gambia shelf. 1 000 tonnes.

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	231	526
NovDec-97	295	254
NovDec-98	388	344
NovDec-99	1 385	467
NovDec-00	270	489

* Horse mackerels 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.

ANNEX I Records of fishing stations

PROJECT STATION:1177
 DATE:30/10/00 GEAR TYPE: PT No:7 POSITION:Lat N 1215
 start stop duration Long W 1702
 TIME :04:14:31 04:44:09 30 (min) Purpose code: 1
 LOG : 284.09 285.81 1.70 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 20 24 Validity code:
 Towing dir: 270° Wire out: 150 m Speed: 30 kn*10
 Sorted: 7 Kg Total catch: 7.81 CATCH/HOUR: 15.62

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Elops lacerta	5.08	12	32.52	
Hemicarax bicolor	4.12	26	26.38	
Ilisha africana	2.40	92	15.36	
Brachydeuterus auritus	1.80	26	11.52	
Sardinella maderensis	1.52	18	9.73	2213
Trachinotus ovatus	0.36	2	2.30	
Trichiurus lepturus	0.24	16	1.54	
Chloroscombrus chrysurus	0.08	4	0.51	
Hemiramphus brasiliensis	0.02	2	0.13	
Total	15.62		99.99	

PROJECT STATION:1178
 DATE:30/10/00 GEAR TYPE: PT No:1 POSITION:Lat N 1225
 start stop duration Long W 1725
 TIME :09:17:59 09:41:44 24 (min) Purpose code: 1
 LOG : 329.30 330.75 1.36 Area code : 4
 FDEPTH: 40 44 GearCond.code:
 BDEPTH: 61 75 Validity code:
 Towing dir: 270° Wire out: 200 m Speed: 35 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Total				

PROJECT STATION:1179
 DATE:30/10/00 GEAR TYPE: PT No:7 POSITION:Lat N 1225
 start stop duration Long W 1710
 TIME :11:50:14 12:21:58 32 (min) Purpose code: 1
 LOG : 348.42 349.95 1.51 Area code : 4
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 19 19 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 30 kn*10
 Sorted: 77 Kg Total catch: 77.13 CATCH/HOUR: 144.62

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sphyraena guachancho	96.84	159	66.96	
Scorpaenopsis tritor	20.21	21	13.97	
Trachinotus ovatus	14.55	84	10.06	
Sardinella maderensis	4.95	39	3.42	2214
Chloroscombrus chrysurus	4.01	39	2.77	
Caranx senegalensis	1.58	6	1.09	
Decapterus rhonchus	1.46	2	1.01	
Bemora remora	0.49	2	0.34	
Hemicarax bicolor	0.45	4	0.31	
Trichiurus lepturus	0.08	2	0.06	
Total	144.62		99.99	

PROJECT STATION:1180
 DATE:30/10/00 GEAR TYPE: BT No:2 POSITION:Lat N 1231
 start stop duration Long W 1704
 TIME :14:00:59 14:30:33 30 (min) Purpose code: 1
 LOG : 360.99 362.44 1.44 Area code : 4
 FDEPTH: 13 13 GearCond.code:
 BDEPTH: 13 13 Validity code:
 Towing dir: 360° Wire out: 80 m Speed: 30 kn*10
 Sorted: 89 Kg Total catch: 427.16 CATCH/HOUR: 854.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	304.80	728	35.68	
Pomadasys jubelini	160.80	240	18.82	
Ilisha africana	76.40	10540	8.94	
Alectis alexandrinus	64.80	80	7.58	
Rhinoptera marginata	55.60	24	6.51	
Chloroscombrus chrysurus	43.60	460	5.10	
Arius heudeloti	35.80	74	4.19	
Galeoides decadactylus	31.60	320	3.70	
Sardinella maderensis	20.40	120	2.39	2215
Trichiurus lepturus	19.60	400	2.29	
Selene dorsalis	14.40	160	1.69	
GERREIDAE	13.20	80	1.55	
Sphyraena guachancho	7.04	16	0.82	
Scorpaenopsis tritor	1.88	2	0.22	
Carcharhinus sp.	1.76	2	0.21	
Elops lacerta	1.32	4	0.15	
Pseudolithus senegalensis	0.56	2	0.07	
Pteroncion peli	0.20	2	0.02	
Penaeus kerathurus	0.20	2	0.02	
Pteroncion peli	0.20	2	0.02	
Drepane africana	0.20	2	0.02	
Total	854.36		99.99	

PROJECT STATION:1181
 DATE:30/10/00 GEAR TYPE: PT No:4 POSITION:Lat N 1245
 start stop duration Long W 1736
 TIME :20:19:29 20:49:58 30 (min) Purpose code: 1
 LOG : 421.74 423.35 1.60 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 52 51 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 35 kn*10
 Sorted: 9 Kg Total catch: 9.54 CATCH/HOUR: 19.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	6.88	128	36.06	2217
DALDA01	2.48	10	13.00	
Fistularia petimba	2.28	8	11.95	
Lagocephalus laevigatus	2.16	4	11.32	
Decapterus rhonchus	1.92	48	10.06	2216
Engraulis encrasicolus	1.52	238	7.97	
Ariomma bondi	0.80	10	4.19	
Sardinella aurita	0.44	14	2.31	
Decapterus rhonchus	0.32	2	1.68	
Sepia officinalis hierredda	0.28	6	1.47	
Total	19.08		100.01	

PROJECT STATION:1182
 DATE:30/10/00 GEAR TYPE: PT No:4 POSITION:Lat N 1245
 start stop duration Long W 1723
 TIME :22:17:25 22:49:27 32 (min) Purpose code: 1
 LOG : 435.17 436.96 1.79 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 37 35 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 35 kn*10
 Sorted: 439 Kg Total catch: 439.04 CATCH/HOUR: 823.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	336.00	2070	40.82	
Sardinella maderensis	231.60	1500	28.13	2218
Galeoides decadactylus	74.40	90	9.04	
Alectis alexandrinus	68.51	81	8.32	
Pomadasys jubelini	37.05	71	4.50	
Decapterus rhonchus	24.56	77	2.98	2219
Sphyraena guachancho	20.48	15	2.49	
Selene dorsalis	19.80	150	2.41	
Sepia officinalis hierredda	6.60	30	0.80	
Dactylopterus volitans	4.20	30	0.51	
Total	823.20		100.00	

PROJECT STATION:1183
 DATE:31/10/00 GEAR TYPE: PT No:7 POSITION:Lat N 1245
 start stop duration Long W 1710
 TIME :00:05:29 00:15:00 30 (min) Purpose code: 1
 LOG : 447.15 448.64 1.47 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 20 19 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 30 kn*10
 Sorted: 20 Kg Total catch: 20.86 CATCH/HOUR: 41.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	26.36	410	63.18	
Arius heudeloti	6.56	8	15.72	
Selene dorsalis	2.36	30	5.66	
Scorpaenopsis tritor	1.76	2	4.22	
Decapterus rhonchus	1.76	12	4.22	2221
Trachinotus ovatus	0.52	2	1.25	
Trichiurus lepturus	0.52	4	1.25	
Sardinella maderensis	0.48	6	1.15	2220
Chloroscombrus chrysurus	0.44	6	1.05	
Ilisha africana	0.44	6	1.05	
C R A B S	0.36	6	0.86	
Hemiramphus brasiliensis	0.16	2	0.38	
Total	41.72		99.99	

PROJECT STATION:1184
 DATE:31/10/00 GEAR TYPE: BT No:2 POSITION:Lat N 1251
 start stop duration Long W 1703
 TIME :01:40:23 02:10:08 30 (min) Purpose code: 1
 LOG : 457.30 458.77 1.47 Area code : 4
 FDEPTH: 18 19 GearCond.code:
 BDEPTH: 18 19 Validity code:
 Towing dir: 360 Wire out: 90 m Speed: 30 kn*10
 Sorted: 32 Kg Total catch: 195.56 CATCH/HOUR: 391.12

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Brachydeuterus auritus	136.40	1896	34.87	
Sardinella maderensis	86.64	900	22.15	2222
Arius heudeloti	84.00	408	21.48	
Pomadasya jubelini	32.16	60	8.22	
Decapterus rhonchus	11.04	36	2.82	
Syacium micrurum	7.20	12	1.84	
Selene dorsalis	6.48	72	1.66	
Mugil capurrii	6.24	12	1.60	
GERREIDAE	6.00	96	1.53	
SQUASE01	5.76	24	1.47	
Sphyaena guachancho	4.32	12	1.10	
Chloroscombrus chrysurus	2.16	36	0.55	
Galeoides decadactylus	1.44	48	0.37	
Penaeus notialis	0.72	300	0.18	
Penaeus kerathurus	0.72	36	0.18	
Total	391.28	100.02		

PROJECT STATION:1185
 DATE:31/10/00 GEAR TYPE: PT No:6 POSITION:Lat N 1255
 start stop duration Long W 1708
 TIME :03:27:57 03:57:50 30 (min) Purpose code: 1
 LOG : 469.68 471.52 1.80 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 22 26 Validity code:
 Towing dir: 270 Wire out: 150 m Speed: 37 kn*10
 Sorted: 64 Kg Total catch: 1394.49 CATCH/HOUR: 2788.98

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Chloroscombrus chrysurus	1624.54	20898	58.25	
Brachydeuterus auritus	847.10	123410	30.37	
Alectis alexandrinus	180.60	172	6.48	
Sardinella maderensis	60.20	558	2.16	2223
Galeoides decadactylus	25.80	128	0.93	
Sphyaena guachancho	13.76	42	0.49	
Arius heudeloti	12.90	86	0.46	
GERREIDAE	8.60	86	0.31	
Decapterus rhonchus	8.60	42	0.31	
Selene dorsalis	6.02	86	0.22	
Penaeus notialis	0.86	42	0.03	
Total	2788.98	100.01		

PROJECT STATION:1186
 DATE:31/10/00 GEAR TYPE: PT No:4 POSITION:Lat N 1255
 start stop duration Long W 1724
 TIME :05:51:48 06:22:38 31 (min) Purpose code: 4
 LOG : 485.80 487.68 1.85 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 44 47 Validity code:
 Towing dir: 270 Wire out: 150 m Speed: 35 kn*10
 Sorted: 34 Kg Total catch: 387.14 CATCH/HOUR: 749.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Decapterus rhonchus	442.84	1788	59.10	2225
Alectis alexandrinus	268.26	277	35.80	
Caranx cryosus	31.35	23	4.18	2224
Selene dorsalis	2.55	21	0.34	
Sarda sarda	2.36	2	0.31	
Auxis thazard	1.94	4	0.26	
Total	749.30	99.99		

PROJECT STATION:1187
 DATE:31/10/00 GEAR TYPE: BT No:2 POSITION:Lat N 1315
 start stop duration Long W 1658
 TIME :13:51:33 14:21:02 29 (min) Purpose code: 1
 LOG : 564.81 566.31 1.49 Area code : 5
 FDEPTH: 15 16 GearCond.code:
 BDEPTH: 15 16 Validity code:
 Towing dir: 350 Wire out: 90 m Speed: 30 kn*10
 Sorted: 70 Kg Total catch: 599.08 CATCH/HOUR: 1239.48

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Chloroscombrus chrysurus	509.14	8230	47.53	
Brachydeuterus auritus	289.12	5487	23.33	
Pomadasya jubelini	173.75	492	14.02	
Sparus caeruleostictus *	73.86	211	5.96	
Sardinella maderensis	60.50	563	4.88	2226
Balistes punctatus	15.48	17	1.25	
Sphyaena guachancho	15.48	35	1.25	
Pomadasya incisus	6.68	35	0.54	
Decapterus rhonchus	2.46	52	0.20	
Selene dorsalis	2.11	35	0.17	
GERREIDAE	0.83	8	0.07	
Galeoides decadactylus	0.46	4	0.04	
Total	1229.87	99.24		

PROJECT STATION:1188
 DATE:31/10/00 GEAR TYPE: PT No:1 POSITION:Lat N 1315
 start stop duration Long W 1710
 TIME :16:27:50 16:58:26 31 (min) Purpose code: 1
 LOG : 583.29 585.32 2.00 Area code : 5
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 37 34 Validity code:
 Towing dir: 90 Wire out: 150 m Speed: 40 kn*10
 Sorted: 13 Kg Total catch: 13.14 CATCH/HOUR: 25.43

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Chloroscombrus chrysurus	19.55	194	76.88	
Sardinella maderensis	5.15	48	20.25	2227
Brachydeuterus auritus	0.58	8	2.28	
Sepia elegans	0.15	12	0.59	
Total	25.43	100.00		

PROJECT STATION:1189
 DATE:31/10/00 GEAR TYPE: PT No:4 POSITION:Lat N 1325
 start stop duration Long W 1712
 TIME :22:53:54 23:23:26 30 (min) Purpose code: 1
 LOG : 645.48 647.22 1.72 Area code : 5
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 45 42 Validity code:
 Towing dir: 90 Wire out: 150 m Speed: 35 kn*10
 Sorted: 35 Kg Total catch: 370.82 CATCH/HOUR: 741.64

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Brachydeuterus auritus	253.20	3220	34.14	
Chloroscombrus chrysurus	195.20	1440	26.32	
Sardinella aurita	90.40	58	12.19	2229
Selene dorsalis	89.60	820	12.08	
Trachurus traciae	52.00	620	7.01	2230
Sardinella maderensis	31.60	260	4.26	2228
Arius heudeloti	14.04	10	1.89	
Sphyaena guachancho	7.60	22	1.02	
Decapterus rhonchus	4.00	20	0.54	
Dactylopterus volitans	3.20	10	0.43	
Decapterus punctatus	0.80	60	0.11	
Total	741.64	99.99		

PROJECT STATION:1190
 DATE:1/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1325
 start stop duration Long W 1702
 TIME :00:27:46 00:57:17 30 (min) Purpose code: 1
 LOG : 655.16 656.62 1.44 Area code : 5
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 24 21 Validity code:
 Towing dir: 90 Wire out: 150 m Speed: 30 kn*10
 Sorted: 36 Kg Total catch: 287.28 CATCH/HOUR: 574.56

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Brachydeuterus auritus	378.56	6144	65.89	
Sardinella maderensis	81.44	928	14.17	2231
Pomadasya jubelini	52.16	192	9.08	
Arius heudeloti	32.32	128	5.63	
Chloroscombrus chrysurus	15.04	176	2.62	
Pomadasya incisus	5.76	32	1.00	
Trichurus lepturus	5.12	16	0.89	
Selene dorsalis	1.92	16	0.33	
Decapterus rhonchus	1.60	16	0.28	
Sardinella aurita	0.64	96	0.11	2232
Total	574.56	100.00		

PROJECT STATION:1191
 DATE:1/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1335
 start stop duration Long W 1700
 TIME :03:30:28 04:00:04 30 (min) Purpose code: 1
 LOG : 675.68 677.44 1.51 Area code : 5
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 16 21 Validity code:
 Towing dir: 270 Wire out: 150 m Speed: 30 kn*10
 Sorted: 32 Kg Total catch: 342.31 CATCH/HOUR: 684.62

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP	
weight	numbers			
Brachydeuterus auritus	390.00	5440	56.97	
Sardinella maderensis	81.20	1040	11.86	2233
Pomadasya jubelini	47.60	120	6.95	
Pomadasya incisus	40.40	220	5.90	
GERREIDAE	25.20	260	3.68	
Octopus vulgaris	23.60	20	3.45	
Galeoides decadactylus	13.20	80	1.93	
Arius heudeloti	10.80	40	1.58	
Pomadasya jubelini	9.12	20	1.33	
Carcharhinus limbatus	8.80	2	1.29	
Decapterus punctatus	8.00	4	1.17	
Pagellus bellottii	6.02	34	0.88	
Chloroscombrus chrysurus	4.80	60	0.70	
Selene dorsalis	4.00	20	0.58	
Dactylopterus volitans	2.40	20	0.35	
Trichurus lepturus	2.16	4	0.32	
SQUASE01	1.76	8	0.26	
Scomeromorus tritor	1.44	2	0.21	
Sparus caeruleostictus *	1.44	6	0.21	
Penaeus kerathurus	1.08	76	0.16	
Pagrus pagrus	0.80	2	0.12	
Lutjanus dentatus	0.48	2	0.07	
Penaeus notialis	0.32	26	0.05	
Total	684.62	100.02		

PROJECT STATION:1192
 DATE: 1/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1335 Long W 1709
 start stop duration
 TIME :05:33:21 06:07:03 34 (min) Purpose code: 1
 LOG : 685.37 687.16 1.77 Area code : 5
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 38 41 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 30 kn*10
 Sorted: 38 Kg Total catch: 180.98 CATCH/HOUR: 319.38

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	81.48	739	25.51	
Sardinella aurita	81.16	524	25.41	2234
Brachydeuterus auritus	80.05	946	25.06	
Sardinella maderensis	41.77	454	13.08	2235
Sphyræna guachancho	18.21	7	5.70	
Decapterus rhonchus	6.83	41	2.14	
Decapterus punctatus	4.61	184	1.44	
Arius heudeloti	2.58	2	0.81	
Selene dorsalis	2.22	25	0.70	
Remora remora	0.32	9	0.10	
Sepia officinalis hierreda	0.16	25	0.05	
Total	319.39		100.00	

PROJECT STATION:1193
 DATE: 1/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1345 Long W 1701
 start stop duration
 TIME :14:16:29 14:46:04 30 (min) Purpose code: 1
 LOG : 763.89 765.49 1.58 Area code : 4
 FDEPTH: 23 25 GearCond.code:
 BDEPTH: 23 25 Validity code:
 Towing dir: 270e Wire out: 120 m Speed: 30 kn*10
 Sorted: 66 Kg Total catch: 1421.15 CATCH/HOUR: 2842.30

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	1265.06	196510	44.51	
Chloroscombrus chrysurus	1213.46	15222	42.69	
Pagellus bellottii	76.54	558	2.69	
Decapterus rhonchus	67.08	430	2.36	2238
Sphyræna guachancho	47.30	128	1.66	
Pomadasy incisus	43.00	214	1.51	
Galeoides decadactylus	42.14	258	1.48	
Sparus pagrus africanus *	18.92	42	0.67	
Sardinella aurita	16.34	86	0.57	2237
Pseudupeneus prayensis	16.34	86	0.57	
Pagellus acarne	16.34	86	0.57	
GERREIDAE	10.32	86	0.36	
Selene dorsalis	7.74	86	0.27	
Sardinella maderensis	1.72	86	0.06	2236
Total	2842.30		99.97	

PROJECT STATION:1194
 DATE: 1/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1349 Long W 1658
 start stop duration
 TIME :16:38:14 17:07:34 29 (min) Purpose code: 1
 LOG : 780.88 782.34 1.45 Area code : 4
 FDEPTH: 16 15 GearCond.code:
 BDEPTH: 16 15 Validity code:
 Towing dir: 140e Wire out: 90 m Speed: 30 kn*10
 Sorted: 39 Kg Total catch: 517.92 CATCH/HOUR: 1071.56

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	327.60	4734	30.57	
Pomadasy jubelini	277.03	888	25.85	
Alectis alexandrinus	174.83	188	16.32	
Sphyræna guachancho	143.09	403	13.35	
Galeoides decadactylus	48.41	269	4.52	
Sardinella maderensis	27.43	188	2.56	2239
Pagrus pagrus	21.52	54	2.01	
Chloroscombrus chrysurus	14.52	188	1.36	
Decapterus rhonchus	12.91	54	1.20	2240
GERREIDAE	12.37	108	1.15	
Sparus caeruleostictus *	5.92	81	0.55	
Pomadasy incisus	2.69	27	0.25	
Selene dorsalis	2.69	27	0.25	
Pseudupeneus prayensis	0.54	27	0.05	
Total	1071.55		99.99	

PROJECT STATION:1195
 DATE: 1/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 1355 Long W 1709
 start stop duration
 TIME :18:21:19 20:01:27 32 (min) Purpose code: 1
 LOG : 800.96 802.62 1.64 Area code : 4
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 34 32 Validity code:
 Towing dir: 90e Wire out: 150 m Speed: 31 kn*10
 Sorted: 71 Kg Total catch: 1505.73 CATCH/HOUR: 2823.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	1295.44	11931	45.88	
Sardinella aurita	720.56	3859	25.52	2241
Brachydeuterus auritus	252.79	2402	8.95	
Sardinella maderensis	200.81	1536	7.11	2242
Decapterus rhonchus	126.79	1063	4.49	2243
Pomadasy incisus	91.35	630	3.24	
Dactylopterus volitans	55.91	433	1.98	
Trachurus trecae	27.56	354	0.98	2244
Decapterus punctatus	16.54	591	0.59	
Pagellus bellottii	14.96	79	0.53	
Carcharhinus limbatus	11.44	2	0.41	
Auxis thazard	5.55	4	0.20	
Sepia officinalis hierreda	3.15	79	0.11	
Total	2823.25		99.99	

PROJECT STATION:1196
 DATE: 2/11/00 GEAR TYPE: PT No:5 POSITION:Lat N 1405 Long W 1719
 start stop duration
 TIME :00:01:20 01:40:56 30 (min) Purpose code: 1
 LOG : 855.12 856.97 1.82 Area code : 4
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 69 72 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 40 kn*10
 Sorted: 11 Kg Total catch: 11.49 CATCH/HOUR: 22.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	13.88	292	60.40	
Trachinocephalus myops	7.52	1150	32.72	
Loligo vulgaris	0.40	6	1.74	
Remora remora	0.32	2	1.39	
Sardinella aurita	0.32	4	1.39	
Sepia elegans	0.16	8	0.70	
OPHIDIIDAE	0.12	292	0.52	
Priacanthus arenatus	0.08	4	0.35	
Alloteuthis africana	0.08	52	0.35	
Ariomma bondi	0.08	24	0.35	
Selene dorsalis	0.02	12	0.09	
Total	22.98		100.00	

PROJECT STATION:1197
 DATE: 2/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1405 Long W 1708
 start stop duration
 TIME :03:20:41 03:21:09 30 (min) Purpose code: 1
 LOG : 871.59 873.60 1.98 Area code : 4
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 30 33 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 40 kn*10
 Sorted: 67 Kg Total catch: 1483.64 CATCH/HOUR: 2967.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	2270.40	20636	76.51	
Brachydeuterus auritus	285.12	3124	9.61	
Carcharhinus limbatus	227.04	44	7.65	
Decapterus rhonchus	56.32	704	1.90	2246
Sphyræna guachancho	55.44	176	1.87	
Sardinella maderensis	21.12	132	0.71	2245
Decapterus punctatus	18.48	132	0.62	2247
Pomadasy incisus	10.56	44	0.36	
Selene dorsalis	9.68	44	0.33	
Dactylopterus volitans	4.40	44	0.15	
Peneus notialis	4.40	132	0.15	
Trachurus trecae	4.40	44	0.15	
Total	2967.36		100.01	

PROJECT STATION:1198
 DATE: 2/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1405 Long W 1704
 start stop duration
 TIME :06:40:57 08:20:33 16 (min) Purpose code: 1
 LOG : 882.44 883.28 0.82 Area code : 4
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 19 22 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 30 kn*10
 Sorted: 54 Kg Total catch: 53.96 CATCH/HOUR: 202.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	123.45	1534	61.01	
Decapterus rhonchus	38.36	461	18.96	2248
GERREIDAE	19.50	184	9.64	
Chloroscombrus chrysurus	7.13	56	3.52	
Carcharhinus limbatus	4.05	4	2.00	
Pomadasy jubelini	3.98	8	1.97	
Galeoides decadactylus	3.00	15	1.48	
Selene dorsalis	1.35	11	0.67	
Pomadasy incisus	0.83	8	0.41	
Calappa pelli	0.38	4	0.19	
Sepia elegans	0.15	11	0.07	
Alloteuthis africana	0.08	41	0.04	
Peneus kerathurus	0.08	4	0.04	
Sepia officinalis hierreda	0.04	4	0.02	
Total	202.38		100.02	

PROJECT STATION:1199
 DATE: 2/11/00 GEAR TYPE: PT No:3 POSITION:Lat N 1416 Long W 1712
 start stop duration
 TIME :07:35:10 08:26:01 33 (min) Purpose code: 1
 LOG : 907.32 909.63 1.99 Area code : 4
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 34 32 Validity code:
 Towing dir: 90e Wire out: 120 m Speed: 45 kn*10
 Sorted: 5 Kg Total catch: 4.56 CATCH/HOUR: 8.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	4.22	29	50.90	2249
CARCA01	3.78	27	45.60	
Sardinella aurita	0.29	2	3.50	
Total	8.29		100.00	

PROJECT STATION:1200
 DATE: 2/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1414 Long W 1731
 start stop duration
 TIME :11:16:37 11:44:20 28 (min) Purpose code: 1
 LOG : 931.84 933.28 1.44 Area code : 4
 FDEPTH: 126 123 GearCond.code:
 BDEPTH: 126 123 Validity code:
 Towing dir: 180° Wire out: 400 m Speed: 30 kn*10
 Sorted: 37 Kg Total catch: 148.32 CATCH/HOUR: 317.83

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Boops boops	239.14	3497	75.24	
Trachurus trecae	55.89	1080	17.58	
Ariomma bondi	18.34	309	5.77	
Scomber japonicus	2.74	17	0.86	
Decapterus rhonchus	1.71	17	0.54	
Total	317.82		99.99	

PROJECT STATION:1201
 DATE: 2/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1428 Long W 1709
 start stop duration
 TIME :16:48:40 17:28:01 39 (min) Purpose code: 1
 LOG : 984.76 986.78 2.00 Area code : 4
 FDEPTH: 21 19 GearCond.code:
 BDEPTH: 21 19 Validity code:
 Towing dir: 180° Wire out: 120 m Speed: 30 kn*10
 Sorted: 69 Kg Total catch: 6369.22 CATCH/HOUR: 9798.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	7221.88	132669	73.70	
Diplodus vulgaris	1516.22	27300	15.47	
Galeoides decadactylus	237.62	2829	2.42	
Sphyaena guachancho	161.23	283	1.65	
Lithognathus mormyrus	149.92	566	1.53	
Pomadasya jubelini	147.09	283	1.50	
Parus caeruleostictus	87.68	283	0.89	
Pomadasya incisus	84.86	849	0.87	
CAKCA01	67.88	566	0.69	
Pseudupeneus prayensis	55.15	1272	0.56	
Pagellus bellottii	48.08	708	0.49	
GERREIDAE	14.14	142	0.14	
Decapterus rhonchus	7.06	142	0.07	
Total	9798.81		99.98	

PROJECT STATION:1202
 DATE: 3/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1448 Long W 1729
 start stop duration
 TIME :01:06:29 01:35:21 29 (min) Purpose code: 1
 LOG :1064.33 1066.17 1.83 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 101 124 Validity code:
 Towing dir: 320° Wire out: 150 m Speed: 30 kn*10
 Sorted: 40 Kg Total catch: 141.47 CATCH/HOUR: 292.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Auxis thazard	252.00	1260	86.09	
Trachurus trecae	17.38	600	5.94	
Synagrops microlepis	9.41	1130	3.21	
Ariomma bondi	3.91	261	1.34	
Sardinella aurita	3.62	238	1.24	2250
Engraulis encrasicolus	2.17	811	0.74	
MYCTOPHIDAE	1.45	223	0.50	
Lagocephalus lagocephalus	0.72	6	0.25	
Sepia elegans	0.72	14	0.25	
Trichiurus lepturus	0.58	14	0.20	
Todarodes sagittatus	0.58	14	0.20	
Lagocephalus laevigatus	0.08	6	0.03	
Selene dorsalis	0.06	14	0.02	
Total	292.68		100.01	

PROJECT STATION:1203
 DATE: 3/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1454 Long W 1725
 start stop duration
 TIME :05:47:31 06:19:01 32 (min) Purpose code: 1
 LOG :1095.55 1097.54 1.97 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 136 124 Validity code:
 Towing dir: 150° Wire out: 153 m Speed: kn*10
 Sorted: 75 Kg Total catch: 2074.05 CATCH/HOUR: 3888.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	2806.03	38931	72.16	2251
Auxis thazard	599.16	2837	15.41	
Brachydeuterus auritus	313.50	1650	8.06	
Trichiurus lepturus	133.03	1031	3.42	
Scomber japonicus	19.59	53	0.50	
Sardinella aurita	16.50	206	0.42	
Lagocephalus lagocephalus	1.03	53	0.03	
Total	3888.84		100.00	

PROJECT STATION:1204
 DATE: 3/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1510 Long W 1700
 start stop duration
 TIME :16:21:10 16:50:32 29 (min) Purpose code: 1
 LOG :1196.18 1197.58 1.35 Area code : 4
 FDEPTH: 48 47 GearCond.code:
 BDEPTH: 48 47 Validity code:
 Towing dir: 210° Wire out: 220 m Speed: 30 kn*10
 Sorted: 69 Kg Total catch: 589.21 CATCH/HOUR: 1219.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	566.98	5506	46.51	
Brachydeuterus auritus	252.19	1601	20.69	
Pagellus bellottii	228.79	1618	18.77	
Pomadasya jubelini	39.04	106	3.20	
Boops boops	37.63	528	3.09	
Lithognathus mormyrus	24.97	89	2.05	
Sphyaena guachancho	16.88	238	1.38	
Penaeus notialis	13.37	117	1.10	
Pomadasya incisus	13.01	54	1.07	
Loligo vulgaris	11.61	1055	0.95	
Pseudupeneus prayensis	6.50	124	0.53	
Alloteuthis africana	2.81	950	0.23	
Pistularia petimba	2.81	35	0.23	
Trichiurus lepturus	1.76	35	0.14	
Decapterus rhonchus	0.70	70	0.06	
Total	1219.05		100.00	

PROJECT STATION:1205
 DATE: 3/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 1515 Long W 1655
 start stop duration
 TIME :18:37:37 19:05:53 28 (min) Purpose code: 1
 LOG :1212.41 1214.16 1.71 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 31 47 Validity code:
 Towing dir: 290° Wire out: 150 m Speed: 35 kn*10
 Sorted: 66 Kg Total catch: 3093.00 CATCH/HOUR: 6627.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	4723.07	34078	71.26	
Trachurus trecae	1223.36	8471	18.46	2253
Chloroscombrus chrysurus	139.50	996	2.10	
Decapterus rhonchus	129.54	499	1.95	
Selene dorsalis	121.56	1296	1.83	
Pomadasya incisus	111.60	300	1.68	
Lithognathus mormyrus	60.77	300	0.92	
Selene dorsalis	29.89	101	0.45	
Remora remora	24.90	101	0.38	
Sardinella maderensis	23.91	199	0.36	
Boops boops	21.92	199	0.33	
Stromateus fiatola	21.00	28	0.32	
Total	6631.02		100.04	

PROJECT STATION:1206
 DATE: 4/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1527 Long W 1653
 start stop duration
 TIME :00:06:43 00:36:48 30 (min) Purpose code: 1
 LOG :1258.39 1259.95 1.54 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 55 69 Validity code:
 Towing dir: 294° Wire out: 150 m Speed: 30 kn*10
 Sorted: 71 Kg Total catch: 1070.70 CATCH/HOUR: 2141.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	1582.50	8040	73.90	
Selene dorsalis	262.80	1290	12.27	
Brachydeuterus auritus	91.20	720	4.26	
Trachurus trecae	63.00	480	2.94	
Decapterus rhonchus	52.80	300	2.47	
Trichiurus lepturus	27.00	450	1.26	
Campodrama glaycos	14.40	30	0.67	
Stromateus fiatola	14.40	30	0.67	
Trachinotus ovatus	10.80	30	0.50	
Sphyaena guachancho	9.00	60	0.42	
Engraulis encrasicolus	4.80	3450	0.22	
Alloteuthis africana	1.80	510	0.08	
Loligo vulgaris	1.20	600	0.06	
Sepia elegans	0.60	120	0.03	
Sardinella aurita	0.32	4	0.01	
Sardinella maderensis	0.02	2		
Total	2136.64		99.76	

PROJECT STATION:1207
 DATE: 4/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1534 Long W 1649
 start stop duration
 TIME :02:17:03 02:47:02 30 (min) Purpose code: 1
 LOG :1273.45 1275.18 1.72 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 44 55 Validity code:
 Towing dir: 306° Wire out: 150 m Speed: 35 kn*10
 Sorted: 42 Kg Total catch: 694.42 CATCH/HOUR: 1388.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	540.00	972	38.88	
Selene dorsalis	257.76	2052	18.56	
Chloroscombrus chrysurus	180.00	972	12.96	
Decapterus punctatus	87.80	396	6.32	
Trichiurus lepturus	68.40	1368	4.92	
Alectis alexandrinus	60.48	36	4.35	
Carcharhinus limbatus	57.60	24	4.15	
Trachinotus ovatus	57.60	216	4.15	
Sphyaena guachancho	19.44	180	1.40	
Sardinella aurita	11.52	180	0.83	
Sardinella maderensis	6.48	180	0.47	
Sepia elegans	3.60	180	0.26	
Dactylopterus volitans	2.16	36	0.16	
Total	1352.84		97.41	

PROJECT STATION:1208
 DATE: 4/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1538
 start stop duration Long W 1655
 TIME :03:48:08 04:18:09 30 (min) Purpose code: 1
 LOG :1280.87 1282.81 1.94 Area code : 4
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 90 102 Validity code:
 Towing dir: 306° Wire out: 150 m Speed: 40 kn*10
 Sorted: 40 Kg Total catch: 39.61 CATCH/HOUR: 79.22

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Total				

PROJECT STATION:1209
 DATE: 4/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1543
 start stop duration Long W 1638
 TIME :08:40:29 09:12:01 32 (min) Purpose code: 1
 LOG :1324.31 1326.18 1.86 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 20 21 Validity code:
 Towing dir: 106° Wire out: 150 m Speed: 35 kn*10
 Sorted: 26 Kg Total catch: 192.45 CATCH/HOUR: 360.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	249.56	741448	69.16	
Pomadasy jubelini	59.06	113	16.37	
Trichiurus lepturus	21.19	60	5.87	
Ilisha africana	5.36	62	1.49	
Galeoides decadactylus	4.88	13	1.35	
Brachydeuterus auritus	4.13	32	1.14	
Selene dorsalis	3.71	53	1.03	
Sphyræna guachancho	3.19	6	0.88	
Sardinella maderensis	3.09	83	0.86	
Stromateus fiatola	2.72	4	0.75	
Sardinella aurita	1.86	32	0.52	
Trachinotus ovatus	1.44	11	0.40	
Caranx senegalus	0.66	2	0.18	
Total	360.85		100.00	

PROJECT STATION:1210
 DATE: 4/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 1552
 start stop duration Long W 1640
 TIME :10:39:55 11:08:14 20 (min) Purpose code: 1
 LOG :1337.44 1339.32 1.79 Area code : 4
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 34 41 Validity code:
 Towing dir: 288° Wire out: 150 m Speed: 35 kn*10
 Sorted: 32 Kg Total catch: 172.01 CATCH/HOUR: 368.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	105.00	999	28.49	
Trachinotus ovatus	80.87	28	21.94	
Chloroscombrus chrysurus	55.05	309	14.94	
Decapterus rhonchus	44.55	180	12.09	
Carcharhinus limbatus	32.01	26	8.68	
Sardinella maderensis	17.40	75	4.72	2254
Ilisha africana	12.90	180	3.50	
Selene dorsalis	6.30	144	1.71	
Stromateus fiatola	3.64	4	0.99	
Galeoides decadactylus	3.30	6	0.90	
Alectis alexandrinus	2.61	9	0.71	
Sardinella aurita	1.80	75	0.49	
Pomadasy jubelini	1.80	4	0.49	
Lagocephalus lagocephalus	1.20	4	0.33	
Remora remora	0.11	2	0.03	
Sphyræna guachancho	0.04	2	0.01	
Total	368.58		100.02	

PROJECT STATION:1211
 DATE: 4/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1530
 start stop duration Long W 1647
 TIME :14:20:20 14:49:37 29 (min) Purpose code: 1
 LOG :1372.84 1374.31 1.45 Area code : 4
 FDEPTH: 23 21 GearCond.code:
 BDEPTH: 23 21 Validity code:
 Towing dir: 66° Wire out: 150 m Speed: 30 kn*10
 Sorted: 68 Kg Total catch: 1107.12 CATCH/HOUR: 2290.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	793.82	8466	34.66	
Chloroscombrus chrysurus	436.97	5052	19.08	
Trichiurus lepturus	273.10	1502	11.92	
Sepia officinalis hierredda	218.48	319	9.54	
Ilisha africana	141.10	2367	6.16	
Selene dorsalis	132.00	2230	5.76	
Alectis alexandrinus	78.29	137	3.42	
Galeoides decadactylus	77.38	2450	3.38	
Pomadasy jubelini	68.28	182	2.98	
Stromateus fiatola	31.61	41	1.38	
Arius laticutatus	15.48	46	0.68	
Sphyræna guachancho	10.01	91	0.44	
Sepia bertheloti	5.46	14	0.24	
GOBIIDAE	1.82	46	0.08	
Sardinella aurita	1.82	91	0.08	
Sardinella maderensis	1.82	46	0.08	
Lithognathus mormyrus	1.32	2	0.06	
Total	2290.58		100.02	

PROJECT STATION:1212
 DATE: 4/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1602
 start stop duration Long W 1641
 TIME :23:16:58 23:48:45 32 (min) Purpose code: 1
 LOG :1457.19 1458.82 1.61 Area code : 4
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 54 63 Validity code:
 Towing dir: 270° Wire out: 150 m Speed: 30 kn*10
 Sorted: 50 Kg Total catch: 148.74 CATCH/HOUR: 278.89

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	84.75	1191	30.39	
Alectis alexandrinus	43.50	30	15.60	
Brachydeuterus auritus	34.20	195	12.26	
Stromateus fiatola	28.69	36	10.29	
Selene dorsalis	21.75	113	7.80	
Trichiurus lepturus	16.20	240	5.81	
Decapterus rhonchus	16.05	68	5.75	2255
Sphyræna guachancho	12.00	15	4.30	
Engraulis encrasicolus	6.00	17700	2.15	
Chloroscombrus chrysurus	5.21	23	1.87	
Sphyrna zygaena	3.56	2	1.28	
Loligo vulgaris	2.70	1635	0.97	
Lagocephalus laevisgatus	2.10	23	0.75	
Alloteuthis africana	1.65	578	0.59	
Sepia officinalis hierredda	0.30	23	0.11	
Sardinella aurita	0.15	15	0.05	
Todarodes sagittatus	0.08	30	0.03	
Total	278.89		100.00	

Annex II Instruments and fishing gear used

The Simrad EK-500, 38kHz scientific echo sounder was used during the survey for fish abundance estimation. The Bergen Echo Integrator system (BEI) logging the echogram raw data from the sounder, was used to scrutinize the acoustic records, and to allocate integrator data to fish species. All raw data were stored to tape, and a backup of the database of scrutinized data, stored.

The details of the settings of the 38kHz echo sounder where as follows:

Tranceiver-1 menu (38 kHz lowering keel)

Transducer depth	5.5 m
Absorbtion coeff.	10 dB/km
Pulse length	medium (1ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-21.0 dB
SV transducer gain	27.39 dB
TS transducer gain	27.52 dB
Angle sensitivity	21.9
3 dB beamwidth	6.8 dg
Alongship offset	-0.03 "
Athwardship offset	0.06 "

Display menu

Echogram	1
Bottom range	10 m
Bottom range start	10 m
TVG	20 log R
Sv colour min	-60 dB

Printer- menu

Echogram	1
Range	0 – 50 or 0 – 100 and 100 - 350 m
TVG	20 log R

Bottom detection menu Minimum level -40 dB

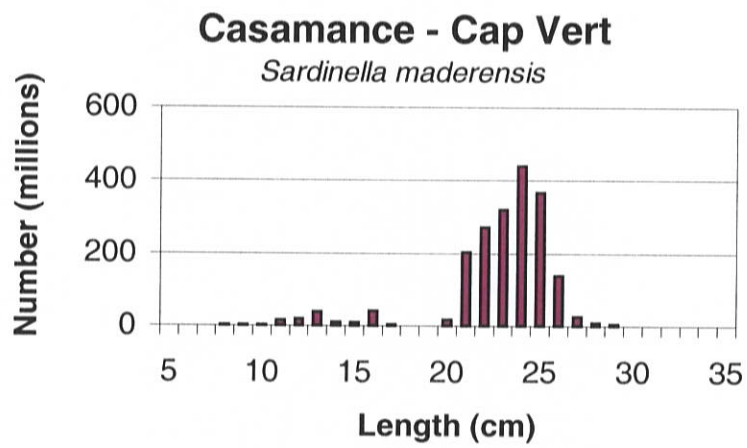
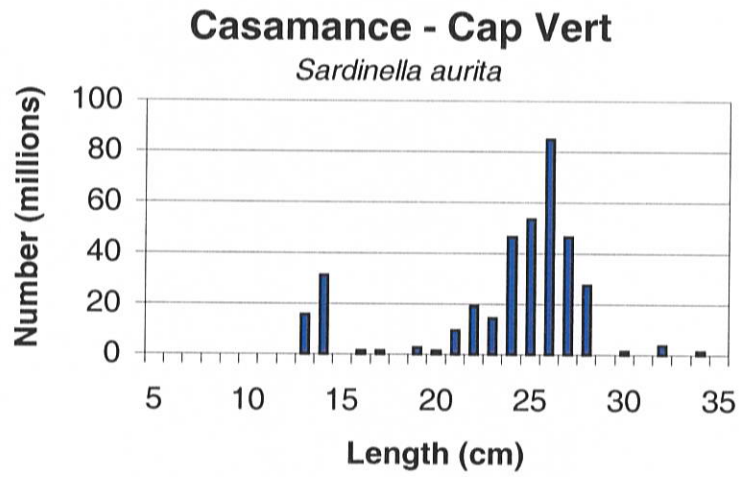
Hydrography

Conductivity, temperature, density and dissolved oxygen were sampled at CTD stations with Seabird 911 + CTD sonde. The salinity is computed from the data on conductivity by the software retrieving data from the sensors.

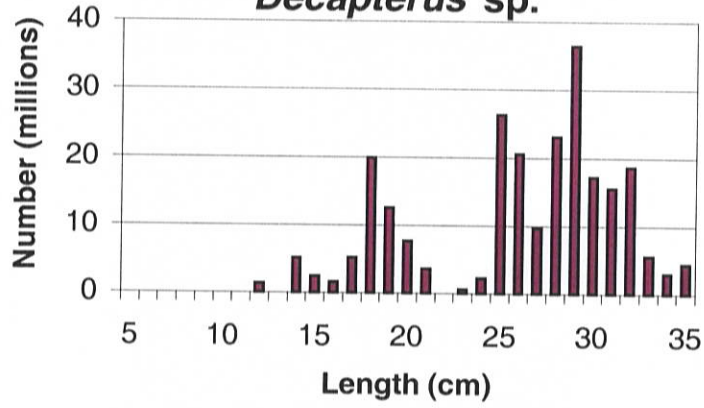
Fishing gear

The vessel has two different sized "Åkrahavn" pelagic trawls and one "Gisund super bottom trawl". For all trawls, the Tyborøn, 7.8m² (1670kg) trawl doors were used. Complete drawings of the trawls used are included.

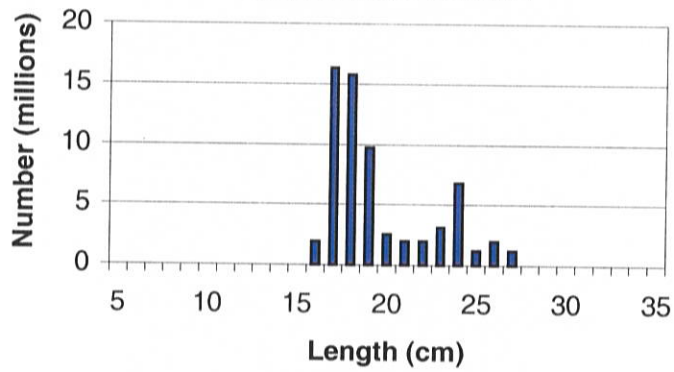
Annex III Pooled length distribution by species and regions



Casamance - Cap Vert
***Decapterus* sp.**



Casamance - Cap Vert
Trachurus trecae



Annex IV Stock length distribution by numbers and weight

Sardinella aurita

Length cm	N (millions)					Biomass (tonnes)				
	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL
5										
6										
7										
8										
9										
10										
11										
12										
13				15 576	15 576				330	330
14				31 152	31 152				817	817
15										
16			1 355		1 355			52		52
17			1 355		1 355			62		62
18										
19			2 710		2 710			173		173
20			1 355		1 355			100		100
21			9 483		9 483			811		811
22			19 066		19 066			1 868		1 868
23		3 676	10 607		14 282	410	1 184			1 594
24		11 027	19 859	15 576	46 461	1 395	2 512	1 970		5 876
25		36 756	16 588		53 343	5 241	2 365			7 607
26		18 378	19 859	46 728	84 965	2 941	3 178	7 478		13 598
27		14 702	31 589		46 291	2 630	5 650			8 279
28		18 378	9 252		27 630	3 659	1 842			5 501
29										
30			1 355		1 355			331		331
31										
32		3 676			3 676	1 085				1 085
33										
34			1 355		1 355			478		478
35										
TOTAL		106 591	145 785	109 032	361 409		17 361	20 606	10 595	48 561

Annex IV Continued

Sardinella maderensis

Length cm	N (millions)					Biomass (tonnes)				
	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL
5										
6										
7										
8			1 355		1 355			7		7
9			1 355		1 355			10		10
10			1 355		1 355			13		13
11			2 579	12 115	14 694			34	158	192
12			18 055		18 055			303		303
13			25 793	12 115	37 907			546	256	802
14			9 783		9 783			257		257
15			7 868		7 868			252		252
16			5 159	36 344	41 502			199	1 404	1 603
17			2 710		2 710			125		125
18										
19										
20			14 054	3 407	17 461			1 041	252	1 294
21		3 676	84 895	114 598	203 168		314	7 256	9 795	17 365
22		29 404	85 797	156 777	271 978		2 880	8 405	15 358	26 643
23		129 432	110 160	80 179	319 771		14 446	12 295	8 949	35 690
24		171 570	72 504	194 737	438 811		21 699	9 170	24 629	55 498
25		222 897	57 179	86 517	366 592		31 785	8 154	12 337	52 276
26		66 948	24 222	47 384	138 554		10 715	3 877	7 583	22 175
27		15 621		9 949	25 570		2 794		1 779	4 573
28		3 676		4 361	8 037		732		868	1 600
29				4 741	4 741				1 047	1 047
30										
31										
32										
33										
34										
35										
TOTAL		643 223	524 821	763 223	1 931 267		85 365	51 943	84 416	221 724

Annex IV Continued

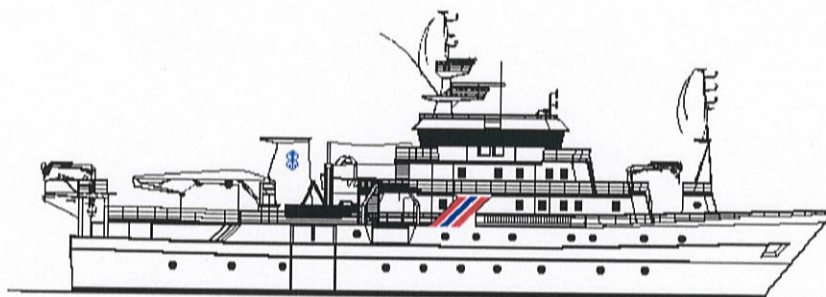
Trachurus trecae

Length cm	N (millions)					Biomass (tonnes)				
	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16				1 934	1 934				75	75
17	858			15 472	16 330	40	40		713	792
18	7 154	1 633		6 962	15 749	390	478		379	1 247
19	7 154	2 177		387	9 718	456	595		25	1 076
20	2 003	544			2 547	148	189			337
21	1 951				1 951	167	167			334
22	1 951				1 951	191	191			382
23	3 122				3 122	348	348			697
24	6 243	544			6 788	790	858			1 648
25	1 171				1 171	167	167			334
26	1 561			387	1 948	250	250		62	562
27	1 171				1 171	209	209			419
28										
29										
30										
31										
32										
33										
34										
35										
TOTAL	34 339	4 898		25 142	64 378	3 156	3 493		1 253	7 902

Annex IV Continued

Decapterus sp.

Length cm	N (millions)					Biomass (tonnes)				
	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL	St. Louis- Cape Vert	Cape Vert- Gambia	Gambia	Casa- mance	TOTAL
5										
6										
7										
8										
9										
10										
11										
12		1 306			1 306		22			22
13										
14		1 959		3 094	5 054		51		81	132
15				2 321	2 321				74	74
16				1 547	1 547				60	60
17		5 166			5 166		238			238
18		19 944			19 944		1 086			1 086
19		11 362		1 160	12 523		725		74	799
20		6 489		1 160	7 649		481		86	567
21		3 508			3 508		300			300
22										
23		544			544		61			61
24		1 809		410	2 218		229		52	281
25		9 060		17 212	26 272		1 292		2 454	3 746
26	4 888	13 161		2 479	20 528	782	2 106		397	3 285
27	1 908	2 452		5 328	9 687	341	439		953	1 733
28	1 908	1 908		19 301	23 117	380	380		3 843	4 602
29	9 538	12 503		14 344	36 385	2 106	2 760		3 167	8 033
30	3 219	3 219		10 735	17 174	786	786		2 619	4 190
31	2 146	2 146		11 265	15 557	577	577		3 028	4 182
32	4 292	4 292		10 036	18 620	1 267	1 267		2 963	5 497
33	1 073	1 073		3 358	5 505	347	347		1 086	1 780
34				2 929	2 929				1 034	1 034
35	1 073	1 617		1 679	4 370	413	622		646	1 681
36	4 292					1 795				
38										
TOTAL	30 046	103 519		108 359	241 924	6 999	13 768		22 617	43 383



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

Cruise Report No 12/2000

Part II MAURITANIA

10 - 18 November 2000

CRUISE REPORTS 'DR FRIDTJOF NANSEN'
SURVEY OF THE PELAGIC FISH RESOURCES
NORTH WEST AFRICA

Part II
MAURITANIA
10 - 18 November 2000

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Bergen, 1998

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CHAPTER 1 INTRODUCTION

1.1 Objective of the cruise

The general objectives were to estimate the 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 there over a period of 50 days, in October-December 2000. For Mauritania the agreed objectives were:

- To map the distribution and estimate the biomass of the main small pelagic fish using hydroacoustic methods. The species of interest are: sardine *Sardina pilchardus*, sardinella *Sardinella aurita*, *S. maderensis*, horse mackerel *Trachurus 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.
- To sample standard hydrographical transects for temperature, salinity and oxygen at about 16°40' N, 18°00' N, 19°00' N, 20°00' N and off Cape Blanc.

The time allocated for this part of the survey, off Mauritania, was 7 days.

1.2 Participation

Members of the scientific teams were:

Centre National de Recherches Océanographiques et des Pêches, Mauritania:
Ely Ould BEIBOU, Sall MAMADOU and M'bodj OUMAR

Centre de Recherches Océanographiques de Dakar-Thiaroy, Senegal:
Abdoulaye SARRE

Department of Fisheries, The Gambia:
Juldah JALLOW

Institut National de Recherches Halieutiques, Morocco:
Hassan MOUSTAHFID

Institute of Marine Research, Norway:
Reidar TORESEN, Valantine ANTHONYPILLAI, Tore MØRK and Jan Frode WILHELMSEN

1.3 Narrative

After embarking of scientists from Mauritania and Morocco, the survey of the Mauritanian shelf started on November the 10 with systematic parallel course tracks spaced about 10 NM (nautical miles) apart. 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. In the latter case, 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). The shelf was covered up to Cape Blanc before a call was made in Nouakchott on November 18, to let participants from the Senegal, The Gambia and Mauritania disembark and scientists from Morocco come onboard.

The hydrographic profile at 16°40' N was sampled on 10 November, at 18°00' N on 12 at 19°00' N on 14 at 20°00' N on 15 and off Cape Blanc on 16 November.

The survey was terminated in Nouakchott on 18 November.

1.4 Methods

Environmental Data

Surface temperature and meteorological data from a weather station were logged automatically and recorded with position and bottom depth every nautical mile sailed.

Hydrographic profiles were collected with a CTD sonde and temperature, salinity, and pressure (depth) were logged by the Seabird Software. From these data series, records were selected from standard depths and presented in figures.

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:

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

The specific condition factors obtained from the samples and applied for this survey were: 0.96 for sardinellas and horse mackerels, and 1.0 for pilchard.

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.

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

The complete records of fishing stations are shown in Annex I.

The following target groups were used for Senegal:

- 1) sardinellas (flat sardinella *Sardinella maderensis* and round sardinella *S. aurita*),
- 2) horse mackerels (Atlantic horse mackerel *Thrachurus trecae*, round scad *Decapterus punctatus*, and false scad *Decapterus rhonchus*),

- 3) other pelagic carangids and associated species (Atlantic bumper *Chloroscombrus chrysurus*, African lookdown *Selene dorsalis*, chub mackerel *Scomber japonicus*, largehead hairtail *Trichiurus lepturus*, and barracudas *Sphyraena* spp.),
- 4) other demersal species (such as bigeye grunt *Brachydeuterus auritus*, Sparidae and Haemulidae), and
- 5) other clupeids such as West African ilisha *Ilisha africana*.

Acoustic sampling

A SIMRAD EK500 Echo-sounder 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 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):

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

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

$$\rho_i = S_A \cdot \frac{P_i}{\sum_{i=1}^n \frac{P_i}{C_{Fi}}}$$

where

ρ_i = density of fish in length group i

S_A = mean integrator value

p_i = proportion of fish in length group i

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

sample of the target species, and

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

The integrator outputs were split in fish groups using a combination of behaviour pattern as deduced from echo diagrams, the 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.

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). A sample of 60 flat sardinella in one sample will have equal importance to 30 fish in another sample and not the double weight in accordance with the number of fish in the sample.
- 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 if the length distributions are punched into the Excel spread-sheet prepared for the estimation of the abundance of fish.

- 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 (also automatically done in the Excel spread-sheet given that the s_A – value for the region is punched into the sheet).
- 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. (This is done in the Excel spread-sheet, given that the area of the region is punched into the sheet).
- The numbers are converted to biomass using the estimated weight at length. (Done in the Excel sheet if the condition factor is punched).

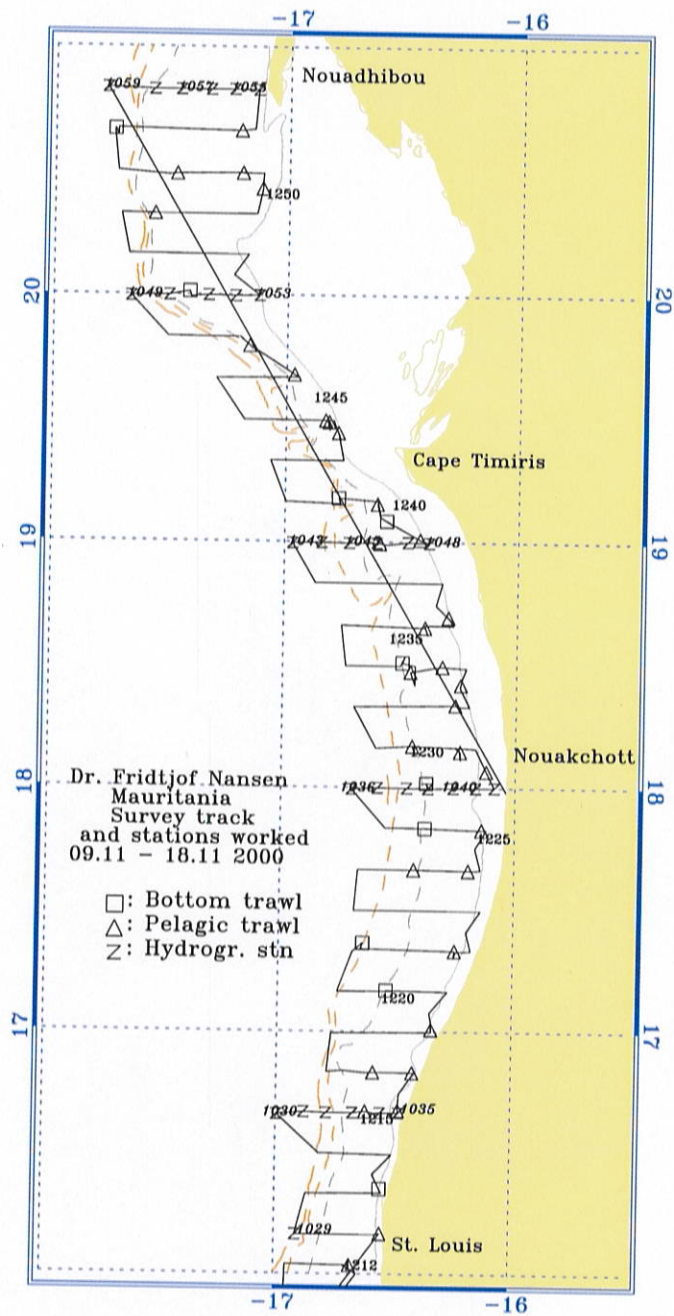


Figure 1 Course track and fishing and hydrographic stations

CHAPTER 2 SURVEY RESULTS

2.1 Hydrography

Figure 2 shows the distribution of temperature, salinity and oxygen in the five profiles and Figure 3 the sea surface temperature at 5 m of depth.

The distribution of surface temperature showed that, near the coast, there was in general lower temperatures than offshore. Over the shelf from St. Louis to Cape Timiris there was a decrease from 24°C to 23°C offshore and from 22 to 19°C inshore.

Between Cape Timiris and Cape Blanc, the surface temperature was low inshore, 18-19°C, increasing offshore to 20°C. Off Cape Blanc, the offshore temperature was 21°C while inshore, the temperature was less than 17°C.

All hydrographic profiles showed a sharp thermocline.

2.2 Pelagic fish on the shelf from St. Louis to Cape Timiris

Figures 4, 5 and 6 show the distribution of the main groups of pelagic fish by contoured acoustic densities for the whole shelf of Mauritania.

Sardinellas were found over the inner shelf in a nearly continuous belt along the entire coast from St. Louis to some 10 NM north of Cape Timiris, see Figure 4. Particularly dense school areas were located between about 17°05' N and 17°30' N, and at about 18°30' N and at 18°50' N. In addition, more offshore aggregations were found between 18°45' N - about 19°30' N.

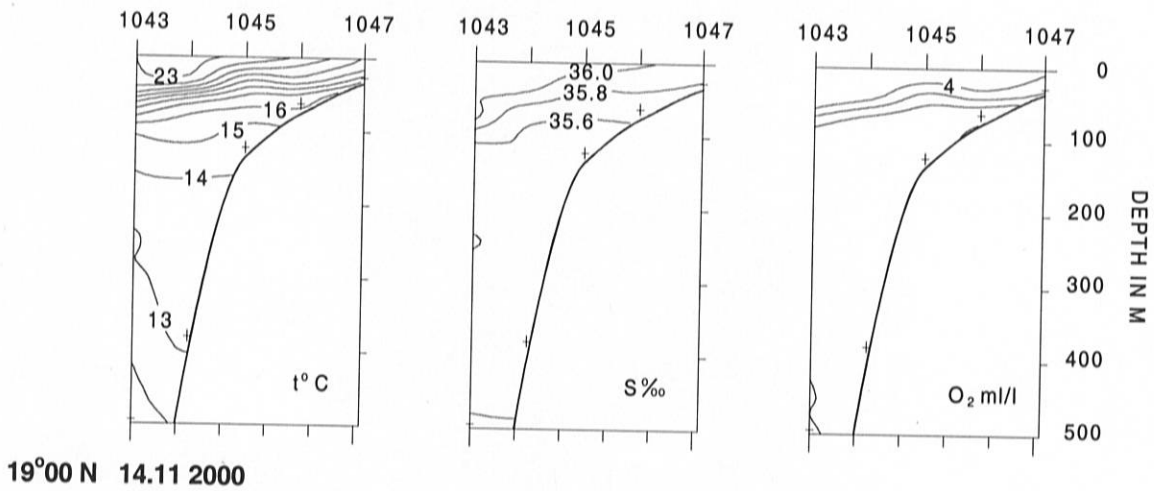
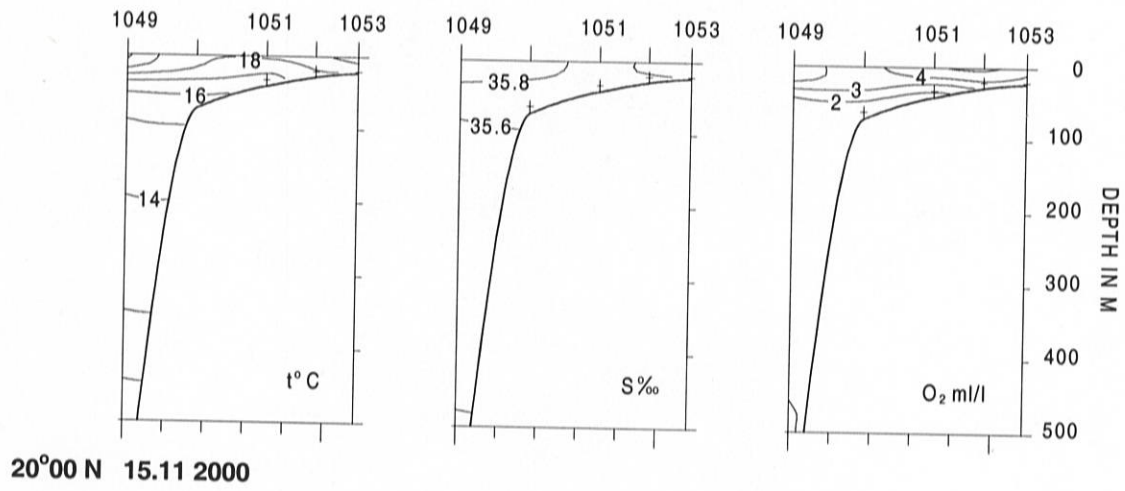
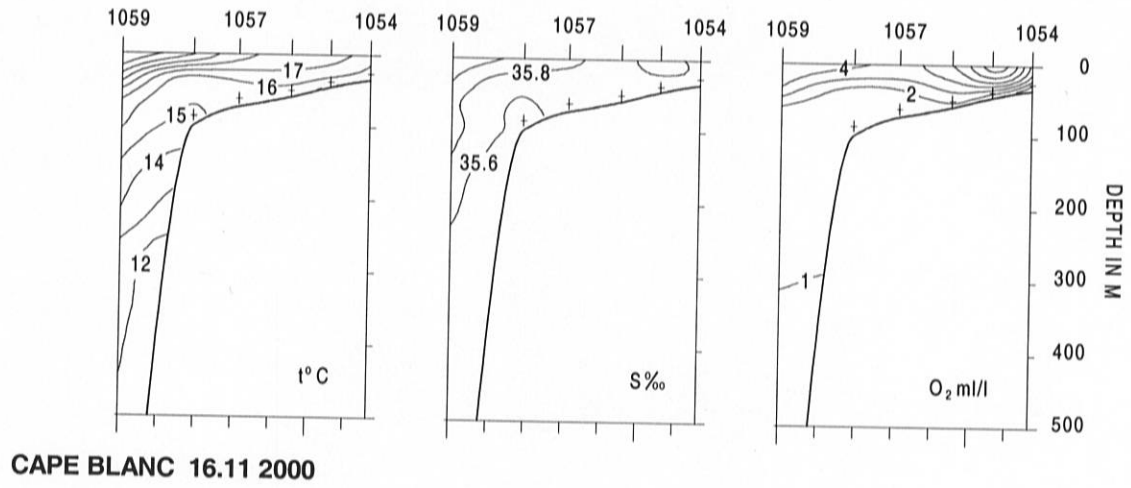
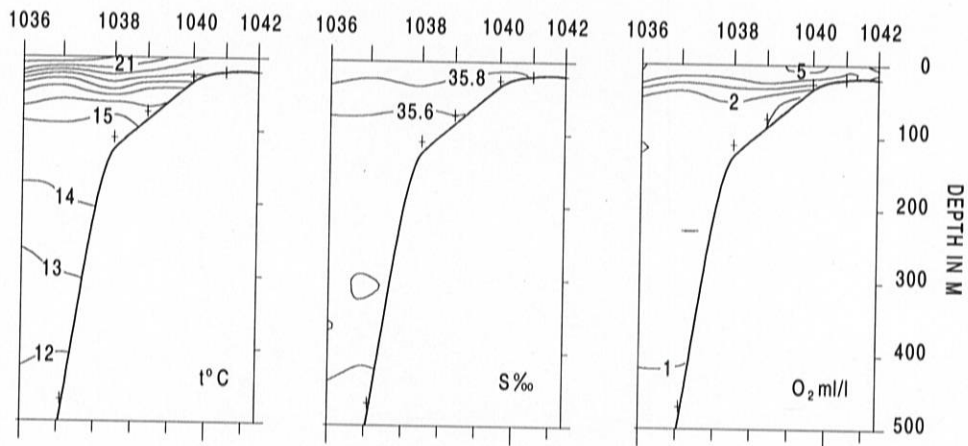
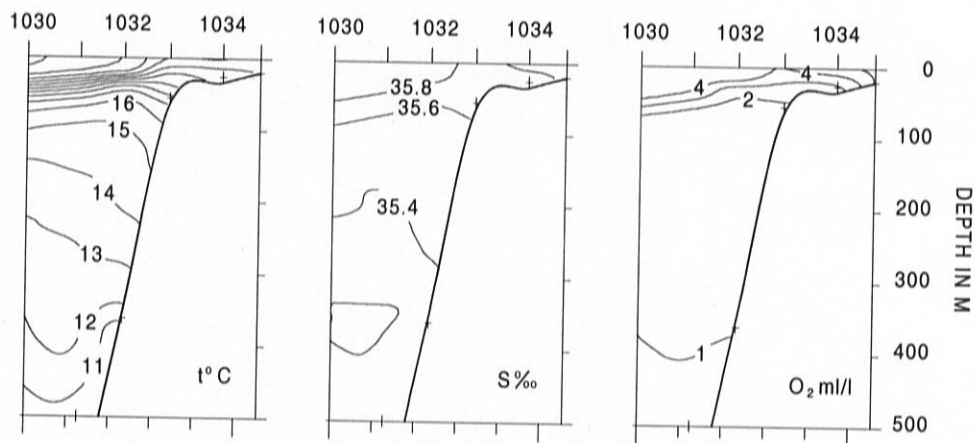


Figure 2. Hydrographic profiles with distribution of temperature, salinity and oxygen



18°00' N 12.11 2000



16°40' N 10.11 2000

Figure 2. continued.

The samples showed sardinellas of varying size, - the round sardinella south of Cape Timiris with modal lengths of 14 and 34 cm, while the flat sardinella had modal lengths of 14 and 30 cm, see Annex III. The stock length compositions by numbers and weight are shown in Annex IV.

Table 1 gives the biomass estimates of sardinellas based on their size composition in the area of sampling. The total estimate was 880 thousand tonnes of which 63% was flat- and 37% round sardinella.

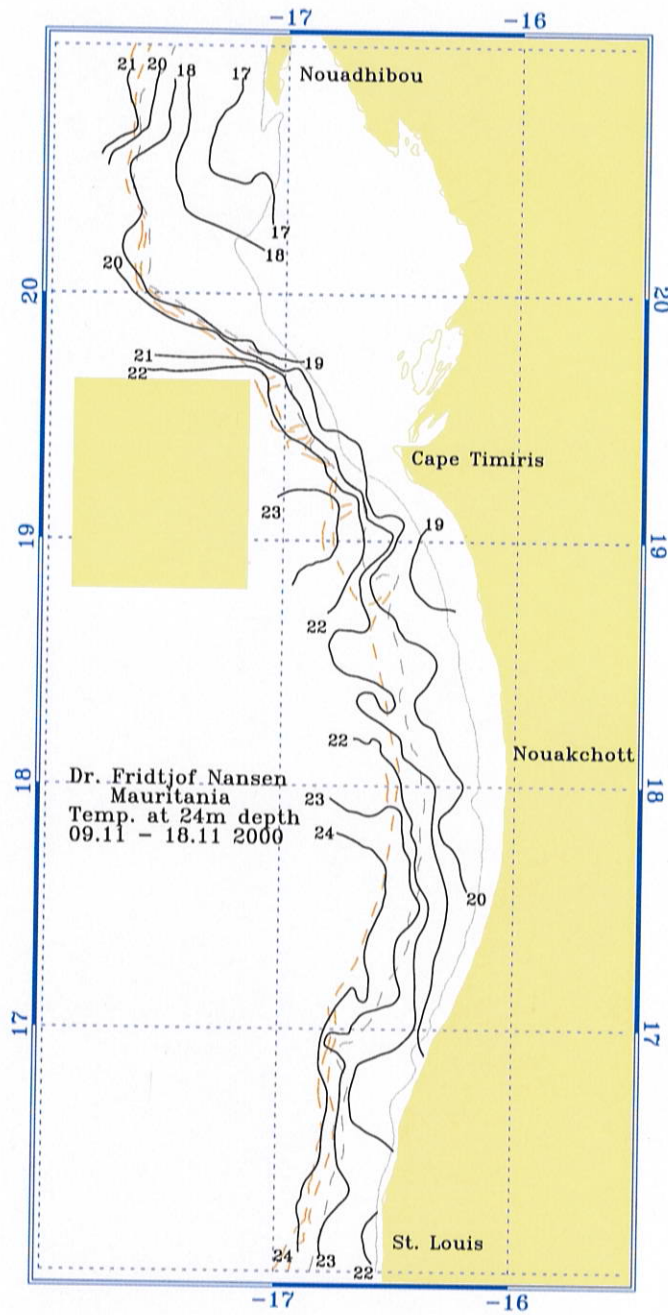


Figure 3 Sea surface temperature.

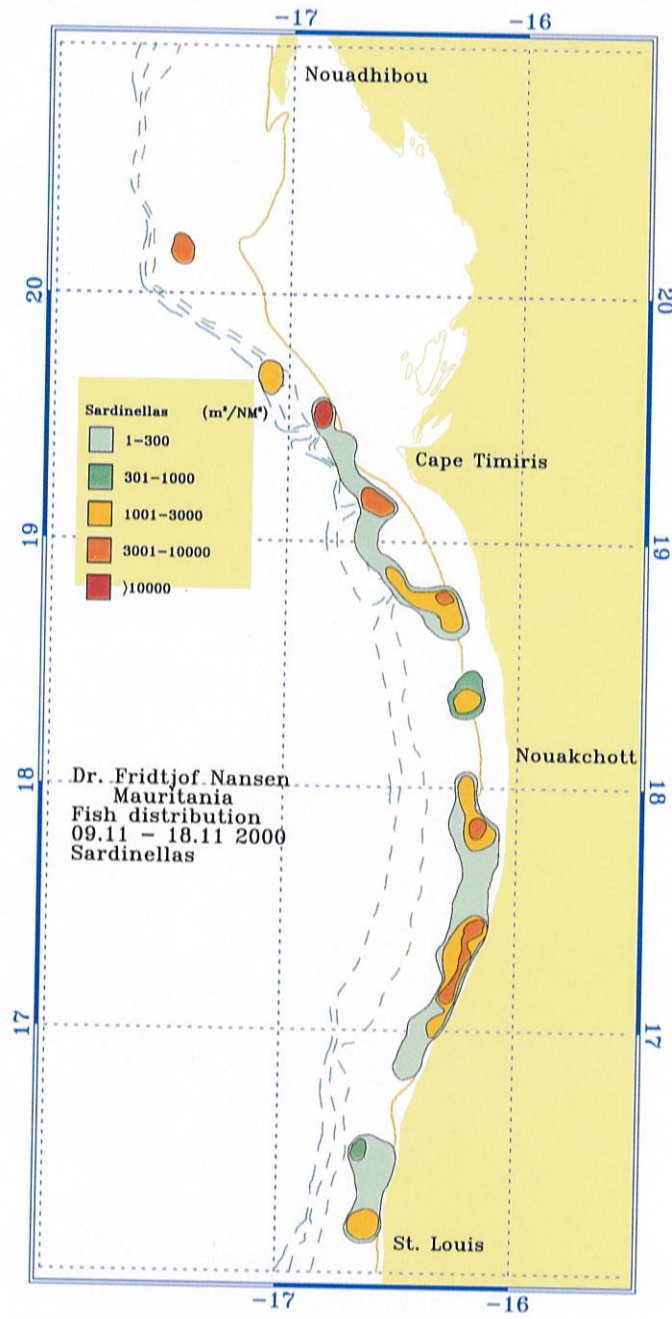


Figure 4 Distribution of sardinellas.

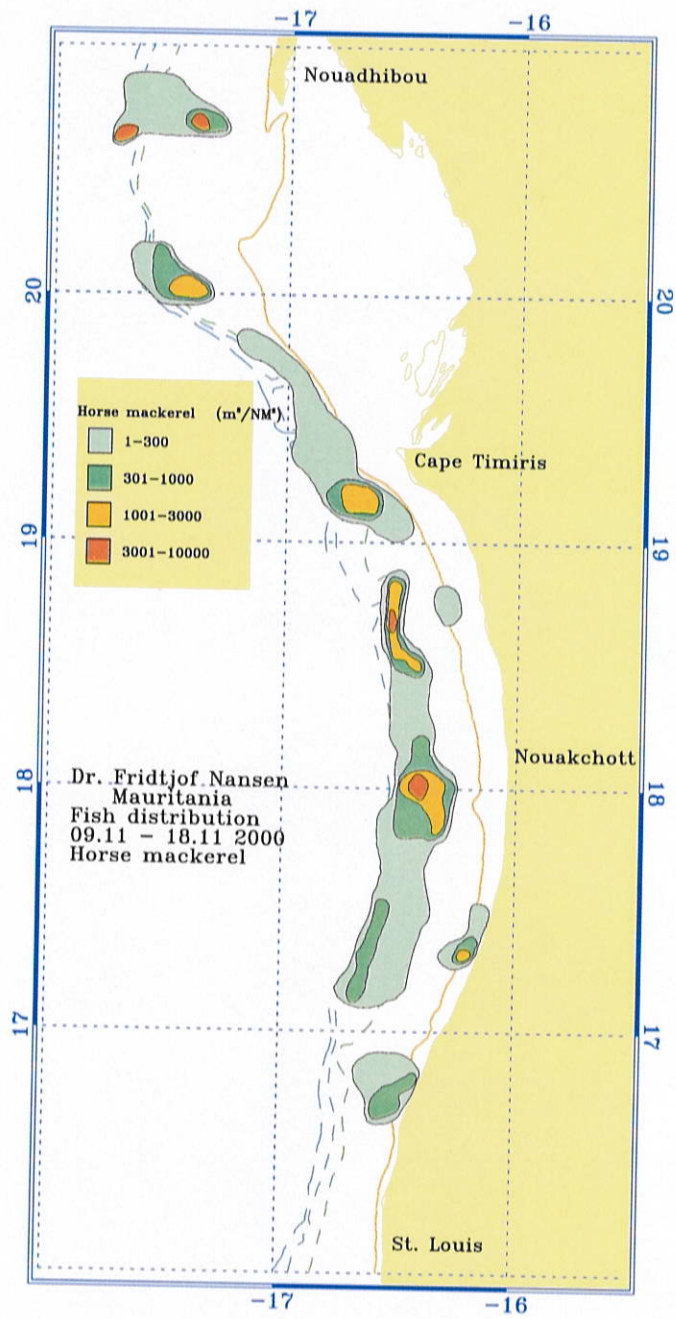


Figure 5 Distribution of horse mackerels.

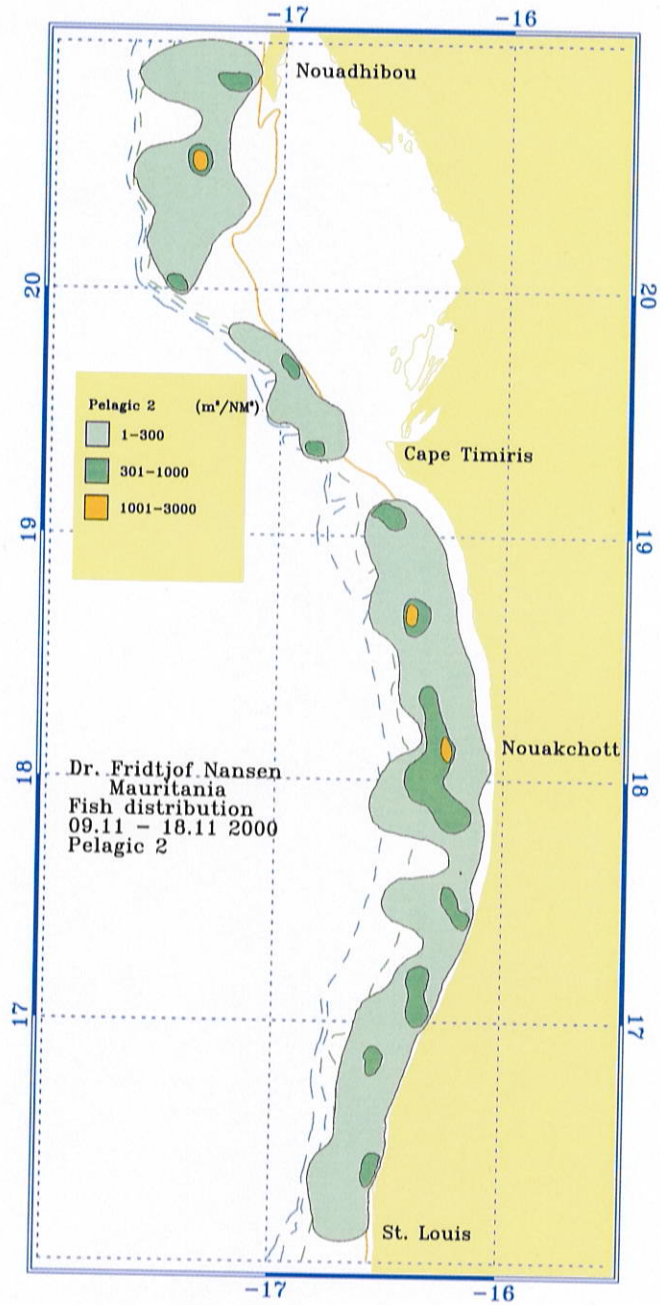


Figure 6 Distribution of carangids and associated species.

The distribution of horse mackerels is shown in Figure 5. Horse mackerels occurred in two main concentrations; a large one between 17°05'N - 18°55'N, and a smaller one between 19°00'N and 19°55'N. The densest concentrations in these aggregations were found at about 18°00'N, 18°50'N and at 19°05'N. The main aggregations were found at the edge of the shelf, and at daytime the fish were found close to the bottom at depths around 50-120 m. The biomass was estimated at 567 000 tonnes. The horse mackerels were mostly *Trachurus trecae*, which dominated the biomass estimate (97%). False scad (*Decapterus ronchus*) were also present in the samples, mostly in the near shore concentrations. *T. trachurus* were observed only in very few samples during this survey. Three modal lengths were observed in the total length distribution of *Trachurus trecae*, namely 12, 22 and 38 cm.

Figure 6 shows the distribution of the other carangids and associated species, which took the form of a continuous belt of various densities on the entire shelf. The total biomass was estimated at 206 000 tonnes. The samples from the distributional areas consisted of bumper, false scad, West African Spanish mackerel, Atlantic bonito, pompano with small amounts of chub mackerel, *Scomber japonicus* and barracudas.

Table 1. St. Louis to CapeTimiris. Biomass estimates of pelagic fish, 1 000 tonnes.

Flat sardinella	Round sardinella	Horse mackerels	Other Carangids etc.
521	309	567	206

2.3 Pelagic fish on the shelf from Cape Timiris to Cape Blanc

In earlier years, aggregations of juvenile sardinella and carangids were found in the area between Cape Timiris and Cape Blanc. Such registrations were not done this year.

Only a few specimens of adult sardinella were caught in the trawl catches in this area and sparse registrations were done by the echo sounder system. The estimate for sardinella in the area was thus, only some 32 000 tonnes, of which 62% were flat sardinella.

Horse mackerel were recorded in two smaller, but rather dense areas at the outer parts of the shelf. The aggregations consisted of medium sized (modal length 21 cm) *Trachurus trecae* and were estimated at 172 000 tonnes.

Between Cape Timiris and Cape Blanc, two aggregations of rather high densities of pilchard were recorded (Figure 7). The aggregation was estimated at 726 000 tonnes. The samples showed that there was a mixture of different size groups of pilchard in the area, with modal lengths of 14, 19 and 23 cm. The largest pilchard were found in an aggregation somewhat offshore. The other concentration extended northwards to the northern border of the survey area.

A limited number of anchovy were present in the catches on the inner parts of the shelf. However, no anchovy schools could be identified on the echograms, and therefore no acoustic estimate is done for anchovy.

The carangids and associated species were found in as a continuous belt of low-density shoals all the way to Cape Blanc (Figure 6). The biomass was estimated at 89 000 tonnes. The catches of this group consisted mainly of barracuda, Spanish mackerel and bluefish (*Pomatomus saltatrix*).

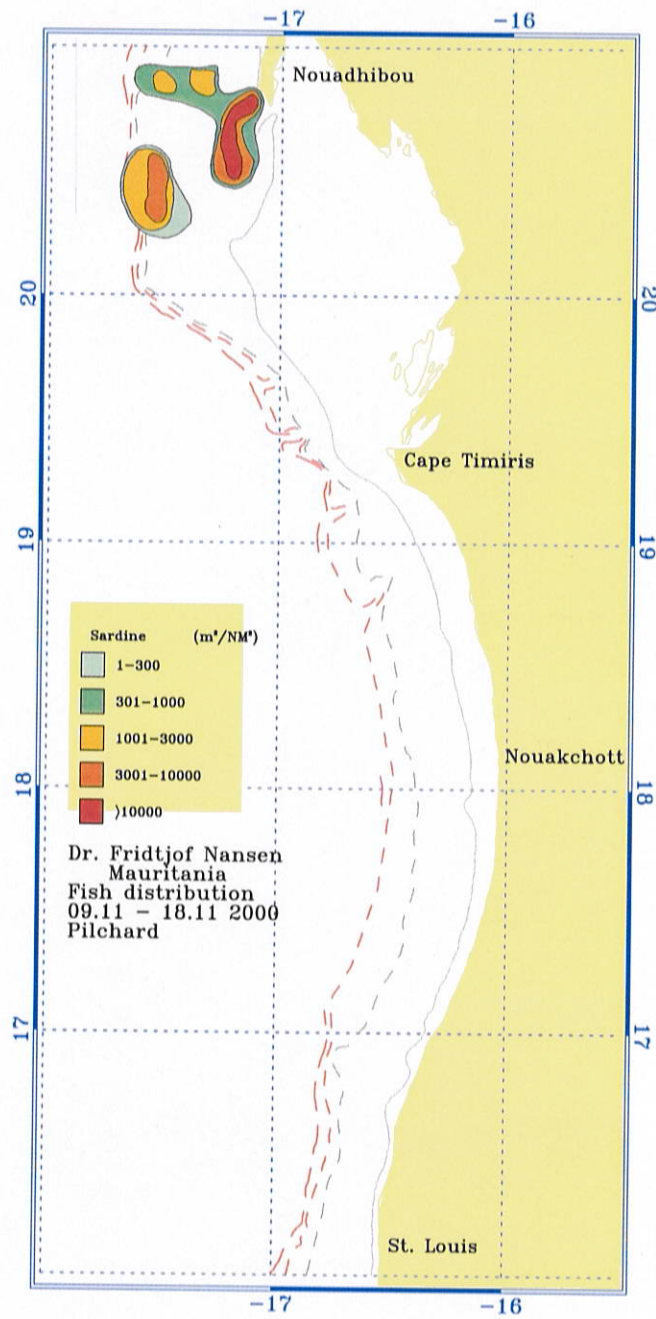


Figure 7. Distribution of pilchard. CapeTimiris – CapeBlanc.

CHAPTER 3 OVERVIEW AND SUMMARY OF RESULTS

The survey was conducted successfully in the period 10 to 18 November with a course track of 2 200 NM and 42 fishing stations (Figure 1).

The hydrographical data showed lowered surface temperatures inshore between St. Louis and Cape Timiris with upward slanting isotherms shorewards from about 50 m depth.

Mainly adult sardinella were found in high densities between St. Louis and Cape Timiris, while no juveniles were found in the area between Cape Timiris and Cape Blanc as in previous years (Figure 4). Horse mackerels were found in medium densities in four main areas; the largest one extending from about 17°00'N to about 19°00'N (Figure 5). Carangids (not including horse mackerel) and associated species occurred in low densities all along the shelf, with patches of high density areas (Figure 6).

Pilchard were found in the area south of Cape Blanc and were estimated at 726 000 tonnes. Pilchard has not been found in this area recently.

The total biomass of sardinella was estimated at 920 000 tonnes (63% flat and 37% round sardinella), that of horse mackerel at 743 000 tonnes and that of the carangids and associated species at 295 000 tonnes, see Table 2.

Table 2 Summary of biomass estimates of pelagic fish, Mauritania. 1 000 tonnes.

	Flat sardinella	Round sardinella	Horse mackerel	Carangids etc.
St. Louis-Cape Timiris	556	324	567	206
Cape Timiris-Cape Blanc	20	20	176	89
Total	576	344	743	295

Table 3 lists biomass estimates of sardinella and carangids and associated species from previous 'Dr Fridtjof Nansen' surveys of this shelf region. Compared with the surveys from the same season: NovDec/86, NovDec/95 and NovDec/96, the estimate of 920 000 tonnes of sardinella from the current survey is low, however higher than last years estimate of 700 000 tonnes. The carangid estimate (including horse mackerels) of 1 038 000 tonnes is the highest ever estimated in this period of the year in Mauritania.

Table 3 Biomass estimates from 'Dr Fridtjof Nansen' surveys of the Mauritanian shelf, thousand tonnes.

Survey:	Sardinellas	Carangids etc.
AprMay-81	20	370
Sept -81	75	*
FebMar-82	50	470
NovDec-86	300	540
FebMar-92	1970	190
NovDec-95	178	190
NovDec-96	1405	400
NovDec-97	1200	660
NovDec-98	1125	284
NovDec-99	742	559
NovDec-00	920	1038

* Not available

ANNEX I Records of fishing stations

PROJECT STATION:1213
 DATE:10/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1610 Long W 1633
 start stop duration
 TIME :07:54:15 08:24:09 30 (min) Purpose code: 1
 LOG :1946.11 1947.65 1.52 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 19 27 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 30 kn*10
 Sorted: 39 Kg Total catch: 231.60 CATCH/HOUR: 463.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	360.00	1500	77.72	2257
Sardinella maderensis	84.00	1140	18.13	2256
Trachinotus ovatus	12.00	84	2.59	
Brachydeuterus auritus	3.60	36	0.78	
Chloroscombrus chrysurus	3.60	24	0.78	
Total	463.20		100.00	

PROJECT STATION:1214
 DATE:10/11/00 GEAR TYPE: BT No: POSITION:Lat N 1621 Long W 1633
 start stop duration
 TIME :13:39:09 14:12:02 33 (min) Purpose code: 1
 LOG :1997.79 1999.32 1.50 Area code : 3
 FDEPTH: 20 23 GearCond.code:
 BDEPTH: 20 23 Validity code:
 Towing dir: 350e Wire out: 120 m Speed: 30 kn*10
 Sorted: 68 Kg Total catch: 836.42 CATCH/HOUR: 1520.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sparus caeruleostictus *	214.11	522	14.08	
Galeoides decadactylus	154.73	836	10.17	
Pomadasys rogeri	144.27	1045	9.49	
Gymnura altavela	131.73	62	8.66	
Chloroscombrus chrysurus	125.45	1004	8.25	
Brachydeuterus auritus Juv.	96.18	962	6.32	
Pseudoclitus sp.	71.09	84	4.67	
Selene dorsalis	63.15	1673	4.15	
Pomadasys incisus	60.64	251	3.99	
Trichiurus lepturus	56.91	171	3.74	
Diplodus vulgaris	53.11	84	3.49	
Plectorhynchus mediterraneus	52.27	125	3.44	
DREPANIDAE	33.45	125	2.20	
Decapterus rhonchus	31.36	125	2.06	
Sardinella aurita	31.36	105	2.06	
Ilisha africana	23.42	418	1.54	
Pteroscion pelli	23.00	209	1.51	
Sardinella maderensis	21.75	544	1.43	2258
Sphyrna guachancho	19.65	85	1.29	
Campogramma glaycos	18.82	20	1.24	
Pagellus bellottii	15.05	84	0.99	
Dentex canariensis	12.55	42	0.83	
Chaetodon hoefleri	11.71	62	0.77	
Pseudupeneus prayensis	9.62	62	0.63	
Trachinotus ovatus	7.53	20	0.50	
Pteromylaeus bovinus	5.64	2	0.37	
Mycteroperca rubra	4.55	2	0.30	
Loligo vulgaris	4.55	22	0.30	
Leptocharias smithii	4.33	5	0.28	
Sphyrna zygaena	4.04	2	0.27	
Epinephelus aeneus	3.64	2	0.24	
Dasyatis marmorata	3.45	2	0.23	
Carcharhinus sp.	3.24	4	0.21	
Octopus vulgaris	2.07	2	0.14	
Lagocephalus lagocephalus	1.35	4	0.09	
Sepia officinalis hierredda	1.02	2	0.07	
Total	1520.79		100.00	

PROJECT STATION:1215
 DATE:10/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1640 Long W 1637
 start stop duration
 TIME :22:05:09 22:35:03 30 (min) Purpose code: 1
 LOG :2064.68 2066.32 1.63 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 52 46 Validity code:
 Towing dir: 90e Wire out: 150 m Speed: 32 kn*10
 Sorted: 90 Kg Total catch: 90.36 CATCH/HOUR: 180.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	111.32	754	61.60	2259
Trichiurus lepturus	25.00	294	13.83	
Carcharhinus sp.	14.40	6	7.97	
Loligo vulgaris	5.68	852	3.14	
Sphyrna guachancho	5.60	60	3.10	
Arius heudeloti	5.40	2	2.99	
Alectis alexandrinus	4.60	2	2.55	
Trachinotus ovatus	3.20	8	1.77	
Remora remora	1.80	10	1.00	
Pomadasys incisus	1.60	6	0.89	
Engraulis encrasicolus	1.28	806	0.71	
Alloteuthis africana	0.56	216	0.31	
Lagocephalus laevigatus	0.20	2	0.11	
Boops boops	0.08	2	0.04	
Total	180.72		100.01	

PROJECT STATION:1216
 DATE:11/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1641 Long W 1629
 start stop duration
 TIME :00:02:08 00:31:45 30 (min) Purpose code: 1
 LOG :2074.10 2075.56 1.45 Area code : 3
 FDEPTH: 19 5 GearCond.code:
 BDEPTH: 19 5 Validity code:
 Towing dir: 360e Wire out: 150 m Speed: 30 kn*10
 Sorted: 28 Kg Total catch: 129.74 CATCH/HOUR: 259.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	158.40	836	61.05	2260
Alectis alexandrinus	36.32	104	14.00	
Sphyrna zygaena	14.00	8	5.40	
Chloroscombrus chrysurus	9.60	48	3.70	
Trichiurus lepturus	7.36	40	2.84	
Sphyrna guachancho	7.20	136	2.77	
Lagocephalus laevigatus	6.68	6	2.57	
Rhinoptera marginata	5.48	4	2.11	
Carcharhinus sp.	3.60	6	1.39	
Galeoides decadactylus	3.20	80	1.23	
Brachydeuterus auritus Juv.	2.40	248	0.92	
Pomadasys rogeri	2.36	4	0.91	
Pagellus bellottii	1.60	8	0.62	
Loligo vulgaris	1.08	4	0.42	
Dactylopterus volitans	0.20	2	0.08	
Total	259.48		100.01	

PROJECT STATION:1217
 DATE:11/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1650 Long W 1625
 start stop duration
 TIME :01:41:18 02:11:12 30 (min) Purpose code: 1
 LOG :2085.21 2086.74 1.52 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 21 21 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 30 kn*10
 Sorted: 34 Kg Total catch: 115.85 CATCH/HOUR: 231.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	105.24	414	45.42	2261
Decapterus rhonchus	27.00	228	11.65	
Brachydeuterus auritus Juv.	22.80	168	9.84	
Alectis alexandrinus	20.64	24	8.91	
Pteromylaeus bovinus	10.56	2	4.56	
Trachinotus ovatus	6.36	30	2.74	
Carcharhinus sp.	6.18	18	2.71	
Trichiurus lepturus	6.18	18	2.67	
Pomadasys incisus	5.52	24	2.38	
Pomadasys rogeri	4.20	18	1.81	
Chloroscombrus chrysurus	3.00	18	1.29	
Campogramma glaycos	3.00	6	1.29	
Selene dorsalis	2.40	24	1.04	
Lagocephalus laevigatus	2.12	2	0.91	
Dactylopterus volitans	1.80	12	0.78	
Sardinella aurita	1.80	6	0.78	
Dasyatis marmorata	1.60	2	0.69	
Sphyrna guachancho	1.20	12	0.52	
Total	231.70		99.99	

PROJECT STATION:1218
 DATE:11/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1650 Long W 1635
 start stop duration
 TIME :03:13:29 03:43:17 30 (min) Purpose code: 1
 LOG :2094.95 2096.75 1.77 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 58 78 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 38 kn*10
 Sorted: 12 Kg Total catch: 96.88 CATCH/HOUR: 193.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	119.92	376	61.89	
Trachurus trecae	40.60	1314	20.95	2262
Sphyrna zygaena	20.24	2	10.45	
Trichiurus lepturus	9.20	226	4.75	
Decapterus rhonchus	1.68	10	0.87	
Loligo vulgaris	1.00	34	0.52	
Lagocephalus laevigatus	0.60	8	0.31	
Alloteuthis subulata	0.32	156	0.17	
Sardinella aurita	0.20	2	0.10	
Total	193.76		100.01	

PROJECT STATION:1219
 DATE:11/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1701
 start stop duration Long W 1621
 TIME :08:21:27 08:21:37 32 (min) Purpose code: 1
 LOG :2142.52 2144.16 1.63 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 19 19 Validity code:
 Towing dir: 0 Wire out: 150 m Speed: 30 kn*10
 Sorted: 690 Kg Total catch: 69.08 CATCH/HOUR: 129.53

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	54.64	199	42.18	2263
Trachinotus ovatus	36.94	159	28.52	
Sardinella aurita	25.31	92	19.54	2264
Sphyrna zygaena	4.28	2	3.30	
Chloroscombrus chrysurus	3.04	19	2.35	
Caranx senegalensis	2.51	6	1.94	
Orcynopsis unicolor	2.33	2	1.80	
Remora remora	0.49	2	0.38	
Total	129.54		100.01	

PROJECT STATION:1220
 DATE:11/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1710
 start stop duration Long W 1632
 TIME :12:03:31 12:34:12 31 (min) Purpose code: 1
 LOG :2171.34 2172.77 1.42 Area code : 3
 FDEPTH: 99 92 GearCond.code:
 BDEPTH: 99 92 Validity code:
 Towing dir: 90e Wire out: 400 m Speed: 30 kn*10
 Sorted: 30 Kg Total catch: 109.67 CATCH/HOUR: 212.26

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	123.68	5750	58.27	2265
Zeus faber	35.54	52	16.74	
Trichiurus lepturus	18.97	48	8.94	
Dentex macrophthalma	9.06	70	4.27	
Merluccius senegalensis	4.92	10	2.32	
Illex coindetii	4.65	627	2.19	
Loligo vulgaris	3.87	31	1.82	
Raja sp.	2.71	2	1.28	
Octopus vulgaris	2.59	6	1.22	
Protula barbata	2.40	4	1.13	
Sepia officinalis hierreda	1.35	2	0.64	
Torpedo torpedo	1.08	2	0.51	
Caranx senegalensis	0.87	2	0.41	
Alloteuthis africana	0.58	23	0.27	
Total	212.27		100.01	

PROJECT STATION:1221
 DATE:11/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1722
 start stop duration Long W 1638
 TIME :15:58:58 16:28:53 30 (min) Purpose code: 1
 LOG :2204.84 2206.35 1.51 Area code : 3
 FDEPTH: 211 205 GearCond.code:
 BDEPTH: 211 205 Validity code:
 Towing dir: 200e Wire out: 700 m Speed: 30 kn*10
 Sorted: 67 Kg Total catch: 795.64 CATCH/HOUR: 1591.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chlorophthalmus atlanticus	454.40	2662	28.56	
Merluccius merluccius	332.80	4562	20.91	
Synagrops microlepis	219.20	2962	13.78	
Scorpaena elongata	201.60	3040	12.67	
Trachurus trachurus	150.92	260	9.48	2266
Helicolenus dactylopterus	100.80	760	6.33	
Pterothrissus belloci	48.00	360	2.87	
Trichiurus lepturus	45.60	56	0.85	
Parapenaeus longirostris	13.60	2080	0.50	
MYCTOPHIDAE	8.00	920	0.31	
Palinurus sp.	4.96	2	0.25	
Todaropsis eblanae	4.88	20	0.07	
Zenopsis conchifer	4.00	40	0.06	
Dentex macrophthalmus	1.12	2	0.03	
Remora remora	1.00	2		
Illex coindetii	0.40	6		
Total	1591.28		100.00	

PROJECT STATION:1222
 DATE:11/11/00 GEAR TYPE: PT No:3 POSITION:Lat N 1720
 start stop duration Long W 1615
 TIME :19:26:10 19:45:58 20 (min) Purpose code: 1
 LOG :2232.75 2234.33 1.56 Area code : 3
 FDEPTH: 13 13 GearCond.code:
 BDEPTH: 29 27 Validity code:
 Towing dir: 180e Wire out: 170 m Speed: 50 kn*10
 Sorted: 75 Kg Total catch: 1125.60 CATCH/HOUR: 3376.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	2209.50	7695	65.43	2270
Trachurus trecae	855.00	7380	25.32	2267
Decapterus rhonchus	122.40	585	3.62	2268
Pomadasya incisus	27.90	135	0.83	
Loligo vulgaris	24.30	45	0.72	
Brachydeuterus auritus Juv.	22.50	2205	0.67	
Arius heudeloti	21.60	90	0.64	
Pomadasya jubelini	20.70	45	0.61	
Pagellus bellottii	20.70	45	0.61	
Chloroscombrus chrysurus	20.70	135	0.61	
Sardinella aurita	19.80	180	0.59	2269
Pagellus bellottii	13.50	90	0.40	
Trichiurus lepturus	11.70	45	0.35	
Sphyrna guanchancho	4.50	45	0.13	
Pseudupeneus prayensis	2.70	45	0.08	
Total	3397.50		100.61	

PROJECT STATION:1223
 DATE:12/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1740
 start stop duration Long W 1626
 TIME :03:03:24 03:33:02 30 (min) Purpose code: 1
 LOG :2307.83 2309.72 1.88 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 103 100 Validity code:
 Towing dir: 90e Wire out: 160 m Speed: 40 kn*10
 Sorted: 14 Kg Total catch: 14.20 CATCH/HOUR: 28.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	7.20	110	25.35	2271
Illex coindetii	5.28	332	18.59	
Trachinotus ovatus	4.80	14	16.90	
Auxis thazard	4.64	2	16.34	
Trichiurus lepturus	3.40	2	11.97	
Sarda sarda	2.56	2	9.01	
Argentina sphyraena	0.52	318	1.83	
Total	28.40		99.99	

PROJECT STATION:1224
 DATE:12/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1740
 start stop duration Long W 1612
 TIME :04:55:17 05:25:03 30 (min) Purpose code: 1
 LOG :2321.34 2322.99 1.64 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 39 27 Validity code:
 Towing dir: 90e Wire out: 160 m Speed: 30 kn*10
 Sorted: 36 Kg Total catch: 35.73 CATCH/HOUR: 71.46

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	48.00	272	67.17	2274
Sardinella maderensis	7.72	24	10.80	2273
Trachurus trachurus	4.60	8	6.44	
Trachurus trecae	3.60	110	5.04	2272
Alectis alexandrinus	2.00	6	2.80	
Trichiurus lepturus	1.40	10	1.96	
Campogramma glaycos	0.96	2	1.34	
Sphyrna barracuda	0.84	2	1.18	
Brachydeuterus auritus	0.72	6	1.01	
Loligo vulgaris	0.60	4	0.84	
Selene dorsalis	0.60	4	0.84	
Todaropsis eblanae	0.34	2	0.48	
Priacanthus arenatus	0.08	2	0.11	
Total	71.46		100.01	

PROJECT STATION:1225
 DATE:12/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1750
 start stop duration Long W 1608
 TIME :07:00:50 07:07:54 7 (min) Purpose code: 1
 LOG :2336.82 2337.18 0.34 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 21 23 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 30 kn*10
 Sorted: 32 Kg Total catch: 164.28 CATCH/HOUR: 1408.11

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	1033.71	7114	73.41	
Sardinella maderensis	293.14	986	20.82	2275
Sardinella aurita	57.43	171	4.08	2276
Pomadasya rogeri	8.57	9	0.61	
Pomadatus saltatrix	6.34	9	0.45	
Brachydeuterus auritus	3.94	43	0.28	
Trichiurus lepturus	2.91	17	0.21	
Decapterus rhonchus	1.03	9	0.07	
Sepia elegans	0.51	9	0.04	
Trachurus trecae	0.51	9	0.04	
Total	1408.09		100.01	

PROJECT STATION:1226
 DATE:12/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1750
 start stop duration Long W 1623
 TIME :08:50:06 09:22:09 32 (min) Purpose code: 1
 LOG :2352.54 2354.25 1.71 Area code : 3
 FDEPTH: 98 95 GearCond.code:
 BDEPTH: 98 95 Validity code:
 Towing dir: 90e Wire out: 350 m Speed: 30 kn*10
 Sorted: 60 Kg Total catch: 205.44 CATCH/HOUR: 385.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	267.09	3056	69.34	2277
Zeus faber	44.36	39	11.52	
Illex coindetii	30.19	1890	7.84	
Boops boops	15.09	459	3.92	
Dentex macrophthalmus	10.50	139	2.73	
SQUOLOI	6.17	45	1.60	
Pagellus bellottii	3.28	6	0.85	
Torpedo torpedo	2.25	4	0.58	
Merluccius senegalensis	1.80	2	0.47	
Chloroscombrus chrysurus	1.44	6	0.37	
Trichiurus lepturus	1.44	6	0.37	
Dentex maroccanus	0.92	6	0.24	
Smaris macrophthalmus *	0.39	6	0.10	
Argentina sphyraena	0.26	6	0.07	
Total	385.18		100.00	

PROJECT STATION:1227
 DATE:12/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1801 Long W 1623
 start stop duration
 TIME :15:04:41 15:34:02 29 (min) Purpose code: 1
 LOG :2401.48 2402.95 1.37 Area code : 3
 FDEPTH: 88 85 GearCond.code:
 BDEPTH: 88 85 Validity code:
 Towing dir: 150° Wire out: 320 m Speed: 30 kn*10
 Sorted: 30 Kg Total catch: 547.28 CATCH/HOUR: 1132.30

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophthalmus	679.03	4407	59.97	
Trachurus trecae	191.96	666	16.95	2278
Spondyliosoma cantharus	58.97	62	5.21	
Boops boops	51.52	1552	4.55	
Umbрина canariensis	49.66	124	4.39	
Plectorhynchus mediterraneus	41.59	31	3.67	
Scorpaena sp.	21.72	62	1.92	
Parapristipoma octolineatum	18.62	31	1.64	
Trachurus trachurus	9.93	62	0.88	
Pagellus bellottii	9.31	31	0.82	
Total	1132.31		100.00	

PROJECT STATION:1228
 DATE:12/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1804 Long W 1607
 start stop duration
 TIME :18:13:40 18:42:35 29 (min) Purpose code: 1
 LOG :2423.92 2425.30 1.39 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 17 17 Validity code:
 Towing dir: 340° Wire out: 150 m Speed: 30 kn*10
 Sorted: 31 Kg Total catch: 30.72 CATCH/HOUR: 63.56

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	47.59	101	74.87	
Lagocephalus laevigatus	5.09	8	8.01	
Pomadasy jubelini	3.93	4	6.18	
Chloroscombrus chrysaureus	3.89	17	6.12	
Decapterus rhonchus	1.16	6	1.83	
Trachurus trecae	0.99	2	1.56	
Loligo vulgaris	0.74	2	1.16	
Sphyræna sphyraena	0.17	2	0.27	
Total	63.56		100.00	

PROJECT STATION:1229
 DATE:12/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 1809 Long W 1614
 start stop duration
 TIME :20:10:17 20:41:11 31 (min) Purpose code: 1
 LOG :2437.38 2439.26 1.88 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 31 32 Validity code:
 Towing dir: 180° Wire out: 150 m Speed: 33 kn*10
 Sorted: 42 Kg Total catch: 107.04 CATCH/HOUR: 207.17

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Boops boops	38.90	2514	18.78	
Decapterus rhonchus	28.57	122	13.79	2279
Plectorhynchus mediterraneus	27.87	99	13.45	
Trachurus trecae	26.83	139	12.95	2280
Pagellus bellottii	20.67	163	9.98	
Auxis thazard	19.05	52	9.20	
Pomadasy rogeri	11.07	10	5.34	
Pomadasy incisus	11.03	52	5.32	
Sardinella maderensis	8.01	75	3.87	2281
Sparus caeruleostictus *	4.88	6	2.36	
Trichiurus lepturus	3.06	6	1.48	
Parapristipoma octolineatum	2.09	6	1.01	
Scomber japonicus	1.39	6	0.67	
Umbрина canariensis	1.16	2	0.56	
Loligo vulgaris	0.97	15	0.47	
Pseudupeneus prayensis	0.81	6	0.39	
Sphyræna sphyraena	0.35	6	0.17	
Alloteuthis africana	0.00			
Total	206.71		99.79	

PROJECT STATION:1230
 DATE:12/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1810 Long W 1626
 start stop duration
 TIME :22:42:05 23:12:46 31 (min) Purpose code: 1
 LOG :2456.86 2458.52 1.65 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 96 82 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 30 kn*10
 Sorted: 6 Kg Total catch: 5.62 CATCH/HOUR: 10.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	9.91	19	91.08	
Ariomma bondi	0.19	8	1.75	
MYCTOPHIDAE	0.19	37	1.75	
Illex coindetii	0.19	46	1.75	
Argentina sphyraena	0.19	52	1.75	
Synagrops microlepis	0.15	31	1.38	
Selene dorsalis	0.04	6	0.37	
Total	10.86		99.83	

PROJECT STATION:1231
 DATE:13/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1820 Long W 1616
 start stop duration
 TIME :04:01:16 04:31:10 30 (min) Purpose code: 1
 LOG :2506.54 2508.19 1.60 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 27 23 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 30 kn*10
 Sorted: 55 Kg Total catch: 111.59 CATCH/HOUR: 223.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	157.84	572	70.72	2283
Sardinella aurita	60.42	142	27.07	2282
Loligo vulgaris	2.40	4	1.08	
Trichiurus lepturus	1.00	2	0.45	
Lagocephalus laevigatus	0.92	2	0.41	
Scomber japonicus	0.60	2	0.27	
Total	223.18		100.00	

PROJECT STATION:1232
 DATE:13/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1825 Long W 1614
 start stop duration
 TIME :05:40:52 06:12:20 31 (min) Purpose code: 1
 LOG :2516.29 2517.80 1.50 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 22 20 Validity code:
 Towing dir: 19° Wire out: 150 m Speed: 30 kn*10
 Sorted: 73 Kg Total catch: 219.60 CATCH/HOUR: 425.03

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	256.65	552	60.38	2284
Sardinella maderensis	151.08	383	35.55	2285
Pomadasy incisus	8.25	29	1.94	
Decapterus rhonchus	7.55	163	1.78	
Boops boops	0.81	35	0.19	
Pagellus bellottii	0.70	6	0.16	
Total	425.04		100.00	

PROJECT STATION:1233
 DATE:13/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 1830 Long W 1619
 start stop duration
 TIME :07:24:08 07:55:58 32 (min) Purpose code: 1
 LOG :2526.60 2528.28 1.67 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 37 43 Validity code:
 Towing dir: 270° Wire out: 150 m Speed: 32 kn*10
 Sorted: 1 Kg Total catch: 0.90 CATCH/HOUR: 1.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Camogramma glaycos	1.69	2	100.00	
Total	1.69		100.00	

PROJECT STATION:1234
 DATE:13/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 1829 Long W 1627
 start stop duration
 TIME :09:15:29 10:14:10 59 (min) Purpose code: 1
 LOG :2536.62 2540.16 3.33 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 67 60 Validity code:
 Towing dir: 180° Wire out: 250 m Speed: 38 kn*10
 Sorted: Kg Total catch: 0.18 CATCH/HOUR: 0.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinus draco	0.08	3	44.44	
Illex coindetii	0.04	7	22.22	
Trachurus trecae	0.02	9	11.11	
Lagocephalus laevigatus	0.01	1	5.56	
Argentina sphyraena	0.01	3	5.56	
Selene dorsalis	0.01	1	5.56	
MYCTOPHIDAE	0.01	7	5.56	
Total	0.18		100.01	

PROJECT STATION:1235
 DATE:13/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1831 Long W 1629
 start stop duration
 TIME :11:39:53 12:09:41 30 (min) Purpose code: 1
 LOG :2552.14 2553.71 1.55 Area code : 3
 FDEPTH: 88 81 GearCond.code:
 BDEPTH: 88 81 Validity code:
 Towing dir: 30° Wire out: 350 m Speed: 30 kn*10
 Sorted: 50 Kg Total catch: 165.21 CATCH/HOUR: 330.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	281.28	968	85.13	2286
Zeus faber	29.48	46	8.92	
GALATHEIDAE *	7.20	3312	2.18	
Illex coindetii	4.92	408	1.49	
Dentex macrophthalmus	4.92	252	1.49	
Dentex angolensis	1.02	18	0.31	
Loligo vulgaris	0.88	6	0.27	
Todaropsis eblanae	0.36	6	0.11	
Boops boops	0.18	6	0.05	
Monochirus hiapidus	0.12	12	0.04	
GOBIIDAE	0.06	6	0.02	
Total	330.42		100.01	

PROJECT STATION:1236
 DATE:13/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1839 Long W 1624
 start stop duration
 TIME :17:03:47 17:36:51 33 (min) Purpose code: 1
 LOG :2605.10 2607.17 1.88 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 55 50 Validity code:
 Towing dir: 170° Wire out: 150 m Speed: 38 kn*10
 Sorted: 1 Kg Total catch: 0.85 CATCH/HOUR: 1.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Campogramma glaycos	1.55	2	100.00	
Total	1.55		100.00	

PROJECT STATION:1241
 DATE:14/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 1909 Long W 1636
 start stop duration
 TIME :10:10:19 10:46:34 36 (min) Purpose code: 1
 LOG :2739.29 2741.78 2.28 Area code : 3
 FDEPTH: 22 22 GearCond.code:
 BDEPTH: 67 67 Validity code:
 Towing dir: 171° Wire out: 150 m Speed: 42 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Total				

PROJECT STATION:1237
 DATE:13/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1842 Long W 1618
 start stop duration
 TIME :19:14:23 19:42:29 28 (min) Purpose code: 1
 LOG :2621.69 2623.29 1.60 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 19 17 Validity code:
 Towing dir: 135° Wire out: 150 m Speed: 33 kn*10
 Sorted: 99 Kg Total catch: 408.86 CATCH/HOUR: 876.13

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	679.29	1596	77.53	2287
Decapterus rhonchus	75.86	1704	8.66	
Boops boops	47.14	2154	5.38	
Diplodus puntazzo	36.99	30	4.22	
Sardinella maderensis	22.29	54	2.54	2288
Sepia bertheloti	5.36	11	0.61	
Pomadasy incisus	4.84	19	0.55	
Sphyræna sphyraena	2.70	19	0.31	
Spondyliosoma cantharus	0.86	2	0.10	
Decapterus punctatus	0.43	11	0.05	
Pseudupeneus prayensis	0.39	2	0.04	
Total	876.15		99.99	

PROJECT STATION:1242
 DATE:14/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1911 Long W 1646
 start stop duration
 TIME :12:53:54 13:23:44 30 (min) Purpose code: 1
 LOG :2758.65 2760.09 1.43 Area code : 3
 FDEPTH: 181 210 GearCond.code:
 BDEPTH: 181 210 Validity code:
 Towing dir: 165° Wire out: 630 m Speed: 30 kn*10
 Sorted: 16 Kg Total catch: 357.24 CATCH/HOUR: 714.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chlorophthalmus atlanticus	296.00	1856	41.43	
Merluccius senegalensis	87.20	480	12.20	
Scorpaena sp.	80.80	480	11.31	
Dentex macrophthalmus	56.00	200	7.84	
Trachurus trachurus	48.12	92	6.73	2291
Synagrops microlepis	40.00	2680	5.60	
Pontinus kuhlii	28.00	1640	3.92	
GALATHEIDAE *	14.40	1000	2.02	
Parapanaeus longirostris	13.60	2000	1.90	
Zenopsis conchifer	13.12	14	1.84	
Todaropsis eblanae	12.00	94	1.68	
Capros aper	12.00	800	1.68	
Zeus faber	5.20	20	0.73	
Trichiurus lepturus	4.04	8	0.57	
Citharus linguatula	4.00	120	0.56	
Total	714.48		100.01	

PROJECT STATION:1238
 DATE:14/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 1900 Long W 1635
 start stop duration
 TIME :04:10:52 04:39:44 29 (min) Purpose code: 1
 LOG :2701.21 2702.79 1.60 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 72 67 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 35 kn*10
 Sorted: 14 Kg Total catch: 14.76 CATCH/HOUR: 30.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Campogramma glaycos	12.95	12	42.40	
Trichiurus lepturus	10.14	14	33.20	
Sarda sarda	6.54	12	21.41	
Trachurus trecae	0.95	39	3.11	2289
Illex coindetii	0.08	2	0.26	
Total	30.66		100.38	

PROJECT STATION:1243
 DATE:14/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1927 Long W 1647
 start stop duration
 TIME :18:59:58 19:30:30 31 (min) Purpose code: 1
 LOG :2811.46 2813.18 1.71 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 21 19 Validity code:
 Towing dir: 165° Wire out: 150 m Speed: 34 kn*10
 Sorted: 50 Kg Total catch: 233.58 CATCH/HOUR: 452.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pomadasy incisus	233.65	987	51.68	
Diplodus puntazzo	67.59	139	14.95	
Stromateus fiatola	40.41	35	8.94	
Decapterus rhonchus	32.52	1057	7.19	
Sardinella maderensis	18.00	37	3.98	2292
Pagellus bellottii	9.29	35	2.05	
Sardinella aurita	8.83	46	1.95	2293
Scomberomorus tritor	8.13	2	1.80	
SHPSPO1	7.90	46	1.75	
Loligo vulgaris	7.90	163	1.75	
Boops boops	6.27	337	1.39	
Spondyliosoma cantharus	4.18	12	0.92	
Penaeus notialis	3.48	174	0.77	
Diplodus bellottii	3.02	12	0.67	
Capros aper	0.93	23	0.21	
Total	452.10		100.00	

PROJECT STATION:1239
 DATE:14/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1905 Long W 1621
 start stop duration
 TIME :06:38:06 07:08:45 31 (min) Purpose code: 1
 LOG :2716.79 2718.24 1.43 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 24 28 Validity code:
 Towing dir: 295° Wire out: 150 m Speed: 32 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Total				

PROJECT STATION:1244
 DATE:14/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 1930 Long W 1650
 start stop duration
 TIME :20:36:46 20:55:41 19 (min) Purpose code: 1
 LOG :2822.06 2823.07 0.97 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 35 28 Validity code:
 Towing dir: 90° Wire out: 150 m Speed: 32 kn*10
 Sorted: 22 Kg Total catch: 21.88 CATCH/HOUR: 69.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	20.72	859	29.99	
Sardinella aurita	18.44	47	26.69	2294
Sphyræna guachancho	6.82	25	9.87	
Decapterus rhonchus	5.05	25	7.31	
Sardinella maderensis	4.74	9	6.86	2295
Trichiurus lepturus	3.54	16	5.12	
Stromateus fiatola	3.16	3	4.57	
Diplodus puntazzo	2.34	6	3.39	
Spondyliosoma cantharus	1.07	3	1.55	
Loligo vulgaris	0.82	6	1.19	
Penaeus notialis	0.44	16	0.64	
Lagocephalus laevis	0.38	3	0.55	
Synchiropus phaeton	0.38	9	0.55	
Pomadasy incisus	0.38	6	0.55	
Brachydeuterus auritus Juv.	0.32	38	0.46	
Boops boops	0.25	6	0.36	
Engraulis encrasicolus	0.19	25	0.28	
Selene dorsalis	0.03	13	0.04	
Total	69.07		99.97	

PROJECT STATION:1240
 DATE:14/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 1905 Long W 1634
 start stop duration
 TIME :08:26:07 08:56:01 30 (min) Purpose code: 1
 LOG :2728.22 2729.86 1.64 Area code : 3
 FDEPTH: 59 50 GearCond.code:
 BDEPTH: 59 50 Validity code:
 Towing dir: 125° Wire out: 200 m Speed: 30 kn*10
 Sorted: 15 Kg Total catch: 14.92 CATCH/HOUR: 29.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	19.00	48	63.67	2290
Campogramma glaycos	3.04	4	10.19	
Loligo vulgaris	2.96	8	9.92	
Diplodus sp.	1.60	2	5.36	
Decapterus rhonchus	1.52	2	5.09	
Scomber japonicus	1.00	2	3.35	
Pagellus bellottii	0.72	10	2.41	
Total	29.84		99.99	

PROJECT STATION:1245
 DATE:14/11/00 GEAR TYPE: PT No:3 POSITION:Lat N 1929
 start stop duration Long W 1649
 TIME :21:33:33 22:03:29 30 (min) Purpose code: 1
 LOG :2825.93 2828.07 1.96 Area code : 3
 FDEPTH: 15 15 GearCond.code:
 BDEPTH: 29 31 Validity code:
 Towing dir: 155e Wire out: 150 m Speed: 43 kn*10
 Sorted: 59 Kg Total catch: 98.17 CATCH/HOUR: 196.34

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	63.20	160	32.19	2296
Trachurus trecae	51.20	1764	26.08	2298
Stromateus fiatola	29.20	22	14.87	
Decapterus rhonchus	23.04	64	11.73	2297
Trichiurus lepturus	9.60	20	4.89	
Pomadasy incisus	7.60	28	3.87	
Engraulis encrasicolus	5.76	928	2.93	
Loligo vulgaris	1.26	8	0.64	
Sphyræna sphyraena	1.12	8	0.57	
Lagocephalus laeigatus	0.88	4	0.45	
Brachydeuterus auritus Juv.	0.80	72	0.41	
Pagellus acarne	0.64	8	0.33	
Selene dorsalis	0.56	76	0.29	
Boops boops	0.48	4	0.24	
Pagellus bellottii	0.48	4	0.24	
Sardinella aurita - Juveniles	0.40	24	0.20	2299
Sardinella maderensis - Juv.	0.08	8	0.04	
Sepia officinalis hierredda	0.04	4	0.02	
Total	196.34		99.99	

PROJECT STATION:1246
 DATE:15/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1941
 start stop duration Long W 1658
 TIME :03:19:23 04:09:02 30 (min) Purpose code: 1
 LOG :2886.70 2888.43 2.08 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 61 72 Validity code:
 Towing dir: 304e Wire out: 150 m Speed: 40 kn*10
 Sorted: 36 Kg Total catch: 941.30 CATCH/HOUR: 1882.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	1840.00	3650	97.74	
Trachurus trecae	19.60	20	1.04	2302
Sardinella maderensis	15.24	40	0.81	2300
Sardinella aurita	7.16	16	0.38	2301
Decapterus rhonchus	0.60	2	0.03	
Total	1882.60		100.00	

PROJECT STATION:1247
 DATE:15/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 1948
 start stop duration Long W 1710
 TIME :05:38:09 06:09:12 31 (min) Purpose code: 1
 LOG :2899.84 2901.69 1.84 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 79 51 Validity code:
 Towing dir: 310e Wire out: 150 m Speed: 30 kn*10
 Sorted: 27 Kg Total catch: 95.19 CATCH/HOUR: 184.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	164.90	2253	89.50	
Trachurus trecae	9.48	14	5.15	2303
Campogramma glaycos	8.36	8	4.54	
Sepia orbignyana	0.62	31	0.34	
Illex coindetii	0.46	15	0.25	
Selene dorsalis	0.31	31	0.17	
Trachurus trecae, juvenile	0.08	8	0.04	
Trachurus trecae, juvenile	0.02	10	0.01	2304
Total	184.23		100.00	

PROJECT STATION:1248
 DATE:15/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2001
 start stop duration Long W 1725
 TIME :11:54:59 12:24:37 30 (min) Purpose code: 2
 LOG :2953.09 2954.35 0.96 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 50 50 Validity code:
 Towing dir: 170e Wire out: 200 m Speed: 30 kn*10
 Sorted: 71 Kg Total catch: 460.73 CATCH/HOUR: 921.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	845.00	8450	91.70	2305
Scomber scombrus	34.84	80	3.78	2306
Loligo vulgaris	29.52	162	3.20	
Octopus vulgaris	6.08	4	0.66	
Campogramma glaycos	2.60	2	0.28	
Sepia officinalis hierredda	1.50	4	0.16	
Cepola macrophthalma	0.80	2	0.09	
Illex coindetii	0.76	8	0.08	
Zeus faber	0.36	2	0.04	
Total	921.46		99.99	

PROJECT STATION:1249
 DATE:15/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 2020
 start stop duration Long W 1734
 TIME :20:32:07 21:03:45 32 (min) Purpose code: 1
 LOG :3035.76 3037.54 1.78 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 73 81 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 30 kn*10
 Sorted: 140 Kg Total catch: 4957.82 CATCH/HOUR: 9295.91

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	8889.56	62938	95.63	2308
Scomber japonicus	202.13	394	2.17	2307
Sepia bertheloti	76.13	66	0.82	
Auxis thazard	48.56	66	0.52	
Trachurus trecae	26.74	45	0.29	2309
Trichiurus lepturus	17.33	24	0.19	
Trachurus trecae, juvenile	11.81	525	0.13	
MYCTOPHIDAE	5.91	459	0.06	
Argentina sphyraena	5.25	66	0.06	
Sarda sarda	5.10	6	0.05	
CONGRIDAE	4.69	4	0.05	
Selene dorsalis	1.97	197	0.02	
Lagocephalus lagocephalus	0.75	2	0.01	
Total	9295.93		100.00	

PROJECT STATION:1250
 DATE:16/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 2026
 start stop duration Long W 1707
 TIME :00:44:59 01:14:44 30 (min) Purpose code: 2
 LOG :3071.64 3073.18 1.53 Area code : 3
 FDEPTH: 0 0 GearCond.code:
 BDEPTH: 25 26 Validity code:
 Towing dir: 7e Wire out: 150 m Speed: 40 kn*10
 Sorted: 5 Kg Total catch: 73.13 CATCH/HOUR: 146.26

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomberomorus tritor	125.72	40	85.96	
Decapterus rhonchus	20.00	486	13.67	2310
Loligo vulgaris	0.38	6	0.26	
Sardinella aurita - Juveniles	0.16	6	0.11	
Total	146.26		100.00	

PROJECT STATION:1251
 DATE:16/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 2030
 start stop duration Long W 1712
 TIME :02:57:01 03:05:14 8 (min) Purpose code: 1
 LOG :3081.86 3082.31 0.45 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 33 33 Validity code:
 Towing dir: 90e Wire out: 150 m Speed: 40 kn*10
 Sorted: 44 Kg Total catch: 20000.00 CATCH/HOUR: 150000.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	50000.00	4389533	33.33	2311
Total	50000.00		33.33	

PROJECT STATION:1252
 DATE:16/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 2029
 start stop duration Long W 1729
 TIME :05:01:44 05:31:04 29 (min) Purpose code: 2
 LOG :3099.59 3101.54 1.93 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 61 62 Validity code:
 Towing dir: 270e Wire out: 150 m Speed: 40 kn*10
 Sorted: Kg Total catch: 8.52 CATCH/HOUR: 17.63

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	9.52	14	54.00	
Trachurus trecae	3.72	43	21.10	
Lagocephalus laeigatus	1.86	10	10.55	
Sepia officinalis hierredda	0.87	37	4.93	
Argentina sphyraena	0.62	155	3.52	
Loligo vulgaris	0.41	60	2.33	
Sardina pilchardus	0.27	6	1.53	
Trachurus trecae, juvenile	0.21	145	1.19	
Alloteuthis africana	0.08	4	0.45	
Selene dorsalis	0.04	10	0.23	
Pagellus bellottii	0.02	2	0.11	
Total	17.62		99.94	

PROJECT STATION:1253
 DATE:16/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2040
 start stop duration Long W 1745
 TIME :08:36:03 09:15:10 39 (min) Purpose code: 1
 LOG :3128.64 3130.49 1.72 Area code : 3
 FDEPTH: 380 322 GearCond.code:
 BDEPTH: 380 322 Validity code:
 Towing dir: 180° Wire out:1050 m Speed: 29 kn*10
 Sorted: 31 Kg Total catch: 1044.20 CATCH/HOUR: 1606.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pontinus kuhlii	836.92	13826	52.10	
Lophius budegassa	237.48	52	14.78	
MYCTOPHIDAE	167.38	33058	10.42	
Epigonus sp.	88.92	994	5.54	
Galeus melastomus	73.23	471	4.56	
Coelorinchus coelorhincus	37.66	523	2.34	
Todarodes sagittatus	35.57	52	2.21	
TRHGE01	23.02	837	1.43	
Parapenaeus longirostris	20.92	1308	1.30	
Tetragonurus atlanticus	18.83	52	1.17	
CYNOGLOSSIDAE	10.46	105	0.65	
TRITR02	10.46	157	0.65	
Capros aper	10.46	52	0.65	
Nzumia aequalis	10.46	418	0.65	
Synagrops microlepis	8.37	52	0.52	
Aristeus antennatus	6.28	1831	0.39	
Plesionika heterocarpus	5.23	209	0.33	
Octopus vulgaris	4.18	52	0.26	
Palinurus mauritanicus	0.62	2	0.04	
Total	1606.45		99.99	

PROJECT STATION:1254
 DATE:16/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 2040
 start stop duration Long W 1712
 TIME :12:54:10 13:24:00 30 (min) Purpose code: 1
 LOG :3164.88 3164.88 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 40 40 Validity code:
 Towing dir: 270° Wire out:3166 m Speed:200 kn*10
 Sorted: 65 Kg Total catch: 4986.42 CATCH/HOUR: 9972.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	9726.60	230230	97.53	2313
Engraulis encrasicolus	231.00	22946	2.32	2314
Loligo vulgaris	7.80	10	0.08	
Trachurus trecae, juvenile	6.16	6930	0.06	
Trichiurus lepturus	1.28	2	0.01	
Total	9972.84		100.00	

Annex II Instruments and fishing gear used

The Simrad EK-500, 38kHz scientific echo sounder was used during the survey for fish abundance estimation. The Bergen Echo Integrator system (BEI) logging the echogram raw data from the sounder, was used to scrutinize the acoustic records, and to allocate integrator data to fish species. All raw data were stored to tape, and a backup of the database of scrutinized data, stored.

The details of the settings of the 38kHz echo sounder where as follows:

Tranceiver-1 menu (38 kHz lowering keel)

Transducer depth	5.5 m
Absorbtion coeff.	10 dB/km
Pulse length	medium (1ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-21.0 dB
SV transducer gain	27.39 dB
TS transducer gain	27.52 dB
Angle sensitivity	21.9
3 dB beamwidth	6.8 dg
Alongship offset	-0.03 "
Athwardship offset	0.06 "

Display menu

Echogram	1
Bottom range	10 m
Bottom range start	10 m
TVG	20 log R
Sv colour min	-60 dB

Printer- menu

Echogram	1
Range	0 – 50 or 0 – 100 and 100 - 350 m
TVG	20 log R

Bottom detection menu Minimum level -40 dB

Hydrography

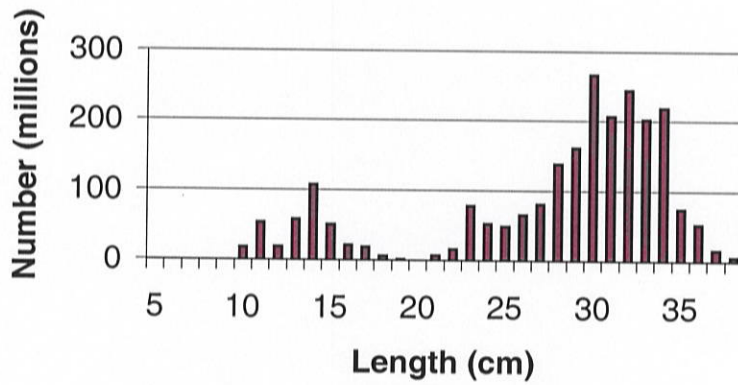
Conductivity, temperature, density and dissolved oxygen were sampled at CTD stations with Seabird 911 + CTD sonde. The salinity is computed from the data on conductivity by the software retrieving data from the sensors.

Fishing gear

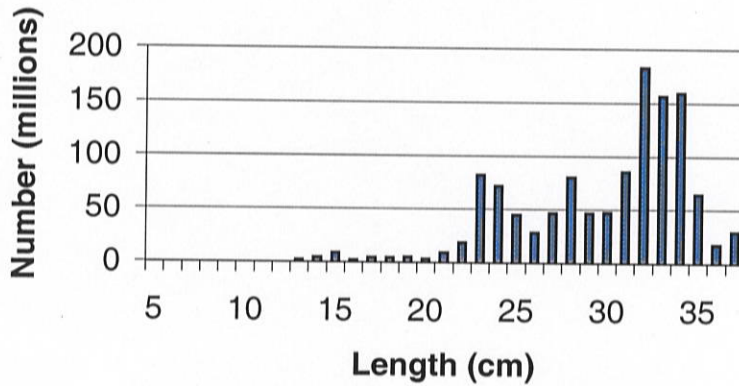
The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl". For all trawls, the Tyborøn, 7.8m² (1670kg) trawl doors were used. Complete drawings of the trawls used are included.

Annex III Pooled length distribution by species and regions

St. Louis - Cape Blanc *Sardinella maderensis*

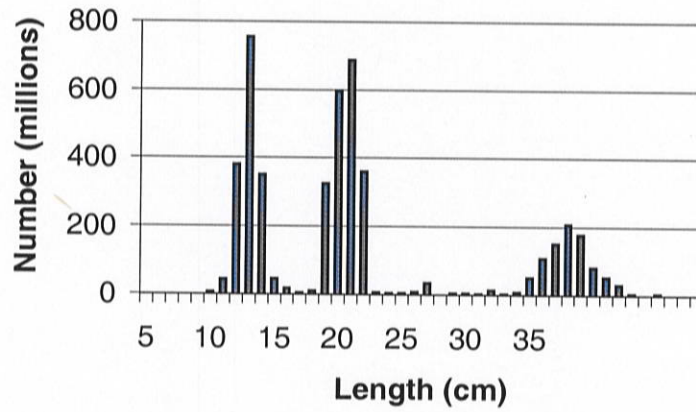


St. Louis - Cape Blanc *Sardinella aurita*

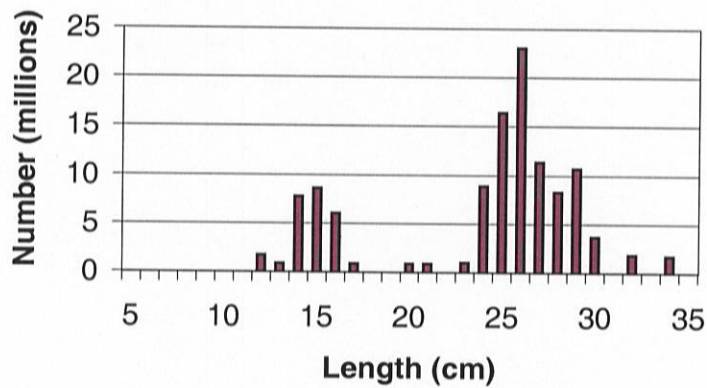


Annex III continued

St. Louis - Cape Blanc
Trachurus trecae

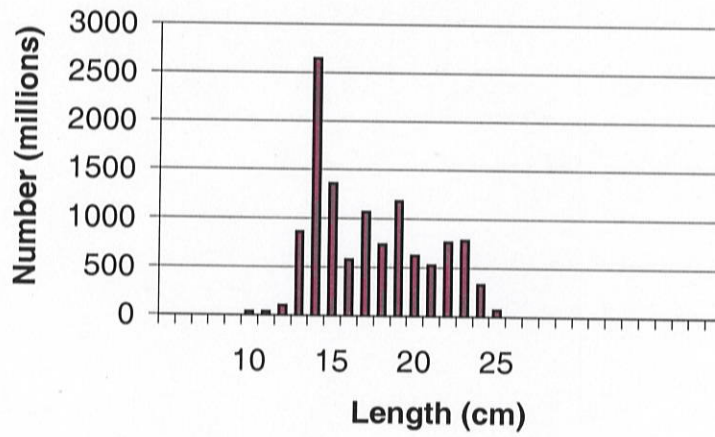


St. Louis - Cape Blanc
Decapterus sp.



Annex III Continued

Cape Timiris - Cape Blanc
Sardina pilchardus



Annex IV Estimates of numbers and weight by length.

Mauritania 2000

Sardinella aurita

Length cm	N (millions)			Biomass (tonnes)		
	St.Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL	St.Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL
5						
6						
7						
8						
9						
10						
11						
12						
13	2 051		2 051	48		48
14	4 102		4 102	120		120
15	8 204		8 204	293		293
16	1 974		1 974	85		85
17	3 948		3 948	203		203
18	3 948		3 948	240		240
19	4 683		4 683	333		333
20	2 709		2 709	224		224
21	8 862		8 862	845		845
22	18 458		18 458	2 018		2 018
23	82 062		82 062	10 224		10 224
24	71 808		71 808	10 138		10 138
25	45 027		45 027	7 167		7 167
26	28 281		28 281	5 052		5 052
27	46 381		46 381	9 260		9 260
28	72 433	7 467	79 900	16 097	1 659	17 756
29	46 653		46 653	11 498		11 498
30	47 172		47 172	12 849		12 849
31	78 105	7 467	85 572	23 436	2 240	25 676
32	182 476		182 476	60 135		60 135
33	149 140	7 467	156 606	53 827	2 695	56 522
34	144 294	14 933	159 228	56 882	5 887	62 769
35	64 683		64 683	27 781		27 781
36	17 451		17 451	8 146		8 146
37	14 482	14 933	29 415	7 332	7 560	14 892
38		7 467	7 467			
39						
TOTAL	1 117 455	37 333	1 154 788	324 235	20 041	344 277

Annex IV continued

Mauritania 2000

Sardinella maderensis

Length cm	N (millions)			Biomass (tonnes)		
	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL	St. Louis- Cape Timiris	Cape Timiris Cape Blanc	TOTAL
5						
6						
7						
8						
9						
10	17 631		17 631	196		196
11	52 892		52 892	772		772
12	18 289		18 289	343		343
13	57 433		57 433	1 357		1 357
14	106 727		106 727	3 124		3 124
15	50 266		50 266	1 797		1 797
16	20 678		20 678	892		892
17	18 426		18 426	948		948
18	5 923		5 923	360		360
19	658		658	47		47
20						
21	6 859		6 859	654		654
22	658	14 933	15 591	72	1 633	1 705
23	2 632	74 666	77 298	328	9 302	9 630
24	14 597	37 333	51 930	2 061	5 271	7 331
25	26 125	22 400	48 525	4 159	3 566	7 724
26	65 299		65 299	11 666		11 666
27	80 801		80 801	16 132		16 132
28	137 996		137 996	30 667		30 667
29	161 271		161 271	39 746		39 746
30	265 755		265 755	72 386		72 386
31	206 906		206 906	62 083		62 083
32	244 224		244 224	80 484		80 484
33	201 839		201 839	72 847		72 847
34	219 026		219 026	86 342		86 342
35	74 506		74 506	32 000		32 000
36	52 201		52 201	24 368		24 368
37	15 585		15 585	7 890		7 890
38	5 195		5 195	2 846		2 846
39						
40						
TOTAL	2 057 419	149 332	2 206 750	556 566	19 772	576 337

Annex IV continued

Mauritania 2000

Trachurus trecae

Length cm	N (millions)			Biomass (tonnes)		
	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL
9						
10	5 694		5 694	63		63
11	43 361		43 361	633		633
12	379 922		379 922	7 124		7 124
13	754 889		754 889	17 830		17 830
14	349 353		349 353	10 224		10 224
15	45 462		45 462	1 625		1 625
16	16 410		16 410	708		708
17	3 995		3 995	206		206
18	9 680		9 680	588		588
19	19 935	303 463	323 397	1 419	21 601	23 020
20	20 985	576 579	597 564	1 736	47 686	49 422
21	18 938	667 618	686 556	1 807	63 696	65 503
22	24 631	333 809	358 440	2 693	36 502	39 195
23	6 034		6 034	752		752
24	2 990		2 990	422		422
25	3 399		3 399	541		541
26	7 367		7 367	1 316		1 316
27	3 968	30 346	34 315	792	6 059	6 851
28						
29	3 968		3 968	978		978
30	3 968		3 968	1 081		1 081
31	2 402		2 402	721		721
32	12 804		12 804	4 220		4 220
33	2 402		2 402	867		867
34	7 333		7 333	2 891		2 891
35	49 907		49 907	21 435		21 435
36	106 539		106 539	49 735		49 735
37	149 964		149 964	75 919		75 919
38	207 456		207 456	113 652		113 652
39	175 751		175 751	103 983		103 983
40	80 476		80 476	51 322		51 322
41	53 456		53 456	36 679		36 679
42	30 534		30 534	22 502		22 502
43	3 728		3 728	2 946		2 946
44	2 402	1 911 817	1 914 219	2 032		2 032
45	3 728		3 728	3 371		3 371
46						
47						
48						
49	3 728		3 728	4 341		4 341
50						
TOTAL	1 799 797	1 911 815	3 711 612	549 152	175 544	724 697

Annex IV continued

Mauritania 2000

Decapterus sp.

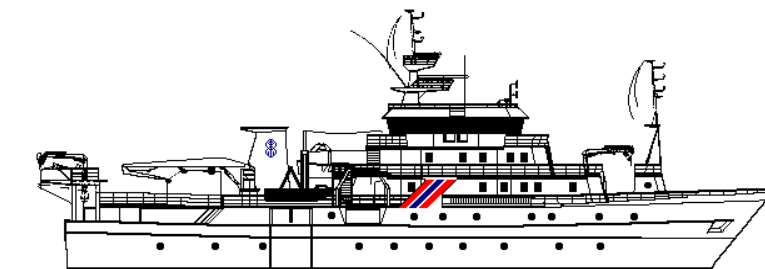
Length cm	N (millions)			Biomass (tonnes)		
	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL
5						
6						
7						
8						
9						
10						
11						
12	1 720		1 720	32		32
13	860		860	20		20
14	7 739		7 739	226		226
15	8 599		8 599	307		307
16	6 019		6 019	260		260
17	860		860	44		44
18						
19						
20	860		860	71		71
21	860		860	82		82
22						
23	997		997	124		124
24	8 889		8 889	1 255		1 255
25	16 388		16 388	2 609		2 609
26	23 016		23 016	4 112		4 112
27	11 338		11 338	2 264		2 264
28	8 274		8 274	1 839		1 839
29	10 723		10 723	2 643		2 643
30	3 707		3 707	1 010		1 010
31						
32	1 857		1 857	612		612
33						
34	1 720		1 720	678		678
35						
36						
38						
TOTAL	114 424		114 424	18 188		18 188

Annex IV continued

Mauritania 2000

Sardina pilchardus

Length cm	N (millions)		Biomass (tonnes)	
	Cape Timiris- Cape Blanc	TOTAL	Cape Timiris- Cape Blanc	TOTAL
9				
10	32 947	32 947	381	381
11	32 947	32 947	501	501
12	98 841	98 841	1 930	1 930
13	860 531	860 531	21 172	21 172
14	2 643 583	2 643 583	80 593	80 593
15	1 354 738	1 354 738	50 449	50 449
16	577 918	577 918	25 961	25 961
17	1 068 708	1 068 708	57 276	57 276
18	737 040	737 040	46 667	46 667
19	1 179 264	1 179 264	87 441	87 441
20	626 484	626 484	53 972	53 972
21	526 234	526 234	52 299	52 299
22	765 876	765 876	87 238	87 238
23	781 075	781 075	101 367	101 367
24	330 107	330 107	48 546	48 546
25	62 877	62 877	10 426	10 426
26				
TOTAL	11 679 172	11 679 172	726 220	726 220



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

Part III

MOROCCO

18 November - 19 December 2000

CRUISE REPORT "DR FRIDTJOF NANSEN"

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

Part III

MOROCCO

18 November-19 December 2000

by

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Bergen, 2000**

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ANNEX III	Biomass and number by length

CHAPTER 1 INTRODUCTION

1.1 Survey objectives

The specific objectives for the survey in Morocco were:

- 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 sample standard hydrographical transects for temperature, salinity and oxygen off Cape Blanc, Dakhla, Cape Bojador, Cape Juby, Cape Dra and Cape Ghir.

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

1.2 Participation

Members of the scientific teams were:

Institut National de Recherche Halieutique, Morocco:

Mostafa CHBANI IDRISSE (18.11-04.12), Hassan MOUSTAHFID, Hamid LCHFIRI, Lahcen ABOUABDELLAH, Hakim MESFIOUI and Said SEMMOUMI.

Centre National de Recherches Océanographiques et des Pêches, Mauritania:

Mamadou SALL.

Institute of Marine Research, Norway(IMR):

Tore STRØMME (cruise leader), Marek OSTROWSKI (4.12-19.12), Oddgeir ALVHEIM, Tore MØRK, and Frode WILHEMLSEN.

Special team on SODAPS sonar development (separate objective) 18.11-4.12. From IMR:

John DALEN, Bjørn TOTLAND, Ingvald SVELLINGEN, Per Erik NORDBØ

1.3 Narrative

Figure 1 shows the cruise track and the stations worked during the survey. Departure was from Nouakchott on November 18, steaming north to Cape Blanc. During the preceding survey in Mauritania aggregations of sardine was registered south of Cape Blanc with good registrations in the border area. The Morocco survey grid started south of these registrations in order to capture them as one structure. The survey proceeded northwards with an acoustic sampling grid with a transect distance 10 NM apart, covering the shelf and slope down until about 200 m bottom depth. The coastal waters north of Dakhla were resurveyed with a dense grid for a more detailed mapping of the structure of sardines. North of Cape Bojador the survey was interrupted with a call on Las Palmas 2-4 December for refuelling and disembarkment of scientists. The survey work in Moroccan waters was resumed north of Cape Bojador on the early morning of 5 December, continuing northwards. The northern limit of the survey, at Cape Cantin, was reached on 14 December. The vessel called on Agadir 15-16 December for meetings and disembarkment of Moroccan scientist. Finalisation of the report was done during steaming to Las Palmas 16-18 December. The weather gave very favourable working conditions throughout the survey period.

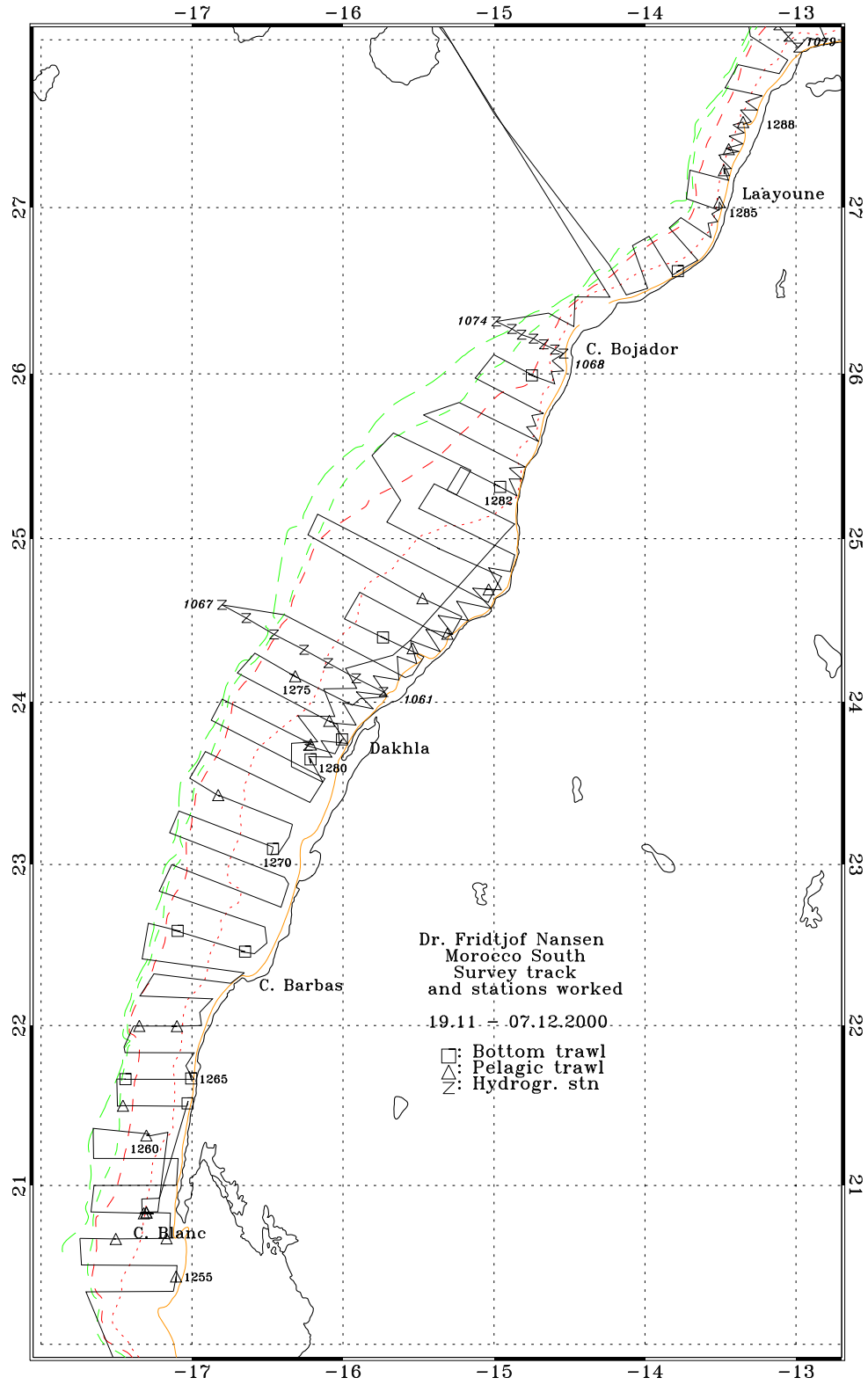


Figure 1a. Course track with fishing and hydrographic stations, Cape Blanc to Cape Juby. Depth contours at 20 m, 50 m, 100 m, 200 m and 500 m are indicated.

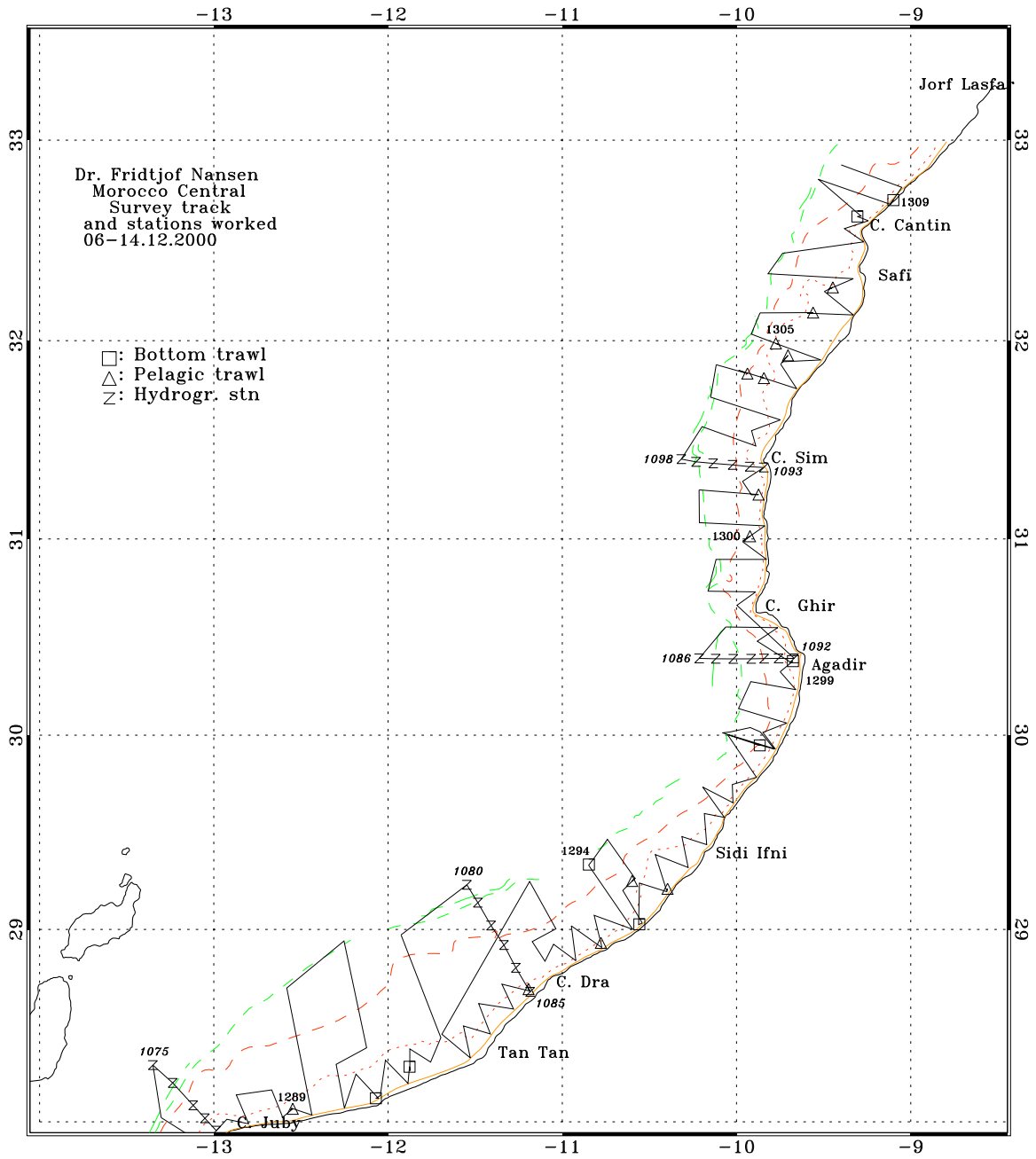


Figure 1b. Course track with fishing and hydrographic stations, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

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, global 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. CTD-stations were recorded at the standard hydrographic transects. A Seabird 911+ CTD probe was used to obtain vertical profiles of temperature, salinity and oxygen. 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.

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 *Decapterus rhonchus*),
- 5) Mackerels (chub mackerel *Scomber japonicus*), In the records from the BEI system, this group is labelled PEL1 (in Moroccan waters only).
- 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 echo-grams 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 by 5 NM intervals. The BEI system does not underestimate dense schools and schools close to the bottom as some times may have happened with the EK500 Integrator used in the 1992 surveys. The splitting and allocation of the integrator outputs (s_A -values) 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 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 $TS = 20 \log L - \text{be } 72$ the formula can further simplified into:

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

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 were converted to biomass by length group using the estimated weight at length from the length-weight relationship:

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

The specific condition factors obtained from the samples and applied for this survey were: 0.82 for sardine, 0.94 for *Sardinella 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 Weather conditions and hydrography

Wind conditions

The continental shelf off Morocco is located in the region of the Trade winds, which drive the upwelling along the coast. During winter season, the strong and steady equatorialward winds are persistent off the southern Morocco, between Cape Blanc and Cape Bojador. In contrast, wind conditions are variable off the central Morocco during this period, whereby spells of short-duration wind events are interleaved with periods of calm weather.

The wind conditions recorded during the 2000 winter survey resemble well the average seasonal pattern. This is demonstrated in Figures 2a and 2b, which depict distribution of wind vectors recorded along the survey track. The features seen on these figures are briefly summarized below in terms of average wind conditions along the main coastal regions.

Cape Blanc to Dakhla, Figure 2a. Steady winds from NNE with average speed of 18.2 knots (9.4 m/s); maximum velocities reaching 29.8 knots (15.3 m/s).

Dakhla to Cape Bojador. Average wind speed in this region was 14.8 knots (7.6 m/s). Dominant direction NNE, with the exception of few transects located north of Dakhla near latitude 24°40'N, where a weak wind (2 m/s) from SEE was recorded.

Cape Bojador to Cape Juby. Average wind speed in this region decreased to 9.0 knots (4.6 m/s), with the direction turning towards NE.

Cape Juby to Tan Tan, Figure 2b. A major wind reversal was observed in this region. The wind was blowing offshore, from SSE, with the mean velocity of 13.5 knots (7 m/s).

Tan Tan to Sidi Ifini. Average wind speed: 11.8 knots (6.1 m/s), wind direction has returned to the dominant, upwelling favourable, NNE direction.

Sidi Ifini to Cape Cantin. Wind speed and direction were variable in this region. Two stronger winds events, each lasting 24 hours, were recorded: (1) between Agadir and Cape Ghir, and (2) off Cape Sim. The characteristic feature of the Cape Ghir event, Figure 2b, was the constant wind speed (>15 knots) accompanied by a gradual change in the direction from N to SEE, as the survey track was approaching the coastline. Such variability is probably attributable to the local and diurnal disturbances of the large-scale wind field in the presence of the nearby Atlas Mountains.

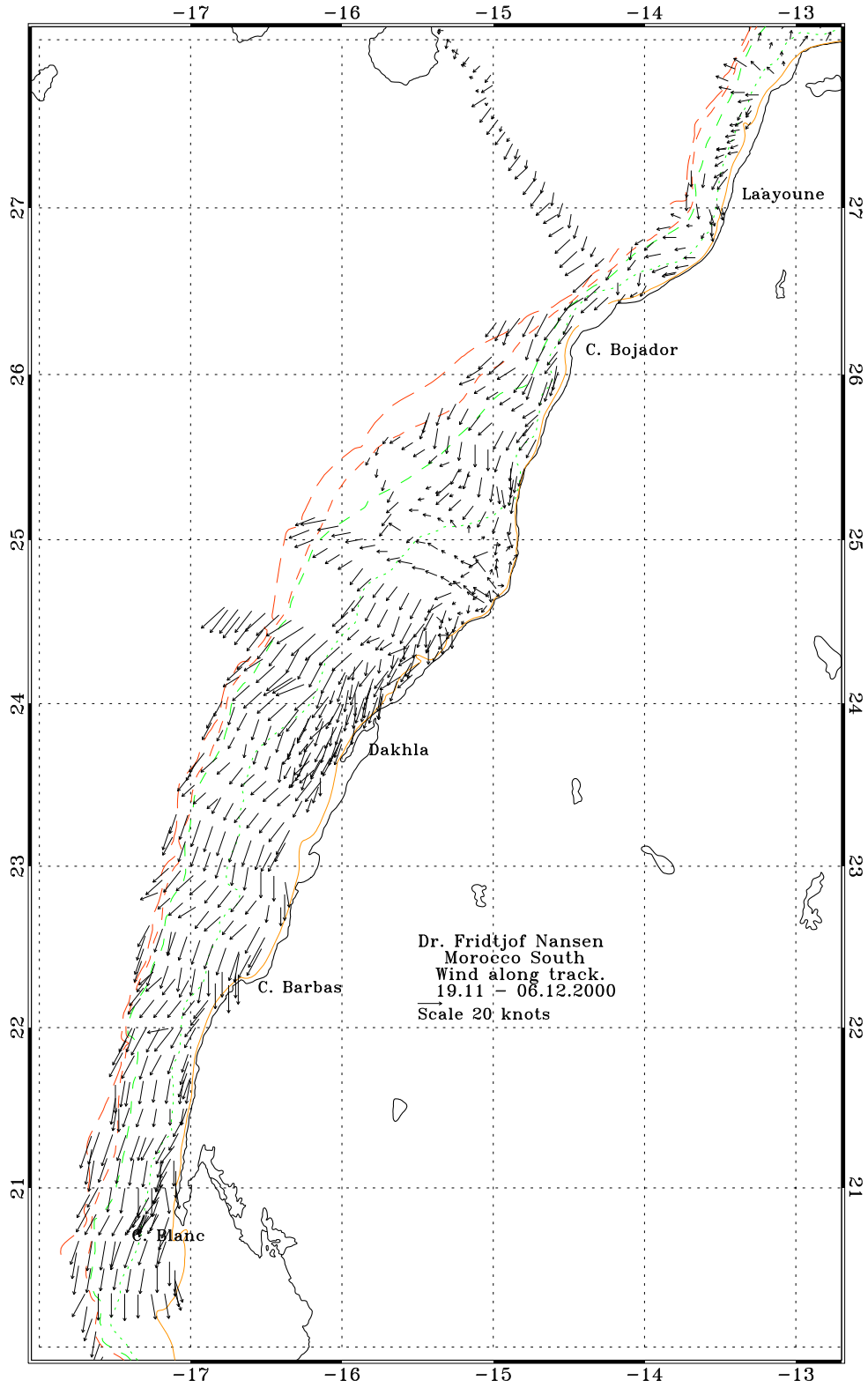


Figure 2a Wind conditions along the survey track 19 November - 6 December, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

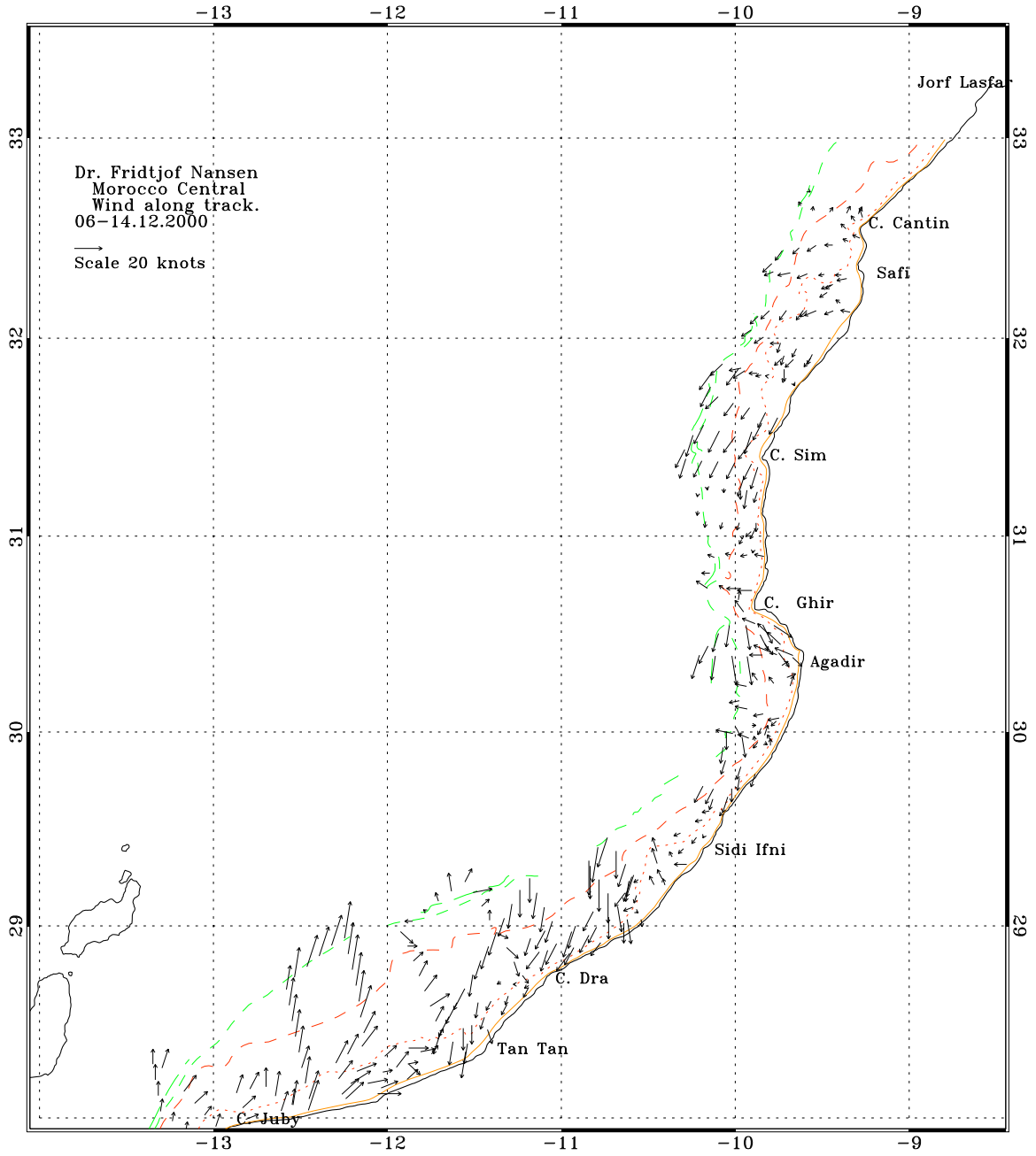


Figure 2b Wind conditions along the survey track 6-14 December, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

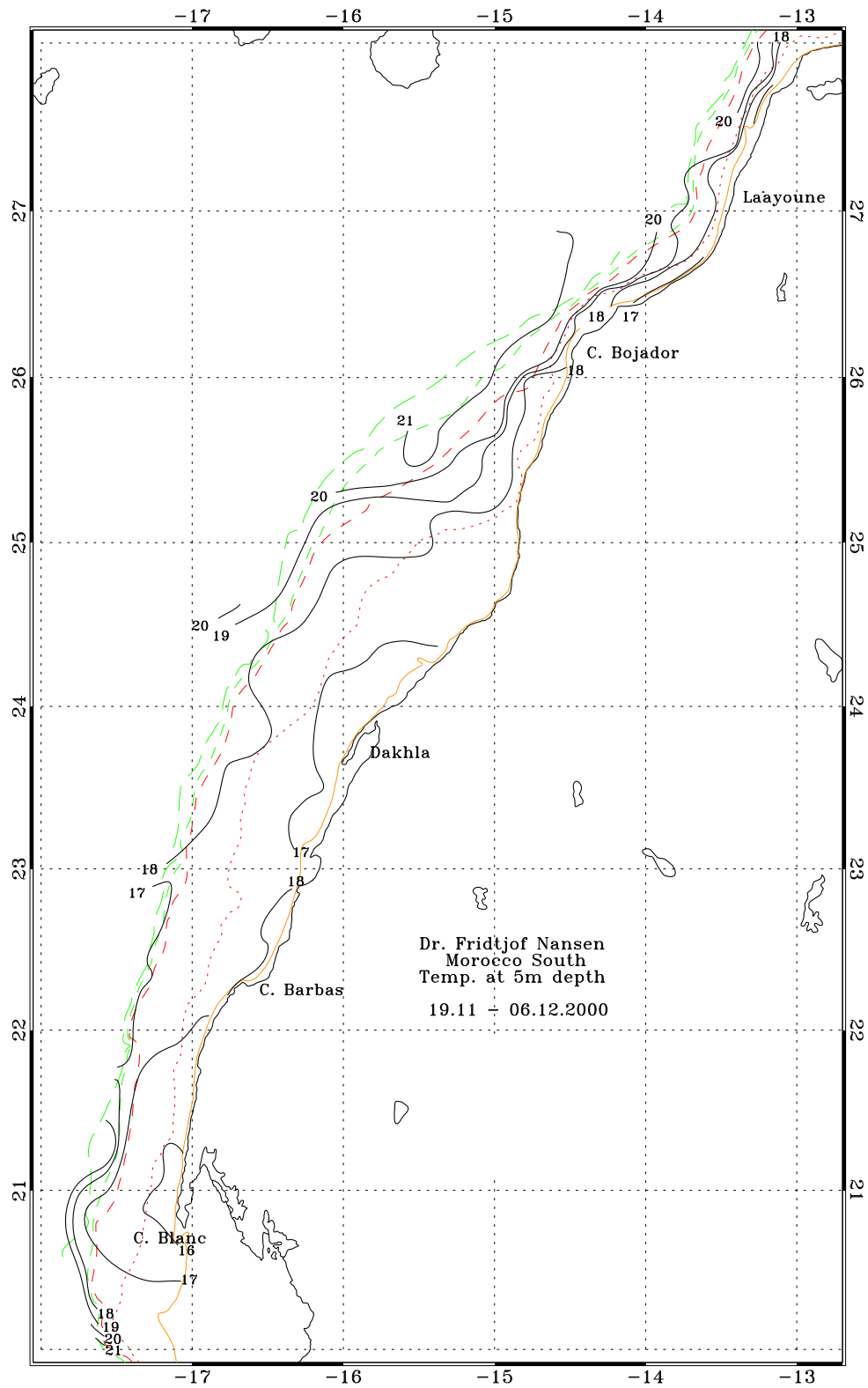


Figure 3a Sea surface temperature (at 5m depth), Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

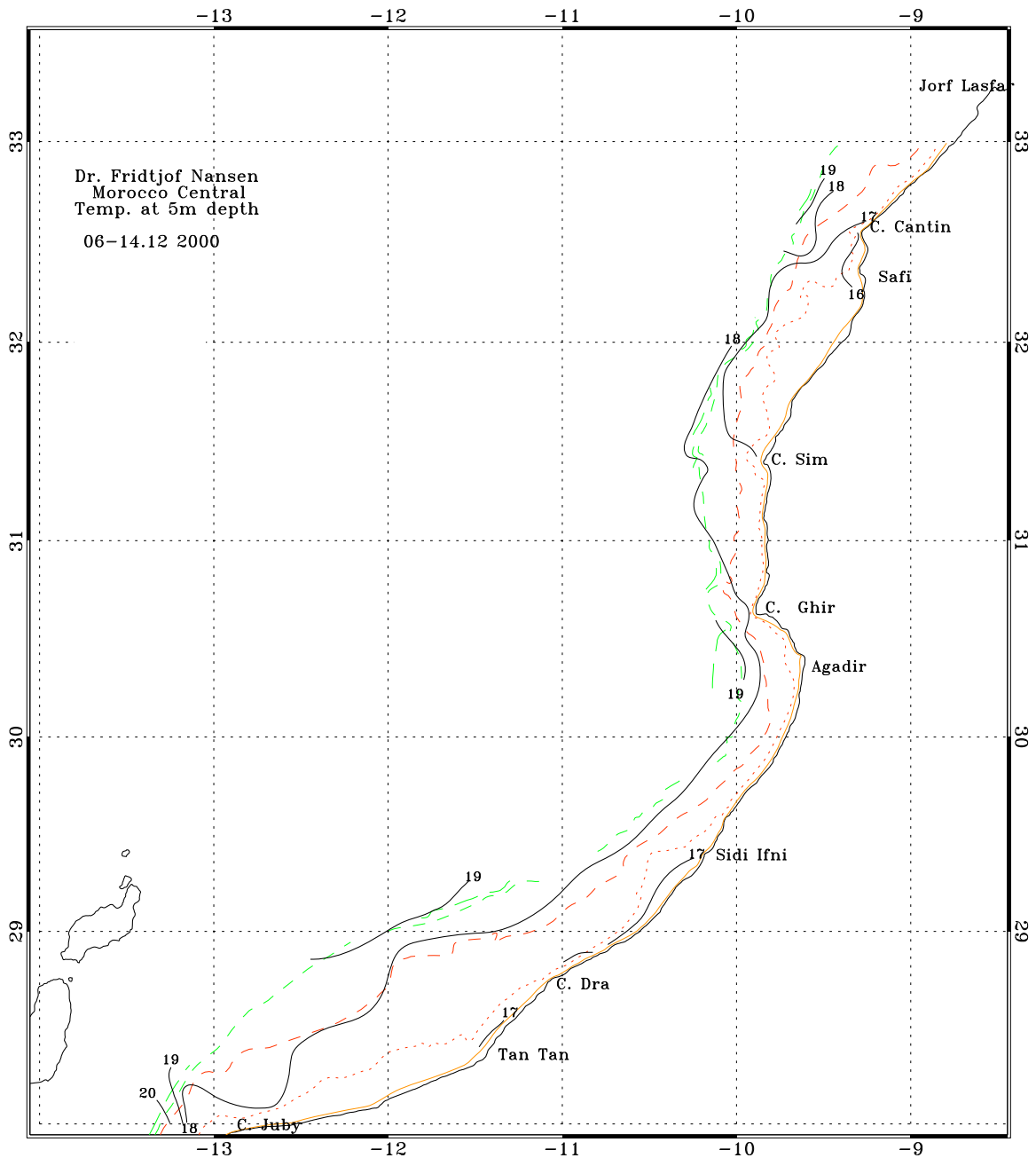


Figure 3b Sea surface temperature (at 5m depth), Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

Surface temperature

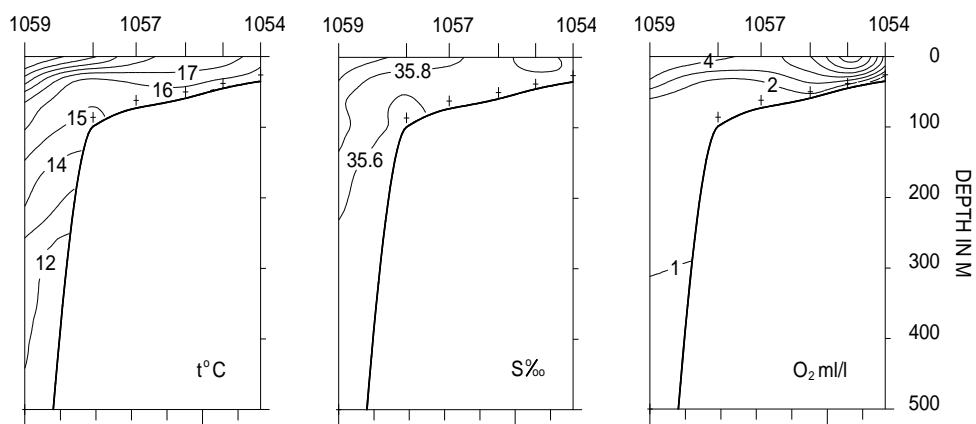
Maps of surface temperatures, as recorded by the ship's thermograph from the depth of 5m are demonstrated in Figure 3a for the southern, and in Figure 3b for the central Morocco regions, respectively. Signatures of coastal upwelling, characterized by inshore pockets of water with temperatures $< 17^{\circ}\text{C}$, are identifiable at five localities: off Cape Blanc, (2) off Dakhla, (3) to the

north of Cape Bojador, (4) between Tan Tan and Sidi Ifini, and (5) between Cape Sin and Cape Cantin. The lowest subsurface temperature was recorded in the Cape Blank cell: 15.8 °C. Low temperatures were also noted in the northernmost cell, south of Cape Cantin (16 °C).

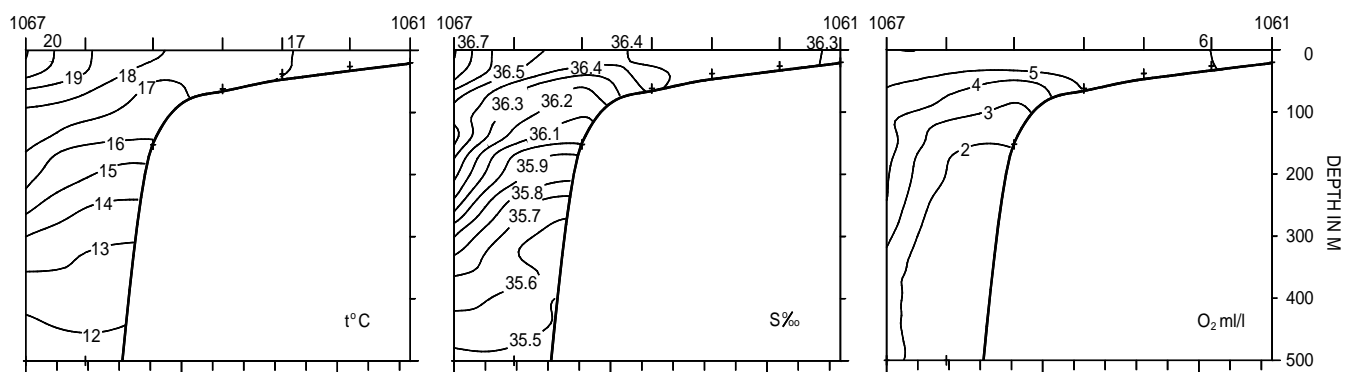
Another characteristic feature of the subsurface temperature distribution was the presence of the body of warm water >20 °C, which run more or less parallel to the coast, between Dakhla and Cape Juby, Figure 3a. These waters delimit the inshore boundary the southward-bound Canary Current, and constitute a permanent hydrographic feature observed off Cape Bojador; it has been also observed in previous winter surveys with Dr. Fridtjof Nansen carried out in this region.

Vertical structure of temperature, salinity and oxygen

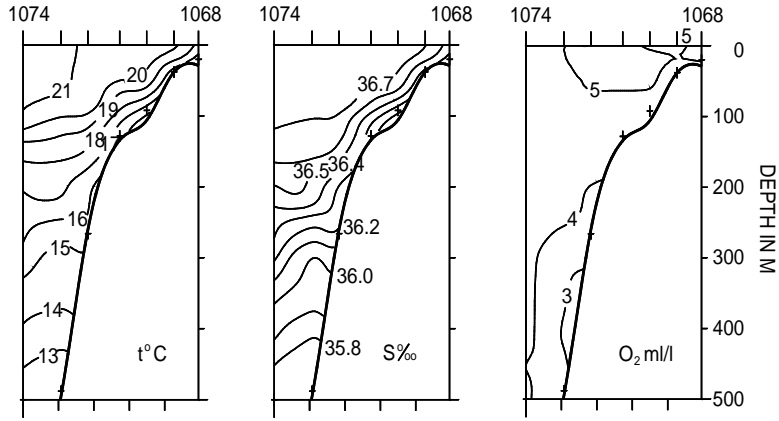
Vertical sections of temperature, salinity and oxygen are shown in Figure 4. The locations of the CTD stations from southern Morocco are given in Figure 1a and those from central Morocco in Figure 1b, respectively.



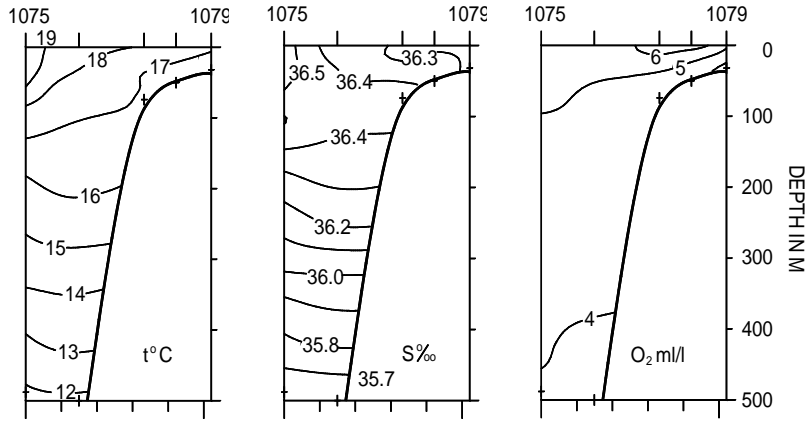
CAPE BLANC 16.11.2000



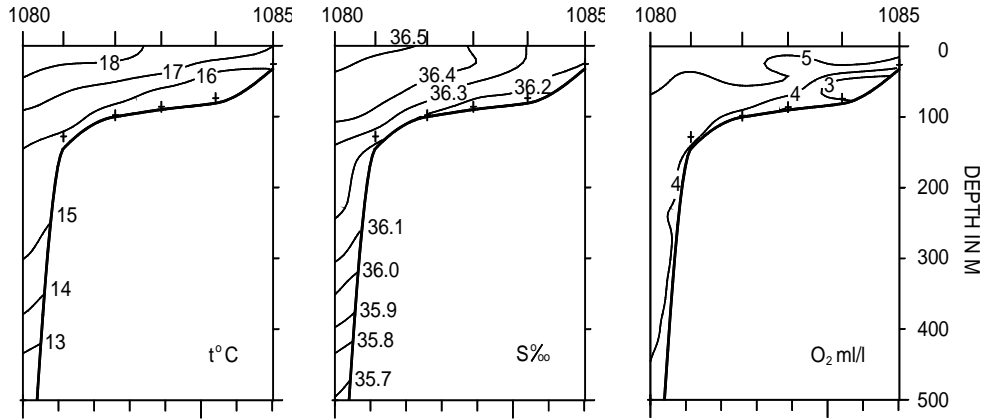
DAKHLA 25.11.2000



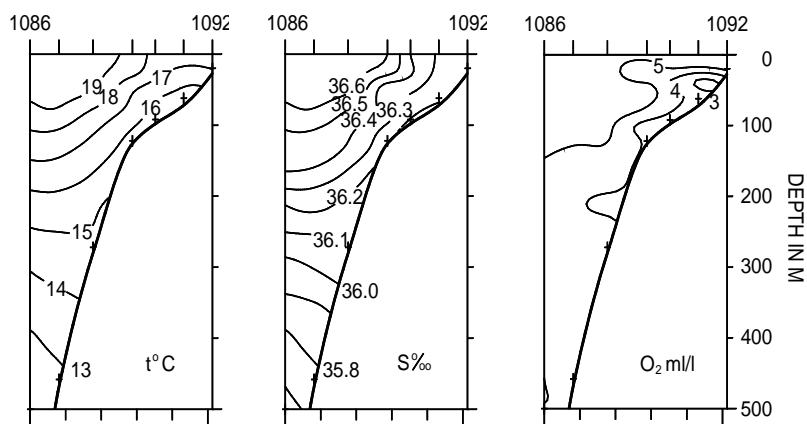
CAPE BOJADOR 01.12.2000



CAPE JUBY 06.08.2000



CAPE DRA 08.12.2000



AGADIR 11-12.12.2000

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

All sections of temperature and salinity exhibit the characteristic upward tilt of isolines in the inshore direction - an indicative of the upwelling-induced uplift of subsurface water masses into the coastal area.

The southernmost section, off Cape Blanc, shows the presence of the South Atlantic water masses on the shelf region. This is indicated by a relatively low salinity ($S < 36$) and also by low oxygen content ($O < 2$ ml/l).

Examining the subsequent sections in Figure 4, it is clear that shelf regions to the north of Cape Blanc were penetrated by the North Atlantic water masses associated with the Canary Current, characterized by high salinity ($S > 36.3$) and by high oxygen concentration (> 4 ml/l).

Summary of hydrographic conditions

The hydrographic conditions encountered during the 2000 survey were typical for the winter season in the shelf off Morocco. The wind conditions in the south were dominated by a persistent, equatorialward alongshore wind, favouring development of coastal upwelling. To the north, a more variable wind conditions were found, with spells of stronger winds and periods of calmer conditions. From subsurface temperature measurements, five regions with inshore temperatures less than 17 °C were identified as probable locations of the active coastal upwelling cells. These were: the region off Cape Blanc, Dakhla, area north of Cape Bojador, inshore zone between Tan Tan and Sidi Ifini, and region between Cape Sim and Cape Cantin.

The wind conditions and hydrographic features observed during the 2000 survey were rather similar to those recorded in the previous survey, in December 1999. The two main differences

were: (1) in the whole survey area, the slightly lower temperatures and salinities were recorded during the year 2000; (2) in the region of shelf-break of southern Morocco, the northward penetration of the low oxygen subsurface waters characteristic to the South Atlantic regime ($O < 2$ ml/l) was observed in 2000, but not in 1999, Figure 4.

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

Figures 5 to 8 show the distribution of the main groups of pelagic fish by contoured acoustic densities.

Sardine, *Sardina pilchardus*, Figure 5, was first encountered south of Cape Blanc in Mauritanian waters, extending northwards with patches close to the shore until Cape Barbas. A notable concentration was located close to the shelf edge close to 20°N. The major concentration of sardine was encountered, as in previous years, between 23 and 25° N, more broken up than in previous years and also with some adult fish more offshore. The sardine found close to the shore south of C. Barbas was mainly small sized fish with modal length 11-13 cm while offshore it was mainly big sized fish 23 cm. The dense school aggregations nearshore in the Dakhla area, consisted mostly of sardine with modal length 15-17 cm, mixed with smaller amounts of big fish (mode 22-23 cm).

Between Cape Bojador and Cape Juby dense registrations of sardine was recorded very close to the shore. The registrations were particularly dense from Laayoune and northwards. The samples showed that there was mainly small sized fish with mode around 12 cm, added with some representation from 17 and 21 cm groups.

The general picture of the sardine south of Bojador is that is perhaps more southern compared to previous years and more broken up in patches. The concentrations off Laayoune were denser than in previous years. See Figure 6.

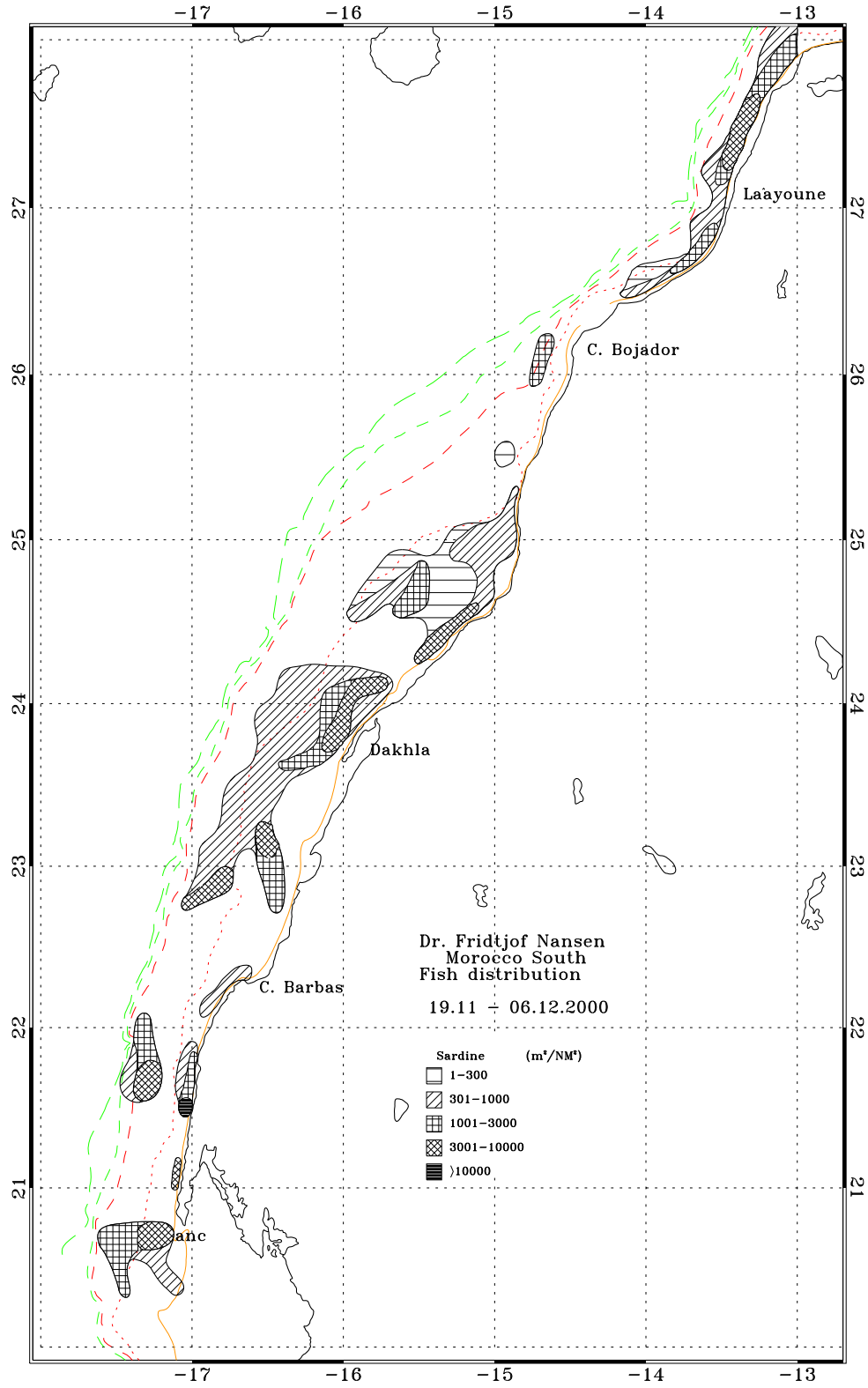


Figure 5 Distribution of sardine, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

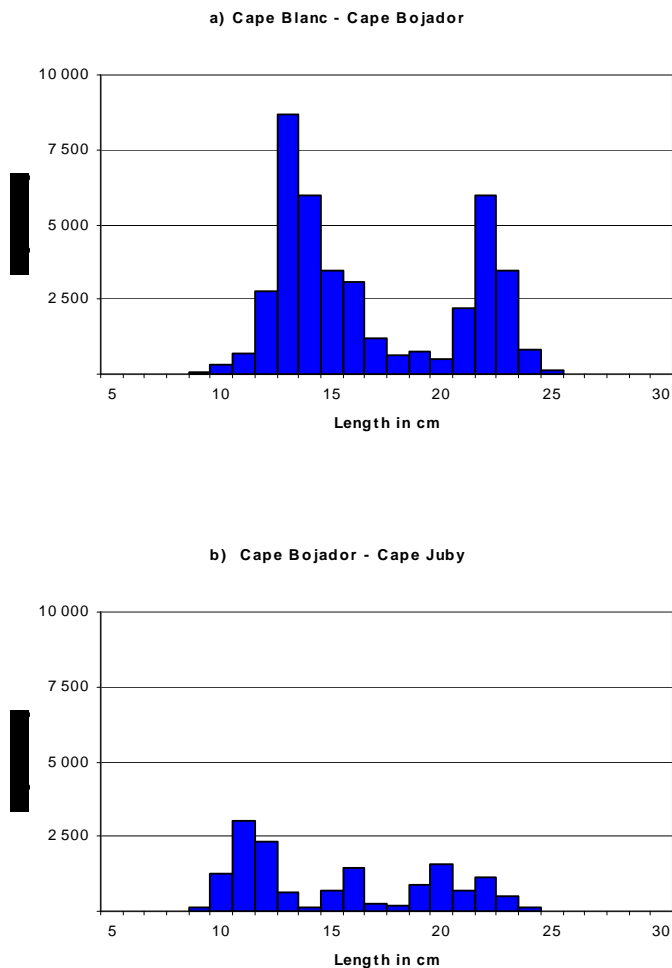


Figure 6. Length frequency distributions sardine.

Sardinellas (*Sardinella aurita* and *Sardinella maderensis*) were only found between Cape Blanc and Cape Barbas in two small, but very dense aggregations, Figure 7. In addition, one offshore aggregation was located west of Cape Barbas. The concentrations are considerably smaller in extent than in the late previous years, but contains some extremely high integrator values.

Horse mackerels (*Trachurus trachurus* and *T. trecae*) were found in dense concentrations between Cape Blanc and Cape Barbas, between 50 and 200m bottom depth. It was also common at the outer shelf off Dakhla and further north, between Laayoune and Cape Juby, Figure 8.

Chub mackerel (*Scomber japonicus*) were found in small-scattered patches between Cape Blanc and Cape Bojador, in low to medium dense concentrations, Figure 9.

Anchovy (*Engraulis encrasicolus*) were only recorded coincidentally at two instances, both forming small patches only (no figure).

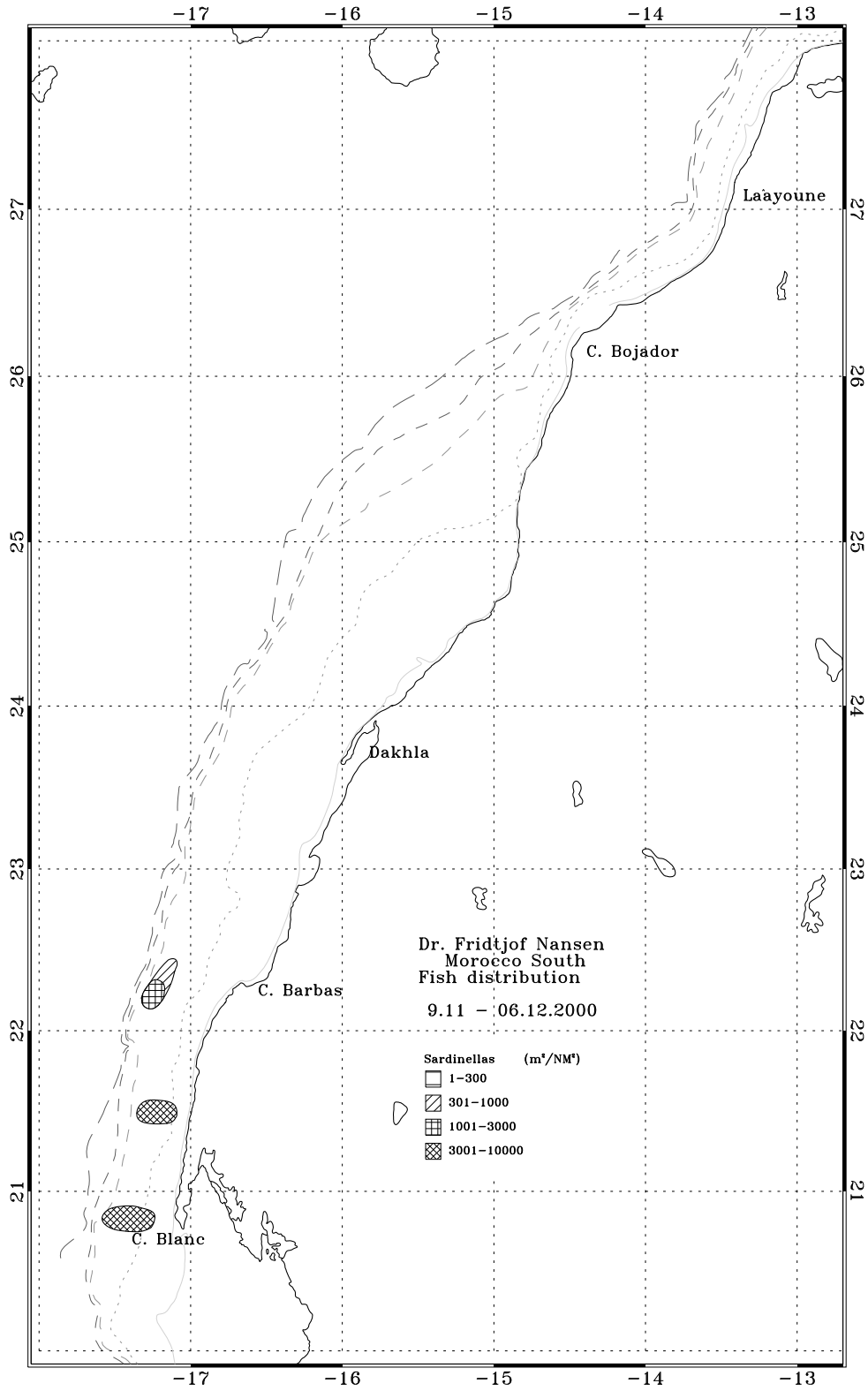


Figure 7. Distribution of sardinella, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

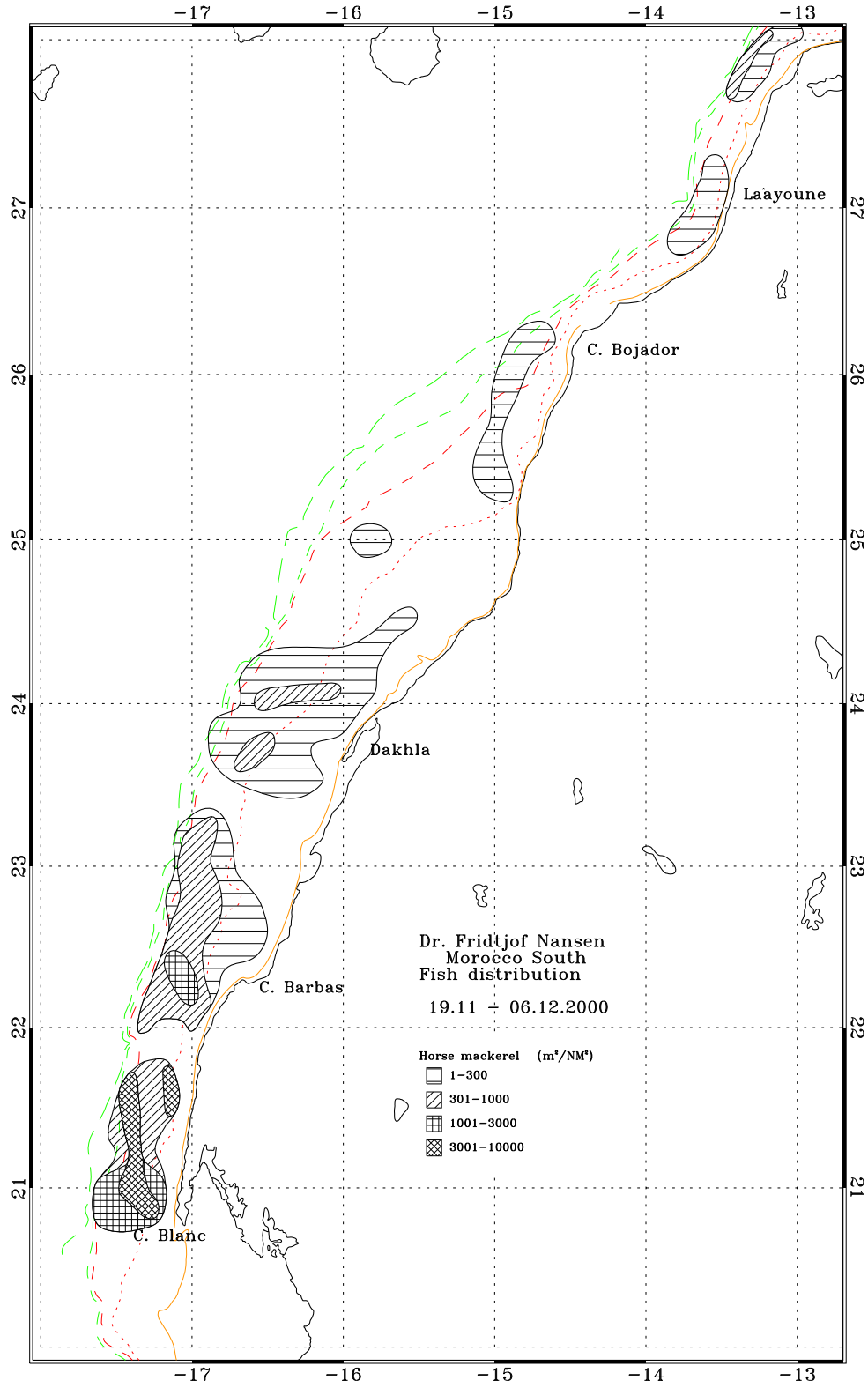


Figure 8. Distribution of horse mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

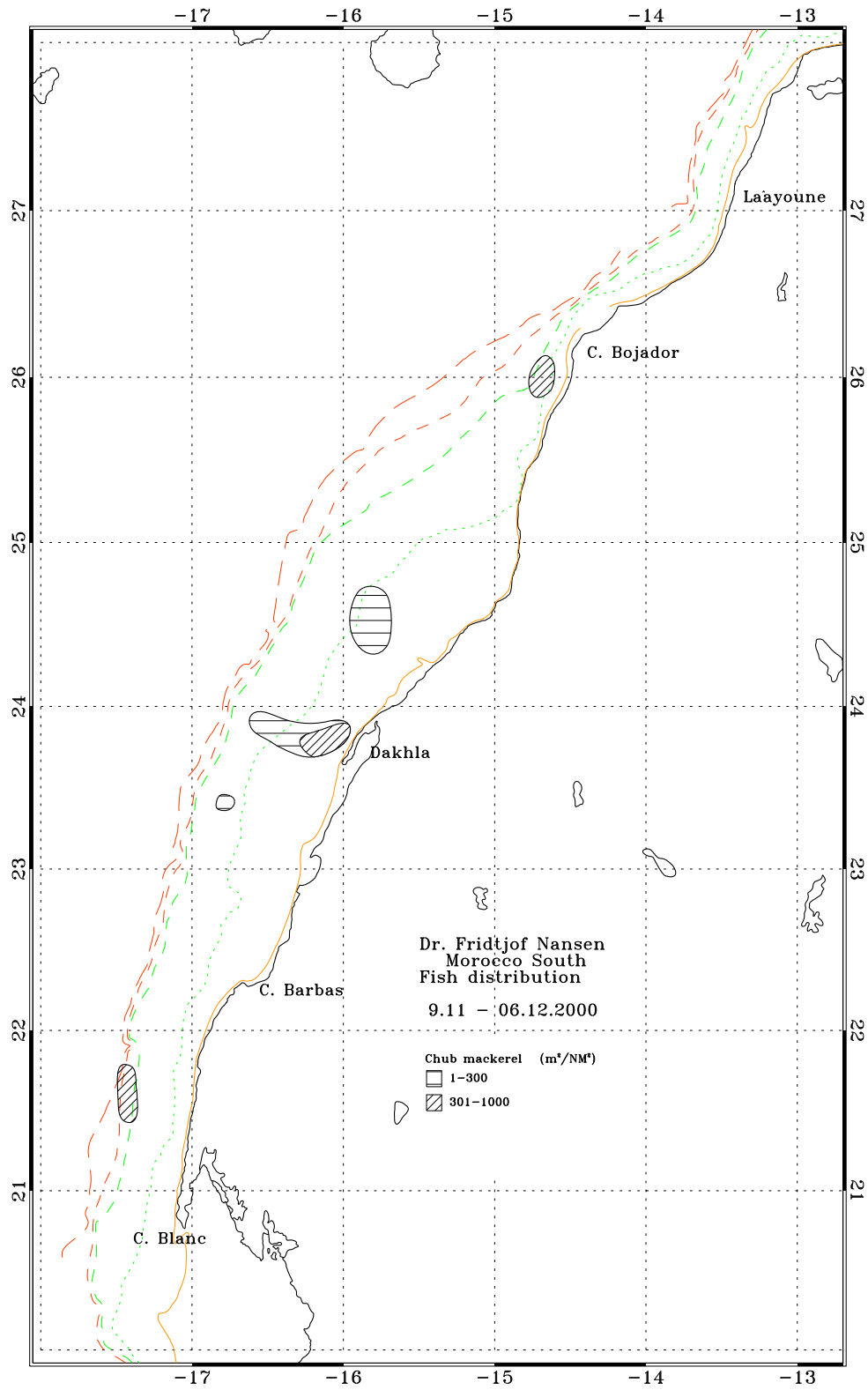


Figure 9. Distribution of chub mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

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

Sardine, Figure 10, was registered more or less along the entire coast in this region. Very high densities were recorded off Tan Tan and Sidi Ifni. Off Safi dense concentrations were found from the coast unto mid-shelf. These concentrations were more abundant compared to previous years.

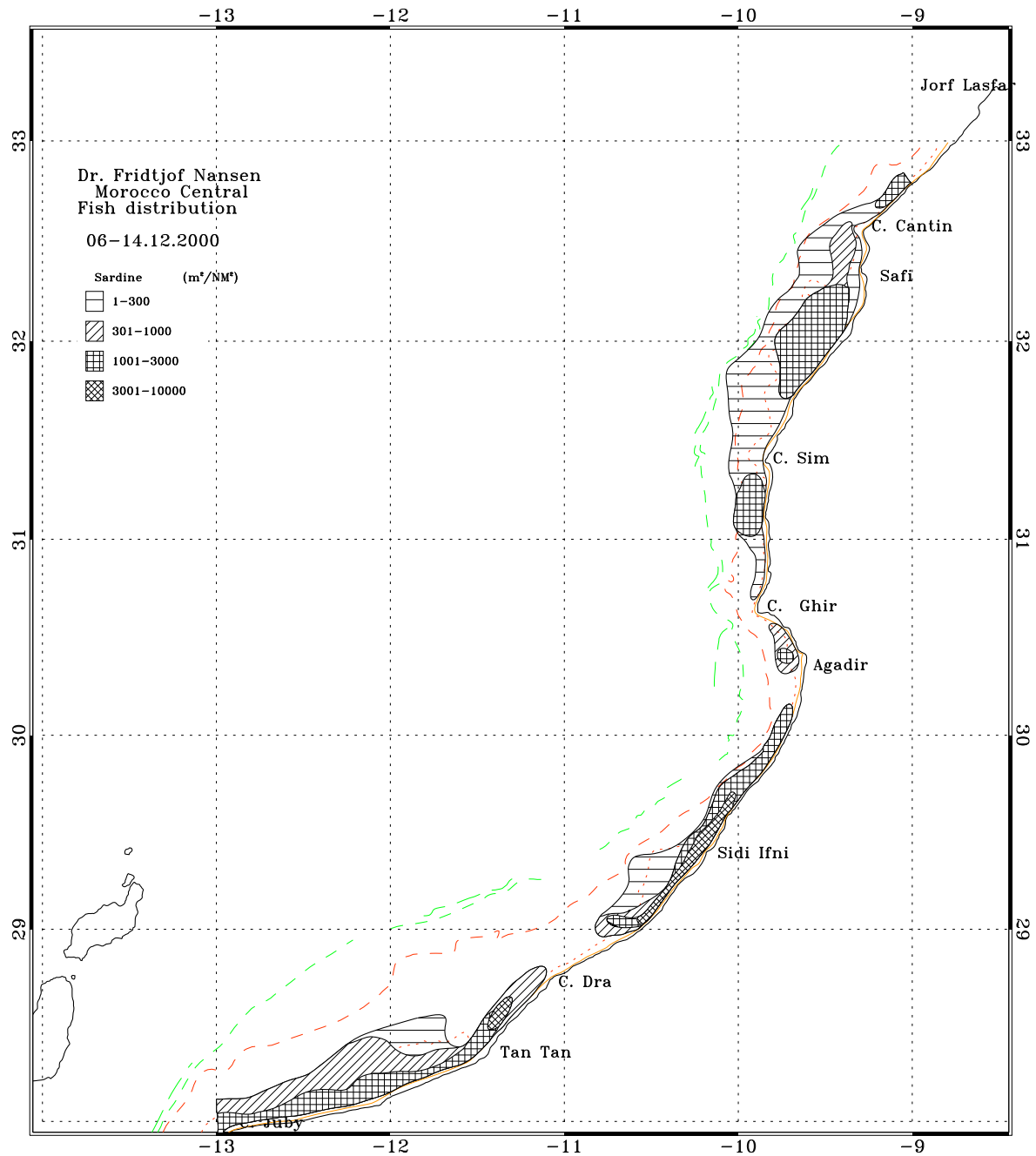


Figure 10. Distribution of sardine, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

Anchovy was also common in the shallow areas, Figure 11, but not as dense as the sardine. The areas of highest densities were off Cape Dra, off Agadir, between Cape Ghir and Cape Sim and at the outer shelf south of Safi. One dense patch of limited size was registered off Cape Cantin.

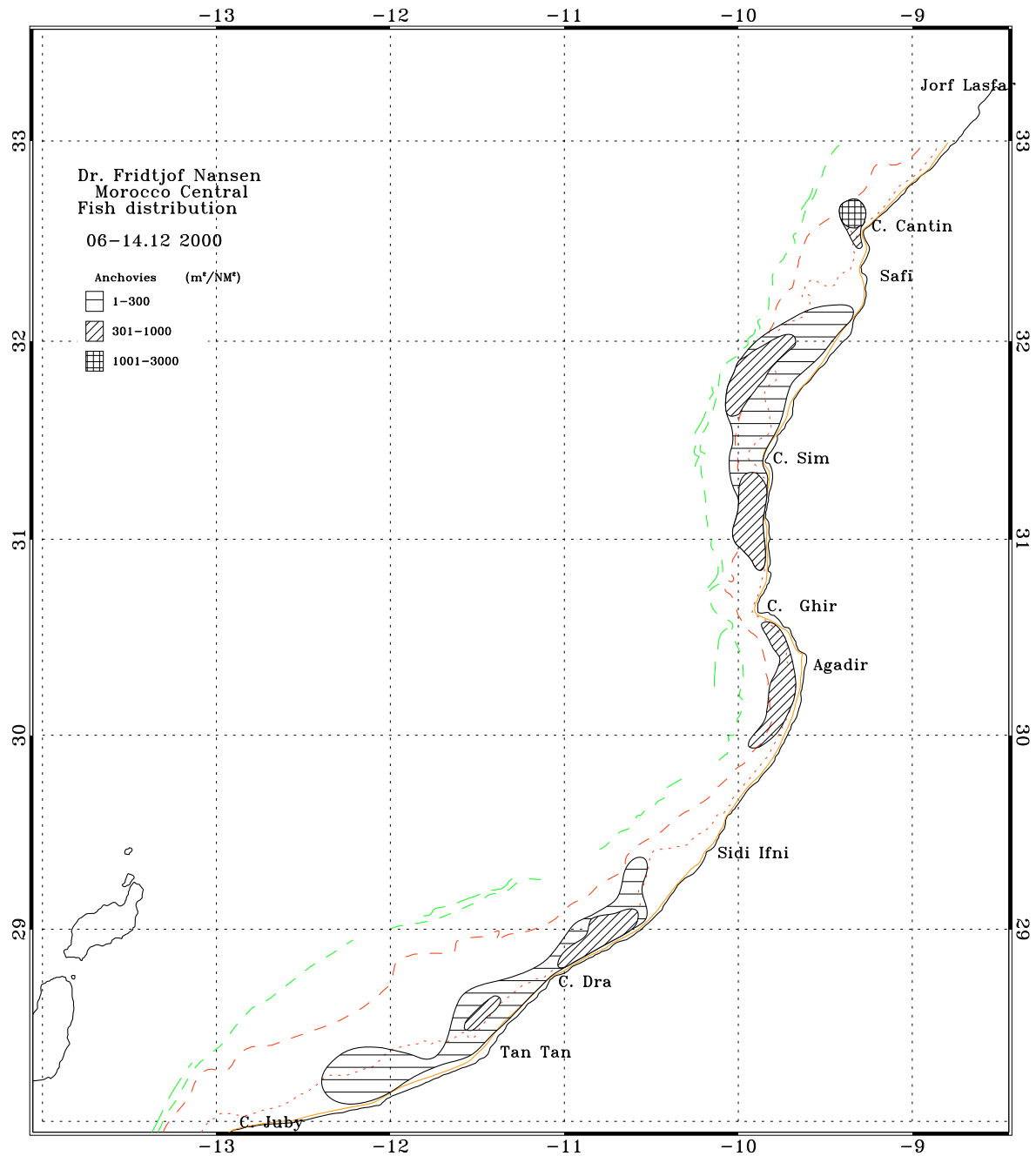


Figure 11. Distribution of anchovy, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

Recordings of **horse mackerel** in this region were few and mostly at low to moderate densities, Figure 12. One dense, but small patch was encountered north of Cape Cantin.

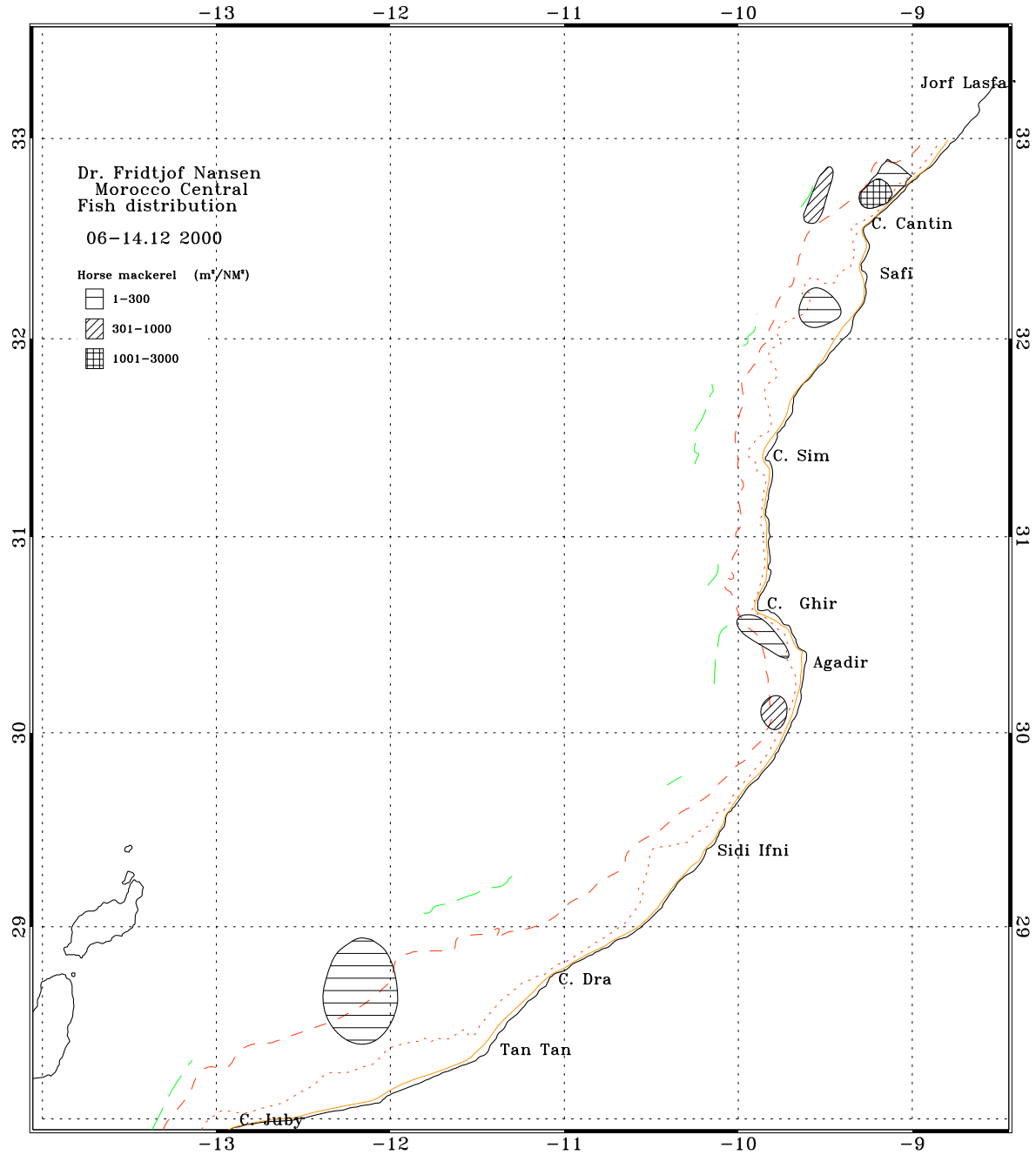


Figure 12. Distribution of horse mackerel, Cape Juby to Cape Cantin . Depth contours as in Fig. 1a.

Registers of **chub mackerel** were few and no aggregations that could support a fishery were observed, Figure 13.

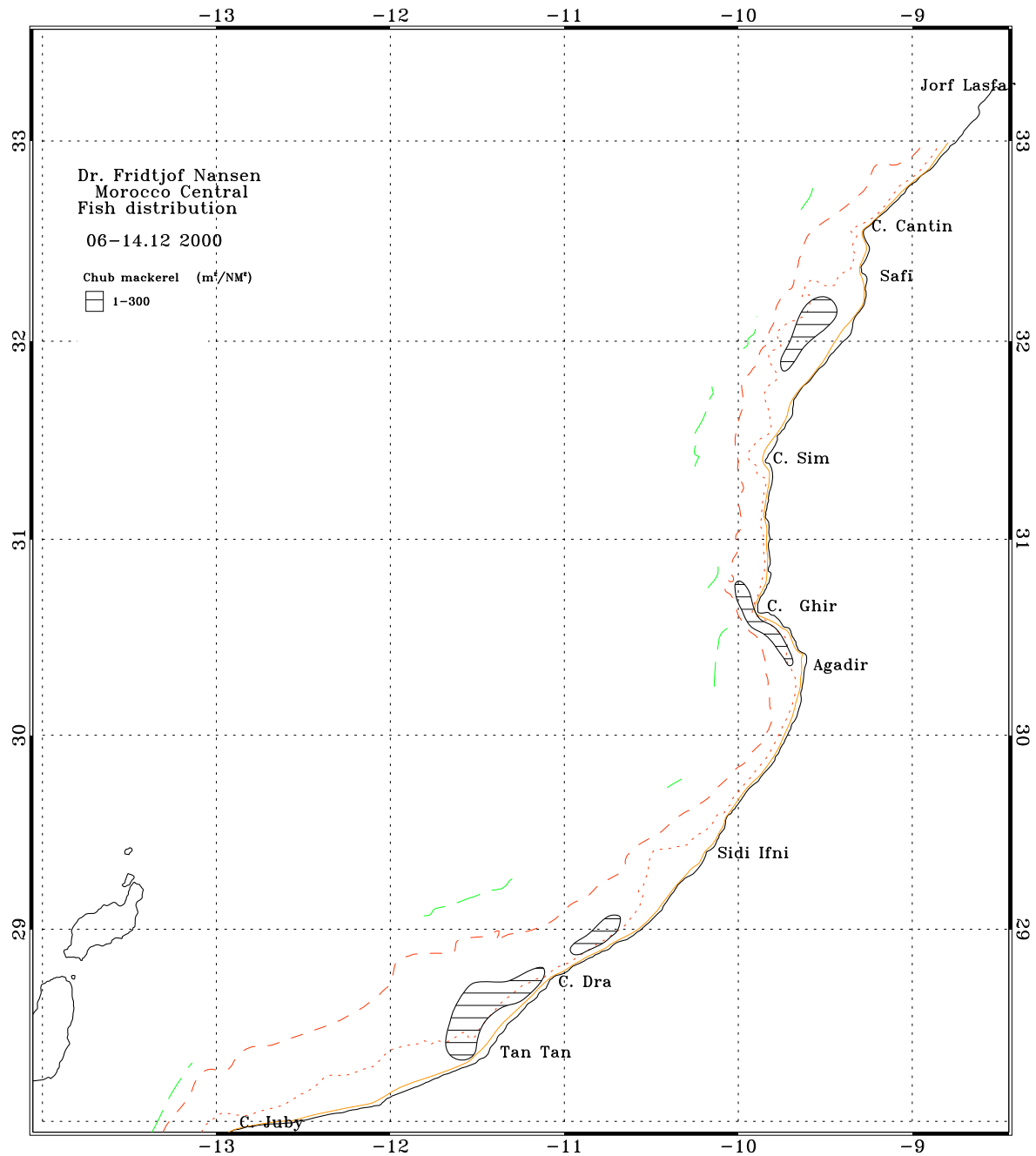


Figure 13. Distribution of chub mackerel, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

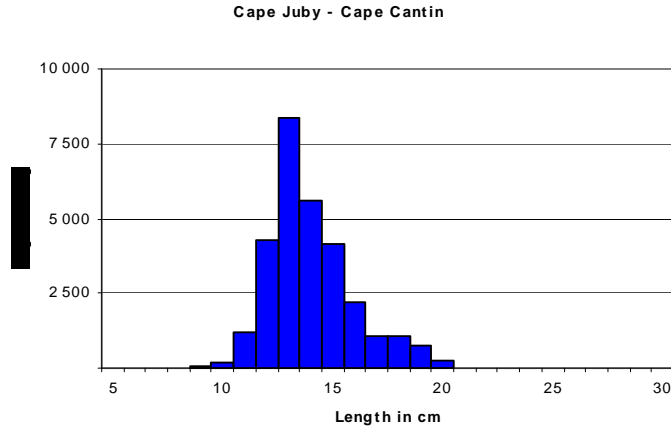


Figure 14 Length frequency distribution of sardine.

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 2.16 million tonnes (2.00 including sardine south off Cape Blanc). The length distribution is earlier shown in Figure 9a. Most of the fish in terms of biomass consist of older fish with mean length around 22 cm. This cohort showed up in the 1998 survey with a mean around 18 cm. Compared with earlier years, the development in the adult part of the stock (i.e. fish >19 cm) is:

1996:	4 600 000 tonnes	47 400 mill fish
1997:	240 000 tonnes	2 900 mill fish
1998:	340 000 tonnes	3 400 mill fish
1999:	1 000 000 tonnes	13 700 mill fish
2000:	1 360 000 tonnes	13 200 mill fish

This confirms that the adult stock has gained in biomass in the latest year through intrinsic growth in bodyweight; the amount in numbers is practically the same. There is a gap in the length distribution between 16 and 20 cm, Figure 9a, indicating that recruitment has been poor in the later years. However a younger cohort with mode around 13 cm shows good strength and will, given normal conditions, give important contributions to rebuild the stock.

Sardinella was estimated to 1.6 million tonnes consisting only of round sardinella, located between Cape Blanc and Cape Barbas. This is the same as estimated last year. However caution should be applied when interpreting the result, as the relative high abundance originates from two extremely high 5-mile values only. Also the allocation to round and not flat sardinella is based on one trawl sample only. Thus the precision of this estimate is low. The total regional compound stock of round and flat sardinellas is estimated to **2.8 million tonnes** (Annex 1), a reduction from the 3.6 million tonnes estimated in 1999.

The two species of **horse mackerel** combined was estimated to 1.2 million tonnes, of which about roughly 1.0 million and 0.2 million were Cunene and Atlantic horse mackerel respectively. The Cunene horse mackerel forms part of the stock distributed also south of Cape Blanc. The regional estimate for Cunene horse mackerel is 1.71 million tonnes of which roughly 60% was located north of Cape Blanc.

Cape Bojador – Cape Juby

Sardine was estimated to 595 000 tonnes, a considerable increase from the 340 000 tonnes of the previous year. The fish consists of several cohorts with modes around 11, 16, 20 and 22 cm, Figure 9b. Young fish (<19 cm) makes up 34% in weight and 67% in numbers of the biomass.

Some minor aggregations of horse mackerel were found in the region, but for convenience this has been included in the estimate for Cape Blanc-Cape Bojador.

Cape Juby – Cape Cantin

The **sardine** is estimated to 770 000 tonnes, a 120 000 increase from the 650 000 tonnes of previous year. The stock in both sub-regions has more or less the same length profile and is dominated by small sized fish with mode 13-14 cm, Figure 14. The number of fish less than 18 cm has in one year increased from 14 to 29 billion, Annex 1. This indicates that recruitment is good. However, the adult part of the stock, here defined as fish >17 cm has decreased from 230 000 to 120 000 tonnes, which could indicate that the spawning stock is under some strain.

Anchovies was estimated to 100 000 tonnes, a not significant increase from last years' estimate of 70 000 tonnes. The main part of the population belongs to a cohort with mode around 11-12 cm.

Atlantic horse mackerel was estimated to 90 000 tonnes, of which 70 000 is in the patches off Cape Cantin.

Chub mackerel was estimated to 20 000 tonnes, mostly as scattered fish.

Table 1. Morocco. Summary of biomass estimates of pelagic fish, 1 000 tonnes.							
Region	Sardines	Round sardinella	Flat sardinella	Atlantic horse mackerel	Cunene horse mackerel	Chub mackerel	Anchovy
Cape Blanc- Cape Bojador	2 000	1600	0	180	1 000	0	15
Cape Bojador- Cape Juby	595	0	0	0	0	0	0
Cape Juby- Cape Cantin	770	0	0	90	0	20	100
Totals	3365	1600	0	270	1 000	20	115

CHAPTER 3 CONCLUDING REMARKS

The survey was conducted successfully in the period 19th November to 15th December with an acoustic course track of 5000 NM and 57 fishing stations. The limits of the school areas of the sardine, anchovy and horse mackerel are thought to have been well determined and the main areas adequately sampled. Sardinellas were registered at very high densities in a few areas of limited extent. The estimates from these suffer from low precision. The weather conditions were favourable and did not put any constraints on the survey work.

The hydrographic data show well-developed upwelling along the whole coastline. The temperature and salinity observed show typical seasonal patterns with no anomalies.

Figure 15 gives a general overview on the major aggregations of pelagic fish with rounded biomass figures. The biomass estimates are also summarised in Table 1.

In contrast to previous years the sardine was found in a more southern distribution, partially extending into Mauritanian waters. The fish was more spread out in patches, and the area north of Dakhla contains less fish than in previous years. The biomass of sardine has increased from 1.7 to 2 million tonnes. Recruitment has been successful during 2000 and the strength of the juveniles is above normal. It is expected that the biomass will further increase during 2001 as the abundant juveniles increase in body weight. The abundance of sardine between Cape Bojador and Cape Juby is estimated to 595 000 tonnes, a considerable increase from the 300 000 tonnes of the previous year. At the same time the fishery in this region has caught 300 000 tonnes during 2000. This supports the hypothesis that the stock in this area is fed from neighbouring regions. The stock between Cape Juby and Cape Cantin is estimated to 770 000 tonnes, a slight increase from the 650 000 of last year. Recruitment has been good in the region, while the adult part of the stock has decreased from 230 000 to 120 000 tonnes. This could indicate that the fishing pressure on the adult stock is rather high and that the sustainability at present is much dependent on continued successful recruitment.

A few, but very dense, concentrations of sardinellas were found north of Cape Blanc. The sardinella is estimated to 1.6 million tonnes, a figure that should be treated with some caution as it has a low precision. The total regional stock of sardinella is estimated to 2.7 million tonnes compared to the 3.6 million tonnes of the previous year.

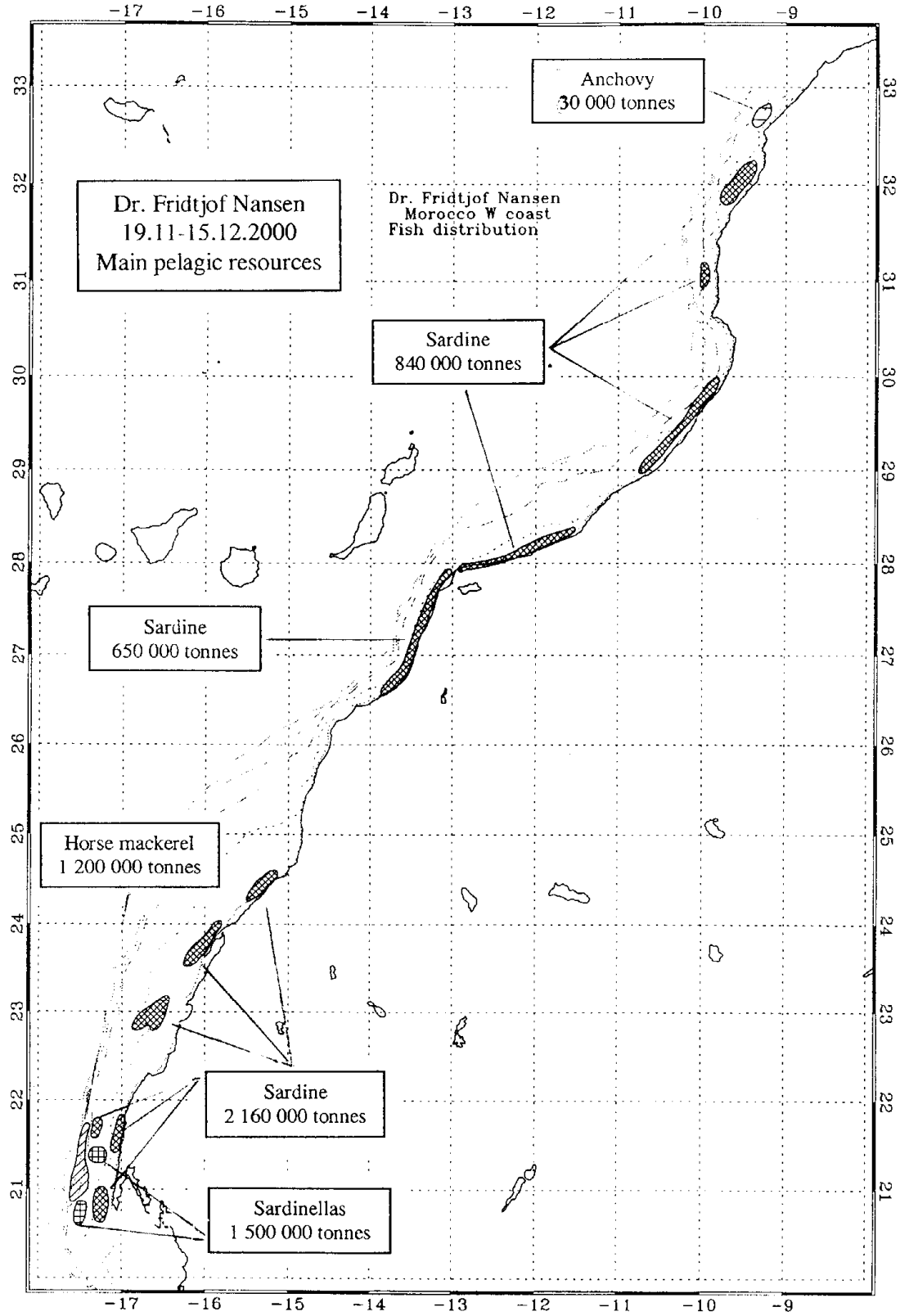


Figure 15. Map of the major pelagic fish concentrations with estimated abundance (1 000 tonnes), Cape Blanc to Cape Cantin.

Horse mackerel was mainly located between Cape Blanc and Cape Barbas. The estimate is 1.2 million tonnes of which 1 million tonnes was from Cunene horse mackerel. The regional estimate on Cunene horse mackerel is 1.8 million tonnes, while in the previous year this estimate was only 470 000 tonnes.

Anchovy registrations were common from Cape Juby and northwards. The estimate of 100 000 tonnes is rather poor compared to the survey in 1998, but practically the same as in 1999 (70 000 tonnes).

Trends 1995-2000, sardine

Figure 16 shows the biomass estimates of sardine compared with results from previous “Dr. Fridtjof Nansen” surveys. Figure 17 shows the biomass figures 1995-2000 by length classes. Both figures show that the southern stock, including the sardine between Cape Bojador and Cape Juby, is gradually recovering from the drastic decline observed at the end of 1997. The last estimate holds a considerable amount of juveniles and, given normal growth conditions, it is expected further increase in the stock during 2001. Within a year the southern stock could possibly approach the long-term mean of the period 1986-96.

The central stock between Cape Juby and Safi seems to continue on a slowly increasing trend and is now comparable to the estimate in the 80ies. However, the length profile of the time-series, Figure 17 (top) show that the adult part of the stock has decreased during 2000, while recruitment on the other hand is strong. The present fishing pressure seems to be high, as the stock does not seem to accumulate any older year classes. Therefore the state of the stock is at present probably very dependent of a continued strong recruitment level.

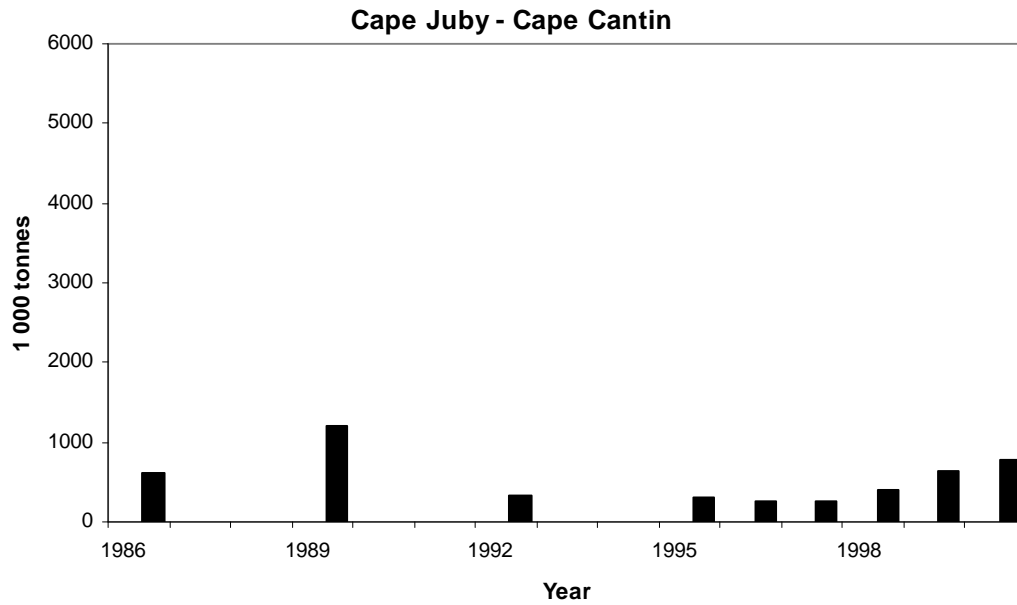
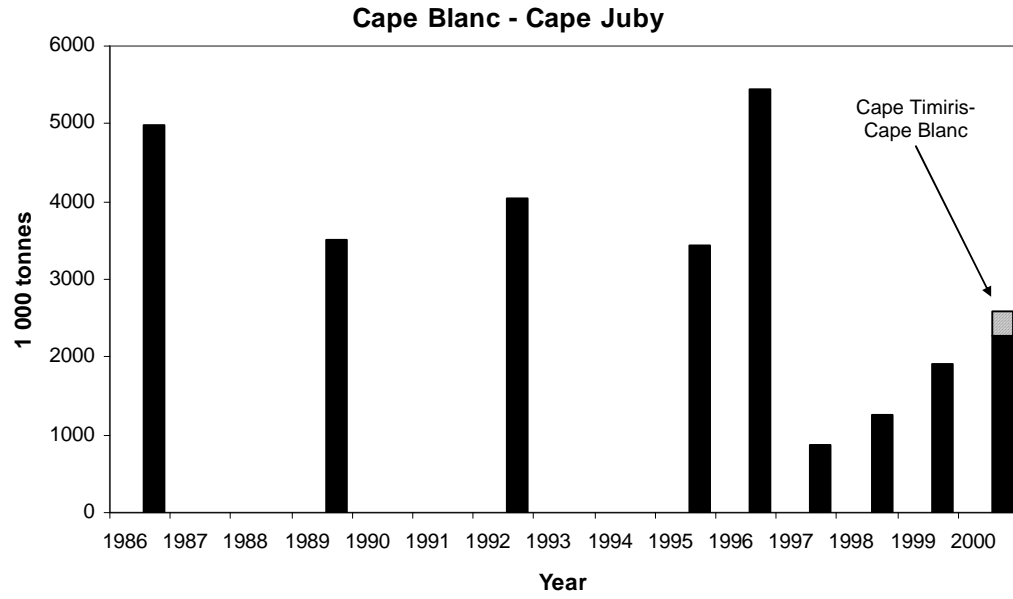


Figure 16. Sardine biomass estimates Cape Blanc-Cape Juby and Cape Juby- Cape Cantin, Dr. Fridtjof Nansen 1986-2000.

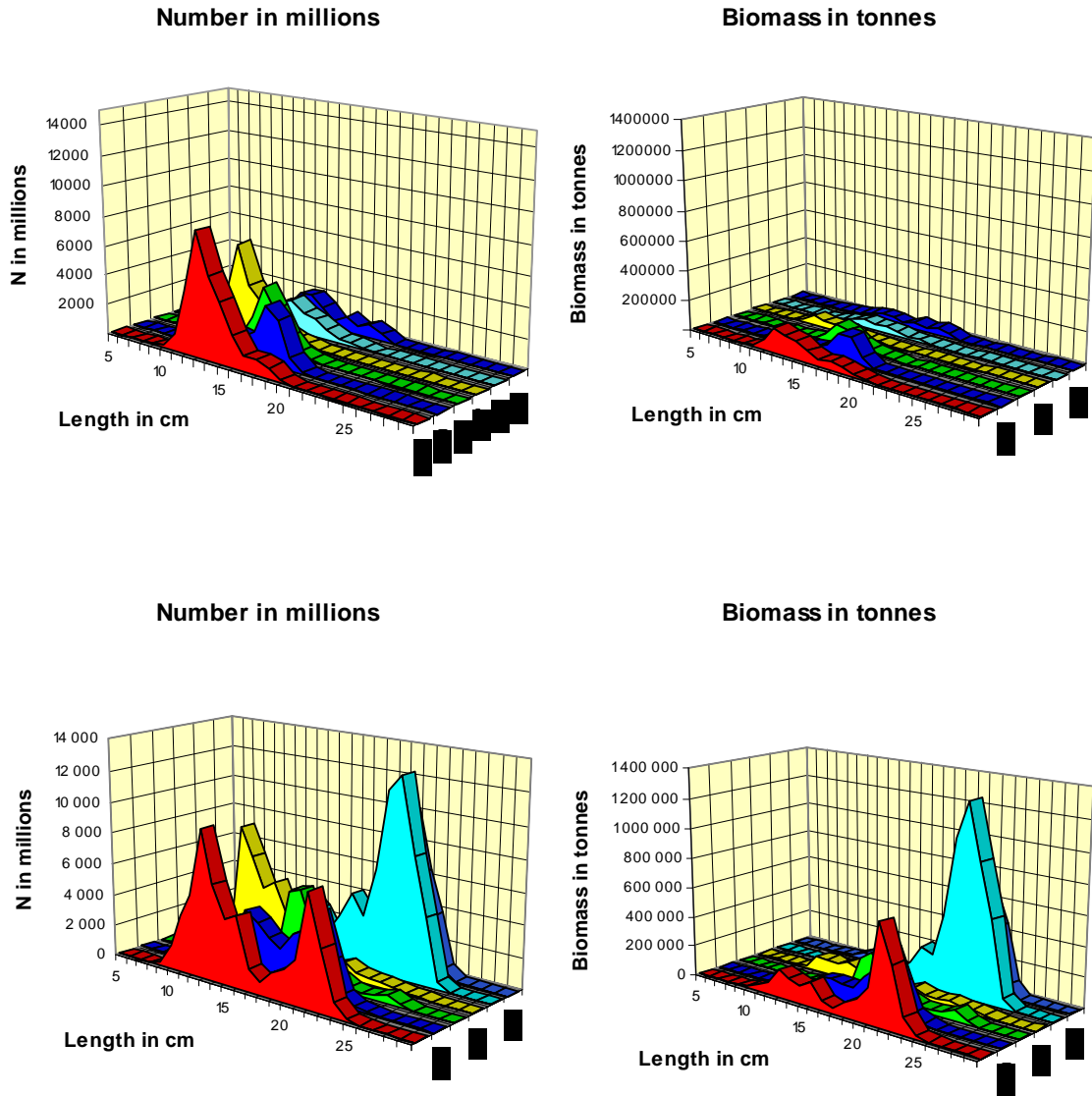


Figure 17. Numbers and biomass by length class, 1995-2000. Cape Juby - Cape Cantin (top) and Cape Blanc (Cape Timiris) - Cape Juby (bottom).

Annex I Records of fishing stations

PROJECT STATION:1255
 DATE:19/11/00 GEAR TYPE: PT No:4 POSITION:Lat N 2026 Long W 1706
 start stop duration
 TIME :17:47:45 18:19:03 31 (min) Purpose code: 1
 LOG :3637.98 3640.23 2.23 Area code : 3
 FDEPTH: 1 1 GearCond.code:
 BDEPTH: 24 22 Validity code:
 Towing dir: 195° Wire out: 150 m Speed: 30 kn*10

Sorted: 33 Kg Total catch: 468.58 CATCH/HOUR: 906.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	894.19	37037	98.60	2315
Engraulis encrasicolus	11.65	2954	1.28	2316
Trachurus trecae	0.81	352	0.09	
Trachurus trachurus	0.27	81	0.03	
Total	906.92		100.00	

PROJECT STATION:1260
 DATE:21/11/00 GEAR TYPE: PT No:3 POSITION:Lat N 2119 Long W 1718
 start stop duration
 TIME :00:00:42 00:25:14 25 (min) Purpose code: 1
 LOG :3914.48 3915.89 1.38 Area code : 2
 FDEPTH: 38 45 GearCond.code:
 BDEPTH: 65 62 Validity code:
 Towing dir: 90° Wire out: 120 m Speed: 40 kn*10

Sorted: 17 Kg Total catch: 16.80 CATCH/HOUR: 40.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	40.32	305	100.00	
Total	40.32		100.00	

PROJECT STATION:1256
 DATE:20/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2040 Long W 1730
 start stop duration
 TIME :01:18:22 01:28:41 10 (min) Purpose code: 1
 LOG :3713.38 3714.05 0.66 Area code : 3
 FDEPTH: 30 25 GearCond.code:
 BDEPTH: 71 74 Validity code:
 Towing dir: 270° Wire out: 120 m Speed: 30 kn*10

Sorted: 31 Kg Total catch: 116.72 CATCH/HOUR: 700.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	677.28	4920	96.71	2317
Scomber japonicus	12.72	36	1.82	
Argentina sphyraena	4.80	312	0.69	
Trachurus trecae	3.36	24	0.48	
Sepia officinalis hierredda	0.96	24	0.14	
Selene dorsalis	0.48	48	0.07	
GOBIIDAE	0.24	24	0.03	
Allotheutis subulata	0.24	48	0.03	
Trachurus trecae, juvenile	0.24	48	0.03	
Total	700.32		100.00	

PROJECT STATION:1261
 DATE:21/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2050 Long W 1718
 start stop duration
 TIME :05:06:00 05:36:06 30 (min) Purpose code: 1
 LOG :3962.28 3964.29 1.99 Area code : 2
 FDEPTH: 25 31 GearCond.code:
 BDEPTH: 50 45 Validity code:
 Towing dir: 360° Wire out: 120 m Speed: 35 kn*10

Sorted: 8 Kg Total catch: 8.05 CATCH/HOUR: 16.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	10.70	66	66.46	2320
Sardinella aurita	1.80	8	11.18	2322
Pagellus bellottii	1.36	10	8.45	
Scomber japonicus	0.68	2	4.22	
Sardinella aurita - Juveniles	0.66	70	4.10	2321
Decapterus rhonchus	0.50	2	3.11	
Loligo vulgaris	0.32	40	1.99	
Boops boops	0.04	2	0.25	
Trachurus trecae, juvenile	0.02	20	0.12	
Sepia officinalis hierredda	0.02	4	0.12	
Total	16.10		100.00	

PROJECT STATION:1257
 DATE:20/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2040 Long W 1710
 start stop duration
 TIME :04:11:37 04:18:17 7 (min) Purpose code: 1
 LOG :3735.72 3736.20 0.49 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 35 36 Validity code:
 Towing dir: 270° Wire out: 100 m Speed: 35 kn*10

Sorted: 34 Kg Total catch: 2999.91 CATCH/HOUR: 25713.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	25682.92	609566	99.88	2318
Engraulis encrasicolus	30.60	2297	0.12	
Total	25713.52		100.00	

PROJECT STATION:1262
 DATE:21/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2131 Long W 1702
 start stop duration
 TIME :11:22:49 11:30:23 8 (min) Purpose code: 1
 LOG :4021.04 4021.55 0.51 Area code : 2
 FDEPTH: 27 27 GearCond.code:
 BDEPTH: 27 27 Validity code:
 Towing dir: 190° Wire out: 140 m Speed: 30 kn*10

Sorted: 41 Kg Total catch: 5000.00 CATCH/HOUR: 37500.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	31860.60	1542300	84.96	2314
Engraulis encrasicolus	5636.63	484748	15.03	2313
Campogramma glaycos	2.78	8	0.01	
Total	37500.01		100.00	

PROJECT STATION:1258
 DATE:20/11/00 GEAR TYPE: PT No:3 POSITION:Lat N 2050 Long W 1718
 start stop duration
 TIME :07:17:31 07:47:48 30 (min) Purpose code: 1
 LOG :3760.72 3762.58 1.83 Area code : 3
 FDEPTH: 30 34 GearCond.code:
 BDEPTH: 51 45 Validity code:
 Towing dir: 90° Wire out: 85 m Speed: 30 kn*10

Sorted: 1 Kg Total catch: 0.76 CATCH/HOUR: 1.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sarda sarda	1.52	2	100.00	
Total	1.52		100.00	

PROJECT STATION:1263
 DATE:21/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2130 Long W 1727
 start stop duration
 TIME :14:47:40 14:48:41 1 (min) Purpose code: 1
 LOG :4050.07 4050.13 0.09 Area code : 2
 FDEPTH: 100 100 GearCond.code:
 BDEPTH: 102 102 Validity code:
 Towing dir: 90° Wire out: 200 m Speed: 32 kn*10

Sorted: 2 Kg Total catch: 2.12 CATCH/HOUR: 127.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	78.00	300	61.32	
Scomber japonicus	19.20	60	15.09	
PENAEIDAE	12.00	480	9.43	
Trachurus trecae, juvenile	12.00	180	9.43	
Selene dorsalis	4.80	60	3.77	
Serranus africana	1.20	60	0.94	
Total	127.20		99.98	

PROJECT STATION:1259
 DATE:20/11/00 GEAR TYPE: PT No:3 POSITION:Lat N 2050 Long W 1719
 start stop duration
 TIME :09:02:37 09:24:01 21 (min) Purpose code: 1
 LOG :3770.58 3771.92 1.32 Area code : 3
 FDEPTH: 36 38 GearCond.code:
 BDEPTH: 51 47 Validity code:
 Towing dir: 90° Wire out: 95 m Speed: 30 kn*10

Sorted: 53 Kg Total catch: 53.37 CATCH/HOUR: 152.49

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	142.86	780	93.68	2319
Decapterus rhonchus	2.29	6	1.50	
Sardinella maderensis	2.20	6	1.44	
Zeus faber	1.63	3	1.07	
Spondyliosoma cantharus	1.57	6	1.03	
Sardinella aurita	1.17	3	0.77	
Dentex gibbosus	0.77	3	0.50	
Total	152.49		99.99	

PROJECT STATION:1264
 DATE:21/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2140 Long W 1726
 start stop duration
 TIME :17:21:28 17:26:48 5 (min) Purpose code: 1
 LOG :4069.30 4069.59 0.28 Area code : 3
 FDEPTH: 109 109 GearCond.code:
 BDEPTH: 109 109 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10

Sorted: 64 Kg Total catch: 2005.00 CATCH/HOUR: 24060.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	20250.00	247464	84.16	2316
Scomber japonicus	3000.00	13740	12.47	2318
Sardina pilchardus	600.00	5520	2.49	2315
Trachurus trachurus	168.72	1212	0.70	2317
Lepidopus caudatus	37.44	372	0.16	
Total	24056.16		99.98	

PROJECT STATION:1265

DATE:21/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2140
 start stop duration Long W 1700
 TIME :21:05:27 21:23:03 18 (min) Purpose code: 1
 LOG :4104.94 4105.89 0.95 Area code : 3
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 25 25 Validity code:
 Towing dir: 355ø Wire out: 120 m Speed: 30 kn*10

Sorted: 30 Kg Total catch: 584.61 CATCH/HOUR: 1948.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	373.33	38033	19.16	2319
Diplodus bellottii	281.40	4153	14.44	
Pomadasys incisus	261.33	840	13.41	
Decapterus rhonchus	237.07	7793	12.17	
Engraulis encrasicolus	176.40	33460	9.05	2320
Mustelus mustelus	168.33	137	8.64	
Plectorhynchus mediterraneus	165.13	127	8.47	
Loligo vulgaris	138.33	2250	7.10	
Pagellus bellottii	35.00	283	1.80	
Galeoides decadactylus	28.00	187	1.44	
Conger conger	13.33	3	0.68	
Torpedo torpedo	12.70	17	0.65	
Diplodus sargus *	9.07	17	0.47	
Dentex canariensis	8.33	40	0.43	
Dasyatis centroura	5.80	3	0.30	
Mullus surmuletus	5.67	13	0.29	
Umbrina canariensis	5.33	7	0.27	
Argyrosomus regius	4.73	7	0.24	
Allotheutis subulata	4.67	1960	0.24	
Rhinobatos rhinobatos	4.33	3	0.22	
Raja microcellata	2.97	3	0.15	
Pomadasys peroteti	2.80	140	0.14	
Diplodus vulgaris	2.77	3	0.14	
Parapristipoma octolineatum	1.87	280	0.10	
Total	1948.69		100.00	

PROJECT STATION:1266

DATE:22/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2200
 start stop duration Long W 1721
 TIME :02:39:07 02:49:23 10 (min) Purpose code: 1
 LOG :4156.88 4157.60 0.71 Area code : 2
 FDEPTH: 30 35 GearCond.code:
 BDEPTH: 81 85 Validity code:
 Towing dir: 270ø Wire out: 140 m Speed: 35 kn*10

Sorted: 73 Kg Total catch: 1380.00 CATCH/HOUR: 8280.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	8071.20	65400	97.48	2321
Trachurus trecae	100.80	1080	1.22	2322
Lagocephalus lagocephalus	60.00	120	0.72	
Sarda sarda	24.00	24	0.29	
Scomber japonicus	24.00	120	0.29	
Total	8280.00		100.00	

PROJECT STATION:1267

DATE:22/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2200
 start stop duration Long W 1706
 TIME :05:02:22 05:32:13 30 (min) Purpose code: 1
 LOG :4175.29 4177.20 1.89 Area code : 2
 FDEPTH: 40 35 GearCond.code:
 BDEPTH: 57 60 Validity code:
 Towing dir: 270ø Wire out: 140 m Speed: 35 kn*10

Sorted: 11 Kg Total catch: 11.94 CATCH/HOUR: 23.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	19.00	12	79.56	
Loligo vulgaris	2.60	338	10.89	
Sardinella aurita	1.28	8	5.36	
Sepia officinalis hierredda	0.44	2	1.84	
Scomber japonicus	0.40	2	1.68	
Allotheutis subulata	0.14	16	0.59	
Trachurus, Juveniles	0.02	2	0.08	
Total	23.88		100.00	

PROJECT STATION:1268

DATE:22/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2235
 start stop duration Long W 1706
 TIME :21:48:19 22:17:27 29 (min) Purpose code: 1
 LOG :4345.59 4347.15 1.55 Area code : 3
 FDEPTH: 68 76 GearCond.code:
 BDEPTH: 68 76 Validity code:
 Towing dir: 290ø Wire out: 240 m Speed: 30 kn*10

Sorted: 44 Kg Total catch: 44.54 CATCH/HOUR: 92.15

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trachurus	43.86	1916	47.60	2323
Trachurus trecae	22.97	275	24.93	2324
Zeus faber	7.97	8	8.65	
Loligo vulgaris	4.08	17	4.43	
Pagellus bellottii	3.89	19	4.22	
Aspitrigla obscura	3.10	254	3.36	
Dentex macrophthalmus	3.08	126	3.34	
Merluccius polli	0.87	2	0.94	
Lepidotrigla sp.	0.74	17	0.80	
Trachinus draco	0.64	6	0.69	
Citharus linguatula	0.52	19	0.56	
Arnoglossus thori	0.21	17	0.23	
Solea senegalensis	0.14	2	0.15	
Trachinus vipera	0.08	8	0.09	
Total	92.15		99.99	

PROJECT STATION:1269

DATE:23/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2228
 start stop duration Long W 1639
 TIME :01:38:11 02:08:09 30 (min) Purpose code: 1
 LOG :4377.29 4378.90 1.60 Area code : 2
 FDEPTH: 38 40 GearCond.code:
 BDEPTH: 38 40 Validity code:
 Towing dir: 285ø Wire out: 160 m Speed: 30 kn*10

Sorted: 42 Kg Total catch: 77.84 CATCH/HOUR: 155.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pagellus bellottii	48.48	1200	31.14	
Loligo vulgaris	40.40	1108	25.95	
Decapterus rhonchus	26.04	1092	16.73	
Trachurus trecae	21.00	204	13.49	2325
Octopus vulgaris	7.40	8	4.75	
Chelidonichthys obscurus	7.20	222	4.62	
Spondyliosa cantharus	1.80	84	1.16	
Pomadasys incisus	1.20	6	0.77	
Trachurus trachurus	0.96	42	0.62	
Mullus surmuletus	0.60	18	0.39	
Sepia officinalis hierredda	0.48	12	0.31	
Syacium micrurum	0.12	12	0.08	
Total	155.68		100.01	

PROJECT STATION:1270

DATE:23/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2306
 start stop duration Long W 1628
 TIME :23:23:03 23:53:23 30 (min) Purpose code: 1
 LOG :4598.25 4600.02 1.75 Area code : 2
 FDEPTH: 30 31 GearCond.code:
 BDEPTH: 30 31 Validity code:
 Towing dir: 190ø Wire out: 140 m Speed: 30 kn*10

Sorted: 30 Kg Total catch: 91.59 CATCH/HOUR: 183.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	82.80	5552	45.20	2327
SOLEIDAE	36.60		19.98	
Sardina pilchardus	24.00	696	13.10	2326
Chelidonichthys obscurus	22.80		12.45	
Loligo vulgaris	11.40		6.22	
Trachurus trecae	2.40	12	1.31	
Callionymus lyra	1.20	36	0.66	
Trachinus vipera	0.90	12	0.49	
Pagellus bellottii	0.60	12	0.33	
Pagellus acarne	0.48	12	0.26	
Total	183.18		100.00	

PROJECT STATION:1271

DATE:24/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2326
 start stop duration Long W 1650
 TIME :04:48:48 05:01:30 13 (min) Purpose code: 1
 LOG :4646.76 4647.59 0.82 Area code : 2
 FDEPTH: 30 35 GearCond.code:
 BDEPTH: 76 72 Validity code:
 Towing dir: 124ø Wire out: 100 m Speed: 35 kn*10

Sorted: 38 Kg Total catch: 114.30 CATCH/HOUR: 527.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	509.54	11008	96.59	2328
Scomber japonicus	14.12	125	2.68	2329
Loligo vulgaris	3.88	28	0.74	
Total	527.54		100.01	

PROJECT STATION:1272

DATE:24/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 2344
 start stop duration Long W 1613
 TIME :21:33:28 22:03:12 30 (min) Purpose code: 1
 LOG :4822.24 4823.73 1.50 Area code : 3
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 37 38 Validity code:
 Towing dir: 297ø Wire out: 150 m Speed: 30 kn*10

Sorted: 112 Kg Total catch: 112.79 CATCH/HOUR: 225.58

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	196.40	2012	87.06	2330
Scomber japonicus	27.26	132	12.08	2331
Pagellus bellottii	0.70	4	0.31	
Trachurus trecae	0.48	6	0.21	
Spondyliosa cantharus	0.34	10	0.15	
Aspitrigla obscura	0.34	8	0.15	
Trachinus draco	0.06	2	0.03	
Total	225.58		99.99	

PROJECT STATION:1273
 DATE:25/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2346
 start stop duration Long W 1600
 TIME :00:46:25 01:16:11 30 (min) Purpose code: 1
 LOG :4844.78 4846.55 1.75 Area code : 2
 FDEPTH: 28 26 GearCond.code:
 BDEPTH: 28 26 Validity code:
 Towing dir: 208ø Wire out: 120 m Speed: 30 kn*10
 Sorted: 46 Kg Total catch: 688.38 CATCH/HOUR: 1376.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	585.48	7518	42.53	
Pagellus bellottii	273.00	2730	19.83	
Spondylosoma cantharus	178.92	6090	13.00	
Pomadasys incisus	124.32	882	9.03	
Pagellus acarne	106.68	1806	7.75	
Trachurus trachurus	26.88	252	1.95	
Chelidonichthys obscurus	17.64	252	1.28	
Umbrina canariensis	15.12	42	1.10	
Decapterus rhonchus	10.92	42	0.79	
Halobatrachus didactylus	10.48	12	0.76	
Raja straeleni	7.88	4	0.57	
Plectorhinchus mediterraneus	7.56	42	0.55	
Argyrosomus regius	6.40	2	0.46	
Mullus surmuletus	3.36	42	0.24	
Octopus vulgaris	1.52	2	0.11	
Loligo vulgaris	0.40	2	0.03	
Scomber japonicus	0.20	2	0.01	
Total	1376.76		99.99	

PROJECT STATION:1274
 DATE:25/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2353
 start stop duration Long W 1605
 TIME :02:51:17 03:06:09 15 (min) Purpose code: 1
 LOG :4858.90 4859.86 0.95 Area code : 2
 FDEPTH: 18 18 GearCond.code:
 BDEPTH: 35 34 Validity code:
 Towing dir: 118ø Wire out: 80 m Speed: 35 kn*10
 Sorted: 34 Kg Total catch: 134.02 CATCH/HOUR: 536.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	500.80	4208	93.42	2332
Scomber japonicus	28.80	128	5.37	
Trichiurus lepturus	4.88	4	0.91	
Trachurus trachurus	1.60	16	0.30	
Total	536.08		100.00	

PROJECT STATION:1275
 DATE:25/11/00 GEAR TYPE: PT No:1 POSITION:Lat N 2410
 start stop duration Long W 1619
 TIME :10:25:04 10:39:24 14 (min) Purpose code: 1
 LOG :4929.83 4930.77 0.93 Area code : 2
 FDEPTH: 20 34 GearCond.code:
 BDEPTH: 67 69 Validity code:
 Towing dir: 300ø Wire out: 130 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Total				

PROJECT STATION:1276
 DATE:26/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2424
 start stop duration Long W 1544
 TIME :10:03:44 10:35:12 31 (min) Purpose code:
 LOG :5145.39 5147.12 1.71 Area code :
 FDEPTH: 33 31 GearCond.code:
 BDEPTH: 33 31 Validity code:
 Towing dir: 112ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 14 Kg Total catch: 14.40 CATCH/HOUR: 27.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	26.13	85	93.76	2333
Loligo vulgaris	1.12	12	4.02	
Octopus vulgaris	0.62	2	2.22	
Total	27.87		100.00	

PROJECT STATION:1277
 DATE:26/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 2438
 start stop duration Long W 1528
 TIME :20:17:00 20:47:16 30 (min) Purpose code: 1
 LOG :5238.80 5240.35 1.56 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 32 33 Validity code:
 Towing dir: 298ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 25 Kg Total catch: 2500.00 CATCH/HOUR: 5000.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	4992.86	125654	99.86	2334
Trichiurus lepturus	5.02	2	0.10	
Loligo vulgaris	2.12	4	0.04	
Total	5000.00		100.00	

PROJECT STATION:1278
 DATE:28/11/00 GEAR TYPE: PT No:6 POSITION:Lat N 2441
 start stop duration Long W 1502
 TIME :10:15:29 10:45:54 30 (min) Purpose code: 1
 LOG :5600.48 5602.29 1.81 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 27 27 Validity code:
 Towing dir: 96ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 43 Kg Total catch: 5044.84 CATCH/HOUR: 10089.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	5364.00	56890	53.16	
Sardina pilchardus	4588.00	176104	45.47	2335
Pagellus acarne	47.04	470	0.47	
Pomadasys incisus	42.34	236	0.42	
Scomber japonicus	17.76	28	0.18	2336
Sarda sarda	8.80	10	0.09	
Aspitrigla obscura	7.46	72	0.07	
Trichiurus lepturus	3.92	2	0.04	
Zeus faber	3.88	2	0.04	
Octopus vulgaris	2.54	2	0.03	
Spondylosoma cantharus	2.34	234	0.02	
Loligo vulgaris	1.60	8	0.02	
Total	10089.68		100.01	

PROJECT STATION:1279
 DATE:28/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 2425
 start stop duration Long W 1519
 TIME :18:04:54 18:35:06 30 (min) Purpose code: 1
 LOG :5668.96 5670.79 1.80 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 21 19 Validity code:
 Towing dir: 90ø Wire out: 180 m Speed: 30 kn*10
 Sorted: 43 Kg Total catch: 2993.70 CATCH/HOUR: 5987.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	5952.54	81998	99.42	2337
Sepia officinalis hierredda	27.90	140	0.47	
Diplodus bellottii	6.96	138	0.12	
Total	5987.40		100.01	

PROJECT STATION:1280
 DATE:29/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2339
 start stop duration Long W 1613
 TIME :10:19:16 10:49:59 31 (min) Purpose code: 1
 LOG :5830.93 5832.52 1.53 Area code : 3
 FDEPTH: 30 30 GearCond.code:
 BDEPTH: 30 30 Validity code:
 Towing dir: 150ø Wire out: 140 m Speed: 30 kn*10
 Sorted: 62 Kg Total catch: 62.72 CATCH/HOUR: 121.39

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	98.25	917	80.94	2338
Pagellus bellottii	10.61	58	8.74	
Spondylosoma cantharus	4.39	114	3.62	
Scomber japonicus	3.87	23	3.19	
Decapterus rhonchus	2.48	12	2.04	
Loligo vulgaris	1.47	43	1.21	
Trachurus trecae	0.25	2	0.21	
Aspitrigla obscura	0.08	2	0.07	
Total	121.40		100.02	

PROJECT STATION:1281
 DATE:30/11/00 GEAR TYPE: PT No:7 POSITION:Lat N 2420
 start stop duration Long W 1532
 TIME :00:39:03 01:11:51 33 (min) Purpose code: 1
 LOG :5964.09 5965.62 1.50 Area code : 2
 FDEPTH: 1 1 GearCond.code:
 BDEPTH: 24 25 Validity code:
 Towing dir: ø Wire out: 140 m Speed: 35 kn*10
 Sorted: 37 Kg Total catch: 182.80 CATCH/HOUR: 332.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	319.82	4025	96.23	2339
Diplodus bellottii	11.09	118	3.34	
Loligo vulgaris	1.45	4	0.44	
Total	332.36		100.01	

PROJECT STATION:1282
 DATE:30/11/00 GEAR TYPE: BT No:2 POSITION:Lat N 2519
 start stop duration Long W 1458
 TIME :13:12:45 13:57:05 44 (min) Purpose code:
 LOG :6079.97 6082.14 2.43 Area code :
 FDEPTH: 58 63 GearCond.code:
 BDEPTH: 58 63 Validity code:
 Towing dir: 300ø Wire out: 250 m Speed: 30 kn*10
 Sorted: 43 Kg Total catch: 288.00 CATCH/HOUR: 392.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pagellus bellottii	169.72	210	43.22	
Loligo vulgaris	114.22	220	29.08	
Trachurus trachurus	45.82	258	11.67	2340
Pagellus acarne	34.75	191	8.85	
Boops boops	7.25	67	1.85	
Diplodus vulgaris	6.87	19	1.75	
Spondylosoma cantharus	4.77	19	1.21	
Mullus surmuletus	3.63	38	0.92	
Octopus vulgaris	3.03	3	0.77	
Aspitrigla obscura	2.67	29	0.68	
Total	392.73		100.00	

PROJECT STATION:1283
 DATE: 1/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 2559
 start stop duration Long W 1445
 TIME :10:47:48 11:18:11 30 (min) Purpose code: 1
 LOG :6282.40 6283.81 1.43 Area code : 3
 FDEPTH: 100 103 GearCond.code:
 BDEPTH: 100 103 Validity code:
 Towing dir: 298ø Wire out: 350 m Speed: 30 kn*10

Sorted: 12 Kg Total catch: 12.17 CATCH/HOUR: 24.34

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pagellus bellottii	7.70	40	31.64	
Loligo vulgaris	5.46	10	22.43	
Pagellus acarne	4.90	20	20.13	
Sardina pilchardus	3.46	32	14.22	2341
Pagellus erythrinus	1.82	6	7.48	
Scomber japonicus	0.80	2	3.29	
Aspitrigla obscura	0.20	2	0.82	
Total	24.34		100.01	

PROJECT STATION:1287
 DATE: 5/12/00 GEAR TYPE: PT No:6 POSITION:Lat N 2721
 start stop duration Long W 1327
 TIME :23:25:38 23:47:20 22 (min) Purpose code: 1
 LOG :6843.41 6844.34 0.93 Area code : 2
 FDEPTH: 2 10 GearCond.code:
 BDEPTH: 49 38 Validity code:
 Towing dir: 290ø Wire out: 150 m Speed: 30 kn*10

Sorted: 38 Kg Total catch: 192.80 CATCH/HOUR: 525.82

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	511.36	31718	97.25	2348
Pomadasys incisus	10.36	109	1.97	
Diplodus bellottii	1.50	41	0.29	
Pagellus acarne	0.82	3	0.16	
Allotheutis subulata	0.82	232	0.16	
Scomber japonicus	0.55	14	0.10	
Sepia orbignyana	0.41	14	0.08	
Total	525.82		100.01	

PROJECT STATION:1284
 DATE: 5/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 2637
 start stop duration Long W 1347
 TIME :07:04:53 07:15:06 10 (min) Purpose code: 1
 LOG :6700.70 6701.23 0.54 Area code : 3
 FDEPTH: 34 36 GearCond.code: 9
 BDEPTH: 34 36 Validity code: 1
 Towing dir: 236ø Wire out: 150 m Speed: 30 kn*10

Sorted: 31 Kg Total catch: 372.01 CATCH/HOUR: 2232.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pomadasys incisus	829.20	8460	37.15	
Diplodus vulgaris	538.20	2580	24.11	
Diplodus bellottii	328.80	9540	14.73	
Trichiurus lepturus	203.40	96	9.11	
Plectorhinchus mediterraneus	61.80	120	2.77	
Trachurus trachurus	58.62	330	2.63	2343
Dasyatis centroura	54.96	12	2.46	
Loligo vulgaris	52.80	120	2.37	
Umbrina canariensis	45.00	120	2.02	
Sardina pilchardus	19.86	300	0.89	2342
Scorpaena scrofa	16.80	360	0.75	
Serranus cabrilla	10.20	180	0.46	
Pagellus acarne	4.80	60	0.22	
Allotheutis subulata	4.68	90	0.21	
Mullus surmuletus	2.22	30	0.10	
Citharus linguatula	0.24	12	0.01	
Engraulis encrasicolus	0.24	36	0.01	
Sepia orbignyana	0.12	6	0.01	
SOAB001	0.12	6	0.01	
Total	2232.06		100.02	

PROJECT STATION:1288
 DATE: 6/12/00 GEAR TYPE: PT No:1 POSITION:Lat N 2731
 start stop duration Long W 1321
 TIME :03:52:37 04:05:18 13 (min) Purpose code: 1
 LOG :6877.34 6878.23 0.88 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 37 32 Validity code:
 Towing dir: 180ø Wire out: 80 m Speed: 35 kn*10

Sorted: 37 Kg Total catch: 111.37 CATCH/HOUR: 514.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	497.08	14760	96.70	2349
Pomadasys incisus	8.03	83	1.56	
Loligo vulgaris	4.48	5	0.87	
Scomber japonicus	3.88	125	0.75	2350
Diplodus bellottii	0.28	14	0.05	
Engraulis encrasicolus	0.28	28	0.05	
Total	514.03		99.98	

PROJECT STATION:1285
 DATE: 5/12/00 GEAR TYPE: PT No:1 POSITION:Lat N 2702
 start stop duration Long W 1330
 TIME :14:38:19 15:18:18 40 (min) Purpose code: 1
 LOG :6769.99 6772.93 2.93 Area code : 3
 FDEPTH: 15 18 GearCond.code:
 BDEPTH: 38 31 Validity code:
 Towing dir: 180ø Wire out: 80 m Speed: 35 kn*10

Sorted: 29 Kg Total catch: 29.32 CATCH/HOUR: 43.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	34.50	470	78.44	2344
Scomber japonicus	3.89	38	8.84	2345
Loligo vulgaris	2.70	6	6.14	
Campogramma glaycos	1.98	8	4.50	
Pomadasys incisus	0.45	5	1.02	
Diplodus bellottii	0.30	8	0.68	
Sepia orbignyana	0.17	2	0.39	
Total	43.99		100.01	

PROJECT STATION:1289
 DATE: 7/12/00 GEAR TYPE: PT No:6 POSITION:Lat N 2804
 start stop duration Long W 1233
 TIME :23:56:23 00:12:24 16 (min) Purpose code: 1
 LOG :7053.06 7053.85 0.79 Area code : 1
 FDEPTH: 2 2 GearCond.code:
 BDEPTH: 39 39 Validity code:
 Towing dir: 240ø Wire out: 140 m Speed: 35 kn*10

Sorted: 43 Kg Total catch: 431.40 CATCH/HOUR: 1617.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1575.00	74138	97.36	2351
Scomber japonicus	42.75	338	2.64	2352
Total	1617.75		100.00	

PROJECT STATION:1286
 DATE: 5/12/00 GEAR TYPE: PT No:4 POSITION:Lat N 2713
 start stop duration Long W 1329
 TIME :19:59:46 20:29:10 29 (min) Purpose code: 1
 LOG :6816.54 6817.87 1.32 Area code : 3
 FDEPTH: 2 2 GearCond.code:
 BDEPTH: 40 36 Validity code:
 Towing dir: 170ø Wire out: 150 m Speed: 30 kn*10

Sorted: 37 Kg Total catch: 946.73 CATCH/HOUR: 1958.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1149.31	76256	58.68	2346
Trachurus trachurus	558.62	14663	28.52	2347
Diplodus vulgaris	124.66	466	6.36	
Diplodus bellottii	57.93	1241	2.96	
Pomadasys incisus	55.34	517	2.83	
Scomber japonicus	3.62	52	0.18	
Pagellus acarne	3.62	52	0.18	
Allotheutis subulata	2.07	569	0.11	
Sepia officinalis hierredda	1.59	2	0.08	
Engraulis encrasicolus	1.03	621	0.05	
Spondyliosoma cantharus	0.95	2	0.05	
Total	1958.74		100.00	

PROJECT STATION:1290
 DATE: 7/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 1204
 start stop duration Long W 1204
 TIME :15:16:57 15:46:57 30 (min) Purpose code: 1
 LOG :7208.01 7209.53 1.51 Area code : 1
 FDEPTH: 25 26 GearCond.code:
 BDEPTH: 25 26 Validity code:
 Towing dir: 50ø Wire out: 120 m Speed: 30 kn*10

Sorted: 42 Kg Total catch: 426.30 CATCH/HOUR: 852.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	770.00	35020	90.31	2353
Engraulis encrasicolus	41.00	2920	4.81	2354
Allotheutis subulata	16.20	3100	1.90	
Diplodus bellottii	6.40	80	0.75	
Mustelus mustelus	5.76	2	0.68	
Merluccius merluccius	5.60	840	0.66	
Sepia officinalis hierredda	5.00	10	0.59	
Diplodus puntazzo	2.44	4	0.29	
Trachurus, Juveniles	0.20	40	0.02	
Total	852.60		100.01	

PROJECT STATION:1291
 DATE: 7/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 2817
 start stop duration Long W 1153
 TIME :18:50:22 19:19:19 29 (min) Purpose code: 1
 LOG :7238.13 7239.44 1.29 Area code : 3
 FDEPTH: 41 41 GearCond.code:
 BDEPTH: 41 41 Validity code:
 Towing dir: 180ø Wire out: 140 m Speed: 30 kn*10
 Sorted: 70 Kg Total catch: 70.01 CATCH/HOUR: 144.85

PROJECT STATION:1295
 DATE: 9/12/00 GEAR TYPE: PT No:3 POSITION:Lat N 2915
 start stop duration Long W 1036
 TIME :20:01:19 20:01:39 20 (min) Purpose code: 1
 LOG :7640.91 7642.27 1.36 Area code : 3
 FDEPTH: 25 19 GearCond.code: 9
 BDEPTH: 55 60 Validity code: 1
 Towing dir: 40ø Wire out: 90 m Speed: 30 kn*10
 Sorted: 3 Kg Total catch: 2.58 CATCH/HOUR: 7.74

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	40.97	1051	28.28	
Solea vulgaris	19.86	695	13.71	
Solenocera membranacea	18.25	18977	12.60	
Gobius sp	18.25	18977	12.60	
Mullus surmuletus	14.07	674	9.71	
Pagellus acarne	4.80	112	3.31	
Engraulis encrasicolus	3.81	319	2.63	2356
Trachinus draco	3.52	157	2.43	
Allotheutis subulata	3.14	604	2.17	
Sardina pilchardus	3.06	116	2.11	2355
Trigla lyra	2.90	87	2.00	
Torpedo marmorata	2.57	10	1.77	
Sepia officinalis hierredda	2.54	6	1.75	
Merluccius merluccius	1.94	29	1.34	
Octopus vulgaris	1.63	2	1.13	
Scomber japonicus	0.87	25	0.60	
Pagellus bellottii	0.83	4	0.57	
Scorpaena sp.	0.70	4	0.48	
Cepola macrophthalma	0.58	21	0.40	
Penaeus kerathurus	0.48	6	0.33	
Parapenaeus longirostris	0.08	8	0.06	
Total	144.85		99.98	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	3.93	351	50.78	2361
Diplodus vulgaris	1.80	6	23.26	
Sardina pilchardus	1.65	45	21.32	2360
Trisopterus luscus	0.36	3	4.65	
Total	7.74		100.01	

PROJECT STATION:1296
 DATE: 9/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 2902
 start stop duration Long W 1033
 TIME :23:40:22 23:45:15 5 (min) Purpose code: 1
 LOG :7663.16 7663.41 0.23 Area code : 1
 FDEPTH: 26 26 GearCond.code:
 BDEPTH: 26 26 Validity code:
 Towing dir: 240ø Wire out: 100 m Speed: 30 kn*10
 Sorted: 38 Kg Total catch: 189.23 CATCH/HOUR: 2270.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2220.00	128424	97.76	2362
Engraulis encrasicolus	16.20	1320	0.71	2363
Pomadasyus incisus	13.20	180	0.58	
Trachurus trachurus	9.60	1260	0.42	
Pagellus acarne	6.00	180	0.26	
Diplodus bellottii	2.40	120	0.11	
Sardinella aurita	2.16	180	0.10	
Allotheutis subulata	1.20	660	0.05	
Total	2270.76		99.99	

PROJECT STATION:1292
 DATE: 8/12/00 GEAR TYPE: PT No:4 POSITION:Lat N 2841
 start stop duration Long W 1112
 TIME :10:38:37 11:09:44 31 (min) Purpose code: 1
 LOG :7362.67 7364.05 1.38 Area code : 3
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 41 48 Validity code:
 Towing dir: 330ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 65 Kg Total catch: 64.99 CATCH/HOUR: 125.79

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	87.10	2553	69.24	2358
Scomber japonicus	29.42	277	23.39	2359
Engraulis encrasicolus	8.86	670	7.04	2357
Liocarcinus sp	0.41	39	0.33	
Total	125.79		100.00	

PROJECT STATION:1297
 DATE:10/12/00 GEAR TYPE: PT No:7 POSITION:Lat N 2913
 start stop duration Long W 1024
 TIME :02:49:47 03:00:00 10 (min) Purpose code: 1
 LOG :7688.46 7688.99 0.53 Area code : 1
 FDEPTH: 19 19 GearCond.code:
 BDEPTH: 34 34 Validity code:
 Towing dir: 220ø Wire out: 100 m Speed: 34 kn*10
 Sorted: 39 Kg Total catch: 3002.70 CATCH/HOUR: 18016.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	17920.80	772632	99.47	2364
Scomber japonicus	59.40	456	0.33	
Lepidopus caudatus	16.20	6	0.09	
Trachurus trachurus	14.40	960	0.08	
Trisopterus luscus	5.40	540	0.03	
Total	18016.20		100.00	

PROJECT STATION:1293
 DATE: 9/12/00 GEAR TYPE: PT No:6 POSITION:Lat N 2856
 start stop duration Long W 1047
 TIME :10:33:51 11:38:17 64 (min) Purpose code: 1
 LOG :7563.09 7566.54 3.43 Area code : 1
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 47 59 Validity code:
 Towing dir: 347ø Wire out: 150 m Speed: 30 kn*10
 Sorted: 5 Kg Total catch: 5.52 CATCH/HOUR: 5.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepidopus caudatus	3.94	2	76.06	
Scomber japonicus	0.75	2	14.48	
Sarda sarda	0.49	1	9.46	
Total	5.18		100.00	

PROJECT STATION:1298
 DATE:10/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 2957
 start stop duration Long W 952
 TIME :16:45:15 17:18:28 33 (min) Purpose code: 1
 LOG :7813.88 7815.64 1.75 Area code : 1
 FDEPTH: 96 109 GearCond.code:
 BDEPTH: 96 109 Validity code:
 Towing dir: 290ø Wire out: 340 m Speed: 30 kn*10
 Sorted: 27 Kg Total catch: 27.15 CATCH/HOUR: 49.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepidopus caudatus	33.35	16	67.56	
Allotheutis subulata	6.18	1756	12.52	
Merluccius merluccius	4.71	22	9.54	
Loligo vulgaris	2.55	4	5.17	
Pagellus acarne	1.69	7	3.42	
TRGTRO3	0.78	4	1.58	
Trisopterus minutus	0.09	2	0.18	
Engraulis encrasicolus	0.02	2	0.04	
Total	49.37		100.01	

PROJECT STATION:1294
 DATE: 9/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 2920
 start stop duration Long W 1051
 TIME :16:29:22 16:52:38 23 (min) Purpose code: 1
 LOG :7610.34 7610.76 0.09 Area code : 1
 FDEPTH: 124 123 GearCond.code: 9
 BDEPTH: 124 123 Validity code: 1
 Towing dir: 215ø Wire out: 420 m Speed: 30 kn*10
 Sorted: Kg Total catch: 8.26 CATCH/HOUR: 21.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophthalmus	11.95	97	55.45	
Anthias anthias	9.52	368	44.18	
Macrorhamphosus scolopax	0.08	3	0.37	
Total	21.55		100.00	

PROJECT STATION:1299
 DATE:11/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 3023
 start stop duration Long W 941
 TIME :14:15:14 14:30:17 15 (min) Purpose code: 1
 LOG :7932.36 7933.14 0.77 Area code : 1
 FDEPTH: 28 30 GearCond.code:
 BDEPTH: 28 30 Validity code:
 Towing dir: 232ø Wire out: 120 m Speed: 30 kn*10

Sorted: 43 Kg Total catch: 530.04 CATCH/HOUR: 2120.16

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	1728.00	187968	81.50	2366
Sardina pilchardus	147.84	7440	6.97	2365
Pagellus acarne	114.24	2640	5.39	
Scomber japonicus	64.32	408	3.03	2367
Trachurus trachurus	21.12	1056	1.00	
Loligo vulgaris	18.92	208	0.89	
Lepidopus caudatus	7.76	4	0.37	
Diplodus puntazzo	5.96	4	0.28	
Lithognathus mormyrus	4.92	8	0.23	
Pagellus bellottii	2.88	48	0.14	
Diplodus sargus *	2.28	4	0.11	
Mullus surmuletus	1.44	48	0.07	
Allotheutis subulata	0.48	144	0.02	
Total	2120.16		100.00	

PROJECT STATION:1300
 DATE:12/12/00 GEAR TYPE: PT No:3 POSITION:Lat N 3101
 start stop duration Long W 955
 TIME :09:13:35 09:55:49 42 (min) Purpose code: 1
 LOG :8097.91 8100.48 2.56 Area code : 3
 FDEPTH: 40 40 GearCond.code:
 BDEPTH: 70 85 Validity code:
 Towing dir: 235ø Wire out: 150 m Speed: 30 kn*10

Sorted: 44 Kg Total catch: 534.17 CATCH/HOUR: 763.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	653.83	53759	85.68	2369
Sardina pilchardus	95.66	2774	12.54	2368
Lepidopus caudatus	11.34	6	1.49	
Scomber japonicus	2.27	26	0.30	2370
Total	763.10		100.01	

PROJECT STATION:1301
 DATE:12/12/00 GEAR TYPE: PT No:1 POSITION:Lat N 3113
 start stop duration Long W 952
 TIME :15:54:13 16:28:38 34 (min) Purpose code: 1
 LOG :8158.56 8160.70 2.12 Area code : 3
 FDEPTH: 45 60 GearCond.code:
 BDEPTH: 68 78 Validity code:
 Towing dir: 270ø Wire out: 250 m Speed: 35 kn*10

Sorted: 41 Kg Total catch: 1047.50 CATCH/HOUR: 1848.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1174.85	51799	63.56	2371
Engraulis encrasicolus	613.24	62239	33.17	2372
Lepidopus caudatus	39.53	282	2.14	
Trachurus trachurus	20.91	39	1.13	2373
Total	1848.53		100.00	

PROJECT STATION:1302
 DATE:13/12/00 GEAR TYPE: PT No:3 POSITION:Lat N 3150
 start stop duration Long W 956
 TIME :07:17:59 07:57:03 39 (min) Purpose code: 1
 LOG :8286.64 8289.40 2.72 Area code : 3
 FDEPTH: 25 30 GearCond.code:
 BDEPTH: 105 143 Validity code:
 Towing dir: 289ø Wire out: 140 m Speed: 30 kn*10

Sorted: 1 Kg Total catch: 1.20 CATCH/HOUR: 1.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Mola mola	1.85	2	100.00	
Total	1.85		100.00	

PROJECT STATION:1303
 DATE:13/12/00 GEAR TYPE: PT No:3 POSITION:Lat N 3149
 start stop duration Long W 951
 TIME :09:27:53 09:47:11 19 (min) Purpose code: 1
 LOG :8301.59 8302.72 1.13 Area code : 3
 FDEPTH: 30 40 GearCond.code:
 BDEPTH: 58 64 Validity code:
 Towing dir: 288ø Wire out: 110 m Speed: 30 kn*10

Sorted: 44 Kg Total catch: 1308.80 CATCH/HOUR: 4133.05

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	3420.00	398447	82.75	2375
Sardina pilchardus	710.53	38406	17.19	2374
Trachurus trachurus	2.53	3	0.06	
Total	4133.06		100.00	

PROJECT STATION:1304
 DATE:13/12/00 GEAR TYPE: PT No:1 POSITION:Lat N 3156
 start stop duration Long W 942
 TIME :12:52:04 13:29:09 37 (min) Purpose code: 1
 LOG :8329.92 8332.44 2.49 Area code : 1
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 43 44 Validity code:
 Towing dir: 265ø Wire out: 120 m Speed: 36 kn*10

Sorted: 42 Kg Total catch: 1692.00 CATCH/HOUR: 2743.78

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	2724.32	146270	99.29	2376
Scomber japonicus	19.46	195	0.71	
Total	2743.78		100.00	

PROJECT STATION:1305
 DATE:13/12/00 GEAR TYPE: PT No:1 POSITION:Lat N 3159
 start stop duration Long W 946
 TIME :16:29:32 16:45:54 16 (min) Purpose code: 1
 LOG :8360.24 8361.28 1.04 Area code : 1
 FDEPTH: 25 20 GearCond.code:
 BDEPTH: 55 51 Validity code:
 Towing dir: 111ø Wire out: 120 m Speed: 35 kn*10

Sorted: 34 Kg Total catch: 172.90 CATCH/HOUR: 648.38

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	541.88	22680	83.57	2377
Engraulis encrasicolus	103.13	12315	15.91	2378
Trachurus trachurus	2.63	4	0.41	
Allotheutis subulata	0.75	319	0.12	
Total	648.39		100.01	

PROJECT STATION:1306
 DATE:13/12/00 GEAR TYPE: PT No:7 POSITION:Lat N 3208
 start stop duration Long W 934
 TIME :20:20:07 20:52:29 32 (min) Purpose code: 1
 LOG :8395.57 8397.37 1.77 Area code : 1
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 38 43 Validity code:
 Towing dir: 270ø Wire out: 200 m Speed: 30 kn*10

Sorted: 47 Kg Total catch: 47.98 CATCH/HOUR: 89.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	64.13	1461	71.29	2377
Scomber japonicus	11.81	144	13.13	2380
Engraulis encrasicolus	8.83	1232	9.82	2378
Trachurus trachurus	4.31	92	4.79	2379
Belone belone gracilis	0.38	8	0.42	
Allotheutis subulata	0.26	77	0.29	
Boops boops	0.15	2	0.17	
Trachurus picturatus	0.09	2	0.10	
Total	89.96		100.01	

PROJECT STATION:1307
 DATE:14/12/00 GEAR TYPE: PT No:1 POSITION:Lat N 3216
 start stop duration Long W 927
 TIME :00:20:55 00:39:58 19 (min) Purpose code: 1
 LOG :8428.25 8429.52 1.26 Area code : 1
 FDEPTH: 20 30 GearCond.code:
 BDEPTH: 47 49 Validity code:
 Towing dir: 248ø Wire out: 120 m Speed: 34 kn*10

Sorted: 37 Kg Total catch: 149.72 CATCH/HOUR: 472.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	461.05	12635	97.51	1307
Pagellus acarne	6.44	1048	1.36	
Engraulis encrasicolus	2.40	366	0.51	
Scomber japonicus	1.89	25	0.40	
Pagellus erythrinus	1.01	3	0.21	
Total	472.79		99.99	

PROJECT STATION:1308
 DATE:14/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 3237
 start stop duration Long W 918
 TIME :10:04:18 10:25:38 21 (min) Purpose code: 1
 LOG :8516.26 8517.36 1.09 Area code : 3
 FDEPTH: 72 66 GearCond.code:
 BDEPTH: 72 66 Validity code:
 Towing dir: 85ø Wire out: 280 m Speed: 30 kn*10

Sorted: 44 Kg Total catch: 875.80 CATCH/HOUR: 2502.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	2400.00	230840	95.91	2382
Sardina pilchardus	102.29	4114	4.09	2381
Dicentrarchus labrax	9.66	3	0.39	
Zeus faber	0.63	3	0.03	
Aspitrigla obscura	0.14	3	0.01	
Total	2512.72		100.43	

PROJECT STATION:1309
 DATE:14/12/00 GEAR TYPE: BT No:2 POSITION:Lat N 3242
 start stop duration Long W 906
 TIME :16:10:50 16:40:40 30 (min) Purpose code: 1
 LOG :8571.84 8573.58 1.72 Area code : 1
 FDEPTH: 34 28 GearCond.code:
 BDEPTH: 34 28 Validity code:
 Towing dir: 215e Wire out: 120 m Speed: 30 kn*10

Sorted: 32 Kg Total catch: 548.86 CATCH/HOUR: 1097.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trachurus	499.20	15336	45.48	2383
Sardina pilchardus	229.92	9242	20.95	2382
Loligo vulgaris	109.80	2146	10.00	
Diplodus sargus *	106.00	130	9.66	
Pagellus acarne	31.40	64	2.86	
Diplodus bellottii	24.24	264	2.21	
Diplodus vulgaris	22.00	14	2.00	
Lichia amia	20.00	2	1.82	
Dicentrarchus punctatus	18.00	28	1.64	
Pagellus acarne	12.96	360	1.18	
Dicentrarchus labrax	12.00	6	1.09	
Zeus faber	5.40	4	0.49	
Aspitrigla obscura	2.60	4	0.24	
Liza aurata	2.40	2	0.22	
Balistes sp.	1.80	2	0.16	
Total	1097.72		100.00	

Annex II Instruments and fishing gear used

The Simrad EK-500, 38 kHz echo scientific sounder was used during the survey for fish abundance estimation. The Bergen Echo Integrator system (BEI) logging the echogram raw data from the sounder, was used to scrutinize the acoustic records, and to allocate integrator data to fish species. All raw data was stored to tape, and a backup of the database of scrutinized data, stored. The details of the settings of the 38 kHz where as follows:

Transceiver-1 menu	Transducer depth	5.5 - 7.5 m
	Absorbtion coeff.	10 dB/km
	Pulse length	medium (1ms)
	Bandwidth	wide
	Max power	2000 Watt
	2-way beam angle	-21.0 dB
	SV transducer gain	27.45 dB
	TS transducer gain	27.65 dB
	Angle sensitivity	21.9
	3 dB beamwidth	6.8°
	Alongship offset	-0.03°
	Athwardship offset	0.06°
Display menu	Echogram	1
	Bottom range	10 m
	Bottom range start	10 m
	TVG	20 log R
	Sv colour min	-67 dB
	TS Colour minimum	-60 dB
Printer- menu	Range	0 - 50 or 0 -100 m and 100 - 350m
	TVG	20 log R
	Sv colour min	-63 dB
Bottom detection menu	Minimum level	-40 dB

A calibration experiment using a standard copper sphere, performed in Baia dos Elefantos 12 August 1999 gave the following results:

Sv Transducer gain 27.45 dB
Ts Transducer gain 27.65 dB

Fishing gear

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super" bottom trawl. For all trawls, the Tyborøn, 7.8m² (1 670 kg) trawl doors were used. Complete drawings of the trawls used are included.

Annex III Biomass and number by fish length class

Sardine (Sardina pilchardus)

MOROCCO - MAURITANIA, November-December 2000

Length cm	C.Juby-C.Cantin		C.Bojador-C.Juby		C.Blanc-C.Bojador		C.Timiris-C.Blanc		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5										
6										
7										
8										
9	539	77	904	129	447	64			1,890	269
10	1,838	194	11,876	1,251	3,262	344			16,975	1,788
11	15,025	1,203	37,293	2,990	7,652	614	710	57	60,680	4,864
12	68,771	4,288	37,495	2,341	7,561	472	36,586	2,284	150,413	9,386
13	168,679	8,343	13,206	655	34,369	1,704	141,347	7,006	357,601	17,707
14	139,705	5,585	3,878	155	41,920	1,677	107,734	4,310	293,236	11,727
15	126,248	4,134	20,254	663	78,004	2,554	28,126	921	252,631	8,273
16	80,896	2,196	53,643	1,456	109,418	2,970	4,195	114	248,153	6,737
17	46,903	1,067	11,740	267	52,291	1,190			110,934	2,524
18	55,727	1,073	9,758	188	32,356	623			97,841	1,884
19	46,576	766	53,959	887	45,933	755			146,467	2,409
20	19,208	272	110,831	1,569	36,302	514			166,341	2,355
21	2,520	31	54,879	673	180,991	2,221			238,390	2,925
22			107,184	1,148	557,726	5,971			664,910	7,119
23			51,060	480	368,606	3,464			419,666	3,944
24			17,048	141	97,366	807			114,414	949
25					21,239	156			21,239	156
26					3,370	22			3,370	22
27					1,450	9			1,450	9
28										
29										
30										
Total	772,634	29,228	595,006	14,994	1,680,264	26,131	318,698	14,692	3,366,603	85,045

Round sardinella (*Sardinella aurita*)**SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, October-December 2000**

Length cm	Number in millions				Biomass in tonnes			
	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6								
7								
8								
9			1,156.8	1,156.8			9,323	9,323
10			1,060.4	1,060.4			11,539	11,539
11			964.0	964.0			13,782	13,782
12			192.8	192.8			3,540	3,540
13	15.6	2.1		17.6	368	48		416
14	31.2	4.1		35.3	912	120		1,032
15		8.2		8.2		293		293
16	1.4	2.0		3.3	58	85		144
17	1.4	3.9		5.3	70	203		273
18		3.9		3.9		240		240
19	2.7	4.7		7.4	193	333		526
20	1.4	2.7		4.1	112	224		336
21	9.5	8.9		18.3	905	845		1,750
22	19.1	18.5		37.5	2,085	2,018		4,103
23	14.3	82.1		96.3	1,779	10,224		12,003
24	46.5	71.8	96.4	214.7	6,559	10,138	13,326	30,023
25	53.3	45.0	96.4	194.8	8,491	7,167	15,026	30,684
26	85.0	28.3		113.2	15,179	5,052		20,232
27	46.3	46.4		92.7	9,242	9,260		18,502
28	27.6	77.3	470.0	574.8	6,140	17,168	102,264	125,572
29		46.7		46.7		11,498		11,498
30	1.4	47.2		48.5	369	12,849		13,218
31		82.9	470.0	552.9		24,882	138,077	162,959
32	3.7	182.5		186.2	1,211	60,135		61,346
33		154.0	566.4	720.3		55,566	200,150	255,717
34	1.4	153.9	939.9	1,095.2	534	60,683	362,807	424,024
35		64.7		64.7		27,781		27,781
36		17.5	96.4	113.9		8,146	44,065	52,211
37		24.1	939.9	964.0		12,212	465,921	478,133
38		4.8	470.0	474.8		2,641	252,099	254,739
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	361.4	1,187.9	7,519.4	9,068.7	54,208	339,813	1,631,919	2,025,940

Flat sardinella (*Sardinella maderensis*)**SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, October-December 2000**

Length cm	Number in millions				Biomass in tonnes			
	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6								
7								
8	1.4			1.4	8			8
9	1.4			1.4	11			11
10	1.4	17.6		19.0	15	196		211
11	14.7	52.9		67.6	215	772		987
12	18.1	18.3		36.3	339	343		681
13	37.9	57.4		95.3	895	1,357		2,252
14	9.8	106.7		116.5	286	3,124		3,410
15	7.9	50.3		58.1	281	1,797		2,078
16	41.5	20.7		62.2	1,790	892		2,682
17	2.7	18.4		21.1	139	948		1,087
18		5.9		5.9		360		360
19		0.7		0.7		47		47
20	17.5			17.5	1,444			1,444
21	203.2	6.9		210.0	19,384	654		20,038
22	272.0	0.7		272.6	29,741	72		29,813
23	319.8	2.6		322.4	39,840	328		40,168
24	438.8	14.6		453.4	61,951	2,061		64,012
25	366.6	26.1		392.7	58,355	4,159		62,513
26	138.6	65.3		203.9	24,753	11,666		36,419
27	25.6	80.8		106.4	5,105	16,132		21,237
28	8.0	138.0		146.0	1,786	30,667		32,453
29	4.7	161.3		166.0	1,168	39,746		40,914
30		265.8		265.8		72,386		72,386
31		206.9		206.9		62,083		62,083
32		253.9		253.9		83,661		83,661
33		250.0		250.0		90,243		90,243
34		243.1		243.1		95,843		95,843
35		89.0		89.0		38,210		38,210
36		52.2		52.2		24,368		24,368
37		15.6		15.6		7,890		7,890
38		5.2		5.2		2,846		2,846
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	1931.3	2226.8		4158.1	247,506	592,849		840,355

Anchovy (*Engraulis encrasicolus*)**MOROCCO, November-December 2000**

Length cm	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions
5						
6						
7						
8	53	16	43	13	95	29
9	187	40	159	34	346	75
10	5,866	938	461	74	6,327	1,012
11	43,145	5,253	2,949	359	46,094	5,613
12	36,800	3,489	6,416	608	43,215	4,097
13	15,768	1,187	3,485	262	19,253	1,449
14	2,580	157	464	28	3,044	185
15	337	17	170	8	507	25
16						
17						
18						
19						
20						
Total	104,734	11,097	14,148	1,387	118,882	12,485

Atlantic horse mackerel (*Trachurus trachurus*)

MOROCCO, November-December 2000

Length cm	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions
5						
6						
7						
8						
9						
10	179	18.4			179	18.4
11	1,335	104.5			1,335	104.5
12	864	52.7	6,141	374.3	7,005	427.0
13	88	4.3	14,938	722.8	15,026	727.0
14	759	29.6	10,002	390.6	10,761	420.2
15	2,648	84.7	2,634	84.2	5,282	168.9
16	6,391	169.4	2,091	55.4	8,482	224.8
17	5,701	126.6	2,496	55.4	8,197	182.1
18	2,546	47.9	508	9.5	3,054	57.4
19						
20	57	0.8			57	0.8
21	290	3.5	1,119	13.4	1,408	16.9
22	588	6.1	2,557	26.7	3,145	32.9
23			23,685	217.3	23,685	217.3
24			35,810	289.9	35,810	289.9
25	7,707	55.3	12,897	92.6	20,605	147.9
26	19,223	123.0	20,840	133.3	40,063	256.3
27	22,556	129.1	21,676	124.1	44,232	253.2
28	14,347	73.8	12,684	65.2	27,031	139.0
29			8,782	40.7	8,782	40.7
30			834	3.5	834	3.5
31						
32			3,853	13.4	3,853	13.4
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
Total	85,280	1,029.7	183,545	2,712.4	268,826	3,742.0

Annex III page 6

Cunene horse mackerel (*Trachurus trecae*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, October-December 2000

Length cm	Number in millions				Biomass in tonnes			
	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6								
7								
8								
9								
10		5.7		5.7		63		63
11		43.4		43.4		633		633
12		379.9		379.9		7,124		7,124
13		754.9	70.3	825.2		17,830	1,452	19,283
14		349.4		349.4		10,224		10,224
15		45.5		45.5		1,625		1,625
16	1.9	16.4		18.3	83	708		791
17	16.3	4.0		20.3	840	206		1,046
18	15.7	9.7	25.8	51.2	957	588	1,372	2,918
19	9.7	323.4	159.1	492.2	692	23,020	9,908	33,620
20	2.5	597.6	1,129.5	1,729.6	211	49,422	81,740	131,372
21	2.0	686.6	2,339.6	3,028.1	186	65,503	195,315	261,004
22	2.0	358.4	1,367.2	1,727.6	213	39,195	130,813	170,221
23	3.1	6.0	397.9	407.1	389	752	43,379	44,520
24	6.8	3.0	294.0	303.8	958	422	36,320	37,700
25	1.2	3.4	127.9	132.4	186	541	17,811	18,539
26	1.9	7.4	102.3	111.6	348	1,316	15,992	17,656
27	1.2	34.3	364.3	399.7	234	6,851	63,633	70,718
28			284.4	284.4			55,308	55,308
29		4.0	316.2	320.2		978	68,189	69,167
30		4.0	156.6	160.5		1,081	37,311	38,392
31		2.4	105.4	107.8		721	27,673	28,394
32		12.8	134.1	146.9		4,220	38,662	42,882
33		2.4	159.7	162.1		867	50,419	51,285
34		7.3	134.1	141.4		2,891	46,248	49,139
35		49.9	54.3	104.2		21,435	20,388	41,823
36		106.5	25.6	132.1		49,735	10,447	60,181
37		150.0	76.7	226.7		75,919	33,987	109,907
38		207.5		207.5		113,652		113,652
39		175.8		175.8		103,983		103,983
40		80.5		80.5		51,322		51,322
41		53.5		53.5		36,679		36,679
42		30.5		30.5		22,502		22,502
43		3.7		3.7		2,946		2,946
44		2.4		2.4		2,032		2,032
45		3.7		3.7		3,371		3,371
46								
47								
48								
49		3.7		3.7		4,341		4,341
50								
Total	64.4	4,529.4	7,824.8	12,418.5	5,298	724,697	986,368	1,716,362

Annex III page 7**Chub mackerel (*Scomber japonicus*)****MOROCCO - MAURITANIA, November-December 2000**

Length cm	C.Juby-C.Cantin		C.Blanc-C.Juby		St. Louis-C.Blanc		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19			86	1.4			86	1.4
20	1,146	15.8	199	2.8			1,345	18.6
21	3,926	47.0	230	2.8			4,156	49.8
22	4,133	43.2	570	6.0			4,702	49.1
23	7,025	64.4					7,025	64.4
24	2,229	18.0	225	1.8			2,454	19.9
25	1,211	8.7	1,269	9.1			2,480	17.8
26	753	4.8	5,246	33.6			5,999	38.4
27	421	2.4	10,534	60.3			10,955	62.7
28	156	0.8	14,315	73.6			14,471	74.4
29	173	0.8	7,630	35.4			7,803	36.2
30	563	2.4	2,096	8.8			2,659	11.2
31	422	1.6	12,327	47.0			12,749	48.6
32			4,547	15.8			4,547	15.8
33			1,627	5.2			1,627	5.2
34			5,959	17.3			5,959	17.3
35			3,589	9.5			3,589	9.5
36			1,052	2.6			1,052	2.6
37								
38								
39								
40								
Total	22,157	210.0	71,501	332.7			93,658	542.7