

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

**Part I SENEGAL - THE GAMBIA**

**30 October - 9 November 1999**

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

**Institute of Marine Research  
Bergen, Norway**

**Department of Fisheries  
Banjul, The Gambia**

CRUISE REPORTS 'DR FRIDTJOF NANSEN'

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

**Part I**

**SENEGAL - THE GAMBIA  
30 October - 9 November 1999**

by

**R. Toresen**

and

**J. Kolding**

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

**Institute of Marine Research  
Bergen, 1999**

## TABLE OF CONTENTS

---

CHAPTER 1	INTRODUCTION.....	1
1.1	Objectives of the cruise.....	1
1.2	Participation.....	1
1.3	Narrative.....	2
1.4	Methods.....	2
CHAPTER 2	SURVEY RESULTS.....	7
2.1	Hydrography.....	7
2.2	The Casamance shelf.....	9
2.3	The Gambian shelf.....	10
2.4	The Gambian border - Cape Vert.....	10
2.5	Cape Vert - St. Louis.....	11
CHAPTER 3	OVERVIEW AND SUMMARY OF RESULTS.....	15
Annex I	Records of fishing stations	
Annex II	Description of instruments and fishing gear used	
Annex III	Pooled length distributions by species and regions	
Annex IV	Stock length distributions by numbers and weight	
Annex V	Stratified biomass estimates	

## CHAPTER 1 INTRODUCTION

---

### 1.1 Objectives 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-November and December 1999. 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: round sardinella *Sardinella aurita*, flat sardinella *Sardinella maderensis*, Atlantic 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 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, Mor SYLLA and Serigne SYLLA

Department of Fisheries, The Gambia:  
Ousmann Mass JOBE, Juldeh JALLOW and Asberr MENDY

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



Institute of Marine Research, Norway:

Reidar TORESEN, Jeppe KOLDING, Magne OLSEN, Thor Egil JOHANSSON and Tore MØRK.

### 1.3 Narrative

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

The survey started off Casamance on October 30 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 2 and that off Cape Vert on November 5.

### 1.4 Methods

#### *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. At each station on the standard hydrographic transects two 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. Individual weights, in grams, were measured for the sardinella species. The weight measurements were used to establish the power factor,  $b$ , in the length-weight relationship:

$$\bar{w} = a \cdot L^b \quad (1)$$

The factor,  $b$ , was estimated to 2.96 for both flat and round sardinella. 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 *Trachurus trecae*, round scad *Decapterus punctatus*, and false scad *Decapterus rhonchus*),
- 3) Other pelagic carangids and associated species (Atlantic bumber *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 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:

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

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

$\rho_i$  = 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 ( $\sigma_{bs}^{-1}$ ) of a fish in length group  $i$

Using equation (3), the pooled length distribution is used together with the mean  $s_A$ -value to calculate the density by length groups for each observed area of distribution (stratum). The total number by length group in the area is obtained by multiplying each density by the 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 (equation 1). Finally the total biomass estimate is obtained by summing the biomass by length group and strata within each sector of the survey, or by calculating a stratified estimate of the mean density and multiplying by the total area of distribution (Annex V). Estimates of the coefficient of variation ( $CV = \text{Standard deviation}/\text{mean}$ ) for the stratified mean densities were calculated with the underlying assumption that is constant when  $s_A$ -values are converted to densities ( $t/NM^2$ ). The CV of the  $S_A$ -values within each stratum and area of fish distribution (see maps of distribution) were calculated based on the allocated 5 NM averages and the number of observations thus represents the number of 5 NM intervals covered within each stratum. All equations and some theoretical background for the calculations is given in Annex V.

Equations (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 are geographically segregated. When no segregation occurs the various length distributions are pooled together with equal importance. Otherwise, when the size distribution varies within the sampling site, these distributions are post-stratified and estimates of mean densities are calculated separately, or 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.

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

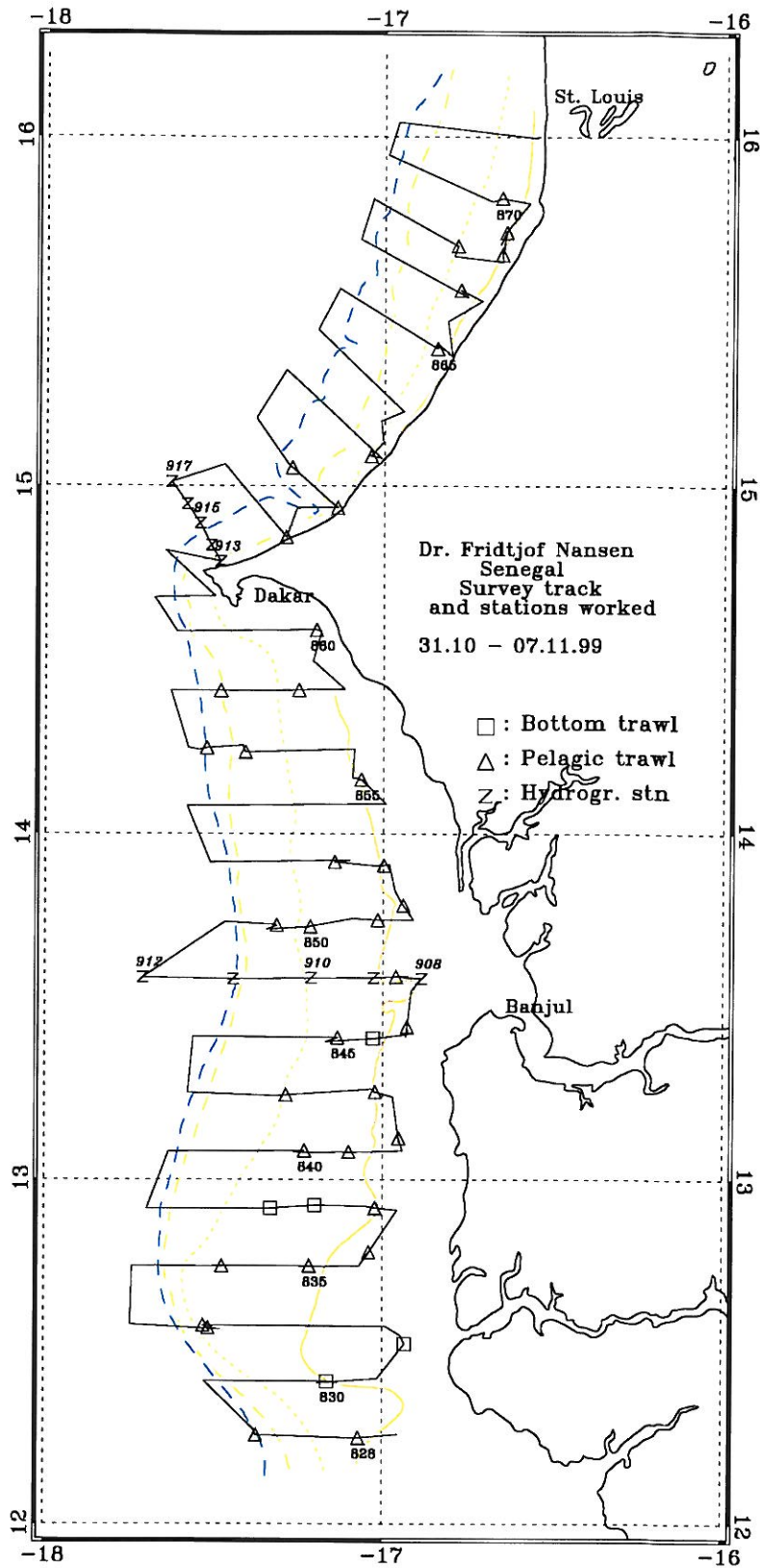
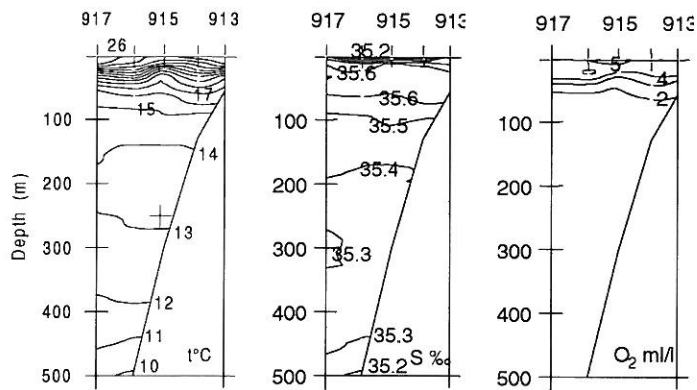


Figure 1 Course tracks with fishing and hydrographic stations; Casamance to St. Louis.

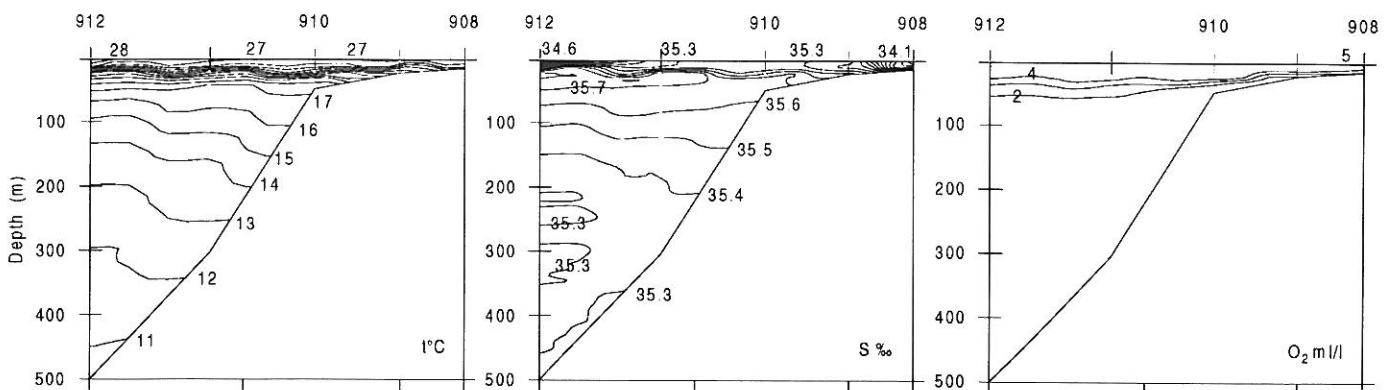
## CHAPTER 2 SURVEY RESULTS

### 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 5.11 1999



THE GAMBIA - WEST 2.11 1999

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

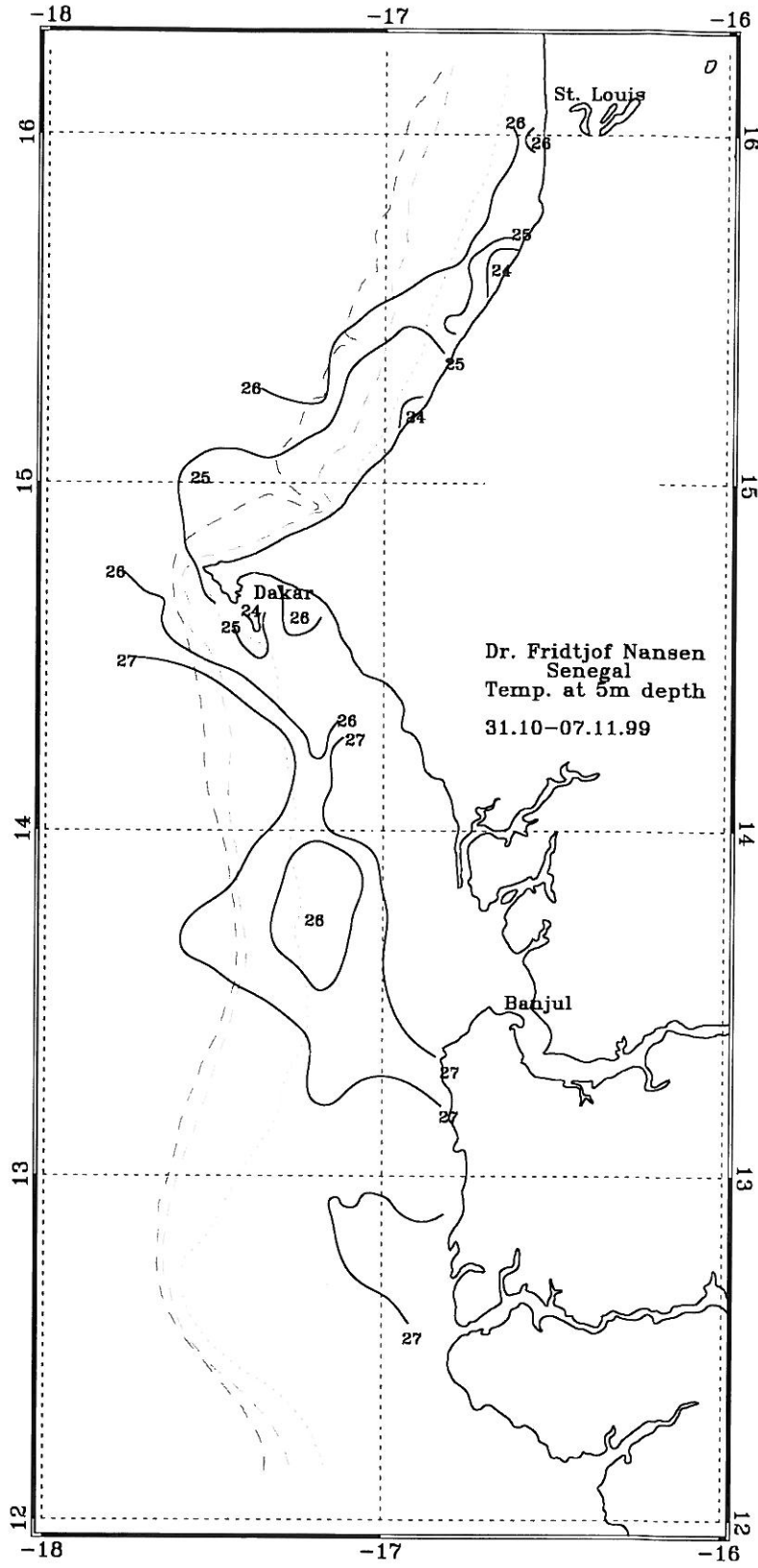


Figure 3 Sea surface temperature; Casamance to St. Louis.

The distribution of surface temperature and the profile The Gambia-west show that there was a stable surface layer with a temperature of 26-27°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 about 25-26°C over the outer shelf to 24°C near the coast.

## 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, there was a continuous aggregation of sardinella of low density in south towards the border to Guinea Bissau, to higher density in the north. The high density aggregation was found some 30 - 40 NM north-west of the Gambia River mouth (Figure 4). The samples from these aggregation were flat sardinella (*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 164 000 tonnes (Table 1).

An aggregation of horse mackerels (*Trachurus* and *Decapterus*) was found some 40 NM west of the river mouth (Figure 5). The biomass of this group was estimated at 20 000 tonnes. The false scad dominated the group by 70 % and two dominating modal length groups were found, one at 24 cm and the other at 13 cm. The stock length compositions by numbers and weight are shown in Annex IV.

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 carangids, scombrids and hairtails with the carangids as the dominating group. See Annex I (records of fishing stations) for species composition in the hauls taken in this area (stn. no. 828-839). The estimated biomass of this group of fish was 101 000 tonnes.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
164	+	20	77



### 2.3 The Gambian shelf

The school area of sardinella off Casamance continued northwards off The Gambia (Figure 4). The highest concentrations were recorded in two high density areas some 20 NM off the coast, north and south in the area. The samples showed a 68% dominance of flat sardinella (*Sardinella maderensis*). The pooled length composition of the flat sardinella had a mode of 24 cm, see Annex III, while the mode of the length distribution for round sardinella was 23 cm. The stock length compositions by numbers and weight are shown in Annex IV.

Table 2 shows that the biomass estimates of the sardinellas amounted to 366 000 tonnes, of which 251 000 tonnes were flat sardinella.

Horse mackerels were found in an area with low densities some 10 to 50 NM off the coast (Figure 5). The false scad totally dominated in this area and the biomass was estimated at 11 000 tonnes. The stock length compositions by numbers and weight are shown in Annex IV.

Carangids and associated species were found in a wide area over the entire shelf (Figure 6). Catches of this group consisted mainly of carangids. See Annex I (records of fishing stations) for species composition in the hauls taken in this area (st. no. 840-848). The biomass was estimated at 133 000 tonnes.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
251	115	11	133

### 2.4 The Gambian border - Cape Vert

The school area of sardinella off The Gambia continued northwards to about 14°N (Figure 4). Table 3 shows the biomass estimates for the two sardinella species that summed up to 784 000 tonnes. Round sardinella dominated the estimated biomass in the area by 55%.

Pooled length compositions of samples showed that the adult part of the flat sardinella had a modal length of 24 cm and the round sardinella had it of 28 cm, see Annex III. Stock size compositions by numbers and weight are shown in Annex IV.

Horse mackerels were distributed in two medium dense concentrations, one just north of the boarder to The Gambia and the other south of Dakar (Figure 5). The biomass was estimated at 32 000 tonnes and the Atlantic horse mackerel dominated the group by 66%. Stock size compositions by numbers and weight are shown in Annex IV.

Also here, the carangids and associated pelagic fish were distributed over most of the area, see Figure 6. Atlantic bumper, *Chloroscombrus chrysurus* was caught in most of the trawl samples. The biomass of the carangids and associated pelagic fish was estimated at about 79 000 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.
349	435	32	79

## 2.5 Cape Vert - St. Louis

On this part of the shelf sardinellas were found in medium dense inshore concentrations (Figure 4). The samples showed a dominance of flat sardinella. The modal lengths of the flat sardinella was 8, 13 and 28 cm, see Annex III. Flat sardinella dominated the group by 68%. The biomass of the sardinellas was estimated at 71 000 tonnes (Table 4).

Horse mackerels were found in a medium dense concentration about 20 NM north of Dakar (Figure 5). Atlantic horse mackerel dominated the group by 95% and modal lengths were 14, 21 and 28 cm. The estimated biomass in the area was 4 000 tonnes.

Carangids and associated pelagic fish were mainly found inshore from Dakar to about 15°30'N and over the entire shelf further north to St. Louis (Figure 6). The catches consisted also here of Atlantic bumper, lookdown *Selene dorsalis* and hairtails. The biomass estimate was 111 000 tonnes.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
48	23	4	111

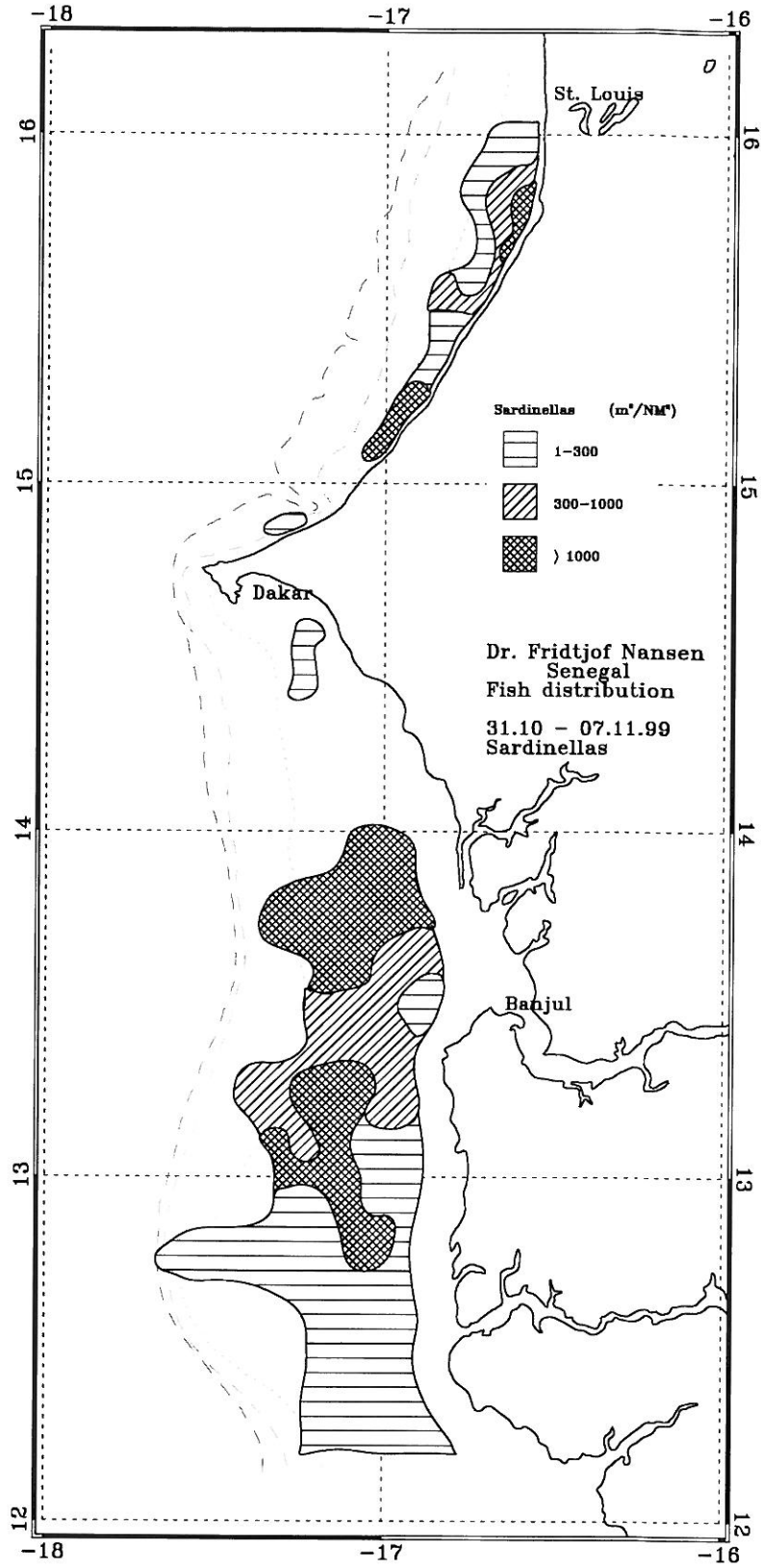


Figure 4 Distribution of sardinellas; Casamance to St. Louis.

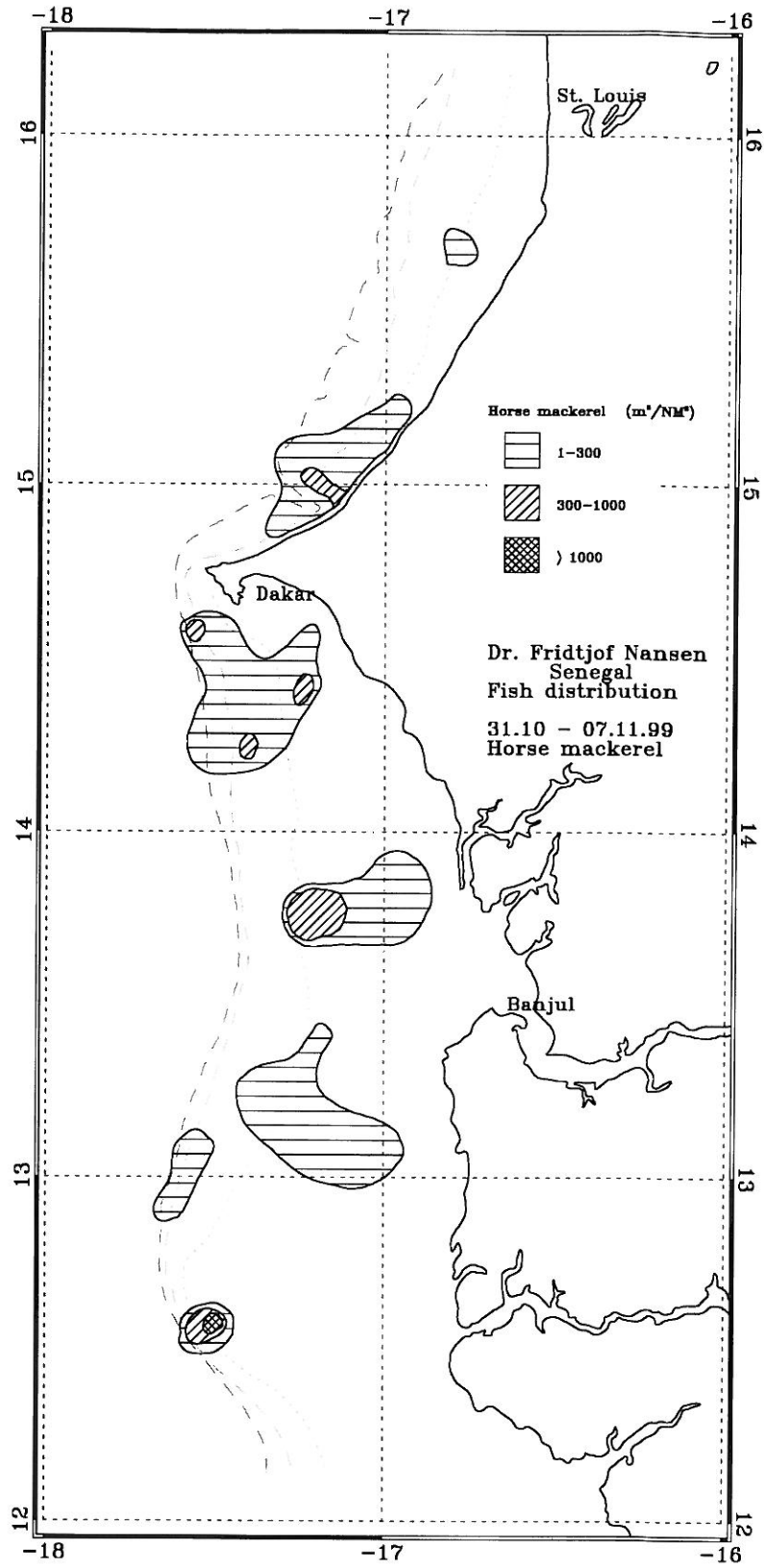


Figure 5 Horse mackerels; Casamance to St. Louis.

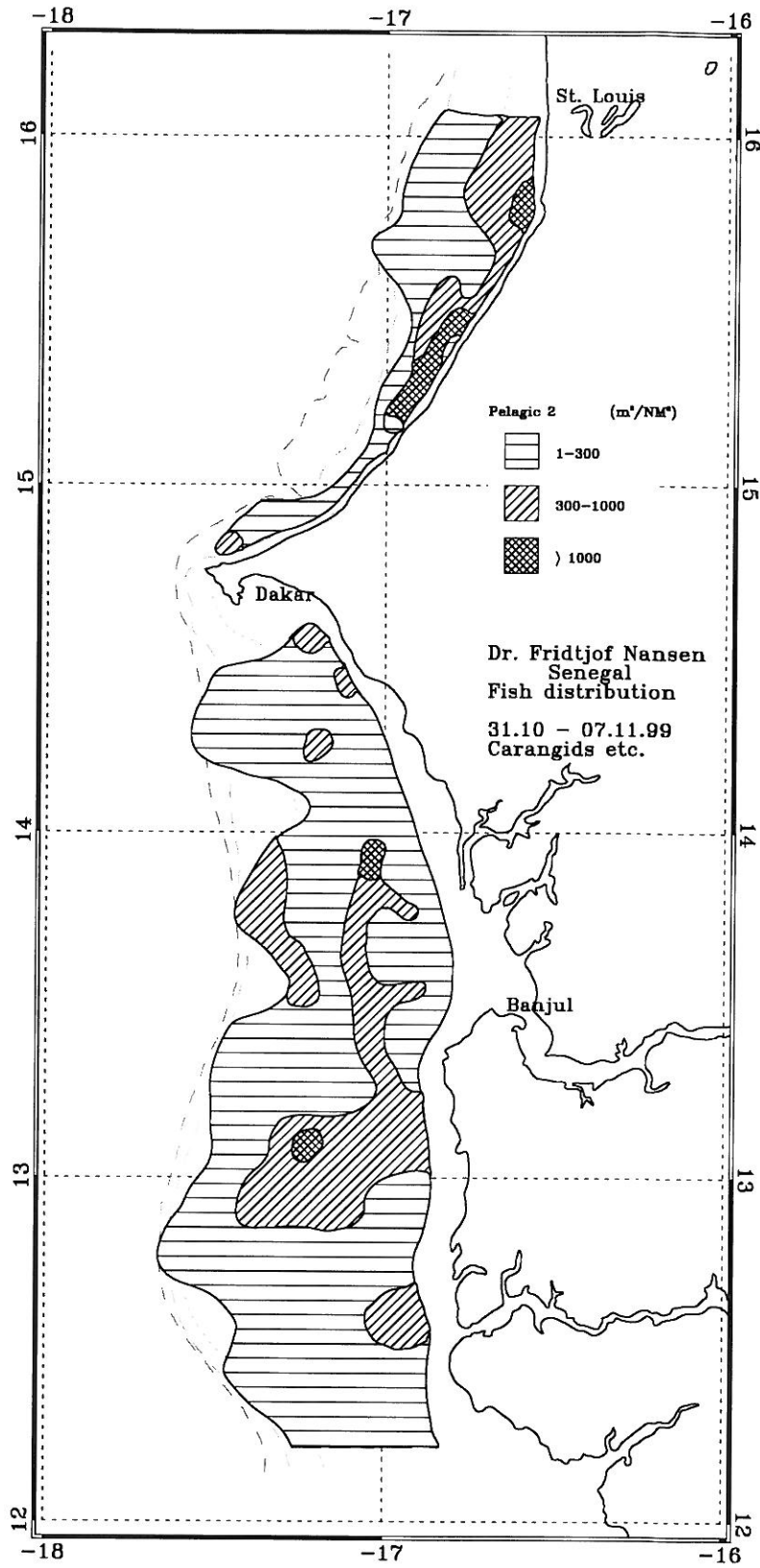


Figure 6. Carangids and associated species; Casamance to St. Louis

## CHAPTER 3 OVERVIEW AND SUMMARY OF RESULTS

---

The survey was conducted successfully in the period October 30 to November 9 with a course track of about 1 500 NM and 43 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 concentration from Casamance to about 14°N. (Figure 4). High densities were found in the area off The Gambia and west of the Saloum River. Off Gambia flat sardinella dominated, while off Saloum River, the two species were present in about equal amounts. Sardinellas were also found inshore north of Dakar.

Horse mackerels were found in medium densities in scattered aggregations (Figure 5). Totally, false scad dominated by 65% in terms of biomass.

The distribution of carangids and associated species formed a wide band along the coast (Figure 5). South of Cape Vert the catches of this group consisted of Atlantic bumper, barracudas and hairtails. The catches north of Cape Vert were also dominated by bumper with the additional presence of little tunny *Euthynnus alletteratus* and hairtail.

An overview of the estimates of biomass of the main groups of pelagic fish based on the echo integration data is shown in Table 5. The total biomass of sardinellas was thus 1 385 000 tonnes, horse mackerels 67 000 tonnes and of carangids and associated species about 400 000 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	48	23	4	111
Cape Vert-Gambia	349	435	32	79
Gambia	251	115	11	133
Casamance	164	+	20	77
Total	812	573	67	400

Table 6 lists all biomass estimates of sardinellas and carangids and associated species from '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 within the season of northern distribution. Compared with the NovDec/96 and NovDec/97 surveys the estimate of 1 385 000 tonnes of sardinellas from the current survey is very high and nearly double the estimate of NovDec/95. The high estimate of sardinellas this year may be explained by increased production due to extraordinary heavy rainfall this year. This has led to record high levels of flow of nutrient rich water from the rivers. The carangid estimate of 467 000 tonnes is somewhat higher than that of 1998 and lower than the estimate of 526 000 tonnes in 1996.

Table 6. Biomass estimates from '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

\* Not available

## References

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

# Annex I Records of fishing stations

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 828  
 DATE: 1/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1215  
 start stop duration Long W 1704  
 TIME :00:00:30 00:00:40 30 (min) Purpose code: 1  
 LOG :2735.47 2735.62 1.13 Area code : 1  
 FDEPTH: 0 0 GearCond.code:  
 BDEPTH: 27 30 Validity code:  
 Towing dir: 270° Wire out: 160 m Speed: 35 kn\*10  
 Sorted: 1 Kg Total catch: 1.29 CATCH/HOUR: 2.58

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	2.44	18	94.57	1661
Trichurus lepturus	0.10	2	3.88	
Ilisha africana	0.04	4	1.55	
<b>Total</b>	<b>2.58</b>	<b>100.00</b>		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 829  
 DATE: 1/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1216  
 start stop duration Long W 1722  
 TIME :03:32:16 04:03:13 30 (min) Purpose code: 1  
 LOG :2754.26 2755.55 1.13 Area code : 1  
 FDEPTH: 0 0 GearCond.code:  
 BDEPTH: 216 158 Validity code:  
 Towing dir: 360° Wire out: 160 m Speed: 35 kn\*10  
 Sorted: 5 Kg Total catch: 33.16 CATCH/HOUR: 66.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	57.00	28500	85.95	
Caranx senegallus	4.48	4	6.76	
Euthymus alletteratus	4.44	4	6.69	
Sepia officinalis hierredda	0.44	8	0.66	
Aricomma bondi	0.32	10	0.48	
PARALEPIDIDAE	0.10	4	0.15	
Selene dorsalis	0.02	2	0.03	
<b>Total</b>	<b>66.80</b>	<b>100.72</b>		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 830  
 DATE: 1/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1225  
 start stop duration Long W 1710  
 TIME :08:17:27 08:47:18 30 (min) Purpose code: 1  
 LOG :2794.95 2796.69 1.73 Area code : 1  
 FDEPTH: 19 20 GearCond.code:  
 BDEPTH: 19 20 Validity code:  
 Towing dir: 270° Wire out: 110 m Speed: 30 kn\*10  
 Sorted: 67 Kg Total catch: 169.00 CATCH/HOUR: 338.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	140.00		41.42	
SPHYRAENIDAE	38.00	146	11.24	
Chloroscombrus chrysurus	30.00	470	8.88	
Selene dorsalis	28.00	396	8.28	
Trachinotus ovatus	28.00	76	8.28	
Arius heudeloti	21.00	10	6.21	
Ilisha africana	18.00	570	5.33	
Sardinella maderensis	7.50	56	2.22	1662
Trichurus lepturus	5.00	160	1.78	
Scomberomorus tritor	5.70	6	1.69	
Caranx senegallus	3.20	6	0.95	
Albula vulpes	2.50	6	0.74	
Stromateus fiatola	1.90	6	0.56	
Alectis alexandrinus	1.70	6	0.50	
Pomadasyus peroteti	1.40	6	0.41	
Galeoides decadactylus	1.20	16	0.36	
Callinectes sp.	1.10	30	0.33	
Pteroscion pelli	1.00	10	0.30	
Pennaeus notialis	1.00	310	0.30	
<b>Total</b>	<b>337.20</b>		<b>99.78</b>	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 831  
 DATE: 1/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 1231  
 start stop duration Long W 1656  
 TIME :11:11:44 11:28:36 17 (min) Purpose code: 1  
 LOG :2816.61 2817.56 0.93 Area code : 1  
 FDEPTH: 13 14 GearCond.code:  
 BDEPTH: 13 14 Validity code:  
 Towing dir: 330° Wire out: 80 m Speed: 30 kn\*10  
 Sorted: 60 Kg Total catch: 60.07 CATCH/HOUR: 212.01

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	131.12	3254	61.85	
Sardinella maderensis	49.05	565	23.14	1663
Selene dorsalis	8.40	4	3.96	
Scomberomorus tritor	7.84	7	3.70	
Sphyraena sphyraena	5.44	14	2.57	
Brachydeuterus auritus	3.81	106	1.80	
Albula vulpes	2.12	7	1.00	
Trachinotus ovatus	1.13	14	0.53	
Hemicaranx bicolor	0.92	7	0.43	
Stromateus fiatola	0.85	4	0.40	
Galeoides decadactylus	0.42	4	0.20	
Ilisha africana	0.35	14	0.17	
Caranx senegallus	0.35	4	0.17	
Arius heudeloti	0.21	7	0.10	
<b>Total</b>	<b>212.02</b>		<b>100.02</b>	

DATE: 1/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1235  
 start stop duration Long W 1732  
 TIME :15:37:46 16:12:32 35 (min) Purpose code: 1  
 LOG :2854.40 2856.31 1.89 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 48 43 Validity code:  
 Towing dir: 90° Wire out: 160 m Speed: 35 kn\*10  
 Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 833  
 DATE: 1/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 1234  
 start stop duration Long W 1731  
 TIME :17:02:11 17:34:17 32 (min) Purpose code: 1  
 LOG :2859.66 2861.63 1.95 Area code : 1  
 FDEPTH: 25 25 GearCond.code:  
 BDEPTH: 46 41 Validity code:  
 Towing dir: 90° Wire out: 120 m Speed: 36 kn\*10  
 Sorted: 4 Kg Total catch: 3.52 CATCH/HOUR: 6.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	6.60	19	100.00	1664
<b>Total</b>	<b>6.60</b>	<b>100.00</b>		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 834  
 DATE: 1/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1245  
 start stop duration Long W 1729  
 TIME :22:56:06 23:27:04 31 (min) Purpose code: 1  
 LOG :2907.19 2908.76 1.55 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 44 46 Validity code:  
 Towing dir: 270° Wire out: 125 m Speed: 30 kn\*10  
 Sorted: 44 Kg Total catch: 53.38 CATCH/HOUR: 103.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus punctatus	33.88	1546	32.60	1665
Sardinella maderensis	17.07	95	16.52	1666
Sphyraena sphyraena	16.72	35	16.18	
Engraulis encrasicolus	13.49	12627	13.06	
Selene dorsalis	6.58	35	6.37	
Decapterus rhonchus	5.92	17	5.73	
SEPIIDAE	4.32	8634	4.18	
Trichurus lepturus	1.24	2	1.20	
Euthymus alletteratus	0.93	2	0.90	
Echeneis naucrates	0.58	6	0.56	
Sardinella aurita	0.54	8	0.52	1667
Sepia orbignyana	0.31	2	0.30	
Scomber japonicus	0.31	2	0.30	
Pomatomus saltatrix	0.27	54	0.26	
Ilisha africana	0.27	27	0.26	
Brachydeuterus auritus	0.27	350	0.26	
Trachurus trecae	0.27	4	0.26	
Fistularia tabacaria	0.27	2	0.26	
Aricomma bondi	0.19	2	0.18	
Octopus sp.	0.08	2	0.08	
<b>Total</b>	<b>103.31</b>		<b>99.98</b>	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 835  
 DATE: 2/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1245  
 start stop duration Long W 1713  
 TIME :01:46:23 02:16:14 30 (min) Purpose code: 1  
 LOG :2927.33 2929.48 1.64 Area code : 1  
 FDEPTH: 0 0 GearCond.code:  
 BDEPTH: 24 27 Validity code:  
 Towing dir: 270° Wire out: 150 m Speed: 32 kn\*10  
 Sorted: 62 Kg Total catch: 820.84 CATCH/HOUR: 1641.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	366.32	11508	52.77	
Chloroscombrus chrysurus	404.32	5412	24.63	
Ilisha africana	61.60	2268	3.75	
Selene dorsalis	50.96	544	1.10	
Pseudotolithus senegalensis	47.04	56	2.87	
Sphyraena sphyraena	34.44	112	2.10	
Stromateus fiatola	32.48	84	1.98	
Sepia officinalis hierredda	16.80	28	1.02	
Orcynopsis unicolor	15.12	28	0.92	
Albula vulpes	14.00	28	0.85	
Lagocephalus laevigatus	14.00	56	0.85	
Trichurus lepturus	11.76	56	0.72	
Trichurus lepturus	11.76	56	0.72	
Sardinella maderensis	9.52	56	0.58	
Pomadasyus jubelini	9.52	28	0.58	
Echeneis naucrates	9.52	28	0.58	
Pteroscion pelli	6.16	1932	0.38	
Pennaeus notialis	4.48	448	0.27	
Caranx crysos	3.60	2	0.22	
Alectis alexandrinus	3.16	2	0.19	
ATHERINIDAE	0.56	504	0.03	
Galeoides decadactylus	0.00			
<b>Total</b>	<b>1627.12</b>		<b>99.11</b>	



DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 836  
 DATE: 2/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1247  
 start stop duration Long W 1702  
 TIME :04:17:46 04:47:17 30 (min) Purpose code: 1  
 LOG :2945.06 2946.74 1.68 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 17 17 Validity code:  
 Towing dir: 215ø Wire out: 150 m Speed: 32 kn\*10  
 Sorted: 32 Kg Total catch: 476.00 CATCH/HOUR: 952.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	373.00	3120	39.18	1668
Brachydeuterus auritus	266.40	2880	27.98	
Arius laticutatus	94.20	90	9.89	
Chloroscombrus chrysurus	53.60	1286	6.68	
Ilisha africana	38.40	10590	4.03	
OPHICHTHIDAE	36.00	30	3.78	
Sphyræna sphyraena	33.60	150	3.53	
Trichiurus lepturus	13.20	450	1.39	
Callinectes pallidus	12.00	60	1.26	
Penaeus notialis	10.20	4340	1.07	
Dasyatis margarita	3.60	30	0.38	
Galeoides decadactylus	3.00	180	0.32	
Selene dorsalis	2.40	150	0.25	
Sepia elegans	1.20	120	0.13	
Sepia officinalis hierredda	1.20	90	0.13	
Cynoglossus senegalensis	0.60	30	0.06	
Total	952.60		100.06	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 837  
 DATE: 2/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1255  
 start stop duration Long W 1701  
 TIME :06:33:09 07:03:06 30 (min) Purpose code: 1  
 LOG :2961.94 2963.49 1.54 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 21 21 Validity code:  
 Towing dir: 270ø Wire out: 110 m Speed: 30 kn\*10  
 Sorted: 42 Kg Total catch: 42.00 CATCH/HOUR: 84.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	34.84	128	41.48	
Brachydeuterus auritus	26.28	358	31.29	
Sardinella maderensis	12.24	124	14.57	1669
Chloroscombrus chrysurus	4.04	86	4.81	
Ilisha africana	1.64	52	1.95	
Sphyræna guanchancho	1.44	6	1.71	
Sepia officinalis hierredda	1.16	14	1.38	
Galeoides decadactylus	0.64	8	0.76	
Caranx senegalus	0.36	2	0.43	
Mugil cephalus	0.36	2	0.43	
Selene dorsalis	0.36	8	0.43	
Alectis alexandrinus	0.32	2	0.38	
Callinectes sp	0.08	10	0.10	
Arius heudeloti	0.04	2	0.05	
Penaeus notialis	0.02	2	0.02	
Total	83.82		99.79	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 838  
 DATE: 2/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 1256  
 start stop duration Long W 1712  
 TIME :08:29:01 08:59:12 30 (min) Purpose code: 1  
 LOG :2974.00 2975.57 1.54 Area code : 1  
 FDEPTH: 29 28 GearCond.code:  
 BDEPTH: 29 28 Validity code:  
 Towing dir: 90ø Wire out: 110 m Speed: 30 kn\*10  
 Sorted: 59 Kg Total catch: 501.60 CATCH/HOUR: 1003.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	555.20	8670	55.34	
Chloroscombrus chrysurus	263.20	4846	26.24	
Galeoides decadactylus	52.80	222	5.26	
Selene dorsalis	43.80	698	4.37	
Pomadasy peroteti	23.40	34	2.33	
Decapterus punctatus	15.40	52	1.54	
Trichiurus lepturus	13.60	68	1.36	
Ilisha africana	9.20	170	0.92	
Arius heudeloti	7.80	170	0.78	
Sphyræna guanchancho	7.20	34	0.72	
SEPIIDAE	5.40	18	0.54	
STROMATEIDAE	4.60	18	0.46	
GERREIDAE	2.00	18	0.20	
Pomadasy incisus	2.00	18	0.20	
Total	1005.60		100.26	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 839  
 DATE: 2/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 1255  
 start stop duration Long W 1720  
 TIME :10:30:20 10:45:04 15 (min) Purpose code: 1  
 LOG :2986.83 2987.68 0.81 Area code : 1  
 FDEPTH: 39 38 GearCond.code:  
 BDEPTH: 39 38 Validity code:  
 Towing dir: 90ø Wire out: 135 m Speed: 30 kn\*10  
 Sorted: 64 Kg Total catch: 321.00 CATCH/HOUR: 1284.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	756.00	1788	58.88	
Chloroscombrus chrysurus	412.00	540	32.09	
Selene dorsalis	74.40	640	5.79	
Pomadasy incisus	7.04	20	0.55	
Trachurus trecae	6.80	60	0.53	
Sardinella maderensis	6.40	60	0.50	
Decapterus punctatus	4.64	8	0.36	
Trichiurus lepturus	4.00	20	0.31	
Pagellus bellottii	3.60	24	0.28	
Pomadasy peroteti	2.64	4	0.21	
Argyroscopus regius	1.52	4	0.12	
Sardinella aurita	0.20	20	0.02	
Total	1279.24		99.64	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 840  
 DATE: 2/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 1305  
 start stop duration Long W 1714  
 TIME :16:48:26 17:18:26 30 (min) Purpose code: 1  
 LOG :3047.12 3048.96 1.81 Area code : 1  
 FDEPTH: 15 15 GearCond.code:  
 BDEPTH: 39 42 Validity code:  
 Towing dir: 270ø Wire out: 100 m Speed: 35 kn\*10  
 Sorted: 68 Kg Total catch: 3353.56 CATCH/HOUR: 6707.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	3208.00	31948	47.83	
Sardinella maderensis	2309.00	21952	34.41	1670
Brachydeuterus auritus	568.40	1372	8.47	
Arius heudeloti	317.52	98	4.73	
Sardinella aurita	117.60	686	1.75	1671
Decapterus rhonchus	105.84	686	1.58	
Trachinotus ovatus	31.36	98	0.47	
Alectis alexandrinus	25.48	392	0.38	
Sphyræna guanchancho	23.52	98	0.35	
Total	6705.72		99.97	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 841  
 DATE: 2/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1305  
 start stop duration Long W 1706  
 TIME :18:58:42 19:17:53 19 (min) Purpose code: 1  
 LOG :3061.28 3062.23 0.93 Area code : 1  
 FDEPTH: 0 0 GearCond.code:  
 BDEPTH: 27 29 Validity code:  
 Towing dir: 270ø Wire out: 130 m Speed: 30 kn\*10  
 Sorted: 61 Kg Total catch: 824.74 CATCH/HOUR: 2604.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	1120.36	18802	43.02	
Chloroscombrus chrysurus	571.58	9594	21.95	
Sardinella maderensis	511.58	5457	19.64	1673
Decapterus rhonchus	217.89	1108	8.37	1672
Sphyræna guanchancho	101.87	246	3.91	
Selene dorsalis	21.32	341	0.82	
Pomadasy peroteti	16.36	16	0.63	
Galeoides decadactylus	16.20	85	0.62	
Trichiurus lepturus	13.64	44	0.52	
Pomadasy incisus	7.67	44	0.29	
GERREIDAE	4.26	44	0.16	
Penaeus notialis	1.58	85	0.06	
Total	2604.31		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 842  
 DATE: 2/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1307  
 start stop duration Long W 1657  
 TIME :21:16:20 21:31:42 15 (min) Purpose code: 1  
 LOG :3076.90 3077.67 0.75 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 16 16 Validity code:  
 Towing dir: 180ø Wire out: 90 m Speed: 30 kn\*10  
 Sorted: 64 Kg Total catch: 1344.57 CATCH/HOUR: 5378.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	3265.24	58712	60.71	
Brachydeuterus auritus	1034.84	21404	19.24	
Sardinella maderensis	587.16	6888	12.78	1674
Pomadasy peroteti	78.80	384	1.47	
Sepia officinalis hierredda	75.44	164	1.40	
Arius heudeloti	52.48	76	0.98	
Ilisha africana	44.28	820	0.82	
Trichiurus lepturus	37.72	164	0.70	
Selene dorsalis	31.16	492	0.58	
Sphyræna guanchancho	30.16	72	0.56	
Galeoides decadactylus	29.52	164	0.55	
Eucinostomus melanopterus	11.48	84	0.21	
Total	5378.28		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 843  
 DATE: 2/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1315  
 start stop duration Long W 1701  
 TIME :23:13:59 23:29:10 15 (min) Purpose code: 1  
 LOG :3089.87 3090.66 0.78 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 19 20 Validity code:  
 Towing dir: 300ø Wire out: 80 m Speed: 30 kn\*10  
 Sorted: 34 Kg Total catch: 259.58 CATCH/HOUR: 1038.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	350.80	6496	34.75	
Sardinella maderensis	326.40	4544	31.44	1675
Chloroscombrus chrysurus	245.60	5280	23.65	
Arius laticutatus	34.56	160	3.33	
Sphyræna sphyraena	23.60	64	2.27	
Sardinella aurita	14.08	128	1.36	1676
Selene dorsalis	9.60	160	0.92	
Pomadasy jubelini	8.32	24	0.80	
Decapterus rhonchus	4.16	128	0.40	
Decapterus punctatus	3.20	32	0.31	
Eucinostomus melanopterus	3.20	32	0.31	
Galeoides decadactylus	2.56	160	0.25	
Penaeus notialis	1.92	128	0.18	
Sepia elegans	1.28	32	0.12	
Ilisha africana	1.28	32	0.12	
Penaeus kerathurus	0.64	96	0.06	
Total	1041.20		100.27	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 844  
 DATE: 3/11/99 GEAR TYPE: PT No.4 POSITION:Lat N 1315  
 start stop duration Long W 1717  
 TIME :01:38:28 02:08:11 30 (min) Purpose code: 1  
 LOG :3106.32 3108.02 1.68 Area code : 1  
 FDEPTH: 0 0 GearCond.code:  
 BDEPTH: 51 55 Validity code:  
 Towing dir: 270° Wire out: 150 m Speed: 32 kn\*10

Sorted: 40 Kg Total catch: 179.74 CATCH/HOUR: 359.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	258.80	1850	74.77	1678
Decapterus rhonchus	28.40	170	7.90	1679
Sardinella maderensis	21.40	150	5.95	1677
Trachurus trecae	16.40	300	4.56	
Scomber japonicus	12.00	70	3.34	
Alectis alexandrinus	9.88	8	2.75	
Selene dorsalis	2.20	10	0.61	
Echeneis naucrates	0.40	2	0.11	
Total	359.48		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 845  
 DATE: 3/11/99 GEAR TYPE: PT No.4 POSITION:Lat N 1325  
 start stop duration Long W 1708  
 TIME :08:20:22 09:00:32 40 (min) Purpose code: 1  
 LOG :3161.60 3163.80 2.18 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 38 40 Validity code:  
 Towing dir: 270° Wire out: 120 m Speed: 30 kn\*10

Sorted: 30 Kg Total catch: 30.00 CATCH/HOUR: 45.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	2.31	18	5.13	1680
Decapterus rhonchus	2.13	17	4.73	1681
Chloroscombrus chrysurus	0.60	2	1.33	
Sardinella maderensis	0.36	3	0.80	
Echeneis naucrates	0.27	2	0.60	
Selene dorsalis	0.15	2	0.33	
Scomber japonicus	0.15	2	0.33	
Total	5.97		13.25	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 846  
 DATE: 3/11/99 GEAR TYPE: BT No.2 POSITION:Lat N 1324  
 start stop duration Long W 1702  
 TIME :10:29:18 10:48:58 20 (min) Purpose code: 1  
 LOG :3174.76 3175.95 1.13 Area code : 1  
 FDEPTH: 23 25 GearCond.code:  
 BDEPTH: 23 25 Validity code:  
 Towing dir: 270° Wire out: 80 m Speed: 30 kn\*10

Sorted: 28 Kg Total catch: 71.21 CATCH/HOUR: 213.63

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	139.05	2730	65.09	
Sardinella maderensis	41.70	354	19.52	1682
Chloroscombrus chrysurus	19.50	249	9.13	
Selene dorsalis	4.50	45	2.11	
Lagocephalus laevigatus	2.85	15	1.33	
Trichurus lepturus	2.70	15	1.26	
Galeoides decadactylus	1.50	15	0.70	
Decapterus rhonchus	1.08	6	0.51	
Selar crumenophthalmus	0.75	9	0.35	
Total	213.63		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 847  
 DATE: 3/11/99 GEAR TYPE: PT No.7 POSITION:Lat N 1326  
 start stop duration Long W 1656  
 TIME :12:06:50 12:36:16 29 (min) Purpose code: 1  
 LOG :3186.30 3188.07 1.75 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 17 16 Validity code:  
 Towing dir: 185° Wire out: 100 m Speed: 35 kn\*10

Sorted: 35 Kg Total catch: 406.10 CATCH/HOUR: 840.21

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sphyræna sphyraena	235.34	621	28.01	
Chloroscombrus chrysurus	200.17	3854	23.82	
Sardinella maderensis	183.10	1655	21.79	1683
Brachydeuterus auritus	102.41	2638	12.19	
Scomberomorus tritor	81.21	79	9.67	
Selene dorsalis	12.93	234	1.54	
Sardinella aurita	9.83	130	1.17	1684
Ethmalosa fimbriata	8.79	79	1.05	
Sphyrna lewini	3.27	2	0.39	
Drepane africana	2.19	2	0.26	
Paragaleus pectoralis	0.95	2	0.11	
Total	840.19		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 848  
 DATE: 3/11/99 GEAR TYPE: PT No.7 POSITION:Lat N 1335  
 start stop duration Long W 1658  
 TIME :14:49:53 15:19:40 30 (min) Purpose code: 1  
 LOG :3206.01 3208.02 1.99 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 19 20 Validity code:  
 Towing dir: 90° Wire out: 120 m Speed: 35 kn\*10

Sorted: 55 Kg Total catch: 3589.34 CATCH/HOUR: 7178.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	3945.00	3372	54.95	1686
Paragaleus pectoralis	1764.00	1950	24.57	
Sardinella aurita	561.00	4800	7.81	1685
Trichurus lepturus	264.00	450	3.68	
Scomberomorus tritor	261.00	300	3.64	
Sphyræna sphyraena	216.00	600	3.01	
Brachydeuterus auritus	48.00	1200	0.67	
Ethmalosa fimbriata	45.00	150	0.63	
Arius laticaudatus	39.00	150	0.54	
Dasyatis margarita	21.00	150	0.29	
Pomadour jubelini	14.68	36	0.20	
Total	7178.68		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 849  
 DATE: 4/11/99 GEAR TYPE: PT No.4 POSITION:Lat N 1344  
 start stop duration Long W 1719  
 TIME :00:26:24 00:56:14 30 (min) Purpose code: 1  
 LOG :3283.86 3285.72 1.84 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 75 82 Validity code:  
 Towing dir: 262° Wire out: 150 m Speed: 35 kn\*10

Sorted: 41 Kg Total catch: 368.43 CATCH/HOUR: 736.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	483.60	25120	65.63	1688
Sardinella aurita	122.40	1040	15.61	1687
Scomber japonicus	106.00	2800	14.39	
Sphyræna sphyraena	8.40	60	1.14	
Lagocephalus laevigatus	3.36	4	0.46	
Alectis alexandrinus	3.04	4	0.41	
Sepia elegans	2.02	8	0.27	
Saurida brasiliensis	2.00	280	0.27	
Boops boops	1.60	180	0.22	
Fistularia tabacaria	0.84	4	0.11	
Sphaeroides spengleri	0.80	40	0.11	
OHICHTHIDAE	0.28	2	0.04	
Total	734.34		99.66	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 850  
 DATE: 4/11/99 GEAR TYPE: PT No.4 POSITION:Lat N 1344  
 start stop duration Long W 1713  
 TIME :02:24:30 02:47:09 23 (min) Purpose code: 1  
 LOG :3295.50 3296.70 1.18 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 46 49 Validity code:  
 Towing dir: 262° Wire out: 160 m Speed: 35 kn\*10

Sorted: 35 Kg Total catch: 719.33 CATCH/HOUR: 1876.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	1358.61	9916	72.40	1690
Sardinella maderensis	349.57	2137	18.63	1689
Trachurus trecae	73.43	877	3.91	1692
Decapterus rhonchus	59.22	329	3.16	1691
Scomber japonicus	16.43	110	0.88	
Dactylopterus volitans	14.24	55	0.76	
Todarodes sagittatus	2.19	55	0.12	
MONACANTHIDAE	2.14	3	0.11	
Octopus vulgaris	0.57	3	0.03	
ANRAAO	0.10	3	0.01	
Total	1876.50		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 851  
 DATE: 4/11/99 GEAR TYPE: PT No.7 POSITION:Lat N 1345  
 start stop duration Long W 1701  
 TIME :04:56:38 05:10:43 14 (min) Purpose code: 1  
 LOG :3312.93 3313.78 0.84 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 25 26 Validity code:  
 Towing dir: 270° Wire out: 150 m Speed: 35 kn\*10

Sorted: 37 Kg Total catch: 1441.88 CATCH/HOUR: 6179.49

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	4378.71	68263	70.96	1693
Chloroscombrus chrysurus	1082.14	21974	17.51	
Brachydeuterus auritus	418.71	8863	6.78	
Sardinella aurita	147.00	2263	2.38	1694
Decapterus rhonchus	71.57	943	1.16	
Lagocephalus laevigatus	26.40	189	0.43	
Penaeus notialis	18.86	566	0.31	
Decapterus punctatus	15.09	377	0.24	
Arius laticaudatus	14.83	9	0.24	
Penaeus kerathurus	3.77	189	0.06	
Alectis alexandrinus	1.19	4	0.02	
Echeneis naucrates	0.86	4	0.01	
Total	6179.33		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 852  
 DATE: 4/11/99 GEAR TYPE: PT No.7 POSITION:Lat N 1348  
 start stop duration Long W 1656  
 TIME :06:29:28 06:49:23 20 (min) Purpose code: 1  
 LOG :3324.70 3325.75 1.06 Area code : 1  
 FDEPTH: 50 5 GearCond.code:  
 BDEPTH: 17 17 Validity code:  
 Towing dir: 130° Wire out: 80 m Speed: 30 kn\*10

Sorted: 34 Kg Total catch: 236.00 CATCH/HOUR: 708.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	634.50	12663	89.62	1695
Sardinella maderensis	36.54	357	5.16	
Pomadour jubelini	19.32	42	2.73	
Brachydeuterus auritus	12.18	840	1.72	
Penaeus notialis	2.10	63	0.30	
Arius heudeloti	2.10	21	0.30	
Sepia officinalis hierredda	0.84	21	0.12	
Penaeus kerathurus	0.42	21	0.06	
Total	708.00		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 853  
 DATE: 4/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1354  
 start stop duration Long W 1700  
 TIME :08:41:21 09:11:08 30 (min) Purpose code: 1  
 LOG :3340.30 3342.15 1.74 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 17 22 Validity code:  
 Towing dir: 270° Wire out: 80 m Speed: 30 kn\*10

Sorted: 51 Kg Total catch: 359.42 CATCH/HOUR: 718.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	322.56	514	44.87	1696
Paragaleus pectoralis	198.80	168	27.66	
Chloroscombrus chrysurus	94.08	1708	13.09	
Pomadasy jubelini	52.36	1288	7.28	
Scomberomorus tritor	34.24	16	4.76	
Sardinella aurita	8.96	70	1.25	
Pomadasy incisus	3.64	14	0.51	
Fistularia tabacaria	3.36	28	0.47	
Selene dorsalis	0.84	14	0.12	
Total	718.84		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 854  
 DATE: 4/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1355  
 start stop duration Long W 1709  
 TIME :10:19:56 11:12:12 52 (min) Purpose code: 1  
 LOG :3350.32 3353.07 2.65 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 15 32 Validity code:  
 Towing dir: 90° Wire out: 110 m Speed: 30 kn\*10

Sorted: 14 Kg Total catch: 14.20 CATCH/HOUR: 16.38

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lagocephalus laevigatus	6.85	39	41.82	
Sphyrna mokarran	2.58	1	15.75	
Dactylopterus volitans	1.55	7	9.46	
Sphyrna guachancho	1.38	8	8.42	
Alectis alexandrinus	1.15	1	7.02	
Echeneis naucrates	1.13	3	6.90	
Chloroscombrus chrysurus	0.81	6	4.95	
Pomadasy incisus	0.69	6	4.21	
Sardinella aurita	0.23	1	1.40	
Total	16.37		99.93	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 855  
 DATE: 4/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1409  
 start stop duration Long W 1704  
 TIME :19:12:04 19:41:24 29 (min) Purpose code: 1  
 LOG :3429.86 3431.45 1.57 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 18 21 Validity code:  
 Towing dir: 300° Wire out: 80 m Speed: 30 kn\*10

Sorted: 40 Kg Total catch: 40.02 CATCH/HOUR: 82.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pomadasy peroteti	17.83	46	21.53	
Brachydeuterus auritus	16.14	182	19.49	
Chloroscombrus chrysurus	9.69	74	10.50	
Lagocephalus laevigatus	6.50	14	7.85	
Alectis alexandrinus	5.42	10	6.55	
Sepia officinalis hierredda	4.76	41	5.75	
Galeoides decadactylus	3.93	10	4.75	
Arius heudeloti	3.02	4	3.65	
Sardinella maderensis	2.07	12	2.50	1697
Pomadasy incisus	2.03	12	2.45	
GERREIDAE	1.99	19	2.40	
Sphyrna guachancho	1.90	4	2.29	
Decapterus rhonchus	1.49	39	1.80	
Scomber japonicus	1.28	2	1.55	
Plectorhynchus mediterraneus	1.08	8	1.30	
Octopus vulgaris	1.03	2	1.24	
Dactylopterus volitans	0.99	4	1.20	
Penaeus notialis	0.62	46	0.75	
Echeneis naucrates	0.54	2	0.65	
Sardinella aurita	0.41	2	0.50	
Pagellus bellottii	0.41	2	0.50	
Selene dorsalis	0.21	8	0.25	
Loligo vulgaris	0.17	74	0.21	
Chilomycterus spinosus mauret.	0.12	2	0.14	
Scorpaena stephanica	0.08	2	0.10	
Pseudupeneus prayensis	0.08	29	0.10	
Total	82.79		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 856  
 DATE: 4/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1414  
 start stop duration Long W 1725  
 TIME :22:40:19 23:10:15 30 (min) Purpose code: 1  
 LOG :3456.58 3457.85 1.26 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 91 91 Validity code:  
 Towing dir: 330° Wire out: 120 m Speed: 30 kn\*10

Sorted: 30 Kg Total catch: 45.11 CATCH/HOUR: 90.22

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	81.84	5658	90.71	1698
Aricmma bondi	5.20	588	5.76	
Scomber japonicus	1.56	24	1.73	
Dactylopterus volitans	0.72	6	0.80	
ANQUILLIFORMES	0.42	24	0.47	
Selene dorsalis	0.24	18	0.27	
Sepiella rondeletii	0.24	4	0.27	
Total	90.22		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 857  
 DATE: 5/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1415  
 start stop duration Long W 1731  
 TIME :00:28:29 00:53:20 25 (min) Purpose code: 1  
 LOG :3465.24 3466.56 1.29 Area code : 1  
 FDEPTH: 1 1 GearCond.code:  
 BDEPTH: 151 353 Validity code:  
 Towing dir: 270° Wire out: 160 m Speed: 35 kn\*10

Sorted: 19 Kg Total catch: 75.54 CATCH/HOUR: 181.30

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	153.22	902	84.51	
MYCTOPHIDAE	21.89	13594	12.07	
SEPIIDAE	4.70	2333	2.59	
Trachurus trecae	0.96	998	0.53	
TRACHIPTERIDAE	0.53	2	0.29	
Total	181.30		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 858  
 DATE: 5/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1425  
 start stop duration Long W 1729  
 TIME :03:29:29 03:59:11 30 (min) Purpose code: 1  
 LOG :3487.75 3489.87 2.10 Area code : 1  
 FDEPTH: 1 1 GearCond.code:  
 BDEPTH: 95 94 Validity code:  
 Towing dir: 90° Wire out: 160 m Speed: 35 kn\*10

Sorted: 35 Kg Total catch: 444.23 CATCH/HOUR: 888.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	464.40	20488	52.27	1699
Scomber japonicus	383.80	7176	43.20	
Trichiurus lepturus	25.00	156	2.81	
Aricmma bondi	10.40	182	1.17	
Cypselurus pinnatibarbatu	2.60	26	0.29	
Echeneis naucrates	2.00	4	0.23	
Sardinella aurita	0.26	26	0.03	
Total	888.46		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 859  
 DATE: 5/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1425  
 start stop duration Long W 1715  
 TIME :05:37:12 06:05:16 28 (min) Purpose code: 1  
 LOG :3501.37 3503.21 1.82 Area code : 1  
 FDEPTH: 1 1 GearCond.code:  
 BDEPTH: 40 36 Validity code:  
 Towing dir: 90° Wire out: 130 m Speed: 30 kn\*10

Sorted: 28 Kg Total catch: 71.10 CATCH/HOUR: 152.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	31.29	429	20.54	1702
Sardinella aurita	27.21	242	17.86	1700
Decapterus rhonchus	26.79	392	17.58	1701
Pomadasy incisus	21.75	146	14.28	
Pagellus bellottii	16.50	161	10.83	
Euthynnus alletteratus	13.29	49	8.72	
Scomber japonicus	7.50	71	4.92	1703
Trigla lyra	3.11	4	2.04	
Roops boops	1.50	21	0.98	
Octopus vulgaris	1.39	4	0.91	
Lagocephalus laevigatus	1.29	11	0.85	
ECHENEIDIDAE	0.43	4	0.28	
Fistularia tabacaria	0.21	4	0.14	
Selene dorsalis	0.11	118	0.07	
Total	152.37		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 860  
 DATE: 5/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1435  
 start stop duration Long W 1712  
 TIME :09:33:38 09:41:26 8 (min) Purpose code: 1  
 LOG :3525.09 3525.15 1.04 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 20 23 Validity code:  
 Towing dir: 270° Wire out: 30 m Speed: 30 kn\*10

Sorted: 61 Kg Total catch: 60.88 CATCH/HOUR: 202.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	182.87	777	90.11	1704
Sardinella maderensis	8.53	43	4.20	1705
Decapterus rhonchus	4.53	20	2.23	
Chloroscombrus chrysurus	3.20	20	1.58	
Diplodus bellottii	1.40	40	0.69	
Alectis alexandrinus	1.00	3	0.49	
Fistularia tabacaria	0.60	3	0.30	
Pomadasy jubelini	0.33	10	0.16	
Penaeus notialis	0.33	10	0.16	
ECHENEIDIDAE	0.13	3	0.06	
Total	202.92		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 861  
 DATE: 6/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1451  
 start stop duration Long W 1718  
 TIME :23:49:02 00:06:30 17 (min) Purpose code: 1  
 LOG :3635.66 3636.56 0.88 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 65 85 Validity code:  
 Towing dir: 20° Wire out: 120 m Speed: 35 kn\*10

Sorted: Kg Total catch: 493.95 CATCH/HOUR: 1743.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	748.59	22182	42.94	1706
Trichiurus lepturus	408.71	2700	23.44	
Sardinella aurita	387.53	54794	22.23	1707
Sphyrna sphyraena	106.94	900	6.13	
Scomber japonicus	44.47	371	2.55	
Loligo vulgaris	29.65	159	1.70	
Lagocephalus laevigatus	15.88	159	0.91	
Aricmma bondi	1.06	53	0.06	
Total	1742.83		99.96	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 862  
 DATE: 6/11/99 GEAR TYPE: FT No:4 POSITION:Lat N 1456  
 Long W 1708  
 TIME :01:50:41 02:04:05 13 (min) Purpose code: 1  
 LOG :3649.34 3650.02 0.68 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 63 99 Validity code:  
 Towing dir: 317ø Wire out: 160 m Speed: 35 kn\*10

Sorted: 37 Kg Total catch: 812.90 CATCH/HOUR: 3751.85

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Trachurus traciae	1896.37	35640	50.54		1710
Brachydeuterus auritus	645.78	4468	17.21		
Sardinella maderensis	467.08	7920	12.45		1708
Decapterus rhonchus	322.89	4265	8.61		1709
Sphyræna sphyraena	127.94	1523	3.41		
Scomber japonicus	69.05	508	1.84		
Dactylopterus volitans	54.83	305	1.46		
Trichiurus lepturus	50.77	812	1.35		
Uraspis secunda	40.62	203	1.08		
Sepia officinalis hierredda	32.49	55237	0.87		
Selene dorsalis	22.34	102	0.60		
Saurida brasiliensis	6.09	1218	0.16		
Loligo vulgaris	6.09	102	0.16		
Decapterus punctatus	2.03	203	0.05		
Lagocephalus laevigatus	1.02	203	0.03		
Total	3745.39		99.82		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 863  
 DATE: 6/11/99 GEAR TYPE: FT No:4 POSITION:Lat N 1503  
 Long W 1717  
 TIME :03:43:11 03:56:02 13 (min) Purpose code: 1  
 LOG :3659.96 3660.73 0.76 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 4  
 BDEPTH: 125 132 Validity code:  
 Towing dir: 317ø Wire out: 160 m Speed: 35 kn\*10

Sorted: 30 Kg Total catch: 579.88 CATCH/HOUR: 2676.37

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Trachurus trachurus	2676.37	19292	100.00		
Total	2676.37		100.00		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 864  
 DATE: 6/11/99 GEAR TYPE: FT No:4 POSITION:Lat N 1502  
 Long W 1702  
 TIME :09:14:15 10:17:38 63 (min) Purpose code: 1  
 LOG :3706.24 3709.49 3.15 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 44 38 Validity code:  
 Towing dir: 35ø Wire out: 130 m Speed: 30 kn\*10

Sorted: 32 Kg Total catch: 707.08 CATCH/HOUR: 673.41

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Chloroscombrus chrysurus	185.64	1090	27.57		
Sardinella maderensis	144.57	6055	21.47		1712
Brachydeuterus auritus	114.44	1048	16.99		
Sardinella aurita	83.39	3792	12.38		1711
Lagocephalus laevigatus	49.03	189	7.28		
Selene dorsalis	43.58	398	6.47		
Trachurus traciae	24.80	325	3.68		
Trichiurus lepturus	14.67	168	2.18		
Pagellus bollottii	9.23	42	1.37		
Pomadasyx incisus	3.35	21	0.50		
Total	672.69		99.89		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 865  
 DATE: 6/11/99 GEAR TYPE: FT No:4 POSITION:Lat N 1524  
 Long W 1651  
 TIME :16:51:55 17:06:21 14 (min) Purpose code: 1  
 LOG :3767.16 3767.93 0.76 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 29 31 Validity code:  
 Towing dir: 20ø Wire out: 150 m Speed: 38 kn\*10

Sorted: 57 Kg Total catch: 1627.88 CATCH/HOUR: 6976.63

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Chloroscombrus chrysurus	4234.29	34543	60.69		
Brachydeuterus auritus	1916.57	14931	27.47		
Sardinella maderensis - Juv.	463.54	24291	6.64		1714
Pomadasyx jubelini	98.49	270	1.41		
Selene dorsalis	80.23	1783	1.15		
Trachinus armatus	80.23	446	1.15		
Sardinella aurita - Juveniles	62.40	3120	0.89		1713
Ilisha africana	26.74	223	0.38		
RHINOPTERIDAE	11.57	4	0.17		
Paragaleus pectoralis	2.57	4	0.04		
Total	6976.63		99.99		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 866  
 DATE: 6/11/99 GEAR TYPE: FT No:7 POSITION:Lat N 1534  
 Long W 1647  
 TIME :19:52:13 20:21:19 29 (min) Purpose code: 1  
 LOG :3790.84 3792.38 1.68 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 31 25 Validity code:  
 Towing dir: 120ø Wire out: 80 m Speed: 30 kn\*10

Sorted: 35 Kg Total catch: 453.44 CATCH/HOUR: 938.15

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Chloroscombrus chrysurus	347.50	3254	37.04		
Sardinella maderensis	244.22	5729	26.03		1716
Brachydeuterus auritus	211.94	2421	22.59		
Ilisha africana	45.19	538	4.82		
Trichiurus lepturus	32.28	242	3.44		
Sardinella aurita	27.97	403	2.98		1715
Selene dorsalis	17.21	430	1.83		
Lagocephalus laevigatus	5.92	27	0.63		
Decapterus rhonchus	5.38	27	0.57		
Sphyræna guachancho	0.54	27	0.06		
Total	938.15		99.99		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 867  
 DATE: 7/11/99 GEAR TYPE: FT No:4 POSITION:Lat N 1541  
 Long W 1647  
 TIME :01:24:41 01:50:48 26 (min) Purpose code: 1  
 LOG :3838.93 3840.85 1.87 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 48 47 Validity code:  
 Towing dir: 200ø Wire out: 160 m Speed: 35 kn\*10

Sorted: 117 Kg Total catch: 316.72 CATCH/HOUR: 730.89

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Trichiurus lepturus	177.23	3999	24.25		
Paragaleus pectoralis	136.98	52	18.74		
Decapterus rhonchus	115.27	658	15.77		1717
Auxis thazard	63.69	295	8.71		
Brachydeuterus auritus	61.96	434	8.48		
Scomber japonicus	38.77	226	5.30		
Trachurus traciae	36.35	192	4.97		1718
Lagocephalus laevigatus	29.77	23	4.07		
Trachinotus ovatus	23.54	88	3.22		
Sphyrna zygaena	21.18	5	2.90		
Stromateus fiatola	14.88	18	2.04		
Dactylopterus volitans	5.49	14	0.75		
Alectis alexandrinus	5.03	5	0.69		
Echeneis naucrates	0.74	2	0.10		
Total	730.88		99.99		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 868  
 DATE: 7/11/99 GEAR TYPE: FT No:7 POSITION:Lat N 1540  
 Long W 1639  
 TIME :03:26:00 03:56:00 30 (min) Purpose code: 1  
 LOG :3857.70 3853.30 4.40 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 22 22 Validity code:  
 Towing dir: 360ø Wire out: 160 m Speed: 3 kn\*10

Sorted: 37 Kg Total catch: 68.96 CATCH/HOUR: 137.92

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Brachydeuterus auritus	29.20	632	21.17		
Chloroscombrus chrysurus	23.92	500	17.34		
Sardinella maderensis	18.00	92	13.05		1719
Ilisha africana	14.32	192	10.38		
Trichiurus lepturus	14.08	276	10.21		
Selene dorsalis	13.20	528	9.57		
Paragaleus pectoralis	7.76	4	5.63		
Lagocephalus laevigatus	4.16	24	3.02		
Sardinella maderensis - Juv.	4.08	684	2.96		1720
Scomberomus tritor	2.24	4	1.62		
Galeoides decadactylus	2.24	4	1.62		
Trachinotus ovatus	1.92	28	1.39		
Selar crumenophthalmus	1.36	4	0.99		
Sphyræna guachancho	0.64	8	0.46		
Pentanemus quinquarius	0.48	4	0.35		
Penaeus notialis	0.32	44	0.23		
Total	137.92		99.99		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 869  
 DATE: 7/11/99 GEAR TYPE: FT No:7 POSITION:Lat N 1544  
 Long W 1639  
 TIME :04:42:00 05:11:57 30 (min) Purpose code: 1  
 LOG :3856.90 3859.30 2.33 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 23 22 Validity code:  
 Towing dir: 200ø Wire out: 100 m Speed: 38 kn\*10

Sorted: 47 Kg Total catch: 1732.96 CATCH/HOUR: 3465.92

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Sardinella maderensis	1356.80	14400	39.15		1722
Sardinella aurita	600.00	7600	17.31		1721
Chloroscombrus chrysurus	480.00	10400	13.85		
Trachinotus ovatus	158.40	4080	4.57		
Selene dorsalis	156.80	1840	4.52		
Pomadasyx jubelini	148.80	240	4.29		
Brachydeuterus auritus	123.20	2720	3.55		
Galeoides decadactylus	112.40	240	3.24		
Paragaleus pectoralis	108.80	80	3.14		
Stromateus fiatola	78.40	80	2.26		
Lichia amia	52.80	80	1.52		
Ilisha africana	40.00	720	1.15		
Trichiurus lepturus	34.00	340	0.69		
Pomadasyx peroteti	24.00	80	0.69		
Sphyrna zygaena	3.52	2	0.10		
Total	3467.92		100.03		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 870  
 DATE: 7/11/99 GEAR TYPE: FT No:4 POSITION:Lat N 1549  
 Long W 1639  
 TIME :07:26:48 07:56:24 30 (min) Purpose code: 1  
 LOG :3875.95 3877.75 1.78 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 32 37 Validity code:  
 Towing dir: 290ø Wire out: 125 m Speed: 30 kn\*10

Sorted: Kg Total catch: 42.47 CATCH/HOUR: 84.94

SPECIES	CATCH/HOUR		% OF TOT.	C	SAMP
	weight	numbers			
Lagocephalus laevigatus	32.78	22	38.59		
Decapterus rhonchus	19.12	110	22.51		
Sardinella maderensis	19.08	130	22.46		1723
Paragaleus pectoralis	11.00	4	13.95		
Brachydeuterus auritus	1.04	10	1.22		
Dactylopterus volitans	0.72	2	0.85		
Trichiurus lepturus	0.54	30	0.75		
Selene dorsalis	0.56	20	0.66		
Total	84.94		99.99		

## Annex II Instruments and fishing gear used

The Simrad EK-500, 38kHz 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 38kHz where as follows:

<b>Transceiver-1 menu</b>	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 dg
	Alongship offset	-0.03 dg
Athwardship offset	0.06 dg	
<b>Display menu</b>	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
<b>Printer- menu</b>	Range	0 - 50 or 0 -100 m and 100 - 350m
	TVG	20 log R
	Sv colour min	-63 dB
<b>Bottom detection menu</b>	Minimum level	-40 dB

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

Sv Transducer gain 27.45 dB  
Ts Transducer gain 27.65 dB

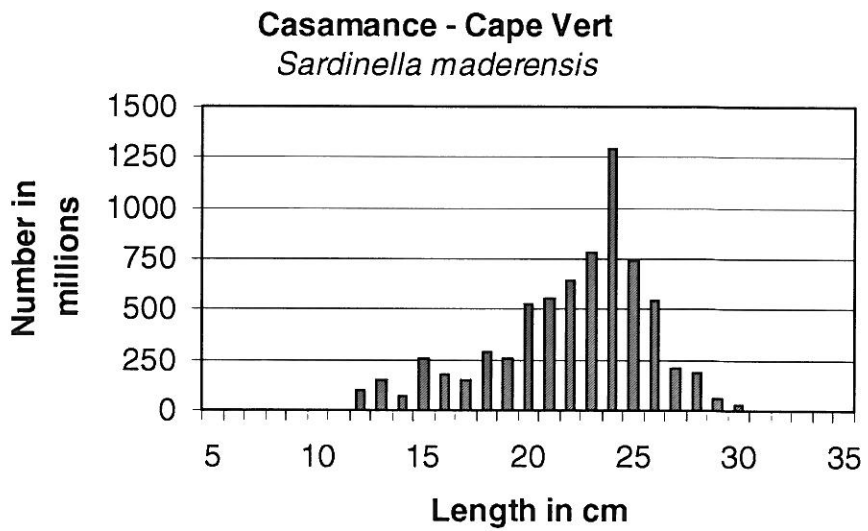
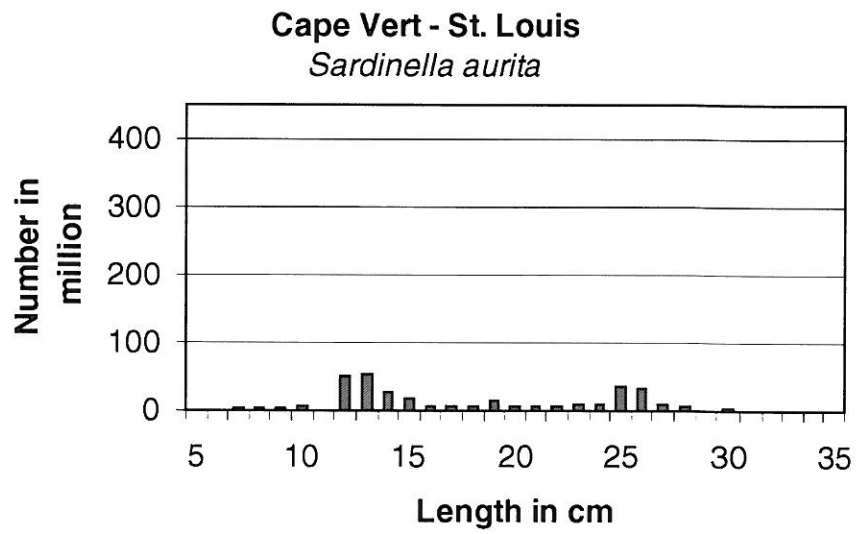
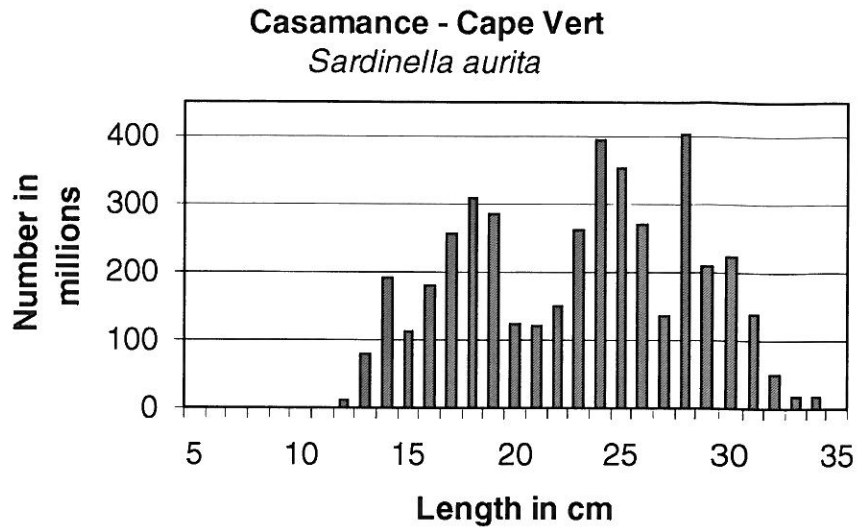
**Hydrography**

Conductivity, temperature, density and dissolved oxygen were sampled regularly 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.

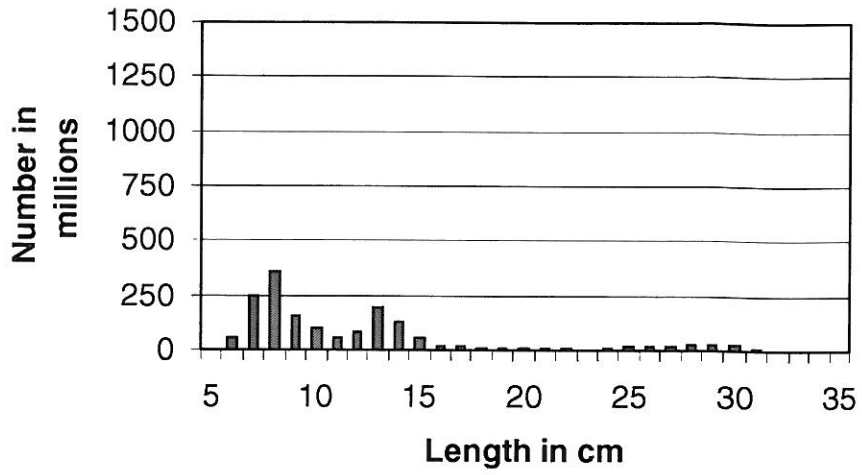
**Fishing gear**

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super" bottom trawl. For all trawls, the Tyborøn, 7.8m<sup>2</sup> (1670kg) trawl doors were used. Complete drawings of the trawls used are included.

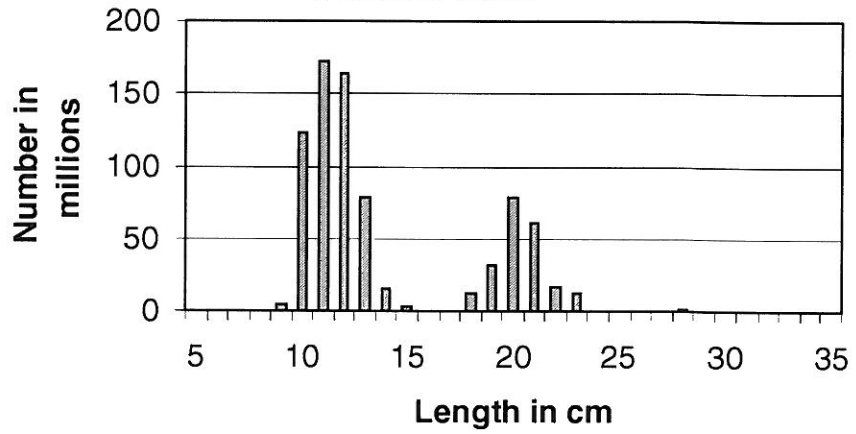
### Annex III Pooled length distribution by species and regions



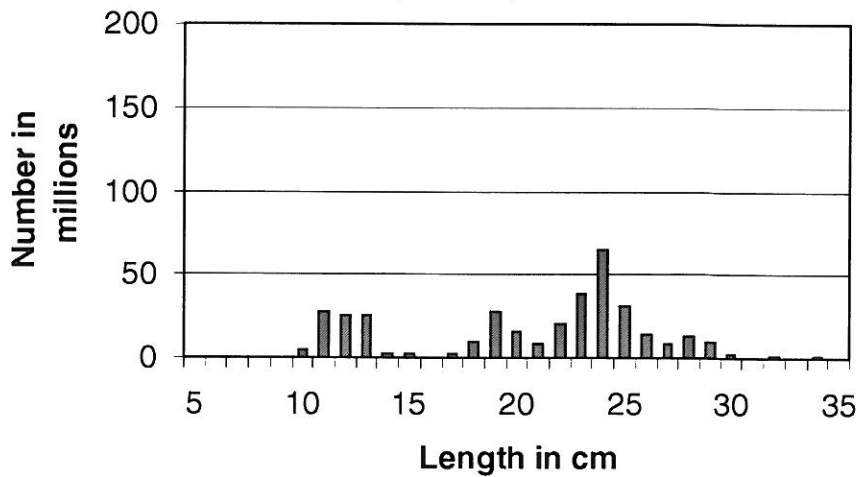
**Cape Vert - St. Louis**  
*Sardinella maderensis*



**Casamance - Cape Vert**  
*Trachurus trecae*



**Casamance - Cape Vert**  
*Decapterus sp.*

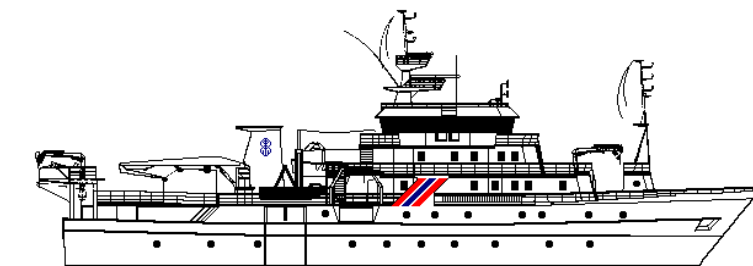




## Annex IV Stock length distribution by numbers and weight

### *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	2.4				2.4	9				9
8	2.4				2.4	14				14
9	2.4				2.4	19				19
10	4.8				4.8	51				51
11	1.3				1.3	18				18
12	48.7	11.2			59.9	860	197			1 058
13	52.1	78.3			130.4	1 156	1 736			2 891
14	27.8	190.1			217.9	763	5 208			5 970
15	16.8	112.1			128.9	561	3 741			4 302
16	4.5	179.5			184.0	183	7 206			7 389
17	7.3	256.7			264.0	348	12 270			12 619
18	4.8	308.6			313.5	272	17 390			17 661
19	14.8	281.9	3.5		300.2	975	18 562	227		19 764
20	7.3	98.9	24.8		131.0	557	7 553	1 894		10 004
21	4.9	82.9	39.1		126.9	427	7 285	3 441		11 154
22	6.1	63.7	85.6		155.4	617	6 406	8 607		15 629
23	9.7	83.5	178.0		271.3	1 112	9 552	20 363		31 028
24	9.7	288.9	105.4		404.0	1 258	37 384	13 635		52 276
25	36.4	268.4	84.0		388.9	5 310	39 104	12 232		56 646
26	31.7	113.8	156.0		301.5	5 175	18 573	25 461		49 209
27	8.6	108.1	27.5		144.1	1 560	19 690	5 001		26 251
28	4.9	295.7	106.7		407.3	984	59 872	21 612		82 468
29		196.8	11.5		208.3		44 122	2 579		46 701
30	2.4	224.6			227.1	601	55 590			56 191
31		137.0			137.0		37 314			37 314
32		49.5			49.5		14 775			14 775
33		16.5			16.5		5 387			5 387
34		16.5			16.5		5 877			5 877
35										
TOTAL	312.0	3 463.3	822.0	+	4 597.4	22 828	434 793	115 053	+	572 674



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

**Part II**

**MAURITANIA**

**9 - 18 November 1999**

CRUISE REPORT 'DR FRIDTJOF NANSEN'

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

**Part II**

**MAURITANIA**  
**9 - 18 November 1999**

by

**R. Toresen**

and

**J. Kolding**

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

**Institute of Marine Research**  
**Bergen, 1999**

## TABLE OF CONTENTS

---

CHAPTER 1	INTRODUCTION.....	1
1.1	Objectives of the cruise.....	1
1.2	Participation .....	1
1.3	Narrative.....	2
1.4	Methods.....	2
CHAPTER 2	SURVEY RESULTS.....	7
2.1	Hydrography .....	7
2.2	Pelagic fish on the shelf from St. Louis to Cape Timiris.....	7
2.3	Pelagic fish on the shelf from Cape Timiris to Cape Blanc .....	14
CHAPTER 3	OVERVIEW AND SUMMARY OF RESULTS.....	17
ANNEX I	Records of fishing stations	
ANNEX II	Instruments and fishing gear used	
ANNEX III	Pooled length distributions by main species	
ANNEX IV	Biomass and number by length	
ANNEX V	Stratified biomass estimates	

## CHAPTER 1 INTRODUCTION

---

### 1.1 Objectives of the cruise

The defined general objectives were to estimate and map the distribution and biomass 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 November-December 1999.

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 mackerels *Trachurus trecae* and *T. trachurus*, 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 was 6 days.

### 1.2 Participation

Members of the scientific teams were:

Institut Mauritanien de Recherches Océanographiques et des Pêches, Mauritania:

Ebaye O. Mohamed MAHMOUD, Wagué ABDOULAYE, Sall Mamadou DIALLO,  
Ely O. Sidi O. BEIBOU and Lam MAMADOU

Centre de Recherches Océanographiques de Dakar-Thiaroy, Senegal:

Ibrahima SOW

Department of Fisheries, the Gambia:

Juldeh JALLOW

Institut National de Recherches Halieutiques, Morocco:

Hakim MESFIOUI

Institute of Marine Research, Norway:

Reidar TORESEN, Jeppe KOLDING, Magne OLSEN, Thor Egil JOHANSSON and  
Tore MØRK

### **1.3 Narrative**

After getting onboard the Mauritanian scientific team in Dakar on 9 November, the survey of the Mauritanian shelf started on 10 November. Figure 1 shows the survey tracks and the fishing and hydrographical stations. Systematic parallel transects were run with 10 NM (nautical miles) distance in between.

The hydrographic profile at 16°40' N was sampled on 10 November, at 18°00' N on 12, at 19°00' N on 13, at 20°00' N on 15 and off Cape Blanc on 16 November.

The survey was terminated in Nouakchott on 17 November.

### **1.4 Methods**

#### *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. At each station on the standard hydrographic transects two 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. Individual weights, in grams, were measured for the *Sardinella* species. The weight measurements were used to establish the power factor,  $b$ , in the length-weight relationship:

$$\bar{w} = a \cdot L^b \quad (1)$$

The factors,  $a$  and  $b$ , were estimated at 0.010 and 2.97 for sardinellas, and at 0.012 and 2.94 for horse mackerels. However, for the sake of consistency with earlier years a factor of 2.96 for  $b$  was used for both sardinellas and mackerels. The complete records of fishing stations are shown in Annex I.

The following target groups were used for Mauritania:

- 1) Sardinellas (flat sardinella *Sardinella maderensis* and round sardinella *S. aurita*),
- 2) Anchovy (European anchovy *Engraulis encrasicolus*),
- 3) Sardine (European pilchard/Sardine *Sardina pilchardus*),
- 4) Horse mackerels (Atlantic horse mackerel *Trachurus trachurus*, Cunene horse mackerel *T. trecae* and false scad *Decapterus rhonchus*),
- 5) Other pelagic carangids and associated species (Atlantic bumber *Chloroscombrus chrysurus*, African lookdown *Selene dorsalis*, chub mackerel *Scomber japonicus*, largehead hairtail *Trichiurus lepturus*, and barracudas *Sphyraena* spp.),
- 6) Other demersal species (such as bigeye grunt *Brachydeuterus auritus*, Sparidae and Haemulidae), and
- 7) Other clupeids such as West African ilisha *Ilisha africana*.

### *Acoustic Sampling*

A SIMRAD EK500 Echosounder was used and the echograms were stored on both paper and files. The acoustic biomass estimates were based on the integration technique. The Bergen Integrator (BEI) was used for analysis and allocation of the integrated  $s_A$ -values (average area back scattering coefficient in  $m^2/NM$ ) to the individual specified target groups 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:

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

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

- $\rho_i$  = 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 ( $\sigma_{bs}^{-1}$ ) of a fish in length group  $i$

Using equation (3), the pooled length distribution is used together with the mean  $s_A$ -value to calculate the density by length groups for each observed area of distribution (stratum). The total number by length group in the area is obtained by multiplying each density by the 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 (equation 1). Finally the total biomass estimate is obtained by summing the biomass by length group and strata within each sector of the survey, or by calculating a stratified estimate of the mean density and multiplying by the total area of distribution, Annex V. Estimates of the coefficient of variation (CV=Standard deviation/mean) for the stratified mean densities were calculated with the underlying assumption that is constant when  $s_A$ -values are converted to densities ( $t/NM^2$ ). The CV of the  $s_A$  -values within each stratum and area of fish distribution (see maps of distribution) were calculated based on the allocated 5 NM averages and the number of observations thus represents the number of 5 NM intervals covered within each stratum. All equations and some theoretical background for the calculations is given in Annex V.

Equations (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 are geographically segregated. When no segregation occurs the various length distributions are pooled together with equal importance. Otherwise, when the size distribution varies within the sampling site, these distributions are post-stratified and estimates of mean densities are calculated separately, or 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.

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

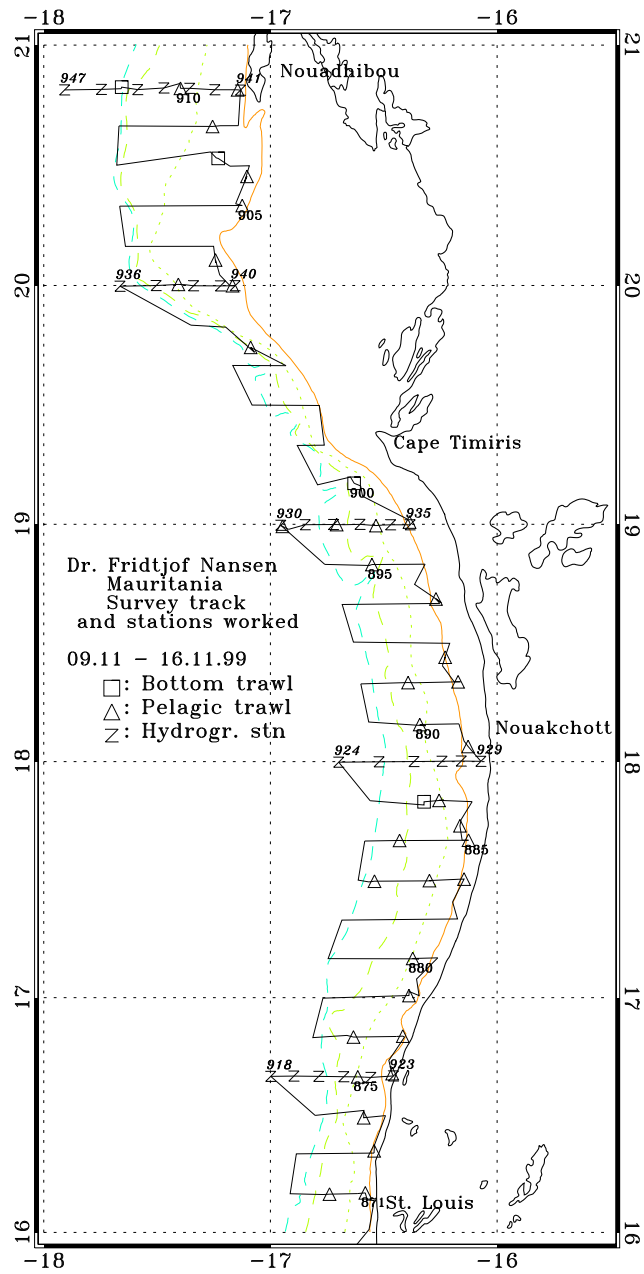


Figure 1. Course track and fishing and hydrographic stations.

## **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.

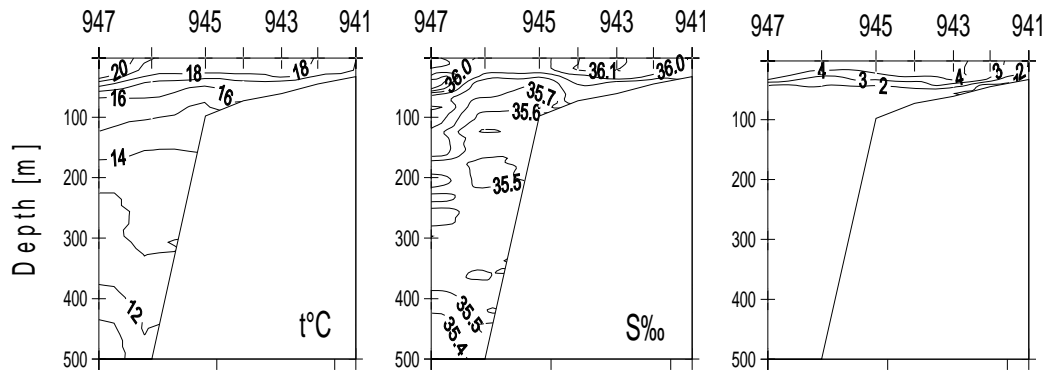
The distribution of surface temperature showed that over the shelf from St. Louis to Cape Timiris there was a decrease offshore from 25 °C to 22 °C. Near the coast, the temperature was stable all along the coast at around 19-21 °C. Off shore, however, there was in general 2-4 °C higher temperatures than inshore. The surface temperature was in general somewhat lower this year than in 1998.

All hydrographic profiles showed a sharp cline at around 50 m, except the northernmost transect off Cape Blanc, which had colder, denser water and a more mixed profile.

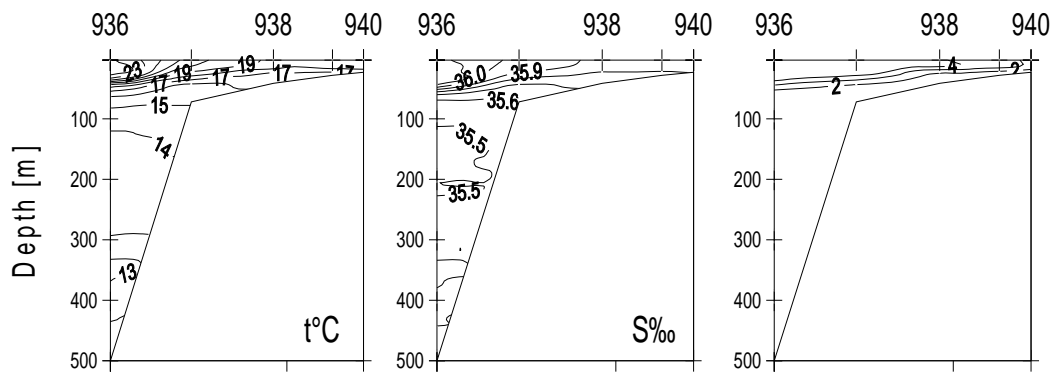
### **2.2 Pelagic fish on the shelf from St. Louis to Cape Timiris**

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.

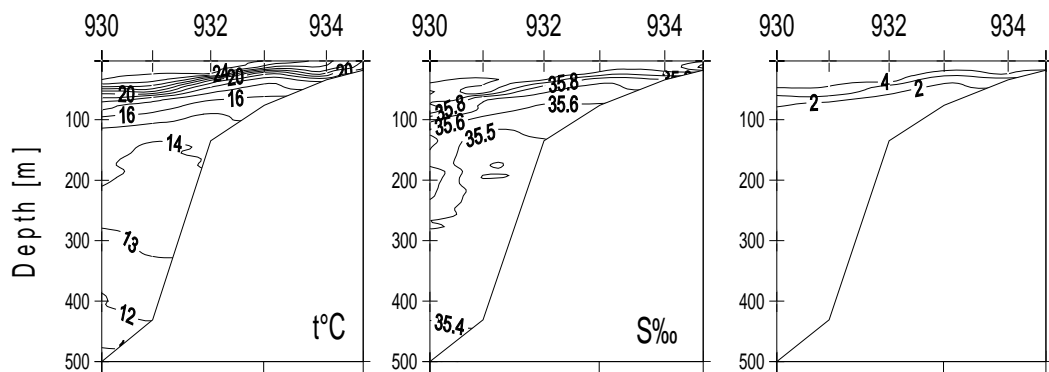
Sardinellas were found over the inner shelf in a nearly continuous belt along the coast from about 16°40'N to some 10 NM north of Nouakchott, see Figure 4. Particularly dense school areas were located at about 16°50' N and between 17°00' N and 17°10' N. In addition, more offshore aggregations were found between 17°50' N - about 18°00' N. However, the area distribution of sardinellas this year was much smaller than compared to 1998.



**CAPE BLANC 16.11 1999**

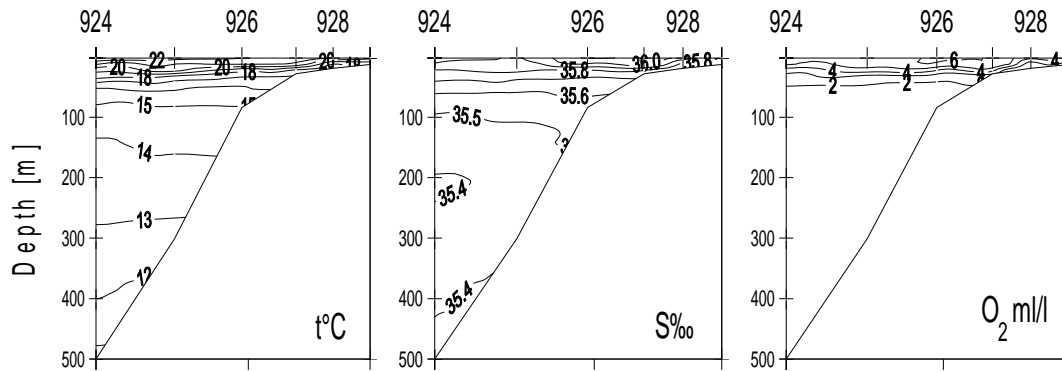


**20°00 N 15.11 1999**

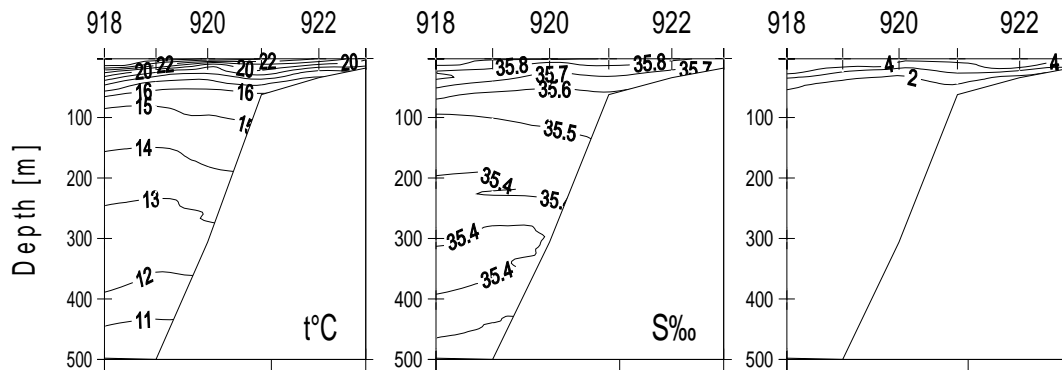


**19°00 N 14.11 1999**

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



**18°00' N 12.11 1999**



**16°40' N 10.11 1999**

Figure 2. continued.

The samples showed consistent large sizes of both sardinella species south of Cape Timiris with a modal length of 34 cm for round sardinella and 30 cm flat sardinella, see Annex III. The stock length compositions by numbers and weight are shown in Annex IV.

Table 1 gives the biomass estimates of sardinellas for this shelf based on their size composition in the area of sampling. The total estimate was 315 000 tonnes of which 67% was round and 33% flat sardinella.

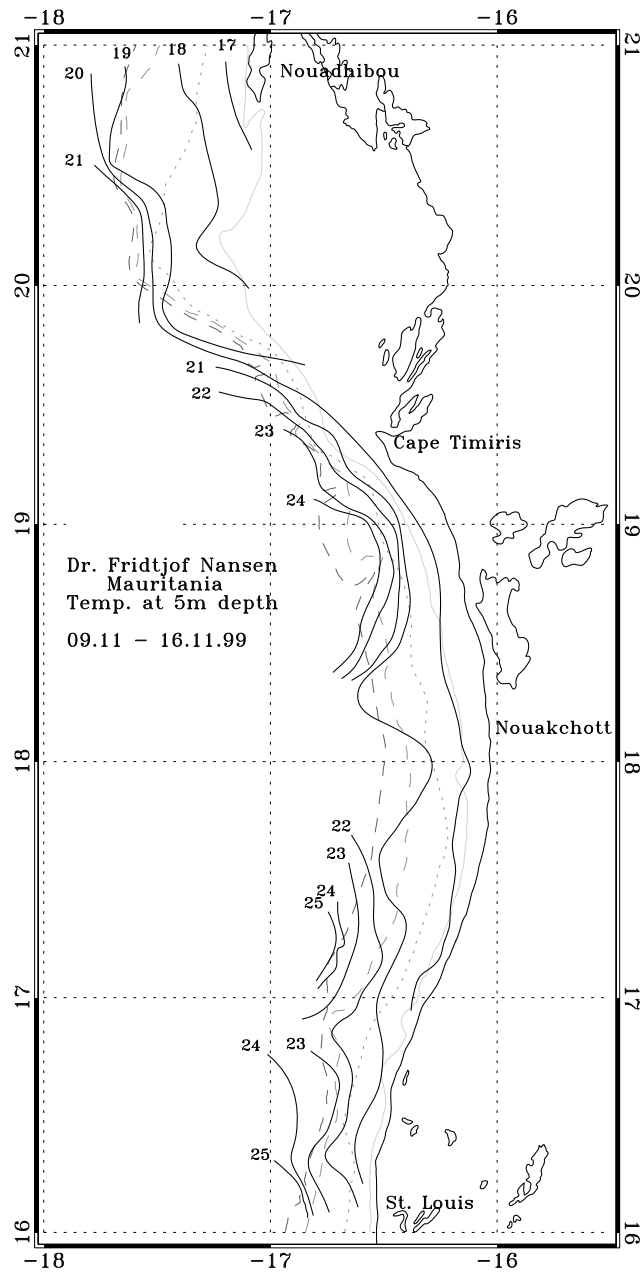


Figure 3. Sea surface temperature.

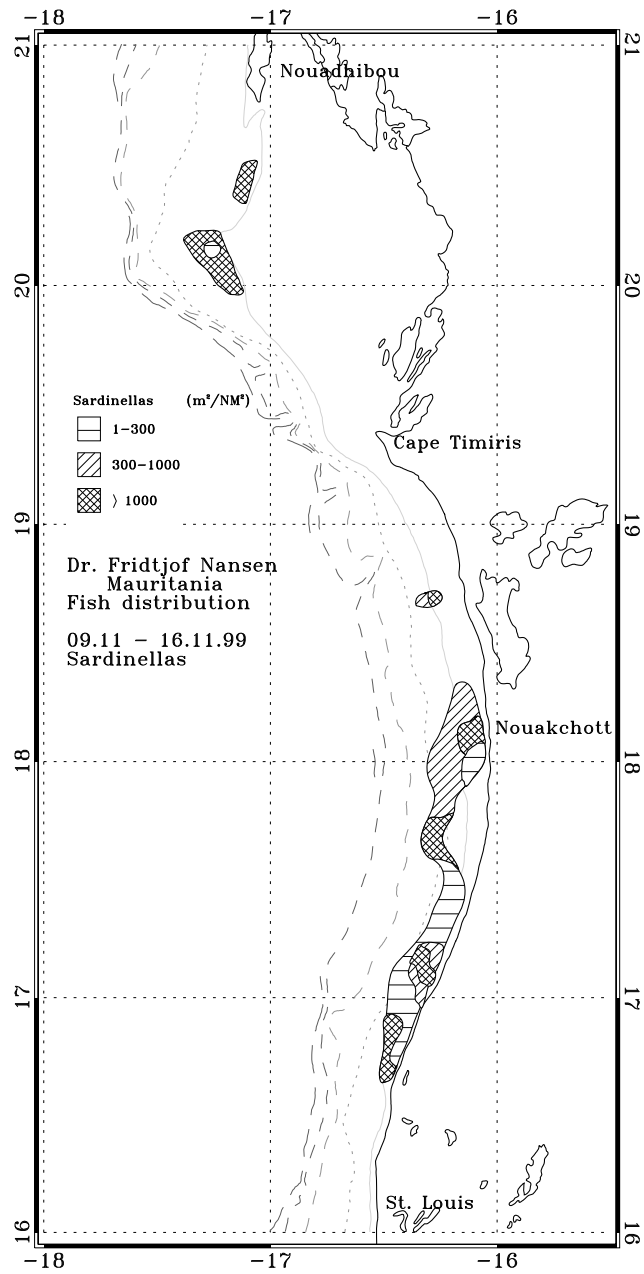


Figure 4. Distribution of sardinellas.

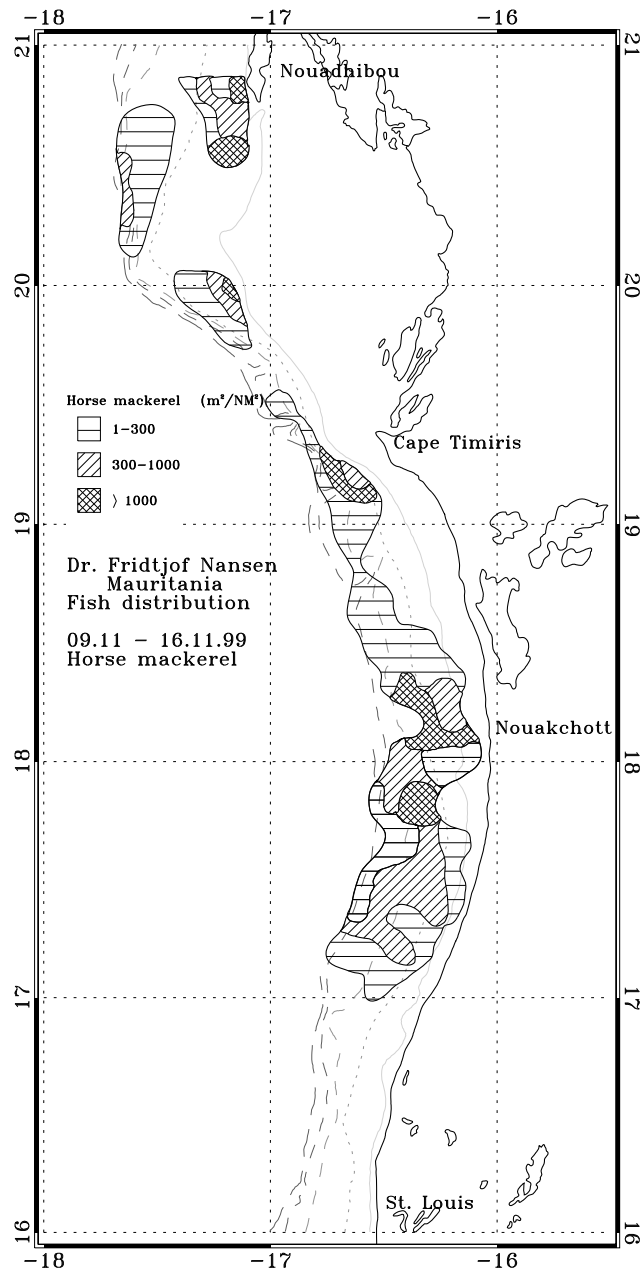


Figure 5. Distribution of horse mackerels.



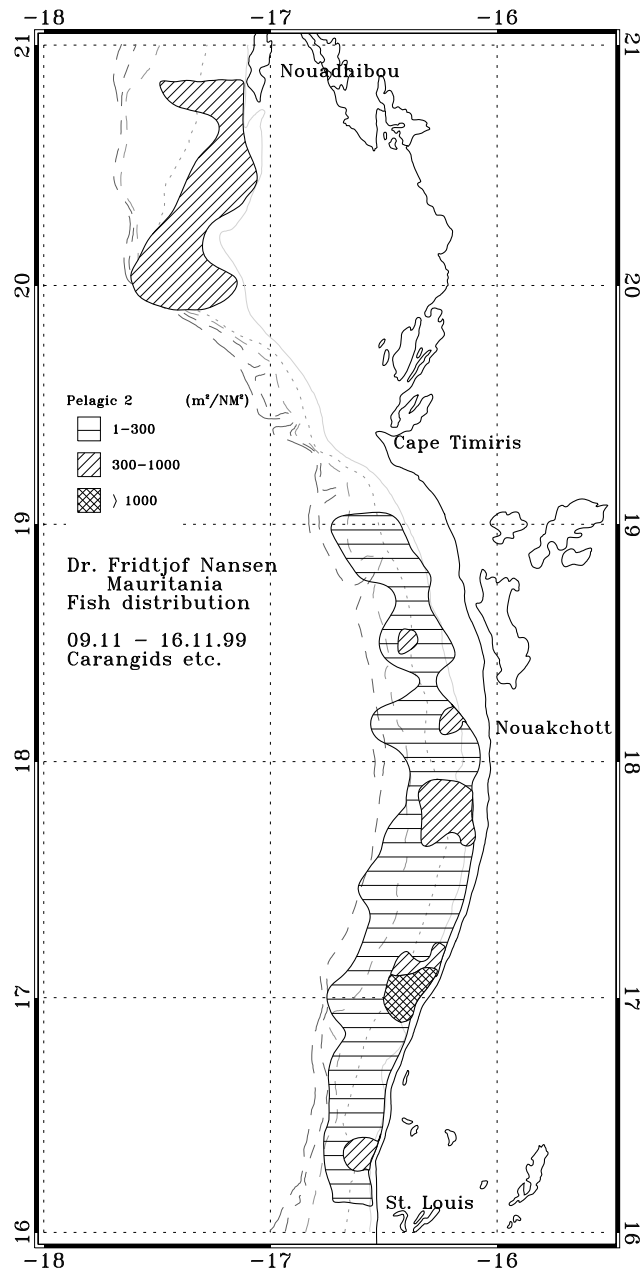


Figure 6. Distribution of carangids and associated species.

The distribution of horse mackerel is shown in Figure 5. Horse mackerel occurred in one large concentration between 17°00'N - 19°30'N. The aggregations were found as a continuous belt from inshore to about 30 NM offshore. The biomass was estimated at 238 000 tonnes. A mixture

of false scad, *Decapterus* sp. and Cunene horse mackerel, *Trachurus trecae*, was recorded and the biomass of false scad dominated by 60%. The modal lengths observed of Cunene horse mackerel was 12 cm while for false scad it was 34 cm, see Annex III. The stock length compositions by numbers and weight for the two species are shown in Annex IV.

Figure 6 shows the distribution of the mixed group which took the form of a continuous belt from St. Louis to about 19°00'N. The total biomass was estimated at 181 000 tonnes. The samples from the distributional areas consisted of Atlantic bumper, *Chloroscombrus chrysurus*, hairtail, *Trichiurus lepturus*, African look down *Selene dorsalis*, West African Spanish mackerel, *Scomberomorus tritor*, pompano, *Trachinotus* spp. with small amounts of chub mackerel, *Scomber japonicus* and barracudas, *Sphyaena* spp.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
105	210	238	181

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

Two areas with dense schools of juvenile sardinellas were recorded, Figure 4, at about 20°00'N-20°15'N and at about 20°20'N to 20°30'N. Both round and flat sardinella were present, with modal lengths of 13 and 10 cm respectively, see Annex III. The stock length compositions by numbers and weight for the two species are shown in Annex IV.

The main distribution area of juvenile sardinellas in this area is thought to lie in shallow inshore waters, which could not be covered by the survey. The patches which were surveyed therefore only represent incidental unknown parts of the total abundance of the juvenile stocks. However, the biomass of the sardinella covered by the vessel was estimated to some 427 000 tonnes. The round sardinella dominated in the catches by some 80%.

Horse mackerels were recorded in three smaller areas at the outer parts of the shelf, Figure 5. The aggregations which were rather sparse consisted of smaller Cunene horse mackerel. The total biomass was estimated at 60 000 tonnes. The samples show a modal length was 13 cm, see Annex III. The stock length compositions by numbers and weight is shown in Annex IV.

One area with varying densities of anchovy were recorded, Figure 7, from about 20°00'N to about 20°30'N. The anchovy was often mixed with juvenile sardinellas and carangids. Also for anchovy, the main distributional in this area is thought to lie in shallow inshore waters,

which could not be covered by the survey. The estimate of 100 000 tonnes is therefore thought to be an underestimate and should not be used for assessment purpose. The modal length of the anchovy was 8 cm.

The carangids and associated species were found in one main concentration in this area, from about 20°00'N to Cape Blanc, see Figure 6.

The catches of this group consisted mainly of largehead hairtail, *Trichiurus lepturus*. The biomass was estimated at 82 000 tonnes.

Large concentrations of fishing vessels were encountered in this area dominated by juvenile fish populations.

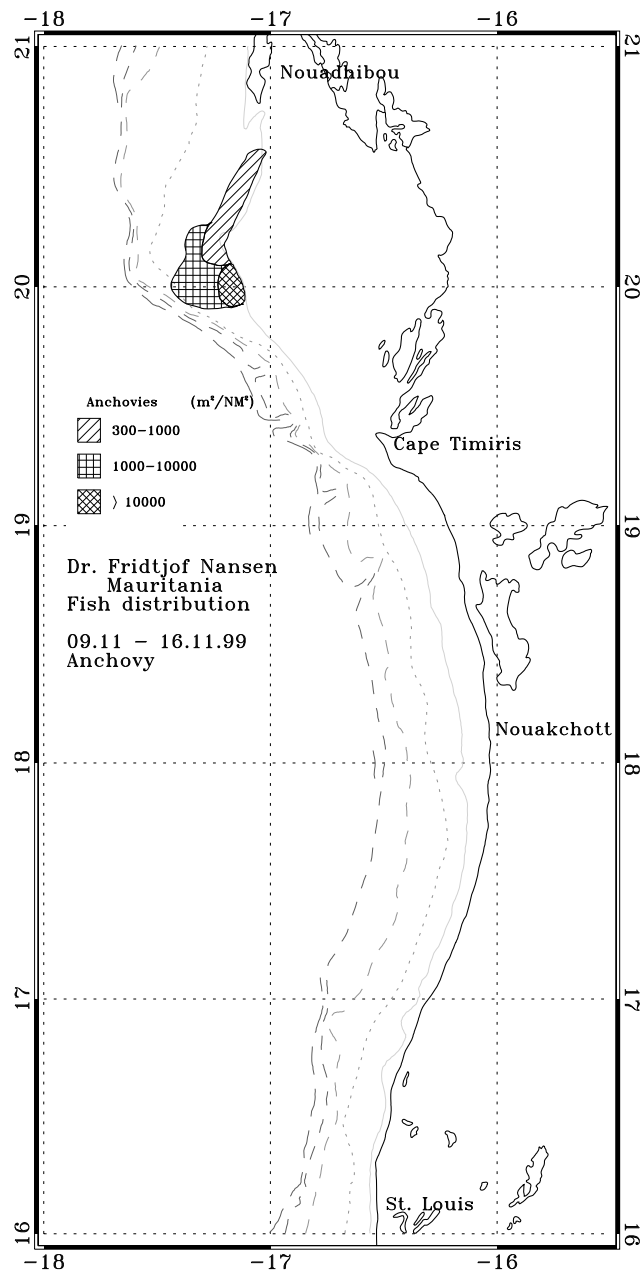


Figure 7. Distribution of anchovy. Cape Timiris - Cape Blanc.

## CHAPTER 3 OVERVIEW AND SUMMARY OF RESULTS

---

The survey was conducted successfully in the period 9 to 18 November with a course track of 1 200 NM and 41 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 density between St. Louis and Cape Timiris, while juveniles were found in the area between Cape Timiris and Cape Blanc, Figure 4. This year smaller Horse mackerels dominated and were found in medium density in one main area extending from about 17°00'N to Cape Timiris, Figure 5. Carangids (not including horse mackerels) and associated species occurred in low densities all along the shelf, with patches of high-density areas, Figure 6.

The total biomass of sardinella was estimated at 742 000 tonnes consisting of 25% flat and 75% round sardinella. Nearly 60% of this biomass is juveniles. The total biomass of horse mackerel was estimated at 296 000 tonnes and that of the carangids and associated species at 263 000 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	105	210	238	181
Cape Timiris-Cape Blanc	78	349	58	82
Total	183	559	296	263

Table 3 lists biomass estimates of sardinella and carangids and associated species from all 'Dr. Fridtjof Nansen' surveys of this shelf region. Compared with the surveys from, the same season: NovDec/86, NovDec/95, NovDec/96 and NovDec/97, the estimate of 742 000 tonnes of sardinella from the current survey is the lowest on record and follow a decreasing trend since 1995. The carangid estimate of 559 000 tonnes is at the same level as earlier years. The low estimate of sardinellas may be explained by the large quantities found in Senegal and the Gambia this year. However, the status of the stock cannot be assessed before the whole region is covered.

Table 3 Biomass estimates from previous 'Dr Fridtjof Nansen' surveys of the Mauritanian shelf. 1 000 tonnes.

Survey:	Sardinellas	Carangids etc.* <sub>1</sub>
AprMay-81	20	370
Sept -81	75	* <sub>2</sub>
FebMar-82	50	470
NovDec-86	300	540
FebMar-92	1970	190
NovDec-95	1780	190
NovDec-96	1405	400
NovDec-97	1200	660
NovDec-98	1125	543
NocDec-99	742	559

1. Including the horse mackerels.
2. Not available.

## References

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

# Annex I Records of fishing stations

<p>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 871            DATE:10/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1610            start stop duration Long W 1635            TIME :02:35:02 03:11:52 37 (min) Purpose code: 1            LOG :4192.37 4194.45 2.07 Area code : 2            FDEPTH: 5 5 GearCond.code:            BDEPTH: 29 42 Validity code:            Towing dir: 270ø Wire out: 160 m Speed: 35 kn*10</p> <p>Sorted: 39 Kg Total catch: 97.62 CATCH/HOUR: 158.30</p>	<table border="0" style="width: 100%;"> <tr><td>Trachurus trecae</td><td>6.60</td><td>38</td><td>2.24</td><td>1729</td></tr> <tr><td>Decapterus rhonchus</td><td>5.04</td><td>16</td><td>1.71</td><td>1728</td></tr> <tr><td>Pomadasys incisus</td><td>2.56</td><td>12</td><td>0.87</td><td></td></tr> <tr><td>Pomadasys rogeri</td><td>1.80</td><td>2</td><td>0.61</td><td></td></tr> <tr><td>Sardinella maderensis</td><td>1.80</td><td>8</td><td>0.61</td><td></td></tr> <tr><td>Trichiurus lepturus</td><td>1.24</td><td>2</td><td>0.42</td><td></td></tr> <tr><td>Lithognathus mormyrus</td><td>0.96</td><td>2</td><td>0.33</td><td></td></tr> <tr><td>Scomber japonicus</td><td>0.36</td><td>2</td><td>0.12</td><td></td></tr> <tr><td>Echeneis naucrates</td><td>0.08</td><td>2</td><td>0.03</td><td></td></tr> <tr><td><b>Total</b></td><td><b>294.80</b></td><td></td><td><b>99.99</b></td><td></td></tr> </table>	Trachurus trecae	6.60	38	2.24	1729	Decapterus rhonchus	5.04	16	1.71	1728	Pomadasys incisus	2.56	12	0.87		Pomadasys rogeri	1.80	2	0.61		Sardinella maderensis	1.80	8	0.61		Trichiurus lepturus	1.24	2	0.42		Lithognathus mormyrus	0.96	2	0.33		Scomber japonicus	0.36	2	0.12		Echeneis naucrates	0.08	2	0.03		<b>Total</b>	<b>294.80</b>		<b>99.99</b>																																																			
Trachurus trecae	6.60	38	2.24	1729																																																																																																	
Decapterus rhonchus	5.04	16	1.71	1728																																																																																																	
Pomadasys incisus	2.56	12	0.87																																																																																																		
Pomadasys rogeri	1.80	2	0.61																																																																																																		
Sardinella maderensis	1.80	8	0.61																																																																																																		
Trichiurus lepturus	1.24	2	0.42																																																																																																		
Lithognathus mormyrus	0.96	2	0.33																																																																																																		
Scomber japonicus	0.36	2	0.12																																																																																																		
Echeneis naucrates	0.08	2	0.03																																																																																																		
<b>Total</b>	<b>294.80</b>		<b>99.99</b>																																																																																																		
<p>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 872            DATE:10/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1640            start stop duration Long W 1637            TIME :19:39:32 20:10:10 31 (min) Purpose code: 1            LOG :4318.14 4319.85 1.67 Area code : 2            FDEPTH: 5 5 GearCond.code:            BDEPTH: 48 43 Validity code: 1            Towing dir: 90ø Wire out: 140 m Speed: 30 kn*10</p> <p>Sorted: 29 Kg Total catch: 58.66 CATCH/HOUR: 113.54</p>	<table border="0" style="width: 100%;"> <tr><td>Trachurus trecae</td><td>58.06</td><td>1970</td><td>51.14</td><td>1730</td></tr> <tr><td>Trachinotus ovatus</td><td>15.56</td><td>50</td><td>13.70</td><td></td></tr> <tr><td>Todarodes sagittatus</td><td>10.06</td><td>27</td><td>8.86</td><td></td></tr> <tr><td>Auxis thazard</td><td>7.20</td><td>4</td><td>6.34</td><td></td></tr> <tr><td>Lagocephalus laevigatus</td><td>4.10</td><td>35</td><td>3.61</td><td></td></tr> <tr><td>Loligo vulgaris</td><td>4.10</td><td>58</td><td>3.61</td><td></td></tr> <tr><td>Sardinella aurita</td><td>2.86</td><td>66</td><td>2.52</td><td></td></tr> <tr><td>Trichiurus lepturus</td><td>2.55</td><td>27</td><td>2.25</td><td></td></tr> <tr><td>Campogramma graycos</td><td>2.01</td><td>4</td><td>1.77</td><td></td></tr> <tr><td>Sepia bertheloti</td><td>1.94</td><td>4</td><td>1.71</td><td></td></tr> <tr><td>Sepia officinalis hierredda</td><td>1.24</td><td>4</td><td>1.09</td><td></td></tr> <tr><td>Chlorophthalmus atlanticus</td><td>1.01</td><td>1548</td><td>0.89</td><td></td></tr> <tr><td>Scomber scombrus</td><td>1.01</td><td>12</td><td>0.89</td><td></td></tr> <tr><td>Boops boops</td><td>0.93</td><td>70</td><td>0.82</td><td></td></tr> <tr><td>Alloteuthis africana</td><td>0.85</td><td>387</td><td>0.75</td><td></td></tr> <tr><td>Pagellus bellottii</td><td>0.04</td><td>4</td><td>0.04</td><td></td></tr> <tr><td><b>Total</b></td><td><b>113.52</b></td><td></td><td><b>99.99</b></td><td></td></tr> </table>	Trachurus trecae	58.06	1970	51.14	1730	Trachinotus ovatus	15.56	50	13.70		Todarodes sagittatus	10.06	27	8.86		Auxis thazard	7.20	4	6.34		Lagocephalus laevigatus	4.10	35	3.61		Loligo vulgaris	4.10	58	3.61		Sardinella aurita	2.86	66	2.52		Trichiurus lepturus	2.55	27	2.25		Campogramma graycos	2.01	4	1.77		Sepia bertheloti	1.94	4	1.71		Sepia officinalis hierredda	1.24	4	1.09		Chlorophthalmus atlanticus	1.01	1548	0.89		Scomber scombrus	1.01	12	0.89		Boops boops	0.93	70	0.82		Alloteuthis africana	0.85	387	0.75		Pagellus bellottii	0.04	4	0.04		<b>Total</b>	<b>113.52</b>		<b>99.99</b>																
Trachurus trecae	58.06	1970	51.14	1730																																																																																																	
Trachinotus ovatus	15.56	50	13.70																																																																																																		
Todarodes sagittatus	10.06	27	8.86																																																																																																		
Auxis thazard	7.20	4	6.34																																																																																																		
Lagocephalus laevigatus	4.10	35	3.61																																																																																																		
Loligo vulgaris	4.10	58	3.61																																																																																																		
Sardinella aurita	2.86	66	2.52																																																																																																		
Trichiurus lepturus	2.55	27	2.25																																																																																																		
Campogramma graycos	2.01	4	1.77																																																																																																		
Sepia bertheloti	1.94	4	1.71																																																																																																		
Sepia officinalis hierredda	1.24	4	1.09																																																																																																		
Chlorophthalmus atlanticus	1.01	1548	0.89																																																																																																		
Scomber scombrus	1.01	12	0.89																																																																																																		
Boops boops	0.93	70	0.82																																																																																																		
Alloteuthis africana	0.85	387	0.75																																																																																																		
Pagellus bellottii	0.04	4	0.04																																																																																																		
<b>Total</b>	<b>113.52</b>		<b>99.99</b>																																																																																																		
<p>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 872            DATE:10/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1644            start stop duration Long W 1644            TIME :04:26:07 05:00:38 35 (min) Purpose code: 1            LOG :4201.68 4203.36 1.66 Area code : 2            FDEPTH: 5 5 GearCond.code:            BDEPTH: 86 92 Validity code:            Towing dir: 270ø Wire out: 160 m Speed: 35 kn*10</p> <p>Sorted: 7 Kg Total catch: 6.50 CATCH/HOUR: 11.14</p>	<table border="0" style="width: 100%;"> <tr><td>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 876 DATE:10/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1641 start stop duration Long W 1628 TIME :22:03:25 22:18:18 15 (min) Purpose code: 1 LOG :4328.88 4329.72 0.82 Area code : 2 FDEPTH: 5 5 GearCond.code: BDEPTH: 19 20 Validity code: 1 Towing dir: 348ø Wire out: 80 m Speed: 30 kn*10</td><td>59 Kg</td><td>149.20</td><td>596.80</td></tr> </table>	DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 876 DATE:10/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1641 start stop duration Long W 1628 TIME :22:03:25 22:18:18 15 (min) Purpose code: 1 LOG :4328.88 4329.72 0.82 Area code : 2 FDEPTH: 5 5 GearCond.code: BDEPTH: 19 20 Validity code: 1 Towing dir: 348ø Wire out: 80 m Speed: 30 kn*10	59 Kg	149.20	596.80																																																																																																
DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 876 DATE:10/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1641 start stop duration Long W 1628 TIME :22:03:25 22:18:18 15 (min) Purpose code: 1 LOG :4328.88 4329.72 0.82 Area code : 2 FDEPTH: 5 5 GearCond.code: BDEPTH: 19 20 Validity code: 1 Towing dir: 348ø Wire out: 80 m Speed: 30 kn*10	59 Kg	149.20	596.80																																																																																																		
<p>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 873            DATE:10/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1621            start stop duration Long W 1633            TIME :09:35:29 10:04:34 29 (min) Purpose code: 1            LOG :4243.54 4245.13 1.55 Area code : 2            FDEPTH: 10 10 GearCond.code: 1            BDEPTH: 19 20 Validity code:            Towing dir: 10ø Wire out: 80 m Speed: 30 kn*10</p> <p>Sorted: 58 Kg Total catch: 292.25 CATCH/HOUR: 604.66</p>	<table border="0" style="width: 100%;"> <tr><td>Sardinella aurita</td><td>345.80</td><td>1820</td><td>57.94</td><td>1731</td></tr> <tr><td>Brachydeuterus auritus</td><td>61.20</td><td>1800</td><td>10.25</td><td></td></tr> <tr><td>Decapterus rhonchus</td><td>47.80</td><td>220</td><td>8.01</td><td>1732</td></tr> <tr><td>Trichiurus lepturus</td><td>47.20</td><td>212</td><td>7.91</td><td></td></tr> <tr><td>Selene dorsalis</td><td>41.80</td><td>1080</td><td>7.00</td><td></td></tr> <tr><td>Sepia officinalis hierredda</td><td>11.20</td><td>20</td><td>1.88</td><td></td></tr> <tr><td>Todarodes sagittatus</td><td>10.20</td><td>32</td><td>1.71</td><td></td></tr> <tr><td>Ilisha africana</td><td>10.00</td><td>12</td><td>1.68</td><td></td></tr> <tr><td>Rhinobatos rhinobatos</td><td>9.20</td><td>12</td><td>1.54</td><td></td></tr> <tr><td>Arius heudeloti</td><td>5.20</td><td>20</td><td>0.87</td><td></td></tr> <tr><td>Pteroscion peli</td><td>4.20</td><td>72</td><td>0.70</td><td></td></tr> <tr><td>Lagocephalus laevigatus</td><td>4.00</td><td>20</td><td>0.67</td><td></td></tr> <tr><td>Alectis alexandrinus</td><td>3.00</td><td>60</td><td>0.50</td><td></td></tr> <tr><td>Stromateus fiatola</td><td>1.60</td><td>12</td><td>0.27</td><td></td></tr> <tr><td>Chloroscombrus chrysurus</td><td>1.40</td><td>12</td><td>0.23</td><td></td></tr> <tr><td>Parapenaeus longirostris</td><td>0.60</td><td>60</td><td>0.10</td><td></td></tr> <tr><td>Trachurus trecae</td><td>0.40</td><td>32</td><td>0.07</td><td></td></tr> <tr><td>Sardinella maderensis</td><td>0.40</td><td>28</td><td>0.07</td><td></td></tr> <tr><td>Galeoides decadactylus</td><td>0.20</td><td>12</td><td>0.03</td><td></td></tr> <tr><td><b>Total</b></td><td><b>605.40</b></td><td></td><td><b>101.43</b></td><td></td></tr> </table>	Sardinella aurita	345.80	1820	57.94	1731	Brachydeuterus auritus	61.20	1800	10.25		Decapterus rhonchus	47.80	220	8.01	1732	Trichiurus lepturus	47.20	212	7.91		Selene dorsalis	41.80	1080	7.00		Sepia officinalis hierredda	11.20	20	1.88		Todarodes sagittatus	10.20	32	1.71		Ilisha africana	10.00	12	1.68		Rhinobatos rhinobatos	9.20	12	1.54		Arius heudeloti	5.20	20	0.87		Pteroscion peli	4.20	72	0.70		Lagocephalus laevigatus	4.00	20	0.67		Alectis alexandrinus	3.00	60	0.50		Stromateus fiatola	1.60	12	0.27		Chloroscombrus chrysurus	1.40	12	0.23		Parapenaeus longirostris	0.60	60	0.10		Trachurus trecae	0.40	32	0.07		Sardinella maderensis	0.40	28	0.07		Galeoides decadactylus	0.20	12	0.03		<b>Total</b>	<b>605.40</b>		<b>101.43</b>	
Sardinella aurita	345.80	1820	57.94	1731																																																																																																	
Brachydeuterus auritus	61.20	1800	10.25																																																																																																		
Decapterus rhonchus	47.80	220	8.01	1732																																																																																																	
Trichiurus lepturus	47.20	212	7.91																																																																																																		
Selene dorsalis	41.80	1080	7.00																																																																																																		
Sepia officinalis hierredda	11.20	20	1.88																																																																																																		
Todarodes sagittatus	10.20	32	1.71																																																																																																		
Ilisha africana	10.00	12	1.68																																																																																																		
Rhinobatos rhinobatos	9.20	12	1.54																																																																																																		
Arius heudeloti	5.20	20	0.87																																																																																																		
Pteroscion peli	4.20	72	0.70																																																																																																		
Lagocephalus laevigatus	4.00	20	0.67																																																																																																		
Alectis alexandrinus	3.00	60	0.50																																																																																																		
Stromateus fiatola	1.60	12	0.27																																																																																																		
Chloroscombrus chrysurus	1.40	12	0.23																																																																																																		
Parapenaeus longirostris	0.60	60	0.10																																																																																																		
Trachurus trecae	0.40	32	0.07																																																																																																		
Sardinella maderensis	0.40	28	0.07																																																																																																		
Galeoides decadactylus	0.20	12	0.03																																																																																																		
<b>Total</b>	<b>605.40</b>		<b>101.43</b>																																																																																																		
<p>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 874            DATE:10/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1629            start stop duration Long W 1635            TIME :12:17:58 12:47:42 30 (min) Purpose code: 1            LOG :4262.92 4264.83 1.87 Area code : 2            FDEPTH: 5 5 GearCond.code:            BDEPTH: 32 33 Validity code:            Towing dir: 360ø Wire out: 150 m Speed: 40 kn*10</p> <p>Sorted: Kg Total catch: 147.40 CATCH/HOUR: 294.80</p>	<table border="0" style="width: 100%;"> <tr><td>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 876 DATE:10/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1629 start stop duration Long W 1635 TIME :12:17:58 12:47:42 30 (min) Purpose code: 1 LOG :4262.92 4264.83 1.87 Area code : 2 FDEPTH: 5 5 GearCond.code: BDEPTH: 32 33 Validity code: Towing dir: 360ø Wire out: 150 m Speed: 40 kn*10</td><td>Kg</td><td>147.40</td><td>294.80</td></tr> </table>	DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 876 DATE:10/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1629 start stop duration Long W 1635 TIME :12:17:58 12:47:42 30 (min) Purpose code: 1 LOG :4262.92 4264.83 1.87 Area code : 2 FDEPTH: 5 5 GearCond.code: BDEPTH: 32 33 Validity code: Towing dir: 360ø Wire out: 150 m Speed: 40 kn*10	Kg	147.40	294.80																																																																																																
DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 876 DATE:10/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1629 start stop duration Long W 1635 TIME :12:17:58 12:47:42 30 (min) Purpose code: 1 LOG :4262.92 4264.83 1.87 Area code : 2 FDEPTH: 5 5 GearCond.code: BDEPTH: 32 33 Validity code: Towing dir: 360ø Wire out: 150 m Speed: 40 kn*10	Kg	147.40	294.80																																																																																																		
<p>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 873            DATE:10/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1621            start stop duration Long W 1633            TIME :09:35:29 10:04:34 29 (min) Purpose code: 1            LOG :4243.54 4245.13 1.55 Area code : 2            FDEPTH: 10 10 GearCond.code: 1            BDEPTH: 19 20 Validity code:            Towing dir: 10ø Wire out: 80 m Speed: 30 kn*10</p> <p>Sorted: 58 Kg Total catch: 292.25 CATCH/HOUR: 604.66</p>	<table border="0" style="width: 100%;"> <tr><td>Trichiurus lepturus</td><td>218.90</td><td>3776</td><td>36.20</td><td>1728</td></tr> <tr><td>Chloroscombrus chrysurus</td><td>93.10</td><td>941</td><td>15.40</td><td></td></tr> <tr><td>Brachydeuterus auritus</td><td>72.41</td><td>921</td><td>11.98</td><td></td></tr> <tr><td>Selene dorsalis</td><td>57.93</td><td>1324</td><td>9.58</td><td></td></tr> <tr><td>Pomadasys rogeri</td><td>43.45</td><td>166</td><td>7.19</td><td></td></tr> <tr><td>Ilisha africana</td><td>28.14</td><td>331</td><td>4.65</td><td></td></tr> <tr><td>Arius heudeloti</td><td>27.93</td><td>10</td><td>4.62</td><td></td></tr> <tr><td>Drepane africana</td><td>17.17</td><td>10</td><td>2.84</td><td></td></tr> <tr><td>Rhinoptera marginata</td><td>12.41</td><td>10</td><td>2.05</td><td></td></tr> <tr><td>Sardinella maderensis</td><td>11.59</td><td>83</td><td>1.92</td><td></td></tr> <tr><td>Trachurus trecae</td><td>6.62</td><td>248</td><td>1.09</td><td></td></tr> <tr><td>Decapterus rhonchus</td><td>5.38</td><td>31</td><td>0.89</td><td></td></tr> <tr><td>Pteroscion peli</td><td>5.17</td><td>10</td><td>0.86</td><td></td></tr> <tr><td>Pomadasys jubelini</td><td>4.14</td><td>10</td><td>0.68</td><td></td></tr> <tr><td>Galeoides decadactylus</td><td>3.52</td><td>21</td><td>0.58</td><td></td></tr> <tr><td>Alectis alexandrinus</td><td>0.62</td><td>21</td><td>0.10</td><td></td></tr> <tr><td>Parapenaeus longirostris</td><td>0.62</td><td>10</td><td>0.10</td><td></td></tr> <tr><td>Sardinella aurita</td><td>0.21</td><td>31</td><td>0.03</td><td></td></tr> <tr><td><b>Total</b></td><td><b>609.31</b></td><td></td><td><b>100.76</b></td><td></td></tr> </table>	Trichiurus lepturus	218.90	3776	36.20	1728	Chloroscombrus chrysurus	93.10	941	15.40		Brachydeuterus auritus	72.41	921	11.98		Selene dorsalis	57.93	1324	9.58		Pomadasys rogeri	43.45	166	7.19		Ilisha africana	28.14	331	4.65		Arius heudeloti	27.93	10	4.62		Drepane africana	17.17	10	2.84		Rhinoptera marginata	12.41	10	2.05		Sardinella maderensis	11.59	83	1.92		Trachurus trecae	6.62	248	1.09		Decapterus rhonchus	5.38	31	0.89		Pteroscion peli	5.17	10	0.86		Pomadasys jubelini	4.14	10	0.68		Galeoides decadactylus	3.52	21	0.58		Alectis alexandrinus	0.62	21	0.10		Parapenaeus longirostris	0.62	10	0.10		Sardinella aurita	0.21	31	0.03		<b>Total</b>	<b>609.31</b>		<b>100.76</b>						
Trichiurus lepturus	218.90	3776	36.20	1728																																																																																																	
Chloroscombrus chrysurus	93.10	941	15.40																																																																																																		
Brachydeuterus auritus	72.41	921	11.98																																																																																																		
Selene dorsalis	57.93	1324	9.58																																																																																																		
Pomadasys rogeri	43.45	166	7.19																																																																																																		
Ilisha africana	28.14	331	4.65																																																																																																		
Arius heudeloti	27.93	10	4.62																																																																																																		
Drepane africana	17.17	10	2.84																																																																																																		
Rhinoptera marginata	12.41	10	2.05																																																																																																		
Sardinella maderensis	11.59	83	1.92																																																																																																		
Trachurus trecae	6.62	248	1.09																																																																																																		
Decapterus rhonchus	5.38	31	0.89																																																																																																		
Pteroscion peli	5.17	10	0.86																																																																																																		
Pomadasys jubelini	4.14	10	0.68																																																																																																		
Galeoides decadactylus	3.52	21	0.58																																																																																																		
Alectis alexandrinus	0.62	21	0.10																																																																																																		
Parapenaeus longirostris	0.62	10	0.10																																																																																																		
Sardinella aurita	0.21	31	0.03																																																																																																		
<b>Total</b>	<b>609.31</b>		<b>100.76</b>																																																																																																		
<p>DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 874            DATE:10/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1629            start stop duration Long W 1635            TIME :12:17:58 12:47:42 30 (min) Purpose code: 1            LOG :4262.92 4264.83 1.87 Area code : 2            FDEPTH: 5 5 GearCond.code:            BDEPTH: 32 33 Validity code:            Towing dir: 360ø Wire out: 150 m Speed: 40 kn*10</p> <p>Sorted: Kg Total catch: 147.40 CATCH/HOUR: 294.80</p>	<table border="0" style="width: 100%;"> <tr><td>Loligo vulgaris</td><td>72.32</td><td>214</td><td>24.53</td><td></td></tr> <tr><td>Pomadasys jubelini</td><td>51.72</td><td>150</td><td>17.54</td><td></td></tr> <tr><td>Alectis alexandrinus</td><td>50.80</td><td>56</td><td>17.23</td><td></td></tr> <tr><td>Trachinotus ovatus</td><td>49.00</td><td>176</td><td>16.62</td><td></td></tr> <tr><td>Lagocephalus laevigatus</td><td>35.12</td><td>32</td><td>11.91</td><td></td></tr> <tr><td>Stromateus fiatola</td><td>8.08</td><td>10</td><td>2.74</td><td></td></tr> <tr><td>Chloroscombrus chrysurus</td><td>7.32</td><td>38</td><td>2.48</td><td></td></tr> </table>	Loligo vulgaris	72.32	214	24.53		Pomadasys jubelini	51.72	150	17.54		Alectis alexandrinus	50.80	56	17.23		Trachinotus ovatus	49.00	176	16.62		Lagocephalus laevigatus	35.12	32	11.91		Stromateus fiatola	8.08	10	2.74		Chloroscombrus chrysurus	7.32	38	2.48																																																																		
Loligo vulgaris	72.32	214	24.53																																																																																																		
Pomadasys jubelini	51.72	150	17.54																																																																																																		
Alectis alexandrinus	50.80	56	17.23																																																																																																		
Trachinotus ovatus	49.00	176	16.62																																																																																																		
Lagocephalus laevigatus	35.12	32	11.91																																																																																																		
Stromateus fiatola	8.08	10	2.74																																																																																																		
Chloroscombrus chrysurus	7.32	38	2.48																																																																																																		

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 877  
 DATE:11/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1650  
 start stop duration  
 TIME :23:44:25 00:14:43 30 (min) Purpose code: 1  
 LOG :4340.35 4342.00 1.64 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 21 23 Validity code:  
 Towing dir: 270ø Wire out: 75 m Speed: 35 kn\*10

Sorted: 34 Kg Total catch: 286.18 CATCH/HOUR: 572.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	244.80	1040	42.77	1733
Brachydeuterus auritus	106.56	2896	18.62	
Sardinella aurita	78.08	256	13.64	1734
Selene dorsalis	60.16	1616	10.51	
Decapterus rhonchus	24.00	96	4.19	1735
Arius heudeloti	13.32	22	2.33	
Alectis alexandrinus	12.40	22	2.17	
Sepia officinalis hierredda	8.72	24	1.52	
Trichiurus lepturus	8.32	304	1.45	
Ilisha africana	3.52	256	0.61	
Galeoides decadactylus	3.52	80	0.61	
Sparus caeruleostictus *	2.88	16	0.50	
Stromateus fiatola	2.56	16	0.45	
Sphyræna guachancho	2.24	112	0.39	
Engraulis encrasicolus	1.28	32	0.22	
Total	572.36		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 878  
 DATE:11/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1650  
 start stop duration  
 TIME :01:37:23 02:07:13 30 (min) Purpose code: 1  
 LOG :4352.96 4354.69 1.71 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 91 106 Validity code:  
 Towing dir: 270ø Wire out: 160 m Speed: 38 kn\*10

Sorted: 30 Kg Total catch: 251.04 CATCH/HOUR: 502.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	457.60	13728	91.14	
Trachurus trecae	22.40	416	4.46	
Ruvettus pretiosus	8.48	2	1.69	
Echeneis naucrates	5.00	8	1.00	
MYCTOPHIDAE	4.48	1472	0.89	
Loligo vulgaris	0.96	80	0.19	
Illex coindetii	0.96	176	0.19	
Scomber japonicus	0.76	8	0.15	
SQUASEI	0.64	96	0.13	
Ariomma bondi	0.32	32	0.06	
Chlorophthalmus atlanticus	0.32	48	0.06	
Selene dorsalis	0.16	32	0.03	
Total	502.08		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 879  
 DATE:11/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1701  
 start stop duration  
 TIME :06:35:16 06:56:27 21 (min) Purpose code: 1  
 LOG :4396.58 4397.63 1.02 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 23 24 Validity code:  
 Towing dir: 360ø Wire out: 80 m Speed: 30 kn\*10

Sorted: 132 Kg Total catch: 5940.00 CATCH/HOUR: 16971.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	15004.29	126000	88.41	1739
Sardinella maderensis	1432.29	6043	8.44	1738
Sardinella aurita	437.14	1800	2.58	1737
Selene dorsalis	56.57	129	0.33	
Decapterus rhonchus	30.86	129	0.18	
Brachydeuterus auritus	10.29	129	0.06	
Brachydeuterus auritus	10.29	129	0.06	
Total	16981.73		100.06	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 880  
 DATE:11/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1710  
 start stop duration  
 TIME :10:17:54 10:47:21 29 (min) Purpose code: 1  
 LOG :4421.34 4422.96 1.61 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 45 36 Validity code:  
 Towing dir: 90ø Wire out: 135 m Speed: 30 kn\*10

Sorted: 25 Kg Total catch: 78.22 CATCH/HOUR: 161.83

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trachurus	40.22	1899	24.85	1780
Brachydeuterus auritus	39.10	273	24.16	
Pomadasys rogeri	35.38	74	21.86	
Trichiurus lepturus	9.93	254	6.14	
Lagocephalus laevigatus	7.57	31	4.68	
Pagellus bellottii	5.83	37	3.60	
Sarda sarda	5.71	6	3.53	
Pomadasys incisus	4.47	19	2.76	
Sardinella aurita	3.85	12	2.38	
Campogramma glycos	3.35	6	2.07	
Selene dorsalis	2.23	6	1.38	
Trachinotus ovatus	2.11	6	1.30	
Loligo vulgaris	2.07	8	1.28	
Total	161.82		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 881  
 DATE:11/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1730  
 start stop duration  
 TIME :19:20:49 19:50:07 29 (min) Purpose code: 1  
 LOG :4499.35 4500.88 1.51 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 18 21 Validity code:  
 Towing dir: 270ø Wire out: 80 m Speed: 30 kn\*10

Sorted: 562 Kg Total catch: 112.50 CATCH/HOUR: 232.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	110.07	757	47.29	1782
Trachurus trecae	45.35	1775	19.48	1783

Sardinella aurita	31.70	91	13.62	1781
Brachydeuterus auritus	17.71	236	7.61	
Mugil cephalus	8.94	4	3.84	
Sardinella maderensis	4.39	12	1.89	
Stromateus fiatola	4.22	4	1.81	
Lagocephalus laevigatus	2.90	8	1.25	
Loligo vulgaris	2.40	8	1.03	
Sepia officinalis hierredda	1.16	4	0.50	
Dasyatis margarita	0.99	4	0.43	
Boops boops	0.99	62	0.43	
Pomadasys rogeri	0.83	4	0.36	
Selene dorsalis	0.66	4	0.28	
Sphyræna sphyraena	0.41	8	0.18	
Pseudupeneus prayensis	0.04	4	0.02	
Total	232.76		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 882  
 DATE:11/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1730  
 start stop duration  
 TIME :21:05:46 21:05:56 10 (min) Purpose code: 1  
 LOG :4509.48 4509.99 0.51 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 58 57 Validity code:  
 Towing dir: 90ø Wire out: 135 m Speed: 30 kn\*10

Sorted: 32 Kg Total catch: 163.90 CATCH/HOUR: 983.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	900.00	54600	91.52	1784
Sepia officinalis hierredda	40.20	90	4.09	
Trichiurus lepturus	40.20	90	4.09	
Spherooides spengleri	3.00	30	0.31	
Total	983.40		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 883  
 DATE:12/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1730  
 start stop duration  
 TIME :22:47:38 00:00:51 30 (min) Purpose code: 1  
 LOG :4525.47 4526.89 1.41 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 157 174 Validity code:  
 Towing dir: 270ø Wire out: 100 m Speed: 35 kn\*10

Sorted: Kg Total catch: 29.44 CATCH/HOUR: 58.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	22.16	30	37.64	
Pteroscion peli	14.24	1496	24.18	
Arius heudeloti	11.68	2	19.84	
MYCTOPHIDAE	5.60	1848	9.51	
Mugil capurrii	4.08	4	6.93	
Sepia officinalis hierredda	0.64	104	1.09	
Illex coindetii	0.32	72	0.54	
Selene dorsalis	0.16	24	0.27	
Total	58.88		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 884  
 DATE:12/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1740  
 start stop duration  
 TIME :02:32:28 03:23:52 30 (min) Purpose code: 1  
 LOG :4549.11 4550.82 1.70 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 103 100 Validity code:  
 Towing dir: 90ø Wire out: 160 m Speed: 38 kn\*10

Sorted: 30 Kg Total catch: 132.12 CATCH/HOUR: 264.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	148.60	9970	56.24	1785
Trichiurus lepturus	103.52	142	39.18	
Trachinotus ovatus	5.64	20	2.13	
Arius heudeloti	5.04	4	1.91	
Illex coindetii	0.70	170	0.26	
Chlorophthalmus atlanticus	0.40	624	0.15	
Loligo vulgaris	0.28	2	0.11	
SEPIIDAE	0.06	54	0.02	
Total	264.24		100.00	



DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 885  
 DATE:12/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1740  
 start stop duration  
 TIME :05:04:54 05:55:53 29 (min) Purpose code: 1  
 LOG :4567.44 4569.07 1.62 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 17 23 Validity code: 1  
 Towing dir: 270ø Wire out: 80 m Speed: 30 kn\*10

Sorted: 31 Kg Total catch: 126.40 CATCH/HOUR: 261.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	141.19	935	53.99	
Brachydeuterus auritus	46.34	389	17.72	
Trachurus trecae	23.17	910	8.86	1786
Lagocephalus laevigatus	11.75	8	4.49	
Sardinella aurita	8.44	25	3.23	
Ballistes caprisiscus	7.94	8	3.04	
Loligo vulgaris	7.12	33	2.72	
Sepia officinalis hierredda	6.29	41	2.41	
Chloroscombrus chrysurus	3.48	17	1.33	
Boops boops	3.31	207	1.27	
Pagellus bellottii	2.48	8	0.95	
Total	261.51		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 886  
 DATE:12/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1744  
 start stop duration  
 TIME :06:45:56 06:46:24 28 (min) Purpose code: 1  
 LOG :4573.15 4574.75 1.58 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 24 26 Validity code: 1  
 Towing dir: 15ø Wire out: 80 m Speed: 30 kn\*10

Sorted: Kg Total catch: 16.28 CATCH/HOUR: 34.89

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lagocephalus laevigatus	25.11	17	71.97	
Chloroscombrus chrysurus	8.70	43	24.94	
Sardinella aurita	1.07	11	3.07	
Total	34.88		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 887  
 DATE:12/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1750  
 start stop duration  
 TIME :09:17:12 09:17:34 22 (min) Purpose code: 1  
 LOG :4590.27 4591.54 1.22 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 62 44 Validity code: 1  
 Towing dir: 90ø Wire out: 135 m Speed: 30 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 888  
 DATE:12/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 1750  
 start stop duration  
 TIME :10:58:11 10:59:14 16 (min) Purpose code: 1  
 LOG :4604.26 4605.08 0.81 Area code : 2  
 FDEPTH: 77 77 GearCond.code:  
 BDEPTH: 77 77 Validity code: 1  
 Towing dir: 180ø Wire out: 380 m Speed: 30 kn\*10

Sorted: 123 Kg Total catch: 4318.46 CATCH/HOUR: 16194.23

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	11653.13	486521	71.96	1787
Dentex canariensis	1108.54	2318	6.85	
Pagellus bellottii	1096.95	3090	6.77	
Dentex macropthalmus	575.51	4635	3.55	
Sparus caeruleostictus *	258.79	581	1.60	
Scorpaena stephanica	208.58	968	1.29	
Boops boops	181.54	1354	1.12	
Dentex maroccanus	173.81	3476	1.07	
Mycteroperca rubra	135.19	195	0.83	
Plectorhinchus mediterraneus	122.70	150	0.76	
Zeus faber	115.88	386	0.72	
Parapristigomus octolineatum	112.01	195	0.69	
Pagellus acarne	54.08	968	0.33	
Dicologlossa cuneata	30.90	195	0.19	
Sardinella aurita	23.18	581	0.14	
Sepia officinalis hierredda	21.90	23	0.14	
Sparus auriga *	5.78	4	0.04	
Octopus vulgaris	4.80	8	0.03	
Total	15883.27		98.08	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 889  
 DATE:12/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1804  
 start stop duration  
 TIME :20:15:42 20:16:12 30 (min) Purpose code: 1  
 LOG :4674.31 4676.04 1.71 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 17 19 Validity code: 1  
 Towing dir: 330ø Wire out: 80 m Speed: 30 kn\*10

Sorted: 28 Kg Total catch: 87.48 CATCH/HOUR: 174.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	86.04	990	49.18	1789
Sardinella aurita	60.00	342	34.29	1788
Sardinella maderensis	9.00	24	5.14	
Trachurus trecae	8.40	132	4.80	
Sepia officinalis hierredda	4.16	6	2.38	
Pomadasy s rogersi	3.40	4	1.94	
Scomber japonicus	2.28	18	1.30	
Dicologlossa cuneata	0.60	6	0.34	
Sphyrna guachancho	0.60	6	0.34	
Pseudupeneus prayensis	0.24	6	0.14	
Penaeus notialis	0.12	6	0.07	
Penaeus kerathurus	0.12	6	0.07	
Total	174.96		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 890  
 DATE:12/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1809  
 start stop duration  
 TIME :03:22:53 04:14:23 30 (min) Purpose code: 1  
 LOG :4732.31 4733.98 1.64 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 73 63 Validity code: 1  
 Towing dir: 90ø Wire out: 160 m Speed: 38 kn\*10

TIME :22:47:29 22:47:59 28 (min) Purpose code: 1  
 LOG :4693.01 4694.55 1.50 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 58 50 Validity code: 1  
 Towing dir: 100ø Wire out: 135 m Speed: 30 kn\*10  
 Sorted: 34 Kg Total catch: 178.76 CATCH/HOUR: 383.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	211.29	11111	55.16	1790
JELLYOO	148.50	589	38.77	
Sepia officinalis hierredda	12.51	30	3.27	
Arius heudeloti	4.71	2	1.23	
Mugil capurrii	2.36	2	0.62	
Chlorophthalmus atlanticus	1.29	321	0.34	
Spherooides spengleri	0.86	21	0.22	
CONGRIDAE	0.54	21	0.14	
Loligo vulgaris	0.47	4	0.12	
Boops boops	0.43	75	0.11	
Sepia bertheloti	0.11	32	0.03	
Total	383.07		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 891  
 DATE:13/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1820  
 start stop duration  
 TIME :03:22:53 04:14:23 30 (min) Purpose code: 1  
 LOG :4732.31 4733.98 1.64 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 73 63 Validity code: 1  
 Towing dir: 90ø Wire out: 160 m Speed: 38 kn\*10

Sorted: 43 Kg Total catch: 2491.48 CATCH/HOUR: 4982.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	4932.20	254020	98.98	1791
Sardinella aurita - Juveniles	33.80	1170	0.68	
Spherooides spengleri	7.80	260	0.16	
Sardinella aurita	4.84	12	0.10	
Arius heudeloti	3.32	2	0.07	
Loligo vulgaris	1.00	4	0.02	
Total	4982.96		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 892  
 DATE:13/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1820  
 start stop duration  
 TIME :06:12:47 06:32:16 19 (min) Purpose code: 1  
 LOG :4746.49 4747.48 0.98 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 17 18 Validity code: 1  
 Towing dir: 270ø Wire out: 80 m Speed: 30 kn\*10

Sorted: Kg Total catch: 20.85 CATCH/HOUR: 65.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	47.43	805	72.04	1792
Dentex canariensis	15.09	16	22.92	
Trachurus trecae	2.46	41	3.74	
Pomadasy s incisus	0.51	3	0.77	
Sardinella aurita	0.32	6	0.49	
Loligo vulgaris	0.03	3	0.05	
Total	65.84		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 893  
 DATE:13/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1826  
 start stop duration  
 TIME :07:57:04 08:07:18 10 (min) Purpose code: 1  
 LOG :4755.66 4756.20 0.53 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 19 21 Validity code: 1  
 Towing dir: 200ø Wire out: 80 m Speed: 30 kn\*10

Sorted: Kg Total catch: 0.14 CATCH/HOUR: 0.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Auxis thazard	0.84	6	100.00	
Total	0.84		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 894  
 DATE:13/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 1841  
 start stop duration  
 TIME :15:44:09 16:14:09 30 (min) Purpose code: 1  
 LOG :4823.64 4825.27 1.62 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 17 14 Validity code: 1  
 Towing dir: 127ø Wire out: 75 m Speed: 35 kn\*10

Sorted: Kg Total catch: 118.18 CATCH/HOUR: 236.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	188.84	402	79.90	1794
Sardinella maderensis	25.20	54	10.66	1793
Diplodus sargus *	19.84	20	8.39	
Decapterus rhonchus	2.12	8	0.90	
Plectorhinchus mediterraneus	0.16	2	0.07	
Total	236.16		99.92	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 895  
 DATE:13/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1850  
 start stop duration Long W 1633  
 TIME :19:30:00 19:53:38 24 (min) Purpose code: 1  
 LOG :4853.10 4854.37 0.69 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 282 118 Validity code:  
 Towing dir: 280ø Wire out: 130 m Speed: 30 kn\*10  
 Sorted: Kg Total catch: 31.86 CATCH/HOUR: 79.65

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichiurus lepturus	78.20	2925	98.18
Trachurus trecae	1.45	63	1.82
Total	79.65	100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 896  
 DATE:14/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1859  
 start stop duration Long W 1657  
 TIME :23:35:43 00:05:35 30 (min) Purpose code: 1  
 LOG :4882.10 4883.83 1.70 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 943 809 Validity code:  
 Towing dir: 90ø Wire out: 130 m Speed: 35 kn\*10  
 Sorted: 38 Kg Total catch: 642.08 CATCH/HOUR: 1284.16

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Katsuwonus pelamis	1127.32	282	87.79
MYCTOPHIDAE	117.44	146800	9.15
Brama brama	29.04	264	2.26
DASYATIIDAE	6.52	2	0.51
Gempylus serpens	3.44	108	0.27
Cubiceps sp.	0.40	12	0.03
Total	1284.16	100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 897  
 DATE:14/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1900  
 start stop duration Long W 1642  
 TIME :02:30:15 03:00:12 30 (min) Purpose code: 1  
 LOG :4897.00 4898.96 1.96 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 127 114 Validity code:  
 Towing dir: 90ø Wire out: 160 m Speed: 36 kn\*10  
 Sorted: 43 Kg Total catch: 42.89 CATCH/HOUR: 85.78

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sphyrna zygaena	42.00	2	48.96
Trachurus trecae	35.20	2026	41.04
Engraulis encrasicolus	8.40	662	9.79
NEMICHTHYIDAE	0.04	10	0.05
Sardinella aurita	0.04	2	0.05
Brama brama	0.04	4	0.05
Cynoglossus sp.	0.02	2	0.02
Katsuwonus pelamis	0.02	4	0.02
Pteroscion peli	0.02	2	0.02
Total	85.78	100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 898  
 DATE:14/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1900  
 start stop duration Long W 1632  
 TIME :04:55:56 05:25:35 30 (min) Purpose code: 1  
 LOG :4907.22 4908.87 1.61 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 58 43 Validity code:  
 Towing dir: 90ø Wire out: 160 m Speed: 35 kn\*10  
 Sorted: 67 Kg Total catch: 945.02 CATCH/HOUR: 1890.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	1181.04	80808	62.49
Auxis thazard	689.92	1540	36.50
Sardinella aurita	13.44	532	0.71
Mugil cephalus	3.92	2	0.21
Sepia officinalis hierredda	1.12	28	0.06
Remora remora	0.60	2	0.03
Total	1890.04	100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 899  
 DATE:14/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1900  
 start stop duration Long W 1632  
 TIME :04:55:56 05:25:35 30 (min) Purpose code: 1  
 LOG :4907.22 4908.87 1.61 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 58 43 Validity code:  
 Towing dir: 90ø Wire out: 160 m Speed: 35 kn\*10  
 Sorted: 67 Kg Total catch: 945.02 CATCH/HOUR: 1890.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Auxis thazard	689.92	1540	36.50
Mugil cephalus	3.92	2	0.21
Sepia officinalis hierredda	1.12	28	0.06
Remora remora	0.60	2	0.03
Total	695.56	36.80	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 900  
 DATE:14/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 1910  
 start stop duration Long W 1638  
 TIME :09:38:09 10:12:26 34 (min) Purpose code: 1  
 LOG :4936.72 4938.58 1.82 Area code : 2  
 FDEPTH: 77 87 GearCond.code:  
 BDEPTH: 77 87 Validity code:  
 Towing dir: 310ø Wire out: 270 m Speed: 30 kn\*10  
 Sorted: 63 Kg Total catch: 1921.02 CATCH/HOUR: 3390.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	2192.82	16793	64.68
Trichiurus lepturus	1060.94	2118	31.30
Camponogramma glaycos	33.88	41	1.00
Scorpaena stephanica	21.18	159	0.62

Dentex macrophthalmus 20.12 1535 0.59  
 Decapterus rhonchus 17.54 28 0.52 1798  
 Loligo vulgaris 14.40 32 0.42  
 Octopus vulgaris 5.93 16 0.17  
 Sepia officinalis hierredda 5.58 2 0.16  
 Brotula barbata 5.29 53 0.16  
 Dicologlossa cuneata 5.29 424 0.16  
 Zeus faber 3.88 4 0.11  
 Engraulis encrasicolus 3.18 265 0.09  
 Total 3390.03 99.98

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 901  
 DATE:14/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 1944  
 start stop duration Long W 1705  
 TIME :20:10:07 20:39:53 30 (min) Purpose code: 1  
 LOG :5029.05 5030.64 1.56 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 99 101 Validity code:  
 Towing dir: 140ø Wire out: 130 m Speed: 30 kn\*10  
 Sorted: 24 Kg Total catch: 97.54 CATCH/HOUR: 195.08

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
MYCTOPHIDAE	78.00	22600	39.98
Trachurus trecae	64.00	3112	32.81
Pteroscion peli	42.00	6832	21.53
Engraulis encrasicolus	6.00	408	3.08
Trichiurus lepturus	3.64	14	1.87
Auxis thazard	1.24	2	0.64
PARALEPIDIDAE	0.20	2	0.10
Total	195.08	100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 902  
 DATE:15/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2000  
 start stop duration Long W 1724  
 TIME :03:52:18 04:22:15 30 (min) Purpose code: 1  
 LOG :5086.60 5088.30 1.67 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 47 45 Validity code:  
 Towing dir: 90ø Wire out: 125 m Speed: 35 kn\*10  
 Sorted: 85 Kg Total catch: 460.72 CATCH/HOUR: 921.44

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Engraulis encrasicolus	726.88	127336	78.89
Decapterus rhonchus	54.88	106	5.96
Sepia officinalis hierredda	53.90	2134	5.85
Trachurus trecae	40.48	2882	4.39
Mugil capurrii	34.84	12	3.78
Scomberomorus tritor	4.12	2	0.45
Scomber japonicus	2.64	22	0.29
Loligo vulgaris	1.76	110	0.19
Trachurus trachurus	0.88	2	0.10
Sardina pilchardus	0.44	44	0.05
Uranoscopus polli	0.40	2	0.04
Sphoeroides spengleri	0.22	22	0.02
Total	921.44	100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 903  
 DATE:15/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2000  
 start stop duration Long W 1710  
 TIME :06:43:55 06:55:28 12 (min) Purpose code: 1  
 LOG :5102.54 5103.19 0.67 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 24 24 Validity code: 1  
 Towing dir: 290ø Wire out: 80 m Speed: 30 kn\*10  
 Sorted: 19 Kg Total catch: 468.20 CATCH/HOUR: 2341.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Decapterus rhonchus	946.00	3960	40.41
Engraulis encrasicolus	925.00	333410	39.51
Sardinella maderensis	140.00	15180	5.98
Scomberomorus tritor	118.90	50	5.08
Arius heudeloti	85.00	110	3.63
Sardinella aurita	70.00	10450	2.99
Mustelus mustelus	16.00	35	0.68
Trachurus trecae	15.00	2200	0.64
Pomadasy incisus	6.60	20	0.28
Pomatodus saltatrix	5.80	5	0.25
Sepia officinalis hierredda	2.50	5	0.11
Total	2330.80	99.56	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 904  
 DATE:15/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2006  
 start stop duration Long W 1715  
 TIME :08:17:47 08:27:56 10 (min) Purpose code: 1  
 LOG :5112.08 5112.76 0.64 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 24 24 Validity code: 1  
 Towing dir: 170ø Wire out: 70 m Speed: 30 kn\*10

Sorted: 10 Kg Total catch: 1963.58 CATCH/HOUR: 11781.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	8110.08	362268	68.84	1807
Engraulis encrasicolus	2649.60	493056	22.49	1808
Sardinella maderensis	576.00	40320	4.89	
Sardina pilchardus	299.52	18432	2.54	
Scomberomorus tritor	72.00	36	0.61	
Stromateus fiatola	66.84	66	0.57	
Sepia officinalis hierredda	3.00	6	0.03	
Mustelus mustelus	2.28	6	0.02	
Stromateus fiatola	2.28	6	0.02	
Pomadasy incisus	1.80	6	0.02	
Diplodus vulgaris	0.96	6	0.01	
Total	11784.36		100.04	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 905  
 DATE:15/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2020  
 start stop duration Long W 1707  
 TIME :15:55:20 16:25:21 30 (min) Purpose code: 1  
 LOG :5181.36 5183.11 1.68 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 21 22 Validity code:  
 Towing dir: 270ø Wire out: 100 m Speed: 35 kn\*10

Sorted: 12 Kg Total catch: 26.39 CATCH/HOUR: 52.78

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	48.24	15972	91.40	1809
Sepia officinalis hierredda	2.08	10	3.94	
Arius heudeloti	1.32	2	2.50	
Sardinella aurita	0.40	144	0.76	
Pomadasy incisus	0.32	2	0.61	
Trachurus trecae	0.12	4	0.23	
Sardinella maderensis	0.08	8	0.15	
Sardina pilchardus	0.08	16	0.15	
Loligo vulgaris	0.08	4	0.15	
Schedophilus pamarco	0.04	2	0.08	
Microchirus sp.	0.02	2	0.04	
Total	52.78		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 906  
 DATE:15/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2027  
 start stop duration Long W 1706  
 TIME :17:43:36 18:06:40 23 (min) Purpose code: 1  
 LOG :5191.96 5193.56 1.59 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 25 24 Validity code: 1  
 Towing dir: 202ø Wire out: 130 m Speed: 30 kn\*10

Sorted: 36 Kg Total catch: 1906.12 CATCH/HOUR: 4972.49

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	2618.09	97941	52.65	1812
Sardina pilchardus	1671.24	58735	33.61	1810
Engraulis encrasicolus	605.01	100247	12.37	1811
Lichia amia	51.60	3	1.04	
Sardinella maderensis	10.85	814	0.22	
Decapterus rhonchus	0.83	3	0.02	
Total	4957.62		99.71	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 907  
 DATE:15/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 2032  
 start stop duration Long W 1714  
 TIME :19:59:19 20:08:52 10 (min) Purpose code: 1  
 LOG :5207.35 5207.88 0.51 Area code : 2  
 FDEPTH: 38 38 GearCond.code:  
 BDEPTH: 38 38 Validity code:  
 Towing dir: 300ø Wire out: 110 m Speed: 30 kn\*10

Sorted: Kg Total catch: 5.84 CATCH/HOUR: 35.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	30.36	1188	86.64	1813
Pagellus bellottii	3.72	102	10.62	
Sepia officinalis hierredda	0.36	18	1.03	
Loligo vulgaris	0.36	6	1.03	
Scomber japonicus	0.24	6	0.68	
Total	35.04		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 908  
 DATE:16/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2040  
 start stop duration Long W 1715  
 TIME :02:00:19 02:30:13 30 (min) Purpose code: 1  
 LOG :5267.67 5269.57 1.91 Area code : 2  
 FDEPTH: 7 5 GearCond.code:  
 BDEPTH: 42 41 Validity code:  
 Towing dir: 90ø Wire out: 150 m Speed: 38 kn\*10

Sorted: 37 Kg Total catch: 37.08 CATCH/HOUR: 74.16

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	37.96	896	51.19	1814
Loligo vulgaris	22.64	346	30.53	
Sardinella maderensis	7.08	20	9.55	
Scomber japonicus	2.52	28	3.40	
Pagellus bellottii	1.04	10	1.40	
Sepia officinalis hierredda	1.04	14	1.40	
Boops boops	0.60	88	0.81	
Sardinella aurita	0.56	4	0.76	
Trachurus trachurus	0.52	30	0.70	
Schedophilus pamarco	0.20	2	0.27	
Total	74.16		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 909  
 DATE:16/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2049  
 start stop duration Long W 1709

TIME :04:41:05 05:11:07 30 (min) Purpose code: 1  
 LOG :5284.28 5285.98 1.67 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 36 34 Validity code:  
 Towing dir: 270ø Wire out: 120 m Speed: 35 kn\*10  
 Sorted: 1 Kg Total catch: 1.65 CATCH/HOUR: 3.30

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	1.40	4	42.42	
Loligo vulgaris	1.04	68	31.52	
Sardinella aurita	0.84	2	25.45	
Sphoeroides spengleri	0.02	2	0.61	
Total	3.30		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 910  
 DATE:16/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2049  
 start stop duration Long W 1724  
 TIME :06:58:24 07:25:12 27 (min) Purpose code: 1  
 LOG :5298.99 5300.34 1.23 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 59 60 Validity code:  
 Towing dir: 360ø Wire out: 80 m Speed: 30 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION: 911  
 DATE:16/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 2050  
 start stop duration Long W 1739  
 TIME :09:34:56 09:43:13 8 (min) Purpose code: 1  
 LOG :5317.05 5317.47 0.41 Area code : 2  
 FDEPTH: 252 283 GearCond.code:  
 BDEPTH: 252 283 Validity code:  
 Towing dir: 180ø Wire out: 750 m Speed: 30 kn\*10

Sorted: 29 Kg Total catch: 229.18 CATCH/HOUR: 1718.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scorpaena sp.	1329.30	23258	77.34	
Merluccius senegalensis	108.30	263	6.30	
Zenopsis conchifer	96.45	143	5.61	
Trachurus trecae	67.20	158	3.91	
Lophiodes kempi	45.30	8	2.64	
Capros aper	19.80	495	1.15	
Brama brama	19.20	15	1.12	
Pteroscacion peli	15.30	1215	0.89	
MCTOPHIDAE	7.20	2115	0.42	
Scyliorhinus canicula	4.50	90	0.26	
Schedophilus pamarco	3.90	8	0.23	
Sepia officinalis hierredda	2.70	135	0.16	
Chlorophthalmus atlanticus	2.70	180	0.16	
Dentex macropthalmus	2.25	8	0.13	
Pseudupeneus prayensis	1.05	8	0.06	
Scomber japonicus	0.90	8	0.05	
Total	1726.05		100.43	

## Annex II Instruments and fishing gear used

The Simrad EK-500, 38kHz 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 38kHz where as follows:

<b>Transceiver-1 menu</b>	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 dg
	Alongship offset	-0.03 dg
Athwardship offset	0.06 dg	
<b>Display menu</b>	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
	<b>Printer- menu</b>	Range
TVG		20 log R
Sv colour min		-63 dB
<b>Bottom detection menu</b>	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

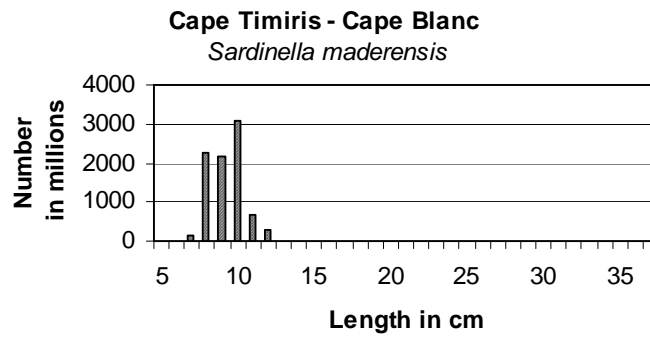
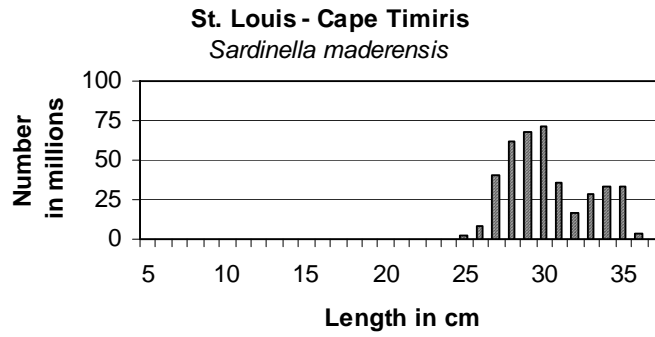
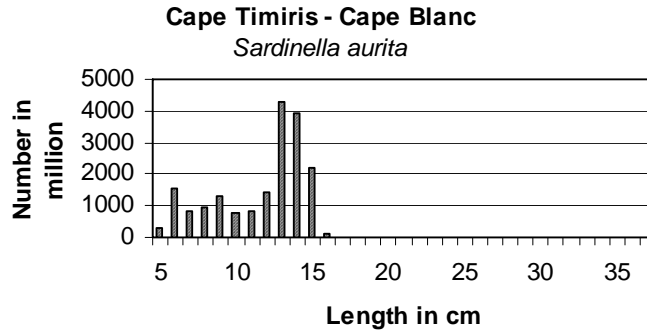
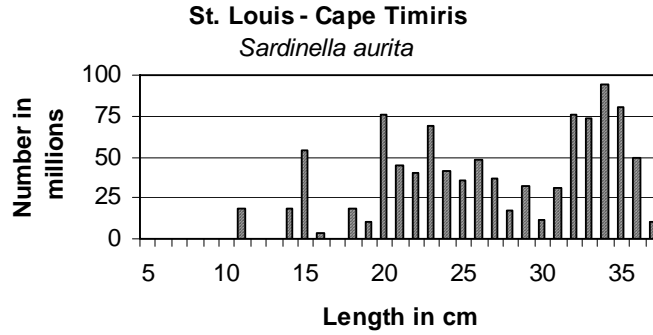
## **Hydrography**

Conductivity, temperature, density and dissolved oxygen were sampled regularly 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.

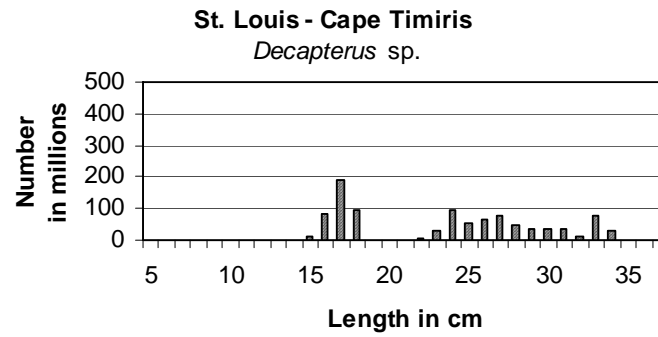
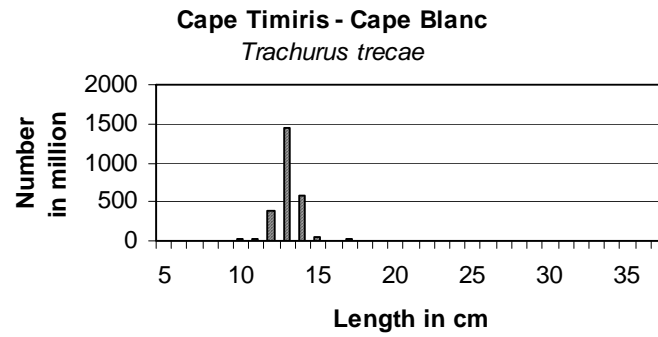
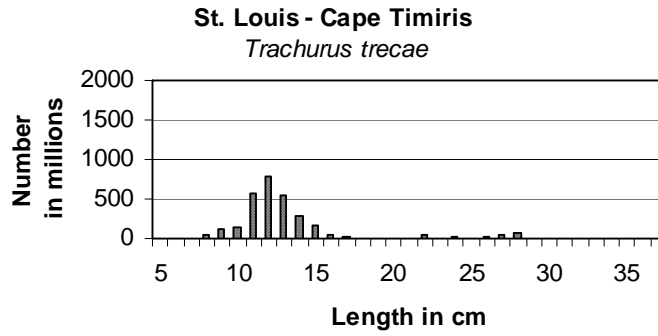
## **Fishing gear**

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super" bottom trawl. For all trawls, the Tyborøn, 7.8m<sup>2</sup> (1670kg) trawl doors were used. Complete drawings of the trawls used are included.

## Annex III Pooled length distributions by species and regions



### Annex III continued



## Annex IV Stock length distribution by numbers and weight

### *Sardinella aurita*

Length cm	Number in millions			Biomass (tonnes)		
	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL
5		312.4	312.4		486	
6		1 562.1	1 562.1		3 980	3 980
7		812.3	812.3		3 162	3 162
8		937.3	937.3		5 284	5 284
9		1 312.2	1 312.2		10 281	10 281
10		749.8	749.8		7 901	7 901
11	18.1	812.3	830.4	249	11 204	11 454
12		1 437.1	1 437.1		25 372	25 372
13		4 311.4	4 311.4		95 590	95 590
14	18.1	3 936.5	3 954.6	495	107 836	108 331
15	54.3	2 187.0	2 241.2	1 810	72 983	74 794
16	3.5	125.0	128.5	140	5 018	5 158
17						
18	18.1		18.1	1 019		1 019
19	10.5		10.5	689		689
20	76.2		76.2	5 821		5 821
21	44.9		44.9	3 943		3 943
22	40.1		40.1	4 035		4 035
23	69.1		69.1	7 902		7 902
24	40.9		40.9	5 292		5 292
25	36.1		36.1	5 258		5 258
26	47.7		47.7	7 792		7 792
27	36.3		36.3	6 603		6 603
28	17.2		17.2	3 488		3 488
29	31.8		31.8	7 139		7 139
30	11.1		11.1	2 754		2 754
31	31.5		31.5	8 586		8 586
32	75.4		75.4	22 532		22 532
33	73.5		73.5	24 002		24 002
34	93.9		93.9	33 471		33 471
35	80.9		80.9	31 363		31 363
36	49.2		49.2	20 729		20 729
37	10.1		10.1	4 614		4 614
TOTAL	988.5	18 495.5	19 484.0	209 727	349 097	558 338



## Annex IV continued

<i>Sardinella maderensis</i>						
Length cm	Number in millions			Biomass (tonnes)		
	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL
5						
6						
7		125.0	125.0		486	486
8		2249.4	2249.4		12 681	12 681
9		2187.0	2187.0		17 136	17 136
10		3061.7	3061.7		32 262	32 262
11		687.3	687.3		9 481	9 481
12		312.4	312.4		5 516	5 516
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25	2.5		2.5	358		358
26	8.2		8.2	1 334		1 334
27	40.9		40.9	7 443		7 443
28	62.1		62.1	12 577		12 577
29	67.8		67.8	15 201		15 201
30	71.8		71.8	17 774		17 774
31	35.1		35.1	9 569		9 569
32	16.3		16.3	4 882		4 882
33	28.4		28.4	9 278		9 278
34	33.7		33.7	12 016		12 016
35	33.7		33.7	13 077		13 077
36	3.4		3.4	1 420		1 420
37						
TOTAL	403.9	8622.9	9026.8	104928.7	77561.3	182 490

## Annex IV continued

*Trachurus trecae*

Length cm	Numbers in million			Biomass (tonnes)		
	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL	St. Louis- Cape Timiris	Cape Timiris- Cape Blanc	TOTAL
5						
6						
7						
8	44.2		44.2	249		249
9	126.0		126.0	987		987
10	149.0	14.6	163.6	1 570	154	1 724
11	564.5	14.6	579.1	7 787	201	7 988
12	792.3	393.7	1 186.1	13 988	6 951	20 940
13	545.8	1 443.7	1 989.5	12 100	32 009	44 109
14	275.4	568.7	844.1	7 543	15 580	23 123
15	166.1	58.3	224.4	5 543	1 947	7 489
16	57.2		57.2	2 297		2 297
17	12.6	29.2	41.7	600	1 394	1 994
18	4.7		4.7	263		263
19	11.2		11.2	736		736
20	9.0		9.0	690		690
21	11.0		11.0	963		963
22	55.3		55.3	5 562		5 562
23	9.0		9.0	1 034		1 034
24	34.8		34.8	4 506		4 506
25						
26	17.4		17.4	2 842		2 842
27	43.5		43.5	7 928		7 928
28	60.9		60.9	12 336		12 336
29						
30	8.7		8.7	2 154		2 154
31						
32						
33						
34						
35						
36						
37						
TOTAL	2 998.6	2 522.9	5 521.5	91 677	58 236	149 913

## Annex IV continued

*Decapterus* sp.

Length cm	Numbers in 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						
14						
15	10.4		10.4	347		347
16	84.4		84.4	3 390		3 390
17	193.4		193.4	9 244		9 244
18	95.1		95.1	5 361		5 361
19	2.6		2.6	172		172
20						
21	1.8		1.8	155		155
22	5.5		5.5	557		557
23	27.7		27.7	3 173		3 173
24	96.9		96.9	12 545		12 545
25	54.6		54.6	7 952		7 952
26	65.1		65.1	10 624		10 624
27	78.4		78.4	14 282		14 282
28	46.7		46.7	9 449		9 449
29	37.7		37.7	8 451		8 451
30	35.9		35.9	8 881		8 881
31	34.8		34.8	9 480		9 480
32	12.8		12.8	3 829		3 829
33	79.5		79.5	25 981		25 981
34	28.1		28.1	10 012		10 012
35	1.1		1.1	414		414
36						
37						
TOTAL	992.6		992.6	144 299		144 299

## Annex V Stratified biomass estimates

### 1. Stratified mean density

The stratified estimator of mean density in the entire area is calculated as (Cochran, 1977; eq. 5.1, p. 91)

$$\bar{y}_{st} = \sum_{i=1}^L W_i \bar{y}_i, \quad (1)$$

where

$L$  is the number of areas,

$n_i$  is the number of 5 NM observations in the  $i^{\text{th}}$  area,

$y_{i,k}$  is the  $S_A$ - value by the  $k^{\text{th}}$  5 NM interval in area  $i$ ,

$\bar{y}_i = \frac{\sum_{k=1}^{n_i} y_{i,k}}{n_i}$  is the average  $S_A$ - value in the  $i^{\text{th}}$  area, and

$W_i = \frac{\text{area}_i}{\text{total area}}$  is the proportion of the  $i^{\text{th}}$  area to the total area of distribution.

The estimated variance of the stratified mean,  $\bar{y}_{st}$ , is

$$\text{var}(\bar{y}_{st}) = \sum_{i=1}^L W_i^2 \frac{s_i^2}{n_i}, \quad (2)$$

where

$$s_i^2 = \frac{\sum_{k=1}^{n_i} (y_{i,k} - \bar{y}_i)^2}{n_i - 1}. \quad (3)$$

When  $\bar{y}_{st}$  is converted to fish densities ( $\text{t/nm}^2$ ) then an estimate of the total biomass in the total area is calculated by

$$B = \bar{y}_{st} \cdot \text{total area} \quad (4)$$

### 2. References

Cochran, W. G., 1977. Sampling Techniques, 3<sup>rd</sup> ed. John Wiley and Sons, New York, NY, 428 pp.

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

## Sardinellas

Stratified total biomass estimate

Equation numbers (1) and (2) refers to Appendix V in report

Sub-area	Area (NM <sup>2</sup> )	No Obs	Density (t/NM <sup>2</sup> )	CV (SA/5NM)	Equation(1)=	SD	Est. Variance	Equation (2)=
St, Louis-Cape Timiris	749	24	419.454	1.932	350.25	810.212	656443.881	19070.633
Cape Timiris-Cape Blanc A	109	3	3711.603	1.099	451.02	4077.738	16627943.324	81843.726
Cape Timiris-Cape Blanc B	39	2	566.894	0.819	24.65	464.254	215532.180	203.717

Total 897 Var(strat-mean)= 101118.08

Stratified mean= 825.91

SE(strat-mean)= 317.99

Total biomass = 740 844

## Horse Mackerels

Stratified total biomass estimate

Equation numbers (1) and (2) refers to Appendix V in report

Sub-area	Area (NM <sup>2</sup> )	No Obs	Density (t/NM <sup>2</sup> )	CV (SA/5NM)	Equation(1)=	SD	Est. Variance	Equation (2)=
St, Louis-Cape Timiris	<b>2373</b>	63	100.393	1.351	73.41	135.586	18383.504	156.046
Cape Timiris-Cape Blanc A	<b>229</b>	7	58.180	1.332	4.11	77.498	6005.935	4.273
Cape Timiris-Cape Blanc B	<b>376</b>	10	41.709	0.626	4.83	26.122	682.344	0.916
Cape Timiris-Cape Blanc C	<b>267</b>	9	130.015	1.039	10.70	135.062	18241.705	13.722

Total	3245						Var(strat-mean)=	174.96
-------	------	--	--	--	--	--	------------------	--------

Stratified mean =

SE(strat-mean)=

Total Biomass =	<input type="text" value="301 952"/>
-----------------	--------------------------------------

## Carangids etc.

Stratified total biomass estimate

Equation numbers (1) and (2) refers to Appendix V in report

Sub-area	Area (NM <sup>2</sup> )	No Obs	Density (t/NM <sup>2</sup> )	CV (SA/5NM)	Equation(1) =	SD	Est. Variance	Equation (2)=
St, Louis-Cape Timiris	3027	81	61.839	1.548	47.55	95.703	9159.150	66.844
Cape Timiris-Cape Blanc A	910	25	89.682	2.255	20.73	202.245	40902.998	87.411

Total	3937						Var(strat-mean)=	154.26
-------	------	--	--	--	--	--	------------------	--------

Stratified mean = 68.27

SE(strat-mean)= 12.42

Total Biomass =	268 798
-----------------	---------

## Anchovy

Stratified total biomass estimate

Equation numbers (1) and (2) refers to Appendix V in report

Sub-area	Area (NM <sup>2</sup> )	No Obs	Density (t/NM <sup>2</sup> )	CV (SA/5NM)	Equation(1)=	SD	Est. Variance	Equation (2)=
Cape Timiris-Cape Blanc	408	10	418.558	1.495	418.56	625.574	391343.354	39134.335

Total

408

Var(strat-mean)=

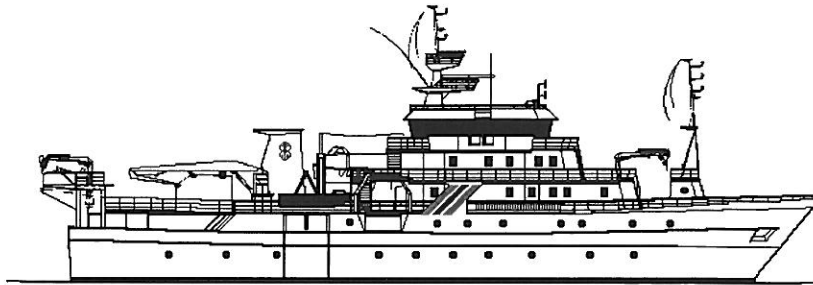
39134.34

Stratified mean = 418.56

SE(strat-mean)= 197.82

Total biomass = 170 772





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

**Part III MOROCCO**

**21 November - 19 December 1999**

**Institut National de Recherche Halieutique  
Casablanca, Maroc**

**Institute of Marine Research  
Bergen, Norway**

CRUISE REPORT "DR FRIDTJOF NANSEN"

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

**Part III MOROCCO**  
**21 November-19 December 1999**

by

**Tore Strømme\***

**Jeppe Kolding\***

**Marek Ostrowski\***

**Mostafa Chbani Idrissi\*\***

and

**Oddgeir Alvheim\***

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

\*\* Institut National de Recherche Halieutique  
Casablanca, Morocco

**Institute of Marine Research**

## TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION.....	1
1.1 Survey objectives .....	1
1.2 Participation .....	1
1.3 Narrative.....	2
1.4 Methods.....	5
CHAPTER 2 SURVEY RESULTS .....	10
2.1 Hydrography conditions .....	10
2.2 Distribution of pelagic fish on the shelf from Cape Blanc to Cape Juby .....	20
2.3 Distribution of pelagic fish on the shelf from Cape Juby to Casablanca .....	26
2.4 Biomass estimates .....	31
CHAPTER 3 CONCLUDING REMARKS .....	33
ANNEX I	Biomass and number by length
ANNEX II	Records of fishing stations
ANNEX III	Instruments and fishing gear used

## CHAPTER 1 INTRODUCTION

---

### 1.1 Survey objectives

The defined general objectives were to estimate and map the distribution and biomass 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 November-December 1999. Similar surveys in the region had been conducted annually in the same season in the period 1995-98.

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 21 days.

### 1.2 Participation

Members of the scientific teams were:

Institut National de Recherches Halieutiques, Morocco:

Mostafa CHBANI IDRISSE, Hamid CHFIRI, Hassan MOSTAHFID, Lahcen ABOUABDELLAH, and Hakim MESFIOUI(18.11-04.12).

Centre National de Recherches Océanographiques et des Pêches, Mauritanie:  
 Ebaye O. Mohamed MAHMOUD (18.11-04.12).

Institute of Marine Research, Norway(IMR):

Jeppe KOLDING (18.11-4.12, cruise leader), Tore STRØMME (4.12-19.12, cruise leader),  
 Marek OSTROWSKI (4.12-19.12), Oddgeir ALVHEIM, Magne OLSEN (18.11-4.12), Tore  
 MØRK, and Thor JOHANSSON.

Special team on sonar development (separate objective) 18.11-4.12:

From IMR: John DALEN, Bjørn TOTLAND

From Christian Michelsen Research: Per Erik NORDBØ

### **1.3 Narrative**

The survey started one day late due to delayed equipment arriving from Norway. Departure was from Nouakchott on November 20, steaming north to Cape Blanc to resume from where the Mauritanian survey ended. On November 21<sup>st</sup> in the evening the survey started off Cape Blanc and continued 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. High concentrations of sardine were found in the area between Dakhla and 25° N in accordance with the experience from previous years. This area was resurveyed in a denser zigzag pattern on November 29-30, in order to more accurately delineate the resources. The survey then continued north of 25° N to Laayoune where the survey was interrupted by a call at Las Palmas 4 December for bunkering and crew change. Hydrographic sections were carried out off Dakhla and Cape Bojador. The survey was resumed south of Laayoune on 6 December. Between Cape Juby and Cape Dra the sampling of the outer shelf was less intensive, with distance increased to 20 NM between the transects. Hydrographic sections were sampled off Cape Juby, Cape Dra, Agadir and Cap Sim. The vessel called on Agadir 15-16 December for disembarkment of the Moroccan research team. The vessel thereafter steamed to Las Palmas with arrival 18 December. The weather gave very favourable working conditions for the whole survey period.

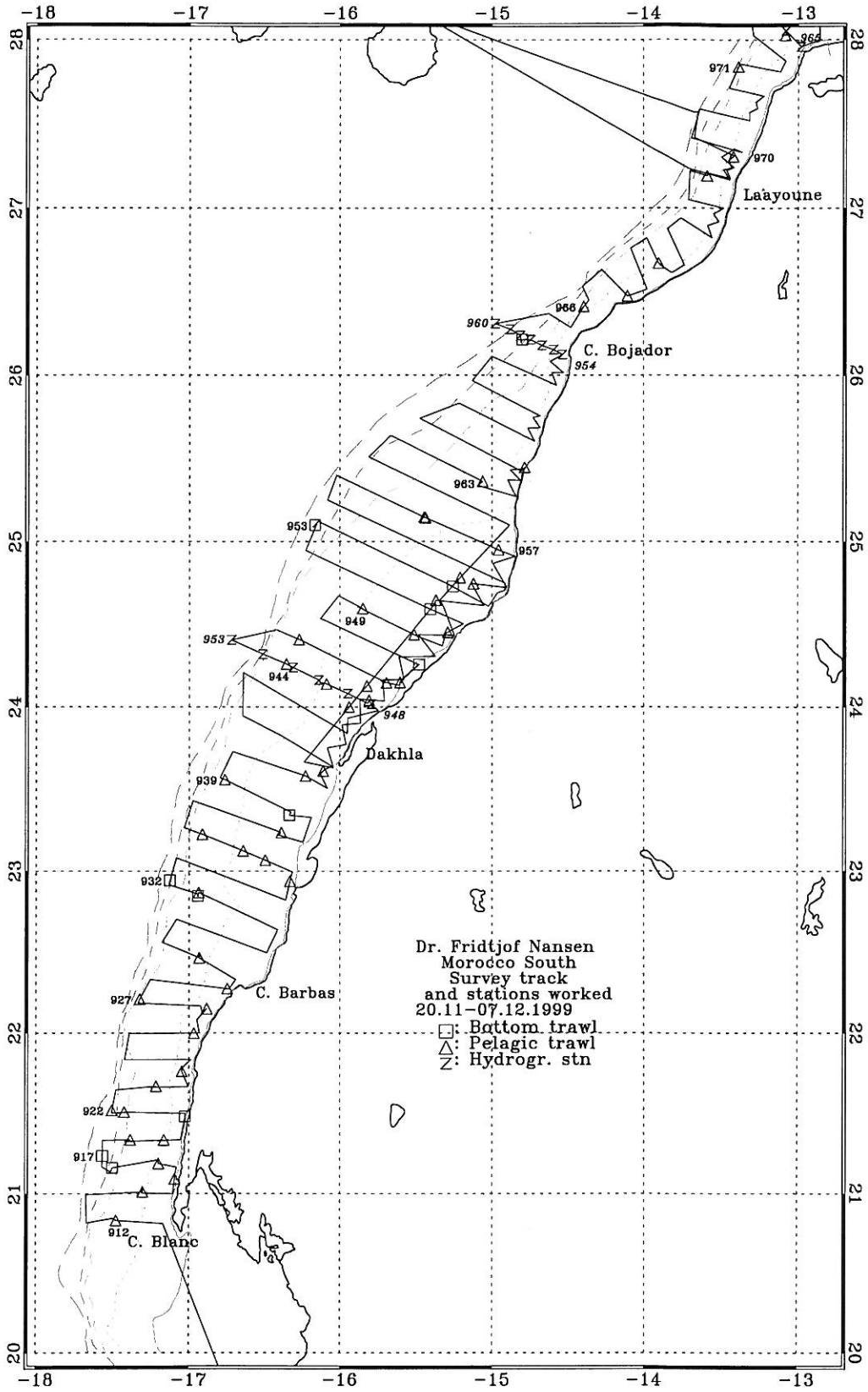


Figure 1a Course track with fishing and hydrographic stations, Cape Blanc to Cape Juby.

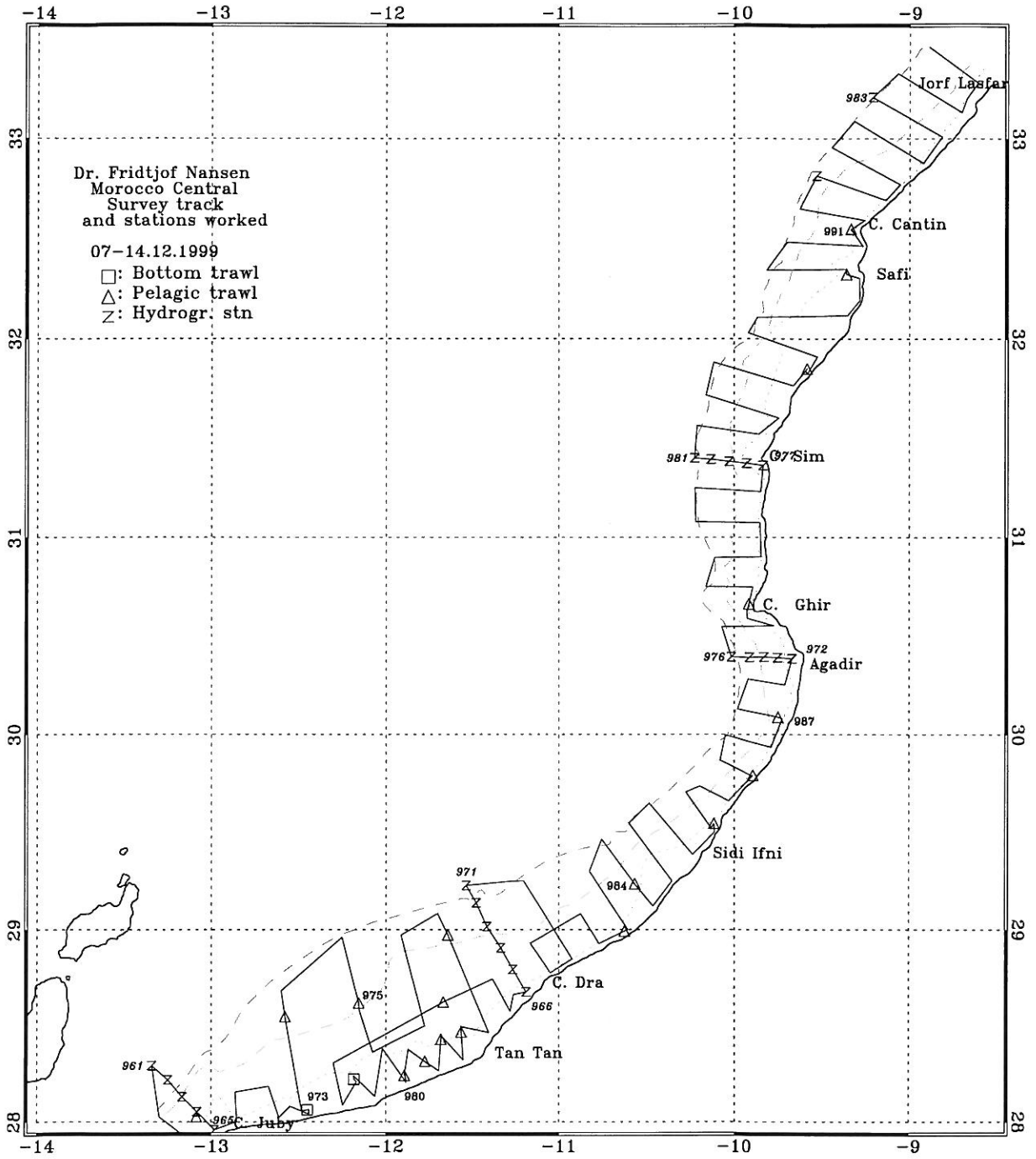


Figure 1b Course track with fishing and hydrographic stations, Cape Juby to Jorf Lasfar.

## 1.4 Methods

### *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. At each station on the standard hydrographic transects two 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 false scad *Decapterus rhonchus*),
- 5) Mackerels (chub mackerel *Scomber japonicus*),



- 6) Other pelagic scombrids, carangids and associated species (such as *Auxis* sp., *Caranx* sp. and largehead hairtail *Trichiurus lepturus*),  
 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:

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

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

$$C_{Fi} = 1.26 \cdot 10^6 \cdot L_i^{-2} \quad (1)$$

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:

$$\rho_i = s_A \cdot \frac{p_i}{\sum_{i=1}^n \frac{p_i}{C_{Fi}}} \quad (2)$$

where  $\rho_i$  = 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 ( $\sigma_{bs}^{-1}$ ) of a fish in length group  $i$

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

$$\rho_i = 1261217 * s_A^{-1} \frac{n_i}{\sum_{i=\min}^{\max} n_i l_i^2} \quad (3)$$

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 TS equation. For other TS relationships the equation constant is. The table is presented to facilitate a recalculation in case improved TS measurements are provided in the future:

Using equation (3), the pooled length distribution is used together with the mean  $s_A$ -value to calculate the density by length groups for each observed area of distribution. The total number by length group in the area is obtained by multiplying each density by the 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:

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

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

The specific condition factors obtained from the samples and applied for this survey were: 0.82 for sardine , 0.84 for sardinellas and horse mackerel and 0.54 for the anchovies.

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 are geographically segregated. When no segregation occurs the various length distributions are pooled together with equal importance. Otherwise, when the size distribution varies with the sampling site, 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 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 (3) 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 NAN-SIS software or spreadsheets after the scientist has completed the two first steps in the above list manually.

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

## CHAPTER 2 SURVEY RESULTS

---

### 2.1 Hydrographic Conditions

#### *Wind conditions and Subsurface Temperature*

Continuous recordings of temperature were done at the intake of seawater to the ship's cooling system. Since this water was pumped from depth of 5 meters, the measurements are representative to subsurface layer, as opposed to satellite imagery, which provides a temperature of a thin layer located directly at the surface (SST). Results in terms of distribution maps are presented in Figures 3a (Cape Blanc to Cape Juby) and Figure 3b (Cape Juby to Jorf Lasfar). These maps were interpolated from the data collected along the acoustic survey track (Figure 1). The main observed feature on those maps was a systematic decrease in temperature towards the coast, what indicated an ongoing upwelling. Indeed, the lowest temperatures were recorded along the inshore end-pieces of the transects, where they typically stayed in the range of 16 to 17°C. A notable exception occurred south of Dakhla, where the temperature > 18°C water spread across the whole survey region. This event was apparently connected to the wind slackening and changing direction in this region (Figure 4a), what hampered the development of upwelling. A similar event of the 18°C water spreading onshore during wind relaxation was recorded south of Agadir (Figure 3b and 4b).

Apart from the aforesaid events, the regular wind conditions persisted in the surveyed region, with the prevailing northeasterly trade winds oriented alongshore and thus creating favorable conditions for the development of upwelling (Figure 4).

#### *Subsurface Waters Masses and Coastal Upwelling*

The high productivity in a coastal area is associated with coastal upwelling systems, where, typically, nutrient-rich subsurface water masses rise to the surface and develop the chain of food web reactions: primary production - plankton - fish. However, the properties of the water masses drawn by the upwelling to surface are variable, and an opposite situation also occurs (e.g. el niño), in which the water mass entrained in the coastal area by upwelling is depleted from nutrients and hence it hampers, rather than stimulating the production. To accompany our abundance surveys carried out in the Moroccan upwelling area, we measure properties of the subsurface water masses of the region and trace their presence the coastal

area in order to understand in what ways their seasonal and interannual variability affects the productivity along the shelf.

The Moroccan shelf is located in the transition zone between two major hydrographic regimes of the northeast Atlantic. To the north, hydrography is dominated by the southward flowing Canary Current system, bringing to the region high temperatures, salinities and oxygen concentrations. South of the transition, water masses are of tropical origin, being relatively cooler, less saline and with lower oxygen concentrations. For consistence with existing oceanographic terminology, we use the term North Atlantic Central Water (NACW) for the northern domain, and South Atlantic Central Water (SACW) for the southern regime.

In the following, we describe the distribution of seawater properties along the Moroccan coast (temperature, salinity and oxygen), as these were observed during the 1999 survey. The results are presented in Figure 2 by means of vertical sections of temperature salinity and oxygen. These were obtained from the data collected along the set of sections parallel to coast, of which locations are depicted in the Figure 1.

SACW was clearly observed along the southernmost section off Cape Blanc, below the depth 70m. It was characterized by temperature less than  $17^{\circ}\text{C}$  and salinity less than  $35.8\text{‰}$ . In the salinity section, the subsurface isohalines formed a dome-like feature most pronounced at Stations 945 and 946. Based on the water density distribution (not included in this report), it was deduced that this feature manifested a northbound subsurface flow occurring offshore in the southern part of the surveyed region. From the oxygen distribution, it is evident that SACW was associated with very low oxygen concentrations ( $< 2 \text{ ml/l}$ ).

SACW was separated from the surface water by the thermocline at a depth of 70m. In the surface layer, the  $17^{\circ}$  and  $18^{\circ}\text{C}$  isotherms sloped up towards the coast, suggesting an ongoing upwelling event, uplifting the cooler waters to the surface. However, a detectable increase in the near-bottom temperature and salinity at the inshore station (Table 1), indicated that the upwelled waters were drawn from above the thermocline rather than from the underlying subsurface SACW layer.

There is a well know fact (i.e. Manríquez, Fraga, 1982) that north of Cape Blanc a drastic change in water properties occurs, marking the transition from SACW to NACW. This transition zone appears to pose a natural hydrographic boundary dividing the major pelagic fish stocks of the region: sardinellas in the south, and sardines in the north.

The second surveyed section at Dakhla, some 200 nautical miles to the north of Cape Blanc, was certainly in the northern side of the aforementioned transition boundary. The hydrographic regime observed along this section was entirely within the domain NACW. At the outermost station (Station 953), for example, at depth of 200m, the observed temperature was 16.2°C, salinity 36.3‰ and oxygen concentration was 4 ml/l. For comparison, at the respective station from Cape Blanc section (Station 947) the temperature was 13.5°C, salinity 35.6‰ and oxygen concentration was 1.4 ml/l.

The warm and saline body of water ( $T > 19^{\circ}\text{C}$ ,  $S > 36.7\text{‰}$ ) visible in the western part of the Dakhla section bears the T-S signature of the southward flowing Canary Current. Under the current, in the shelf break region, upwelling process was detectable in terms the subsurface water at temperature 17°C and salinity 36.3‰ advancing onshore. This upwelled water extended inshore to Station 951, where it reached the depth of 45 meters. Further inshore, in the surface layer, a slight decrease of temperature towards the coast was observed, but salinity was uniform and relatively high ( $>35.5\text{‰}$ ). The presence of this high and uniform salinity near the coast in conjunction with the recorded low wind velocities on the approach to Dakhla section (Figure 4a) indicated that upwelling was in a stage of relaxation: decreasing alongshore wind stopped the offshore transport of the surface water, and gave rise to the compensational flow of the more saline water from the Canary Current domain onto the coast.

The next section along the survey path was that off Cape Bojador. The shelf at this location becomes steeper and narrower. The surface body of water associated with the Canary Current penetrated deep inshore. Still, there were clear signs of the upwelling of the  $T=17^{\circ}\text{C}$  and  $S=35.3\text{‰}$  water across the shelf. At the innermost station (Station 954) the upwelled water was present from the bottom to the depths of 20 m (Table 1). At the shallower depths, the warmer and more saline surface waters, connected to the Canary Current were observed.

The high temperature and salinity waters transported with the Canary Current were observed on the two subsequent sections along the survey path, off Cape Juby and Cape Dra. These two locations are in the region where the ocean boundaries form a narrow passage with the eastern Canary Islands Fuerteventura and Lanzarote. To the north of this passage, at the two northernmost sections of the survey, off Agadir and Cape Sim the T-S signature of the Canary Current disappeared from the record.

The presence of the subsurface waters in the coastal area, attributable to upwelling persisted on all sections northwards of Cape Bojador. Towards the North the upwelled waters along the coast became cooler and less saline, matching the change in the water properties of the

NACW subsurface layer on the offshore side of each respective section. Oxygen concentrations in the upwelled water, except that off Cape Blanc, were higher than those observed in the subsurface layer (Table ??).

Table 1. Comparison between temperature, salinity and oxygen observed near the bottom at the shelf-break station and the station nearest to the coast. A close match between the offshore and inshore temperatures and salinities indicates an influence of upwelling.

Section	Stations at shelf break					Inshore stations				
	Station	Depth	T (°C)	S(psu)	O <sub>2</sub> (ml/l)	Station	Depth	T (°C)	S(psu)	O <sub>2</sub> (ml/l)
Cape Blanc	945	96	14.6	35.6	1.3	941	30	17.0	36.0	1.9
Dakhla	953	103	17.0	36.3	2.9	948	22	18.1	36.5	5.9
Cape Bojador	957	134	16.9	36.4	4.3	954	28	16.8	36.4	4.7
Cape Juby	963	095	17.1	36.4	4.3	965	33	17.4	36.4	4.8
Cape Dra	970	137	16.8	36.4	4.1	966	32	16.1	36.3	5.6
Agadir	975	118	15.9	36.3	3.8	972	23	16.4	36.3	5.0
Cape Sim	980	119	16.1	36.3	4.6	972	18	16.3	36.3	5.0

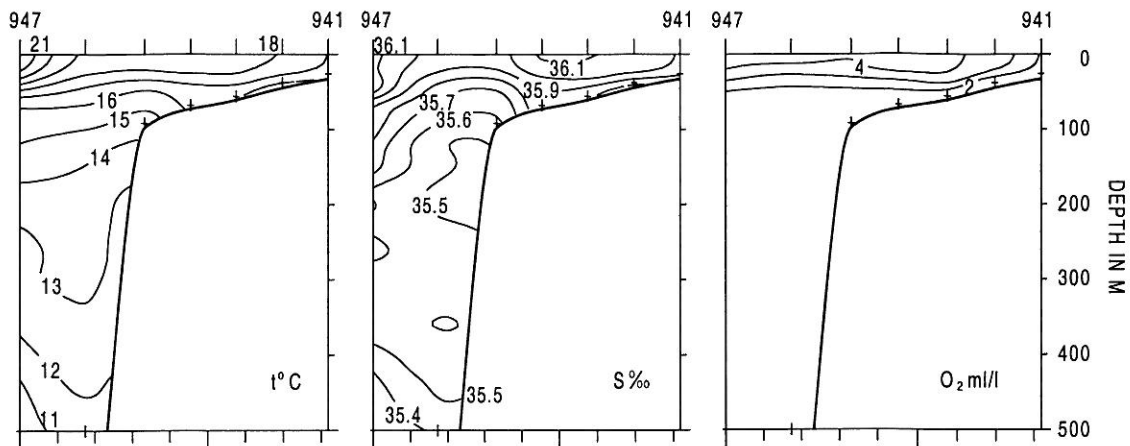
The main features of the hydrographic conditions encountered during the survey agreed well with the long-term seasonal distributions for the winter season (Mittelstaed, 1991). (1) SACW was detected only in the southernmost part of survey area, while NACW persisted on the remaining sections. (2) Hydrographic signatures of the ongoing upwelling events were observed throughout the whole survey area.

### References:

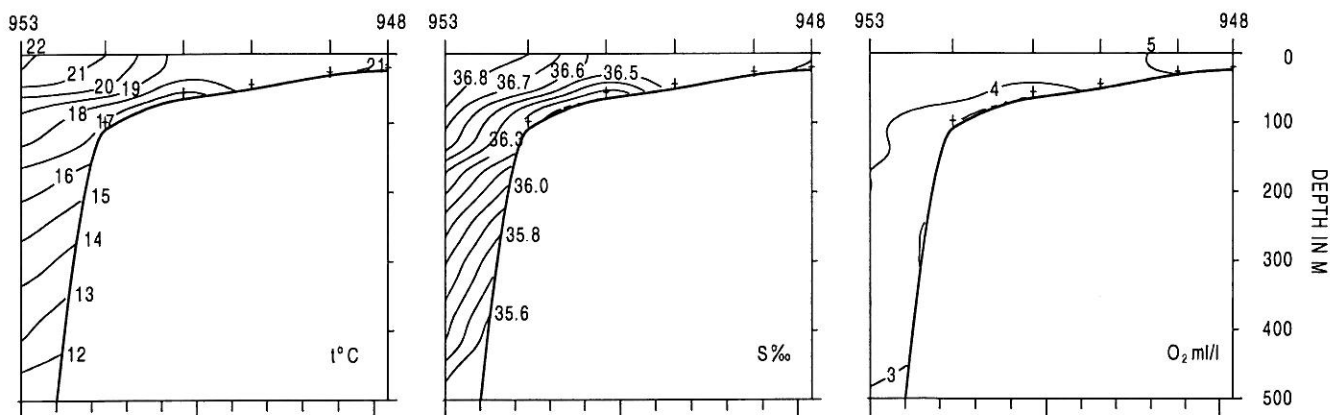
Manríquez, M., Fraga, F. 1982. The distribution of water masses in the upwelling region off Northwest Africa in November. *Rapports Et Proces-Verbaux Des Reunions*, vol 18, pp. 39-47.

Mittelstaedt, E. 1991. The ocean boundary along the northwest African coast: Circulation and oceanographic properties at the sea surface. *Prog. Oceanog.* Vol. 26, pp. 307-355

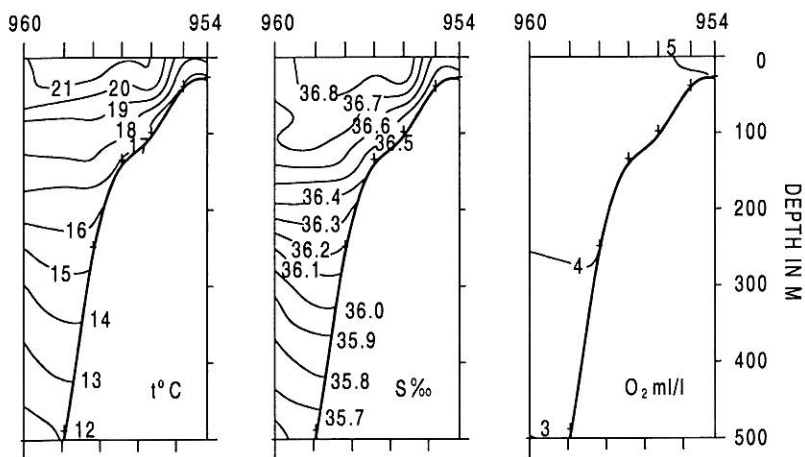




**CAPE BLANC 16.11.1999**



**DAKHLA 26-27.11.1999**



**CAPE BOJADOR 02.12.1999**

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

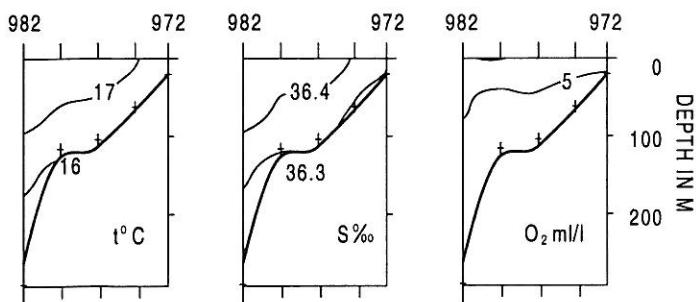
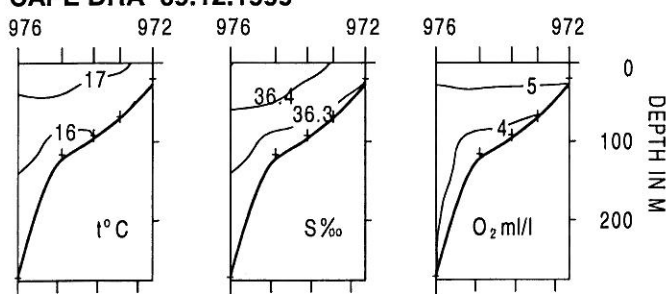
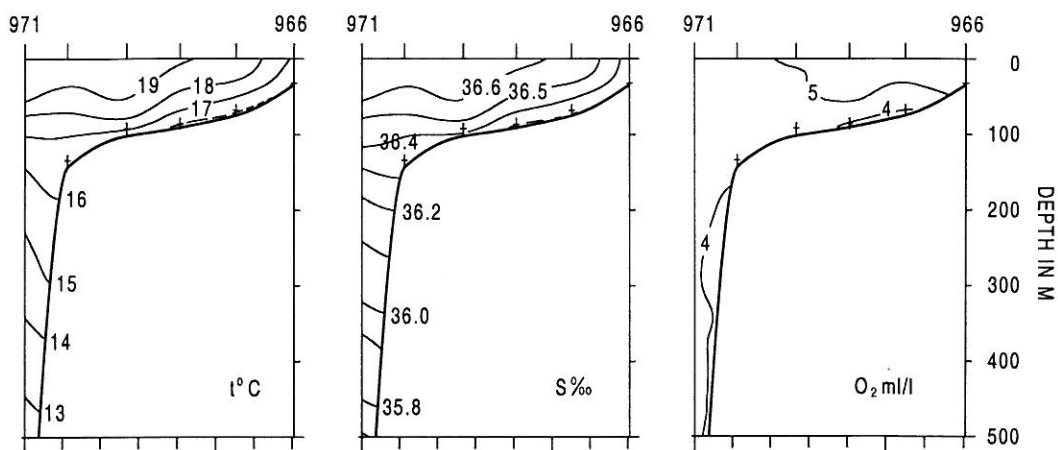
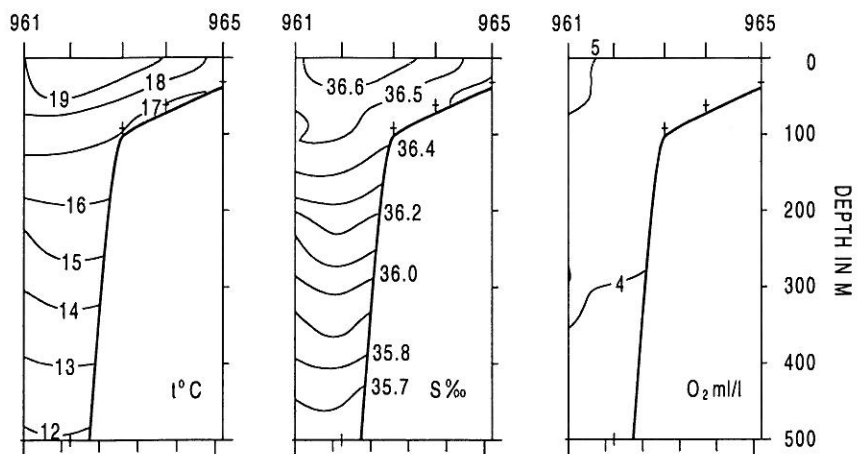


Figure 2 cont. Hydrographic profiles with distribution of temperature, salinity and oxygen.

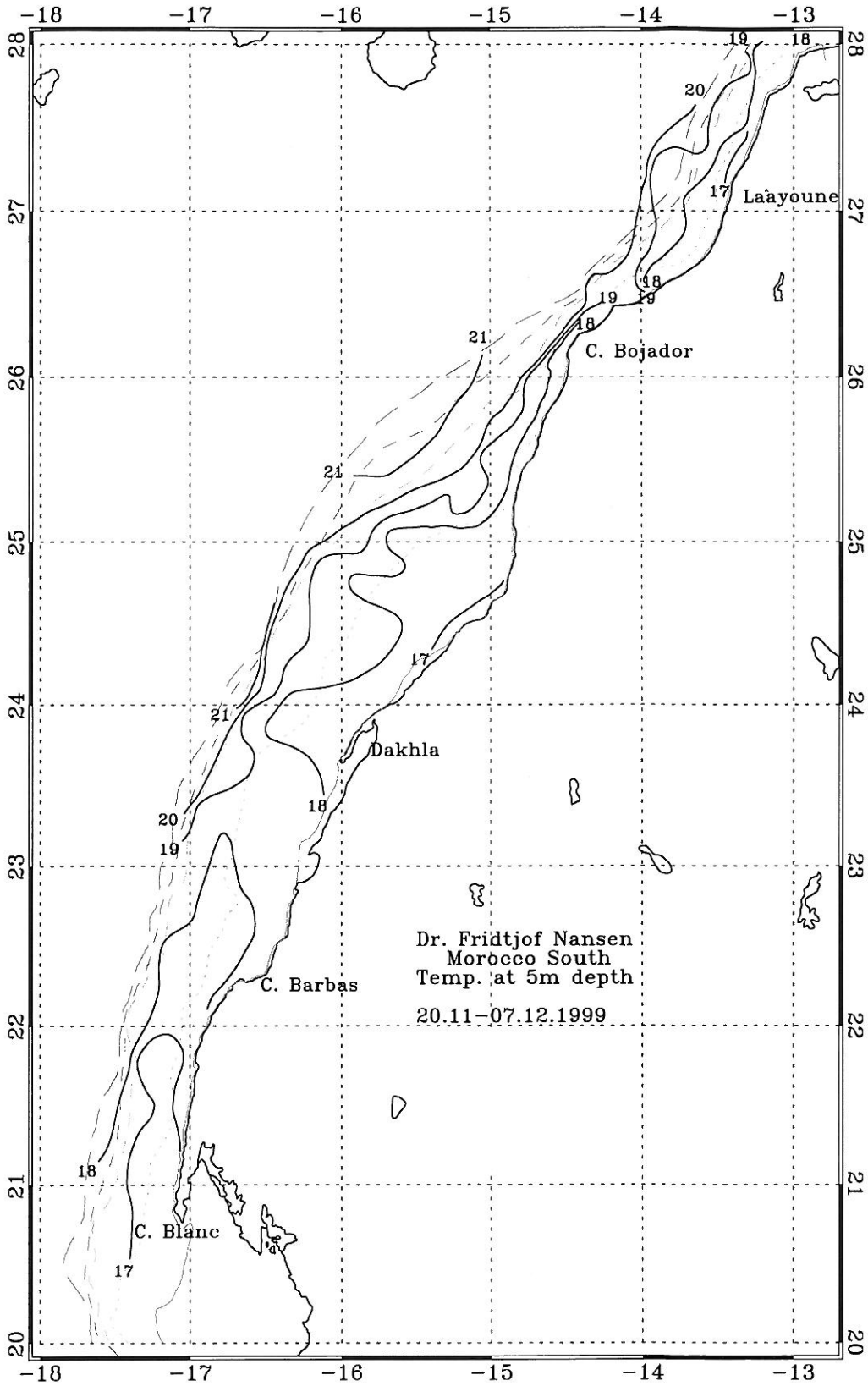


Figure 3a Sea surface temperature, Cape Blanc to Cape Juby.

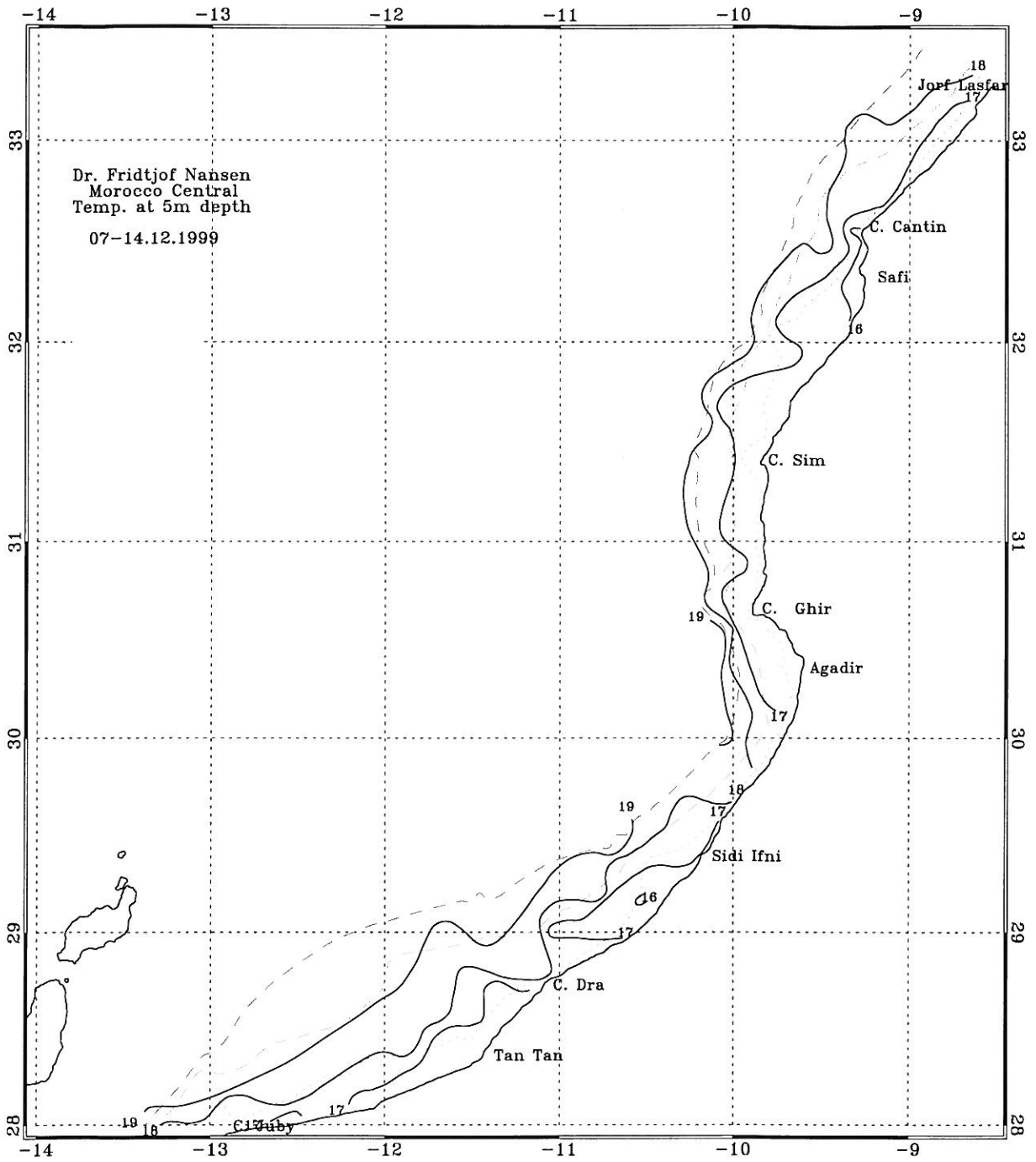


Figure 3b Sea surface temperature, Cape Juby to Jorf Lasfar.

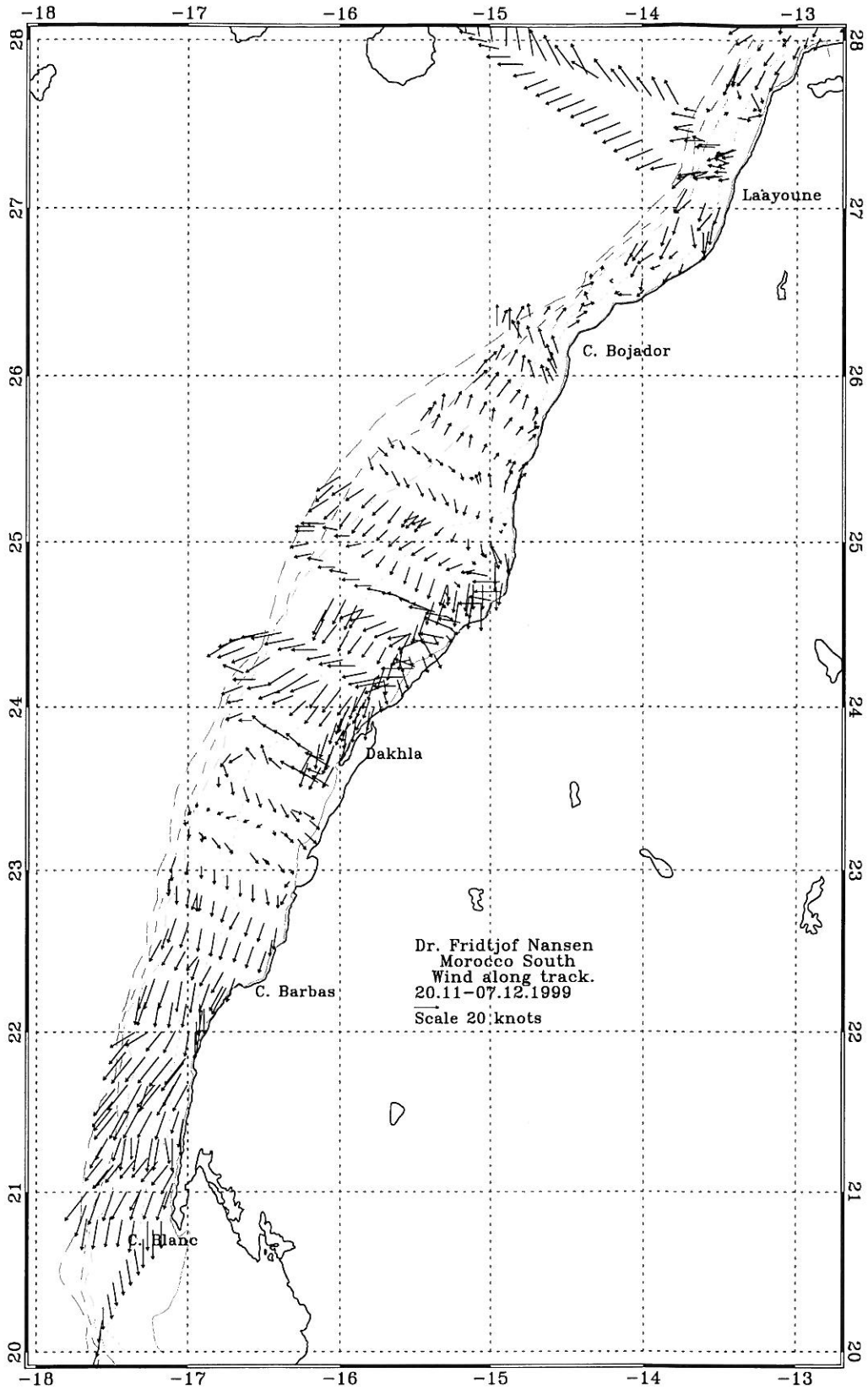


Figure 4a Wind conditions along the survey track 18 November - 6 December, Cape Blanc to Cape Juby.

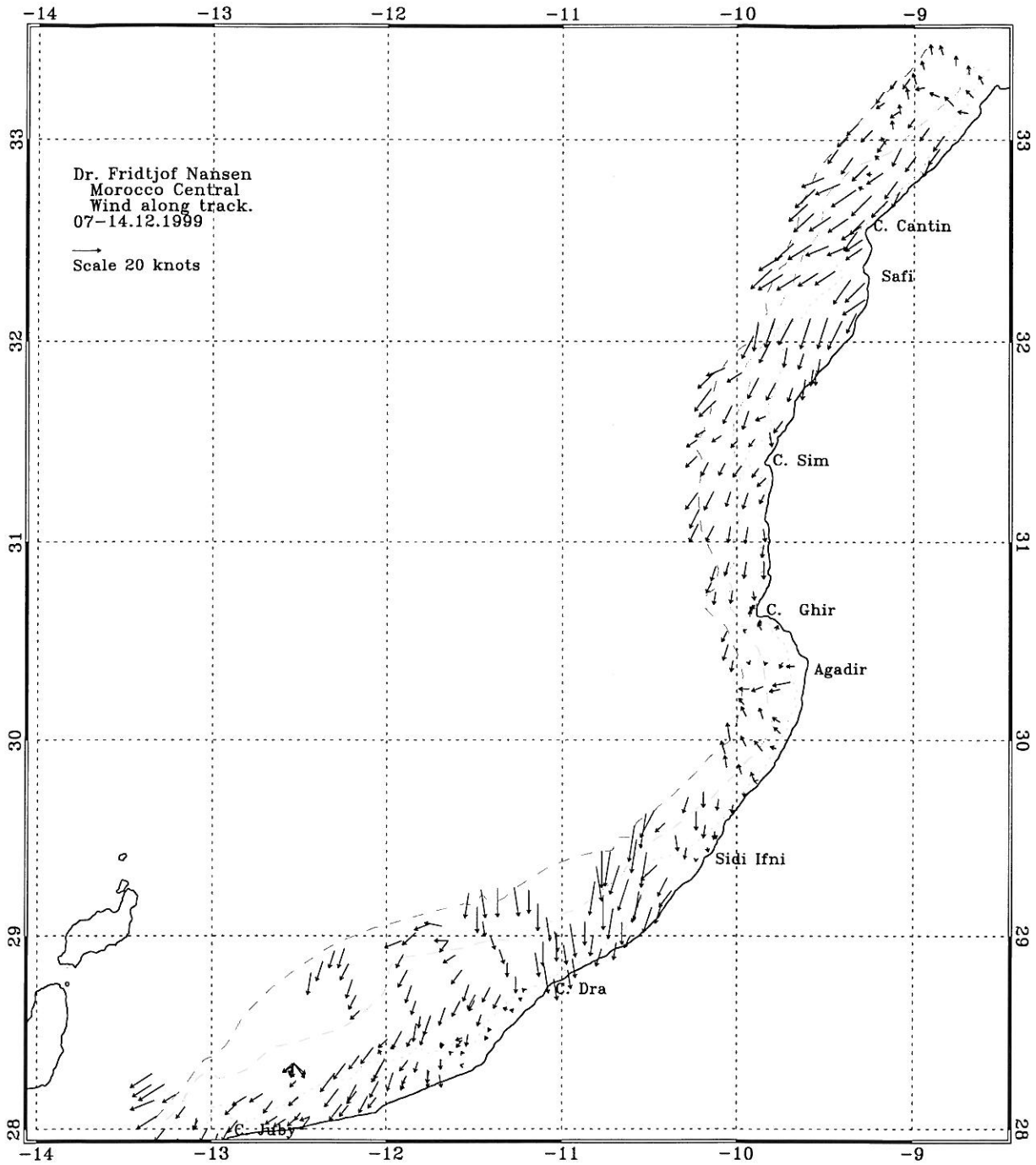


Figure 4b Wind conditions along the survey track 6-15 December, Cape Juby to Jorf Lasfar.

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

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

**Sardine**, The southernmost aggregation of sardine *Sardina pilchardus* were found west of Cape Barbas (Fig. 5). This was mainly small sized fish with modal length 12-13 cm. Two main concentrations were found between about 23°00'N and 25°20'N much in line with the distribution the previous year. The densest aggregations, close to the shore, consisted mostly of sardine with modal length in samples between 17 and 18 cm, but older fish with mode around 21 cm were also present. The fish were observed in dense schools, well suited for acoustic estimation and sufficient off the coast for the vessel to detect the inner limit of the distribution. The survey between Cape Bojador and Cape Juby was interrupted by a call at Las Palmas. After the call part of the area south of Laâyoune was re-covered to control for movement of fish in the interim period. The 27° latitude was chosen as the splitting point between the two coverages as this was an area with little fish. Three dense concentrations of sardine were found in this region (Fig. 5). Pooled mean  $s_A$  values classified by depth zones give a picture on how the fish is distributed by depth, Figure 9. It shows that the highest densities are found in the 20-30 m bottom depth zone decreasing considerably towards 50 m.

The length frequency distribution of sardines shows that between Cape Blanc and Cape Bojador the fish consist of two modes of 15.5 and 20.5 cm (Figure 10a). The sardine between Cape Bojador and Cape Juby (Fig. 10b) have modal lengths around 13 and 19 cm.

**Sardinellas** were mainly found between Cape Blanc and Cape Barbas and in high densities (Fig. 6). In addition some small and relatively weak patches were found off Dakhla and Cape Bojador. It was a mixture of flat sardinella (*Sardinella maderensis*) and round sardinella (*Sardinella aurita*), but the latter's mean share in the catches about 2/3. The sardinellas were mainly found between 40 and 100 m bottom depth Figure 9.

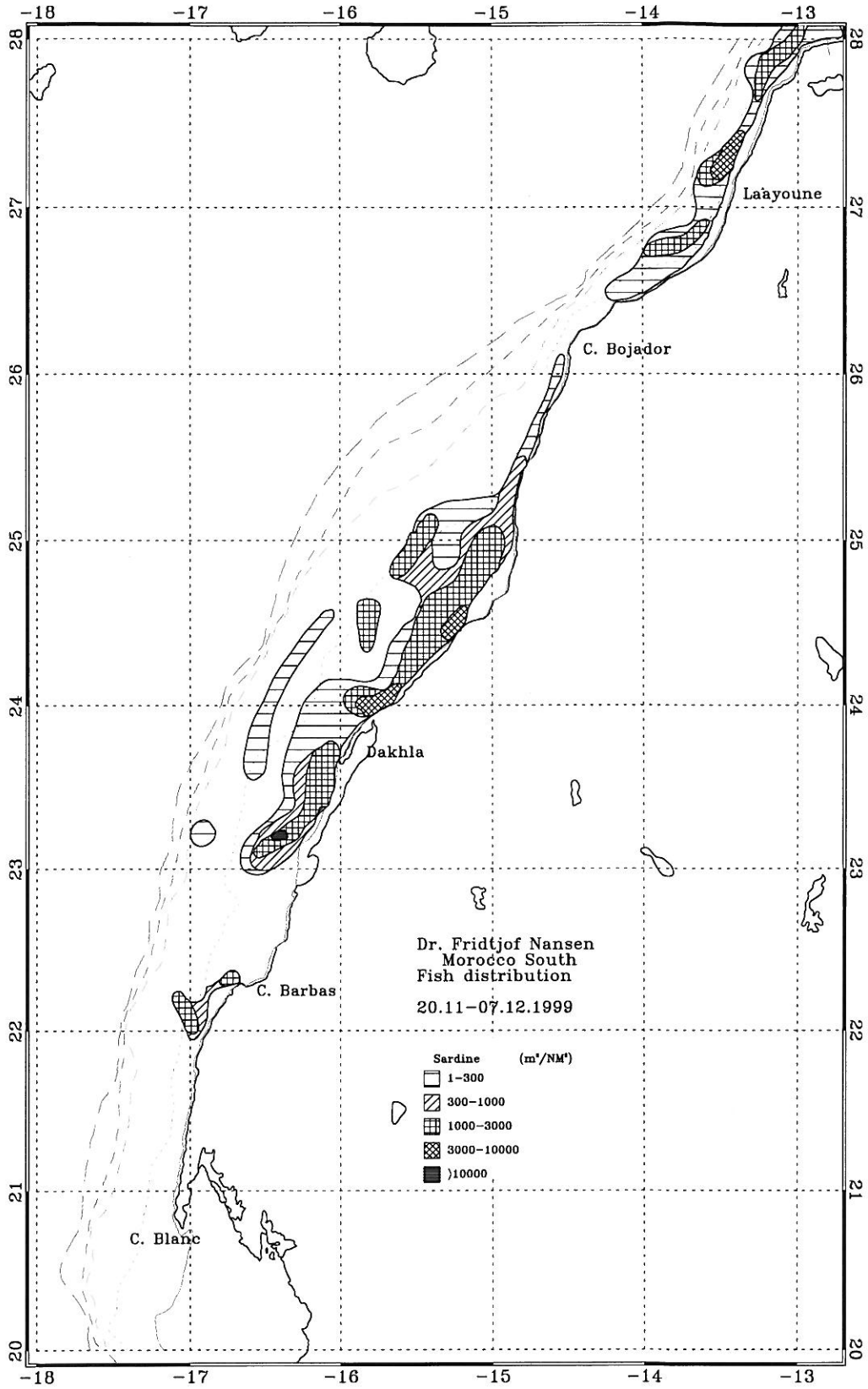


Figure 5 Distribution of sardine, Cape Blanc to Cape Juby.



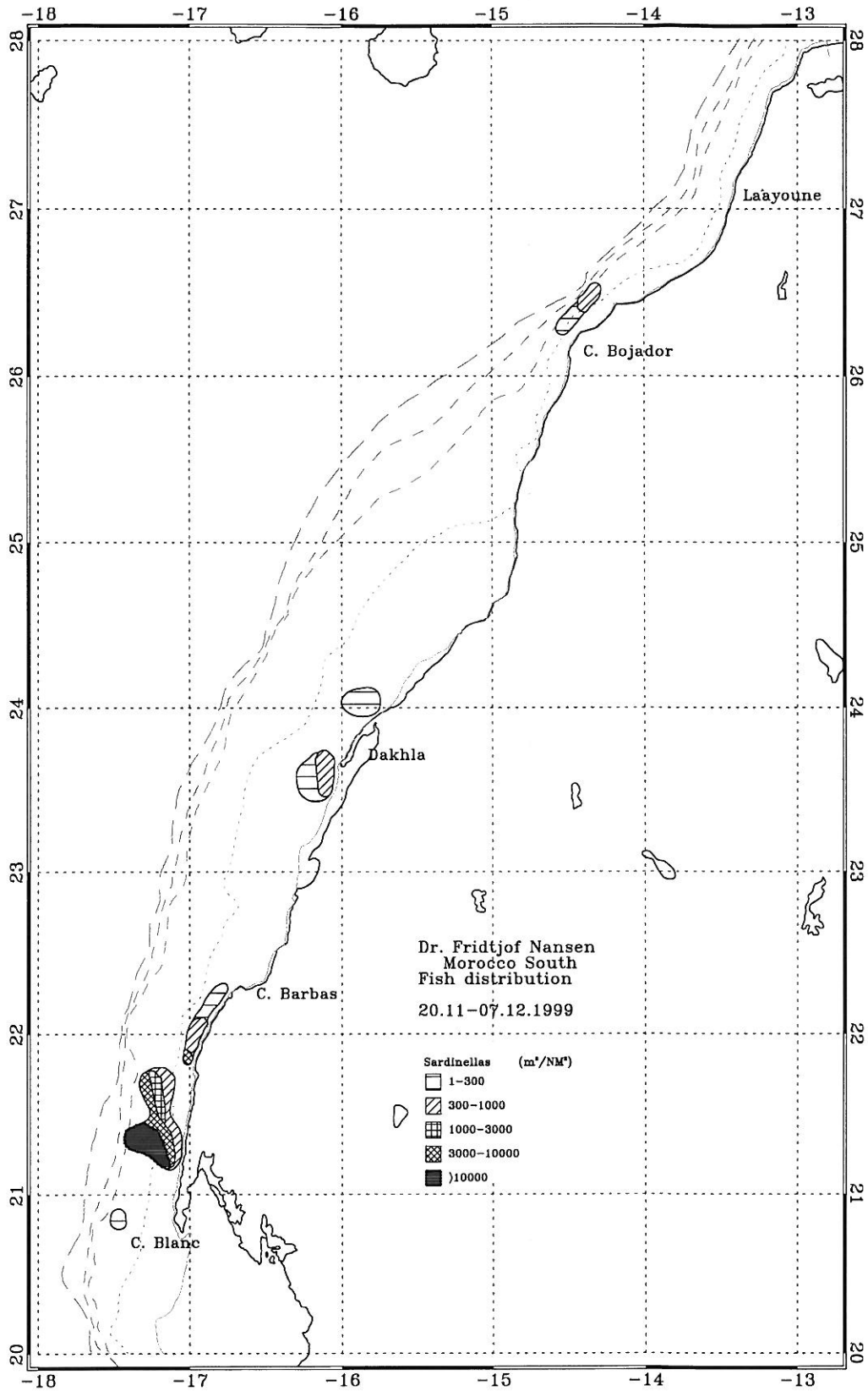


Figure 6 Distribution of sardinella, Cape Blanc to Cape Juby.

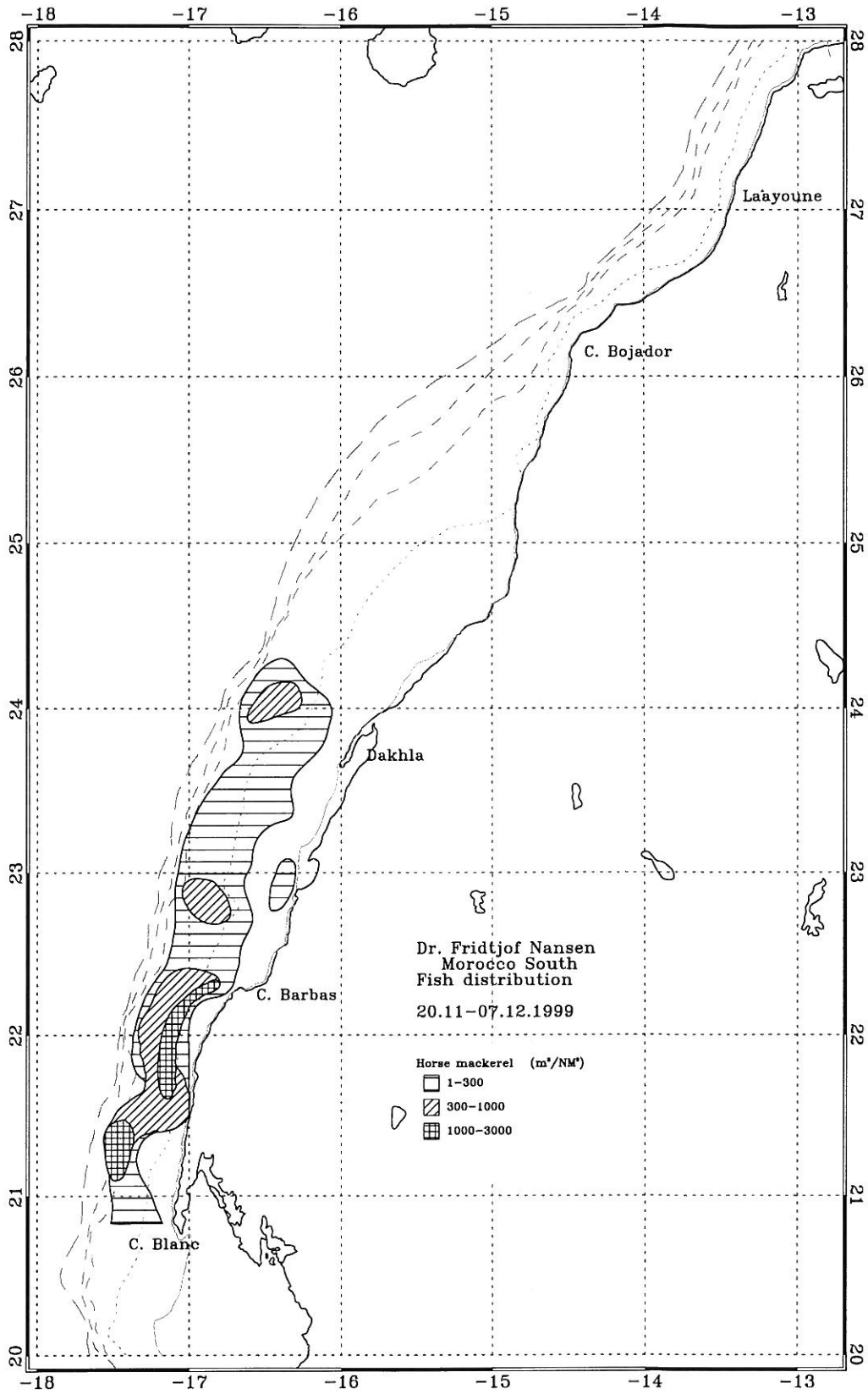


Figure 7 Distribution of horse mackerel, Cape Blanc to Cape Juby.

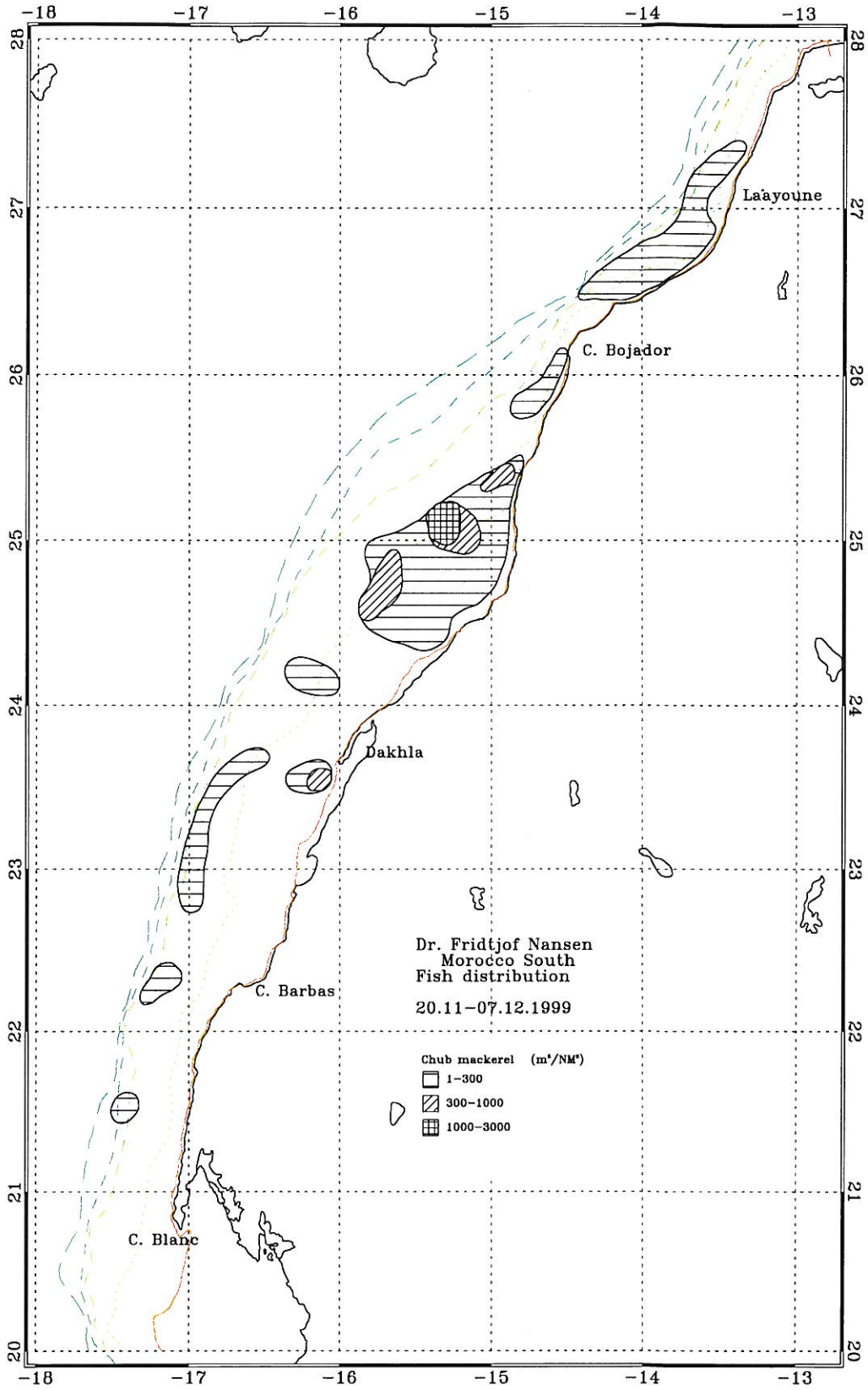


Figure 8 Distribution of chub mackerel, Cape Blanc to Cape Juby.

**Horse mackerels** (*Trachurus trachurus* and *T. trecae*) were found in a more or less continuous belt along the coast from Cape Blanc to about 24°30'N (Figure 7). The two species were mixed, but with a dominance of the Cunene (*T. trecae*) in the catches by about 75 %. The horse mackerel classification was mainly based on the characteristics of the echo traces. The horse mackerel were mainly registered between 50 and 100 m bottom depth (Figure 9).

**Chub mackerel** (*Scomber japonicus*) were a common species from Dakhla and northwards, in contrast to previous surveys (Figure 8). Aggregated patches were located close to the 50 m bottom depth contour between 24°30' and 25°30' N.

**Anchovy** were only recorded at one low-density patch off Cape Barbass.

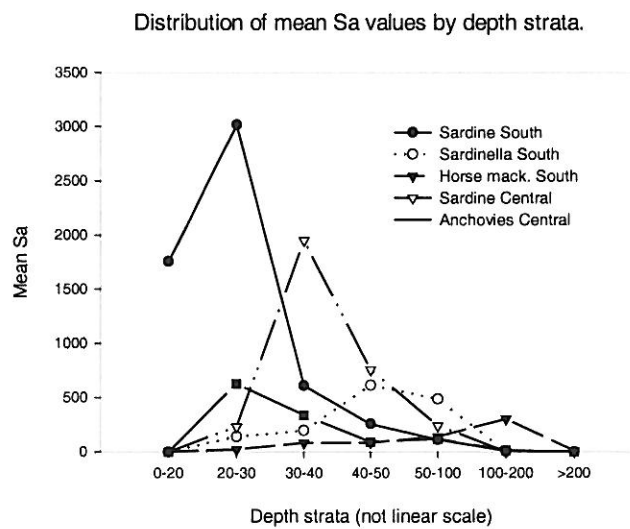


Figure 9 Distribution of mean  $S_A$  values by depth strata, Cape Blanc – Cape Bojador

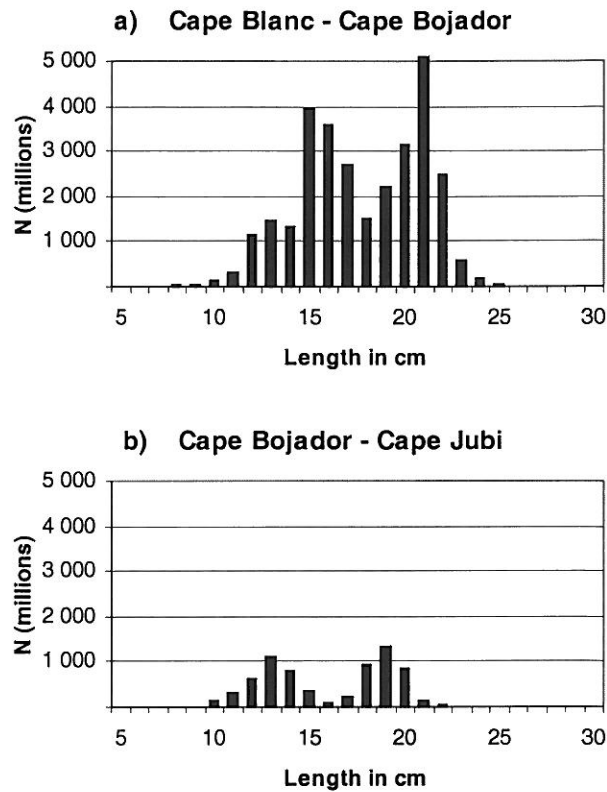


Figure 10 Length frequency distributions sardine.

### 2.3 Distribution of pelagic fish on the shelf from Cape Juby to Jorf Lasfar.

**Sardine** (Figure 11) was found as a continuous and mostly dense band in the shallow areas from Cape Juby up to about  $30^{\circ}$  N. Further north a few patches were located but with lower densities, except one small very dense patch off Cape Cantin. In general, the pattern was much like the distribution observed the previous year. The estimated composite length frequency distribution from the area (Figure 15) shows that the sardine is composed of two cohorts, with modal lengths 12 and 15 cm respectively. The distribution of  $s_A$  values (Figure 9) show that the sardine is mainly concentrated in the 30-40 m bottom depth zone.

**Anchovy** (Figure 12) was found mainly all along the coast; in patches south of Sidi Ifni and in a continuous band further north. The highest concentrations were located off Agadir and south of Safi. The distribution pattern is much similar to the previous year. Most of the fish was found in shallow waters, except off Safi were it was located over 70-80 m bottom depth. The size range was 8-15 cm and mean size in the range 10-13 cm. The highest acoustic densities were obtained in the 20-30 m depth zone (Figure 9).

**Horse mackerel** (Figure 13) and **chub mackerel** (Figure 14) were both fairly common, but scattered. North of Cape Juby neither species formed aggregations of interest for a targeted fishery.

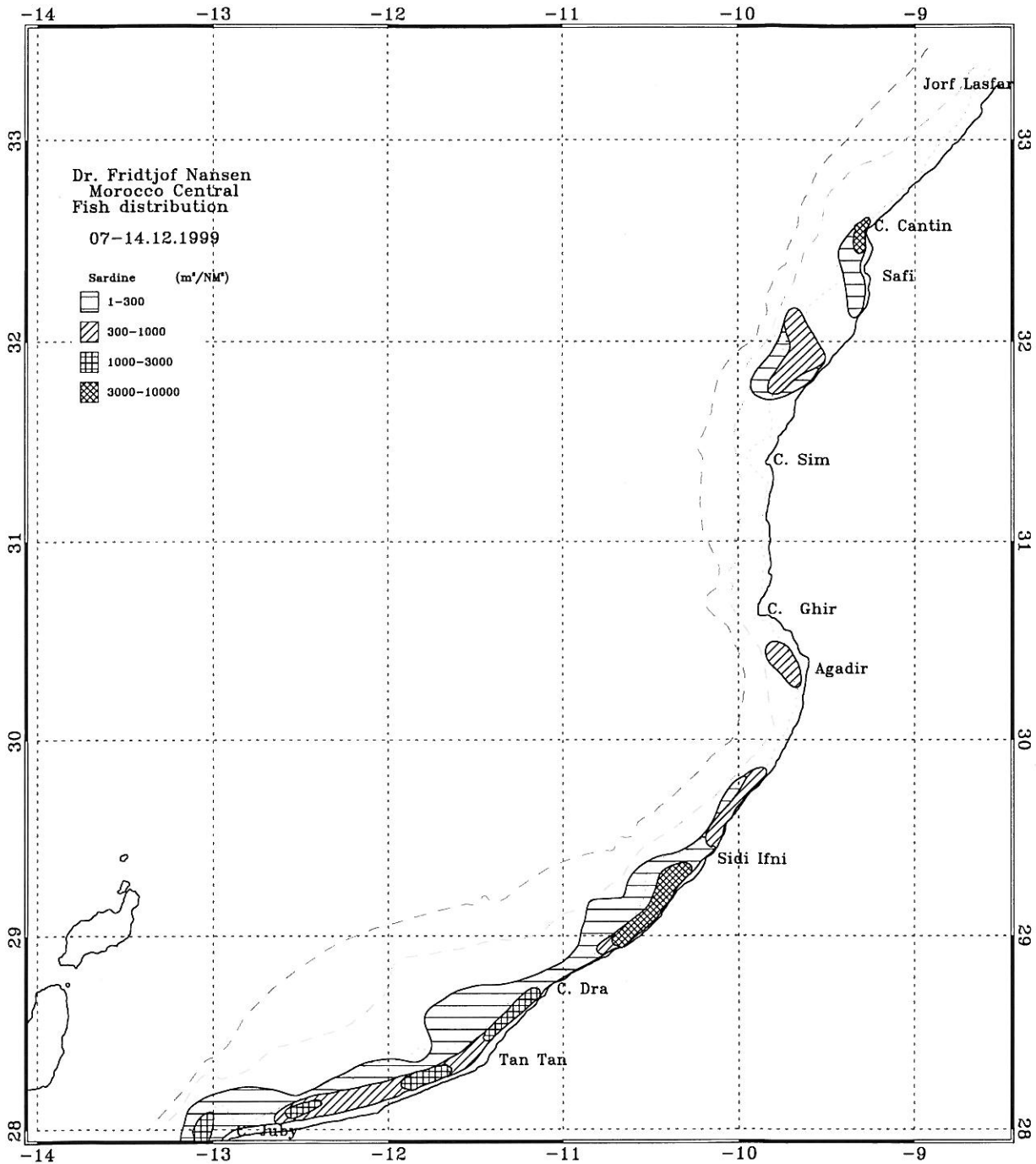


Figure 11 Distribution of sardine, Cape Juby to Jorf Lasfar.

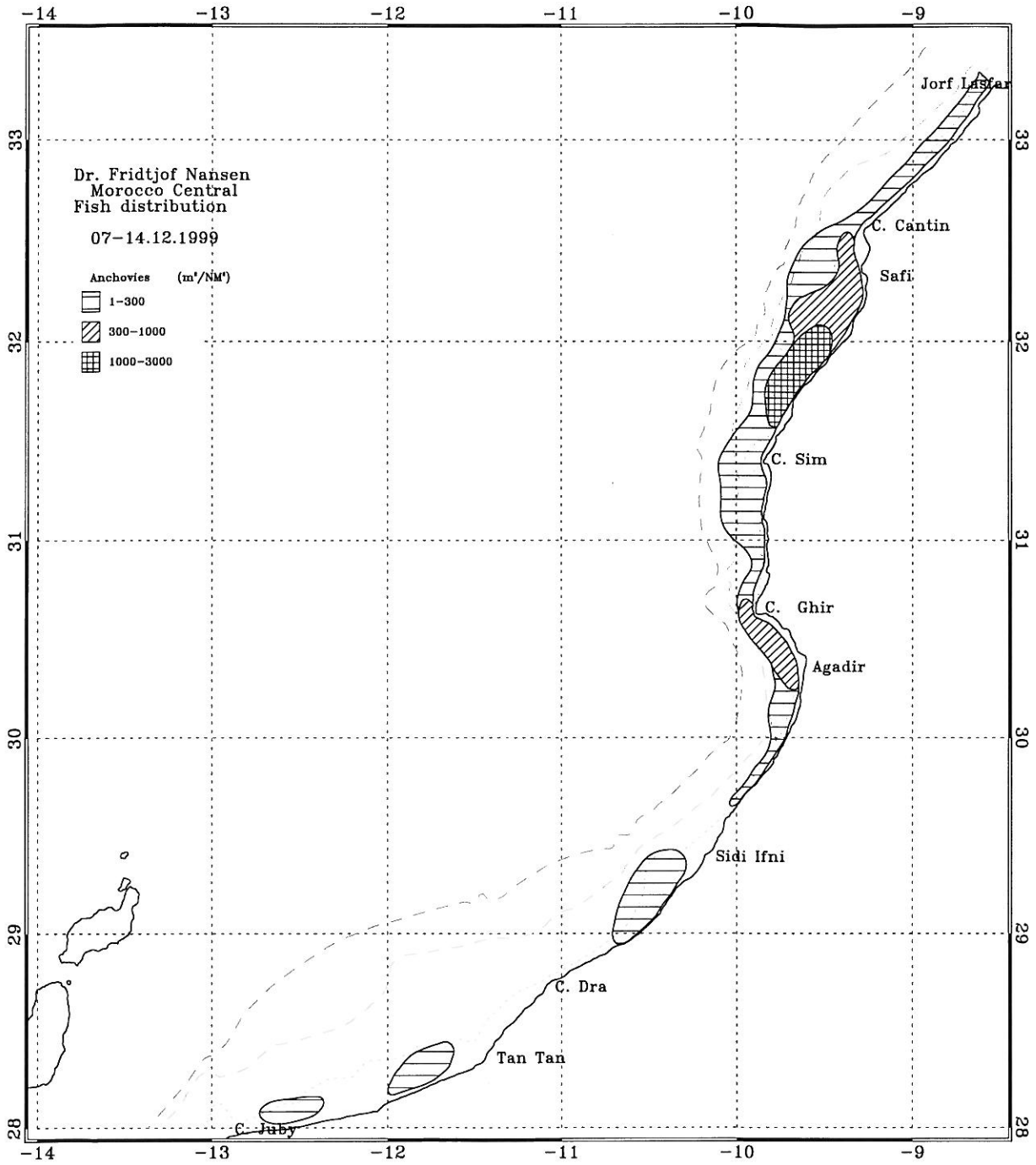


Figure 12 Distribution of anchovy, Cape Juby to Jorf Lasfar.

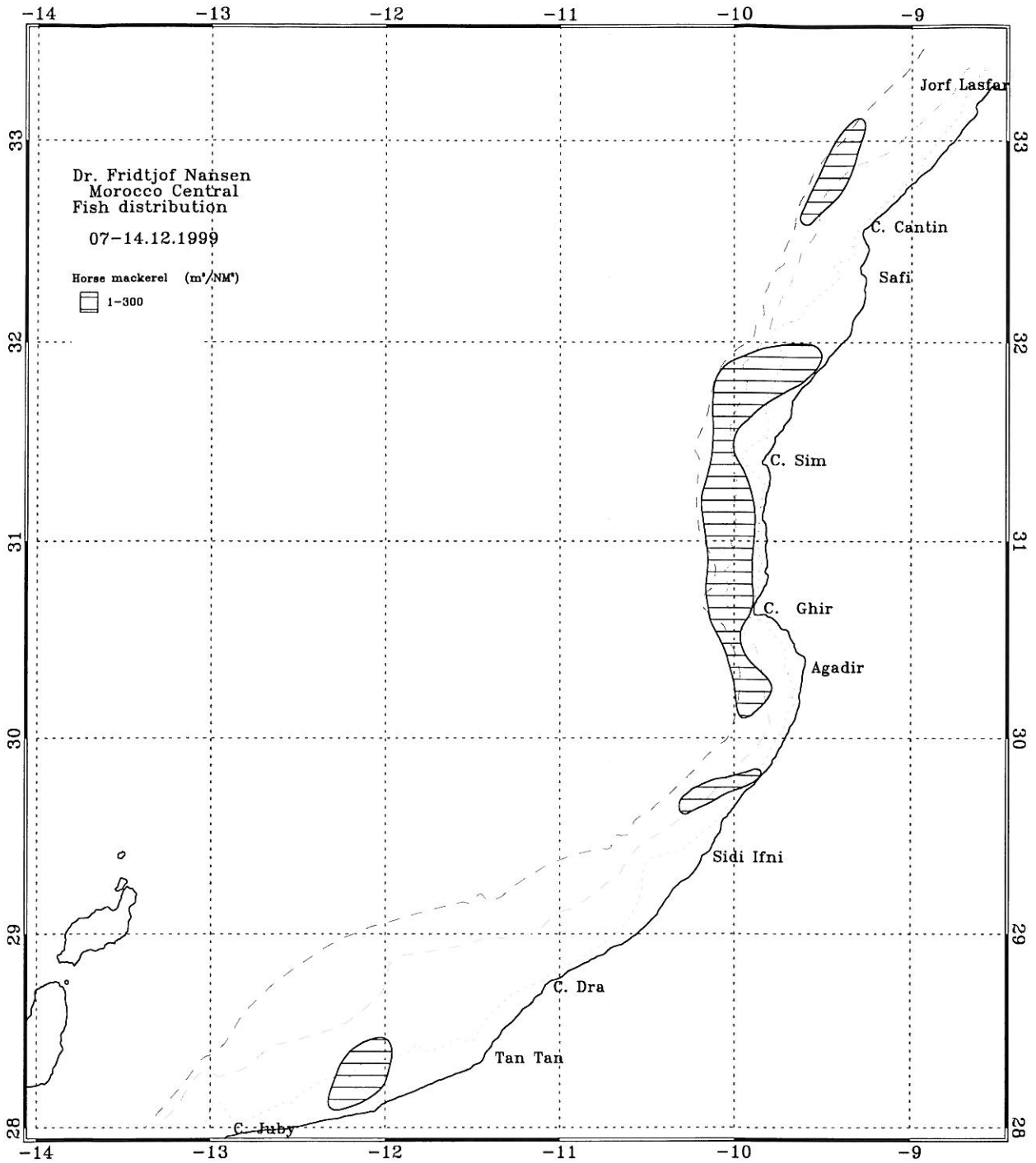


Figure 13 Distribution of horse mackerel, Cape Juby to Jorf Lasfar.



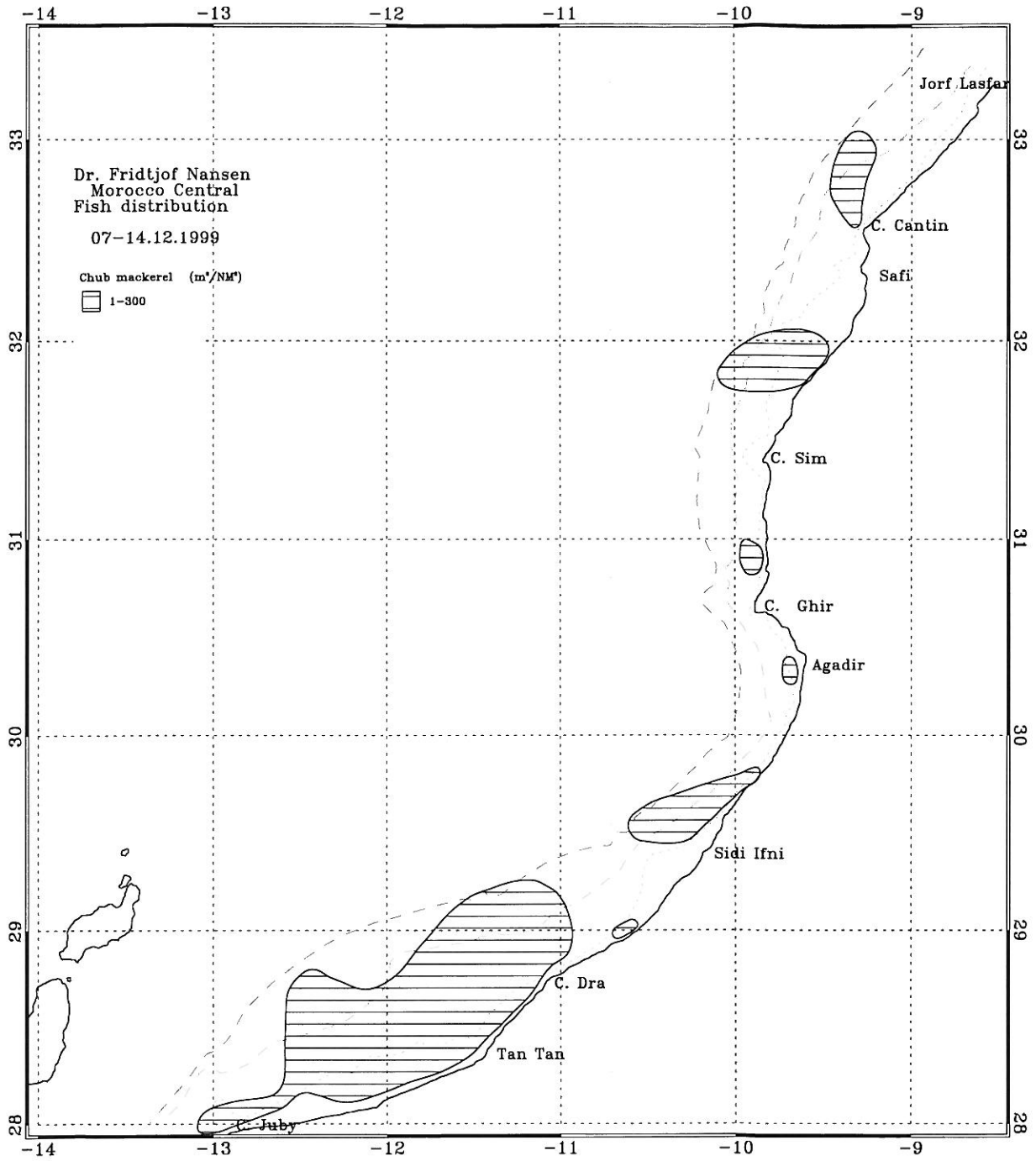


Figure 14 Distribution of chub mackerel, Cape Juby to Jorf Lasfar.

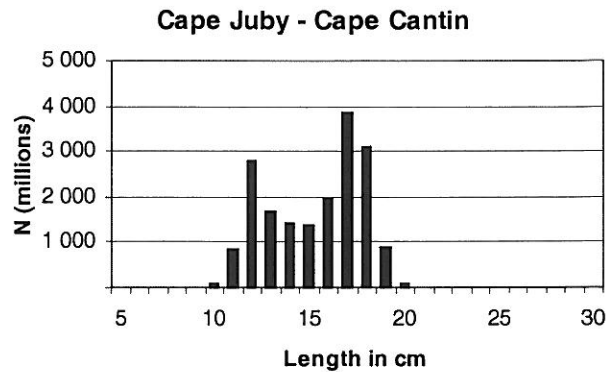


Figure 15 Length frequency distribution of sardine.

## 2.4 Biomass estimates

A summary on biomass estimates is given in Table 2 below. Detailed biomass estimates in number and weight by length groups are shown in Annex I.

### Cape Blanc-Cape Bojador

The **sardine** was estimated to 1 700 000 thousand tonnes. The length distribution is earlier shown in Figure 10. Most of the fish in terms of biomass belong to a cohort with mean length around 21 cm. This is the same cohort that was observed as dominating the 1998 population but then with a length around 18 cm. This confirms that the adult stock is rebuilding. Compared with 1996 and 1997, the development in this part of the stock (i.e. fish >19cm) 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

A younger cohort around 16 cm is also of good strength and will, given normal conditions, assist in rebuilding the stock.

**Sardinella** was estimated to 1 500 000 tonnes, exclusively located between Cape Blanc and Cape Barbas. In rough figures about 1 and 0.5 million are round and flat sardinella respectively. The total regional stock of round and flat sardinella is estimated to 3 600 000 tonnes, of which about 40% was located north of Cape Blanc.

The two species of **horse mackerel** combined was estimated to 400 000 tonnes of which about roughly 300 000 and 100 000 tonnes was Cunene and Atlantic horse mackerel respectively. The 400 000 tonnes Cunene horse mackerel forms part of the stock distributed also south of Cape Blanc. The regional estimate for Cunene horse mackerel is 470 000 tonnes of which about 65% was located north of Cape Blanc.

### **Cape Bojador-Cape Juby**

**Sardine** was estimated to 300 000 tonnes, close to the 340 000 of the previous year. The fish consists of two cohorts with modes around 13 and 19 cm of which the last makes up around 50% in terms of numbers but 75% in terms of biomass.

No other species were estimated for this area.

### **Cape Juby – Jorf Lasfar**

The **sardine** is estimated to 650 000 tonnes, a considerable increase from the 340 000 tonnes of previous year. The fish is mainly in the region Cape Juby - Agadir and is made up of two cohorts with about 12.5 and 17.5 cm modal length respectively. The number of fish less than 16 cm could be taken as a rough index of recruitment. In 1998 and 1999, 11 and 8 billion fish were estimated respectively. Given the error factors that influence length based acoustic assessments the two figures indicate recruitment of the same order of magnitude. With a growing adult stock and favourable recruitment we conclude that this stock seems to be on a positive trend.

**Anchovies** was estimated to 70 000 tonnes, a considerable reduction from the 400 000 tonnes of previous year. In 1997 the anchovies in this area was estimated to 63 000 tonnes so the recent figure represents a fallback to the earlier condition. The main part of the population belongs to a cohort with mode around 12 cm.

**Atlantic horse mackerel** was estimated to 40 thousand tonnes only.

**Chub mackerel** was estimated to 100 000 tonnes, mostly as scattered fish.

Table 2 Morocco. Summary of biomass estimates of pelagic fish, 1000 tonnes.							
Region	Sardines	Round sardinella	Flat sardinella	Atlantic horse mackerel	Cunene horse mackerel	Chub mackerel	Anchovy
Cape Blanc-Cape Bojador	1700	1000	500	100	290	150	30
Cape Bojador-Cape Juby	300	0	0	0	0	20	0
Cape Juby-Jorf Lasfar	650	0	0	40	0	100	70
Totals	2650	1000	500	140	290	270	100

## CHAPTER 3 CONCLUDING REMARKS

---

The survey was conducted successfully in the period 19<sup>th</sup> November to 18<sup>th</sup> December with an acoustic course track of 4 575 NM and 79 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. 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 near the coast matched the properties of the subsurface water masses at the shelf-break.

Figure 16 gives a general overview on the major aggregations of pelagic fish with rounded biomass figures. The biomass estimates are also summarised in Table 2.

As in previous years, the main concentrations of sardine were found in shallow waters north off Dakhla and between Cape Bojador and Agadir. The concentrations off Dakhla has the same distribution limit as in previous years and is estimated to 1 700 000 tonnes, a considerable increase from the 600 000 tonnes of 1997. The estimated number of fish has increased from 14.5 billion fish to 30 billion, indicating successful recruitment. On the narrow shelf between Cape Bojador and Cape Juby the sardine was estimated to 300 000 tonnes, not significantly different from the 340 000 of previous year. Between Cape Juby and Cape Cantin the sardine estimates indicate a growth in biomass also during 1999, from 360 000 tonnes to 660 000 tonnes. The estimated number of fish has increased from 14 to 18 billion fish.

Concentrations of round and flat sardinellas were found between Cape Blanc and Cape Barbas. This forms the northern extension of the sardinella stock, which has its center of gravity in Senegal and Mauritania. The sardinella north of Cape Blanc was estimated to 1 500 000 tonnes, about 40% of the total stock (3 600 000 tonnes).

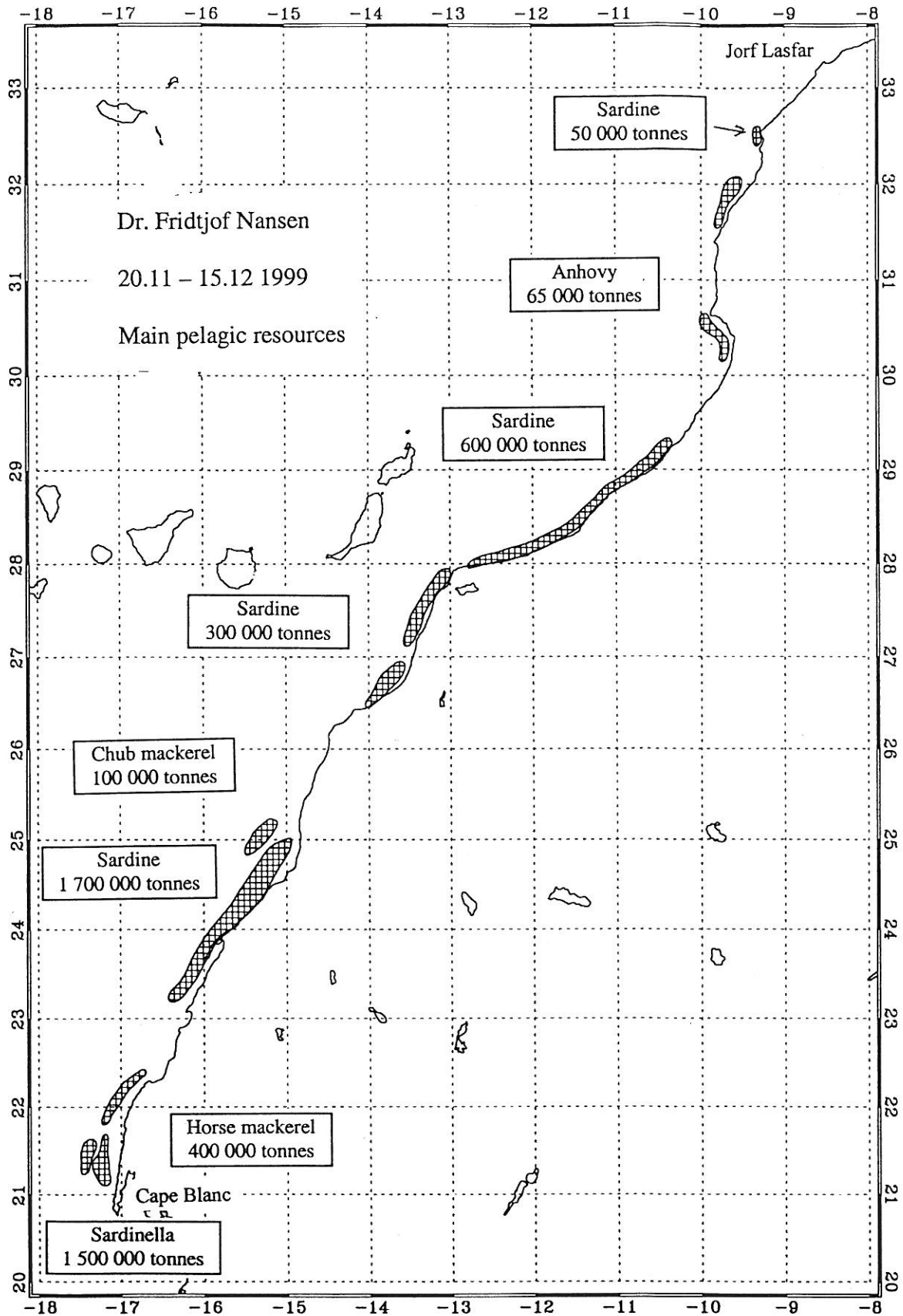


Figure 16. Map of the major pelagic fish concentrations with estimated abundance (thousand tonnes), Cape Blanc to Cape Cantin.

Horse mackerel was found in concentrations between Cape Blanc and Cape Barbas, as a continuation of the distribution recorded in Mauritania. Further north, horse mackerel was generally scattered. The biomass of horse mackerel was estimated to 500 000 tonnes compared to 640 000 tonnes in 1998. The total estimate of horse mackerel from Cape Verde to Cape Bojador is 470 000 tonnes compared to 875 000 tonnes in 1997.

Anchovy registrations were poor. Some concentrations were found off Agadir and between Cape Sim and Cape Cantin. The biomass was estimated to 100 000 tonnes, a considerable decrease from 400 0000 tonnes in 1998, but more in line with the 60 000 estimate in 1997.

### **Trends 1995-99, sardine**

Figure 17 shows the biomass estimates of sardine compared with results from previous "Dr. Fridtjof Nansen" surveys. Fig. 14 shows the biomass figures 1995-99 by length classes. The sardine stock between Cape Blanc and Cape Juby has undergone a dramatic change since the survey in November 1996. The stock estimate has declined from 5.3 million tonnes in late 1996 to 870 thousand tonnes in 1997. A slow growth in a population with poor recruitment was observed during 1998 and the recent strong increase observed in 1999, both from intrinsic growth and good recruitment, signify that the stock is recovering well.

The central stock between Cape Juby and Safi seems to have grown well also during 1999, from 380 to 600 thousand tonnes, and is now approaching the level of the 80ies. The recent growth is both intrinsic and from recruitment, Figure 18, and the stock seems to tolerate the present fishing pressure. The sardine between Cape Bojador and Cape Juby is estimated to 300 thousand tonnes, more or less of the same level as in the previous years survey. It has not been clarified if this fish is part of the central stock, part of the southern stock or forms a separate unit.

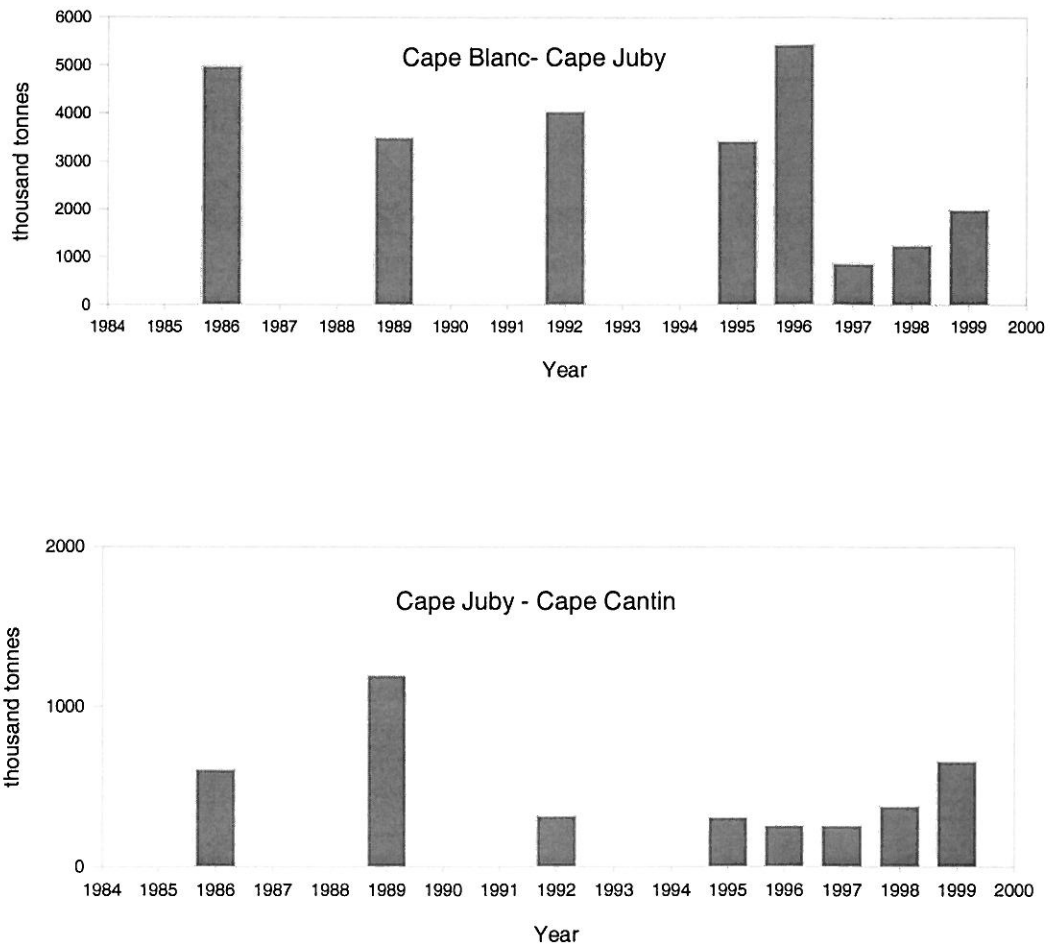


Figure 17 Sardine biomass estimates Cape Blanc-Cape Juby and Cape Juby- Cape Cantin, Dr. Fridtjof Nansen 1986-96.



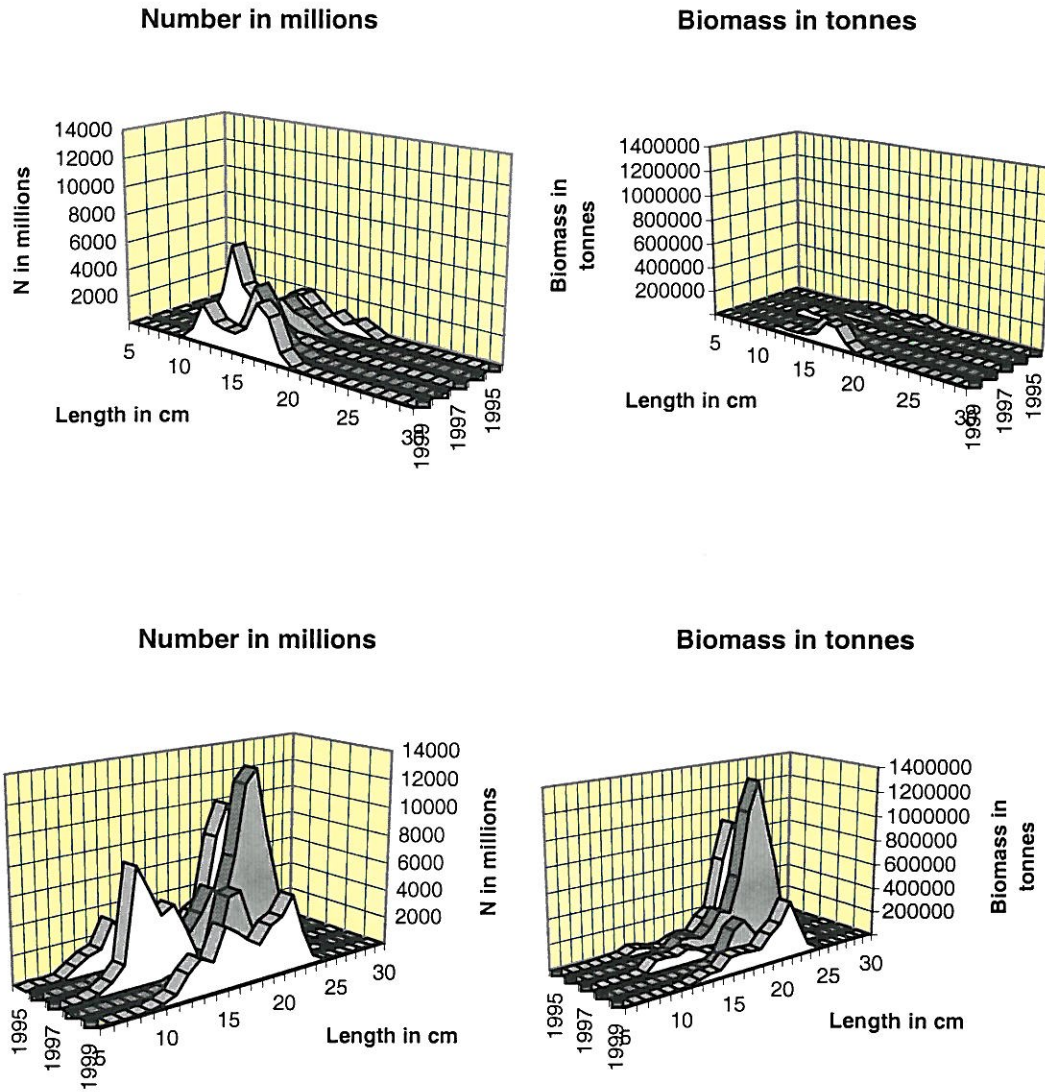


Figure 18 Numbers and biomass by length class, 1995-99. Cape Juby - Cape Cantin (top) and Cape Blanc - Cape Juby (bottom).

## Annex I Biomass and number by fish length class

### Sardine (*Sardina pilchardus*)

#### MOROCCO 1999

Length cm	C.Jubi-C.Cantin		C.Bojador-C.Jubi		C.Blanc-C.Bojador		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5								
6								
7								
8					121	23	121	23
9			53	7	338	46	392	53
10	715	72	1 299	130	1 208	121	3 223	324
11	11 189	855	3 963	303	3 982	304	19 134	1 463
12	47 061	2 802	10 189	607	19 517	1 162	76 767	4 570
13	35 398	1 673	23 140	1 094	30 776	1 454	89 313	4 221
14	37 439	1 428	21 113	805	34 315	1 309	92 867	3 542
15	43 391	1 355	11 220	350	125 682	3 924	180 293	5 630
16	75 131	1 945	3 760	97	139 114	3 601	218 005	5 643
17	177 014	3 841	10 770	234	124 841	2 709	312 625	6 783
18	168 567	3 096	51 031	937	81 101	1 489	300 699	5 522
19	56 456	885	85 886	1 347	140 478	2 203	282 820	4 435
20	7 428	100	61 994	837	232 670	3 140	302 093	4 077
21	501	6	11 512	135	436 670	5 109	448 682	5 250
22			4 791	49	242 211	2 473	247 002	2 521
23					66 564	596	66 564	596
24					20 638	163	20 638	163
25					5 057	35	5 057	35
26								
27								
28								
29								
30								
Total	660 289	18 057	300 721	6 932	1 705 284	29 863	2 666 293	54 853

Round sardinella (*Sardinella aurita*)

## SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO 1999

Length cm	Number in millions				Biomass in tonnes			
	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5		312		312		486		486
6		1 562		1 562		3 980		3 980
7	2	812		815	9	3 162		3 171
8	2	937		940	14	5 284		5 297
9	2	1 312		1 315	19	10 281		10 300
10	5	750	14	769	51	7 901	150	8 102
11	1	830	28	860	18	11 454	387	11 859
12	60	1 437	250	1 747	1 058	25 372	4 419	30 849
13	130	4 311	998	5 439	2 891	95 590	22 118	120 599
14	218	3 955	929	5 102	5 970	108 331	25 461	139 763
15	129	2 241	163	2 533	4 302	74 794	5 443	84 538
16	184	128	37	349	7 389	5 158	1 483	14 030
17	264			264	12 619			12 619
18	313	18	0	332	17 661	1 019	0	18 680
19	300	10	1	312	19 764	689	65	20 519
20	131	76	1	208	10 004	5 821	76	15 901
21	127	45	2	174	11 154	3 943	175	15 272
22	155	40	16	211	15 629	4 035	1 600	21 264
23	271	69	19	359	31 028	7 902	2 161	41 091
24	404	41	6	451	52 276	5 292	772	58 340
25	389	36	8	433	56 646	5 258	1 194	63 098
26	301	48	1	350	49 209	7 792	162	57 164
27	144	36	1	181	26 251	6 603	181	33 035
28	407	17		425	82 468	3 488		85 956
29	208	32		240	46 701	7 139		53 840
30	227	11	16	255	56 191	2 754	4 056	63 001
31	137	32	247	416	37 314	8 586	67 322	113 222
32	49	75	314	439	14 775	22 532	93 836	131 143
33	16	73	389	479	5 387	24 002	127 206	156 594
34	16	94	273	384	5 877	33 471	97 449	136 797
35		81	245	326		31 363	94 910	126 273
36		49	633	682		20 729	266 348	287 076
37		10	198	208		4 614	90 147	94 761
38			139	139			68 554	68 554
39			1	1			453	453
40			23	23			13 090	13 090
41							12 464	12 464
42			1	1			563	563
43								
44								
45								
46								
47								
48								
49								
50								
Total	4 597	19 484	4 954	29 035	572 674	558 824	1 002 245	2 133 743

**Flat sardinella (*Sardinella maderensis*)****SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO 1999**

Length cm	Number in millions				Biomass in tonnes			
	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6	55			55	141			141
7	250	125		375	973	486		1 459
8	353	2 249		2 602	1 989	12 681		14 671
9	155	2 187		2 342	1 216	17 136		18 352
10	101	3 062		3 163	1 067	32 262		33 329
11	57	687		744	785	9 481		10 266
12	188	312		500	3 311	5 516		8 826
13	337			337	7 481			7 481
14	197			197	5 394			5 394
15	310			310	10 358			10 358
16	192			192	7 693			7 693
17	161			161	7 703			7 703
18	296			296	16 659			16 659
19	260			260	17 097			17 097
20	525			525	40 076			40 076
21	557			557	48 987			48 987
22	646			646	64 925			64 925
23	786			786	89 889			89 889
24	1 299			1 299	168 136			168 136
25	753	2		756	109 757	358		110 115
26	557	8	1	566	90 948	1 334	162	92 445
27	219	41	1	261	39 867	7 443	181	47 492
28	215	62	4	281	43 445	12 577	805	56 827
29	80	68	2	150	17 981	15 201	446	33 628
30	56	72	94	222	13 839	17 774	23 243	54 856
31	6	35	117	158	1 562	9 569	31 982	43 113
32		16	344	361	0	4 882	102 841	107 722
33		28	396	424	0	9 278	129 351	138 629
34		34	370	404	0	12 016	131 826	143 842
35		34	140	174	0	13 077	54 423	67 499
36		3	24	27		1 420	10 074	11 494
37								
38								
39								
40								
41			1	1			525	525
42								
43			1	1			603	603
44								
45								
46								
47								
48								
49								
50								
<b>Total</b>	<b>8 611</b>	<b>9 027</b>	<b>1 495</b>	<b>19 133</b>	<b>811 280</b>	<b>182 490</b>	<b>486 461</b>	<b>1 480 230</b>

**Anchovy (*Engraulis encrasicolus*)****MOROCCO 1999**

Length cm	C.Jubi-C.Cantin		C.Blanc-C.Jubi		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions
5						
6						
7	114	50	63	28	177	78
8	873	263	914	276	1 787	539
9	1 915	414	2 808	606	4 723	1 020
10	2 645	423	8 444	1 351	11 089	1 774
11	13 827	1 684	11 999	1 461	25 827	3 145
12	24 881	2 359	3 780	358	28 660	2 717
13	19 249	1 449			19 249	1 449
14	2 326	141			2 326	141
15	83	4			83	4
16	67	3			67	3
17						
18						
19						
20						
Total	65 979	6 790	28 008	4 080	93 987	10 870

Atlantic horse mackerel (*Trachurus trachurus*)

## MOROCCO 1999

Length cm	C.Jubi-C.Cantin		C.Blanc-C.Jubi		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions
5						
6						
7						
8						
9						
10			116	11.0	116	11.0
11			848	61.5	848	61.5
12			1 547	87.6	1 547	87.6
13			1 757	79.2	1 757	79.2
14			3 483	127.1	3 483	127.1
15	627	18.8	2 050	61.4	2 677	80.2
16	2 948	73.4	2 646	65.9	5 594	139.3
17	1 416	29.6	3 058	64.0	4 474	93.6
18	285	5.1	2 265	40.2	2 550	45.3
19	1 056	16.0			1 056	16.0
20	272	3.6	71	0.9	342	4.5
21	274	3.1			274	3.1
22	313	3.1			313	3.1
23						
24						
25						
26			1 049	6.4	1 049	6.4
27			7 023	38.6	7 023	38.6
28	297	1.5	6 506	32.1	6 802	33.6
29	1 027	4.6	5 764	25.7	6 790	30.3
30	770	3.1	4 771	19.3	5 542	22.4
31			6 999	25.7	6 999	25.7
32			7 677	25.7	7 677	25.7
33						
34			4 581	12.9	4 581	12.9
35			12 463	32.1	12 463	32.1
36			16 237	38.6	16 237	38.6
37			2 932	6.4	2 932	6.4
38	4 606	9.3	3 169	6.4	7 775	15.8
39	8 282	15.6			8 282	15.6
40	5 351	9.3			5 351	9.3
41	7 668	12.5	7 914	12.9	15 583	25.3
42	2 057	3.1			2 057	3.1
43	4 407	6.2			4 407	6.2
44	2 357	3.1			2 357	3.1
45						
Total	44 013	221.0	104 925	881.7	148 937	1102.7



**Cunene horse mackerel (*Trachurus trecae*)****MOROCCO 1999**

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			47	4.5	47	4.5
11			3 419	247.9	3 419	247.9
12			18 840	1 067.2	18 840	1 067.2
13			33 326	1 503.1	33 326	1 503.1
14			16 961	619.1	16 961	619.1
15			5 697	170.7	5 697	170.7
16			10 359	258.0	10 359	258.0
17			5 753	120.4	5 753	120.4
18			2 142	38.0	2 142	38.0
19			3 946	59.9	3 946	59.9
20			6 510	85.3	6 510	85.3
21			22 588	257.0	22 588	257.0
22			34 183	339.9	34 183	339.9
23			22 637	197.9	22 637	197.9
24			23 283	179.9	23 283	179.9
25			10 509	72.1	10 509	72.1
26			15 561	95.3	15 561	95.3
27			6 900	37.9	6 900	37.9
28			1 980	9.8	1 980	9.8
29			6 301	28.1	6 301	28.1
30			4 534	18.3	4 534	18.3
31			2 663	9.8	2 663	9.8
32			5 472	18.3	5 472	18.3
33			5 985	18.3	5 985	18.3
34						
35						
36			7 715	18.3	7 715	18.3
37			8 358	18.3	8 358	18.3
38			4 517	9.2	4 517	9.2
39						
40						
41						
42						
43						
44						
45						
Total	0	0	290 187	5 502.5	290 187	5 502.5

**Cunene horse mackerel (*Trachurus trecae*)****SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO 1999**

Length cm	Number in millions				Biomass in tonnes			
	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6								
7								
8		44.2		44.2		249		249
9	4.4	126.0		130.4	35	987		1 022
10	126.1	163.6	4.5	294.2	1 329	1 724	47	3 100
11	176.1	579.1	247.9	1 003.1	2 428	7 988	3 419	13 836
12	169.9	1 186.1	1 067.2	2 423.2	2 999	20 940	18 840	42 780
13	87.8	1 989.5	1 503.1	3 580.4	1 947	44 109	33 326	79 382
14	20.2	844.1	619.1	1 483.4	552	23 123	16 961	40 636
15	6.2	224.4	170.7	401.3	205	7 489	5 697	13 392
16	3.5	57.2	258.0	318.6	139	2 297	10 359	12 795
17	1.2	41.7	120.4	163.3	59	1 994	5 753	7 805
18	14.1	4.7	38.0	56.8	797	263	2 142	3 202
19	34.6	11.2	59.9	105.8	2 281	736	3 946	6 963
20	82.5	9.0	85.3	176.9	6 302	690	6 510	13 502
21	66.6	11.0	257.0	334.5	5 857	963	22 588	29 407
22	19.3	55.3	339.9	414.5	1 936	5 562	34 183	41 681
23	12.6	9.0	197.9	219.5	1 437	1 034	22 637	25 107
24		34.8	179.9	214.7		4 506	23 283	27 788
25			72.1	72.1			10 509	10 509
26	1.3	17.4	95.3	114.0	213	2 842	15 561	18 616
27	1.3	43.5	37.9	82.7	238	7 928	6 900	15 066
28	2.9	60.9	9.8	73.6	582	12 336	1 980	14 899
29	0.7		28.1	28.8	146		6 301	6 447
30	0.7	8.7	18.3	27.7	161	2 154	4 534	6 849
31			9.8	9.8			2 663	2 663
32	1.3		18.3	19.6	390		5 472	5 861
33			18.3	18.3			5 985	5 985
34								
35								
36			18.3	18.3			7 715	7 715
37			18.3	18.3			8 358	8 358
38			9.2	9.2			4 517	4 517
39								
40								
41								
42								
43								
44								
45								
Total	833.2	5 521.5	5 502.5	11 857.2	30 033	149 913	290 187	470 134



**Chub mackerel (*Scomber japonicus*)****MOROCCO 1999**

Length cm	C.Jubi-C.Cantin		C.Bojador-C.Jubi		C.Blanc-C.Bojador		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5								
6								
7								
8								
9								
10								
11								
12								
13								
14					23	1.1	23	1.1
15			163	6.1	546	20.4	709	26.4
16	3 653	113.0	681	21.1	8 684	268.5	13 018	402.5
17	18 026	467.1	3 335	86.4	25 091	650.2	46 451	1 203.8
18	16 210	355.6	1 993	43.7	39 551	867.6	57 754	1 266.9
19	17 333	324.7	490	9.2	44 167	827.3	61 991	1 161.2
20	16 946	273.2	622	10.0	14 023	226.1	31 591	509.3
21	11 434	159.8	544	7.6	8 480	118.5	20 457	285.9
22	4 391	53.5			4 809	58.6	9 200	112.2
23	3 476	37.2	718	7.7	3 547	38.0	7 741	82.8
24	1 286	12.1	814	7.7	1 320	12.5	3 420	32.3
25	907	7.6			708	5.9	1 615	13.5
26	1 636	12.2			212	1.6	1 848	13.8
27	569	3.8	182	1.2	1 321	8.8	2 072	13.8
28								
29	702	3.8	1 197	6.5	611	3.3	2 509	13.6
30	3 104	15.2	2 645	12.9	856	4.2	6 604	32.3
31			1 457	6.5			1 457	6.5
32								
33			1 752	6.5	894	3.3	2 647	9.8
34								
35								
36								
37								
38								
39								
40								
<b>Total</b>	<b>99 673</b>	<b>1 838.8</b>	<b>16 592</b>	<b>233.0</b>	<b>154 843</b>	<b>3 115.8</b>	<b>271 108</b>	<b>5 187.7</b>

## Annex II Records of fishing stations

PROJECT STATION: 912  
 DATE: 21/11/99 GEAR TYPE: PT No:5 POSITION: Lat N 2050 Long W 1728  
 start stop duration  
 TIME : 20:45:36 21:16:02 30 (min) Purpose code: 1  
 LOG : 5807.62 5809.05 1.40 Area code : 3  
 FDEPTH: 0 0 GearCond.code:  
 BDEPTH: 75 77 Validity code:  
 Towing dir: 320° Wire out: 150 m Speed: 30 kn\*10

Sorted: 81 Kg Total catch: 140.14 CATCH/HOUR: 280.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	156.10	6330	55.69	1819
Sardinella aurita	43.60	118	15.56	1815
Sarda sarda	29.80	20	10.63	
Sardinella maderensis	26.40	80	9.42	1816
Trichiurus lepturus	11.20	10	4.00	
Sardina pilchardus	7.70	134	2.75	1818
Scomber japonicus	3.64	22	1.30	1817
Loligo vulgaris	1.82	64	0.65	
Allotheutis subulata	0.02	36	0.01	
<b>Total</b>	<b>280.28</b>		<b>100.01</b>	

PROJECT STATION: 913  
 DATE: 22/11/99 GEAR TYPE: PT No:4 POSITION: Lat N 2101 Long W 1718  
 start stop duration  
 TIME : 01:34:54 02:05:27 31 (min) Purpose code: 1  
 LOG : 5851.23 5852.77 1.48 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 57 57 Validity code:  
 Towing dir: 10° Wire out: 150 m Speed: 30 kn\*10

Sorted: 22 Kg Total catch: 22.08 CATCH/HOUR: 42.74

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sarda sarda	26.67	10	62.40	
Loligo vulgaris	6.31	153	14.76	
Sardinella aurita	5.85	15	13.69	1820
Trichiurus lepturus	2.71	2	6.34	
Allotheutis subulata	0.70	244	1.64	
Trachurus trecae	0.27	10	0.63	
Trachurus trachurus	0.15	6	0.35	
Todaropsis eblanae	0.08	12	0.19	
<b>Total</b>	<b>42.74</b>		<b>100.00</b>	

PROJECT STATION: 914  
 DATE: 22/11/99 GEAR TYPE: PT No:7 POSITION: Lat N 2106 Long W 1706  
 start stop duration  
 TIME : 04:25:57 04:56:01 30 (min) Purpose code: 1  
 LOG : 5872.52 5873.91 1.36 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 31 32 Validity code:  
 Towing dir: 7° Wire out: 150 m Speed: 30 kn\*10

Sorted: 14 Kg Total catch: 14.18 CATCH/HOUR: 28.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Camopogramma gloycos	11.04	18	38.93	
Sardinella aurita	6.00	18	21.16	
Loligo vulgaris	5.20	150	18.34	
Stromateus fiatola	2.12	8	7.48	
Dicentrarchus punctatus	1.56	2	5.50	
Sardina pilchardus	1.40	12	4.94	
Trachurus trecae	0.60	20	2.12	
Sardinella maderensis	0.40	2	1.41	
Trachurus trachurus	0.04	2	0.14	
<b>Total</b>	<b>28.36</b>		<b>100.02</b>	

PROJECT STATION: 915  
 DATE: 22/11/99 GEAR TYPE: PT No:4 POSITION: Lat N 2111 Long W 1712  
 start stop duration  
 TIME : 06:25:20 06:53:34 28 (min) Purpose code: 1  
 LOG : 5884.88 5886.30 1.39 Area code : 3  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 47 48 Validity code: 9  
 Towing dir: ø Wire out: 150 m Speed: 30 kn\*10

Sorted: Kg Total catch: 29.91 CATCH/HOUR: 64.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diplodus bellottii	19.93	45	31.10	
Spondyliosoma cantharus	16.71	49	26.07	
Trachurus trecae	11.79	135	18.40	1821
Decapterus rhonchus	3.64	21	5.68	
Pomadasys inciscus	3.00	17	4.68	
Plectorhynchus mediterraneus	2.79	4	4.35	
Diplodus bellottii	1.93	17	3.01	
Sardinella aurita	1.71	4	2.67	
Pagellus bellottii	1.29	9	2.01	
Loligo vulgaris	0.86	58	1.34	
Dentex gibbosus	0.43	2	0.67	
Engraulis encrasicolus	0.02	13	0.03	
Sardina pilchardus	0.00	2		
<b>Total</b>	<b>64.10</b>		<b>100.01</b>	

PROJECT STATION: 916  
 DATE: 22/11/99 GEAR TYPE: BT No:2 POSITION: Lat N 2110 Long W 1730  
 start stop duration  
 TIME : 09:13:21 09:44:32 31 (min) Purpose code: 1  
 LOG : 5906.63 5908.39 1.71 Area code : 3  
 FDEPTH: 113 117 GearCond.code:  
 BDEPTH: 113 117 Validity code:  
 Towing dir: 200° Wire out: 400 m Speed: 33 kn\*10

Sorted: 57 Kg Total catch: 56.98 CATCH/HOUR: 110.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	38.32	292	34.75	1822
Zeus faber	34.45	52	31.24	
Dentex macropthalmus	30.58	428	27.73	
Scomber japonicus	3.10	41	2.81	1823
Scorpaena elongata	1.08	4	0.98	
Trachurus trachurus	1.05	14	0.95	
Pagellus acarne	0.62	2	0.56	
Zenopsis conchifer	0.62	2	0.56	
Allotheutis subulata	0.23	58	0.21	
Capros aper	0.15	27	0.14	
Serranus cabrilla	0.04	2	0.04	
Loligo vulgaris	0.02	2	0.02	
SOLEIDAE	0.02	4	0.02	
<b>Total</b>	<b>110.28</b>		<b>100.01</b>	

PROJECT STATION: 917  
 DATE: 22/11/99 GEAR TYPE: BT No:2 POSITION: Lat N 2114 Long W 1734  
 start stop duration  
 TIME : 10:57:08 11:29:03 32 (min) Purpose code: 1  
 LOG : 5916.85 5918.29 1.40 Area code : 3  
 FDEPTH: 285 301 GearCond.code:  
 BDEPTH: 285 301 Validity code:  
 Towing dir: 10° Wire out: 850 m Speed: 30 kn\*10

Sorted: 237 Kg Total catch: 1622.18 CATCH/HOUR: 3041.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Helicolenus dactylopterus	1528.88	37463	50.27	
Capros aper	450.56	10969	14.81	
Hoplostethus mediterraneus	409.22	6497	13.45	
Merluccius senegalensis	170.96	308	5.62	
Schedophilus ovalis	157.05	236	5.16	
SCYLIORHINIDAE	84.38	1097	2.77	
Zenopsis conchifer	44.33	98	1.46	
Seylichinus canicula	42.19	84	1.39	
MYCTOPHIDAE	38.81	8944	1.28	
Trachurus trachurus	37.73	109	1.24	
Beryx splendens	37.13	169	1.22	
Trachurus trecae	18.83	99	0.62	
Todarodes sagittatus	13.95	19	0.46	
Chlorophthalmus agassizi	3.38	253	0.11	
SOLEIDAE	3.38	84	0.11	
Cynoglossus sp.	0.84	84	0.03	
<b>Total</b>	<b>3041.62</b>		<b>100.00</b>	

PROJECT STATION: 918  
 DATE: 22/11/99 GEAR TYPE: PT No:1 POSITION: Lat N 2120 Long W 1723  
 start stop duration  
 TIME : 13:49:20 14:18:48 29 (min) Purpose code: 1  
 LOG : 5935.51 5937.64 2.04 Area code : 3  
 FDEPTH: 10 20 GearCond.code:  
 BDEPTH: 88 99 Validity code:  
 Towing dir: 270° Wire out: 120 m Speed: 40 kn\*10

Sorted: 6 Kg Total catch: 6.38 CATCH/HOUR: 13.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	8.69	21	65.83	1824
Sardinella maderensis	4.51	12	34.17	1825
<b>Total</b>	<b>13.20</b>		<b>100.00</b>	

PROJECT STATION: 919  
 DATE: 22/11/99 GEAR TYPE: PT No:1 POSITION: Lat N 2120 Long W 1710  
 start stop duration  
 TIME : 16:32:44 17:04:01 31 (min) Purpose code: 1  
 LOG : 5955.76 5958.02 2.21 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 56 58 Validity code:  
 Towing dir: 270° Wire out: 120 m Speed: 40 kn\*10

Sorted: 115 Kg Total catch: 3512.10 CATCH/HOUR: 6797.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella aurita	4415.21	10562	64.95	1826
Sardinella maderensis	2284.26	6627	33.60	1827
Trichiurus lepturus	48.23	45	0.71	
Sarda sarda	47.19	17	0.69	
Auxis thazard	2.71	4	0.04	
<b>Total</b>	<b>6797.62</b>		<b>99.99</b>	

PROJECT STATION: 920  
 DATE:22/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 2129  
 start stop duration Long W 1702  
 TIME :19:09:34 19:35:01 25 (min) Purpose code: 1  
 LOG :5976.59 5977.71 1.11 Area code : 3  
 FDEPTH: 25 25 GearCond.code:  
 BDEPTH: 25 25 Validity code:  
 Towing dir: 11e Wire out: 150 m Speed: 29 kn\*10

Sorted: 174 Kg Total catch: 1145.18 CATCH/HOUR: 2748.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	825.60	5254	30.04	1828
Diplodus bellottii	599.04	7097	21.80	
Trachurus trecae	568.32	31874	20.68	1829
Pomadasys incisus	245.76	1152	8.94	
Mustelus mustelus	237.84	163	8.65	
Loligo vulgaris	115.20	1421	4.19	
Umbrina cirrosa	49.92	461	1.82	
Argyrosomus regius	26.88	77	0.98	
Sphyræna sphyraena	23.04	2	0.84	
Engraulis encrasicolus	19.20	2074	0.70	1830
Diplodus cervinus cervinus	13.92	10	0.51	
Dicologlossa cuneata	9.22	384	0.34	
Diplodus sargus *	4.56	7	0.17	
Dicentrarchus punctatus	4.32	10	0.16	
Uranoscopus scaber	1.92	2	0.07	
Pagellus bellottii	1.54	77	0.06	
Sardina pilchardus	1.54	2	0.06	
Torpedo torpedo	0.62	2	0.02	
Total	2748.44		100.03	

PROJECT STATION: 921  
 DATE:22/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2131  
 start stop duration Long W 1725  
 TIME :22:15:08 22:42:07 27 (min) Purpose code: 1  
 LOG :6002.48 6004.00 1.51 Area code : 3  
 FDEPTH: 50 40 GearCond.code:  
 BDEPTH: 105 100 Validity code:  
 Towing dir: 90e Wire out: 120 m Speed: 35 kn\*10

Sorted: 35 Kg Total catch: 34.84 CATCH/HOUR: 77.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scomber japonicus	53.56	762	69.18	1831
Trachurus trecae	21.33	522	27.55	1832
Trachurus trachurus	1.29	80	1.67	1833
Sardina pilchardus	1.24	13	1.60	
Total	77.42		100.00	

PROJECT STATION: 922  
 DATE:23/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2131  
 start stop duration Long W 1730  
 TIME :00:08:06 00:12:26 4 (min) Purpose code: 1  
 LOG :6015.18 6015.46 0.27 Area code : 3  
 FDEPTH: 80 70 GearCond.code:  
 BDEPTH: 364 364 Validity code:  
 Towing dir: 180e Wire out: 280 m Speed: 35 kn\*10

Sorted: 39 Kg Total catch: 707.50 CATCH/HOUR: 10612.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	10554.00	5065800	99.45	
Scomber japonicus	46.50	510	0.44	1834
Trachurus trecae	4.20	75	0.04	
Trichurus lepturus	3.00	900	0.03	
Lestidium sp.	3.00	300	0.03	
Todarodes sagittatus	1.80	15	0.02	
Lestidium sp.	0.15	15		
Total	10612.65		100.01	

PROJECT STATION: 923  
 DATE:23/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2140  
 start stop duration Long W 1713  
 TIME :03:22:20 03:56:28 34 (min) Purpose code: 1  
 LOG :6041.97 6044.45 2.39 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 66 68 Validity code:  
 Towing dir: 270e Wire out: 120 m Speed: 40 kn\*10

Sorted: 4 Kg Total catch: 4.35 CATCH/HOUR: 7.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	6.28	5891	81.77	
Sardinella aurita	0.78	2	10.16	
Loligo vulgaris	0.25	30	3.26	
Trachurus trecae	0.25	7	3.26	
Allotheutis subulata	0.11	28	1.43	
Onychoteuthis banksi	0.02	2	0.26	
Total	7.69		100.14	

PROJECT STATION: 924  
 DATE:23/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2146  
 start stop duration Long W 1703  
 TIME :06:33:57 06:56:42 23 (min) Purpose code: 1  
 LOG :6066.41 6067.69 1.25 Area code : 3  
 FDEPTH: 0 0 GearCond.code:  
 BDEPTH: 40 40 Validity code:  
 Towing dir: 11e Wire out: 120 m Speed: 35 kn\*10

Sorted: 63 Kg Total catch: 345.26 CATCH/HOUR: 900.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	803.48	42430	89.21	1836
Loligo vulgaris	31.57	89	3.51	
Decapterus rhonchus	18.26	55	2.03	1835
Sarda sarda	14.61	5	1.62	
Allotheutis subulata	9.91	496	1.10	
Trichurus lepturus	7.04	3	0.78	
Scomber japonicus	3.23	26	0.36	
Sardina pilchardus	3.13	26	0.35	
Auxis thazard	2.61	3	0.29	
Trachurus trecae	2.19	10	0.24	
Pomadasys incisus	1.77	8	0.20	
Sardinella aurita	1.57	5	0.17	
Sardinella maderensis	0.78	3	0.09	
Loligo vulgaris	0.52	52	0.06	
Total	900.67		100.01	

PROJECT STATION: 925  
 DATE:23/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2200  
 start stop duration Long W 1658  
 TIME :14:32:00 15:03:23 31 (min) Purpose code: 1  
 LOG :6137.60 6137.62 0.01 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 35 35 Validity code:  
 Towing dir: 270e Wire out: 120 m Speed: 40 kn\*10

Sorted: 65 Kg Total catch: 64.64 CATCH/HOUR: 125.11

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	71.96	9681	57.52	1838
Sardina pilchardus	38.21	2241	30.54	1837
Sardinella aurita	9.29	441	7.43	1839
Trichurus lepturus	3.33	2	2.66	
Decapterus rhonchus	1.35	4	1.08	
Plectorhinchus mediterraneus	0.97	2	0.78	
Total	125.11		100.01	

PROJECT STATION: 926  
 DATE:23/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2209  
 start stop duration Long W 1653  
 TIME :17:01:21 17:35:51 35 (min) Purpose code: 1  
 LOG :6154.19 6156.42 2.23 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 12 38 Validity code:  
 Towing dir: 230e Wire out: 140 m Speed: 40 kn\*10

Sorted: 320 Kg Total catch: 412.66 CATCH/HOUR: 707.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pomatomus saltatrix	489.43	168	69.19	
Trachurus trachurus	111.50	5126	15.76	1840
Sardina pilchardus	84.75	14290	11.98	1842
Engraulis encrasicolus	12.21	514	1.73	1841
Sarda sarda	3.94	2	0.56	
Decapterus punctatus	3.19	9	0.45	
Trachurus trecae	1.23	9	0.17	
Campogramma glaycos	1.17	2	0.17	
Total	707.42		100.01	

PROJECT STATION: 927  
 DATE:23/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2213  
 start stop duration Long W 1719  
 TIME :20:35:53 21:05:48 30 (min) Purpose code: 1  
 LOG :6184.54 6186.12 1.57 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 97 101 Validity code:  
 Towing dir: 26e Wire out: 150 m Speed: 32 kn\*10

Sorted: 37 Kg Total catch: 474.05 CATCH/HOUR: 948.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	600.00	26020	63.28	1844
Trachurus trachurus	173.40	15382	18.29	1843
Scomber japonicus	162.60	2640	17.15	1845
Todarodes sagittatus	5.40	10	0.57	
Auxis thazard	4.80	6	0.51	
Loligo vulgaris	1.60	6	0.17	
MYCTOPHIDAE	0.30	150	0.03	
Total	948.10		100.00	

PROJECT STATION: 928  
 DATE:24/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2216  
 start stop duration Long W 1645  
 TIME :00:59:06 01:09:41 11 (min) Purpose code: 1  
 LOG :6222.94 6223.54 0.61 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 29 30 Validity code:  
 Towing dir: 280e Wire out: 150 m Speed: 35 kn\*10

Sorted: 105 Kg Total catch: 1463.16 CATCH/HOUR: 7980.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	6305.45	269329	79.01	1849
Campogramma glaycos	1038.55	2040	13.01	
Decapterus rhonchus	262.25	1167	3.29	1848
Sardinella aurita	244.80	11313	3.07	1847
Scomber japonicus	44.51	371	0.56	
Trachurus trecae	36.11	447	0.45	1846
Loligo vulgaris	24.00	251	0.30	
Pomatomus saltatrix	23.13	33	0.29	
Dicentrarchus punctatus	2.07	5	0.03	
Total	7980.87		100.01	

PROJECT STATION: 929  
 DATE:24/11/99 GEAR TYPE: PT No:5 POSITION:Lat N 2228  
 start stop duration Long W 1656  
 TIME :03:40:14 04:09:36 29 (min) Purpose code: 1  
 LOG :6246.21 6247.72 1.49 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 57 57 Validity code:  
 Towing dir: 360e Wire out: 150 m Speed: 40 kn\*10

Sorted: 2 Kg Total catch: 1.76 CATCH/HOUR: 3.64

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Loligo vulgaris	3.43	21	94.23	
Allotheutis subulata	0.21	60	5.77	
Total	3.64		100.00	

PROJECT STATION: 930  
 DATE:24/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2252  
 start stop duration Long W 1656  
 TIME :14:58:41 15:19:37 21 (min) Purpose code: 1  
 LOG :6358.30 6359.69 1.39 Area code : 3  
 FDEPTH: 30 30 GearCond.code:  
 BDEPTH: 61 60 Validity code:  
 Towing dir: 180ø Wire out: 120 m Speed: 40 kn\*10  
 Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION: 931  
 DATE:24/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 2251  
 start stop duration Long W 1657  
 TIME :15:44:00 16:00:34 17 (min) Purpose code: 1  
 LOG :6361.07 6361.78 0.70 Area code : 3  
 FDEPTH: 61 61 GearCond.code:  
 BDEPTH: 61 61 Validity code:  
 Towing dir: 20ø Wire out: 220 m Speed: 30 kn\*10  
 Sorted: 36 Kg Total catch: 335.54 CATCH/HOUR: 1184.26

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Trachurus trecae 837.32 49362 70.70 1830  
 Scomber japonicus 175.34 5019 14.81 1831  
 Trachurus trachurus 88.94 4002 7.51 1832  
 Loligo vulgaris 30.92 78 2.61  
 Zeus faber 18.64 28 1.57  
 Sardina pilchardus 17.79 191 1.50  
 Dentex gibbosus 11.58 39 0.98  
 Spondylosoma cantharus 2.33 7 0.20  
 Chelidonichthys obscurus 0.71 11 0.06  
 Sepia officinalis hierredda 0.35 4 0.03  
 Mullus surmuletus 0.35 4 0.03  
 Total 1184.27 100.00

PROJECT STATION: 932  
 DATE:24/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 2257  
 start stop duration Long W 1708  
 TIME :16:41:22 18:20:00 29 (min) Purpose code: 1  
 LOG :6377.75 6379.20 1.41 Area code : 3  
 FDEPTH: 180 174 GearCond.code:  
 BDEPTH: 180 174 Validity code:  
 Towing dir: 200ø Wire out: 600 m Speed: 30 kn\*10  
 Sorted: 39 Kg Total catch: 68.18 CATCH/HOUR: 141.06

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Scorpaena scrofa 35.75 248 25.34  
 Trachurus trachurus 25.74 91 18.25 1833  
 Merluccius nemegalensis 20.48 43 14.52  
 Dentex macropthalmus 11.79 267 8.36  
 Octopus vulgaris 8.90 6 6.31  
 Capros aper 7.82 360 5.54  
 Todarodes sagittatus 6.00 8 4.25  
 Scorpaena sp. 5.83 56 4.13  
 Sepia orbignyana 4.72 155 3.35  
 Lepidopus caudatus 4.47 50 3.17  
 Pagellus acarne 3.72 12 2.64  
 Macrorhamphosus scolopax 1.99 68 1.41  
 Citharus linguatula 1.12 37 0.79  
 Argentina sphyraena 0.87 112 0.62  
 Seranus cabrilla 0.74 6 0.52  
 Scomber japonicus 0.62 6 0.44  
 Allothetis subulata 0.25 87 0.18  
 OPHIDIIDAE 0.25 12 0.18  
 Total 141.06 100.00

PROJECT STATION: 933  
 DATE:25/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2256  
 start stop duration Long W 1620  
 TIME :00:30:35 01:00:02 29 (min) Purpose code: 1  
 LOG :6440.53 6442.21 1.64 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 28 25 Validity code:  
 Towing dir: 12ø Wire out: 150 m Speed: 35 kn\*10  
 Sorted: 25 Kg Total catch: 24.88 CATCH/HOUR: 51.48

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sarda sarda 23.05 6 44.77  
 Trachurus trecae 16.14 364 31.35 1834  
 Campofarma glaycos 6.79 25 13.19  
 Decapterus rhonchus 2.07 14 4.02  
 Sardinella maderensis 1.94 8 3.77  
 Pomatomus saltatrix 1.49 6 2.89  
 Total 51.48 99.99

PROJECT STATION: 934  
 DATE:25/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2304  
 start stop duration Long W 1630  
 TIME :02:50:06 02:59:45 10 (min) Purpose code: 1  
 LOG :6457.27 6457.84 0.57 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 33 32 Validity code:  
 Towing dir: 120ø Wire out: 120 m Speed: 40 kn\*10  
 Sorted: 38 Kg Total catch: 4579.20 CATCH/HOUR: 27475.20

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 27475.20 635040 100.00 1835  
 Total 27475.20 100.00

PROJECT STATION: 935  
 DATE:25/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2307  
 start stop duration Long W 1639  
 TIME :04:19:14 04:48:54 30 (min) Purpose code: 1  
 LOG :6468.10 6469.89 1.77 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 38 47 Validity code:  
 Towing dir: 292ø Wire out: 150 m Speed: 40 kn\*10  
 Sorted: 104 Kg Total catch: 103.88 CATCH/HOUR: 207.76

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Trichiurus lepturus 200.72 130 96.61  
 Sparus aurata 7.04 2 3.39  
 Total 207.76 100.00

PROJECT STATION: 936  
 DATE:25/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2314  
 start stop duration Long W 1655  
 TIME :06:41:55 07:14:14 32 (min) Purpose code: 1  
 LOG :6486.29 6487.93 1.60 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 67 64 Validity code:  
 Towing dir: 292ø Wire out: 150 m Speed: 33 kn\*10  
 Sorted: Kg Total catch: 36.60 CATCH/HOUR: 68.63

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 24.34 767 35.47 1836  
 Trichiurus lepturus 18.64 11 27.16  
 Scomber japonicus 11.70 244 17.05 1837  
 Trachurus trecae 10.88 531 15.85 1838  
 Loligo vulgaris 1.80 4 2.62  
 Trachurus trachurus 1.28 43 1.87 1839  
 Total 68.64 100.02

PROJECT STATION: 937  
 DATE:25/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2314  
 start stop duration Long W 1623  
 TIME :13:02:58 13:26:26 23 (min) Purpose code: 1  
 LOG :6544.91 6546.37 1.44 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 29 28 Validity code:  
 Towing dir: 215ø Wire out: 120 m Speed: 40 kn\*10  
 Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION: 938  
 DATE:25/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 2321  
 start stop duration Long W 1620  
 TIME :17:00:12 17:29:38 29 (min) Purpose code: 1  
 LOG :6578.68 6579.99 1.27 Area code : 3  
 FDEPTH: 28 27 GearCond.code:  
 BDEPTH: 28 27 Validity code:  
 Towing dir: 30ø Wire out: 150 m Speed: 30 kn\*10  
 Sorted: 35 Kg Total catch: 352.30 CATCH/HOUR: 728.90

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 666.21 15122 91.40 1840  
 Trachurus trecae 47.17 1200 6.47 1841  
 Trachinus draco 5.38 103 0.74  
 Octopus vulgaris 4.14 4 0.57  
 Scomber japonicus 3.31 62 0.45  
 Dentex gibbosus 0.83 21 0.11  
 Sepia officinalis hierredda 0.62 2 0.09  
 Loligo vulgaris 0.41 21 0.06  
 Spondylosoma cantharus 0.41 2 0.06  
 Chelidonichthys obscurus 0.41 21 0.06  
 Total 728.89 100.01

PROJECT STATION: 939  
 DATE:25/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2334  
 start stop duration Long W 1646  
 TIME :20:26:58 21:00:00 33 (min) Purpose code: 1  
 LOG :6607.89 6609.50 1.60 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 71 79 Validity code:  
 Towing dir: 296ø Wire out: 150 m Speed: 30 kn\*10  
 Sorted: 38 Kg Total catch: 1027.74 CATCH/HOUR: 1868.62

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Scomber japonicus 889.09 22464 47.58 1852  
 Trachurus trachurus 649.09 25418 34.74 1853  
 Trachurus trecae 294.55 14220 15.76 1854  
 Sardina pilchardus 29.45 764 1.58  
 Trichiurus lepturus 4.18 4 0.22  
 Loligo vulgaris 2.25 2 0.12  
 Total 1868.61 100.00

PROJECT STATION: 940  
 DATE:26/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2335  
 start stop duration Long W 1614  
 TIME :01:08:21 01:23:02 15 (min) Purpose code: 1  
 LOG :6649.80 6650.67 0.85 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 33 31 Validity code:  
 Towing dir: 120e Wire out: 150 m Speed: 35 kn\*10

Sorted: 34 Kg Total catch: 1192.10 CATCH/HOUR: 4768.40  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 3808.00 48316 79.86 1855  
 Sardinella aurita 462.00 1400 9.69 1857  
 Scomber japonicus 448.00 3500 9.40 1856  
 Trachurus trachurus 50.40 840 1.06  
 Total 4768.40 100.01

PROJECT STATION: 941  
 DATE:26/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2337  
 start stop duration Long W 1607  
 TIME :01:31:58 03:46:20 14 (min) Purpose code: 1  
 LOG :6667.28 6668.05 0.75 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 29 27 Validity code:  
 Towing dir: 55e Wire out: 150 m Speed: 30 kn\*10

Sorted: 35 Kg Total catch: 414.54 CATCH/HOUR: 1776.60  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 1689.26 19153 95.08 1858  
 Sardinella maderensis 50.14 223 2.82  
 Loligo vulgaris 16.71 111 0.94  
 Campogramma glaycos 14.40 17 0.81  
 Pagellus bellottii 4.46 56 0.25  
 Scomber japonicus 1.63 4 0.09  
 Total 1776.60 99.99

PROJECT STATION: 942  
 DATE:26/11/99 GEAR TYPE: PT No:1 POSITION:Lat N 2402  
 start stop duration Long W 1548  
 TIME :17:02:16 17:20:21 18 (min) Purpose code: 1  
 LOG :6796.64 6797.89 1.23 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 25 24 Validity code:  
 Towing dir: 203e Wire out: 125 m Speed: 40 kn\*10

Sorted: 69 Kg Total catch: 484.68 CATCH/HOUR: 1615.60  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 1416.33 15680 87.67 1859  
 Sardinella aurita 147.93 1167 9.16 1860  
 Sardinella maderensis 51.33 233 3.18 1861  
 Total 1615.59 100.01

PROJECT STATION: 943  
 DATE:26/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2408  
 start stop duration Long W 1605  
 TIME :19:27:06 19:57:08 30 (min) Purpose code: 1  
 LOG :6815.34 6817.30 2.23 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 38 45 Validity code:  
 Towing dir: 296e Wire out: 150 m Speed: 40 kn\*10

Sorted: 34 Kg Total catch: 556.16 CATCH/HOUR: 1112.32  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 659.20 8032 59.26 1862  
 Scomber japonicus 448.00 8512 40.28 1863  
 Trichurus lepturus 3.48 2 0.31  
 Campogramma glaycos 1.24 2 0.11  
 Pomadasys incisus 0.40 2 0.04  
 Total 1112.32 100.00

PROJECT STATION: 944  
 DATE:26/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2416  
 start stop duration Long W 1621  
 TIME :22:13:09 22:41:53 29 (min) Purpose code: 1  
 LOG :6833.41 6834.91 1.48 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 68 70 Validity code:  
 Towing dir: 296e Wire out: 150 m Speed: 30 kn\*10

Sorted: 53 Kg Total catch: 314.32 CATCH/HOUR: 650.32  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Scomber japonicus 391.03 11526 60.13 1864  
 Sardina pilchardus 152.69 3310 23.48 1865  
 Sepia orbignyana 29.79 74 4.58  
 Trichurus lepturus 26.48 19 4.07  
 Trachurus trachurus 20.48 708 3.15 1866  
 Trachurus trecae 14.52 633 2.23 1867  
 Prionace glauca 9.93 2 1.53  
 Loligo vulgaris 5.38 4 0.83  
 Total 650.30 100.00

PROJECT STATION: 945  
 DATE:27/11/99 GEAR TYPE: PT No:5 POSITION:Lat N 2424  
 start stop duration Long W 1616  
 TIME :04:10:52 04:44:46 34 (min) Purpose code: 1  
 LOG :6882.09 6883.62 1.52 Area code : 3  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 71 68 Validity code: 9  
 Towing dir: 115e Wire out: 150 m Speed: 30 kn\*10

Sorted: 4 Kg Total catch: 3.92 CATCH/HOUR: 6.92  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sarda sarda 5.72 2 82.66  
 Loligo vulgaris 1.09 2 15.75  
 Scomber japonicus 0.11 2 1.59  
 Total 6.92 100.00

PROJECT STATION: 946  
 DATE:27/11/99 GEAR TYPE: PT No:4 POSITION:Lat N 2409  
 start stop duration Long W 1541  
 TIME :08:44:01 09:13:10 29 (min) Purpose code: 1  
 LOG :6920.98 6923.06 2.06 Area code : 3  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 21 23 Validity code: 9  
 Towing dir: 295e Wire out: 120 m Speed: 43 kn\*10

Sorted: 1 Kg Total catch: 1.19 CATCH/HOUR: 2.46  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Belone svetovidovi \* 2.32 58 94.31  
 Engraulis encrasicolus 0.12 27 4.88  
 Sardinella pilchardus 0.02 2 0.81  
 Total 2.46 100.00

PROJECT STATION: 947  
 DATE:27/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2409  
 start stop duration Long W 1536  
 TIME :10:27:30 10:56:53 29 (min) Purpose code: 1  
 LOG :6932.60 6934.11 1.48 Area code : 3  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 19 19 Validity code: 9  
 Towing dir: 22e Wire out: 150 m Speed: 30 kn\*10

Sorted: Kg Total catch: 0.02 CATCH/HOUR: 0.04  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Engraulis encrasicolus 0.04 4 100.00  
 Total 0.04 100.00

PROJECT STATION: 948  
 DATE:27/11/99 GEAR TYPE: BT No:2 POSITION:Lat N 2415  
 start stop duration Long W 1529  
 TIME :12:09:21 12:32:20 23 (min) Purpose code: 1  
 LOG :6943.50 6944.72 1.19 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 20 20 Validity code:  
 Towing dir: 235e Wire out: 150 m Speed: 30 kn\*10

Sorted: 103 Kg Total catch: 4867.69 CATCH/HOUR: 12698.32  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Diplopus bellottii 11124.65 175135 87.61  
 Sardina pilchardus 484.17 6052 3.81 1868  
 Pomadasys incisus 435.00 3783 3.43  
 Pagellus acarne 295.04 7187 2.32  
 Trachurus trachurus 90.78 3404 0.71  
 Pagrus pagrus 56.74 190 0.45  
 Diplopus vulgaris 53.48 112 0.42  
 Loligo vulgaris 56.74 569 0.45  
 Mullus surmuletus 26.77 446 0.21  
 Scomber japonicus 22.70 378 0.18  
 Raja undulata 21.18 10 0.17  
 Sparus auriga \* 17.43 68 0.14  
 Spondylisoma cantharus 11.35 378 0.09  
 Octopus vulgaris 2.30 3 0.02  
 Total 12698.33 100.01

PROJECT STATION: 949  
 DATE:27/11/99 GEAR TYPE: PT No:3 POSITION:Lat N 1551  
 start stop duration Long W 1551  
 TIME :19:11:59 19:40:45 29 (min) Purpose code: 1  
 LOG :7010.25 7012.28 2.00 Area code : 3  
 FDEPTH: 15 15 GearCond.code:  
 BDEPTH: 43 49 Validity code:  
 Towing dir: 295e Wire out: 150 m Speed: 40 kn\*10

Sorted: 41 Kg Total catch: 1437.38 CATCH/HOUR: 2973.89  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 2151.72 29534 72.35 1869  
 Scomber japonicus 802.76 18286 26.99 1870  
 Belone svetovidovi \* 8.28 166 0.28  
 Trichurus lepturus 6.91 2 0.23  
 Loligo vulgaris 4.22 4 0.14  
 Total 2973.89 99.99

PROJECT STATION: 950  
 DATE:27/11/99 GEAR TYPE: PT No:3 POSITION:Lat N 2426  
 start stop duration Long W 1531  
 TIME :22:35:12 22:46:19 11 (min) Purpose code: 1  
 LOG :7038.39 7039.09 0.69 Area code : 3  
 FDEPTH: 15 15 GearCond.code:  
 BDEPTH: 26 27 Validity code:  
 Towing dir: 294e Wire out: 120 m Speed: 35 kn\*10

Sorted: 31 Kg Total catch: 628.80 CATCH/HOUR: 3429.82  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 3192.73 95613 98.92 1871  
 Scomber japonicus 26.18 436 0.76  
 Engraulis encrasicolus 6.55 655 0.19  
 Belone svetovidovi \* 4.36 109 0.13  
 Total 3429.82 100.00

PROJECT STATION: 951  
 DATE:28/11/99 GEAR TYPE: PT No:7 POSITION:Lat N 2427  
 start stop duration Long W 1517  
 TIME :00:57:34 01:20:48 23 (min) Purpose code: 1  
 LOG :7057.36 7058.63 1.26 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 23 23 Validity code:  
 Towing dir: 63e Wire out: 150 m Speed: 30 kn\*10

Sorted: 33 Kg Total catch: 366.52 CATCH/HOUR: 956.14  
 SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 949.83 11335 99.34 1872  
 Diplopus bellottii 5.74 86 0.60  
 Trachurus trachurus 0.57 29 0.06  
 Total 956.14 100.00

PROJECT STATION: 952  
 DATE: 28/11/99 GEAR TYPE: BT No:2 POSITION: Lat N 2436  
 start stop duration Long W 1524  
 TIME :03:36:04 04:01:58 26 (min) Purpose code: 1  
 LOG :7078.51 7079.71 1.18 Area code : 3  
 FDEPTH: 30 30 GearCond.code:  
 BDEPTH: 30 30 Validity code:  
 Towing dir: 115e Wire out: 150 m Speed: 30 kn\*10

Sorted: 46 Kg Total catch: 46.34 CATCH/HOUR: 106.94

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
SOLEIDAE	55.11	8266	51.53
Sardina pilchardus	29.72	408	27.79
Scomber japonicus	8.91	155	8.33
Trachinus vipera	8.77	242	8.20
Chelidonichthys obscurus	0.88	30	0.82
Dicologlossa cuneata	0.78	14	0.73
Sepia officinalis hierredda	0.78	7	0.73
Pagellus bellottii	0.60	5	0.56
Trachurus trachurus	0.55	9	0.51
Loligo vulgaris	0.42	5	0.39
Solea sp.	0.23	7	0.22
Boops boops	0.18	5	0.17
Total	106.93	99.98	

PROJECT STATION: 953  
 DATE: 28/11/99 GEAR TYPE: BT No:2 POSITION: Lat N 2506  
 start stop duration Long W 1610  
 TIME :10:43:41 11:13:17 30 (min) Purpose code: 1  
 LOG :7146.84 7148.26 1.34 Area code : 3  
 FDEPTH: 241 255 GearCond.code:  
 BDEPTH: 241 255 Validity code:  
 Towing dir: 241e Wire out: 700 m Speed: 30 kn\*10

Sorted: 41 Kg Total catch: 120.72 CATCH/HOUR: 241.44

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Lepidopus caudatus	127.36	848	52.75
Dentex macrophthalmus	75.52	624	31.28
Merluccius senegalensis	17.04	64	7.06
Zeus faber	7.12	42	2.95
Capros aper	7.04	1360	2.92
Mullus surmuletus	1.76	6	0.73
Trachurus trachurus	1.52	8	0.63
Illex coindetii	0.96	10	0.40
Trachinus draco	0.80	8	0.33
Microchirus boscanion	0.48	80	0.20
Shrimps, small, non comm.	0.48	176	0.20
PORTUNIDAE	0.32	48	0.13
Sepia orbignyana	0.32	8	0.13
Citharus linguatula	0.32	8	0.13
Macrobrachyus scolopax	0.16	16	0.07
Allotheutis subulata	0.16	24	0.07
Scorpaena sp.	0.08	16	0.03
Total	241.44	100.01	

PROJECT STATION: 954  
 DATE: 28/11/99 GEAR TYPE: BT No:2 POSITION: Lat N 2444  
 start stop duration Long W 1515  
 TIME :17:08:23 17:38:49 30 (min) Purpose code: 1  
 LOG :7208.57 7210.16 1.55 Area code : 3  
 FDEPTH: 33 34 GearCond.code:  
 BDEPTH: 33 34 Validity code:  
 Towing dir: 292e Wire out: 150 m Speed: 30 kn\*10

Sorted: 37 Kg Total catch: 170.74 CATCH/HOUR: 341.48

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	251.00	5272	73.50
Scomber japonicus	78.00	1938	22.84
Trachurus trachurus	3.20	70	0.94
Raja clavata	2.48	2	0.73
Octopus vulgaris	2.16	4	0.63
Trachinus draco	1.80	40	0.53
Loligo vulgaris	1.20	6	0.35
Mullus surmuletus	0.84	2	0.25
Dicologlossa cuneata	0.80	10	0.23
Total	341.48	100.00	

PROJECT STATION: 955  
 DATE: 29/11/99 GEAR TYPE: PT No:1 POSITION: Lat N 2509  
 start stop duration Long W 1527  
 TIME :08:27:02 08:48:49 22 (min) Purpose code: 1  
 LOG :7357.11 7358.64 1.56 Area code : 3  
 FDEPTH: 25 25 GearCond.code:  
 BDEPTH: 70 74 Validity code:  
 Towing dir: 290e Wire out: 130 m Speed: 40 kn\*10

Sorted: 37 Kg Total catch: 37.10 CATCH/HOUR: 101.18

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachinus draco	101.18	1710	100.00
Total	101.18	100.00	

PROJECT STATION: 956  
 DATE: 29/11/99 GEAR TYPE: PT No:1 POSITION: Lat N 2509  
 start stop duration Long W 1526  
 TIME :09:49:15 10:30:14 41 (min) Purpose code: 1  
 LOG :7365.60 7368.38 2.75 Area code : 3  
 FDEPTH: 25 25 GearCond.code:  
 BDEPTH: 69 75 Validity code:  
 Towing dir: 290e Wire out: 130 m Speed: 45 kn\*10

Sorted: 35 Kg Total catch: 116.92 CATCH/HOUR: 171.10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Scomber japonicus	131.12	2309	76.63
Trachinus armatus	28.10		16.42
Sardinella aurita	9.89	22	5.78
Sardinella maderensis	1.05	3	0.61
Sepia officinalis hierredda	0.94	6	0.55
Total	171.10	99.99	

PROJECT STATION: 957  
 DATE: 29/11/99 GEAR TYPE: PT No:6 POSITION: Lat N 2457  
 start stop duration Long W 1457  
 TIME :14:09:27 14:32:01 23 (min) Purpose code: 1  
 LOG :7402.82 7404.21 1.37 Area code : 3  
 FDEPTH: 25 25 GearCond.code:  
 BDEPTH: 36 38 Validity code:  
 Towing dir: 295e Wire out: 150 m Speed: 40 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION: 958  
 DATE: 29/11/99 GEAR TYPE: PT No:6 POSITION: Lat N 2445  
 start stop duration Long W 1507  
 TIME :18:47:42 19:21:50 34 (min) Purpose code: 1  
 LOG :7445.82 7447.81 1.98 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 33 31 Validity code:  
 Towing dir: 98e Wire out: 130 m Speed: 33 kn\*10

Sorted: 37 Kg Total catch: 2053.15 CATCH/HOUR: 3623.21

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	352.35	49534	98.04
Scomber japonicus	67.94	1442	1.88
Trachurus trachurus	1.94	97	0.05
Engraulis encrasicolus	0.97	97	0.03
Total	3623.20	100.00	

PROJECT STATION: 959  
 DATE: 29/11/99 GEAR TYPE: PT No:6 POSITION: Lat N 2439  
 start stop duration Long W 1522  
 TIME :22:41:35 23:16:51 35 (min) Purpose code: 1  
 LOG :7479.15 7481.20 2.02 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 31 30 Validity code:  
 Towing dir: 219e Wire out: 130 m Speed: 33 kn\*10

Sorted: 35 Kg Total catch: 3414.52 CATCH/HOUR: 5853.46

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	5708.57	102686	97.52
Scomber japonicus	96.00	2229	1.64
Engraulis encrasicolus	48.00	3771	0.82
Loligo vulgaris	0.89	2	0.02
Total	5853.46	100.00	

PROJECT STATION: 960  
 DATE: 30/11/99 GEAR TYPE: PT No:6 POSITION: Lat N 2408  
 start stop duration Long W 1549  
 TIME :03:00:39 03:29:28 29 (min) Purpose code: 1  
 LOG :7519.44 7521.31 1.84 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 28 29 Validity code:  
 Towing dir: 228e Wire out: 150 m Speed: 40 kn\*10

Sorted: 22 Kg Total catch: 22.38 CATCH/HOUR: 46.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Scomber japonicus	21.48	399	46.39
Trachurus trachurus	10.30	267	22.25
Trachurus trecae	8.69	300	18.77
Sardina pilchardus	3.27	68	7.06
Loligo vulgaris	2.11	6	4.56
Belone svetovidovi *	0.21	4	0.45
Sardinella aurita	0.21	6	0.45
Pagellus bellottii	0.02	2	0.04
Trachinotus sp.	0.02	6	0.04
Total	46.31	100.01	

PROJECT STATION: 961  
 DATE: 30/11/99 GEAR TYPE: PT No:6 POSITION: Lat N 2400  
 start stop duration Long W 1556  
 TIME :04:42:58 04:46:19 3 (min) Purpose code: 1  
 LOG :7531.19 7531.39 0.20 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 33 30 Validity code:  
 Towing dir: 40e Wire out: 120 m Speed: 40 kn\*10

Sorted: 34 Kg Total catch: 440.90 CATCH/HOUR: 8818.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	8148.40	210080	92.41
Scomber japonicus	421.20	8320	4.78
Trachurus trachurus	93.60	2340	1.06
Sardinella aurita	72.80	2600	0.83
Trachurus trecae	41.60	1300	0.47
Engraulis encrasicolus	36.40	3380	0.41
Pagellus bellottii	4.00	20	0.05
Total	8818.00	100.01	

PROJECT STATION: 962  
 DATE: 30/11/99 GEAR TYPE: PT No:3 POSITION: Lat N 2447  
 start stop duration Long W 1513  
 TIME :21:02:25 21:31:18 29 (min) Purpose code: 1  
 LOG :7702.07 7703.86 1.77 Area code : 3  
 FDEPTH: 15 15 GearCond.code:  
 BDEPTH: 34 35 Validity code:  
 Towing dir: 42e Wire out: 150 m Speed: 33 kn\*10

Sorted: 36 Kg Total catch: 729.26 CATCH/HOUR: 1508.81

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardina pilchardus	1452.41	29048	96.26
Scomber japonicus	55.45	1200	3.68
Engraulis encrasicolus	0.62	41	0.04
Pomadasys incisus	0.33	2	0.02
Total	1508.81	100.00	



PROJECT STATION: 963  
DATE: 1/12/99 GEAR TYPE: PT No:1 POSITION: Lat N 2522 Long W 1504  
start stop duration  
TIME :09:42:15 10:20:04 38 (min) Purpose code: 1  
LOG :7835.00 7837.33 2.28 Area code : 3  
FDEPTH: 42 40 GearCond.code: 2  
BDEPTH: 69 70 Validity code: 9  
Towing dir: 227° Wire out: 300 m Speed: 30 kn\*10  
Sorted: 123 Kg Total catch: 123.10 CATCH/HOUR: 194.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	170.21	178	87.57	
Scomber japonicus	24.16	406	12.43	1893
Total	194.37		100.00	

PROJECT STATION: 964  
DATE: 1/12/99 GEAR TYPE: PT No:5 POSITION: Lat N 2527 Long W 1447  
start stop duration  
TIME :14:37:00 15:03:55 27 (min) Purpose code: 1  
LOG :7877.97 7879.82 1.75 Area code : 3  
FDEPTH: 20 20 GearCond.code: 1  
BDEPTH: 31 30 Validity code: 9  
Towing dir: 210° Wire out: 130 m Speed: 40 kn\*10  
Sorted: 4 Kg Total catch: 3.58 CATCH/HOUR: 7.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Camponogramma glaycos	7.73	7	97.11	
Sardina pilchardus	0.22	2	2.76	
Total	7.95		99.87	

PROJECT STATION: 965  
DATE: 2/12/99 GEAR TYPE: BT No:2 POSITION: Lat N 2613 Long W 1448  
start stop duration  
TIME :11:32:47 11:58:43 26 (min) Purpose code: 1  
LOG :8085.98 8087.25 1.25 Area code : 3  
FDEPTH: 200 182 GearCond.code: 2  
BDEPTH: 200 182 Validity code: 2  
Towing dir: 190° Wire out: 600 m Speed: 30 kn\*10  
Sorted: 67 Kg Total catch: 92.18 CATCH/HOUR: 212.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex maroccanus	61.38	651	28.85	
Dentex macropthalmus	54.00	688	25.39	
Zeus faber	32.17	23	15.12	
Merluccius senegalensis	26.72	53	12.56	
Lagocephalus laevisgatus	9.78	7	4.60	
Zenopsis conchifer	8.91	5	4.19	
Trachurus trachurus	7.66	32	3.60	1894
Umbrina canariensis	3.05	9	1.43	
Ilex coindetii	2.22	25	1.04	
Lepidopus caudatus	1.89	32	0.89	
Scomber japonicus	1.85	5	0.87	
Callanthias ruber	1.48	129	0.70	
Mullus surmuletus	0.60	2	0.28	
Chelidonichthys obscurus	0.51	2	0.24	
Argentina sphyraena	0.28	23	0.13	
Allotheutis subulata	0.18	74	0.08	
Citharus linguatula	0.05	5	0.02	
Total	212.73		99.99	

PROJECT STATION: 966  
DATE: 2/12/99 GEAR TYPE: PT No:6 POSITION: Lat N 2625 Long W 1424  
start stop duration  
TIME :18:57:40 19:26:20 29 (min) Purpose code: 1  
LOG :8142.09 8143.94 1.85 Area code : 3  
FDEPTH: 5 5 GearCond.code: 2  
BDEPTH: 28 26 Validity code: 2  
Towing dir: 220° Wire out: 130 m Speed: 33 kn\*10  
Sorted: 82 Kg Total catch: 81.56 CATCH/HOUR: 168.74

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Spondyliosoma cantharus	91.45	416	54.20	
Sardinella aurita	33.39	97	19.79	1895
Trachinotus ovatus	25.70	72	15.23	
Scomber japonicus	9.06	19	5.37	
Sarda sarda	6.29	2	3.73	
Sardinella maderensis	2.65	4	1.57	1896
Boops boops	0.21	4	0.12	
Total	168.75		100.01	

PROJECT STATION: 967  
DATE: 2/12/99 GEAR TYPE: PT No:6 POSITION: Lat N 2628 Long W 1406  
start stop duration  
TIME :22:48:29 23:18:30 30 (min) Purpose code: 1  
LOG :8178.28 8180.25 1.97 Area code : 3  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 29 29 Validity code: 2  
Towing dir: 70° Wire out: 130 m Speed: 33 kn\*10  
Sorted: 33 Kg Total catch: 64.06 CATCH/HOUR: 128.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	47.20	4236	36.84	1897
Sarpa salpa	26.32	76	20.54	
Engraulis encrasicolus	20.40	5612	15.92	1898
Scomber japonicus	20.24	256	15.80	1899
Trachinotus ovatus	5.36	28	4.18	
Trachurus trachurus	5.28	120	4.12	1900
Liza ramada	2.36	2	1.84	
Pagellus bellottii	0.64	4	0.50	
Loligo vulgaris	0.56	4	0.44	
Boops boops	0.32	8	0.25	
Diplodus bellottii	0.16	4	0.12	
Total	128.84		100.55	

PROJECT STATION: 968  
DATE: 3/12/99 GEAR TYPE: PT No:6 POSITION: Lat N 2640 Long W 1354  
start stop duration  
TIME :03:01:49 03:31:20 30 (min) Purpose code: 1  
LOG :8218.87 8220.68 1.76 Area code : 3  
FDEPTH: 5 5 GearCond.code: 2  
BDEPTH: 52 48 Validity code: 2  
Towing dir: 140° Wire out: 150 m Speed: 40 kn\*10  
Sorted: 113 Kg Total catch: 112.77 CATCH/HOUR: 225.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	219.08	164	97.14	
Sardina pilchardus	5.64	88	2.50	1901
Allotheutis subulata	0.56	210	0.25	
Sepia orbignyana	0.24	4	0.11	
Sepiola rondeletii	0.02	30	0.01	
Total	225.54		100.01	

PROJECT STATION: 969  
DATE: 3/12/99 GEAR TYPE: PT No:1 POSITION: Lat N 2712 Long W 1336  
start stop duration  
TIME :12:58:35 13:14:07 16 (min) Purpose code: 1  
LOG :8313.31 8314.36 1.04 Area code : 3  
FDEPTH: 60 60 GearCond.code: 2  
BDEPTH: 81 79 Validity code: 2  
Towing dir: 28° Wire out: 300 m Speed: 40 kn\*10  
Sorted: 37 Kg Total catch: 1039.92 CATCH/HOUR: 3899.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	3546.90	53550	90.95	1902
Scomber japonicus	273.00	7245	7.00	1903
Engraulis encrasicolus	79.80	4305	2.05	1904
Total	3899.70		100.00	

PROJECT STATION: 970  
DATE: 3/12/99 GEAR TYPE: PT No:3 POSITION: Lat N 2718 Long W 1326  
start stop duration  
TIME :15:44:13 15:52:49 9 (min) Purpose code: 1  
LOG :8335.28 8335.91 0.63 Area code : 3  
FDEPTH: 15 15 GearCond.code: 2  
BDEPTH: 27 31 Validity code: 2  
Towing dir: 237° Wire out: 200 m Speed: 40 kn\*10  
Sorted: 50 Kg Total catch: 99.28 CATCH/HOUR: 661.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	401.87	6147	60.72	1906
Camponogramma glaycos	176.27	227	26.63	
Spondyliosoma cantharus	59.73	320	9.02	
Scomber japonicus	24.00	160	3.63	1905
Total	661.87		100.00	

PROJECT STATION: 971  
DATE: 6/12/99 GEAR TYPE: PT No:1 POSITION: Lat N 2732 Long W 1324  
start stop duration  
TIME :17:40:45 17:53:24 13 (min) Purpose code: 1  
LOG :8709.29 8710.06 0.74 Area code : 3  
FDEPTH: 100 100 GearCond.code: 2  
BDEPTH: 173 256 Validity code: 2  
Towing dir: 225° Wire out: 450 m Speed: 40 kn\*10  
Sorted: 1 Kg Total catch: 1.24 CATCH/HOUR: 5.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepidopus caudatus	5.45	106	95.28	
Maurilicus muelleri	0.28	198	4.90	
Total	5.73		100.18	

PROJECT STATION: 972  
DATE: 7/12/99 GEAR TYPE: PT No:1 POSITION: Lat N 2802 Long W 1305  
start stop duration  
TIME :02:57:40 03:16:00 18 (min) Purpose code: 1  
LOG :8788.91 8790.23 1.29 Area code : 2  
FDEPTH: 20 20 GearCond.code: 2  
BDEPTH: 73 73 Validity code: 2  
Towing dir: 30° Wire out: 150 m Speed: 40 kn\*10  
Sorted: 32 Kg Total catch: 64.26 CATCH/HOUR: 214.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	213.07	10193	99.47	1907
Scomber japonicus	0.80	20	0.37	
Engraulis encrasicolus	0.13	27	0.06	
Allotheutis subulata	0.13	47	0.06	
Sepia bertheloti	0.07	13	0.03	
Total	214.20		99.99	

PROJECT STATION: 973  
DATE: 7/12/99 GEAR TYPE: BT No:2 POSITION: Lat N 2804 Long W 1227  
start stop duration  
TIME :10:30:43 11:02:00 31 (min) Purpose code: 1  
LOG :8856.13 8857.93 1.76 Area code : 3  
FDEPTH: 32 33 GearCond.code: 2  
BDEPTH: 32 33 Validity code: 2  
Towing dir: 260° Wire out: 160 m Speed: 30 kn\*10  
Sorted: 45 Kg Total catch: 709.60 CATCH/HOUR: 1373.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	682.06	104315	49.66	1908
Sardina pilchardus	627.10	40065	45.66	1909
Diplodus bellottii	35.61	697	2.59	
Octopus vulgaris	5.42	4	0.39	
Scomber japonicus	5.34	31	0.39	1910
Allotheutis subulata	4.65	852	0.34	
Pagellus bellottii	3.87	39	0.28	
Camponogramma glaycos	3.48	6	0.25	
Pomatomus saltatrix	2.17	2	0.16	
Loligo vulgaris	1.66	4	0.12	
Loligo vulgaris	1.55	116	0.11	
Trachurus trachurus	0.50	10	0.04	
Total	1373.41		99.99	

PROJECT STATION: 974  
 DATE: 7/12/99 GEAR TYPE: PT No:1 POSITION:Lat N 2833 Long W 1235  
 start stop duration  
 TIME :14:30:00 14:55:00 25 (min) Purpose code: 1  
 LOG :8892.00 8893.40 1.40 Area code : 2  
 FDEPTH: 85 85 GearCond.code:  
 BDEPTH: 105 101 Validity code:  
 Towing dir: 176e Wire out: 400 m Speed: 40 kn\*10  
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 NOCATCH 0.00

PROJECT STATION: 975  
 DATE: 7/12/99 GEAR TYPE: PT No:4 POSITION:Lat N 2837 Long W 1209  
 start stop duration  
 TIME :20:31:39 21:03:00 31 (min) Purpose code: 1  
 LOG :8949.49 8951.09 2.23 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 104 101 Validity code:  
 Towing dir: 169e Wire out: 150 m Speed: 30 kn\*10  
 Sorted: 34 Kg Total catch: 405.12 CATCH/HOUR: 784.10

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Scomber japonicus 725.11 18128 92.48 1911  
 Engraulis encrasicolus 54.35 2950 6.93 1912  
 Sardina pilchardus 4.65 70 0.59 1912  
 Total 784.11 100.00

PROJECT STATION: 976  
 DATE: 8/12/99 GEAR TYPE: PT No:1 POSITION:Lat N 2858 Long W 1139  
 start stop duration  
 TIME :05:22:37 05:35:16 13 (min) Purpose code: 1  
 LOG :9022.23 9023.20 0.95 Area code : 3  
 FDEPTH: 25 25 GearCond.code:  
 BDEPTH: 111 114 Validity code:  
 Towing dir: 340e Wire out: 150 m Speed: 40 kn\*10  
 Sorted: 37 Kg Total catch: 325.80 CATCH/HOUR: 1503.69

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Scomber japonicus 1481.54 24692 98.53 1913  
 Sardina pilchardus 22.15 346 1.47 1914  
 Total 1503.69 100.00

PROJECT STATION: 977  
 DATE: 8/12/99 GEAR TYPE: PT No:3 POSITION:Lat N 2828 Long W 1134  
 start stop duration  
 TIME :10:18:15 10:49:26 31 (min) Purpose code: 1  
 LOG :9070.55 9072.43 1.86 Area code : 3  
 FDEPTH: 30 30 GearCond.code:  
 BDEPTH: 51 56 Validity code:  
 Towing dir: e Wire out: 200 m Speed: 35 kn\*10  
 Sorted: 36 Kg Total catch: 284.06 CATCH/HOUR: 549.79

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 548.13 8880 99.70 1915  
 Scomber japonicus 1.51 37 0.27 1916  
 Trachinus draco 0.15 15 0.03 1916  
 Total 549.79 100.00

PROJECT STATION: 978  
 DATE: 8/12/99 GEAR TYPE: PT No:1 POSITION:Lat N 2826 Long W 1141  
 start stop duration  
 TIME :13:32:29 13:42:46 10 (min) Purpose code: 1  
 LOG :9097.92 9098.68 0.76 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 52 53 Validity code:  
 Towing dir: 7e Wire out: 150 m Speed: 40 kn\*10  
 Sorted: 37 Kg Total catch: 440.00 CATCH/HOUR: 2640.00

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 1128.96 27792 42.76 1917  
 Engraulis encrasicolus 1088.64 67932 41.24 1918  
 Scomber japonicus 421.92 10962 15.98 1919  
 Total 2639.52 99.98

PROJECT STATION: 979  
 DATE: 8/12/99 GEAR TYPE: PT No:3 POSITION:Lat N 2819 Long W 1147  
 start stop duration  
 TIME :15:57:26 16:22:34 25 (min) Purpose code: 1  
 LOG :9118.43 9120.28 1.82 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 45 40 Validity code:  
 Towing dir: 111e Wire out: 250 m Speed: 40 kn\*10  
 Sorted: 50 Kg Total catch: 50.06 CATCH/HOUR: 120.14

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Scomber japonicus 94.66 2170 78.79 1920  
 Sardina pilchardus 17.38 295 14.47 1921  
 Engraulis encrasicolus 7.25 1087 6.03 1922  
 Trachinotus ovatus 0.96 2 0.80 1922  
 Total 120.25 100.09

PROJECT STATION: 980  
 DATE: 8/12/99 GEAR TYPE: PT No:6 POSITION:Lat N 2815 Long W 1154  
 start stop duration  
 TIME :18:31:48 18:49:17 17 (min) Purpose code: 1  
 LOG :9139.73 9140.67 0.92 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 38 40 Validity code:  
 Towing dir: 14e Wire out: 150 m Speed: 35 kn\*10  
 Sorted: 35 Kg Total catch: 3012.74 CATCH/HOUR: 10633.20

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 10620.00 349341 99.88 1923  
 Engraulis encrasicolus 12.00 1800 0.11 1923  
 Allothautis subulata 1.20 300 0.01 1923  
 Total 10633.20 100.00

PROJECT STATION: 981  
 DATE: 8/12/99 GEAR TYPE: BT No:2 POSITION:Lat N 2813 Long W 1211  
 start stop duration  
 TIME :23:07:22 23:25:48 18 (min) Purpose code: 1  
 LOG :9183.73 9184.82 1.06 Area code : 2  
 FDEPTH: 45 45 GearCond.code:  
 BDEPTH: 45 45 Validity code:  
 Towing dir: 140e Wire out: 200 m Speed: 33 kn\*10  
 Sorted: 34 Kg Total catch: 236.89 CATCH/HOUR: 789.63

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Trachurus trachurus 317.20 7710 40.17 1925  
 Scomber japonicus 254.80 3420 32.27 1924  
 Engraulis encrasicolus 42.80 3200 5.42 1926  
 Pomadasys incisus 38.40 440 4.86 1926  
 Pagellus acarne 30.80 160 3.80 1926  
 Argyrosomus hololepidotus 30.00 3 3.80 1926  
 Sardina pilchardus 20.80 510 2.63 1927  
 Pagellus bellottii 16.20 160 2.05 1927  
 Trachinus draco 15.20 360 1.92 1927  
 Boops boops 9.20 240 1.17 1927  
 Chelidonichthys obscurus 5.20 100 0.66 1927  
 Mullus surmuletus 3.03 10 0.38 1927  
 Umbrina cirrosa 2.80 20 0.35 1927  
 Tripterus luscus 1.20 20 0.15 1927  
 Pegusa lascaris 0.80 3 0.10 1927  
 Diplodus bellottii 0.80 20 0.10 1927  
 Sepia orbigynana 0.20 20 0.03 1927  
 Spondylisoma cantharus 0.20 20 0.03 1927  
 Total 789.63 99.99

PROJECT STATION: 982  
 DATE: 9/12/99 GEAR TYPE: PT No:1 POSITION:Lat N 2838 Long W 1140  
 start stop duration  
 TIME :05:20:21 05:32:17 12 (min) Purpose code: 1  
 LOG :9245.63 9246.43 0.80 Area code : 3  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 64 65 Validity code:  
 Towing dir: 64e Wire out: 140 m Speed: 40 kn\*10  
 Sorted: 31 Kg Total catch: 62.84 CATCH/HOUR: 314.20

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 225.60 3890 71.80 1928  
 Scomber japonicus 82.00 1810 26.10 1929  
 Trachinus draco 6.60 90 2.10 1929  
 Total 314.20 100.00

PROJECT STATION: 983  
 DATE: 9/12/99 GEAR TYPE: PT No:6 POSITION:Lat N 2900 Long W 1037  
 start stop duration  
 TIME :23:40:32 23:51:11 11 (min) Purpose code: 1  
 LOG :9424.88 9425.59 0.58 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 30 29 Validity code:  
 Towing dir: 60e Wire out: 150 m Speed: 35 kn\*10  
 Sorted: 77 Kg Total catch: 2184.24 CATCH/HOUR: 11914.04

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardina pilchardus 11522.29 550058 96.71 1930  
 Engraulis encrasicolus 96.38 10882 0.81 1931  
 Scomber japonicus 87.05 1707 0.73 1931  
 Chelidonichthys lucerna 74.62 153 0.63 1931  
 Pagellus acarne 68.40 933 0.57 1931  
 Diplodus bellottii 37.31 464 0.31 1931  
 Trachurus trachurus 27.98 775 0.23 1931  
 Total 11914.03 99.99

PROJECT STATION: 984  
 DATE: 10/12/99 GEAR TYPE: PT No:3 POSITION:Lat N 2914 Long W 1034  
 start stop duration  
 TIME :05:15:18 05:28:45 13 (min) Purpose code: 1  
 LOG :9476.74 9477.59 0.83 Area code : 3  
 FDEPTH: 15 15 GearCond.code:  
 BDEPTH: 56 58 Validity code:  
 Towing dir: 325e Wire out: 150 m Speed: 40 kn\*10  
 Sorted: 37 Kg Total catch: 74.62 CATCH/HOUR: 344.40

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Engraulis encrasicolus 183.88 13851 53.39 1932  
 Sardina pilchardus 160.25 3572 46.51 1932  
 Belone svetovidovi \* 0.28 5 0.08 1932  
 Total 344.41 100.00



PROJECT STATION: 985  
 DATE:10/12/99 GEAR TYPE: PT No:3 POSITION:Lat N 2933  
 start stop duration Long W 1007  
 TIME :14:19:01 14:41:52 23 (min) Purpose code: 1  
 LOG :9565.15 9566.77 1.60 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 39 42 Validity code:  
 Towing dir: 215e Wire out: 240 m Speed: 40 kn\*10  
 Sorted: 37 Kg Total catch: 739.20 CATCH/HOUR: 1928.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1928.35	36003	100.00	1934
Total	1928.35		100.00	

PROJECT STATION: 986  
 DATE:10/12/99 GEAR TYPE: PT No:6 POSITION:Lat N 2948  
 start stop duration Long W 954  
 TIME :19:00:45 19:24:32 24 (min) Purpose code: 1  
 LOG :9607.93 9609.22 1.27 Area code : 3  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 36 33 Validity code:  
 Towing dir: 220e Wire out: 150 m Speed: 33 kn\*10  
 Sorted: 34 Kg Total catch: 1004.40 CATCH/HOUR: 2511.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	654.00	14835	26.05	1935
Scomber japonicus	628.50	8758	25.03	1938
Diplodus vulgaris	595.50	2775	23.72	
Trachurus trachurus	192.00	3825	7.65	1937
Fomadasys incisivus	157.50	2325	6.27	
Engraulis encrasicolus	91.50	17750	3.64	1936
Boops boops	88.50	600	3.52	
Pagellus acarne	31.50	225	1.25	
Sarpa salpa	31.50	75	1.25	
Chelidonichthys lucerna	12.00	75	0.48	
Spondyliosoma cantharus	10.50	150	0.42	
Pagellus bellottii	9.00	75	0.36	
Belone svetovidovi *	9.00	150	0.36	
Total	2511.00		100.00	

PROJECT STATION: 987  
 DATE:11/12/99 GEAR TYPE: PT No:4 POSITION:Lat N 3005  
 start stop duration Long W 945  
 TIME :00:26:18 00:57:23 31 (min) Purpose code: 1  
 LOG :9655.58 9657.39 1.79 Area code : 2  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 83 95 Validity code:  
 Towing dir: 284e Wire out: 150 m Speed: 40 kn\*10  
 Sorted: 38 Kg Total catch: 152.42 CATCH/HOUR: 295.01

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	293.57	31008	99.51	1939
Trachurus trachurus	1.12	2	0.38	
Scomber japonicus	0.23	4	0.08	
Allotheutis subulata	0.08	15	0.03	
Total	295.00		100.00	

PROJECT STATION: 988  
 DATE:11/12/99 GEAR TYPE: PT No:1 POSITION:Lat N 3040  
 start stop duration Long W 955  
 TIME :12:48:06 13:11:06 23 (min) Purpose code: 1  
 LOG :9755.54 9757.14 1.55 Area code : 2  
 FDEPTH: 30 20 GearCond.code:  
 BDEPTH: 53 50 Validity code:  
 Towing dir: 200e Wire out: 200 m Speed: 40 kn\*10  
 Sorted: 37 Kg Total catch: 229.20 CATCH/HOUR: 597.91

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	585.70	46717	97.96	1940
Trachurus trachurus	7.20	10	1.20	
Lepidopus caudatus	4.07	3	0.68	
Scomber japonicus	0.78	3	0.13	
Allotheutis subulata	0.16	47	0.03	
Total	597.91		100.00	

PROJECT STATION: 989  
 DATE:12/12/99 GEAR TYPE: PT No:3 POSITION:Lat N 3151  
 start stop duration Long W 935  
 TIME :13:21:02 13:35:07 12 (min) Purpose code: 1  
 LOG :9992.76 9993.60 0.83 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 30 11 Validity code:  
 Towing dir: 220e Wire out: 240 m Speed: 40 kn\*10  
 Sorted: 31 Kg Total catch: 164.24 CATCH/HOUR: 821.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	555.50	55505	67.64	1942
Sardina pilchardus	220.50	15225	26.85	1941
Lepidopus caudatus	26.20	15	3.19	
Trachurus trachurus	7.50	25	0.91	
Scomber japonicus	6.40	110	0.78	
Pagellus acarne	5.10	10	0.62	
Total	821.20		99.99	

PROJECT STATION: 990  
 DATE:12/12/99 GEAR TYPE: PT No:4 POSITION:Lat N 3219  
 start stop duration Long W 922  
 TIME :21:47:54 22:16:34 29 (min) Purpose code: 1  
 LOG : 75.32 76.90 1.56 Area code : 2  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 46 48 Validity code:  
 Towing dir: 10e Wire out: 150 m Speed: 36 kn\*10  
 Sorted: 35 Kg Total catch: 292.66 CATCH/HOUR: 605.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis encrasicolus	488.28	36958	80.64	1943
Sardina pilchardus	93.68	2648	15.47	1944
Lepidopus caudatus	12.91	6	2.13	
Trachurus trachurus	3.68	6	0.61	
Pagellus acarne	2.57	6	0.42	
Stromateus fiatola	1.99	2	0.33	
Diplodus vulgaris	1.03	2	0.17	
Allotheutis subulata	0.99	430	0.16	
Chelidonichthys lucerna	0.21	2	0.03	
Sepiolo rondeleti	0.17	50	0.03	
Total	605.51		99.99	

PROJECT STATION: 991  
 DATE:13/12/99 GEAR TYPE: PT No:6 POSITION:Lat N 3233  
 start stop duration Long W 920  
 TIME :04:44:24 05:03:43 19 (min) Purpose code: 1  
 LOG : 141.60 142.77 1.16 Area code : 3  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 36 50 Validity code:  
 Towing dir: 144e Wire out: 150 m Speed: 40 kn\*10  
 Sorted: 58 Kg Total catch: 480.40 CATCH/HOUR: 1517.05

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardina pilchardus	1400.59	29507	92.32	1945
Scomber japonicus	48.51	644	3.20	
Trachurus trachurus	37.58	76	2.48	
Diplodus sargus *	12.51	13	0.82	
Lepidopus caudatus	10.80	6	0.71	
Engraulis encrasicolus	4.55	303	0.30	
Dicentrarchus labrax	2.08	3	0.14	
Chelidonichthys lucerna	0.44	3	0.03	
Total	1517.06		100.00	

### Annex III Instruments and fishing gear used

The Simrad EK-500, 38kHz 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 38kHz where as follows:

<b>Transceiver-1 menu</b>	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 dg
	Alongship offset	-0.03 dg
Athwardship offset	0.06 dg	
<b>Display menu</b>	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
<b>Printer- menu</b>	Range	0 - 50 or 0 -100 m and 100 - 350m
	TVG	20 log R
	Sv colour min	-63 dB
<b>Bottom detection menu</b>	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, 7.8m<sup>2</sup> (1670 kg) trawl doors were used. Complete drawings of the trawls used are included.