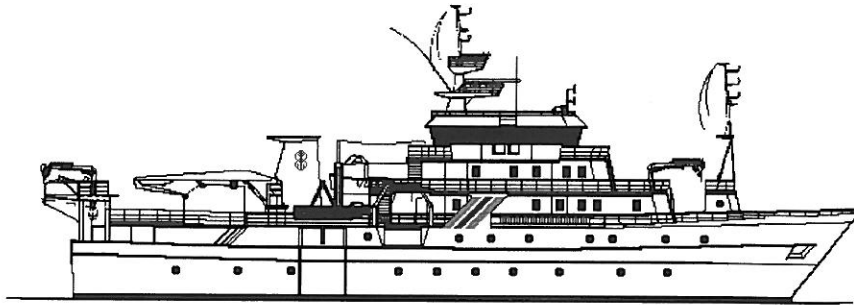


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CRUISE REPORTS "DR. FRIDTJOF NANSEN"



## **SURVEYS OF THE FISH RESOURCES OF ANGOLA**

**Cruise Report No 1/96**

**Surveys of the pelagic resources**

**28 February - 1 April 1996**

**Institute of Marine Research  
Bergen  
Norway**

**Instituto de Investigação Pesqueira, IIP  
Luanda  
Angola**

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28 February to 1 April 1995**

by

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Bergen, 1995**

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## CHAPTER 1 INTRODUCTION

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### 1.1 Objectives

The objectives of the survey had been previously agreed upon with the Director of the Instituto de Investigação Pesqueira (IIP). These can be summarized as follows:

- To map the distribution and estimate the abundance of the commercially important pelagic and semi-pelagic fish species in Angolan waters, including the two sardinella species *Sardinella aurita* and *S. maderensis*, the Cunene horse mackerel *Trachurus trecae*, the Cape horse mackerel *Trachurus capensis*, the pilchard *Sardinops ocellata* and other pelagic species, mainly carangids.
- To estimate the biological condition of sardinella and Cunene horse mackerel, length/weight relationships and reproductive stages.
- Map the general hydrographic regime by using a CTD sonde all over the survey area and monitor the temperature, salt and oxygen on IIP standard profiles for hydrographical studies. Survey the Angola Dome.
- Conduct current measurements with ADCP system.
- On-the-job training for the Angolan participants on the main survey routines, including collection and processing of raw data, species identification, utilization of the programme package NAN-SIS and general methodology in acoustic abundance estimation.

### 1.2 Participation

The scientific staff consisted of:

From IIP, Angola: Agostinho DUARTE, Vianda FILIPE (to 26 March), Luis FRANSISKO (to 10 March), Fernando GOMBO (from 26 March), N'Kosi LUYEYE, Epalanga MARTINHO (from 11 March), Joaquim PIMENTEL (to 10 March), Pedro PANZO (to 10 March), Rafael SARAIVA (from 11 March) and Filomena VAS VALHO (from 11 March).

From IMR, Bergen: Valentine ANTHONYPILLAI, Martin DAHL, Tor GAMMELSRØD (from 10 - 26 March), Erling MOLVÆR and Reidar TORESEN.

### 1.3 Narrative

The survey started at Luanda in the afternoon 28 February 1996. The area off Cabinda was not covered because of restrictions due to oil drilling activities. From the Congo River and southward, the entire shelf was covered from close to shore (20 m depth) to beyond the 200 m isobath or to where no pelagic fish were recorded. In the northernmost part of the survey area, the cruise track consisted of triangular transects, their endpoints about 15 nautical miles (NM) apart. When having past the oil drilling field north of N'Zeto the survey design was changed to parallel transects 5 NM apart. This pattern was followed until we passed Benguela. Further south, the area was covered by triangular transects. On the 10 March a call was made in Luanda and during the following days, from 11-15 March a survey of the Angola Dome was carried out. The acoustic investigation of the pelagic resources was resumed off Pta. das Palmeirinhas and in 10 days the area between Luanda and Benguela was covered. For two days, the Angola Dome was again surveyed, and this time successfully. A call was made in Lobito on the 26 March whereafter the area between Benguela and Cunene was surveyed. CTD (Conductivity-Temperature-Depth) and ADCP (Acoustic Doppler Current Profiler) measurements were taken regularly and on standard hydrographical sections. Trawling was done on registrations. Compared to last years survey, at the same time of the year, somewhat more pelagic fish was found during the present investigation.

### 1.4 Survey effort

Figures 1.1 a-d show the cruise tracks with fishing stations and the hydrographic profiles and Table 1 the number of hydrographic, pelagic and bottom trawl stations and distance surveyed in the three regions.

Table 1 Number of bottom (BT) and pelagic (PT) trawl stations, hydrographic stations and distance surveyed (NM) by area.

Area	BT	PT	CTD	Distance surveyed
Cabinda-Luanda	6	29	52	1 312
Luanda-Benguela	5	34	89	2 664
Benguela-Cunene	6	9	42	1 155
Total	17	72	183	5 131

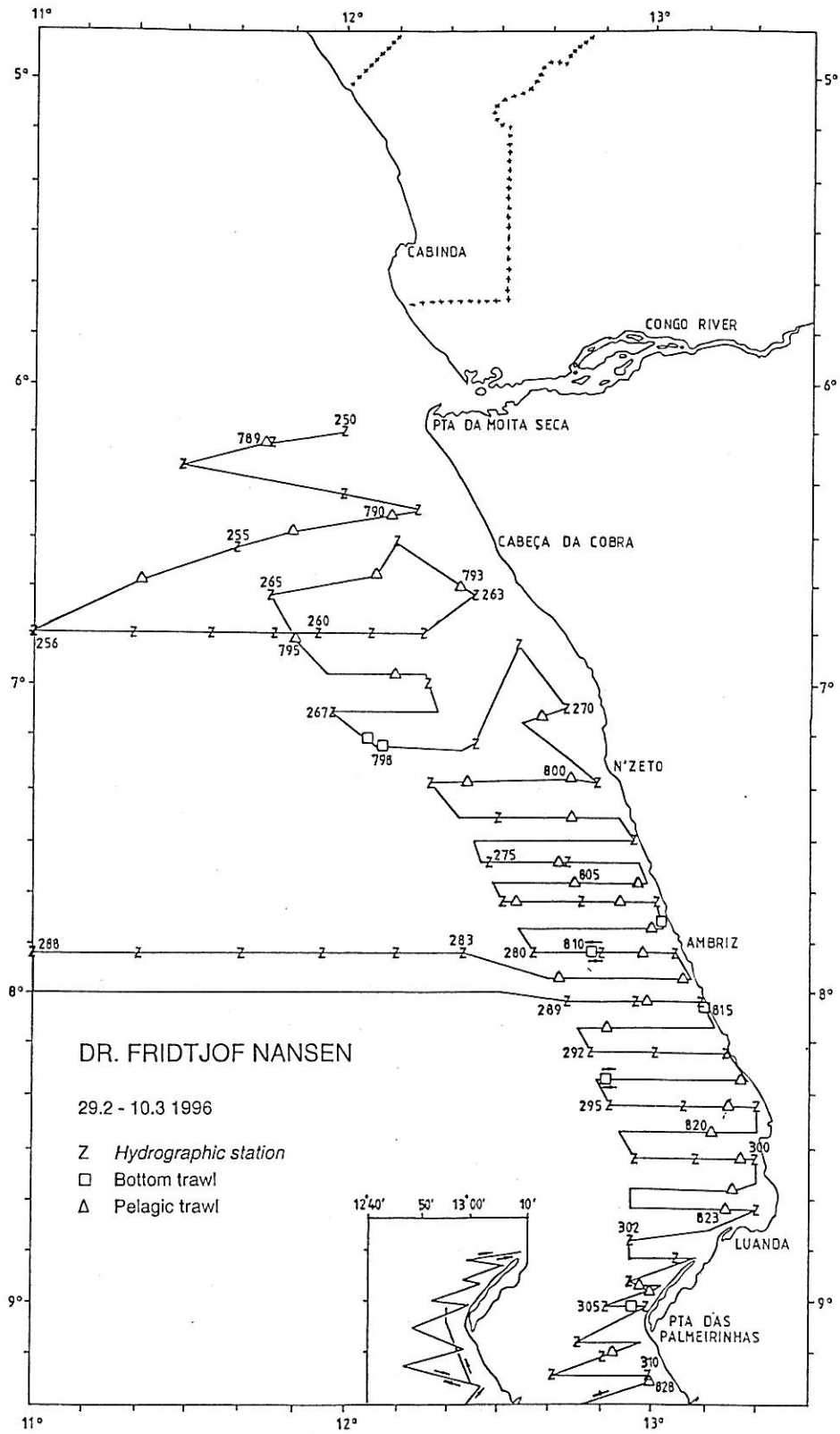


Figure 1.1 a. Course track with fishing and hydrographic stations, Cabinda-Luanda.

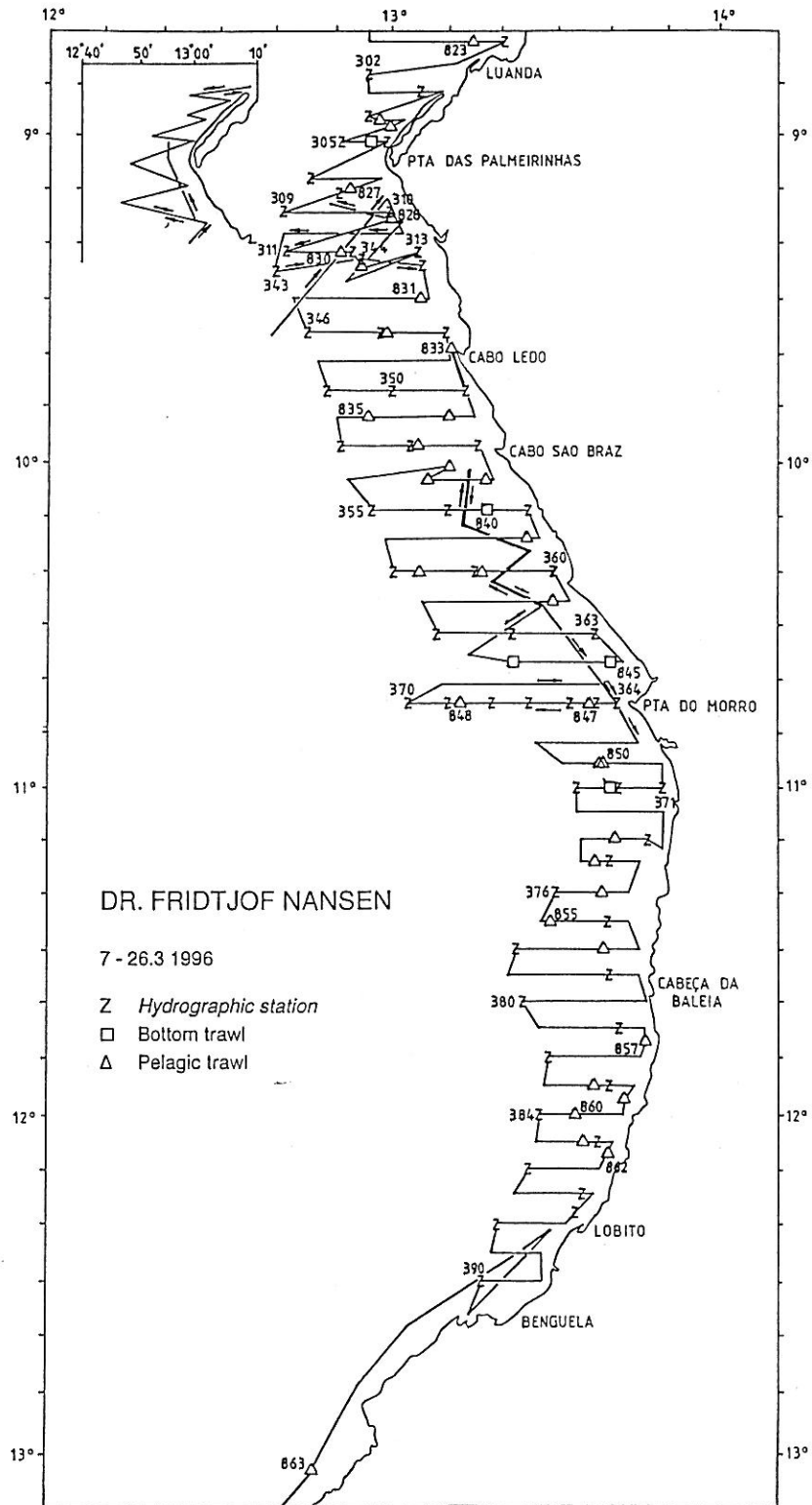


Figure 1.1 b. Course track with fishing and hydrographic stations, Luanda-Benguela.

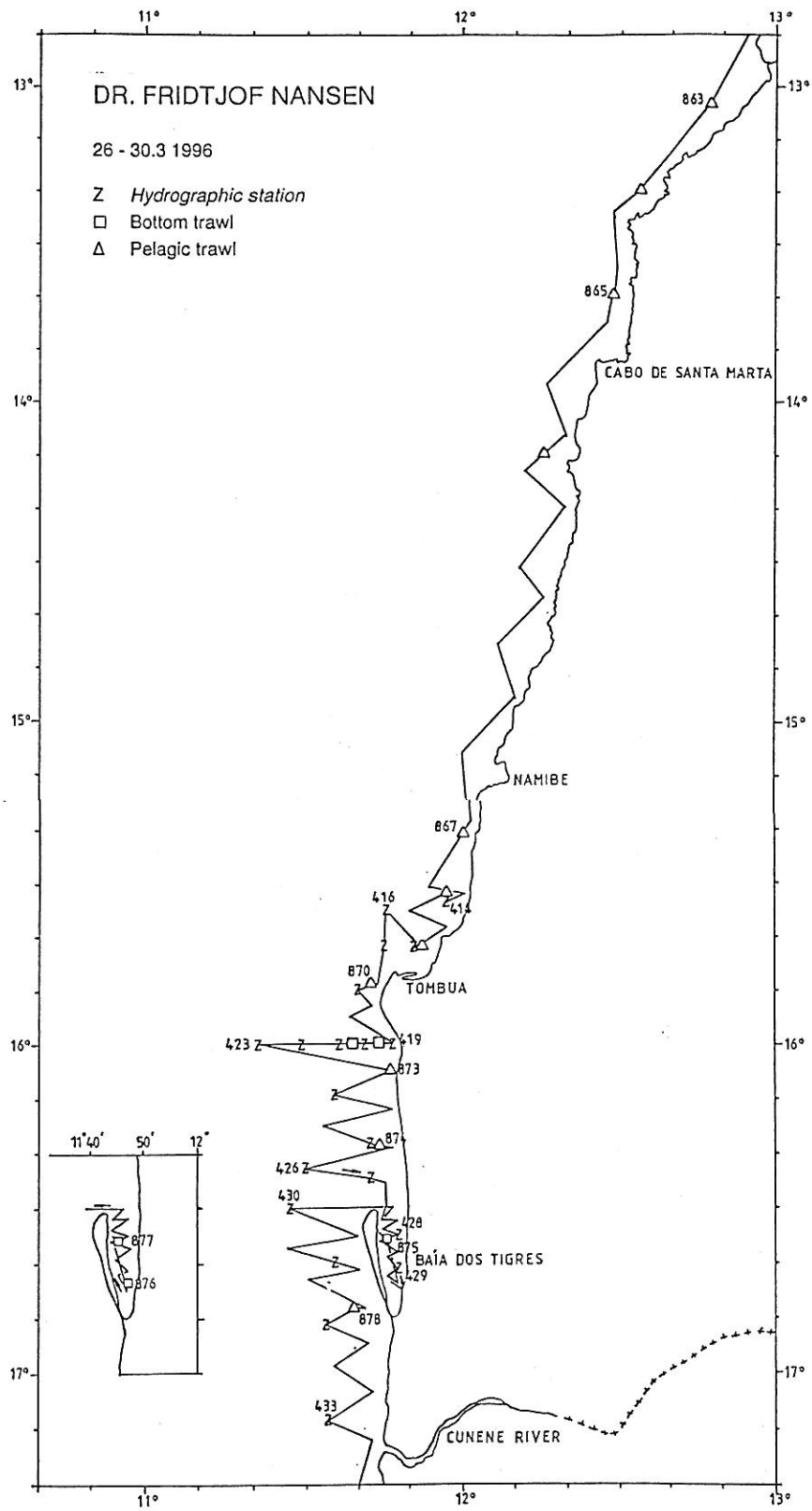


Figure 1.1 c. Course track with fishing and hydrographic stations, Benguela-Cunene.



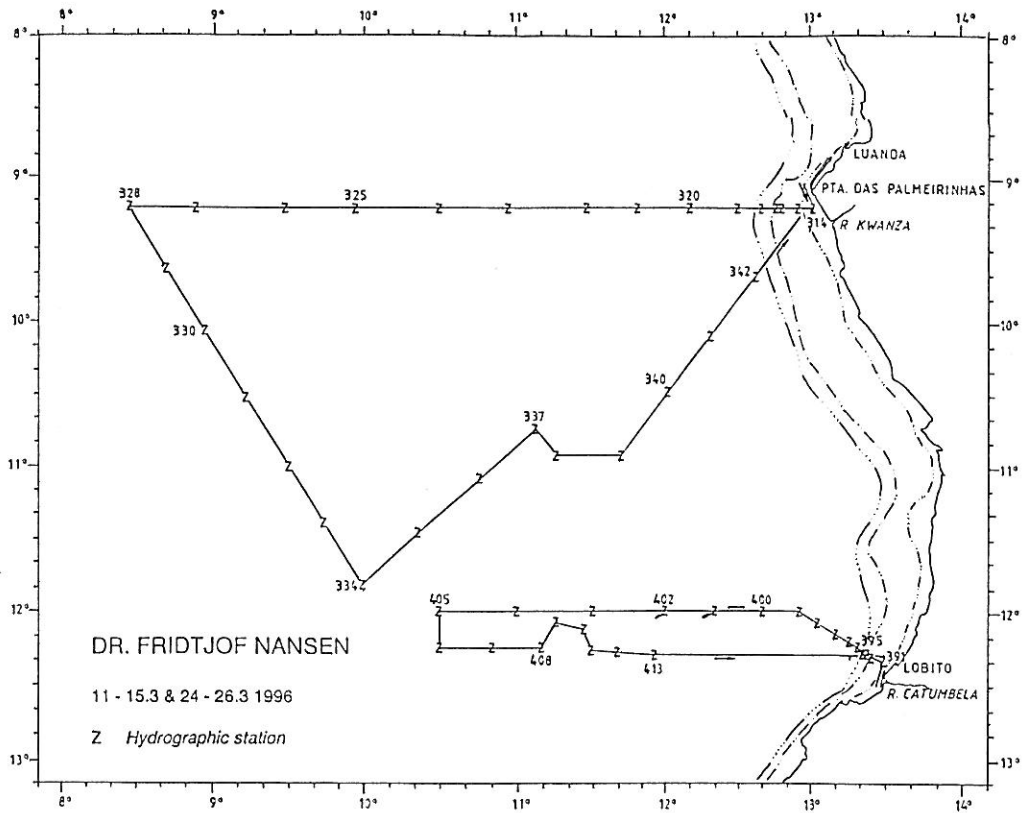


Figure 1.1 d. Course track with hydrographic stations to survey the Angola Dome.

## CHAPTER 2 METHODS

---

### 2.1 Hydrographic sampling

#### *CTD measurements*

A Seabird 911 CTD Plus was used to obtain a general overview and standard vertical profiles of temperature, salinity and oxygen. Real time plotting and logging was done using the Seabird Seasave software installed on a PC. The profiles were taken down to a few meters above the bottom for depths less than 1500 m. For greater depths when surveying the Angola Dome most stations were taken to 500 m or more, while about each fourth station was continued down to 2000 m.

A minimum of two Niskin bottles were triggered on each CTD station for calibration of the conductivity and oxygen sensors. In addition water samples were collected for analysis of nutrients at IIP's laboratory in Lobito.

For the salinity 77 accepted calibration points indicated an offset of the CTD of -0.029. However, as this was close to the standard deviation (0.025) we accepted the CTD values without correction.

For the oxygen calibration 77 points were accepted giving the following formula for correcting the CTD values:

$$O_{2\text{cor}} = O_{2\text{ctd}} \cdot 1.025 + 0.025$$

The standard deviation was large (0.378), indicating that there were some problem with the oxygen titration in the laboratory.

#### *ADCP current measurements*

A ship born Acoustic Doppler Current Profiler (ADCP) from RD Instruments was activated on every CTD station with depth greater than 35 m. Bottom tracking was applied on bottom depths

less than about 350 m, otherwise GPS navigation was used. The ADCP was set to ping every 8 seconds, the depth cell was chosen to 8 m and the number of cells to 50. As a routine the data were averaged over 300 seconds. Both the raw and averaged data were stored on files. The data were presented using the PC software UMS (Underway Mapping System), supported by the Sea Fisheries Research Institute, Cape Town, South Africa (Zauner, 1995).

### *Meteorological observations*

Wind (direction and speed), air temperature, solar radiation and sea surface temperature (5 m depth) were logged automatically every nautical mile using an Aanderaa meteorological station.

### *Calibration of the Sensor-data STD belonging to IIP, Luanda*

Parallel measurements were taken with the Seabird CTD and the Sensor data STD. The results were compared and found satisfactorily. The STD will be used to establish a fixed station in Luanda.

## **2.2 Fish sampling**

### *Abundance estimation*

The catches were sampled for species composition, by weight and numbers. Biological samples, i. e. length and weight compositions were taken for the target species. Records of fishing stations are presented in Annex I.

A description of the acoustic instruments and their standard settings is given in Annex III. This also includes a description of the fishing gear used.

The following target strength (TS) function was applied to convert  $S_A$ -values (mean integrator value for a given area) to number of fish (pilchard, sardinella and Cunene horse mackerel):

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

or in the form  $C_F = 1.26 \cdot 10^6 \cdot L^{-2} \quad (2)$

where  $L$  is total length and  $C_F$  is the fish conversion factor. The following formula was used to calculate the number of fish in length groups (cm) for each fish concentration:

$$N_i = A \cdot S_A \cdot \frac{P_i}{\sum_{i=1}^n \frac{P_i}{C_{Fi}}} \quad (3)$$

where:

$N_i$  = number of fish in length group  $i$

$A$  = area (NM<sup>2</sup>) of fish concentration

$S_A$  = mean integrator value in area ( $A$ )

$p_i$  = proportion of fish in length group  $i$  in samples from the area

$C_{Fi}$  = fish conversion factor for length group  $i$

The number per length group ( $N_i$ ) was then summed and the total number of fish obtained:

$$N = \sum_{i=1}^n N_i \quad (4)$$

In the case of co-occurrence of *Sardinella aurita* and *S. maderensis* (these species cannot be separated by the echo traces), the respective contribution to the  $S_A$  value attributed to the 'sardinella' category was split in accordance with their presence in the trawl catches. The biomass of fish per length group ( $B_i$ ) was calculated by applying the theoretical weight by length ( $W_i$ ) (calculated by using the condition factor, 0.87), multiplied by number of fish in the same length groups ( $N_i$ ). The total biomass in each area was obtained by adding the biomass of each length group:

$$B = \sum_{i=1}^n N_i \bar{W}_i \quad (5)$$

The number and biomass per length group in each concentration were at last added up to obtain the totals for each region.

The mean integrator values in each sampling unit ( $S_A$ -values) were divided between the following categories of fish on the basis of trawl catches and characteristics of the echo traces:

- sardinella (*Sardinella aurita* and *S. maderensis*)
- pilchard (*Sardinops ocellatus*)

- round herring (*Etrumeus whiteheadi*)
- anchovy (*Engraulis capensis*)
- horse mackerel (*Trachurus trecae* and *T. capensis*)
- carangids, scombrids, barracudas and hairtails (other pelagic species)
- bigeye grunt (*Brachydeuterus auritus*)
- other demersal fish
- mesopelagic fish
- plankton

### *Biological sampling*

Total length and body weight were recorded for sardinella and horse mackerel to the nearest 1 cm or 1 g below, respectively. Sex and reproductive stages were described by macroscopic examination, scoring each individually sampled fish according to the following categories:

- |   |                |
|---|----------------|
| 1 | Juvenile       |
| 2 | Inactive       |
| 3 | Active         |
| 4 | Ripe           |
| 5 | Running/ Spent |

The records of fishing stations are presented in Annex I. Pooled length frequency distributions (weighted by the catch) of the target species by area, are shown in Annex II.

## CHAPTER 3 OCEANOGRAPHIC CONDITIONS

During the corresponding cruise last year (1995) during February - March, anomalous oceanographic conditions were found along the whole Angolan coast with a brackish and warm upper layer. Also this year seem to be anomalous, but the amplitude of the warming and freshening was found to be about half the amplitude of the "Benguela Niño '95".

The Angola Dome was surveyed for 5 days, and we found it situated rather far south compared to earlier observations.

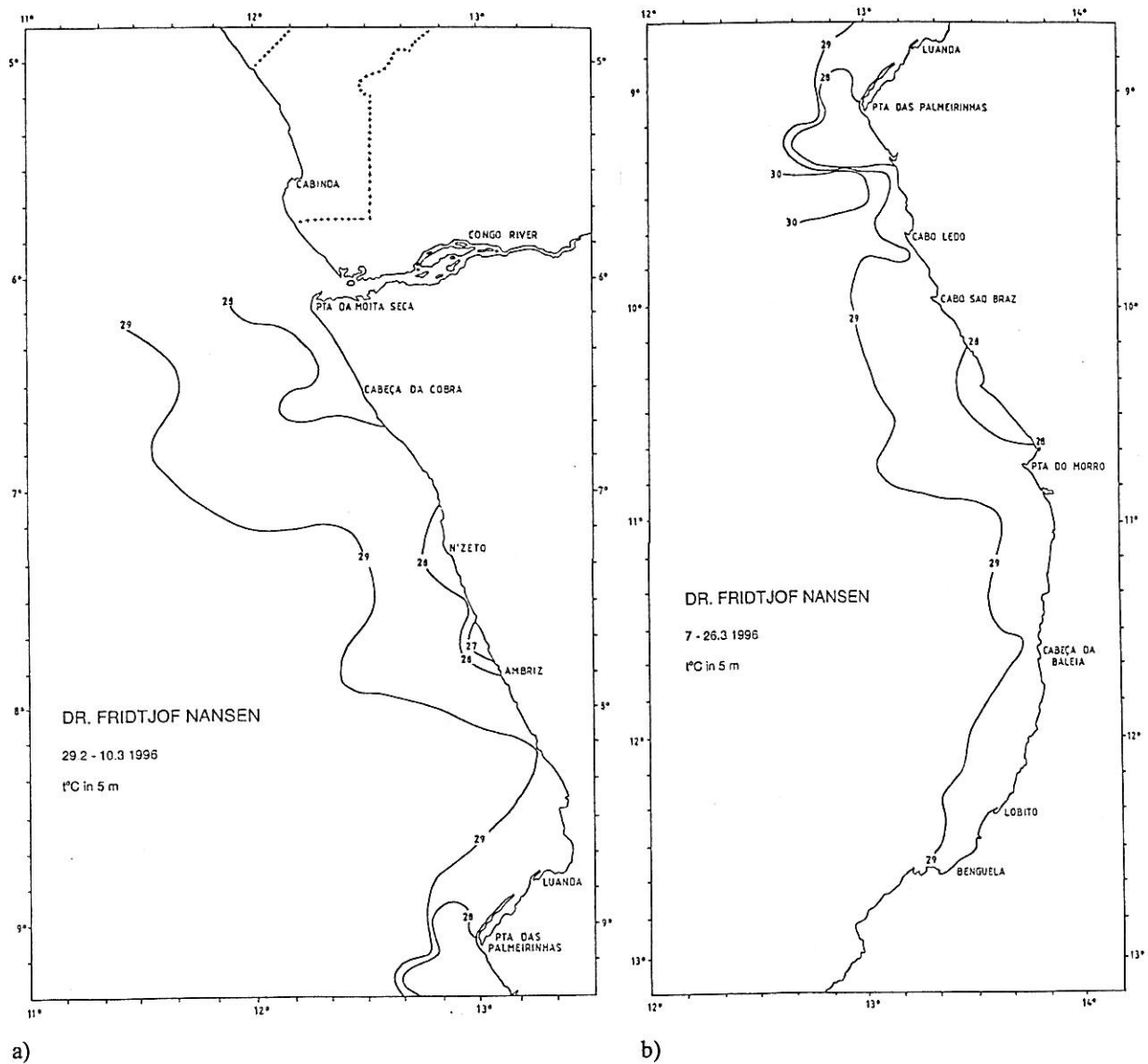


Figure 3.1. Horizontal distribution of surface (5 m) temperature: a) Cabinda-Luanda; b) Luanda-Benguela; c) Tombua-Cunene.

### Surface distribution

The temperature at the surface (5 m depth) is shown in Figure 3.1 (a, b and c), and the salinity distribution in Figure 3.2 (a, b and c). The temperature in the surface is in the range of 26°C to ° 30 C. Note the temperature minima close to the coast, for example near Ambriz and Pta. das Palmeirinhas. These seem to compare well with regions of maximum biomass estimates of pelagic fish, see below.

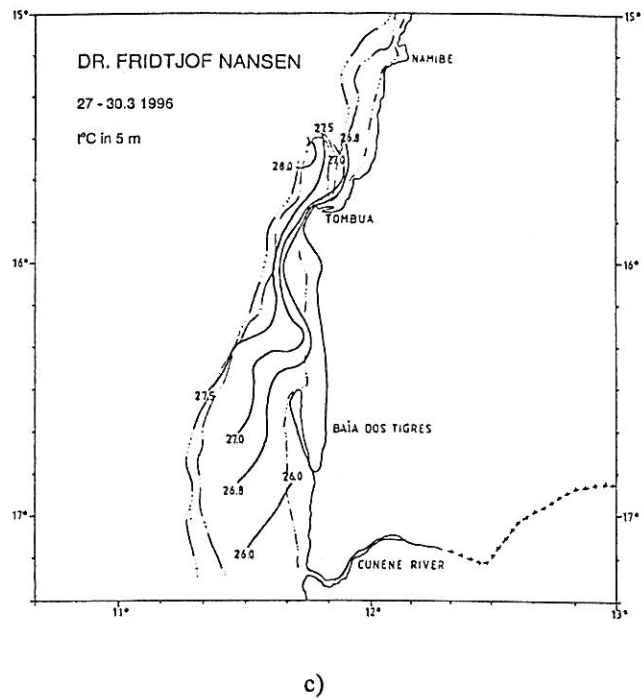
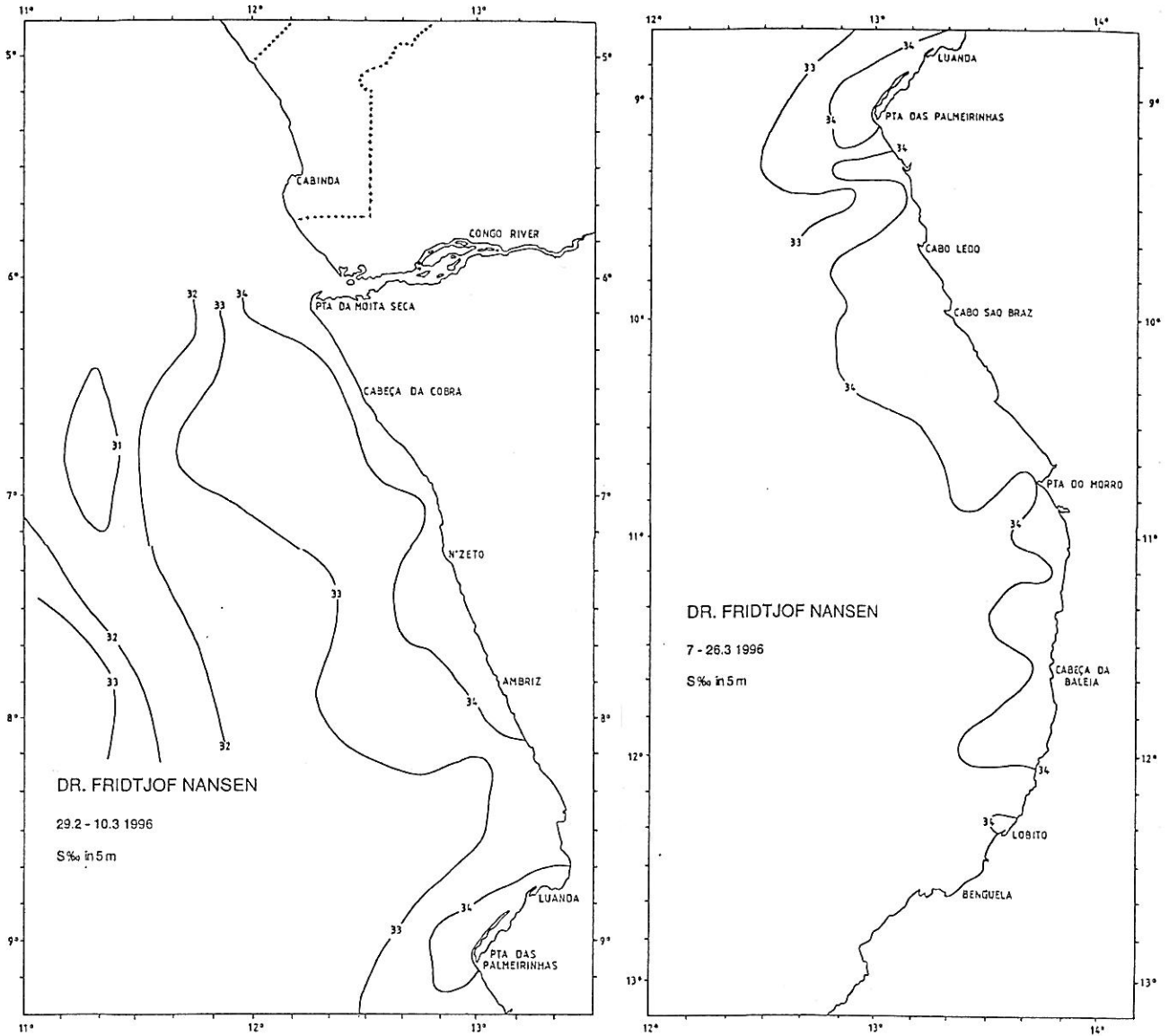


Figure 3.1. continued.

The surface salinity ranges from about 29 to 35 psu. Influence of fresh water is obvious in the salinity distribution map. Some heavy rain occurred during the cruise, making flooding of the rivers. The salinity minimum found some 60 NM south-west of the Congo River, indicate that the river water is deviated towards north before being trapped by a southward-bound current further off-shore.



a)

b)

Figure 3.2. Horizontal distribution of surface (5m) salinity: a) Cabinda-Luanda; b) Luanda-Benguela; c) Tombua-Cunene.



### Vertical sections

The vertical distributions of temperature, salinity and oxygen along the standard sections are shown in Figures 3.3-3.8. Note the warm and brackish surface layer, especially in the northern and central part of the survey area. Last year, which was defined as an Benguela Niño year, the surface layer was even warmer, more brackish and deeper. It might be that the year 1996 will be defined as a moderate Benguela Niño year.

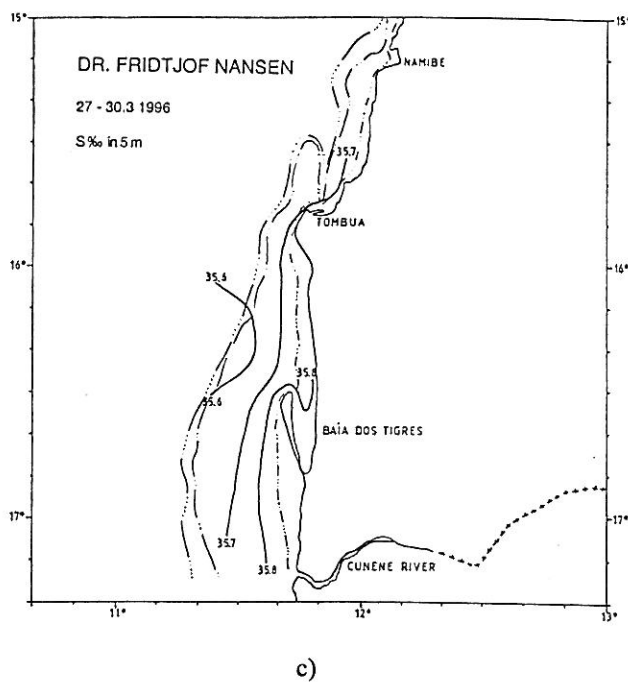


Figure 3.2. continued.

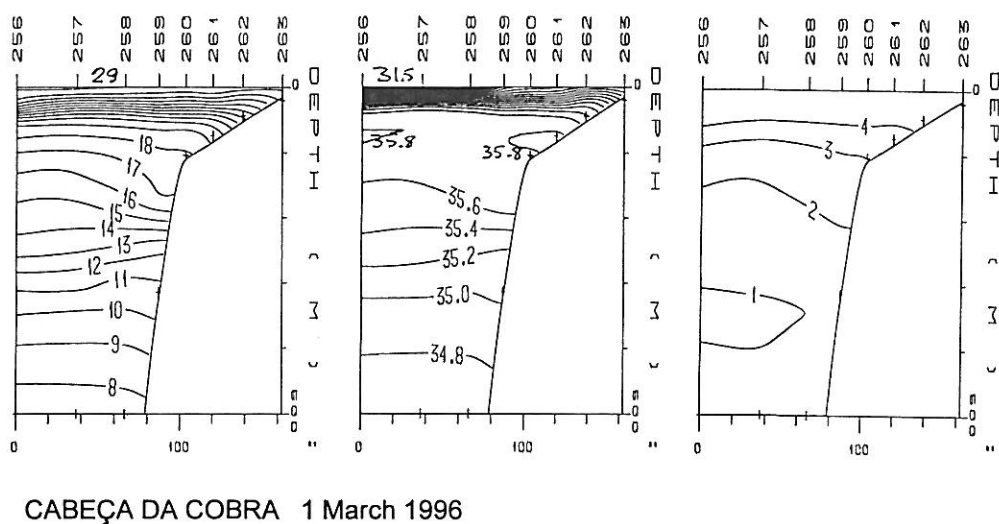
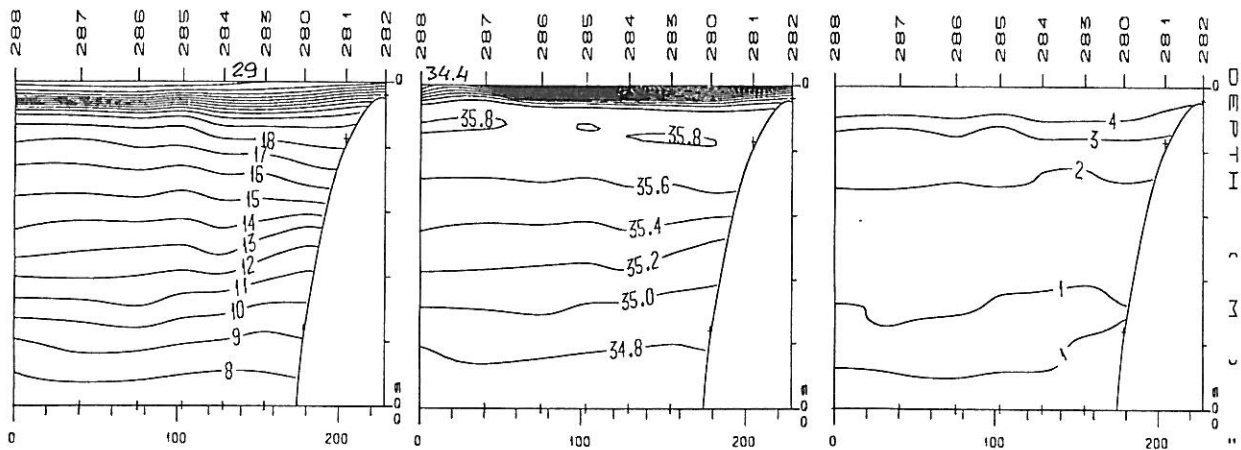


Figure 3.3 Vertical sections of a) temperature, b) salinity and c) oxygen. Cabeça da Cobra.

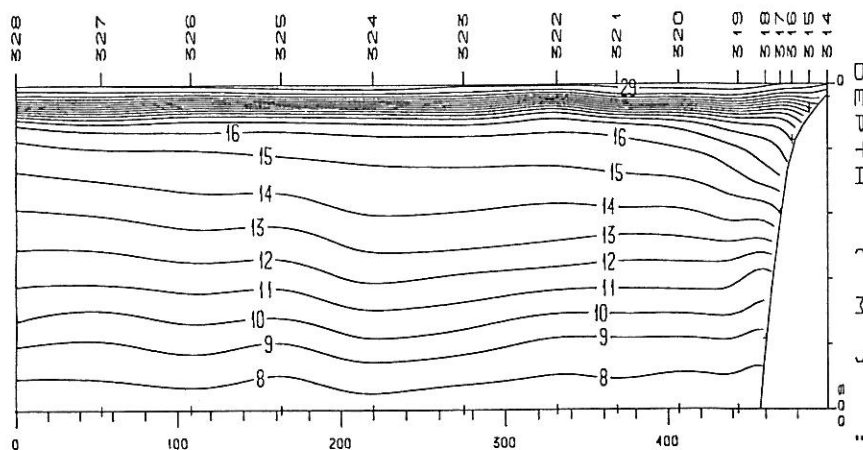
The temperature sections show the signature of upwelling at some of the locations, see for instance the section at Cabeça da Cobra (Fig. 3.3) and Pta. das Palmeirinhas, (Fig. 3.5), while the section in between at Ambriz (Fig. 3.4) hardly shows any structure at all. An inspection of the corresponding salinity sections that the interpretation of the temperature distribution as a patchy upwelling is probably wrong. The vertical divergence of the isohalines approaching the shore at for instance Pta. das Palmeirinhas (Fig. 3.5) is rather the structure of a brackish coastal current. It is interesting to note that such a coastal current is not seen at all in the section further north at Ambriz (Fig. 3.4). A possible interpretation is that an onshore current hits the coast at about Ambriz, and is deviated towards the south, see results from the ADCP measurements below.

The oxygen minimum layer was found between 300-500 m depth as usual (Figs. 3.3-3.8).



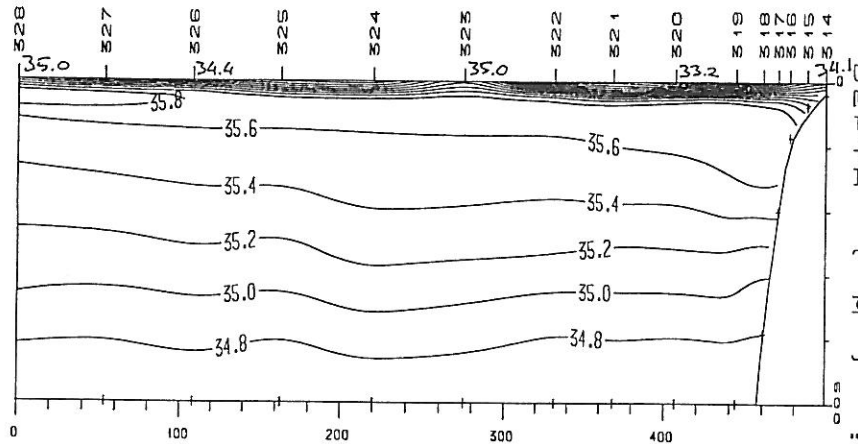
AMBRIZ 4 - 5 March 1996

Figure 3.4 Vertical sections of temperature, salinity and oxygen. Ambriz.



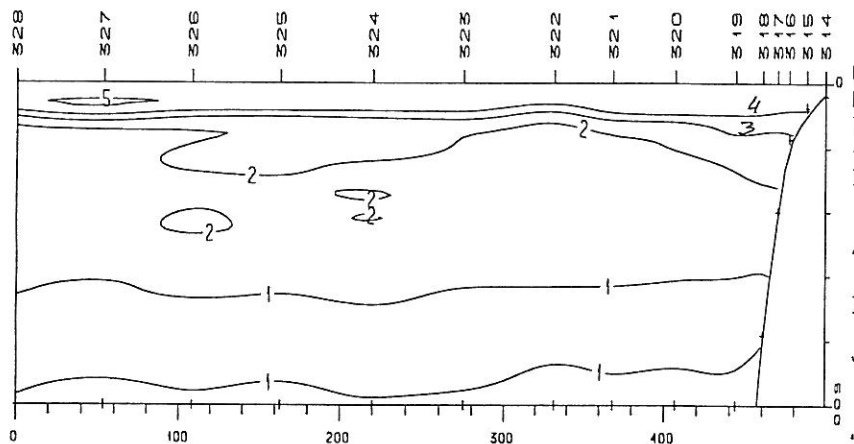
PTA. DAS PARMEIRINHAS 11 - 13 March 1996

Figure 3.5 Vertical section of temperature at Pta. das Palmeirinhas.



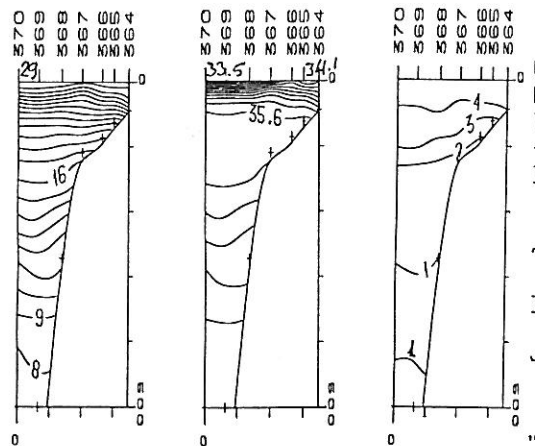
PTA. DAS PARMEIRINHAS 11 - 13 March 1996

Figure 3.5 cont. Vertical section of salinity at Pta. das Palmeirinhas.



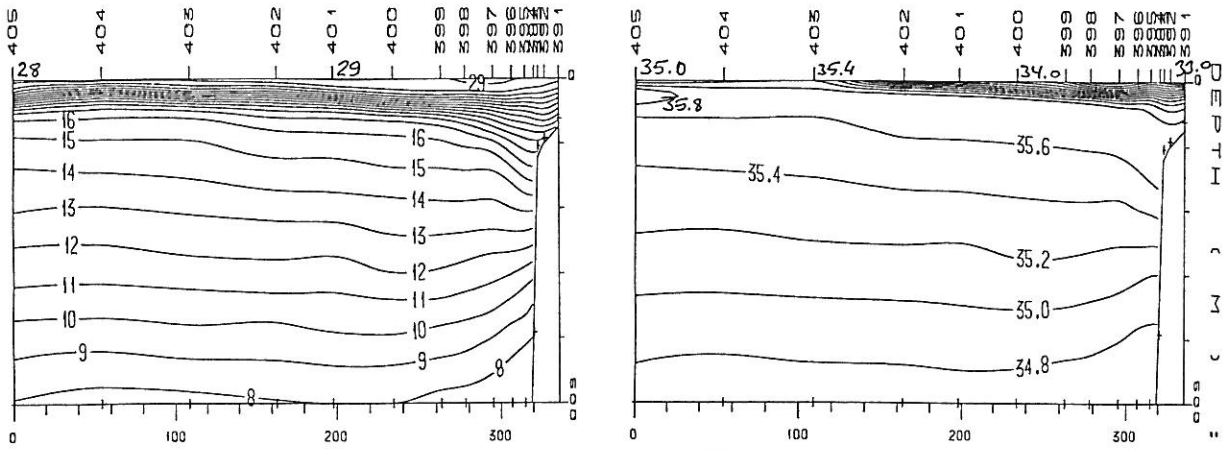
PTA. DAS PARMEIRINHAS 11 - 13 March 1996

Figure 3.5 cont. Vertical section of oxygen at Pta. das Palmeirinhas.



PTA. DO MORRO 20 March 1996

Figure 3.6 Vertical sections of temperature, salinity and oxygen. Pta. do Morro.



LOBITO 24 March 1996

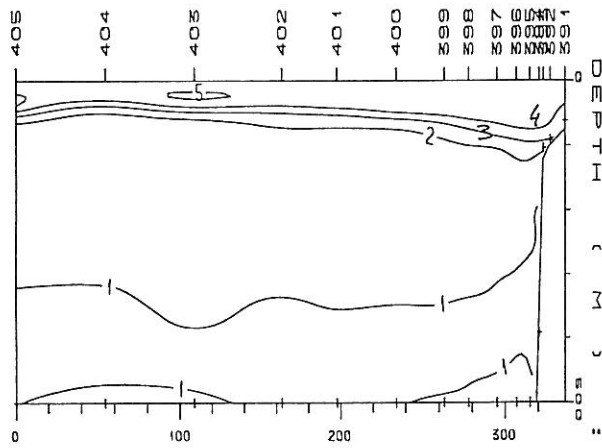
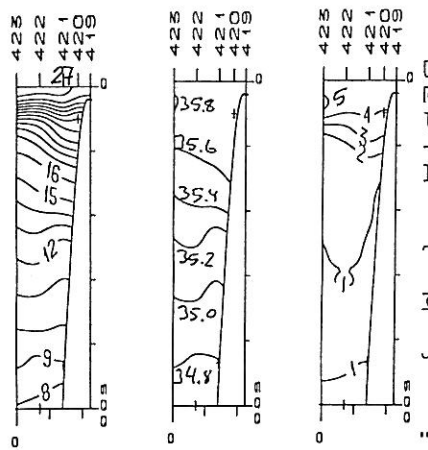


Figure 3.7 Vertical sections of temperature, salinity and oxygen. Lobito.



TOMBUA 28 March 1996

Figure 3.8 Vertical sections of temperature, salinity and oxygen. Baía dos Tigres.

### *The current pattern at 35 m depth*

The results of the ADCP measurements at 35 m depth are shown in Fig. 3.9. All accepted 5 min averages are shown. Although the current vectors show a rather confused picture, some structure seems to emerge. There is a tendency south of 8°S that a rather strong (up to 0.5 m/s) coastal current to the south. At 8°S there seems to be an onshore current. Thus it is likely that this current hits the Angolan coast, it deviates towards the south and provokes the strong coastal current.

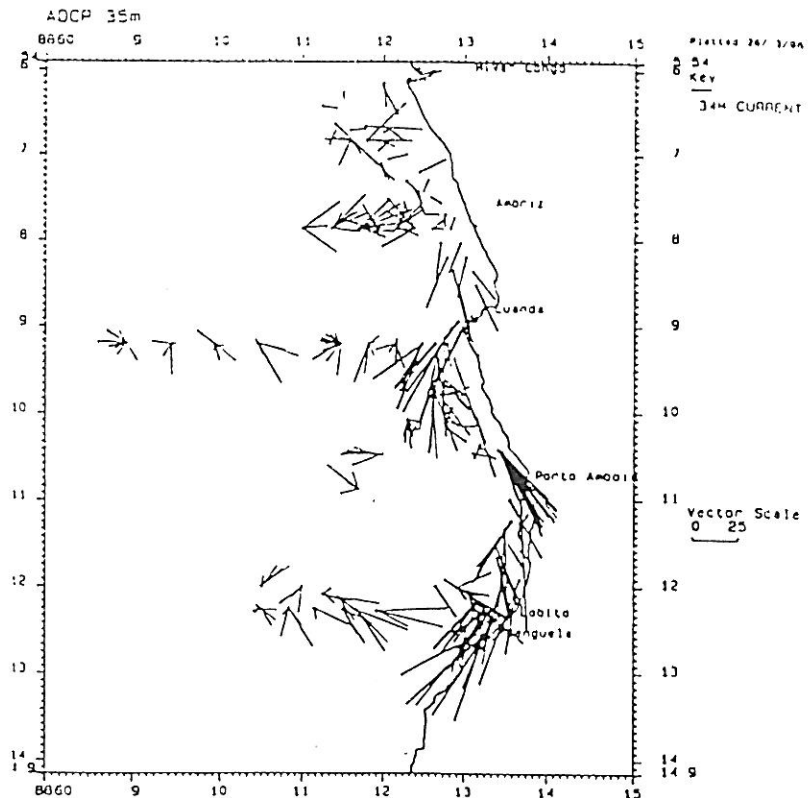
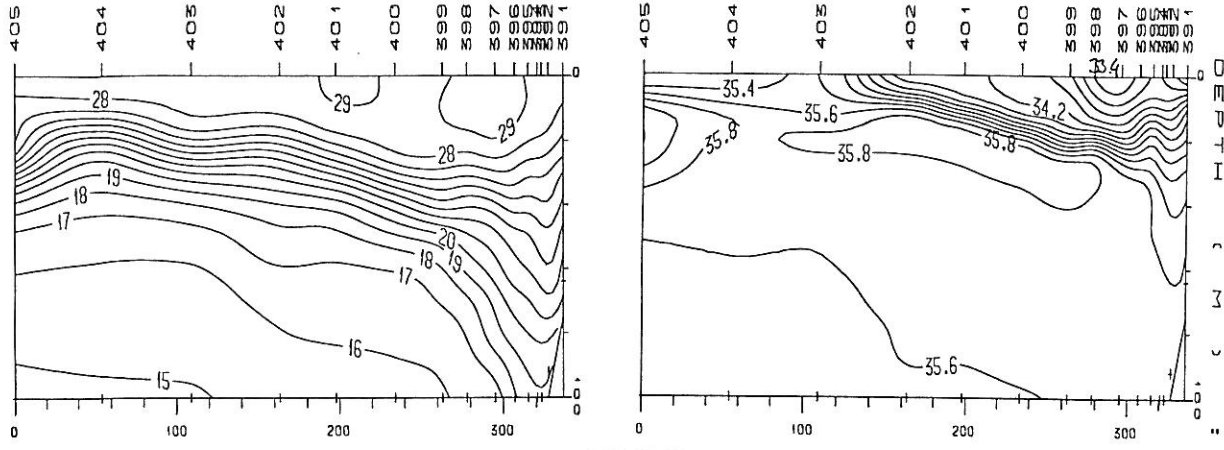


Figure 3.9 The results of the ADCP measurements at 35m depth.

Also note that there is a very strong cyclonic circulation at about 12°S, 10°30'E where the Angola Dome was observed.

### *Survey of the Angola Dome*

The Lobito section shown in Fig. 3.8 indicates the centre of a dome station 404. In Fig. 3.10 we have plotted the same section, but just for the upper 100 m. Around station 404 we observe a subsurface temperature minimum, salinity maximum and oxygen maximum. Also note the downward tilt of the isolines all the way to the continental slope. This indicates that it is the Angola Dome which has provoked the strong coastal southwards current observed during the present cruise.



LOBITO 24 March 1996

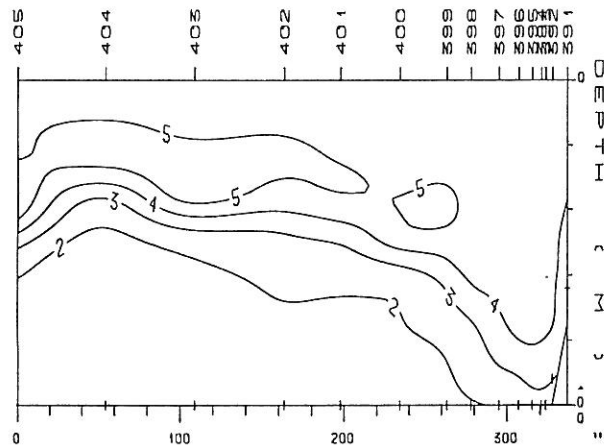


Fig. 3.10 Same as Fig 3.7, but for just the upper 100 m.

A bird perspective of the Angola Dome is seen in Fig. 3.11 where the temperature at 20 m depth is shown. Thus the Angola Dome does not seem to be circular, like a low pressure in the atmosphere, but has the shape of a boomerang.

The Dome seems to be situated further south than earlier observed, see for instance Voituriez and Herbland (1982)

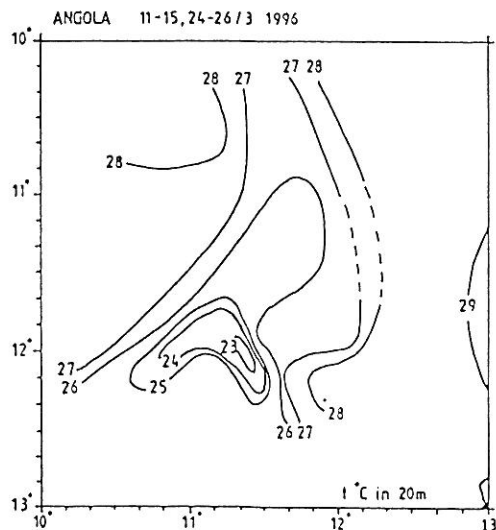


Fig. 3.11 Horizontal distribution of the temperature at 20 m in the vicinity of the Angola Dome.

*Benguela Niño - even in 1996?*

As mentioned above the surface water-masses were relatively brackish and warm. In Fig. 3.12 we compare the vertical profiles of temperature, salinity and oxygen at a station outside Pta. das Palmeirinhas (at 400 m bottom depth) for the years 1994, 1995 and 1996. We observe that 1996 is about half way between the two previous years in all three properties. Thus 1996 may be defined as the kid brother of the Benguela Niño 1995.

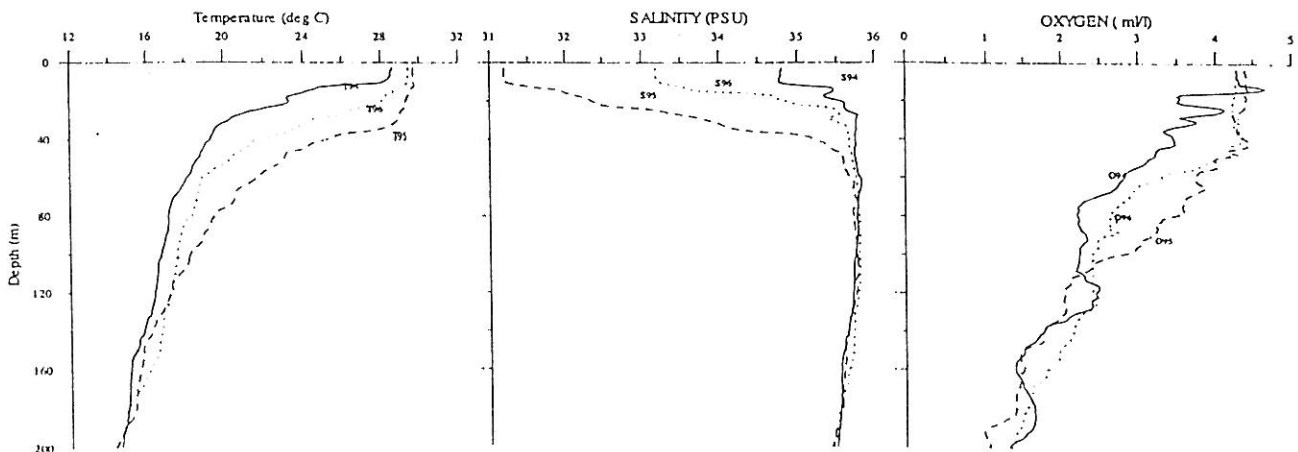


Fig. 3.12 Comparison of vertical profiles of temperature, salinity and oxygen observed down to 200 m depth in the Pta. das Palmeirinhas section in March 1994, 1995 and 1996.

While the Benguela Niño 1995 penetrated as far south as 24°S (Gammelsrød, Fidel & Filipe, 1995) the surface temperature registrations taken while the ship was heading northwards in the end of February, show that the temperature front was found at about 15°S, see Fig. 3.13. So, beside being smaller in amplitude, the “Kid Benguela Niño 1996” is also restricted to a smaller area.

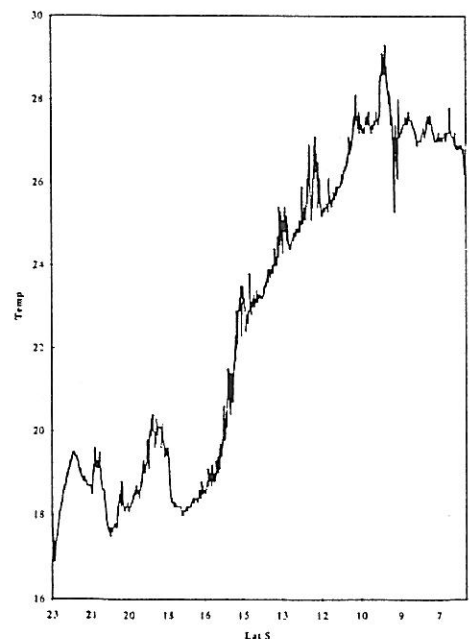


Figure 3.13 Surface temperature (5 m depth) taken by RV “Dr. Fridtjof Nansen” steaming from Walvis Bay to Northern Angola.

## CHAPTER 4      DISTRIBUTION, COMPOSITION AND BIOMASS ESTIMATES OF PELAGIC FISH

---

Generally, the distribution of the pelagic fish is very dynamic. We are studying fast swimming fish with significant changes in behaviour during the day. The most striking feature, common for most pelagic species in this region, is the concentration in schools at daytime, often close to surface. At night the schools tend to dissolve and the fish is spread often in a somewhat deeper layer. This is generally the case for the clupeoids and most carangids, but during the present survey the clupeoids were concentrated in schools both during day and night in a somewhat deeper layer than usually observed. This may be explained by the relatively high surface temperatures. The horse mackerels do not concentrate in schools near the surface at daytime. Instead, the shoals seek to the bottom. The schools, which may be quite dense, tend to stick close to the bottom on the shelf. During this survey, large schools of horse mackerel were occasionally recorded at the edge of the shelf at depths around 100-150 m. In the evening the shoals dissolved and the fish ascended somewhat, but did not go to the surface as was observed in August 1995. This may be explained by the high surface temperatures which the fish probably try to avoid.

### 4.1 Cabinda-Luanda

#### 4.1.1 Sardinella

Figure 4.1 shows the distribution of both sardinellas in the northern region, including the varying degree of their concentrations as average acoustic integrator values for each area. Sardinella were found in shelf waters from the Congo River to Luanda in four separate areas. The highest concentrations were detected off Ambriz. Here, dense schools of smaller sardinella were recorded close to shore while the larger, adult sardinella were found more offshore. *S. maderensis* dominated and less than ten percent of the sardinella appeared to be *S. aurita*.

The total length frequency distributions of the sardinellas (Figure 4.2 a and b) show the dominance of small individuals for flat sardinella (a) with more than 60% of the number of individuals less than 15 cm and a dominant cohort with modal length at 13 cm. For the round sardinella the adult fish predominate with two cohorts. One with modal length at 26 cm and the other at 32 cm.



The biomass estimate for the two species combined totalled about 70 000 tonnes, of which about 5 000 tonnes is *S. aurita*. Some 29% of the total estimated biomass of sardinella in Angolan waters were found north of Luanda.

4.1.2 Cunene horse mackerel

Only a very limited concentration of horse mackerel where observed in the Cabinda-Luanda region (Figure 4.3.). Some fifteen nautical miles north west of Luanda some dense schools were detected close to bottom. This was estimated to about 6 000 tonnes and it consisted of large fish with modal length of 36 cm (Figure 4.4).

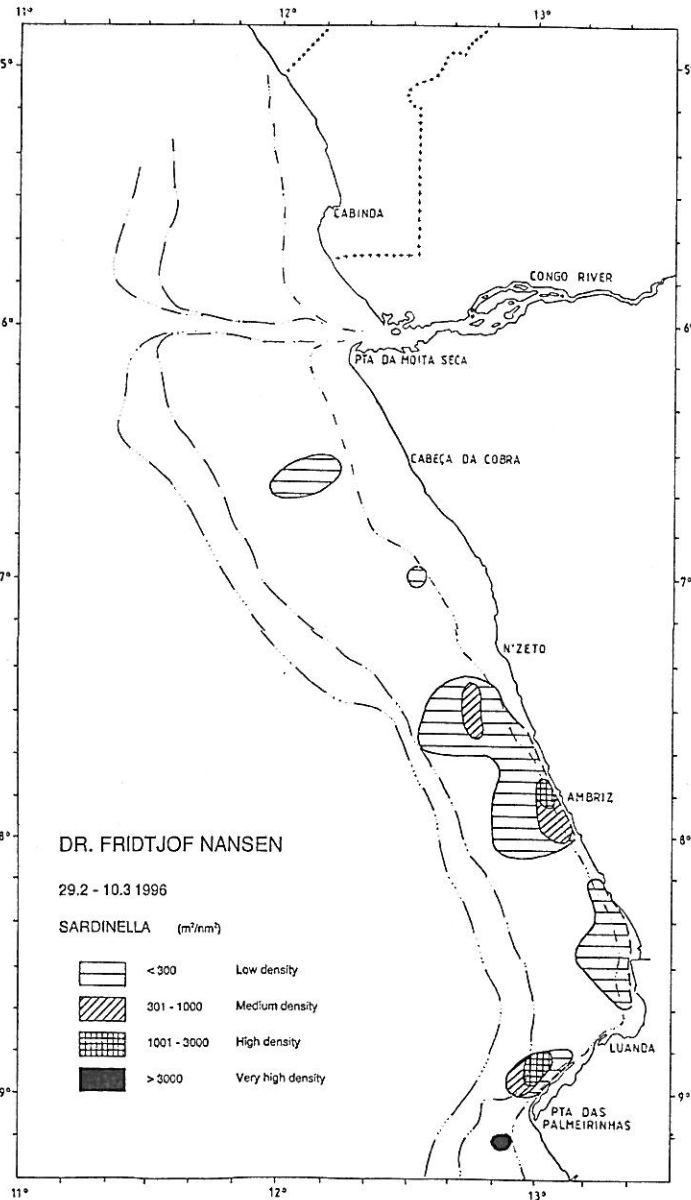


Figure 4.1. Distribution of *Sardinella* spp. Cabinda-Luanda.

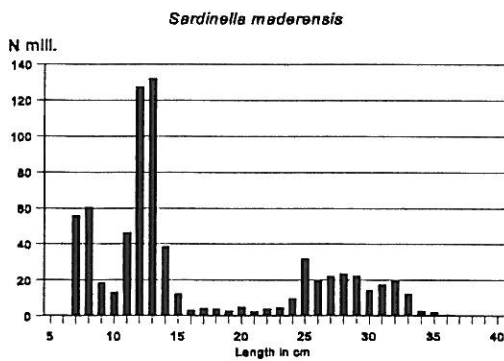


Figure 4.2 a Total length distribution of flat sardinella (*S. maderensis*), Cabinda-Luanda.

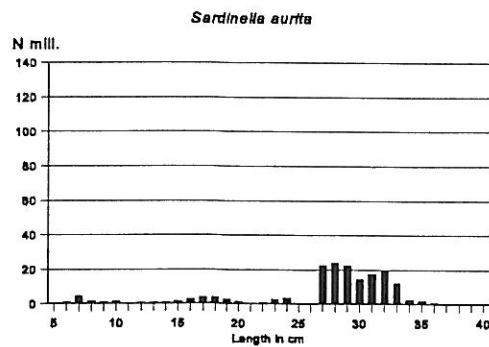


Figure 4.2 b Total length distribution of round sardinella (*S. aurita*), Cabinda-Luanda.

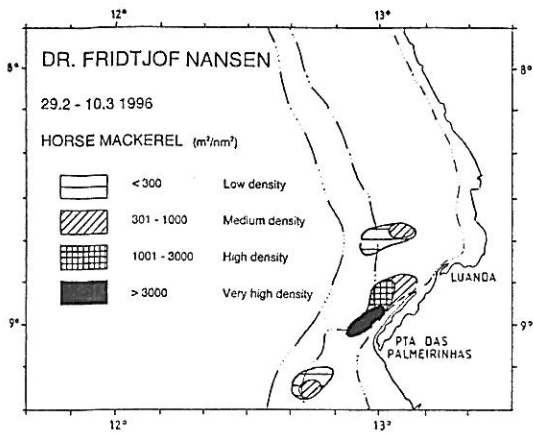


Figure 4.3. Distribution of Cunene horse mackerel (*Trachurus trecae*). Cabinda-Luanda.

4.1.3 Other pelagic species

Figure 4.5 shows the distribution of pelagic fish type 2 for the region Cabinda-Luanda. This category includes various pelagic groups: carangids (other than horse mackerel), barracudas, scombrids and hairtails. Medium concentrations were detected in the whole region from the Congo River to Luanda. The biomass estimate was obtained by using an overall average length (about 31 cm) for this area and resulted in a value of about 92 000 tonnes. The composition in the catches shows a dominance of Carangidae (84%) (*Chloroscombrus chrysurus* and *Selene dorsalis*), followed by Sphyraenidae (barracudas) (8%). The above estimate and relative abundance of the various groups are obviously very rough but still useful to give an idea of the order of magnitude of the resources and to indicate

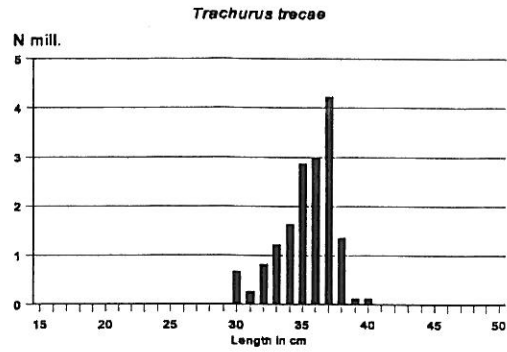


Figure 4.4. Total length distribution of Cunene horse mackerel (*T. trecae*), Cabinda-Luanda.

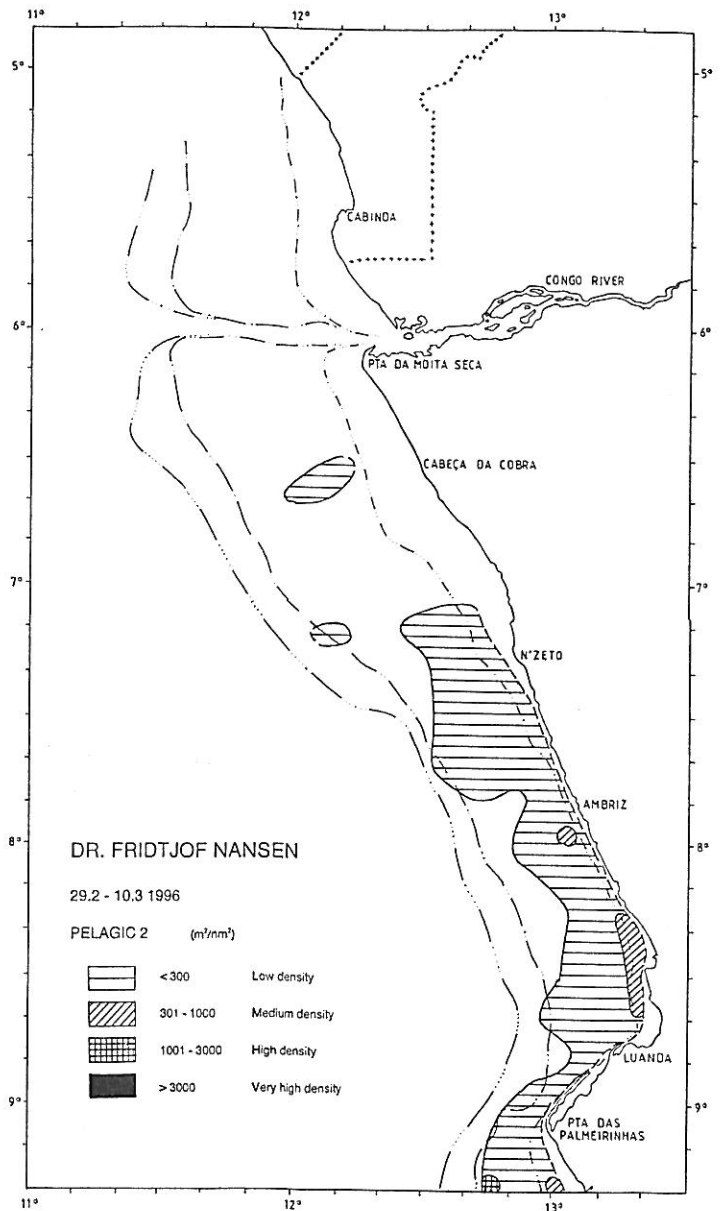


Figure 4.5. Distribution of pelagic fish type 2 (P2), Cabinda - Luanda.

whether important changes have occurred. As compared with earlier surveys with the RV 'Dr. Fridtjof Nansen', the value obtained for this area is somewhat higher than the average values obtained in 1985-86 (65 000 tonnes).

## 4.2 Luanda-Benguela

### 4.2.1 Sardinella

The distribution of the two sardinella species in this region is shown in Figure 4.6. They are found in four main concentrations, one between Luanda and Pta. das Palmeirinhas, another in the area between Cabo Ledo to some 20 NM south of Cabo Sao Braz. A third one was found off Pta. do Morro and the fourth between Cabeça da Baleia and Benguela. The fish were mainly recorded close to the shore to about 10-15 NM off except for the area off Pta. do Morro where the concentrations were recorded more offshore. During night, pelagic trawling close to the surface occasionally yielded sardinella together with hairtails and small tunas or carangids (i.e. *Chloroscombrus*). However, the sardinellas were also during night often found in schools in mid-water layers. During day-time, the schools usually were recorded deeper.

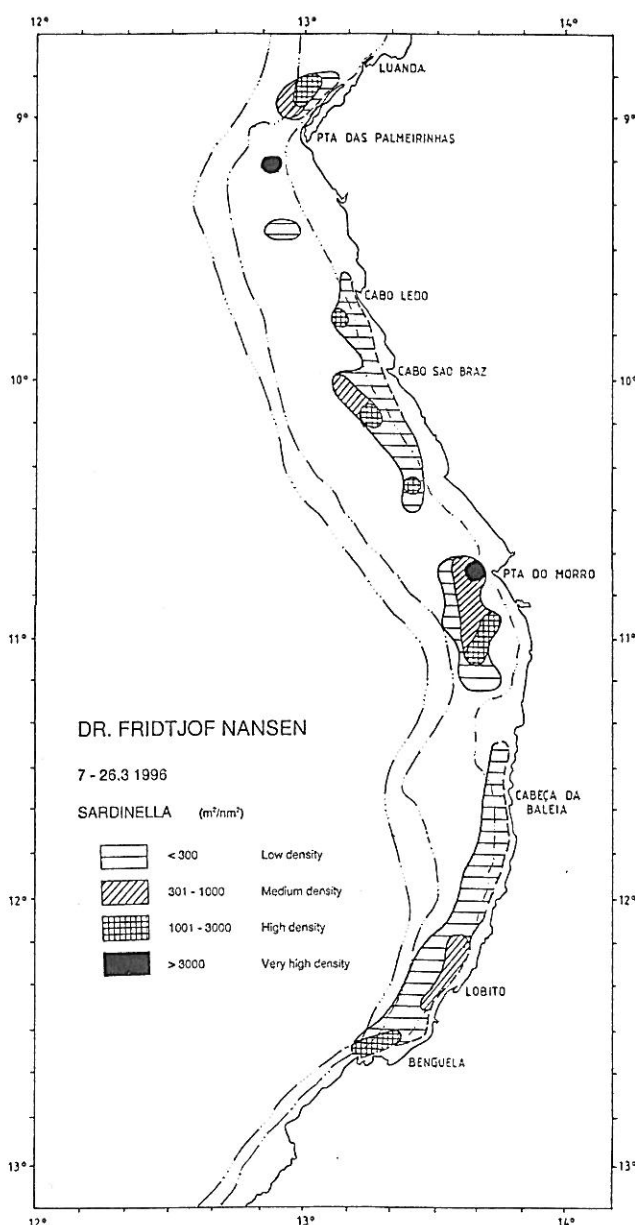


Figure 4.6. Distribution of *Sardinella* spp. Luanda-Benguela.

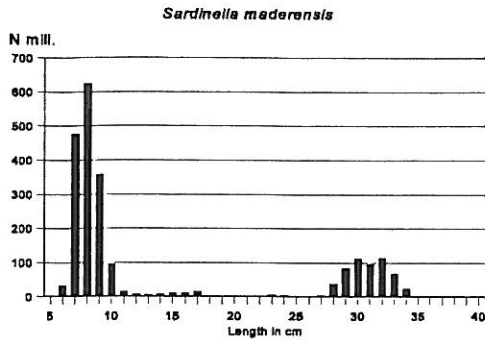


Figure 4.7 a Total length distribution of flat sardinella (*Sardinella maderensis*), Luanda-Benguela.

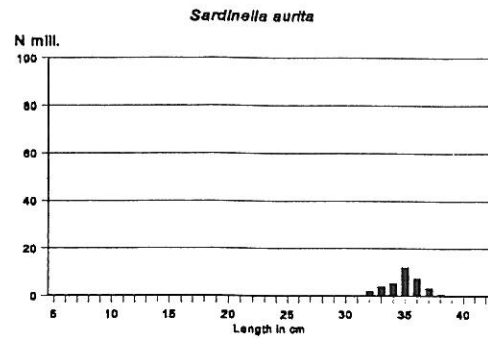


Figure 4.7 b Total length distribution of round sardinella (*S. aurita*), Luanda-Benguela.

Most of the samples included small flat sardinella (modal length 8 cm)(Fig. 4.7 a). As in the region north of Luanda, the element of round sardinella is almost negligible. More than 73% of the estimated number of sardinella in this area were less than 15 cm. This number (about 1.5 billion individuals) must be rated as a fairly good sign of recruitment. The biomass was estimated to about 175 000 tonnes which constitutes 71% of the total estimate. Of the biomass, the round sardinella represents less than 10%, and in terms of numbers even less.

#### 4.2.2 Cunene horse mackerel

Horse mackerel were distributed along the edge of the shelf in limited areas in this region (Fig. 4.8). One concentration was found between Luanda and Pta. das Palmeirinhas. Here, quite dense schools were recorded close to bottom. Another limited area of very high concentrations were found between Pta. do Morro and

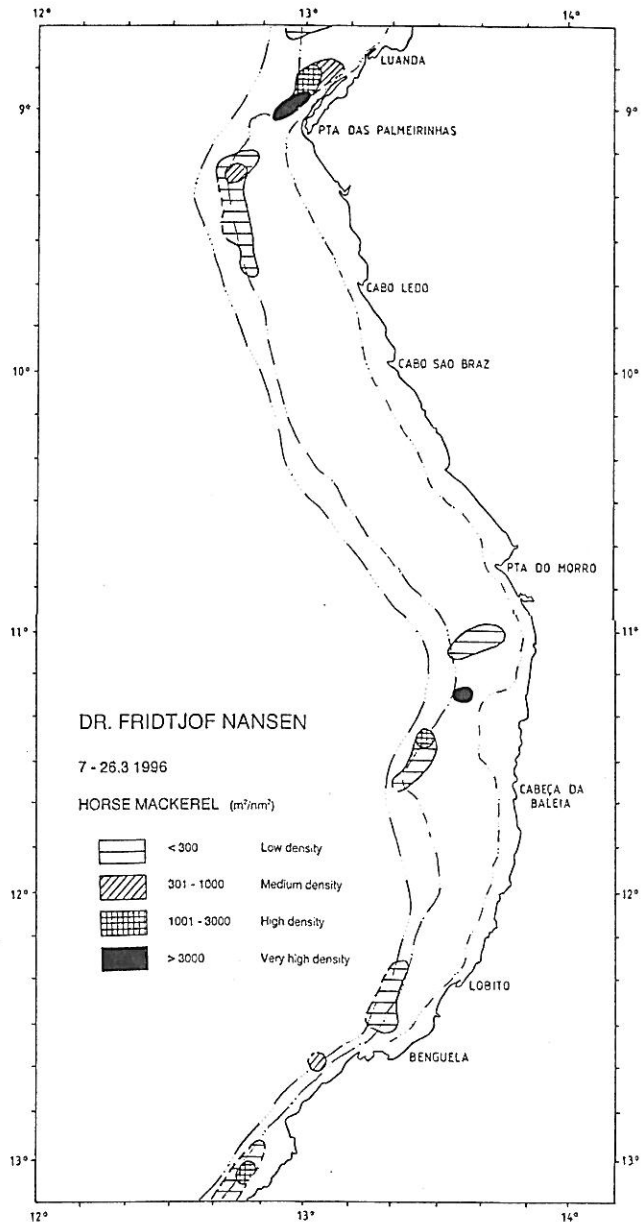


Figure 4.8. Distribution of horse mackerel (*Trachurus trecae*), Luanda-Benguela.

Cabeça da Baleia, where a very large aggregation was recorded close to the bottom (even at night). A sampling haul revealed large horse mackerel (modal length 36 cm). Concentrations were also found between Pta. das Palmeirinhas and Cabo Ledo and off Benguela. The fish were distributed close to the bottom at daytime and dispersed during night still in the deeper layers. The length distribution (Fig. 4.9) shows that large fish dominate. The estimated biomass in the region amounts to 214 000 tonnes which is well above last years August estimate (160 000 tonnes).

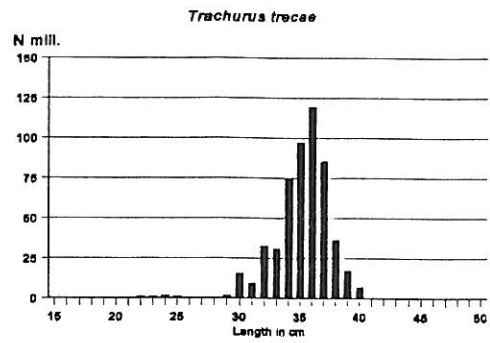


Figure 4. 9. Total length distribution of Cunene horse mackerel (*Trachurus trecae*), Luanda-Benguela.

#### 4.2.3 Other pelagic species

Other pelagic species were widely distributed in this region (Fig. 4.10). The carangids were dominating with the Atlantic bumper (*Chloroscombrus chrysurus*) as the most common species. The carangids constituted 65% of this group while the scombrids (3%) and hairtails (9%) were also quite common. The fish was rather evenly distributed with no places of dense concentrations. The estimated biomass totalled about 175 000 tonnes.

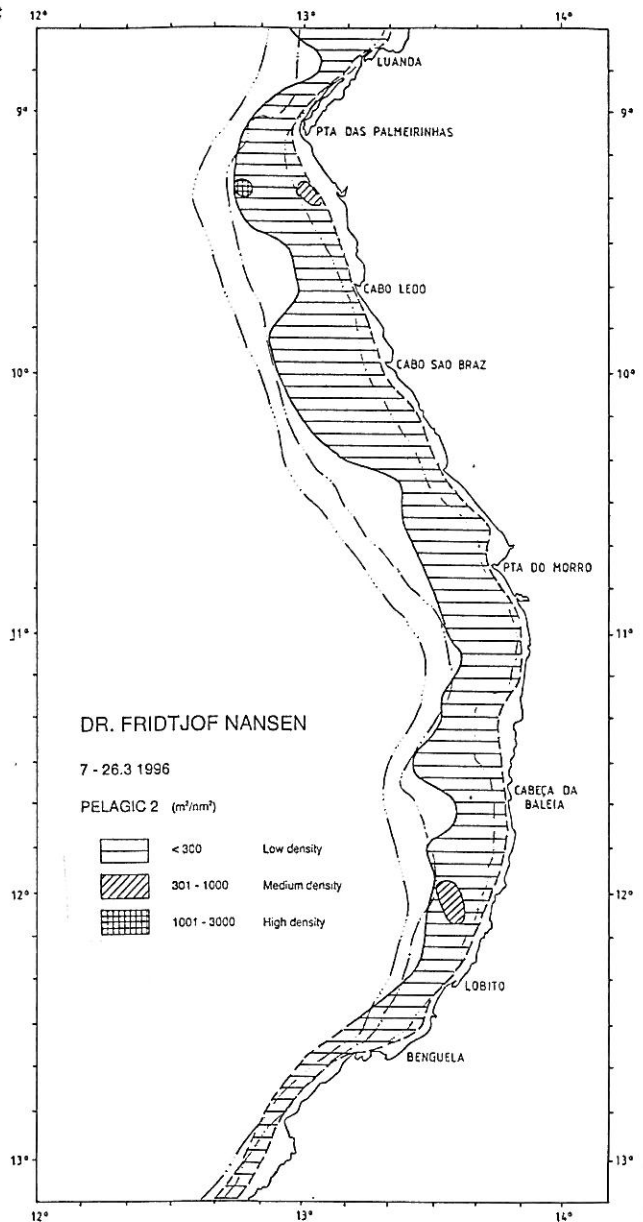


Figure 4.10 Distribution of other pelagic species. Luanda-Benguela.

### 4.3. Benguela - Cunene

#### 4.3.1 Sardinella

Sardinella was recorded in the Tombua Bay and in three localities along the coast down to Baía dos Tigres

(Fig. 4.11). Mostly large *S. maderensis* were caught (Fig. 4.12), but in Baía dos Tigres the round sardinella dominated. North of the bay, the two species mixed. An biomass estimate of the sardinellas combined yielded 49 000 tonnes. 90% of which was *S. maderensis*.

#### 4.3.2 Horse mackerel

The horse mackerel in this region generally consists of two species, the Cunene horse mackerel (*Trachurus trecae*) and the Cape horse mackerel (*Trachurus capensis*). The two species are generally mixing in the area between Tombua and Cunene. However, the catches show that the Cunene horse mackerel dominate completely during this survey as no Cape horse mackerel were found. This is probably also caused by the high temperatures in the area (see Fig. 3.1.c).

The distribution of horse mackerel between Benguela and Cunene is shown in Figure 4.13.

The shelf north of Tombua is very narrow and therefore the distribution of fish here is found to be very close to shore. The horse mackerel were found to be distributed more or less all along the coast. In the area south of Tombua small horse mackerel were found close to shore while the larger fish were concentrated in deeper waters. In Baía dos Tigres, dense concentrations of small

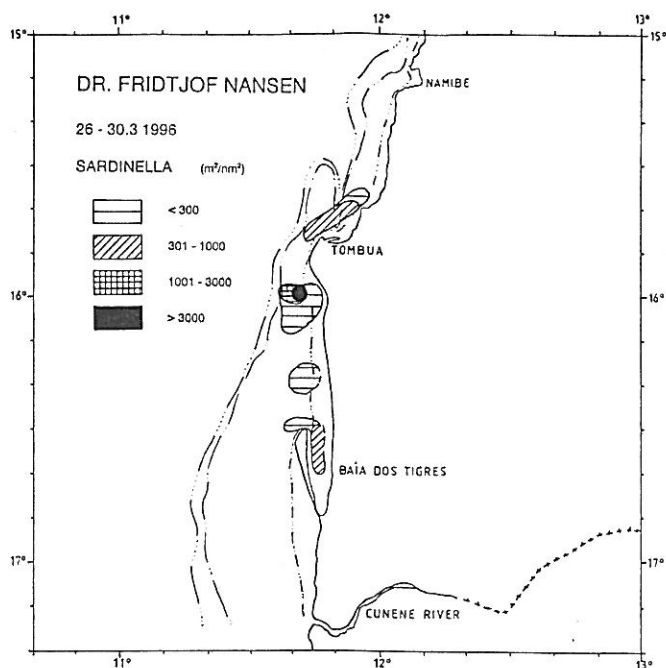
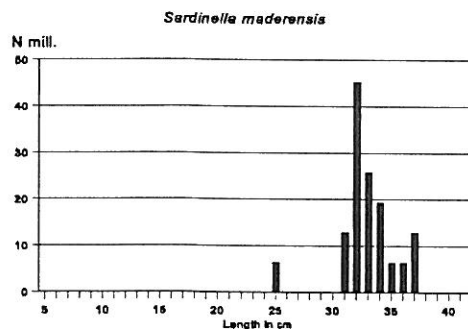


Figure 4.11. Distribution of *Sardinella* spp., Benguela-Cunene.



horse mackerel were recorded during night. Small horse mackerel were distributed all along the coast to Cunene.

The total length distribution of *Trachurus trecae* in the region is shown in Figure 4.14 and it shows that in this region quite a large part of the fish is small (64% less than 21 cm). The estimated biomass is 286 000 tonnes. This figure is much higher than earlier estimates of the biomass in the area, which in the early nineties was around 100 000 tonnes.

#### 4.3.3 Pilchard

No pilchard were observed in the region during this survey. This is probably again caused by the high temperatures in the upper water layers (see Fig.3.1.c), which are some 6-8 degrees higher than 'normal' for the area.

#### 4.3.4 Other pelagic species

No other pelagic species in the area south of Benguela is worth mentioning. Very few specimens of round herring (*Etrumeus whiteheadi*) were caught in Baía dos Tigres but this was too sparse to be estimated acoustically. Other groups of species, like carangids or scombrids were virtually absent in the whole area.

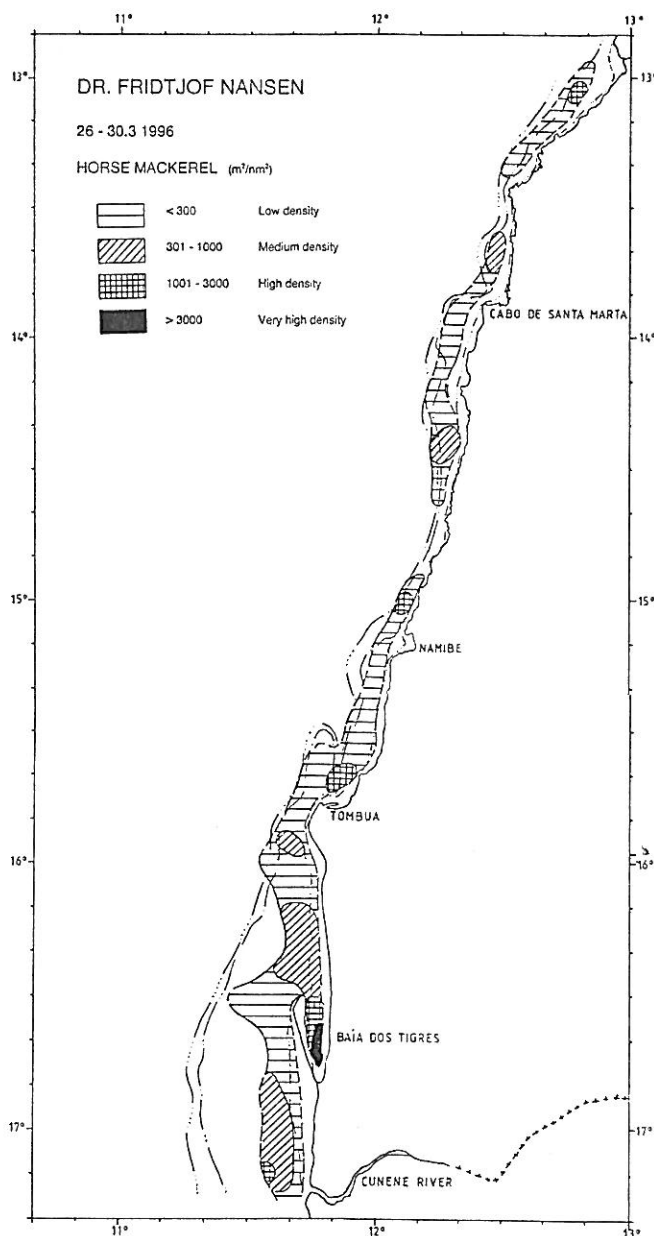


Figure 4.13. Distribution of *Trachurus trecae*, Benguela-Cunene.

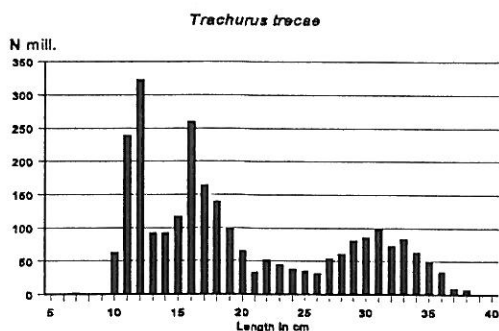


Figure 4.14.

Total length distribution of Cunene horse mackerel (*Trachurus trecae*), Benguela-Tombua.

CHAPTER 5 OTHER INVESTIGATIONS

5.1 Maturity stages

*Sardinella*

Proportions of maturity stages per length group for round and flat sardinella in the surveyed regions are shown in Figures 5.1 and 5.2.

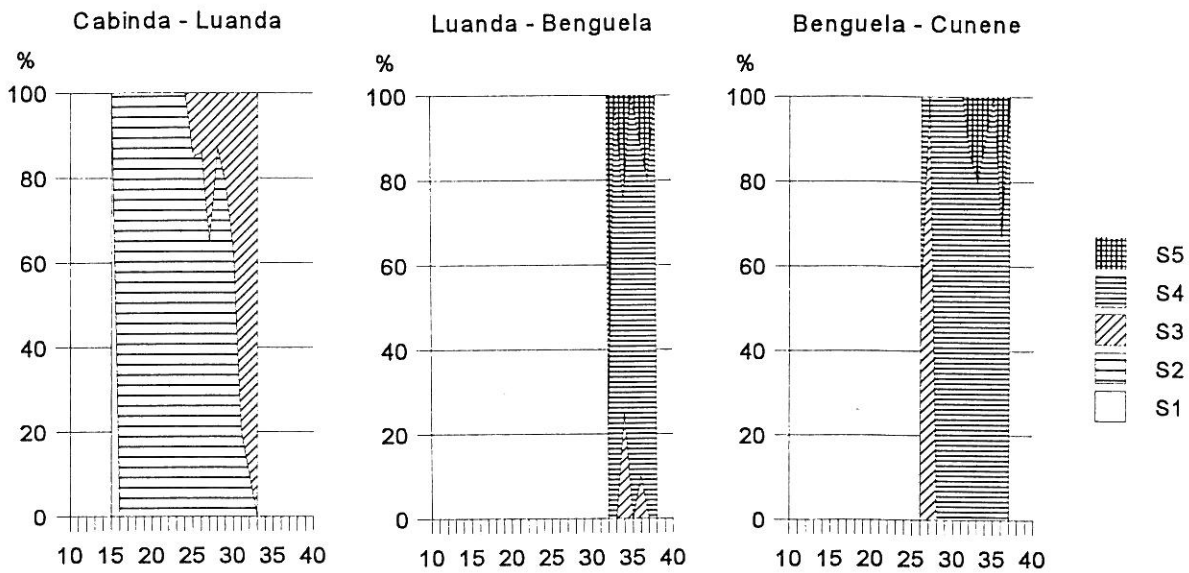


Figure 5.1 Proportions of maturity stages per length group for *Sardinella aurita* in the northern, central and southern regions.

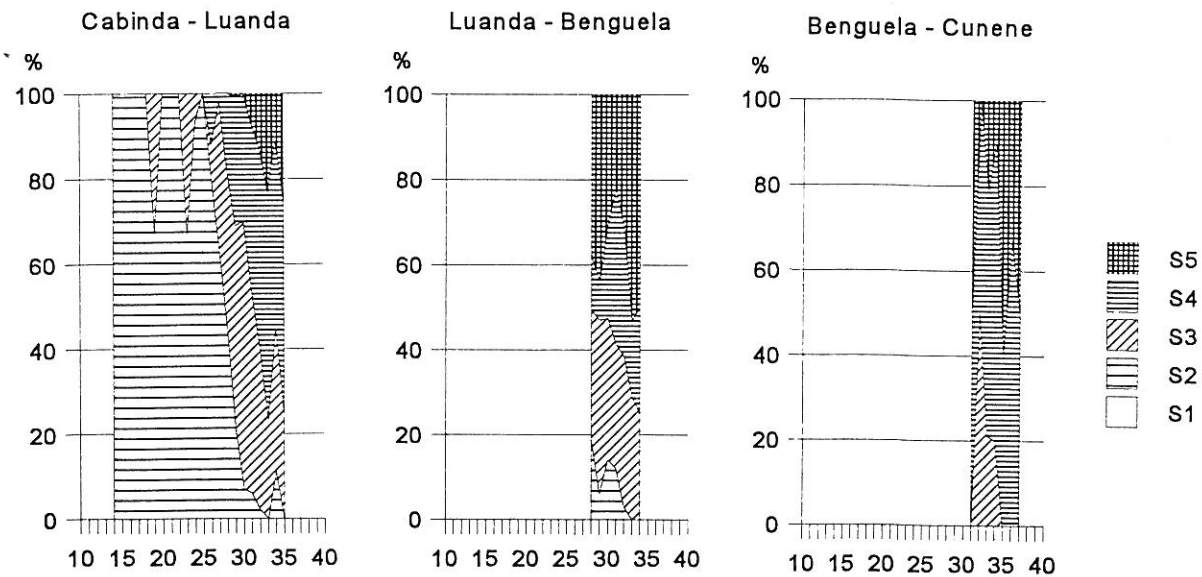


Figure 5.2 Proportions of maturity stages per length group for *Sardinella maderensis* in the northern, central and southern regions.



In the Cabinda-Luanda region significant proportions of sardinellas were immature. The length at which 50 % of the fish are mature to spawn is 31 cm for round sardinella and 28 cm for flat sardinella. In the regions south of Luanda only the round sardinella with length less than 28 cm and a smaller proportion of the flat sardinella with length less than 34 cm are found to be immature.

### *Horse mackerel*

Proportions of maturity stages per length group for *Cunene horse mackerel* in the central and southern regions are shown in Figures 5.3.

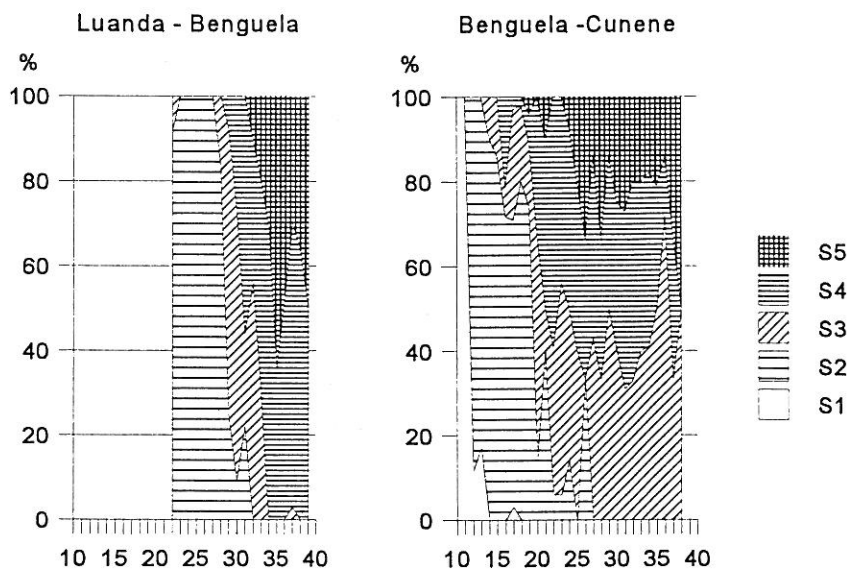


Figure 5.3 Proportions of maturity stages per length group for *Trachurus trecae* in the central and southern regions.

In the region between Luanda and Benguela the samples show that fish of length less than 29 cm were not mature to spawn while in the region between Benguela and Cunene the corresponding was 19 cm.

### 5.2 Acoustic investigation on night/day variations of behaviour of sardinella

Some preliminary investigations were carried out on the night and day variations in behaviour of sardinella in relation to acoustic estimation. This was done by repeating the coverage of a concentration of the fish several times both night and day. The investigation was not very successful because too low densities of fish were recorded and the sardinella did not behave in

usual manner. The schools which were recorded during day did not dissolve during night, but stayed as schools in a somewhat shallower layer. In the contrary to what was expected, the number of miles with sardinella were much higher during day and the mean  $S_A$ -values were also higher. Significantly lower number of schools were detected during night, which may be explained by dissolving of some schools, but single traces of sardinella or other fish in the area were not possible to detect on the echo sounder. Further investigations should be carried out on these features during a later survey where hydrographic conditions are more normal and denser concentrations of sardinella are observed.

## CHAPTER 6 REVIEW OF SURVEY RESULTS AND AVAILABILITY FOR FISHERY

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### 6.1 Sardinella and horse mackerel

The survey on pelagic stocks in Angola, in March 1995, resulted in unexpectedly low estimates of both sardinella and horse mackerel (Tables 2 and 3). This was surprising considering the consistent increase in the biomass of both species observed since 1989. The low estimates were explained by a possible large migration away from an area with exceptional climatic conditions i.e. an upper water layer about 30 m thick, with very low salinity and high temperatures. This situation may also have led to greater methodical problems for the acoustic abundance estimation, such as spreading of fish over larger areas. During the present survey, the climatic conditions also seem to be abnormal, but to a lesser degree than the one carried out last year (see Chapter 3 in this report). The present estimates of fish are lower than the ones obtained in August last year, but somewhat higher than the March survey. *What happens*

Table 2 Estimates of biomass of sardinellas by regions and surveys (1 000 tonnes)

Survey	Cunene-Benguela	Benguela-Luanda	Luanda-Cabinda	Benguela-Cabinda	TOTAL
1/85	25	220	80	300	325
2/85	110	190	180	370	480
3/85	0	70	190	260	260
4/85	0	200	110	310	310
1/86	10	140	110	250	260
2/86	10	130	130	260	270
1/89	40	200	60	260	300
2/89	20	40	130	170	190
3/89	40	100	60	160	200
1/91	+	180	120	300	300
2/91	+	68	154	222	222
1/92	+	119	161	280	280
1/94	*	410	100	510	510
2/94	*	245	290	535	535
1/95	*	140	24	164	
2/95	+	277	297	574	574
1/96	49	175	70	245	294

\* not surveyed

Table 3 Estimates of Cunene horse mackerel by regions and surveys  
(1 000 tonnes)

Survey	Cunene-Benguela	Benguela-Luanda	Luanda-Cabinda	Benguela-Cabinda	TOTAL
1/85	30	195	40	235	265
3/85	50	90	40	130	180
4/851/86	100	125	20	145	245
1/89	35	55	40	95	130
3/89	170	40	35	75	245
1/91	100	80	20	100	200
2/91	100	70	30	100	200
1/92	98	86	80	166	264
1/94	*	238	1	239	
2/94	*	130	120	250	
1/95	*	*	84	84	
2/95	70	160	110	270	340
1/96	286	214	6	220	506

\* not surveyed

## 6.2 Availability for fishery

The results of the present survey indicate substantial biomasses of pelagic fish, but it is uncertain to what extent these resources accessible to the fishing fleet.

Sardinella has a distribution in deeper layers at this time of the year (below 30 m depth) and should be accessible for both pelagic trawling and large purse seiners. In the northern region the area between N'Zeto and Ambriz is the most likely to give high catch quantities at present while in the central region localities with higher concentrations are off Pta. das Palmeirinhas, at Cabeça da Baleia and in the Lobito-Benguela area.

Horse mackerel has a different distribution than sardinella, close to the bottom during daytime and dispersed, but still in deeper layers during the night. This species is therefore not well available for purse seiners as the concentrations in the surface are too low. For trawlers, however, it should be no problem to get good catches, especially on the bottom during daytime.

### *On the job training*

The oceanographers Fillipe and Rafael were responsible for the daily routines regarding the water sampling. As this was the first trip with the new "Dr. Fridtjof Nansen" for Rafael, Filipe

introduced him to the routines onboard. He also showed him how to operate the Portasal salinometer and the Winkler titration routines applied onboard.

Filipe learned how to use Grapher, and produced some of the figures presented in this report. The operation of the Sensor Data STD was worked through, and routines for setting up a fixed station in Luanda were discussed.

Filipe also participated in the discussion related to the report.

N'Kosi and Filomena participated in the estimation of the fish abundance and used both the NAN-SIS-package and the spread-sheet (Excel) for this purpose.

## **References**

Gammelsrød, T., Q. Fidel & L.V.V. Filipe (1995). The Benguela Niño 1995 observed in Angolan waters. ICES CM1995/C:12 Ref.G,H

Voituriez, H. & C. Herbland (1982) Rapp P.-v Cons inst exp Mer 180:114-130

# Annex I Records of fishing stations

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 789  
 DATE:29/ 2/96 GEAR TYPE: PT No:2 POSITION:Lat S 612  
 start stop duration Long E 1145  
 TIME :07:50:00 08:20:00 30 (min) Purpose code: 1  
 LOG :4648.40 4650.10 1.70 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 104 105 Validity code: 1  
 Towing dir: 260° Wire out: 130 m Speed: 30 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 790  
 DATE:29/ 2/96 GEAR TYPE: PT No:2 POSITION:Lat S 626  
 start stop duration Long E 1209  
 TIME :15:25:00 15:55:00 30 (min) Purpose code: 1  
 LOG :4713.00 4714.30 1.30 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 41 45 Validity code: 1  
 Towing dir: 260° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 791  
 DATE:29/ 2/96 GEAR TYPE: PT No:2 POSITION:Lat S 629  
 start stop duration Long E 1150  
 TIME :18:00:00 18:30:00 30 (min) Purpose code: 1  
 LOG :4732.30 4733.80 1.50 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 119 123 Validity code: 1  
 Towing dir: 255° Wire out: 150 m Speed: 3 kn\*10

Sorted: 5 Kg Total catch: 8.74 CATCH/HOUR: 17.48

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardinella maderensis	CLUSL02 10.24	52	58.58 1731
Euthynnus alletteratus	SCMEU01 4.26	22	24.37
Trichiurus lepturus	TRITR01 2.14	16	12.24
Ariomma bondi	ARMAR01 0.50	10	2.86
Sardinella aurita	CLUSL01 0.34	2	1.95
Total	17.48		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 792  
 DATE:29/ 2/96 GEAR TYPE: PT No:2 POSITION:Lat S 639  
 start stop duration Long E 1122  
 TIME :21:47:00 22:17:00 30 (min) Purpose code: 1  
 LOG :4762.90 4764.50 1.60 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 752 764 Validity code: 1  
 Towing dir: 245° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 14.33 CATCH/HOUR: 28.66

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Cubiceps sp.	NOHCU00 12.20	474	42.57
MYCTOPHIDAE	MYCAA00 6.96	11010	24.28
Euthynnus alletteratus	SCMEU01 4.92	4	17.17
Sardinella maderensis	TRITR02 1.62	8	5.65 1732
Trichiurus lepturus	TRITR01 0.92	4	3.21
Macropodus macrogeneion	PARMA01 0.64	138	2.23
Istiatus brasiliensis	SHASO01 0.52	2	1.81
Ariomma bondi	ARMAR01 0.34	12	1.19
Illex coindetii	SQUOM21 0.26	42	0.91
Seriola carpenteri	COUPE02 0.20	2	0.70
Thyrsites atun	GEMTR01 0.08	8	0.28
Total	28.66		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 793  
 DATE: 1/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 640  
 start stop duration Long E 1223  
 TIME :18:23:00 18:53:00 30 (min) Purpose code: 1  
 LOG :4889.40 4891.00 1.60 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 23 24 Validity code: 1  
 Towing dir: 305° Wire out: 120 m Speed: 4 kn\*10

Sorted: Kg Total catch: 1.94 CATCH/HOUR: 3.88

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachinotus ovatus	CARTCO3 2.10	4	54.12
Scomberomorus tritor	SCMSHO1 1.44	2	37.11
Allotautia africana	SQUL011 0.08	26	2.06
Sardinella maderensis	CLUSL02 0.06	18	1.55
Decapterus rhonchus	CARD02 0.02	10	0.52
Total	3.70		95.36

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 794  
 DATE: 1/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 638  
 start stop duration Long E 1206  
 TIME :21:24:00 21:54:00 30 (min) Purpose code: 1  
 LOG :4912.60 4914.20 1.60 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 73 76 Validity code: 1  
 Towing dir: 200° Wire out: 150 m Speed: 3 kn\*10

Sorted: 51 Kg Total catch: 100.06 CATCH/HOUR: 200.12

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardinella maderensis	CLUSL02 112.80	498	56.37 1734
Sardinella aurita	CLUSL01 29.50	150	14.74 1733
Brachydeuterus auritus	PODBR01 26.30	258	13.14 1735
Euthynnus alletteratus	SCMEU01 11.76	12	5.88
Trachinotus ovatus	CARTCO3 9.74	26	4.87
Sphyræna guachancho	SPHSP01 9.50	10	4.75
Saurida brasiliensis	SYNSA01 0.44	138	0.22
Allotautia africana	SQUL011 0.08	36	0.04
Total	200.12		100.01

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 795  
 DATE: 2/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 651  
 start stop duration Long E 1151  
 TIME :02:10:00 02:35:00 25 (min) Purpose code: 1  
 LOG :4950.00 4950.20 1.20 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 237 200 Validity code: 1  
 Towing dir: 144° Wire out: 150 m Speed: 3 kn\*10

Sorted: 1 Kg Total catch: 30.49 CATCH/HOUR: 73.18

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichiurus lepturus	TRITR01 45.12	442	61.66
MYCTOPHIDAE	MYCAA00 11.26	11578	15.39
Euthynnus alletteratus	SCMEU01 4.06	12	5.55
Sardinella maderensis	CLUSL02 3.72	17	5.08 1736
Echeneis naucrates	ECNEC01 3.53	2	4.82
Illex coindetii	SQUOM21 2.50	878	3.42
Thyrsites atun	GEMTR01 1.37	170	1.87
Brachydeuterus auritus	PODBR01 0.96	10	1.31
Sardinella aurita	CLUSL01 0.58	5	0.79 1737
Synagrops microlepis	ACRSY01 0.10	12	0.14
Total	73.20		100.03

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 796  
 DATE: 2/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 658  
 start stop duration Long E 1210  
 TIME :05:00:00 05:30:00 30 (min) Purpose code: 1  
 LOG :4972.50 4974.00 2.10 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 89 85 Validity code: 1  
 Towing dir: 103° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 0.49 CATCH/HOUR: 0.98

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Euthynnus alletteratus	SCMEU01 0.84	4	85.71
Illex coindetii	SQUOM21 0.12	36	12.24
Cubiceps sp.	NOHCU00 0.02	2	2.04
Total	0.98		99.99

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 797  
 DATE: 2/ 3/96 GEAR TYPE: BT No:7 POSITION:Lat S 711  
 start stop duration Long E 1205  
 TIME :10:35:00 11:05:00 30 (min) Purpose code: 1  
 LOG :5019.20 5020.20 1.00 Area code : 1  
 FDEPTH: 247 238 GearCond.code: 1  
 BDEPTH: 247 238 Validity code: 1  
 Towing dir: 308° Wire out: 800 m Speed: 3 kn\*10

Sorted: 57 Kg Total catch: 144.33 CATCH/HOUR: 288.66

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichiurus lepturus	TRITR01 210.00	1526	72.75
Merluccius polli	MEPME03 17.66	460	6.12
Synagrops microlepis	ACRSY01 16.30	1004	5.65
Zenopsis conchifer	ZEIZN01 14.50	144	5.02
MYCTOPHIDAE	MYCAA00 7.06	5086	2.45
Parapenaeus longirostris	SHRPE31 6.10	780	2.11
Echeneis naucrates	ECNEC01 5.16	10	1.79
Illex coindetii	SQUOM21 4.26	56	1.48
Chlorophthalmus punctatus	CHLCH06 2.00	280	0.69
Pterothrissus belloci	ALBPT01 1.90	20	0.66
Ariomma bondi	ARMAR01 1.60	44	0.55
Sepiella ornata	SQUSE21 1.20	96	0.42
Coelorrhinchus coelorrhinchus	HARCO04 0.66	24	0.23
Scorpaena normani	SCRS03 0.26	6	0.09
Total	288.66		100.01

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 798  
 DATE: 2/ 3/96 GEAR TYPE: BT No:1 POSITION:Lat S 712  
 start stop duration Long E 12066  
 TIME :12:15:00 12:45:00 30 (min) Purpose code: 1  
 LOG :5028.00 5029.30 1.30 Area code : 1  
 FDEPTH: 219 240 GearCond.code: 1  
 BDEPTH: 219 240 Validity code: 1  
 Towing dir: 274° Wire out: 750 m Speed: 3 kn\*10

Sorted: 53 Kg Total catch: 183.05 CATCH/HOUR: 366.10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichiurus lepturus	TRITR01 201.00	1794	54.90
Zenopsis conchifer	ZEIZN01 34.50	408	9.42
Synagrops microlepis	ACRSY01 23.10	1530	6.31
Dentex angolensis	SPADE01 20.80	56	5.68
Illex coindetii	SQUOM21 20.52	318	5.61
Spicara alta	CENSP01 16.40	98	4.48
Merluccius polli	MEPME03 12.78	396	3.49
Parapenaeus longirostris	SHRPE31 8.22	1026	2.25
Heptanchias perlo	SHAHK11 7.30	2	1.99
Scorpaena normani	SCRS03 4.62	112	1.26
Pterothrissus belloci	ALBPT01 4.56	36	1.25
Chelidonichthys lyra *	TRGCH04 3.66	30	1.00
Dentex macropthalmus	SPADE03 3.12	18	0.85
Chlorophthalmus punctatus	CHLCH06 2.34	120	0.64
Ariomma bondi	ARMAR01 1.44	42	0.39
Sepiella ornata	SQUSE21 1.02	78	0.28
Uranoscopus cadenati	URAURO2 0.72	6	0.20
Total	366.10		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 799  
DATE: 2/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 706  
start stop duration Long E 12385  
TIME :19:49:00 20:19:00 30 (min) Purpose code: 1  
LOG :6089.90 6091.60 1.70 Area code : 1  
FDEPTH: 0 0 GearCond.code: 1  
BDEPTH: 31 36 Validity code:  
Towing dir: 250° Wire out: 150 m Speed: 37 kn\*10  
Sorted: Kg Total catch: 64.45 CATCH/HOUR: 128.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Alectis alexandrinus	CARAL01	69.60	78	54.00
Sphyræna sphyraena	SPHSP02	38.80	2	30.10
Scoræomorus tritor	SCMSM01	8.74	4	6.78
Trachinotus ovatus	CARTCO3	7.70	16	5.97
Lagocephalus laevisgatus	TETLA01	1.92	2	1.49
Sphyræna guachancho	SPHSP01	1.02	2	0.79
Decapterus rhonchus	CARDE02	0.64	44	0.50
Alloteuthis africana	SQUL011	0.46	94	0.36
Sepia officinalis hierredda	SQUSE11	0.02	4	0.02
Total		128.90		100.01

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 800  
DATE: 2/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 718  
start stop duration Long E 12435  
TIME :23:33:00 00:03:00 30 (min) Purpose code: 1  
LOG :5118.40 5119.90 1.50 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 37 41 Validity code:  
Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
Sorted: Kg Total catch: 45.89 CATCH/HOUR: 91.78

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	CARTCO3	64.90	170	70.71
Sphyræna guachancho	SPHSP01	12.40	14	13.51
Decapterus rhonchus	CARDE02	5.58	96	6.08
Caranx hippos	CARCA14	2.20	2	2.40
Illex coindetii	SQUM021	1.84	960	2.00
Scoræomorus tritor	SCMSM01	1.76	2	1.92
Sardinella aurita	CLUSL01	1.28	150	1.39
Boops boops	SPAB001	0.70	210	0.76
Saurida brasiliensis	SYNSA01	0.66	170	0.72
Sardinella maderensis	CLUSL02	0.26	2	0.28
Sepia officinalis hierredda	SQUSE11	0.20	14	0.22
Total		91.78		99.99

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 801  
DATE: 3/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 718  
start stop duration Long E 12235  
TIME :02:23:00 02:53:00 30 (min) Purpose code: 1  
LOG :5137.90 5139.30 1.40 Area code : 1  
FDEPTH: 10 10 GearCond.code: 1  
BDEPTH: 119 133 Validity code:  
Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
Sorted: Kg Total catch: 15.99 CATCH/HOUR: 31.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichurus lepturus	TRITR01	14.70	190	45.97
Scoræomorus tritor	SCMSM01	13.90	16	43.46
Trachinotus ovatus	CARTCO3	2.70	8	8.44
Saurida brasiliensis	SYNSA01	0.44	122	1.38
Illex coindetii	SQUM021	0.14	50	0.44
Synagrops microlepis	ACRSY01	0.06	18	0.19
Sepia officinalis hierredda	SQUSE11	0.04	4	0.13
Total		31.98		100.01

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 802  
DATE: 3/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 726  
start stop duration Long E 1244  
TIME :07:30:00 07:50:00 20 (min) Purpose code: 1  
LOG :5178.00 5179.20 1.20 Area code : 1  
FDEPTH: 17 15 GearCond.code: 1  
BDEPTH: 59 62 Validity code: 1  
Towing dir: 270° Wire out: 100 m Speed: 4 kn\*10  
Sorted: 17 Kg Total catch: 48.44 CATCH/HOUR: 145.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	CLUSL02	145.20	609	99.92
Echeneis naucrates	ECNEC01	0.12	3	0.08
Total		145.32		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 803  
DATE: 3/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 733  
start stop duration Long E 1242  
TIME :15:58:00 16:28:00 30 (min) Purpose code: 1  
LOG :5251.70 5252.80 1.10 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 70 76 Validity code: 1  
Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
Sorted: Kg Total catch: 13.53 CATCH/HOUR: 27.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scoræomorus tritor	SCMSM01	26.90	8	99.41
Echeneis naucrates	ECNEC01	0.12	2	0.44
Sepia officinalis hierredda	SQUSE11	0.04	2	0.15
Total		27.06		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 804  
DATE: 3/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 738  
start stop duration Long E 1257  
TIME :18:45:00 19:15:00 30 (min) Purpose code: 1  
LOG :5272.00 5273.70 1.70 Area code : 1  
FDEPTH: 0 0 GearCond.code: 1  
BDEPTH: 34 39 Validity code:  
Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
Sorted: Kg Total catch: 101.63 CATCH/HOUR: 203.26

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	CARTCO3	74.90	184	36.85
Scoræomorus tritor	SCMSM01	52.10	62	25.63
Engraulis encrasicolus	ENGEN01	25.24	10912	12.42
Sardinella maderensis	CLUSL02	23.40	488	11.51
Sphyræna guachancho	SPHSP01	10.78	20	5.30
Alloteuthis africana	SQUL011	4.48	6794	2.20
Galeorhinus galeus	SHATR51	3.60	2	1.77
Decapterus rhonchus	CARDE02	3.32	206	1.63
Elops lacerta	ELOEL03	2.40	4	1.18
Boops boops	SPAB001	1.22	684	0.60
Sardinella aurita	CLUSL01	0.60	10	0.30
Selene dorsalis	CARSL01	0.42	2	0.21
Sepia officinalis hierredda	SQUSE11	0.40	40	0.20
Brachydeuterus auritus	PODBR01	0.40	6	0.15
Saurida brasiliensis	SYNSA01	0.10	32	0.05
Total		203.26		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 805  
DATE: 3/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 738  
start stop duration Long E 1244  
TIME :20:36:00 21:06:00 30 (min) Purpose code: 1  
LOG :5283.90 5285.50 1.60 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 89 95 Validity code: 1  
Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
Sorted: 28 Kg Total catch: 102.63 CATCH/HOUR: 205.26

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	CLUSL02	94.90	576	46.23
Sardinella aurita	CLUSL01	54.80	464	26.70
Euthynnus alletteratus	SCHEU01	42.20	60	20.56
Alloteuthis africana	SQUL011	5.04	2290	2.46
Trachinotus ovatus	CARTCO3	2.82	6	1.37
Caranx crysos	CARCA02	2.52	2	1.23
Trichurus lepturus	TRITR01	2.24	6	1.09
Illex coindetii	SQUM021	0.54	6	0.26
Lagocephalus laevisgatus	TETLA01	0.20	8	0.20
Total		205.26		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 806  
DATE: 3/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 741  
start stop duration Long E 1233  
TIME :23:47:00 00:17:00 30 (min) Purpose code: 1  
LOG :5305.30 5306.80 1.50 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 196 137 Validity code: 1  
Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10  
Sorted: Kg Total catch: 12.96 CATCH/HOUR: 25.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichurus lepturus	TRITR01	24.80	246	95.68
Illex coindetii	SQUM021	0.86	106	3.32
Saurida brasiliensis	SYNSA01	0.14	406	0.54
Ariomma bondi	ARMAR01	0.12	4	0.46
Total		25.92		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 807  
DATE: 4/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 742  
start stop duration Long E 1253  
TIME :02:50:00 03:20:00 30 (min) Purpose code: 1  
LOG :5326.30 5327.90 1.60 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 56 47 Validity code: 1  
Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10  
Sorted: Kg Total catch: 19.32 CATCH/HOUR: 38.64

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus rhonchus	CARDE02	15.66	188	40.53
Sphyræna guachancho	SPHSP01	14.90	22	38.56
Illex coindetii	SQUM021	3.10	1108	8.02
Selene dorsalis	CARSL01	2.70	8	6.99
Saurida brasiliensis	SYNSA01	1.16	316	3.00
Boops boops	SPAB001	0.56	56	1.45
Sardinella maderensis	CLUSL02	0.32	2	0.83
Sardinella aurita	CLUSL01	0.24	12	0.62
Total		38.64		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 808  
DATE: 4/ 3/96 GEAR TYPE: BT No:7 POSITION:Lat S 746  
start stop duration Long E 13019  
TIME :05:24:00 05:54:00 30 (min) Purpose code: 1  
LOG :6342.50 6344.00 1.50 Area code : 1  
FDEPTH: 26 26 GearCond.code: 1  
BDEPTH: 26 26 Validity code: 1  
Towing dir: 340° Wire out: 150 m Speed: 3 kn\*10  
Sorted: 21 Kg Total catch: 1323.76 CATCH/HOUR: 2647.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Illex africana	CLUSL01	1021.80	48642	38.59
Chlorocoburus chrysurus	CARCH01	952.60	15686	35.98
Sphyræna guachancho	SPHSP01	281.60	990	10.64
Sardinella maderensis	CLUSL02	228.80	14036	8.64
Scoræomorus tritor	SCMSM01	48.62	66	1.84
Brachydeuterus auritus	PODBR01	40.04	1188	1.51
Arius parkii	ARDAR09	33.20	4	1.25
Galeorhinus galeus	SHATR51	10.86	6	0.41
Selene dorsalis	CARSL01	8.36	308	0.32
Galeoides decadactylus	PLMGA01	7.04	22	0.27
Trichurus lepturus	TRITR01	5.72	154	0.22
Argyroscopus hololepidotus	SCIAR03	3.94	4	0.15
Myliobatis aquila	MYMY11	2.68	2	0.10
Alectis alexandrinus	CARAL01	2.26	2	0.09
Total		2647.52		100.01

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 809  
DATE: 4/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 747  
Long E 12598  
TIME :07:03:00 07:33:00 30 (min) Purpose code: 1  
LOG :6350.30 6351.80 1.50 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 39 46 Validity code: 1  
Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 17 37 CATCH/HOUR: 34.74

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Euthynnus alletteratus	SCME01	27.60	40	79.45	
Scomberomorus tritor	SCMSM01	5.20	6	14.97	
Decapterus rhonchus	CARDE02	1.94	22	5.58	
Total		34.74		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 810  
DATE: 4/ 3/96 GEAR TYPE: BT No:1 POSITION:Lat S 752  
Long E 12484  
TIME :12:35:00 12:55:00 20 (min) Purpose code: 1  
LOG :5395.80 5396.60 0.80 Area code : 1  
FDEPTH: 105 107 GearCond.code: 1  
BDEPTH: 105 107 Validity code: 1  
Towing dir: 266° Wire out: 400 m Speed: 30 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
N O C A T C H	NOCAT00	0.00			
Total					

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 811  
DATE: 4/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 751  
Long E 12582  
TIME :14:57:00 15:27:00 30 (min) Purpose code: 1  
LOG :5411.00 5412.50 1.50 Area code : 1  
FDEPTH: 10 10 GearCond.code: 1  
BDEPTH: 56 65 Validity code: 1  
Towing dir: 283° Wire out: 150 m Speed: 30 kn\*10

Sorted: Kg Total catch: 2.71 CATCH/HOUR: 5.42

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Scomberomorus tritor	SCMSM01	5.42	6	100.00	
Total		5.42		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 812  
DATE: 4/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 757  
Long E 13061  
TIME :18:03:00 18:23:00 20 (min) Purpose code: 1  
LOG :5430.80 5431.90 1.10 Area code : 1  
FDEPTH: 0 0 GearCond.code: 1  
BDEPTH: 29 35 Validity code: 1  
Towing dir: 270° Wire out: 150 m Speed: 32 kn\*10

Sorted: 15 Kg Total catch: 4099.20 CATCH/HOUR: 12297.60

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Chloroscombrus chrysurus	CARCH01	9657.00	150120	78.53	
Sardinella maderensis	CLUSL02	1530.00	67320	12.44	1745
Sphyræna guachancho	SPHSP01	415.80	720	3.38	
Brachydeuterus auritus	PODBR01	303.00	18120	2.46	
Scomberomorus tritor	SCMSM01	171.00	240	1.39	
Galeorhinus galeus	SHATR51	144.00	60	1.17	
Ilisha africana	CLULI01	35.40	1440	0.29	
Selene dorsalis	CARSLO1	33.00	1320	0.27	
Galeoides decadactylus	PLNGA01	8.40	60	0.07	
Total		12297.60		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 813  
DATE: 4/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 757  
Long E 12429  
TIME :20:41:00 21:11:00 30 (min) Purpose code: 1  
LOG :5452.60 5453.60 1.60 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 144 258 Validity code: 1  
Towing dir: 270° Wire out: 150 m Speed: 32 kn\*10

Sorted: Kg Total catch: 68.28 CATCH/HOUR: 136.56

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Carcharhinus limbatus	SHACA17	90.00	2	65.91	
Trichlorurus lepturus	TRITR01	23.80	258	17.43	
MYCTOPHIDAE	MYCAA00	11.10	11574	8.13	
Euthynnus alletteratus	SCMEU01	6.16	12	4.51	
Selene dorsalis	CARSLO1	5.18	14	3.79	
Ariomma bondi	ARHAR01	0.32	4	0.23	
Total		136.56		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 814  
DATE: 5/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 802  
Long E 1259  
TIME :23:55:00 00:25:00 30 (min) Purpose code: 1  
LOG :5677.00 5678.30 1.30 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 82 75 Validity code: 1  
Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 43.50 CATCH/HOUR: 87.00

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Sardinella maderensis	CLUSL02	34.46	144	39.61	1746
Trichlorurus lepturus	TRITR01	13.10	42	15.06	
Sardinella aurita	CLUSL01	11.08	54	12.74	1747
Euthynnus alletteratus	SCMEU01	4.22	8	4.85	
Brachydeuterus auritus	PODBR01	4.22	44	4.74	
Sphyræna guachancho	SPHSP01	4.12	28	4.74	
Chloroscombrus chrysurus	CARCH01	3.02	24	3.47	
Trachurus trecae	CARTR02	2.70	80	3.10	1748
Saurida brasiliensis	SYNSA01	2.62	826	3.01	
Sarda sarda	SCMSA01	2.08	2	2.39	
Selene dorsalis	CARSLO1	1.88	30	2.16	
Ilex coindetii	SQOMW21	1.50	626	1.72	
Trachinotus ovatus	CARTC03	1.30	4	1.49	
Engraulis encrasicolus	ENGNO1	0.70	168	0.80	
Total		87.00		99.99	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 815  
DATE: 6/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 202  
Long E 1310  
TIME :02:00:00 02:30:00 30 (min) Purpose code: 1  
LOG :5687.70 5689.30 1.60 Area code : 1  
FDEPTH: 5 5 GearCond.code: 1  
BDEPTH: 26 27 Validity code: 1  
Towing dir: 158° Wire out: 100 m Speed: 3 kn\*10

Sorted: 32 Kg Total catch: 226.31 CATCH/HOUR: 452.62

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Brachydeuterus auritus	PODBR01	157.00	40796	78.87	
Chloroscombrus chrysurus	CARCH01	39.76	2450	8.78	
Sphyræna guachancho	SPHSP01	37.94	126	8.38	
Sardinella maderensis	CLUSL02	9.94	1092	2.20	1749
Galeoides decadactylus	PLNGA01	2.80	70	0.62	
Ilisha africana	CLULI01	2.52	168	0.56	
Selene dorsalis	CARSLO1	1.96	154	0.43	
Sepia officinalis hierredda	SQUSE11	0.70	70	0.15	
Total		452.62		99.99	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 816  
DATE: 6/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 806  
Long E 1250  
TIME :05:23:00 05:53:00 30 (min) Purpose code: 1  
LOG :5719.20 5716.00 3.20 Area code : 1  
FDEPTH: 0 0 GearCond.code: 1  
BDEPTH: 120 120 Validity code: 1  
Towing dir: 268° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
N O C A T C H	NOCAT00	0.00			
Total					

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 817  
DATE: 6/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 817  
Long E 13158  
TIME :11:08:00 11:38:00 30 (min) Purpose code: 1  
LOG :5760.90 5762.70 1.80 Area code : 1  
FDEPTH: 0 0 GearCond.code: 1  
BDEPTH: 30 38 Validity code: 1  
Towing dir: 270° Wire out: 150 m Speed: 30 kn\*10

Sorted: 31 Kg Total catch: 173.72 CATCH/HOUR: 347.44

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Sphyræna guachancho	SPHSP01	147.50	298	42.45	
Chloroscombrus chrysurus	CARCH01	93.68	822	26.96	
Scomberomorus tritor	SCMSM01	56.40	62	16.23	
Rhizoprionodon acutus	SHACA61	29.90	12	8.61	
Rhinoptera marginata	RAYRH13	8.00	2	2.30	
Sardinella maderensis	CLUSL02	6.52	50	1.88	1750
Trachinotus ovatus	CARTC03	5.44	12	1.57	
Total		347.44		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 818  
DATE: 6/ 3/96 GEAR TYPE: BT No:1 POSITION:Lat S 817  
Long E 12510  
TIME :15:13:00 15:28:00 15 (min) Purpose code: 1  
LOG :5793.90 5794.70 0.80 Area code : 1  
FDEPTH: 195 194 GearCond.code: 1  
BDEPTH: 195 194 Validity code: 1  
Towing dir: 326° Wire out: 750 m Speed: 30 kn\*10

Sorted: 33 Kg Total catch: 143.79 CATCH/HOUR: 575.16

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
MYCTOPHIDAE	MYCAA00	373.60	438128	64.96	
Synagrops microlepis	ACRSY01	141.60	11488	24.62	
Trichlorurus lepturus	TRITR01	30.00	72	5.22	
Albipinna alba	ALBPT01	6.88	48	1.20	
Pterothia bellioi	SHRPE11	6.40	880	1.11	
Parapenaeus longirostris	ZEIZNO1	5.72	4	0.99	
Zenopsis cocchifer	SPADE03	4.88	44	0.85	
Dentex macrophthalmus	CHLCH01	3.84	768	0.67	
Chlorophthalmus atlanticus	SCIPN01	1.20	8	0.21	
Pentheroscion mbizi	SPADE01	0.56	4	0.10	
Dentex angolensis	SQUSE11	0.48	16	0.08	
Sepia officinalis hierredda					
Total		575.16		100.01	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 819  
DATE: 6/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 822  
Long E 1314  
TIME :19:00:00 19:30:00 30 (min) Purpose code: 1  
LOG :5823.10 5824.70 1.60 Area code : 1  
FDEPTH: 0 0 GearCond.code: 1  
BDEPTH: 43 38 Validity code: 1  
Towing dir: 90° Wire out: 150 m Speed: 32 kn\*10

Sorted: 18 Kg Total catch: 771.32 CATCH/HOUR: 1542.64

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Chloroscombrus chrysurus	CARCH01	1198.20	17622	77.67	
Sphyræna guachancho	SPHSP01	116.60	2332	7.56	
Sardinella maderensis	CLUSL02	100.80	3300	6.53	
Sphyræna sphyraena	SPHSP02	33.90	2	2.20	1751
Ilisha africana	CLULI01	29.16	888	1.89	
Brachydeuterus auritus	PODBR01	19.50	1672	1.26	
Rhizoprionodon acutus	SHACA61	16.38	8	1.06	
Selene dorsalis	CARSLO1	10.20	204	0.66	
Engraulis encrasicolus	ENGNO1	5.40	1836	0.35	
Scomberomorus tritor	SCMSM01	4.46	4	0.29	
Trachinotus ovatus	CARTC03	2.74	8	0.18	
Trichlorurus lepturus	TRITR01	2.28	84	0.15	
Alectis alexandrinus	CARAL01	1.86	2	0.12	
Alloteuthis africana	SQULI01	0.72	168	0.05	
Trachinotus goreensis	CARTC02	0.44	2	0.03	
Total		1542.64		100.00	



DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 820  
 DATE: 6/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 827  
 start stop duration Long E 13109  
 TIME :21:42:00 22:12:00 30 (min) Purpose code: 1  
 LOG :5841.40 5843.10 1.70 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 67 75 Validity code: 1  
 Towing dir: 270° Wire out: 150 m Speed: 34 kn\*10

Sorted: 19 Kg Total catch: 92.23 CATCH/HOUR: 184.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	CLUSL02	105.00	56.92	1753
Rhizoprionodon acutus	SHACA61	26.10	14.15	
Selene dorsalis	CARS101	23.10	12.52	
Trichurus lepturus	TRITR01	7.32	3.97	
Euthynnus alletteratus	SCHEU01	6.60	3.58	
Engraulis encrasicolus	ENGEN01	4.82	2.61	
Sphyræna guachancho	SPHSP01	4.50	2.44	
Sardinella aurita	CLUSL01	4.48	2.43	1752
Scomberomorus tritor	SCMSM01	1.76	0.95	
Trachinotus ovatus	CARTC03	0.64	0.35	
Saurida brasiliensis	SYNSA01	0.14	0.08	
Total		184.46	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 821  
 DATE: 7/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 832  
 start stop duration Long E 1316  
 TIME :02:58:00 03:28:00 30 (min) Purpose code: 1  
 LOG :5884.60 5885.90 1.30 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 40 31 Validity code: 1  
 Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10

Sorted: 2 Kg Total catch: 157.50 CATCH/HOUR: 315.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sphyræna guachancho	SPHSP01	140.60	44.63	
Rhizoprionodon acutus	SHACA61	36.00	11.43	
Sardinella maderensis	CLUSL02	34.20	10.86	1754
Scomberomorus tritor	SCMSM01	32.40	10.29	
Brachydeuterus auritus	PODBR01	24.60	7.81	
Sphyræna lewini	SHASPL2	19.90	6.32	
Engraulis encrasicolus	ENGEN01	7.56	2.40	
Pomadasys peroteti	PODPO03	5.24	1.66	
Selene dorsalis	CARS101	2.76	0.88	
Alectis alexandrinus	CARAL01	2.64	0.84	
Pseudotolithus typus	SCIPS03	2.26	0.72	
Euthynnus alletteratus	SCHEU01	1.82	0.58	
Trichurus lepturus	TRITR01	1.76	0.56	
Chloroscombrus chrysurus	CARCH01	1.20	0.38	
Sphyræna sphyraena	SPHSP02	1.10	0.35	
Ilisha africana	CLULI01	0.96	0.30	
Total		315.00	100.01	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 822  
 DATE: 7/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 838  
 start stop duration Long E 1314  
 TIME :05:11:00 05:41:00 30 (min) Purpose code: 1  
 LOG :5897.20 5898.80 1.60 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 60 68 Validity code: 1  
 Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 18.16 CATCH/HOUR: 36.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SCMTH02		34.40	94.71	
Scomberomorus tritor	SCMSM01	1.92	5.29	
Total		36.32	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 823  
 DATE: 7/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 842  
 start stop duration Long E 13145  
 TIME :09:52:00 10:22:00 30 (min) Purpose code: 1  
 LOG :5937.50 5939.40 1.90 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 58 51 Validity code: 1  
 Towing dir: 90° Wire out: 150 m Speed: 38 kn\*10

Sorted: Kg Total catch: 3.54 CATCH/HOUR: 7.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Euthynnus alletteratus	SCHEU01	5.24	74.01	
Scomberomorus tritor	SCMSM01	1.58	22.32	
Sardinella aurita	CLUSL01	0.26	3.67	
Total		7.08	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 824  
 DATE: 7/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 857  
 start stop duration Long E 1257  
 TIME :18:51:00 19:21:00 30 (min) Purpose code: 1  
 LOG :6000.40 6002.00 1.60 Area code : 1  
 FDEPTH: 28 24 GearCond.code: 1  
 BDEPTH: 222 200 Validity code: 1  
 Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 360.42 CATCH/HOUR: 720.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	MYCAA00	591.80	82.10	
Trichurus lepturus	TRITR01	88.20	12.24	
Sardinella maderensis	CLUSL02	33.10	4.59	1755
Caranx crysos	CARCA02	2.72	0.38	
Sardinella aurita	CLUSL01	1.64	0.23	
Selene dorsalis	CARS101	1.40	0.19	
Synagrops microlepis	ACRSY01	1.32	0.18	
Euthynnus alletteratus	SCHEU01	0.50	0.07	
Macroparalepis macrogenion	PARMA01	0.16	0.02	
Total		720.84	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 825  
 DATE: 7/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 858  
 start stop duration Long E 1259  
 TIME :20:40:00 21:10:00 30 (min) Purpose code: 1  
 LOG :6010.10 6011.70 1.60 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 134 165 Validity code: 1  
 Towing dir: 255° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 24.53 CATCH/HOUR: 49.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selene dorsalis	CARS101	39.60	120	80.72
Sardinella maderensis	CLUSL02	5.24	26	10.68
Sphyræna guachancho	SPHSP01	3.76	4	7.66
Hemiramphus balao	HEMHE02	0.26	2	0.53
Sardinella aurita	CLUSL01	0.20	4	0.41
Total		49.06	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 826  
 DATE: 7/ 3/96 GEAR TYPE: BT No:1 POSITION:Lat S 901  
 start stop duration Long E 1256  
 TIME :23:08:00 21:20:00 12 (min) Purpose code: 1  
 LOG :6025.20 6025.70 0.50 Area code : 1  
 FDEPTH: 195 187 GearCond.code: 1  
 BDEPTH: 195 187 Validity code: 1  
 Towing dir: 211° Wire out: 700 m Speed: 3 kn\*10

Sorted: 46 Kg Total catch: 499.95 CATCH/HOUR: 2499.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	CARTR02	1968.75	5125	78.76
Dentex macrophthalmus	SPAED03	231.25	1450	9.25
Pterothrius belloci	ALBPT01	116.00	900	4.64
Trichurus lepturus	TRITR01	61.50	350	2.46
Centropristis granulosa	SHASQ14	36.50	15	1.46
Dentex angolensis	SPAED01	32.25	150	1.29
Parapeneus longirostris	SHRPE31	21.50	11550	0.86
Umbrina canariensis	SCIDM01	12.75	25	0.51
MYCTOPHIDAE	MYCAA00	8.00	5475	0.32
Synagrops microlepis	ACRSY01	7.25	725	0.29
Trigla lyra	TRGTR02	4.00	25	0.16
Total		2499.75	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 827  
 DATE: 8/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 910  
 start stop duration Long E 1253  
 TIME :03:55:00 04:25:00 30 (min) Purpose code: 1  
 LOG :6061.00 6062.40 1.40 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 48 61 Validity code: 1  
 Towing dir: 251° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 36.53 CATCH/HOUR: 73.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selene dorsalis	CARS101	32.00	110	43.80
Sphyræna guachancho	SPHSP01	30.50	40	41.75
MYCTOPHIDAE	MYCAA00	2.72	2598	3.72
Loligo vulgaris	SQUL021	2.36	972	3.23
Illex coindetii	SQUMZ1	1.54	1078	2.11
Sardinella maderensis	CLUSL02	1.52	6	2.08
Brachydeuterus auritus	PODBR01	1.00	10	1.37
Sardinella aurita	CLUSL01	0.66	2	0.90
Sphyræna sphyraena	SPHSP02	0.32	2	0.44
Chloroscombrus chrysurus	CARCH01	0.28	2	0.38
Decapterus rhonchus	CARDE02	0.16	2	0.22
Total		73.06	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 828  
 DATE: 8/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 916  
 start stop duration Long E 13003  
 TIME :08:42:00 09:12:00 30 (min) Purpose code: 1  
 LOG :6094.30 6096.00 1.70 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 19 20 Validity code: 1  
 Towing dir: 165° Wire out: 120 m Speed: 34 kn\*10

Sorted: Kg Total catch: 110.38 CATCH/HOUR: 220.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sphyræna guachancho	SPHSP01	155.70	430	70.53
Chloroscombrus chrysurus	CARCH01	20.60	570	9.33
Rhizoprionodon acutus	SHACA61	18.30	8	8.29
Arius parkii	ARBAR09	6.40	2	2.90
Myliobatis aquila	RAYMY11	4.46	2	2.02
Selene dorsalis	CARS101	2.54	110	1.15
Brachydeuterus auritus	PODBR01	2.20	254	1.00
Caranx senegalus	CARCA03	2.18	2	0.99
Stromateus fiatola	STRST01	1.82	4	0.82
Scomberomorus tritor	SCMSM01	1.76	2	0.80
Trachurus trecae	CARTR02	1.66	4	0.75
Uraspis secunda	CARUR01	1.60	6	0.72
Trachinotus goreensis	CARTC02	0.62	2	0.28
Ilisha africana	CLULI01	0.44	16	0.20
Trichurus lepturus	TRITR01	0.34	24	0.15
Galeoides decadactylus	PLNGA01	0.08	4	0.04
Sardinella maderensis	CLUSL02	0.06	2	0.03
Total		220.76	100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 829  
 DATE: 8/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 924  
 start stop duration Long E 12554  
 TIME :13:25:00 13:55:00 30 (min) Purpose code: 1  
 LOG :6131.80 6133.20 1.40 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 60 66 Validity code: 1  
 Towing dir: 170° Wire out: 150 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	NOCAT00	0.00		
Total				

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 830  
 DATE:15/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 922 Long E 1251  
 start stop duration  
 TIME :09:42:00 10:12:00 30 (min) Purpose code: 1  
 LOG :7185.50 7186.90 1.40 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 91 95 Validity code: 1  
 Towing dir: 35° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: Kg Total catch: 2.05 CATCH/HOUR: 4.10

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 835  
 DATE:16/ 3/96 GEAR TYPE: PT No:9 POSITION:Lat S 951 Long E 1256  
 start stop duration  
 TIME :23:26:00 23:56:00 30 (min) Purpose code: 1  
 LOG :7449.20 7450.90 1.70 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 116 121 Validity code: 1  
 Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: 2 Kg Total catch: 50.62 CATCH/HOUR: 101.24

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Euthynnus alletteratus SCMEU01 4.10 4 100.00  
 Total 4.10 100.00

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Selene dorsalis CARSL01 64.80 202 64.01  
 Caranx crysos CARCA02 15.10 12 14.92  
 Brachydeuterus auritus POBRO1 6.00 42 5.93  
 Trachinotus ovatus CARTC03 5.68 14 5.61  
 Trichurus lepturus TRITR01 4.04 12 3.99  
 Sardinella maderensis CLUSL02 3.38 12 3.34 1759  
 Chloroscombrus chrysurus CARCH01 1.04 8 1.03  
 Scomber japonicus SCMSC01 0.62 4 0.61  
 Lolligo vulgaris SQULO21 0.30 128 0.30  
 Saurida brasiliensis SYNSA01 0.20 96 0.20  
 Trachurus trecae CARTR02 0.08 2 0.08  
 Total 101.24 100.02

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 831  
 DATE:15/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 926 Long E 1304  
 start stop duration  
 TIME :18:53:00 19:23:00 30 (min) Purpose code: 1  
 LOG :7268.10 7269.80 1.70 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 28 34 Validity code: 1  
 Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: 2 Kg Total catch: 105.24 CATCH/HOUR: 210.48

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 836  
 DATE:17/ 3/96 GEAR TYPE: PT No:9 POSITION:Lat S 956 Long E 1304  
 start stop duration  
 TIME :03:05:00 03:35:00 30 (min) Purpose code: 1  
 LOG :7475.10 7476.50 1.40 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 83 79 Validity code: 1  
 Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: 9 Kg Total catch: 142.39 CATCH/HOUR: 284.78

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Boops boops SPABO01 42.68 23048 20.28  
 Sphyræna guachancho SPHSP01 30.04 66 14.27  
 Lutjanus goresensis LUTLU01 29.90 34 14.21  
 Caranx crysos CARCA02 28.10 32 13.35  
 Sardinella maderensis CLUSL02 16.30 1944 7.74 1757  
 Epinephelus goresensis SEREP26 12.74 4 6.05  
 Pomadasys incisus PODPO02 8.70 42 4.13  
 Pomadasys rogeri PODPO04 6.76 6 3.21  
 Engraulis encrasicolus ENGEN01 6.34 2904 2.95  
 Trachinotus ovatus CARTC03 4.94 12 2.35  
 Sparus caeruleostictus SPASAO1 4.38 4 2.08  
 Scomberomorus tritor SCMSM01 3.46 2 1.64  
 Sphyræna afra SPHSP03 3.40 84 1.62  
 Alecthis alexandrinus CARAL01 3.20 2 1.52  
 Pseudupeneus prayensis MULPS01 1.66 864 0.79  
 Saurida brasiliensis SYNSA01 1.66 398 0.79  
 Decapterus rhombus CARDE02 1.66 42 0.79  
 Selene dorsalis CARSL01 1.28 2 0.61  
 Pagellus bellottii SPAPA02 1.04 2 0.49  
 Allotectia africana SQULO11 1.00 600 0.48  
 Ilisha africana CLULI01 0.64 10 0.30  
 Hemiramphus balao HEMHE02 0.24 2 0.11  
 Total 210.12 99.82

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Selene dorsalis CARSL01 270.40 1024 94.95  
 Trichurus lepturus TRITR01 5.80 22 2.04  
 Trachurus trecae, juvenile CARTR02 2.58 280 0.91 1760  
 Illex coindetii SQUOM21 2.02 534 0.71  
 Brachydeuterus auritus POBRO1 1.74 16 0.61  
 Trachinotus ovatus CARTC03 0.72 2 0.25  
 Sardinella maderensis CLUSL02 0.50 8 0.18  
 Sphyræna sphyraena SPHSP02 0.42 4 0.15  
 Saurida brasiliensis SYNSA01 0.38 100 0.13  
 Lagocephalus laevigatus TETLA01 0.18 2 0.06  
 Sepia officinalis hierredda SQUSE11 0.04 4 0.01  
 Total 284.78 100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 832  
 DATE:16/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 935 Long E 1257  
 start stop duration  
 TIME :08:25:00 08:55:00 30 (min) Purpose code: 1  
 LOG :7329.50 7331.30 1.80 Area code : 1  
 FDEPTH: 10 30 GearCond.code: 1  
 BDEPTH: 83 92 Validity code: 1  
 Towing dir: 270° Wire out: 100 m Speed: 36 kn\*10  
 Sorted: Kg Total catch: CATCH/HOUR:

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 837  
 DATE:17/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1003 Long E 1317  
 start stop duration  
 TIME :05:42:00 06:12:00 30 (min) Purpose code: 1  
 LOG :7493.90 7495.00 1.10 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 19 24 Validity code: 1  
 Towing dir: 270° Wire out: 140 m Speed: 2 kn\*10  
 Sorted: Kg Total catch: 1.60 CATCH/HOUR: 3.20

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 NO C A T C H NOCAT00 0.00  
 Total

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Trachinotus ovatus CARTC03 2.48 8 77.50  
 Chloroscombrus chrysurus CARCH01 0.72 6 22.50  
 Total 3.20 100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 833  
 DATE:16/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 939 Long E 1310  
 start stop duration  
 TIME :18:32:00 19:02:00 30 (min) Purpose code: 1  
 LOG :7412.20 7414.00 1.80 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 22 20 Validity code: 1  
 Towing dir: 351° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: 1 Kg Total catch: 55.57 CATCH/HOUR: 111.14

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 838  
 DATE:17/ 3/96 GEAR TYPE: PT No:8 POSITION:Lat S 1002 Long E 1306  
 start stop duration  
 TIME :07:38:00 08:38:00 60 (min) Purpose code: 1  
 LOG :7506.80 7510.90 4.10 Area code : 1  
 FDEPTH: 30 30 GearCond.code: 1  
 BDEPTH: 83 61 Validity code: 1  
 Towing dir: 90° Wire out: 180 m Speed: 41 kn\*10  
 Sorted: Kg Total catch: 2.76 CATCH/HOUR: 2.76

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Engraulis encrasicolus ENGEN01 36.34 17890 32.70  
 Ilisha africana CLULI01 15.66 400 14.09  
 Sardinella maderensis CLUSL02 13.70 2468 12.33 1758  
 Sphyræna guachancho SPHSP01 13.60 64 12.24  
 Etimalosa fibriata CLUEH01 9.84 18 8.85  
 Scomberomorus tritor SCMSM01 8.40 12 7.56  
 Chloroscombrus chrysurus CARCH01 4.46 560 4.01  
 Galeoides decadactylus PLNGA01 3.02 20 2.72  
 Brachydeuterus auritus POBRO1 2.74 32 2.47  
 Albulia vulpes ALBAL01 1.34 2 1.21  
 Caranx crysos CARCA02 0.58 2 0.52  
 Trachinotus ovatus CARTC03 0.32 2 0.29  
 Tylosurus crocodillus crocodil BELIT01 0.10 2 0.09  
 Total 110.10 99.08

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Chloroscombrus chrysurus CARCH01 0.83 2 30.07  
 Euthynnus alletteratus SCMEU01 0.81 1 29.35  
 Sphyræna guachancho SPHSP01 0.56 1 20.29  
 Selene dorsalis CARSL01 0.56 2 20.29  
 Total 2.76 100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 834  
 DATE:16/ 3/96 GEAR TYPE: PT No:9 POSITION:Lat S 951 Long E 1310  
 start stop duration  
 TIME :21:13:00 21:43:00 30 (min) Purpose code: 1  
 LOG :7433.30 7435.10 1.80 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 35 46 Validity code: 1  
 Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: 18 Kg Total catch: 96.31 CATCH/HOUR: 192.62

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 839  
 DATE:17/ 3/96 GEAR TYPE: PT No:8 POSITION:Lat S 1001 Long E 1309  
 start stop duration  
 TIME :09:18:00 09:34:00 16 (min) Purpose code: 1  
 LOG :7513.20 7514.00 0.80 Area code : 1  
 FDEPTH: 30 30 GearCond.code: 1  
 BDEPTH: 62 68 Validity code: 1  
 Towing dir: 265° Wire out: 180 m Speed: 3 kn\*10  
 Sorted: 42 Kg Total catch: 138.51 CATCH/HOUR: 519.41

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sphyræna guachancho SPHSP01 47.00 240 24.40  
 Sphyræna sphyraena SPHSP02 30.90 2 16.04  
 Alecthis alexandrinus CARAL01 28.40 38 14.74  
 Ilisha africana CLULI01 24.80 826 12.88  
 Brachydeuterus auritus POBRO1 14.24 1714 7.39  
 Chloroscombrus chrysurus CARCH01 13.54 160 7.03  
 Pomadasys rogeri PODPO04 11.60 12 6.02  
 Selene dorsalis CARSL01 5.50 152 2.86  
 Sardinella maderensis CLUSL02 4.62 612 2.40  
 Scomberomorus tritor SCMSM01 3.80 4 1.97  
 Engraulis encrasicolus ENGEN01 2.22 536 1.15  
 Trichurus lepturus TRITR01 1.80 6 0.93  
 Lagocephalus laevigatus TETLA01 1.44 2 0.75  
 Saurida brasiliensis SYNSA01 1.28 384 0.66  
 Eucinostomus melanopterus GEREU01 0.78 26 0.40  
 Trachurus trecae CARTR02 0.52 2 0.27  
 Gobiidae GOBAA00 0.18 342 0.09  
 Total 192.62 99.98

SPECIES CATCH/HOUR % OF TOT. C SAMP  
 weight numbers  
 Sardinella maderensis CLUSL02 228.94 878 44.08 1762  
 Sardinella aurita CLUSL01 190.50 473 36.68 1761  
 Stromateus fiatola STRST01 98.44 101 18.95  
 Trachinotus ovatus CARTC03 1.54 4 0.30  
 Total 519.42 100.01

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 840  
 DATE:17/ 3/96 GEAR TYPE: BT No:1 POSITION:Lat S 1008  
 start stop duration Long E 1317  
 TIME :15:02:00 15:17:00 15 (min) Purpose code: 1  
 LOG :7562.90 7563.70 0.80 Area code : 1  
 FDEPTH: 44 50 GearCond.code: 1  
 BDEPTH: 44 50 Validity code: 1  
 Towing dir: 260° Wire out: 200 m Speed: 3 kn\*10  
 Sorted: Kg Total catch: 124.97 CATCH/HOUR: 499.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus	PODBR01	194.50	2780	38.93
Ilisha africana	CLULI01	62.40	1716	12.48
Galeoides decadactylus	PLNGA01	44.20	88	8.84
Sphyræna guachancho	SPHSP01	26.60	40	5.32
Trichiurus lepturus	TRITR01	26.40	136	5.28
Pagellus bellottii	SPAPA01	22.60	76	4.52
Stromateus fiatola	STRST01	17.40	40	3.48
Sardinella maderensis	CLUSL02	16.12	1536	3.22
Chloroscombrus chrysurus	CARCH01	15.84	156	3.17
Selene dorsalis	CARSL01	15.32	288	3.06
Pseudotolithus brachygnathus	SCIPSO5	14.80	16	2.96
Synagrops microlepis	ACRSY01	10.64	652	2.13
Trachurus trecae	CARTR02	9.04	52	1.81
Pomadasy jubelini	PODPO01	7.80	28	1.56
Pomadasy incisus	PODPO02	6.76	28	1.35
Torpedo marmorata	RAYTO12	5.28	4	1.06
Epinephelus aeneus	SEREP01	2.80	4	0.56
Trachurus trecae, juvenile	CARTR92	1.28	288	0.26
Total		499.88		99.99

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 841  
 DATE:17/ 3/96 GEAR TYPE: PT No:9 POSITION:Lat S 1014  
 start stop duration Long E 1323  
 TIME :18:19:00 18:49:00 30 (min) Purpose code: 1  
 LOG :7580.60 7582.60 2.00 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 31 39 Validity code: 1  
 Towing dir: 270° Wire out: 150 m Speed: 4 kn\*10  
 Sorted: Kg Total catch: 98.97 CATCH/HOUR: 197.94

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Ilisha africana	CLULI01	65.70	4730	33.19
Sphyræna guachancho	SPHSP01	45.00	142	22.73
Ethmalosa fimbriata	CLUEM01	22.00	36	11.11
Trichiurus lepturus	TRITR01	15.20	60	7.68
Trachinotus ovatus	CARTC03	12.90	42	6.52
Sardinella maderensis	CLUSL02	9.14	768	4.46
Brachydeuterus auritus	PODBR01	8.82	466	4.66
Chloroscombrus chrysurus	CARCH01	8.50	108	4.29
Engraulis encrasicolus	ENGEN01	3.28	1410	1.66
Arius parkii	ARDAR09	2.56	2	1.29
Galeoides decadactylus	PLNGA01	1.84	4	0.93
Scomberomus tritor	SCMSM01	1.64	2	0.83
Selene dorsalis	CARSL01	0.70	16	0.35
Pteroscopus peli	SCIPT01	0.66	8	0.33
Total		197.94		99.99

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 842  
 DATE:17/ 3/96 GEAR TYPE: PT No:9 POSITION:Lat S 1019  
 start stop duration Long E 1304  
 TIME :22:49:00 23:19:00 30 (min) Purpose code: 1  
 LOG :7617.80 7619.70 1.90 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 118 112 Validity code: 1  
 Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: Kg Total catch: 13.40 CATCH/HOUR: 26.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selene dorsalis	CARSL01	12.30	38	45.90
Trichiurus lepturus	TRITR01	4.46	34	16.64
Auxis thazard	SCHAO01	3.74	26	13.96
Saurida brasiliensis	SYNSA01	2.56	722	9.55
Sphyræna sphyraena	SPHSP01	1.60	4	5.97
MYCTOPHIDAE	MYCAA00	0.48	272	1.79
Trachinotus ovatus	CARTC03	0.44	2	1.64
Synagrops microlepis	ACRSY01	0.36	84	1.34
Brachydeuterus auritus	PODBR01	0.32	2	1.19
Illex coindetii	SQUOM21	0.30	2	1.12
Ariomma bondi	ARMAR01	0.24	2	0.90
Total		26.80		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 843  
 DATE:18/ 3/96 GEAR TYPE: PT No:9 POSITION:Lat S 1020  
 start stop duration Long E 1316  
 TIME :00:54:00 01:24:00 30 (min) Purpose code: 1  
 LOG :7630.40 7632.00 1.60 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 86 79 Validity code: 1  
 Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: 14 Kg Total catch: 53.57 CATCH/HOUR: 107.14

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selene dorsalis	CARSL01	57.70	154	53.85
Brachydeuterus auritus	PODBR01	19.90	544	18.57
Trichiurus lepturus	TRITR01	18.10	90	16.89
Saurida brasiliensis	SYNSA01	5.44	1578	5.08
Sphyræna guachancho	SPHSP01	2.60	4	2.43
Trachinotus ovatus	CARTC03	1.42	4	1.33
Illex coindetii	SQUOM21	0.52	204	0.49
Trachurus trecae, juvenile	CARTR92	0.48	44	0.45
Sardinella maderensis	CLUSL02	0.48	8	0.45
Exocoetidae	ECNEC01	0.40	2	0.37
EXOPA01		0.10	2	0.09
Total		107.14		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 844  
 DATE:18/ 3/96 GEAR TYPE: PT No:9 POSITION:Lat S 1025  
 start stop duration Long E 1329  
 TIME :03:55:00 04:25:00 30 (min) Purpose code: 1  
 LOG :7652.60 7654.10 1.50 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 38 45 Validity code: 1  
 Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: 55 Kg Total catch: 189.04 CATCH/HOUR: 378.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Ilisha africana	CLULI01	161.74	4806	42.78
Chloroscombrus chrysurus	CARCH01	64.74	564	17.12
Trachinotus ovatus	CARTC03	40.20	114	10.63
Scomberomus tritor	SCMSM01	29.00	32	7.67
Sphyræna guachancho	SPHSP01	23.60	54	6.24
Sardinella maderensis	CLUSL02	23.14	970	6.12
Sphyræna lewini	SHASP12	12.10	4	3.20
Selene dorsalis	CARSL01	9.54	110	2.52
Trichiurus lepturus	TRITR01	3.74	16	0.99
Caramx crysos	CARCA02	3.74	16	0.99
Brachydeuterus auritus	PODBR01	3.50	180	0.91
Engraulis encrasicolus	ENGEN01	1.84	3826	0.49
Alloteuthis africana	SQUL011	1.20	170	0.32
Total		378.08		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 845  
 DATE:18/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1036  
 start stop duration Long E 1340  
 TIME :12:25:00 13:05:00 40 (min) Purpose code: 1  
 LOG :7724.60 7726.60 2.00 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 26 28 Validity code: 1  
 Towing dir: 312° Wire out: 120 m Speed: 30 kn\*10  
 Sorted: Kg Total catch: 2.60 CATCH/HOUR: 3.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinotus ovatus	CARTC03	1.70	6	43.59
Scomberomus tritor	SCMSM01	1.16	2	29.74
Raja miraletus	RAYRA11	1.04	2	26.67
Total		3.90		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 846  
 DATE:18/ 3/96 GEAR TYPE: BT No:1 POSITION:Lat S 1037  
 start stop duration Long E 1122  
 TIME :09:35:30 15:00:00 236 (min) Purpose code: 1  
 LOG :7751.50 7752.50 1.00 Area code : 1  
 FDEPTH: 107 112 GearCond.code: 1  
 BDEPTH: 107 112 Validity code: 9  
 Towing dir: 260° Wire out: 400 m Speed: 30 kn\*10  
 Sorted: Kg Total catch: 1.29 CATCH/HOUR: 0.33

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selene dorsalis	CARSL01	1.43	3	433.33
Trachinotus ovatus	CARTC03	1.36	5	412.12
Brachydeuterus auritus	PODBR01	0.31	3	93.94
Trichiurus lepturus	TRITR01	0.21	3	63.64
Boops boops	SPABO01	0.05	3	15.15
Total		3.36		1018.18

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 847  
 DATE:20/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1045  
 start stop duration Long E 1336  
 TIME :17:20:00 17:35:00 15 (min) Purpose code: 1  
 LOG :8171.60 8172.50 1.50 Area code : 1  
 FDEPTH: 26 25 GearCond.code: 1  
 BDEPTH: 69 67 Validity code: 1  
 Towing dir: 360° Wire out: 170 m Speed: 3 kn\*10  
 Sorted: 135 Kg Total catch: 974.36 CATCH/HOUR: 3897.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	CARCH01	1652.84	11512	42.41
Selene dorsalis	CARSL01	814.92	2552	20.91
Sardinella maderensis	CLUSL02	659.72	2988	16.93
Sphyræna guachancho	SPHSP01	424.84	408	10.90
Stromateus fiatola	STRST01	334.92	376	8.59
Trachurus trecae	CARTR02	12.20	60	0.31
Total		3899.44		100.05

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 848  
 DATE:20/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1044  
 start stop duration Long E 1312  
 TIME :21:33:00 21:44:00 11 (min) Purpose code: 1  
 LOG :8202.60 8203.20 0.60 Area code : 1  
 FDEPTH: 15 30 GearCond.code: 1  
 BDEPTH: 540 504 Validity code: 1  
 Towing dir: 360° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: Kg Total catch: 111.10 CATCH/HOUR: 606.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Ariomma bondi	ARMAR01	539.45	737253	89.02
MYCTOPHIDAE	MYCAA00	66.55	1816	10.98
Total		606.00		100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 849  
 DATE:21/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1056  
 start stop duration Long E 13379  
 TIME :07:46:00 08:16:00 30 (min) Purpose code: 1  
 LOG :8296.60 8298.00 1.40 Area code : 1  
 FDEPTH: 35 40 GearCond.code: 1  
 BDEPTH: 95 90 Validity code: 1  
 Towing dir: 360° Wire out: 190 m Speed: 28 kn\*10  
 Sorted: Kg Total catch: 8.95 CATCH/HOUR: 17.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Euthynnus alletteratus	SCMET01	17.90	8	100.00
Total		17.90		100.00

## Fishing gear

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl". The pelagic trawl is equipped with a trawleye that provides information on the trawl opening and distance of the footrope to the bottom.

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm meshsize in the codend with an innernet of 10 mm meshsize. The estimated opening is 6 m (observed 5.7) and distance between wings during towing about 18 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. The doors are of 'Thyborøn' combi type, 7.81 m<sup>2</sup>, 1670 kg, their distance while trawling about 46 m in average. This distance is kept constant at all depths by the use of a 9.5 m strap between the wires at 130 m distance from the doors (applied at depths greater than 60 m). A tickler chain (44 m in total) was attached at the footrope at every second haul.

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

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 850  
 DATE:21/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1057  
 start stop duration Long E 13378  
 TIME :09:00:00 09:48:00 48 (min) Purpose code: 1  
 LOG :8299.90 8303.20 3.30 Area code : 1  
 FDEPTH: 50 75 GearCond.code: 1  
 BDEPTH: 94 102 Validity code:  
 Towing dir: 180° Wire out: 250 m Speed: 40 kn\*10

Sorted: Kg Total catch: 38.85 CATCH/HOUR: 48.56

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sphyræna sphyraena	SPHSP02	30.75	1	63.32	
Selene dorsalis	CARSL01	12.00	15	24.71	
Sphyræna guachancho	SPHSP01	3.26	3	6.71	
Ethynnus alletteratus	SCHM001	2.46	8	5.07	
Lagocephalus laevisgatus	TEFLA01	0.09	1	0.19	
Total		48.56		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 851  
 DATE:21/ 3/96 GEAR TYPE: BT No:1 POSITION:Lat S 1100  
 start stop duration Long E 1340  
 TIME :13:10:00 13:40:00 30 (min) Purpose code: 1  
 LOG :8331.10 8333.10 2.00 Area code : 1  
 FDEPTH: 82 76 GearCond.code: 1  
 BDEPTH: 82 76 Validity code: 1  
 Towing dir: 20° Wire out: 320 m Speed: 3 kn\*10

Sorted: 63 Kg Total catch: 450.81 CATCH/HOUR: 901.62

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	PODBR01	648.70	14728	71.95	
Trachurus trecae	CARTR02	57.84	404	6.42	1769
Stromateus fiatola	STRTR01	46.80	54	5.19	
Trichiurus lepturus	TRITR01	42.64	208	4.73	
Sphyræna guachancho	SPHSP01	33.00	68	3.66	
Trachurus trecae, juvenile	CARTR92	29.12	2158	3.23	1768
Selene dorsalis	CARSL01	25.60	92	2.84	
Atractodes aequidens	SCIAF01	4.16	40	0.46	
Umbrina canariensis	SCIUW01	4.02	78	0.45	
Sepia orbignyana	SQUSE13	2.42	2	0.27	
Dentex macrophthalmus	SPADE03	1.92	6	0.21	
Synagrops microlepis	ACRSY01	1.82	220	0.20	
Pagellus bellottii	SPAPA02	1.72	12	0.19	
Zeus faber	ZEZEJ01	1.10	2	0.12	
Illex coindetii	SQOQM21	0.52	220	0.06	
Parapenaeus longirostris	SHRPE31	0.12	12	0.01	
Saurida brasiliensis	SYNSA01	0.12	40	0.01	
Total		901.62		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 852  
 DATE:21/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1110  
 start stop duration Long E 13407  
 TIME :18:24:00 18:54:00 30 (min) Purpose code: 1  
 LOG :8374.10 8375.80 1.70 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 98 109 Validity code:  
 Towing dir: 270° Wire out: 150 m Speed: 34 kn\*10

Sorted: Kg Total catch: 35.55 CATCH/HOUR: 71.10

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	CLUSL02	48.90	266	68.78	1770
Sphyræna guachancho	SPHSP01	8.66	8	12.18	
Trichiurus lepturus	TRITR01	5.78	36	8.13	
Selene dorsalis	CARSL01	2.70	8	3.80	
Sardinella aurita	CLUSL01	1.56	4	2.19	
Synagrops microlepis	ACRSY01	1.50	200	2.11	
Brachydeuterus auritus	PODBR01	0.54	6	0.76	
GOBIIDAE	GOBAA00	0.52	196	0.73	
Saurida brasiliensis	SYNSA01	0.34	28	0.48	
Alloteuthis africana	SQUL011	0.32	32	0.45	
Engraulis encrasicolus	ENGEN01	0.28	2	0.39	
Total		71.10		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 853  
 DATE:21/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1195  
 start stop duration Long E 1337  
 TIME :21:27:00 21:47:00 20 (min) Purpose code: 1  
 LOG :8394.40 8395.80 1.00 Area code : 1  
 FDEPTH: 40 60 GearCond.code: 1  
 BDEPTH: 91 110 Validity code: 1  
 Towing dir: 360° Wire out: 250 m Speed: 42 kn\*10

Sorted: 168 Kg Total catch: 877.07 CATCH/HOUR: 2631.21

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	CARTR02	2464.02	6552	93.65	1771
Brachydeuterus auritus	PODBR01	116.37	1062	4.42	
Sardinella maderensis	CLUSL02	22.77	93	0.87	
Selene dorsalis	CARSL01	19.50	63	0.74	
Sardinella aurita	CLUSL01	4.50	15	0.17	
Trichiurus lepturus	TRITR01	4.05	15	0.15	
Total		2631.21		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 854  
 DATE:21/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1120  
 start stop duration Long E 1339  
 TIME :00:12:00 00:42:00 30 (min) Purpose code: 1  
 LOG :8411.90 8413.50 1.60 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 33 40 Validity code:  
 Towing dir: 270° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 4.27 CATCH/HOUR: 8.54

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sphyræna guachancho	SPHSP01	5.02	6	58.78	
Illex coindetii	SQOQM21	0.94	50	11.01	
Brachydeuterus auritus	PODBR01	0.88	16	10.30	
Sardinella maderensis	CLUSL02	0.86	4	10.07	
Saurida brasiliensis	SYNSA01	0.84	12	9.84	
Total		8.54		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 855  
 DATE:22/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1125  
 start stop duration Long E 1329  
 TIME :02:57:00 03:42:00 45 (min) Purpose code: 1  
 LOG :8430.80 8433.30 2.50 Area code : 1  
 FDEPTH: 30 10 GearCond.code: 1  
 BDEPTH: 87 61 Validity code:  
 Towing dir: 90° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 3.90 CATCH/HOUR: 5.20

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	CARTR02	2.36	7	45.38	
Auxis thazard	SCHM001	1.81	8	34.81	
Illex coindetii	SQOQM01	0.52	312	10.00	
Trichiurus lepturus	TRITR01	0.27	1	5.19	
Sphyræna sphyraena	SPHSP02	0.12	1	2.31	
Saurida brasiliensis	SYNSA01	0.07	33	1.35	
Synagrops microlepis	ACRSY01	0.04	9	0.77	
MYCTOPHIDAE	MYCAA00	0.01	8	0.19	
Total		5.20		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 856  
 DATE:22/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1130  
 start stop duration Long E 1338  
 TIME :06:52:00 07:22:00 30 (min) Purpose code: 1  
 LOG :8455.50 8487.30 1.80 Area code : 1  
 FDEPTH: 0 0 GearCond.code: 1  
 BDEPTH: 41 45 Validity code:  
 Towing dir: 270° Wire out: 150 m Speed: 36 kn\*10

Sorted: Kg Total catch: 0.69 CATCH/HOUR: 1.38

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Trachinotus ovatus	CARTC03	0.98	2	71.01	
Alloteuthis africana	SQUL011	0.30	210	21.74	
Illex coindetii	SQOQM01	0.08	30	5.80	
Sepia officinalis hlerredda	SQUSE11	0.02	6	1.45	
Total		1.38		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 857  
 DATE:22/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1147  
 start stop duration Long E 1345  
 TIME :17:43:00 18:13:00 30 (min) Purpose code: 1  
 LOG :8552.50 8554.40 1.90 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 25 27 Validity code: 1  
 Towing dir: 193° Wire out: 150 m Speed: 38 kn\*10

Sorted: 64 Kg Total catch: 355.69 CATCH/HOUR: 711.38

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	CARCH01	495.54	4874	69.66	
Ilisha africana	CLUJL01	68.96	3476	9.69	
Sardinella maderensis	CLUSL02	66.96	2244	9.41	1772
Brachydeuterus auritus	PODBR01	29.80	2360	4.19	
Galeoides decadactylus	PLNGA01	19.02	44	2.67	
Sphyræna guachancho	SPHSP01	8.36	56	1.18	
Trichiurus lepturus	TRITR01	7.58	56	1.07	
Selene dorsalis	CARSL01	5.50	88	0.77	
Engraulis encrasicolus	ENGEN01	4.18	1254	0.59	
Rhizoprionodon acutus	SHACA61	3.08	4	0.43	
Pomadourus incisus	PODPO02	2.08	12	0.29	
Sepia officinalis hlerredda	SQUSE11	0.32	44	0.04	
Total		711.38		99.99	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 858  
 DATE:22/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1155  
 start stop duration Long E 1336  
 TIME :21:49:00 22:19:00 30 (min) Purpose code: 1  
 LOG :8585.60 8587.40 1.80 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 81 70 Validity code: 1  
 Towing dir: 90° Wire out: 150 m Speed: 36 kn\*10

Sorted: Kg Total catch: 47.68 CATCH/HOUR: 95.36

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	TRITR01	23.60	90	24.75	
Sardinella maderensis	CLUSL02	17.26	60	18.10	1773
Scomberomorus tritor	SCMSM01	16.80	8	17.62	
Selene dorsalis	CARSL01	11.92	34	12.50	
Brachydeuterus auritus	PODBR01	11.88	100	12.46	
Ethynnus alletteratus	SCHM001	4.98	12	5.22	
Trachinotus ovatus	CARTC03	3.36	8	3.52	
Sardinella aurita	CLUSL01	2.24	14	2.35	
Sphyræna guachancho	SPHSP01	1.40	8	1.47	
Alloteuthis africana	SQUL011	0.68	264	0.71	
Trachurus trecae, juvenile	CARTR92	0.48	40	0.50	
Engraulis encrasicolus	ENGEN01	0.40	76	0.42	
Saurida brasiliensis	SYNSA01	0.16	38	0.17	
EXOPA01	EXOPA01	0.10	2	0.10	
GOBIIDAE	GOBAA00	0.10	138	0.10	
Total		95.36		99.99	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 859  
 DATE:22/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1158  
 start stop duration Long E 13528  
 TIME :23:49:00 00:19:00 30 (min) Purpose code: 1  
 LOG :8595.90 8597.40 1.50 Area code : 1  
 FDEPTH: 10 10 GearCond.code: 1  
 BDEPTH: 29 32 Validity code:  
 Towing dir: 200° Wire out: 150 m Speed: 30 kn\*10

Sorted: 36 Kg Total catch: 124.95 CATCH/HOUR: 249.90

SPECIES	CATCH/HOUR	weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	CLUSL02	78.60	1110	31.45	1774
Chloroscombrus chrysurus	CARCH01	70.80	1344	28.33	
Ilisha africana	CLUJL01	43.20	1014	17.29	
Sphyræna guachancho	SPHSP01	20.60	76	8.24	
Brachydeuterus auritus	PODBR01	8.28	930	3.31	
Pomadourus incisus	PODPO01	7.00	16	2.80	
Trichiurus lepturus	TRITR01	5.88	90	2.35	
Sardinella aurita	CLUSL01	4.82	12	1.85	
Engraulis encrasicolus	ENGEN01	4.62	1542	1.81	
Trachinotus ovatus	CARTC03	2.52	18	1.01	
Selene dorsalis	CARSL01	1.26	36	0.50	
Sphyræna sphyraena	SPHSP02	0.84	2	0.34	
Galeoides decadactylus	PLNGA01	0.70	4	0.28	
Synagrops microlepis	ACRSY01	0.66	36	0.26	
Illex coindetii	SQOQM21	0.12	102	0.05	
Total		249.90		99.99	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 860  
 DATE:21/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1200 Long E 13335  
 start stop duration  
 TIME :01:30:00 02:00:00 30 (min) Purpose code: 1  
 LOG :8606.50 8607.70 1.70 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 90 98 Validity code:  
 Towing dir: 270° Wire out: 150 m Speed: 30 kn\*10  
 Sorted: Kg Total catch: 30.38 CATCH/HOUR: 60.76

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Brachydeuterus auritus	PODBR01 21.20 144	34.89	
Selene dorsalis	CARSL01 19.60 46	32.26	
Trichiurus lepturus	TRITR01 6.10 36	10.04	
Sardinella maderensis	CLUSL02 4.60 16	7.57	
Euthynnus alletteratus	SCHEU01 3.54 2	5.83	
Caranx hippos	CARCA14 2.56 2	4.21	
Illex coindetii	SQUOM21 1.90 974	3.13	
Trachurus trecae, juvenile	CARTR02 0.70 32	1.15	
Sardinella aurita	CLUSL01 0.42 2	0.69	
GOBIIDAE	GOBAA00 0.08 166	0.13	
Saurida brasiliensis	SYNSA01 0.04 22	0.07	
EXOPA01	0.02 2	0.03	
Total		60.76	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 861  
 DATE:21/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1205 Long E 13350  
 start stop duration  
 TIME :04:33:00 05:03:00 30 (min) Purpose code: 1  
 LOG :8637.30 8628.40 1.60 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 79 70 Validity code:  
 Towing dir: 90° Wire out: 150 m Speed: 30 kn\*10  
 Sorted: Kg Total catch: 20.99 CATCH/HOUR: 41.98

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Selene dorsalis	CARSL01 16.90 44	40.26	
Brachydeuterus auritus	PODBR01 5.52 38	13.15	
Sardinella maderensis	CLUSL02 4.34 16	10.34	
Sphyræna guachancho	SPHSP01 4.24 4	10.10	
Trichiurus lepturus	TRITR01 3.08 16	7.34	
Caranx crysos	CARCA02 2.54 2	6.05	
Trachinotus ovatus	CARTC03 2.18 6	5.19	
Hemiramphus balao	HEMHE02 1.44 12	3.43	
Sardinella aurita	CLUSL01 1.42 4	3.38	
Chloroscombrus chrysurus	CARCH01 0.32 2	0.76	
Total		41.98	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 862  
 DATE:21/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1207 Long E 13398  
 start stop duration  
 TIME :06:25:00 06:55:00 30 (min) Purpose code: 1  
 LOG :8636.50 8638.40 1.90 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 33 34 Validity code:  
 Towing dir: 210° Wire out: 150 m Speed: 38 kn\*10  
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
N O C A T C H	NOCAT00 0.00		
Total			

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 863  
 DATE:26/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1304 Long E 12471  
 start stop duration  
 TIME :18:33:00 19:00:00 27 (min) Purpose code: 1  
 LOG :9234.40 9235.90 1.50 Area code : 1  
 FDEPTH: 50 80 GearCond.code:  
 BDEPTH: 112 105 Validity code:  
 Towing dir: 42° Wire out: 320 m Speed: 30 kn\*10  
 Sorted: 127 Kg Total catch: 926.51 CATCH/HOUR: 2058.91

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	CARTR02 1976.02 6073	95.97	1775
Trichiurus lepturus	TRITR01 30.60 129	1.49	
MYCTOPHIDAE	MYCAA00 19.16 11793	0.93	
Scomber japonicus	SCMSC01 13.69 16	0.66	
Sarda sarda	SCMSA01 7.87 2	0.38	
Atractoscion aequidens	SCIAT01 5.02 2	0.24	
Dentex macrophthalmus	SPADE03 4.02 16	0.20	
Syngnathus microlepis	ACRSY01 1.60 596	0.08	
Sepia officinalis hierredda	SQUSE11 0.47 16	0.02	
Todaropsis eblanae	SQUOM51 0.31 16	0.02	
Parapenaeus longirostris	SHRPE31 0.16 16	0.01	
Total		2058.92	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 864  
 DATE:26/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1329 Long E 12327  
 start stop duration  
 TIME :21:22:00 21:52:00 30 (min) Purpose code: 1  
 LOG :9257.60 9259.30 Area code : 1  
 FDEPTH: 5 5 GearCond.code:  
 BDEPTH: 290 335 Validity code:  
 Towing dir: 225° Wire out: 150 m Speed: kn\*10  
 Sorted: Kg Total catch: 26.61 CATCH/HOUR: 53.22

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Selene dorsalis	CARSL01 33.30 68	62.57	
MYCTOPHIDAE	MYCAA00 8.50 15146	15.97	
Ommastrephes pteropus	SQUOM61 5.70 20	10.71	
Todaropsis eblanae	SQUOM51 3.42 40	6.43	
Auxis thazard	SCHA001 2.30 20	4.32	
Total		53.22	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 865  
 DATE:27/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1340 Long E 1228  
 start stop duration  
 TIME :00:04:00 00:34:00 30 (min) Purpose code: 1  
 LOG :9279.00 9280.50 1.50 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 117 122 Validity code:  
 Towing dir: 192° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: Kg Total catch: 6.23 CATCH/HOUR: 12.46

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichiurus lepturus	TRITR01 4.62 34	37.08	
MYCTOPHIDAE	MYCAA00 3.56 5238	28.57	
SQUOM62	1.38 16	11.08	
Selene dorsalis	CARSL01 0.92 2	7.38	
Lepidopus caudatus	TRILE01 0.90 2	7.22	
Illex coindetii	SQUOM21 0.84 310	6.74	
Hemiramphus balao	HEMHE02 0.24 2	1.93	
Total		12.46	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 866  
 DATE:27/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1410 Long E 1215  
 start stop duration  
 TIME :04:45:00 05:15:00 30 (min) Purpose code: 1  
 LOG :9317.40 9319.00 1.60 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 104 191 Validity code:  
 Towing dir: 214° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: Kg Total catch: 0.12 CATCH/HOUR: 0.24

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Ommastrephes pteropus	SQUOM61 0.15 4	66.67	
Sepiella ornata	SQUSE21 0.08 4	33.33	
Total		0.24	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 867  
 DATE:27/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1521 Long E 12008  
 start stop duration  
 TIME :13:55:00 14:20:00 25 (min) Purpose code: 1  
 LOG :9406.60 9408.50 1.90 Area code : 1  
 FDEPTH: 35 25 GearCond.code:  
 BDEPTH: 45 36 Validity code:  
 Towing dir: 192° Wire out: 150 m Speed: 30 kn\*10  
 Sorted: Kg Total catch: 1.23 CATCH/HOUR: 2.95

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Euthynnus alletteratus	SCHEU01 2.26 5	76.61	
Sardinella maderensis	CLUSL02 0.62 2	21.02	
Sepia bertheloti	SQUSE12 0.07 5	2.37	
Total		2.95	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 868  
 DATE:27/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1532 Long E 1156  
 start stop duration  
 TIME :18:02:00 18:32:00 30 (min) Purpose code: 1  
 LOG :9441.90 9443.50 1.60 Area code : 1  
 FDEPTH: 50 50 GearCond.code:  
 BDEPTH: 93 91 Validity code:  
 Towing dir: 360° Wire out: 250 m Speed: 3 kn\*10  
 Sorted: 50 Kg Total catch: 111.95 CATCH/HOUR: 223.90

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	CARTR02 86.10 514	38.45	1776
Pagellus bellottii	SPAPA02 64.50 462	28.81	
Dentex macrophthalmus	SPADE03 38.10 214	17.02	
Atractoscion aequidens	SCIAT01 21.20 14	9.47	
Sardinella maderensis	CLUSL02 5.04 18	2.25	
Zeus faber	ZEIZ01 2.14 4	0.96	
Boops boops	SPABO01 1.24 8	0.55	
Centrophorus squamosus	SHASQ15 1.22 2	0.54	
MYCTOPHIDAE	MYCAA00 1.08 314	0.48	
Euthynnus alletteratus	SCHEU01 1.08 2	0.48	
Sarpa salpa	SPAS101 0.74 2	0.33	
Trichiurus lepturus	TRITR01 0.60 4	0.27	
Sepiella ornata	SQUSE21 0.48 46	0.21	
Sepia bertheloti	SQUSE12 0.24 2	0.11	
Alloteuthis africana	SQULO11 0.08 14	0.04	
Lagocephalus laevigatus	TETLA01 0.04 8	0.02	
GOBIIDAE	GOBAA00 0.02 14	0.01	
Total		223.90	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 869  
 DATE:27/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1542 Long E 1152  
 start stop duration  
 TIME :21:16:00 21:37:00 21 (min) Purpose code: 1  
 LOG :9466.10 9467.20 1.10 Area code : 1  
 FDEPTH: 50 50 GearCond.code:  
 BDEPTH: 93 93 Validity code:  
 Towing dir: 50° Wire out: 200 m Speed: 3 kn\*10  
 Sorted: 115 Kg Total catch: 1277.75 CATCH/HOUR: 3650.71

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	CARTR02 2974.71 12289	81.48	1777
Trichiurus lepturus	TRITR01 408.57 2200	11.19	
Sardinella maderensis	CLUSL02 204.29 660	5.60	1778
Atractoscion aequidens	SCIAT01 53.71 29	1.47	
Pagellus bellottii	SPAPA02 9.43 31	0.26	
Total		3650.71	100.00

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 870  
 DATE:28/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1549 Long E 1142  
 start stop duration  
 TIME :00:55:00 01:25:00 30 (min) Purpose code: 1  
 LOG :9491.70 9493.30 1.60 Area code : 1  
 FDEPTH: 10 10 GearCond.code:  
 BDEPTH: 85 96 Validity code:  
 Towing dir: 245° Wire out: 150 m Speed: 3 kn\*10  
 Sorted: Kg Total catch: 1.44 CATCH/HOUR: 2.88

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Auxis thazard	SCHAC01 2.18 6	75.69	
Illex coindetii	SQUOM21 0.32 2	11.11	
Trichiurus lepturus	TRITR01 0.32 2	11.11	
MYCTOPHIDAE	MYCAA00 0.04 14	1.39	
Selene dorsalis	CARSL01 0.02 22	0.69	
Total		2.88	99.99

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 871  
 DATE:28/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1559  
 start stop duration Long E 1143  
 TIME :04:35:00 05:05:00 30 (min) Purpose code: 1  
 LOG :9515.50 9517.30 1.80 Area code : 1  
 FDEPTH: 0 GearCond.code: 1  
 BDEPTH: 31 40 Validity code: 1  
 Towing dir: 250° Wire out: 150 m Speed: 3 kn\*10

Sorted: Kg Total catch: 2.59 CATCH/HOUR: 5.18

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Trachinotus ovatus	CARTC03	5.18	16	100.00	
Total		5.18		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 872  
 DATE:28/ 3/96 GEAR TYPE: BT No: POSITION:Lat S 1600  
 start stop duration Long E 1139  
 TIME :06:01:00 06:16:00 15 (min) Purpose code: 1  
 LOG :9521.60 9522.20 0.60 Area code : 1  
 FDEPTH: 99 88 GearCond.code: 1  
 BDEPTH: 99 88 Validity code: 1  
 Towing dir: 180° Wire out: 370 m Speed: 3 kn\*10

Sorted: 69 Kg Total catch: 433.07 CATCH/HOUR: 1732.28

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Atractoscion aeguidens	SCIAT01	755.00	792	44.16	
Trachurus trecae	CARTR02	605.92	12208	34.98	1779
Dentex macrophthalmus	SPADE03	201.60	5740	11.64	
Lithognathus mormyrus	SPAL101	42.56	156	2.46	
Todarodes sagittatus	SQUOH31	21.00	140	1.21	
Sarpa salpa	SPAS101	20.00	44	1.15	
Sepia berthelotii	SQUSE12	18.60	16	1.07	
Dentex canariensis	SPADE02	16.64	56	0.96	
Pomatomus saltatrix	POTPO01	14.28	16	0.43	
Zeus faber	ZEIZE01	7.40	16	0.82	
Pagellus bellottii	SPAPA02	6.72	28	0.39	
Trichiurus lepturus	TRITR01	6.56	28	0.38	
Umbra canariensis	SCIUM01	5.16	16	0.30	
Todaropsis eblanae	SQUOM51	0.84	56	0.05	
Total		1732.28		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 873  
 DATE:28/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1605  
 start stop duration Long E 1145  
 TIME :12:09:00 13:09:00 60 (min) Purpose code: 1  
 LOG :9570.00 9574.00 4.00 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 34 30 Validity code: 1  
 Towing dir: 350° Wire out: 150 m Speed: 35 kn\*10

Sorted: Kg Total catch: 6.75 CATCH/HOUR: 6.75

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Trachinotus ovatus	CARTC03	4.60	12	68.15	
Euthynnus alletteratus	SCHEU01	1.67	2	24.74	
Sardinella maderensis	CLUSL02	0.39	1	5.78	
Trachurus trecae, juvenile	CARTR92	0.05	75	0.74	
Sepia elegans	SQUSE15	0.04	4	0.59	
Total		6.75		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 874  
 DATE:28/ 3/96 GEAR TYPE: PT No:1 POSITION:Lat S 1619  
 start stop duration Long E 1144  
 TIME :18:45:00 19:00:00 15 (min) Purpose code: 1  
 LOG :9627.90 9628.80 0.90 Area code : 1  
 FDEPTH: 15 15 GearCond.code: 1  
 BDEPTH: 45 44 Validity code: 1  
 Towing dir: 180° Wire out: 80 m Speed: 35 kn\*10

Sorted: 68 Kg Total catch: 236.97 CATCH/HOUR: 947.88

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Trachurus trecae	CARTR02	655.88	10836	69.19	1780
Sardinella aurita	CLUSL01	140.68	448	14.84	1782
Sardinella maderensis	CLUSL02	116.20	364	12.26	1781
Trachinotus ovatus	CARTC03	20.44	56	2.16	
Decapterus rhonchus	CARDE02	11.04	72	1.16	
Trachurus capensis	CARTR04	3.64	16	0.38	
Total		947.88		99.99	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 875  
 DATE:29/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1636  
 start stop duration Long E 1145  
 TIME :04:20:00 04:50:00 30 (min) Purpose code: 1  
 LOG :9703.90 9705.40 1.50 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 17 16 Validity code: 1  
 Towing dir: 360° Wire out: 150 m Speed: 3 kn\*10

Sorted: 98 Kg Total catch: 1569.28 CATCH/HOUR: 3138.56

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Trachurus trecae	CARTR02	3049.60	135304	97.17	1783
Etrumeus whiteheadi	CIJET02	25.60	1280	0.82	
Pagellus bellottii	SPAPA02	20.48	320	0.65	
Sphyrna lewini	SHASP12	16.00	2	0.51	
Brachydeuterus auritus	PODBR01	6.72	224	0.21	
Sphyrna guachancho	SPHSP01	5.76	32	0.18	
Lithognathus mormyrus	SPAL101	3.52	32	0.11	
Pomadasys incisus	PODPO02	3.20	32	0.10	
Sardinella maderensis	CLUSL02	2.88	32	0.09	
Trichiurus lepturus	TRITR01	2.56	32	0.08	
Selene dorsalis	CARSL01	2.24	32	0.07	
Total		3138.56		99.99	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 876  
 DATE:29/ 3/96 GEAR TYPE: BT No: POSITION:Lat S 1641  
 start stop duration Long E 11462  
 TIME :08:42:00 09:12:00 30 (min) Purpose code: 1  
 LOG :9718.40 9720.30 1.90 Area code : 1  
 FDEPTH: 11 11 GearCond.code: 1  
 BDEPTH: 11 11 Validity code: 1  
 Towing dir: Wire out: 100 m Speed: 38 kn\*10

Sorted: 5 Kg Total catch: 398.76 CATCH/HOUR: 797.52

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Trachurus trecae, juvenile	CARTR92	600.00	32160	75.23	1784
Spodilyosoma cantharus	SPASP01	66.00	192	8.28	
Brachydeuterus auritus	PODBR01	42.00	1656	5.27	
Trachinotus ovatus	CARTC03	28.44	516	3.57	
Pomatomus saltatrix	POTPO01	13.44	24	1.69	
Pomadasys jubelina	PODPO01	11.76	60	1.47	
Lithognathus mormyrus	SPAL101	11.52	96	1.44	
Atractoscion aeguidens	SCIAT01	7.68	12	0.96	
Lagocephalus laevigatus	TETLA01	6.24	12	0.78	
Pomadasys incisus	PODPO02	5.64	12	0.71	
Chloroscombrus chrysurus	CARCH01	4.80	12	0.60	
Total		797.52		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 877  
 DATE:29/ 3/96 GEAR TYPE: PT No:7 POSITION:Lat S 1636  
 start stop duration Long E 1145  
 TIME :11:30:00 12:00:00 30 (min) Purpose code: 1  
 LOG :9738.80 9740.20 1.40 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 18 14 Validity code: 1  
 Towing dir: 58° Wire out: 150 m Speed: 30 kn\*10

Sorted: Kg Total catch: 3.04 CATCH/HOUR: 6.08

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Sardinella aurita	CLUSL01	3.78	20	62.17	
Trachinotus ovatus	CARTC03	2.18	36	35.86	
Brachydeuterus auritus	PODBR01	0.12	4	1.97	
Total		6.08		100.00	

DR. FRIDTJOF NANSEN PROJECT:A4 PROJECT STATION: 878  
 DATE:29/ 3/96 GEAR TYPE: PT No:2 POSITION:Lat S 1648  
 start stop duration Long E 11389  
 TIME :21:00:00 21:30:00 30 (min) Purpose code: 1  
 LOG :9833.50 9835.40 1.90 Area code : 1  
 FDEPTH: 5 5 GearCond.code: 1  
 BDEPTH: 56 77 Validity code: 1  
 Towing dir: 254° Wire out: 150 m Speed: 38 kn\*10

Sorted: 16 Kg Total catch: 153.28 CATCH/HOUR: 306.56

SPECIES	CATCH/HOUR	CATCH/HOUR		% OF TOT. C	SAMP
		weight	numbers		
Trachurus trecae	CARTR02	240.60	3578	78.48	1785
Euthynnus alletteratus	SCHEU01	40.30	84	13.15	
Sardinella maderensis	CLUSL02	17.00	48	5.55	1786
Trachinotus ovatus	CARTC03	7.66	14	2.50	
Scomber japonicus	SCMSC01	0.86	4	0.28	
Trichiurus lepturus	TRITR01	0.14	2	0.05	
Total		306.56		100.01	

## Annex II Instruments and fishing gear used

The Simrad EK-500/38kHz scientific sounder was used during the survey for fish abundance estimation. The Bergen Echo Integrator system (BEI) was used to scrutinize the acoustic records from the 38kHz echo sounder, and to allocate integrator values to fish species.

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

### Tranceiver-1 menu (38 kHz lowering keel)

Transducer depth	5.0 - 7.5m
Absorption coeff.	10 dB/km
Pulse length	medium (1ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-21.0 dB
SV transducer gain	28.1 dB
TS transducer gain	28.0 dB
Angle sensitivity	21.9
3 dB beamwidth	6.8 dg
Alongship offset	0.00 "
Athwardship offset	0.04 "

### Display menu

Echogram	1 (38 kHz)
Bottom range	15 m
Bottom range start	10 m
Sv colour min	-67 dB

### Printer- menu

Echogram	1 (38 kHz)
Range	50, 100, 250 and 500 m
Range start	0
Bottom range	12 m
Bottom range start	10 m
Sv colour min	-67 dB
TVG	20 log R

**Bottom detection menu** Minimum level -50 - -35 dB



## Fishing gear

The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super bottom trawl". All three trawls were used during the survey.

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm meshsize in the codend with an inner net of 10 mm meshsize. The estimated opening is 6 m (observed 5.7) and distance between wings during towing about 18 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. The doors are of 'Thyborøn' combi type, 7.81 m<sup>2</sup>, 1670 kg, their distance while trawling about 46 m in average. This distance is kept constant at all depths by the use of a 9.5 m strap between the wires at 130 m distance from the doors (applied at depths greater than 60 m). A tickler chain (44 m in total) was attached at the footrope.

The SCANMAR system was used both on pelagic and bottom trawls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission.

The doors are fitted with sensors to provide information on their distance.

A height sensor is fitted to the bottom trawl to measure the trawl opening and provide information on clearance.

The pelagic trawl is equipped with a trawleye that provides information on the trawl opening and the distance of the footrope to the bottom.



# F/F Dr. Fridtjof Nansen

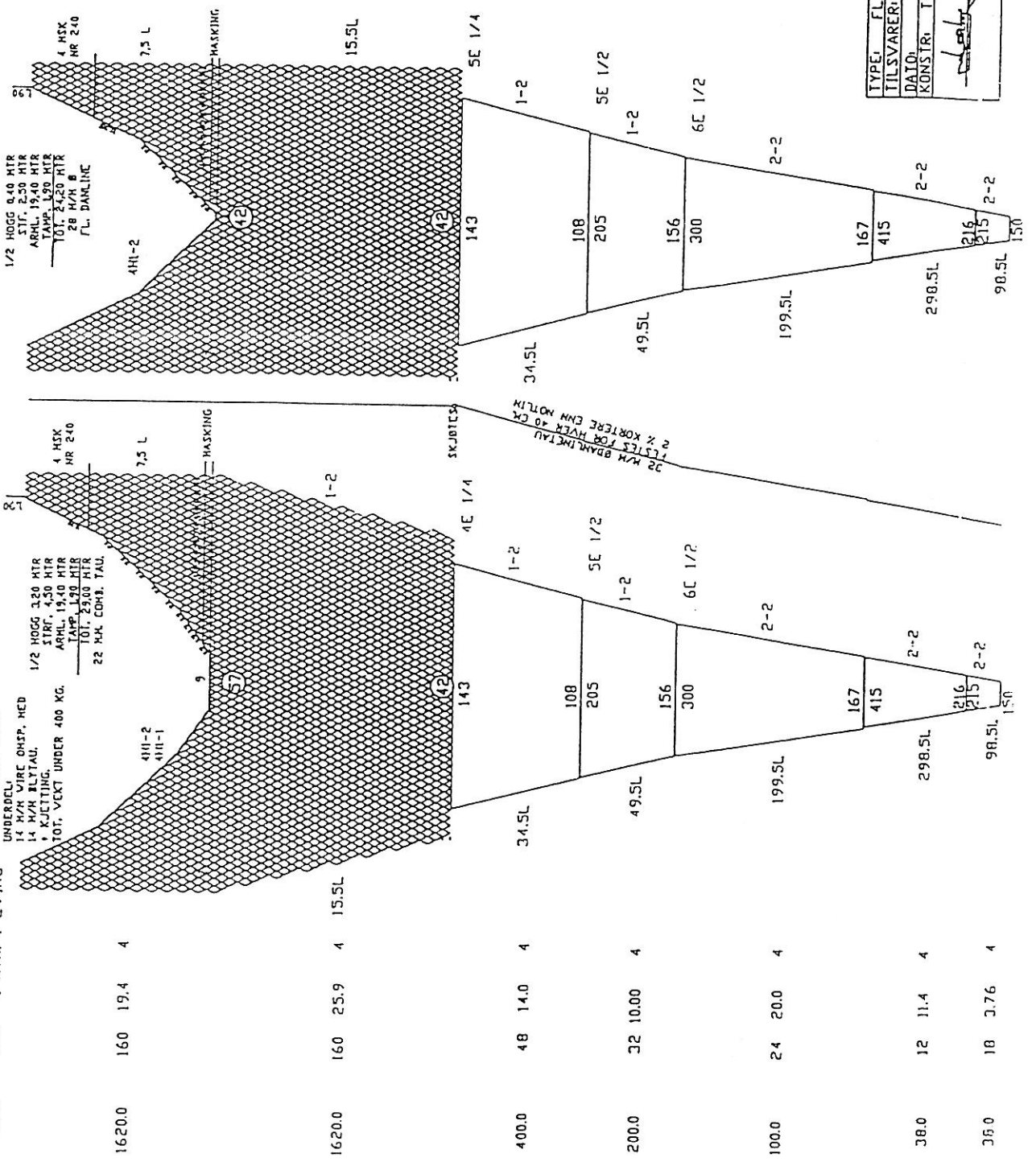
MASKER TRAAD LENGDE MASKER  
H/H NR. I MTR. I E Ving

OVERDEL,  
50 STK 11" KULER  
ONGLOTTET AV HETT.

UNDERDEL  
14 H/H VIRE OMSP. HED  
14 H/H BLYTAU,  
1 STREK, 4,50 MTR  
+ KJETTING.  
TOT. VEKT UNDER 400 KG.  
TAMP, 1,20 MTR  
101. 2300 MTR  
22 H/H. COMB. TAU.

STØDER

1/2 HOGG 0,40 MTR  
STF. 2,50 MTR  
ARML. 19,40 MTR  
TAMP. 1,20 MTR  
TOT. 24,20 MTR  
28 H/H B  
FL. DANLINE



MASKER	TRAAD	LENGDE	MASKER
H/H	NR.	I MTR.	I E Ving
16200	160	19.4	4
16200	160	25.9	4
4000	48	14.0	4
2000	32	10.00	4
1000	24	20.0	4
380	12	11.4	4
360	18	3.76	4

TYPE:	FLYTETRAL 198 HSK X 1620 H/H
TILSVARER:	4010 X 80 MTR/ØHKR: 320
DATE:	23/6 93
KONSTR:	T-H IEGNMR: 510
	SKALAN: 0



Bottom trawl: High opening shrimp and fish trawl with net headline 31m (floatline), foot-  
 rope 47m, gear with 12 cm diameter roller disks, 40 m sweeps, estimated headline height  
 6m and distance between wings during towing 18-20m.

