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CRUISE REPORTS "DR. FRIDTJOF NANSEN"

SURVEYS OF THE FISH RESOURCES OF ANGOLA

PART II

Preliminary Cruise Report No 2/96

Survey of the pelagic resources
19 August - 7 September 1996

Institute of Marine Research
IMR, Bergen

Institute of Fisheries Research
IIP, Luanda

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CHAPTER 1 INTRODUCTION

1.1 Objectives

The objectives of the survey, previously agreed upon with the Director of the Instituto de Investigação Pesqueira (IIP), are the same as earlier pelagic surveys off Angola, i.e.:

- 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.

- Conduct current measurements with ADCP system.

- On-the-job training for the Angolan participants on the main survey routines would be imparted, including collection and processing of raw data, species identification, utilization of the programme package NAN-SIS. In addition, the vessel would host a training course in acoustics for 4 Angolan and 4 Namibian participants, in the period 26 August-8 September.

The aim of these surveys is to build a time series to allow a better understanding of the fluctuations in the main pelagic stocks and of the main species biology.

The training course in acoustics was organized in cooperation with the FAO/DANIDA project 'Training in tropical fish stock assessment'

1.2 Participation

The scientific staff consisted of:

From IIP, Angola: Filomena Vas Valho (to 14 September), N'Kosi Luyeye, Vianda Filipe, António Lopes Manuel de Barros (19-24 August);

From IMR, Bergen: Martin Dahl, Ole Gullaksen, Christian Rohleder, Gabriella Bianchi

Acoustic course:

Instructors: Poul Degnbol (North Sea Centre, Hirtshals, Denmark);
John Dalen and Ingvald Svellingen (Institute of Marine Research,Bergen, Norway);

Participants: Filomena Vaz Velho, Nkosi Luyeye, Agostinho Duarte, Afonso Miguel (Instituto de Investigação Pesqueira, Luanda, Angola);
Rudi Cloete, Anke Lemensiek, Heidrun Plarre, Helen Boyer (Ministry of Fisheries and Marine Resources, Swakopmund, Namibia).

1.3 Narrative

The survey started at Point Noire in the afternoon 19 August 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. The course track consisted of systematic triangular transects, their endpoints about 15 nautical miles apart. This distance was however smaller (to about 5 nautical miles) in correspondence with narrower parts of the shelf. In areas where significant concentrations of pelagic fish were detected, surveying was conducted both during daytime and nighttime. CTD (Conductivity-Temperature-Depth) and ADCP (Acoustic Doppler Current Profiler) measurements were taken on standard hydrographical sections. A call was made in Luanda on 24 August to embark the Angolan and Namibian participants in the acoustic course, to be held onboard from 26 August to 8 September, parallel to the acoustic survey. An additional call in Luanda on 28 September was necessary due to the delayed arrival of the Namibian participants. The survey terminated just north of the Cunene River estuary. Therafter, the vessel steamed towards Walvis Bay to disembark all the partcipants in the cruise.

1.4 Survey effort

Figures 1a-c 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
Cab-Luanda	2	23	15	1 023
Luanda-Beng.	1	34	15	1 325
Beng.-Cunene	4	16	6	570
Total	7	73	36	2 918

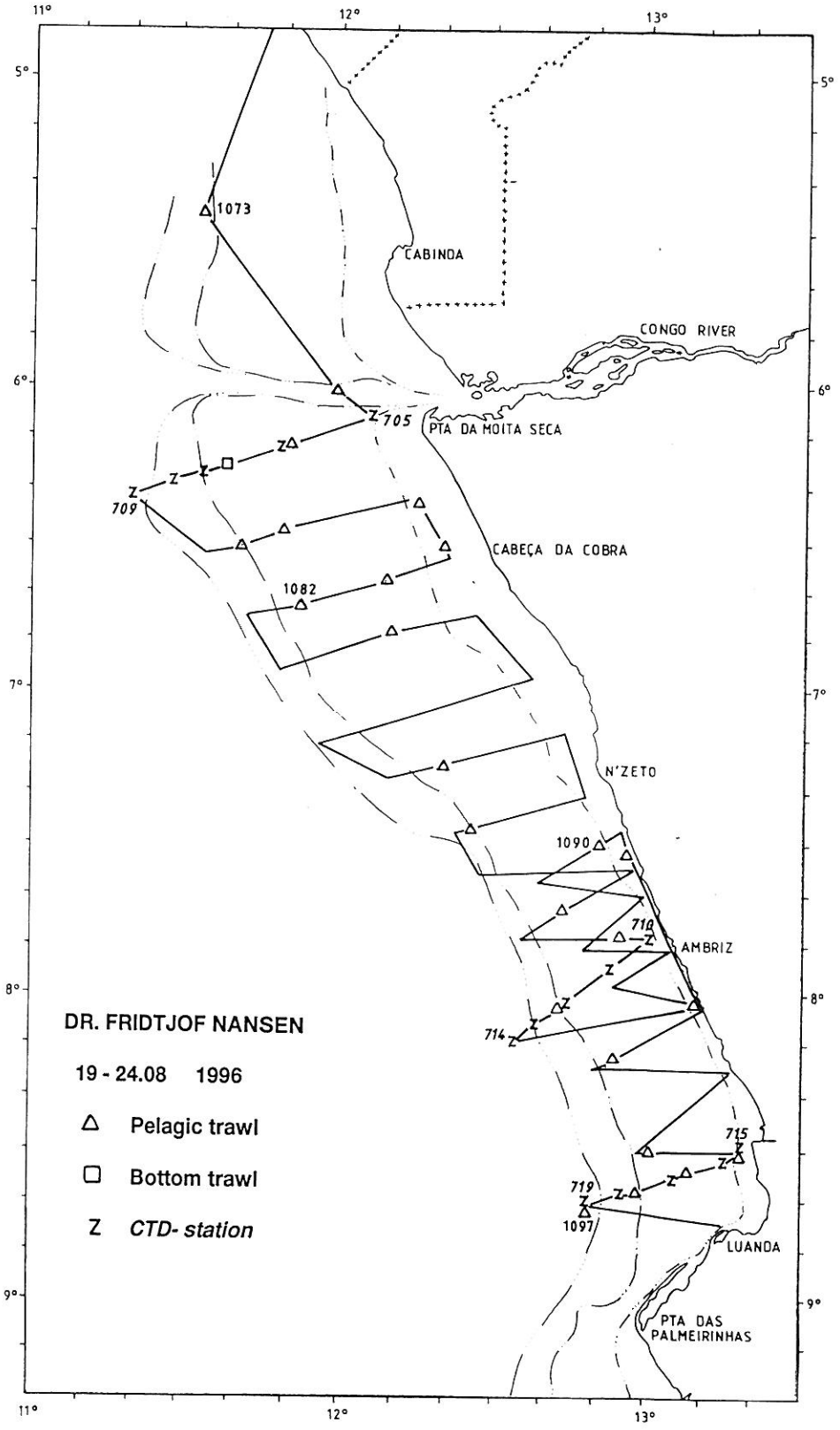


Figure 1a. Course track with fishing and hydrographic stations, Cabinda-Luanda.

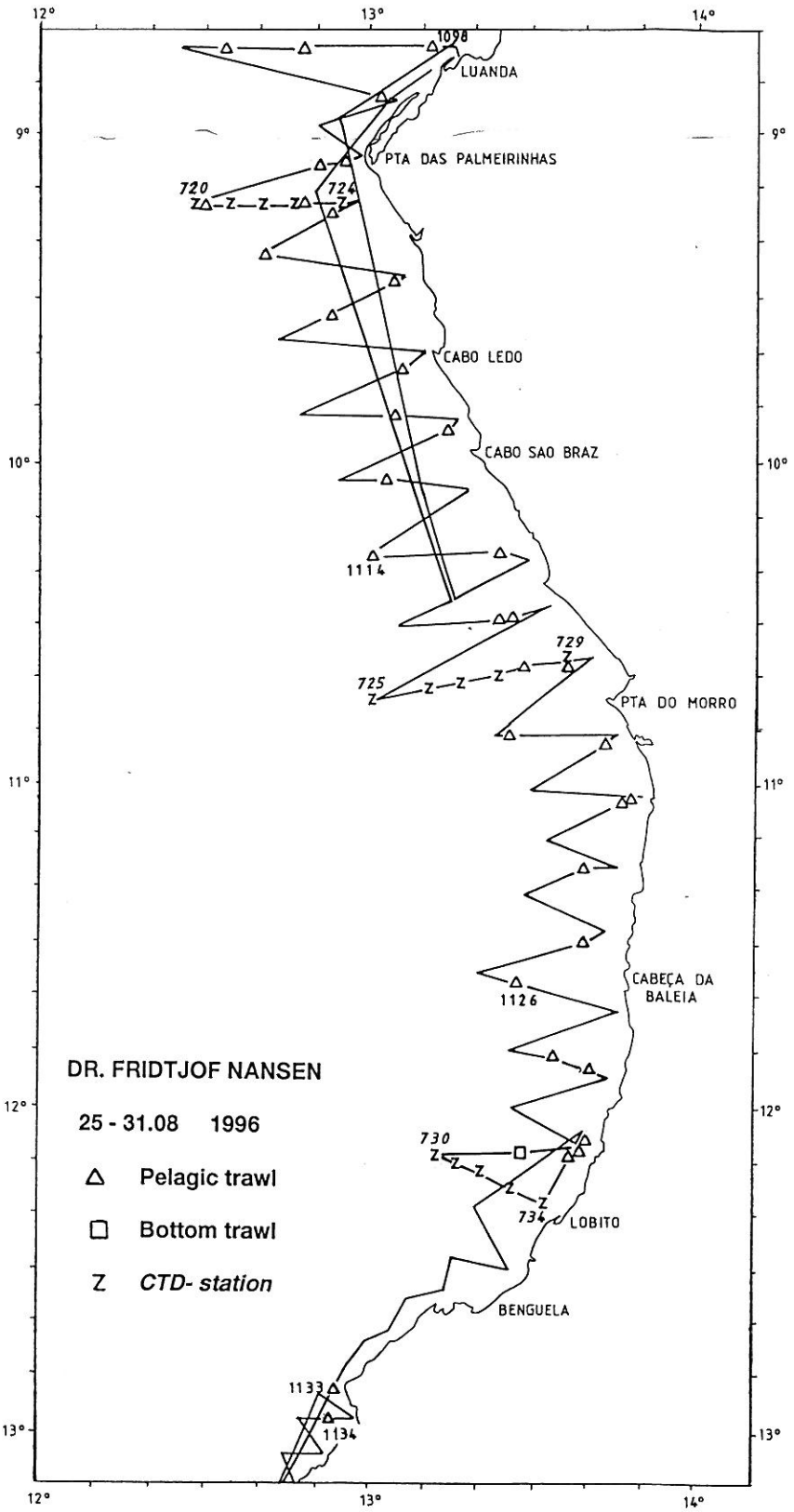


Figure 1b. Course track with fishing and hydrographic stations, Luanda-Benguela.

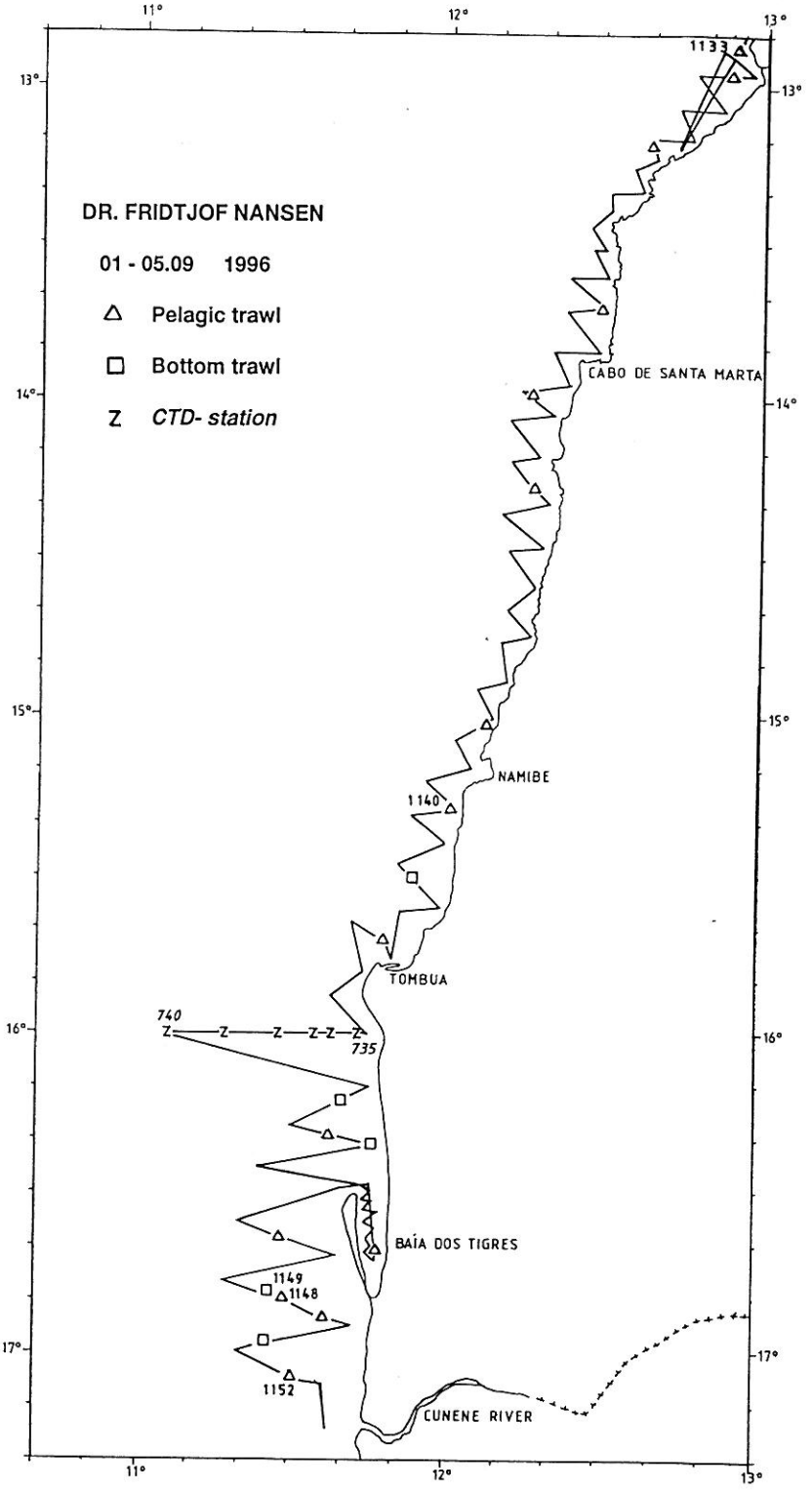


Figure 1c. Course track with fishing and hydrographic stations, Benguela-Cunene.

CHAPTER 2 METHODS

2.1 Hydrographic sampling

A Seabird 911 CTD plus was used to obtain 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 metres above the bottom. Two Niskin bottles were triggered for water samples on each station, one near the bottom and one near the surface (5 m depth). This was done only in the CDT stations between Cabinda and Luanda. The samples were analysed for salinity using a Guildline Portasal salinometer, and the oxygen content was determined using the Winkler method. These laboratory values were used for calibration of the CTD after removing obvious outliers.

Using 29 points for the salinity calibration the average difference between the Seabird values and the laboratory analysis was -0.026 (±0.034). Thus the CTD values were a little bit low compared to the Portasal. However, as the difference was within the standard deviation of the calibration, the salinity values presented here are taken from the CTD without any correction.
For oxygen 22 samples were accepted for the calibration. A linear regression gave the following formula for correcting the oxygen values:

$$O_2 = O_{2ctd} * 1.045 + 0.02$$

The standard deviation of the calibration was 0.230.

ADCP current measurements

A ship born Acoustic Doppler Current Profiler (ADCP) from RD Instruments was activated on every CTD station with bottom depths greater than about 25 m. 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 for analyses onboard. Both the raw and averaged data were stored on files. The data were analysed by the PC software UMS (Underway Mapping System).

Meteorological observations

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

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):

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

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

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:

$$N_i = A \cdot s_A \cdot \frac{p_i}{\sum_{i=1}^{n} \frac{p_i}{C_{Fi}}} \qquad (3)$$

where:
- N_i = number of fish in length group i
- A = area (naut.miles^2) 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:

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

The length distribution of a given species within an area was computed by weighing the length frequencies obtained in each trawl sample within the area by the average s_A value attributed to

that species in the 5 mile where the sample was taken.

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

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

The number and biomass per length group in each concentration were at last summed 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 (*S. aurita* and *S. maderensis*)
- horse mackerel (*T. trecae and T. capensis*)
- pilchard
- round herring
- anchovy
- P2 (carangids, scombrids, barracudas, big-eye grunt and hairtails)
- other demersal 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 selected species by area, are shown in Annex II.

CHAPTER 3 OCEANOGRAPHIC CONDITIONS

Vertical sections

The vertical distributions of temperature, salinity and oxygen along the standard sections are shown in Figures 4 a-g.

Horizontal maps (temp in 5m) ???

In the northernmost section (Pointa da Moita Seca) brackish water, probably from the Congo River was found close to the shore. In the section at Ambriz there is no sign of the Congo River water, and maximum salinities (35.8) are found at the surface. In both section the isolines are mainly horizontal, which indicates that no upwelling is occurring. Surface temperatures were about 21 °C on the shelf and 22 °C offshore. The section off Luanda showed lower temperatures (19 °C close to coastline and 20 °C offshore) as compared to the northernmost sections. The oxygen distribution is more or less as usually observed, with surface values of 4-5 ml/l, and a minimum (<.1ml/l) is found at about 300m depth.

Clear signs of upwelling were found off Pta.das Palmeirinhas (Fig.2 d), with the characteristic up tilting of the isotherms toward the coast. The sections taken in central Angola on the contrary, (Pta. do Morro and Lobito, Fig 2 e and f) seem to indicate a less dynamic situation with no uplifting of the isolines. Surface temperature was however slightly lower close to the coast that further offshore (18 to 19°C and 20 to 21°C , respectively).

The section off Tombua (Fig. 2 g) shows a rather different structure of the water masses, with clear signs of upwelling and a very weak thermocline. Surface temperatures were 16 to 18°C. This structure is similar to the areas under the influence of the Benguela Current. The above indicates that the frontal area is probably located between Lobito and Tombua.

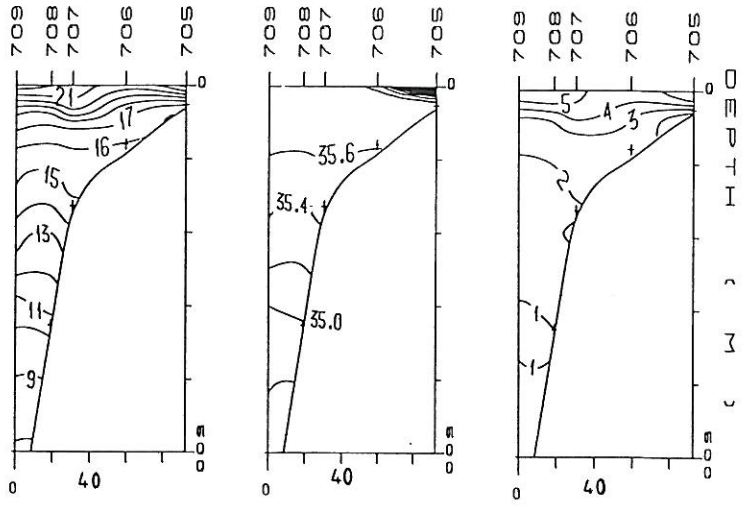


Figure 2 a . Vertical profiles of temperature, salinity and oxygen, Pta. de Moita Seca

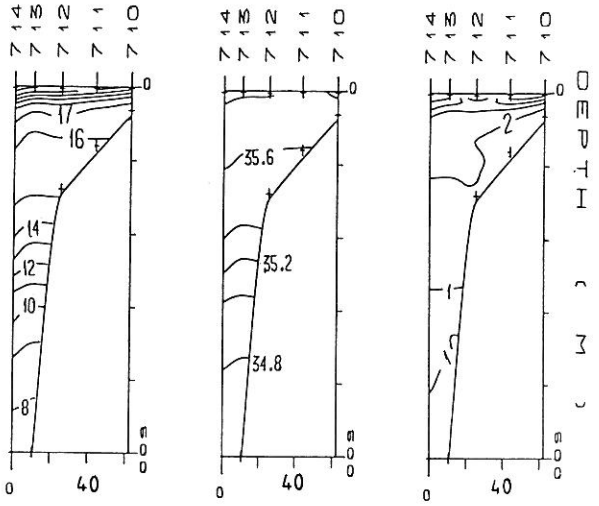


Figure 2 b . Vertical profiles of temperature, salinity and oxygen, Ambriz

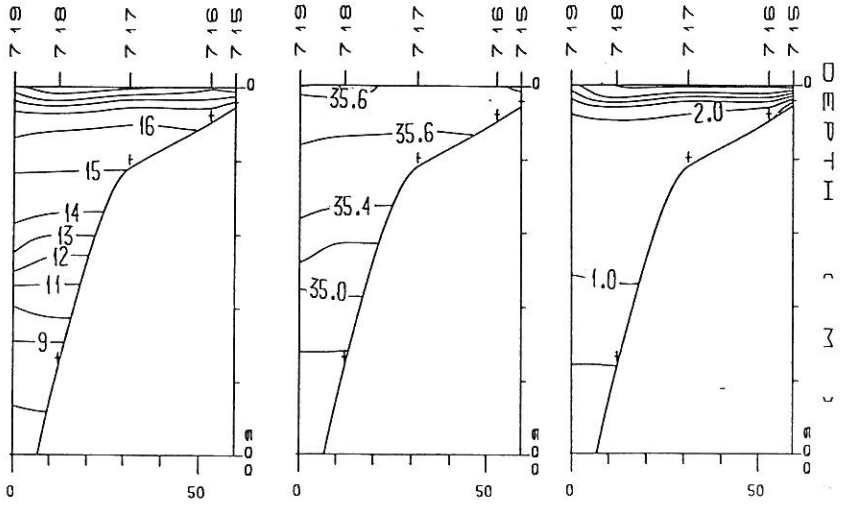


Figure 2 c . Vertical profiles of temperature, salinity and oxygen, Luanda

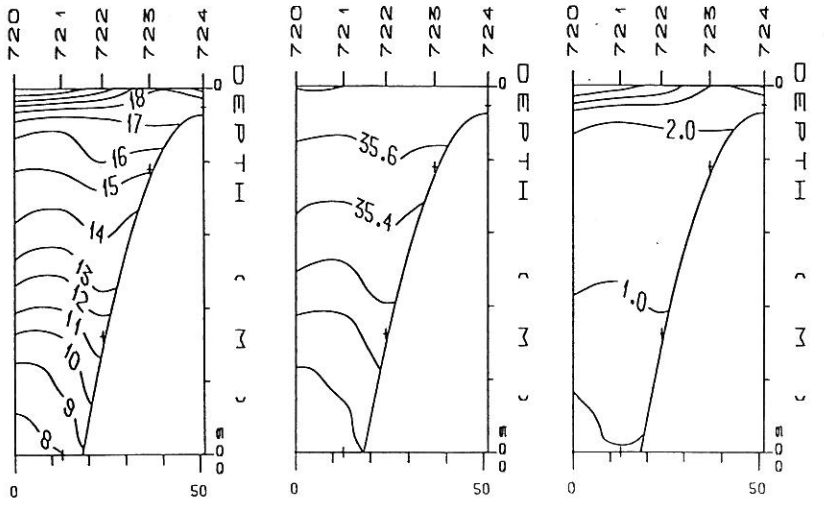


Figure 2 d . Vertical profiles of temperature, salinity and oxygen, Pta das Palmeirinhas

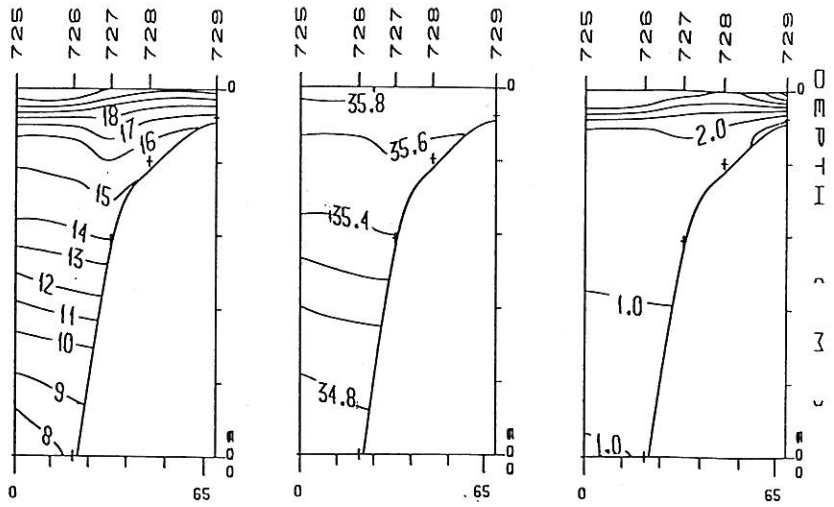


Figure 2 e . Vertical profiles of temperature, salinity and oxygen, Pta.do Morro

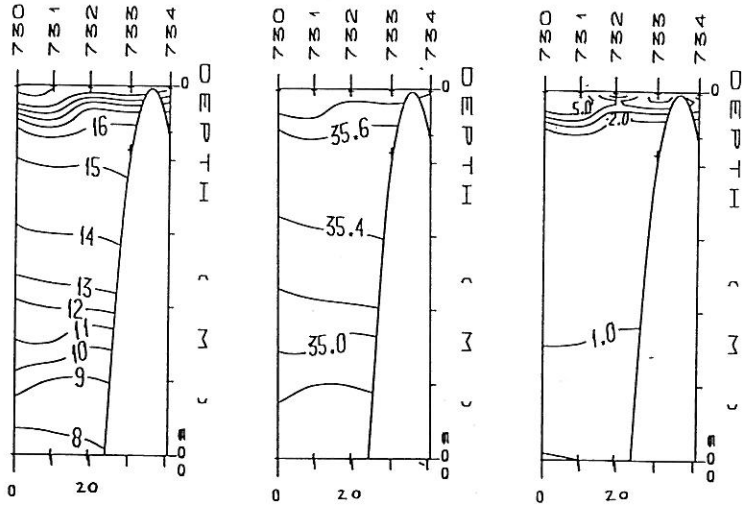


Figure 2 f . Vertical profiles of temperature, salinity and oxygen, Lobito

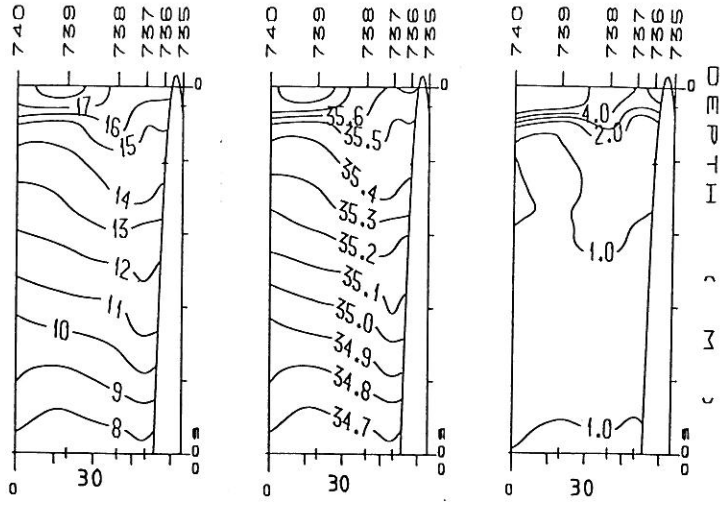
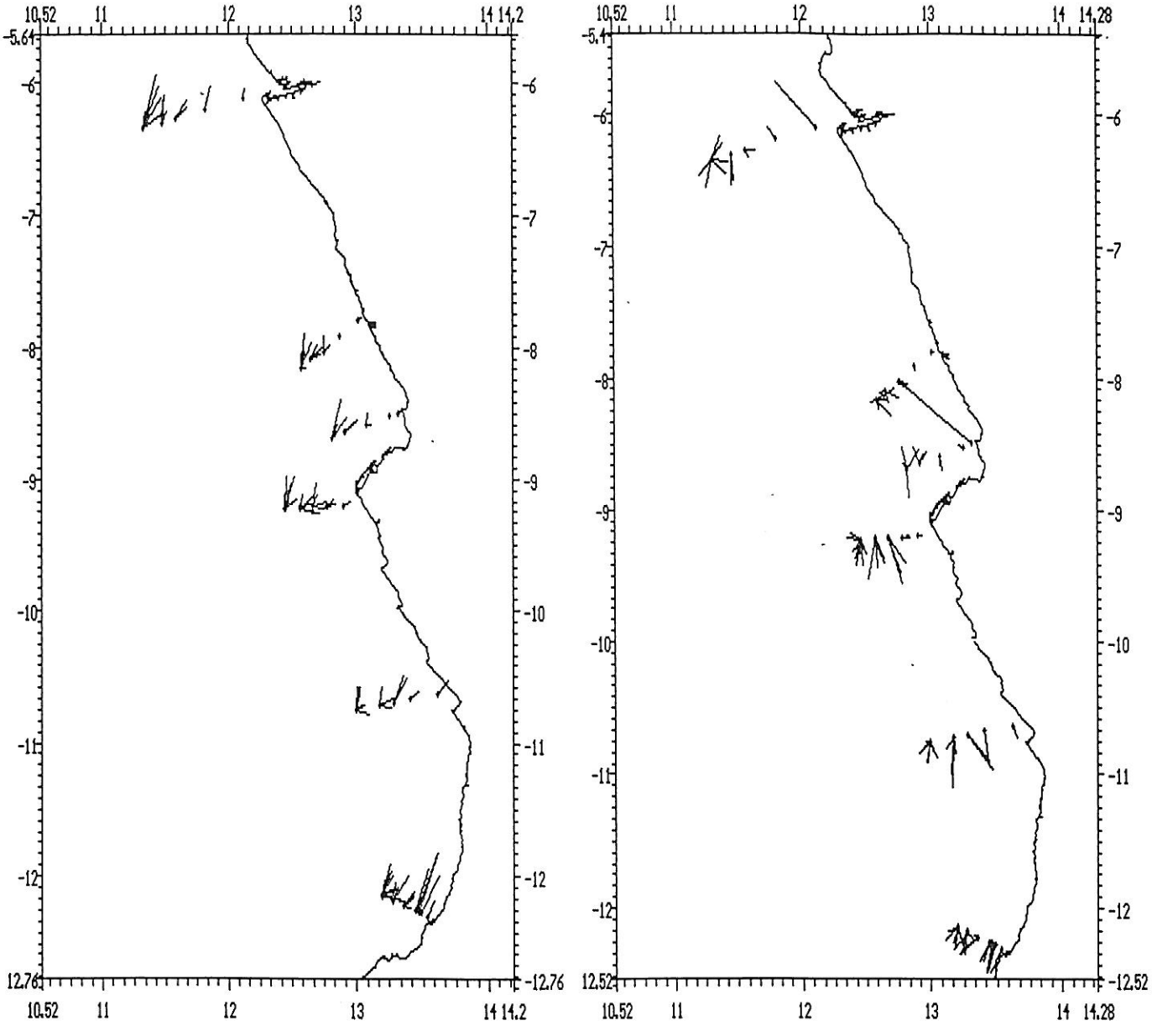


Figure 2g . Vertical profiles of temperature, salinity and oxygen, Tombua

ADCP measurements

Figures 3 (a and b) show the main current directions and strengths at 34 and 18 m depth respectively. The currents closer to the surface are characterized by a major northward component that is typical for the season. At 34 m depth the directions and strengths are less consistent. Two vectors just north of the Congo River estuary and north of Luanda show a particularly strong northward component.



a) b)

Figure 3. ADCP measurements. a) at 18 m depth and b) at 34 m depth

CHAPTER 4 DISTRIBUTION, COMPOSITION AND BIOMASS ESTIMATES OF PELAGIC FISH

4.1 Cabinda-Luanda

The northern shelf region, between the border with Congo and the border with Zaire, was not covered by the survey because of oil extraction activities. The entire exclusion of this area from the survey coverage started with the August-September survey in 1995. Comparison with earlier surveys should take into account this difference in coverage.

4.1.1 Sardinella

Figure 6 shows the distribution of both sardinellas (*Sardinella aurita*, the round sardinella, and *Sardinella maderensis*, the flat sardinella) for the northern region, including the varying degree of their concentrations as average acoustic integrator values for each area. Both species were found in shelf waters from the Congo River to Luanda, with highest concentrations in the shallow area between Pta da Moita Seca and Cabeça da Cobra and off Ambriz. The former area consisted of juveniles of both species, with the round sardinella dominating the catches. In the rest of the area the flat sardinella was dominating.

The biomass of the flat sardinella was estimated to 146 000 tonnes, while the round sardinella was estimated to 87 000 tonnes (see Chapter 6 for comparisons with earlier surveys).

The length frequency distributions for both species are presented in Fig. 7 (a and b). They show the dominance in numbers of juveniles and modes of 11cm and 36 cm for the round sardinella and 8, 24 and 32 cm for the flat sardinella. Surveys in later years have failed in detecting juvenile fish in this region. This might be due to the limits of 10 nm miles kept from the coast for security reasons in earlier surveys, while it was not considered any longer necessary in the present survey.

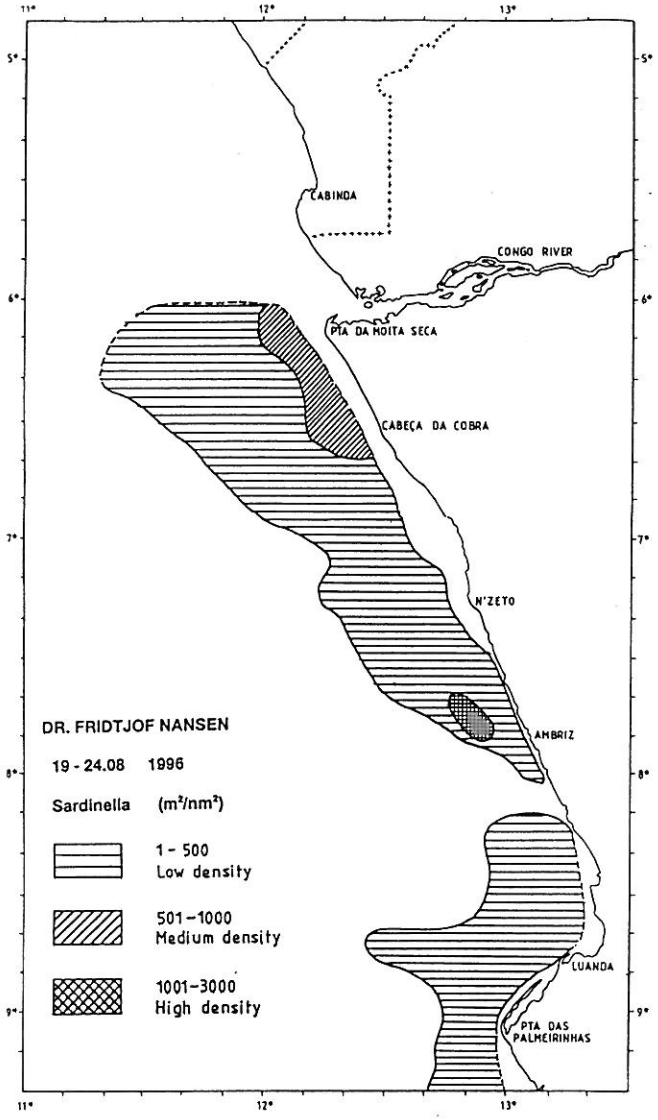


Figure 4. Distribution of *Sardinella* spp. Cabinda-Luanda.

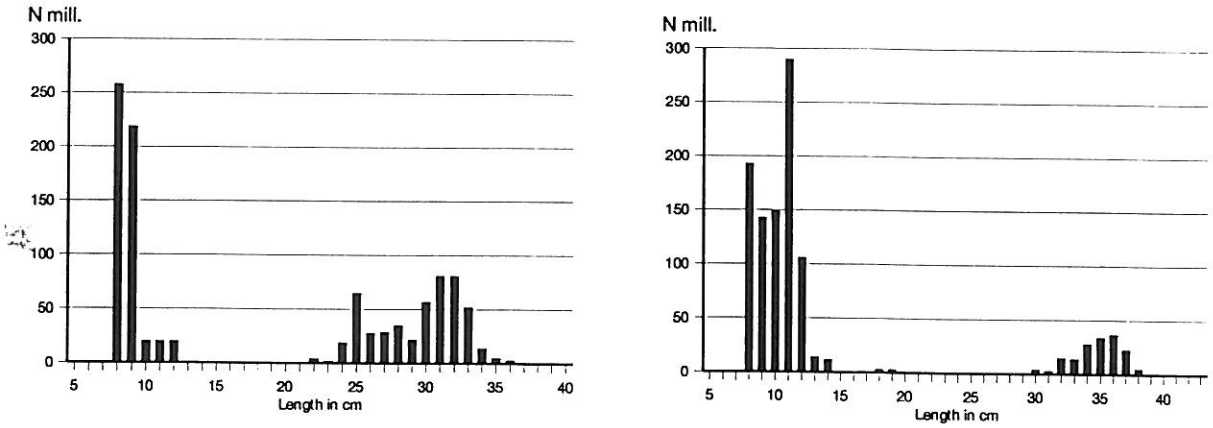


Figure 5. Total length distribution of flat sardinella (*Sardinella maderensis)* and round sardinella (*S. aurita*). Cabinda-Luanda

4.1.2 Cunene horse mackerel

Figure 6 shows the distribution of horse mackerel for the region Cabinda-Luanda. The species appeared to be distributed, in low concentrations, throughout the intermediate and deeper parts of the shelf region. The main concentration was found just north of Cabeça da Cobra and consisted mainly of juvenile fish with a mode of 5 cm. Figure 7 shows the length distribution of horse mackerel for the whole region. Also for horse mackerel, juveniles dominate, followed by a cohort with mode 17 cm and adults up to 40 cm. The total biomass of horse mackerel in this region was estimated to 63 000 tonnes.

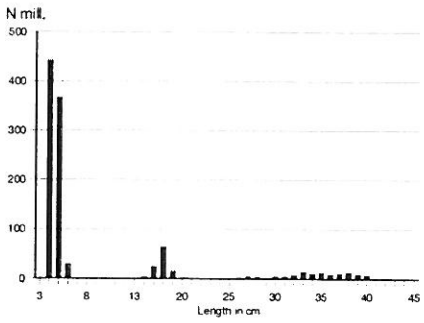


Figure 7. Estimated abundance of Cunene horse mackerel (*Trachurus trecae*) divided in length groups, Cabinda - Luanda.

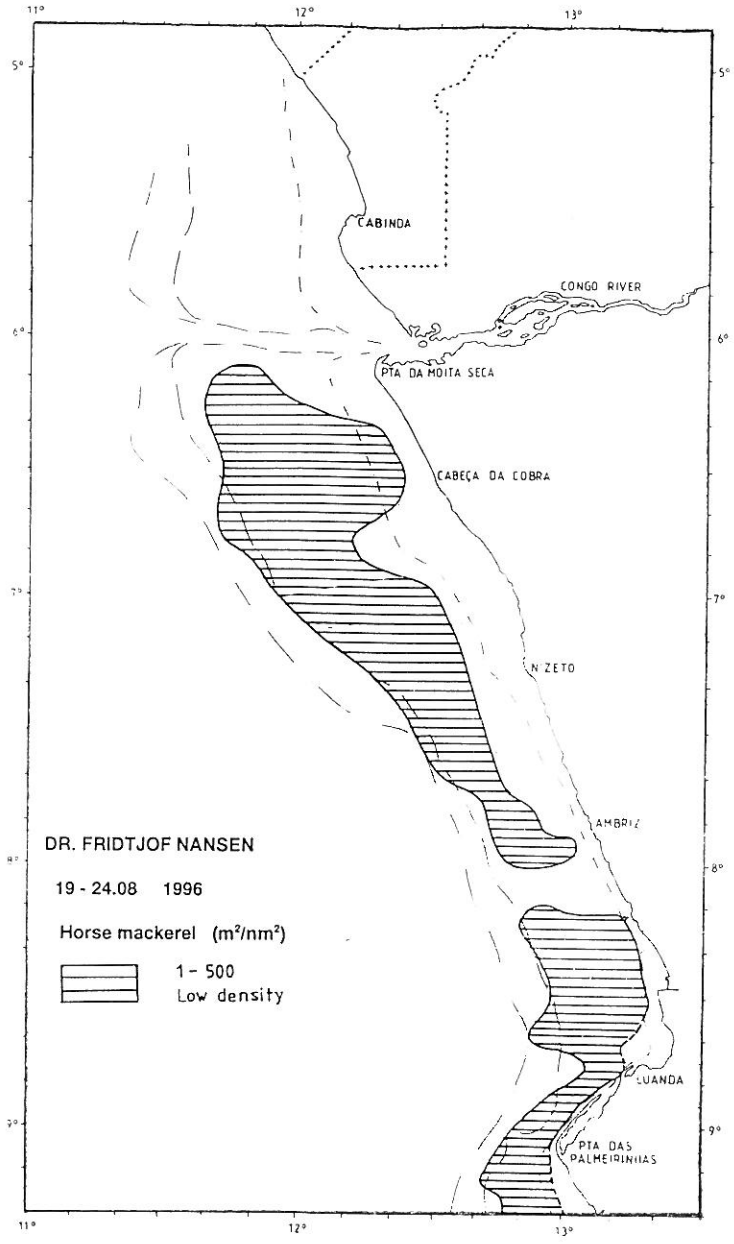


Figure 6. Distribution of Cunene horse mackerel (*Trachurus trecae*). Cabinda-Luanda

4.1.3 Other pelagic species

Figure 8 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 the hairtail. Table 2 shows the catch rates of the main categories included in this group. Sardinella and horse mackerel are not included.

Table 2. Catch rates (kg/h) of main groups of pelagic fish. Cabinda-Luanda

ST.NO.	DEP.	Oth. Caran	Scombrids	Barracudas	Hairtail	Other
1073			5.1		68.4	180.6
1074		248.5		30.4	129.9	160.2
1075	5	0.1			2.1	96.9
1076	121	0.1				
1077		0.1	4.4			38.0
1078	120				46.2	365.1
1079	5			49.0		252.2
1080	5					4004.6
1081		64.6	4.1		45.1	33.9
1082					29.7	273.6
1083	5	2.0				566.7
1084		4.8	39.6		46.6	836.8
1085		8.2	34.8		155.8	455.0
1086	10	0.1				4.0
1087	5	2.9				2.2
1088	230				3.1	285.7
1089	5			3.9	77.8	401.8
1090		446.4	7.4	85.1		9.2
1091		1.7	9.0	1.2		14.5
1092						80.0
1093	5				12.6	962.9
1094				7.7	4.6	1531.40
1095	5	4.1	4.6		2.8	38.0
1096	5	1.1	36.9		34.7	222.0
1097	5				0.7	92.1
MEAN		31.4	5.8	7.0	26.4	436.3

Highest concentrations were detected in the shallow waters between Pta da Moita Seca and Cabeça da Cobra and between N'Zeto and Ambriz. The biomass estimate was obtained by using an overall average length (about 35 cm) for this area and resulted in a value of about 56 000 tonnes. The composition in the catches shows a dominance of Carangidae (*Selene dorsalis* and *Trachinotus ovatus*) followed by hairtail (*Trichiurus lepturus*), both in the shallow inshore waters as well as over the edge of the shelf. 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 whether important changes have occurred. This group includes several species of commercial importance, particularly for small scale fisheries.

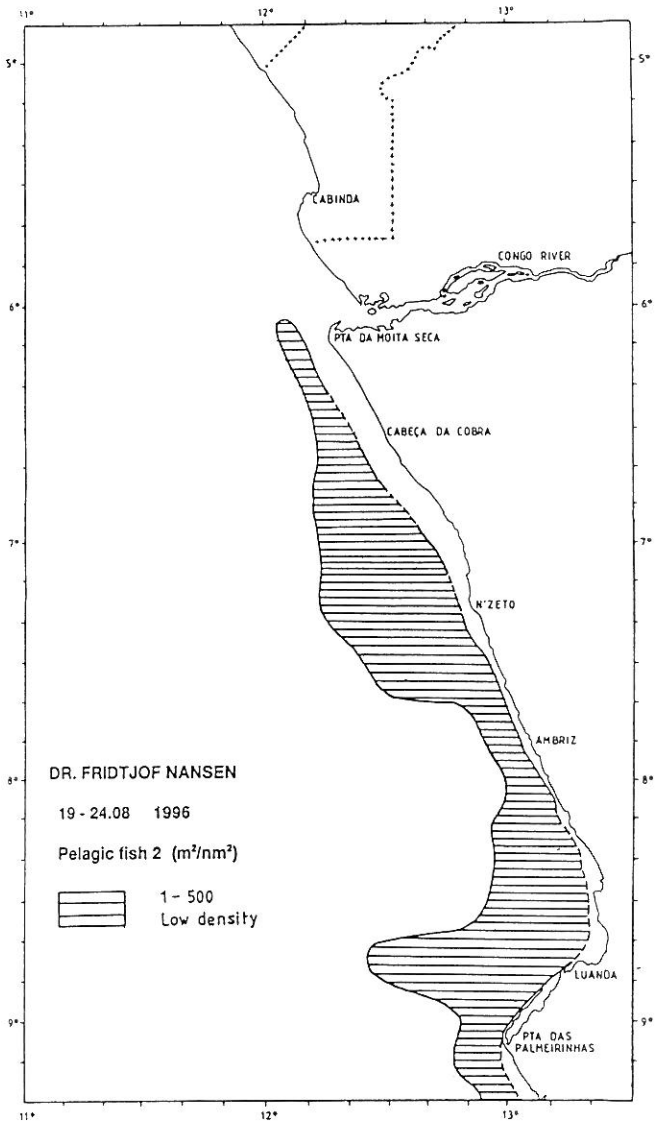


Figure 8. Distribution of pelagic fish type 2. Cabinda-Luanda.

4.2 Luanda-Benguela

4.2.1 Sardinella

The distribution of the two sardinella species in this region is shown in Figure 9. They are found throughout the region, mainly over shelf waters. Off Pta. das Palmeirinhas sardinellas vere found far offshore, about 40 nm from the coastline and over 1300 m depth. These were mainly large adults of both species. During nighttime, pelagic trawling close to the surface usually yielded sardinella together with hairtails and small tunas or carangids (i.e. *Trachinotus*) almost anywhere along this part of the coast. During daytime, the sardinellas would form schools very close to the surface. These schools were detactable only with the sonar or by direct observation at the sea surface.

Most of the samples included large fish: modal length 33 cm for the flat sardinella and 35 cm for the round sardinella (Fig. 10).The element of young fish was almost negligible. Some young round sardinella, with an average total legth of about 17 cm, were found off Pta do Morro.

The biomass on the shelf was estimated to about 130 000 tonnes of which about 5% were *S. aurita* and 95% *S. maderensis.*

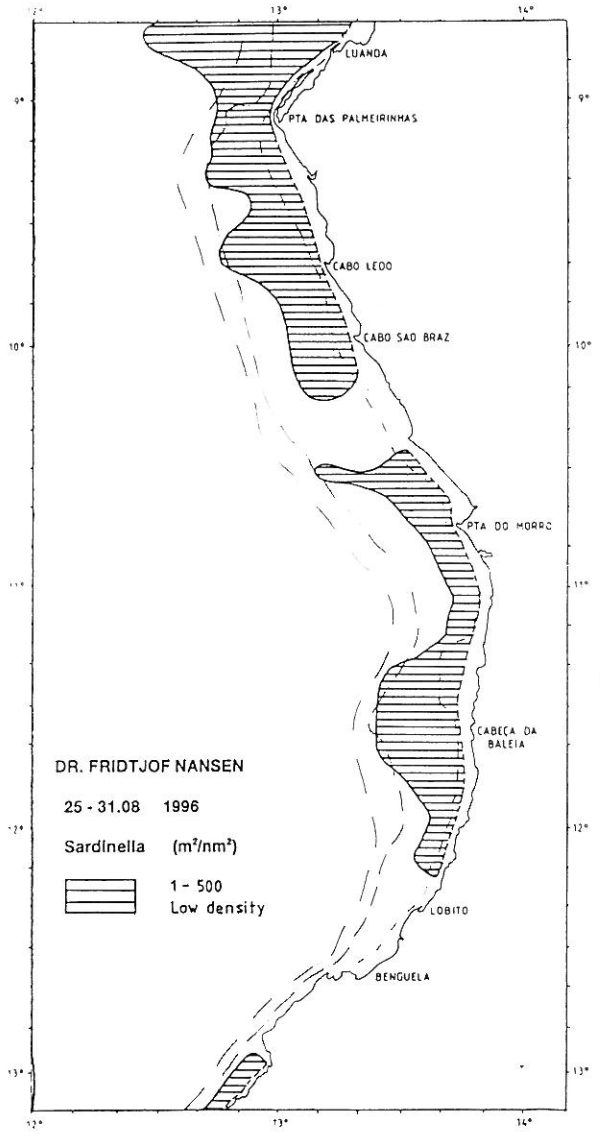


Figure 9. Distribution of *Sardinella* spp. Luanda-Benguela

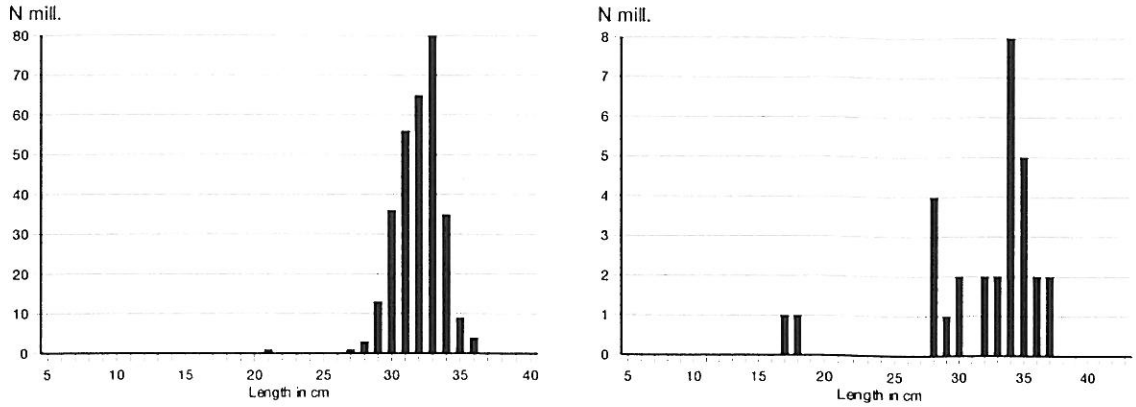


Figure 10. Total length distribution of flat sardinella (*Sardinella maderensis*) and round sardinella (*Sardinella aurita*), Luanda-Benguela

4.2.2 Cunene horse mackerel

Horse mackerel were evenly distributed over most of the inner shelf in this region (Figure 11). Larger concentrations were found closer to the coast and particularly between Pta do Morro and Cabeça da Baleia. The largest was found off Pta das Palmeirinhas. The vertical distribution was very much the same as was observed north of Luanda,- dense schools close to bottom at daytime and dispersal and concentration of single fish near the surface during night. The length distribution (Fig. 12) shows that large fish dominate (mode 35 cm), but a cohort of 15 cm mode is also present. The biomass estimate for the species was about 157 000 tonnes.

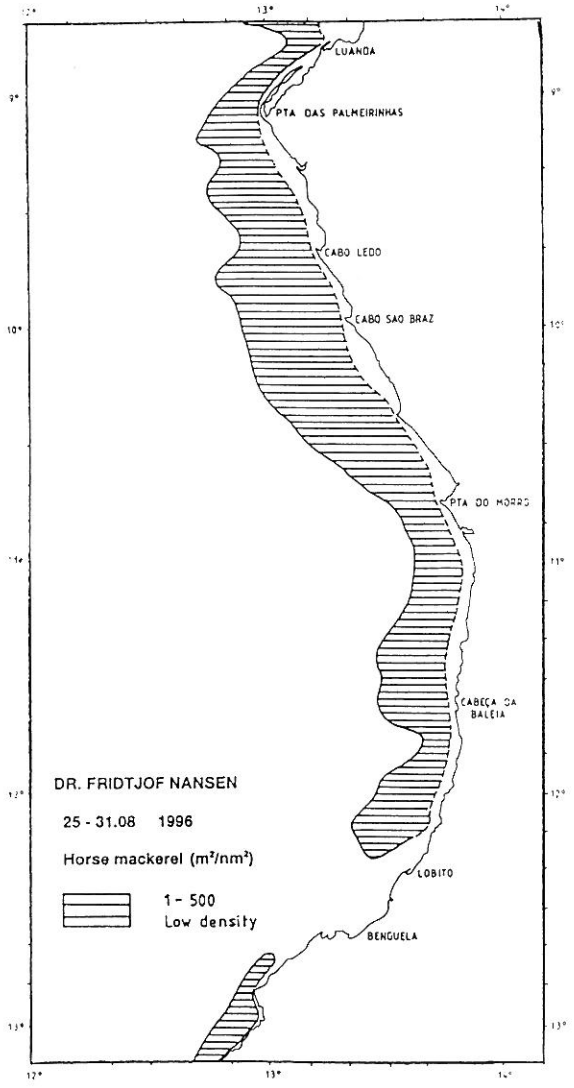


Figure 11. Distribution of horse mackerel (*Trachurus trecae*), Luanda-Benguela

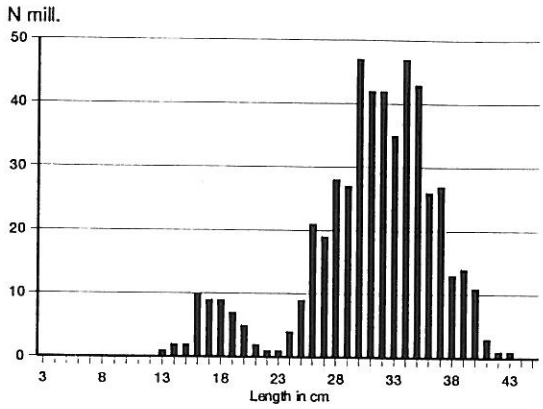


Figure 14. Total length distribution of horse mackerel (*Trachurus trecae*), Luanda-Benguela.

4.2.3 Other pelagic species

Figure 15 shows that pelagic species type 2 were widely distributed in this region from shallow coastal waters to beyond the edge of the continental shelf. Also here the carangids were dominating with the lookdown (*Selene dorsalis*) as the most common species. The carangids constituted 65% of this group, the scombrids about 9%, barracudas 11% and hairtails (15%) were also quite common The fish was rather evenly distributed with no places of dense concentrations. The estimated biomass totalled about 72 000 tonnes.

Table 3. Catch rates (kg/h) of main groups of pelagic fish. Luanda-Benguela

ST.NO.	DEP.	Oth.Carang	Scombrids	Barracudas	Hairtail	Other
1098		29.2				23.1
1099		35.4	4.8		55.2	355.9
1100		22.8	5.6		1.9	163.6
1101		12.1	2.8		15.0	137.8
1102		115.7	9.4	10.8	7.5	75.8
1103	25	2.1	7.7			0.7
1104						0.6
1105		112.7	0.6			7.5
1106		63.2		6.6	6.6	328.6
1107	5	0.6				28.3
1108		260.0	7.3	98.7	8.7	796.7
1109	5	20.6	7.8	5.6	24.5	43.2
1110	10	205.8	2.7	2.4		570.8
1111		4.9				192.7
1112	24	20.2			3.8	444.7
1113	10		23.3		23.6	73.8
1114	10		1.2			295.0
1115	10	21.2			19.0	1428.7
1116		165.8	4.1			4.0
1117	33	4.5				700.0
1118		49.4	7.4		27.3	523.6
1119	5				17.6	1231.6
1120						8.0
1121	5	37.7		12.5	35.8	6182.3
1122	5	13.3	21.4			6320.4
1123	20	30.2			7.5	1603.8
1124	10	57.8		8.6	8.5	169.3
1125		27.6	24.7	22.5	10.0	1532.2
1126			0.0		6.5	46.8
1127			4.8			21.8
1128	5		38.2	5.2	6.6	2190.2
1129						
1130	10		7.9	2.6	0.1	36.5
1131	103			16.2		1326.4
1132	5	2.3		33.4	22.4	529.0
MEAN		37.5	5.2	6.4	8.8	782.7

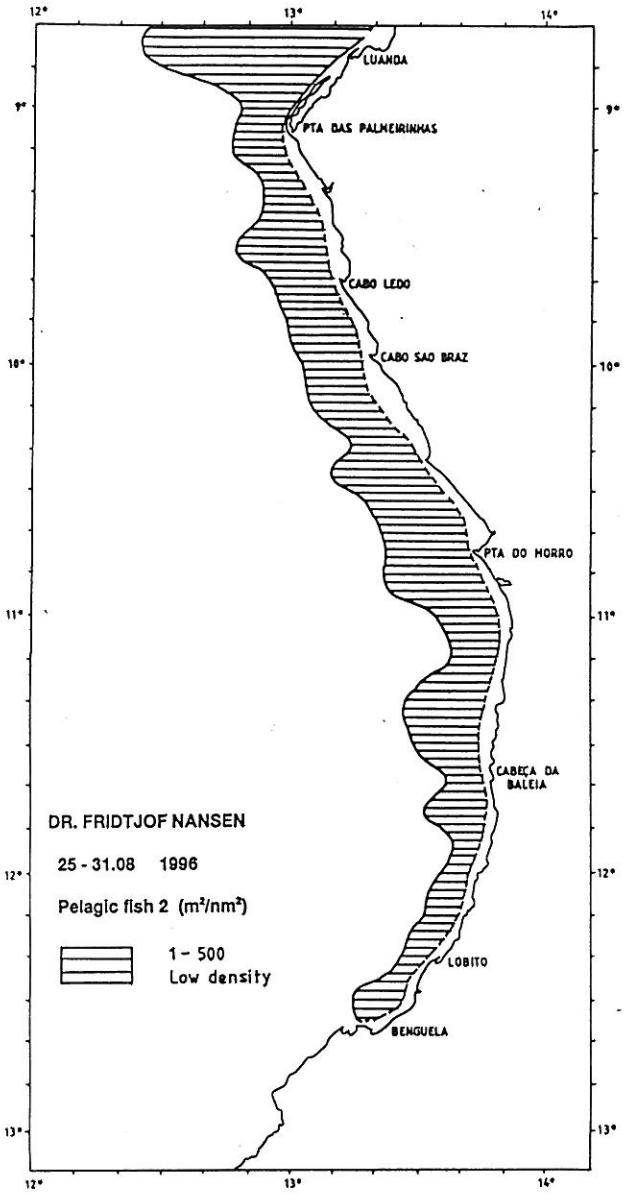


Figure 13. Distribution of pelagic fish type 2. Luanda-Benguela.

4.3. Benguela - Cunene

4.3.1 Horse mackerel

The horse mackerel in this region consists of two species, the Cunene horse mackerel (*Trachurus trecae*) and the Cape horse mackerel (*Trachurus capensis*). The latter species reaches its northernmost distribution in southern Angola but is mainly found further south, off Namibia and south Africa. Its northernmost distribution is related to the displacement of the Angola-Benguela front. This species started appearing in the catches off Cabo de Santa Marta (about 14 °S), mixed with the Cunene horse mackerel. The two species co-occur throughout the southern Angolan shelf. Close to the border with Namibia, the catches consisted of Cape horse mackerel only. Horse

mackerel was schooling near the bottom during daytime, and could be caught with bottom trawls mixed with species of the genus *Dentex* (mainly *D. macrophthalmus*) or in mid-waters during nighttime. Horse mackerel seem to be the dominating species both in the pelagic and the near bottom environment.

The distribution of the species combined, between Benguela and Cunene, is shown in Figure 14. The horse mackerel were found to be distributed more or less all along the coast, except for a smaller area some 15 nm north of Cabo de Santa Marta. The biomass estimate for both species combined totalled 140 000 tonnes, 70 % of which was Cunene horse mackerel and about 30 % Cape horse mackerel.

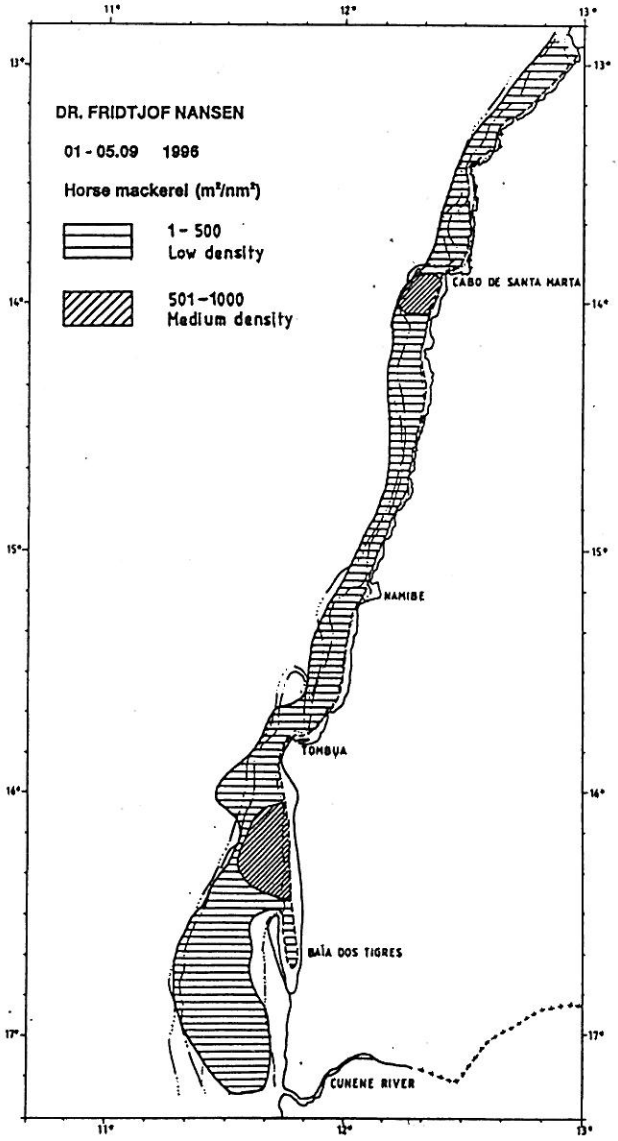
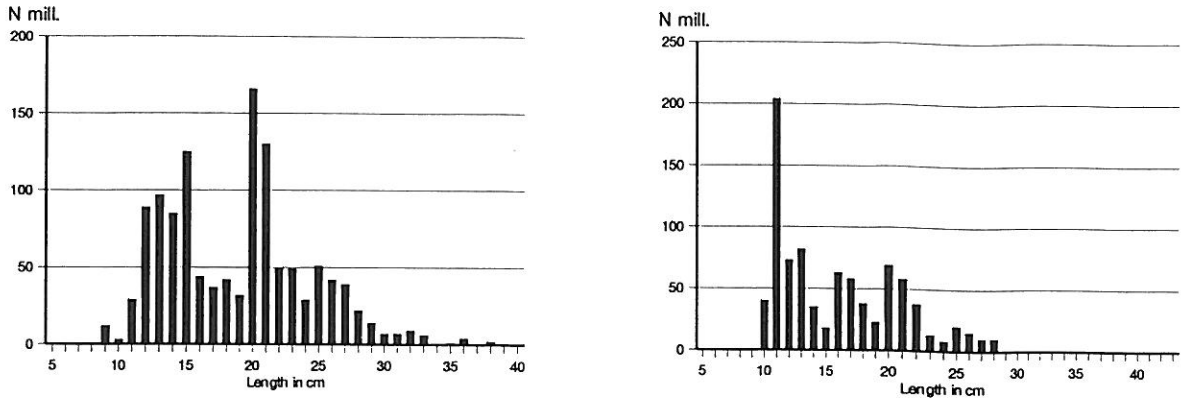


Figure 14. Distribution of *Trachurus trecae* and *Trachurus capensis* , Benguela-Cunene

The length frequency distributions for both species are presented in figure 15 (a and b). It is difficult to clearly distinguish cohorts in the frequency distributions. There are two modes of 15 and 21 cm for the Cunene horse mackerel and of 11, 17 and 21 for the Cape horse mackerel.



a) b)

Figure 15. Total length distribution of *Trachurus trecae* (a) and *T. capensis* (b) Benguela-Tombua.

Differently to what observed off central and northern Angola, the Cunene horse mackerel appear to consist of young individuals only. This pattern is consitent with what was observed in earlier surveys. Very little is known about the migration pattern of this species but, from the length frequency distributions it would appear that the southern Angolan region is a major feeding area. On the other hand, the lack of large adults in the population may also be indicative of high fishing pressure on this part of the stock. Also in the case of *Trachurus capensis*, only young fish were caught.

4.3.2 Pilchard

This species was caught at two stations only, in the midlle of the shelf and at about 16°20 S and close to the border with Namibia, respectively. Because of the extremely low abundance, it was not possible to estimate the biomass for this species.

4.3.3 Round herring

This species (*Etrumeus whiteheadi*) was the most abundant of the clupeoids. Its distribution is shown in figure 15. It was caught in the pelagic trawl throughout the shelf from south of Tombua to the border with Namibia. Its biomass was estimated to about 24 000 tonnes, using a condition factor of 0.66. The length frequency distribution of figure 16 shows one mode at 15 cm which is consistent with earlier surveys.

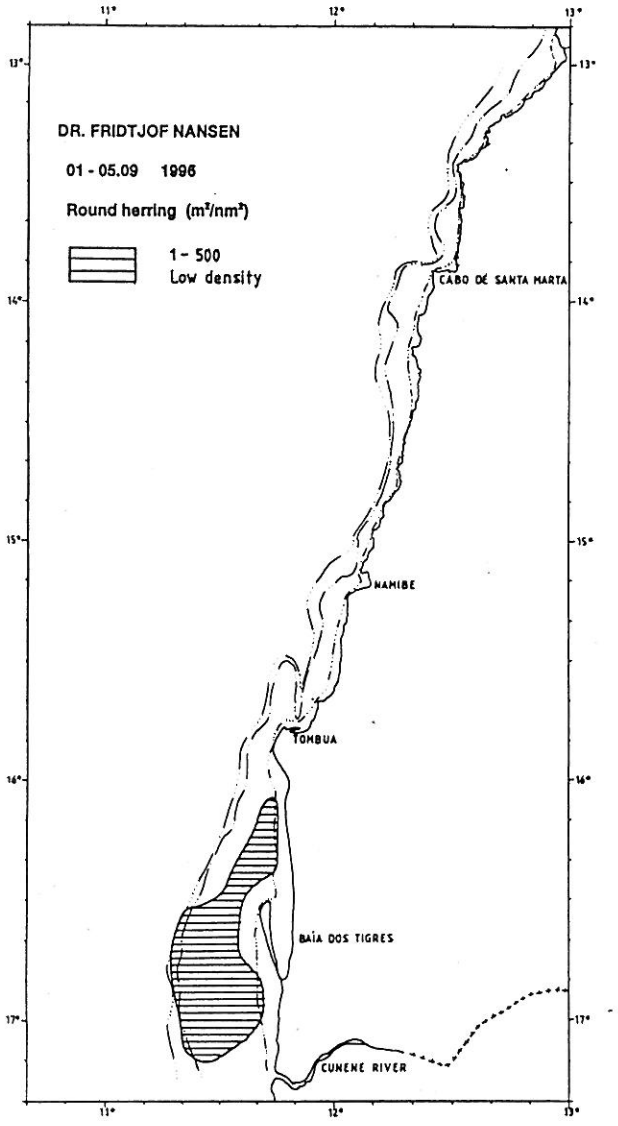


Figure 15. Distribution of round herring (*Etrumeus whiteheadi*), Tombua-Cunene.

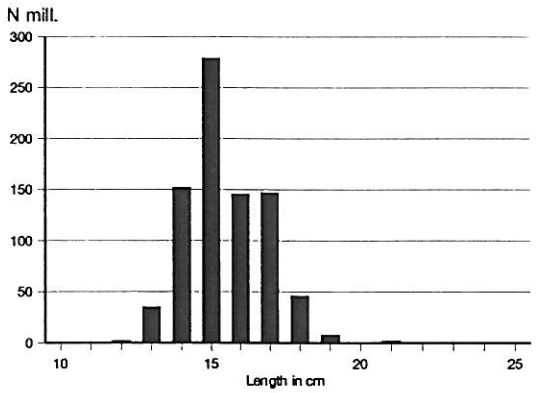
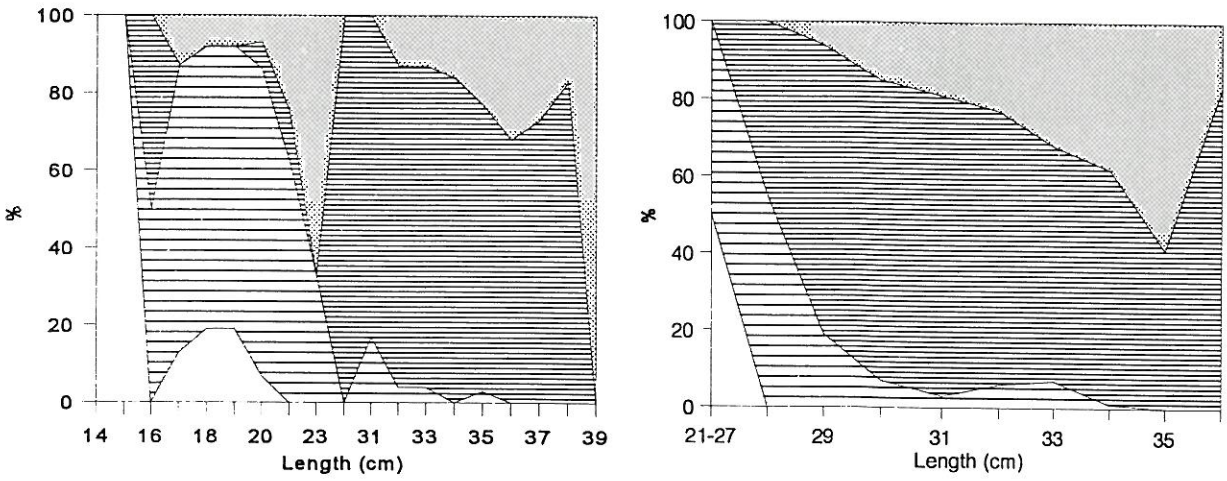


Figure 16. Total length distribution of round herring (*Etrumeus whiteheadi*), Luanda-Benguela.

5.1 Sardinellas (*Sardinella maderensis* and *Sardinella aurita*)

Figure 17 (a and b) shows the results of the sampling for determining the maturity stages of *Sardinella maderensis*, for the region Cabinda-Luanda (N=1231) and Luanda-Benguela (N=702), respectively. The length range is different in the two cases but the fisures show that practically 100% of flat sardinella > 28 cm was spawning or almost ripe to spawn, in both regions.
This situation is typical of the cold season, when the greater dynamics of the water masses enhances productivity. This in term makes the growth conditions for larvae and juveniles more favourable.



a) b)

Figure 17. Relative frequency of maturity stages at different length groups. *Sardinella maderensis*.
a) Cabinda-Luanda; b) Luanda-Benguela.

The round sardinella (N=405) was found to be in stages 4 and 5 (ripe and running, respectively) in almost 100% of individuals larger than 30 cm. All individuals under 16 cm were inactive but some young specimens of 17 cm were found to be ripe (Fig. 18). Only a few specimens of round sardinella were measured in the region Luanda-Benguela and these are not represented. They were mostly above 34 cm and they all had active gonads.

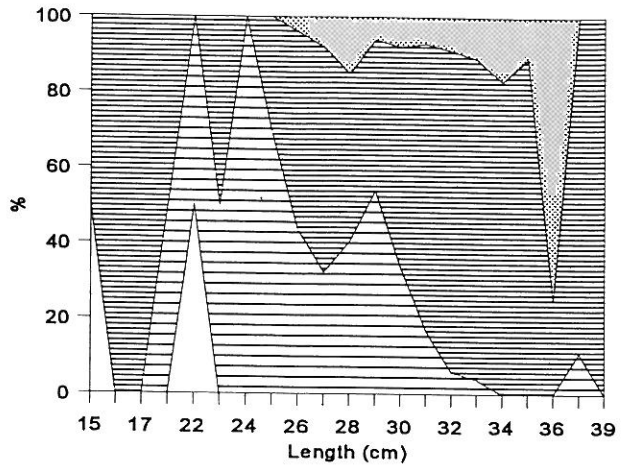


Figure 18. Relative frequency of maturity stages at different length groups. *Sardinella aurita.* Luanda-Cabinda

5.2 Horse mackerel (*Trachurus trecae*)

Figure 19 shows the relative frequency of occurrence of maturity stages 2 to 5 for the region Cabinda-Luanda (a) and Luanda-Benguela (b). The total number of fish sampled were 683 in the

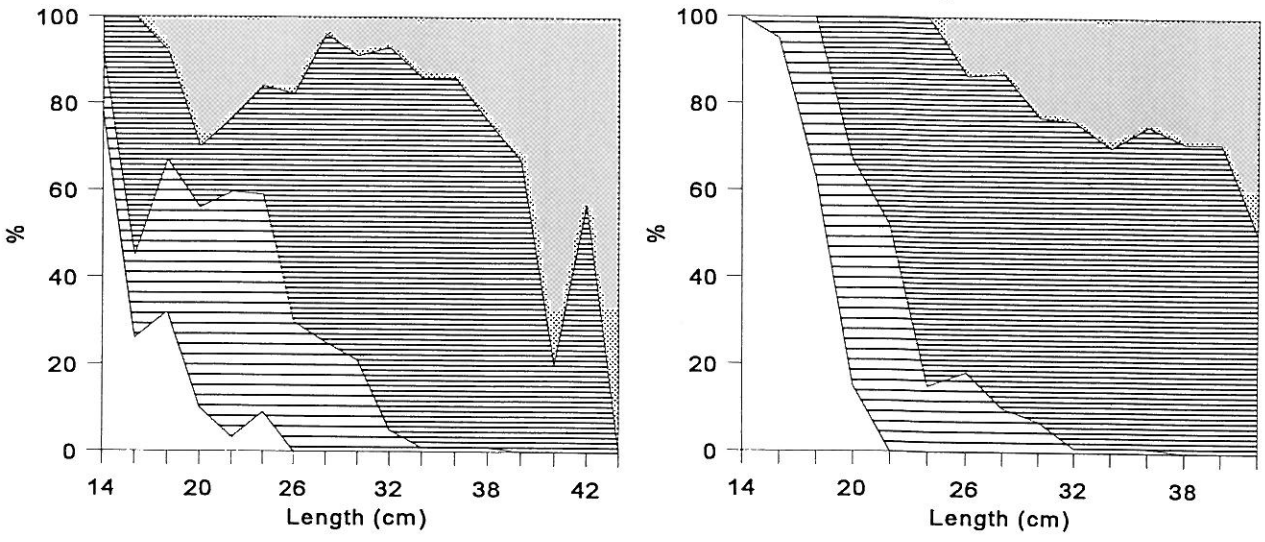


Figure 19. Relative frequency of maturity stages at different length groups of *Trachurus trecae.* a) Cabinda-Luanda; b) Luanda-Benguela.

former and 725 for the latter. In both cases, more than 80% of the fish analysed was close to being ripe or was ripe and spawning. A high percentage of young specimens had ripe gonads or

were spawning in the Cabinda-Luanda region, with some specimens of 16-17 cm having running gonads. In the Luanda-Benguela region a very low percentage of the young fish below 20 cm had active gonads.

Also for horse mackerel this appears to be the peak spawning season.

CHAPTER 6 REVIEW OF SURVEY RESULTS

6.1 Sardinella and horse mackerel

The survey on pelagic stocks in Angola, in March 1996, resulted in a low estimates of both sardinella and horse mackerel (Tables 4 and 5),consisten with the results obtained in the course of the February-March 1995 survey. In both cases, abnormal conditions of temperature and salinity had been observed which seemed to influence the behaviour of these species and make them less available to echo detection. The 1995 winter survey, however, gave rather consistent results with previous surveys at the same time of the year.

Sardinellas were estimated to 363 000 tonnes, which is the lowest estimate for this season. A general impression from the survey was the limited occurrence of large schools. Small schools were often detecred visually and observed in the sonar diagrams. This estimate should therefore be considered as an underestimate. The introduction a method for biomass estimation based on the sonar readings will soon be available and a final estimate will be calculated.

Table 4 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
2/96	+	130	233	363	363

* not surveyed

Table 5 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
2/96	140	157	63	220	360

* not surveyed

The total obtained for the region Benguela-Cabinda is rather consistent with previous estimates. They show a trend of a northward displacement of the stock in the winter season. The main differences in the estimates are found in the Cunene-Benguela region. These estimates should be seen in combination with the estimates of the Namibian part of the stock, at least for *Trachurus capensis*.

Annex I Records of fishing stations

PROJECT STATION:1073
DATE:19/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 526
start stop duration Long E 1134
TIME :20:48:00 21:18:00 30 (min) Purpose code: 1
LOG :7685.30 7687.00 1.70 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 303 301 Validity code: 4
Towing dir: 5° Wire out: 150 m Speed: 34 kn*10

Sorted: 91 Kg Total catch: 127.11 CATCH/HOUR: 254.22

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	112.00	454	44.06	2412
Trichiurus lepturus	68.40	732	26.91	
MYCTOPHIDAE	61.20	19524	24.07	
Euthynnus alletteratus	5.16	4	2.03	
Trachurus trecae	2.84	8	1.12	
Centrolophus niger	2.56	4	1.01	
Ornithoteuthis antillarum	0.84	52	0.33	
Sardinella aurita	0.74	2	0.29	
Paralepis sp.	0.20	28	0.08	
Sepiella ornata	0.16	8	0.06	
Ariomma bondi	0.08	4	0.03	
Naucrates ductor	0.04	4	0.02	
Total	254.22		100.01	

PROJECT STATION:1074
DATE:20/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 600
start stop duration Long E 1159
TIME :02:35:00 03:05:00 30 (min) Purpose code: 1
LOG :7745.00 7747.20 2.20 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 480 952 Validity code: 4
Towing dir: 128° Wire out: 170 m Speed: 35 kn*10

Sorted: 196 Kg Total catch: 284.51 CATCH/HOUR: 569.02

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	222.60	802	39.12	2415
Sardinella maderensis	132.00	496	23.20	2413
Trichiurus lepturus	129.90	1492	22.83	
Sphyraena afra	30.40	2	5.34	
Chloroscombrus chrysurus	14.62	88	2.57	
Caranx senegallus	11.28	12	1.98	
MYCTOPHIDAE	10.56	5280	1.86	
Hexanchus griseus	9.30	2	1.63	
Pentheroscion mbizi	6.60	400	1.16	
Saurida brasiliensis	1.54	132	0.27	
Trachurus trecae	0.22	142	0.04	2414
Total	569.02		100.00	

PROJECT STATION:1075
DATE:20/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 611
start stop duration Long E 1149
TIME :06:16:00 06:46:00 30 (min) Purpose code: 1
LOG :7775.30 7777.00 1.80 Area code : 3
FDEPTH: 5 5 GearCond.code:
BDEPTH: 92 83 Validity code: 4
Towing dir: 76° Wire out: 150 m Speed: 36 kn*10

Sorted: 49 Kg Total catch: 49.50 CATCH/HOUR: 99.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	43.30	108	43.74	2416
T U R T L E S	40.00	2	40.40	
Sardinella maderensis	11.72	42	11.84	2417
Trichiurus lepturus	2.10	6	2.12	
Echeneis naucrates	1.50	4	1.52	
Lagocephalus laevigatus	0.18	14	0.18	
Octopus sp.	0.16	2	0.16	
Sepia sp.	0.10	6	0.10	
Selene dorsalis	0.04	20	0.04	
Total	99.10		100.10	

PROJECT STATION:1076
DATE:20/ 8/96 GEAR TYPE: BT No:9 POSITION:Lat S 615
start stop duration Long E 1138
TIME :08:45:00 08:53:00 8 (min) Purpose code: 1
LOG :7794.40 7794.80 0.40 Area code : 3
FDEPTH: 121 120 GearCond.code:
BDEPTH: 121 120 Validity code: 9
Towing dir: 68° Wire out: 410 m Speed: 30 kn*10

Sorted: Kg Total catch: 0.01 CATCH/HOUR: 0.08

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis, juveniles	0.08	15	100.00	
Total	0.08		100.00	

PROJECT STATION:1077
DATE:20/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 630
start stop duration Long E 1142
TIME :14:51:00 15:21:00 30 (min) Purpose code: 1
LOG :7845.70 7847.60 1.90 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 172 143 Validity code: 4
Towing dir: 74° Wire out: 170 m Speed: 38 kn*10

Sorted: 21 Kg Total catch: 21.25 CATCH/HOUR: 42.50

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	30.40	80	71.53	2418
Sardinella maderensis	5.50	18	12.94	2419
Auxis thazard	4.40	10	10.35	
Naucrates ductor	1.60	2	3.76	
ARGONAUTIDAE	0.30	6	0.71	
C E P H A L O P O D A	0.26	4	0.61	
Selene dorsalis, juveniles	0.04	16	0.09	
Total	42.50		99.99	

PROJECT STATION:1078
DATE:20/ 8/96 GEAR TYPE: BT No:9 POSITION:Lat S 628
start stop duration Long E 1149
TIME :16:35:00 17:05:00 30 (min) Purpose code: 1
LOG :7856.50 7858.20 1.70 Area code : 3
FDEPTH: 118 121 GearCond.code:
BDEPTH: 118 121 Validity code: 4
Towing dir: 254° Wire out: 450 m Speed: 33 kn*10

Sorted: 80 Kg Total catch: 205.67 CATCH/HOUR: 411.34

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	282.10	690	68.58	2421
Trichiurus lepturus	46.20	42	11.23	
Dentex congoensis	22.16	304	5.39	
Trachurus trecae, juvenile	19.00	470	4.62	2420
Umbrina canariensis	16.06	32	3.90	
Dentex angolensis	10.88	70	2.65	
Torpedo torpedo	3.12	4	0.76	
Illex coindetii	2.84	84	0.69	
Todaropsis eblanae	2.42	46	0.59	
Pagellus bellottii	2.28	14	0.55	
Uranoscopus polli	1.68	14	0.41	
Lepidotrigla carolae	0.94	24	0.23	
Boops boops	0.74	4	0.18	
Bembrops sp.	0.46	4	0.11	
Chelidonichthys gabonensis	0.46	4	0.11	
Total	411.34		100.00	

PROJECT STATION:1079
DATE:20/ 8/96 GEAR TYPE: PT No:7 POSITION:Lat S 623
start stop duration Long E 1214
TIME :19:51:00 20:21:00 30 (min) Purpose code: 1
LOG :7886.80 7888.40 1.60 Area code : 3
FDEPTH: 5 5 GearCond.code:
BDEPTH: 25 26 Validity code: 4
Towing dir: 148° Wire out: 150 m Speed: 32 kn*10

Sorted: 68 Kg Total catch: 150.60 CATCH/HOUR: 301.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	123.74	127902	41.08	2423
Brachydeuterus auritus	60.30	1044	20.02	
Sardinella maderensis	42.30	244	14.04	2424
Sphyraena guachancho	36.60	82	12.15	
Sardinella aurita	21.60	1296	7.17	2422
Sphyraena sphyraena	12.40	44	4.12	
Todaropsis eblanae	2.06	44	0.68	
Raja miraletus	1.16	8	0.39	
Pagellus bellottii	0.72	170	0.24	
Illex coindetii	0.36	8	0.12	
Total	301.24		100.01	

PROJECT STATION:1080
DATE:20/ 8/96 GEAR TYPE: PT No:7 POSITION:Lat S 630
start stop duration Long E 1219
TIME :21:26:00 21:56:00 30 (min) Purpose code: 1
LOG :7897.00 7898.70 1.70 Area code : 3
FDEPTH: 5 5 GearCond.code:
BDEPTH: 24 26 Validity code: 9
Towing dir: 330° Wire out: 150 m Speed: 3 kn*10

Sorted: 1 Kg Total catch: 2002.30 CATCH/HOUR: 4004.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	4000.00		99.89	
Sardinella aurita	3.68	324	0.09	2425
Sardinella maderensis	0.92	108	0.02	2426
Total	4004.60		100.00	

PROJECT STATION:1081
DATE:21/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 637
start stop duration Long E 1208
TIME :23:54:00 00:24:00 30 (min) Purpose code: 1
LOG :7917.50 7919.40 1.90 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 64 71 Validity code: 4
Towing dir: 252° Wire out: 180 m Speed: 35 kn*10

Sorted: 73 Kg Total catch: 73.87 CATCH/HOUR: 147.74

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachinotus ovatus	64.60	138	43.73	2428
Trichiurus lepturus	45.10	98	30.53	2427
Trachurus trecae	19.80	48	13.40	2430
Sepia orbignyana	6.92	8	4.68	
Scomber japonicus	4.12	6	2.79	
Sepia officinalis hierredda	3.32	10	2.25	
Lagocephalus laevigatus	1.80	2	1.22	
Saurida brasiliensis	1.18	550	0.80	
Naucrates ductor	0.54	2	0.37	
Trachurus trecae, juvenile	0.36	270	0.24	2429
Total	147.74		100.01	

DATE:21/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1082
start stop duration POSITION:Lat S 642
Long E 1152
TIME :02:10:00 02:40:00 30 (min) Purpose code: 1
LOG :7935.50 7937.10 1.60 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 127 121 Validity code: 4
Towing dir: 72° Wire out: 170 m Speed: 33 kn*10

Sorted: 152 Kg Total catch: 152.06 CATCH/HOUR: 304.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	113.40	362	37.29	2432
Prionace glauca	75.20	2	24.73	
Trachurus trecae	47.00	208	15.45	2433
Sardinella aurita	32.20	78	10.59	2431
Trichiurus lepturus	29.70	42	9.77	2434
Saurida brasiliensis	4.12	732	1.35	
Sepiella ornata	1.10	74	0.36	
Naucrates ductor	0.44	2	0.14	
Todaropsis eblanae	0.16	4	0.05	
Total	303.32		99.73	

DATE:21/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1083
start stop duration POSITION:Lat S 649
Long E 1212
TIME :07:45:00 08:15:00 30 (min) Purpose code: 1
LOG :7991.00 7992.90 1.90 Area code : 3
FDEPTH: 5 5 GearCond.code:
BDEPTH: 57 69 Validity code: 4
Towing dir: 250° Wire out: 150 m Speed: 38 kn*10

Sorted: 284 Kg Total catch: 284.42 CATCH/HOUR: 568.84

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	558.00	1730	98.09	2436
Sardinella aurita	4.76	12	0.84	2435
J E L L Y F I S H	4.00		0.70	
Trachinotus ovatus	2.08	4	0.37	
Total	568.84		100.00	

DATE:21/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1084
start stop duration POSITION:Lat S 715
Long E 1220
TIME :18:33:00 19:03:00 30 (min) Purpose code: 1
LOG :8099.40 8100.90 1.50 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 125 116 Validity code: 4
Towing dir: 75° Wire out: 150 m Speed: 30 kn*10

Sorted: 222 Kg Total catch: 463.90 CATCH/HOUR: 927.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	502.00	1758	54.11	2438
Trachurus trecae	203.20	1098	21.90	2439
Sardinella aurita	131.00	308	14.12	2437
Trichiurus lepturus	46.60	132	5.02	
Sarda sarda	15.20	6	1.64	
Scomber japonicus	9.80	16	1.06	
Auxis thazard	7.60	16	0.82	
Euthynnus alletteratus	7.00	6	0.75	
Trachinotus ovatus	4.80	12	0.52	
Sepiella ornata	0.60	12	0.06	
Saurida brasiliensis	0.04	4		
Total	927.84		100.00	

DATE:22/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1085
start stop duration POSITION:Lat S 727
Long E 1225
TIME :00:28:00 00:58:00 30 (min) Purpose code: 1
LOG :8160.00 8161.90 1.90 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 257 398 Validity code: 4
Towing dir: 254° Wire out: 160 m Speed: 27 kn*10

Sorted: 200 Kg Total catch: 326.90 CATCH/HOUR: 653.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	155.80	3694	23.83	
Trachurus trecae	147.20	598	22.51	2440
Sardinella aurita	109.80	278	16.79	2442
Sardinella maderensis	80.80	288	12.36	2441
Sphyrna lewini	68.80	2	10.52	
MYCTOPHIDAE	34.00	21348	5.20	
Euthynnus alletteratus	31.80	28	4.86	
Dasyatis violacea	14.40	2	2.20	
Trachinotus ovatus	8.20	22	1.25	
Scomber japonicus	3.00	4	0.46	
Total	653.80		99.98	

DATE:22/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1086
start stop duration POSITION:Lat S 743
Long E 1243
TIME :06:48:00 07:18:00 30 (min) Purpose code: 1
LOG :8221.00 8222.70 1.70 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 103 96 Validity code: 4
Towing dir: 60° Wire out: 160 m Speed: 34 kn*10

Sorted: 2 Kg Total catch: 2.01 CATCH/HOUR: 4.02

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	4.00		99.50	
Selene dorsalis, juveniles	0.02	4	0.50	
Total	4.02		100.00	

DATE:22/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1087
start stop duration POSITION:Lat S 748
Long E 1254
TIME :10:30:00 11:00:00 30 (min) Purpose code: 1
LOG :8255.00 8256.50 1.50 Area code : 3
FDEPTH: 5 5 GearCond.code:
BDEPTH: 66 58 Validity code: 1
Towing dir: 90° Wire out: 160 m Speed: 3 kn*10

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

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachinotus ovatus	2.90	8	55.98	
Sardinella maderensis	1.64	6	31.66	2443
Sepiella ornata	0.64	18	12.36	
Total	5.18		100.00	

DATE:22/ 8/96 GEAR TYPE: PT No:5 PROJECT STATION:1088
start stop duration POSITION:Lat S 803
Long E 1243
TIME :15:20:00 15:50:00 30 (min) Purpose code: 1
LOG :8291.30 8292.90 1.60 Area code : 3
FDEPTH: 230 230 GearCond.code:
BDEPTH: 250 254 Validity code: 4
Towing dir: 264° Wire out: 540 m Speed: 28 kn*10

Sorted: 144 Kg Total catch: 144.46 CATCH/HOUR: 288.92

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	155.80	141512	53.92	
J E L L Y F I S H	129.96		44.98	
Trichiurus lepturus	3.16	6	1.09	
Total	288.92		99.99	

DATE:22/ 8/96 GEAR TYPE: PT No:7 PROJECT STATION:1089
start stop duration POSITION:Lat S 802
Long E 1309
TIME :21:57:00 22:17:00 20 (min) Purpose code: 1
LOG :8345.40 8346.60 1.20 Area code : 3
FDEPTH: 5 5 GearCond.code:
BDEPTH: 25 25 Validity code: 4
Towing dir: 160° Wire out: 150 m Speed: 35 kn*10

Sorted: 86 Kg Total catch: 161.21 CATCH/HOUR: 483.63

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	225.90	8631	46.71	
Pteroscion peli	103.05	2385	21.31	
Trichiurus lepturus	77.85	1980	16.10	
Illsha africana	23.67	522	4.89	
Trachurus trecae	20.70	45	4.28	2444
Stromateus fiatola	11.52	21	2.38	
Arius latiscutatus	7.35	3	1.52	
Sepia orbignyana	4.86	9	1.00	
Sphyraena guachancho	3.96	27	0.82	
Pseudotolithus typus	3.51	3	0.73	
Sardinella maderensis	1.26	18	0.26	
Total	483.63		100.00	

DATE:23/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1090
start stop duration POSITION:Lat S 731
Long E 1249
TIME :08:15:00 08:45:00 30 (min) Purpose code: 1
LOG :8444.10 8445.80 1.70 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 35 35 Validity code: 4
Towing dir: 220° Wire out:1603 m Speed: 4 kn*10

Sorted: 274 Kg Total catch: 274.10 CATCH/HOUR: 548.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	363.30	994	66.27	2446
Sphyraena guachancho	85.10	72	15.52	2447
Trachinotus ovatus	45.50	94	8.30	
Decapterus rhonchus	34.60	56	6.31	2445
Hemicaranx bicolor	7.60	26	1.39	
Scomberomorus tritor	7.48	6	1.36	
Caranx senegallus	2.30	2	0.42	
Stromateus fiatola	1.62	2	0.30	
Chloroscombrus chrysurus	0.70	2	0.13	
Total	548.20		100.00	

DATE:23/ 8/96 GEAR TYPE: PT No:7 PROJECT STATION:1091
start stop duration POSITION:Lat S 732
Long E 1256
TIME :10:14:00 10:44:00 30 (min) Purpose code: 1
LOG :8458.90 8460.70 1.80 Area code : 3
FDEPTH: 0 0 GearCond.code:
BDEPTH: 24 25 Validity code: 4
Towing dir: 160° Wire out: 160 m Speed: 36 kn*10

Sorted: Kg Total catch: 13.28 CATCH/HOUR: 26.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomberomorus tritor	9.02	6	33.96	
Stromateus fiatola	6.28	8	23.64	
Hemicaranx bicolor	5.80	18	21.84	
Trachinotus ovatus	1.78	2	6.70	
Trachinus araneus	1.56	2	5.87	
Sphyraena guachancho	1.20	2	4.52	
Trachurus trecae, juvenile	0.92	58	3.46	2448
Total	26.56		99.99	

PROJECT STATION:1092

DATE:23/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 812

	start	stop	duration			Long E 1253
TIME	:15:48:00	16:18:00	30	(min)	Purpose code:	1
LOG	:8512.30	8513.90	1.60		Area code :	3
FDEPTH:	0	0			GearCond.code:	
BDEPTH:	117	119			Validity code:	4

Towing dir: 238° Wire out: 160 m Speed: 32 kn*10

Sorted: 40 Kg Total catch: 40.00 CATCH/HOUR: 80.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Isurus oxyrinchus	80.00	2	100.00	
Total	80.00		100.00	

PROJECT STATION:1093

DATE:23/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 830

	start	stop	duration			Long E 1302
TIME	:22:02:00	22:32:00	30	(min)	Purpose code:	1
LOG	:8571.20	8272.90	1.70		Area code :	3
FDEPTH:	5	5			GearCond.code:	
BDEPTH:	121	111			Validity code:	4

Towing dir: 96° Wire out: 160 m Speed: 34 kn*10

Sorted: Kg Total catch: 487.70 CATCH/HOUR: 975.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	708.80	2128	72.67	2449
Trachurus trecae	250.60	980	25.69	2450
Trichiurus lepturus	12.60	70	1.29	
MYCTOPHIDAE	3.58	1184	0.37	
Total	975.58		100.02	

PROJECT STATION:1094

DATE:24/ 8/96 GEAR TYPE: PT No:7 POSITION:Lat S 830

	start	stop	duration			Long E 1319
TIME	:00:20:00	00:50:00	30	(min)	Purpose code:	1
LOG	:8588.90	8590.60	1.70		Area code :	3
FDEPTH:	0	0			GearCond.code:	
BDEPTH:	25	32			Validity code:	4

Towing dir: 220° Wire out: 160 m Speed: 39 kn*10

Sorted: Kg Total catch: 771.80 CATCH/HOUR: 1543.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	881.20	9824	57.09	
Sardinella maderensis	467.50	2036	30.29	2451
Trachurus trecae	82.00	936	5.31	2453
Sardinella aurita	72.00	1034	4.66	2452
Pomadasys jubelini	14.20	34	0.92	
Sepia orbignyana	8.14	12	0.53	
Sphyraena guachancho	7.70	44	0.50	
Hemicaranx bicolor	4.96	22	0.32	
Trichiurus lepturus	4.60	34	0.30	
Trachurus trecae, juvenile	1.40	78	0.09	
Total	1543.70		100.01	

PROJECT STATION:1095

DATE:24/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 834

	start	stop	duration			Long E 1308
TIME	:02:14:00	02:44:00	30	(min)	Purpose code:	1
LOG	:8601.40	8603.20	1.80		Area code :	3
FDEPTH:	5	5			GearCond.code:	
BDEPTH:	88	98			Validity code:	4

Towing dir: 260° Wire out: 160 m Speed: 37 kn*10

Sorted: Kg Total catch: 25.10 CATCH/HOUR: 50.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	20.70	52	41.24	2454
Synagrops microlepis	17.26	11168	34.38	
Sarda sarda	4.64	2	9.24	
Trachinotus ovatus	4.10	12	8.17	
Trichiurus lepturus	2.80	24	5.58	
Saurida brasiliensis	0.62	54	1.24	
Total	50.12		99.85	

PROJECT STATION:1096

DATE:24/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 839

	start	stop	duration			Long E 1258
TIME	:04:14:00	04:44:00	30	(min)	Purpose code:	1
LOG	:8613.10	8614.70	1.60		Area code :	3
FDEPTH:	5	5			GearCond.code:	
BDEPTH:	253	290			Validity code:	4

Towing dir: 230° Wire out: 160 m Speed: 34 kn*10

Sorted: Kg Total catch: 147.70 CATCH/HOUR: 295.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	109.40	356	37.03	2456
Mola mola	60.00	2	20.31	
Trichiurus lepturus	34.70	368	11.75	
Trachurus trecae	32.40	74	10.97	2757
Euthynnus alletteratus	27.30	44	9.24	
MYCTOPHIDAE	15.60	5814	5.28	
Scomber japonicus	8.30	4	2.81	
Sardinella aurita	3.94	10	1.33	2455
Trachinotus ovatus	1.88	6	0.64	
Scomber japonicus	1.30	2	0.44	
Paralepis sp.	0.38	20	0.13	
Echeneis naucrates	0.30	4	0.10	
Total	295.50		100.03	

PROJECT STATION:1097

DATE:24/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 841

	start	stop	duration			Long E 1249
TIME	:06:37:00	07:07:00	30	(min)	Purpose code:	1
LOG	:8624.60	8626.50	1.90		Area code :	3
FDEPTH:	5	5			GearCond.code:	
BDEPTH:	641	525			Validity code:	4

Towing dir: 96° Wire out: 160 m Speed: 38 kn*10

Sorted: Kg Total catch: 46.42 CATCH/HOUR: 92.84

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	67.00	206	72.17	2459
Sardinella aurita	25.00	58	26.93	2458
Trichiurus lepturus	0.72	2	0.78	
Sepia sp.	0.12	6	0.13	
Total	92.84		100.01	

PROJECT STATION:1098

DATE:25/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 844

	start	stop	duration			Long E 1310
TIME	:15:57:00	16:27:00	30	(min)	Purpose code:	1
LOG	:8677.10	8679.00	1.90		Area code :	2
FDEPTH:	0	0			GearCond.code:	
BDEPTH:	77	77			Validity code:	4

Towing dir: ° Wire out: 180 m Speed: 39 kn*10

Sorted: 26 Kg Total catch: 26.23 CATCH/HOUR: 52.46

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	23.00	76	43.84	2461
Sardinella maderensis	22.50	64	42.89	2460
Decapterus rhonchus	4.58	8	8.73	
Trachinotus ovatus	1.78	6	3.39	
Sepiella ornata	0.60	16	1.14	
Total	52.46		99.99	

PROJECT STATION:1099

DATE:25/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 844

	start	stop	duration			Long E 1247
TIME	:19:10:00	19:40:00	30	(min)	Purpose code:	1
LOG	:8709.80	8706.60	3.20		Area code :	2
FDEPTH:	0	0			GearCond.code:	
BDEPTH:	680	656			Validity code:	4

Towing dir: 190° Wire out: 160 m Speed: 36 kn*10

Sorted: Kg Total catch: 225.70 CATCH/HOUR: 451.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Alopias superciliosus	140.00	2	31.01	
Sardinella aurita	135.20	322	29.95	2465
Sardinella maderensis	63.80	190	14.13	2464
Trichiurus lepturus	55.20	856	12.23	
Trachinotus ovatus	35.40	100	7.84	2462
Trachurus trecae	8.20	18	1.82	2463
MYCTOPHIDAE	7.80	2710	1.73	
Euthynnus alletteratus	4.80	6	1.06	
Mugil sp.	0.40	2	0.09	
Taractichthys longipinnis	0.20	2	0.04	
Sepiella ornata	0.20	26	0.04	
Taractes asper	0.12	2	0.03	
Total	451.32		99.97	

PROJECT STATION:1100

DATE:25/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 843

	start	stop	duration			Long E 1231
TIME	:21:31:00	22:01:00	30	(min)	Purpose code:	1
LOG	: 872.80	8723.60	0.80		Area code :	2
FDEPTH:	0	0			GearCond.code:	
BDEPTH:	1205	1266			Validity code:	4

Towing dir: 280° Wire out: 160 m Speed: 36 kn*10

Sorted: 97 Kg Total catch: 96.99 CATCH/HOUR: 193.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	123.40	316	63.61	2468
Sardinella maderensis	37.50	184	19.33	2467
Trachinotus ovatus	22.80	60	11.75	2466
Auxis thazard	3.50	8	1.80	
Euthynnus alletteratus	2.18	2	1.12	
Trichiurus lepturus	1.90	26	0.98	
MYCTOPHIDAE	1.20	162	0.62	
Ariomma bondi	0.72	38	0.37	
Cubiceps sp.	0.30	6	0.15	
Nealotus tripes	0.30	18	0.15	
Ornithoteuthis antillarum	0.16	14	0.08	
Fistularia petimba	0.02	2	0.01	
Total	193.98		99.97	

PROJECT STATION:1101

DATE:26/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 853

	start	stop	duration			Long E 1302
TIME	:02:55:00	03:25:00	30	(min)	Purpose code:	1
LOG	:8769.80	8771.60	1.80		Area code :	2
FDEPTH:	0	0			GearCond.code:	
BDEPTH:	128	181			Validity code:	4

Towing dir: 295° Wire out: 160 m Speed: 33 kn*10

Sorted: 83 Kg Total catch: 83.91 CATCH/HOUR: 167.82

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	77.50	600	46.18	2469
Sardinella maderensis	54.50	162	32.48	2470
Trichiurus lepturus	15.00	142	8.94	
Trachinotus ovatus	11.46	32	6.83	2471
Sardinella aurita	3.58	8	2.13	2472
Sarda sarda	2.84	2	1.69	
Mugil sp.	1.78	2	1.06	
Selene dorsalis	0.68	2	0.41	
OMMASTREPHIDAE	0.24	6	0.14	
Synagrops microlepis	0.12	24	0.07	
Saurida brasiliensis	0.12	44	0.07	
Total	167.82		100.00	

PROJECT STATION:1102

DATE:26/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 906
start stop duration Long E 1254
TIME :06:56:00 07:26:00 30 (min) Purpose code: 1
LOG :8805.70 8807.60 1.90 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 51 57 Validity code: 4
Towing dir: 256° Wire out: 150 m Speed: 38 kn*10

Sorted: 109 Kg Total catch: 109.72 CATCH/HOUR: 219.44

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis	102.00	338	46.48	2474
Sardinella maderensis	50.50	172	23.01	2475
Trachurus trecae	14.78	30	6.74	2473
Trachinotus ovatus	10.02	28	4.57	
Sphyraena sphyraena	9.50	26	4.33	
Trichiurus lepturus	7.50	22	3.42	
Caranx crysos	6.06	6	2.76	
Sarda sarda	5.98	2	2.73	
Stromateus fiatola	3.72	4	1.70	
Euthynnus alletteratus	3.48	6	1.59	
Decapterus rhonchus	3.20	6	1.46	
Sphyraena guachancho	1.38	2	0.63	
Mugil sp.	0.82	4	0.37	
Chloroscombrus chrysurus	0.50	2	0.23	
J E L L Y F I S H	0.00	2952		
Total	219.44		100.02	

PROJECT STATION:1103

DATE:26/ 8/96 GEAR TYPE: PT No:1 POSITION:Lat S 907
start stop duration Long E 1249
TIME :08:30:00 09:00:00 30 (min) Purpose code: 1
LOG :8815.00 8816.40 1.40 Area code : 2
FDEPTH: 25 25 GearCond.code:
BDEPTH: 87 110 Validity code: 4
Towing dir: 9° Wire out: 180 m Speed: 28 kn*10

Sorted: 5 Kg Total catch: 5.31 CATCH/HOUR: 10.62

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	5.96	4	56.12	
Trachinotus ovatus	2.10	4	19.77	
Euthynnus alletteratus	1.80	2	16.95	
Sardinella maderensis	0.76	2	7.16	
Total	10.62		100.00	

PROJECT STATION:1104

DATE:26/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 913
start stop duration Long E 1229
TIME :12:47:00 13:17:00 30 (min) Purpose code: 1
LOG :8844.70 8846.50 1.80 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 898 774 Validity code: 4
Towing dir: 88° Wire out: 170 m Speed: 36 kn*10

Sorted: Kg Total catch: 0.30 CATCH/HOUR: 0.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Selene dorsalis, juveniles	0.40	24	66.67	
Peristedion cataphractum	0.10	4	16.67	
Schedophilus sp.	0.06	2	10.00	
Trachurus trecae	0.02	8	3.33	
CHAETODONTIDAE	0.02	2	3.33	
Total	0.60		100.00	

PROJECT STATION:1105

DATE:26/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 912
start stop duration Long E 1247
TIME :16:07:00 16:37:00 30 (min) Purpose code: 1
LOG :8862.70 8864.60 1.90 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 108 95 Validity code: 4
Towing dir: 88° Wire out: 170 m Speed: 34 kn*10

Sorted: 60 Kg Total catch: 60.41 CATCH/HOUR: 120.82

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachinotus ovatus	112.70	296	93.28	2476
Sardinella maderensis	5.20	16	4.30	2477
Sardinella aurita	1.88	4	1.56	
Euthynnus alletteratus	0.62	2	0.51	
Sepiella ornata	0.20	4	0.17	
Lagocephalus laevigatus	0.18	4	0.15	
Sphoeroides sp.	0.04	2	0.03	
Total	120.82		100.00	

PROJECT STATION:1106

DATE:26/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 914
start stop duration Long E 1252
TIME :18:29:00 18:59:00 30 (min) Purpose code: 1
LOG :8877.20 8878.70 1.50 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 64 82 Validity code: 4
Towing dir: 234° Wire out: 150 m Speed: 30 kn*10

Sorted: 202 Kg Total catch: 202.50 CATCH/HOUR: 405.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	270.80	518	66.86	2482
Trachurus trecae	45.40	116	11.21	2479
Trachinotus ovatus	37.00	96	9.14	2478
Selene dorsalis	26.20	78	6.47	2481
Sardinella aurita	6.80	22	1.68	2480
Trichiurus lepturus	6.60	44	1.63	
Sphyraena sphyraena	3.40	14	0.84	
Alloteuthis africana	3.40	1152	0.84	
Sphyraena guachancho	3.20	4	0.79	
Sepia officinalis hierredda	2.20	2	0.54	
Sepiella ornata	0.08	2	0.02	
Total	405.08		100.02	

PROJECT STATION:1107

DATE:26/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 923
start stop duration Long E 1240
TIME :20:50:00 21:20:00 30 (min) Purpose code: 1
LOG :8893.90 8895.50 1.60 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 305 315 Validity code: 4
Towing dir: 185° Wire out: 150 m Speed: 32 kn*10

Sorted: 145 Kg Total catch: 14.50 CATCH/HOUR: 29.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	26.70	15504	92.07	
Trachurus trecae	1.10	2	3.79	
Selene dorsalis	0.64	2	2.21	
Illex coindetii	0.26	34	0.90	
Todaropsis eblanae	0.08	16	0.28	
Selene dorsalis, juveniles	0.08	26	0.28	
Alloteuthis africana	0.06	6	0.21	
TREMOCTOPODIDAE	0.04	4	0.14	
Paralepis sp.	0.04	2	0.14	
J E L L Y F I S H	0.00	40		
Total	29.00		100.02	

PROJECT STATION:1108

DATE:27/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 928
start stop duration Long E 1303
TIME :00:19:00 00:49:00 30 (min) Purpose code: 1
LOG :8924.30 8926.00 1.70 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 30 41 Validity code: 4
Towing dir: 245° Wire out: 170 m Speed: 30 kn*10

Sorted: 321 Kg Total catch: 585.80 CATCH/HOUR: 1171.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lutjanus agennes	386.40	42	32.98	
Selene dorsalis	258.70	846	22.08	2483
Stromateus fiatola	203.12	222	17.34	2486
Brachydeuterus auritus	131.30	1098	11.21	
Sphyraena guachancho	78.66	66	6.71	2485
Trachurus trecae	21.98	52	1.88	2484
Sphyraena afra	20.10	2	1.72	
Lutjanus fulgens	12.80	20	1.09	
Galeoides decadactylus	11.06	20	0.94	
Sardinella maderensis	9.04	26	0.77	
Trichiurus lepturus	8.78	26	0.75	
Scomberomorus tritor	7.34	6	0.63	
Caranx senegallus	7.02	6	0.60	
Pagellus bellottii	6.38	14	0.54	
Caranx crysos	4.04	6	0.34	
Lithognathus mormyrus	3.06	6	0.26	
Chloroscombrus chrysurus	1.30	6	0.11	
Pteroscion peli	0.52	6	0.04	
Total	1171.60		99.99	

PROJECT STATION:1109

DATE:27/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 934
start stop duration Long E 1251
TIME :02:21:00 02:51:00 30 (min) Purpose code: 1
LOG :8937.70 8939.50 1.80 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 115 126 Validity code: 4
Towing dir: 248° Wire out: 170 m Speed: 33 kn*10

Sorted: 50 Kg Total catch: 50.94 CATCH/HOUR: 101.88

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	28.00	82	27.48	2488
Trichiurus lepturus	24.50	116	24.05	
Trachinotus ovatus	19.00	56	18.65	
Sardinella maderensis	8.70	30	8.54	2487
Sarda sarda	7.88	4	7.73	
Sepia sp.	4.60	6	4.52	
Sphyraena sphyraena	3.08	8	3.02	
Sphyraena guachancho	2.58	2	2.53	
Brachydeuterus auritus	1.90	16	1.86	
Selene dorsalis	1.64	4	1.61	
Total	101.88		99.99	

PROJECT STATION:1110

DATE:27/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 943
start stop duration Long E 1306
TIME :07:15:00 07:45:00 30 (min) Purpose code: 1
LOG :8981.90 8984.20 2.10 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 45 51 Validity code: 4
Towing dir: 165° Wire out: 160 m Speed: 42 kn*10

Sorted: 151 Kg Total catch: 390.94 CATCH/HOUR: 781.88

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	489.60	1826	62.62	2492
Decapterus rhonchus	123.90	210	15.85	2490
Selene dorsalis	80.10	228	10.24	2489
Sardinella maderensis	61.30	204	7.84	2491
Stromateus fiatola	8.76	12	1.12	
Spondyliosoma cantharus	7.44	6	0.95	
Euthynnus alletteratus	2.70	6	0.35	
Sphyraena sphyraena	2.46	6	0.31	
Sarpa salpa	2.16	6	0.28	
Trachinotus ovatus	1.86	6	0.24	
Sardinella aurita	1.60	4	0.20	
Total	781.88		100.00	

PROJECT STATION:1111

DATE:27/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 952
start stop duration Long E 1303
TIME :11:59:00 12:29:00 30 (min) Purpose code: 1
LOG :9023.50 9025.10 1.60 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 81 73 Validity code: 4
Towing dir: 93° Wire out: 170 m Speed: 28 kn*10

Sorted: 98 Kg Total catch: 98.84 CATCH/HOUR: 197.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	181.30	690	91.71	2494
Sardinella aurita	9.08	22	4.59	2493
Trachinotus ovatus	4.94	14	2.50	
Lagocephalus laevigatus	2.00	4	1.01	
Sepiella ornata	0.26	10	0.13	
Echeneis naucrates	0.10	2	0.05	
Total	197.68		99.99	

PROJECT STATION:1112

DATE:27/ 8/96 GEAR TYPE: PT No:7 POSITION:Lat S 955
start stop duration Long E 1313
TIME :14:25:00 14:55:00 30 (min) Purpose code: 1
LOG :9041.10 9042.50 1.40 Area code : 2
FDEPTH: 24 24 GearCond.code:
BDEPTH: 24 24 Validity code: 4
Towing dir: 360° Wire out: 150 m Speed: 25 kn*10

Sorted: 67 Kg Total catch: 234.40 CATCH/HOUR: 468.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pseudotolithus senegalensis	207.00	224	44.16	
Brachydeuterus auritus	77.00	1430	16.42	
Pteroscion peli	73.40	1962	15.66	
Trachurus trecae	23.10	74	4.93	2495
Galeoides decadactylus	18.40	108	3.92	
Sardinella maderensis	15.00	56	3.20	2496
Decapterus rhonchus	12.80	18	2.73	
Ilisha africana	10.60	152	2.26	
Plectorhinchus mediterraneus	8.00	8	1.71	
Parapenaeopsis atlantica	4.58	972	0.98	
Trichiurus lepturus	3.80	116	0.81	
Cynoglossus browni	3.80	8	0.81	
Selene dorsalis	3.80	8	0.81	
Chloroscombrus chrysurus	3.60	28	0.77	
Pentanemus quinquarius	2.80	72	0.60	
Drepane africana	0.44	8	0.09	
Sepia elegans	0.36	8	0.08	
Stromateus fiatola	0.26	8	0.06	
Total	468.74		100.00	

PROJECT STATION:1113

DATE:27/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 1004
start stop duration Long E 1302
TIME :18:09:00 18:39:00 30 (min) Purpose code: 1
LOG :9075.60 9077.10 1.50 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 96 92 Validity code: 4
Towing dir: 92° Wire out: 160 m Speed: 30 kn*10

Sorted: 60 Kg Total catch: 60.39 CATCH/HOUR: 120.78

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	72.20	528	59.78	2498
Trichiurus lepturus	23.60	70	19.54	
Auxis thazard	23.30	82	19.29	2497
Illex coindetii	1.48	224	1.23	
Sepiella ornata	0.16	4	0.13	
Saurida brasiliensis	0.04	4	0.03	
J E L L Y F I S H	0.00	240		
Total	120.78		100.00	

PROJECT STATION:1114

DATE:27/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 1018
start stop duration Long E 1259
TIME :22:43:00 22:56:00 13 (min) Purpose code: 1
LOG :9116.70 9117.50 0.80 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 240 260 Validity code: 4
Towing dir: 160° Wire out: 160 m Speed: 30 kn*10

Sorted: 64 Kg Total catch: 64.19 CATCH/HOUR: 296.26

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyrna lewini	161.54	5	54.53	
MYCTOPHIDAE	127.62	140377	43.08	
Trachurus trecae	5.82	42	1.96	2499
Auxis thazard	1.20	5	0.41	
Paralepis sp.	0.09	5	0.03	
Total	296.27		100.01	

PROJECT STATION:1115

DATE:28/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 1017
start stop duration Long E 1322
TIME :01:35:00 02:05:00 30 (min) Purpose code: 1
LOG :9142.50 9144.10 1.60 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 49 58 Validity code: 4
Towing dir: 270° Wire out: 160 m Speed: 31 kn*10

Sorted: 122 Kg Total catch: 734.52 CATCH/HOUR: 1469.04

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	721.80	3014	49.13	2501
Brachydeuterus auritus	705.60	5630	48.03	2500
Selene dorsalis	21.24	48	1.45	
Trichiurus lepturus	19.08	228	1.30	
Sepiella ornata	0.72	12	0.05	
Pteroscion peli	0.48	12	0.03	
Selene dorsalis, juveniles	0.12	24	0.01	
Total	1469.04		100.00	

PROJECT STATION:1116

DATE:29/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 1028
start stop duration Long E 1324
TIME :07:22:00 07:53:00 31 (min) Purpose code: 1
LOG :9447.50 9449.30 1.80 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 69 52 Validity code: 4
Towing dir: 83° Wire out: 160 m Speed: 36 kn*10

Sorted: 89 Kg Total catch: 89.94 CATCH/HOUR: 174.08

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachinotus ovatus	165.87	681	95.28	2502
Euthynnus alletteratus	4.12	4	2.37	
Sardinella maderensis	2.38	8	1.37	
Lagocephalus laevigatus	1.59	14	0.91	
Sepiella ornata	0.12	4	0.07	
Total	174.08		100.00	

PROJECT STATION:1117

DATE:29/ 8/96 GEAR TYPE: PT No:1 POSITION:Lat S 1027
start stop duration Long E 1325
TIME :08:25:00 08:55:00 30 (min) Purpose code: 1
LOG :9450.80 9452.60 1.80 Area code : 2
FDEPTH: 30 35 GearCond.code:
BDEPTH: 57 72 Validity code: 4
Towing dir: 260° Wire out: 180 m Speed: 36 kn*10

Sorted: 72 Kg Total catch: 352.28 CATCH/HOUR: 704.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	684.20	2874	97.11	2503
Brachydeuterus auritus	14.00	96	1.99	
Selene dorsalis	4.50	10	0.64	
Sepia orbignyana	1.86	2	0.26	
Total	704.56		100.00	

PROJECT STATION:1118

DATE:29/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 1039
start stop duration Long E 1329
TIME :17:54:00 18:24:00 30 (min) Purpose code: 1
LOG :9528.30 9530.00 1.70 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 90 81 Validity code: 4
Towing dir: 81° Wire out: 160 m Speed: 34 kn*10

Sorted: 133 Kg Total catch: 303.94 CATCH/HOUR: 607.88

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	288.60	1788	47.48	2504
Trachurus trecae	134.70	1354	22.16	2506
Isurus oxyrinchus	90.00	6	14.81	
Trachinotus ovatus	49.44	222	8.13	2505
Trichiurus lepturus	27.30	210	4.49	
Sepia sp.	7.98	96	1.31	
Euthynnus alletteratus	7.46	6	1.23	
Uraspis secunda	2.40	6	0.39	
Total	607.88		100.00	

PROJECT STATION:1119

DATE:29/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 1038
start stop duration Long E 1336
TIME :19:34:00 20:04:00 30 (min) Purpose code: 1
LOG :9538.00 9539.80 1.80 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 46 53 Validity code: 4
Towing dir: 260° Wire out: 160 m Speed: 36 kn*10

Sorted: 127 Kg Total catch: 624.60 CATCH/HOUR: 1249.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	561.60	3906	44.96	2509
Sardinella maderensis	427.00	1502	34.18	2508
Trachurus trecae	206.60	602	16.54	2507
Sardinella aurita	29.60	350	2.37	2510
Trichiurus lepturus	17.60	296	1.41	
Stromateus fiatola	6.80	10	0.54	
Total	1249.20		100.00	

PROJECT STATION:1120

DATE:29/ 8/96 GEAR TYPE: PT No:2 POSITION:Lat S 1051
start stop duration Long E 1325
TIME :23:27:00 23:57:00 30 (min) Purpose code: 1
LOG :9570.90 9572.80 1.90 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 265 180 Validity code: 4
Towing dir: 90° Wire out: 160 m Speed: 32 kn*10

Sorted: 4 Kg Total catch: 4.04 CATCH/HOUR: 8.08

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	6.90	5750	85.40	
Octopus sp.	0.96	8	11.88	
Sphoeroides sp.	0.12	4	1.49	
Sepia sp.	0.04	2	0.50	
Paralepis sp.	0.04	2	0.50	
Selene dorsalis, juveniles	0.02	4	0.25	
Total	8.08		100.02	

DATE:30/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1121
start stop duration POSITION:Lat S 1053
Long E 1342
TIME :03:01:00 03:31:00 30 (min) Purpose code: 1
LOG :9599.20 9600.10 0.90 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 52 63 Validity code: 4
Towing dir: 239° Wire out: 170 m Speed: 34 kn*10

Sorted: 134 Kg Total catch: 3134.69 CATCH/HOUR: 6269.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	4849.46	40490	77.35	2511
Trachurus trecae	809.80	3584	12.92	2512
Sardinella maderensis	402.58	1350	6.42	2513
Pomadasys jubelini	107.04	94	1.71	
Selene dorsalis	37.70	94	0.60	
Trichiurus lepturus	35.84	1024	0.57	
Sardinella aurita	13.50	46	0.22	
Sphyraena sphyraena	12.56	46	0.20	
Total	6268.48		99.99	

DATE:30/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1122
start stop duration POSITION:Lat S 1104
Long E 1347
TIME :07:25:00 07:55:00 30 (min) Purpose code: 1
LOG :5638.80 5640.80 2.00 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 48 57 Validity code: 4
Towing dir: 243° Wire out: 160 m Speed: 40 kn*10

Sorted: 148 Kg Total catch: 3177.57 CATCH/HOUR: 6355.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	6072.00	18422	95.54	2515
Sardinella aurita	215.74	506	3.39	2514
Trachurus trecae	32.66	92	0.51	
Sarda sarda	21.40	12	0.34	
Trachinotus ovatus	13.34	46	0.21	
Total	6355.14		99.99	

DATE:30/ 8/96 GEAR TYPE: PT No:1 PROJECT STATION:1123
start stop duration POSITION:Lat S 1104
Long E 1347
TIME :09:10:00 09:35:00 25 (min) Purpose code: 1
LOG :9648.20 9650.10 1.90 Area code : 2
FDEPTH: 20 20 GearCond.code:
BDEPTH: 49 52 Validity code: 4
Towing dir: 180° Wire out: 150 m Speed: 40 kn*10

Sorted: 137 Kg Total catch: 684.00 CATCH/HOUR: 1641.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	973.20	3029	59.28	2516
Trachurus trecae	390.60	1116	23.79	2517
Brachydeuterus auritus	239.40	2244	14.58	
Selene dorsalis	26.40	60	1.61	
Trichiurus lepturus	7.56	132	0.46	
Trachinotus ovatus	3.84	12	0.23	
Sepiella ornata	0.60	12	0.04	
Total	1641.60		99.99	

DATE:30/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1124
start stop duration POSITION:Lat S 1117
Long E 1339
TIME :13:45:00 14:15:00 30 (min) Purpose code: 1
LOG :9690.30 9692.20 1.90 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 34 34 Validity code: 4
Towing dir: 190° Wire out: 180 m Speed: 36 kn*10

Sorted: 122 Kg Total catch: 122.18 CATCH/HOUR: 244.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	82.40	280	33.72	2521
Sardinella maderensis	44.00	134	18.01	2522
Brachydeuterus auritus	38.10	982	15.59	2519
Decapterus rhonchus	37.80	132	15.47	2520
Selene dorsalis	15.32	36	6.27	2518
Sphyraena sphyraena	8.62	44	3.53	
Trichiurus lepturus	8.56	20	3.50	
Trachinotus ovatus	4.70	24	1.92	
Sepia sp.	2.54	2	1.04	
Lagocephalus laevigatus	1.68	4	0.69	
Pagellus bellottii	0.58	4	0.24	
Fistularia petimba	0.06	4	0.02	
Total	244.36		100.00	

DATE:30/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1125
start stop duration POSITION:Lat S 1130
Long E 1339
TIME :17:48:00 18:03:00 15 (min) Purpose code: 1
LOG :9727.10 9727.90 0.80 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 39 37 Validity code: 4
Towing dir: 60° Wire out: 160 m Speed: 32 kn*10

Sorted: 134 Kg Total catch: 404.31 CATCH/HOUR: 1617.24

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	1129.20	3440	69.82	2524
Trachurus trecae	283.80	860	17.55	2523
Brachydeuterus auritus	49.80	552	3.08	
Stromateus fiatola	29.40	36	1.82	
Pomatomus saltatrix	25.56	24	1.58	
Sarda sarda	24.72	12	1.53	
Selene dorsalis	22.80	60	1.41	
Sphyraena guachancho	22.56	24	1.39	
Trichiurus lepturus	10.08	108	0.62	
Rhizoprionodon acutus	9.48	12	0.59	
Sardinella aurita	5.04	12	0.31	
Trachinotus ovatus	4.80	12	0.30	
Total	1617.24		100.00	

DATE:30/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1126
start stop duration POSITION:Lat S 1138
Long E 1327
TIME :21:00:00 21:30:00 30 (min) Purpose code: 1
LOG :9757.10 9758.60 1.50 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 126 119 Validity code: 4
Towing dir: 104° Wire out: 160 m Speed: 30 kn*10

Sorted: 26 Kg Total catch: 26.71 CATCH/HOUR: 53.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	42.20	878	79.00	2525
Trichiurus lepturus	6.54	22	12.24	
MYCTOPHIDAE	3.10	950	5.80	
Saurida brasiliensis	0.70	124	1.31	
Illex coindetii	0.54	26	1.01	
Todaropsis eblanae	0.32	32	0.60	
Scomber japonicus	0.02	2	0.04	
Total	53.42		100.00	

DATE:31/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1127
start stop duration POSITION:Lat S 1151
Long E 1334
TIME :02:15:00 02:45:00 30 (min) Purpose code: 1
LOG :9804.40 9806.00 1.60 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 108 101 Validity code: 4
Towing dir: 106° Wire out: 170 m Speed: 34 kn*10

Sorted: 13 Kg Total catch: 13.32 CATCH/HOUR: 26.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Isurus oxyrinchus	19.10	2	71.70	
Sarda sarda	3.36	4	12.61	
Trachurus trecae	2.42	70	9.08	2526
Euthynnus alletteratus	1.46	4	5.48	
Illex coindetii	0.28	16	1.05	
Todaropsis eblanae	0.02	2	0.08	
J E L L Y F I S H	0.00	600		
Total	26.64		100.00	

DATE:31/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1128
start stop duration POSITION:Lat S 1154
Long E 1341
TIME :03:44:00 04:04:00 20 (min) Purpose code: 1
LOG :9812.90 9814.10 1.20 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 58 68 Validity code: 4
Towing dir: 288° Wire out: 170 m Speed: 37 kn*10

Sorted: 135 Kg Total catch: 746.81 CATCH/HOUR: 2240.43

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	1474.29	5859	65.80	2528
Trachurus trecae	670.74	2694	29.94	2529
Euthynnus alletteratus	38.28	66	1.71	
Sardinella aurita	34.50	117	1.54	2527
Brachydeuterus auritus	10.56	66	0.47	
Trichiurus lepturus	6.60	249	0.29	
Sphyraena sphyraena	5.28	18	0.24	
Todaropsis eblanae	0.18	18	0.01	
Total	2240.43		100.00	

DATE:31/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1129
start stop duration POSITION:Lat S 1207
Long E 1338
TIME :08:27:00 08:58:00 31 (min) Purpose code: 1
LOG :9855.70 9857.40 1.70 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 39 37 Validity code: 4
Towing dir: 25° Wire out: 160 m Speed: 34 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	0.00	48		
Total				

DATE:31/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1130
start stop duration POSITION:Lat S 1206
Long E 1338
TIME :09:27:00 09:57:00 30 (min) Purpose code: 1
LOG :9858.60 9860.60 2.00 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 37 39 Validity code: 4
Towing dir: 206° Wire out: 160 m Speed: 40 kn*10

Sorted: 23 Kg Total catch: 23.62 CATCH/HOUR: 47.24

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	19.80	72	41.91	2531
Sardinella aurita	7.34	32	15.54	2530
Scomberomorus tritor	4.86	2	10.29	
Pomatomus saltatrix	4.30	6	9.10	
Sarda sarda	3.12	2	6.60	
Sphyraena sphyraena	2.60	10	5.50	
Mugil cephalus	1.98	2	4.19	
Trachurus trecae	1.50	6	3.18	
Pomadasys jubelini	0.98	2	2.07	
Brachydeuterus auritus	0.62	4	1.31	
Trichiurus lepturus	0.12	2	0.25	
Engraulis encrasicolus	0.02	2	0.04	
Total	47.24		99.98	

DATE:31/ 8/96 GEAR TYPE: PT No:7 PROJECT STATION:1131
start stop duration POSITION:Lat S 1209
Long E 1327
TIME :11:41:00 12:11:00 30 (min) Purpose code: 1
LOG :9875.10 9876.60 1.50 Area code : 2
FDEPTH: 105 101 GearCond.code:
BDEPTH: 105 101 Validity code: 4
Towing dir: 90° Wire out: 420 m Speed: 28 kn*10

Sorted: 100 Kg Total catch: 671.30 CATCH/HOUR: 1342.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1009.60	6232	75.20	2532
Dentex macrophthalmus	215.80	1412	16.07	
Dentex angolensis	28.40	174	2.12	
Raja miraletus	18.00	28	1.34	
Branchiostegus semifasciatus	17.00	14	1.27	
Zeus faber	16.80	28	1.25	
Sphyraena sphyraena	16.20	28	1.21	
Chaetodon hoefleri	9.40	66	0.70	
Dentex barnardi	9.00	28	0.67	
Pagellus bellottii	2.00	28	0.15	
Lepidotrigla carolae	0.40	14	0.03	
Total	1342.60		100.01	

DATE:31/ 8/96 GEAR TYPE: PT No:2 PROJECT STATION:1132
start stop duration POSITION:Lat S 1207
Long E 1338
TIME :19:22:00 19:53:00 31 (min) Purpose code: 1
LOG :9930.20 9931.90 1.70 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 38 38 Validity code: 4
Towing dir: 22° Wire out: 160 m Speed: 34 kn*10

Sorted: 124 Kg Total catch: 303.46 CATCH/HOUR: 587.34

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	168.62	1136	28.71	2533
Sardinella maderensis	140.07	484	23.85	2535
Trachurus trecae	106.20	420	18.08	2534
Pomadasys jubelini	73.78	116	12.56	
Sphyraena guachancho	31.49	77	5.36	
Trichiurus lepturus	22.49	184	3.83	
Stromateus fiatola	10.55	10	1.80	
Pomatomus saltatrix	7.74	2	1.32	
Sepia officinalis hierredda	7.55	10	1.29	
Pomadasys incisus	7.45	48	1.27	
Spondyliosoma cantharus	4.10	4	0.70	
Trachinotus ovatus	2.36	4	0.40	
Sphyraena sphyraena	1.97	4	0.34	
Lithognathus mormyrus	1.94	4	0.33	
Pteroscion peli	0.68	4	0.12	
Penaeus notialis	0.19	4	0.03	
Sepiella ornata	0.15	4	0.03	
Total	587.33		100.02	

DATE: 1/ 9/96 GEAR TYPE: PT No:2 PROJECT STATION:1133
start stop duration POSITION:Lat S 1252
Long E 1253
TIME :03:45:00 04:15:00 30 (min) Purpose code: 1
LOG : 19.20 20.70 1.50 Area code : 1
FDEPTH: 5 5 GearCond.code:
BDEPTH: 76 258 Validity code: 4
Towing dir: 26° Wire out: 170 m Speed: 36 kn*10

Sorted: 71 Kg Total catch: 70.98 CATCH/HOUR: 141.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Alopias superciliosus	60.00	2	42.27	
Sphyrna lewini	42.00	6	29.59	
Trachurus trecae	31.90	528	22.47	2536
Sphyraena sphyraena	4.48	16	3.16	
Trichiurus lepturus	3.18	28	2.24	
MYCTOPHIDAE	0.16	96	0.11	
Lagocephalus laevigatus	0.16	2	0.11	
Sepiella ornata	0.08	2	0.06	
J E L L Y F I S H	0.00	40		
Total	141.96		100.01	

DATE: 2/ 9/96 GEAR TYPE: PT No:2 PROJECT STATION:1134
start stop duration POSITION:Lat S 1258
Long E 1251
TIME :00:00:00 00:30:00 30 (min) Purpose code: 1
LOG : 85.90 87.70 1.80 Area code : 1
FDEPTH: 10 10 GearCond.code:
BDEPTH: 83 60 Validity code: 4
Towing dir: 90° Wire out: 170 m Speed: 36 kn*10

Sorted: 138 Kg Total catch: 413.55 CATCH/HOUR: 827.10

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	804.30	4934	97.24	2537
Pomatomus saltatrix	8.40	12	1.02	
Sardinella maderensis	6.72	18	0.81	
Sphyraena guachancho	5.46	6	0.66	
Sphyraena sphyraena	1.74	6	0.21	
Trichiurus lepturus	0.48	12	0.06	
Total	827.10		100.00	

DATE: 2/ 9/96 GEAR TYPE: PT No:2 PROJECT STATION:1135
start stop duration POSITION:Lat S 1311
Long E 1240
TIME :04:26:00 04:41:00 15 (min) Purpose code: 1
LOG : 125.70 126.70 1.00 Area code : 1
FDEPTH: 0 0 GearCond.code:
BDEPTH: 195 111 Validity code: 4
Towing dir: 174° Wire out: 170 m Speed: 37 kn*10

Sorted: 214 Kg Total catch: 405.70 CATCH/HOUR: 1622.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1123.20	8944	69.21	2538
Alopias superciliosus	240.00	4	14.79	
Isurus oxyrinchus	130.00	8	8.01	
Sphyrna lewini	106.80	4	6.58	
Trichiurus lepturus	16.32	132	1.01	
MYCTOPHIDAE	6.48	2652	0.40	
Total	1622.80		100.00	

DATE: 2/ 9/96 GEAR TYPE: BT No:9 PROJECT STATION:1136
start stop duration POSITION:Lat S 1342
Long E 1230
TIME :10:38:00 10:45:00 7 (min) Purpose code: 1
LOG : 184.30 184.70 0.40 Area code : 1
FDEPTH: 109 109 GearCond.code:
BDEPTH: 109 109 Validity code: 4
Towing dir: 300° Wire out: 400 m Speed: 32 kn*10

Sorted: 93 Kg Total catch: 121.73 CATCH/HOUR: 1043.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	930.43	8983	89.17	2539
Dentex barnardi	31.71	51	3.04	
Dentex angolensis	24.69	77	2.37	
Anthias anthias	13.20	60	1.27	
Plectorhinchus mediterraneus	12.51	26	1.20	
Sparus pagrus africanus *	10.20	9	0.98	
Raja miraletus	6.43	9	0.62	
Pagellus bellottii	4.89	26	0.47	
Parapristipoma octolineatum	4.20	9	0.40	
Lepidotrigla cadmani	1.89	9	0.18	
Umbrina canariensis	1.71	9	0.16	
Chelidonichthys capensis	1.54	9	0.15	
Total	1043.40		100.01	

DATE: 2/ 9/96 GEAR TYPE: PT No:7 PROJECT STATION:1137
start stop duration POSITION:Lat S 1359
Long E 1216
TIME :15:05:00 15:35:00 30 (min) Purpose code: 1
LOG : 226.40 227.80 1.40 Area code : 1
FDEPTH: 134 121 GearCond.code:
BDEPTH: 134 121 Validity code: 4
Towing dir: 78° Wire out: 500 m Speed: 29 kn*10

Sorted: 97 Kg Total catch: 2720.50 CATCH/HOUR: 5441.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	3544.00	42504	65.14	2541
Trachurus capensis	1668.00	19208	30.66	2540
Dentex macrophthalmus	166.80	2464	3.07	
Atractoscion aequidens	62.20	56	1.14	
Total	5441.00		100.01	

DATE: 2/ 9/96 GEAR TYPE: PT No:2 PROJECT STATION:1138
start stop duration POSITION:Lat S 1416
Long E 1216
TIME :20:00:00 20:30:00 30 (min) Purpose code: 1
LOG : 271.80 273.50 1.70 Area code : 1
FDEPTH: 5 5 GearCond.code:
BDEPTH: 86 102 Validity code: 4
Towing dir: 316° Wire out: 160 m Speed: 34 kn*10

Sorted: 100 Kg Total catch: 832.40 CATCH/HOUR: 1664.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1020.00	5394	61.27	2542
Sardinella maderensis	592.60	1908	35.60	2543
Pomatomus saltatrix	31.60	32	1.90	
Trachurus capensis	6.98	32	0.42	
Sardinella aurita	6.30	32	0.38	
Sphyraena guachancho	4.32	16	0.26	
Alloteuthis africana	1.50	580	0.09	
MYCTOPHIDAE	1.50	698	0.09	
Total	1664.80		100.01	

DATE: 3/ 9/96 GEAR TYPE: PT No:2 PROJECT STATION:1139
start stop duration POSITION:Lat S 1502
Long E 1207
TIME :04:40:00 05:10:00 30 (min) Purpose code: 1
LOG : 356.50 358.20 1.70 Area code : 1
FDEPTH: 10 10 GearCond.code:
BDEPTH: 89 65 Validity code: 4
Towing dir: 60° Wire out: 160 m Speed: 34 kn*10

Sorted: Kg Total catch: 0.06 CATCH/HOUR: 0.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	0.12	2	100.00	
Total	0.12		100.00	

DATE: 3/ 9/96 GEAR TYPE: PT No:2 PROJECT STATION:1140
start stop duration POSITION:Lat S 1517
Long E 1201
TIME :08:46:00 09:16:00 30 (min) Purpose code: 1
LOG : 391.60 393.20 1.60 Area code : 1
FDEPTH: 5 5 GearCond.code:
BDEPTH: 40 44 Validity code: 4
Towing dir: 200° Wire out: 160 m Speed: 32 kn*10

Sorted: 30 Kg Total catch: 30.09 CATCH/HOUR: 60.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sphyrna lewini	60.00	2	99.70	
Sepiella ornata	0.18	4	0.30	
Total	60.18		100.00	

PROJECT STATION:1141

DATE: 3/ 9/96 GEAR TYPE: BT No:9 POSITION:Lat S 1530

	start	stop	duration			Long E 1153
TIME	:12:36:00	12:55:00	19	(min)	Purpose code:	1
LOG	: 424.80	425.50	0.70		Area code :	1
FDEPTH:	113	111			GearCond.code:	8
BDEPTH:	113	111			Validity code:	4

Towing dir: 316° Wire out: 480 m Speed: 32 kn*10

Sorted: 68 Kg Total catch: 68.02 CATCH/HOUR: 214.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Squalus mitsukurii	92.21	540	42.93	
Pagellus bellottii	44.05	341	20.51	
Myliobatis aquila	39.79	3	18.52	
Dentex angolensis	21.47	69	10.00	
Squatina squatina	5.68	6	2.64	
Zeus faber	3.82	9	1.78	
Dentex barnardi	3.13	9	1.46	
Raja miraletus	2.78	3	1.29	
Sparus pagrus africanus *	1.86	3	0.87	
Total	214.79		100.00	

PROJECT STATION:1142

DATE: 3/ 9/96 GEAR TYPE: PT No:2 POSITION:Lat S 1541

	start	stop	duration			Long E 1148
TIME	:16:16:00	16:46:00	30	(min)	Purpose code:	1
LOG	: 458.00	459.60	1.60		Area code :	1
FDEPTH:	0	0			GearCond.code:	
BDEPTH:	92	202			Validity code:	4

Towing dir: 115° Wire out: 170 m Speed: 28 kn*10

Sorted: 1 Kg Total catch: 0.49 CATCH/HOUR: 0.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Seriola lalandi	0.98	2	100.00	
Total	0.98		100.00	

PROJECT STATION:1143

DATE: 4/ 9/96 GEAR TYPE: BT No:9 POSITION:Lat S 1612

	start	stop	duration			Long E 1139
TIME	:07:55:00	08:15:00	20	(min)	Purpose code:	1
LOG	: 585.30	586.30	1.00		Area code :	1
FDEPTH:	61	58			GearCond.code:	
BDEPTH:	61	58			Validity code:	4

Towing dir: 60° Wire out: 210 m Speed: 30 kn*10

Sorted: 29 Kg Total catch: 730.00 CATCH/HOUR: 2190.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagellus bellottii	948.75	84225	43.32	2544
Trachurus trecae	821.25	38043	37.50	2545
Trachurus capensis	405.00	17901	18.49	2546
Alloteuthis africana	7.50	1125	0.34	
Umbrina canariensis	7.50	150	0.34	
J E L L Y F I S H	0.00	90		
Total	2190.00		99.99	

PROJECT STATION:1144

DATE: 4/ 9/96 GEAR TYPE: PT No:1 POSITION:Lat S 1619

	start	stop	duration			Long E 1138
TIME	:10:47:00	11:02:00	15	(min)	Purpose code:	1
LOG	: 609.80	610.70	0.90		Area code :	1
FDEPTH:	40	40			GearCond.code:	
BDEPTH:	76	79			Validity code:	4

Towing dir: 280° Wire out: 180 m Speed: 3 kn*10

Sorted: 792 Kg Total catch: 554.40 CATCH/HOUR: 2217.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Etrumeus whiteheadi	2122.40	56596	95.71	2547
Sardinops ocellatus	93.52	1220	4.22	2548
Sardinella aurita	1.68	28	0.08	
Total	2217.60		100.01	

PROJECT STATION:1145

DATE: 4/ 9/96 GEAR TYPE: PT No:7 POSITION:Lat S 1620

	start	stop	duration			Long E 1145
TIME	:12:18:00	12:38:00	20	(min)	Purpose code:	1
LOG	: 620.80	621.90	1.10		Area code :	1
FDEPTH:	20	38			GearCond.code:	
BDEPTH:	20	38			Validity code:	4

Towing dir: 285° Wire out: 150 m Speed: 31 kn*10

Sorted: 266 Kg Total catch: 3009.19 CATCH/HOUR: 9027.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	5542.65	230373	61.40	2549
Trachurus capensis	2983.20	240582	33.05	2550
Pagellus bellottii	491.55	35256	5.44	
Boops boops	10.17	339	0.11	
Total	9027.57		100.00	

PROJECT STATION:1146

DATE: 4/ 9/96 GEAR TYPE: PT No:7 POSITION:Lat S 1640

	start	stop	duration			Long E 1146
TIME	:19:54:00	20:14:00	20	(min)	Purpose code:	1
LOG	: 690.40	691.70	1.30		Area code :	1
FDEPTH:	5	5			GearCond.code:	
BDEPTH:	14	16			Validity code:	4

Towing dir: 345° Wire out: 120 m Speed: 35 kn*10

Sorted: 30 Kg Total catch: 60.04 CATCH/HOUR: 180.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	176.10	5700	97.77	2551
Sepia orbignyana	1.50	30	0.83	
Lithognathus mormyrus	1.02	48	0.57	
Trichiurus lepturus	0.48	12	0.27	
Atractoscion aequidens	0.42	12	0.23	
Pagellus bellottii	0.36	24	0.20	
Sepiella ornata	0.18	6	0.10	
Engraulis encrasicolus	0.06	6	0.03	
Total	180.12		100.00	

PROJECT STATION:1147

DATE: 5/ 9/96 GEAR TYPE: PT No:2 POSITION:Lat S 1638

	start	stop	duration			Long E 1128
TIME	:01:09:00	01:39:00	30	(min)	Purpose code:	1
LOG	: 738.50	740.40	1.90		Area code :	1
FDEPTH:	10	10			GearCond.code:	
BDEPTH:	116	120			Validity code:	4

Towing dir: 287° Wire out: 170 m Speed: 35 kn*10

Sorted: 75 Kg Total catch: 226.20 CATCH/HOUR: 452.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Etrumeus whiteheadi	406.68	18486	89.89	2552
Engraulis encrasicolus	45.72	2732	10.11	2553
Total	452.40		100.00	

PROJECT STATION:1148

DATE: 5/ 9/96 GEAR TYPE: PT No:1 POSITION:Lat S 1650

	start	stop	duration			Long E 1127
TIME	:07:28:00	07:58:00	30	(min)	Purpose code:	1
LOG	: 797.60	799.70	2.10		Area code :	1
FDEPTH:	40	60			GearCond.code:	
BDEPTH:	119	123			Validity code:	4

Towing dir: 288° Wire out: 190 m Speed: 42 kn*10

Sorted: 48 Kg Total catch: 48.38 CATCH/HOUR: 96.76

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Etrumeus whiteheadi	91.80	3802	94.87	2555
Engraulis encrasicolus	4.96	252	5.13	2554
J E L L Y F I S H	0.00	40		
Total	96.76		100.00	

PROJECT STATION:1149

DATE: 5/ 9/96 GEAR TYPE: BT No:9 POSITION:Lat S 1649

	start	stop	duration			Long E 1125
TIME	:08:39:00	08:49:00	10	(min)	Purpose code:	1
LOG	: 801.50	801.90	0.40		Area code :	1
FDEPTH:	124	126			GearCond.code:	
BDEPTH:	124	126			Validity code:	4

Towing dir: 106° Wire out: 400 m Speed: 30 kn*10

Sorted: 284 Kg Total catch: 170.46 CATCH/HOUR: 1022.76

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex macrophthalmus	586.80	6270	57.37	2557
Trachurus capensis	223.80	8028	21.88	2556
Merluccius capensis	28.08	72	2.75	
Galeichthys feliceps	25.20	72	2.46	
Trigla lyra	11.52	108	1.13	
Todaropsis eblanae	10.80	108	1.06	
Anthias anthias	6.12	36	0.60	
Umbrina canariensis	5.04	72	0.49	
Pagellus bellottii	5.04	36	0.49	
Citharus linguatula	0.36	36	0.04	
Total	902.76		88.27	

PROJECT STATION:1150

DATE: 5/ 9/96 GEAR TYPE: PT No:1 POSITION:Lat S 1654

	start	stop	duration			Long E 1137
TIME	:10:39:00	11:09:00	30	(min)	Purpose code:	1
LOG	: 816.80	818.70	1.90		Area code :	1
FDEPTH:	45	45			GearCond.code:	
BDEPTH:	77	74			Validity code:	4

Towing dir: 180° Wire out: 190 m Speed: 30 kn*10

Sorted: 27 Kg Total catch: 26.68 CATCH/HOUR: 53.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Etrumeus whiteheadi	51.80	2446	97.08	2559
Trachurus capensis	0.92	98	1.72	2558
Engraulis encrasicolus	0.64	36	1.20	
Total	53.36		100.00	

PROJECT STATION:1151

DATE: 5/ 9/96 GEAR TYPE: PT No:7 POSITION:Lat S 1658

	start	stop	duration			Long E 1125
TIME	:14:03:00	14:33:00	30	(min)	Purpose code:	1
LOG	: 845.40	846.80	1.40		Area code :	1
FDEPTH:	118	116			GearCond.code:	
BDEPTH:	118	116			Validity code:	4

Towing dir: 77° Wire out: 450 m Speed: 31 kn*10

Sorted: 314 Kg Total catch: 1069.64 CATCH/HOUR: 2139.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus capensis	1832.60	44220	85.66	2560
Dentex macrophthalmus	170.00	2244	7.95	
Sepia orbignyana	68.68	68	3.21	
Zeus faber	24.48	68	1.14	
Arius heudeloti	17.68	68	0.83	
Anthias anthias	10.88	136	0.51	
Serranus cabrilla	8.16	68	0.38	
Umbrina canariensis	6.80	68	0.32	
Total	2139.28		100.00	

PROJECT STATION:1152

DATE: 5/ 9/96 GEAR TYPE: PT No:2 POSITION:Lat S 1705

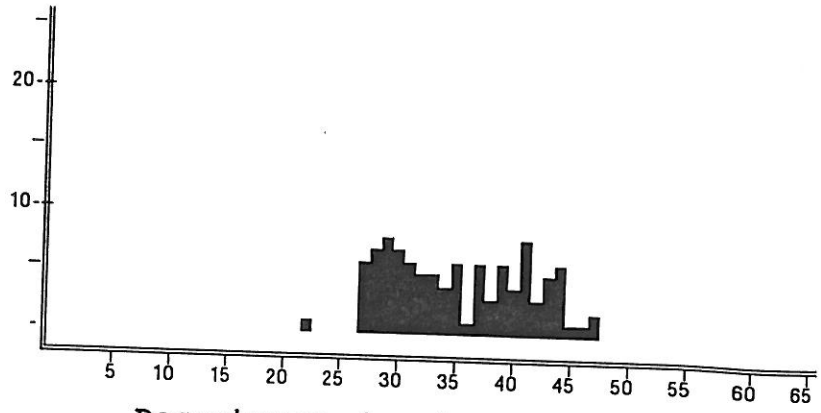
	start	stop	duration			Long E 1131
TIME	:17:02:00	17:32:00	30	(min)	Purpose code:	1
LOG	: 868.80	870.60	1.80		Area code :	1
FDEPTH:	10	10			GearCond.code:	
BDEPTH:	108	105			Validity code:	4

Towing dir: 2° Wire out: 170 m Speed: 36 kn*10

Sorted: 68 Kg Total catch: 610.92 CATCH/HOUR: 1221.84

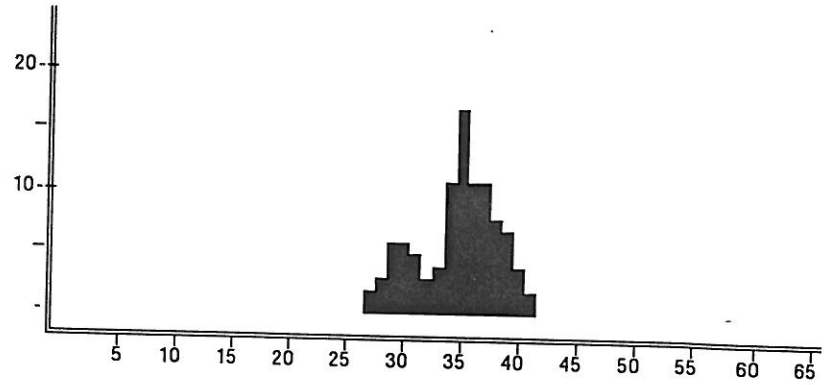
SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Etrumeus whiteheadi	1109.70	31312	90.82	2562
Sardinops ocellatus	111.60	1530	9.13	2561
Engraulis encrasicolus	0.54	36	0.04	
Total	1221.84		99.99	

Annex II. Length distributions of main species



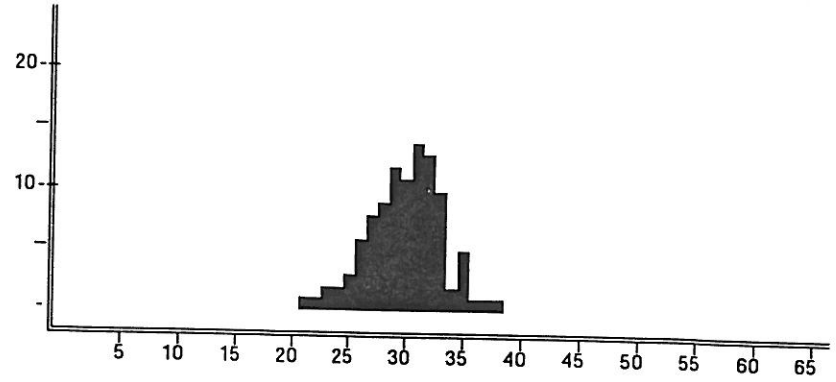
Decapterus rhonchus
Cabinda-Benguela
Pooled sample (simple adding).

MEAN LENGTH = 35.69cm N= 129
NUMBER OF SUBSAMPLES : 3



Trachinotus ovatus
Cabinda-Benguela
Pooled sample (simple adding).

MEAN LENGTH = 35.29cm N= 402
NUMBER OF SUBSAMPLES : 9



Selene dorsalis
Cabinda-Benguela
Pooled sample (simple adding).

MEAN LENGTH = 30.37cm N= 368
NUMBER OF SUBSAMPLES : 8

Annex III 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 where as follows:

Tranceiver-1 menu (38 kHz lowering keel)

Transducer depth	5.0 - 7.5m
Absorbtion coeff.	10 dB/km
Pulse length	medium (1ms)
Bandwidth	wide
Max power	2000 Watt
2-way beam angle	-21.0 dB
SV transducer gain	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". 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 innernett 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 equiped with a 12" rubber bobbins gear. The doors are of 'Thyborøn' combi type, 7.81 m^2, 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..