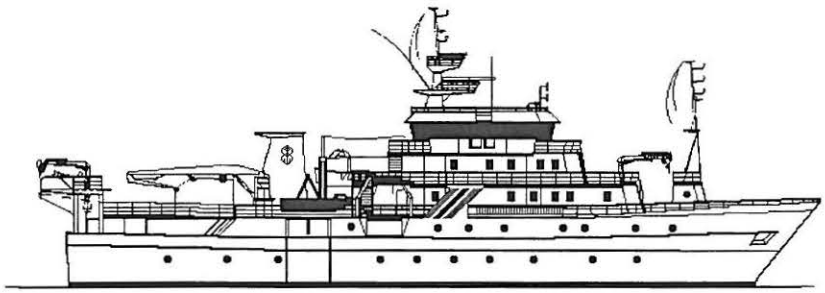

SURVEY OF THE PELAGIC FISH RESOURCES OFF NORTH WEST AFRICA

Part III

MOROCCO

18 May – 22 June 2002

Institut National de Recherche Halieutique
Casablanca, Maroc

Institute of Marine Research
Bergen, Norway

CRUISE REPORT "DR FRIDTJOF NANSEN"

SURVEY OF THE PELAGIC FISH RESOURCES NORTH WEST AFRICA

Part III

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by

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Bergen, 2002

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CHAPTER 1 INTRODUCTION

1.1 Survey objectives

The specific objectives for the survey in Morocco were:

- To map the distribution and estimate the biomass of the main small pelagic fish species using hydroacoustic methods. The species of interest were: sardine *Sardina pilchardus*, sardinellas *Sardinella aurita*, *S. maderensis*, chub mackerel *Scomber japonicus*, horse mackerel *Trachurus trachurus*, *T. trecae*, and anchovy *Engraulis encrasicolus*.
- To identify acoustic targets by midwater and bottom trawl sampling and process the catches by recording weight and number by species. For the target species, length frequencies are taken to describe the size distribution.
- As a pilot project: to collect otoliths of sardine and try to read these during the survey.
- To sample standard hydrographical transects for temperature, salinity and oxygen off Cape Blanc, Cape Barbas, Dakhla, Cape Bojador, Cape Juby, Cape Dra and Cape Ghir.

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

1.2 Participation

Members of the scientific teams were:

Institut National de Recherche Halieutique, Morocco:

Hassan MOUSTAHFID (team leader), Hamid CHFIRI, Mohamed ARAABAB Ahmed YOUSSOUFI and Rachid ZIANI

Institut Mauritanien de Recherches Océanographiques et des Pêches, Mauritania:

Mohamed O/SIDI

Institute of Marine Research, Norway (IMR):

Oddgeir ALVHEIM (cruise leader 18 May-1 June), Tore STRØMME (cruise leader 2-17 June), Marek OSTROWSKI (2-17 June), Tore MØRK, and Jarle WANGENSTEN (18 May-1 June), Reider Toresen (cruise leader 17-22 June), Magne OLSEN (17-22 June) and Terje HAUGLAND (17-22 June).

1.3 Narrative

Figure 1 shows the cruise track and the stations worked during the survey. The vessel departed from Agadir on May 18, steaming northwards to Cape Cantin from where the sampling work started. The survey proceeded southwards with an acoustic sampling grid with a transect distance 10 nautical miles (NM) apart, covering the shelf and slope down until about 200 m bottom depth. The outer shelf between Cape Dra and Cape Juby was sampled with a more open grid as it is known from previous surveys that this part of the shelf holds few pelagic resources and no sardine. The survey continued to south of Cape Bojador when sampling was interrupted with a call at Las Palmas 1-2 June for refuelling and change of crew. The survey proceeded southwards covering the wide shelf between Cape Bojador and Cape Barbas with transects. South of Cape Barbas the survey was interrupted due to a failure in the main engine and it was necessary to return to Las Palmas on 17 June for service. The survey work in the region Cape Barbas-Cape Blanc was resumed as part of the following survey in Mauritania and the results as concerns the pelagic resources is included in this report.

The weather was somewhat rougher than during normal December surveys, but did not constrain the survey work.

1.4 Methods

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

Environmental data

Meteorological observations including wind direction and speed, air temperature, global radiation and sea surface temperature (SST) were automatically logged and recorded with position and bottom depth every nautical mile sailed using an Aanderaa meteorological station. CTD-stations were recorded at the standard hydrographic transects. A Seabird 911+ CTD probe was used to obtain vertical profiles of temperature, salinity and oxygen. Real time plotting and logging was done using the customised Seabird Seasave software installed on a PC. The profiles were in general taken down to a few meters above the bottom. In deep stations, however, data logging was interrupted at 500 m. Niskin bottles were triggered for water samples, one near the surface and one near the bottom, in order to calibrate the oxygen and salinity sensors. The water samples were analysed for dissolved oxygen using the Winkler method, and for salinity using a Guildline Portasal salinometer mod. 8410.

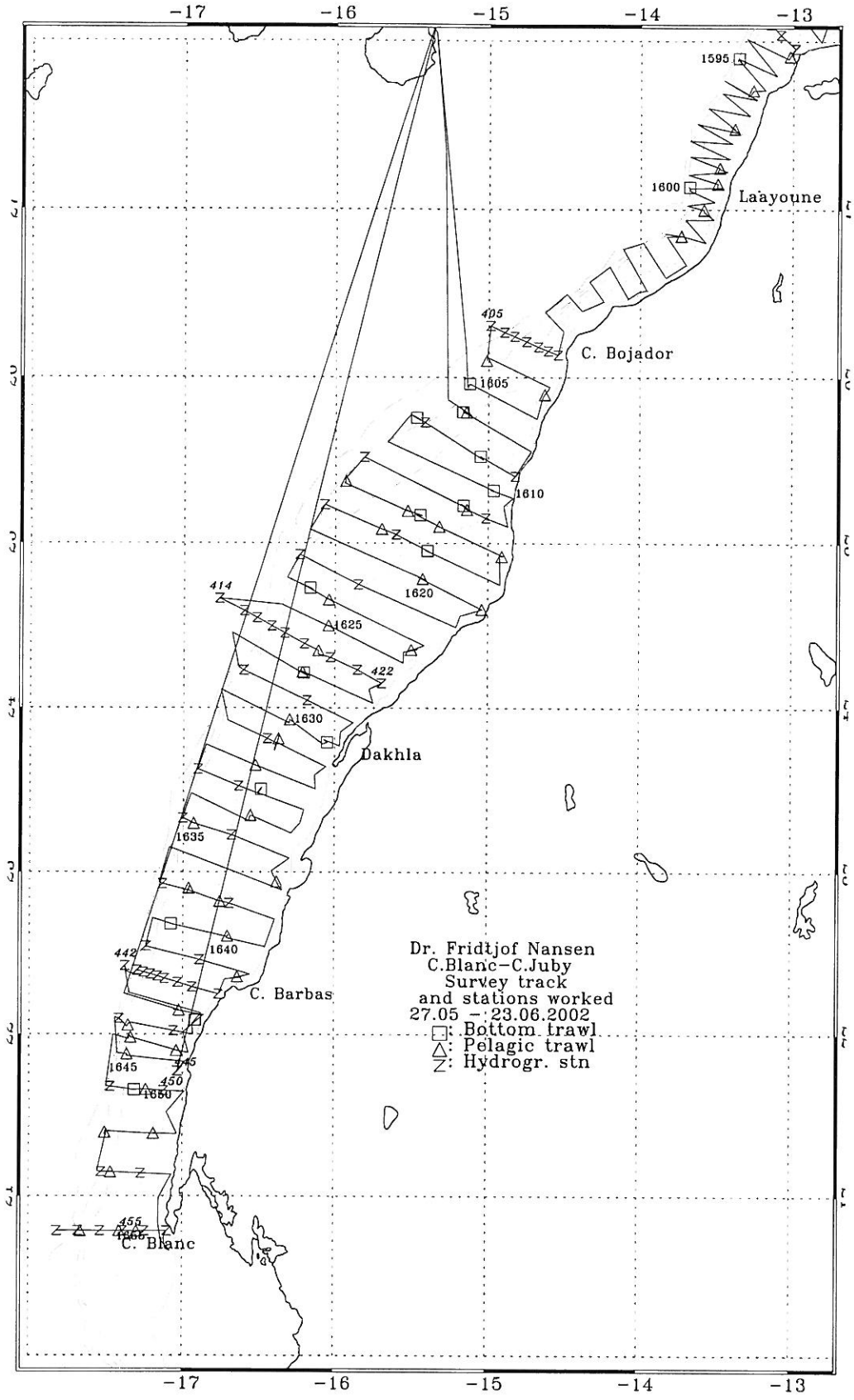


Figure 1a. Course track with fishing and hydrographic stations, Cape Blanc to Cape Juby. Depth contours at 20 m, 50 m, 100 m, 200 m and 500 m are indicated.

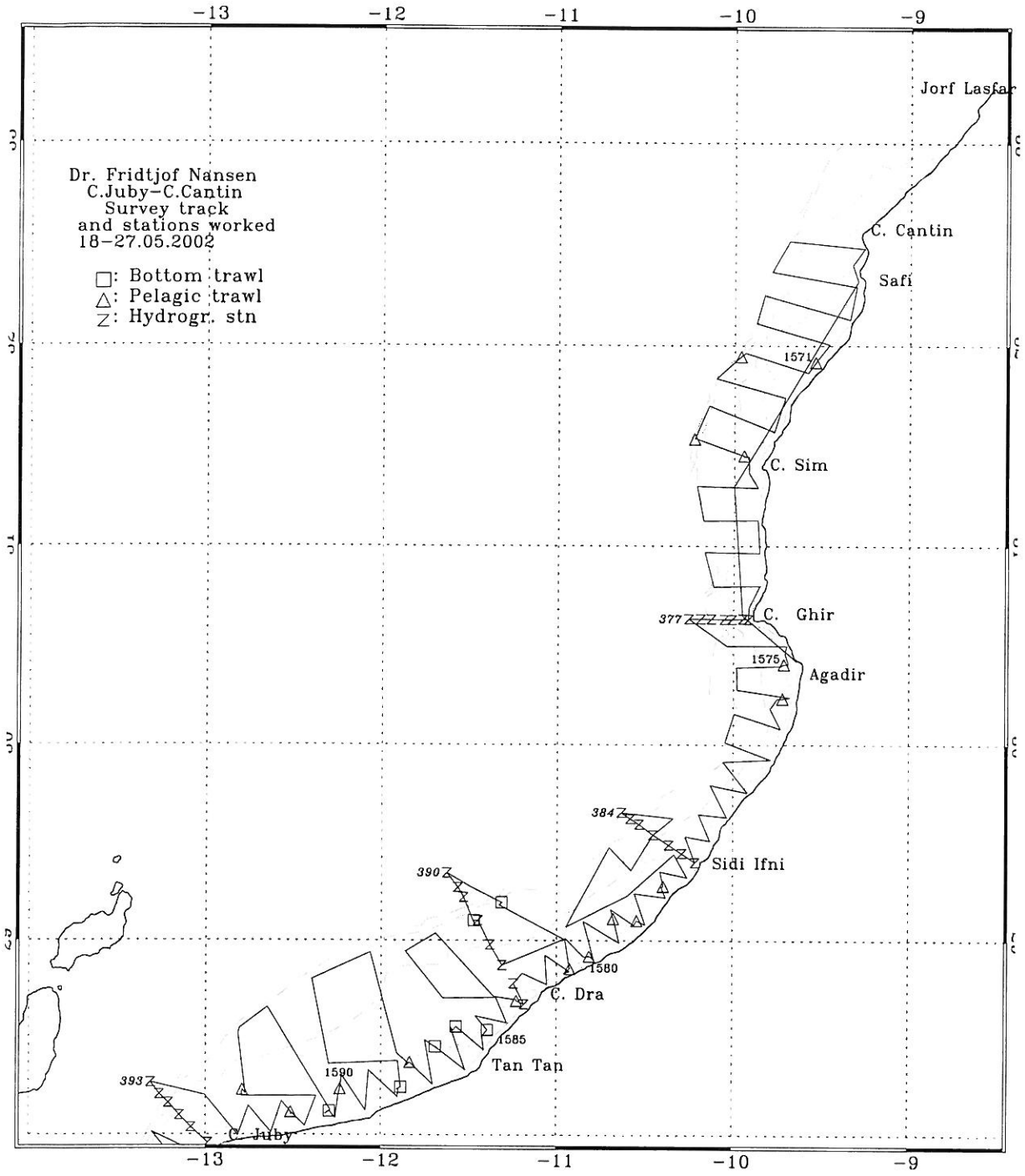


Figure 1b. Course track with fishing and hydrographic stations, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

Biological sampling

Biological sampling of the fish was carried out using trawls. A pelagic trawl with floats was often used. A smaller pelagic trawl or the bottom trawl with floats was used for sampling the pelagic fish in very shallow waters (depth less than 25 m). Annex III gives a description of the instruments and the fishing gear used. All catches were sampled for composition by weight and numbers of each species caught. Species identification was based on the FAO Species Guides. Length frequency distributions, by total fish length in cm, of the selected target species were taken in all the stations where they were present. The complete records of fishing stations are shown in Annex II.
The following target groups were used for Morocco:

1. Sardine (European pilchard *Sardina pilchardus*),
2. Sardinellas (flat sardinella *Sardinella maderensis* and round sardinella *S. aurita*),
3. Anchovy (European anchovy *Engraulis encrasicolus*),
4. Horse mackerels (Atlantic horse mackerel *Trachurus trachurus*, Cunene horse mackerel *T. trecae*,
5. Mackerels (chub mackerel *Scomber japonicus),*
6. Other pelagic scombrids, carangids and associated species (such as *Auxis* sp., *Caranx* sp. and largehead hairtail *Trichiurus lepturus*), BEI group PEL2,
7. Other demersal species (such as Sparidae, Haemulidae and Merluccidae).

Otoliths of sardine, sardinella, horse mackerel and chub mackerel were collected for a regional project on aging. Some of the sardine otoliths were read during the survey.

Acoustic sampling

A SIMRAD EK500 Echosounder was used and the echograms were stored on both paper and files. The acoustic biomass estimates were based on the integration technique. The Bergen Integrator (BEI) was used for analysis and allocation of the integrated s_A-values (average area back scattering coefficient in m^2/NM^2) to the individual specified target groups by 5 NM intervals. The BEI system has improved capabilities in discriminating dense fish aggregations close to the bottom as compared to the inbuilt integrator in EK500, which was used in the surveys prior to 1995. The splitting and allocation of the integrator outputs (s_A-values) was based on a combination of a visual scrutiny of species characteristics as deduced from echo diagrams, the BEI analysis, and the catch compositions.

In cases where the target category of fish contains more than one species (sardinellas and horse mackerels), the mean s_A-value allocated to the category is divided between the species in the same ratio as their relative contribution to the mean back scattering strength in the length frequency samples.

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

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

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

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

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

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

where ρ_i = density (n/NM^2) of fish in length group i

s_A = mean integrator value (m^2/NM^2)

p_i = proportion of fish in length group i

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

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

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

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

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

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

l_i = mid length of fish in length group i.

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

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

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

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

$$\overline{w} = \frac{cond}{100} * L^3 \qquad (3)$$

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

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

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

For the estimation of the biomass of target group 6, carangids and associated species, an overall average length of 23 cm and a condition factor of 0.88 (to calculate mean weight of this length group) were applied.

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

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

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

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

CHAPTER 2 SURVEY RESULTS

2.1 Hydrographic conditions

Weather conditions during the survey, were dominated by persistent north-easterly trades blowing along the length of Moroccan coast. These strong winds lead to the intensification of upwelling and coastal currents. The hydrography on the shelf was dominated by water masses of the North Atlantic origin. Water masses of the tropical Atlantic domain were detected only in the southernmost part of the survey grid along the continental slope, probably too deep to influence the conditions in the habitat of pelagic stocks on the shelf. However, it is important to observe that area off Cape Blanc, where the influence of the tropical Atlantic is expected to be the most pronounced, was not covered in this survey.

Wind conditions

In the north, between Cape Cantin to Cape Ghir, Figure 2b, a strong northerly gale hit the survey region. Steady winds continued to blow alongshore with exceeding 12-13 m/s until the survey reached Cape Ghir. South of Cape Ghir, between Agadir and Sidi Ifni the wind speed dropped below 5 m/s and wind direction become variable. This significant decrease in wind intensity was in agreement with the long-term seasonal wind patterns observed in this area, which is sheltered from north-easterly trade winds by the nearby Atlas Mountains. Further south, the survey entered into the region between Cape Dra and Cape Juby, into the westward-oriented section of the coast, where the main wind stress is oriented onshore. The strong northeasterly wind was picked up again and its velocity arose to 10 m/s. South of Cape Juby, the survey turned southwards, following the changing direction of the coastline, and entered the Laayoune region. The wind conditions had become somewhat calmer; south of Cap Juby the speed dropped below 9 m/s, decreasing further down to 7 m/s off Cape Barbas. Following the four days interruption, between May 31 and June 4, the survey headed south of 26° N into the Dakhla region, which is the area well-known for the strongest alongshore winds in all seasons. Figure 2a clearly shows that throughout this region the wind blew steadily from the northeasterly directions, had a nearly constant velocity in the range of 10-13 m/s and very little of spatial variation.

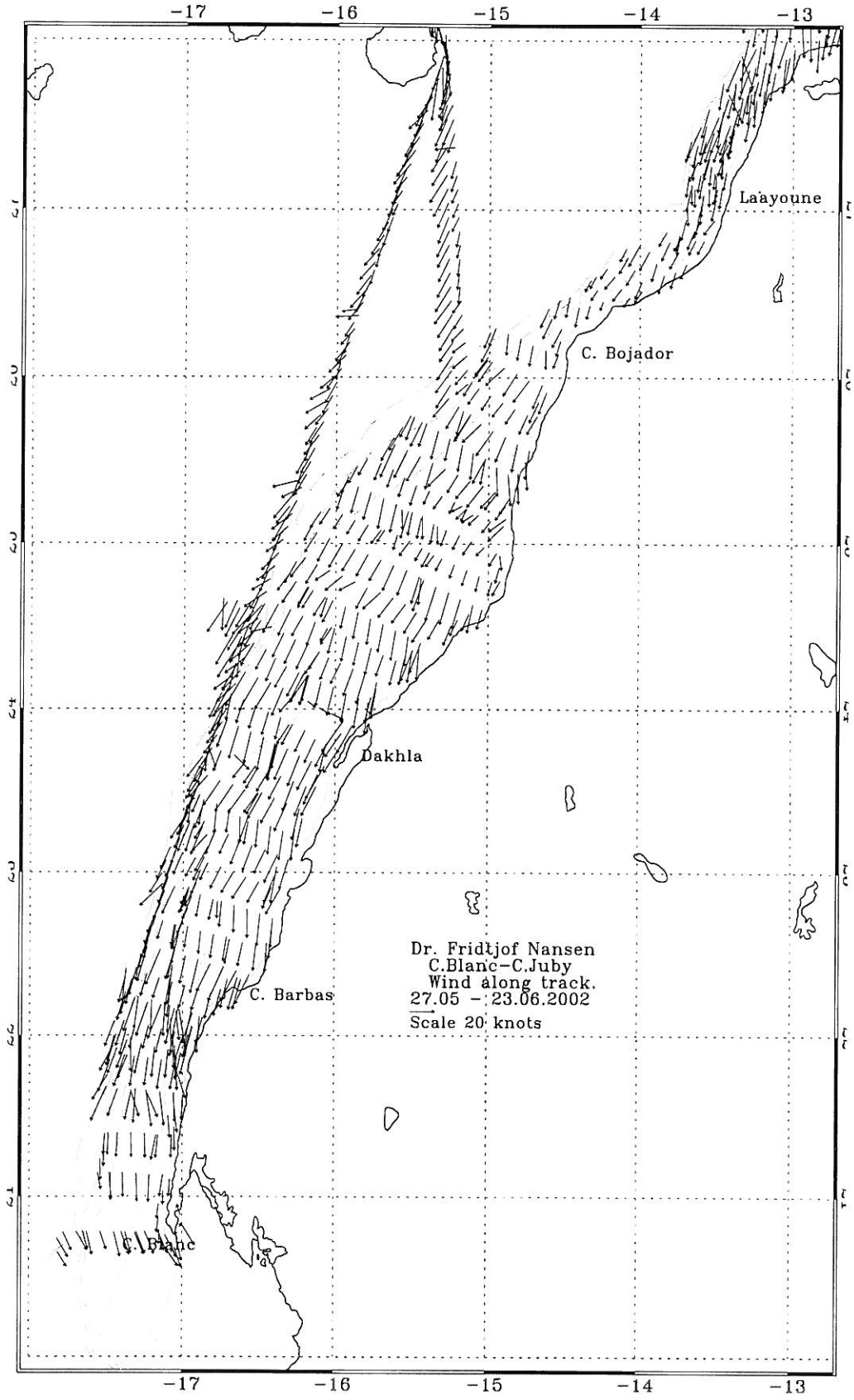


Figure 2a. Wind conditions along the survey, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

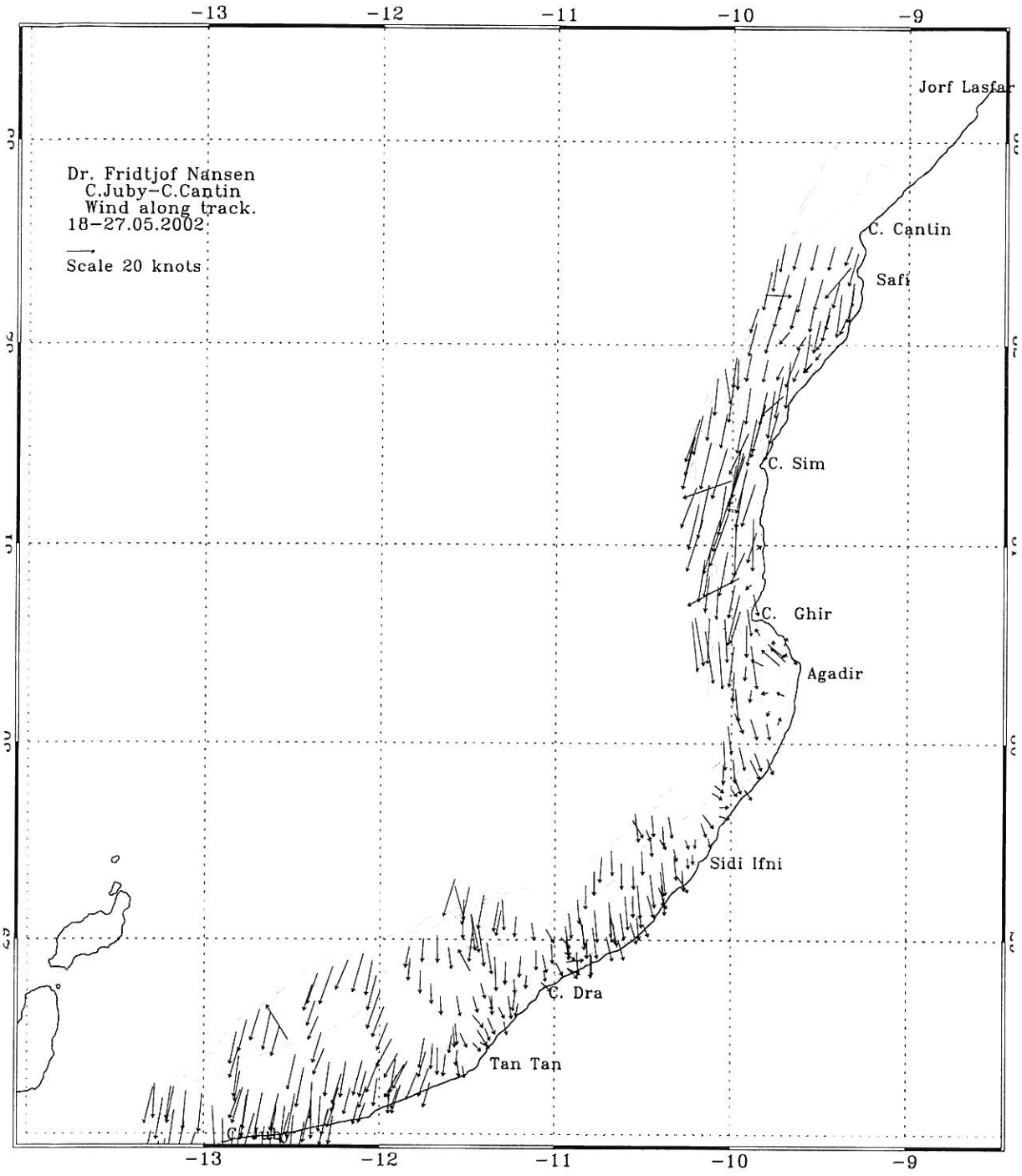


Figure 2b. Wind conditions along the survey, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

Sea surface temperature

During the survey, the predominant alongshore orientation of the wind field reinforced coastal upwelling along the northern Morocco. The cooling of coastal waters due to upwelling is clearly manifested in the distributions of sea surface temperature, Figure 3b.

The two prominent upwelling cells were observed off Safi and between Cape Sim and Cape Ghir, with temperatures below 15 °C and 14 °C, respectively. This was more than three degrees below the temperatures in the offshore waters. Another well-developed upwelling cell was found off Sidi Ifni, where the observed temperature was less then 16 °C. In the northern region, the only warmer near shore waters were found in the wind-sheltered area off Agadir, where near shore temperature rose to 18-19 °C.

The southernmost prominent upwelling cell was observed south of Cape Juby, near the coastal town of Laayoune, Figure 3a. The sea surface temperature at this upwelling centre was below 16 °C.

Interestingly, no upwelling signature was detected near shore in the Dakhla region, in spite of the strong, upwelling-favourable winds. In fact, off Cape Barbas the inshore waters were even warmer than those at the shelf-break. We attribute this to the fact that our observation took place during a strong and persistent wind event. The pools of cool inshore water related to upwelling, which probably had occurred at the wind onset, by the time we reached the survey area, were dispersed by the strong turbulence and mixing of the wind-driven, shallow coastal current. This condition would be probably short-lived, lasting for the duration of the strong wind episode. However, it may have affected the distribution of fish by forcing those species, which avoid living in the extremely turbid inshore waters, to move out across the shelf. For example, the distribution of sardine recorded in this region, Figure 5 exhibits an offshore shift that could be coupled to the above process.

Vertical distribution and water masses

The two principal water masses observed in the northern part of the survey grid, from Cape Cantin to Cape Juby were representing the North Atlantic domain (NACW): the high salinity surface water associated with the Mediterranean outflow and the underlying it, North Atlantic Central Water (NACW). The signatures of these water masses were clearly identifiable at 25-30 NM offshore from the hydrographic sections, Figure 4. The subsurface core of the Mediterranean water was observed at a depth of 50 m. As one moved from Sidi Ifni to Cape Bojador, the salinity at the core increased from 36.3 to 36.8 psu, and temperature was 14-15 °C. It is this water mass, which is upwelling along the coast of the northern Morocco and constitutes, in modified from, the shelf waters along the coast. In this survey, the most pronounced uplift of NACW to the shelf was detected at Cape Ghir, Figure 4. Comparing this figure with the SST distribution, it becomes evident this uplift was matched by the pool of cold water to the north of Cape Ghir, observed on the SST distribution map, Figure 3b.

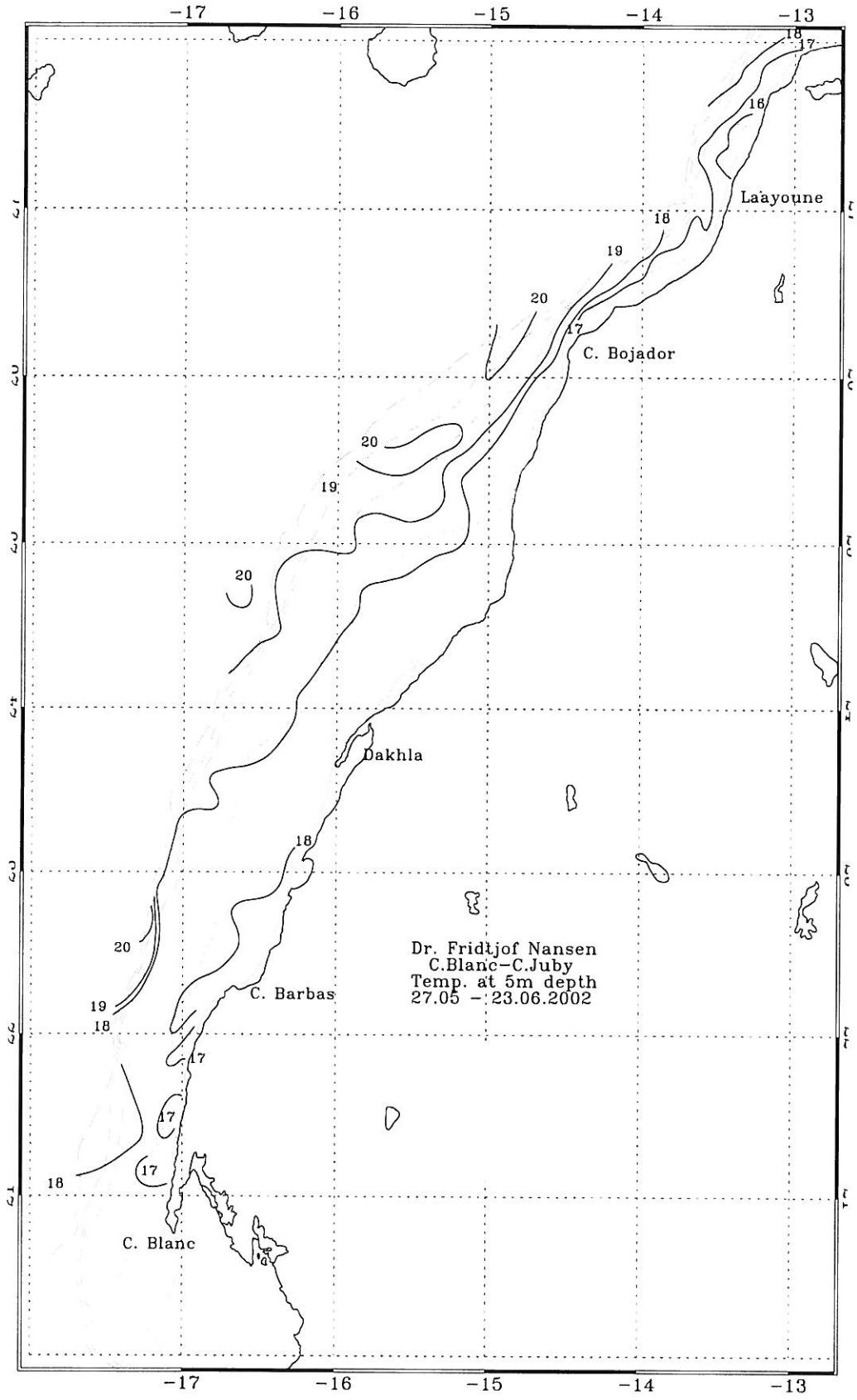


Figure 3a. Sea surface temperature (at 5 m depth), Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

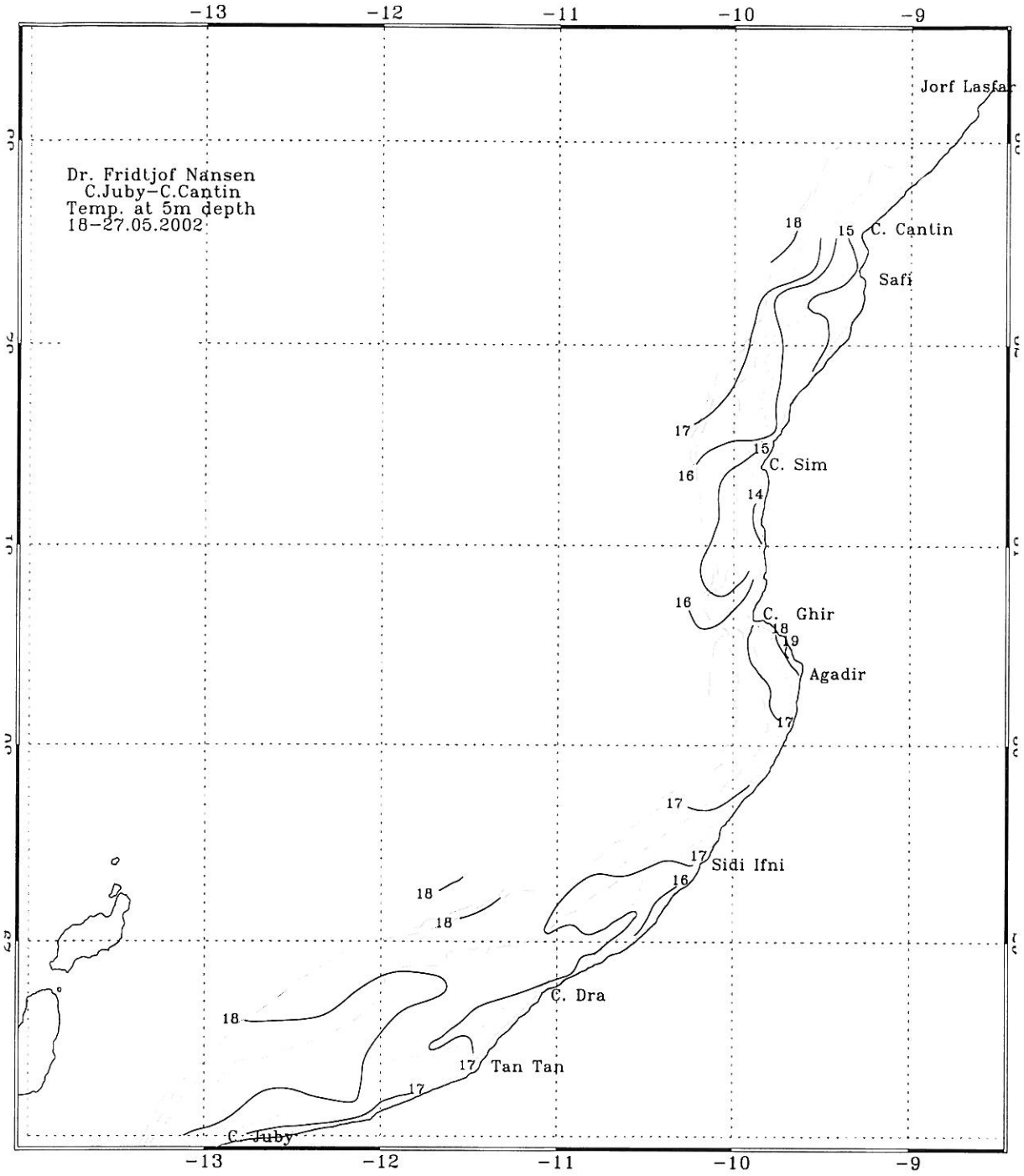


Figure 3b. Sea surface temperature (at 5 m depth), Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

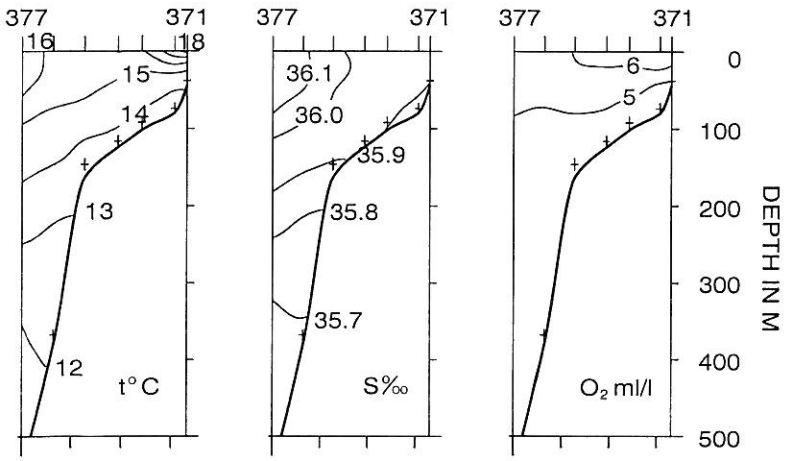
Along the remaining sections in the northern region, the presence of NACW on the shelf was less pronounced, but still detectable in the bottom layers offshore.

As the survey moved south, NACW disappeared from the record at the Cape Bojador section. The steep and short shelf along that section was dominated entirely by the Mediterranean Surface Water carried with the Canary Current. The current measurements made with an ADCP, Acoustic

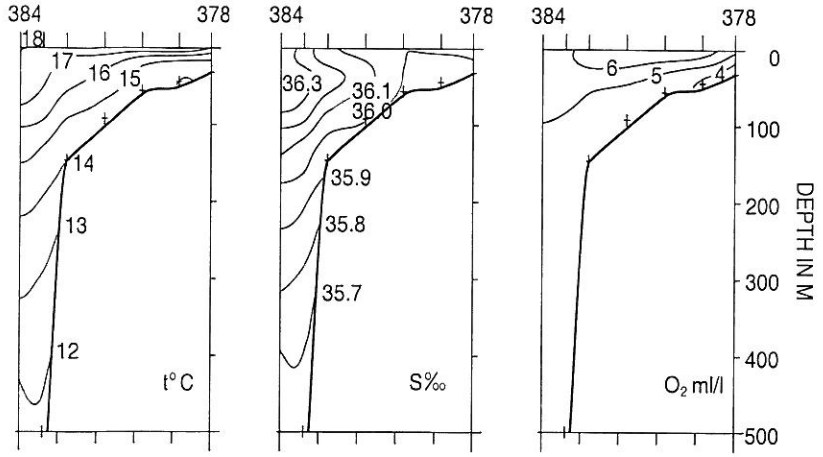
Doppler Current Profiler, (not reported here because of problem with calibration of absolute values), clearly showed that at this location the current was threefold stronger than elsewhere in the survey region and that its main branch turned south-westwards.

The two southernmost sections, off Dakhla and Cape Bojador exhibited these three main features: (1) uniform, well mixed water column on the shelf, T = 17 °C, S = 36.1 psu; (2) the presence of the Canary Current in the surface layer at the shelf break; and (3) a poleward undercurrent along the upper slope, transporting to the region South Atlantic Central Water (SACW) with S < 35.8 psu, T < 16 °C and O_2 < 3 ml/l.

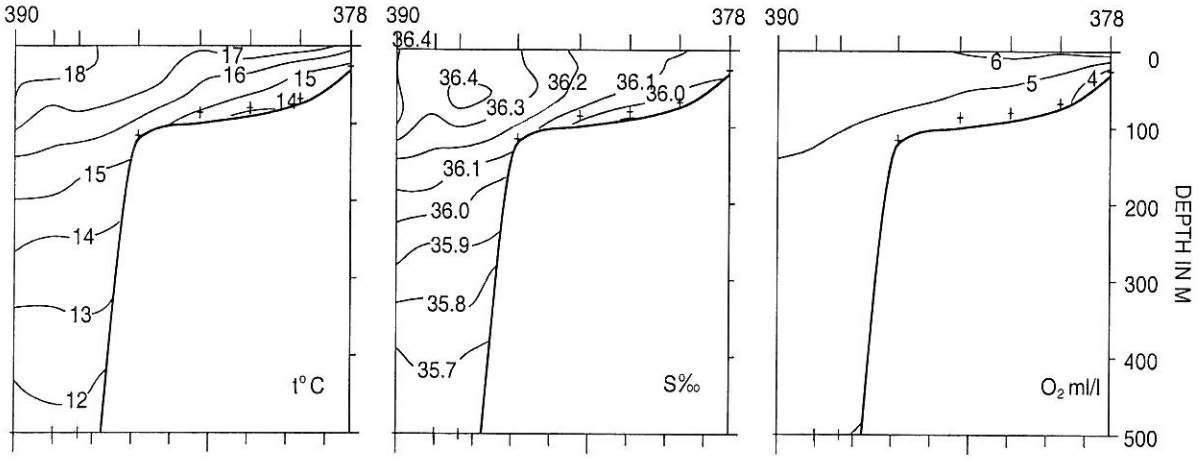
Until this survey, our knowledge on the magnitude the South Atlantic waters incursions into the Dakhla shelf has been limited. We did, however, observed a strong relationship between the type of water mass present at Cape Blanc (21° N) and species composition of the surveyed stocks. To increase further our understanding of the relationship between hydrography and fish stock composition in this important for fisheries region, we have established a new fine-resolution grid of hydrographic stations. The grid is oriented alongshore, following the 50 and 200 m depth contours Figure 1a exhibits the grid of the stations along 200 m observed during this survey and the resulting sections for temperature, salinity and oxygen. From that figure, it is evident that the SACW intrusion reached its northernmost location approximately at 24 °N while remaining below the shelf-beak throughout the whole region. Not shown here is the distribution at 50 m, which showed a presence of well-mixed North Atlantic Waters (T = 17 °C, S = 36.1 psu) in the inshore of the Dakhla-Cape Barbas region without a trace of influence of the South Atlantic domain.



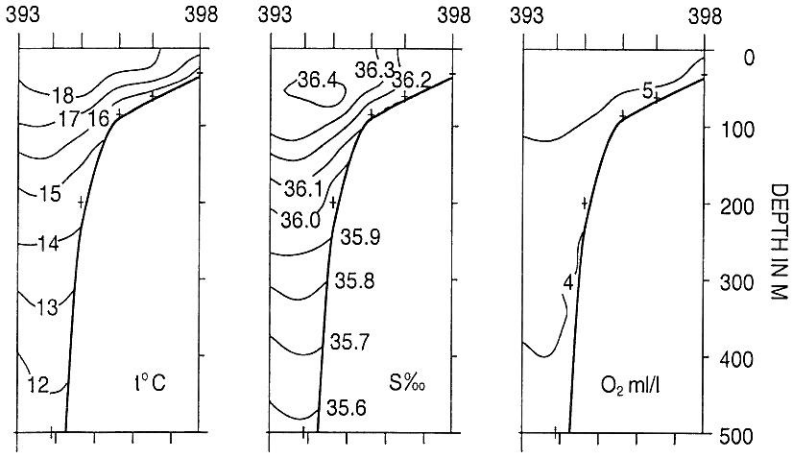
CAPE GHIR – 21.05.2002



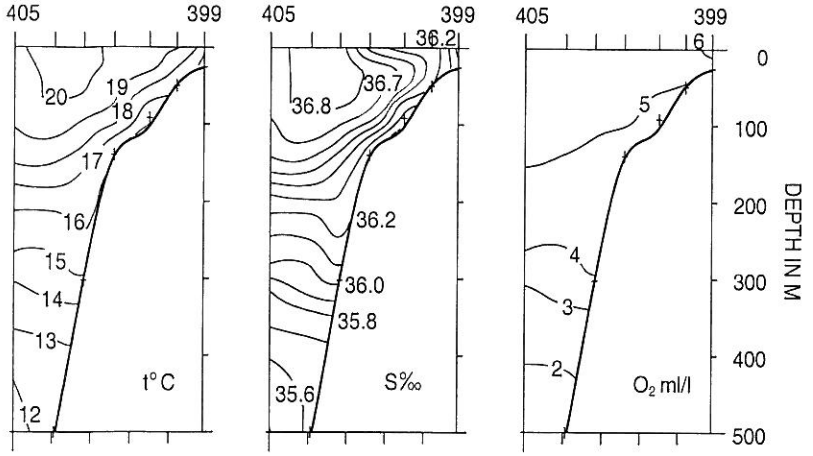
SIDI IFNI – 22.05.2002



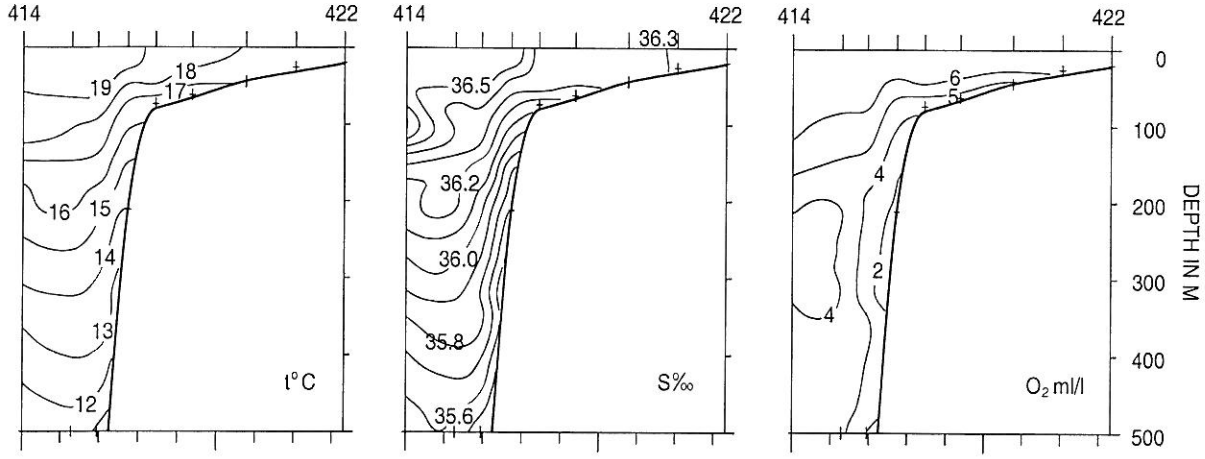
CAPE DRA – 23-24.05.2002



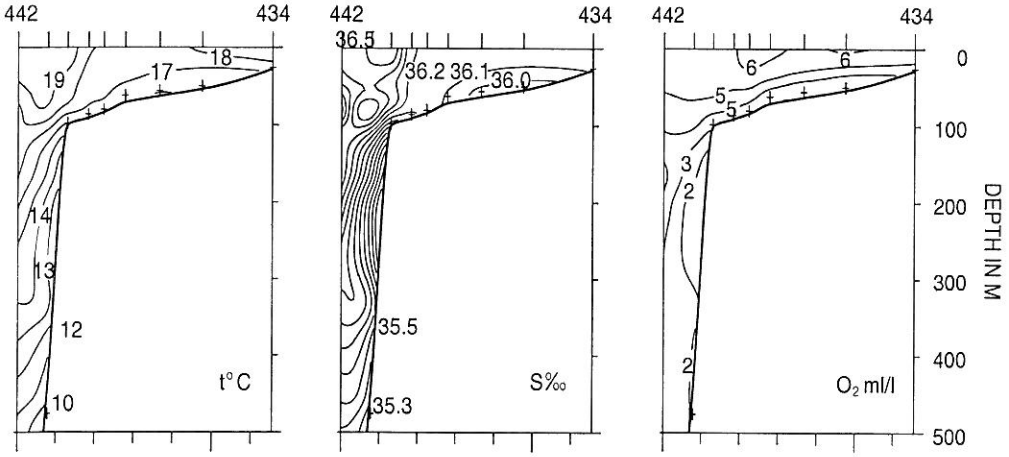
CAPE JUBY – 27.05.2002



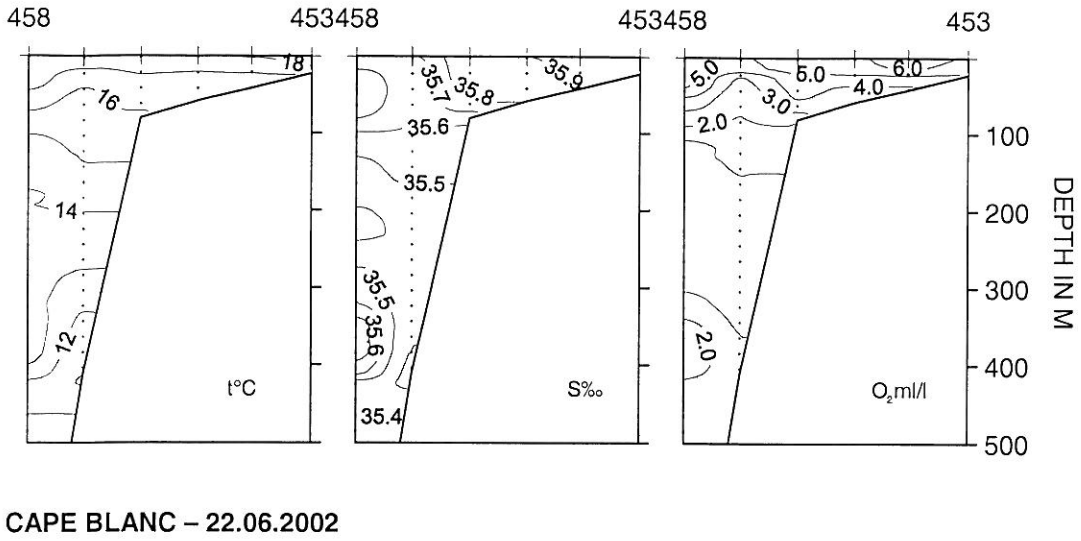
CAPE BOJADOR – 30.05.2002



DAKHLA – 08.06.2002



CAPE BARBAS - 12.06.2002



CAPE BLANC – 22.06.2002

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

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

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

Sardine, *Sardina pilchardus*, Figure 5, was found along most of the coast, generally with a more offshore distribution compared to the surveys in the later years. South of Cape Barbas there was a predominance of juveniles with a mean length 13 cm, Figure 9b. The highest concentrations of sardine occurred between 23 and 25 °N but were not as dense as during the two previous surveys. These aggregations consisted mostly of fish in the range 19-24 cm. Between Cape Bojador and Cape Juby the fish was mainly in the range 14-18 cm, Figure 9a. Recruitment seems fairly successful with abundant small sized sardine south of Cape Barbas and extending into Mauritania.

Sardinellas (Sar*dinella aurita* and *Sardinella maderensis*) were found in aggregations with low densities between Dakhla and Cape Blanc, Figure 6. The high densities of sardinella were probably distributed more south of Cape Blanc in Mauritania and Senegal.

Horse mackerels (*Trachurus trachurus* and *T. trecae*) were common from Cape Blanc to Cape Bojador, mostly at low densities at the outer shelf, Figure 7.

Chub mackerel (*Scomber japonicus*) was recorded in low densities along the outer shelf from Cape Juby to Cape Blanc, Figure 8.

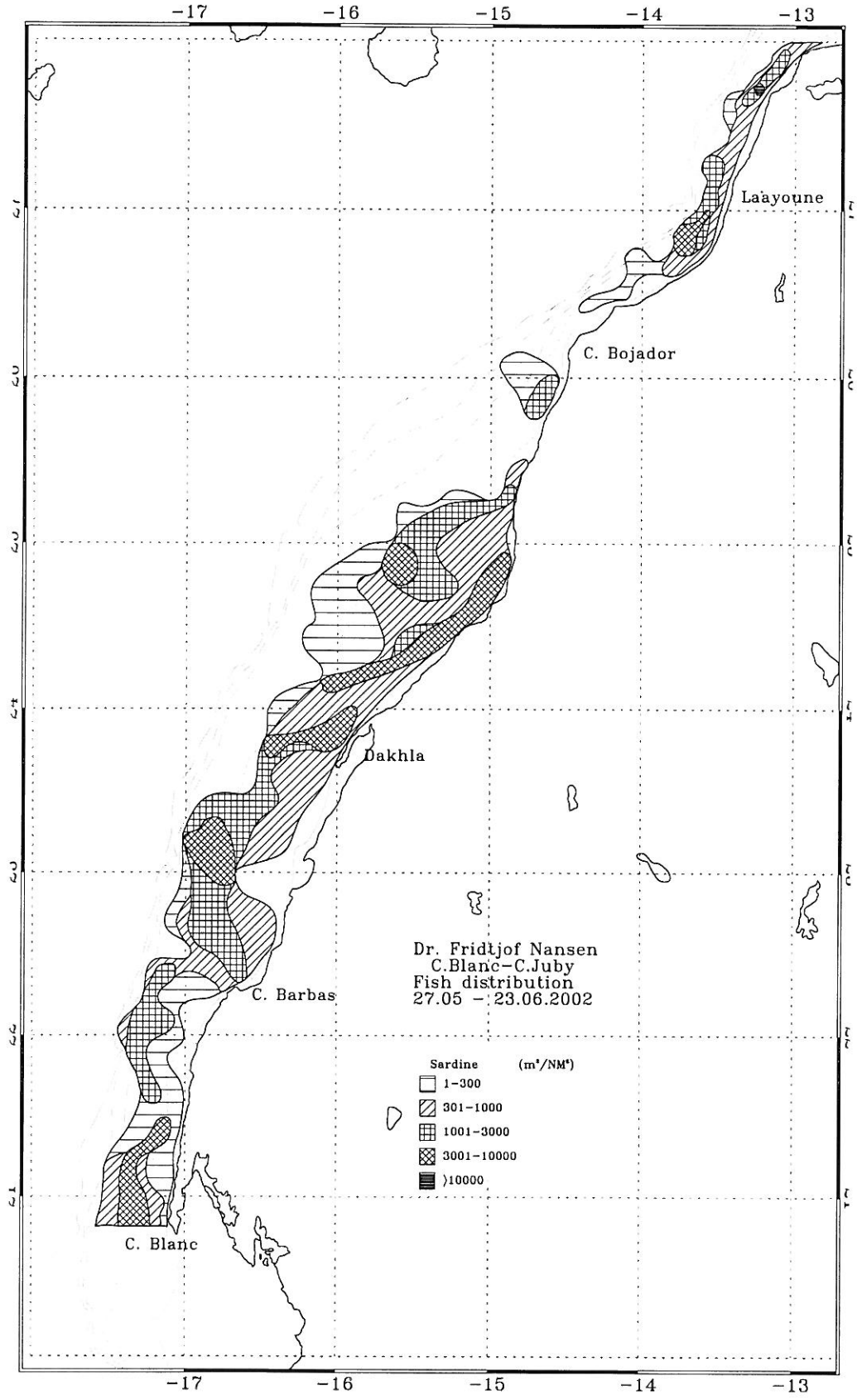


Figure 5. Distribution of sardine, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

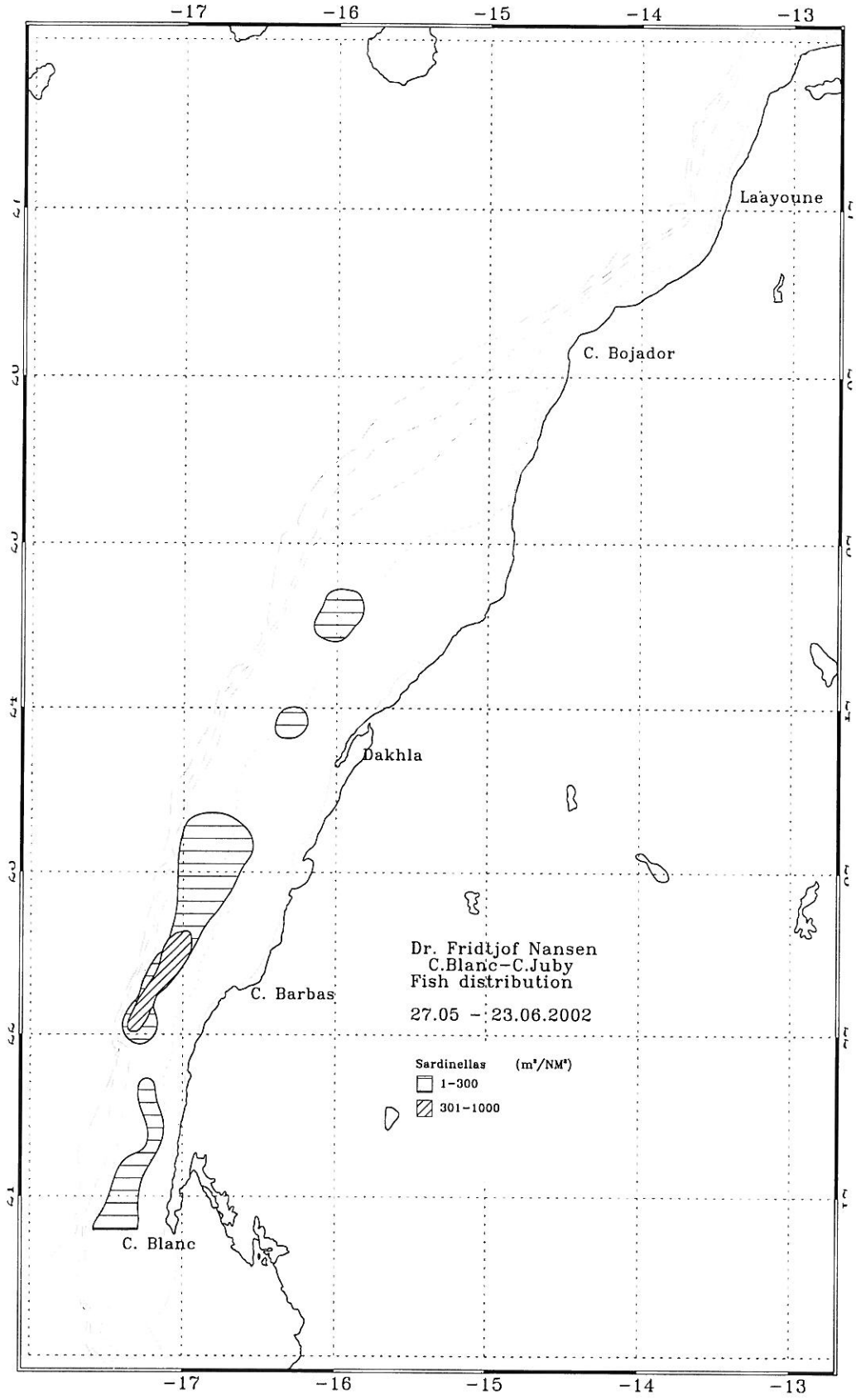


Figure 6. Distribution of sardinella, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

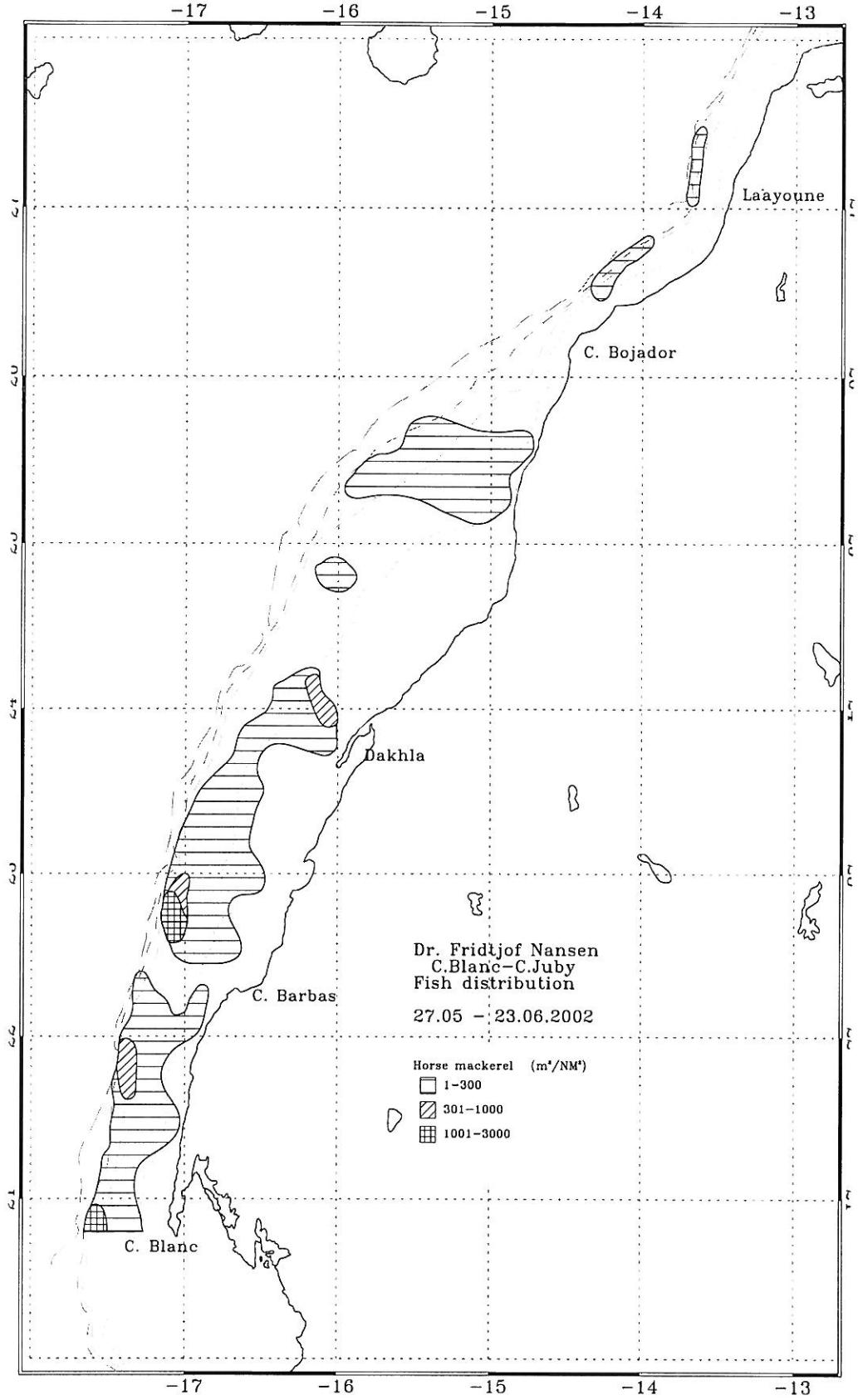


Figure 7. Distribution of horse mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

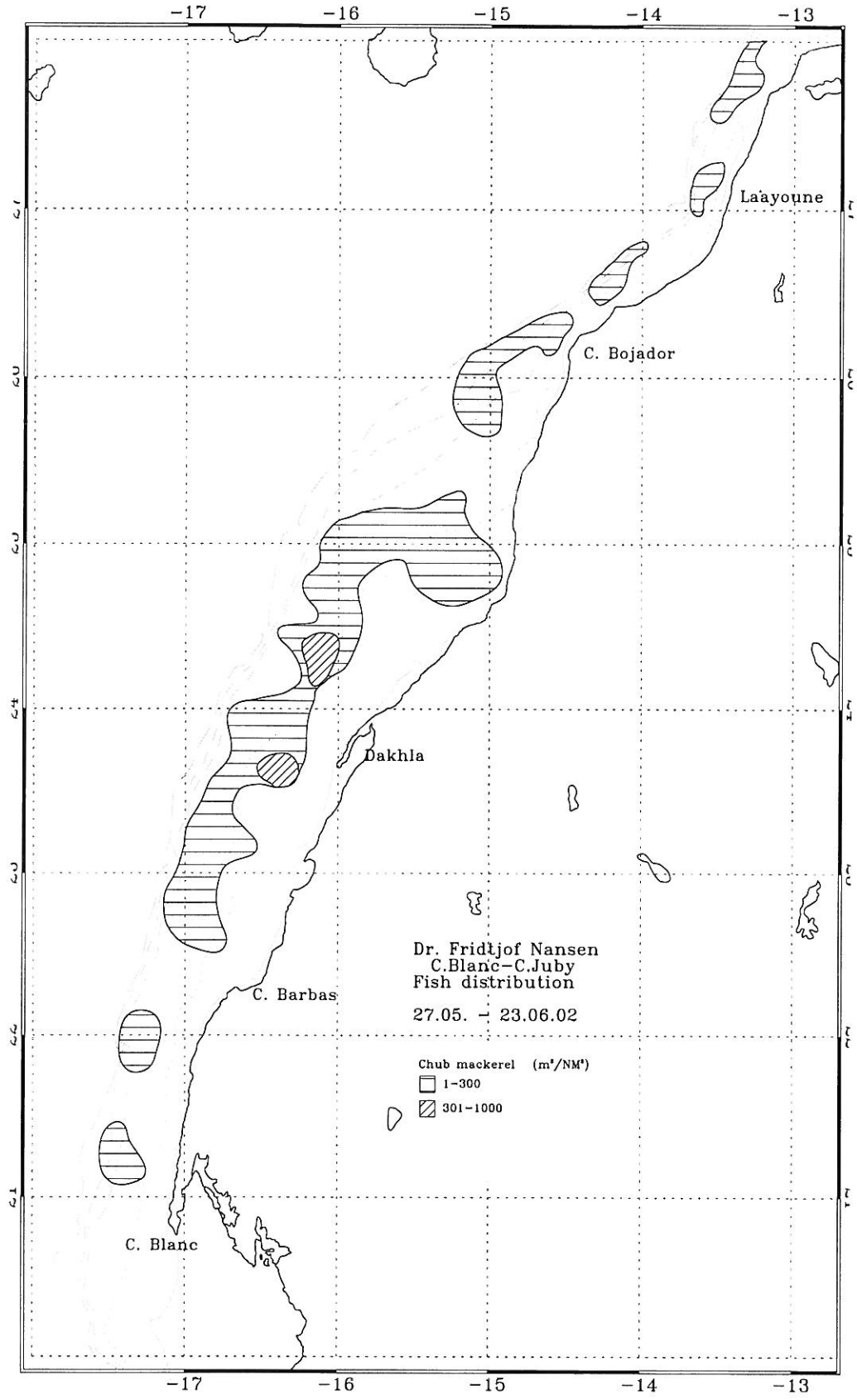


Figure 8. Distribution of chub mackerel, Cape Blanc to Cape Juby. Depth contours as in Fig. 1a.

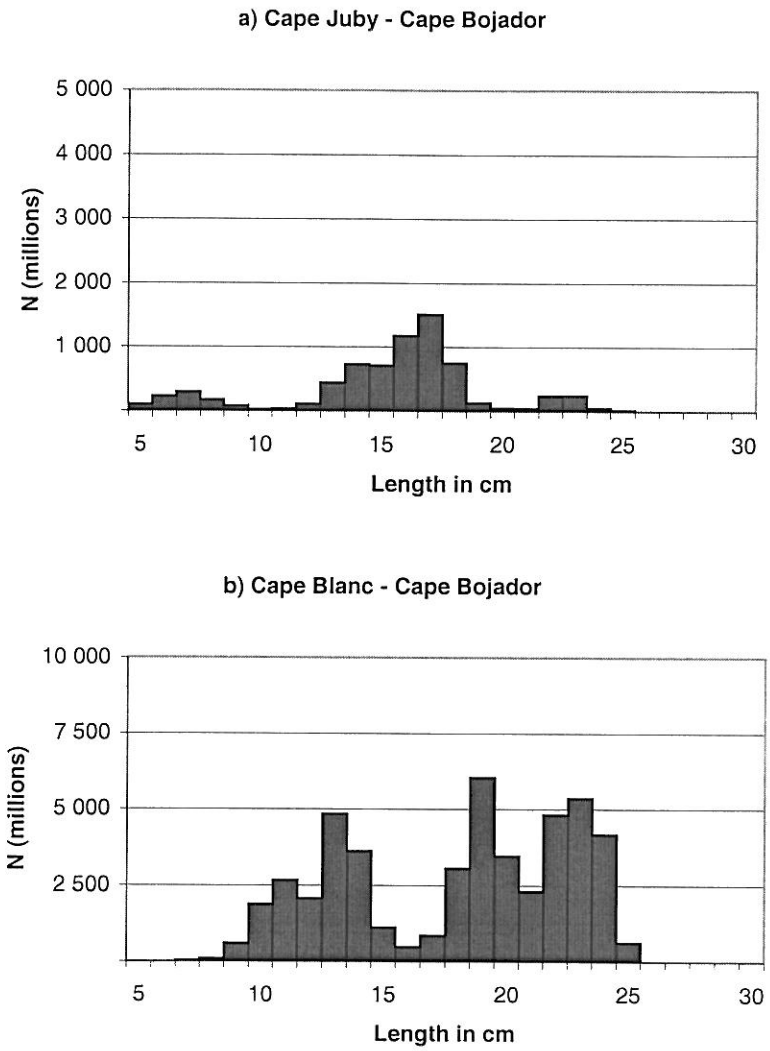


Figure 9. Length frequency distributions sardine Cape Blanc to Cape Juby.

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

Sardine, Figure 10, was registered along most of the coast except between Sidi Ifni and Cape Ghir. The highest densities were recorded between Cape Juby and Cape Dra and between Cape Sim and Safi. The general picture has much resemblance with the previous surveys. The pooled length distributions on sardine, Figure 12, show that the main part of the sardine is made up by younger sardines with two modes; around 9 and 17 cm.

Anchovy was found in several patches along the coast, Figure 11. In the last two surveys anchovy was almost absent from the area, but seems now to regain some of its earlier strength.

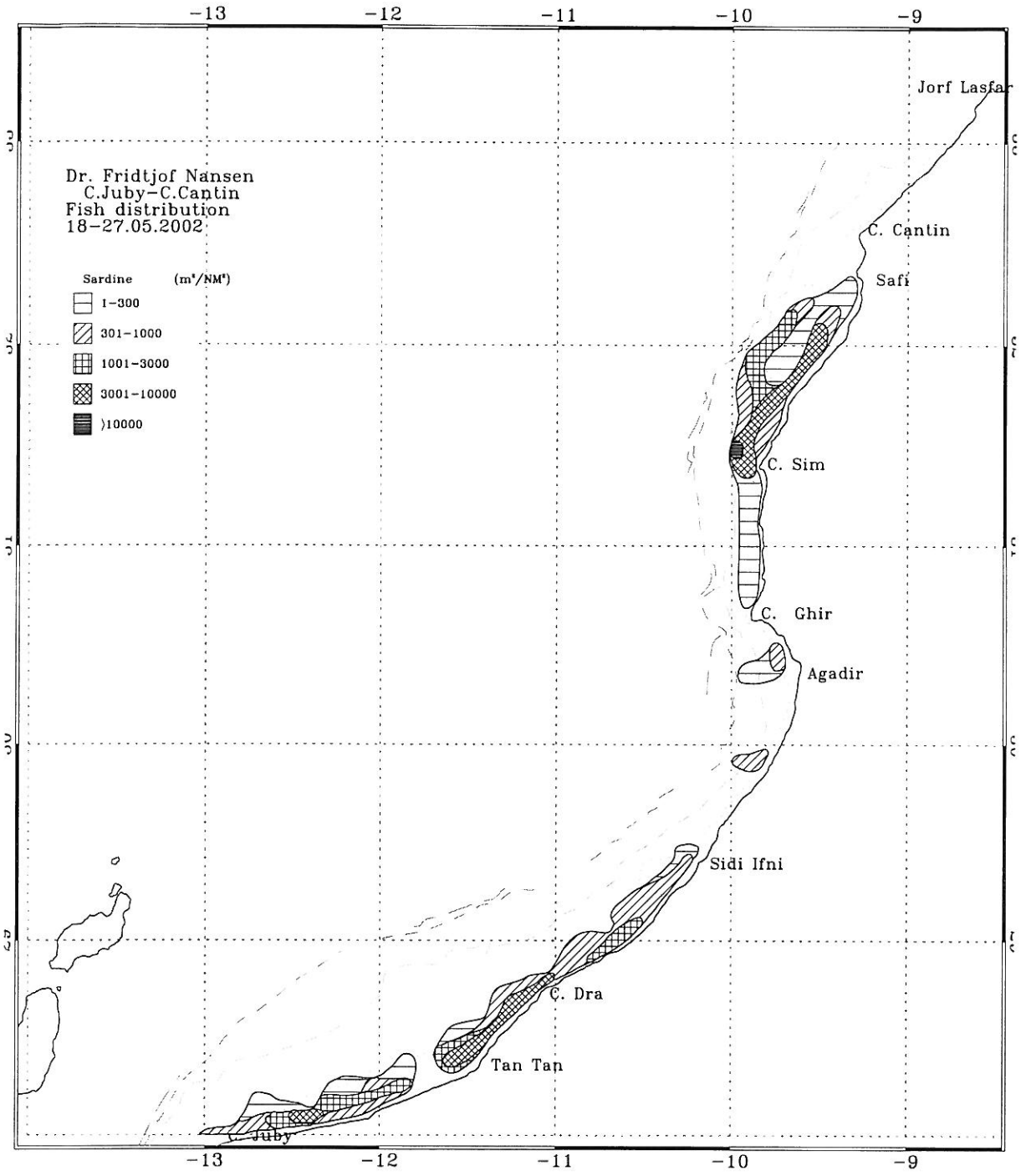


Figure 10. Distribution of sardine, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

Recordings of **horse mackerel** and **chub mackerel** were rather few as expected from previous surveys in the region. A narrow band of chub mackerel registered by the acoustic system at the shelf break off Tan Tan could indicate that the species is slightly more abundant in this area.

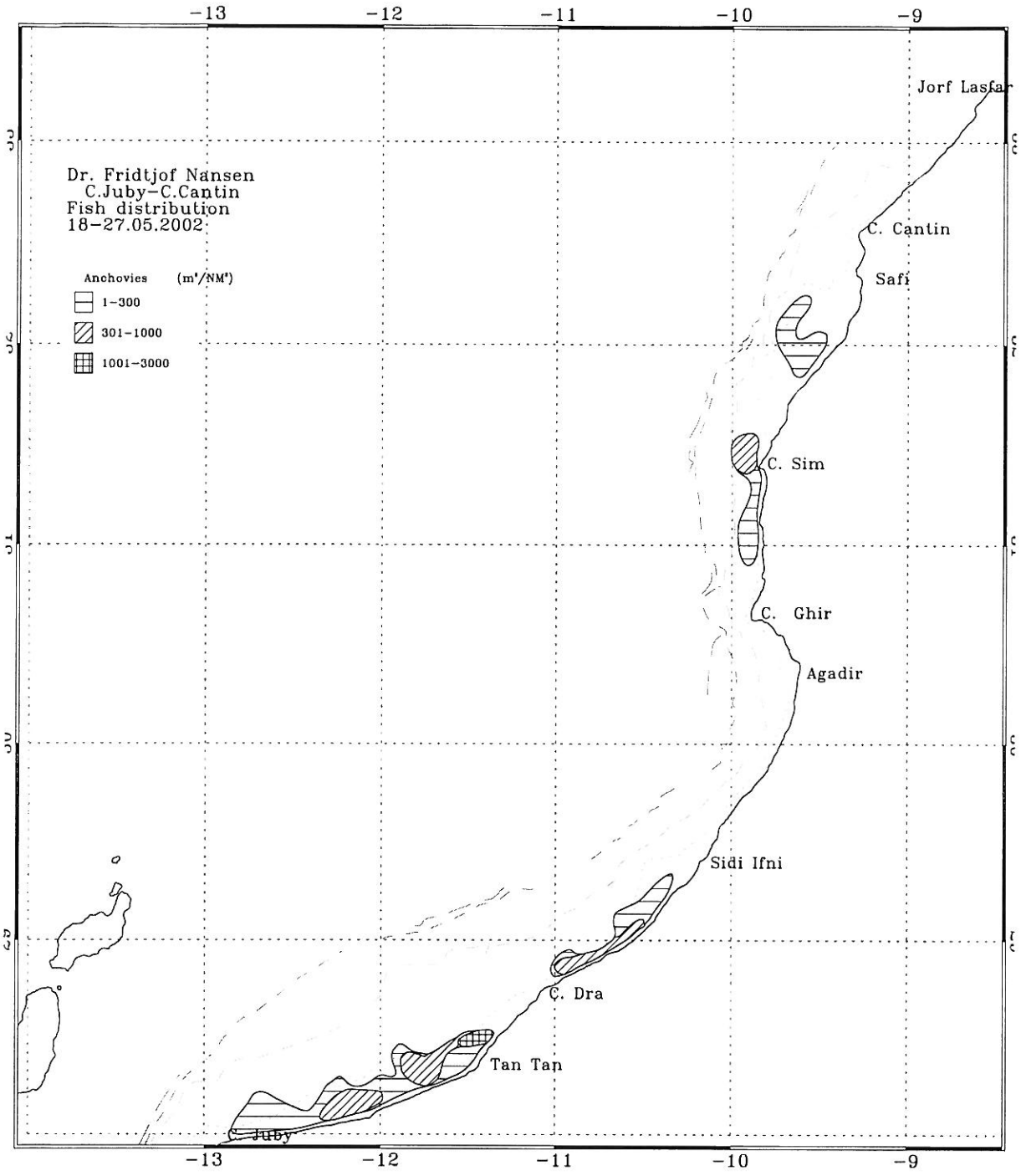


Figure 11. Distribution of anchovy, Cape Juby to Cape Cantin. Depth contours as in Fig. 1a.

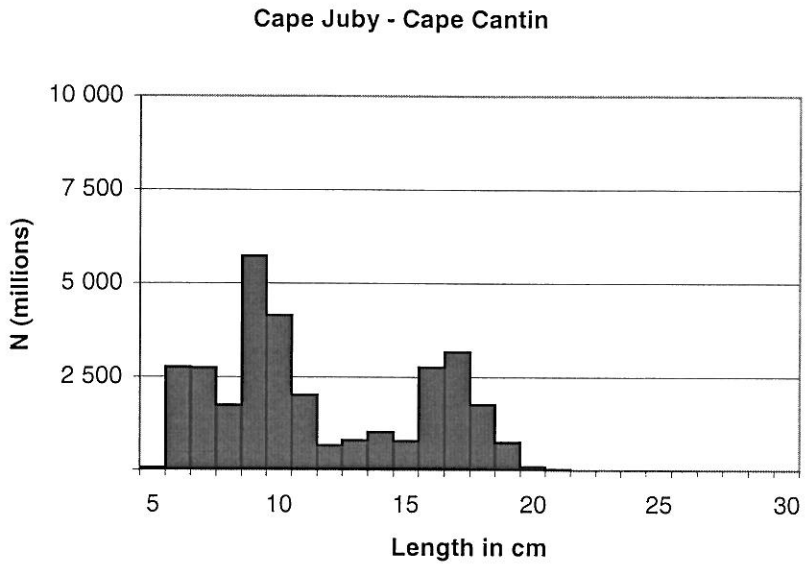


Figure 12. Length frequency distribution of sardine Cape Juby to Cape Cantin.

2.4 Biomass estimates

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

Cape Blanc-Cape Bojador

The **sardine** was estimated to 2.9 million tonnes, a considerable reduction from the 3.5 million tonnes estimated in November 2001. The length distribution is earlier shown in Figure 9. Most of the fish in terms of biomass consist of older fish. Compared with earlier years, the development in the "adult" part of the stock (i.e. fish > 19 cm) is:

Survey	Thousand tonnes	Million fish
November-December 1996	4 600	47 400
November-December 1997	240	2 900
November-December 1998	340	3 400
November-December 1999	1 000	11 500
November-December 2000	1 260	13 200
May-June 2001*	1 975	22 500
November-December 2001	3 200	32 000
May-June 2002*	2 100	21 400

* Including sardine in Mauritania

Recruitment seems fairly successful, with 52 billion fish in the range 9-15 cm, made up of fish south of Cape Barbas and including fish in Mauritanian waters who were surveyed one week later.

Sardinella was estimated to 165 thousand tonnes consisting only of round sardinella. This estimate is a considerable reduction from the 2.5 million tonnes estimated 6 months earlier. This is assumed to be more the feature of a seasonal fluctuation as most sardinella is assumed to be south of the thermal front between the Canary Current and the tropical waters.

The two species of **horse mackerel** combined was estimated 385 thousand tonnes, of which about roughly 190 thousand and 195 thousand were Atlantic and Cunene horse mackerel respectively.

Cape Bojador-Cape Juby

Sardine was estimated to 271 thousand tonnes a considerable reduction from the 650 thousand tonnes estimated in June and in November 2001. The biomass is mainly composed of young fish less than 19 cm in length.

Cape Juby – Cape Cantin

The **sardine** is estimated to 590 thousand tonnes, down from 890 thousand tonnes in December 2001. Abundance in numbers is about 30 billion, almost the same as the 27 billion estimated last December. The size group 15-19 cm has been reduced by about 35% since December, but this is compensated by a strong recruitment of younger fish. The presence of fish of 7-11 cm length is several times as strong now as compared to a year earlier, in June 2001.

Anchovies were estimated to 40 thousand tonnes compared to 100 thousand a year earlier. Two modes, 8 and 12 cm, are found in the length distributions, Annex 1.

Table 2 Summary of biomass estimates of pelagic fish, thousand tonnes.

Region	Sardines	Round sardinella	Flat sardinella	Atlantic horse mackerel	Cunene horse mackerel	Chub mackerel	Anchovy
Cape Blanc-Cape Bojador	2 900	165	0	190	195	215	15
Cape Bojador-Cape Juby	270	0	0	1	0	10	0
Cape Juby-Cape Cantin	590	0	0	45	0	65	40
Totals	3 760	165	0	235	195	290	55

CHAPTER 3 CONCLUDING REMARKS

The survey was conducted in the period 18th May to 13th June when the work had to be interrupted due to engine failure. This left a small unsurveyed area north of Cape Blanc which was covered in connection with the following survey in Mauritania. The results from the remaining part are merged into this report. The survey area Cape Cantin-Cape Blanc was covered with an acoustic course track of 5050 NM and 86 fishing stations. The limits of the school areas of the sardine, anchovy and horse mackerel are thought to have been well determined and the main areas adequately sampled. The weather conditions were rough in the northern part of the survey area and put some constraints on the survey work.

The hydrographical data show the upwelling occurring in the usual locations along the coast. Distribution of temperature and salinity indicate a colder coastal climate than expected from the long termed seasonal mean.

Figure 13 gives a general overview on the major aggregations of pelagic fish with rounded biomass figures. The biomass estimates are also summarised in Table 2.

Generally the sardine has a distribution pattern as normal for the season: juveniles south of Cape Barbas and the main part of the adult southern stock between Cape Barbas and 24°30'N. The biomass of sardine between Cape Blanc and Cape Bojador has decreased from 3.5 million tonnes in November 2001 to 2.9 million during the last survey. Of this 2.1 million is old fish in the Dakhla region, while 800 thousand tonnes is from fish south of Cape Barbas. (A further 840 000 tonnes of young sardine was recorded in Mauritanian waters in the following week when these waters were surveyed.)

Sardine in the region Cape Bojador-Cape Juby is estimated to 270 thousand tonnes, the same as in December 2000. Also this area holds considerable juveniles that will grow during 2001. Further north, the stock between Cape Juby and Cape Cantin is estimated to 590 thousand tonnes, down from 890 thousand estimated in December 2001. The number of recruits is relatively high and represents more than 50% of the stock. This could indicate that recruitment to the northern part of the central stock will be strong in 2001.

The concentrations of round sardinella found between Dakhla and Cape Blanc represent only 165 thousand tonnes, a considerable reduction from the 2.5 million tonnes estimated 6 months earlier. The fish recordings extend southwards into Mauritania, which probably holds the main part of the stock during this season.

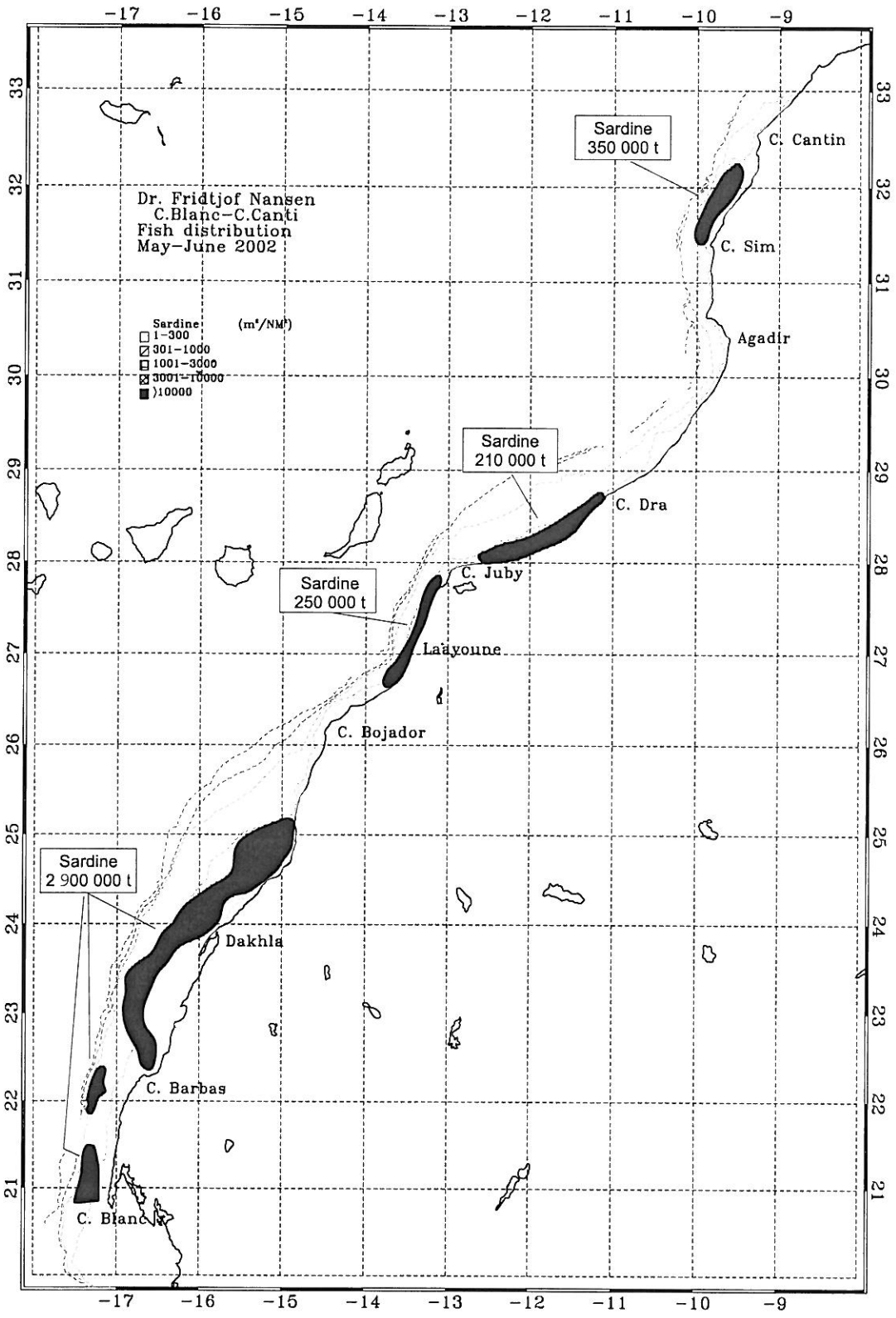


Figure 13. Map of the major pelagic fish concentrations with estimated abundance (thousand tonnes), Cape Blanc to Cape Cantin.

Horse mackerel was mainly found scattered between Cape Blanc and Cape Bojador. The estimate is 385 thousand tonnes, almost the same as in December 2001. This year the number of juveniles is relatively high, indicating strong recruitment.

Anchovy was found in several patches along the coast. The biomass was estimated to 55 thousand tonnes, a considerable increase from 8 thousand tonnes estimated in November 2001. This could indicate that the anchovy is about to regain its earlier strength.

Trends 1995-2002, sardine

Figure 14 shows the biomass estimates of sardine compared with results from previous "Dr. Fridtjof Nansen" surveys. Figure 15 shows the biomass figures 1995-2002 by length classes. Both figures show that the southern stock, including the sardine between Cape Bojador and Cape Juby, is slightly lower compared with one year earlier. Analysed by size groups the reduction comes in the adult part of the stock, which has declined from 3.2 to 2.1 million tonnes. This is compensated by new recruitment at the order of 800 thousand tonnes. In addition, during the following survey in Mauritania (23-29 June), 840 thousand tonnes of sardine was recorded south of Cape Blanc. This aggregation consisted almost exclusively of fish less than 17 cm. This points to a fairly good new year-class of sardine that should recruit to the main stock later in the year.

Small fish, as observed towards the end of last year, dominates the central stock between Cape Juby and Safi. The level of the stock is lower than in November and June 2001. Probably due to the high fishing pressure on the central stock, the adult part has been strongly reduced. This is compensated by strong recruitment of younger fish. The fishery in this region continues to be on one dominant year class of young fish and is therefore dependent on successful recruitment each year. The fish is captured in the middle of its most intensive growth period (growth overfishing), and if the fish instead would be allowed to grow more before it is fished, a higher yield should be expected.

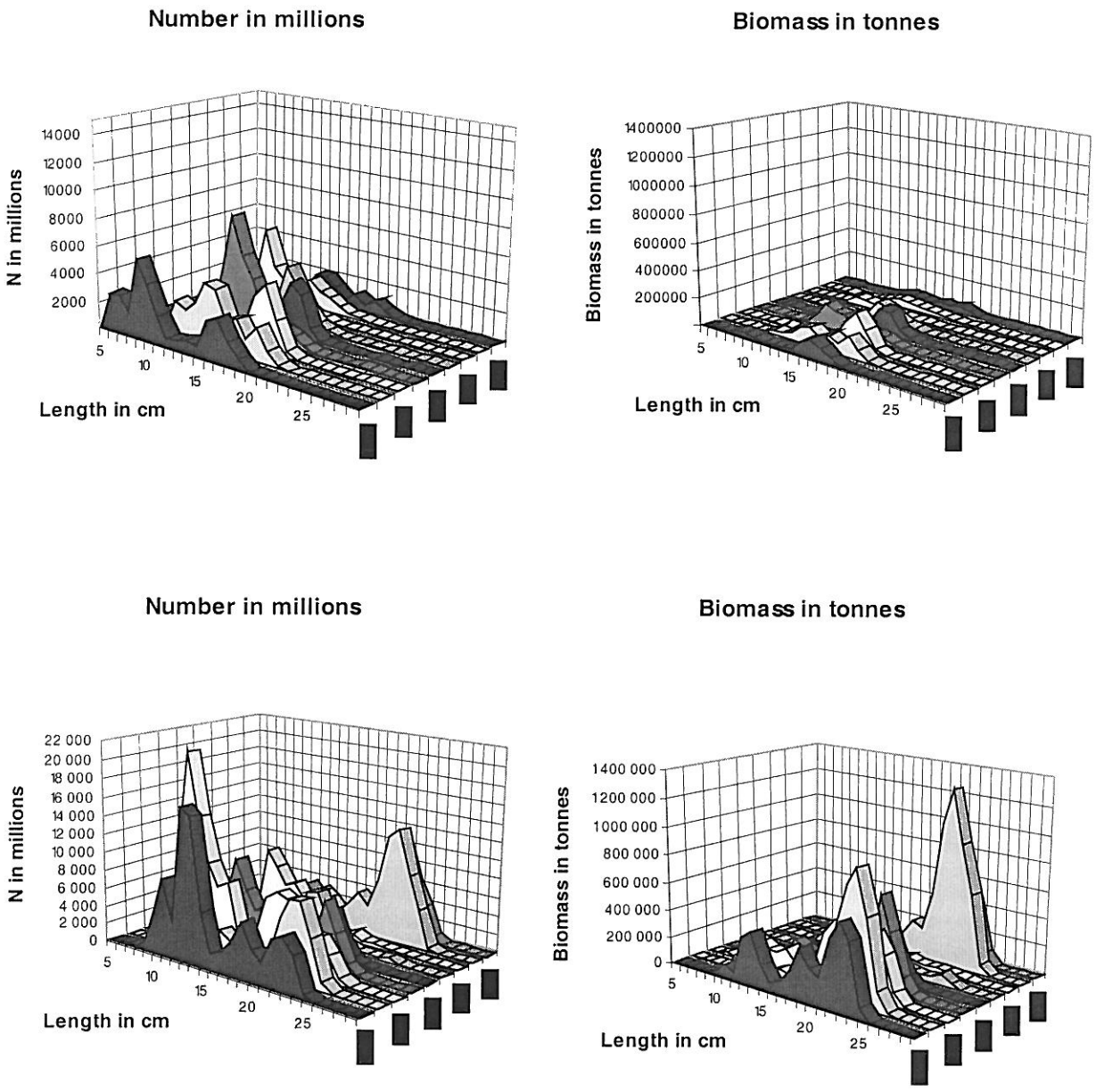


Figure 15. Numbers and biomass by length class, 1995-2002. Cape Juby-Cape Cantin (top) and Cape Timiris-Cape Juby (bottom).

Annex I Biomass and number by fish length class

Sardine (*Sardina pilchardus*)

MOROCCO & MAURITANIA, May-June 2002

Length	C.Juby-C.Cantin		C.Bojador-C.Juby		C.Blanc-C.Bojador		C.Timiris-C.Blanc		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5	81	60	127	93					209	153
6	6 204	2 755	502	223					6 706	2 978
7	9 480	2 740	995	288	114	33			10 589	3 061
8	8 756	1 739	833	165	419	83			10 007	1 987
9	40 265	5 727	540	77	4 148	590	3 763	502	44 953	6 394
10	39 352	4 146	194	20	17 787	1 874	28 561	2 919	57 332	6 040
11	25 137	2 016	362	29	33 139	2 657	69 283	5 657	58 639	4 702
12	10 568	660	1 690	106	33 030	2 062	32 150	2 032	45 288	2 828
13	15 861	786	8 805	436	97 414	4 828	231 890	11 226	122 079	6 051
14	25 138	1 006	18 205	728	90 202	3 608	282 208	11 368	133 545	5 342
15	23 396	766	21 646	709	33 941	1 112	123 503	4 093	78 982	2 587
16	101 098	2 745	43 247	1 174	17 660	479	8 068	229	162 005	4 398
17	138 584	3 153	66 223	1 507	37 284	848			242 091	5 509
18	90 756	1 748	38 658	745	158 148	3 046			287 562	5 539
19	44 795	737	7 669	126	366 421	6 026			418 885	6 889
20	5 907	84	3 071	43	243 132	3 442			252 110	3 569
21	1 283	16	3 254	40	187 391	2 299	18 786	232	191 928	2 355
22			21 845	234	448 996	4 807	21 322	229	470 841	5 041
23			25 756	242	569 134	5 348	24 519	229	594 890	5 590
24			5 602	46	501 536	4 159			507 139	4 205
25			1 777	13	84 151	619			85 928	632
26										
27										
28										
29										
30										
Total	586 663	30 882	271 000	7 045	2 924 046	47 922	844 053	38 716	4 625 762	124 565

Round sardinella (*Sardinella aurita*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
4								
5								
6								
7								
8		15,0		15,0		89		89
9		121,9		121,9		1 003		1 003
10		602,4		602,4		6 695		6 695
11		655,2		655,2		9 566		9 566
12		430,0		430,0		8 063		8 063
13		1676,5		1 676,5		39 599		39 599
14		2284,4	3,5	2 287,8		66 856	99	66 955
15		1824,1	4,1	1 828,2		65 212	143	65 354
16		591,0	4,1	595,1		25 487	172	25 659
17		276,8	27,4	304,2		14 240	1 379	15 620
18		12,3	63,5	75,9		749	3 781	4 531
19		12,3	83,2	95,5		877	5 797	6 674
20			63,1	63,1			5 111	5 111
21			107,4	107,4			10 034	10 034
22			48,2	48,2			5 160	5 160
23	42,0		23,7	65,7	5 228		2 891	8 119
24	67,5		24,9	92,4	9 531		3 436	12 967
25	73,0		22,6	95,6	11 617		3 530	15 147
26	89,4		6,0	95,4	15 971		1 053	17 025
27	82,1	2,9		85,1	16 393	587		16 980
28	51,1	31,4		82,4	11 354	6 969		18 323
29	25,5	91,7	3,5	120,7	6 296	22 602	834	29 732
30		53,9		53,9		14 679		14 679
31		94,6	3,5	98,1		28 400	1 016	29 415
32		145,2	6,9	152,1		47 847	2 231	50 078
33		255,1	18,3	273,4		92 065	6 478	98 544
34		449,4	50,2	499,6		177 173	19 367	196 541
35		326,8	65,8	392,6		140 353	27 663	168 016
36		107,9	79,0	186,9		50 393	36 098	86 491
37		62,3	48,5	110,8		31 540	24 039	55 579
38			9,0	9,0			4 832	4 832
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	430,6	10 123,4	766,2	11 320,2	76 391	851 045	165 144	1 092 580

Flat sardinella (*Sardinella maderensis*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6								
7								
8	25,5			25,5	151			151
9	51,1			51,1	421			421
10	25,5	20,5		46,1	284	228		512
11		75,2		75,2		1 098		1 098
12		20,5		20,5		385		385
13		6,8		6,8		162		162
14	3,4			3,4	100			100
15	28,9			28,9	1 035			1 035
16	6,8			6,8	293			293
17	13,6			13,6	700			700
18	59,7			59,7	3 626			3 626
19	75,2			75,2	5 352			5 352
20	72,3			72,3	5 978			5 978
21	284,8			284,8	27 175			27 175
22	315,1			315,1	34 458			34 458
23	815,3			815,3	101 578			101 578
24	1252,2			1252,2	176 778			176 778
25	660,3	10,4		670,7	105 105	1 651		106 756
26	199,4	10,4		209,8	35 627	1 853		37 480
27	69,1	17,2		86,3	13 788	3 436		17 224
28	10,7	30,9		41,6	2 373	6 864		9 237
29		24,7		24,7		6 098		6 098
30	25,5	38,9		64,4	6 958	10 591		17 549
31		53,0		53,0		15 909		15 909
32		28,3		28,3		9 319		9 319
33		21,2		21,2		7 654		7 654
34		14,1		14,1		5 574		5 574
35		14,1		14,1		6 073		6 073
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	3994,5	386,3		4380,8	521 779	76 894		598 673

Anchovy (*Engraulis encrasicolus*)

MOROCCO, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions
5	56	62,2	1	1,2	57	63,4
6	616	415,2	18	12,0	634	427,2
7	1 610	706,9	90	39,6	1 701	746,5
8	3 431	1 034,6	110	33,1	3 541	1 067,7
9	2 151	464,5	806	174,2	2 957	638,7
10	3 368	538,7	4 704	752,4	8 071	1 291,2
11	6 886	838,5	7 383	898,9	14 269	1 737,4
12	14 359	1 361,4	2 008	190,4	16 366	1 551,8
13	6 005	452,0	647	48,7	6 652	500,7
14	796	48,4	464	28,2	1 260	76,6
15			144	7,2	144	7,2
16						
17						
18						
19						
20						
Total	39 277	5 922,4	16 374	2185,8	55 651	8 108,2

Atlantic horse mackerel (*Trachurus trachurus*)

MOROCCO, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions
5						
6						
7	1	0,2	15	4,2	16	4,4
8			294	57,1	294	57,1
9	11	1,6	2 073	287,9	2 084	289,4
10	59	6,0	9 181	944,2	9 240	950,2
11	76	6,0	15 160	1 186,7	15 236	1 192,6
12	51	3,1	7 273	443,3	7 324	446,4
13	31	1,5	1 512	73,2	1 543	74,7
14	72	2,8	353	13,8	425	16,6
15	34	1,1	664	21,2	698	22,3
16	9	0,2			9	,2
17			414	9,2	414	9,2
18	25	0,5	207	3,9	232	4,4
19	351	5,6	693	11,1	1 044	16,8
20	325	4,5	8 837	122,1	9 162	126,6
21	558	6,7	45 937	550,3	46 495	556,9
22	250	2,6	25 512	266,6	25 762	269,2
23	208	1,9	13 242	121,5	13 449	123,4
24	58	0,5	5 135	41,6	5 193	42,0
25			13 977	100,3	13 977	100,3
26			13 525	86,5	13 525	86,5
27			8 039	46,0	8 039	46,0
28			6 782	34,9	6 782	34,9
29			6 135	28,4	6 135	28,4
30	57	0,2	2 230	9,4	2 287	9,6
31			1 746	6,7	1 746	6,7
32			1 438	5,0	1 438	5,0
33						
34						
35	446	1,2			446	1,2
36	323	0,8	679	1,7	1 002	2,5
37	1 226	2,8			1 226	2,8
38	2 842	5,9			2 842	5,9
39	7 163	13,8			7 163	13,8
40	9 044	16,2			9 044	16,2
41	6 646	11,1			6 646	11,1
42	6 373	9,9			6 373	9,9
43	8 200	11,9			8 200	11,9
44	2 048	2,8			2 048	2,8
45						
46	668	0,8			668	,8
47	356	0,4			356	,4
48						
49						
50						
Total	46 485	121,3	191 053	4 477	237 538	4 598

Cunene horse mackerel (*Trachurus trecae*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
4		93,1		91,1		81		81
5		1 738,1		1 737,1		2 776		2 776
6	5,2	9 096,8		9 102,0	14	23 983		23 997
7	183,6	16 660,9		16 844,5	744	67 477		68 220
8	294,2	15 392,9	39,8	15 726,9	1 735	90 750	205	92 690
9	91,2	35 001,0	278,6	35 370,7	750	288 086	2006	290 843
10	132,8	19 581,3	46,4	19 760,5	1 476	217 610	451	219 538
11	171,6	4 603,1	19,9	4 794,6	2 506	67 207	254	69 967
12	50,5	2 006,7		2 057,2	946	37 626		38 572
13	9,7	170,3	39,7	219,8	230	4 023	821	5 074
14	5,7	24,3	6,6	36,7	167	712	170	1 049
15			19,9	19,9			621	621
16			59,6	59,6			2247	2 247
17								
18			39,7	39,7			2112	2 112
19								
20	10,8		29,5	40,3	894		2134	3 027
21	140,5			140,5	13 407			13 407
22	291,8		52,4	344,2	31 913		5012	36 925
23	205,4		142,8	348,2	25 587		15569	41 156
24	43,2		606,5	649,8	6 104		74925	81 029
25			328,1	328,1			45699	45 699
26			83,7	83,7			13082	13 082
27			97,8	97,8			17087	17 087
28			49,1	49,1			9546	9 546
29			14,7	14,7			3179	3 179
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	1 636,4	104 368,5	1 951,7	107 956,7	86 473	800 332	195 120	1 081 925

Chub mackerel (*Scomber japonicus*)

MOROCCO - MAURITANIA, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		C.Blanc-C.Timiris		C.Timiris-St.Louis		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5										
6										
7										
8										
9										
10	17	1,8							17	1,8
11	293	23,0	21	1,6					314	24,6
12	721	44,0	251	15,3			147	8,9	1 119	68,2
13	3 502	169,5	1 720	83,2			2 589	125,3	7 811	378,0
14	1 422	55,5	1 739	67,9	12	0,5	8 479	331,1	11 653	455,0
15	1 400	44,7	956	30,6	183	5,8	8 398	268,5	10 937	349,6
16	1 412	37,4	779	20,6	220	5,8	5 065	134,2	7 476	198,1
17	6 710	149,0	666	14,8	175	3,9	2 014	44,7	9 566	212,5
18	11 841	222,6	532	10,0	26	0,5	1 904	35,8	14 303	268,9
19	18 690	300,1	1 402	22,5	121	1,9	2 230	35,8	22 443	360,3
20	6 040	83,5	2 547	35,2	211	2,9	648	8,9	9 446	130,5
21	2 401	28,8	2 898	34,7	41	0,5			5 340	64,0
22	1 745	18,2	4 028	42,1	93	1,0			5 866	61,3
23	1 226	11,2	5 307	48,7					6 533	59,9
24	850	6,9	7 383	59,8					8 233	66,6
25	692	5,0	7 191	51,6					7 883	56,6
26	473	3,0	21 978	140,6					22 450	143,6
27	428	2,4	36 981	211,7					37 409	214,1
28	235	1,2	34 976	179,9					35 210	181,1
29	545	2,5	21 214	98,4					21 759	100,9
30	1 558	6,5	11 701	49,1					13 258	55,6
31	2 141	8,2	8 581	32,7					10 721	40,8
32	993	3,4	6 816	23,6					7 809	27,1
33	629	2,0	5 289	16,7					5 918	18,7
34	62	0,2	1 682	4,9					1 744	5,1
35	136	0,4	3 808	10,1					3 945	10,5
36			2 362	5,8					2 362	5,8
37	80	0,2	11 570	26,1					11 651	26,3
38			13 082	27,3					13 082	27,3
39			2 711	5,2					2 711	5,2
40			1 306	2,3					1 306	2,3
41			1 405	2,3					1 405	2,3
42			503	0,8					503	0,8
43										
44										
45										
Total	66 241	1 231,2	223 385	1 376,2	1 082	22,9	31 475	993,4	322 182	3 623,6

Annex II Records of fishing stations

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1571
DATE:20/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 3155
start stop duration Long W 932
TIME :07:44:53 07:56:34 12 (min) Purpose code: 1
LOG :5854.60 5855.41 0.80 Area code : 1
FDEPTH: 20 20 GearCond.code:
BDEPTH: 30 30 Validity code:
Towing dir: 40ø Wire out: 130 m Speed: 40 kn*10

Sorted: 35 Kg Total catch: 177.45 CATCH/HOUR: 887.25

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	858.75	18550	96.79	2639
Engraulis encrasicolus	19.50	1600	2.20	2640
Lepidopus caudatus	8.25	5	0.93	
Trachurus trachurus	0.75	75	0.08	
Total	887.25		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1572
DATE:20/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 3157
start stop duration Long W 958
TIME :11:29:00 11:37:00 8 (min) Purpose code: 1
LOG :5885.94 5886.47 0.52 Area code : 1
FDEPTH: 100 100 GearCond.code:
BDEPTH: 125 120 Validity code:
Towing dir: 36ø Wire out: 360 m Speed: 40 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1573
DATE:20/ 5/02 GEAR TYPE: PT No: 4 POSITION:Lat N 3132
start stop duration Long W 1014
TIME :20:22:07 20:43:26 21 (min) Purpose code: 1
LOG :5965.77 5966.86 1.06 Area code : 1
FDEPTH: 10 10 GearCond.code:
BDEPTH: 266 263 Validity code:
Towing dir: 27ø Wire out: 150 m Speed: 30 kn*10

Sorted: 6 Kg Total catch: 6.00 CATCH/HOUR: 17.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Liocarcinus sp	10.86	797	63.36	
MYCTOPHIDAE	6.29	3709	36.70	
Total	17.15		100.06	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1574
DATE:20/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 3127
start stop duration Long W 957
TIME :23:05:55 23:08:56 3 (min) Purpose code: 1
LOG :5986.19 5986.44 0.24 Area code : 1
FDEPTH: 10 10 GearCond.code:
BDEPTH: 54 55 Validity code:
Towing dir: 212ø Wire out: 150 m Speed: 40 kn*10

Sorted: 36 Kg Total catch: 1171.75 CATCH/HOUR: 23435.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	20588.00	2526200	87.85	2641
Engraulis encrasicolus	2294.00	197120	9.79	2642
Scomber japonicus	490.00	38540	2.09	2643
Lepidopus caudatus	49.00	40	0.21	
Trachurus trachurus	14.00	20	0.06	
Total	23435.00		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1575
DATE:21/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 3024
start stop duration Long W 943
TIME :20:29:41 20:44:53 15 (min) Purpose code: 1
LOG :6168.19 6169.21 1.02 Area code : 1
FDEPTH: 10 10 GearCond.code:
BDEPTH: 40 55 Validity code:
Towing dir: 270ø Wire out: 150 m Speed: 50 kn*10

Sorted: 37 Kg Total catch: 583.60 CATCH/HOUR: 2334.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	2235.00	208764	95.74	2644
Lepidopus caudatus	57.00	40	2.44	
Trachurus trachurus	37.32	56	1.60	2645
Diplodus sargus *	5.00	8	0.21	
Total	2334.32		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1576
DATE:22/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 3014
start stop duration Long W 943
TIME :00:41:41 01:07:43 26 (min) Purpose code: 1
LOG :6207.27 6208.85 1.56 Area code : 1
FDEPTH: 10 10 GearCond.code:
BDEPTH: 79 86 Validity code:
Towing dir: 270ø Wire out: 150 m Speed: 40 kn*10

Sorted: 124 Kg Total catch: 124.95 CATCH/HOUR: 288.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Liocarcinus sp	138.46	10161	48.02	
Trachurus trachurus	113.08	226	39.22	2646
Lepidopus caudatus	35.08	28	12.17	
Diplodus sargus *	1.73	2	0.60	
Total	288.35		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1577
DATE:23/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2917
start stop duration Long W 1024
TIME :08:16:49 08:25:53 9 (min) Purpose code: 1
LOG :6507.94 6508.57 0.63 Area code : 1
FDEPTH: 20 20 GearCond.code:
BDEPTH: 42 43 Validity code:
Towing dir: 240ø Wire out: 160 m Speed: 45 kn*10

Sorted: 40 Kg Total catch: 413.55 CATCH/HOUR: 2757.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	1583.33	199460	57.43	2648
Sardina pilchardus	1000.00	135133	36.27	2647
Lepidopus caudatus	90.33	60	3.28	
Scomber japonicus	83.33	5133	3.02	2649
Total	2756.99		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1578
DATE:23/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2906
start stop duration Long W 1033
TIME :11:53:56 12:16:59 23 (min) Purpose code: 1
LOG :6539.99 6541.60 1.60 Area code : 1
FDEPTH: 20 20 GearCond.code: 1
BDEPTH: 40 40 Validity code: 1
Towing dir: 208ø Wire out: m Speed: kn*10

Sorted: 4 Kg Total catch: 28.35 CATCH/HOUR: 73.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	50.22	16445	67.90	2650
Engraulis encrasicolus	23.74	6950	32.10	2651
Total	73.96		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1579
DATE:23/ 5/02 GEAR TYPE: PT No: POSITION:Lat N 2907
start stop duration Long W 1041
TIME :15:03:56 15:30:30 27 (min) Purpose code: 1
LOG :6562.16 6563.86 1.69 Area code : 2
FDEPTH: 0 40 GearCond.code:
BDEPTH: 66 61 Validity code:
Towing dir: 160ø Wire out: 180 m Speed: kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1580
DATE:23/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2855
start stop duration Long W 1049
TIME :19:45:30 20:08:18 23 (min) Purpose code: 1
LOG :6600.11 6601.79 1.61 Area code : 1
FDEPTH: 20 20 GearCond.code:
BDEPTH: 48 54 Validity code:
Towing dir: 240ø Wire out: 170 m Speed: 40 kn*10

Sorted: Kg Total catch: 0.60 CATCH/HOUR: 1.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepidopus caudatus	1.57	3	100.00	
Total	1.57		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1581
DATE:24/ 5/02 GEAR TYPE: BT No: POSITION:Lat N 2906
start stop duration Long W 1129
TIME :01:40:24 03:20:00 28 (min) Purpose code: 1
LOG :6652.38 6653.87 1.48 Area code : 1
FDEPTH: 122 117 GearCond.code: 1
BDEPTH: 122 117 Validity code: 1
Towing dir: 165º Wire out: 350 m Speed: 40 kn*10

Sorted: Kg Total catch: 0.20 CATCH/HOUR: 0.43

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardina pilchardus	0.26	6	60.47	
Scomber japonicus	0.17	2	39.53	
Total	0.43		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1582
DATE:24/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2912
start stop duration Long W 1119
TIME :11:17:24 11:38:31 21 (min) Purpose code: 1
LOG :6700.12 6701.24 1.10 Area code : 1
FDEPTH: 151 143 GearCond.code:
BDEPTH: 151 143 Validity code:
Towing dir: 230º Wire out: 520 m Speed: 30 kn*10

Sorted: 27 Kg Total catch: 90.36 CATCH/HOUR: 258.17

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Dentex maroccanus	134.71	1057	52.18	
Zeus faber	50.14	37	19.42	
Callanthias ruber	47.09	3614	18.24	
Dentex gibbosus	9.14	9	3.54	
Scomber japonicus	8.00	134	3.10	2652
Sphoeroides pachgaster	7.43	20	2.88	
Mullus surmuletus	0.89	6	0.34	
Illex coindetii	0.57	3	0.22	
Sardina pilchardus	0.20	3	0.08	
Total	258.17		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1583
DATE:24/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2851
start stop duration Long W 1055
TIME :15:56:00 16:23:00 27 (min) Purpose code: 1
LOG :6738.80 6740.70 1.90 Area code : 1
FDEPTH: 20 20 GearCond.code:
BDEPTH: 51 47 Validity code:
Towing dir: 230º Wire out: 150 m Speed: 40 kn*10

Sorted: 29 Kg Total catch: 200.20 CATCH/HOUR: 444.89

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	283.11	41358	63.64	2653
Sardina pilchardus	158.67	9213	35.66	2654
Scomber japonicus	3.11	124	0.70	
Total	444.89		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1584
DATE:24/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2841
start stop duration Long W 1114
TIME :21:32:19 21:37:58 6 (min) Purpose code: 1
LOG :6786.25 6786.59 0.33 Area code : 1
FDEPTH: 10 10 GearCond.code:
BDEPTH: 44 46 Validity code:
Towing dir: 12º Wire out: 150 m Speed: 35 kn*10

Sorted: 38 Kg Total catch: 759.40 CATCH/HOUR: 7594.00

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardina pilchardus	7540.00	183600	99.29	2655
Lepidopus caudatus	52.00	30	0.68	
Scomber japonicus	2.00	20	0.03	
Total	7594.00		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1585
DATE:25/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2833
start stop duration Long W 1124
TIME :08:48:36 09:37:09 49 (min) Purpose code: 1
LOG :6894.06 6896.51 2.42 Area code : 1
FDEPTH: 36 38 GearCond.code:
BDEPTH: 36 38 Validity code:
Towing dir: 221º Wire out: 180 m Speed: 30 kn*10

Sorted: 25 Kg Total catch: 100.69 CATCH/HOUR: 123.29

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Diplodus bellottii	57.12	911	46.33	
Merluccius senegalensis	19.78	392	16.04	
Sardina pilchardus	17.49	4080	14.19	2655
Engraulis encrasicolus	8.27	2251	6.71	2656
Trachurus trachurus	6.36	380	5.16	2657
Scomber scombrus	2.52	12	2.04	
Loligo vulgaris	2.28	1063	1.85	
Loligo vulgaris	2.18	20	1.77	
Diplodus puntazzo	1.68	1	1.36	
Scomber japonicus	1.52	17	1.23	2658
Umbrina canariensis	1.18	40	0.96	
Pagellus acarne	1.13	5	0.92	
Diplodus vulgaris	0.75	5	0.61	
Dicologoglossa cuneata	0.40	18	0.32	
Spondyliosoma cantharus	0.26	4	0.21	
TRIGLIDAE	0.18	7	0.15	
Trisopterus luscus	0.11	7	0.09	
Gobius sp	0.11	48	0.09	
Total	123.32		100.03	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1586
DATE:25/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2834
start stop duration Long W 1135
TIME :11:51:14 12:19:16 28 (min) Purpose code: 1
LOG :6915.00 6916.42 1.43 Area code : 1
FDEPTH: 62 60 GearCond.code:
BDEPTH: 62 60 Validity code:
Towing dir: 226º Wire out: 270 m Speed: 30 kn*10

Sorted: 30 Kg Total catch: 323.45 CATCH/HOUR: 693.11

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Scomber japonicus	518.57	4800	74.82	2659
Trachurus trachurus	87.86	1007	12.68	2660
Pagellus acarne	35.36	257	5.10	
Lepidopus caudatus	21.43	13	3.09	
Pagellus erythrinus	11.79	64	1.70	
Diplodus vulgaris	5.36	43	0.77	
Psetta maxima	5.25	2	0.76	
Alloteuthis subulata	3.64	964	0.53	
Zeus faber	2.57	2	0.37	
Loligo vulgaris	1.29	43	0.19	
Total	693.12		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1587
DATE:25/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2827
start stop duration Long W 1142
TIME :16:23:42 16:47:27 24 (min) Purpose code: 1
LOG :6952.01 6953.25 1.23 Area code : 1
FDEPTH: 52 51 GearCond.code:
BDEPTH: 52 51 Validity code:
Towing dir: 122º Wire out: 200 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 137.64 CATCH/HOUR: 344.10

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Pagellus acarne	152.00	790	44.17	
Scomber japonicus	71.50	730	20.78	2663
Engraulis encrasicolus	58.00	5035	16.86	2662
Loligo vulgaris	34.50	320	10.03	
Trachurus trachurus	19.00	240	5.52	2664
Sardina pilchardus	9.10	180	2.64	2661
Total	344.10		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1588
DATE:25/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2823
start stop duration Long W 1150
TIME :20:30:33 20:49:08 19 (min) Purpose code: 1
LOG :6986.28 6987.73 1.44 Area code : 1
FDEPTH: 20 20 GearCond.code:
BDEPTH: 47 47 Validity code:
Towing dir: 226º Wire out: 160 m Speed: 40 kn*10

Sorted: 39 Kg Total catch: 426.46 CATCH/HOUR: 1346.72

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	1231.58	119053	91.45	2666
Scomber japonicus	97.89	1162	7.27	2667
Sardina pilchardus	14.21	789	1.06	2665
Pagellus bellottii	1.61	3	0.12	
Merluccius senegalensis	1.29	16	0.10	
Trachurus trachurus	0.13	3	0.01	
Total	1346.71		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1589
DATE:26/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2815
start stop duration Long W 1153
TIME :09:14:30 09:42:22 28 (min) Purpose code: 1
LOG :7105.35 7106.82 1.45 Area code : 1
FDEPTH: 38 37 GearCond.code:
BDEPTH: 38 37 Validity code:
Towing dir: 244º Wire out: 180 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 338.80 CATCH/HOUR: 726.00

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Sardina pilchardus	385.71	35040	53.13	2668
Scomber japonicus	160.71	1479	22.14	2670
Merluccius senegalensis	53.14	806	7.32	
Engraulis encrasicolus	25.71	4245	3.54	2669
Trachurus trachurus	24.64	1371	3.39	2671
Pagellus acarne	18.86	64	2.60	
Trachinus draco	18.00	193	2.48	
Diplodus bellottii	15.43	214	2.13	
Alloteuthis subulata	6.00	1350	0.83	
Diplodus vulgaris	5.79	43	0.80	
Umbrina canariensis	4.50	150	0.62	
Campogramma glaycos	3.00	2	0.41	
Chelidonichthys lucerna	1.71	21	0.24	
Loligo vulgaris	1.50	86	0.21	
Dicologoglossa cuneata	0.64	21	0.09	
Scorpaena notata	0.43	21	0.06	
GOBIIDAE	0.21	64	0.03	
Total	725.98		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1590
DATE:26/ 5/02 GEAR TYPE: PT No: 8 POSITION:Lat N 2814
start stop duration Long W 1214
TIME :15:12:02 15:32:00 20 (min) Purpose code: 1
LOG :7153.80 7155.10 1.30 Area code : 1
FDEPTH: 20 25 GearCond.code:
BDEPTH: 49 49 Validity code:
Towing dir: 187º Wire out: 150 m Speed: 40 kn*10

Sorted: 35 Kg Total catch: 35.51 CATCH/HOUR: 106.53

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Scomber japonicus	102.00	375	95.75	2672
Trachinus draco	2.49	81	2.34	
Trachinotus ovatus	2.04	9	1.91	
Total	106.53		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1591
DATE:26/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2807
start stop duration Long W 1218
TIME :17:22:05 17:49:36 28 (min) Purpose code: 1
LOG :7169.30 7170.88 1.56 Area code : 1
FDEPTH: 40 38 GearCond.code:
BDEPTH: 40 38 Validity code:
Towing dir: 240º Wire out: 160 m Speed: 30 kn*10

Sorted: 72 Kg Total catch: 72.16 CATCH/HOUR: 154.63

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Spondyliosoma cantharus	56.04	148	36.24	
Merluccius senegalensis	21.21	317	13.72	
Pagellus acarne	20.14	71	13.02	
Engraulis encrasicolus	17.51	6283	11.32	2674
Sardina pilchardus	13.18	4832	8.52	2673
Pagellus bellottii	11.36	49	7.35	
Diplodus vulgaris	6.43	26	4.16	
Alloteuthis subulata	3.49	1069	2.26	
Diplodus bellottii	2.14	34	1.38	
Dicologoglossa cuneata	1.29	39	0.83	
Umbrina canariensis	1.07	15	0.69	
Gobius sp	0.60	268	0.39	
Scorpaena notata	0.13	2	0.08	
Sepia officinalis hierredda	0.04	2	0.03	
Total	154.63		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1592
DATE:27/ 5/02 GEAR TYPE: PT No: 8 POSITION:Lat N 2814
start stop duration Long W 1247
TIME :03:14:56 03:42:16 27 (min) Purpose code: 1
LOG :7253.44 7255.43 1.98 Area code : 2
FDEPTH: 20 35 GearCond.code:
BDEPTH: 80 76 Validity code:
Towing dir: 180º Wire out: 180 m Speed: 40 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1593
DATE:27/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2807
start stop duration Long W 1231
TIME :08:47:03 08:59:27 12 (min) Purpose code: 1
LOG :7298.39 7299.29 0.89 Area code : 1
FDEPTH: 35 35 GearCond.code:
BDEPTH: 47 44 Validity code:
Towing dir: 161º Wire out: 170 m Speed: 40 kn*10

Sorted: 39 Kg Total catch: 982.49 CATCH/HOUR: 4912.45

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	4875.00	561550	99.24	2675
Engraulis encrasicolus	18.75	2000	0.38	
Sardinella aurita	12.40	270	0.25	2676
Scomber japonicus	4.15	70	0.08	
Pagellus acarne	2.15	10	0.04	
Total	4912.45		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1594
DATE:27/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2755
start stop duration Long W 1301
TIME :22:46:58 23:01:52 15 (min) Purpose code: 1
LOG :7411.39 7412.42 1.03 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 31 28 Validity code:
Towing dir: 207º Wire out: 150 m Speed: 40 kn*10

Sorted: 36 Kg Total catch: 78.54 CATCH/HOUR: 314.16

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	256.00	42164	81.49	2677
Merluccius merluccius	16.96	200	5.40	
Stromateus fiatola	11.40	16	3.63	
Sarpa salpa	6.56	56	2.09	
Diplodus vulgaris	4.40	88	1.40	
Scomber japonicus	4.40	36	1.40	
Diplodus sargus *	3.68	4	1.17	
Alloteuthis subulata	2.96	1016	0.94	
Scorpaena notata	2.32	96	0.74	
Sepia officinalis hierredda	1.80	8	0.57	
Chelidonichthys lucerna	1.16	8	0.37	
Sepia orbignyana	0.68	32	0.22	
Dicologoglossa cuneata	0.64	16	0.20	
Boops boops	0.44	4	0.14	
Campogramma glaycos	0.36	8	0.11	
Trisopterus luscus	0.16	8	0.05	
Diplodus bellottii	0.16	8	0.05	
Trachurus trachurus	0.08	8	0.03	
Total	314.16		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1595
DATE:28/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2754
start stop duration Long W 1321
TIME :09:00:42 09:21:09 20 (min) Purpose code: 1
LOG :7470.23 7471.34 1.10 Area code : 2
FDEPTH: 108 109 GearCond.code:
BDEPTH: 108 109 Validity code:
Towing dir: 215º Wire out: 420 m Speed: 30 kn*10

Sorted: 32 Kg Total catch: 98.36 CATCH/HOUR: 295.08

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	237.60	12897	80.52	2679
Macrorhamphosus scolopax	20.61	1464	6.98	
Dentex macrophthalmus	17.46	873	5.92	
Zeus faber	5.82	3	1.97	
Sphoeroides pachgaster	5.40	3	1.83	
Dentex maroccanus	4.50	72	1.53	
Engraulis encrasicolus	3.33	180	1.13	2678
Trachurus picturatus	0.36	18	0.12	
Total	295.08		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1596
DATE:28/ 5/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2742
start stop duration Long W 1316
TIME :12:02:34 12:31:00 28 (min) Purpose code: 1
LOG :7494.17 7496.16 1.98 Area code : 2
FDEPTH: 20 20 GearCond.code:
BDEPTH: 40 46 Validity code:
Towing dir: 218º Wire out: 150 m Speed: 40 kn*10

Sorted: 34 Kg Total catch: 2000.00 CATCH/HOUR: 4285.71

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	3151.29	132752	73.53	2680
Engraulis encrasicolus	1134.43	92374	26.47	2681
Total	4285.72		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1597
DATE:28/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2729
start stop duration Long W 1323
TIME :21:29:37 21:59:03 29 (min) Purpose code: 1
LOG :7583.07 7584.86 1.76 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 46 64 Validity code:
Towing dir: 310º Wire out: 150 m Speed: 40 kn*10

Sorted: 31 Kg Total catch: 61.68 CATCH/HOUR: 127.61

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	123.93	4074	97.12	2682
Engraulis encrasicolus	2.11	641	1.65	2683
Pagellus bellottii	1.41	41	1.10	
Alloteuthis subulata	0.17	83	0.13	
Total	127.62		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1598
DATE:29/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2715
start stop duration Long W 1329
TIME :09:45:06 10:17:53 33 (min) Purpose code: 1
LOG :7685.56 7687.77 2.19 Area code : 2
FDEPTH: 20 20 GearCond.code:
BDEPTH: 47 55 Validity code:
Towing dir: 204º Wire out: 170 m Speed: 40 kn*10

Sorted: 33 Kg Total catch: 69.49 CATCH/HOUR: 126.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	121.27	3182	95.98	2684
Scomber japonicus	5.07	33	4.01	2685
Total	126.34		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1599
DATE:29/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2709
start stop duration Long W 1330
TIME :14:03:14 14:25:32 22 (min) Purpose code: 1
LOG :7722.33 7723.93 1.60 Area code : 2
FDEPTH: 20 20 GearCond.code:
BDEPTH: 45 44 Validity code:
Towing dir: 186º Wire out: 140 m Speed: 40 kn*10

Sorted: 11 Kg Total catch: 11.11 CATCH/HOUR: 30.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	30.00	630	99.01	2686
Sardinella aurita	0.30	5	0.99	
Total	30.30		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1600
DATE:29/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2708
start stop duration Long W 1341
TIME :17:01:34 17:23:36 22 (min) Purpose code: 1
LOG :7745.83 7746.96 1.11 Area code : 2
FDEPTH: 106 127 GearCond.code:
BDEPTH: 106 127 Validity code:
Towing dir: 180º Wire out: 400 m Speed: 30 kn*10

Sorted: 30 Kg Total catch: 151.84 CATCH/HOUR: 414.11

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex macrophthalmus	188.18	2831	45.44	
Scomber japonicus	171.14	1653	41.33	2687
Trachurus trachurus	28.77	248	6.95	2688
Pagellus acarne	21.41	123	5.17	
Octopus vulgaris	2.84	3	0.69	
Dentex maroccanus	1.77	82	0.43	
Total	414.11		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1601
DATE:29/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2700
start stop duration Long W 1335
TIME :20:49:33 20:58:59 9 (min) Purpose code: 1
LOG :7778.22 7778.86 0.70 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 70 70 Validity code:
Towing dir: 196º Wire out: 150 m Speed: 40 kn*10

Sorted: 35 Kg Total catch: 353.44 CATCH/HOUR: 2356.27

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	2333.33	35713	99.03	2689
Engraulis encrasicolus	18.00	2000	0.76	2690
Scomber japonicus	4.93	67	0.21	
Total	2356.26		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1602
DATE:30/ 5/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2651
start stop duration Long W 1344
TIME :01:32:00 01:39:00 7 (min) Purpose code: 1
LOG :7819.60 7820.10 0.53 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 79 75 Validity code:
Towing dir: 104º Wire out: 150 m Speed: 40 kn*10

Sorted: Kg Total catch: 2033.00 CATCH/HOUR: 17425.72

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	17142.86	273180	98.38	2691
Argyrosomus regius	282.86	34	1.62	
Total	17425.72		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1603
DATE:30/ 5/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2606
start stop duration Long W 1501
TIME :23:37:44 23:58:32 21 (min) Purpose code: 1
LOG :8022.86 8024.08 1.21 Area code : 1
FDEPTH: 180 180 GearCond.code:
BDEPTH: 289 316 Validity code:
Towing dir: 13º Wire out: 700 m Speed: 40 kn*10

Sorted: 4 Kg Total catch: 4.65 CATCH/HOUR: 13.29

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	12.57	4751	94.58	
Sepia orbignyana	0.63	34	4.74	
Scomber japonicus	0.06	3	0.45	
Lepidotrigla dieuzeidei	0.03	3	0.23	
Total	13.29		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1604
DATE:31/ 5/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2554
start stop duration Long W 1438
TIME :03:39:54 03:55:43 16 (min) Purpose code: 1
LOG :8055.23 8056.39 1.16 Area code : 1
FDEPTH: 180 100 GearCond.code:
BDEPTH: 44 38 Validity code:
Towing dir: 217º Wire out: 150 m Speed: 40 kn*10

Sorted: 31 Kg Total catch: 344.45 CATCH/HOUR: 1291.69

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	1162.50	62179	90.00	2693
Scomber japonicus	108.75	233	8.42	2694
Lepidopus caudatus	20.44	11	1.58	
Total	1291.69		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1605
DATE:31/ 5/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2558
start stop duration Long W 1507
TIME :08:42:08 09:09:46 28 (min) Purpose code: 1
LOG :8094.99 8096.46 1.47 Area code : 1
FDEPTH: 200 198 GearCond.code:
BDEPTH: 200 198 Validity code:
Towing dir: 214º Wire out: 730 m Speed: 30 kn*10

Sorted: 115 Kg Total catch: 115.66 CATCH/HOUR: 247.84

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	99.75	679	40.25	2695
Merluccius merluccius	64.71	107	26.11	
Zeus faber	40.29	43	16.26	
Dentex maroccanus	19.35	336	7.81	
Sphoeroides pachgaster	6.60	4	2.66	
Trachurus trachurus	4.97	28	2.01	2696
Macrorhamphosus scolopax	3.71	212	1.50	
Dentex macrophthalmus	2.76	109	1.11	
Illex coindetii	1.52	34	0.61	
Lepidopus caudatus	1.46	2	0.59	
Pagellus acarne	0.99	4	0.40	
Mullus surmuletus	0.88	4	0.36	
Anthias anthias	0.39	15	0.16	
Alloteuthis subulata	0.28	64	0.11	
Trachurus picturatus	0.19	11	0.08	
Total	247.85		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1606
DATE: 4/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2547
start stop duration Long W 1509
TIME :08:39:08 08:57:27 18 (min) Purpose code: 1
LOG :8387.52 8388.91 1.39 Area code : 2
FDEPTH: 100 100 GearCond.code:
BDEPTH: 170 180 Validity code:
Towing dir: 302º Wire out: 230 m Speed: 40 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1607
DATE: 4/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2547
start stop duration Long W 1510
TIME :09:35:24 10:05:10 30 (min) Purpose code: 1
LOG :8391.39 8392.82 1.41 Area code : 2
FDEPTH: 177 166 GearCond.code:
BDEPTH: 177 166 Validity code:
Towing dir: 122º Wire out: 520 m Speed: 30 kn*10

Sorted: 32 Kg Total catch: 77.37 CATCH/HOUR: 154.74

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	56.80	2748	36.71	2697
Dentex maroccanus	30.68	836	19.83	
Macrorhamphosus scolopax	23.00	1420	14.86	
Engraulis encrasicolus	11.76	740	7.60	2698
Merluccius merluccius	7.60	10	4.91	
Zeus faber	7.60	8	4.91	
Dasyatis centroura	5.12	2	3.31	
Dentex macrophthalmus	4.48	80	2.90	
Anthias anthias	2.36	96	1.53	
Alloteuthis subulata	1.20	22	0.78	
Lepidopus caudatus	1.20	2	0.78	
Capros aper	1.00	4	0.65	
Mullus surmuletus	0.60	2	0.39	
Trachurus picturatus	0.50	4	0.32	
Pagellus acarne	0.42	2	0.27	
Illex coindetii	0.42	2	0.27	
Total	154.74		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1608
DATE: 4/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2531
start stop duration Long W 1503
TIME :15:59:53 16:29:45 30 (min) Purpose code: 1
LOG :8447.04 8448.62 1.58 Area code : 2
FDEPTH: 86 83 GearCond.code:
BDEPTH: 86 83 Validity code:
Towing dir: 120º Wire out: 320 m Speed: 30 kn*10

Sorted: 45 Kg Total catch: 45.29 CATCH/HOUR: 90.58

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trachurus	85.20	482	94.06	2699
Boops boops	3.88	30	4.28	
Belone belone gracilis	1.10	16	1.21	
Pagellus erythrinus	0.30	2	0.33	
Alloteuthis africana	0.10	2	0.11	
Total	90.58		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1609
DATE: 4/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2545
start stop duration Long W 1528
TIME :20:16:01 20:46:13 30 (min) Purpose code: 1
LOG :8481.83 8483.46 1.64 Area code : 2
FDEPTH: 262 227 GearCond.code:
BDEPTH: 262 227 Validity code:
Towing dir: 121º Wire out: 800 m Speed: 30 kn*10

Sorted: 75 Kg Total catch: 75.40 CATCH/HOUR: 150.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex maroccanus	23.40	262	15.52	
Trachurus trachurus	20.10	100	13.33	2700
Merluccius merluccius	19.60	26	13.00	
Dentex macrophthalmus	18.44	190	12.23	
Heptranchias perlo	16.70	12	11.07	
Lepidotrigla dieuzeidei	13.30	710	8.82	
Macrorhamphosus scolopax	11.78	736	7.81	
Illex coindetii	10.60	68	7.03	
Zenopsis conchifer	6.68	10	4.43	
Lepidopus caudatus	4.12	24	2.73	
Pagellus acarne	1.90	6	1.26	
Mullus surmuletus	1.58	4	1.05	
Conger conger	1.06	24	0.70	
Boops boops	0.60	4	0.40	
Capros aper	0.32	8	0.21	
Citharus linguatula	0.26	8	0.17	
Helicolenus dactylopterus	0.20	6	0.13	
Sepia orbignyana	0.08	4	0.05	
Argentina sphyraena	0.06	26	0.04	
Solenocera membranacea	0.02	8	0.01	
Total	150.80		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1610
DATE: 5/ 6/02 GEAR TYPE: BT No: POSITION:Lat N 2519
start stop duration Long W 1458
TIME :03:09:12 03:35:49 27 (min) Purpose code: 1
LOG :8544.59 8545.84 1.24 Area code : 1
FDEPTH: 57 60 GearCond.code:
BDEPTH: 57 60 Validity code:
Towing dir: 195º Wire out: 220 m Speed: 30 kn*10

Sorted: 29 Kg Total catch: 111.64 CATCH/HOUR: 248.09

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagellus acarne	48.93	333	19.72	
Pomadasys incisus	41.53	240	16.74	
Plectorhinchus mediterraneus	25.07	53	10.11	
Trichiurus lepturus	18.00	7	7.26	
Boops boops	17.73	327	7.15	
Aspitrigla obscura	15.27	227	6.16	
Argyrosomus regius	14.89	2	6.00	
Trachurus trachurus	11.13	76	4.49	2701
Dentex macrophthalmus	11.07	73	4.46	
Loligo vulgaris	9.53	16	3.84	
Umbrina canariensis	8.73	27	3.52	
Pagellus erythrinus	8.47	47	3.41	
Dentex canariensis	5.47	20	2.20	
Spondyliosoma cantharus	4.20	27	1.69	
Trachinus draco	3.87	47	1.56	
Mullus surmuletus	2.16	9	0.87	
Diplodus vulgaris	1.47	7	0.59	
Scomber japonicus	0.58	2	0.23	
Total	248.10		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1611
DATE: 5/ 6/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2512
start stop duration Long W 1508
TIME :08:10:40 08:30:47 20 (min) Purpose code: 1
LOG :8586.34 8587.61 1.26 Area code : 2
FDEPTH: 15 35 GearCond.code:
BDEPTH: 59 58 Validity code:
Towing dir: 116ø Wire out: 105 m Speed: 30 kn*10

Sorted: 48 Kg Total catch: 48.55 CATCH/HOUR: 145.65

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	138.45	1476	95.06	2702
Scomber japonicus	7.20	39	4.94	2703
Total	145.65		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1612
DATE: 5/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2514
start stop duration Long W 1510
TIME :09:38:39 10:11:51 33 (min) Purpose code: 1
LOG :8595.56 8597.40 1.83 Area code : 2
FDEPTH: 60 60 GearCond.code:
BDEPTH: 60 60 Validity code:
Towing dir: 116ø Wire out: 200 m Speed: 30 kn*10

Sorted: 67 Kg Total catch: 67.14 CATCH/HOUR: 122.07

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Diplodus vulgaris	91.45	340	74.92	
Dentex canariensis	18.82	64	15.42	
Spondyliosoma cantharus	5.42	38	4.44	
Pagrus auriga	2.65	4	2.17	
Pagellus erythrinus	2.55	13	2.09	
Loligo vulgaris	1.05	4	0.86	
Trachinus draco	0.13	2	0.11	
Total	122.07		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1613
DATE: 5/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2522
start stop duration Long W 1556
TIME :16:30:30 16:46:39 16 (min) Purpose code: 1
LOG :8657.06 8657.96 0.91 Area code : 2
FDEPTH: 150 135 GearCond.code:
BDEPTH: 163 163 Validity code:
Towing dir: 220ø Wire out: 340 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 34.06 CATCH/HOUR: 127.73

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dentex macrophthalmus	121.88	2014	95.42	
Lepidopus caudatus	5.06	26	3.96	
Trachurus trachurus	0.79	4	0.62	
Total	127.73		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1614
DATE: 5/ 6/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2512
start stop duration Long W 1532
TIME :19:51:58 20:33:29 42 (min) Purpose code: 1
LOG :8686.37 8688.77 2.38 Area code : 2
FDEPTH: 20 55 GearCond.code:
BDEPTH: 80 82 Validity code:
Towing dir: 296ø Wire out: 140 m Speed: 30 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1615
DATE: 5/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2510
start stop duration Long W 1527
TIME :21:58:19 22:28:35 30 (min) Purpose code: 1
LOG :8699.39 8700.99 1.59 Area code : 2
FDEPTH: 73 76 GearCond.code:
BDEPTH: 73 76 Validity code:
Towing dir: 292ø Wire out: 250 m Speed: 30 kn*10

Sorted: 33 Kg Total catch: 103.68 CATCH/HOUR: 207.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	45.30	312	21.85	2705
Dentex macrophthalmus	39.78	552	19.18	
Pomadasys incisus	35.04	162	16.90	
Engraulis encrasicolus	25.14	948	12.12	2704
Pagellus erythrinus	19.80	96	9.55	
Conger conger	10.38	42	5.01	
Boops boops	6.84	132	3.30	
Spondyliosoma cantharus	5.82	30	2.81	
Trichiurus lepturus	5.00	2	2.41	
Pagellus acarne	4.08	36	1.97	
Microchirus sp.	2.64	366	1.27	
Aspitrigla obscura	1.86	24	0.90	
Merluccius merluccius	1.78	2	0.86	
Sardina pilchardus	1.50	30	0.72	
Trachurus trachurus	0.54	12	0.26	
Macrorhamphosus scolopax	0.48	108	0.23	
Sepiella ornata	0.36	162	0.17	
Trachinus draco	0.30	6	0.14	
GOBIIDAE	0.24	108	0.12	
Pagellus erythrinus	0.18	138	0.09	
Sepiola rondeleti	0.18	12	0.09	
Capros aper	0.12	24	0.06	
Total	207.36		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1616
DATE: 6/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2506
start stop duration Long W 1519
TIME :23:58:49 00:15:44 17 (min) Purpose code: 1
LOG :8712.93 8714.05 1.11 Area code : 2
FDEPTH: 25 30 GearCond.code:
BDEPTH: 51 53 Validity code:
Towing dir: 305ø Wire out: 100 m Speed: 35 kn*10

Sorted: 33 Kg Total catch: 79.89 CATCH/HOUR: 281.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	234.35	4136	83.11	2706
Trichiurus lepturus	24.71	7	8.76	
Scomber japonicus	19.13	116	6.78	2707
Pomadasys incisus	1.48	7	0.52	
Pagellus bellottii	1.24	7	0.44	
Pagellus erythrinus	1.06	4	0.38	
Total	281.97		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1617
DATE: 6/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2455
start stop duration Long W 1455
TIME :03:42:57 03:58:15 15 (min) Purpose code: 1
LOG :8743.02 8743.90 0.89 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 32 33 Validity code:
Towing dir: 320ø Wire out: 80 m Speed: 35 kn*10

Sorted: 35 Kg Total catch: 803.70 CATCH/HOUR: 3214.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	3080.00	32824	95.81	2708
Scomber japonicus	101.60	376	3.16	2709
Trichiurus lepturus	33.20	12	1.03	
Total	3214.80		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1618
DATE: 6/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2457
start stop duration Long W 1524
TIME :08:27:26 08:57:55 30 (min) Purpose code: 1
LOG :8786.57 8788.11 1.53 Area code : 2
FDEPTH: 42 40 GearCond.code:
BDEPTH: 42 40 Validity code:
Towing dir: 115ø Wire out: 160 m Speed: 30 kn*10

Sorted: 97 Kg Total catch: 129.52 CATCH/HOUR: 259.04

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	211.40	1190	81.61	2710
Diplodus bellottii	25.78	284	9.95	
Trichiurus lepturus	7.32	2	2.83	
Pagellus bellottii	5.16	36	1.99	
Spondyliosoma cantharus	4.36	38	1.68	
Boops boops	2.36	24	0.91	
Pomadasys incisus	1.12	4	0.43	
Trachinus draco	0.36	2	0.14	
Pagellus acarne	0.36	2	0.14	
Trachurus trachurus	0.36	2	0.14	
Aspitrigla obscura	0.28	2	0.11	
Loligo vulgaris	0.18	4	0.07	
Total	259.04		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1619
DATE: 6/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2505
start stop duration Long W 1542
TIME :11:44:25 12:03:16 19 (min) Purpose code: 1
LOG :8810.94 8811.90 0.96 Area code : 2
FDEPTH: 40 40 GearCond.code:
BDEPTH: 72 71 Validity code:
Towing dir: 115ø Wire out: 120 m Speed: 32 kn*10

Sorted: Kg Total catch: 0.04 CATCH/HOUR: 0.13

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	0.13	3	100.00	
Total	0.13		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1620
DATE: 6/ 6/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2447
start stop duration Long W 1526
TIME :20:35:51 20:59:47 24 (min) Purpose code: 1
LOG :8893.04 8894.84 1.78 Area code : 2
FDEPTH: 14 13 GearCond.code:
BDEPTH: 36 37 Validity code:
Towing dir: 298ø Wire out: 80 m Speed: 45 kn*10

Sorted: 34 Kg Total catch: 137.12 CATCH/HOUR: 342.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	230.00	2910	67.09	2712
Spondyliosoma cantharus	70.70	380	20.62	
Scomber japonicus	28.00	143	8.17	2713
Diplodus bellottii	8.50	80	2.48	
Diplodus vulgaris	3.40	10	0.99	
Pagellus bellottii	1.40	10	0.41	
Trachinus draco	0.80	10	0.23	
Total	342.80		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1621
DATE: 7/ 6/02 GEAR TYPE: PT No: 7 POSITION:Lat N 2436
start stop duration Long W 1502
TIME :00:09:49 00:16:04 6 (min) Purpose code: 1
LOG :8923.94 8924.44 0.49 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 31 28 Validity code:
Towing dir: 250ø Wire out: 150 m Speed: 32 kn*10

Sorted: 32 Kg Total catch: 3500.00 CATCH/HOUR: 35000.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	35000.00	301900	100.00	2714
Total	35000.00		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1622
DATE: GEAR TYPE: BT No: POSITION:Lat N 1307
start stop duration Long W 1720
TIME :17:25:43 17:26:05 (min) Purpose code: 1
LOG :8862.58 8862.65 0.09 Area code : 2
FDEPTH: 47 48 GearCond.code:
BDEPTH: 47 48 Validity code:
Towing dir: ø Wire out: 450 m Speed:420 kn*10

Sorted: 2 Kg Total catch: 2.97 CATCH/HOUR: 178.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pagellus acarne	84.00	600	47.14	
Spondyliosoma cantharus	45.00	300	25.25	
Loligo vulgaris	35.40	60	19.87	
Trachinus draco	10.80	120	6.06	
Aspitrigla obscura	3.00	60	1.68	
Total	178.20		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1623
DATE: 7/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2440
start stop duration Long W 1602
TIME :12:59:32 13:29:21 30 (min) Purpose code: 1
LOG :9037.84 9039.67 1.83 Area code : 2
FDEPTH: 30 35 GearCond.code:
BDEPTH: 64 67 Validity code:
Towing dir: 305ø Wire out: 120 m Speed: 38 kn*10

Sorted: 4 Kg Total catch: 4.29 CATCH/HOUR: 8.58

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	8.20	100	95.57	2715
Scomber japonicus	0.26	2	3.03	
Sardina pilchardus	0.12	2	1.40	
Total	8.58		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1624
DATE: 7/ 6/02 GEAR TYPE: PT No: 7 POSITION:Lat N 2421
start stop duration Long W 1530
TIME :18:53:45 19:30:26 37 (min) Purpose code: 1
LOG :9088.75 9090.56 1.77 Area code : 2
FDEPTH: 5 5 GearCond.code:
BDEPTH: 22 22 Validity code:
Towing dir: 65ø Wire out: 220 m Speed: 30 kn*10

Sorted: 36 Kg Total catch: 12000.00 CATCH/HOUR: 19459.46

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	19459.46	147806	100.00	2716
Total	19459.46		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1625
DATE: 8/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2430
start stop duration Long W 1603
TIME :00:03:11 00:40:48 38 (min) Purpose code: 1
LOG :9132.95 9135.18 2.22 Area code : 2
FDEPTH: 30 36 GearCond.code:
BDEPTH: 57 54 Validity code:
Towing dir: 115ø Wire out: 100 m Speed: 35 kn*10

Sorted: 62 Kg Total catch: 62.67 CATCH/HOUR: 98.95

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	98.53	368	99.58	2718
Sardinella aurita	0.35	5	0.35	
Sardina pilchardus	0.08	2	0.08	
Total	98.96		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1626
DATE: 8/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2421
start stop duration Long W 1606
TIME :12:08:16 12:27:32 19 (min) Purpose code: 1
LOG :9228.12 9229.49 1.35 Area code : 2
FDEPTH: 30 25 GearCond.code:
BDEPTH: 57 51 Validity code:
Towing dir: 180ø Wire out: 120 m Speed: 40 kn*10

Sorted: 31 Kg Total catch: 185.34 CATCH/HOUR: 585.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	469.89	2691	80.28	2720
Sardina pilchardus	108.00	1402	18.45	2719
Sardinella aurita	7.39	57	1.26	
Total	585.28		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1627
DATE: 8/ 6/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2413
start stop duration Long W 1613
TIME :19:56:35 20:35:24 39 (min) Purpose code: 1
LOG :9298.55 9301.23 2.67 Area code : 2
FDEPTH: 20 30 GearCond.code:
BDEPTH: 61 59 Validity code:
Towing dir: 115ø Wire out: 140 m Speed: 40 kn*10

Sorted: 7 Kg Total catch: 7.09 CATCH/HOUR: 10.91

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	9.80	55	89.83	2721
Sardina pilchardus	0.98	14	8.98	2722
Engraulis encrasicolus	0.12	6	1.10	
Total	10.90		99.91	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1628
DATE: 8/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2413
start stop duration Long W 1612
TIME :21:36:26 22:06:14 30 (min) Purpose code: 1
LOG :9307.65 9309.24 1.59 Area code : 2
FDEPTH: 63 60 GearCond.code:
BDEPTH: 63 60 Validity code:
Towing dir: 116ø Wire out: 220 m Speed: 30 kn*10

Sorted: 32 Kg Total catch: 127.00 CATCH/HOUR: 254.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trachurus	78.80	816	31.02	2723
Pagellus acarne	43.52	224	17.13	
Dentex maroccanus	32.48	568	12.79	
Pagellus bellottii	21.76	176	8.57	
Pomadasys incisus	18.88	120	7.43	
Spondyliosoma cantharus	13.92	64	5.48	
Boops boops	8.88	152	3.50	
Dentex gibbosus	8.64	8	3.40	
Aspitrigla obscura	7.12	128	2.80	
Scomber japonicus	5.60	24	2.20	
Umbrina canariensis	3.92	16	1.54	
Trachinus draco	2.64	32	1.04	
Dentex macrophthalmus	2.56	8	1.01	
Trachurus trecae	2.56	16	1.01	
Trachinus vipera	1.20	16	0.47	
Trachurus picturatus	0.96	8	0.38	
Loligo vulgaris	0.40	16	0.16	
Citharus linguatula	0.16	16	0.06	
Total	254.00		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1629
DATE: 9/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2347
start stop duration Long W 1603
TIME :09:54:24 10:24:46 30 (min) Purpose code: 1
LOG :9423.32 9425.06 1.71 Area code : 2
FDEPTH: 30 31 GearCond.code:
BDEPTH: 30 31 Validity code:
Towing dir: 300ø Wire out: 120 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 1403.29 CATCH/HOUR: 2806.58

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Diplodus bellottii	1472.00	15920	52.45	
Scomber japonicus	470.40	2160	16.76	2725
Sardina pilchardus	247.20	1840	8.81	2724
Pagellus bellottii	220.80	1440	7.87	
Pagellus acarne	112.80	960	4.02	
Plectorhinchus mediterraneus	100.60	148	3.58	
Pomadasys incisus	59.20	320	2.11	
Trachurus trachurus	55.20	480	1.97	
Decapterus rhonchus	33.60	400	1.20	
Trachurus trecae	16.80	160	0.60	
Dentex canariensis	11.20	80	0.40	
Loligo vulgaris	6.00	44	0.21	
Diplodus vulgaris	0.78	2	0.03	
Total	2806.58		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1630
DATE: 9/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2356
start stop duration Long W 1618
TIME :12:29:32 12:48:12 19 (min) Purpose code: 1
LOG :9442.57 9443.88 1.29 Area code : 2
FDEPTH: 25 25 GearCond.code:
BDEPTH: 50 49 Validity code:
Towing dir: 190ø Wire out: 110 m Speed: 41 kn*10

Sorted: 35 Kg Total catch: 525.10 CATCH/HOUR: 1658.21

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	1374.95	21752	82.92	2726
Sardinella aurita	183.47	2343	11.06	2728
Scomber japonicus	99.79	695	6.02	2727
Total	1658.21		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1631
DATE: 9/ 6/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2349
start stop duration Long W 1622
TIME :19:33:41 20:31:33 58 (min) Purpose code: 1
LOG :9509.38 9513.82 4.41 Area code : 2
FDEPTH: 21 26 GearCond.code:
BDEPTH: 46 43 Validity code:
Towing dir: 190ø Wire out: 140 m Speed:450 kn*10

Sorted: 65 Kg Total catch: 65.67 CATCH/HOUR: 67.93

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	41.38	239	60.92	2729
Sardina pilchardus	26.28	388	38.69	2730
Pomadasys incisus	0.23	1	0.34	
Loligo vulgaris	0.05	1	0.07	
Total	67.94		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1632
DATE:10/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2339
start stop duration Long W 1631
TIME :02:58:24 03:29:44 31 (min) Purpose code: 1
LOG :9575.08 9576.86 1.76 Area code : 2
FDEPTH: 28 22 GearCond.code:
BDEPTH: 42 39 Validity code:
Towing dir: 104º Wire out: 100 m Speed: 34 kn*10

Sorted: 60 Kg Total catch: 60.93 CATCH/HOUR: 117.93

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	75.48	1034	64.00	2731
Scomber japonicus	34.26	174	29.05	2732
Uranoscopus scaber	2.44	2	2.07	
Pomadasys incisus	2.07	12	1.76	
Spondyliosoma cantharus	1.53	17	1.30	
Sardinella aurita	0.62	10	0.53	
Dentex canariensis	0.45	2	0.38	
Umbrina canariensis	0.39	2	0.33	
Pagellus bellottii	0.35	4	0.30	
Trachurus trachurus	0.19	2	0.16	
Trachinus draco	0.15	2	0.13	
Total	117.93		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1633
DATE:10/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2330
start stop duration Long W 1629
TIME :10:13:32 10:45:07 32 (min) Purpose code: 1
LOG :9637.37 9639.16 1.80 Area code : 2
FDEPTH: 37 39 GearCond.code:
BDEPTH: 37 39 Validity code:
Towing dir: 220º Wire out: 150 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 522.46 CATCH/HOUR: 979.61

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	956.25	9816	97.62	2733
Trachurus trachurus	14.25	163	1.45	2734
Spondyliosoma cantharus	3.09	28	0.32	
Scomber japonicus	2.38	11	0.24	
Loligo vulgaris	1.65	13	0.17	
Plectorhinchus mediterraneus	1.39	2	0.14	
Aspitrigla obscura	0.60	4	0.06	
Total	979.61		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1634
DATE:10/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2321
start stop duration Long W 1633
TIME :16:18:54 16:44:55 26 (min) Purpose code: 1
LOG :9691.75 9693.91 2.15 Area code : 2
FDEPTH: 10 15 GearCond.code:
BDEPTH: 35 38 Validity code:
Towing dir: 200º Wire out: 80 m Speed: 35 kn*10

Sorted: 35 Kg Total catch: 800.71 CATCH/HOUR: 1847.79

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	1846.15	15104	99.91	2735
Scomber japonicus	1.64	5	0.09	
Total	1847.79		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1635
DATE:10/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2318
start stop duration Long W 1656
TIME :21:33:43 21:53:58 20 (min) Purpose code: 1
LOG :9736.47 9737.75 1.26 Area code : 2
FDEPTH: 20 17 GearCond.code:
BDEPTH: 81 86 Validity code:
Towing dir: 293º Wire out: 100 m Speed:400 kn*10

Sorted: 33 Kg Total catch: 33.63 CATCH/HOUR: 100.89

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	86.55	1131	85.79	2736
Ruvettus pretiosus	5.01	3	4.97	
Todarodes sagittatus	3.27	12	3.24	
Scomber japonicus	2.82	21	2.80	
Sardinella aurita	2.25	30	2.23	
Merluccius merluccius	0.99	3	0.98	
Total	100.89		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1636
DATE:11/ 6/02 GEAR TYPE: PT No: 7 POSITION:Lat N 2257
start stop duration Long W 1623
TIME :03:37:09 04:05:27 28 (min) Purpose code: 1
LOG :9791.02 9792.93 1.90 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 31 26 Validity code:
Towing dir: 150º Wire out: 150 m Speed: 40 kn*10

Sorted: 3 Kg Total catch: 3.64 CATCH/HOUR: 7.80

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Decapterus rhonchus	3.62	58	46.41	2737
Scomber japonicus	1.01	2	12.95	
Pomatomus saltatrix	0.86	2	11.03	
Loligo vulgaris	0.77	64	9.87	
Trachurus trecae	0.56	2	7.18	
Diplodus bellottii	0.34	2	4.36	
Belone belone gracilis	0.24	2	3.08	
Alloteuthis subulata	0.13	32	1.67	
Pagellus bellottii	0.13	2	1.67	
Dicologoglossa cuneata	0.11	4	1.41	
Sepia orbignyana	0.04	4	0.51	
Total	7.81		100.14	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1637
DATE:11/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2254
start stop duration Long W 1658
TIME :11:54:36 12:30:23 36 (min) Purpose code: 1
LOG :9868.38 9870.89 2.49 Area code : 2
FDEPTH: 30 40 GearCond.code:
BDEPTH: 68 75 Validity code:
Towing dir: º Wire out: 200 m Speed: 45 kn*10

Sorted: 6 Kg Total catch: 6.00 CATCH/HOUR: 10.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepidopus caudatus	5.48	30	54.80	
Scomber japonicus	4.52	37	45.20	2738
Total	10.00		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1638
DATE:11/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2254
start stop duration Long W 1658
TIME :13:55:40 14:08:07 12 (min) Purpose code: 1
LOG :9879.19 9880.05 0.86 Area code : 2
FDEPTH: 40 45 GearCond.code:
BDEPTH: 68 71 Validity code:
Towing dir: 200º Wire out: 180 m Speed: 45 kn*10

Sorted: 1 Kg Total catch: 1.89 CATCH/HOUR: 9.45

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepidopus caudatus	2.95	15	31.22	
Engraulis encrasicolus	2.85	160	30.16	2739
Scomber japonicus	1.40	25	14.81	
Trachinus draco	1.30	5	13.76	
Sardina pilchardus	0.65	15	6.88	
Sardinella aurita	0.30	5	3.17	
Total	9.45		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1639
DATE:11/ 6/02 GEAR TYPE: PT No: 5 POSITION:Lat N 2249
start stop duration Long W 1646
TIME :16:25:46 16:55:27 30 (min) Purpose code: 1
LOG :9898.14 9900.01 1.86 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 55 56 Validity code:
Towing dir: 287º Wire out: 160 m Speed: 40 kn*10

Sorted: 67 Kg Total catch: 4000.00 CATCH/HOUR: 8000.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	7305.64	61738	91.32	2741
Sardinella aurita	694.36	1418	8.68	2740
Total	8000.00		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1640
DATE:11/ 6/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2237
start stop duration Long W 1642
TIME :22:02:18 22:17:06 15 (min) Purpose code: 1
LOG :9951.15 9951.70 0.55 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 40 42 Validity code:
Towing dir: 20º Wire out: 120 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 114.33 CATCH/HOUR: 457.32

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	345.60	2524	75.57	2742
Pomadasys incisus	35.16	192	7.69	
Scomber japonicus	20.64	96	4.51	2743
Spondyliosoma cantharus	17.40	96	3.80	
Plectorhinchus sp.	12.52	16	2.74	
Trachurus trecae	7.04	60	1.54	2745
Pagellus bellottii	6.36	36	1.39	
Trachurus trachurus	4.92	36	1.08	2744
Pagellus acarne	3.00	12	0.66	
Diplodus bellottii	1.68	12	0.37	
Boops boops	1.68	24	0.37	
Aspitrigla obscura	1.32	12	0.29	
Total	457.32		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1641
DATE:12/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2241
start stop duration Long W 1705
TIME :01:05:56 01:35:42 30 (min) Purpose code: 1
LOG :9976.63 9978.13 1.50 Area code : 2
FDEPTH: 74 71 GearCond.code:
BDEPTH: 74 71 Validity code:
Towing dir: 114º Wire out: 240 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 111.11 CATCH/HOUR: 222.22

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trachurus	130.44	6852	58.70	2747
Engraulis encrasicolus	27.18	1818	12.23	2746
Aspitrigla obscura	10.98	216	4.94	
Trachurus trecae	8.34	72	3.75	2748
Trachinus armatus	8.28	162	3.73	
Pagellus bellottii	6.50	40	2.93	
Pagellus acarne	6.30	28	2.84	
Arnoglossus imperialis	5.40	360	2.43	
Citharus linguatula	3.48	108	1.57	
Microchirus sp.	3.42	210	1.54	
Spondyliosoma cantharus	2.34	10	1.05	
Scomber japonicus	1.68	60	0.76	
Sardina pilchardus	1.56	42	0.70	
Dentex gibbosus	1.16	8	0.52	
Merluccius merluccius	0.96	2	0.43	
Sardinella aurita	0.84	12	0.38	
Uranoscopus cadenati	0.78	2	0.35	
Dentex canariensis	0.58	2	0.26	
Illex coindetii	0.50	2	0.23	
Loligo vulgaris	0.48	2	0.22	
Boops boops	0.42	6	0.19	
Trachinus draco	0.42	6	0.19	
Dentex macrophthalmus	0.18	6	0.08	
Total	222.22		100.02	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1642
DATE:12/ 6/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2221
start stop duration Long W 1639
TIME :08:55:34 09:26:12 31 (min) Purpose code: 1
LOG : 46.08 47.69 1.57 Area code : 2
FDEPTH: 0 0 GearCond.code:
BDEPTH: 33 28 Validity code:
Towing dir: 78º Wire out: 120 m Speed: 30 kn*10

Sorted: 42 Kg Total catch: 848.03 CATCH/HOUR: 1641.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	1238.71	132387	75.47	2749
Engraulis encrasicolus	387.10	51803	23.58	2750
Scomber japonicus	10.74	25	0.65	2751
Sepia officinalis hierredda	1.95	6	0.12	
Trachinotus ovatus	1.10	4	0.07	
Trachurus trecae	0.91	8	0.06	
Decapterus rhonchus	0.75	6	0.05	
Trachurus trachurus	0.08	2		
Total	1641.34		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1643
DATE:12/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 2205
start stop duration Long W 1655
TIME :20:23:24 20:43:04 20 (min) Purpose code: 1
LOG : 141.33 142.36 1.01 Area code : 2
FDEPTH: 31 31 GearCond.code:
BDEPTH: 31 31 Validity code:
Towing dir: 226º Wire out: 120 m Speed: 30 kn*10

Sorted: 30 Kg Total catch: 562.90 CATCH/HOUR: 1688.70

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Diplodus vulgaris	513.00	4905	30.38	
Diplodus bellottii	312.30	5175	18.49	
Plectorhinchus mediterraneus	161.10	585	9.54	
Spondyliosoma cantharus	159.30	4410	9.43	
Trachurus trecae	125.73	963	7.45	2752
Dentex canariensis	111.60	630	6.61	
Pagrus auriga	86.10	96	5.10	
Diplodus cervinus cervinus	45.15	27	2.67	
Zeus faber	28.35	24	1.68	
Pomadasys rogeri	28.35	540	1.68	
Pomadasys incisus	22.50	90	1.33	
Scorpaena scrofa	22.05	270	1.31	
Loligo vulgaris	21.15	630	1.25	
Decapterus rhonchus	15.93	228	0.94	2753
Umbrina canariensis	9.21	6	0.55	
Pagellus bellottii	8.55	315	0.51	
Argyrosomus regius	6.45	6	0.38	
Trachurus trachurus	6.12	36	0.36	2754
Conger conger	3.51	3	0.21	
Alloteuthis subulata	2.25	360	0.13	
Total	1688.70		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1644
DATE:13/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2203
start stop duration Long W 1721
TIME :00:00:40 00:12:51 12 (min) Purpose code: 1
LOG : 172.15 172.89 0.74 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 87 89 Validity code:
Towing dir: 220º Wire out: 120 m Speed: 35 kn*10

Sorted: 33 Kg Total catch: 3000.00 CATCH/HOUR: 15000.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	12451.30	92775	83.01	2755
Sardinella aurita	1896.90	15735	12.65	2756
Scomber japonicus	359.60	4495	2.40	
Trachurus trachurus	292.20	22925	1.95	2757
Total	15000.00		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1645
DATE:13/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2153
start stop duration Long W 1722
TIME :03:53:06 04:03:10 10 (min) Purpose code: 1
LOG : 203.91 204.56 0.64 Area code : 2
FDEPTH: 30 30 GearCond.code:
BDEPTH: 105 106 Validity code:
Towing dir: 180º Wire out: 120 m Speed: 40 kn*10

Sorted: 34 Kg Total catch: 509.10 CATCH/HOUR: 3054.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trachurus	2952.00	222102	96.64	2758
Scomber japonicus	84.60	4410	2.77	2759
Trachurus trecae	9.90	90	0.32	
Engraulis encrasicolus	6.30	450	0.21	
Sardina pilchardus	1.80	90	0.06	
Total	3054.60		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1646
DATE:21/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2209
start stop duration Long W 1702
TIME :01:07:02 01:37:52 31 (min) Purpose code: 1
LOG :1055.86 1057.96 2.09 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 44 58 Validity code:
Towing dir: 280º Wire out: 120 m Speed: 40 kn*10

Sorted: 26 Kg Total catch: 26.63 CATCH/HOUR: 51.54

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trichiurus lepturus	21.77	21	42.24	
Sardinella aurita	16.35	93	31.72	2760
Sardinella maderensis	9.19	19	17.83	2761
Pomatomus saltatrix	2.48	2	4.81	
Scomber japonicus	1.74	8	3.38	
Total	51.53		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1647
DATE:21/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2154
start stop duration Long W 1702
TIME :05:34:48 06:04:10 29 (min) Purpose code: 1
LOG :1093.71 1095.53 1.80 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 41 49 Validity code:
Towing dir: 284º Wire out: 14 m Speed: 30 kn*10

Sorted: 27 Kg Total catch: 27.14 CATCH/HOUR: 56.15

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	51.52	130	91.75	2762
Scomber japonicus	2.26	8	4.02	
Alloteuthis subulata	1.45	420	2.58	
Loligo vulgaris	0.52	23	0.93	
Trachurus trachurus	0.41	4	0.73	
Total	56.16		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1648
DATE:21/ 6/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2159
start stop duration Long W 1720
TIME :08:12:29 08:42:28 30 (min) Purpose code: 1
LOG :1111.68 1113.09 1.40 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 78 82 Validity code:
Towing dir: 350º Wire out: 140 m Speed: 30 kn*10

Sorted: 8 Kg Total catch: 8.00 CATCH/HOUR: 16.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomber japonicus	15.40	96	96.25	2763
Sarda sarda	0.60	2	3.75	
Total	16.00		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1649
DATE:21/ 6/02 GEAR TYPE: BT No: POSITION:Lat N 2139
start stop duration Long W 1719
TIME :13:15:19 13:45:10 30 (min) Purpose code: 1
LOG :1155.57 1157.04 1.44 Area code : 2
FDEPTH: 79 88 GearCond.code:
BDEPTH: 79 88 Validity code:
Towing dir: 275º Wire out: 300 m Speed: 30 kn*10

Sorted: 40 Kg Total catch: 2047.94 CATCH/HOUR: 4095.88

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trachurus	2815.00	203546	68.73	2764
Engraulis encrasicolus	680.00	47300	16.60	2765
Dentex macrophthalmus	195.00	2500	4.76	
Pagellus acarne	107.00	500	2.61	
Trachurus trecae	63.00	100	1.54	
Umbrina canariensis	62.00	200	1.51	
Plectorhinchus mediterraneus	39.80	22	0.97	
Scomber japonicus	20.00	1200	0.49	
Lepidopus caudatus	19.20	68	0.47	
Epinephelus aeneus	15.50	2	0.38	
Zeus faber	14.10	20	0.34	
Serranus cabrilla	14.00	100	0.34	
Scorpaena scrofa	12.00	200	0.29	
Merluccius senegalensis	9.00	100	0.22	
Dentex gibbosus	5.86	6	0.14	
Anthias anthias	5.00	100	0.12	
Spondyliosoma cantharus	4.34	8	0.11	
Dentex canariensis	3.90	8	0.10	
Diplodus bellottii	3.02	6	0.07	
Pagrus africanus	2.76	2	0.07	
Uranoscopus scaber	1.66	2	0.04	
Conger conger	1.30	2	0.03	
Diplodus vulgaris	1.26	2	0.03	
Scyliorhinus canicula	1.18	2	0.03	
Total	4095.88		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1650
DATE:21/ 6/02 GEAR TYPE: PT No: 5 POSITION:Lat N 2140
start stop duration Long W 1714
TIME :15:10:26 15:40:12 30 (min) Purpose code: 1
LOG :1166.90 1168.75 1.82 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 65 67 Validity code:
Towing dir: 275º Wire out: 150 m Speed: 40 kn*10

Sorted: 76 Kg Total catch: 2290.63 CATCH/HOUR: 4581.26

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	3777.00	27780	82.44	2767
Sardinella aurita	804.00	12060	17.55	2766
Scomber japonicus	0.26	2	0.01	
Total	4581.26		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1651
DATE:21/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2123
start stop duration Long W 1711
TIME :20:53:35 21:07:49 14 (min) Purpose code: 1
LOG :1215.99 1216.76 0.75 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 60 60 Validity code:
Towing dir: 112º Wire out: 140 m Speed: 32 kn*10

Sorted: 76 Kg Total catch: 1142.00 CATCH/HOUR: 4894.29

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	4482.86	157770	91.59	2768
Sardinella maderensis	286.07	771	5.84	
Sardinella aurita	125.36	257	2.56	
Total	4894.29		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1652
DATE:22/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2124
start stop duration Long W 1730
TIME :23:39:17 00:10:02 31 (min) Purpose code: 1
LOG :1238.89 1240.23 1.30 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 306 271 Validity code:
Towing dir: 35ø Wire out: 140 m Speed: 40 kn*10

Sorted: 33 Kg Total catch: 265.81 CATCH/HOUR: 514.47

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trachurus	246.97	2539	48.00	2769
Trachurus trecae	160.26	1208	31.15	2770
Scomber japonicus	106.84	1332	20.77	2771
Todarodes sagittatus	0.41	2	0.08	
Total	514.48		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1653
DATE:22/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2109
start stop duration Long W 1728
TIME :03:02:38 03:16:57 14 (min) Purpose code: 1
LOG :1263.98 1265.03 1.03 Area code : 2
FDEPTH: 15 15 GearCond.code:
BDEPTH: 103 107 Validity code:
Towing dir: 272ø Wire out: 80 m Speed: 45 kn*10

Sorted: 36 Kg Total catch: 107.25 CATCH/HOUR: 459.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	429.43	17563	93.43	2772
Scomber japonicus	21.34	206	4.64	
Trachurus trachurus	8.74	720	1.90	2773
Engraulis encrasicolus	0.13	13	0.03	
Total	459.64		100.00	

PROJECT STATION:1654
DATE:23/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2047
start stop duration Long W 1718
TIME :18:23:59 18:42:08 18 (min) Purpose code: 1
LOG :1382.23 1383.38 1.14 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 46 43 Validity code:
Towing dir: 90ø Wire out: 140 m Speed: 35 kn*10

Sorted: 7 Kg Total catch: 7.64 CATCH/HOUR: 25.47

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	10.50	87	41.22	2774
Scomber japonicus	6.43	157	25.25	2777
Decapterus rhonchus	5.07	30	19.91	2775
Engraulis encrasicolus	1.97	217	7.73	2776
Sepiella ornata	0.70	20	2.75	
Trachurus trachurus	0.57	30	2.24	
Boops boops	0.23	3	0.90	
Total	25.47		100.00	

PROJECT STATION:1655
DATE:23/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2047
start stop duration Long W 1724
TIME :20:30:08 20:58:08 28 (min) Purpose code: 1
LOG :1395.07 1396.74 1.68 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 59 58 Validity code:
Towing dir: 90ø Wire out: 140 m Speed: 35 kn*10

Sorted: 42 Kg Total catch: 1257.00 CATCH/HOUR: 2693.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	1957.50	91596	72.67	2778
Engraulis encrasicolus	392.14	48572	14.56	2780
Trachurus trachurus	258.43	27394	9.59	2781
Sardinella aurita	48.21	135	1.79	2779
Trachurus trecae	32.14	771	1.19	
Scomber japonicus	2.57	129	0.10	
SYNODONTIDAE	1.93	193	0.07	
Alloteuthis subulata	0.64	129	0.02	
Total	2693.56		99.99	

PROJECT STATION:1656
DATE:24/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2047
start stop duration Long W 1740
TIME :23:39:18 00:09:31 30 (min) Purpose code: 1
LOG :1416.32 1417.91 1.58 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 315 99 Validity code:
Towing dir: 90ø Wire out: 200 m Speed: 40 kn*10

Sorted: 32 Kg Total catch: 1491.65 CATCH/HOUR: 2983.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1916.00	226826	64.22	2783
Trachurus trachurus	758.80	88412	25.43	2782
Engraulis encrasicolus	238.32	19346	7.99	
Sardina pilchardus	27.10	1028	0.91	
MYCTOPHIDAE	23.36	7662	0.78	
Scomber japonicus	19.62	748	0.66	
Total	2983.20		99.99	

Annex III Instruments and fishing gear used

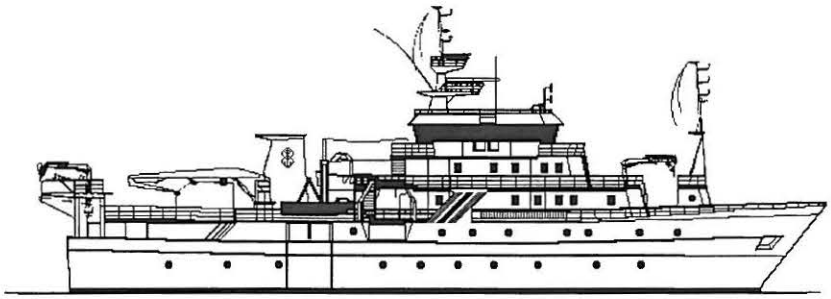
The Simrad EK-500, 38kHz echo scientific sounder was used during the survey for fish abundance estimation. The Bergen Echo Integrator system (BEI) logging the echogram raw data from the sounder, was used to scrutinize the acoustic records, and to allocate integrator data to fish species. All raw data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

Transceiver-1 menu	Transducer depth	5.5 - 7.5 m
	Absorption coeff.	10 dB/km
	Pulse length	medium (1ms)
	Bandwidth	wide
	Max power	2000 Watt
	2-way beam angle	-21.0 dB
	SV transducer gain	27.01 dB
	TS transducer gain	27.26 dB
	Angle sensitivity	21.9
	3 dB beamwidth along.	7.1°
	3 dB beamwidth athw.	6.9°
	Alongship offset	0.07°
	Athwardship offset	0.03°
Display menu	Echogram	1
	Bottom range	10 m
	Bottom range start	9 m
	TVG	20 log R
	Sv colour min	-67 dB
	TS Colour minimum	-60 dB
Printer- menu	Range	0-50, 0-100, 0-150, 0-250 or 0-500m
	TVG	20 log R
	Sv colour min	-60 dB
Bottom detection menu	Minimum level	-40 dB

A calibration experiment using a standard copper sphere was performed in False Bay, South Africa 22 April 2002.

Fishing gear

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



SURVEY OF THE PELAGIC FISH RESOURCES OFF NORTH WEST AFRICA

Part II

MAURITANIA

23 - 29 June 2002

Institut Mauritanien de Recherches Océanographiques et des Pêches
Nouadhibou, Mauritania

Institute of Marine Research
Bergen, Norway

CRUISE REPORTS 'DR FRIDTJOF NANSEN'

SURVEY OF THE PELAGIC FISH RESOURCES NORTH WEST AFRICA

Part II

MAURITANIA

23 - 29 June 2002

by

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Institute of Marine Research
Bergen, 2003

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CHAPTER 1 INTRODUCTION

1.1 Objective of the cruise

The general objectives were to estimate the biomass and map the distribution of small pelagic fish stocks off NW Africa (Morocco, Mauritania, Senegal and the Gambia) by hydro-acoustic methods and describe the hydrographic conditions there over a period of 50 days, in June-July 2002. For Mauritania the agreed objectives were:

- To map the distribution and estimate the biomass of the main small pelagic fish using hydro-acoustic methods. The species of interest are: sardine *Sardina pilchardus*, sardinella *Sardinella aurita*, *S. maderensis*, horse mackerels *Trachurus trachurus* and *T. trecae*, false scad *Caranx rhonchus*, anchovy *Engraulis encrasicolus* and chub mackerel *Scomber japonicus*.

- To identify and describe the size distribution of the target fish populations by mid-water and bottom trawl sampling and process the catches by recording weight and number by species.

- To sample standard hydrographical transects for temperature, salinity and oxygen at about 16°40'N, 18°00'N, 19°00'N, 20°00'N and off Cape Blanc.

The time allocated for this part of the survey, off Mauritania, was 6 days.

1.2 Participation

Members of the scientific teams were:

Institut Mauritanien de Recherches Océanographiques et des Pêches:

Mohamed El Moustapha O. BOUZOUMA, Mohamed O. SIDI, Abdoulaye N'DIAYE, Ahmed DIAGNE

Centre de Recherches Océanographiques de Dakar-Thiaroye, Senegal:

Abdoulaye SARRE

Department of Fisheries, The Gambia:
Juldah JALLOW

Institut National de Recherche Halieutique, Morocco:
Hassan MOUSTAHFID

Institute of Marine Research, Norway:
Reidar TORESEN, Magne OLSEN, Tore MØRK and Terje HAUGLAND

1.3 Narrative

Due to technical problems in the main engine onboard RV 'Dr. Fridtjof Nansen' on the part of the survey covering Moroccan waters, the time available for surveying in Mauritania was limited to six days. After embarking of scientists from Mauritania, Senegal and the Gambia, in Nouadhibou the survey of the Mauritanian shelf started on June the 23, at Cape Blanc, with systematic parallel course tracks spaced about 15 NM (nautical miles) apart. To cover the whole distribution area of pelagic fish, the shelf was covered from the 15 m isobath and offshore to the 500 m isobath. Trawling was done irregularly, either to identify echo registrations or to check 'blindly' if fish were mixed with the plankton in the upper layers of the water column. A smaller pelagic trawl or the bottom trawl with floats was used for sampling the pelagic fish in very shallow waters (depth less than 25 m). The shelf was covered south to St. Louis before a call was made in Nouakchott on June 29, to let participants from Morocco, and Mauritania disembark and scientists from Senegal and the Gambia come onboard.

The hydrographic profile at 16°40'N was sampled on 28 June, at 18°00'N on 29 at 19°00'N on 25 and off Cape Blanc on 23 June. Due to limited time in Mauritanian waters, the hydrographic section at 20°00'N was omitted.

The survey was terminated in Nouakchott on 29 June. The course tracks with the fishing and hydrographical stations are shown in Figure 1.

1.4 Methods

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

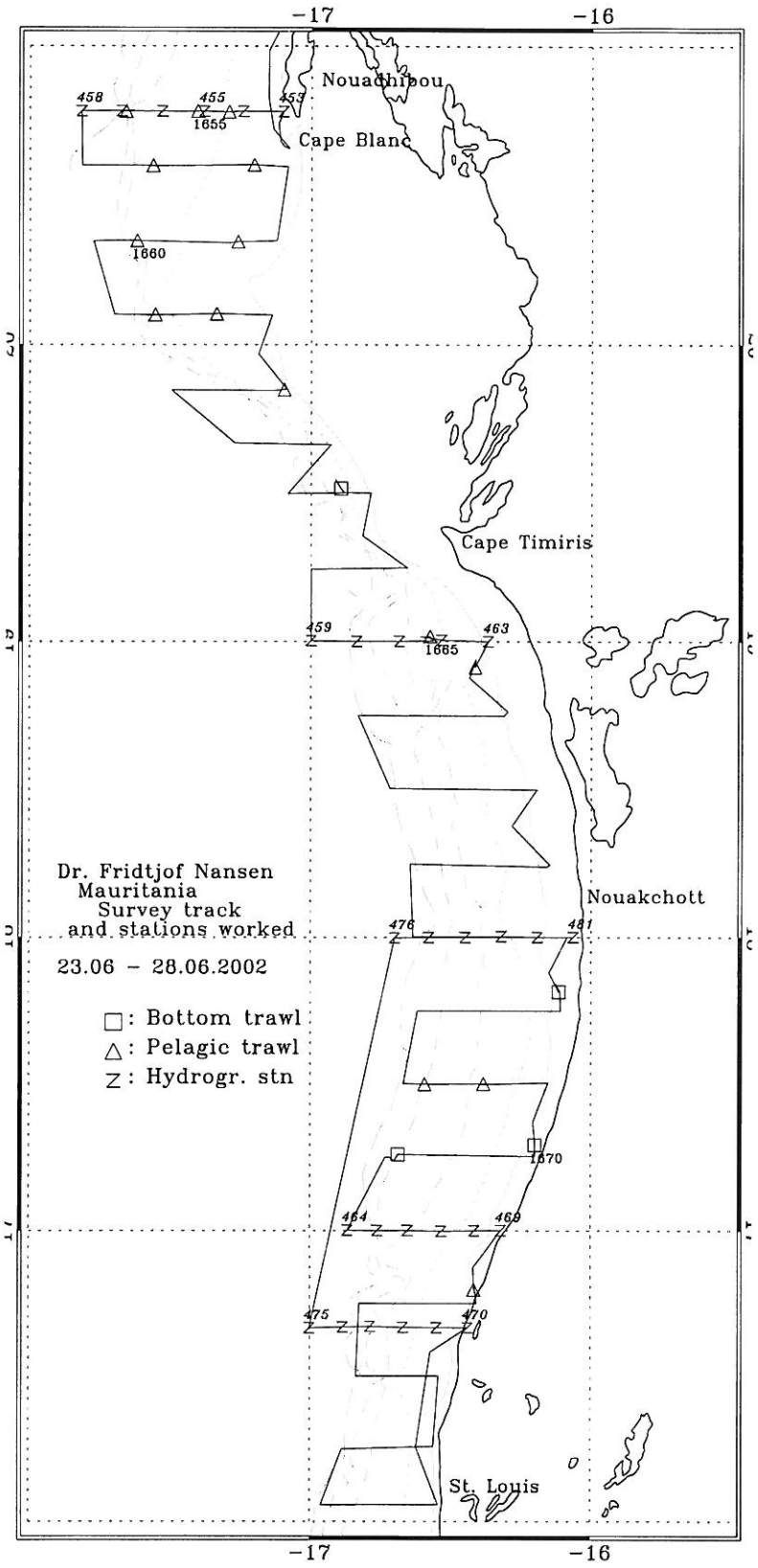


Figure 1. Course track and fishing and hydrographic stations

Hydrographic profiles were collected with a Seabird 911+ CTD probe. Temperature, salinity, oxygen and pressure (depth) were logged by the Seabird Software. From these data series, records were selected from standard depths and presented in figures.

Biological sampling

Biological sampling of the fish was carried out using trawls. A pelagic trawl with floats was often used. A smaller pelagic trawl or the bottom trawl with floats was used for sampling the pelagic fish in very shallow waters (depth less than 25 m). Annex II gives a description of the instruments and the fishing gear used. All catches were sampled for composition by weight and numbers of each species caught. Species identification was based on the FAO Species Guides. Length frequency distributions, by total fish length in cm, of the selected target species were taken in all the stations where they were present. Individual weight measurements were taken regularly to estimate the condition factor in the length-weight relationship:

$$\overline{w} = \frac{cond}{100} \cdot L^3$$

The specific condition factors obtained from the samples and applied for this survey were: 0.96 for sardinellas and horse mackerels, 0.82 for pilchard and 0.54 for anchovy. For chub mackerel, *Scomber japonicus,* a condition factor of 0.84 was used.

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

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

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

The following target groups were used for Mauritania:

1. Sardinellas (flat sardinella *Sardinella maderensis* and round sardinella *S. aurita*),
2. Sardine *Sardina pilchardus,*
3. Horse mackerels (Atlantic horse mackerel *Trachurus trachurus,* Cunene horse mackerel *Trachurus trecae*, and false scad *Caranx rhonchus*),
4. Chub mackerel *Scomber japonicus,*

5. Other pelagic carangids and associated species (Atlantic bumper *Chloroscombrus chrysurus*, African lookdown *Selene dorsalis*, largehead hairtail *Trichiurus lepturus*, and barracudas *Sphyraena* spp.),
6. Other demersal species (such as bigeye grunt *Brachydeuterus auritus*, Sparidae and Haemulidae),
7. Other clupeids such as West African ilisha *Ilisha africana.*

Acoustic sampling

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

In cases where the target category of fish contains more than one species (sardinellas and horse mackerels), the mean s_A-value allocated to the category is divided between the species in the same ratio as their contribution to the mean back scattering strength in the length frequency samples.

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

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

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

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

where L is total length in 1 cm length group i and C_{Fi} (m^{-2}) is the reciprocal back scattering strength, or so-called fish conversion factor.

In order to split and convert the allocated s_A-values (m^2/NM^2) to fish densities (numbers per length group per NM^2), the following formula was used:

$$\rho_i = s_A \cdot \frac{p_i}{\sum_{i=1}^{n} \frac{p_i}{C_{F_i}}}$$

where

ρ_i = density of fish in length group i

s_A = mean integrator value

p_i = proportion of fish in length group i

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

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

The integrator outputs were split in fish groups using a combination of behaviour pattern as deduced from echo diagrams, the BEI analysis and catch composition as described below. The following groups were used for Mauritania: 1) sardinellas, 2) sardine, 3) horse mackerels, 4) chub mackerel, 5) carangids and associated species and 6) demersal fish.

The above equations show that the conversion from s_A-values to number of fish is dependent on the length composition of the fish. It is therefore important to get representative length distributions from the stock in the whole distribution area.

When the size classes (of e.g. young fish and older fish) are well mixed, the various length distributions can be pooled together with equal importance. Otherwise, when the size classes are segregated, the total distribution area has to be post-stratified, according to the length distributions, and separate estimates are made for the regions containing fish with equal size.

A systematic approach to a) divide the s_A-value between species in a category of fish (e.g. *Sardinella aurita* and *S. maderensis*) and b) produce pooled length distributions of a target species for use in the above equation and c) calculate the biomass estimates for a region, is obtained through the following procedure:

- The samples of the species in the category (e.g. sardinellas) are respectively pooled together with equal importance (normalized). A sample of 60 flat sardinella in one sample will have equal importance to 30 fish in another sample and not the double weight in accordance with the number of fish in the sample.

- The mean back scattering strength (ρ/s_A) of each length frequency distribution of the target species is calculated and summed. This is automatically done if the length distributions are punched into an Excel spreadsheet prepared for the estimation of the abundance of fish (made available onboard 'Dr. Fridtjof Nansen').

- The mean s_A-value allocated to the category of fish in the region is divided between the species in the same ratio as their relative contribution to the mean back scattering strength of the length groups in the sample (also automatically done in the Excel spread-sheet given that the s_A-value for the region is punched into the sheet).

- The pooled length distribution is used, together with the mean s_A-value, to calculate the density (numbers per square NM) by length groups and species, using the above formula. The total number by length group in the area is obtained by multiplying each number by the area. (This is done in the Excel spreadsheet, given that the area of the region is punched into the sheet).

- The numbers are converted to biomass using the estimated weight at length. (Done in the Excel sheet if the condition factor is punched).

CHAPTER 2 SURVEY RESULTS

2.1 Weather conditions and hydrography

Wind conditions

Distribution of wind speed and direction recorded along the survey track is presented in Figure 2.

Weather conditions during the survey were dominated by strong north-easterly winds in the Cape Blanc area, Figure 2. These strong winds in this region lead to the intensification of upwelling and coastal currents.

Farther south the wind direction was changed to the west-east, and the hydrography south of Cape Timiris was dominated by tropical waters (more than 22 °C).

Hydrography

Figure 3 shows the distribution of sea surface temperature along the survey track. The characteristic feature of the sea surface temperature to the south of Nouakchott is a predominance of tropical warm surface water >23 °C as a seasonal effect.

North of Cape Timiris to Cape Blanc, the distribution of sea surface temperature is affected by the persistence of the upwelling waters from the north with temperatures <19 °C. The thermal front was located at about 19 °N, which is farther south than normal (20-21 °N).

Figure 4 shows the distribution of temperature, salinity and oxygen in the four profiles.

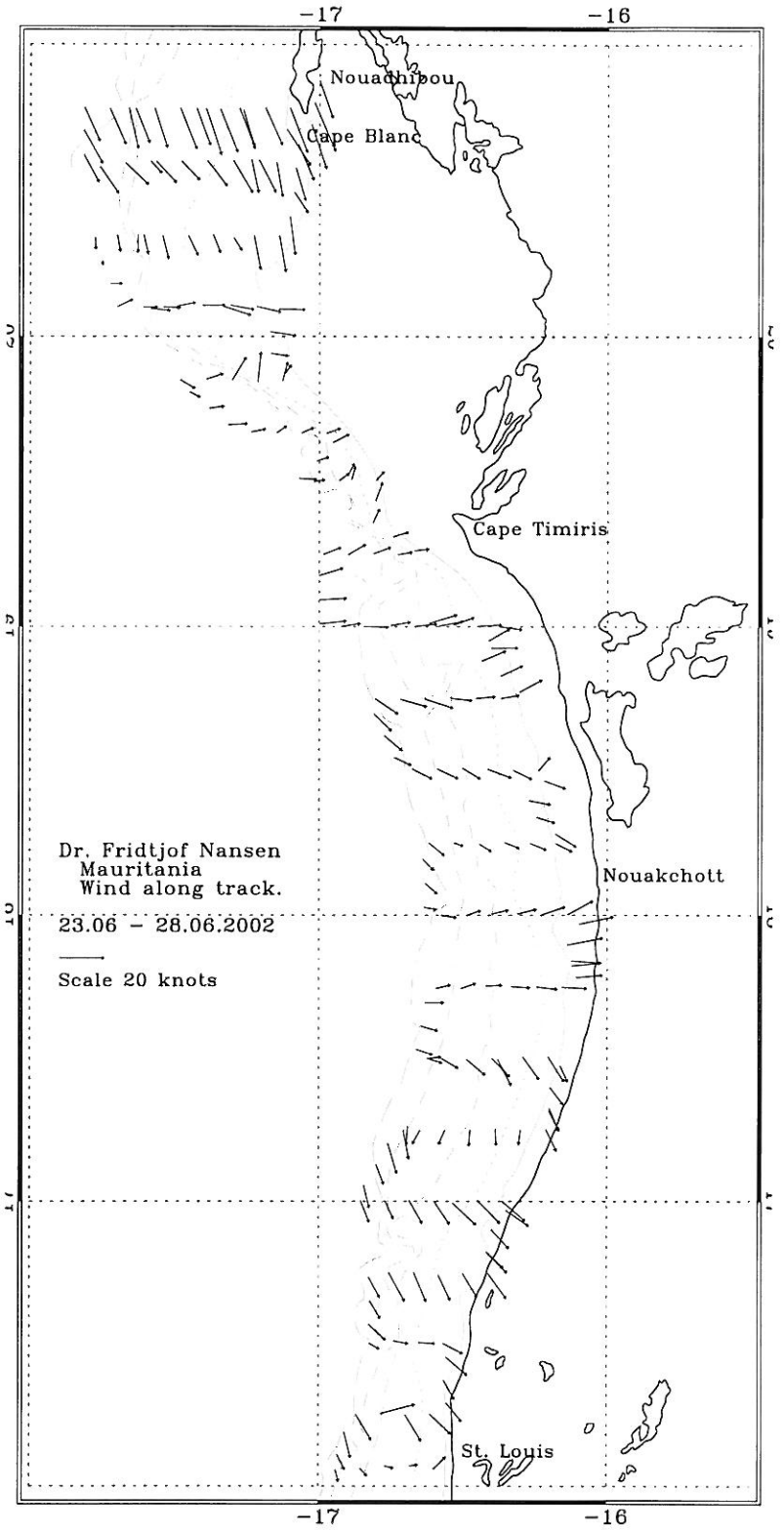


Figure 2. Wind conditions in the surveyed area.

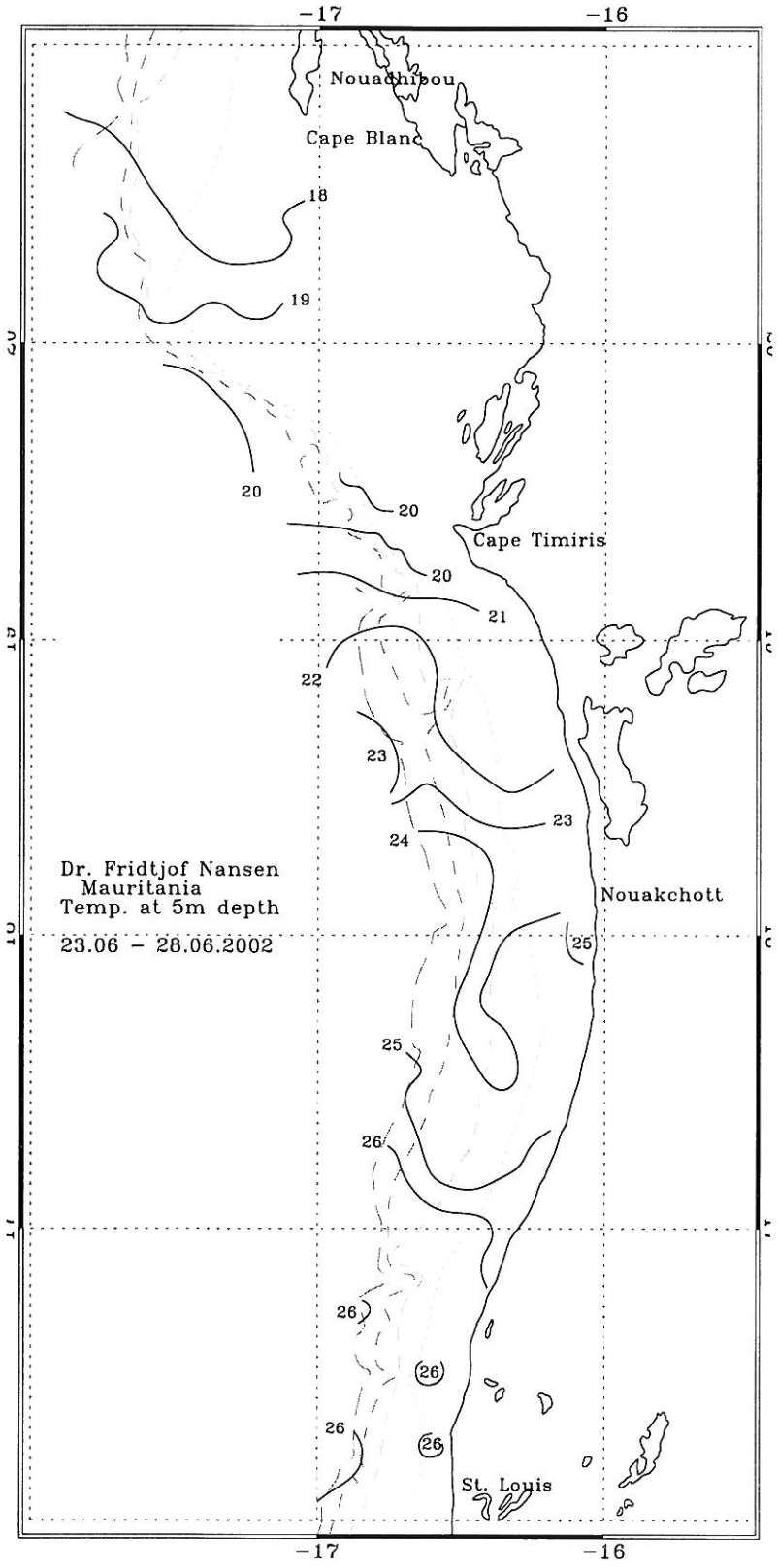
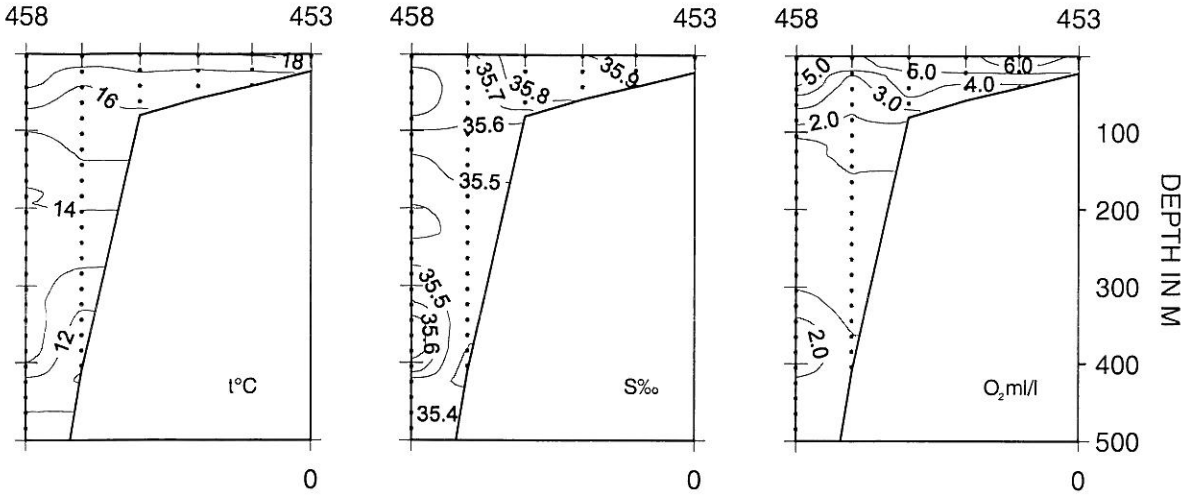
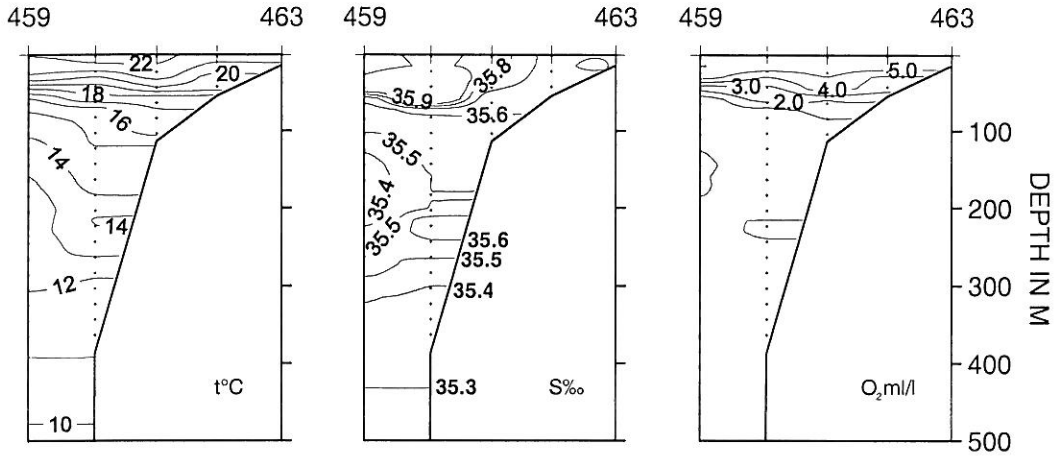


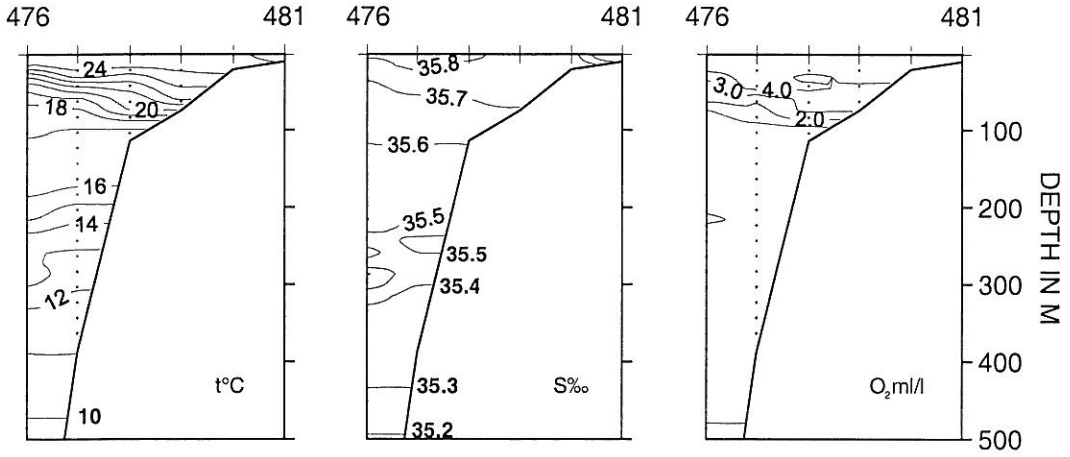
Figure 3. Sea surface temperature.



CAPE BLANC 23.06 2002



19°00 N 25.06 2002



18°00' N 29.06 2002

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

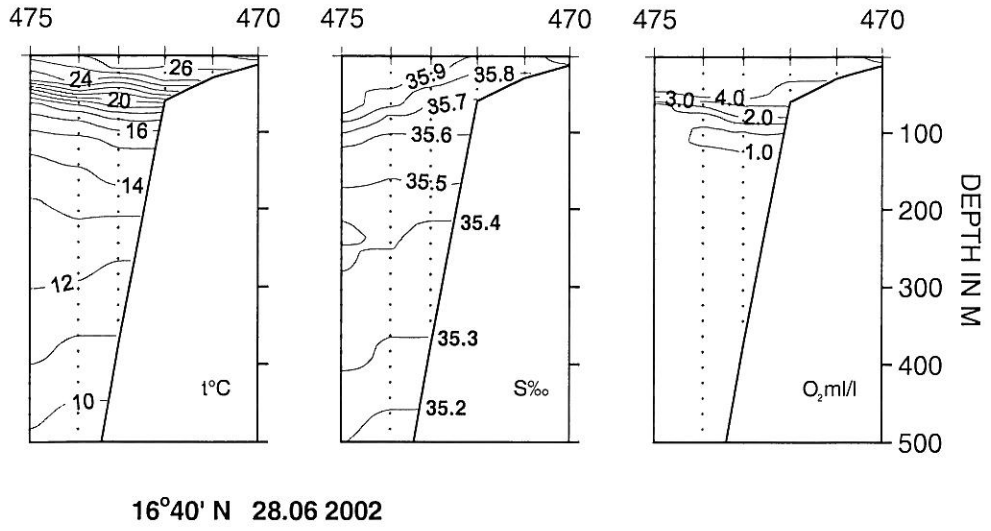


Figure 4. continued.

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

Figures 5 shows the distribution of sardinellas on the shelf of Mauritania.

Sardinellas were found over the inner shelf in a nearly continuous belt along the coast from St. Louis to some 20 NM north of Nouakchott, see Figure 5. Particularly dense school areas were located north and south of Nouakchott. Another area with relatively dense schools was found some 30 NM south of Cape Timiris.

The samples showed sardinellas of varying size, the round sardinella south of Cape Timiris with modal lengths of 14, 29, 31 and 34 cm, while the flat sardinella had modal lengths of 11, 28 and 31 cm. Stock length compositions by numbers and weight in Annex IV.

Table 1 gives the biomass estimates of sardinellas based on their size composition in the area of sampling. The total estimate was 234 thousand tonnes of which 67% was round and 33% flat sardinella.

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

Flat sardinella	Round sardinella	Horse mackerels	Other Carangids etc.
77	157	587	148

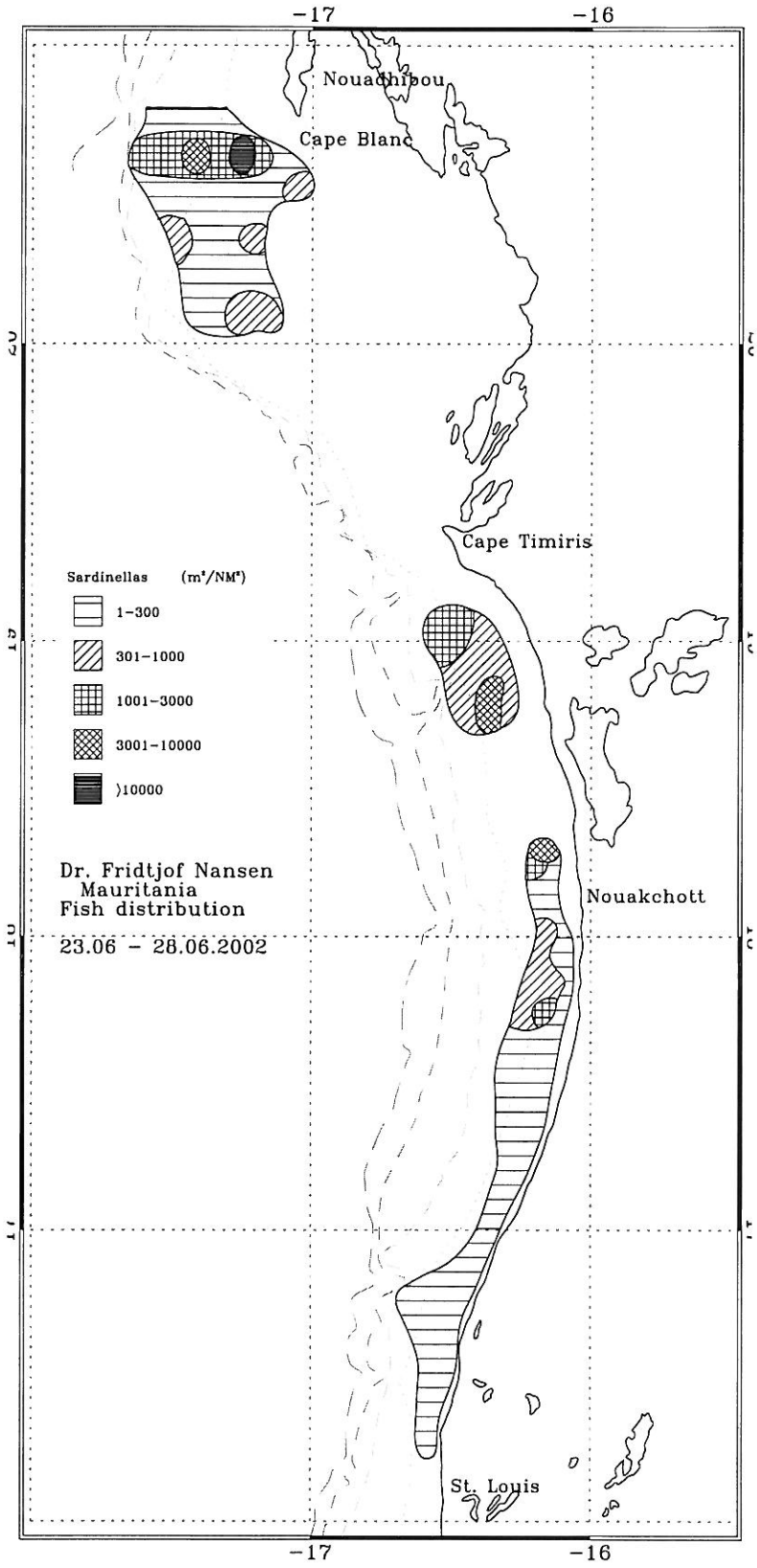


Figure 5. Distribution of sardinellas.

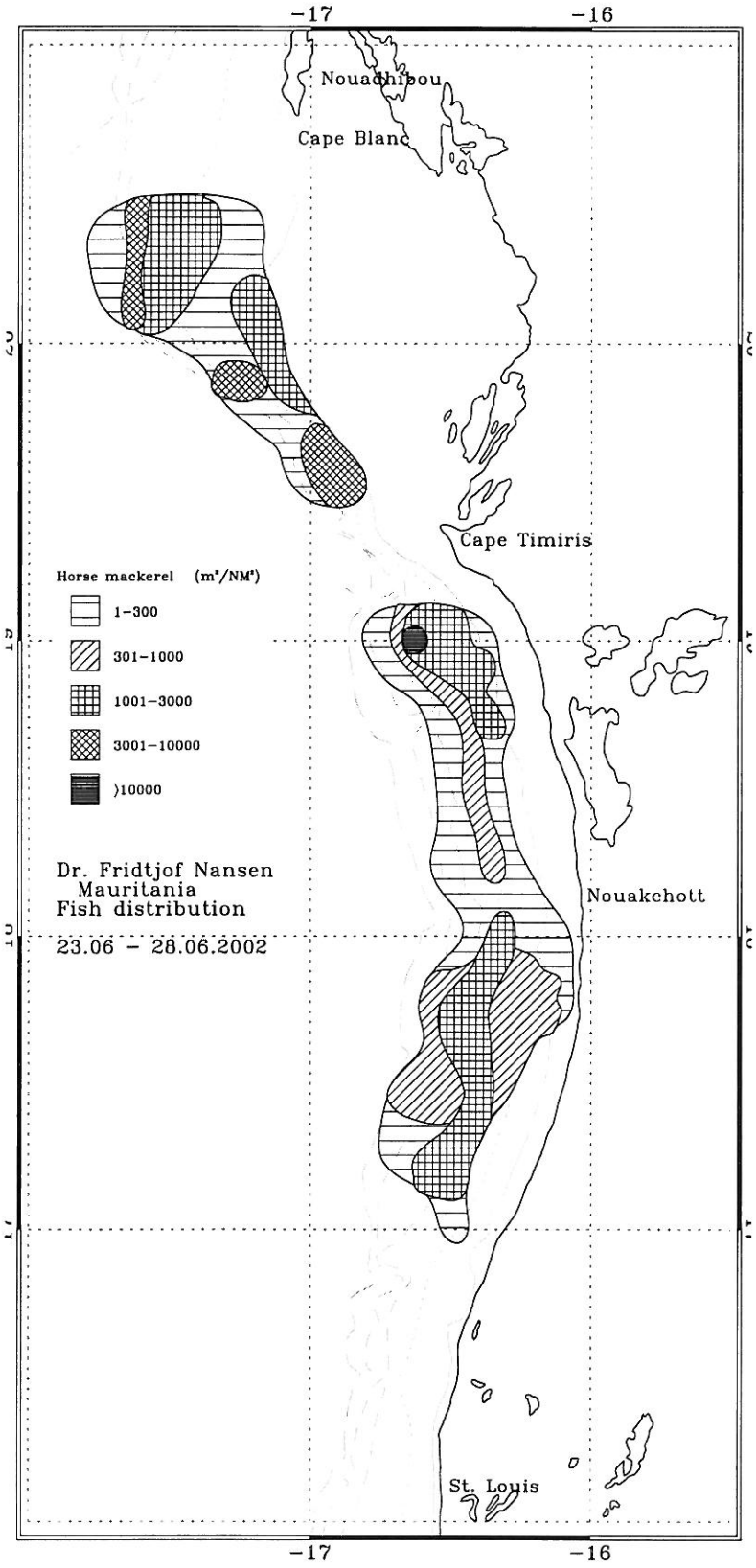


Figure 6. Distribution of horse mackerels.

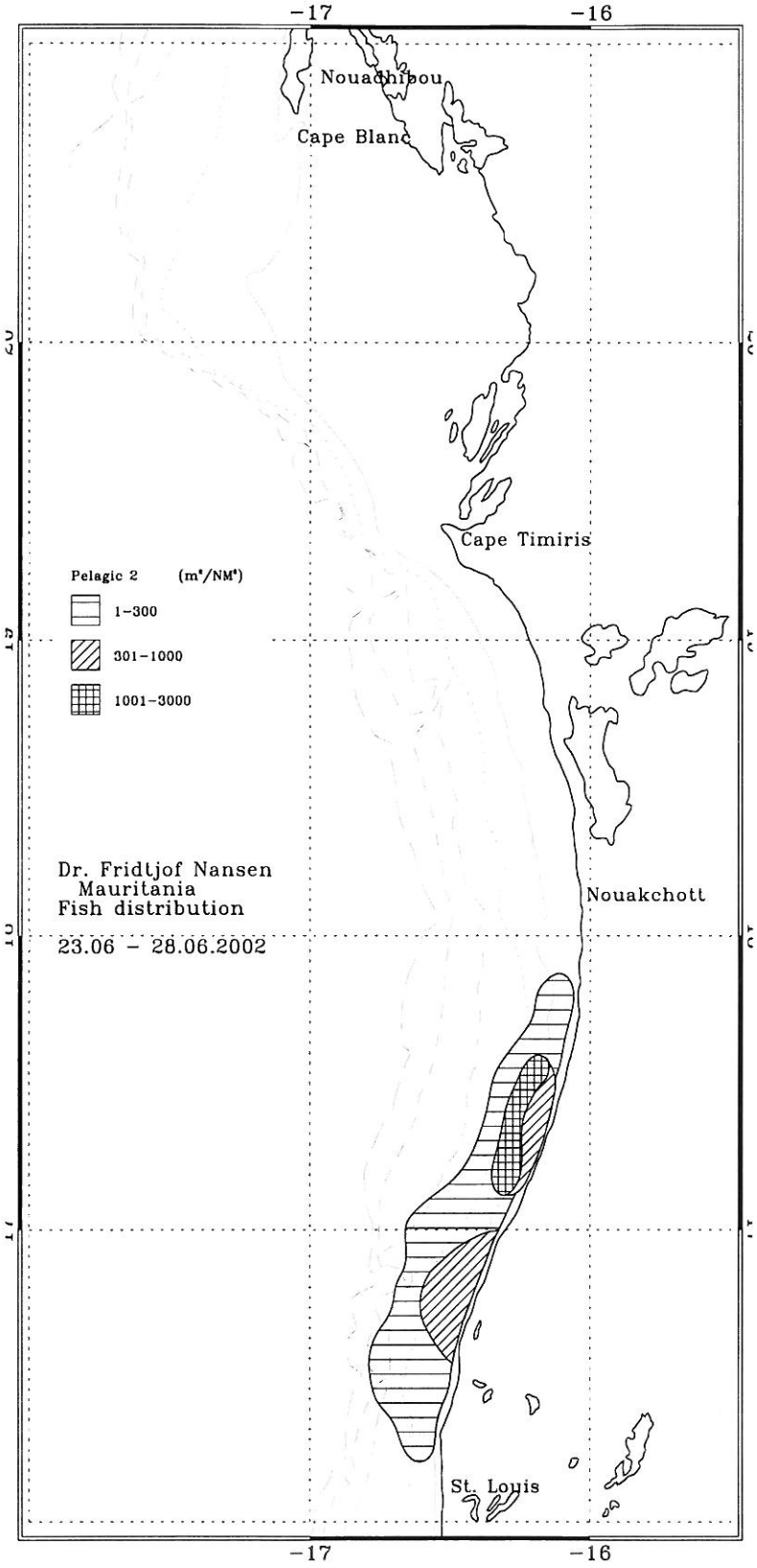


Figure 8. Distribution of carangids and associated species.

The distribution of the horse mackerels, Cunene horse mackerel and false scad is shown in Figure 6. Horse mackerels occurred in one main concentration; between 17°00'-19°00'N. The most dense concentrations in these aggregations were found at about 17°30'-17°50'N and at about 19°00'N. The aggregations were found all over the shelf, at daytime close to the bottom at depths around 50-120 m, while at night the fish raised to a more pelagic distribution. The biomass was estimated at 587 thousand tonnes. The horse mackerels were mostly *Trachurus trecae,* which dominated the biomass estimate by 69%.

Young individuals of *Trachurus trecae* dominated totally with a modal length of 9 cm. False scad, *Caranx rhonchus,* were the second most numerous of the horse mackerels, mostly in the near shore concentrations, and had modal lengths of 14, 18, 26, and 43 cm. Estimated number and biomass by length-groups and sectors are given in Annex IV.

Anchovy was found in two areas in this region, Figure 7, one some 30 NM south of Nouakchott, and the other off Cape Timiris. The northernmost one had higher density. The biomass was estimated at 49 thousand tonnes. The estimated number and biomass by length group is shown in Annex IV.

Figure 8 shows the distribution of the other carangids and associated species, which took the form of a continuous belt of various densities on the entire shelf. The total biomass was estimated at 148 thousand tonnes. The samples from the distributional areas consisted of bumper, West African Spanish mackerel, Atlantic bonito, pompano with small amounts of barracudas.

Chub mackerel was found in two small areas with rather low density, one at about 19°N and the other at about 17°30'N. The biomass of chub mackerel, *Scomber japonicus* was estimated to 31 thousand tonnes.

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

There are often aggregations of juvenile fish in the area between Cape Timiris and Cape Blanc, and this year, small sardine, sardinella and horse mackerels were found.

Between Cape Timiris and Cape Blanc, a large aggregation with rather high densities of sardine was recorded, Figure 9. The aggregation was estimated at 844 thousand tonnes.

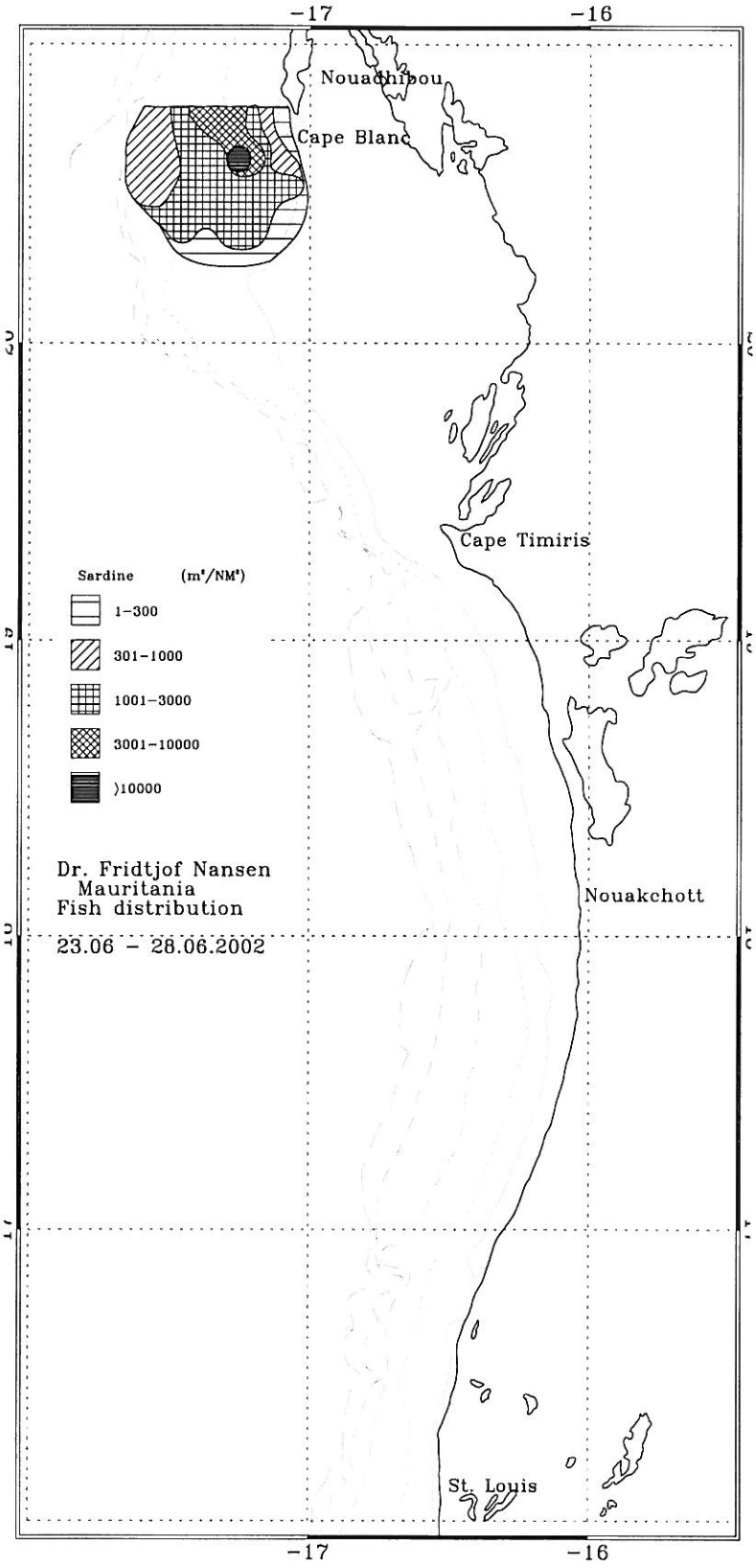


Figure 9. Distribution of sardine. Cape Timiris-Cape Blanc.

The samples showed that small individuals (<16 cm) dominated (estimated at some 38 billion individuals). However, the estimate of small fish in the area must be regarded as uncertain and low because the area, Banc d'Arguin cannot be covered by the vessel. It is believed that a lot of juvenile fish is distributed there. The modal lengths of sardine in the samples of the catches were 11, 13.5, and 21 cm.

Round sardinella were found in an aggregation of schools between 20°05'N and 20°30'N, Figure 5. The concentrations were relatively dense and the estimate was some 694 thousand tonnes, Table 2. The modal lengths were 11, 14, 29, and 34 cm.

Horse mackerel were recorded continuously along the shelf edge, Figure 6. The aggregations consisted of young *Trachurus trecae,* estimated at 397 thousand tonnes. The modal length was 9 cm.

Anchovy were present in rather dense concentrations in the outer parts of the shelf, Figure 7. These were estimated at a biomass of 113 thousand tonnes. However, it is believed that the coverage of anchovy is not complete as there may be fish in the Banc d'Arguin.

An estimate of chub mackerel was made also for this area. A very small aggregation was found at the outer shelf, estimated at 1 thousand tonnes.

Other carangids and associated species were not found in significant amounts during this survey.

Table 2. St. Louis to Cape Timiris. Biomass estimates of pelagic fish, thousand tonnes.

Flat sardinella	Round sardinella	Horse mackerels	Other Carangids etc.
0	694	397	0

CHAPTER 3 OVERVIEW AND SUMMARY OF RESULTS

Although shorter time than usual, the survey was conducted successfully in the period 23 to 29 June with a course track of 1 200 NM and 19 fishing stations, Figure 1.

The hydrographical data show that the temperature is lower than the long-term mean. The thermal front was found somewhat farther south than last year.

Mainly adult flat sardinella were found between St. Louis and Cape Timiris, Figure 5, but high concentrations of round sardinella were found between Cape Timiris and Cape Blanc. Horse mackerels were found in high densities of juveniles, mainly in two main areas; the largest one extending from about 17°00'N to about 19°00'N, Figure 6. Carangids (not including horse mackerel) and associated species occurred in low densities along the southern parts of the shelf, Figure 8.

Sardine was found in the area south of Cape Blanc, Figure 9 and was estimated at 844 thousand tonnes. Significant amounts of juvenile pilchard were observed.

The total biomass of sardinella was estimated at 928 thousand tonnes (8% flat and 92% round sardinella), that of horse mackerels at 984 thousand tonnes and that of the carangids and associated species at 148 thousand tonnes, see Table 3.

Table 3 Summary of biomass estimates of pelagic fish, Mauritania, thousand tonnes.

	Flat sardinella	Round sardinella	Horse mackerel	Carangids etc.
St. Louis-Cape Timiris	77	157	587	148
Cape Timiris-Cape Blanc		694	397	
Total	77	851	984	148

Table 4 lists biomass estimates of sardinella and carangids and associated species from previous 'Dr Fridtjof Nansen' surveys of this shelf region. Compared with a survey from the same season in 2001 the estimate of 928 thousand tonnes of sardinella from the current survey is high. The carangid estimate (including horse mackerels) of 1 132 thousand tonnes is also high compared with last years estimate.

Table 4 Biomass estimates from 'Dr. Fridtjof Nansen' surveys of the Mauritanian shelf, thousand tonnes.

Survey:	Sardinellas	Carangids etc.
AprMay-81	20	370
Sept -81	75	*
FebMar-82	50	470
NovDec-86	300	540
FebMar-92	1970	190
NovDec-95	1780	190
NovDec-96	1400	400
NovDec-97	1200	660
NovDec-98	1130	280
NovDec-99	740	560
NovDec-00	930	1 040
June -01	570	670
NovDec-01	230	370
June -02	930	1 130

* Not available

References:

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

Annex I Records of fishing stations

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1654
DATE:23/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2047
start stop duration Long W 1718
TIME :18:23:59 18:42:08 18 (min) Purpose code: 1
LOG :1382.23 1383.38 1.14 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 46 43 Validity code:
Towing dir: 90o Wire out: 140 m Speed: 35 kn*10

Sorted: 7 Kg Total catch: 7.64 CATCH/HOUR: 25.47

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	10.50	87	41.22	2774
Scomber japonicus	6.43	157	25.25	2777
Caranx rhonchus	5.07	30	19.91	2775
Engraulis encrasicolus	1.97	217	7.73	2776
Sepiella ornata	0.70	20	2.75	
Trachurus trachurus	0.57	30	2.24	
Boops boops	0.23	3	0.90	
Total	25.47		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1655
DATE:23/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2047
start stop duration Long W 1724
TIME :20:30:08 20:58:08 28 (min) Purpose code: 1
LOG :1395.07 1396.74 1.68 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 59 58 Validity code:
Towing dir: 90o Wire out: 140 m Speed: 35 kn*10

Sorted: 42 Kg Total catch: 1257.00 CATCH/HOUR: 2693.57

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	1957.50	91596	72.67	2778
Engraulis encrasicolus	392.14	48572	14.56	2780
Trachurus trachurus	258.43	27394	9.59	2781
Sardinella aurita	48.21	135	1.79	2779
Trachurus trecae	32.14	771	1.19	
Scomber japonicus	2.57	129	0.10	
SYNODONTIDAE	1.93	193	0.07	
Alloteuthis subulata	0.64	129	0.02	
Total	2693.56		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1656
DATE:24/ 6/02 GEAR TYPE: PT No: 4 POSITION:Lat N 2047
start stop duration Long W 1740
TIME :23:39:18 00:09:31 30 (min) Purpose code: 1
LOG :1416.32 1417.91 1.58 Area code : 2
FDEPTH: 10 10 GearCond.code:
BDEPTH: 315 99 Validity code:
Towing dir: 90o Wire out: 200 m Speed: 40 kn*10

Sorted: 32 Kg Total catch: 1491.65 CATCH/HOUR: 2983.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	1916.00	226826	64.22	2783
Trachurus trachurus	758.80	88412	25.43	2782
Engraulis encrasicolus	238.32	19346	7.99	
Sardina pilchardus	27.10	1028	0.91	
MYCTOPHIDAE	23.36	7662	0.78	
Scomber japonicus	19.62	748	0.66	
Total	2983.20		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1657
DATE:24/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 2036
start stop duration Long W 1734
TIME :04:36:38 04:51:12 15 (min) Purpose code: 1
LOG :1456.27 1457.17 0.89 Area code : 2
FDEPTH: 20 20 GearCond.code:
BDEPTH: 74 79 Validity code:
Towing dir: 270o Wire out: 80 m Speed: 36 kn*10

Sorted: 34 Kg Total catch: 133.08 CATCH/HOUR: 532.32

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	204.00	4480	38.32	2785
Engraulis encrasicolus	198.40	25984	37.27	
Sardina pilchardus	96.00	2576	18.03	2784
Trachurus trecae	18.40	2032	3.46	
Scomber japonicus	9.60	96	1.80	
Saurida brasiliensis	2.88	240	0.54	
Sepiella ornata	1.76	64	0.33	
Trachurus trachurus	1.28	2192	0.24	
Total	532.32		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1658
DATE:24/ 6/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2036
start stop duration Long W 1712
TIME :07:30:58 08:00:14 29 (min) Purpose code: 1
LOG :1481.39 1482.70 1.30 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 37 38 Validity code:
Towing dir: 270o Wire out: 150 m Speed: 30 kn*10

Sorted: 36 Kg Total catch: 6999.92 CATCH/HOUR: 14482.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	12148.64	770208	83.88	2787
Sardinella aurita	2130.83	55806	14.71	2786
Trachurus trecae	71.69	4779	0.50	
Scomber japonicus	71.69	797	0.50	
Engraulis encrasicolus	51.79	7171	0.36	
Trachurus trachurus	7.97	1194	0.06	
Total	14482.61		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1659
DATE:24/ 6/02 GEAR TYPE: PT No: 6 POSITION:Lat N 2021
start stop duration Long W 1716
TIME :11:35:09 12:05:13 30 (min) Purpose code: 1
LOG :1515.96 1517.51 1.55 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 33 32 Validity code:
Towing dir: 270o Wire out: 120 m Speed: 40 kn*10

Sorted: 36 Kg Total catch: 2007.00 CATCH/HOUR: 4014.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardina pilchardus	2361.60	221056	58.83	2790
Engraulis encrasicolus	1100.80	171904	27.42	
Sardinella aurita	380.00	18432	9.47	2788
Trachurus trecae, juvenile	126.72	11264	3.16	2789
Loligo vulgaris	37.12	512	0.92	
Mugil capurrii	6.60	2	0.16	
Octopus vulgaris	3.40	4	0.08	
Total	4016.24		100.04	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1660
DATE:24/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 2021
start stop duration Long W 1737
TIME :14:50:58 14:54:27 3 (min) Purpose code: 1
LOG :1539.57 1540.14 0.56 Area code : 3
FDEPTH: 55 55 GearCond.code:
BDEPTH: 84 95 Validity code:
Towing dir: 270o Wire out: 200 m Speed: 40 kn*10

Sorted: 47 Kg Total catch: 48.30 CATCH/HOUR: 966.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae, juvenile	946.00	69500	97.93	2791
Auxis thazard	16.00	40	1.66	
Lagocephalus laevigatus	4.00	20	0.41	
Total	966.00		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1661
DATE:24/ 6/02 GEAR TYPE: PT No: 3 POSITION:Lat N 2006
start stop duration Long W 1733
TIME :18:23:20 18:49:41 26 (min) Purpose code: 1
LOG :1574.37 1576.10 1.70 Area code : 3
FDEPTH: 40 40 GearCond.code:
BDEPTH: 88 102 Validity code:
Towing dir: 270o Wire out: 140 m Speed: 35 kn*10

Sorted: 19 Kg Total catch: 500.00 CATCH/HOUR: 1153.85

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae, juvenile	949.66	164758	82.30	2792
Engraulis encrasicolus	177.51	30429	15.38	2793
Sardinella aurita	8.88	35	0.77	
Scomber japonicus	8.88	60	0.77	
Trachurus trachurus	5.91	1299	0.51	
Trichiurus lepturus	2.95	60	0.26	
Total	1153.79		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1662
DATE:24/ 6/02 GEAR TYPE: PT No: 7 POSITION:Lat N 2006
start stop duration Long W 1720
TIME :20:41:23 20:58:48 17 (min) Purpose code: 1
LOG :1593.23 1594.02 0.77 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 30 32 Validity code:
Towing dir: 270ø Wire out: 200 m Speed: 30 kn*10

Sorted: 33 Kg Total catch: 271.81 CATCH/HOUR: 959.33

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	680.47	110008	70.93	2796
Trachurus trecae, juvenile	128.47	29026	13.39	2794
Sardinella aurita	53.26	480	5.55	2795
Caranx rhonchus	45.46	339	4.74	
Pagellus bellottii	33.32	1384	3.47	
Brachydeuterus auritus	8.75	480	0.91	
Diplodus bellottii	4.52	28	0.47	
Scomber japonicus	4.52	311	0.47	
Sepiella ornata	0.56	28	0.06	
Total	959.33		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1663
DATE:25/ 6/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1951
start stop duration Long W 1706
TIME :00:29:12 00:59:10 30 (min) Purpose code: 1
LOG :1626.14 1628.07 1.92 Area code : 3
FDEPTH: 5 5 GearCond.code:
BDEPTH: 17 21 Validity code:
Towing dir: 270ø Wire out: 120 m Speed: 35 kn*10

Sorted: 112 Kg Total catch: 162.02 CATCH/HOUR: 324.04

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caranx rhonchus	139.20	864	42.96	2798
Trachurus trecae, juvenile	56.00	15824	17.28	2797
Engraulis encrasicolus	38.00	10136	11.73	2799
Stromateus fiatola	33.70	28	10.40	
Scomberomorus tritor	22.50	4	6.94	
Arius heudeloti	8.40	12	2.59	
Campogramma glaycos	6.80	10	2.10	
Trachinotus ovatus	6.20	12	1.91	
Sardinella aurita	3.36	32	1.04	
Alectis alexandrinus	2.10	2	0.65	
Sardinella maderensis	2.00	8	0.62	
Pomadasys incisus	2.00	8	0.62	
Loligo vulgaris	0.94	4	0.29	
Pagellus bellottii	0.48	8	0.15	
Sepiella ornata	0.20	6	0.06	
Trachurus trachurus, juveniles	0.16	40	0.05	
Total	322.04		99.39	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1664
DATE:25/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1931
start stop duration Long W 1654
TIME :09:21:18 09:51:49 31 (min) Purpose code: 1
LOG :1712.40 1714.14 1.74 Area code : 3
FDEPTH: 66 67 GearCond.code:
BDEPTH: 66 67 Validity code:
Towing dir: 330ø Wire out: 250 m Speed: 30 kn*10

Sorted: 44 Kg Total catch: 1657.55 CATCH/HOUR: 3208.16

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae, juvenile	2850.00	832200	88.84	2801
Loligo vulgaris	232.26	3581	7.24	
Trichiurus lepturus	60.00	155	1.87	
Engraulis encrasicolus	23.23	2419	0.72	
Scomber japonicus	19.35	194	0.60	
Caranx rhonchus	12.77	39	0.40	2800
Arius heudeloti	4.65	4	0.14	
Octopus vulgaris	3.39	10	0.11	
Argyrosomus regius	2.52	2	0.08	
Total	3208.17		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1665
DATE:25/ 6/02 GEAR TYPE: PT No: 1 POSITION:Lat N 1901
start stop duration Long W 1634
TIME :19:46:44 20:17:26 31 (min) Purpose code: 1
LOG :1805.46 1807.39 1.84 Area code : 3
FDEPTH: 20 25 GearCond.code:
BDEPTH: 66 74 Validity code:
Towing dir: 290ø Wire out: 100 m Speed: 35 kn*10

Sorted: 21 Kg Total catch: 347.75 CATCH/HOUR: 673.06

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae, juvenile	557.42	79932	82.82	2803
Engraulis encrasicolus	87.10	8193	12.94	2802
Scomber japonicus	15.48	581	2.30	
Caranx rhonchus	9.19	23	1.37	
Saurida brasiliensis	3.87	387	0.57	
Total	673.06		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1666
DATE:25/ 6/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1855
start stop duration Long W 1625
TIME :23:12:35 23:43:27 31 (min) Purpose code: 1
LOG :1830.64 1832.30 1.65 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 32 27 Validity code:
Towing dir: 20ø Wire out: 160 m Speed: 30 kn*10

Sorted: 34 Kg Total catch: 436.31 CATCH/HOUR: 844.47

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae, juvenile	377.42	44390	44.69	2806
Sardinella aurita	265.65	9842	31.46	2804
Scomber japonicus	132.97	4703	15.75	2808
Engraulis encrasicolus	44.42	3803	5.26	2805
Liocarcinus corrugatus	6.39	842	0.76	
Caranx rhonchus	5.83	25	0.69	2807
Plectorhinchus mediterraneus	3.56	2	0.42	
Trachinus draco	3.19	87	0.38	
Pagellus bellottii	2.61	87	0.31	
Octopus vulgaris	2.11	2	0.25	
Pomadasys incisus	0.33	2	0.04	
Total	844.48		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1667
DATE:26/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1749
start stop duration Long W 1607
TIME :20:03:16 20:33:08 30 (min) Purpose code: 1
LOG :2036.22 2038.02 1.80 Area code : 3
FDEPTH: 16 17 GearCond.code:
BDEPTH: 16 17 Validity code:
Towing dir: 335ø Wire out: 100 m Speed: 30 kn*10

Sorted: 60 Kg Total catch: 328.66 CATCH/HOUR: 657.32

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella aurita	140.00	564	21.30	2810
Pomadasys jubelini	93.00	300	14.15	
Caranx rhonchus	92.40	564	14.06	2809
Chloroscombrus chrysurus	56.76	480	8.64	
Leptocharias smithii	49.80	72	7.58	
Galeoides decadactylus	45.12	276	6.86	
Sparus caeruleostictus *	38.28	132	5.82	
Sardinella maderensis	36.60	118	5.57	2811
Brachydeuterus auritus	35.52	360	5.40	
Alectis alexandrinus	26.40	24	4.02	
Drepane africana	9.60	12	1.46	
Gymnura micrura	9.00	12	1.37	
Pseudupeneus prayensis	8.16	72	1.24	
Eucinostomus melanopterus	7.20	60	1.10	
Pagellus bellottii	5.64	252	0.86	
Sphyraena guachancho	1.80	12	0.27	
Pomadasys incisus	1.56	24	0.24	
Penaeus kerathurus	0.48	36	0.07	
Total	657.32		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1668
DATE:27/ 6/02 GEAR TYPE: PT No: 2 POSITION:Lat N 1730
start stop duration Long W 1635
TIME :02:34:32 03:04:17 30 (min) Purpose code: 1
LOG :2096.27 2098.02 1.77 Area code : 3
FDEPTH: 130 130 GearCond.code:
BDEPTH: 196 248 Validity code:
Towing dir: 270ø Wire out: 350 m Speed: 40 kn*10

Sorted: 12 Kg Total catch: 49.98 CATCH/HOUR: 99.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius polli	56.84	2002	56.86	
Trachurus trecae	21.20	1354	21.21	2812
Parapenaeus longirostris	6.44	1146	6.44	
Scomber japonicus	5.72	144	5.72	
Plesionika sp.	5.56	3092	5.56	
MYCTOPHIDAE	2.08	872	2.08	
Synagrops microlepis	2.00	306	2.00	
Solenocera africana	0.08	24	0.08	
Pasiphaea sivado	0.04	32	0.04	
Total	99.96		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1669
DATE:27/ 6/02 GEAR TYPE: PT No: 5 POSITION:Lat N 1730
start stop duration Long W 1623
TIME :05:00:07 05:00:57 13 (min) Purpose code: 1
LOG :2115.24 2115.91 0.67 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 83 88 Validity code:
Towing dir: 270ø Wire out: 150 m Speed: 45 kn*10

Sorted: 6 Kg Total catch: 1000.71 CATCH/HOUR: 4618.66

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae, juvenile	4336.15	594277	93.88	2814
Engraulis encrasicolus	270.92	47215	5.87	2813
Scomber japonicus	7.38	775	0.16	
Euthynnus alletteratus	3.74	5	0.08	
Total	4618.19		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1670
DATE:27/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1717
start stop duration Long W 1612
TIME :08:37:24 09:07:32 30 (min) Purpose code: 1
LOG :2145.88 2147.36 1.48 Area code : 3
FDEPTH: 16 19 GearCond.code:
BDEPTH: 16 19 Validity code:
Towing dir: 358º Wire out: 100 m Speed: 30 kn*10

Sorted: 53 Kg Total catch: 1165.30 CATCH/HOUR: 2330.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	1166.00	10024	50.03	
Sparus caeruleostictus *	224.00	680	9.61	
Pomadasys incisus	210.00	3360	9.01	
Galeoides decadactylus	194.00	2760	8.32	
Pomadasys jubelini	88.00	320	3.78	
Sphyrna lewini	64.00	120	2.75	
Plectorhinchus mediterraneus	60.00	240	2.57	
Balistes punctatus	56.00	40	2.40	
Pagrus auriga	42.00	80	1.80	
Caranx rhonchus	38.00	200	1.63	
Zanobatus shoenleinii	32.00	40	1.37	
Epinephelus aeneus	28.60	16	1.23	
Drepane africana	28.00	120	1.20	
Pseudupeneus prayensis	26.00	240	1.12	
Rhinoptera marginata	22.30	4	0.96	
Sardinella aurita	20.00	80	0.86	
Selene dorsalis	20.00	12	0.86	
Scomberomorus tritor	11.10	4	0.48	
Total	2330.00		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1671
DATE:27/ 6/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1716
start stop duration Long W 1641
TIME :13:06:22 13:36:12 30 (min) Purpose code:
LOG :2185.08 2186.59 1.48 Area code : 3
FDEPTH: 195 197 GearCond.code: 1
BDEPTH: 195 197 Validity code:
Towing dir: 180º Wire out: 650 m Speed: 30 kn*10

Sorted: 93 Kg Total catch: 308.79 CATCH/HOUR: 617.58

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chlorophthalmus atlanticus	169.40	5810	27.43	
Caranx rhonchus	153.20	224	24.81	2815
Merluccius polli	147.00	3610	23.80	
Synagrops microlepis	105.00	13468	17.00	
Todaropsis eblanae	19.60	252	3.17	
Pterothrissus belloci	14.00	252	2.27	
Scomber japonicus	5.32	56	0.86	
Trachurus trecae, juvenile	1.68	140	0.27	
Zenopsis conchifer	1.68	112	0.27	
Trachurus trachurus, juveniles	0.28	28	0.05	
Helicolenus dactylopterus	0.28	84	0.05	
Parapenaeus longirostris	0.14	28	0.02	
Total	617.58		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1672
DATE:27/ 6/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1648
start stop duration Long W 1625
TIME :22:00:06 22:20:08 20 (min) Purpose code: 1
LOG :2256.61 2257.61 0.99 Area code : 3
FDEPTH: 10 10 GearCond.code:
BDEPTH: 20 20 Validity code:
Towing dir: 358º Wire out: 160 m Speed: 30 kn*10

Sorted: 28 Kg Total catch: 243.53 CATCH/HOUR: 730.59

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	344.40	4326	47.14	
Chloroscombrus chrysurus	79.20	816	10.84	
Pomadasys jubelini	55.20	264	7.56	
Sardinella maderensis	48.00	672	6.57	2816
Selene dorsalis	43.20	456	5.91	
Sparus caeruleostictus *	39.60	120	5.42	
Rhizoprionodon acutus	29.70	12	4.07	
Drepane africana	28.80	192	3.94	
Galeoides decadactylus	16.80	168	2.30	
Rhinoptera marginata	16.65	3	2.28	
Sphyraena guachancho	14.40	24	1.97	
Leptocharias smithii	5.55	6	0.76	
Alectis alexandrinus	3.60	24	0.49	
Pseudupeneus prayensis	2.40	24	0.33	
Trichiurus lepturus	2.25	3	0.31	
Penaeus notialis	1.20	96	0.16	
Total	730.95		100.05	

Annex II Instruments and fishing gear used

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

Transceiver-1 menu	Transducer depth	5.5 - 7.5 m
	Absorption coeff.	10 dB/km
	Pulse length	medium (1ms)
	Bandwidth	wide
	Max power	2000 Watt
	2-way beam angle	-21.0 dB
	SV transducer gain	27.01 dB
	TS transducer gain	27.26 dB
	Angle sensitivity	21.9
	3 dB beamwidth along.	7.1°
	3 dB beamwidth athw.	6.9°
	Alongship offset	0.07°
	Athwardship offset	0.03°
Display menu	Echogram	1
	Bottom range	10 m
	Bottom range start	9 m
	TVG	20 log R
	Sv colour min	-67 dB
	TS Colour minimum	-60 dB
Printer- menu	Range	0-50, 0-100, 0-150, 0-250 or 0-500m
	TVG	20 log R
	Sv colour min	-60 dB
Bottom detection menu	Minimum level	-40 dB

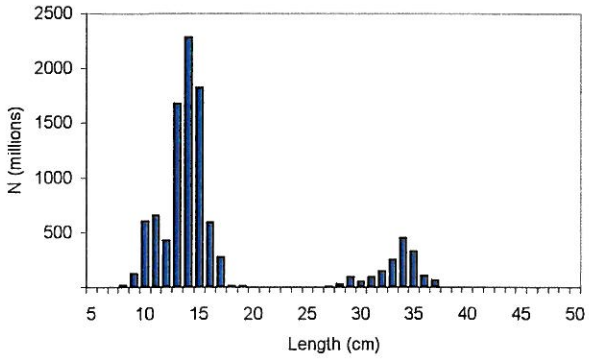
A calibration experiment using a standard copper sphere was performed in False Bay, South Africa 22 April 2002.

Fishing gear

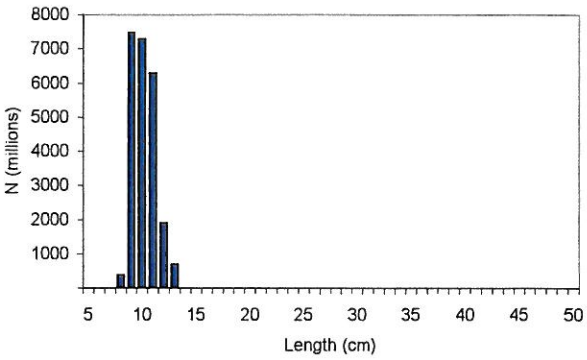
The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super" bottom trawl. For all trawls, the Tyborøn, 7.8m² (1670 kg) trawl doors were used. Complete drawings of the trawls used are included.

Annex III Pooled length distributions by species

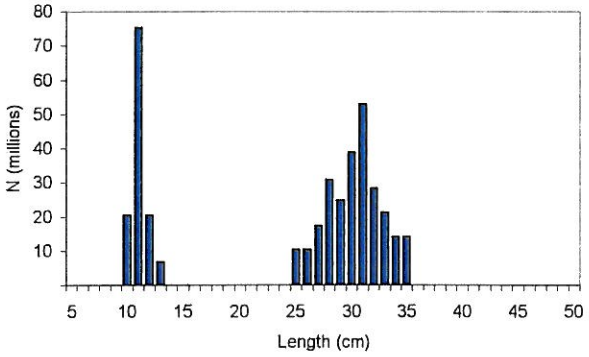
Sardinella aurita



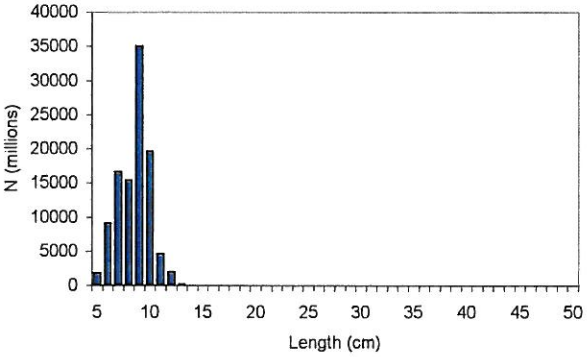
Engraulis encrasicolus



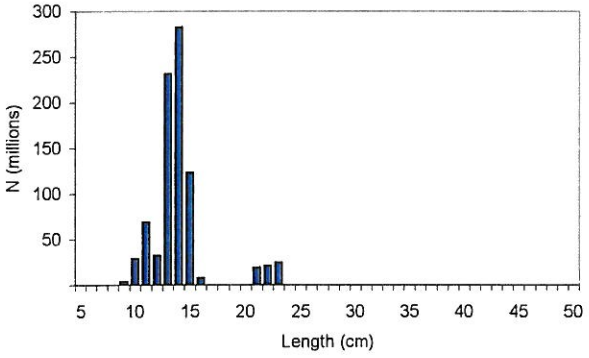
Sardinella maderensis



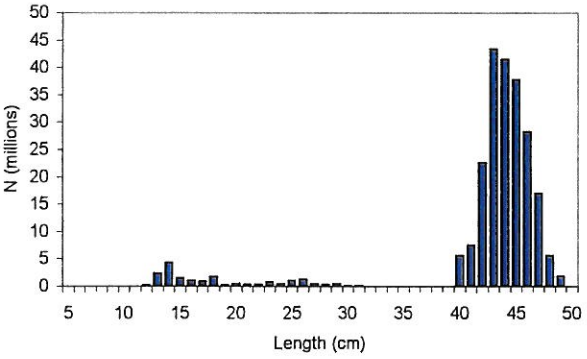
Trachurus trecae



Sardina pilchardus



Caranx rhonchus



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

Mauritania, June 2002

Sardinella aurita

	N (thousands)			Biomass (tonnes)		
Length cm	St.Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL	St.Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL
5						
6						
7						
8		15 030	15 030		89	89
9		121 866	121 866		1 003	1 003
10		602 422	602 422		6 695	6 695
11		655 222	655 222		9 566	9 566
12	41 492	388 537	430 029	778	7 285	8 063
13	1 203 256	473 288	1 676 544	28 420	11 179	39 599
14	1 410 715	873 656	2 284 371	41 287	25 569	66 856
15	1 078 782	745 366	1 824 148	38 566	26 646	65 212
16	41 492	549 528	591 020	1 789	23 698	25 487
17	41 492	235 289	276 781	2 135	12 106	14 240
18		12 325	12 325		749	749
19		12 325	12 325		877	877
20						
21						
22						
23						
24						
25						
26						
27	2 941		2 941	587		587
28	14 703	16 655	31 358	3 267	3 701	6 969
29	29 405	62 302	91 707	7 247	15 355	22 602
30	20 584	33 310	53 894	5 607	9 073	14 679
31	32 346	62 302	94 648	9 706	18 694	28 400
32	20 584	124 604	145 187	6 783	41 063	47 847
33	5 881	249 208	255 089	2 123	89 943	92 065
34	17 643	431 795	449 438	6 955	170 218	177 173
35	2 941	323 846	326 787	1 263	139 090	140 353
36		107 949	107 949		50 393	50 393
37		62 302	62 302		31 540	31 540
38						
39						
TOTAL	3 964 254	6 159 125	10 123 379	156 513	694 533	851 045

Annex IV continued

Mauritania, June 2002

Sardinella maderensis

	N (thousands)			Biomass (tonnes)		
Length cm	St. Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL	St. Louis-Cape Timiris	Cape Timiris Cape Blanc	TOTAL
5						
6						
7						
8						
9						
10	20 514		20 514	228		228
11	75 218		75 218	1 098		1 098
12	20 514		20 514	385		385
13	6 838		6 838	162		162
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25	10 373		10 373	1 651		1 651
26	10 373		10 373	1 853		1 853
27	17 211		17 211	3 436		3 436
28	30 887		30 887	6 864		6 864
29	24 743		24 743	6 098		6 098
30	38 882		38 882	10 591		10 591
31	53 021		53 021	15 909		15 909
32	28 278		28 278	9 319		9 319
33	21 208		21 208	7 654		7 654
34	14 139		14 139	5 574		5 574
35	14 139		14 139	6 073		6 073
36						
37						
38						
39						
40						
TOTAL	386 334		386 334	76 894		76 894

Annex IV continued

Mauritania, June 2002

Trachurus trecae

	N (thousands)			Biomass (tonnes)		
Length cm	St. Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL	St. Louis-Cape Timiris	Cape Timiris Cape Blanc	TOTAL
4		93 086	93 086		81	81
5	559 914	1 178 227	1 738 141	894	1 882	2 776
6	1 959 698	7 137 104	9 096 802	5 167	18 816	23 983
7	5 355 147	11 305 765	16 660 912	21 688	45 788	67 477
8	7 521 450	7 871 412	15 392 862	44 343	46 407	90 750
9	19 720 654	15 280 312	35 000 965	162 317	125 769	288 086
10	8 647 064	10 934 190	19 581 254	96 097	121 514	217 610
11	2 159 606	2 443 513	4 603 120	31 531	35 676	67 207
12	1 934 055	72 667	2 006 721	36 264	1 363	37 626
13	170 317		170 317	4 023		4 023
14	24 331		24 331	712		712
15						
16						
17						
TOTAL	48 052 234	56 316 276	104 368 510	403 035	397 296	800 332

Annex IV continued

Mauritania, June 2002

Caranx rhonchus

	N (thousands)			Biomass (tonnes)		
Length cm	St. Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL	St. Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL
5						
6						
7						
8						
9						
10						
11						
12	290		290	5		5
13	2 290		2 290	54		54
14	4 307		4 307	126		126
15	1 553		1 553	56		56
16	1 106		1 106	48		48
17	961		961	49		49
18	1 704		1 704	104		104
19	223		223	16		16
20	441		441	36		36
21	369		369	35		35
22	374		374	41		41
23	810		810	101		101
24	514		514	73		73
25	1 106		1 106	176		176
26	1 268		1 268	227		227
27	441		441	88		88
28	369		369	82		82
29	447		447	110		110
30	73		73	20		20
31	73		73	22		22
32						
33						
34						
35						
36						
37						
38						
39						
40	5 667		5 667	3 614		3 614
41	7 557		7 557	5 185		5 185
42	22 670		22 670	16 706		16 706
43	43 450		43 450	34 334		34 334
44	41 561		41 561	35 159		35 159
45	37 783		37 783	34 166		34 166
46	28 337		28 337	27 352		27 352
47	17 002		17 002	17 493		17 493
48	5 667		5 667	6 207		6 207
49	1 889		1 889	2 200		2 200
50						
TOTAL	230 300		230 300	183 884		183 884

Annex IV continued

Mauritania, June 2002

Sardina pilchardus

	N (thousands)		Biomass (tonnes)	
Length cm	Cape Timiris-Cape Blanc	TOTAL	Cape Timiris-Cape Blanc	TOTAL
5,0				
5,5				
6,0				
6,5				
7,0				
7,5				
8,0				
8,5				
9,0	45 612	45 612	296	296
9,5	456 115	456 115	3 467	3 467
10,0	866 619	866 619	7 653	7 653
10,5	2 052 518	2 052 518	20 909	20 909
11,0	3 668 818	3 668 818	42 835	42 835
11,5	1 988 233	1 988 233	26 448	26 448
12,0	1 239 776	1 239 776	18 688	18 688
12,5	792 091	792 091	13 462	13 462
13,0	3 309 462	3 309 462	63 128	63 128
13,5	7 916 881	7 916 881	168 763	168 763
14,0	6 542 446	6 542 446	155 238	155 238
14,5	4 825 143	4 825 143	126 970	126 970
15,0	2 576 873	2 576 873	74 940	74 940
15,5	1 515 825	1 515 825	48 563	48 563
16,0	229 282	229 282	8 068	8 068
16,5				
17,0				
17,5				
18,0				
18,5				
19,0				
19,5				
20,0				
20,5				
21,0	133 382	133 382	10 495	10 495
21,5	98 264	98 264	8 291	8 291
22,0	131 018	131 018	11 834	11 834
22,5	98 264	98 264	9 487	9 487
23,0	98 264	98 264	10 127	10 127
23,5	131 018	131 018	14 393	14 393
24,0				
24,5				
TOTAL	38 715 902	38 715 902	844 053	844 053

Annex IV continued

Mauritania, June 2002

Engraulis encrasicolus

	N (thousands)			Biomass (tonnes)		
Length cm	Cape Timiris-Cape Blanc	St. Louis-Cape Timiris	TOTAL	Cape Timiris-Cape Blanc	St. Louis-Cape Timiris	TOTAL
5,0						
5,5						
6,0						
6,5						
7,0						
7,5						
8,0						
8,5	280 500	92 381	372 880	1 015	334	1 349
9,0	1 708 565	242 273	1 950 837	7 302	1 035	8 338
9,5	5 219 021	309 674	5 528 695	26 121	1 550	27 671
10,0	2 964 722	255 329	3 220 052	17 240	1 485	18 725
10,5	3 407 796	656 587	4 064 383	22 861	4 405	27 266
11,0	3 277 096	800 381	4 077 477	25 197	6 154	31 350
11,5	1 500 960	708 133	2 209 093	13 149	6 203	19 352
12,0	42 381	1 078 563	1 120 944	421	10 706	11 127
12,5		772 688	772 688		8 648	8 648
13,0		575 965	575 965		7 235	7 235
13,5		110 230	110 230		1 547	1 547
14,0						
14,5						
15,0						
15,5						
16,0						
16,5						
17,0						
17,5						
18,0						
18,5						
19,0						
19,5						
20,0						
TOTAL	18 401 040	5 602 203	24 003 243	113 305	49 303	162 609

Annex IV continued

Mauritania, June 2002

Scomber japonicus

	N (thousands)			Biomass (tonnes)		
Length cm	St. Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL	St. Louis-Cape Timiris	Cape Timiris-Cape Blanc	TOTAL
5						
6						
7						
8						
9						
10						
11						
12	8 949		8 949	147		147
13	125 289		125 289	2 589		2 589
14	331 120	486	331 606	8 479	12	8 492
15	268 475	5 837	274 313	8 398	183	8 581
16	134 238	5 837	140 075	5 065	220	5 286
17	44 746	3 892	48 637	2 014	175	2 190
18	35 797	486	36 283	1 904	26	1 930
19	35 797	1 946	37 742	2 230	121	2 351
20	8 949	2 919	11 868	648	211	859
21		486	486		41	41
22		973	973		93	93
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
TOTAL	993 359	22 863	1 016 222	31 475	1 082	32 557

Annex V Regional estimates

Sardine (*Sardina pilchardus*)

MOROCCO & MAURITANIA, May-June 2002

Length	C.Juby-C.Cantin		C.Bojador-C.Juby		C.Blanc-C.Bojador		C.Timiris-C.Blanc		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5	81	60	127	93					209	153
6	6 204	2 755	502	223					6 706	2 978
7	9 480	2 740	995	288	114	33			10 589	3 061
8	8 756	1 739	833	165	419	83			10 007	1 987
9	40 265	5 727	540	77	4 148	590	3 763	502	44 953	6 394
10	39 352	4 146	194	20	17 787	1 874	28 561	2 919	57 332	6 040
11	25 137	2 016	362	29	33 139	2 657	69 283	5 657	58 639	4 702
12	10 568	660	1 690	106	33 030	2 062	32 150	2 032	45 288	2 828
13	15 861	786	8 805	436	97 414	4 828	231 890	11 226	122 079	6 051
14	25 138	1 006	18 205	728	90 202	3 608	282 208	11 368	133 545	5 342
15	23 396	766	21 646	709	33 941	1 112	123 503	4 093	78 982	2 587
16	101 098	2 745	43 247	1 174	17 660	479	8 068	229	162 005	4 398
17	138 584	3 153	66 223	1 507	37 284	848			242 091	5 509
18	90 756	1 748	38 658	745	158 148	3 046			287 562	5 539
19	44 795	737	7 669	126	366 421	6 026			418 885	6 889
20	5 907	84	3 071	43	243 132	3 442			252 110	3 569
21	1 283	16	3 254	40	187 391	2 299	18 786	232	191 928	2 355
22			21 845	234	448 996	4 807	21 322	229	470 841	5 041
23			25 756	242	569 134	5 348	24 519	229	594 890	5 590
24			5 602	46	501 536	4 159			507 139	4 205
25			1 777	13	84 151	619			85 928	632
26										
27										
28										
29										
30										
Total	586 663	30 882	271 000	7 045	2 924 046	47 922	844 053	38 716	4 625 762	124 565

Round sardinella (*Sardinella aurita*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
4								
5								
6								
7								
8		15,0		15,0		89		89
9		121,9		121,9		1 003		1 003
10		602,4		602,4		6 695		6 695
11		655,2		655,2		9 566		9 566
12		430,0		430,0		8 063		8 063
13		1676,5		1 676,5		39 599		39 599
14		2284,4	3,5	2 287,8		66 856	99	66 955
15		1824,1	4,1	1 828,2		65 212	143	65 354
16		591,0	4,1	595,1		25 487	172	25 659
17		276,8	27,4	304,2		14 240	1 379	15 620
18		12,3	63,5	75,9		749	3 781	4 531
19		12,3	83,2	95,5		877	5 797	6 674
20			63,1	63,1			5 111	5 111
21			107,4	107,4			10 034	10 034
22			48,2	48,2			5 160	5 160
23	42,0		23,7	65,7	5 228		2 891	8 119
24	67,5		24,9	92,4	9 531		3 436	12 967
25	73,0		22,6	95,6	11 617		3 530	15 147
26	89,4		6,0	95,4	15 971		1 053	17 025
27	82,1	2,9		85,1	16 393	587		16 980
28	51,1	31,4		82,4	11 354	6 969		18 323
29	25,5	91,7	3,5	120,7	6 296	22 602	834	29 732
30		53,9		53,9		14 679		14 679
31		94,6	3,5	98,1		28 400	1 016	29 415
32		145,2	6,9	152,1		47 847	2 231	50 078
33		255,1	18,3	273,4		92 065	6 478	98 544
34		449,4	50,2	499,6		177 173	19 367	196 541
35		326,8	65,8	392,6		140 353	27 663	168 016
36		107,9	79,0	186,9		50 393	36 098	86 491
37		62,3	48,5	110,8		31 540	24 039	55 579
38			9,0	9,0			4 832	4 832
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	430,6	10 123,4	766,2	11 320,2	76 391	851 045	165 144	1 092 580

Flat sardinella (*Sardinella maderensis*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6								
7								
8	25,5			25,5	151			151
9	51,1			51,1	421			421
10	25,5	20,5		46,1	284	228		512
11		75,2		75,2		1 098		1 098
12		20,5		20,5		385		385
13		6,8		6,8		162		162
14	3,4			3,4	100			100
15	28,9			28,9	1 035			1 035
16	6,8			6,8	293			293
17	13,6			13,6	700			700
18	59,7			59,7	3 626			3 626
19	75,2			75,2	5 352			5 352
20	72,3			72,3	5 978			5 978
21	284,8			284,8	27 175			27 175
22	315,1			315,1	34 458			34 458
23	815,3			815,3	101 578			101 578
24	1252,2			1252,2	176 778			176 778
25	660,3	10,4		670,7	105 105	1 651		106 756
26	199,4	10,4		209,8	35 627	1 853		37 480
27	69,1	17,2		86,3	13 788	3 436		17 224
28	10,7	30,9		41,6	2 373	6 864		9 237
29		24,7		24,7		6 098		6 098
30	25,5	38,9		64,4	6 958	10 591		17 549
31		53,0		53,0		15 909		15 909
32		28,3		28,3		9 319		9 319
33		21,2		21,2		7 654		7 654
34		14,1		14,1		5 574		5 574
35		14,1		14,1		6 073		6 073
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	3994,5	386,3		4380,8	521 779	76 894		598 673

Anchovy (*Engraulis encrasicolus*)

MOROCCO, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions
5	56	62,2	1	1,2	57	63,4
6	616	415,2	18	12,0	634	427,2
7	1 610	706,9	90	39,6	1 701	746,5
8	3 431	1 034,6	110	33,1	3 541	1 067,7
9	2 151	464,5	806	174,2	2 957	638,7
10	3 368	538,7	4 704	752,4	8 071	1 291,2
11	6 886	838,5	7 383	898,9	14 269	1 737,4
12	14 359	1 361,4	2 008	190,4	16 366	1 551,8
13	6 005	452,0	647	48,7	6 652	500,7
14	796	48,4	464	28,2	1 260	76,6
15			144	7,2	144	7,2
16						
17						
18						
19						
20						
Total	39 277	5 922,4	16 374	2185,8	55 651	8 108,2

Atlantic horse mackerel (*Trachurus trachurus*)

MOROCCO, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions
5						
6						
7	1	0,2	15	4,2	16	4,4
8			294	57,1	294	57,1
9	11	1,6	2 073	287,9	2 084	289,4
10	59	6,0	9 181	944,2	9 240	950,2
11	76	6,0	15 160	1 186,7	15 236	1 192,6
12	51	3,1	7 273	443,3	7 324	446,4
13	31	1,5	1 512	73,2	1 543	74,7
14	72	2,8	353	13,8	425	16,6
15	34	1,1	664	21,2	698	22,3
16	9	0,2			9	,2
17			414	9,2	414	9,2
18	25	0,5	207	3,9	232	4,4
19	351	5,6	693	11,1	1 044	16,8
20	325	4,5	8 837	122,1	9 162	126,6
21	558	6,7	45 937	550,3	46 495	556,9
22	250	2,6	25 512	266,6	25 762	269,2
23	208	1,9	13 242	121,5	13 449	123,4
24	58	0,5	5 135	41,6	5 193	42,0
25			13 977	100,3	13 977	100,3
26			13 525	86,5	13 525	86,5
27			8 039	46,0	8 039	46,0
28			6 782	34,9	6 782	34,9
29			6 135	28,4	6 135	28,4
30	57	0,2	2 230	9,4	2 287	9,6
31			1 746	6,7	1 746	6,7
32			1 438	5,0	1 438	5,0
33						
34						
35	446	1,2			446	1,2
36	323	0,8	679	1,7	1 002	2,5
37	1 226	2,8			1 226	2,8
38	2 842	5,9			2 842	5,9
39	7 163	13,8			7 163	13,8
40	9 044	16,2			9 044	16,2
41	6 646	11,1			6 646	11,1
42	6 373	9,9			6 373	9,9
43	8 200	11,9			8 200	11,9
44	2 048	2,8			2 048	2,8
45						
46	668	0,8			668	,8
47	356	0,4			356	,4
48						
49						
50						
Total	46 485	121,3	191 053	4 477	237 538	4 598

Cunene horse mackerel (*Trachurus trecae*)

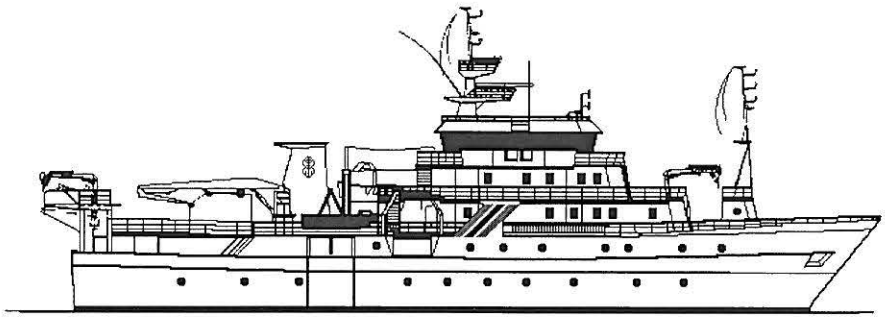
SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
4		93,1		91,1		81		81
5		1 738,1		1 737,1		2 776		2 776
6	5,2	9 096,8		9 102,0	14	23 983		23 997
7	183,6	16 660,9		16 844,5	744	67 477		68 220
8	294,2	15 392,9	39,8	15 726,9	1 735	90 750	205	92 690
9	91,2	35 001,0	278,6	35 370,7	750	288 086	2006	290 843
10	132,8	19 581,3	46,4	19 760,5	1 476	217 610	451	219 538
11	171,6	4 603,1	19,9	4 794,6	2 506	67 207	254	69 967
12	50,5	2 006,7		2 057,2	946	37 626		38 572
13	9,7	170,3	39,7	219,8	230	4 023	821	5 074
14	5,7	24,3	6,6	36,7	167	712	170	1 049
15			19,9	19,9			621	621
16			59,6	59,6			2247	2 247
17								
18			39,7	39,7			2112	2 112
19								
20	10,8		29,5	40,3	894		2134	3 027
21	140,5			140,5	13 407			13 407
22	291,8		52,4	344,2	31 913		5012	36 925
23	205,4		142,8	348,2	25 587		15569	41 156
24	43,2		606,5	649,8	6 104		74925	81 029
25			328,1	328,1			45699	45 699
26			83,7	83,7			13082	13 082
27			97,8	97,8			17087	17 087
28			49,1	49,1			9546	9 546
29			14,7	14,7			3179	3 179
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	1 636,4	104 368,5	1 951,7	107 956,7	86 473	800 332	195 120	1 081 925

Chub mackerel (*Scomber japonicus*)

MOROCCO - MAURITANIA, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		C.Blanc-C.Timiris		C.Timiris-St.Louis		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5										
6										
7										
8										
9										
10	17	1,8							17	1,8
11	293	23,0	21	1,6					314	24,6
12	721	44,0	251	15,3			147	8,9	1 119	68,2
13	3 502	169,5	1 720	83,2			2 589	125,3	7 811	378,0
14	1 422	55,5	1 739	67,9	12	0,5	8 479	331,1	11 653	455,0
15	1 400	44,7	956	30,6	183	5,8	8 398	268,5	10 937	349,6
16	1 412	37,4	779	20,6	220	5,8	5 065	134,2	7 476	198,1
17	6 710	149,0	666	14,8	175	3,9	2 014	44,7	9 566	212,5
18	11 841	222,6	532	10,0	26	0,5	1 904	35,8	14 303	268,9
19	18 690	300,1	1 402	22,5	121	1,9	2 230	35,8	22 443	360,3
20	6 040	83,5	2 547	35,2	211	2,9	648	8,9	9 446	130,5
21	2 401	28,8	2 898	34,7	41	0,5			5 340	64,0
22	1 745	18,2	4 028	42,1	93	1,0			5 866	61,3
23	1 226	11,2	5 307	48,7					6 533	59,9
24	850	6,9	7 383	59,8					8 233	66,6
25	692	5,0	7 191	51,6					7 883	56,6
26	473	3,0	21 978	140,6					22 450	143,6
27	428	2,4	36 981	211,7					37 409	214,1
28	235	1,2	34 976	179,9					35 210	181,1
29	545	2,5	21 214	98,4					21 759	100,9
30	1 558	6,5	11 701	49,1					13 258	55,6
31	2 141	8,2	8 581	32,7					10 721	40,8
32	993	3,4	6 816	23,6					7 809	27,1
33	629	2,0	5 289	16,7					5 918	18,7
34	62	0,2	1 682	4,9					1 744	5,1
35	136	0,4	3 808	10,1					3 945	10,5
36			2 362	5,8					2 362	5,8
37	80	0,2	11 570	26,1					11 651	26,3
38			13 082	27,3					13 082	27,3
39			2 711	5,2					2 711	5,2
40			1 306	2,3					1 306	2,3
41			1 405	2,3					1 405	2,3
42			503	0,8					503	0,8
43										
44										
45										
Total	66 241	1 231,2	223 385	1 376,2	1 082	22,9	31 475	993,4	322 182	3 623,6



SURVEY OF THE PELAGIC FISH RESOURCES OFF NORTH WEST AFRICA

Part I

SENEGAL - THE GAMBIA

30 June - 8 July 2002

Centre de Recherches Océanographiques de Dakar-Thiaroye
Dakar, Senegal

Institute of Marine Research
Bergen, Norway

Department of Fisheries
Banjul, the Gambia

CRUISE REPORTS 'DR FRIDTJOF NANSEN'

SURVEY OF THE PELAGIC FISH RESOURCES OFF NORTH WEST AFRICA

Part I

SENEGAL - THE GAMBIA

30 June - 8 July 2002

by

Reidar Toresen*

Abdoulaye Sarre**

and

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

Institute of Marine Research

Bergen, 2002

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CHAPTER 1 INTRODUCTION

1.1 Objective of the cruise

The general objectives were to estimate the biomass and map the distribution of small pelagic fish stocks off NW Africa (Morocco, Mauritania, Senegal and the Gambia) by hydro-acoustic methods and describe the hydrographic conditions there over a period of 50 days, in June-July 2002. For Senegal and the Gambia the agreed objectives were:

- To map the distribution and estimate the biomass for the main small pelagic fish using hydro-acoustic methods. The species of interest were: sardinella *Sardinella aurita*, *Sardinella maderensis*, horse mackerel *Trachurus trachurus* and *T. trecae*, false scad *Caranx rhonchus*, and anchovy *Engraulis encrasicolus*.

- To identify and describe the size distribution of the target fish populations by midwater and bottom trawl sampling and process the catches by recording weight and number by species.

- To sample standard hydrographical transects for temperature, salinity and oxygen at about 13°35' N and 14°50' N.

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

1.2 Participation

Members of the scientific teams were:

Centre de Recherches Océanographiques de Dakar-Thiaroye, Senegal:
Abdoulaye SARRE, Mor SYLLA, Ibrahima SOW and Cheikh NDOUR

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

Institut Mauritanien de Recherches Océanographiques et des Pêches:
Abdoulaye N'DIAYE

Old Dominion University, Norfolk, Virginia, USA:
Jennifer M. MARTIN

Institute of Marine Research, Norway:
Reidar TORESEN, Magne OLSEN, Tore MØRK and Terje HAUGLAND

1.3 Narrative

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

The survey started off St. Louis on June 30 with systematic parallel course tracks spaced about 10 NM (nautical miles) apart. To cover the whole distribution area of pelagic fish, the shelf was covered from the 15 m isobath and offshore to the 500 m isobath. Trawling was done irregularly, either to identify echo registrations or to check 'blindly' if fish were mixed with the plankton in the upper layers of the water column. In the latter case, pelagic trawl with floats was often used. A smaller pelagic trawl or the bottom trawl with floats was used for sampling the pelagic fish in very shallow waters (depth less than 25 m). The shelf was covered down to Casamance. The survey was finished in Dakar July 7.

The hydrographic profile off the Gambia was carried out on 4th July and that off Cape Vert on 2nd July.

1.4 Methods

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

Hydrographic profiles were collected with a Seabird 911+ CTD probe and temperature, salinity, oxygen and pressure (depth) were logged by the Seabird Software. From these data series, records were selected from standard depths and presented in figures.

Biological sampling
Biological sampling of the fish was carried out using trawls. A pelagic trawl with floats was often used. A smaller pelagic trawl or the bottom trawl with floats was used for sampling the

pelagic fish in very shallow waters (depth less than 25 m). Annex II gives a description of the instruments and the fishing gear used. All catches were sampled for composition by weight and numbers of each species caught. Species identification was based on the FAO Species Guides. Length frequency distributions, by total fish length in cm, of the selected target species were taken in all the stations where they were present. Individual weight measurements were taken regularly to estimate the condition factor in the length-weight relationship:

$$\overline{w} = \frac{cond}{100} \cdot L^3$$

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

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

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

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

The following target groups were used for Senegal:

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

Acoustic sampling

A SIMRAD EK500 Echosounder was used with the settings as shown in Annex II. The Bergen Integrator (BEI) was used for analysis and allocation of the integrated s_A-values to the individual

specified target groups by 5 NM intervals. The allocation of values to target groups was based on a combination of a visual scrutiny of the behaviour pattern as deduced from echo diagrams, the BEI analysis, and the catch compositions.

In cases where the target category of fish contains more than one species (sardinellas and horse mackerels), the mean s_A-value allocated to the category is divided between the species in the same ratio as their contribution to the mean back scattering strength in the length frequency samples.

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

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

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

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

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

$$\rho_i = s_A \cdot \frac{p_i}{\sum_{i=1}^{n} \frac{p_i}{C_{F_i}}}$$

where

ρ_i = density of fish in length group i

s_A = mean integrator value

p_i = proportion of fish in length group i

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

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

The integrator outputs were split in fish groups using a combination of behaviour pattern as deduced from echo diagrams, the BEI analysis and catch composition as described below. The following groups were used for Senegal: 1) sardinellas, 2) horse mackerels, 3) carangids and associated species, and 4) demersal fish.

The above equations show that the conversion from s_A-values to number of fish is dependent on the length composition of the fish. It is therefore important to get representative length distributions from the stock in the whole distribution area.

When the size classes (of e.g. young fish and older fish) are well mixed, the various length distributions can be pooled together with equal importance. Otherwise, when the size classes are segregated, the total distribution area has to be post-stratified, according to the length distributions, and separate estimates are made for the regions containing fish with equal size.

For a region representing a distribution of a target-specie, the following basic data are needed for the estimation of abundance; 1) the average s_A-value for the region, 2) the surface (usually square nautical miles, NM^2), and 3) a representative length distribution of the fish in the region. If the targeted fish is a mixture of more than one species, for example sardinellas, a representative distribution of the two, within the region, as shown in the trawl catches, are used. A length distribution representing the number of the two species for each catch will have to be calculated. Thereafter, these distributions have to be normalized to a unit number (usually 100) so they are equally weighted.

A systematic approach to a) divide the s_A-value between species in a category of fish (e.g. *Sardinella aurita* and *S. maderensis*) and b) produce pooled length distributions of a target species for use in the above equation and c) calculate the biomass estimates for a region, is obtained through the following procedure:

- The samples of the species in the category (e.g. sardinellas) are respectively pooled together with equal importance (normalized).

- The mean back scattering strength (ρ/s_A) of each length frequency distribution of the target species is calculated and summed. This is automatically done in the Excel spread-sheet made available for acoustic abundance estimation onboard RV "Dr. Fridtjof Nansen", provided the data are punched in this sheet.

- The mean s_A-value allocated to the category of fish in the region is divided between the species in the same ratio as their relative contribution to the mean back scattering strength of

the length groups in the sample representing the region (also automatically done in the Excel spread-sheet given that the s_A-value for the region is punched into the sheet).

- The pooled length distribution is used, together with the mean s_A-value, to calculate the density (numbers per square NM) by length groups and species, using the above formula. The total number by length group in the area is obtained by multiplying each number by the area. (This is done in the Excel spreadsheet, given that the area of the region is punched into the sheet).

- The numbers are converted to biomass using the estimated weight at length. (Done in the Excel sheet if the condition factor is punched).

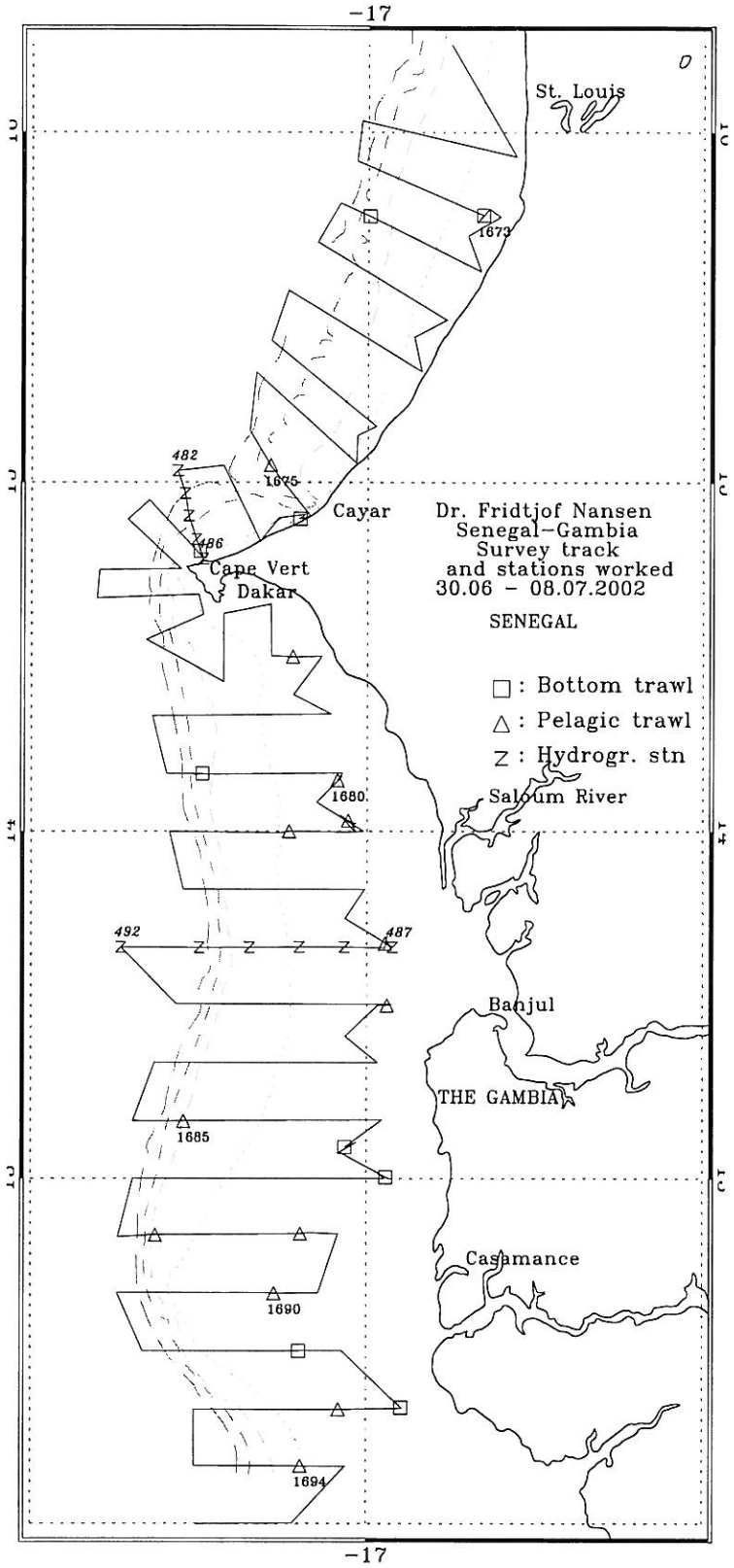
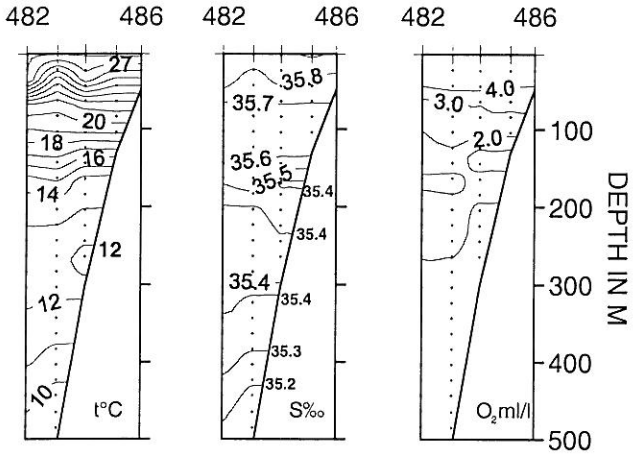


Figure 1. Course tracks with fishing and hydrographic stations; Casamance to St. Louis.

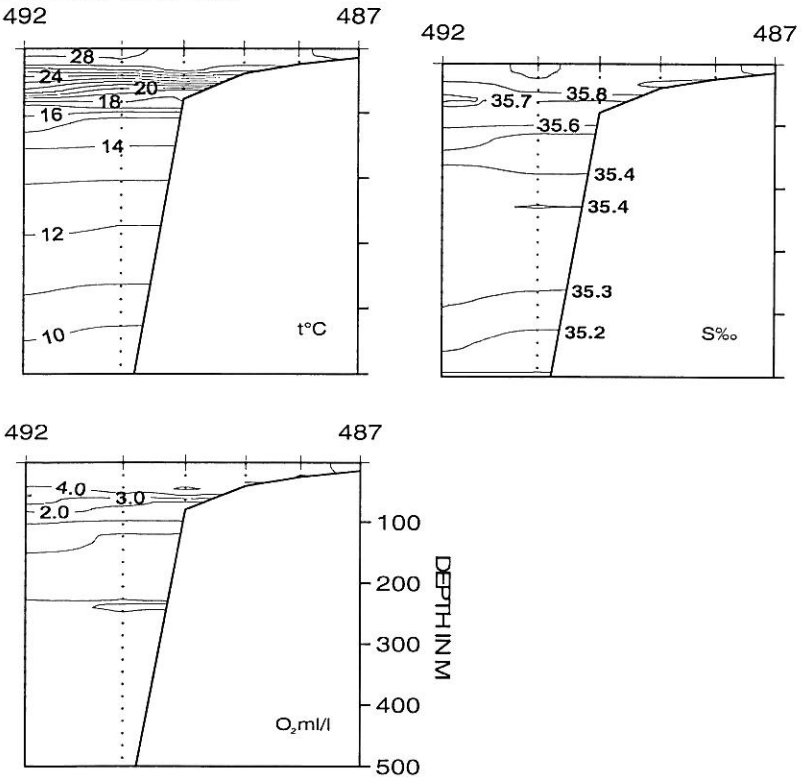
CHAPTER 2 SURVEY RESULTS

2.1 Hydrography

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



CAPE VERT 02.07 2002



THE GAMBIA - WEST 04.07 2002

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

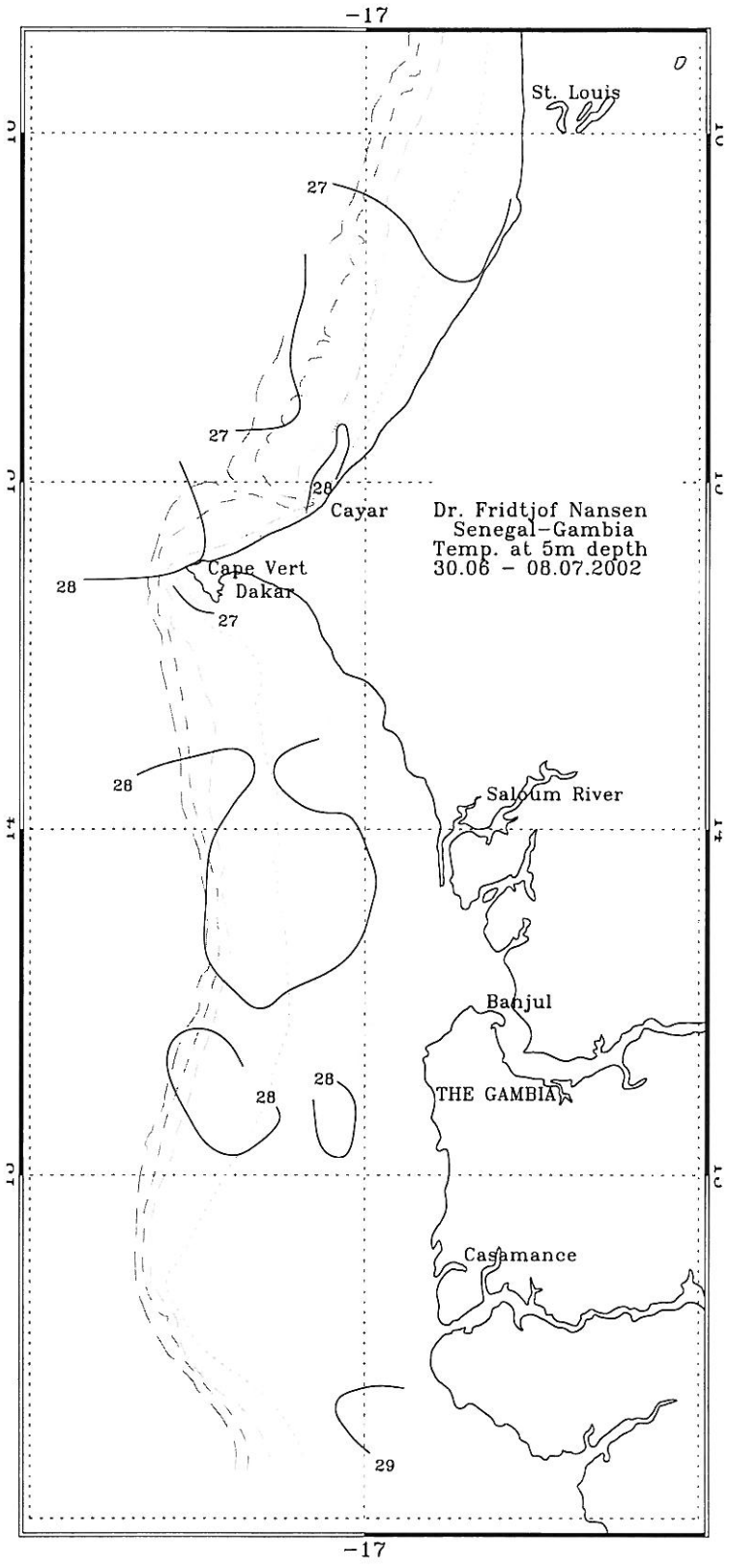


Figure 3. Sea surface temperature; Casamance to St. Louis.

The distribution of surface temperature and the profile the Gambia-West show that there was a stable surface layer with a temperature of 28-29 °C over the whole shelf south of Dakar. North of Cape Vert there was a trend of decreasing temperature towards the shore, with a decline from 27 °C over the entire shelf just north of Cape Vert to 26 °C off St. Louis.

2.2 The Casamance shelf

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

Off the Casamance coast, there were two school areas of sardinella of medium and high density in shallow waters, mostly inside the 50 m depth line, one in the southernmost part of the covered area and the other at the boarder between Senegal and the Gambia, Figure 4. The samples from this aggregation were predominantly *Sardinella maderensis*. The modal size was 21 cm (total length). Stock length compositions by numbers and weight in Annex IV. The total biomass of sardinellas in the area was estimated at 59 thousand tonnes, Table 1.

In the same areas as the sardinellas were found, false scad (*Caranx rhonchus*) were also found. These rather low concentrations were estimated at 2 thousand tonnes, and the fish had modal lengths of 8, 26 and 30 cm, Annex IV.

Other pelagic fish were found over most of the shelf, see Figure 6. The trawl samples indicated that these consisted of bumper, lookdown, barracudas, two-colour jack and hairtails, with the bumper as the dominating species. The estimated biomass of this group of fish was 142 thousand tonnes.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
59	0.2	2	142

2.3 The Gambian shelf

The school area of sardinella found at the southern boarder between the Gambia and Senegal continued northwards into the Gambian zone, Figure 4. A rather high density concentration was recorded at the northern boarder of the Gambia, some 20 NM west of Banjul. The samples

showed an 85% dominance of flat sardinella, *Sardinella maderensis* with a smaller proportion of round sardinella, *S. aurita*. The length composition of the flat sardinella had modes of 9, 19 and 24 cm, see Annex IV. The stock length compositions by numbers and weight are shown in Annex IV.

Table 2 shows that the biomass estimates of the sardinellas amounted to 408 thousand tonnes, of which 348 thousand tonnes were flat sardinella.

Horse mackerels were found mostly near the bottom at the edge of the shelf, some 40 NM from the coast, Figure 5. However, the densities were very low and the biomass estimated at 3 thousand tonnes only. Only *Trachurus trecae* were found, with a modal length of 10 cm.

Carangids and associated species were found widely distributed over the inner shelf, Figure 6. Catches of this group consisted mainly of bumper, African lookdown and barracudas. The biomass was estimated at 59 thousand tonnes.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
348	60	3	59

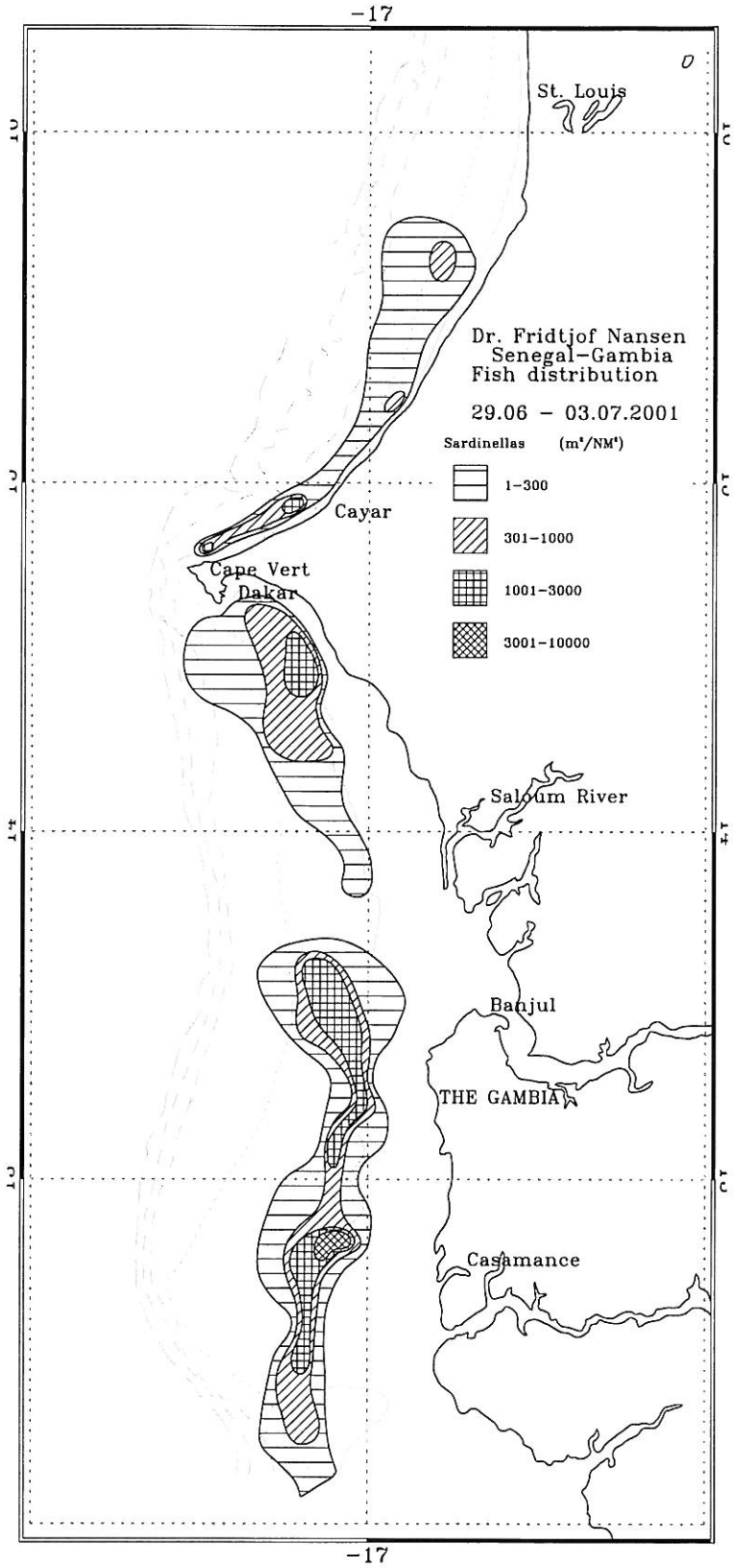


Figure 4. Distribution of sardinellas; Casamance to St. Louis.

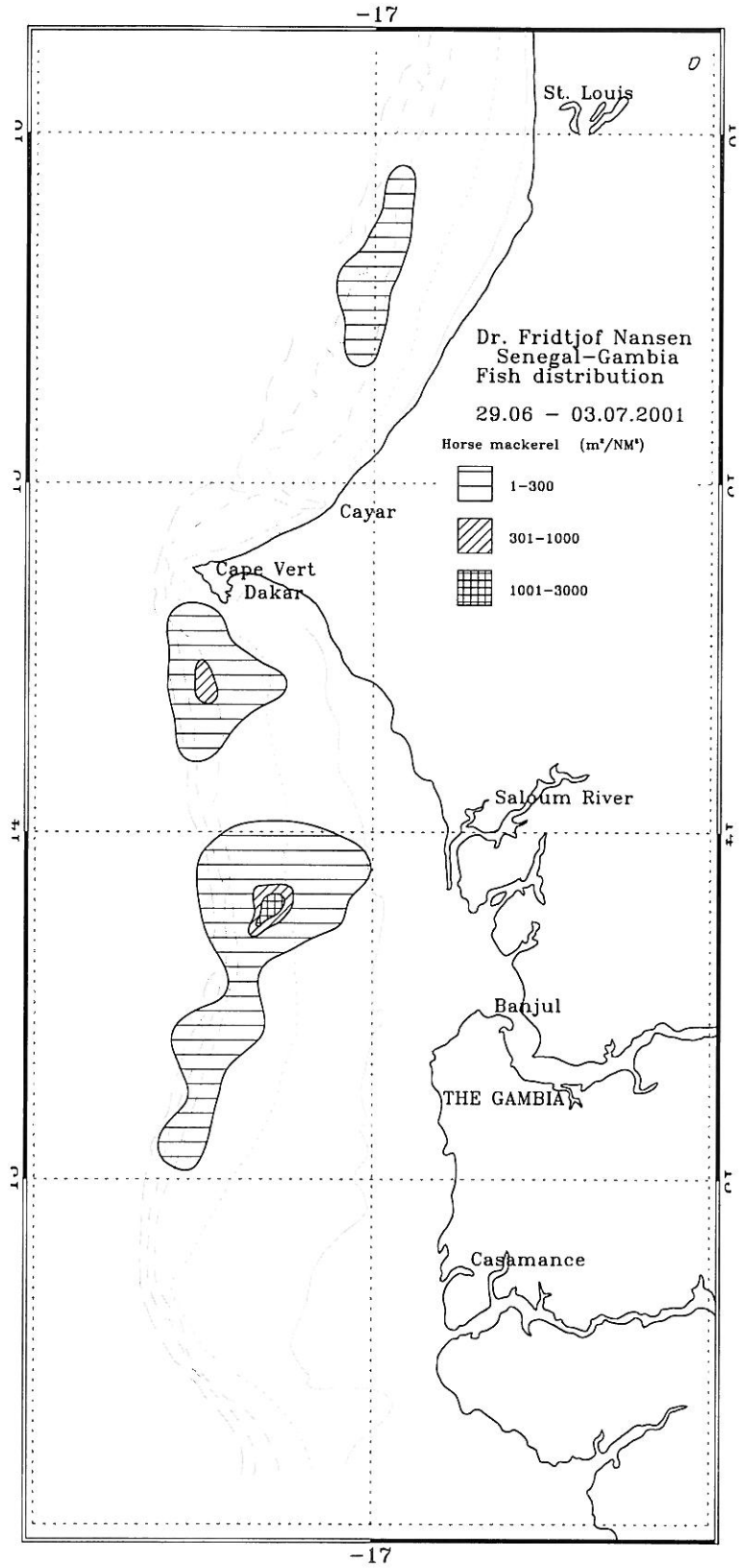


Figure 5. Horse mackerels; Casamance to St. Louis.

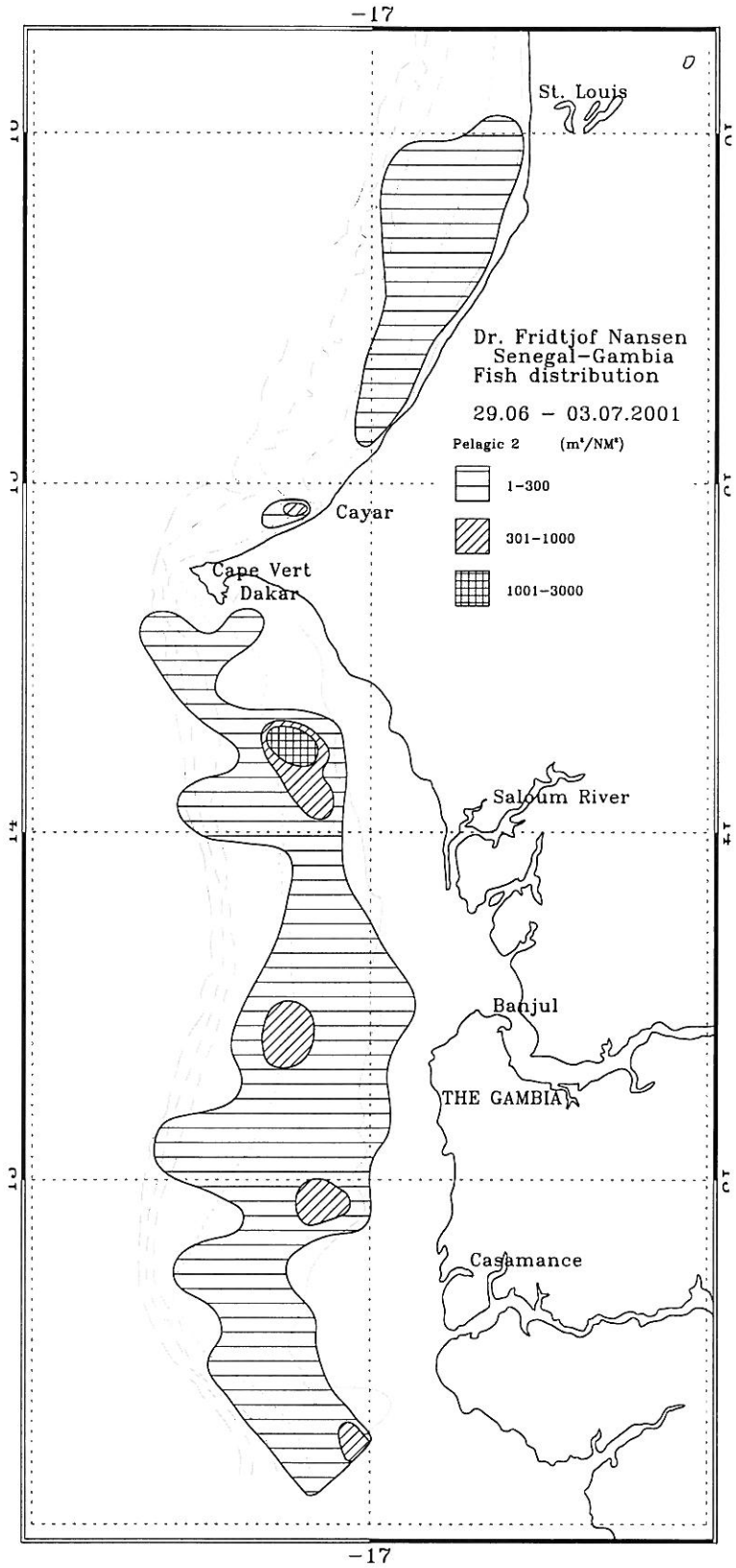


Figure 6. Carangids and associated species; Casamance to St. Louis

2.4 The Gambian border - Cape Vert

Sardinellas were distributed from the outlet of the Saloum River to some 15 NM south of Dakar (Figure 4). Medium and low densities were found in all this area. Table 3 shows the biomass estimates for the two sardinella species that summed up to 123 thousand tonnes. Flat sardinella dominated the estimated biomass in the area by 90%.

Pooled length compositions of samples showed that the flat sardinella had a modal length of 24 cm while the round sardinella had modal lengths of 26 cm, see Annex IV. Stock size compositions by numbers and weight are shown in Annex IV.

The horse mackerels in this area were distribution along the outer part of the shelf, between the outlet of the Saloum River and Dakar, Figure 5. The total biomass was estimated at 6 thousand tonnes and Cunene horse mackerel dominated completely. Two modal lengths were found on 8 and 11 cm.

Also here, the carangids and associated pelagic fish, were distributed over most of the area at medium densities, see Figure 5. Again, bumper was caught in most of the trawl samples. The biomass of the carangids and associated pelagic fish was estimated at about 83 thousand tonnes, Table 3.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
102	11	6	83

2.5 Cape Vert - St. Louis

Almost no sardinella were found in this area. Only a small inshore concentration was found, some 40 NM south of St. Louis, Figure 4. The flat sardinella dominated the total biomass estimate of 17 thousand tonnes by 76 %. The round sardinella had a modal length of 26 cm, while that of flat sardinella was 25 cm.

Horse mackerel were found in two medium to low density areas, one just north of Cape Vert, and the other one some 50 NM south of St. Louis and northwards to the border, Figure 5. The

total biomass was estimated at 78 thousand tonnes, and the catches show that only Cunene horse mackerel were found. The modal length was 22 cm.

Carangids and associated pelagic fish were mainly found over the entire shelf, in a larger area, extending from Cayar to St Louis. A smaller aggregation was found north of Cape Vert, Figure 6. The catches consisted also here of bumper, African lookdown and hairtails. The biomass estimate was 59 thousand tonnes.

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

Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
13	4	78	59

CHAPTER 3 OVERVIEW AND SUMMARY OF RESULTS

The survey was conducted successfully in the period June 30 to July 8 with a course track of about 1 600 NM and 22 fishing stations.

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

Sardinellas were found in one main area, off Banjul to Dakar, with a few smaller aggregations south and north of this, Figure 4. High densities were found off Casamance and west of Banjul. Flat sardinella dominated in all areas.

Horse mackerels were found in two main areas; one between the Saloum River and Dakar, and the other along the outer shelf south of St. Louis, Figure 5. Some smaller concentrations were found off the Gambia and in the Casamance area.

Other carangids and associated species were distributed over most of the shelf at rather low densities, Figure 5. The catches of this group consisted of bumper, barracudas and hairtails.

An overview of the acoustic estimates of biomass of the main groups of pelagic fish is shown in Table 5. The total biomass of sardinellas was thus 597 thousand tonnes, horse mackerels 88 thousand tonnes and of carangids and associated species 343 thousand tonnes.

Table 5. Summary of biomass estimates of pelagic fish, Senegal and the Gambia. thousand tonnes.

	Flat sardinella	Round sardinella	Horse mackerels	Carangids etc.
St. Louis-Cape Vert	13	4	78	59
Cape Vert-the Gambia	102	11	6	83
the Gambia	348	60	3	59
Casamance	59	+	2	142
Total	522	75	89	343

Table 6 lists biomass estimates of sardinellas and carangids (including the horse mackerels) and associated species from the 'Dr. Fridtjof Nansen' surveys of this shelf region. Large-scale latitudinal movements of pelagic fish between West Sahara and Guinea Bissau are well known, and in the summer the sardinellas should be concentrated in Senegal for spawning. Compared with the July survey last year, the estimate of 597 thousand tonnes of sardinellas

from the current survey is higher. The carangid estimate of 432 thousand tonnes is also higher than last years estimate.

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

Survey:	Sardinellas	Carangids etc.*
AprMay-81	210	570
Sept -81	360	**
FebMar-82	40	90
NovDec-86	330	170
FebMar-92	1 530	690
NovDec-95	760	220
NovDec-96	230	530
NovDec-97	300	250
NovDec-98	390	340
NovDec-99	1 390	470
NovDec-00	300	540
JunJul-01	410	230
NovDec-01	430	480
JunJul-02	600	430

* Horse mackerels and other carangids
** Not available

References

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

Annex I Records of fishing stations

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1673
DATE: 1/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1546
start stop duration Long W 1639
TIME :08:24:30 08:55:54 31 (min) Purpose code: 1
LOG :2796.35 2798.02 1.66 Area code : 4
FDEPTH: 27 28 GearCond.code:
BDEPTH: 27 28 Validity code:
Towing dir: 230ø Wire out: 120 m Speed: 30 kn*10

Sorted: 64 Kg Total catch: 543.10 CATCH/HOUR: 1051.16

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Galeoides decadactylus	444.19	1997	42.26	2817
Brachydeuterus auritus	228.19	1483	21.71	
Drepane africana	82.74	1376	7.87	
Ilisha africana	72.81	157	6.93	
Pteroscion peli	45.29	1010	4.31	
Pomadasys rogeri	40.06	1010	3.81	
Pentanemus quinquarius	27.17	383	2.58	
Pseudotolithus senegalensis	25.78	209	2.45	
Selene dorsalis	22.65	1916	2.15	
Eucinostomus melanopterus	13.94	122	1.33	
Sphyrna lewini	10.45	209	0.99	
Trichiurus lepturus	9.23	296	0.88	
Cynoponticus ferox	7.74	8	0.74	
Sphyraena guachancho	7.14	17	0.68	
Stromateus fiatola	4.18	17	0.40	
Pseudupeneus prayensis	2.61	17	0.25	
Arius heudeloti	2.26	17	0.22	
Sepiella ornata	1.74	70	0.17	
Penaeus notialis	1.57	70	0.15	
Pisodonophis semicinctus	0.56	2	0.05	
Panulirus regius	0.48	2	0.05	
Trachurus trecae, juvenile	0.35	70	0.03	
Total	1051.13		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1674
DATE: 1/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1546
start stop duration Long W 1700
TIME :13:45:16 13:57:16 12 (min) Purpose code: 1
LOG :2841.84 2842.50 0.94 Area code : 4
FDEPTH: 125 117 GearCond.code:
BDEPTH: 125 117 Validity code:
Towing dir: 116ø Wire out: 400 m Speed: 30 kn*10

Sorted: 31 Kg Total catch: 183.10 CATCH/HOUR: 915.50

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae, juvenile	811.25	146025	88.61	2818
Synagrops microlepis	64.50	19305	7.05	
Trichiurus lepturus	18.00	20	1.97	
Sphoeroides pachgaster	4.50	5	0.49	
Illex coindetii	4.15	710	0.45	
Todaropsis eblanae	4.00	35	0.44	
Brachydeuterus auritus	2.50	20	0.27	
Arius heudeloti	2.25	15	0.25	
Dentex angolensis	1.75	15	0.19	
Dentex macrophthalmus	1.75	25	0.19	
Zeus faber	0.50	5	0.05	
Antigonia capros	0.25	5	0.03	
Engraulis encrasicolus	0.10	10	0.01	
Total	915.50		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1675
DATE: 2/ 7/02 GEAR TYPE: PT No: 3 POSITION:Lat N 1503
start stop duration Long W 1717
TIME :05:52:24 06:07:38 15 (min) Purpose code: 1
LOG :3006.15 3006.98 0.82 Area code : 4
FDEPTH: 25 25 GearCond.code:
BDEPTH: 128 136 Validity code:
Towing dir: 315ø Wire out: 135 m Speed: 35 kn*10

Sorted: 35 Kg Total catch: 107.61 CATCH/HOUR: 430.44

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	238.80	26268	55.48	2819
Brachydeuterus auritus	97.80	540	22.72	2820
Auxis thazard	59.28	228	13.77	
Scomber japonicus	23.04	192	5.35	
Euthynnus alletteratus	7.68	12	1.78	
Sarda sarda	2.40	12	0.56	
Ariomma bondi	0.84	12	0.20	
Trachurus trecae	0.60	60	0.14	
Total	430.44		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1676
DATE: 2/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1454
start stop duration Long W 1712
TIME :08:20:18 08:20:28 20 (min) Purpose code: 1
LOG :3024.96 3026.15 1.18 Area code : 4
FDEPTH: 49 60 GearCond.code:
BDEPTH: 49 60 Validity code:
Towing dir: 50ø Wire out: 220 m Speed: 30 kn*10

Sorted: 69 Kg Total catch: 357.73 CATCH/HOUR: 1073.19

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Trachurus trecae	625.35	11985	58.27	2822
Brachydeuterus auritus	136.11	750	12.68	
Pagellus bellottii	120.45	2472	11.22	2823
Pseudupeneus prayensis	60.54	549	5.64	2821
Scomber japonicus	36.78	132	3.43	
Sphyraena guachancho	35.82	132	3.34	
Sepia officinalis hierredda	12.87	48	1.20	
Boops boops	11.88	114	1.11	
Drepane africana	10.41	15	0.97	
Aluterus blankerti	8.07	15	0.75	
Caranx rhonchus	5.79	15	0.54	
Chilomycterus spinosus mauret.	3.63	15	0.34	
Lagocephalus laevigatus	2.64	33	0.25	
Fistularia petimba	1.98	33	0.18	
Uraspis secunda	0.87	3	0.08	
Total	1073.19		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1677
DATE: 2/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1448
start stop duration Long W 1730
TIME :14:49:11 15:14:04 25 (min) Purpose code: 1
LOG :3076.13 3077.44 1.30 Area code : 3
FDEPTH: 111 124 GearCond.code:
BDEPTH: 111 124 Validity code:
Towing dir: 316ø Wire out: 400 m Speed: 31 kn*10

Sorted: 76 Kg Total catch: 1076.18 CATCH/HOUR: 2582.83

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	1170.96	126317	45.34	2825
Caranx rhonchus	966.96	934	37.44	
Trachurus trecae	146.88	13745	5.69	2824
Dentex macrophthalmus	72.62	490	2.81	
Antigonia capros	47.74	734	1.85	
Illex coindetii	47.33	612	1.83	
Squatina oculata	33.24	14	1.29	
Sphyraena guachancho	29.78	41	1.15	
Selene dorsalis	28.15	41	1.09	
Raja miraletus	26.52	41	1.03	
Boops boops	7.34	82	0.28	
Saurida brasiliensis	2.45	286	0.09	
Total	2579.97		99.89	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1678
DATE: 3/ 7/02 GEAR TYPE: PT No: 1 POSITION:Lat N 1430
start stop duration Long W 1713
TIME :04:56:11 05:10:05 14 (min) Purpose code: 1
LOG :3215.12 3216.06 0.93 Area code : 4
FDEPTH: 10 15 GearCond.code: 1
BDEPTH: 32 34 Validity code: 1
Towing dir: 270ø Wire out: 80 m Speed: 40 kn*10

Sorted: 32 Kg Total catch: 1036.23 CATCH/HOUR: 4440.99

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	2434.29	26880	54.81	
Sardinella maderensis	1220.57	7131	27.48	2827
Sardinella aurita	419.66	2469	9.45	2826
Chloroscombrus chrysurus	161.83	1783	3.64	
Trachurus trecae, juvenile	76.80	9609	1.73	2828
Pagellus bellottii	42.51	137	0.96	
Alectis alexandrinus	38.40	137	0.86	
Sphyraena guachancho	22.71	73	0.51	
Boops boops	21.94	1509	0.49	
Plectorhinchus mediterraneus	2.27	4	0.05	
Total	4440.98		99.98	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1679
DATE: 3/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1410
start stop duration Long W 1729
TIME :12:36:41 13:06:19 30 (min) Purpose code: 1
LOG :3288.76 3290.31 1.53 Area code : 4
FDEPTH: 102 120 GearCond.code:
BDEPTH: 102 120 Validity code:
Towing dir: 270ø Wire out: 350 m Speed: 30 kn*10

Sorted: 64 Kg Total catch: 843.85 CATCH/HOUR: 1687.70

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Boops boops	776.26	9924	46.00	
Engraulis encrasicolus	497.50	44150	29.48	2830
Trachurus trecae, juvenile	312.60	21300	18.52	2829
Priacanthus arenatus	43.70	98	2.59	
Scomber japonicus	12.00	2000	0.71	
Epinephelus aeneus	9.60	2	0.57	
Dentex congoensis	8.12	70	0.48	
Pagrus africanus	5.78	14	0.34	
Plectorhinchus mediterraneus	4.80	2	0.28	
Anthias anthias	3.26	476	0.19	
Zeus faber	2.60	2	0.15	
Umbrina canariensis	2.22	8	0.13	
Illex coindetii	1.86	8	0.11	
Raja miraletus	1.80	2	0.11	
Parapristipoma octolineatum	1.78	4	0.11	
Pagrus africanus	1.40	8	0.08	
Sphoeroides pachgaster	1.00	26	0.06	
Brama brama	1.00	26	0.06	
Dentex macrophthalmus	0.70	4	0.04	
Erythrocles monodi	0.66	2	0.04	
Ariomma bondi	0.26	26	0.02	
Total	1688.90		100.07	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1680
DATE: 3/ 7/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1409
start stop duration Long W 1705
TIME :16:20:00 16:38:00 18 (min) Purpose code: 1
LOG :3319.90 3321.10 1.11 Area code : 4
FDEPTH: 10 10 GearCond.code:
BDEPTH: 21 19 Validity code:
Towing dir: 45ø Wire out: 100 m Speed: 40 kn*10

Sorted: 21 Kg Total catch: 21.05 CATCH/HOUR: 70.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	65.17	357	92.87	2831
Sardinella aurita	3.90	20	5.56	
Chloroscombrus chrysurus	0.63	7	0.90	
Sepia bertheloti	0.47	27	0.67	
Total	70.17		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1681
DATE: 3/ 7/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1402
start stop duration Long W 1703
TIME :20:18:53 20:52:41 34 (min) Purpose code: 1
LOG :3348.36 3350.03 1.64 Area code : 4
FDEPTH: 10 10 GearCond.code:
BDEPTH: 22 25 Validity code:
Towing dir: 300ø Wire out: 180 m Speed: 30 kn*10

Sorted: 32 Kg Total catch: 101.05 CATCH/HOUR: 178.32

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	86.29	1129	48.39	
Chloroscombrus chrysurus	30.18	434	16.92	2833
Sardinella maderensis	17.42	116	9.77	2832
Pomadasys jubelini	11.54	48	6.47	
Galeoides decadactylus	5.88	74	3.30	
Sardinella aurita	4.13	26	2.32	
Arius parkii	3.62	4	2.03	
Pagellus bellottii	3.23	566	1.81	
Sphyraena guachancho	3.02	16	1.69	
Eucinostomus melanopterus	3.02	48	1.69	
Selene dorsalis	2.17	21	1.22	
Alectis alexandrinus	1.96	5	1.10	
Plectorhinchus mediterraneus	1.96	5	1.10	
Caranx rhonchus	1.54	11	0.86	
Penaeus notialis	0.90	30	0.50	
Penaeus kerathurus	0.64	26	0.36	
Pseudupeneus prayensis	0.58	5	0.33	
Spondyliosoma cantharus	0.53	5	0.30	
Trachurus trecae, juvenile	0.21	42	0.12	
Total	178.82		100.28	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1682
DATE: 3/ 7/02 GEAR TYPE: PT No: 4 POSITION:Lat N 1400
start stop duration Long W 1714
TIME :23:01:50 23:32:19 30 (min) Purpose code: 1
LOG :3367.27 3368.88 1.59 Area code : 4
FDEPTH: 10 10 GearCond.code:
BDEPTH: 45 51 Validity code:
Towing dir: 270ø Wire out: 140 m Speed: 35 kn*10

Sorted: 23 Kg Total catch: 47.82 CATCH/HOUR: 95.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	25.00	164	26.14	2834
Trachurus trecae, juvenile	11.56	1824	12.09	2835
Caranx rhonchus	9.20	36	9.62	
Sardinella aurita	8.64	52	9.03	
Eucinostomus melanopterus	8.48	80	8.87	
Sphyraena guachancho	6.48	16	6.78	
Brachydeuterus auritus	5.60	44	5.86	
Selene dorsalis	5.48	32	5.73	
Boops boops	3.56	712	3.72	
Scomber japonicus	3.24	40	3.39	
Decapterus punctatus	3.00	140	3.14	
Pomadasys incisus	2.76	20	2.89	
Sardinella maderensis	1.16	8	1.21	
Priacanthus arenatus	0.96	8	1.00	
Sepiella ornata	0.56	24	0.59	
Total	95.68		100.06	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1683
DATE: 4/ 7/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1341
start stop duration Long W 1657
TIME :08:06:05 08:35:59 30 (min) Purpose code: 1
LOG :3449.76 3451.25 1.48 Area code : 4
FDEPTH: 10 10 GearCond.code:
BDEPTH: 18 18 Validity code:
Towing dir: 15ø Wire out: 170 m Speed: 30 kn*10

Sorted: 15 Kg Total catch: 15.28 CATCH/HOUR: 30.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	15.10	164	49.41	2836
Scomberomorus tritor	12.90	12	42.21	
Chloroscombrus chrysurus	1.18	14	3.86	
Sardinella aurita	1.14	6	3.73	
Liza falcipinnis	0.24	2	0.79	
Total	30.56		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1684
DATE: 4/ 7/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1330
start stop duration Long W 1656
TIME :20:05:43 20:36:34 31 (min) Purpose code: 1
LOG :3555.57 3557.21 1.60 Area code : 5
FDEPTH: 10 10 GearCond.code:
BDEPTH: 19 19 Validity code:
Towing dir: 270ø Wire out: 170 m Speed: 30 kn*10

Sorted: 28 Kg Total catch: 301.70 CATCH/HOUR: 583.94

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	461.61	7903	79.05	2837
Sardinella maderensis	27.97	199	4.79	2838
Caranx rhonchus	22.26	116	3.81	
Eucinostomus melanopterus	18.39	213	3.15	
Pomadasys incisus	11.61	77	1.99	
Engraulis encrasicolus	8.52	1703	1.46	
Sphyraena guachancho	7.16	39	1.23	
Sardinella aurita	4.47	25	0.77	2839
Trichiurus lepturus	4.45	19	0.76	
Pagellus bellottii	4.06	561	0.70	
Trachurus trecae, juvenile	3.87	677	0.66	
Elops lacerta	3.19	12	0.55	
Priacanthus arenatus	2.13	19	0.36	
Pseudupeneus prayensis	1.35	19	0.23	
Penaeus notialis	1.18	43	0.20	
Sepiella ornata	0.77	39	0.13	
Diplodus bellottii	0.39	77	0.07	
Caranx crysos	0.29	2	0.05	
Epinephelus aeneus	0.25	2	0.04	
Total	583.92		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1685
DATE: 5/ 7/02 GEAR TYPE: PT No: 1 POSITION:Lat N 1310
start stop duration Long W 1733
TIME :04:06:53 04:27:59 21 (min) Purpose code: 1
LOG :3632.98 3634.37 1.36 Area code : 5
FDEPTH: 45 40 GearCond.code:
BDEPTH: 102 106 Validity code:
Towing dir: 270ø Wire out: 150 m Speed: 40 kn*10

Sorted: 36 Kg Total catch: 831.68 CATCH/HOUR: 2376.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	1261.71	126171	53.10	2841
Trachurus trecae, juvenile	1110.57	102580	46.74	2840
Sepia officinalis hierredda	3.94	131	0.17	
Total	2376.22		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1686
DATE: 5/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1305
start stop duration Long W 1704
TIME :09:25:35 10:03:44 38 (min) Purpose code: 1
LOG :3682.73 3684.86 2.09 Area code : 5
FDEPTH: 23 20 GearCond.code:
BDEPTH: 23 20 Validity code:
Towing dir: 62ø Wire out: 120 m Speed: 30 kn*10

Sorted: 29 Kg Total catch: 470.20 CATCH/HOUR: 742.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caranx rhonchus	504.47	1989	67.95	2843
Chloroscombrus chrysurus	144.47	1682	19.46	2842
Sepia officinalis hierredda	49.74	69	6.70	
Sardinella maderensis	37.18	189	5.01	
Alectis alexandrinus	2.57	2	0.35	
Alloteuthis africana	2.13	1042	0.29	
Decapterus punctatus	0.95	24	0.13	
Echeneis naucrates	0.46	3	0.06	
Nicholsina usta	0.30	2	0.04	
Fistularia petimba	0.14	3	0.02	
Total	742.41		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1687
DATE: 5/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1300
start stop duration Long W 1657
TIME :11:51:15 12:21:07 30 (min) Purpose code: 1
LOG :3700.52 3702.19 1.64 Area code : 5
FDEPTH: 15 17 GearCond.code:
BDEPTH: 15 17 Validity code:
Towing dir: 300ø Wire out: 100 m Speed: 31 kn*10

Sorted: 31 Kg Total catch: 1606.75 CATCH/HOUR: 3213.50

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	2970.00	45100	92.42	
Sardinella maderensis	97.00	6600	3.02	
Caranx rhonchus	76.00	12000	2.37	2844
Scomberomorus tritor	18.70	20	0.58	
Selene dorsalis	18.00	200	0.56	
Eucinostomus melanopterus	11.00	200	0.34	
Alectis alexandrinus	8.36	4	0.26	
Caranx crysos	3.32	2	0.10	
Liza falcipinnis	3.14	6	0.10	
Pomadasys jubelini	2.10	12	0.07	
Sphyraena guachancho	2.04	4	0.06	
Mugil capurrii	1.88	12	0.06	
Trichiurus lepturus	1.62	4	0.05	
Priacanthus arenatus	0.32	2	0.01	
Ephippion guttifer	0.02	2		
Total	3213.50		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1688
DATE: 5/ 7/02 GEAR TYPE: PT No: 3 POSITION:Lat N 1250
start stop duration Long W 1738
TIME :19:04:41 19:34:14 30 (min) Purpose code: 1
LOG :3768.06 3769.81 1.73 Area code : 4
FDEPTH: 30 40 GearCond.code:
BDEPTH: 74 132 Validity code:
Towing dir: 270ø Wire out: 150 m Speed: 35 kn*10

Sorted: 2 Kg Total catch: 2.07 CATCH/HOUR: 4.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sepiella ornata	2.68	214	64.73	
Echeneis naucrates	1.46	2	35.27	
Total	4.14		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1689
DATE: 5/ 7/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1250
start stop duration Long W 1712
TIME :22:34:52 23:05:39 31 (min) Purpose code: 1
LOG :3798.95 3800.51 1.54 Area code : 4
FDEPTH: 10 10 GearCond.code:
BDEPTH: 26 25 Validity code:
Towing dir: 90ø Wire out: 170 m Speed: 30 kn*10

Sorted: 468 Kg Total catch: 468.77 CATCH/HOUR: 907.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pomadasys jubelini	841.35	2059	92.73	2845
Arius parkii	28.35	25	3.12	
Alectis alexandrinus	8.19	27	0.90	
Albula vulpes	7.14	14	0.79	
Pomadasys rogeri	6.58	10	0.73	
Galeoides decadactylus	6.52	8	0.72	
Eucinostomus melanopterus	3.25	52	0.36	
Trichiurus lepturus	2.85	8	0.31	
Caranx rhonchus	0.64	2	0.07	
Engraulis encrasicolus	0.39	46	0.04	
Selar crumenophthalmus	0.35	2	0.04	
Pagellus bellottii	0.33	60	0.04	
Dicologoglossa cuneata	0.33	27	0.04	
Decapterus punctatus	0.27	35	0.03	
Penaeus notialis	0.23	17	0.03	
Chloroscombrus chrysurus	0.21	2	0.02	
Trachurus trecae, juvenile	0.10	17	0.01	
Echeneis naucrates	0.08	2	0.01	
Sepia officinalis hierredda	0.08	2	0.01	
OPHIDIIDAE	0.02	2		
Pseudupeneus prayensis	0.02	2		
Bothus podas africanus	0.02	2		
Total	907.30		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1690
DATE: 6/ 7/02 GEAR TYPE: PT No: 7 POSITION:Lat N 1240
start stop duration Long W 1716
TIME :01:49:24 02:19:13 30 (min) Purpose code: 1
LOG :3824.31 3826.05 1.75 Area code : 4
FDEPTH: 10 10 GearCond.code:
BDEPTH: 26 29 Validity code:
Towing dir: ø Wire out: 120 m Speed: 35 kn*10

Sorted: Kg Total catch: 12.73 CATCH/HOUR: 25.46

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Arius heudelotii	17.50	18	68.74	
Chloroscombrus chrysurus	4.50	38	17.67	
Caranx rhonchus	2.08	108	8.17	2846
Pomadasys jubelini	0.72	2	2.83	
Selene dorsalis	0.46	2	1.81	
Mugil capurrii	0.20	2	0.79	
Total	25.46		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1691
DATE: 6/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1230
start stop duration Long W 1712
TIME :09:04:05 09:34:22 30 (min) Purpose code: 1
LOG :3893.92 3895.46 1.52 Area code : 4
FDEPTH: 19 19 GearCond.code:
BDEPTH: 19 19 Validity code:
Towing dir: 270ø Wire out: 100 m Speed: 30 kn*10

Sorted: 8 Kg Total catch: 91.69 CATCH/HOUR: 183.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis encrasicolus	57.20	32140	31.19	
Alectis alexandrinus	25.40	52	13.85	
Scomberomorus tritor	20.00	28	10.91	
Sphyrna lewini	18.10	20	9.87	
Trichiurus lepturus	11.70	28	6.38	
Rhizoprionodon acutus	10.00	18	5.45	
Elops lacerta	9.20	18	5.02	
Caranx rhonchus	8.80	4620	4.80	2847
Sphyraena guachancho	6.40	8	3.49	
Galeoides decadactylus	4.00	6	2.18	
Albula vulpes	2.90	6	1.58	
Arius parkii	2.80	4	1.53	
Sparus caeruleostictus *	2.60	6	1.42	
Arius latiscutatus	2.50	4	1.36	
Drepane africana	0.60	2	0.33	
Eucinostomus melanopterus	0.40	4	0.22	
Sardinella maderensis	0.32	88	0.17	
Caranx crysos	0.20	4	0.11	
Dicologoglossa cuneata	0.10	4	0.05	
Decapterus punctatus	0.08	8	0.04	
Chloroscombrus chrysurus	0.08	88	0.04	
Total	183.38		99.99	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1692
DATE: 6/ 7/02 GEAR TYPE: BT No: 8 POSITION:Lat N 1220
start stop duration Long W 1654
TIME :12:08:33 12:38:11 30 (min) Purpose code: 1
LOG :3920.44 3922.05 1.60 Area code : 4
FDEPTH: 16 18 GearCond.code:
BDEPTH: 16 18 Validity code:
Towing dir: 313ø Wire out: 100 m Speed: 30 kn*10

Sorted: 40 Kg Total catch: 1608.98 CATCH/HOUR: 3217.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus Juvenile	2281.50	273780	70.90	
Sphyraena guachancho	721.50	2262	22.42	
Brachydeuterus auritus	150.54	4602	4.68	
Alectis alexandrinus	11.40	4	0.35	
Galeoides decadactylus	9.36	156	0.29	
Callinectes marginatus	9.36	546	0.29	
Selene dorsalis	8.58	390	0.27	
Scomberomorus tritor	5.70	10	0.18	
Ephippion guttifer	5.70	2	0.18	
Arius heudelotii	5.40	6	0.17	
Caranx crysos	2.76	4	0.09	
Pseudotolithus elongatus	1.88	2	0.06	
Mustelus mustelus	1.74	4	0.05	
Elops lacerta	1.36	4	0.04	
Ilisha africana	0.78	468	0.02	
Trichiurus lepturus	0.40	2	0.01	
Total	3217.96		100.00	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1693
DATE: 6/ 7/02 GEAR TYPE: PT No: 1 POSITION:Lat N 1220
start stop duration Long W 1705
TIME :14:27:12 14:57:15 30 (min) Purpose code: 1
LOG :3937.53 3939.65 2.11 Area code : 4
FDEPTH: 10 15 GearCond.code:
BDEPTH: 28 27 Validity code:
Towing dir: 90ø Wire out: 80 m Speed: 40 kn*10

Sorted: 36 Kg Total catch: 279.57 CATCH/HOUR: 559.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella maderensis	319.50	18150	57.14	2848
Brachydeuterus auritus	81.90	4080	14.65	
Chloroscombrus chrysurus	66.30	2550	11.86	
Sphyraena guachancho	42.30	94	7.57	
Caranx rhonchus	10.80	38	1.93	
Caranx rhonchus juv	6.30	2520	1.13	2849
Selene dorsalis	6.30	120	1.13	
Sepia officinalis hierredda	6.00	420	1.07	
Scomberomorus tritor	4.34	8	0.78	
Galeoides decadactylus	4.20	210	0.75	
Trichiurus lepturus	4.00	12	0.72	
Eucinostomus melanopterus	3.60	30	0.64	
Sardinella aurita	3.30	30	0.59	
Engraulis encrasicolus	0.30	60	0.05	
Total	559.14		100.01	

DR. FRIDTJOF NANSEN PROJECT:W3 PROJECT STATION:1694
DATE: 6/ 7/02 GEAR TYPE: PT No: 6 POSITION:Lat N 1210
start stop duration Long W 1712
TIME :21:02:19 21:18:29 16 (min) Purpose code: 1
LOG :4000.99 4001.95 0.95 Area code : 4
FDEPTH: 10 10 GearCond.code:
BDEPTH: 54 61 Validity code:
Towing dir: 270ø Wire out: 140 m Speed: 30 kn*10

Sorted: 31 Kg Total catch: 10009.25 CATCH/HOUR: 37534.69

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chloroscombrus chrysurus	22250.25	328969	59.28	2851
Sardinella maderensis	13876.50	119625	36.97	2850
Selene dorsalis	1375.69	10766	3.67	
Rhizoprionodon acutus	32.25	8	0.09	
Total	37534.69		100.01	

Annex II Instruments and fishing gear used

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

Transceiver-1 menu	Transducer depth	5.5 - 7.5 m
	Absorption coeff.	10 dB/km
	Pulse length	medium (1ms)
	Bandwidth	wide
	Max power	2000 Watt
	2-way beam angle	-21.0 dB
	SV transducer gain	27.01 dB
	TS transducer gain	27.26 dB
	Angle sensitivity	21.9
	3 dB beamwidth along.	7.1°
	3 dB beamwidth athw.	6.9°
	Alongship offset	0.07°
	Athwardship offset	0.03°
Display menu	Echogram	1
	Bottom range	10 m
	Bottom range start	9 m
	TVG	20 log R
	Sv colour min	-67 dB
	TS Colour minimum	-60 dB
Printer- menu	Range	0-50, 0-100, 0-150, 0-250 or 0-500m
	TVG	20 log R
	Sv colour min	-60 dB
Bottom detection menu	Minimum level	-40 dB

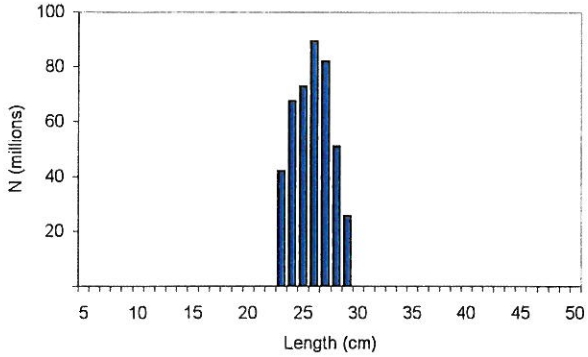
A calibration experiment using a standard copper sphere was performed in False Bay, South Africa 22 April 2002.

Fishing gear

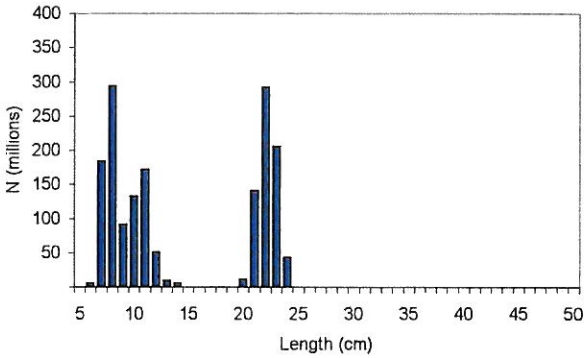
The vessel has two different sized "Åkrahamn" pelagic trawls and one "Gisund super" bottom trawl. For all trawls, the Tyborøn, 7.8m² (1670 kg) trawl doors were used. Complete drawings of the trawls used are included.

Annex III Pooled length distributions by species

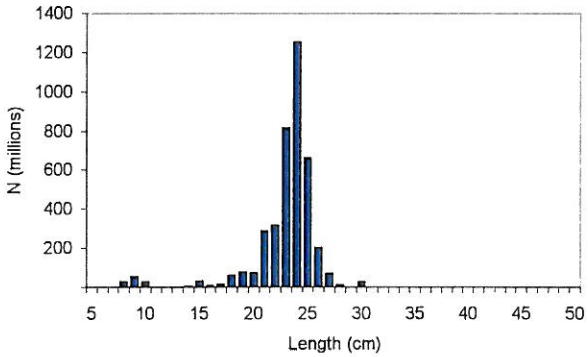
Sardinella aurita



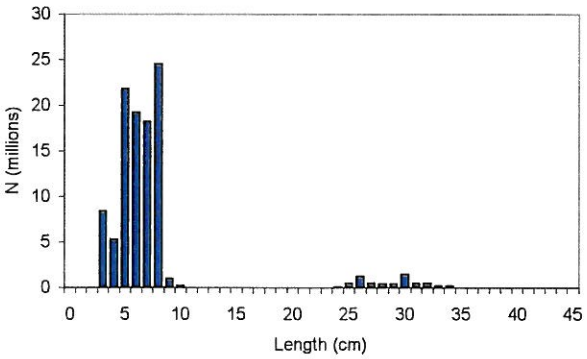
Trachurus trecae



Sardinella maderensis



Caranx rhonchus



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

Senegal and the Gambia, June -July 2002

Sardinella aurita

	N (thousands)					Biomass (tonnes)				
Length cm	St. Louis-Cape Vert	Cape Vert-Gambia	The Gambia	Casa-mance	TOTAL	St. Louis-Cape Vert	Cape Vert-Gambia	The Gambia	Casa-mance	TOTAL
20										
21										
22										
23	4 459	11 959	25 468	77	41 963	555	1 490	3 173	10	5 228
24	4 459	11 959	50 937	155	67 509	629	1 688	7 191	22	9 531
25	5 945	15 945	50 937	155	72 982	946	2 538	8 108	25	11 617
26	10 403	27 904	50 937	155	89 399	1 859	4 985	9 100	28	15 971
27	1 486	3 986	76 405	232	82 110	297	796	15 254	46	16 393
28			50 937	155	51 092			11 320	34	11 354
29			25 468	77	25 546			6 277	19	6 296
30										
TOTAL	26 752	71 754	331 090	1 005	430 600	4 287	11 497	60 423	183	76 391

Sardinella maderensis

	N (thousands)					Biomass (tonnes)				
Length cm	St. Louis-Cape Vert	Cape Vert-Gambia	The Gambia	Casa-mance	TOTAL	St. Louis-Cape Vert	Cape Vert-Gambia	The Gambia	Casa-mance	TOTAL
5										
6										
7										
8			25 468	77	25 546			150	0	151
9			50 937	155	51 092			419	1	421
10			25 468	77	25 546			283	1	284
11										
12										
13										
14		3 403			3 403		100			100
15		3 403	25 468	77	28 949		122	910	3	1 035
16		6 806			6 806		293			293
17		13 612			13 612		700			700
18		54 447	265	4 941	59 653		3 309	16	300	3 626
19		34 029	26 265	14 899	75 193		2 422	1 870	1 061	5 352
20		30 627	2 123	39 526	72 275		2 533	176	3 269	5 978
21		17 015	158 649	109 160	284 823		1 623	15 136	10 415	27 175
22		32 173	183 587	99 356	315 116		3 518	20 075	10 865	34 458
23	1 486	65 858	642 284	105 687	815 316	185	8 205	80 021	13 167	101 578
24	10 403	218 469	946 314	76 970	1 252 157	1 469	30 843	133 599	10 867	176 778
25	32 696	187 622	409 088	30 881	660 287	5 205	29 866	65 119	4 916	105 105
26	20 807	66 017	102 405	10 191	199 419	3 717	11 794	18 295	1 821	35 627
27	10 403	27 904	25 734	5 018	69 059	2 077	5 571	5 138	1 002	13 788
28	1 486	3 986	265	4 941	10 679	330	886	59	1 098	2 373
29										
30			25 468	77	25 546			6 937	21	6 958
31										
TOTAL	77 282	765 371	2 649 789	502 033	3 994 476	12 983	101 787	348 204	58 806	521 779

Annex IV continued

Senegal and the Gambia, June -July 2002

Trachurus trecae

	N (thousands)					Biomass (tonnes)				
Length cm	St. Louis-Cape Ver	Cape Vert Gambia	The Gambia	Casa-mance	TOTAL	St. Louis-Cape Ver	Cape Vert Gambia	The Gambia	Casa-mance	TOTAL
5										
6		5 226			5 226		14			14
7		183 605			183 605		744			744
8		278 798	15 444		294 241		1 644	91		1 735
9		44 838	46 331		91 170		369	381		750
10		65 907	66 923		132 830		732	744		1 476
11		118 433	53 195		171 628		1 729	777		2 506
12		16 144	34 319		50 464		303	643		946
13		2 877	6 864		9 741		68	162		230
14		573	5 148		5 721		17	151		167
15										
16										
17										
18										
19										
20	10 809				10 809	894				894
21	140 519				140 519	13 407				13 407
22	291 847				291 847	31 913				31 913
23	205 374				205 374	25 587				25 587
24	43 237				43 237	6 104				6 104
25										
TOTAL	691 785	716 402	228 225		1 636 412	77 905	5 619	2 949		86 473

Annex IV continued

Senegal and the Gambia, June -July 2002

Caranx rhonchus

	N (thousands)					Biomass (tonnes)				
Length cm	St. Louis-Cape Vert	Cape Vert Gambia	The Gambia	Casa-mance	TOTAL	St. Louis-Cape Vert	Cape Vert Gambia	The Gambia	Casa-mance	TOTAL
2										
3				8 370	8 370				3	3
4				5 286	5 286				5	5
5				21 855	21 855				35	35
6				19 238	19 238				51	51
7				18 212	18 212				74	74
8				24 502	24 502				144	144
9				981	981				8	8
10				196	196				2	2
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24				73	73				10	10
25				511	511				81	81
26				1 241	1 241				222	222
27				511	511				102	102
28				438	438				97	97
29				438	438				108	108
30				1 460	1 460				398	398
31				511	511				153	153
32				511	511				168	168
33				219	219				79	79
34				219	219				86	86
35										
36										
TOTAL				104 771	104 771				1 827	1 827

Annex V Regional estimates

Sardine (*Sardina pilchardus*)

MOROCCO & MAURITANIA, May-June 2002

Length	C.Juby-C.Cantin		C.Bojador-C.Juby		C.Blanc-C.Bojador		C.Timiris-C.Blanc		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5	81	60	127	93					209	153
6	6 204	2 755	502	223					6 706	2 978
7	9 480	2 740	995	288	114	33			10 589	3 061
8	8 756	1 739	833	165	419	83			10 007	1 987
9	40 265	5 727	540	77	4 148	590	3 763	502	44 953	6 394
10	39 352	4 146	194	20	17 787	1 874	28 561	2 919	57 332	6 040
11	25 137	2 016	362	29	33 139	2 657	69 283	5 657	58 639	4 702
12	10 568	660	1 690	106	33 030	2 062	32 150	2 032	45 288	2 828
13	15 861	786	8 805	436	97 414	4 828	231 890	11 226	122 079	6 051
14	25 138	1 006	18 205	728	90 202	3 608	282 208	11 368	133 545	5 342
15	23 396	766	21 646	709	33 941	1 112	123 503	4 093	78 982	2 587
16	101 098	2 745	43 247	1 174	17 660	479	8 068	229	162 005	4 398
17	138 584	3 153	66 223	1 507	37 284	848			242 091	5 509
18	90 756	1 748	38 658	745	158 148	3 046			287 562	5 539
19	44 795	737	7 669	126	366 421	6 026			418 885	6 889
20	5 907	84	3 071	43	243 132	3 442			252 110	3 569
21	1 283	16	3 254	40	187 391	2 299	18 786	232	191 928	2 355
22			21 845	234	448 996	4 807	21 322	229	470 841	5 041
23			25 756	242	569 134	5 348	24 519	229	594 890	5 590
24			5 602	46	501 536	4 159			507 139	4 205
25			1 777	13	84 151	619			85 928	632
26										
27										
28										
29										
30										
Total	586 663	30 882	271 000	7 045	2 924 046	47 922	844 053	38 716	4 625 762	124 565

Round sardinella (*Sardinella aurita*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
4								
5								
6								
7								
8		15,0		15,0		89		89
9		121,9		121,9		1 003		1 003
10		602,4		602,4		6 695		6 695
11		655,2		655,2		9 566		9 566
12		430,0		430,0		8 063		8 063
13		1676,5		1 676,5		39 599		39 599
14		2284,4	3,5	2 287,8		66 856	99	66 955
15		1824,1	4,1	1 828,2		65 212	143	65 354
16		591,0	4,1	595,1		25 487	172	25 659
17		276,8	27,4	304,2		14 240	1 379	15 620
18		12,3	63,5	75,9		749	3 781	4 531
19		12,3	83,2	95,5		877	5 797	6 674
20			63,1	63,1			5 111	5 111
21			107,4	107,4			10 034	10 034
22			48,2	48,2			5 160	5 160
23	42,0		23,7	65,7	5 228		2 891	8 119
24	67,5		24,9	92,4	9 531		3 436	12 967
25	73,0		22,6	95,6	11 617		3 530	15 147
26	89,4		6,0	95,4	15 971		1 053	17 025
27	82,1	2,9		85,1	16 393	587		16 980
28	51,1	31,4		82,4	11 354	6 969		18 323
29	25,5	91,7	3,5	120,7	6 296	22 602	834	29 732
30		53,9		53,9		14 679		14 679
31		94,6	3,5	98,1		28 400	1 016	29 415
32		145,2	6,9	152,1		47 847	2 231	50 078
33		255,1	18,3	273,4		92 065	6 478	98 544
34		449,4	50,2	499,6		177 173	19 367	196 541
35		326,8	65,8	392,6		140 353	27 663	168 016
36		107,9	79,0	186,9		50 393	36 098	86 491
37		62,3	48,5	110,8		31 540	24 039	55 579
38			9,0	9,0			4 832	4 832
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	430,6	10 123,4	766,2	11 320,2	76 391	851 045	165 144	1 092 580

Flat sardinella (*Sardinella maderensis*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
5								
6								
7								
8	25,5			25,5	151			151
9	51,1			51,1	421			421
10	25,5	20,5		46,1	284	228		512
11		75,2		75,2		1 098		1 098
12		20,5		20,5		385		385
13		6,8		6,8		162		162
14	3,4			3,4	100			100
15	28,9			28,9	1 035			1 035
16	6,8			6,8	293			293
17	13,6			13,6	700			700
18	59,7			59,7	3 626			3 626
19	75,2			75,2	5 352			5 352
20	72,3			72,3	5 978			5 978
21	284,8			284,8	27 175			27 175
22	315,1			315,1	34 458			34 458
23	815,3			815,3	101 578			101 578
24	1252,2			1252,2	176 778			176 778
25	660,3	10,4		670,7	105 105	1 651		106 756
26	199,4	10,4		209,8	35 627	1 853		37 480
27	69,1	17,2		86,3	13 788	3 436		17 224
28	10,7	30,9		41,6	2 373	6 864		9 237
29		24,7		24,7		6 098		6 098
30	25,5	38,9		64,4	6 958	10 591		17 549
31		53,0		53,0		15 909		15 909
32		28,3		28,3		9 319		9 319
33		21,2		21,2		7 654		7 654
34		14,1		14,1		5 574		5 574
35		14,1		14,1		6 073		6 073
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	3994,5	386,3		4380,8	521 779	76 894		598 673

Anchovy (*Engraulis encrasicolus*)

MOROCCO, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions
5	56	62,2	1	1,2	57	63,4
6	616	415,2	18	12,0	634	427,2
7	1 610	706,9	90	39,6	1 701	746,5
8	3 431	1 034,6	110	33,1	3 541	1 067,7
9	2 151	464,5	806	174,2	2 957	638,7
10	3 368	538,7	4 704	752,4	8 071	1 291,2
11	6 886	838,5	7 383	898,9	14 269	1 737,4
12	14 359	1 361,4	2 008	190,4	16 366	1 551,8
13	6 005	452,0	647	48,7	6 652	500,7
14	796	48,4	464	28,2	1 260	76,6
15			144	7,2	144	7,2
16						
17						
18						
19						
20						
Total	39 277	5 922,4	16 374	2185,8	55 651	8 108,2

Atlantic horse mackerel (*Trachurus trachurus*)

MOROCCO, May-June 2002

Length	C.Juby-C.Cantin		C.Blanc-C.Juby		Total	
cm	tonnes	N millions	tonnes	N millions	tonnes	N millions
5						
6						
7	1	0,2	15	4,2	16	4,4
8			294	57,1	294	57,1
9	11	1,6	2 073	287,9	2 084	289,4
10	59	6,0	9 181	944,2	9 240	950,2
11	76	6,0	15 160	1 186,7	15 236	1 192,6
12	51	3,1	7 273	443,3	7 324	446,4
13	31	1,5	1 512	73,2	1 543	74,7
14	72	2,8	353	13,8	425	16,6
15	34	1,1	664	21,2	698	22,3
16	9	0,2			9	,2
17			414	9,2	414	9,2
18	25	0,5	207	3,9	232	4,4
19	351	5,6	693	11,1	1 044	16,8
20	325	4,5	8 837	122,1	9 162	126,6
21	558	6,7	45 937	550,3	46 495	556,9
22	250	2,6	25 512	266,6	25 762	269,2
23	208	1,9	13 242	121,5	13 449	123,4
24	58	0,5	5 135	41,6	5 193	42,0
25			13 977	100,3	13 977	100,3
26			13 525	86,5	13 525	86,5
27			8 039	46,0	8 039	46,0
28			6 782	34,9	6 782	34,9
29			6 135	28,4	6 135	28,4
30	57	0,2	2 230	9,4	2 287	9,6
31			1 746	6,7	1 746	6,7
32			1 438	5,0	1 438	5,0
33						
34						
35	446	1,2			446	1,2
36	323	0,8	679	1,7	1 002	2,5
37	1 226	2,8			1 226	2,8
38	2 842	5,9			2 842	5,9
39	7 163	13,8			7 163	13,8
40	9 044	16,2			9 044	16,2
41	6 646	11,1			6 646	11,1
42	6 373	9,9			6 373	9,9
43	8 200	11,9			8 200	11,9
44	2 048	2,8			2 048	2,8
45						
46	668	0,8			668	,8
47	356	0,4			356	,4
48						
49						
50						
Total	46 485	121,3	191 053	4 477	237 538	4 598

Cunene horse mackerel (*Trachurus trecae*)

SENEGAL - THE GAMBIA - MAURITANIA - MOROCCO, May-July 2002

Length	Number in millions				Biomass in tonnes			
cm	Senegal	Mauritania	Morocco	Total	Senegal	Mauritania	Morocco	Total
4		93,1		91,1		81		81
5		1 738,1		1 737,1		2 776		2 776
6	5,2	9 096,8		9 102,0	14	23 983		23 997
7	183,6	16 660,9		16 844,5	744	67 477		68 220
8	294,2	15 392,9	39,8	15 726,9	1 735	90 750	205	92 690
9	91,2	35 001,0	278,6	35 370,7	750	288 086	2006	290 843
10	132,8	19 581,3	46,4	19 760,5	1 476	217 610	451	219 538
11	171,6	4 603,1	19,9	4 794,6	2 506	67 207	254	69 967
12	50,5	2 006,7		2 057,2	946	37 626		38 572
13	9,7	170,3	39,7	219,8	230	4 023	821	5 074
14	5,7	24,3	6,6	36,7	167	712	170	1 049
15			19,9	19,9			621	621
16			59,6	59,6			2247	2 247
17								
18			39,7	39,7			2112	2 112
19								
20	10,8		29,5	40,3	894		2134	3 027
21	140,5			140,5	13 407			13 407
22	291,8		52,4	344,2	31 913		5012	36 925
23	205,4		142,8	348,2	25 587		15569	41 156
24	43,2		606,5	649,8	6 104		74925	81 029
25			328,1	328,1			45699	45 699
26			83,7	83,7			13082	13 082
27			97,8	97,8			17087	17 087
28			49,1	49,1			9546	9 546
29			14,7	14,7			3179	3 179
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
Total	1 636,4	104 368,5	1 951,7	107 956,7	86 473	800 332	195 120	1 081 925

Chub mackerel (*Scomber japonicus*)

MOROCCO - MAURITANIA, May-June 2002

Length cm	C.Juby-C.Cantin		C.Blanc-C.Juby		C.Blanc-C.Timiris		C.Timiris-St.Louis		Total	
	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions	tonnes	N millions
5										
6										
7										
8										
9										
10	17	1,8							17	1,8
11	293	23,0	21	1,6					314	24,6
12	721	44,0	251	15,3			147	8,9	1 119	68,2
13	3 502	169,5	1 720	83,2			2 589	125,3	7 811	378,0
14	1 422	55,5	1 739	67,9	12	0,5	8 479	331,1	11 653	455,0
15	1 400	44,7	956	30,6	183	5,8	8 398	268,5	10 937	349,6
16	1 412	37,4	779	20,6	220	5,8	5 065	134,2	7 476	198,1
17	6 710	149,0	666	14,8	175	3,9	2 014	44,7	9 566	212,5
18	11 841	222,6	532	10,0	26	0,5	1 904	35,8	14 303	268,9
19	18 690	300,1	1 402	22,5	121	1,9	2 230	35,8	22 443	360,3
20	6 040	83,5	2 547	35,2	211	2,9	648	8,9	9 446	130,5
21	2 401	28,8	2 898	34,7	41	0,5			5 340	64,0
22	1 745	18,2	4 028	42,1	93	1,0			5 866	61,3
23	1 226	11,2	5 307	48,7					6 533	59,9
24	850	6,9	7 383	59,8					8 233	66,6
25	692	5,0	7 191	51,6					7 883	56,6
26	473	3,0	21 978	140,6					22 450	143,6
27	428	2,4	36 981	211,7					37 409	214,1
28	235	1,2	34 976	179,9					35 210	181,1
29	545	2,5	21 214	98,4					21 759	100,9
30	1 558	6,5	11 701	49,1					13 258	55,6
31	2 141	8,2	8 581	32,7					10 721	40,8
32	993	3,4	6 816	23,6					7 809	27,1
33	629	2,0	5 289	16,7					5 918	18,7
34	62	0,2	1 682	4,9					1 744	5,1
35	136	0,4	3 808	10,1					3 945	10,5
36			2 362	5,8					2 362	5,8
37	80	0,2	11 570	26,1					11 651	26,3
38			13 082	27,3					13 082	27,3
39			2 711	5,2					2 711	5,2
40			1 306	2,3					1 306	2,3
41			1 405	2,3					1 405	2,3
42			503	0,8					503	0,8
43										
44										
45										
Total	66 241	1 231,2	223 385	1 376,2	1 082	22,9	31 475	993,4	322 182	3 623,6