

BENEFIT SURVEYS

Cruise Report No 2/97

**Methodological studies on the horse mackerel stock
in the Agulhas region, South Africa**

13 - 25 September 1997

**Institute of Marine Research
Bergen, Norway**

**Sea Fisheries Research Institute
Cape Town, South Africa**

**Ministry of Fisheries & Resources
Swakopmund, Namibia**

CRUISE REPORT "DR. FRIDTJOF NANSEN"

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in the Agulhas region, South Africa**

13 - 25 September 1997

by

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TABLE OF CONTENTS

CHAPTER 1	INTRODUCTION	1
1.1	Objectives	1
1.2	Participation	1
1.3	Schedule	2
1.4	Survey effort	2
CHAPTER 2	MATERIAL AND METHODS	
2.1	Hydrography, weather and current	4
2.1.1	Hydrography and weather	4
2.1.2	Current	
2.2	Distribution and abundance estimation	4
2.2.1	Survey area	4
2.2.2	Acoustic methodology	5
2.2.3	Biological sampling	7
2.3	Diurnal experiments	8
CHAPTER 3	RESULTS AND DISCUSSION	10
3.1	Hydrography	10
3.2	Distribution of horse mackerel	15
3.3	Abundance	15
3.1	Diurnal experiments	17
CHAPTER 4	CONCLUDING REMARKS	23
Annex I	Instruments and fishing gear	
Annex II	Hydrographic profiles	
Annex III	Records of fishing stations	
Annex IV	Size distribution	

CHAPTER 1 INTRODUCTION

1.1 Objectives

Survey the outer shelf of the Eastern Agulhas Bank to:

- estimate biomass, population structure and distribution of Cape horse mackerel (*Trachurus trachurus capensis*) using hydroacoustics, midwater and bottom trawling.
- collect hydrographic (including dissolved oxygen) and zooplankton data, and profile current by ADCP at selected stations along the survey grid, to assist in understanding the horizontal and vertical distribution patterns of Cape horse mackerel.
- investigate the diurnal variability of the fish and plankton communities, and their trophic interactions, by means of multidisciplinary sampling at three fixed stations.

1.2 Participation

The scientific staff from Sea Fisheries Research Institute (SFRI), Cape Town, South Africa were:

Manuel BARANGE (Team leader), Johan AUGUSTYN, Rob COOPER, Marjolaine KRUG, Larry HUTCHINGS, Stan PILLAR, Sharon du PLESSIS, Johan RADEMAN and Daphne RHEEDER. Alan BOYD sailed from Cape Town, and disembarked in Port Elizabeth after calibrating the ADCP.

The scientific staff from the National Marine Information and Research Centre (NatMIRC), Swakopmund, Namibia were:

Ekkehard KLINGELHOEFFER and Peter SCHNEIDER.

The scientific staff from the Institute of Marine Research (IMR), Bergen, Norway, were:

Ingvar J. HUSE (Cruise leader), Svein FLOEN, Magnar MJANGER and Jan VÅGENES.

1.3 Schedule

The RV 'Dr. Fridtjof Nansen' left Cape Town at 13h00 on 13 September 1997 and steamed to a nearby position, off Green Point, to calibrate the scientific echosounders. The calibration was completed in the evening, and the ship then steamed eastwards to 33°36.7' S, 27°19.9 E. The first CTD line commenced at a bottom depth of 100 m. The survey followed a systematic parallel grid, with grid lines 36 nautical miles (NM) apart. Three 24 h special investigations were carried out during the survey. The second one was aborted after 8 h due to a scarcity of horse mackerel in the area. The third one was carried out after the survey grid was covered. «Dr. Fridtjof Nansen» left the survey area on 24 September and arrived in Cape Town at 1400 h on 25 September.

1.4 Survey effort

The course track with the trawl stations and CTD stations is presented in Figure 1.

The number of trawl hauls and CTD stations by gear type are listed in Table 1 below.

Table 1: Number of CTD and trawls stations.

Area	Bottom trawls (Bt)	Pelagic trawls (Pt)	Trawl failure (Bt)	Trawl failure (Pt)	Total no. of trawls	CTD stations
S 34-37° E 22-27.5°	29	17	0	4*	46	63

* Missed targets

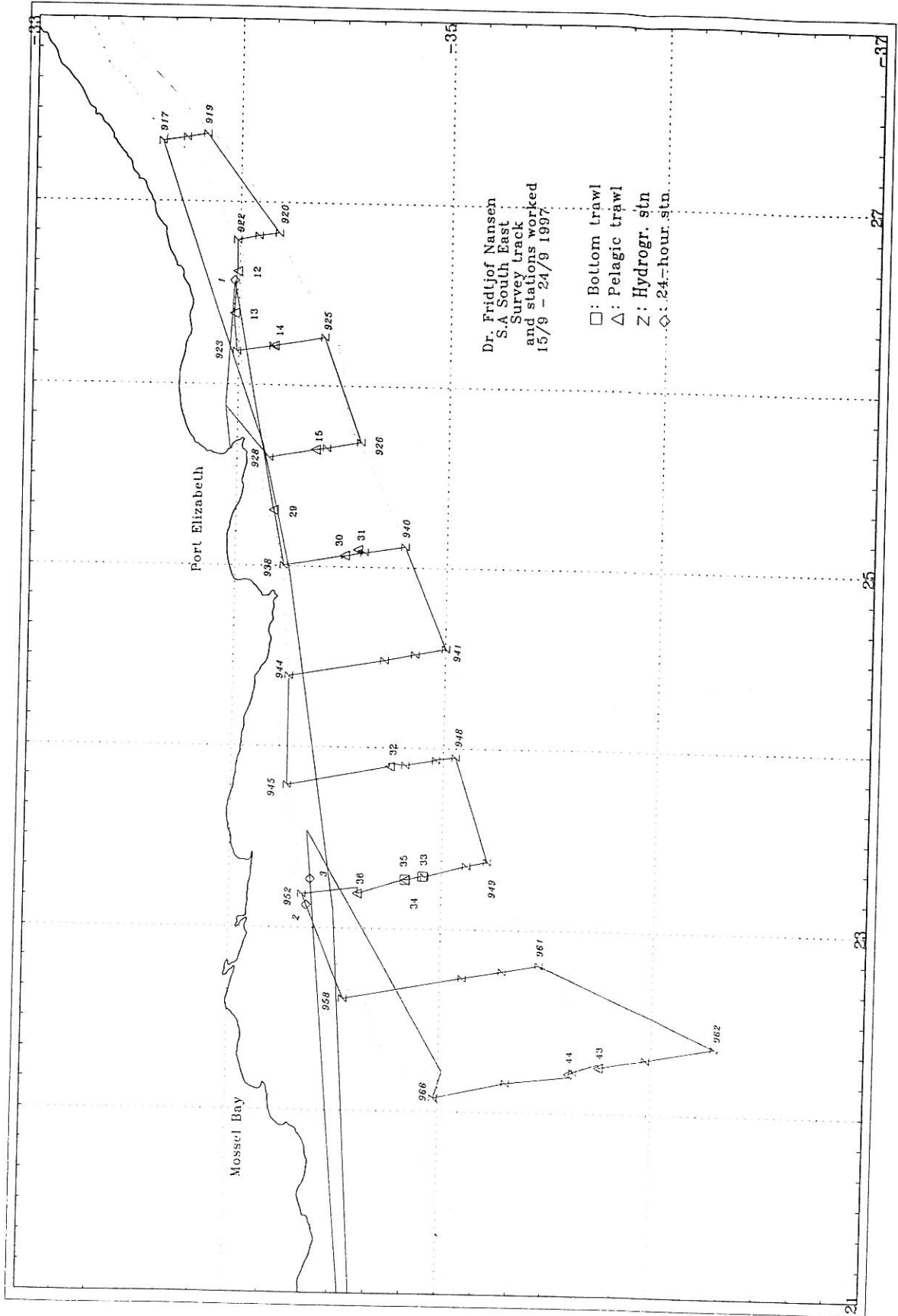


Figure 1. Course track, CTD and fishing stations, Mossel Bay to East London.

CHAPTER 2 MATERIALS AND METHODS

2.1 Hydrography, weather and current

2.1.1 Hydrography and weather

A Seabird 911+ CTD probe was used to obtain vertical profiles of temperature, salinity and oxygen. The probe also carried a fluorometer and a photomultiplier based luxmeter. Real time plotting and logging was done using the Seabird Seasave software installed on a PC. A total of 63 CTD stations were worked along 10 hydrographic sections from 27.5°E' to 22°00' E (Annex II). At each station two Niskin bottles were triggered for water samples, one near the surface and one near the bottom. In order to calibrate the oxygen and salinity sensors, these samples were analysed for dissolved oxygen using the Winkler method and salinity using a PORTASAL mod. 8410 salinometer. Sea temperature at 5 m depth was recorded continuously during the cruise and an Aanderaa weather station logged the weather conditions. Surface illumination was logged every 10 minutes from 17 September.

2.1.2 Current

Water flow data was collected using the Acoustic Doppler Current Profiler (ADCP), continuously along lines 1, 3, 5, 7, and 9, and on station along lines 2, 4, 6, 8 and 10. When possible data was referenced to bottom, although the navigation-referenced option had to be used when bottom-tracking was not successful (mainly in the deep stations). Preliminary maps were computed to describe water movements in the upper mixed layer (30 m deep) and near the sea bed.

2.2 Distribution and abundance estimation

2.2.1 Survey area

The limits of the survey area were determined from previous surveys of horse mackerel conducted by the Sea Fisheries Research Institute (SFRI). The main aim was to cover a substantial amount of the core area occupied by horse mackerel in the eastern Agulhas Bank, between East London and Mossel Bay, where horse mackerel tends to occur in the pelagic and demersal domains. The survey followed a systematic parallel grid of 10 lines separated

36 NM between, between 27.5° E to 22° E. The lines extended offshore from approximately the 100 m to the 1000 m contour line.

The course tracks with the trawling and CTD stations are shown in Figure 1.

2.2.2 Acoustic methodology

An acoustic calibration was considered necessary due to the upgrade of the EK500 software to version 5.3. The transducers located in the lowering keel (ES38B and ES120-7) were calibrated using the LOBE programme. Small adjustments in the TS gain of both transducers were required (-0.06 dB and 0.6 dB respectively), as well as in the offsets. Due to interference with seals and a slight current, the echoes from the sphere could not be integrated successfully to correct the Sv gain. The estimated TS gain was used as Sv gain. An attempt to calibrate the hull mounted transducers failed as a result of the high noise levels and very unstable response of both the 38 and 18 kHz transducers. It is recommended that this be investigated in the future.

A description of the acoustic instruments and their standard settings are given in Annex I, including a description of the fishing gear used. Data was logged simultaneously to the BEI and to the PC-based EP500 logging system, via ethernet. BEI data was processed on board, while EP data will be processed by the SFRI in the near future.

An acoustic echo-integration system provided measurements of fish densities, averaged over 5 NM distances. The acoustic unit measured by this calibrated echo-integrator system is the area backscattering coefficient, S_A .

The scrutinising process of the Bergen Echo Integrator, BEI, was used to partition integrator data to species or species groups by separating echo recordings horizontally or vertically. Integrator data from fish targets were allocated to the following groups on the basis of trawl sampling and acoustic character, as recognised from the echo recordings:

- Horse mackerel
- Hake
- Round herring
- Anchovy
- Pelagic I (mackerel)
- Other demersal species
- Plankton

Two methods of abundance estimation were followed. In the first method, areas of fish distribution were divided into smaller units if significant differences were observed in the density of the fish and the average lengths of the fish in a specific area. The average S_A -values within a unit were then obtained by averaging all data measured during the coverage of that area, excluding those values obtained between the course lines. The area was calculated in cm^2 using a planimeter and converted to NM^2 .

The following target strength (TS) function was applied to convert S_A -values (mean integrator values for given areas) to numbers of fish:

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

$$C_F = 1.26 * 10^6 * L^{-2}$$

where L is the length of the fish in centimetres and C_F is a conversion factor. This target strength to size relationship has been used for a number of fish species (horse mackerel, pilchard, anchovy and round herring), although originally derived from earlier measurements of North Sea herring.

The number of fish in each length frequency group (cm) in an area was calculated by applying the following formula:

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

where

N_i	=	number of fish in length group i
A	=	area in NM^2
S_A	=	mean integrator value in the area
P_i	=	proportion of fish in length group i in samples from the area
C_{Fi}	=	fish conversion factor for length group i

The number per length group was then summed and the total number of fish obtained. The total biomass of fish was computed using the mean weight per length-group obtained from trawl samples.

In the second method, transects were treated as if they were randomly taken samples from the study area. The mean density of each line was computed by averaging the 5 NM records, and

the mean density for the area estimated by averaging the mean line densities, weighted by their lengths. The area was estimated using the start and end positions of the first and last transects, using the facility implemented in the SFRI Underway Mapping System.

For comparative purposes, the same target strength expression applied in the first method was used, although *in situ* estimates of Cape horse mackerel target strength are now available, indicating that horse mackerel is more similar in reflective properties to gadoids than to clupeoids. The following published TS expression was therefore used:

$$TS = -15.4 \log L - 7.7 \text{ (dB/kg)}$$

While the $(20 \log L - 72)$ expression is presently used for horse mackerel in the Nansen Programme and in Namibia, it is believed that the above expression provides more accurate estimates of horse mackerel in South Africa. Assessment numbers are therefore given using both expressions.

2.2.3 Biological sampling

Trawl sampling strategy

A representative sample of one to three baskets was taken from each trawl catch, depending on the size and composition of the total catch. To ensure that the sample is representative, the catch was well mixed. The random sample was then used in order to determine the species composition and the size composition.

The procedures to determine the size composition for all commercial species were as follows:

- Total length (Lt):
 - 100 horse mackerel per sample for total length
 - 50 fish per sample for: pilchard, anchovy, round herring and hake
- Measurement:
 - Recorded to the nearest 1.0 cm below for both the pelagic species (horse mackerel, round herring, anchovy and pilchard) and hake.
- Weight:
 - Total weight of measured fish sampled in kg

Biological data (horse mackerel)

Biological data were collected for Cape horse mackerel and Cape hakes, and included the following parameters:

- Otolith sampling (only horse mackerel)
- Stomach contents (fixed in formalin for later processing)
- Reproductive and gonad status
- Size composition

Processing of biological data

Four strata were used for the abundance calculations. Horse mackerel data were pooled within strata.

Size frequency data and trawl station data were entered onto the NAN-SIS data base, for all station (Nos.12 - 57). Total length frequency distributions (Annex IV) have been calculated using the S_A values as weighting factors for combining length samples for individual trawl stations, which are detailed in Annex III.

2.3 Diurnal experiments

Three diurnal experiments were conducted. The first took place on the 17/18 September at 33°58'S and 26°23'E, in water depths of approximately 110 m. The second was conducted on 21 September at 34°21'S and 23°09'E, also in water depths of 110 m. The last experiment was carried in similar water depths at the position 34°23'S and 23°16'E. The first and third experiments lasted 24 hours. The second was discontinued after 8 hours due to the absence of suitable horse mackerel targets.

At each position, and at selected intervals, CTD casts were made to obtain profiles of water temperature, salinity, dissolved oxygen, fluorometry and light levels during the diurnal cycle. A total of 9, 5 and 13 casts were obtained during each of the three respective experiments. Water flow was measured using an Acoustic Doppler Current Profiler (ADCP). A total of 15 minutes of data was collected every hour for this purpose. Stratified zooplankton samples were obtained using the recently purchased Hydrobios multiple net, fitted with 405µm-mesh nets. Six, 3 and 6 oblique tows were conducted in each of the three

experiments respectively. Flowmeters were used to estimate the volume of water filtered by each net.

Continuous acoustic records at 38 and 120 kHz were logged, and used to determine the depth of potential fish targets. Fish sampling included a combination of bottom (8) and pelagic (5) trawls during the first experiment. Generally, pelagic trawls were restricted to night-time hours. Five bottom trawls were completed during the second experiment, before it was terminated. Twelve bottom trawls were conducted throughout the 24 hours during the third experiment. Pelagic trawls were not used during this experiment as fishable targets were not perceived in midwater after sunset. A full species composition was obtained for each trawl, as well as size frequencies of the main species. Stomach contents of large hake were analyzed on board, but the stomach contents of small hake and horse mackerel were preserved for further analysis ashore. The reproductive status of hake and horse mackerel were determined on board.

CHAPTER 3 RESULTS AND DISCUSSION

3.1 Hydrography and weather

The results of the CTD measurements are shown in Annex II, and a plot of temperatures at 5 m is shown in Figure 2. The horizontal distribution of temperatures at 5 m is characterised by warm water in the offshore region, caused by the inside edge of the Agulhas current. The shelf region is almost isothermal near the surface, although cooler water can be observed west of Port Elizabeth in the inshore regions.

Wind

In general, wind conditions were favourable for acoustic surveying (Figure 3.). Surveying could continue undisturbed for all but 4-5 hours of the survey period.

Light

Surface light was logged at 15 minute intervals from 17 September. An underwater light profile was taken at every CTD station with a probe mounted on the CTD. The underwater profiles showed that marked bands of bioluminescence were present in the water column at most night stations.

Currents

Maps of ADCP measured currents at 35 m depth and near the bottom are shown in Figures 4 and 5 respectively. Water movement in the area of study is characterised by three main features. First, the expected strong southwesterly flow of the Agulhas current south and east of Port Elizabeth. As the shelf broadens south of Mossel Bay, water flowed both along and across the isobaths, bringing warmer water onto the Agulhas Bank. Finally, clear counter-currents can be observed in the inner and mid-shelf through the region. These patterns are evident in both the upper mixed-layer and near-bottom flows, although the latter evidences further the strong E-NE flow of the shelf waters.

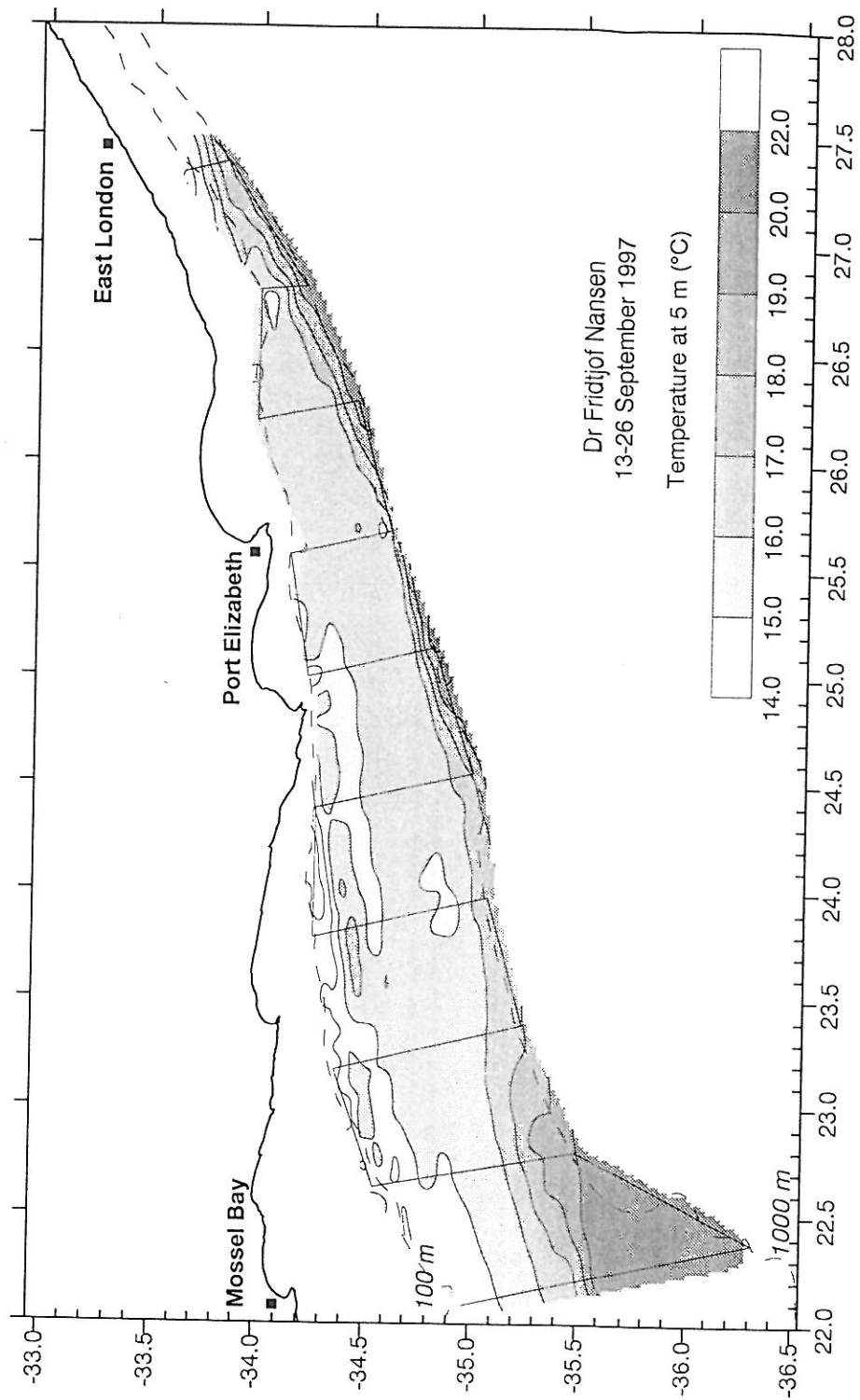


Figure 2 Distribution of sea temperature at 5 m depth.

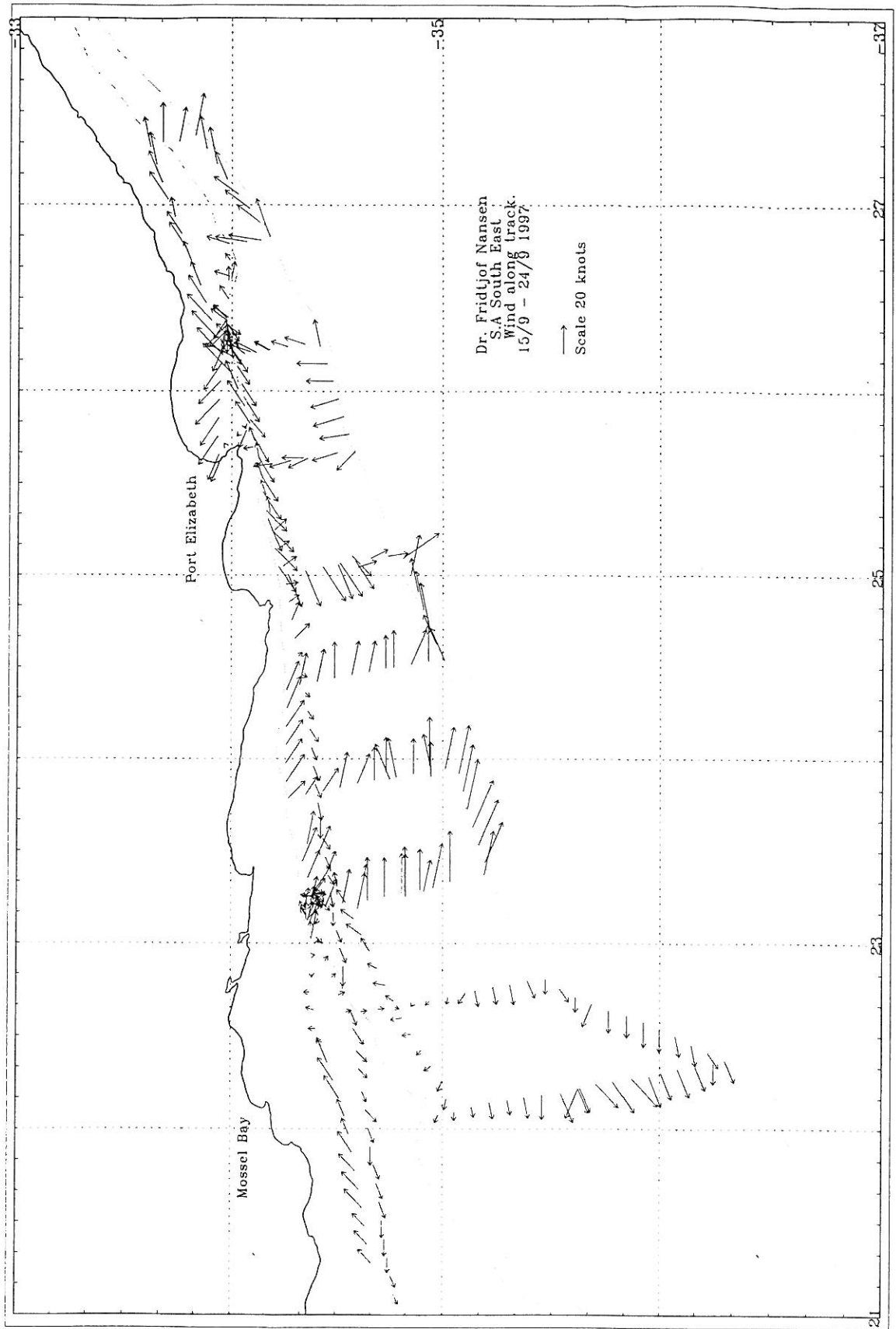


Figure 3 Wind speed (knots).

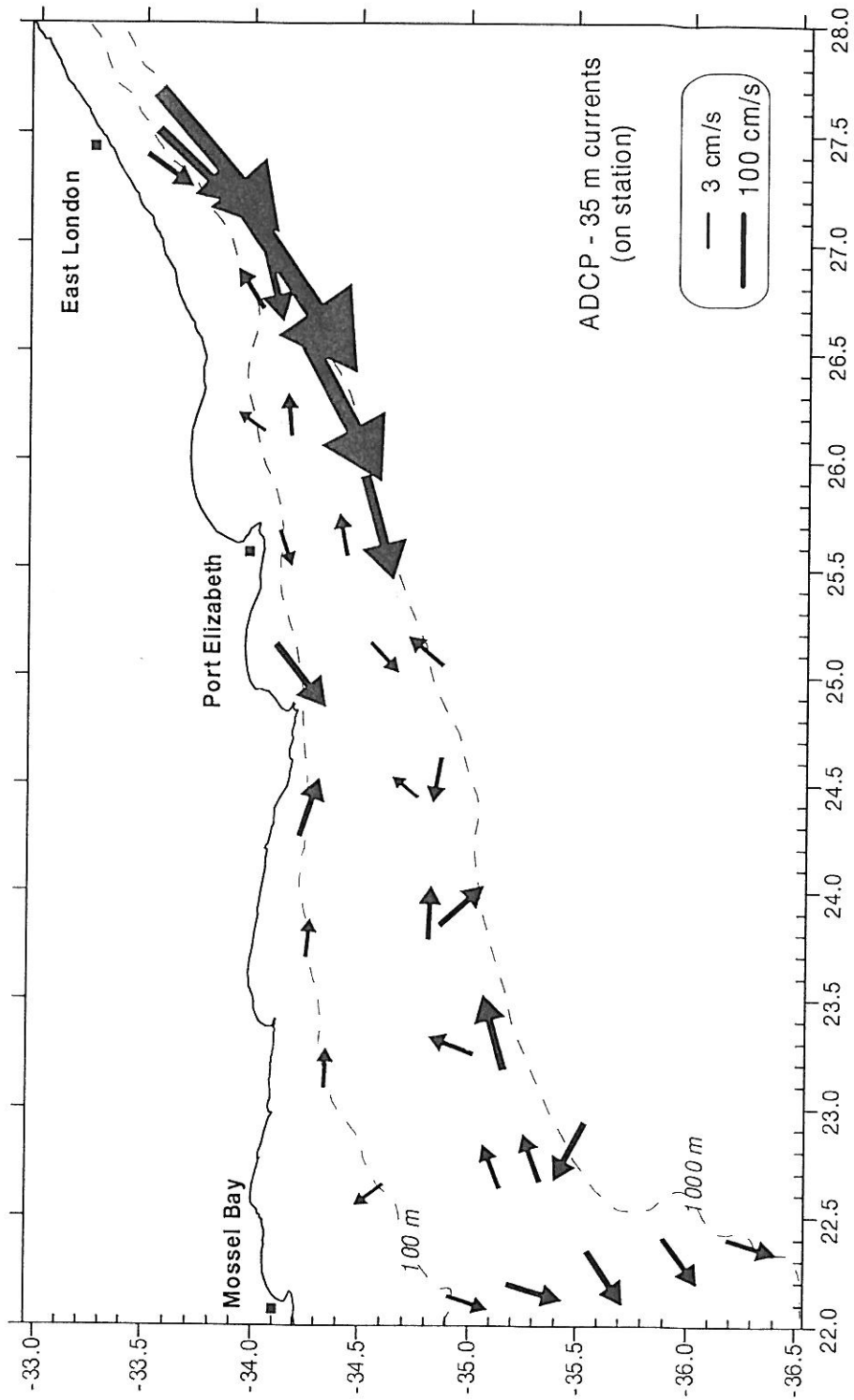


Figure 4 Currents at 35 m measured on station by ADCP.

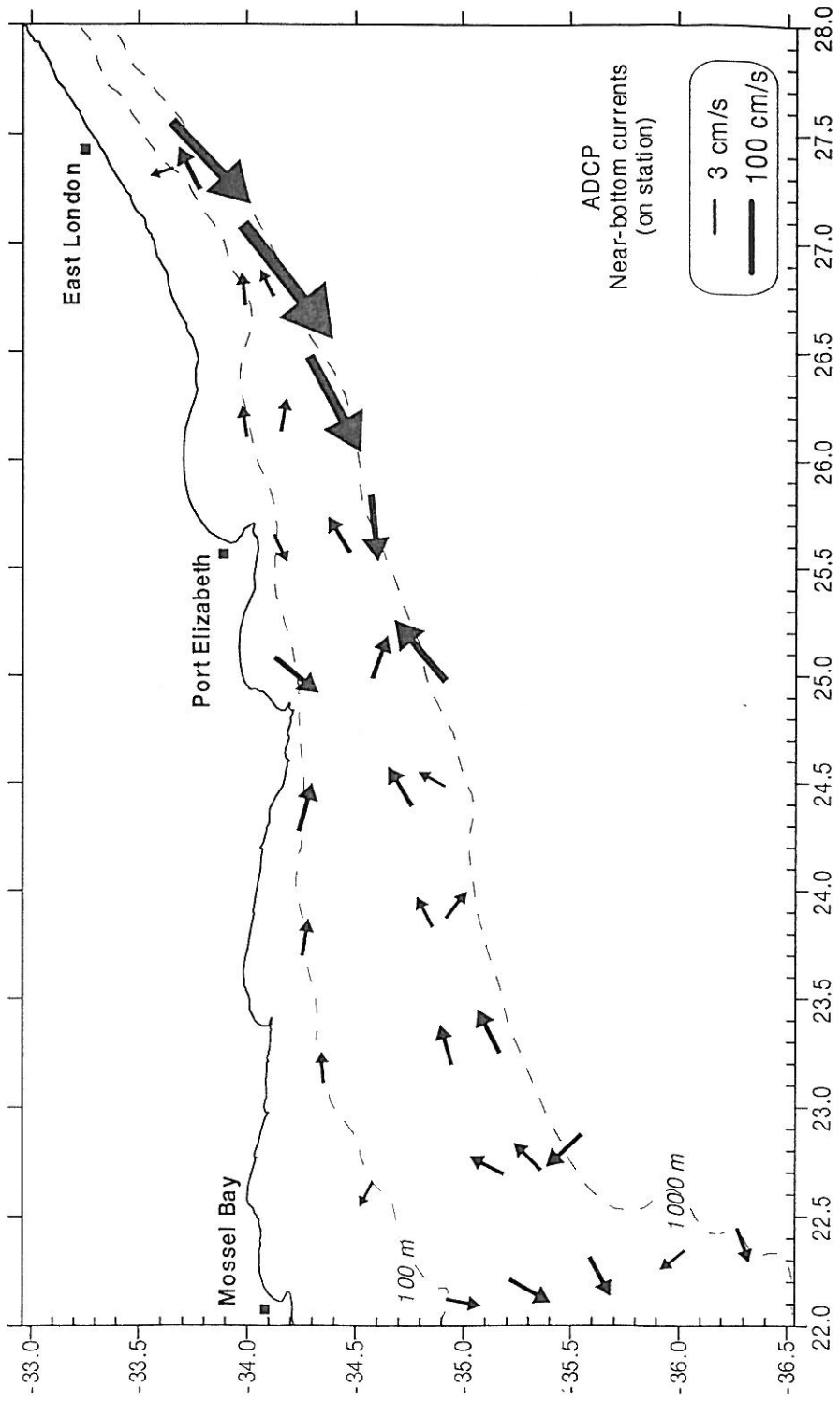


Figure 5 Currents near bottom measured on station by ADCP.

3.2 Distribution of horse mackerel

The distribution patterns of the horse mackerel is shown in Figure 6. The scale used in the distribution charts to illustrate different levels of density is presented in absolute acoustic units, which is the mean integrator value S_A for a given area.

Contrary to expectations few horse mackerel targets were encountered over the shelf break, with most fish occupying the central shelf region. Densities were also lower than in previous cruises. Of note is that horse mackerel were seldom seen in midwater, remaining in the lower 20-30 m (10 m during the day) of the water column at all times. Highest densities were observed inshore, east of Port Elizabeth, and in mid-shelf, west of Port Elizabeth.

3.3 Abundance

The total estimated biomass of horse mackerel is given in Table 2.

Table 2. Total abundance of horse mackerel using different methods and TS values.

<i>HORSE MACKEREL ABUNDANCE</i>	
Method 1 using $20 \log L - 72$	343,831
Method 2 (S. African) using $20 \log L - 72$	357,368 (CV= 32%)
Method 2 (S. African) using $-15.4 \log L - 7.7$ (kg)	111,883 (CV= 36%)

* CV's estimated as if the transect lines were randomly positioned

The results show that in this assessment the two methods did not come up with very different numbers, but Method 1 did not provide a CV. The effect of the two different TS functions applied is, however, significant and should be addressed further.

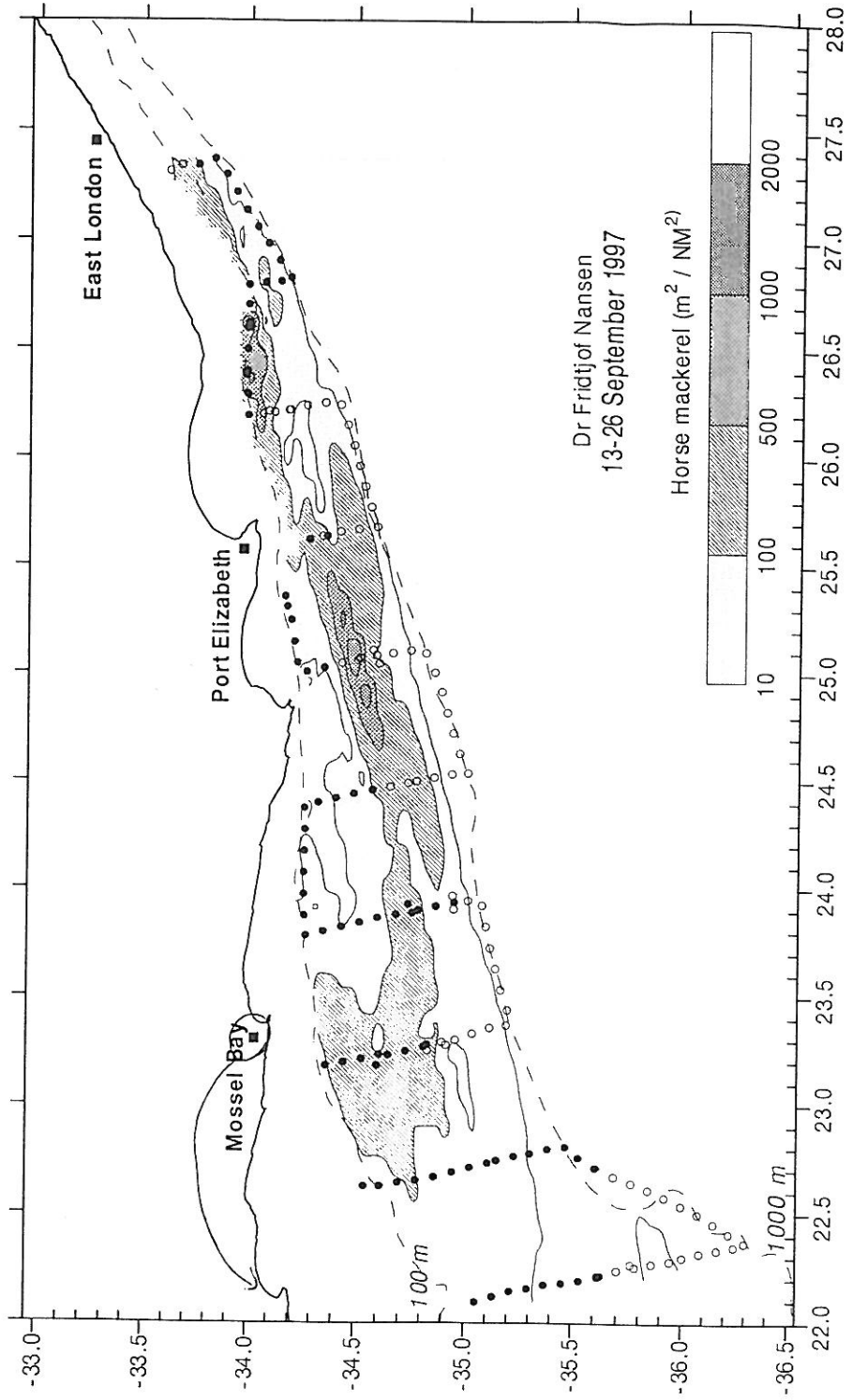


Figure 6 Distribution of horse mackerel.

3.4 Diurnal experiments

A) Experiment 1

The environment was characterised by a mixed layer of approximately 20 m and relatively weak water stratification at the beginning of the experiment. A progressive intrusion of warmer water at depth was observed throughout the day (Fig. 7). Fluorescence records indicate an increase in phytoplankton above 30 m, towards the end of the study period. Water flow was predominantly 20-30 cm/s W-SW (longshore). Hydrobios samples identified *Calanus agulhensis* as the main zooplankton species. Juvenile euphausiids were also observed at night, but were not present in the daytime samples. *Calanus* was not abundant during the day, indicating either net avoidance or migration below the maximum net depth (approximately 10 m off the bottom). Zooplankton appeared to concentrate near the bottom during the day and above the thermocline at night.

Acoustic records showed strong anchovy targets in the upper 40 m during the night, descending rapidly to approximately 80 m during the day. This prevented them from coming in contact with horse mackerel, which occurred predominantly below 80 m at night and below 90 m during the day (Fig. 8). A total of 240 horse mackerel (30-50 cm) and 160 hake (35-70 cm) stomachs were analysed. On the basis of preliminary stomach fullness and prey freshness, it was demonstrated that horse mackerel only fed during the day, largely on euphausiids. Feeding commenced in the morning, peaking in late afternoon. Stomach fullness remained low during the night. Some horse mackerel in the daytime samples had coarse sand grains in their stomachs and one had ingested a cumacean and a polychaete worm, indicating that feeding took place close to the sea bed. Around 60 % of the hake had empty stomachs. Those that had digested food fed largely on small hake, anchovy and cariid shrimps. Only three hake had horse mackerel in their stomachs. As hake are only capable of ingesting prey up to one-third of their body length, most of the hake under study would be incapable of consuming the size horse mackerel available to them.

Anchovy stomach samples indicated nocturnal feeding on juvenile euphausiids and *Calanus*.

B) Experiment 2

During the 8 h study period (starting at 6:30) the environment remained stable, with a 25 m surface mixed layer above a developed thermocline. Water temperatures were lower than in the first experiment (Figure 9). High fluorescence counts were measured in the upper mixed layer. As three of the 5 bottom trawls taken during the period contained no horse mackerel, the experiment was terminated. The limited data from the experiment complement

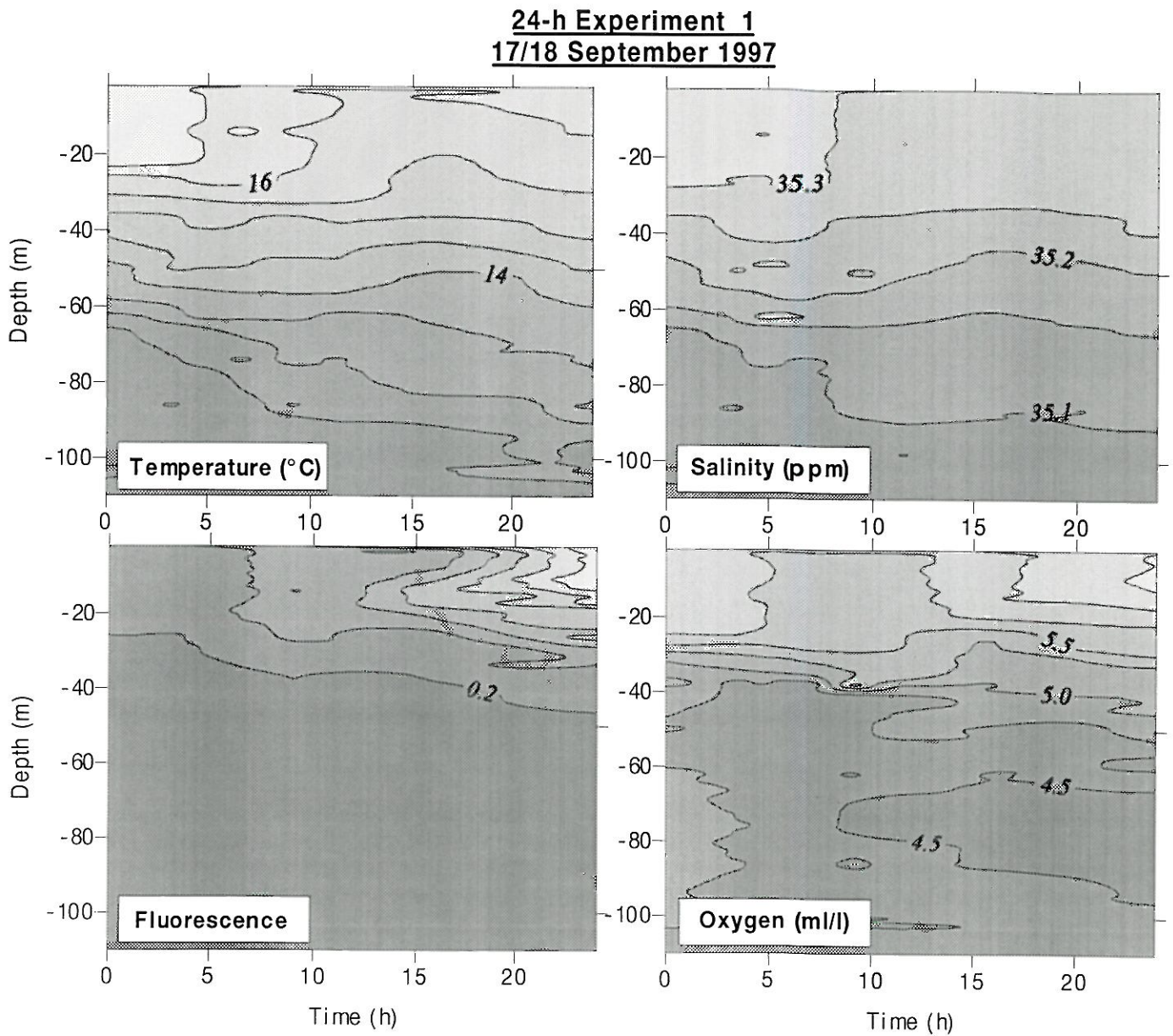


Figure 7. 5 m values of temperature, salinity, fluorescence and oxygen for 24 h experiment 1.

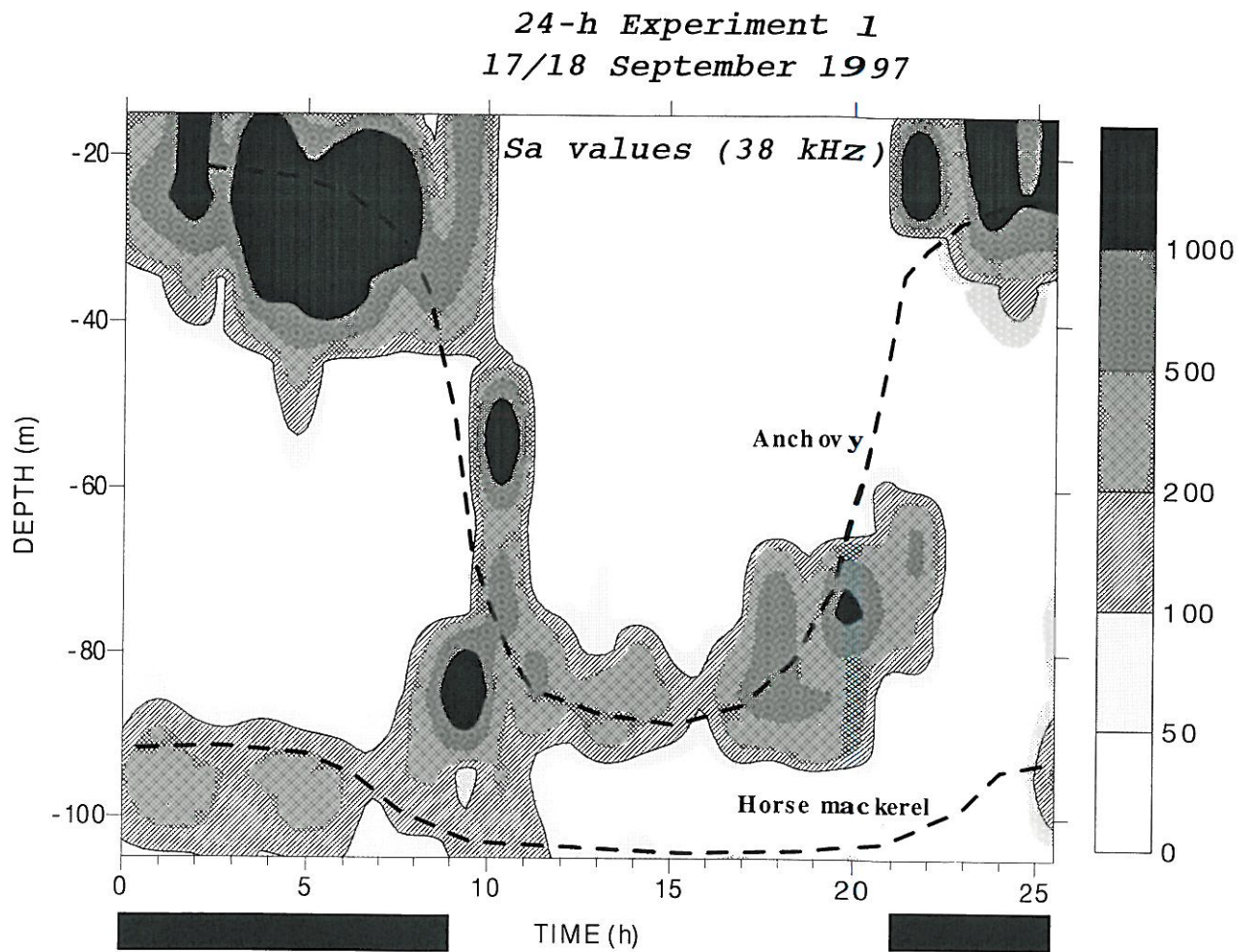


Figure 8. Diurnal vertical distribution for horse mackerel and anchovy presented as allocated S_A values.

24-h Experiment 2 (not completed)
21 September 1997

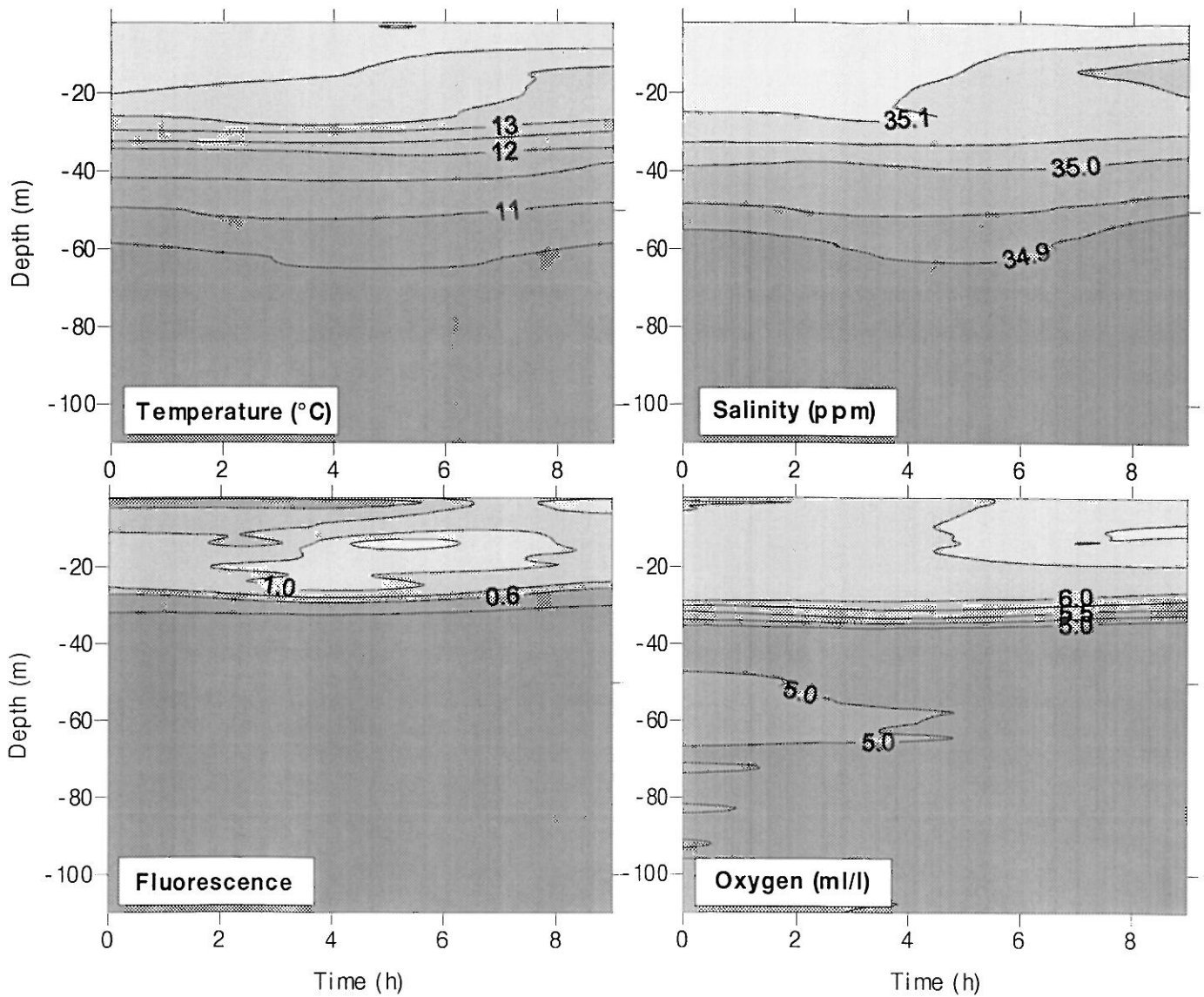


Figure 9. 5 m values of temperature, salinity, fluorescence and oxygen for 24 h experiment 2

those from the third experiment, which took place in a nearby location.

C) Experiment 3

A strong thermocline at 20-25 m characterised the environmental conditions during the third experiment, with progressive warming below it throughout the day (Figure 10). The zooplankton community was similar to the first series: *Calanus* dominant, with euphausiid juvenile stages, followed by small copepods, ctenophores, siphonophores, chaetognaths, and cladocerans in lesser quantities. Both sardine and anchovy eggs were collected, but in low concentrations. *Noctiluca*, the phosphorescent dinoflagellate, developed into a dense bloom during the latter part of the 24-hr series. Zooplankton biomass was generally lower than during the first time-series. Vertical migration was pronounced for the older stages of *Calanus* and euphausiids, and ctenophores and chaetognaths appeared to track the movement of the copepods.

On the basis of stomach fullness and prey freshness of 203 fish examined during the 24-h period, it was demonstrated that horse mackerel fed mostly in the afternoon. It is noteworthy that during the third experiment some horse mackerel appeared to feed after sunset (largely on adult *Calanus* copepods), at least until midnight. This feeding pattern was not consistent with the first experiment, when the horse mackerel stopped feeding after sunset, prior to their ascent to midwater. However, during the third experiment horse mackerel remained close to the sea bed at all times. It is suggested that, by doing so, the horse mackerel were able to exploit that proportion of the copepod population that may not have migrated towards the surface at night.

Of the 315 hake stomachs examined during the second and third experiments around 60% were empty. There appeared to be no difference in the proportion of empty stomachs during day and night. The smaller hake fed largely on pelagic fish. Only eight stomachs contained horse mackerel remains.

24-h Experiment 3
23/24 September 1997

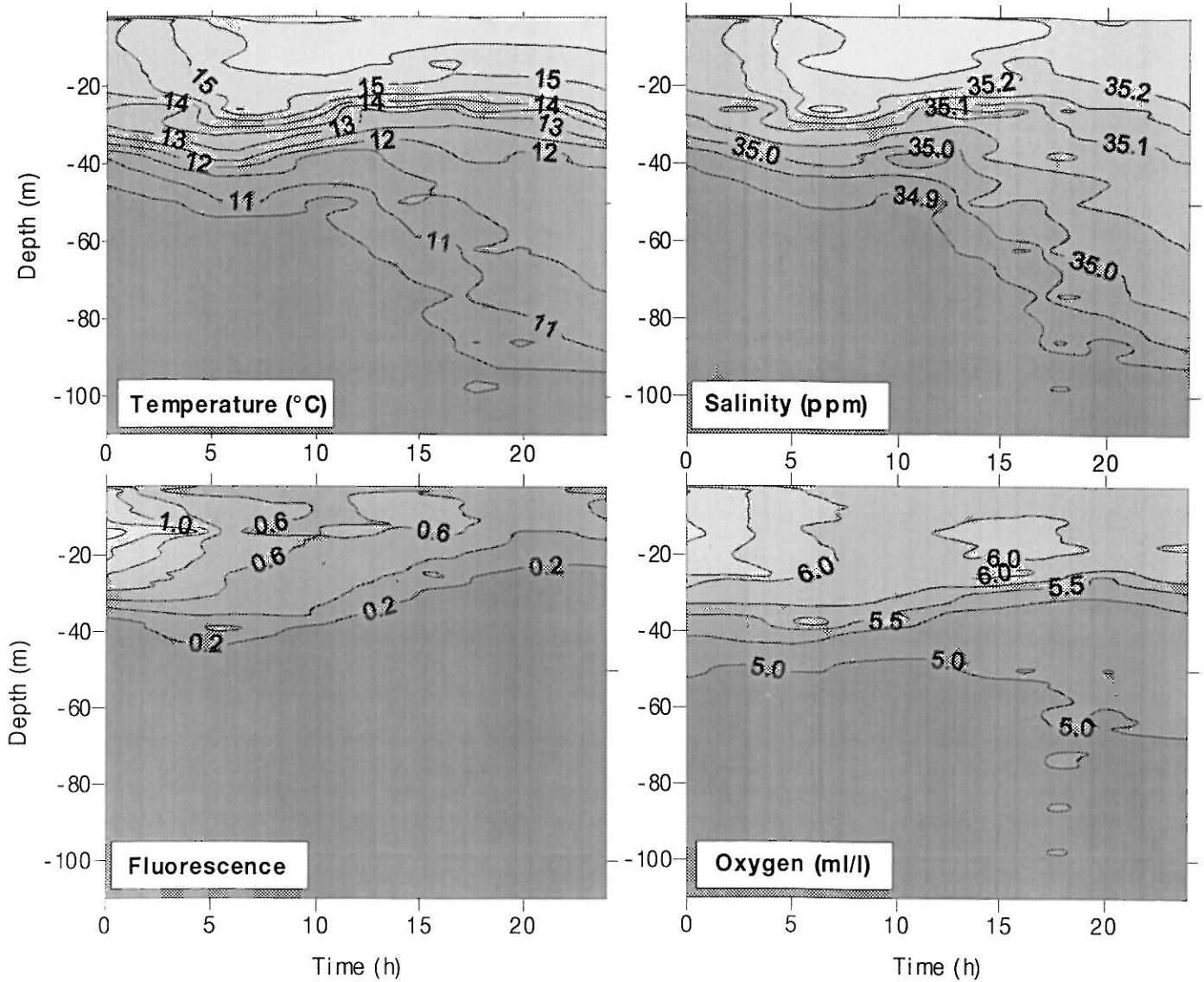


Figure 10. 5 m values of temperature, salinity, fluorescence and oxygen for 24 h experiment 3.

CHAPTER 4 CONCLUDING REMARKS

The survey was successful in mapping and estimating the size of the horse mackerel resource of the area under study. The survey also provided good information on the vertical distributional patterns in horse mackerel. Most of the horse mackerel encountered remained close to the bottom at all times. The traditional pelagic targets near the shelf-break were not found, possibly because the fish concentrated over the shelf region instead. It has been proposed that during El Nino years horse mackerel in South Africa's South Coast tends to concentrate closer to the sea bed. Such an anomaly is expected to affect the environment of southern Africa in 1997/98.

The diurnal experiments confirmed previous studies on the diet of horse mackerel in South Africa, as well as their feeding rhythm. Fish feed largely during the day, and mainly in the afternoon. The presence of sand grains in the stomachs of horse mackerel indicate daytime feeding near the bottom. It appears that the period of maximum feeding coincides with the vertical migrations of the dominant zooplankters from off the bottom. Horse mackerel moved off the bottom at night, but to lesser extent that was previously observed in other studies. It is suggested that the vertical movement of horse mackerel may be related to predator avoidance rather than feeding or reproductive strategies.

The cruise provided further evidence of the vertical dynamics of the horse mackerel, a prerequisite for the design of a successful survey programme. It was of interest to note that the current regime observed could provide a possible retention mechanism for fish on the south coast of South Africa, brought about by the southwesterly flow offshore and the northeasterly flow inshore.

Annex I Instruments and fishing gear

The Simrad scientific echo sounder EK 500/38 kHz, was used during the survey for estimation of fish density. The Bergen Echo Integrator system (BEI) logging the echogram raw data from the echo-sounder was used to scrutinise 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 scrutinised data was stored. The details of the settings of the 38 kHz echo sounder were as follows:

Transceiver-1 menu

Transducer depth	5.5 m
Absorption coeff.	10 dB/km
Pulse length	medium
Bandwidth	wide
Max. power	2 000 W
Angle sensitivity	21.9
2-way beam angle	-21.0 dB
SV transducer gain	27.54 dB
TS transducer gain	27.54 dB
3 dB Beamwidth	6.8 deg
Alongship offset	0.02 deg
Athwardship offset	0.08 deg

Display menu

Echogram	1
Bottom range	12 m
Bottom start	10 m
TVG	20 log R
SV Colour minimum	-72 dB
TS Colour minimum	-65 dB

Printer settings

Range	0-250, 0-500 m
TVG	20 log R
Sv Colour minimum	-72 dB

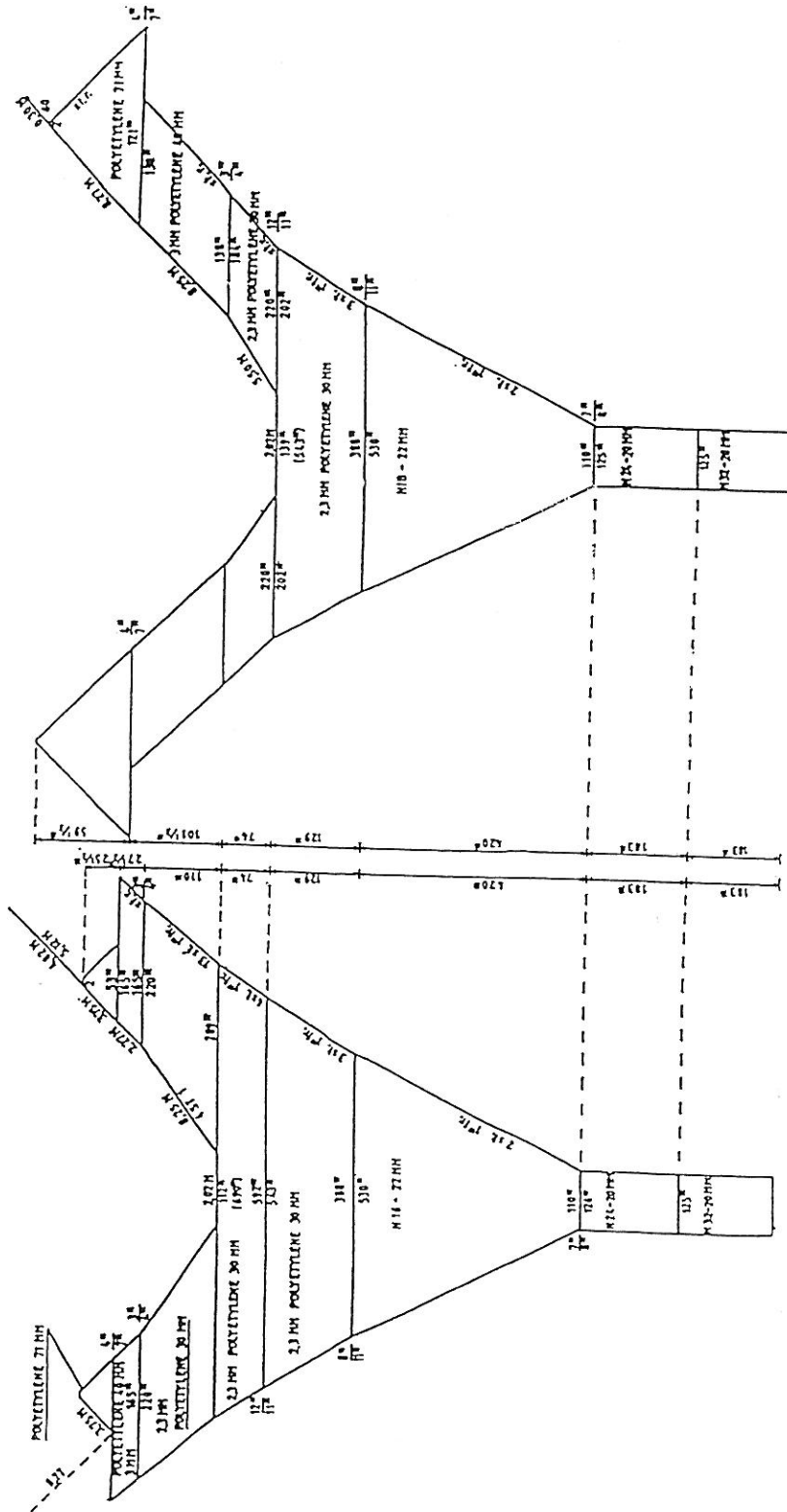
Bottom detection menu

Minimum level	-45 dB
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FISHING GEAR

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

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



F/F Dr. Fridtjof Nansen

OVER/UNDER/SIDER

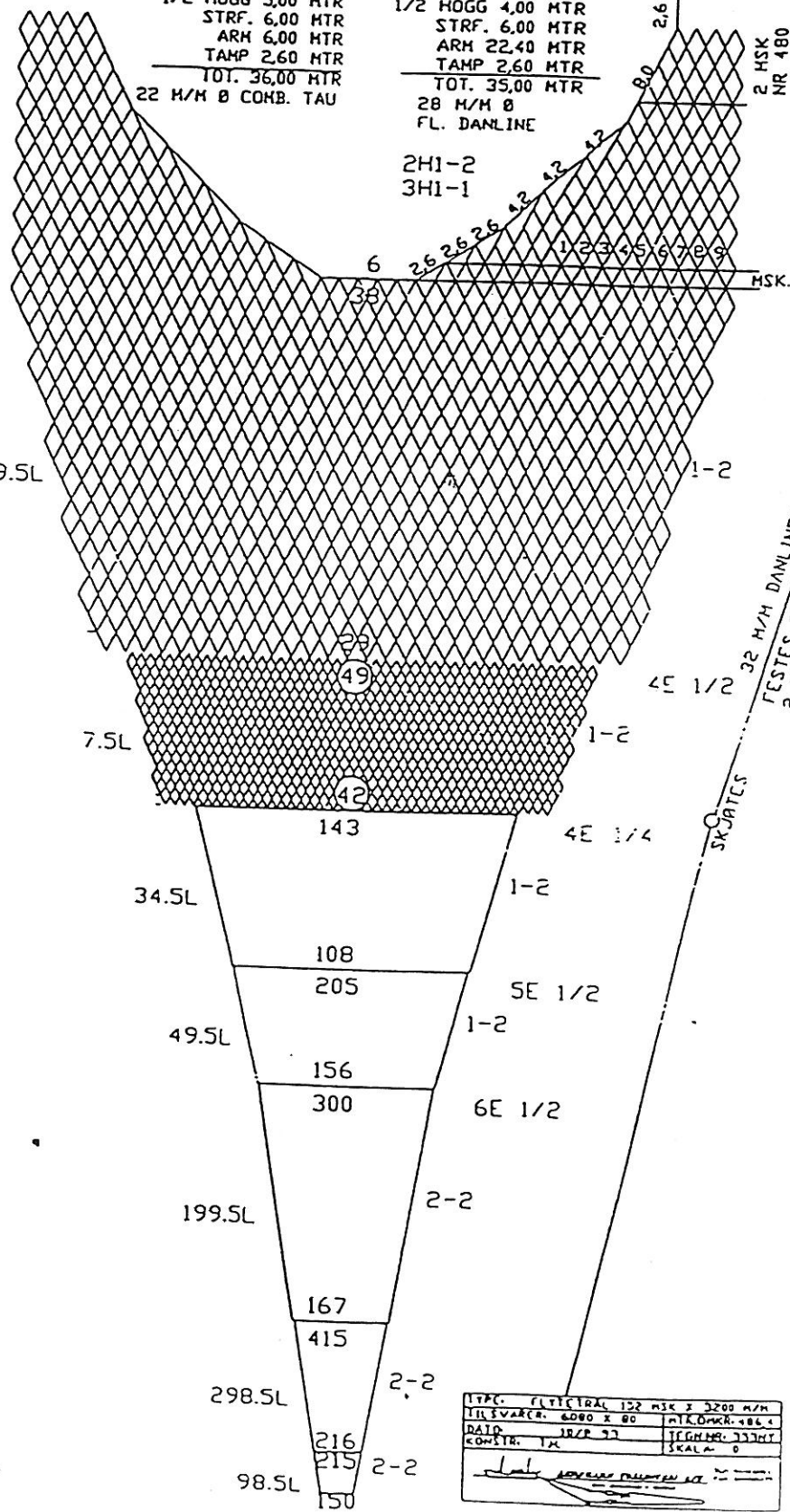
OVERDEL:
50 STK 11" PLASTKULER
UNDERDEL
14 M/M VIRE OHSP. MED
14 M/M BLYTAU
+ KJETTING.
TOTAL VEKT UNDER 400 KG.

MASKER TRAAD LENGDE MASKER
M/M NR. I MTR. I EVING

SIDER.
1/2 HOGG 4,00 MTR
STRF. 6,00 MTR
ARM 22,40 MTR
TAMP 2,60 MTR
TOT. 35,00 MTR
28 M/M Ø
FL. DANLINE

1/2 HOGG 5,00 MTR
STRF. 6,00 MTR
ARM 6,00 MTR
TAMP 2,60 MTR
TOT. 36,00 MTR
22 M/M Ø COHB. TAU

3200.0	240	22.4	4
3200.0	240	32.0	4 9.5L
1620.0	160	13.0	4
400.0	48	14.0	4
200.0	32	10.00	4
100.0	24	20.0	4
38.0	12	11.4	4
38.0	18	3.76	4



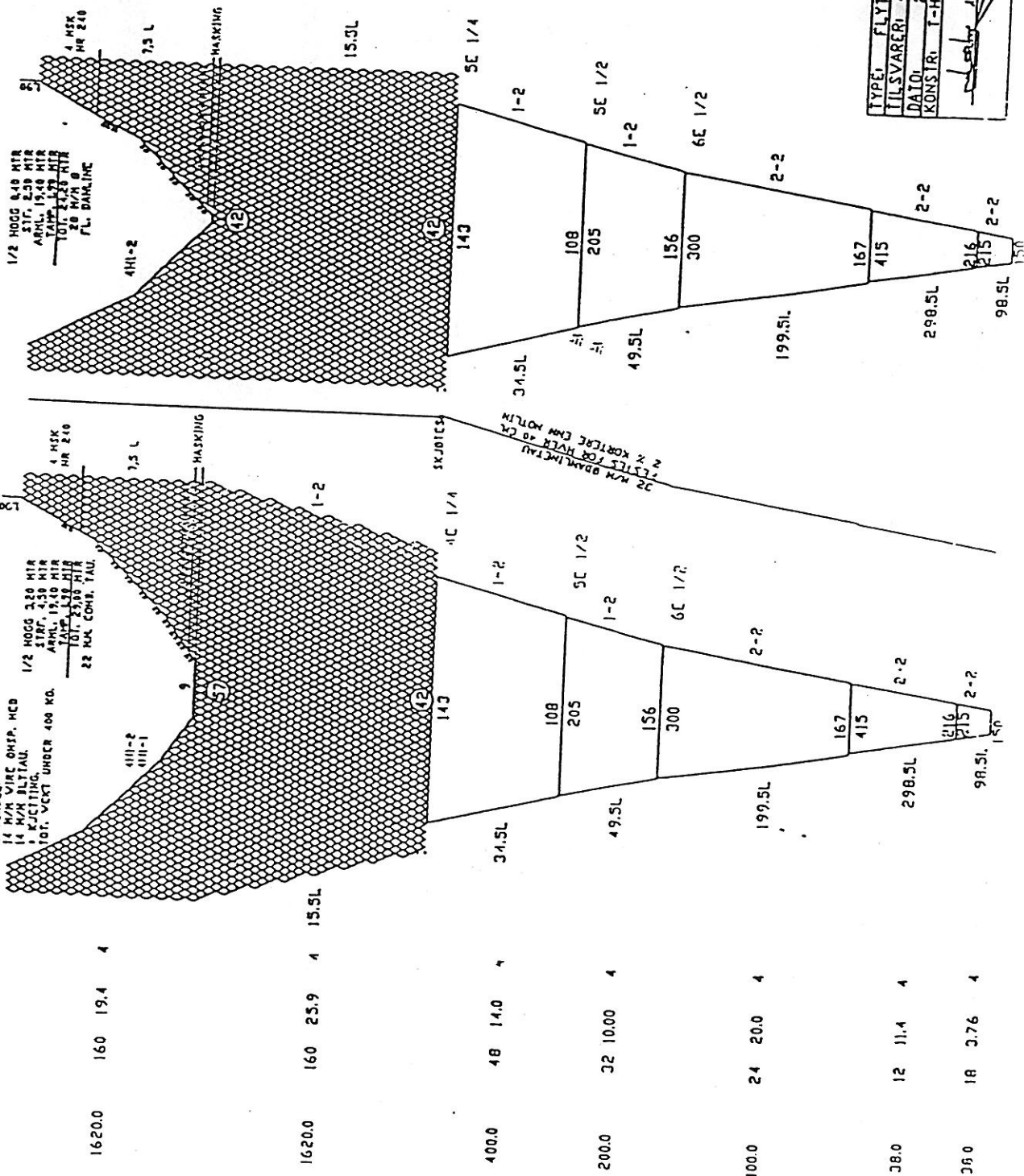
TYPE:	FLUTTERAL 122 MSK 3 3200 M/M
ILL SVARER:	6080 X 80 MTR. OMKR. 486.4
DAIP:	1R/P 97
KOMSTR.:	1X
TEGNER:	1977/11
SKALA:	0

F/F Dr. Fridtjof Nansen

HASKER TRAAD LENGDE HASKER
M/H NR. I HTR. I EVING

OVERDEL
58 STK III- KULLER
OMSLUTTET AV METT.
UNDERDEL
14 M/M VIRE ØHSP. MED
14 M/M BLTIAU.
I KJØTTING.
TOT. VEKT UNDER 400 KG.


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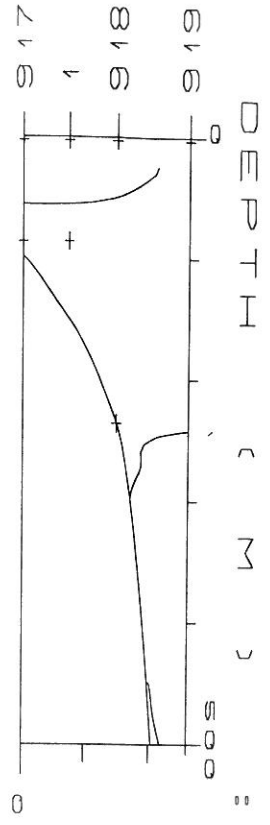
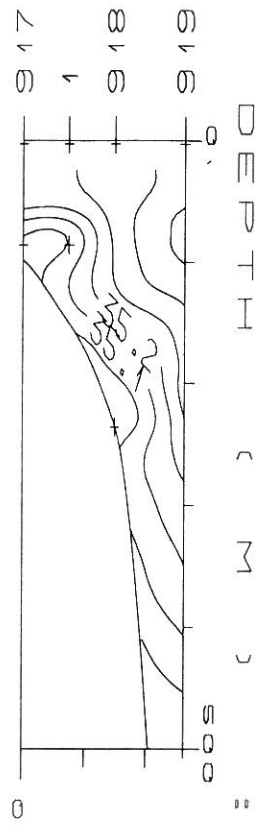
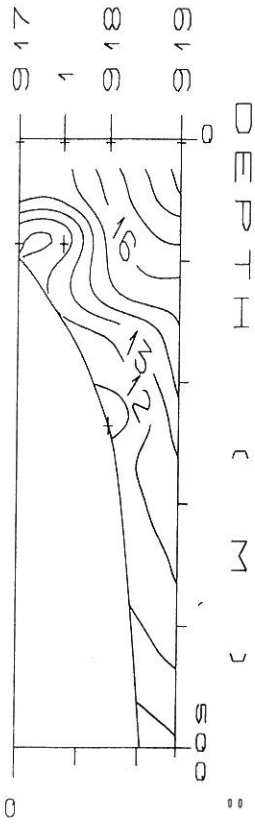
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517. 239 MTR
481. 1548 MTR
TOT. 3172 MTR
28 M/M Ø
FL. DAMM. INC

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TOT. 3172 MTR
22 M/M ØHSP. I METT.

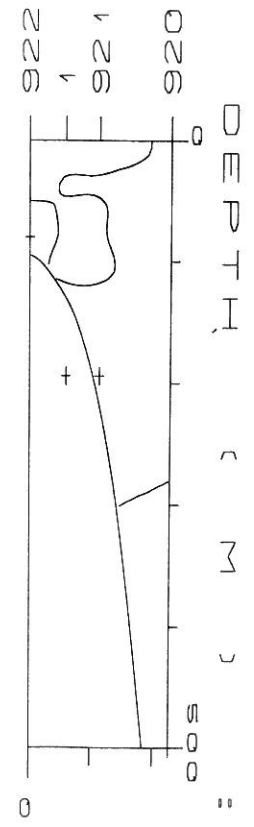
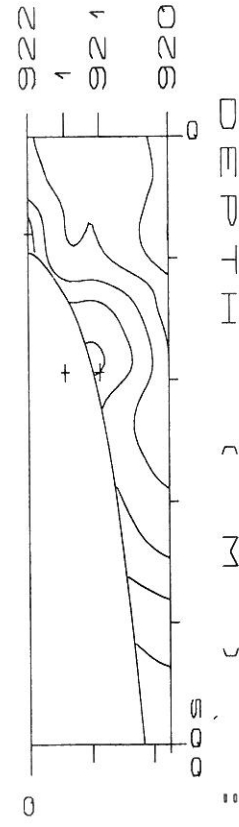
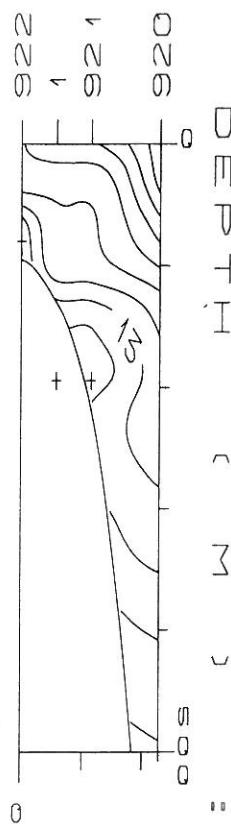
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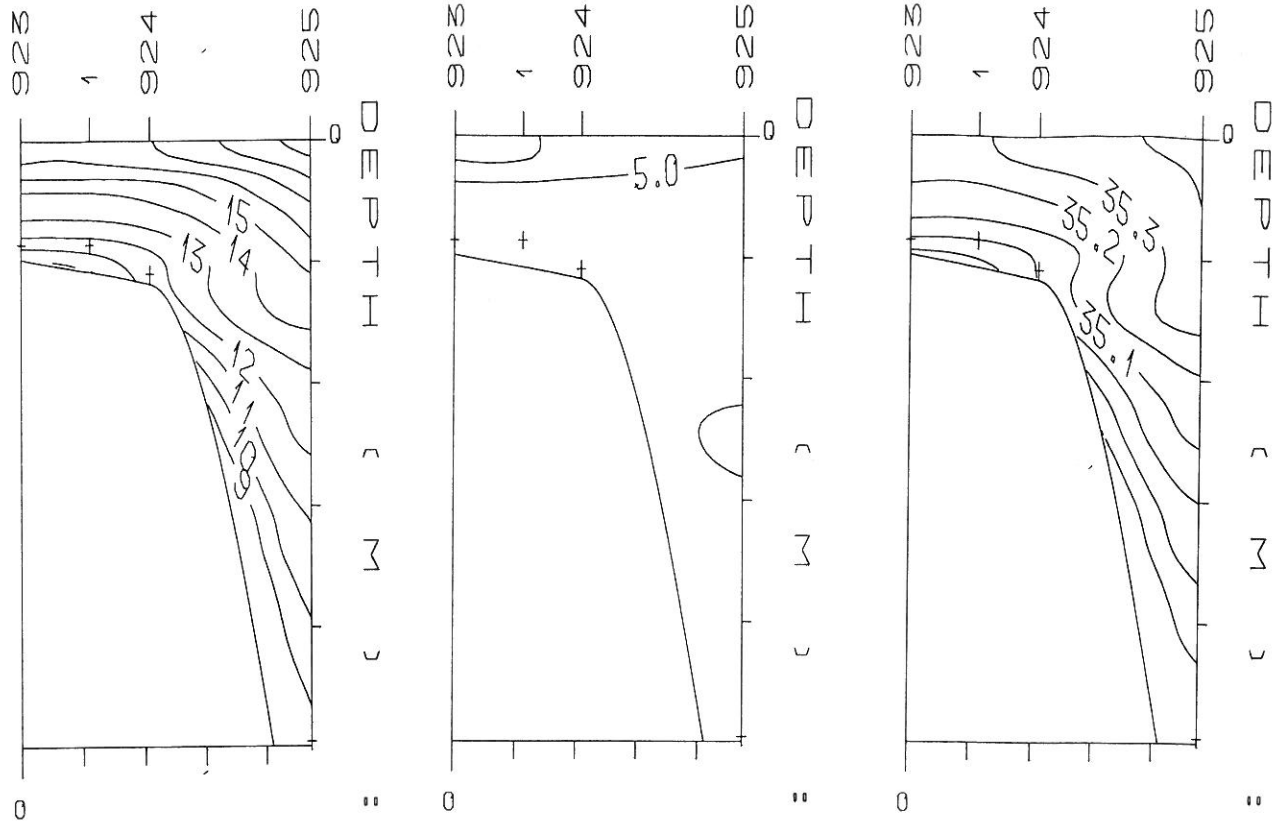
Annex II Hydrographic profiles



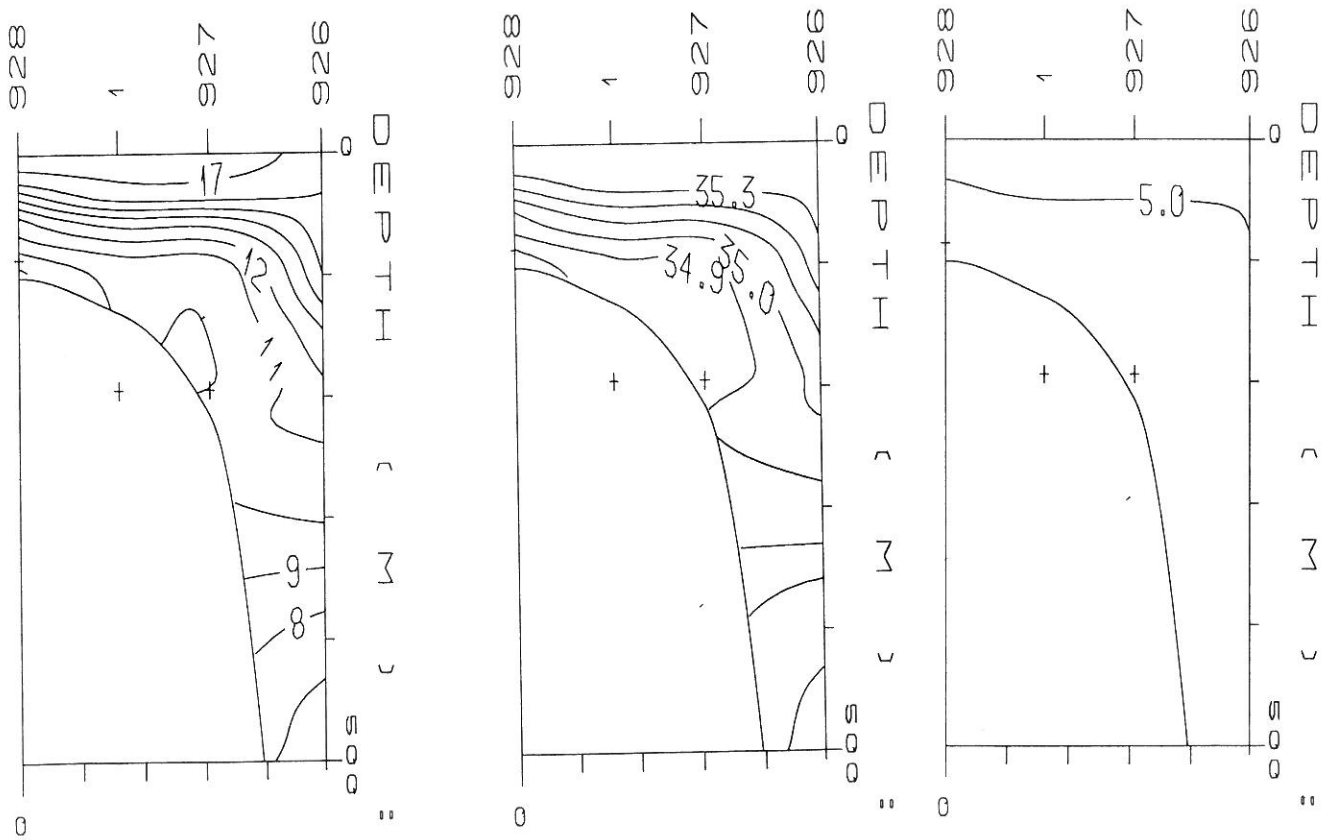
Temperature, salinity and oxygen profiles



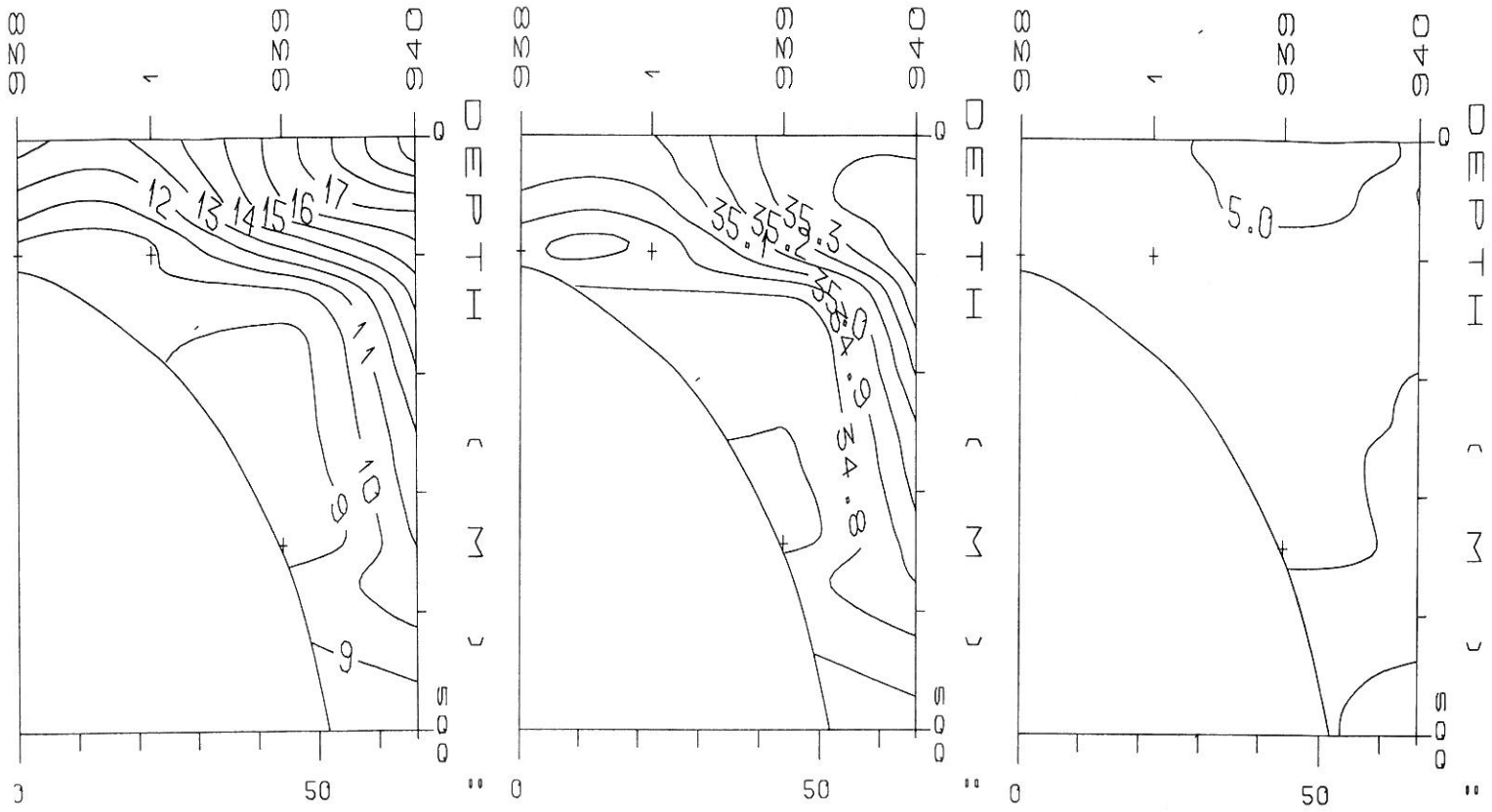
Temperature, salinity and oxygen profiles



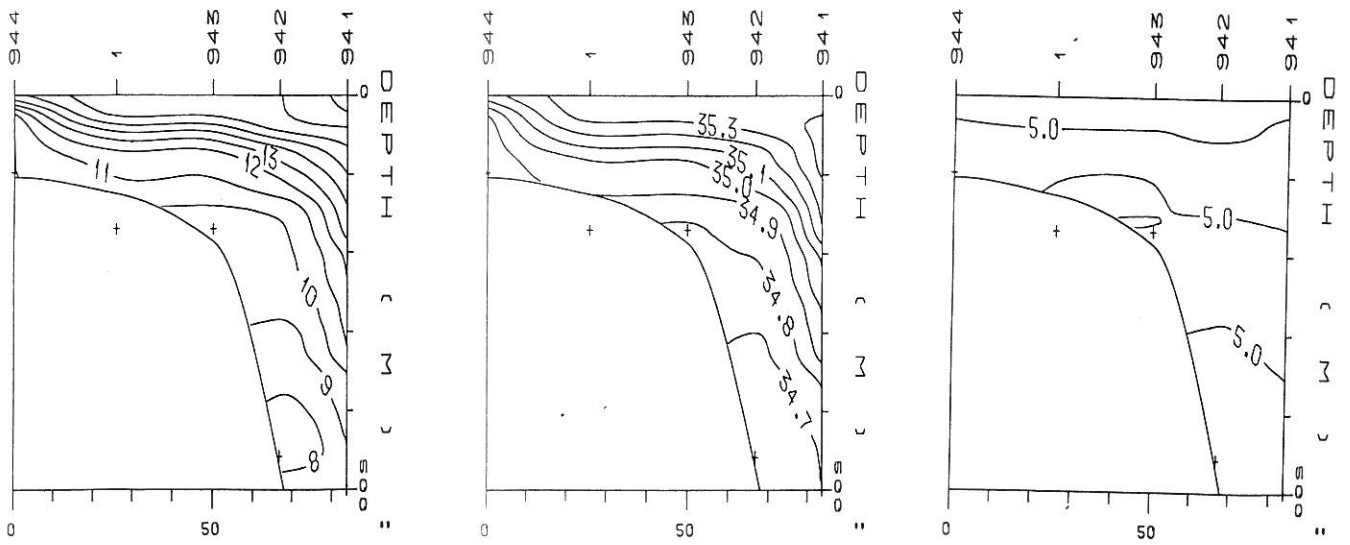
Temperature, salinity and oxygen profiles



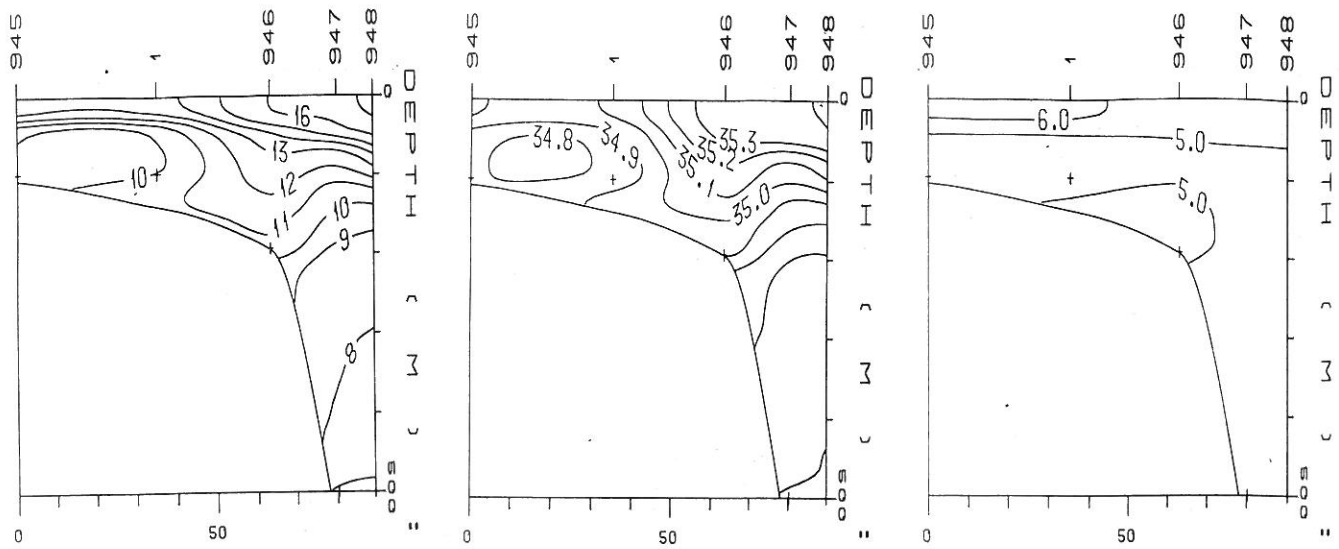
Temperature, salinity and oxygen profiles



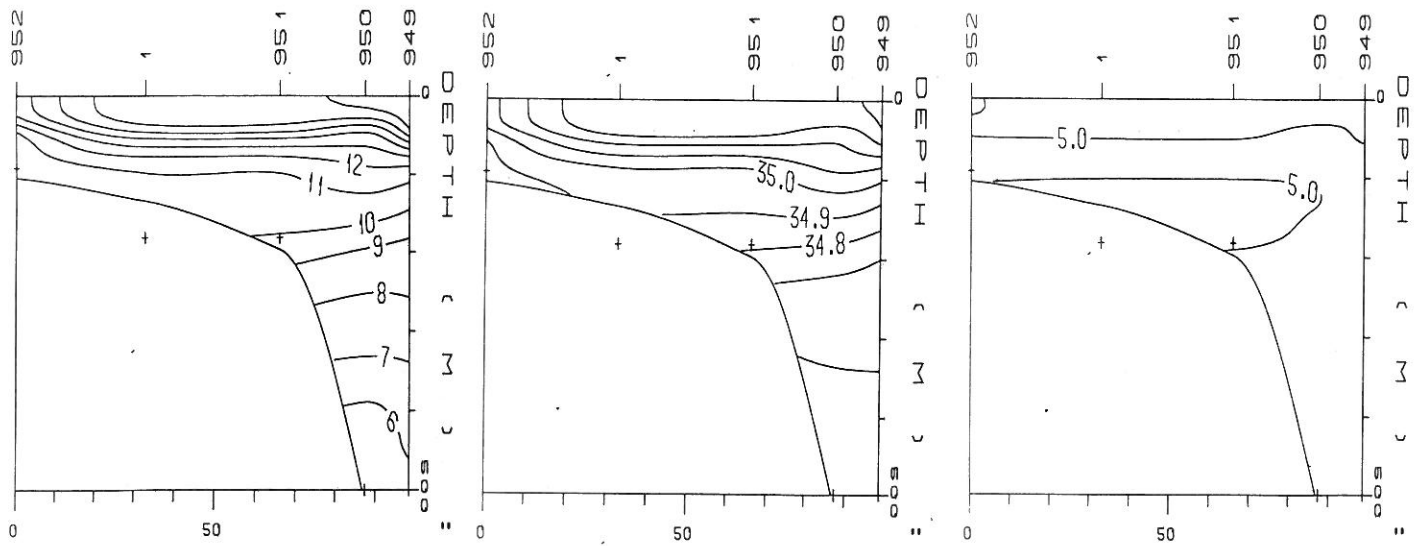
Temperature, salinity and oxygen profiles



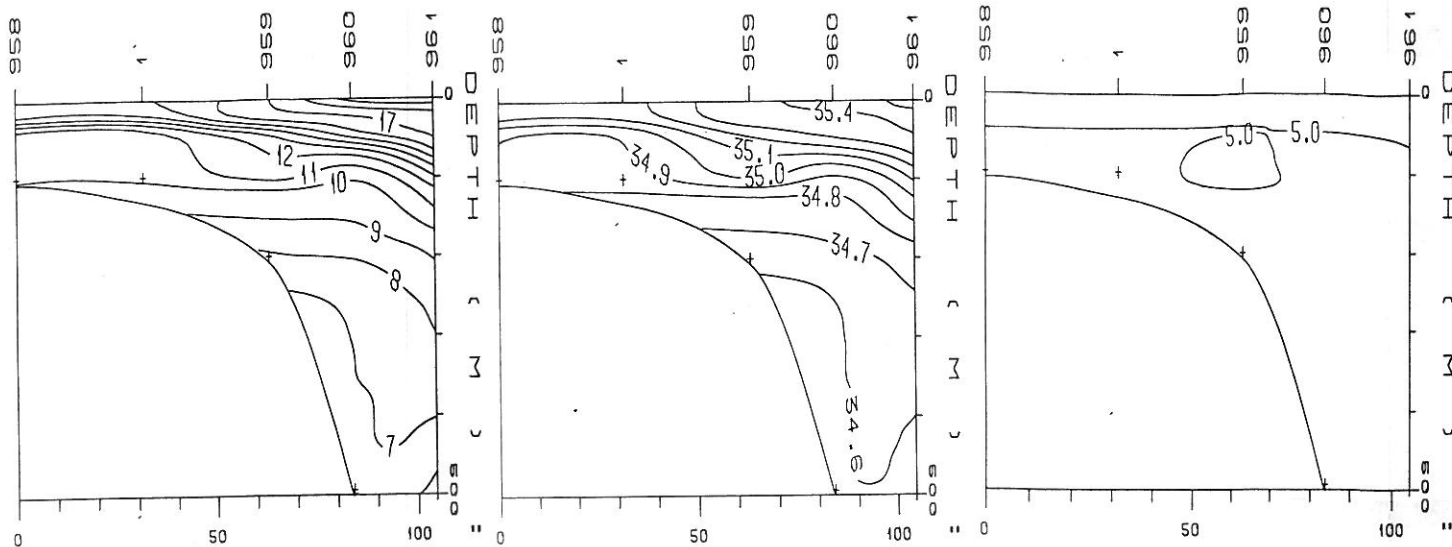
Temperature, salinity and oxygen profiles



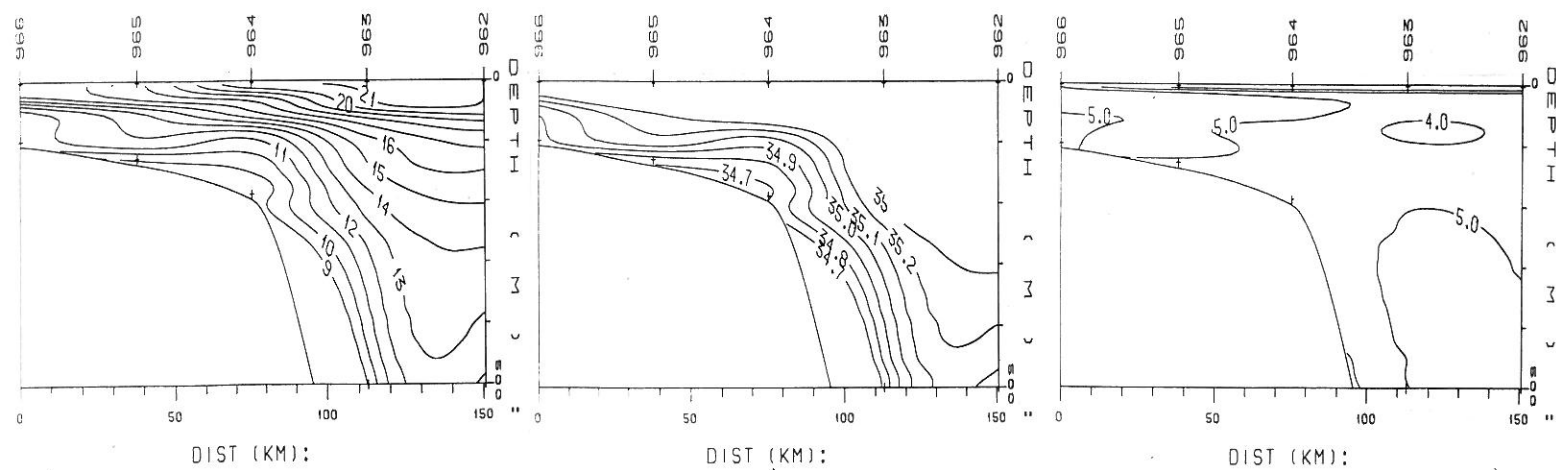
Temperature, salinity and oxygen profiles



Temperature, salinity and oxygen profiles



Temperature, salinity and oxygen profiles



Temperature, salinity and oxygen profiles

Annex III Records of fishing stations

PROJECT STATION: 12
 DATE: 15/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3359 Long E 2637
 start stop duration
 TIME :23:21:20 23:21:20 10 (min) Purpose code: 1
 LOG :4500.20 4500.80 0.60 Area code :
 FDEPTH: 60 60 GearCond.code: 2
 BDEPTH: 101 101 Validity code: 1
 Towing dir: 85° Wire out: 240 m Speed: 4 kn*10
 Sorted: 51 Kg Total catch: 50.87 CATCH/HOUR: 305.22

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	116.10	9612	38.04	15
Merluccius capensis	80.70	258	26.44	19
Trachurus capensis	57.00	138	18.68	18
Chelidonichthys queketti	43.20	372	14.15	20
LOLIGINIDAE	2.04	18	0.67	
Spherooides pachgaster	1.98	6	0.65	
Sepia australis	1.98	708	0.65	
Scomber japonicus	1.74	18	0.57	
Sardinops ocellatus	0.30	12	0.10	16
Etrumeus whiteheadi	0.18	12	0.06	17
Total	305.22		100.01	

PROJECT STATION: 16
 DATE: 17/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 4721 Long E 3358
 start stop duration
 TIME :18:13:00 18:34:00 21 (min) Purpose code: 1
 LOG :4721.00 4722.00 1.00 Area code :
 FDEPTH: 80 80 GearCond.code: 1
 BDEPTH: 108 108 Validity code:
 Towing dir: 270° Wire out: m Speed: 3 kn*10
 Sorted: 98 Kg Total catch: 98.58 CATCH/HOUR: 281.66

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	206.14	314	73.19	30
Merluccius capensis, juveniles	41.00	4020	14.56	29
Chelidonichthys queketti	20.49	137	7.27	31
Lepidopus caudatus	5.51	3	1.96	
Sepia australis	5.31	1897	1.89	
Engraulis capensis	2.17	169	0.77	32
Champsodon capensis	0.60	3	0.21	
Loligo reynaudi	0.14	51	0.05	
Rossia enigmatica	0.11	86	0.04	
Bregmaceros sp.	0.09	60	0.03	
Sardinops ocellatus	0.06	3	0.02	
TETRAODONTIDAE	0.03	20	0.01	
Total	281.65		100.00	

PROJECT STATION: 13
 DATE: 15/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3358 Long E 2623
 start stop duration
 TIME :01:40:00 01:41:00 21 (min) Purpose code: 1
 LOG :4520.50 4521.90 1.40 Area code : 1
 FDEPTH: 94 94 GearCond.code: 1
 BDEPTH: 110 110 Validity code: 1
 Towing dir: 84° Wire out: 252 m Speed: 4 kn*10
 Sorted: 78 Kg Total catch: 155.26 CATCH/HOUR: 443.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	337.14	743	76.00	22
Merluccius capensis	50.29	1120	11.34	23
Chelidonichthys queketti	48.57	343	10.95	21
Engraulis capensis	2.86	269	0.64	24
Scomber japonicus	2.29	6	0.52	25
LOLIGINIDAE	1.66	6	0.37	
Sepia australis	0.80	286	0.18	
Total	443.61		100.00	

PROJECT STATION: 17
 DATE: 17/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3359 Long E 2622
 start stop duration
 TIME 20:40:52 20:55:45 15 (min) Purpose code: 1
 LOG 4730.60 4731.65 1.02 Area code :
 FDEPTH: 25 28 GearCond.code:
 BDEPTH: 107 108 Validity code:
 Towing dir: 270° Wire out: 100 m Speed: 40 kn*10
 Sorted: 59 Kg Total catch: 59.97 CATCH/HOUR: 239.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	221.80	17216	92.46	
Galeorhinus galeus	8.76	4	3.65	
Amblyrhynchotes honkenii	6.28	16	2.62	
Loligo reynaudi	2.40	48	1.00	34
Sardinops ocellatus	0.48	20	0.20	33
Scomber japonicus	0.16	20	0.07	35
Total	239.88		100.00	

PROJECT STATION: 14
 DATE: 16/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3410 Long E 2610
 start stop duration
 TIME :06:41:00 06:41:00 15 (min) Purpose code: 1
 LOG :4555.80 3556.60 9.20 Area code :
 FDEPTH: 90 90 GearCond code: 2
 BDEPTH: 121 118 Validity code:
 Towing dir: 350° Wire out: 250 m Speed: 3 kn*10
 Sorted: 32 Kg Total catch: 1061.14 CATCH/HOUR: 4244.56

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	3222.20	245976	75.91	27
Engraulis capensis	689.52	58476	16.24	26
Sardinops ocellatus	255.92	13656	6.03	28
Scomber japonicus	76.92	264	1.81	
Total	4244.56		99.99	

PROJECT STATION: 18
 DATE: 17/ 9/97 GEAR TYPE: BT No POSITION: Lat S 3359 Long E 2621
 start stop duration
 TIME 21:45:24 22:01:46 16 (min) Purpose code: 1
 LOG 4734.15 4734.96 0.79 Area code :
 FDEPTH: 108 108 GearCond code:
 BDEPTH: 108 108 Validity code:
 Towing dir: 86° Wire out: 400 m Speed: 30 kn*10
 Sorted: 121 Kg Total catch: 203.26 CATCH/HOUR: 762.23

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	492.68	975	64.64	36
Merluccius capensis	154.88	229	20.32	37
Squalus megalops	28.11	34	3.71	
Pteromyxus lanarius	24.19	38	3.17	
Merluccius capensis, juveniles	23.91	1793	3.14	
Rhinobatos annulatus	13.88	4	1.82	
Gempsterus capensis	9.41	19	1.21	18
Chelidonichthys capensis	5.51	8	0.72	
Lepidopus caudatus	4.28	8	0.56	
Sepia australis	1.68	585	0.25	
Chelidonichthys queketti	1.46	8	0.19	
Cynoglossus zanzibarensis	0.64	4	0.08	
Sardinops ocellatus	0.49	11	0.06	
Engraulis capensis	0.38	19	0.05	
Etrumeus whiteheadi	0.34	15	0.04	
Total	762.26		99.98	

PROJECT STATION: 15
 DATE: 16/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat N 3421 Long E 2519
 start stop duration
 TIME :15:20:40 15:31:24 11 (min) Purpose code: 1
 LOG :4621.80 4622.40 0.60 Area code :
 FDEPTH: 110 110 GearCond code: 3
 BDEPTH: 120 120 Validity code:
 Towing dir: 170° Wire out: 270 m Speed: kn*10
 Sorted: 1 Kg Total catch: 0.77 CATCH/HOUR: 4.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Loligo reynaudi	4.20	16	100.00	
Total	4.20		100.00	

PROJECT STATION: 19
 DATE: 18/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3359 Long E 2621
 start stop duration
 TIME 00:02:42 00:32:24 30 (min) Purpose code: 1
 LOG 4740.96 4742.71 2.01 Area code :
 FDEPTH: 80 80 GearCond code:
 BDEPTH: 110 108 Validity code:
 Towing dir: 270° Wire out: 250 m Speed: 40 kn*10
 Sorted: 4 Kg Total catch: 34.19 CATCH/HOUR: 68.38

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	36.24	2818	53.00	
Merluccius paradoxus	20.64	2122	30.18	
Chelidonichthys queketti	3.94	24	5.18	
Sepia australis	2.99	1697	4.33	
Sardinops ocellatus	2.22	92	3.25	
Trachinocephalus myops	1.48	110	2.14	
Etrumeus whiteheadi	1.02	34	1.49	
OCTOPUSIDAE	0.28	24	0.41	
Total	68.38		100.00	

PROJECT STATION: 20
 DATE: 18/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3359 Long E 2621
 start stop duration
 TIME : 02:10:30 02:41:06 31 (min) Purpose code: 1
 LOG : 4747.09 4748.66 1.53 Area code :
 FDEPTH: 80 100 GearCond.code:
 BDEPTH: 111 109 Validity code:
 Towing dir: 90° Wire out: 4749 m Speed: 330 kn*10
 Sorted: 34 Kg Total catch: 118.94 CATCH/HOUR: 230.21

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	121.18	9180	52.64	
Trachurus capensis	45.48	81	19.76	39
Merluccius capensis, juveniles	40.24	2125	17.48	
Chelidonichthys queketti	16.49	110	7.16	40
Chelidonichthys capensis	2.42	2	1.05	
Lepidopus caudatus	2.13	2	0.93	
Sardinops ocellatus	0.91	45	0.40	
Sepia australis	0.91	45	0.40	
Etrumeus whiteheadi	0.45	45	0.20	
Total	230.21		100.02	

PROJECT STATION: 21
 DATE: 18/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3359 Long E 2622
 start stop duration
 TIME : 04:16:08 04:32:20 16 (min) Purpose code: 1
 LOG : 4752.28 4753.15 0.85 Area code :
 FDEPTH: 111 110 GearCond.code:
 BDEPTH: 111 110 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10
 Sorted: 313 Kg Total catch: 1235.89 CATCH/HOUR: 4634.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	3832.50	7980	82.69	41
Merluccius capensis	543.94	634	11.74	42
Squalus megalops	50.70	49	1.09	
Chelidonichthys capensis	41.25	34	0.89	
Torpedo nobiliana	37.50	4	0.81	
Chelidonichthys queketti	37.50	139	0.81	
Merluccius capensis, juveniles	17.21	911	0.37	
Lepidopus caudatus	11.63	8	0.25	
Coneplax sp	9.00	4	0.19	
Austroglossus pectoralis	8.81	19	0.19	
Callorhynchus capensis	8.63	4	0.19	
Ubrina canariensis	7.16	8	0.15	
Loligo reynaudi	5.89	26	0.13	
Pterogymnus lanarius	5.81	11	0.13	
Gonypterus capensis	4.54	4	0.10	
Mustelus palumbes	3.53	4	0.08	
Raja miraletus	3.53	4	0.08	
Argyrosomus hololepidotus	2.03	8	0.04	
Trichiurus lepturus	1.58	4	0.03	
Cynoglossus capensis	1.50	4	0.03	
Sepia australis	0.19	30		
Zeus capensis	0.11	4		
Lolliguncula sp	0.08	19		
Total	4634.62		99.99	

PROJECT STATION: 22
 DATE: 18/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3359 Long E 2622
 start stop duration
 TIME : 06:11:28 06:21:57 10 (min) Purpose code: 1
 LOG : 4758.71 4759.33 0.58 Area code :
 FDEPTH: 108 108 GearCond.code:
 BDEPTH: 108 108 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10
 Sorted: 206 Kg Total catch: 188.49 CATCH/HOUR: 2330.94

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	1678.20	5142	72.00	43
Merluccius capensis	507.30	774	21.76	44
Pterogymnus lanarius	15.10	48	1.51	
Squalus megalops	26.70	18	1.15	
Callorhynchus capensis	26.10	6	1.12	
Phinobatus anaulatus	14.20	6	0.82	
Merluccius capensis, juveniles	10.44	185	0.45	
Chelidonichthys queketti	10.32	34	0.44	
Loligo reynaudi	10.02	114	0.43	
Lepidopus caudatus	2.54	6	0.11	
EPICHLIPIIDAE	2.28	6	0.10	
Engraulis capensis	2.22	18	0.10	
Champsodon capensis	0.24	6	0.01	
Lolliguncula sp	0.12	42	0.01	
Sepia australis	0.06	6		
Total	2330.94		100.01	

PROJECT STATION: 23
 DATE: 18/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3359 Long E 2622
 start stop duration
 TIME : 08:10:11 08:26:05 16 (min) Purpose code: 1
 LOG : 4764.37 4765.17 0.77 Area code :
 FDEPTH: 108 108 GearCond.code:
 BDEPTH: 108 108 Validity code:
 Towing dir: 86° Wire out: 400 m Speed: 30 kn*10
 Sorted: 395 Kg Total catch: 1053.26 CATCH/HOUR: 3949.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	2107.88	3079	53.37	46
Trachurus capensis	1221.00	3713	30.91	45
Saurida undosquamis	143.63	4	3.64	
Sepia australis	135.75	19	3.44	
Merluccius capensis, juveniles	66.68	3120	1.69	
Arnoglossus capensis	49.88	4	1.26	
Pterogymnus lanarius	36.19	49	0.92	
Raja straeleni	33.38	11	0.85	
Chelidonichthys queketti	28.69	124	0.73	
Squalus megalops	25.13	26	0.64	
Chelidonichthys capensis	23.81	23	0.60	
Callorhynchus capensis	20.78	8	0.53	
Loligo reynaudi	14.25	251	0.36	
Gonypterus capensis	13.31	11	0.34	
Pliotrema warreni	12.00	4	0.30	
Argyrosomus hololepidotus	11.06	8	0.28	
Austroglossus pectoralis	2.06	4	0.05	
Congliopodus torvus	1.95	4	0.05	
Scomber japonicus	1.84	19	0.05	
Lepidopus caudatus	0.30	8	0.01	
Lolliguncula sp	0.15	75		
Champsodon capensis	0.04	4		
Total	3949.76		100.02	

PROJECT STATION: 24
 DATE: 18/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3359 Long E 2621
 start stop duration
 TIME : 10:35:14 11:05:07 30 (min) Purpose code: 1
 LOG : 4769.55 4770.83 1.27 Area code :
 FDEPTH: 109 108 GearCond.code:
 BDEPTH: 109 108 Validity code:
 Towing dir: 86° Wire out: 400 m Speed: 20 kn*10
 Sorted: 228 Kg Total catch: 314.94 CATCH/HOUR: 629.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	263.76	726	41.87	47
Merluccius capensis	248.30	300	39.42	48
Merluccius capensis, juveniles	24.86	1510	3.95	49
Pterogymnus lanarius	21.30	36	3.38	
Loligo reynaudi	16.80	332	2.67	
Chelidonichthys capensis	10.60	14	1.68	
Chelidonichthys queketti	7.80	46	1.24	
Austroglossus pectoralis	7.40	14	1.17	
Raja straeleni	6.40	4	1.02	
Sphyrna zygaena	5.80	2	0.92	
Squalus megalops	5.30	4	0.84	
Argyrosomus hololepidotus	3.90	6	0.62	
Lepidopus caudatus	2.50	18	0.40	
Ubrina canariensis	1.42	2	0.23	
Dasyatis violacea	1.40	2	0.22	
Satyricthys adeni	1.20	2	0.19	
Sepia australis	0.76	150	0.12	
Cynoglossus capensis	0.38	8	0.06	
Total	629.88		100.00	

PROJECT STATION: 25
 DATE: 18/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3359 Long E 2622
 start stop duration
 TIME : 12:03:14 12:32:36 29 (min) Purpose code: 1
 LOG : 4773.80 4775.53 1.73 Area code :
 FDEPTH: 108 108 GearCond.code:
 BDEPTH: 108 108 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10
 Sorted: 232 Kg Total catch: 232.35 CATCH/HOUR: 480.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	123.72	333	25.74	50
Merluccius capensis	81.76	74	12.85	51
Mustelus mustelus	31.01	2	6.45	
Merluccius capensis, juveniles	15.62	1001	3.35	
Pterogymnus lanarius	14.79	25	1.08	
Sphyrna zygaena	8.07	2	1.68	
Callorhynchus capensis	4.86	2	1.01	
Austroglossus pectoralis	2.98	6	0.62	
Lepidopus caudatus	2.05	12	0.43	
Squalus megalops	1.66	2	0.35	
Ubrina canariensis	1.34	2	0.28	
Loligo reynaudi	1.06	12	0.22	
Chelidonichthys queketti	1.01	6	0.21	
Cynoglossus canebarensis	0.56	6	0.12	
Sepia australis	0.31	52	0.06	
Lolliguncula metcateris	0.14	54	0.01	
Etrumeus whiteheadi	0.14	10	0.01	
Total	271.12		56.43	

PROJECT STATION: 26
 DATE: 18/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3359 Long E 2620
 start stop duration
 TIME :14:04:26 14:33:44 29 (min) Purpose code: 1
 LOG :4779.44 4780.75 1.31 Area code :
 FDEPTH: 110 110 GearCond code:
 BDEPTH: 110 110 Validity code:
 Towing dir: 90° Wire out: 400 m Speed: 30 kn*10
 Sorted: 325 Kg Total catch: 325.47 CATCH/HOUR: 673.39

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	409.14	497	60.76	52
Merluccius capensis	173.79	248	25.81	53
Merluccius capensis, juveniles	20.17	1188	3.00	
Pterogymnus lanarius	13.34	23	1.98	
Loligo reynaudi	11.67	292	1.73	
Chelidonichthys queketti	11.38	64	1.69	
Callorhynchus capensis	4.45	2	0.66	
Umbrina canariensis	4.34	6	0.64	
Gemypterus capensis	4.18	6	0.62	
Lepidopus caudatus	3.79	10	0.56	
Chelidonichthys capensis	3.62	6	0.54	
Mustelus mustelus	2.38	2	0.35	
Squalus megalops	2.38	2	0.35	
Austroglossus pectoralis	2.11	4	0.31	
Argyrosomus hololepidotus	2.03	4	0.30	
Sepia australis	1.66	637	0.25	
Cynoglossus capensis	1.61	21	0.24	
Etrumeus whiteheadi	0.62	46	0.09	
Engraulis capensis	0.41	29	0.06	
Champsodon capensis	0.21	54	0.03	
Lolligoneula mercatoris	0.06	33	0.01	
Squilla sp	0.04	4	0.01	
Total	673.38		99.99	

PROJECT STATION: 27
 DATE: 18/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3359 Long E 2620
 start stop duration
 TIME :16:11:57 16:28:33 17 (min) Purpose code: 1
 LOG :4785.20 4785.95 0.75 Area code :
 FDEPTH: 110 110 GearCond code:
 BDEPTH: 110 110 Validity code:
 Towing dir: 90° Wire out: 400 m Speed: 30 kn*10
 Sorted: 267 Kg Total catch: 273.96 CATCH/HOUR: 966.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	360.71	28	37.31	
Trachurus capensis	249.18	445	25.77	54
Merluccius capensis	215.29	275	22.27	55
Squilla mantis	34.94	4	3.61	
Pterogymnus lanarius	19.24	32	1.99	
Chelidonichthys queketti	18.53	113	1.92	
Chelidonichthys capensis	13.76	14	1.42	
Merluccius capensis, juveniles	12.64	706	1.31	
Sepia australis	10.45	3342	1.08	
Engraulis capensis	10.38	915	1.07	
Argyrosomus hololepidotus	5.47	7	0.57	
Mustelus mustelus	4.24	4	0.44	
Umbrina canariensis	3.71	4	0.38	
Squalus megalops	3.53	4	0.37	
Loligo reynaudi	1.55	18	0.16	
Cynoglossus capensis	1.27	18	0.13	
Trichurus lepturus	1.13	7	0.12	
Champsodon capensis	0.21	46	0.02	
Lolligoneula sp	0.21	74	0.02	
Synagrops microlepis	0.11	28	0.01	
Gemypterus capensis	0.11	4	0.01	
Lepidopus caudatus	0.11	4	0.01	
Sardinops ocellatus	0.07	4	0.01	
Ovalipes punctatus	0.04	4		
Coeloclinchus sp	0.04	4		
Rossia sp	0.04	7		
Total	966.96		100.00	

PROJECT STATION: 28
 DATE: 18/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3359 Long E 2619
 start stop duration
 TIME :18:37:04 18:19:14 24 (min) Purpose code: 1
 LOG :4794.02 4794.29 1.27 Area code :
 FDEPTH: 80 70 GearCond code:
 BDEPTH: 108 102 Validity code:
 Towing dir: 90° Wire out: 200 m Speed: 40 kn*10
 Sorted: 115 Kg Total catch: 150.36 CATCH/HOUR: 392.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	199.43	344	50.84	56
Etrumeus whiteheadi	83.48	83	21.28	
Merluccius capensis, juveniles	49.04	1629	12.50	
Engraulis capensis	44.61	4283	11.37	
Chelidonichthys queketti	7.33	44	1.87	
Champsodon capensis	3.44	1171	0.88	
Sepia australis	2.97	892	0.76	
Loligo reynaudi	0.89	3	0.23	
Sardinops ocellatus	0.21	16	0.05	
Synagrops microlepis	0.13	52	0.03	
Rossia enigmatica	0.13	151	0.03	
Lepidopus caudatus	0.13	5	0.03	
Scomber japonicus	0.13	16	0.03	
Lolligoneula sp	0.10	42	0.03	
Gomyrops boops	0.08	5	0.02	
Macrotrophosodes sp	0.03	10	0.01	
Laspeyresius sp	0.03	3	0.01	
Halargyreus thymonisi	0.03	3	0.01	
Brevoortia sp	0.03	157	0.01	
Sepia officinalis brevipinna	0.03	3	0.01	
Total	392.25		100.00	

PROJECT STATION: 29
 DATE: 19/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3411 Long E 2519
 start stop duration
 TIME :01:07:21 01:20:54 14 (min) Purpose code: 1
 LOG :4849.95 4850.46 0.49 Area code :
 FDEPTH: 900 100 GearCond code:
 BDEPTH: 109 110 Validity code:
 Towing dir: 90° Wire out: 200 m Speed: 30 kn*10
 Sorted: 13 Kg Total catch: 13.64 CATCH/HOUR: 58.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chelidonichthys queketti	27.86	163	47.66	58
Trachurus capensis	25.76	81	44.06	57
Merluccius capensis	4.03	13	6.89	59
Sepia australis	0.30	86	0.51	
Etrumeus whiteheadi	0.26	4	0.44	
Champsodon capensis	0.17	13	0.29	
Krill	0.09	274	0.15	
Total	58.47		100.00	

PROJECT STATION: 30
 DATE: 19/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3431 Long E 2504
 start stop duration
 TIME :05:11:23 05:35:50 24 (min) Purpose code: 1
 LOG :4886.42 4887.72 1.30 Area code :
 FDEPTH: 90 90 GearCond code:
 BDEPTH: 122 120 Validity code:
 Towing dir: 345° Wire out: 250 m Speed: 35 kn*10
 Sorted: 1 Kg Total catch: 0.78 CATCH/HOUR: 1.95

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Loligo reynaudi	1.95	13	100.00	
Rossia enigmatica	0.03	5	1.54	
Total	1.98		101.54	

PROJECT STATION: 31
 DATE: 19/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3435 Long E 2506
 start stop duration
 TIME :07:52:38 08:06:15 14 (min) Purpose code:
 LOG :4902.07 4902.79 0.71 Area code :
 FDEPTH: 100 120 GearCond code:
 BDEPTH: 154 157 Validity code:
 Towing dir: 250° Wire out: 350 m Speed: 35 kn*10
 Sorted: 82 Kg Total catch: 1361.95 CATCH/HOUR: 5836.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	3855.21	13663	66.05	60
Scomber japonicus	1981.71	5190	33.95	61
Total	5836.92		100.00	

PROJECT STATION: 32
 DATE: 20/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3445 Long E 2354
 start stop duration
 TIME :00:44:14 01:02:20 18 (min) Purpose code:
 LOG :5053.11 5054.35 1.02 Area code :
 FDEPTH: 120 120 GearCond code:
 BDEPTH: 149 146 Validity code:
 Towing dir: 150° Wire out: 280 m Speed: 30 kn*10
 Sorted: 13 Kg Total catch: 13.12 CATCH/HOUR: 41.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	15.87	250	36.29	66
Trachurus capensis	13.47	43	30.80	62
Merluccius capensis	9.60	3	21.95	64
Chelidonichthys queketti	1.97	23	4.50	63
Merluccius paradoxus	1.80	7	1.66	65
Sardinops ocellatus	0.70	7	1.60	67
Sepia australis	0.53	67	1.21	
Total	41.74		100.01	

PROJECT STATION: 33
 DATE: 20/ 9/97 GEAR TYPE: BT No:1 POSITION: Lat S 3455 Long E 2317
 start stop duration
 TIME :11:44:27 11:58:46 11 (min) Purpose code: 1
 LOG :5150.70 5151.40 0.70 Area code :
 FDEPTH: 184 184 GearCond code:
 BDEPTH: 184 184 Validity code:
 Towing dir: 185° Wire out: 580 m Speed: 30 kn*10
 Sorted: 56 Kg Total catch: 55.81 CATCH/HOUR: 256.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Helicolenus dactylopterus	96.23	360	37.48	68
Merluccius paradoxus	53.34	215	20.85	69
Chelidonichthys queketti	35.34	185	13.84	70
Merluccius capensis	28.62	14	11.15	71
Loligo reynaudi	20.34	65	8.00	
Lophius comertus	12.69	5	1.41	72
Sepia australis	5.26	637	2.05	
Campoplex spinifer	1.75	5	0.68	
Pterogymnus lanarius	1.38	5	0.34	
Cynoglossus canzianensis	1.20	5	0.47	
Total	256.75		100.00	

PROJECT STATION: 34
 DATE: 20/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3450 Long E 2316
 start stop duration
 TIME :15:55:11 16:00:35 5 (min) Purpose code: 1
 LOG :5163.38 5163.65 0.27 Area code :
 FDEPTH: 120 110 GearCond code:
 BDEPTH: 142 141 Validity code:
 Towing dir: 90° Wire out: 270 m Speed: 35 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

PROJECT STATION: 35
 DATE: 20/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3450 Long E 2316
 start stop duration
 TIME :16:56:42 17:00:14 4 (min) Purpose code: 1
 LOG :5167.77 5167.93 0.16 Area code :
 FDEPTH: 141 141 GearCond code: 9
 BDEPTH: 141 141 Validity code:
 Towing dir: 70° Wire out: 560 m Speed: 30 kn*10

Sorted: 40 Kg Total catch: 40.40 CATCH/HOUR: 606.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pterogymnus lanarius	316.50	705	52.23	76
Trachurus capensis	84.75	225	13.99	74
Helicolenus dactylopterus	75.00	915	12.38	73
Argyrozona argyrozona	59.25	30	9.78	75
Scyllorhinus capensis	45.00	15	7.43	
Anthias anthias	7.50	75	1.24	
Octopus vulgaris	7.50	15	1.24	
Chelidonichthys queketti	3.90	30	0.64	
Chelio sp.	3.60	15	0.59	
Zeus capensis	2.40	30	0.40	
Pagellus bellottii	0.60	15	0.10	
Total	606.00		100.02	

PROJECT STATION: 36
 DATE: 20/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3436 Long E 2311
 start stop duration
 TIME :19:36:36 20:07:59 31 (min) Purpose code: 1
 LOG :5186.94 5188.67 1.70 Area code :
 FDEPTH: 78 82 GearCond code:
 BDEPTH: 118 119 Validity code:
 Towing dir: 99° Wire out: 200 m Speed: 35 kn*10

Sorted: 11 Kg Total catch: 11.96 CATCH/HOUR: 23.15

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	10.84	23	46.83	77
Merluccius capensis	5.71	4	24.67	78
Chelidonichthys queketti	3.50	27	15.12	79
Sepia australis	2.50	410	10.80	
Loligo reynaudi	0.25	2	1.08	
Congloporus spinifer	0.17	2	0.73	
Squalus megalops	0.10	2	0.43	
Callionymus sp.	0.02	2	0.09	
Lagocephalus sp.	0.02	2	0.09	
Rossia enigmatica	0.02	2	0.09	
Champsodon capensis	0.02	6	0.09	
Total	23.15		100.02	

PROJECT STATION: 37
 DATE: 21/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3422 Long E 2308
 start stop duration
 TIME :07:00:08 07:22:04 22 (min) Purpose code: 1
 LOG :5231.11 5232.62 1.56 Area code :
 FDEPTH: 112 111 GearCond code:
 BDEPTH: 112 111 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10

Sorted: 250 Kg Total catch: 513.06 CATCH/HOUR: 1399.25

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	685.91	2836	49.02	80
Squalus megalops	267.95	927	19.15	
Pterogymnus lanarius	150.00	355	10.72	
Merluccius capensis	115.77	161	8.27	81
Loligo reynaudi	36.46	155	6.89	
Argyrozona argyrozona	11.32	41	2.95	
Callorhynchus capensis	28.50	16	2.04	
Raja wallacei	6.41	3	0.46	
Pliotrema varient	4.23	3	0.30	
Raja straeleni	1.53	5	0.11	
Scyllorhinus capensis	1.17	3	0.08	
Total	1399.25		99.95	

PROJECT STATION: 38
 DATE: 21/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3422 Long E 2308
 start stop duration
 TIME :09:16:50 09:33:43 17 (min) Purpose code: 1
 LOG :5237.45 5238.29 0.82 Area code :
 FDEPTH: 111 109 GearCond code:
 BDEPTH: 111 109 Validity code:
 Towing dir: 8° Wire out: 400 m Speed: 30 kn*10

Sorted: 95 Kg Total catch: 95.72 CATCH/HOUR: 337.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Squalus megalops	115.41	371	34.16	
Pterogymnus lanarius	91.76	215	27.16	
Merluccius capensis	76.59	131	22.67	82
Callorhynchus capensis	30.88	18	9.14	
Raja wallacei	9.71	7	2.87	
Raja straeleni	5.65	14	1.67	
Loligo reynaudi	4.55	71	1.35	
Congloporus spinifer	1.20	7	0.36	
Chelidonichthys queketti	0.99	7	0.29	
Zeus capensis	0.88	14	0.26	
Scyllorhinus capensis	0.21	4	0.06	
Total	337.83		99.99	

PROJECT STATION: 39
 DATE: 21/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3422 Long E 2308
 start stop duration
 TIME :11:07:24 11:22:08 15 (min) Purpose code: 1
 LOG :5241.92 5242.67 0.75 Area code :
 FDEPTH: 110 109 GearCond code: 1
 BDEPTH: 110 109 Validity code:
 Towing dir: 80° Wire out: 400 m Speed: 30 kn*10

Sorted: 83 Kg Total catch: 189.19 CATCH/HOUR: 756.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	582.40	2384	76.96	83
Pterogymnus lanarius	74.00	176	9.78	
Merluccius capensis	33.80	40	4.47	84
Callorhynchus galeus	31.40	4	4.15	
Squalus megalops	22.80	92	3.01	
Loligo reynaudi	6.12	44	0.81	
Raja wallacei	2.88	4	0.38	
Raja straeleni	2.64	8	0.35	
Congloporus spinifer	0.40	4	0.05	
Cenopterus capensis	0.16	4	0.02	
Zeus capensis	0.16	4	0.02	
Total	756.76		100.00	

PROJECT STATION: 40
 DATE: 21/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3422 Long E 2308
 start stop duration
 TIME :13:17:33 13:32:05 15 (min) Purpose code: 1
 LOG :5248.08 5248.82 0.74 Area code :
 FDEPTH: 110 109 GearCond code:
 BDEPTH: 110 109 Validity code:
 Towing dir: 85° Wire out: 400 m Speed: 30 kn*10

Sorted: 110 Kg Total catch: 110.33 CATCH/HOUR: 441.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	137.80	252	40.29	85
Squalus megalops	168.80	656	38.25	
Pterogymnus lanarius	74.40	164	16.86	
Argyrozona argyrozona	8.84	8	2.00	
Loligo reynaudi	6.00	72	1.16	
Raja straeleni	3.28	8	0.74	
Chelidonichthys capensis	1.40	4	0.12	
Chelidonichthys queketti	0.44	4	0.10	
Zeus capensis	0.24	4	0.05	
Sepia australis	0.12	28	0.03	
Total	441.32		100.00	

PROJECT STATION: 41
 DATE: 21/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3422 Long E 2308
 start stop duration
 TIME :15:10:15 15:26:04 15 (min) Purpose code: 1
 LOG :5253.86 5254.61 0.74 Area code :
 FDEPTH: 112 110 GearCond code:
 BDEPTH: 112 110 Validity code:
 Towing dir: 85° Wire out: 400 m Speed: 30 kn*10

Sorted: 31 Kg Total catch: 31.68 CATCH/HOUR: 126.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	42.00	72	33.14	87
Squalus megalops	16.60	104	28.88	
Pterogymnus lanarius	31.20	64	24.62	
Loligo reynaudi	7.08	96	5.49	
Congloporus spinifer	4.88	4	3.85	
Trachurus capensis	1.08	4	2.43	86
Gonorynchus gonorynchus	1.00	4	0.79	
Congloporus spinifer	0.88	4	0.69	
Total	126.72		99.99	

PROJECT STATION: 42
 DATE: 21/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3422
 start stop duration Long E 2310
 TIME :16:27:50 16:49:47 22 (min) Purpose code: 1
 LOG :5257.12 5258.20 1.08 Area code :
 FDEPTH: 112 110 GearCond code:
 BDEPTH: 112 110 Validity code:
 Towing dir: 85° Wire out: 400 m Speed: 30 kn*10

Sorted: 181 Kg Total catch: 258.02 CATCH/HOUR: 703.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	283.77	584	40.33	89
Squalus megalops	275.18	1105	39.11	
Pterogymnus lanarius	54.55	125	7.75	
Trachurus capensis	48.68	134	6.92	88
Callorhynchus capensis	20.05	14	2.85	
Mustelus palumbes	6.82	3	0.97	
Sepia australis	2.89	589	0.41	
Raja wallacei	1.85	5	0.26	
Austroglossus pectoralis	1.83	11	0.26	
Raja straeleni	1.50	5	0.21	
Merluccius capensis, juveniles	1.36	19	0.19	90
Haploblepharus edwardsii	1.25	3	0.18	
Gonorynchus gonorynchus	1.01	3	0.14	
Chelidonicichthys queketti	1.01	5	0.14	
Conglopodus spinifer	1.01	5	0.14	
Raja pullopectata	0.35	3	0.05	
Loligo reynaudi	0.25	5	0.04	
Zeus faber	0.19	3	0.03	
Champsodon capensis	0.16	19	0.02	
Total	703.71		100.00	

PROJECT STATION: 43
 DATE: 22/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3546
 start stop duration Long E 2215
 TIME :12:37:47 13:04:07 26 (min) Purpose code: 1
 LOG :5443.77 5444.79 0.95 Area code :
 FDEPTH: 100 100 GearCond code:
 BDEPTH: 260 297 Validity code:
 Towing dir: 65° Wire out: 400 m Speed: 30 kn*10

Sorted: 3 Kg Total catch: 3.45 CATCH/HOUR: 7.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	2.73	115	97.11	92
Sardinops ocellatus	0.23	14	2.89	91
Total	7.96		100.00	

PROJECT STATION: 44
 DATE: 22/ 9/97 GEAR TYPE: PT No:1 POSITION: Lat S 3537
 start stop duration Long E 2213
 TIME :15:32:06 15:52:10 20 (min) Purpose code: 1
 LOG :5459.84 5460.91 1.06 Area code :
 FDEPTH: 100 100 GearCond code:
 BDEPTH: 191 196 Validity code:
 Towing dir: 200° Wire out: 400 m Speed: 30 kn*10

Sorted: 14 Kg Total catch: 14.24 CATCH/HOUR: 42.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	42.50	705	99.72	93
Nodaropsis eblanae	0.12	6	0.28	
Total	42.72		100.00	

PROJECT STATION: 45
 DATE: 21/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3423
 start stop duration Long E 2315
 TIME :07:27:04 07:48:47 22 (min) Purpose code: 1
 LOG :5610.5 5611.08 1.06 Area code :
 FDEPTH: 110 111 GearCond code:
 BDEPTH: 110 111 Validity code:
 Towing dir: 90° Wire out: 400 m Speed: 30 kn*10

Sorted: 142 Kg Total catch: 112.03 CATCH/HOUR: 387.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	134.68	508	41.22	94
Merluccius capensis	81.43	83	21.02	95
Pterogymnus lanarius	62.45	122	16.12	
Chelidonicichthys capensis	28.85	11	8.49	
Squalus megalops	16.23	14	4.19	
Thysites atun	15.82	3	4.08	
Loligo reynaudi	11.18	114	2.89	
Callorhynchus capensis	7.64	4	1.97	
Raja straeleni	4.23	3	1.09	
Argyroteuthis argentea	3.37	3	0.61	
Haploblepharus edwardsii	1.83	3	0.47	
Helicolenus dactylopterus	0.95	112	0.25	
Zeus capensis	0.93	3	0.24	
Conglopodus spinifer	0.55	5	0.14	
Gonypterus capensis	0.49	3	0.13	
Sepia australis	0.11	5	0.11	
Austroglossus capensis	0.11	3	0.04	
Total	387.35		99.96	

PROJECT STATION: 46
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3423
 start stop duration Long E 2315
 TIME :09:22:21 09:42:38 20 (min) Purpose code: 1
 LOG :5616.76 5617.79 1.06 Area code :
 FDEPTH: 110 110 GearCond code:
 BDEPTH: 110 110 Validity code:
 Towing dir: 90° Wire out: 400 m Speed: 30 kn*10

Sorted: 45 Kg Total catch: 45.75 CATCH/HOUR: 137.25

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	68.25	90	49.73	96
Loligo reynaudi	20.55	246	14.97	
Pterogymnus lanarius	19.80	57	14.43	
Squalus megalops	6.45	15	4.70	
Chelidonicichthys capensis	5.76	3	4.20	
Helicolenus dactylopterus	4.71	42	3.43	
Etrumeus whiteheadi	2.82	96	2.05	97
Engraulis capensis	2.43	237	1.77	98
Haploblepharus edwardsii	1.65	3	1.20	
Scyliorhinus capensis	1.47	6	1.07	
Gonorynchus gonorynchus	1.26	3	0.92	
Sardinops ocellatus	0.87	57	0.63	99
Chelidonicichthys queketti	0.78	6	0.57	
Conglopodus spinifer	0.45	3	0.33	
Total	137.25		100.00	

PROJECT STATION: 47
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3423
 start stop duration Long E 2315
 TIME :11:10:03 11:30:20 20 (min) Purpose code: 1
 LOG :5621.93 5622.88 0.94 Area code :
 FDEPTH: 109 110 GearCond code:
 BDEPTH: 109 110 Validity code:
 Towing dir: 90° Wire out: 400 m Speed: 30 kn*10

Sorted: 181 Kg Total catch: 179.72 CATCH/HOUR: 539.16

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	350.55	1638	65.02	100
Merluccius capensis	52.35	51	9.71	101
Pterogymnus lanarius	31.80	87	5.90	
Callorhynchus capensis	28.20	18	5.23	
Helicolenus dactylopterus	19.65	498	3.64	
Loligo reynaudi	9.91	111	2.77	
Haploblepharus edwardsii	9.93	3	1.84	
Conglopodus torvus	8.16	9	1.51	
Conglopodus spinifer	6.72	39	1.25	
Squalus megalops	5.34	12	0.99	
Mustelus palumbes	5.07	1	0.94	
Chelidonicichthys queketti	4.20	24	0.78	
Gonorynchus gonorynchus	0.93	1	0.17	
Scyliorhinus capensis	0.87	3	0.16	
Gonypterus capensis	0.30	3	0.06	
Zeus capensis	0.18	3	0.03	
Total	539.16		100.00	

PROJECT STATION: 48
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3423
 start stop duration Long E 2315
 TIME :13:12:23 13:32:08 20 (min) Purpose code: 1
 LOG :5627.21 5628.15 0.92 Area code :
 FDEPTH: 109 110 GearCond code:
 BDEPTH: 109 110 Validity code:
 Towing dir: 90° Wire out: 400 m Speed: 30 kn*10

Sorted: 56 Kg Total catch: 56.25 CATCH/HOUR: 168.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	88.45	114	52.36	102
Helicolenus dactylopterus	21.90	112	12.98	
Loligo reynaudi	12.84	132	7.61	
Haploblepharus edwardsii	9.33	18	5.53	
Mustelus palumbes	8.16	3	4.84	
Octopus vulgaris	7.50	6	4.44	
Scyliorhinus capensis	6.12	3	3.63	
Pterogymnus lanarius	5.85	24	3.47	
Conglopodus spinifer	2.19	15	1.30	
Zeus capensis	1.86	18	1.10	
Gonorynchus gonorynchus	1.18	6	0.82	
Squalus megalops	1.15	3	0.80	
Gonypterus capensis	1.11	6	0.69	
Chelidonicichthys queketti	0.54	6	0.32	
Cynoglossus zanzibarensis	0.15	4	0.09	
Sepia australis	0.06	6	0.04	
Total	168.75		100.02	

PROJECT STATION: 49
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3423
 start stop duration Long E 2315
 TIME :15:12:52 15:33:21 20 (min) Purpose code: 1
 LOG :5632.74 5633.75 1.00 Area code :
 FDEPTH: 110 110 GearCond.code:
 BDEPTH: 110 110 Validity code:
 Towing dir: 90° Wire out: 400 m Speed: 30 kn*10

Sorted: 79 Kg Total catch: 79.46 CATCH/HOUR: 238.38

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Merluccius capensis	171.30 237	71.86	103
Helicolenus dactylopterus	30.15 405	12.63	
Callorhynchus capensis	11.25 3	4.72	
Loligo reynaudi	6.75 39	2.83	
Pterogymnus laniarius	6.09 27	2.55	
Haplolepharus edwardsii	5.16 6	2.16	
Congiopodus torvus	2.07 9	0.87	
Chelidonichthys queketti	1.50 9	0.63	
Trachurus capensis	1.20 3	0.50	
Cynoglossus zanzibarensis	0.60 3	0.25	
Zeus capensis	0.60 9	0.25	
Congiopodus spinifer	0.57 3	0.24	
Genypterus capensis	0.54 6	0.23	
Squalus megalops	0.36 3	0.15	
Sepia australis	0.18 30	0.08	
Arnoglossus capensis	0.03 9	0.01	
Champsodon capensis	0.03 3	0.01	
Total	238.38	99.99	

PROJECT STATION: 52
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2318
 TIME :21:10:13 21:30:34 20 (min) Purpose code: 1
 LOG :5658.02 5659.08 1.05 Area code :
 FDEPTH: 112 112 GearCond.code:
 BDEPTH: 112 112 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 32 kn*10

Sorted: 78 Kg Total catch: 78.73 CATCH/HOUR: 236.19

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Pterogymnus laniarius	75.90	32.14	
Trachurus capensis	64.80 264	27.44	108
Merluccius capensis	37.20 24	15.75	109
Helicolenus dactylopterus	21.75 324	9.21	
Chelidonichthys capensis	15.30 9	6.48	
Squalus megalops	6.90 21	2.92	
Octopus vulgaris	6.72 6	2.85	
Chelidonichthys queketti	1.32 9	0.56	
Genypterus capensis	0.96 3	0.41	
Sepia typica	0.90 3	0.38	
Cynoglossus zanzibarensis	0.84 6	0.36	
Zeus faber	0.75 12	0.32	
Congiopodus spinifer	0.60 3	0.25	
Chelodactylus fasciatus	0.60 3	0.25	
Sepia australis	0.60 81	0.25	
Arnoglossus capensis	0.51 24	0.22	
Loligo reynaudi	0.27 3	0.11	
Gnathopis sp	0.21 6	0.09	
Callionymus sp.	0.03 3	0.01	
Rossia sp	0.03 3	0.01	
Total	236.19	100.01	

PROJECT STATION: 50
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2317
 TIME :17:26:01 17:46:58 21 (min) Purpose code: 1
 LOG :5642.86 5644.03 1.15 Area code :
 FDEPTH: 112 112 GearCond.code:
 BDEPTH: 112 112 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10

Sorted: 75 Kg Total catch: 75.30 CATCH/HOUR: 215.14

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Merluccius capensis	100.00 174	46.48	105
Pterogymnus laniarius	55.71 161	25.89	
Helicolenus dactylopterus	19.57 314	9.10	
Callorhynchus capensis	8.74 3	4.06	
Squalus megalops	6.51 14	3.03	
Octopus vulgaris	5.71 3	2.65	
Trachurus capensis	5.29 34	2.46	104
Genypterus capensis	2.89 9	1.34	
Chelidonichthys queketti	2.54 26	1.18	
Chelidonichthys capensis	2.37 3	1.10	
Engraulis capensis	1.63 123	0.76	
Sepia hieronis	1.43 3	0.66	
Loligo reynaudi	0.97 6	0.45	
Panulirus sp	0.83 3	0.39	
Cynoglossus zanzibarensis	0.83 9	0.39	
Zeus capensis	0.43 3	0.20	
Arnoglossus capensis	0.31 14	0.14	
Sepia australis	0.14 29	0.07	
Callionymus sp	0.11 11	0.05	
Sardinops ocellatus	0.11 3	0.05	
Gnathopis sp	0.11 3	0.05	
Sepia tuberculata	0.09 3	0.04	
Sepia typica	0.09 9	0.04	
Total	216.41	100.58	

PROJECT STATION: 53
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2317
 TIME :23:12:21 23:32:18 20 (min) Purpose code: 1
 LOG :5663.69 5664.65 0.95 Area code :
 FDEPTH: 112 112 GearCond.code:
 BDEPTH: 112 112 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10

Sorted: 66 Kg Total catch: 66.70 CATCH/HOUR: 200.10

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Pterogymnus laniarius	49.65 129	24.81	
Merluccius capensis	43.65 60	21.81	111
Trachurus capensis	41.61 186	20.79	110
Helicolenus dactylopterus	29.10 445	14.54	
Loligo reynaudi	5.91 30	2.95	
Chelidonichthys capensis	5.28 3	2.64	
Octopus vulgaris	4.98 3	2.49	
Squalus megalops	1.90 24	1.95	
Sepia typica	3.21 6	1.60	
Congiopodus torvus	2.79 3	1.39	
Genypterus capensis	2.55 9	1.27	
Cynoglossus zanzibarensis	1.62 15	0.81	
Gnathopis sp	1.26 27	0.63	
Chelidonichthys queketti	1.14 15	0.57	
Scomber japonicus	0.99 3	0.49	
Arnoglossus capensis	0.75 36	0.37	
Zeus capensis	0.51 9	0.25	
Sepia australis	0.45 84	0.22	
Congiopodus spinifer	0.45 3	0.22	
MACROURIDAE	0.30 9	0.15	
Engraulis capensis	0.09 9	0.04	
Total	200.19	99.99	

PROJECT STATION: 51
 DATE: 23/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2317
 TIME :19:17:24 19:37:40 20 (min) Purpose code: 1
 LOG :5651.26 5652.39 1.11 Area code :
 FDEPTH: 112 112 GearCond.code:
 BDEPTH: 112 112 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 32 kn*10

Sorted: 73 Kg Total catch: 73.35 CATCH/HOUR: 220.05

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Pterogymnus laniarius	83.30 183	28.84	
Trachurus capensis	80.25 224	22.84	107
Merluccius capensis	41.55 84	20.25	106
Helicolenus dactylopterus	25.35 417	11.52	
Octopus vulgaris	15.42 6	7.01	
Squalus megalops	8.64 21	3.83	
Chelidonichthys capensis	4.23 3	1.92	
Zeus capensis	2.90 12	1.35	
Genypterus capensis	2.82 13	1.28	
Chelidonichthys queketti	1.32 13	0.60	
Callionymus sp	0.51 9	0.23	
Gnathopis sp	0.33 6	0.15	
Sepia australis	0.27 13	0.12	
Loligo reynaudi	0.21 12	0.10	
Engraulis capensis	0.15 9	0.07	
Arnoglossus capensis	0.03 12	0.01	
Total	219.75	99.81	

PROJECT STATION: 54
 DATE: 24/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2317
 TIME :01:15:01 01:35:19 20 (min) Purpose code: 1
 LOG :5664.82 5666.80 0.97 Area code :
 FDEPTH: 112 112 GearCond.code:
 BDEPTH: 112 112 Validity code:
 Towing dir: 90° Wire out: 561 m Speed: 140 kn*10

Sorted: 88 Kg Total catch: 88.41 CATCH/HOUR: 265.23

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Trachurus capensis	129.00 571	48.64	112
Merluccius capensis	43.15 85	17.02	111
Pterogymnus laniarius	39.60 114	14.91	
Helicolenus dactylopterus	21.40 381	8.01	
Callorhynchus capensis	8.85 3	1.44	
Chelidonichthys capensis	4.38 3	1.55	
Loligo reynaudi	3.51 15	1.42	
Congiopodus torvus	1.15 3	1.19	
Squalus megalops	2.71 6	1.01	
Chelidonichthys queketti	2.67 24	1.01	
Arnoglossus capensis	1.11 51	0.47	
Zeus capensis	1.08 9	0.41	
Cynoglossus zanzibarensis	1.08 9	0.41	
Congiopodus spinifer	0.65 3	0.25	
Genypterus capensis	0.54 3	0.20	
Sepia australis	0.42 8	0.16	
Total	265.23	100.01	

PROJECT STATION: 55
 DATE: 24/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2317
 TIME :03:10:29 03:30:28 20 (min) Purpose code: 1
 LOG :5673.93 5675.05 1.11 Area code :
 FDEPTH: 112 111 GearCond.code:
 BDEPTH: 112 111 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 30 kn*10

Sorted: 57 Kg Total catch: 57.79 CATCH/HOUR: 173.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	74.25	330	42.83	114
Merluccius capensis	52.35	78	30.20	115
Helicolenus dactylopterus	15.75	255	9.08	
Pterogymnus lanarius	12.75	90	7.35	
Scomber japonicus	5.37	15	3.10	
Squalus megalops	3.63	9	2.09	
Engraulis capensis	1.86	156	1.07	
Gnathopis sp.	1.47	57	0.85	
Chelidonichthys queketti	1.17	15	0.67	
Zeus capensis	1.05	3	0.61	
Sepia australis	0.90	177	0.52	
Gonorrhynchus gonorrhynchus	0.87	3	0.50	
Arnoglossus capensis	0.78	36	0.45	
Conglopodus spinifer	0.51		0.29	
Cynoglossus zanzibarensis	0.36	3	0.21	
Champsodon capensis	0.18	6	0.10	
Etrumeus whiteheadi	0.12	3	0.07	
Total		173.37	99.99	

PROJECT STATION: 56
 DATE: 24/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2317
 TIME :05:05:43 05:25:37 20 (min) Purpose code: 1
 LOG :5680.53 5681.60 1.06 Area code :
 FDEPTH: 112 112 GearCond.code:
 BDEPTH: 112 112 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 31 kn*10

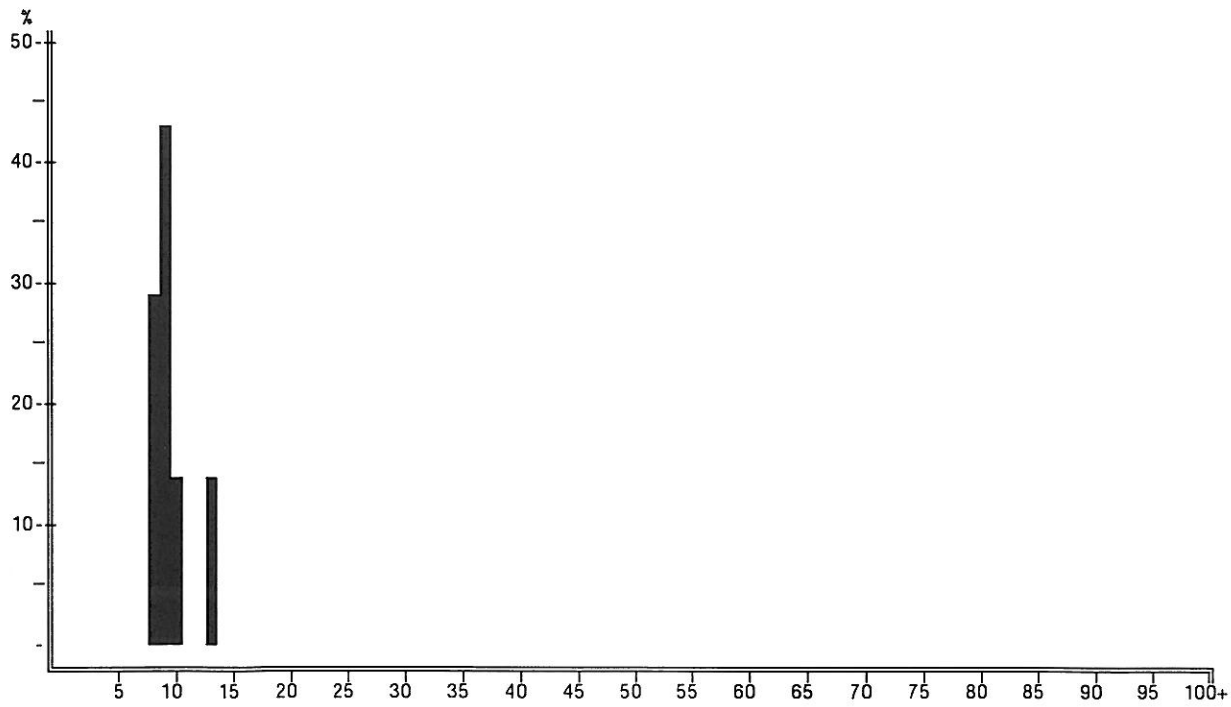
Sorted: 47 Kg Total catch: 47.80 CATCH/HOUR: 143.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pterogymnus lanarius	34.65	87	24.16	
Trachurus capensis	29.10	135	20.29	117
Squalus megalops	24.60	45	17.15	
Merluccius capensis	11.70	18	8.16	116
Helicolenus dactylopterus	11.70	105	8.16	
Loligo reynaudi	9.24	93	6.44	
Conglopodus torvus	6.60	6	4.60	
Callorhynchus capensis	6.60	3	4.60	
Chelidonichthys capensis	4.50	3	3.14	
Gonorrhynchus gonorrhynchus	1.98	6	1.18	
Haploblepharus edwardsii	1.95	3	1.16	
Chelidonichthys queketti	0.48	3	0.33	
Arnoglossus capensis	0.03	6	0.02	
Total		143.13	99.79	

PROJECT STATION: 57
 DATE: 24/ 9/97 GEAR TYPE: BT No: POSITION: Lat S 3424
 start stop duration Long E 2318
 TIME :07:07:47 07:27:39 20 (min) Purpose code: 1
 LOG :5686.96 5687.87 1.09 Area code :
 FDEPTH: 112 112 GearCond.code:
 BDEPTH: 112 112 Validity code:
 Towing dir: 270° Wire out: 400 m Speed: 31 kn*10

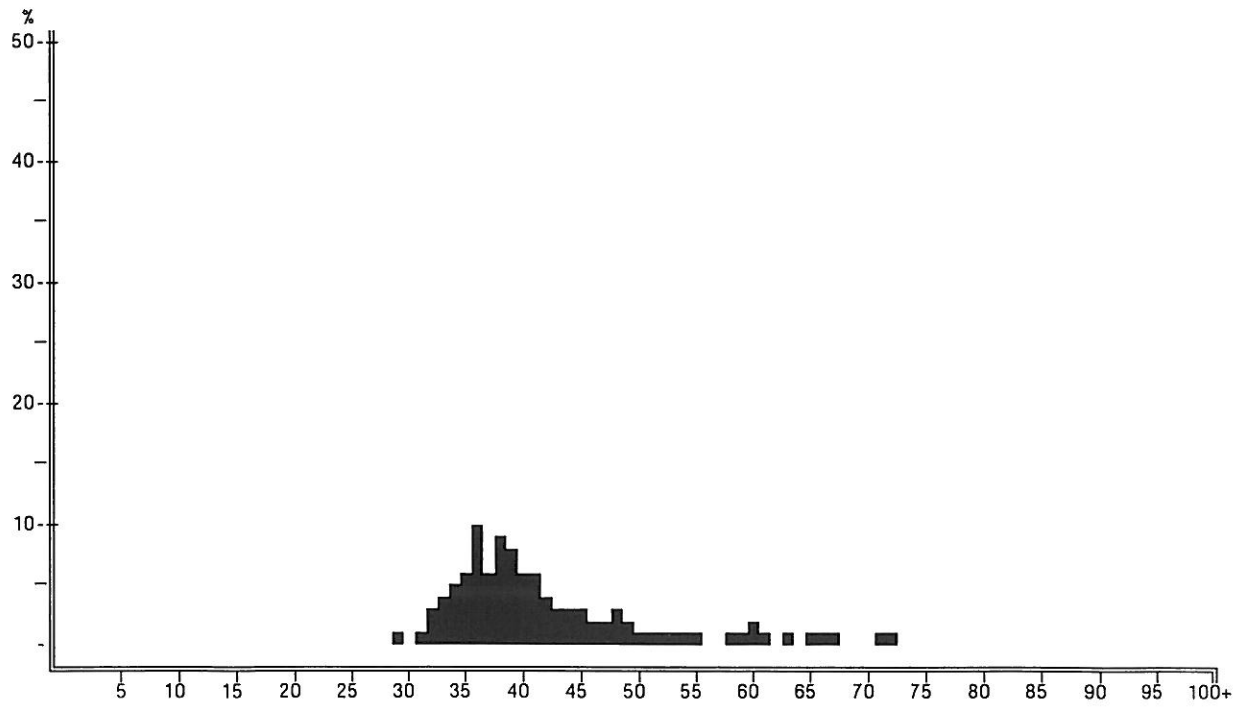
Sorted: 35 Kg Total catch: 35.18 CATCH/HOUR: 105.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pterogymnus lanarius	12.70	96	30.98	
Trachurus capensis	20.25	87	19.19	118
Squalus megalops	13.20	21	12.51	
Argyrozona argyrozona	7.98	9	7.56	
Loligo reynaudi	5.70	78	5.40	
Merluccius capensis	5.25	15	4.97	119
Helicolenus dactylopterus	4.80	54	4.55	
Conglopodus torvus	4.59	9	4.35	
Haploblepharus edwardsii	4.12	6	4.09	
Gonorrhynchus gonorrhynchus	4.14	3	3.92	
Chelidonichthys capensis	4.74	3	4.65	
Scylliochthys capensis	0.51	3	0.48	
Chelidonichthys queketti	0.35	3	0.34	
Total		105.51	99.99	



Merluccius capensis, juveniles
Experiment No. 2
Pooled sample (simple adding).

MEAN LENGTH = 9.93cm N= 7
 NUMBER OF SUBSAMPLES : 1
 SAMPLES FOUND BETWEEN ST. NO. 42 AND 42.
 SAMPLES SEARCHED BETWEEN ST. NO. 37 AND 42 .



Merluccius capensis
Experiment No. 3
Pooled sample (simple adding).

MEAN LENGTH = 43.03cm N= 383
 NUMBER OF SUBSAMPLES : 13
 SAMPLES FOUND BETWEEN ST. NO. 45 AND 57.
 SAMPLES SEARCHED BETWEEN ST. NO. 45 AND 57 .

