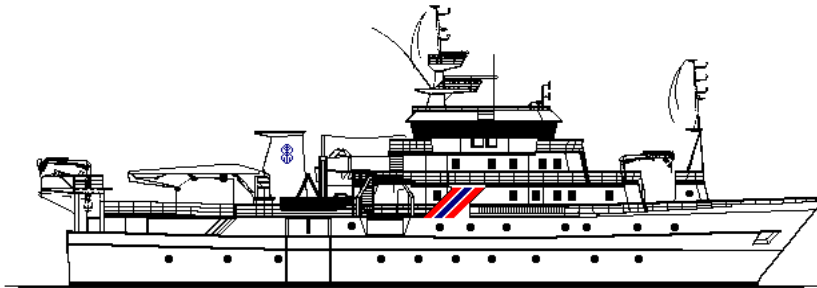


NORAD - FAO/UNDP PROJECT GLO 92/013

CRUISE REPORTS "DR. FRIDTJOF NANSEN"



## **BENEFIT SURVEYS**

**Cruise Report No 4/2000**

**Multifrequency acoustic target identification, multisampler trawling, trophic interaction and sonar studies**

**12 – 30 June 2000**

**Marine Coastal Management  
Cape Town  
South-Africa**

**Ministry of Fisheries & Marine Resources  
Swakopmund  
Republic of Namibia**

**Institute of Marine Research  
Bergen  
Norway**

**Cape Technikon  
Cape Town  
South-Africa**

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**12 – 30 June 2000**

by

**Janet Coetzee<sup>1</sup>, Ole Arve Misund<sup>2</sup>, Dagmar Merkle<sup>1</sup>, Mike Soule<sup>1</sup>, Charlene Rogers<sup>3</sup>,  
Roar Skeide<sup>2</sup>, Anja Kreiner<sup>4</sup>, Granville Louw<sup>1</sup>, Rob Cooper<sup>1</sup>, Ralton Maree<sup>1</sup>, Eli  
Haugland<sup>2</sup>, Tembaletu Tanci<sup>1</sup>, Ebrahim Galie<sup>1</sup>, Magnar Mjanger<sup>2</sup>, Jarle Johannesen<sup>2</sup>,  
Shawn Berry<sup>1</sup>, Megan Terry<sup>1</sup>, Susan Jones<sup>1</sup> and Envor Malan<sup>1</sup>**

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## CHAPTER 1 INTRODUCTION

### 1.1 BACKGROUND

Off the west and south coasts of South Africa, and the Coast of Namibia, four pelagic fish species co-occur in varying degrees at different times of the year. These include anchovy (*Engraulis capensis*), sardine (*Sardinops sagax*), round herring (*Etrumeus whiteheadi*) and juvenile horse mackerel (*Trachurus trachurus capensis*). Acoustic assessments of the biomass of both anchovy and sardine in the Benguela current region have been done since the mid 1980's.

Accurate hydro acoustic assessment of the biomass of a particular species has been limited, however, by the difficulty to objectively differentiate among taxonomic groups of sound-scatterers. Identification methods most commonly used include trawl sampling close to the acoustic targets and visual interpretation of the echograms based on previous knowledge of a species' shoaling patterns. Often, however, these techniques have not enabled unbiased discrimination between co-occurring fish species. Catchability of different species may vary and the trawl cannot achieve a spatial and temporal sampling comparable with that of acoustic sampling. In addition, identifying species based on echogram characteristics remains subjective. Species mixing in aggregations may therefore lead to biases in the proportion of the measured acoustic energy allocated to a particular species.

The development of fish-species identification methods based on acoustic data may be one of the keys for the reduction of error in biomass estimation. The scattering of sound by marine organisms depends upon their size, shape, orientation and physiological properties as well as the frequency of the echosounder. With the many varied species of pelagic and mesopelagic fish species in the Benguela region, spanning a wide range of these morphological parameters, the scattering properties will in turn vary widely.

At present, most acoustic surveys in the Benguela region are based on samples taken using 38 kHz transducers. However, several vessels in the area have multifrequency capabilities. It would therefore be potentially possible to use acoustic signatures at more than one frequency to identify the main scattering organisms.

Ground-truthing can also be improved by using multiple cod-end nets capable of catching discrete vertical layers and horizontally separated fish schools, as apposed to the single cod-end nets currently used throughout the Benguela.

In addition, the acoustic records collected may reveal spatial relationships between marine organisms, particularly in the biologically-complex scattering layers of the northern and southern Benguela, where macrozooplankton, micronekton, and fish scattering layers aggregate and interact. It is therefore possible to investigate trophic links between different scattering layers observed and to highlight the reasons behind their spatial and temporal structural patterns.

A further objective of this study was to evaluate the progress made in the development of the processing software needed for fish school mapping when using sonar. Horizontal guided sonar can record fish schools where conventional echo integration fails due to vessel avoidance and distribution above the transducer depth. Such distribution pattern and avoidance reactions can cause significant difference in number of schools recorded when comparing fish density estimates obtained by sonar and echo sounder. Using the sonar in combination with traditional echo integration will probably improve the biomass estimation for fishery management.

Finally, target strength is the scaling factor required to convert echo intensity to fish density. The accurate determination of target strength is therefore essential when backscattering area collected during acoustic surveys is translated to biomass estimates. The objective of target strength experiments during this survey was to obtain accurate *in situ* target strengths of loosely aggregated, homogenous pelagic fish scattering layers and to test the feasibility of using multifrequency methods for discrimination of single targets.

## **1.2 OBJECTIVES OF THE SURVEY**

The overall survey objective was to improve species identification techniques using multifrequency acoustics, but more specifically:

- To carry out continous acoustic measurements of hake (*Merluccius capensis*, M.

*paradoxus*) and associated pelagic species at 18, 38 and 120 kHz during 24 hour cycles to elaborate potential acoustical characteristics at different times of day and night.

- Species identification of recorded layers or schools were to be conducted using standard pelagic sampling trawl with an attached multiple cod-end device (Multisampler) enabling discrete samples to be obtained from various depths. A demersal trawl was used to sample fish close to and on the bottom.
- The entire water column was to be sampled for zooplankton with the Hydrobios multinet to enable characterisation of each specific zooplankton layer and for analysis of feeding strategies
- To collect *in situ* target strength data on loosely aggregated, homogenous pelagic fish scattering layers.
- CTD casts and ADCP recordings were to be carried out for mapping of environmental factors.
- To compare the diurnal migration pattern of hake and related species at two or more differently located 24 hour stations.
- To find an area dominated by juvenile horse mackerel and to conduct a 24 hour experiment for studies of vertical migration, pelagic fish school composition and feeding strategy
- To conduct small boat experiments to study the effects of vessel avoidance by pelagic schools
- To conduct a sonar survey for testing of the latest SODAPS software and for comparing biomass estimates obtained from traditional echo sounding and the mapping of schools by the sonar method.
- To carry out studies of pelagic schools in South-Africa and study intra- and inter school variation of species- and size distribution by means of *Multisampler* and Scanmar systems.

### 1.3 PARTICIPATION

The scientific staff consisted of:

From South Africa:

12/6/00 – 18/6/00 Janet Coetzee (cruise leader), Shawn Berry, Rob Cooper, Mike Soule, Ralton Maree, Granville Louw, Charlene Rogers, Ebrahim Galie and Tembaletu Tanci

18/6/00 – 29/6/00 Janet Coetzee, Dagmar Merkle, Megan Terry, Susan Jones, Envor Malan, Charlene Rogers and Granville Louw.

From Namibia:

18/6/00 – 24/6/00 Anja Kreiner

From Norway:

12/6/00 - 18/6/00 Magnar Mjanger, Jarle Johannesen, Roar Skeide

18/6/00 - 29/6/00 Ole Misund (cruise responsible), Eli Haugland, Magnar Mjanger, Jarle Johannesen, Roar Skeide

### 1.4 NARRATIVE

The RV *Dr. Fridtjof Nansen* departed from Cape Town at 17:00 on 12 June, and headed for False Bay for calibration of the scientific echo sounders. To make use of time before sunrise, two transects were done in an east/west direction across the bay for collection of target strength data. Two pelagic trawls were also carried out to identify the sound scattering layers. The calibration commenced at 08:00 and was completed by 18:00.

Following the calibration, a 24 hour diel cycle experiment was initiated about 40 nm west of Cape Town. The first bottom trawl started at midnight on the 13<sup>th</sup> and the last pelagic multisample trawl of the experiment was just after midnight on the 14<sup>th</sup>. Five complete cycles including a bottom trawl, multisampler trawl, and CTD cast were completed during this experiment. Unfortunately no multinet hauls were possible as the motor was not onboard.

On completion of the first diel cycle experiment the ship steamed towards Cape Hangklip where a school composition/scattering layer experiment was initiated on the 15<sup>th</sup>. Ten transects were steamed between Cape Hangklip and Cape Agulhas, during which 31 trawls were done. Most of these were multisample trawls where discreet schools or scattering layers were targeted. On completion of the 10 transects, the ship steamed back to Cape Town to Dock on the 18<sup>th</sup>.

A changeover of scientific personell took place on the 19<sup>th</sup> and some additional bunkering took place. The ship then departed from Cape Town at 21:00 and steamed towards Quoin Point in search of juvenile Horse mackerel schools. Two days were spent trawling with the multisampler on discreet schools and sampling vertically separated layers. No horse mackerel schools were however found, only a very weak scattering layer from the surface down to about 50 m. These horse mackerel were still very small (5cm or less total length) and not suitable for a horse mackerel dynamics study. By 16:00 on the 21<sup>st</sup> the wind had increased considerably and we decided to seek the shelter of False Bay.

On arrival in False Bay a sonar study was started at 21:00 on the 19<sup>th</sup>. The study consisted of Five transects which we repeated three times during the next 36 hours. Unfortunately the multisampler motor was damaged in one large catch of anchovy and further target identification trawls were done with the large pelagic trawl. 12 trawls were done inside False Bay and mostly anchovy was found. Ten CTD cast were also made during the course of this mini survey in False Bay. The sonar study was completed by midday on the 23<sup>rd</sup>. As a spare gear for the multisampler motor was ordered from Bergen, we had to stay in False Bay waiting for its delivery by small boat from Simon's Town. The evening of the 23<sup>rd</sup> was spend doing two bottom trawls to find large hake from which we could collect some samples for stomach content analysis. On completion of the trawls we anchored in False Bay for the rest of the night.

On the 24<sup>th</sup> a small boat experiment was attempted. Unfortunately the wind increased rapidly and the experiment had to be called off after just 3 nm of data had been collected. We then steamed closer to Simon's Town and had the multisampler gear delivered to the ship. One scientist and one crew member were also disembarked.

On the 25<sup>th</sup> we steamed north to an area about 30 nm off Dassen Island and started searching for a suitable spot to conduct our second diel cycle experiment. This diel cycle experiment was started at 16:30 on the 25<sup>th</sup> and lasted until 10:00 on the 27<sup>th</sup>. A total of 8 cycles comprising a bottom trawl, multisampler trawl, multinet plankton trawl and a CTD were completed.

Thereafter, we headed north to the region off Cape Columbine in search of horse mackerel and other pelagic schools to conduct more trawling with the multisampler. A further three multisampler trawls were conducted during the evening and night of the 27<sup>th</sup> in order to catch discrete schools and determine the homogeneity of scattering layer distributions. We then did a further 2 small boat experiments of 10 nm each in St. Helena Bay on the morning and afternoon of the 28<sup>th</sup>. Between experiments, another mini sonar survey was conducted. On the evening of the 28<sup>th</sup> we headed back to Cape Town and docked at 08:00 on the 29<sup>th</sup> September.



## **CHAPTER 2      METHODS**

### **2.1 HYDROGRAPHY AND WEATHER DATA**

Meteorological information such as air and surface temperature, wind speed and direction and solar intensity was logged continuously from the ANDREAA weather station. CTD casts a Seabird 911 CTD were done regularly to obtain profiles of temperature, salinity and oxygen. Samples for calibration of the oxygen and salinity sensors were also collected. The oxygen samples were analysed on board, whilst the salinity samples were analysed at the MCM office in Cape Town. ADCP (Acoustic Doppler Current Profiler) measurements were carried out as well.

### **2.2 SURVEY AREA**

The survey area was limited to the shelf area between St Helena Bay and Cape Agulhas (Fig. 1). The first diel cycle experiment took place at a position 40 nm west of Cape Town where the same 5 nm section of track was sampled repeatedly for 24 hours. The second diel cycle experiment was done west of Dassen Island and lasted for 42 hours. The first school composition/scattering layer study consisted on 10 transects between Cape Hangklip and Cape Agulhas. The second school composition/scattering layer study was done in the same area, but consisted of only 5 transects. The transects varied from 10 to 20 nm in length and were positioned approximately normal to the coast. The Sonar survey was done in False Bay and consisted of 5 parallel transects running north to south and positioned 3 nm apart. This grid was repeated three times. The first small boat experiment was also done in False Bay and limited to 3 nm. A further 2 small boat experiments were conducted in St. Helena Bay.

### **2.3 MULTIFREQUENCY ACOUSTIC SAMPLING AND ANALYSIS**

The EK500 echo sounder equipped with three split beam transducers operating at nominal frequencies of 18, 38 and 120 kHz logged data continuously during the survey. The settings used in the EK500 transceiver menus are presented in ANNEX I. To minimise differences in sampling resolution, the pulse length and band width setting of the 18 and 120 kHz transducer were altered to short/wide and long/narrow respectively. Sonardata Echolog software was used to log the data from the ethernet communications port. The data were logged simultaneously by the Bergen Echo Integrator (BEI). Analysis and post processing of logged data was done using Sonardata Echoview software as well as the BEI . All three transceiver were successfully calibrated in False Bay and the new settings were implemented before the start of the survey.

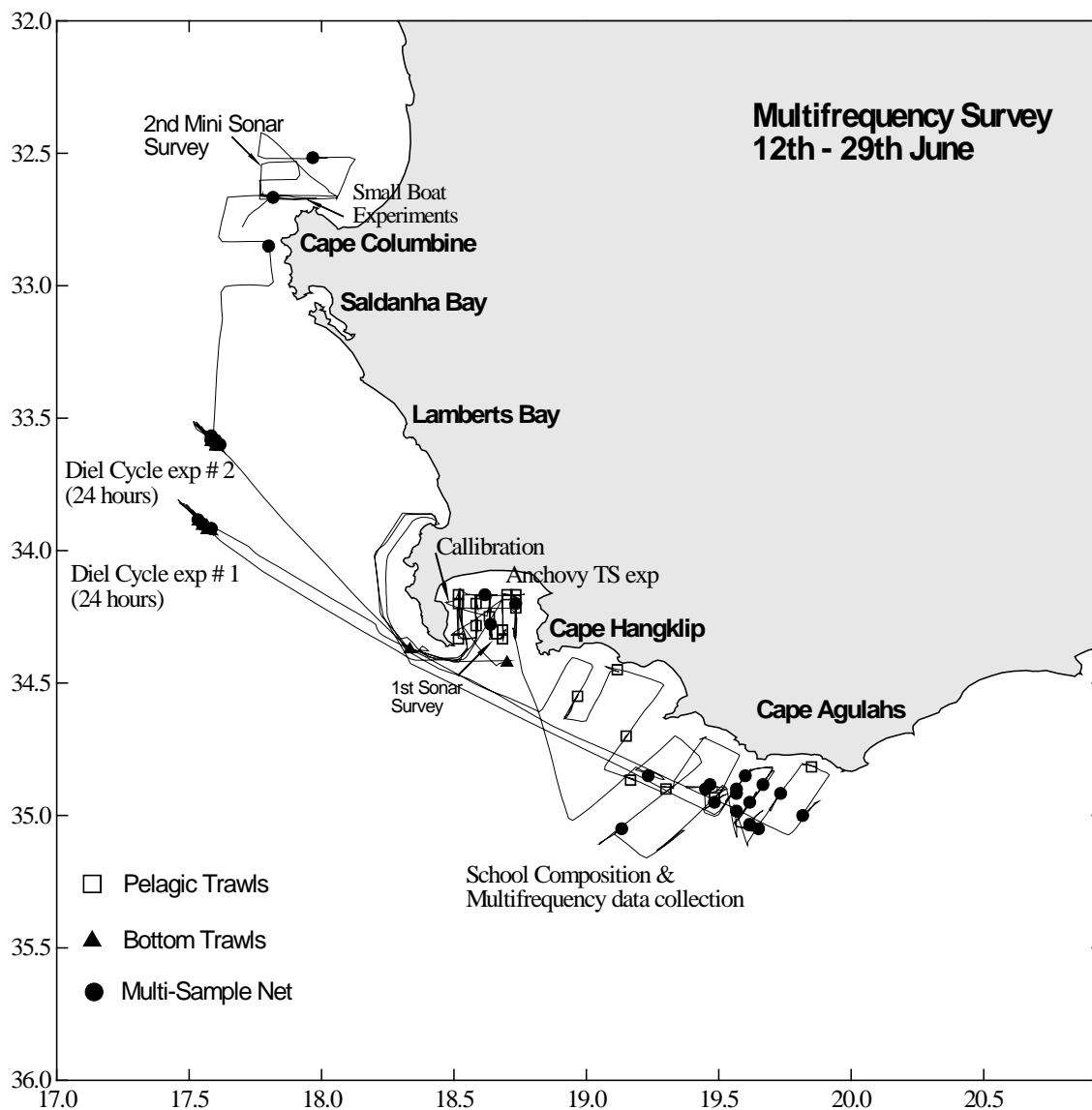


Figure 1. Cruise track and survey details.

A complete discription of the calibration procedures and results are shown in ANNEX IV. A minimum integration threshold of  $-70\text{dB}$  was used for all three frequencies. Integration limits were set to 5 m below the transducer and 1 m off the bottom. The entire survey was done with the keel in the lowered position. The effective integration limits for the 38 kHz and 120 kHz (keel mounted) transducers was therefore 13 m below the surface and that of the 18 kHz transducer (hull mounted) was 10.5 m. A schematic layout of the transducers (Fig. 2) shows the positioning of the transducers.



tend to disperse into layers were therefore analysed. Analysis were also limited to areas where trawl sampling indicated monospecific fish distribution.

Due to the differences in the beam geometry of the three transducers used, it was necessary to standardise the resolvable pulse volume and ensonified volume. At 38 and 120 kHz the resolving distance ( $c\tau/2$ ) is 0.75 m while at 18 kHz it is 0.52 m. To enable comparison of backscattering values at the different frequencies, we therefore averaged bins vertically and used a “new” resolving pulse volume of 3 m at 38 and 120 kHz and 3.15 m at 18 kHz. This effectively translated into averaging 4 bins at 38 and 120 kHz and six bins at 18 kHz.

Also, the number of scatterers ( $n$ ) which are ensonified by the beam will increase with range ( $r$ ), due to the conical shape of the beam according to the following equation:

$$n = \rho_v \cdot A_r \cdot \frac{c\tau}{2} \quad (1)$$

where  $\rho_v \sim$  the target density (number per unit volume),

$A_r \sim$  insonified area at distance  $r$ , and

$\frac{c\tau}{2} \sim$  resolving distance (m)

To calculate the ensonified area  $A_r$ , for each transducer, it is necessary to first calculate the solid angle ( $\Omega$ ) from the half beam angle ( $\hat{\theta}$ ) as follows:

$$\Omega = 2\pi(1 - \cos\hat{\theta})$$

Where  $\hat{\theta}$  in rad. =  $\left( \frac{\frac{\theta}{360} \cdot 2\pi}{2} \right)$ , and  $\theta$  is the beamwidth in degrees

The ensonified area ( $m^2$ ) is then the product of the solid angle and the square of the range

$$A_r = r^2 \Omega$$

And substituting for ( $A_r$ ) in (1), the increase in number of scatterers within the resolved volume as a function of range is calculated:

$$n = \rho_v \cdot r^2 \cdot \Omega \cdot \frac{c\tau}{2}$$

The ratio of the increase in the number of scatterers within the resolved volume is then calculated between transducers. For the purposes of this study, the solid angle of the 18 kHz transducer was theoretically reduced to that of the 38 kHz transducer and the ratio of  $n$  (reduced, 38kHz  $\Omega$ ) to  $n$  (wide 18 kHz  $\Omega$ ) was calculated to be 0.417. In effect this necessitates a reduction in Sv value at 18 kHz of approximately 3.8 dB. Figure 3 shows the

comparison of pulse volume vs range for the three different transducers before any standardization. Figure 4 shows the volume differential between transducers, after applying corrections for changes in sampling volume with range and pulse duration.

These corrections were then applied to the raw sv data exported by echoview and frequency distributions of density for different species at 18, 38 and 120 kHz were computed.

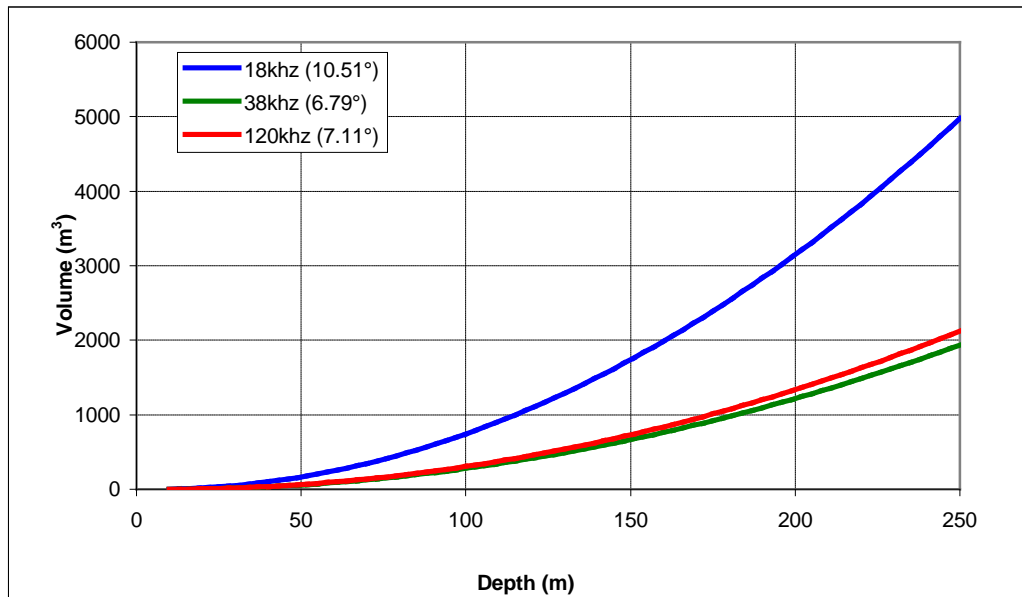


Figure 3. Pulse volume vs. range of the 18, 38 and 120 kHz transducers on *Dr. Fridtjof Nansen*.

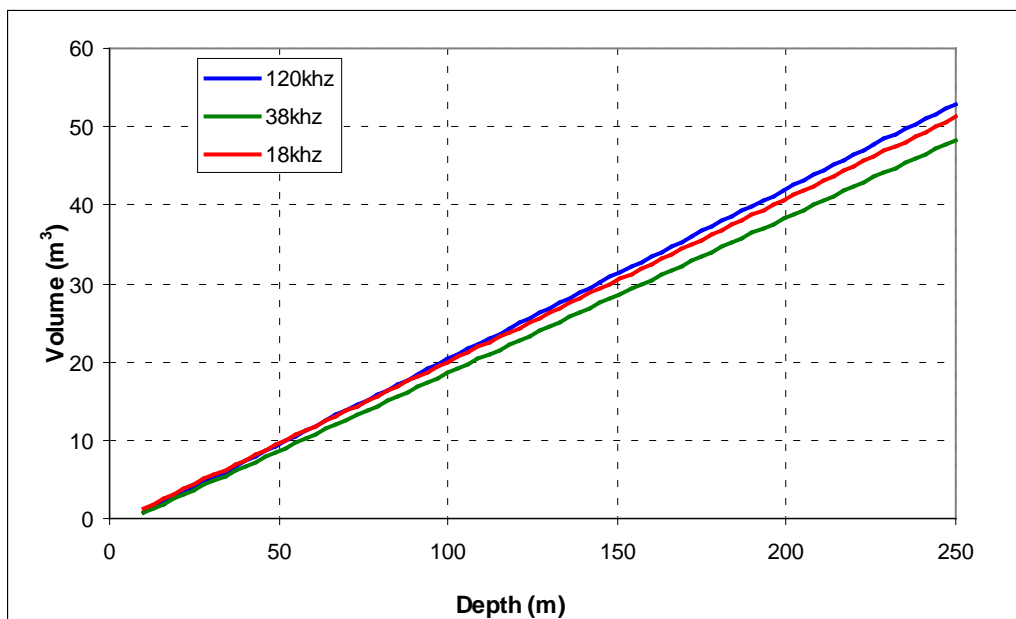


Figure 4. Volume differentials between transducers, after applying sampling volume and pulse duration corrections.

## **2.4 TRAWL SAMPLING**

Sampling trawls used included the large pelagic trawl (30 m vertical opening), the small pelagic trawl (10 m vertical opening) with the multisampler attached and a bottom trawl (5 m vertical opening), with floats for midwater trawling and without floats for bottom trawling. The multisampler was equipped with three codends, which were remotely opened and closed to obtain discrete, uncontaminated samples at different depths or to sample single schools. Thyborøn 2000kg trawl doors were used in all hauls. The settings of the doors were those normally used during pelagic trawling, even for demersal trawling. Detailed operation and adjustments made to the multisampler since 1999 are described in ANNEX III.

A random sample of fish representative of the total catch was taken from the trawl, the size of the sample depending largely on the species mixture of the catch. In cases where the catch was small, the total catch was sampled. To determine the catch composition of the trawl the number and weight for each species in the random sample was recorded. This sample was then raised to the total catch. A random sample of about 100 fish per species, if available, were measured to the nearest 0.5 cm below total length to obtain the size composition of the catch. A sample of each species was frozen for further analysis ashore.

## **2.4 DIEL CYCLE EXPERIMENTS**

For examination of structural patterns and trophic relations between different scattering layers, two diel cycle experiments were completed. The first experiment lasted 24 hours and took place approximately 40 nm west of Cape Town (33° 52.56 S 17° 31.61 E) in about 340 m of water. The second experiment lasted for 42 hours and was done about 20 nm west of Dassen Island (33° 33.72 S 17° 33.95 E) at a depth of approximately 240 m. During these experiments, continuous monitoring by means of multifrequency acoustics, depth discrete sampling of plankton and nekton and frequent CTD casts were done. Sampling during these experiments was restricted to the same 5 nm section of track for the duration of the experiment. Sampling commenced with a bottom trawl, followed by a midwater trawl which sampled various vertically separated layers by means of the multisampler. Finally a depth-stratified zooplankton haul by means of the Hydrobios multinet sampler was done followed by a CTD cast to the bottom.

The hydrobios sampler was fitted with five 405µm mesh nets and flowmeters at the front of each net monitored the volume of water filtered by each net. The nets were hauled obliquely at 0.5 m.s<sup>-1</sup> whilst steaming at approximately 2 knots in a circle. The concentrated samples were

preserved in 4 % buffered formalin. Hydrographical sampling was carried out after each cycle. CTD casts obtained profiles of water temperature, salinity and dissolved oxygen. Water samples were collected for calibration of both the oxygen and salinity probes. Depth specific current speed and direction, including the vertical component and error were measured continuously throughout the experiments using an Acoustic Doppler Current Profiler (ADCP). A total of 5 cycles were sampled during the first experiment and 8 cycles during the second experiment, consisting of a total of 13 bottom trawl, 13 multisampler trawls, 13 hydrobios multinet hauls and 12 CTD casts.

Acoustic data at all three frequencies was logged continuously to determine the depths of and to integrate the various pelagic scattering layers. The species composition of the layers was determined by trawls and the size frequency of the main species was measured. A subsample of each species of hake (*Merluccius capensis* and *Merluccius paradoxus*) were classified by stomach fullness. The stomach content analysis of hake was done on board and included classifying prey items into the lowest possible taxonomic group. Other fish species such as horse mackerel (*Trachurus capensis*), anchovy (*Engraulis capensis*), sardine (*Sardinops sagax*), redeye (*Etrumeus whiteheadi*) and mesopelagic fish (*Maurollicus* spp. and *Lampanyctodes* spp.) were frozen whole for further processing ashore.

## **2.5 SCHOOL COMPOSITION/SCATTERING LAYER STUDIES**

The first and second school composition/scattering layer study took place between Cape Hanglip and Cape Agulhas. A total of 15 parallel transects were surveyed and sampling with both the large pelagic trawl and multisampler trawl was done on a regular basis. During daytime the aim was to sample as many discrete pelagic schools as possible. During the night time vertically separated layers were sampled by means of the multisampler. In order to ensure discrete sampling of schools during the day the time was calculated, based on the trawl configuration and the warp out, that it would take a school once observed on the EK500 to be observed on the trawl monitor system. This ensured that only schools actually observed on the EK500 were sampled. Once the same school was observed on the trawl monitor, the school entering the trawl was marked and labelled on echoview to enable precise matching of the trawl catch with the acoustic recording and the relevant cod-end opened. The time was then calculated, based on warp length and vessel speed, that it would take the school to reach the grid of the multisampler. This ensured that the multisampler was opened and closed at the right time to allow entry of only one school into each codend. Continuous acoustic data was recorded at all three frequencies throughout the duration of these studies.

## ***In Situ* TARGET STRENGTH EXPERIMENTS**

Experiments were conducted to investigate the use of multifrequency techniques to improve the recognition of single targets. By using single target detections within the 120 kHz acoustic beam to discriminate between multiple and single echoes detected within the 38 kHz beam, multiple target echoes may be rejected from target strength measurements.

Transects were sampled along a survey grid in False Bay to search for, and identify single target echoes. Despite targeting numerous single target echoes, few trawls had a catch composition suitable for target strength experiments. While most single target echoes that were trawled upon were found to include various species, few trawls caught more than 95% of a single species. The data presented in the results concentrates on homogenous juvenile horse mackerel samples.

### **2.6 VESSEL AVOIDANCE EXPERIMENTS**

A set of three experiments using a small (5.3 m) Man-Over-Board boat equipped with a portable 38 kHz scientific echo sounder (Simrad EY500) were conducted to study near-surface schooling and vessel avoidance. A complete list of the boat and echo-sounder specifications and settings used is shown in ANNEX I.

The first experiment was done in False Bay on the morning of the 24<sup>th</sup>. During this experiment, the small boat was positioned 0.3 nm ahead of the Nansen (Figure 2). A constant speed of 5 knots was maintained and synchronised intervals of equal length were surveyed by both vessels. Conditions were however too rough and the experiment was terminated after 3 nm. The second and third experiments were done in St. Helena Bay on the morning and afternoon of the 28<sup>th</sup>, with the Nansen again following behind the small boat at a constant speed of 5 knots and an inter-vessel spacing of 0.3nm. Weather conditions during these last two experiments were more favourable. The length of the survey transects in St. Helena Bay was 10 nm.

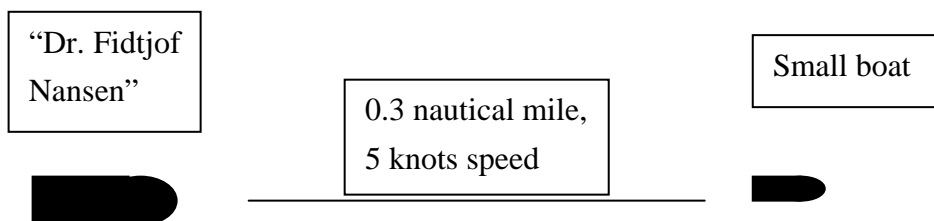


Figure 5. Protocol of small boat experiments in False Bay June 24<sup>th</sup> and in St. Helenabay June 28<sup>th</sup>.



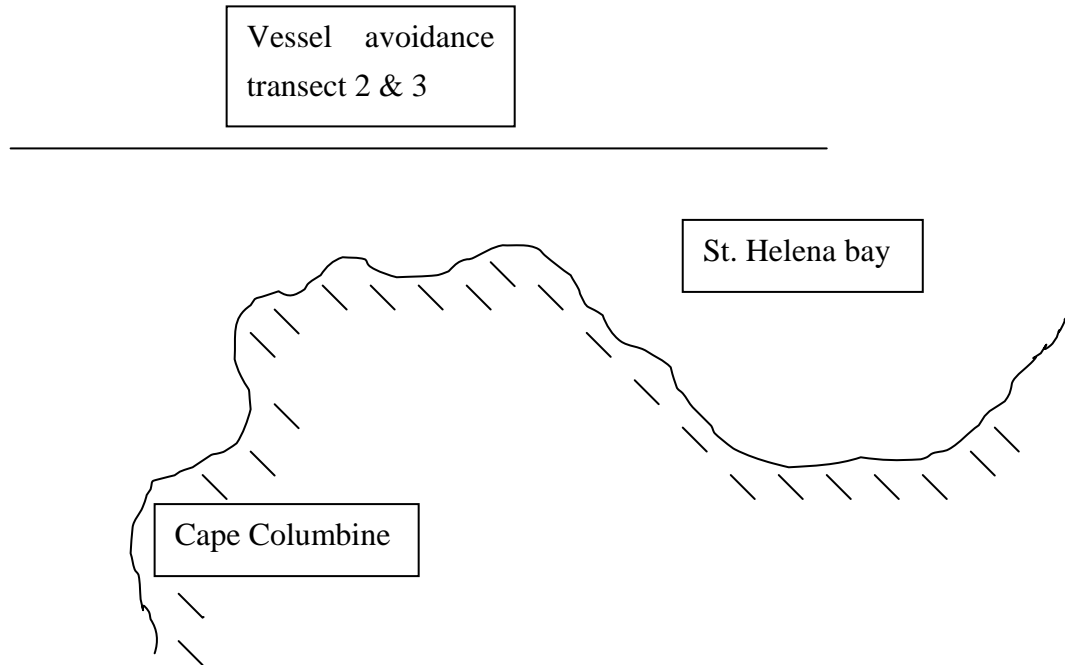


Figure 6. Position of the vessel avoidance transect run by the small boat in front of R/V “Dr. Fridtjof Nansen” June 28<sup>th</sup>.

## 2.7 SONAR COMPARATIVE DENSITY ESTIMATION

R/V “Dr. Fridtjof Nansen” is equipped with a fish school mapping sonar Simrad SF 950D. The sonar is interfaced to SODAPS (Sonar Data Processing System), which is a workstation based software system for logging, on-line monitoring and post processing of sonar data. The system has been specified, modelled and coded during a co-operative R&D project between the IMR and Christian Michelsen Research AS (CMR), Bergen, Norway. The system is rather complex by its structure as well as by its performance, particularly when running in the on-line mode (under-way mode). It runs comparative tests between every sample of the volume backscattering coefficient ( $s_v$ ) of all 32 sonar beams and likewise between neighbouring beams - all in each ping return. During these detections it forms so-called echolines and echoblocks. Thereafter it tests and compares between consecutive pings to form echoblock chains or school candidates. Echolines, echoblocks and school candidates are all elements of potential schools. We have previous to this cruise worked with SODAPS onboard RV “Dr. Fridtjof Nansen” from 1997 to December 1999.

A sonar survey was conducted in False Bay, from 21<sup>st</sup> to 23<sup>rd</sup> June 2000. A grid of transect

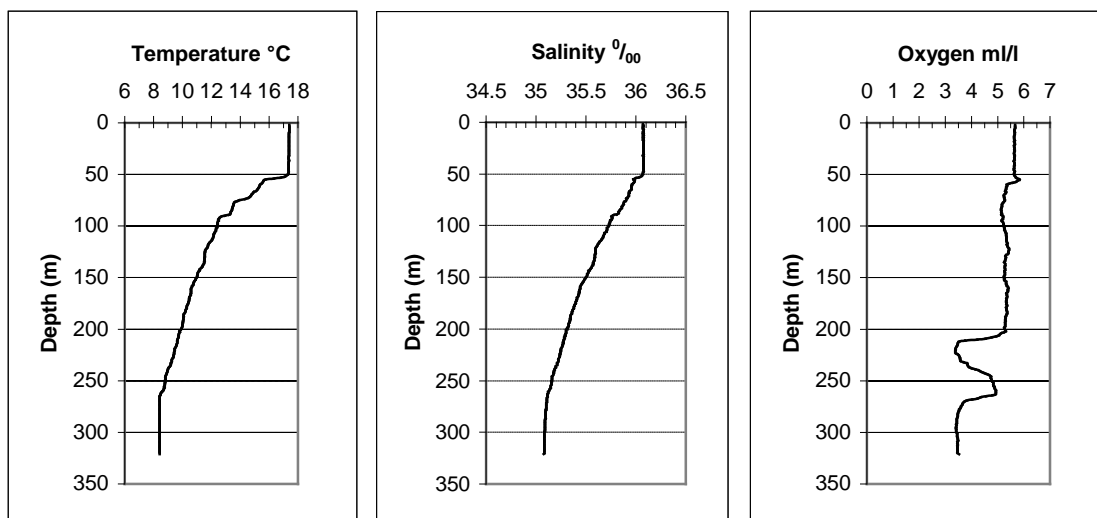
lines which covered a total of 62 nm was surveyed three times. The first of these three mini surveys was done both in darkness and daylight, the second only in darkness and the third in daylight only. During the survey, data was collected both from the echo sounder and the sonar. The SODAPS system logged the sonar data continuously. The collected data was later edited in the echogram window before report files were made. Unfortunately the SODAPS system did not function completely as planned, and severely restricted the possibilities for conducting an automated comparative sonar and echo sounder survey. The only estimates available from the sonar at this time are therefore based on summed area of schools which were manually identified and measured on the echogram paper.

# CHAPTER 3 RESULTS

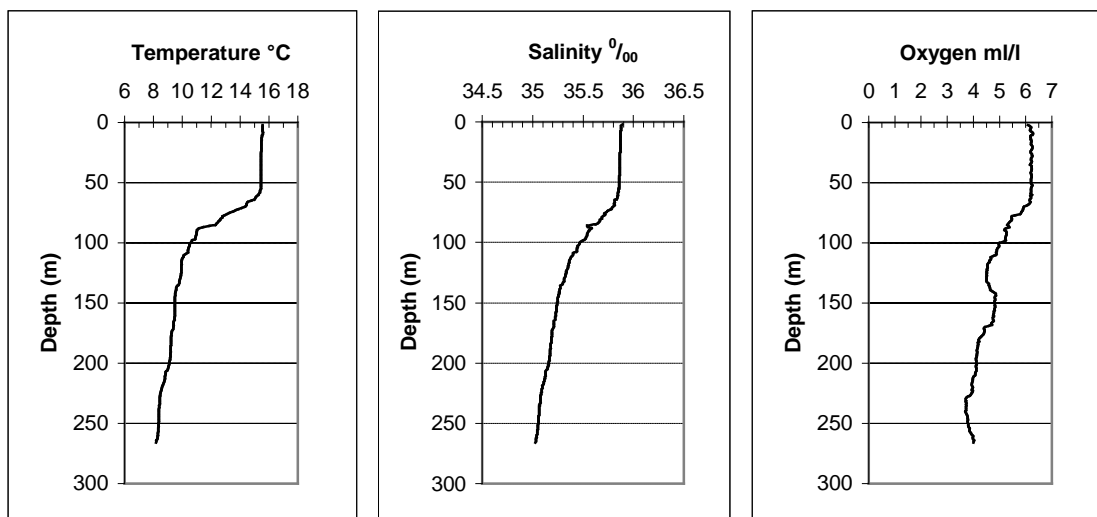
## 3.1 HYDROGRAPHY AND WEATHER DATA

Conditions during the survey were mostly favourable with light north westerly winds throughout the duration of the survey. During the second week however, a gale force northerly wind was experienced, with some large swell. Hydrographical profiles for a selected CTD cast of both diel stations and for the sonar study (False Bay) are presented in Figure 7 (a, b and c).

(a)



(b)



(c)

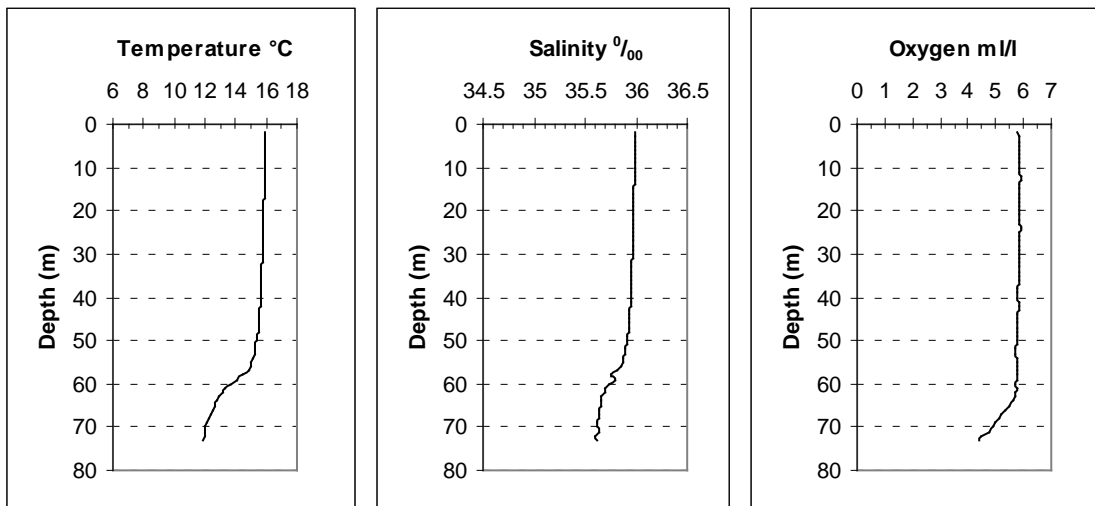


Figure 7. CTD profiles at diel cycle experiment 1 (a), diel cycle experiment 2 (b) and in False Bay during the sonar experiment (c).

ADCP data collected during the diel cycle experiments is shown in Figure 8. The processed data were exported to ascii format and three 5 minute ensembles averaged. Generally it indicated light and variable north westerly flow in the upper 150 m of the water column and then increases to strong south easterly flow at greater depth.

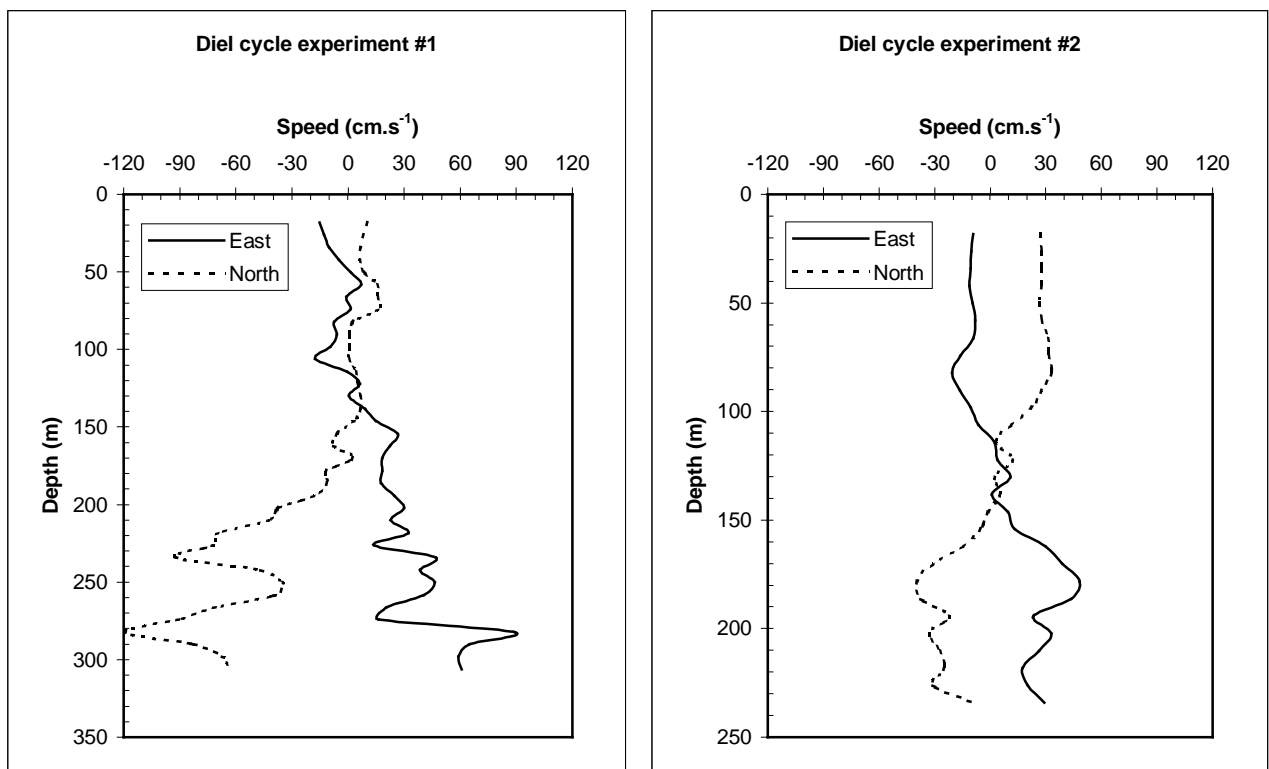


Figure 8. ADCP current profiles as recorded during the diel cycle experiments.

### 3.2 MULTIFREQUENCY ACOUSTIC SAMPLING AND ANALYSIS

As explained in the methods section, only data from suitably identified homogeneous scattering layers were to be used for the testing of the multifrequency target identification method. For the purposes of this report, only an example of the output is presented. The analysis of the multifrequency data requires a lot of data processing with special adapted software and will only be completed at a later stage and included in future publications of the BENEFIT target identification group.

An example featuring three distinct scattering layers, recorded during this survey, i.e. anchovy, juvenile horse mackerel and light fish is given below in Figure 9. Frequency distributions of Sv (dB) at different frequencies for each of the species was calculated. As this distribution is density dependent, ratios of different frequencies have been presented instead.

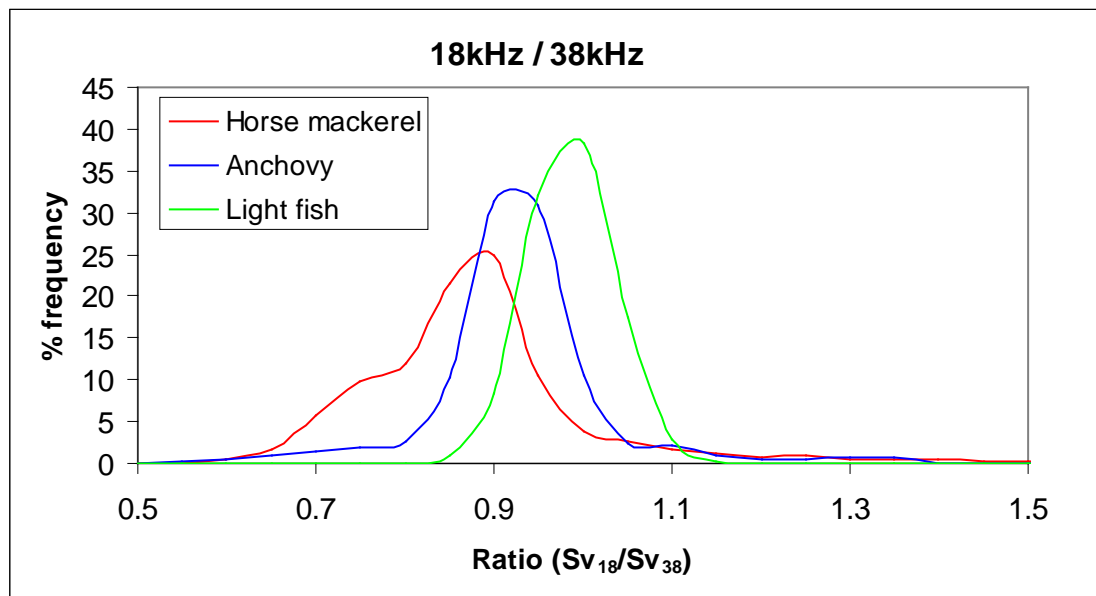


Figure 9(a). Ratios of backscatter at 18 and 38 kHz for anchovy, horse mackerel and lightfish.

The frequency distribution of ratios of Sv values recorded for all three species at 18 kHz and 38 kHz shows three peaks which are slightly separated for the different species. For anchovy and horse mackerel, the peaks are less than one indicating larger backscatter at 38 kHz than at 18 kHz. Even though the peaks are close together, a slightly lower average backscatter at 18 kHz for horse mackerel is evident. These differences should become clearer when comparing the Sv values in the linear domain. Lightfish on the other hand showed relatively larger mean backscatter at 18 kHz compared to 38 kHz and could possibly be discriminated on this bases from the other two species.

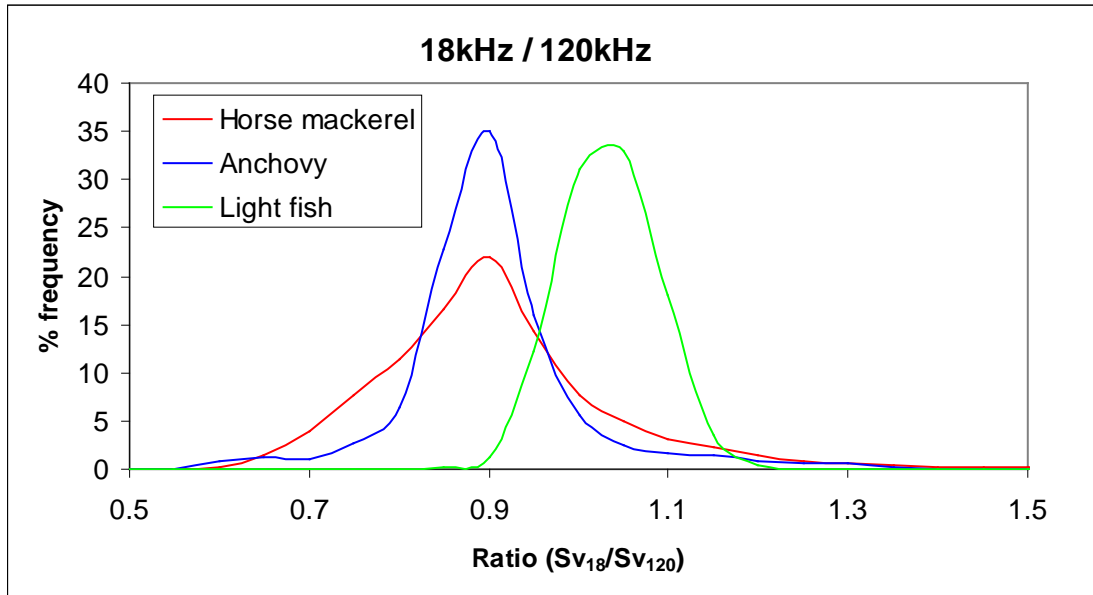


Figure 9(b). Ratios of backscatter at 18 and 120 kHz for anchovy, horse mackerel and lightfish.

The ratio of 18 kHz to 120 kHz shows identical peaks for anchovy and horse mackerel, indicating that 38 kHz is possibly the only of the three frequencies which could discriminate between these two species. The distribution is, however, wider in the case of horse mackerel and some further analysis of the data at a later stage to discern the reasons for this is required. In both cases, the Sv values at 18 kHz were lower than those measured at 120 kHz. For lightfish, the ratio of backscatter is positive, indicating higher values at 18kHz than at 120 kHz. Again this shows discrimination of lightfish from the other two species on the basis of the relatively higher backscatter at 18 kHz. The fact that the peaks overlap for horse mackerel and anchovy would at this stage rule out any discrimination between these two species based on comparison of backscatter by these two frequencies alone.

When comparing backscatter values at the frequencies of 38 kHz and 120 kHz no clear peaks are found. The 38 to 120 kHz backscatter appears stronger for lightfish compared to the other two species, but could possibly be reflecting a density dependence rather than a discriminating power. All of these data are only preliminary findings and some way of incorporating density effects needs to be taken into account. The offset of the 18 kHz from the acoustic axis would lead to more variation in higher density situations, where the homogeneity of fish scattering layers is not known. Further analysis of this data will be done ashore and the results will be published in the scientific literature. More clear signals may also emerge when doing these comparisons in the linear domain, rather than in the current logarithmic domain.

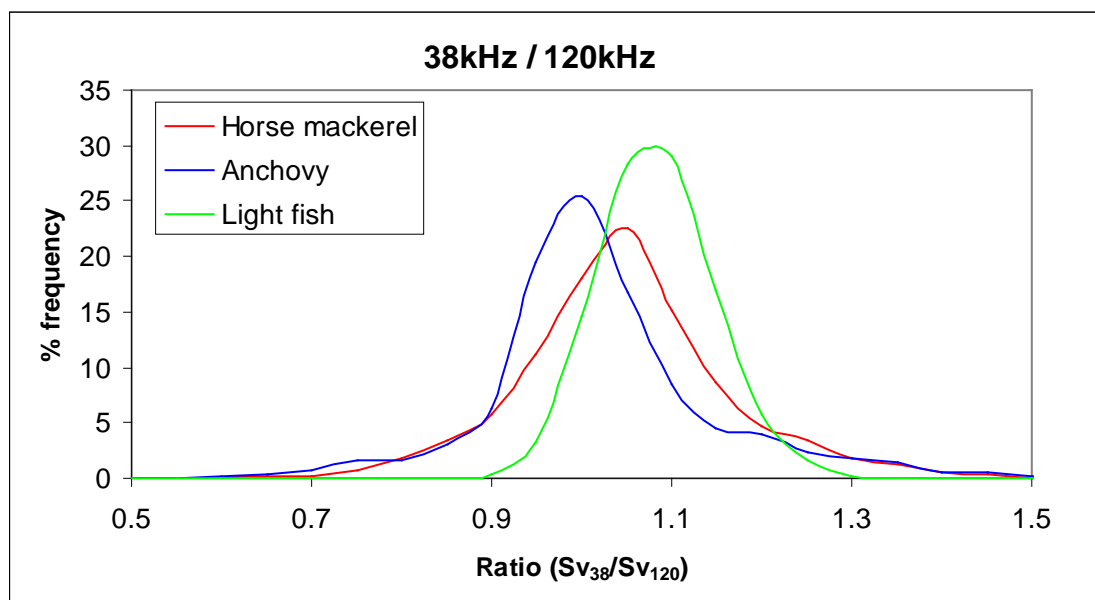


Figure 9(b). Ratios of backscatter at 38 and 120 kHz for anchovy, horse mackerel and lightfish.

### 3.3 TRAWL SAMPLING

A total of 133 trawls were completed during the survey. Most of the trawls were multisampler trawls (100 in total or 34 trawls using 3 cod-ends on all occasions except two when 2 cod-ends were used). A further 18 trawls using the large pelagic trawl (mostly with floats on the headline) were done. Bottom trawls done during the diel cycle experiments made up another 15 trawls. All catches were sorted, processed and entered into the Nansis trawl data base. A summary of all trawls completed are shown in ANNEX II.

From 23h00 on the 13/06/2000 to 22h55 on the 14/06/2000 a twenty-four hour diel cycle experiment was conducted 40 nmiles west of Cape Town. Five bottom trawls (634, 638, 642, 646 and 650) and five multisampler trawls (635-637, 639-641, 643-645, 647-649 and 651-653) were completed alternately in the 24 hours.

Each bottom trawl lasted between 20 and 30 minutes with the catches ranging from 300kg to 823kg. *Merluccius paradoxus* (*M. paradoxus*) dominated the mass of the catches in trawls 638, 642 and 646 with *Macrouridae* (rattails) being the second most dominant. In trawls 634 and 650 the mass of the rattails exceeded the mass of *M. paradoxus*. During all the multisampler tows it was attempted to catch discrete layers of fish at different depths in the water column. Each layer was fished for approximately 20 minutes. In three of the tows *M. paradoxus* was the dominant species in the bottom layer and in all three cases the catches were made at night. No trend could be seen between the upper two layers of the five tows but generally if fish was

caught in the middle layer of the water column of a specific trawl the same fish was seen in the upper layer of the same trawl. Closer investigation of the length frequency data will reveal if there was a difference in the mean length of the fish in the different layers.

From 12h17 on the 15/6/2000 to 10h38 on the 21/6/2000 a school and scattering layer composition experiment was completed between Cape Hangklip and Cape Agulhas. Seven large pelagic trawls (654-660), 15 multi-sampler trawls (661-681 and 683-706) and one bottom trawl was used as a pelagic trawl. Large pelagic trawl no.659 was aborted because the net twisted, while the bottom trawl caught very little fish compared to the large pelagic trawls. Most of the big pelagic trawls occurred at night and the depths ranged between 15 and 30m. *Trachurus capensis* (maasbanker), *Engraulis capensis* (anchovy) and *Etrumeus whiteheadi* (redeye) were caught in all the pelagic trawls. *Sardinops ocellatus's* (pilchard) were found in all, except trawl 660 and 682. Of the above species, anchovy was the most dominant in most cases, but redeye dominate the catch in trawl 658.

Eight of the multisampler tows (661-675, 679-681, 683-685 and 704-706) were fished at approximately the same depths, attempting to catch discreet shoals of fish, to see if shoal compositions were similar. In all of the multisampler hauls, the three cod ends yielded catches that showed similar catch compositions, with only slight variations (if any) from cod end to cod end. In five of the eight multisampler tows, anchovy were caught and in most of the catches this was the dominant species. Seven multisampler tows (676-678 and 680-703) were done to attempt capturing discreet layers of fish. No trends could be seen between the different groups of cod ends (trawls) or between the cod ends of each trawl. Redeye, anchovy and *Chrysaora* (jelly) were caught in most of the trawls but the percentage they contributed to the catches, differed randomly.

From 20h40 on the 21/06/2000 to 8h39 on the 22/06/2000 a sonar experiment was done in False Bay. During trawling for this experiment the motor of the multisampler started to malfunction. For trawl 707 the multisampler was used but only one net opened. The large pelagic trawl was used for trawl 708 and the multisampler was attempted again for 709-711 and all three nets were successfully opened and closed. For trawls 712-713 the multisampler was used and only two nets opened and during the next multisampler tow (714-715) the motor of the multisampler failed. No multisampler trawls were done until the faulty part was replaced on the 24/06/2000. It was then decided to trawl with the large pelagic trawl. The scanmar trawleye's battery was flat for trawl 716 and trawl 717 was a test trawl for the pelagic trawl once the battery had been replaced. Trawls 718 to 724 were successful pelagic trawls and trawls 725 and 726 were bottom trawls.



From 14h53 on the 25/06/2000 to 06h02 on the 27/06/2000 a thirty-nine hour diel cycle experiment was conducted 20 nmiles west of Dassen Island. Eight bottom trawls (726, 730, 734, 738, 742, 746, 750 and 754) and eight multisampler trawls (727-729, 731-733, 735-737, 739-741, 743-745, 747-749, 751-753 and 755-757) were completed alternately in the 39 hours.

Each bottom trawl lasted between fifteen and twenty minutes with the catch sizes ranging from 305kg to 1510kg. *Helicolenus dactlopterus* (jacobever), *Macrouridae* (rattails), *Paracallionymus costatus* (dragonets), *M. paradoxus*, *M. capensis*, *Lampanyctus hectoris* (lanternfish) and *Maurolicus muelleri* (lightfish) were caught in all the bottom trawls. Trawls that were done during the night dominated by rattails and those done during the day were dominated by *M. paradoxus*. The multisampler trawls were all done at different depths to catch different layers of fish for comparison. Lightfish and lanternfish were caught in most of the nets. Lightfish seemed to be the more dominant in the two lower layers and the lanternfish was the more dominant species in the top layers of the multisampler catches. The bottom net of the trawls that were done at night all contained *M. paradoxus* and in most of the trawls containing *M. paradoxus*, the hake was the dominating species.

### **3.4 DIEL CYCLE EXPERIMENTS**

The first diel experiment took place 40 nm west of Cape Town in 340m of water and lasted for 24 hours. During this experiment five bottom trawls were carried out, each shortly followed by a multisample trawl which sampled three discrete layers in separated codends. *Merluccius capensis* was only found in four of the 10 trawls done and then mostly in the bottom trawl. The multisampler trawl only managed one positive trawl and that was directly after the first bottom trawl, around midnight. This indicates that although only a few *Merluccius capensis* were in the area, they tended to migrate up into the water column at night. *Merluccius paradoxus* on the other hand were more dominant, which is expected due to the normal deeper distribution of this species. All of the bottom trawls showed substantial catches, with the largest number being caught during the day. Three out of the five multisample trawls had good catches of *Merluccius paradoxus*. These were all night trawls with the greatest number being caught in the first net, which is the closest to the bottom. No hake were caught in the surface net. This showed that they migrated only slightly off the bottom into the midwater at night. No hake were caught in the multisampler during the day.

The second diel experiment was 20 nm west of Dassen Island in 240m of water. The idea was to try and get a good mix of both *M. capensis* and *M. paradoxus*. Here eight bottom and eight multisample trawls were done. *M. paradoxus* was still the dominant species with good catches recorded in the bottom trawls. During the multisample trawls hake from both species were

mostly found in the bottom net, except during the day where none were caught. The only multisample trawl that showed any significant migration was the first one at around 16h00 hours. Here 82 individuals were caught in the bottom net, 210 in the middle net and 29 near the surface. Light fish were the most dominant fish species in all of these three nets.

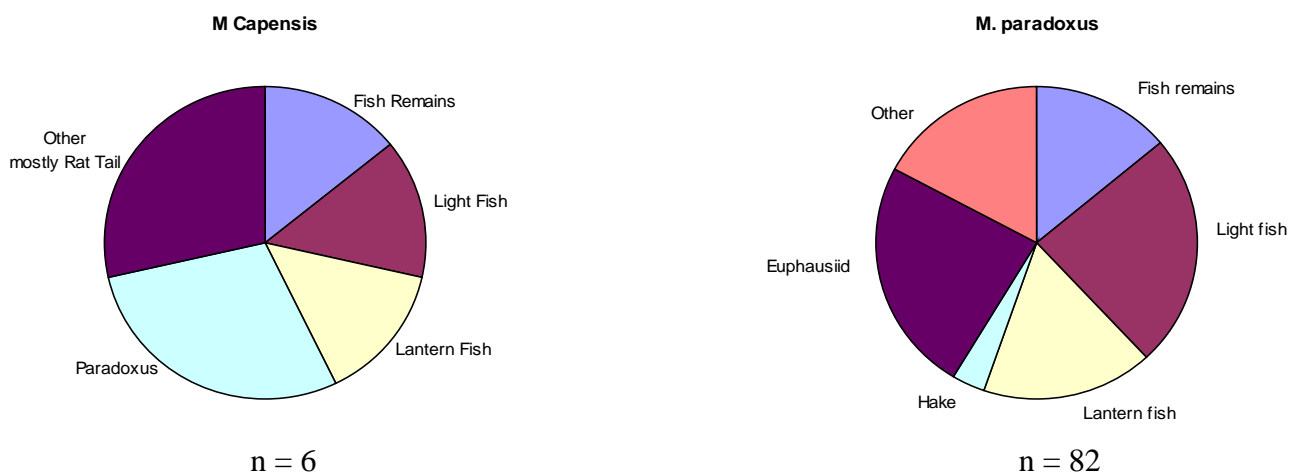
### Feeding

Summarizing the prey into major food groups from stomachs pooled over all the trawls for the first experiment (Figure 10) shows that most of the diet consists of fish and Euphausiids. Food consumption expressed as frequency of occurrence shows that most of the food ingested by *M. paradoxus* was mesopelagic fish (40 %), followed by Euphausiids (35 %), fish remains (20 %) and hake (5 %). The dietary composition for *M. capensis* consisted solely of fish, namely mesopelagics, hake and rat tails. There was a low incidence of fresh food in the stomach of both hake species.

During the second experiment, both *Merluccius capensis* and *Merluccius paradoxus* fed largely on mesopelagic species, with light fish being the most common prey item. Indications are that these light fish were mostly trawl caught. Rat tails and Euphausiids were also consumed by *M. capensis* (Figure 10).

Further analysis of these data and stomach content analysis of the other main species sampled during these experiments will be analysed ashore.

### Experiment 1



## Experiment 2

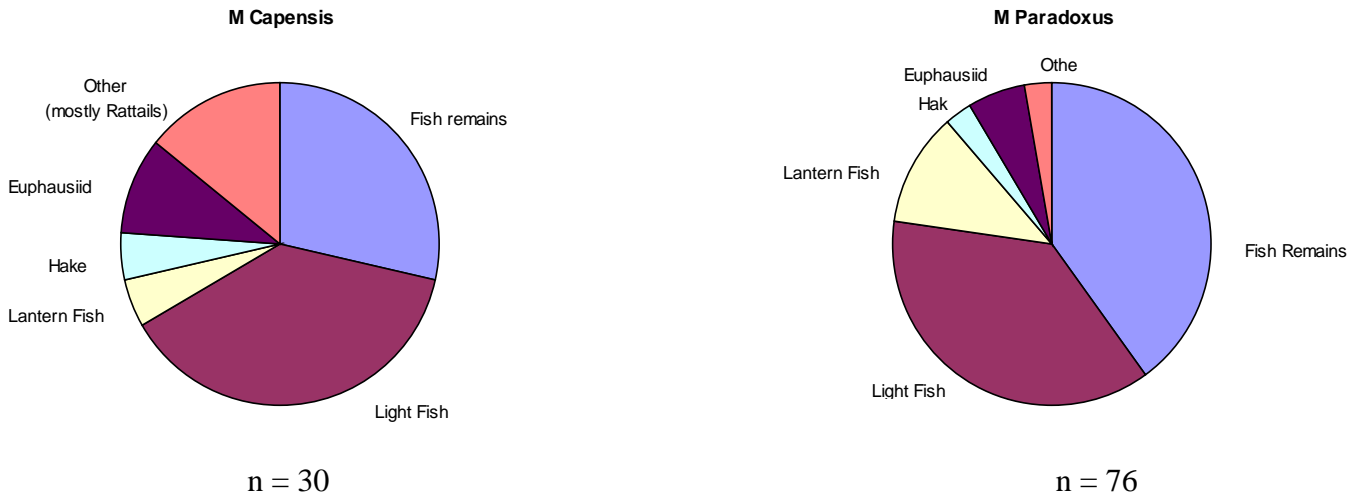
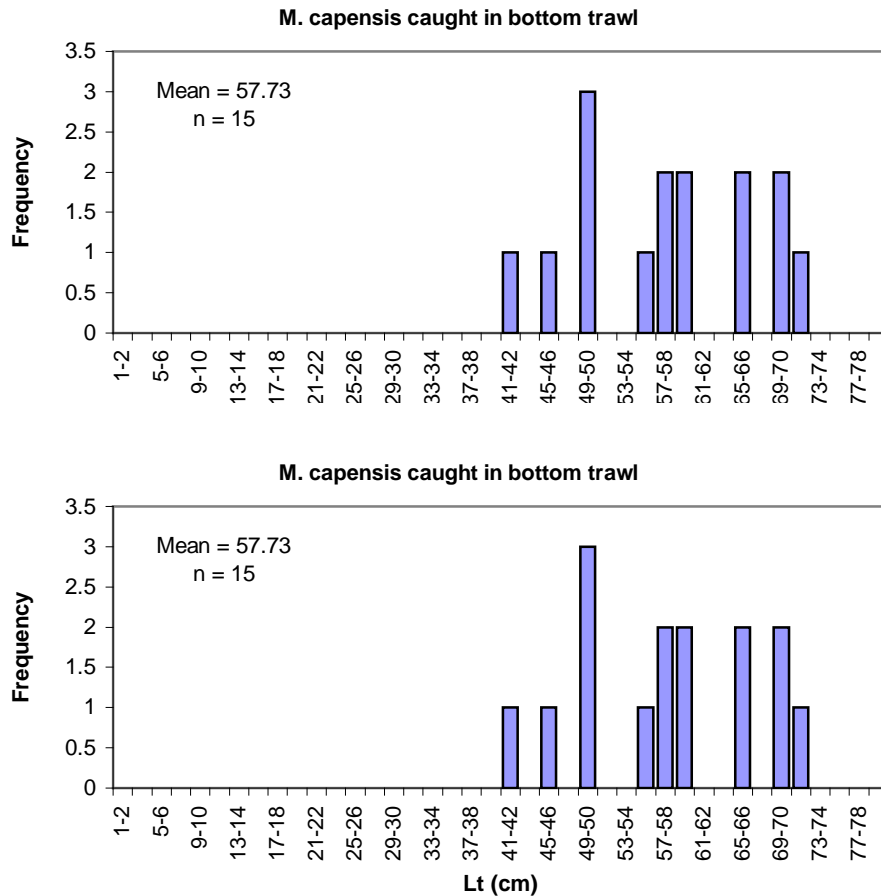


Figure 10. Frequency of occurrence of different prey taxa in the stomachs of *Merluccius capensis* and *Merluccius paradoxus* from bottom and multisample trawls taken during experiments 1 (upper two diagrams) and 2 (lower two diagrams)

## Size composition

### Diel experiment 1



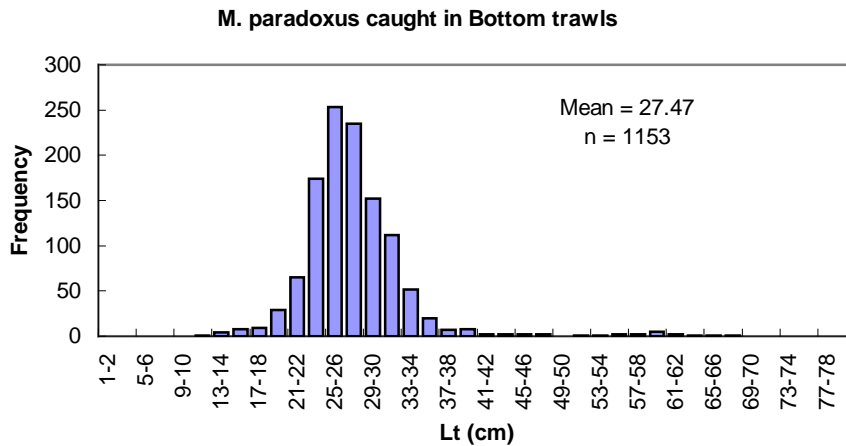


Figure 11. Length frequency distribution of hakes sampled during diel cycle experiment 1.

All of the *M. capensis* were caught in the bottom trawls and were comparatively larger than *M. paradoxus* caught in coinciding trawls (Figure 11). The fact that they were only caught in the bottom trawl suggests that there was little to no vertical migration. Unfortunately the sample size was very small making it difficult to draw any main conclusions as to the true length distribution of the population in the area.

The length frequency compositions of *M. paradoxus* in both bottom and multisample trawls were very similar. The bottom trawls had a mean of 27.47 cm while the multisample trawls showed a mean of 29.78 cm (Figure 11). This indicates no size specific vertical migration.

For the second diel cycle experiment, the *M. paradoxus* that were caught in the bottom trawls were smaller than the *M. capensis* (Figure 12). This may be due to trawls being deployed in shallower water, at a depth where large *M. capensis* specimens should be dominant and small *M. paradoxus* more plentiful than larger *M. paradoxus*. Although a similar trend seems to occur in the pelagic trawls, the total number of *M. capensis* samples is considerably smaller than that of the demersal trawls and therefore it is difficult to make an accurate assessment.

### 3.5 SCHOOL COMPOSITION/SCATTERING LAYER STUDIES

The multisampler was the main sampling device used to identify various scattering layers at night and to sample discrete schools during the day. This was essential for ground truthing of the species composition of acoustically ensonified layers. In most of the multisampler hauls that were fished at the same depth, the three cod ends yielded catches that showed similar catch compositions, with only slight variations (if any) from cod end to cod end. In five of the eight multisampler tows, anchovy were caught and in most of the catches this was the dominant

species. Seven multisampler tows aimed at capturing discreet layers of fish. No trends could be seen between the different groups of cod ends (trawls) or between the cod ends of each trawl. Redeye, anchovy and *Chrysaora* (jelly) were caught in most of the trawls but the percentage they contributed to the catches, differed randomly.

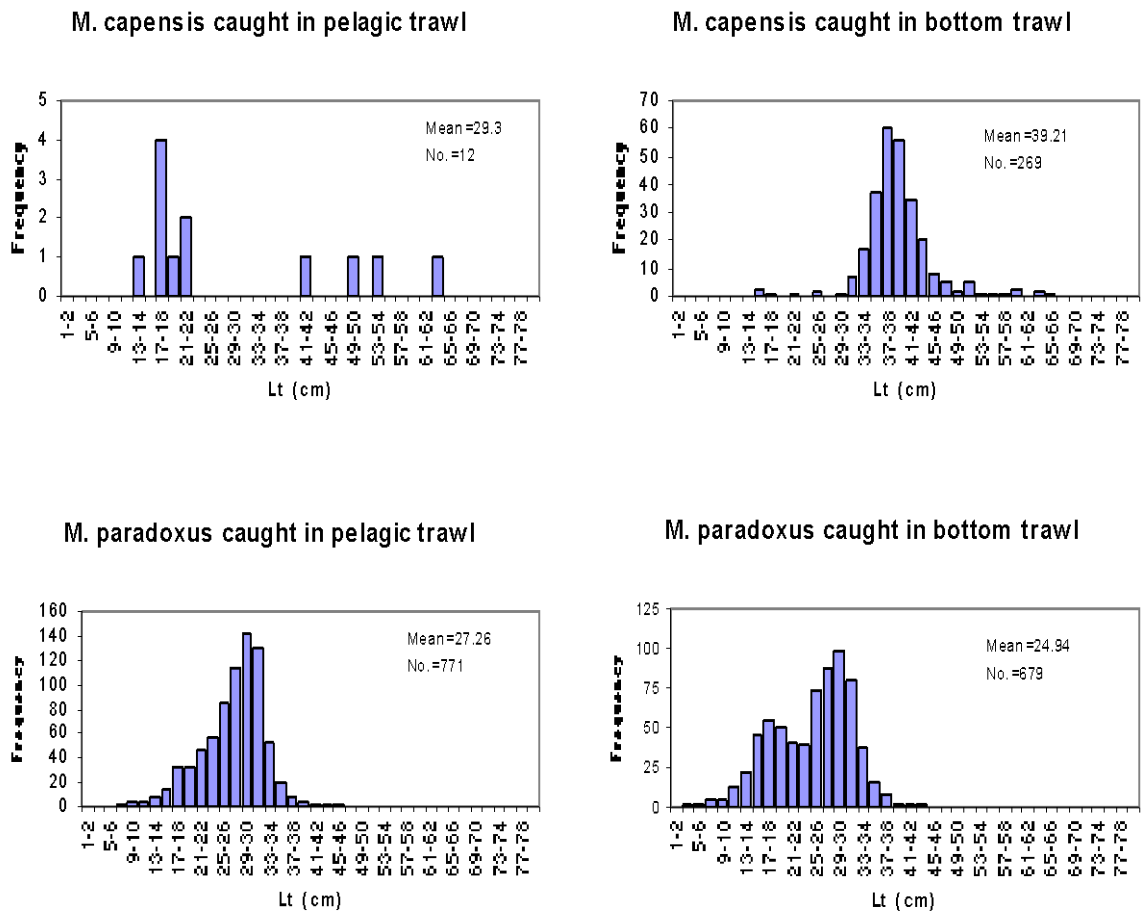


Figure 12. Comparison of the length frequency distributions of both species of hake as sampled by the pelagic and bottom trawls during diel cycle experiment 2.

## TARGET STRENGTH EXPERIMENTS

Target strength values were derived from the selection illustrated in Figure 13.

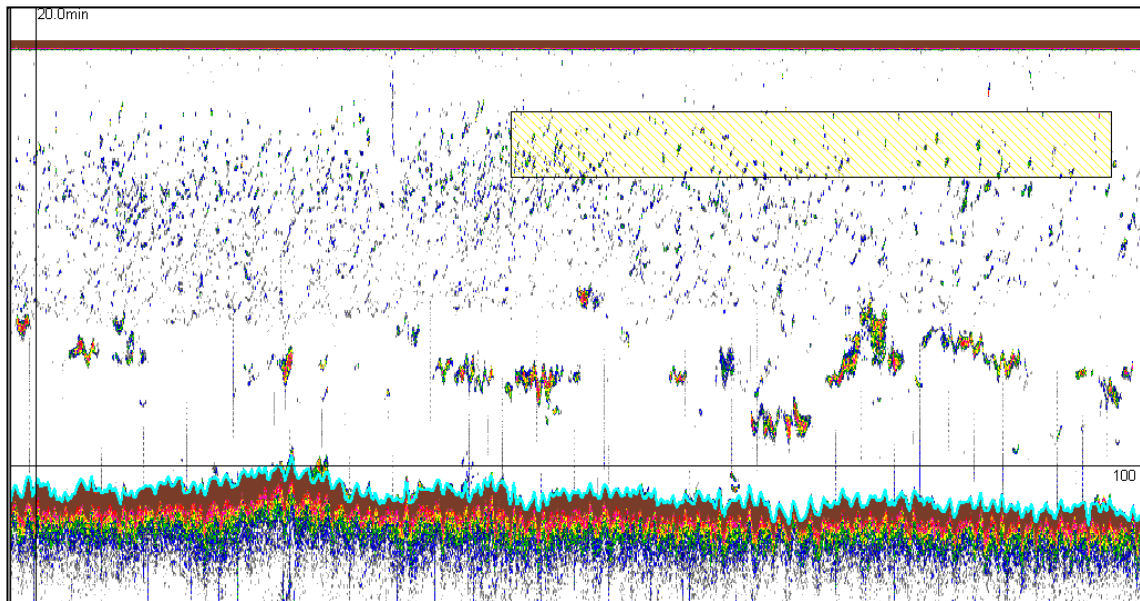


Figure 13. Acoustic echogram illustrating the selection of single targets for target strength analysis.

A total of 3388 horse mackerel (*Trachurus trachurus capensis*) specimens were caught with a mean total length of 5.5 cm (Fig. 14). Target strength frequency histograms are represented in Figure 15 for 38 kHz (a) and 120 kHz (b). The observed target strengths cover a wide range, spanning more than 20 dB.

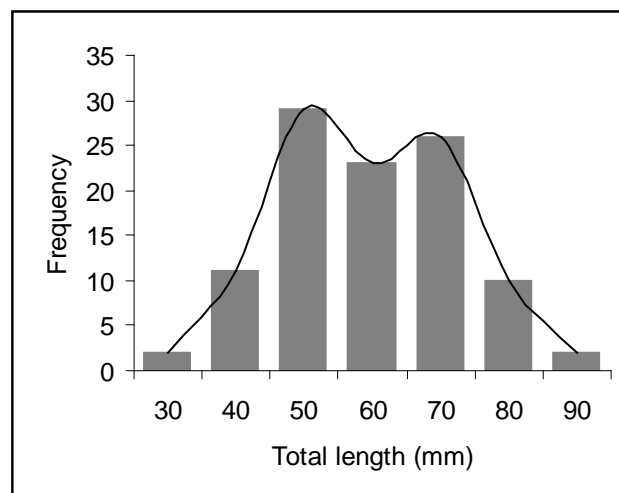


Figure 14. Total length frequency histogram for a homogenous juvenile horse mackerel catch.

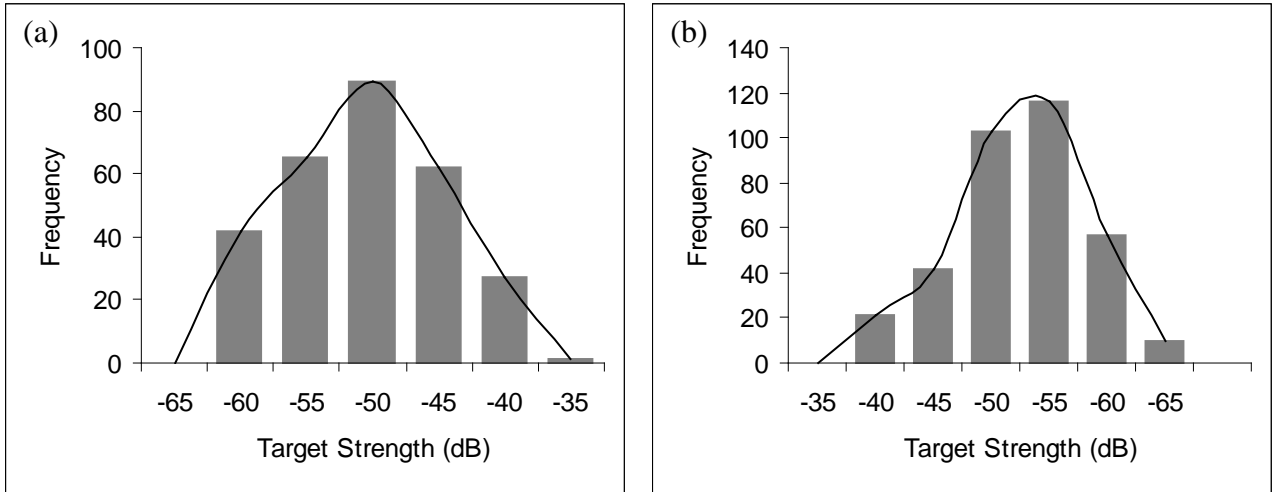


Figure 15. Target strength frequency histograms for juvenile horse mackerel at 38 kHz (a) and 120 kHz (b).

Experiments were conducted to investigate the use of multifrequency techniques to improve the recognition of single targets. By using single target detections within the 120 kHz acoustic beam to discriminate between multiple and single echoes detected within the 38 kHz beam, multiple target echoes may be rejected from target strength measurements. Preliminary results are illustrated in figure 16, presenting the target strength frequency histogram at 38 kHz for the catch of horse mackerel presented above. After rejecting multiple echoes using 120 kHz as a discriminator, a bi-modal frequency distribution is apparent, where accepted single targets and rejected multiple echoes are represented by black and grey bars, respectively.

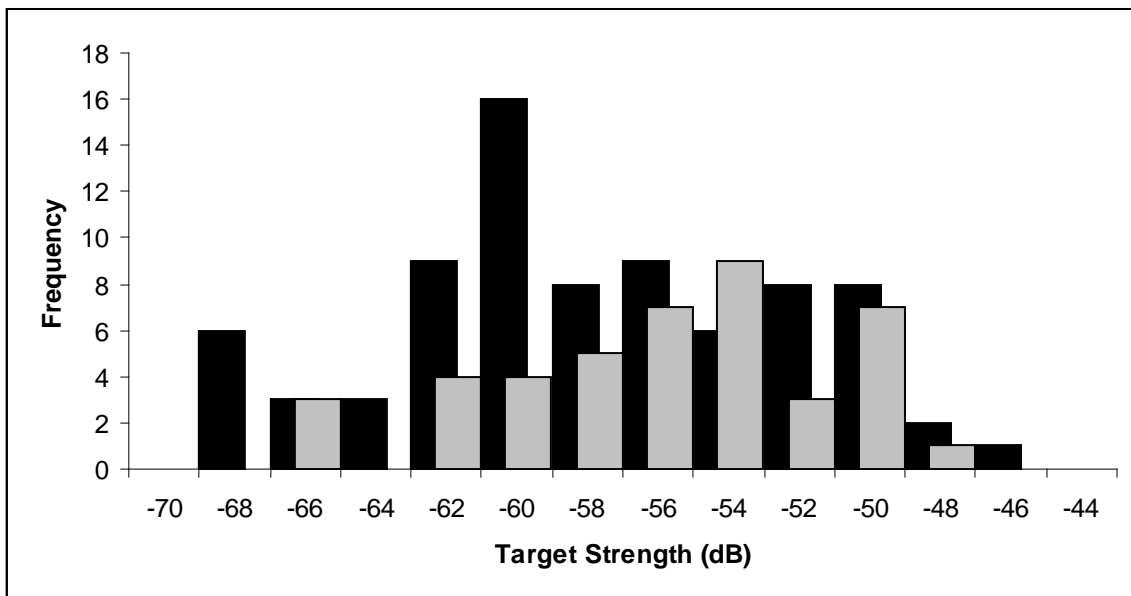


Figure 16. Juvenile horse mackerel target strength frequency histogram for accepted single targets (black bars) and rejected multiple echoes (grey bars).

### **3.7 VESSEL AVOIDANCE EXPERIMENTS**

The first small boat experiment in False Bay on June 24<sup>th</sup> was successful for a distance of 3 nautical miles only. The experimental transect started nearshore and the experimental transect was run downwind, but increasing swell in the more exposed outer area of the Bay forced us to stop the trial after 3.0 nautical miles. The swell was then about 3 m and the wind speed about 15 m/s from north east. There were good recordings on both the Simrad EY500 echo sounder onboard the small boat and on the Simrad EK500 echo sounder onboard R/V “Dr. Fridtjof Nansen”. No immediate difference in echo integration values, vertical distribution or structure of the fish aggregations recorded could be distinguished between the recordings made by the small boat and the research vessel itself.

The weather conditions during the 2<sup>nd</sup> and 3<sup>rd</sup> vessel avoidance experiment using the small boat in St. Helena Bay on June 28<sup>th</sup> was more favourable. The wind was from south - south west at a speed of about 5 m/s and both experiments were successful. Experiment no. 2 headed offshore at 270° starting at 09:25 local time, while experiment no. 3 headed inshore at 90° starting at 15:35 local time. The bottom depth on the transect varied from 35 m (inshore) to 85 m (offshore). During both experiments numerous small schools, probably of small sardine and anchovy were recorded off bottom or midwater. As in the False Bay experiment no immediate difference in echo integration values, vertical distribution or structure of the fish aggregations recorded could be distinguished between the recordings made by the small boat and the research vessel itself.

The recordings of the three vessel avoidance experiments is scheduled to be properly analysed during July/August 2000 for inclusion in a report to the International Council for the Exploration of the Sea by Coetzee, Misund and Boyer, and that will be presented during a theme session on incorporation of external factors into resource surveys during the Annual Science Conference in Brügge in September 2000.

### **3.8 SONAR COMPARATIVE DENSITY ESTIMATION**

The shortcomings of the SODAPS system severely restricted the possibilities for conducting an automated comparative sonar and echo sounder survey, which was planned. Due to this the estimation of biomass based on data from the SODAPS system is still, due to various problems very time consuming and will be completed in Bergen. A full report of problems experienced with the SODAPS software is incorporated into ANNEX V.



The only estimates available from the sonar at this time are therefore based on summed area of schools. The biomass in the area of the sonar survey was estimated from each of the three minisurveys. A mean biomass of pelagic species (mostly anchovy) of about 20 100 tonnes was estimated in the survey area. This will later be compared with the estimates based on the automatic recordings in the SODAPS system and also the biomass estimates from the echo integration system.

## ANNEX I

Table 1. SIMRAD EK 500 Transceiver menu settings prior to acoustic calibration.

	Transceiver 1 38 kHz	Transceiver 2 120 kHz	Transceiver 3 18 kHz
Mode	Active	Active	Active
Transducer type	ES38B	ES120-7	ES18-11
Transducer sequence	Off	Off	Off
Transducer depth (m)	5.5	5.5	5.5
Absorption coeff. (dB/km)	10	38	3
Pulse Length	Medium	Long	Short
Bandwidth	Wide	Narrow	Wide
Max. Power (W)	2000	1000	2000
2-Way Beam Angle	-21.0	-20.6	-17.2
Sv. Transducer Gain	27.45	26.01	21.69
TS. Transducer Gain	27.65	26.17	21.60
Angle sens. Along.	21.9	21.0	13.9
Angle sens. Athw.	21.9	21.0	13.9
3 dB Beamwidth Along	6.8	7.6	10.9
3 dB Beamwidth Athw.	6.7	7.6	10.9
Alongship offset	-0.03	-0.05	-0.04
Athwartship offset	0.06	0.08	0.03

Table 2. SIMRAD EK 500 Transceiver menu settings after acoustic calibration.

	Transceiver 1 38 kHz	Transceiver 2 120 kHz	Transceiver 3 18 kHz
Mode	Active	Active	Active
Transducer type	ES38B	ES120-7	ES18-11
Transducer sequence	Off	Off	Off
Transducer depth (m)	8	8	5.5
Absorption coeff. (dB/km)	10	38	3
Pulse Length	Medium	Long	Short
Bandwidth	Wide	Narrow	Wide
Max. Power (W)	2000	1000	2000
2-Way Beam Angle	-21.0	-20.6	-17.2
Sv. Transducer Gain	27.39	25.45	21.45
TS. Transducer Gain	27.52	25.53	21.05
Angle sens. Along.	21.9	21.0	13.9
Angle sens. Athw.	21.9	21.0	13.9
3 dB Beamwidth Along	6.8	7.6	10.9
3 dB Beamwidth Athw.	6.7	7.6	10.9
Alongship offset	-0.03	-0.05	-0.04
Athwartship offset	0.06	0.08	0.03

## ANNEX I (continued).

### Small boat and portable echo sounder specifications and settings.

The Simrad EY500/38 kHz portable scientific echo sounder fitted with a split beam transducer was operated from a small boat during several exercises to study fish schooling behaviour. All raw data were stored to tape and a colour printout of echograms was generated. The details of the settings of the portable 38 kHz echo sounder were as follows:

Table 3. SIMRAD EY 500 Transceiver menu settings.

Transducer type	ES38-12
Absorption coeff.	10 dB/km
Pulse length	Medium
Bandwidth	Auto
Max. power	125W
Angle Sensitivity	12.5
2-way beam angle	-15.8 deg
SV transducer gain	23.26 dB
TS transducer gain	22.93 dB
3 dB Beamwidth along.	11.9 deg
3 dB Beamwidth athw.ship	11.7 deg
Alongship offset	0.01 deg
Athwartship offset	-0.02 deg

Table 4. Man-Over-Board boat specifications

Length	5.3 m
Width	2.1 m
Power	40 Hp
Draught	1.2 m
Weight	2000 kg

## ANNEX II Records of fishing stations

PROJECT STATION: 632

DATE:13/ 6/00 GEAR TYPE: PT No:7 POSITION:Lat S 3410  
 start stop duration Long E 1844  
 TIME :00:40:17 00:55:04 15 (min) Purpose code: 1  
 LOG :1939.93 1941.03 1.10 Area code : 2  
 FDEPTH: 15 15 GearCond.code:  
 BDEPTH: 35 39 Validity code:  
 Towing dir: 270° Wire out: 160 m Speed: 35 kn\*10

Sorted: 2 Kg Total catch: 1.71 CATCH/HOUR: 6.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELCHOO	3.52	40	51.46	
Engraulis capensis	3.32	676	48.54	5232
Total	6.84		100.00	

PROJECT STATION: 635

DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3354  
 start stop duration Long E 1733  
 TIME :01:40:04 02:00:21 20 (min) Purpose code: 1  
 LOG :2069.91 2070.94 1.01 Area code : 2  
 FDEPTH: 280 280 GearCond.code:  
 BDEPTH: 320 322 Validity code:  
 Towing dir: 320° Wire out: 850 m Speed: 32 kn\*10

Sorted: 47 Kg Total catch: 77.80 CATCH/HOUR: 233.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	132.48	438	56.76	5239
Maurolucus muelleri	91.62	91620	39.25	5240
Merluccius capensis	5.34	3	2.29	
Lophius vomerinus	3.96	6	1.70	
Total	233.40		100.00	

PROJECT STATION: 633

DATE:13/ 6/00 GEAR TYPE: PT No:7 POSITION:Lat S 3410  
 start stop duration Long E 1842  
 TIME :01:33:28 01:48:16 15 (min) Purpose code: 1  
 LOG :1943.06 1944.05 0.97 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 41 33 Validity code:  
 Towing dir: 90° Wire out: 180 m Speed: 35 kn\*10

Sorted: 2 Kg Total catch: 2.70 CATCH/HOUR: 10.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELCHOO	8.12	80	75.19	
Engraulis capensis	1.84	408	17.04	5233
Galeichthys feliceps	0.76	4	7.04	
Sardinops ocellatus	0.08	4	0.74	
Total	10.80		100.01	

PROJECT STATION: 636

DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3352  
 start stop duration Long E 1731  
 TIME :02:36:10 02:51:52 16 (min) Purpose code: 1  
 LOG :2073.15 2074.06 0.90 Area code : 2  
 FDEPTH: 200 200 GearCond.code:  
 BDEPTH: 341 357 Validity code:  
 Towing dir: 320° Wire out: 780 m Speed: 32 kn\*10

Sorted: 5 Kg Total catch: 5.47 CATCH/HOUR: 20.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	9.60	45	46.81	5243
Merluccius capensis	5.55	4	27.06	
Maurolucus muelleri	2.29	2288	11.17	5245
TRACHTERIDAE	1.73	4	8.43	
Lampanyctodes hectoris	0.94	401	4.58	5244
Todaropsis eblanae	0.34	4	1.66	
LYCOTEUTHIDAE	0.08	15	0.39	
Total	20.53		100.10	

PROJECT STATION: 634

DATE:13/ 6/00 GEAR TYPE: BT No: POSITION:Lat S 3353  
 start stop duration Long E 1732  
 TIME :21:40:58 23:20:24 29 (min) Purpose code: 1  
 LOG :2061.65 2063.20 1.54 Area code : 2  
 FDEPTH: 326 318 GearCond.code:  
 BDEPTH: 326 318 Validity code:  
 Towing dir: 140° Wire out: 1100 m Speed: 30 kn\*10

Sorted: Kg Total catch: 416.62 CATCH/HOUR: 861.97

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MACROURIDAE	501.10	21014	58.13	
Merluccius paradoxus	166.76	910	19.35	5235
Lophius vomerinus	46.97	35	5.45	5234
Todaropsis eblanae	43.74	528	5.07	
Helicolenus dactylopterus	32.73	321	3.80	
Maurolucus muelleri	25.78	27832	2.99	
Merluccius capensis	16.55	8	1.92	5236
PARAPAGURIDAE *	10.43	904	1.21	
Paracallionymus costatus	10.14	1016	1.18	
Lampanyctodes hectoris	3.77	1504	0.44	5238
Genypterus capensis	1.86	4	0.22	
Zeus capensis	1.08	2	0.13	
Trachurus capensis	1.03	2	0.12	
Holohalaelurus regani	0.04	2		
Total	861.98		100.01	

PROJECT STATION: 637

DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3350  
 start stop duration Long E 1730  
 TIME :03:03:40 03:30:40 27 (min) Purpose code: 1  
 LOG :2074.65 2076.30 1.64 Area code : 2  
 FDEPTH: 70 50 GearCond.code:  
 BDEPTH: 370 415 Validity code:  
 Towing dir: 320° Wire out: 250 m Speed: 32 kn\*10

Sorted: 11 Kg Total catch: 55.50 CATCH/HOUR: 123.33

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	50.82	2542	41.21	
JELCHOO	32.58	20	26.42	
Lampanyctodes hectoris	19.53	9767	15.84	5241
Maurolucus muelleri	15.76	22509	12.78	5242
LYCOTEUTHIDAE	3.78	756	3.06	
Todaropsis eblanae	0.87	11	0.71	
Total	123.34		100.02	

PROJECT STATION: 641

PROJECT STATION: 638  
 DATE:14/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3355  
 start stop duration Long E 1734  
 TIME :05:01:06 05:01:29 30 (min) Purpose code: 1  
 LOG :2084.97 2086.55 1.57 Area code : 2  
 FDEPTH: 320 319 GearCond.code:  
 BDEPTH: 320 319 Validity code:  
 Towing dir: 140ø Wire out: 900 m Speed: 30 kn\*10  
 Sorted: 75 Kg Total catch: 300.00 CATCH/HOUR: 600.00

DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3350  
 start stop duration Long E 1729  
 TIME :09:01:04 09:22:03 21 (min) Purpose code: 1  
 LOG :2095.80 2097.13 1.32 Area code : 2  
 FDEPTH: 50 8 GearCond.code:  
 BDEPTH: 400 452 Validity code:  
 Towing dir: 320ø Wire out: 50 m Speed: 30 kn\*10  
 Sorted: 15 Kg Total catch: 15.65 CATCH/HOUR: 44.71

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	355.94	1978	59.32	5247
MACROURIDAE	125.46	4646	20.91	
Todaropsis eblanae	39.32	458	6.55	
PARAPAGURIDAE *	22.92	2084	3.82	
Helicolenus dactylopterus	19.78	170	3.30	5246
Lophius vomerinus	15.60	8	2.60	
Octopus vulgaris	8.76	16	1.46	
Genypterus capensis	7.24	8	1.21	
Maurolicus muelleri	2.02	2020	0.34	
Paracallionymus costatus	1.12	112	0.19	
Lampanyctodes hectoris	1.12	374	0.19	
Myxine capensis	0.64	8	0.11	
Holohalaelurus regani	0.08	8	0.01	
Total	600.00		100.01	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELCH00	43.66	266	97.65	
Maurolicus muelleri	0.54	489	1.21	5251
Todaropsis eblanae	0.29	51	0.65	
Lampanyctodes hectoris	0.23	123	0.51	5250
Total	44.72		100.02	

PROJECT STATION: 642

PROJECT STATION: 639  
 DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3353  
 start stop duration Long E 1732  
 TIME :06:40:10 06:40:24 20 (min) Purpose code: 1  
 LOG :2092.20 2093.38 1.17 Area code : 2  
 FDEPTH: 280 260 GearCond.code:  
 BDEPTH: 329 342 Validity code:  
 Towing dir: 320ø Wire out: 900 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 1.79 CATCH/HOUR: 5.37

DATE:14/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3354  
 start stop duration Long E 1733  
 TIME :10:00:24 10:00:51 22 (min) Purpose code: 1  
 LOG :2105.70 2106.81 1.11 Area code : 2  
 FDEPTH: 319 318 GearCond.code:  
 BDEPTH: 319 318 Validity code:  
 Towing dir: 140ø Wire out:1050 m Speed: 30 kn\*10  
 Sorted: 824 Kg Total catch: 823.73 CATCH/HOUR: 2246.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	4.98	12	92.74	
Maurolicus muelleri	0.33	324	6.15	5248
Lampanyctodes hectoris	0.06	30	1.12	5249
Total	5.37		100.01	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	1465.25	7778	65.22	5255
MACROURIDAE	392.70	19470	17.48	
Lampanyctodes hectoris	65.40	26910	2.91	5257
Lophius vomerinus	61.25	35	2.73	5256
Helicolenus dactylopterus	55.50	600	2.47	
Merluccius capensis	53.24	30	2.37	5254
Todaropsis eblanae	53.10	660	2.36	
TRACHIPTERIDAE	50.67	68	2.26	
Aequorea aequorea	23.40	240	1.04	
PARAPAGURIDAE *	15.30	1470	0.68	
Paracallionymus costatus	6.30	630	0.28	
Genypterus capensis	2.02	3	0.09	
Zeus capensis	1.80	3	0.08	
Holohalaelurus regani	0.60	30	0.03	
MYCTOPHIDAE	0.14	8	0.01	
Total	2246.67		100.01	

PROJECT STATION: 643

PROJECT STATION: 640  
 DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3351  
 start stop duration Long E 1730  
 TIME :08:20:33 08:20:55 2 (min) Purpose code: 1  
 LOG :2095.16 2095.28 0.11 Area code : 2  
 FDEPTH: 80 79 GearCond.code:  
 BDEPTH: 380 383 Validity code:  
 Towing dir: 320ø Wire out: 300 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 0.15 CATCH/HOUR: 4.50

DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3355  
 start stop duration Long E 1735  
 TIME :12:51:00 13:10:48 20 (min) Purpose code: 1  
 LOG :2111.73 2112.86 1.11 Area code : 2  
 FDEPTH: 265 265 GearCond.code:  
 BDEPTH: 319 321 Validity code:  
 Towing dir: 320ø Wire out: 850 m Speed: 30 kn\*10  
 Sorted: 3 Kg Total catch: 3.86 CATCH/HOUR: 11.58

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	2.40	90	53.33	
Lampanyctodes hectoris	1.50	780	33.33	5252
Maurolicus muelleri	0.60	690	13.33	5253
Total	4.50		99.99	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	10.62	33	91.71	
Maurolicus muelleri	0.96	741	8.29	5258
Total	11.58		100.00	

Total 66.45 100.01

PROJECT STATION: 644
DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3354
start stop duration Long E 1733
TIME :13:26:09 13:45:11 19 (min) Purpose code: 1
LOG :2113.52 2114.61 1.08 Area code : 2
FDEPTH: 100 100 GearCond.code:
BDEPTH: 321 326 Validity code:
Towing dir: 320ø Wire out: 300 m Speed: 30 kn\*10

Sorted: 1 Kg Total catch: 0.05 CATCH/HOUR: 0.16

Table with 4 columns: SPECIES, CATCH/HOUR weight, % OF TOT. C numbers, SAMP. Row 1: Maurolicus muelleri, 0.16, 133, 100.00, 5259. Row 2: Total, 0.16, 100.00.

PROJECT STATION: 648
DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3353
start stop duration Long E 1732
TIME :17:38:14 17:57:07 19 (min) Purpose code: 1
LOG :2128.39 2129.52 1.10 Area code : 2
FDEPTH: 75 75 GearCond.code:
BDEPTH: 332 338 Validity code:
Towing dir: 320ø Wire out: 300 m Speed: 30 kn\*10

Sorted: 18 Kg Total catch: 18.41 CATCH/HOUR: 58.14

Table with 4 columns: SPECIES, CATCH/HOUR weight, % OF TOT. C numbers, SAMP. Rows include Lampanyctodes hectoris, MYCTOPHIDAE, Merluccius paradoxus, LYCOTEUTHIDAE, Todaropsis eblanae, PARALEPIDIDAE. Total: 58.13, 99.98.

PROJECT STATION: 645
DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3353
start stop duration Long E 1732
TIME :13:53:03 14:12:24 19 (min) Purpose code: 1
LOG :2115.04 2116.27 1.22 Area code : 2
FDEPTH: 28 18 GearCond.code:
BDEPTH: 330 339 Validity code:
Towing dir: 320ø Wire out: 110 m Speed: 35 kn\*10

Sorted: Kg Total catch: CATCH/HOUR:

Table with 4 columns: SPECIES, CATCH/HOUR weight, % OF TOT. C numbers, SAMP. Row 1: Total, 0.00, 0.00.

PROJECT STATION: 649
DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3351
start stop duration Long E 1731
TIME :18:06:49 18:26:34 20 (min) Purpose code: 1
LOG :2130.02 2131.22 1.18 Area code : 2
FDEPTH: 25 24 GearCond.code:
BDEPTH: 344 364 Validity code:
Towing dir: 320ø Wire out: 100 m Speed: 30 kn\*10

Sorted: 36 Kg Total catch: 36.55 CATCH/HOUR: 109.65

Table with 4 columns: SPECIES, CATCH/HOUR weight, % OF TOT. C numbers, SAMP. Rows include MYCTOPHIDAE, LYCOTEUTHIDAE, Aequorea aequorea, Lampanyctodes hectoris. Total: 109.65, 100.00.

PROJECT STATION: 646
DATE:14/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3354
start stop duration Long E 1733
TIME :15:22:25 15:42:07 20 (min) Purpose code: 1
LOG :2120.52 2121.50 0.97 Area code : 2
FDEPTH: 320 319 GearCond.code:
BDEPTH: 320 319 Validity code:
Towing dir: 140ø Wire out:1050 m Speed: 30 kn\*10

Sorted: 108 Kg Total catch: 540.27 CATCH/HOUR: 1620.81

Table with 4 columns: SPECIES, CATCH/HOUR weight, % OF TOT. C numbers, SAMP. Rows include Merluccius paradoxus, MACROURIDAE, Todaropsis eblanae, Helicolenus dactylopterus, Lophius vomerinus, PARAPAGURIDAE \*, Todarodes sagittatus, Lampanyctodes hectoris, Zeus capensis, Paracallionymus costatus. Total: 1620.84, 100.00.

PROJECT STATION: 650
DATE:14/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3354
start stop duration Long E 1734
TIME :19:56:33 20:26:35 30 (min) Purpose code: 1
LOG :2138.39 2139.80 1.39 Area code : 2
FDEPTH: 315 316 GearCond.code:
BDEPTH: 315 316 Validity code:
Towing dir: 140ø Wire out: 900 m Speed: 30 kn\*10

Sorted: 112 Kg Total catch: 675.37 CATCH/HOUR: 1350.74

Table with 4 columns: SPECIES, CATCH/HOUR weight, % OF TOT. C numbers, SAMP. Rows include MACROURIDAE, Merluccius paradoxus, PARAPAGURIDAE \*, Lophius vomerinus, Aequorea aequorea, Todaropsis eblanae, Helicolenus dactylopterus, Malacocephalus laevis, Paracallionymus costatus, Holohalaelurus regani, Lampanyctodes hectoris, MYCTOPHIDAE, Rossia sp., LYCOTEUTHIDAE. Total: 1350.76, 100.00.

PROJECT STATION: 647
DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3354
start stop duration Long E 1733
TIME :17:00:49 17:20:34 20 (min) Purpose code: 1
LOG :2126.50 2127.70 1.20 Area code : 2
FDEPTH: 280 280 GearCond.code:
BDEPTH: 322 325 Validity code:
Towing dir: 320ø Wire out:1030 m Speed: 30 kn\*10

Sorted: 22 Kg Total catch: 22.15 CATCH/HOUR: 66.45

Table with 4 columns: SPECIES, CATCH/HOUR weight, % OF TOT. C numbers, SAMP. Rows include Merluccius paradoxus, Aequorea aequorea, MYCTOPHIDAE, Todaropsis eblanae, Lampanyctodes hectoris, Maurolicus muelleri. Total: 22.15, 66.45.

PROJECT STATION: 651  
 DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3355  
 start stop duration Long E 1735  
 TIME :21:31:19 21:51:54 21 (min) Purpose code: 1  
 LOG :2144.97 2146.26 1.28 Area code : 2  
 FDEPTH: 280 275 GearCond.code:  
 BDEPTH: 316 316 Validity code:  
 Towing dir: 320ø Wire out:1060 m Speed: 30 kn\*10

Sorted: 30 Kg Total catch: 30.54 CATCH/HOUR: 87.26

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	78.86	303	90.37	5272
Aequorea aequorea	5.06	17	5.80	
Lampanyctodes hectoris	1.57	820	1.80	5273
Zeus capensis	1.03	3	1.18	
Todaropsis eblanae	0.60	9	0.69	
MYCTOPHIDAE	0.09	6	0.10	
Maurollicus muelleri	0.06	43	0.07	
Total	87.27		100.01	

PROJECT STATION: 652  
 DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3353  
 start stop duration Long E 1733  
 TIME :22:08:12 22:28:03 20 (min) Purpose code: 1  
 LOG :2146.80 3352.40 5.60 Area code : 2  
 FDEPTH: 100 50 GearCond.code:  
 BDEPTH: 316 316 Validity code:  
 Towing dir: 320ø Wire out: m Speed: 30 kn\*10

Sorted: 29 Kg Total catch: 29.92 CATCH/HOUR: 89.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	89.37	35331	99.57	5274
MYCTOPHIDAE	0.39	24	0.43	
Total	89.76		100.00	

PROJECT STATION: 653  
 DATE:14/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3352  
 start stop duration Long E 1732  
 TIME :22:42:59 22:55:27 12 (min) Purpose code: 1  
 LOG :2148.92 2149.70 0.77 Area code : 2  
 FDEPTH: 30 30 GearCond.code:  
 BDEPTH: 329 340 Validity code:  
 Towing dir: 320ø Wire out: 120 m Speed: 30 kn\*10

Sorted: 30 Kg Total catch: 30.72 CATCH/HOUR: 153.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	151.65	9225	98.73	5275
Todaropsis eblanae	1.95	365	1.27	
Total	153.60		100.00	

PROJECT STATION: 654  
 DATE:15/ 6/00 GEAR TYPE: PT No:2 POSITION:Lat S 3433  
 start stop duration Long E 1858  
 TIME :12:17:06 13:19:05 62 (min) Purpose code: 1  
 LOG :2271.66 2275.14 3.39 Area code : 2  
 FDEPTH: 30 45 GearCond.code:  
 BDEPTH: 116 137 Validity code:  
 Towing dir: 205ø Wire out: 180 m Speed: 35 kn\*10

Sorted: 320 Kg Total catch: 416.80 CATCH/HOUR: 403.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	307.74	918	76.30	
Engraulis capensis	42.77	7095	10.60	5277
Trachurus capensis	26.42	10807	6.55	5276
Sardinops ocellatus	25.16	1610	6.24	5278
Etrumeus whiteheadi	1.26	179	0.31	5279

Total 403.35 100.00  
 PROJECT STATION: 655  
 DATE:15/ 6/00 GEAR TYPE: PT No:2 POSITION:Lat S 3427  
 start stop duration Long E 1907  
 TIME :16:00:41 16:21:26 21 (min) Purpose code: 1  
 LOG :2297.33 2298.80 1.45 Area code : 2  
 FDEPTH: 25 28 GearCond.code:  
 BDEPTH: 59 61 Validity code:  
 Towing dir: 290ø Wire out: 140 m Speed: 30 kn\*10

Sorted: 24 Kg Total catch: 3000.00 CATCH/HOUR: 8571.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	5249.60	403814	61.25	5280
Engraulis capensis	3245.60	649120	37.87	5281
Etrumeus whiteheadi	54.46	13614	0.64	5282
Trachurus capensis	21.77	1814	0.25	
Total	8571.43		100.01	

PROJECT STATION: 656  
 DATE:15/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3442  
 start stop duration Long E 1909  
 TIME :19:33:10 19:38:33 5 (min) Purpose code: 1  
 LOG :2327.88 2328.21 0.32 Area code : 2  
 FDEPTH: 30 30 GearCond.code:  
 BDEPTH: 105 102 Validity code:  
 Towing dir: 30ø Wire out: 120 m Speed: 30 kn\*10

Sorted: 26 Kg Total catch: 200.58 CATCH/HOUR: 2406.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	2273.40	324768	94.45	5283
Etrumeus whiteheadi	127.08	6360	5.28	5284
Sardinops ocellatus	3.72	96	0.15	
Trachurus capensis	2.88	720	0.12	
Total	2407.08		100.00	

PROJECT STATION: 657  
 DATE:15/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3452  
 start stop duration Long E 1910  
 TIME :21:45:37 22:15:28 30 (min) Purpose code: 1  
 LOG :2346.24 2347.79 1.52 Area code : 2  
 FDEPTH: 30 30 GearCond.code:  
 BDEPTH: 151 150 Validity code:  
 Towing dir: 295ø Wire out: 120 m Speed: 34 kn\*10

Sorted: 26 Kg Total catch: 77.91 CATCH/HOUR: 155.82

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	89.64	1212	57.53	5287
Aequorea aequorea	33.84	90	21.72	
Engraulis capensis	15.18	1062	9.74	5285
Etrumeus whiteheadi	12.66	282	8.12	5286
Squalus megalops	4.26	42	2.73	
Trachurus capensis	0.24	210	0.15	5288
Total	155.82		99.99	

PROJECT STATION: 658  
 DATE:16/ 6/00 GEAR TYPE: PT No:2 POSITION:Lat S 3454  
 start stop duration Long E 1918  
 TIME :00:28:51 00:40:36 12 (min) Purpose code: 1  
 LOG :2363.34 2364.15 0.79 Area code : 2  
 FDEPTH: 15 20 GearCond. code:  
 BDEPTH: 120 112 Validity code:  
 Towing dir: 100ø Wire out: 120 m Speed: 35 kn\*10  
 Sorted: 64 Kg Total catch: 1000.00 CATCH/HOUR: 5000.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	2423.50	51310	48.47	5289
Sardinops ocellatus	1127.50	16375	22.55	5292
Trachurus capensis	1077.50	326215	21.55	5291
Engraulis capensis	358.65	93250	7.17	5290
Todaropsis eblanae	10.15	315	0.20	
TRACHTERIDAE	3.10	80	0.06	
Total	5000.40		100.00	

PROJECT STATION: 662  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3456  
 start stop duration Long E 1930  
 TIME :07:51:03 07:56:06 5 (min) Purpose code: 1  
 LOG :2418.08 2418.38 0.30 Area code : 2  
 FDEPTH: 80 82 GearCond. code:  
 BDEPTH: 125 124 Validity code:  
 Towing dir: 40ø Wire out: 340 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 1.45 CATCH/HOUR: 17.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	14.88	300	85.52	
Engraulis capensis	2.04	132	11.72	5297
Trachurus capensis	0.48	120	2.76	5298
Total	17.40		100.00	

PROJECT STATION: 660  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3456  
 start stop duration Long E 1929  
 TIME :05:36:18 06:01:00 25 (min) Purpose code: 1  
 LOG :2404.40 2406.00 1.65 Area code : 2  
 FDEPTH: 24 24 GearCond. code:  
 BDEPTH: 120 112 Validity code:  
 Towing dir: 40ø Wire out: 100 m Speed: 35 kn\*10  
 Sorted: 20 Kg Total catch: 20.60 CATCH/HOUR: 49.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	32.64	4661	66.02	5293
Aequorea aequorea	12.82	257	25.93	
Etrumeus whiteheadi	3.98	286	8.05	5294
Total	49.44		100.00	

PROJECT STATION: 663  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3456  
 start stop duration Long E 1930  
 TIME :08:05:06 08:10:29 5 (min) Purpose code: 1  
 LOG :2418.85 2419.19 0.40 Area code : 2  
 FDEPTH: 30 30 GearCond. code:  
 BDEPTH: 119 115 Validity code:  
 Towing dir: 40ø Wire out: 135 m Speed: 30 kn\*10  
 Sorted: 10 Kg Total catch: 9.87 CATCH/HOUR: 118.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	90.00	30000	75.99	5299
Todaropsis eblanae	27.60	552	23.30	
Aequorea aequorea	0.84	168	0.71	
Total	118.44		100.00	

PROJECT STATION: 661  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3457  
 start stop duration Long E 1929  
 TIME :07:36:42 07:39:38 3 (min) Purpose code: 1  
 LOG :2417.13 2417.34 0.21 Area code : 2  
 FDEPTH: 32 40 GearCond. code:  
 BDEPTH: 136 135 Validity code:  
 Towing dir: 40ø Wire out: 140 m Speed: 30 kn\*10  
 Sorted: 25 Kg Total catch: 25.16 CATCH/HOUR: 503.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	274.80	25000	54.61	5295
Trachurus capensis	158.80	31760	31.56	5296
Aequorea aequorea	69.60	1400	13.83	
Total	503.20		100.00	

PROJECT STATION: 664  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3455  
 start stop duration Long E 1934  
 TIME :10:37:08 10:40:07 3 (min) Purpose code: 1  
 LOG :2438.69 2438.86 0.17 Area code : 2  
 FDEPTH: 75 75 GearCond. code:  
 BDEPTH: 109 107 Validity code:  
 Towing dir: 210ø Wire out: 250 m Speed: 35 kn\*10  
 Sorted: 32 Kg Total catch: 32.39 CATCH/HOUR: 647.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	626.00	18800	96.63	5300
Aequorea aequorea	16.80	40	2.59	
Engraulis capensis	2.80	220	0.43	5301
Trachurus capensis	1.40	400	0.22	5302
Sardinops ocellatus	0.80	20	0.12	
Total	647.80		99.99	



PROJECT STATION: 665  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3455  
 start stop duration Long E 1933  
 TIME :10:40:41 10:44:50 4 (min) Purpose code: 1  
 LOG :2438.89 2439.10 0.23 Area code : 2  
 FDEPTH: 75 75 GearCond.code:  
 BDEPTH: 109 112 Validity code:  
 Towing dir: 210ø Wire out: 250 m Speed: 35 kn\*10  
 Sorted: 23 Kg Total catch: 23.20 CATCH/HOUR: 348.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	320.10	9330	91.98	5303
Aequorea aequorea	27.60	75	7.93	
Trachurus capensis	0.30	105	0.09	
Total	348.00		100.00	

PROJECT STATION: 669  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3456  
 start stop duration Long E 1933  
 TIME :12:32:48 12:52:37 20 (min) Purpose code: 1  
 LOG :2446.33 2447.51 1.17 Area code : 2  
 FDEPTH: 30 28 GearCond.code:  
 BDEPTH: 115 116 Validity code:  
 Towing dir: 210ø Wire out: 160 m Speed: 33 kn\*10  
 Sorted: 7 Kg Total catch: 7.23 CATCH/HOUR: 21.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	16.20	7656	74.69	5308
J E L L Y F I S H	5.49	141	25.31	
Total	21.69		100.00	

PROJECT STATION: 666  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3455  
 start stop duration Long E 1933  
 TIME :10:46:30 10:50:47 4 (min) Purpose code: 1  
 LOG :2439.20 2439.43 0.23 Area code : 2  
 FDEPTH: 80 80 GearCond.code:  
 BDEPTH: 112 109 Validity code:  
 Towing dir: 210ø Wire out: 250 m Speed: 35 kn\*10  
 Sorted: 34 Kg Total catch: 67.64 CATCH/HOUR: 1014.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	945.00	25005	93.14	5305
Aequorea aequorea	64.20	180	6.33	
Trachurus capensis	2.40	660	0.24	5304
Sardinops ocellatus	2.10	30	0.21	
Engraulis capensis	0.90	30	0.09	
Total	1014.60		100.01	

PROJECT STATION: 670  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3451  
 start stop duration Long E 1936  
 TIME :14:40:02 14:43:22 3 (min) Purpose code: 1  
 LOG :2458.66 2458.86 0.20 Area code : 2  
 FDEPTH: 45 45 GearCond.code:  
 BDEPTH: 73 72 Validity code:  
 Towing dir: 210ø Wire out: 200 m Speed: 33 kn\*10  
 Sorted: 3 Kg Total catch: 3.91 CATCH/HOUR: 78.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	63.80	12760	81.59	5309
Sardinops ocellatus	7.20	620	9.21	5310
CLURTO2	5.20	1240	6.65	5311
Trachurus capensis	2.00	700	2.56	5312
Total	78.20		100.01	

PROJECT STATION: 667  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3454  
 start stop duration Long E 1934  
 TIME :12:01:30 12:06:59 5 (min) Purpose code: 1  
 LOG :2444.53 2444.85 0.32 Area code : 2  
 FDEPTH: 25 27 GearCond.code:  
 BDEPTH: 105 107 Validity code:  
 Towing dir: ø Wire out: 160 m Speed: 33 kn\*10  
 Sorted: 2 Kg Total catch: 30.30 CATCH/HOUR: 363.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	254.40	110592	69.97	5306
J E L L Y F I S H	109.20	4512	30.03	
Total	363.60		100.00	

PROJECT STATION: 671  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3451  
 start stop duration Long E 1936  
 TIME :14:45:59 14:52:05 6 (min) Purpose code: 1  
 LOG :2459.02 2459.39 0.35 Area code : 2  
 FDEPTH: 45 45 GearCond.code:  
 BDEPTH: 76 80 Validity code:  
 Towing dir: 210ø Wire out: m Speed: kn\*10  
 Sorted: 38 Kg Total catch: 38.03 CATCH/HOUR: 380.30

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	253.40	42230	66.63	5313
Sardinops ocellatus	107.80	6740	28.35	5314
Aequorea aequorea	15.70	310	4.13	
Trachurus capensis	3.30	1220	0.87	5315
Etrumeus whiteheadi	0.10	30	0.03	
Total	380.30		100.01	

PROJECT STATION: 668  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3454  
 start stop duration Long E 1934  
 TIME :12:09:33 12:30:20 21 (min) Purpose code: 1  
 LOG :2445.00 2446.18 1.18 Area code : 2  
 FDEPTH: 27 30 GearCond.code:  
 BDEPTH: 105 113 Validity code:  
 Towing dir: 210ø Wire out: m Speed: kn\*10  
 Sorted: 43 Kg Total catch: 43.11 CATCH/HOUR: 123.17

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	92.97	2449	75.48	
Trachurus capensis	26.31	9680	21.36	5307
Aequorea aequorea	3.89	17	3.16	
Total	123.17		100.00	

PROJECT STATION: 672  
 DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3452  
 start stop duration Long E 1936  
 TIME :14:53:57 15:00:52 7 (min) Purpose code: 1  
 LOG :2459.51 2459.91 0.39 Area code : 2  
 FDEPTH: 45 42 GearCond.code:  
 BDEPTH: 77 90 Validity code:  
 Towing dir: 210ø Wire out: 200 m Speed: 35 kn\*10  
 Sorted: 30 Kg Total catch: 65.98 CATCH/HOUR: 565.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	280.54	40080	49.61	5316
Etrumeus whiteheadi	193.97	38794	34.30	5317
Aequorea aequorea	38.31	763	6.77	
Trachurus capensis	34.03	11340	6.02	5319
Sardinops ocellatus	18.77	891	3.32	5318

Total 565.62 100.02

PROJECT STATION: 673

DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3453  
start stop duration Long E 1940

TIME :17:11:46 17:32:26 21 (min) Purpose code: 1  
LOG :2475.61 2476.84 1.22 Area code : 2  
FDEPTH: 30 20 GearCond.code:  
BDEPTH: 62 60 Validity code:  
Towing dir: 30ø Wire out: 120 m Speed: 30 kn\*10

Sorted: 27 Kg Total catch: 81.57 CATCH/HOUR: 233.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	133.20	26640	57.15	5320
Sardinops ocellatus	97.37	5126	41.78	5321
Etrumeus whiteheadi	2.14	429	0.92	5323
Trachurus capensis	0.34	171	0.15	5322
Total	233.05		100.00	

PROJECT STATION: 674

DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3451  
start stop duration Long E 1941

TIME :17:34:25 17:44:04 10 (min) Purpose code: 1  
LOG :2476.96 2477.54 0.57 Area code : 2  
FDEPTH: 20 20 GearCond.code:  
BDEPTH: 62 64 Validity code:  
Towing dir: 30ø Wire out: 120 m Speed: 30 kn\*10

Sorted: 3 Kg Total catch: 3.90 CATCH/HOUR: 23.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	7.98	510	34.10	5325
Engraulis capensis	7.98	1596	34.10	5324
Aequorea aequorea	7.38	150	31.54	
Trachurus capensis	0.06	18	0.26	
Total	23.40		100.00	

PROJECT STATION: 675

DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3451  
start stop duration Long E 1942

TIME :17:49:25 17:59:53 10 (min) Purpose code: 1  
LOG :2477.91 2478.66 0.74 Area code : 2  
FDEPTH: 5 5 GearCond.code:  
BDEPTH: 63 59 Validity code:  
Towing dir: 30ø Wire out: 70 m Speed: 30 kn\*10

Sorted: 26 Kg Total catch: 1029.21 CATCH/HOUR: 6175.26

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	5798.52	362406	93.90	5326
Engraulis capensis	374.40	74880	6.06	5327
Etrumeus whiteheadi	2.40	480	0.04	
Total	6175.32		100.00	

PROJECT STATION: 676

DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3502  
start stop duration Long E 1937

TIME :20:13:05 20:13:12 23 (min) Purpose code: 1  
LOG :2498.05 2499.39 1.33 Area code : 2  
FDEPTH: 110 110 GearCond.code:  
BDEPTH: 143 137 Validity code:  
Towing dir: 30ø Wire out: 400 m Speed: 30 kn\*10

Sorted: 47 Kg Total catch: 46.67 CATCH/HOUR: 121.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	62.35	217	51.21	5330
JELAE00	21.39	428	17.57	
Merluccius capensis	17.77	86	14.60	5329
Chelidonichthys queketti	15.18	34	12.47	5331
Squalus megalops	2.30	5	1.89	
TRACHTERIDAE	1.83	3	1.50	
Merluccius sp.	0.50	117	0.41	5328
Sepia australis	0.44	42	0.36	

Total 121.76 100.01

PROJECT STATION: 677

DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3501  
start stop duration Long E 1938

TIME :20:55:18 21:08:55 14 (min) Purpose code: 1  
LOG :2499.93 2500.71 0.91 Area code : 2  
FDEPTH: 60 60 GearCond.code:  
BDEPTH: 132 126 Validity code:  
Towing dir: 30ø Wire out: 240 m Speed: 30 kn\*10

Sorted: 38 Kg Total catch: 37.83 CATCH/HOUR: 162.13

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Galeorhinus galeus	149.23	9	92.04	
Trachurus capensis	6.47	26	3.99	5332
Engraulis capensis	4.29	270	2.65	5333
TRACHTERIDAE	1.29	21	0.80	
Aequorea aequorea	0.86	4	0.53	
Total	162.14		100.01	

PROJECT STATION: 678

DATE:16/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3459  
start stop duration Long E 1939

TIME :21:17:48 21:24:41 7 (min) Purpose code: 1  
LOG :2501.15 2501.53 0.38 Area code : 2  
FDEPTH: 30 30 GearCond.code:  
BDEPTH: 127 124 Validity code:  
Towing dir: 30ø Wire out: 120 m Speed: 30 kn\*10

Sorted: 27 Kg Total catch: 27.04 CATCH/HOUR: 231.77

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	200.06	4260	86.32	5334
Engraulis capensis	17.31	1149	7.47	5336
Sardinops ocellatus	13.97	214	6.03	5335
Todaropsis eblanae	0.43	9	0.19	
Total	231.77		100.01	

PROJECT STATION: 679

DATE:17/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3455  
start stop duration Long E 1944

TIME :00:17:29 00:24:55 7 (min) Purpose code: 1  
LOG :2522.60 2523.03 0.43 Area code : 2  
FDEPTH: 35 35 GearCond.code:  
BDEPTH: 64 75 Validity code:  
Towing dir: 210ø Wire out: 180 m Speed: 35 kn\*10

Sorted: 33 Kg Total catch: 32.72 CATCH/HOUR: 280.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	185.14	21746	66.01	5337
Sardinops ocellatus	53.66	2631	19.13	5338
Callorhynchus capensis	12.51	9	4.46	
Squalus megalops	10.97	17	3.91	
Trachurus capensis	9.09	1526	3.24	5339
Etrumeus whiteheadi	4.63	326	1.65	5340
Sepia australis	4.11	197	1.47	
Chelidonichthys capensis	0.17	9	0.06	
Small squids	0.09	77	0.03	
Merluccius capensis	0.09	9	0.03	
Total	280.46		99.99	

PROJECT STATION: 680  
 DATE:17/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3456  
 start stop duration Long E 1943  
 TIME :00:35:37 00:47:23 12 (min) Purpose code: 1  
 LOG :2523.70 2524.45 0.76 Area code : 2  
 FDEPTH: 30 30 GearCond. code:  
 BDEPTH: 75 83 Validity code:  
 Towing dir: 210ø Wire out: 200 m Speed: 35 kn\*10  
 Sorted: 29 Kg Total catch: 85.58 CATCH/HOUR: 427.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	377.00	64425	88.10	5343
Sardinops ocellatus	45.00	3215	10.52	5341
Trachurus capensis	4.85	1705	1.13	5342
Etrumeus whiteheadi	1.05	395	0.25	
Total	427.90		100.00	

PROJECT STATION: 684  
 DATE:17/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3459  
 start stop duration Long E 1950  
 TIME :07:36:16 07:45:10 9 (min) Purpose code: 1  
 LOG :2568.18 2568.69 0.49 Area code : 2  
 FDEPTH: 20 24 GearCond. code:  
 BDEPTH: 67 70 Validity code:  
 Towing dir: 30ø Wire out: 110 m Speed: 30 kn\*10  
 Sorted: 28 Kg Total catch: 115.72 CATCH/HOUR: 771.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	668.27	83533	86.62	5349
Aequorea aequorea	59.47	1187	7.71	
Sardinops ocellatus	22.93	1767	2.97	5350
Etrumeus whiteheadi	20.53	1207	2.66	5351
Trachurus capensis	0.27	40	0.03	
Total	771.47		99.99	

PROJECT STATION: 681  
 DATE:17/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3458  
 start stop duration Long E 1942  
 TIME :01:12:14 01:22:41 10 (min) Purpose code: 1  
 LOG :2526.15 2526.86 0.70 Area code : 2  
 FDEPTH: 15 15 GearCond. code:  
 BDEPTH: 104 107 Validity code:  
 Towing dir: 210ø Wire out: 160 m Speed: 35 kn\*10  
 Sorted: 33 Kg Total catch: 133.28 CATCH/HOUR: 799.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	729.12	19512	91.18	5344
Sardinops ocellatus	46.08	1032	5.76	5346
Engraulis capensis	18.72	2352	2.34	5345
Todaropsis eblanae	5.52	144	0.69	
Trachurus capensis	0.24	24	0.03	
Total	799.68		100.00	

PROJECT STATION: 685  
 DATE:17/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3458  
 start stop duration Long E 1951  
 TIME :07:54:29 08:07:01 13 (min) Purpose code: 1  
 LOG :2569.19 2569.83 0.63 Area code : 2  
 FDEPTH: 40 40 GearCond. code:  
 BDEPTH: 73 70 Validity code:  
 Towing dir: 30ø Wire out: 140 m Speed: 30 kn\*10  
 Sorted: 6 Kg Total catch: 6.16 CATCH/HOUR: 28.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	15.83	1320	55.68	5354
Sardinops ocellatus	6.14	318	21.60	5353
Engraulis capensis	3.78	475	13.30	5352
Aequorea aequorea	2.68	55	9.43	
Total	28.43		100.01	

PROJECT STATION: 682  
 DATE:17/ 6/00 GEAR TYPE: PT No:7 POSITION:Lat S 3449  
 start stop duration Long E 1951  
 TIME :03:48:00 04:18:08 30 (min) Purpose code: 1  
 LOG :2543.80 2545.79 2.01 Area code : 2  
 FDEPTH: 15 3 GearCond. code:  
 BDEPTH: 33 37 Validity code:  
 Towing dir: 290ø Wire out: 140 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 1.96 CATCH/HOUR: 3.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Galeorhinus galeus	2.56	4	65.31	
Pomatomus saltatrix	0.48	40	12.24	
SPASPOO	0.36	2	9.18	
Loligo reynaudi	0.36	4	9.18	
Etrumeus whiteheadi	0.12	16	3.06	
Trachurus capensis	0.02	4	0.51	
Engraulis capensis	0.02	8	0.51	
Total	3.92		99.99	

PROJECT STATION: 686  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3457  
 start stop duration Long E 1937  
 TIME :08:47:30 09:00:08 13 (min) Purpose code: 1  
 LOG :2848.29 2848.99 0.69 Area code : 2  
 FDEPTH: 90 105 GearCond. code:  
 BDEPTH: 128 122 Validity code:  
 Towing dir: 30ø Wire out: 380 m Speed: 30 kn\*10  
 Sorted: 33 Kg Total catch: 33.28 CATCH/HOUR: 153.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	87.83	2188	57.18	5356
Aequorea aequorea	65.45	277	42.61	
Sardinops ocellatus	0.32	5	0.21	
Total	153.60		100.00	

PROJECT STATION: 683  
 DATE:17/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3500  
 start stop duration Long E 1949  
 TIME :07:04:53 07:31:01 26 (min) Purpose code: 1  
 LOG :2566.42 2567.91 1.47 Area code : 2  
 FDEPTH: 40 35 GearCond. code:  
 BDEPTH: 74 64 Validity code:  
 Towing dir: 30ø Wire out: 160 m Speed: 30 kn\*10  
 Sorted: 35 Kg Total catch: 52.62 CATCH/HOUR: 121.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	108.00	15429	88.94	5347
Aequorea aequorea	9.65	194	7.95	
Etrumeus whiteheadi	3.69	81	3.04	5348
Sardinops ocellatus	0.07	5	0.06	

PROJECT STATION: 687  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3457  
 start stop duration Long E 1937  
 TIME :09:01:17 09:12:25 11 (min) Purpose code: 1  
 LOG :2849.06 2849.70 0.64 Area code : 2  
 FDEPTH: 90 85 GearCond. code:  
 BDEPTH: 122 112 Validity code:  
 Towing dir: 30ø Wire out: 380 m Speed: 30 kn\*10  
 Sorted: 57 Kg Total catch: 56.51 CATCH/HOUR: 308.24

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	232.69	6311	75.49	5357
Aequorea aequorea	48.82	185	15.84	
Sardinops ocellatus	25.96	360	8.42	5358
Trachurus capensis	1.31	11	0.42	

Total 308.78 100.17  
 PROJECT STATION: 688  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3456  
 start stop duration Long E 1938  
 TIME :09:17:58 09:24:32 7 (min) Purpose code: 1  
 LOG :2849.99 2850.33 0.35 Area code : 2  
 FDEPTH: 35 30 GearCond.code:  
 BDEPTH: 110 110 Validity code:  
 Towing dir: 30ø Wire out: 170 m Speed: 30 kn\*10  
 Sorted: 10 Kg Total catch: 10.08 CATCH/HOUR: 86.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	78.86	429	91.27	
Etrumeus whiteheadi	6.86	171	7.94	5359
Trachurus capensis	0.69	420	0.80	5360
Total	86.41		100.01	

PROJECT STATION: 692  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3459  
 start stop duration Long E 1934  
 TIME :14:51:15 14:58:09 7 (min) Purpose code: 1  
 LOG :2882.69 2883.09 0.58 Area code : 2  
 FDEPTH: 90 90 GearCond.code:  
 BDEPTH: 142 143 Validity code:  
 Towing dir: 180ø Wire out: m Speed: kn\*10  
 Sorted: 6 Kg Total catch: 6.38 CATCH/HOUR: 54.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELCH00	39.26	103	71.79	
Etrumeus whiteheadi	15.43	326	28.21	5364
Total	54.69		100.00	

PROJECT STATION: 689  
 DATE:20/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3503  
 start stop duration Long E 1939  
 TIME :11:53:29 12:06:46 13 (min) Purpose code: 1  
 LOG :2867.39 2868.04 0.65 Area code : 2  
 FDEPTH: 100 115 GearCond.code:  
 BDEPTH: 145 147 Validity code:  
 Towing dir: 210ø Wire out: 300 m Speed: 35 kn\*10  
 Sorted: 29 Kg Total catch: 48.54 CATCH/HOUR: 224.03

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	198.60	4278	88.65	5361
Aequorea aequorea	24.97	92	11.15	
Todaropsis eblanae	0.46	9	0.21	
Total	224.03		100.01	

PROJECT STATION: 693  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3501  
 start stop duration Long E 1934  
 TIME :15:08:14 15:44:57 37 (min) Purpose code: 1  
 LOG :2883.80 2886.29 2.48 Area code : 2  
 FDEPTH: 52 52 GearCond.code:  
 BDEPTH: 146 151 Validity code:  
 Towing dir: 180ø Wire out: 250 m Speed: 35 kn\*10  
 Sorted: 37 Kg Total catch: 36.84 CATCH/HOUR: 59.74

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	40.56	966	67.89	5365
JELCH00	8.71	19	14.58	
Aequorea aequorea	5.53	156	9.26	
Sardinops ocellatus	4.70	66	7.87	5366
Trachurus capensis	0.24	159	0.40	5367
Total	59.74		100.00	

PROJECT STATION: 690  
 DATE:20/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3504  
 start stop duration Long E 1938  
 TIME :12:17:43 12:28:12 10 (min) Purpose code: 1  
 LOG :2868.69 2869.33 0.62 Area code : 2  
 FDEPTH: 75 75 GearCond.code:  
 BDEPTH: 149 150 Validity code:  
 Towing dir: 210ø Wire out: 300 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 0.67 CATCH/HOUR: 4.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JALAE01	3.00	6	74.63	
Etrumeus whiteheadi	1.02	24	25.37	
Total	4.02		100.00	

PROJECT STATION: 694  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3503  
 start stop duration Long E 1934  
 TIME :15:53:09 16:05:17 12 (min) Purpose code: 1  
 LOG :2886.75 2887.61 0.85 Area code : 2  
 FDEPTH: 25 20 GearCond.code:  
 BDEPTH: 152 153 Validity code:  
 Towing dir: 180ø Wire out: 160 m Speed: 30 kn\*10  
 Sorted: 20 Kg Total catch: 20.28 CATCH/HOUR: 101.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	70.40	1695	69.43	5368
Sardinops ocellatus	25.95	335	25.59	5369
Aequorea aequorea	5.05	60	4.98	
Total	101.40		100.00	

PROJECT STATION: 691  
 DATE:20/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3505  
 start stop duration Long E 1937  
 TIME :12:38:39 12:51:33 13 (min) Purpose code: 1  
 LOG :2869.92 2870.75 0.81 Area code : 2  
 FDEPTH: 25 20 GearCond.code:  
 BDEPTH: 152 154 Validity code:  
 Towing dir: 210ø Wire out: 150 m Speed: 33 kn\*10  
 Sorted: 17 Kg Total catch: 17.41 CATCH/HOUR: 80.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	53.91	4117	67.09	5362
Aequorea aequorea	25.25	623	31.43	
Trachurus capensis	1.20	1131	1.49	5363
Total	80.36		100.01	

PROJECT STATION: 695  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3453  
 start stop duration Long E 1928  
 TIME :18:16:21 18:31:48 15 (min) Purpose code: 1  
 LOG :2906.33 2907.23 0.88 Area code : 2  
 FDEPTH: 60 60 GearCond.code:  
 BDEPTH: 106 118 Validity code:  
 Towing dir: 270ø Wire out: 250 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 1.07 CATCH/HOUR: 4.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELCH00	2.56	8	59.81	
Engraulis capensis	0.80	60	18.69	5370
Krill	0.48	1872	11.21	
TRACHIPTERIDAE	0.20	16	4.67	
Aequorea aequorea	0.12	4	2.80	
Sepia australis	0.08	8	1.87	
C R A B S	0.04	152	0.93	
SOLEIDAE	0.00	4		
Zeus capensis	0.00	4		

Total 4.28 99.98  
 PROJECT STATION: 696  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3453  
 start stop duration Long E 1927  
 TIME :18:41:29 18:56:13 15 (min) Purpose code: 1  
 LOG :2907.60 2908.70 1.10 Area code : 2  
 FDEPTH: 30 30 GearCond. code:  
 BDEPTH: 120 118 Validity code:  
 Towing dir: 270ø Wire out: 150 m Speed: 4 kn\*10  
 Sorted: 1 Kg Total catch: 1.11 CATCH/HOUR: 4.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	2.48	160	55.86	5371
JELCHOO	1.96	4	44.14	
Total	4.44		100.00	

PROJECT STATION: 697  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3454  
 start stop duration Long E 1927  
 TIME :18:35:29 18:50:13 15 (min) Purpose code: 1  
 LOG :2907.30 2908.26 0.82 Area code : 2  
 FDEPTH: 30 30 GearCond. code:  
 BDEPTH: 120 118 Validity code:  
 Towing dir: 270ø Wire out:2908 m Speed:340 kn\*10  
 Sorted: 51 Kg Total catch: 334.30 CATCH/HOUR: 1337.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	1123.72	28628	84.04	5372
Sardinops ocellatus	188.76	4340	14.12	5373
JELCHOO	10.40	80	0.78	
C E P H A L O P O D A	9.88	184	0.74	
Scomber japonicus	4.44	28	0.33	
Total	1337.20		100.01	

PROJECT STATION: 698  
 DATE:20/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3454  
 start stop duration Long E 1927  
 TIME :18:41:13 18:57:23 16 (min) Purpose code: 1  
 LOG :2907.76 2908.68 0.90 Area code : 2  
 FDEPTH: 30 30 GearCond. code:  
 BDEPTH: 124 123 Validity code:  
 Towing dir: 270ø Wire out: 150 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 1.06 CATCH/HOUR: 3.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis, juveniles	2.25	975	56.53	5374
Merluccius capensis	1.01	8	25.38	5375
Aequorea aequorea	0.53	4	13.32	
C R A B S	0.08	135	2.01	
Engraulis capensis	0.08	4	2.01	
Trachurus capensis	0.04	11	1.01	
Total	3.99		100.26	

PROJECT STATION: 699  
 DATE:20/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3505  
 start stop duration Long E 1920  
 TIME :23:39:08 23:52:51 14 (min) Purpose code: 1  
 LOG :2941.97 2942.89 0.90 Area code : 2  
 FDEPTH: 50 50 GearCond. code:  
 BDEPTH: 167 165 Validity code:  
 Towing dir: 42ø Wire out: 300 m Speed: 32 kn\*10  
 Sorted: 4 Kg Total catch: 3.62 CATCH/HOUR: 15.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachipterus trachipterus	7.29	9	47.00	
Engraulis capensis	3.51	210	22.63	5376
Aequorea aequorea	1.67	9	10.77	
Trachurus capensis	0.86	69	5.54	5377
Centroscyllum fabricii	0.77	13	4.96	
Merluccius capensis, juveniles	0.56	287	3.61	5378
C E P H A L O P O D A	0.43	13	2.77	
C R A B S	0.39	943	2.51	
TRACHIPTERIDAE	0.04	9	0.26	

Total 15.52 100.05  
 PROJECT STATION: 700  
 DATE:21/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3504  
 start stop duration Long E 1921  
 TIME :23:57:11 00:08:26 11 (min) Purpose code: 1  
 LOG :2943.12 2943.84 0.70 Area code : 2  
 FDEPTH: 25 25 GearCond. code:  
 BDEPTH: 166 165 Validity code:  
 Towing dir: 42ø Wire out: 150 m Speed: 30 kn\*10  
 Sorted: 8 Kg Total catch: 7.65 CATCH/HOUR: 41.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	25.42	502	60.92	5380
Engraulis capensis	15.55	900	37.26	5379
Aequorea aequorea	0.65	5	1.56	
Trachurus capensis	0.05	44	0.12	
Merluccius capensis, juveniles	0.05	33	0.12	
Total	41.72		99.98	

PROJECT STATION: 701  
 DATE:21/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3503  
 start stop duration Long E 1908  
 TIME :03:13:42 03:37:40 24 (min) Purpose code: 1  
 LOG :2967.04 2968.47 1.41 Area code : 2  
 FDEPTH: 75 75 GearCond. code:  
 BDEPTH: 177 179 Validity code:  
 Towing dir: 225ø Wire out: m Speed: kn\*10  
 Sorted: 2 Kg Total catch: 2.17 CATCH/HOUR: 5.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELCHOO	5.13	33	94.48	
Merluccius sp.	0.30	113	5.52	5381
Total	5.43		100.00	

PROJECT STATION: 702  
 DATE:21/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3504  
 start stop duration Long E 1906  
 TIME :03:44:20 04:01:38 17 (min) Purpose code: 1  
 LOG :2968.83 2969.93 1.09 Area code : 2  
 FDEPTH: 50 30 GearCond. code:  
 BDEPTH: 178 181 Validity code:  
 Towing dir: 225ø Wire out: 240 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 1.33 CATCH/HOUR: 4.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELCHOO	3.00	7	63.97	
Squalus megalops	1.38	14	29.42	
Merluccius sp.	0.28	145	5.97	5382
C E P H A L O P O D A	0.04	7	0.85	
Total	4.70		100.21	

PROJECT STATION: 703  
 DATE:21/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3506  
 start stop duration Long E 1904  
 TIME :04:13:26 04:28:33 15 (min) Purpose code: 1  
 LOG :2970.71 2971.72 1.00 Area code : 2  
 FDEPTH: 25 25 GearCond. code:  
 BDEPTH: 182 185 Validity code:  
 Towing dir: 225ø Wire out: 200 m Speed: 30 kn\*10  
 Sorted: 8 Kg Total catch: 8.35 CATCH/HOUR: 33.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	30.32	640	90.78	5383
Trachurus capensis	2.16	8	6.47	
Merluccius sp.	0.92	444	2.75	5384
Total	33.40		100.00	

PROJECT STATION: 704  
 DATE:21/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3451  
 start stop duration Long E 1914  
 TIME :10:05:39 10:15:02 9 (min) Purpose code: 1  
 LOG :3021.50 3022.08 0.58 Area code : 2  
 FDEPTH: 110 110 GearCond. code:  
 BDEPTH: 132 130 Validity code:  
 Towing dir: 0 Wire out: 420 m Speed: 32 kn\*10  
 Sorted: 33 Kg Total catch: 33.38 CATCH/HOUR: 222.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Etrumeus whiteheadi	371.33	8160	166.87	5385
Aequorea aequorea	75.93	240	34.12	
Total	447.26		200.99	

PROJECT STATION: 708  
 DATE:21/ 6/00 GEAR TYPE: PT No:5 POSITION:Lat S 3420  
 start stop duration Long E 1841  
 TIME :23:37:53 23:55:25 18 (min) Purpose code: 1  
 LOG :3126.44 3127.56 1.10 Area code : 2  
 FDEPTH: 15 15 GearCond. code:  
 BDEPTH: 80 74 Validity code:  
 Towing dir: 3500 Wire out: 160 m Speed: 30 kn\*10  
 Sorted: 34 Kg Total catch: 272.24 CATCH/HOUR: 907.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	869.60	121253	95.83	5389
Aequorea aequorea	23.20	107	2.56	
Etrumeus whiteheadi	5.33	1013	0.59	5390
Sardinops ocellatus	4.80	373	0.53	5391
C E P H A L O P O D A	2.67	240	0.29	
Trachurus capensis	1.33	560	0.15	5392
Merluccius sp.	0.53	80	0.06	
Total	907.46		100.01	

PROJECT STATION: 705  
 DATE:21/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3451  
 start stop duration Long E 1915  
 TIME :10:22:34 10:27:21 5 (min) Purpose code: 1  
 LOG :3022.55 3022.84 0.28 Area code : 2  
 FDEPTH: 115 115 GearCond. code:  
 BDEPTH: 131 129 Validity code:  
 Towing dir: 1200 Wire out: 420 m Speed: 34 kn\*10  
 Sorted: 9 Kg Total catch: 9.15 CATCH/HOUR: 109.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	90.12	276	82.08	
Etrumeus whiteheadi	16.32	240	14.86	5386
Centroscyllum fabricii	2.52	24	2.30	
Sardinops ocellatus	0.84	12	0.77	
Total	109.80		100.01	

PROJECT STATION: 709  
 DATE:22/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3416  
 start stop duration Long E 1838  
 TIME :02:07:00 02:13:00 6 (min) Purpose code: 1  
 LOG :3138.60 3139.00 0.40 Area code : 2  
 FDEPTH: 0 0 GearCond. code:  
 BDEPTH: 67 67 Validity code:  
 Towing dir: 1800 Wire out: m Speed: 3 kn\*10  
 Sorted: 16 Kg Total catch: 16.16 CATCH/HOUR: 161.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	106.20	20240	65.72	5394
TRACHIPTERIDAE	35.00	250	21.66	5396
Aequorea aequorea	7.50	270	4.64	
JELCHOO	6.40	30	3.96	
Merluccius sp.	5.00	360	3.09	5395
Sepia australis	1.30	380	0.80	
C E P H A L O P O D A	0.20	40	0.12	
Total	161.60		99.99	

PROJECT STATION: 706  
 DATE:21/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3451  
 start stop duration Long E 1916  
 TIME :10:28:22 10:38:50 10 (min) Purpose code: 1  
 LOG :3022.91 3023.53 0.62 Area code : 2  
 FDEPTH: 115 115 GearCond. code:  
 BDEPTH: 129 125 Validity code:  
 Towing dir: 1200 Wire out: 420 m Speed: 32 kn\*10  
 Sorted: 11 Kg Total catch: 10.82 CATCH/HOUR: 64.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	61.98	174	95.47	
Etrumeus whiteheadi	2.94	66	4.53	5387
Total	64.92		100.00	

PROJECT STATION: 710  
 DATE:22/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3417  
 start stop duration Long E 1838  
 TIME :02:23:00 02:32:00 9 (min) Purpose code: 1  
 LOG :3139.60 3140.20 0.60 Area code : 2  
 FDEPTH: 0 0 GearCond. code:  
 BDEPTH: 72 72 Validity code:  
 Towing dir: 70 Wire out: m Speed: 3 kn\*10  
 Sorted: 12 Kg Total catch: 11.56 CATCH/HOUR: 77.07

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	66.20	10920	85.90	5397
TRIGLIDAE	4.33	40	5.62	
Merluccius sp.	3.80	527	4.93	5398
Aequorea aequorea	0.87	7	1.13	
Etrumeus whiteheadi	0.67	113	0.87	5399
JELCHOO	0.47	13	0.61	
Sepia australis	0.33	187	0.43	
Sardinops ocellatus	0.20	20	0.26	
TRACHIPTERIDAE	0.07	7	0.09	
C E P H A L O P O D A	0.07	27	0.09	
Trachurus capensis	0.07	133	0.09	5400
Total	77.08		100.02	

PROJECT STATION: 707  
 DATE:21/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3412  
 start stop duration Long E 1844  
 TIME :20:40:45 20:45:52 5 (min) Purpose code: 1  
 LOG :3108.97 3109.31 0.33 Area code : 2  
 FDEPTH: 10 10 GearCond. code:  
 BDEPTH: 40 40 Validity code:  
 Towing dir: 1800 Wire out: 100 m Speed: 30 kn\*10  
 Sorted: 27 Kg Total catch: 1700.00 CATCH/HOUR: 20400.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	15534.00	188916	76.15	5389
Engraulis capensis	4866.00	911112	23.85	5388
C E P H A L O P O D A	7.56	756	0.04	
Total	20407.56		100.04	

PROJECT STATION: 711  
 DATE:22/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3418  
 start stop duration Long E 1838  
 TIME :02:37:00 02:46:00 9 (min) Purpose code: 1  
 LOG :3140.60 3141.10 0.50 Area code : 2  
 FDEPTH: 0 0 GearCond. code:  
 BDEPTH: 76 76 Validity code:  
 Towing dir: 180ø Wire out: m Speed: 3 kn\*10  
 Sorted: 39 Kg Total catch: 39.21 CATCH/HOUR: 261.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	252.13	39447	96.45	5404
Etrumeus whiteheadi	6.93	1233	2.65	5403
Aequorea aequorea	1.13	7	0.43	
Sardinops ocellatus	0.93	93	0.36	5402
Trachurus capensis	0.20	80	0.08	5401
C E P H A L O P O D A	0.07	7	0.03	
Total	261.39		100.00	

PROJECT STATION: 716  
 DATE:22/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3417  
 start stop duration Long E 1835  
 TIME :09:22:03 09:39:45 18 (min) Purpose code: 1  
 LOG :3178.79 3179.81 1.02 Area code : 2  
 FDEPTH: 25 30 GearCond. code:  
 BDEPTH: 61 65 Validity code:  
 Towing dir: 180ø Wire out: 140 m Speed: 30 kn\*10  
 Sorted: 8 Kg Total catch: 7.78 CATCH/HOUR: 25.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	15.70	4837	60.55	5411
JELCH00	3.63	147	14.00	
Engraulis capensis	3.30	337	12.73	5410
Aequorea aequorea	2.50	10	9.64	
Etrumeus whiteheadi	0.57	147	2.20	5409
C E P H A L O P O D A	0.17	20	0.66	
TRACHTERIDAE	0.07	23	0.27	
Total	25.94		100.05	

PROJECT STATION: 712  
 DATE:22/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3410  
 start stop duration Long E 1837  
 TIME :05:12:39 05:22:45 10 (min) Purpose code: 1  
 LOG :3156.40 3157.02 0.62 Area code : 2  
 FDEPTH: 20 19 GearCond. code:  
 BDEPTH: 40 41 Validity code:  
 Towing dir: 90ø Wire out: 110 m Speed: 35 kn\*10  
 Sorted: 7 Kg Total catch: 6.53 CATCH/HOUR: 39.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	22.38	4866	57.12	5405
JELCH00	6.48	30	16.54	
Aequorea aequorea	6.48	234	16.54	
Galeichthys feliceps	3.18	12	8.12	
C E P H A L O P O D A	0.60	168	1.53	
Trachurus capensis	0.06	84	0.15	5406
Total	39.18		100.00	

PROJECT STATION: 717  
 DATE:22/ 6/00 GEAR TYPE: PT No:2 POSITION:Lat S 3420  
 start stop duration Long E 1831  
 TIME :11:56:59 11:57:12 (min) Purpose code: 1  
 LOG :3192.48 3192.51 0.03 Area code : 2  
 FDEPTH: 30 30 GearCond. code:  
 BDEPTH: 62 62 Validity code:  
 Towing dir: ø Wire out: 140 m Speed: 30 kn\*10  
 Sorted: 3 Kg Total catch: 3.36 CATCH/HOUR: 201.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	142.20	72780	70.54	5412
Aequorea aequorea	28.80	120	14.29	
JELCH00	26.40	1140	13.10	
Engraulis capensis	3.00	420	1.49	
C E P H A L O P O D A	0.60	60	0.30	
TRACHTERIDAE	0.60	240	0.30	
Total	201.60		100.02	

PROJECT STATION: 713  
 DATE:22/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3410  
 start stop duration Long E 1838  
 TIME :05:25:16 05:31:48 7 (min) Purpose code: 1  
 LOG :3157.19 3157.59 0.39 Area code : 2  
 FDEPTH: 15 18 GearCond. code:  
 BDEPTH: 41 42 Validity code:  
 Towing dir: 90ø Wire out: 110 m Speed: 30 kn\*10  
 Sorted: 38 Kg Total catch: 37.77 CATCH/HOUR: 323.74

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	282.17	54266	87.16	5407
JELCH00	30.94	189	9.56	
Aequorea aequorea	10.29	609	3.18	
C E P H A L O P O D A	0.17	34	0.05	
Trachurus capensis	0.17	51	0.05	5408
Total	323.74		100.00	

PROJECT STATION: 718  
 DATE:22/ 6/00 GEAR TYPE: PT No:5 POSITION:Lat S 3412  
 start stop duration Long E 1831  
 TIME :13:45:48 14:07:13 21 (min) Purpose code: 1  
 LOG :3204.27 3205.60 1.32 Area code : 2  
 FDEPTH: 10 10 GearCond. code:  
 BDEPTH: 40 38 Validity code:  
 Towing dir: 180ø Wire out: 160 m Speed: 35 kn\*10  
 Sorted: 7 Kg Total catch: 7.11 CATCH/HOUR: 20.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	41.49	6949	204.28	5414
JELCH00	37.26	2446	183.46	
Aequorea aequorea	1.94	11	9.55	
Trachurus capensis	0.34	217	1.67	5413
TRACHTERIDAE	0.11	23	0.54	
C E P H A L O P O D A	0.11	11	0.54	
Total	81.25		400.04	

PROJECT STATION: 719  
 DATE:22/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3410  
 start stop duration Long E 1831  
 TIME :16:57:17 17:32:19 35 (min) Purpose code: 1  
 LOG :3214.16 3216.12 1.96 Area code : 2  
 FDEPTH: 5 5 GearCond. code:  
 BDEPTH: 37 43 Validity code:  
 Towing dir: 180° Wire out: 160 m Speed: 30 kn\*10  
 Sorted: 32 Kg Total catch: 156.74 CATCH/HOUR: 268.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	212.85	37538	79.21	5417
Chelidonichthys queketti	32.64	204	12.15	5416
R A Y S	11.83	3	4.40	
JELCHOO	4.39	55	1.63	
Merluccius capensis	3.05	12	1.14	5415
Todaropsis eblanae	1.30	206	0.48	
Callorhinchus capensis	1.13	3	0.42	
Aequorea aequorea	1.10	48	0.41	
Sardinops ocellatus	0.27	82	0.10	
Trachurus capensis	0.14	48	0.05	
Sepia australis	0.02	27	0.01	
Total	268.72		100.00	

PROJECT STATION: 723  
 DATE:23/ 6/00 GEAR TYPE: PT No:4 POSITION:Lat S 3413  
 start stop duration Long E 1844  
 TIME :04:48:27 05:09:59 22 (min) Purpose code: 1  
 LOG :3287.20 3288.55 1.27 Area code : 2  
 FDEPTH: 5 5 GearCond. code:  
 BDEPTH: 44 41 Validity code:  
 Towing dir: 360° Wire out: 160 m Speed: 30 kn\*10  
 Sorted: 67 Kg Total catch: 266.28 CATCH/HOUR: 726.22

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	716.18	111905	98.62	5424
Aequorea aequorea	5.45	131	0.75	
JELCHOO	2.95	11	0.41	
C E P H A L O P O D A	0.55	55	0.08	
Sardinops ocellatus	0.55	55	0.08	
Etrumeus whiteheadi	0.33	11	0.05	
Chelidonichthys queketti	0.11	11	0.02	
Sepia australis	0.11	11	0.02	
Total	726.23		100.03	

PROJECT STATION: 720  
 DATE:22/ 6/00 GEAR TYPE: PT No:4 POSITION:Lat S 3412  
 start stop duration Long E 1835  
 TIME :20:37:46 21:00:34 23 (min) Purpose code: 1  
 LOG :3238.20 3239.48 1.27 Area code : 2  
 FDEPTH: 5 5 GearCond. code:  
 BDEPTH: 43 45 Validity code:  
 Towing dir: 180° Wire out: 160 m Speed: 30 kn\*10  
 Sorted: 1 Kg Total catch: 11.89 CATCH/HOUR: 31.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	21.23	8183	68.44	5418
Engraulis capensis	21.23	8183	68.44	
JELCHOO	8.11	70	26.14	
C E P H A L O P O D A	0.97	266	3.13	
Sepia australis	0.23	23	0.74	
TRACHIPTERIDAE	0.23	47	0.74	
Sardinops ocellatus	0.23	47	0.74	
Total	52.23		168.37	

PROJECT STATION: 724  
 DATE:23/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3422  
 start stop duration Long E 1820  
 TIME :14:52:28 15:26:49 34 (min) Purpose code: 1  
 LOG :3374.63 3376.52 1.88 Area code : 2  
 FDEPTH: 149 140 GearCond. code:  
 BDEPTH: 149 140 Validity code:  
 Towing dir: 130° Wire out: 480 m Speed: 30 kn\*10  
 Sorted: 423 Kg Total catch: 422.84 CATCH/HOUR: 746.19

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	353.68	934	47.40	5426
Raja straeleni	95.65	106	12.82	
LBOPA51	71.54	443	9.59	5427
Chelidonichthys queketti	69.60	245	9.33	5430
Merluccius capensis	27.00	30	3.62	
SQUALIDAE	26.86	62	3.60	
Trachurus capensis	20.91	81	2.80	5413
Callorhinchus capensis	18.28	14	2.45	
Etrumeus whiteheadi	15.21	286	2.04	5432
Lophius vomerinus	13.96	19	1.87	5428
Merluccius paradoxus	12.21	58	1.64	5425
Zeus capensis	8.26	85	1.11	5429
SOLEIDAE	4.96	56	0.66	5434
Todaropsis eblanae	2.89	11	0.39	
Todarodes sagittatus	2.22	311	0.30	
Thyrsites atun	1.02	4	0.14	5433
Loligo reynaudi	0.85	2	0.11	
Sardinops ocellatus	0.71	9	0.10	
Genypterus capensis	0.16	4	0.02	
Liza richardsonii	0.12	2	0.02	
SCRME01	0.11	16	0.01	
Total	746.20		100.02	

PROJECT STATION: 721  
 DATE:22/ 6/00 GEAR TYPE: PT No:5 POSITION:Lat S 3415  
 start stop duration Long E 1838  
 TIME :23:07:34 23:22:36 15 (min) Purpose code: 1  
 LOG :3253.18 3254.10 0.91 Area code : 2  
 FDEPTH: 15 15 GearCond. code:  
 BDEPTH: 55 52 Validity code:  
 Towing dir: 360° Wire out: 160 m Speed: 35 kn\*10  
 Sorted: 28 Kg Total catch: 140.71 CATCH/HOUR: 562.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	545.00	85280	96.83	5419
Aequorea aequorea	5.40	100	0.96	
C E P H A L O P O D A	5.40	100	0.96	
Rhabdosargus globiceps	4.40	8	0.78	
Chelidonichthys queketti	2.64	16	0.47	

PROJECT STATION: 725  
 DATE:23/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3425  
 start stop duration Long E 1842  
 TIME :18:41:01 19:12:55 32 (min) Purpose code: 1  
 LOG :3401.71 3403.49 1.76 Area code : 2  
 FDEPTH: 96 103 GearCond. code:  
 BDEPTH: 96 103 Validity code:  
 Towing dir: 270° Wire out: 320 m Speed: 30 kn\*10  
 Sorted: 282 Kg Total catch: 282.43 CATCH/HOUR: 529.56

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



PROJECT STATION: 726  
 DATE:25/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :14:53:42 15:08:27 15 (min) Purpose code: 1  
 LOG :3545.72 3546.48 0.77 Area code : 2  
 FDEPTH: 264 256 GearCond. code:  
 BDEPTH: 264 256 Validity code:  
 Towing dir: 140° Wire out: 810 m Speed: 30 kn\*10  
 Sorted: 89 Kg Total catch: 422.69 CATCH/HOUR: 1690.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	805.84	6020	47.66	5444
MACROURIDAE	376.32	16744	22.26	5441
Merluccius capensis	155.68	308	9.21	5449
Merluccius sp.	114.24	3024	6.76	5445
Lophius vomerinus	59.36	80	3.51	5446
Lampanyctodes hectoris	53.48	25984	3.16	5447
Helicolenus dactylopterus	43.44	768	2.57	5440
MYCTOPHIDAE	23.80	1316	1.41	5443
Todaropsis eblanae	18.64	100	1.10	
Paracallionymus costatus	16.24	1456	0.96	5442
Maurolicus muelleri	9.96	8008	0.59	5448
Jasus lalandii	5.60	40	0.33	
Raja straeleni	3.28	4	0.19	
PARAPAGURIDAE *	2.24	252	0.13	
Octopus vulgaris	1.76	4	0.10	
Genypteris capensis	0.88	4	0.05	
Total	1690.76		99.99	

PROJECT STATION: 727  
 DATE:25/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :16:48:14 17:08:00 20 (min) Purpose code: 1  
 LOG :3551.56 3552.71 1.14 Area code : 2  
 FDEPTH: 240 260 GearCond. code:  
 BDEPTH: 261 279 Validity code:  
 Towing dir: 320° Wire out: 940 m Speed: 25 kn\*10  
 Sorted: 30 Kg Total catch: 30.28 CATCH/HOUR: 90.84

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	37.56	111	41.35	
Merluccius paradoxus	34.74	246	38.24	5453
Maurolicus muelleri	13.38	15921	14.73	5450
MACROURIDAE	3.12	162	3.43	5452
Lophius vomerinus	1.56	3	1.72	
Lampanyctodes hectoris	0.48	267	0.53	5451
Total	90.84		100.00	

PROJECT STATION: 728  
 DATE:25/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3334  
 start stop duration Long E 1734  
 TIME :17:17:55 17:22:28 5 (min) Purpose code: 1  
 LOG :3553.24 3553.51 0.26 Area code : 2  
 FDEPTH: 200 200 GearCond. code:  
 BDEPTH: 290 298 Validity code:  
 Towing dir: 320° Wire out: 840 m Speed: 25 kn\*10  
 Sorted: 30 Kg Total catch: 90.12 CATCH/HOUR: 1081.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	587.52	2520	54.33	5457
Maurolicus muelleri	398.88	398880	36.88	5454
Merluccius capensis	60.48	72	5.59	5456
TRACHTERIDAE	14.04	36	1.30	
Aequorea aequorea	13.32	36	1.23	
Todaropsis eblanae	3.24	108	0.30	
Sepia australis	2.16	36	0.20	
Lampanyctodes hectoris	1.80	684	0.17	5455
Total	1081.44		100.00	

PROJECT STATION: 729  
 DATE:25/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3333  
 start stop duration Long E 1733  
 TIME :17:35:46 17:50:59 15 (min) Purpose code: 1  
 LOG :3554.12 3555.02 0.89 Area code : 2  
 FDEPTH: 100 100 GearCond. code:  
 BDEPTH: 318 356 Validity code:  
 Towing dir: 320° Wire out: 440 m Speed: 25 kn\*10  
 Sorted: 5 Kg Total catch: 5.24 CATCH/HOUR: 20.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	8.96	116	42.75	5461
Lampanyctodes hectoris	4.24	1440	20.23	5459
MYCTOPHIDAE	3.12	200	14.89	5460
Aequorea aequorea	1.52	96	7.25	
Maurolicus muelleri	1.48	1580	7.06	5458
JELCHOO	0.88	4	4.20	
C E P H A L O P O D A	0.64	24	3.05	
MACROURIDAE	0.08	4	0.38	
Trachyrincus scabrus	0.04	4	0.19	
Total	20.96		100.00	

PROJECT STATION: 730  
 DATE:25/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3336  
 start stop duration Long E 1736  
 TIME :19:58:24 20:18:07 20 (min) Purpose code: 1  
 LOG :3564.15 3565.19 1.03 Area code : 2  
 FDEPTH: 251 244 GearCond. code:  
 BDEPTH: 251 244 Validity code:  
 Towing dir: 140° Wire out: 820 m Speed: 30 kn\*10  
 Sorted: 155 Kg Total catch: 437.47 CATCH/HOUR: 1312.41

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius capensis	1439.67	2355	109.70	5462
Merluccius paradoxus	667.05	2355	50.83	5463
MACROURIDAE	441.75	14775	33.66	5470
Aequorea aequorea	301.41	1386	22.97	
Raja straeleni	140.37	45	10.70	
Helicolenus dactylopterus	86.67	1959	6.60	5466
S H A R K S	68.64	153	5.23	
Maurolicus muelleri	55.23	45882	4.21	5467
Lophius vomerinus	44.22	87	3.37	5465
Paracallionymus costatus	43.77	2220	3.34	5469
PARAPAGURIDAE *	34.11	990	2.60	
Merluccius paradoxus	27.27	549	2.08	5464
Trachurus capensis	24.39	45	1.86	
C E P H A L O P O D A	15.18	66	1.16	
Lampanyctodes hectoris	14.31	7380	1.09	5468
Genypteris capensis	5.28	21	0.40	
Myxine capensis	3.09	21	0.24	
Total	3412.41		260.04	

PROJECT STATION: 731  
 DATE:25/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :21:56:58 22:07:16 10 (min) Purpose code: 1  
 LOG :3568.36 3569.00 0.64 Area code : 2  
 FDEPTH: 210 210 GearCond. code:  
 BDEPTH: 264 274 Validity code:  
 Towing dir: 320° Wire out: 850 m Speed: 35 kn\*10  
 Sorted: 22 Kg Total catch: 93.34 CATCH/HOUR: 560.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	409.68	517218	73.15	5471
Aequorea aequorea	84.30	282	15.05	
Merluccius paradoxus	40.20	258	7.18	5473
Merluccius capensis	19.38	204	3.46	5474
Lampanyctodes hectoris	4.14	3024	0.74	5472
Sepia australis	1.56	24	0.28	
MACROURIDAE	0.78	24	0.14	
Total	560.04		100.00	

PROJECT STATION: 732  
 DATE:25/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3334  
 start stop duration Long E 1734  
 TIME :22:24:24 22:34:01 10 (min) Purpose code: 1  
 LOG :3569.91 3570.51 0.60 Area code : 2  
 FDEPTH: 100 90 GearCond. code:  
 BDEPTH: 289 302 Validity code:  
 Towing dir: 320ø Wire out: 380 m Speed: 35 kn\*10  
 Sorted: 3 Kg Total catch: 58.40 CATCH/HOUR: 350.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	296.70	69660	84.67	5477
Maurolicus muelleri	50.22	59004	14.33	5476
Lampanyctodes hectoris	2.34	120	0.67	
Merluccius sp.	1.14	456	0.33	5475
Total	350.40		100.00	

PROJECT STATION: 735  
 DATE:26/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3336  
 start stop duration Long E 1736  
 TIME :03:10:50 03:21:11 10 (min) Purpose code: 1  
 LOG :3588.28 3588.91 0.62 Area code : 2  
 FDEPTH: 210 210 GearCond. code:  
 BDEPTH: 246 250 Validity code:  
 Towing dir: 320ø Wire out: 850 m Speed: 35 kn\*10  
 Sorted: 36 Kg Total catch: 71.10 CATCH/HOUR: 426.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	258.96	261120	60.70	5487
Aequorea aequorea	111.60	312	26.16	
Merluccius paradoxus	48.96	288	11.48	5486
Lophius vomerinus	7.08	12	1.66	
Total	426.60		100.00	

PROJECT STATION: 733  
 DATE:25/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3333  
 start stop duration Long E 1733  
 TIME :22:47:20 22:58:26 11 (min) Purpose code: 1  
 LOG :3571.38 3572.15 0.77 Area code : 2  
 FDEPTH: 25 25 GearCond. code:  
 BDEPTH: 330 363 Validity code:  
 Towing dir: 320ø Wire out: 140 m Speed: 35 kn\*10  
 Sorted: 5 Kg Total catch: 72.70 CATCH/HOUR: 396.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	242.40	128853	61.13	5479
Lampanyctodes hectoris	154.15	9665	38.87	5478
Total	396.55		100.00	

PROJECT STATION: 736  
 DATE:26/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :03:41:33 03:51:12 10 (min) Purpose code: 1  
 LOG :3589.99 3590.59 0.59 Area code : 2  
 FDEPTH: 85 85 GearCond. code:  
 BDEPTH: 261 269 Validity code:  
 Towing dir: 320ø Wire out: 350 m Speed: 32 kn\*10  
 Sorted: 32 Kg Total catch: 63.72 CATCH/HOUR: 382.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	352.56	168612	92.22	5483
Maurolicus muelleri	29.76	27528	7.78	5488
Total	382.32		100.00	

PROJECT STATION: 734  
 DATE:26/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3336  
 start stop duration Long E 1736  
 TIME :01:50:05 02:05:07 15 (min) Purpose code: 1  
 LOG :3583.53 3584.29 0.76 Area code : 2  
 FDEPTH: 256 249 GearCond. code:  
 BDEPTH: 256 249 Validity code:  
 Towing dir: 140ø Wire out: 850 m Speed: 30 kn\*10  
 Sorted: 31 Kg Total catch: 305.36 CATCH/HOUR: 1221.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MACROURIDAE	571.60	19160	46.80	5482
Merluccius capensis	298.00	680	24.40	5484
Maurolicus muelleri	143.60	126640	11.76	5483
Merluccius paradoxus	131.20	720	10.74	5485
Helicolenus dactylopterus	24.00	440	1.96	5480
C E P H A L O P O D A	14.40	80	1.18	
Octopus vulgaris	12.40	4	1.02	
Aequorea aequorea	11.60	40	0.95	
Trachurus capensis	6.24	16	0.51	
Genypterus capensis	4.00	16	0.33	
Paracallionymus costatus	2.00	440	0.16	5481
Merluccius sp.	0.80	120	0.07	
S H A R K S	0.80	40	0.07	
Lampanyctodes hectoris	0.40	20	0.03	
PARAPAGURIDAE *	0.40	240	0.03	
Total	1221.44		100.01	

PROJECT STATION: 737  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3334  
 start stop duration Long E 1734  
 TIME :04:04:00 04:14:51 11 (min) Purpose code: 1  
 LOG :3591.40 3592.14 0.73 Area code : 2  
 FDEPTH: 25 25 GearCond. code:  
 BDEPTH: 286 306 Validity code:  
 Towing dir: 320ø Wire out: 200 m Speed: 25 kn\*10  
 Sorted: 38 Kg Total catch: 107.29 CATCH/HOUR: 585.22

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	564.87	271145	96.52	5490
BRAMIDAE	20.35	11	3.48	5491
Total	585.22		100.00	

PROJECT STATION: 738  
 DATE:26/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3335  
 start stop duration Long E 1736  
 TIME :07:02:58 07:19:44 17 (min) Purpose code: 1  
 LOG :3600.92 3601.77 0.85 Area code : 2  
 FDEPTH: 256 249 GearCond. code:  
 BDEPTH: 256 249 Validity code:  
 Towing dir: 140ø Wire out: 900 m Speed: 30 kn\*10  
 Sorted: 44 Kg Total catch: 1415.68 CATCH/HOUR: 4996.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	1922.26	12762	38.47	5493
Trachurus capensis	973.55	2598	19.48	5492
MACROURIDAE	765.74	32301	15.33	5499
Aequorea aequorea	345.60	1694	6.92	
Helicolenus dactylopterus	318.49	6889	6.37	5497
PARAPAGURIDAE *	250.73	21798	5.02	
Lophius vomerinus	143.44	565	2.87	5498
Merluccius capensis	81.32	339	1.63	
Paracallionymus costatus	79.06	8245	1.58	5496
Todaropsis eblanae	51.95	678	1.04	
Maurolicus muelleri	40.66	32527	0.81	5494
Lampanyctodes hectoris	15.81	5421	0.32	5495
Sepia australis	7.91	452	0.16	

Total 4996.52 100.00  
 PROJECT STATION: 739  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :08:32:01 08:36:42 5 (min) Purpose code: 1  
 LOG :3604.47 3604.77 0.29 Area code : 2  
 FDEPTH: 230 235 GearCond. code:  
 BDEPTH: 260 264 Validity code:  
 Towing dir: 320° Wire out: 950 m Speed: 25 kn\*10  
 Sorted: 8 Kg Total catch: 363.39 CATCH/HOUR: 4360.68

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	4205.04	4205040	96.43	5500
Aequorea aequorea	155.64	576	3.57	
Total	4360.68		100.00	

PROJECT STATION: 742  
 DATE:26/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :12:41:10 12:56:52 16 (min) Purpose code: 1  
 LOG :3619.11 3619.89 0.78 Area code : 2  
 FDEPTH: 265 256 GearCond. code: 1  
 BDEPTH: 265 256 Validity code:  
 Towing dir: 140° Wire out: 850 m Speed: 30 kn\*10  
 Sorted: 115 Kg Total catch: 1510.64 CATCH/HOUR: 5664.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	4031.63	14235	71.17	5507
MACROURIDAE	645.45	21694	11.39	5501
Merluccius sp.	495.79	9990	8.75	5505
JELAE00	98.66	536	1.74	
Trachurus capensis	82.39	195	1.45	
Merluccius capensis	81.90	390	1.45	5506
Lophius vomerinus	59.48	49	1.05	
BRAMIDAE	54.75	26	0.97	
Lampanyctodes hectoris	29.25	18428	0.52	5503
Paracallionymus costatus	25.84	2486	0.46	5504
C E P H A L O P O D A	21.94	146	0.39	
Helicolenus dactylopterus	20.96	390	0.37	
Maurolicus muelleri	15.60	26276	0.28	5502
PARAPAGURIDAE *	0.98	244	0.02	
SQUALIDAE	0.98	49	0.02	
Total	5665.60		100.03	

PROJECT STATION: 740  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3333  
 start stop duration Long E 1733  
 TIME :09:11:17 09:21:53 11 (min) Purpose code: 1  
 LOG :3606.82 3607.47 0.63 Area code : 2  
 FDEPTH: 180 189 GearCond. code:  
 BDEPTH: 313 338 Validity code:  
 Towing dir: 320° Wire out: 740 m Speed: 25 kn\*10  
 Sorted: 1 Kg Total catch: 0.86 CATCH/HOUR: 4.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	1.96		41.79	
Maurolicus muelleri	1.47	1767	31.34	
JELCH00	0.65	16	13.86	
Aequorea aequorea	0.60	5	12.79	
Total	4.68		99.78	

PROJECT STATION: 743  
 DATE:26/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3336  
 start stop duration Long E 1737  
 TIME :14:10:41 14:22:13 12 (min) Purpose code: 1  
 LOG :3625.09 3625.74 0.66 Area code : 2  
 FDEPTH: 220 226 GearCond. code:  
 BDEPTH: 242 246 Validity code:  
 Towing dir: 320° Wire out: 850 m Speed: 35 kn\*10  
 Sorted: 46 Kg Total catch: 775.24 CATCH/HOUR: 3876.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	3691.70	4153210	95.24	5508
Aequorea aequorea	156.75	665	4.04	
BRAMIDAE	27.75	10	0.72	
Total	3876.20		100.00	

PROJECT STATION: 741  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3332  
 start stop duration Long E 1732  
 TIME :09:43:33 09:51:28 8 (min) Purpose code: 1  
 LOG :3608.53 3608.96 0.42 Area code : 2  
 FDEPTH: 30 20 GearCond. code:  
 BDEPTH: 388 409 Validity code:  
 Towing dir: 320° Wire out: 180 m Speed: 25 kn\*10  
 Sorted: 5 Kg Total catch: 5.14 CATCH/HOUR: 38.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	33.60	83	87.16	
Maurolicus muelleri	4.95	3713	12.84	
Total	38.55		100.00	

PROJECT STATION: 744  
 DATE:26/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3335  
 start stop duration Long E 1736  
 TIME :14:27:30 14:39:26 12 (min) Purpose code: 1  
 LOG :3626.09 3626.81 0.71 Area code : 2  
 FDEPTH: 190 190 GearCond. code:  
 BDEPTH: 248 254 Validity code:  
 Towing dir: 320° Wire out: 850 m Speed: 35 kn\*10  
 Sorted: 10 Kg Total catch: 10.48 CATCH/HOUR: 52.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	35.35	100	67.46	
Maurolicus muelleri	17.05	23870	32.54	5509
Total	52.40		100.00	

PROJECT STATION: 745  
 DATE:26/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3334  
 start stop duration Long E 1735  
 TIME :14:55:14 15:04:53 10 (min) Purpose code: 1  
 LOG :3627.71 3628.40 0.68 Area code : 2  
 FDEPTH: 60 60 GearCond. code:  
 BDEPTH: 264 278 Validity code:  
 Towing dir: 320ø Wire out: 350 m Speed: 35 kn\*10

Sorted: 4 Kg Total catch: 3.88 CATCH/HOUR: 23.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	13.14	36	56.44	
Maurolicus muelleri	5.04	5544	21.65	5510
JELCHOO	4.86	144	20.88	
Lampanyctodes hectoris	0.24	192	1.03	
Total	23.28		100.00	

PROJECT STATION: 748  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3334  
 start stop duration Long E 1735  
 TIME :19:42:21 19:52:37 10 (min) Purpose code: 1  
 LOG :3641.77 3642.42 0.64 Area code : 2  
 FDEPTH: 125 125 GearCond. code:  
 BDEPTH: 267 277 Validity code:  
 Towing dir: 320ø Wire out: 580 m Speed: 30 kn\*10

Sorted: 19 Kg Total catch: 18.62 CATCH/HOUR: 111.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	99.00	59634	88.61	5522
Aequorea aequorea	8.70	30	7.79	
Lampanyctodes hectoris	2.28	822	2.04	5521
Merluccius sp.	1.74	102	1.56	5523
Total	111.72		100.00	

PROJECT STATION: 746  
 DATE:26/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3336  
 start stop duration Long E 1736  
 TIME :17:39:58 17:56:50 17 (min) Purpose code: 1  
 LOG :3636.07 3636.90 0.83 Area code : 2  
 FDEPTH: 252 246 GearCond. code:  
 BDEPTH: 252 246 Validity code:  
 Towing dir: 140ø Wire out: 900 m Speed: 30 kn\*10

Sorted: 76 Kg Total catch: 677.09 CATCH/HOUR: 2389.73

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	675.88	3028	28.28	5514
MACROURIDAE	664.59	28846	27.81	5511
Aequorea aequorea	474.64	2354	19.86	
Merluccius capensis	284.65	491	11.91	5515
Helicolenus dactylopterus	99.71	2111	4.17	5513
PARAPAGURIDAE *	50.79	5382	2.13	
Paracallionymus costatus	43.91	5171	1.84	5512
Lophius vomerinus	30.71	60	1.29	
SQUALIDAE	26.96	275	1.13	
Todaropsis eblanae	10.98	60	0.46	
Maurolicus muelleri	10.66	11012	0.45	5517
Trachurus capensis	10.66	32	0.45	
Genypterus capensis	2.51	32	0.11	
Lampanyctodes hectoris	2.51	1316	0.11	5516
MYCTOPHIDAE	0.64	32	0.03	
Total	2389.80		100.03	

PROJECT STATION: 749  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3333  
 start stop duration Long E 1734  
 TIME :20:06:35 20:16:58 10 (min) Purpose code: 1  
 LOG :3643.24 3643.91 0.66 Area code : 2  
 FDEPTH: 75 75 GearCond. code:  
 BDEPTH: 294 314 Validity code:  
 Towing dir: 320ø Wire out: 400 m Speed: 25 kn\*10

Sorted: 5 Kg Total catch: 30.25 CATCH/HOUR: 181.50

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	158.46	103026	87.31	5524
MYCTOPHIDAE	15.06	870	8.30	5525
Maurolicus muelleri	7.98	16644	4.40	5526
Total	181.50		100.01	

PROJECT STATION: 750  
 DATE:26/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :22:22:07 22:37:06 15 (min) Purpose code: 1  
 LOG :3652.42 3653.19 0.75 Area code : 2  
 FDEPTH: 263 254 GearCond. code:  
 BDEPTH: 263 254 Validity code:  
 Towing dir: 140ø Wire out: 850 m Speed: 30 kn\*10

Sorted: 111 Kg Total catch: 454.07 CATCH/HOUR: 1816.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MACROURIDAE	538.72	25324	29.66	5532
Merluccius paradoxus	526.40	2536	28.98	5534
PARAPAGURIDAE *	174.72	16352	9.62	
Merluccius capensis	144.76	320	7.97	5533
Paracallionymus costatus	76.16	4352	4.19	5531
Lophius vomerinus	63.72	56	3.51	5527
Maurolicus muelleri	53.76	60676	2.96	5530
Merluccius capensis	43.68	32	2.40	5535
Aequorea aequorea	35.84	168	1.97	
Helicolenus dactylopterus	33.76	588	1.86	5528
Lampanyctodes hectoris	33.04	15020	1.82	5529
Genypterus capensis	29.12	56	1.60	
C E P H A L O P O D A	21.84	168	1.20	
Zeus capensis	12.32	56	0.68	
Merluccius sp.	11.20	280	0.62	
Merluccius paradoxus	6.60	4	0.36	
JELCHOO	5.04	224	0.28	
S H A R K S	2.80	112	0.15	
Sepia australis	2.24	56	0.12	
MYCTOPHIDAE	0.56	28	0.03	
Total	1816.28		99.98	

PROJECT STATION: 747  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3335  
 start stop duration Long E 1736  
 TIME :19:22:16 19:33:06 11 (min) Purpose code: 1  
 LOG :3640.58 3641.28 0.69 Area code : 2  
 FDEPTH: 210 210 GearCond. code:  
 BDEPTH: 254 261 Validity code:  
 Towing dir: 320ø Wire out: 940 m Speed: 30 kn\*10

Sorted: 22 Kg Total catch: 21.80 CATCH/HOUR: 118.91

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	64.25	75818	54.03	5520
Merluccius paradoxus	42.71	355	35.92	5518
Aequorea aequorea	11.13	38	9.36	
Lampanyctodes hectoris	0.82	393	0.69	5519
Total	118.91		100.00	

PROJECT STATION: 751  
 DATE:26/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :23:41:19 23:50:10 9 (min) Purpose code: 1  
 LOG :3656.87 3657.42 0.54 Area code : 2  
 FDEPTH: 220 220 GearCond.code:  
 BDEPTH: 261 269 Validity code:  
 Towing dir: 320ø Wire out: 850 m Speed: 35 kn\*10  
 Sorted: 18 Kg Total catch: 17.46 CATCH/HOUR: 116.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Merluccius paradoxus	65.47	313	56.25	5538
Aequorea aequorea	27.13	113	23.31	
Maurolicus muelleri	11.87	13293	10.20	5537
Merluccius capensis	9.00	7	7.73	
Lampanyctodes hectoris	1.40	747	1.20	5536
Merluccius sp.	0.93	27	0.80	
JELCHOO	0.33	13	0.28	
MACROURIDAE	0.27	13	0.23	
Total	116.40		100.00	

PROJECT STATION: 754  
 DATE:27/ 6/00 GEAR TYPE: BT No:7 POSITION:Lat S 3335  
 start stop duration Long E 1735  
 TIME :03:46:26 04:02:16 16 (min) Purpose code: 1  
 LOG :3672.51 3673.33 0.81 Area code : 2  
 FDEPTH: 261 253 GearCond.code:  
 BDEPTH: 261 253 Validity code:  
 Towing dir: 140ø Wire out: 850 m Speed: 30 kn\*10  
 Sorted: 105 Kg Total catch: 753.75 CATCH/HOUR: 2826.56

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SQUALIDAE	1544.06	266	54.63	
MACROURIDAE	456.38	19883	16.15	5551
Merluccius capensis	358.69	735	12.69	5545
Merluccius paradoxus	190.35	1140	6.73	5544
Lophius vomerinus	67.05	75	2.37	
Aequorea aequorea	57.30	266	2.03	
Helicolenus dactylopterus	33.94	720	1.20	5550
Maurolicus muelleri	31.76	34084	1.12	5547
Paracallionymus costatus	27.60	2963	0.98	5546
PARAPAGURIDAE *	21.26	2595	0.75	
Merluccius sp.	12.64	1268	0.45	5548
Genypterus capensis	7.20	38	0.25	
C E P H A L O P O D A	6.34	64	0.22	
Raja straeleni	4.80	11	0.17	
Zeus capensis	4.16	11	0.15	
Lampanyctodes hectoris	2.40	885	0.08	5549
Sepia australis	0.64	26	0.02	
Total	2826.57		99.99	

PROJECT STATION: 752  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3334  
 start stop duration Long E 1734  
 TIME :00:08:04 00:18:05 10 (min) Purpose code: 1  
 LOG :3658.38 3659.00 0.61 Area code : 2  
 FDEPTH: 90 90 GearCond.code:  
 BDEPTH: 290 308 Validity code:  
 Towing dir: 320ø Wire out: 450 m Speed: 35 kn\*10  
 Sorted: 3 Kg Total catch: 4.32 CATCH/HOUR: 25.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	10.38	5496	40.05	5539
Lophius vomerinus	8.16	6	31.48	
Maurolicus muelleri	4.50	1362	17.36	5540
Merluccius sp.	2.34	216	9.03	5541
Genypterus capensis	0.54	6	2.08	
Total	25.92		100.00	

PROJECT STATION: 755  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3334  
 start stop duration Long E 1735  
 TIME :05:09:26 05:22:00 13 (min) Purpose code: 1  
 LOG :3676.20 3677.00 0.79 Area code : 2  
 FDEPTH: 210 210 GearCond.code:  
 BDEPTH: 272 291 Validity code:  
 Towing dir: 320ø Wire out: 940 m Speed: 25 kn\*10  
 Sorted: 21 Kg Total catch: 20.86 CATCH/HOUR: 96.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	48.00	38598	49.85	5553
Merluccius paradoxus	22.11	125	22.96	5554
Merluccius capensis	14.03	9	14.57	5555
Aequorea aequorea	10.71	37	11.12	
C E P H A L O P O D A	0.97	18	1.01	
Lampanyctodes hectoris	0.46	226	0.48	5552
Total	96.28		99.99	

PROJECT STATION: 753  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3332  
 start stop duration Long E 1732  
 TIME :00:44:05 00:53:22 9 (min) Purpose code: 1  
 LOG :3660.64 3661.30 0.65 Area code : 2  
 FDEPTH: 40 40 GearCond.code:  
 BDEPTH: 383 414 Validity code:  
 Towing dir: 320ø Wire out: 250 m Speed: 35 kn\*10  
 Sorted: 9 Kg Total catch: 53.27 CATCH/HOUR: 355.13

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lampanyctodes hectoris	234.93	104660	66.15	5542
MYCTOPHIDAE	119.00	7067	33.51	5543
C E P H A L O P O D A	1.20	160	0.34	
Total	355.13		100.00	

PROJECT STATION: 756  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3333  
 start stop duration Long E 1733  
 TIME :05:32:50 05:43:06 10 (min) Purpose code: 1  
 LOG :3677.55 3678.13 0.58 Area code : 2  
 FDEPTH: 130 130 GearCond.code:  
 BDEPTH: 308 330 Validity code:  
 Towing dir: 310ø Wire out: 560 m Speed: 25 kn\*10  
 Sorted: 4 Kg Total catch: 29.82 CATCH/HOUR: 178.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	115.56	143376	64.59	5556
Aequorea aequorea	63.36	204	35.41	
Total	178.92		100.00	

PROJECT STATION: 757  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3332  
 start stop duration Long E 1732  
 TIME :06:02:10 06:13:13 11 (min) Purpose code: 1  
 LOG :3679.18 3679.88 0.69 Area code : 2  
 FDEPTH: 50 50 GearCond.code:  
 BDEPTH: 382 415 Validity code:  
 Towing dir: 320ø Wire out: 220 m Speed: 25 kn\*10  
 Sorted: 2 Kg Total catch: 1.54 CATCH/HOUR: 8.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Maurolicus muelleri	3.71	131	44.17	5559
MYCTOPHIDAE	3.71	131	44.17	5557
Lampanyctodes hectoris	0.98	218	11.67	
Total	8.40		100.01	

PROJECT STATION: 761  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3240  
 start stop duration Long E 1749  
 TIME :18:21:12 18:21:38 2 (min) Purpose code: 1  
 LOG :3782.39 3782.51 0.11 Area code : 2  
 FDEPTH: 17 17 GearCond.code:  
 BDEPTH: 61 61 Validity code:  
 Towing dir: 270ø Wire out: 115 m Speed: 30 kn\*10  
 Sorted: 15 Kg Total catch: 32.46 CATCH/HOUR: 973.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	944.10	266700	96.95	5570
Trachurus capensis	18.00	4890	1.85	5572
Sardinops ocellatus	7.80	720	0.80	5571
Etrumeus whiteheadi	3.90	660	0.40	
Total	973.80		100.00	

PROJECT STATION: 758  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3251  
 start stop duration Long E 1748  
 TIME :13:26:16 13:32:21 6 (min) Purpose code: 1  
 LOG :3744.65 3745.02 0.37 Area code : 2  
 FDEPTH: 35 40 GearCond.code:  
 BDEPTH: 61 59 Validity code:  
 Towing dir: 180ø Wire out: 180 m Speed: 35 kn\*10  
 Sorted: 9 Kg Total catch: 254.22 CATCH/HOUR: 2542.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	2040.00	510000	80.25	5567
Sardinops ocellatus	369.70	30450	14.54	5568
Etrumeus whiteheadi	81.60	25570	3.21	5569
Trachurus capensis	29.90	9790	1.18	5566
Thyrsites atun	21.00	10	0.83	
Total	2542.20		100.01	

PROJECT STATION: 762  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3240  
 start stop duration Long E 1749  
 TIME :19:00:06 19:05:11 5 (min) Purpose code: 1  
 LOG :3782.61 3782.91 0.29 Area code : 2  
 FDEPTH: 18 18 GearCond.code:  
 BDEPTH: 62 68 Validity code:  
 Towing dir: 270ø Wire out: 115 m Speed: 30 kn\*10  
 Sorted: 6 Kg Total catch: 32.44 CATCH/HOUR: 389.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	365.04	94152	93.77	5573
Lampanyctodes hectoris	17.40	24360	4.47	5574
Sardinops ocellatus	3.12	252	0.80	
Trachurus capensis	2.52	756	0.65	
Etrumeus whiteheadi	1.20	240	0.31	
Total	389.28		100.00	

PROJECT STATION: 759  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3251  
 start stop duration Long E 1748  
 TIME :13:33:05 13:36:08 3 (min) Purpose code: 1  
 LOG :3745.07 3745.26 0.18 Area code : 2  
 FDEPTH: 40 40 GearCond.code:  
 BDEPTH: 59 57 Validity code:  
 Towing dir: 180ø Wire out: 180 m Speed: 35 kn\*10  
 Sorted: 14 Kg Total catch: 37.49 CATCH/HOUR: 749.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	445.80	37220	59.46	5560
Engraulis capensis	227.40	43520	30.33	5561
Thyrsites atun	64.00	20	8.54	
Etrumeus whiteheadi	12.00	3540	1.60	5562
Trachurus capensis	0.60	140	0.08	5563
Total	749.80		100.01	

PROJECT STATION: 763  
 DATE:27/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3240  
 start stop duration Long E 1748  
 TIME :19:09:59 19:13:23 3 (min) Purpose code: 1  
 LOG :3783.18 3783.38 0.19 Area code : 2  
 FDEPTH: 18 18 GearCond.code:  
 BDEPTH: 64 73 Validity code:  
 Towing dir: 270ø Wire out: 115 m Speed: 30 kn\*10  
 Sorted: 10 Kg Total catch: 37.50 CATCH/HOUR: 750.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	641.20	156360	85.49	5575
Sardinops ocellatus	65.80	5500	8.77	5576
Lampanyctodes hectoris	39.40	57380	5.25	5577
Trachurus capensis	3.60	940	0.48	5578
Total	750.00		99.99	

PROJECT STATION: 760  
 DATE:27/ 6/00 GEAR TYPE: PT No:1 POSITION:Lat S 3251  
 start stop duration Long E 1748  
 TIME :13:36:50 13:44:30 8 (min) Purpose code: 1  
 LOG :3745.30 3745.76 0.46 Area code : 2  
 FDEPTH: 40 25 GearCond.code:  
 BDEPTH: 57 57 Validity code:  
 Towing dir: 180ø Wire out: 120 m Speed: 35 kn\*10  
 Sorted: 14 Kg Total catch: 1344.43 CATCH/HOUR: 10083.23

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinops ocellatus	9143.25	546233	90.68	5564
Engraulis encrasicolus	916.50	76868	9.09	5565
Thyrsites atun	16.05	8	0.16	
Etrumeus whiteheadi	7.43	2970	0.07	
Total	10083.23		100.00	

PROJECT STATION: 764  
 DATE:28/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3231  
 start stop duration Long E 1758  
 TIME :00:10:15 00:20:59 11 (min) Purpose code: 1  
 LOG :3820.02 3820.67 0.65 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 76 76 Validity code:  
 Towing dir: 90ø Wire out: 160 m Speed: 34 kn\*10  
 Sorted: 34 Kg Total catch: 33.63 CATCH/HOUR: 183.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	87.05	21556	47.45	5579
Thyrsites atun	42.87	22	23.37	
Aequorea aequorea	28.96	109	15.79	
Chelidonichthys queketti	22.25	93	12.13	
C E P H A L O P O D A	1.20	33	0.65	
Merluccius capensis	0.93	5	0.51	
Trachurus capensis	0.16	49	0.09	

Total 183.42 99.99  
 PROJECT STATION: 765  
 DATE:28/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3231  
 start stop duration Long E 1759  
 TIME :00:21:40 00:35:02 13 (min) Purpose code: 1  
 LOG :3820.71 3821.49 0.85 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 76 76 Validity code:  
 Towing dir: 90ø Wire out: 160 m Speed: 34 kn\*10  
 Sorted: 40 Kg Total catch: 39.59 CATCH/HOUR: 182.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Engraulis capensis	87.83	20238	48.07	5580
JELEA01	70.62	189	38.65	
Chelidonichthys queketti	18.09	78	9.90	
Thyrsites atun	5.72	5	3.13	
C E P H A L O P O D A	0.23	5	0.13	
Sardinops ocellatus	0.23	23	0.13	
Total	182.72		100.01	

PROJECT STATION: 766  
 DATE:28/ 6/00 GEAR TYPE: PT No:3 POSITION:Lat S 3231  
 start stop duration Long E 1800  
 TIME :00:36:28 00:49:11 13 (min) Purpose code: 1  
 LOG :3821.58 3822.33 0.74 Area code : 2  
 FDEPTH: 20 20 GearCond.code:  
 BDEPTH: 76 76 Validity code:  
 Towing dir: 90ø Wire out: 160 m Speed: 34 kn\*10  
 Sorted: 28 Kg Total catch: 27.65 CATCH/HOUR: 127.62

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Thyrsites atun	43.02	28	33.71	
Aequorea aequorea	42.09	102	32.98	
Engraulis capensis	30.18	7108	23.65	5581
Chelidonichthys queketti	11.58	42	9.07	
C E P H A L O P O D A	0.37	14	0.29	
JELCH00	0.32	5	0.25	
Trachurus capensis	0.05	14	0.04	
Total	127.61		99.99	

## ANNEX III MultiSampler



### SPECIFICATIONS

The main sampling device used during this cruise has been the MultiSampler attached to a very small pelagic trawl, named “small Åkratrål”. As illustrated in Fig.1, the MultiSampler was equipped with a new 16 meter long extension net that gave a very smooth funnel from the trawlbelly to the 1m” opening of the MultiSampler. This extension piece is manufactured from 40mm diamond meshes that ensured no escapement of even small fish. To prevent a possible expansion of the net in situations while trawling in very dense aggregations of fish, the end of the extension piece was covered by a 80mm square mesh net.

The three new codends showed in Fig.2, were 18 meters long with 24 mm meshsize. They were equipped with a cover in 140 mm meshes, and an inner-net of 10 mm mesh size at the end section. This design enabled us to handle the catch very safely and efficiently. At the same time, the species composition and size frequencies of the samples were much more representative than would have been the case had only one ordinary codend been used.

### RESULTS

The MultiSampler was used during the entire cruise, with a total of 40 trawls or 120 discrete samples being obtained. It worked perfectly nearly all the time apart from one trawl when a screw had loosened in the gearbox of the release unit. This was fixed and the system worked properly for the rest of the survey.

Last year we had some problems due to a leakage in the sealing of the motor for the release unit. This problem seems to have been solved and the changing of the extension piece and the codends, plus some strengthening of the framework have made the MultiSampler a very useful and reliable sampling tool.



FIG. 1  
EXTENSION PIECE FOR MultiSampler

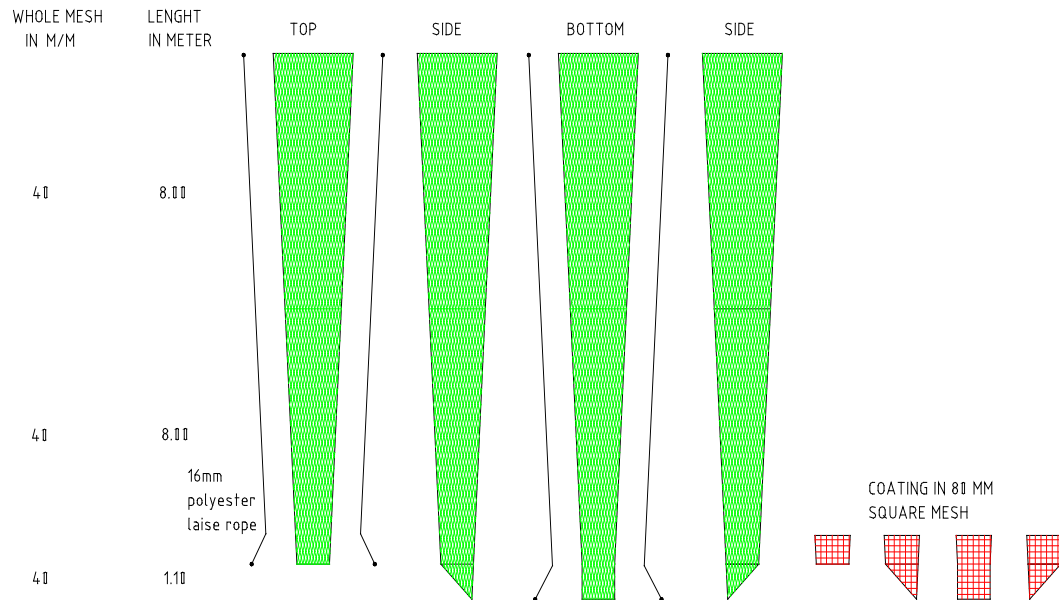
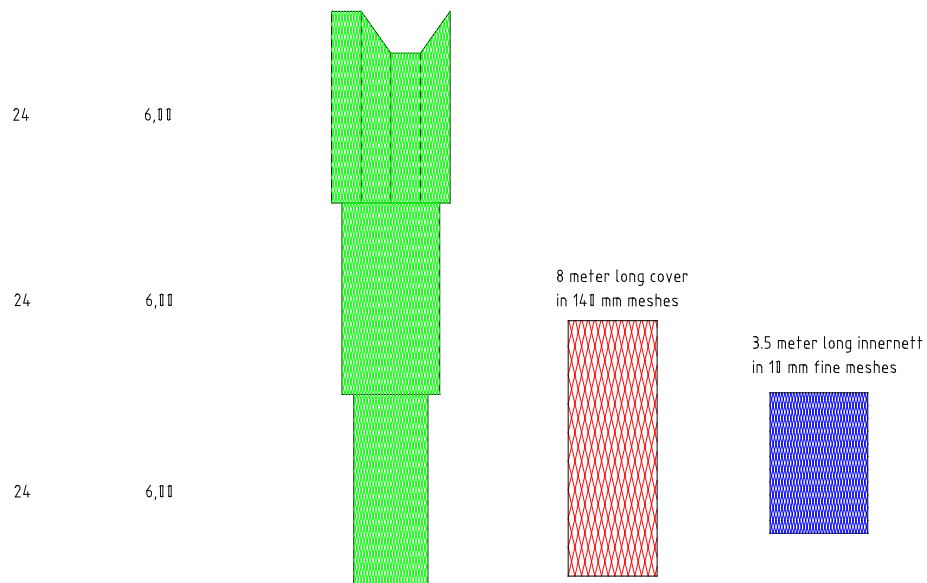


FIG. 2  
CODENDS FOR MultiSampler ( 3Pcs.)



## ANNEX IV

### CALIBRATION OF THE SIMRAD EK500 ECHO-SOUNDER

#### 1.0 Introduction

One of the primary objectives of the Target Identification Cruise, was to collect multi-frequency acoustic data from scattering layers and mono-specific fish shoals off the coast of South Africa. Targeted trawls were used to identify the species composition of observed scattering layers and shoals, while multi-frequency acoustic data were continuously logged to investigate the potential for acoustic identification of targets.

The echo-sounder employed for the acoustic component of this exercise was the SIMRAD EK500 scientific sounder equipped with three split-beam transceivers operating at nominal frequencies of 18, 38 and 120 kHz.

The calibration of the EK500 took place in False Bay on the morning of the 13<sup>th</sup> June 2000.

#### 2.0 Environmental Conditions

The vessel steamed into False Bay and anchored in 50m of water using both the bow and stern anchors (trawl doors). The lowered keel was raised and a CTD dip was initiated prior to deploying the calibration sphere. Environmental parameters are listed in Table 1 below.

Table 1. Environmental parameters determined prior to/during calibration in False Bay

PARAMETER	
Vessel Position (lat / long)	34 11.24 S / 18 40.70 E
Wind Speed ( $\text{ms}^{-1}$ )	2.1
Wind Direction	50E
Sea State	2
Salinity ( $\lambda$ )	35.6
Sea Temperature (EC)	13.7
Sound Speed ( $\text{ms}^{-1}$ )	1504
Water Depth (below keel) (m)	44

### 3.0 Calibration

The heave and roll sensors were turned off prior to calibration and transducer depth offsets were set to zero. The log menu on the EK500 was set to output integration tables to the printer for the selected layers at intervals of 0.3 nm at a simulated vessel speed of 10 knots. Transceiver settings prior to calibration are detailed in Annex I.

Difficulty was experienced in executing the SIMRAD Lobe program. Beam plots of the along and athwartships axes were thus produced by logging echo trace data to text files via the EK500 serial port and post-processing logged detections via EXCEL.

### 4.0 Results and Conclusions

Results obtained for the calibration are summarised in Tables 2 and 3 overleaf. Along and athwartships beam plots for all three frequencies are reproduced in Figures 1 and 2.

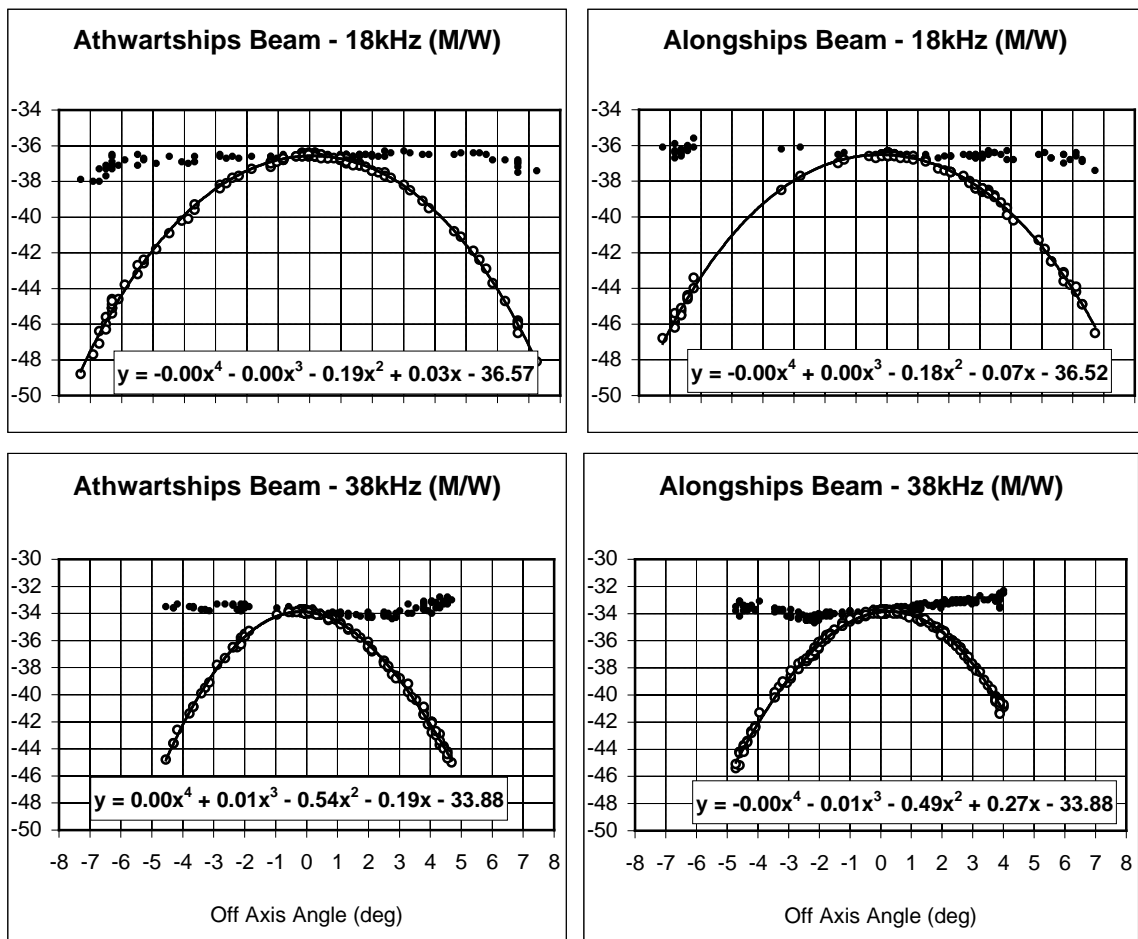


Figure 1. Along and athwartships beam plots for 18 and 38 kHz frequencies.

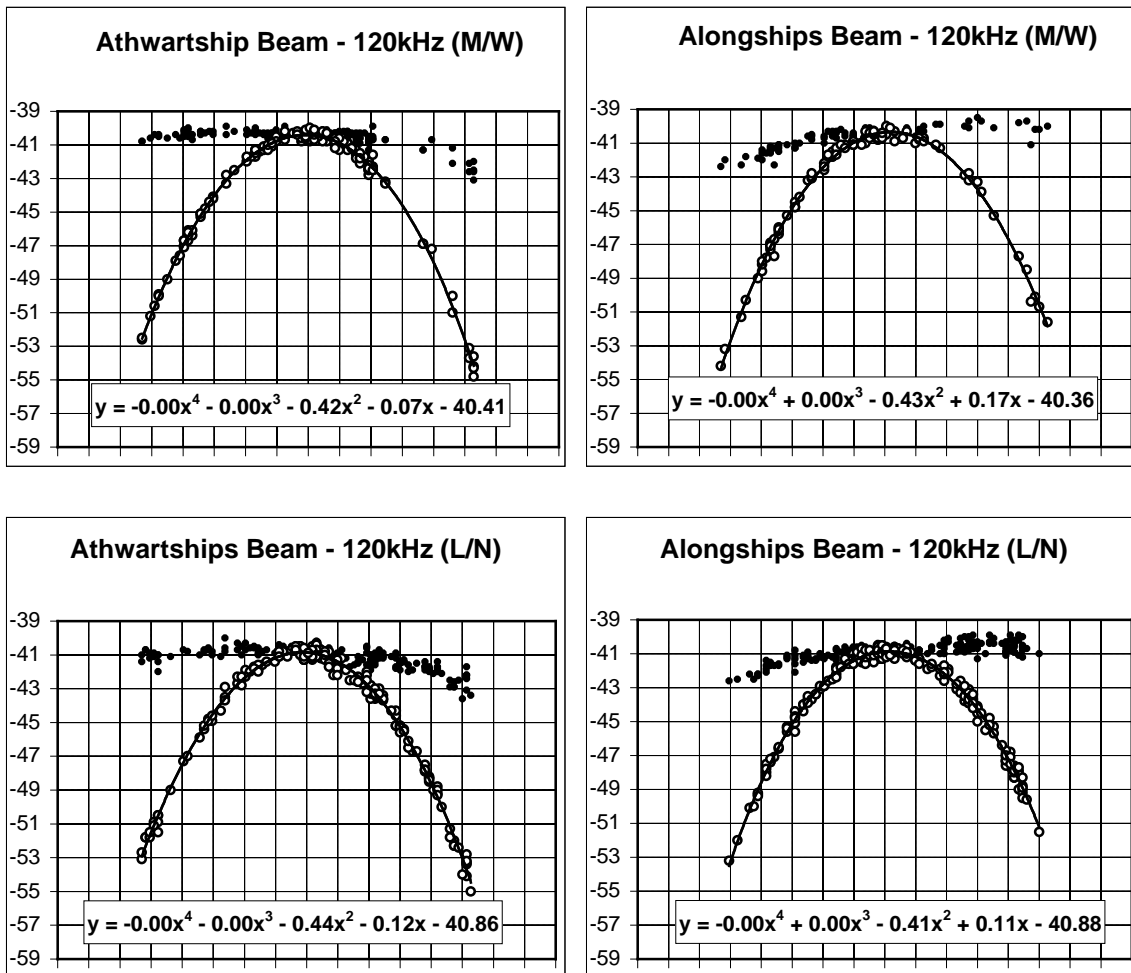


Figure 2. Along and athwartships beam plots for 120 kHz frequency.

#### 4.1 38kHz

Medium/Wide: The change in TS and SV gains was  $-0.13$  dB and  $-0.06$  dB respectively. The  $TS_{\text{gain}}$  change (estimated visually from on-axis measurements) was confirmed by fitting a 4<sup>th</sup> order polynomial to the uncompensated TS data obtained during a beam plot exercise.

#### 4.2 120kHz

Medium/Wide: The change in TS and SV gains was  $-0.41$  dB and  $-0.27$  dB respectively. The  $TS_{\text{gain}}$  change (estimated visually from on-axis

measurements) was confirmed by fitting a 4<sup>th</sup> order polynomial to the uncompensated TS data obtained during beam plotting.

Long/Narrow: The change in TS and SV gains was  $-0.64$  dB and  $-0.56$  dB respectively. The  $TS_{\text{gain}}$  change (estimated visually from on-axis measurements) was confirmed by fitting a 4<sup>th</sup> order polynomial to the uncompensated TS data obtained during beam plotting.

### 4.3 18kHz

Medium/Wide: The change in TS and SV gains was  $-0.55$  dB and  $-0.08$  dB respectively. The  $TS_{\text{gain}}$  change (estimated visually from on-axis measurements) was confirmed by fitting a 4<sup>th</sup> order polynomial to the uncompensated TS data obtained during beam plotting.

Long/Narrow: The change in TS and SV gains was  $-0.55$  dB and  $-0.24$  dB respectively.

The results of the calibration indicate a general decrease in sensitivity at all three frequencies. The change in TS and SV gain sensitivity at 38 kHz is within acceptable limits, the 0.13 dB decrease in the former being confirmed by an analysis of beam plot data (Figure 1). The decrease in sensitivity at 120 and 18 kHz is however cause for concern.

While the precise measurement of SA values (and hence  $SV_{\text{gain}}$ ) is largely dependent on the prevailing weather and sea state at the time of calibration, the  $TS_{\text{gain}}$  can be determined by recording spot readings of sphere target strength while momentarily positioned on the transducer axis. Consequently, there is an increased likelihood of variability in the integrated SA values (and hence  $SV_{\text{gain}}$ ) as opposed to the measured on-axis target strength of the calibration sphere, particularly when the prevailing weather conditions deteriorate.

This does not appear to be the case with the current calibration however and changes in  $TS_{\text{gain}}$  exceed changes measured in the  $SV_{\text{gain}}$  parameter by as much as 0.47dB or 11%. While the  $SV_{\text{gain}}$  change at 18kHz and 120kHz is less than 0.3 dB (except in the case of the long/narrow pulse/bandwidth combination at 120kHz), the  $TS_{\text{gain}}$  has changed by  $-0.41$  dB and  $-0.64$  dB at the

medium/wide and long/narrow settings at 120kHz respectively. The  $TS_{\text{gain}}$  change is  $-0.55$  dB at both pulse/bandwidth combinations used at 18kHz.

These results relate to a change in target strength of between 1.10 dB and 1.28 dB (29% to 34%) between calibrations and, if valid, introduce additional uncertainty which must be factored into any analysis of back-scatter using multi frequency data. While every effort was made to ensure that the current calibration was procedurally correct, serious consideration was given to rejecting the current results and retaining those values obtained previously, particularly at 18 kHz and 120 kHz. However, due to the level of agreement obtained when comparing spot measurements close to the axis, and the predicted on-axis target strength obtained from the 4<sup>th</sup> order polynomial beam approximation (Table 3 and Figures 1 and 2), the results were considered plausible and applicable for the survey. Future calibrations should however carefully monitor any potential fluctuation in sensitivity observed, particularly at 18kHz and 120kHz.

Beamplots were carried out using the existing EK500 transceiver beam parameter settings (Table 2). The plots for the along and athwartships axes at 18, 120 and 38kHz are shown in figures 1 and 2. The 4th order polynomial approximations to each specific beam function are also detailed. Plots were produced by screening the logged single target detections and confining the alternate axis angular values to  $< 0.25E$ . There is some evidence to suggest that the beam parameters are not optimal for compensation purposes, particularly at 120kHz and 38kHz. A more detailed analysis will be required to optimise these parameters for multi frequency target strength experiments.



Table 2. Revised TS and SV transducer gain settings (boldface) after completion of the calibration exercise. Values in italics indicate previously determined gain settings obtained during the St Helena Bay calibration in September 1999. The pulse/bandwidth combinations used during the current multi-frequency species identification survey are shown shaded. Note that beam parameters at all frequencies remain unchanged from those previously determined.

TRANSCIEVER	1 : 38kHz		2 : 120kHz				3 : 18kHz			
Sphere Range (m)	17.6		23.94				22.75			
Sphere / TS	60mm Copper / -33.6 dB		38.1mm Tungsten Carbide / -39.58dB				60mm Copper / -35.4dB			
Transducer Type	ES38B		ES120-7				ES18-11			
Pulse Duration	Medium		Medium		Long		Medium		Short	
Bandwidth	Wide		Wide		Narrow		Wide		Wide	
TS <sub>gain</sub> (dB)	<i>27.65</i>	<b>27.52</b>	<i>25.82</i>	<b>25.41</b>	<i>26.17</i>	<b>25.53</b>	<i>21.80</i>	<b>21.25</b>	<i>21.60</i>	<b>21.05</b>
SV <sub>gain</sub> (dB)	<i>27.45</i>	<b>27.39</b>	<i>25.70</i>	<b>25.43</b>	<i>26.01</i>	<b>25.45</b>	<i>21.49</i>	<b>21.41</b>	<i>21.69</i>	<b>21.45</b>
ΔTS <sub>gain</sub> / ΔSV <sub>gain</sub> (dB)	-0.13	-0.06	-0.41	-0.27	-0.64	-0.56	-0.55	-0.08	-0.55	-0.24
Along. 3dB Beamwidth	6.8E		7.6E				10.9E			
Athwart. 3dB Beamwidth	6.7E		7.6E				10.9E			
Alongships Offset	-0.03E		-0.05E				-0.04E			
Athwartships Offset	0.06E		0.08E				0.03E			



Table 3. Comparison of the difference between sphere TS and measured TS (shaded cells) for (i) sphere echoes detected within 0.1 E of the axis and (ii) the on-axis TS value as predicted by a 4<sup>th</sup> order polynomial fit (to the along and athwartships axes) from logged beam plot data at 18, 38 and 120kHz respectively.

TRANSCEIVER	PULSE DURATION / BANDWIDTH	SPHERE TS [dB]	Average uncompensated sphere TS for echoes within $\forall$ 0.1E of the axis.			$\delta TS_{\text{sphere}}$ [dB]	On-axis sphere TS predicted by 4 <sup>th</sup> order polynomial approximation. (see Figure 1) [dB]	$\delta TS_{\text{sphere}}$ [dB]
			N	TS <sub>uc</sub> (ave) [dB]	SD [dB]			
1: 18kHz	Medium/Wide	-35.40	14	-36.49	$\forall$ 0.05	-1.09	-36.55	-1.15
2: 38kHz	Medium/Wide	-33.60	18	-33.86	$\forall$ 0.08	-0.26	-33.88	-0.28
3: 120kHz	Medium/Wide	-39.58	4	-40.29	$\forall$ 0.28	-0.71	-40.39	-0.81
	Long/Narrow	-39.58	11	-40.93	$\forall$ 0.21	-1.35	-40.87	-1.29

## **ANNEX V**

### **REPORT ON THE FUNCTIONING OF THE SODAPS SYSTEM**

#### **Experiences from working with the Sodaps system:**

We had difficulties to get the Sodaps system to run. On many occasions the system would not start to log data from the sonar. (The default sonar parameters was set by starting the program “mon”() and the detection and logging parameters by starting the program “param” (), which both seemed to be working OK.)

If the sonar stopped logging it was recommended in the preliminary version of the Sodaps manual to switch the sonar on and off. We therefore turned the sonar off and on before we again restarted the Sodaps-system but without success. Then a rebooting of the unix-machine “Mandela” was done and we then succeeded to start the Sodaps system.

#### **Logging of the sonar data:**

During the real time logging of the sonar data both the logging and the print out of the echogram stopped several times. This happened about once per hour. We had to watch the system continuously to restart it when the real time logging stopped. The data files stored were automatically separated in files of very short duration, mostly from 8 to 15 minutes. This resulted in a lot of files and fewer, bigger files would have been easier to handle.

#### **Post processing in the echogram window:**

In the echogram window under the option: “new school detection”. Will a reduction in the ”min block length” exclude schools with a high density and long vertical extension, due to short horizontal extension?

The echogram window shows the schools identified by school number and marked by a school box. If one big school is detected as several segments and therefore separated into several school boxes (several school id numbers) the “join” function is supposed to join these segments together. If the join function were used several times to join a big school together, parts of the school that before joining was included in at least one of the school boxes, were not included in the resulting last big school box, composted of all the smaller ones. (Eg. file: “Fri 23 Jun 10:30:10 2000”, school ID 173, 184, 186, 188, 189 and 194.). If joining two

smaller school boxes that both are surrounded by a bigger one, it seems impossible to join these two small boxes without rejecting the big one or alternatively also including the big one. Perhaps one school box and the belonging school ID no. should be marked with the same colour so that it is easier to separate them from other schools.

We were only able to load one file at a time of about 8 min or about 1.3 nautical mile duration (when cruising at 11 knots) into the echogram window. Most school recordings were split in several detections and with the difficulties in using the join function to properly identify one detection per school plus substantial time to de-classify detections of noise and bottom echo, operation of SODAPS became very labour intensive and time consuming. We also experienced that operations in the echogram window often resulted in a halt of the data logging process, and we therefore had to wait with school classification until after the sonar survey.

#### **School view window:**

When considering a school in the school view window it seems that the schools have got a kind of “tail” when passing through the beam fan. Sometimes when considering a school in school view both the school view and the echogram closed down and the message “segmentation fault (core dumped) appeared. This happened often when looking at several schools from the same echogram window.

SODAPS probably produced a substantial underestimation of the horizontal area of the schools. This is because the estimation of area is based on detection ping by ping, and because the sonar signal processed by SODAPS is un-smoothed and thereby fluctuating substantially from one ping to another. This is evident when visualizing school detections in the School View window.

#### **Generate report:**

After the schools had been evaluated in the echogram window, the file can be marked with “Finished”. But when creating the report it should be possible to find the same marking “Finished” besides the files. We then wonder if these files are the same as we treated in the echogram window. The manual says that the report program makes reports of the data the way they were treated in the echogram window.

When a report is generated it is stored under /user/sonar/src/data, not in the directory /data/report/ where it seemed that it should be stored from the directory window with the text “/data/report/”. The name of the report file is given in the window “Selection”.

It is possible to make one report file from several data files?

It should be possible to select the variables you want to include in the report files.

The heading of the variables should have no more than 8 characters, this is the maximum character number allowed in SAS and thereby it will do the import of data into SAS easier. Another problem under the import of data from SODAPS to SAS is that the column number for each variable is not constant in SODAPS (e.g. school area). This generates problems using the input method “column input” in SAS.

**Paper echogram:**

The recordings on the paper echogram produced by the HP paint jet printer were made in mono colour (dark red) during the whole survey. This complicated identification and manual measurements of schools on the paper echogram. It should be easier to change the colour settings of the printer if this has to be adjusted from time to time.