

BENEFIT SURVEYS

Cruise Report No 2/2001

Acoustic survey errors

18 April – 2 May 2001

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

**Institute of Fisheries Research
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**Institute of Marine Research
Bergen Norway**

CRUISE REPORTS “DR. FRIDTJOF NANSEN”

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by

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TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Objectives of the survey	3
1.3 Participation	4
1.4 Narrative.....	4
CHAPTER 2 METHODS.....	6
2.1 Hydrography and weather data.....	6
2.2 Survey area.....	6
2.3 Multi-frequency acoustic sampling.....	7
2.3.1 Refit of drop keel in Cape Town, January 2001	8
2.4 Trawl sampling	9
2.5 Diel cycle experiments	10
2.6 <i>in situ</i> Target strength experiments	11
2.7 Vessel avoidance experiments	12
CHAPTER 3 RESULTS.....	14
3.1 Hydrography and weather data.....	14
3.2 Diel cycle experiments	15
3.3.1 Diel cycle I	15
3.3.2 Diel cycle II.....	17
3.4 <i>in situ</i> Target strength experiments	18
3.4.1 Multifrequency acoustic analysis	20
3.5 Vessel avoidance experiments	21
5. ACKNOWLEDGEMENTS	25
REFERENCES	26
ANNEX I TRANSCIEVER MENU SETTINGS	
ANNEX II CALIBRATION REPORT	
ANNEX III RECORDS OF FISHING STATIONS	
ANNEX IV DIEL CYCLE DATASHEETS.	

CHAPTER 1 INTRODUCTION

1.1 Background

Hydroacoustic surveying is a foremost means of estimating the abundance of pelagic fish, and is applied for a number of species worldwide. The main advantages of the method are the ability of sampling large volumes of water with relatively low effort and the high sample resolution in both the horizontal and the vertical planes. Acoustic surveying has the last decade been utilised in the direct assessment of the commercially important pelagic fish species of Namibia and Angola, specifically horse mackerel (*Trachurus trachurus capensis*, and *T. trecae*), sardinella (*Sardinella madarensis*, and *S. aurita*), anchovy (*Engraulis capensis*) and sardine (*Sardinops sagax*). The method relies, however, on the fundamental assumptions that 1) unbiased returns from all targets are recorded, 2) that the recorded acoustic intensity can be correctly allocated among the taxons present, and 3) that the acoustic intensities of each taxon can be correctly converted to actual animal densities.

Assumption 1 may, however, be violated under the following conditions:

- a) If targets inhabit volumes not covered by the acoustic beam, i.e. if they occupy the acoustic blind zones, at the time of sampling. Specifically, if these are in the near-bottom dead zone, in which targets are masked by the first bottom returns, and the upper blind zone, or between the surface and the upper integration limit of the transducer (transducer near field + the narrowest part of the beam). This is a problem in species that are distributed close to the bottom (e.g. horse mackerel) or the surface (sardinella) during surveying.
- b) If the recorded back-scattering area s_A (m^2/nm^2) of scatters is affected by the presence of the vessel, i.e. avoidance behaviour. Vessel avoidance may cause fish to move out of the acoustic beam, in which case they are not recorded, or to change their angular orientation within the beam (i.e. to dive), and hence their scattering properties. Bias in acoustic abundance estimates due to vessel avoidance is reported for a range of pelagic fish species.
- c) Attenuation of the acoustic pulse due to absorption in scattering layers may cause a range- and density dependent non- linear reduction in recorded density for strong aggregations.

Assumption 2 entails that the different taxons of the ensonified population can be recognised. Targets are usually identified by combining visual scrutiny of the scattering patterns with data from independent trawl samples from the ensonified population, but problems are frequently

encountered due to e.g:

- a) Spatial and/or temporal changes in scattering properties of taxons due to changes in behaviour (e.g. schooling/shoaling, dispersing, vertical migration),
- b) Overlapping distributions, masking acoustic characteristics of different targets (e.g. horse mackerel mixed with aggregations of prey items like euphausiids and/or copepods).

Representative biological samples are prerequisite also for obtaining mean size and mean weight estimates needed to convert acoustic density to total number of individuals and to total biomass, respectively. For splitting the biomass on size groups, size distribution and size-weight keys are required as well. Commonly used in acoustic surveying for this purpose are sampling trawls that are specially designed to catch representatively. There are, however, certain limitations related to trawl performance, mainly:

- c) Availability – the extent to which the targets were present in the sampled volume (trawl sample volume is always very small compared to the acoustic sample volume),
- d) Catchability – the extent to which the targets encountered in the trawl path are caught (usually both size- and species dependent),
- e) Compatibility – the extent to which the acoustically and biologically sampled volumes can be compared (knowledge of trawl position, depth and geometry, and contamination of biological sample from other depths).

Finally, the calculation of absolute fish densities requires that the dorsal aspect scattering of the targets at the given frequency can be predicted. The mean backscattering cross section of a target σ_{target} (m^2) is commonly related to the size of a standard sphere with a 2 m radius, giving the relation (Love 1971):

$$\text{TS} = 10 \log (\sigma_{\text{target}} / 4\pi) \quad (\text{dB}) \quad (1)$$

where TS is the target strength, or the backscattering cross section in the logarithmic domain. The target strength is usually related to the fish total length (L), using the relation (Foote et al. 1986):

$$\text{TS} = x \log L + y \quad (\text{dB}) \quad (2)$$

where x and y are linear regression coefficients. For many commercially important species σ has been shown to be proportional to the squared total length of the fish at 38 kHz. For

facilitation of direct comparison between different regressions series, (2) can thus be modified to a one-coefficient form, keeping $x = 20$ (Love 1977):

$$TS = 20 \log L + b_{20} \text{ (dB)} \quad (3)$$

If the average acoustic backscattering cross section $\langle\sigma\rangle$ of the ensonified population is known, recorded area backscattering coefficient, s_A (m^2/nm^2) can hence be converted to number of fish per unit squared nautical mile, ρ_A using:

$$\rho_A = s_A/\sigma \quad (4)$$

The absolute acoustic estimate relies not only on the unbiased estimate of the integrated backscattering area of the target population, but also on the mean size of the targets, the relationship between target size and target strength, and (unless the target strength is related directly to weight) the relationship between size and weight.

Errors in acoustic surveying relevant for the BENEFIT region were discussed during a workshop in Cape Town in December 2000. Several of the key factors above were discussed, and the workshop provided advice for activities to be addressed during this survey.

1.2 Objectives of the survey

The overall survey objective was to carry out experimental work that may aid in reducing errors in hydroacoustic surveys in the BENEFIT region. The main objectives were:

- To conduct calibrated acoustic measurements of Cape horse mackerel (*T. trachurus capensis*), Cunene horse mackerel (*T. trecae*), Round sardinella (*Sardinella aurita*) and Flat sardinella (*S. maderensis*) at 18, 38, 120 and 200 kHz.
- To study diurnal variations in recorded acoustic density, s_A (m^2/nm^2) and target strength, TS in horse mackerel.
- To record *in situ* target strength on loosely organised, monospecific aggregations of homogeneously sized pelagic fish.
- To study avoidance behaviour of pelagic fish during acoustic surveying, and to quantify effects of vessel avoidance on recorded acoustic densities.

- Species identification of layers and schools of fish using the mid-sized pelagic sample trawl (~15 m vertical opening) fitted with Multisampler, surface trawling (“balloon hauls”) using the small pelagic trawl (~10 m opening) and bottom trawls (~5 m).
- Species identification of scattering layers of plankton using the Hydrobios multinet plankton sampler.
- Logging of meteorological data (air and sea surface temperature, wind strength and direction), CTD casts (temperature, salinity, Oxygen) and ADCP profiles (horizontal and vertical current and error speed and direction).

1.3 Participation

The scientific staff consisted of:

From IIM: Filomena VAZ-VELHO¹, Henriette Lutuba NSILULU¹

From NatMIRC: Angie KANANDJEMBO¹, Jens-Otto KRAKSTAD¹, Josia HALWOODI², Aili HAMUNYELA², Erin RUSH³, Martha UUMATI²

From IMR: Bjørn Erik AXELSEN¹ (Cruise leader), Reidar JOHANNESSEN¹, Magnar MJANGER¹, Magne OLSEN¹.

1. 18.04 – 02.05 2001
2. 22.04 - 02.05 2001
3. 18.04 – 22.04 2001

1.4 Narrative

The R.V. *Dr. Fridtjof Nansen* departed from Walvis Bay at 14:00 (local time) on 18th April 2001, and headed directly for Lang Strand for calibration of the 18, 38, 120 and 200 kHz scientific echo sounders.

The vessel steamed north to Cape Frio at 19°00’S after completion of the calibration on the 20th April. Two consecutive 24-hour diel cycle stations were carried out from 18:00 on 21st April. Hydroacoustic data was recorded continuously from all four frequencies of the EK500 during the experiment. The first pelagic trawl started at 19:00 and the last pelagic multisampler trawl

of the experiment ended at 18:30 on the 23rd. 13 complete sampling cycles including multisampler trawls, CTD/ADCP casts and multinet plankton hauls were completed during these experiments.

The R.V. *Welwitschia* met R.V. *Dr. Fridtjof Nansen* midday on 22nd April during the experiment for a changeover of personnel.

After completion of the first diel cycle experiment the ship steamed northwards to Tiger Bay in Angola where the portable transducer for the Simrad EY500 echo sounder mounted in the small (5.3 m) Man Over Board (MOB) boat was calibrated. The vessel then searched for dense concentrations of horse mackerel and sardinella further north into the Namib area. The second diel experiment was initiated here at 01:00 on the 27th April. Two 24 hours cycles were completed on the 29th April 00:00. Hydroacoustic data was recorded continuously from all four frequencies of the EK500 during the experiment, and altogether 12 cycles of multisampler trawls, bottom trawl, CTD/ADCP and multinet hauls were conducted.

The next experiment was a mini survey conducted north of Lobito. Three cycles of avoidance studies on *Sardinella* were conducted from 12:00 on the 29th April to the 1st May using the MOB boat in cooperation with the *Dr. Fridtjof Nansen*. Both vessels recorded acoustic data continuously during the experiment. The vessel then steamed to Luanda where it arrived the 2nd May at 08:00.

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 from the 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 and analysed onboard. Current measurements using a 150 kHz RDI ADCP (Acoustic Doppler Current Profiler) measurements were carried out at each CTD station.

2.2 Survey area

The survey area was the shelf from Walvis Bay, Namibia to Luanda, Angola (Figure1). The first diel cycle experiment took place in northern Namibia at 19°01'S 12°04'E, at approximately 180 m depth. In this experiment the same 5 nm section of track was sampled repeatedly for 48 hours. The second diel cycle experiment was conducted outside Lobito, Angola at 12°28'S 13°25'E for another 48 hours. The water depth was approximately 50-70 m. Two successful mini survey experiments were carried out north of Lobito at 12°09'S 13°39'E using the MOB boat.

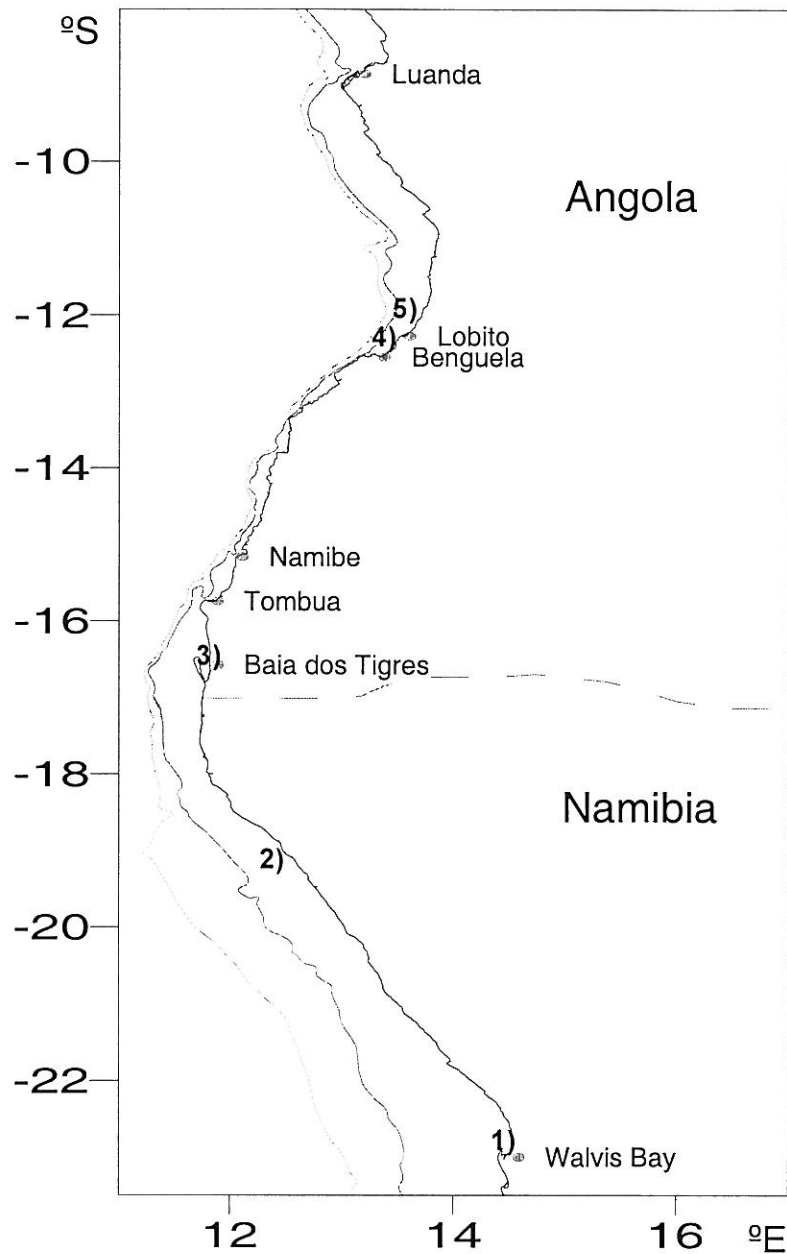


Figure 1. Survey area with the different working areas: 1) Calibration of EK500 18, 38, 120 (EK1) and 200 (EK2) kHz echosounders; 2) 48h diel cycle 1; 3) calibration of portable EY500 38 kHz echosounder on the MOB boat); 4) 48h diel cycle 2; 5) Mini-survey for comparative avoidance experiments.

2.3 Multi-frequency acoustic sampling

Two Simrad EK500 echo sounders equipped with a total of four acoustic transducers mounted on the submersible keel (Figure 2) operating at nominal frequencies of 18, 38, 120 kHz split beam and 200 kHz single beam were operated throughout the survey. The settings used in the two EK500 transceiver menus are presented in ANNEX I. To minimise differences in sampling resolution, the pulse length and bandwidth setting of the four transducers were altered to short/wide (18 kHz) and long/narrow (38, 120 and 200 kHz) respectively. Sonardata Echolog® software version 2.1 was used to log the data from the Ethernet communications port. Data

were also logged simultaneously using the Bergen Echo Integrator (BEI). Analysis and post processing of logged data was done using Sonardata Echoview® software version 2.20.52. All four transceivers were successfully calibrated in Walvis Bay (ANNEX II) and the new settings were implemented before the start of the survey.

2.3.1 Refit of drop keel in Cape Town, January 2001

Recently, several modifications have been made to the transducer arrangement of the drop keel. The modifications were done during a refit in Cape Town in January 2001. The ship was dry-docked, and the keel was lifted up through a shaft that runs in the full height of the ship and opens up onto the roof of the wheelhouse. The keel was transported to a workshop where the keel-face was levelled according the off-axis deviation angle at normal ship trim, as estimated during acoustic surveys. The keel was sandblasted, primed and painted. Shells, barnacles and other shrubbery were removed from the keel and inside the shaft. A new, bigger cable gate was fitted to the shaft in order for all cables to run through the same gate. The cables for the 38 and 120 kHz transducers, and the Scanmar hydrophone (HCL) were somewhat squeezed, and were therefore replaced with new, thinner, cables (50 m).

New holes were bored for 18 kHz (aft), 120 kHz (central, starboard side) and 200 kHz (central, port) transducers. The 38 kHz was left in its original position. The old hole for the 120 kHz was covered. The existing 18 kHz transducer was removed from its initial position on the hull and fitted onto the keel. A new 200 kHz single beam transducer (ES 200-7F) was fitted next to the 120 kHz split beam transducer in the centre of the keel face. The modifications of the transducer arrangement have effectively ensured optimal configuration of the transducers, as they are now positioned on the same acoustic axis giving ~vertical transmission at normal ship trim and with minimal horizontal spacing of the transducers. The new transducer arrangement on the drop keel is illustrated in Figure 2a, while Figures 2b and 2c are photos of the keel face before and after the refit, respectively.

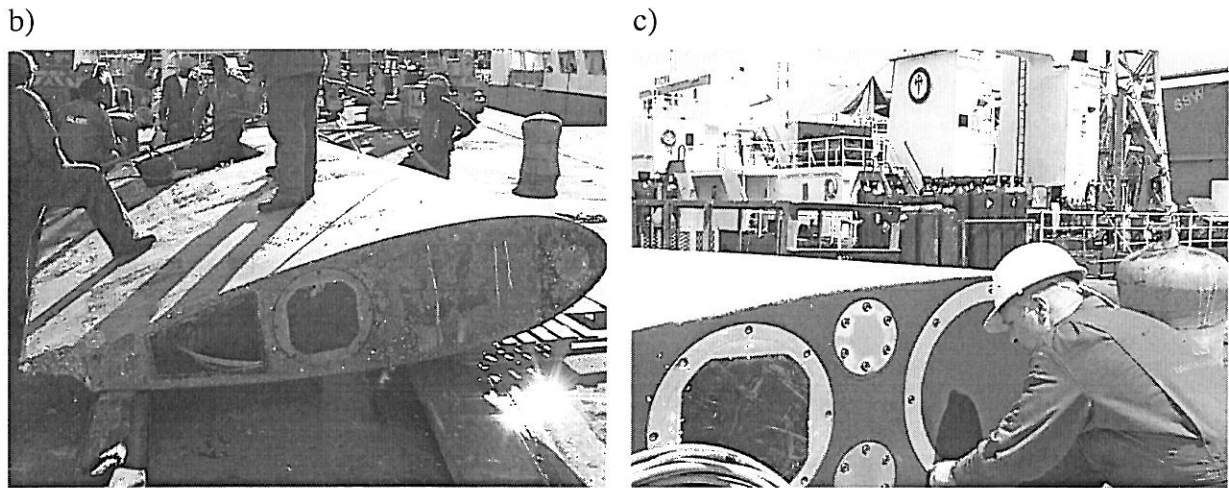
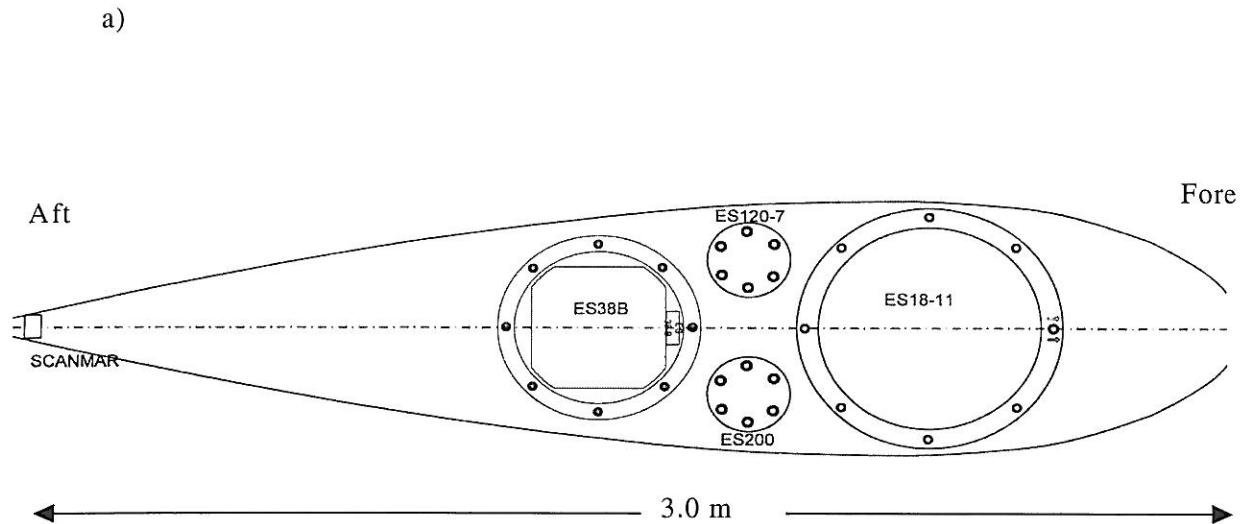


Figure 2. Transducer arrangement of the drop keel of R/V “Dr. Fridtjof Nansen” showing schematic illustration of the new orientation of the transducers on the keel (scale 1:10) (a) and photo taken before (b) and after (c) the refit in Cape Town in January 2001.

2.4 Trawl sampling

Sampling trawls used included the large pelagic trawl (30 m vertical opening) with the multisampler attached, the small pelagic trawl (10 m vertical opening) and a bottom trawl (5 m vertical opening). 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’ Kombi 6.7 m² 1670 kg trawl doors were used in all hauls.

Random samples of fish representative of the total catch were taken from the trawl catches. The size of the samples was largely determined from the degree of mixing of the catch. In cases where the catch was small, the total catch was always sampled. The number and total weight for each species were recorded in each sample and raised to the total catch. A random sample of about 100 fish per species of sardinella and horse mackerel, if available, were measured to the nearest 1 cm below total length to obtain the size composition of the catch. Biological samples of the two horse mackerel species including individual length, weight, sex, maturity and stomach fullness were recorded. Stomach samples of *T. trachurus capensis* and *T. trecae* were collected for further analyses onshore.

A total of 87 trawls were completed during the survey. Altogether 64 hauls were multisampler trawls, and a further 7 trawls were conducted with the small pelagic trawl (mostly with floats on the headline). Bottom trawls done during the second diel cycle experiments made up another 16 trawls. All catches were sorted for species composition and entered into the NAN-SIS trawl database. A summary of all catch rates is shown in ANNEX III.

2.5 Diel cycle experiments

For identification of different scattering layers, and examination of structural patterns and trophic relations two diel cycle experiments were completed, one in the Northern Benguela and one in the Angola dome area. Both experiments lasted 48 hours and sampling was restricted to the same 5 nm section of track. The area under the vessel was continuously monitored with multifrequency acoustics. The different scattering layers were continuously sampled in cycles (ANNEX IV). A cycle commenced with the pelagic multisampler trawl followed by a bottom trawl (only experiment two), and depth discrete samples of plankton and nekton with the Hydrobios multinet sampler, followed by a CTD cast and ADCP to the bottom.

The hydrobios sampler was fitted with five 405 μm 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 $0.5 \text{ m}\cdot\text{s}^{-1}$ while steaming at less than 2 knots towing speed. 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 the oxygen probe (the salinity probe was delivered for service on land before the survey). 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 14 cycles were completed during the first experiment and 13 cycles during the second experiment, altogether constituting a total of 13 bottom trawl samples, 57 multisampler trawl samples, 125 Hydrobios Multinet plankton

samples and 27 CTD casts.

Acoustic data at all four frequencies was logged continuously to determine the depths of and to integrate the various pelagic scattering layers. Trawls determined the species composition of the layers and the size frequency of the main species was measured. A sub sample of each species of horse mackerel were collected for analyses of stomach fullness and stored for stomach content analyses ashore.

2.6 *in situ* Target strength experiments

During diel cycle 1 (northern Namibia), the scattering of a population of juvenile horse mackerel around 15 cm (14.9 ± 0.71 cm (Mean \pm Std. Dev., N = 2010) was monitored. The min-max range of total fish length was 12-19 cm. The small sample variation in fish length makes the population suitable for target strength considerations. The population was readily identified during vertical migrations from about 50 m (25 to 75 m) at night to about 125 m (100-150 m) during daytime. Some undulations in the layers were seen both during day and night time, and the degree of polarisation changed over time, particularly at daytime. The bottom depth in the area was about 175 m.

The echograms from the acoustic recordings during the experiment was combined with information from the biological sampling (plankton multinet and cod end multisampler) by superimpose on the echograms “marker” boxes at relevant depths and time locations in Echoview. The different scattering layers were identified and the main taxons and their relative abundance in dry weight were noted in the “comment” fields for scrutiny purposes. The data were then divided according to the sample activities that had been carried out (i.e. trawling, plankton netting, CTD casts etc.). Relatively loose aggregations of horse mackerel were carefully selected for extraction of traces for target strength considerations. Only parts were scattering layers of plankton (krill and euphausiids) did not appear to bias the scattering from the horse mackerel, were used in the analysis. Only single target outputs from the TS detection algorithm of the EK500 (single target telegrams) were used. These had to be validated for erroneous contributions from plankton and multiple records of target fish. Single targets were extracted using the target-tracking module of Echoview (v 2.20.52, released 2001). This module identifies traces originating from single specimens by comparing the position of scatterers from ping to ping. Traces were accepted according to predefined criteria (Table 1). Criteria should be formulated to exclude multiple targets and other invalid contributions, but should not be so strict that unreasonably many valid targets are likely to be excluded. Trace-data (mean trace target strength, number of records in trace, mean depth, time etc) for approved regions was then exported to CSV-files for further processing. Tracking the targets is

advantageous because it promotes equal contribution of all ensonified fish, as only mean-track values are re-averaged to obtain population means. All averaging must be done in the linear domain.

At a later stage these data will be further scrutinised using multi-frequency analysis techniques. Two approaches will be pursued:

- 1) Removal of contributions from other scatterers (krill and euphausiids) using multi-frequency target identification.
- 2) Removal of multiples using split-beam target triangulation

For certain taxons, the frequency response (differences in target strength between frequencies) is known for applied frequencies. Masking away contributions from non-target scatterers (that satisfy known frequency responses unique to these groups) may hence aid to remove “noise” from the target strength records (approach 1). Further, contributions from multiple targets can be considerably reduced using the split-beam target triangulation method, in which recorded targets in the acoustic beam of interest (e.g. 38 kHz) are validated by means of cross-referencing their positions with those of the other split-beam transducers (18 and/or 120 kHz) (approach 2). Other than removing biased data points and making interpretation easier, these techniques, if successfully applied, enable the use of a larger part of the original dataset, hence increasing the value of the observations.

Table 1. Acoustic settings in the target-tracking module of Echoview when exporting single targets for TS-measurements

EV-file properties Menu (Track settings)	Variable settings (Data settings / filter properties)		
Min. numbers of single targets in a track	6	Filter angles	
Max. gap between single targets (pings)	1	Max. allowed alongship angle (\pm degree)	5
Max. change in range (m)	0.5	Max. allowed atwartship angle (\pm degree)	5
Max change in alongship angle (\pm degree)	4	Max gain compensation (dB)	10
Max change in atwartship angle (\pm degree)	4		

2.7 Vessel avoidance experiments

Four mini-survey experiments were conducted north of Lobito using the MOB boat (5.3 m long, 50 HP outboard engine) equipped with a portable 38 kHz scientific echosounder (Simrad EY500) in order to study near-surface schooling and vessel avoidance.

The first experiment was carried out midday 29 March, while the second started on the 30th in the morning. A nighttime experiment later on that evening had to be terminated after the laptop

used to log the acoustic data on the MOB boat was soaked by seawater. A new coverage was carried out the next morning. Unfortunately, due to data logging problems, only data from two complete replicas of the mini-survey were obtained.

During the experiments, the small boat was operated at a distance of about 0.4 nm ahead of the Nansen at a speed of approximately 5 knots (Figure 3). The operation of the MOB boat was assisted via radio communication (portable VHF), using distance and bearing information of the MOB obtained from the radar on the Nansen. Assuming that the MOB boat did not exhibit any avoidance responses in the fish, this can be considered comparative calibrated acoustic records of the non-disturbed and the regular survey situations. It should be noted, however, that the standard speed during surveys is 10 knots, and that the avoidance pattern may then be different.

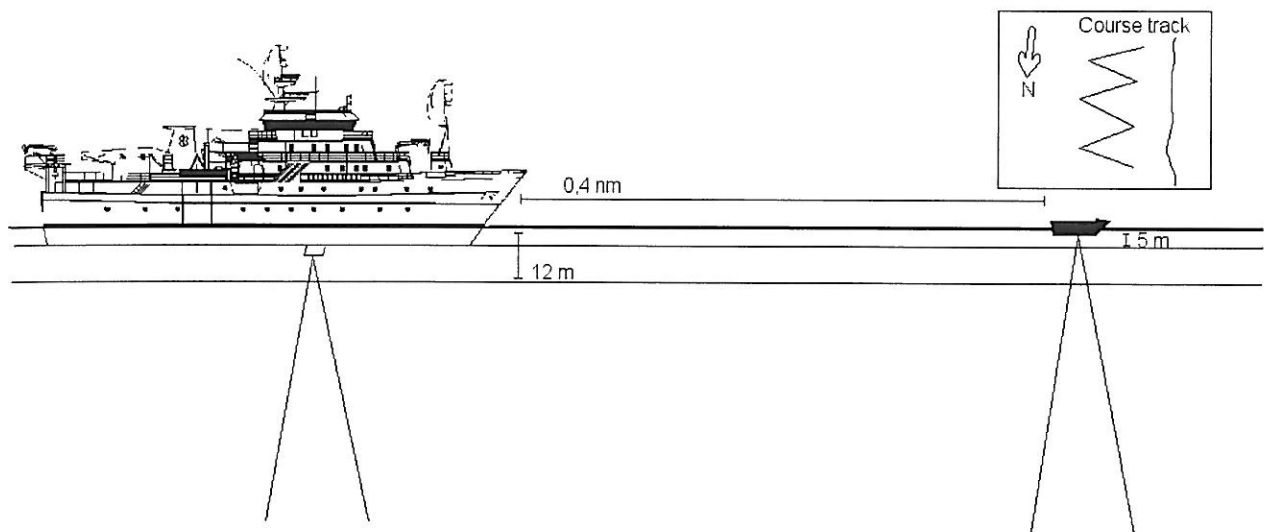


Figure 3. Illustration of the vessel avoidance experiment with Dr. Fridtjof Nansen and the MOB boat

CHAPTER 3 RESULTS

The project collected large amounts of zoo plankton, hydro acoustic, ADCP data that requires massive analyses after the survey. This report can therefore only show examples and preliminary results from the survey. However, the main objectives of the survey stated in the introduction and suggested during the survey error workshop in December 2000 have been accomplished. The results will be analyzed in forthcoming workshops under this BENEFIT project and the final results discussed in publications derived from these results.

3.1 Hydrography and weather data

Conditions during the survey were mostly favourable with light northwesterly winds throughout the duration of the survey. Hydrographical profiles for the CTD cast from both diel stations are presented in Figure 4 (a and b) and for the MOB mini survey. The data show relatively stable oceanographic conditions during both experiments with some diurnal variation during diel cycle two especially in the oxygen profile. ADCP data collected during the diel cycle experiments will be processed in Bergen at a later stage.

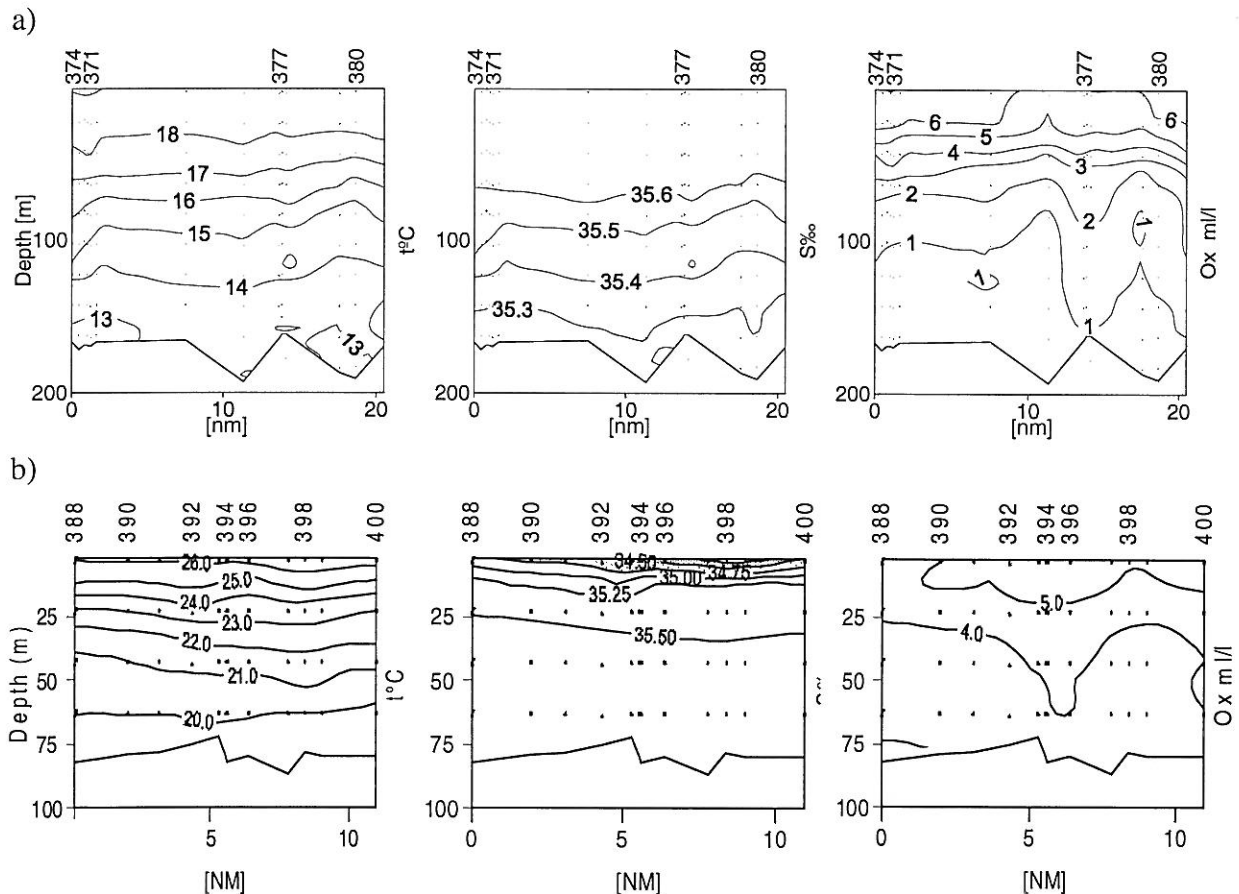


Figure 4. Temperature, salinity and oxygen profiles from diel cycle experiment 1 a) and 2 b)

3.2 Diel cycle experiments

Analyses of species and size composition in the multisampler trawl nets from diel cycle one and two were done at sea to identify the different scattering layers. Stomach content and plankton multinet were taken back and will be analysed on land.

3.3.1 Diel cycle I

A composite plot of the acoustic recordings from the 38 kHz transducer during the first diel experiment is shown in Figure 5. The species composition during the first 48 hours cycle was dominated completely by juvenile cape horse mackerel with a homogenous length distribution of 14.9 cm (Figure 6). Some jellyfish (*Aequorea aequorea*) were present on all depths. The zooplankton in the water column will be identified from the plankton multinet hauls. The horse mackerel had a clear diel vertical migration, with highest concentrations in the upper 50 m at night and aggregated in midwater deeper than 100 m during the day. The vertical migration was gradual, and the fish were found at the deepest water depths around midday. The bottom depths during the experiment ranged between 106 m and 188 m.

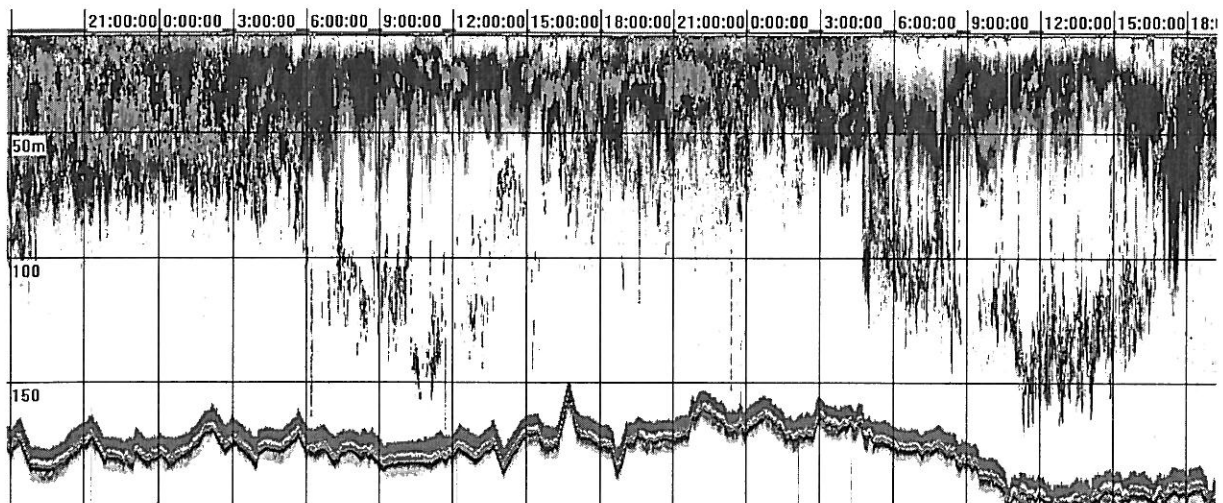


Figure 5. Composite figure of the acoustic recording from the 38 kHz transducer during diel experiment one. Time is GMT

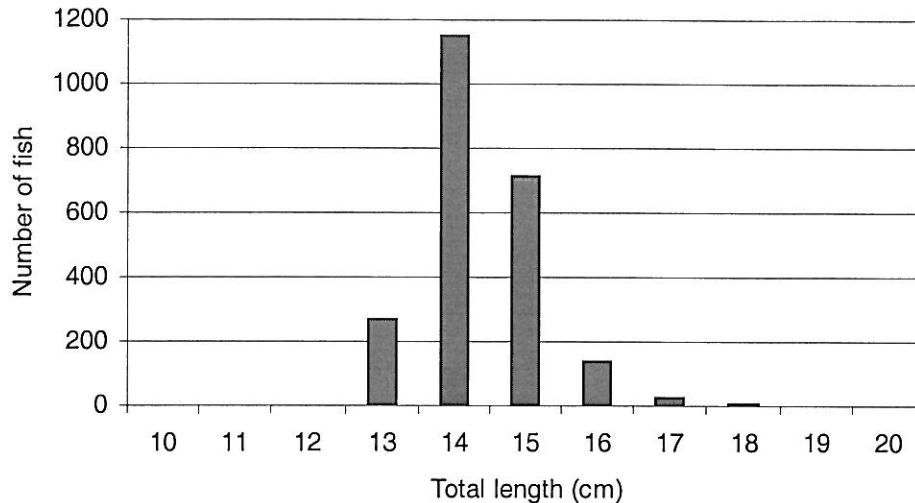


Figure 6. Length frequency of horse mackerel *Trachurus trachurus capensis* during the first diel cycle

The first diel cycle consisted of trawl stations 781-818 (ANNEX III and IV), all trawl hauls except 804-807 which were ordinary pelagic trawl hauls, were multisampler hauls. Station 808-810 was discarded because the multisampler malfunctioned. Most of the hauls were conducted on standard depths of 75 m 50 m and 25 m with 10-15 min trawls on each depth. Table 2 shows the catch/hour of horse mackerel during the experiment. The catches identify layers of horse mackerel in the echogram. Cycle 8-10 (station 804-807) was conducted as single hauls with an ordinary pelagic trawl in order to charge the multisampler battery. There were no horse mackerel in the trawl catches during cycle 5 and 7 and little in 8 and 9. The echogram (Figure 5) supports that horse mackerel moved out of the study area during this period. It was decided to move a few nm north and a little deeper to follow the fish, and good concentrations were found again in the morning 05:00 (cycle 10).

Table 2 Depth (m) and catch rate (kg/h) of horse mackerel during diel cycle 1. Time is GMT

1	2		3		4		5		6		7		8-10		11		12		13		
19:14-20:01	00:57-01:50		04:30-05:10		09:30-10:33		14:18-15:11		17:21-18:19		20:01-20:51		22:48-05:55		11:09-11:55		14:42-17:46		17:35-18:27		
75	7,9	75	17,6	75	0,2	100	150	60	0,0	95	3,3	75	0,0	25	10,3	100	4907	125	1250	100	8,6
50	0,6	50	48,3	50	46,8	110	325,6	50	0,0	50	0,8	50	0,0	25	6,2	140	1773	25	6,7	50	9,1
25	132,5	25	39,9	25	2,5	28	0,7	25	0,0	28	48,3	28	0,0	50	910,2	50	0,3	-	-	25	7,9

Figure 7 shows the stomach filling of horse mackerel *T. trachurus capensis* and *T. trecae* during diel experiments one and two. The figure shows that both species of horse mackerel fed in the afternoon during the survey. The diet will be examined more closely on land, and compared to available zooplankton in the water column.

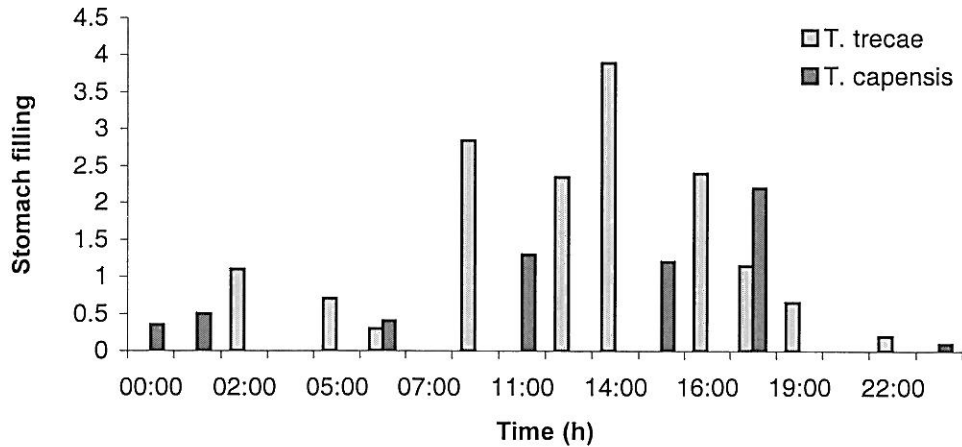


Figure 7 Preliminary analyses of the stomach filling of horse mackerel. Both *T. trachurus. capensis* and *T. trecae* were eating in late afternoon. Time is GMT.

3.3.2 Diel cycle II

A composite plot of the acoustic recordings from the 38 kHz transducer during the second diel experiment is shown in Figure 8. Acoustic scatters were present in the whole water column with slightly different distribution between day and night. The bottom depths in the area were less than 100 m.

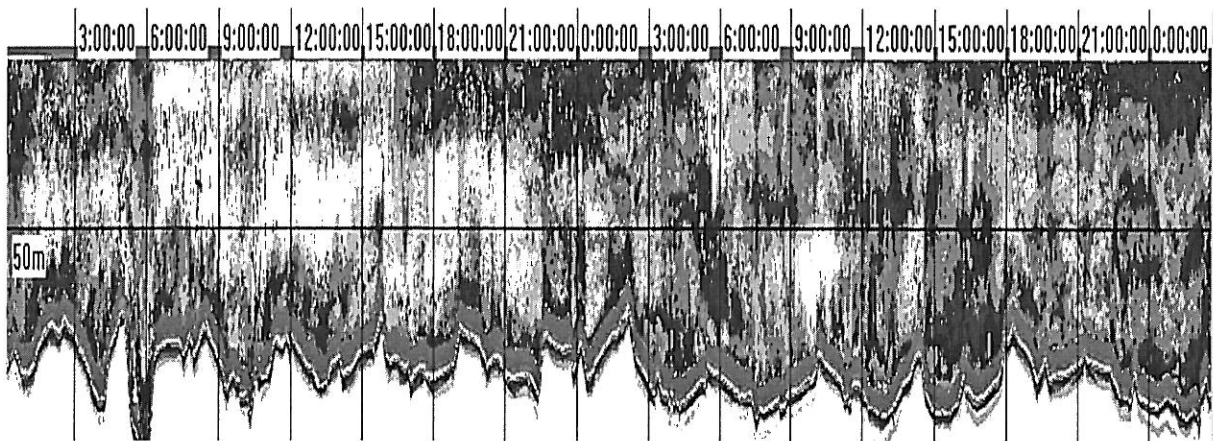


Figure 8. A composite plot of the acoustic recordings from the 38 kHz transducer during the second diel experiment. Time is GMT

The catch per hour of the main species are summarised for different depths and times of the day (Table 3). Day refers to 06:00-18:00 GMT. Only 2 multinet were normally released, one at depths deeper than 45 m, and one shallower than 30 m. The species composition during the experiment was complex. There were as expected large differences in the catch composition at different depths and between day and night. *Sardinella (S. maderensis)* dominated completely in shallow waters during the day, and in deeper layers >45 m depth at night. *Trichiurus lepturus*, *Brachydeuterus auritus* and horse mackerel (*T. trache*) dominated in bottom trawls,

all with highest concentrations during the day. Adult horse mackerel were not present in bottom trawls at night while juvenile horse mackerel were not present in the water column during the day.

Table 3. Summary of main species composition in multinet and bottom trawls during diel cycle 2. The data is given as sum of catch per hour in kilos for all hauls.

SPECIES	<30m		>45m		Bottom trawl		Sum	% of total catch
	Day	Night	Day	Night	Day	Night		
<i>Sardinella maderensis</i>	1029.6	747.6	104.0	882.7	2.3	7.2	2773.5	26.3
<i>Trichiurus lepturus</i>	-	8.2	102.4	64.6	919.3	449.2	1543.7	14.7
Juvenile <i>Brachydeuterus auritus</i>	-	2.0	-	91.5	598.4	275.0	966.7	9.2
Adult <i>Brachydeuterus auritus</i>	-	3.3	4.2	138.0	465.9	158.8	770.1	7.3
Juvenile <i>Trachurus traciae</i>	-	15.9	-	80.5	642.6	27.8	766.7	7.3
Adult <i>Trachurus traciae</i>	10.0	5.2	51.8	-	377.9	-	444.8	4.2
<i>Pagellus bellottii</i>	-	-	-	0.2	47.8	281.0	329.1	3.1
<i>Umbrina canariensis</i>	-	-	-	0.3	67.2	127.1	194.6	1.8
<i>Pterothrissus belloci</i>	-	-	-	-	96.2	92.7	188.8	1.8
<i>Dentex angolensis</i>	-	-	-	-	66.7	104.7	171.4	1.6
<i>Brotula barbata</i>	-	-	-	-	62.2	103.9	166.1	1.6
<i>Chelidonichthys lucerna</i>	-	-	-	-	-	118.4	118.4	1.1
<i>Selene dorsalis</i>	1.1	-	88.7	-	23.5	-	113.3	1.1
<i>Parapenaeus longirostris</i>	-	0.2	-	2.5	8.7	97.9	109.2	1.0
<i>Sepia orbignyana</i>	-	-	-	1.4	27.3	73.4	102.1	1.0
Sum	1040.7	782.3	351.1	1261.6	3405.9	1917.1	8758.6	83.1
Total catch	1091.0	834.7	362.7	1303.2	3854.9	3089.1	10535.5	100.0
% of total catch	95.4	93.7	96.8	96.8	88.4	62.1	83.1	

The length frequency of horse mackerel a) and sardinella b) is shown in Figure 9. Both length frequencies show that several different cohorts were present during the experiment. Juvenile horse mackerel and adult sardinella dominated. The data were not suitable for target strength experiments.

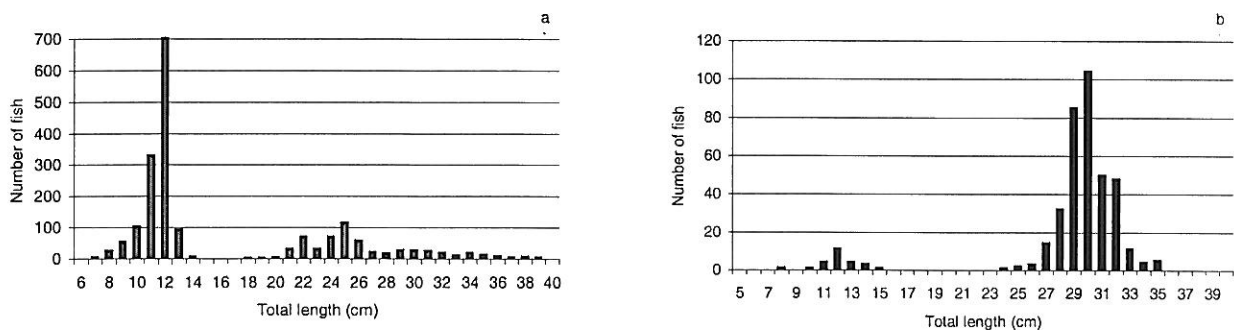


Figure 9. Length frequency of horse mackerel (*T. traciae*) a) and sardinella (*S. maderensis*) b) during the second diel cycle

3.4 *in situ* Target strength experiments

The single target echogram (38 kHz) used for target detection of horse mackerel during diel cycle one is shown side by side with the equivalent Sv echogram in Figure 10. The single target

detection algorithm in Echoview selected suitable candidates for TS measurements according to the criteria's in Table 1. No data was selected inside of the horse mackerel schools seen in the right echogram because these are too dense for single target experiments. The data was manually scrutinized to get rid of unwanted targets (marked "others" in the echogram, Figure 10). The preliminary TS data from the single target echogram was exported twice, first used before the manual scrutiny, and then after correction so that all of the targets were what we believed to be horse mackerel (Figure 11). The figure show that most of the values on the right tail of the TS distribution was discarded.

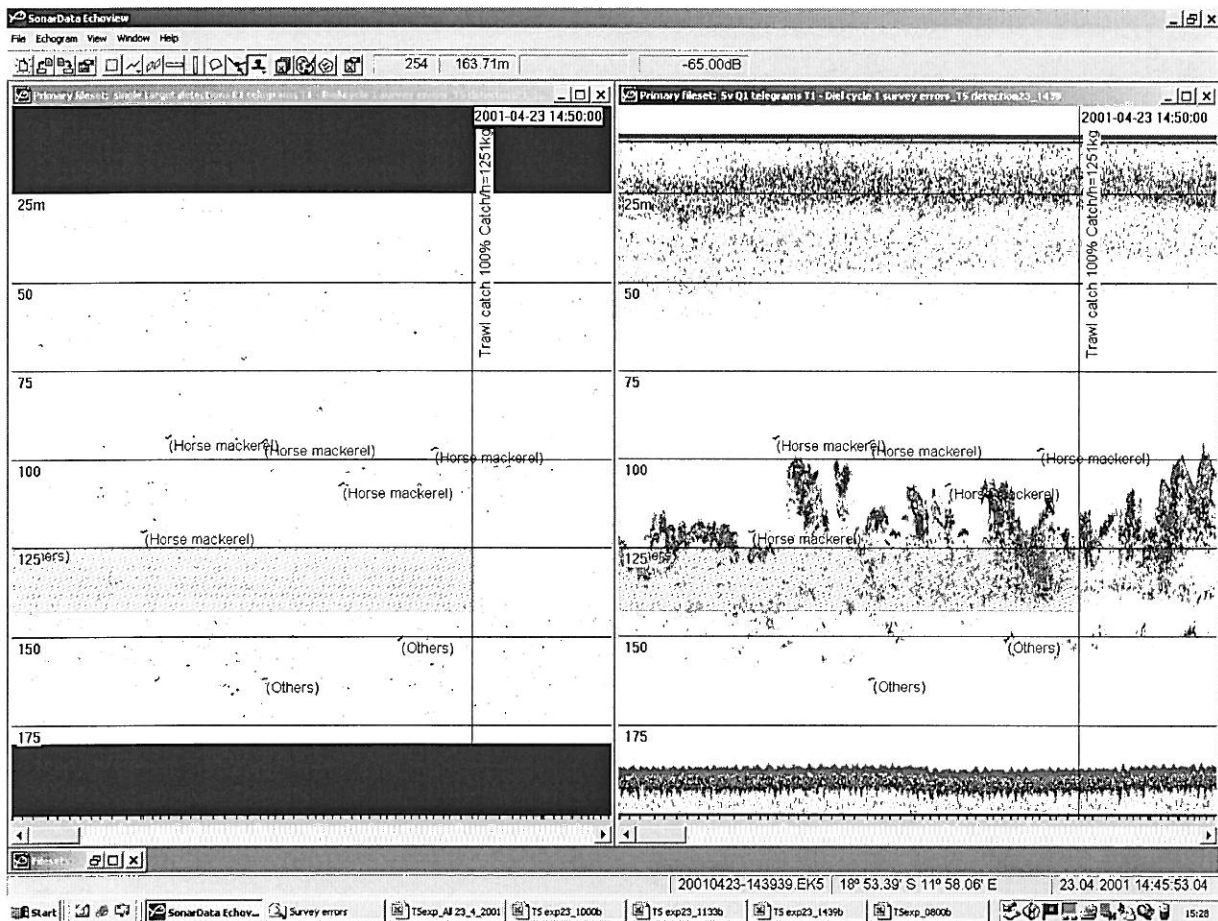


Figure 10. Example of single target detection echogram from the diel cycle one used for acoustic single target measurements of horse mackerel (left) including the excluded unwanted targets (others), and the equivalent Sv echogram (right). The red area on the echograms symbolise the trawl path that identified parts of the layer

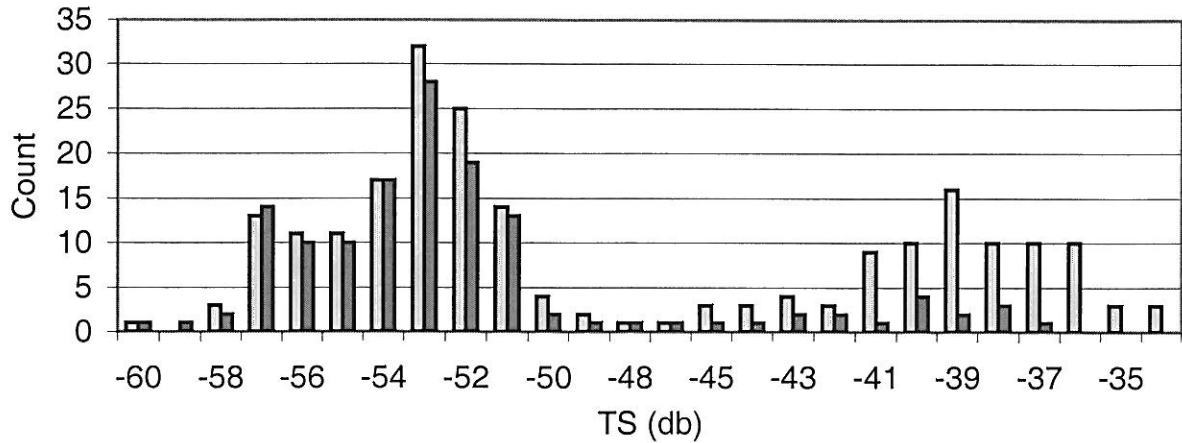


Figure 11. Distribution of acoustic single target measurements of horse mackerel (*T. trachurus capensis*) before (blue) and after (red) manual scrutiny of single targets.

Table 5 summarizes the result after the manual scrutiny, and the preliminary results suggest a B_{20} constant = -71.0 for cape horse mackerel in this situation. This is what is used during routine surveys today. However the results from this experiment illustrates the uncertainty around this value and highlights that manual scrutiny of single targets is essential even in relatively homogeneous layers of only one fish species like in this example. Manual scrutiny of the single targets has in this example excluded most of the unwanted targets, but it is suspected that some still remains. Unwanted targets can include fish that are so close together that they have been interpreted as a single individual with higher target strength, or other species not caught by the sample trawl. Further cleaning and manipulation of the data can produce the best approach ahead.

Table 5. Preliminary results of single target measurements of horse mackerel (*T. trachurus capensis*) after manual scrutiny of single targets.

n	Depth (m)		TS (dB)	B_{20}
	Mean	SD		
137	105.7	17.9	-47.8	-71.0

3.4.1 Multifrequency acoustic analysis

As explained in the methods section, only data from suitably identified homogeneous scattering layers were used for the testing of the multifrequency target identification method. The basic idea is simple. Acoustic targets from a specific species / group have specific backscattering characteristics at different frequencies. The Sv ratios between two frequencies will be characteristic for the group and can be used to separate between different species or groups of species e.g. plankton and horse mackerel. The analysis of the multifrequency data requires a lot

of data processing, and will only be completed at a later stage. For the purposes of this report, only an example featuring distinct scattering layers of juvenile horse mackerel at three different frequency ratios from diel cycle one is presented (Figure 12). The horse mackerel show different characteristics for each of these frequency ratios. Note the peak around 0.1. This peak probably corresponds to small amounts of plankton mixed in the horse mackerel aggregations and could be filtered away from a new horse mackerel echogram using the Sv ratio information.

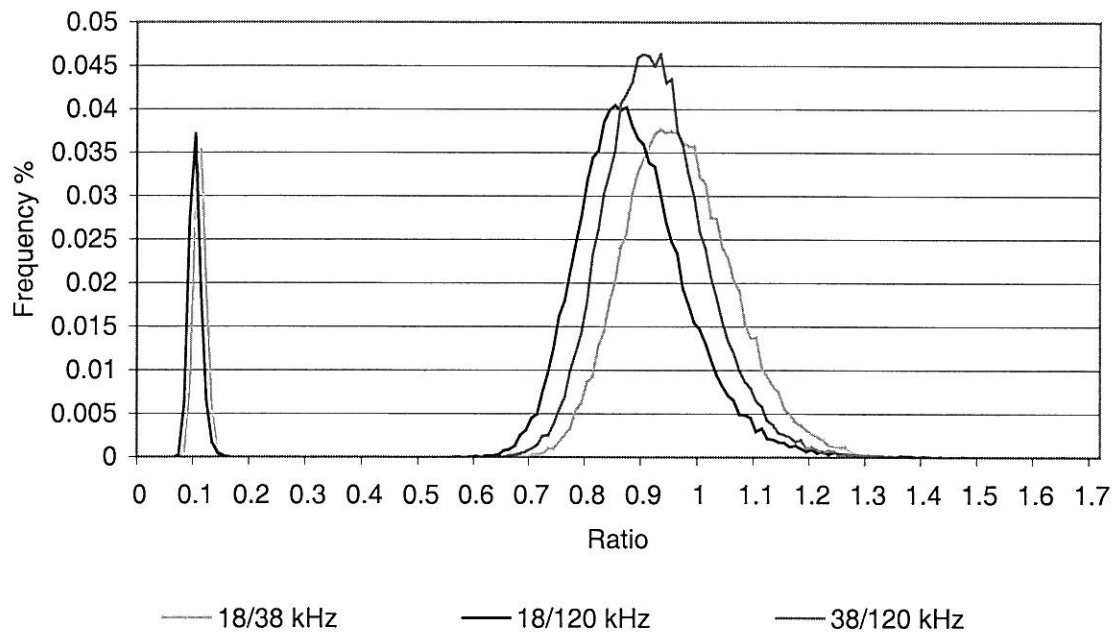


Figure 12. Ratios of Sv backscatter at 18 and 38 kHz a), 18 and 120 kHz b) 38 and 120 kHz c) for horse mackerel

3.5 Vessel avoidance experiments

The vessel avoidance experiment was conducted with the MOB steaming in front of Dr. Fridtjof Nansen on transects with water depths of ~20 m – 50 m. Only data from two of the four mini surveys were suitable for avoidance studies. Visual scrutiny of the acoustic records suggested that the surveyed population consisted of a mix of sardinella (*S. maderensis*) and other pelagic species. This was confirmed by the trawl sample, which contained a mix of *S. maderensis* (22 %) other small pelagic (73 %) and some demersal (5 %) species (Annex III, station 869). The true ratio of the sardinella was, however, probably considerably higher, as the sardinella actively avoids the fishing gear and therefore is difficult to catch, particularly during the day (Misund et al., 1998).

The matched echograms from the two vessels are shown in Figure 13. The two vessels had different minimum integration depth (Figure 3, green line in Figure 13). The effective integration depth on Dr. Fridtjof Nansen is 12 m with the drop keel in lowered position, and the

transducer on the MOB was efficient from 5 m depth. The overall integration results from the two experiments show a consistent pattern with lower densities recorded with the Dr. Fridtjof Nansen than the MOB using the 5 m upper integration limit and higher densities using the 12 m limit (Table 6). The results suggest that the fish reacted to Dr. Fridtjof Nansen by vertical avoidance. The results showed that when integrating echograms from both vessels at 12 m (green line, Figure 13) the average s_A was lower for the MOB ($\langle s_A \rangle = 882$) than for the Dr. Fridtjof Nansen ($\langle s_A \rangle = 1030$) ($p < 0.04$, Sign permutation test). However, when the echogram from the MOB boat was integrated from 5 m depth (green line) they showed slightly higher but not significantly different ($\langle s_A \rangle = 1272$) readings to Dr. Fridtjof Nansen ($p < 0.64$, Sign permutation test). The results can be interpreted that the fish between 5 m and 12 m depth dived before passage of the research vessel. In this specific situation avoidance reaction seems to at least partly correct for another survey error namely fish in the surface dead zone. However, the experiments should be replicated, with special emphasis on potential effects of target density, vertical distribution and seasonal effects.

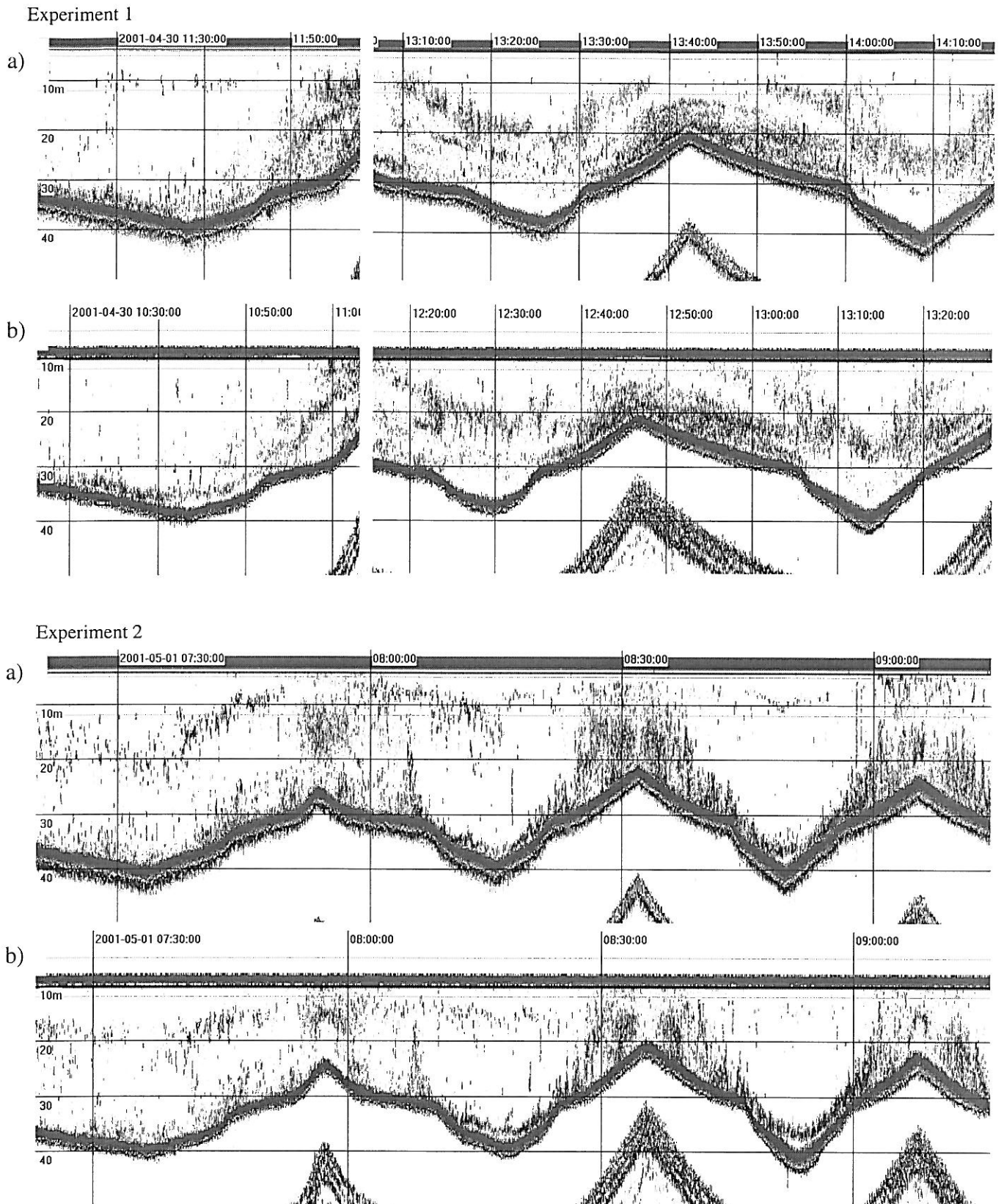


Figure 13. Echograms recorded by the MOB boat a) and Dr. Fridtjof Nansen b) during the experiment 1 and 2. The two green lines at 5 and 12 m water depth correspond to the integration levels in Table 6. The gap in the echogram during experiment 1 was created when the batteries to the EV500 on the MOB had to be charged.

Table 6. Comparative echo integration using the R/V “Dr. Fridtjof Nansen” (DFN) and the man-over-board boat (MOB) with different upper integration limits (subscript). Average s_A (m^2/nm^2) is given with corresponding standard error of the mean in brackets.

Experiment	DFN _{12m}	MOB _{5m}	MOB _{12m}
1	818 (79)	984 (266)	805 (185)
2	1265 (212)	1589 (346)	968 (167)
overall	1030 (113)	1272 (218)	882 (124)

5. ACKNOWLEDGEMENTS

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ANNEX I TRANSCEIVER MENU SETTINGS

Table 1. SIMRAD EK 500 Transceiver menu settings after acoustic calibration.

Echosounder	EK 1	EK 1	EK 1	EK 2
Transceiver	1	2	3	1
Carrier frequency	38 kHz	120 kHz	18 kHz	200 kHz
Mode	Active	Active	Active	Active
Transducer type	ES 38B	ES 120-7	ES 18-11	ES 200-F7
Transducer sequence	Off	Off	Off	Off
Transducer depth (m)	8	8	8	8
Absorption coeff. (dB/km)	10	38	3	53
Pulse Length	Long	Long	Short	Long
Bandwidth	Narrow	Narrow	Wide	Narrow
Max. Power (W)	2000	1000	2000	1000
2-Way Beam Angle	-21.0	-20.6	-17.2	-20.5
Sv. Transducer Gain	27.37	26.01	23.95	25.51
TS. Transducer Gain	27.49	26.42	23.74	26.20
Angle sens. Along.	21.9	21.0	13.9	0
Angle sens. Athw.	21.9	21.0	13.9	0
3 dB Beamwidth Along	7.0	7.52	11.2	0
3 dB Beamwidth Athw.	6.7	7.31	10.8	0
Alongship offset	0.14	-0.04	-0.10	-0.04
Athwartship offset	-0.02	-0.16	-0.05	0.03
Sound velocity (ms ⁻¹)	1498	1498	1498	1498

Table 2. SIMRAD EK 500 TS detection menu settings used during the survey.

Echosounder	EK 1	EK 1	EK 1	EK 2
Transceiver	1	2	3	1
Minimum value	-80 dB	-80 dB	-80 dB	-80 dB
Min. length	0.8	0.8	0.8	0.8
Max. length	1.8	1.8	1.8	1.8
Max. gain compensation	6.0	6.0	6.0	6.0
Max. phase deviation	5.0	5.0	5.0	5.0

ANNEX II CALIBRATION REPORT

The R.V. *Dr. Fridtjof Nansen* did a calibration of the scientific echo sounders 18 kHz, 38 kHz, 120 kHz (EK1) and 200 kHz (EK2) at Lang Strand (Walvis Bay) on the 18/4-2001 (Table 1) and on the portable EY-500, ES38-12 transducer at Tiger Bay 25/4-2001 (Table 2)

Table 1 Calibration of the 18kHz, 38kHz, 120kHz (EK1) and 200kHz (EK2) transducers at Lang Strand (Walvis Bay) on the 18/4-2001

Vessel: Dr. Fridtjof Nansen	Date: 19/4-2001	Place: Langstrand, Namibia
Echosounder: EK-500-2	Prev. calib. Never	Sphere depth: 13.8 m
Transducer ES200-7F	Bottom depth: 28 m	T, Sphere depth 14.6 °C
Sound velocity: 1507 m/s	Sphere: WC 38.1	S, Sphere depth 35.4 ‰

Parameter	Previous values	Values after calibration
Transducer depth	0.0	8
Absorption coefficient (dB/km)	53	53
Pulse duration (ms)	Long	Long
Bandwidth (kHz)	Narrow	Narrow
Transmission effect re. Terminals (W)	1000	1000
Equivalent beam width (10 log ψ) (dB)	-20.5	-20.5
Sv transducer gain (dB)	26.3	25.51
TS transducer gain (dB)	26.3	26.20
Angle sensitivity alongship		
Angle sensitivity atwardship		
3 dB beamwidth Alongship (deg)		
3 dB beamwidth Atwardship (deg)		
Alongship deviation from centre (deg)		
Atwardship deviation from centre (deg)		
TS reading Sphere before Calibration	dB	
Read s_A before calibration (m^2/nm^2)	2272	
Theoretical s_A at sphere depth (m^2/nm^2)	3262	
s_A sphere after calibration (m^2/nm^2)	3070	

Vessel: Dr. Fridtjof Nansen	Date: 19/4-2001	Place: Langstrand, Namibia
Echosounder: EK-500-1	Prev. calib. 13/6-2000	Sphere depth: 13.9 m
Transducer ES120-7	Bottom depth: 28 m	T, Sphere depth 14.6 °C
Sound velocity: 1507 m/s	Sphere: WC 38.1	S, Sphere depth 35.4 ‰

Parameter	Previous values	Values after calibration
Transducer depth	0.0	8
Absorption coefficient (dB/km)	38	38
Pulse duration (ms)	Medium	Medium
Bandwidth (kHz)	Wide	Wide
Transmission effect re. Terminals (W)	1000	1000
Equivalent beam width (10 log ψ) (dB)	-20.6	-20.6
Sv transducer gain (dB)	25.7	25.74
TS transducer gain (dB)	25.82	26.03
Angle sensitivity alongship	21.0	21.0
Angle sensitivity atwardship	21.0	21.0
3 dB beamwidth Alongship (deg)	7.6	7.5
3 dB beamwidth Atwardship (deg)	7.6	7.3
Alongship deviation from centre (deg)	-0.05	0.09
Atwardship deviation from centre (deg)	0.08	-0.16

TS reading Sphere before Calibration	dB
Read s_A before calibration (m^2/nm^2)	2846
Theoretical s_A at sphere depth (m^2/nm^2)	2796
S_A sphere after calibration (m^2/nm^2)	2793

Vessel: Dr. Fridtjof Nansen	Date: 19/4-2001	Place: Langstrand, Namibia
Echosounder: EK-500-1	Prev. calib. 13/6-2000	Sphere depth: 13.9 m
Transducer ES120-7	Bottom depth: 28 m	T, Sphere depth 14.6 °C
Sound velocity: 1507 m/s	Sphere: WC 38.1	S, Sphere depth 35.4 ‰

Parameter	Previous values	Values after calibration
Transducer depth	0.0	8
Absorption coefficient (dB/km)	38	38
Pulse duration (ms)	Long	Long
Bandwidth (kHz)	Narrow	Narrow
Transmission effect re. Terminals (W)	1000	1000
Equivalent beam width (10 log ψ) (dB)	-20.6	-20.6
Sv transducer gain (dB)	25.45	26.01
TS transducer gain (dB)	25.53	26.42
Angle sensitivity alongship	21.0	21.0
Angle sensitivity atwardship	21.0	21.0
3 dB beamwidth Alongship (deg)	7.6	7.5
3 dB beamwidth Atwardship (deg)	7.6	7.3
Alongship deviation from centre (deg)	-0.05	0.09
Atwardship deviation from centre (deg)	0.08	-0.16
TS reading Sphere before Calibration	37.8 dB	
Read s_A before calibration (m^2/nm^2)	3550	
Theoretical s_A at sphere depth (m^2/nm^2)	2740	
s_A sphere after calibration (m^2/nm^2)	2722	

Vessel: Dr. Fridtjof Nansen	Date: 19/4-2001	Place: Langstrand, Namibia
Echosounder: EK-500-1	Prev. calib. 28/3-2001	Sphere depth: 15.8 m
Transducer ES38B	Bottom depth: 28 m	T, Sphere depth 14.6 °C
Sound velocity: 1507 m/s	Sphere: Cu 60	S, Sphere depth 35.4 ‰

Parameter	Previous values	Values after calibration
Transducer depth	0.0	8
Absorption coefficient (dB/km)	10	10
Pulse duration (ms)	Medium	Medium
Bandwidth (kHz)	Wide	wide
Transmission effect re. Terminals (W)	2000	2000
Equivalent beam width (10 log ψ) (dB)	-21.0	-21.0
Sv transducer gain (dB)	26.45	27.37
TS transducer gain (dB)	28.05	27.49
Angle sensitivity alongship	21.9	21.9
Angle sensitivity atwardship	21.9	21.9
3 dB beamwidth Alongship (deg)	6.9	7.0
3 dB beamwidth Atwardship (deg)	6.4	6.7
Alongship deviation from centre (deg)	-0.07	0.14
Atwardship deviation from centre (deg)	-0.28	-0.02
TS reading Sphere before Calibration	34.7 dB	
Read s_A before calibration (m^2/nm^2)	14641	
Theoretical s_A at sphere depth (m^2/nm^2)	9598	
S_A sphere after calibration (m^2/nm^2)	9628	

Vessel: Dr. Fridtjof Nansen	Date: 19/4-2001	Place: Langstrand, Namibia
Echosounder: EK-500-1	Prev. calib. 18/4-2001	Sphere depth: 15.25 m
Transducer ES18-11	Bottom depth: 28 m	T, Sphere depth 14.6 °C
Sound velocity: 1507 m/s	Sphere: Cu 60	S, Sphere depth 35.4 ‰

Calibrated 3 times. This is last calibration results.

Parameter	Previous values	Values after calibration
Transducer depth	0.0	8
Absorption coefficient (dB/km)	3	3
Pulse duration (ms)	Medium	Medium
Bandwidth (kHz)	Wide	wide
Transmission effect re. Terminals (W)	2000	2000
Equivalent beam width (10 log ψ) (dB)	-17.2	-17.2
Sv transducer gain (dB)	24.62	24.34
TS transducer gain (dB)	24.54	24.50
Angle sensitivity alongship	13.9	13.9
Angle sensitivity atwardship	13.9	13.9
3 dB beamwidth Alongship (deg)	11.1	10.9
3 dB beamwidth Atwardship (deg)	10.8	10.8
Alongship deviation from centre (deg)	-0.13	-0.13
Atwardship deviation from centre (deg)	-0.00	0.03

TS reading Sphere before Calibration	33.9 dB
Read s_A before calibration (m^2/nm^2)	3250
Theoretical s_A at sphere depth (m^2/nm^2)	3689
S_A sphere after calibration (m^2/nm^2)	3665

Vessel: Dr. Fridtjof Nansen	Date: 19/4-2001	Place: Langstrand, Namibia
Echosounder: EK-500-1	Prev. calib. 18/4-2001	Sphere depth: 15.25 m
Transducer ES18-11	Bottom depth: 28 m	T, Sphere depth 14.6 °C
Sound velocity: 1507 m/s	Sphere: Cu 60	S, Sphere depth 35.4 ‰

Calibrated 2 times. This is last calibration result.

Parameter	Previous values	Values after calibration
Transducer depth	0.0	8
Absorption coefficient (dB/km)	3	3
Pulse duration (ms)	Short	Short
Bandwidth (kHz)	Wide	Wide
Transmission effect re. Terminals (W)	2000	2000
Equivalent beam width (10 log ψ) (dB)	-17.2	-17.2
Sv transducer gain (dB)	23.86	23.95
TS transducer gain (dB)	23.89	23.74
Angle sensitivity alongship	13.9	13.9
Angle sensitivity atwardship	13.9	13.9
3 dB beamwidth Alongship (deg)	10.9	11.2
3 dB beamwidth Atwardship (deg)	10.8	10.8
Alongship deviation from centre (deg)	-0.13	-0.10
Atwardship deviation from centre (deg)	-0.03	0.05

TS reading Sphere before Calibration	34.8 dB
Read s_A before calibration (m^2/nm^2)	3842
Theoretical s_A at sphere depth (m^2/nm^2)	3681
S_A sphere after calibration (m^2/nm^2)	3694

Table 2. Calibration report from the calibration of the EY-500 in Tiger Bay.

Vessel: Dr. Fridtjof Nansen	Date: 25/4-2001	Place: Tiger Bay ,Angola
Echosounder: EY-500	Prev. calib. 29/4-1998	Sphere depth: 11.8 m
Transducer ES38-12	Bottom depth: 25 m	T, Sphere depth 20.8 °C
Sound velocity: 1525 m/s	Sphere: CU 60	S, Sphere depth 35.6 ‰

Parameter	Previous values	Values after calibration
Transducer depth	0.0	1.5
Absorption coefficient (dB/km)	10	10
Pulse duration (ms)	Medium	Medium
Bandwidth (kHz)	Auto	Auto
Transmission effect re. terminals (W)	125	250
Equivalent beam width ($10 \log \psi$) (dB)	-15.8	-15.8
Sv transducer gain (dB)	23.26	21.68
TS transducer gain (dB)	22.93	21.73
Angle sensitivity alongship	12.5	12.5
Angle sensitivity atwardship	12.5	12.5
3 dB beamwidth Alongship (deg)	11.9	11.9
3 dB beamwidth Atwardship (deg)	11.7	11.7
Alongship deviation from centre (deg)	0.01	0.01
Atwardship deviation from centre (deg)	-0.02	-0.02
TS reading Sphere before Calibration	-36.0 dB	
Read s_A before calibration (m^2/nm^2)	2487	
Theoretical s_A at sphere depth (m^2/nm^2)	5137	
S_A sphere after calibration (m^2/nm^2)	5225	

ANNEX III RECORDS OF FISHING STATIONS

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 780
 DATE:20/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 2139
 start stop duration Long E 1336
 TIME :10:47:42 10:49:48 2 (min) Purpose code: 3
 LOG :3496.93 3497.06 2.42 Area code : 2
 FDEPTH: 40 40 GearCond.code:
 BDEPTH: 106 106 Validity code:
 Towing dir: 140 Wire out: 110 m Speed: 30 kn*10
 Sorted: 3 Kg Total catch: 2.81 CATCH/HOUR: 84.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	84.30 5820	100.00	5582
Total	84.30	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 781
 DATE:21/ 4/01 GEAR TYPE: PT No:3 POSITION:Lat S 1902
 start stop duration Long E 1206
 TIME :05:39:46 06:10:26 31 (min) Purpose code: 3
 LOG :3688.24 3690.11 1.86 Area code : 3
 FDEPTH: 50 75 GearCond.code:
 BDEPTH: 165 187 Validity code:
 Towing dir: 215 Wire out: 295 m Speed: 30 kn*10
 Sorted: 30 Kg Total catch: 220.50 CATCH/HOUR: 426.77

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	426.83 17181	100.01	5583
Total	426.83	100.01	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 782
 DATE:21/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1901
 start stop duration Long E 1205
 TIME :13:44:22 14:05:16 21 (min) Purpose code: 1
 LOG :3757.70 3759.01 0.99 Area code : 3
 FDEPTH: 110 100 GearCond.code:
 BDEPTH: 169 168 Validity code:
 Towing dir: 340 Wire out: 280 m Speed: 32 kn*10
 Sorted: 7 Kg Total catch: 30.00 CATCH/HOUR: 85.71

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	85.71 3160	100.00	5584
Total	85.71	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 783
 DATE:21/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1904
 start stop duration Long E 1204
 TIME :19:14:34 19:24:57 10 (min) Purpose code: 1
 LOG :3775.50 3776.10 0.59 Area code : 3
 FDEPTH: 75 75 GearCond.code:
 BDEPTH: 178 178 Validity code:
 Towing dir: 345 Wire out: 200 m Speed: 30 kn*10
 Sorted: 1 Kg Total catch: 1.32 CATCH/HOUR: 7.92

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	7.92 240	100.00	5585
Total	7.92	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 784
 DATE:21/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1900
 start stop duration Long E 1203
 TIME :19:32:36 19:42:38 10 (min) Purpose code: 1
 LOG :3776.53 3777.14 0.27 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 178 178 Validity code:
 Towing dir: 345 Wire out: 140 m Speed: 30 kn*10
 Sorted: Kg Total catch: 0.10 CATCH/HOUR: 0.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	0.60 18	100.00	
Total	0.60	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 785
 DATE:21/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1859
 start stop duration Long E 1203
 TIME :19:51:04 20:01:19 10 (min) Purpose code: 1
 LOG :3777.71 3778.43 0.71 Area code : 3
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 177 176 Validity code:
 Towing dir: 345 Wire out: 80 m Speed: 30 kn*10
 Sorted: 22 Kg Total catch: 22.15 CATCH/HOUR: 132.90

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	132.54 5238	99.73	5586
SQUAR10	0.36 6	0.27	
Total	132.90	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 786
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1901
 start stop duration Long E 1204
 TIME :00:57:16 01:06:58 10 (min) Purpose code: 1
 LOG :3801.28 3801.90 0.62 Area code : 3
 FDEPTH: 75 75 GearCond.code:
 BDEPTH: 172 172 Validity code: 1
 Towing dir: 340 Wire out: 240 m Speed: 34 kn*10
 Sorted: 3 Kg Total catch: 2.94 CATCH/HOUR: 17.64

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	17.64 576	100.00	5587
Total	17.64	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 787
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1900
 start stop duration Long E 1204
 TIME :01:13:55 01:23:53 10 (min) Purpose code: 1
 LOG :3802.34 3803.01 0.67 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 171 169 Validity code: 1
 Towing dir: 340 Wire out: 180 m Speed: 36 kn*10
 Sorted: 8 Kg Total catch: 8.06 CATCH/HOUR: 48.36

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	48.36 1464	100.00	5588
Total	48.36	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 788
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1858
 start stop duration Long E 1204
 TIME :01:40:06 01:50:16 10 (min) Purpose code: 1
 LOG :3804.14 3804.90 0.75 Area code : 3
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 166 163 Validity code: 1
 Towing dir: 340 Wire out: 120 m Speed: 38 kn*10
 Sorted: 7 Kg Total catch: 6.65 CATCH/HOUR: 39.90

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	39.90 1668	100.00	5589
Total	39.90	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 789
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1900
 start stop duration Long E 1204
 TIME :04:30:51 04:41:00 10 (min) Purpose code: 1
 LOG :3814.90 3815.56 0.51 Area code : 3
 FDEPTH: 75 75 GearCond.code:
 BDEPTH: 169 170 Validity code:
 Towing dir: 340 Wire out: 240 m Speed: 35 kn*10
 Sorted: 2 Kg Total catch: 1.61 CATCH/HOUR: 9.66

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Aequorea aequorea	8.40 798	86.96	
Merluccius polli	0.60 6	6.21	
Ommastrephes bartrami	0.30 24	3.11	
CARTR91	0.24 6	2.48	
Trichiurus sp.	0.12 6	1.24	
Total	9.66	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 790
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1859
 start stop duration Long E 1204
 TIME :04:48:37 04:58:49 10 (min) Purpose code: 1
 LOG :3816.04 3816.71 0.66 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 170 170 Validity code:
 Towing dir: 340 Wire out:3817 m Speed:180 kn*10
 Sorted: 8 Kg Total catch: 8.09 CATCH/HOUR: 48.54

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
CARTR91	46.80 1746	96.42	5590
Hyperoglyphe moselii	1.20 6	2.47	
Ommastrephes bartrami	0.54 24	1.11	
Total	48.54	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 791
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1858
 start stop duration Long E 1203
 TIME :05:10:18 05:21:52 12 (min) Purpose code: 1
 LOG :3817.42 3818.17 0.75 Area code : 3
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 167 166 Validity code:
 Towing dir: 340e Wire out: 100 m Speed: 30 kn*10
 Sorted: 1 Kg Total catch: 0.65 CATCH/HOUR: 3.25

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 797
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1859
 start stop duration Long E 1204
 TIME :15:01:31 15:11:48 10 (min) Purpose code: 1
 LOG :3856.06 3856.74 0.68 Area code : 3
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 164 164 Validity code:
 Towing dir: 340e Wire out: 105 m Speed: 35 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
CARTR91	2.50 85	76.92	5591
SQUAR10	0.35 5	10.77	
SQUOY00	0.25 5	7.69	
Selene dorsalis, juveniles	0.15 15	4.62	
Total	3.25	100.00	

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 792
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1901
 start stop duration Long E 1204
 TIME :09:30:00 09:42:00 12 (min) Purpose code: 1
 LOG :3834.70 3835.40 0.70 Area code : 3
 FDEPTH: 100 100 GearCond.code: 7
 BDEPTH: 176 175 Validity code: 9
 Towing dir: 340e Wire out: m Speed: 5 kn*10
 Sorted: 5 Kg Total catch: 30.20 CATCH/HOUR: 151.00

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 798
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1856
 start stop duration Long E 1202
 TIME :17:21:59 17:31:57 10 (min) Purpose code: 1
 LOG :3867.56 3868.06 0.49 Area code : 3
 FDEPTH: 95 100 GearCond.code:
 BDEPTH: 164 165 Validity code:
 Towing dir: 155e Wire out: 290 m Speed: 30 kn*10
 Sorted: 6 Kg Total catch: 6.33 CATCH/HOUR: 37.98

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
CARTR91	150.00 5745	99.34	5592
Sepia sp.	1.00 5	0.66	
Total	151.00	100.00	

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Aequorea aequorea	26.16 1944	68.88	
Merluccius polli	6.90 48	18.17	
CARTR91	3.30 120	8.69	5595
Chrysaora sp.	1.56 36	4.11	
Sufflogobius bibarbatus	0.06 24	0.16	
Total	37.98	100.01	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 793
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1900
 start stop duration Long E 1204
 TIME :09:44:41 10:07:46 23 (min) Purpose code: 1
 LOG :3835.51 3836.89 1.36 Area code : 3
 FDEPTH: 110 110 GearCond.code:
 BDEPTH: 175 175 Validity code:
 Towing dir: 340e Wire out: 290 m Speed: 30 kn*10
 Sorted: 5 Kg Total catch: 124.80 CATCH/HOUR: 325.57

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 799
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1857
 start stop duration Long E 1202
 TIME :17:42:55 17:54:37 12 (min) Purpose code: 1
 LOG :3868.55 3869.14 0.59 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 165 168 Validity code:
 Towing dir: 155e Wire out: 150 m Speed: 30 kn*10
 Sorted: 3 Kg Total catch: 2.71 CATCH/HOUR: 13.55

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
CARTR91	325.57 12261	100.00	5593
Total	325.57	100.00	

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Aequorea aequorea	11.60 615	85.61	
Hyperoglyphe moselii	1.10 5	8.12	
CARTR91	0.80 30	5.90	5596
Onmastrephes bartrami	0.05 10	0.37	
Total	13.55	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 794
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1859
 start stop duration Long E 1203
 TIME :10:22:05 10:33:24 11 (min) Purpose code: 1
 LOG :3837.67 3838.42 0.74 Area code : 3
 FDEPTH: 28 25 GearCond.code:
 BDEPTH: 175 176 Validity code:
 Towing dir: 340e Wire out: 90 m Speed: 30 kn*10
 Sorted: Kg Total catch: 0.44 CATCH/HOUR: 2.40

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 800
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1858
 start stop duration Long E 1203
 TIME :18:09:07 18:19:21 10 (min) Purpose code: 1
 LOG :3869.82 3870.38 0.55 Area code : 3
 FDEPTH: 28 25 GearCond.code:
 BDEPTH: 168 169 Validity code:
 Towing dir: 155e Wire out: 80 m Speed: 30 kn*10
 Sorted: 9 Kg Total catch: 9.38 CATCH/HOUR: 56.28

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
SQUOY00	1.75 5	72.92	
CARTR91	0.65 27	27.08	5594
Total	2.40	100.00	

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
CARTR91	48.30 1890	85.82	5597
Chrysaora sp.	3.12 6	5.54	
Aequorea aequorea	3.06 300	5.44	
Hyperoglyphe moselii	1.02 6	1.81	
Onmastrephes bartrami	0.36 42	0.64	
SQUOY00	0.30 12	0.53	
Sufflogobius bibarbatus	0.12 24	0.21	
Total	56.28	99.99	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 795
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1902
 start stop duration Long E 1205
 TIME :14:18:08 14:29:20 11 (min) Purpose code: 1
 LOG :3853.17 3853.92 0.75 Area code : 3
 FDEPTH: 60 60 GearCond.code:
 BDEPTH: 173 171 Validity code:
 Towing dir: 340e Wire out: 200 m Speed: 35 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 801
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1858
 start stop duration Long E 1203
 TIME :20:01:06 20:11:56 11 (min) Purpose code: 1
 LOG :3876.17 3876.87 0.70 Area code : 3
 FDEPTH: 75 75 GearCond.code:
 BDEPTH: 167 167 Validity code:
 Towing dir: 330e Wire out: m Speed: 15 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 796
 DATE:22/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1901
 start stop duration Long E 1205
 TIME :14:40:11 14:51:47 12 (min) Purpose code: 1
 LOG :3854.64 3855.43 0.57 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 167 165 Validity code:
 Towing dir: 340e Wire out: 180 m Speed: 35 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 802
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1857
 start stop duration Long E 1203
 TIME :20:21:10 20:32:27 11 (min) Purpose code: 1
 LOG :3877.43 3878.16 0.72 Area code : 3
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 166 167 Validity code:
 Towing dir: 330e Wire out: m Speed: 15 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 803
 DATE:22/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1856
 start stop duration Long E 1202
 TIME :20:41:00 20:51:36 11 (min) Purpose code: 1
 LOG :3878.71 3879.48 0.77 Area code : 3
 FDEPTH: 28 25 GearCond.code: 1
 BDEPTH: 166 166 Validity code: 1
 Towing dir: 330° Wire out: 90 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 809
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1851
 start stop duration Long E 1158
 TIME :08:35:29 08:54:03 19 (min) Purpose code: 1
 LOG :3918.17 3919.18 1.01 Area code : 3
 FDEPTH: 75 75 GearCond.code: 7
 BDEPTH: 174 175 Validity code: 9
 Towing dir: 150° Wire out: 215 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 804
 DATE:22/ 4/01 GEAR TYPE: PT No:3 POSITION:Lat S 1853
 start stop duration Long E 1201
 TIME :22:28:29 22:48:53 20 (min) Purpose code: 1
 LOG :3884.63 3886.16 1.52 Area code : 3
 FDEPTH: 25 25 GearCond.code: 1
 BDEPTH: 154 158 Validity code: 1
 Towing dir: 325° Wire out: 80 m Speed: 30 kn*10
 Sorted: 5 Kg Total catch: 4.58 CATCH/HOUR: 13.74

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 810
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1852
 start stop duration Long E 1158
 TIME :09:06:43 09:18:02 11 (min) Purpose code: 1
 LOG :3919.78 3920.39 0.60 Area code : 3
 FDEPTH: 27 27 GearCond.code: 7
 BDEPTH: 175 176 Validity code: 9
 Towing dir: 150° Wire out: 75 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 CARTR91 10.29 417 74.89 5598
 Callohrinchus capensis 1.83 3 13.32
 SQUOYO0 0.72 3 5.24
 Trichiurus sp. 0.57 231 4.15
 Cmmastrephes bartrami 0.33 42 2.40
 Total 13.74 100.00

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 805
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1853
 start stop duration Long E 1201
 TIME :00:59:16 01:19:11 20 (min) Purpose code: 1
 LOG :3893.25 3894.84 1.60 Area code : 3
 FDEPTH: 25 25 GearCond.code: 1
 BDEPTH: 158 161 Validity code: 1
 Towing dir: 325° Wire out: 100 m Speed: 38 kn*10
 Sorted: 9 Kg Total catch: 9.45 CATCH/HOUR: 28.35

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 811
 DATE:23/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1852
 start stop duration Long E 1157
 TIME :11:08:59 11:14:45 6 (min) Purpose code: 1
 LOG :3927.00 3927.41 0.40 Area code : 3
 FDEPTH: 100 100 GearCond.code: 1
 BDEPTH: 190 186 Validity code: 1
 Towing dir: 0 Wire out: 400 m Speed: 35 kn*10
 Sorted: 35 Kg Total catch: 490.70 CATCH/HOUR: 4907.00

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 Myliobatis aquila 20.07 6 70.79
 CARTR91 6.15 246 21.69 5599
 Hyperoglyphe moselii 1.05 9 3.70
 Trichiurus sp. 0.51 216 1.80
 Cmmastrephes bartrami 0.30 81 1.06
 Sepia sp. 0.18 9 0.63
 Selene dorsalis, juveniles 0.09 33 0.32
 Total 28.35 99.99

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 CARTR91 4907.00 196560 100.00 5601
 Total 4907.00 100.00

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 806
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1853
 start stop duration Long E 1201
 TIME :03:12:32 03:32:19 20 (min) Purpose code: 1
 LOG :3901.51 3902.83 1.31 Area code : 3
 FDEPTH: 50 50 GearCond.code: 1
 BDEPTH: 160 161 Validity code: 1
 Towing dir: 330° Wire out: m Speed: kn*10
 Sorted: 31 Kg Total catch: 31.40 CATCH/HOUR: 94.20

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 812
 DATE:23/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1852
 start stop duration Long E 1157
 TIME :11:20:10 11:26:03 5 (min) Purpose code: 1
 LOG :3927.74 3928.07 0.32 Area code : 3
 FDEPTH: 140 140 GearCond.code: 1
 BDEPTH: 187 187 Validity code: 1
 Towing dir: 0 Wire out: 420 m Speed: 35 kn*10
 Sorted: 30 Kg Total catch: 147.80 CATCH/HOUR: 1773.60

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 Myliobatis aquila 49.20 6 52.23
 Gymnura sp. 45.00 3 47.77
 Total 94.20 100.00

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 CARTR91 1773.60 69360 100.00 5602
 Total 1773.60 100.00

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 807
 DATE:23/ 4/01 GEAR TYPE: PT No:3 POSITION:Lat S 1847
 start stop duration Long E 1156
 TIME :05:27:50 05:55:31 28 (min) Purpose code: 1
 LOG :3911.70 3913.12 1.41 Area code : 3
 FDEPTH: 50 75 GearCond.code: 1
 BDEPTH: 167 168 Validity code: 1
 Towing dir: 145° Wire out: 180 m Speed: 30 kn*10
 Sorted: 30 Kg Total catch: 424.76 CATCH/HOUR: 910.20

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 813
 DATE:23/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1851
 start stop duration Long E 1156
 TIME :11:42:56 11:55:13 12 (min) Purpose code: 1
 LOG :3928.97 3929.76 0.78 Area code : 3
 FDEPTH: 50 50 GearCond.code: 1
 BDEPTH: 188 188 Validity code: 1
 Towing dir: 340° Wire out: 160 m Speed: 38 kn*10
 Sorted: Kg Total catch: 0.05 CATCH/HOUR: 0.25

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 CARTR91 910.20 36480 100.00 5600
 Total 910.20 100.00

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 CARTR91 0.25 10 100.00
 Total 0.25 100.00

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 808
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1850
 start stop duration Long E 1157
 TIME :08:21:01 08:31:04 10 (min) Purpose code: 1
 LOG :3917.41 3917.94 0.52 Area code : 3
 FDEPTH: 110 130 GearCond.code: 7
 BDEPTH: 172 172 Validity code: 9
 Towing dir: 150° Wire out: 300 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 814
 DATE:23/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1853
 start stop duration Long E 1158
 TIME :14:42:59 14:50:33 8 (min) Purpose code: 1
 LOG :3939.55 3940.03 0.49 Area code : 3
 FDEPTH: 125 120 GearCond.code: 1
 BDEPTH: 186 186 Validity code: 1
 Towing dir: 330° Wire out: 320 m Speed: 35 kn*10
 Sorted: 13 Kg Total catch: 166.79 CATCH/HOUR: 1250.93

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

SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 CARTR91 1250.93 46410 100.00 5603
 Total 1250.93 100.00

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 815
 DATE:23/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1852
 start stop duration Long E 1157
 TIME :15:03:54 15:16:15 12 (min) Purpose code: 1
 LOG :3940.88 3941.80 0.93 Area code : 3
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 187 186 Validity code: 1
 Towing dir: 330° Wire out: 100 m Speed: 35 kn*10

Sorted: 1 Kg Total catch: 1.33 CATCH/HOUR: 6.65

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
CARTR91	3.40	120	51.13	5604
SQUOY00	3.05	5	45.86	
Selene dorsalis, juveniles	0.20	15	3.01	
Total	6.65		100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 816
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1850
 start stop duration Long E 1156
 TIME :17:35:33 17:46:44 11 (min) Purpose code: 1
 LOG :3948.30 3948.87 0.56 Area code : 3
 FDEPTH: 100 100 GearCond.code:
 BDEPTH: 185 186 Validity code:
 Towing dir: 145° Wire out: 280 m Speed: 30 kn*10

Sorted: 5 Kg Total catch: 7.28 CATCH/HOUR: 39.71

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	25.91	2438	65.25	
CARTR91	8.56	256	21.56	5605
Chrysaora sp.	2.13	153	5.36	
Merluccius polli	2.02	16	5.09	
Krill	1.04	6355	2.62	
Onmastrephes bartrami	0.05	11	0.13	
Total	39.71		100.01	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 817
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1851
 start stop duration Long E 1156
 TIME :17:55:48 18:06:07 10 (min) Purpose code: 1
 LOG :3949.27 3949.84 0.57 Area code : 3
 FDEPTH: 50 48 GearCond.code:
 BDEPTH: 187 186 Validity code:
 Towing dir: 145° Wire out: 160 m Speed: 30 kn*10

Sorted: 13 Kg Total catch: 13.56 CATCH/HOUR: 81.36

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	44.16	3972	54.28	
Krill	12.54	76914	15.41	
Chrysaora sp.	12.36	24	15.19	
CARTR91	9.06	312	11.14	5606
Merluccius polli	2.04	12	2.51	
Hyperoglyphe moselii	0.72	6	0.88	
Onmastrephes bartrami	0.42	96	0.52	
Selene dorsalis, juveniles	0.06	12	0.07	
Total	81.36		100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 818
 DATE:23/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1852
 start stop duration Long E 1157
 TIME :18:17:26 18:27:53 10 (min) Purpose code: 1
 LOG :3950.41 3951.00 0.58 Area code : 3
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 185 185 Validity code:
 Towing dir: 145° Wire out: 80 m Speed: 30 kn*10

Sorted: 8 Kg Total catch: 8.42 CATCH/HOUR: 50.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aequorea aequorea	21.18	1908	41.92	
Krill	20.52	125850	40.62	
CARTR91	7.92	270	15.68	5607
Onmastrephes bartrami	0.60	48	1.19	
TRACHIPTERIDAE	0.24	6	0.48	
SYGAA00	0.06	18	0.12	
Total	50.52		100.01	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 819
 DATE:24/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1640
 start stop duration Long E 1137
 TIME :18:21:01 18:46:51 26 (min) Purpose code: 1
 LOG :4169.17 4170.75 1.57 Area code : 3
 FDEPTH: 25 22 GearCond.code:
 BDEPTH: 87 90 Validity code:
 Towing dir: 200° Wire out: 80 m Speed: 30 kn*10

Sorted: Kg Total catch: 55.60 CATCH/HOUR: 128.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae	87.44	6496	68.15	5608
Synagrops microlepis	13.66	157	10.65	
Sepia officinalis hierredda	13.15	18	10.25	
Sphyrna lewini	4.32	2	3.37	
Trichurus lepturus	2.56	32	2.00	
J E L L Y F I S H	1.82	134	1.42	
Leptocharias smithii	1.34	2	1.04	
Sepia bertheloti	1.20	12	0.94	
Thorogobius angolensis	0.92	1108	0.72	
Loligo vulgaris	0.62	7	0.48	
Todarodes sagittatus	0.53	74	0.41	
Eragmaceros sp.	0.46	482	0.36	
Todaropsis eblanae	0.12	39	0.09	
Calappa sp.	0.12	2	0.09	
Lagocephalus sp.	0.02	2	0.02	
Selene dorsalis, juveniles	0.02	5	0.02	
Total	128.30		100.01	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 820
 DATE:24/ 4/01 GEAR TYPE: BT No:7 POSITION:Lat S 1632
 start stop duration Long E 1127
 TIME :21:10:55 21:29:30 19 (min) Purpose code: 1
 LOG :4188.65 4189.44 0.78 Area code : 1
 FDEPTH: 111 109 GearCond.code:
 BDEPTH: 111 109 Validity code:
 Towing dir: 140° Wire out: 300 m Speed: 30 kn*10

Sorted: 66 Kg Total catch: 558.28 CATCH/HOUR: 1762.99

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophthalmus	741.56	18657	42.07	
Squalus blainvilliei	522.57	1288	29.64	
Trachurus capensis	129.13	1424	7.32	5609
Pagellus bellottii	84.03	591	4.77	
Trachurus trecae	76.23	1020	4.32	5610
Trigla lyra	39.19	351	2.22	
SQUSE02	27.13	243	1.54	
Loligo vulgaris	22.55	136	1.28	
Merluccius polli	17.18	54	0.97	
Spondylisoma cantharus	15.85	28	0.90	
Scorpaena normani	15.32	161	0.87	
Zeus faber	13.96	28	0.79	
Monolele microstoma	12.35	644	0.70	
Scomber japonicus	11.02	161	0.63	
OPHICHTHIDAE	7.80	429	0.44	
Galeichthys feliceps	7.26	28	0.41	
Lepidotrigla cadmani	7.26	136	0.41	
Argoossus imperialis	5.91	322	0.34	
Umbriina canariensis	2.97	28	0.17	
CENSFO1	2.97	161	0.17	
Solenocera africana	0.54	107	0.03	
Spicara alta				
Total	1762.88		99.99	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 821
 DATE:25/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1629
 start stop duration Long E 1129
 TIME :00:01:03 00:23:34 23 (min) Purpose code: 1
 LOG :4208.86 4210.17 1.31 Area code : 1
 FDEPTH: 90 80 GearCond.code:
 BDEPTH: 103 99 Validity code: 1
 Towing dir: 360° Wire out: m Speed: kn*10

Sorted: 10 Kg Total catch: 9.69 CATCH/HOUR: 25.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus capensis	20.50	138	81.09	5611
Sepia bertheloti	1.93	29	7.63	
Argyroscopus hololepidotus	1.62	3	6.41	
Trigla lyra	0.94	5	3.72	
Dentex macrophthalmus	0.29	10	1.15	
Total	25.28		100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 822
 DATE:25/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1627
 start stop duration Long E 1129
 TIME :00:33:01 00:47:11 14 (min) Purpose code: 1
 LOG :4210.71 4211.68 0.96 Area code : 1
 FDEPTH: 25 25 GearCond.code:
 BDEPTH: 97 98 Validity code: 1
 Towing dir: 360° Wire out: 100 m Speed: 35 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 823
 DATE:25/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1625
 start stop duration Long E 1143
 TIME :04:16:10 04:33:24 17 (min) Purpose code: 1
 LOG :4237.60 4238.61 1.00 Area code : 1
 FDEPTH: 35 35 GearCond.code:
 BDEPTH: 51 50 Validity code:
 Towing dir: 15e Wire out: 120 m Speed:340 kn*10
 Sorted: 5 Kg Total catch: 4.81 CATCH/HOUR: 16.98

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Trachurus capensis	4.59 35	27.03	5612
Sepia officinalis hierredda	3.81 81	22.44	
Myliobatis aquila	2.33 4	13.72	
Loligo vulgaris	2.26 85	13.31	
Trachurus trecae, juvenile	1.73 265	10.19	5613
Galeichthys feliceps	1.27 4	7.48	
Trachurus trecae	0.71 4	4.18	
Dentex macropthalmus	0.18 67	1.06	
Trachinus armatus	0.11 4	0.65	
Total	16.99	100.06	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 824
 DATE:25/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1624
 start stop duration Long E 1144
 TIME :04:36:43 04:48:18 12 (min) Purpose code: 1
 LOG :4238.82 4239.61 0.78 Area code : 1
 FDEPTH: 10 12 GearCond.code:
 BDEPTH: 50 48 Validity code:
 Towing dir: 15e Wire out: 90 m Speed: 36 kn*10
 Sorted: 10 Kg Total catch: 9.56 CATCH/HOUR: 47.80

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Scomber japonicus	28.30 65	59.21	
Trachurus trecae, juvenile	11.55 590	24.16	5614
Loligo vulgaris	3.70 215	7.74	
Trachurus trecae	1.60 10	3.35	
J E L L Y F I S H	1.40 10	2.93	
Sepia officinalis hierredda	1.15 10	2.41	
Saurida brasiliensis	0.05 5	0.10	
Selene dorsalis, juveniles	0.05 15	0.10	
Total	47.80	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 825
 DATE:26/ 4/01 GEAR TYPE: PT No:6 POSITION:Lat S 1227
 start stop duration Long E 1321
 TIME :21:38:22 22:08:54 31 (min) Purpose code: 1
 LOG :4563.76 4565.70 1.94 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 102 82 Validity code:
 Towing dir: 160e Wire out: 160 m Speed: 40 kn*10
 Sorted: 11 Kg Total catch: 10.65 CATCH/HOUR: 20.61

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	7.43 4995	36.05	
Illex coindetii	5.26 6	25.52	
Euthynnus alletteratus	4.41 2	21.40	
Sardinella maderensis	2.26 31	10.97	5616
Trachurus trecae, juvenile	0.45 29	2.18	5615
Scomber japonicus	0.43 8	2.09	
J E L L Y F I S H	0.17 14	0.82	
Synagrops microlepis	0.17 48	0.82	
Lagocephalus laevisgatus	0.02 2	0.10	
Total	20.60	99.95	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 826
 DATE:27/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1324
 TIME :01:24:12 01:43:27 19 (min) Purpose code: 1
 LOG :4588.25 4589.41 1.15 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 72 68 Validity code: 1
 Towing dir: 40e Wire out: 80 m Speed: 35 kn*10
 Sorted: 69 Kg Total catch: 241.02 CATCH/HOUR: 761.12

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Sardinella maderensis	705.47 3316	92.69	5617
Myliobatis aquila	37.23 22	4.89	
Ommastrephes bartrami	8.08 13	1.06	
Trichiurus lepturus	4.11 22	0.54	
Trachurus trecae, juvenile	4.11 243	0.54	5618
Total	759.00	99.72	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 827
 DATE:27/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :01:50:09 02:00:15 10 (min) Purpose code: 1
 LOG :4589.79 4590.30 0.50 Area code : 2
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 67 66 Validity code: 1
 Towing dir: 40e Wire out: 170 m Speed: 35 kn*10
 Sorted: 47 Kg Total catch: 46.91 CATCH/HOUR: 281.46

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	119.88 894	42.59	
Sardinella maderensis	117.90 474	41.89	5619
Trichiurus lepturus	21.72 84	7.72	
Brachydeuterus auritus Juv.	17.76 3744	6.31	
Trachurus trecae, juvenile	4.20 354	1.49	5620
Total	281.46	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 828
 DATE:27/ 4/01 GEAR TYPE: BT No:7 POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :03:05:28 03:29:17 24 (min) Purpose code: 1
 LOG :4592.96 4594.33 1.36 Area code : 2
 FDEPTH: 70 75 GearCond.code:
 BDEPTH: 70 75 Validity code:
 Towing dir: 235e Wire out: 250 m Speed: 30 kn*10
 Sorted: 70 Kg Total catch: 209.49 CATCH/HOUR: 523.73

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Brachydeuterus auritus	144.60 26918	27.61	
Trichiurus lepturus	106.58 945	20.35	
Citharus linguatula	54.68 1478	10.44	
Sepia officinalis hierredda	45.00 458	8.59	
Grammolites gruvelli	30.98 533	5.92	
Pagellus bellottii	30.53 345	5.83	
Umbrina canariensis	29.10 308	5.56	
Trigla lyra	13.58 135	2.59	
Parapenaeus longirostris	10.88 4973	2.08	
Brotila barbata	8.85 105	1.69	
Thorogobius angolensis	7.88 6173	1.50	
Raja miraletus	6.90 8	1.32	
Torpedo nobiliana	6.30 8	1.20	
Octopus vulgaris	5.55 8	1.06	
Serranus cabrilla	5.03 98	0.96	
Lithognathus mormyrus	4.05 8	0.77	
Sardinella maderensis	3.45 23	0.66	
Argyrosomus hololepidotus	3.15 23	0.60	
Pterothrissus belloci	3.00 38	0.57	
Trachurus trecae, juvenile	0.83 53	0.16	
MURAENIDAE	0.75 8	0.14	
Arnoglossus imperialis	0.68 75	0.13	
Lophius vaillanti	0.23 8	0.04	
C R A B S	0.15 75	0.03	
ANTENNARIIDAE	0.15 8	0.03	
Total	522.88	99.83	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 829
 DATE:27/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1228
 start stop duration Long E 1324
 TIME :06:34:55 06:47:00 12 (min) Purpose code: 1
 LOG :4605.15 4605.88 0.71 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 70 70 Validity code: 1
 Towing dir: 50e Wire out: 80 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 830
 DATE:27/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :06:56:03 07:14:14 18 (min) Purpose code: 1
 LOG :4606.42 4607.41 0.98 Area code : 2
 FDEPTH: 47 47 GearCond.code:
 BDEPTH: 70 70 Validity code:
 Towing dir: 48e Wire out: 200 m Speed: 30 kn*10
 Sorted: 58 Kg Total catch: 58.15 CATCH/HOUR: 193.83

SPECIES	CATCH/HOUR weight numbers	% OF TOT. C	SAMP
Sardinella maderensis	93.30 470	48.13	5622
Trichiurus lepturus	51.03 167	26.33	
Trachurus trecae	41.77 200	21.55	5621
Uraspis secunda	4.37 3	2.25	
Brachydeuterus auritus	2.03 13	1.05	
Selene dorsalis	0.77 7	0.40	
Chloroscombrus chrysurus	0.57 3	0.29	
Total	193.84	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 831
 DATE:27/ 4/01 GEAR TYPE: BT No:7 POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :08:30:43 09:01:57 31 (min) Purpose code: 1
 LOG :4614.71 4616.69 1.99 Area code : 2
 FDEPTH: 66 74 GearCond.code: 1
 BDEPTH: 66 74 Validity code: 1
 Towing dir: 235e Wire out: 250 m Speed: 30 kn*10
 Sorted: 143 Kg Total catch: 576.39 CATCH/HOUR: 1115.59

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Brachydeuterus auritus	441.10 61545	39.54	
Trachurus trecae, juvenile	193.06 14563	17.31	5624
Trachurus trecae	187.99 741	16.85	5623
Trachurus trecae	187.99 741	16.85	5623
Trichiurus lepturus	134.03 846	12.01	
Lithognathus mormyrus	55.53 128	4.98	
Citharus linguatula	22.80 772	2.04	
Brotula barbata	14.71 110	1.32	
Grammoplites gruvelli	13.61 221	1.22	
Umbrina canariensis	11.59 128	1.04	
Pagellus bellottii	9.93 110	0.89	
Galeoides decadactylus	6.99 184	0.63	
Batrachoides liberlensis	5.52 17	0.49	
Sepia bertheloti	4.22 74	0.38	
Pterothrissus belloci	3.31 37	0.30	
MVLPS91	2.75 17	0.25	
Parapenaeus longirostris	2.57 826	0.23	
Selene dorsalis	2.21 37	0.20	
Dentex canariensis	2.21 54	0.20	
Dentex canariensis	2.21 54	0.20	
Sufflogobius bibarbatus	0.74 147	0.07	
Saurida brasiliensis	0.37 74	0.03	
Thorogobius angolensis	0.17 37	0.02	
C R A B S	0.17 147	0.02	
Total	1305.78	117.07	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 832
 DATE:27/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1230
 start stop duration Long E 1322
 TIME :10:53:49 11:05:06 11 (min) Purpose code: 1
 LOG :4624.30 4624.89 0.58 Area code : 2
 FDEPTH: 52 52 GearCond.code: 1
 BDEPTH: 77 76 Validity code: 1
 Towing dir: 50e Wire out: m Speed: kn*10
 Sorted: 20 Kg Total catch: 19.78 CATCH/HOUR: 107.89

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Selene dorsalis	54.11 431	50.15	
Trichiurus lepturus	40.09 120	37.16	
Sardinella maderensis	9.16 33	8.49	
Chloroscombrus chrysurus	2.35 11	2.18	
Brachydeuterus auritus	2.18 16	2.02	
Total	107.89	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 833
 DATE:27/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1229
 start stop duration Long E 1323
 TIME :11:13:16 11:23:45 10 (min) Purpose code: 1
 LOG :4625.31 4625.87 0.54 Area code : 2
 FDEPTH: 22 22 GearCond.code: 1
 BDEPTH: 72 68 Validity code: 1
 Towing dir: 50e Wire out: 105 m Speed: 35 kn*10
 Sorted: 3 Kg Total catch: 2.71 CATCH/HOUR: 16.26

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	9.96 42	61.25	
Sardinella maderensis	5.16 24	31.73	
Selene dorsalis	1.14 12	7.01	
Total	16.26	99.99	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 834
 DATE:27/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :12:12:58 12:42:36 30 (min) Purpose code: 1
 LOG :4629.69 4631.61 1.92 Area code : 2
 FDEPTH: 71 75 GearCond.code: 1
 BDEPTH: 71 75 Validity code: 1
 Towing dir: 230e Wire out: 250 m Speed: 31 kn*10
 Sorted: 27 Kg Total catch: 248.32 CATCH/HOUR: 496.64

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trichiurus lepturus	406.44 1296	81.84	
Raja miraletus	27.54 36	5.55	
Pistularia petimba	19.98 18	4.02	
Selene dorsalis	16.02 126	3.23	
Stromateus fiatola	10.08 18	2.03	
Trachurus trecae	8.00 42	1.61	5626
Trachurus trecae	8.00 42	1.61	
Brachydeuterus auritus	7.20 54	1.45	
Trachurus trecae, juvenile	1.20 14	0.24	5627
Citharus linguatula	0.18 18	0.04	
Total	504.64	101.62	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 835
 DATE:27/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1323
 TIME :14:34:22 14:50:22 16 (min) Purpose code: 1
 LOG :4637.95 4638.81 0.86 Area code : 2
 FDEPTH: 60 55 GearCond.code: 1
 BDEPTH: 75 72 Validity code: 1
 Towing dir: e Wire out: 190 m Speed: 35 kn*10
 Sorted: 4 Kg Total catch: 3.80 CATCH/HOUR: 14.25

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae	9.53 38	66.88	
Trichiurus lepturus	4.73 15	33.19	
Total	14.26	100.07	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 836
 DATE:27/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1324
 TIME :15:00:26 15:16:47 16 (min) Purpose code: 1
 LOG :4639.29 4640.14 0.83 Area code : 2
 FDEPTH: 25 26 GearCond.code: 1
 BDEPTH: 72 71 Validity code: 1
 Towing dir: 50e Wire out: 100 m Speed: 35 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 837
 DATE:27/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1228
 start stop duration Long E 1324
 TIME :16:06:44 16:36:26 30 (min) Purpose code: 1
 LOG :4642.81 4644.59 1.75 Area code : 2
 FDEPTH: 74 74 GearCond.code: 1
 BDEPTH: 74 74 Validity code: 1
 Towing dir: 230e Wire out: 260 m Speed: 31 kn*10
 Sorted: 87 Kg Total catch: 226.25 CATCH/HOUR: 452.50

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Brachydeuterus auritus Juv.	143.52 20364	31.72	
Trachurus trecae, juvenile	70.52 4934	15.58	5629
Trichiurus lepturus	59.16 422	13.07	
Trachurus trecae	49.24 336	10.88	5628
Pterothrissus belloci	29.90 384	6.61	
Citharus linguatula	16.78 448	3.71	
Dentex angolensis	14.96 188	3.31	
Octopus vulgaris	13.00 6	2.87	
Umbrina canariensis	12.68 110	2.80	
Synagrops microlepis	8.72 2424	1.93	
Brotula barbata	7.34 46	1.62	
Fistularia petimba	6.12 6	1.35	
Raja miraletus	4.62 6	1.02	
Sepia bertheloti	3.06 40	0.68	
Parapenaeus longirostris	2.56 1352	0.57	
Sardinella maderensis	2.28 6	0.50	
Saurida brasiliensis	1.62 404	0.36	
Calappa rubroguttata	1.10 6	0.24	
Chaetodon hoefleri	1.04 6	0.23	
Dentex macropthalmus	1.04 6	0.23	
Sufflogobius bibarbatus	0.72 410	0.16	
Pagellus bellottii	0.66 6	0.15	
Microchirus frechkopi	0.66 14	0.15	
Grammoplites gruvelli	0.52 6	0.11	
Sepia orbignyana	0.26 14	0.06	
Dentex canariensis	0.26 26	0.06	
Alloteuthis africana	0.20 20	0.04	
Arnoglossus imperialis	0.06 6	0.01	
Total	452.60	100.02	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 838
 DATE:27/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1229
 start stop duration Long E 1323
 TIME :17:56:12 18:06:19 10 (min) Purpose code: 1
 LOG :4648.31 4648.95 0.63 Area code : 2
 FDEPTH: 18 15 GearCond.code: 1
 BDEPTH: 77 77 Validity code: 1
 Towing dir: 45e Wire out: 85 m Speed: 30 kn*10
 Sorted: 77 Kg Total catch: 77.01 CATCH/HOUR: 462.06

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Sardinella maderensis	441.00 1980	95.44	5630
Sardinella aurita	21.06 84	4.56	5631
Total	462.06	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 839
 DATE:27/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1228
 start stop duration Long E 1323
 TIME :18:13:58 18:27:58 14 (min) Purpose code: 1
 LOG :4649.40 4650.16 0.75 Area code : 2
 FDEPTH: 48 48 GearCond.code:
 BDEPTH: 77 77 Validity code: 1
 Towing dir: 45e Wire out: 185 m Speed: 30 kn*10
 Sorted: 8 Kg Total catch: 8.43 CATCH/HOUR: 36.13

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	19.63	90	54.33	5632
Trichiurus lepturus	6.60	26	18.27	
Brachydeuterus auritus Juv.	4.41	699	12.21	
Trachurus trecae, juvenile	2.40	197	6.64	5633
Brachydeuterus auritus	1.37	9	3.79	
Saurida brasiliensis	0.69	171	1.91	
Synagrops microlepis	0.47	146	1.30	
Parapenaeus longirostris	0.34	214	0.94	
Bregmaceros sp.	0.17	193	0.47	
Sepiella ornata	0.04	9	0.11	
Total	36.12		99.97	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 840
 DATE:27/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :19:17:35 19:48:30 31 (min) Purpose code: 1
 LOG :4653.63 4655.27 1.62 Area code : 2
 FDEPTH: 67 68 GearCond.code:
 BDEPTH: 67 68 Validity code: 1
 Towing dir: 225e Wire out: 260 m Speed: 30 kn*10
 Sorted: 31 Kg Total catch: 277.47 CATCH/HOUR: 537.04

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus Juv.	113.40	20503	21.12	
Trichiurus lepturus	107.83	662	20.08	
Pagellus bellottii	69.33	784	12.91	
Citharus linguatula	51.56	2299	9.60	
Torpedo torpedo	32.75	70	6.10	
Grammolites gruvelli	26.13	523	4.87	
Raja miraletus	17.77	17	3.31	
Parapenaeus longirostris	15.68	8239	2.92	
Serranus accraensis	14.81	296	2.76	
Brotula barbata	14.11	122	2.63	
Chelidonichthys capensis	12.54	105	2.34	
Sepia bertheloti	10.97	348	2.04	
Umbrina canariensis	9.41	70	1.75	
Sepia officinalis hierredda	9.06	70	1.69	
Trachurus trecae, juvenile	8.01	627	1.49	5634
Branchiostegus semifasciatus	5.57	52	1.04	
Thorogobius angolensis	3.31	2038	0.62	
Dentex angolensis	3.31	2038	0.62	
Pterothrissus belloci	2.96	35	0.55	
Arnoglossus imperialis	2.44	174	0.45	
Microchirus frechkopi	2.09	52	0.39	
C R A B S	1.05	314	0.20	
ANTENNARIIDAE	1.05	17	0.20	
Sufflogobius bibarbatu	0.70	52	0.13	
Pseudupeneus prayensis	0.35	17	0.07	
OPHICHTHIDAE	0.35	17	0.07	
Total	536.54		99.95	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 841
 DATE:27/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1229
 start stop duration Long E 1322
 TIME :21:11:19 21:21:22 10 (min) Purpose code: 1
 LOG :4661.18 4661.71 0.51 Area code : 2
 FDEPTH: 50 56 GearCond.code:
 BDEPTH: 77 78 Validity code: 1
 Towing dir: 45e Wire out: 185 m Speed: 30 kn*10
 Sorted: 127 Kg Total catch: 126.58 CATCH/HOUR: 759.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella maderensis	744.30	2646	98.00	5635
Sardinella maderensis - Juv.	9.72	600	1.28	5636
Trachurus trecae, juvenile	4.80	312	0.63	5637
MYCTOPHIDAE	0.66	300	0.09	
Total	759.48		100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 842
 DATE:27/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1228
 start stop duration Long E 1323
 TIME :21:34:23 21:50:41 16 (min) Purpose code: 1
 LOG :4662.34 4663.28 0.93 Area code : 2
 FDEPTH: 22 18 GearCond.code:
 BDEPTH: 77 77 Validity code: 1
 Towing dir: 45e Wire out: 85 m Speed: 30 kn*10
 Sorted: 3 Kg Total catch: 3.36 CATCH/HOUR: 12.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae, juvenile	4.54	319	36.03	5638
Brachydeuterus auritus	3.30	23	26.19	
MYCTOPHIDAE	1.99	900	15.79	
POBSERI	1.69	296	13.41	
Saurida brasiliensis	0.64	184	5.08	
Bregmaceros sp.	0.30	323	2.38	
Parapenaeus longirostris	0.15	109	1.19	
Total	12.61		100.07	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 843
 DATE:27/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :22:51:35 23:21:22 30 (min) Purpose code: 1
 LOG :4666.73 4668.40 1.66 Area code : 2
 FDEPTH: 69 71 GearCond.code:
 BDEPTH: 69 71 Validity code: 1
 Towing dir: 225e Wire out: 260 m Speed: 30 kn*10
 Sorted: 58 Kg Total catch: 204.90 CATCH/HOUR: 409.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	125.20	1260	30.55	
Brachydeuterus auritus Juv.	60.28	10956	14.71	
Citharus linguatula	50.90	11712	12.42	
Grammolites gruvelli	33.60	546	8.20	
Chelidonichthys capensis	20.38	162	4.97	
Brotula barbata	16.04	98	3.91	
Parapenaeus longirostris	15.40	7700	3.76	
Sepia orbignyana	12.68	218	3.09	
Dentex angolensis	12.32	224	3.01	
SCIVM01	12.32	106	3.01	
Pagellus bellottii	12.18	106	2.97	
Torpedo torpedo	9.88	22	2.41	
OPHICHTHIDAE	6.80	8	1.66	
Pterothrissus belloci	5.40	64	1.32	
Pararistipoma sp.	5.12	78	1.25	
GOBIIDAE	3.22	108	0.79	
Trachurus trecae, juvenile	2.74	280	0.67	5639
CONGRIDAE	1.34	28	0.33	
Pseudupeneus prayensis	1.06	8	0.26	
Syacium micrum	0.90	36	0.22	
Miracorvina angolensis	0.56	8	0.14	
Pegusa lascaris	0.50	8	0.12	
Epinephelus sp.	0.42	8	0.10	
Synagrops microlepis	0.36	14	0.09	
C R A B S	0.28	14	0.07	
Dentex canariensis	0.28	8	0.07	
Total	410.16		100.10	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 844
 DATE:28/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1323
 TIME :00:45:47 01:03:37 18 (min) Purpose code: 1
 LOG :4671.50 4672.45 0.95 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 74 72 Validity code: 1
 Towing dir: 45e Wire out: 100 m Speed: 35 kn*10
 Sorted: 1 Kg Total catch: 0.90 CATCH/HOUR: 3.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachurus trecae, juvenile	1.60	103	53.33	5640
Sardinella maderensis	0.97	3	32.33	
Saurida brasiliensis	0.17	3	5.67	
Brachydeuterus auritus	0.10	23	3.33	
MYCTOPHIDAE	0.07	23	2.33	
Sepiella ornata	0.03	3	1.00	
Sphyræna sphyraena	0.03	3	1.00	
Total	2.97		98.99	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 845
 DATE:28/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1324
 TIME :01:08:57 01:24:54 16 (min) Purpose code: 1
 LOG :4672.75 4673.64 0.88 Area code : 2
 FDEPTH: 55 55 GearCond.code: 1
 BDEPTH: 71 68 Validity code: 1
 Towing dir: 45e Wire out: 190 m Speed: 30 kn*10
 Sorted: 12 Kg Total catch: 11.51 CATCH/HOUR: 43.16

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Brachydeuterus auritus Juv.	19.35	3469	44.83	
Brachydeuterus auritus	11.14	71	25.81	
Trichiurus lepturus	6.38	45	14.78	
Trachurus trecae, juvenile	3.60	270	8.34	5641
Sardinella maderensis	0.83	8	1.92	
Saurida brasiliensis	0.53	311	1.23	
Sepia orbignyana	0.38	8	0.88	
Umbrina canariensis	0.34	4	0.79	
Pagellus bellottii	0.23	8	0.53	
Grammolites gruvelli	0.23	4	0.53	
Engraulis encrasicolus	0.11	64	0.25	
Sepiella ornata	0.08	4	0.19	
Total	43.20		100.08	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 846
 DATE:28/ 4/01 GEAR TYPE: BT No:4 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :02:32:13 03:02:33 30 (min) Purpose code: 1
 LOG :4676.14 4677.81 1.67 Area code : 2
 FDEPTH: 74 79 GearCond.code: 1
 BDEPTH: 74 79 Validity code:
 Towing dir: 245e Wire out: 260 m Speed: 30 kn*10
 Sorted: 69 Kg Total catch: 242.13 CATCH/HOUR: 484.26

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Trichiurus lepturus	78.40 1078	16.19	
Citharus linguatula	75.60 1982	15.61	
Brachydeuterus auritus Juv.	61.88 11348	12.78	
Chelidonicichthys gabonensis	55.65 336	11.49	
Dentex angolensis	47.32 568	9.77	
Sepia orbignyana	28.78 840	5.94	
Parapenaeus longirostris	23.52 21812	4.86	
Grammolites gruvelli	23.46 212	4.84	
Thorogobius angolensis	20.44 14820	4.22	
Pterothrissus belloci	15.96 204	3.30	
Sepia officinalis hierredda	14.98 36	3.09	
Umbrina canariensis	11.14 126	2.30	
Brotula barbata	7.64 42	1.58	
Raja miraletus	5.96 8	1.23	
Dentex canariensis	2.32 28	0.48	
Torpedo torpedo	2.32 8	0.48	
C R A B S	1.62 526	0.33	
Lepidotrigla cadmani	1.34 8	0.28	
Chaetodon hoefleri	1.20 8	0.25	
Octopus vulgaris	1.20 8	0.25	
Dentex macropthalmus	1.20 8	0.25	
Boops boops	0.98 8	0.20	
MURAENIDAE	0.50 8	0.10	
Branchiostegus semifasciatus	0.36 8	0.07	
CRACHII	0.36 8	0.07	
Arnoglossus imperialis	0.28 22	0.06	
Total	484.42	100.02	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 847
 DATE:28/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1323
 TIME :04:33:14 04:47:59 15 (min) Purpose code: 1
 LOG :4681.28 4682.12 0.83 Area code : 2
 FDEPTH: 68 68 GearCond.code: 1
 BDEPTH: 83 82 Validity code:
 Towing dir: 50e Wire out: 200 m Speed: 34 kn*10
 Sorted: 19 Kg Total catch: 18.90 CATCH/HOUR: 75.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Trachurus trecae, juvenile	40.12 3232	53.07	5642
Trichiurus lepturus	17.00 56	22.49	
Brachydeuterus auritus Juv.	6.08 972	8.04	
Brachydeuterus auritus	5.56 36	7.35	
Bregmaceros sp.	2.80 2208	3.70	
Saurida brasiliensis	1.68 496	2.22	
Sufflogobius bibarbatus	1.64 4268	2.17	
Pteroscion peli	0.52 144	0.69	
SQVSE21	0.16 24	0.21	
Alloteuthis africana	0.04 76	0.05	
Parapenaeus longirostris	0.04 24	0.05	
Total	75.64	100.04	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 848
 DATE:28/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :04:54:35 05:05:18 11 (min) Purpose code: 2
 LOG :4682.46 4683.05 0.59 Area code :
 FDEPTH: 30 30 GearCond.code:
 BDEPTH: 81 80 Validity code:
 Towing dir: 50e Wire out: 105 m Speed: 30 kn*10
 Sorted: 10 Kg Total catch: 9.62 CATCH/HOUR: 52.47

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Sardinella maderensis	39.71 131	75.68	5644
Trachurus trecae	5.18 38	9.87	5643
Trichiurus lepturus	4.09 16	7.79	
Uraspis secunda	3.38 5	6.44	
Sepiella ornata	0.05 5	0.10	
Lagocephalus laevigatus	0.05 5	0.10	
Total	52.46	99.98	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 849
 DATE:28/ 4/01 GEAR TYPE: BT No:4 POSITION:Lat S 1228
 start stop duration Long E 1324
 TIME :06:09:25 06:39:11 30 (min) Purpose code: 1
 LOG :4686.29 4687.92 1.63 Area code : 2
 FDEPTH: 78 80 GearCond.code: 1
 BDEPTH: 78 80 Validity code:
 Towing dir: 230e Wire out: 280 m Speed: 30 kn*10
 Sorted: 55 Kg Total catch: 374.00 CATCH/HOUR: 748.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Brachydeuterus auritus Juv.	320.92 4878	42.90	
Trachurus trecae, juvenile	135.14 10012	18.07	5645
Trichiurus lepturus	63.50 724	8.49	
Trachurus trecae	48.76 298	6.52	5646
Citharus linguatula	32.32 768	4.32	
Umbrina canariensis	31.18 226	4.17	
Dentex angolensis	23.28 316	3.11	
Pterothrissus belloci	15.36 204	2.05	
Pagellus bellottii	14.92 136	1.99	
Synagrops microlepis	14.00 3028	1.87	
Sepia orbignyana	13.78 68	1.84	
Brachydeuterus auritus	11.98 90	1.60	
GFDBR01	11.76 114	1.57	
Grammolites gruvelli	4.06 68	0.54	
Chelidonicichthys capensis	3.62 22	0.48	
Parapenaeus longirostris	1.80 836	0.24	
C R A B S	1.36 430	0.18	
Sepiella ornata	0.22 22	0.03	
Total	747.96	99.97	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 850
 DATE:28/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :09:06:57 09:17:11 10 (min) Purpose code: 1
 LOG :4695.54 4696.11 0.55 Area code : 2
 FDEPTH: 60 60 GearCond.code: 1
 BDEPTH: 81 81 Validity code:
 Towing dir: 45e Wire out: 185 m Speed: 30 kn*10
 Sorted: 3 Kg Total catch: 2.55 CATCH/HOUR: 15.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Selene dorsalis	15.30 138	100.00	
Total	15.30	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 851
 DATE:28/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :09:29:28 09:39:35 10 (min) Purpose code: 1
 LOG :4696.74 4697.29 0.53 Area code : 2
 FDEPTH: 30 30 GearCond.code:
 BDEPTH: 80 79 Validity code: 1
 Towing dir: 45e Wire out: 110 m Speed: 30 kn*10
 Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 852
 DATE:28/ 4/01 GEAR TYPE: BT No:7 POSITION:Lat S 1226
 start stop duration Long E 1325
 TIME :10:31:03 11:01:05 30 (min) Purpose code: 1
 LOG :4700.24 4701.99 1.74 Area code : 2
 FDEPTH: 76 78 GearCond.code:
 BDEPTH: 76 78 Validity code:
 Towing dir: 225e Wire out: 250 m Speed: 30 kn*10
 Sorted: 31 Kg Total catch: 315.05 CATCH/HOUR: 630.10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Trichiurus lepturus	174.24 1098	27.65	
Trachurus trecae, juvenile	156.78 10998	24.88	5648
Brachydeuterus auritus Juv.	89.28 15282	14.17	
Trachurus trecae	68.44 434	10.86	5647
Citharus linguatula	29.34 702	4.66	
Pterothrissus belloci	20.22 234	3.21	
Lithognathus mormyrus	17.28 36	2.74	
Dentex angolensis	15.30 180	2.43	
Zeus faber	9.00 18	1.43	
Brotula barbata	7.38 54	1.17	
Torpedo torpedo	6.30 18	1.00	
Pagellus bellottii	5.76 36	0.91	
Brachydeuterus auritus	5.58 36	0.89	
Galeoides decadactylus	5.40 90	0.86	
Selene dorsalis	5.22 36	0.83	
Umbrina canariensis	5.22 54	0.83	
Synagrops microlepis	2.52 558	0.40	
Dentex canariensis	2.34 54	0.37	
Grammolites gruvelli	1.08 18	0.17	
Sepia orbignyana	0.90 72	0.14	
GOBIDAE	0.54 774	0.09	
Saurida brasiliensis	0.36 72	0.06	
Total	628.48	99.75	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 853
 DATE:28/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1322
 TIME :13:00:40 13:19:18 19 (min) Purpose code: 1
 LOG :4706.27 4707.34 1.06 Area code : 2
 FDEPTH: 70 70 GearCond.code:
 BDEPTH: 87 84 Validity code:
 Towing dir: 50° Wire out: 210 m Speed: 35 kn*10

Sorted: 6 Kg Total catch: 6.43 CATCH/HOUR: 20.31

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Selene dorsalis	18.13	142	89.27
Trichurus lepturus	0.92	3	4.53
Sardinella maderensis	0.76	3	3.74
Trachurus trecae	0.51	3	2.51
Total	20.32	100.05	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 854
 DATE:28/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :13:28:53 13:40:00 11 (min) Purpose code: 1
 LOG :4707.47 4708.40 0.70 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 82 80 Validity code:
 Towing dir: 50° Wire out: 90 m Speed: 35 kn*10

Sorted: Kg Total catch: 0.26 CATCH/HOUR: 1.42

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardinella maderensis	1.42	5	100.00
Total	1.42	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 855
 DATE:28/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :14:40:03 15:10:09 30 (min) Purpose code: 1
 LOG :4710.76 4712.31 1.54 Area code : 2
 FDEPTH: 82 86 GearCond.code:
 BDEPTH: 82 86 Validity code:
 Towing dir: 230° Wire out: 290 m Speed: 30 kn*10

Sorted: 44 Kg Total catch: 210.47 CATCH/HOUR: 420.94

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trachurus trecae, juvenile	85.92	5952	20.41 5650
Trichurus lepturus	81.96	660	19.47
Brachydeuterus auritus Juv.	44.64	5172	10.60
Citharus linguatula	30.36	696	7.21
Synagrops microlepis	27.36	5784	6.50
Pterothrissus belloci	27.36	360	6.50
Brotula barbata	21.00	60	4.99
Pagellus bellottii	16.56	168	3.93
Trachurus trecae	15.44	76	3.67 5649
Dentex angolensis	13.20	156	3.14
Sepia orbignyana	12.36	60	2.94
Lepidotrigla carolae	11.40	96	2.71
Stromateus fiatola	7.10	6	1.69
Umbrina canariensis	6.48	48	1.54
Fistularia petimba	4.44	12	1.05
Dentex canariensis	4.44	96	1.05
Chaetodon hoefleri	2.28	12	0.54
Parapenaeus longirostris	1.80	684	0.43
Saurida brasiliensis	1.56	408	0.37
Dentex macrophthalmus	1.44	12	0.34
Grammolites gruvelli	1.32	36	0.31
Dicologlossa hexophthalma	0.84	12	0.20
GOBIIDAE	0.60	816	0.14
Zeus faber	0.48	12	0.11
Alloteuthis africana	0.36	72	0.09
Boops boops	0.24	12	0.06
Total	420.94	99.99	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 856
 DATE:28/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1323
 TIME :16:36:08 16:56:08 20 (min) Purpose code: 1
 LOG :4714.84 4716.00 1.15 Area code : 2
 FDEPTH: 65 65 GearCond.code:
 BDEPTH: 82 82 Validity code:
 Towing dir: 45° Wire out: 205 m Speed: 35 kn*10

Sorted: 4 Kg Total catch: 3.69 CATCH/HOUR: 11.07

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trichurus lepturus	5.61	33	50.68
Stromateus fiatola	4.26	3	38.48
Sardinella maderensis	0.81	3	7.32
Selene dorsalis	0.39	3	3.52
Total	11.07	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 857
 DATE:28/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :17:07:21 17:18:46 11 (min) Purpose code: 1
 LOG :4716.54 4717.19 0.64 Area code : 2
 FDEPTH: 27 20 GearCond.code:
 BDEPTH: 82 80 Validity code:
 Towing dir: 45° Wire out: 4717 m Speed: 120 kn*10

Sorted: 1 Kg Total catch: 0.97 CATCH/HOUR: 5.29

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sarda sarda	5.29	5	100.00
Total	5.29	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 858
 DATE:28/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :17:20:16 17:30:24 10 (min) Purpose code: 1
 LOG :4717.27 4717.86 0.58 Area code : 2

FDEPTH: 20 18 GearCond.code:
 BDEPTH: 80 79 Validity code:
 Towing dir: 45° Wire out: 80 m Speed: 30 kn*10
 Sorted: 101 Kg Total catch: 100.99 CATCH/HOUR: 605.94

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sardinella maderensis	582.06	2304	96.06 5651
Sardinella aurita	12.18	48	2.01
Scomber japonicus	11.70	30	1.93
Total	605.94	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 859
 DATE:28/ 4/01 GEAR TYPE: BT No:4 POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :18:23:09 18:54:14 31 (min) Purpose code: 1
 LOG :4720.52 4722.05 1.51 Area code : 2
 FDEPTH: 67 72 GearCond.code:
 BDEPTH: 67 72 Validity code:
 Towing dir: 230° Wire out: 250 m Speed: 30 kn*10

Sorted: 32 Kg Total catch: 129.96 CATCH/HOUR: 251.54

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Citharus linguatula	40.49	1347	16.10
Grammolites gruvelli	24.85	441	9.88
Pagellus bellottii	23.23	225	9.24
Brotula barbata	20.28	170	8.06
Brachydeuterus auritus Juv.	19.05	3453	7.57
Parapenaeus longirostris	18.12	7246	7.20
Torpedo torpedo	17.42	39	6.93
Sepia orbignyana	15.10	186	6.00
Serranus accraensis	11.30	232	4.49
Umbrina canariensis	11.15	116	4.43
Chelidonichthys capensis	9.68	93	3.85
Raja miraletus	5.57	8	2.21
Pseudupeneus prayensis	4.95	31	1.97
Sepia officinalis hierredda	4.72	31	1.88
Trachurus trecae, juvenile	4.65	356	1.85 5652
Galeoides decadactylus	2.71	15	1.08
Microchirus frechkopi	2.25	54	0.89
Trichurus lepturus	2.17	62	0.86
Arnoglossus imperialis	2.09	196	0.83
Synagrops microlepis	2.01	581	0.80
Pterothrissus belloci	1.94	23	0.77
Dentex canariensis	1.70	39	0.68
C R A B S	1.39	356	0.55
Bassanago albescens	1.39	31	0.55
Sufflogobius bibarbatus	1.32	472	0.52
Chaetodon hoefleri	0.85	8	0.34
Branchiostegus semifasciatus	0.77	8	0.31
ANTENNARIIDAE	0.39	8	0.16
Total	251.54	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 860
 DATE:28/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1228
 start stop duration Long E 1324
 TIME :20:18:34 00:00:00 221 (min) Purpose code: 1
 LOG :4726.31 4726.31 Area code : 2
 FDEPTH: 54 54 GearCond.code:
 BDEPTH: 77 77 Validity code:
 Towing dir: 40° Wire out: 190 m Speed: 30 kn*10

Sorted: 23 Kg Total catch: 23.26 CATCH/HOUR: 6.31

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Brachydeuterus auritus Juv.	2.88	511	45.64
Trichurus lepturus	1.43	3	22.66
Trachurus trecae, juvenile	1.37	102	21.71 5653
MYCTOPHIDAE	0.31	153	4.91
Synagrops microlepis	0.21	70	3.33
GOBIIDAE	0.05	103	0.79
Sepiella ornata	0.02	0	0.32
Saurida brasiliensis	0.02	5	0.32
Sepia orbignyana	0.01	0	0.16
Parapenaeus longirostris	0.01	3	0.16
Bregmaceros sp.	0.01	5	0.16
Total	6.32	100.16	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 861
 DATE:28/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1227
 start stop duration Long E 1325
 TIME :20:42:54 20:58:03 15 (min) Purpose code: 1
 LOG :4727.69 4728.60 0.91 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 76 75 Validity code:
 Towing dir: 40° Wire out: 85 m Speed: 30 kn*10

Sorted: Kg Total catch: CATCH/HOUR:

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

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 862
 DATE:28/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1226
 start stop duration Long E 1325
 TIME :21:42:13 22:12:24 30 (min) Purpose code: 1
 LOG :4731.26 4732.71 1.44 Area code : 2
 FDEPTH: 74 76 GearCond.code:
 BDEPTH: 74 76 Validity code:
 Towing dir: 230° Wire out: 260 m Speed: 30 kn*10
 Sorted: 29 Kg Total catch: 129.94 CATCH/HOUR: 259.88

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Citharus linguatula	47.80	1058	18.39
Chelidonicichthys capensis	31.96	252	12.30
Sepia bertheloti	25.84	36	9.94
Pagellus bellottii	22.86	226	8.80
Brachydeuterus auritus Juv.	20.34	792	7.83
Grammolites gruvelli	17.56	216	6.76
Umbrina canariensis	13.68	108	5.26
Dentex angolensis	12.60	162	4.85
Sepia orbignyana	11.08	334	4.26
Brotula barbata	9.82	90	3.78
Pterothrissus belloci	8.82	108	3.39
Parapenaeus longirostris	7.48	2494	2.88
Epinephelus gorenensis	6.94	10	2.67
Torpedo torpedo	4.42	10	1.70
Sardinella maderensis	3.78	18	1.45
COBIIDAE	3.24	2880	1.25
MYCTOPHIDAE	2.70	1216	1.04
Octopus vulgaris	2.62	10	1.01
Trachurus trecae, juvenile	2.26	162	0.87
Synagrops microlepis	1.00	252	0.38
Trichiurus lepturus	0.90	90	0.35
Dicologlossa hexophthalma	0.82	10	0.32
OPHIURIDAE	0.46	18	0.18
Sardinella maderensis - Juv.	0.18	18	0.07
ANTENNARIIDAE	0.06	10	0.02
Total	259.22	99.75	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 866
 DATE:29/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1225
 start stop duration Long E 1325
 TIME :01:23:31 01:53:12 30 (min) Purpose code: 1
 LOG :4741.97 4743.53 1.54 Area code : 2
 FDEPTH: 88 86 GearCond.code:
 BDEPTH: 88 86 Validity code:
 Towing dir: 235° Wire out: 300 m Speed: 30 kn*10
 Sorted: 94 Kg Total catch: 312.15 CATCH/HOUR: 624.30

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Pagellus bellottii	122.90	1060	19.69
Chelidonicichthys lucerna	118.40	990	18.97
Citharus linguatula	73.50	1720	11.77
Pterothrissus belloci	54.60	710	8.75
Umbrina canariensis	40.30	100	6.46
Dentex angolensis	29.10	290	4.66
Trichiurus lepturus	28.10	100	4.50
Brotula barbata	27.20	140	4.36
Raja miraletus	19.30	20	3.09
Pontinus accraensis	15.50	120	2.48
Brachydeuterus auritus	14.20	2000	2.27
Sepia bertheloti	11.50	30	1.84
Scorpaena nomani	11.40	110	1.83
Lepidotrigla carolae	10.60	190	1.70
Epinephelus sp.	10.00	10	1.60
Trachurus trecae, juvenile	9.30	650	1.49
Chelidonicichthys capensis	7.20	50	1.15
Parapenaeus longirostris	6.80	2610	1.09
Sepia orbignyana	5.80	100	0.93
Dentex macrophthalmus	5.30	30	0.85
Saurida brasiliensis	1.90	240	0.30
Dicologlossa hexophthalma	1.70	20	0.27
Dentex canariensis	1.40	50	0.22
COBIIDAE	1.00	1020	0.16
Synagrops microlepis	0.90	180	0.14
Uranoscopus sp.	0.30	10	0.05
Total	628.20	100.62	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 863
 DATE:29/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1228
 start stop duration Long E 1323
 TIME :23:50:57 00:05:39 15 (min) Purpose code: 1
 LOG :4737.31 4738.17 0.86 Area code : 2
 FDEPTH: 65 65 GearCond.code:
 BDEPTH: 83 84 Validity code:
 Towing dir: 0° Wire out: 190 m Speed: 35 kn*10
 Sorted: 24 Kg Total catch: 24.00 CATCH/HOUR: 96.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Brachydeuterus auritus Juv.	40.64	1388	42.33
Trachurus trecae, juvenile	20.80	1652	21.67
MYCTOPHIDAE	14.88	12092	15.50
Trichiurus lepturus	11.44	36	11.92
Parapenaeus longirostris	2.08	1204	2.17
COBIIDAE	1.92	3236	2.00
Sepia bertheloti	1.28	4	1.33
Saurida brasiliensis	1.28	480	1.33
Sepia orbignyana	1.00	4	1.04
Sepiella ornata	0.36	68	0.38
Synagrops microlepis	0.24	72	0.25
Engraulis encrasicolus	0.08	132	0.08
Boops boops	0.04	4	0.04
Lagocephalus laevigatus	0.04	8	0.04
Total	96.08	100.08	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 867
 DATE:30/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1209
 start stop duration Long E 1339
 TIME :08:14:42 08:46:33 32 (min) Purpose code: 1
 LOG :4878.95 4880.51 1.55 Area code : 2
 FDEPTH: 29 30 GearCond.code:
 BDEPTH: 29 30 Validity code:
 Towing dir: 210° Wire out: 120 m Speed: 30 kn*10
 Sorted: 61 Kg Total catch: 675.31 CATCH/HOUR: 1266.21

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Brachydeuterus auritus	500.98	7198	39.57
Trichiurus lepturus	92.40	576	7.30
Galeoides decadactylus	90.96	557	7.18
Ilisha africana	86.42	2743	6.83
Pteroscion pelli	80.44	1547	6.35
Pomadasy jubelini	70.74	165	5.59
Drepane africana	70.74	165	5.59
Chloroscombrus chrysurus	61.26	743	4.84
Sphyraena guachancho	45.58	103	3.60
Torpedo sp.	42.73	23	3.37
Pomadasy incisus	26.81	206	2.12
Trachurus trecae	23.93	141	1.89
Arius laticutatus	20.42	21	1.61
Lithognathus mormyrus	18.15	83	1.43
Pseudotolithus typus	12.38	21	0.98
Sphyraena sphyraena	6.60	62	0.52
Cynoglossus canariensis	3.92	21	0.31
Dasyatis margarita	2.89	21	0.23
Dicologlossa cuneata	1.44	41	0.11
Selene dorsalis	1.24	21	0.10
Peneaus notialis	0.62	21	0.05
Total	1260.65	99.57	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 864
 DATE:29/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1227
 start stop duration Long E 1324
 TIME :00:11:37 00:21:49 10 (min) Purpose code: 1
 LOG :4738.50 4739.06 0.56 Area code : 2
 FDEPTH: 50 50 GearCond.code:
 BDEPTH: 84 85 Validity code:
 Towing dir: 45° Wire out: 150 m Speed: 35 kn*10
 Sorted: 1 Kg Total catch: 0.81 CATCH/HOUR: 4.86

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae, juvenile	3.18	222	65.43
MYCTOPHIDAE	1.08	534	22.22
Brachydeuterus auritus Juv.	0.36	66	7.41
Sepiella ornata	0.12	24	2.47
Saurida brasiliensis	0.06	24	1.23
COBIIDAE	0.06	96	1.23
Total	4.86	99.99	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 865
 DATE:29/ 4/01 GEAR TYPE: PT No:2 POSITION:Lat S 1226
 start stop duration Long E 1324
 TIME :00:28:53 00:43:55 15 (min) Purpose code: 1
 LOG :4739.45 4740.37 0.92 Area code : 2
 FDEPTH: 20 20 GearCond.code:
 BDEPTH: 85 84 Validity code:
 Towing dir: 45° Wire out: 100 m Speed: 36 kn*10
 Sorted: 2 Kg Total catch: 1.92 CATCH/HOUR: 7.68

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Trachurus trecae, juvenile	5.60	392	72.92
Sardinella maderensis	1.48	4	19.27
MYCTOPHIDAE	0.28	136	3.65
Brachydeuterus auritus Juv.	0.16	4	2.08
Synagrops microlepis	0.12	28	1.56
Engraulis encrasicolus	0.04	44	0.52
Total	7.68	100.00	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 868
 DATE:30/ 4/01 GEAR TYPE: BT No: POSITION:Lat S 1209
 start stop duration Long E 1339
 TIME :14:23:32 14:52:25 30 (min) Purpose code: 1
 LOG :4912.58 4914.14 1.54 Area code : 2
 FDEPTH: 28 29 GearCond.code:
 BDEPTH: 28 29 Validity code:
 Towing dir: 215° Wire out: 130 m Speed: 30 kn*10
 Sorted: 60 Kg Total catch: 300.96 CATCH/HOUR: 601.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pentheroscion mbizi	146.20	316	24.29	
Brachydeuterus auritus	62.90	1460	10.45	
Galeoides decadactylus	55.40	220	9.20	
Trichiurus lepturus	53.60	870	8.90	
Pseudotolithus typus	52.60	60	8.74	
Ilisha africana	50.00	350	8.31	
Lagocephalus sp.	31.00	10	5.15	
Ethmalosa fimbriata	26.10	620	4.34	
Brachydeuterus auritus Juv.	15.30	2000	2.54	
Squatina oculata	15.30	20	2.54	
Dasyatris margarita	12.60	30	2.09	
Pomadasy incisus	10.50	60	1.74	
Drepane africana	8.90	20	1.48	
Torpedo marmorata	8.50	10	1.41	
Cynoglossus canariensis	8.00	30	1.33	
Selene dorsalis	6.90	100	1.15	
Pomadasy peroteti	6.70	10	1.11	
Pteroscion peli	6.50	480	1.08	
Pomadasy rogeri	4.90	10	0.81	
Sphyaena sphyaena	4.30	10	0.71	
Penaeus notialis	4.10	92	0.68	
Grammolites gruvelli	3.80	60	0.63	
Pegusa lascaris	3.70	70	0.61	
Cymopoticus ferox	1.34	2	0.22	
Chilomycterus spinosus mauret.	0.98	2	0.16	
Sepiella ornata	0.80	100	0.13	
Torpedo torpedo	0.60	30	0.10	
Trachurus trecae	0.40	10	0.07	
Total		601.92	99.97	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 869
 DATE:30/ 4/01 GEAR TYPE: PT No:1 POSITION:Lat S 1209
 start stop duration Long E 1339
 TIME :16:13:26 16:43:15 30 (min) Purpose code: 1
 LOG :4918.93 4921.29 2.35 Area code : 2
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 29 32 Validity code:
 Towing dir: 205° Wire out: 80 m Speed: 4 kn*10
 Sorted: 140 Kg Total catch: 139.78 CATCH/HOUR: 279.56

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chloroscombrus chrysurus	140.32	1516	50.19	
Sardinella maderensis	55.66	306	19.91	5660
Selene dorsalis	24.64	222	8.81	
Trichiurus lepturus	11.96	64	4.28	
Sphyaena guachancho	9.18	48	3.28	
Pomadasy jubelini	8.48	22	3.03	
Galeoides decadactylus	6.88	28	2.46	
Sardinella maderensis - Juv.	6.04	258	2.16	5661
Panulirus regius	3.84	8	1.37	
Pteroscion peli	2.74	104	0.98	
Ilisha africana	2.04	58	0.73	
Brachydeuterus auritus	1.90	90	0.68	
Pseudotolithus senegalensis	1.86	4	0.67	
Sepia orbignyana	1.48	2	0.53	
Trachinotus ovatus	0.42	6	0.15	
Pomadasy incisus	0.40	6	0.14	
Alectis alexandrinus	0.40	4	0.14	
Lagocephalus laevigatus	0.36	2	0.13	
Chaetodon hoefleri	0.28	2	0.10	
Grammolites gruvelli	0.18	2	0.06	
Sepiella ornata	0.14	16	0.05	
Dicologlossa cuneata	0.12	2	0.04	
Squilla mantis	0.08	2	0.03	
Total		279.40	99.92	

DR. FRIDTJOF NANSEN PROJECT:BE PROJECT STATION: 870
 DATE: 1/ 5/01 GEAR TYPE: PT No:6 POSITION:Lat S 1210
 start stop duration Long E 1338
 TIME :09:42:07 10:12:19 30 (min) Purpose code: 1
 LOG :4979.18 4980.69 1.40 Area code : 2
 FDEPTH: 5 5 GearCond.code:
 BDEPTH: 38 29 Validity code:
 Towing dir: 30° Wire out: 155 m Speed: 30 kn*10
 Sorted: 141 Kg Total catch: 141.60 CATCH/HOUR: 283.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sphyaena africana *	60.00	2	21.19	
Brachydeuterus auritus	30.34	252	10.71	
Sphyaena sphyaena	29.28	90	10.34	
Gymnura micrura	20.00	2	7.06	
Pteroscion peli	19.00	644	6.71	
Pomadasy incisus	18.10	116	6.39	
Ilisha africana	16.80	54	5.93	
Pomadasy jubelini	16.44	42	5.81	
Trichiurus lepturus	13.00	222	4.59	
Galeoides decadactylus	12.16	58	4.29	
Sardinella maderensis	11.02	66	3.89	
Trachinotus ovatus	8.52	92	3.01	
Scomberomorus tritor	7.80	10	2.75	
Trachurus trecae	5.18	36	1.83	5562
Arius parkii	4.16	2	1.47	
Pseudotolithus typus	4.08	6	1.44	
Ethmalosa fimbriata	4.04	30	1.43	
Lithognathus mormyrus	1.00	2	0.35	
Selene dorsalis	0.62	8	0.22	
Trachinotus goreensis	0.52	2	0.18	
Decapterus sp.	0.48	2	0.17	
Total		282.54	99.76	

ANNEX IV DIEL CYCLE DATASHEETS.

Dr. F. Nansen 2001 Survey errors, 48 hrs diel cycle experiment # 1
 Target species: *T. trachurus capensis* juveniles (14-16 cm)
 Position: ~19°00' S, 12°00'E
 Bottom depth: ~160 m
 Start: 21.04, 18:00 UTC (Multinet)
 Stop: 23.04, 19:00 UTC (CTD/ ADCP)
 Multinet depths: 1: 0-30, 2: 30-60, 3: 60-90, 4: 90-120, 5: 120-150
 Multinet mesh size: 405 micrometer

Cycle 1			
Multinet sample no:	PL 1		Difference
Date:	4/21/01		
Time (UTC):	18:15	18:23	0:08
Revolutions	open	close	
Depth 1	9302	9554	252
Depth 2	60643	60739	96
Depth 3	84989	85118	129
Depth 4	36105	36193	88
Depth 5	38939	39116	177
Echolog file	20010421-180243.EK5		742
Multisampler	Station	Time	Depth
MS 1	783	19:14-19:24	75
MS 2	784	19:32-19:42	50
MS 3	785	19:51:20.01	25
Echolog file	20010421-191146.EK5		
CTD Station	HD 369		
Time (UTC)	20:51		
Echolog file	20010421-203727.EK5		
CTD file	sta0369		
ADCP	ADCP 1.1	failed	
Time (UTC)	20:51	failed	
ADCP file			

Cycle 2			
Multinet sample no:	PL 2		Difference
Date:	4/21/01		
Time (UTC):	21:21	21:28	0:07
Revolutions	open	close	
Depth 1	9554	9787	233
Depth 2	60739	61103	364
Depth 3	85118	85481	363
Depth 4	36193	36614	421
Depth 5	39116	39455	339
Echolog file	20010421-211145.EK5		1720
Multisampler	Station	Time	Depth
MS 1	786	00:57-01:07	75
MS 2	787	01:14-01:24	50
MS 3	788	01:40-01:50	25
Echolog file	20010422-005319.EK5		
CTD Station	HD 370		
Time	2:45		
Echolog file	20010422-023507.EK5		
CTD file	sta0370		
ADCP	ADCP 1.2	failed	
Time	2:45	failed	
ADCP file			

Cycle 3			
Multinet sample no:	failed		Difference
Date:	4/22/01		
Time (UTC):	-	-	
Revolutions	open	close	
Depth 1	failed	failed	failed
Depth 2	failed	failed	failed
Depth 3	failed	failed	failed
Depth 4	failed	failed	failed
Depth 5	failed	failed	failed
Echolog file	-		
Multisampler	Station	Time	Depth
MS 1	789	04:31-04:41	75
MS 2	790	04:49-04:59	50
MS 3	791	05:10-05:20	25
Echolog file	20010422-041703.EK5		
CTD Station	HD 371		
Time (UTC)	6:08		
Echolog file	20010422-055619.EK5		
CTD file	sta 371		
ADCP	ADCP 1.3	failed	
Time (UTC)	6:08	failed	
ADCP file			

Cycle 4			
Multinet sample no:	PL 3		Difference
Date:	4/22/01		
Time (UTC):	8:30	8:38	0:08
Revolutions	open	close	
Depth 1	9787	10057	270
Depth 2	61103	61541	438
Depth 3	85481	86003	522
Depth 4	36614	36812	198
Depth 5	39455	39810	355
Echolog file	20010422-082207.EK5		1783
NB! All samples are slightly overestimated from last deployment			
Multisampler	Station	Time	Depth
MS 1	792	failed	-
MS 2	793	09:44-10:08	110
MS 3	794	10:22-10:33	25
Echolog file	20010422-094342.EK5		
CTD Station	HD 372		
Time (UTC)	11:31		
Echolog file	20010422-112103.EK5		
CTD file	sta 372		
ADCP	ADCP 1.4		
Time (UTC)	11:34		
ADCP file	BE2010		

Cycle 5			
Multinet sample no:	PL 4		Difference
Date:	4/22/01		
Time (UTC):	11:57	12:05	0:08
Revolutions	open	close	
Depth 1	10057	10624	567
Depth 2	61541	61899	358
Depth 3	86003	86304	301
Depth 4	36812	37016	204
Depth 5	39810	40237	427
Echolog file	20010422-115240.EK5		1857
NB! No catch in first series, ship relocated a bit north for new sample!			
Multisampler	Station	Time	Depth
MS 1	795/ 798	14:18/17:22-32	100
MS 2	796/ 799	14:40/17:43-55	50
MS 3	797/ 800	15:01/18:09-19	25
Echolog file	20010422-170827.EK5		
CTD Station	HD 373/ HD 374		
Time (UTC)	15:59/ 19:10		
Echolog file	20010422-190515.EK5		
CTD file	sta 373/ 374		
ADCP	ADCP 1.5/ ADCP 1.6		
Time (UTC)	15:55/ 19:07		
ADCP file	BE2011/ BE2012		

Cycle 6			
Multinet sample no:	PL 5		Difference
Date:	4/22/01		
Time (UTC):	19:28	19:39	0:11
Revolutions	open	close	
Depth 1	10624	10920	296
Depth 2	61899	62091	192
Depth 3	86304	86514	210
Depth 4	37016	37114	98
Depth 5	40237	40572	335
Echolog file	20010422-192125.EK5		1131
NB! NO CATCH ! Fish relocated a bit north-west			
Multisampler	Station	Time	Depth
MS 1	801	20:01-20:12	75
MS 2	802	20:21-20:32	50
MS 3	803	20:41-20:52	25
Echolog file	20010422-195347.EK5		
CTD Station	HD 375		
Time (UTC)	21:15		
Echolog file	20010422-205918.EK5		
CTD file	sta 375		
ADCP	ADCP 1.7		
Time (UTC)	21:20		
ADCP file	BE2013		

Cycle 7			
Multinet sample no:	PL 6		Difference
Date:	4/22/01		
Time (UTC):	21:57	22:06	0:09
Revolutions	open	close	
Depth 1	10920	11505	585
Depth 2	62091	62542	451
Depth 3	86514	86833	319
Depth 4	37114	37319	205
Depth 5	40572	40865	293
Echolog file	20010422-214901.EK5		1853
NB1 ! No m-s trawl (battery charging)			
NB2 ! Ship relocated a bit north-west to follow fish!			
Multisampler	Station	Time	Depth
MS 1	804	22:28	25
MS-2	(small pel trawl)		
MS-3			
Echolog file	20010422-222159.EK5		
CTD Station			
	HD 376		
Time (UTC)	23:15		
Echolog file	20010422-231145.EK5		
CTD file	sta 376		
ADCP			
	ADCP 1.8		
Time (UTC)	23:19		
ADCP file	BE2014		

Cycle 8			
Multinet sample no:	PL 7		Difference
Date:	4/22/01		
Time (UTC):	23:30	23:46	0:16
Revolutions	open	close	
Depth 1	11505	11626	121
Depth 2	62542	62683	141
Depth 3	86833	87174	341
Depth 4	37319	37718	399
Depth 5	40865	41451	586
Echolog file	20010422-233837.EK5		1588
NB! No m-s trawl (battery charging)			
Multisampler	Station	Time	Depth
MS 1	805	0:59	25
MS-2	(small pel trawl)		
MS-3			
Echolog file	20010423-005103.EK5		
CTD Station			
	HD 377		
Time (UTC)	1:31		
Echolog file	20010423-012227.EK5		
CTD file	sta 377		
ADCP			
	ADCP 1.9		
Time (UTC)	1:36		
ADCP file	BE2015		

Cycle 9			
Multinet sample no:	PL 8		Difference
Date:	4/23/01		
Time (UTC):	1:53	2:11	0:18
Revolutions	open	close	
Depth 1	11626	12101	475
Depth 2	62683	63049	366
Depth 3	87174	87544	370
Depth 4	37718	37955	237
Depth 5	41451	41799	348
Echolog file	20010423-013841.EK5		1796
NB! No m-s trawl (battery charging).			
Multisampler	Station	Time	Depth
MS 1	806	3:12	50
MS-2	(small pel trawl)		
MS-3			
Echolog file	20010423-025853.EK5		
CTD Station			
	HD 378		
Time (UTC)	3:45		
Echolog file	20010423-033014.EK5		
CTD file	sta 378		
ADCP			
	ADCP 1.10		
Time (UTC)	3:48		
ADCP file	BE2016		

Cycle 10			
Multinet sample no:	PL9		Difference
Date:	4/23/01		
Time (UTC):	4:17	4:43	0:26
Revolutions	open	close	
Depth 1	12101	12738	637
Depth 2	63049	63659	610
Depth 3	87544	88033	489
Depth 4	37955	38362	407
Depth 5	41799	42250	451
Echolog file	20010423-040212.EK5		2594
NB! No m-s trawl (battery charging).			
Multisampler	Station	Time	Depth
MS 1	807	5:28	50
MS-2	(small pel trawl)		
MS-3			
Echolog file	20010423-052615.EK5		
CTD Station			
	HD 379		
Time (UTC)	6:27		
Echolog file	20010423-061629.EK5		
CTD file	sta 379		
ADCP			
	ADCP 1.11/ ADCP 1.12		
Time (UTC)	06:23/ 09:42		
ADCP file	BE2017/ BE2018		

Cycle 11			
Multinet sample no:	PL 10		Difference
Date:	4/23/01		
Time (UTC):	7:19		
Revolutions	open	close	
Depth 1	12738	13025	287
Depth 2	63659	63856	197
Depth 3	88033	88208	175
Depth 4	38362	38504	142
Depth 5	42250	42573	323
Echolog file	20010423-070548.EK5		1124
NB! Trawl extension twisted => catch (HMX) discarded, NEW sample !			
Multisampler	Station	Time	Depth
MS 1	808/ 811	08:21/ 11:08	110/ 100
MS 2	809/ 812	08:35/ 11:20	75/ 140
MS 3	810/ 813	09:06/ 11:43	27/ 50
Echolog file	20010423-105949.EK5		
NB! Ship relocates to meet R/V "Welwitchia"			
CTD Station	HD 380		
Time (UTC)	12:54		
Echolog file	20010423-124123.EK5		
CTD file	sta 380		
ADCP	ADCP 1.13		
Time (UTC)	12:50		
ADCP file	BE2019		

Cycle 12			
Multinet sample no:	PL11		Difference
Date:	4/23/01		
Time (UTC):	13:12	13:22	0:10
Revolutions	open	close	
Depth 1	13025	13219	194
Depth 2	63856	63993	137
Depth 3	88208	88445	237
Depth 4	38504	38778	274
Depth 5	42573	43022	449
Echolog file	20010423-125828.EK5		1291
Multisampler	Station	Time	Depth
MS 1	814	14:43-14:50	125
MS 2	815	15:04-15:16	25
MS-3	not used		
Echolog file	20010423-143939.EK5		
CTD Station	HD 381		
Time (UTC)	16:21		
Echolog file	20010423-162046.EK5		
CTD file	sta 381		
NB! Recorded a bit too long, but this is corrected			
ADCP	ADCP 1.14		
Time (UTC)	16:14		
ADCP file	BE2020		

Cycle 13			
Multinet sample no:	PL 12		Difference
Date:	4/23/01		
Time (UTC):	16:36		
Revolutions	open	close	
Depth 1	13219	13455	236
Depth 2	63993	64156	163
Depth 3	88445	88667	222
Depth 4	38778	39027	249
Depth 5	43022	43384	362
Echolog file	20010423-163656.EK5		1232
Net 2 is slightly under-represented because of spill			
Multisampler	Station	Time	Depth
MS 1	816	17:35-17:47	100
MS 2	817	17:56-18:06	50
MS 3	818	18:17-18:28	25
Echolog file	20010423-172657.EK5		
CTD Station	HD 382		
Time (UTC)	19:05		
Echolog file	20010423-185346.EK5		
CTD file	sta 382		
NB! File BE2021 is a test-file			
ADCP	ADCP 1.15		
Time (UTC)	19:00		
ADCP file	BE2022		

Dr. F. Nansen 2001 Survey errors, 48 hrs diel cycle experiment # 2

Target species: *Trachurus trecae* juveniles and *Sardinella sp.*

Position: ~12°30' S, 13°20' E

Bottom depth: ~70 m

Start: 27.04, 01:00 UTC (Multisampler)

Stop: 29.04, 00:00 UTC (CTD/ ADCP)

Multinet depths: varied, mainly: 1: 0-10, 2: 10-20, 3: 20-30, 4: 30-40, 5: 40-70 (bottom)

Multinet mesh size: 405 micrometer

Cycle 1			
Date:	4/27/01		
Multisampler	Station	Time	Depth
MS 1	826	1:24	20
MS 2	827	1:50	50
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	828	3:05	70
Echolog file			
CTD Station	HD 388		
Time (UTC)	4:04		
Echolog file			
CTD file	sta0388		
ADCP	ADCP 2.1		
Time (UTC)	3:59		
ADCP file	BEN2027		
NB! Ship relocated from fishing boats - Multinet taken at 57 m			
Multinet sample no:	PL 13		Duration
Time (UTC):	4:49	5:17	0:28
Revolutions	open	close	Depth range
Depth 1	13455	13835	0-10
Depth 2	64156	64331	10-20
Depth 3	88667	88810	20-30
Depth 4	39027	39172	30-40
Depth 5	43384	43727	40-57
Echolog file			

Cycle 2			
Date:	4/27/01		
Multisampler	Station	Time	Depth
MS 1	829	6:34	20
MS 2	830	6:56	47
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	831	8:30	66
Echolog file			
CTD Station	HD 389		
Time (UTC)	9:57		
Echolog file			
CTD file	sta0389		
ADCP	ADCP 2.2		
Time (UTC)	9:25		
ADCP file	BEN2028		
NB! Different depth ranges in this Multinet series			
Multinet sample no:	PL 14		Duration
Time (UTC):	10:07	10:15	0:08
Revolutions	open	close	Depth range
Depth 1	13835	14184	0-15
Depth 2	64331	64607	15-25
Depth 3	88810	89124	25-40
Depth 4	39172	39548	40-55
Depth 5	43727	44059	55-70
Echolog file			

Cycle 3			
Date:	4/27/01		
Multisampler	Station	Time	Depth
MS 1	832	10:53	52
MS 2	833	11:13	22
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	834	12:13	73
Echolog file			
CTD Station	HD 390		
Time (UTC)	13:23		
Echolog file			
CTD file	sta0390		
ADCP	ADCP 2.3		
Time (UTC)	13:19		
ADCP file	BEN2029		
Multinet sample no:	PL 15		Duration
Time (UTC):	13:48		
Revolutions	open	close	Depth range
Depth 1	14184	14864	0-10
Depth 2	64607	64868	10-20
Depth 3	89124	89349	20-30
Depth 4	39548	39630	30-40
Depth 5	44059	44164	40-70
Echolog file			

Cycle 5			
Date:	4/27/01		
Multisampler	Station	Time	Depth
MS 1	838	17:56	16
MS 2	839	18:14	48
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	840	19:18	67
Echolog file			
CTD Station	HD 392		
Time (UTC)	20:19		
Echolog file			
CTD file	sta0392		
ADCP	ADCP 2.5		
Time (UTC)	20:12		
ADCP file	BEN2031		
Multinet sample no:	PL 17		Duration
Time (UTC):	20:31	20:38	0:07
Revolutions	open	close	Depth range
Depth 1	15741	16080	0-10
Depth 2	65104	65425	10-20
Depth 3	89523	89800	20-30
Depth 4	39813	39971	30-40
Depth 5	44458	44791	40-70
Echolog file			

Cycle 4			
Date:	4/27/01		
Multisampler	Station	Time	Depth
MS 1	835	14:34	67
MS 2	836	15:00	25
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	837	16:07	74
Echolog file			
CTD Station	HD 391		
Time (UTC)	17:14		
Echolog file			
CTD file	sta0391		
ADCP	ADCP 2.4		
Time (UTC)	17:07		
ADCP file	BEN2030		
Multinet sample no:	PL 16		Duration
Time (UTC):	17:28		
Revolutions	open	close	Depth range
Depth 1	14864	15741	0-10
Depth 2	64868	65104	10-20
Depth 3	89349	89523	20-30
Depth 4	39630	39813	30-40
Depth 5	44164	44458	40-70
Echolog file			

Cycle 6			
Date:	4/27/01		
Multisampler	Station	Time	Depth
MS 1	841	21:11	53
MS 2	842	21:34	20
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	843	22:52	70
Echolog file			
CTD Station	HD 393		
Time (UTC)	23:51		
Echolog file			
CTD file	sta0393		
ADCP	ADCP 2.6		
Time (UTC)	23:49		
ADCP file	BEN2032		
Multinet sample no:	PL 18		Duration
Time (UTC):	0:17		
Revolutions	open	close	Depth range
Depth 1	16080	16554	0-10
Depth 2	65425	65630	10-20
Depth 3	89800	90009	20-30
Depth 4	39971	40149	30-40
Depth 5	44791	45182	40-66
Echolog file			

Cycle 7			
Date:	4/28/01		
Multisampler	Station	Time	Depth
MS 1	844	0:46	73
MS 2	845	1:09	55
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	846	2:32	75
Echolog file			
CTD Station	HD 394		
Time (UTC)	3:33		
Echolog file			
CTD file	sta0394		
ADCP	ADCP 2.7		
Time (UTC)	3:30		
ADCP file	BEN2033		
Multinet sample no:	PL 19		Duration
Time (UTC):	3:47		
Revolutions	open	close	Depth range
Depth 1	16554	17747	0-10
Depth 2	65630	66239	10-20
Depth 3	90009	90233	20-30
Depth 4	40149	40392	30-50
Depth 5	45182	45531	50-76
Echolog file			

Cycle 9			
Date:	4/28/01		
Multisampler	Station	Time	Depth
MS 1	850	9:07	60
MS 2	851	9:29	30
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	852	10:31	77
Echolog file			
CTD Station	HD 396		
Time (UTC)	11:40		
Echolog file			
CTD file	sta0396		
ADCP	ADCP 2.9		
Time (UTC)	11:36		
ADCP file	BEN2035		
Multinet sample no:	PL 21		Duration
Time (UTC):	11:52		
Revolutions	open	close	Depth range
Depth 1	17815	18807	0-10
Depth 2	66659	67220	10-20
Depth 3	90544	90901	20-30
Depth 4	40743	40985	30-50
Depth 5	45862	46307	50-73
Echolog file			

Cycle 8			
Date:	4/28/01		
Multisampler	Station	Time	Depth
MS 1	847	4:33	68
MS 2	848	4:55	30
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	849	6:09	79
Echolog file			
CTD Station	HD 395		
Time (UTC)	7:12		
Echolog file			
CTD file	sta0395		
ADCP	ADCP 2.8		
Time (UTC)	7:04		
ADCP file	BEN2034		
NB ! Old depths were used for the two deepest samples!			
Multinet sample no:	PL 20		Duration
Time (UTC):	7:25	7:36	0:11
Revolutions	open	close	Depth range
Depth 1	17747	17815	0-10
Depth 2	66239	66659	10-20
Depth 3	90233	90544	20-30
Depth 4	40392	40743	30-40
Depth 5	45531	45862	40-70
Echolog file			

Cycle 10			
Date:	4/28/01		
Multisampler	Station	Time	Depth
MS 1	853	13:01	70
MS 2	854	13:29	20
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	855	14:10	84
Echolog file			
CTD Station	HD 397		
Time (UTC)	15:46		
Echolog file			
CTD file	sta0397		
ADCP	ADCP 2.10		
Time (UTC)	15:44		
ADCP file	BEN2036		
Multinet sample no:	PL 22		Duration
Time (UTC):	16:02		
Revolutions	open	close	Depth range
Depth 1	18807	19313	0-10
Depth 2	67220	67658	10-20
Depth 3	90901	91125	20-30
Depth 4	40985	41162	30-50
Depth 5	46307	46497	50-76
Echolog file			

Cycle 11			
Date:	4/28/01		
Multisampler	Station	Time	Depth
MS 1	856	16:36	65
MS 2	857	17:07	23
MS 3	858	17:20	19
Echolog file			
Demersal trawl	Station	Time	Depth
BT	859	18:23	70
Echolog file			
CTD Station	HD 398		
Time (UTC)	19:28		
Echolog file			
CTD file	sta0398		
ADCP	ADCP 2.11		
Time (UTC)	19:19		
ADCP file	BEN2037		
Multinet sample no:	PL 23		Duration
Time (UTC):	19:38		
Revolutions	open	close	Depth range
Depth 1	19313	19727	0-10
Depth 2	67658	68024	10-20
Depth 3	91125	91345	20-30
Depth 4	41162	41405	30-50
Depth 5	46497	46881	50-70
Echolog file			

Cycle 12			
Date:	4/28/01		
Multisampler	Station	Time	Depth
MS 1	860	20:19	54
MS 2	861	20:43	20
MS-3	not opened	-	-
Echolog file			
Demersal trawl	Station	Time	Depth
BT	862	21:42	75
Echolog file			
CTD Station	HD 399		
Time (UTC)	22:56		
Echolog file			
CTD file	sta0399		
ADCP	ADCP 2.12		
Time (UTC)	22:48		
ADCP file	BEN2038		
Multinet sample no:	PL 24		Duration
Time (UTC):	23:11		
Revolutions	open	close	Depth range
Depth 1	19727	20553	0-10
Depth 2	68024	68530	10-20
Depth 3	91345	91678	20-30
Depth 4	41405	41633	30-50
Depth 5	46881	47235	50-76
Echolog file			

Cycle 13			
Date:	4/28/01		
Multisampler	Station	Time	Depth
MS 1	863	23:51	65
MS 2	864	0:12	50
MS 3	865	0:29	20
Echolog file			
Demersal trawl	Station	Time	Depth
BT	866	1:24	87
Echolog file			
CTD Station	HD 400		
Time (UTC)	2:36		
Echolog file			
CTD file	sta0400		
ADCP	ADCP 2.13		
Time (UTC)	2:34		
ADCP file	BEN2039		
Multinet sample no:	PL 25		Duration
Time (UTC):	2:50		
Revolutions	open	close	Depth range
Depth 1	20553	21274	0-10
Depth 2	68530	69103	10-20
Depth 3	91678	91879	20-30
Depth 4	41633	41724	30-50
Depth 5	47235	47455	50-76
Echolog file			