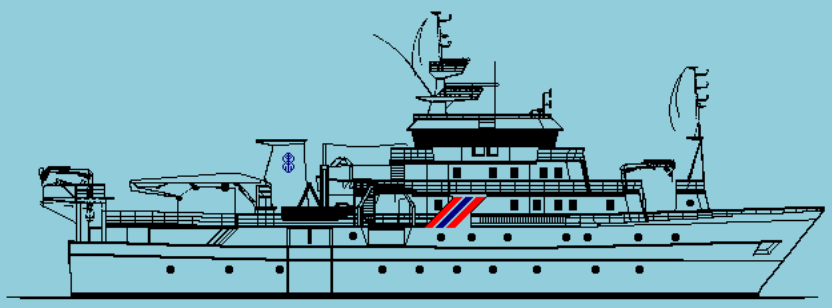

2007 BENEFIT SURVEY NO. 4

TRANSBOUNDARY SURVEY BETWEEN NAMIBIA AND SOUTH AFRICA WITH FOCUS ON SHARED STOCKS OF HAKE

Cruise report No 4/2007

30 March – 19 April 2007

by

Erling Kåre Stenevik [1], Marek Lipinski [2], Lara Jane Atkinson [3] and Oddgeir Alvheim [1]

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Bergen May 2007

THE EAF-NANSEN PROJECT

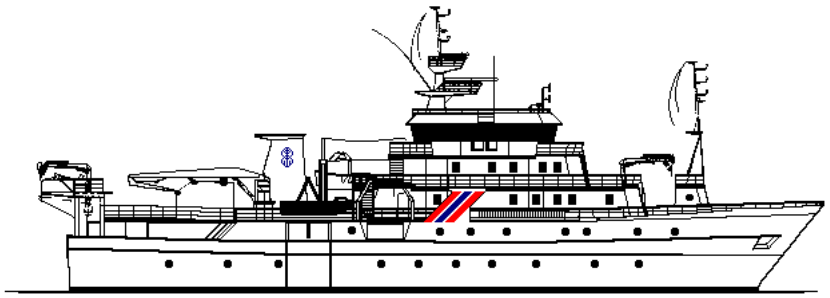
FAO started the implementation of the project "Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries (EAF-Nansen GCP/INT/003/NOR)" in December 2006 with funding from the Norwegian Agency for Development Cooperation (Norad). The EAF-Nansen project is a follow-up to earlier projects/programmes in a partnership involving FAO, Norad and the Institute of Marine Research (IMR), Bergen, Norway on assessment and management of marine fishery resources in developing countries. The project works in partnership with governments and also GEF-supported Large Marine Ecosystem (LME) projects and other projects that have the potential to contribute to some components of the EAF-Nansen project.

The EAF-Nansen project offers an opportunity to coastal countries in sub-Saharan Africa, working in partnership with the project, to receive technical support from FAO for the development of national and regional frameworks for the implementation of Ecosystem Approach to Fisheries management and to acquire additional knowledge on their marine ecosystems for their use in planning and monitoring. The project contributes to building the capacity of national fisheries management administrations in ecological risk assessment methods to identify critical management issues and in the preparation, operationalization and tracking the progress of implementation of fisheries management plans consistent with the ecosystem approach to fisheries.

LE PROJET EAF-NANSEN

La FAO a initié la mise en oeuvre du projet "Renforcement de la base des connaissances pour mettre en œuvre une approche écosystémique des pêcheries marines dans les pays en développement (EAF-Nansen GCP/INT/003/NOR)" en décembre 2006. Le projet est financé par de l'Agence norvégienne de coopération pour le développement (Norad). Le projet EAF-Nansen fait suite aux précédents projets/ programmes dans le cadre du partenariat entre la FAO, Norad et l'Institut de recherche marine (IMR) de Bergen en Norvège, sur l'évaluation et l'aménagement des ressources halieutiques dans les pays en développement. Le projet est mis en oeuvre en partenariat avec les gouvernements et en collaboration avec les projets grands écosystèmes marins (GEM) soutenus par le Fonds pour l'Environnement Mondial (FEM) et d'autres projets régionaux qui ont le potentiel de contribuer à certains éléments du projet EAF-Nansen.

Le projet EAF-Nansen offre l'opportunité aux pays côtiers de l'Afrique subsaharienne partenaires de recevoir un appui technique de la FAO pour le développement de cadres nationaux et régionaux visant une approche écosystémique de l'aménagement des pêches et la possibilité d'acquérir des connaissances complémentaires sur leurs écosystèmes marins. Ces éléments seront utilisés pour la planification et le suivi des pêcheries et de leurs écosystèmes. Le projet contribue à renforcer les capacités des administrations nationales responsables de l'aménagement des pêches en introduisant des méthodes d'évaluation des risques écologiques pour identifier les questions d'aménagement d'importance majeure ainsi que la préparation, la mise en œuvre et le suivi des progrès de la mise en œuvre de plans d'aménagement des ressources marines conformes à l'approche écosystémique des pêches.



2007 BENEFIT SURVEY NO. 4

TRANSBOUNDARY SURVEY BETWEEN NAMIBIA AND SOUTH AFRICA WITH FOCUS ON SPAWNING AND THE EARLY LIFE HISTORY OF HAKES

Cruise Report No 4 2007

30 March – 19 April 2007

by

Erling Kåre Stenevik[1)], Hans Verheye[2)], Marek Lipinski [2)], Larry Hutchings[2)], John Field[3)], Lara Jane Atkinson[3)], Samuel Kakambi Mafwila[2)] and Oddgeir Alvheim[1)]

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Bergen, May 2007

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1 Introduction

Given the importance of *Merluccius paradoxus* for the South-African and Namibian fisheries surprisingly little is known about the early life stages of the species. There are anecdotal information on spawning grounds (Crawford *et al*., 1987; Hutchings *et al*., 2002) and some information on peak spawning periods is also gathered from the fisheries (B. Rose, Irvin and Johnson, Cape Town, unpublished data and pers. comm.), but systematic collection of information on spawning and eggs and larvae are missing. It is well established through surveys (Le Clus *et al*., 2005) that the area between Hondeklip Bay and Orange River holds large amount of juvenile fish and this is also the only area where small *M. paradoxus* less than 5 cm is encountered in the bottom trawl (Strømme *et al*., 2005). The survey carried out in February March 2005 confirmed that the area north of Hondeklip held the smallest fish, and as it grew bigger it diffused or migrated 'omnidirectional' from this site. That the area between Hondeklip Bay and Orange River forms the main nursery area for the *M. paradoxus* seems quite evident.

However, where the main spawning grounds are and what drift mechanisms the eggs and larvae utilises to reach the nursery ground are still not well understood. Also the annual spawning cycle of the stock needs an improved understanding. To put more ight upon this question and to be able to describe the full lifecycle of the species was the overall objective of the survey documented here.

The impacts of demersal trawl fishing on benthic macrofauna and demersal fish communities are poorly understood in South Africa and Namibia. In developing an ecosystem approach to fisheries management for demersal trawling, the largest fishery sectors in both South Africa and Namibia, there is an urgent need to investigate the interactions between fishing activity, fishing pressures and their impacts on benthic and fish communities. The impact of trawling on the benthic habitat and biota has been identified to be a major threat to sustainability of the demersal fishery and is urgently required to be addressed in terms of the commitment to an Ecosystem Approach to Fishing.

The NORSA Project 3004, initiated during the RV *Dr. Fridtjof Nansen* Cruise 404, aims to quantify the effects of trawling on the species composition, diversity, abundance and biomass of benthic macrofauna (from benthic grab samples and invertebrates retained in the trawl net) and fish assemblages (from trawls) in the southern Benguela region.

Specific objectives of the cruise were:

1. To plan and conduct a transboundary survey between Cape Agulhas and Lüderitz to produce distribution and abundance maps of eggs and larvae from *M. capensis* and *M. paradoxus*. Approximate age of eggs and larvae will be determined during the survey in order to assist in the tracing of the geographical origin of the spawning.

2. To sample the adult population of *M. paradoxus* at the outer shelf and slope to check for maturity stages in order to localise spawning grounds geographically.

3. To check the gonadosomatic index of a representative sample of the females in order to backcalulate the main spawning period.

4. To collect relevant environment data to better understand the environmental impact on the distribution of hakes and on the drift lanes for eggs and larvae. Possible retention mechanisms that would facilitate aggregation of post larvae close to the nursery grounds will be looked for.

5. To collect genetic samples of the two species of hake at adult and juvenile stage, to look for genetic robust identifiers to assist in the species differentiation of eggs and larvae.

6. Collect benthic samples to study the effects of trawling on the species composition, diversity, abundance and biomass of benthic macrofauna (from benthic grab samples and invertebrates retained in the trawl net) and fish assemblages (from trawls)

2 Materials and methods

2.1 Registration of weather conditions

The underway weather data aboard Dr. Fridtjof Nansen are logged with the Aanderaa Weather Station unit fitted with the following sensors:

Sensor type	Measurement units
Air temperature	Degrees °C
Wind speed	M/s
Solar radiation	W/m^2

Wind direction	Degrees re. the magnetic N. Pole
Sea surface temperature	Degrees °C

All sensors but Sea surface temperature (SST) are mounted on a mast positioned midships, at about 20 meters above the sea level. The SST sensor is located at the intake of the water for cooling the engine and its readings are representative to a water layer at about 5 meters below the sea level.

The weather station data were logged continuously throughout the survey. The results presented in this report are based on a standard output from the logging system comprising one nautical mile averages along the ship's track.

2.2 Hydrography

The data on temperature salinity and oxygen were collected with a CTD *Seabird 9 plus* probe between the surface and 10 meters off the bottom. CTDs were made at each trawl station.

2.3 Plankton sampling and processing

2.3.1 *Multinet plankton sampler*

Eggs, larvae and zooplankton were sampled with a Multinet plankton sampler from Hydrobios. The plankton sampler has 5 nets with a mesh size of 405 μm. The opening of the plankton sampler is 0.5 x 0.5 m. A flow meter was mounted in the opening of each net to measure the filtered volume. A Scanmar depth recorder with acoustic transmission to the vessel was mounted on top of the Multinet. The depth intervals used during this survey were 0 - 50 m, 50 – 100 m, 100 – 150 m, 150 – 200 m and 200 – 250 m.

2.3.2 *Processing of ichthyoplankton*

After removing the cups from the Multinet the samples were transferred into petri dishes and examined under a stereomicroscope. All fish larvae and fish eggs were removed from the sample and identified using the key of Olivar and Fortuño (1991). Since it is not possible to distinguish between the two hake species on the egg and larval stage, all hake eggs and larvae were preserved in either liquid nitrogen or 96% alcohol for genetic analyses. All fish larvae were counted and the standard length of hake larvae was measured before they were preserved. Fish eggs were identified, counted and staged and all hake eggs were removed from the sample and preserved.

2.4 Benthic sampling

Benthic sampling were completed at three study sites (one in Namibia and two in South Africa) during this research cruise (Table 1).

Table 1: Details of three benthic sampling sites

Site	**Benthic grabs (Co-ordinates)**		**Trawls (Co-ordinates)**	
	Heavily fished	**Lightly fished**	**Heavily fished**	**Lightly fished**
Namibia (south of Lüderitz)	27°46.5'S 14°41.91'E	27°48.9'S 14°46.43'E	27°45.7'S 14°41.7'E	27°48.8'S 14°46.0'E
Childs Bank	30°42.88'S 15°25.66'E	30°42.67'S 15°26.01'E	30°43.0'S 15°25.2'E	30°40.4'S 15°25.0'E
Cape Columbine	32°37.4'S 16°38.47'E	32°36.9'S 16°41.36'E	32°36.8'S 16°41.3'E	32°36.8'S 16°41.3'E

At each sampling site, a CTD meter was lowered into the water until approximately 5 m from the sea floor, providing a site specific water column profile of salinity, oxygen and temperature.

Benthic Grabs

Suitable benthic structure (sediment suitable for the grab to penetrate) was identified at each sampling site by means of studying the echosounder reading in the bridge. A Van Veen grab (Figure 2.1), with a surface area of 0.20 m^2, was attached to a winch and deployed, under tension, onto the seafloor. Five replicate grabs samples were taken at each sampling site in each of the heavily and lightly trawled areas. Five additional benthic grabs were taken after three research trawls had been completed in the lightly trawled areas of the Namibian site and Childs Bank, to assess the immediate effects of trawling on the macrofauna. It was not possible to conduct additional grab samples at the Cape Columbine site due to time restrictions. Once the Van Veen grab was retrieved on deck, a small trap door at the top of the grab was accessed to obtain 275 ml sediment samples for particle size analysis and organic content, labelled and frozen. The grab was then opened and all sediment washed into a 70 litre metal basin. The sediment volume was measured (litres) and then washed over two stacked sieves with mesh sizes of 10 mm (upper sieve) and 1 mm (lower sieve). All macrofauna >1 mm in size, retained by the sieves, were carefully placed into sample bottles, labelled and preserved in 96% ethanol. The ethanol in the samples was decanted and replaced with fresh ethanol (96%) solution 24-48 hours after initial collection, to ensure specimen preservation. Laboratory analyses will include washing the samples, sorting into common genera and transferring specimens into 1% phenoxatol (ethylenglycolmonophenylether) followed by further analyses to the lowest taxonomic level. Abundance, biomass (wet and dry mass) and average size of all benthic macrofauna will be recorded for the all samples.

Figure 2.1. Van Veen grab used for benthic sampling.

Demersal trawls

Three replicate trawls were conducted in heavily and lightly fished areas at three sampling sites (Namibia, Childs Bank and Cape Columbine). Except for two trawls in the lightly fished area of Childs Bank (reduced to 15 minutes due to rocky ground), each trawl was logged at 30 minutes bottom time. In addition, trawls were conducted in selected areas to look for spawning hake (Figure 3.2). Trawls were conducted during daylight hours between 07h00 and 18h00 local time (UTC+2). The procedure for sampling research trawls is fully described by Strømme (1992) but a brief description is provided here.

Fish:

All fish species in the trawl net were recorded for species composition by weight and numbers. The entire catch was sorted, species identified, length measured (total length) for key target species, weighed (kilograms), and recorded in the *Nan-Sis* database. Biological samples of target species were taken for some trawls, and included total length (cm), body weight (g), sex, reproductive stages and stomach samples. Reproductive stages were determined by an experienced person, and scored according to a five point classification scale. Genetic samples were taken from the target species

(especially *Merluccius paradoxus*). These were placed in foil with labels (including: station number, species, date, sex and gonad stage). Genetic samples were immediately frozen for later analysis.

Invertebrates:

All epibenthic invertebrate fauna were also collected from each trawl, sorted by species, identified (where possible), counted (abundance) and weighed (biomass). Any specimens for which the identification was unknown were labelled and preserved appropriately (either 96% ethanol or formalin) for further identification by specialists. Photographic records were kept of all invertebrate specimens occurring in each trawl.

Data Analysis

All data collected during this research cruise will be analysed for community composition, diversity, abundance and biomass using PRIMER software as part of two PhD studies in accordance with the NORSA Project 3004.

3 Narrative

The scientific staff consisted of:

From MCM, South Africa:

Marek R. Lipinski, Hans Verheye, Larry Hutchings, Sharon du Plessis

From UCT, South Africa

Lara Atkinson, John Field (until 12 April), Samuel Kakambi Mafwila

From NatMIRC, Namibia:

Victor Hashoongo (until 12 April), Twalinohamba Akawa, Erasmus Kakonya (from 12 April)

From IMR, Norway:

Erling Kåre Stenevik (cruise leader), Oddgeir Alvheim, Tore Mørk, Ann-Kristin Abrahamsen.

From UiO, Norway

Anne Lise Fleddum, Anders Bjørgesæter

From University of Bremen, Germany

Britta Grote

The cruise tracks with fishing and hydrographical stations are shown in Figures 3.1 and 3.2.

The vessel departed Walvis Bay at 18:00 on 30th March and headed south to start the sampling south of Lüderitz. The first days were dedicated to bottom sampling using bottom trawl and grab. When arriving at the first station at 05:00 on 1st April the bottom was surveyed to find proper ground for sampling. 8 grabs and three bottom trawl hauls were conducted on each of two positions representing a lightly and heavily trawled area respectively. During night time when bottom sampling was terminated Multinet hauls were conducted to look for hake eggs and larvae. At 22:00 on 1st April the trawling operations in this area was finished and the ship steamed southward to the first Multinet transect where we arrived at 15:00 on 2nd April. One and a half transects were sampled before arriving at the second bottom sediment station west of Childs Bank at 15:00 on 4th April. After surveying the bottom, grabbing started at 17:30 and continued with 10 grabs until midnight. Two Multinets were conducted during the night before trawling started in the heavily trawled area at 08:00 on 5th April. The bottom sampling was finished at midnight and the vessel steamed to take the last station on the Multinet line. Due to bad weather, however, it was not possible to take the station and we headed towards the outer station on the next line where we arrived on 6th April at 0730. The weather had calmed enough so that the plankton sampling could start. Work progressed with cross shelf sections with Multinet and occasional bottom trawl until early morning on the 12th when the ship headed for Cape Town to change some of the scientific staff. The ship docked from 09:00 to 15:00 after which we steamed north to resume station work with Multinet sections and bottom trawling. On 15th April at 18:00 there was a problem in the engine. The problem was so serious that it required the ship to immediately break of the survey and head for Cape Town at reduced speed. The survey ended at 34°54 S 18°20 E and we arrived Cape Town on 16th April at 07:30.

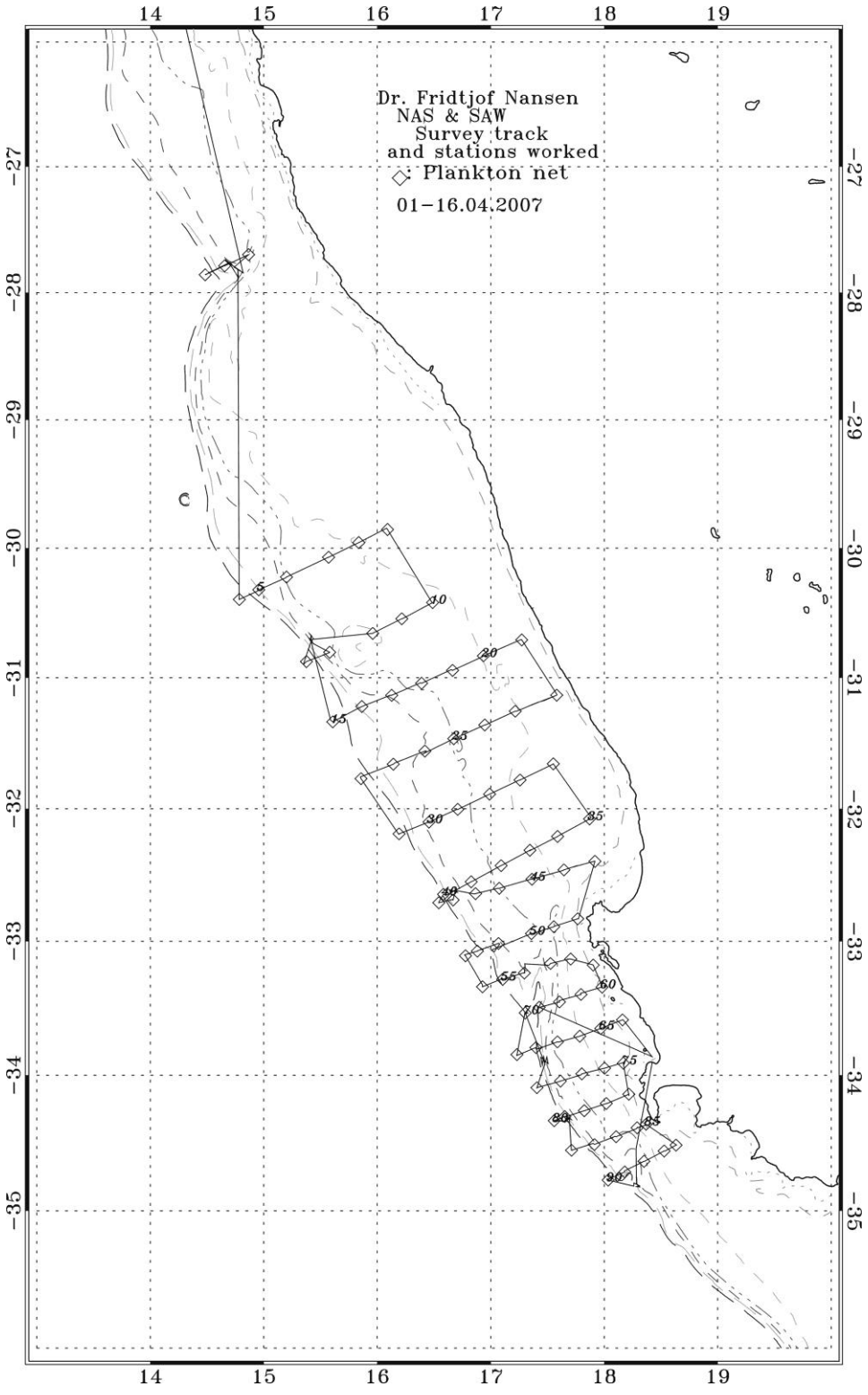


Figure 3.1. Plankton stations.

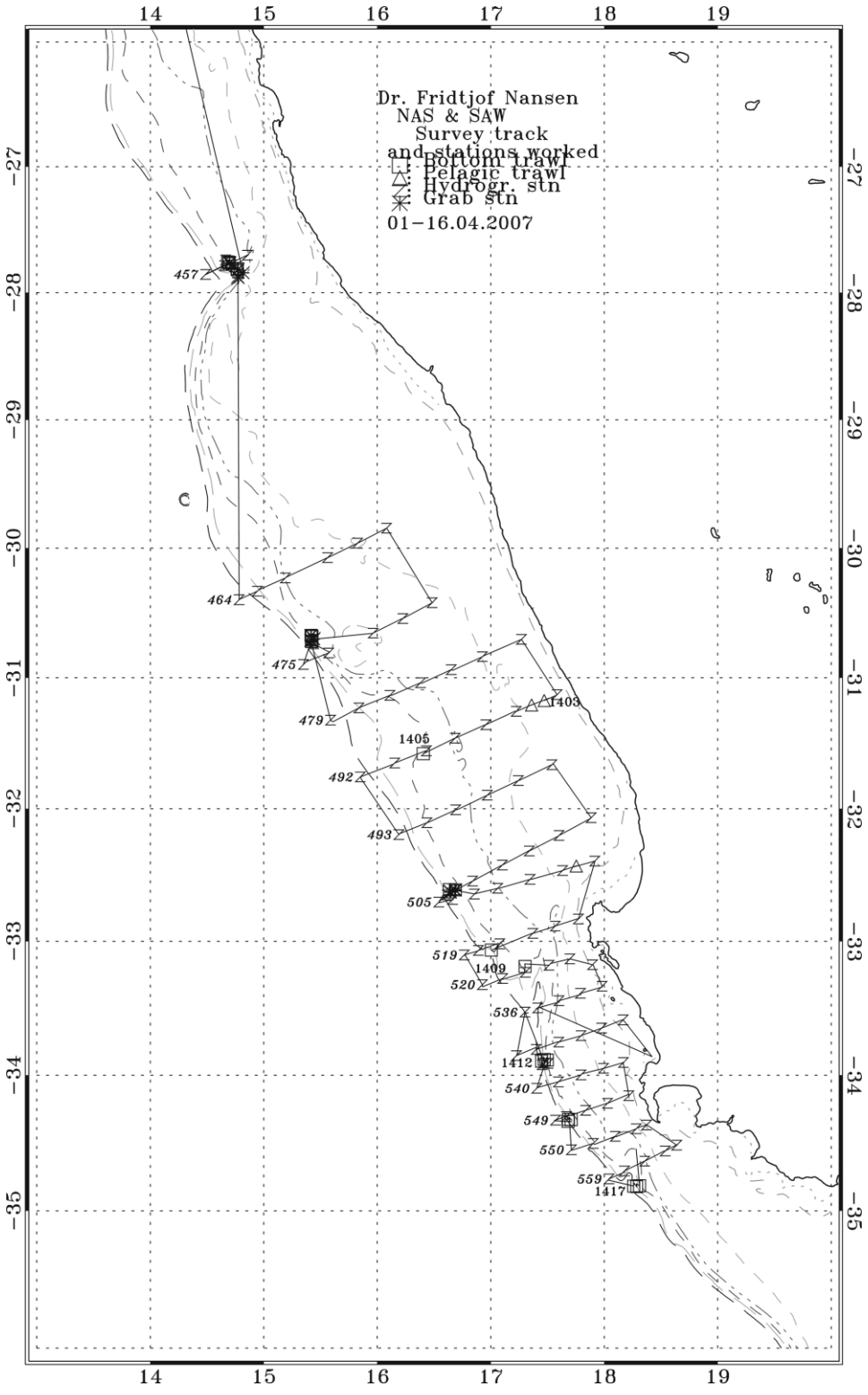


Figure 3.2. Hydrography, trawl and grab stations.

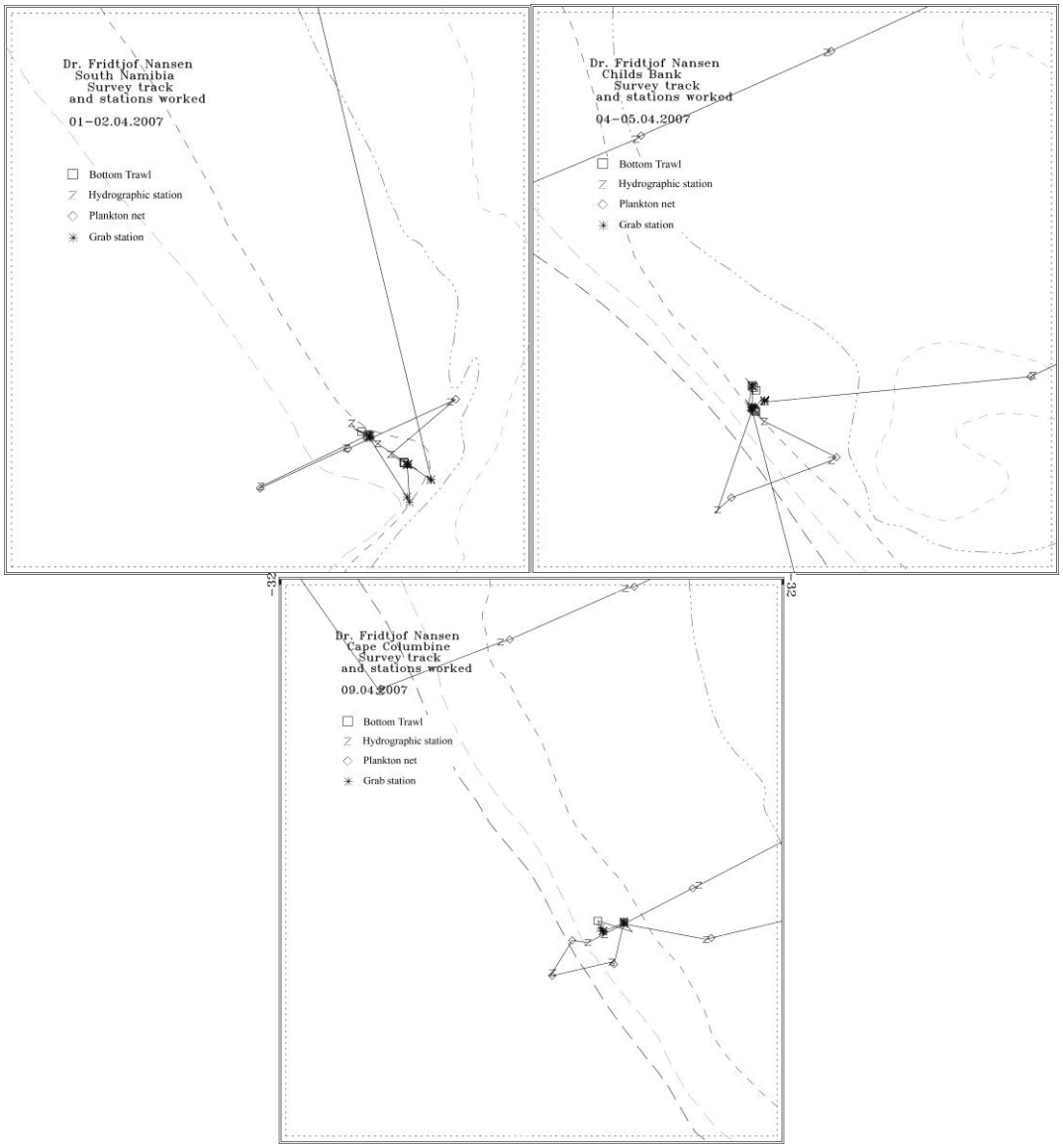


Figure 3.3. Benthic sampling stations south of Lüderitz (upper left panel), west of Childs Bank (upper right panel) and off Cape Columbine (lower panel).

4 Results and Discussion

4.1 Hydrography

The cruise was partitioned into two, with benthic investigations at Lüderitz (28^{o}S) and Childs Bank 31(^{o}S) and hake larval sampling from 30^{o}S to Cape Point at 34^{o}S. on 14 transects between the 100m and 1400m isobaths.

Winds

Calm, windless conditions (Fig.4.1) prevailed for the first part of the cruise, with little swell, allowing benthic grabs to be successfully completed. A moderate southerly wind blew for one day and then

declined, followed by calms, then a gentle NW and westerly winds for the remainder of the voyage. These are normal conditions for the end of the summer upwelling season.

Satellite imagery

With little active upwelling, cool water was confined to a narrow strip close inshore, with relatively warm water over most of the shelf, typical of autumn months of April – June (Fig. 4.2.). A convoluted front with weak gradients occurred offshore at about the 1000m isobath, with a moderate mesoscale eddy at 31^{o}S. Low phytoplankton concentrations were observed over most of the shelf with higher concentrations close inshore (Fig. 4.3.). Two large filaments of pigments extended offshore from Cape Columbine (32 ^{o}S) and Hondeklip Baai (30^{o}S). The front was very close inshore off Cape Point.

Vertical sections

Most of the inshore-offshore sections on the west coast, north of 32^{o}S, showed a stable surface layer with marked, shallow thermoclines (Fig.4.4, S. of Lüderitz and Lines 1-7 RSA) . A subsurface shallow salinity maximum indicated some upwelling prior to the survey, followed by sunwarming of the upper mixed layer. Dissolved oxygen values were less than 2 ml/l inshore, but less than 1 ml/l in St Helena bay (transect 7). Offshore, dissolved oxygen levels were high from surface to bottom and no potential barrier to organisms.

South of Cape Columbine (33^{o}S) to Cape Point (34^{o}S), vertically orientated isohalines and steeply sloping isotherms indicated recent upwelling, with the southernmost transects showing relaxation of the upwelling again in the upper layers, following westerly winds and shoreward movement of the warm surface layers (Fig. 4.4, lines 8-11). Some evidence of an upwelling front and the associated northward-flowing jet current could be seen from lines 6 (33^{o}S) to line14 (35^{o}S), lying over the 200-300m isobath in the south and over the 300-400m isobath further north.

A longshore section of the temperature, salinity and oxygen over the 300-400m isobaths (Fig. 4.5) indicated no marked alongshore gradients in water masses close to the bottom, from Lüderitz to Cape Point. Bottom temperatures at 300-400m ranged from 6-8^{o}C, bottom salinities from 34.6 to 34.8 and 3.5 to 4.0 ml/l dissolved oxygen. This indicates that no low oxygen, high salinity central water, derived from the western south Atlantic via the Angolan Basin, was present along the shelf, but well ventilated South Atlantic “eastern” Central water from the Cape Basin was present along the shelf at depths favoured by hakes.

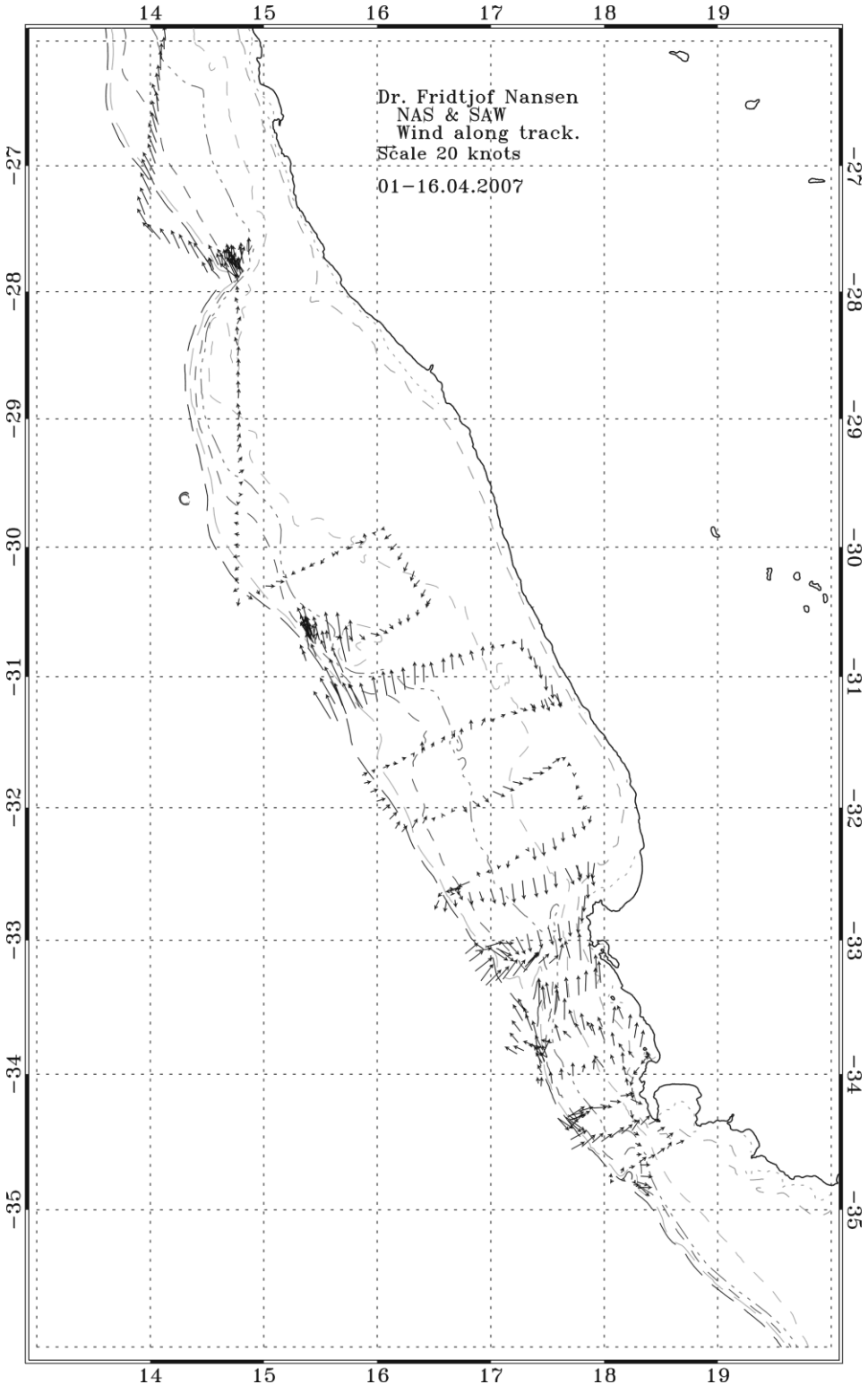


Fig. 4.1. Wind along track.

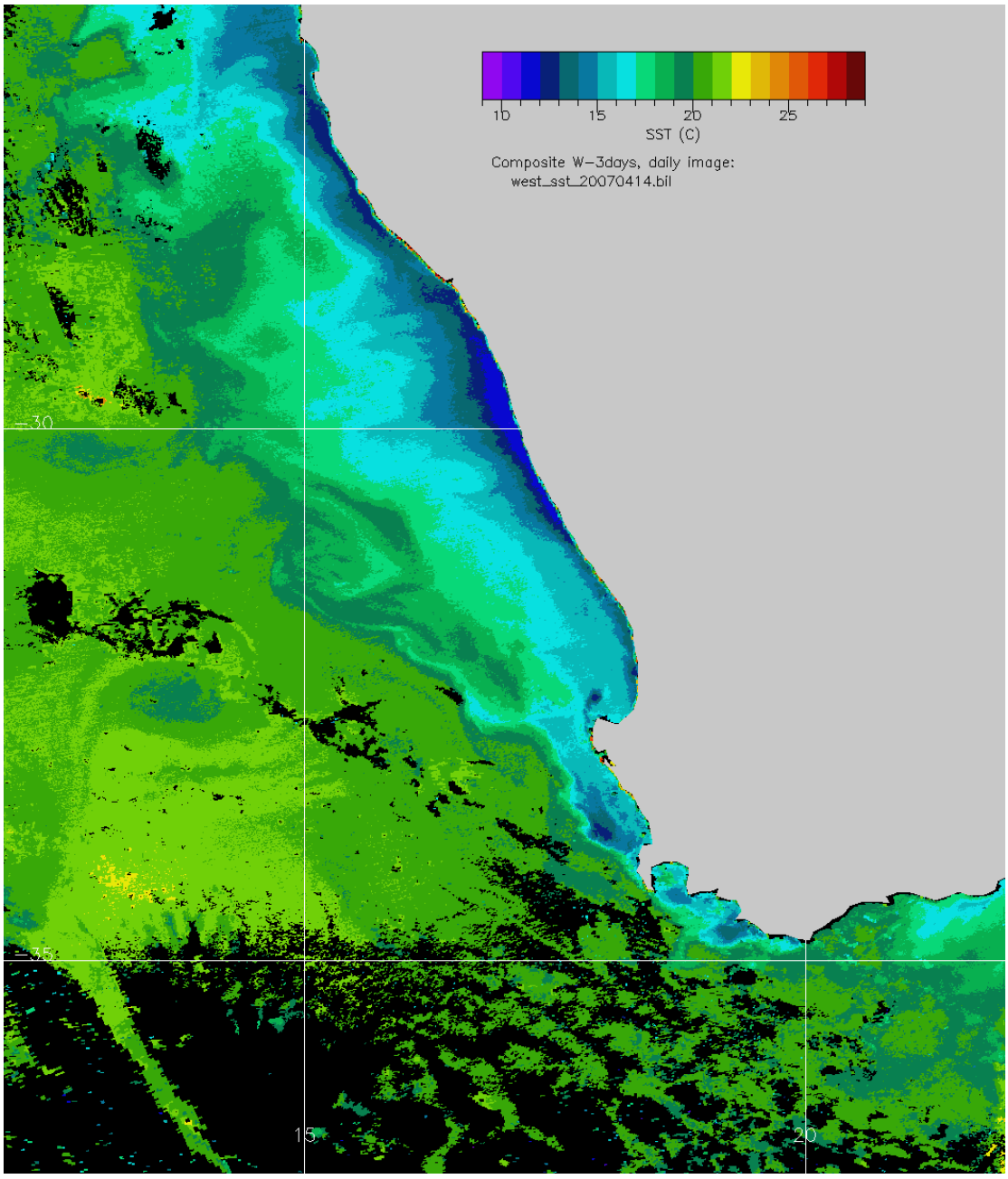


Fig. 4.2. Surface temperature for 14-04-2007.

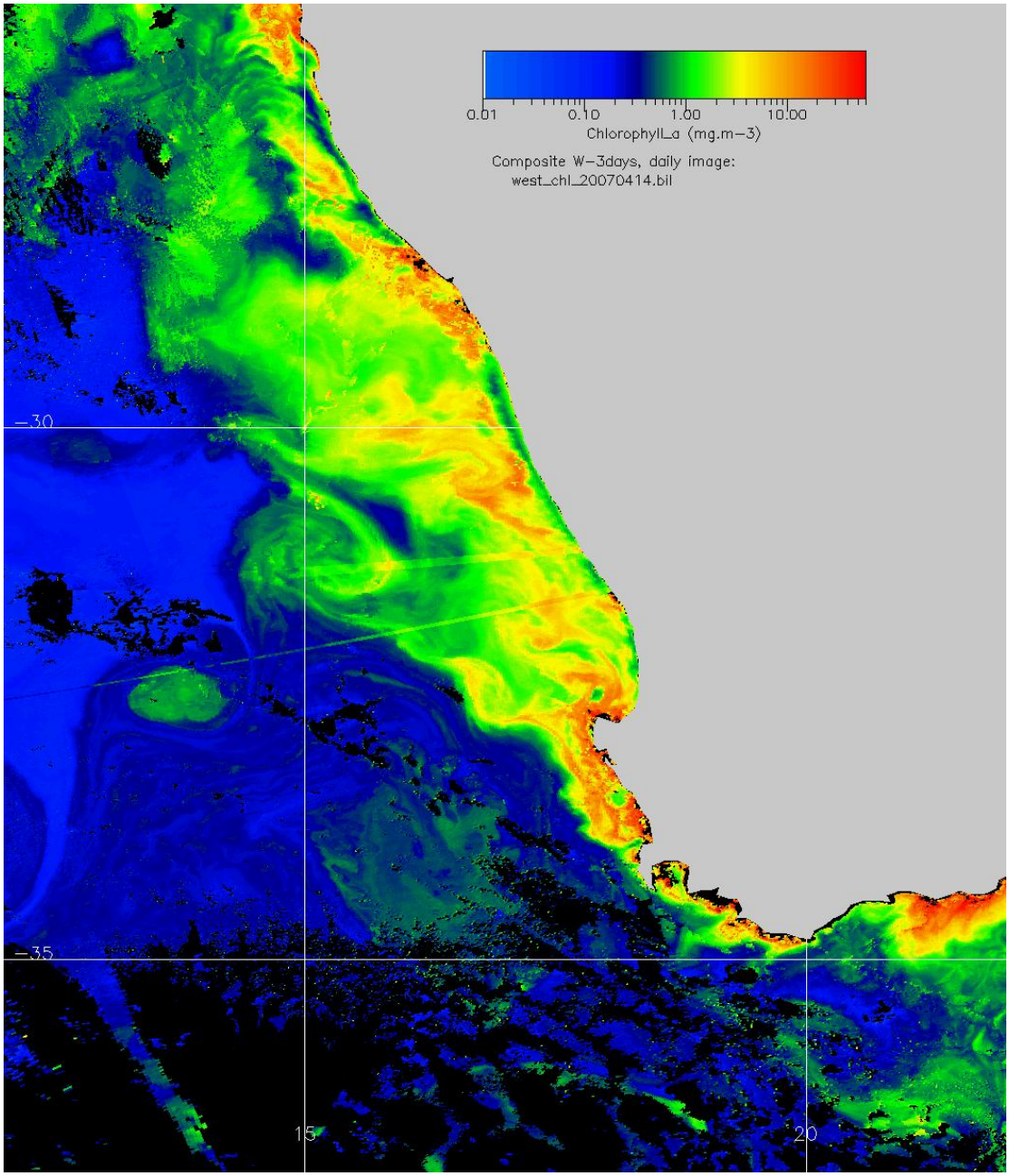
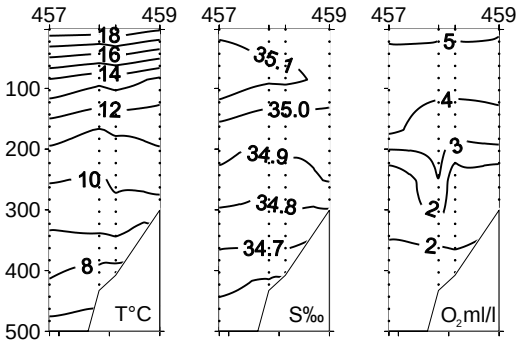
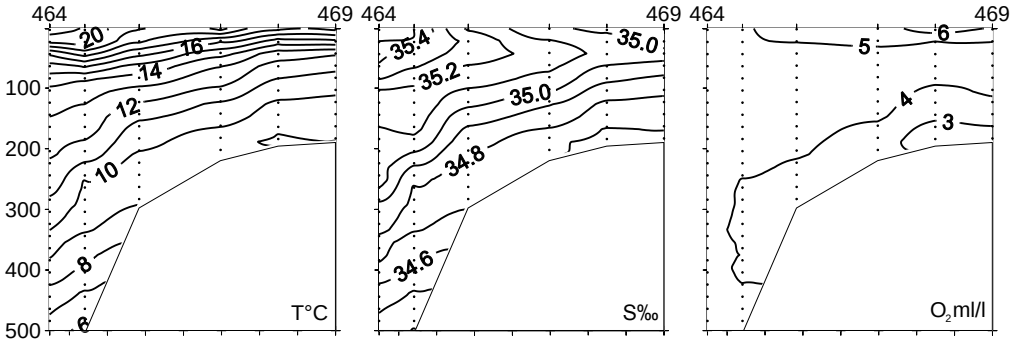


Fig. 4.3. Chlorophyll a distribution for 14-04-2007.





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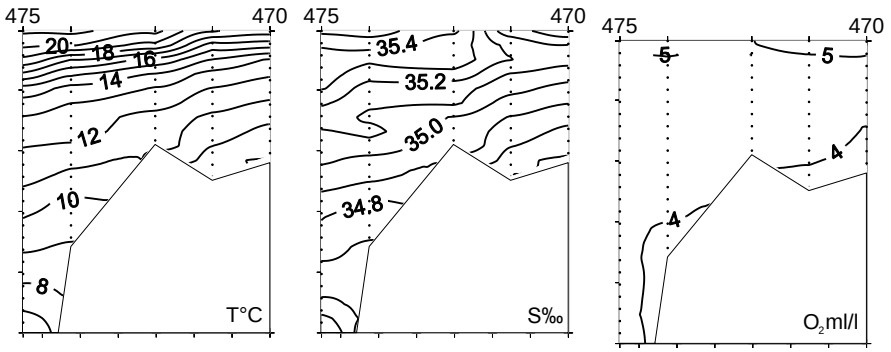

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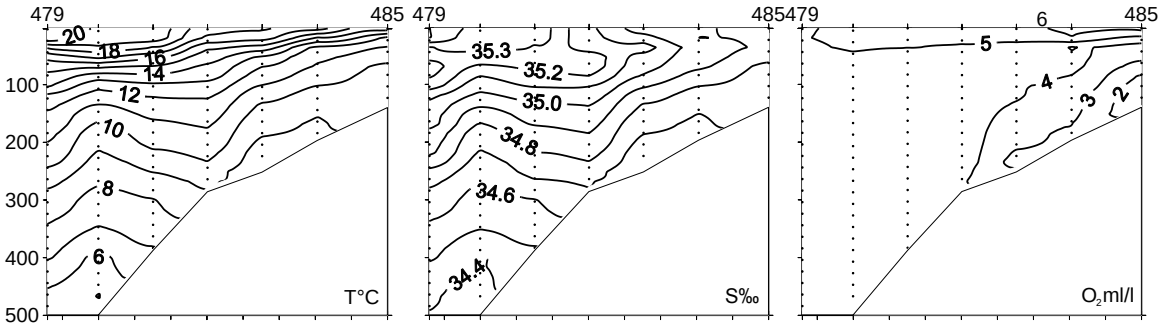

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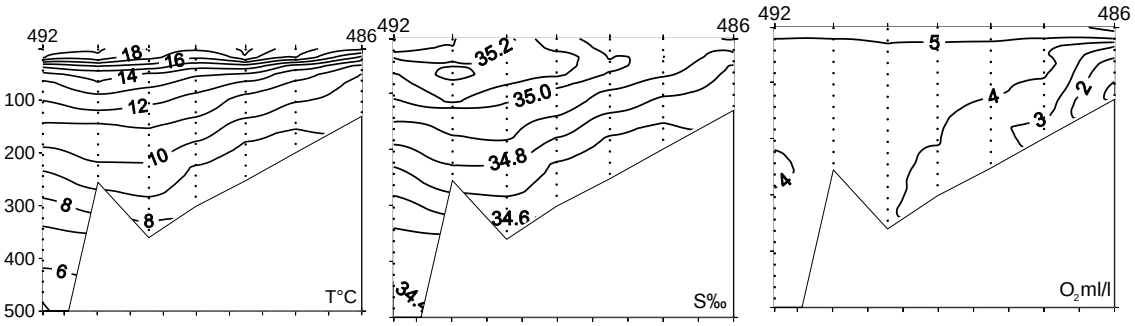

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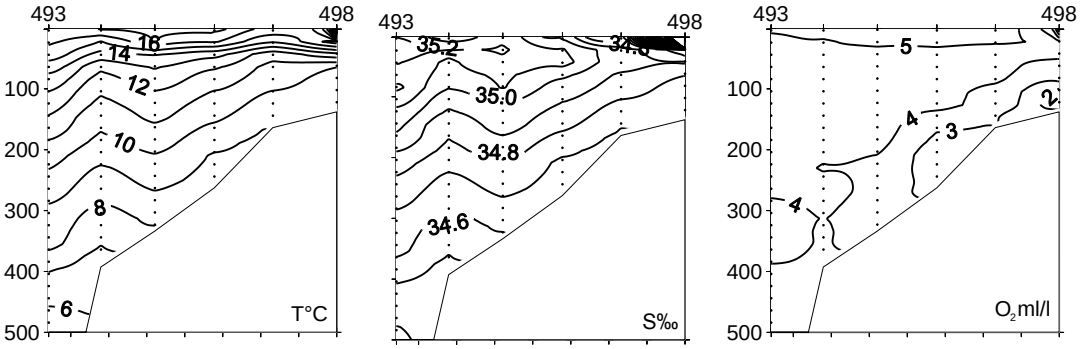

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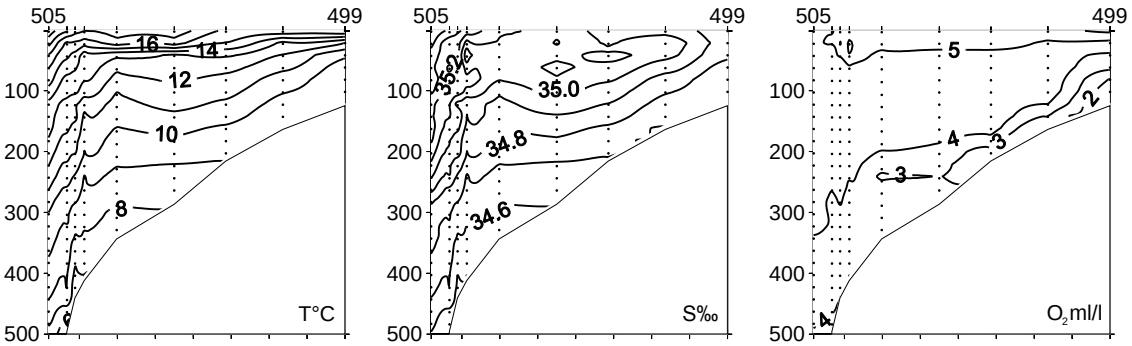

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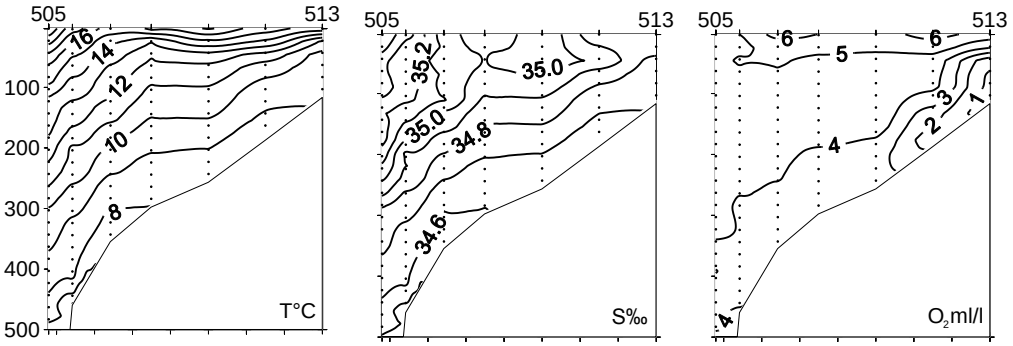

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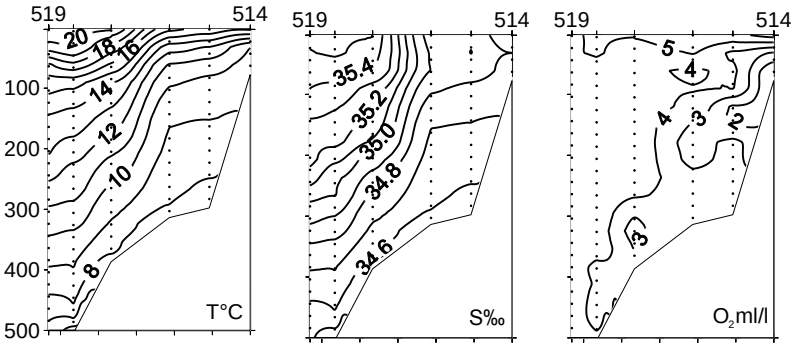

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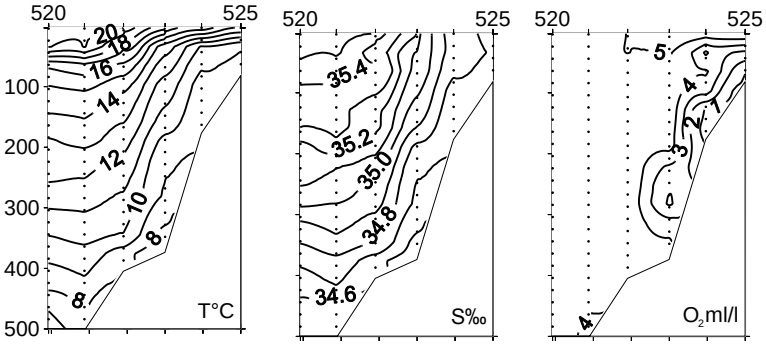

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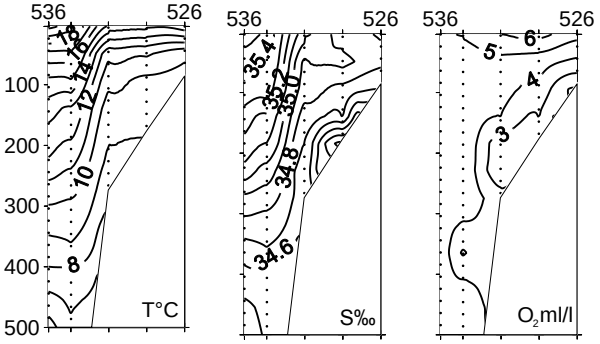
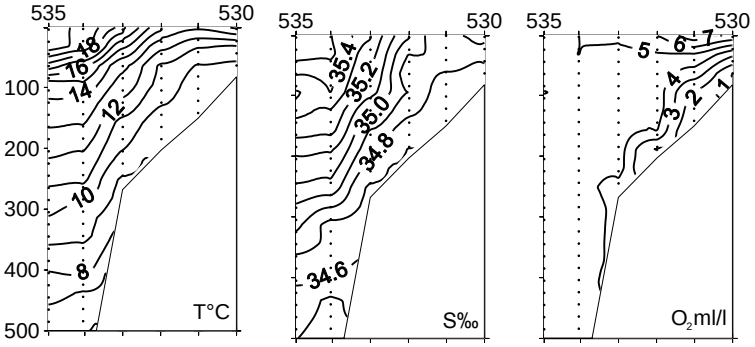
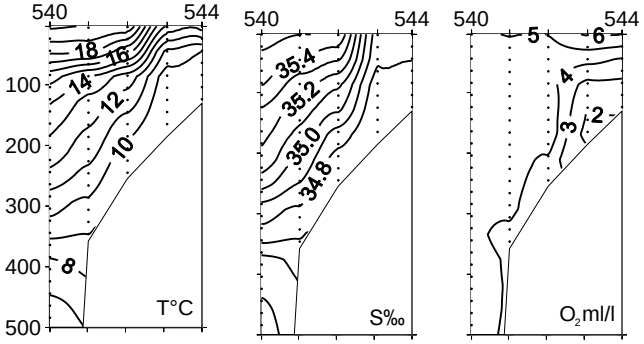


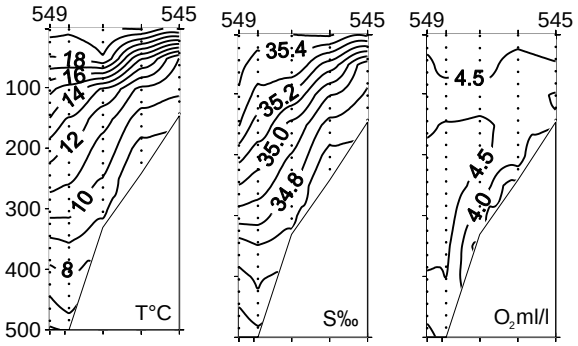
Line 10 RSA – 11-12.04.2007



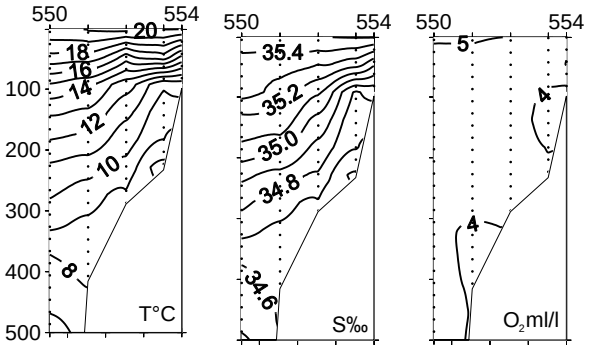
Line 11 RSA – 12-13.04.2007



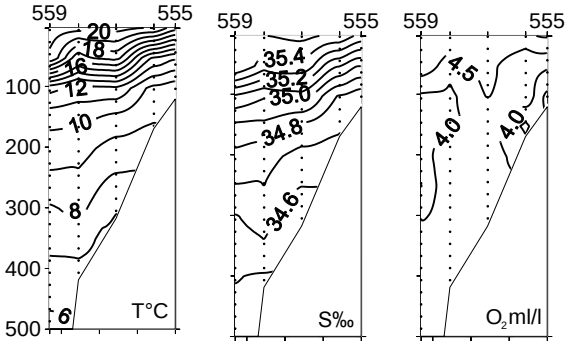
Line 12 RSA – 13-14.04.2007



Line 13 RSA – 14.04.2007



Line 14 RSA – 14.04.2007



Line 15 RSA – 15.04.2007

Fig.4.4. Temperature, salinity and dissolved oxygen sections.

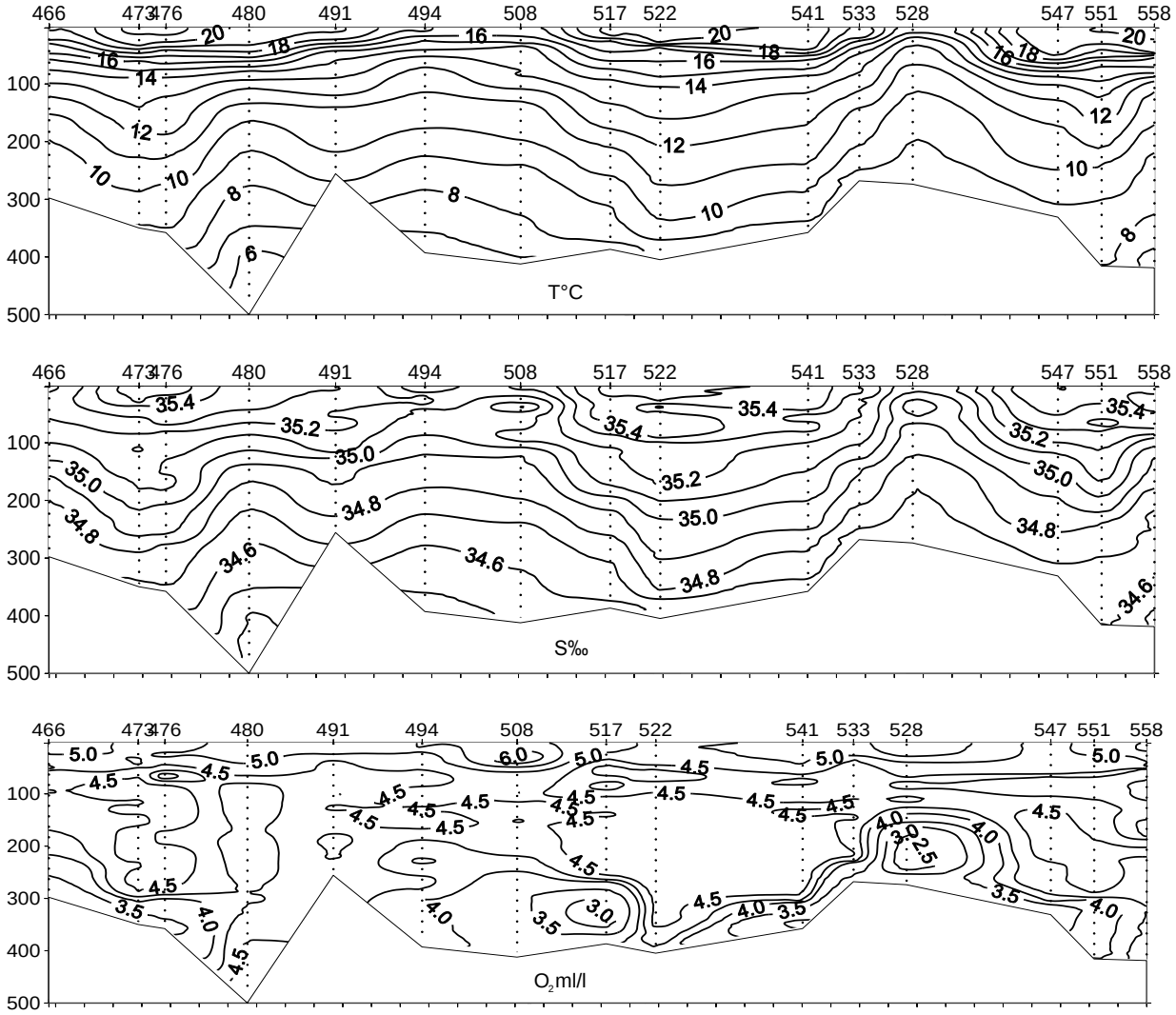


Fig. 4.5. Longshore N-S sections at 300-400m for temperature, salinity and oxygen.

4.2 Ichthyoplankton

For the purpose of this cruise report, only results for hake eggs and larvae obtained from onboard microscope analysis of Multinet collections are considered. Table 2 provides a summary of the presence and abundance of hake eggs and larvae collected in the upper 250 m (usually stratified in five 50-m depth layers) of the water column. It is currently impossible to identify the eggs and larvae of the two hake species, *M. capensis* and *M. Paradoxus*, at sea without genetic analysis, hence the data presented here do not distinguish between the two species. In addition, it should be noted that it is very likely that the area of distribution of both eggs and larvae was only partially covered owing to the survey being curtailed due to engine problems.

All hake eggs and larvae were observed in the southern part of the survey grid (south of 32°30'S), similar to the distribution pattern in October 2005. During April 2007, hake larvae were distributed between 34°S and 35°S, off the Cape Peninsula, whereas eggs were more widely distributed, between

32°30'S and 34°30'S. The highest abundance of eggs (55 eggs 10 m^{-2}) was observed at station PL84, while larval abundance peaked at station PL 85, both stations being located in the inshore region off Cape Point.

Table 2: List of Plankton & CTD stations and Multinet depth strata where Hake eggs and larvae were collected. Abundances are in No. per m^3 per depth stratum, and in No. per 10 m^2 in the upper 250 m for each station.

PL Stat. No.	CTD Stat. No.	Lat. S deg.	Lat. min.	Long. E deg.	Long. min.	Depth strata	Eggs No. m^{-3}	Larvae No. m^{-3}	**Eggs No. 10 m^{-2}**	**Larvae No. 10 m^{-2}**
40	504	-32	38.8	16	35.0	50-0m	0.012	0.000	**6.11**	**0.00**
42	506	-32	41.4	16	40.1	50-0m	0.010	0.000	**4.86**	**0.00**
51	517	-33	1.0	17	4.1	100-50m	0.065	0.000	**32.36**	**0.00**
52	518	-33	4.4	16	52.9	50-0m	0.016	0.000	**7.91**	**0.00**
56	522	-33	14.2	17	17.8	200-150m 150-100m 100-50m	0.013 0.016 0.051	0.000 0.000 0.000	**40.01**	**0.00**
76	545	-34	8.4	18	12.9	50-25m 25-0m	0.184 0.000	0.026 0.070	**45.93**	**24.15**
77	546	-34	12.5	18	1.1	150-100m	0.037	0.000	**18.57**	**0.00**
78	547	-34	15.6	18	50.1	100-50m	0.000	0.016	**0.00**	**8.24**
83	552	-34	27.3	18	6.3	50-0m	0.000	0.017	**0.00**	**8.35**
84	553	-34	23.3	18	17.3	100-50m 50-0m	0.064 0.095	0.000 0.000	**55.63**	**0.00**
85	554	-34	21.7	18	22.7	75-50m 50-2 m	0.000 0.000	0.026 0.082	**0.00**	**26.92**
86	555	-34	30.9	18	37.9	50-25m	0.000	0.095	**0.00**	**23.70**
87	556	-34	33.5	18	31.6	157-100m	0.023	0.000	**13.23**	**0.00**
88	557	-34	38.2	18	21.0	50-0m	0.000	0.019	**0.00**	**9.58**

Densities never exceeded 0.2 eggs m^{-3} and 0.1 larvae m^{-3} in any depth layer, while integrated abundances were < 60 eggs 10 m^{-2} and <30 larvae 10 m^{-2} in the upper 250 m of the water column at anyone station. This indicates that low spawning activity of hake took place during this survey. This is

in contrast to a similar survey conducted in the same area during October 2005 when peak abundances of 341 – 411 eggs 10 m^{-2} and up to 72 larvae 10 m^{-2} were observed

There was no clear pattern in the vertical distribution of either the eggs or the larvae.

4.3 Fish Biology

Annex 1 shows the complete record of the fishing stations.

During the cruise 26 bottom trawls and 3 pelagic trawls were made. Genetics and maturity of *Merluccius paradoxus* were analyzed (663 individuals) from 14 bottom trawls. Also, 16 biological analyses of *M. paradoxus* were made.

General pelagic trawl results

Trawling depth varied from 20 to 100 m, and bottom depth from 137 to 182 m. There were no juvenile hakes in these catches. Species present were jelly (242 kg), *Maurolicus muelleri* (49 kg), *Trachurus capensis* juveniles (0.011 kg, 10 individuals of 5 cm Lt), and then single juveniles of *Helicolenus dactylopterus, Engraulis encrasicolus, Todarodes angolensis* and *Argonauta hians*.

General bottom trawl results

All trawls were made in deep waters: 344-553 m. Total catch was 9105.619 kg. During this particular cruise benthic fauna was also recorded to some detail, therefore number of items on the species list was on average far greater than during previous cruises, in some instances exceeding 50 entries. *Merluccius paradoxus* (main object of the survey) occurred in all bottom trawls (total catch of large fish was 1595 kg or 17.5% of the total catch; total catch of small fish was 2720.2 kg or 29.9 % of the total catch; juveniles were sporadic in only three trawls, 105 individuals weighing 1.067 kg). The background species for *M. paradoxus* surveys, *Helicolenus dactylopterus*, was present in all but two trawls. Catch of *M. capensis* was small (62 kg of 18 large individuals, i.e. 0.7% of the total catch). This result reinforces the view that large *M. capensis* in the area of research is scarce.

Length frequencies for *M. paradoxus* (pooled for the following categories: large and small in 300-400 m, 401-500 m and >500 m, and all juveniles i.e. 7 categories) and for *H. dactylopterus* (pooled together) are given in Figure 4.6.

Results of maturity analyses

There were no running *M. paradoxus* present in the catches. There were only two mature females (Fig. 4.7: photograph of the mature gonads; Fig. 4.8: positions of stations where these mature females

were found). In four surveys of Dr. Fridtjof Nansen, 4601 adult females of *M. paradoxus* were checked for maturity; only 12 individuals were found mature or running (spawning), i.e. 0.26%. This clearly indicates that either spawning is extremely patchy and/or fits into narrow temporal windows, or (as is more probable) occurs off the bottom and therefore bottom trawl can only scoop stray fish and this itself is rare. Figure 4.9 shows length distributions of main species caught in the bottom trawl.

Results of biological and genetics analyses

Genetic samples were transferred to the University of Stellenbosch; results are not available as yet. Likewise, otolith readings are not as yet available. Investigated fish were mostly adults; only one analysis of juveniles was done. These juveniles varied between 12 and 20 cm Lt and 3 out of 10 were feeding on euphausiids. Investigated adults varied between 34 and 78 cm. Maturity of females was mostly 5 and 6, therefore gonad weights were mostly small. Stomachs were mostly everted, therefore it is difficult to estimate feeding intensity. Food constituted mostly crustaceans (deepwater shrimps, *Funchalia woodwardi*, euphausiids), myctophids and *Lycoteuthis lorigera*).

Figure 4.7. Gonad stages of *M. paradoxus.* The two gonads to the left are mature.

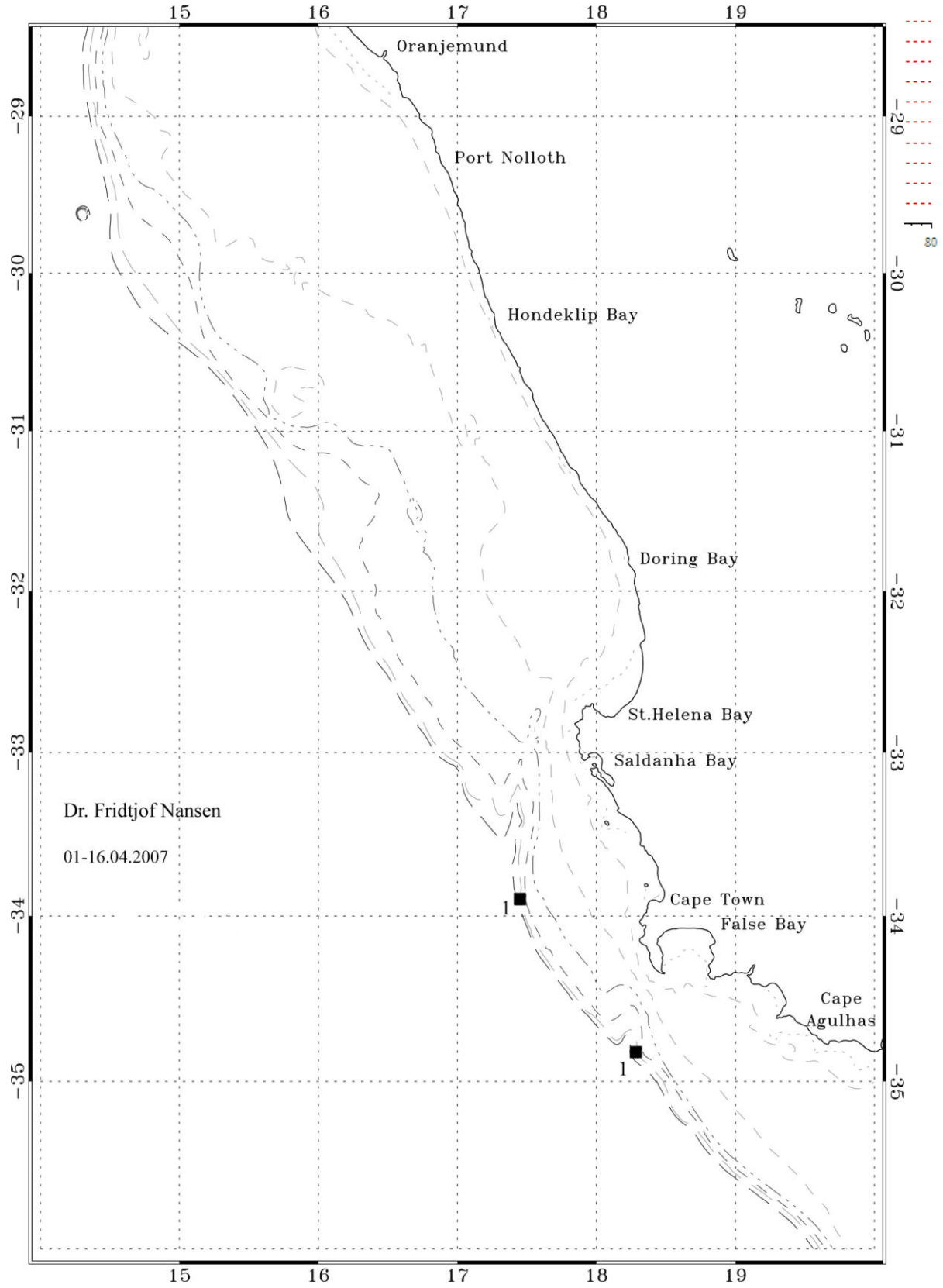


Figure 4.8. Location of the bottom trawl stations where mature *M. paradoxus* were caught.

5 References

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ANNEX RECORDS OF FISHING STATIONS

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1391
DATE :02/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 27°48.78
start stop duration Lon E 14°46.03
TIME :06:08:10 06:36:44 28.6 (min) Purpose : 3
LOG : 2644.20 2645.65 1.5 Region : 5030
FDEPTH: 435 452 Gear cond.: 0
BDEPTH: 435 452 Validity : 0
Towing dir: 0° Wire out : 1200 m Speed : 3.0 kn
Sorted : 167 Total catch: 166.62 Catch/hour: 349.92

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caelorinchus simorhynchus	75.60	945	21.61	
Shrimps, small, non comm.	45.93	0	13.13	
Bristle worms	45.93	0	13.13	
Merluccius paradoxus	37.80	229	10.80	6
Genypterus capensis	35.70	17	10.20	4
Merluccius paradoxus	25.20	34	7.20	1
Notacanthus sexspinis	14.70	294	4.20	
Plesionika martia	10.92	2004	3.12	
Todarodes angolensis, male	5.82	13	1.66	2
J E L L Y F I S H	5.04	0	1.44	
Nezumia sp.	5.00	153	1.43	
Hoplostethus cadenati	4.39	109	1.25	
Helicolenus dactylopterus	3.91	6	1.12	5
Photichthys argenteus	3.84	17	1.10	
Todarodes angolensis, female	2.86	4	0.82	3
Hydrolagus sp.	2.52	2	0.72	
Bassanago albescens	2.28	6	0.65	
Parapagurus dimorphus	2.08	0	0.59	
Promethichthys prometheus	2.06	2	0.59	
Malacocephalus laevis	2.02	4	0.58	
Starfish	1.81	0	0.52	
Lampanyctodes hectoris	1.64	0	0.47	
Parapagurus pilosimanus	1.58	0	0.45	
Epigonus sp.	1.11	101	0.32	
Whelks	1.11	25	0.32	
Ophichthus bennettai	1.09	2	0.31	
Stereomastis sp.	0.95	0	0.27	
Starfish	0.80	50	0.23	0
Lucigadus ori	0.69	50	0.20	
Anemones, white	0.64	11	0.18	
Psychrolutes macrocephalus	0.63	15	0.18	
Echinus gilchristi ?	0.62	15	0.18	
Heart urchin	0.47	15	0.13	
Myxine capensis	0.42	4	0.12	
Caelorinchus braueri	0.42	42	0.12	
Mursia cristimanus	0.37	4	0.11	
Physiculus capensis	0.36	50	0.10	
Symbolophorus boops	0.34	40	0.10	
PARALEPIDIDAE	0.34	2	0.10	
Hermits, mixed	0.34	36	0.10	
Gymnoscopelus sp.	0.19	17	0.05	
Bathophilus longipinnis	0.09	4	0.03	
Yarrella blackfordi	0.07	4	0.02	
Tripterophycis gilchristi	0.05	4	0.01	
Sea pens	0.05	2	0.01	
Paracallionymus costatus	0.05	6	0.01	
Stoloteuthis sp.	0.04	8	0.01	
Neoscopelus macrolepidotus	0.03	4	0.01	
Chaunax pictus	0.02	2	0.00	
Bathynectes piperitus	0.02	6	0.00	
Rochinia sp.	0.01	11	0.00	
Sepia sp.	0.01	4	0.00	
Argyropelecus aculeatus	0.01	2	0.00	
Total	349.92		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1392
DATE :02/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 27°48.69
start stop duration Lon E 14°45.94
TIME :07:43:58 08:12:49 28.9 (min) Purpose : 3
LOG : 2651.45 2652.79 1.3 Region : 5030
FDEPTH: 435 446 Gear cond.: 0
BDEPTH: 435 446 Validity : 0
Towing dir: 0° Wire out : 1200 m Speed : 2.8 kn
Sorted : 180 Total catch: 179.66 Catch/hour: 373.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	56.15	77	15.03	9
Bristle worms	55.11	0	14.75	
Shrimps, small, non comm.	53.84	0	14.41	
Caelorinchus simorhynchus	45.55	684	12.19	
Merluccius paradoxus	43.67	216	11.69	10
Genypterus capensis	38.47	15	10.30	7
Parapagurus dimorphus	17.03	0	4.56	
Notacanthus sexspinis	11.85	168	3.17	
Hydrolagus sp.	9.15	10	2.45	
Lophius vomerinus	8.32	2	2.23	8
Hoplostethus cadenati	4.87	108	1.30	
Parapagurus pilosimanus	3.83	0	1.02	
Starfish	3.41	0	0.91	
Nezumia sp.	3.22	158	0.86	
Plesionika martia	2.41	697	0.65	
Octopus magnificus	2.00	2	0.53	
Lampanyctodes hectoris	1.91	909	0.51	
Epigonus telescopus	1.48	171	0.40	
Hermits, mixed	1.39	83	0.37	
Todarodes angolensis, male	1.35	4	0.36	12
Stereomastis sp.	1.31	216	0.35	
Anemones, white	0.83	10	0.22	
Bassanago albescens	0.81	2	0.22	
Galeus polli	0.71	10	0.19	
Whelks	0.61	10	0.16	
Anemones, coral	0.48	2	0.13	
Symbolophorus boops	0.47	62	0.13	
Echinus gilchristi ?	0.40	6	0.11	
Helicolenus dactylopterus	0.40	2	0.11	11
Gymnoscopelus sp.	0.34	31	0.09	
Myxine capensis	0.33	2	0.09	
Yarrella blackfordi	0.28	19	0.07	
Lucigadus ori	0.27	21	0.07	
Photichthys argenteus	0.24	15	0.06	
Todaropsis eblanae, female	0.17	2	0.04	13
Tripterophycis gilchristi	0.16	8	0.04	
Physiculus capensis	0.11	15	0.03	
Photonectes braueri	0.10	4	0.03	
Neoscopelus macrolepidotus	0.08	8	0.02	
Rochinia sp.	0.07	15	0.02	
URCHINS	0.07	6	0.02	
Psychrolutes macrocephalus	0.05	4	0.01	
Sergia sp.	0.05	15	0.01	
PARALEPIDIDAE	0.04	2	0.01	
Chauliodus sloani	0.04	2	0.01	
Argyropelecus aculeatus	0.04	6	0.01	
Caelorinchus braueri	0.04	6	0.01	
Stoloteuthis sp.	0.03	10	0.01	
Mursia cristimanus	0.02	4	0.01	
Bathynectes piperitus	0.02	4	0.00	
CYPRAEIDAE (Bulia)	0.01	4	0.00	
Paracallionymus costatus	0.01	2	0.00	
Lycoteuthis lorigera	0.01	2	0.00	
Total	373.64		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1393
DATE :02/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 27°48.75
start stop duration Lon E 14°45.99
TIME :09:21:01 09:51:06 30.1 (min) Purpose : 3
LOG : 2658.20 2659.63 1.4 Region : 5030
FDEPTH: 435 453 Gear cond.: 0
BDEPTH: 435 453 Validity : 0
Towing dir: 0° Wire out : 1200 m Speed : 2.9 kn
Sorted : 162 Total catch: 161.57 Catch/hour: 322.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Shrimps, small, non comm.	94.22	0	29.24	
Merluccius paradoxus	39.08	44	12.13	15
Bristle worms	38.31	12421	11.89	
Genypterus capensis	35.89	16	11.14	14
Merluccius paradoxus	33.90	152	10.52	16
Caelorinchus simorhynchus	21.93	219	6.81	
Notacanthus sexspinis	15.95	261	4.95	
J E L L Y F I S H	7.98	0	2.48	
Lophius vomerinus	6.58	2	2.04	17
Hoplostethus cadenati	5.98	158	1.86	
Parapagurus pilosimanus	3.51	0	1.09	
Starfish	2.67	0	0.83	
Lampanyctodes hectoris	1.99	0	0.62	
Todarodes angolensis, female	1.83	4	0.57	19
Nezumia sp.	1.71	96	0.53	
Todarodes angolensis, male	1.54	4	0.48	18
Epigonus sp.	1.08	132	0.33	
Photichthys argenteus	0.88	44	0.27	
Gymnoscopelus sp.	0.84	76	0.26	
Whelks	0.82	16	0.25	
Echinus gilchristi ?	0.81	16	0.25	
Hermits, mixed	0.76	20	0.24	
Anemones, white	0.73	10	0.23	
Stereomastis sp.	0.60	108	0.19	
Promethichthys prometheus	0.40	4	0.12	
Yarrella blackfordi	0.34	20	0.11	
Etmopterus brachyurus	0.26	2	0.08	
Symbolophorus boops	0.21	26	0.06	
Malacocephalus laevis	0.19	4	0.06	
Neoscopelus macrolepidotus	0.18	18	0.06	
Physiculus capensis	0.16	10	0.05	
Spatangus capensis	0.16	4	0.05	
Heart urchin	0.15	20	0.05	
Galeus polli	0.14	2	0.04	
Rochinia sp.	0.07	10	0.02	
Photonectes braueri	0.07	2	0.02	
Tripterophycis gilchristi	0.06	6	0.02	
Chauliodus sloani	0.06	2	0.02	
Stoloteuthis sp.	0.04	10	0.01	
Sergia sp.	0.03	8	0.01	
Anemones, coral	0.02	2	0.01	
Caelorinchus braueri	0.02	6	0.01	
Paracallionymus costatus	0.02	22	0.01	
Psychrolutes macrocephalus	0.01	2	0.00	
Sepia sp.	0.01	4	0.00	
Total	322.18		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1394
DATE :02/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 27°45.72
start stop duration Lon E 14°41.73
TIME :11:29:01 11:58:57 29.9 (min) Purpose : 3
LOG : 2667.99 2669.51 1.5 Region : 5030
FDEPTH: 404 409 Gear cond.: 0
BDEPTH: 404 409 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 3.0 kn
Sorted : 763 Total catch: 762.56 Catch/hour: 1528.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	484.97	752	31.74	20
J E L L Y F I S H	305.61	0	20.00	
Merluccius paradoxus	282.57	1820	18.49	22
Caelorinchus simorhynchus	150.30	15579	9.84	
Genypterus capensis	130.26	72	8.52	21
Parapagurus pilosimanus	95.39	4770	6.24	
Anemones, white	28.26	0	1.85	
Lophius vomerinus	14.03	4	0.92	23
Starfish	4.81	0	0.31	
Shrimps, small, non comm.	4.81	0	0.31	
Helicolenus dactylopterus	4.41	24	0.29	24
Lucigadus ori	3.61	226	0.24	
Todarodes angolensis, female	2.75	6	0.18	26
Holohalaelurus regani	2.40	10	0.16	
Whelks	2.28	36	0.15	
Todarodes angolensis, male	1.80	4	0.12	25

Lycoteuthis lorigera	1.58	26	0.10	
Bassanago albescens	1.52	4	0.10	
Gymnoscopelus sp.	1.08	84	0.07	
Scopelosaurus meadi	0.98	30	0.06	
Physiculus capensis	0.92	76	0.06	
Epigonus sp.	0.90	100	0.06	
Photichthys argenteus	0.44	26	0.03	
Paracallionymus costatus	0.36	20	0.02	
Bathynectes piperitus	0.24	20	0.02	
Bassanago albescens	0.22	6	0.01	0
Anemones, coral	0.21	2	0.01	
Malacocephalus laevis	0.20	4	0.01	
Hermits, mixed	0.19	12	0.01	
Symbolophorus boops	0.16	20	0.01	
Lampanyctodes hectoris	0.16	0	0.01	
Tripterophycis gilchristi	0.15	12	0.01	
Argyropelecus aculeatus	0.10	2	0.01	
PARALEPIDIDAE	0.08	8	0.01	
Hoplostethus cadenati	0.07	2	0.00	
Rochinia sp.	0.06	8	0.00	
Hoplostethus mediterraneus	0.05	2	0.00	
Stoloteuthis sp.	0.05	14	0.00	
PORIFERA (Sponges)	0.05	0	0.00	
Stereomastis sp.	0.04	8	0.00	
Electrona risso	0.03	6	0.00	
ARGENTINIDAE	0.03	2	0.00	
Sepia hieronis	0.02	2	0.00	
Sternoptyx diaphana	0.00	2	0.00	
Total	1528.17		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1395
DATE :02/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 27°45.39
start stop duration Lon E 14°41.01
TIME :13:14:24 13:44:18 29.9 (min) Purpose : 3
LOG : 2672.64 2674.21 1.6 Region : 5030
FDEPTH: 406 408 Gear cond.: 0
BDEPTH: 406 408 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 3.2 kn
Sorted : 684 Total catch: 684.00 Catch/hour: 1373.04

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	566.08	881	41.23	27
J E L L Y F I S H	319.17	0	23.25	
Caelorinchus simorhynchus	126.46	1859	9.21	
Merluccius paradoxus	110.40	680	8.04	28
Genypterus capensis	94.35	44	6.87	29
Parapagurus pilosimanus	71.46	0	5.20	
Anemones, white	39.71	0	2.89	
Shrimps, small, non comm.	12.85	0	0.94	
Octopus magnificus	7.23	2	0.53	
Bassanago albescens	3.41	8	0.25	
Todarodes angolensis, male	3.41	8	0.25	31
Holohalaelurus regani	3.01	10	0.22	
Whelks	2.75	40	0.20	
Helicolenus dactylopterus	2.21	12	0.16	30
Starfish	2.07	0	0.15	
Lucigadus ori	2.01	126	0.15	
Raja leopardus	1.00	2	0.07	
Beryx decadactylus	0.92	2	0.07	
Epigonus sp.	0.79	84	0.06	
Photichthys argenteus	0.59	38	0.04	
Myxine capensis	0.48	6	0.04	
PORIFERA (Sponges)	0.46	2	0.03	
Scopelosaurus meadi	0.44	12	0.03	
Gymnoscopelus sp.	0.38	34	0.03	
Physiculus capensis	0.34	36	0.02	
Paracallionymus costatus	0.30	20	0.02	
Lampanyctodes hectoris	0.15	0	0.01	
Tripterophycis gilchristi	0.14	8	0.01	
Malacocephalus laevis	0.13	4	0.01	
Lycoteuthis lorigera	0.09	12	0.01	
Promethichthys prometheus	0.05	4	0.00	
Rochinia sp.	0.04	4	0.00	
Symbolophorus boops	0.03	4	0.00	
Nezumia sp.	0.02	2	0.00	
Chauliodus sloani	0.02	6	0.00	
Stoloteuthis sp.	0.02	6	0.00	
Sea pens	0.02	2	0.00	
Bathynectes piperitus	0.01	2	0.00	
Paraliparis australis	0.01	4	0.00	
Maurolicus muelleri	0.00	2	0.00	
Total	1373.04		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1396
DATE :02/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 27°45.87
start stop duration Lon E 14°41.69
TIME :14:55:44 15:25:43 30.0 (min) Purpose : 3
LOG : 2677.46 2678.98 1.5 Region : 5030
FDEPTH: 407 408 Gear cond.: 0
BDEPTH: 407 408 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 3.0 kn
Sorted : 720 Total catch: 719.50 Catch/hour: 1439.49

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	572.19	0	39.75	
Merluccius paradoxus	342.11	544	23.77	33
Caelorinchus simorhynchus	164.05	3729	11.40	
Genypterus capensis	126.04	68	8.76	32
Parapagurus pilosimanus	95.19	0	6.61	
Merluccius paradoxus	62.02	484	4.31	34
Anemones, white	18.51	0	1.29	
Hydrolagus sp.	14.00	12	0.97	
Shrimps, small, non comm.	10.40	0	0.72	
Holohalaelurus regani	10.00	30	0.69	
Helicolenus dactylopterus	5.00	24	0.35	35
Lucigadus ori	3.74	624	0.26	
Starfish	3.02	0	0.21	
Todarodes angolensis, female	2.50	4	0.17	36
Octopus magnificus	2.20	2	0.15	
Physiculus capensis	1.40	700	0.10	
Whelks	1.20	18	0.08	
Bassanago albescens	0.92	4	0.06	
Galeus polli	0.60	4	0.04	
Photichthys argenteus	0.58	42	0.04	
Anemones, coral	0.56	4	0.04	
Lampanyctodes hectoris	0.55	0	0.04	0
Epigonus sp.	0.42	66	0.03	
Tripterophycis gilchristi	0.36	26	0.02	
Gymnoscopelus sp.	0.35	30	0.02	
Scopelosaurus meadi	0.28	10	0.02	
Lampanyctodes hectoris	0.25	0	0.02	
Rochinia sp.	0.21	14	0.01	
Symbolophorus boops	0.16	14	0.01	
Notacanthus sexspinis	0.14	2	0.01	
Nezumia sp.	0.10	12	0.01	
Bathynectes piperitus	0.08	4	0.01	
Paracallionymus costatus	0.08	22	0.01	
Lycoteuthis lorigera	0.06	8	0.00	
Promethichthys prometheus	0.05	4	0.00	
Stoloteuthis sp.	0.04	12	0.00	
Hermits, mixed	0.04	6	0.00	
Leptocephalus	0.03	2	0.00	
Electrona risso	0.02	6	0.00	
Mursia cristimanus	0.02	2	0.00	
Total	1439.49		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1397
DATE :05/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 30°43.04
start stop duration Lon E 15°25.23
TIME :05:51:01 06:21:03 30.0 (min) Purpose : 3
LOG : 3076.48 3077.91 1.4 Region : 6100
FDEPTH: 400 397 Gear cond.: 0
BDEPTH: 400 397 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 2.9 kn
Sorted : 454 Total catch: 454.00 Catch/hour: 907.40

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	571.62	6250	63.00	39
Merluccius paradoxus	105.93	110	11.67	38
Lophius vomerinus	43.97	32	4.85	40
Genypterus capensis	37.97	28	4.19	41
Caelorinchus simorhynchus	35.58	1779	3.92	
Lepidopus caudatus	28.98	32	3.19	
Merluccius capensis	20.19	6	2.22	37
Malacocephalus laevis	16.79	66	1.85	
Epigonus sp.	9.99	264	1.10	
Helicolenus dactylopterus	7.20	28	0.79	42
Brama brama	6.00	4	0.66	43
Bassanago albescens	5.60	8	0.62	
Anemones, white	4.98	0	0.55	
Holohalaelurus regani	2.00	6	0.22	
Starfish	1.79	0	0.20	
Paracallionymus costatus	1.66	276	0.18	
Bristle worms	1.16	0	0.13	
Beryx splendens	1.04	4	0.11	
Anemones, pink	0.99	26	0.11	
Todaropsis eblanae, male	0.90	6	0.10	44
Todarodes angolensis, female	0.74	2	0.08	45
Bathynectes piperitus	0.54	14	0.06	
Pterygosquilla armata capensis	0.39	0	0.04	
Physiculus capensis	0.29	32	0.03	
Ophichthus bennettai	0.20	2	0.02	
Stereomastis sp.	0.18	56	0.02	
Rossia enigmatica	0.12	24	0.01	
Lucigadus ori	0.12	26	0.01	
Photichthys argenteus	0.10	2	0.01	
Lampanyctodes hectoris	0.10	54	0.01	
Whelks	0.09	4	0.01	
Rochinia sp.	0.05	14	0.01	
Chlorophthalmus punctatus	0.04	12	0.00	
Sepia hieronis	0.02	2	0.00	
Sepia sp.	0.02	6	0.00	
Heart urchin	0.02	4	0.00	
Psychrolutes macrocephalus	0.01	2	0.00	
Paraliparis australis	0.01	12	0.00	
Total	907.40		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1398
DATE :05/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 30°43.17
start stop duration Lon E 15°25.35
TIME :07:31:06 08:01:01 29.9 (min) Purpose : 3
LOG : 3083.99 3085.38 1.4 Region : 6100
FDEPTH: 399 397 Gear cond.: 0
BDEPTH: 399 397 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 2.8 kn
Sorted : 284 Total catch: 283.90 Catch/hour: 569.33

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	200.53	1013	35.22	48
Genypterus capensis	77.21	46	13.56	47
Lepidopus caudatus	68.18	82	11.98	
Lophius vomerinus	44.12	30	7.75	51
Merluccius paradoxus	38.10	32	6.69	49
Merluccius capensis	30.88	8	5.42	50
Caelorinchus simorhynchus	28.07	1404	4.93	
Raja wallacei	20.05	4	3.52	
Helicolenus dactylopterus	11.43	38	2.01	56
Thyrsites atun	10.83	4	1.90	46
Malacocephalus laevis	8.02	62	1.41	
Epigonus telescopus	7.02	195	1.23	
Starfish	5.24	0	0.92	
Todaropsis eblanae, female	3.15	4	0.55	54
Paracallionymus costatus	2.01	668	0.35	
Brama brama	2.01	2	0.35	52
Anemones, white	1.82	26	0.32	
Holohalaelurus regani	1.47	14	0.26	
Bristle worms	1.30	0	0.23	
Anemones, pink	1.19	28	0.21	
Todaropsis eblanae, male	1.18	4	0.21	53
Pterygosquilla armata capensis	1.16	0	0.20	
Bassanago albescens	1.00	2	0.18	
Cyttus traversi	0.80	2	0.14	
Todarodes angolensis, female	0.68	2	0.12	55
Myxine capensis	0.46	6	0.08	
Bathynectes piperitus	0.46	10	0.08	
Mursia cristimanus	0.28	36	0.05	
Physiculus capensis	0.15	12	0.03	
Stereomastis sp.	0.13	38	0.02	
Lampanyctodes hectoris	0.12	64	0.02	
Lucigadus ori	0.11	22	0.02	
Rossia enigmatica	0.06	12	0.01	
Sepia sp.	0.04	8	0.01	
Whelks	0.02	2	0.00	
Lamp shell	0.01	2	0.00	

Rochinia sp.	0.00	2	0.00
Total	569.33		100.00

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1399
DATE :05/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 30°43.26
start stop duration Lon E 15°25.44
TIME :09:10:27 09:40:29 30.0 (min) Purpose : 3
LOG : 3091.29 3092.76 1.5 Region : 6100
FDEPTH: 399 397 Gear cond.: 0
BDEPTH: 399 397 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 2.9 kn
Sorted : 223 Total catch: 223.06 Catch/hour: 445.53

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	151.80	821	34.07	58
Lepidopus caudatus	67.91	86	15.24	
Merluccius paradoxus	67.91	50	15.24	57
Genypterus capensis	44.94	24	10.09	60
Lophius vomerinus	24.77	22	5.56	63
Merluccius capensis	15.98	4	3.59	59
Caelorinchus simorhynchus	10.79	385	2.42	
Epigonus telescopus	10.19	156	2.29	
Todaropsis eblanae, female	8.51	54	1.91	66
Brama brama	6.59	4	1.48	61
Starfish	6.51	0	1.46	
Malacocephalus laevis	6.39	22	1.43	
Anemones, white	5.25	54	1.18	
Helicolenus dactylopterus	3.60	22	0.81	62
Bristle worms	3.32	0	0.74	
Todaropsis eblanae, male	2.16	16	0.48	65
Paracallionymus costatus	2.00	334	0.45	
Zeus capensis	1.86	2	0.42	67
Pterygosquilla armata capensis	1.56	0	0.35	
Anemones, pink	1.06	32	0.24	
Todarodes angolensis, male	0.74	2	0.17	64
Bathynectes piperitus	0.39	10	0.09	
Stereomastis sp.	0.25	0	0.06	
Mursia cristimanus	0.22	28	0.05	
Malacocephalus laevis	0.21	4	0.05	0
Ophichthus bennettai	0.13	2	0.03	
Rossia enigmatica	0.12	8	0.03	
Physiculus capensis	0.09	6	0.02	
Sepia sp.	0.06	10	0.01	
Lampanyctodes hectoris	0.06	32	0.01	
Whelks	0.04	2	0.01	
Lucigadus ori	0.04	8	0.01	
Holohalaelurus regani	0.03	4	0.01	
Heart urchin	0.03	6	0.01	
Chlorophthalmus punctatus	0.02	6	0.00	
Abraliopsis gilchristi	0.02	4	0.00	
Lamp shell	0.01	2	0.00	
Tripterophycis gilchristi	0.01	2	0.00	
Parapagurus dimorphus	0.01	4	0.00	
Maurolicus muelleri	0.00	2	0.00	
Inioteuthis capensis	0.00	2	0.00	
Rochinia sp.	0.00	2	0.00	
Copepods	0.00	4	0.00	
Total	445.53		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1400
DATE :05/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 30°40.44
start stop duration Lon E 15°24.99
TIME :12:34:53 12:56:27 21.6 (min) Purpose : 3
LOG : 3104.77 3105.81 1.0 Region : 6100
FDEPTH: 346 344 Gear cond.: 0
BDEPTH: 346 344 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 2.9 kn
Sorted : 265 Total catch: 265.01 Catch/hour: 737.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caelorinchus simorhynchus	165.51	921	22.45	
Merluccius paradoxus	121.00	832	16.41	70
Dead coral & starfish	59.81	0	8.11	
Helicolenus dactylopterus	57.02	462	7.74	73
Dead coral	41.45	0	5.62	
Genypterus capensis	36.16	28	4.91	72
Merluccius paradoxus	36.16	28	4.91	69
Lepidopus caudatus	36.16	120	4.91	
Lophius vomerinus	25.03	19	3.40	74
Merluccius capensis	23.09	6	3.13	68
Epigonus telescopus	20.03	715	2.72	
PORIFERA (Sponges)	17.17	0	2.33	
Starfish	14.16	0	1.92	
Thyrsites atun	11.96	6	1.62	71
Spatangus capensis	9.35	0	1.27	
Raja confundens	6.95	6	0.94	
Scyliorhinus capensis	6.68	3	0.91	
Starfish	6.65	0	0.90	0
Zeus capensis	5.56	8	0.75	75
Anemones, pink	4.53	56	0.62	
Squalus mitsukurii	4.17	3	0.57	
Parapagurus pilosimanus	3.98	0	0.54	
Todarodes angolensis, female	3.34	6	0.45	79
Todaropsis eblanae, female	3.25	22	0.44	78
Malacocephalus laevis	2.78	22	0.38	
Whelks	2.57	0	0.35	
Balonophyllia	2.42	0	0.33	
Gorgorians	2.23	0	0.30	
Paracallionymus costatus	1.95	139	0.26	
Todaropsis eblanae, male	1.78	14	0.24	77
Echinus gilchristi ?	0.98	14	0.13	
Holohalaelurus regani	0.86	3	0.12	
Heart urchin	0.44	39	0.06	
Exodromidia sp.	0.34	45	0.05	
Rochinia sp.	0.33	0	0.05	
Mursia cristimanus	0.27	33	0.04	
Opistobranch	0.26	47	0.03	
Physiculus capensis	0.20	8	0.03	
Rossia enigmatica	0.17	8	0.02	
Lophius vomerinus	0.11	8	0.02	76
Sepia sp.	0.09	17	0.01	
Pterygosquilla armata capensis	0.06	19	0.01	
Bathynectes piperitus	0.06	6	0.01	
CYPRAEIDAE (Bulia)	0.05	28	0.01	
Stereomastis sp.	0.03	8	0.00	
Maurolicus muelleri	0.03	17	0.00	
Lamp shell	0.02	3	0.00	
Chlorophthalmus punctatus	0.01	3	0.00	
Lampanyctodes hectoris	0.01	6	0.00	
Abraliopsis gilchristi	0.01	3	0.00	
Pycnogonid	0.00	3	0.00	
SOLEIDAE	0.00	3	0.00	
Total	737.25		100.01	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1401
DATE :05/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 30°40.67
start stop duration Lon E 15°25.20
TIME :14:15:57 14:30:30 14.6 (min) Purpose : 3
LOG : 3112.08 3112.83 0.7 Region : 6100
FDEPTH: 346 347 Gear cond.: 0
BDEPTH: 346 347 Validity : 0
Towing dir: 0° Wire out : 900 m Speed : 3.1 kn
Sorted : 162 Total catch: 161.55 Catch/hour: 666.20

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caelorinchus simorhynchus	144.33	1443	21.66	
Merluccius paradoxus	86.60	689	13.00	82
Dead coral	86.60	0	13.00	
Brama brama	70.10	41	10.52	85
Helicolenus dactylopterus	51.55	322	7.74	86
PORIFERA (Sponges)	42.80	0	6.43	
Lophius vomerinus	27.22	16	4.09	84
Genypterus capensis	21.86	16	3.28	83
Merluccius paradoxus	21.44	12	3.22	81
Caelorinchus simorhynchus	18.14	647	2.72	0
Lepidopus caudatus	10.31	45	1.55	
Starfish, mixed	10.19	0	1.53	
Epigonus sp.	9.90	198	1.49	
Spatangus capensis	8.74	0	1.31	
Cruriraja parcomaculata	7.42	4	1.11	
Balonophyllia	6.56	0	0.98	
Merluccius capensis	5.77	4	0.87	80
Todarodes angolensis, female	4.12	8	0.62	89
Lophius vomerinus	4.04	25	0.61	91
Parapagurus pilosimanus	4.00	0	0.60	
Paracallionymus costatus	3.30	507	0.50	
Anemones, pink	3.05	45	0.46	
Malacocephalus laevis	2.62	12	0.39	
Todarodes angolensis, male	2.14	4	0.32	88
Zeus capensis	2.06	4	0.31	87
Raja confundens	2.06	4	0.31	
Whelks	1.77	66	0.27	
Heart urchin	1.31	78	0.20	
Todaropsis eblanae, male	1.11	8	0.17	90
Exodromidia sp.	0.93	91	0.14	
Echinus gilchristi ?	0.62	12	0.09	
Parapagurus dimorphus	0.54	82	0.08	
Rochinia sp.	0.43	0	0.06	
Starfish	0.42	0	0.06	
Gorgorians	0.41	0	0.06	
Mursia cristimanus	0.33	41	0.05	
Cyttus traversi	0.25	4	0.04	
Maurolicus muelleri	0.23	148	0.03	
Opistobranch	0.18	21	0.03	
Pterygosquilla armata capensis	0.12	41	0.02	
Lampanyctodes hectoris	0.10	33	0.01	
Rossia enigmatica	0.10	4	0.01	
Scale worms	0.10	12	0.01	
Sepia sp.	0.08	12	0.01	
Symbolophorus boops	0.04	4	0.01	
CYPRAEIDAE (Bulia)	0.04	16	0.01	
Stereomastis sp.	0.03	8	0.00	
Bathynectes piperitus	0.03	8	0.00	
Ostracods	0.01	8	0.00	
Total	666.12		99.99	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1402
DATE :05/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 30°40.96
start stop duration Lon E 15°25.46
TIME :15:35:07 15:50:18 15.2 (min) Purpose : 3
LOG : 3117.93 3118.66 0.7 Region : 6100
FDEPTH: 349 345 Gear cond.: 0
BDEPTH: 349 345 Validity : 0
Towing dir: 0° Wire out : 900 m Speed : 2.9 kn
Sorted : 97 Total catch: 96.81 Catch/hour: 382.91

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	94.92	712	24.79	92
Caelorinchus simorhynchus	43.51	649	11.36	
Helicolenus dactylopterus	28.12	210	7.34	93
Dead coral	24.52	0	6.40	
Lophius vomerinus	22.15	20	5.78	94
Starfish, mixed	19.58	0	5.11	
PORIFERA (Sponges)	17.60	0	4.60	
Zeus capensis	17.01	28	4.44	95
Octopus magnificus	14.63	4	3.82	
Raja straeleni	12.26	4	3.20	
Squalus mitsukurii	11.87	8	3.10	
Merluccius capensis	9.10	4	2.38	96
Brama brama	7.12	4	1.86	99
Raja leopardus	5.14	4	1.34	
Genypterus capensis	4.75	4	1.24	98
Anemones, pink	3.92	59	1.02	
Chlorophthalmus punctatus	3.80	4	0.99	
Spatangus capensis	3.52	47	0.92	
PARAPAGURIDAE *	3.28	0	0.86	
Todaropsis eblanae, male	2.97	24	0.77	100
Merluccius paradoxus	2.77	4	0.72	97
Lepidopus caudatus	2.77	8	0.72	
Malacocephalus laevis	2.37	32	0.62	
Bassanago albescens	2.37	4	0.62	
Todaropsis eblanae, female	2.29	16	0.60	101
Parapagurus pilosimanus	2.21	107	0.58	
Epigonus sp.	1.98	138	0.52	
Raja confundens	1.98	4	0.52	
Balonophyllia	1.86	0	0.49	
Echinus gilchristi ?	1.74	20	0.45	
Paracallionymus costatus	1.74	233	0.45	
Starfish	1.42	0	0.37	
Gorgorians	0.99	0	0.26	
Whelks	0.91	28	0.24	
Anemones, white	0.67	4	0.18	
Physiculus capensis	0.53	32	0.14	

Heart urchin	0.40	28	0.10	
Rochinia sp.	0.39	0	0.10	
Exodromidia sp.	0.31	47	0.08	
Pterygosquilla armata capensis	0.31	115	0.08	
Lophius vomerinus	0.28	20	0.07	102
Lampanyctodes hectoris	0.28	0	0.07	
Parapagurus dimorphus	0.28	12	0.07	
Maurolicus muelleri	0.25	0	0.07	
Mursia cristimanus	0.19	20	0.05	
Scale worms	0.18	16	0.05	
Opistobranch	0.16	55	0.04	
Rossia enigmatica	0.12	8	0.03	
S H R I M P S	0.04	20	0.01	
Sepia sp.	0.03	4	0.01	
CYPRAEIDAE (Bulia)	0.02	8	0.00	
Ostracods	0.01	12	0.00	
Total	381.60		99.66	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1403
DATE :07/04/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 31°10.41
start stop duration Lon E 17°28.28
TIME :06:38:50 07:12:13 33.4 (min) Purpose : 1
LOG : 3333.88 3336.22 2.3 Region : 6100
FDEPTH: 20 20 Gear cond.: 0
BDEPTH: 151 137 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 4.2 kn
Sorted : 0 Total catch: 0.12 Catch/hour: 0.22

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Engraulis encrasicolus, juvenile	0.00	2	0.00	
Helicolenus dactylopterus, juvenile	0.00	2	0.00	
Argonauta hians	0.18	2	0.00	
Todarodes angolensis, juvenile	0.04	4	0.00	
Trachurus trachurus, juvenile	0.00	2	0.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1404
DATE :07/04/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 31°12.46
start stop duration Lon E 17°21.65
TIME :08:51:39 08:56:37 5.0 (min) Purpose : 1
LOG : 3348.86 3349.17 0.3 Region : 6100
FDEPTH: 100 100 Gear cond.: 0
BDEPTH: 182 181 Validity : 0
Towing dir: 0° Wire out : 250 m Speed : 3.7 kn
Sorted : 100 Total catch: 100.01 Catch/hour: 1207.36

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	1207.24	0	99.99	
Trachurus trachurus, juvenile	0.12	109	0.01	103
Total	1207.36		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1405
DATE :07/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 31°34.80
start stop duration Lon E 16°24.32
TIME :17:39:26 18:07:37 28.2 (min) Purpose : 3
LOG : 0.00 3410.463410.5 Region : 6100
FDEPTH: 366 362 Gear cond.: 0
BDEPTH: 366 362 Validity : 0
Towing dir: 0° Wire out : 925 m Speed : 7264.0 kn
Sorted : 234 Total catch: 234.35 Catch/hour: 499.15

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	127.80	522	25.60	104
Caelorinchus simorhynchus	108.63	765	21.76	
Dead coral	74.55	0	14.93	
Helicolenus dactylopterus	43.66	143	8.75	106
PORIFERA (Sponges)	41.87	0	8.39	
Genypterus capensis	39.40	15	7.89	108
Merluccius paradoxus	12.78	13	2.56	107
Starfish	9.33	0	1.87	
Epigonus sp.	7.14	83	1.43	
Parapagurus pilosimanus	5.86	0	1.17	
Merluccius capensis	5.32	2	1.07	105
Anemones, pink	4.28	9	0.86	
Octopus magnificus	4.26	2	0.85	
Raja leopardus	2.56	2	0.51	
Whelks	2.37	0	0.48	
Hermits, mixed	2.11	0	0.42	
Raja confundens	1.51	2	0.30	
Exodromidia sp.	1.19	132	0.24	
Todaropsis eblanae, female	1.15	6	0.23	109
Mursia cristimanus	0.85	111	0.17	
Rochinia sp.	0.62	0	0.12	
Paracallionymus costatus	0.36	53	0.07	
Opistobranch	0.32	55	0.06	
Gorgorians	0.27	0	0.05	
Lucigadus ori	0.12	15	0.02	
Physiculus capensis	0.11	11	0.02	
Giant bullia gastropod	0.11	4	0.02	
Sepia sp.	0.11	28	0.02	
Scale worms	0.11	9	0.02	
Bathynectes piperitus	0.10	4	0.02	
Toe cowries (Trivia spp.?)	0.07	9	0.01	
Maurolicus muelleri	0.04	32	0.01	
Tripterophycis gilchristi	0.04	6	0.01	
Helicolenus dactylopterus	0.03	4	0.01	110
White sea cucumber	0.03	34	0.01	
Holohalaelurus regani	0.03	4	0.01	
Lophius vomerinus	0.02	2	0.00	111
ISOPODS	0.02	0	0.00	
CYPRAEIDAE (Bulia)	0.01	2	0.00	
Ostracods	0.00	4	0.00	
Total	499.15		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1406
DATE :09/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 32°36.80
start stop duration Lon E 16°41.29
TIME :12:33:14 13:02:43 29.5 (min) Purpose : 3
LOG : 3692.89 3694.27 1.4 Region : 6100
FDEPTH: 412 414 Gear cond.: 0
BDEPTH: 412 414 Validity : 0
Towing dir: 0° Wire out : 1100 m Speed : 2.8 kn
Sorted : 413 Total catch: 412.66 Catch/hour: 839.59

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Notacanthus sexspinis	331.64	3316	39.50	
Merluccius paradoxus	91.56	309	10.90	113
Merluccius paradoxus	81.38	85	9.69	112
Caelorinchus simorhynchus	54.93	844	6.54	
Mixed debries	49.85	0	5.94	
Bassanago albescens	44.76	51	5.33	
Helicolenus dactylopterus	36.62	144	4.36	115
Lophius vomerinus	30.52	28	3.63	116
Heart urchin	28.89	0	3.44	
Starfish	20.98	0	2.50	
Genypterus capensis	16.28	8	1.94	114
Octopus magnificus	10.78	2	1.28	
Whelks	7.69	0	0.92	
Anemones, white	7.63	63	0.91	
Torpedo nobiliana	4.27	2	0.51	
Myxine capensis	3.30	37	0.39	
Parapagurus dimorphus	2.36	0	0.28	
Lucigadus ori	2.34	332	0.28	
Stereomastis sp.	2.32	0	0.28	
Anemones, pink	1.65	116	0.20	
Mursia cristimanus	1.59	0	0.19	
Cyttus traversi	1.12	4	0.13	
Paracallionymus costatus	1.10	191	0.13	
Red/white banded leg prawn, gr	0.90	0	0.11	
Hermits, mixed	0.81	49	0.10	
Todaropsis eblanae, female	0.81	4	0.10	117
Physiculus capensis	0.79	63	0.09	
Parapagurus pilosimanus	0.56	47	0.07	
Tripterophycis gilchristi	0.32	20	0.04	
Chlorophthalmus punctatus	0.30	6	0.04	
Flattened rostrum pink prawn	0.28	24	0.03	
CYPRAEIDAE (Bulia)	0.22	67	0.03	
Rossia enigmatica	0.19	12	0.02	
Lampanyctodes hectoris	0.17	83	0.02	
Rochinia sp.	0.15	0	0.02	
Hoplostethus mediterraneus	0.14	2	0.02	
Sepia sp.	0.11	20	0.01	
Symbolophorus boops	0.08	4	0.01	
Lamp shell	0.07	12	0.01	
Epigonus sp.	0.04	4	0.01	
Merluccius paradoxus, juvenile	0.04	4	0.00	118
Maurolicus muelleri	0.02	16	0.00	
Cranchia scabra	0.02	2	0.00	
Exodromidia sp.	0.02	2	0.00	
Inioteuthis capensis	0.01	2	0.00	
Total	839.59		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1407
DATE :09/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 32°36.65
start stop duration Lon E 16°38.10
TIME :14:29:34 14:59:25 29.9 (min) Purpose : 3
LOG : 3702.92 3704.41 1.5 Region : 6100
FDEPTH: 440 440 Gear cond.: 0
BDEPTH: 440 440 Validity : 0
Towing dir: 0° Wire out : 1050 m Speed : 3.0 kn
Sorted : 399 Total catch: 399.03 Catch/hour: 802.06

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	223.12	513	27.82	120
Merluccius paradoxus	154.77	187	19.30	119
Notacanthus sexspinis	140.70	1278	17.54	
Lophius vomerinus	86.43	66	10.78	123
Caelorinchus simorhynchus	58.29	444	7.27	
Genypterus capensis	32.16	8	4.01	122
Helicolenus dactylopterus	24.12	157	3.01	121
Starfish	18.73	0	2.34	
Bassanago albescens	12.06	20	1.50	
Myxine capensis	10.05	0	1.25	
Red/white banded leg prawn, gr	9.01	0	1.12	
Plesionika martia	6.93	0	0.86	
Lucigadus ori	4.42	316	0.55	
Stereomastis sp.	4.14	0	0.52	
Paracallionymus costatus	3.92	561	0.49	
Etmopterus brachyurus	2.99	28	0.37	
Tripterophycis gilchristi	2.33	113	0.29	
Physiculus capensis	1.71	90	0.21	
Whelks	1.60	36	0.20	
Heart urchin	1.45	0	0.18	
Dead coral	0.45	0	0.06	
Anemones, white	0.44	4	0.05	
Rossia enigmatica	0.42	18	0.05	
Hoplostethus mediterraneus	0.33	4	0.04	
Malacocephalus laevis	0.26	6	0.03	
Parapagurus pilosimanus	0.23	22	0.03	
Cynoglossus zanzibarensis	0.15	2	0.02	125
Mursia cristimanus	0.14	62	0.02	
Chaunax pictus	0.13	2	0.02	
Flattened rostrum pink prawn	0.08	6	0.01	
Parapagurus dimorphus	0.06	0	0.01	
Rochinia sp.	0.06	0	0.01	
Caelorinchus braueri	0.06	24	0.01	
Psychrolutes macrocephalus	0.05	4	0.01	
Sergia sp.	0.05	8	0.01	
Chaceon sp.	0.04	10	0.01	
Lampanyctodes hectoris	0.03	16	0.00	
Bristle worms	0.03	14	0.00	
Maurolicus muelleri	0.03	20	0.00	
Bathypolypus valdiviae	0.02	2	0.00	
Merluccius paradoxus, juvenile	0.01	2	0.00	124
CYPRAEIDAE (Bulia)	0.01	2	0.00	
Symbolophorus boops	0.01	2	0.00	
Chlorophthalmus punctatus	0.01	2	0.00	
Inioteuthis capensis	0.00	2	0.00	
Paraliparis australis	0.00	4	0.00	
Myctophum sp.	0.00	2	0.00	
Total	802.06		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1408
DATE :10/04/2007 GEAR TYPE: PT NO: 1 POSITION:Lat S 32°25.93
start stop duration Lon E 17°45.23
TIME :06:30:35 06:47:50 17.3 (min) Purpose : 1
LOG : 3769.71 3770.76 1.1 Region : 6100
FDEPTH: 70 85 Gear cond.: 0
BDEPTH: 165 167 Validity : 0
Towing dir: 0° Wire out : 230 m Speed : 3.7 kn

Sorted : 96 Total catch: 191.00 Catch/hour: 664.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Aequorea forskalea	493.91	0	74.35	
Maurolicus muelleri	170.43	0	25.65	
Total	664.35		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1409
DATE :10/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 33°3.96
start stop duration Lon E 17°0.33
TIME :17:47:38 18:17:29 29.9 (min) Purpose : 3
LOG : 3854.98 3856.47 1.5 Region : 6100
FDEPTH: 471 467 Gear cond.: 0
BDEPTH: 471 467 Validity : 0
Towing dir: 0° Wire out : 1100 m Speed : 3.0 kn
Sorted : 116 Total catch: 115.98 Catch/hour: 233.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	148.74	712	63.81	130
Bassanago albescens	20.10	34	8.62	
Merluccius paradoxus	12.06	8	5.17	126
Caelorinchus simorhynchus	11.66	486	5.00	
Malacocephalus laevis	8.44	8	3.62	
Helicolenus dactylopterus	8.44	46	3.62	127
Starfish	4.27	0	1.83	
Lophius vomerinus	3.02	2	1.29	128
Whelks	2.87	62	1.23	
Stereomastis sp.	2.69	0	1.16	
Todaropsis eblanae, female	2.41	12	1.03	129
Anemones, white	1.97	14	0.84	
Red/white banded leg prawn, gr	1.89	0	0.81	
Heart urchin	1.41	92	0.60	
Paracallionymus costatus	0.89	159	0.38	
Myxine capensis	0.72	8	0.31	
Anemones, pink	0.48	6	0.21	
Symbolophorus boops	0.20	12	0.08	
Physiculus capensis	0.16	14	0.07	
Lucigadus ori	0.12	18	0.05	
PORIFERA (Sponges)	0.09	0	0.04	
Parapagurus pilosimanus	0.07	10	0.03	
Psychrolutes macrocephalus	0.06	4	0.03	
Hermits, mixed	0.05	10	0.02	
CORAL	0.05	0	0.02	
Chaceon sp.	0.04	20	0.02	
Mursia cristimanus	0.04	10	0.02	
Tripterophycis gilchristi	0.03	4	0.01	
Rochinia sp.	0.03	14	0.01	
Lampanyctodes hectoris	0.03	14	0.01	
Maurolicus muelleri	0.02	18	0.01	
Epigonus sp.	0.02	2	0.01	
Sepia sp.	0.02	2	0.01	
Snapper shrimp (Alpheus sp.?)	0.01	4	0.01	
Total	233.12		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1410
DATE :11/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 33°11.29
start stop duration Lon E 17°18.13
TIME :07:16:27 07:38:06 21.7 (min) Purpose : 3
LOG : 3923.71 3924.88 1.2 Region : 6100
FDEPTH: 389 382 Gear cond.: 0
BDEPTH: 389 382 Validity : 0
Towing dir: 0° Wire out : 1050 m Speed : 3.3 kn
Sorted : 561 Total catch: 561.50 Catch/hour: 1556.11

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepidopus caudatus	579.21	840	37.22	
Zeus capensis	410.16	806	26.36	133
Merluccius paradoxus	252.19	987	16.21	131
Merluccius paradoxus	113.63	122	7.30	132
Merluccius capensis	38.80	11	2.49	134
Helicolenus dactylopterus	30.48	205	1.96	135
Caelorinchus simorhynchus	27.16	388	1.75	
Todaropsis eblanae, female	26.33	183	1.69	138
Octopus magnificus	25.50	3	1.64	
Squalus mitsukurii, female	16.63	3	1.07	
Todaropsis eblanae, male	12.19	97	0.78	137
Brama brama	10.53	6	0.68	136
Starfish	2.41	0	0.15	
Holohalaelurus regani	2.22	6	0.14	
Beryx splendens	1.66	6	0.11	
Whelks	1.37	39	0.09	
Parapagurus dimorphus	1.16	0	0.07	
Stereomastis sp.	0.72	114	0.05	
Parapagurus pilosimanus	0.72	30	0.05	
Rochinia sp.	0.67	94	0.04	
Paracallionymus costatus	0.57	75	0.04	
Lampanyctodes hectoris	0.40	175	0.03	
Sea pens	0.33	3	0.02	
Mursia cristimanus	0.33	61	0.02	
Rossia enigmatica	0.19	6	0.01	
Psychrolutes macrocephalus	0.09	6	0.01	
Lucigadus ori	0.07	6	0.00	
Hermits, mixed	0.06	22	0.00	
Epigonus sp.	0.06	3	0.00	
Sepia sp.	0.05	11	0.00	
Opistobranch	0.05	14	0.00	
Gymnoscopelus sp.	0.04	3	0.00	
GALATHEIDAE	0.03	6	0.00	
Physiculus capensis	0.02	3	0.00	
Chlorophthalmus punctatus	0.02	3	0.00	
Exodromidia sp.	0.02	3	0.00	
Chaceon sp.	0.01	8	0.00	
ISOPODS	0.01	22	0.00	
Maurolicus muelleri	0.01	6	0.00	
Total	1556.11		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1411
DATE :13/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 33°52.96
start stop duration Lon E 17°28.23
TIME :08:11:29 08:44:04 32.6 (min) Purpose : 3
LOG : 4192.77 4194.15 1.4 Region : 6100
FDEPTH: 458 461 Gear cond.: 0
BDEPTH: 458 461 Validity : 0
Towing dir: 0° Wire out : 1200 m Speed : 2.5 kn

Sorted : 183 Total catch: 182.63 Catch/hour: 336.24

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	110.46	123	32.85	139
Caelorinchus simorhynchus	64.44	2222	19.16	
Bassanago albescens	60.75	74	18.07	
Merluccius paradoxus	25.77	140	7.67	140
Helicolenus dactylopterus	18.41	114	5.48	142
Lophius vomerinus	12.34	4	3.67	143
Squalus mitsukurii, female	8.28	2	2.46	
Octopus magnificus	7.55	4	2.24	
Caelorinchus braueri	6.26	482	1.86	
Anemones, pink	3.53	31	1.05	
Starfish	2.51	0	0.75	
Paracallionymus costatus	1.93	247	0.57	
Zeus capensis	1.84	4	0.55	144
Todaropsis eblanae, female	1.61	7	0.48	145
Notacanthus sexspinis	1.28	17	0.38	
Tripterophycis gilchristi	1.23	50	0.36	
Raja confundens	0.92	2	0.27	
Physiculus capensis	0.90	48	0.27	
Red/white banded leg prawn, gr	0.83	0	0.25	
Beryx splendens	0.77	4	0.23	
Stereomastis sp.	0.75	0	0.22	
Lucigadus ori	0.67	74	0.20	
Anemones, white	0.62	6	0.18	
Merluccius paradoxus, juvenile	0.61	28	0.18	141
Flattened rostrum pink prawn	0.39	44	0.11	
Epigonus sp.	0.29	26	0.09	
Lampanyctodes hectoris	0.21	110	0.06	
Rossia enigmatica	0.13	4	0.04	
Whelks	0.13	0	0.04	
Lycoteuthis lorigera	0.13	6	0.04	
CYPRAEIDAE (Bulia)	0.13	37	0.04	
Rochinia sp.	0.08	17	0.02	
Symbolophorus boops	0.08	4	0.02	
Photichthys argenteus	0.07	2	0.02	
Maurolicus muelleri	0.07	53	0.02	
Gymnoscopelus sp.	0.07	6	0.02	
Electrona risso	0.05	6	0.02	
Myctophum sp.	0.04	11	0.01	
Heart urchin	0.03	2	0.01	
MYCTOPHIDAE	0.02	22	0.01	
Hermits, mixed	0.02	9	0.00	
Anemones, D.W.	0.01	2	0.00	
Abraliopsis gilchristi	0.01	2	0.00	
Chlorophthalmus punctatus	0.01	2	0.00	
Bristle worms	0.01	2	0.00	
Total	336.24		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1412
DATE :13/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 33°53.68
start stop duration Lon E 17°26.91
TIME :10:31:40 11:01:28 29.8 (min) Purpose : 3
LOG : 4202.50 4204.23 1.7 Region : 6100
FDEPTH: 546 549 Gear cond.: 0
BDEPTH: 546 549 Validity : 0
Towing dir: 0° Wire out : 1350 m Speed : 3.5 kn
Sorted : 141 Total catch: 140.93 Catch/hour: 283.84

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caelorinchus braueri	157.10	2244	55.35	
Merluccius paradoxus	39.27	22	13.84	146
Helicolenus dactylopterus	22.16	433	7.81	149
Merluccius paradoxus	17.52	24	6.17	147
Octopus magnificus	12.08	8	4.26	
Lophius vomerinus	8.06	2	2.84	148
Anemones, pink	6.32	56	2.23	
Plesionika martia	4.57	0	1.61	
Notacanthus sexspinis	3.69	62	1.30	
Bassanago albescens	3.65	10	1.28	
Starfish	1.88	0	0.66	
Chlorophthalmus punctatus	1.55	6	0.55	
Funchalia woodwardi	1.21	93	0.43	
Photichthys argenteus	1.00	18	0.35	
Lucigadus ori	0.66	73	0.23	
Anemones, white	0.65	8	0.23	
Lampanyctodes hectoris	0.46	228	0.16	
Malacocephalus laevis	0.29	6	0.10	
Psychrolutes macrocephalus	0.28	6	0.10	
Symbolophorus boops	0.17	8	0.06	
Hoplostethus cadenati	0.14	2	0.05	
Paracallionymus costatus	0.14	20	0.05	
Physiculus capensis	0.12	6	0.04	
Diaphus effulgens	0.12	4	0.04	
Gymnoscopelus sp.	0.09	4	0.03	
Stereomastis sp.	0.09	22	0.03	
Lepidion capensis	0.09	2	0.03	
Lycoteuthis lorigera	0.09	4	0.03	
Epigonus telescopus	0.08	8	0.03	
Nezumia sp.	0.08	14	0.03	
Whelks	0.06	14	0.02	
Todarodes angolensis, female	0.05	2	0.02	150
Tripterophycis gilchristi	0.04	2	0.01	
Rochinia sp.	0.02	10	0.01	
Neolithodes capensis	0.02	2	0.01	
Hermits, mixed	0.02	10	0.01	
Cranchia scabra	0.01	2	0.00	
Electrona risso	0.01	2	0.00	
Maurolicus muelleri	0.01	6	0.00	
Total	283.84		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1413
DATE :13/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 33°53.25
start stop duration Lon E 17°29.94
TIME :13:04:28 13:34:23 29.9 (min) Purpose : 3
LOG : 4214.26 4215.72 1.5 Region : 6100
FDEPTH: 379 380 Gear cond.: 0
BDEPTH: 379 380 Validity : 0
Towing dir: 0° Wire out : 850 m Speed : 2.9 kn
Sorted : 240 Total catch: 1537.09 Catch/hour: 3082.41

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	2338.24	12309	75.86	152
Merluccius paradoxus	308.82	6233	10.02	155
Caelorinchus simorhynchus	257.29	7147	8.35	

Anemones, pink	27.21	191	0.88	
Merluccius paradoxus	26.07	40	0.85	177
Helicolenus dactylopterus	24.26	235	0.79	157
Zeus capensis	18.05	30	0.59	153
Paracallionymus costatus	14.26	1119	0.46	
Octopus magnificus	10.03	10	0.33	
Symbolophorus boops	8.68	411	0.28	
Starfish	8.40	985	0.27	
Lepidopus caudatus	6.62	14	0.21	
Todaropsis eblanae, male	6.37	44	0.21	159
Todaropsis eblanae, female	6.32	44	0.21	160
Lampanyctodes hectoris	5.24	2124	0.17	
Genypterus capensis	5.21	2	0.17	154
Lophius vomerinus	2.41	2	0.08	151
Anemones, white	2.31	30	0.07	
Physiculus capensis	1.57	88	0.05	
Merluccius paradoxus, juvenile	1.44	176	0.05	156
Malacocephalus laevis	0.94	14	0.03	
Plagiogeneion rubignosus	0.51	2	0.02	
Rossia enigmatica	0.41	14	0.01	
Lycoteuthis lorigera	0.35	14	0.01	
Beryx splendens	0.32	2	0.01	
Whelks	0.29	30	0.01	
Maurolicus muelleri	0.26	162	0.01	
Anemones, coral	0.15	14	0.01	
Polymixia nobilis	0.10	2	0.00	
Cubiceps capensis	0.10	14	0.00	
Lophius vomerinus	0.09	2	0.00	158
Rochinia sp.	0.07	14	0.00	
Hermits, mixed	0.01	14	0.00	
Total	3082.41		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1414
DATE :14/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 34°20.46
start stop duration Lon E 17°40.90
TIME :10:02:15 10:32:03 29.8 (min) Purpose : 3
LOG : 4338.40 4339.85 1.5 Region : 6100
FDEPTH: 539 551 Gear cond.: 0
BDEPTH: 539 551 Validity : 0
Towing dir: 0° Wire out : 1300 m Speed : 2.9 kn
Sorted : 348 Total catch: 348.35 Catch/hour: 701.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	326.17	228	46.50	162
Caelorinchus braueri	257.72	7581	36.74	
Plesionika martia	30.20	4099	4.31	
Helicolenus dactylopterus	22.15	93	3.16	161
Squalus mitsukurii	14.09	2	2.01	
Lucigadus ori	10.67	815	1.52	
Lycoteuthis lorigera	7.59	330	1.08	
Octopus magnificus	5.03	2	0.72	
Bassanago albescens	4.03	22	0.57	
Anemones, pink	3.28	48	0.47	
Funchalia woodwardi	3.08	268	0.44	
Psychrolutes macrocephalus	3.02	18	0.43	
Lophius vomerinus	2.82	2	0.40	163
Todaropsis eblanae, female	2.19	8	0.31	164
Photichthys argenteus	1.50	32	0.21	
Starfish	1.35	0	0.19	
Notacanthus sexspinis	1.31	16	0.19	
Lampanyctodes hectoris	0.82	449	0.12	
Symbolophorus boops	0.75	56	0.11	
Nezumia sp.	0.67	135	0.10	
Gymnoscopelus sp.	0.50	36	0.07	
Hoplostethus mediterraneus	0.42	22	0.06	
Paracallionymus costatus	0.26	32	0.04	
Ophichthus bennettai	0.25	2	0.04	
Tripterophycis gilchristi	0.24	10	0.03	
Kuronezumia leonis	0.21	2	0.03	
Caelorinchus simorhynchus	0.16	2	0.02	
Stereomastis sp.	0.14	26	0.02	
Ornithoteuthis antillarum	0.11	2	0.02	
Whelks	0.10	4	0.01	
Cranchia scabra	0.09	2	0.01	
MYCTOPHIDAE	0.08	22	0.01	
Coloconger cadenati	0.07	2	0.01	
GALATHEIDAE	0.07	6	0.01	
Epigonus sp.	0.04	2	0.01	
PARALEPIDIDAE	0.04	2	0.01	
Physiculus capensis	0.04	4	0.01	
Lepidion capensis	0.04	2	0.01	
Electrona risso	0.02	2	0.00	
Diaphus sp.	0.01	4	0.00	
Stoloteuthis sp.	0.01	4	0.00	
Abraliopsis gilchristi	0.01	2	0.00	
Chlorophthalmus punctatus	0.01	2	0.00	
Argyropelecus aculeatus	0.01	2	0.00	
Trachyscorpia capensis	0.00	2	0.00	
Paraliparis australis	0.00	2	0.00	
Total	701.38		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1415
DATE :14/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 34°19.56
start stop duration Lon E 17°41.11
TIME :11:53:08 12:22:57 29.8 (min) Purpose : 3
LOG : 4345.92 4347.38 1.5 Region : 6100
FDEPTH: 500 500 Gear cond.: 0
BDEPTH: 500 500 Validity : 0
Towing dir: 0° Wire out : 1150 m Speed : 2.9 kn
Sorted : 262 Total catch: 262.10 Catch/hour: 527.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	307.85	354	58.38	165
Caelorinchus braueri	62.37	1783	11.83	
Helicolenus dactylopterus	28.17	137	5.34	167
Caelorinchus simorhynchus	26.16	501	4.96	
Genypterus capensis	20.12	4	3.82	166
Octopus magnificus	16.10	4	3.05	
Squalus mitsukurii, female	12.07	2	2.29	
Red/white banded leg prawn, gr	7.36	0	1.40	
Bassanago albescens	6.84	28	1.30	
Plesionika martia	5.90	0	1.12	
Lycoteuthis lorigera	5.61	173	1.06	
Lucigadus ori	5.55	467	1.05	
Lophius vomerinus	4.43	4	0.84	168
Starfish	3.66	0	0.69	
Todaropsis eblanae, female	3.30	14	0.63	170
Anemones, pink	2.90	34	0.55	
Beryx splendens	1.37	4	0.26	
Notacanthus sexspinis	1.01	8	0.19	
Symbolophorus boops	0.87	60	0.17	
Tripterophycis gilchristi	0.85	36	0.16	
Lampanyctodes hectoris	0.75	427	0.14	
Gymnoscopelus sp.	0.72	66	0.14	
Psychrolutes macrocephalus	0.57	4	0.11	
Photichthys argenteus	0.44	8	0.08	
Stereomastis sp.	0.37	68	0.07	
Paracallionymus costatus	0.33	46	0.06	
Myxine capensis	0.28	4	0.05	
Todaropsis eblanae, male	0.27	2	0.05	169
Anemones, white	0.26	4	0.05	
Malacocephalus laevis	0.24	6	0.05	
Physiculus capensis	0.16	12	0.03	
Whelks	0.10	2	0.02	
Funchalia woodwardi	0.10	8	0.02	
Parapagurus pilosimanus	0.09	26	0.02	
GALATHEIDAE	0.06	12	0.01	
Cranchia scabra	0.05	2	0.01	
PARALEPIDIDAE	0.04	2	0.01	
Rossia enigmatica	0.03	2	0.01	
Hoplostethus mediterraneus	0.00	2	0.00	
Paraliparis australis	0.00	2	0.00	
Total	527.35		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1416
DATE :14/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 34°19.69
start stop duration Lon E 17°42.53
TIME :13:50:10 14:20:05 29.9 (min) Purpose : 3
LOG : 4355.80 4357.33 1.5 Region : 6100
FDEPTH: 454 458 Gear cond.: 0
BDEPTH: 454 458 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 3.1 kn
Sorted : 356 Total catch: 356.11 Catch/hour: 714.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	320.86	696	44.93	171
Caelorinchus simorhynchus	154.41	6104	21.62	
Helicolenus dactylopterus	89.44	624	12.52	173
Bassanago albescens	40.11	86	5.62	
Todaropsis eblanae, female	38.10	195	5.34	176
Merluccius paradoxus	20.05	16	2.81	172
Starfish	7.28	0	1.02	
Todaropsis eblanae, male	7.02	52	0.98	175
Lophius vomerinus	5.41	4	0.76	174
Anemones, pink	5.09	28	0.71	
Octopus magnificus	3.81	2	0.53	
Lucigadus ori	3.65	203	0.51	
Red/white banded leg prawn, gr	3.49	0	0.49	
Symbolophorus boops	3.21	291	0.45	
Paracallionymus costatus	2.61	261	0.37	
Tripterophycis gilchristi	2.21	146	0.31	
Lycoteuthis lorigera	1.80	94	0.25	
Diaphus effulgens	1.26	158	0.18	
Malacocephalus laevis	0.70	22	0.10	
PARALEPIDIDAE	0.48	30	0.07	
Parapagurus pilosimanus	0.45	60	0.06	
Whelks	0.37	8	0.05	
Physiculus capensis	0.30	24	0.04	
Funchalia woodwardi	0.29	26	0.04	
Stereomastis sp.	0.28	52	0.04	
Rossia enigmatica	0.25	6	0.03	
Anemones, white	0.22	2	0.03	
Lampanyctodes hectoris	0.20	88	0.03	
Myxine capensis	0.17	2	0.02	
Ophichthus bennettai	0.16	2	0.02	
Epigonus sp.	0.12	12	0.02	
Chaunax pictus	0.09	2	0.01	
Heart urchin	0.06	8	0.01	
Photichthys argenteus	0.05	4	0.01	
Leptocephalus	0.04	2	0.01	
CYPRAEIDAE (Bulia)	0.02	6	0.00	
Rochinia sp.	0.02	12	0.00	
Hermits, mixed	0.01	6	0.00	
Myctophum sp.	0.00	2	0.00	
Maurolicus muelleri	0.00	2	0.00	
Total	714.12		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1417
DATE :15/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 34°49.09
start stop duration Lon E 18°15.61
TIME :11:02:15 11:32:09 29.9 (min) Purpose : 3
LOG : 4484.96 4486.40 1.4 Region : 6100
FDEPTH: 551 553 Gear cond.: 0
BDEPTH: 551 553 Validity : 0
Towing dir: 0° Wire out : 1250 m Speed : 2.9 kn
Sorted : 102 Total catch: 102.14 Catch/hour: 204.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caelorinchus braueri	142.47	2262	69.51	
Merluccius paradoxus	28.09	16	13.71	178
Starfish	9.49	0	4.63	
Psychrolutes macrocephalus	5.08	40	2.48	
Photichthys argenteus	3.39	48	1.65	
Funchalia woodwardi	2.55	0	1.24	
Synaphobranchus kaupii	2.49	22	1.21	
Chaeceon macphersoni	2.07	6	1.01	
Anemones, pink	2.01	12	0.98	
Plesionika martia	1.06	0	0.52	
Todaropsis eblanae, female	0.96	4	0.47	179
Nezumia sp.	0.87	108	0.43	
Notacanthus sexspinis	0.77	12	0.38	
Malacocephalus laevis	0.66	2	0.32	
Stoloteuthis sp.	0.41	88	0.20	
Lampanyctodes hectoris	0.36	229	0.18	
Chaceon chuni	0.32	4	0.16	
Raja leopardus	0.21	4	0.10	
Bathypolypus valdiviae	0.21	6	0.10	
Lucigadus ori	0.19	16	0.09	
Echinus gilchristi ?	0.15	6	0.07	
Hoplostethus mediterraneus	0.14	2	0.07	
Argyropelecus aculeatus	0.14	10	0.07	
MYCTOPHIDAE	0.13	12	0.06	
Neoscopelus macrolepidotus	0.11	8	0.05	
Parapagurus pilosimanus	0.08	4	0.04	

Paracallionymus costatus	0.07	8	0.03
Gymnoscopelus sp.	0.06	6	0.03
Electrona risso	0.06	10	0.03
Chlorophthalmus punctatus	0.05	12	0.03
Aristeus varidens	0.05	2	0.02
Sergia sp.	0.03	10	0.02
Myctophum sp.	0.03	8	0.02
Idiacanthus atlanticus	0.03	2	0.01
Symbolophorus boops	0.02	2	0.01
Astronesthes niger	0.02	2	0.01
Champsodon capensis	0.02	2	0.01
Diretmus argenteus	0.02	2	0.01
Physiculus capensis	0.02	2	0.01
Ijimaia loppei	0.01	2	0.01
Lepidion capensis	0.01	2	0.01
Whelks	0.01	4	0.00
Rochinia sp.	0.01	6	0.00
Abraliopsis gilchristi	0.01	2	0.00
Maurolicus muelleri	0.00	2	0.00
Cryptopsaras couesii	0.00	2	0.00
Diaphus sp.	0.00	6	0.00
Ostracods	0.00	2	0.00
Total	204.96		100.00

Stereomastis sp.	0.31	66	0.04
Psychrolutes macrocephalus	0.28	6	0.03
Gymnoscopelus sp.	0.27	22	0.03
Anemones, white	0.20	6	0.03
Argyropelecus aculeatus	0.20	61	0.03
Rossia enigmatica	0.20	17	0.02
Malacocephalus laevis	0.18	6	0.02
Epigonus telescopus	0.15	17	0.02
Maurolicus muelleri	0.14	100	0.02
Diaphus effulgens	0.13	6	0.02
Electrona risso	0.12	17	0.01
Leptocephalus	0.11	6	0.01
PARALEPIDIDAE	0.10	6	0.01
Scale worms	0.09	22	0.01
Hermits, mixed	0.08	61	0.01
Serrated rost pink prawn	0.08	22	0.01
Myctophum sp.	0.06	17	0.01
Anemones, coral	0.04	6	0.00
Idiacanthus atlanticus	0.04	6	0.00
Abraliopsis gilchristi	0.03	6	0.00
Sepia sp.	0.02	6	0.00
Paraliparis australis	0.01	6	0.00
Opistobranch	0.01	6	0.00
Total	816.40		100.00

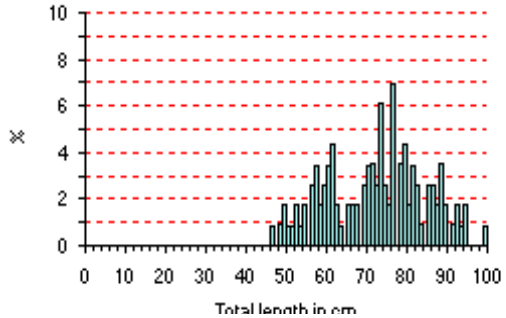
R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1418
DATE :15/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 34°49.35
start stop duration Lon E 18°17.16
TIME :14:49:00 15:20:00 31.0 (min) Purpose : 3
LOG : 4493.00 4494.50 1.5 Region : 6100
FDEPTH: 504 505 Gear cond.: 0
BDEPTH: 504 505 Validity : 0
Towing dir: 0° Wire out : 1150 m Speed : 3.0 kn
Sorted : 147 Total catch: 146.87 Catch/hour: 284.26

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Caelorinchus braueri	136.45	3329	48.00	
Merluccius paradoxus	100.65	70	35.41	180
Psychrolutes macrocephalus	9.68	93	3.40	
Genypterus capensis	7.74	2	2.72	182
Caelorinchus simorhynchus	5.61	95	1.97	
Helicolenus dactylopterus	4.65	31	1.63	181
Paracallionymus costatus	3.58	569	1.26	
Todaropsis eblanae, female	3.25	14	1.14	183
Starfish	3.06	0	1.08	
Photichthys argenteus	1.49	29	0.52	
Lampanyctodes hectoris	1.47	894	0.52	
Bathypolypus valdiviae	1.24	27	0.44	
Lucigadus ori	0.93	99	0.33	
Plesionika martia	0.93	178	0.33	
Anemones, pink	0.84	14	0.30	
Lycoteuthis lorigera	0.73	33	0.26	
Whelks	0.32	15	0.11	
Funchalia woodwardi	0.30	23	0.10	
Symbolophorus boops	0.23	19	0.08	
Physiculus capensis	0.22	21	0.08	
Tripterophycis gilchristi	0.15	6	0.05	
Rochinia sp.	0.09	39	0.03	
Chaeceon macphersoni	0.09	2	0.03	
Bristle worms	0.08	15	0.03	
Stereomastis sp.	0.08	15	0.03	
Gymnoscopelus sp.	0.06	6	0.02	
Idiacanthus atlanticus	0.05	2	0.02	
Rossia enigmatica	0.05	6	0.02	
Argyropelecus aculeatus	0.03	6	0.01	
Stoloteuthis sp.	0.03	10	0.01	
Champsodon capensis	0.03	4	0.01	
Diaphus effulgens	0.03	2	0.01	
Electrona risso	0.02	2	0.01	
Cubiceps capensis	0.02	2	0.01	
Diretmus argenteus	0.02	4	0.01	
Hermits, mixed	0.01	6	0.00	
Opistobranch	0.01	2	0.00	
LYCOTEUTHIDAE	0.01	2	0.00	
Cruriraja parcomaculata	0.01	2	0.00	
Chaunax pictus	0.01	2	0.00	
Diaphus sp.	0.01	2	0.00	
Cranchia scabra	0.00	2	0.00	
Total	284.26		100.00	

R/V "DR. FRIDTJOF NANSEN" SURVEY:2007404 STATION: 1419
DATE :15/04/2007 GEAR TYPE: BT NO: 18 POSITION:Lat S 34°48.94
start stop duration Lon E 18°18.66
TIME :14:38:41 14:49:32 10.9 (min) Purpose : 3
LOG : 4498.40 4499.00 0.6 Region : 6100
FDEPTH: 454 450 Gear cond.: 0
BDEPTH: 454 450 Validity : 0
Towing dir: 0° Wire out : 1000 m Speed : 3.3 kn
Sorted : 148 Total catch: 147.63 Catch/hour: 816.40

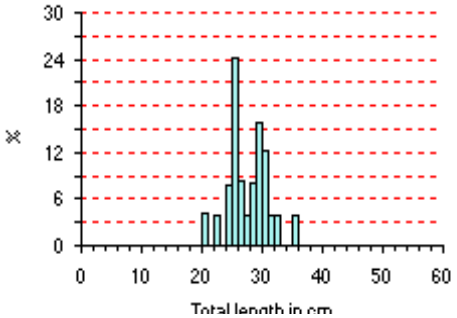
SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Merluccius paradoxus	348.39	326	42.67	184
Bassanago albescens	149.31	133	18.29	
Helicolenus dactylopterus	141.01	813	17.27	186
Caelorinchus simorhynchus	82.95	951	10.16	
Torpedo nobiliana	23.78	6	2.91	
Merluccius paradoxus	16.59	39	2.03	185
Parapagurus pilosimanus	9.84	636	1.21	
Lucigadus ori	8.85	1062	1.08	
Todaropsis eblanae, female	4.31	17	0.53	188
Starfish	4.08	0	0.50	
Lycoteuthis lorigera	3.94	227	0.48	
Holohalaelurus regani	2.76	6	0.34	
Paracallionymus costatus	2.64	299	0.32	
Todaropsis eblanae, male	2.52	17	0.31	187
Physiculus capensis	1.91	155	0.23	
Whelks	1.84	122	0.22	
Lampanyctodes hectoris	1.64	730	0.20	
Tripterophycis gilchristi	1.38	122	0.17	
Photichthys argenteus	1.18	44	0.14	
Dead coral	1.08	0	0.13	
Hoplostethus mediterraneus	0.79	6	0.10	
Beryx splendens	0.73	6	0.09	
Bathypolypus valdiviae	0.64	17	0.08	
Rochinia sp.	0.56	205	0.07	
Symbolophorus boops	0.50	33	0.06	
Bristle worms yellow	0.33	50	0.04	

Annex 2 Length frequencies



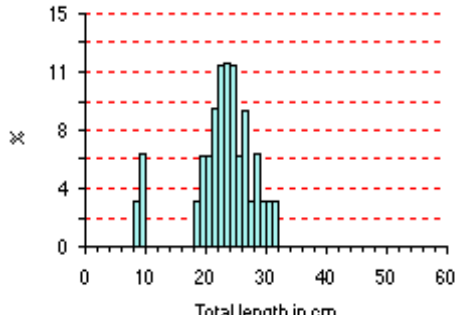
Genypterus capensis Namibia south

Mean length = 72.21 N = 115



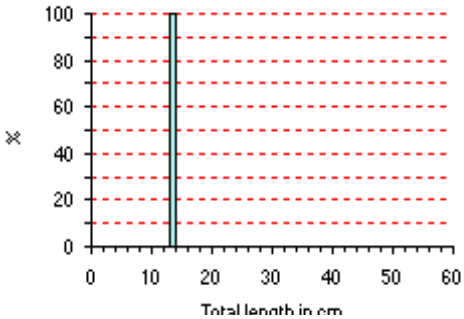
Todarodes angolensis Namibia south

Mean length = 27.65 N = 25



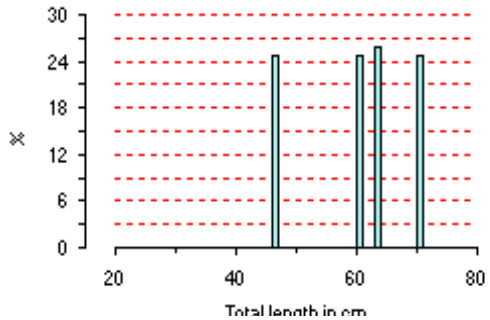
Helicolenus dactylopterus Namibia south

Mean length = 22.90 N = 34



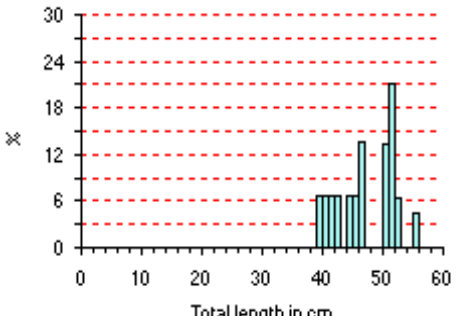
Todaropsis eblanae Namibia south

Mean length = 13.50 N = 1



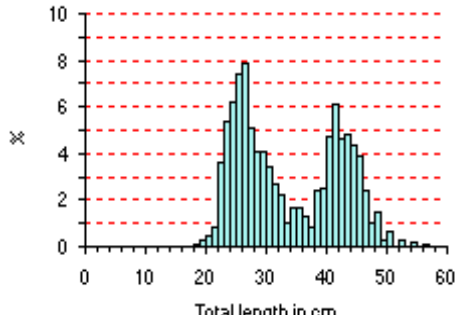
Lophius vomerinus Namibia south

Mean length = 60.28 N = 4



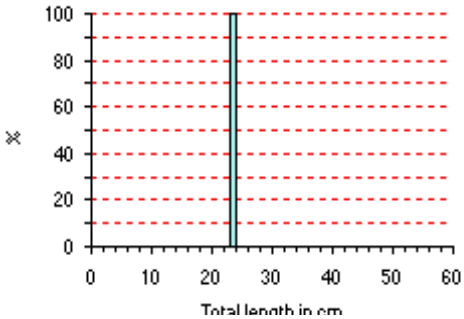
Brama brama South Africa west

Mean length = 47.20 N = 18



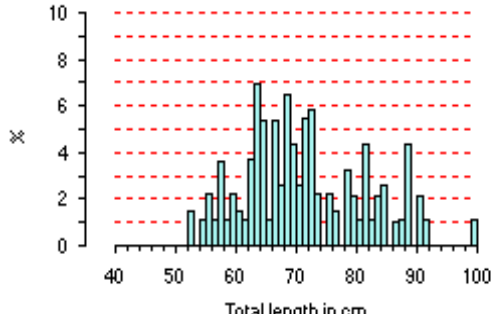
Merluccius paradoxus Namibia south

Mean length = 33.82 N = 1623



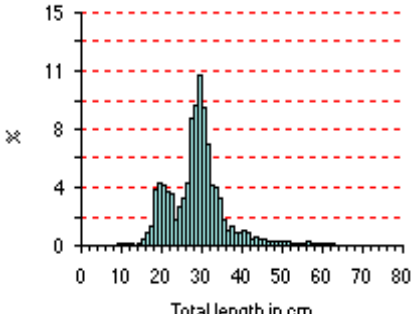
Cynoglossus zanzibarensis South Africa west

Mean length = 23.50 N = 1



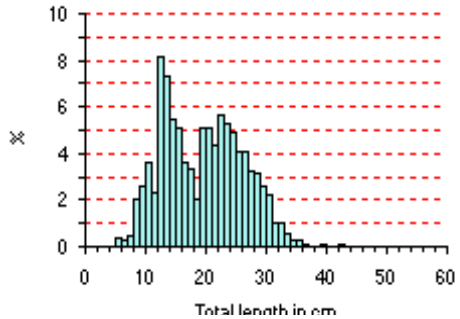
Genypterus capensis South Africa west

Mean length = 71.58 N = 83



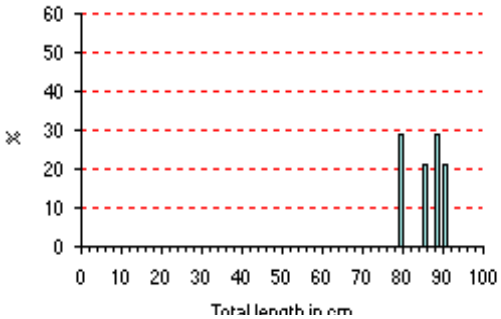
Merluccius paradoxus South Africa west

Mean length = 29.13 N = 4324



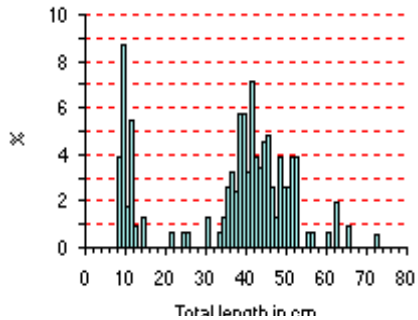
Helicolenus dactylopterus South Africa west

Mean length = 19.46 N = 1521



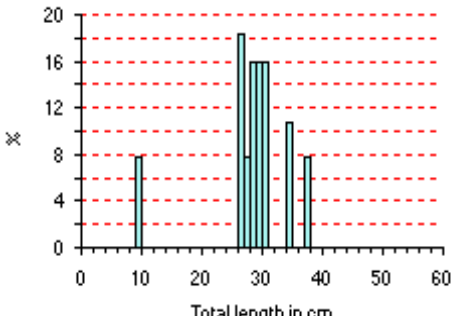
Thyrsites atun South Africa west

Mean length = 85.68 N = 4



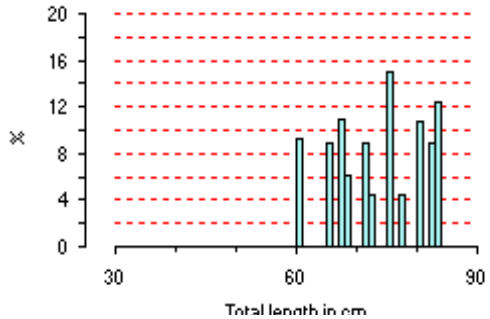
Lophius vomerinus South Africa west

Mean length = 36.55 N = 131



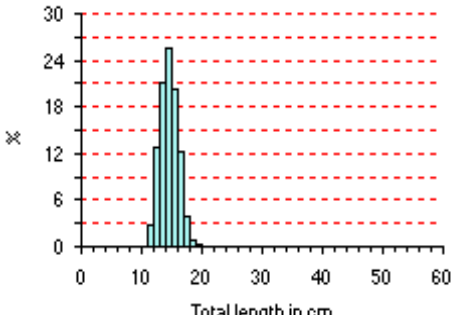
Todarodes angolensis South Africa west

Mean length = 28.39 N = 9



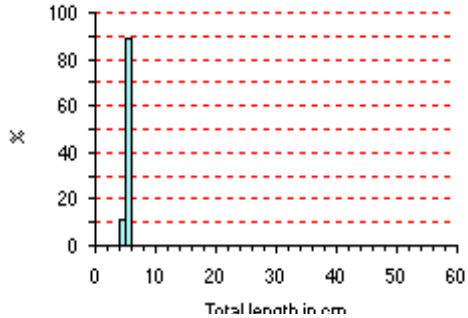
Merluccius capensis South Africa west

Mean length = 73.68 N = 18



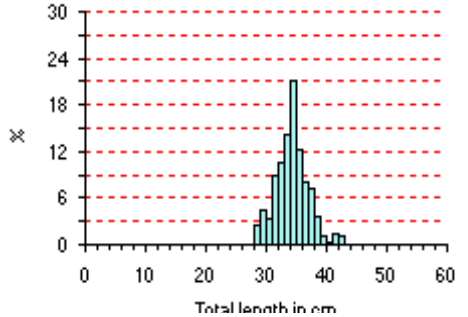
Todaropsis eblanae South Africa west

Mean length = 14.56 N = 339



Trachurus trachurus South Africa west

Mean length = 5.39 N = 9



Zeus capensis South Africa west

Mean length = 34.27 N = 135