

## 2011 BCC SURVEY

### SURVEY TO DETERMINE SPAWNING OF THE DEEP WATER HAKE *M. PARADOXUS* IN THE NORTHERN BENGUELA REGION OFF NAMIBIA

Cruise report No 9/2011

23 September – 8 October 2011

Bergen, October 2011

Institute of Marine Research

Norway



## 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.

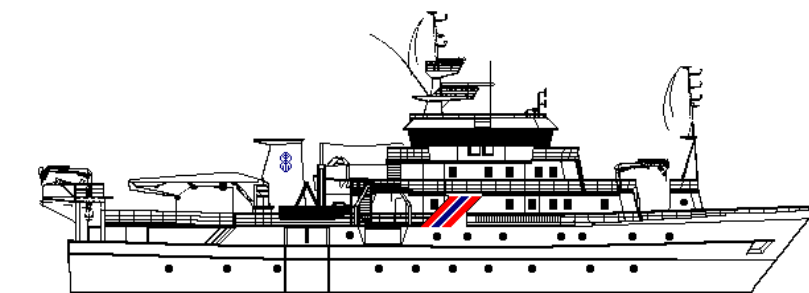
The EAF-Nansen project offers an opportunity to coastal countries in sub-Saharan Africa, working in partnership with the project, to receive technical support from FAO for the development of national and regional frameworks for the implementation of Ecosystem Approach to Fisheries management and to acquire 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.





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By

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## **CHAPTER 1 INTRODUCTION**

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To date there has been limited search for spawning deep sea hake (*Merluccius paradoxus*) in Namibian waters. Conclusions drawn from annual hake survey data are that the species spawns in South African waters, with juveniles transported into Namibian nursery grounds. However, gonad maturity data collected during routine Namibian biomass surveys (1990-2010) show that large (>60cm) and stage 4 (ripe and running) fish are found in Namibian waters all the way from the orange river border to the north, as far as 20°S. It still remains uncertain though whether, and if so, exactly where and when, deep sea hake spawn in Namibian waters. This needs to be investigated thoroughly, in order to establish whether recruitment to the Namibian deep sea hake population comes from, as currently assumed, solely from the southern Benguela, or from a Namibian spawning population(s).

### 1.1 Objectives

The primary objectives of the survey were:

- to conduct bottom trawling between 400 and 1000 m depth, largely based on positions trawled on during the annual hake survey
- to sample the adult population of *M. paradoxus* and inspect maturity stages in order to identify spawning fish and locate potential spawning locations geographically
- to conduct multisampler stations at < 500 m bottom depth in order to collect hake eggs and larvae and identify potential spawning areas geographically
- to collect gonad samples of *M. paradoxus* for later histological analysis
- to collect environmental and hydroacoustic data to improve our understanding of the link between the environment and the distribution of the hakes, and the fish community structure in the distribution areas of the hake.

### 1.2 Participants

The scientific staff that participated on this survey consisted of:

- Lauren Abels, Samantha Ockhuis (*BCRE, South Africa*)
- Sarah Paulus, Suama Kashava, Malakia Shimanda, Johnny Gamatham, Ernestus Kangombe, Heniritha Sibanda (*NatMIRC, Namibia*)
- Oddgeir Alvheim, Arved Staby, Jan Frode Wilhelmsen, (*IMR, Norway*)
- Britta Grote (*ZMT Bremen, Germany*)

## **CHAPTER 2 MATERIALS AND METHODS**

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### 2.1 Registration of weather conditions

The underway weather data onboard *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 <sup>2</sup>
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 at midship, about 20 meters above 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. Only wind speeds (Annex 1) are presented in this report.

### 2.2 Hydrography

Temperature, salinity and oxygen data were collected with a CTD *Seabird 9 plus* probe between the surface and 10 meters off the bottom before every trawl and multinet station.

### 2.3 Ichthyoplankton sampling (multinet)

Fish eggs and larvae were sampled with a Hydrobios (Kiel) multinet in 4 depth ranges: 250 – 150 m, 150 – 100 m, 100 – 50 m, and 50 m – surface. The meshsize of the nets was 405 µm and the multinet was towed between 1- 2 knots. The nets were washed down after heaving once at the side of the ship, and the content in the cups analysed under stereo microscopes. Selected eggs and larvae were preserved in ethanol for later inspection.

## 2.4 Acoustic measurements

Acoustic data was recorded at 18, 38, 120, and 200 kHz, and the data from the 38 kHz transducer scrutinized in LSSS. Results from the echo allocation are not included in this report but were provided on disk to NatMIRC.

## 2.5 Trawl sampling procedures

The standard bottom trawl of Dr. Fridtjof Nansen, a Gisund Super shrimp cum fish trawl, was used in the survey. A description of the trawl and gear is given in Annex 3. Trawl duration was generally approximately 30 minutes at 3 knots, but could vary according to bottom conditions (when these became unsuitable) and indications of large catch size. The exact time for start and stop of the trawl operation was determined by SCANMAR sensors.

### 2.5.1 *Handling the catch*

All hake were sampled, when possible. The species composition of the bycatch was determined from 1-2 baskets (depending on the bycatch species diversity and size), and the number and weight of the identified species recorded. For especially big catches all large hake were sampled before the remaining smaller hake were sub-sampled. The number of baskets with bycatch and, in the case of larger catches, hake was estimated before the catch was discarded. Hake were sorted according to sex before the total weight of males and females was determined. Females with stage 2 gonads and higher were selected during the length measuring process and kept separate for later inspection and sampling of the gonads

### 2.5.2 *Biological data*

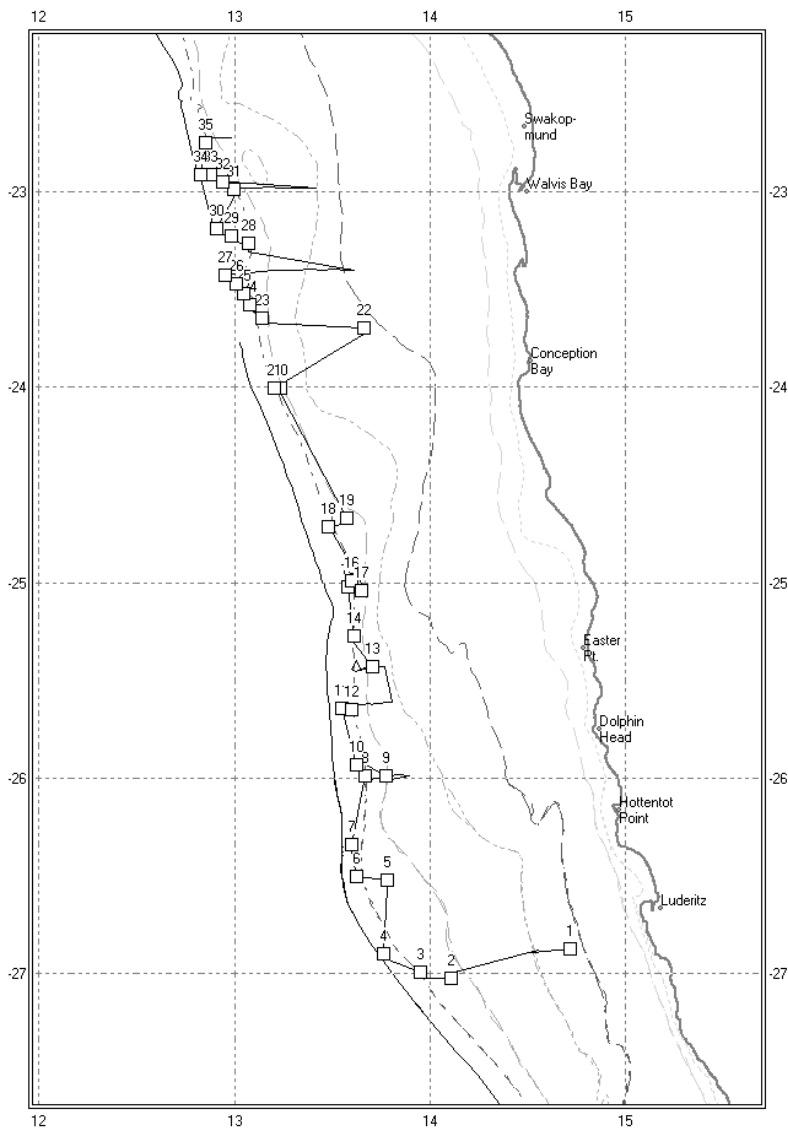
Total length (cm) of male and female hake was recorded to the nearest lower cm on electronic measuring boards. Length measurements of all commercially important species were also taken. Additional biological data - length, weight, gonad maturity stage, and gonad weight - was collected for a total of twenty individual hake. When present all stage 3 females were sampled, otherwise 10 males and 10 females with different maturity stages were sampled. All stage 3 females were selected from the total catch, implying that the absence of stage 3 females for selected stations is indicative of none being caught in the trawl. Since the total number of female fish caught in each catch is known, the the percentage of stage 3 females in each catch could be estimated. The maturity scale used is the one adopted by NatMIRC (Payne, 1986), and is described below. Pictures of the different female maturity stages are shown in Annex 3. In addition muscle tissue and otoliths were sampled for genetic analysis and ageing studies respectively. For detailed information on biological sampling methods, see MFMRs 'Guidelines for measurements of hake during biomass surveys'.

Stage	Females	Males
1 – inactive	Gonads small, slender, transparent, no visible sign of eggs	Gonads very small, slender, transparent and ribbon-like, unlobed
2 – active	Gonads larger, filling with small pink-orange, opaque eggs	Larger and distended, white opaque, typically lobed
3 – ripe	Gonads large in relation to size, distended and filled with opaque eggs, ovaries bright orange to deep pink	Gonads very large in relation to fish size, white opaque, distended with sperm, with pronounced lobes
4 - ripe and running	Translucent eggs can be extruded through the cloaca with slight abdominal pressure	Gonads very large and distended, with sperm flowing spontaneously
5 – spent	Gonads visually empty, but large, flabby, prominently veined and often bloodshot	Gonads very large, lobed, flabby but not distended



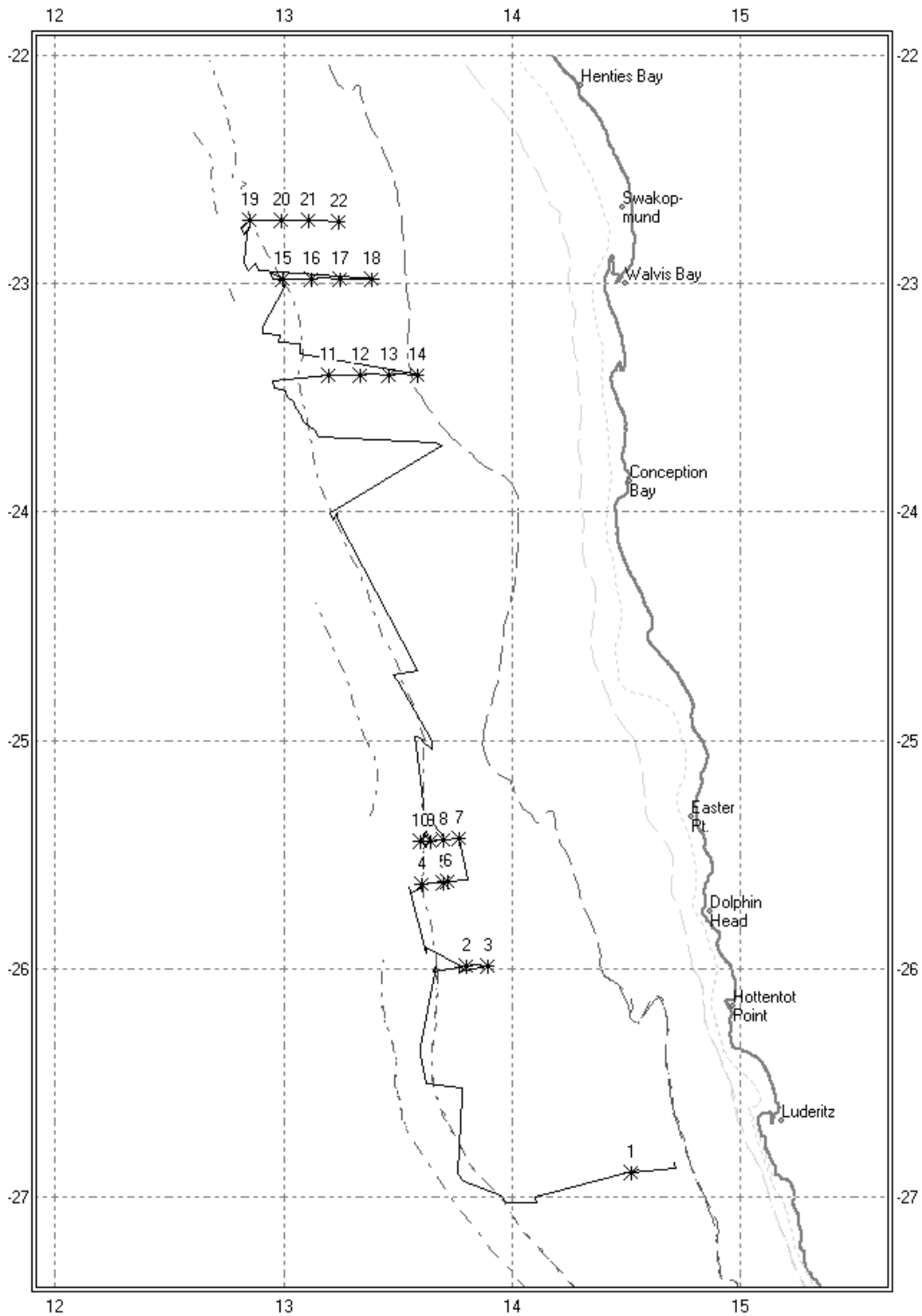
## CHAPTER 3 NARRATIVE

The vessel departed Cape Town on Monday 26<sup>th</sup> September at 15:00 (local time) with a 3 day delay (original date of departure 23<sup>rd</sup> September), and steamed northwards to the southern area of the northern Benguela region, west of Lüderitz. She arrived at the first trawl station at approximately 23h00 (UTC) on Wednesday 28<sup>th</sup> September. Due to time constraints the survey area was restricted to the area between 27° – 23° latitude south and 400 – 800 m bottom depth. Trawling was restricted to day time (08h00-19h00) and a total of 36 bottom trawls (station # 1 – 37), 22 multinet - (station # 1 – 22) and 53 CTDO stations (station # 944 – 997) were performed. Trawling was not possible deeper than 600 m between 24°S and 25°S due to 'bad' (hard) bottom.

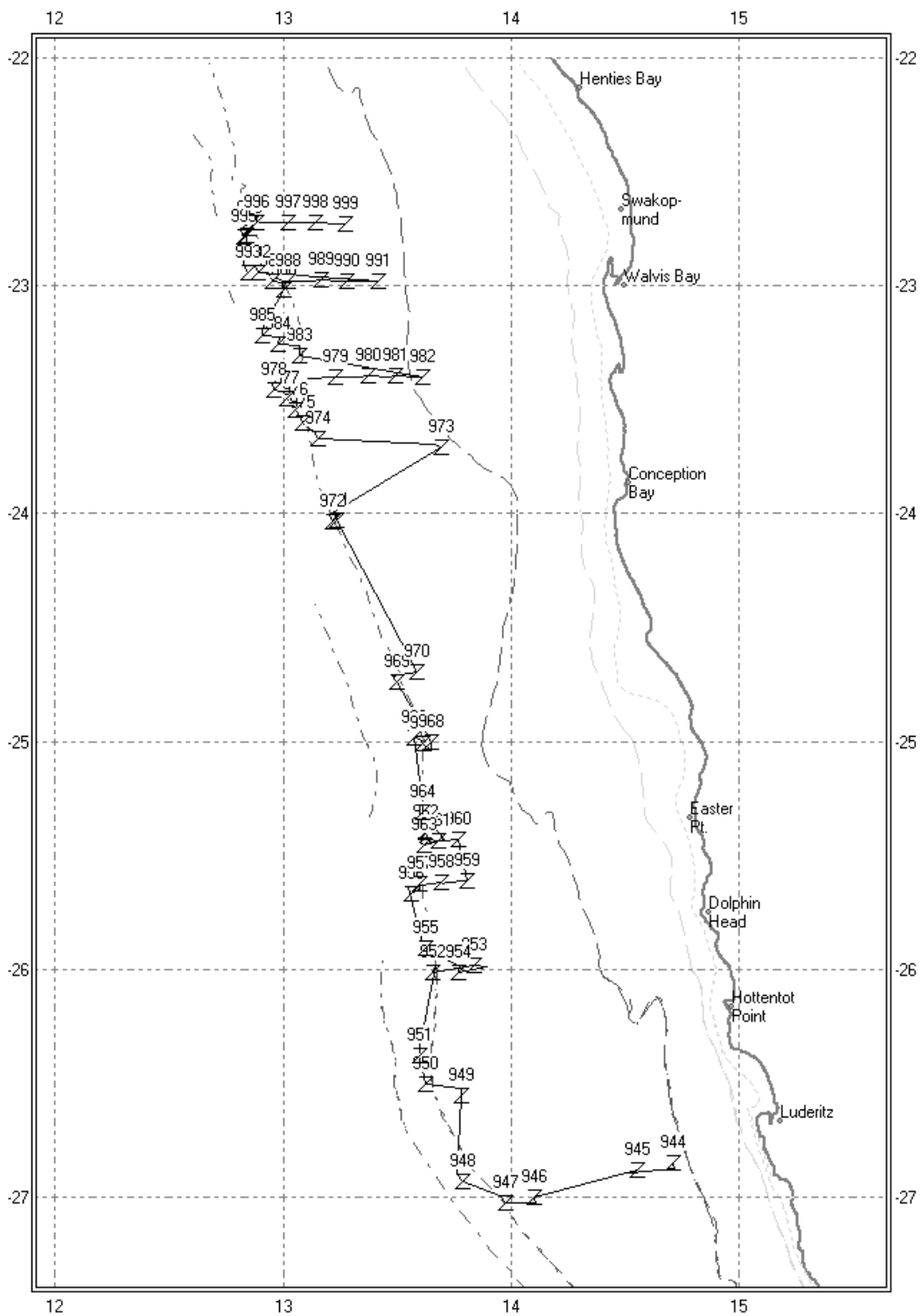


**Figure 1:** Course track showing the distribution of bottom trawl stations (square symbol).

Unfavorable weather conditions (strong winds and high wave action, see Annex 1 for wind speeds) prevented the collection of multinet data between 30<sup>th</sup> September and 5<sup>th</sup> of October. Trawling was interrupted at noon on 3<sup>rd</sup> October until 14h00 4<sup>th</sup> October, after two trawls got damaged and needed to be repaired. The vessel arrived at Walvis Bay on Saturday 8<sup>th</sup> October at 12h00.



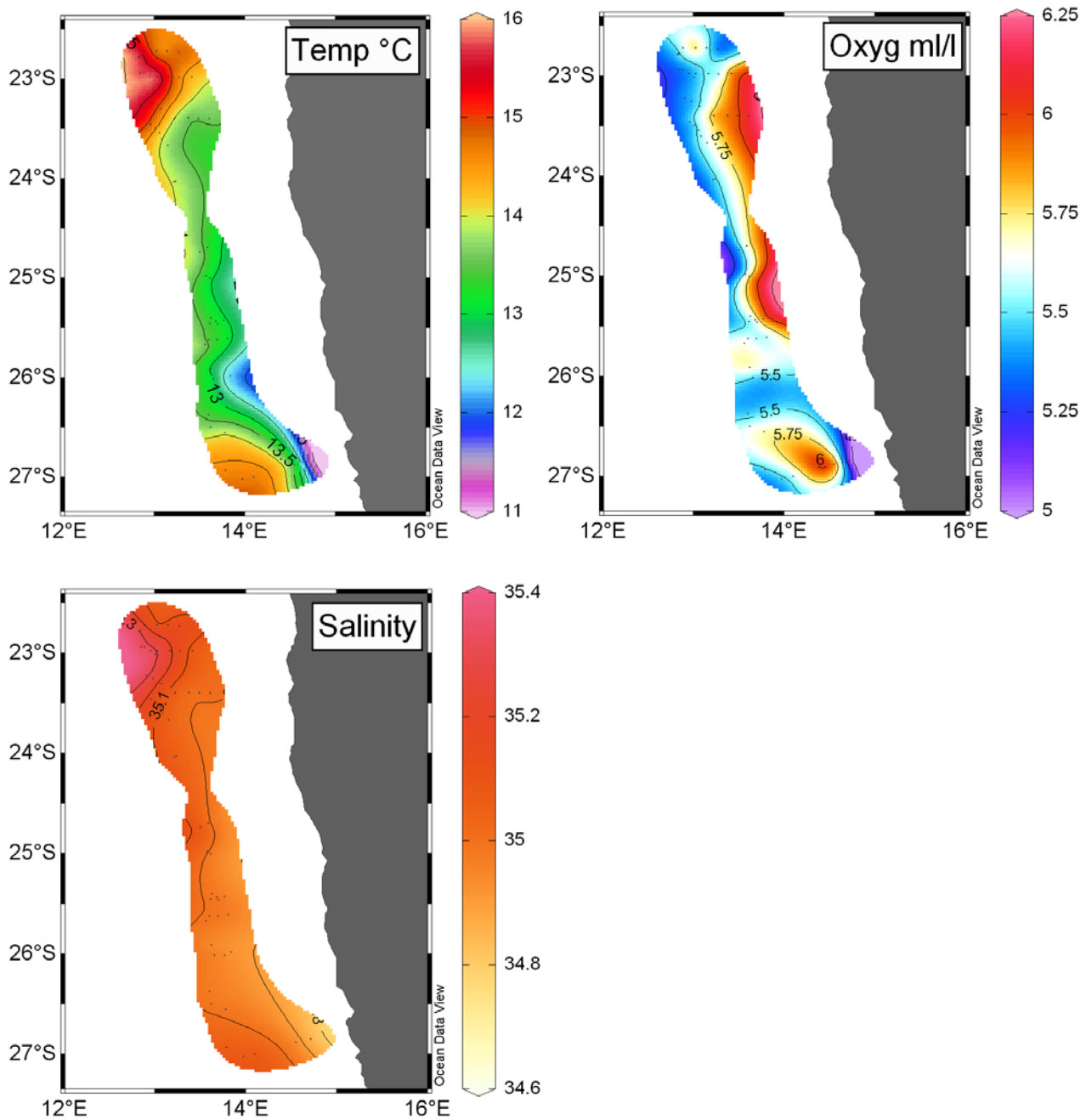
**Figure 2:** Positions of multinet stations.



**Figure 3:** CTDO stations.

## CHAPTER 4 RESULTS

### Hydrography

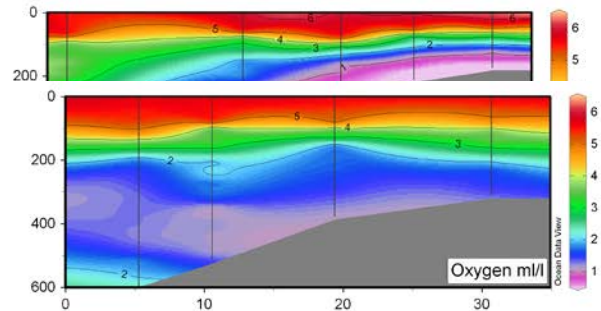
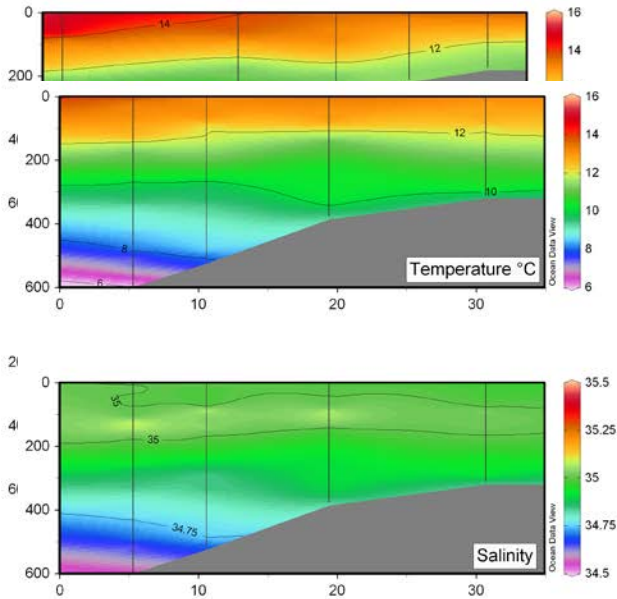


**Figure 3:** Temperature, oxygen and salinity profiles from selected station at different latitudes.

Sea surface temperature was between 12-15.9 °C and decreased to 10.4-11.3 at 250 m depth. Dissolved oxygen (DO) and density decreased from 5.5 at the surface to 1.1-3.1 ml/l, and from 26-25.3 to 26.74-26.86 at 250 m depth respectively. Below 400 m depth temperature was generally below 9 °C and measured 4.8 at 740 m depth. Oxygen minimum zone was between 200 and 450 m depth, and on the northern transect (23 °S) DO levels were as low as 0.8 ml/l at ?? m.

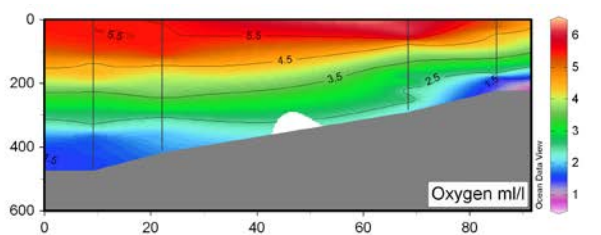
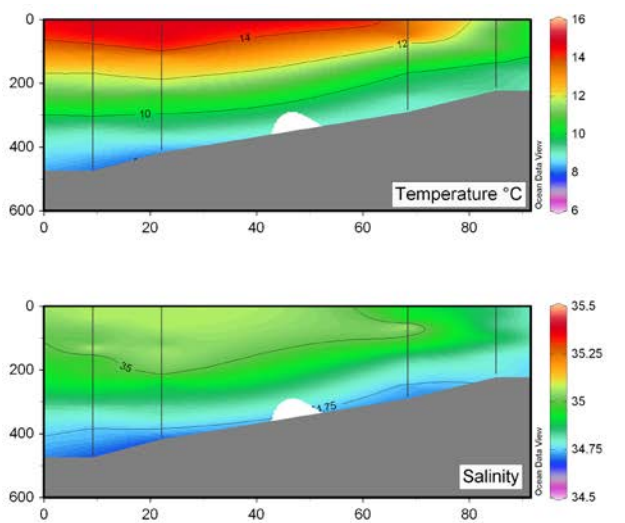
## Cross shelf hydrographic profiles

### Line 23.5 °S



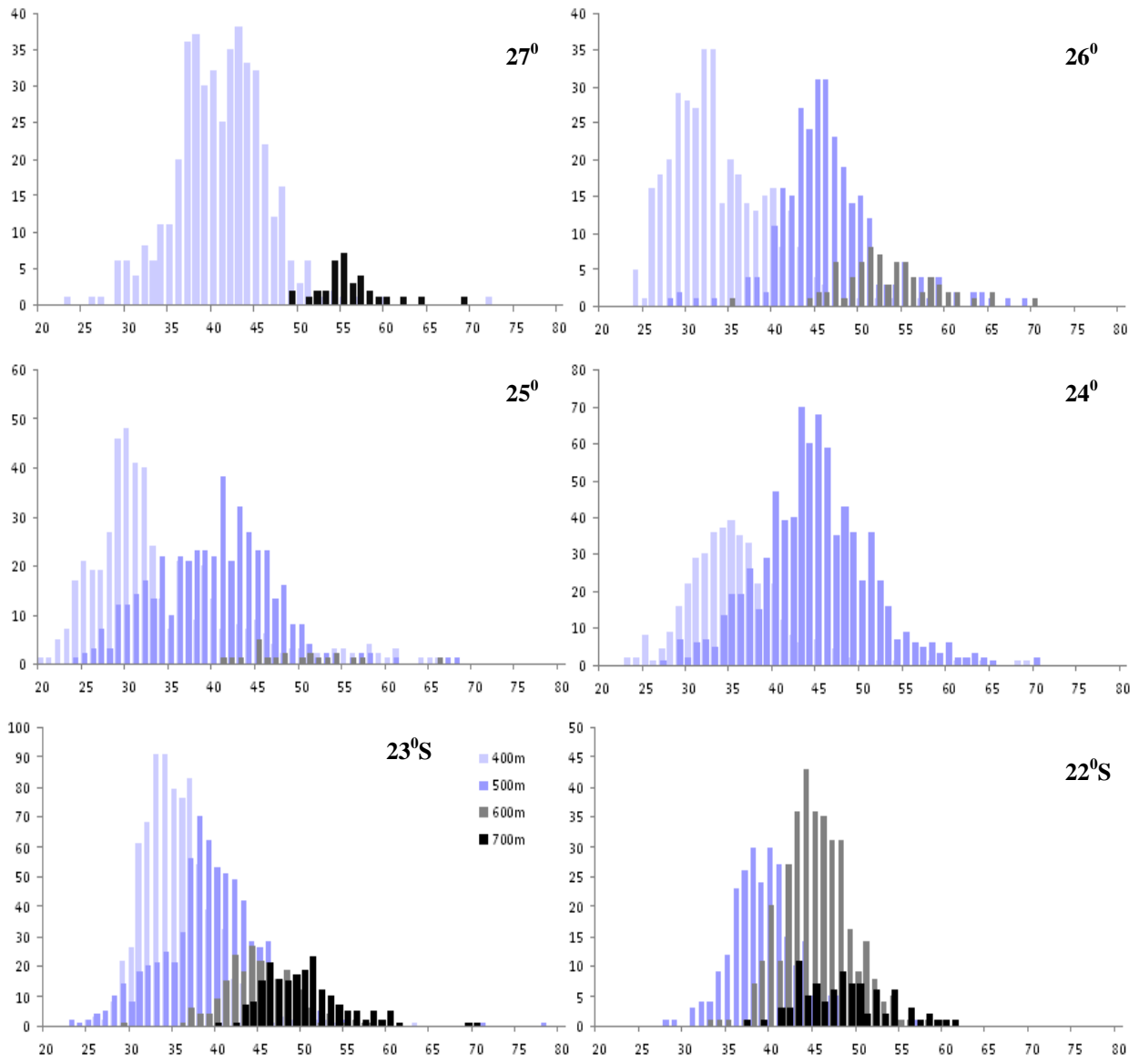
### Line 25.5 °S

### Line 27°S

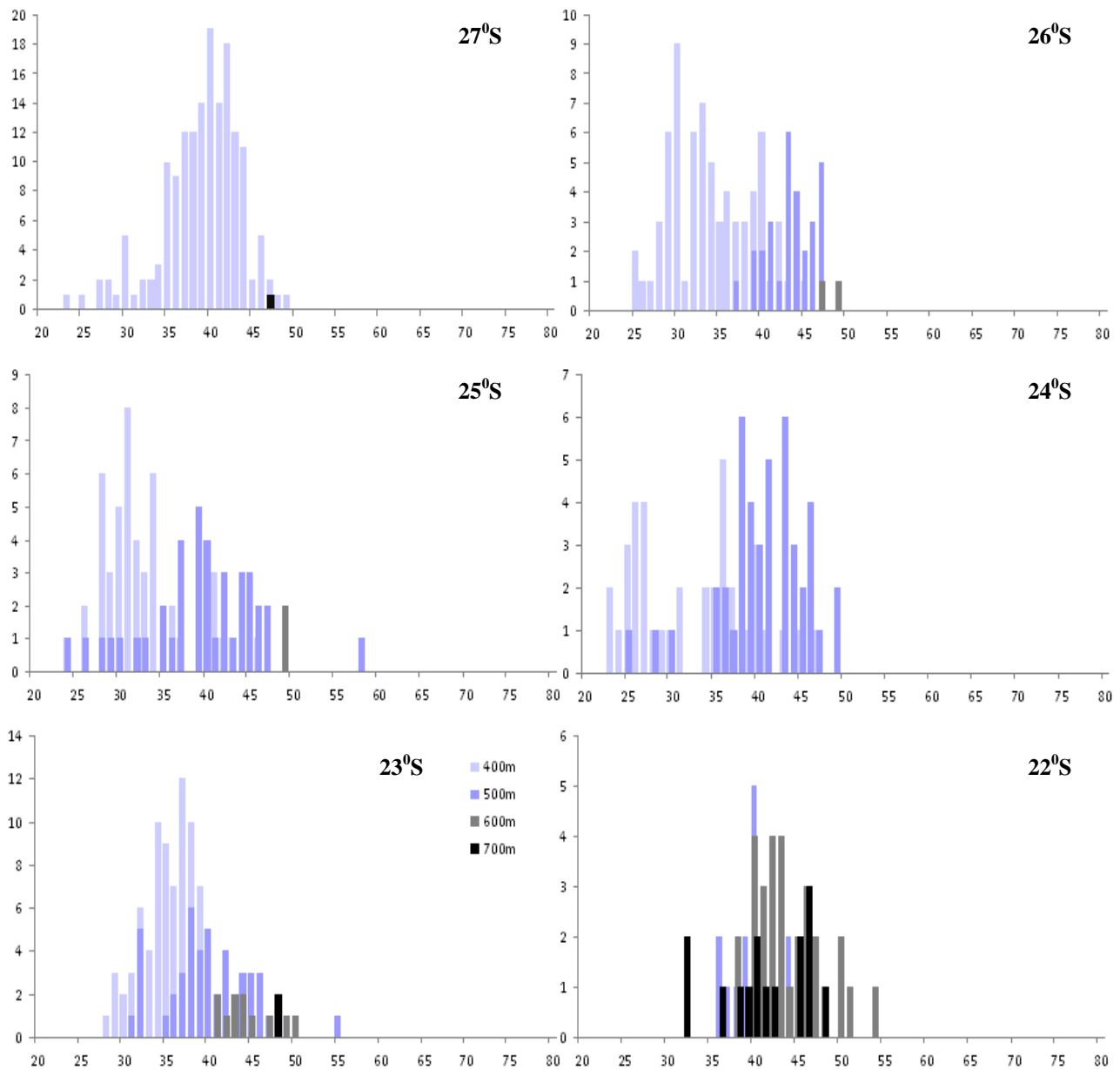


## 4.1 Length distributions

Females measured 20 – 78 cm, and males 23 – 58 cm. The average length of both male and female deep sea hake increased with increasing depth (Figs. 4 and 5, Table 1). No apparent difference between male and female length was visible within a depth range, although all larger fish caught (> 60 cm), regardless of depth, were females. Average length did not seem to vary greatly with latitude, although a trend of decreasing average length with decreasing latitude is visible (Table 1).



**Figure 4:** Female deep sea hake length distributions (number per length class) by depth range and latitude.



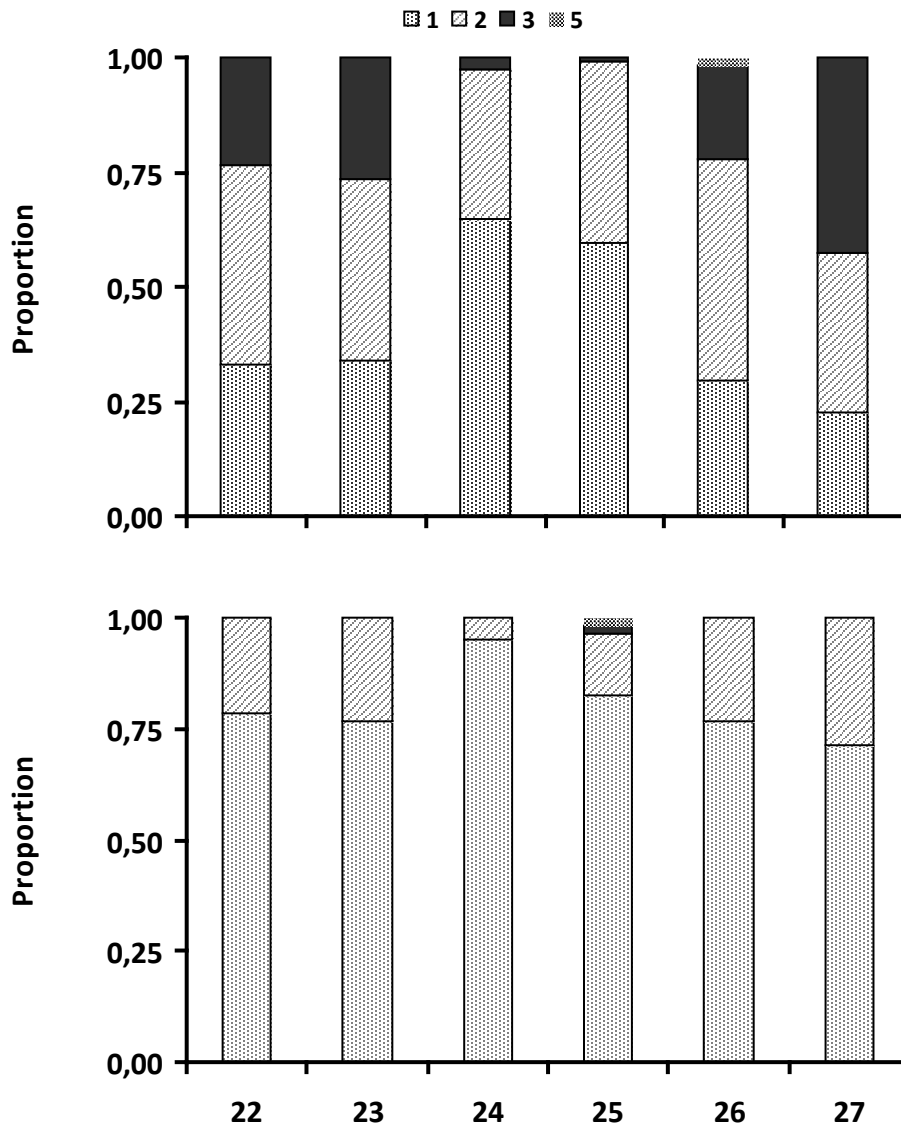
**Figure 5:** Male deep sea hake length distributions (number per length class) by depth range and latitude.

**Table 1:** Average length (cm) of male and female deep sea hake by depth and latitude.

Latitude	male	female	male	female	male	female	male	female
	400 m		500 m		600 m		700 m	
27	39	41					47	56
26	34	34	43	45	48	53		
25	32	33	40	42	49	49		
24	35	35	43	45				
23	36	36	40	40	44	45	48	50
22			40	39		45	43	48

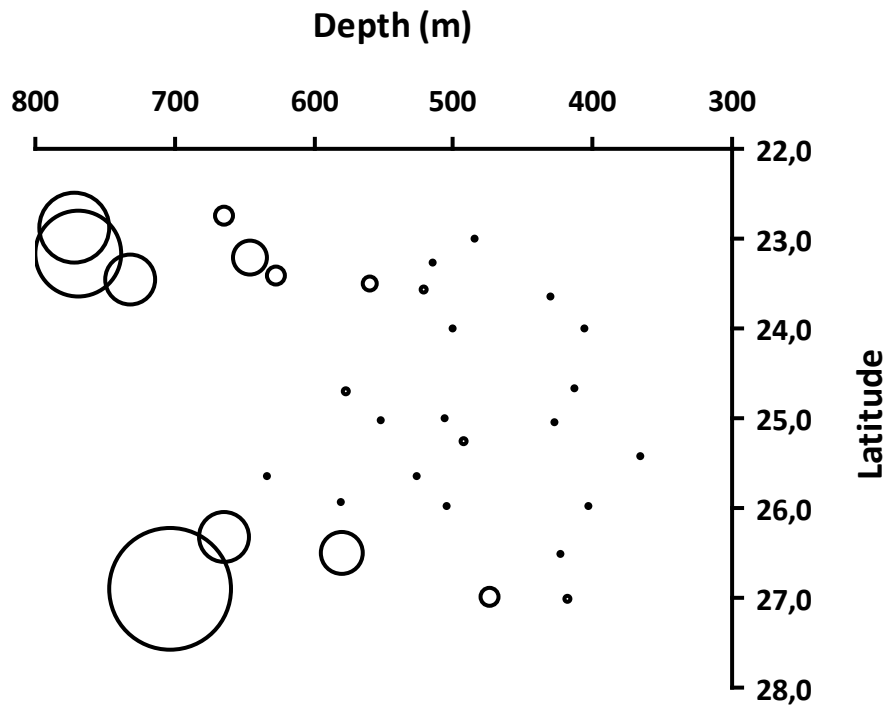
## 4.2 Gonad maturity

Neither ripe-running females nor ripe-running males were found, and only one probably spent female and male were identified during the course of the survey (Fig. 6). Ripe males were practically absent, with a majority of inactive males (stage 1) and a smaller proportion of maturing fish (stage2; Fig. 6). The relative proportion of ripe females in biological samples (n=20 per station) was higher south of 26°S and north of 24°S (Fig. 6).



**Figure 6:** Proportions of female (top) and male (bottom) maturity stages by latitude. NOTE: proportions are based on biological samples (n = 20).

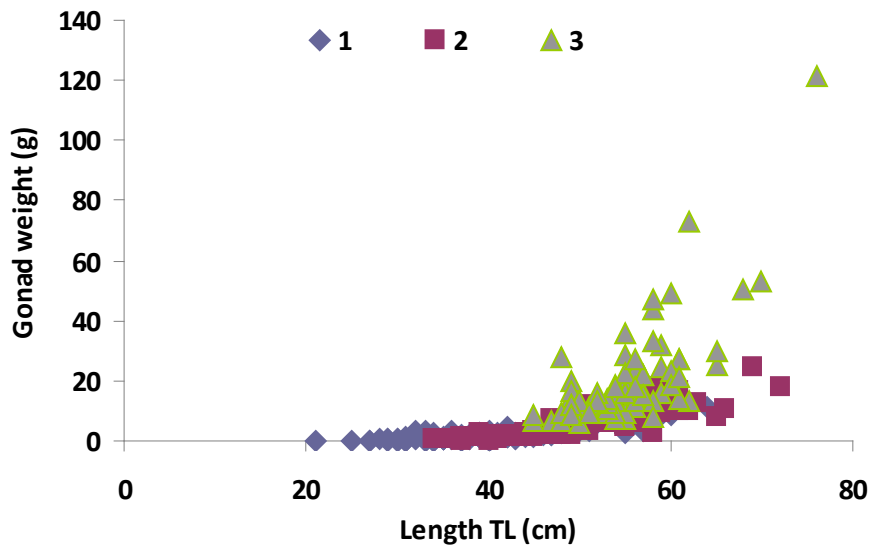




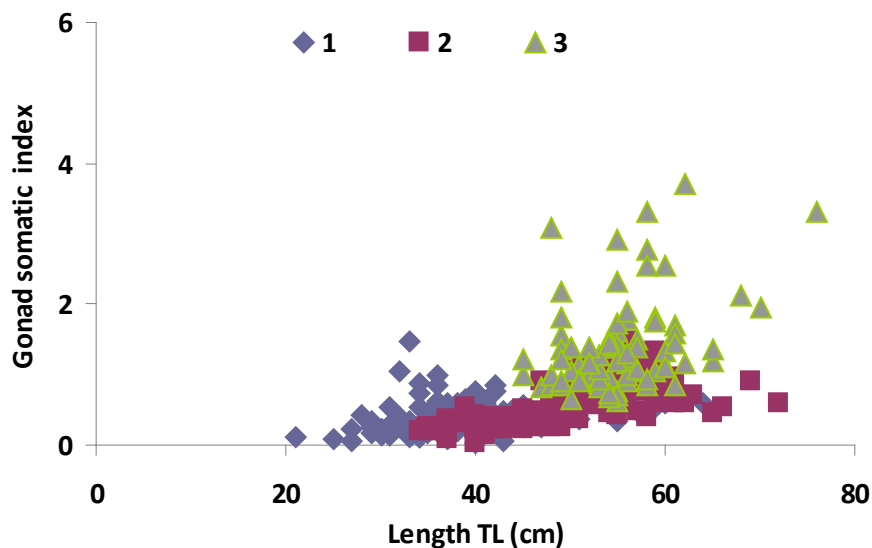
**Figure 7:** Percentage of ripe (stage 3) deep sea hake females in trawl catches by depth. Largest circle size indicates 41% and smallest 0,3% ripe females sampled in trawl catches.

Based on the limited biological data collected, the proportion of females with ripe gonads seems to increase with depth (Fig. 7). Few ripe females were caught inshore of 600 m, but their contribution was generally above 20% in catches deeper than 700 m. Between 24°S and 26°S just one trawl station was deeper than 600 m and two ripe females were caught. The lack of geographical coverage and biological samples from deeper waters makes it thus difficult to draw any conclusions about the absence or presence of ripe females in this area. The smallest female with maturing (stage 2) gonads was 34 cm and with ripe gonads 45 cm long (Figure 8). Average length of stage 3 females was 55 cm. The data suggests that females only start maturing once > 30 cm and possibly spawn when > 40 cm.

Average stage 3 gonad weight of a female weighing on average 1345 g was 21 g, less than 2% of its total weight. Less than 6% of stage 3 gonads sampled weighed more than 50, corresponding to a GSI of 1.9 to 3.7. The GSI for females staged as ripe ranged between 0.5 and 4 (Figure 9). In a study of the spawning cycle of the European hake, Recasens et al. (2008) found that stage 2 GSI ranged between 2 and 6, stage 3 GSI between 4 and 8 and stage 4 females between 8 and 18. Considering that fully developed and close to spawning (ripe and running) female gonads can contribute at least 8 % to the total body weight, the current data suggests that only few females had started investing resources in the development of eggs, and that with all certainty spawning was not taking place. It is more likely that spawning occurs later towards the end of the year.



**Figure 8:** Female length and gonad weight for different maturity stages.

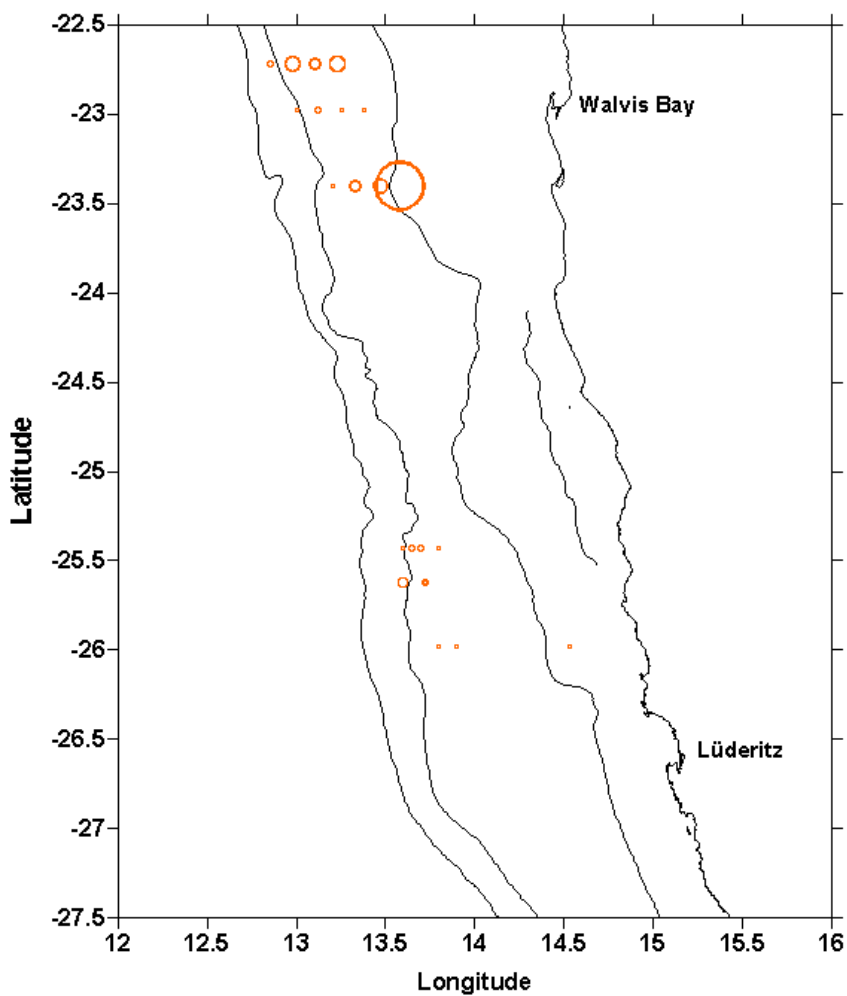


**Figure 9:** Female GSI for different maturity stages.

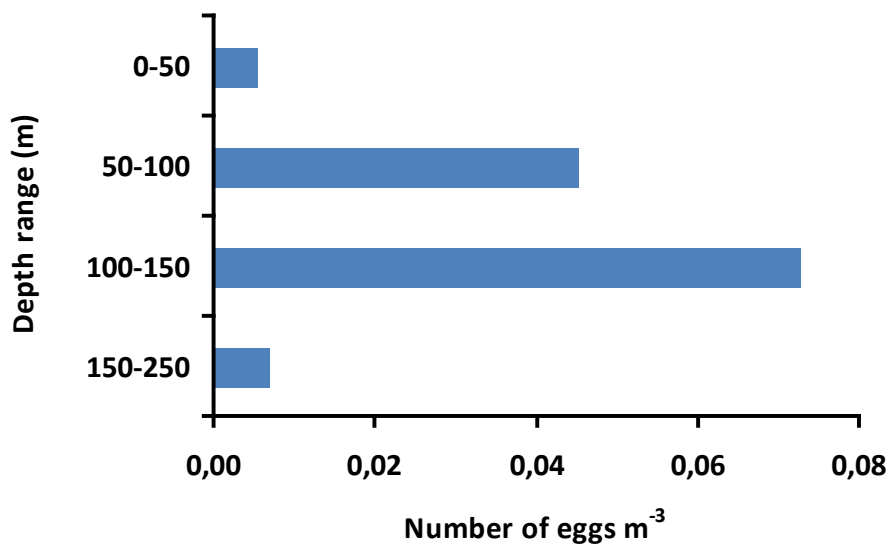
The GSI data and gonad weight data further suggests that the staging of hake maturity stages is somewhat inconsistent, and that resultantly the macroscopic staging of maturity stages would need to be looked at in more detail.

### 4.3 Eggs and larvae

Due to the patchy distribution of the multinet stations, owing bad weather, limited conclusions regarding the distribution of eggs can be drawn. The abundance of hake eggs (eggs m<sup>-2</sup>) increased at the inshore stations. Some hake eggs (7) were found at 25<sup>0</sup>30 at app. 400 m bottom depth,



**Figure 10:** Distribution of hake eggs (total number of eggs). Maximum circle size is equivalent to 306 eggs.



**Figure 11:** Vertical distribution of hake eggs (mean number of eggs m<sup>-3</sup>).

While at 23<sup>00</sup>20, at 200 and 300 m bottom depth, a total of 306 eggs (station 14) were counted (Fig.10). Highest egg abundance (mean eggs m<sup>-3</sup>) was found in the 100 – 150 m depth strata (Fig. 11), where oxygen ranged from 0.7 – 2.1 ml l<sup>-1</sup>, and temperature from 11.4 – 13 °C. Based on this distribution pattern it is most likely that the majority of inshore eggs caught were *M. capensis* and those found deeper *M. paradoxus* eggs, although this would need to be verified by genetic analyses. Only two hake larvae (early stage) were found during the entire survey. The low abundance of eggs and the low number of larvae found may be indicative of very limited spawning activity taking place.

## **CHAPTER 5 CONCLUSION**

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The survey covered only a fraction of the northern Benguela region, approximately half of the Namibian slope area. Since higher proportions of ripe females were found in the southern part of the surveyed area (26°S-27°S), it would be advisable that future surveys also covered the area south of 27°S up to at least 29°S.

The data shows that most ripe females were found deeper than 600 m depth, suggesting that spawning most likely would take place in deeper waters, perhaps even beyond 700 m. By restricting survey effort to a depth range of 550 to 800 m bottom depth, valuable survey time can be saved by omitting shallower stations that contribute little to the overall understanding of the distribution and presence of spawning fish.

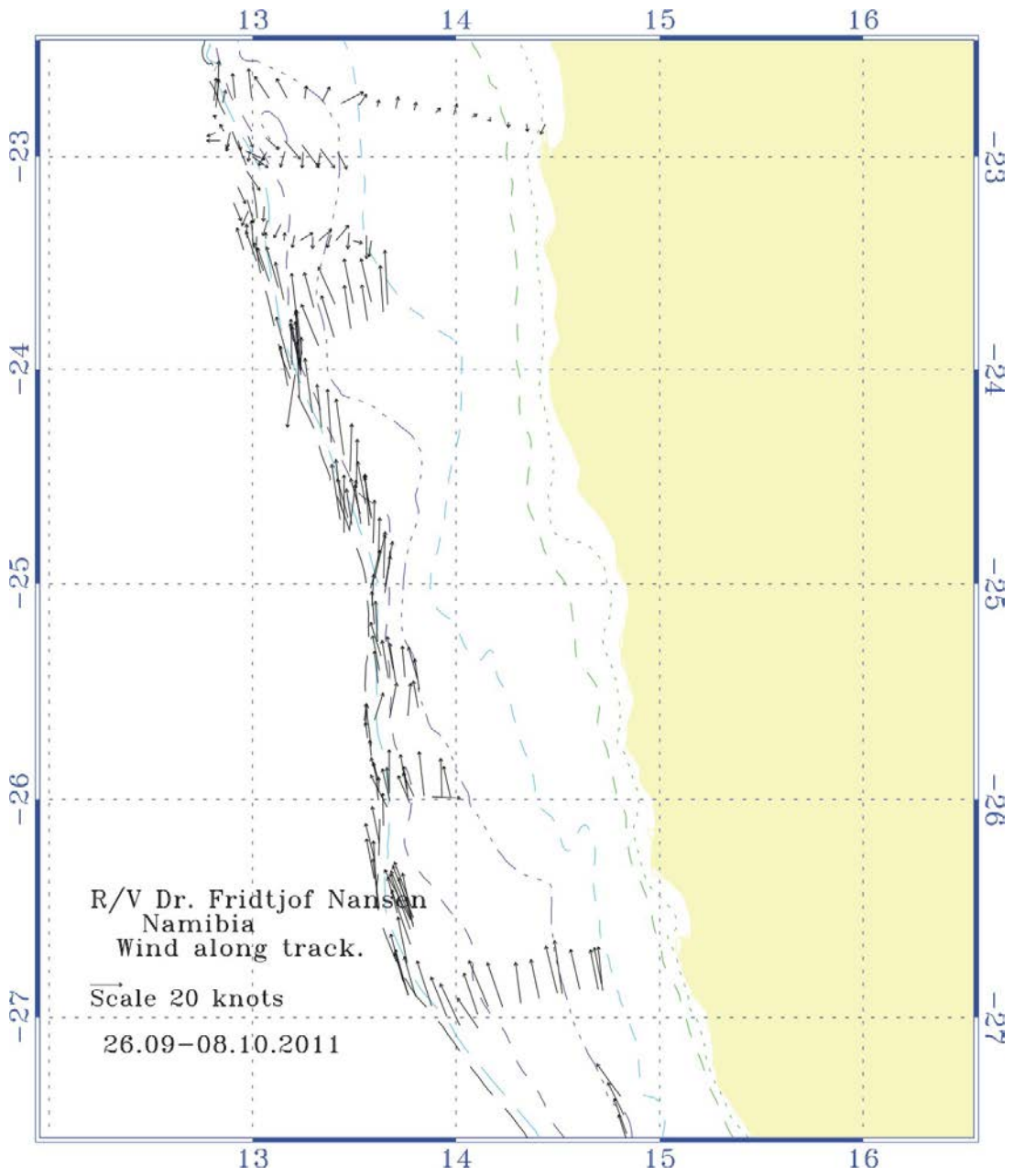
The fact that no ripe and running nor spent males or females were found during the survey, in addition to only few possibly deep sea hake eggs and larvae, suggest that spawning was not taking place nor had taken place. Furthermore, average stage 3 gonad weight was comparatively low (low GSI), meaning that even females with stage 3 gonads were most likely not going to spawn within the next following weeks or perhaps month. As such shifting the timing of a future survey to November / December may increase the probability of finding spawning deep sea hake.

The question of whether *M. paradoxus* spawn in the northern Benguela region (20°S to 29°S) has not been resolved with this survey. Additional surveys would need to be conducted, covering a wider latitudinal range and deeper habitat, as well as taking place in late summer.

## **REFERENCES**

Recasense L, Chiericoni V, and Belcar P(2008) Spawning pattern and batch fecundity of the European hake (*Merluccius merluccius* (Linnaeus, 1758)) in the western Mediterranean. *Scientia Marina* **72**: 721-732

# Annex 1: Wind speed



## Annex 2: Fishing stations

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 1  
 DATE : 28/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 26°52.48  
 start stop duration Lon E 14°43.13  
 TIME : 23:12:31 23:43:40 Purpose : 1  
 LOG : 3803.60 3804.90 1.3 Region : 5000  
 FDEPTH: 224 224 Gear cond.: 0  
 BDEPTH: 224 Validity: 0  
 Towing dir: 0° Wire out : 580 m Speed : 7326.4 kn  
 Sorted : 32 Total catch: 254.00 Catch/hour: 489.25

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius capensis	478.65	97.83
Lophius vomerinus	7.70	1.57
Sufflogobius bibarbatus	2.89	0.59
<b>Total</b>	<b>489.25</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 2  
 DATE : 29/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 27°1.36  
 start stop duration Lon E 14°6.62  
 TIME : 07:11:16 07:44:03 Purpose : 3  
 LOG : 3850.77 3852.31 1.5 Region : 5000  
 FDEPTH: 416 420 Gear cond.: 0  
 BDEPTH: 416 420 Validity: 0  
 Towing dir: 0° Wire out : 920 m Speed : 3.0 kn  
 Sorted : 224 Total catch: 525.93 Catch/hour: 1025.20

SPECIES	CATCH/HOUR	% OF TOT. C
Coelorinchus simorhynchus	257.89	25.16
Merluccius paradoxus, female	238.50	23.26
Merluccius paradoxus, male	116.37	11.35
Miscellaneous fishes	85.96	8.39
Cruriraja parcomaculata	82.46	8.04
Todarodes sagittatus	63.16	6.16
Helicolenus dactylopterus	52.63	5.13
Anemones, white	47.19	4.60
Lampanyctus australis	25.26	2.46
Sea urchin	22.11	2.16
Nezumia micronychodon	8.42	0.82
Genypterus capensis	7.89	0.77
Photichthys argenteus	7.72	0.75
Notacanthus sexspini	2.46	0.24
Lampanyctodes hectotis	1.58	0.15
Plesiionka martia	1.58	0.15
Selachophidium guentheri	1.40	0.14
Galus polli	1.40	0.14
Bathynectes piperitus	0.35	0.03
Mystriophis rostellatus	0.33	0.03
Symbolophorus boops	0.18	0.02
Maja squinado	0.18	0.02
Tripterygius gilchristi	0.18	0.02
<b>Total</b>	<b>1025.20</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 3  
 DATE : 29/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 26°59.69  
 start stop duration Lon E 13°57.18  
 TIME : 09:54:17 10:26:13 Purpose : 3  
 LOG : 3863.13 3864.63 1.5 Region : 5000  
 FDEPTH: 472 474 Gear cond.: 0  
 BDEPTH: 472 474 Validity: 0  
 Towing dir: 0° Wire out : 1050 m Speed : 2.8 kn  
 Sorted : 113 Total catch: 179.57 Catch/hour: 337.43

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	137.36	40.71
Coelorinchus simorhynchus	57.22	16.96
Nezumia micronychodon	20.91	6.20
Selachophidium guentheri	20.13	5.96
Merluccius paradoxus, male	12.40	3.68
Hoplostethus cadenati	10.07	2.98
Raja confundens	8.42	2.49
J E L L Y F I S H	8.16	2.42
Lampanyctus australis	6.84	2.03
Anemones, white	6.39	1.89
Notacanthus sexspini	5.86	1.74
Genypterus capensis	5.73	1.70
Yarellia blackfordi	5.52	1.64
Helicolenus dactylopterus	5.26	1.56
Miscellaneous fishes	3.81	1.13
Etmopterus brachyurus	3.76	1.11
Trachyrincus scabrus	2.57	0.76
Ebinania costaecanarie	2.57	0.76
Photichthys argenteus	2.57	0.76
Lithodes ferox	2.25	0.67
Starfish	1.92	0.57
Epi gonus telescopus	1.58	0.47
Epi gonus denticulatus	1.05	0.31
Opisthoteuthis agassizi	0.92	0.27
G A S T R O P O D S	0.92	0.27
Stomias boa boa	0.86	0.26
Bassanago albescens	0.60	0.18
Thysanoteuthis rhombus	0.34	0.10
Benthoedus tenuis	0.26	0.08
Nezumia leonis	0.26	0.08
Cyttus traversi	0.21	0.06
Neosopelus macrolepidotus	0.19	0.06
Nematocarcinus africanus	0.13	0.04
Tripterygius gilchristi	0.13	0.04
Lampadena pontifex	0.08	0.02
Maja squinado	0.08	0.02
Xenodermichthys copei	0.08	0.02
<b>Total</b>	<b>337.43</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 4  
 DATE : 29/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 26°54.09  
 start stop duration Lon E 13°45.94  
 TIME : 13:36:02 14:07:11 Purpose : 3  
 LOG : 3882.96 3884.53 1.6 Region : 5000  
 FDEPTH: 699 706 Gear cond.: 0  
 BDEPTH: 699 706 Validity: 0  
 Towing dir: 0° Wire out : 1600 m Speed : 3.0 kn  
 Sorted : 78 Total catch: 102.23 Catch/hour: 196.91

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	70.21	35.65
Nezumia micronychodon	20.61	10.47
Coelorinchus matania	18.49	9.39
Trachyscorpia eschmeyerii	14.64	7.43
Selachophidium guentheri	12.29	6.24
Deania calcea	9.63	4.89
Miscellaneous fishes	7.20	3.66
Neocyttus rhomboidalis	6.53	3.33
Todarodes sagittatus	6.32	3.21

SPECIES	CATCH/HOUR	% OF TOT. C
Hoplostethus atlanticus	5.12	56
Starfish	4.93	15
Lepidion capensis	4.20	19
Raja confundens	3.47	35
Centrosyllium fabrii	2.74	8
Chacina maritima	2.22	17
Notacanthus sexspini	1.89	27
Coelorinchus matania	1.62	8
Merluccius paradoxus, male	1.52	2
Alliocyttus verrucosus	0.96	23
Photichthys argenteus	0.77	73
Stomias boa boa	0.54	15
Glyphus marsupialis	0.35	146
Nemichthys scolopaceus	0.31	8
Yarellia blackfordi	0.23	12
Lithodes ferox	0.12	8
<b>Total</b>	<b>196.91</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 5  
 DATE : 30/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 26°31.28  
 start stop duration Lon E 13°46.98  
 TIME : 06:35:03 07:05:14 Purpose : 3  
 LOG : 3931.38 3932.90 1.5 Region : 5000  
 FDEPTH: 424 421 Gear cond.: 0  
 BDEPTH: 424 421 Validity: 0  
 Towing dir: 0° Wire out : 950 m Speed : 3.0 kn  
 Sorted : 99 Total catch: 202.05 Catch/hour: 401.69

SPECIES	CATCH/HOUR	% OF TOT. C
Coelorinchus simorhynchus	148.61	37.00
Merluccius paradoxus, female	84.10	310
Miscellaneous fishes	47.02	0
Lophius vomerinus	24.25	4
Merluccius paradoxus, male	18.79	82
Sea urchin	16.80	676
Anemones, white	11.73	30
Nezumia micronychodon	11.53	40
Schedophilus huttoni	9.05	4
Selachophidium guentheri	8.65	179
Helicolenus dactylopterus	6.36	22
Starfish	3.38	139
Cruriraja parcomaculata	3.38	2
Notacanthus sexspini	1.59	14
J E L L Y F I S H	1.09	0
Myxine capensis	1.09	60
G A S T R O P O D S	0.70	40
Todarodes sagittatus	0.60	4
Raja caudaspinosa	0.50	30
Hoplostethus cadenati	0.50	20
Photichthys argenteus	0.50	10
Tripterygius gilchristi	0.30	30
Yarellia blackfordi	0.30	10
Nematocarcinus africanus	0.30	89
Epi gonus denticulatus	0.20	40
Stomias boa boa	0.20	10
Bathynectes piperitus	0.10	10
Symbolophorus boops	0.10	10
<b>Total</b>	<b>401.69</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 6  
 DATE : 30/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 26°30.18  
 start stop duration Lon E 13°37.34  
 TIME : 09:52:07 10:23:27 Purpose : 3  
 LOG : 3943.20 3947.13 3.9 Region : 5000  
 FDEPTH: 573 585 Gear cond.: 0  
 BDEPTH: 573 585 Validity: 0  
 Towing dir: 0° Wire out : 1250 m Speed : 7.5 kn  
 Sorted : 27 Total catch: 219.29 Catch/hour: 419.96

SPECIES	CATCH/HOUR	% OF TOT. C
Nezumia micronychodon	94.22	1620
Merluccius paradoxus, female	92.79	169
Selachophidium guentheri	70.90	1402
Trachyrincus scabrus	39.87	368
Todarodes sagittatus	15.86	34
Hydrolycus sp.	14.25	23
Miscellaneous fishes	12.41	0
Hoplostethus atlanticus	10.11	506
Etmopterus brachyurus	8.73	34
Coelorinchus simorhynchus	8.04	123
Coelorinchus matania	8.04	34
Merluccius paradoxus, male	7.85	17
Genypterus capensis	7.47	4
Raja confundens	7.12	57
Epi gonus telescopus	5.63	57
Epi gonus denticulatus	4.71	92
Lithodes ferox	4.37	23
Etmopterus sp.	3.33	11
Notacanthus sexspini	2.64	69
Starfish	1.03	161
G A S T R O P O D S	0.57	23
<b>Total</b>	<b>419.96</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 7  
 DATE : 30/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 26°20.36  
 start stop duration Lon E 13°35.84  
 TIME : 12:25:25 12:53:35 Purpose : 3  
 LOG : 3954.43 3955.81 1.4 Region : 5000  
 FDEPTH: 661 668 Gear cond.: 0  
 BDEPTH: 661 668 Validity: 0  
 Towing dir: 0° Wire out : 1400 m Speed : 2.9 kn  
 Sorted : 64 Total catch: 341.04 Catch/hour: 726.39

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	130.35	158
Centrosyllium fabrii	114.80	119
Hoplostethus atlanticus	109.48	473
Centrosyllium crepidater	67.84	45
Miscellaneous fishes	67.39	0
Nezumia micronychodon	52.93	745
Bathyrhaja smithi	37.21	9
Ebinania costaecanarie	18.79	21
Bassanago albescens	17.68	30
Notacanthus sexspini	14.31	141
Raja confundens	12.16	53
Trachyscorpia eschmeyerii	12.01	21
Selachophidium guentheri	10.88	179
Coelorinchus matania	9.84	36
Etmopterus brachyurus	8.43	21
Lophius vomerinus	7.77	2
Hydrolycus sp.	6.26	9
G A S T R O P O D S	6.05	134

Lepidion capensis	3.58	15	0.49
Todarodes sagittatus	3.58	9	0.49
Merluccius paradoxus, male	3.30	4	0.45
Neocyttus rhomboidalis	2.98	7	0.41
Raja leopardus	2.17	15	0.30
Chaceon maritae	1.92	13	0.26
Sea urchin, weak spines	1.04	9	0.14
GERYONIDAE	0.89	9	0.12
Coelorinchus sp.	0.83	9	0.11
Alloctytus verrucosus	0.53	15	0.07
26 Starfish	0.45	45	0.06
Photichthys sp.	0.30	45	0.04
Nemichthys scolopaceus	0.23	9	0.03
Hoplostethus cadenati	0.23	21	0.03

POLYCHAELIDAE	0.15	9	0.02
Total	726.39		100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 8  
 DATE : 30/09/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 25°59.20  
 start stop duration Lon E 13°40.20  
 TIME : 16:13:13 16:43:11 30.0 (min) Purpose : 1  
 LOG : 3978.98 3980.49 1.5 Region : 5000  
 FDEPTH: 505 504 Gear cond.: 5000  
 BDEPTH: 505 504 Validity : 0  
 Towing dir: 0° Wire out : 1200 m Speed : 3.0 kn  
 Sorted : 18 Total catch: 246.40 Catch/hour: 493.13

SPECIES		CATCH/HOUR		% OF TOT. C	
SAMP	weight	numbers			
Merluccius paradoxus, female	139.19	270	28.23	29	
Trachyrincus scabrus	99.07	558	20.09		
Selachophidi um guentheri	88.62	1279	17.97		
Nezumia mi cronchodon	74.57	1909	15.12		
Notacanthus sexspini s	21.61	648	4.38		
Lophius vomerinus	18.31	10	3.71	28	
Merluccius paradoxus, male	14.71	32	2.98	27	
Coelorinchus simorhynchus	12.07	216	2.45		
Lithodes ferox	4.80	8	0.97		
MI SCELLANEUS	4.32	0	0.88		
Opi sthoteuthis agassizi	3.24	18	0.66		
Hoplostethus cadenati	2.88	126	0.58		
Starfish	2.34	36	0.47		
Coelorinchus matamua	1.26	36	0.26		
Myxine capensis	1.26	18	0.26		
Yarrel la blackfordi	1.08	90	0.22		
Photichthys argenteus	1.08	180	0.22		
Bathyroconger vicinus	0.54	18	0.11		
Epi gonus denticulatus	0.54	36	0.11		
Symbol ophorus boops	0.36	36	0.07		
Lampanyctodes hectoris	0.36	162	0.07		
Shrimps, small, non comm.	0.36	36	0.07		
C R A B S	0.36	36	0.07		
Xenodermichthys copei	0.18	18	0.04		
Total	493.13		100.00		

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 9  
 DATE : 01/10/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 25°59.18  
 start stop duration Lon E 13°46.65  
 TIME : 06:10:41 06:41:47 31.1 (min) Purpose : 3  
 LOG : 4021.00 4022.56 1.6 Region : 5000  
 FDEPTH: 404 403 Gear cond.: 0  
 BDEPTH: 404 403 Validity : 0  
 Towing dir: 0° Wire out : 920 m Speed : 3.0 kn  
 Sorted : 0 Total catch: 128.66 Catch/hour: 248.22

SPECIES		CATCH/HOUR		% OF TOT. C	
SAMP	weight	numbers			
Merluccius paradoxus, female	96.46	413	38.86	30	
Genypterus capensis	35.79	15	14.42	32	
Nezumia mi cronchodon	26.24	394	10.57	33	
Lophius vomerinus	19.29	4	7.77	32	
Helicolenus dactylopterus	15.14	60	6.10	34	
Coelorinchus simorhynchus	14.57	154	5.87		
Merluccius paradoxus, male	13.70	56	5.52	31	
MI scellaneous fishes	11.13	0	4.48		
Galus polli	3.36	56	1.35		
Cruriraja parcomaculata	2.45	2	0.99		
Hoplostethus cadenati	1.77	71	0.72		
Todarodes sagittatus	1.43	2	0.58		
Symbol ophorus boops	0.96	112	0.39		
Selachophidi um guentheri	0.89	14	0.36		
Yarrel la blackfordi	0.85	52	0.34		
Notacanthus sexspini s	0.83	58	0.33		
Photichthys argenteus	0.81	81	0.33		
Lampanyctodes hectoris	0.60	299	0.24		
Tripterophycis gilchristi	0.41	4	0.16		
Lampanyctus australis	0.29	35	0.12		
Stomias boa boa	0.21	10	0.09		
Squilla aculata calmani	0.17	4	0.07		
Plesionika martia	0.17	60	0.07		
Epi gonus denticulatus	0.15	42	0.06		
G A S T R O P O D S	0.15	6	0.06		
Epi gonus telescopus	0.14	2	0.05		
Myxine capensis	0.10	2	0.04		
Bathynectes piperitus	0.06	8	0.02		
Starfish	0.04	2	0.02		
Krill	0.02	75	0.01		
Aristeus varidens	0.02	2	0.01		
Ebinania costaecanarie	0.02	2	0.01		
Total	248.22		100.00		

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 10  
 DATE : 01/10/2011 GEAR TYPE: BT No: 21 POSITION: Lat S 25°56.05  
 start stop duration Lon E 13°37.35  
 TIME : 09:09:41 09:34:00 24.3 (min) Purpose : 3  
 LOG : 4036.73 4037.95 1.2 Region : 5000  
 FDEPTH: 582 581 Gear cond.: 0  
 BDEPTH: 582 581 Validity : 0  
 Towing dir: 0° Wire out : 1320 m Speed : 3.0 kn  
 Sorted : 98 Total catch: 251.79 Catch/hour: 621.19

SPECIES		CATCH/HOUR		% OF TOT. C	
SAMP	weight	numbers			
Merluccius paradoxus, female	119.41	155	19.22	35	
Cruriraja parcomaculata	87.63	44	14.11		
Selachophidi um guentheri	80.23	1303	12.92		
Nezumia mi cronchodon	80.08	1569	12.89		
Lophius vomerinus	40.34	10	6.49	37	
Bassanago albescens	36.12	59	5.81		
Centrosyllium fabricii	30.35	44	4.89		
MI scellaneous fishes	25.31	0	4.07		
Trachyrincus scabrus	24.87	163	4.00		

Ebinania costaecanarie	18.21	15	2.93
Notacanthus sexspini s	16.13	311	2.60
Coelorinchus simorhynchus	13.91	74	2.24
Etmopterus brachyurus	12.14	30	1.95
Coelorinchus matamua	11.99	178	1.93
Merluccius paradoxus, male	6.04	10	0.97
Todarodes sagittatus	5.77	15	0.93
Lepidion capensis	4.88	30	0.79
Alloctytus verrucosus	1.78	30	0.29
Epi gonus denticulatus	1.48	74	0.24
Lithodes ferox	1.18	15	0.19
Bathyroconger vicinus	1.18	30	0.19
Hoplostethus cadenati	0.74	15	0.12
Hoplostethus atlanticus	0.67	2	0.11
Neoscopolus macrolepidotus	0.59	30	0.10
POLYCHAELIDAE	0.15	15	0.02
Total	621.19		100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 11  
 DATE : 01/10/2011 GEAR TYPE: BT No: 25 POSITION: Lat S 25°38.46  
 start stop duration Lon E 13°32.99  
 TIME : 13:36:57 13:49:57 13.0 (min) Purpose : 3  
 LOG : 4062.46 4062.95 0.5 Region : 5000  
 FDEPTH: 633 636 Gear cond.: 0  
 BDEPTH: 633 636 Validity : 0  
 Towing dir: 0° Wire out : 1400 m Speed : 2.2 kn  
 Sorted : 56 Total catch: 226.80 Catch/hour: 1046.77

SPECIES		CATCH/HOUR		% OF TOT. C	
SAMP	weight	numbers			
Cruriraja parcomaculata	212.31	258	20.28		
Starfish	193.11	16062	18.45		
Selachophidi um guentheri	151.38	3766	14.46		
MI scellaneous fishes	90.46	0	8.64		
Nezumia mi cronchodon	89.72	8972	8.57		
Merluccius paradoxus, female	80.31	102	7.67	40	
Lophius vomerinus	60.46	9	5.78	42	
Sea urchin, weak spines	54.65	1625	5.22		
Raja leopardus	51.32	74	4.90		
Coelorinchus matamua	21.42	185	2.05		
Raja confundens	12.55	258	1.20		
Alloctytus verrucosus	7.75	111	0.74	43	
Merluccius paradoxus, male	6.23	9	0.60	41	
Bathylagichthys problematica	4.06	37	0.39		
Sea cucumbers	3.32	332	0.32		
Hoplostethus atlanticus	2.58	185	0.25	44	
Hoplostethus cadenati	2.58	111	0.25		
Funchalia woodwardi	1.06	74	0.10		
Lampanyctodes hectoris	0.74	37	0.07		
Neoscopolus macrolepidotus	0.74	37	0.07		
Total	1046.77		100.00		

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 12  
 DATE : 01/10/2011 GEAR TYPE: BT No: 25 POSITION: Lat S 25°38.80  
 start stop duration Lon E 13°35.95  
 TIME : 15:21:44 15:38:59 17.3 (min) Purpose : 3  
 LOG : 4068.12 4068.81 0.7 Region : 5000  
 FDEPTH: 529 523 Gear cond.: 0  
 BDEPTH: 529 523 Validity : 0  
 Towing dir: 0° Wire out : 1200 m Speed : 2.4 kn  
 Sorted : 68 Total catch: 417.73 Catch/hour: 1045.97

SPECIES		CATCH/HOUR		% OF TOT. C	
SAMP	weight	numbers			
Cruriraja parcomaculata	344.77	292	23.73		
MI scellaneous fishes	311.65	0	21.45		
Nezumia mi cronchodon	236.17	4237	16.25		
Selachophidi um guentheri	178.23	3263	12.27		
Merluccius paradoxus, female	94.09	191	6.48	45	
Lithodes ferox	61.36	97	4.22		
Starfish	43.34	2191	2.98		
Lophius vomerinus	39.65	17	2.73	47	
Yarrel la blackfordi	28.24	1120	1.94		
Sea urchin, weak spines	25.32	1461	1.74		
Myxine capensis	17.04	243	1.17		
Opi sthoteuthis agassizi	16.56	49	1.14		
Coelorinchus matamua	16.07	243	1.11		
Epi gonus denticulatus	8.77	195	0.60		
Merluccius paradoxus, male	8.35	10	0.57	46	
Alloctytus verrucosus	7.79	146	0.54	48	
Galus polli	5.36	49	0.37		
Notacanthus sexspini s	4.38	195	0.30		
Hoplostethus cadenati	4.38	148	0.30		
Bathyroconger vicinus	1.46	49	0.10		
Total	1452.97		100.00		

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 13  
 DATE : 02/10/2011 GEAR TYPE: BT No: 25 POSITION: Lat S 25°25.73  
 start stop duration Lon E 13°42.22  
 TIME : 06:19:36 06:49:46 30.2 (min) Purpose : 3  
 LOG : 4119.81 4121.27 1.5 Region : 5000  
 FDEPTH: 367 365 Gear cond.: 0  
 BDEPTH: 367 365 Validity : 0  
 Towing dir: 0° Wire out : 840 m Speed : 2.9 kn  
 Sorted : 114 Total catch: 525.73 Catch/hour: 1045.54

SPECIES		CATCH/HOUR		% OF TOT. C	
SAMP	weight	numbers			
Merluccius capensis, female	413.46	137	39.55	49	
Merluccius paradoxus, female	296.74	477	28.38	51	
Merluccius capensis, male	85.95	40	8.22	50	
Torpedo nobiliana	63.44	2	6.07		
MI scellaneous fishes	59.09	0	5.65		
Merluccius paradoxus, male	43.20	74	4.13	52	
Nezumia mi cronchodon	21.82	718	2.09		
Helicolenus dactylopterus	14.88	12	1.42	55	
Coelorinchus simorhynchus	10.86	119	1.04		
Galus polli	9.15	153	0.87		
Lophius vomerinus	8.85	8	0.85	53	
Krill	5.65	28220	0.54		
Lampanyctodes hectoris	2.90	1931	0.28		
Notacanthus sexspini s	2.74	127	0.26		
Squalus megalops	2.39	8	0.23		
Genypterus capensis	2.29	2	0.22	54	
Todaropsis eblanæ	0.78	316	0.07		
Epi gonus denticulatus	0.44	16	0.04		
Myxine capensis	0.34	16	0.03		
Symbol ophorus boops	0.18	50	0.02		
Shrimps, small, non comm.	0.18	179	0.02		
Squilla aculata calmani	0.08	24	0.01		
Selachophidi um guentheri	0.08	8	0.01		
Bathynectes piperitus	0.08	34	0.01		
Total	1045.54		100.00		

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 14



DATE : 02/10/2011 GEAR TYPE: BT NO: 25 POSITION: Lat S 25° 16.29  
 start stop duration Lon E 13° 36.87  
 TIME : 09:00:54 09:30:44 29.8 (mi n) Purpose : 3  
 LOG : 4131.89 4133.37 1.5 Region : 5000  
 FDEPTH: 487 496 Gear cond.: 0  
 BDEPTH: 487 496 Validity : 0  
 Towing dir: 0° Wire out : 1080 m Speed : 3.0 kn  
 Sorted : 24 Total catch: 304.69 Catch/hour: 612.85

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	157.29	25.67
Hoplostethus cadenati	98.56	16.08
Selachophidium guentheri	88.43	14.42
Nezumia micronychodon	65.17	10.63
Trachyrhynchus scabrus	56.48	9.22
Lithodes ferox	54.67	8.92
Miscellaneous fishes	23.53	3.84
Merluccius paradoxus, male	14.38	2.35
Notacanthus sexspinis	13.21	2.16
Yarellia blackfordi	12.31	2.01
Cruriraja parcomaculata	10.68	1.74
Ebinania costaecanarie	7.60	1.24
Galeus polli	7.42	1.21
Lophius vomerinus	4.83	0.79
Bathyrcongery vicinus	3.98	0.65
Sea cucumbers	3.98	0.65
Coelorhynchus matama	3.80	0.62
Epi gonus telescopus	2.72	0.44
Coelorhynchus simorhynchus	2.17	0.35
Lampanyctus australis	0.54	0.09
Plesionika martia	0.54	0.09
Lampanyctodes hectoris	0.36	0.06
Shrimps, small, non comm.	0.18	0.03
<b>Total</b>	<b>612.85</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 15  
 DATE : 02/10/2011 GEAR TYPE: BT NO: 25 POSITION: Lat S 25° 1.17  
 start stop duration Lon E 13° 34.76  
 TIME : 11:34:18 12:05:10 30.9 (mi n) Purpose : 3  
 LOG : 4147.19 4148.70 1.5 Region : 5000  
 FDEPTH: 551 553 Gear cond.: 0  
 BDEPTH: 551 553 Validity : 0  
 Towing dir: 0° Wire out : 1200 m Speed : 2.9 kn

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	488.56	32.97
Raja leopards	210.73	14.22
Lithodes ferox	183.60	12.39
Nezumia micronychodon	156.84	10.58
Selachophidium guentheri	146.88	9.91
Notacanthus sexspinis	27.38	1.85
Merluccius paradoxus, male	24.51	1.65
Epi gonus denticulatus	18.67	1.26
Hoplostethus cadenati	16.18	1.09
Miscellaneous fishes	13.07	0.88
Lophius vomerinus	11.28	0.76
Bathyr Raja smithi	11.18	0.75
Yarellia blackfordi	3.11	0.21
Symbolophorus boops	1.87	0.13
Lampanyctodes hectoris	1.24	0.08
Starfish	0.62	0.04
Plesionika martia	0.62	0.04
Lampanyctus australis	0.62	0.04
<b>Total</b>	<b>1481.89</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 16  
 DATE : 02/10/2011 GEAR TYPE: BT NO: 25 POSITION: Lat S 24° 59.40  
 start stop duration Lon E 13° 36.01  
 TIME : 13:36:07 13:54:31 18.4 (mi n) Purpose : 3  
 LOG : 4152.75 4153.47 0.7 Region : 5000  
 FDEPTH: 506 508 Gear cond.: 0  
 BDEPTH: 506 508 Validity : 0  
 Towing dir: 0° Wire out : 1050 m Speed : 2.4 kn  
 Sorted : 27 Total catch: 142.79 Catch/hour: 465.62

SPECIES	CATCH/HOUR	% OF TOT. C
Selachophidium guentheri	103.50	22.23
Lophius vomerinus	72.55	15.58
Merluccius paradoxus, female	70.61	15.16
Nezumia micronychodon	51.55	11.07
Cruriraja parcomaculata	45.00	9.66
Lithodes ferox	35.71	7.67
Miscellaneous fishes	29.84	6.41
Galeus polli	12.82	2.75
Hoplostethus cadenati	6.46	1.39
Merluccius paradoxus, male	6.20	1.33
Notacanthus sexspinis	6.07	1.30
Myxine capensis	5.97	1.28
E C H I N O D E R M A T A	5.18	1.11
Epi gonus telescopus	4.21	0.90
Anemones white	3.33	0.71
G A S T R O P O D S	1.96	0.42
Brama brama	1.47	0.32
Starfish	1.17	0.25
Yarellia blackfordi	0.98	0.21
ACTIDAE	0.59	0.13
Octopus vulgaris	0.49	0.11
<b>Total</b>	<b>465.63</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 17  
 DATE : 02/10/2011 GEAR TYPE: BT NO: 25 POSITION: Lat S 25° 2.21  
 start stop duration Lon E 13° 39.02  
 TIME : 15:50:15 16:20:19 30.1 (mi n) Purpose : 3  
 LOG : 4161.60 4163.12 1.5 Region : 5000  
 FDEPTH: 431 423 Gear cond.: 0  
 BDEPTH: 431 423 Validity : 0  
 Towing dir: 0° Wire out : 995 m Speed : 3.0 kn  
 Sorted : 102 Total catch: 460.41 Catch/hour: 919.29

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	254.58	27.69
Hoplostethus cadenati	210.73	22.94
Nezumia micronychodon	82.72	9.00
Cruriraja parcomaculata	71.78	7.81
Coelorhynchus simorhynchus	48.36	5.26
Galeus polli	39.87	4.34

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, male	33.08	178
Selachophidium guentheri	32.83	974
Miscellaneous fishes	26.82	0
Merluccius paradoxus, female	25.56	22
Lithodes ferox	24.00	34
Lophius vomerinus	17.77	16
Helicolenus dactylopterus	12.12	118
Yarellia blackfordi	9.32	517
Notacanthus sexspinis	6.87	16
Merluccius capensis, female	6.59	6
Myxine capensis	3.89	76
Sea urchin, weak spines	3.89	136
Epi gonus denticulatus	3.55	110
Bathynectes piperitus	1.36	110
PANDALIDAE	1.10	228
Plesionika martia	0.76	254
Aristeus varians	0.68	42
Ebinania costaecanarie	0.42	16
J E L Y F I S H	0.42	8
Lampanyctodes hectoris	0.08	58
Munda sp.	0.01	50
<b>Total</b>	<b>919.30</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 18  
 DATE : 03/10/2011 GEAR TYPE: BT NO: 25 POSITION: Lat S 24° 42.92  
 start stop duration Lon E 13° 28.73  
 TIME : 06:36:50 07:06:56 30.1 (mi n) Purpose : 3  
 LOG : 4211.77 4213.31 1.5 Region : 5000  
 FDEPTH: 574 579 Gear cond.: 2  
 BDEPTH: 574 579 Validity : 2  
 Towing dir: 0° Wire out : 1280 m Speed : 3.0 kn  
 Sorted : 585 Total catch: 953.94 Catch/hour: 1901.54

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	532.03	27.98
Notacanthus sexspinis	483.19	25.41
Centroscymnus coelolepis	157.40	8.28
Todarodes sagittatus	156.92	8.25
Cruriraja parcomaculata	83.72	4.40
Deania profundorum	69.85	3.67
Miscellaneous fishes	57.89	3.04
Nezumia micronychodon	57.89	3.04
Trachyrhynchus scabrus	57.41	3.02
Coelorhynchus matama	41.14	2.16
Himantolophus groenlandicus	37.79	1.99
Deania quadri spinosum	36.36	1.91
Centroscymnus coelolepis	20.13	1.06
Selachophidium guentheri	20.09	1.06
Vitrel edomella richardi	19.61	1.03
Opiotretus agassizi	19.14	0.98
Hoplostethus cadenati	18.66	0.98
Merluccius paradoxus, male	18.64	0.98
Lophius vomerinus	7.48	0.39
Allocyttus verrucosus	2.87	0.15
GONOSTOMATIDAE	0.96	0.05
Yarellia blackfordi	0.96	0.05
Melanocetus johnsonii	0.48	0.03
Photichthys argenteus	0.48	0.03
Neoscolepus macrolepidotus	0.48	0.03
<b>Total</b>	<b>1901.54</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 19  
 DATE : 03/10/2011 GEAR TYPE: BT NO: 6 POSITION: Lat S 24° 40.07  
 start stop duration Lon E 13° 34.45  
 TIME : 12:51:52 13:27:48 35.9 (mi n) Purpose : 3  
 LOG : 4233.35 4235.05 1.7 Region : 5000  
 FDEPTH: 416 409 Gear cond.: 0  
 BDEPTH: 416 409 Validity : 0  
 Towing dir: 0° Wire out : 1000 m Speed : 2.8 kn  
 Sorted : 113 Total catch: 159.70 Catch/hour: 266.61

SPECIES	CATCH/HOUR	% OF TOT. C
Merluccius paradoxus, female	98.58	36.98
Cruriraja parcomaculata	30.05	11.27
Nezumia micronychodon	29.30	10.99
Helicolenus dactylopterus	20.45	7.67
Lophius vomerinus	18.20	6.83
Coelorhynchus simorhynchus	10.27	3.85
Selachophidium guentheri	8.80	3.30
Raja confusus	7.51	2.82
Genypterus capensis	7.43	2.79
Merluccius paradoxus, male	6.76	2.54
Brama brama	5.76	2.16
Epi gonus telescopus	5.01	1.88
Miscellaneous fishes	4.21	1.58
Bassanago albescens	3.01	1.13
Todarodes sagittatus	2.42	0.91
Anemones white	1.95	0.73
Etmopterus gracilispinis	1.17	0.44
Myxine capensis	0.83	0.31
Notacanthus sexspinis	0.83	0.31
G A S T R O P O D S	0.67	0.25
Galeus polli	0.67	0.25
Lampanyctodes hectoris	0.62	0.23
Hoplostethus cadenati	0.50	0.19
Epi gonus denticulatus	0.42	0.16
Lampanyctus australis	0.25	0.09
Yarellia blackfordi	0.25	0.09
Photichthys argenteus	0.20	0.08
Bathynectes piperitus	0.17	0.06
S H R I M P S	0.17	0.06
Munda sp.	0.17	0.06
<b>Total</b>	<b>266.61</b>	<b>100.00</b>

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 20  
 DATE : 04/10/2011 GEAR TYPE: BT NO: 24 POSITION: Lat S 24° 0.07  
 start stop duration Lon E 13° 14.07  
 TIME : 13:16:23 13:48:34 32.2 (mi n) Purpose : 3  
 LOG : 4307.59 4309.15 1.6 Region : 5000  
 FDEPTH: 415 397 Gear cond.: 0  
 BDEPTH: 415 397 Validity : 0  
 Towing dir: 0° Wire out : 1000 m Speed : 2.9 kn  
 Sorted : 29 Total catch: 263.19 Catch/hour: 490.87

SPECIES	CATCH/HOUR	% OF TOT. C
Hoplostethus cadenati	180.53	20.48
Merluccius paradoxus, female	53.90	10.98
Miscellaneous fishes	43.34	8.83

Nezumia micronychodon	41.78	1990	8.51	
Helicolenus dactylopterus	38.51	35	7.42	88
Epi gonus denticulatus	25.98	1333	5.29	
Ebi nania costaecanarie	25.46	52	5.19	
Merluccius capensis, female	24.34	26	4.96	84
Galeus polli	21.67	235	4.42	
Coel orin chus simorhynchus	17.23	196	3.51	
Sel achophi di um guentheri	14.75	222	3.41	
Todarodes sagittatus	12.53	26	2.55	
Bathyroconger vicinus	12.40	26	2.53	
Schedophilus huttoni	10.82	7	2.20	
Stomi as boa boa	8.49	808	1.73	
Squal us megalops	7.83	13	1.60	
Merluccius paradoxus, male	6.90	34	1.41	81
Notacanthus sexspinis	5.61	222	1.14	
Lophi us vomerinus	4.48	7	0.91	85
Genypterus capensis	3.08	2	0.63	86
Aristeus vari dens	2.87	509	0.59	
Merluccius capensis, male	2.14	2	0.44	83
Brama brama	1.77	2	0.36	87
PALAEMONIDAE	1.57	222	0.32	
Sergestes sp.	1.04	170	0.21	
Yarrella blackfordi	1.04	65	0.21	
Lampadena pontifex	0.52	39	0.11	
Lampanyctodes hecto raris	0.26	26	0.05	
Total	490.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 21  
DATE : 04/10/2011 GEAR TYPE: BT NO: 24 POSITION: Lat S 24° 0.10  
start stop duration Lon E 13° 12.08  
TIME : 16:30:04 17:00:21 30.3 (min) Purpose : 3  
LOG : 4319.70 4321.21 1.5 Region : 5000  
FDEPTH: 500 502 Gear cond.: 0  
BDEPTH: 500 502 Validity : 0  
Towing dir: 0° Wire out : 1100 m Speed : 3.0 kn  
Sorted : 32 Total catch: 593.32 Catch/hour: 1175.67

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Hoplostethus cadenati	309.31 72	26.31
Merluccius paradoxus, female	227.38 658	19.34
Trachyrincus scabrus	120.67 638	10.26
Nezumia micronychodon	94.60 2628	8.05
Schedophilus huttoni	71.57 28	6.09
Neoharriotta pinnata	45.50 28	3.87
Todarodes sagittatus	43.83 111	3.73
Ebi nania costaecanarie	41.06 55	3.49
Raja confundens	38.56 28	3.28
Lophi us vomerinus	37.25 26	3.17
Sel achophi di um guentheri	29.68 777	2.52
Epi gonus denticulatus	27.19 943	2.31
Galeus polli	26.91 277	2.29
Merluccius paradoxus, male	14.37 50	1.22
Miscellaneous fishes	12.21 0	1.04
Notacanthus sexspinis	11.37 250	0.97
Bathyroconger vicinus	8.88 250	0.76
Helicolenus dactylopterus	5.55 50	0.47
Merluccius capensis, female	4.93 2	0.42
Lithodes ferox	3.47 10	0.29
Yarrella blackfordi	0.83 139	0.07
PALAEMONIDAE	0.55 139	0.05
Total	1175.67	100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 22  
DATE : 04/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23° 41.73  
start stop duration Lon E 13° 39.79  
TIME : 22:27:34 22:42:27 21.9 (min) Purpose : 3  
LOG : 4356.02 4357.13 1.1 Region : 5000  
FDEPTH: 214 216 Gear cond.: 0  
BDEPTH: 214 216 Validity : 0  
Towing dir: 0° Wire out : 500 m Speed : 3.0 kn  
Sorted : 47 Total catch: 501.18 Catch/hour: 1373.72

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Merluccius capensis	749.66 6828	54.57
Chrysaora hyoscella	342.90 0	24.96
Aequorea forskalea	159.80 0	11.63
Trachurus trachurus	101.69 757	7.40
Coel orin chus sp.	5.76 175	0.42
Sufflogobius barbatus	5.21 493	0.38
Bathynectes piperitus	3.21 88	0.23
Helicolenus dactylopterus	2.60 321	0.19
Chirophthalmas sp.	1.45 145	0.11
Sel achophi di um guentheri	1.45 30	0.11
Total	1373.72	100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 23  
DATE : 05/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23° 38.71  
start stop duration Lon E 13° 8.42  
TIME : 06:21:12 06:50:46 29.6 (min) Purpose : 3  
LOG : 4390.10 4391.51 1.4 Region : 5000  
FDEPTH: 431 438 Gear cond.: 0  
BDEPTH: 431 438 Validity : 0  
Towing dir: 0° Wire out : 850 m Speed : 2.9 kn  
Sorted : 127 Total catch: 297.11 Catch/hour: 602.86

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Merluccius paradoxus, female	163.75 505	27.16
Hoplostethus cadenati	112.92 3892	18.73
Miscellaneous fishes	71.16 0	11.80
Nezumia micronychodon	55.25 1690	9.16
Helicolenus dactylopterus	49.00 455	8.13
Schedophilus huttoni	30.82 28	5.11
Sel achophi di um guentheri	29.54 838	4.90
Lophi us vomerinus	17.75 22	2.95
Galeus polli	11.93 99	1.98
Ebi nania costaecanarie	9.09 14	1.51
Merluccius paradoxus, male	7.71 37	1.28
Lithodes ferox	7.41 8	1.23
Raja confundens	7.39 14	1.23
Epi gonus telescopus	5.68 99	0.94
Todarodes sagittatus	5.11 14	0.85
Merluccius capensis, female	3.15 4	0.52
Coel orin chus simorhynchus	2.98 71	0.49
Plesionika martia	2.27 753	0.38
Epi gonus denticulatus	1.28 43	0.21
Bathyroconger vicinus	1.28 43	0.21
PALAEMONIDAE	1.14 312	0.19
Trachyrincus scabrus	1.14 43	0.19
Coel orin chus namata	1.14 28	0.19
Bathynectes piperitus	0.99 28	0.16
Yarrella blackfordi	0.71 114	0.12
PANDALIDAE	0.57 156	0.09
Notacanthus sexspinis	0.43 43	0.07
Lampanyctus australis	0.43 43	0.07
Aristeus vari dens	0.43 43	0.07
Lampadena pontifex	0.28 28	0.05

Howella sherborni 0.14 14 0.02  
Total 602.86 100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 24  
DATE : 05/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23° 34.54  
start stop duration Lon E 13° 4.75  
TIME : 09:07:39 09:37:27 29.8 (min) Purpose : 3  
LOG : 4397.81 4399.35 1.5 Region : 5000  
FDEPTH: 519 519 Gear cond.: 0  
BDEPTH: 519 519 Validity : 0  
Towing dir: 0° Wire out : 1150 m Speed : 3.1 kn  
Sorted : 233 Total catch: 421.76 Catch/hour: 849.18

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Merluccius paradoxus, female	354.06 1025	41.69
Hoplostethus cadenati	118.39 274	13.94
ARI STEIDAE	104.86 52430	12.35
Sel achophi di um guentheri	52.43 1170	6.17
Nezumia micronychodon	52.15 2255	6.14
Cruriraja parcomaculata	22.97 14	2.71
Merluccius paradoxus, male	21.04 58	2.48
Trachyrincus scabrus	18.60 169	2.19
Lophi us vomerinus	14.80 20	1.74
Bassanago albescens	11.84 14	1.39
Lithodes ferox	11.28 30	1.33
Schedophilus huttoni	10.43 14	1.23
Ebi nania costaecanarie	10.29 14	1.21
Todarodes sagittatus	7.75 28	0.91
Yarrella blackfordi	6.20 409	0.73
Miscellaneous fishes	4.79 0	0.56
Photichthys argenteus	4.65 28	0.55
Bathyroconger vicinus	4.51 127	0.53
Helicolenus dactylopterus	4.37 28	0.51
Raja confundens	3.81 14	0.45
Brama brama	2.05 2	0.24
Plesionika martia	1.97 564	0.23
Chaceon maritae	1.85 2	0.22
Aristeus vari dens	1.41 282	0.17
Lampanyctus australis	1.13 240	0.13
Notacanthus sexspinis	0.85 28	0.10
Galeus polli	0.14 28	0.02
Bajacaliforni a magalops	0.14 14	0.02
Astronesthes sp.	0.14 14	0.02
Stomi as boa boa	0.14 14	0.02
Epi gonus denticulatus	0.14 14	0.02
Total	849.18	100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 25  
DATE : 05/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23° 31.05  
start stop duration Lon E 13° 2.83  
TIME : 11:05:20 11:38:37 33.3 (min) Purpose : 3  
LOG : 4403.35 4404.87 1.5 Region : 5000  
FDEPTH: 565 558 Gear cond.: 0  
BDEPTH: 565 558 Validity : 0  
Towing dir: 0° Wire out : 1300 m Speed : 2.7 kn  
Sorted : 110 Total catch: 463.40 Catch/hour: 835.46

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Merluccius paradoxus	601.48 1555	71.99
Hoplostethus cadenati	49.04 881	5.87
Nezumia micronychodon	47.27 2008	5.66
Plesionika martia	30.96 7141	3.71
Sel achophi di um guentheri	30.87 559	3.69
Lithodes ferox	15.47 23	1.85
Merluccius paradoxus	9.57 15	1.15
Notacanthus sexspinis	9.34 77	1.12
Miscellaneous fishes	9.19 0	1.10
Todarodes sagittatus	8.19 23	0.98
Lophi us vomerinus	5.73 8	0.69
Trachyrincus scabrus	3.52 46	0.42
Galeus polli	3.44 23	0.41
Chaceon maritae	2.51 4	0.30
Heterocarpus grimaldi	2.06 54	0.25
Raja confundens	1.98 8	0.24
Bathyroconger vicinus	1.06 31	0.13
Photichthys argenteus	0.69 46	0.08
Epi gonus denticulatus	0.61 15	0.07
Lampanyctus australis	0.61 69	0.07
Yarrella blackfordi	0.61 46	0.07
Symbolophorus boops	0.45 15	0.05
Starfish	0.38 8	0.05
Muni da sp.	0.22 54	0.03
Xenodermichthys copei	0.07 8	0.01
POLYCHAELIDAE	0.07 8	0.01
Lampadena pontifex	0.07 8	0.01
Total	835.46	100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 26  
DATE : 05/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23° 28.06  
start stop duration Lon E 13° 0.62  
TIME : 13:22:30 13:54:12 31.7 (min) Purpose : 3  
LOG : 4409.83 4411.44 1.6 Region : 5000  
FDEPTH: 628 627 Gear cond.: 0  
BDEPTH: 628 627 Validity : 0  
Towing dir: 0° Wire out : 1400 m Speed : 3.0 kn  
Sorted : 114 Total catch: 455.02 Catch/hour: 861.24

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Hoplostethus cadenati	178.88 3494	20.77
Merluccius paradoxus	118.30 282	13.74
Nezumia micronychodon	104.57 1968	12.14
Miscellaneous fishes	62.50 0	7.26
Lamprogrammus exultans	49.70 221	5.77
Sel achophi di um guentheri	48.47 886	5.63
Bajacaliforni a magalops	41.83 837	4.86
Todarodes sagittatus	30.26 25	3.51
Opisthotectus agassizii	25.34 98	2.94
Yarrella blackfordi	22.15 1181	2.57
Cruriraja parcomaculata	16.49 49	1.91
Anemones, white	15.99 49	1.86
Lophi us vomerinus	15.62 8	1.81
Galeus polli	14.76 74	1.71
Bathyroconger vicinus	14.52 271	1.69
Lophi us vailanti	9.37 2	1.09
Heterocarpus grimaldi	8.61 492	1.00
Bristle worms (straws)	8.37 0	0.97
Lithodes ferox	8.12 25	0.94
Ebi nania costaecanarie	7.87 25	0.91
Trachyrincus scabrus	7.63 98	0.89
Merluccius paradoxus	6.91 15	0.80

SPECIES	CATCH/HOUR	% OF TOT. C	
Notacanthus sexspinis	5.41	123	0.63
Coelorinchus matama	4.43	122	0.51
Plesiionka martia	4.18	984	0.49
Bathylagus glacialis *	3.94	271	0.46
Neoscopelus macropodotus	2.95	123	0.34
Bassanago albescens	2.74	2	0.32
Neoharriotta pinnata	2.54	2	0.29
Alloctytus verrucosus	2.21	25	0.25
Centrolophus niger	2.20	2	0.25
Chaceon maritae	1.93	2	0.22
Munda sp.	1.72	468	0.20
Hydrolyagus sp.	1.65	2	0.19
Starfish	1.48	74	0.17
POLYCHAELIDAE	1.48	148	0.17
Nephropsis atlantica	1.48	25	0.17
Schedophilus huttoni	1.21	2	0.14
Photichthys argenteus	0.98	148	0.11
Nezumia sp.	0.74	25	0.09
Shrimps, small, non comm.	0.74	123	0.09
Scopelosaurus sp.	0.49	49	0.06
Neocyttus rhomboidalis	0.47	2	0.05
Total	861.24		100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 27  
DATE : 05/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23°25.46  
start stop duration Lon E 12°57.17  
TIME : 15:51:36 16:21:07 Purpose : 3  
LOG : 4418.11 4419.63 1.5 Region : 5000  
FDEPTH: 732 731 Gear cond.: 0  
BDEPTH: 732 731 Validity : 0  
Towing dir: 0° Wire out : 1590 m Speed : 3.1 kn  
Sorted : 121 Total catch: 377.25 Catch/hour: 766.77

SPECIES	CATCH/HOUR	% OF TOT. C		
Merluccius paradoxus	169.41	278	22.09	114
Nezumia micronychodon	133.17	3238	17.37	
Raja confundens	67.13	55	8.76	
Miscellaneous fishes	52.13	0	6.80	
Yarellia blackfordi	47.38	2360	6.18	
Coelorinchus matama	46.83	91	6.11	
Selachophidium guentheri	38.78	604	5.06	
Anemones, white	33.48	73	4.37	
Todarodes sagittatus	32.56	37	4.25	
Allopocephalus sp.	32.01	73	4.17	
Coelorinchus acanthiger	24.15	91	3.15	
Bathyroconger vicinus	19.21	146	2.50	
Bajacalifornia magalops	10.43	91	1.36	
Plesiionka sp.	9.70	2140	1.26	
Sea urchin, weak spines	8.78	238	1.15	
Notacanthus sexspinis	6.40	73	0.83	
Dirole in troni gra	5.85	146	0.76	
Merluccius paradoxus	4.78	10	0.62	11
Alloctytus verrucosus	4.57	91	0.60	
Bathylagus glacialis *	4.02	348	0.52	
Lithodes ferox	3.05	2	0.40	
Bristle worms (straws)	2.74	402	0.36	
Hoplostethus cadenati	2.20	55	0.29	
Hoplostethus atlanticus	1.69	14	0.22	115
Chaceon maritae	1.57	4	0.20	
Lampyctus australis	1.46	293	0.19	
Heterocarpus grimaldi	0.91	37	0.12	
Halosaurus oventi	0.55	37	0.07	
POLYCHAELIDAE	0.55	37	0.07	
Starfish	0.37	18	0.05	
Munda sp.	0.37	220	0.05	
Lampadena pontifex	0.18	37	0.02	
Nephropsis atlantica	0.18	18	0.02	
Photichthys argenteus	0.18	37	0.02	
Total	766.77		100.00	

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 28  
DATE : 06/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23°15.91  
start stop duration Lon E 13°4.15  
TIME : 06:15:16 06:44:51 Purpose : 3  
LOG : 4494.13 4495.67 1.5 Region : 5000  
FDEPTH: 515 515 Gear cond.: 0  
BDEPTH: 515 515 Validity : 0  
Towing dir: 0° Wire out : 1150 m Speed : 3.1 kn  
Sorted : 26 Total catch: 1675.12 Catch/hour: 3397.81

SPECIES	CATCH/HOUR	% OF TOT. C		
Nezumia micronychodon	2725.01	305124	80.20	117
Merluccius paradoxus	203.35	661	5.98	
Trachyrincus scabrus	168.86	1189	4.97	
Hoplostethus cadenati	55.86	2725	1.64	
Deania profundorum	29.76	18	0.88	
Cruriraja parcomaculata	28.11	18	0.83	
Plesiionka martia	24.65	7783	0.73	
Selachophidium guentheri	23.73	517	0.70	
Schedophilus huttoni	20.08	18	0.59	
Lithodes ferox	18.99	55	0.56	
Lophius vomerinus	14.30	12	0.42	11
Miscellaneous fishes	14.06	0	0.41	
Merluccius paradoxus	11.72	30	0.35	11
Notacanthus sexspinis	11.50	146	0.34	
Todarodes sagittatus	7.85	18	0.23	
J E L L Y F I S H	6.94	0	0.20	
Centrophorus granulosus	6.21	18	0.18	
Heliolenus dactylopterus	4.75	37	0.14	12
Epi gonus denticulatus	3.83	73	0.11	
Galus polli	2.92	18	0.09	
Bassanago albescens	2.62	2	0.08	
Raja confundens	2.56	18	0.08	
Epi gonus telescopus	1.83	18	0.05	
Chaceon maritae	1.76	4	0.05	
Lampyctus australis	1.46	201	0.04	
Bathyroconger vicinus	1.28	18	0.04	
Thysanoteuthis rhombus	0.91	18	0.03	
Neoscopelus macropodotus	0.91	37	0.03	
Aristeus vari dens	0.55	37	0.02	
Nephropsis atlantica	0.55	18	0.02	
Munda sp.	0.18	18	0.01	
PASIPHAELIDAE	0.18	18	0.01	
Lycoteuthis diadema *	0.18	18	0.01	
PARAPAGURIDAE	0.18	18	0.01	
Scopelosaurus sp.	0.18	18	0.01	
Total	3397.81		100.00	

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 29  
DATE : 06/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23°13.65  
start stop duration Lon E 12°58.89  
TIME : 08:40:10 09:09:48 Purpose : 3  
LOG : 4503.66 4505.14 1.5 Region : 5000  
FDEPTH: 650 639 Gear cond.: 0  
BDEPTH: 650 639 Validity : 0  
Towing dir: 0° Wire out : 1450 m Speed : 3.0 kn  
Sorted : 36 Total catch: 279.49 Catch/hour: 565.77

SPECIES	CATCH/HOUR	% OF TOT. C		
Miscellaneous fishes	103.58	0	18.31	
Merluccius paradoxus	88.36	162	15.62	121
Selachophidium guentheri	60.22	1004	10.64	
Anemones, white	50.45	213	8.92	
Raja cf. dissimilis	43.38	14	7.66	
Nezumia micronychodon	34.72	1984	6.14	
Bajacalifornia magalops	22.81	184	4.03	
Ebi nani a costaecanarie	20.83	28	3.68	
GONOSTOMATI DAE	13.60	1177	2.40	
Allopocephalus sp.	13.32	1228	2.35	
Heterocarpus grimaldi	13.04	765	2.30	
Lophius vomerinus	11.03	8	1.95	12
Bristle worms (straws)	9.21	14	1.63	
Tetragonus atlanticus	8.79	28	1.55	
Todarodes sagittatus	8.64	28	1.53	
Raja confundens	7.79	28	1.38	
Yarellia blackfordi	5.95	198	1.05	
Bathylagus glacialis *	5.10	482	0.90	
Plesiionka acanthurus	4.96	992	0.88	
Lithodes ferox	4.68	14	0.83	
Lampyctus exutus	4.11	142	0.73	
Bathyroconger vicinus	3.54	57	0.63	
Merluccius paradoxus	3.44	6	0.61	122
Neocyttus rhomboidalis	2.98	14	0.53	124
Coelorinchus matama	2.55	14	0.45	
Raja urchin, weak spines	2.55	99	0.45	
Melanocetus johnsonii	2.41	43	0.43	
Starfish	2.41	99	0.43	
Lampyctus australis	1.84	255	0.33	
Galus polli	1.84	14	0.33	
Alloctytus verrucosus	1.42	28	0.25	125
Octopus sp.	1.42	28	0.25	
MELANOSTOMATI DAE	1.28	57	0.23	
POLYCHAELIDAE	1.13	85	0.20	
Nephropsis atlantica	0.99	57	0.18	
Munda sp.	0.28	99	0.05	
Notacanthus sexspinis	0.28	14	0.05	
Photichthys argenteus	0.28	43	0.05	
Glyphus marsupialis	0.14	14	0.03	
Astronesthes sp.	0.14	14	0.03	
NOTOSUIDAE	0.14	14	0.03	
Nemichthys scolopaceus	0.14	14	0.03	
Total	565.77		100.00	

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 30  
DATE : 06/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 23°11.33  
start stop duration Lon E 12°54.34  
TIME : 11:19:12 11:53:01 Purpose : 3  
LOG : 4513.71 4515.23 1.5 Region : 5000  
FDEPTH: 774 764 Gear cond.: 0  
BDEPTH: 774 764 Validity : 0  
Towing dir: 0° Wire out : 1700 m Speed : 2.7 kn  
Sorted : 34 Total catch: 274.06 Catch/hour: 486.21

SPECIES	CATCH/HOUR	% OF TOT. C		
Merluccius paradoxus	88.53	110	18.21	126
Raja confundens	52.90	53	10.88	
Miscellaneous fishes	34.17	0	7.03	
Coelorinchus acanthiger	33.74	160	6.94	
Nezumia micronychodon	27.89	1033	5.74	
Coelorinchus matama	26.51	75	5.45	
Bathyraja smithi	23.84	11	4.90	
Centroscyllium coelolepis	23.10	11	4.75	
Tetragonus atlanticus	20.54	64	4.23	
Selachophidium guentheri	16.18	202	3.33	
Allopocephalus sp.	13.84	43	2.85	
Anemones, white	13.31	43	2.74	
Dirole in troni gra	10.54	255	2.17	
Hoplostethus atlanticus	10.38	82	2.13	128
Neocyttus rhomboidalis	10.29	16	2.12	130
Todarodes sagittatus	10.22	11	2.10	
Deania calcea	10.11	11	2.08	
Sea urchin, weak spines	9.90	373	2.04	
Notacanthus sexspinis	8.73	85	1.80	
Lithodes ferox	7.36	4	1.51	
Bathyroconger vicinus	6.28	21	1.29	
Alloctytus verrucosus	5.32	99	1.09	129
Chaceon maritae	4.88	16	1.00	
Merluccius paradoxus	2.75	4	0.57	127
Bristle worms (straws)	2.66	415	0.55	
Bajacalifornia magalops	2.55	53	0.53	
Plesiionka acanthurus	2.34	511	0.48	
GONOSTOMATI DAE	1.06	160	0.22	
Bathylagus glacialis *	1.06	160	0.22	
Nephropsis atlantica	0.96	53	0.20	
MELANOSTOMATI DAE	0.96	21	0.20	
J E L L Y F I S H	0.85	0	0.18	
Thysanoteuthis rhombus	0.43	11	0.09	
Stomias boa boa	0.43	21	0.09	
Anoplogaster cornuta	0.43	11	0.09	
Howella shernborni	0.32	32	0.07	
Halosaurus oventi	0.32	11	0.07	
Glyphus marsupialis	0.32	11	0.07	
POLYCHAELIDAE	0.11	21	0.02	
Munda sp.	0.11	85	0.02	
Total	486.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 31  
DATE : 06/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 22°59.27  
start stop duration Lon E 12°59.82  
TIME : 14:13:44 14:44:38 Purpose : 3  
LOG : 4527.74 4529.29 1.6 Region : 5000  
FDEPTH: 491 479 Gear cond.: 0  
BDEPTH: 491 479 Validity : 0  
Towing dir: 0° Wire out : 1100 m Speed : 3.0 kn  
Sorted : 34 Total catch: 250.58 Catch/hour: 486.72

SPECIES	CATCH/HOUR	% OF TOT. C		
Merluccius paradoxus	238.14	1150	48.93	132
Plesiionka sp.	46.27	16824	9.51	
Merluccius paradoxus	32.15	126	6.60	131
Selachophidium guentheri	31.82	749	6.54	
Nezumia micronychodon	20.69	844	4.25	
Heliolenus dactylopterus	18.18	58	3.74	133
Ebi nani a costaecanarie	15.03	23	3.09	
Lophius vomerinus	12.53	8	2.57	135
Miscellaneous fishes	10.55	0	2.17	
Schedophilus huttoni	10.55	6	2.17	
Hoplostethus cadenati	7.46	16	1.53	
Todarodes angolensis	6.76	12	1.39	
Lithodes ferox	5.83	23	1.20	
Epi gonus telescopus	5.77	58	1.19	
Genypterus capensis	5.44	2	1.12	134
Galus polli	4.72	35	0.97	
J E L L Y F I S H	4.66	0	0.96	
Notacanthus sexspinis	4.66	0	0.96	
Trachyrincus scabrus	3.73	76	0.77	

Lampanyctodes hectortis	0.58	41	0.12
Bathylolopus valdiviae	0.41	6	0.08
POLYCHAETIDAE	0.17	17	0.04
Aristeus variidens	0.17	17	0.04
PASIPHAETIDAE	0.17	35	0.04
Maurollicus muelleri	0.17	17	0.04
Bathyroconger vicinus	0.12	6	0.02
Total	486.72		100.00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 32  
 DATE : 06/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 22° 57. 09  
 start stop duration Lon E 12° 56. 30  
 TIME : 16: 16: 27 16: 44: 52 28. 4 (min) Purpose : 3  
 LOG : 4535. 10 4536. 63 1. 5 Region : 5000  
 FDEPTH: 570 572 Gear cond.: 0  
 BDEPTH: 570 572 Validity : 0  
 Towing dir: 0° Wire out : 1250 m Speed : 3. 2 kn  
 Sorted : 26 Total catch: 216. 74 Catch/hour: 457. 58

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Merluccius paradoxus, female	116. 64 289	25. 49 137
Trachyrincus scabrus	93. 10 561	20. 35
Nezumia m cronychodon	65. 62 2430	14. 34
Raja cf dssimilis	43. 70 38	9. 55
Selachophidi um guentheri	41. 42 931	9. 05
Ebi nani a costaecanarie	25. 84 13	5. 65
Hoplostethus cadenati	19. 00 355	4. 15
Bajacali fornia magal ops	10. 13 342	2. 21
Merluccius paradoxus, male	10. 03 23	2. 19 136
Miscellaneous fishes	9. 12 0	1. 99
Todarodes angolensis	6. 71 13	1. 47
Lithodes ferox	5. 70 13	1. 25
Heterocarpus grimaldi	2. 15 76	0. 47
Chaceon maritae	1. 86 2	0. 41
Lophi us vomerinus	1. 54 2	0. 34 138
Notacanthus sexspinis	1. 52 25	0. 33
Thysanoteuthis rhombus	1. 14 13	0. 25
Galeus polli	1. 14 13	0. 25
Neosopelus macrolepidotus	0. 57 13	0. 12
Bathyroconger vicinus	0. 25 13	0. 06
Aristeus variidens	0. 13 13	0. 03
Nephropsis atlantica	0. 13 13	0. 03
Muni da sp.	0. 13 13	0. 03
Total	457. 58	100. 00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 33  
 DATE : 07/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 22° 54. 76  
 start stop duration Lon E 12° 52. 63  
 TIME : 06: 36: 34 07: 06: 20 30. 1 (min) Purpose : 3  
 LOG : 4604. 48 4605. 98 1. 5 Region : 5000  
 FDEPTH: 661 658 Gear cond.: 0  
 BDEPTH: 661 658 Validity : 0  
 Towing dir: 0° Wire out : 1450 m Speed : 3. 1 kn  
 Sorted : 67 Total catch: 233. 33 Catch/hour: 465. 73

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Selachophidi um guentheri	57. 84 1138	12. 42
Ebi nani a costaecanarie	57. 01 60	12. 24
Nezumia m cronychodon	51. 50 2707	11. 06
Miscellaneous fishes	47. 90 0	10. 29
Merluccius paradoxus, female	44. 51 80	9. 56 139
Raja leopardus	33. 65 24	7. 23
Bajacali fornia magal ops	24. 07 192	5. 17
Heterocarpus grimaldi	21. 32 1629	4. 58
Todarodes sagittatus	19. 88 36	4. 27
Vitreledonella richardi	19. 64 12	4. 22
Lophi us vomerinus	18. 16 6	3. 90 140
Bathyroconger vicinus	12. 22 120	2. 62
Schedophilus huttoni	8. 02 12	1. 72
Bristle worms (straws)	6. 71 862	1. 44
Coelorinchus acanthiger	5. 87 72	1. 26
Sea urchin, weak spines	4. 67 611	1. 00
Yarrella blackfordi	4. 55 192	0. 98
Anemones, white	3. 95 12	0. 85
Bathylagus glacilis *	2. 75 204	0. 59
Hoplostethus atlanticus	2. 69 14	0. 58
Coelorinchus matama	2. 40 12	0. 51
Plesionika acanthurus	2. 28 455	0. 49
Raja confundens	2. 16 36	0. 46
Chaceon maritae	1. 80 4	0. 39
Thysanoteuthis rhombus	1. 80 12	0. 39
Muni da sp.	1. 56 623	0. 33
Anoplogaster cornuta	1. 20 24	0. 26
Hoplostethus cadenati	0. 96 12	0. 21
Trachyrincus scabrus	0. 96 12	0. 21
Starfish	0. 84 36	0. 18
Lampanyctus australis	0. 60 36	0. 13
PASIPHAETIDAE	0. 60 72	0. 13
Nephropsis atlantica	0. 48 12	0. 10
Neosopelus macrolepidotus	0. 48 12	0. 10
Stomias boa boa	0. 24 12	0. 05
Tripl ophos hemingi	0. 24 12	0. 05
NOTOSUDIDAE	0. 24 12	0. 05
Total	465. 73	100. 00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 34  
 DATE : 07/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 22° 54. 49  
 start stop duration Lon E 12° 49. 72  
 TIME : 09: 24: 24 09: 54: 38 30. 2 (min) Purpose : 3  
 LOG : 4615. 56 4617. 12 1. 6 Region : 5000  
 FDEPTH: 765 777 Gear cond.: 0  
 BDEPTH: 765 777 Validity : 0  
 Towing dir: 0° Wire out : 1650 m Speed : 3. 1 kn  
 Sorted : 110 Total catch: 267. 29 Catch/hour: 530. 69

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Merluccius paradoxus, female	129. 75 177	24. 45 142
Nezumia m cronychodon	61. 83 1692	11. 65
Miscellaneous fishes	56. 35 0	10. 62
Coelorinchus acanthiger	44. 20 191	8. 33
Opisthotethus agassizi	39. 55 36	7. 45
Selachophidi um guentheri	34. 19 405	6. 44
Trachyscorpia eschmeyeri	27. 40 24	5. 16
Deani a profundorum	23. 59 24	4. 44
Coelorinchus matama	18. 11 48	3. 41
Raja confundens	17. 27 24	3. 25
Sea urchin, weak spines	17. 04 893	3. 21
Hoplostethus atlanticus	16. 18 149	3. 05 145
Di crol ene intronigra	11. 08 167	2. 09
Bajacali fornia magal ops	6. 55 0	1. 23
Allocyttus verrucosus	4. 94 52	0. 93 144
Bathyroconger vicinus	4. 41 24	0. 83
Merluccius paradoxus, male	3. 18 6	0. 60 143
Plesionika acanthurus	2. 62 500	0. 49
Anemones, white	2. 62 12	0. 49
Notacanthus sexspinis	2. 03 12	0. 38
Bristle worms (straws)	1. 95 322	0. 37
Chaceon maritae	1. 59 4	0. 30

Nephropsis atlantica	1. 19	71	0. 22
Yarrella blackfordi	0. 71	24	0. 13
Stomias boa boa	0. 60	24	0. 11
Muni da sp.	0. 48	310	0. 09
Bathylagus glacilis *	0. 36	24	0. 07
Lampadena pontifex	0. 36	24	0. 07
Lampanyctus australis	0. 24	36	0. 04
PASIPHAETIDAE	0. 12	24	0. 02
POLYCHAETIDAE	0. 12	24	0. 02
Halosaurus ovenii	0. 12	24	0. 02
Total	530. 69		100. 00

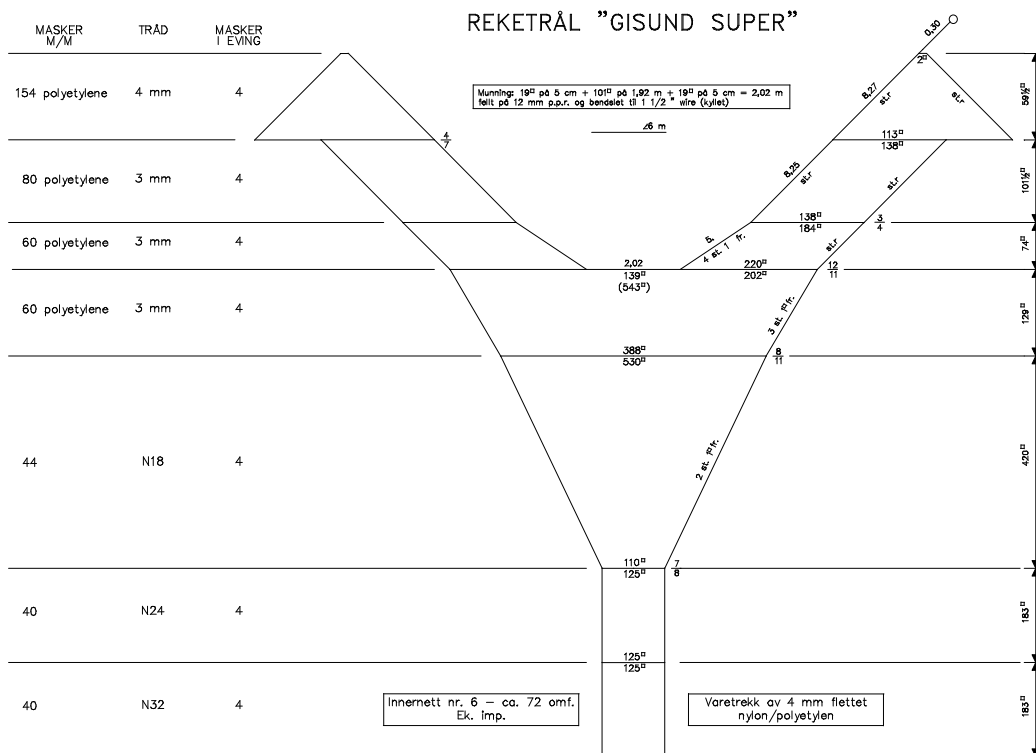
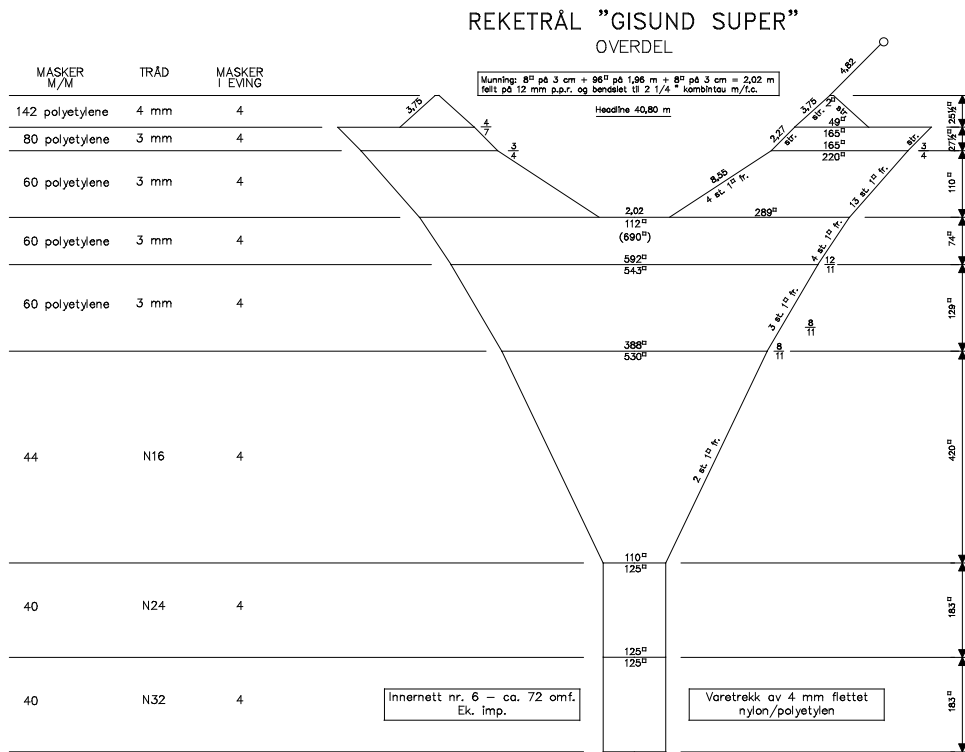
R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 35  
 DATE : 07/10/2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 22° 44. 77  
 start stop duration Lon E 12° 51. 17  
 TIME : 12: 04: 09 12: 33: 39 29. 5 (min) Purpose : 3  
 LOG : 4626. 94 4628. 38 1. 4 Region : 5000  
 FDEPTH: 550 530 Gear cond.: 0  
 BDEPTH: 550 530 Validity : 0  
 Towing dir: 0° Wire out : 1200 m Speed : 2. 9 kn  
 Sorted : 78 Total catch: 200. 95 Catch/hour: 408. 71

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Trachyrincus scabrus	133. 83 669	32. 74
Merluccius paradoxus, female	90. 31 244	22. 10 146
Selachophidi um guentheri	44. 85 1167	10. 97
Nezumia m cronychodon	33. 74 1822	8. 26
Ebi nani a costaecanarie	25. 48 28	6. 24
Heterocarpus grimaldi	11. 25 384	2. 75
Lophi us vomerinus	9. 86 6	2. 41 148
Miscellaneous fishes	9. 25 0	2. 26
Raja confundens	8. 54 43	2. 09
Bajacali fornia magal ops	8. 26 299	2. 02
Notacanthus sexspinis	7. 55 43	1. 86
Merluccius paradoxus, male	4. 88 10	1. 19 147
Ancistrocheirus lesueurii	3. 60 4	0. 88
Chaceon maritae	3. 54 4	0. 87
Hoplostethus cadenati	3. 27 57	0. 80
Lamprogrammus exutus	3. 13 14	0. 77
Yarrella blackfordi	2. 28 100	0. 56
Bassanago albescens	1. 36 2	0. 33
Barbourisia rufa	1. 30 2	0. 32
Helicolenus dactylopterus	1. 12 4	0. 27 149
Lithodes ferox	0. 87 4	0. 21
Lampanyctus australis	0. 43 43	0. 10
Plesionika maritae	0. 43 128	0. 10
Nephropsis atlantica	0. 43 43	0. 10
Bathylagus glacilis *	0. 28 14	0. 07
PASIPHAETIDAE	0. 28 43	0. 07
Aristeus variidens	0. 28 28	0. 07
Tripl ophos hemingi	0. 14 28	0. 03
POLYCHAETIDAE	0. 14 14	0. 03
Total	408. 71	100. 00

R/V Dr. Fridtjof Nansen SURVEY: 2011409 STATION: 36  
 DATE : 07. 10. 2011 GEAR TYPE: BT NO: 21 POSITION: Lat S 22° 45. 34  
 start stop duration Lon E 12° 49. 01  
 TIME : 14: 33: 00 15: 05: 05 32. 1 (min) Purpose : 3  
 LOG : 4637. 68 4639. 27 1. 6 Region : 5000  
 FDEPTH: 663 664 Gear cond.: 0  
 BDEPTH: 663 664 Validity : 0  
 Towing dir: 0° Wire out : 1450 m Speed : 3. 0 kn  
 Sorted : 234 Total catch: 327. 61 Catch/hour: 612. 55

SPECIES	CATCH/HOUR	% OF TOT. C
SAMP	weight numbers	
Merluccius paradoxus, female	332. 16 585	54. 23 150
Raja leopardus	55. 87 30	9. 12
Selachophidi um guentheri	55. 79 1324	9. 11
Ebi nani a costaecanarie	29. 02 22	4. 74
Merluccius paradoxus, male	27. 39 56	4. 47 151
Nezumia m cronychodon	24. 90 883	4. 07
Todarodes sagittatus	14. 96 30	2. 44
Deani a profundorum	13. 69 15	2. 23
Lithodes ferox	10. 00 0	1. 63
Coelorinchus acanthiger	7. 55 30	1. 23
Miscellaneous fishes	6. 66 0	1. 09
Lophi us vomerinus	4. 86 2	0. 79 152
Neoharriotta pinnata	3. 85 2	0. 63
Trachyrincus scabrus	3. 74 15	0. 61
Bathyroconger vicinus	3. 66 37	0. 60
Heterocarpus grimaldi	3. 66 232	0. 60
Starfish	3. 14 7	0. 51
Plesionika acanthurus	2. 62 576	0. 43
Notacanthus sexspinis	1. 35 7	0. 22
J E L L Y F I S H	1. 12 0	0. 18
Bajacali fornia magal ops	1. 05 22	0. 17
Allocyttus verrucosus	0. 97 15	0. 16
Hoplostethus cadenati	0. 90 22	0. 15
Brama brama	0. 71 2	0. 12 153
Bristle worms (straws)	0. 60 60	0. 10
POLYCHAETIDAE	0. 37 15	0. 06
Muni da sp.	0. 37 262	0. 06
Yarrella blackfordi	0. 30 22	0. 05
Neosopelus macrolepidotus	0. 22 15	0. 04
Nephropsis atlantica	0. 22 22	0. 04
ENOPLUTEUTHIDAE	0. 22 7	0. 04
Nemichthys scolopaceus	0. 22 7	0. 04
Bathylagus glacilis *	0. 15 45	0. 02
Aristeus variidens	0. 11 7	0. 02
PASIPHAETIDAE	0. 11 15	0. 02
Total	612. 55	100. 00

## Annex 2: Fishing gear

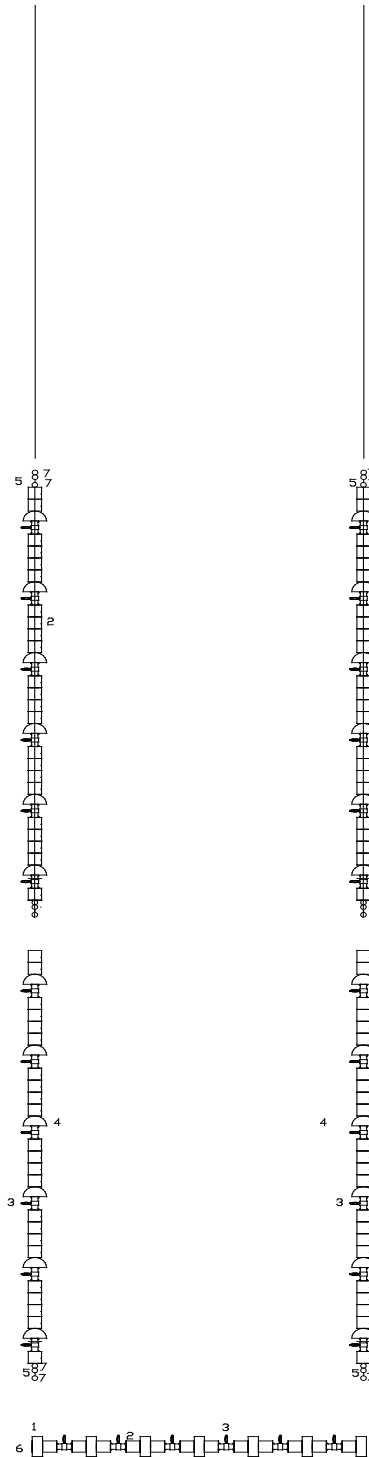


**Annex 2: Fishing gear**

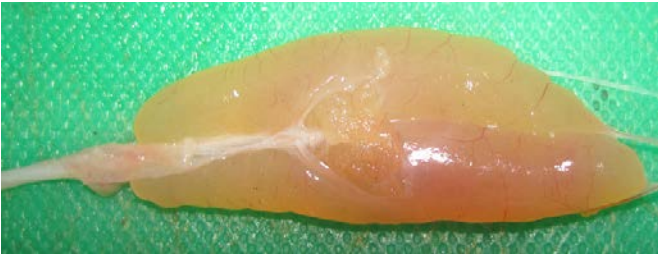
DEKN L TROH  
N AHC MM6  
M28

RAVEGD  
M22

RAVEGD  
M22



**Annex 3: Deep water hake gonad maturity stages (female)**



**Stage 1 (41 cm)**



**Stage 2 (38 cm)**



**Stage 3 (52 cm)**



**Stage 5 female (58 cm)**