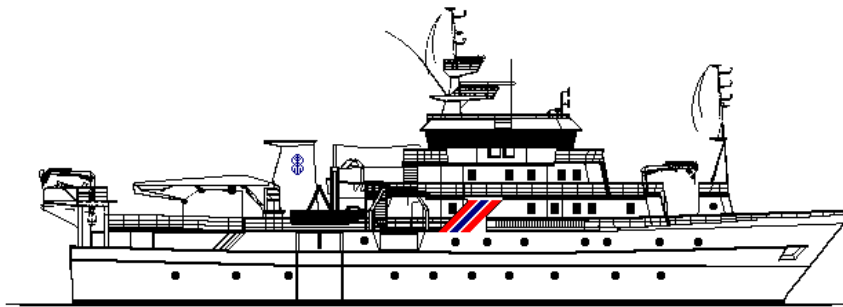


FAO-NORAD PROJECTNO: GCP/INT/003/NOR
FRIDTJOF NANSEN"

CRUISE REPORT "DR.



Cape Verde

CCLME Ecosystem Survey

04- 20 June 2011

Institute of Marine Research

Norway

CRUISE REPORT "DR. FRIDTJOF NANSEN"

Cape Verde

CCLME Ecosystem Survey

04-20 June 2011

By

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1. INTRODUCTION

1.1.About Cape Verde

The Cape Verde archipelago is situated on the west African coast about 550 km west of Senegal. It consists of ten islands and several islets, The island group has a surface area of 4,033 km² and a coastline of 1.020 km. The continental shelf is small (5,394 km²) and the country has an EEZ of 734,265 km². Cape Verde is characterized by low rainfall and a severe shortage of mineral resources. Marine resources are therefore of great significance as fishery has large social and economic effects. It guarantees employment for a large part of the population, contributes to food security, and fish is the major source of animal protein for most of the people on the islands. The fishing industry also contributes to the entry of foreign currency through exports.

In June 2011 the EAF-Nansen Project of FAO in partnership with the West African Regional Fisheries Project (WARFP-CV), the Canary Current Large marine Ecosystem (CCLME) and the General Directorate of Fisheries of Cape Verde undertook a 16 days ecosystem baseline survey in Cape Verde Islands with the R/V “Dr. Fridtjof Nansen” to study pelagic and demersal fish resources and the marine ecosystem.

1.2.Aims and objectives

The aim of the R/V ‘Dr. Fridtjof Nansen’ survey was to establish the physical, chemical and biological characteristics of the ecosystem associated with shelf region of Cape Verde.

The main objectives of the survey were as follows:

- To determine the distribution and abundance of small pelagic fish resources along the coast of Cape Verde using acoustics methods and a systematic grid survey strategy.
- Obtain information on demersal fish abundance and biodiversity by demersal trawling where bottom-trawlable conditions exist.
- To use regular midwater and bottom trawls on target fish aggregations for species composition, biological information and genetic material of selected small pelagic fishes for fisheries resource assessment purposes.
- To establish as far as possible the distribution, abundance and composition of other organisms at a number of trophic levels along the shelf.

(Phytoplankton, zooplankton, cetaceans and sea birds, and benthos biodiversity).

- Capacity building of CCLME and Cape Verdean trainees and young scientists.

1.3.Participation

A total of 16 scientists and technicians participated in the survey. The full list of the participants and their affiliations is given in Table 1.1 below.

Table 1.1 List of participants

Participant	Institution	Main responsibility	Dates onboard
Jens Otto Krakstad	IMR	cruise leader	04/06-21/06-2011
Oddgeir Alvheim	IMR	chief technician	04/06-21/06-2011
Paul Robinson	CCLME consultant	birds and marine mammals	04/06-21/06-2011
Frøydis Lygre	IMR	Benthos	04/06-21/06-2011
Ana Ramos Martos	IEO	Epibenthos	04/06-18/06-2011
Ole Sverre Fossheim	IMR	Instrument operator	04/06-21/06-2011
Inês Dias Bernardes	IMR	Technician	04/06-21/06-2011
Marcia Valadares Costa	INDP	plankton sampling	04/06-18/06-2011
Elton Ramos Silva	Uni-CV	fish sampling	04/06-18/06-2011
Eloisa Gomes Monterio	Uni-CV	fish sampling	04/06-18/06-2011
Jarle Kristiansen	IMR	instrument chief	04/06-21/06-2011
Vito Melo Ramos	INDP	local cruise leader	04/06-21/06-2011
Kimberly Wieber	ODU	fish taxonomy, genetics	04/06-18/06-2011
Khalid Manchih	INRH	fish taxonomy	04/06-18/06-2011
Mohamed Ben Lemlih	IMROP	fish sampling	04/06-18/06-2011
Vanda Monteiro Marques	INDP	fish sampling, taxonomy	07/06-18/06-2011
Paulo Varela	INDP	fish sampling	07/06-18/06-2011

Elizandro Rodrigues	Lima	Uni-CV	fish sampling	07/06-18/06-20 11
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List of institution abbreviations:

INDP: Instituto Nacional De Desenvolvimento Das Pescas, Cape Verde

IMR: Institute of Marine Research, Norway

IEO: Instituto Español de Oceanografía, Spain

IMROP: Mauritanian Institute for Oceanographic Research and Fisheries, Mauritania

ODU: Old Dominion University, USA

INRH: National Institute of Fisheries Research Morocco

Uni-CV: Universidade de Cabo Verde

1.4.Narrative

The vessel left Mindelo on 4th June at 09:15 and crossed over to Brava island making a CTD transect to 3000 m depth with accompanying plankton sampling in the upper 200 m en route. The vessel continued to survey around the islands Brava and Fogo, before passing over to Santiago. CTD's were taken to 1500 m depth on the southern side of the islands with proximately 20 nm spacing. The steepness of the slope and roughness of the bottom made both benthos sampling with grab/sledge and bottom trawling impossible. The vessel called in port in Praia on the 6th June at 19:30 to prepare for a visit by a Cape Verdean/Norwegian delegation that arrived on the 7th June at 09:30. After a successful visit onboard the vessel left port again on the 7th June at 18:00. Three additional cruise participants were embarking while in port. After leaving port the vessel continued to survey clockwise around Santiago before passing across to Maio and further to Boa Vista. Two fish traps were set in the evening 11th June on the southern side of Boa Vista before continuing to survey the eastern side. When picking up the traps the following evening the rope of one of the traps was caught in the propeller. As a consequence the vessel had to anchor for the night waiting for a diver from the island to come and assist us to remove it. The vessel left anchorage 12:30 on the 13th June and continued the survey without further delay. The narrow platform between Maio and Sal was surveyed using zigzag transect mainly during the night and fish on bottom trawl stations during the day. The shelf is relatively flat and generally trawlable to a depth of 100 m. Deeper than this it becomes very steep and rough, limiting bottom trawling in most areas.

The vessel crossed over from Sal to São Nicolau on the 15th June in the morning and continued to survey the platform between São Nicolau and Santo Antão until the 18th June. The survey completed on arrival in port in Mindelo at lunch on the 18th June. The survey procedure with day trawling and acoustic coverage at night followed between Maio and Sal was continued between São Nicolau and Santo

Antão. However, the steep and uneven bottom topography in this area limited daytime trawling to some extent.

CTD stations were taken offshore at 1500 m depth with spacing of roughly 20 nm on the eastern side of the shelf in the whole area. Multinet to 200 m depth was taken on all these stations. Additionally CTD's were also taken on all bottom trawl stations. Benthos samples were taken randomly with grab or with the Snell sledge in areas where trawling was not possible or where trawling did not give adequate samples of benthos material.

Survey effort

For the purpose of acoustic and swept area abundance estimation the coast was divided into two areas. The first area (Area 1) included the south of Cape Verde including the islands known as the Sotavento Islands (Maio, Santiago, Fogo and Brava) and Sal and Boa Vista. The north western area (Area 2) included the islands; Santo Antão, São Vicente, Santa Luzia and São Nicolau who share a common platform. Figures 1.1-1.2 show the cruise tracks with bottom trawls, pelagic trawls, hydrographic stations, and plankton stations. Table 1.2 summarises the survey effort in each sub-area.

Table 1.2. Number of hydrographic (CTD), plankton (PL), pelagic trawl (PT), and bottom trawl (BT) stations as well as the distance surveyed (NM) during the survey, by sub-areas.

Area	CTD	Benthos	PL	PT	BT	NM
Area 1	50	7	24	9	23	1400
Area 2	16	2	6	2	7	500
Total	66	9	30	11	30	1885

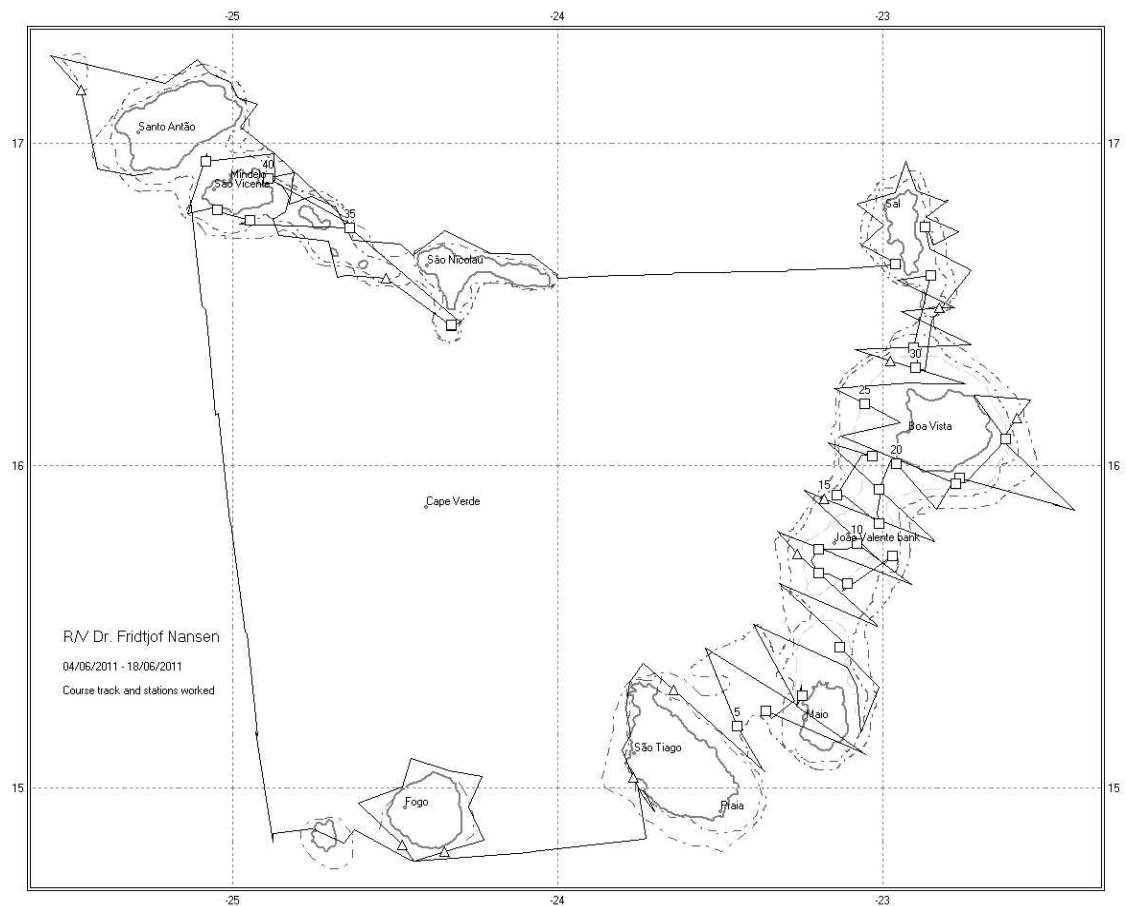


Figure 1.1. Course track with bottom trawl (□) and pelagic (Δ) trawl stations. The 100, 500 and 1000 m depth contours are indicated.

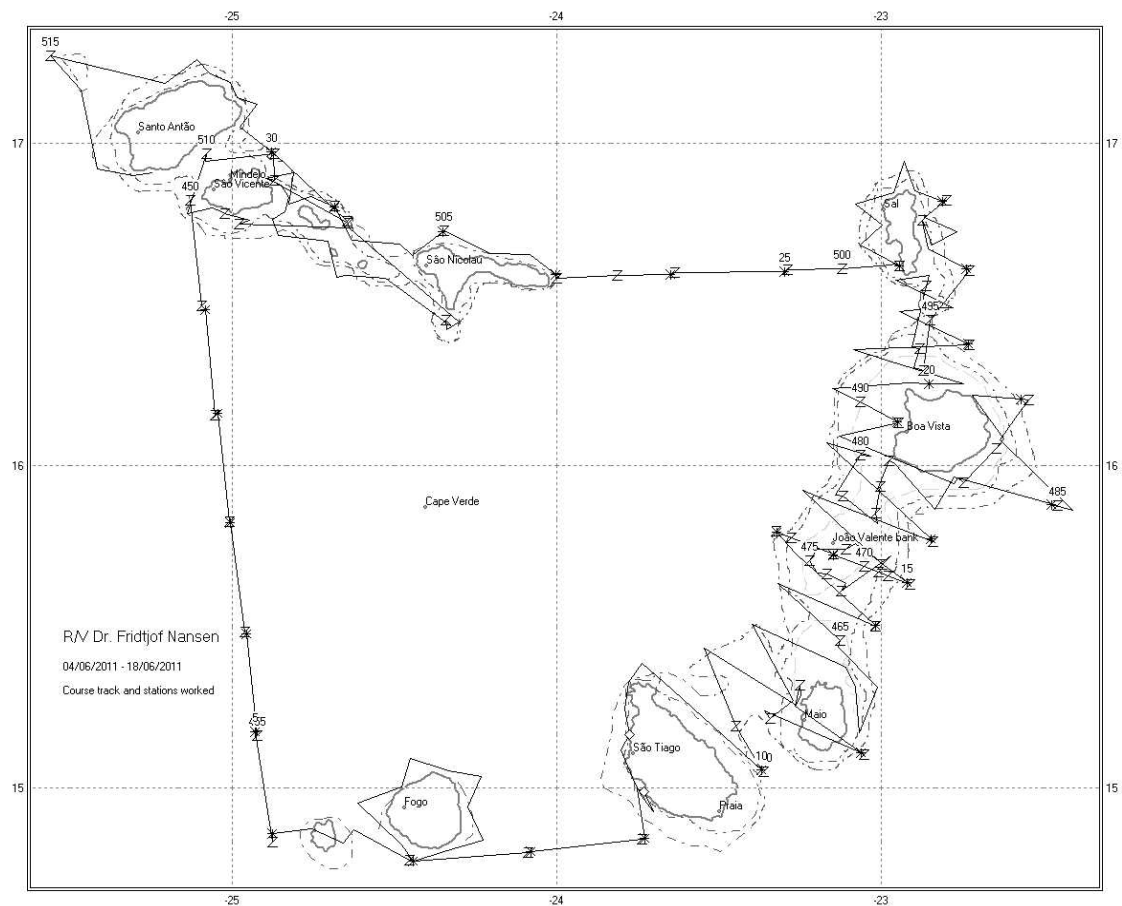


Figure 1.2. Course track with hydrographic (Z), plankton (X) and benthos (◇) stations. The 100, 500 and 1000 m depth contours are indicated.

2. METHODS

1.5. Meteorological and hydrographical sampling

CTD profiles

A Seabird 911 CTD was used to obtain vertical profiles of temperature, salinity and oxygen. Real time plotting and logging was done using the Seabird Seasave software installed on a PC. The stations on the shelf and slope were usually taken down to a few metres above the bottom, whilst offshore the maximum sampling depth was 1500 m except on the CTD line between São Vicente and Brava, where CTD's were taken to 3000 m depth. Water samples were taken at 6 standard depths; 200 m, 100 m, 75 m, 50 m, 25 m and 5 m below surface for nutrient analysis. Nutrient samples were frozen onboard for analysis on land at INDP.

Also attached to the CTD was a Chelsea Mk III Aquatracka fluorometer. It measures chlorophyll-a concentration in microgram per litre with an uncertainty of 3%. Factory slope and offset were 0.921 and -0.02. The readings will be calibrated against samples of chlorophyll preserved for later analysis.

Fluorescence: Chl-a

Water samples were taken using Niskin bottles on the CTD rosette: 6 standard depths; 200 m, 100 m, 75 m, 50 m, 25 m and 5 m below surface. 1000 ml of water from each depth was filtered through a 2.5 cm diameter Whatman GF/F filter, and the filter paper was then folded and stored frozen for later analysis at INDP.

Thermosalinograph

The SBE 21 Seacat thermosalinograph was running routinely during the survey, obtaining samples of sea surface salinity and relative temperature and fluorescence (5 m depth) every 10 seconds. An attached in-line Turner Design SCUFA Fluorometer continuously measured Chlorophyll a levels [RFU] at 5 m below the sea surface while underway during the entire cruise.

Current speed and direction measurements (ADCP)

A vessel-mounted Acoustic Doppler Current Profiler (VMADCP) from RD Instruments was run continuously during the survey in broadband mode shallower than about 400 m and in narrow band mode in deeper waters. The frequency of the VMADCP is 150 kHz and data were averaged and stored in 3 m or 4 m vertical bins. All data were stored on files for post survey processing.

Meteorological observations

Wind direction and speed, air temperature, air pressure, relative humidity, and sea surface temperature (5 m depth) were logged automatically every 1 min. on an WIMDA meteorological station.

1.6. Zooplankton sampling

Zooplankton samples were collected with Hydro-Bios Multinet (Figure 1.2). The multinet was equipped with 5 nets for depth-stratified sampling, pressure sensor and electronic flow meters. The nets were fitted with 180 μm mesh and the water flow through the nets was measured. The multinet was deployed and retrieved at a rate of ~ 1.5 m per second and was obliquely hauled. The five nets were triggered at the pre-selected depth intervals at 5 standard depth intervals; 200 - 100 m, 100 - 75, 75 - 50 m 50 - 25 m and 25 m- Surface.

The nets were rinsed and the samples stored in marked bottles and preserved with 4% buffered formaldehyde.

1.7. Biological fish sampling

Demersal trawl hauls were taken randomly on the shelf during daytime while pelagic hauls were taken randomly throughout the survey at night and to catch acoustic targets.

Trawl hauls were sampled for species composition by weight and number. The deck sampling procedure is described in detail by Strømme (1992). Length measurements were taken for selected target species on most stations. An Electronic Fish Meter (SCANTROL) connected to a customised data acquisition system (Nansis) running on a Windows PC was used for length measurements. The total length of each fish was recorded to the nearest 1 cm, rounding down when this was between sizes. Sex were collected from the first randomly selected 20-30 individuals of target species.

The carapace length for crustaceans was measured to the nearest 0.1 cm, again rounding down. Basic information recorded at each fishing station, i.e. trawl hauls, is presented in Annex I. Pooled length frequency distributions, raised to catch per hour, of selected species by region are shown in Annex II.

Two individuals of each species were sampled for DNA. Each specimen was assigned a unique collection number and photographed.

DNA: Muscle tissue was always taken from dorsal lateral musculature on the right side of the fish, or ventrally in the case of flatfish. This was done to preserve the left aspect of the fish in a good condition for reference pictures and meristic counts. Muscle tissue was dissected and placed into 1.5 ml Eppendorf tubes

containing 95% ethanol. In most cases, specimens that were used for DNA sampling were also kept as vouchers by fixing them in 10% formalin. A label with the same identification number used for the DNA tube was attached to the specimens through the mouth and gills for reference purposes. All specimens were fixed in formalin until the end of the survey and then rinsed in fresh water. Each specimen was wrapped in damp cheesecloth and packaged in plastic bags for shipment to the Smithsonian Institute. Upon arrival to the Smithsonian Institute specimens will be stored in 80% ethanol.

1.8. Epibenthos sampling

Epibenthos was collected from bottom trawl catches during the survey at depths between 30 to 960 m. All collected invertebrates (total catch except in stations 14, 24, 28 and 29) were separated on deck to morphospecies level, counted and weighed. Only in station 12, quantification was not possible because benthic sub sampling was not kept.

A reference collection comprising 457 samples and 948 exemplars was preserved in formalin (8-10%) or alcohol (70%) for posterior taxonomic study at INDP, with the support of the Spanish IEO-Vigo University specialist team. Faunistic data and collection details were stored on board in standard format files of IEO.

General photography of global catches, benthic groups and individual species, were taken from fresh material at all stations. These files were stored in independent files per trawl stations.

1.9. Inbenthos sampling

The soft-bottom benthic macrofauna sampling was carried out from random selected stations (Figure 1.2). A Sneli Sledge (Sneli, 1998) was deployed to obtain the samples. The sledge consists of two heavy steel runners on either side of a box of perforated stainless steel plates 200 cm long, 80 cm wide and 20 cm high in outer dimensions. The weight of the sledge is about 80 kg which is favourable when lowering the gears into deep water.

The sediment samples were washed on a sediment-washing table through 5 mm² and 1 mm² mesh size sieve. The remaining sieved sediments were transferred in turns into inner and outer-labelled plastic sample holding containers. The containers were labelled using the year, station numbers, replicate type, date and the type of preservative used and sent to the University of Bergen for further analyses on land. Annex VIII gives details of the samples.

1.10. Seabird and cetacean visual observation

The objectives of the seabird and cetaceans survey were to record: (1) the perpendicular distance from the observer to all bird and mammal observations whilst the vessel was on transect; and (2) interactions between the vessel and

birds during trawls. The transect methods, to enable density estimates, are fully described in Buckland et al 2001. This and the trawl observations followed the protocols currently being used further north in the East Atlantic (www.fameproject.eu). The one observer on board (PR) made observations from dawn to dusk, with short breaks, resulting in 11.5 to 12 hours of observations daily. For transects, observer eye height was 12.5m, on the deck in front of the wheelhouse. 180 degree forwards scan by eye was used, supplemented by periodic scans with binocular and telescope for cetaceans and to confirm bird identification. Observations were assigned to distance bands with the aid of horizontal and vertical angle measurement to the individual (or estimation, if there was much simultaneous activity) and later triangulation. Birds were assigned to species, number, age, distance, flight direction and behaviour (ESAS coded). Cetacean behaviour and means of detection were recorded and where possible photographs taken. Environmental variables that could influence detection or behaviour (for example sea state, glare) were recorded at the start of each transect and subsequently whenever they changed. Observations of trawls were made from the back of the boat during the trawl, from setting to landing of nets. Birds were classified according to their behaviour and the vessel activity. During all surveys observations were timed to the nearest minute, synchronised to the vessel computer. Observations were then linked to the vessel position, provided at 2 minute intervals, and other attributes simultaneously recorded on the vessel computer. The survey form templates, codes used on the forms and the final data spreadsheet were provided at the end of the survey.

1.11. Multibeam echo sounder for bottom mapping

The EM 710 multibeam echo sounder is a high to very high-resolution seabed mapping system. Acquisition depth is approximately 3 m below the transducers, and the maximum acquisition depth is limited, in practice, to 1500 m on “Dr. Fridtjof Nansen”. Across track coverage (swath width) is up to 5.5 times water depth and may be limited by the operator either in angle or in swath width without reducing the number of beams. The operating frequencies are between 70 to 100 kHz. There are 128 beams with dynamic focusing employed in the near field. The transmitting fan is divided into three sectors to maximize range capability and to suppress interference from multiples of strong bottom echoes. The sectors are transmitted sequentially within each ping, and use distinct frequencies or waveforms. The along track beam width is 1 degree. Ping rate is set (manually) according to depth. The receiving beam width is 2 degrees. All raw data from the EM 710 multibeam echo sounder was stored to disk for later analyses, the data was also logged to the Olex plotting system onboard.

1.12. Biomass estimates

Acoustic abundance estimation

A SIMRAD ER 60 Echo sounder was used to survey the water column and the echograms were stored on files. The acoustic biomass estimates were based on the integration technique. The Large Scale Survey System (LSSS) from MAREC (www.marec.no) was used for integration and allocation of the integrated s_A -values (average area back scattering coefficient in m^2/NM^2). The splitting and allocation of the integrator outputs (s_A -values) was based on a combination of a visual scrutiny of the behaviour pattern as deduced from echo diagrams, LSSS analysis and the catch composition. The mean integrator value in each sampling unit (s_A -values) was divided between the following standard categories/groups of fish: PEL 1 (Clupeoid species), PEL 2 (Carangids, Scombrids, Leiognathids and associated pelagic species like barracudas and hairtails), ODFI (Demersal species), Mesfi (Meseopelagic species) and Plank (Plankton).

The following target strength (TS) function was applied to convert s_A -values (mean integrator value for a given area) to number of fish by category:

$$TS = 20 \log L - 72 \text{ dB} \quad (1)$$

or in the form

$$C_F = 1.26 \cdot 10^6 \cdot L^{-2} \quad (2)$$

$$N_i = A \cdot s_A \cdot \frac{p_i}{\sum_{i=1}^n \frac{p_i}{C_{Fi}}} \quad (3)$$

where L is the total length and C_F is the reciprocal back scattering strength, or the so-called fish conversion factor. Generally, in order to split and convert the allocated s_A -values (m^2/NM^2) to fish densities (number per length group per NM^2) the following formula was used

where: N_i = number of fish in length group i

A = area (NM^2) of fish concentration

s_A = mean integrator value (echo density) in area A (m^2/NM^2)

p_i = proportion of fish in length group i in samples from the area

C_{Fi} = fish conversion factor for length group i

Further, the traditional method is to sum the number per length group (N_i) to obtain the total number of fish:

$$N = \sum_{i=1}^n N_i \quad (4)$$

The length distribution of a given species within an area is computed by simple addition of the length frequencies obtained in the pelagic trawl samples within the area. In the case of co-occurrence of target species, the s_A value is split in accordance with length distribution and catch rate in numbers in the trawl catches. Biomass per length group (B_i) is estimated by applying measured weights by length (W_i) when available or theoretical weights (calculated by using condition factors), multiplied with number of fish in the same length group (N_i). The total biomass in each area is obtained by summing the biomass of each length group:

$$B = \sum_{i=1}^n N_i \overline{W}_i \quad (5)$$

The number and biomass per length group in each concentration are then added to obtain totals for each region.

However, the combination of low s_A value recorded, few PEL1 and PEL2 in the bottom trawl catch and few pelagic trawls made the splitting by length groups unreliable. Therefore, a theoretic mean length of 23 cm was used to convert the s_A values by stratum (Equation 3) to number of fish. Equation 5 was used to convert the number of fish in the defined average length class (23 cm) to total estimated biomasses of PEL1 and PEL2.

A description of the fishing gears used, acoustic instruments and their standard settings is given in Annex III.

Swept area biomass calculations

The biomass calculation of demersal fish in the survey area was based on the swept area method. All valid stations are treated as representative for the relevant depth intervals where the species or group of species were caught. All biomass calculations were done in the software program Nansis.

All equations for the calculations are given in Annex IV. The effective fishing width of trawl gear used by R/V “Dr Fridtjof Nansen” is considered to be 18.5 m. The effective fishing area is the product of the fishing width multiplied by the towing distance measured by the GPS. It is assumed that all fish within the trawling path are caught, which gives a catchability coefficient (q), i.e. the fraction of the fish encountered by the trawl that was actually caught, equal to 1.

The catchability coefficient is seldom known, but because the coefficient is assumed to be constant between surveys, the swept-area estimates will reflect any change in population abundances between surveys.

During this survey trawling was only possible in certain areas. Large parts of the shelf in Cape Verde consists of hard and rough ground that is not trawlable.

Interpretation of data from the trawl survey should therefore be done with caution. Catch rates and biomass estimates are indicative only and reference to biodiversity is relevant for the areas covered.

3. RESULTS

1.13. Hydrographic sections

The continental shelf around Cape Verde is generally very narrow but with a bank between the islands of Maio, Boa Vista and Sal. Further west there is also another bank between the north-western islands of São Nicolau to Santo Antão. Cape Verde is located within the eco-bio-geographical NATR (North Atlantic Tropical Goral Region). It is bordered by the cold Canary Current and under the influence of seasonal variations of the North Equatorial Current (NEC) and North Equatorial Counter Current (NECC), affecting the circulation from the surface to 200 m depth. In this relation, it is considered that the seasonal behaviour of the surface ocean circulation in the northeast tropical Atlantic is a dynamic response of the seasonal winds in the area and the meridional dislocation of the Inter Tropical Convergence Zone - ITCZ. From July to December, the ITCZ reach its northernmost point, causing a strong seasonal variation of the NECC between parallels 10° and 5°N (Stramma and Siedler, 1998). When the NECC reach the African coast, some water flows up the coast in a northerly direction and appears as a warm current nominated the Mauritania Current (CM). The waters of the Canary Current intensify to reach the archipelago of Cape Verde and suffer complex hydrodynamic effects forming asymmetrical structures and small-scale turbulent flow, both cyclonic and anticyclonic. These structures appear to play an important role not only in the mixing of surface waters throughout the archipelago but also in the flow of water out of the archipelago, when they tend to degenerate in the south/southeast direction. These physical structures are associated with bio-oceanographic processes related, among others, with the phenomenon of upwelling and dynamic flows of biological materials, which ultimately determine the levels of fish production in the region. Also related to this, the archipelago is located near the large upwelling off the coast of Mauritania and it is estimated that filaments of this system reach the Cape Verdean shores and causes increased primary production within the archipelago.

On the surface, the sea temperature varies between 21 and 22°C in the cold season and between 23 and 27°C in the hot season. However up to 100 m depth there is a strong stratification of temperature distribution with the mixing layer varying between 25 and 40 m characterized with temperatures around 25°C. From this depth, the thermocline is established where the thermal gradient is approximately 0.1°C/m to 100 m. At the base of the thermocline, the temperature drops to values of about 15 and 16°C. Between 100 and 150 m, the gradient of temperature decreases significantly and reaches values of 10°C at 500 m 6°C at 1000 m (Marques *et al.*, 1997).

Still, among others oceanographic phenomena that occur in the area of Cape Verde, we highlight at south of latitude 20°N the *Cape Verde Front Zone* (CVFZ) that originates by the meeting of two water masses, the North Atlantic Central Water (NACW) and the South Atlantic Central Water (SACW) (Zenk, 1991) and the *Oxygen Minimum Zone* (OMZ) (Stramma et al., 2008).

Wind pattern, sea surface temperature, salinity and fluorescence

The wind pattern around the island (Figure 3.1) showed very stable conditions with the wind direction generally coming from north – northeast, with some curving around the island formations in the area. The wind was from moderate breeze to gale with strongest wind in the northern and western part of the area.

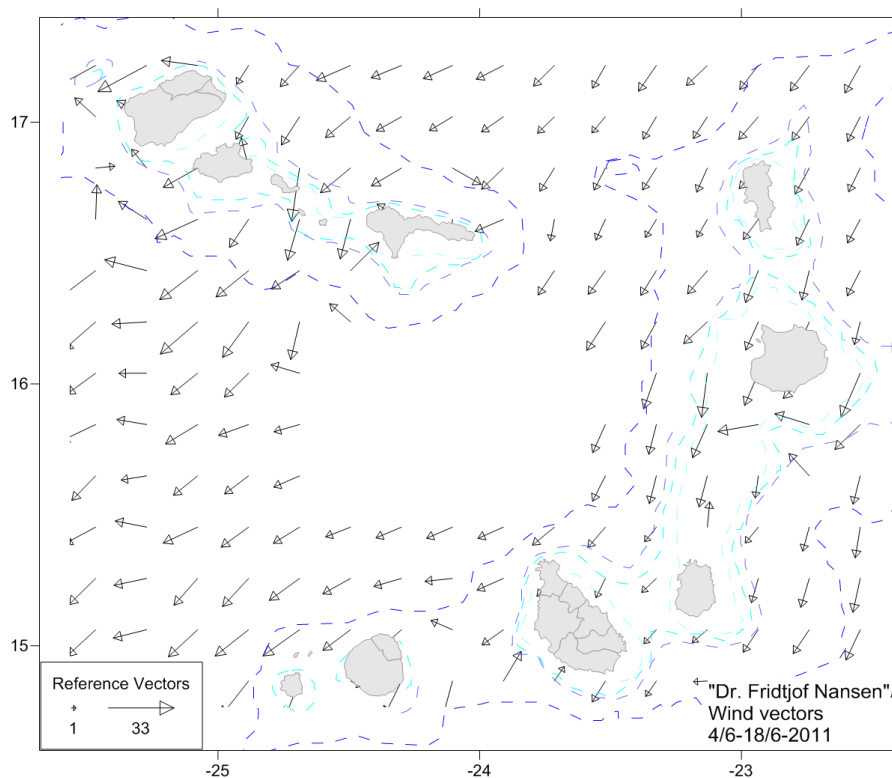


Figure 3.1. Distribution of wind vectors around Cape Verde during the survey period

The sea surface temperature (SST, 5m depth) for the surveyed area is described in Figure 3.2. The SST was relatively stable and ranged from 23 to 24°C over the whole survey area. The coolest temperatures were found around Sal and the northern end of Boa Vista, and in the shallow area in North West between São Vicente and Ilheu Raso, the small island west of São Nicolau. The sea surface salinity (SSS) was also relatively stable ranging between 36.1 and 36.5. The coolest surface water masses were corresponding with SSS of 36.3. The Sea surface fluorescence showed very low values over most of the area but with increased concentrations at the northern end of Boa Vista and around Sal, and in the North West in the shallow area between São Vicente and Ilheu Raso, and

north and south of São Nicolau. Increased concentrations in the surface of fluorescence in the surface waters corresponded relatively well with cooler water masses indicating slight mixing of surface water masses with nutrient rich water coming to the surface.

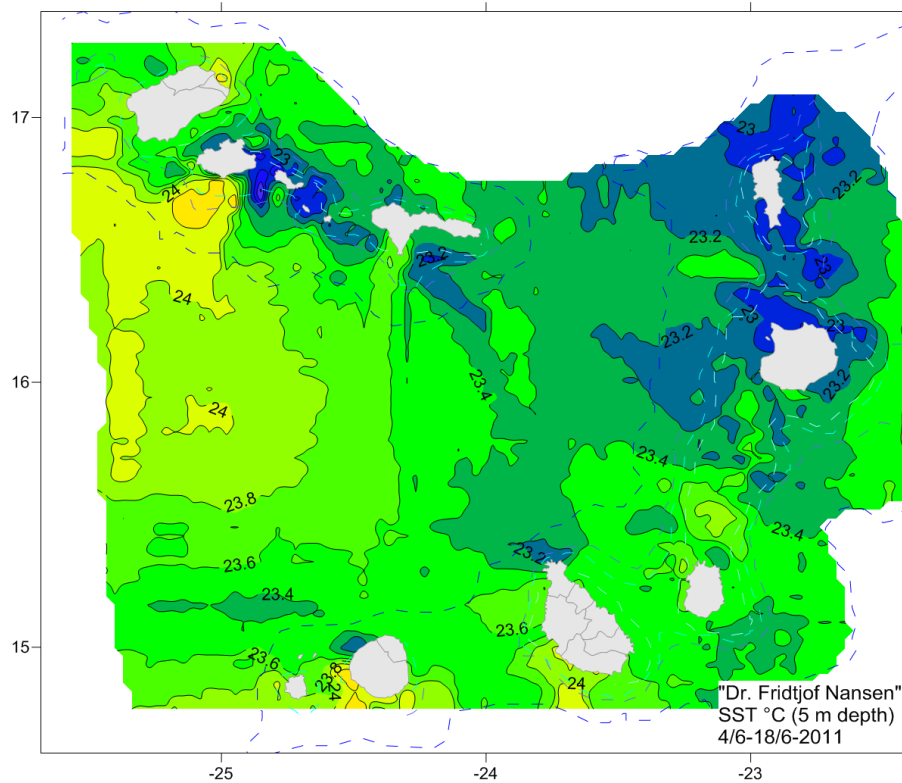


Figure 3.2. Horizontal distribution of sea surface temperature around Cape Verde (5 m depth) in the period of the survey.

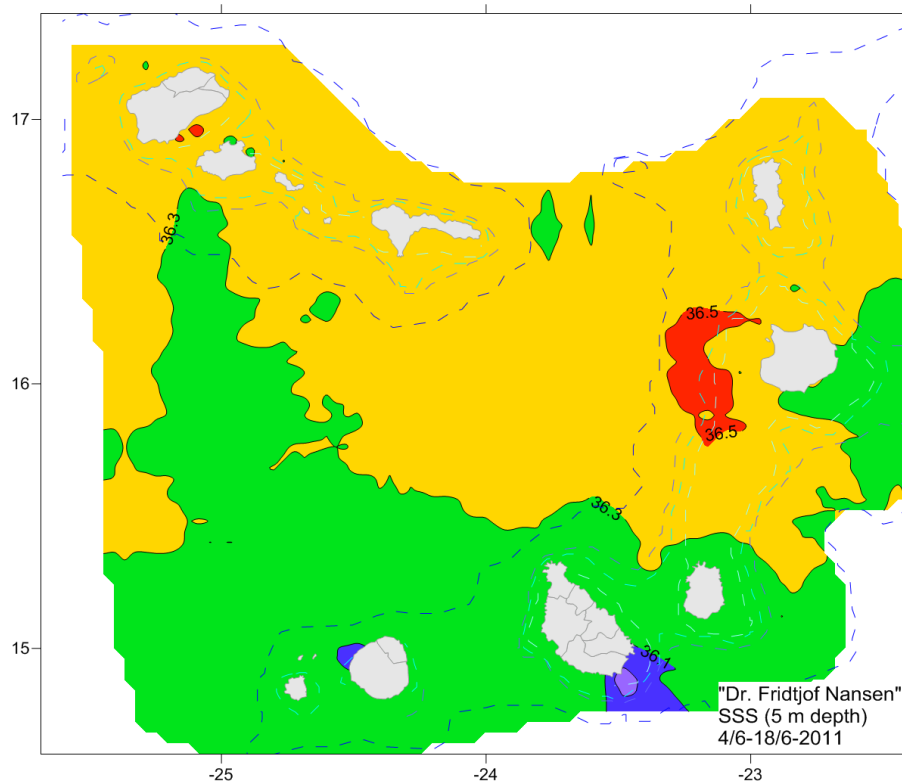


Figure 3.3. Horizontal distribution of sea surface salinity around Cape Verde (5 m depth) in the period of the survey.

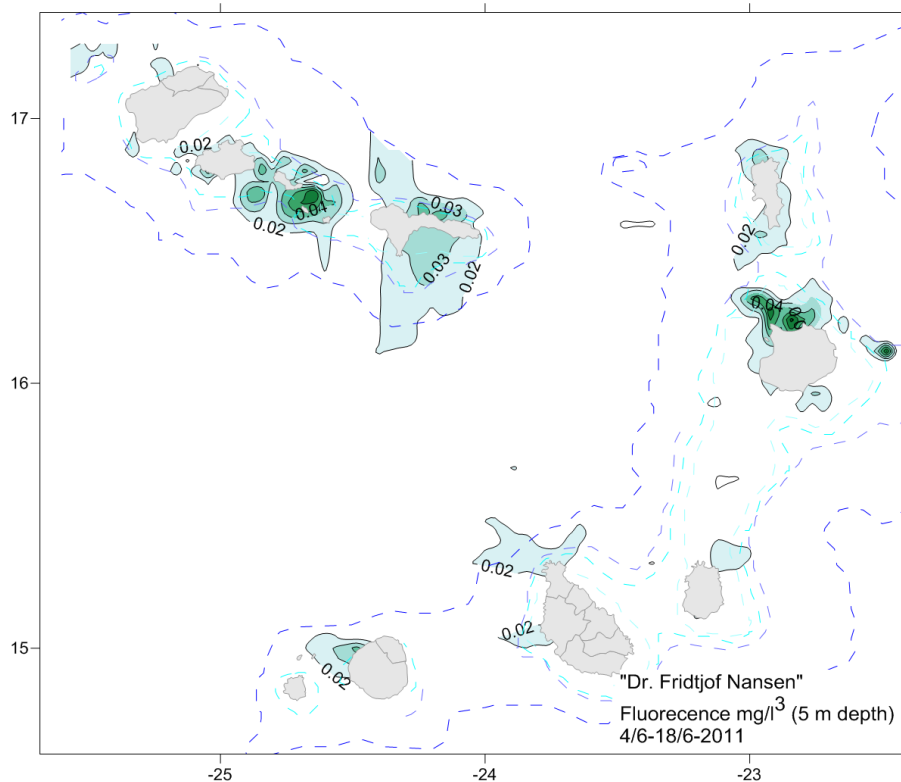


Figure 3.4. Horizontal distribution of surface fluorescence around Cape Verde during the survey period (5 m depth).

Vertical CTD casts

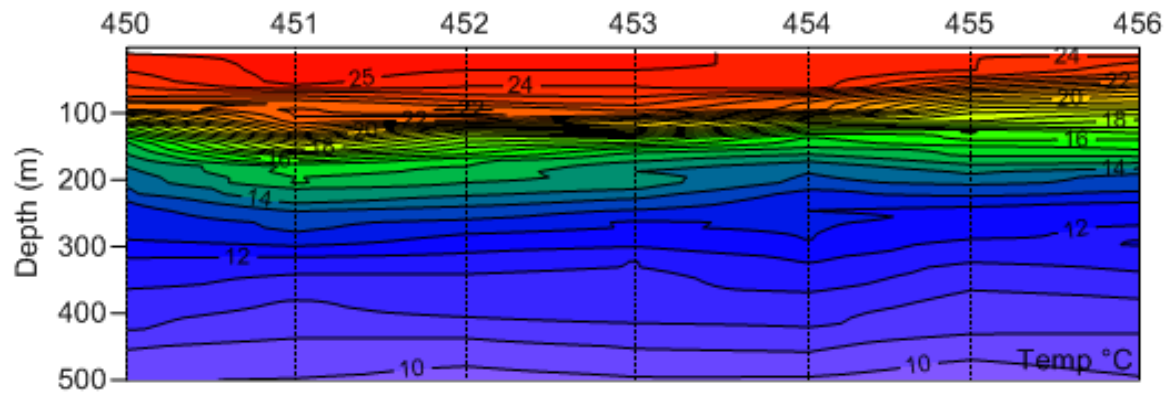
CTD's were taken at the outside of the islands all around the island group at 1500 m depth (except for the first line between São Vicente and Brava where the casts were made to 3000 m depth). Additionally, CTD's were taken at all bottom trawls, and on a CTD transect across the João Valente bank. Only selected CTD transects are shown, and only to a depth of 500 m. Water samples were taken at predefined depths for analyses of nutrients (see Method chapter), filters with chlorophyll samples were taken at the same depths. The samples will be analysed after the survey at INDP, Cape Verde.

Several CTD transects was made as part of the investigations but only three transects are shown in the report as the oceanographic conditions resembled each other through the survey area. Data from the other transects are available on request (Se Figure 1.2 for information on the position of all CTD stations). The first CTD line was made between the islands of São Vicente and Brava. The CTD transect (Figure 3.5) was approximately 120 nm long. Temperature in the surface waters were around 25°C in the northern part of the area with cooler waters in the south close to Brava (24°C). The thermocline was generally found around

100-120 m depth along the transect. Further down the water temperature decreased gradually to 10°C at 500 m depth and further to 2.7°C at 3000 m depth. Relatively high salinity was observed, (Sal.>36.2), a body of higher salinity water can be observed at the south of São Vicente (Sal >37.0) at around 100 m depth. Deeper than 100 m depth the salinity declined towards 35.2 at 500 m depth. Oxygen concentrations were highest above 100 m with oxygen around 4.6 with a strong chemocline around 120 m depth just below the fluorescence maximum in the north but becoming more shallow closer to Brava. Fluorescence showed highest concentrations around 75-100 m depth with higher concentrations at each side of the transect, and especially in the north (immediately south of São Vicente).

The second transect (Figure 3.6) show temperature, salinity, dissolved oxygen and fluorescence observed across the João Valente bank. The section across the bank was taken to observe any upwelling in the area as previously reported during the 1981 survey. However the section did not give any indication of this. The minimum depth on the bank where the section was taken was about 70 m. Temperatures ranged from around 24°C in the surface layer on both sides of the bank with a thermocline around 70 - 75 m depth. Temperatures around 10.5°C was observed around 500 m depth. Salinity around 36.2-36.3 was observed in the upper 100 m, with a body of more saline water (36.4) coming in from the east. Salinity at 500 m was <35.4. The fluorescence maximum was found around 70 m depth, with the maximum concentration on top of the shelf and decreasing concentrations to each side. The surface layer was well oxygenated with decreasing concentrations with depth.

The third transect displayed show temperature, salinity, dissolved oxygen and fluorescence observed between Sal and São Nicolau. This section in the northeast is where the main flow of water from the canary current enters the archipelago. Surface temperatures were >24°C, with a thermocline around 100 m depth lifting slightly towards 50 m depth in the western part of the transect . Temperature in the deeper layers seems very stable with temperatures around 10°C at 500 m depth. Salinity concentrations were <36.4 in the surface, increasing to 36.8 in the eastern part of the transect between 50 -100 m depth. West of this body a slightly less saline water mass corresponding with the cooler water masses can be observed. The same pattern is also observed in the oxygen plot with water masses of lower oxygen is moving towards the surface in the west of the transect. The surface waters are otherwise well oxygenated with surface values around 4.6 ml/l. The fluorescence has a maximum around 75 m depth at the middle of the transect, and again, with a lifting of more nutrient rich waters towards the surface in the west.



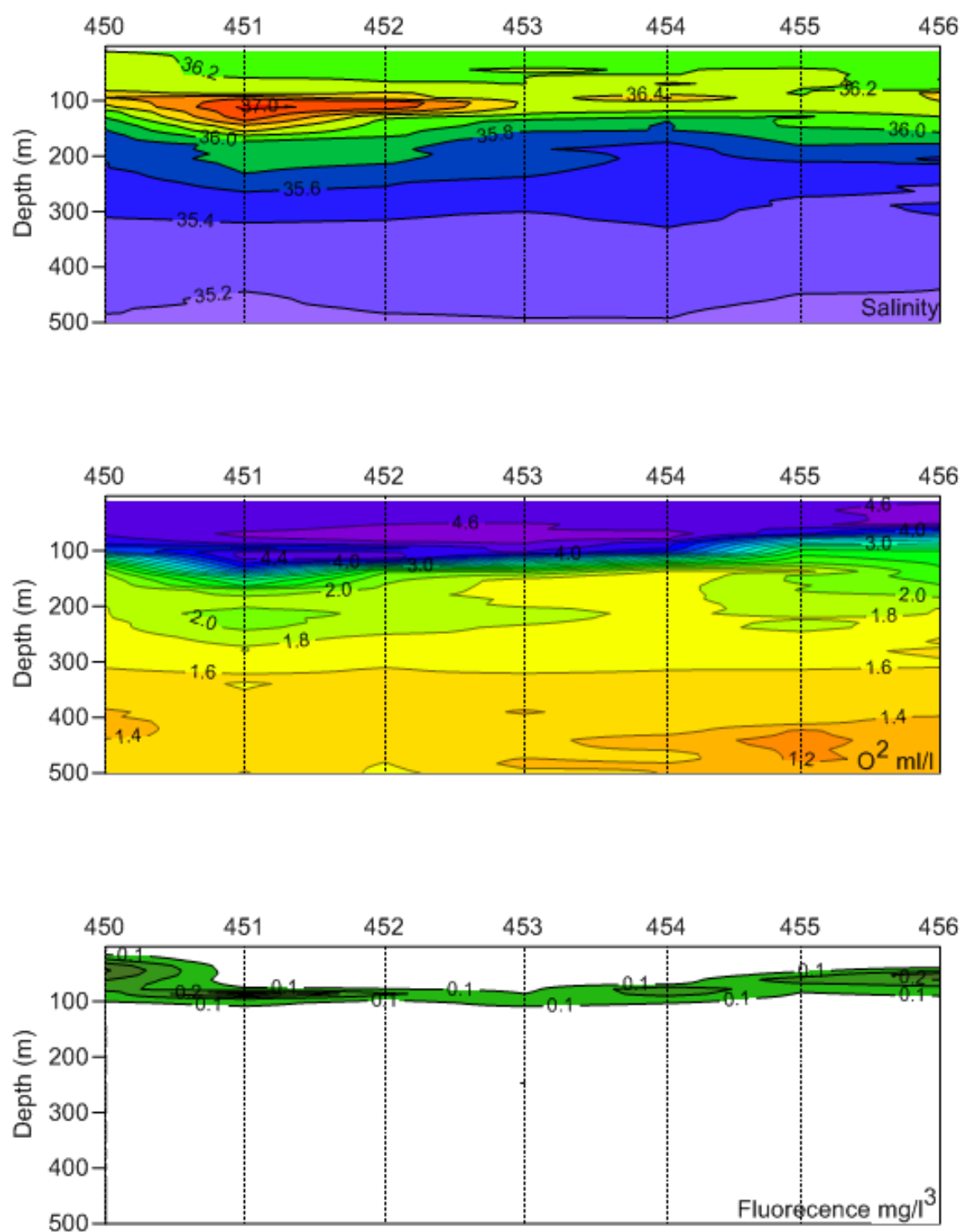


Figure 3.5. Temperature, salinity, dissolved oxygen and fluorescence observed on the transect between São Vicente and Brava.

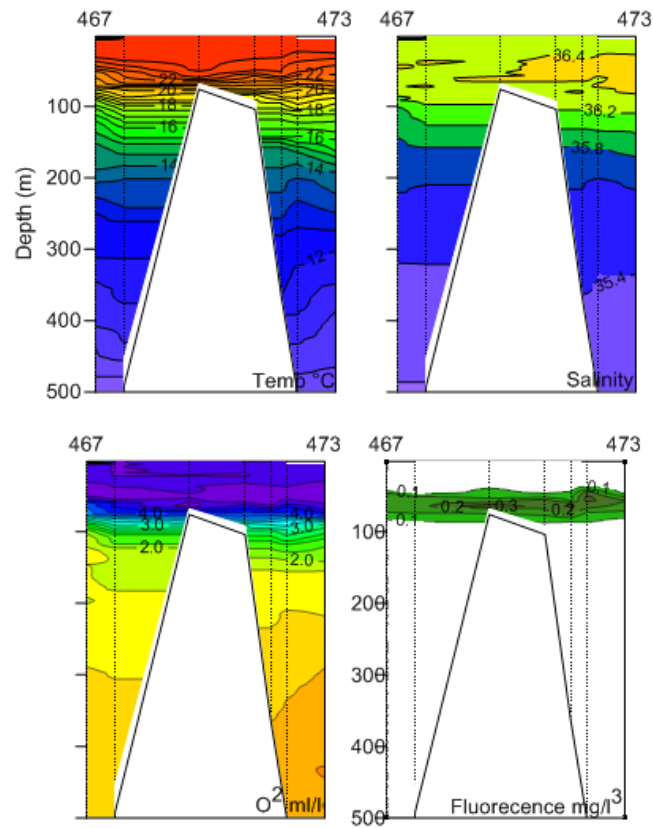


Figure 3.6. Temperature, salinity, dissolved oxygen and fluorescence observed across the João Valente bank

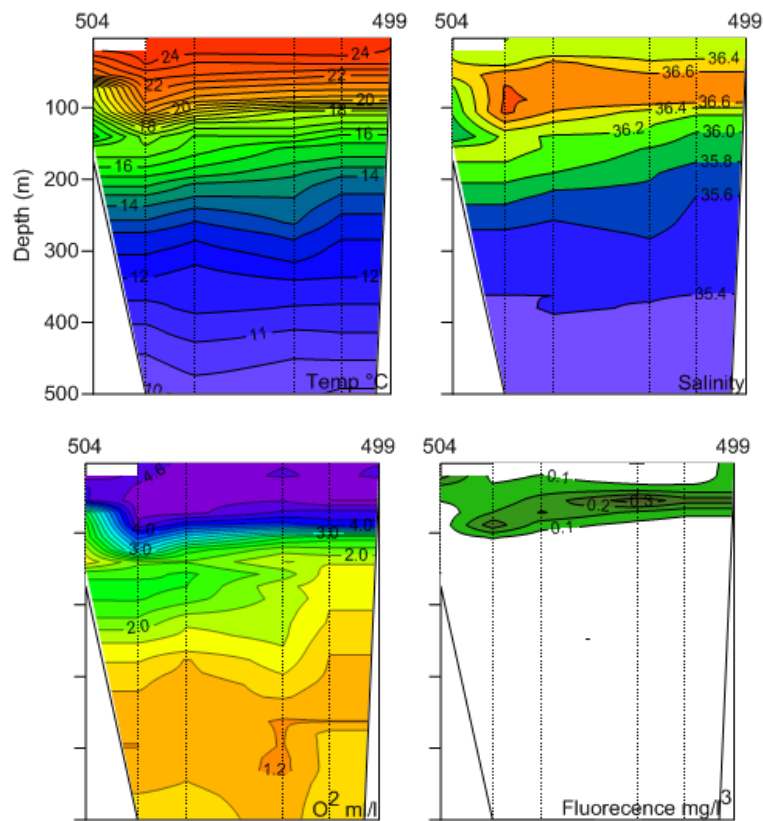


Figure 3.7. Temperature, salinity, dissolved oxygen and fluorescence observed on the transect between Sal and São Nicolau.

Zooplankton

A total of 30 multinet stations were taken for zooplankton sampling (Annex IV), but one station was not sampled because of problems with the net. At most stations 5 samples were taken from the predefined depths. When bottom depth was less than 200 m the numbers of samples (nets) were reduced accordingly. All together 137 samples were preserved for further analyses ashore at INDP.

1.14. Acoustic abundance and distribution

The hydroacoustic survey covered the shelf and slope from roughly 30 m depth to 1500 m bottom depth. Continuous acoustic recording and analysis were carried out throughout the survey to depths of 500 m. The very narrow shelf around Cape Verde was covered with a zigzag pattern. No clupeid fish (PEL1) aggregations were found during the acoustic survey or in any of the trawl catches although *Sardinella aurita* has been reported from this region before. The PEL2 group (horse mackerels, scads, scombrids, cutlass fish etc.) was absent from the southern part of the survey area between Bravo and São Tiago. Some minor concentrations were found on the west side of Maio, while the main concentrations in Area 1 were found on the southern side of Boa Vista and around Sal. The largest concentrations of pelagic fish was found in shallow waters (<100 m depth) in area 2 between São Vicente and Ilheu Raso. The concentrations corresponded with observed increased levels of fluorescence in that area. The most common pelagic species found in the trawl catches during the survey of Cape Verde were *Seriola fasciata* and *Caranx crysos* (frequency of occurrence), while the biggest catches by weight was made of *Selar crumenophthalmus*. However, catches of pelagic species were generally low. This is reflected in the acoustic biomass estimation. The abundance of pelagic fish is assessed to 3 thousand tonnes, exclusively belonging to the PEL2 group. Of this 1 300 tonnes were found in area 2. The biomass estimate is based on an average fish length of 23 cm (see methods). Some of the fish were found in shallow water and smaller concentrations may have been missed inshore of the area surveyed. The shelf around Cape Verde is very steep and this effect can only have contributed to a small extent.

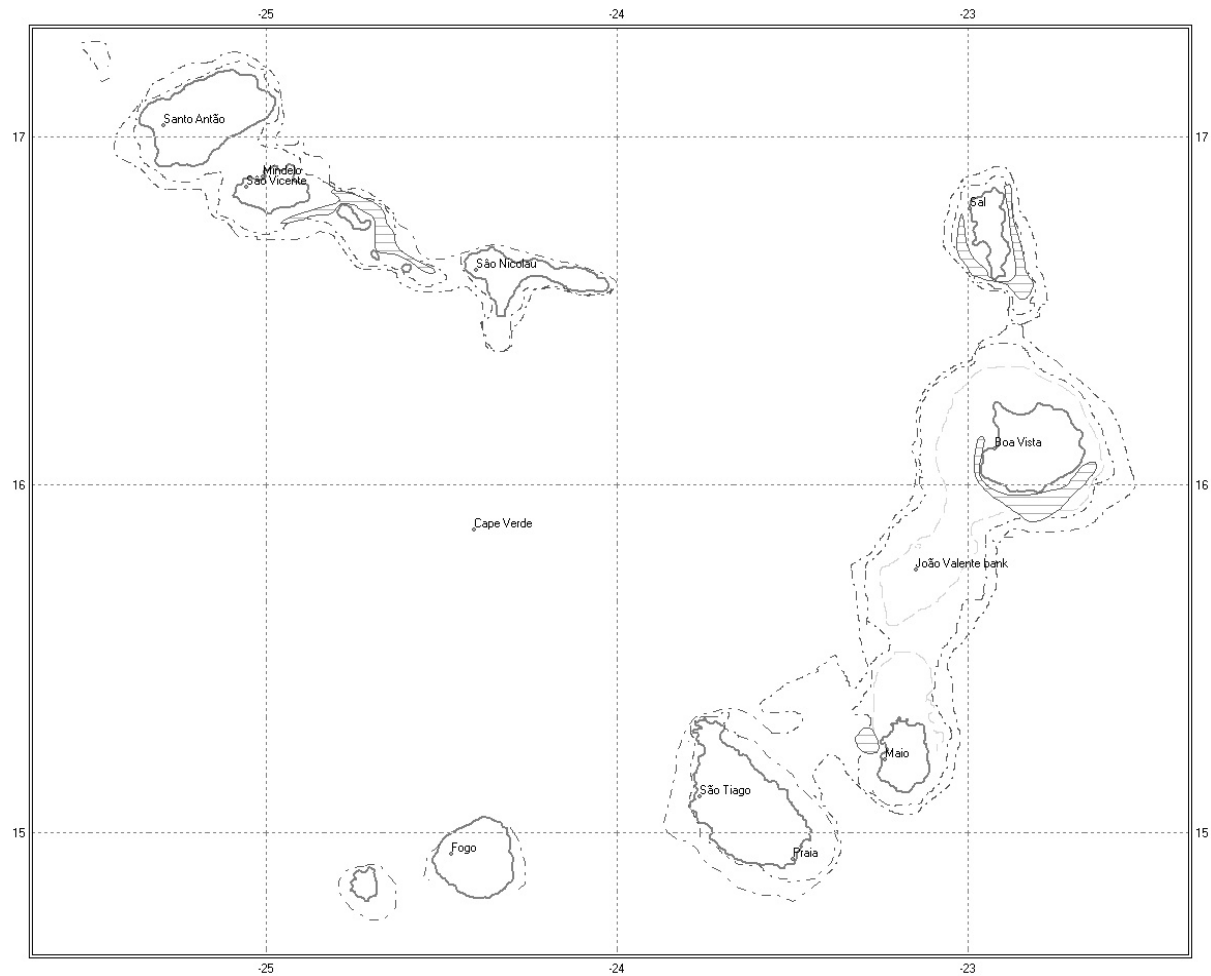


Figure 3.8 Distribution of PEL 2 during the survey. 100, 500 and 1000 m isobaths are indicated.

Table 3.1 Acoustic estimates of carangids, scombrids and associated pelagic (PEL2) in tons (t).

Region	Biomass (t)
Region 1	1 700
Region 2	1 300
Total	3 000

1.15. Swept area abundance and distribution

The topography off the islands of Brava, Fogo and Santiago is such that bottom trawling generally is not possible. No information on the fish resources around these islands were therefore obtained as part of the trawl survey. However, as these islands virtually have no shelf, the amount of demersal fish is expected to be low. This assumption is also supported by the acoustic recordings where very little fish (with the exception of some myctophids) were found around the three islands.

Two separate regions were used for the analyses of trawl catch data. The region Maio- Boa Vista- Sal has a wider platform with a bank between the islands of Maio and Boa Vista. Further west, the islands of Santo Antão, São Vicente, Santa Luzia and São Nicolau shear a common platform. The two areas both have a relatively shallow shelf, a mixture of hard and sandy substrate on the shelf and a very steep and roughed slope to around 3 000 m depth or more. Only “valid” bottom trawls were included in the analyses, and catch rates were analysed for three depth regions; 30-50 m, 50-100 m and 101-500 m. One trawl at approximately 1000 m depth was not included in the analyses.

Region 1. Maio – Sal

A total of 20 valid trawl stations were conducted on the shelf between Maio and Sal. 4 of these were found between 30 – 50 m, 12 between 51 – 100 m and 4 between 100 – 500 m depth (Table 3.2). No trawls were made shallower than 30 m bottom depth. The total average catch rates in the 30 – 50 m depth region were 1070 kg/h. However it should be noted that the average is very dependent on one station with a very high catch (Station 23, with a total catch of 2293 kg/h). Of the total average catch pelagic species consisted 6.1 % (65 kg/h), 3.6% (39 kg/h) were commercial demersal species and 4.8% were sharks. No cephalopods or shrimps were found. The group of “other” species includes species not found in any of the other groups. The species in this group are often considered to be of less commercial importance. The catch rates of this group were 914 kg/h and 85% of the overall catch. The most abundant species within the group was: *Galeoides decadactylus* *Strombus latus* and *Pseudupeneus prayensis* (Annex X).

The total average catch rate in the depth region between 51-100 m was 298 kg/h. Of this commercial demersal species consisted 5.7% (17 kg/h), pelagic species showed average catch rates of 11 kg/h (3.8%), sharks had average catch rates of 17 kg/h (5.7%) while cephalopods had average catch rates of 0.2 kg/h. The group of other species had relatively high catch rate with 253 kg/h and 84.8% of the overall catch. The most abundant species were: *Antigonia capros*, *Taeniura grabata* and *Dactylopterus volitans* (Annex X).

In the depth region between 100 – 500 m the catch rates were on average 1087 kg/h. Demersal species were the most important contributing 51.8% (563 kg/h) to the overall catch, cephalopods had average catch rates of 36.4 kg/h (3.3% of the catch) while pelagic species, shrimps and sharks were all insignificant in the catches. The group of other species contributed 44.3% (481 kg/h) to the overall catch. The most abundant species were *Dentex macrophthalmus*, *Glossanodon leioglossus* and *Antigonia capros* (Annex X).

Table 3.2. Catch rates (kg/hour) by main groups caught in valid swept area bottom trawl hauls. Region 1. a): 30-50 m, b): 50-100 m, c): 101-500 m

a)

Station	Gear depth	Cephalopods	Demersals	Pelagic	Sharks	Shrimps	Other	Total
6	33	0	137.9	0	74.5	0	779.3	991.7
22	39	0	0	1.8	0	0	471	472.8
23	43	0	17.4	212.4	118.6	0	1945	2293.5
28	38	0	0.1	46.6	14.3	0	459.3	520.2
Mean	38.2	0	38.9	65.2	51.8	0	913.6	1069.5
Std dev	4.1	0	66.5	100.5	55	0	703.3	848.9
%		0.0	3.6	6.1	4.8	0	85.4	100.0

b)

Station	Gear depth	Cephalopods	Demersals	Pelagic	Sharks	Shrimps	Other	Total
8	81.5	0	0	0	0	0	26.1	26.1
10	67	0	0	0	6.4	0	58.4	64.8
11	81.5	0	0	0	0	0	48.6	48.6
12	78	0.1	0.2	29.9	31.2	0	567.8	629.2
16	89	0	36.9	0	10.9	0	177.6	225.4
18	78.5	1.8	0.1	0	10.6	0	540.4	553
19	70.5	0	0	0	0	0	18.8	18.8
20	51.5	0	38.1	18.3	30.2	0	116.2	202.8
24	59.5	1	0	0	23.6	0	194.7	219.3
25	95	0	0	49.5	47.5	0	830.4	927.4
30	77	0	0	0	9.3	0	145.2	154.5
31	51	0	127.5	37.5	32.9	0	308.5	506.3
Mean	73.3	0.2	16.9	11.3	16.9	0	252.7	298
Std dev	13.9	0.6	37.7	18	15.7	0	260	289.8
%		0.1	5.7	3.8	5.7	0	84.8	100.0

c)

Station	Gear depth	Cephalopods	Demersals	Pelagic	Sharks	Shrimps	Other	Total
13	173.5	0.3	0.7	0	3.5	0	335.5	339.9
14	200.5	139.3	1467.5	0	6.8	0	881.4	2495
17	248	6.2	118.7	1.1	4.1	0	172.5	302.6
29	234	0	664.3	0	10.9	0	534.1	1209.3
Mean	214	36.4	562.8	0.3	6.3	0	480.9	1086.7
Std dev	33.6	68.6	668.8	0.5	3.4	0	305.2	1028.1
%		3.3	51.8	0.0	0.6	0	44.3	100.0

The group of commercial demersal species was subdivided to separate catches of croakers, groupers, grunts, seabreams and snappers. Table 3.3 show the catch rates for each of these groups per depth region. Seabreams was the only group within the depth region 30-50 m that showed any importance in the catches. Catch rates of 16 kg/h (1.4% of the overall catch). Grunts had catch rates of 5.2 kg/h (0.5%). No catches were made of any of the other species groups. In the depth region between 51-100 m seabreams showed catch rates of 8.8 kg/h (3.0%), while grunts had catch rates of 3.1 kg/h and groupers catch rates of 2.5 kg/h. In deeper waters 101-500 m depth the seabreams became considerably more important with average catches of 536 kg/h contributing 49.3% to the overall catch. Non catches were made of croakers, groupers, grunts or snappers.

Table 3.3. Catch rates (kg/hour) by demersal groups caught in valid swept area bottom trawl hauls. Region 1. : a) 30-50 m, b): 50-100 m, c): 101-500 m

a)

Station	Gear depth	Croaker s	Grouper s	Grunts	Seabrea m	Snapper s	Other	Total
6	33	0	0	3.5	61.9	0	926.3	991.7
22	39	0	0	0	0	0	472.8	472.8
23	43	0	0	17.4	0	0	2276	2293.5
28	38	0	0.1	0	0	0	520.1	520.2
Mean	38.2	0	0	5.2	15.5	0	1048.8	1069.5
Std dev	4.1	0	0.1	8.3	31	0	843.1	848.9
%		0.0	0.0	0.5	1.4	0	98.1	100.0

b)

Station	Gear depth	Croaker s	Grouper s	Grunts	Seabrea m	Snapper s	Other	Total
8	81.5	0	0	0	0	0	26.1	26.1
10	67	0	0	0	0	0	64.8	64.8
11	81.5	0	0	0	0	0	48.6	48.6
12	78	0	0.2	0	0	0	629.1	629.2
16	89	0	29.9	0	7	0	188.4	225.4
18	78.5	0	0.1	0	0	0	552.9	553
19	70.5	0	0	0	0	0	18.8	18.8
20	51.5	0	0	5.9	32.3	0	164.7	202.8
24	59.5	0	0	0	0	0	219.3	219.3
25	95	0	0	0	0	0	927.4	927.4
30	77	0	0	0	0	0	154.5	154.5
31	51	0	0	31.7	65.9	1	407.7	506.3
Mean	73.3	0	2.5	3.1	8.8	0.1	283.5	298
Std dev	13.9	0	8.6	9.1	20.2	0.3	286.9	289.8
%		0.0	0.8	1.0	3.0	0.0	95.1	100.0

c)

Station	Gear depth	Croaker s	Grouper s	Grunts	Seabrea m	Snapper s	Other	Total
13	173.5	0	0	0	0.7	0	339.2	339.9
14	200.5	0	0	0	1461.5	0	1033.6	2495
17	248	0	0	0	105.7	0	196.9	302.6
29	234	0	0	0	575.2	0	634.1	1209.3
Mean	214	0	0	0	535.8	0	550.9	1086.7
Std dev	33.6	0	0	0	665.8	0	369.7	1028.1
%		0.0	0.0	0.0	49.3	0	50.7	100.0

Region 2. Santo Antão - São Nicolau

Only 6 valid trawl stations were made in this area due to generally poor trawling conditions. These ranged from 41 - 279 m. Because of the low number of trawls there was made no attempt to separate the trawls per depth region, Table 3.4 therefore shows average catches between 41 - 279 m depth.

Total catches in the area was relatively low with 201 kg/h. Of this the sharks were the most abundant group (excluding "others") with 20.4% of the total catch or 41 kg/h. Pelagic species were the second most important group with 10.4% of the

total catch and 21 kg/h. Valuable demersal species were only 1.2% of the total catch while cephalopods and shrimps were 0.5% and <0.05% of the total. The group of other species were the most abundant with 67.6% of the total catch or 136 kg/h. The most abundant species in the region were *Taeniura grabata*, *Mustulus mustulus*, *Dactylopterus volitans* and *Dasyatis centroura* (Annex X).

The demersal group was not divided further into subgroups since catch rates were generally very low.

Table 3.4. Catch rates (kg/hour) by main groups caught in valid swept area bottom trawl hauls in Region 2. a) 30 - 500 m

Station	Gear depth	Cephalopods	Demersal	Pelagic	Sharks	Shrimps	Other	Total
34	77	0.5	0	0	0	0	191.5	192
35	63.5	1.7	16.6	55.9	15.5	0	207.3	297
36	279	4.5	0	0	0	0.4	68.7	73.6
37	41	0	0	1.8	0	0	35.1	36.9
38	98.5	0	0	51.1	242.3	0	197.9	491.4
39	62	0	0	5.9	0	0	165.9	171.8
40	48.5	0.1	0	31.7	29.6	0	87.2	148.6
Mean	95.6	1.0	2.4	20.9	41.1	0.1	136.2	201.6
Std dev	83.0	1.7	6.3	24.9	89.5	0.2	70.7	153.0
%		0.5	1.2	10.4	20.4	0.0	67.6	100.0

Biomass estimates

Annex X gives catch rates of species per region and depth. Swept area biomass estimates of some selected species are shown in Table 3.5. The estimates are based on the trawlable areas (Figure 1.1). Areas without trawls are not included in the estimates, and these must be considered indicative only.

The biomass of *Dactylopterus volitans* was estimated to be 1020 tonnes and had the largest overall biomass of a single species within the island group. It was mainly found between Maio and Boa Vista while smaller concentrations were also found east of Sal and south of Sao Vicente, mainly at depths around 50-100 m depth, but also in hauls both deeper and shallower than this (Figure 3.9). *Pseudopeneus prayensis* was found around Boa Vista and in small patches at Maio, east of Sal and on both sides of Sao Vicente. *Lethrinus atlanticus* was found patchily at Maio, Boa Vista and Sal. *Galeoides decadactylus* was found in small patches east of Sal and south of Boa Vista. *Fistularia petimba* was found in similar regions as the *Dactylopterus volitans*, between Maio and Boa Vista while smaller concentrations were also found east of Sal and south of Sao Vicente and São Nicolau.

The conch *Strombus latus* were also among the most caught species in certain areas. The main part of the distribution was found on the East of Boa Vista and the East of Sal with highest concentrations in shallow waters < 50 m but also deeper than this.

Table 3.5. Swept area biomass estimates of some selected abundant species

Species	Total Area (nm ²)	Biomass (tonnes)
<i>Dactylopterus volitans</i>	743.5	1018.6
<i>Pseudopeneus prayensis</i>	206.1	284.7
<i>Lethrinus atlanticus</i>	75.8	145.5
<i>Galeoides decadactylus</i>	53.4	867.3

<i>Fistularia petimba</i>	718.4	252.8
<i>Strombus latus</i>	88.9	172.6

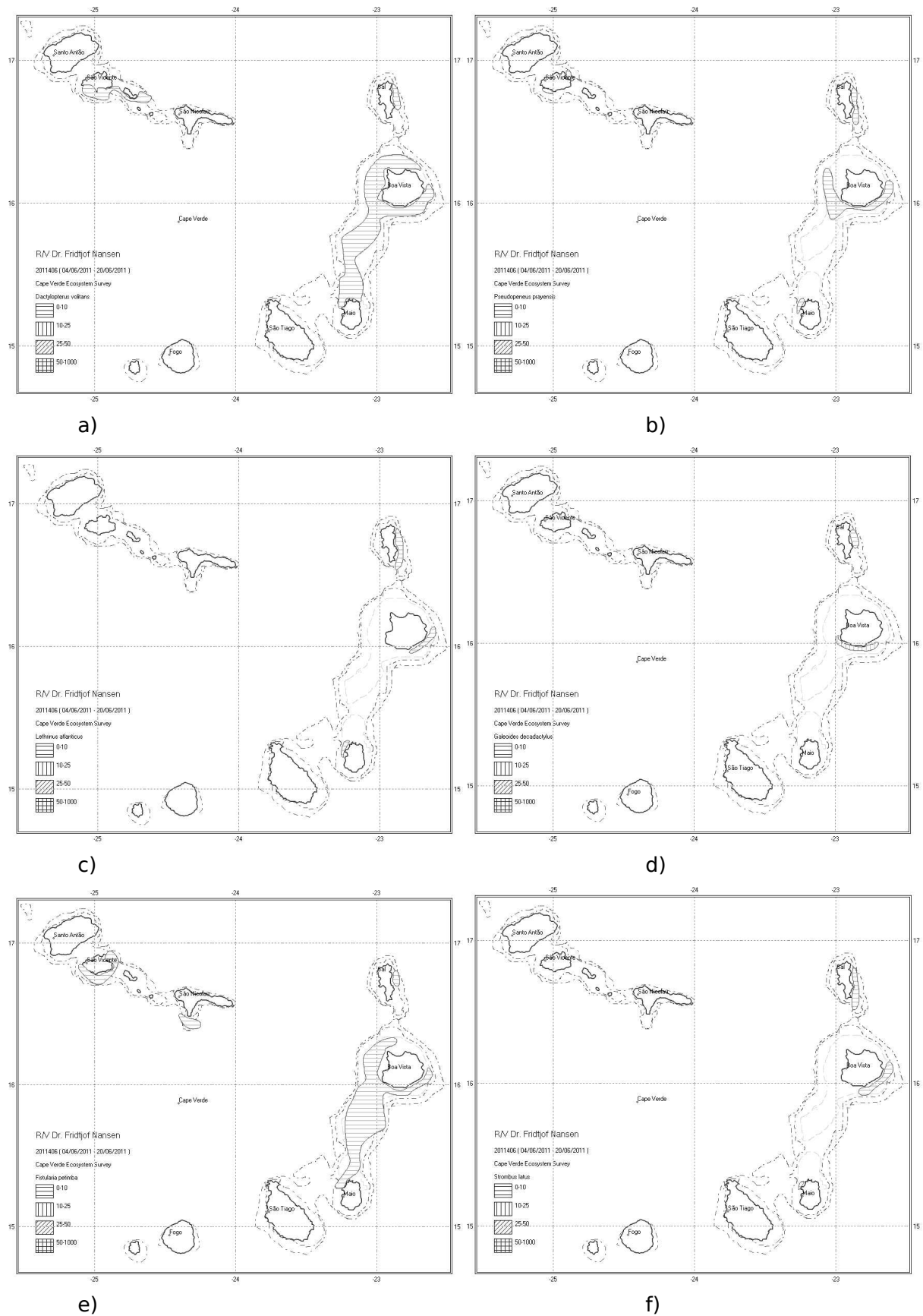


Figure 3.9 Distribution pattern of selected demersal species during the survey; a) *Dactylopterus volitans*, b) *Pseudopeneus prayensis*, c) *Lethrinus atlanticus*, d) *Galeoides decadactylus*, e) *Fistularia petimba*, f) *Strombus latus*

Biodiversity

A total of 41 trawls were conducted during this survey, 28 bottom trawls were accepted as valid and 11 trawls were conducted for species identification with pelagic trawl. 22 bottom trawls were carried out between 31 to 100 m, 5 between 160 m to 300 m and 2 between 850 and 910 m. The fishing depths for the pelagic trawl hauls were between 0 – 100 m over bottom depths from 200 to 2100 m.

In Cape Verde a total of 12 marine fish species are accepted as endemic species based on FishBase (2004). *Raja herwigi* (Rajidae) were recorded on eight trawl stations, *Diplodus prayensis* (Sparidae), *Virididentex acromegalus* (Sparidae) and *Parapercis atlantica* (Pinguipedidae) on two trawl stations, and *Chromis lubbocki* (Pomacentridae) on one station. A total of 200+ fish species were recorded in the Nansis database during the survey (Annex 1).

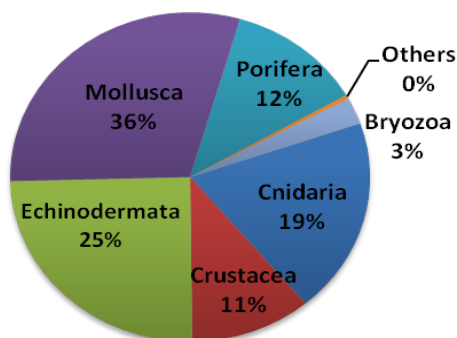
Genetics

A total of 240 tissue samples were taken for DNA analyses to be further processed by the Laboratory of Analytical Biology at the Smithsonian Institute (see Annexes VI and VII).

1.16. Epibentos

A total of 7,319 exemplars with a total weight of 729 kg, belonging to 9 Phyla, 23 Classes and 201 morphospecies were caught during the survey. The main numerical abundances corresponded to Mollusca (2,137 indiv.; 36%), followed by Echinodermata (1815 ind., 25%), Cnidaria (1,404 indiv., 19%), Porifera (897 indiv., 12%) and Crustacea (799 indiv., 11%) (Figure 3.10, left). Global weight composition was also dominated by Echinodermata (414 kg, 57%) and Mollusca (261 kg; 36%), without relevance of the rest of the Phyla (Figure 3.10, right).

Total number = 7,319



Total weight = 729 kg

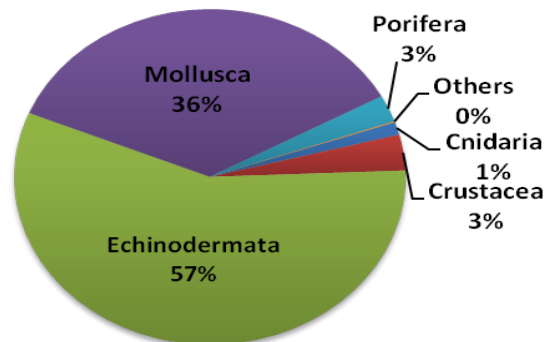


Figure 3.10. Global composition in number (left) and weight (right) by main Phylum of the epibenthic fauna collected during Cape Verde Survey.

Prosobranchia and Holothuroidea were the most important groups, both in number and in weight (Figure 3.11). This was due to the figures of two species which were dominant in the epibenthic communities of Cape Verde Islands: the gastropod *Strombus latus* (1,435 indiv.; 229 kg) in coastal waters, and the holothurid *Mesothuria lactea* (757 indiv.; 350 kg), in deep bottoms.

A total of 201 morphospecies were registered, but this figure is only approximate while the taxonomic study is ongoing. At Phylum level, highest diversity (species richness) was exhibited by Porifera (44 sp.), Cnidaria (40 sp.), Crustacea (38 sp.), Mollusca (36 sp.) and Echinodermata (33 sp.) (Figure 3.12). While the species richness by Class was in this order: Demospongia (41 sp.) and Decapoda (37 sp.), followed at great distance by Prosobranchia (17 sp.), Asteroidea (14 sp.) and Scleractinia and Cephalopoda (10 sp.). The rest of the taxonomic groups do not exhibit a noticeable diversity.

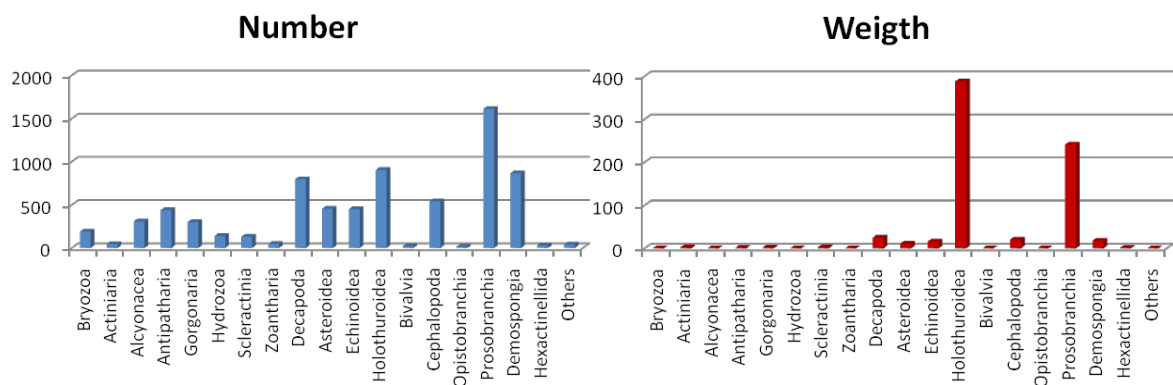


Figure 3.11. Numerical abundances (top) and weight (bottom) by taxonomic Class.

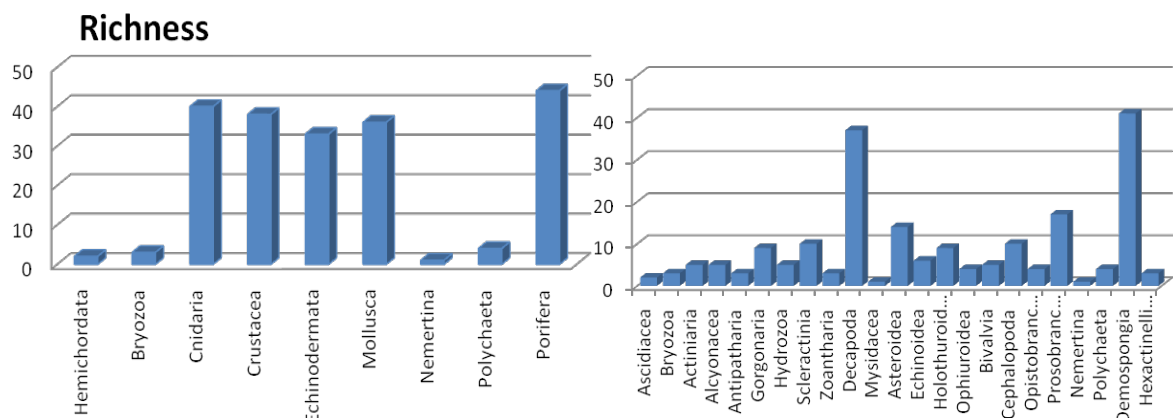


Figure 3.12. Richness (morphospecies number) by Phylum (left) and Class (right).

Ecological considerations

Due to difficult trawling bottom around the Cape Verde Islands, almost all stations have been made in coastal waters of the continental shelf (30-100 m depth), mainly at the bank between Maio and Boa Vista islands. The majority of

sampled shelf bottoms corresponded to coraligenous communities, composed of incrusting suspension feeder fauna, mainly demosponges. Accompanying fauna was constituted, at all depths, by asteroida, prosobranchia, decapoda and cephalopoda. It is notable the abundance of two black-corals species (*Antipatharia*) and the hydrozoan *Lythocarpia miriophylum*, both of great size, in western area of Boa Vista island.

1.17. Soft sediments

Samples of soft sediments were collected with the Sneli sledge. All together 9 samples were taken during the survey, additional samples were taken from 12 bottom trawls on sandy substrate. Annex VIII gives an overview of the samples. The samples will be analysed at the University of Bergen and the results will be presented in a separate report.

1.18. Seabirds

The number of observations, by species, during vessel transects, are shown in Figure 3.13. A total of 480 observations of 1049 birds were made. Of the 11 species, nine breed on Cape Verde, are at nests during June and feed offshore. The two other species recorded, common tern *Sterna hirundo* and great skua *Stercorarius sku*, are Palearctic breeding species classified as scarce visitors to Cape Verde (Hazvoet 2011). *Sterna hirundo* also breeds in small numbers in Senegal and it is possible that the observations here, which included birds in breeding plumage, are of an undetected breeding population. One Cape Verde breeding seabird, magnificent frigatebird *Fregata magnificens*, was not recorded during the survey, but with a population of only 1-3 pairs this was not unexpected.

The boat attracted few birds during trawls, with only four records of brown booby *Sula leucogaster*, which also followed the boat for prolonged periods to feed on flying fish (*Exocoetidae* sp.). This was perhaps surprising as two of the islands' most abundant breeding seabirds, Cape Verde shearwater *Calonectris edwardsii* and white-faced storm-petrel *Pelagodroma marina*, were often seen associating with smaller fishing boats during the survey and *C.edwardsii* has been recorded associating in large flocks with trawlers off Senegal and in its wintering range off Brazil.

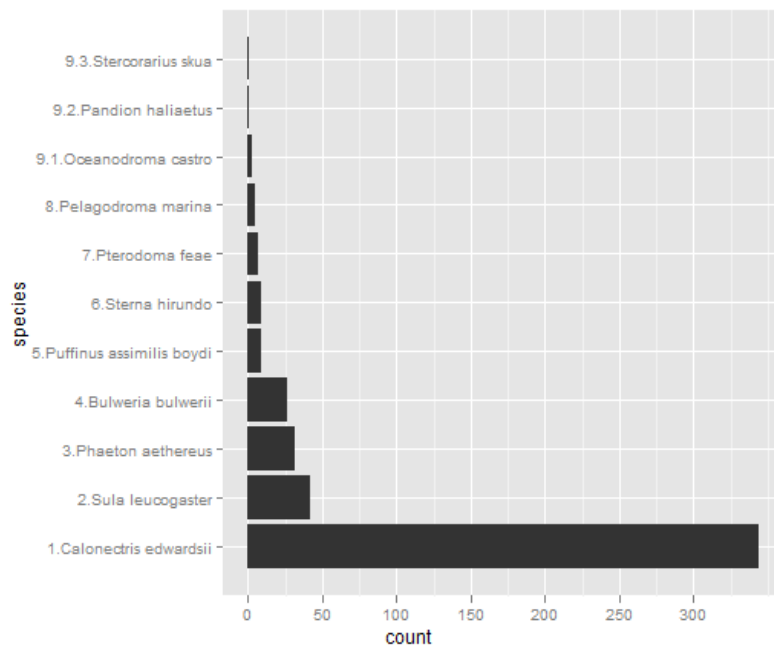
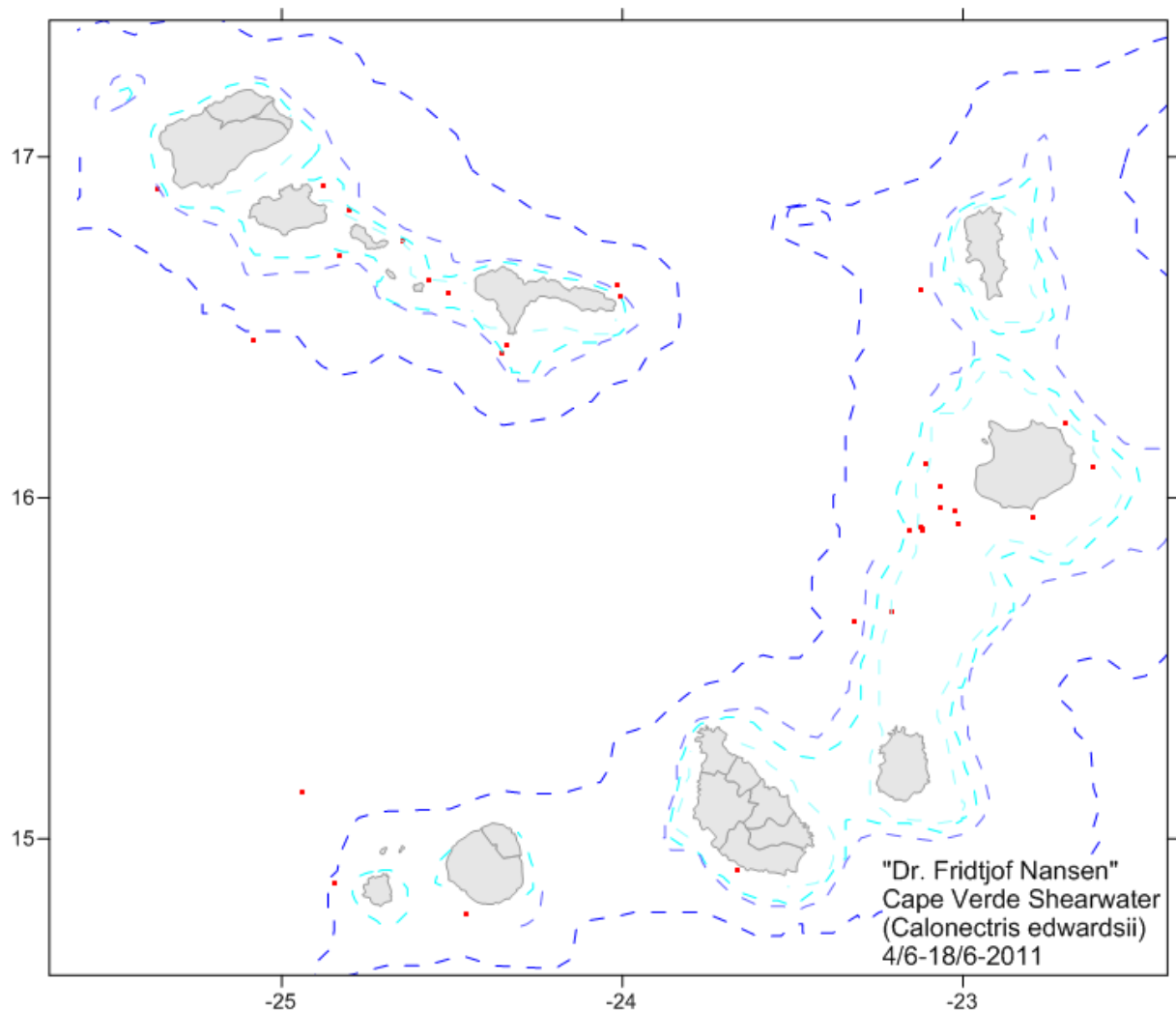


Figure 3.13: The number of observations of birds from the RV Fridtjof Nansen during 4-18 June 2011

The most abundant species, *Calonectris edwardsii*, Figure 3.14, is also Cape Verde's one endemic seabird. The observations during the survey are the first to map the species' offshore distribution, though probably only covering a small part of the June foraging range: occasional observations were made after the survey, all along the return route of the vessel during 19-20 June to within 10km of Senegal's coast. Around the islands most birds were in small groups, except towards dusk when hundreds (excluded from the graph) gathered off its main breeding islands of Raso and Branco. Few birds were seen feeding, although sea conditions made observation of birds on the water difficult for much of the survey. The few feeding groups located were all mixed species groups where *C.edwardsii* associated with *S. Leucogaster*, *S. hirundo*, (Cape Verde) little shearwater *Puffinus assimilis boydi* and Feae's petrel *Pterodroma feae*.



3.14. Observations of Cape Verde Shearwater during the survey.

Of the two other most abundant species, *S. leucogaster* was typically seen in small groups in direct flight. Birds also accompanied the vessel on its return trip for the first 80 km east of Boa Vista, to the edge of the Boa Vista sea mound. Most observations of red-billed tropicbird *Phaeton aethereus* were within sight of islands with known breeding colonies. The distribution of species will be subject to further analysis in future reports.

1.19. Cetaceans

There were 16 observations of a minimum of 91 cetaceans, of four species. The total includes a number of distant, unidentified groups of dolphins. There was one observation of a whale, a breaching humpback *Megaptera novaengliae* seen outside of the survey period, but well described. Three species of dolphin were recorded: in decreasing order of abundance these were rough-toothed *Steno bredanensis*, long-beaked common *Stenella capensis* and common bottlenose *Tursiops truncatus*. More distant groups were assigned to *Stenella/Dephinus* sp. Estimated dolphin group size had a mean of 6 and range of 3 to 15. The

confirmed dolphin species were each recorded bow-riding on occasions. There are as yet no data to put the survey observations in context.

4. SUMMARY AND CONCLUSIONS

The previous survey with the R.V. Dr. Fridtjof Nansen in Cape Verde was in 1981 with the old Dr. Fridtjof Nansen that was decommissioned in 1993. The trawl gear on that vessel and especially the acoustic equipment was different but the survey methodology today still have many similarities to what was done during that survey. Also other surveys has been conducted in the region most notably for this study the trawls surveys with the INIP vessel R.V. Islandia and the survey in 1997 with the Spanish vessel R.V. Capricórnio.

Pelagic species

The concentration of pelagic fish found during the present survey was low, and no clupeids were found. A total of 3000 tons of Carangids and associated species (PEL 2) were found. This is considerable lower than the roughly 50 000 tons found during the 1981 survey with the old Dr. Fridtjof Nansen (FAO 1984), although the distribution areas of pelagic fish from the two surveys compared well (but with smaller densities and distribution areas in 2011). The survey in 1997 with the Spanish vessel R.V. Capricórnio (IPIMAR (Portugal); INDP (República de Cabo Verde), 1987) indicates a biomass of almost 15 000 tonnes of mackerel (It is unclear what mackerel means in this context but it is assumed that it is comparable to Pel2 referred to in this report).

The main pelagic species found in 1981 were *Decapterus macarellus*, *D. punctatus* and *D. rhonchus*. During the present survey all three species were found but none of them were among the most commonly caught pelagic species. Seasonal changes in distribution pattern off the shelf or potential migration of pelagic fish to or from the island group may have had an effect. The most likely reason is however a strong decline in pelagic resources. The two past surveys compared with the present survey and indicate a strong decline in the pelagic resources over the past thirty years. The present estimate should be verified by another survey in the near future. Pelagic landings should be monitored closely and it is recommended to take management actions to ensure that the stocks of pelagic fish are not depleted further.

Demersal species

The catch rates from the swept area hauls from the 1981 survey was 69.1 tonnes/nm² on average. The highest average catch rates were found between the islands of Sal, Boavista and Maio, with average catch rates of 78.6 tonnes/nm² (FAO 1984). The most abundant species during the survey were *Decapterus punctatus*, *Pseudupeneus prayensis*, *Antigonia capros*, *Decapterus rhonchus*,

Lithognathus mormyrus and *Pagellus acarne*. During the present survey abundance of demersal resources were considerably lower than in 1981. The total average catch to 500 m depth was 17.37 tonnes/nm². The larger shelf area between Maio and Sal yielded the highest catch rates, 20.66 tonnes/nm², while the area between São Nicolau and Santo Antão had average catches of 6.38 tonnes/nm² (Annex X). The three most abundant species overall during the survey was *Dentex macrophthalmus*, *Galeoides decadactylus*, *Antigonia capros*. The biomass of the 6 most abundant species were < 3000 tonnes, while an overall swept area biomass of about 50 000 tonnes was estimate in 1981 (FAO 1984). Although the two ways (1981 survey vs 2011 survey) of presenting the biomass estimates are different it strongly indicates that the biomass has decreased considerably over the period. One should keep in mind that the estimates from these surveys mainly are based on results from trawl hauls on the shelf, as most of the slope is untrawlable. Likewise, seasonal variations in fish abundance and distribution may affect the overall resource situation and will not be picked up during a single survey. It is probable that the overall resource situation is better than what these estimates indicate.

Both pelagic and demersal resources are considerably lower in 2011 than in 1981. These resources of considerable importance to Cape Verde seem to be declining to low levels. Seasonality and survey methodology can however not explain the decline between the two surveys and a general decrease in fish biomass has probably occurred over the period. It will be important that the resources are monitored regularly and it is recommended another survey to verify the results from the present survey with the R.V. Dr. Fridtjof Nansen.

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ANNEX I RECORDS OF FISHING STATIONS

R/V Dr. Fridtjof Nansen SURVEY:2011406
DATE :05/06/2011 GEAR TYPE: PT NO: 1
TIME :21:33:59 22:01:11 27.2 (min)
LOG : 9441.09 9442.82 1.7
FDEPTH: 50 50
BDEPTH: 1279 1137
Towing dir: 0° Wire out : 120 m
Sorted : 3 Total catch: 3.23

STATION: 1
POSITION:Lat N 14°49.33
Lon W 24°28.79
Purpose : 1
Region : 1500
Gear cond.: 0
Validity : 0
Speed : 3.8 kn
Catch/hour: 7.12

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Benthosema sp.	4.54	2673	63.76
Liocranchia reinhardtii	0.88	13	12.38
Small squids	0.42	419	5.88
Cubiceps sp.	0.37	26	5.26
Leptocephalus	0.26	62	3.71
Illex sp.	0.22	15	3.10
Unidentified fish	0.11	251	1.52
Nealotus tripes	0.09	7	1.24
MYCTOPHIDAE	0.07	31	0.93
Taractes sp.	0.07	4	0.93
ONYCHOTEUTHIDAE	0.02	2	0.31
PARALEPIDIDAE	0.02	4	0.31
TETRAODONTIDAE, juvenile	0.01	18	0.15
BRAMIDAE, juvenile	0.01	13	0.15
STOMIDAE	0.01	11	0.11
Hippocampus sp.	0.00	2	0.06
GONOSTOMATIDAE	0.00	20	0.06
PARALEPIDIDAE, juvenile	0.00	4	0.03
Aburria sp.	0.00	2	0.03
Unidentified squid	0.00	2	0.03
Stomias boa boa	0.00	2	0.02
Pallinurus sp., juvenile	0.00	2	0.02
Lagocephalus sp., juvenile	0.00	2	0.02
Squillidae, juvenile	0.00	2	0.01
MONACANTHIDAE, juvenile	0.00	4	0.00
Fistularia sp., juvenile	0.00	2	0.00
Total	7.12	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406
DATE :06/06/2011 GEAR TYPE: PT NO: 1
TIME :05:21:12 05:51:32 30.3 (min)
LOG : 9503.24 9504.70 1.5
FDEPTH: 50 32
BDEPTH: 657 783
Towing dir: 0° Wire out : 90 m
Sorted : 2 Total catch: 1.76

STATION: 2
POSITION:Lat N 14°48.10
Lon W 24°20.92
Purpose : 1
Region : 1500
Gear cond.: 0
Validity : 0
Speed : 2.9 kn
Catch/hour: 3.47

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Hygophum proximum	1.25	953	35.88
Cubiceps pauciradiatus	0.95	63	27.33
Leptocephalus	0.31	162	9.05
Myctophum nitidulum	0.21	113	6.09
Illex sp.	0.15	40	4.27
Todarodes sp.	0.13	10	3.70
Todarodes sp., juvenile	0.10	67	2.90
ONYCHOTEUTHIDAE	0.07	26	1.88
Liocranchia reinhardtii	0.05	4	1.42
ONYCHOTEUTHIDAE	0.04	42	1.08
Symbolephorus evermanni	0.04	6	1.03
S H R I M P S	0.03	221	1.00
Gonostoma sp.	0.02	10	0.68
Stomias boa boa	0.02	4	0.68
Remora remora	0.02	2	0.63
Aburria sp.	0.02	10	0.51
SCORPAENIDAE	0.01	4	0.40
PARALEPIDIDAE	0.01	2	0.28
BREGMACEROTIDAE	0.01	2	0.28
STOMIDAE	0.01	24	0.23
Diaphus sp.	0.01	2	0.17
Nemichthys scolopaceus	0.01	4	0.17
BOTHIDAE	0.00	6	0.11
DIRETMIDAE	0.00	2	0.06
GRAMMICOLEPIDIDAE	0.00	4	0.06
BERYCIDAE	0.00	4	0.06
Total	3.47	99.97	

R/V Dr. Fridtjof Nansen SURVEY:2011406
DATE :07/06/2011 GEAR TYPE: PT NO: 1
TIME :20:44:41 21:16:15 31.6 (min)
LOG : 9621.50 9623.15 1.7
FDEPTH: 29 27
BDEPTH: 705 524
Towing dir: 0° Wire out : 70 m
Sorted : 6 Total catch: 6.12

STATION: 3
POSITION:Lat N 15°1.90
Lon W 23°46.09
Purpose : 1
Region : 1500
Gear cond.: 0
Validity : 0
Speed : 3.1 kn
Catch/hour: 11.63

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Hippocampus sp.	8.55	8550	73.49
J E L L Y F I S H	1.23	0	10.62
Onychoteuthidae ident 1	0.87	412	7.50
Small squids	0.76	0	6.53
Leptocephalus	0.06	34	0.49
Myctophum nitidulum	0.05	63	0.41
Illex sp.	0.02	2	0.18
Onychoteuthidae ident 2	0.02	23	0.18
Ancistrotethus sp.	0.02	17	0.15
Promethichthys prometheus	0.02	2	0.13
Nealotus tripes	0.01	2	0.11
Onychoteuthidae ident 3	0.01	13	0.08
Onychoteuthidae ident 4	0.00	2	0.03
Crustacea Decapoda	0.00	9	0.03
Nemichthys scolopaceus	0.00	2	0.02
Apogon sp., juvenile	0.00	2	0.02
Hippocampus sp.	0.00	2	0.02
Crustacea Amphipoda	0.00	2	0.02
Total	11.63	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406
DATE :08/06/2011 GEAR TYPE: PT NO: 1
TIME :01:23:56 01:53:44 29.8 (min)
LOG : 9653.44 9654.96 1.5
FDEPTH: 30 35
BDEPTH: 1052 948
Towing dir: 0° Wire out : 80 m
Sorted : 3 Total catch: 2.65

STATION: 4
POSITION:Lat N 15°18.27
Lon W 23°38.63
Purpose : 1
Region : 1500
Gear cond.: 0
Validity : 0
Speed : 3.1 kn
Catch/hour: 5.33

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Cryptoparasar couesii	1.61	2	30.22
Cubiceps pauciradiatus	1.09	56	20.39
PHOTICHTHYIDAE	0.94	0	17.72
Lampanyctus sp.	0.56	622	10.43
Hygophum sp.	0.39	401	7.25
GEMPYLIDAE	0.25	24	4.63
Gempylus serpens	0.12	2	2.23
Leptocephalus	0.07	20	1.33
Myctophum sp.	0.07	16	1.28
Brama sp.	0.05	2	0.88
Todarodes sp.	0.03	189	0.64
S H R I M P S	0.03	165	0.52
ACANTHURIDAE	0.02	56	0.38
Cubiceps baxteri	0.02	2	0.38
Liocranchia reinhardtii	0.02	10	0.34
Illex sp.	0.02	79	0.30
ONYCHOTEUTHIDAE	0.01	103	0.24
Stomias boa boa	0.01	4	0.23
ONYCHOTEUTHIDAE	0.01	93	0.15
Nemichthys curvirostris	0.01	2	0.11
SCOMBRIDAE, juvenile	0.01	8	0.11
GONOSTOMATIDAE	0.01	4	0.11
BREGMACEROTIDAE	0.00	4	0.08
Unidentified larvae	0.00	6	0.04
Total	5.33	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406
DATE :08/06/2011 GEAR TYPE: BT NO: 21
TIME :09:13:13 09:13:19 20.0 (min)
LOG : 9696.69 9696.70 1.0
FDEPTH: 878 878
BDEPTH: 878 878
Towing dir: 0° Wire out : 2000 m
Sorted : 449 Total catch: 448.88

STATION: 5
POSITION:Lat N 15°11.56
Lon W 23°27.04
Purpose : 3
Region : 1500
Gear cond.: 8
Validity : 4
Speed : 3.0 kn
Catch/hour: 1346.63

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Mesotaria lactea	960.00	1986	71.29
HISTIOEUTHIDAE	90.00	3	6.68
Synaphobranchus kaupii	58.98	387	4.38
Bathyrroconger vicinus	32.25	90	2.39
Nezumia spl	30.75	504	2.28
Benthogone oseae	30.00	60	2.23
Bathygadus melanobranchus	25.38	177	1.88
Centrophorus granulosus	22.65	6	1.68
Plesiopeneaeus edwardsianus	22.14	147	1.64
Gadomus arcuatus	7.35	48	0.55
Chaceon maritae	5.58	3	0.41
Actinaria sp3	5.31	117	0.39
Scleraetinia indet 1	4.86	216	0.36
Nezumia sp2	4.83	63	0.36
Pharosoma placenta	4.83	147	0.36
Nettastoma melanurum	4.59	24	0.34
Acanella arbuscula	4.53	678	0.34
Sphaerosoma grimaldii	3.54	39	0.26
Chaceon affinis	3.45	3	0.26
Coryphaenoides zaniophorus	2.79	27	0.21
GONOSTOMATIDAE	2.27	9	0.17
Halosaurus phusionarius	2.25	54	0.17
Plesiopeneaeus edwardsianus	2.19	39	0.16
Glyphus marsupialis	2.10	15	0.16
Rouleina attrita	1.53	21	0.11
Heterocarpus grimaldi	1.26	117	0.09
Actinanga sp.	1.05	3	0.08
Lamprogrammus niger	0.86	12	0.06
Stomias boa boa	0.84	18	0.06
Aristeus cf varidens	0.81	87	0.06
Scleraetinia indet 2	0.81	33	0.06
PASIPHAIDAE	0.63	21	0.05
Aphrocallistea beatrix	0.63	36	0.05
Dibranchus atlanticus	0.63	6	0.05
Talismania antillarum	0.57	21	0.04
Stereomastis sp.	0.45	33	0.03
Squillidae	0.38	3	0.03
Actinanga richardii	0.36	3	0.03
Notacanthus bonaparte	0.36	6	0.03
Stichopus sp.	0.36	3	0.03
Scleraetinia indet 3	0.33	24	0.02
Goniasteridae indet 1	0.26	27	0.02
Malacosteus niger	0.25	3	0.02
Platyberyx opalescens	0.21	3	0.02
Tedania sp.	0.21	132	0.02
Unidentified fish	0.21	0	0.02
Hydrozoa spp.	0.14	51	0.01
Chauliodus sloani	0.12	12	0.01
Gonostoma elongatum	0.12	6	0.01
Bathypterois viridensis	0.10	6	0.01
Acanthephyra pelagica	0.08	21	0.01
Malacosteus niger	0.07	3	0.01
Hymenopeneaeus chacei	0.07	15	0.00
Umiada sp.	0.06	57	0.00
Gnathophausia sp.	0.06	6	0.00
Aldrovandia sp.	0.05	6	0.00
Stereomastis spc1	0.04	12	0.00
Pasiphaea multidentata	0.04	3	0.00
Ophiotrix sp.	0.03	15	0.00
Plesionika sp.	0.03	12	0.00
Epizoanthus paguri phylus	0.03	129	0.00
Parapagurus pilosimanus	0.03	129	0.00
Argyropelecus gigas	0.03	3	0.00
Bathypterois sp	0.02	6	0.00
Systellapis debilis	0.02	12	0.00
Argyropelecus olfonsi	0.01	6	0.00
Argyropelecus affinis	0.01	6	0.00
Photostomias guernei	0.01	3	0.00
SERGESTIDAE	0.01	6	0.00
Zoantharia indet	0.01	3	0.00
Stomias affinis	0.01	3	0.00
Iridogorgia spc1	0.01	9	0.00
Sternopyx pseudobscura	0.00	3	0.00
Sternopyx diaphana	0.00	3	0.00
Total	1346.80	100.01	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 6
DATE :08/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 15°17.18
start stop duration Lon W 23°14.93
TIME :14:54:32 15:24:22 29.8 (min) Purpose : 3
LOG : 9741.95 9743.43 1.5 Region : 1500
FDEPTH: 31 35 Gear cond.: 0
BDEPTH: 31 35 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
Sorted : 493 Total catch: 493.20 Catch/hour: 991.69

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Strombus latus	225.80 1367	22.77	
Taeniura grabata	130.70 2	13.18	
Pseudupeneus prayensis	128.49 696	12.96	3
Lithognathus mormyrus	61.93 184	6.24	7
Diplodus fasciatus	52.68 177	5.31	4
Diodon hystrix	49.06 82	4.95	
Mustelus mustelus	48.06 22	4.85	
Sparisoma rubripinne	45.80 67	4.62	6
Balistes punctatus	45.24 72	4.56	
Lethrinus atlanticus	34.54 105	3.48	5
Mustelus mustelus	26.44 24	2.67	8
Chilomycterus reticulatus	25.34 16	2.55	
Stephanolepis hispidus	22.72 213	2.29	
Dactylopterus volitans	17.90 34	1.80	
Diplodus prayensis	16.89 66	1.70	
Balistes capricus	14.28 18	1.44	
Diodon sp.	11.94 38	1.20	
SCORPAENIDAE	7.96 38	0.80	
Rypticus saponaceus	4.32 70	0.44	
Bodianus speciosus	4.26 4	0.43	9
Pomadoury rogeri	3.46 2	0.35	10
Virididontes acromegalus	2.92 6	0.29	11
Starfish, juvenile	2.35 147	0.24	
Fistularia petimba	1.97 22	0.20	
Diodon sp.	1.53 4	0.15	0
Asteroides indetCV2	1.35 32	0.14	0
Sphoeroides marmoratus	1.25 16	0.13	
Xyrichtys novacula	0.97 18	0.10	
Fistularia tabacaria	0.64 2	0.06	
Asteroides indetCV1	0.36 22	0.04	
Demospongiae indetCV1	0.34 6	0.03	
Demospongiae indetCV2	0.11 2	0.01	0
Antennarius pardalis	0.05 2	0.01	
Synodus synodus	0.03 2	0.00	
Antipatharia indetCV1	0.02 6	0.00	
Total	991.69	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 7
DATE :09/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 15°14.31
start stop duration Lon W 23°21.67
TIME :01:22:54 01:39:17 16.4 (min) Purpose : 3
LOG : 9803.25 9804.00 0.8 Region : 1500
FDEPTH: 848 909 Gear cond.: 0
BDEPTH: 848 909 Validity : 0
Towing dir: 0° Wire out : 1650 m Speed : 2.8 kn
Sorted : 397 Total catch: 396.76 Catch/hour: 1453.33

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Hexanchus griseus	1282.05 4	88.21	12
Mesostoma lactea	110.07 349	7.57	
Bathylagus melanobranchus	8.50 51	0.58	
Plesiopomus edwardsianus	7.44 62	0.51	
Chaceon affinis	7.18 7	0.49	
Benthogone rosea	6.85 88	0.47	
Synaphobranchus kaupii	6.15 55	0.42	
Nezumia aequalis	5.60 132	0.39	
Bathyrhynchus vicinus	3.30 7	0.23	
Pharomoma placenta	2.89 114	0.20	
Gadomus arcuatus	2.37 4	0.16	
Acanthephyra sp.	1.54 84	0.11	
Acanella arbuscula	1.43 154	0.10	
Diretmoides parini	1.32 4	0.09	
Aristeus cf varidens	1.25 40	0.09	
MACROURIDAE	0.92 7	0.06	
Sphoerosoma grimaldii	0.88 26	0.06	
Talismania longifilis	0.57 4	0.04	
Pasiphaea cf tarde	0.37 15	0.03	
Chaunax pictus	0.37 4	0.03	
Heterocarpus grimaldi	0.29 18	0.02	
Scleareaetia indet 1	0.29 11	0.02	
Stomias boa boa	0.27 4	0.02	
Actiniaria sp 3	0.26 7	0.02	
Diretmoides pauciradiatus	0.22 11	0.02	
Scleareaetia indet 3	0.21 7	0.01	
Halosaurus phusoniarius	0.15 11	0.01	
Scleareaetia indet 4	0.12 4	0.01	
Systellapis debilis	0.07 48	0.00	
SERGESTIDAE	0.06 7	0.00	
Argyropelecus aculeatus	0.05 11	0.00	
Acanthephyra pelagica	0.04 7	0.00	
Gonostoma elongatum	0.03 4	0.00	
Photostomias guernei	0.03 7	0.00	
Electrona risso	0.03 4	0.00	
Lampanyctus sp.	0.03 11	0.00	
Antigonia capros	0.02 4	0.00	
PASIPHAIDAE	0.02 4	0.00	
Prosobranchide spp.	0.02 7	0.00	
Serrivomer sp.	0.02 4	0.00	
MYCTOPHIDAE	0.01 15	0.00	
Diaphus sp.	0.01 7	0.00	
Acanthephyra sp.	0.01 4	0.00	0
Melanonus zugmayeri	0.01 4	0.00	
Munida sp.	0.01 7	0.00	
Argyropelecus affinis	0.01 4	0.00	
Gnathopausia sp.	0.00 4	0.00	
Total	1453.33	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 8
DATE :09/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 15°26.24
start stop duration Lon W 23°8.02
TIME :14:12:24 14:27:44 15.3 (min) Purpose : 3
LOG : 9906.09 9906.86 0.8 Region : 1500
FDEPTH: 81 82 Gear cond.: 0
BDEPTH: 81 82 Validity : 0
Towing dir: 0° Wire out : 210 m Speed : 3.0 kn
Sorted : 7 Total catch: 6.67 Catch/hour: 26.10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Lagocephalus laevigatus	12.83 129	49.16	
Fistularia petimba	3.90 70	14.93	
Zeus faber	3.52 4	13.47	
Uranoscopus cadonati	1.85 4	7.10	
Raja herwigii	0.93 4	3.57	
Dactylopterus volitans	0.92 4	3.54	
Xyrichtys novacula	0.69 12	2.65	
Chelidonichthys sp.	0.68 8	2.62	
Synodus saurus	0.33 4	1.27	
Trachinus pellegrini	0.18 8	0.67	
Calappidae indetCV4	0.10 4	0.39	
Scleareaetia indet 4	0.10 4	0.39	
Demospongiae indetCV3	0.06 4	0.22	
Total	26.10	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 9
DATE :10/06/2011 GEAR TYPE: PT NO: 1 POSITION:Lat N 15°43.47
start stop duration Lon W 23°15.84
TIME :00:38:16 01:09:14 31.0 (min) Purpose : 1
LOG : 9968.36 9969.94 1.6 Region : 1500
FDEPTH: 72 66 Gear cond.: 0
BDEPTH: 157 429 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 3 Total catch: 2.95 Catch/hour: 5.72

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Cubiceps pauciradiatus	1.74 10	30.47	
MYCTOPHIDAE	1.41 0	24.71	
Abralia sp.	1.07 1016	18.75	
PARALEPIDIDAE	0.54 151	9.38	
Leptocephalus	0.24 66	4.23	
Todarodes sagittatus	0.22 8	3.79	
J E L Y F I S H	0.17 31	3.01	
Illex sp.	0.09 4	1.62	
Liocarcharia reinhardtii	0.04 27	0.78	
ATHERINIDAE	0.04 6	0.74	
Nealotus tripes	0.03 4	0.61	
Promethichthys prometheus	0.03 2	0.44	
Synagrops sp.	0.02 4	0.41	
Unid. juvenile fishes	0.02 17	0.37	
Shrimps, small, non comm.	0.02 85	0.27	
PHOTICHTHYIDAE	0.01 16	0.10	
BOTHIDAE, juvenile	0.00 10	0.07	
Unid. juvenile fishes	0.00 4	0.07	0
TETRAODONTIDAE, juvenile	0.00 2	0.03	
Decapeterus macarellus, juvenile	0.00 2	0.03	
Priacanthus sp.	0.00 2	0.03	
APOGONIDAE, juvenile	0.00 2	0.03	
, juvenile	0.00 4	0.03	
Total	5.72	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 10
DATE :10/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°45.55
start stop duration Lon W 23°4.83
TIME :11:02:02 11:32:06 30.1 (min) Purpose : 3
LOG : 15.36 16.85 1.5 Region : 1500
FDEPTH: 73 61 Gear cond.: 0
BDEPTH: 73 61 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.0 kn
Sorted : 32 Total catch: 32.45 Catch/hour: 64.78

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Dactylopterus volitans	24.69 80	38.12	15
Syacium micrurus	6.45 64	9.95	13
Mustelus mustelus	6.41 2	9.89	
Sphoeroides marmoratus	4.55 40	7.03	
Stephanolepis hispidus	3.21 28	4.96	
Scorpaena notata	3.13 32	4.84	16
MONACANTHIDAE	2.51 4	3.88	
Synodus saurus	2.40 30	3.70	
Fistularia petimba	2.20 72	3.39	
Diodon hystrix	1.88 18	2.90	
Rypticus saponaceus	1.78 48	2.74	
Raja herwigii	1.56 4	2.40	
TRACHINIDAE	1.20 20	1.85	
Chelidonichthys sp2	0.92 8	1.42	
TETRAODONTIDAE	0.82 4	1.26	
Bothus podas africanus	0.36 4	0.55	14
Xyrichtys novacula	0.30 6	0.46	
Chelidonichthys sp1	0.24 2	0.37	
Antennarius sp.	0.10 2	0.15	
Arnoglossus imperialis	0.08 6	0.12	
Hippocampus sp.	0.01 2	0.01	
Serranus sanctaehelenae	0.00 2	0.00	
Total	64.78	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 11
DATE :10/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°44.41
start stop duration Lon W 23°11.87
TIME :12:45:58 13:13:55 28.0 (min) Purpose : 3
LOG : 23.25 24.61 1.4 Region : 1500
FDEPTH: 82 81 Gear cond.: 0
BDEPTH: 82 81 Validity : 0
Towing dir: 0° Wire out : 210 m Speed : 2.9 kn
Sorted : 23 Total catch: 22.64 Catch/hour: 48.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sphoeroides pachgaster	11.44	84	23.54	
TRIGLIDAE	5.97	49	12.28	
Dactylopterus volitans	5.88	17	12.10	
Syacium micrurum	5.58	58	11.48	
Synodus saurus	4.47	54	9.19	
Aluterus sp.	3.46	4	7.11	
Raja herwigi	3.46	9	7.11	
Zeus faber	2.19	2	4.51	
Scorpaena scrofa	1.85	15	3.80	
Trachinus draco	1.09	17	2.25	
Fistularia petimba	0.84	2	1.72	
Uranoscopus sp.	0.71	4	1.46	
Xyrichtys novacula	0.47	17	0.97	
Rypticus saponaceus	0.36	11	0.75	
Suberites sp CV1	0.31	2	0.64	
Chaeronia sp.	0.12	2	0.25	0
Calappidae spCV1	0.10	2	0.21	
Asteroidea indetCV2	0.08	2	0.17	
Lythoosopia miriophylum	0.06	6	0.13	
Philine sp.	0.05	26	0.10	
PARAPAGURIDAE	0.03	9	0.07	
Xenophera sp	0.02	13	0.05	
Muricidae indetCV2	0.02	2	0.03	
Paracentrotus sp.	0.02	2	0.03	
Aphroditea indetCV1	0.01	2	0.02	
Actiniaria indetCV1	0.01	2	0.02	
Total	48.60		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 12
DATE :10/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°39.98
start stop duration Lon W 23°11.99
TIME :14:11:38 14:42:12 30.6 (min) Purpose : 3
LOG : 29.21 30.69 1.5 Region : 1500
FDEPTH: 77 79 Gear cond.: 0
BDEPTH: 77 79 Validity : 0
Towing dir: 10° Wire out : 210 m Speed : 2.9 kn
Sorted : 320 Total catch: 320.48 Catch/hour: 629.22

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Taeniura grabata	471.20	8	74.89	
Fistularia petimba	59.00	172	9.38	
Seriola fasciata	29.94	24	4.76	17
Mustelus mustelus, male	29.06	10	4.62	
Sphoeroides pachgaster	15.22	79	2.42	
Dactylopterus volitans	9.05	26	1.44	
Scorpaena scrofa	4.14	35	0.66	
Geodidae indetCV2	3.81	18	0.61	
Stephanolepis sp.	2.45	2	0.39	
Mustelus mustelus, female	2.16	4	0.34	
Rypticus saponaceus	0.96	20	0.15	
Demosponge indetCV15	0.74	14	0.12	
Lepidotrigla sp.	0.31	6	0.05	
Sphoeroides marmoratus	0.27	2	0.04	
PARAPAGURIDAE	0.22	6	0.04	
Serranus sp.	0.16	14	0.02	
Muraena sp.	0.16	2	0.02	
Octopus burryi	0.08	2	0.01	
Hippocampus sp.	0.08	2	0.01	
Antigonia capros	0.08	2	0.01	
Asteroidea indetCV5	0.06	2	0.01	
Muricidae indetCV1	0.04	2	0.01	
Cipreidae indetCV1	0.02	2	0.00	
Total	629.22		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 13
DATE :10/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°38.08
start stop duration Lon W 23°6.59
TIME :17:04:14 17:29:40 25.4 (min) Purpose : 3
LOG : 47.17 48.49 1.3 Region : 1500
FDEPTH: 162 185 Gear cond.: 0
BDEPTH: 162 185 Validity : 0
Towing dir: 0° Wire out : 385 m Speed : 3.1 kn
Sorted : 144 Total catch: 144.10 Catch/hour: 340.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Antigonia capros	262.37	3414	77.17	
Sphoeroides marmoratus	57.45	344	16.90	
Fistularia petimba	7.05	19	2.07	
Synchiropus phaeton	1.92	9	0.56	
Heptranchias perlo	1.77	2	0.52	
Mustelus mustelus	1.72	7	0.51	
Zeus faber	1.53	2	0.45	
Syacium micrurum	1.40	116	0.41	
Raja herwigi	1.03	2	0.30	
Uranoscopus sp.	0.71	2	0.21	
Dentex macrophthalmus	0.69	24	0.20	
Synodus synodus	0.68	83	0.20	
Trachinus draco	0.31	2	0.09	
Illex sp.	0.26	7	0.08	
PARAPAGURIDAE	0.15	17	0.04	
Bryozoa spp	0.14	12	0.04	
Macrorhaphosus scolopax	0.13	5	0.04	
Antigonia capros, juvenile	0.13	26	0.04	
Demospongiae indetCV3	0.12	47	0.03	
Demosponge indetCV15	0.10	24	0.03	
Caryophyllidae indetCV1	0.06	35	0.02	
Hydrozoa spp.	0.05	7	0.01	
Pectinidae indetCV1	0.04	12	0.01	
Synodus sp.	0.04	17	0.01	
Pectinidae indetCV1	0.04	5	0.01	
Lythoosopia miriophylum	0.04	7	0.01	
Fussinus sp.	0.03	5	0.01	
Caryophyllidae indetCV2	0.02	35	0.01	
Caryophyllidae indetCV3	0.02	2	0.01	
G A S T R O P O D S	0.01	2	0.00	
Total	340.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 14
DATE :10/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°43.23
start stop duration Lon W 22°58.31
TIME :19:43:26 20:14:34 31.1 (min) Purpose : 3

LOG : 63.62 65.19 1.6 Region : 1500
FDEPTH: 208 193 Gear cond.: 0
BDEPTH: 208 193 Validity : 0
Towing dir: 0° Wire out : 450 m Speed : 3.0 kn
Sorted : 111 Total catch: 1294.95 Catch/hour: 2495.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophthalmus	1461.46	22353	58.57	18
Glossanodon leioglossus	429.29	22364	17.21	
Ariomma melanum	348.75	10443	13.98	
Illex sp.	139.31	3370	5.58	
Aulopus cadenati	18.94	264	0.76	
Antigonia capros	17.38	2397	0.70	
Zenopsis conchifer	14.51	13	0.58	20
Synchiropus phaeton	7.63	368	0.31	
Sphoeroides pachgaster	6.84	53	0.27	
Aulopus filamentosus	6.59	79	0.26	
Pagellus acarne	6.05	53	0.24	
Lophius sp.	5.43	2	0.22	
Peristedion cataphractum	4.74	158	0.19	
Zeus faber	4.16	4	0.17	19
Coelorinchus coelorhincus	3.95	131	0.16	
Mustelus mustelus	3.91	2	0.16	
Heptranchias perlo	2.85	6	0.11	
Malacocephalus occidentalis	2.54	26	0.10	
Raja herwigi	1.87	6	0.07	
Arnoglossus imperialis	1.85	185	0.07	
TRACHINIDAE	1.85	526	0.07	
Dicologlossa hexophthalma	1.85	53	0.07	
SCORPAENIDAE	1.31	53	0.05	
Fistularia petimba	0.69	2	0.03	
Stichopus sp.	0.42	2	0.02	
Calappa cf granulata	0.29	6	0.01	
Synodus saurus	0.27	53	0.01	
Echelus myrus	0.23	2	0.01	
Chaeronia sp.	0.04	2	0.00	
Tedania sp.	0.01	2	0.00	
Antipatharia indetCV1	0.00	2	0.00	
Antipatharia indetCV3	0.00	2	0.00	
Astropectinidae undetCV1	0.00	2	0.00	
Total	2495.02		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 15
DATE :11/06/2011 GEAR TYPE: PT NO: 1 POSITION:Lat N 15°53.75
start stop duration Lon W 23°10.89
TIME :00:35:37 01:06:11 30.6 (min) Purpose : 1
LOG : 91.56 93.34 1.8 Region : 1500
FDEPTH: 52 53 Gear cond.: 0
BDEPTH: 379 205 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.5 kn
Sorted : 2 Total catch: 2.07 Catch/hour: 4.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lagocephalus sp., juvenile	1.51	422	37.20	
Nealotus tripes	1.22	53	29.95	
MYCTOPHIDAE	0.86	1015	21.26	
Cubiceps sp.	0.18	10	4.35	
C E P H A L O P O D A	0.16	16	3.86	
Onychoteuthidae ident 3	0.06	31	1.45	
Illex sp.	0.04	2	0.97	
Onychoteuthidae ident 2	0.01	10	0.34	
Unidentified squid	0.01	6	0.19	
PARALEPIDIDAE, juvenile	0.01	4	0.19	
Copepods	0.00	12	0.05	
Decapterus macarellus, juvenile	0.00	2	0.05	
Acanthurus monroviae, juvenile	0.00	2	0.05	
Shrimps, small, non comm.	0.00	14	0.05	
Unidentified fish, juvenile	0.00	2	0.05	
APOGONIDAE, juvenile	0.00	4	0.00	
Lampanyctus sp.	0.00	2	0.00	
PARALEPIDIDAE	0.00	2	0.00	
Total	4.06		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 16
DATE :11/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°1.70
start stop duration Lon W 23°2.04
TIME :09:26:03 09:55:52 29.8 (min) Purpose : 3
LOG : 149.80 151.24 1.5 Region : 1500
FDEPTH: 79 99 Gear cond.: 0
BDEPTH: 79 99 Validity : 0
Towing dir: 0° Wire out : 210 m Speed : 2.9 kn
Sorted : 112 Total catch: 112.00 Catch/hour: 225.35

TIME :14:00:55 14:32:29 31.6 (min) Purpose : 3
LOG : 176.63 178.23 1.6 Region : 1500
FDEPTH: 80 77 Gear cond.: 0
BDEPTH: 80 77 Validity : 0
Towing dir: 0° Wire out : 200 m Speed : 3.0 kn
Sorted : 291 Total catch: 291.00 Catch/hour: 553.05

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pseudupeneus prayensis	47.79	313	21.21	28
Sargocentron hastatus	39.84	206	17.68	24
Epinephelus costae	23.94	6	10.63	22
Priacanthus arenatus	22.54	50	10.00	25
Mustelus mustelus	10.87	6	4.82	
Holothuria spp.	7.20	4	3.20	
Dentex macrophthalmus	7.00	1260	3.11	
Dactylopterus volitans	6.40	28	2.84	
Fistularia petimba	6.20	14	2.75	
Bodianus speciosus	5.43	2	2.41	23
Cephalopholis taeniops	5.03	6	2.23	21
Antipatharia indetCV1	4.41	443	1.96	
Sphoeroides pachgaster	4.31	38	1.91	
Diodon sp.	4.19	2	1.86	0
Taeniura grabata	4.06	2	1.82	
Scorpaena notata	3.16	42	1.40	27
Chelidonichthys lastoviza	2.82	30	1.25	
Rypticus saponaceus	2.66	54	1.18	
Scorpaena scrofa	2.31	2	1.03	26
Demospongiae indetCV16	2.25	52	1.00	
Chaetodon sp.	2.13	18	0.95	
Asteroidea indetCV2	1.55	66	0.69	
Syacium micrurum	1.53	16	0.68	
Arnoglossus imperialis	1.13	111	0.50	
Demospongiae indetCV17	1.00	14	0.44	
Serranus scriba	0.95	4	0.42	
Hexactinellida indetCV1	0.90	8	0.40	
Bothus podas africanus	0.48	6	0.21	
Diodon sp.	0.48	2	0.21	
Trachinus draco	0.30	4	0.13	
Leptogorgia spCV1	0.24	2	0.11	
Xenophera sp	0.23	62	0.10	
Antipatharia indetCV2	0.18	40	0.08	
Suberites sp CV1	0.18	2	0.08	
Geodiidae indetCV3	0.17	8	0.08	
Fistularia petimba	0.16	14	0.07	
Synodus sp.	0.14	28	0.06	
Geodiidae indetCV4	0.14	0	0.06	
Pectinidae indetCV1	0.13	16	0.06	
Geodiidae indetCV1	0.12	8	0.05	
Demospongiae indetCV18	0.10	2	0.05	
Demospongiae indetCV4	0.10	6	0.05	
Demospongiae spp.	0.09	10	0.04	
Hydrozoa spp.	0.07	58	0.03	
Heteroriacanthus cruentatus	0.06	2	0.03	
Demospongiae indetCV2	0.05	2	0.02	
Inachidae indetCV1	0.04	4	0.02	
Brachyura spp.	0.04	46	0.02	
Demospongiae indetCV19	0.03	10	0.02	
Alcyonacae indetCV1	0.03	56	0.02	
Astropectinidae undetCV1	0.03	2	0.01	
Goniasteridae indetCV2	0.03	2	0.01	
Chaeronia sp.	0.03	2	0.01	
Calappidae indetCV1	0.03	2	0.01	
Cidaroidae indetCV1	0.02	4	0.01	
Paracentrotus sp.	0.02	2	0.01	
CONIDAE	0.01	2	0.01	
PAGUROIDEA	0.01	2	0.01	
Brachyura indetCV1	0.01	2	0.00	
Ophiuroidea indetCV1	0.00	2	0.00	
Ophiuroidea indetCV2	0.00	2	0.00	
P O L Y C H A E T A	0.00	8	0.00	
Total		225.35	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 17
DATE :11/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°54.44
start stop duration Lon W 23°8.57
TIME :11:49:50 12:12:33 22.7 (min) Purpose : 3
LOG : 164.39 165.51 1.1 Region : 1500
FDEPTH: 261 235 Gear cond.: 0
BDEPTH: 261 235 Validity : 0
Towing dir: 0° Wire out : 580 m Speed : 3.0 kn
Sorted : 115 Total catch: 114.54 Catch/hour: 302.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophthalmus	105.68	1328	34.92	31
Antigonia capros	49.27	291	16.28	
Zenopsis conchifer	30.25	29	10.00	
Pontinus sp.	28.67	248	9.47	
Holoturia spCV1	17.73	111	5.86	
Peristedion cataphractum	16.78	690	5.54	
Pagellus acarne	13.05	74	4.31	29
Echinus spCV1	7.40	11	2.44	
Paramola cuvieri	6.61	13	2.18	
Illex sp.	6.18	87	2.04	
Demospongiae indetCV20	5.63	18	1.86	
Heptranchias perlo	4.10	5	1.35	
Syacium micrurum	1.85	124	0.61	30
Sphoeroides pachgaster	1.66	8	0.55	
Chlorophthalmus sp.	1.56	50	0.52	
Trachurus trachurus	1.08	3	0.36	
Fistularia petimba	1.08	3	0.36	
Synchiropus phaeton	0.92	34	0.31	
Asteroidea indetCV2	0.72	45	0.24	
Antipatharia indetCV1	0.66	211	0.22	
Aulopus filamentosus	0.50	11	0.17	
Pseudupeneus prayensis	0.37	3	0.12	
Bembrops heterurus	0.13	3	0.04	
Antipatharia indetCV3	0.13	3	0.04	
Cyttopsis roseus	0.11	3	0.03	
Lythocspia miriophyllum	0.10	16	0.03	
Antipatharia indetCV2	0.08	5	0.03	
Demospongiae indetCV22	0.08	3	0.03	
Holoturia spCV2	0.05	3	0.02	
Macrorhamphosus scolopax	0.05	3	0.02	
Inachidae indetCV1	0.04	5	0.01	
Gorgorion indetCV1	0.03	3	0.01	
Demospongiae indetCV21	0.03	3	0.01	
CONGRIDAE	0.03	3	0.01	
Demospongiae indetCV19	0.01	3	0.00	
Total		302.61	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 18
DATE :11/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°49.12
start stop duration Lon W 23°0.71

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Antigonia capros	274.72	2659	49.67	
Taeniura grabata	95.03	2	17.18	
Fistularia petimba	94.08	293	17.01	
Dactylopterus volitans	24.33	97	4.40	
Sphoeroides pachgaster	23.26	184	4.21	
Lepidotrigla cadmani	10.64	124	1.92	
Rhizoprionodon acutus	5.89	4	1.07	
Mustelus mustelus	4.75	2	0.86	
SCORPAENIDAE	4.18	30	0.76	
Zenopsis conchifer	2.05	2	0.37	
Peristedion cataphractum	1.60	59	0.29	
Clypeaster spCV1	1.58	4	0.29	
Asteroidea indetCV2	1.50	59	0.27	
Syacium micrurum	1.35	13	0.24	
Zeus faber	1.24	2	0.22	
Asteroidea indetCV4	1.24	17	0.22	
Aluterus sp.	1.08	2	0.20	
Sepia officinalis	0.91	4	0.16	
Octopus sp.	0.76	6	0.14	
Geodiidae indetCV4	0.65	8	0.12	
Synodus saurus	0.63	10	0.11	
Demospongiae indetCV23	0.34	17	0.06	
Sphoeroides marmoratus	0.26	4	0.05	
Octopus burryi	0.17	8	0.03	
Demospongiae indetCV4	0.14	8	0.03	
Bembrops heterurus	0.13	4	0.02	
PAGUROIDEA	0.13	15	0.02	
Serranus sp.	0.11	13	0.02	
Parapercia atlantica	0.08	6	0.01	
Antennarius pardalis	0.05	2	0.01	
Cipreidae indentCV2	0.03	6	0.01	
Cymbium spCV1	0.02	4	0.00	
Munida sp.	0.02	2	0.00	
Lythocspia miriophyllum	0.02	4	0.00	
Demospongiae indetCV24	0.02	2	0.00	
Cidaroidae indetCV1	0.01	2	0.00	
Pectinidae indetCV1	0.01	2	0.00	
Ophiuroidea indetCV3	0.01	2	0.00	
Aphroditeae indetCV1	0.00	2	0.00	
Hydrozoa spp.	0.00	2	0.00	
Total		553.04	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 19
DATE :11/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°55.52
start stop duration Lon W 23°0.70
TIME :16:14:43 16:29:04 14.4 (min) Purpose : 3
LOG : 185.41 186.18 0.8 Region : 1500
FDEPTH: 71 70 Gear cond.: 0
BDEPTH: 71 70 Validity : 0
Towing dir: 0° Wire out : 185 m Speed : 3.2 kn
Sorted : 5 Total catch: 4.51 Catch/hour: 18.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dactylopterus volitans	5.44	17	28.84	
Geodiidae indetCV2	4.22	79	22.40	
Raja herwigi	2.22	4	11.76	
Scorpaena scrofa	1.80	13	9.54	
Fistularia petimba	1.34	8	7.10	
Sargocentron hastatus	0.75	4	3.99	
Diodon hystrix	0.71	4	3.77	
Pseudupeneus prayensis	0.67	4	3.55	
Chaetodon hoeferli	0.46	4	2.44	
Muricidae indetCV1	0.35	8	1.86	
Paraconger notialis	0.29	4	1.55	
Trachinus draco	0.21	4	1.11	
Rypticus saponaceus	0.17	4	0.89	
Opistobranchia indetCV1	0.12	4	0.64	
Demospongiae indetCV2	0.08	4	0.44	
Antipatharia indetCV1	0.02	13	0.11	
Garbage	0.00	4	0.00	
Total		18.85	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 20
DATE :12/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°0.33
start stop duration Lon W 22°57.55
TIME :19:18:42 19:49:10 30.5 (min) Purpose : 3
LOG : 201.60 203.20 1.6 Region : 1500
FDEPTH: 44 59 Gear cond.: 0
BDEPTH: 44 59 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.2 kn
Sorted : 103 Total catch: 102.99 Catch/hour: 202.80

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dactylopterus volitans	55.33	187	27.28	39
Lithognathus mormyrus	32.25	79	15.90	33
Albula vulpes	20.91	37	10.31	34
Mustelus mustelus	19.69	30	9.71	
Caranx crysos	15.02	45	7.41	36
Galeoides decadactylus	11.50	39	5.67	38
Rhizoprionodon acutus	10.53	6	5.19	
Pseudupeneus prayensis	10.36	75	5.11	37
Syacium micrurum	10.06	116	4.96	40
Pomadasys rogeri	5.87	8	2.89	32
Auxis thazard	3.25	6	1.60	35
Demospongiae indetCV25	1.60	30	0.79	
Aluterus heudelotii	1.22	2	0.60	
Stephanolepis hispidus	1.04	10	0.51	
Fistularia petimba	1.02	26	0.50	
Rypticus saponaceus	0.61	10	0.30	
Aluterus monoceros	0.43	2	0.21	
Synodus synodus	0.33	4	0.17	
Demospongiae indetCV26	0.29	6	0.14	
Priacanthus arenatus	0.24	2	0.12	
Pegusa lascaris	0.24	2	0.12	
Demospongiae indetCV27	0.19	2	0.09	
Xyrichtys novacula	0.18	2	0.09	
Trachinus draco	0.18	2	0.09	
Antipatharia indetCV1	0.14	10	0.07	
Demospongiae indetCV23	0.09	2	0.05	
Astropectinidae undetCV1	0.08	2	0.04	
Demospongiae indetCV28	0.07	2	0.04	
Asteroidea indetCV2	0.03	2	0.01	
Lythoosopia miriophyllum	0.02	6	0.01	
Astropectinidae indetCV2	0.01	2	0.00	
Chlamys spCV1	0.01	2	0.00	
Garbage	0.00	2	0.00	
Total	202.80		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 21
DATE :12/06/2011 GEAR TYPE: PT NO: 1 POSITION:Lat N 16°8.82
start stop duration Lon W 22°35.38
TIME :05:48:32 06:18:38 30.1 (min) Purpose : 1
LOG : 276.35 277.97 1.6 Region : 1500
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 634 448 Validity : 0
Towing dir: 0° Wire out : 80 m Speed : 3.2 kn
Sorted : 2 Total catch: 2.49 Catch/hour: 4.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	1.59	42	32.17	
MYCTOPHIDAE	1.53	1198	30.96	
Nealotus tripes	1.30	36	26.14	
Cubiceps sp.	0.40	10	8.04	
Illex sp.	0.10	2	2.01	
Onychoteuthidae ident 3	0.02	10	0.40	
Unidentified fish	0.01	20	0.16	
Isopod	0.00	6	0.08	
Decapterus macarellus, juvenile	0.00	2	0.04	
Total	4.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 22
DATE :12/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°4.94
start stop duration Lon W 22°37.43
TIME :12:09:09 12:34:31 25.4 (min) Purpose : 3
LOG : 312.48 313.91 1.4 Region : 1500
FDEPTH: 31 47 Gear cond.: 0
BDEPTH: 31 47 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
Sorted : 200 Total catch: 199.90 Catch/hour: 472.75

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pseudupeneus prayensis	146.98	1120	31.09	41
Strombus latus	55.46	393	11.73	
Balistes capricus	50.37	45	10.66	
Dactylopterus volitans	39.14	194	8.28	43
Balistes punctatus	37.96	64	8.03	
Lethrinus atlanticus	34.41	92	7.28	42
Diodon hystrix, juvenile	32.64	166	6.90	
Stephanolepis hispidus	25.19	263	5.33	
Aluterus monoceros	8.82	5	1.87	
Chilomycterus spinosus mauret.	7.05	31	1.66	
Diodon hystrix	6.08	5	1.29	
Sphoeroides marmoratus	5.63	64	1.19	
Fistularia tabacaria	3.24	7	0.69	
Fistularia petimba	3.07	38	0.65	
Xyrichtys novacula	2.72	45	0.58	
Sparisoma rubripinne	2.41	5	0.51	
Trachinotus goreensis	1.75	2	0.37	
Ophichthus ophis	1.44	2	0.31	
Syacium micrurum	1.23	9	0.26	
Strombus spCV1	1.22	2	0.26	
Rypticus saponaceus	0.99	17	0.21	
Synodus saurus	0.95	12	0.20	
Scorpaena notata	0.83	17	0.18	
Asteroidea indetCV3	0.74	43	0.16	
Bothus podas africanus	0.47	5	0.10	
Muricidae indetCV1	0.38	9	0.08	
Synodus synodus	0.21	7	0.05	
Trachinus draco	0.19	5	0.04	
Asteroidea indetCV2	0.13	5	0.03	
Calappa cf granulata	0.09	5	0.02	
Venerupis spCV1	0.09	5	0.02	
Asteroidea indetCV6	0.03	2	0.01	
Ophiotrix sp.	0.01	2	0.00	
Garbage	0.00	5	0.00	
Total	472.75		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 23
DATE :12/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°57.64
start stop duration Lon W 22°45.94
TIME :15:09:40 15:31:34 21.9 (min) Purpose : 3
LOG : 330.20 331.29 1.1 Region : 1500
FDEPTH: 43 43 Gear cond.: 0
BDEPTH: 43 43 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 419 Total catch: 837.12 Catch/hour: 2293.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Galeoides decadactylus	1384.66	6685	60.37	50
Dactylopterus volitans	231.51	1279	10.09	49
Selar crumenophthalmus	206.85	1146	9.02	48
Rhizoprionodon acutus	187.67	33	4.69	
Diodon hystrix	73.70	866	3.21	
Pseudupeneus prayensis	57.64	296	2.51	45
Lethrinus atlanticus	49.76	99	2.17	44
Balistes punctatus	35.73	22	1.56	
Stephanolepis hispidus	22.47	247	0.98	
Asteroidea indetCV2	19.84	323	0.86	
Pomadasys rogeri	17.42	33	0.76	46
Balistes capricus	13.81	11	0.60	
Scorpaena notata	12.93	225	0.56	
Mustelus mustelus	10.96	5	0.48	
Rypticus saponaceus	9.75	186	0.43	
Demospongiae indetCV25	9.70	230	0.42	
Strombus latus	8.82	110	0.38	
Caranx crysos	5.59	11	0.24	
Chilomycterus spinosus mauret.	3.29	16	0.14	
Sphoeroides marmoratus	2.14	16	0.09	
Fistularia petimba	1.70	22	0.07	
Aluterus schoepfi	1.53	5	0.07	
Demospongiae indetCV30	1.44	5	0.06	
Demospongiae indetCV26	1.30	33	0.06	
Antennarius striatus	0.75	11	0.03	
Demospongiae indetCV29	0.67	5	0.03	
Demospongiae indetCV27	0.63	27	0.03	
Muricidae indetCV1	0.40	5	0.02	
Echinasteridae indetCV1	0.22	5	0.01	
Asteroidea indetCV1	0.20	38	0.01	
Antennarius pardalis	0.11	5	0.00	
Demospongiae indetCV31	0.09	5	0.00	
Asteroidea indetCV3	0.08	5	0.00	
Calappidae indetCV3	0.07	5	0.00	
Fussinus sp.	0.05	5	0.00	
Total	2293.47		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 24
DATE :12/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 15°56.57
start stop duration Lon W 22°46.54
TIME :16:46:31 17:01:31 15.0 (min) Purpose : 3
LOG : 333.47 334.14 0.7 Region : 1500
FDEPTH: 59 60 Gear cond.: 0
BDEPTH: 59 60 Validity : 0
Towing dir: 0° Wire out : 195 m Speed : 2.7 kn
Sorted : 55 Total catch: 54.82 Catch/hour: 219.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dactylopterus volitans	83.80	352	38.22	
Balistes capricus	68.40	44	31.19	
Rhizoprionodon acutus	23.60	4	10.76	
Diodon hystrix	14.60	56	6.66	
Stephanolepis hispidus	5.76	60	2.63	
Rypticus saponaceus	5.76	116	2.63	
Syacium micrurum	3.84	44	1.75	51
Fistularia petimba	2.24	36	1.02	
Chilomycterus spinosus mauret.	1.80	8	0.82	
Aluterus schoepfi	1.48	4	0.67	
Asteroidea indetCV2	1.42	48	0.65	
Sphoeroides marmoratus	1.12	12	0.51	
Sepia officinalis	1.00	4	0.46	
Strombus latus	0.84	12	0.38	
Alcyracea indetCV1	0.72	16	0.33	
Demospongiae indetCV27	0.48	36	0.22	
Priacanthus arenatus	0.44	4	0.20	
Scorpaena notata	0.28	8	0.13	
Bryzoa indetCV2	0.22	24	0.10	
Bryzoa indetCV1	0.18	24	0.08	
Xenophera sp	0.18	24	0.08	
Demospongiae indetCV18	0.18	48	0.08	
Asteroidea indetCV6	0.16	8	0.07	
Asciitaceae indetCV1	0.16	4	0.07	
Asteroidea indetCV7	0.12	4	0.06	
Asteroidea indetCV1	0.09	4	0.04	
Antennarius striatus	0.09	4	0.04	
Pectinidae indetCV1	0.08	4	0.03	
Muricidae indetCV1	0.06	8	0.03	
Asteroidea indetCV3	0.04	4	0.02	
Cidaroidae indetCV1	0.04	4	0.02	
Bryozoa spp.	0.04	160	0.02	
Antipatharia indetCV1	0.02	16	0.01	
Astipectinidae undetCV1	0.02	4	0.01	
Hydrozoa spp.	0.01	12	0.00	
Nemertira indetCV1	0.01	4	0.00	
Total	219.28		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 25
DATE :13/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°11.43
start stop duration Lon W 23°3.46
TIME :16:48:59 17:04:27 15.5 (min) Purpose : 3
LOG : 394.53 395.31 0.8 Region : 1500
FDEPTH: 98 92 Gear cond.: 0
BDEPTH: 98 92 Validity : 0
Towing dir: 0° Wire out : 230 m Speed : 3.0 kn
Sorted : 239 Total catch: 239.11 Catch/hour: 927.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Antigonia capros	676.41	5643	72.94	
Dactylopterus volitans	73.69	268	7.95	52
Seriola fasciata	49.45	50	5.33	53
Mustelus mustelus	47.51	16	5.12	
Fistularia petimba	19.78	47	2.13	
Balistes caprisus	14.97	12	1.61	
Chelidonichthys sp1	6.17	39	0.66	
Cidaroidae indetCV1	5.82	652	0.63	
Geodiidae indetCV2	5.04	35	0.54	
Lagocephalus sp.	4.96	35	0.54	0
Zeus faber	3.53	8	0.38	
Chelidonichthys lastoviza	3.18	23	0.34	
Raja herwigii	1.98	4	0.21	
Sargocentron hastatus	1.71	12	0.18	
Pseudupeneus prayensis	1.71	8	0.18	
Hexactinellida indetCV1	1.50	35	0.16	
Chaetodon marcellae	1.28	19	0.14	
Stephanolepis hispidus	1.20	12	0.13	
Scorpaena notata	1.16	8	0.13	
Syacium micrurum	0.89	35	0.10	
Demospongiae indetCV28	0.57	31	0.06	
Antipatharia indetCV2	0.50	81	0.05	
Demospongiae indetCV16	0.49	12	0.05	
Asteroidea indetCV2	0.47	19	0.05	
Hexactinellida indetCV3	0.36	16	0.04	
Hexactinellida indetCV2	0.28	12	0.03	
Demospongiae spp.	0.27	16	0.03	
Scleractinia indetCV20	0.23	4	0.03	0
Alcyonacae indetCV2	0.23	0	0.03	0
Bryozoa indetCV3	0.21	35	0.02	0
Aphroditae indetCV1	0.19	8	0.02	
Syllidae spp	0.19	19	0.02	0
Demospongiae indetCV17	0.16	8	0.02	
Alcyonacae indetCV1	0.15	78	0.02	
Demospongiae indetCV3	0.12	31	0.01	
Alcyonacae indetCV4	0.12	8	0.01	0
Aphroditidae spCV1	0.12	4	0.01	0
Dendrophyllia sp.	0.12	27	0.01	0
Antipatharia indetCV1	0.10	112	0.01	
PAGUROIDEA	0.10	19	0.01	0
Xenophera sp	0.07	16	0.01	
Lythospsia miriophyllum	0.07	8	0.01	
Brachyura spp.	0.06	16	0.01	0
Muricidae indetCV1	0.05	4	0.01	0
Synodus saurus	0.04	12	0.00	
Alcyonacae indetCV5	0.04	19	0.00	0
Hydrozoa spp.	0.04	66	0.00	
Pectinidae indetCV1	0.03	4	0.00	
Paracentris	0.02	4	0.00	0
Patellidae indetCV1	0.01	4	0.00	0
G A S T R O P O D S	0.01	12	0.00	0
Gorgorian indetCV2	0.01	4	0.00	0
Macropodia indetCV1	0.00	4	0.00	0
Total		927.37	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 26
DATE :13/06/2011 GEAR TYPE: PT NO: 4 POSITION:Lat N 16°19.47
start stop duration Lon W 22°58.60
TIME :22:17:02 22:46:19 29.3 (min) Purpose : 1
LOG : 440.98 442.45 1.5 Region : 1500
FDEPTH: 5 90 Gear cond.: 0
BDEPTH: 104 213 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 3.0 kn
Sorted : 0 Total catch: 0.46 Catch/hour: 0.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Isopod	0.00	2	0.00	
J E L L Y F I S H	0.01	2	0.00	
Phyllosoma	0.00	2	0.00	
Myctophum obtusirastre	0.02	16	0.00	
Macroparalepis brevis	0.02	2	0.00	
Aburria sp.	0.08	29	0.00	
Ommastrephes sp.	0.78	2	0.00	
Saurida sp., juvenile	0.00	2	0.00	
Synodus sp., juvenile	0.00	2	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 27
DATE :14/06/2011 GEAR TYPE: PT NO: 24 POSITION:Lat N 16°29.37
start stop duration Lon W 22°49.69
TIME :05:15:19 05:45:42 30.4 (min) Purpose : 1
LOG : 490.00 491.61 1.6 Region : 1500
FDEPTH: 50 42 Gear cond.: 0
BDEPTH: 562 962 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 3.2 kn
Sorted : 3 Total catch: 3.22 Catch/hour: 6.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
MYCTOPHIDAE	1.50	2413	23.57	
C E P H A L O P O D A	0.95	47	14.98	
Cubiceps sp.	0.95	41	14.89	
Leptocephalus	0.61	120	9.62	
Illex sp.	0.55	18	8.68	
Nealotus tripes	0.55	32	8.68	
J E L L Y F I S H	0.41	0	6.51	
CENTROLOPHIDAE	0.38	2	5.89	
Liocranchia reinhardtii	0.10	14	1.52	
BOTHIDAE, juvenile	0.08	34	1.27	
S H R I M P S	0.08	385	1.24	
PARALEPIDIDAE, juvenile	0.06	10	0.93	
Cubiceps pauciradiatus	0.06	6	0.93	
PHOTICHTHYIDAE	0.03	51	0.50	
C E P H A L O P O D A	0.03	2	0.40	
Diplophos maderensis	0.01	8	0.19	0
XXXXXX	0.00	30	0.06	
Apogon sp., juvenile	0.00	2	0.03	
Isopod	0.00	2	0.03	
Astronesthes neopogon, juvenile	0.00	2	0.03	
Bregmaceros sp., juvenile	0.00	2	0.03	
Leptocephalus	0.00	2	0.00	0
Total		6.37	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 28
DATE :14/06/2011 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°35.40
start stop duration Lon W 22°51.30
TIME :08:16:29 08:45:36 29.1 (min) Purpose : 3
LOG : 512.76 514.33 1.6 Region : 1500
FDEPTH: 31 45 Gear cond.: 0
BDEPTH: 31 45 Validity : 0
Towing dir: 0° Wire out : 102 m Speed : 3.2 kn
Sorted : 179 Total catch: 358.03 Catch/hour: 738.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Diodon holocanthus	198.35	3120	26.87	
Strombus latus	183.92	1142	24.91	
Lethrinus atlanticus	118.56	482	16.06	55
Pseudupeneus prayensis	47.67	289	6.46	56
Pseudocaranx dentex	46.56	21	6.31	54
Rypticus saponaceus	19.51	342	2.64	
Strombus spCV1	17.94	29	2.43	
Stephanolepis hispidus	15.05	186	2.04	
Rhizoprionodon acutus	14.27	4	1.93	
Sparisoma rubripinne	12.54	29	1.70	
Cidaroidae indetCV1	12.45	342	1.69	
Scorpaena notata	12.16	128	1.65	58
Chilomycterus spinosus mauret.	6.43	25	0.87	
Fistularia tabacaria	6.19	12	0.84	
Sphoeroides marmoratus	5.03	58	0.68	
Scorpaena scrofa	4.45	16	0.60	57
Balistes punctatus	4.41	4	0.60	
Aluterus heudelotii	4.00	8	0.54	
Sparisoma sp.	1.65	49	0.22	
Gymnothorax vicinus	1.44	8	0.20	
Muricidae indetCV1	1.02	16	0.14	
Conus spCV2	0.64	12	0.09	
Demospongiae indetCV29	0.60	21	0.08	
Gymnothorax polygonius	0.54	4	0.07	
Xyrichtys novacula	0.49	12	0.07	
Bothus podas africanus	0.45	8	0.06	
PAGUROIDEA	0.45	16	0.06	
Asteroidea indetCV2	0.41	74	0.06	
Synodus saurus	0.33	4	0.04	
Bryozoa spp.	0.23	124	0.03	
Serranus sanctaehelenae	0.12	21	0.02	
Asteroidea indetCV3	0.10	4	0.01	
Synaptidae indetCV1	0.06	4	0.01	
Calappidae indetCV1	0.05	4	0.01	
Muricidae indetCV3	0.05	4	0.01	
Demospongiae indetCV27	0.03	4	0.00	
Aphroditae indetCV1	0.02	4	0.00	
Aphroditidae spCV1	0.02	4	0.00	
Demospongiae indetCV16	0.02	4	0.00	
Total		738.20	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 29
DATE :14/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°21.93
start stop duration Lon W 22°54.41
TIME :11:33:07 11:53:27 20.3 (min) Purpose : 3
LOG : 536.88 537.91 1.0 Region : 1500
FDEPTH: 233 235 Gear cond.: 0
BDEPTH: 233 235 Validity : 0
Towing dir: 0° Wire out : 545 m Speed : 3.0 kn
Sorted : 236 Total catch: 434.32 Catch/hour: 1281.19

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dentex macrophthalmus	575.22	10773	44.90	59
Glossanodon leioglossus	263.42	0	20.56	
Antigonia capros	125.07	0	9.76	
Pagellus acarne	89.09	1028	6.95	60
Zenopsis conchifer	66.08	83	5.16	
Stichopus sp.	30.03	106	2.34	
Aulopus filamentosus	29.56	419	2.31	
Illex coindetii	27.67	425	2.16	
Lophius vaillanti	13.27	3	1.04	
Sphoeroides pachgaster	11.68	47	0.91	
Mustelus mustelus	10.91	12	0.85	
Peristedion cataphractum	9.62	324	0.75	
Todaropsis eblanae	5.84	35	0.46	
Zeus faber	5.60	6	0.44	
Synchiropus phaeton	5.55	283	0.43	
Echinus spCV1	4.60	6	0.36	
Stichopus spCV2	3.60	12	0.28	
Bembrops heterurus	1.53	35	0.12	
Monolene microstoma	1.06	112	0.08	
Stephanolepis hispidus	0.71	6	0.06	
Echelus myrus	0.27	3	0.02	
Pontinus accraensis	0.24	18	0.02	
Synodus saurus	0.18	18	0.01	
Pontinus kuhlii	0.12	6	0.01	
Calappa granulata	0.09	6	0.01	
Parapercis atlantica	0.06	6	0.00	
Macrorhamphosus scolopax	0.06	6	0.00	
Goniasteridae indetCV2	0.04	12	0.00	
PAGUROIDEA	0.03	6	0.00	
Total		1281.19	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 30
DATE :14/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°18.16
start stop duration Lon W 22°54.07
TIME :13:06:50 13:36:59 30.2 (min) Purpose : 3
LOG : 543.34 544.86 1.5 Region : 1500
FDEPTH: 79 75 Gear cond.: 0
BDEPTH: 79 75 Validity : 0
Towing dir: 0° Wire out : 200 m Speed : 3.0 kn
Sorted : 79 Total catch: 78.78 Catch/hour: 156.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dasyatis pastinaca	119.36	2	76.16	
Aluterus schoepfi	11.54	10	7.36	
Mustelus mustelus	9.25	2	5.90	
Fistularia petimba	4.48	24	2.86	
Syacium micrurum	4.42	103	2.82	61
Dactylopterus volitans	3.58	14	2.28	
Illex coindetii	1.29	20	0.83	
Synchiropus phaeton	1.05	48	0.67	
Todaropsis eblanae	0.66	4	0.42	
Synodus saurus	0.48	12	0.30	
Peristedion cataphractum	0.26	6	0.17	
Xenophora sp	0.22	70	0.14	
Astropectinidae indetCV2	0.09	2	0.06	
Sphoeroides pachgaster	0.04	2	0.03	
Total		156.72	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 31
DATE :14/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°44.49
start stop duration Lon W 22°52.21
TIME :20:33:29 20:53:39 20.2 (min) Purpose : 3
LOG : 585.82 586.82 1.0 Region : 1500
FDEPTH: 39 63 Gear cond.: 0
BDEPTH: 39 63 Validity : 0
Towing dir: 0° Wire out : 125 m Speed : 3.0 kn
Sorted : 177 Total catch: 177.19 Catch/hour: 527.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Galeoides decadactylus	88.05	304	16.71	73
Lithognathus mormyrus	65.09	201	12.50	69
Acanthurus monroviae	57.41	98	10.89	72
Lethrinus atlanticus	41.94	104	7.96	70
Rhizoprionodon acutus	32.87	12	6.24	
Pomadasys incisus	31.68	173	6.01	74
Caranx crysos	22.67	62	4.30	78
Mulloidichthys martinicus	16.90	39	3.21	62
Rypticus saponaceus	14.13	342	2.68	
Pseudupeneus prayensis	12.91	65	2.45	63
Syacium micrurum	12.11	125	2.30	
Boops boops	11.75	48	2.23	65
Dactylopterus volitans	10.53	21	2.00	
Selar crumenophthalmus	8.92	42	1.69	79
Strombus latus	8.54	42	1.62	
Parapristipoma humile	8.21	30	1.56	64
Priacanthus arenatus	7.97	18	1.51	68
Chromis lubbocki	7.85	122	1.49	
Sphoeroides marmoratus	7.05	65	1.34	
Diodon hystrix	6.51	59	1.24	
Sparisoma rubripinne	6.07	9	1.15	75
SCYLLARIDAE	6.04	9	1.15	
Sphyræna viridensis	4.22	3	0.80	77
Bothus podas africanus	3.87	59	0.73	
Stephanolepis hispidus	3.42	30	0.65	
Virrididentex acromegalus	3.12	6	0.59	67
Sargocentron hastatus	3.06	15	0.58	
Diplodus prayensis	2.92	12	0.55	
Diplodus fasciatus	2.92	12	0.55	66
Stichopus spCV3	2.38	3	0.45	
Balistes capricus	1.84	3	0.35	
Myripristis jacobus	1.76	24	0.33	
Decapterus punctatus	1.67	12	0.32	71
Fistularia petimba	1.52	3	0.29	
Sepia officinalis	1.40	6	0.27	
Scorpaena notata	1.16	9	0.22	
Lutjanus fulgens	1.01	3	0.19	76
Uranoscopus polli	0.59	3	0.11	
Asteroida indetCV3	0.56	39	0.11	
Chilomycterus spinosus mauret.	0.51	6	0.10	
Pegusa lascaris	0.45	3	0.08	
Asteroida indetCV4	0.36	18	0.07	
Aplysia spCV1	0.33	6	0.06	
Chaetodon robustus	0.30	3	0.06	
Antennarius striatus	0.24	6	0.05	
Demospongiae indetCV6	0.24	12	0.05	
Asteroida indetCV6	0.22	21	0.04	
Hippocampus sp.	0.18	3	0.03	
Aplidium ?	0.17	12	0.03	
Demospongiae indetCV26	0.11	9	0.02	
Goniasteridae indetCV2	0.10	24	0.02	
Melongemidae indetCV1	0.09	3	0.02	
Apogon sp.	0.09	30	0.02	
Muricidae indetCV1	0.07	3	0.01	
Synodus saurus	0.06	6	0.01	
Gorgorion indetCV3	0.06	3	0.01	
Octopus burryi	0.06	3	0.01	
Astropectinidae undetCV1	0.03	3	0.01	
Opistobranchia indetCV2	0.01	3	0.00	
Gorgorion indetCV4	0.01	3	0.00	
Total		527.09	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 32
DATE :15/06/2011 GEAR TYPE: BT NO: 24 POSITION:Lat N 16°37.56
start stop duration Lon W 22°57.69
TIME :07:23:02 07:31:36 8.6 (min) Purpose : 3
LOG : 659.39 659.85 0.5 Region : 1500
FDEPTH: 31 44 Gear cond.: 8
BDEPTH: 31 44 Validity : 9
Towing dir: 0° Wire out : 102 m Speed : 3.2 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
N O C A T C H	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 33
DATE :16/06/2011 GEAR TYPE: PT NO: 4 POSITION:Lat N 16°34.88
start stop duration Lon W 24°31.81
TIME :09:59:37 10:32:49 33.2 (min) Purpose : 1
LOG : 835.02 836.99 2.0 Region : 1500
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 176 646 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.6 kn
Sorted : 0 Total catch: 0.02 Catch/hour: 0.03

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus punctatus	0.01	2	0.00	
Stephanolepis sp., juvenile	0.00	2	0.00	
MYCTOPHIDAE	0.00	4	0.00	
Lagocephalus lagocephalus, juvenile	0.00	4	0.00	
Decapterus sp., juvenile	0.02	33	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 34
DATE :16/06/2011 GEAR TYPE: BT NO: 1 POSITION:Lat N 16°26.10
start stop duration Lon W 24°19.80
TIME :14:00:27 14:16:47 16.2 (min) Purpose : 3
LOG : 864.30 865.13 0.8 Region : 1500
FDEPTH: 77 77 Gear cond.: 0
BDEPTH: 77 77 Validity : 0
Towing dir: 0° Wire out : 200 m Speed : 2.6 kn
Sorted : 52 Total catch: 51.83 Catch/hour: 191.98

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Taeniura grabata	185.19 4	96.46	
Spherooides marmoratus	2.15 26	1.12	
Rypticus saponaceus	1.63 15	0.85	
Bothus podas africanus	0.78 19	0.41	
Xyrichtys novacula	0.44 7	0.23	
Antennarius striatus	0.33 7	0.17	
Fistularia petimba	0.30 15	0.15	
Sepia bertheloti	0.26 7	0.13	
Octopus burryi	0.21 19	0.11	
Asterioidea indetCV2	0.18 4	0.09	
Geodidae indetCV2	0.13 7	0.07	
Acanella arbuscula	0.07 19	0.04	
Demospongiae indetCV29	0.06 15	0.03	
Synodus saurus	0.04 4	0.02	
Demospongiae sp.	0.04 11	0.02	
Serranus sanctaehelenae	0.04 7	0.02	
Antipatharia indetCV1	0.03 11	0.02	
Aplidium ?	0.03 4	0.01	
Uropterygius wheeleri	0.03 4	0.01	
Asterioidea indetCV8	0.02 7	0.01	
Antigonia capros	0.02 4	0.01	
Hydrozoa spp.	0.01 93	0.01	
Aphroditidae spCV1	0.01 7	0.01	
Total	191.98	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 35
DATE :16/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 16°44.22
start stop duration Lon W 24°38.39
TIME :21:49:14 22:04:45 15.5 (min) Purpose : 3
LOG : 930.39 931.26 0.9 Region : 1500
FDEPTH: 61 66 Gear cond.: 1
BDEPTH: 61 66 Validity : 3
Towing dir: 0° Wire out : 150 m Speed : 3.3 kn
Sorted : 77 Total catch: 76.81 Catch/hour: 296.96

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Taeniura grabata	135.31 4	45.56	
Uraspis helvola	55.28 54	18.62	80
Dactylopterus volitans	29.96 73	10.09	86
Mustelus mustelus	15.46 4	5.21	
Sargocentron hastatus	10.24 50	3.45	85
Epigonus telescopus	9.66 1740	3.25	
Lampanyctus sp.	9.28 3325	3.12	
Pomadasyr rogeri	8.81 8	2.97	
Parapristipoma humile	3.94 15	1.33	
Priacanthus armatus	3.94 8	1.33	
Pomadasyr incisus	3.87 15	1.30	
Ophichthus ophis	2.28 4	0.77	
Scorpaena notata	1.55 12	0.52	
ENOPLUTEUTHIDAE	1.39 595	0.47	
Mulloidichthys martinicus	1.39 8	0.47	
Promethichthys prometheus	1.31 35	0.44	
Syacium micrurum	0.77 4	0.26	
Selar crumenophthalmus	0.66 15	0.22	
Apogon sp.	0.46 255	0.16	
Bothus podas africanus	0.39 8	0.13	
Rypticus saponaceus	0.31 4	0.10	
Sepia officinalis	0.27 4	0.09	
Erythrocles monodi	0.23 23	0.08	
Fistularia tabacaria	0.08 4	0.03	
Hippocampus sp.	0.05 4	0.02	
Aulostomus strigosus	0.04 4	0.01	
Acanthurus monroviae, juvenile	0.00 4	0.00	
Heteriacanthus cruentatus	0.00 4	0.00	
Total	296.96	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 36
DATE :17/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 16°56.61
start stop duration Lon W 25°4.95
TIME :04:29:25 05:00:21 30.9 (min) Purpose : 3
LOG : 978.58 979.79 1.2 Region : 1500
FDEPTH: 275 283 Gear cond.: 1
BDEPTH: 275 283 Validity : 0
Towing dir: 0° Wire out : 700 m Speed : 2.4 kn
Sorted : 34 Total catch: 37.96 Catch/hour: 73.61

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Gephyroberyx darwini	29.57 23	40.18	
Aulopus filamentosus	18.36 91	24.95	62
Dactylopterus volitans	4.65 12	6.32	
Chlorophthalmus agassizi	4.09 219	5.56	
Illex coindetii	3.99 50	5.42	
Physiculus cf microbarbata	3.14 35	4.27	
Synchiropus phaeton	2.99 80	4.06	
Paramola cuvieri	1.28 2	1.74	
Glossanodon leioglossus	1.16 198	1.58	
Sargocentron hastatus	1.09 6	1.48	
Echelus myrus	0.95 12	1.29	
ENOPLUTEUTHIDAE	0.54 252	0.74	
Gnathopis mystax	0.35 10	0.47	
Macrorhamphosus scolopax	0.35 12	0.47	
Plesionika heterocarpus	0.26 622	0.36	
Spherooides pachgaster	0.23 2	0.32	
MYCTOPHIDAE	0.16 25	0.21	
Promethichthys prometheus	0.12 2	0.16	
Argyripnus atlanticus	0.10 25	0.13	
Heterocarpus sp.	0.07 37	0.10	
Zenopsis conchifer	0.04 2	0.05	
Antigonia capros, juvenile	0.04 12	0.05	
Erythrocles monodi	0.02 2	0.03	
Solenocera sp.	0.02 21	0.03	
ATHERINIDAE	0.02 4	0.02	
Lampanyctus sp.	0.01 2	0.01	
Hippocampus sp.	0.01 2	0.01	
Total	73.61	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 37
DATE :17/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 16°47.61
start stop duration Lon W 25°2.91
TIME :08:02:26 08:28:37 26.2 (min) Purpose : 3
LOG : 1003.46 1004.75 1.3 Region : 1500

FDEPTH: 34 48 Gear cond.: 0
BDEPTH: 34 48 Validity : 0
Towing dir: 0° Wire out : 102 m Speed : 3.0 kn
Sorted : 16 Total catch: 16.10 Catch/hour: 36.91

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Aluterus heudelotii	10.91 11	29.57	
Fistularia tabacaria	5.64 5	15.28	
Diodon sp.	3.99 18	10.81	
Rypticus scriptus	3.67 5	9.94	
Pseudopeneus prayensis	2.98 64	8.07	
Dactylopterus volitans	2.29 16	6.21	
Seriola fasciata	2.06 5	5.59	
Fistularia petimba	1.49 2	4.04	
Stephanolepis hispidus	0.87 2	2.36	
Syacium micrurum	0.71 9	1.93	
Bothus podas africanus	0.60 5	1.61	
Spherooides marmoratus	0.48 5	1.30	
Scorpaena notata	0.46 5	1.24	
Seriola fasciata, juvenile	0.32 5	0.87	
Raja herwigii, juvenile	0.32 2	0.87	
	0.11 2	0.31	
Total	36.91	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 38
DATE :17/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 16°45.60
start stop duration Lon W 24°56.80
TIME :10:41:32 11:11:14 29.7 (min) Purpose : 3
LOG : 1017.51 1018.98 1.5 Region : 1500
FDEPTH: 97 100 Gear cond.: 0
BDEPTH: 97 100 Validity : 0
Towing dir: 0° Wire out : 250 m Speed : 3.0 kn
Sorted : 243 Total catch: 243.32 Catch/hour: 491.39

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Mustelus mustelus	242.34 83	49.32	90
Taeniura grabata	100.98 2	20.55	
Dasyatis centroura	80.78 2	16.44	
Seriola fasciata	34.94 34	7.11	91
Pseudocaranx dentex	16.20 6	3.30	92
Aluterus heudelotii	9.25 6	1.88	
Fistularia petimba	3.33 10	0.68	
Dactylopterus volitans	2.28 6	0.46	
Stephanolepis hispidus	0.32 4	0.07	
Spherooides pachgaster	0.28 4	0.06	
Fistularia tabacaria	0.20 2	0.04	
Uranoscopus polli	0.20 2	0.04	
Rypticus saponaceus	0.14 2	0.03	
Squilla mantis	0.10 2	0.02	
Antennarius pardalis	0.04 2	0.01	
Total	491.39	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 39
DATE :17/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 16°44.21
start stop duration Lon W 24°58.39
TIME :14:53:22 15:11:14 17.9 (min) Purpose : 3
LOG : 1045.84 1046.63 0.8 Region : 1500
FDEPTH: 60 64 Gear cond.: 0
BDEPTH: 60 64 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 2.7 kn
Sorted : 51 Total catch: 51.18 Catch/hour: 171.82

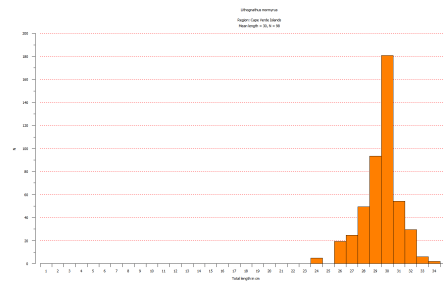
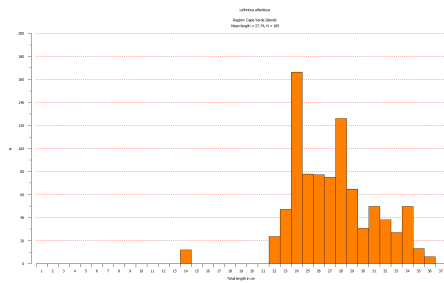
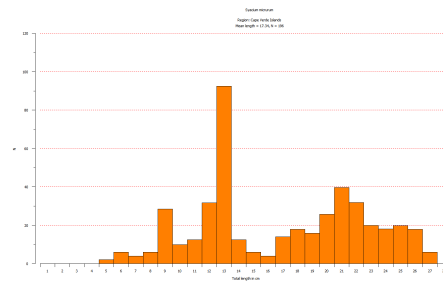
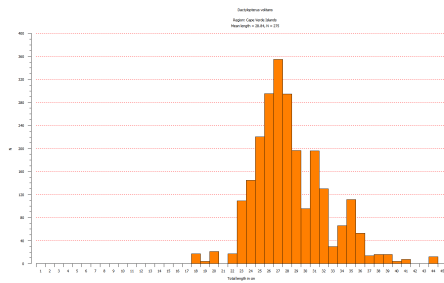
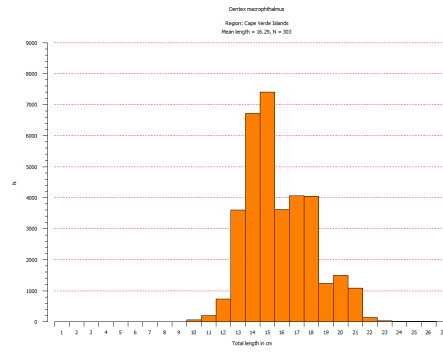
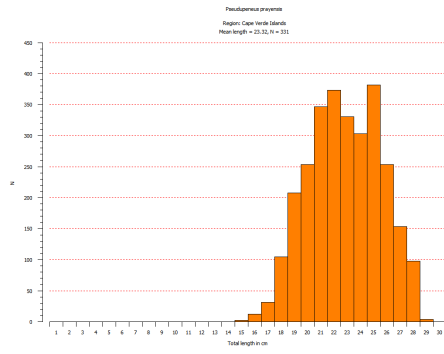
SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Dactylopterus volitans	128.93 355	75.04	93
Aluterus schoepfi	14.10 17	8.21	
Balistes capricus	10.14 10	5.90	
Spherooides marmoratus	3.73 27	2.17	
Seriola fasciata	3.73 7	2.17	
Diodon hystrix	3.42 7	1.99	
Caranx crysos	2.15 3	1.25	
Ophichthus ophis	2.01 3	1.17	
Fistularia tabacaria	1.98 3	1.15	
Rypticus saponaceus	1.28 17	0.74	
Antipatharia indetCV2	0.35 34	0.21	
Total	171.82	100.00	

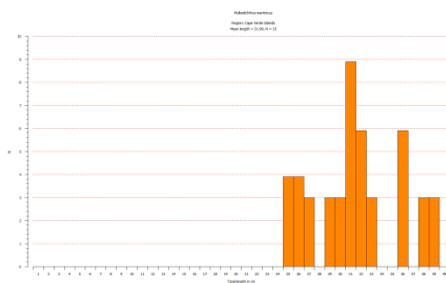
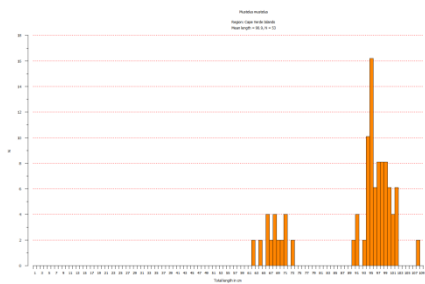
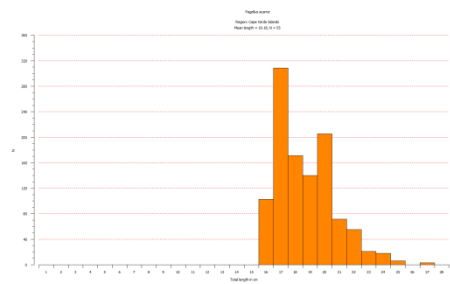
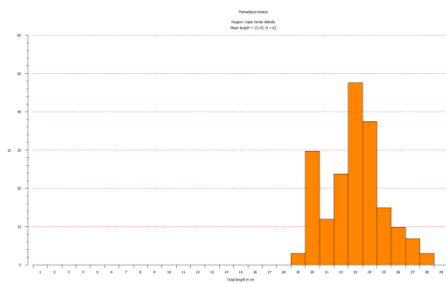
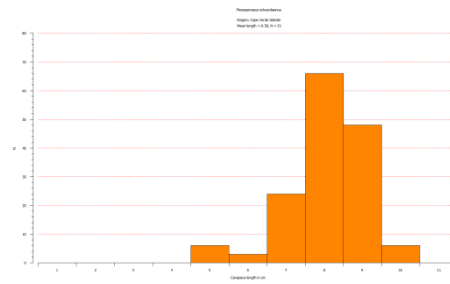
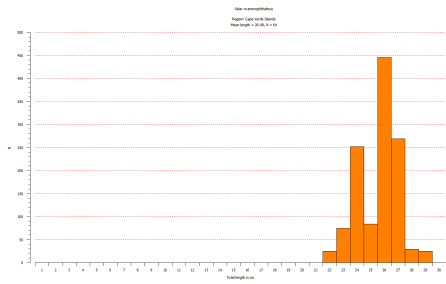
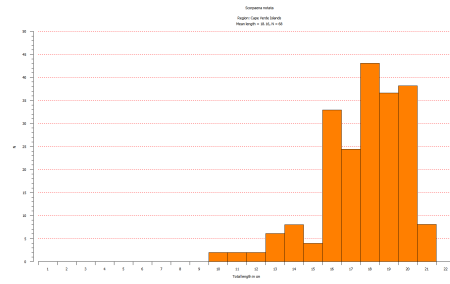
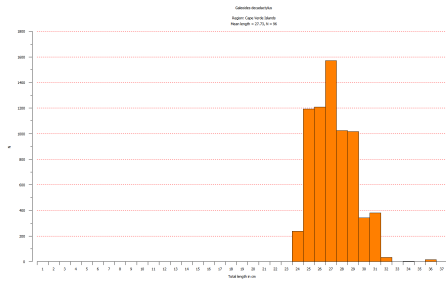
R/V Dr. Fridtjof Nansen SURVEY:2011406 STATION: 40
DATE :17/06/2011 GEAR TYPE: BT NO: 21 POSITION:Lat N 16°53.36
start stop duration Lon W 24°53.45
TIME :17:52:08 18:06:49 14.7 (min) Purpose : 3
LOG : 1065.46 1066.23 0.8 Region : 1500
FDEPTH: 50 47 Gear cond.: 0
BDEPTH: 50 47 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.1 kn
Sorted : 36 Total catch: 36.37 Catch/hour: 148.55

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Balistes capricus	36.96 33	24.88	
Mustelus mustelus	29.61 8	19.93	
Dactylopterus volitans	24.38 57	16.41	
Pseudocaranx dentex	14.91 8	10.04	
Aluterus sp.	13.07 12	8.80	
Seriola fasciata	8.58 8	5.77	
Seriola rivoliana	8.17 8	5.50	
Pseudopeneus prayensis	4.29 16	2.89	
Paraconger notialis	3.06 4	2.06	
Demospongiae indetCV35	1.84 82	1.24	
Rypticus saponaceus	1.23 16	0.82	
Scorpaena notata	0.60 4	0.47	
Diodon hystrix	0.49 4	0.33	
Stephanolepis hispidus	0.41 4	0.27	
Fistularia petimba	0.33 4	0.22	
Syacium micrurum	0.29 4	0.19	
Octopus burryi	0.10 4	0.07	
Xyrichtys novacula	0.08 4	0.05	
Demospongiae indetCV8	0.06 0	0.04	
Total	148.55	100.00	

SPECIES	CATCH/HOUR weight	% OF TOT. C	SAMP
Leptocephalus	0.03	28	0.00
Diodon hystrix, juvenile	0.00	2	0.00
J E L L Y F I S H	0.26	0	0.00
MYCTOPHIDAE	0.01	18	0.00
S H R I M P S	0.00	24	0.00
Unidentified fish	0.00	2	0.00
XXXXXX	0.00	24	0.00
XXXXXXX	0.02	58	0.00
XXXXXXX	0.02	0	0.00

ANNEX II. LENGTH DISTRIBUTION OF MAIN SPECIES





ANNEX III. INSTRUMENTS AND FISHING GEAR USED

Echo sounder

The SIMRAD ER60/38 kHz scientific sounder was used during the survey for fish abundance estimation. The LSSS Integrator system was used to scrutinise the acoustic records. The settings of the echo sounders were as follows:

Settings:

	Transceiver 3	Transceiver 4	Transceiver 1	Transceiver 2
--	----------------------	----------------------	----------------------	----------------------

Frequency:	18 kHz	38 kHz	120 kHz	200 kHz
Transducer:	ES18-11	ES38B	ES120-7	ES200-7

Transceiver menu:

Mode	Active	Active	Active	Active
Transducer Type	ES18	ES38	ES120	ES200
Transd. Sequence	Off	Off	Off	Off
Transd Depth	5,5m	5,5m	5,5 m	5,5 m
Absorption Coeff.	2,2 dB/km	8,5 dB/km	45,1	68,9 dB/km
Pulse Length	1,024 ms	1,024 ms	1,024 ms	1,024 ms
Bandwidth	1,57 kHz	2,43 kHz	3,03 kHz	3,09 kHz
Max. Power	2000 W	2000 W	250 W	120 W
2-way Beam Angle	-17,0 dB	-20,6 dB	-20,8 dB	-20,7 dB
Gain	23,13 dB	25,99 dB	25,00 dB	25,38 dB
SA correction	-0,70 dB	-0,59 dB	-0,31 dB	-0,24 dB
Angle Sens. Along	13,9	21,9	21,0	23,00
Angle Sens. Athw.	13,9	21,9	21,0	23,00
3 dB Beamw. Along	10,55 °	6,74 °	7,37 °	6,15 °
3 dB Beamw. Athw.	10,50 °	6,77 °	7,46 °	6,27 °
Alongship Offset	0,14 °	0,13 °	-0,08 °	0,14 °
Athw. ship Offset	0,01 °	0,04 °	0,00 °	0,01 °

TS Detection menu

Min. Value	-50 dB	-50 dB	-50 dB	-50 dB
Min. Echo Length	80 %	80 %	80 %	80 %
Max. Echo Length	180 %	180 %	180 %	180 %
Max. Gain Comp.	6,0 dB	6,0 dB	6,0 dB	6,0 dB
Max. Phase Dev.	8,0	8,0	8,0	8,0

Fishing gear

The vessel has both "Harstad" and "Åkrahamn" pelagic trawls and a "Gisund super bottom trawl".

The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm mesh size in the cod end with an inner net of 10 mm mesh size (see drawings below). The estimated opening is 6 m (observed 5.7) and distance between wings during towing about 18 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. The doors are of 'Thyborøn' combi type, 7.81 m², 1670 kg, their distance while trawling about 45 - 55 m on average, depending on the

depth (least distance at low depths). This distance can be kept constant (about 50 m) at all depths by the use of a 9.5 m strap between the wires at 130 m distance from the doors, normally applied at depths greater than 80 m.

The SCANBAS system was used on all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their distance and the trawl with a trawl eye that provides information on the trawl opening, the distance of the footrope to the bottom, bottom contact and fish entering the trawl.

ANNEX IV EQUATIONS

Biomass estimates

The stratified estimator of mean density in the entire area is calculated as (Cochran, 1977)

$$\bar{y}_{st} = \sum_{i=1}^L W_i \bar{y}_i, \quad (1)$$

where

L is the number of strata,

W_i is the proportion of the i^{th} stratum of the total survey area,

$\bar{y}_i = \frac{\sum_{k=1}^{n_i} y_{i,k}}{n_i}$ is the average density in the i^{th} stratum

$y_{i,k}$ is the density [tonnes/NM²] by the k^{th} tow in stratum i

n_i is the number of tows in the i^{th} stratum.

The total biomass in the area is calculated by

$$B = \sum_{i=1}^L W_i \bar{y}_i A \quad (2)$$

The estimated variance of the biomass (var(biomass)) was calculated by:

$$\text{var}(b i o m a s s) = \left(\sum_{i=1}^L \frac{W_i^2 s_i^2}{n_i} \right) A^2 \quad (3)$$

where

s_i^2 is the variance of the density in the i^{th} stratum, and A is total area

The standard error (SE) of the stratified mean was calculated as (Cochran 1977):

$$S E = \sqrt{\text{var}(b i o m a s s)} \quad (4)$$

The precision for the estimates (CV) was calculated by (Zar 1999¹):

$$C V = \frac{S E}{b i o m a s s} \quad (5)$$

If the sample size is “large” enough, then the Central Limit Theorem states that each time a survey is conducted there is a 95% chance that the true mean is in the interval (see Cochran², 1977)

$$b i o m a s s \pm t_{(n-1)} S E \quad (6)$$

where t is from Students t-table with $(n-1)$ degrees of freedom and $\alpha = 0.025$.

¹ Zar JH, 1999, Biostatistical analysis. Prentice Hall, New Jersey, 4. ed., 663 pp.

² Cochran, W.G.1977. Sampling Techniques, 3rd ed. John Wiley and Sons, N.Y. 228 pp.

Annex V CHECKLIST OF ENDEMIC MARINE FISH SPECIES IN CAPE VERDE

This list of marine fish species found exclusively in Cape Verde is based on the taxonomy used in FishBase 2004 (2004). For further details on possible inaccuracies in the list see [Sources & Caveats](#).

FishBase 2004: a global information system on fishes. DVD. WorldFish Center - Philippine Office, Los Banos, Philippines. Published in May 2004.

The current version of this electronic database is accessible [here](#).

OC = a FishBase occurrence record suggests a specimen from another country outside normal stated range (these vary widely in reliability from obvious misidentifications to being almost certainly correct)

Lipophrys caboverdensis (Blenniidae)
Parablennius salensis (Blenniidae)
Scartella caboverdiana (Blenniidae)
Gobius ateriformis (Gobiidae)
Gobius tetraphthalmus (Gobiidae)
Girella stuebeli OC (Kyphosidae)
Chelon bispinosus OC (Mugilidae) **Cape Verde Mullet**
Anarchias longicaudis (Muraenidae)
Ethadophis foresti (Ophichthidae)
Ophidion saldanhai (Ophidiidae)
Parapercis atlantica (Pinguipedidae)
Chromis lubbocki (Pomacentridae) **Lubbock's Chromis**
Similiparma hermani (Pomacentridae) **Cape Damsel**
Raja herwigi (Rajidae) **Cape Verde Skate**
Pegusa cadenati OC (Soleidae) **Cadenat's Sole**
Diplodus prayensis (Sparidae) **Two-banded Seabream**
Virididentex acromegalus (Sparidae) **Bulldog Dentex**

An additional endemic marine fish species described too recently to be included in FishBase 2004 is given below. This list is primarily based on information from the 13 March 2009 version of the Catalog of Fishes database (current version [here](#)) and includes species described through 2008. In addition to the 17 endemic marine fish species listed above, the additional species listed below gives a total of 18 species of marine fishes known solely from Cape Verde.

Didogobius wirtzi (Gobiidae) 2008

ANNEX VI. CTD, AND PLANKTON COLLECTED FOR ANALYSES AT INDP

Nutrients samples:

57 bottles of 250 ml of sea water

83 bottles of 500 ml sea water

Chlorophyll samples:

60 Petri dishes with filters

Zooplankton from multinet:

ANNEX VII. LIST OF SPECIES FOR DNA ANALYSES AND CONSERVATION AT SMITHSONIAN INSTITUTE

Specimen #	Trawl #	Family	Genus	Species	Comments
CV11-001	T1	Bromidae	?		1
CV11-002	T1	Nomeidae	Cubiceps	pauciradiatus	
CV11-003	T1	Nomeidae	Cubiceps	pauciradiatus	
CV11-004	T1	Gempylidae	Neolotus	tripes	
CV11-005	T1	Gempylidae	Neolotus	tripes	
CV11-006	T1	Paralepididae	Paralepis	sp.	
CV11-007	T1	Stomiidae	?	?	
CV11-008	T1	Syngnathidae	Hippocanthus	sp.	
CV11-009	T2	Echiniidae	Remora	remora	
CV11-010	T2	Nemichthyidae	Nemichthys	scolopaceus	
CV11-011	T2	Nemichthyidae	Nemichthys	scolopaceus	
CV11-012	T2	Myctophidae	Hygophum	proximum	
CV11-013	T2	Myctophidae	Hygophum	proximum	
CV11-014	T2	Myctophidae	Myctophum	nitidulum	
CV11-015	T2	Myctophidae	Myctophum	nitidulum	
CV11-016	T2	Myctophidae	Symbolophorus	evermanni	
CV11-017	T2	Myctophidae	Symbolophorus	evermanni	
CV11-018	T3	Gempylidae	Promethichthys	prometheus	
CV11-019	T4	Gempylidae	Gempylus	serpens	
CV11-020	T4	Ceratiidae	Cryptopsaras	couesi	
CV11-021	T4	Bromidae	?		2
CV11-022	T4	Nomeidae	Cubiceps	baxteri	
CV11-023	T5	Ogcocephalidae	Dibranchus	atlanticus	
CV11-024	T5	Ogcocephalidae	Dibranchus	atlanticus	
CV11-025	T5	Nettastomatidae	Nettastoma	melanurum	
CV11-026	T5	Nettastomatidae	Nettastoma	melanurum	
CV11-027	T5	Stomiidae	Stomias	boa	
CV11-028	T5	Congridae	Bathyrocongerrus	vicinus	
CV11-029	T5	Congridae	Bathyrocongerrus	vicinus	
CV11-030	T5	Synaphobranchidae	Synaphobranchus	kaupi	
CV11-031	T5	Synaphobranchidae	Synaphobranchus	kaupi	
CV11-032	T5	Macrouridae	Gadumus	arcuatus	
CV11-033	T5	Macrouridae	Gadumus	arcuatus	
CV11-034	T5	Macrouridae	Bathygadus	melanobranchus	
CV11-035	T5	Macrouridae	Bathygadus	melanobranchus	
CV11-036	T5	Alepocephalidae	Rouleina	attrita?	Check for photophores
CV11-037	T5	Alepocephalidae	Rouleina	attrita?	Check for photophores
CV11-038	T5	Alepocephalidae	Talismania	antillarum	
CV11-039	T5	Alepocephalidae	Talismania	antillarum	
CV11-040	T5	Notocanthidae	Notocanthus	bonapartei	
CV11-041	T5	Notocanthidae	Notocanthus	bonapartei	
CV11-042	T5	Caristiidae	Platyberyx	opalescens	
CV11-043	T5	Ipnopidae	Bathypterois	viridensis	
CV11-044	T5	Ipnopidae	Bathypterois	viridensis	
CV11-045	T5	Ipnopidae	Bathypterois	sp. 2	
CV11-046	T5	Ipnopidae	Bathypterois	sp. 2	

CV11-047	T5	Sternoptychidae	Argyropelecus	olfonsi	
CV11-048	T5	Sternoptychidae	Argyropelecus	olfonsi	
CV11-049	T5	Sternoptychidae	Sternoptyx	diaphana	
CV11-050	T5	Sternoptychidae	Sternoptyx	pseudodiaphana	
CV11-051	T5	Sternoptychidae	Argyropelecus	gigas	
CV11-052	T5	Sternoptychidae	Argyropelecus	affinis	
CV11-053	T5	Sternoptychidae	Argyropelecus	affinis	
CV11-054	T5	Stomiidae	Photostomias	guernei	
CV11-055	T5	Stomiidae	Malacosteus	niger	?
CV11-056	T5	Ophiidae	Lamprogremmus	niger	
CV11-057	T5	Gonostomidae	Gonostoma	elongatum	
CV11-058	T5	Halosauridae	Halosaurus	johnsonianus	
CV11-059	T5	Halosauridae	Halosaurus	johnsonianus	
CV11-060	T5	Stomiidae	Stomias	affinis	
CV11-061	T5	Stomiidae	Chauliodus	sloani	
CV11-062	T6	Monacanthidae	Stephanolepis	hispidus	
CV11-063	T6	Monacanthidae	Stephanolepis	hispidus	
CV11-064	T6	Diodontidae	Diodon	hystrix	
CV11-065	T6	Diodontidae	Diodon	hystrix	
CV11-066	T7	Diretmidae	Diretmoides	parini	
CV11-067	T7	Chaunacidae	Chaunax	pictus	
CV11-068	T7	Caproidea	Antigonia	caprus	
CV11-069	T7	Diretmidae	Diretmoides	pauciradiatus	
CV11-070	T7	Diretmidae	Diretmoides	pauciradiatus	
CV11-071	T8	Zeidae	Zeus	faber	
CV11-072	T8	Tetraodontidae	Sphoeroides	pachygaster	
CV11-073	T8	Tetraodontidae	Sphoeroides	pachygaster	
CV11-074	T8	Fistularidae	Fistularia	Tabacaria	
CV11-075	T8	Fistularidae	Fistularia	petinba	
CV11-076	T8	Trachinidae	Trachinus	pellegrini	
CV11-077	T8	Chelidonichthidae	Chelidonichthys	sp. 1	
CV11-078	T8	Labridae	Xyrichtys	novacula	
CV11-079	T8	Labridae	Xyrichtys	novacula	
CV11-080	T9	Acropomatidae	Synagrops	sp. 1	japonicus?
CV11-081	T9	Acropomatidae	Synagrops	sp. 1	japonicus?
CV11-082	T10	Triakidae	Mustelus	mustelus	no specimen
CV11-083	T10	Dactylopteridae	Dactylopterus	volitans	
CV11-084	T10	Dactylopteridae	Dactylopterus	volitans	
CV11-085	T10	Serranidae	Rypticus	saponaceus	
CV11-086	T10	Serranidae	Rypticus	saponaceus	
CV11-087	T10	Paralichthyidae	Syacium	micrurum	
CV11-088	T10	Paralichthyidae	Syacium	micrurum	
CV11-089	T10	Scorpaenidae	Scorpaena	notata	
CV11-090	T10	Scorpaenidae	Scorpaena	notata	
CV11-091	T10	Triglidae	Chelidonichthys	sp. 1	
CV11-092	T10	Monacanthidae	Aluterus	heudelotti	
CV11-093	T10	Tetraodontidae	Sphoeroides	mormoratus	
CV11-094	T10	Tetraodontidae	Sphoeroides	mormoratus	
CV11-095	T10	Bothidae	Bothus	podas	
CV11-096	T10	Trachinidae	Trachinus	draco	
CV11-097	T10	Trachinidae	Trachinus	draco	
CV11-098	T10	Triglidae	Trigloporus	lastoviza?	

CV11-099	T10	Rajadae	Raja	herwigi	
CV11-100	T10	Rajadae	Raja	herwigi	
CV11-101	T10	Serranidae		sp. 1	
CV11-102	T11	Uranoscopidae	Uranoscopus	polli	
CV11-103	T11	Uranoscopidae	Uranoscopus	polli	
CV11-104	T12	Triakidae	Mustelus	mustelus	no specimen
CV11-105	T12	Serranidae		sp. 1	
CV11-106	T12	Triglidae	Trigloporus	lastoviza	
CV11-107	T12	Triglidae	Trigloporus	lastoviza	
CV11-108	T12	Carangidae	Seriola	fasciata	
CV11-109	T12	Carangidae	Seriola	fasciata	
CV11-110	T13	Caproidea	Antigonia	capros	
CV11-111	T13	Sparidae	Dentex	macrophthalmus	
CV11-112	T13	Sparidae	Dentex	macrophthalmus	
CV11-113	T13	Synodontidae	Synodus	saurus	
CV11-114	T13	Synodontidae	Synodus	saurus	
CV11-115	T13	Callionymidae	Synchirops	phaeton	
CV11-116	T13	Callionymidae	Synchirops	phaeton	
CV11-117	T13	Hexanchidae	Heptrachias	perlo	
CV11-118	T14	Ariommatidae	Arioma	melanum	
CV11-119	T14	Ariommatidae	Arioma	melanum	
CV11-120	T14	Argentinidae	Glossanodon	leioglossus	
CV11-121	T14	Argentinidae	Glossanodon	leioglossus	
CV11-122	T14	Trachinidae	Trachinus	sp. 1	Similar to <i>T. pellegrini</i>
CV11-123	T14	Trachinidae	Trachinus	pellegrini	
CV11-124	T14	Scorpaenidae	Pontinus	kuhlui	yellow roof of mouth red roof of mouth
CV11-125	T14	Scorpaenidae	Pontinus	accraensis	
CV11-126	T14	Zeiidae	Zenopsis	conchifer	
CV11-127	T14	Soleidae	Dicologlossa	hexophthalma	
CV11-128	T14	Ophichthyidae	Echelus	myrus	
CV11-129	T14	Macrouridae	Malacocephalus	occidentalis	
CV11-130	T14	Macrouridae	Caelorichus	caelorinchus	
CV11-131	T14	Macrouridae	Caelorichus	caelorinchus	
CV11-132	T14	Aulopidae	Aulopus	filamentous	female
CV11-133	T14	Aulopidae	Aulopus	filamentous	female
CV11-134	T14	Aulopidae	Aulopus	filamentous	male
CV11-135	T14	Peristediidae	Peristedion	cataphractom	
CV11-136	T14	Peristediidae	Peristedion	cataphractom	
CV11-137	T14	Hexanchidae	Heptrachias	perlo	
CV11-138	T14	Sparidae	Pagellus	acarne	
CV11-139	T16	Serranidae	Epinephelus	costae	
CV11-140	T16	Serranidae	Epinephelus	costae	no specimen
CV11-141	T16	Serranidae	Epinephelus	costae	no specimen
CV11-142	T16	Serranidae	Cephalopholus	taeniops	
CV11-143	T16	Priacanthidae	Priacanthus	arenatus	
CV11-144	T16	Priacanthidae	Priacanthus	arenatus	
CV11-145	T16	Holocentridae	Sargocentron	hastatus	
CV11-146	T16	Holocentridae	Sargocentron	hastatus	
CV11-147	T16	Serranidae	Serranus	articauda?	
CV11-148	T16	Bothidae	Bothus	podas	
CV11-149	T16	Priacanthidae	Heteropriacanthus	cruentatus	
CV11-150	T16	Mullidae	Pseudopeneus	prayensis	
CV11-151	T16	Mullidae	Pseudopeneus	prayensis	
CV11-152	T16	Chaetodontidae	Chaetodon	robustus	

CV11-153	T16	Chaetodontidae	Chaetodon	robustus
CV11-154	T16	Pinguipedidae	Parapercis	atlantica?
CV11-155	T17	Chlorophthalma dae	Chlorophthalmus	agassizi
CV11-156	T17	Chlorophthalma dae	Chlorophthalmus	agassizi
CV11-157	T17	Sparidae	Pagellus	acarne
CV11-158	T17	Sparidae	Pagellus	acarne
CV11-159	T20	Polynemidae	Galeoides	decadactylus
CV11-160	T20	Polynemidae	Galeoides	decadactylus
CV11-161	T20	Carangidae	Caranx	crysos
CV11-162	T20	Carangidae	Caranx	crysos
CV11-163	T20	Scombridae	Auxis	thazard
CV11-164	T20	Albulidae	Albula	vulpes
CV11-165	T20	Albulidae	Albula	vulpes
CV11-166	T20	Sparidae	Lithognathus	mormyrus
CV11-167	T20	Sparidae	Lithognathus	mormyrus
CV11-168	T20	Haemulidae	Pomadasys	rogeri
CV11-169	T20	Carcharhinidae	Rhizoprionodon	acutus
CV11-170	T20	Soleidae	Pegusa	lascaris
CV11-171	T20	Monocanthidae	Aluterus	heudeloti
CV11-172	T20	Monocanthidae	Aluterus	sp
CV11-173	T23	Antennariidae	Antennarius	pardalis
CV11-174	T22	Scaridae	Sparisoma	rubripinne
CV11-175	T22	Balistidae	Balistes	capricus
CV11-176	T22	Balistidae	Balistes	punctatus
CV11-177	T22	Balistidae	Balistes	punctatus
CV11-178	T22	Lethrinidae	Lethrinus	atlanticus
CV11-179	T22	Lethrinidae	Lethrinus	atlanticus
CV11-180	T28	Scaridae	Sparisoma	cretense? cf.
CV11-181	T28	Serranidae	Serranus	sanctae-helenae
CV11-182	T28	Aulostomidae	Aulostomus	strigosus
CV11-183	T28	Aulostomidae	Aulostomus	strigosus spinosus
CV11-184	T28	Diodontidae	Chilomycterus	mauretanica
CV11-185	T28	Synodontidae	Synodus Gymnothoraxq polygonius	synodus
CV11-186	T28	Muraenidae	Gymnothorax	vicinus
CV11-187	T28	Muraenidae	Gymnothorax	vicinus
CV11-188	T28	Carangidae	Pseudocaranx	dentex
CV11-189	T31	Mullidae	Mulloidichthys	martinicus
CV11-190	T31	Mullidae	Mulloidichthys	martinicus
CV11-191	T31	Haemulidae	Parapristipoma	humile
CV11-192	T31	Haemulidae	Parapristipoma	humile
CV11-193	T31	Holocentridae	Myripristis	jacobus
CV11-194	T31	Holocentridae	Myripristis	jacobus
CV11-195	T31	Lutjanidae	Lutjanus	fulgens
CV11-196	T31	Sparidae	Viridentex	acromegalus
CV11-197	T31	Sparidae	Viridentex	acromegalus
CV11-198	T31	Acanthuridae	Acanthurus	monroviae
CV11-199	T31	Sparidae	Diplodus	fasciatus
CV11-200	T31	Soleidae	Pegusa	lascaris
CV11-201	T31	Pomacentridae	Chromis	lubbocki
CV11-202	T31	Pomacentridae	Chromis	lubbocki
CV11-203	T31	Sparidae	Diplodus	prayensis
CV11-204	T31	Sparidae	Diplodus	prayensis
CV11-205	T31	Haemulidae	Pomadasys	incisus
CV11-206	T31	Haemulidae	Pomadasys	incisus

CV11-207	T31	Carangidae	Caranx	crysos	
CV11-208	T31	Carangidae	Caranx	crysos	
CV11-209	T31	Carangidae	Decapterus	punctatus	
CV11-210	T31	Carangidae	Decapterus	punctatus	
CV11-211	T31	Carangidae	Selar	crumenophthalmus	
CV11-212	T31	Carangidae	Selar	crumenophthalmus	
CV11-213	T31	Sphyraenidae	Sphyraena	viridensis	no specimen
CV11-214	T31	Antennariidae	Antennarius	striatus	
CV11-215	T31	Antennariidae	Antennarius	striatus	
CV11-216	T31	Syngnathidae	Hippocampus	hippocampus?	
CV11-217	T31	Apogonidae	?	?	
CV11-218	T31	Apogonidae	?	?	
CV11-219	T34	Muraenidae	Uropterygius	wheeleri	
CV11-220	T35	Epigonidae	Epigonus	telescopus	
CV11-221	T35	Epigonidae	Epigonus	telescopus	
CV11-222	T35	Emmelichthyidae	Erythrocles	monodi	
CV11-223	T35	Emmelichthyidae	Erythrocles	monodi	
CV11-224	T35	Carangidae	Uraspis	helvola	
CV11-225	T35	Ophichthyidae	Ophichthus	ophis	
CV11-226	T36	Physidae	Physiculus	microbarbatum	
CV11-227	T36	Physidae	Physiculus	microbarbatum	
CV11-228	T36	Congridae	Gnathphis	mystax	
CV11-229	T36	Sternoptychidae	Argyriphus	atlanticus	
CV11-230	T36	Sternoptychidae	Argyriphus	atlanticus	
CV11-231	T36	Centriscidae	Macroramphosus	scolopax	
CV11-232	T36	Centriscidae	Macroramphosus	scolopax	
CV11-233	T36	Ophichthyidae	Echelus	myrus	No Photo
CV11-234	T36	Trachichthyidae	Gephyoberyx	darwinii	
CV11-235	T37	Monocanthidae	Aluterus	scriptus	
CV11-236	T38	Fistularidae	Fistularia	tabacaria	
CV11-237	T38	Tetraodontidae	Sphoeroides	pachygaster	
CV11-238	T38	Tetraodontidae	Sphoeroides	pachygaster	
CV11-239	T38	Antennariidae	Antennarius	pardalis	
CV11-240	T37	Carangidae	Seriola	fasciata	Juvenile

ANNEX VIII. LIST OF SPECIES FOR CONSERVATION AT INDP, CAPE VERDE

1 exemplar per specie

Station 14	
	<i>Lophius sp.</i>
	<i>Antigonia capros</i>
	<i>Synodus saurus</i>
	<i>Aroglossus imperealis</i>
	<i>Pagellus acarne</i>
	<i>Fistularia petimba</i>
Station 16	
	<i>Diodon histrix</i>
	<i>Zeus faber</i>
	<i>Mustelus mustelus</i>
	<i>Dentex macrophthalmus</i>
	<i>Antenarius pardalis</i>
Station 17	
	<i>Sphoeroides pachygaster</i>
	<i>Synchinapus phaeton</i>
	<i>Chlorophthalmus sp.</i>
	<i>Aulopus filamentosus</i>
	<i>Pontinus sp.</i>
	<i>Bembrops heterurus</i>
	<i>Heptabrachias parlo</i>
	<i>Cytopsis roseus</i>
	<i>Peristidion cataphractum</i>
Station 18	
	<i>Parapercis atlantica</i>
	<i>Aluterus sp.</i>
	<i>Cubiceps sp.</i>
	<i>Dactylopterus volitans</i>
Station 20	
	<i>Caranx crysos</i>
	<i>Galeoides decadactylus</i>
	<i>Albula vulpes</i>
	<i>Lithognathus mormyrus</i>
Station 22	
	<i>Ophichthus ophis</i>
	<i>Trachinotus goreensis</i>
	<i>Synodus synodus</i>
	<i>Sphoeroides marmoratus</i>

	<i>Chylomicterus spinosus</i>
	<i>mauritanicus</i>
	<i>Scorpaena notata</i>
Station 23	
	<i>Aluterus sp.</i>
	<i>Antenarius pardalis</i>
	<i>Antenarius stratus</i>
Station 29	
	<i>Aulostomus strigosus</i>
	<i>Bembrops heterurus</i>
	<i>Monolene microstoma</i>
	<i>Parapercis atlantica</i>
	<i>Pontinus KuhlII</i>
	<i>Pontinus accraensis</i>
Station 30	
	<i>Sphoeroides pachygaster</i>
	<i>Peristidion cataphractum</i>
	<i>Synchirops phaeton</i>
Station 31	
	<i>Boops boops</i>
	<i>Diplodus prayensis</i>
	<i>Achanthurus monroviae</i>
	<i>Pomadasys incisus</i>
	<i>Caranx crysos</i>
	<i>Chromis lubbocki</i>
	<i>Chaetodon robustus</i>
	<i>Sphyraena viridensis</i>
Station 36	
	<i>Echelus myrus</i>
	<i>Chlorophthalmus agassizii</i>
	<i>Gephyoberix darwinii</i>
	<i>Physiculus microbarbata</i>
	<i>Gnatophis mystax</i>

ANNEX IX. SOFT SEDIMENT MACROBENTHOS AND SEDIMENTS FOR THE UNIVERSITY OF BERGEN

Station	Date	Type	EtOH	formalin	5 mm formalin	5 mm EtOH	> 5 mm - 1 mm formalin	> 5 mm - 1 mm EtOH	> 1 mm - 0,5 mm formalin	> 1 mm - 0,5 mm EtOH
SL 1	6/8/2011	Bulk			1	2	6	6	1	1
		Lettfraksjon							2	2
		Tungfraksjon			1	1	2	2	1	1
		Sortert	1	5						
SL 2	6/9/2011	Bulk								
		Lettfraksjon							2	2
		Tungfraksjon			1	1	5	4	1	
		Sortert								
SL 3	6/9/2011	Bulk								
		Lettfraksjon								
		Tungfraksjon								
		Sortert	2	3						
SL 4	6/9/2011	Bulk			1	1	4	4	1	
		Lettfraksjon							1	1
		Tungfraksjon								
		Sortert		1						
SL 5	6/10/2011	Bulk								
		Lettfraksjon							1	1
		Tungfraksjon							3*	3*
		Sortert	2	3						
SL 6	6/11/2011	Bulk			2	2	3	3	2	1
		Lettfraksjon							2	2
		Tungfraksjon								
		Sortert								
SL 7	6/15/2011	Bulk								
		Lettfraksjon							2	2
		Tungfraksjon					3	3		2
		Sortert		1						
SL 8	6/17/2011	Bulk					3	3		1
		Lettfraksjon							2	2
		Tungfraksjon								
		Sortert		1						
SL 9	6/18/2011	Bulk					5	5	1	1
		Lettfraksjon								
		Tungfraksjon								
		Sortert								
BT 5	6/8/2011	Lettfraksjon								
		Div/sortert	3							
		Bulk								
BT 6	6/8/2011	Lettfraksjon								
		Div/sortert	1	2						
		Bulk								
BT 10	6/10/2011	Lettfraksjon	1	1						
		Div/sortert	1	1						
		Bulk								
BT 13	6/10/2011	Lettfraksjon		1						
		Div/sortert								
		Bulk								
BT 16	6/11/2011	Lettfraksjon	1	1						
		Div/sortert		1						
		Bulk								
BT 18	6/11/2011	Lettfraksjon	2	1						
		Div/sortert		2						
		Bulk								
BT 19	6/11/2011	Lettfraksjon	1	1						
		Div/sortert		2						
		Bulk								
BT 22	6/12/2011	Lettfraksjon	1??	2??	alle tre står oppført som FORM					
		Div/sortert								
		Bulk								
BT 23	6/12/2011	Lettfraksjon	1	1						
		Div/sortert		1						
		Bulk								
BT 24	6/12/2011	Lettfraksjon	1							
		Div/sortert								
		Bulk		1						
BT 25	6/13/2011	Lettfraksjon								
		Div/sortert	1							
		Bulk								
BT 28	6/14/2011	Lettfraksjon	1	1						

ANNEX X. SWEEP AREA ANALYSES PER REGION

Region 1.

SPECIES NAME	Lower limits, Kg/ nm					% inci- denc e	Mean dens. t/nm ²	30-50 m	50-100 m	100-50 0m
	>0	10	30	10 0	30 0					
Dentex macrophthalmus	2		1	1	1	25	3.55 4		0.02	17.709
Galeoides decadactylus	1	1			1	15	2.48 5	11.59 2	0.277	
Antigonia capros	3	1	3	1		40	2.29 8		2.593	3.712
RAYDA63	1		2	1		20	1.19 9	1.098	1.633	
ARGGL01			1	1		10	1.14 3			5.715
Dactylopterus volitans	10	3	2			75	0.99 2	2.378	0.86	
Strombus latus	3	1	2			30	0.77 6	3.801	0.027	
Pseudupeneus prayensis	5	3	2			50	0.72 8	3.017	0.206	0.003
Ariomma melanum				1		5	0.57 6			2.882
Lethrinus atlanticus		4	1			25	0.44 6	1.877	0.118	
Mustelus mustelus	11	3				70	0.38 6	0.718	0.359	0.136
Selar crumenophthalmus	1		1			10	0.36 1	1.732	0.025	
Fistularia petimba	16	1	1			90	0.35 5	0.054	0.549	0.072
Rhizoprionodon acutus	4	1	1			30	0.32 8	1.012	0.209	
Diodon holocanthus			1			5	0.30 6	1.532		
Diodon hystrix	5	2				35	0.30 6	1.315	0.071	
Balistes capriscus	4	2				30	0.27 7	0.608	0.259	
Lithognathus mormyrus		3				15	0.26 6	0.52	0.27	
Illex sp.	2		1			15	0.24 1			1.206
Balistes punctatus	1	3				20	0.19 9	0.994		
Dasyatis pastinaca			1			5	0.19 9		0.331	
Zenopsis conchifer	2	2				20	0.18 7		0.006	0.919
Pagellus acarne	2	1				15	0.17 9			0.893
Stephanolepis hispidus	10					50	0.16 3	0.681	0.043	0.006
Sphoeroides marmoratus	9	1				50	0.13 7	0.109	0.037	0.465
Seriola fasciata		2				10	0.13 3		0.221	
Sphoeroides pachgaster	8					40	0.12 5		0.153	0.167
Sparisoma rubripinne	3	1				20	0.11 10	0.499	0.017	
Rypticus saponaceus	12					60	0.10 1	0.276	0.076	
Acanthurus monroviae		1				5	0.09 7		0.161	
Diplodus fasciatus	1	1				10	0.09 3	0.443	0.008	
Syacium micrurum	12					60	0.08 5	0.009	0.129	0.027
Sargocentron hastatus	3	1				20	0.07 7		0.129	

Pseudocaranx dentex	1	5	0.07	2	0.36		
			0.07	1			
Caranx crysos	3	15	0.07	1	0.047	0.103	
Aulopus filamentosus	3	15	0.06				0.302
			0.05	7	0.208	0.025	
Scorpaena notata	8	40	0.05	5			
Peristedion cataphractum	5	25	0.05	5		0.005	0.26
			0.05	3		0.089	
Pomadasyx incisus	1	5	20.6	36.72			
Sum all species			61	7	10.036	36.468	
Sum SNAPPERS, JOBFISHES			0.00	2		0.003	
Sum GROUPERS, SEABASSES			0.05	2	0.001	0.086	
Sum GRUNTS, SWEETLIPS			0.11	1	0.175	0.127	
Sum CROAKERS, DRUMS, WEAKF., KOBES							
Sum PANDORAS, PORGIES, SEABREAMS,			4.13	5	1.129	0.315	18.603
Sum SHARKS, CHIMAERAS			0.72	9	1.729	0.569	0.209
Sum BATOID FISHES, RAYS			1.41	9	1.098	1.992	0.024
			0.30	7		0.018	1.481
Sum CEPHALOPODS							
Numbers of stations included in analysis, total and by depth strata			20	4	12	4	

Region 2

SPECIES NAME	Lower limits, Kg/nm			% incidence	Mean density, t/nm ²	30-50 m	50-100 m	100-500 m
	>0	10	30					
RAYDA63			2	33.3	1.56		3.134	
				3	7			
Mustelus mustelus	1		1	33.3	1.50	0.471	2.703	
Dactylopterus volitans	4		1	83.3	0.99	0.423	1.646	0.198
				3	7			
Dasyatis centroura		1		16.6	7		0.901	
				66.6	0.27			
Seriola fasciata	3	1		7	4	0.167	0.436	
				33.3				
Balistes capriscus	1	1		3	0.26	0.588	0.127	
				16.6				
Gephyroberyx darwini		1		7	0.21			1.26
Pseudocaranx dentex	2			33.3	0.16	0.237	0.181	
				3	9			
Aulopus filamentosus	1			16.6				
				7	0.13			0.783
				33.3	0.11			
Aluterus heudelotii	2			3	3	0.184	0.103	
				16.6	0.08			
Aluterus schoepfi	1			7	9		0.177	
				16.6	0.06			
Aluterus sp.	1			7	9	0.208		
					0.04			
Fistularia tabacaria	3			50	5	0.095	0.027	
				16.6	0.04			
Seriola rivoliana	1			7	3	0.13		
Rypticus saponaceus	5			83.3	0.04			
				3	1	0.07	0.035	
Sphoeroides	3			50	0.03	0.008	0.07	

marmoratus			8			
Pseudupeneus		33.3	0.03			
prayensis	2	3	6	0.107		
Chlorophthalmus		16.6	0.02			
agassizi	1	7	9			0.174
		16.6	0.02			
Illex coindetii	1	7	8			0.17
		66.6	0.02			
Fistularia petimba	4	7	7	0.02	0.04	
		33.3	0.02			
Diodon hystrix	2	3	4	0.008	0.043	
		16.6	0.02			
Diodon sp.	1	7	2	0.067		
		16.6	0.02			
MORPH60	1	7	2			0.134
Synchiropus		16.6	0.02			
phaeton	1	7	1			0.127
		16.6	0.02			
Aluterus scriptus	1	7	1	0.062		
		16.6	0.01			
Paraconger notialis	1	7	6	0.049		
		16.6	0.01			
Caranx crysos	1	7	4		0.027	
		16.6	0.01			
Ophichthus ophis	1	7	3		0.025	
		16.6	0.00			
SHRPA49	1	7	2			0.011
		16.6	0.00			
Heterocarpus sp.	1	7	1			0.003
		16.6				
Solenocera sp.	1	7				0.001
			0.09			
Other fish			9	0.093	0.044	0.275
			6.37			
Sum all species			9	2.986	9.721	3.137
Sum SNAPPERS, JOBFISHES						
Sum GROUPERS, SEABASSES						
Sum GRUNTS, SWEETLIPS						
Sum CROAKERS, DRUMS, WEAKF., KOB						
Sum PANDORAS, PORGIES, SEABREAMS,						
			1.50			
Sum SHARKS, CHIMAERAS			8	0.471	2.703	
			2.01			
Sum BATOID FISHES, RAYS			8	0.002	4.035	
			0.03			
Sum CEPHALOPODS			5	0.002	0.005	0.193
Numbers of stations included in analysis, total and by depth strata			6	2	3	1