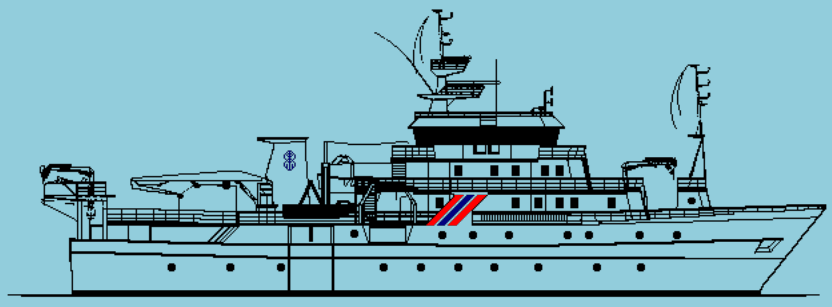

MYANMAR

Ecosystem Survey

13 NOVEMBER – 17 DECEMBER 2013

Institute of Marine Research

Norway

CRUISE REPORT "DR. FRIDTJOF NANSEN"

MYANMAR
Ecosystem Survey

13 NOVEMBER – 17 DECEMBER 2013

by

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THE EAF-NANSEN PROJECT

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

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

LE PROJET EAF-NANSEN

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

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

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1. INTRODUCTION

This survey with the Research Vessel "Dr. Fridtjof Nansen" in Myanmar came about after a request from Myanmar Department of Fisheries (DoF) to FAO following consultations between the Norwegian Agency for Development Cooperation (Norad), the Bay of Bengal Marge Marine Ecosystem (BoBLME)[1] project and the Department of Fisheries (DoF) of Myanmar.

The survey was implemented within the framework of a Tripartite Agreement between Norad (on behalf of the Norwegian Ministry of Foreign Affairs), the Institute of Marine Research of Bergen (IMR) and FAO. The survey by the R/V Dr. Fridtjof Nansen, was conducted between 13 November and 18 December 2013 and covered the shelf and slope from the border with Bangladesh in the north to the border with Thailand in the south.

FAO has been collaborating with Norad and the Institute of Marine Research of Bergen, Norway to carry out fisheries resources and environment surveys in developing countries in Africa, Asia and Latin America using the vessel R/V Dr Fridtjof Nansen since 1975.

The old "Dr. Fridtjof Nansen" carried out four surveys in the period 1979-1980 in cooperation with the Burmese (today Myanmar) Government, the Institute of Marine Research and FAO. No fisheries surveys covering the whole coast have been conducted in Myanmar waters since then.
The main purpose of earlier surveys (particularly in the 70s and 80s) was to find new fish resources as a basis for sector development. Today many nations have exploited their resources fully and beyond their Maximum Sustainable Yield (MSY) and other human activities are threatening the marine environment. Surveys can provide unique information on various aspects of ecosystem status, valuable not only in relation to fisheries management, but also in the context of marine spatial planning and ecosystem management.
Myanmar is the largest fishing nation in the Bay of Bengal region. Total marine catches are uncertain but estimates ranges as high as 1.3 – 1.8 million tons per year. The wild fish and livestock sector contributes around 9 % to the GDP and large part of the human population finds their livelihood in this sector[2]. Oil and gas exploration are being planned but very little is known on the possible impacts of these activities on the marine environment and its resources.

Ecosystem based approaches to management require a more comprehensive knowledge of the ecosystem and fishery-independent surveys are thus of high relevance. This survey was planned as a baseline-study of the shelf and upper slope within Myanmar EEZ, to assess the abundance of demersal and pelagic fish resources, as well as carry out investigations on biodiversity, zoo- and phytoplankton and the physical environment.

1.1. The Survey area

[1] The BOBLME is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Global Environment Facility (GEF), Norad, Sida, FAO, NOAA and World Bank.

[2] http://www.fao.org/fi/oldsite/FCP/en/MMR/profile.htm

The BOBLME “National Report of Myanmar On the Sustainable Management of The Bay of Bengal Large Marine Ecosystem” gives a overview of Myanmar and the marine sector. Myanmar is the largest country in mainland Southeast Asia comprising a land area of over 676,577 square kilometres and geographically located between latitudes 9º 32' and 28º 31' N, and longitudes 92º 10' and 101º 11' E, thus stretching over 2280 kilometres. It shares common maritime boundaries with Bangladesh in the north-east of the Bay of Bengal and with Thailand and India in the Andaman Sea which is a part of the Bay of Bengal. Myanmar continental shelf covers approximately 230,000 sq.km, and is relatively wider in the central and southern parts. The Exclusive Economic Zone (EEZ) is about 486,000 sq.km. The coastal zones of Myanmar can be subdivided into three main areas, namely the Rakhine Coast, Ayeyarwady Delta and Tanintharyi Coast. Many rivers flow into the coastal zones such as the "Mayu" and "Kaladan" rivers in the Rakhine Coastal area: the "Ayeyarwady", "Sittaung" and "Thanlwin" rivers in Delta coastal area and the "Ye", "Dawai", "Tanintharyi" and "Lenya" rivers in the Tanintharyi coastal area.

1.2. Aims and objectives

The purpose of the R/V ‘Dr. Fridtjof Nansen’ survey was established during a meeting held on 15 October in the Myanmar capital Nay Pyi Taw between representatives from Myanmar Department of Fisheries, IMR, FAO, and BOBLME, and during a second meeting held onboard the vessel on t 12 November between representatives of Myanmar FAO, BOBLME and the Cruise leader outlining the priorities in terms of thematic sampling to be achieved during the ecosystem survey

Based on the sampling priorities and discussions during the meeting the main objectives of the survey were set as follows:

- To obtain information on demersal fish abundance and biodiversity by demersal trawling where conditions for bottom-trawling are adequate.
- To determine the distribution and abundance of small pelagic fish resources using acoustic methods and a systematic grid survey strategy.
- Additional biological sampling from trawl catches to collect data on size distribution, further biological information and genetic material from selected species.
- To establish as far as possible the distribution, abundance and composition of other taxa at different trophic levels along the shelf (phyto- and zooplankton, fish eggs and larvae)
- Map the environmental conditions in the survey area (temperature, salinity, oxygen, chlorophyll, nutrients and sediments).
- Capacity building of BOBLME trainees and young scientists.

1.3. Participation

A total of 24 scientists and technicians from Myanmar and Norway 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.

Participants:	Institution	Nationality	Embarkation date	Disembarkation date	e-mail address
Jens-Otto Krakstad (Cr. leader) 1st leg	IMR	Norway	11.11	2.12	jensotto@imr.no
Kathrine Michalsen (Cr. leader) 2nd leg	IMR	Norway	2.12	19.12	kathrine.michalsen@imr.no

Diana Zaera	IMR	Norway	11.11	2.12	
Merete Kvalsund	IMR	Norway	2.12	19.12	
Bjørn Krafft	IMR	Norway	11.11	2.12	
Espen Bagøien	IMR	Norway	2.12	19.12	
Oddgeir Alvheim	IMR	Norway	11.11	19.12	
Tore Mørk	IMR	Norway	11.11	19.12	
Jan Frode Wilhelmsen	IMR	Norway	11.11	2.12	
Jarle Kristiansen	IMR	Norway	2.12	18.12	
Mya Than Tun (Local Cr. leader)	DoF	Myanmar	11.11	18.12	myathantundof@gmail.com
Htun Thein	DoF	Myanmar	11.11	18.12	htuntein.akyab@gmail.com
Win Ko Ko	DoF	Myanmar	11.11	18.12	kowinko.do@gmail.com
Han Win	DoF	Myanmar	11.11	18.12	
Aung Win Sein	DoF	Myanmar	11.11	18.12	
Zay Yar Min	DoF	Myanmar	11.11	18.12	
SanThar Tun	MCU	Myanmar	11.11	2.12	
Kyaw Thuya	MCU	Myanmar	11.11	2.12	
Zin Lin Khing	MCU	Myanmar	2.12	18.12	
Nyo Nyo Tun	MCU	Myanmar	2.12	18.12	
Myo Min Tun	MCU	Myanmar	11.11	18.12	Myomintun51Mmt@gmail.com
Naung Naung Oo	MCU	Myanmar	11.11	18.12	
Wai Yan Tin Oo	NAVY	Myanmar	11.11	18.12	
Khin Maung Aye	DoF	Myanmar	11.11	18.12	

List of institution abbreviations:
IMR - Institute of Marine Research
DoF - Department of fisheries, Ministry of Livestock, Fisheries and Rural Development
MCU – Mawlamyine University, Mon State
NAVY - Myanmar Navy Hydrographic office

1.4. Narrative

The vessel left port in Yangon, Myanmar 13 November at 06:30 local time (local time = UTC+6.5 hours) to go to anchorage and wait for high tide to go down the river. The vessel then moved to the northern part of the survey area to start the sampling program. The first transect at 19°26' N was reached on the 14 November at 21:41 UTC. The coverage of the northern Rakhine region was completed on 21 November at 13:00 h UTC. The next region, the Delta coastal zone (Gulf of Mottama) was commenced immediately after this. In this region transects were very long and it was decided to set a maximum distance of 20 nm between trawl stations (given that bottom conditions allowed trawling).

The survey was carried out around the clock with the shallow region covered during day while the deep water region was covered at night. This diurnal sampling system was only possible to achieve in the northern region, due to long transects. After a short visit to Yangon to change scientist the 1'st to 2'nd of December, the cruise continued and the Delta region was completed on 30. November at 11:00 h UTC. The third region, the Tanintharyi coast, was completed on 17. Dec at 01:00 h UTC. The cruise was ended by a wrap-up meeting and offloading of samples close to the city of Kaw Thoung.

The survey transects were made perpendicular to depth isobaths and spaced 20 nautical miles (NM) apart. They covered the depth-interval between ~20 m depth near the coast to 500 m depth offshore. Bottom trawling was conducted within four different depth-strata on each of these transects between 20-50 m, 50-100 m, 100-200 m and between 200-500 m depth, but with a maximum distance of 20 nm between trawl stations. When time and bottom conditions permitted, occasional trawls were conducted deeper than 500 m. Pelagic trawls were made to sample acoustic targets, but were also made "blindly" along transects when time permitted. CTD's were taken at each bottom-trawl station.

Every third transect was termed an "Ecosystem transect" with a more elaborate sampling program. These transects extended to 1000 m depth. CTD's were taken at bottom-depths of 1000 m, 500 m, 200 m, 100 m, 50 m and 30 m at the coastal margin of the transect. Additionally, three stations for sampling of nutrients, chlorophyll, phyto- and zooplankton, as well as soft-sediment invertebrates were conducted at positions with bottom-depths of 500 m, 100 m, and 30 m. Trawling was undertaken within the same depth-regions as for all other transects.

Acoustic data from the ER 60 echosounder (18 kHz 38 kHz 120 kHz and 200 kHz transducers), the multibeam bottom mapping echosounder SM710 ADCP data, and data from the thermosalinograph and weather station were recorded continuously during the survey.

Survey effort

For the purpose of acoustic and swept area abundance estimation the coast was divided into three regions. The first region (the Rakhine coastal zone) included the area from the border to Bangladesh to Mawtin Point. Region two (the Deltaic coast) covered the central Myanmar delta region, while region three (the Tanintharyi coast) covered the area from Htarwe to the border with Thailand (Figure 1.1). The cruise tracks with bottom-trawls and pelagic trawl station can be found in Figure 1.1. while the hydrographic stations and the position of the ecosystem transects can be found in Figures 1.2. 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) and benthos sampling stations, as well as the distance covered (NM) during the survey by sub-areas.

Region	Nautical miles	Bottom trawls valid per depth region						Pelagic trawls	CTD	Plankton*	Sediment**
		Total	>15	>50	>100	>200	>500				
Rakhine cost	962	41	14	13	12	2	0	3	72	15	42
Deltaic cost	2158	58	14	22	17	5	0	0	79	11	58
Tanintharyi coast	1500	46	2	18	11	13	2	0	63	12	45
Total	4620	145	30	53	40	20	2	3	214	38	145

*Each plankton station consists of 4 different plankton nets (see methods)

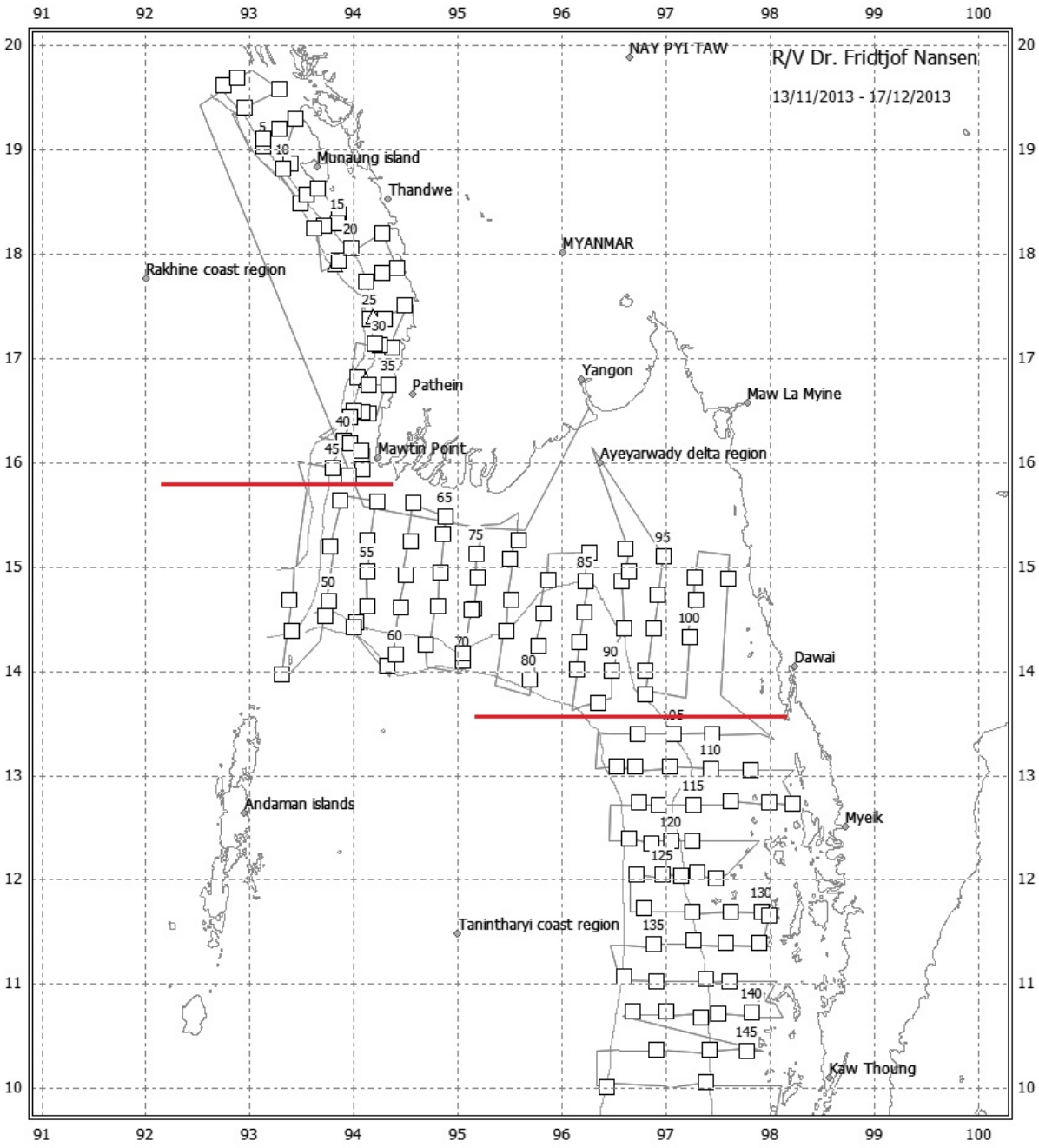


Figure 1.1. Course track with bottom (□) and pelagic (Δ) trawl stations. The 100 m and 500 m depth contour is indicated. The red lines indicates the separation between the three main regions.

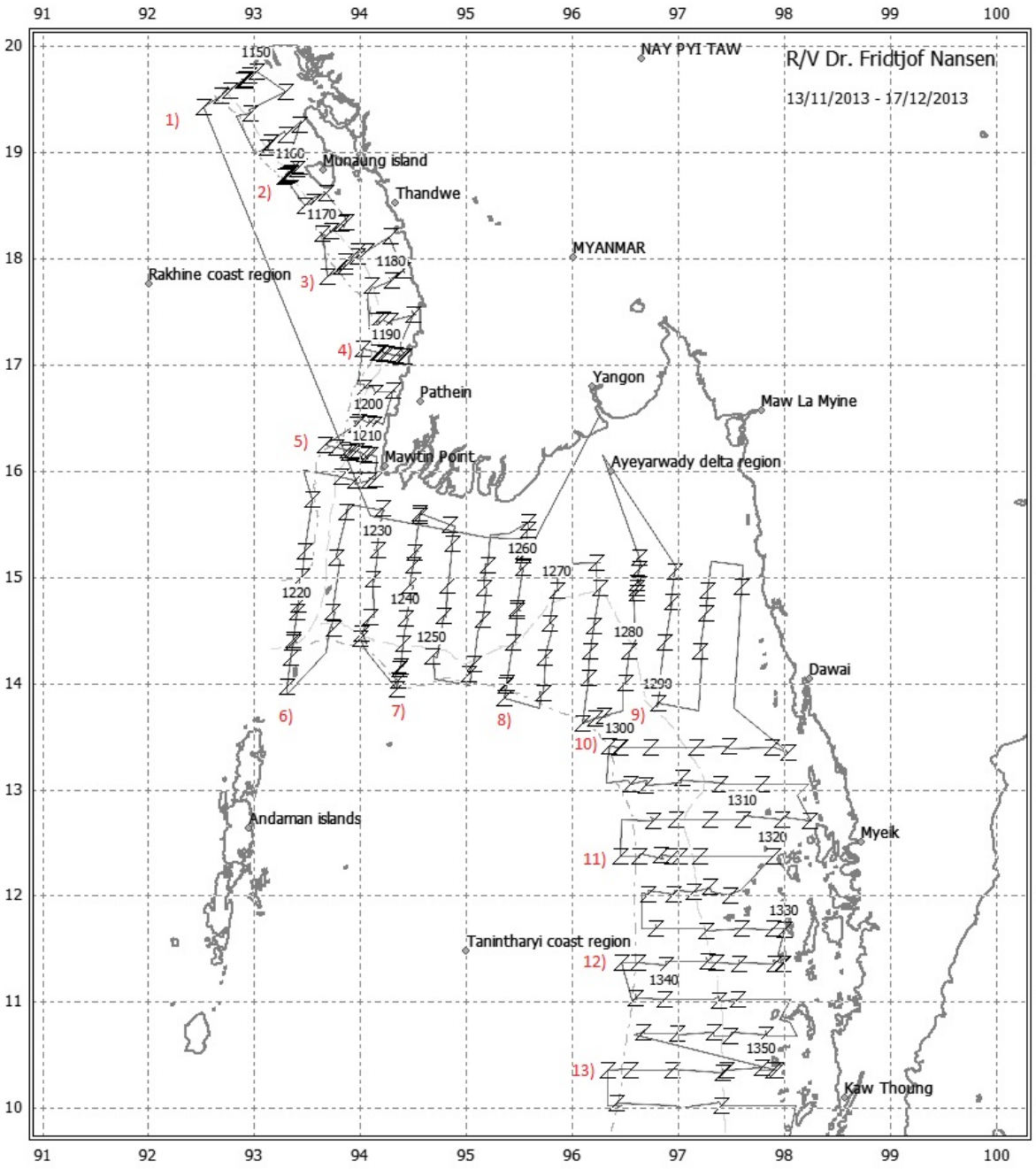


Figure 1.2 Course track with hydrographic (Z) stations. The 100 m and 500 m depth contour is indicated. The numbers 1-13 indicate the position of the “Ecosystem transect”.

2. METHODS

2.1. Meteorological and hydrographical sampling

Meteorological observations
Wind direction and speed, air temperature, air pressure, relative humidity and sea-surface temperature (5 m depth) were logged automatically every 60 sec. with an WIMDA meteorological sensor.

CTD
Vertical profiles of temperature, salinity, fluorescence, and oxygen were obtained by the Seabird 911 plus probe. The CTD was equipped with an uncalibrated Aqua Tracka MK III fluorometer, SBE 3plus temperature sensor, SBE 4C conductivity sensor, and a SBE 43 oxygen sensor. Real-time logging and plotting was done using the Seabird Seasave software installed on a PC. Above the shelf and slope the profiles ranged from the surface to within a few metres above the bottom. Offshore the maximum sampling depth was 1500 m. Horizontal near-surface (5 m depth) distributions of temperature (°C), salinity (PST)), oxygen (ml/l) (lower left) and fluorescence (index on relative scale) for various regions of the Myanmar coastal area were made by use of the software Ocean Data View, interpolating by DIVA gridding (Ocean Data View, Schlitzer, R., http://odv.awi.de, 2013). Vertical distributions of the same variables for selected oceanographic transects were made the same way (see Results). Note varying colour scales among the various figures.

8 Niskin water-bottles (10 l) attached to a CTD-mounted rosette were used to collect water at predefined depths (see below).

A Portasal salinometer (mod. 8410) was used to validate/calibrate the salinity (conductivity)-measurements from the CTD.

For validation of the oxygen-measurements from the CTD-mounted sensor, the oxygen-concentrations in sea-water samples from all 8 Niskin-bottles at selected deep plankton-stations were analyzed by the Winkler redox titration method following the procedures of Hagebø (2008). To calculate oxygen-concentration per weight-unit of seawater, a sea-water sample for oxygen-analyses was collected first from the Niskin-bottles, and subsequently the water temperature from the same Niskin bottle was measured. These temperature-data were used to calculate potential temperature at the time when the Winkler-reagents were added.

Seawater samples (20ml) for nutrient analyses (nitrate, nitrite, silicate and phosphate) were taken from the Niskin water-bottles at; 25 and 5 m at the shallow plankton-stations (30 m bottom-depth), at 100, 75, 50, 25, and 5 m at the intermediately deep plankton stations (100 m bottom-depth), and at 500, 300, 200, 100, 75, 50, 25, and 5 m at the deep plankton-stations (500 m bottom-depth). The seawater samples were stored in 20 ml polyethylene vials, conserved with 0.2 ml chloroform, and kept cool and dark in a refrigerator (Hagebø and Rey, 1984). Due practical challenges, the transportation of the samples from the ship to the laboratory in Bergen took 3 days. During this period the samples were subject to the temperature of the surrounding environment. The analyses were made on shore by Institute of Marine Research (Bergen, Norway), using a modified Alpkem Auto Analyzer C (O I Analytical, USA) and following standard procedures (Strickland and Parsons,

1972). Extra standards were added during the analysis in order to cover the whole measurement range. We cannot discard the possibility of the increased transportation temperature to some degree having affected the laboratory results, although we did not see clear signs of this. During the laboratory's quality control of the data, some outlying values that were obviously wrong were excluded. The quality control included evaluation of the ratios between the different nutrients. In this report we only present the nutrient results that seem to be sound.

Chlorophyll *a* is a plant pigment, which in oceanography typically is used as an indirect measure for phytoplankton biomass. For analysis of chlorophyll *a* and phaeopigment concentrations, water-samples (263 ml) were collected from the CTD-mounted Niskin bottles at the same standardized depths as described above for the nutrients, but also from surface-samples collected with a bucket. The water-samples were filtered on Munktell glass-fiber filters (GF/C 25 mm diameter) using a custom-made filtration system. The filters were then stored in the dark at -18°C for subsequent analysis on shore. After the cruise, the pigment samples were transported to the laboratory in a cooling-box with freezing-elements. Due to practical challenges, the transportation of the samples from the ship to the laboratory in Bergen lasted ca. 2 days, during which the pigment-samples were held dark. The samples were kept in thermally insulated containers with freezing elements during transport, but the temperature in the containers had risen when the samples arrived at their destination in Norway. This was revealed by the freezing elements then being partly thawed. The analyses were made on shore by Institute of Marine Research (Bergen, Norway). The pigments were then extracted with 90% acetone in darkness over night in the laboratory, and the extracts centrifuged and analysed using a Turner Design fluorometer model 10 AU calibrated with pure chlorophyll *a* (Sigma Inc) (Jeffrey and Humphrey, 1975). Fluorescence was measured before and after acidification by a drop of 5% HCl, and concentrations of chlorophyll *a* and phaeorbides estimated according to Holm-Hansen *et al*. (1965). Some chlorophyll may have become degraded during transport due to the increased temperature mentioned above. Hence, we do not discard the possibility of the *in situ* chlorophyll concentrations in the study area actually being higher than here reported. As part of the quality control, the chlorophyll/phaeophytin ratios were evaluated. Some samples showed a comparatively lower chlorophyll/phaeophytin ratio than the rest. These samples were generally collected at depths greater than 50m (hence a natural explanation), and no patterns regarding the stations geographical positions were found with respect to this ratio.

The Mk III Aquatracka fluorometer measures *in situ* fluorescence on relative scale,, which after the cruise was related to absolute chlorophyll *a* concentrations obtained from the laboratory analyses of the samples collected from the water-bottles. Using untransformed raw data for the uppermost 200m, and having removed 1 extreme outlier, the Pearsons correlation coefficient was ~ 0.8 (129 degrees of freedom, p-value < 2×10^{-16}). Adding observations from depths between 200-500 m had little effect on the relationship. Hence, strong fluorescence typically concurred with high chlorophyll concentrations, although the considerable unexplained variation in this relationship should also be noted.

Thermosalinograph

The SBE 21 Seacat thermosalinograph was running continuously during the survey obtaining samples of sea surface (5 m depth) salinity and relative temperature every 10 seconds. An attached in-line C3 Turner Design Submersible Fluorometer measured turbidity and chlorophyll *a* levels.

Current speed and direction measurements (ADCP)
The current profiles were continuously recorded along the path of the vessel by the vessel mounted Ocean Surveyor 150 kHz ADCP. The ADCP has a maximum range between 200 – 400 m depth and transmission of transducer pulses was synchronized with the echo sounder. The system was run in narrow band mode and data were averaged in 8 m vertical bins and stored on files for post survey processing.

A Louvered ADCP (L-ADCP) consisting of two Workhorse 300 kHz ADCP's mounted on the CTD carousel fazing upwards to the surface and downwards, respectively, was used on every 1000 m station to obtain more detailed information about current pattern, especially in deeper waters beyond the range of the vessel mounted ADCP.

All data from the ADCP's will be processed on land after the survey.

2.2. Phytoplankton sampling

At each plankton-station, qualitative phytoplankton samples were collected with a net (35 cm in diameter and mesh-size of 10 µm), hauled vertically from the depth of 30m to the surface (25-0m at the shallow stations). The samples were preserved with 2 ml 20% formalin and stored on dark 100 ml glass bottles for subsequent taxonomic analyses on shore.

In addition mixed water-samples were collected from the Niskin-bottles representing the depths of 25, 5, and 0 m for the 30 m stations, and 50, 25, 5, and 0 m for the 100 m and 500 m stations. These samples were preserved with 2 ml lugol on dark 100 ml glass bottles for subsequent taxonomic analysis on shore.

2.3. Zooplankton sampling

Zooplankton samples were collected with a Hydro-Bios Multinet with mouth-opening area of 0.25 m^2. The Multinet was equipped with 5 nets of mesh-size 180 µm for depth-stratified sampling. The net is equipped with a pressure sensor and two electronic flowmeters. The Multinet sampling was done by oblique hauls, with an average towing speed of ~ 1.35 - 1.55 ms^{-1}. At the shallow (30m) plankton-stations, one net was towed in the 25-0 depth-stratum. At the medium-deep (100m) stations, four nets sampled the strata of 100-75, 75-50, 50-25, and 25-0 m. At the deep (500m) plankton-station, five nets sampled the strata of 200-100, 100-75, 75-50, 50-25, and 25-0 m.

Additionally, at all plankton-stations a WP2 net (56 cm diameter, mesh size 180 µm) (Fraser 1966, Anonymous 1968) as well as a Juday net (36 cm diameter, mesh size 90 µm) (Juday 1916) were hauled vertically from the same maximum depth as for the deepest Multinet (shallow plankton-station 25 m, medium-deep plankton-station 100 m, and deep plankton-station 200 m) to the surface – with a speed of ~ 0.5 ms^{-1}.

For all three types of plankton nets, each sample was divided into two equally large parts using a Motoda plankton splitter (Motoda 1959). Half the sample was preserved with borax-buffered formalin resulting in a final formalin concentration of 4% in a 100 ml plastic bottle for subsequent taxonomic analysis on shore. The other half of the sample was sequentially sieved through three filters to obtain the plankton biomasses representing the size-fractions >2000 µm, 2000-1000 µm, and 1000-180 µm (and 180-90 µm for the samples from the Juday net). The biomass samples were stored on pre-weighed aluminium dishes and dried at ~70 °C for periods of 6–24 h. After drying, the

samples were stored frozen at -18°C for subsequent weighing of biomass dry weight on shore (after a second time of drying).

2.4. Sediment sampling

A stainless steel cylinder was mounted on the footrope of the trawl to collect bottom sediment samples at every trawl station. The samples were collected from the cylinder when the trawl was hauled on deck and stored in a plastic bag (www.eurofins.com), roughly classified according to grain size and stored frozen for further analyses of sedimentological and chemical composition.

2.5. Biological fish sampling

Demersal trawl hauls were taken randomly (within the depth strata described above) on the shelf while pelagic hauls were taken randomly throughout the survey at night and to catch acoustic targets. Annex III describes the fishing gear used during the survey.

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 below (rounding down to nearest cm). Sex was 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 below. 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.

2.6. 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 1000 - 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.

2.7. Single beam acoustic sampling

Acoustic equipment

Acoustic data were recorded using a Simrad ER60 scientific echo sounder equipped with keel-mounted transducers at nominal operating frequencies of 18, 38, 120 and 200 kHz. All transceivers were calibrated close to Kyun Phi Lar, in the southern part of Myanmar on the 14th of December 2013.

Acoustic data were logged and post-processed using the latest acoustic data post-processing software the Large Scale Survey System (LSSS) Version 1.6.1. Technical specifications and operational settings of the echo sounder used during the survey are given in Annex III.

Allocation of acoustic energy to species group

The acoustic data were scrutinized using the LSSS version 1.6.1. Back scatters were displayed at 38 kHz. The mean 5 nautical miles (NM) area backscattering coefficient s_A (m^2/NM^2) was allocated to a predefined set of species groups on the basis of established echogram features. Ground truthing and estimation of mean length and weight were accomplished by means of targeted pelagic and demersal trawling. For carangids and associated species an overall average length of 23 cm and a condition factor of 0.88 were applied. The target groups used during the survey can be found in Table 2.1 while the complete records of fishing stations and catches are shown in Annex I.

Table 2.1 Allocation of acoustic densities to functional species groups. The most typical species in each group are listed.

Group	Taxon	Species
Pelagic species 1	Clupeidae[1]	
		Dussumieria acuta
		Ilisha spp.
		Sardinella gibbosa
	Engraulididae	
		Stolephorus spp.
		Thryssa spp.
Pelagic species 2		
	Carangidae[2]	
		Alectis spp.
		Atule mate
		Atropus atropos
		Caranx spp.
		Carangoides spp.
		Decapterus spp.
		Scomberoides spp.
		Megalaspis cordyla
	Scombridae	*Rastrelliger spp.*
		Scomberomorus spp.
	Sphyraenidae	*Sphyraena spp.*
	Trichiuridae	*Lepturacanthus savala*
Other demersal species	Demersal families	
Mesopelagic species	Myctophidae	
	Other mesopelagic fish	
Plankton	Calanoidae	*Calanus sp.*
	Euphausiidae	*Meganyctiphanes sp.*
	Other 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

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

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

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

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 10 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 (10 cm) to total estimated biomasses of PEL1 and PEL2. 10 cm mean length was made to make the estimates comparable with the historic estimates presented from the 1979 and 1980.

A description of the fishing gears used acoustic instruments and their standard settings are 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 index will reflect any change in population abundances between surveys.

3. WIND, HYDROGRAPHY AND FLUORESCENCE

3.1. Horizontal patterns of wind, near-surface hydrography, oxygen and fluorescence.

Wind speed and direction was recorded from the vessels weather station located in the mast above the wheel house and results are illustrated in Figure 3.1. The horizontal distributions of near-surface temperature, salinity, oxygen and fluorescence, all measured at depth of 5m, are presented in Figures 3.2-3.5. The data presented in these figures were collected by the CTD, and CTD-attached sensors.

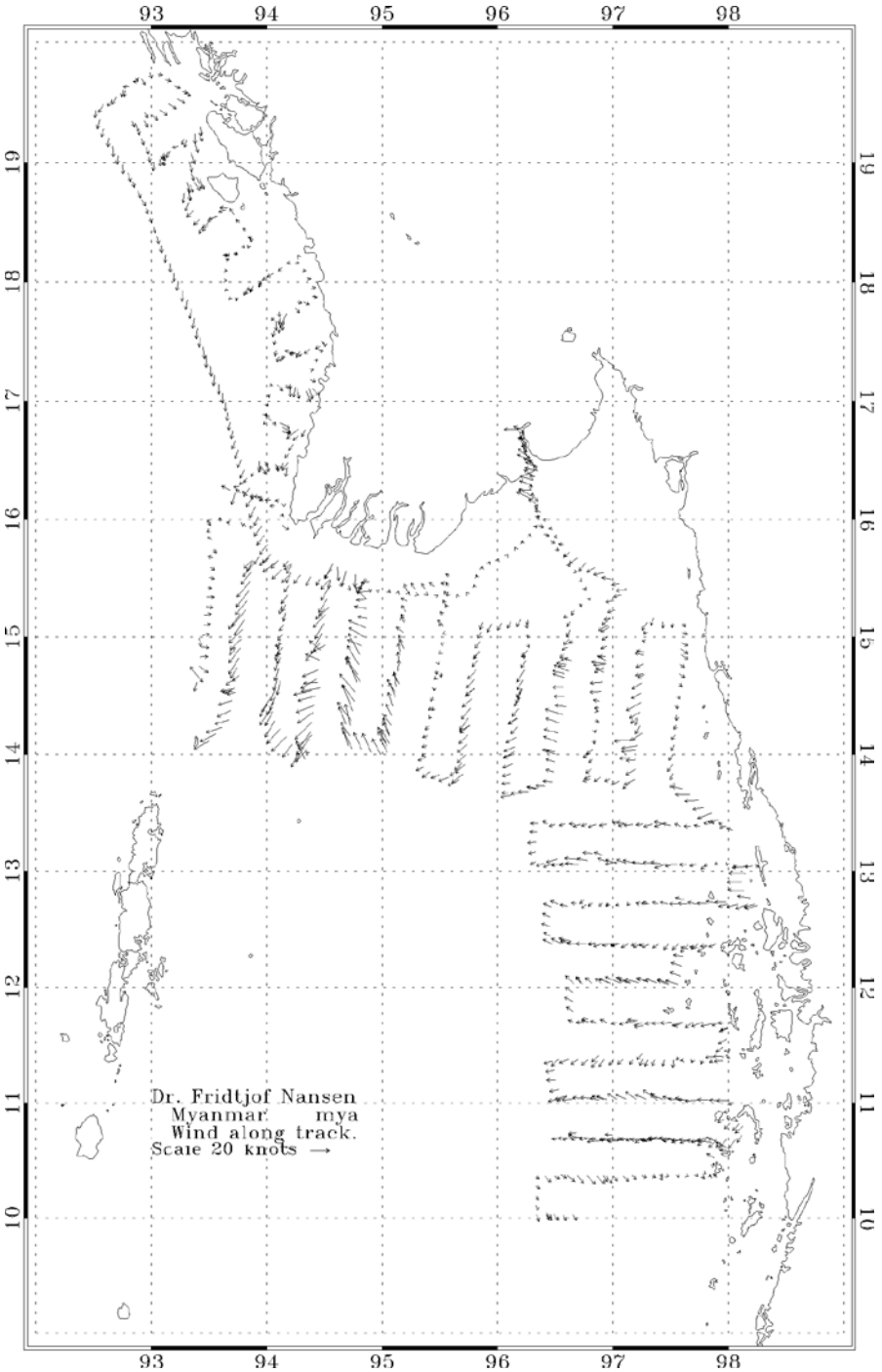


Figure 3.1. Wind speed and direction as recorded from the vessels weather station.

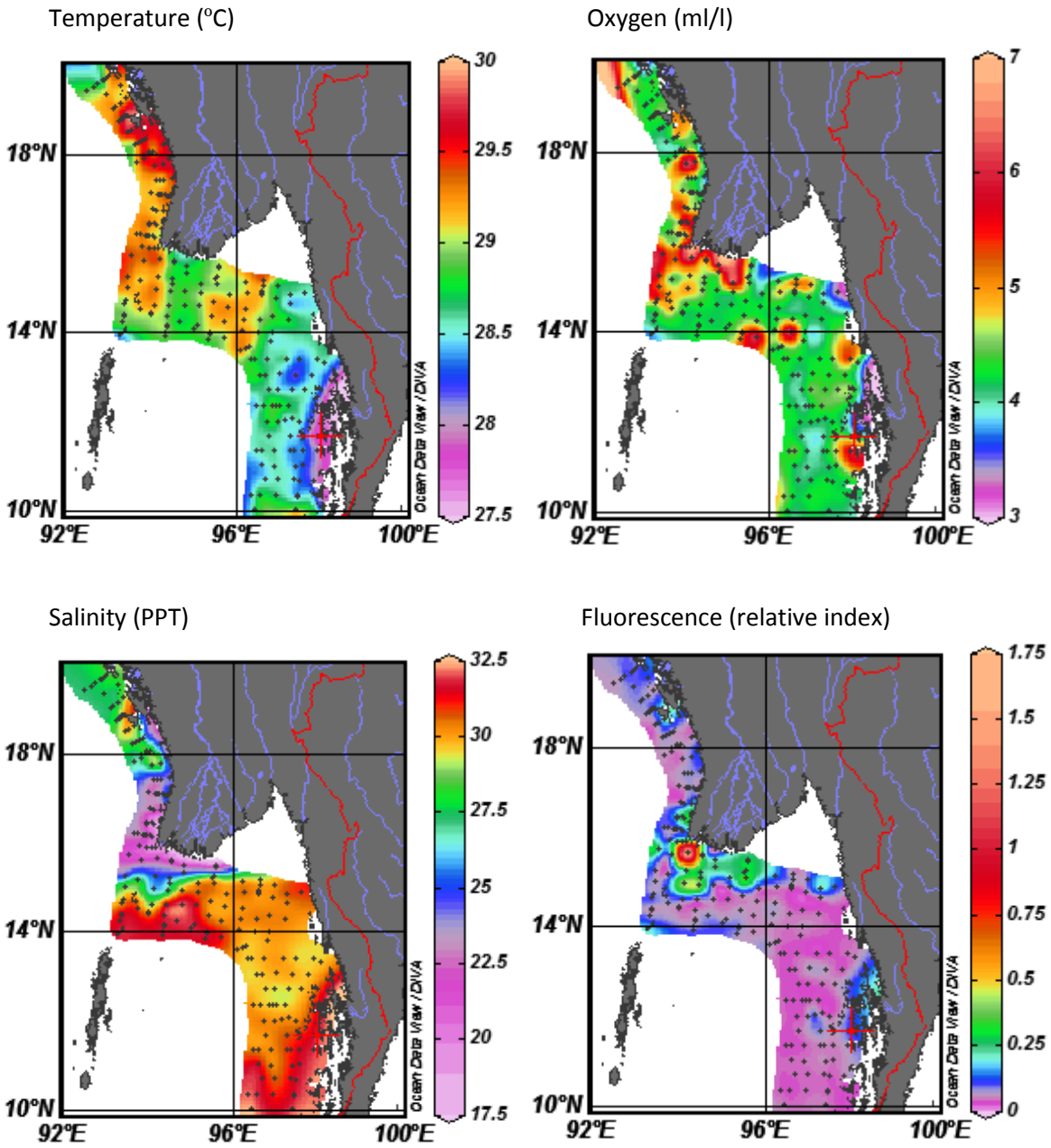


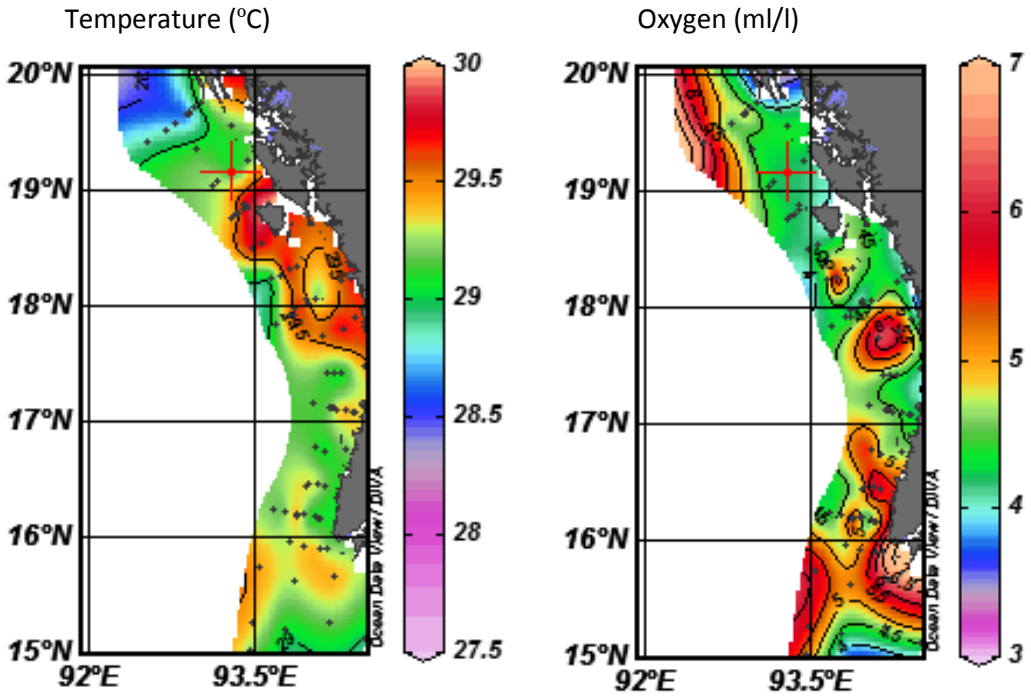
Figure 3.2. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence for the whole Myanmar coastal area. Station positions are indicated as black dots. Produced with the software Ocean Data View, interpolating by DIVA gridding (Ocean Data View, Schlitzer, R., **http://odv.awi.de**, 2013).

The main spatial patterns in near-surface (5m depth) temperature, salinity, oxygen and relative fluorescence within the whole Myanmar coastal area are visualized in figure 3.2. All four variables show spatial dynamics and in some areas also strong gradients. Most notable in the figure are the comparatively warmer upper water-masses along the Rhakine coast, the more saline upper water masses in the southern part of Myanmar coastal area, as well as the fluorescence hotspot in the Ayeyarwady Delta region. In the following, the oceanographic features for the Rhakine coastal region, the Ayeyarwady Delta region, and the Tanintharyi coastal region are presented separately.

The Rakhine coastal zone

A generally calm wind averaging 9.7 m/s (6.9 - 12.7 m/s 25% - 75% percentile) increased slightly as the vessel moved northward (Figure 3.1). The direction was generally from W-NW but with a few changes in direction to NE connected with a local maximum in air pressure and wind.

Near-surface temperature (5m depth) along the Rakhine coastal zone was generally high, with the warmest water masses >29.5° in the central part of the region off Andrew Bay, and decreasing offshore (Figure 3.3). The coolest water masses were found to the north, close to the Bangladeshi border. Near-surface salinity ranged between ~ 18-30, and seemed to be strongly influenced by the runoff from the numerous rivers in the region. Highest salinity was noted in the region around the Munaung island, while the lowest salinity of < 20 occurred in water masses near the coast in the southern part of the region. The oxygen levels measured in the surface layer at depth of 5m were generally quite high, between ~ 4 - 6.5 ml/l, and showed relatively high variability. The highest near-surface relative fluorescence of ~ 0.3 was found in the southern part of the region, off Mawtin point, although elevated levels also were recorded around the Munaung island. We do here not consider the very high levels in the area furthest to the south, since these will be discussed in the section for the Ayeyarwady Delta region.



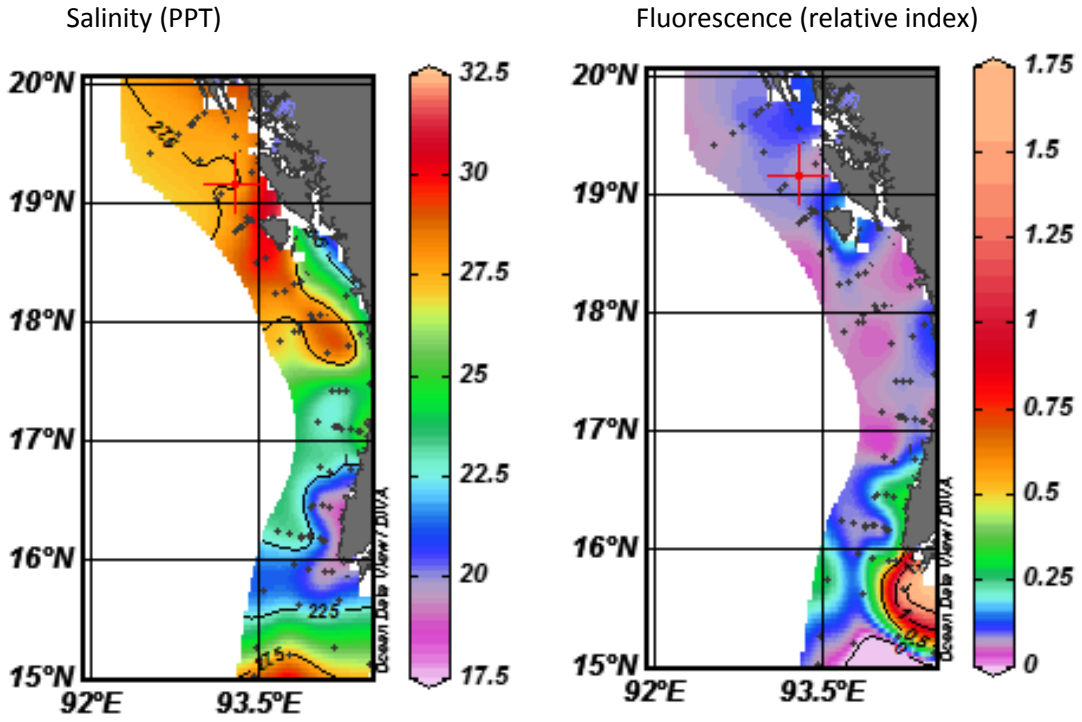


Figure 3.3. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Rhakine coastal region. Station positions indicated as black dots. Note variable colour scales for the different figures.

The Ayeyarwady Delta region

The highest wind speed for the whole cruise was recorded in this area, as the vessel touched the outskirts of a typhoon. The maximum wind speed recorded was 29.7 m/s (Figure 3.1). The direction was variable and changed in direction from NW and SW

Near-surface temperatures (5m depth) above 29°C were observed in the westernmost and mid-parts of the Ayeyarwady Delta region, with a somewhat cooler area stretching southwards in between (Figure 3.4). Furthest to the east of the Delta region, the temperatures were slightly cooler than elsewhere, displaying value down to ~28.5°C. Salinity at 5m depth showed strong variation within the Ayeyarwady Delta region, generally ranging within about 17 and 32. The most conspicuous feature was a sharp and strong north-south gradient, with the lowest levels near shore, and increasing southwards. Oxygen-concentrations at depth of 5m in the Delta region generally ranged within 4 and 6 ml/l. Note that the east- and northernmost areas in figure 3.4 indicated to have values below 4 ml/l seem to be artefacts due to interpolation and few stations in the outermost part of the interpolation-area. Fluorescence (index on relative scale) varied strongly within the Delta region, with the values at 5m spanning from near zero to a maximum of 1.6 at a station just south of Pathein. The very high value of 1.6 was by far the highest value detected at 5m depth for any station in the entire coastal study-area off Myanmar. Still, several stations in the vicinity showed elevated fluorescence levels compared to what was typical in the overall area. In general, the stations near the northern coastline indicated higher phytoplankton concentrations than further south.

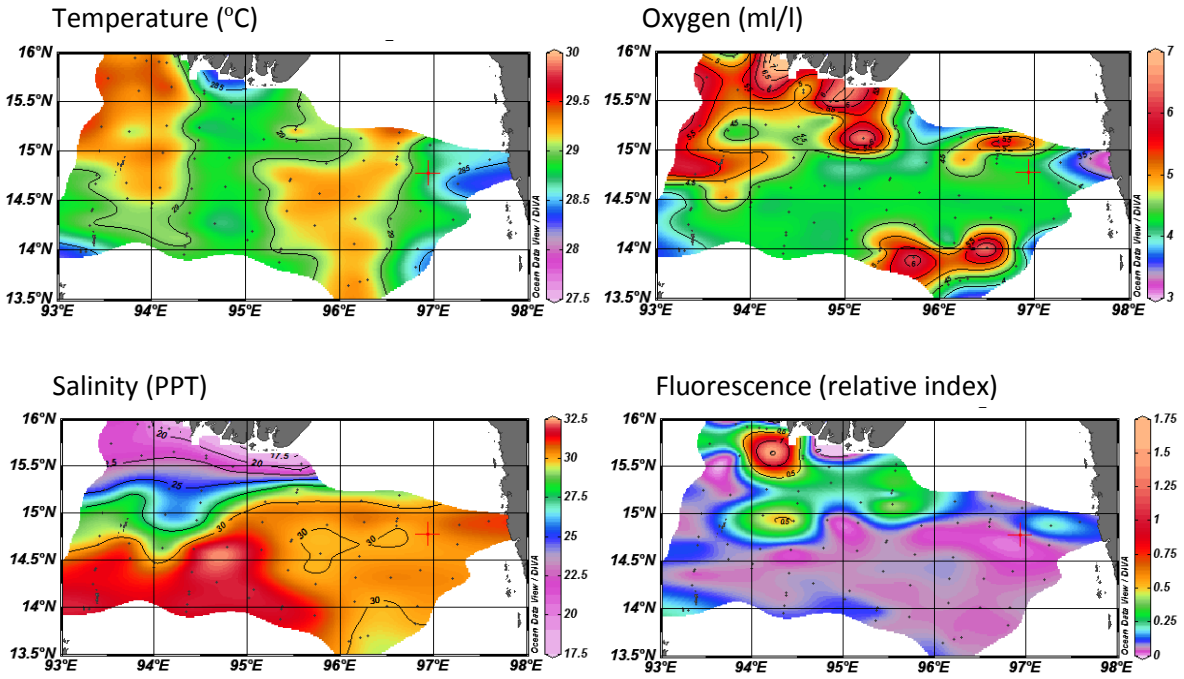


Figure 3.4. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Ayeyarwady Delta region. Station positions indicated as black dots. Note variable colour scales for the different figures.

The Tanintharyi coastal region

Generally calm wind averaging 9.4 m/s (Figure 3.1). The direction was variable, but mainly blowing from land and westwards (SW, NW or W).

Temperatures at depth of 5m in the Tanintharyi coastal region tended to be slightly cooler than in the regions further north (Figs. 3.5 and 3.2). The temperatures were typically about 28-29 °C at this depth, though slightly lower (~27.5-28°C) at some north-eastern stations near the coast. Salinity at 5m was generally above ~29.5, and increasing towards the east and south. The highest 5m levels were encountered in the most southerly area, in some cases with values between 32 and 32.5. Oxygen concentrations at 5m depth in this regions were generally between 4 -5 ml/l, with levels in the higher part of this range and at some stations also > 5 ml/l in the eastern part of the area near the coast. A few coast-near stations in the northern part of the region, however, actually showed 5m oxygen concentrations below 4 ml/l as indicated in Figure 3.5. Fluorescence levels throughout the Tanintharyi coastal region were comparatively low, only with a few stations in the north-eastern part displaying slightly higher values. We note that one particular coastal station (bottom-depth 30m) displayed very high fluorescence at depth of 6 m (no data available for 5m), which is not revealed by Figs. 3.2 and 3.5 which are based on data from 5m. This particular station, no. 1331, also had a high chlorophyll level at ~ 5m.

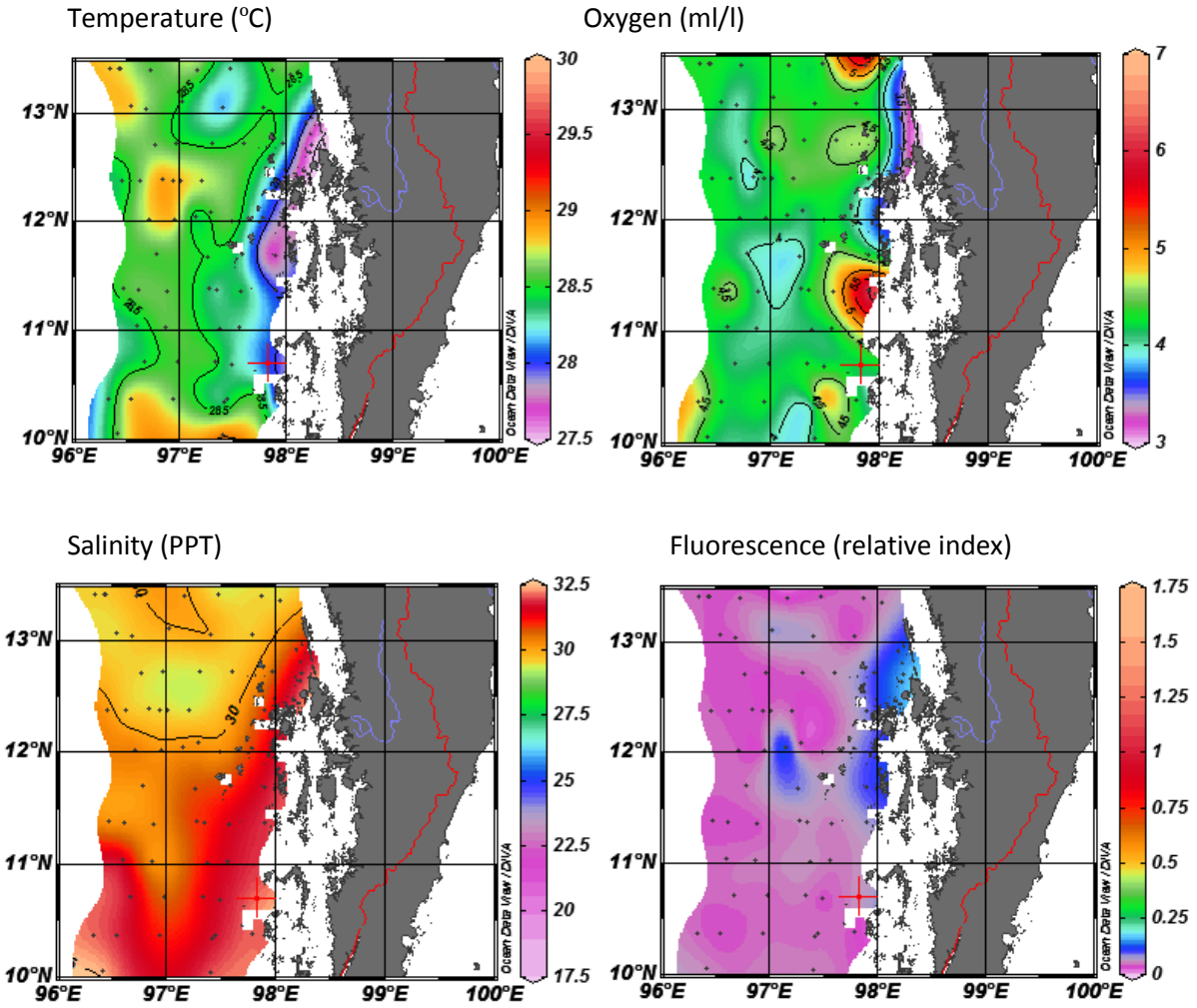


Figure 3.5. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Tanintharyi coastal region. Station positions indicated as black dots. Note variable colour scales for the different figures.

3.2. Cross-shelf vertical profiles for hydrography, oxygen and fluorescence.

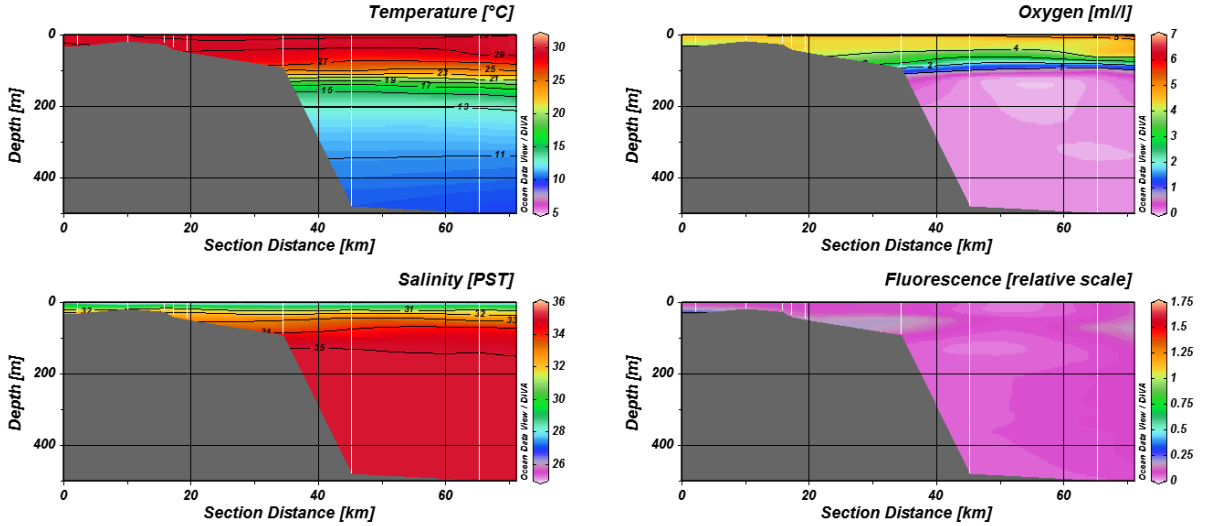
Cross shelf CTD profiles were made for all environmental transects. Stations were taken at predefined depths with a maximum depth of 1000 m. All casts were made to within a few meters from the bottom. Figures 3.6 - 3.8 shows vertical distributions of temperature, salinity, oxygen, and fluorescence along the "ecosystem" transects down to 500 m depth.

The Rakhine coastal region

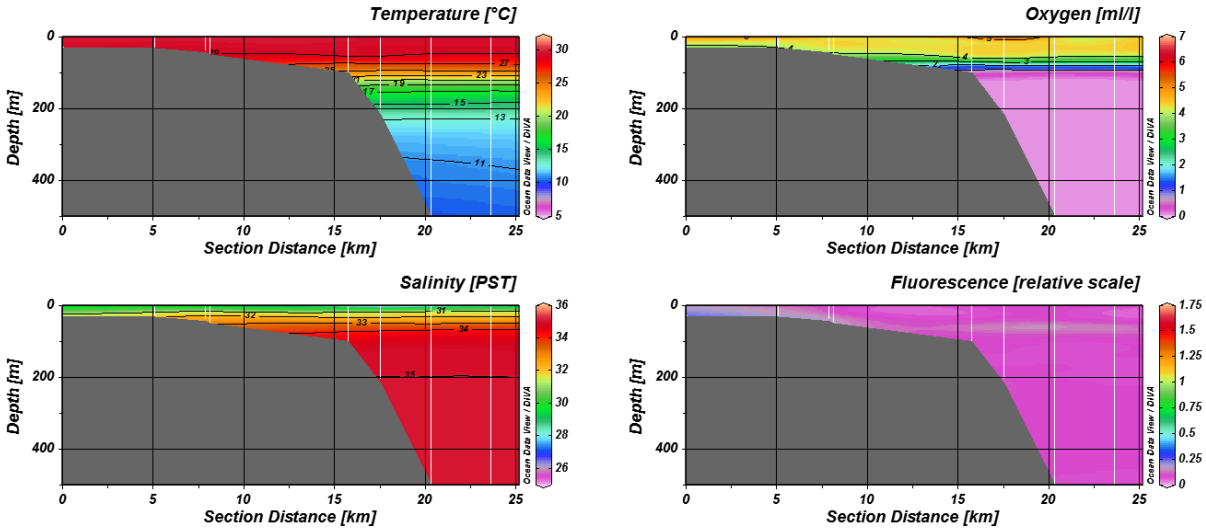
Five hydrographic transects were made along the Rakhine coast (Figure 3.6). The figure shows from north to south the hydrographic transects off 1. Phayonika, 2. Munaung Island, 3. Andrew Bay, 4. Dome Hill and 5. Mawtin Point (See Figure 1.2 for position of the transects). The temperature profiles in the region showed relatively warm surface waters (~ 29-30°C), little variation in temperature between the coast and offshore, and decreasing temperature with depth. At 100 m depth temperatures were generally about 21-23 °C. Temperatures at 500 m were roughly 10°C, and around 6.8°C at 1000 m depth. The profiles generally showed a surface layer of low salinity <= 30, and as low as <20 in some inshore areas, especially from Andrew Bay and southwards. The salinity typically increased rapidly down to about 100 m, and was rather stable around 35.0 in deeper waters. Oxygen concentrations were highest in the surface, and decreased with depth. A strong oxycline was generally found at depths of about 70-100 m. Below this, the water masses were typically hypoxic

with O_2 levels <0.25 to more than 500 m depth. Oxygen concentrations increased slightly below this, approaching ~ 1 ml/l at around 1000 m depth. The fluorescence-maximum was generally found along the bottom of the shelf, and continued at around 50-80 m depth. Maximum recordings were generally made inshore above the shelf.

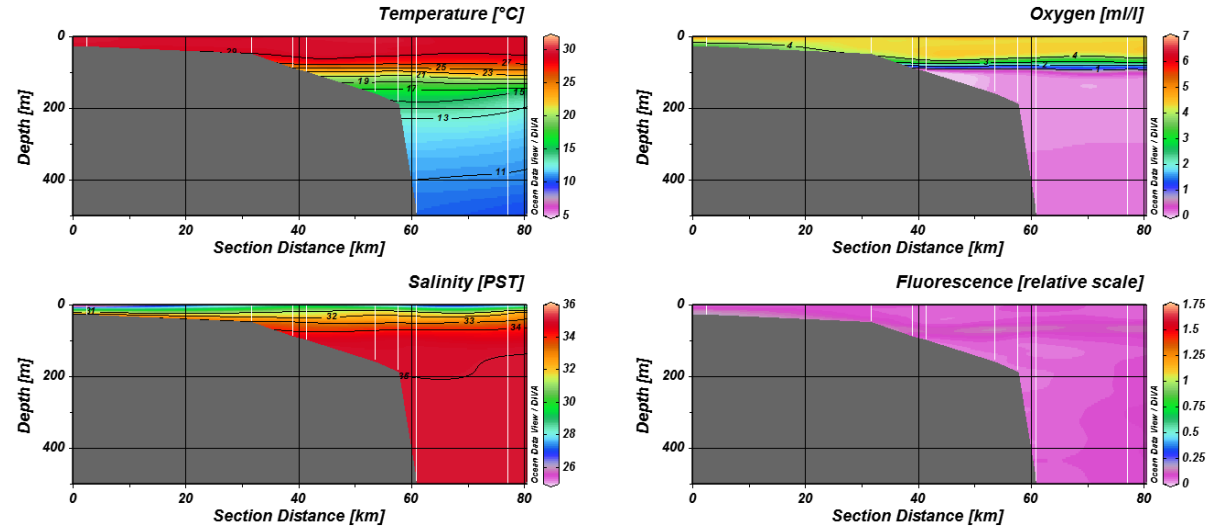
Transect Phayonika;



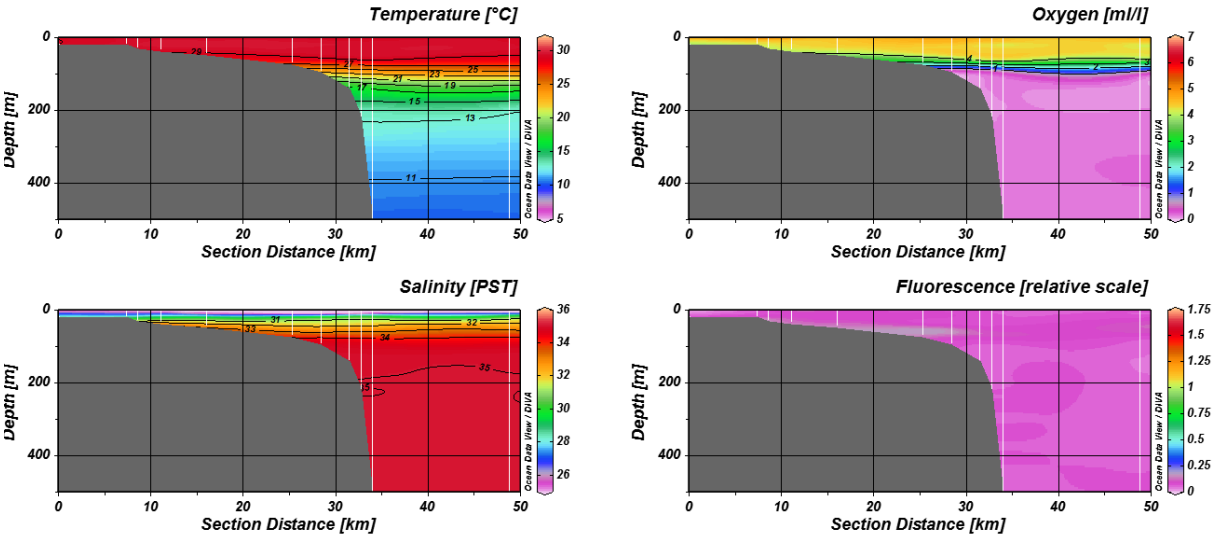
Transect Munaung;



Transect Andrew Bay;



Transect Dome Hill;



Transect Mawtin Point;

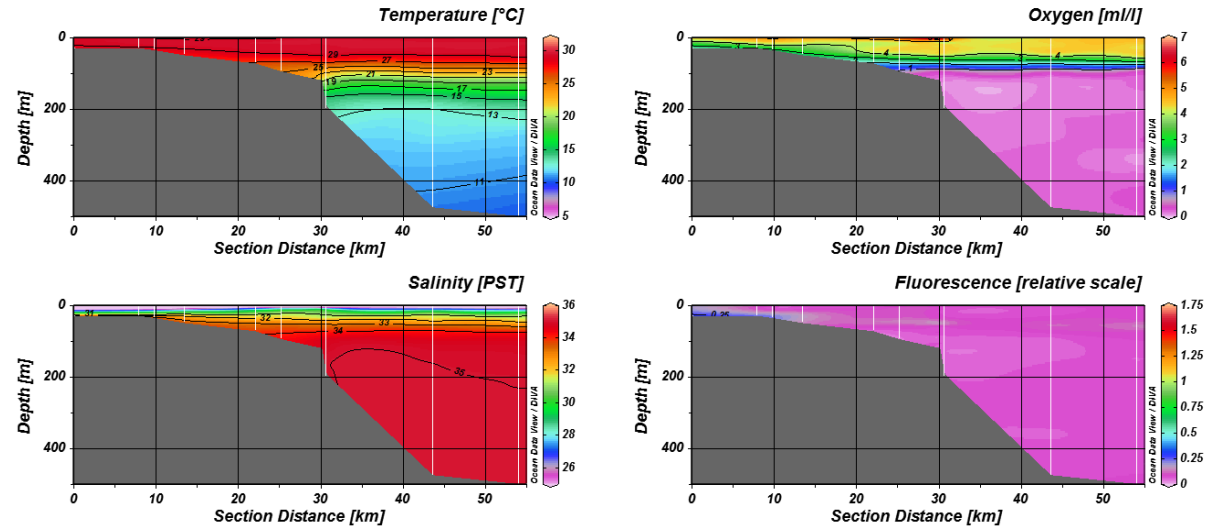
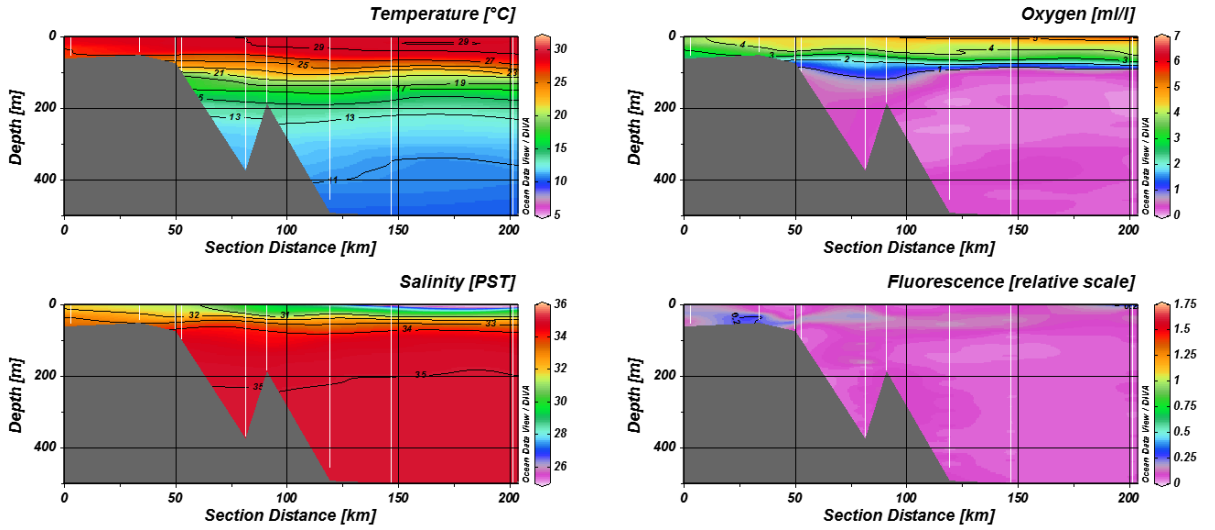


Figure 3.6. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Rakhine coastal region. Sections at Phayonika, Munaung, Andrew Bay, Dome Hill and Mawtin Point. CTD stations indicated by white vertical lines. Produced with the software Ocean Data View, interpolating by DIVA gridding (Ocean Data View, Schlitzer, R., http://odv.awi.de, 2013).

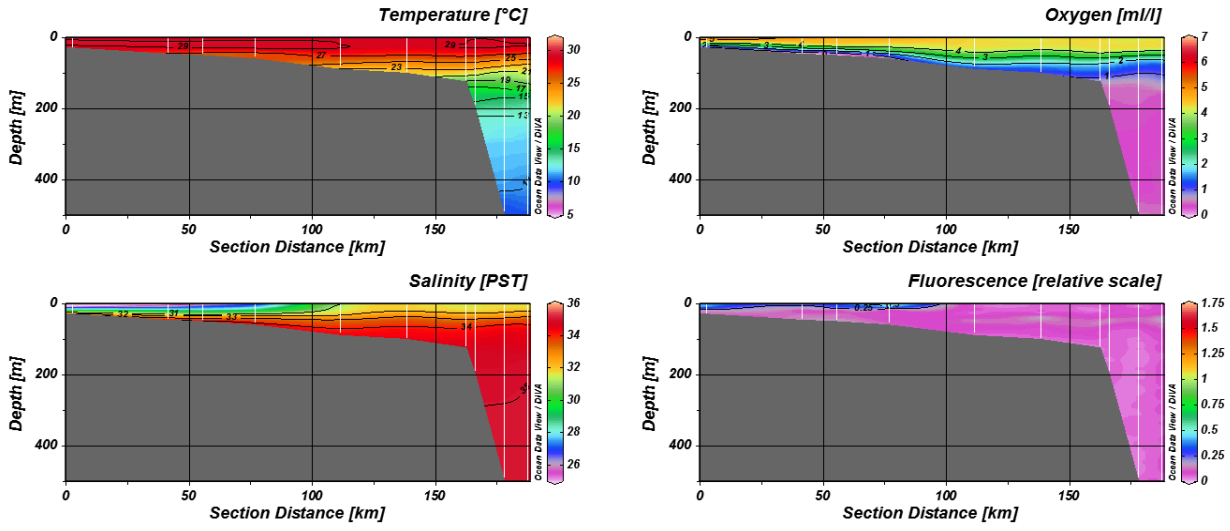
The Ayeyarwady Delta region

Four hydrographic transects were made across the shelf of the Ayeyarwady Delta region (Figure 3.7). The figure shows the hydrographic transects off 6. Nicobar, 7. Pathein-west, 8. Pathein-east, and 9. Yangon (See Figure 1.2 for position of the transects). Surface temperatures along these transects were high, typically above 29°C. Also here, we observed little variation in temperature between the coastal and offshore upper waters. The temperatures decreased with depth, and at 100 m depth the temperatures were typically about 21°C. Temperatures at 500 m were roughly 10°C, and at transect Yangon the value at almost 1000m was ~ 6.7°C. The profiles generally showed a low salinity (=< 30) surface layer, with values as low as ~ 20 at the outer part of the Nicobar and inner part of the Pathein-west transects. The salinity typically increased rapidly down to about 100 m, and was rather stable around 35.0 in deeper waters. Oxygen concentrations were highest in the surface layers (typically ~ 4-5 ml/l), and decreasing with depth. A strong oxycline was generally found at depths of about 40-120 m. Below this, the water masses were typically hypoxic with O_2 levels <0.5 to more than 500 m depth. Oxygen concentrations increased slightly below this, reaching ~ 1 ml/l at around 1000 m depth (transect Yangon). The fluorescence-maximum was generally inshore, either along the bottom of the shelf or closer to the surface. This maximum tended to continue at around 50-80 m depth at the outer part of the shelf and into more oceanic regions.

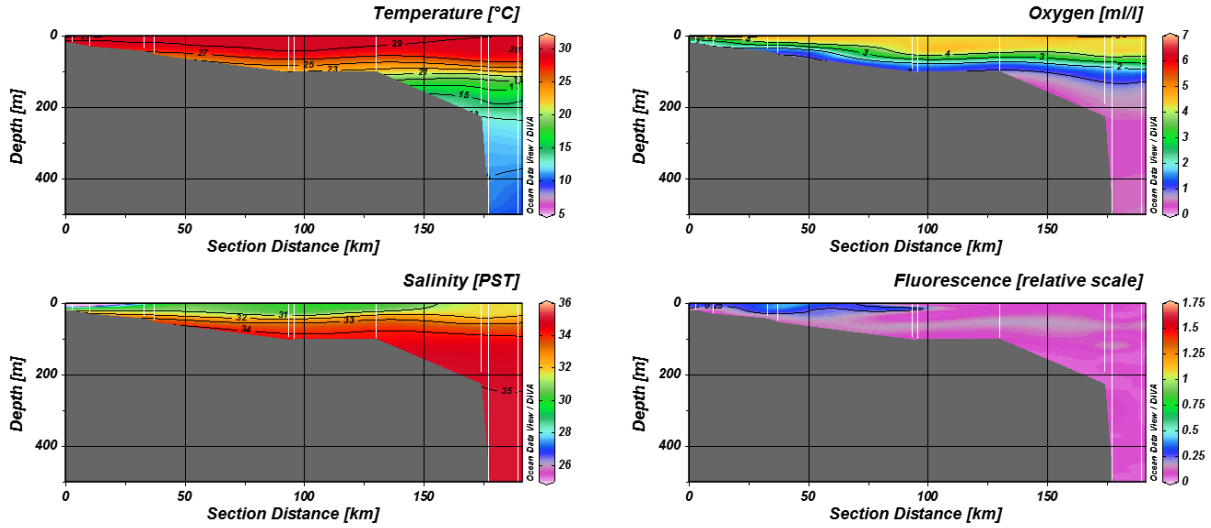
Transect Nicobar;



Transect Patheine – west;



Transect Pathein – east;



Transect Yangon;

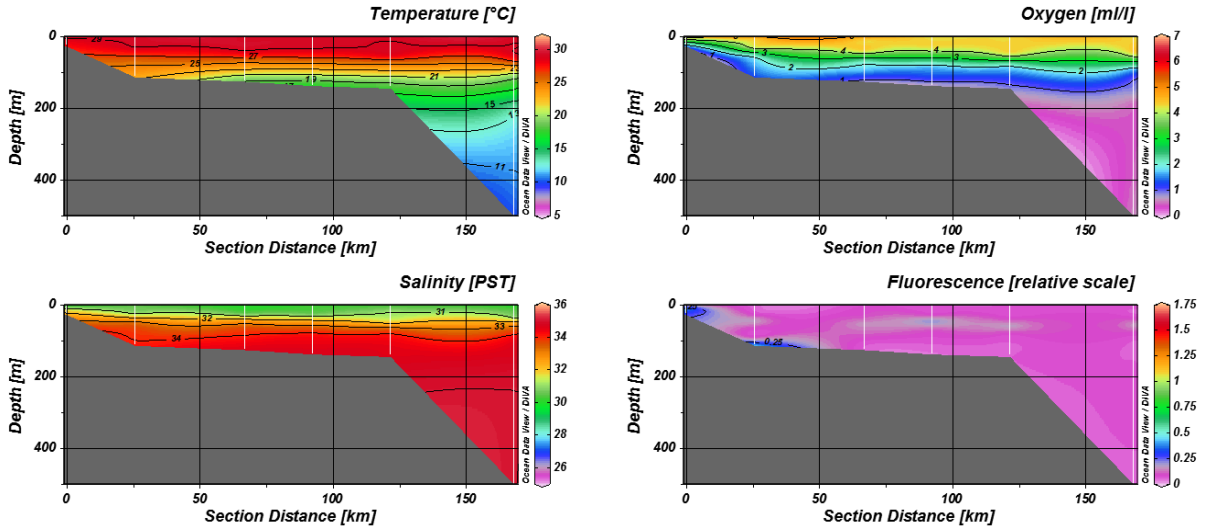


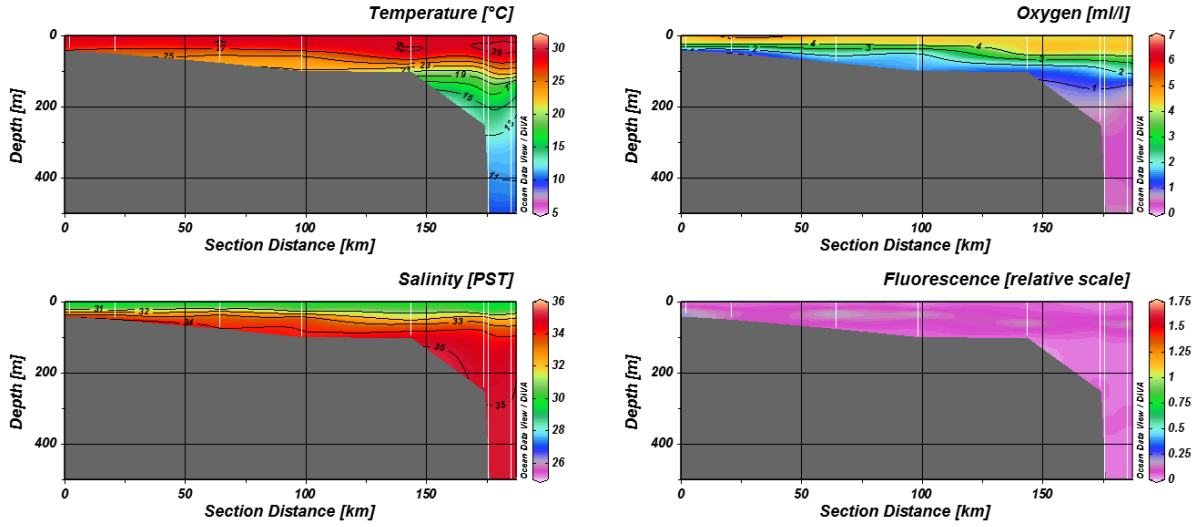
Figure 3.7. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Ayeyarwady Delta region. Sections at Nicoba, Pathine, Rear-Pathine, Yangon. CTD stations indicated by white vertical lines.

The Tanintharyi coastal zone

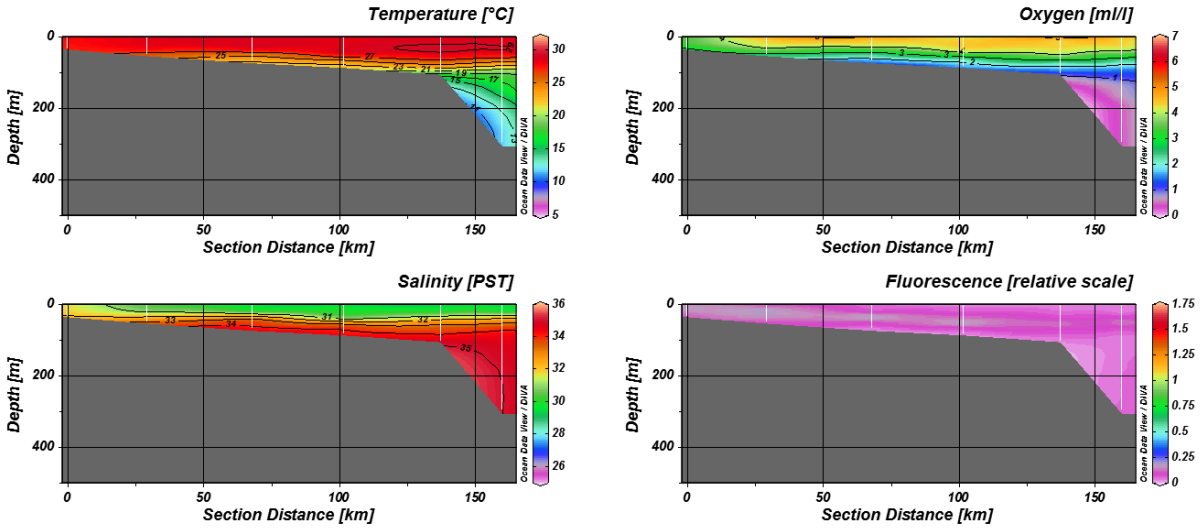
Four hydrographic transects were made across the shelf of the Tanintharyi coastal region (Figure 3.8). The figure shows the hydrographic transects off 10. Pe Det, 11. Tapo, 12. Bokpyin and 13. Kampong Lama (See Figure 1.2 for position of the transects). Surface temperatures along these transects were high, typically above ~27-29°C. No strong temperature variation in upper layers was observed between the coastal and offshore waters. The temperatures decreased with depth, being roughly about 21-23°C at 100 m. The temperatures at 500 m were ca. 9-10°C, ant at transects Pe Dat and Bokpyin the values at about 1000m were ~ 6-6.5°C. The profiles showed a low salinity upper layer, with values of about 31-33 for the inner parts of the shelf areas. Down to about 100m the salinity increased rapidly, and was rather stable around 35.0 in deeper waters. Oxygen concentrations were highest in the surface layers (typically ~ 4-5 ml/l). A strong oxycline was generally found at depths of about 40-120 m. Below this, the water masses were typically hypoxic with O_2 levels of ~0.5 or lower to more than 500 m depth. Oxygen concentrations increased slightly below this, reaching a little more than 1 ml/l at around 1000 m depth (transect Bokpyin). The

fluorescence-maxima were generally observed inshore at rather shallow depths. The maxima were typically rather low, but elevated levels were detected along the inner part of the Bokpyin transect (relative index > 0.25 at the two innermost stations).

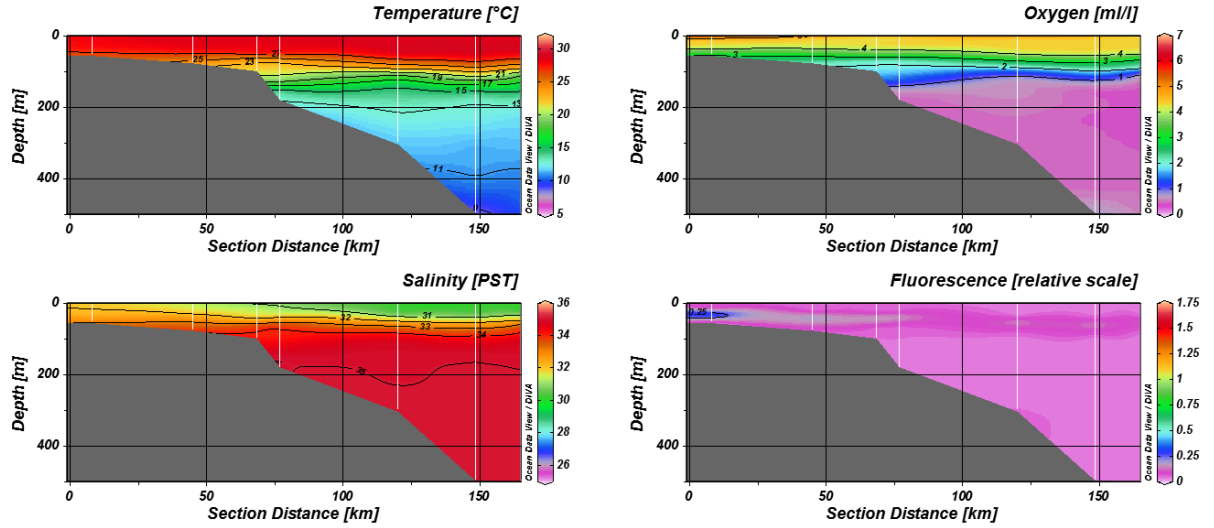
Transect Pe Det;



Transcribe;



Transect Bokpyin;



Transect Kampong Lama;

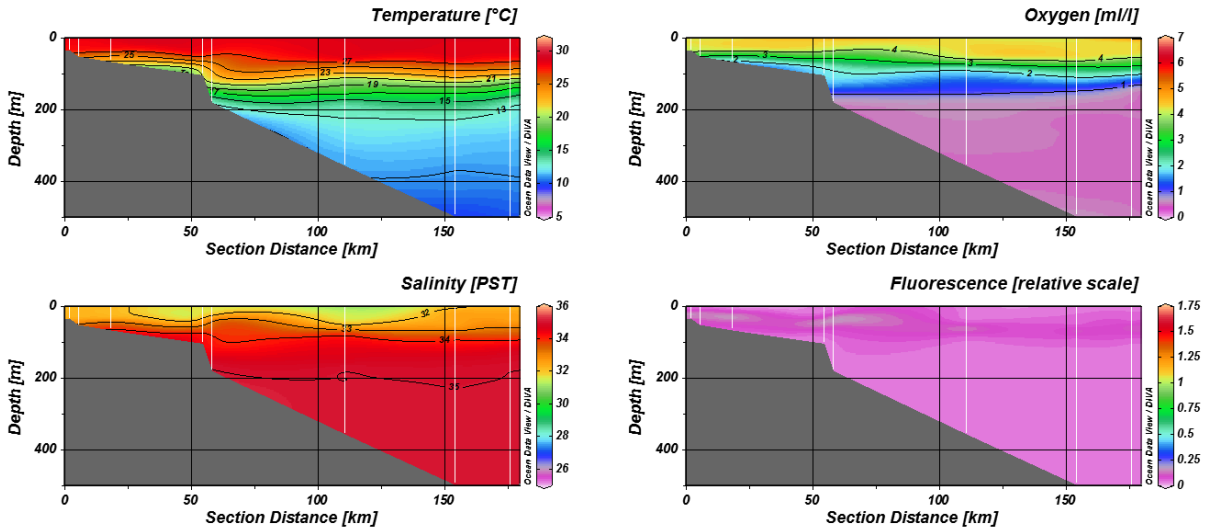


Figure 3.8. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Tanintharyi region. Sections at Pe Det, Tapo, Bokpyin, Kampong Lama. CTD stations indicated by white vertical lines.

Nutrients, chlorophyll and plankton

Nutrients

Nutrient concentrations generally varied strongly with depth, and particularly nitrate, silicate and phosphate concentrations spanned great ranges (Figure 3.9). When considering data from all stations pooled (Figure 3.9), regardless of bottom-depth and geographic location, the overall picture was that nitrate and phosphate levels were very low near the surface, increased with depth, and could reach very high levels at depths of 500m. Silicate concentrations were generally low near the surface, though not depleted, and increased from the sampling-depth of 50 m to reach very high values at depth of 500m (Figure 3.9). Nitrite, however, displayed a very different vertical distribution than the three other nutrients here presented. The concentrations of nitrite were typically highest at depth of about 50m, although never reaching values above 0.7 µmol l^{-1} at any station or depth.

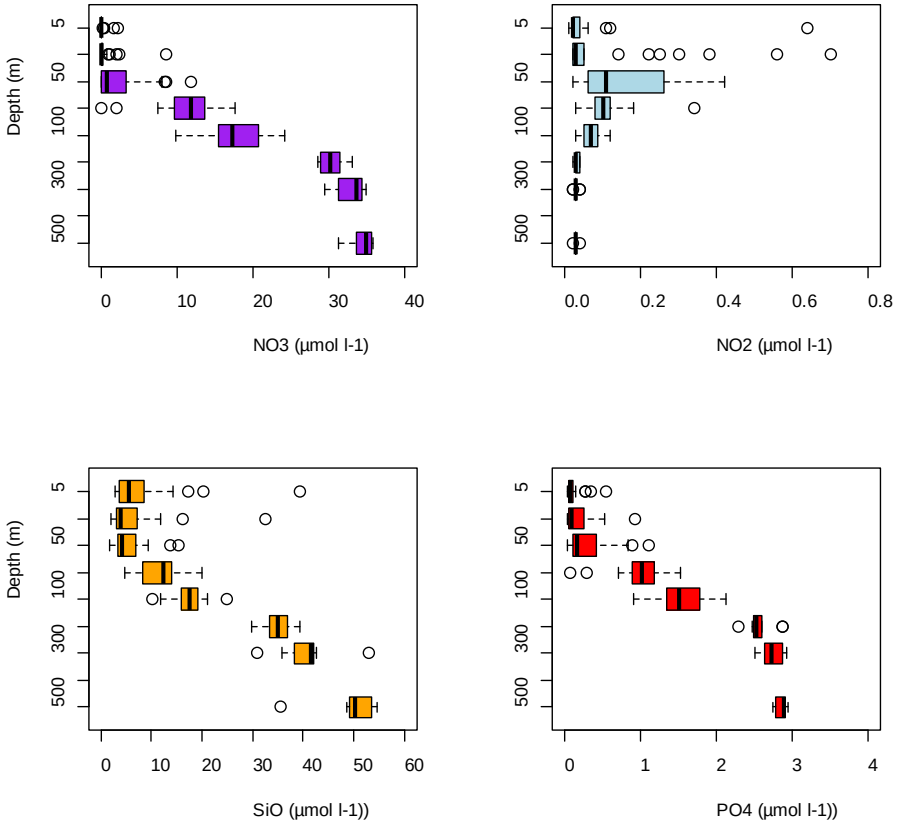


Figure 3.9. Box plots showing nutrient concentrations versus depth. Nitrate – upper left, nitrite – upper right, silicate lower left, and phosphate lower right. All stations regardless of bottom-depth and geographical location are here pooled to provide an overview, although this will increase the variation and may mask patterns on finer spatial scales. Note that the Y-axis does not reflect depth on equidistant scale.

In Figures 3.10 and 3.11, the dataset is split into three different categories depending on bottom-depth and hence distance from the coastline. Data from all geographic locations, however, are still pooled which may mask spatial patterns. Still, Figure 3.10 shows that the nitrate values are higher in the uppermost 25 m at the stations closest to the coastline, compared to the stations with bottom-depths of 100 and 500m. At the deep stations, the nitrate levels increased with depth, and at 500m the median value was almost 35 µmol l^{-1}. Nitrite levels were also higher in the uppermost 25 m at the stations nearest the coastline, as compared to the stations in deeper areas. For stations with bottom-depth 100m, the highest median nitrite concentration was observed at sampling-depth of 50m (0.17 µmol l^{-1}), and for stations with bottom-depth of 500m the highest median occurred at depth of 75m (0.11 µmol l^{-1}).

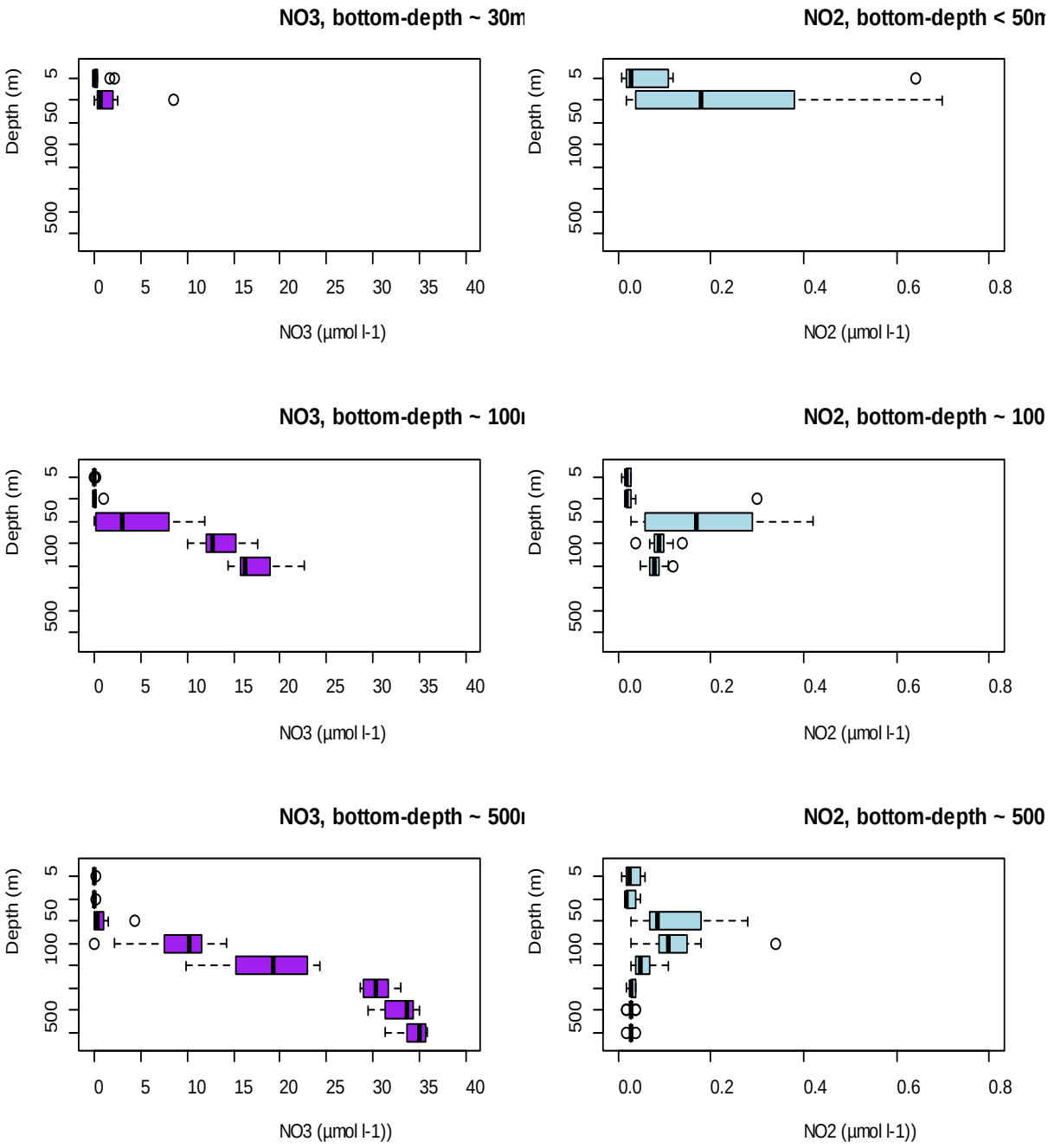


Figure 3.10. Box plots showing concentrations of nitrate (left panels) and nitrite (right panels) with depth at shallow stations (bottom-depth ~ 30 m), intermediately deep stations (bottom-depth ~100 m), and deep stations (bottom depth ~500m) from the entire study area. All stations within each bottom-depth category from the whole study area are here pooled. Note that the Y-axis does not reflect depth on equidistant scale, and that the scales of the X-axes differ for NO_3 versus NO_2.

Silicate values were higher in the 0-25 m stratum for stations nearest the coastline compared to the same depth-stratum for stations with bottom-depths of 100 and 500m (Figure 3.11). The median silicate concentrations in upper waters were well always above 0, regardless of bottom-depth. For the deepest stations, the silicate concentrations increased from 25m to 500m, where the median value was very high (~50 µmol l^{-1}).

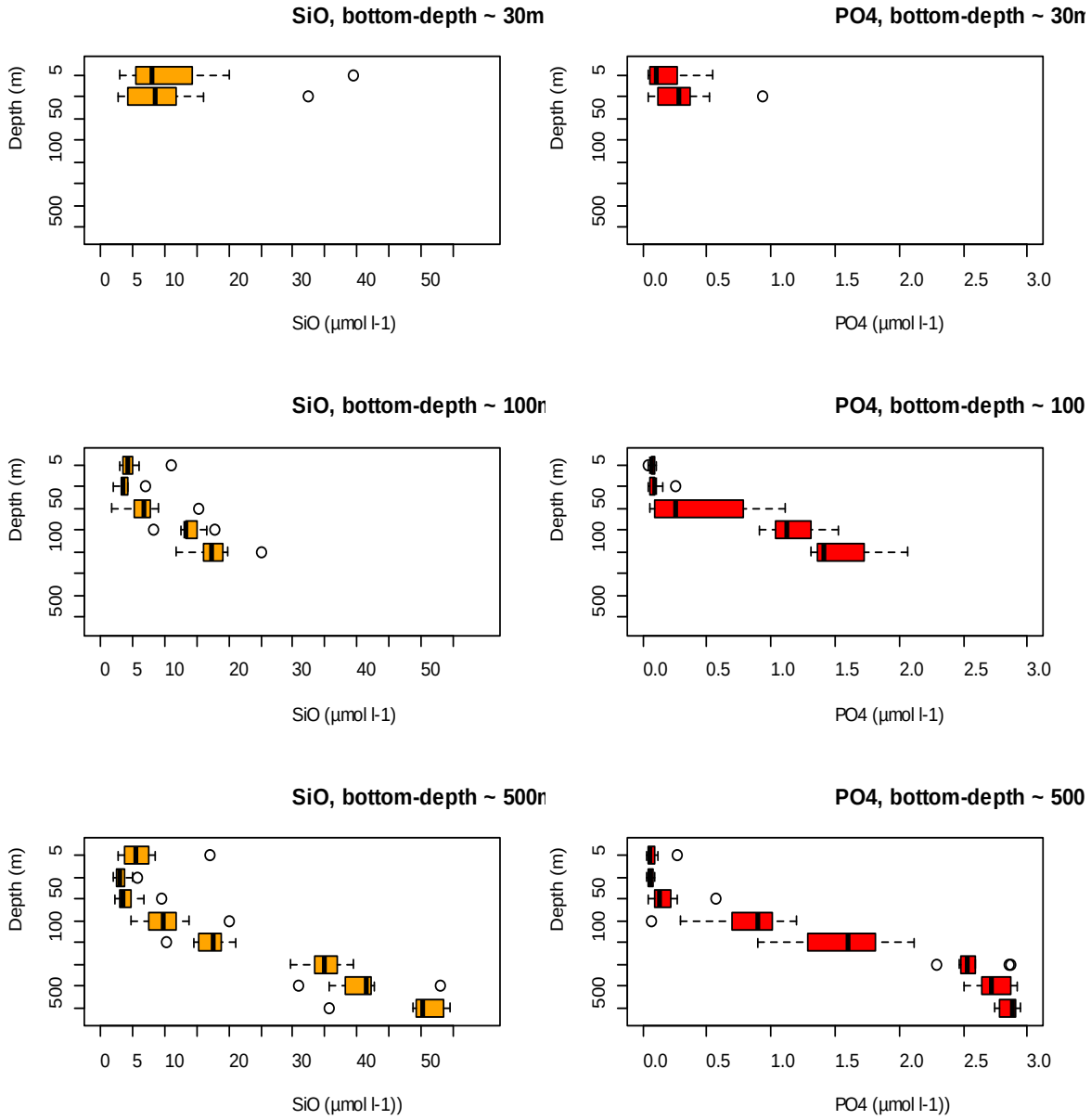


Figure 3.11. Box plots showing concentrations of silicate (left panels) and phosphate (right panels) with depth at shallow stations (bottom-depth ~ 30 m), intermediately deep stations (bottom-depth ~100 m, and deep stations (bottom-depth ~500m) from the entire study area. All stations within each bottom-depth category from the whole study area are here pooled. Note that the Y-axis does not reflect depth on equidistant scale, and that the scales of the X-axes differ for SiO versus PO_4.

Phosphate values were typically higher in the 0-25 m stratum for the stations closest to the coastline compared to same depth-stratum for stations with bottom-depths of 100 and 500m (Figure 3.11). Median phosphate concentrations at 5 and 25 m for stations of the two latter bottom-depth categories were very low, but increased with depth. For the deepest stations, the phosphate concentrations reached its highest median value at depth of 500m (~ 2.9 µmol l^{-1}).

These nutrient data can be studied in more detail, for instance by evaluating different geographical areas as well as individual stations regions separately. To obtain a better understanding of the physical and biological processes governing the nutrient patterns, these data can be related to datasets for physical or biological variables obtained during the cruise.

Chlorophyll

Chlorophyll levels were generally low to moderate, depending on geographic location and depth (Figure 3.12). The range of values for all stations and depths within the whole dataset varied between 0 and 3.4 mg chl.*a* m^{-3}. A few comparatively "extreme" values between 2.1 and 3.4 mg chl.*a* m^{-3} were observed near the coast, comprising 2 stations in the Ayeyarwady Delta region as well as one coastal station further south in the Thanintharyi region (where fluorescence also was very high at depth of 6m). In Figure 3.12, the chlorophyll concentrations are presented separately for the most shallow coast-near stations, the stations with intermediate bottom-depth (~100m), and the deepest most oceanic stations (bottom-depth ~ 500m). In the presentation, all results for each combination of sampling-depth and bottom-depth are pooled for summary purposes. This provides an overview, but will also increase the variability and may mask patterns on smaller spatial scales.

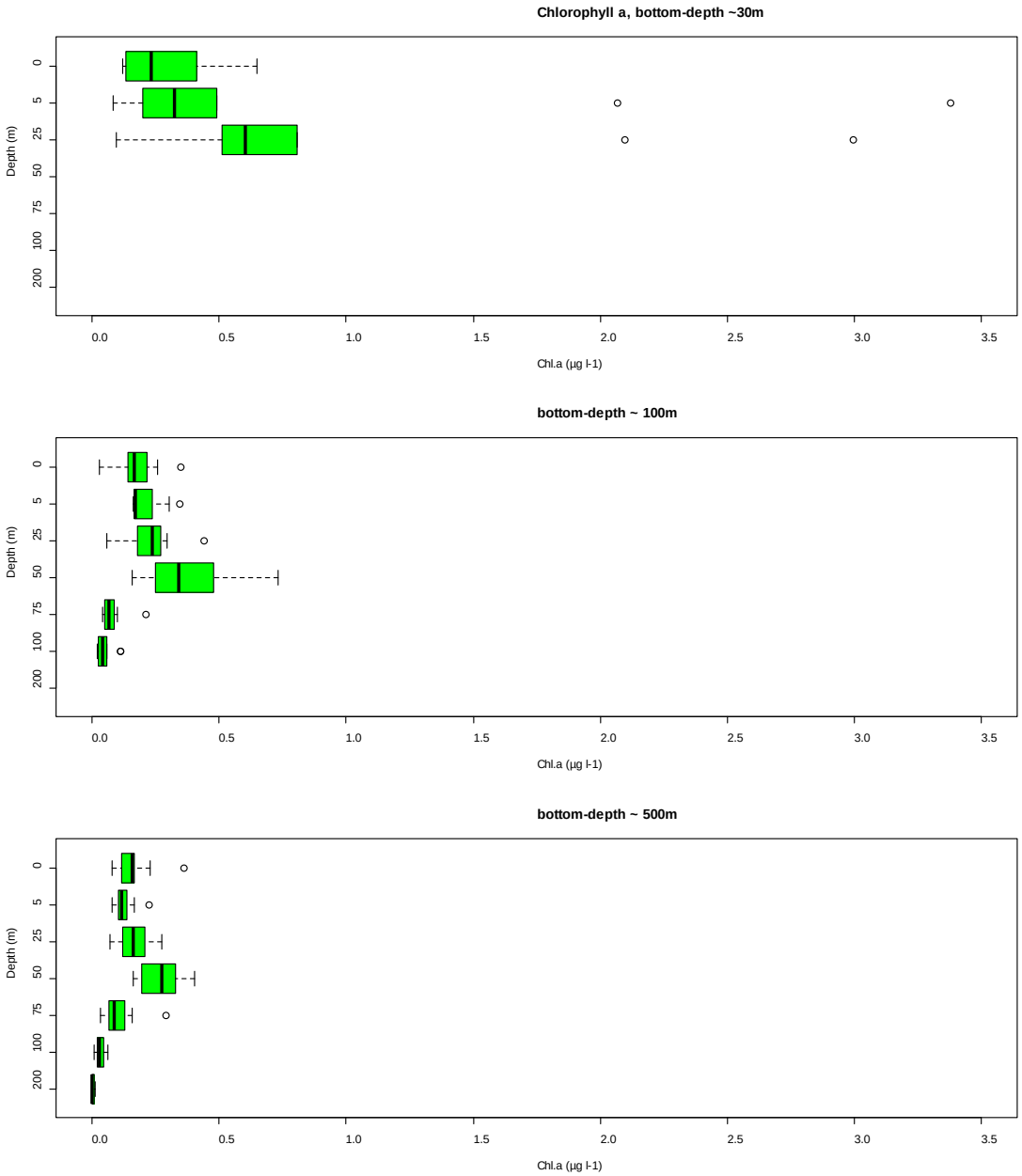


Figure 3.12. Box plots showing depth-specific concentrations of chlorophyll *a* over shallow stations (bottom-depth ~ 30 m), intermediately deep stations (bottom-depth ~ 100 m, and deep stations (bottom--depth ~ 500m) from the entire study area. All stations within each bottom-depth category from the whole study area are here pooled. Note that the Y-axis does not reflect depth on equidistant scale.

The chlorophyll concentrations in upper layers, i.e. depths of 0, 5, and 25 m, were generally highest at the innermost stations near the coast (Figure 3.12). At these shallow stations, the median values for 0 m, 5 m and 25 m were about 0.2, 0.3 and 0.6 mg chl.*a* m^{-3}, respectively The variation in the 0-25 m stratum was larger at the coastal stations than elsewhere, and a few "extreme" values between 2.0 -3.4 mg chl.a m^{-3} were observed for 4 coastal stations. For the stations located at bottom-depths of 100 and 500 m, the pooled data indicated generally low values in the surface increasing with depth down to 50 m. For stations with bottom-depths of 100 as well as 500 m, the median levels were highest at the sampling-depth of 50 m (0.34 and 0.28 mg chl.*a* m^{-3}, respectively). For stations of both these bottom-depth categories, the concentrations thereafter decreased down to 200 m. We note the rather similar vertical chlorophyll patterns that were indicated for the stations with bottom-depths of 100 and 500 m.

Phytoplankton samples

Phytoplankton samples have been taxonomically analysed at the Myeik University, Myanmar during the first months of 2014. In total, 194 taxon was identified to species or to the nearest possible phylogenetic group. The average number of species per station was 44 ± 12 (SD) ranging from 22-72. The most common taxonomic groups were Fam. Chaetocerotaceae (represented with 23 different species), Fam. Ceratiaceae (represented with 22 different species) and Fam. Protoperidinaeae (represented with 15 different species). The stations with the largest species diversity were found close to shore along the Rachine coast and on the shelf area south of 14.5°N (Figure 3.13).

The most common species found were: *Oscillatoria sp* (represented at 34 stations, Fam. Oscillatoriaceae), *Ceratium fura* (represented at 32 stations, Fam. Ceraticeae), *Ceratium Fusus* (represented at 32 stations, also Fam. ceratiaceae), *Rhizosolenia setigera* (represented at 31 stations, Fam. Rhizosoleniaceae), *Thalassionema nitzschioides* (represented at 31 stations, Fam. Thalassionemataceae),*Chaetoceros diversus* (represented at 30 stations, Fam. Chaetocerotaceae), *Chaetoceros lorenzianus* (represented at 30 station, Fam. Chaetocerotaceae), *Hemiaulus sinensis* (represented at 29 stations, Fam. Hemiaulaceae), *Ornithocercus magnificus* (represented at 28 stations, Fam. Dinophysiaceae)

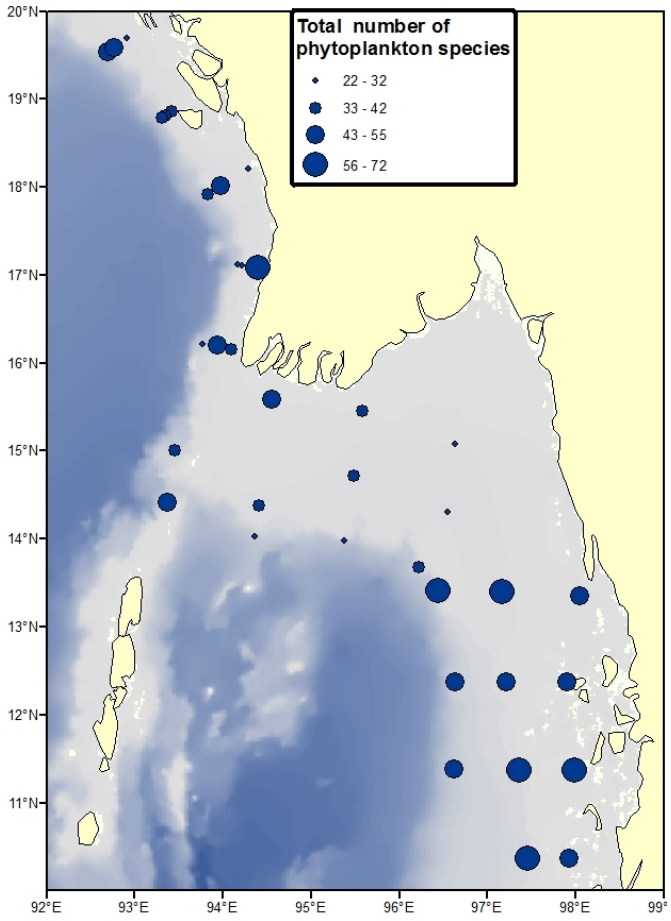


Figure 3.13. Phytoplankton species diversity at environmental stations along the Myanmar coast, November-December 2013.

Zooplankton

All analysed samples for size-fractioned zooplankton biomass were completed at the IMR laboratory facilities during the first months of 2014. Initial exploration of the results from the WP2 net samples show that the stations with the largest biomass are positively correlated with areas of high fluorescence, nutrient levels and frontal zones with high rates of mixing water masses and areas with high phytoplankton diversity (Figure3.14). In a couple of cases the high biomass was highly influenced by incidental collection of large individuals on the >2000µm size fraction (*e.g.* swim crab, shrimp). The different size fractions also display a tendency of gradually larger fractions with smaller individuals from the deeper shelf areas towards the coast (Figure 3.14).

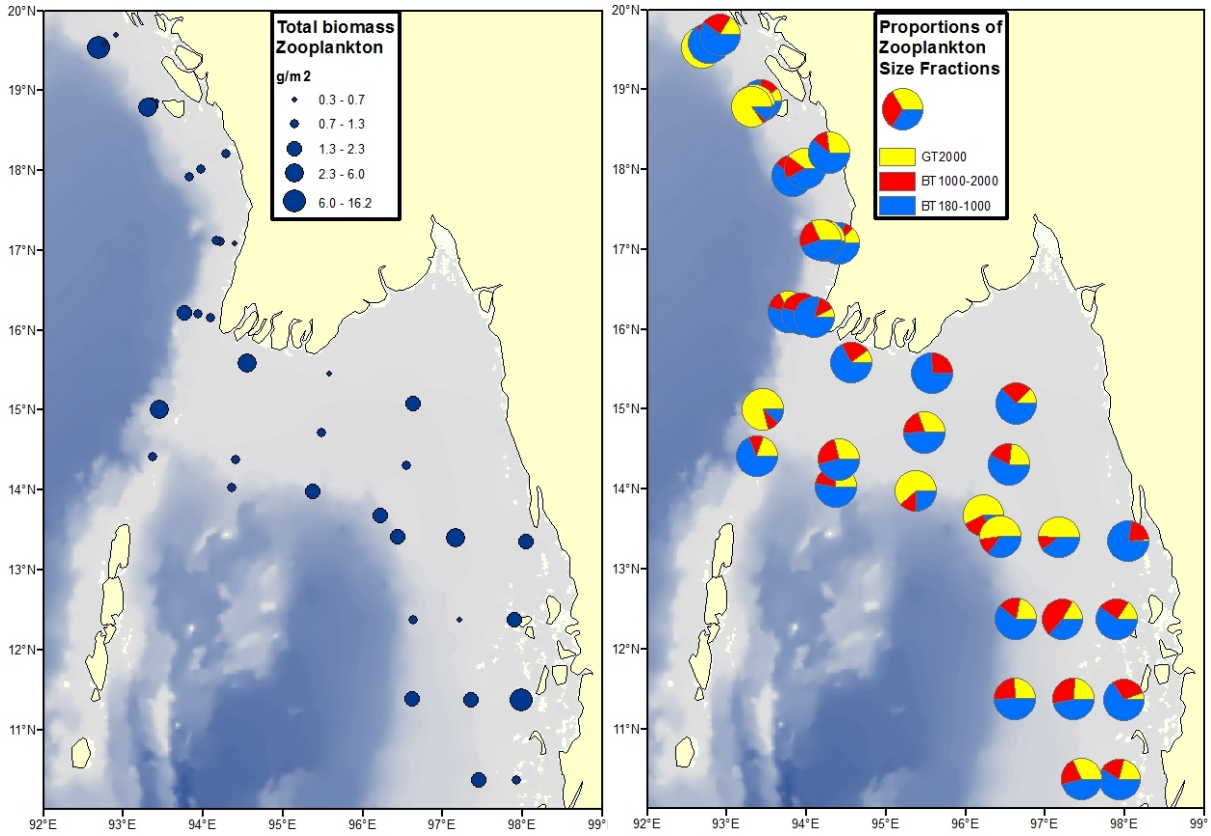


Figure 3.14. Biomass zooplankton (dry-weight g/m2) collected with WP2-net along the cruise lines (left) and proportions of zooplankton size fractions (yellow= >2000µm, red= between 1000-2000µm and blue= between 180-1000µm).

A total of 38 environmental stations were executed during the entire cruise, from shallow to deep waters and along the Myanmar coastline close to the national border in the north to the border in south. All formalin-preserved zooplankton samples from the Multinet, Juday and WP2 nets have been analysed to the lowest taxonomic level at the Myeik University, Myanmar. The analysis from the WP2 net show the presence of 204 different zooplankton taxa determined to genus or species level. The average number of species found per station was 47±15 (SD) ranging from 23-104 species.

The phylogenetic groups represented by the largest species diversity were: Fam. Sagittidae (represented with 14 different species), Class Polychaetae (represented by 12 species), Fam. Paracalidae (represented with 10 different species) and Fam. Pontillidae (represented with 9 different species).

The species most commonly found in the samples from the WP2 net were: *Eucalanus subcrassus* (represented at 37 stations) and *Eucalanus crassus* (found at 36 stations) from the Fam. Eucalanidae, but also: *Acartia erythraea* (found at 36 stations, Fam. Acartidae), *Atlanta peroni* (found at 32 stations, Fam. Atlandidae), *Undinula vulgaris* (found at 32 stations, Fam. Calanidae), *Paracalanus aculeatus* (found at 32 stations, Fam. Paracalanidae), *Oncaea venusta* (found at 32 stations, Fam. Oncaedidae), *Cresis clava* (found at 31 stations, Fam. Creseidae) and *Oikopeura cophocerca* (found at 31 stations, Fam. Oikopleuridae).

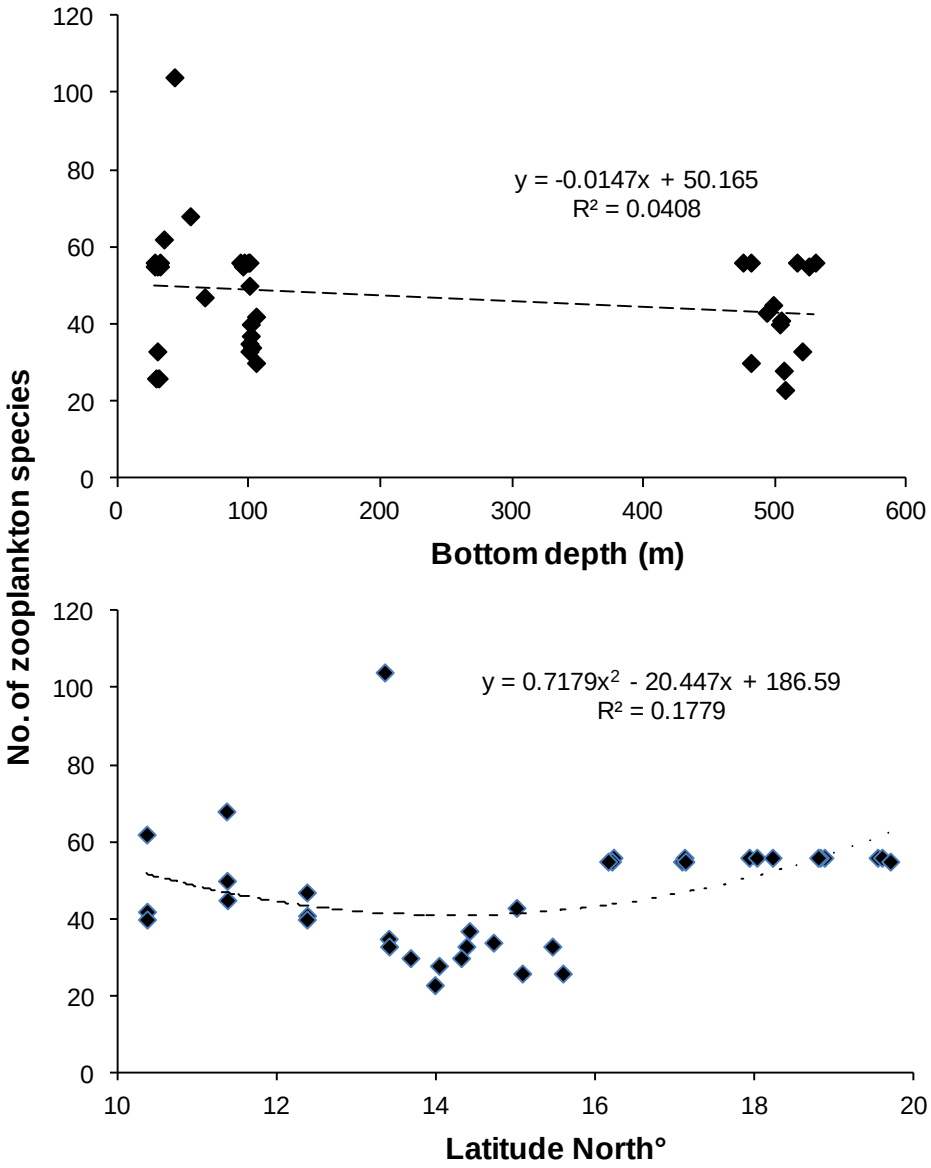


Figure 3.15. Number of zooplankton species in relation to bottom depth (linear regression line: top figure) and latitude (polynomial regression line: bottom figure) at environmental sampling stations using WP2 net.

High species richness could not be explained by bottom depth at sampling stations (Figure 3.15), however, there was a relation found when related to latitude. There was a modest overall increase in species richness in the northern part of the study area and the lowest diversities were related to the areas west of the large river delta complex located between 13-16°N (Figure 3.15).

Sediment samples

All sediment samples was offloaded in Phuket and delivered to BOBLME for arrangement of further analyzes. Dr Somkiat, head of the Oceanography and Marine Environmental Unit at the Phuket Marine Biological Centre, has been contacted and he has agreed to work up the sediment samples.

4. ACOUSTIC ABUNDANCE AND DISTRIBUTION

The hydro acoustic survey covered the shelf and slope from roughly 20 m depth to 500 m bottom depth (1000 m depth on the ecosystem transects). Continuous acoustic recording and analysis were carried out throughout the survey. The survey was not a dedicated acoustic survey and spacing between transects was 20 NM. In addition. Very few acoustic patches were observed during this cruise resulting in only few pelagic trawls to verify acoustic targets. The highest acoustic values were recorded outside the Rakine coast for pel 1, but the abundance was low and belonging to the lowest abundance grouping shown in Figure 4.1 a.

Acoustic distribution and abundance was estimated for two species groups during the survey. These were Pelagic 1 (Pel1) and Pelagic 2 (Pel2). The Pel 1 group of species consists of pelagic fish of the families Clupeidae and Engraulididae, while the Pel 2 species belong to the families Carangidae, Scombridae, Barracuda and Hairtails. Table 2.1 gives an overview of the most common species belonging to each of these groups. The Pelagic 1 species are typically separated from the Pel 2 species based on the presence of the two groups in the trawl catches, and the fact that the Clupeidae and Engraulididae has a much stronger backscattering signal then e.g. the Carangidae and other Pel 2 species.

The data are presented for three main regions 1. Rakhine cost, 2. the Deltaic cost and 3. the Tanintharyi coast. The estimates presented in this report only include the geographic areas covered by the vessel and does not include any evaluation/quantification of how much fish is found inshore of the surveyed area. Myanmar has relatively large shallow water areas and river mouths. Many of the species found during this survey are known to thrive in such environments and it is likely that the biomass of some of these inshore of the survey area was considerable. Summary of backscattered s_A values can be found in Table 4.1 while biomass estimates for the two species groups per region can be found in Table 4.2.

The survey reports from the Dr. Fridtjof Nansen in 1979-1980 include biomass indices' of pelagic fish. The methodology used during those surveys was different from what we use today and the estimates cannot be compared directly.

4.1. The Rakhine coastal zone

Pel1

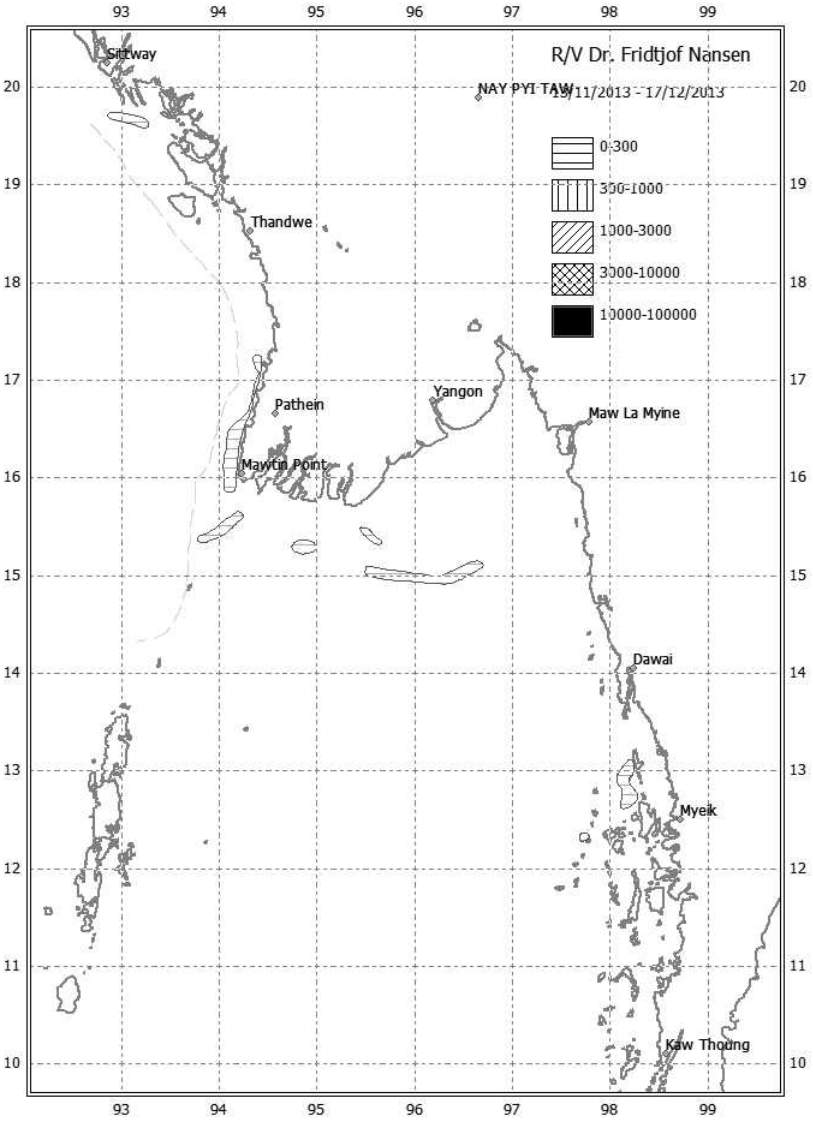
Most of the fish was found between 20 and 50 m depth in two low concentration areas along the Rakhine coast (Figure 4.1, Table 4.1). The distribution was generally between the inner extent of the survey coverage to about 50-70 m depth. A total acoustic abundance index of 10 000 tonnes of fish was estimated based on an set (average) total length of 10 cm (Table 4.2). The most common Clupeid species found in the region was the Sardinella *Sardinella gibbosa*, the Anchovy *Stolephorus indicus*, and the *Ilisha melastoma*. Length frequencies of the most commonly caught species can be found in Annex II.

Pel2

The distribution of these species was found in low density over most of the Rakhine cost (Figure 4.1, Table 4.1). The densities increased slightly southwards and the Pel2 species were found to be most

abundant in the southern part of the Rakhine costal region. A total acoustic abundance index of 22 500 tonnes of fish was estimated based on an set (average) total length of 10 cm (Table 4.2). The most common Pel2 species found in the region was the Hairtail *Lepturacanthus savala,* the Carangid *Megalaspis cordyla*, *Carangoides malabaricus* and the Scombrid *Scomberomorus guttatus* and *Rastrelliger kanagurta*. Length frequencies of the most commonly caught species can be found in Annex II.

a)



b)

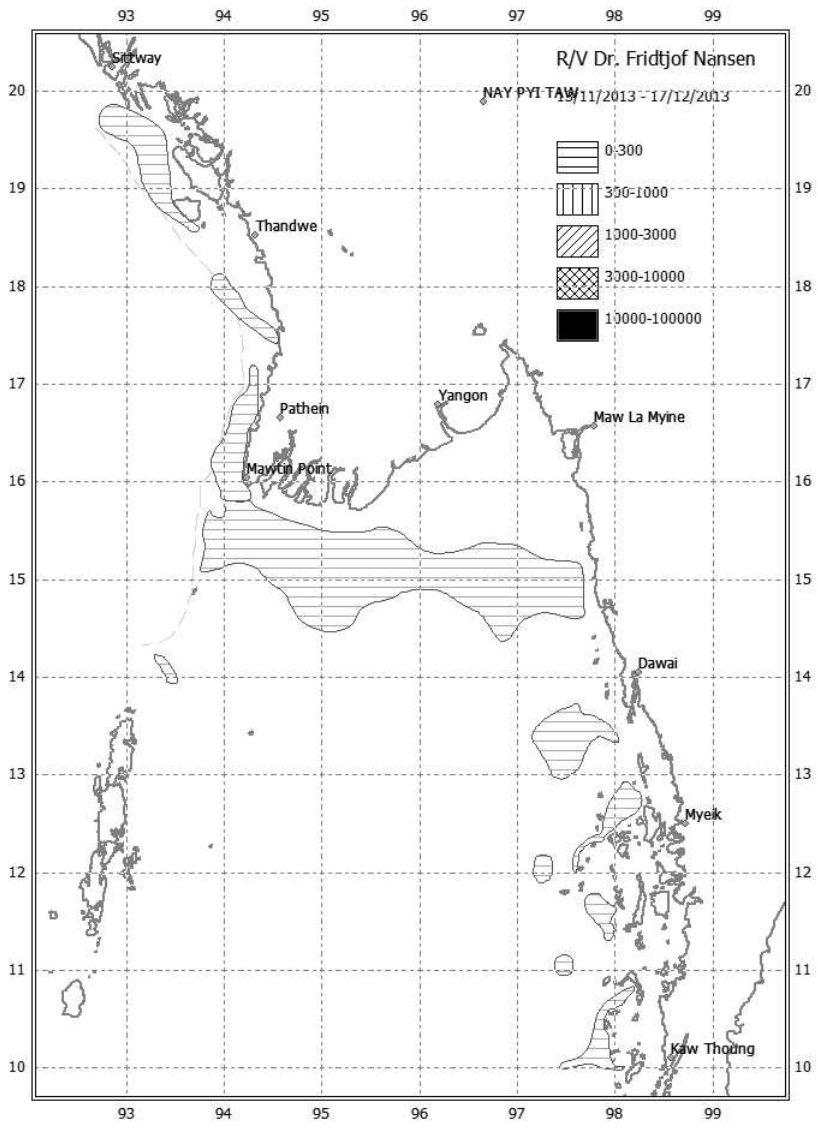


Figure 4.1. Distribution of acoustic backscattering of a) Pel 1 and b) Pel 2 species along the Rakhine cost

4.2. The Deltaic cost

Pel1

Low densities of pel 1 were found in this area (Figure 4.1, Table 4.1). The distribution was generally found at longer distance from the coast line than in the previous area, but almost at the same depth. A total acoustic abundance index of 18 000 tonnes of fish was estimated based on an set (average) total length of 10 cm (Table 4.2). Also here the most common Clupeid species found in the region was the Sardinella *Sardinella gibbosa*, the Anchovy *Stolephorus indicus*, and the *Ilisha melastoma*. Length frequencies of the most commonly caught species can be found in Annex II.

Pel2

The distribution of these species was found in low density over most of the Deltaic area (Figure 4.1, Table 4.1). A total acoustic abundance index of 34 000 tonnes of fish was estimated based on an set (average) total length of 10 cm (Table 4.2). The most common Pel2 species found in the region was the shortfin scad *Decapturus macrosoma,* the Torpedo scad *Megalaspis cordyla*, and the hairtail

Lepturacanthus savala. Length frequencies of the most commonly caught species can be found in Annex II.

4.3. The Tanintharyi coast

Pel1

Low densities of pel 1 were found in this area (Figure 4.1, Table 4.1). Most of the fish was found between 20 and 50 m depth in four low concentration areas. A total acoustic abundance index of 7 000 tonnes of fish (Table 4.2). was estimated based on an set (average) total length of 10 cm. Length frequencies can be found in Annex II.

Pel2

The distribution of these species was found in low density (Figure 4.1, Table 4.1). The densities decreased slightly southwards from the Deltaic area. A total acoustic abundance index of 17 000 tonnes of fish was estimated based on an set (average) total length of 10 cm. The most common Pel2 species found in the region was redtail scad *Decapturus kurroides*, yellow stripe scad *Selaroides leptolepis* and Hairtail *Lepturacanthus savala*. Length frequencies of the most commonly caught species can be found in Annex II.

Table 4.1 S_A values allocated to the different species group per region.

Region	#5 NM scrutinised	Avg. s_A PEL1	# obs.	Avg. s_A PEL2	# obs.	Avg. sA Plankton	Avg. s_A TOTAL
The Rakhine Coast	124	290	12	52	41	2452	2518
The delta area	228	164	9	27	81	2343	2369
The Tanintharyi coast	326	193	11	47	81	2800	2823
Total	678	221	32	40	203	2583	2614

Table 4.2. Biomass estimates of pelagic fish during the survey, Pel 1- Clupeid and Engraulid species and Pel 2- Carangid, Scombrid, Sphyraenid and Trichiurid species.

Region	Pel 1	Pel 2
The Rakhine Coast	10 000	22 500
The delta area	18 000	34 000
The Tanintharyi coast	7 000	17 000
Total	35 000	73 500

5. SWEPT AREA ABUNDANCE AND DISTRIBUTION

The trawl survey covered the shelf and slope from 20 m to 500 m bottom depth. Catch rates in kg/hour and Std. Dev () are presented per region and depth strata for main taxonomic groups found during the survey, English name with scientific name in (). These are; catfish (Ariidae), cusk-eels (Brotula), carangids (Carangidae), cephalopods (Cepalopodae), clupeids (Clupeidae), crabs (Brachyura), croakers (Sciaenidae), anchovies (Engraulidae), Groupers (Serranidae), Grunts (Haemulidae), Hairtails (Trichiuridae), ponyfish (Leiognathidae), Lobsters (Nephropidae and Homaridae), Goatfish (Mullidae), pike congers (Muraenesocidae), rays (Batoidea), mackerels (Scombridae), sea Snakes (Hydrophiinae and Laticauda), sharks (Chondrichthyes), shrimps (Caridea and Dendrobranchiata), snappers (Lutjanidae), soles (Bothidae, Cynoglossidae, Psettodes), butterfishes (Stromateidae), lizardfish (Synodontidae),threadfin (Polynemidae), threadfin breams (Nemipteridae), other species and Total in Table 5.1. The group of other species are considered non-commercial and comprises all species not defined within any of the previously mentioned groups.

Four depth strata were defined prior to the survey 20 -50 m depth (inner shelf) 50 - 100 m depth (outer shelf) 100 - 200 m depth (upper slope) and 200 – 500 m depth (lower slope) in addition some very few trawls were taken in deep water at depths >500 m. The region between the coast and 20 m bottom depth was not covered due to safety restrictions set by the vessel. As Myanmar has a relatively wide shelf especially in the delta area a considerable amount of fish can be found inshore of the area covered by the vessel.

The trawl positions are mapped in Figures 1.1. Station information and catch by species are presented in Annex I.

5.1. Analyses of catch rates

Catch rates are presented per three regions 1. Rakhine cost 2. The Deltaic cost and 3. The Tanintharyi coast. The mean catch rates were generally low but varied considerably throughout the survey. Highest catch rates were found on the Rakhine coast between 20-50 m depth (364 kg/h) while the depth zone between 50 -100 m depth in the same region also showed relatively large catches (204 kg/h). Further south it was the deep water that gave the largest catches. The delta area (199 kg/h) and the Tanintharyi coast (214 kg/h) between 200-500 m bottom depth. while the Tanintharyi coast between 50-100 m depth showed catch rates of 193 kg /h. Lowest catch rates were experienced in the Tanintharyi coast between 20-50 m depth, but only two trawl stations were made in that depth region due to bad trawling conditions on the bottom. Very low trawl catches was also made in the same region between 500-1000 m depth but also here the number of trawl stations were low and not necessarily representative.

In the following we will look more detailed at each of the regions and the species groups dominating in each of them.

The Rakhine coastal zone

A total of 41 valid trawl stations were analysed along the Rakhine coast. of these 14 stations were between 20 -50 m depth, 13 between 50 - 100 m depth, 12 between 100 - 200 m depth and 2 between 200 – 500 m depth. Table 5.1 shows the average catch rates of the main groups caught during the survey.

The Rakhine inner shelf between 20-50 m bottom depth was dominated by pelagic species, Hairtails (129 kg/h), Clupeids (42 kg/h), Carangids (33 kg/h), Engraulids (25 kg/h) and Scombrids (12 kg/h), The typical demersal species, with exception of the Leiognathidae (74 kg/h), gave low catch rates. Of these Shrimps (5.1 kg/h), Threadfin breams (4.9 kg/h), Mullets (4.8 kg/h) and croakers (3.6 kg/h) was the most abundant while the group of 'other' species showed 20 kg/h. Further from the coast, at the outer shelf (50-100 m bottom depth) pelagic species still dominated, but with lower catch rates than further inshore. This group consisted of Hairtails (42.5 kg/h), Carangids (14.5 kg/h), Scombrids (8 kg/h) and Clupeids (5 kg/h). The group of other species were the second largest group with 41 kg/h, while shrimps increased in importance from further inshore with catch rates of 12.7 kg/h. Cephalopods had catch rates of 8.7 kg/h while the demersal fish species in this region was dominated by Threadfin breams (10.3 kg/h) and mullets (8.9 kg/h). Rays and skates showed the largest abundance of the northern region with catch rates of 8.6 kg/h. On the upper slope most commercial fish species became rare, and the catch was dominated by the group of 'other' non commercial species (65 kg/h). In addition to this crabs gave catch rates of 24 kg/h while The lizardfish (Synodontidae) (20.5 kg/h) and threadfin breams had catch rates of 4.9 kg/h. Notably in this depth region was the very low bottom oxygen values recorded. Only few species can survive in these conditions. On the lower slope (200-500 m depth) the group of other species still dominated with 91 kg/h. catch rates were generally similar to the upper slope and crabs was still the most dominating group (15.8 kg/h) although the brotulas became considerably more important with catch rates of 17.7 kg/h, the highest catch rates of this species group found anywhere during the survey. Sharks became more important with 9.1 kg/h while shrimps gave catch rate of 2.5 kg/ h and rays 1.6 kg/h.

The Deltaic cost

A total of 58 valid trawl stations were analysed in the delta region. of these 14 stations were between 20 -50 m depth, 22 between 50 - 100 m depth, 17 between 100 - 200 m depth and 5 between 200 – 500 m depth. Table 5.1 shows the average catch rates of the main groups caught during the survey.

In the delta area catch rates generally declined compared to the Rakhine region. The most common species group on the inner shelf (20-50 m depth) was the pelagic species. Of these 17.9 kg/h was carangids while 11.7kg/h was clupeids and 5.3 kg/h of Engraulids. The 'other' group gave catch rates of 17.4 kg/h. Croakers showed catches of 8.4 kg/h, Synodontidae had catch rates of 8.3 kg/h, shrimps showed catch rates of 7.1 kg/h and mullets had catch rates of 3.1 kg/h. Moving offshore to the outer shelf the pelagic species was dominated by Carangids with 18 kg/h, while the 'other' group gave catches of 55.7 kg/h. Cephalopods became considerably more important with 10.2 kg/h while both mullets (9.4 kg/h), the threadfin breams (10.4 kg/h) showed their highest abundance during the survey. At the upper slope the non commercial species were the most abundant with catch rates of 57.6 kg/h. The Synodontids had the second highest catch rates with 16.1 kg/h. Shrimps increased compared to further inshore with catches of 8.2 kg/h while the threadfin breams was the only group of valuable fish species that was important with catches of 9.9 kg/h. Soles had catch rates of 1.9 kg/h while sharks had catch rates of 3.1 kg/h and rays 2.5 kg/h. At the lower slope (200-500 m depth) catch rates was the highest in the delta area. The other group had catch rates of 90.3 kg/h while

shrimps increased and had considerably higher catches than further inshore with catch rates of 33.3 kg/h. Also lobster increased in catch rates and gave 7 kg/h. while cephalopods showed catch rates of 7.4 kg/h. Of the fish species the brotulas showed catches of 2.9 kg/h while the sharks and rays was the only other two dominating groups with catch rates of 21.3 and 34.7 respectively.

The Tanintharyi coast

A total of 58 valid trawl stations were analysed in the Tanintharyi coast. of these 2 stations were between 20 -50 m depth, 18 between 50 - 100 m depth, 11 between 100 - 200 m depth, 13 between 200 – 500 m depth and 2 >500 m depth. Table 5.1 shows the average catch rates of the main groups caught during the survey.

In the southern region, the Tanintharyi coast, catch rates were generally higher than in the delta region but lower than on the Rakhine coast. Highest catch rates were found on the outer shelf and on the slope. On the inner shelf the pelagic species was the most abundant. Of these Hairtails, Carangids, Engraulids and Scombrids all had similar catch rates around 3-3.5 kg/h each. Cephalopods had its highest abundance in the whole survey area with catch rates of 16.1 kg/h, while the Synodontiodae showed catches of 17.2 kg/h. The group of other species had catch rates of 11 kg/h. All other species groups showed very low abundance. On the outer shelf pelagic species had relatively good catch rates, mainly consisting of Carangids with catch rates of 76.5 kg/h, followed by Hairtails with 9.1 kg/h. The group of other species showed catch rates of 71 kg/h. The cephalopods continued their distribution from the inner shelf but with reduced abundance, and had catch rates of 9.6 kg/h. Of the demersal fish species the synodontidae had the highest catch rates with 15.3 kg/h while threadfin breams gave catches of 6.8 kg/h. This region also showed the highest overall catch rates both of groupers with 5.2 kg/h and of soles with 3.2 kg/h. On the upper slope the other species showed catch rates of 52 kg/h. Rays also showed relatively high catch rates with 27 kg/h. Lobsters (crayfish) became very important in this depth region with 9.5 kg/h while soles gave catch rates of 2.6 kg/h. The pelagic species decreased considerably and was not important in the catches. On the deep slope (200-500 m depth) in this southern region catch rates were still among the highest observed during the survey. The group of other species made up approximately half of the catch with 109.5 kg/h while Shrimps, Lobsters and Cephalopods all became important groups with 39.8 kg/h, 12.2 kg/h and 6.9 kg/h respectively. Of fish species only rays and sharks were important with 34.9 and 8.1 kg/h respectively. Deeper than 500 m two stations were made, however, catch rates were relatively good, and Shrimps (15.4 kg/h), Sharks (29.7 kg/h), Brotula 3.2 kg/h and Lobsters (1.7 kg/h) was all found in some quantity in the region in addition to the group of other species with average catch of 44.8 kg/h.

Table 5.1. Mean catch rates in (kg/hour) and Std. Dev () of main groups caught in valid swept area bottom trawl hauls, per region and depth zone.

Region	Depth int.	# Stations	Gear depth		Ariidae		Brotula		Carangids		Cephalopods		Clupeids		Crabs		Croakers	
Rakhine Coast	20 - 50	14	37.6	(6.1)	0.2	(0.5)	0	(0.0)	32.9	(48.3)	2.8	(4.0)	42	(97.8)	0.7	(1.3)	3.6	(8.3)
Rakhine Coast	50 - 100	13	75.5	(9.6)	0	(0.0)	0	(0.0)	14.5	(12.9)	8.7	(8.0)	5	(15.7)	4.9	(11.9)	0.1	(0.3)
Rakhine Coast	100 - 200	12	139.5	(22.0)	0	(0.0)	0.1	(0.4)	0.2	(0.5)	0.9	(2.2)	0	(0.0)	24.3	(46.7)	0	(0.0)
Rakhine Coast	200 - 500	2	347.8	(162.3)	0	(0.0)	17.7	(24.5)	0	(0.0)	0	(0.0)	0	(0.0)	15.8	(22.3)	0	(0.0)
Delta area	20 - 50	14	33.4	(7.6)	1.6	(3.6)	0	(0.0)	17.9	(47.9)	3.6	(3.2)	11.7	(33.6)	1.7	(3.3)	8.4	(12.8)
Delta area	50 - 100	22	72.2	(14.9)	0.3	(1.3)	0	(0.0)	18	(61.5)	10.2	(20.9)	0.1	(0.5)	0.7	(1.3)	0.8	(2.2)
Delta area	100 - 200	17	126.3	(23.5)	0.3	(1.1)	0.1	(0.4)	0.5	(1.2)	1.5	(1.5)	0	(0.0)	5.6	(11.5)	1.1	(3.0)
Delta area	200 - 500	5	336.1	(78.6)	0	(0.0)	2.9	(5.1)	0	(0.0)	7.4	(7.4)	0	(0.0)	1.5	(3.2)	0	(0.0)
Tanintharyi coast	20 - 50	2	38.5	(5.7)	0	(0.0)	0	(0.0)	3.2	(2.2)	16.1	(10.9)	0.6	(0.5)	0.5	(0.4)	0	(0.0)
Tanintharyi coast	50 - 100	18	77.6	(13.1)	0	(0.0)	0	(0.2)	76.5	(309.8)	9.6	(10.4)	0.2	(0.9)	0.2	(0.5)	0	(0.0)
Tanintharyi coast	100 - 200	11	136.5	(33.0)	0	(0.0)	0	(0.0)	7.1	(22.9)	1.1	(1.7)	0	(0.0)	0.2	(0.8)	0	(0.0)
Tanintharyi coast	200 - 500	13	325.5	(58.8)	0	(0.0)	1.6	(3.3)	0	(0.0)	6.9	(6.6)	0	(0.0)	0	(0.1)	0	(0.0)
Tanintharyi coast	500 - 1000	2	514.2	(1.1)	0	(0.0)	3.2	(1.4)	0	(0.0)	0.8	(1.2)	0	(0.0)	0	(0.0)	0	(0.0)

Region	Depth int.	# Stations	Engraulidae		Groupers		Grunts		Hairtails		Leiognathidae		Lobsters		Mullidae	
Rakhine Coast	20 - 50	14	25	(51.0)	0.3	(1.0)	3	(5.0)	128.5	(415.5)	73.9	(96.7)	0	(0.2)	4.8	(3.6)
Rakhine Coast	50 - 100	13	0.2	(0.8)	2.7	(6.5)	0.6	(1.6)	42.5	(82.0)	25.3	(41.2)	0.1	(0.2)	8.9	(9.1)
Rakhine Coast	100 - 200	12	0.1	(0.2)	0.4	(1.1)	0	(0.0)	0.1	(0.5)	0	(0.0)	0	(0.1)	0	(0.1)
Rakhine Coast	200 - 500	2	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Delta area	20 - 50	14	5.3	(10.4)	0.4	(0.9)	2.6	(5.6)	4.3	(4.5)	7.5	(18.5)	0	(0.0)	3.1	(7.7)
Delta area	50 - 100	22	0	(0.0)	0.6	(1.7)	0	(0.1)	4.8	(11.4)	0.4	(0.9)	0.1	(0.3)	9.4	(18.6)
Delta area	100 - 200	17	0	(0.1)	0	(0.0)	0.1	(0.3)	0.7	(1.3)	0	(0.0)	0.1	(0.2)	0.6	(1.3)
Delta area	200 - 500	5	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	7	(12.2)	0	(0.0)
Tanintharyi coast	20 - 50	2	3	(4.3)	0	(0.0)	0.9	(1.0)	3.6	(2.7)	15.7	(11.8)	0	(0.0)	2.2	(3.2)
Tanintharyi coast	50 - 100	18	0	(0.1)	5.2	(21.2)	0	(0.0)	9.1	(23.1)	0.7	(1.9)	0.1	(0.2)	4.2	(6.9)
Tanintharyi coast	100 - 200	11	0	(0.0)	1.3	(3.8)	0.5	(1.4)	0	(0.0)	0	(0.1)	9.5	(30.5)	1.8	(3.4)
Tanintharyi coast	200 - 500	13	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	12.2	(10.5)	0	(0.0)
Tanintharyi coast	500 - 1000	2	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1.7	(2.4)	0	(0.0)

Cont.

Cont.

Region	Depth int.	# Stations	Muraenesocidae		Rays		Scombrids		Sea Snakes		Sharks		Shrimps		Snappers	
Rakhine Coast	20 - 50	14	0.3	(0.7)	0.6	(1.7)	11.7	(20.7)	0	(0.2)	0	(0.0)	5.1	(10.1)	0.5	(1.7)
Rakhine Coast	50 - 100	13	0	(0.0)	8.6	(31.0)	8.3	(20.4)	0.1	(0.5)	0	(0.0)	12.7	(11.8)	2.1	(4.2)
Rakhine Coast	100 - 200	12	3.4	(8.0)	0.1	(0.3)	0	(0.0)	0.3	(0.7)	2.8	(7.7)	0.3	(0.4)	0	(0.0)
Rakhine Coast	200 - 500	2	0	(0.0)	1.6	(2.2)	0	(0.0)	0	(0.0)	9.1	(6.7)	2.5	(3.6)	0	(0.0)
Delta area	20 - 50	14	4.9	(6.1)	0	(0.1)	4.8	(12.1)	0.3	(1.1)	0.4	(1.4)	7.1	(6.9)	0	(0.1)
Delta area	50 - 100	22	0.4	(1.1)	0.3	(0.8)	1.1	(3.8)	0.1	(0.4)	0.5	(2.2)	1.6	(1.8)	0.1	(0.3)
Delta area	100 - 200	17	0.1	(0.6)	2.5	(3.9)	0	(0.0)	0	(0.0)	3.1	(8.9)	8.2	(24.8)	1.1	(4.3)
Delta area	200 - 500	5	0	(0.0)	34.7	(25.3)	0	(0.0)	0	(0.0)	21.3	(36.6)	33.3	(28.3)	0	(0.0)
Tanintharyi coast	20 - 50	2	0	(0.0)	0	(0.0)	2.5	(0.6)	0	(0.0)	0	(0.0)	2.3	(0.8)	0	(0.0)
Tanintharyi coast	50 - 100	18	0.4	(1.5)	2.8	(5.8)	2	(4.3)	0.1	(0.4)	0.1	(0.5)	0.3	(0.8)	1.4	(4.6)
Tanintharyi coast	100 - 200	11	0	(0.0)	27.3	(74.3)	0.1	(0.2)	0	(0.0)	3.2	(6.1)	0.1	(0.2)	1.4	(3.0)
Tanintharyi coast	200 - 500	13	0	(0.0)	34.9	(45.9)	0	(0.0)	0	(0.0)	8.1	(8.6)	39.8	(48.0)	0	(0.0)
Tanintharyi coast	500 - 1000	2	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	29.7	(25.3)	15.4	(5.6)	0	(0.0)

Region	Depth int.	# Stations	Soles		Stromateidae		Synodontidae		Threadfin		Threadfin breams		Other		Total	
Rakhine Coast	20 - 50	14	0	(0.0)	0.8	(2.7)	3.1	(3.6)	0	(0.2)	4.9	(5.4)	19.4	(12.7)	364.2	(606.1)
Rakhine Coast	50 - 100	13	0.5	(1.3)	0	(0.0)	6.2	(4.6)	0	(0.0)	10.3	(6.9)	41.3	(32.0)	203.6	(100.3)
Rakhine Coast	100 - 200	12	0.1	(0.2)	0	(0.0)	20.5	(50.4)	0	(0.0)	4.9	(16.9)	65	(87.6)	123.5	(145.8)
Rakhine Coast	200 - 500	2	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	90.8	(64.9)	137.5	(61.8)
Delta area	20 - 50	14	1.8	(6.8)	0.8	(1.8)	8.3	(13.4)	2.3	(4.0)	1.6	(3.4)	17.4	(22.5)	117.7	(125.3)
Delta area	50 - 100	22	1.7	(2.9)	0.2	(0.8)	7.9	(12.3)	0.6	(2.7)	10.4	(10.6)	55.7	(153.6)	126.1	(162.9)
Delta area	100 - 200	17	1.9	(2.7)	0	(0.0)	16.1	(12.5)	0	(0.1)	9.9	(8.6)	57.6	(86.0)	111.3	(104.6)
Delta area	200 - 500	5	0	(0.0)	0	(0.0)	0.1	(0.2)	0	(0.0)	0	(0.0)	90.3	(73.1)	198.5	(127.9)
Tanintharyi coast	20 - 50	2	1.8	(2.6)	0	(0.0)	17.2	(5.0)	0	(0.0)	0	(0.0)	11	(7.2)	80.8	(16.4)
Tanintharyi coast	50 - 100	18	3.2	(5.9)	0	(0.0)	15.3	(12.7)	0	(0.0)	6.8	(7.3)	54.8	(92.5)	193.1	(409.6)
Tanintharyi coast	100 - 200	11	2.6	(5.6)	0	(0.0)	10	(12.7)	0	(0.0)	1.6	(2.0)	52	(82.3)	119.9	(137.4)
Tanintharyi coast	200 - 500	13	0.8	(1.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	109.5	(87.6)	213.9	(123.4)
Tanintharyi coast	500 - 1000	2	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	44.8	(1.0)	95.7	(34.5)

5.2. Biomass index –

For the calculation of biomass index a calculation of the areas of the different depth strata's and regions covered by the survey was made (Table 5.2). This also included the area between the coast and 20 m depth to illustrate the ocean area not covered by the survey. A relatively large ocean area is found inshore of what was covered by the survey. From experience these regions can have relatively large biomass of fish but the depletion level also commonly reflect what is observed in deeper waters.

Table 5.2. Calculated areas in NM^2 of the different depth strata regions covered by the survey, and the percentage of each depth strata to the total for each region

Depth range	North (nm^2)	Central (nm^2)	South (nm^2)	North (%)	Central (%)	South (%)
0-20	3991	10581	4629	29.9	26.9	15.8
20-50	2677	8849	5245	20.1	22.5	17.9
50-100	2862	10054	8081	21.4	25.5	27.6
100-200	1204	5394	2716	9.0	13.7	9.3
200-500	1114	1767	6207	8.3	4.5	21.2
500-1000	1497	2727	2394	11.2	6.9	8.2
Total	13346	39372.75	29272.8	100.0	100.0	100.0

The biomass estimates of the various demersal groups of fish and invertebrates can be found in Table 5.3 while a summary can be found in Table 7.1. The individual species groups are not covered further in the text as a description of the most common groups (in kg/h) has been presented above. Pelagic species groups are not reported as these are considered not to be sampled representatively in the bottom trawl catches.

The Total biomass (t) was estimated to be approximately 280 000 tonnes. Of this the Rakhine coastal zone had an estimate of 60 000 tonnes. The highest biomass was found inshore between 20-50 m depth with a total of 31 000. At the outer shelf the biomass was estimated to be 19 000 tonnes. Further offshore the biomass decreased on the upper slope to 4900 tonnes before it increased slightly to 5 200 tonnes at the lower slope.

The Deltaic cost gave a total biomass estimate of 101 000 tonnes. Of this 31 000 tonnes was found inshore between 20-50 m depth, further offshore the biomass increased slightly to 40 000 tonnes. On the upper slope the biomass decreased to 19 000 tonnes, and further on the lower slope to 11 000 tonnes.

The Tanintharyi coast showed the highest overall biomass estimate of112000 tonnes. Of this the inner shelf gave an estimate of 12 000 tonnes, while the outer shelf gave the largest overall estimate for any region during the survey with 47 000 tonnes. The biomass thereafter decreased on the upper slope to 10 000 tonnes and increased considerably to 43 000 on the lower slope. Deeper than this only two trawls were made, but extrapolating over the region 500 – 1000 m depth would give an estimate of 7 000 tonnes.

Table 5.3. Biomass estimates for the main groups of fish found during the survey.

			Ariidae		Brotula		Cephalopods		Crabs		Croakers		Groupers		Grunts		Leiognathidae	
Region	Depth int.	# Stat.	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)
Arakan Coast	20 - 50	14	0.0	21.4	0.0	0.0	0.1	232.9	0.0	53.5	0.1	315.9	0.0	24.1	0.1	265.1	2.4	6318.5
Arakan Coast	50 - 100	13	0.0	0.0	0.0	0.0	0.3	827.1	0.2	503.7	0.0	5.7	0.1	254.7	0.0	57.2	0.9	2444.1
Arakan Coast	100 - 200	12	0.0	0.0	0.0	3.6	0.0	33.7	0.8	984.0	0.0	0.0	0.0	15.7	0.0	0.0	0.0	0.0
Arakan Coast	200 - 500	2	0.0	0.0	0.6	676.3	0.0	0.0	0.5	586.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
delta area	20 - 50	14	0.0	380.5	0.0	0.0	0.1	982.3	0.1	513.3	0.3	2318.5	0.0	88.5	0.1	672.5	0.2	1938.0
delta area	50 - 100	22	0.0	60.3	0.0	0.0	0.3	3297.8	0.0	211.1	0.0	241.3	0.0	181.0	0.0	20.1	0.0	120.7
delta area	100 - 200	17	0.0	43.2	0.0	27.0	0.0	253.5	0.2	954.7	0.0	188.8	0.0	0.0	0.0	10.8	0.0	0.0
delta area	200 - 500	5	0.0	0.0	0.1	157.3	0.2	394.1	0.0	84.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tenasserim coast	20 - 50	2	0.0	0.0	0.0	0.0	0.5	2376.2	0.0	83.9	0.0	0.0	0.0	0.0	0.0	157.4	0.4	2302.7
Tenasserim coast	50 - 100	18	0.0	0.0	0.0	8.1	0.3	2392.0	0.0	40.4	0.0	0.0	0.2	1228.3	0.0	0.0	0.0	169.7
Tenasserim coast	100 - 200	11	0.0	0.0	0.0	0.0	0.0	89.6	0.0	19.0	0.0	0.0	0.0	108.7	0.0	43.5	0.0	2.7
Tenasserim coast	200 - 500	13	0.0	0.0	0.1	316.6	0.2	1365.5	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tenasserim coast	500 - 1000	2	0.0	0.0	0.1	234.6	0.0	59.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum		145		505		1423		12305		4041		3070		1901		1227		13296

Cont.

			Lobsters		Mullidae		Muraenesocidae		Rays		Sea Snakes		Sharks		Shrimps		Snappers	
Region	Depth int.	# Stat.	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)
Arakan Coast	20 - 50	14	0.0	5.4	0.2	404.3	0.0	24.1	0.0	56.2	0.0	5.4	0.0	0.0	0.2	431.1	0.0	40.2
Arakan Coast	50 - 100	13	0.0	5.7	0.3	838.5	0.0	0.0	0.3	747.0	0.0	14.3	0.0	0.0	0.4	1187.7	0.1	188.9
Arakan Coast	100 - 200	12	0.0	1.2	0.0	1.2	0.1	127.7	0.0	3.6	0.0	13.2	0.1	118.0	0.0	9.6	0.0	0.0
Arakan Coast	200 - 500	2	0.0	1.1	0.0	0.0	0.0	0.0	0.1	59.0	0.0	0.0	0.3	339.8	0.1	96.9	0.0	0.0
delta area	20 - 50	14	0.0	0.0	0.1	769.9	0.2	1371.6	0.0	8.8	0.0	79.6	0.0	79.6	0.2	1920.3	0.0	8.8
delta area	50 - 100	22	0.0	20.1	0.3	2966.0	0.0	130.7	0.0	100.5	0.0	40.2	0.0	170.9	0.0	492.7	0.0	30.2
delta area	100 - 200	17	0.0	10.8	0.0	97.1	0.0	27.0	0.1	426.1	0.0	0.0	0.1	523.2	0.3	1370.0	0.0	183.4
delta area	200 - 500	5	0.2	399.4	0.0	0.0	0.0	0.0	1.1	1928.2	0.0	0.0	0.7	1216.0	1.0	1846.9	0.0	0.0
Tenasserim coast	20 - 50	2	0.0	0.0	0.1	393.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	367.2	0.0	0.0
Tenasserim coast	50 - 100	18	0.0	16.2	0.1	1058.6	0.0	97.0	0.1	686.9	0.0	32.3	0.0	32.3	0.0	80.8	0.0	339.4
Tenasserim coast	100 - 200	11	0.3	804.0	0.1	146.7	0.0	0.0	0.8	2251.8	0.0	0.0	0.1	255.3	0.0	8.1	0.0	116.8
Tenasserim coast	200 - 500	13	0.4	2470.4	0.0	0.0	0.0	0.0	1.1	6964.2	0.0	0.0	0.3	1632.4	1.3	8075.2	0.0	0.0
Tenasserim coast	500 - 1000	2	0.1	129.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2221.5	0.5	1144.2	0.0	0.0
Sum		145		3864		6676		1778		13232		185		6589		17031		908

Cont.

			Soles		Stromateidae		Synodontidae		Threadfin		Threadfin breams		Other		Total	
Region	Depth int.	# Stat.	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)	t/nm^2	Biom. (t)
Arakan Coast	20 - 50	14	0.0	0.0	0.0	66.9	0.1	254.3	0.0	5.4	0.2	409.6	0.6	1654.6	11.6	31086.7
Arakan Coast	50 - 100	13	0.0	45.8	0.0	0.0	0.2	589.5	0.0	0.0	0.3	978.8	1.4	3952.3	6.6	18960.0
Arakan Coast	100 - 200	12	0.0	2.4	0.0	0.0	0.7	839.5	0.0	0.0	0.2	209.6	2.1	2496.7	4.0	4875.4
Arakan Coast	200 - 500	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	3444.9	4.7	5201.9
delta area	20 - 50	14	0.0	407.1	0.0	194.7	0.3	2327.4	0.1	522.1	0.0	389.4	0.5	4592.8	3.5	30875.2
delta area	50 - 100	22	0.1	532.9	0.0	40.2	0.2	2382.8	0.0	140.8	0.3	3187.2	1.8	17846.2	4.0	39905.1
delta area	100 - 200	17	0.1	323.6	0.0	0.0	0.5	2745.4	0.0	5.4	0.3	1677.5	1.8	9832.8	3.5	18921.3
delta area	200 - 500	5	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	2.8	4989.4	6.2	11019.8
Tenasserim coast	20 - 50	2	0.1	320.0	0.0	0.0	0.5	2638.4	0.0	0.0	0.0	0.0	0.3	1814.9	2.4	12436.8
Tenasserim coast	50 - 100	18	0.1	824.3	0.0	0.0	0.5	3814.2	0.0	0.0	0.2	1680.8	1.7	13382.1	5.8	46894.0
Tenasserim coast	100 - 200	11	0.1	203.7	0.0	0.0	0.3	809.5	0.0	0.0	0.0	133.1	1.6	4324.4	3.6	9884.6
Tenasserim coast	200 - 500	13	0.0	161.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	22003.6	6.9	42989.2
Tenasserim coast	500 - 1000	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	3303.5	3.0	7092.9
Sum		145		2821		302		16406		674		8666		93638		280143

5.3. Biodiversity

The most commonly used definition of biodiversity is that of the Convention on Biological Diversity 1992. 'Biological diversity' means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

The term biodiversity encompasses variety of biological life at more than one scale. It is not only the variety of species (both plant and animal) but also the variety of genes within those species and the variety of ecosystems in which the species reside. Biodiversity does in other words not exclusively refer to species richness. It also encompasses diversity at a wider scale meaning that differences in the genetic makeup of populations is important. Endemism has a key role to play in this context because endemic species are restricted to small areas and provide pockets of particularly high genetic diversity. In this report we refer mainly to species variation, and ecosystem variation, and this chapter will to try to highlight the main trends in fish diversity from the vessel trawl catches.

A total of 312 fishing stations with all together 444 teleost species belonging to 129 teleost fish families were recorded; for the cartilaginous species the catches showed: 32 shark species belonging to 11 different families 20 ray species from 5 families and 2 species of chimaeras from two different families. 235 different taxonomic entities were identified on the Rakhine Coast, while 352 entities were identified in the delta area and 329 entities on the Tanintharyi coast. Table 5.4 Show the number of different entities caught per trawl in each depth region. The table illustrate that the most species rich area was the 50-100 m depth region in the Delta area.

Table 5.4. Number of different species entities caught per trawl in each depth region.

Depth/region	Rakhine Coast	Delta area	Tanintharyi coast
20-50	132	128	50
50-100	118	201	144
100-200	73	144	117
200-500	23	69	129
>500	10		37
Total	235	352	329

As a measure for relative abundance or commonness of each species in the trawl catches within each of the strata an index of relative importance (%IRI) was used.

Equation 1: $$\%IRI = \frac{(\%N_i + \%W_i) \cdot \%F_i}{\sum_{j=1}^{S} (\%N_j + \%W_j) \cdot \%F_j} * 100$$ (Kolding 1989)

Where:

%Ni = percentage numeric abundance of each species i of total catch in all trawls in a given stratum
%Wi = percentage weight of each species i of total catch in all trawls, in a given stratum
%Fi = percentage frequency of occurrence of each species i in total number of hauls
S is the total number of species j in all trawl hauls in a given stratum

This index is based on the IRI index that combines and represents simultaneously the relative numeric abundance (N), the relative weight (W) and the commonness (F) of a species.

Equation 2: IRI = (%N + %W)* %F (Pinkas et al. 1971, Caddy & Sharp 1986)

Both indexes can be displayed as a rectangle. The %IRI gives the relative area of this rectangle as a percentage commonness of all the other species present within a given cluster. The IRI-analysis identifies the most common species in each strata.

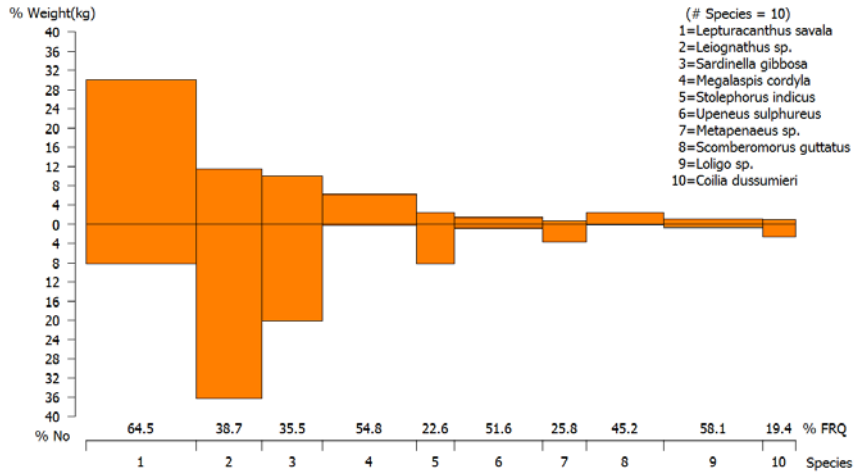
Figure 5.1. show the %IRI-index for the 10 most important species caught in each of the tree main regions for the depth strata 20–50 m, 50-100 m, 100-200 m and 200 – 500 m. The figures illustrate the substantial change in species composition between the different strata's.

The most common species (groups) in the Rakhine coastal zone were *Lepturacanthus savala, Leiognathus* sp.*, Saurida undosquamis, Nemipterus japonicus, Loligo* sp.*,* Crabs, Sardinella gibbosa, Myctophidae and *Aristeus virilise.*

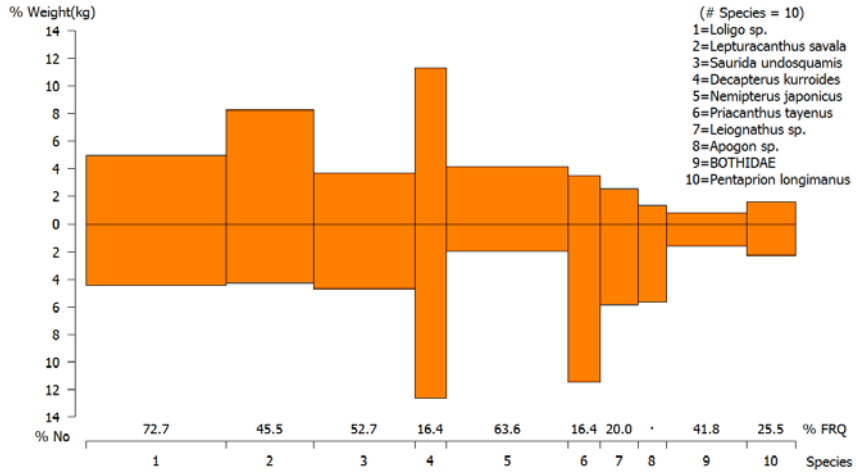
On the Deltaic cost the most common species (groups) were *Saurida undosquamis, Loligo* sp.*, Nemipterus japonicus, Myctophidae, Lepturacanthus savala, Aristeus virilise, Bleekeria* sp.*, Decapterus kurroides and Apogon* sp.

On the Tanintharyi coast the most common species (groups) were *Aristeus virilise, Myctophidae, Saurida undosquamis, Decapterus kurroides, Loligo* sp.*, Plesiobatis daviesi, Satyrichthys adeni, Dactyloptena orientalis* and *Priacanthus macracanthus*

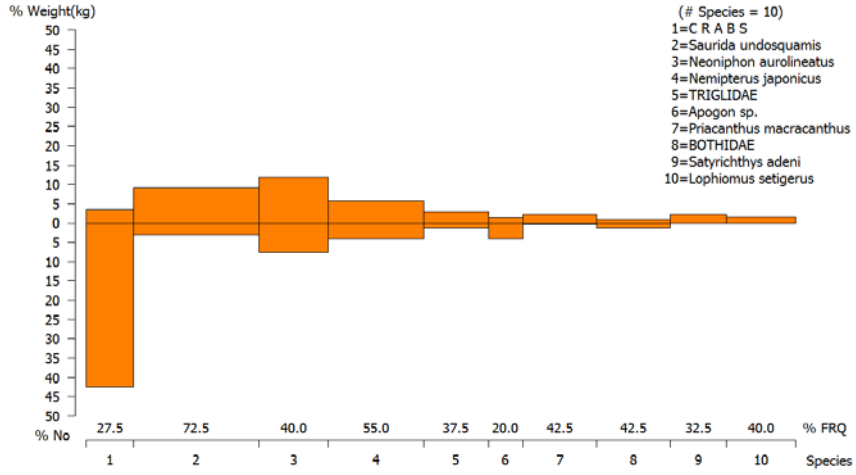
a) Rakhine coastal region
0-50 m



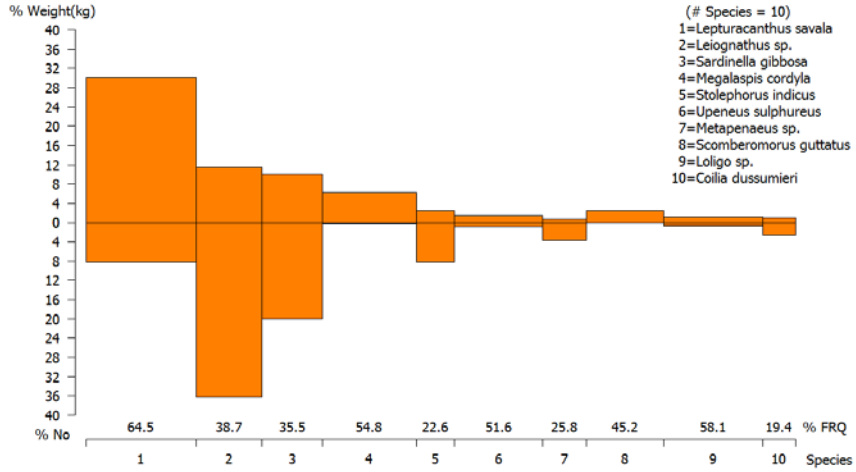
50-100 m



100-200 m

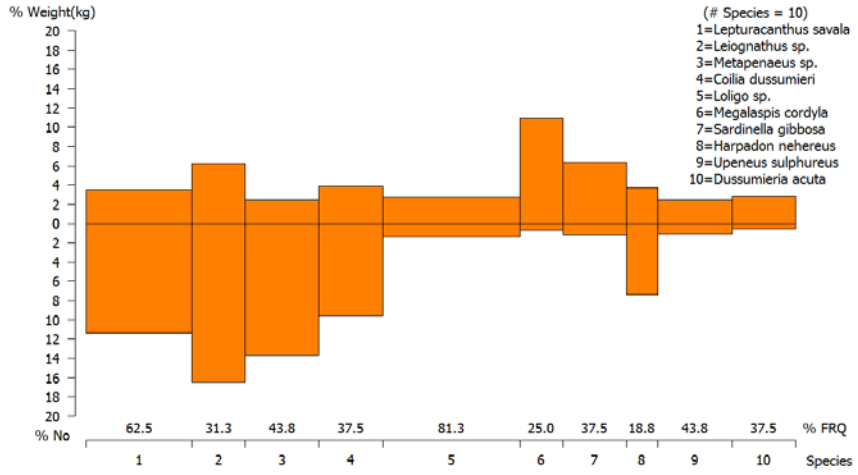


200-500

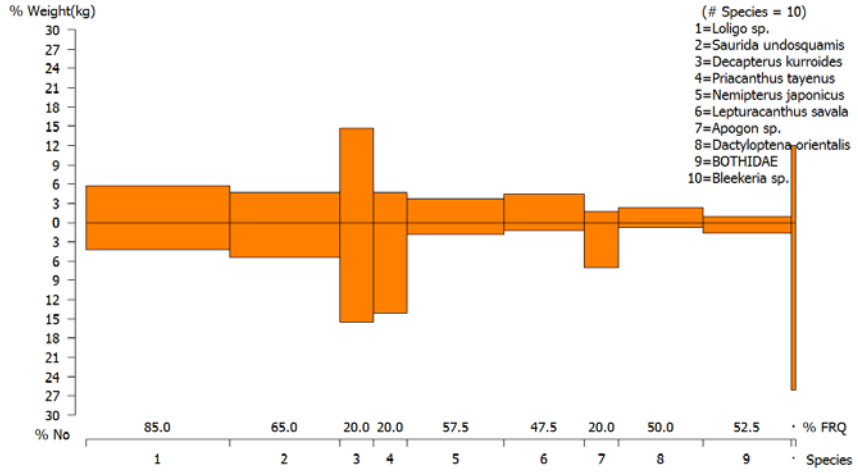


b) *The Deltaic cost*

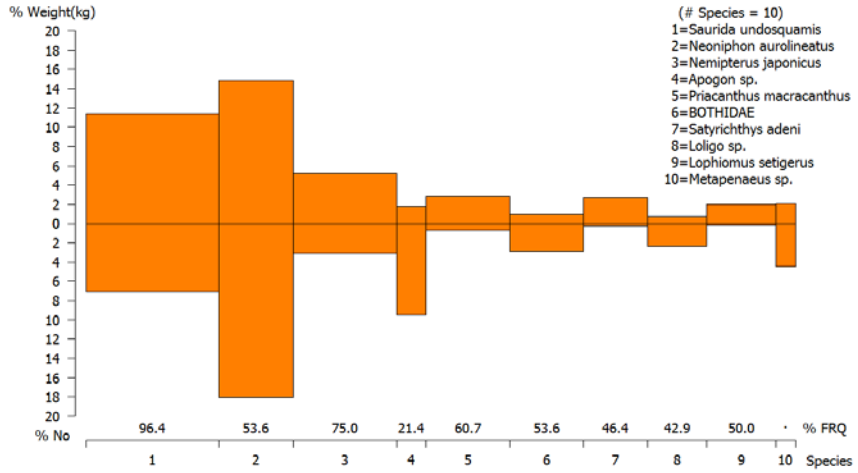
0-50 m



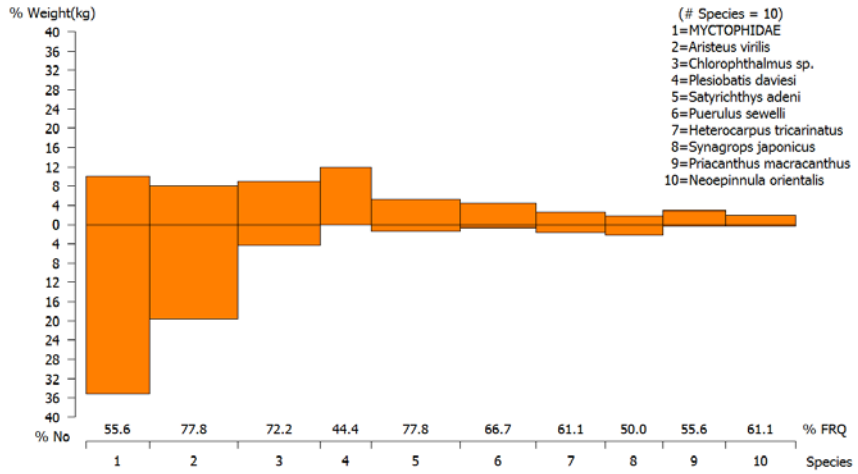
50-100 m



100-200 m

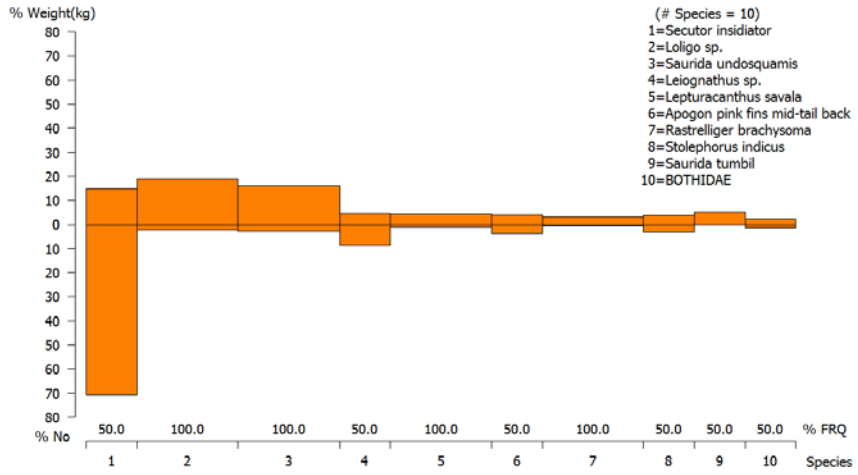


200-500

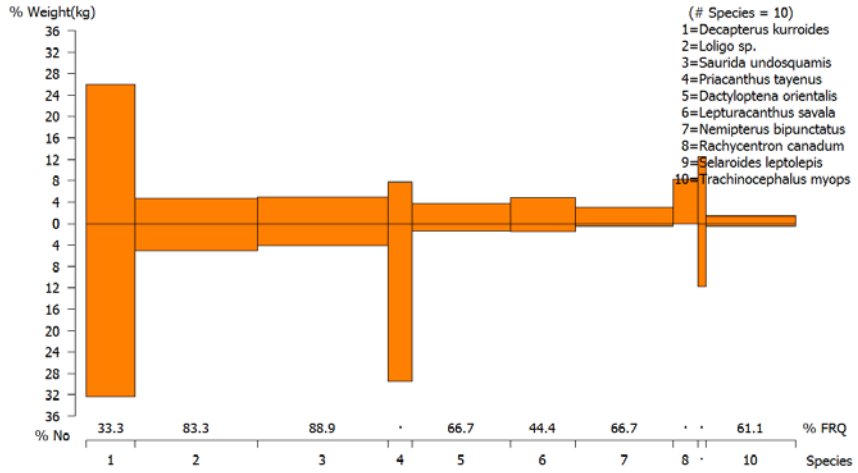


c) The Tanintharyi coast

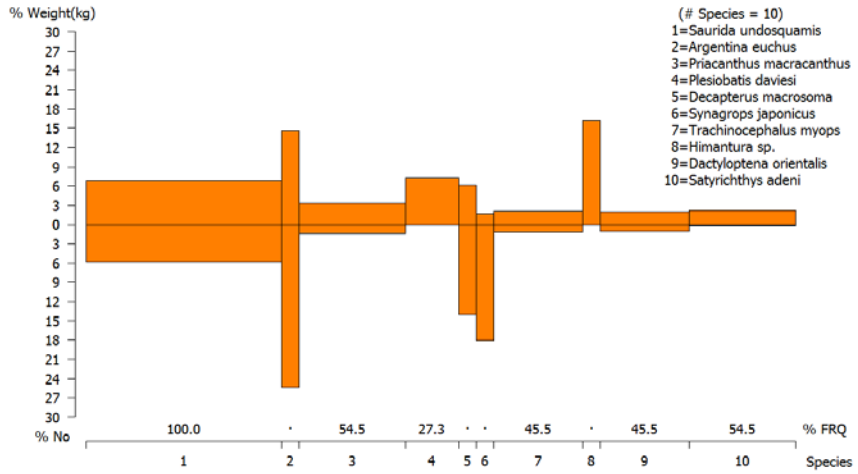
0-50 m



50-100 m



100-200 m



200-500 m

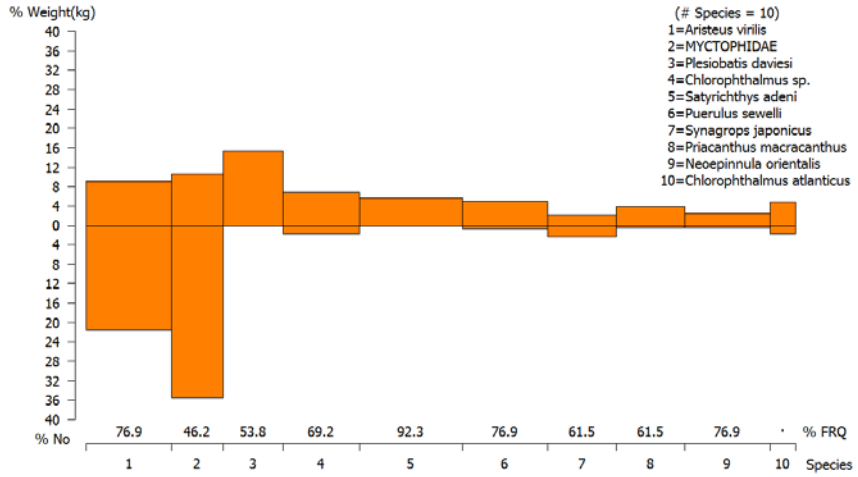


Figure 5.1. Index of relative importance for the 10 most important species or species groups for the depth strata 20–50 m, 50-100 m, 100-200 m and 200-500 m in the Rakhine coastal region (a), the Deltaic cost (b) and the Tanintharyi coast (c)

5.4. Genetics

A number of genetic samples were taken during the survey. Report on genetic analyses on the collected samples will be presented to the BOBLME separately. More than 200 genetic samples have been collected and 500 high resolution pictures have been taken.

6. COMPARISON WITH PREVIOUS SURVEYS

There is great interest in comparing the results of this survey with those carried out in 1979 and 1980, particularly in a situation where information on the state of the fishery resources is poor. Caution however is recommended when comparing the recent results with the results from the 1979-80 surveys. In 1979 the Myanmar coastal shelf was covered twice, first with a general coverage and followed by a partial coverage in selected areas only. Likewise in March-April 1980, a general coverage was carried out first followed by special studies in selected areas. In 1979-80 the main survey method was acoustics with frequent pelagic and demersal trawling for identification of pelagic and demersal acoustic targets. The trawl samples represent therefore aimed trawling at aggregations and are therefore not representative for the mean conditions on the shelf as sampled through a statistical survey design. Only a small area in the NE-part of the delta region was covered by a systematic trawl survey in April 1980. Unfortunately it was not possible to repeat this survey in 2013 as the area was then too densely occupied by local fishing vessels with nets in the sea. The bottom trawl catch rates in 1979-80 vs. 2013 are therefore not directly comparable quantitatively.

The acoustic survey in 1979-80 was carried out with analogue Simrad QM integrators, sometimes vulnerable to saturation in the amplifying system. This could lead to some underestimation of the fish densities at the time. Since late 1980-ies a digital system was introduced combined with routine calibration of the whole acoustic system at regular intervals. This mean that the early system was not as precise as the new system in force since 1987.

The total estimate of small pelagic fish in the 2013 (Nov-Dec) survey was 110 thousand tonnes, rounded to nearest 10 thousand tonnes. In 1979 (same season, Oct-Nov) the total estimate of small pelagic fish was 1 200 thousand tonnes. The earlier surveys showed high seasonality for small pelagic fish and the March-April survey in 1980 gave 2 300 thousand tonnes, close to the double of the autumn 1979 estimate. Comparing autumn 1979 with autumn 2013 there has been a decrease in pelagic fish from 1 200 to 110 thousand tonnes. The most recent estimate is therefore less than 10% of the previous standing stock. Both estimates are based on a mean size of small pelagic fish of 10cm. In 1979-80 this figure was derived from an abundance of trawl samples, while in 2013 pelagic samples are few and small and therefore 10 cm mean size is more an assumption making the two estimates comparable.

The low abundance of pelagic fish is also reflected in the fishing activities aimed at pelagic fish. In 1979 and 1980 44 and 91 aimed pelagic trawls were carried out respectively, while in 2013 registrations were so poor that on only 3 occasions pelagic trawling took place. In 1979-80 there were frequent acoustic registrations of the category “dense” which would signify densities higher than 50 tonnes per nm squared. This is both reflected in the distribution maps and in the echogram recordings printed in the 1979-80 final survey report (Strømme et.al. 1981). Though the 2013 estimate could well be a low-season estimate, the drastic reduction in the pelagic biomass to close to 10% of previous values is a cause for strong concern.

As stated above the demersal catch rates in 1979-80 are not directly comparable with recent results since the first are aimed trawling at acoustic targets and therefore have positive bias as regards the mean values on the shelf. In figure6.1 we have nonetheless compared the two periods showing the most recent catch rates of commercial groups as a percentage of the 1979-80 biased catch rates.

For commercial groups like threadfin, catfish, croakers and snappers the recent estimates are less than 5 of the previous values. Muraenas, sharks, rays and scombrids are affected less and is roundly 50% of previous values. Mullids, groupers, hairtails, shrimps and carangids are in contrast found with higher catch rates in the bottom gear. Figure 6.1seems to suggest that there is a shift in standing stock biomass away from long lived and highly valuable species towards smaller fish with shorter life spans and of lower commercial value. Given the previous caveat the reduction is perhaps not as drastic as 5% of mean standing stock, but still reflect a picture of a fishery that may suffer both from growth and recruitment overfishing.

An analysis of size spectra in the demersal trawl catches should be less susceptible to the bias of aimed trawling at high densities as was the case in the previous surveys. Such analysis is not yet available as part of the Nansis analytical package, but should be carried out soonest as part of the post survey analysis and should include a comparative community structure analysis as well.

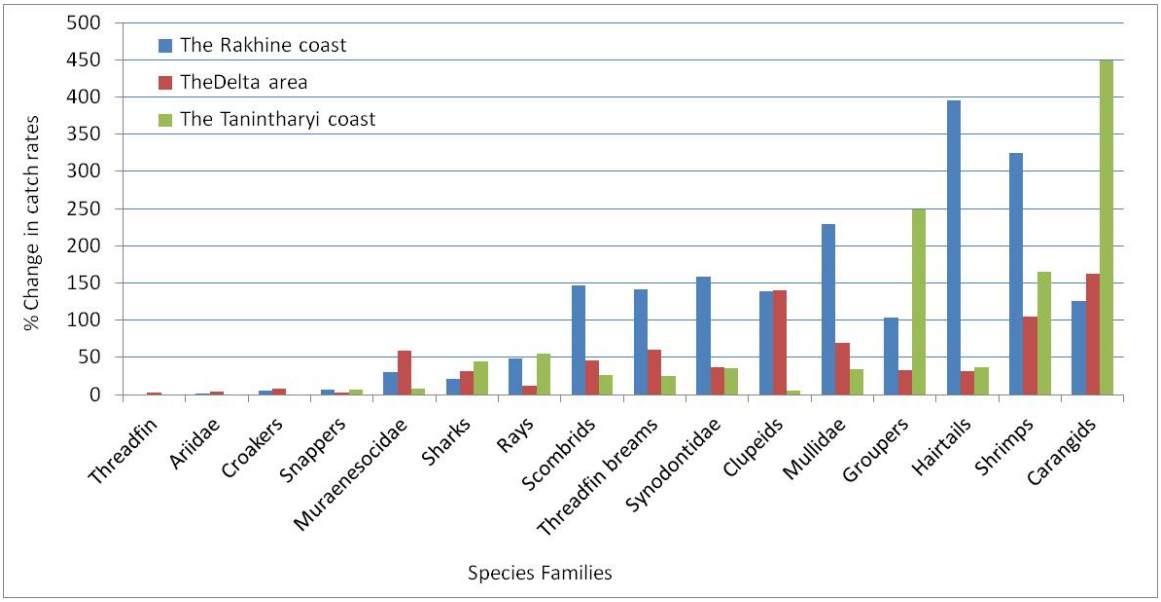


Figure 6.1. Percentage change in demersal catch rates between the 1979 survey (aimed trawling) and the 2013 survey (random trawls). 1979 values = 100%

7. SUMMARY AND CONCLUSIONS

7.1. Present results

The cruise results demonstrate marked spatial patterns in near-surface temperature, salinity, oxygen-levels and relative fluorescence within the Myanmar coastal region. All four variables display clear spatial dynamics, and in some areas also strong horizontal gradients. Most notable are the comparatively warmer upper water-masses along the Rhakine coast, the more saline upper water masses in the southern part of Myanmar coastal area, as well as the high-fluorescence area in the Ayeyarwady Delta coastal region. Our results also show low-oxygen waters with concentrations as low as about 1 ml/l dissolved oxygen in many cases reaching shelf-depths as shallow as ca. 100 m.

Nutrient concentrations generally varied strongly with depth, and particularly nitrate, silicate and phosphate concentrations spanned great ranges. Nitrate and phosphate levels were generally very low in the surface, increased with depth, and could reach very high levels at the depths of 500 m. Silicate concentrations also tended to be low near the surface, though not depleted, and increased to very high values at depths of 500 m. In contrast, nitrite displayed a different vertical distribution from the three other nutrients here described. Nitrite concentrations were typically highest at depth of ~ 50 m, never surpassing values above 0.7 µmol l^{-1} at any station or depth. Nutrient concentrations in the surface-near layers were generally higher at near-shore stations than at stations located further away from land.

Chlorophyll *a* levels were generally low to moderate, depending on location and depth. Considering all stations and depths within the entire survey area, the range of values spanned between 0 and 3.4 mg chl.*a* m^{-3}. Chlorophyll concentrations in surface-near layers were generally highest at the innermost stations near the coast. A few “extreme” values between 2.1 and 3.4 mg chl.*a* m^{-3} were observed near the coast, comprising 2 stations in the Ayeyarwady Delta region as well as one coastal station further south in the Thanintharyi region. For the stations with bottom-depths of 100 and 500 m, the chlorophyll values were generally low near the surface, and showing the highest median values at sampling-depth of 50 m (ca. 0.3 mg chl.*a* m^{-3}). The concentrations would thereafter decrease with depth down to 200 m.

Fish abundance

Abundance of pelagic and demersal fish is reported from the region covered by the survey- generally the depth region between 20- 500 m depth covering the shelf of Myanmar from aprox. 19°30’ N in the north to the border with Thailand at 10°00’ N in the south, see Figure 1.1. Regions with heavy fishing activity, like parts of the delta area, or inshore of 20 m depth was not covered, and the reported abundance estimates does not include those areas even though we are aware that there are important fishing grounds also inshore. However, experience give reason to believe that the catch rates reported for the survey is also reflected in more shallow regions.

The acoustic biomass estimates of pelagic fish was estimated based on a average fish length of 10 cm, and separated in two species groups, Pelagic 1 and pelagic 2. Based on this a total estimate of 109 000 was estimated. Of this approximately 1/3 (35 000 tonnes) was clupeids and anchovies (Pelagic 1), while the rest consisted of carangids and associated species. The highest abundance of

fish was found in the delta area, however, pelagic fish was in general scattered and showed low abundance.

The total swept area biomass estimate (Table 7.1) based on valid bottom trawl hauls was estimated to be 280 000 tonnes. Of this the Rakhine coastal zone had an estimate of 60 000 tonnes. The Deltaic cost gave a total biomass estimate of 101 000 tonnes while the Tanintharyi coast showed the highest overall biomass estimate of 112 000 tonnes.

Table 7.1. Summary of biomass estimates from the different regions and depth strata estimated during the survey

Depth/Region	Rakhine coast	The Deltaic cost	The Tanintharyi coast
20-50 m	31 000	31 000	12 000
50-100 m	19 000	40 000	47 000
100-200 m	4 900	19 000	10 000
200-500 m	5 200	11 000	43 000
Total	60 000	101 000	112 000
Grand Total	280 000		

A more detailed classification of the ecosystem is outside the scope of this cruise report but can be done based on the results and data collected through this survey. However there is evidence from the survey of strong separation between three main ecological regions separating the coastal shelf of Myanmar both in relation to oceanographic characteristics and fish distribution, and also a strong depth separation in relation to the same. The ecosystem in general has strong signs of overfishing / other changes indicated by a general lack of long lived species and considerable lower biomass estimates compared with the findings from the four surveys in 1979 and 1980. These results should be corroborated by any additional information that may be available as regards trends in catch and effort statistics. .

7.2. Recommended follow-up work

The present survey has provided valuable insights and information on the state of Myanmar marine ecosystems and resources. In particular, there seems to be evidence that fish stocks may be overfished, although it is noted that it would be important to carry out another survey during a contrasting season considering that productivity and fish abundance may be subject to seasonal cycles and or migrations.

Key recommendations in relation to the scientific work include:

- Carry out a new survey in Myanmar waters in a contrasting season to validate results obtained during December 2013.

- Complement the information obtained through the surveys with other knowledge (including fishers' knowledge). It is important that the information obtained through the surveys is put into context in relation to fisheries management objectives and related knowledge needs.

- All data collected during the survey belong to Myanmar (these were handed over by the end of the survey). Efforts should be made to further explore the data collected. These could be used to further characterize marine ecosystems and resources of Myanmar, become the

basis for several scientific papers, Master and PhD studies. It is strongly recommended that FAO (including BOBLME) and IMR initiate a dialogue with relevant institutions in Myanmar to further explore possible scientific activities based on the data collected by the Dr. F. Nansen.

- The data collected during this survey should be used for additional analyses to contribute to building an ecosystem characterization, including identification of sensitive/critical habitats or to develop indicators for future resources and ecosystem monitoring.

- Fish egg and larvae samples were not analysed at the time this report was produced. It is recommended and agreed during the post survey meeting that the Mawlamyine University would follow up this. It is important to get a better understanding of fish spawning areas and larval drift in Myanmar waters.

- These investigations showed that several species of poisonous phytoplankton were present. It will be important in the future to establish regular (weekly or monthly) routine monitoring of both zoo and phytoplankton to understand variability in species composition and abundance, and to be able to warn future aquaculture facilities against red tide conditions. Several locations along the coast should be selected for this monitoring.

- Several years ago FAO took the initiative to prepare a fish identification guide for Myanmar. However the guide book is still pending. It is strongly recommended that this work is resumed to improve species identification for both official and recreational use in this country. The work should be carried out in close cooperation with national institutions.

- Baseline studies in relation to oil exploration activities is recommended as a reference/baseline to monitor possible changes caused by this industrial activity.

- Sediment samples are in the custody of the BOBLME and will be analysed in Thailand. Results will be presented to the Department of Fisheries separately from this report. These can also be part of the above mentioned base line studies.

- Likewise fish genetic samples collected are yet to be analysed and results will be presented to Department of Fisheries separately from this report.

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ANNEX I. FISHING STATION

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 1
DATE :15/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°36.90
start stop duration Lon E 92°44.65
TIME :02:28:52 02:59:08 30.3 (min) Purpose : 3
LOG : 9576.16 9577.82 1.7 Region : 10310
FDEPTH: 92 92 Gear cond.: 0
BDEPTH: 92 92 Validity : 0
Towing dir: 0° Wire out : 250 m Speed : 3.3 kn
Sorted : 71 Total catch: 70.97 Catch/hour: 140.67

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Rastrelliger kanagurta	74.83	729	53.19	1
Sphyraena barracuda	28.74	254	20.43	2
Upeneus moluccensis	8.78	389	6.24	
Seriolina nigrofasciata	6.32	14	4.49	4
Pomadasys maculatus	5.37	109	3.82	3
Rachycentron canadum	3.55	4	2.52	
Saurida elongata	2.48	57	1.76	5
Nemipterus japonicus	1.80	77	1.28	
Snail	1.55	0	1.10	
Tetraodon sp.	1.45	10	1.03	
Sardinella sp.	1.27	24	0.90	
Sepia sp.	1.13	2	0.80	
Metapenaeus sp.	0.63	83	0.45	
CLUPEIDAE	0.59	10	0.42	
Selaroides leptolepis	0.56	6	0.39	
Platycephalus sp.	0.40	12	0.28	
Mene maculata	0.30	12	0.21	
Cynoglossus sp.	0.22	24	0.15	
Leiognathus brevirostris	0.22	28	0.15	
Terapon jarbua	0.16	2	0.11	
Naucrates ductor	0.08	2	0.06	
Pentaprion longimanus	0.04	2	0.03	
PORTUNIDAE	0.04	34	0.03	
Loligo sp.	0.02	6	0.01	
MURAENIDAE	0.02	2	0.01	
SCORPAENIDAE	0.00	2	0.00	
Priacanthus sp.	0.00	4	0.00	
Total	140.54		99.90	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 2
DATE :15/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°41.70
start stop duration Lon E 92°52.88
TIME :06:22:37 06:52:25 29.8 (min) Purpose : 3
LOG : 9593.35 9594.92 1.6 Region : 10310
FDEPTH: 45 44 Gear cond.: 0
BDEPTH: 45 44 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
Sorted : 48 Total catch: 47.67 Catch/hour: 95.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	48.18	0	50.20	
Lepturacanthus savala	6.38	0	6.65	
Metapenaeus sp.	5.48	0	5.71	
Upeneus sulphureus	4.67	193	4.87	7
Penaeus monodon	4.61	66	4.80	
Dussumieria acuta	3.24	221	3.38	
Sphyraena obtusata	3.22	36	3.36	9
Saurida elongata	2.21	16	2.31	
Chirocentrus dorab	2.21	4	2.31	
Liagore sp	2.09	0	2.18	
Pomadasys argenteus	1.75	4	1.83	
Scomberomorus guttatus	1.43	4	1.49	
Nemipterus japonicus	1.17	14	1.22	6
Megalaspis cordyla	1.05	4	1.09	
Sepia sp.	0.95	2	0.99	
Lethrinus lentjan	0.95	2	0.99	8
Cepola sp.	0.81	2	0.84	
Parapenaeus sp.	0.81	0	0.84	
Stolephorus indicus	0.66	155	0.69	
Saurida undosquamis	0.66	10	0.69	
Arothron immaculatus	0.64	2	0.67	
Apogon sp.	0.62	74	0.65	
Rastrelliger kanagurta	0.58	8	0.61	
Upeneus vittatus	0.46	14	0.48	
Ilisha elongata	0.32	10	0.34	
Cynoglossus lingua	0.28	2	0.29	
Loligo sp.	0.22	16	0.23	
Mene maculata	0.20	4	0.21	
Platycephalus sp.	0.06	6	0.06	
Priacanthus hamrur	0.04	10	0.04	
Portunus sanguinolentus	0.00	0	0.00	
Charybdis feriata	0.00	2	0.00	
Acanthocepola sp.	0.00	2	0.00	
Total	95.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 3
DATE :15/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°35.04
start stop duration Lon E 93°17.04
TIME :11:10:53 11:32:28 21.6 (min) Purpose : 3
LOG : 9625.06 9626.13 1.1 Region : 10310
FDEPTH: 28 32 Gear cond.: 0
BDEPTH: 28 32 Validity : 1
Towing dir: 0° Wire out : 100 m Speed : 3.0 kn
Sorted : 25 Total catch: 25.34 Catch/hour: 70.45

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	16.71	0	23.72	
Plotosus canius	9.06	3	12.87	
Scomberomorus guttatus	6.28	8	8.92	
Ilisha elongata	5.51	192	7.81	
Metapenaeus sp.	4.39	0	6.24	
Parapenaeus sp.	3.17	0	4.50	
Upeneus sulphureus	3.11	0	4.42	
Apogon sp.	3.06	0	4.34	
Pennahia anea	2.78	0	3.95	
Leiognathus sp.	2.50	0	3.55	
Thryssa setirostris	2.34	0	3.31	
Congresox talabon	2.22	6	3.16	
Pomadasys argenteus	1.67	8	2.37	
Cynoglossus bilineatus	1.39	0	1.97	
Sepia sp.	1.00	0	1.42	
Loligo sp.	0.78	0	1.10	
Penaeus monodon	0.72	14	1.03	
Pampus argenteus	0.61	3	0.87	
Terapon jarbua	0.61	19	0.87	
Gerres filamentosus	0.56	8	0.79	
Megalaspis cordyla	0.50	3	0.71	
Sphyraena jello	0.50	6	0.71	
Sardinella gibbosa	0.33	6	0.47	
Lactarius lactarius	0.28	14	0.39	
Nemipterus japonicus	0.22	3	0.32	
Johnius belangerii	0.11	6	0.16	
Trypauchen microcephalus	0.03	3	0.04	
Total	70.45		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 4
DATE :15/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°24.28
start stop duration Lon E 92°56.87
TIME :14:35:10 15:05:10 30.0 (min) Purpose : 3
LOG : 9653.66 9655.26 1.6 Region : 10310
FDEPTH: 71 69 Gear cond.: 0
BDEPTH: 71 69 Validity : 2
Towing dir: 0° Wire out : 200 m Speed : 3.2 kn
Sorted : 48 Total catch: 47.69 Catch/hour: 95.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Nemipterus japonicus	19.68	480	20.63	14
Upeneus sulphureus	17.16	780	17.99	15
Leiognathus sp.	14.72	0	15.43	
Pentaprion longimanus	11.00	0	11.53	
Saurida tumbil	7.40	56	7.76	13
Metapenaeus sp.	5.00	0	5.24	
Priacanthus tayenus	4.88	0	5.12	
Penaeus monodon	3.92	0	4.11	
Pomadasys argenteus	3.04	2	3.19	11
Carangoides plagiotaenia	2.16	8	2.26	
Sphyraena jello	1.78	32	1.87	12
C R A B S	1.68	0	1.76	
Decapterus russelli	1.00	0	1.05	
Sepia sp.	0.84	0	0.88	
Terapon jarbua	0.80	0	0.84	
Ariomma indicum	0.32	2	0.34	
Congresox talabonoides	0.00	2	0.00	
Xiphocheilus typus	0.00	2	0.00	
Halieutaea sp.	0.00	2	0.00	
SQUILLIDAE	0.00	2	0.00	
ANGUILLIFORMES	0.00	2	0.00	
Cynoglossus sp.	0.00	2	0.00	
Total	95.38		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 5
DATE :16/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°2.17
start stop duration Lon E 93°7.54
TIME :00:09:11 00:39:02 29.9 (min) Purpose : 3
LOG : 9718.38 9719.78 1.4 Region : 10310
FDEPTH: 112 107 Gear cond.: 0
BDEPTH: 112 107 Validity : 0
Towing dir: 0° Wire out : 290 m Speed : 2.8 kn
Sorted : 27 Total catch: 240.70 Catch/hour: 483.66

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida tumbil	164.93	11050	34.10	17
Small crabs	112.12	0	23.18	
TRIGLIDAE	98.38	0	20.34	
Nemipterus japonicus	58.23	7360	12.04	16
Iago omanensis	27.13	54	5.61	
C R A B S	22.06	0	4.56	
Hydrophis atriceps	0.44	4	0.09	
Scolopsis sp.	0.36	0	0.07	
Priacanthus hamrur	0.00	2	0.00	
Apogon sp.	0.00	2	0.00	
Champsodon sp.	0.00	2	0.00	
CALLIONYMIDAE	0.00	2	0.00	
Total	483.66		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 6
DATE :16/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°6.50
start stop duration Lon E 93°7.75
TIME :01:46:07 02:16:35 30.5 (min) Purpose : 3
LOG : 9725.56 9726.91 1.4 Region : 10310
FDEPTH: 78 77 Gear cond.: 0
BDEPTH: 78 77 Validity : 0
Towing dir: 0° Wire out : 200 m Speed : 2.7 kn
Sorted : 60 Total catch: 138.64 Catch/hour: 273.00

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Leiognathus sp.	80.34	0 29.43	
Snail	47.50	0 17.40	
Loligo sp.	21.82	0 7.99	
Pentaprion longimanus	20.87	0 7.65	
Saurida tumbil	18.98	502 6.95	20
C R A B S	18.90	0 6.92	
Sphyraena jello	14.18	102 5.19	19
Scomberomorus commerson	13.08	8 4.79	
Nemipterus japonicus	11.81	228 4.33	18
Upeneus sulphureus	11.11	492 4.07	21
Lepturacanthus savala	2.99	4 1.10	
Seriolina nigrofasciata	2.60	4 0.95	
Penaeus monodon	1.58	20 0.58	
Sepia sp.	1.58	4 0.58	
Epinephelus latifasciatus	1.34	4 0.49	
Metapenaeus sp.	1.34	0 0.49	
Cynoglossus sp.	1.26	0 0.46	
Scomberomorus guttatus	1.26	4 0.46	
Tetraodon sp.	0.47	0 0.17	
OPHICHTHIDAE	0.00	2 0.00	
Epinephelus heniochus	0.00	2 0.00	
SCORPAENIDAE	0.00	2 0.00	
Mene maculata	0.00	0 0.00	
Synodus sp.	0.00	2 0.00	
Total	273.00	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 7
DATE :16/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°12.15
start stop duration Lon E 93°16.69
TIME :04:03:02 04:33:52 30.8 (min) Purpose : 3
LOG : 9739.66 9741.28 1.6 Region : 10310
FDEPTH: 42 41 Gear cond.: 0
BDEPTH: 42 41 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 57 Total catch: 57.28 Catch/hour: 111.44

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Atule mate	35.99	0 32.30	
Leiognathus sp.	28.79	0 25.84	
Atropus atropos	11.98	0 10.75	
Saurida elongata	10.51	173 9.43	24
Upeneus sulphureus	5.56	177 4.99	23
Pentaprion longimanus	5.45	0 4.89	
Nemipterus japonicus	3.74	37 3.35	22
Scomberoides commersonianus	2.14	4 1.92	
Scomberomorus guttatus	1.79	2 1.61	
Chirocentrus dorab	1.71	2 1.54	
Stolephorus sp.	1.36	0 1.22	
Metapenaeus sp.	1.17	0 1.05	
Hydrophis atriceps	0.58	0 0.52	
Arius sp.	0.27	25 0.24	
Penaeus monodon	0.18	12 0.16	25
Carangoides hedlandensis	0.12	0 0.10	
Carangoides malabaricus	0.10	2 0.09	
Uranoscopus affinis	0.00	2 0.00	
Total	111.44	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 8
DATE :16/11/13 GEAR TYPE: NO: 0 POSITION:Lat N 19°17.74
start stop duration Lon E 93°25.88
TIME :06:15:13 06:42:47 27.6 (min) Purpose : 3
LOG : 9754.23 9755.68 1.5 Region : 10310
FDEPTH: 22 23 Gear cond.: 0
BDEPTH: 22 23 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 3.2 kn
Sorted : 118 Total catch: 225.56 Catch/hour: 490.88

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Lepturacanthus savala	159.96	2664 32.59	
Sardinella gibbosa	106.20	87 21.64	
Leiognathus sp.	50.66	0 10.32	
Sphyraena obtusata	39.78	561 8.10	26
Dussumieria acuta	27.60	783 5.62	
Dussumieria elopsoides	25.51	762 5.20	
Pomadasys maculatus	14.54	274 2.96	
Ilisha elongata	9.58	270 1.95	
Scomberomorus commerson	9.49	17 1.93	
Lutjanus johnii	8.53	11 1.74	28
Pomadasys argenteus	5.70	11 1.16	
Penaeus notialis	5.35	239 1.09	
Scolopsis bimaculata	5.05	52 1.03	
Pampus argenteus	4.48	17 0.91	27
Otolithes ruber	3.39	17 0.69	
Terapon jarbua	2.70	74 0.55	
Scomberomorus guttatus	2.18	9 0.44	
Sphyraena putnamie	2.00	4 0.41	
Pennahia anea	1.65	13 0.34	
Scomberoides commersonianus	1.48	4 0.30	
Rastrelliger brachysoma	0.87	4 0.18	
Alepes djedaba	0.70	17 0.14	
Megalaspis cordyla	0.70	17 0.14	
Atropus atropos	0.61	9 0.12	
Lactarius lactarius	0.61	17 0.12	
Thryssa setirostris	0.52	22 0.11	
Lutjanus vitta	0.44	2 0.09	
Anodontostoma chacunda	0.35	4 0.07	
Penaeus monodon	0.26	11 0.05	
Total	490.88	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 9
DATE :16/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°52.49
start stop duration Lon E 93°23.26
TIME :09:50:02 10:09:30 19.5 (min) Purpose : 3
LOG : 9783.49 9784.45 1.0 Region : 10310
FDEPTH: 44 45 Gear cond.: 0
BDEPTH: 44 45 Validity : 1
Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
Sorted : 50 Total catch: 91.64 Catch/hour: 282.40

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Leiognathus sp.	184.90	0 65.47	
Nemipterus japonicus	12.94	123 4.58	29
Carangoides sp.	11.34	31 4.02	
Drepane punctata	11.28	18 3.99	
Lepturacanthus savala	10.23	12 3.62	
Upeneus sulphureus	7.89	253 2.79	30
Scomberomorus guttatus	7.15	12 2.53	31
Megalaspis cordyla	5.30	6 1.88	
Carangoides malabaricus	4.81	3 1.70	
Chirocentrus dorab	4.56	6 1.62	
Sardinella gibbosa	4.44	0 1.57	
Stolephorus indicus	3.08	0 1.09	
Saurida elongata	2.59	136 0.92	33
Sphyraena jello	2.47	9 0.87	32
Metapenaeus sp.	2.10	0 0.74	
Pomadasys maculatus	1.73	12 0.61	
Terapon jarbua	1.73	12 0.61	
Upeneus vittatus	1.60	12 0.57	
Ilisha elongata	1.36	0 0.48	
Tetrosomus gibbosus	0.49	3 0.17	
Epinephelus sexfasciatus	0.43	9 0.15	
Total	282.40	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 10
DATE :16/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°49.28
start stop duration Lon E 93°19.38
TIME :17:49:21 18:19:57 30.6 (min) Purpose : 3
LOG : 9809.26 9810.69 1.4 Region : 10310
FDEPTH: 110 111 Gear cond.: 0
BDEPTH: 110 111 Validity : 2
Towing dir: 0° Wire out : 290 m Speed : 2.8 kn
Sorted : 11 Total catch: 40.48 Catch/hour: 79.37

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Snail	55.84	0 70.36	
INACHIDAE	19.61	0 24.70	
Cynoglossus sp.	1.88	118 2.37	
Drepane punctata	1.25	2 1.58	
Ariosoma sp.	0.63	24 0.79	
Saurida elongata	0.16	8 0.20	
Unidentified fish	0.00	55 0.00	
Ariosoma sp.	0.00	2 0.00	0
Neoepinnula orientalis	0.00	2 0.00	
Lophiomus setigerus	0.00	8 0.00	
Halieutaea sp.	0.00	8 0.00	
BOTHIDAE	0.00	2 0.00	
Total	79.37	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 11
DATE :16/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°29.10
start stop duration Lon E 93°28.96
TIME :22:49:11 23:08:21 19.2 (min) Purpose : 3
LOG : 9844.08 9845.14 1.1 Region : 10310
FDEPTH: 166 173 Gear cond.: 0
BDEPTH: 166 173 Validity : 2
Towing dir: 0° Wire out : 420 m Speed : 3.3 kn
Sorted : 2 Total catch: 8.26 Catch/hour: 25.85

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
INACHIDAE	11.71	736 45.28	
Snail	6.82	1230 26.39	
J E L L Y F I S H	5.57	0 21.55	
Bregmaceros sp.	0.78	901 3.03	
Ariosoma sp.	0.44	22 1.69	
Halieutaea sp.	0.22	34 0.85	
TRIGLIDAE	0.22	34 0.85	
Solenocera sp.	0.09	91 0.36	
Atropus atropos	0.00	6 0.00	
SICYONIIDAE	0.00	47 0.00	
Total	25.85	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 12
DATE :17/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°34.32
start stop duration Lon E 93°32.97
TIME :00:55:33 01:25:05 29.5 (min) Purpose : 3
LOG : 9855.83 9857.23 1.4 Region : 10310
FDEPTH: 91 92 Gear cond.: 0
BDEPTH: 91 92 Validity : 0
Towing dir: 0° Wire out : 240 m Speed : 2.8 kn
Sorted : 47 Total catch: 93.48 Catch/hour: 189.94

SPECIES	CATCH/HOUR weight	% OF TOT. C numbers	SAMP
Lepturacanthus savala	71.93	0 37.87	
Small crabs	40.64	0 21.39	
Metapenaeus sp.	38.28	0 20.15	
Snail	16.90	0 8.90	
Megalaspis cordyla	14.63	61 7.70	35
Nemipterus japonicus	6.18	268 3.25	34
Priacanthus hamrur	0.89	12 0.47	
Uraspis helvola	0.49	4 0.26	
Ariosoma sp.	0.00	2 0.00	
Solenocera sp.	0.00	2 0.00	
Total	189.94	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 13
DATE :17/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°37.72
start stop duration Lon E 93°39.35
TIME :02:44:09 03:14:12 30.1 (min) Purpose : 3
LOG : 9867.37 9868.84 1.5 Region : 10310
FDEPTH: 32 30 Gear cond.: 0
BDEPTH: 32 30 Validity : 0
Towing dir: 0° Wire out : 90 m Speed : 2.9 kn
Sorted : 100 Total catch: 199.64 Catch/hour: 398.62

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella gibbosa	310.48	124193	77.89	38
Scomberomorus guttatus	41.61	76	10.44	39
Megalaspis cordyla	21.56	20	5.41	37
Scomberomorus commerson	7.99	4	2.00	
Pomadasys argenteus	5.71	12	1.43	
Scomberoides commersonianus	4.39	16	1.10	
Chirocentrus dorab	2.48	0	0.62	
Gerres erythrourus	1.92	12	0.48	
Himantura gerrardi	1.84	4	0.46	
Alectis ciliaris	0.64	4	0.16	
Stolephorus indicus	0.00	4	0.00	
Dussumieria acuta	0.00	4	0.00	
Total	398.62		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 14
DATE :17/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°22.60
start stop duration Lon E 93°51.05
TIME :05:55:30 06:25:27 29.9 (min) Purpose : 3
LOG : 9890.98 9892.50 1.5 Region : 10310
FDEPTH: 44 42 Gear cond.: 0
BDEPTH: 44 42 Validity : 0
Towing dir: 0° Wire out : 130 m Speed : 3.1 kn
Sorted : 48 Total catch: 48.48 Catch/hour: 97.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	34.62	0	35.64	
Pentaprion longimanus	16.35	0	16.83	
Carangoides malabaricus	15.71	14	16.17	
Soft corals	5.21	2	5.36	
Nemipterus peronii	5.13	0	5.28	
Nemipterus japonicus	4.65	36	4.79	42
Echeneis naucrates	4.49	4	4.62	
Saurida elongata	4.09	54	4.21	40
Upeneus sulphureus	2.28	72	2.35	41
Loligo sp.	2.08	0	2.15	
Gerres filamentosus	1.16	6	1.20	
L O B S T E R S	0.68	2	0.70	
Fistularia petimba	0.60	26	0.62	
Pseudorhombus quinquocellatus	0.08	2	0.08	
Tetrosomus gibbosus	0.00	2	0.00	
Pseudorhombus quinquocellatus	0.00	2	0.00	0
Fishing gears	0.00	2	0.00	
Total	97.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 15
DATE :17/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°18.11
start stop duration Lon E 93°50.44
TIME :07:32:48 08:02:55 30.1 (min) Purpose : 3
LOG : 9899.03 9900.67 1.6 Region : 10310
FDEPTH: 69 68 Gear cond.: 0
BDEPTH: 69 68 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.3 kn
Sorted : 20 Total catch: 40.64 Catch/hour: 80.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Pentaprion longimanus	21.27	0	26.28	
Carangoides malabaricus	20.64	116	25.49	
Sphyraena forsteri	10.68	80	13.19	
Loligo sp.	9.32	0	11.52	
Saurida undosquamis	5.66	0	6.99	
Nemipterus japonicus	4.38	56	5.41	
Upeneus moluccensis	2.95	100	3.64	
Stolephorus indicus	2.95	0	3.64	
Leiognathus equulus	1.20	24	1.48	
Alectis indica	0.72	8	0.89	
Gerres filamentosus	0.64	4	0.79	
Priacanthus tayenus	0.56	8	0.69	
Total	80.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 16
DATE :17/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°16.18
start stop duration Lon E 93°42.35
TIME :09:30:29 09:52:17 21.8 (min) Purpose : 3
LOG : 9910.99 9912.09 1.1 Region : 10310
FDEPTH: 128 126 Gear cond.: 0
BDEPTH: 128 126 Validity : 0
Towing dir: 0° Wire out : 340 m Speed : 3.0 kn
Sorted : 10 Total catch: 9.86 Catch/hour: 27.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Snail	18.99	0	69.98	
J E L L Y F I S H	2.06	0	7.61	
ACROPOMATIDAE	1.43	0	5.27	
Hydrophis atriceps	1.38	3	5.07	
Priacanthus hamrur	1.38	0	5.07	
Champsodon sp.	1.21	138	4.46	
Stolephorus indicus	0.66	25	2.43	
Neoepinnula orientalis	0.03	6	0.10	
Apogon sp.	0.00	3	0.00	
Plastic bags	0.00	8	0.00	
Total	27.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 17
DATE :17/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°15.20
start stop duration Lon E 93°37.13
TIME :11:53:49 12:23:26 29.6 (min) Purpose : 3
LOG : 9926.29 9927.73 1.4 Region : 10310
FDEPTH: 457 468 Gear cond.: 0
BDEPTH: 457 468 Validity : 0
Towing dir: 0° Wire out : 1080 m Speed : 2.9 kn
Sorted : 60 Total catch: 89.47 Catch/hour: 181.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Snail	55.24	0	30.48	
Serrivomer sp.	47.70	0	26.32	
Pycnocraspedum squamipinne	35.00	320	19.31	43
Chaunax sp.	21.09	0	11.64	
Synaphobranchus sp.	12.52	0	6.91	
Deep sea shrimps	5.04	0	2.78	
Neoharriotta pinnata	2.39	4	1.32	
TRIAKIDAE	1.94	16	1.07	
Neoepinnula orientalis	0.14	4	0.08	
Hoplostethus sp.	0.08	4	0.04	
Nephropsis sp.	0.03	4	0.02	
C R A B S	0.03	4	0.02	
Aristeus virilis	0.01	4	0.01	
TRIAKIDAE	0.00	2	0.00	0
ANGUILLIFORMES	0.00	2	0.00	
Total	181.23		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 18
DATE :17/11/13 GEAR TYPE: PT NO: 1 POSITION:Lat N 17°54.16
start stop duration Lon E 93°48.83
TIME :17:52:15 18:22:44 30.5 (min) Purpose : 1
LOG : 9964.32 9966.09 1.8 Region : 10310
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 596 602 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.5 kn
Sorted : 1 Total catch: 1.26 Catch/hour: 2.48

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	0.87	746	34.92	
Leptocephalus	0.83	372	33.33	
Loligo sp.	0.51	45	20.63	
J E L L Y F I S H	0.12	0	4.76	
Lestrolepis intermedia	0.06	20	2.38	
Synagrops sp.	0.04	12	1.59	
Acropoma sp.	0.02	12	0.79	
Decapterus tabl	0.02	2	0.79	
Vinciguerria sp.	0.02	146	0.79	
Fishing gears	0.00	2	0.00	
Total	2.48		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 19
DATE :17/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°56.65
start stop duration Lon E 93°51.58
TIME :21:47:27 22:16:52 29.4 (min) Purpose : 3
LOG : 9979.37 9981.01 1.6 Region : 10310
FDEPTH: 150 162 Gear cond.: 0
BDEPTH: 150 162 Validity : 2
Towing dir: 0° Wire out : 380 m Speed : 3.3 kn
Sorted : 4 Total catch: 3.52 Catch/hour: 7.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	5.71	0	79.55	
Priacanthus hamrur	0.65	12	9.09	
NEPHROPIDAE	0.41	55	5.68	
ACROPOMATIDAE	0.14	33	1.99	
Solenocera sp.	0.12	98	1.70	
Bregmaceros sp.	0.06	122	0.85	
Champsodon sp.	0.04	2	0.57	
Neoepinnula orientalis	0.02	2	0.28	
Pycnocraspedum squamipinne	0.02	2	0.28	
Fishing gears	0.00	2	0.00	
Leptocephalus	0.00	6	0.00	
Plastic bags	0.00	2	0.00	
Total	7.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 20
DATE :18/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°3.66
start stop duration Lon E 93°58.57
TIME :01:29:18 01:58:28 29.2 (min) Purpose : 3
LOG : 9995.82 9997.42 1.6 Region : 10310
FDEPTH: 89 88 Gear cond.: 0
BDEPTH: 89 88 Validity : 0
Towing dir: 0° Wire out : 240 m Speed : 3.3 kn
Sorted : 144 Total catch: 228.84 Catch/hour: 470.87

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	298.00	5284	63.29	
Dussumieria acuta	57.08	1109	12.12	46
Sphyraena flavicauda	42.08	755	8.94	44
Metapenaeus monoceros	27.00	2700	5.73	
Decapterus kurroides	22.92	434	4.87	
Miscellaneous	9.34	0	1.98	
Saurida tumbil	6.26	395	1.33	45
Nemipterus japonicus	3.85	126	0.82	47
Priacanthus hamrur	1.77	33	0.38	
Uraspis helvola	1.58	45	0.34	
Pennahia anea	0.99	12	0.21	
Epinephelus areolatus	0.00	2	0.00	
Total	470.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 21
DATE :18/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 18°12.48
start stop duration Lon E 94°16.00
TIME :04:55:13 05:20:47 25.6 (min) Purpose : 3
LOG : 18.57 19.84 1.3 Region : 10310
FDEPTH: 35 37 Gear cond.: 0
BDEPTH: 35 37 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
Sorted : 123 Total catch: 175.88 Catch/hour: 412.69

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	91.70	1464	22.22	
Leiognathus sp.	88.70	24835	21.49	
Scomberomorus guttatus	51.39	143	12.45	49
Stolephorus indicus	46.46	6040	11.26	
Lactarius lactarius	22.10	106	5.36	50
Otolithes ruber	21.45	82	5.20	48
Scomberomorus commerson	15.58	21	3.78	
Chirocentrus dorab	15.06	61	3.65	
Caranx sexfasciatus	10.32	38	2.50	
Pampus argenteus	9.95	28	2.41	51
Pomadasys argenteus	8.78	77	2.13	
R A Y S	6.10	5	1.48	
Upeneus sulphureus	5.63	183	1.36	52
Drepane punctata	5.58	12	1.35	
Saurida tumbil	3.57	19	0.86	
Nemipterus japonicus	3.47	33	0.84	
Megalaspis cordyla	2.82	14	0.68	
Terapon jarbua	2.44	70	0.59	
Lutjanus johnii	0.93	2	0.23	54
Polydactylus plebeius	0.66	2	0.16	
Total	412.69		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 22
DATE :18/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°52.47
start stop duration Lon E 94°24.90
TIME :07:47:30 08:07:19 19.8 (min) Purpose : 3
LOG : 42.48 43.63 1.1 Region : 10310
FDEPTH: 31 29 Gear cond.: 0
BDEPTH: 31 29 Validity : 1
Towing dir: 0° Wire out : 100 m Speed : 3.5 kn
Sorted : 71 Total catch: 71.21 Catch/hour: 215.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	71.50	12	33.17	56
Carangoides malabaricus	58.24	227	27.02	57
Scolopsis bimaculata	16.35	327	7.58	
Ephippus orbis	16.10	91	7.47	
Atule mate	8.90	64	4.13	55
Scomberoides commersonianus	6.90	18	3.20	
Lutjanus erythropterus	6.18	9	2.86	
Drepane punctata	5.81	12	2.70	
Epinephelus bleekeri	3.75	6	1.74	78
Alectis indica	3.51	15	1.63	
Megalaspis cordyla	3.15	3	1.46	
Scomberoides tol	2.24	3	1.04	
Sepia sp.	2.06	3	0.95	
Leiognathus daura	2.06	51	0.95	58
Parapenaeus sp.	1.48	9	0.69	
Gerres filamentosus	1.33	9	0.62	
Saurida tumbil	1.18	9	0.55	
Chirocentrus dorab	0.97	3	0.45	
Caranx sexfasciatus	0.91	3	0.42	
Platax teira	0.61	6	0.28	
Lepturacanthus savala	0.61	3	0.28	
Arius sp.	0.51	3	0.24	
Terapon jarbua	0.48	9	0.22	
Calappa lophos	0.38	6	0.18	
Selaroides leptolepis	0.24	6	0.11	
Epinephelus coioides	0.09	3	0.04	53
Aesopia cornuta	0.00	3	0.00	
Plastic bags	0.00	3	0.00	
Fishing gears	0.00	3	0.00	
Total	215.56		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 23
DATE :18/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°49.60
start stop duration Lon E 94°16.32
TIME :10:14:06 10:45:08 31.0 (min) Purpose : 3
LOG : 57.26 58.76 1.5 Region : 10310
FDEPTH: 64 63 Gear cond.: 0
BDEPTH: 64 63 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 2.9 kn
Sorted : 60 Total catch: 114.52 Catch/hour: 221.44

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	123.75	14850	55.89	
Pentaprion longimanus	21.81	2092	9.85	
Upeneus moluccensis	15.08	201	6.81	61
Nemipterus japonicus	13.15	201	5.94	59
Rachycentron canadum	12.26	4	5.54	
Sphyraena jello	11.76	85	5.31	62
Saurida undosquamis	7.89	352	3.56	60
LOLIGINIDAE	5.34	425	2.41	
Epinephelus malabaricus	4.41	2	1.99	
Scomberomorus guttatus	2.75	4	1.24	63
Metapenaeus sp.	1.47	102	0.66	
Atule mate	1.20	8	0.54	
Penaeus monodon	0.46	6	0.21	
Aesopia cornuta	0.08	2	0.03	
Xiphocheilus typus	0.04	4	0.02	
Total	221.44		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 24
DATE :18/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°44.34
start stop duration Lon E 94°6.94
TIME :12:48:29 13:20:09 31.7 (min) Purpose : 3
LOG : 72.94 74.67 1.7 Region : 10310
FDEPTH: 129 130 Gear cond.: 0
BDEPTH: 129 130 Validity : 2
Towing dir: 0° Wire out : 340 m Speed : 3.3 kn
Sorted : 3 Total catch: 2.67 Catch/hour: 5.06

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
B I V A L V E S	1.48	0	29.21	
Sphyraena sp.	1.25	6	24.72	
Priacanthus hamrur	0.80	57	15.73	
Solenocera sp.	0.49	322	9.74	
Upeneus moluccensis	0.34	8	6.74	
LOLIGINIDAE	0.23	38	4.49	
Pentaprion longimanus	0.19	36	3.75	
Leiognathus sp.	0.15	19	3.00	
Cynoglossus sp.	0.08	19	1.50	
Saurida tumbil	0.06	9	1.12	
Total	5.06		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 25
DATE :18/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°22.57
start stop duration Lon E 94°9.41
TIME :19:22:22 19:52:03 29.7 (min) Purpose : 3
LOG : 131.88 133.49 1.6 Region : 10310
FDEPTH: 174 164 Gear cond.: 0
BDEPTH: 174 164 Validity : 2
Towing dir: 0° Wire out : 410 m Speed : 3.2 kn
Sorted : 19 Total catch: 171.18 Catch/hour: 346.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Snail	304.67	0	88.01	
MURAENESOCIDAE	21.11	1492	6.10	
TRIGLIDAE	12.19	73	3.52	
GOBIIDAE	4.73	1784	1.37	
Cynoglossus sp.	2.00	55	0.58	
Ariomma sp.	1.09	218	0.32	
Solenocera sp.	0.36	237	0.11	
Bregmaceros sp.	0.00	146	0.00	
Plastic bags	0.00	2	0.00	
Total	346.17		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 26
DATE :18/11/13 GEAR TYPE: PT NO: 1 POSITION:Lat N 17°24.29
start stop duration Lon E 94°11.25
TIME :20:39:49 21:08:06 28.3 (min) Purpose : 1
LOG : 136.23 137.16 0.9 Region : 10310
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 87 83 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 2.0 kn
Sorted : 0 Total catch: 0.01 Catch/hour: 0.02

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Decapterus russelli	0.02	2	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 27
DATE :19/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°22.74
start stop duration Lon E 94°17.91
TIME :00:45:19 01:16:57 31.6 (min) Purpose : 3
LOG : 164.22 165.99 1.8 Region : 10310
FDEPTH: 72 76 Gear cond.: 0
BDEPTH: 72 76 Validity : 0
Towing dir: 0° Wire out : 190 m Speed : 3.4 kn
Sorted : 84 Total catch: 83.52 Catch/hour: 158.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	73.96	5177	46.70	
Pristipomoides multidens	11.04	15	6.97	64
Upeneus sulphureus	9.97	442	6.30	67
Pentaprion longimanus	8.61	516	5.44	
Nemipterus japonicus	8.38	123	5.29	65
Selar crumenophthalmus	7.17	91	4.53	
Mene maculata	6.98	142	4.41	
LOLIGINIDAE	6.79	542	4.29	
Saurida tumbil	5.95	231	3.76	69
Lepturacanthus savala	5.80	76	3.66	
Rastrelliger kanagurta	5.50	66	3.47	70
Sphyraena jello	3.30	28	2.08	68
Metapenaeus monoceros	2.65	161	1.68	
Dussumieria acuta	2.28	47	1.44	66
Upeneus sp.	0.00	2	0.00	
Psettodes erumei	0.00	2	0.00	
TETRAODONTIDAE	0.00	2	0.00	
Total	158.38		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 28
DATE :19/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°30.47
start stop duration Lon E 94°28.95
TIME :03:42:03 04:12:11 30.1 (min) Purpose : 3
LOG : 185.99 187.58 1.6 Region : 10310
FDEPTH: 44 41 Gear cond.: 0
BDEPTH: 44 41 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 63 Total catch: 62.52 Catch/hour: 124.54

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	74.10	4076	59.50	
Lepturacanthus savala	11.79	189	9.47	
Pentaprion longimanus	8.80	458	7.07	
Upeneus sulphureus	5.50	388	4.41	75
Saurida tumbil	4.50	30	3.61	73
Nemipterus japonicus	3.59	34	2.88	72
Chirocentrus dorab	2.35	12	1.89	
Selar crumenophthalmus	2.31	20	1.86	
Stolephorus indicus	2.07	199	1.66	
Sphyraena jello	1.27	6	1.02	71
Gerres filamentosus	1.20	10	0.96	
Fistularia petimba	1.16	36	0.93	
Himantura gerrardi	0.96	2	0.77	
Rastrelliger kanagurta	0.96	10	0.77	74
Arius sp.	0.92	6	0.74	
Megalaspis cordyla	0.84	4	0.67	
Drepane punctata	0.80	2	0.64	
Tetraodon sp.	0.64	4	0.51	
Penaeus monodon	0.36	8	0.29	
C R A B S	0.28	20	0.22	
Loligo sp.	0.08	8	0.06	
Sea snakes	0.08	2	0.06	
Apogon striped D-fins tail	0.00	2	0.00	
Nemipterus peronii	0.00	2	0.00	
Dactyloptena orientalis	0.00	2	0.00	
Trachinocephalus myops	0.00	2	0.00	
Apogon pink fins mid-tail back	0.00	2	0.00	
Total	124.54		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 29
DATE :19/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°6.72
start stop duration Lon E 94°22.19
TIME :08:13:34 08:42:29 28.9 (min) Purpose : 3
LOG : 218.57 220.16 1.6 Region : 10310
FDEPTH: 43 41 Gear cond.: 0
BDEPTH: 43 41 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
Sorted : 49 Total catch: 49.06 Catch/hour: 101.78

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Stolephorus indicus	34.98	13992	34.37	
Gazza minuta	22.32	1786	21.93	
Upeneus sulphureus	8.84	768	8.68	79
Scomberomorus guttatus	5.44	10	5.34	80
Lepturacanthus savala	5.35	139	5.26	
Megalaspis cordyla	4.73	12	4.65	
Loligo sp.	3.94	237	3.87	
Leiognathus sp.	2.90	52	2.85	
Carangoides malabaricus	2.82	12	2.77	
Atropus atropos	2.61	19	2.57	
Pentaprion longimanus	2.28	124	2.24	
Chirocentrus dorab	1.83	12	1.79	
Gerres filamentosus	1.04	6	1.02	
Saurida elongata	0.87	12	0.86	76
Lagocephalus sp.	0.83	6	0.82	
Mene maculata	0.58	8	0.57	
Sphyraena jello	0.29	2	0.29	
Dussumieria acuta	0.12	2	0.12	
Fishing gears	0.00	2	0.00	
Apogon sp.	0.00	2	0.00	
Total	101.78		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 30
DATE :19/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°8.04
start stop duration Lon E 94°15.16
TIME :10:15:20 10:45:04 29.7 (min) Purpose : 3
LOG : 230.81 232.44 1.6 Region : 10310
FDEPTH: 79 77 Gear cond.: 0
BDEPTH: 79 77 Validity : 0
Towing dir: 0° Wire out : 210 m Speed : 3.3 kn
Sorted : 50 Total catch: 132.50 Catch/hour: 267.41

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Rhinoptera neglecta	111.60	10	41.74	
Lepturacanthus savala	63.77	8928	23.85	
Selar crumenophthalmus	35.52	291	13.28	
Metapenaeus monoceros	11.62	1162	4.35	
Sphyraena obtusata	8.80	149	3.29	81
LOLIGINIDAE	8.56	686	3.20	
Mene maculata	7.27	18	2.72	
S H R I M P S	7.10	3068	2.66	
Saurida tumbil	4.36	678	1.63	84
Megalaspis cordyla	3.87	8	1.45	
Rastrelliger kanagurta	0.97	8	0.36	
C R A B S	0.97	97	0.36	
Scomberomorus guttatus	0.93	2	0.35	
Nemipterus japonicus	0.81	36	0.30	82
Upeneus sulphureus	0.40	93	0.15	83
Selaroides leptolepis	0.36	8	0.14	
Decapterus macrosoma	0.32	8	0.12	
TETRAODONTIDAE	0.16	4	0.06	
Total	267.41		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 31
DATE :19/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 17°8.55
start stop duration Lon E 94°12.28
TIME :13:04:48 13:35:29 30.7 (min) Purpose : 3
LOG : 242.02 243.63 1.6 Region : 10310
FDEPTH: 139 143 Gear cond.: 0
BDEPTH: 139 143 Validity : 2
Towing dir: 0° Wire out : 350 m Speed : 3.2 kn
Sorted : 28 Total catch: 65.70 Catch/hour: 128.49

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
C R A B S, juvenile	111.47	111473	86.76	
TRIAKIDAE	3.87	16	3.01	
Ariosoma sp.	3.72	127	2.89	
C E P H A L O P O D A	3.40	8	2.65	
Lepturacanthus savala	1.80	8	1.40	
Priacanthus hamrur	1.25	16	0.97	
Selar crumenophthalmus	1.25	14	0.97	
Sphyraena obtusata	0.55	8	0.43	
Carangoides plagiotaenia	0.43	2	0.33	
Mene maculata	0.39	2	0.30	
Cynoglossus sp.	0.35	14	0.27	
Total	128.49		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 32
DATE :19/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°49.07
start stop duration Lon E 94°2.17
TIME :20:29:02 20:58:40 29.6 (min) Purpose : 3
LOG : 283.06 284.64 1.6 Region : 10310
FDEPTH: 163 154 Gear cond.: 0
BDEPTH: 163 154 Validity : 2
Towing dir: 0° Wire out : 390 m Speed : 3.2 kn
Sorted : 25 Total catch: 50.36 Catch/hour: 101.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
TRIGLIDAE	55.65	1428	54.57	
MURAENESOCIDAE	19.76	387	19.38	
Snail	7.69	0	7.55	
Priacanthus hamrur	4.21	49	4.13	
Psenopsis obscura	3.32	81	3.26	
C R A B S	2.83	0	2.78	
Synagrops japonicus	1.78	288	1.75	
J E L L Y F I S H	1.21	0	1.19	
Solenocera sp.	1.21	0	1.19	
LABRIDAE	0.89	36	0.87	
Lophiomus setigerus	0.81	4	0.79	
BOTHIDAE	0.73	49	0.71	
Saurida undosquamis	0.65	40	0.64	
Cynoglossus sp.	0.65	12	0.64	
Neoepinnula orientalis	0.49	20	0.48	
Gadella sp.	0.08	4	0.08	
Plastic bags	0.00	2	0.00	
GOBIIDAE	0.00	4	0.00	
Serranidae	0.00	2	0.00	
Total	101.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 33
DATE :19/11/13 GEAR TYPE: PT NO: 1 POSITION:Lat N 16°47.67
start stop duration Lon E 94°6.97
TIME :22:09:32 22:28:52 19.3 (min) Purpose : 1
LOG : 290.75 291.68 0.9 Region : 10310
FDEPTH: 0 0 Gear cond.: 0
BDEPTH: 83 85 Validity : 0
Towing dir: 0° Wire out : 0 m Speed : 2.9 kn
Sorted : 0 Total catch: 0.04 Catch/hour: 0.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MURAENESOCIDAE	0.03	3	0.00	
Loligo sp.	0.09	12	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 34
DATE :20/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°44.63
start stop duration Lon E 94°8.25
TIME :00:15:20 00:33:50 18.5 (min) Purpose : 3
LOG : 302.73 303.62 0.9 Region : 10310
FDEPTH: 69 68 Gear cond.: 0
BDEPTH: 69 68 Validity : 1
Towing dir: 0° Wire out : 200 m Speed : 2.9 kn
Sorted : 72 Total catch: 71.65 Catch/hour: 232.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Mene maculata	41.25	243	17.75	
Pentaprion longimanus	38.53	4236	16.58	
Upeneus moluccensis	31.33	1472	13.48	85
Metapenaeus monoceros	23.74	1661	10.22	
Nemipterus nematophorus	20.82	195	8.96	
Pristipomoides multidens	11.12	42	4.79	
Fistularia petimba	8.92	195	3.84	
Loligo sp.	7.82	470	3.36	
Rastrelliger kanagurta	7.75	114	3.34	86
Saurida undosquamis	6.91	305	2.97	87
Sphyraena jello	5.12	26	2.21	
ANGUILLIFORMES	4.02	658	1.73	
Halieutaea sp.	3.86	58	1.66	
Selar crumenophthalmus	3.70	36	1.59	
Mixed debries	3.50	227	1.51	
SCORPAENIDAE	2.59	120	1.12	
Cynoglossus sp.	2.34	126	1.00	
Psettodes erumei	2.27	3	0.98	
Sunagocia arenicola	2.11	65	0.91	
Cyclichthys spilostylus	1.82	3	0.78	
Uranoscopus affinis	1.30	49	0.56	
L O B S T E R S	0.81	6	0.35	
Penaeus monodon	0.65	3	0.28	
Sea snakes	0.00	3	0.00	
Aesopia cornuta	0.00	3	0.00	
Cepola sp.	0.00	3	0.00	
Antennarius sp.	0.00	3	0.00	
TRIGLIDAE	0.00	3	0.00	
Trixiphichthys weberi	0.00	3	0.00	
C R A B S	0.00	6	0.00	
LITHODIDAE	0.00	3	0.00	
Total	232.28		99.96	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 35
DATE :20/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°45.22
start stop duration Lon E 94°20.13
TIME :02:10:06 02:30:22 20.3 (min) Purpose : 3
LOG : 316.76 317.81 1.1 Region : 10310
FDEPTH: 24 29 Gear cond.: 0
BDEPTH: 24 29 Validity : 1
Towing dir: 0° Wire out : 100 m Speed : 3.1 kn
Sorted : 69 Total catch: 813.21 Catch/hour: 2407.13

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	1569.62	31400	65.21	
Leiognathus sp.	367.10	165197	15.25	
Ilisha melastoma	123.91	33440	5.15	
Sardinella gibbosa	103.13	17201	4.28	
Stolephorus indicus	76.96	38481	3.20	
Penaeus notialis	35.40	4233	1.47	
Chirocentrus dorab	26.94	115	1.12	
Otolithes ruber	24.63	115	1.02	90
Scomberomorus guttatus	19.00	41	0.79	88
Pomadasys argenteus	17.70	885	0.74	
Loligo sp.	13.08	462	0.54	
Gerres filamentosus	9.62	38	0.40	
Upeneus sulphureus	9.24	2001	0.38	89
Sphyraena jello	2.72	12	0.11	
Metapenaeus monoceros	2.69	192	0.11	
Megalaspis cordyla	2.31	38	0.10	
TETRAODONTIDAE	2.31	38	0.10	
Thryssa mystax	0.77	115	0.03	
Pedophthalmus vigil	0.00	3	0.00	
Total	2407.13		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 36
DATE :20/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°28.34
start stop duration Lon E 94°8.49
TIME :05:57:10 06:27:13 30.1 (min) Purpose : 3
LOG : 347.31 349.06 1.8 Region : 10310
FDEPTH: 42 41 Gear cond.: 0
BDEPTH: 42 41 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.5 kn
Sorted : 55 Total catch: 267.50 Catch/hour: 534.11

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Stolephorus indicus	181.90	0	34.06	
Megalaspis cordyla	139.57	280	26.13	
Leiognathus sp.	41.93	0	7.85	
Sardinella gibbosa	33.74	2356	6.32	
Lepturacanthus savala	29.95	399	5.61	
Carangoides malabaricus	20.77	90	3.89	
Chirocentrus dorab	12.58	30	2.36	
Alectis indica	11.78	10	2.21	
Saurida undosquamis	10.98	459	2.06	93
Upeneus moluccensis	9.58	918	1.79	94
Nemipterus japonicus	7.39	70	1.38	92
Loligo sp.	6.59	0	1.23	
Psettodes erumei	6.19	10	1.16	
Metapenaeus sp.	4.79	30	0.90	
Selar crumenophthalmus	4.79	30	0.90	
Scomberomorus guttatus	4.19	10	0.79	91
Sphyraena obtusata	2.00	10	0.37	
Fistularia petimba	2.00	110	0.37	
Siganus canaliculatus	1.60	130	0.30	
Pomadasys argenteus	1.40	10	0.26	
Rossia sp.	0.00	10	0.00	
Sepia sp.	0.00	10	0.00	
Total	533.71		99.93	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 37
DATE :20/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°29.04
start stop duration Lon E 94°5.01
TIME :07:31:17 07:59:56 28.7 (min) Purpose : 3
LOG : 355.89 357.37 1.5 Region : 10310
FDEPTH: 67 66 Gear cond.: 0
BDEPTH: 67 66 Validity : 0
Towing dir: 0° Wire out : 180 m Speed : 3.1 kn
Sorted : 33 Total catch: 66.54 Catch/hour: 139.30

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	34.50	0	24.77	
Megalaspis cordyla	23.45	50	16.83	
Loligo sp.	11.05	180	7.94	
Nemipterus japonicus	9.04	130	6.49	96
Lepturacanthus savala	8.37	167	6.01	
Saurida undosquamis	5.86	343	4.21	99
Rachycentron canadum	5.28	4	3.79	
Epinephelus heniochus	5.19	8	3.73	98
Upeneus moluccensis	4.94	410	3.55	95
Metapenaeus sp.	4.86	314	3.49	
Sphyraena forsteri	4.86	25	3.49	
Sardinella gibbosa	3.60	0	2.58	
Cynoglossus sp.	3.43	25	2.46	
PENAEIDAE	3.35	0	2.40	
Penaeus monodon	2.34	13	1.68	
Parastromateus niger	2.26	8	1.62	
BOTHIDAE	2.09	314	1.50	
Rastrelliger kanagurta	1.34	25	0.96	97
Uranoscopus affinis	1.17	59	0.84	
Halieutaea sp.	1.09	13	0.78	
Fistularia petimba	0.75	21	0.54	
Abalistes stellaris	0.33	4	0.24	
Pentaprion longimanus	0.13	54	0.09	
Serranidae	0.00	2	0.00	
Pterois russelii	0.00	2	0.00	
Total	139.30		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 38
DATE :20/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°29.86
start stop duration Lon E 93°59.53
TIME :09:17:21 09:47:22 30.0 (min) Purpose : 3
LOG : 366.27 367.90 1.6 Region : 10310
FDEPTH: 146 147 Gear cond.: 0
BDEPTH: 146 147 Validity : 0
Towing dir: 0° Wire out : 380 m Speed : 3.2 kn
Sorted : 19 Total catch: 28.98 Catch/hour: 57.92

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
TRIGLIDAE	24.82	991	42.86	
LITHODIDAE, juvenile	11.51	863	19.88	
Cynoglossus sp.	5.94	68	10.25	
Serranidae	3.72	130	6.42	102
Saurida elongata	3.30	142	5.69	100
Uranoscopus affinis	1.86	32	3.21	
TRIAKIDAE	1.82	26	3.14	
ANGUILLIFORMES	1.80	150	3.11	
Priacanthus hamrur	1.74	20	3.00	
Psenopsis obscura	1.32	27	2.28	101
Iago omanensis	0.10	2	0.17	
Total	57.92		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 39
DATE :20/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°26.24
start stop duration Lon E 93°57.59
TIME :11:46:51 12:16:26 29.6 (min) Purpose : 3
LOG : 378.73 380.21 1.5 Region : 10310
FDEPTH: 238 228 Gear cond.: 0
BDEPTH: 238 228 Validity : 2
Towing dir: 0° Wire out : 620 m Speed : 3.0 kn
Sorted : 34 Total catch: 46.26 Catch/hour: 93.87

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
LITHODIDAE, juvenile	31.53	1449	33.59	
ANGUILLIFORMES	14.97	450	15.95	
Champsodon sp.	12.42	992	13.23	
Neoharriotta pinnata	10.35	2	11.02	
Bembrops caudimacula	8.40	170	8.95	
Priacanthus hamrur	5.97	67	6.36	
TRIAKIDAE	3.49	53	3.72	
Raja sp.	3.17	4	3.37	
Uranoscopus affinis	1.70	24	1.82	
Ariosoma sp.	0.73	18	0.78	
Psenopsis obscura	0.73	12	0.78	
Pycnocraspedum squamipinne	0.41	2	0.43	
Chlorophthalmus sp.	0.00	2	0.00	
Total	93.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 40
DATE :20/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°12.64
start stop duration Lon E 93°54.33
TIME :19:38:00 20:01:04 23.1 (min) Purpose : 3
LOG : 424.88 426.13 1.3 Region : 10310
FDEPTH: 152 139 Gear cond.: 0
BDEPTH: 152 139 Validity : 0
Towing dir: 0° Wire out : 360 m Speed : 3.3 kn
Sorted : 33 Total catch: 33.00 Catch/hour: 85.83

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Mixed debries	45.46	0	52.97	
TRIGLIDAE	7.59	489	8.85	
ONYCHOTEUTHIDAE	7.28	16	8.48	
Cynoglossus sp.	6.66	143	7.76	
ANGUILLIFORMES	4.32	221	5.03	
Psenopsis obscura	3.49	75	4.06	
Hydrophis atriceps	2.29	5	2.67	
Ariosoma sp.	2.03	55	2.36	
Pycnocraspedum squamipinne	1.25	21	1.45	
Serranidae	1.20	31	1.39	
RAJIDAE	1.09	3	1.27	
Priacanthus hamrur	1.09	13	1.27	
Saurida undosquamis	0.57	16	0.67	103
Eridacnis radcliffei	0.47	18	0.55	
TRIAKIDAE	0.36	18	0.42	
Synagrops japonicus	0.31	52	0.36	
Bembrops sp.	0.21	5	0.24	
Chlorophthalmus sp.	0.16	13	0.18	
CALLIONYMIDAE	0.00	3	0.00	
Total	85.83		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 41
DATE :21/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°11.56
start stop duration Lon E 93°57.71
TIME :00:12:08 00:38:04 25.9 (min) Purpose : 3
LOG : 445.81 447.10 1.3 Region : 10310
FDEPTH: 74 73 Gear cond.: 0
BDEPTH: 74 73 Validity : 1
Towing dir: 0° Wire out : 200 m Speed : 3.0 kn
Sorted : 46 Total catch: 68.85 Catch/hour: 159.31

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Mene maculata	49.56	296	31.11	
Lepturacanthus savala	30.13	241	18.91	
Loligo sp.	23.12	2545	14.51	
Nemipterus japonicus	15.76	393	9.89	104
Metapenaeus monoceros	9.86	1041	6.19	
Priacanthus hamrur	5.97	52	3.75	105
Cynoglossus sp.	5.69	88	3.57	
S H R I M P S	4.10	1638	2.57	
Selaroides leptolepis	3.47	49	2.18	
Uranoscopus affinis	2.15	278	1.35	
Champsodon sp.	1.60	192	1.00	
Parastromateus niger	1.25	17	0.78	
Saurida elongata	1.25	45	0.78	108
Epinephelus areolatus	1.16	7	0.73	107
C R A B S	1.04	123	0.65	
OCTOPODIDAE	1.04	76	0.65	
Arothron immaculatus	0.83	25	0.52	
Ariosoma sp.	0.62	74	0.39	
Upeneus moluccensis	0.49	90	0.31	106
SCORPAENIDAE	0.14	7	0.09	
Acanthocepola sp.	0.07	2	0.04	0
GOBIIDAE	0.02	2	0.01	
Total	159.31		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 42
DATE :21/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 16°7.32
start stop duration Lon E 94°4.10
TIME :02:02:09 02:32:16 30.1 (min) Purpose : 3
LOG : 457.61 459.24 1.6 Region : 10310
FDEPTH: 36 36 Gear cond.: 0
BDEPTH: 36 36 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 35 Total catch: 35.19 Catch/hour: 70.10

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	45.46	681	64.85	
Leiognathus sp.	5.58	279	7.96	
C R A B S	4.50	120	6.42	
Chirocentrus dorab	2.43	4	3.47	
Metapenaeus monoceros	2.23	279	3.18	
Arius maculatus	1.79	2	2.56	
Mene maculata	1.31	10	1.88	
Arothron immaculatus	1.20	2	1.71	
Lactarius lactarius	1.00	12	1.42	
Parastromateus niger	0.72	10	1.02	
Pennahia sp.	0.68	10	0.97	
Pennahia anea	0.60	22	0.85	
Acanthurus mata	0.42	2	0.60	
Megalaspis cordyla	0.40	2	0.57	
Selar crumenophthalmus	0.40	2	0.57	
Apogon sp.	0.36	70	0.51	
Nemipterus japonicus	0.28	12	0.40	109
Penaeus monodon	0.24	4	0.34	
Ilisha elongata	0.20	2	0.28	
Terapon jarbua	0.16	4	0.23	
SQUILLIDAE	0.16	12	0.23	
Total	70.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 43
DATE :21/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°56.38
start stop duration Lon E 94°4.65
TIME :06:33:02 07:02:58 29.9 (min) Purpose : 3
LOG : 487.75 489.37 1.6 Region : 10310
FDEPTH: 39 37 Gear cond.: 0
BDEPTH: 39 37 Validity : 0
Towing dir: 0° Wire out : 115 m Speed : 3.2 kn
Sorted : 60 Total catch: 88.49 Catch/hour: 177.39

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Leiognathus sp.	44.26	36886	24.95	
Megalaspis cordyla	32.96	76	18.58	118
Carangoides malabaricus	13.59	24	7.66	117
Lepturacanthus savala	11.31	140	6.37	
Nemipterus japonicus	9.86	72	5.56	115
Leiognathus equulus	8.82	60	4.97	
Loligo sp.	8.26	1103	4.66	
Mene maculata	7.38	144	4.16	
Leiognathus splendens	5.93	257	3.35	
Chirocentrus dorab	4.89	12	2.76	
Sphyraena putnamie	4.49	6	2.53	116
Pomadasys argenteus	3.69	40	2.08	114
Scomberoides commersonianus	3.27	6	1.84	
Upeneus sulphureus	2.49	132	1.40	111
Parastromateus niger	2.17	2	1.22	
Tetraodon sp.	2.00	16	1.13	
Alectis ciliaris	1.68	20	0.95	
Saurida elongata	1.60	152	0.90	112
Congresox talabonoides	1.48	2	0.84	
Dussumieria acuta	1.44	44	0.81	113
Gerres filamentosus	1.36	8	0.77	
Portunus sanguinolentus	1.36	12	0.77	
Metapenaeus monoceros	0.92	136	0.52	
Apogon striped D-fins tail	0.80	204	0.45	
Sepia sp.	0.28	4	0.16	
Calappa lophos	0.22	2	0.12	
Saurida undosquamis	0.16	8	0.09	110
Bembrops sp.	0.16	16	0.09	
PORTUNIDAE	0.16	4	0.09	
BOTHIDAE	0.12	36	0.07	
C R A B S	0.10	2	0.06	
Sphyraena sp.	0.08	16	0.05	
Fistularia petimba	0.04	72	0.02	
Stolephorus sp.	0.04	8	0.02	
SYNGNATHIDAE	0.00	4	0.00	
SCORPAENIDAE	0.00	4	0.00	
Acanthurus mata	0.00	2	0.00	
Total	177.39		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 44
DATE :21/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°52.67
start stop duration Lon E 93°56.90
TIME :08:36:38 09:01:38 25.0 (min) Purpose : 3
LOG : 500.67 501.99 1.3 Region : 10310
FDEPTH: 70 70 Gear cond.: 0
BDEPTH: 70 70 Validity : 1
Towing dir: 0° Wire out : 180 m Speed : 3.2 kn
Sorted : 39 Total catch: 91.08 Catch/hour: 218.59

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	71.42	0	32.67	
Epinephelus heniochus	23.52	12	10.76	
Nemipterus japonicus	18.86	259	8.63	121
Selar crumenophthalmus	16.13	0	7.38	
Megalaspis cordyla	15.84	36	7.25	120
Loligo sp.	14.11	1555	6.46	
Upeneus sulphureus	12.96	1483	5.93	119
Metapenaeus monoceros	12.24	1224	5.60	
Saurida elongata	7.92	2376	3.62	
Tetraodon sp.	5.47	79	2.50	
Pristipomoides multidens	4.80	10	2.20	
BOTHIDAE	4.46	850	2.04	
Lophiodes mutilus	2.74	43	1.25	
Shrimps, small, non comm.	2.02	806	0.92	
Hydrophis atriceps	1.92	2	0.88	
Apogon pink fins mid-tail back	1.73	432	0.79	
C R A B S	0.86	101	0.40	
Priacanthus hamrur	0.72	7	0.33	
Champsodon sp.	0.43	238	0.20	
Penaeus monodon	0.43	7	0.20	
Plastic bags	0.00	2	0.00	
Neoniphon aurolineatus	0.00	2	0.00	
Parascolopsis rufomaculatus	0.00	2	0.00	
SCORPAENIDAE	0.00	7	0.00	
yellow black spotted back pectoral	0.00	7	0.00	
Pterygotrigla hemisticta	0.00	2	0.00	
Total	218.59		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 45
DATE :21/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°57.02
start stop duration Lon E 93°47.35
TIME :10:45:35 11:08:11 22.6 (min) Purpose : 3
LOG : 514.04 515.25 1.2 Region : 10310
FDEPTH: 113 109 Gear cond.: 0
BDEPTH: 113 109 Validity : 1
Towing dir: 0° Wire out : 295 m Speed : 3.2 kn
Sorted : 25 Total catch: 50.10 Catch/hour: 133.02

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida elongata	75.82	3109	57.00	122
Champsodon sp.	42.48	5522	31.93	
Pterygotrigla hemisticta	9.77	319	7.34	
Halieutaea sp.	1.17	21	0.88	
Priacanthus hamrur	1.17	27	0.88	
Megalaspis cordyla	0.90	3	0.68	
Metapenaeus sp.	0.74	58	0.56	
Neoniphon aurolineatus	0.53	21	0.40	
Acanthocepola sp.	0.42	5	0.32	
Parascolopsis rufomaculatus	0.01	3	0.01	
WASTE00	0.00	3	0.00	
Total	133.02		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 46
DATE :22/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°41.30
start stop duration Lon E 93°22.71
TIME :02:33:38 03:03:03 29.4 (min) Purpose : 3
LOG : 627.66 629.36 1.7 Region : 10320
FDEPTH: 363 379 Gear cond.: 0
BDEPTH: 363 379 Validity : 0
Towing dir: 0° Wire out : 920 m Speed : 3.4 kn
Sorted : 21 Total catch: 46.04 Catch/hour: 93.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Satyrichthys adeni	34.53	4404	36.75	
Heterocarpus tricarinatus	18.45	331	19.64	
Onychoteuthis sp.	15.43	20	16.42	
Aristeus virilis	8.57	600	9.12	
MYCTOPHIDAE	3.76	678	4.00	
TRIAKIDAE	3.55	6	3.78	
Shrimps, small, non comm.	3.02	906	3.21	
Bythaelurus sp.	2.90	43	3.08	
Holcomycteronus sp.	1.63	4	1.74	
Pycnocraspedum squamipinne	1.31	33	1.39	
Bembrops sp.	0.82	37	0.87	
Tydemania navigatoris	0.00	2	0.00	
Chlorophthalmus sp.	0.00	2	0.00	
C R A B S	0.00	4	0.00	
Physiculus sp.	0.00	2	0.00	
MYCTOPHIDAE	0.00	2	0.00	0
Satyrichthys rieffeli	0.00	2	0.00	
Priacanthus macracanthus	0.00	2	0.00	
Aristeus virilis	0.00	2	0.00	0
Heterocarpus tricarinatus	0.00	2	0.00	0
Chascanopsetta lugubris	0.00	2	0.00	
Total	93.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 47
DATE :22/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°23.33
start stop duration Lon E 93°23.83
TIME :06:48:34 07:11:58 23.4 (min) Purpose : 3
LOG : 652.29 653.08 0.8 Region : 10320
FDEPTH: 75 74 Gear cond.: 0
BDEPTH: 75 74 Validity : 1
Towing dir: 0° Wire out : 195 m Speed : 2.0 kn
Sorted : 15 Total catch: 14.98 Catch/hour: 38.41

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Scomberoides sp.	5.85	15	15.22	
Arothron hispidus	5.85	8	15.22	
Ostracion rhinorhynchus	4.38	5	11.42	
Dactyloptena peterseni	3.03	3	7.88	
Balistoides viridescens	2.92	3	7.61	
Satyrichthys adeni	2.77	5	7.21	
Xiphocheilus typus	2.69	3	7.01	
Abalistes stellaris	2.67	3	6.94	
Pseudobalistes flavimarginatus	2.67	3	6.94	
Parupeneus nansen	1.92	5	5.01	
Ostracion cubicus	1.79	3	4.67	
Lactoria diaphana	1.54	3	4.01	
Heniochus acuminatus	0.10	3	0.27	
Decapterus kurroides	0.10	3	0.27	
Tydemania sp.	0.05	3	0.13	
Synodus binotatus	0.05	3	0.13	
SCORPAENIDAE	0.03	3	0.07	
Coral	0.00	0	0.00	
Puerulus sp.	0.00	3	0.00	
Puerulus sewelli	0.00	3	0.00	
Total	38.41		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 48
DATE :22/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°58.09
start stop duration Lon E 93°18.60
TIME :10:30:06 10:40:30 10.4 (min) Purpose : 3
LOG : 680.69 681.24 0.6 Region : 10320
FDEPTH: 63 62 Gear cond.: 0
BDEPTH: 63 62 Validity : 1
Towing dir: 0° Wire out : 170 m Speed : 3.2 kn
Sorted : 32 Total catch: 129.06 Catch/hour: 744.58

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Bleekeria sp.	736.15	95700	98.87	123
Loligo sp.	6.69	369	0.90	
Tetrosomus gibbosus	1.73	6	0.23	
Total	744.58		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 49
DATE :22/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°31.81
start stop duration Lon E 93°43.35
TIME :17:57:31 18:21:46 24.3 (min) Purpose : 3
LOG : 743.55 744.88 1.3 Region : 10320
FDEPTH: 266 245 Gear cond.: 0
BDEPTH: 266 245 Validity : 2
Towing dir: 0° Wire out : 640 m Speed : 3.3 kn
Sorted : 17 Total catch: 113.87 Catch/hour: 281.74

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chlorophthalmus sp.	74.13	7413	26.31	
Chlorophthalmus sp.	69.62	2511	24.71	0
Raja sp.	45.03	17	15.98	
Metapenaeus sp.	27.02	5404	9.59	
Physiculus sp.	18.36	312	6.52	
Satyrichthys sp.	17.32	69	6.15	
Sepia sp.	14.89	35	5.29	
MYCTOPHIDAE	5.20	433	1.84	
Chaunax sp.	3.81	35	1.35	
Puerulus sewelli	3.46	35	1.23	
Eridacnis radcliffei	2.55	92	0.90	
Cubiceps baxteri	0.17	17	0.06	
Grammoplites scaber	0.17	17	0.06	
Total	281.74		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 50
DATE :22/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°40.38
start stop duration Lon E 93°45.78
TIME :20:10:02 20:29:28 19.4 (min) Purpose : 3
LOG : 757.92 759.00 1.1 Region : 10320
FDEPTH: 85 88 Gear cond.: 0
BDEPTH: 85 88 Validity : 2
Towing dir: 0° Wire out : 260 m Speed : 3.3 kn
Sorted : 15 Total catch: 15.44 Catch/hour: 47.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Upeneus moluccensis	18.68	537	39.18	125
Saurida undosquamis	11.55	1445	24.22	
Nemipterus japonicus	6.98	142	14.64	124
Dactyloptena sp.	2.10	59	4.40	
Upeneus sp.	1.61	0	3.37	
Uranoscopus affinis	1.42	9	2.98	
Loligo sp.	1.36	86	2.85	
Sepia sp.	1.30	25	2.72	
Pentaprion longimanus	0.74	43	1.55	
Leiognathus sp.	0.49	77	1.04	
Samaris cristatus	0.43	22	0.91	
Priacanthus macracanthus	0.25	34	0.52	
Fistularia petimba	0.19	15	0.39	
Champsodon capensis	0.19	40	0.39	
Callionymus cf persicus	0.12	22	0.26	
Aesopia cornuta	0.12	3	0.26	
Apogon striped D-fins tail	0.06	9	0.13	
Malthopsis sp.	0.03	3	0.06	
HARPISQUILLIDAE	0.03	3	0.06	
Tydemania sp.	0.03	3	0.06	
Solenocera choprai	0.00	3	0.00	
Pseudorhombus dupliciocellatus	0.00	3	0.00	
Sicyonia sp.	0.00	3	0.00	
Peristedion weberi	0.00	3	0.00	
Total	47.68		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 51
DATE :23/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°11.64
start stop duration Lon E 93°45.98
TIME :00:32:13 01:02:21 30.1 (min) Purpose : 3
LOG : 792.93 794.50 1.6 Region : 10320
FDEPTH: 81 79 Gear cond.: 0
BDEPTH: 81 79 Validity : 0
Towing dir: 0° Wire out : 220 m Speed : 3.1 kn
Sorted : 74 Total catch: 226.54 Catch/hour: 450.98

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Decapterus macrosoma	291.60	5365	64.66	126
Upeneus moluccensis	68.42	4286	15.17	128
Loligo sp.	32.19	1288	7.14	
Euthynnus affinis	16.48	16	3.65	
Upeneus bensasi	12.26	802	2.72	129
Saurida undosquamis	10.03	794	2.22	130
Abalistes stellatus	7.45	10	1.65	
Nemipterus japonicus	6.27	189	1.39	127
Dactyloptena peterseni	3.90	84	0.87	
Psettodes erumei	1.39	2	0.31	
Pentaprion longimanus	0.98	28	0.22	
Nemipterus bipunctatus	0.00	2	0.00	
Tetrosomus gibbosus	0.00	2	0.00	
Pseudorhombus dupliciocellatus	0.00	2	0.00	
Total	450.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 52
DATE :23/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°38.67
start stop duration Lon E 93°52.23
TIME :04:54:28 05:24:08 29.7 (min) Purpose : 3
LOG : 828.38 829.92 1.5 Region : 10320
FDEPTH: 51 56 Gear cond.: 0
BDEPTH: 51 56 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.1 kn
Sorted : 44 Total catch: 54.86 Catch/hour: 110.94

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Pentaprion longimanus	48.13	2067	43.38	
Loligo sp.	27.38	245	24.68	
Caranx sexfasciatus	12.70	2	11.45	
Abalistes stellaris	9.79	16	8.82	132
Saurida undosquamis	4.89	447	4.41	131
Decapterus macrosoma	2.53	47	2.28	134
Nemipterus bipunctatus	1.88	34	1.70	133
Hydrophis atriceps	1.66	4	1.49	
Lactoria cornuta	0.69	2	0.62	
Thenus orientalis	0.28	2	0.26	
Tetrosomus gibbosus	0.28	2	0.26	
Fistularia petimba	0.26	8	0.24	
Upeneus bensasi	0.26	18	0.24	
Sepia sp.	0.20	6	0.18	
CALLIONYMIDAE	0.00	2	0.00	
Cyclichthys orbicularis	0.00	2	0.00	
Ostracion sp.	0.00	2	0.00	
Total	110.94		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 53
DATE :23/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°37.85
start stop duration Lon E 94°13.11
TIME :09:28:17 09:45:08 16.9 (min) Purpose : 3
LOG : 858.88 859.76 0.9 Region : 10320
FDEPTH: 40 36 Gear cond.: 0
BDEPTH: 40 36 Validity : 1
Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
Sorted : 15 Total catch: 14.78 Catch/hour: 52.63

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Leiognathus sp.	31.34	6267	59.54	
Pomadasys argenteus	8.55	7	16.24	
Drepane punctata	6.20	4	11.77	
Saurida elongata	2.42	36	4.60	135
Loligo sp.	1.50	85	2.84	
Atropus atropos	1.35	11	2.57	
Leiognathus equulus	1.28	11	2.44	
Total	52.63		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 54
DATE :23/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°15.74
start stop duration Lon E 94°7.52
TIME :12:56:20 13:26:37 30.3 (min) Purpose : 3
LOG : 887.60 889.21 1.6 Region : 10320
FDEPTH: 50 52 Gear cond.: 0
BDEPTH: 50 52 Validity : 2
Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
Sorted : 28 Total catch: 53.06 Catch/hour: 105.14

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Nemipterus japonicus	33.21	1643	31.59	136
Apogon sp.	16.57	3808	15.76	
Saurida undosquamis	11.25	460	10.70	139
Pentaprion longimanus	8.24	658	7.84	
Saurida elongata	7.69	569	7.31	137
BOTHIDAE, juvenile	4.99	697	4.75	
Platycephalus sp.	4.28	170	4.07	
Leiognathus sp.	3.96	594	3.77	
Loligo sp.	3.17	170	3.02	
Metapenaeus monoceros	2.73	382	2.60	
Echeneis naucrates	2.34	2	2.22	
Sepia sp.	1.43	71	1.36	
Priacanthus tayenus	1.27	40	1.21	
Sea snakes	1.07	4	1.02	
Ariosoma sp.	0.87	28	0.83	
Congresox talabonoides	0.71	2	0.68	
Upeneus sulphureus	0.71	40	0.68	138
Fistularia petimba	0.63	20	0.60	
yellow black spotted back pectoral	0.00	2	0.00	
SCORPAENIDAE	0.00	2	0.00	
Total	105.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 55
DATE :23/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°57.75
start stop duration Lon E 94°7.78
TIME :17:58:12 18:12:59 14.8 (min) Purpose : 3
LOG : 927.44 928.22 0.8 Region : 10320
FDEPTH: 69 69 Gear cond.: 0
BDEPTH: 69 69 Validity : 2
Towing dir: 0° Wire out : 170 m Speed : 3.1 kn
Sorted : 26 Total catch: 25.86 Catch/hour: 104.99

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Upeneus moluccensis	21.19	0	20.18	
Upeneus bensasi	15.75	179	15.00	141
Nemipterus japonicus	11.77	349	11.21	140
Saurida undosquamis	10.23	0	9.74	
Priacanthus tayenus	5.93	65	5.65	
Halieutaea sp.	5.68	53	5.41	
Congresox talabonoides	4.71	12	4.49	
Dactyloptena orientalis	3.73	61	3.56	
Pentaprion longimanus	3.09	0	2.94	142
Solenocera sp.	2.92	325	2.78	
Parapercis alboguttata	2.52	122	2.40	
Lagocephalus guntheri	1.87	12	1.78	
Abalistes stellatus	1.62	45	1.55	
Loligo sp.	1.46	93	1.39	
Bembrops caudimacula	1.38	0	1.31	
Aluterus monoceros	1.38	4	1.31	
Lophiomus setigerus	1.38	138	1.31	
Cyclichthys spilostylus	1.30	8	1.24	
Hemigaleus microstoma	1.06	4	1.01	
Psettodes erumei	1.06	4	1.01	
Apogon pink fins mid-tail back	0.89	0	0.85	
Inimicus caledonicus	0.81	8	0.77	0
Caranx tille	0.70	4	0.67	
Siganus canaliculatus	0.65	8	0.62	
Trixiphichthys weberi	0.41	20	0.39	
Lutjanus vitta	0.32	8	0.31	
Cynoglossus sp.	0.32	0	0.31	
Aesopia cornuta	0.24	8	0.23	
Hippocampus sp.	0.16	4	0.15	
Sepia sp.	0.16	41	0.15	
Penaeus canaliculatus	0.12	4	0.12	
Epinephelus areolatus	0.08	4	0.08	
Tetrosomus gibbosus	0.08	4	0.08	
Total	104.99		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 56
DATE :23/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°37.63
start stop duration Lon E 94°7.49
TIME :21:12:38 21:25:35 12.9 (min) Purpose : 3
LOG : 953.58 954.29 0.7 Region : 10320
FDEPTH: 88 88 Gear cond.: 0
BDEPTH: 88 88 Validity : 2
Towing dir: 0° Wire out : 240 m Speed : 3.3 kn
Sorted : 14 Total catch: 13.97 Catch/hour: 64.73

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Nemipterus japonicus	25.30	204	39.08	144
Saurida undosquamis	5.65	0	8.73	
Priacanthus tayenus	5.19	37	8.02	145
Seriola dumerili	5.00	5	7.73	
Upeneus sulphureus	3.80	134	5.87	143
Loligo sp.	3.34	134	5.15	
yellow black spotted back pectoral	2.59	144	4.01	
Bembrops caudimacula	2.04	60	3.15	
Aluterus monoceros	1.67	5	2.58	
Psettodes erumei	1.67	5	2.58	
Lutjanus sebae	1.30	5	2.00	
Halieutaea sp.	1.20	5	1.86	
Cynoglossus sp.	1.02	120	1.57	
CALAPPIDAE	0.93	32	1.43	
Siganus canaliculatus	0.93	9	1.43	
Lophiomus setigerus	0.83	5	1.29	
Fistularia petimba	0.74	32	1.15	
Dactyloptena orientalis	0.51	9	0.79	
Trixiphichthys weberi	0.37	19	0.57	
Sepia sp.	0.37	9	0.57	
Muraenesox sp.	0.19	5	0.29	
Halieutaea sp.	0.05	5	0.07	0
SCORPAENIDAE	0.05	5	0.07	
PORTUNIDAE	0.00	5	0.00	
Total	64.73		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 57
DATE :24/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°28.02
start stop duration Lon E 94°1.42
TIME :00:19:30 00:49:10 29.7 (min) Purpose : 3
LOG : 971.12 972.65 1.5 Region : 10320
FDEPTH: 114 113 Gear cond.: 0
BDEPTH: 114 113 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 3.1 kn
Sorted : 19 Total catch: 19.34 Catch/hour: 39.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	18.41	225	47.05	146
Nemipterus japonicus	9.31	202	23.78	147
Triglidae small black spots	3.20	95	8.17	
Scorpaenid with 2 horns	2.02	71	5.17	
Cantherhines multilineatus	1.25	6	3.21	
Neoniphon aurolineatus	1.17	40	3.00	
Halieutaea sp.	1.05	8	2.69	0
Sepia sp.	0.65	16	1.65	
Trachinocephalus myops	0.49	8	1.24	
Narcine prodorsalis	0.49	2	1.24	
Satyrichthys adeni	0.38	4	0.98	
Portunus sp.	0.32	2	0.83	
Halieutaea sp.	0.28	10	0.72	
Parascolopsis tanyactis	0.10	2	0.26	
Lophiomus setigerus	0.00	2	0.00	
J E L L Y F I S H	0.00	0	0.00	
Total	39.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 58
DATE :24/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°25.15
start stop duration Lon E 94°0.03
TIME :02:29:50 02:59:12 29.4 (min) Purpose : 3
LOG : 984.15 985.74 1.6 Region : 10320
FDEPTH: 309 316 Gear cond.: 0
BDEPTH: 309 316 Validity : 0
Towing dir: 0° Wire out : 750 m Speed : 3.2 kn
Sorted : 53 Total catch: 70.10 Catch/hour: 143.21

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
DASYATIDAE	65.99	10	46.08	
MYCTOPHIDAE	14.63	731	10.21	
Psenopsis obscura	13.97	1021	9.76	
Holcomycteronus sp.	10.70	33	7.48	
Shrimps, small, non comm.	7.52	2255	5.25	
Heterocarpus tricarinatus	6.29	447	4.39	
Satyrichthys adeni	5.07	12	3.54	
Aristeus virilis	4.13	343	2.88	
Priacanthus hamrur	4.00	29	2.80	
Torpedo nobiliana	3.06	2	2.14	
Chlorophthalmus sp.	2.53	61	1.77	
Uranoscopus affinis	1.80	6	1.26	
TRIAKIDAE	1.16	14	0.81	
Holcomycteronus sp.	0.96	2	0.67	0
Saurida undosquamis	0.45	8	0.31	
Bembrops curvatura	0.41	8	0.29	
PARALEPIDIDAE	0.37	4	0.26	
Satyrichthys investigatoris	0.08	2	0.06	
Hymenocephalus sp.	0.04	4	0.03	
Rexea bengalensis	0.04	4	0.03	
SQUILLIDAE	0.00	4	0.00	
SCORPAENIDAE	0.00	4	0.00	
Total	143.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 59
DATE :24/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°3.59
start stop duration Lon E 94°19.37
TIME :09:44:01 10:16:18 32.3 (min) Purpose : 3
LOG : 1031.27 1032.91 1.6 Region : 10320
FDEPTH: 454 455 Gear cond.: 0
BDEPTH: 454 455 Validity : 0
Towing dir: 0° Wire out : 1100 m Speed : 3.1 kn
Sorted : 16 Total catch: 49.73 Catch/hour: 92.46

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
R A Y S	21.08	2	22.80	
Torpedo nobiliana	11.83	22	12.79	
Coelorinchus sp.	10.26	149	11.10	
Neoscopelus microchir	9.22	205	9.97	
Centrophorus sp.	5.47	4	5.91	
SEPIIDAE	5.21	22	5.63	
Heterocarpus tricarinatus	4.91	216	5.31	
Aristeus virilis	4.16	353	4.50	
ALEPOCEPHALIDAE	4.16	37	4.50	
UNIDENTIFIED FISH	2.90	71	3.14	
Metanephrops andamanicus	2.53	48	2.73	
Bythaelurus sp.	2.23	37	2.41	
Ruvettus pretiosus	1.52	11	1.65	
Apristurus sp.	1.30	4	1.41	
Sea urchin	1.12	15	1.21	
TRIAKIDAE	1.02	2	1.11	
SCORPAENIDAE	0.67	13	0.72	
Polymixia sp.	0.52	7	0.56	
Chaunax sp.	0.48	7	0.52	
GALATHEIDAE	0.41	19	0.44	
Pasiphaea sp.	0.41	41	0.44	
Ateleopus sp.	0.37	4	0.40	
Nephropsis stewarti	0.30	22	0.32	
GALATHEIDAE	0.19	26	0.20	0
C R A B S	0.19	2	0.20	
Total	92.46		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 60
DATE :24/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°9.57
start stop duration Lon E 94°23.97
TIME :12:24:10 12:39:07 14.9 (min) Purpose : 3
LOG : 1046.12 1046.95 0.8 Region : 10320
FDEPTH: 124 124 Gear cond.: 0
BDEPTH: 124 124 Validity : 2
Towing dir: 0° Wire out : 330 m Speed : 3.3 kn
Sorted : 14 Total catch: 13.56 Catch/hour: 54.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
LUTJANIDAE	13.97	120	25.66	150
Proscyllium magnificum	7.55	20	13.86	
Snyderina yamanokami	6.98	84	12.83	
Neoniphon aurolineatus	4.01	32	7.37	148
Lutjanus madras	3.69	16	6.78	
Saurida undosquamis	3.45	60	6.34	152
Nemipterus japonicus	2.81	60	5.16	151
RAJIDAE	2.33	12	4.28	
Roa jayakari	1.53	36	2.80	
RAJIDAE	1.36	8	2.51	0
Centroberyx druzhini	1.20	4	2.21	
Plectorhinchus sp.	1.12	8	2.06	
LABRIDAE	0.88	40	1.62	
Satyrichthys adeni	0.80	4	1.47	
Histiopterus typus	0.80	4	1.47	
Symphysanodon typus	0.72	20	1.33	
SCORPAENIDAE	0.56	16	1.03	
Pseudomonacanthus elongata	0.32	4	0.59	
Triglidae small black spots	0.24	8	0.44	
Serranidae	0.08	4	0.15	
Parascolopsis eriomma	0.00	4	0.00	
UNIDENTIFIED FISH	0.00	4	0.00	
Total	54.42		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 61
DATE :24/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°36.87
start stop duration Lon E 94°27.15
TIME :18:22:31 18:37:07 14.6 (min) Purpose : 3
LOG : 1086.22 1087.03 0.8 Region : 10320
FDEPTH: 89 88 Gear cond.: 0
BDEPTH: 89 88 Validity : 2
Towing dir: 0° Wire out : 220 m Speed : 3.3 kn
Sorted : 6 Total catch: 5.53 Catch/hour: 22.74

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Nemipterus nematophorus	7.48	41	32.89	
Sepia pharaonis	3.21	4	14.09	
PENAEIDAE	2.47	0	10.84	
Halieutaea sp.	1.89	16	8.31	
Leiognathus sp.	1.81	0	7.95	
Satyrichthys adeni	1.23	4	5.42	
SCORPAENIDAE	0.58	37	2.53	
Bregmaceros sp.	0.58	325	2.53	
Sphyraena putnamie	0.49	8	2.17	
Lophiomus setigerus	0.41	4	1.81	
Uranoscopus affinis	0.33	4	1.45	
Saurida undosquamis	0.33	49	1.45	
Lepturacanthus savala	0.33	4	1.45	
Synagrops japonicus	0.25	53	1.08	
Upeneus moluccensis	0.25	21	1.08	
Nemipterus japonicus	0.25	12	1.08	
Loligo sp.	0.25	25	1.08	
Cociella sp.	0.16	4	0.72	
PORTUNIDAE	0.16	4	0.72	
yellow black spotted back pectoral	0.08	4	0.36	
Epinephelus heniochus	0.08	4	0.36	
Solea sp.	0.08	8	0.36	
Cynoglossus sp.	0.06	70	0.25	
Saurida tumbil	0.00	8	0.00	
Sepia sp.	0.00	4	0.00	
Total	22.74		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 62
DATE :24/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°55.80
start stop duration Lon E 94°29.56
TIME :21:32:20 21:55:13 22.9 (min) Purpose : 3
LOG : 1110.16 1111.48 1.3 Region : 10320
FDEPTH: 58 60 Gear cond.: 0
BDEPTH: 58 60 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.5 kn
Sorted : 21 Total catch: 21.01 Catch/hour: 55.10

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Nemipterus japonicus	17.81	553	32.32	153
Saurida undosquamis	8.34	0	15.14	
Bregmaceros sp.	4.56	0	8.28	
Miscellaneous	4.46	0	8.09	
Upeneus sulphureus	3.99	115	7.23	154
Pentaprion longimanus	3.72	0	6.76	
Parapenaeopsis stylifera	2.10	0	3.81	
Priacanthus tayenus	2.05	29	3.71	
Metapenaeus sp.	1.36	0	2.48	
Apogon pink fins mid-tail back	0.84	0	1.52	
Fistularia petimba	0.79	24	1.43	
Leiognathus sp.	0.63	0	1.14	
Sepia sp.	0.52	26	0.95	
Aesopia cornuta	0.52	3	0.95	
Lagocephalus wheeleri	0.52	5	0.95	
Siganus canaliculatus	0.47	8	0.86	
BOTHIDAE	0.37	47	0.67	
Acanthocepola sp.	0.31	18	0.57	
Lophiomus setigerus	0.31	3	0.57	
Loligo sp.	0.31	21	0.57	
Congresox talabonoides	0.26	3	0.48	
Trixiphichthys weberi	0.26	8	0.48	
Halieutaea sp.	0.21	3	0.38	
Dactyloptena orientalis	0.16	24	0.29	
Pterois russelii	0.10	3	0.19	
Halieutaea sp.	0.10	10	0.19	0
Cantherhines multilineatus	0.00	3	0.00	
Total	55.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 63
DATE :25/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°15.15
start stop duration Lon E 94°32.48
TIME :01:26:31 01:57:57 31.4 (min) Purpose : 3
LOG : 1136.10 1137.95 1.9 Region : 10320
FDEPTH: 44 46 Gear cond.: 0
BDEPTH: 44 46 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.5 kn
Sorted : 66 Total catch: 257.48 Catch/hour: 491.53

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Megalaspis cordyla	148.75	588	30.26	
Leiognathus sp.	64.14	22557	13.05	
Rastrelliger kanagurta	44.44	389	9.04	161
Priacanthus sp.	38.03	535	7.74	
Saurida elongata	29.17	1833	5.93	164
Upeneus sulphureus	28.56	1161	5.81	165
Scomberoides commersonianus	24.13	23	4.91	
Pentaprion longimanus	18.63	1145	3.79	
Sphyraena jello	18.48	206	3.76	163
Pomadasys maculatus	14.51	328	2.95	
Dussumieria acuta	12.06	191	2.45	
Nemipterus japonicus	10.54	99	2.14	162
Congresox talabonoides	8.40	8	1.71	
Pomadasys argenteus	5.35	15	1.09	
Tetraodon sp.	4.43	46	0.90	
Apogon pink fins mid-tail back	3.97	443	0.81	
Siganus canaliculatus	3.51	53	0.71	
Metapenaeus monoceros	3.05	199	0.62	
UNIDENTIFIED FISH	2.75	8	0.56	
Chirocentrus dorab	2.60	8	0.53	
Sepia sp.	2.44	38	0.50	
Arius sp.	1.37	8	0.28	
Penaeus monodon	1.34	8	0.27	
Loligo sp.	0.46	955	0.09	
Sea snakes	0.42	2	0.09	
Total	491.53		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 64
DATE :25/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°37.07
start stop duration Lon E 94°33.92
TIME :05:40:25 05:51:35 11.2 (min) Purpose : 3
LOG : 1164.50 1165.09 0.6 Region : 10320
FDEPTH: 22 24 Gear cond.: 0
BDEPTH: 22 24 Validity : 1
Towing dir: 0° Wire out : 80 m Speed : 3.2 kn
Sorted : 17 Total catch: 17.38 Catch/hour: 93.36

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Metapenaeus sp.	17.08	2562	18.30	
Scomberomorus guttatus	13.97	16	14.96	160
Sphyraena jello	12.25	102	13.12	159
Dussumieria acuta	11.60	338	12.43	155
Sardinella gibbosa	8.81	183	9.44	
Pomadasys maculatus	4.83	107	5.18	
Sepia sp.	4.30	242	4.60	
Lepturacanthus savala	3.12	167	3.34	
Terapon theraps	3.01	75	3.22	
Lactarius lactarius	2.36	86	2.53	158
Upeneus sulphureus	2.26	666	2.42	157
Priacanthus tayenus	1.83	21	1.96	
Gerres sp.	1.50	54	1.61	
Saurida undosquamis	1.50	81	1.61	156
Congresox talabonoides	1.50	5	1.61	
Terapon jarbua	1.07	5	1.15	
Siganus canaliculatus	0.75	16	0.81	
Lagocephalus wheeleri	0.54	81	0.58	
Johnius sp.	0.32	5	0.35	
Aesopia cornuta	0.32	5	0.35	
Penaeus monodon	0.21	5	0.23	
Plotosus sp.	0.21	5	0.23	
Total	93.36		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 65
DATE :25/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°29.24
start stop duration Lon E 94°52.77
TIME :08:45:38 09:09:50 24.2 (min) Purpose : 3
LOG : 1188.03 1189.45 1.4 Region : 10320
FDEPTH: 23 23 Gear cond.: 0
BDEPTH: 23 23 Validity : 1
Towing dir: 0° Wire out : 85 m Speed : 3.5 kn
Sorted : 6 Total catch: 6.03 Catch/hour: 14.96

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Mixed debries	3.30	0	22.06	
Lactarius lactarius	3.17	293	21.23	166
HARPISQUILLIDAE	3.00	45	20.07	
Metapenaeus sp.	1.51	533	10.12	
Sardinella gibbosa	0.79	15	5.31	
Sphyraena jello	0.69	84	4.64	
Terapon jarbua	0.55	12	3.65	
Lutjanus johnii	0.50	2	3.32	
Dussumieria acuta	0.47	15	3.15	
Dactyloptena orientalis	0.40	2	2.65	
Pomadasys maculatus	0.30	2	1.99	
Sepia sp.	0.22	7	1.49	
Ilisha elongata	0.05	2	0.33	
Total	14.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 66
DATE :25/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°19.31
start stop duration Lon E 94°51.54
TIME :11:11:29 11:40:56 29.4 (min) Purpose : 3
LOG : 1204.22 1206.00 1.8 Region : 10320
FDEPTH: 36 35 Gear cond.: 0
BDEPTH: 36 35 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.6 kn
Sorted : 12 Total catch: 11.81 Catch/hour: 24.06

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Lepturacanthus savala	4.97	19885	20.66	
Penaeus stylirostris	4.20	293	17.44	
Miscellaneous fishes, juvenile	3.34	0	13.89	
Loligo sp.	2.36	473	9.82	
SQUILLIDAE	1.96	179	8.13	
Metapenaeus sp.	1.83	69	7.62	
Apogon sp.	1.75	701	7.28	
Lactarius lactarius	1.34	740	5.59	168
Sepia sp.	0.90	57	3.73	
Nemipterus japonicus	0.57	35	2.37	167
Pomadasys maculatus	0.41	4	1.69	
Saurida undosquamis	0.12	4	0.51	
SCORPAENIDAE	0.10	4	0.42	
C R A B S	0.08	4	0.34	
Uranoscopus affinis	0.08	6	0.34	
Sphyraena jello	0.04	8	0.17	
Total	24.06		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 67
DATE :25/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°56.77
start stop duration Lon E 94°49.79
TIME :15:20:09 15:37:52 17.7 (min) Purpose : 3
LOG : 1232.38 1233.33 0.9 Region : 10320
FDEPTH: 56 56 Gear cond.: 0
BDEPTH: 56 56 Validity : 2
Towing dir: 0° Wire out : 155 m Speed : 3.2 kn
Sorted : 20 Total catch: 20.18 Catch/hour: 68.33

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Nemipterus japonicus	34.88	728	51.04	
Saurida elongata	8.80	1442	12.88	0
TETRAODONTIDAE	6.37	51	9.32	
Epinephelus sp.	5.62	17	8.23	
Priacanthus macracanthus	4.74	64	6.94	
Sepia sp.	2.84	78	4.16	
Cynoglossus sp.	1.63	34	2.38	
Otolithes ruber	1.15	7	1.68	
Lepturacanthus savala	1.02	27	1.49	
Upeneus sulphureus	0.95	41	1.39	
Fistularia petimba	0.34	44	0.50	
Total	68.33		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 68
DATE :25/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°37.32
start stop duration Lon E 94°48.29
TIME :19:33:46 19:58:37 24.9 (min) Purpose : 3
LOG : 1255.36 1256.79 1.4 Region : 10320
FDEPTH: 74 72 Gear cond.: 0
BDEPTH: 74 72 Validity : 2
Towing dir: 0° Wire out : 180 m Speed : 3.5 kn
Sorted : 19 Total catch: 19.12 Catch/hour: 46.16

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Nemipterus japonicus	11.11	314	24.06	169
Upeneus sulphureus	7.99	268	17.31	170
Saurida undosquamis	3.48	0	7.53	
Bregmaceros sp.	2.20	790	4.76	
Parapenaeopsis stylifera	2.15	147	4.65	
Lepturacanthus savala	2.15	2	4.65	
Priacanthus tayenus	2.10	31	4.55	
Lophiomus setigerus	2.08	12	4.50	
Loligo sp.	1.86	133	4.03	
BOTHIDAE	1.57	268	3.40	
Halieutaea sp.	0.94	14	2.04	
Dactyloptena orientalis	0.80	12	1.73	
Penaeus monodon	0.70	5	1.52	
Terapon jarbua	0.70	5	1.52	
Leiognathus sp.	0.63	106	1.36	
SCORPAENIDAE	0.58	48	1.26	
Epinephelus heniochus	0.51	7	1.10	
Pentaprion longimanus	0.48	302	1.05	
Cynoglossus sp.	0.46	7	0.99	
Fistularia petimba	0.43	22	0.94	
Apogon striped D-fins tail	0.43	68	0.94	
Cyclichthys spilostylus	0.39	2	0.84	
Pennahia sp.	0.39	2	0.84	
Metapenaeus sp.	0.36	116	0.78	
Pterois russelii	0.34	2	0.73	
Uranoscopus affinis	0.27	2	0.58	
C R A B S	0.24	27	0.52	
Sepia sp.	0.22	7	0.47	
HARPISQUILLIDAE	0.17	22	0.37	
Saurida tumbil	0.14	22	0.31	
yellow black spotted back pectoral	0.12	48	0.26	
Bembrops caudimacula	0.10	5	0.21	
Squillidae	0.10	12	0.21	
Total	46.16		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 69
DATE :26/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°15.55
start stop duration Lon E 94°41.17
TIME :01:42:58 02:15:45 32.8 (min) Purpose : 3
LOG : 1286.33 1287.89 1.6 Region : 10320
FDEPTH: 103 104 Gear cond.: 0
BDEPTH: 103 104 Validity : 0
Towing dir: 0° Wire out : 270 m Speed : 2.9 kn
Sorted : 13 Total catch: 13.40 Catch/hour: 24.53

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	9.99	500	40.75	171
Nemipterus japonicus	5.49	152	22.39	172
Lophiodes mutilus	2.49	11	10.15	
Loligo sp.	2.20	176	8.96	
Halieutaea sp.	2.09	15	8.51	
Upeneus bensasi	0.66	29	2.69	
Priacanthus macracanthus	0.51	51	2.09	
Dactyloptena peterseni	0.40	7	1.64	
Upeneus sulphureus	0.29	13	1.19	
Trixiphichthys weberi	0.18	4	0.75	
Pterois sp.	0.15	5	0.60	
Fistularia petimba	0.07	11	0.30	
Uraspis uraspis	0.00	2	0.00	
BOTHIDAE	0.00	2	0.00	
TRIGLIDAE	0.00	2	0.00	
Parupeneus sp.	0.00	2	0.00	
Cocotropus sp.	0.00	2	0.00	
SCORPAENIDAE	0.00	2	0.00	
Total	24.53		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 70
DATE :26/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°5.89
start stop duration Lon E 95°2.94
TIME :08:48:01 09:10:04 22.0 (min) Purpose : 3
LOG : 1335.89 1337.02 1.1 Region : 10320
FDEPTH: 287 287 Gear cond.: 0
BDEPTH: 287 287 Validity : 0
Towing dir: 0° Wire out : 650 m Speed : 3.1 kn
Sorted : 73 Total catch: 139.92 Catch/hour: 380.91

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Alopias superciliosus	81.67	3	21.44	
MYCTOPHIDAE	57.93	17959	15.21	
Heterocarpus tricarinatus	49.22	3248	12.92	
Aristeus virilis	32.67	4900	8.58	
Puerulus sewelli	28.20	302	7.40	
Plesiobatis daviesi	24.34	3	6.39	
Uranoscopus affinis	18.95	54	4.97	
UNIDENTIFIED FISH	15.25	44	4.00	
Peristedion weberi	10.24	11	2.69	
Physiculus sp.	10.24	403	2.69	
Synagrops japonicus	7.19	768	1.89	
C R A B S	7.19	250	1.89	
Bembrops curvatura	6.10	131	1.60	
PARALEPIDIDAE	5.88	735	1.54	
Priacanthus macracanthus	4.79	54	1.26	
Ateleopus natalensis	4.79	44	1.26	
TRIAKIDAE	4.74	38	1.24	
Psenopsis obscura	3.05	120	0.80	
Torpedo nobiliana	2.40	11	0.63	
Loligo sp.	1.31	22	0.34	
Dactyloptena orientalis	1.09	22	0.29	
TRIGLIDAE	0.87	44	0.23	
Chlorophthalmus sp.	0.87	22	0.23	
SCORPAENIDAE	0.44	44	0.11	
Satyrichthys investigatoris	0.44	11	0.11	
Nephropsis sp.	0.44	54	0.11	
Polymixia nobilis	0.22	11	0.06	
SQUILLIDAE	0.22	11	0.06	
Tydemania navigatoris	0.22	33	0.06	
Rexea bengalensis	0.00	11	0.00	
Neoepinnula orientalis	0.00	11	0.00	
Argyropelecus sp.	0.00	33	0.00	
Total	380.91		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 71
DATE :26/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°10.56
start stop duration Lon E 95°2.46
TIME :11:06:10 11:36:04 29.9 (min) Purpose : 3
LOG : 1347.88 1349.47 1.6 Region : 10320
FDEPTH: 115 113 Gear cond.: 0
BDEPTH: 115 113 Validity : 0
Towing dir: 0° Wire out : 280 m Speed : 3.2 kn
Sorted : 26 Total catch: 26.02 Catch/hour: 52.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	27.90	670	53.42	173
TETRAODONTIDAE	4.42	1502	8.46	
SCORPAENIDAE	3.13	251	6.00	0
Lophiomus setigerus	2.53	8	4.84	
Priacanthus macracanthus	2.37	20	4.53	
Squalus megalops	1.77	2	3.38	
Octopus sp.	1.57	46	3.00	
SCORPAENIDAE	0.96	60	1.84	
Loligo sp.	0.92	112	1.77	
Nemipterus japonicus	0.88	28	1.69	174
Raja sp.	0.80	2	1.54	
TRIGLIDAE	0.76	18	1.46	
Halieutaea sp.	0.72	28	1.38	
BOTHIDAE, juvenile	0.56	58	1.08	
Heterocarpus tricarinatus	0.48	44	0.92	
C R A B S	0.44	20	0.85	
Sepia sp.	0.44	16	0.85	
Sphyraena jello	0.40	6	0.77	
Trachinocephalus myops	0.36	6	0.69	
Scorpaenid with 2 horns	0.28	16	0.54	
Aesopia cornuta	0.24	2	0.46	
Uranoscopus affinis	0.16	2	0.31	
MURAENIDAE	0.12	2	0.23	
Satyrichthys adeni	0.00	2	0.00	
Neoniphon aurolineatus	0.00	2	0.00	
Total	52.23		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 72
DATE :26/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°36.15
start stop duration Lon E 95°8.93
TIME :15:13:40 15:34:56 21.3 (min) Purpose : 3
LOG : 1380.28 1381.41 1.1 Region : 10320
FDEPTH: 85 78 Gear cond.: 5
BDEPTH: 85 78 Validity : 5
Towing dir: 0° Wire out : 210 m Speed : 3.2 kn
Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
NOCATCH	0.00	0	0.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 73
DATE :26/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°35.51
start stop duration Lon E 95°7.71
TIME :16:23:54 16:51:13 27.3 (min) Purpose : 3
LOG : 1384.75 1386.13 1.4 Region : 10320
FDEPTH: 79 85 Gear cond.: 0
BDEPTH: 79 85 Validity : 0
Towing dir: 0° Wire out : 210 m Speed : 3.0 kn
Sorted : 38 Total catch: 37.72 Catch/hour: 82.84

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Nemipterus japonicus	13.79	1019	16.65	
Halieutaea sp.	8.78	103	10.60	
Loxodon macrorhinus	8.70	7	10.50	
C R A B S	5.05	505	6.10	
BOTHIDAE	5.01	650	6.04	
Upeneus sulphureus	4.66	110	5.62	
PRIACANTHIDAE	4.08	46	4.93	
Narcine prodorsalis	3.43	18	4.14	
Sepia sp.	3.34	198	4.03	
Saurida undosquamis	2.99	198	3.61	
SCORPAENIDAE	2.46	246	2.97	
Octopus sp.	2.33	176	2.81	
Apogon striped D-fins tail	2.06	413	2.49	
Metapenaeus sp.	2.06	206	2.49	
Dactyloptena orientalis	1.98	33	2.39	
Congresox talabonoides	1.93	7	2.33	
Hemipristis elongata	1.71	2	2.07	
Pentaprion longimanus	1.45	77	1.75	
TETRAODONTIDAE	1.27	15	1.54	
Lepturacanthus savala	1.23	2	1.48	
Grammoplites sp.	0.92	94	1.11	
Loligo sp.	0.92	64	1.11	
Trixiphichthys weberi	0.75	22	0.90	
SCORPAENIDAE	0.61	48	0.74	0
Cynoglossus sp.	0.57	4	0.69	
Fistularia petimba	0.48	13	0.58	
Epinephelus bleekeri	0.26	2	0.32	
Total	82.84		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 74
DATE :26/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°53.99
start stop duration Lon E 95°11.34
TIME :19:32:55 19:52:45 19.8 (min) Purpose : 3
LOG : 1409.06 1410.09 1.0 Region : 10320
FDEPTH: 62 62 Gear cond.: 0
BDEPTH: 62 62 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.1 kn
Sorted : 15 Total catch: 15.00 Catch/hour: 45.39

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Otolithes ruber	7.26	70	16.00	
Nemipterus japonicus	6.41	209	14.13	175
Penaeus monodon	4.78	378	10.53	
Cynoglossus sp.	3.39	45	7.47	
BOTHIDAE	2.84	390	6.27	
Sepia sp.	2.66	91	5.87	
Uranoscopus affinis	1.66	67	3.67	
Halieutaea sp.	1.57	27	3.47	
Lepturacanthus savala	1.45	54	3.20	
Apogon pink fins mid-tail back	1.39	194	3.07	
Priacanthus hamrur	1.21	9	2.67	
Octopus sp.	1.09	91	2.40	
SCORPAENIDAE	1.09	57	2.40	
Solenocera sp.	0.97	136	2.13	
Arothron immaculatus	0.91	27	2.00	
Fistularia petimba	0.91	36	2.00	
Bregmaceros sp.	0.67	251	1.47	
PARALEPIDIDAE	0.67	21	1.47	
Upeneus sulphureus	0.67	27	1.47	
Bembrops curvatura	0.61	18	1.33	
Ariosoma sp.	0.54	51	1.20	
Selar crumenophthalmus	0.54	3	1.20	
SQUILLIDAE	0.48	73	1.07	0
PORTUNIDAE	0.36	18	0.80	
Apogon sp.	0.30	24	0.67	
Loligo sp.	0.24	21	0.53	
Pterois russelii	0.24	6	0.53	
Acanthocepola sp.	0.18	9	0.40	
Tydemania navigatoris	0.12	15	0.27	
CALLIONYMIDAE	0.06	9	0.13	
SQUILLIDAE	0.03	3	0.07	
Aesopia cornuta	0.03	3	0.07	
C R A B S	0.03	3	0.07	
C R A B S	0.00	3	0.00	0
Leiognathus sp.	0.00	18	0.00	
Liagore sp	0.00	3	0.00	
Trachinocephalus myops	0.00	3	0.00	
Total	45.39		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 75
DATE :26/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°7.41
start stop duration Lon E 95°10.47
TIME :21:56:33 22:14:42 18.1 (min) Purpose : 3
LOG : 1426.34 1427.37 1.0 Region : 10320
FDEPTH: 38 38 Gear cond.: 0
BDEPTH: 38 38 Validity : 2
Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
Sorted : 16 Total catch: 23.28 Catch/hour: 77.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Penaeus sp.	13.59	1224	17.65	
Lactarius lactarius	11.41	245	14.82	176
Sepia sp.	7.44	0	9.66	
Lepturacanthus savala	5.46	0	7.09	
Rachycentron canadum	5.06	5	6.57	
Metapenaeus sp.	4.86	2041	6.31	
Leiognathus sp.	4.66	933	6.06	
Nemipterus japonicus	3.97	2937	5.15	178
SQUILLIDAE	3.47	592	4.51	
Parastromateus niger	2.78	5	3.61	
Lagocephalus wheeleri	2.48	46	3.22	
Upeneus sulphureus	2.48	79	3.22	177
Apogon sp.	2.38	139	3.09	
Cynoglossus sp.	1.59	69	2.06	
Scomberoides commersonianus	1.49	5	1.93	
Loligo sp.	1.19	40	1.55	
Dactyloptena orientalis	0.60	5	0.77	
Aesopia cornuta	0.50	5	0.64	
Megalaspis cordyla	0.50	5	0.64	
Fistularia petimba	0.40	50	0.52	
Saurida tumbil	0.40	5	0.52	
Polydactylus sextarius	0.30	10	0.39	
Pennahia anea	0.00	3	0.00	
Fishing gears	0.00	89	0.00	
Total	77.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 76
DATE :27/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°15.45
start stop duration Lon E 95°34.69
TIME :05:41:38 06:11:43 30.1 (min) Purpose : 3
LOG : 1487.95 1489.80 1.9 Region : 10320
FDEPTH: 39 41 Gear cond.: 0
BDEPTH: 39 41 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.7 kn
Sorted : 46 Total catch: 134.66 Catch/hour: 268.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Sardinella gibbosa	102.33	1969	38.10	179
Megalaspis cordyla	46.68	798	17.38	184
Dussumieria acuta	24.34	529	9.06	180
Atropus atropos	16.76	130	6.24	
Sphyraena jello	12.97	14	4.83	183
Congresox talabonoides	9.93	2	3.70	
Eleutheronema tetradactylum	9.81	6	3.65	
Lepturacanthus savala	8.98	319	3.34	
Loligo sp.	5.98	229	2.23	
Pampus argenteus	5.59	18	2.08	181
Tetraodon sp.	4.59	90	1.71	
Scomberomorus guttatus	4.03	6	1.50	182
Lactarius lactarius	3.39	50	1.26	
Rastrelliger brachysoma	2.79	20	1.04	
Terapon jarbua	2.67	14	1.00	
Sepia sp.	1.60	90	0.59	
Scomberoides tol	1.36	6	0.50	
Parastromateus niger	1.24	4	0.46	
Pennahia sp.	1.20	100	0.45	
Pomadasys maculatus	1.20	20	0.45	
Aesopia cornuta	0.60	10	0.22	
Selaroides leptolepis	0.60	30	0.22	
Total	268.60		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 77
DATE :27/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°5.15
start stop duration Lon E 95°30.26
TIME :07:59:47 08:27:58 28.2 (min) Purpose : 3
LOG : 1502.67 1504.15 1.5 Region : 10320
FDEPTH: 60 63 Gear cond.: 0
BDEPTH: 60 63 Validity : 0
Towing dir: 0° Wire out : 165 m Speed : 3.1 kn
Sorted : 42 Total catch: 41.73 Catch/hour: 88.85

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	42.80	1226	48.17	
Megalaspis cordyla	25.98	87	29.24	186
Rastrelliger brachysoma	3.92	28	4.41	185
Parapenaeopsis stylifera	3.70	224	4.17	
Scomberomorus guttatus	3.62	4	4.07	187
J E L L Y F I S H	2.47	0	2.78	
Sepia sp.	1.98	151	2.23	
Scomberoides tol	1.21	2	1.37	
Penaeus monodon	0.89	4	1.01	
Apogon sp.	0.62	4940	0.69	
Metapenaeus sp.	0.47	204	0.53	
Nemipterus japonicus	0.30	2	0.34	
Pomadasys maculatus	0.26	2	0.29	
Loligo sp.	0.19	17	0.22	
Lagocephalus wheeleri	0.19	2	0.22	
Saurida tumbil	0.09	2	0.10	
Apogon pink fins mid-tail back	0.09	19	0.10	
Upeneus vittatus	0.06	2	0.07	
Leiognathus sp.	0.02	11	0.02	
Total	88.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 78
DATE :27/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°41.57
start stop duration Lon E 95°30.36
TIME :12:48:34 13:20:00 31.4 (min) Purpose : 3
LOG : 1534.38 1536.01 1.6 Region : 10320
FDEPTH: 100 103 Gear cond.: 0
BDEPTH: 100 103 Validity : 2
Towing dir: 0° Wire out : 270 m Speed : 3.1 kn
Sorted : 27 Total catch: 52.72 Catch/hour: 100.64

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Nemipterus japonicus	27.72	504	27.54	188
Apogon sp.	22.37	8018	22.23	
Metapenaeus monoceros	10.54	802	10.47	
Torpedo sp.	9.09	53	9.03	
GOBIIDAE	4.66	420	4.63	
Lophiomus setigerus	3.44	8	3.41	
Halieutaea sp.	3.21	42	3.19	
Narcine prodorsalis	2.75	298	2.73	
Saurida undosquamis	2.67	80	2.66	189
SCORPAENIDAE	1.99	153	1.97	0
Lepturacanthus savala	1.91	76	1.90	
SCORPAENIDAE	1.91	145	1.90	
BOTHIDAE	1.53	191	1.52	
Sepia sp.	1.45	69	1.44	
Parascolopsis tanyactis	1.22	27	1.21	
Cynoglossus sp.	1.22	6	1.21	
Branchiostegus sawakinensis	1.18	4	1.18	
Octopus sp.	1.07	73	1.06	
Uranoscopus affinis	0.53	31	0.53	
Brotula multibarbata	0.19	2	0.19	
Tylerius spinosissimus	0.00	2	0.00	
Total	100.64		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 79
DATE :27/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°23.53
start stop duration Lon E 95°27.63
TIME :16:08:13 16:29:19 21.1 (min) Purpose : 3
LOG : 1558.39 1559.54 1.1 Region : 10320
FDEPTH: 104 101 Gear cond.: 0
BDEPTH: 104 101 Validity : 0
Towing dir: 0° Wire out : 280 m Speed : 3.2 kn
Sorted : 21 Total catch: 42.30 Catch/hour: 120.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	26.50	591	22.03	190
Nemipterus japonicus	10.81	495	8.98	191
Uranoscopus affinis	10.81	142	8.98	
Metapenaeus sp.	8.36	3762	6.95	
Cyclichthys spilostylus	7.96	6	6.62	
BOTHIDAE	7.62	1587	6.34	
Halieutaea sp.	7.39	11	6.15	
Solenocera sp.	4.49	387	3.74	
TETRAODONTIDAE	4.49	1132	3.74	
Lepturacanthus savala	3.87	17	3.22	
Portunus sp.	3.18	23	2.65	
OPHICHTHIDAE	3.18	68	2.65	
Lophiomus setigerus	2.84	6	2.36	
Pseudorhombus quinquocellatus	2.56	80	2.13	
Raja sp.	2.39	6	1.99	
TRIGLIDAE	2.27	34	1.89	
C R A B S	2.22	506	1.84	0
Apogon sp.	1.82	336	1.51	0
Cyclichthys orbicularis	1.36	11	1.13	
Brotula multibarbata	1.14	6	0.95	
Apogon sp.	0.91	176	0.76	
Charybdis affinis	0.91	6	0.76	
Upeneus bensasi	0.57	17	0.47	
C R A B S	0.57	0	0.47	
Loligo sp.	0.34	17	0.28	
CALLIONYMIDAE	0.34	34	0.28	
Sepia sp.	0.23	51	0.19	
Ariosoma sp.	0.23	6	0.19	
Upeneus sulphureus	0.17	6	0.14	
Fistularia petimba	0.11	11	0.09	
Nettastoma sp.	0.11	11	0.09	
Saurida sp.	0.11	28	0.09	
SQUILLIDAE	0.11	17	0.09	
Cynoglossus sp.	0.11	11	0.09	
Aesopia cornuta	0.11	6	0.09	
Leiognathus sp.	0.06	6	0.05	
Carybdis sp.	0.00	3	0.00	
Inimicus sp.	0.00	6	0.00	
Synodus sp.	0.00	3	0.00	
Total	120.28		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 80
DATE :28/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°55.75
start stop duration Lon E 95°41.10
TIME :02:11:46 02:42:17 30.5 (min) Purpose : 3
LOG : 1631.17 1632.91 1.7 Region : 10320
FDEPTH: 173 177 Gear cond.: 0
BDEPTH: 173 177 Validity : 0
Towing dir: 0° Wire out : 450 m Speed : 3.4 kn
Sorted : 19 Total catch: 36.85 Catch/hour: 72.47

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Satyrichthys adeni	31.62	90	43.64	
Neoniphon aurolineatus	20.29	401	28.01	
Saurida undosquamis	7.94	122	10.96	192
Priacanthus macracanthus	1.97	16	2.71	
Histiopterus typus	1.97	4	2.71	
Lophiomus setigerus	1.73	4	2.39	
Squalus megalops	0.98	2	1.36	
TRIGLIDAE	0.94	20	1.30	
SCORPAENIDAE	0.94	12	1.30	
BOTHIDAE	0.87	28	1.19	
Raja sp.	0.83	2	1.14	
Antigonia sp.	0.79	20	1.09	
LABRIDAE	0.79	16	1.09	
Parascolopsis tanyactis	0.71	8	0.98	
Holanthias sp.	0.10	2	0.14	
Plectorhinchus sp.	0.00	2	0.00	
C R A B S	0.00	2	0.00	
Histiopterus typus	0.00	2	0.00	0
Malthopsis sp.	0.00	2	0.00	
Total	72.47		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 81
DATE :28/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°14.80
start stop duration Lon E 95°46.58
TIME :05:48:15 06:17:20 29.1 (min) Purpose : 3
LOG : 1657.68 1659.38 1.7 Region : 10320
FDEPTH: 154 166 Gear cond.: 0
BDEPTH: 154 166 Validity : 0
Towing dir: 0° Wire out : 430 m Speed : 3.5 kn
Sorted : 51 Total catch: 51.33 Catch/hour: 105.87

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Neoniphon aurolineatus	39.70	953	37.50	
Nemipterus japonicus	15.06	260	14.22	193
Saurida undosquamis	13.49	182	12.74	194
Priacanthus macracanthus	8.54	58	8.07	
Lophiomus setigerus	4.83	19	4.56	
C R A B S	2.97	78	2.81	
Parascolopsis tanyactis	2.93	45	2.77	
Starfish	2.23	146	2.10	
Uranoscopus affinis	2.23	35	2.10	
Satyrichthys adeni	2.06	8	1.95	
Lipocheilus carnolabrum	1.53	4	1.44	
Histiopterus typus	1.40	6	1.32	
LABRIDAE	1.32	37	1.25	
PORTUNIDAE	1.32	50	1.25	
Grammoplites sp.	1.20	6	1.13	
TRIGLIDAE	1.07	29	1.01	
Loligo sp.	1.03	56	0.97	
Cynoglossus sp.	0.95	25	0.90	
BOTHIDAE	0.66	56	0.62	
Raja sp.	0.54	4	0.51	
Sepia sp.	0.33	6	0.31	
TETRAODONTIDAE	0.25	8	0.23	
Parabembras curtus	0.25	4	0.23	
Total	105.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 82
DATE :28/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°33.52
start stop duration Lon E 95°49.26
TIME :09:09:04 09:39:43 30.7 (min) Purpose : 3
LOG : 1682.60 1684.22 1.6 Region : 10320
FDEPTH: 116 132 Gear cond.: 0
BDEPTH: 116 132 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 3.2 kn
Sorted : 53 Total catch: 53.11 Catch/hour: 103.93

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Saurida undosquamis	24.70	397	23.76	196
Nemipterus japonicus	21.10	360	20.30	195
Apogon sp.	14.05	877	13.52	
Priacanthus macracanthus	12.84	12	12.35	
Lophiomus setigerus	12.52	47	12.05	
Portunus sp.	3.56	123	3.43	
Cynoglossus sp.	2.15	270	2.07	
Metapenaeus sp.	1.88	523	1.81	
Peristedion weberi	1.68	6	1.62	
Parascolopsis tanyactis	1.68	25	1.62	
PORTUNIDAE	1.10	23	1.05	
Halieutaea sp.	0.94	31	0.90	
Pseudorhombus quinquocellatus	0.86	18	0.83	
Neoniphon aurolineatus	0.82	29	0.79	
Loligo sp.	0.78	18	0.75	
Inimicus caledonicus	0.78	65	0.75	
Raja sp.	0.55	2	0.53	
SCORPAENIDAE	0.51	16	0.49	
Sepia sp.	0.39	20	0.38	
Uranoscopus affinis	0.27	4	0.26	
Fistularia petimba	0.27	16	0.26	
CALLIONYMIDAE	0.12	12	0.11	
Grammoplites scaber	0.08	2	0.08	
Tylerius spinosissimus	0.08	12	0.08	
Scorpaenid with 2 horns	0.04	2	0.04	
Bembrops sp.	0.04	2	0.04	
CALLIONYMIDAE	0.04	2	0.04	0
Aesopia cornuta	0.04	2	0.04	
Apogon sp.	0.04	10	0.04	0
Aesopia cornuta	0.02	2	0.02	0
HARPISQUILLIDAE	0.00	2	0.00	
Fishing gears	0.00	2	0.00	
C R A B S	0.00	2	0.00	
Plastic bags	0.00	2	0.00	
Total	103.93		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 83
DATE :28/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°52.83
start stop duration Lon E 95°52.21
TIME :12:24:05 12:36:38 12.6 (min) Purpose : 3
LOG : 1706.82 1707.43 0.6 Region : 10320
FDEPTH: 113 108 Gear cond.: 0
BDEPTH: 113 108 Validity : 2
Towing dir: 0° Wire out : 300 m Speed : 2.9 kn
Sorted : 22 Total catch: 22.34 Catch/hour: 106.80

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Cynoglossus sp.	15.68	435	14.68	
Ariosoma sp.	9.94	746	9.31	
Apogon sp.	8.70	784	8.15	
Nemipterus japonicus	8.41	110	7.88	197
Pennahia anea	8.22	43	7.70	
GOBIIDAE	6.79	884	6.36	
Bassanago albescens	5.93	14	5.55	
Trypauchen microcephalus	5.83	698	5.46	
Metapenaeus monoceros	5.55	488	5.19	
Lophiodes mutilus	5.35	19	5.01	
C R A B S	5.26	215	4.92	
Saurida elongata	5.26	148	4.92	198
Priacanthus sp.	3.92	24	3.67	
Uranoscopus affinis	2.68	57	2.51	
Congresox talabonoides	2.29	5	2.15	
Lepturacanthus savala	1.91	48	1.79	
ANGUILLIFORMES	1.34	5	1.25	
Brotula multibarbata	1.15	19	1.07	
Halieutaea sp.	1.05	14	0.98	
Decapterus tabl	0.86	5	0.81	
SCORPAENIDAE	0.67	48	0.63	
Total	106.80		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 84
DATE :28/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°8.54
start stop duration Lon E 96°15.50
TIME :17:51:43 18:21:34 29.9 (min) Purpose : 3
LOG : 1749.29 1750.99 1.7 Region : 10320
FDEPTH: 30 29 Gear cond.: 0
BDEPTH: 30 29 Validity : 2
Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
Sorted : 16 Total catch: 26.32 Catch/hour: 52.90

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Metapenaeus sp.	16.08	21307	30.40	
Chrysochir aureus	8.68	277	16.41	199
Pennahia anea	5.59	32	10.56	
Polynemus sp.	3.62	62	6.84	
Charybdis affinis	2.41	16	4.56	
Johnius sp.	2.09	52	3.95	
Congresox talabonoides	1.93	8	3.65	
SQUILLIDAE	1.77	410	3.34	
Thryssa setirostris	1.41	113	2.66	
Portunus sanguinolentus	1.29	113	2.43	
Apogon pink fins mid-tail back	1.29	1158	2.43	
Bregmaceros sp.	1.13	225	2.13	
Pampus argenteus	1.09	2	2.05	
Upeneus sulphureus	0.68	8	1.29	
Lagocephalus sp.	0.64	16	1.22	
Cynoglossus sp.	0.44	12	0.84	
Terapon theraps	0.40	10	0.76	
Solenocera sp.	0.40	121	0.76	0
Sepia sp.	0.40	52	0.76	
Antennarius sp.	0.32	24	0.61	
Trypauchen microcephalus	0.32	16	0.61	
Ariosoma sp.	0.32	8	0.61	
Coilia dussumieri	0.24	30	0.46	
Solenocera sp.	0.16	64	0.30	
Megalaspis cordyla	0.12	2	0.23	
Pomadasys maculatus	0.08	2	0.15	
Aesopia cornuta	0.00	2	0.00	
Loligo sp.	0.00	2	0.00	
C R A B S	0.00	8	0.00	
C R A B S	0.00	8	0.00	0
Total	52.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 85
DATE :28/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°52.06
start stop duration Lon E 96°13.85
TIME :20:36:05 21:06:03 30.0 (min) Purpose : 3
LOG : 1770.47 1772.09 1.6 Region : 10320
FDEPTH: 114 118 Gear cond.: 0
BDEPTH: 114 118 Validity : 2
Towing dir: 0° Wire out : 320 m Speed : 3.2 kn
Sorted : 29 Total catch: 140.00 Catch/hour: 280.28

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Apogon pink fins mid-tail back	91.53	8543	32.66	
Metapenaeus sp.	52.85	436	18.86	
Portunus sanguinolentus	48.05	0	17.14	
Parapenaeopsis stylifera	25.95	1778	9.26	
Solenocera choprai	15.86	0	5.66	
Solenocera sp.	8.65	577	3.09	
Saurida undosquamis	7.09	180	2.53	200
Pennahia anea	7.09	60	2.53	
Osteogeneiosus militaris	4.48	8	1.60	
Sepia sp.	2.88	360	1.03	
Chrysochir aureus	2.76	24	0.99	201
Lepturacanthus savala	2.64	36	0.94	
Ariosoma sp.	2.16	12	0.77	
GOBIIDAE	1.92	168	0.69	
Terapon theraps	1.68	36	0.60	
Loligo sp.	1.44	312	0.51	
Selar crumenophthalmus	1.44	6	0.51	
Polynemus sp.	0.60	12	0.21	
Cynoglossus sp.	0.36	18	0.13	
Nemipterus japonicus	0.36	6	0.13	
Thryssa setirostris	0.24	18	0.09	
Parascolopsis tanyactis	0.24	6	0.09	
Total	280.28		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 86
DATE :29/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°34.38
start stop duration Lon E 96°12.67
TIME :00:54:26 01:25:27 31.0 (min) Purpose : 3
LOG : 1803.10 1804.70 1.6 Region : 10320
FDEPTH: 129 130 Gear cond.: 0
BDEPTH: 129 130 Validity : 0
Towing dir: 0° Wire out : 330 m Speed : 3.1 kn
Sorted : 36 Total catch: 35.76 Catch/hour: 69.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	15.82	253	22.87	202
Nemipterus japonicus	15.28	259	22.09	203
Lophiomus setigerus	6.77	31	9.79	
Priacanthus macracanthus	6.00	46	8.67	
Selar crumenophthalmus	4.68	27	6.77	
C R A B S	3.37	157	4.87	
Raja sp.	2.63	14	3.80	
Lepturacanthus savala	2.36	2	3.41	
S H R I M P S	2.09	213	3.02	
BOTHIDAE	1.97	193	2.85	
Apogon sp.	1.74	124	2.52	0
Parascolopsis rufomaculatus	1.39	23	2.01	
SCORPAENIDAE	1.12	87	1.62	
Loligo sp.	1.08	132	1.57	
Sea urchin	0.70	70	1.01	
Grammoplites sp.	0.54	12	0.78	
Apogon sp.	0.50	44	0.73	
Pennahia anea	0.27	2	0.39	
Neoniphon aurolineatus	0.23	4	0.34	
Upeneus taeniopterus	0.23	15	0.34	
Uranoscopus affinis	0.23	4	0.34	
Sepia sp.	0.15	17	0.22	
SQUILLIDAE	0.00	2	0.00	
Branchiostegus sawakinensis	0.00	2	0.00	
Total	69.17		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 87
DATE :29/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°16.97
start stop duration Lon E 96°10.14
TIME :03:40:06 04:06:02 25.9 (min) Purpose : 3
LOG : 1822.06 1823.42 1.4 Region : 10320
FDEPTH: 144 142 Gear cond.: 0
BDEPTH: 144 142 Validity : 0
Towing dir: 0° Wire out : 370 m Speed : 3.2 kn
Sorted : 21 Total catch: 20.68 Catch/hour: 47.87

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	13.75	243	28.72	205
Nemipterus japonicus	7.13	141	14.89	204
Lophiomus setigerus	5.93	16	12.38	
Loligo sp.	2.87	157	6.00	
Parascolopsis rufomaculatus	2.87	65	6.00	
Neoniphon aurolineatus	2.73	53	5.71	
Priacanthus macracanthus	2.50	21	5.22	
Squalus megalops	2.04	2	4.26	
BOTHIDAE	1.85	157	3.87	
C R A B S	1.71	51	3.58	
Raja sp.	1.39	7	2.90	
Grammoplites sp.	0.60	12	1.26	
Sepia sp.	0.51	12	1.06	
Uranoscopus affinis	0.51	19	1.06	
Cynoglossus sp.	0.42	12	0.87	
Halieutaea sp.	0.37	14	0.77	
Metapenaeus monoceros	0.32	46	0.68	
Stolephorus indicus	0.19	12	0.39	
SCORPAENIDAE	0.19	12	0.39	
Parabembras curtus	0.00	2	0.00	
TETRAODONTIDAE	0.00	2	0.00	
Hoplichthys sp.	0.00	2	0.00	
Total	47.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 88
DATE :29/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°1.18
start stop duration Lon E 96°8.71
TIME :06:41:34 07:11:03 29.5 (min) Purpose : 3
LOG : 1843.85 1845.36 1.5 Region : 10320
FDEPTH: 156 148 Gear cond.: 0
BDEPTH: 156 148 Validity : 0
Towing dir: 0° Wire out : 370 m Speed : 3.1 kn
Sorted : 57 Total catch: 221.78 Catch/hour: 451.38

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Neoniphon aurolineatus	363.42	18425	80.51	206
Saurida undosquamis	53.24	912	11.80	207
Portunus sp.	14.82	423	3.28	
Sea urchin	5.21	0	1.15	
Squalus megalops	3.79	4	0.84	
Priacanthus macracanthus	3.58	33	0.79	
Halieutaea sp.	3.26	8	0.72	
Uranoscopus affinis	1.14	24	0.25	
Raja sp.	1.14	16	0.25	
Nemipterus japonicus	0.98	16	0.22	
Lophiomus setigerus	0.49	16	0.11	
BOTHIDAE	0.33	33	0.07	
L O B S T E R S	0.00	8	0.00	
Total	451.38		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 89
DATE :29/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°42.17
start stop duration Lon E 96°20.44
TIME :14:28:06 15:01:59 33.9 (min) Purpose : 3
LOG : 1890.02 1891.83 1.8 Region : 10320
FDEPTH: 157 166 Gear cond.: 0
BDEPTH: 157 166 Validity : 2
Towing dir: 0° Wire out : 400 m Speed : 3.2 kn
Sorted : 49 Total catch: 70.90 Catch/hour: 125.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Squalus megalops	36.94	34	29.42	
Saurida undosquamis	20.76	251	16.53	217
Satyrichthys adeni	15.73	53	12.52	
Parabembras curtus	12.26	213	9.76	
Plesiobatis daviesi	11.65	2	9.28	
BOTHIDAE	4.82	96	3.84	
Lophiomus setigerus	3.90	18	3.10	
Neoniphon aurolineatus	2.27	60	1.81	
Peristedion weberi	2.27	78	1.81	
TRIGLIDAE	1.91	39	1.52	
Nemipterus japonicus	1.77	32	1.41	208
C R A B S	1.63	46	1.30	
Halieutaea sp.	1.63	14	1.30	
Uranoscopus affinis	1.52	7	1.21	
Tydemania sp.	1.42	312	1.13	
Ibacus peronii	0.99	18	0.79	
Psenopsis obscura	0.85	81	0.68	
Priacanthus macracanthus	0.78	4	0.62	
Raja sp.	0.71	5	0.56	
Parascolopsis rufomaculatus	0.57	32	0.45	
Narcine sp.	0.57	2	0.45	
Sepia sp.	0.35	4	0.28	
MYCTOPHIDAE	0.28	25	0.23	
Bleekeria sp.	0.00	2	0.00	
Total	125.56		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 90
DATE :29/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°0.13
start stop duration Lon E 96°28.49
TIME :18:35:22 18:54:59 19.6 (min) Purpose : 3
LOG : 1921.82 1922.83 1.0 Region : 10320
FDEPTH: 116 117 Gear cond.: 0
BDEPTH: 116 117 Validity : 2
Towing dir: 0° Wire out : 360 m Speed : 3.1 kn
Sorted : 23 Total catch: 23.14 Catch/hour: 70.76

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Nemipterus japonicus	15.17	401	21.43	211
Uranoscopus affinis	5.66	21	7.99	
Trachinocephalus myops	5.35	138	7.56	
Dactyloptena orientalis	5.08	64	7.17	
Peristedion weberi	3.91	31	5.53	
BOTHIDAE	3.49	266	4.93	
Parascolopsis tanyactis	3.30	116	4.67	
Apogon sp.	3.18	272	4.49	
Upeneus bensasi	3.00	168	4.24	210
Portunus sp.	2.32	159	3.28	
Cantherhines multilineatus	2.14	24	3.03	
Pseudorhombus sp.	1.96	12	2.77	
Bleekeria sp.	1.90	3	2.68	
Ariosoma sp.	1.90	52	2.68	
MURAENIDAE	1.28	15	1.82	
CALLIONYMIDAE	1.28	162	1.82	
Cynoglossus sp.	1.22	76	1.73	
Priacanthus macracanthus	1.16	6	1.64	
Saurida undosquamis	1.10	135	1.56	209
Raja sp.	0.80	9	1.12	
Starfish	0.80	34	1.12	
Rhinobatus typus	0.76	3	1.08	
Metapenaeus sp.	0.73	312	1.04	
Parabembras curtus	0.73	15	1.04	
Loligo sp.	0.43	15	0.61	
Tetrosomus gibbosus	0.37	6	0.52	
Narcine sp.	0.28	3	0.39	
Fistularia petimba	0.24	3	0.35	
Octopus sp.	0.24	6	0.35	
Sepia sp.	0.24	3	0.35	
Scorpaenid with 2 horns	0.18	6	0.26	
Synodus sp.	0.18	12	0.26	
Cyclichthys orbicularis	0.12	3	0.17	
SICYONIIDAE	0.12	31	0.17	
Sphoeroides sp.	0.12	3	0.17	
Parapercis alboguttata	0.00	3	0.00	
Total	70.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 91
DATE :29/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°24.93
start stop duration Lon E 96°35.64
TIME :22:56:29 23:20:27 24.0 (min) Purpose : 3
LOG : 1949.73 1951.04 1.3 Region : 10320
FDEPTH: 101 99 Gear cond.: 0
BDEPTH: 101 99 Validity : 2
Towing dir: 0° Wire out : 290 m Speed : 3.3 kn
Sorted : 26 Total catch: 26.46 Catch/hour: 66.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	14.57	1292	22.00	214
Nemipterus japonicus	9.86	383	14.89	212
Priacanthus macracanthus	4.71	45	7.11	
Upeneus bensasi	4.51	451	6.80	213
BOTHIDAE	3.75	451	5.67	
TRIGLIDAE	3.35	118	5.06	
Loligo sp.	2.90	178	4.38	
Satyrichthys adeni	2.80	45	4.23	
Cyclichthys orbicularis	2.60	38	3.93	
C R A B S	2.25	526	3.40	
Seriolina nigrofasciata	1.85	5	2.80	
Lophiomus setigerus	1.75	10	2.65	
Uranoscopus affinis	1.40	13	2.12	
S H R I M P S	1.20	173	1.81	
Halieutaea sp.	1.20	5	1.81	
Abalistes stellatus	0.90	3	1.36	
Pentaprion longimanus	0.90	45	1.36	
Raja sp.	0.85	5	1.28	
Sepia sp.	0.80	45	1.21	
Saurida brasiliensis	0.75	23	1.13	
Cantherhines multilineatus	0.60	8	0.91	
Rhinobatos formosensis	0.60	3	0.91	
Parascolopsis eriomma	0.45	15	0.68	
Satyrichthys investigatoris	0.45	3	0.68	
OCTOPODIDAE	0.35	10	0.53	
CALLIONYMIDAE	0.30	63	0.45	
Pristipomoides sp.	0.25	13	0.38	
Fistularia petimba	0.20	8	0.30	
Synodus binotatus	0.10	5	0.15	
SICYONIIDAE	0.05	10	0.08	
Total	66.28		100.08	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 92
DATE :30/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°51.61
start stop duration Lon E 96°34.31
TIME :04:27:51 04:59:25 31.6 (min) Purpose : 3
LOG : 1998.72 2000.26 1.5 Region : 10320
FDEPTH: 70 70 Gear cond.: 0
BDEPTH: 70 70 Validity : 0
Towing dir: 0° Wire out : 180 m Speed : 2.9 kn
Sorted : 37 Total catch: 55.74 Catch/hour: 105.94

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Apogon sp.	68.76	15128	64.91	
Lepturacanthus savala	9.64	471	9.10	
Cynoglossus lingua	4.16	57	3.93	
Loligo sp.	3.82	177	3.61	
Peristedion weberi	3.25	6	3.07	
Nemipterus japonicus	3.02	29	2.85	215
Dussumieria acuta	2.22	31	2.10	216
Parastromateus niger	2.17	6	2.05	
Pennahia anea	2.11	95	1.99	
Sepia sp.	1.82	165	1.72	
Alectis indica	0.91	6	0.86	
Penaeus monodon	0.74	6	0.70	
Rhinobatos formosensis	0.51	6	0.48	
Pseudorhombus dupliciocellatus	0.51	6	0.48	
Portunus sp.	0.51	6	0.48	
Parapenaeopsis stylifera	0.23	27	0.22	
Dactyloptena orientalis	0.17	6	0.16	
Cantherhines multilineatus	0.11	6	0.11	
Megalaspis cordyla	0.11	6	0.11	
Metapenaeus sp.	0.10	0	0.09	
CALLIONYMIDAE	0.06	10	0.05	
Solenocera sp.	0.06	6	0.05	
HARPISQUILLIDAE	0.06	27	0.05	
Plastic bags	0.00	2	0.00	
TETRAODONTIDAE	0.00	2	0.00	
Apogon pink fins mid-tail back	0.00	2	0.00	
Trypauchen microcephalus	0.00	4	0.00	
Total	105.06		99.18	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 93
DATE :30/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°57.66
start stop duration Lon E 96°38.44
TIME :06:27:37 06:56:53 29.3 (min) Purpose : 3
LOG : 2009.80 2011.53 1.7 Region : 10320
FDEPTH: 36 36 Gear cond.: 0
BDEPTH: 36 36 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.5 kn
Sorted : 14 Total catch: 14.14 Catch/hour: 28.99

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	7.30	875	25.18	
Pampus argenteus	4.22	8	14.57	
Loligo sp.	2.42	199	8.35	
Pennahia anea	1.72	14	5.94	
Terapon theraps	1.68	10	5.80	
Scomberoides commersonianus	1.68	2	5.80	
Congresox talabonoides	1.48	2	5.09	
Lagocephalus wheeleri	1.27	27	4.38	
Cynoglossus lingua	1.07	45	3.68	
Sardinella gibbosa	0.94	23	3.25	219
Scomberoides tol	0.86	4	2.97	
Dussumieria acuta	0.82	16	2.83	218
Sepia sp.	0.78	35	2.69	
Pomadasys maculatus	0.66	12	2.26	
Polynemus sp.	0.53	2	1.84	
Upeneus sulphureus	0.53	10	1.84	
Atropus atropos	0.25	4	0.85	
Chrysochir aureus	0.20	4	0.71	
HARPISQUILLIDAE	0.16	25	0.57	
Lophiomus setigerus	0.12	2	0.42	
CALLIONYMIDAE	0.08	14	0.28	
Selaroides leptolepis	0.08	2	0.28	
Coilia dussumieri	0.04	10	0.14	
Uranoscopus affinis	0.04	2	0.14	
MURAENIDAE	0.02	2	0.07	
Trixiphichthys weberi	0.02	2	0.07	
Plastic bags	0.00	2	0.00	
Fishing gears	0.00	2	0.00	
Total	28.99		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 94
DATE :30/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°10.58
start stop duration Lon E 96°36.78
TIME :10:05:49 10:36:13 30.4 (min) Purpose : 3
LOG : 2029.54 2031.09 1.6 Region : 10320
FDEPTH: 29 28 Gear cond.: 0
BDEPTH: 29 28 Validity : 0
Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
Sorted : 34 Total catch: 47.66 Catch/hour: 94.07

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Otholithoides pama	27.91	111	29.67	221
Osteogeneiosus militaris	10.86	28	11.54	225
Pennahia anea	9.47	257	10.07	227
Shrimps, small, non comm.	8.68	4934	9.23	
Lepturacanthus savala	8.09	223	8.60	
Congresox talabon	5.80	16	6.17	224
Chrysochir aureus	4.11	22	4.36	222
Metapenaeus monoceros	3.55	691	3.78	
Kurtus indicus	3.55	1816	3.78	
Coilia dussumieri	2.01	334	2.14	223
SQUILLIDAE	1.97	395	2.10	
Cynoglossus lingua	1.97	6	2.10	
Scomberoides commersonianus	1.62	6	1.72	228
Leptomelanosoma indicum	1.18	6	1.26	220
Sepia sp.	0.99	79	1.05	
Sardinella gibbosa	0.99	20	1.05	
Rhinobatos formosensis	0.43	2	0.46	
Scomberomorus guttatus	0.36	2	0.38	226
Terapon jarbua	0.28	4	0.29	
Atropus atropos	0.24	4	0.25	
Loligo sp.	0.00	20	0.00	
HARPISQUILLIDAE	0.00	2	0.00	
Total	94.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 95
DATE :04/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 15°6.33
start stop duration Lon E 96°58.65
TIME :00:10:45 00:40:28 29.7 (min) Purpose : 3
LOG : 2295.84 2298.36 2.5 Region : 10320
FDEPTH: 27 28 Gear cond.: 0
BDEPTH: 27 28 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 5.1 kn
Sorted : 20 Total catch: 43.12 Catch/hour: 87.05

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Otholithoides pama	18.13	59	20.83	230
Coilia dussumieri	12.27	2701	14.10	
Leptomelanosoma indicum	11.47	44	13.17	232
Congresox talabon	9.00	16	10.34	231
Metapenaeus tenuipes	5.25	1211	6.03	
Arius venosus	5.21	6	5.98	
Harpadon nehereus	5.17	9044	5.94	
Osteogeneiosus militaris	3.71	18	4.27	234
Lepturacanthus savala	3.03	42	3.48	
Solenocera choprai	2.50	426	2.88	
C R A B S	2.42	234	2.78	
Thryssa mystax	2.42	222	2.78	
Pennahia anea	1.94	6	2.23	229
Johnius sp.	1.62	81	1.86	
Sepia sp.	1.45	141	1.67	
Polynemus paradiseus	1.05	20	1.21	233
Loligo sp.	0.24	85	0.28	
Kurtus indicus	0.16	28	0.19	
Total	87.05		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 96
DATE :04/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°44.22
start stop duration Lon E 96°55.06
TIME :03:09:50 03:39:28 29.6 (min) Purpose : 3
LOG : 2333.45 2335.55 2.1 Region : 10320
FDEPTH: 58 52 Gear cond.: 0
BDEPTH: 58 52 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 4.3 kn
Sorted : 32 Total catch: 32.32 Catch/hour: 65.43

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Polydactylus sextarius	12.71	0	19.43	
Sepia sp.	4.53	0	6.93	
Loligo sp.	4.05	0	6.19	
Pampus argenteus	3.64	6	5.57	
Parastromateus niger	3.56	4	5.45	
Lagocephalus wheeleri	3.32	47	5.07	
Osteogeneiosus militaris	3.32	20	5.07	
Pennahia anea	3.00	61	4.58	
Arius venosus	2.67	4	4.08	
Chrysochir aureus	2.43	2	3.71	
Johnius coitor	2.31	132	3.53	
Scomberoides commersonianus	2.02	4	3.09	
Nemipterus japonicus	1.90	16	2.91	235
Upeneus sulphureus	1.82	32	2.78	236
SQUILLIDAE	1.78	0	2.72	
Lepturacanthus savala	1.74	32	2.66	
Congresox talabon	1.62	2	2.48	
Megalaspis cordyla	1.21	10	1.86	
Parapenaeopsis sculptilis	1.13	67	1.73	
Solenocera choprai	0.89	24	1.36	
Cynoglossus lingua	0.77	36	1.18	
Dussumieria acuta	0.73	10	1.11	
Rastrelliger brachysoma	0.65	4	0.99	
Apogon sp.	0.57	0	0.87	
Harpadon nehereus	0.53	2	0.80	
Charybdis feriata	0.45	2	0.68	
BOTHIDAE	0.45	40	0.68	
Portunus sp.	0.32	32	0.50	
Penaeus monodon	0.28	2	0.43	
Alectis indica	0.24	2	0.37	
Uranoscopus affinis	0.20	8	0.31	
Pomadasys maculatus	0.20	4	0.31	
Portunus sanguinolentus	0.16	2	0.25	
Ephippus orbis	0.12	4	0.19	
SCORPAENIDAE	0.04	2	0.06	
Lutjanus erythropterus	0.04	2	0.06	
Liagore sp	0.00	2	0.00	
Apogon pink fins mid-tail back	0.00	6	0.00	
Total	65.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 97
DATE :04/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°24.51
start stop duration Lon E 96°52.96
TIME :06:52:47 07:10:32 17.8 (min) Purpose : 3
LOG : 2363.18 2364.22 1.0 Region : 10320
FDEPTH: 70 81 Gear cond.: 0
BDEPTH: 70 81 Validity : 0
Towing dir: 0° Wire out : 210 m Speed : 3.5 kn
Sorted : 13 Total catch: 13.38 Catch/hour: 45.23

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	34.82	44	76.98	239
Selar crumenophthalmus	4.26	27	9.42	240
Loligo sp.	2.43	162	5.38	
Pentaprion longimanus	1.76	210	3.89	238
Octopus sp.	0.41	3	0.90	
Trachinocephalus myops	0.34	17	0.75	
C R A B S	0.27	37	0.60	
Seriolina nigrofasciata	0.20	3	0.45	
Stolephorus indicus	0.14	3	0.30	
Saurida undosquamis	0.14	10	0.30	241
Saurida undosquamis	0.14	10	0.30	0
Trypauchen microcephalus	0.10	3	0.22	
BOTHIDAE	0.10	3	0.22	
Sepia sp	0.07	14	0.15	
Alectis ciliaris	0.07	17	0.15	
Total	45.23		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 98
DATE :04/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°0.68
start stop duration Lon E 96°47.57
TIME :10:05:25 10:39:17 33.9 (min) Purpose : 3
LOG : 2390.61 2392.42 1.8 Region : 10320
FDEPTH: 97 89 Gear cond.: 0
BDEPTH: 97 89 Validity : 0
Towing dir: 0° Wire out : 260 m Speed : 3.2 kn
Sorted : 71 Total catch: 78.53 Catch/hour: 139.16

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Upeneus moluccensis	27.36	1474	19.66	243
Apogon pink fins mid-tail back	14.81	2102	10.65	
Selar crumenophthalmus	13.47	120	9.68	245
Nemipterus japonicus	12.47	177	8.96	242
Lepturacanthus savala	10.21	46	7.33	
Rachycentron canadum	9.96	2	7.16	
BOTHIDAE	9.21	921	6.62	
Saurida undosquamis	7.44	638	5.35	
Priacanthus macracanthus	5.90	50	4.24	244
Epinephelus heniochus	5.81	11	4.18	246
Halieutaea sp.	4.75	18	3.41	
Loligo sp.	2.76	152	1.99	
Lophiomus setigerus	1.84	7	1.32	
PORTUNIDAE	1.70	71	1.22	
Portunus sp.	1.56	32	1.12	
Narcine prodorsalis	1.49	32	1.07	
Sphyraena obtusata	1.42	14	1.02	
Panulirus polyphagus	1.17	2	0.84	
Aesopia cornuta	1.13	7	0.81	
Cynoglossus lingua	0.85	4	0.61	
Tylerius spinosissimus	0.64	117	0.46	
SCORPAENIDAE	0.57	28	0.41	0
Dactyloptena orientalis	0.43	7	0.31	
SCORPAENIDAE	0.43	25	0.31	
Parascolopsis tanyactis	0.43	11	0.31	
Neoniphon aurolineatus	0.35	7	0.25	
Cyclichthys orbicularis	0.28	4	0.20	
Leiognathus sp.	0.28	28	0.20	
Sepia sp.	0.14	7	0.10	
Callionymus sp.	0.14	18	0.10	
Metapenaeus sp.	0.14	46	0.10	
Polydactylus sextarius	0.00	0	0.00	
Total	139.16		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 99
DATE :04/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°46.64
start stop duration Lon E 96°48.20
TIME :12:38:47 13:11:10 32.4 (min) Purpose : 3
LOG : 2408.68 2410.63 1.9 Region : 10320
FDEPTH: 93 92 Gear cond.: 0
BDEPTH: 93 92 Validity : 2
Towing dir: 0° Wire out : 260 m Speed : 3.6 kn
Sorted : 35 Total catch: 80.60 Catch/hour: 149.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	50.18	7694	33.60	
Nemipterus japonicus	17.42	337	11.66	247
Cyclichthys orbicularis	9.19	111	6.15	
BOTHIDAE	8.97	626	6.00	
Sargocentron rubrum	7.63	37	5.11	
Upeneus bensasi	7.19	400	4.81	
Trachinocephalus myops	6.89	126	4.62	
Priacanthus macracanthus	5.63	33	3.77	248
Scolopsis bimaculata	3.71	59	2.48	
Uranoscopus affinis	3.63	19	2.43	
Abalistes stellatus	3.04	4	2.03	
Solenocera choprai	2.82	593	1.89	
Dactyloptena orientalis	2.67	67	1.79	
Lophiomus setigerus	2.67	7	1.79	
Selar crumenophthalmus	2.37	22	1.59	263
Sepia sp.	2.15	41	1.44	
Parascolopsis tanyactis	1.93	44	1.29	
TRIGLIDAE	1.63	52	1.09	
Psettodes erumei	1.48	2	0.99	
Halieutaea sp.	1.19	7	0.79	
Portunus sp.	1.04	170	0.69	
Samaris cristatus	0.96	30	0.65	
Triodon macropterus	0.82	2	0.55	
Parupeneus sp.	0.74	7	0.50	
Seriolina nigrofasciata	0.63	2	0.42	
Parapercis alboguttata	0.52	37	0.35	
OCTOPODIDAE	0.37	15	0.25	
Tetrosomus gibbosus	0.37	4	0.25	
Cynoglossus lingua	0.37	15	0.25	
Pterois russelii	0.37	2	0.25	
Fistularia petimba	0.22	15	0.15	
Loligo sp.	0.22	4	0.15	
Callionymus sp.	0.15	4	0.10	
Penaeus japonicus	0.11	2	0.07	
Charybdis feriata	0.07	4	0.05	
Sea snakes	0.00	2	0.00	
Ophidion sp.	0.00	2	0.00	
Matuta planipes	0.00	2	0.00	
Inimicus caledonicus	0.00	2	0.00	
Synodus sp.	0.00	2	0.00	
Total	149.35		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 100
DATE :04/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°19.57
start stop duration Lon E 97°13.89
TIME :21:31:10 21:55:05 23.9 (min) Purpose : 3
LOG : 2484.68 2486.22 1.6 Region : 10320
FDEPTH: 46 47 Gear cond.: 0
BDEPTH: 46 47 Validity : 2
Towing dir: 0° Wire out : 120 m Speed : 3.9 kn
Sorted : 34 Total catch: 33.87 Catch/hour: 84.96

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
BOTHIDAE	24.23	1648	28.52	
Trachinocephalus myops	8.68	301	10.22	
Nemipterus bipunctatus	7.53	43	8.86	250
Saurida elongata	7.22	158	8.50	249
S H A R K S	5.12	3	6.02	
Upeneus bensasi	4.82	125	5.67	251
SNAKE	4.31	8	5.08	
Upeneus sulphureus	4.16	75	4.90	252
Leiognathus sp.	3.26	391	3.84	
Loligo sp.	2.81	30	3.31	
Epinephelus coioides	2.26	5	2.66	
Sepia sp.	1.51	93	1.77	
Halieutaea sp.	1.10	8	1.30	
Pseudorhombus sp.	1.05	40	1.24	
Siganus canaliculatus	1.00	28	1.18	
C R A B S	1.00	98	1.18	
S H R I M P S	0.85	80	1.00	
Dactyloptena orientalis	0.80	15	0.94	
Lophiodes mutilus	0.80	3	0.94	
Bembrops curvatura	0.65	63	0.77	
Aesopia cornuta	0.55	15	0.65	
Apistus carinatus	0.45	8	0.53	
Inimicus caledonicus	0.33	5	0.38	
UNIDENTIFIED FISH	0.30	15	0.35	
Fistularia petimba	0.15	8	0.18	
Heteromycteris sp.	0.00	3	0.00	
Apistus carinatus	0.00	3	0.00	0
Teixeirichthys jordani	0.00	3	0.00	
Total	84.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 101
DATE :05/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°41.37
start stop duration Lon E 97°17.27
TIME :01:20:56 01:51:14 30.3 (min) Purpose : 3
LOG : 2512.97 2514.47 1.5 Region : 10320
FDEPTH: 56 56 Gear cond.: 0
BDEPTH: 56 56 Validity : 0
Towing dir: 0° Wire out : 160 m Speed : 3.0 kn
Sorted : 32 Total catch: 64.24 Catch/hour: 127.21

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Loligo sp.	95.21	3141	74.84	
Atropus atropos	14.97	218	11.77	
Saurida elongata	7.76	404	6.10	253
Sepia sp.	1.27	95	1.00	
Upeneus sulphureus	1.19	28	0.93	254
Grammoplites sp.	1.11	222	0.87	
Lepturacanthus savala	1.03	28	0.81	
Parastromateus niger	1.03	36	0.81	255
Upeneus bensasi	0.79	16	0.62	
Atule mate	0.71	12	0.56	
Pomadasys maculatus	0.63	4	0.50	
Leiognathus sp.	0.55	1663	0.44	
Lagocephalus wheeleri	0.48	12	0.37	
BOTHIDAE	0.24	44	0.19	
Apogon sp.	0.08	36	0.06	
Decapterus kurroides	0.08	8	0.06	
Teixeirichthys sp.	0.06	2	0.05	
Lutjanus malabaricus	0.01	2	0.01	
Trichonotus sp.	0.01	2	0.01	
Parapercis sp.	0.00	2	0.00	
Anacanthus barbatus	0.00	2	0.00	
Heteromycteris sp.	0.00	2	0.00	
Carybdis sp.	0.00	2	0.00	
CALLIONYMIDAE	0.00	2	0.00	
Epinephelus malabaricus, juvenile	0.00	2	0.00	
Total	127.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 102
DATE :05/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°53.83
start stop duration Lon E 97°16.31
TIME :03:46:10 04:17:14 31.1 (min) Purpose : 3
LOG : 2529.53 2530.82 1.3 Region : 10320
FDEPTH: 26 27 Gear cond.: 0
BDEPTH: 26 27 Validity : 0
Towing dir: 0° Wire out : 100 m Speed : 2.5 kn
Sorted : 17 Total catch: 77.91 Catch/hour: 150.45

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Coilia dussumieri	22.71	6813	15.09	
Congresox talabon	21.32	29	14.17	
Harpadon nehereus	18.23	2039	12.12	
Kurtus indicus	16.22	4704	10.78	
Lepturacanthus savala	15.45	463	10.27	
Otholithoides pama	11.43	77	7.60	
Metapenaeus dobsoni	10.66	3994	7.09	
Sepia sp	9.27	1483	6.16	
Pennahia anea	7.88	124	5.24	
C R A B S	5.41	1622	3.59	
SQUILLIDAE	2.78	332	1.85	
Chrysochir aureus	2.32	23	1.54	
Otolithoides biauritus	1.39	15	0.92	
Leptomelanosoma indicum	1.24	8	0.82	
Loligo sp.	1.08	46	0.72	
Metapenaeus sp.	0.93	185	0.62	
Thryssa mystax	0.93	131	0.62	
Polydactylus sextarius	0.62	162	0.41	
Takifugu oblongus	0.56	2	0.37	
Callionymus sp.	0.04	2	0.03	
Total	150.45		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 103
DATE :05/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 14°53.44
start stop duration Lon E 97°35.54
TIME :09:31:50 10:01:04 29.2 (min) Purpose : 3
LOG : 2580.59 2582.00 1.4 Region : 10320
FDEPTH: 31 29 Gear cond.: 0
BDEPTH: 31 29 Validity : 0
Towing dir: 0° Wire out : 115 m Speed : 2.9 kn
Sorted : 33 Total catch: 61.74 Catch/hour: 126.73

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Harpadon nehereus	42.86	3428	33.82	
Coilia dussumieri	32.02	8966	25.27	
Congresox talabon	8.58	14	6.77	256
Carybdis sp.	6.73	1888	5.31	
Otholithoides pama	6.08	78	4.79	258
Ashtoret lunaris	5.01	349	3.95	
Lepturacanthus savala	4.35	140	3.43	
Johnius sp.	3.78	222	2.98	
Cynoglossus sp.	3.04	107	2.40	
Sillaginopsis panijus	2.79	16	2.20	
Polynemus paradiseus	2.05	53	1.62	257
Scomberomorus guttatus	1.89	2	1.49	259
Parapenaeopsis sculptilis	1.56	246	1.23	
Chrysochir aureus	1.48	37	1.17	
Sepia sp.	1.31	131	1.04	
Plicofollis platystomus	1.15	12	0.91	
Metapenaeus sp.	1.07	312	0.84	
SQUILLIDAE	0.49	62	0.39	
TETRAODONTIDAE	0.41	12	0.32	
Terapon jarbua	0.08	16	0.06	
Total	126.73		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 104
DATE :06/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°24.29
start stop duration Lon E 97°26.52
TIME :01:39:58 02:10:02 30.1 (min) Purpose : 3
LOG : 2732.45 2734.12 1.7 Region : 10330
FDEPTH: 79 80 Gear cond.: 0
BDEPTH: 79 80 Validity : 0
Towing dir: 0° Wire out : 200 m Speed : 3.3 kn
Sorted : 41 Total catch: 40.92 Catch/hour: 81.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Aluterus monoceros	28.94	26	35.43	
Loligo sp.	19.08	1240	23.36	
Saurida undosquamis	10.70	687	13.10	260
J E L L Y F I S H	3.35	8	4.11	
Narcine prodorsalis	2.83	14	3.47	
Nemipterus japonicus	2.59	64	3.18	261
Ashtoret lunaris	2.16	194	2.64	
Rhinobatos formosensis	1.60	2	1.96	
Sea snakes	1.60	2	1.96	
BOTHIDAE	1.24	134	1.52	
Upeneus moluccensis	1.16	140	1.42	262
Upeneus bensasi	1.00	58	1.22	
Parupeneus heptacanthus	1.00	4	1.22	
Lophiomus setigerus	0.92	6	1.12	
Dactyloptena orientalis	0.88	10	1.08	
Pentaprion longimanus	0.72	58	0.88	
Inimicus caledonicus	0.52	4	0.64	
Sepia sp	0.40	10	0.49	
Selar crumenophthalmus	0.32	2	0.39	
Siganus canaliculatus	0.24	4	0.29	
Trachinocephalus myops	0.12	2	0.15	
Sunagocia arenicola	0.12	10	0.15	0
Fistularia petimba	0.08	2	0.10	
Parapercis alboguttata	0.08	4	0.10	
Leiognathus brevirostris	0.04	44	0.05	
Samaris cristatus	0.00	2	0.00	
Total	81.68		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 105
DATE :06/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°23.99
start stop duration Lon E 97°4.44
TIME :06:04:18 06:33:49 29.5 (min) Purpose : 3
LOG : 2760.68 2762.16 1.5 Region : 10330
FDEPTH: 96 90 Gear cond.: 0
BDEPTH: 96 90 Validity : 0
Towing dir: 0° Wire out : 230 m Speed : 3.0 kn
Sorted : 14 Total catch: 13.70 Catch/hour: 27.85

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
BOTHIDAE	5.73	297	20.58	
Trachinocephalus myops	5.04	140	18.10	264
Loligo sp.	4.27	285	15.33	
Sepia sp	2.68	12	9.64	
Dactyloptena orientalis	1.91	37	6.86	
Saurida undosquamis	1.79	83	6.42	265
Pterois russelii	1.06	8	3.80	
Rhinobatos formosensis	0.93	2	3.36	
Parupeneus heptacanthus	0.81	4	2.92	
Nemipterus japonicus	0.69	24	2.48	267
Cyclichthys orbicularis	0.69	6	2.48	
Halieutaea indica	0.57	4	2.04	
Priacanthus macracanthus	0.53	4	1.90	
Upeneus bensasi	0.45	49	1.61	266
Uranoscopus affinis	0.37	2	1.31	
Bembrops curvatura	0.33	33	1.17	
Nemipterus bipunctatus	0.00	2	0.00	
Engyprosopon sp.	0.00	2	0.00	
Total	27.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 106
DATE :06/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°24.05
start stop duration Lon E 96°43.29
TIME :09:10:16 09:34:36 24.2 (min) Purpose : 3
LOG : 2786.56 2787.95 1.4 Region : 10330
FDEPTH: 102 103 Gear cond.: 0
BDEPTH: 102 103 Validity : 0
Towing dir: 0° Wire out : 280 m Speed : 2.9 kn
Sorted : 26 Total catch: 52.10 Catch/hour: 129.17

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Decapterus macrosoma	75.37	4522	58.35	
Dactyloptena orientalis	14.18	258	10.98	
Parupeneus heptacanthus	8.23	64	6.37	
Abalistes stellatus	5.45	5	4.22	
Loligo sp.	5.36	1314	4.15	
Cyclichthys spilostylus	3.47	7	2.69	
Nemipterus bipunctatus	2.68	40	2.07	269
Trachinocephalus myops	2.38	69	1.84	271
Saurida undosquamis	2.18	25	1.69	268
Upeneus bensasi	2.18	109	1.69	270
Tetrosomus gibbosus	2.18	25	1.69	
BOTHIDAE	1.98	114	1.54	
Rachycentron canadum	1.44	2	1.11	
Halieutaea sp.	1.09	15	0.84	
Seriolina nigrofasciata	0.60	10	0.46	
Sepia sp	0.40	10	0.31	
Parapterois heterura	0.00	0	0.00	
Trixiphichthys weberi	0.00	2	0.00	
Total	129.17		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 107
DATE :06/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°5.14
start stop duration Lon E 96°31.38
TIME :18:23:49 18:53:47 30.0 (min) Purpose : 3
LOG : 2848.06 2849.50 1.4 Region : 10330
FDEPTH: 252 263 Gear cond.: 0
BDEPTH: 252 263 Validity : 2
Towing dir: 0° Wire out : 630 m Speed : 2.9 kn
Sorted : 31 Total catch: 55.64 Catch/hour: 111.43

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chlorophthalmus atlanticus	42.70	1540	38.32	
Aristeus virilis	18.50	6477	16.61	
Satyrichthys adeni	17.14	52	15.38	
Squalus megalops	12.10	112	10.86	
Puerulus sewelli	9.21	92	8.27	275
Chlorophthalmus sp.	2.32	112	2.08	
Lophiodes mutilus	1.76	8	1.58	
Myctophidae sp. silver	1.68	72	1.51	
Proscyllium magnificum	1.60	4	1.44	
TRIGLIDAE	1.28	44	1.15	
SCORPAENIDAE	1.04	52	0.93	
Raja sp.	0.72	4	0.65	
Psenopsis obscura	0.56	16	0.50	
Macrorhamphosodes uradoi	0.40	72	0.36	
Synagrops japonicus	0.16	24	0.14	
Neoepinnula orientalis	0.16	4	0.14	
Rexea bengalensis	0.08	8	0.07	
Ruvettus pretiosus	0.00	2	0.00	
Zenopsis nebulosa	0.00	2	0.00	
Total	111.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 108
DATE :06/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°5.29
start stop duration Lon E 96°41.95
TIME :20:59:04 21:28:38 29.6 (min) Purpose : 3
LOG : 2863.20 2864.84 1.6 Region : 10330
FDEPTH: 120 125 Gear cond.: 0
BDEPTH: 120 125 Validity : 2
Towing dir: 0° Wire out : 330 m Speed : 3.3 kn
Sorted : 34 Total catch: 33.74 Catch/hour: 68.46

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Epinephelus diacanthus	12.70	2	18.55	274
Neoniphon aurolineatus	7.59	12	11.08	
Rhinobatos formosensis	5.24	8	7.65	
Satyrichthys adeni	5.11	14	7.47	
Saurida undosquamis	4.55	69	6.64	272
Heteromycteris sp.	4.46	61	6.52	
Squalus megalops	3.12	4	4.56	
Cyclichthys spilostylus	3.12	6	4.56	
Parascolopsis tanyactis	3.04	45	4.45	
Priacanthus hamrur	2.80	12	4.09	
Plectorhinchus sp.	2.80	12	4.09	
Nemipterus japonicus	2.31	63	3.38	273
LABRIDAE	1.91	45	2.79	
Snyderina yamanokami	1.34	32	1.96	
Dactyloptena orientalis	0.93	12	1.36	
Fistularia petimba	0.89	4	1.30	
Bassanago albescens	0.85	18	1.24	
Pristipomoides multidens	0.85	2	1.24	
Parapercis alboguttata	0.85	28	1.24	
SCORPAENIDAE	0.57	18	0.83	
Monocentris japonica	0.57	6	0.83	
Synodus binotatus	0.49	12	0.71	
Roa jayakari	0.49	8	0.71	
Trachinocephalus myops	0.49	4	0.71	
Triglidae small black spots	0.45	10	0.65	
Octopus sp.	0.32	4	0.47	
Bleekeria sp.	0.20	12	0.30	
Total	68.06		99.41	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 109
DATE :07/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°5.69
start stop duration Lon E 97°1.92
TIME :01:34:34 02:05:55 31.4 (min) Purpose : 3
LOG : 2895.28 2896.87 1.6 Region : 10330
FDEPTH: 106 101 Gear cond.: 0
BDEPTH: 106 101 Validity : 0
Towing dir: 0° Wire out : 270 m Speed : 3.0 kn
Sorted : 16 Total catch: 16.44 Catch/hour: 31.46

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Upeneus bensasi	5.70	287	18.13	277
Saurida undosquamis	4.71	109	14.96	278
Satyrichthys adeni	3.06	8	9.73	
Nemipterus bipunctatus	2.72	27	8.64	
Loligo sp.	1.72	124	5.47	
Dactyloptena orientalis	1.45	19	4.62	
Nemipterus japonicus	1.38	27	4.38	276
Trachinocephalus myops	1.26	11	4.01	
Rhinobatos granulatus	1.22	4	3.89	
Parascolopsis tanyactis	1.19	19	3.77	
Snyderina yamanokami	1.00	17	3.16	
Seriolina nigrofasciata	0.92	2	2.92	
Decapterus tabl	0.69	21	2.19	
Rastrelliger kanagurta	0.69	6	2.19	
Pterois russelii	0.69	4	2.19	
TRIGLIDAE	0.61	19	1.95	
Priacanthus macracanthus	0.46	2	1.46	
Parupeneus heptacanthus	0.42	4	1.34	
Cyclichthys orbicularis	0.31	6	0.97	
Engyprosopon sp.	0.23	19	0.73	
Leiognathus brevirostris	0.19	17	0.61	
Psettodes erumei	0.19	2	0.61	
Callionymus sp.	0.11	8	0.36	
Selaroides leptolepis	0.11	6	0.36	
Upeneus moluccensis	0.08	2	0.24	
Bassanago albescens	0.08	4	0.24	
Uraspis uraspis	0.08	2	0.24	
Tylerius spinosissimus	0.08	2	0.24	
BOTHIDAE	0.08	6	0.24	
Sepiella sp.	0.04	2	0.12	
Serranidae	0.00	2	0.00	
Proscyllium habereri	0.00	2	0.00	
Total	31.46		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 110
DATE :07/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°3.71
start stop duration Lon E 97°25.61
TIME :04:34:59 05:05:22 30.4 (min) Purpose : 3
LOG : 2921.36 2922.93 1.6 Region : 10330
FDEPTH: 87 88 Gear cond.: 0
BDEPTH: 87 88 Validity : 0
Towing dir: 0° Wire out : 230 m Speed : 3.1 kn
Sorted : 21 Total catch: 21.12 Catch/hour: 41.73

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Saurida undosquamis	11.66	202	27.94	
Loligo sp.	9.29	464	22.25	
Nemipterus bipunctatus	7.86	146	18.84	
BOTHIDAE	2.61	184	6.25	
Sepia sp	2.57	10	6.16	
Satyrichthys adeni	1.19	2	2.84	
Halieutaea indica	0.87	4	2.08	
Narcine prodorsalis	0.87	2	2.08	
Dactyloptena orientalis	0.71	10	1.70	
Pterois russelii	0.71	8	1.70	
Rachycentron canadum	0.59	2	1.42	
Rhinobatos formosensis	0.55	2	1.33	
Trachinocephalus myops	0.51	8	1.23	
Priacanthus macracanthus	0.51	4	1.23	
Upeneus bensasi	0.47	24	1.14	
Selar crumenophthalmus	0.43	4	1.04	
Seriolina nigrofasciata	0.32	4	0.76	
Plastic bags	0.00	2	0.00	
Total	41.73		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 111
DATE :07/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 13°3.37
start stop duration Lon E 97°48.69
TIME :07:50:22 08:12:16 21.9 (min) Purpose : 3
LOG : 2948.40 2949.59 1.2 Region : 10330
FDEPTH: 67 67 Gear cond.: 0
BDEPTH: 67 67 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.3 kn
Sorted : 22 Total catch: 125.26 Catch/hour: 343.18

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Priacanthus tayenus	266.30	51704	77.60	279
Lepturacanthus savala	23.01	82	6.71	
Chirocentrus dorab	15.12	49	4.41	
Saurida undosquamis	10.52	477	3.07	280
Nemipterus bipunctatus	8.22	16	2.40	
Selar crumenophthalmus	6.25	33	1.82	
Saurida elongata	5.92	16	1.72	282
Scomberomorus guttatus	2.25	3	0.65	281
Abalistes stellatus	1.97	16	0.57	
Siganus canaliculatus	1.32	16	0.38	
Upeneus bensasi	1.32	49	0.38	
Megalaspis cordyla	1.32	82	0.38	
Decapterus kurroides	0.66	49	0.19	
Loligo sp.	0.00	3	0.00	
Total	344.16		100.29	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 112
DATE :08/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°43.83
start stop duration Lon E 98°12.93
TIME :03:20:52 03:47:01 26.1 (min) Purpose : 3
LOG : 3010.89 3012.55 1.7 Region : 10330
FDEPTH: 33 36 Gear cond.: 0
BDEPTH: 33 36 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.8 kn
Sorted : 40 Total catch: 40.25 Catch/hour: 92.35

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Secutor insidiator	24.05	19716	26.04	
Loligo sp.	23.82	404	25.79	
Saurida undosquamis	20.42	535	22.11	283
Stolephorus indicus	6.06	909	6.56	
Ichthyscopus lebeck	3.53	2	3.83	
Decapterus tabl	3.03	289	3.28	284
Rastrelliger brachysoma	2.94	96	3.18	
Parapenaeopsis sp.	1.74	303	1.89	
Lepturacanthus savala	1.70	48	1.84	
Sphyraena putnamie	1.56	34	1.69	
Atule mate	0.69	7	0.75	
Alectis indica	0.60	5	0.65	
Uranoscopus affinis	0.60	7	0.65	
Trachinocephalus myops	0.32	34	0.35	
Carangoides sp.	0.32	5	0.35	
Portunus sp.	0.23	30	0.25	
Pomadasys maculatus	0.18	2	0.20	
Selaroides leptolepis	0.14	2	0.15	
Lagocephalus wheeleri	0.14	2	0.15	
Sardinella gibbosa	0.14	16	0.15	
Ilisha elongata	0.09	2	0.10	
Bleekeria sp.	0.05	9	0.05	
Trichonotus sp.	0.02	5	0.02	
Callionymus meridionalis	0.00	2	0.00	
Ulua mentalis	0.00	2	0.00	
Total	92.35		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 113
DATE :08/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°44.47
start stop duration Lon E 97°59.14
TIME :06:04:06 06:18:09 14.1 (min) Purpose : 3
LOG : 3031.59 3032.34 0.8 Region : 10330
FDEPTH: 55 55 Gear cond.: 0
BDEPTH: 55 55 Validity : 0
Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
Sorted : 9 Total catch: 8.94 Catch/hour: 38.18

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Loligo sp.	12.47	307	32.66	
Saurida elongata	8.71	547	22.82	287
Lepturacanthus savala	4.70	132	12.30	285
Rastrelliger kanagurta	3.16	77	8.28	286
Scomberomorus commerson	2.05	4	5.37	
Decapterus tabl	1.88	179	4.92	
Epinephelus sexfasciatus	1.28	4	3.36	
Rastrelliger brachysoma	0.94	13	2.46	
Saurida undosquamis	0.85	38	2.24	288
Ulua mentalis	0.85	9	2.24	
Nemipterus japonicus	0.68	9	1.79	
BOTHIDAE	0.34	34	0.89	
Apogon sp.	0.26	9	0.67	
Total	38.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 114
DATE :08/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°45.11
start stop duration Lon E 97°37.03
TIME :08:59:29 09:31:31 32.0 (min) Purpose : 3
LOG : 3057.14 3058.85 1.7 Region : 10330
FDEPTH: 73 74 Gear cond.: 0
BDEPTH: 73 74 Validity : 0
Towing dir: 0° Wire out : 180 m Speed : 3.2 kn
Sorted : 16 Total catch: 16.30 Catch/hour: 30.54

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Nemipterus bipunctatus	12.63	82	41.34	289
Loligo sp.	4.53	208	14.84	
Saurida undosquamis	2.51	86	8.22	291
Decapterus tabl	2.25	101	7.36	
Trachinocephalus myops	1.80	62	5.89	292
Saurida elongata	1.24	9	4.05	290
Sepia sp	1.09	4	3.56	
Lepturacanthus savala	0.90	13	2.94	
BOTHIDAE	0.75	51	2.45	
Priacanthus macracanthus	0.60	2	1.96	
Siganus canaliculatus	0.49	6	1.59	
Dactyloptena orientalis	0.49	6	1.59	
Upeneus bensasi	0.34	32	1.10	293
Grammoplites sp.	0.30	22	0.98	
Fistularia petimba	0.26	9	0.86	
Parupeneus heptacanthus	0.17	2	0.55	
Halieutaea indica	0.13	2	0.43	
Uraspis uraspis	0.08	2	0.27	
Calappa lophos	0.00	2	0.00	
Total	30.54		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 115
DATE :08/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°43.10
start stop duration Lon E 97°16.09
TIME :11:48:54 12:18:18 29.4 (min) Purpose : 3
LOG : 3080.54 3082.05 1.5 Region : 10330
FDEPTH: 88 88 Gear cond.: 0
BDEPTH: 88 88 Validity : 2
Towing dir: 0° Wire out : 260 m Speed : 3.1 kn
Sorted : 39 Total catch: 39.26 Catch/hour: 80.12

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Parupeneus heptacanthus	20.29	133	25.32	295
Nemipterus bipunctatus	6.82	51	8.51	294
Abalistes stellatus	6.49	8	8.10	
Saurida undosquamis	6.20	94	7.74	
Trachinocephalus myops	5.76	63	7.18	297
Lutjanus lutjanus	5.63	80	7.03	
Sargocentron rubrum	4.73	27	5.91	
Upeneus bensasi	3.51	151	4.38	296
Decapterus kurroides	2.29	86	2.85	
Hemiscyllium sp.	2.08	2	2.60	
Priacanthus hamrur	1.88	8	2.34	
Solenocera sp.	1.88	600	2.34	
Leiognathus brevirostris	1.47	171	1.83	
Cyclichthys orbicularis	1.35	12	1.68	
Dipterygonotus balteatus	1.31	182	1.63	
Tetrosomus gibbosus	1.27	6	1.58	
Rhinobatos formosensis	1.18	2	1.48	
Seriolina nigrofasciata	0.86	2	1.07	
Psettodes erumei	0.82	2	1.02	
Upeneus moluccensis	0.78	12	0.97	
Neotrygon kuhlii	0.73	2	0.92	
Dactyloptena orientalis	0.61	8	0.76	
Decapterus tabl	0.45	2	0.56	
Parapercis alboguttata	0.41	6	0.51	
Pterois russelii	0.33	2	0.41	
Grammoplites sp.	0.29	8	0.36	
Halieutaea sp.	0.24	2	0.31	
Selar crumenophthalmus	0.20	2	0.25	
Lutjanus quinquelineatus	0.20	2	0.25	
Sea snakes	0.08	2	0.10	
Hemiscyllium sp.	0.00	2	0.00	0
Epinephelus areolatus	0.00	2	0.00	
Total	80.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 116
DATE :08/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°43.08
start stop duration Lon E 96°56.08
TIME :14:57:26 15:30:28 33.0 (min) Purpose : 3
LOG : 3105.51 3107.43 1.9 Region : 10330
FDEPTH: 111 106 Gear cond.: 0
BDEPTH: 111 106 Validity : 0
Towing dir: 0° Wire out : 300 m Speed : 3.5 kn
Sorted : 32 Total catch: 57.44 Catch/hour: 104.37

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	25.73	698	24.65	299
Trachinocephalus myops	18.17	291	17.41	298
Engyprosopon sp.	15.34	491	14.69	
TRIAKIDAE	11.45	2	10.97	
Tetrosomus gibbosus	8.00	84	7.66	
Parapterois heterura	6.76	134	6.48	
Pseudorhombus dupliciocellatus	3.78	73	3.62	
Dactyloptena orientalis	3.13	55	2.99	
Cyclichthys orbicularis	2.54	7	2.44	
Upeneus bensasi	1.89	44	1.81	
Cynoglossus sp.	1.82	51	1.74	
Satyrichthys adeni	1.53	4	1.46	
Lophiomus setigerus	0.94	4	0.91	
TETRAODONTIDAE	0.73	22	0.70	
Solenocera sp.	0.65	320	0.63	
Halieutaea sp.	0.58	15	0.56	
Raja sp.	0.44	4	0.42	
yellow black spotted back pectoral	0.29	18	0.28	
Bleekeria sp.	0.22	29	0.21	
Aesopia cornuta	0.22	4	0.21	
TRIGLIDAE	0.15	4	0.14	
Ibacus novemdentatus	0.04	2	0.03	
Total	104.37		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 117
DATE :08/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°44.45
start stop duration Lon E 96°44.62
TIME :17:52:58 18:22:11 29.2 (min) Purpose : 3
LOG : 3124.61 3126.13 1.5 Region : 10330
FDEPTH: 307 312 Gear cond.: 0
BDEPTH: 307 312 Validity : 2
Towing dir: 0° Wire out : 700 m Speed : 3.1 kn
Sorted : 20 Total catch: 40.35 Catch/hour: 82.85

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Apristurus sp.	13.63	234	16.46	
Chlorophthalmus atlanticus	11.83	230	14.28	
Eridacnis radcliffei	8.79	296	10.61	
Macrorhamphosodes uradoi	7.72	4090	9.32	
Puerulus sewelli	7.15	99	8.63	301
Caelorinchus trunovi	6.49	246	7.83	
Squalus megalops	4.02	45	4.86	
Aristeus virilis	3.37	148	4.06	303
Chascanopsetta lugubris	2.96	57	3.57	
Satyrichthys adeni	2.63	12	3.17	
Tydemania navigatoris	2.30	283	2.78	
Bathyteuthis sp.	1.97	62	2.38	
Heterocarpus tricarinatus	1.23	84	1.49	302
Myctophidae sp. silver	1.07	140	1.29	
Raja sp.	1.07	4	1.29	
SCORPAENIDAE	0.90	45	1.09	
Lestrolepis intermedia	0.82	123	0.99	
Erythrocles schlegelii	0.71	2	0.86	300
Lophiodes mutilus	0.66	8	0.79	
Cynoglossus lingua	0.57	12	0.69	
Priacanthus macracanthus	0.49	4	0.59	
Antigonia sp.	0.49	21	0.59	
Dactyloptena orientalis	0.49	8	0.59	
Synagrops japonicus	0.41	53	0.50	
Macrorhamphosodes sp.	0.33	33	0.40	
Macrorhamphosodes alcocki	0.33	33	0.40	
Engyprosopon sp.	0.25	8	0.30	
TRIGLIDAE	0.25	8	0.30	
Polyipnus indicus	0.16	115	0.20	
Grammoplites sp.	0.08	4	0.10	
Total	83.18		100.40	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 118
DATE :09/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°23.96
start stop duration Lon E 96°38.29
TIME :03:24:18 03:54:33 30.3 (min) Purpose : 3
LOG : 3186.14 3187.74 1.6 Region : 10330
FDEPTH: 513 514 Gear cond.: 0
BDEPTH: 513 514 Validity : 0
Towing dir: 0° Wire out : 1300 m Speed : 3.2 kn
Sorted : 25 Total catch: 60.53 Catch/hour: 120.05

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Centrophorus granulosus	47.60	8	39.65	
Aristeus virilis	16.03	1139	13.35	304
Alepocephalus sp.	15.00	175	12.49	
Stemonidium sp.	11.46	91	9.55	
Coelorinchus sp.	9.76	139	8.13	
OPHIDIIDAE	4.13	234	3.44	
Nephropsis sp.	3.09	202	2.58	
Malacocephalus laevis	1.98	8	1.65	
Malacocephalus laevis	1.94	8	1.62	0
Heterocarpus tricarinatus	1.90	95	1.59	305
Ariomma sp.	1.59	40	1.32	
Aristaeomorpha foliacea	1.35	91	1.12	
Neoscopelus sp.	1.11	24	0.93	
PARALEPIDIDAE	0.95	123	0.79	
Coelorinchus sp.	0.63	8	0.53	0
Coloconger sp.	0.40	8	0.33	
Metanephropsis arafurensis	0.36	8	0.30	
Neoepinnula orientalis	0.32	8	0.26	
Black paralepidae	0.16	16	0.13	
Bathypterois phenax	0.11	12	0.09	
Satyrichthys sp.	0.09	4	0.08	
S H R I M P S	0.09	12	0.07	
CRANCHIIDAE	0.00	4	0.00	
NETTASTOMATIDAE	0.00	2	0.00	
Pasiphaea sp.	0.00	2	0.00	
Total	120.05		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 119
DATE :09/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°21.37
start stop duration Lon E 96°51.51
TIME :06:11:48 06:40:57 29.1 (min) Purpose : 3
LOG : 3205.38 3206.88 1.5 Region : 10330
FDEPTH: 257 266 Gear cond.: 0
BDEPTH: 257 266 Validity : 0
Towing dir: 0° Wire out : 620 m Speed : 3.1 kn
Sorted : 22 Total catch: 199.40 Catch/hour: 410.43

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
ARISTEIDAE	158.08	39520	38.52	
Chlorophthalmus atlanticus	79.04	3326	19.26	
Plesiobatis daviesi	50.14	4	12.22	
Puerulus sewelli	25.36	362	6.18	
Bathyteuthis sp.	21.08	66	5.14	
Ateleopus sp.	17.29	165	4.21	
Cubiceps sp.	16.80	543	4.09	
Satyrichthys adeni	10.21	16	2.49	
Apogon sp.	5.93	807	1.44	
Caelorinchus braueri	4.94	165	1.20	
Psenopsis obscura	4.28	82	1.04	
Apristurus saldanha	3.95	66	0.96	
Neoepinnula orientalis	3.62	165	0.88	
Macrorhamphosodes uradoi	1.98	181	0.48	
Cynoglossus sp.	1.98	33	0.48	
Rexea bengalensis	1.98	148	0.48	
Aristeus virilis	1.32	66	0.32	
Heterocarpus tricarinatus	1.32	66	0.32	
Owstonia weberi	0.99	4	0.24	
Lestrolepis intermedia	0.16	16	0.04	
Plesionika cf sp	0.00	4	0.00	
Herterocarpus cf woodmansoni	0.00	4	0.00	
Total	410.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 120
DATE :09/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°22.59
start stop duration Lon E 97°2.79
TIME :09:08:06 09:38:43 30.6 (min) Purpose : 3
LOG : 3222.38 3224.09 1.7 Region : 10330
FDEPTH: 157 167 Gear cond.: 0
BDEPTH: 157 167 Validity : 0
Towing dir: 0° Wire out : 400 m Speed : 3.4 kn
Sorted : 22 Total catch: 21.85 Catch/hour: 42.82

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Synagrops japonicus	19.44	5831	45.40	
Saurida undosquamis	7.45	143	17.39	306
Satyrichthys adeni	4.94	27	11.53	
Portunus sp.	2.70	112	6.32	
Pseudorhombus dupliciocellatus	1.80	31	4.21	
Bathyteuthis sp.	1.61	25	3.75	
Priacanthus macracanthus	1.45	18	3.39	
Lophiodes mutilus	1.25	6	2.93	
Squalus megalops	0.86	2	2.01	
Nemipterus japonicus	0.63	6	1.46	
Parascolopsis tanyactis	0.24	2	0.55	
Sargocentron rubrum	0.18	6	0.41	
Ibacus novemdentatus	0.16	2	0.37	
Grammoplites scaber	0.12	2	0.27	
Total	42.82		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 121
DATE :09/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°22.32
start stop duration Lon E 97°15.35
TIME :12:59:30 13:32:11 32.7 (min) Purpose : 3
LOG : 3243.18 3244.96 1.8 Region : 10330
FDEPTH: 97 100 Gear cond.: 0
BDEPTH: 97 100 Validity : 0
Towing dir: 0° Wire out : 260 m Speed : 3.3 kn
Sorted : 25 Total catch: 50.56 Catch/hour: 92.83

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dactyloptena orientalis	41.49	995	44.70	
Trachinocephalus myops	14.25	250	15.35	307
Sargocentron rubrum	10.21	59	11.00	
Engyprosopon sp.	7.20	202	7.75	
Satyrichthys adeni	3.30	4	3.56	
Bleekeria sp. 'long jaw'	3.08	338	3.32	
Nemipterus japonicus	2.57	11	2.77	
Tetrosomus gibbosus	2.57	26	2.77	
Diodon hystrix	2.06	11	2.22	
Seriolina nigrofasciata	1.76	7	1.90	
Saurida undosquamis	1.18	29	1.27	
Parupeneus heptacanthus	0.88	7	0.95	
Upeneus bensasi	0.66	33	0.71	
Parapterois heterura	0.59	7	0.63	
Lophiomus setigerus	0.51	4	0.55	
TETRAODONTIDAE	0.29	7	0.32	
CALLIONYMIDAE	0.15	7	0.16	
Leiognathus brevirostris	0.07	4	0.08	
Total	92.83		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 122
DATE :09/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°1.21
start stop duration Lon E 97°28.49
TIME :23:03:43 23:15:10 11.4 (min) Purpose : 3
LOG : 3327.62 3328.20 0.6 Region : 10330
FDEPTH: 82 84 Gear cond.: 0
BDEPTH: 82 84 Validity : 2
Towing dir: 0° Wire out : 230 m Speed : 3.0 kn
Sorted : 17 Total catch: 16.50 Catch/hour: 86.46

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Engyprosopon sp.	24.94	1247	28.85	
Trachinocephalus myops	9.75	199	11.27	310
Echeneis naucrates	8.49	10	9.82	
Saurida undosquamis	7.76	131	8.97	308
Nemipterus bipunctatus	7.65	47	8.85	309
Dactyloptena orientalis	6.81	178	7.88	
Sargocentron rubrum	6.08	37	7.03	
Upeneus bensasi	2.62	89	3.03	
Narcine prodorsalis	2.62	5	3.03	
Lophiomus setigerus	1.99	10	2.30	
Decapterus kurroides	1.99	47	2.30	
Priacanthus macracanthus	1.89	16	2.18	
Loligo sp.	1.05	21	1.21	
Grammoplites sp.	0.94	84	1.09	
Aluterus monoceros	0.52	10	0.61	
Sepia sp.	0.31	5	0.36	
Seriolina nigrofasciata	0.31	5	0.36	
Aesopia cornuta	0.21	5	0.24	
CALLIONYMIDAE	0.21	5	0.24	
Halieutaea sp.	0.21	16	0.24	
Trixiphichthys weberi	0.10	5	0.12	
Total	86.46		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 123
DATE :10/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°4.66
start stop duration Lon E 97°17.85
TIME :01:37:06 02:07:42 30.6 (min) Purpose : 3
LOG : 3344.72 3346.36 1.6 Region : 10330
FDEPTH: 91 92 Gear cond.: 0
BDEPTH: 91 92 Validity : 0
Towing dir: 0° Wire out : 240 m Speed : 3.2 kn
Sorted : 8 Total catch: 7.62 Catch/hour: 14.95

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Nemipterus bipunctatus	3.73	59	24.93	311
Echeneis naucrates	3.37	4	22.57	
Parapterois heterura	2.75	37	18.37	
Saurida undosquamis	1.88	18	12.60	
XXXXXXX	1.26	33	8.40	0
Upeneus bensasi	0.51	16	3.41	
Priacanthus macracanthus	0.43	4	2.89	
Cyclichthys orbicularis	0.24	4	1.57	
Trachinocephalus myops	0.20	4	1.31	
Decapterus kurroides	0.20	4	1.31	
Uraspis secunda	0.12	2	0.79	
Dactyloptena orientalis	0.08	2	0.52	
Fistularia petimba	0.08	4	0.52	
Lagocephalus wheeleri	0.08	2	0.52	
Halieutaea sp.	0.04	2	0.26	
Total	14.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 124
DATE :10/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°2.48
start stop duration Lon E 97°8.81
TIME :03:55:40 04:25:09 29.5 (min) Purpose : 3
LOG : 3362.18 3363.79 1.6 Region : 10330
FDEPTH: 132 131 Gear cond.: 0
BDEPTH: 132 131 Validity : 0
Towing dir: 0° Wire out : 350 m Speed : 3.3 kn
Sorted : 7 Total catch: 7.05 Catch/hour: 14.35

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Saurida undosquamis	7.82	155	54.47	312
Nemipterus japonicus	2.16	20	15.04	
Rachycentron canadum	2.12	2	14.75	
Bleekeria sp.	0.57	53	3.97	
Parupeneus heptacanthus	0.41	2	2.84	
OMMASTREPHIDAE	0.31	4	2.13	
Pseudorhombus dupliciocellatus	0.28	6	1.99	
Ibacus novemdentatus	0.20	2	1.42	
Uraspis uraspis	0.16	2	1.13	
Engyprosopon sp.	0.12	2	0.85	
OCTOPODIDAE	0.08	2	0.57	
Upeneus bensasi	0.08	2	0.57	
BOTHIDAE	0.04	2	0.28	
Total	14.35		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 125
DATE :10/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°3.03
start stop duration Lon E 96°57.71
TIME :06:31:26 07:00:45 29.3 (min) Purpose : 3
LOG : 3380.28 3381.72 1.4 Region : 10330
FDEPTH: 263 260 Gear cond.: 0
BDEPTH: 263 260 Validity : 0
Towing dir: 0° Wire out : 620 m Speed : 3.0 kn
Sorted : 37 Total catch: 173.06 Catch/hour: 354.27

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Aristeus virilis	90.89	19529	25.66	
Satyrichthys adeni	68.78	111	19.42	
Synagrops japonicus	46.67	13069	13.17	0
Priacanthus macracanthus	40.04	626	11.30	
Plesiobatis daviesi	17.65	2	4.98	
Synagrops japonicus	17.44	2788	4.92	
Chlorophthalmus sp.	16.46	368	4.65	
Puerulus sewelli	11.05	135	3.12	
SCORPAENIDAE	9.83	1842	2.77	
Psenopsis obscura	8.60	197	2.43	
Caelorinchus trunovi	7.62	233	2.15	
Neoepinnula orientalis	6.39	209	1.80	
Rexea bengalensis	4.42	393	1.25	
HISTIOTEUTHIDAE	3.19	74	0.90	
Cubiceps whiteleggii	1.97	197	0.55	
Squalus megalops	1.80	4	0.51	
Macrorhamphosodes alcocki	1.47	61	0.42	
Plectrogenium nanum	0.00	2	0.00	0
Plectrogenium nanum	0.00	2	0.00	
Lobianchia gemellarii	0.00	2	0.00	
Benthosema fibulatum	0.00	2	0.00	
SQUILLIDAE	0.00	2	0.00	
C R A B S	0.00	6	0.00	
Ateleopus sp.	0.00	4	0.00	
Total	354.27		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 126
DATE :10/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 12°2.88
start stop duration Lon E 96°43.19
TIME :09:26:06 09:56:13 30.1 (min) Purpose : 3
LOG : 3400.18 3401.80 1.6 Region : 10330
FDEPTH: 361 362 Gear cond.: 0
BDEPTH: 361 362 Validity : 0
Towing dir: 0° Wire out : 820 m Speed : 3.2 kn
Sorted : 29 Total catch: 112.94 Catch/hour: 224.98

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Cubiceps whiteleggii	55.62	1251	24.72	313
Solenocera choprai	47.97	8163	21.32	
Synagrops japonicus	18.80	741	8.36	
Neoepinnula orientalis	16.10	303	7.15	314
Priacanthus macracanthus	12.27	151	5.45	
Aristeus virilis	11.79	781	5.24	
HISTIOTEUTHIDAE	11.47	40	5.10	
Myctophum fissunovi	8.45	2279	3.75	
Heterocarpus tricarinatus	6.53	414	2.90	
Myctiphid 'fully scaled'	5.42	1355	2.41	
SCORPAENIDAE	4.30	669	1.91	
Neoscopelus sp.	4.30	191	1.91	
S H R I M P S	3.82	430	1.70	
Metanephropsis arafurensis	3.51	159	1.56	
Squalus megalops	3.35	24	1.49	
Satyrichthys investigatoris	3.03	16	1.35	
Satyrichthys adeni	2.39	8	1.06	
Linuparus trigonus	2.23	2	0.99	
Bembrops platyrhynchus	2.07	4	0.92	
Xenocephalus australis	0.92	2	0.41	
Lestrolepis intermedia	0.64	40	0.28	
Ostracoberyx dorygenys	0.00	2	0.00	
S H R I M P S	0.00	2	0.00	0
Ophidion sp.	0.00	2	0.00	
Stereomastis sp.	0.00	2	0.00	
Plesionika cf sp	0.00	4	0.00	
Cyttopsis rosea	0.00	2	0.00	
Bathyclupea sp.	0.00	2	0.00	
Polyipnus indicus	0.00	6	0.00	
Polymixia berndti	0.00	2	0.00	
Total	224.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 127
DATE :10/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°44.13
start stop duration Lon E 96°46.87
TIME :14:06:12 14:36:56 30.7 (min) Purpose : 3
LOG : 3438.99 3440.59 1.6 Region : 10330
FDEPTH: 318 319 Gear cond.: 0
BDEPTH: 318 319 Validity : 0
Towing dir: 0° Wire out : 800 m Speed : 3.1 kn
Sorted : 70 Total catch: 94.18 Catch/hour: 183.89

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Plesiobatis daviesi	87.86	6	47.78	
Chlorophthalmus sp.	27.73	465	15.08	
Puerulus sewelli	20.23	266	11.00	315
Ommastrephes sp.	10.23	305	5.56	
Ancistrocheirus sp.	6.79	8	3.70	
Psenopsis obscura	6.64	113	3.61	
Heterocarpus woodmasoni	5.47	1312	2.97	
Neoscopelus macrolepidotus	3.44	312	1.87	
Caelorinchus trunovi	2.81	90	1.53	
Ophidion sp.	1.64	16	0.89	
Chascanopsetta lugubris	1.52	20	0.83	
Satyrichthys adeni	1.25	4	0.68	
Heterocarpus tricarinatus	1.25	117	0.68	
TRIAKIDAE	0.94	16	0.51	
Hymenocephalus sp.	0.78	35	0.42	
Holcomycteronus sp. *!*	0.70	4	0.38	
Ateleopus natalensis	0.70	8	0.38	
Proscyllium habereri	0.62	43	0.34	
Solenocera agassizii	0.55	31	0.30	
Raja sp.	0.55	4	0.30	
Cubiceps whiteleggii	0.47	12	0.25	
Satyrichthys investigatoris	0.39	4	0.21	
Rexea bengalensis	0.31	4	0.17	
SCORPAENIDAE	0.23	43	0.13	
Bassanago albescens	0.23	4	0.13	
Synagrops japonicus	0.16	20	0.08	
Lophiomus setigerus	0.16	4	0.08	
Neoepinnula orientalis	0.16	4	0.08	
TRIGLIDAE	0.08	4	0.04	
OPHIDIIDAE	0.00	2	0.00	
Coelorinchus sp.	0.00	8	0.00	
Total	183.89		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 128
DATE :10/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°41.65
start stop duration Lon E 97°14.93
TIME :19:08:52 19:33:34 24.7 (min) Purpose : 3
LOG : 3478.51 3479.84 1.3 Region : 10330
FDEPTH: 114 115 Gear cond.: 0
BDEPTH: 114 115 Validity : 2
Towing dir: 0° Wire out : 320 m Speed : 3.2 kn
Sorted : 6 Total catch: 6.22 Catch/hour: 15.11

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Snyderina yamanokami	6.66	104	44.05	
Dactyloptena orientalis	3.89	10	25.72	
Narcine prodorsalis	1.26	2	8.36	
Satyrichthys adeni	1.02	2	6.75	
Priacanthus macracanthus	0.97	7	6.43	
Plectorhinchus sp.	0.49	2	3.22	
Monocentris japonica	0.24	2	1.61	
Neoniphon aurolineatus	0.19	5	1.29	
Saurida undosquamis	0.15	5	0.96	
Parascolopsis rufomaculatus	0.10	7	0.64	
UNIDENTIFIED FISH	0.05	7	0.32	
LABRIDAE	0.05	2	0.32	
Centroberyx druzhini	0.05	7	0.32	
Total	15.11		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 129
DATE :10/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°41.75
start stop duration Lon E 97°36.96
TIME :22:52:31 23:07:29 15.0 (min) Purpose : 3
LOG : 3503.70 3504.53 0.8 Region : 10330
FDEPTH: 74 74 Gear cond.: 0
BDEPTH: 74 74 Validity : 0
Towing dir: 0° Wire out : 175 m Speed : 3.3 kn
Sorted : 16 Total catch: 15.94 Catch/hour: 63.93

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	22.22	1123	34.76	316
Congresox talabon	6.42	20	10.04	
Priacanthus sp.	4.73	44	7.40	
BOTHIDAE	3.13	405	4.89	
Nemipterus japonicus	3.13	124	4.89	317
Snyderina yamanokami	3.05	48	4.77	
Cyclichthys orbicularis	2.57	16	4.02	
Apogon sp.	2.41	164	3.76	
Dactyloptena orientalis	2.17	36	3.39	
Loligo sp.	2.17	48	3.39	
Lophiomus setigerus	2.09	8	3.26	
Rhinobatos formosensis	2.01	4	3.14	
Grammoplites sp.	2.01	132	3.14	
Bassanago albescens	1.36	56	2.13	
Ophidion sp.	0.80	28	1.25	
Lepturacanthus savala	0.80	8	1.25	
Sepia sp	0.48	24	0.75	
Pterois russelii	0.48	8	0.75	
Fistularia sp.	0.40	28	0.63	
Champsodon sp.	0.40	193	0.63	
Cantherhines multilineatus	0.40	4	0.63	
Siganus canaliculatus	0.32	4	0.50	
Octopus sp.	0.16	8	0.25	
Parapercis alboguttata	0.16	24	0.25	
Cynoglossus sp.	0.08	8	0.13	
Total	63.93		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 130
DATE :11/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°41.63
start stop duration Lon E 97°55.41
TIME :01:42:02 02:06:22 24.3 (min) Purpose : 3
LOG : 3525.70 3527.03 1.3 Region : 10330
FDEPTH: 56 60 Gear cond.: 0
BDEPTH: 56 60 Validity : 0
Towing dir: 0° Wire out : 145 m Speed : 3.3 kn
Sorted : 36 Total catch: 64.32 Catch/hour: 158.68

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Lepturacanthus savala	42.73	725	26.93	
Saurida undosquamis	21.22	933	13.37	
Scomberomorus guttatus	17.02	25	10.73	
Apogon sp.	12.14	646	7.65	
Loligo sp.	9.57	414	6.03	
Apogon sp.	8.78	878	5.53	0
Leiognathus sp.	7.20	4174	4.54	
BOTHIDAE	6.12	794	3.86	
Nemipterus japonicus	5.23	99	3.30	
Dussumieria acuta	3.95	54	2.49	
Saurida tumbil	3.45	5	2.18	
Lagocephalus lunaris	3.36	84	2.11	
Upeneus sulphureus	3.36	143	2.11	
Cynoglossus lingua	3.06	39	1.93	
Penaeus sp.	2.76	207	1.74	
Priacanthus tayenus	2.76	133	1.74	
Seriolina nigrofasciata	1.43	2	0.90	
Uranoscopus affinis	1.18	59	0.75	
Panulirus polyphagus	0.99	2	0.62	
C R A B S	0.79	212	0.50	
Lophiomus setigerus	0.49	5	0.31	
SQUILLIDAE	0.39	5	0.25	
Acanthocepola sp.	0.20	5	0.12	
Trypauchen microcephalus	0.20	10	0.12	
Bassanago albescens	0.20	39	0.12	
GOBIIDAE	0.10	10	0.06	
Pedophthalmus vigil	0.00	2	0.00	
MURAENESOCIDAE	0.00	2	0.00	
Saurida tumbil	0.00	2	0.00	0
Total	158.68		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 131
DATE :11/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°39.41
start stop duration Lon E 97°59.69
TIME :03:24:20 03:54:54 30.6 (min) Purpose : 3
LOG : 3536.30 3537.82 1.5 Region : 10330
FDEPTH: 43 42 Gear cond.: 0
BDEPTH: 43 42 Validity : 0
Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
Sorted : 15 Total catch: 35.24 Catch/hour: 69.17

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida tumbil	8.32	67	12.03	
Leiognathus sp.	7.38	2355	10.67	
Loligo sp.	6.91	220	9.99	
Apogon pink fins mid-tail back	6.59	1052	9.53	
Lepturacanthus savala	5.57	220	8.06	
Saurida undosquamis	5.42	251	7.83	
Cynoglossus lingua	4.55	47	6.58	
Upeneus sulphureus	4.47	137	6.47	318
BOTHIDAE	3.61	393	5.22	
Penaeus sp.	2.20	145	3.18	
Rastrelliger brachysoma	2.12	20	3.06	
Apogon striped D-fins tail	1.88	79	2.72	
SQUILLIDAE	1.73	188	2.50	
Pomadasys kaakan	1.65	12	2.38	
Atropus atropos	1.65	31	2.38	
Sepia sp	1.49	8	2.16	
Dussumieria acuta	0.94	16	1.36	
Charybdis feriata	0.71	2	1.02	
Chirocentrus dorab	0.63	4	0.91	
Penaeus monodon	0.47	4	0.68	
Dactyloptena orientalis	0.31	4	0.45	
Apogon'pale-stripe'	0.16	86	0.23	
Fistularia petimba	0.16	16	0.23	
Penaeus canaliculatus	0.16	4	0.23	
Pedophthalmus vigil	0.08	4	0.11	
SQUILLIDAE	0.00	2	0.00	0
Nemipterus isacanthus	0.00	2	0.00	
Nemipterus marginatus	0.00	2	0.00	
Arothron stellatus, juvenile	0.00	2	0.00	
Alectis ciliaris	0.00	2	0.00	
Total	69.17		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 132
DATE :11/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°23.72
start stop duration Lon E 97°53.76
TIME :07:45:25 08:12:07 26.7 (min) Purpose : 3
LOG : 3566.61 3568.10 1.5 Region : 10330
FDEPTH: 59 57 Gear cond.: 0
BDEPTH: 59 57 Validity : 0
Towing dir: 0° Wire out : 150 m Speed : 3.3 kn
Sorted : 32 Total catch: 92.02 Catch/hour: 206.79

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Lepturacanthus savala	90.47	1807	43.75	
Saurida elongata	30.47	1308	14.74	321
Loligo sp.	29.12	728	14.08	
Saurida undosquamis	21.71	1126	10.50	320
Parastromateus niger	7.15	13	3.46	319
Rastrelliger kanagurta	3.91	20	1.89	322
Secutor insidiator	3.64	2157	1.76	
Scomberomorus commerson	2.92	4	1.41	
Arnoglossus dalgleishi	2.83	222	1.37	
Carangoides armatus	2.70	27	1.30	
Atule mate	2.43	13	1.17	
Apogon 'barred'	1.62	452	0.78	
Tetraodon sp.	1.21	13	0.59	
Grammoplites sp.	1.21	81	0.59	
Chirocentrus dorab	1.08	2	0.52	
Metapenaeus monoceros	1.08	67	0.52	
Sepia sp	0.99	2	0.48	
Upeneus sulphureus	0.81	13	0.39	
Congresox talabon	0.76	2	0.37	
Stolephorus indicus	0.40	13	0.20	
Alectis ciliaris	0.27	7	0.13	
Total	206.79		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 133
DATE :11/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°23.73
start stop duration Lon E 97°34.32
TIME :10:52:59 11:06:14 13.3 (min) Purpose : 3
LOG : 3590.99 3591.74 0.8 Region : 10330
FDEPTH: 79 80 Gear cond.: 0
BDEPTH: 79 80 Validity : 0
Towing dir: 0° Wire out : 213 m Speed : 3.4 kn
Sorted : 136 Total catch: 398.16 Catch/hour: 1802.99

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Decapterus kurroides	883.02	56513	48.98	
Selaroides leptolepis	434.72	20830	24.11	
Rachycentron canadum	285.83	68	15.85	323
Epinephelus bleekeri	73.00	63	4.05	327
Abalistes stellaris	22.91	27	1.27	
Parupeneus heptacanthus	18.84	91	1.04	330
Nemipterus bipunctatus	17.21	86	0.95	329
Epinephelus areolatus	17.21	41	0.95	326
Neotrygon kuhlii	13.68	9	0.76	
Lutjanus vitta	8.42	18	0.47	325
Lutjanus russellii	8.06	18	0.45	324
Pterois russelii	5.07	18	0.28	
Loligo sp.	4.53	18	0.25	
Sphyraena obtusata	4.44	403	0.25	
Lutjanus sebae	2.54	14	0.14	328
Rhinobatos formosensis	2.45	5	0.14	
Trachinocephalus myops	1.09	9	0.06	
Total	1802.99		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 134
DATE :11/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°24.99
start stop duration Lon E 97°15.54
TIME :15:12:20 15:45:15 32.9 (min) Purpose : 3
LOG : 3617.16 3618.92 1.8 Region : 10330
FDEPTH: 183 178 Gear cond.: 0
BDEPTH: 183 178 Validity : 0
Towing dir: 0° Wire out : 500 m Speed : 3.2 kn
Sorted : 40 Total catch: 237.32 Catch/hour: 432.54

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Argentina euchus	178.10	8191	41.18	
Puerulus sewelli	101.30	0	23.42	
Satyrichthys investigatoris	74.25	77	17.17	
Saurida undosquamis	20.41	344	4.72	
Plesiobatis daviesi	14.58	2	3.37	
Lophiomus setigerus	11.99	38	2.77	
Citharoides sp.	9.70	102	2.24	
Neoepinnula orientalis	6.38	64	1.47	
Neoniphon aurolineatus	5.61	153	1.30	
Grammoplites sp.	4.34	129	1.00	
SCORPAENIDAE	1.79	217	0.41	
TRIGLIDAE	1.28	38	0.29	
Antigonia sp.	1.02	89	0.24	
Chascanopsetta lugubris	1.02	38	0.24	
Parascolopsis tanyactis	0.77	26	0.18	
Total	432.54		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 135
DATE :11/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°23.34
start stop duration Lon E 96°52.59
TIME :19:16:32 19:41:36 25.1 (min) Purpose : 3
LOG : 3647.32 3648.61 1.3 Region : 10330
FDEPTH: 302 304 Gear cond.: 0
BDEPTH: 302 304 Validity : 2
Towing dir: 0° Wire out : 690 m Speed : 3.1 kn
Sorted : 30 Total catch: 68.68 Catch/hour: 164.31

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Chlorophthalmus sp.	93.88	3129	57.13	
Satyrichthys adeni	17.27	17	10.51	
Caelorinchus trunovi	16.65	596	10.13	
Aristeus virilis	11.77	3230	7.16	
TRIAKIDAE	8.90	201	5.42	
Puerulus sewelli	6.12	84	3.73	
HISTIOTEUTHIDAE	3.16	50	1.92	
OCTOPODIDAE	1.58	29	0.96	
Chascanopsetta lugubris	1.00	14	0.61	
Uropterygius wheeleri	0.81	2	0.50	
Heterocarpus laevigatus	0.72	179	0.44	
Tydemania navigatoris	0.57	93	0.35	
MYCTOPHIDAE	0.57	136	0.35	
Priacanthus macracanthus	0.43	7	0.26	
Macrorhamphosodes uradoi	0.43	79	0.26	
Psenopsis obscura	0.29	7	0.17	
Antigonia sp.	0.14	14	0.09	
Argentina sp.	0.00	2	0.00	
Total	164.31		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 136
DATE :12/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°4.56
start stop duration Lon E 96°35.84
TIME :04:04:33 04:34:30 29.9 (min) Purpose : 3
LOG : 3704.71 3706.32 1.6 Region : 10330
FDEPTH: 460 455 Gear cond.: 0
BDEPTH: 460 455 Validity : 0
Towing dir: 0° Wire out : 1100 m Speed : 3.2 kn
Sorted : 45 Total catch: 94.62 Catch/hour: 189.62

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Plesiobatis daviesi	80.16	12	42.28	0
Plesiobatis daviesi	60.12	8	31.71	
Satyrichthys adeni	8.26	8	4.35	
Synagrops japonicus	6.25	128	3.30	
Aristeus virilis	6.17	357	3.26	
Loligo sp.	5.85	20	3.09	
Halieutaea sp.	4.33	16	2.28	
Halaelurus lutarius	2.89	28	1.52	
Neoscopelus macrolepidotus	2.81	76	1.48	
Raja sp.	2.40	2	1.27	
Diaphus effulgens	1.92	305	1.01	
Caelorinchus braueri	1.20	36	0.63	
Heptranchias perlo	1.00	2	0.53	
ALEPOCEPHALIDAE	0.96	16	0.51	
Metanephrops andamanicus	0.96	28	0.51	
SCORPAENIDAE	0.72	32	0.38	
Chaunax sp.	0.56	4	0.30	
Heterocarpus tricarinatus	0.56	36	0.30	
Photonectes sp.	0.48	12	0.25	
MYCTOPHIDAE	0.40	48	0.21	
Coloconger scholesi	0.36	12	0.19	
Octopus sp.	0.32	8	0.17	
Solenocera choprai	0.32	12	0.17	
Histioteuthis sp.	0.32	12	0.17	
Astronesthes sp.	0.24	40	0.13	
Leptocephalus	0.04	4	0.02	
Pasiphaea sp.	0.00	2	0.00	
C R A B S	0.00	2	0.00	
Aristaeomorpha foliacea	0.00	2	0.00	
Stereomastis sp.	0.00	2	0.00	
Chauliodus sp.	0.00	2	0.00	
GALATHEIDAE	0.00	2	0.00	
Total	189.62		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 137
DATE :12/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°1.83
start stop duration Lon E 96°54.60
TIME :07:51:36 08:19:20 27.7 (min) Purpose : 3
LOG : 3729.11 3730.64 1.5 Region : 10330
FDEPTH: 325 331 Gear cond.: 0
BDEPTH: 325 331 Validity : 0
Towing dir: 0° Wire out : 770 m Speed : 3.3 kn
Sorted : 36 Total catch: 158.02 Catch/hour: 341.79

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	190.77	55328	55.81	
Aristeus virilis	20.76	8511	6.08	
Halaelurus lutarius	19.47	389	5.70	
Cubiceps sp.	14.71	476	4.30	
Psenopsis obscura	14.28	195	4.18	
Neoepinnula orientalis	13.63	270	3.99	
Neoscopelus macrolepidotus	12.55	2509	3.67	
Puerulus sewelli	10.34	136	3.02	331
OMMASTREPHIDAE	10.17	173	2.97	
Chlorophthalmus sp.	7.57	173	2.21	
Satyrichthys adeni	5.62	11	1.65	
Metanephrops andamanicus	4.76	76	1.39	332
S H R I M P S	3.46	422	1.01	
Priacanthus macracanthus	2.81	43	0.82	
Synagrops japonicus	2.60	184	0.76	
Lophiodes mutilus	1.30	22	0.38	
Chascanopsetta lugubris	1.30	43	0.38	
Lestrolepis intermedia	1.30	87	0.38	
Histioteuthis sp.	0.87	43	0.25	
Triglidae small black spots	0.65	11	0.19	
Hymenocephalus sp.	0.65	43	0.19	
Caelorinchus parallelus	0.65	11	0.19	
Astronesthes sp.	0.65	97	0.19	
Zu elongatus	0.53	2	0.15	
C R A B S	0.43	11	0.13	
OPHIDIIDAE	0.00	2	0.00	
Total	341.79		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 138
DATE :12/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°2.91
start stop duration Lon E 97°22.67
TIME :12:47:40 13:21:18 33.6 (min) Purpose : 3
LOG : 3769.61 3771.45 1.8 Region : 10330
FDEPTH: 111 116 Gear cond.: 0
BDEPTH: 111 116 Validity : 2
Towing dir: 0° Wire out : 290 m Speed : 3.3 kn
Sorted : 186 Total catch: 186.30 Catch/hour: 332.28

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Himantura sp.	196.20	4	59.04	
Plesiobatis daviesi	53.51	2	16.10	
Rachycentron canadum	18.19	12	5.48	333
MYCTOPHIDAE	15.23	3808	4.58	
Satyrichthys adeni	11.41	16	3.44	
Monocentris japonica	9.52	66	2.87	
Saurida undosquamis	8.78	300	2.64	334
Trachinocephalus myops	3.71	16	1.12	
Sargocentron rubrum	2.71	14	0.82	
Tetraodon sp.	2.43	132	0.73	
Engyprosopon sp.	2.25	57	0.68	
Uranoscopus affinis	1.82	4	0.55	
Priacanthus macracanthus	1.68	16	0.50	
Pseudorhombus dupliciocellatus	1.39	23	0.42	
Tetrosomus gibbosus	1.03	7	0.31	
Bleekeria sp.	0.54	43	0.16	
Paralepis elongata	0.43	37	0.13	
Ommastrephes sp.	0.32	5	0.10	
Solenocera sp.	0.32	59	0.10	
Rexea bengalensis	0.18	14	0.05	
Epinephelus radiatus	0.18	2	0.05	
Callionymus sp.	0.14	14	0.04	
Nemipterus japonicus	0.11	4	0.03	
Parapercis sp.	0.11	7	0.03	
Octopus sp.	0.07	2	0.02	
Grammoplites sp.	0.04	2	0.01	
Emmelichthys struhsakeri	0.00	2	0.00	
Cantherhines multilineatus, juvenile	0.00	2	0.00	
Centroberyx druzhini, juvenile	0.00	2	0.00	
Parapercis sp.	0.00	2	0.00	
Total	332.28		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 139
DATE :12/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 11°1.76
start stop duration Lon E 97°36.15
TIME :15:37:32 16:07:17 29.7 (min) Purpose : 3
LOG : 3787.53 3789.24 1.7 Region : 10330
FDEPTH: 81 82 Gear cond.: 0
BDEPTH: 81 82 Validity : 2
Towing dir: 0° Wire out : 210 m Speed : 3.5 kn
Sorted : 35 Total catch: 71.94 Catch/hour: 145.14

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Dactyloptena orientalis	66.90	1001	46.09	
Nemipterus bipunctatus	29.46	234	20.29	335
Trachinocephalus myops	9.52	89	6.56	
Uranoscopus affinis	8.39	40	5.78	
Loligo sp.	7.99	44	5.50	
Upeneus bensasi	7.59	347	5.23	
Priacanthus macracanthus	3.71	36	2.56	
Parupeneus heptacanthus	2.66	12	1.83	
Synodus saurus	1.57	44	1.08	
Pterois russelii	1.13	4	0.78	
Grammoplites scaber	0.89	32	0.61	
Anguilla bengalensis labiata	0.81	2	0.56	
Fistularia petimba	0.81	32	0.56	
Epinephelus bleekeri	0.81	12	0.56	
Pseudorhombus dupliciocellatus	0.73	4	0.50	
Parapterois heterura	0.56	8	0.39	
Dipterygonotus balteatus	0.56	89	0.39	
Aesopia cornuta	0.32	4	0.22	
Aluterus monoceros	0.32	4	0.22	
Parapercis alboguttata	0.24	8	0.17	
Callionymus sp.	0.16	8	0.11	
Odontodactylus japonicus	0.00	2	0.00	
Total	145.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 140
DATE :13/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°44.15
start stop duration Lon E 97°49.51
TIME :02:46:57 03:18:33 31.6 (min) Purpose : 3
LOG : 3874.37 3876.07 1.7 Region : 10330
FDEPTH: 69 68 Gear cond.: 0
BDEPTH: 69 68 Validity : 0
Towing dir: 0° Wire out : 190 m Speed : 3.2 kn
Sorted : 48 Total catch: 47.78 Catch/hour: 90.75

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Saurida undosquamis	32.48	1576	35.79	
Loligo sp.	31.26	1468	34.45	
Dactyloptena orientalis	6.19	106	6.82	
Carangoides malabaricus	3.84	42	4.23	
Saurida tumbil	3.57	13	3.93	
Rastrelliger kanagurta	2.96	21	3.26	336
Lepturacanthus savala	1.63	15	1.80	
Champsodon sp.	1.22	669	1.34	
Priacanthus tayenus	1.06	11	1.17	
Halieutaea indica	1.03	6	1.13	
Nemipterus bipunctatus	0.95	21	1.05	
Grammoplites sp.	0.91	78	1.00	
Epinephelus sexfasciatus	0.72	2	0.80	
Aluterus monoceros	0.68	4	0.75	
Parupeneus heptacanthus	0.53	2	0.59	
BOTHIDAE	0.49	65	0.54	
Fistularia petimba	0.27	19	0.29	
Uraspis helvola	0.19	2	0.21	
Samaris cristatus	0.19	6	0.21	
Sepia sp	0.19	6	0.21	
Lutjanus sebae	0.19	2	0.21	
Upeneus bensasi	0.15	9	0.17	
Teixeirichthys jordani	0.04	2	0.04	
SYNGNATHIDAE	0.00	2	0.00	
Total	90.75		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 141
DATE :13/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°43.14
start stop duration Lon E 97°29.77
TIME :05:58:16 06:28:12 29.9 (min) Purpose : 3
LOG : 3899.49 3901.16 1.7 Region : 10330
FDEPTH: 91 93 Gear cond.: 0
BDEPTH: 91 93 Validity : 0
Towing dir: 0° Wire out : 270 m Speed : 3.4 kn
Sorted : 20 Total catch: 19.88 Catch/hour: 39.84

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Tylerius spinosissimus	14.75	34	37.02	
Triodon macropterus	5.09	2	12.78	
Diodon holocanthus	3.57	6	8.95	
Loligo sp.	3.09	244	7.75	
Nemipterus bipunctatus	2.24	20	5.63	340
Abalistes stellatus	1.88	2	4.73	
Dactyloptena orientalis	1.44	24	3.62	
Parapterois heterura	1.40	16	3.52	
Trachinocephalus myops	1.40	20	3.52	337
Saurida undosquamis	1.40	28	3.52	339
Lactoria diaphana	0.88	8	2.21	
Tetrosomus concatenatus	0.56	8	1.41	
Upeneus bensasi	0.52	20	1.31	338
Halieutaea sp.	0.44	4	1.11	
TETRAODONTIDAE	0.28	4	0.70	
Parupeneus heptacanthus	0.28	2	0.70	
Trixiphichthys weberi	0.20	4	0.50	
BOTHIDAE	0.16	8	0.40	
CALLIONYMIDAE	0.12	2	0.30	
Leiognathus sp.	0.12	12	0.30	
Total	39.84		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 142
DATE :13/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°40.93
start stop duration Lon E 97°19.69
TIME :08:39:54 09:09:06 29.2 (min) Purpose : 3
LOG : 3917.57 3919.01 1.4 Region : 10330
FDEPTH: 281 283 Gear cond.: 0
BDEPTH: 281 283 Validity : 0
Towing dir: 0° Wire out : 690 m Speed : 3.0 kn
Sorted : 52 Total catch: 196.48 Catch/hour: 403.73

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
MYCTOPHIDAE	97.64	44914	24.19	
Aristeus virilis	85.32	22179	21.13	
Priacanthus macracanthus	36.25	432	8.98	
Puerulus sewelli	29.34	485	7.27	341
Neoepinnula orientalis	25.40	456	6.29	
Plesiobatis daviesi	18.90	8	4.68	
Halaelurus lutarius	17.01	271	4.21	
Satyrichthys adeni	16.27	37	4.03	
Synagrops japonicus	14.30	2577	3.54	
Chlorophthalmus sp.	10.60	284	2.63	
Cubiceps sp.	9.37	197	2.32	
Psenopsis obscura	9.12	136	2.26	
Linuparus trigonus	8.63	12	2.14	342
Sepia sp	7.40	160	1.83	
Brotula multibarbata	2.75	62	0.68	
Chascanopsetta lugubris	2.22	49	0.55	
Lophiomus setigerus	1.97	12	0.49	
OPHIDIIDAE	1.73	123	0.43	
S H R I M P S	1.73	210	0.43	
Eridacnis radcliffei	1.48	37	0.37	
Holcomycteronus sp.	1.48	49	0.37	
Bassanago albescens	1.23	49	0.31	
SCORPAENIDAE	1.23	271	0.31	
Caelorinchus trunovi	0.99	37	0.24	
Polymixia berndti	0.86	25	0.21	
Macrorhamphosodes uradoi	0.49	49	0.12	
C R A B S	0.00	2	0.00	
Hoplichthys filamentosus	0.00	2	0.00	
Total	403.73		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 143
DATE :13/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°44.32
start stop duration Lon E 96°59.76
TIME :12:21:29 12:39:19 17.8 (min) Purpose : 3
LOG : 3945.13 3946.03 0.9 Region : 10330
FDEPTH: 328 329 Gear cond.: 0
BDEPTH: 328 329 Validity : 2
Towing dir: 0° Wire out : 790 m Speed : 3.1 kn
Sorted : 17 Total catch: 33.60 Catch/hour: 113.07

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Chlorophthalmus sp.	27.32	390	24.17	
Plesiobatis daviesi	19.32	3	17.08	
Myctophid sp. A	12.52	2006	11.07	
Holcomycteronus sp. *!*	10.50	54	9.29	
Puerulus sewelli	9.62	118	8.51	343
Priacanthus macracanthus	7.40	81	6.55	
Pandalina sp.	6.06	1299	5.36	
Satyrichthys adeni	5.79	13	5.12	
Ommastrephes sp.	3.77	61	3.33	
Hymenocephalus italicus	1.48	27	1.31	
Lophiodes mutilus	1.48	34	1.31	
Heterocarpus tricarinatus	1.35	155	1.19	
Physiculus sp.	1.08	7	0.95	
Triakis megalopterus	0.94	20	0.83	
Chascanopsetta lugubris	0.81	13	0.71	
Neoepinnula orientalis	0.81	20	0.71	
Bembrops curvatura	0.81	13	0.71	
Ariosoma sp.	0.67	13	0.60	
Caelorinchus braueri	0.54	20	0.48	
Solenocera choprai	0.40	20	0.36	
Ophidion barbatum	0.27	7	0.24	
Polymixia nobilis	0.13	7	0.12	
Total	113.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 144
DATE :13/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°44.55
start stop duration Lon E 96°40.74
TIME :15:40:09 16:10:04 29.9 (min) Purpose : 3
LOG : 3970.93 3972.45 1.5 Region : 10330
FDEPTH: 403 403 Gear cond.: 0
BDEPTH: 403 403 Validity : 2
Towing dir: 0° Wire out : 910 m Speed : 3.0 kn
Sorted : 18 Total catch: 26.80 Catch/hour: 53.76

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Hexatrygon brickelli	20.42	4	37.99	
Pandalus sp.	11.88	2552	22.09	
Heterocarpus tricarinatus	8.18	879	15.22	
Chlorophthalmus sp.	4.89	48	9.10	
Polyipnus indicus	2.65	606	4.93	
Holcomycteronus sp. *!*	1.12	4	2.09	
Chaunax sp.	0.96	16	1.79	
Neoscopelus macrolepidotus	0.88	36	1.64	
Triakis megalopterus	0.64	16	1.19	
Chascanopsetta lugubris	0.56	8	1.04	
SCORPAENIDAE	0.48	20	0.90	
Ommastrephes sp.	0.32	4	0.60	
MYCTOPHIDAE	0.24	173	0.45	
Ateleopus natalensis	0.20	4	0.37	
Octopus sp.	0.16	4	0.30	
Neoepinnula orientalis	0.12	4	0.22	
Bembrops curvatura	0.04	4	0.07	0
Total	53.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 145
DATE :15/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°21.42
start stop duration Lon E 97°46.25
TIME :06:33:27 06:59:46 26.3 (min) Purpose : 3
LOG : 4109.62 4111.01 1.4 Region : 10330
FDEPTH: 69 67 Gear cond.: 0
BDEPTH: 69 67 Validity : 0
Towing dir: 0° Wire out : 170 m Speed : 3.2 kn
Sorted : 57 Total catch: 56.59 Catch/hour: 129.10

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
J E L L Y F I S H	26.28	125	20.36	
Loligo sp.	25.64	3333	19.86	
Rhinobatos sp.	20.08	7	15.55	
Saurida undosquamis	17.34	575	13.43	344
Decapterus kurroides	17.06	230	13.22	
Nemipterus bipunctatus	10.77	148	8.34	345
Upeneus bensasi	5.70	333	4.42	346
BOTHIDAE	1.28	55	0.99	
Cyclichthys orbicularis	0.96	11	0.74	
Sea snakes	0.94	2	0.72	
Seriolina nigrofasciata	0.73	9	0.57	
Abalistes sp.	0.41	5	0.32	
Alectis ciliaris	0.37	25	0.28	
Octopus sp.	0.34	2	0.27	
Lagocephalus guntheri	0.32	14	0.25	
Lepturacanthus savala	0.27	5	0.21	
Teixeirichthys jordani	0.23	14	0.18	
Fistularia petimba	0.09	16	0.07	
Amanses cf. scopas	0.09	5	0.07	
Grammoplites sp.	0.09	5	0.07	
Xiphasia setifer	0.05	2	0.04	
Epinephelus bleekeri	0.05	2	0.04	
Rachycentron canadum	0.02	2	0.02	
Total	129.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 146
DATE :15/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°22.72
start stop duration Lon E 97°24.82
TIME :10:54:23 11:24:03 29.7 (min) Purpose : 3
LOG : 4136.85 4138.56 1.7 Region : 10330
FDEPTH: 185 180 Gear cond.: 0
BDEPTH: 185 180 Validity : 1
Towing dir: 0° Wire out : 480 m Speed : 3.4 kn
Sorted : 56 Total catch: 55.66 Catch/hour: 112.56

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Priacanthus macracanthus	35.15	402	31.23	
Plesiobatis daviesi	20.22	2	17.97	
Squalus megalops	8.66	26	7.69	
Lipocheilus carnolabrum	7.72	8	6.86	347
Proscyllium magnificum	7.28	53	6.47	
Narcine sp.	6.96	32	6.18	
Zenopsis nebulosa	5.54	6	4.92	
Linuparus trigonus	2.95	2	2.62	
Argentina sp.	2.91	105	2.59	
Neoniphon aurolineatus	1.98	12	1.76	
Antigonia sp.	1.90	36	1.69	
OMMASTREPHIDAE	1.86	22	1.65	
Serranidae	1.82	55	1.62	
Heptranchias perlo	1.50	2	1.33	
Peristedion weberi	1.33	8	1.19	
Halaelurus sp.	1.01	2	0.90	
Saurida undosquamis	0.77	20	0.68	
Plectorhinchus sp.	0.61	4	0.54	
Upeneus bensasi	0.61	16	0.54	
Rhinobatos formosensis	0.49	2	0.43	
Rastrelliger kanagurta	0.32	4	0.29	
Histiopterus typus	0.32	2	0.29	
Psenopsis obscura	0.24	2	0.22	
Pseudorhombus dupliciocellatus	0.16	2	0.14	
Nemipterus bipunctatus	0.12	2	0.11	
Parascolopsis rufomaculatus	0.12	16	0.11	
Total	112.56		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 147
DATE :15/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°22.04
start stop duration Lon E 96°54.50
TIME :15:21:48 15:54:04 32.3 (min) Purpose : 3
LOG : 4172.99 4174.62 1.6 Region : 10330
FDEPTH: 362 358 Gear cond.: 0
BDEPTH: 362 358 Validity : 0
Towing dir: 0° Wire out : 900 m Speed : 3.0 kn
Sorted : 79 Total catch: 78.91 Catch/hour: 146.72

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Plesiobatis daviesi	92.97	4	63.36	
Puerulus sewelli	9.04	102	6.16	348
Neoscopelus macrolepidotus	7.44	1041	5.07	
Priacanthus macracanthus	5.35	39	3.65	
MYCTOPHIDAE	4.16	535	2.84	
PANDALIDAE	4.16	997	2.84	
Neoepinnula orientalis	4.05	67	2.76	
Psenopsis obscura	3.61	45	2.46	
Satyrichthys adeni	2.45	4	1.67	
TRIAKIDAE	2.38	54	1.62	
Aristeus virilis	2.23	104	1.52	
Narcine sp.	1.86	9	1.27	
Lophiodes mutilus	1.34	9	0.91	
Bembrops curvatura	1.04	24	0.71	
Linuparus trigonus	0.93	2	0.63	
Polyipnus indicus	0.89	372	0.61	
Heterocarpus tricarinatus	0.82	134	0.56	
Zenopsis nebulosa	0.63	2	0.43	
OMMASTREPHIDAE	0.52	6	0.35	
HISTIOTEUTHIDAE	0.48	7	0.33	
Chaunax sp.	0.11	2	0.08	
Chlorophthalmus sp.	0.07	2	0.05	
Polymixia berndti	0.06	2	0.04	
Rexea bengalensis	0.04	2	0.03	
Bembrops sp.	0.04	2	0.03	
PARALEPIDIDAE	0.04	2	0.03	
Total	146.72		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 148
DATE :16/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°1.22
start stop duration Lon E 96°25.73
TIME :02:14:03 02:40:13 26.2 (min) Purpose : 3
LOG : 4248.44 4249.90 1.4 Region : 10330
FDEPTH: 507 523 Gear cond.: 0
BDEPTH: 507 523 Validity : 0
Towing dir: 0° Wire out : 1200 m Speed : 3.3 kn
Sorted : 31 Total catch: 31.08 Catch/hour: 71.26

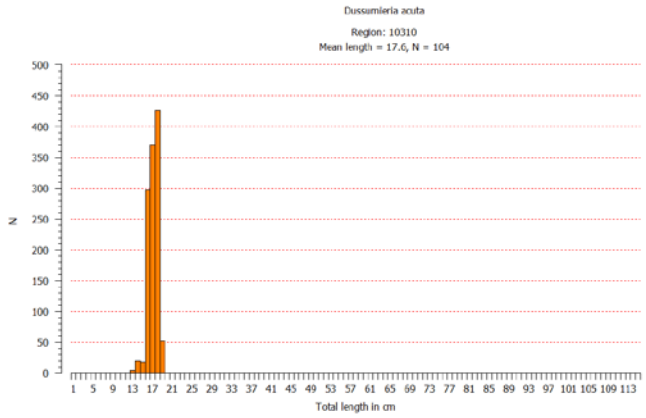
SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Stemonidium sp.	24.67	133	34.62	
Alepocephalus sp.	7.80	165	10.94	
TRIAKIDAE	7.80	50	10.94	
Aristaeomorpha foliacea	5.87	303	8.24	350
Squalus megalops	4.04	7	5.66	
Pandalina sp.	3.94	1023	5.53	
Myctophidae sp. silver	3.48	582	4.89	
Coelorinchus sp.	3.39	83	4.76	
Neoscopelus macrolepidotus	2.38	50	3.35	
Holcomycteronus sp. *!*	1.93	9	2.70	
Histioteuthis sp. *	1.65	9	2.32	
Plesiopenaeus edwardsianus	1.65	23	2.32	349
Hymenocephalus italicus	1.19	46	1.67	
Halieutaea sp. A	0.55	5	0.77	
Satyrichthys adeni	0.28	5	0.39	
Pycnocraspedum squamipinne	0.28	5	0.39	
Setarches guentheri	0.28	5	0.39	
Ostracoberyx dorygenys	0.09	5	0.13	
Total	71.26		100.00	

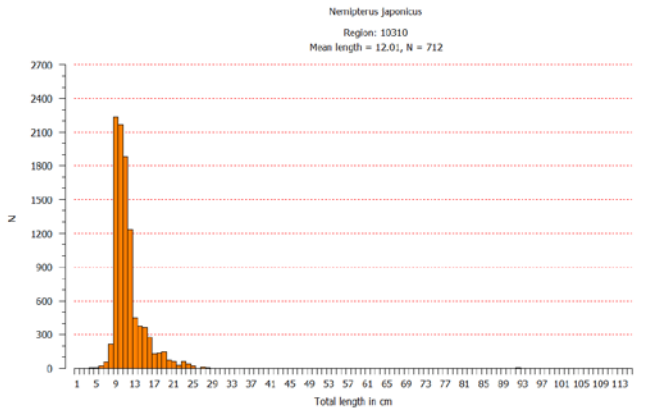
R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 149
DATE :16/12/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 10°3.46
start stop duration Lon E 97°22.78
TIME :09:50:48 10:21:14 30.4 (min) Purpose : 3
LOG : 4315.67 4317.28 1.6 Region : 10330
FDEPTH: 180 181 Gear cond.: 0
BDEPTH: 180 181 Validity : 0
Towing dir: 0° Wire out : 460 m Speed : 3.2 kn
Sorted : 19 Total catch: 18.50 Catch/hour: 36.48

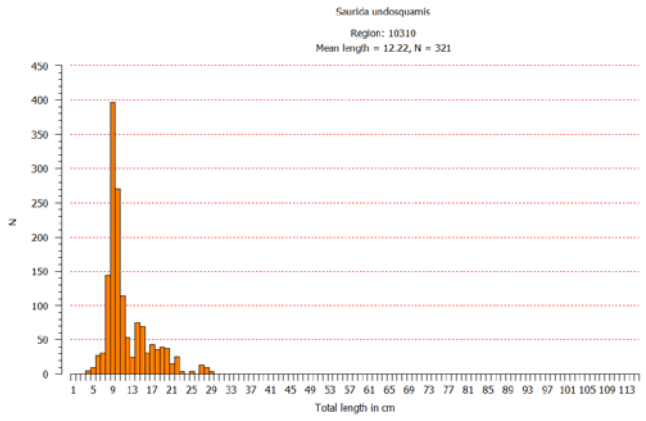
SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP
Argentina sphyraena	10.61	290	29.08	
Lipocheilus carnolabrum	7.14	4	19.57	
Antigonia sp.	4.89	12	13.41	
Chaunax sp.	3.55	4	9.73	
Proscyllium magnificum	1.74	8	4.76	
Symphysanodon typus	1.66	24	4.54	
Neoniphon aurolineatus	1.50	10	4.11	
Priacanthus macracanthus	0.99	6	2.70	
Histiopterus typus	0.83	8	2.27	
Saurida undosquamis	0.79	10	2.16	
Chaetodon quadrimaculatus	0.79	4	2.16	
Parapercis alboguttata	0.71	2	1.95	
Rexea bengalensis	0.43	0	1.19	
Scorpaenid 'blackspot tail'	0.39	8	1.08	
LABRIDAE	0.35	28	0.97	
Snyderina yamanokami	0.12	2	0.32	
Total	36.48		100.00	

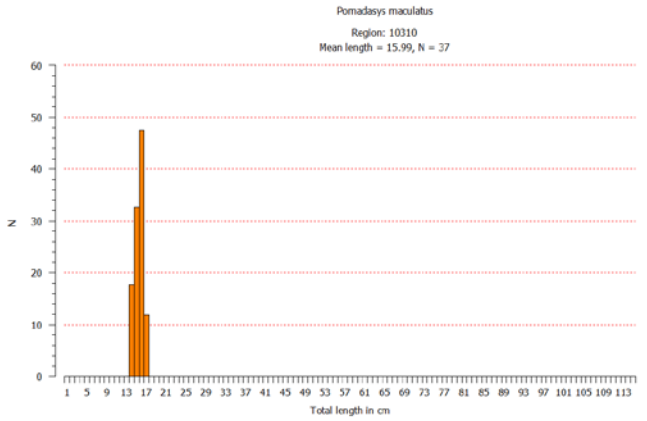
ANNEX II Length distribution

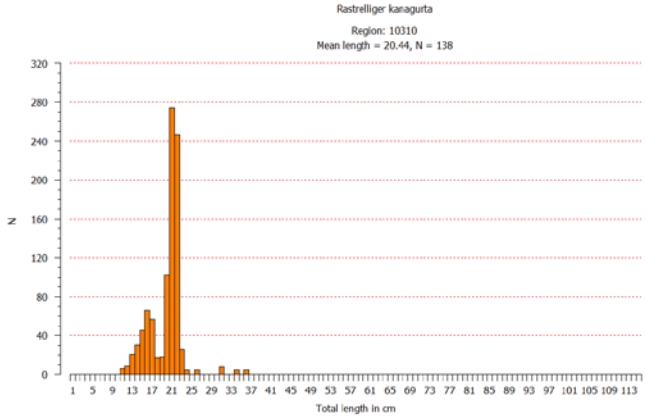
Rakhine cost

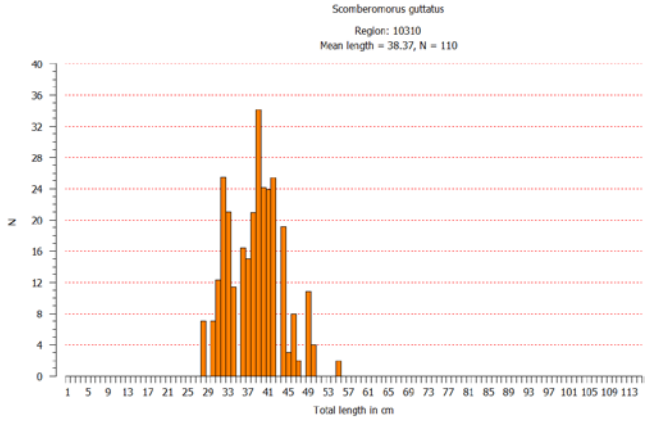


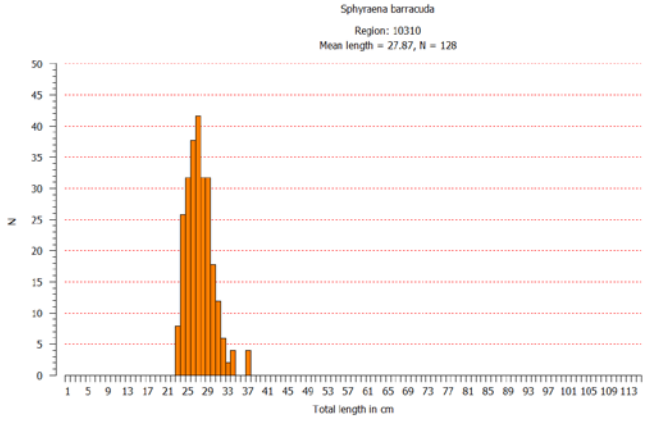


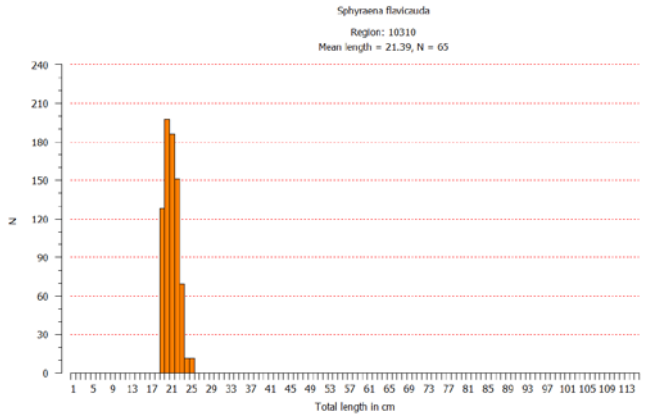


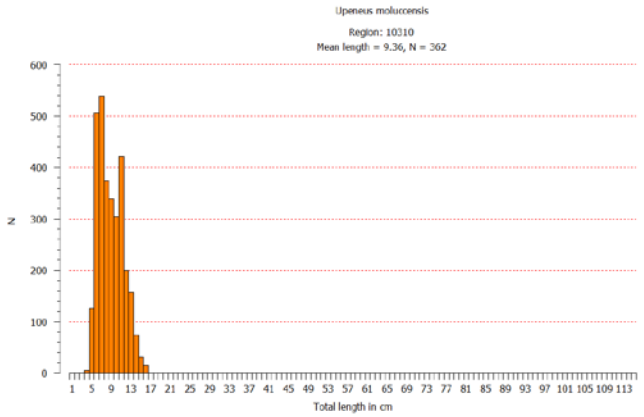


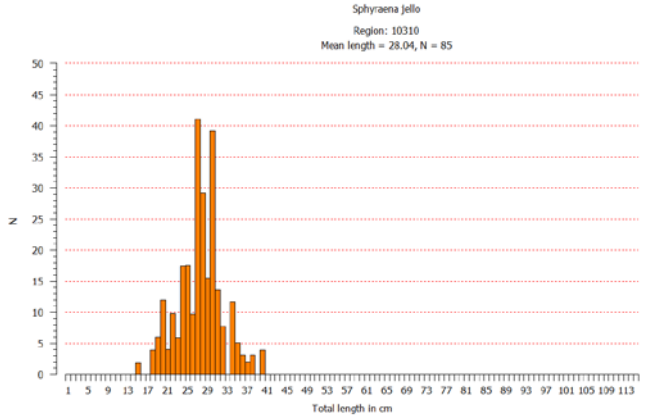


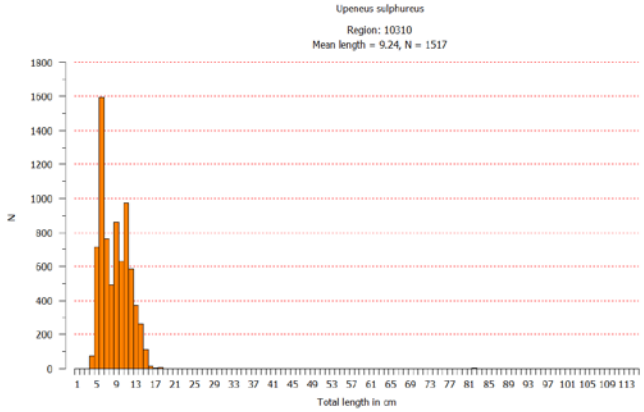


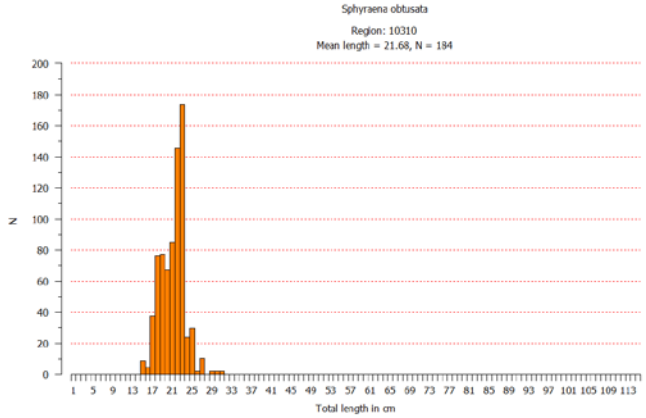


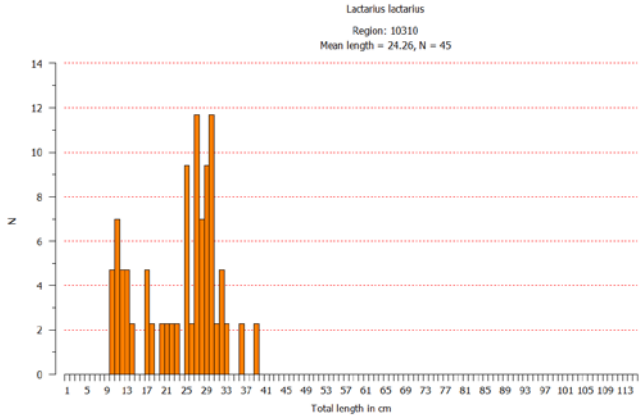

Sphyraena flavicauda
Region: 10310
Mean length = 21.39, N = 65
N
Total length in cm


Upeneus moluccensis
Region: 10310
Mean length = 9.36, N = 362
N
Total length in cm

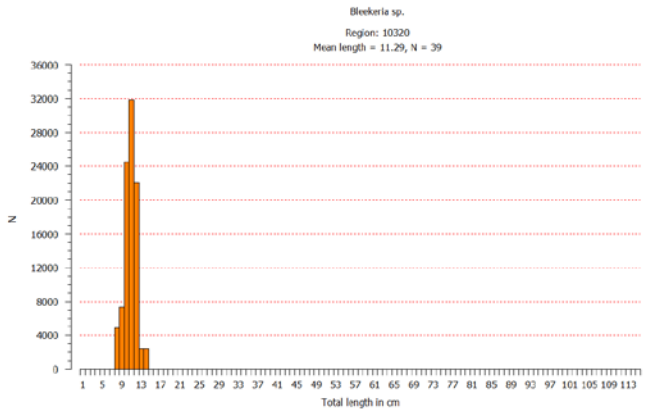

Sphyraena jello
Region: 10310
Mean length = 28.04, N = 85
N
Total length in cm

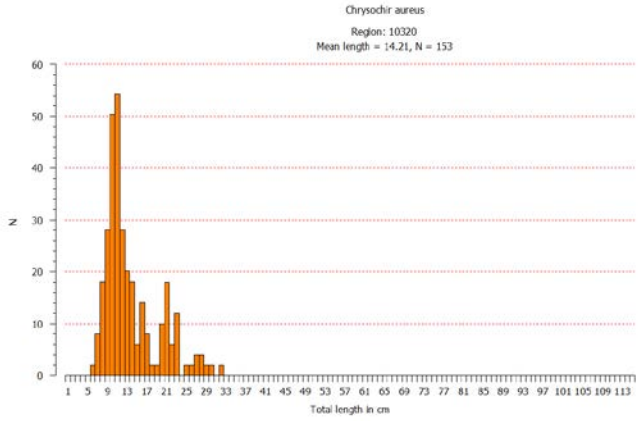

Upeneus sulphureus
Region: 10310
Mean length = 9.24, N = 1517
N
Total length in cm

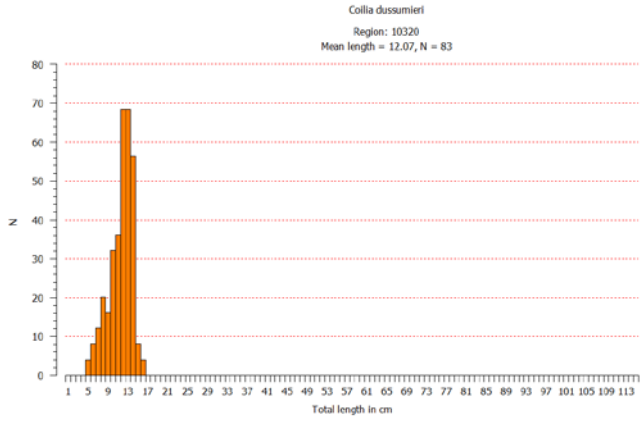

Sphyraena obtusata
Region: 10310
Mean length = 21.68, N = 184
N
Total length in cm

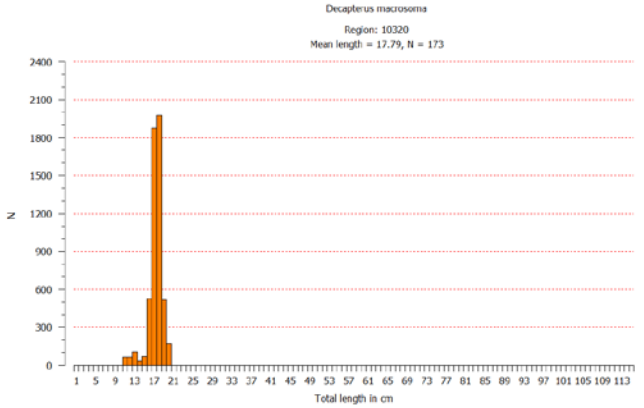

Lactarius lactarius
Region: 10310
Mean length = 24.26, N = 45
N
Total length in cm

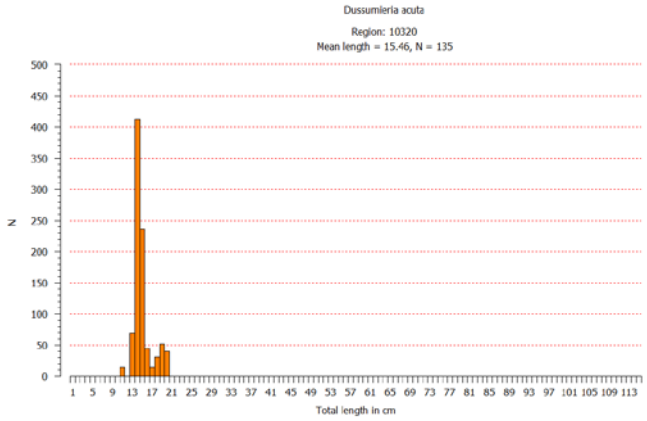
The Delta area

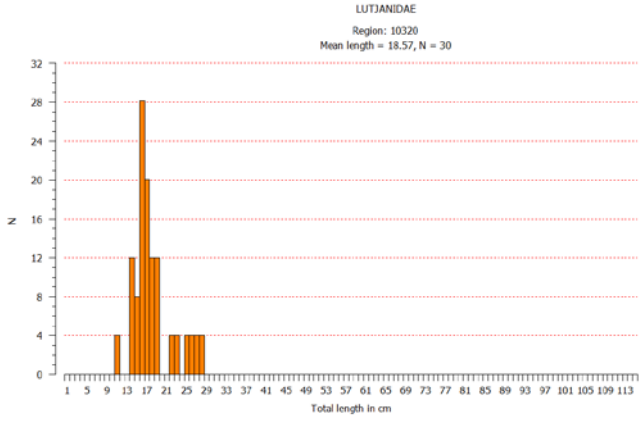


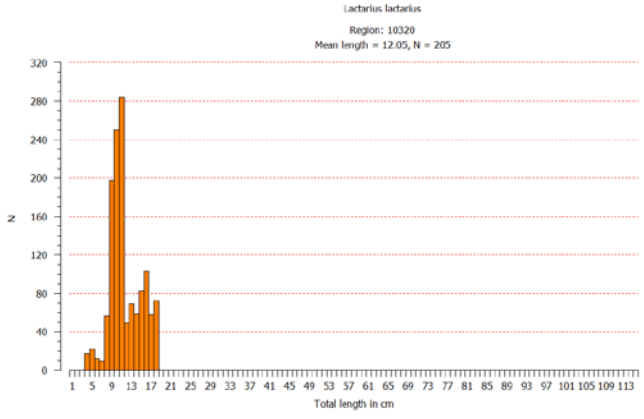


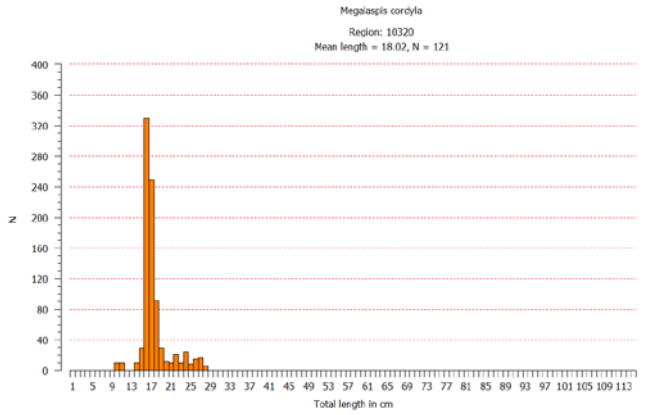


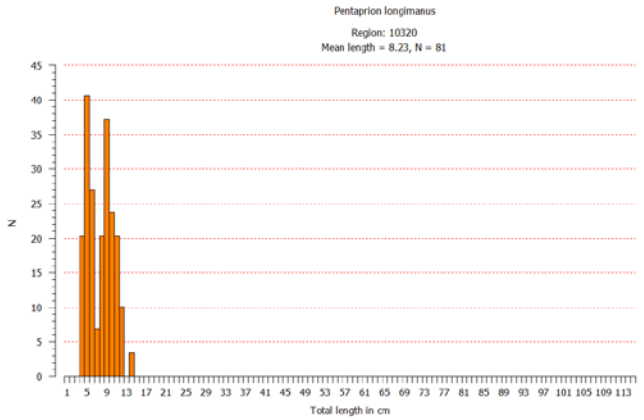


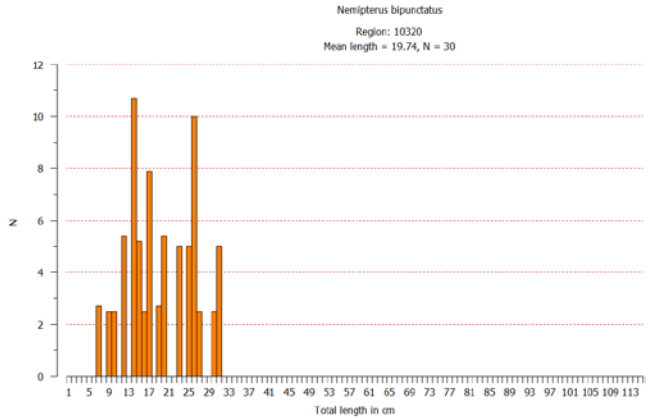


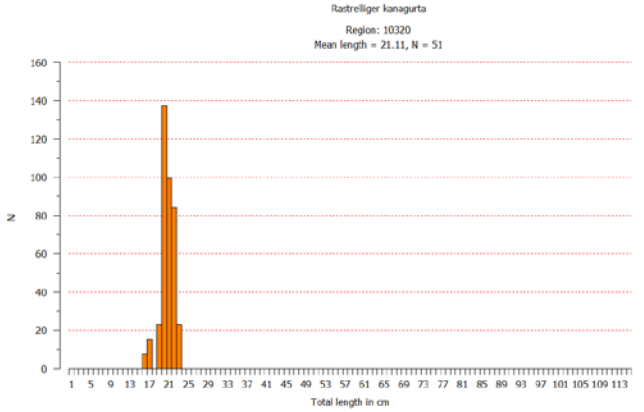


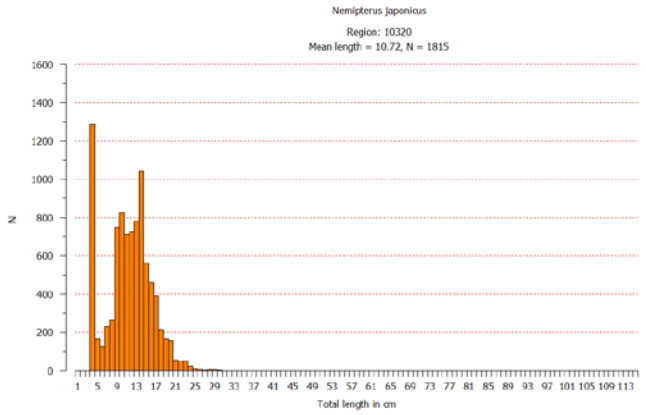


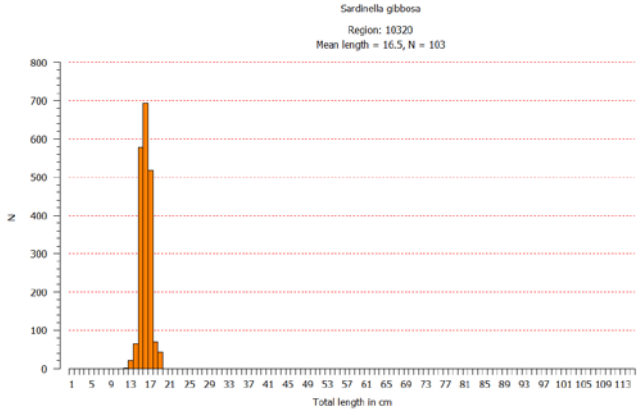

Megalaspis cordyla
Region: 10320
Mean length = 18.02, N = 121
N
Total length in cm

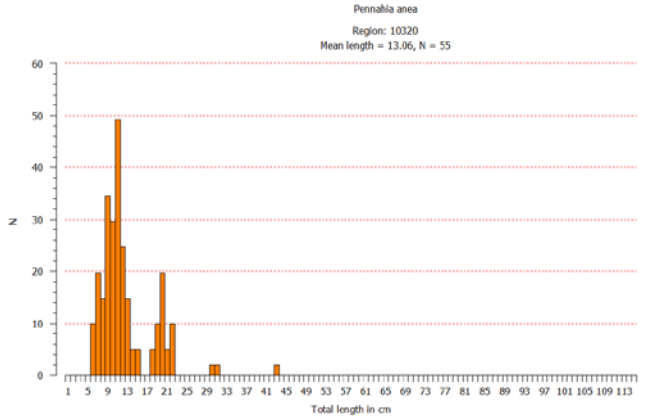

Pentaprion longimanus
Region: 10320
Mean length = 8.23, N = 81
N
Total length in cm

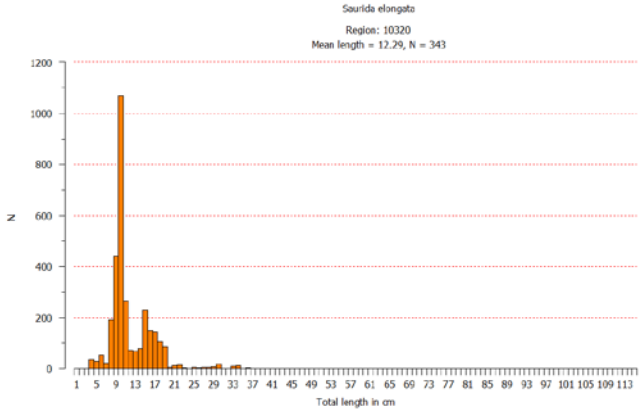

Nemipterus bipunctatus
Region: 10320
Mean length = 19.74, N = 30
N
Total length in cm

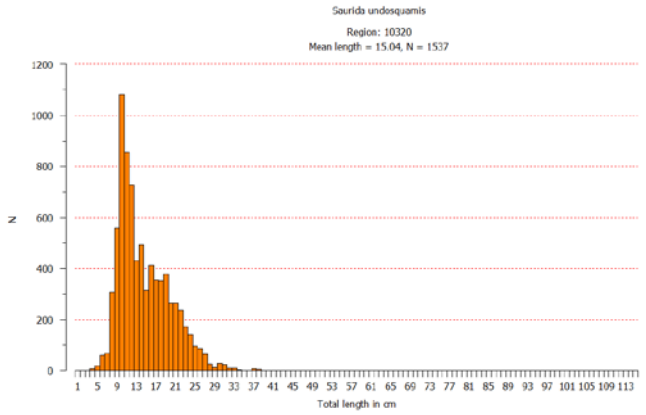

Rastrelliger kanagurta
Region: 10320
Mean length = 21.11, N = 51
N
Total length in cm

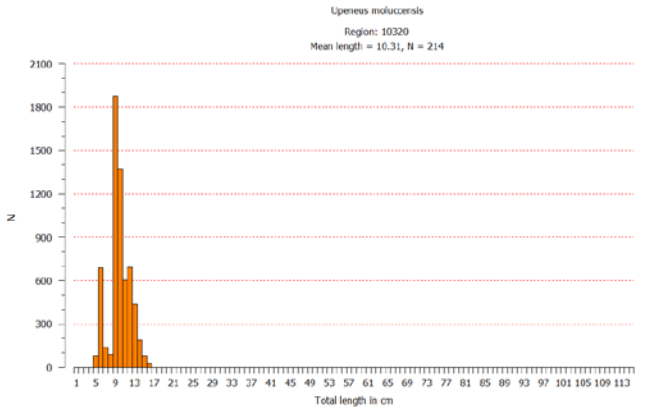

Nemipterus japonicus
Region: 10320
Mean length = 10.72, N = 1815
N
Total length in cm

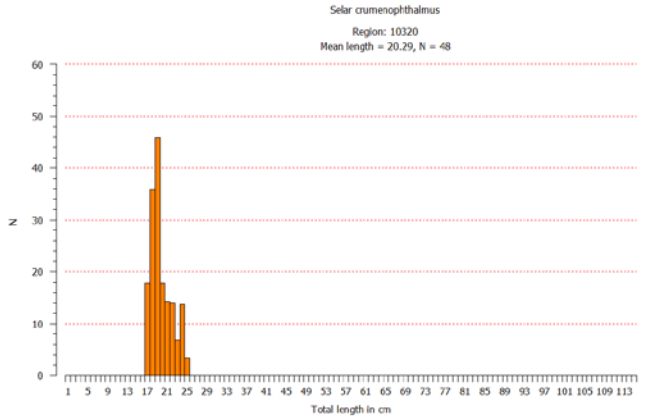

Sardinella gibbosa
Region: 10320
Mean length = 16.5, N = 103
N
Total length in cm

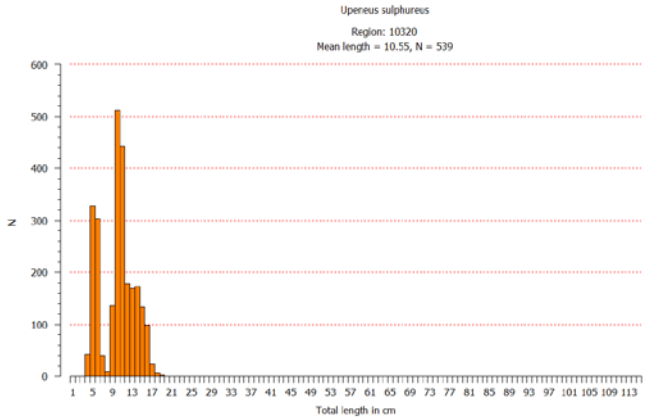

Pennahia anea
Region: 10320
Mean length = 13.06, N = 55
N
Total length in cm

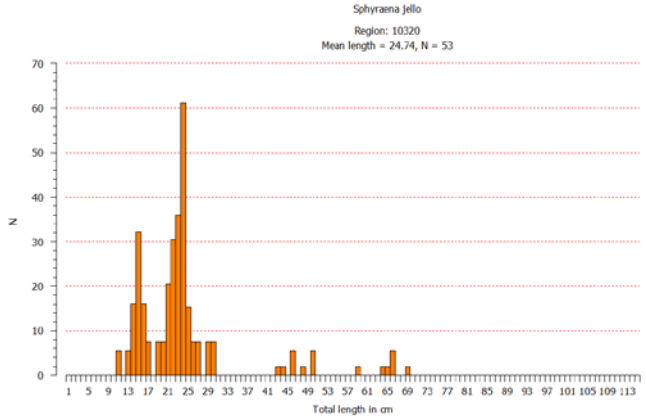

Saurida elongata
Region: 10320
Mean length = 12.29, N = 343
N
Total length in cm

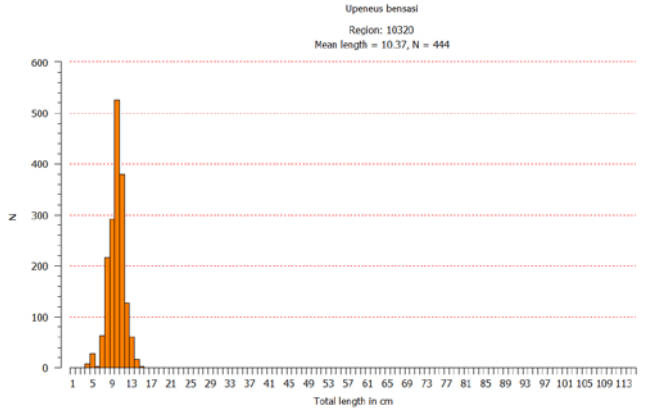

Saurida undosquamis
Region: 10320
Mean length = 15.04, N = 1537
N
Total length in cm


Upeneus moluccensis
Region: 10320
Mean length = 10.31, N = 214
N
Total length in cm

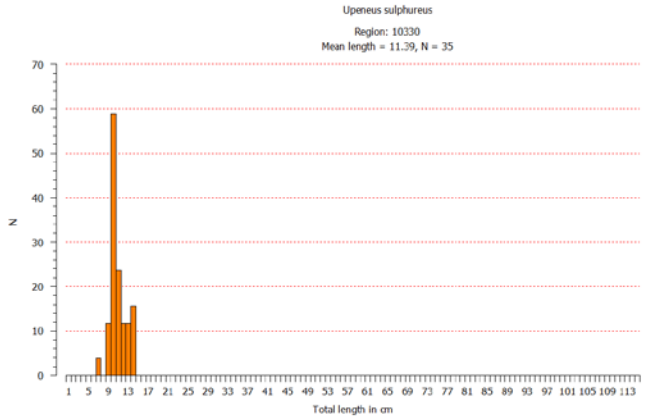

Selar crumenophthalmus
Region: 10320
Mean length = 20.29, N = 48
N
Total length in cm

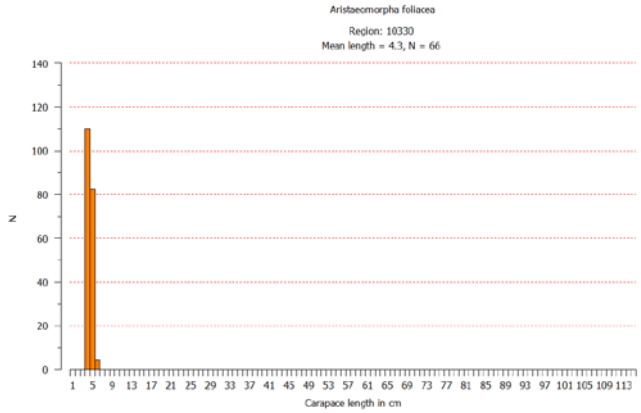

Upeneus sulphureus
Region: 10320
Mean length = 10.55, N = 539
N
Total length in cm

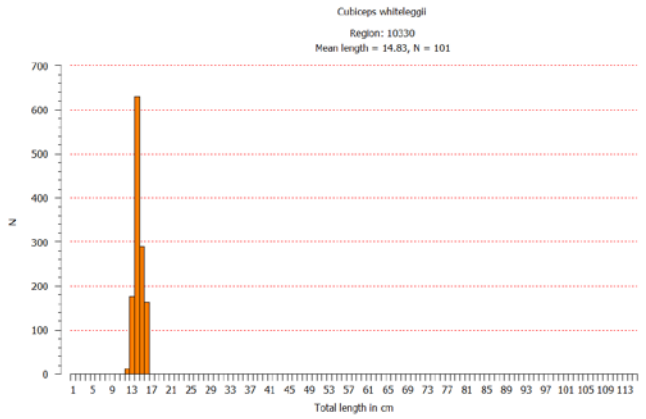

Sphyraena jello
Region: 10320
Mean length = 24.74, N = 53
N
Total length in cm

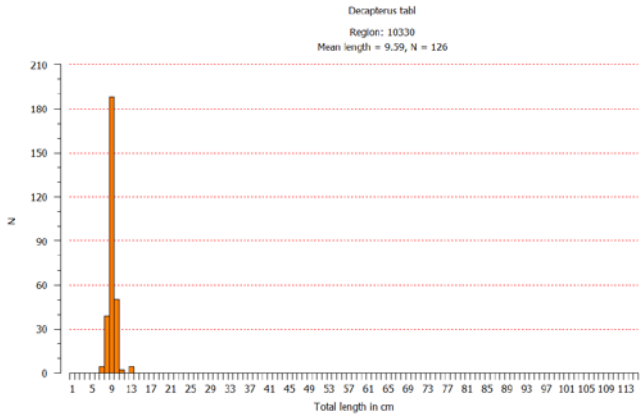

Upeneus bensasi
Region: 10320
Mean length = 10.37, N = 444
N
Total length in cm

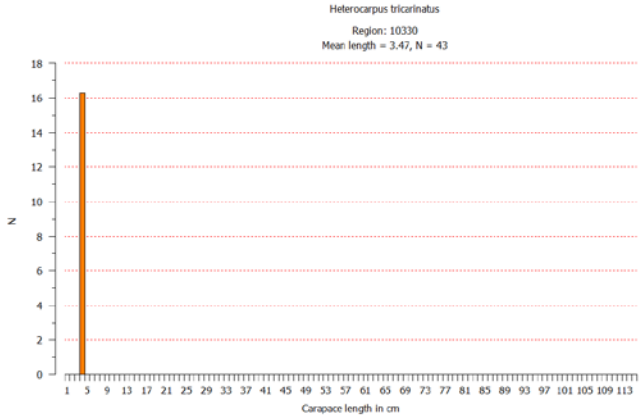
Tanintharyi coast

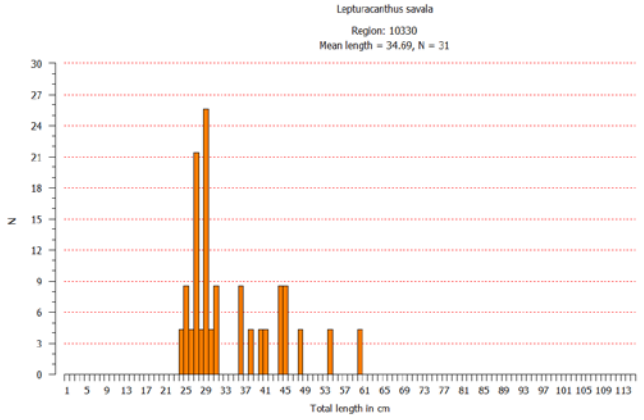


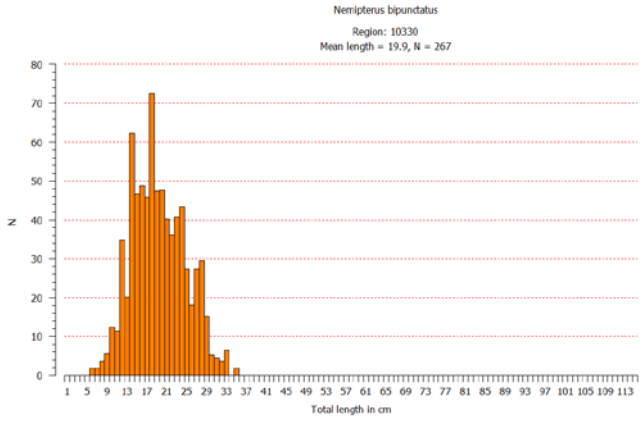








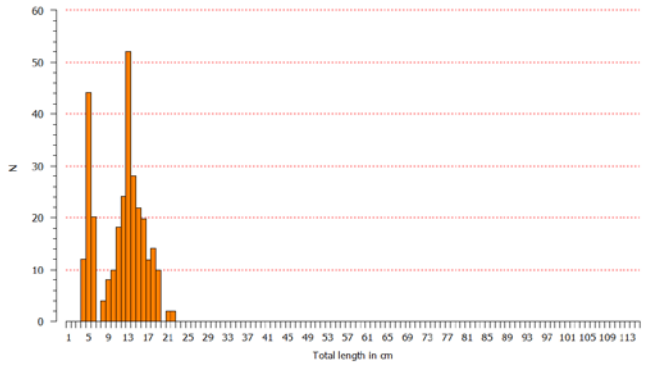




Nemipterus japonicus

Region: 10330

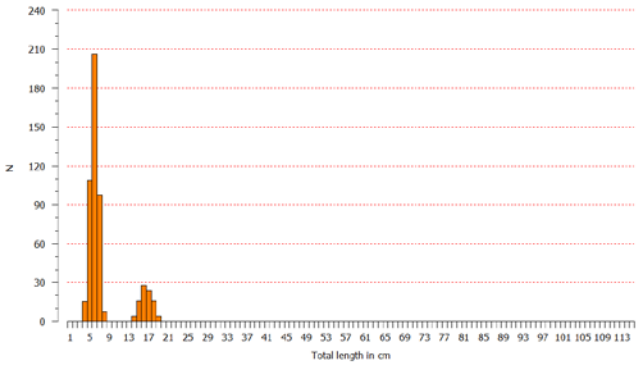
Mean length = 12.18, N = 120



Puerulus sewelli

Region: 10330

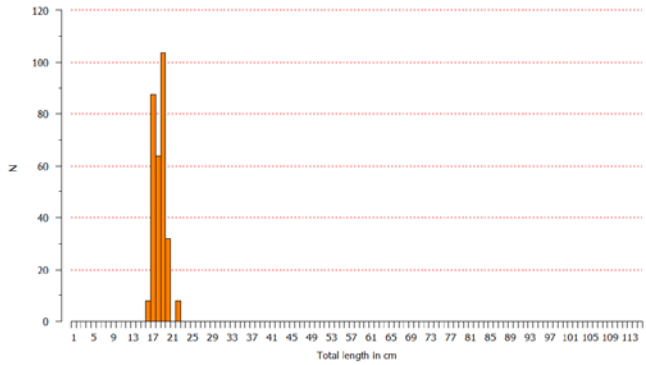
Mean length = 7.84, N = 366



Neoepinnula orientalis

Region: 10330

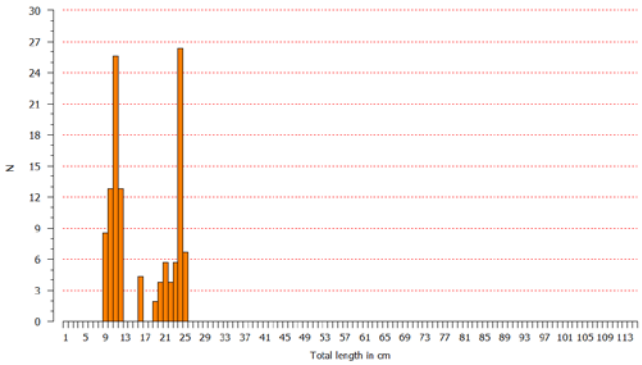
Mean length = 18.82, N = 38



Rastrelliger kanagurta

Region: 10330

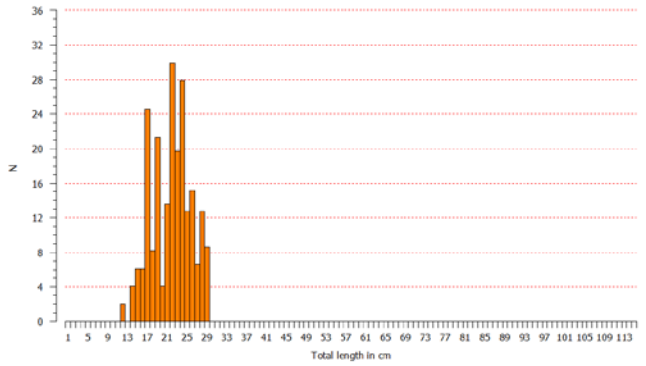
Mean length = 17.07, N = 32



Parupeneus heptacanthus

Region: 10330

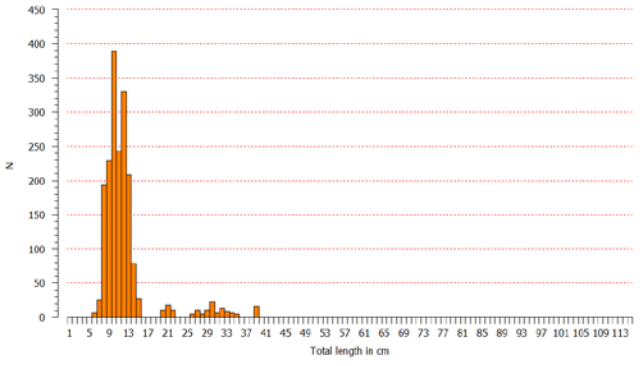
Mean length = 22.37, N = 85



Saurida elongata

Region: 10330

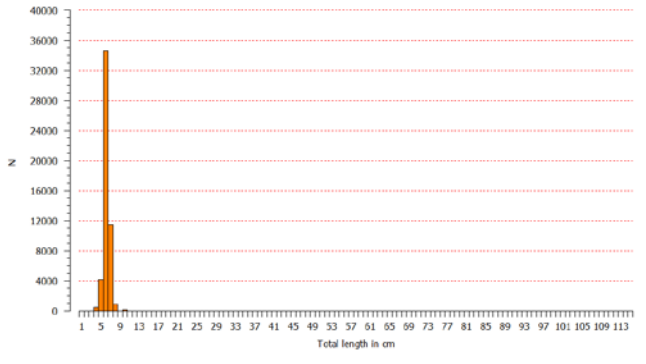
Mean length = 12.65, N = 328



Priacanthus tayenus

Region: 10330

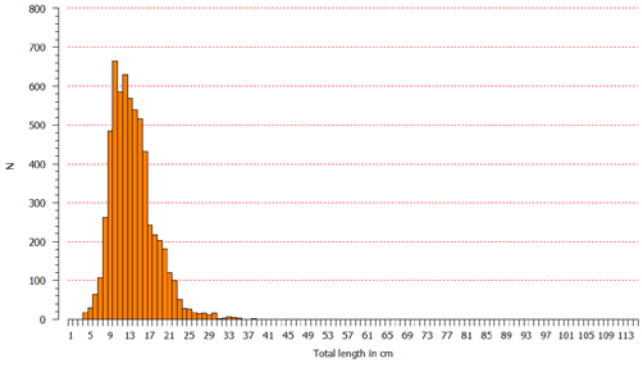
Mean length = 6.67, N = 299

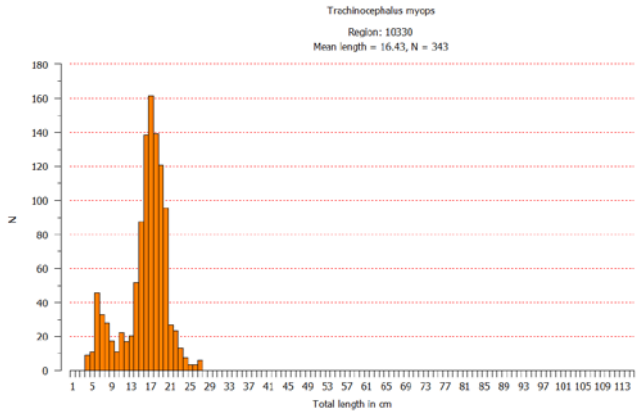


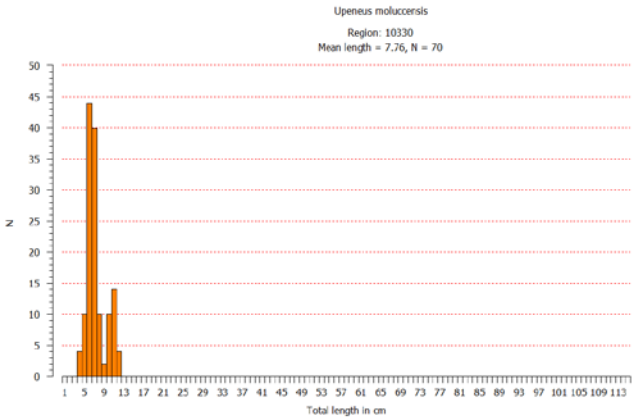
Saurida undosquamis

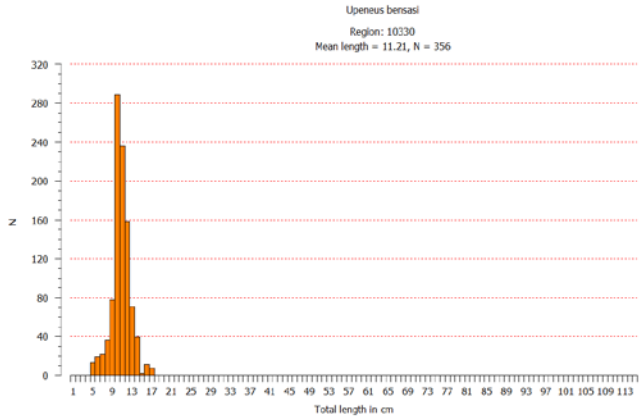
Region: 10330

Mean length = 14.05, N = 1526




Trachinocephalus myops
Region: 10330
Mean length = 16.43, N = 343
N
Total length in cm


Upeneus moluccensis
Region: 10330
Mean length = 7.76, N = 70
N
Total length in cm


Upeneus bensasi
Region: 10330
Mean length = 11.21, N = 356
N
Total length in cm

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:

HAVFORSKNINGSINSTITUTTET

REDERIAVDELINGEN

SEKSJON ELEKTRONISK INSTRUMENTERING

DRIFTSJOURNAL 1 **Kalibrering med referanseku** Rev:2006

Fartøy :	F/F Dr. Fridtjof Nansen		Dato :	14.12.2013	
Ekkolodd :	DFNer60-2		Lokalitet :	Kyunn Phi Lar, Myanmar	
		TSkule:	-34.70 dB		
Kule :	CU-60	(korrigert for lydhastighet ell		Bunndyp :	28 m

Calibration Version 2.1.0.12

Comments:
Myanmar 38kHz

Reference Target:

TS	-34.70 dB	Min. Distance	18.00 m
TS Deviation	5.0 dB	Max. Distance	23.00 m

Transducer: ES38B Serial No. 38000

Frequency	38000 Hz	Beamtype	Split
Gain	25.13 dB	Two Way Beam Angle	-20.6 dB
Athw. Angle Sens.	21.90	Along. Angle Sens.	21.90
Athw. Beam Angle	6.98 deg	Along. Beam Angle	7.01 deg
Athw. Offset Angle	0.02 deg	Along. Offset Angl	0.12 deg
SaCorrection	-0.55 dB	Depth	5.50 m

Transceiver: GPT 38 kHz 009072057b8a 2-1 ES38B

Pulse Duration	1.024 ms	Sample Interval	0.197 m
Power	2000 W	Receiver Bandwidth	2.43 kHz

Sounder Type:
EK60 Version 2.4.3

TS Detection:

Min. Value	-40.0 dB	Min. Spacing	100 %
Max. Beam Comp.	6.0 dB	Min. Echolength	80 %
Max. Phase Dev.	8.0	Max. Echolength	180 %

Environment:

Absorption Coeff.	9.5 dB/km	Sound Velocity	1538.0 m/s

Beam Model results:

Transducer Gain =	26.13 dB	SaCorrection =	-0.71 dB
Athw. Beam Angle =	6.95 deg	Along. Beam Angle =	6.75 deg
Athw. Offset Angle =	0.05 deg	Along. Offset Angle=	0.11 deg

Data deviation from beam model:
RMS = 0.56 dB
Max = 1.51 dB No. = 78 Athw. = 3.4 deg Along = 2.3 deg
Min = -1.82 dB No. = 248 Athw. = -1.2 deg Along = -1.7 deg

Data deviation from polynomial model:
RMS = 0.55 dB
Max = 1.48 dB No. = 78 Athw. = 3.4 deg Along = 2.3 deg
Min = -1.77 dB No. = 248 Athw. = -1.2 deg Along = -1.7 deg

Bemerkninger :
Sterk tidevannsstrøm, noe plankton og noe vind

Vindstyrke : 10 kn. **Vindretning** 130 grader

RådataFil: D:\ER60_CALIBRATION\ER60_CALIBRATION_RAWDATA\2013-12-14\038 kHz\2013409-D20131214-T05393

Filnavn: D:\ER60_CALIBRATION\ER60_CALIBRATION_FILES\2013-12-14\038 khz\38kHz-2013-12-14.txt

Kalibrering utført av: Jarle Kristiansen og Tore Mørk

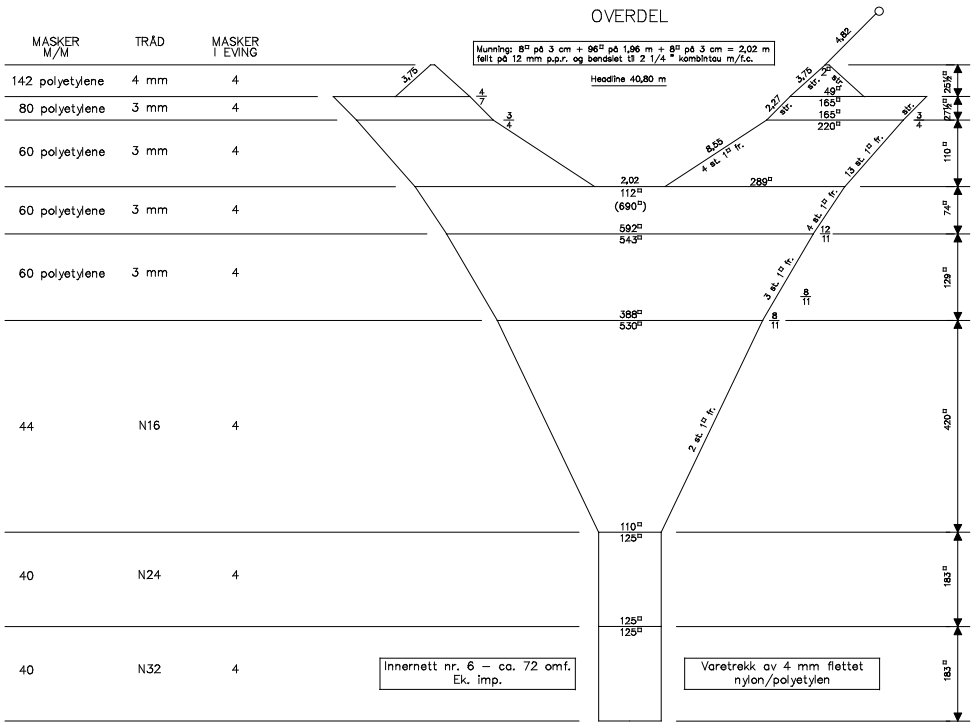
Fishing gear
The vessel has both “Harstad” and "Åkrahamn" pelagic trawls and a "Gisund super bottom trawl".

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 m^2, 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.

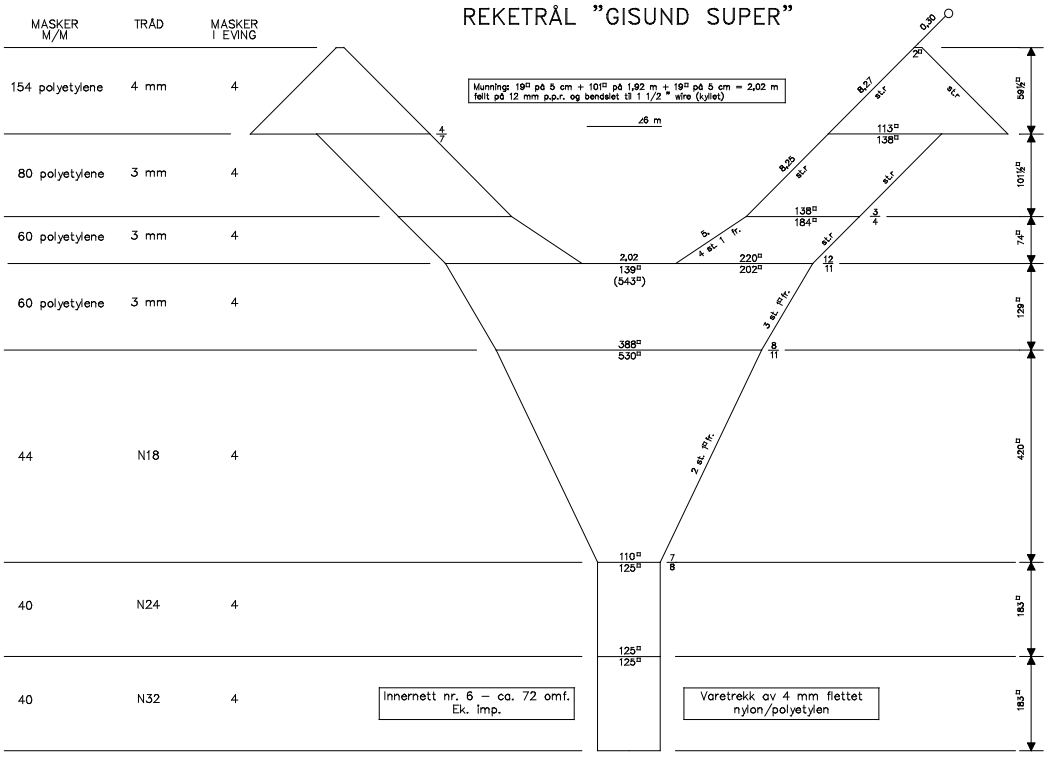
The SCANBAS system was used on all trawl hauls. This equipment consists of sensors, a hydrophone, a receiver, a display unit and a battery charger. Communication between sensors and ship is based on acoustic transmission. The doors are fitted with sensors to provide information on their distance and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

REKETRÅL "GISUND SUPER"

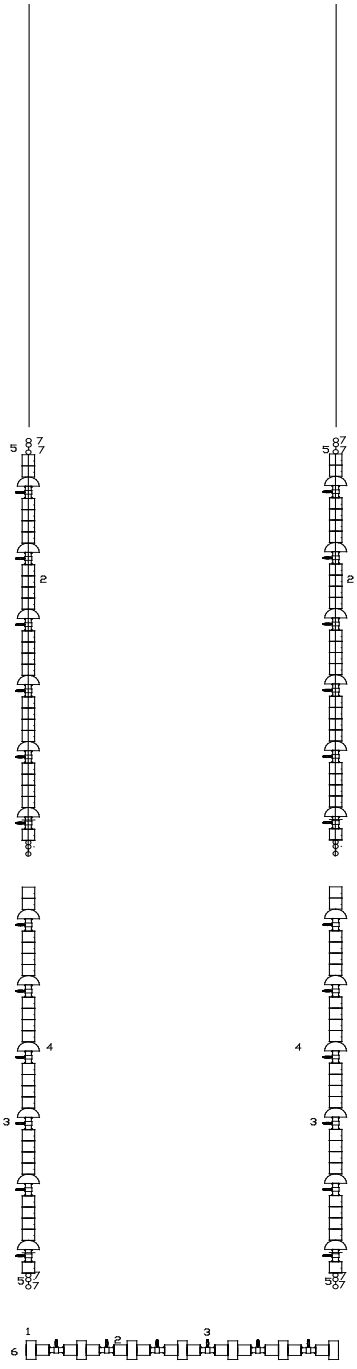
OVERDEL



REKETRÅL "GISUND SUPER"



6,85 M
16 MM CHAIN
SHORT LINKED



SIDE GEAR
6,55 M

SIDE GEAR
6,55 M

ANNEX IV EQUATIONS

Biomass index

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

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

where

L is the number of strata,

$W_i = \dfrac{area_i}{total\ area}$ is the proportion of the i^{th} stratum of the total survey area,

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

$y_{i,k}$ is the density [tonnes/NM^2] 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

$$B = \bar{y}_{st} \cdot total\ area \tag{2}$$

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

$$\mathrm{var}(biomass) = \left(\sum \frac{W_i^2 s_i^2}{n_i} \right) A^2 \tag{3}$$

where

$s_i^2 = \dfrac{\sum_{k=1}^{n_i} (y_{i,k} - \bar{y}_i)^2}{n_i - 1}$, and A is total area

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

$$SE = \sqrt{\mathrm{var}(biomass)} \tag{4}$$