

MYANMAR
Ecosystem Survey

28 APRIL – 02 JUNE 2015

Institute of Marine Research
Norway

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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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CHAPTER 1 INTRODUCTION

Myanmar is the largest fishing nation in the Bay of Bengal region. Total marine catches are uncertain but estimates range as high as 1.3 – 1.8 million tons y⁻¹. The wild fish sector contributes around 10 % to the GDP and large part of the human population find their livelihood in this sector. The country also has high biodiversity. Myanmar's current growth pattern is placing pressure on its environment and, if continued, will be unsustainable given the country's continued population increase, expected rapid industrialization, increased consumption of and demand for natural resources for food production and trade, and increased energy consumption.

Fishery resources in Myanmar waters are typical of Southeast Asia with a large quantity of fish and shrimp in the EEZ. However, studies on marine wildlife in their natural habitats in terms of population's size, distribution, migratory patterns, threats and conservation status are rather limited. Most existing studies have been based on reported sightings and by-catch. Historically, the EAF-Nansen project carried out four surveys with the present vessels predecessor, also named RV Dr. Fridtjof Nansen, in the period 1979-1980 in cooperation with the Burmese (today Myanmar) Government. These surveys have been used as reference points until recently. In 2013 a new survey was carried out in Myanmar by the Dr. Fridtjof Nansen. The result indicated among others that fish biomass had declined substantially and species composition dramatically changed since the historic surveys, in 1979 and 1980. As a consequence, this second (2015) survey in Myanmar came about after a request from Ministry of Livestock, Fisheries and Rural Development, Myanmar, to FAO to verify the results from the 2013 survey and to check seasonal changes in species composition and abundance. This survey is considered a critical component to identify threats to the ecosystems and to monitor the early effect of the management measures put in place. The survey will also provide capacity building of trainees and young scientists in Myanmar.

The results from the Dr. Fridtjof Nansen survey in 2013 provided up to date data on fish distribution, their population and oceanography. This information was applied by the Myanmar government in sustainable planning, management and development in relation to coastal and marine ecosystems. As a direct consequence of the survey, Myanmar has increased their attention on fisheries resources, conservation and sustainable development. Management measures put in place by the government since 2013 include closed season for all fishing gears for all marine waters in Myanmar (May-June, 2014, and May-July in 2015), reduction in the numbers of fishing rafts in the Delta region, banning of foreign fishing vessels (all trawlers) and prohibition in respect to construction of local fishing vessels. The purpose of these measures has been to reduce the fishing pressure.

The cause of loss and unsustainable use of coastal and marine fisheries resources in Myanmar are related with a number of different aspects involving for example limited knowledge and understanding by different stake holders; capacity constraints; lack of environmental safeguards; under-valuation of resources; lack of comprehensive land-use policies and plans; gaps in legislations and weak enforcement; poverty and subsistence needs; lack of grassroots support for conservation; and global climate change. The Department of Fisheries in Myanmar also has limited staff and budgets to regularly patrol for illegal fisheries in the offshore areas of Myanmar, except in partnership with the Myanmar Navy.

This second ecosystem survey was designed to be executed during a different season of the year cycle from the 2013-survey. Assessed comparatively these two surveys should identify seasonal differences, which is crucial for understanding the fish abundance and distribution on the shelf and slope. The study

will cover important levels of the food chain such as the demersal and pelagic fish, zoo- and phytoplankton as well as investigate factors representing the physical environment. The survey is a co-operation between the Myanmar government, the EAF-Nansen Project of FAO, The Norwegian Embassy to Myanmar, and the BOBLME project.

1.1 The survey area

The BOBLME national report of Myanmar “On the Sustainable Management of the Bay of Bengal Large Marine Ecosystem” gives an 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 9° 32' and 28° 31' N, and longitudes 92° 10' and 101° 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 km², and is relatively wider in the central and southern parts. The Exclusive Economic Zone (EEZ) is about 486,000 km². The coastal zones of Myanmar can be subdivided into three main areas, namely the Rakhine Coast, Ayeyarwady Delta and Tanintharyi Coast. Parts of the coast are heavily influenced from fresh water from the many rivers that flow to the coast 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 on the Tanintharyi coast.

1.2 Aims and objectives

The purpose of the R/V ‘Dr. Fridtjof Nansen’ survey is established in the cruise plan forwarded from IMR to DoF before the survey, in the terms of reference (ToR) for the survey from FAO and in meetings between DoF representatives and the cruise leader before the onset of the survey in Yangon on the 26 and 27 April 2015. The design of the survey copy as far as possible the course track and sampling stations of the 2013 ecosystem survey to make the two surveys as comparable as possible.

Based on the sampling priorities and discussions the main objectives of the survey have been 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 Myanmar 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.

Table 1.1 List of participants and their affiliation.

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List of institution abbreviations:

IMR - Institute of Marine Research

DoF - Department of fisheries, Ministry of Livestock, Fisheries and Rural Development

MLMU- Mawlamyine University, Mon State

MU- Myeik University

YGNU- Yangon University

NAVY - Myanmar Navy Hydrographic office

1.4 Narrative

The vessel left port in Yangon, Myanmar 28. April at 10:30 local time (local time = UTC+6.5 hours) and travelled to the northern part of the survey area south of the border with Bangladesh. After completion of bunkering in Sandoway Bay on the 30. April at 15:00 the vessel continued to the start position at 19°41' N and 92°15'E, slightly further north than the start of the 2013 survey. This was reached just after midnight on the 1. May, and the first trawl was towed early that morning. The coverage of the northern Rakhine region was completed on 8. May at 07:30 in the morning. The coverage of the next region, the Ayeyarwady delta coastal zone (Gulf of Mottama) commenced subsequently. On the 15. Mai at 15:30 it was necessary to break off the survey-grid to search medical treatment of a sick survey participant. He was offloaded onshore at 00:30 and the vessel could return to transect. The following trawl was carried out on the 16. May at 09:30. During 17. May, the vessel anchored at lunch-time for the celebration of the Norwegian constitution day. The next day the survey continued at 12:00. The Delta region was completed on 20. May at 17:00 local time. The third region, the coverage of the Tanintharyi coast commenced immediately after and was completed on 30. May at 14:00. The vessel

carried out acoustic bottom mapping in an area 10°12' N, 97°51' E. until the cruise terminated on the 1. June after a wrap-up meeting and offloading of samples in vicinity of the city Kaw Thoung. After the Myanmar scientists left the boat, the vessel steamed to Phuket for crew change and offloading of the Norwegian scientists.

The survey followed the same design as during the 2013 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, 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 also on random along transects when time permitted. CTD's were taken at each bottom trawl station. The survey was carried out around the clock. As far as possible it was attempted to carry out shallow water station during the day to reduce the effect of diel migration on the estimate but due to the very long shelf in Myanmar this was not always practically possible.

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, 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, and data from the thermosalinograph and a weather station were recording continuously during the survey.

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 Ayeyarwady delta (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 are illustrated in Figure 1.1. while the hydrographic stations and the position of the ecosystem transects are displayed in Figures 1.2. Table 1.2 summarises the survey effort in each of the sub-areas.

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 coast	962	49	16	14	13	5	1	4	77	15	41
Deltaic coast	2044	61	15	25	16	5	0	2	76	10	55
Tanintharyi coast	1496	61	10	21	10	17	3	1	78	12	58
Total	4502	171	41	60	39	27	4	7	231	37	154

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

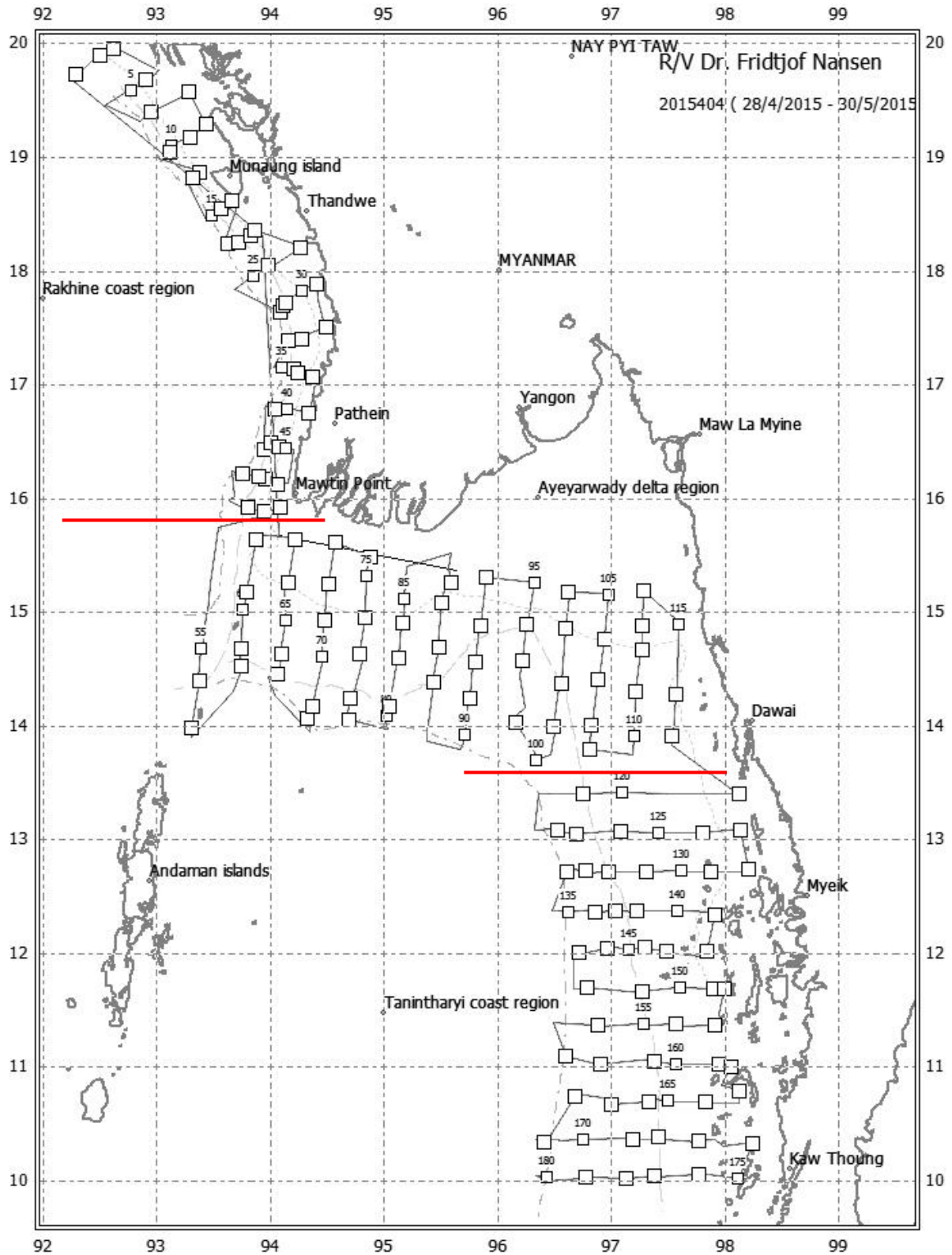


Figure 1.1. Course track with bottom (□) and pelagic (Δ) trawl stations. The 50 m, 100 m and 500 m depth contour is indicated. The red lines indicate the separation between the three main regions.

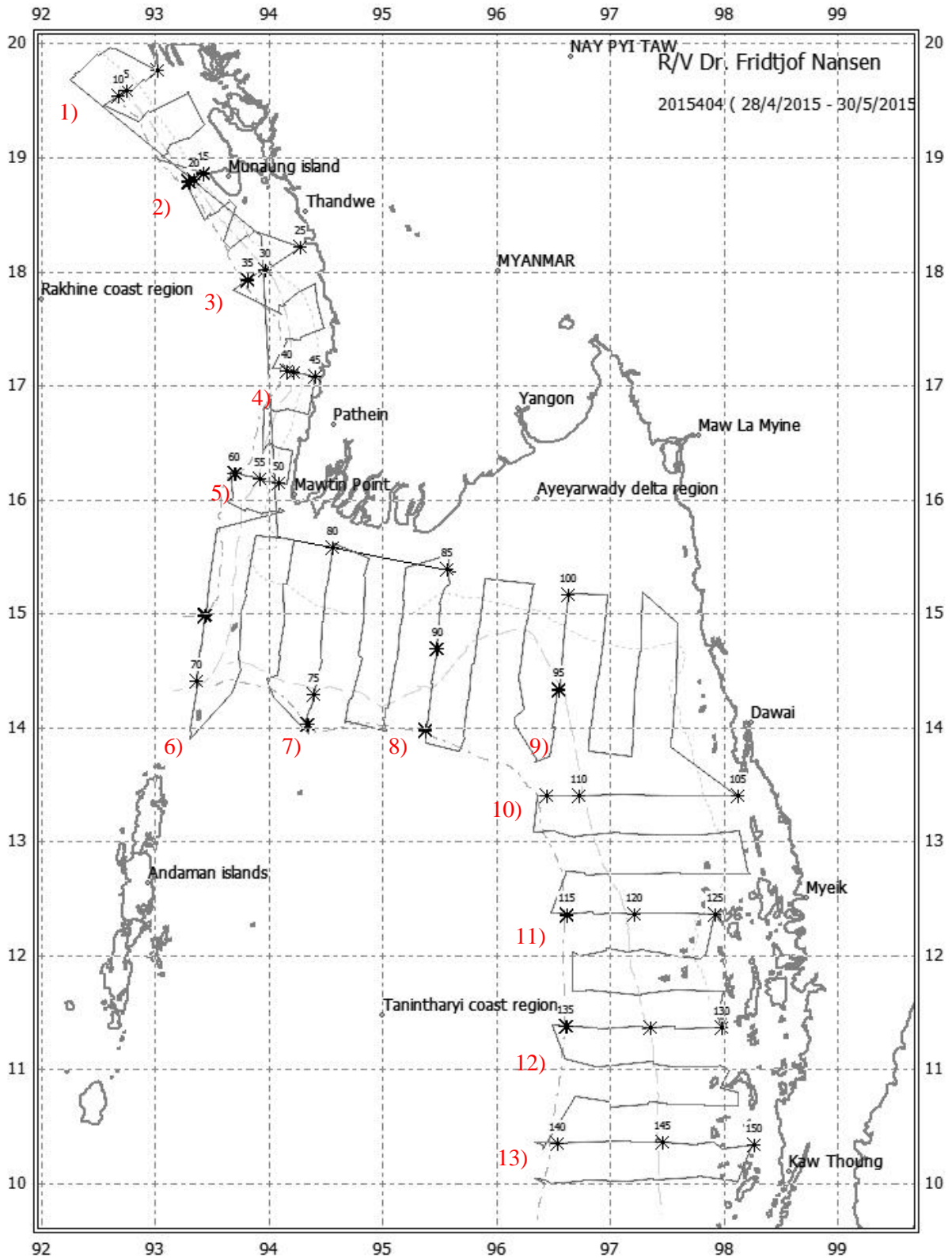


Figure 1.2 Course track with hydrographic (Z) stations. The 50 m, 100 m and 500 m depth contour is indicated. The numbers 1-13 indicate the position of the “Ecosystem transect”.

CHAPTER 2 METHODS

2.1 Meteorological and hydrographic 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 DNMI meteorological weather station.

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, pressure sensor, SBE 43 oxygen sensor, Benthos PSA-916 Sonar altimeter and a Satlantic PAR sensor. Real-time logging and plotting was done using the Seabird Seasave software. Above the shelf and slope, the profiles ranged from the surface to within a few metres above the bottom. 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 between Figures.

9 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 9 Niskin-bottles at selected deep plankton-stations were analysed 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 (20 ml) 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, 400, 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). The analyses will be/was made on shore by the Institute of Marine Research (Bergen, Norway), using a modified Alpkem Auto Analyser C (O I Analytical, USA) and following standard procedures (Strickland and Parsons, 1972).

Chlorophyll a is a plant pigment, which in oceanography typically is used as an indirect measure for phytoplankton biomass. For analysis of chlorophyll an 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. The water-samples were filtered on Munktell fibre glass 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. The analyses will be made on shore by Institute of Marine Research (Bergen, Norway). The pigments were extracted with 90% acetone, 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 an and phaeopigments estimated according to Holm-Hansen et al. (1965).

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.

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 at a speed $<0.1 \text{ ms}^{-1}$ from the depth of 25 m to the surface. 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 Niskin-bottles representing ocean depths of 25, 5, and 0 m for the 30 m depth stations, and 75, 50, 25, 5 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 m². 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 $\sim 1.35 - 1.55 \text{ ms}^{-1}$. 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 $\sim 0.5 \text{ ms}^{-1}$.

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 $>2000 \mu\text{m}$, 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 ~ 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), and stored frozen (-18°C) for further analyses of sedimentological and chemical composition after the survey.

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 echosounder 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. Raw data from the EM 710 multibeam echo sounder was stored to disk in selected areas for later analyses. The data was also logged to the on-board Olex plotting system.

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 in Angola prior to the survey on the 21/02 2015. 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

Acoustic data were post-processed and scrutinized using the latest acoustic data post-processing software the Large Scale Survey System (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 species groups. Note only main species are listed.

Group	Taxon	Species	
Pelagic species 1	Clupeidae ¹	<i>Dussumieria spp.</i> <i>Ilisha spp.</i> <i>Sardinella spp</i> <i>Anodontostoma chacunda</i>	
	Engraulidae	<i>Coilia spp.</i> <i>Stolephorus spp.</i> <i>Setipinna sp.</i> <i>Thryssa spp.</i>	
Pelagic species 2	Carangidae ²	<i>Alectis spp.</i> <i>Atule mate</i> <i>Atropus atropos</i> <i>Caranx spp.</i> <i>Carangoides spp.</i> <i>Decapterus spp.</i> <i>Scomberoides spp.</i> <i>Megalaspis cordyla</i> <i>Parastromateus niger</i> <i>Scomberoides spp.</i> <i>Uraspis spp.</i>	
		Scombridae	<i>Rastrelliger spp.</i> <i>Scomberomorus spp.</i>
		Sphyraenidae	<i>Sphyraena spp.</i>
		Trichiuridae	<i>Lepturacanthus savala</i>
			<i>Tentoriceps cristatus</i>
			<i>Trichiurus lepturus</i>
Other demersal species	Demersal families		
Mesopelagic species	Myctophidae		
	Other mesopelagic fish		
Plankton	Calanoidae	<i>Calanus sp.</i>	
	Euphausiidae	<i>Meganyctiphanes sp.</i>	
	Other plankton		

The following target strength (TS) function was applied to convert sA-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

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

where L is the total length and CF is the reciprocal back scattering strength or the so-called fish conversion factor. Generally, in order to split and convert the allocated sA-values (m²/NM²) to fish densities (number per length group per NM²) 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 (NM²) of fish concentration

s_A = mean integrator value (echo density) in area A (m²/NM²)

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:

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

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, however, it is likely that this underestimates somewhat the true biomass of particularly the PEL 2 species.

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

2.8 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.

CHAPTER 3 WIND, HYDROGRAPHY AND PLANKTON

3.1 Horizontal patterns of wind and near-surface hydrography

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 5 m, are presented in Figures 3.2-3.5. The data presented in these figures were collected by the CTD, and CTD-attached sensors.

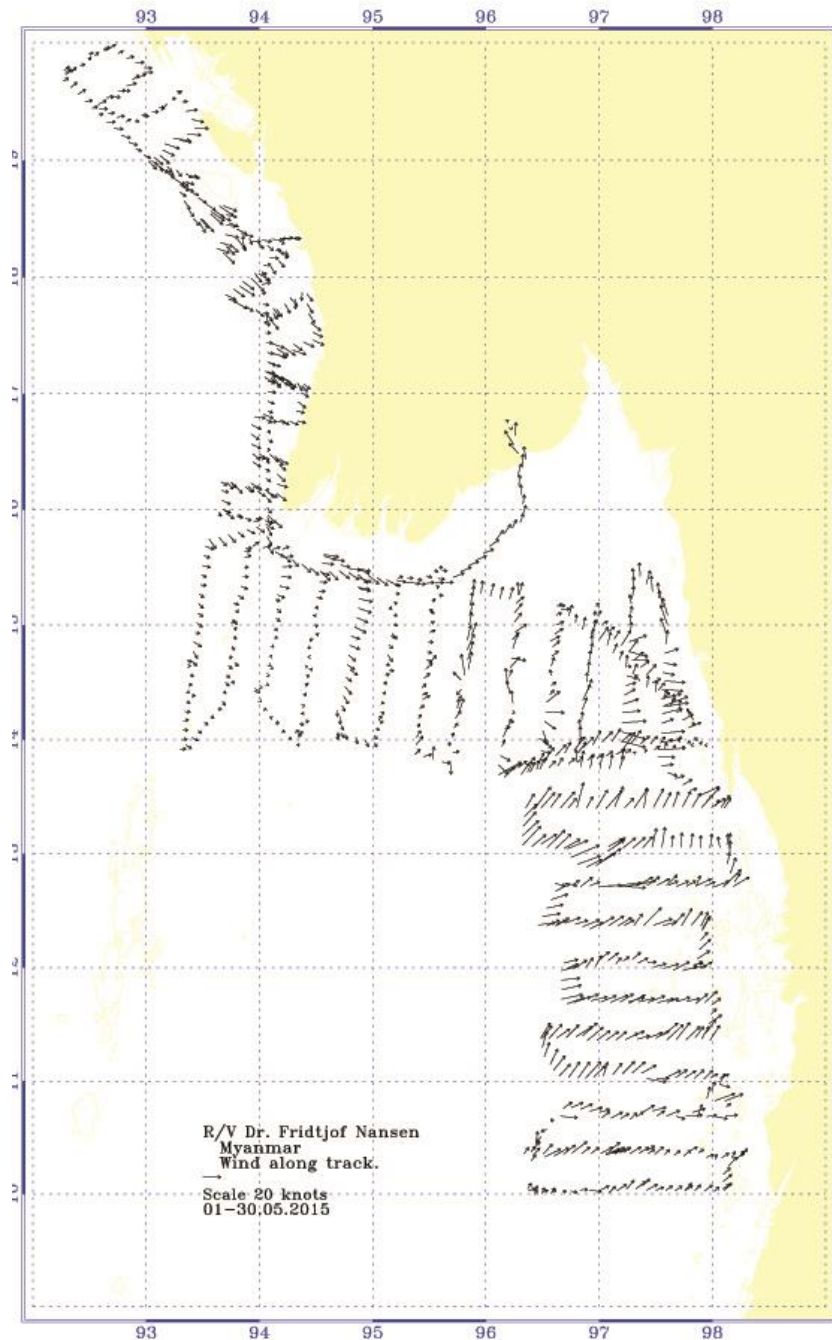


Figure 3.1. Wind speed and direction as recorded from the vessels weather station.

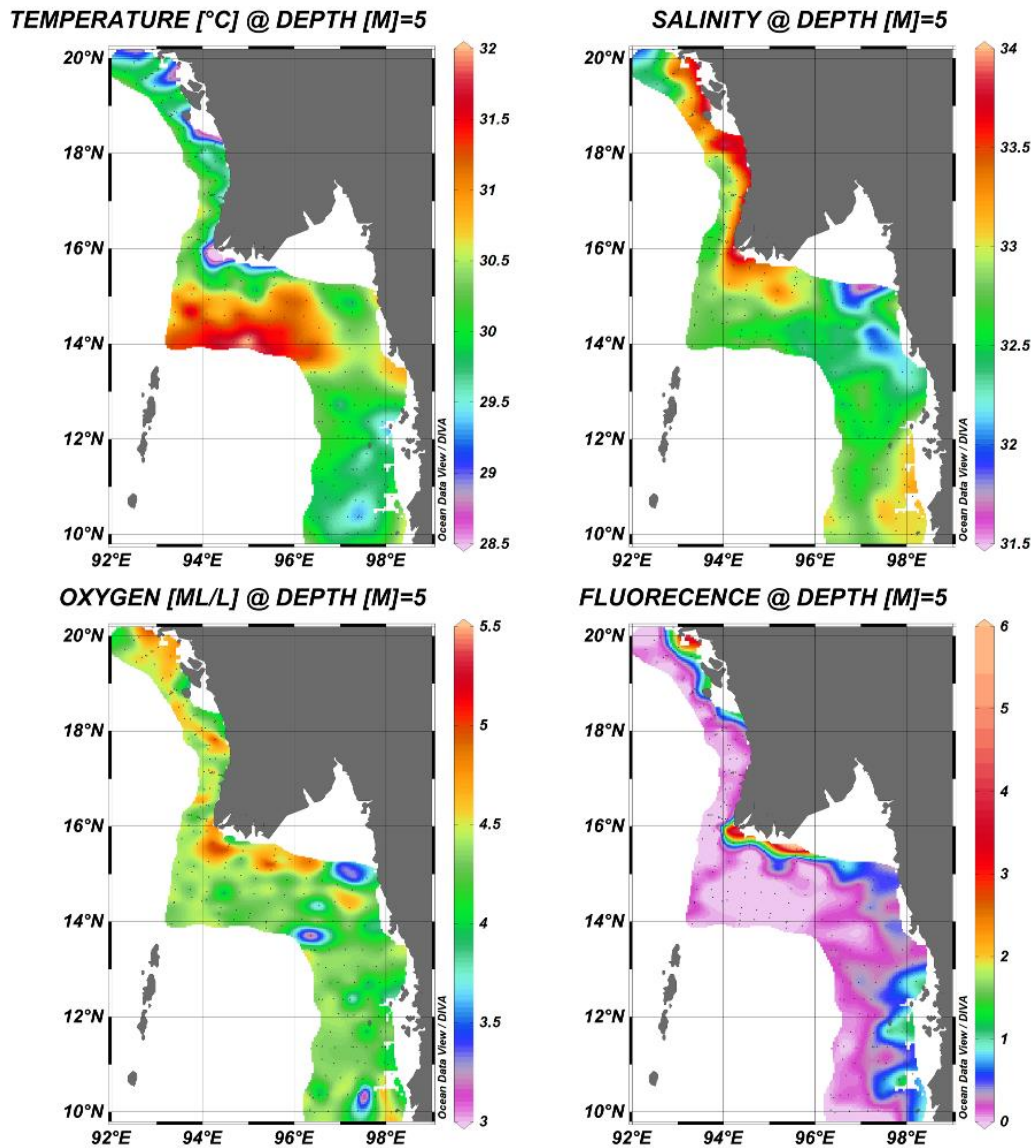


Figure 3.2. Horizontal near-surface (5 m depth) distributions of temperature, salinity, oxygen and fluorescence for the whole Myanmar coastal area. Station positions are indicated as black dots. Produced with the software Ocean Data View (v 4.7.2), interpolating by DIVA gridding (Ocean Data View, Schlitzer, R., <http://odv.awi.de>, 2015).

Rakhine coastal zone

A generally calm wind averaging 10.1 ± 3.4 (SD) m/s (max:22.0 m/s) (Figure 3.1). The direction was generally from W-NW.

Near-surface temperature (5m depth) along the Rakhine coastal zone ranged from 29°C to 30.5°C. Water plumes near the coast of the boarder to Bangladesh, to the north of and around Munaung Island, the waters off Thandwe and the coastline before entering the Ayeyarwady delta region (off Mawtin point) showed the lowest temperatures (Figure 3.3).

Near-surface salinity ranged between ~ 32-34, the waters furthest off the coast in the northern- and southern -most regions displayed the lowest salinity levels. The strongest salinity concentrations were associated close to shore along the entire Rakhine coastline.

The oxygen levels measured in the surface layer at depth of 5 m were generally quite high, between ~ 4 - 5 ml/l, and showed relatively high variability. The lowest concentrations were associated with the coldest water masses described above. Also relatively close to coast south of 18°N a small patch displayed oxygen concentrations in the upper range for the area. Data collected from the Thermosalinograph confirms high turbidity in this particular area, which could cause the elevated concentrations.

The near-surface relative fluorescence ranged from 0 to 2. The highest levels were found related to the shoreline except the part between 17-18°N.

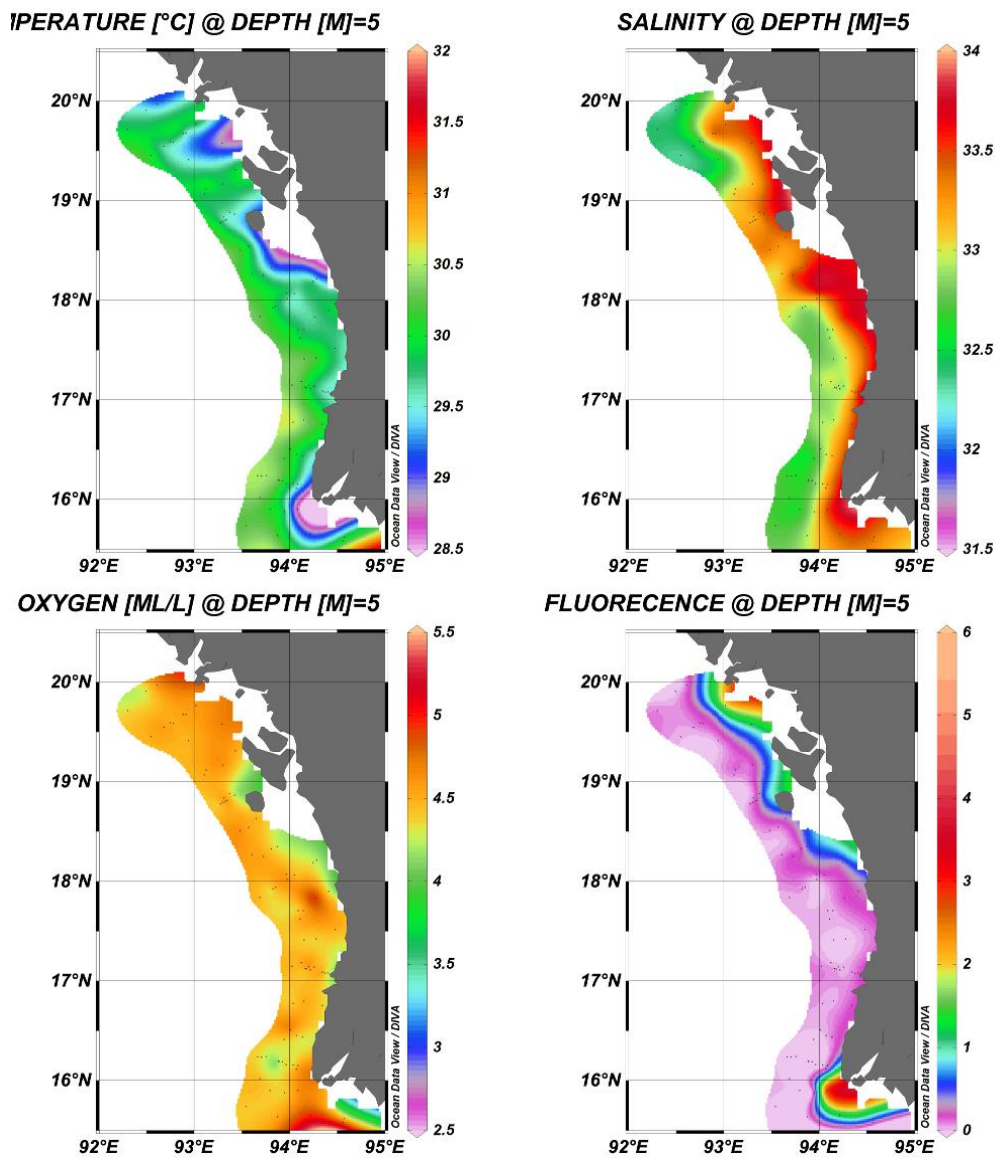


Figure 3.3. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Rakhine coastal region. Station positions indicated as black dots. Note variable colour scales for the different figures.

Ayeyarwady Delta region

The wind speed in this area averaged around 9.4 ± 4.9 (SD) m/s and the maximum recorded speed was 39.2 m/s. The wind was calmest in the western sector and increased in strength towards the east. The prevailing wind direction was from west but occasionally also from the south. The onset of the monsoon became very evident around 15 May when the wind increased considerable in combination with heavy rain falls.

Near-surface temperatures (5 m depth) at 32°C were observed in the outer-mouth and mid-parts of the Ayeyarwady Delta region, with a somewhat cooler area close to shore in the north (Figure 3.4). Furthest to the east of the Delta region, the temperatures were slightly cooler but not as cool as in the northern part. Salinity at 5 m depth, ranged from 31 to 34. The most saline water masses were associated with the cooler water in the northern part close to shore. Less saline water masses were found to the north east and south east. Oxygen-concentrations at depth of 5 m in the Delta region generally ranged between 2.5 and 5.5 ml/l. The highest concentrations were found south east in this region, but also associated with the cool and highest saline water in the northern part, which indicate that most likely these associated waters are influenced by upwelling. A relatively small plume of water located south east off the coast was found to have the lowest oxygen concentrations, possibly caused by advected waters from deeper layers along the shelf edge. Fluorescence (index on relative scale) varied strongly within the Delta region, with the values at 5 m spanning from near zero to a maximum of 6. The highest values were concentrated inshore in the north-eastern parts and were low for the remaining region.

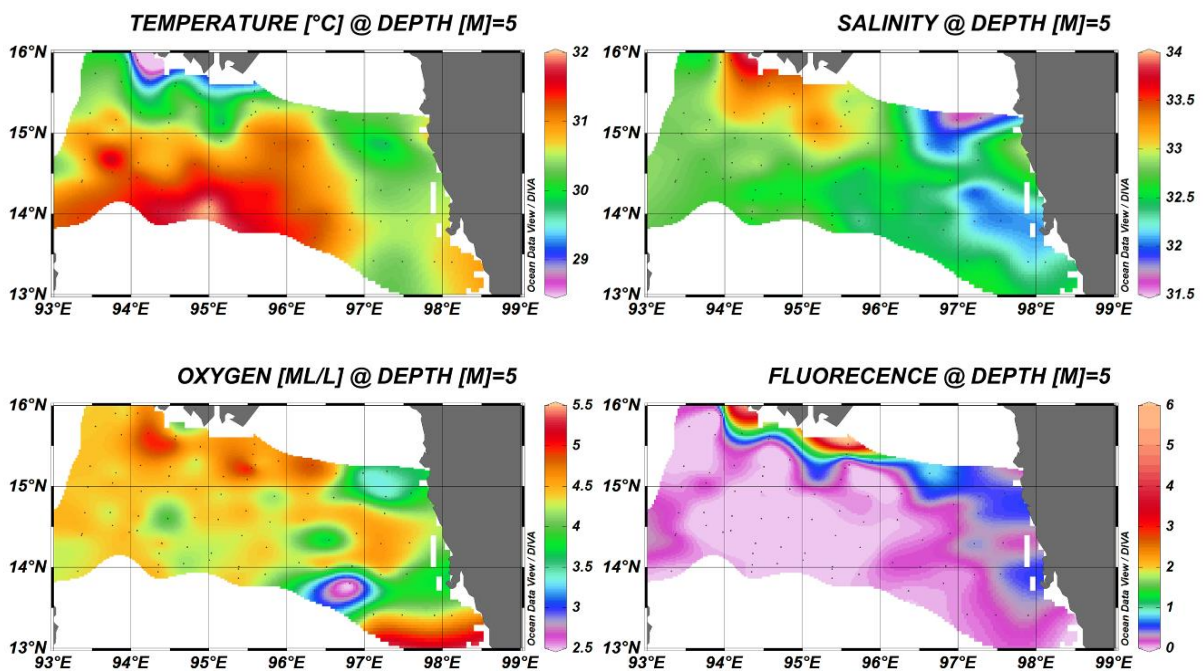


Figure 3.4. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Ayeyarwady Delta region. Station positions indicated as black dots. Note variable colour scales for the different figures.

Tanintharyi coastal region

The strongest wind was experienced in this region with an average at 14.9 ± 5.9 (SD) m/s and a maximum recorded at 49.8 m/s. The SW wind direction was dominating.

Temperatures at depth of 5 m 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 28-32 °C at this depth. A small plume between 11-10°N displayed the coolest water masses in this region. Oxygen concentrations were between 3 -5.5 ml/l, with the lowest concentration to the northwest and at the corresponding site (between 11-10°N) as for the cool water plume. The salinity levels were in the range 31.5-34. The lowest levels were found in the northern part of the delta region, highly influenced by river run off, but also in the region corresponding to the cool water plume and low temperature between 11-10°N, indicating a small upwelling region. The fluorescence was ranging from 0 to about 4. It was highest near shore and island groups in the mid part of the region and decreased towards the slope and the north parts.

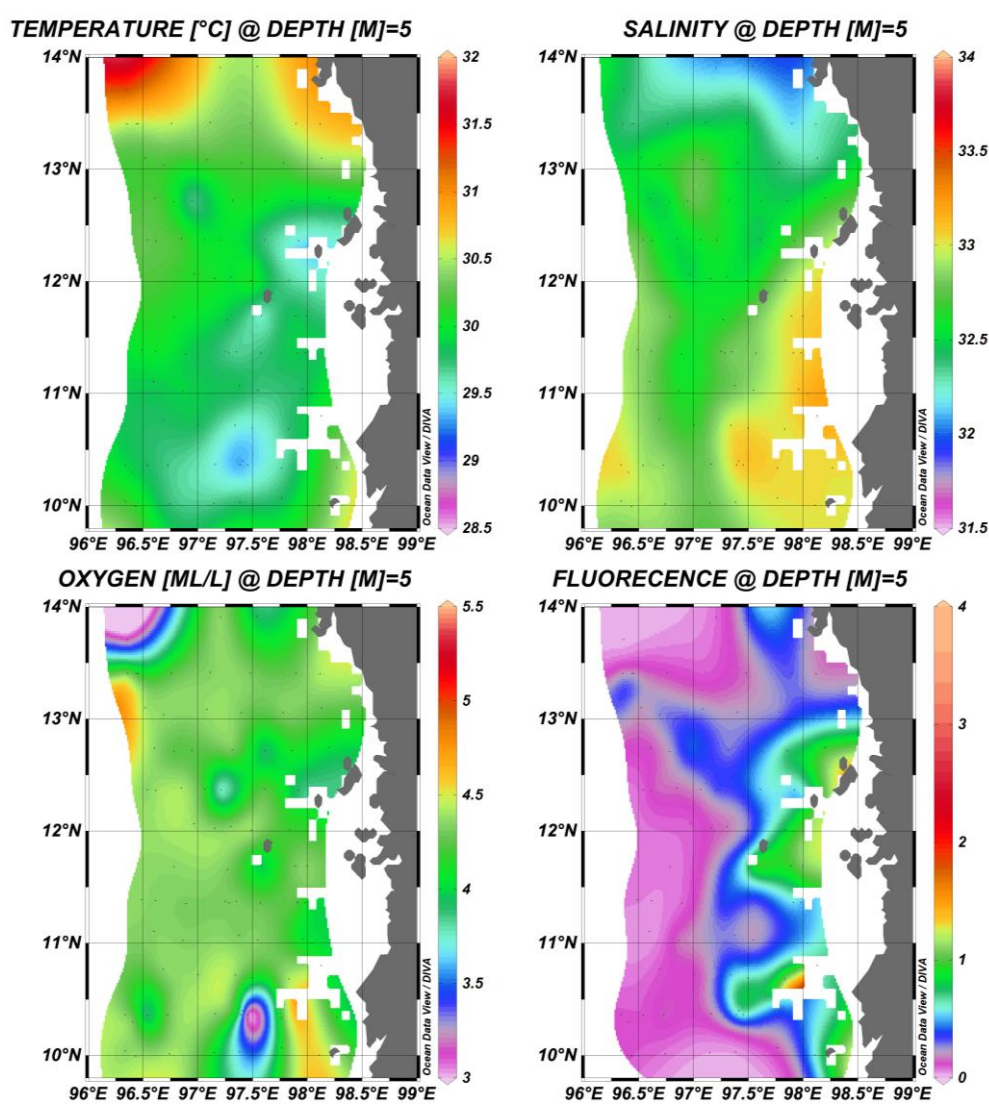


Figure 3.5. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Tanintharyi coastal region. Station positions indicated as black dots. Note variable colour scales for the different figures.

3.2 Cross shelf vertical profiles of hydrography, oxygen and fluorescence

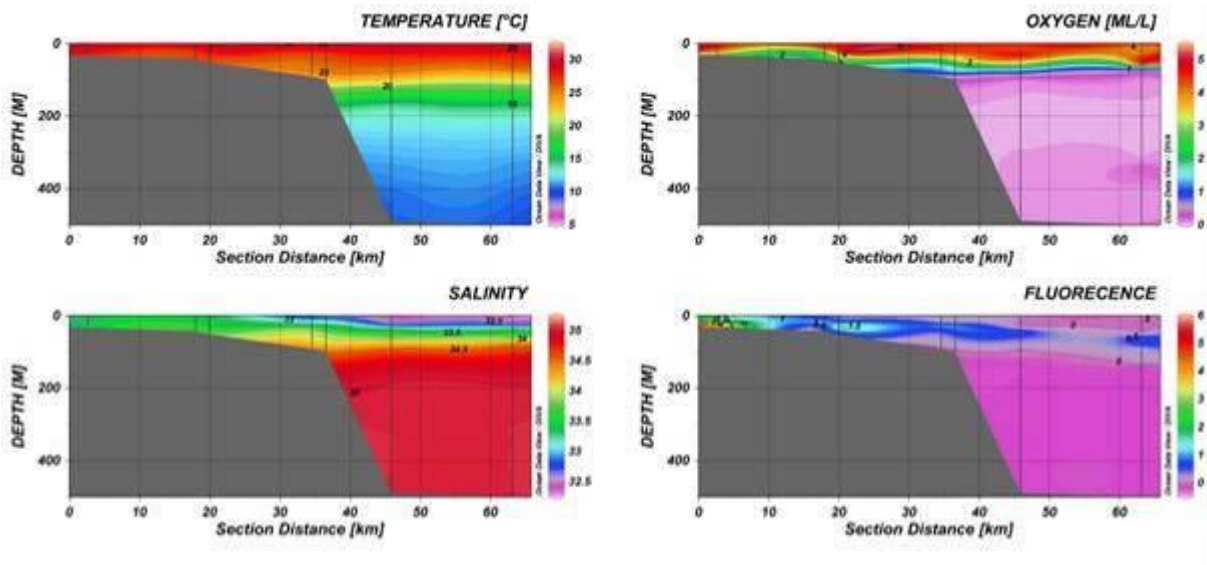
Cross shelf CTD profiles were made for all environmental transects. Stations were taken at predefined depths with a maximum of 1000 m. Figures 3.6 - 3.8 shows vertical distributions of temperature, salinity, oxygen, and fluorescence along the ecosystem transects to 500 m depth.

Rakhine coastal region

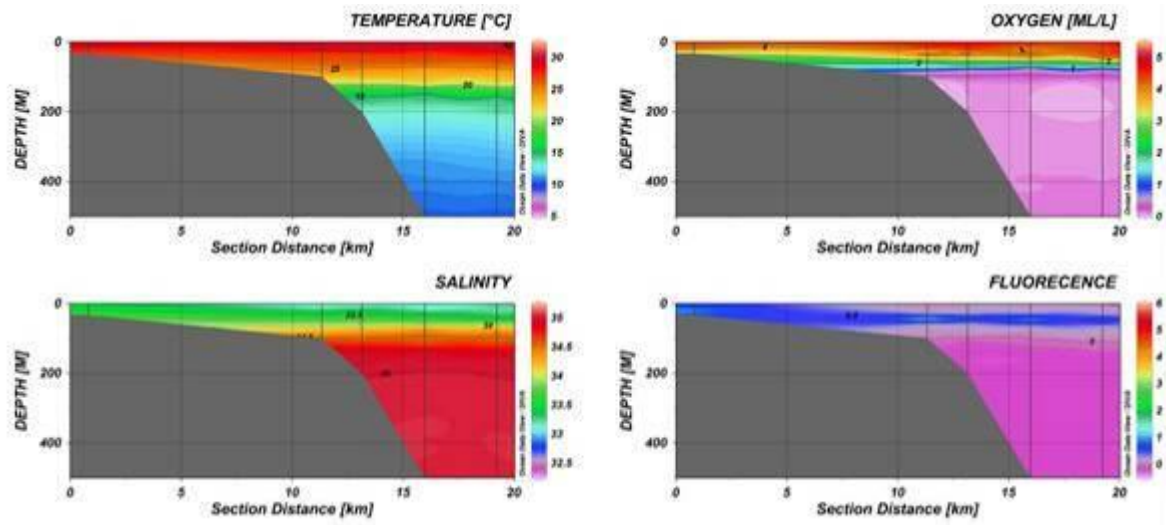
Five environmental transects were made along the Rakhine coast (Figure 3.6). The figure shows from north to south the hydrographic transects off 1. Phayonika, 2. Munaung Island, 3. Andrew Bay, 4. Dome Hill and 5. Mawtin Point (See Figure 1.2 for positions of the transects).

Common for all transect in this region was that the strongest temperature, oxygen and salinity clines were associated with the shelf edge and that the clines seems increasing in strength when steepness of the slope angle increased. The coldest water was typically $<10^{\circ}\text{C}$ in the 400-500 m depths, increasing to 15°C around 200 m and the associated waters above was where the most prominent temperature clines were located. The depth of the strongest salinity- and oxy -clines seem strongly correlated at around 70-100 m depth. Below this, the water masses were typically of highest salinity and with hypoxic O_2 levels <0.25 to more than 500 m depth. The fluorescence-maximum was generally found along the bottom of the shelf, and continued at around 50-80 m depth. Maximum fluorescence recordings were generally made inshore above the shelf; this was especially prominent for Transect 1 (Phayonika).

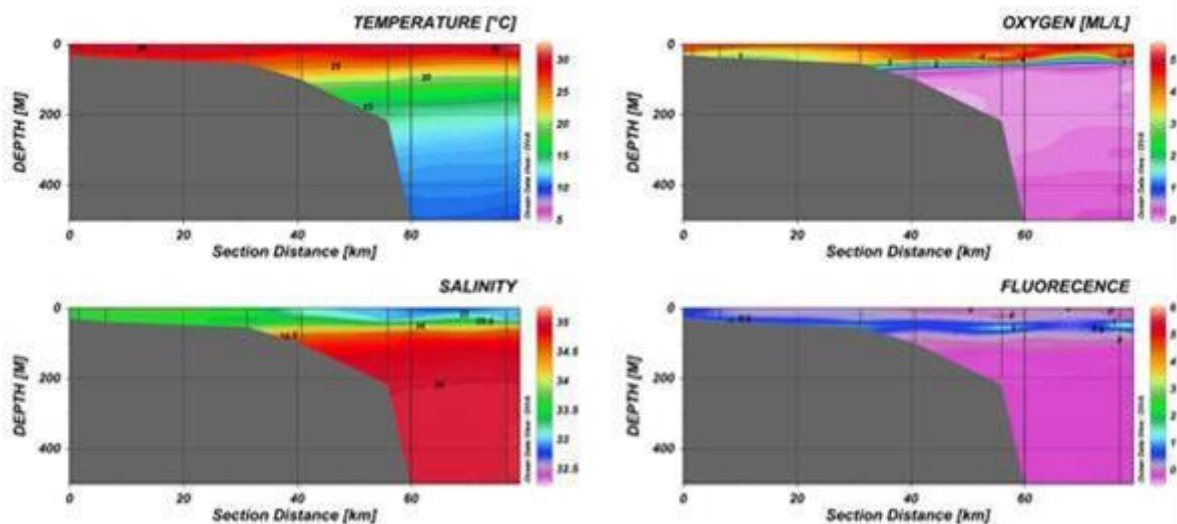
Transect Phayonika;



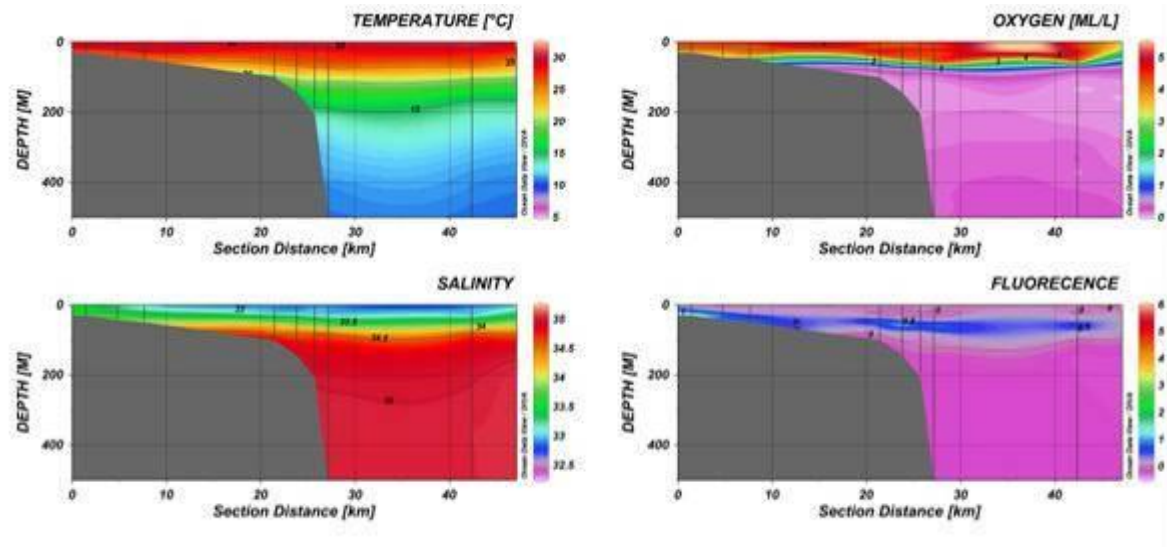
Transect Munaung;



Transect Andrew Bay;



Transect Dome Hill;



Transect Mawtin Point;

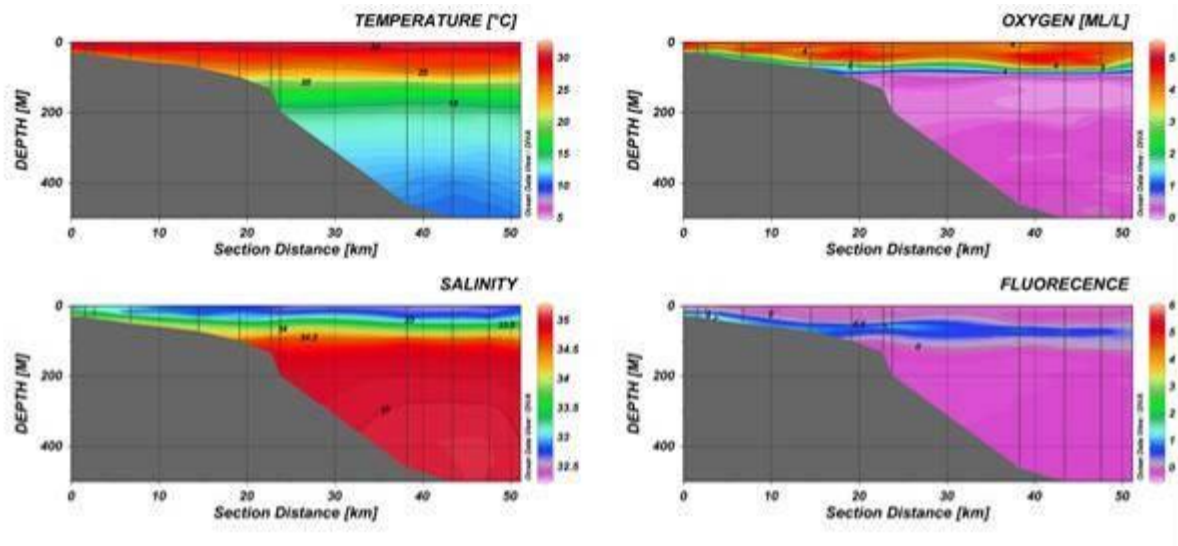


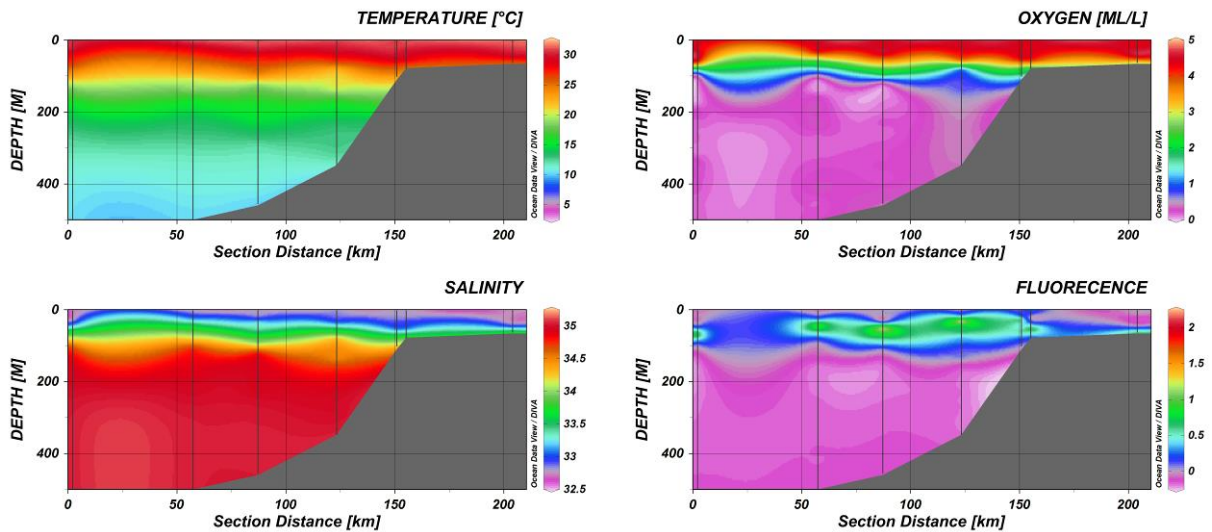
Figure 3.6. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Rakhine coastal region. Sections at Phayonika, Munaung, Andrew Bay, Dome Hill and Mawtin Point. CTD stations indicated by white vertical lines. Produced with the software Ocean Data View, interpolating by DIVA gridding (Ocean Data View (v 4.7.2), Schlitzer, R., <http://odv.awi.de>, 2015).

Ayeyarwady Delta region

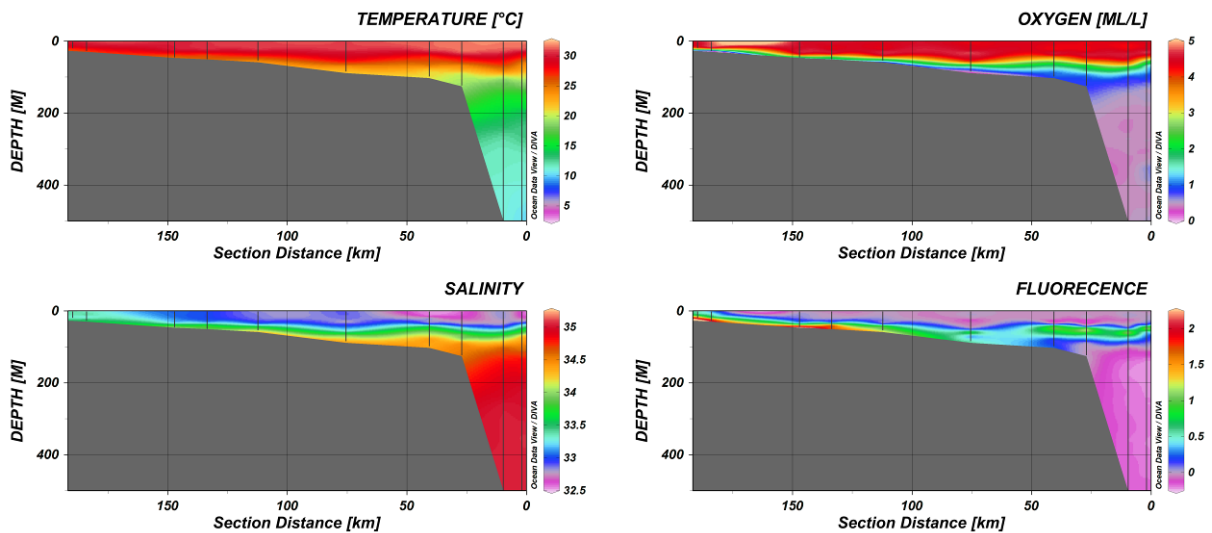
Four hydrographic transects were made across the shelf of the Ayeyarwady Delta region (Figure 3.7). The figure shows the hydrographic transects off 6. Nicobar, 7. Patheine -west, 8. Patheine-east, and 9. Yangon (See Figure 1.2 for position of the transects). Surface temperatures along these transects were high, typically above 30°C. Also here, we observed little variation in temperature between the coastal and offshore upper waters. The temperatures decreased with depth, a strong cline was located between 50- 80 m depending on location along the slope and at 100 m depth the temperatures were typically

about around 20°C. Temperatures at 500 m were roughly 5°C. The profiles generally showed high salinity (from 32.5 - 35), The highest salinity waters were typically deeper than 100 m and off the shelf edge. Oxygen concentrations were highest in the surface layers (typically ~ 4-5 ml/l), and decreasing with depth. A strong oxycline was found at depths of about 40-150 m. Below this, the water masses were typically hypoxic with O₂ levels <0.5 to down to the 500 m depths displayed. The fluorescence maximum was in general very low but located inshore, either along the bottom of the shelf or close to the surface. The highest levels also tended to continue at around 50-80 m depth at the outer part of the shelf and into more oceanic regions.

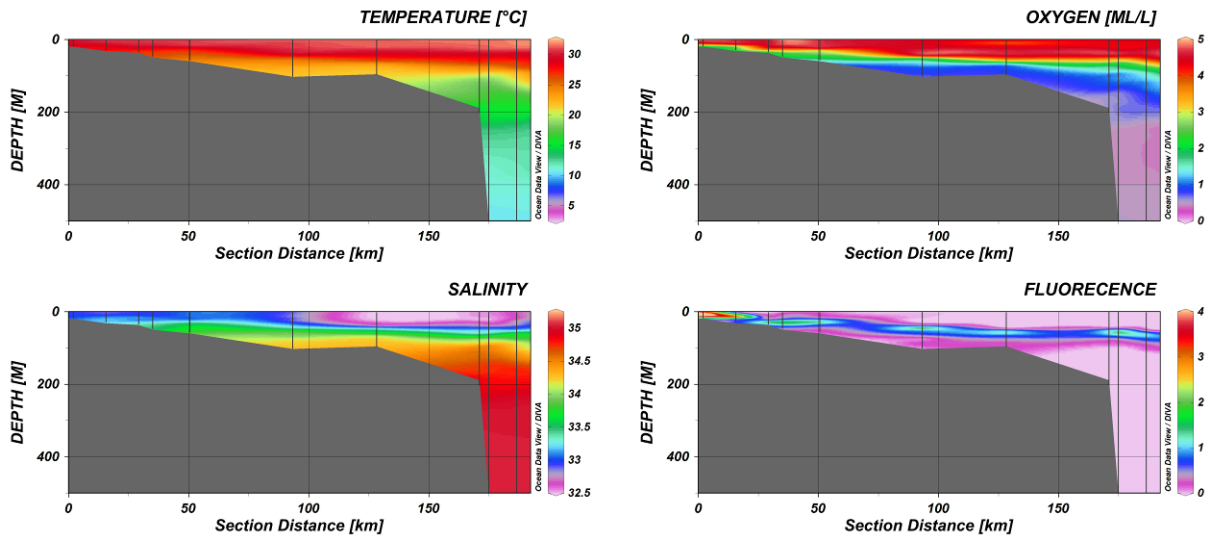
Transect Nicobar;



Transect Patheine – west;



Transect Patheine – east;



Transect Yangon;

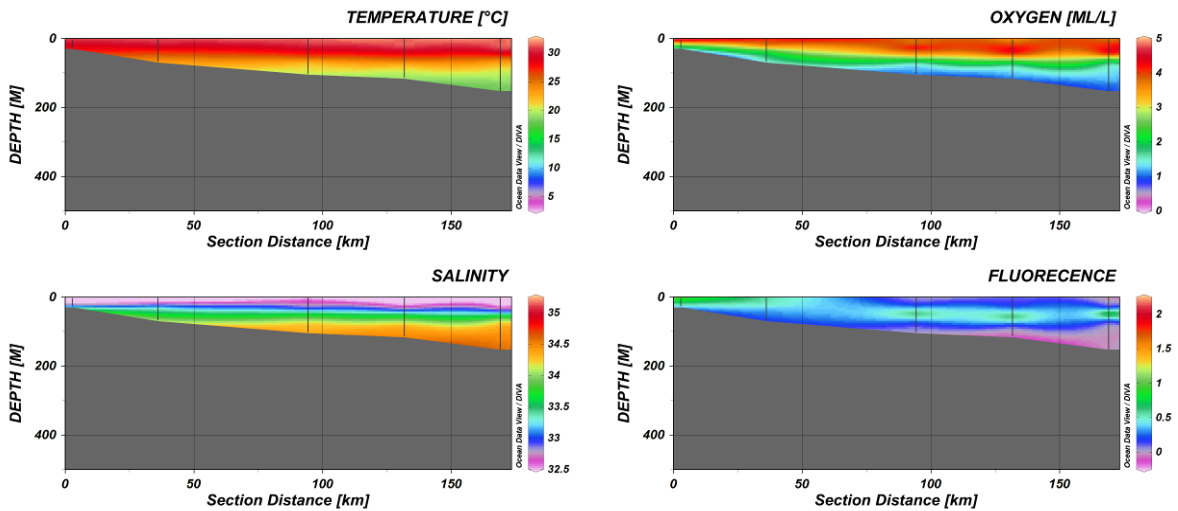


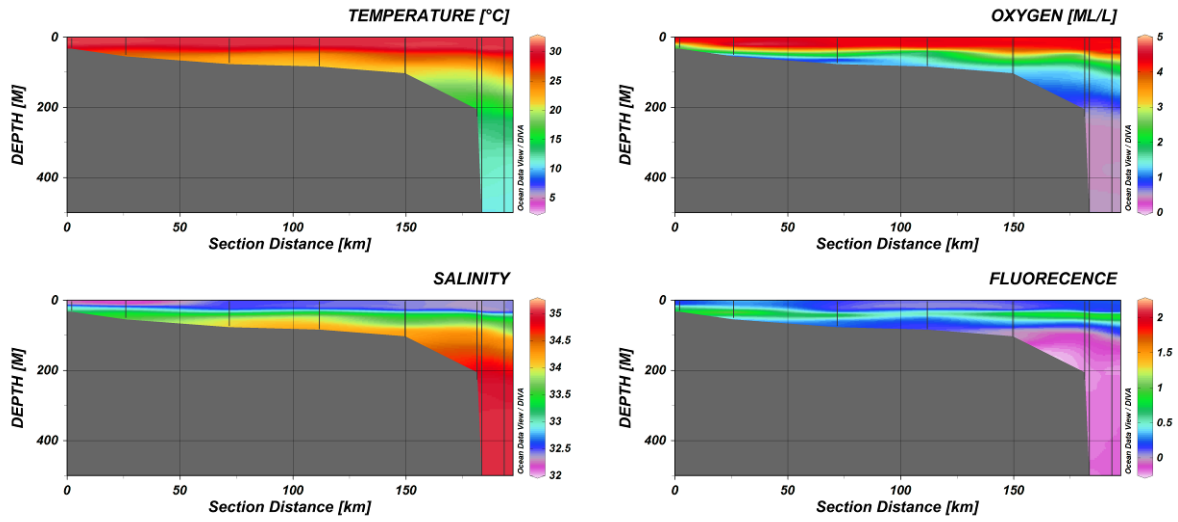
Figure 3.7. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Ayeyarwady delta region. Sections at Nicobar, Patheine west, Patheine east, Yangon. CTD stations indicated by white vertical lines.

Tanintharyi coastal zone

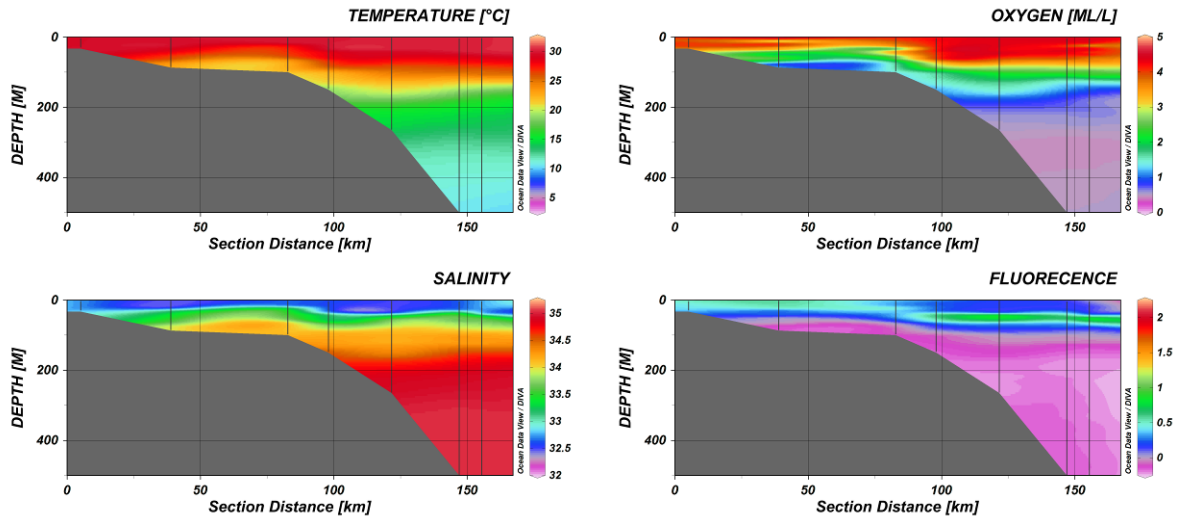
Four hydrographic transects were made across the shelf of the Tanintharyi coastal region (Figure 3.8). The figure shows the hydrographic transects off 10. Pe Det, 11. Tapo, 12. Bokpyin and 13. Kampong Lama (See Figure 1.2 for position of the transects). Surface temperatures along these transects were high, typically above $\sim 30^{\circ}\text{C}$. The temperatures decreased with depth, being roughly about 20°C at 100 m. The temperatures at 500 m were ca. $5\text{-}10^{\circ}\text{C}$. 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 100 m the salinity increased rapidly, and was rather stable around 35.0 in deeper waters. Oxygen concentrations were highest in the surface layers (typically $\sim 4\text{-}5\text{ ml/l}$). A strong oxycline was generally found at depths of about 40 - 120

m. Below this, the water masses were typically hypoxic with O₂ levels of ~0.5 or lower to more than 500 m depth. The fluorescence-maxima were typically rather low, and were observed inshore at rather shallow depths (Kampong Lama).

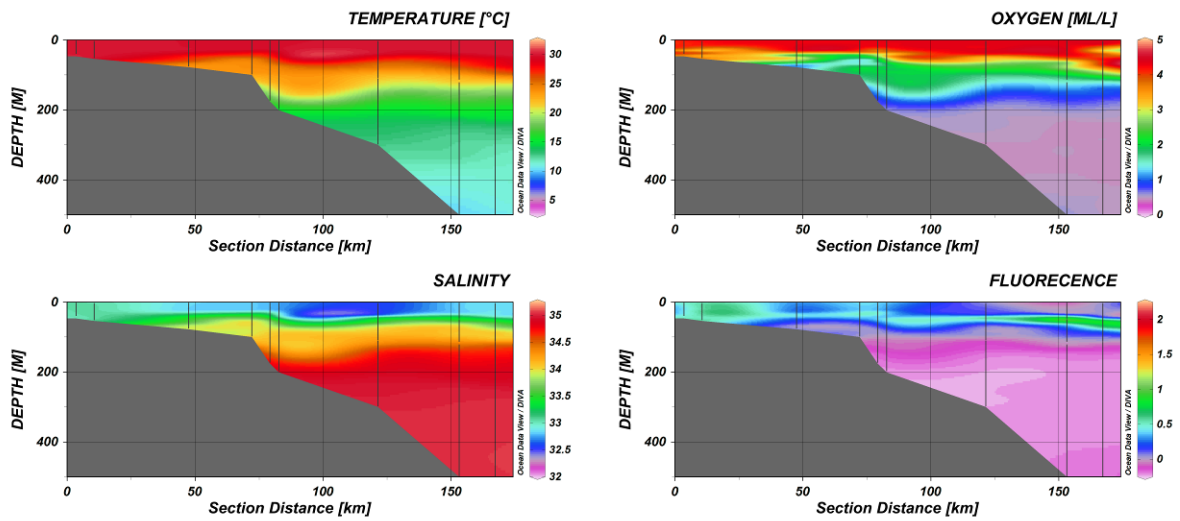
Transect Pe Det;



Transect Tapo;



Transect Bokpyin;



Transect Kampong Lama;

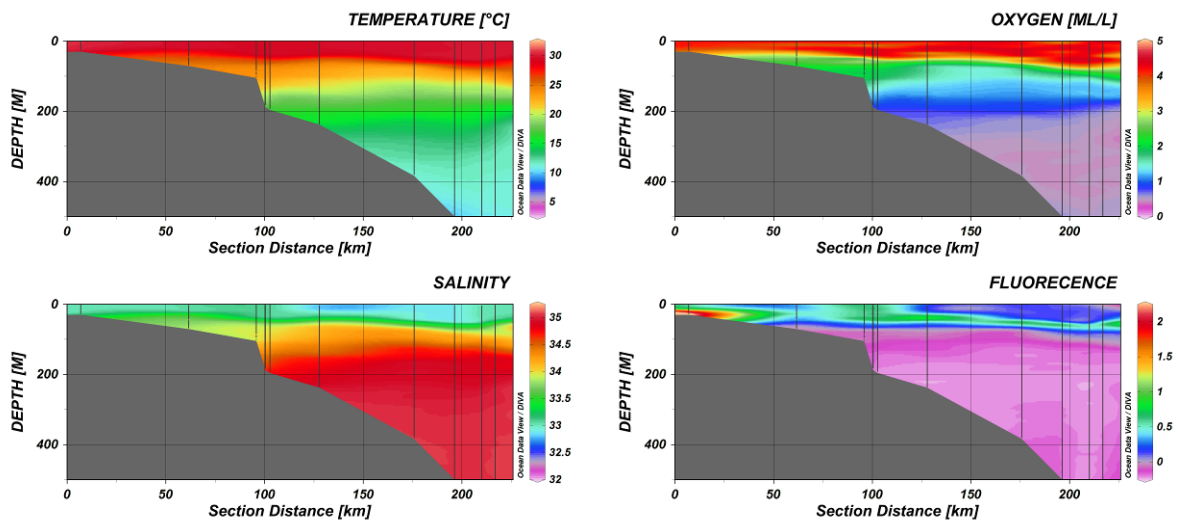


Figure 3.8. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Tanintharyi region. Sections at Pe Det, Tapo, Bokpyin, Kampong Lama. CTD stations indicated by white vertical lines.

3.3 Nutrients, chlorophyll and plankton

Chlorophyll and nutrients

The overall chlorophyll levels for the study area display levels regarded as generally low to moderate, Table 3.1, Figure 3.9. Nutrient levels required for phytoplankton growth (nitrite, nitrate, phosphate and silicate) are strongly depleted in the upper 50 meters of the water column compared to deeper waters Table 3.1, Figure 3.10. This could indicate production of phytoplankton in the upper water column, especially by the nitrate metabolizing phytoplankton since the concentrations increase markedly at greater depths. To be noted is that the most distinct high nutrient concentrations for the system, namely

silicate and nitrate are generally highest at the innermost stations near the coast, most likely as a result of river runoff. Only sporadic evidence in certain areas indicate signs of upwelling.

Table 3.1. Depth stratified mean (\pm SD) concentrations of nutrients and chlorophyll/phaeopigments found at environmental stations in Myanmar, 2015.

Nutrients/Depth	25-0 m	50-25 m	75-50 m	100-75 m	200-100 m
Nitrite ($\mu\text{mol/L}$)	0.12 ± 0.31	0.45 ± 0.40	0.24 ± 0.21	0.11 ± 0.06	0.04 ± 0.02
Nitrate ($\mu\text{mol/L}$)	0.33 ± 1.01	2.82 ± 3.35	15.66 ± 5.05	21.36 ± 5.19	33.04 ± 1.88
Phosphate ($\mu\text{mol/L}$)	0.17 ± 0.18	0.34 ± 0.27	1.21 ± 0.38	1.63 ± 0.39	2.32 ± 0.18
Silicate ($\mu\text{mol/L}$)	4.13 ± 2.70	5.40 ± 2.91	14.16 ± 4.51	20.13 ± 4.42	36.25 ± 3.18
Chlorophyll <i>a</i> (mg/m^3)	0.40 ± 0.41	0.32 ± 0.42	0.12 ± 0.06	0.05 ± 0.04	0.00 ± 0.00
Phaeopigment (mg/m^3)	0.26 ± 0.25	0.40 ± 0.28	0.33 ± 0.12	0.22 ± 0.07	0.06 ± 0.03

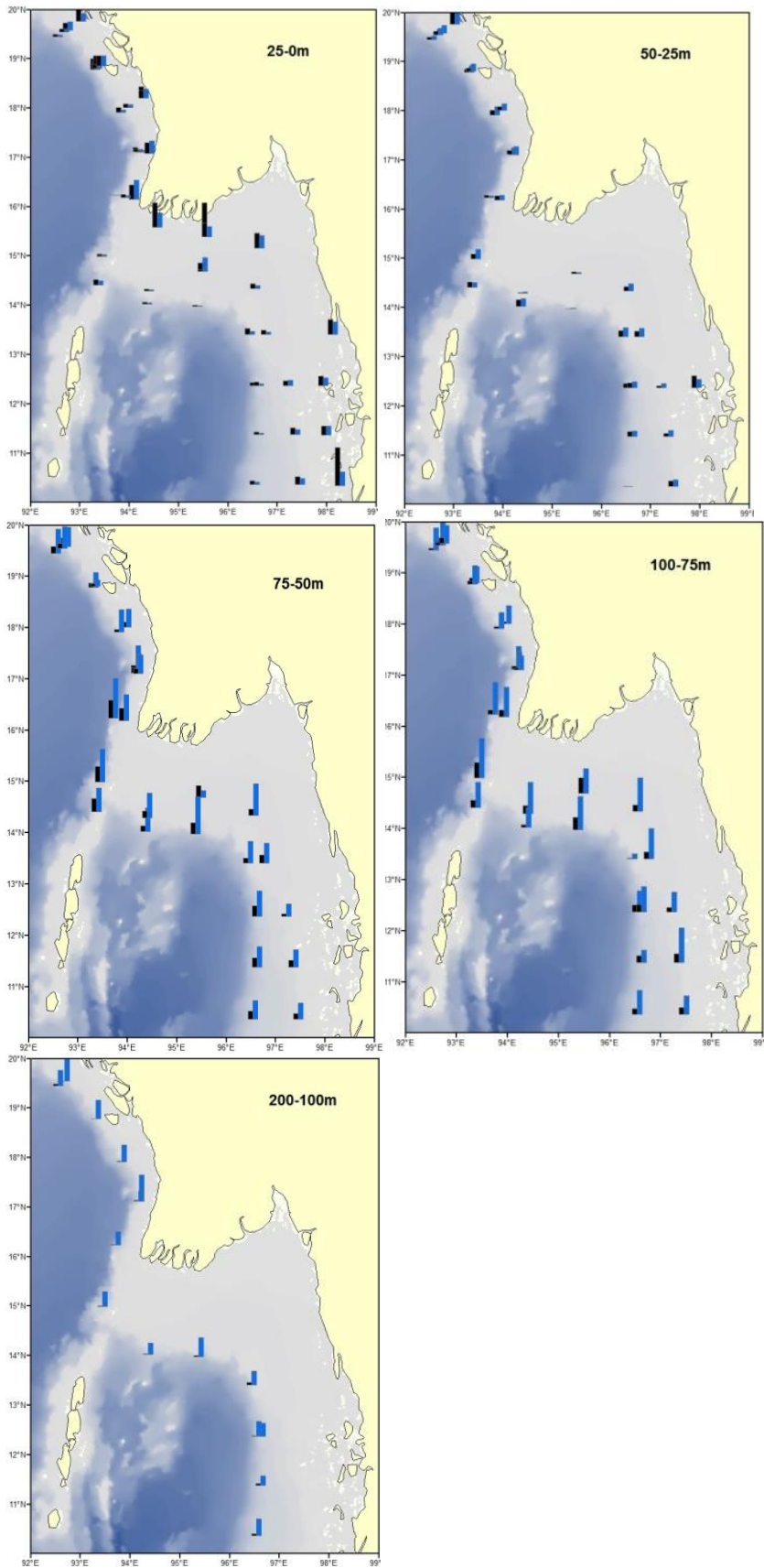


Figure 3.9. Chlorophyll a (black) and phaeopigment concentrations (blue) at 25-0 m, 50-25 m, 75-50 m, 100-75 m and 200-100 m depths, respectively.

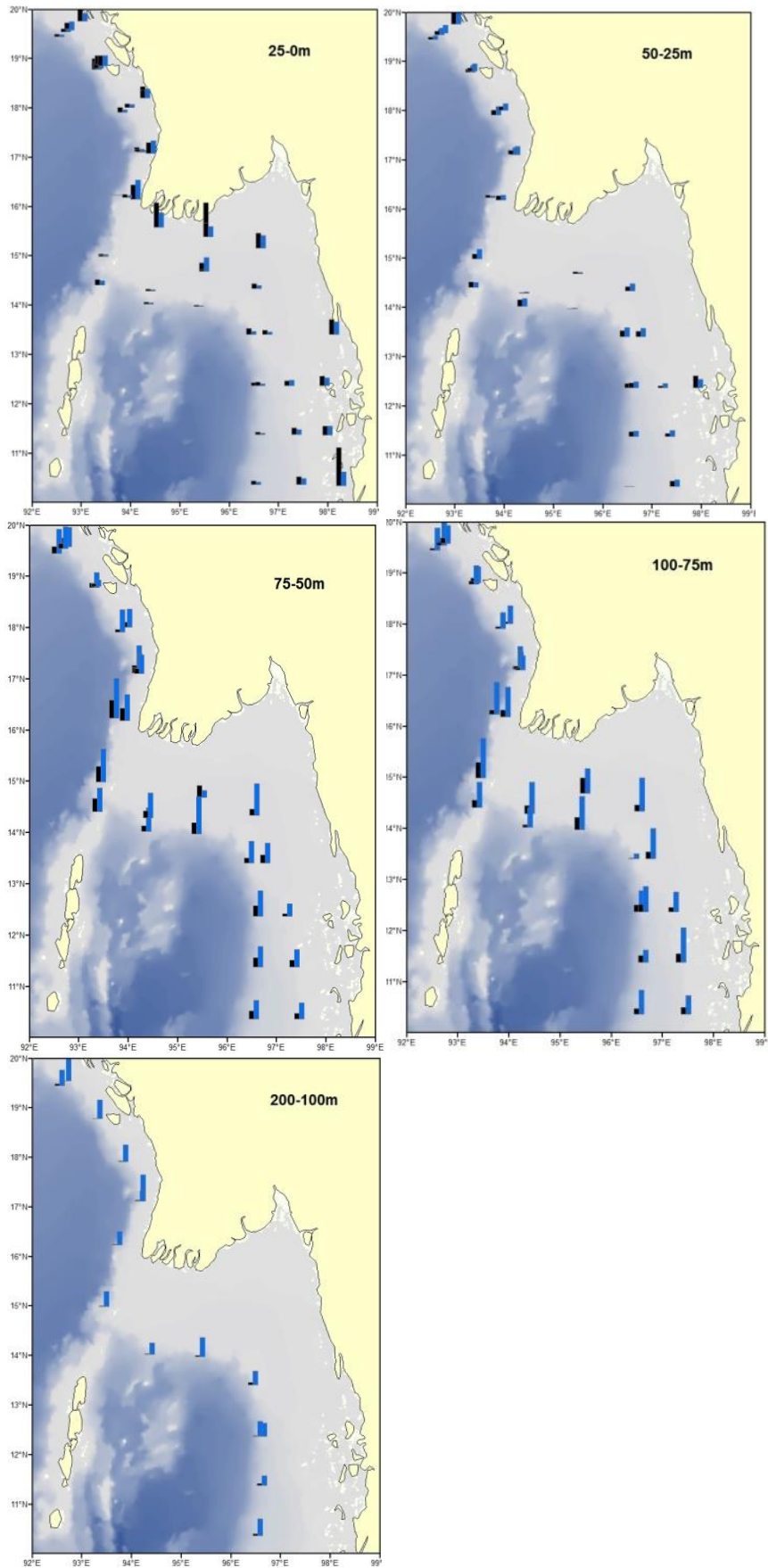


Figure 3.10. Nutrient concentrations: nitrite (red), nitrate (white), phosphate (yellow) and silicate (black) at 25-0 m, 50-25 m, 75-50 m, 100-75 m and 200-100 m depths, respectively.

Phytoplankton

Phytoplankton samples collected will be taxonomically analysed at a University/Institute in Myanmar.

Zooplankton biomass

All analysed samples for size-fractioned zooplankton biomass were completed at the IMR laboratory facilities during August of 2015. 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, Figures 3.9, 3.10 and 3.11).

The overall average zooplankton biomass for the surveyed area was 9.62 ± 3.38 (SD) g/m² dry weight, based on results from the WP2 net. The g/m² biomass distribution was represented with 29% at the 30 m bottom depth stations, 35% at the 100 m bottom depth stations and 35% at the 500 m bottom depth stations, overall. Along the Rakhine coast the largest biomass concentrations were associated with the shelf break, while this pattern was different for the Ayeyarwady Delta area and the Tanintharyi region. The Ayeyarwady Delta displayed the highest concentrations closer to shore, while biomass concentrations were more uniform over the shelf in the Tanintharyi region.

Macro-zooplankton biomass size distribution comprised of 20% >2000 µm, 29% between 2000-1000 µm and 54% between 1000-180 µm. In the >2000 µm fraction amphipods, arrow worms, jellyfish, krill, fish larvae and crab larvae occurred frequently and copepods occurred in a few samples. In the 2000-1000µm fraction the most common taxonomic groups were copepods, but also amphipods, krill, arrow worms, fish larvae, and some jellyfish occurred. In the 1000-180 µm fraction; copepods occurred in all samples and amphipods occurred in 17% of the samples.

All formalin-preserved zooplankton samples from the Multinet, Juday and WP2 will be analysed to the lowest taxonomic level at one or several Universities/Institutes in Myanmar.

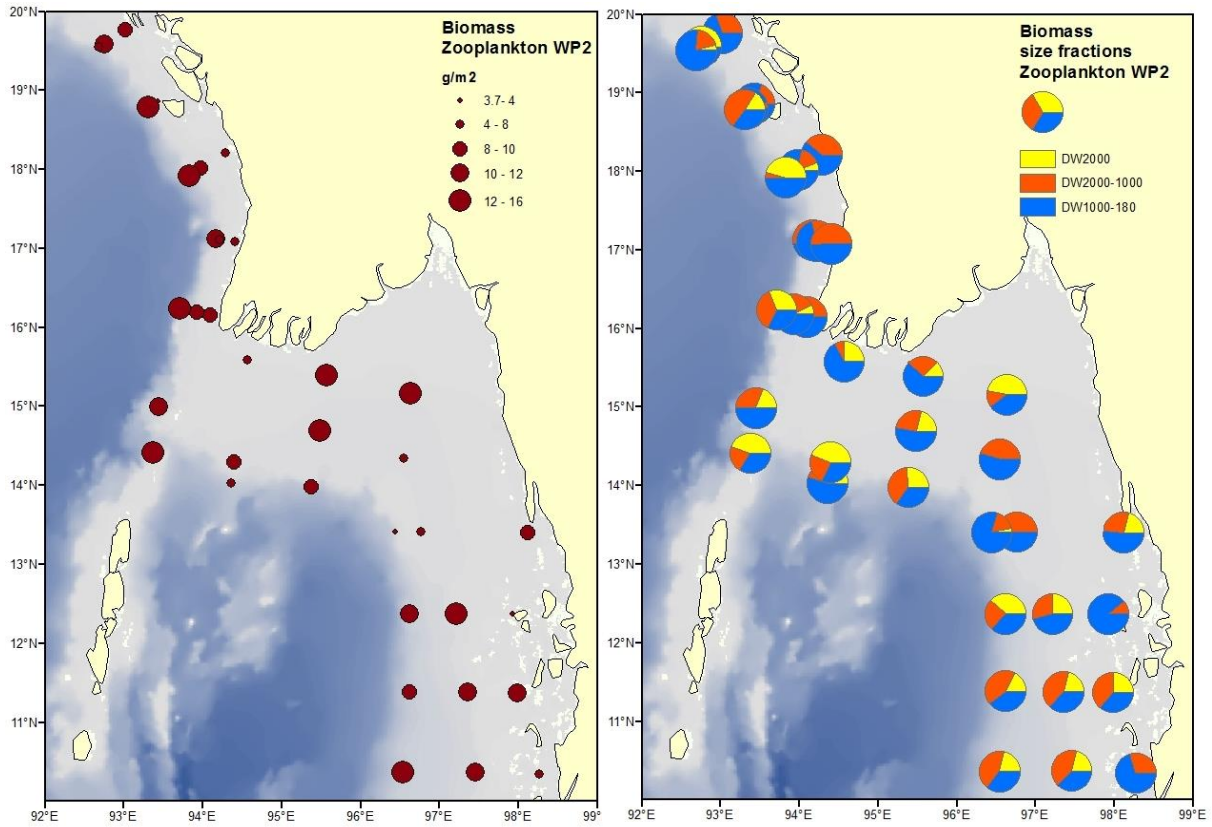


Figure 3.11. Zooplankton biomass (left) and zooplankton size fractions (right), based on analysed WP2 net samples.

3.4 Sediment samples

All sediment samples were offloaded in Phuket and delivered to BOBLME for arrangement of further analyses. Dr Somkiat, head of the Oceanography and Marine Environmental Unit at the Phuket Marine Biological Centre, agreed to work up the sediment samples.

CHAPTER 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. Acoustic registrations of pelagic fish were more widely distributed than in 2013 but of low density.

Acoustic distribution and abundance was estimated for two species groups during the survey. These were Pelagic 1 (Pel 1) and Pelagic 2 (Pel 2). 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 Pel 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 than e.g. the Carangidae and other Pel 2 species.

The data are presented for three main regions 1. Rakhine coast, 2. the Deltaic coast and 3. the Tanintharyi coast. The estimates presented in this report include the geographic region covered by the vessel and does not include any quantification of fish 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 inshore of the survey area is considerable. Summary of backscattered sA values and biomass estimates for the two species groups per region can be found in can be found in Table 4.1.

4.1 Rakhine coastal zone

Pelagic1

The most common Pel1 species on the Rakhine coast was the Engraulidae *Stolephorus indicus*, no other clupeoids were frequent in the catches on the coast. The distribution of this species were found in 3 separate low density concentrations close to the coast, mainly shallower than 50 m, in the northern central and southern part of the Rakhine coast. It is likely that the distribution of these species continued inshore of the surveyed area (Figure 4.1). A total acoustic abundance index of 21 000 tonnes of fish was estimated based on a set (average) total length of 10 cm (Table 4.1), this is about double of the estimate in 2013 of 10 000 tonnes, but is considered well within the range these species can fluctuate in abundance. Length frequencies of commonly caught species can be found in Annex II.

Pelagic2

The distribution of these species was as during the 2013 survey found in low density over most of the Rakhine coast, with the main concentration inshore but with occasional catches also close to the shelf break. (Figure 4.1). A total acoustic abundance index of 19 000 tonnes was found compared with 23 000 tonnes of fish in 2013. The estimates are based on a set (average) total length of 10 cm (Table 4.1). The most common Pel2 species found in the region was the Hairtails; *Trichiurus lepturus* and *Lepturacanthus savala* and the Carangids; *Selar crumenophthalmus* and *Decapterus russelli*. It is notably that the species composition of pelagic species was considerably different from the November-December 2013 survey. During that survey *Lepturacanthus savala*, the Carangid *Megalaspis cordyla*,

Carangoides malabaricus and the Scombrid *Scomberomorus guttatus* and *Rastrelliger kanagurta* dominated. Length frequencies of commonly caught species can be found in Annex II.

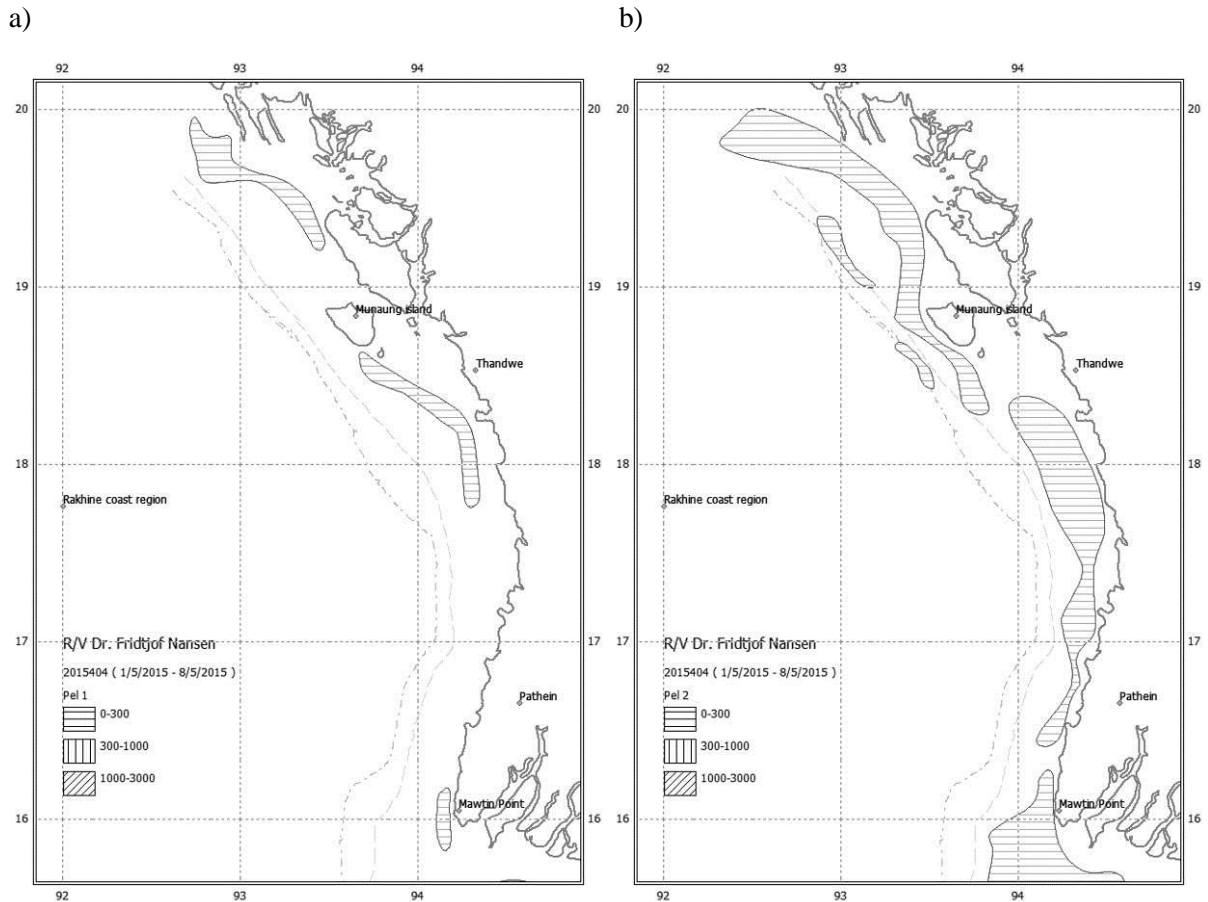


Figure 4.1. Distribution of acoustic backscattering of a) Pel 1 and b) Pel 2 species along the Rakhine coast

Generally juvenile forms of many pelagic and demersal species were found in the delta area, particularly inshore and in the east. These species were mixed with small shrimps and plankton in a dense layer very prominent in the acoustic recordings. Separation of species in this layer was impossible and these very small fish < 5 cm has been characterised as plankton. From the trawl catches it is also noticeable that the species composition found differs noticeably from the findings in the 2013 survey. This may be related to the period of the surveys post monsoon and pre monsoon respectively. Of the pelagic targets that was possible to separate the following was found.

4.2 Ayeyarwady Delta region

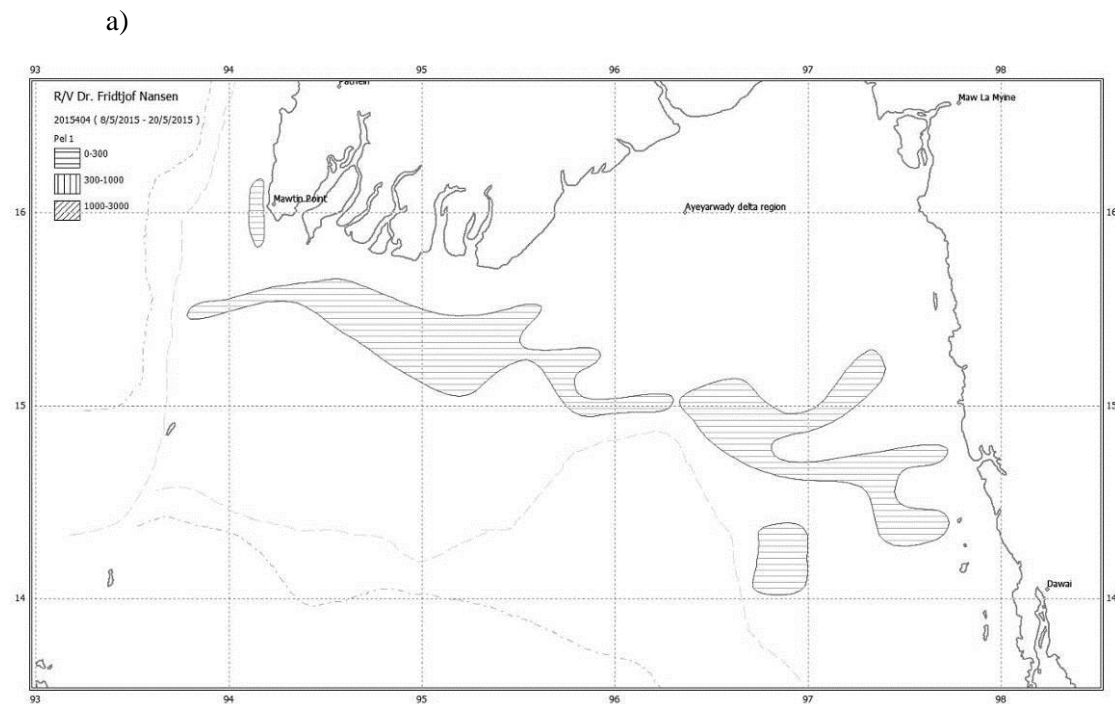
Pelagic1

Low densities of Pel 1 were found widely distributed on the inner shelf in this region (Figure 4.2). A total acoustic abundance index of 36 000 tonnes of fish was estimated based on a set (average) total length of 10 cm (Table 4.1). in 2013 18 000 tonnes were estimated in the same region. The anchovies,

especially *Stolephorus indicus* and *Coilia dussumieri* was by far the most common species found in the region. Length frequencies of commonly caught species can be found in Annex II.

Pelagic2

The distribution of these species was found in low density over most of the Deltaic area (Figure 4.2). A total acoustic abundance index of 50 000 tonnes were found compared with 34 000 tonnes in 2013. The abundance in the Delta region was the highest estimate of the three regions during the surveys. of fish was estimated based on a set (average) total length of 10 cm (Table 4.1). The most common Pel2 species found in the region was the scad, *Selaroides leptolepis*, followed by *Trichiurus lepturus* and *Selar crumenophthalmus*. Length frequencies commonly caught species can be found in Annex II.



b)

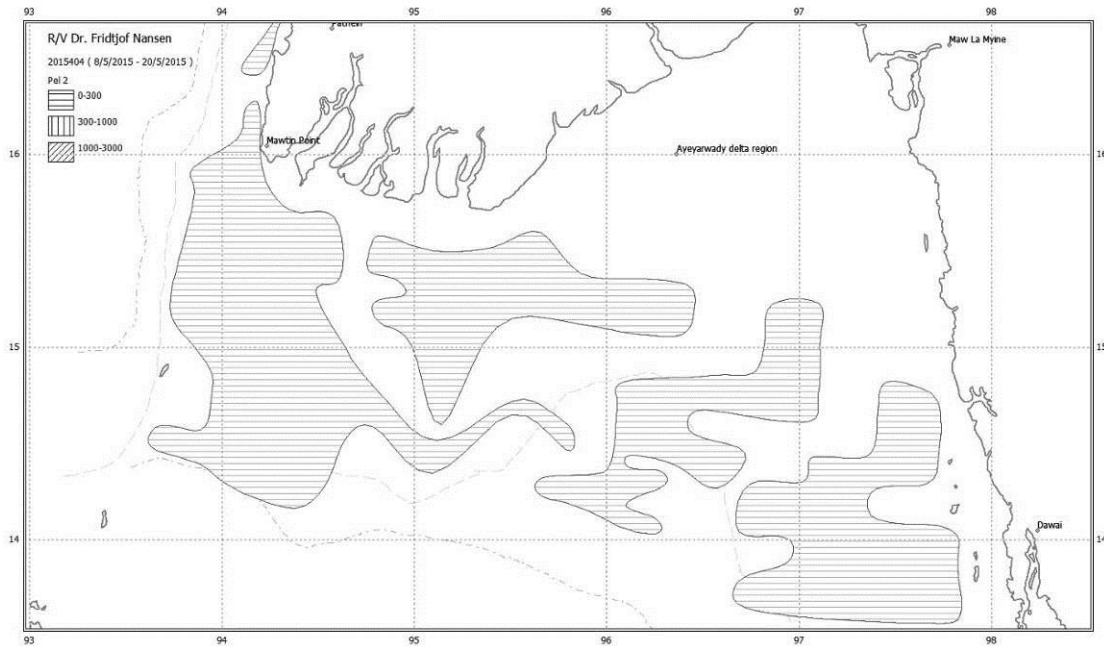


Figure 4.2. Distribution of acoustic backscattering of a) Pel 1 and b) Pel 2 species in the delta region

4.3 Tanintharyi coastal region

Pelagic1

A total of six different distribution areas was defined in this region. Two of them was of medium density while four was of low density. A large part of the distribution was found close to the inshore border of the survey area at < 50 m depth and it is expected that more fish was distributed further inshore. (Figure 4.3). The Tanintharyi region had the highest estimate of pelagic fish of any of the three regions during this survey. A total acoustic abundance index of 52 000 tonnes was considerable more than the estimate of 7 000 tonnes of fish found during the 2013 survey (Table 4.1). The biomass was estimated based on a set (average) total length of 10 cm. The main clupeoid species found in this region was the anchovy *Stolephorus indicus*. Length frequencies can be found in Annex II.

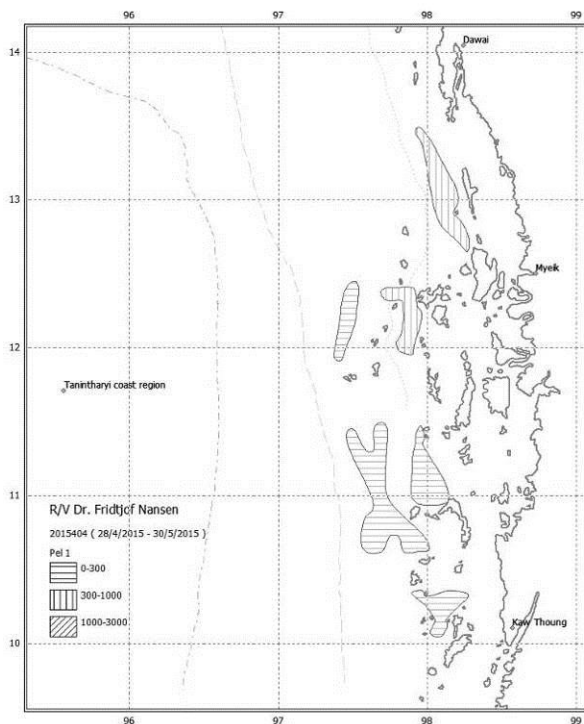
Pelagic2

The distribution of these species was found in three wide but low density areas (Figure 4.3). The densities decreased southwards from the Deltaic area. A total acoustic abundance index of 15 000 tonnes was lower than the 17 000 tonnes of fish estimated in 2013. The estimates were based on a set (average) total length of 10 cm. The most common Pel2 species found in the region was *Trichiurus lepturus*, *Selaroides leptolepis*, *Scomberomorus commerson* and *Rastrelliger brachysoma*. Length frequencies of commonly caught species can be found in Annex II.

Table 4.1. Biomass estimates of pelagic fish during the survey, Pel 1- Clupeid and Engraulid species, and Pel 2- Carangid, Scombrid, Sphraenid and Trichiurid species.

	Pel 1				Pel 2			
	Rakhine	Delta	Tanintharyi	Total	Rakhine	Delta	Tanintharyi	Total
Area (NM ²)	820	3648	1831	6300	2623	12779	3944	19345
Stratums	3	3	6	12	4	4	3	11
Avg. <S _A >	224	69	258	203	78	29	33	48
Biomass:	20680	36313	51763	108756	19315	49897	14628	83839

a)



b)

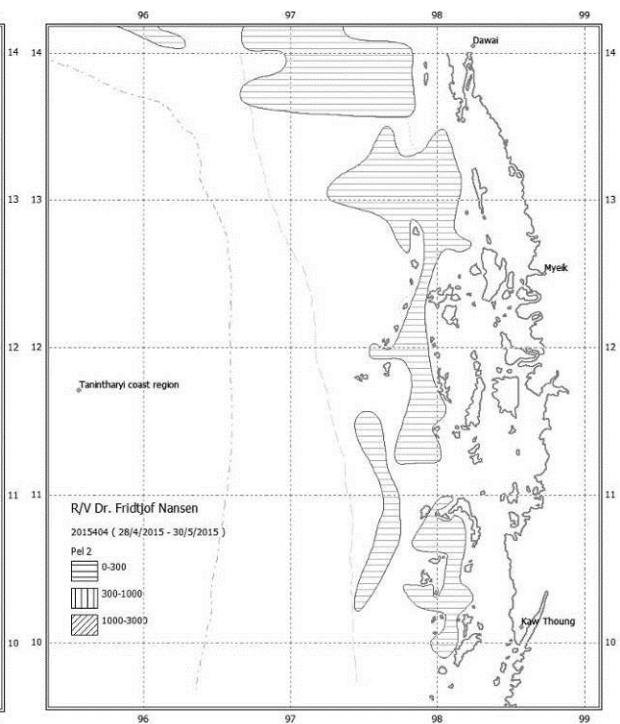


Figure 4.3. Distribution of acoustic backscattering of a) Pel 1 and b) Pel 2 species in the Tanintharyi region

CHAPTER 5 SWEEPED AREA ABUNDANCE AND DISTRIBUTION

The trawl survey used for swept area abundance estimation 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 (Ophidiidae), carangids (Carangidae), cephalopods (Cephalopoda), clupeids (Clupeidae), crabs (Brachyura), croakers (Sciaenidae), anchovies (Engraulidae), Groupers (Serranidae), Grunts (Haemulidae), Hairtails (Trichiuridae), pony fish (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, Psettodidae, Soleidae, Citharidae), butterflyfishes (Stromateidae), lizardfish (Synodontidae), threadfin (Polynemidae), threadfin breems (Nemipteridae), Ariommas (Ariommidae), jellyfish (Medusozoa), bigeyes (Priacanthidae), gurnard (Triglidae), 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 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 region; 1. Rakhine coast 2. The Deltaic coast 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 50- 100 m depth (579 kg/h). In the Delta region it was the deep water that gave the largest catches with 216 kg/h, while on the Tanintharyi coast the depth region between 50-100 m had highest catch rates with 299 kg/h. Lowest catch rates were experienced in the Rakhine coast between 100-200 m depth with catch rates of 126 kg/h.

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

Rakhine coastal zone

A total of 49 valid trawl stations were analysed along the Rakhine coast. of these 16 stations were between 20 -50 m depth, 14 between 50 - 100 m depth, 13 between 100 - 200 m depth, 5 between 200 – 500 m depth and 1 > 500 m. Table 5.1 shows the average catch rates of the main groups caught during the survey.

The most dominant group on the Rakhine inner shelf between 20-50 m bottom depth was jellyfish (79 kg/h). The Leiognathidae, pony fishes (53 kg/h) was the dominant fish taxa followed by a number of pelagic species; Engraulids (17 kg/h), Hairtails (13 kg/h), and Carangids (11 kg/h). All other groups

gave catch rates < 10kg/h and was of lesser importance. In order of appearance in the catches were Haemulidae (9.4 kg/h), Nemipteridae (7.2 kg/h), Ariidae (6.1 kg/h), Synodontidae (5.6 kg/h), Sciaenidae (5.3 kg/h), Cephalopoda (5.0 kg/h), Rays (4.6 kg/h) and Lutjanidae (2.8 kg/h). Although dominated by pelagic species, both catch composition and catch rates different substantially from 2013 when catches were generally higher; The dominating species during that survey was 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 also in 2013.

Further from the coast, at the outer shelf (50-100 m bottom depth) pelagic species became considerably more important. The Carangidae gave catch rates of 348 kg/h and was particularly abundant on the central part of the Rakhine coast, followed by the Hairtails (88.6 kg/h). The group of Synodontidae (Lizardfishes) was the most abundant of the demersal species with 33.8 kg/h. Jellyfish was still frequent in the catches with 29 kg/h followed by Nemipteridae (22.6 kg/h), Priacanthidae (12.6 kg/h), and Cephalopoda (5.1 kg/h). The overall catch rate in this depth region was considerably higher than in 2013, particularly because of the comparably higher catches of carangids (14.5 kg/h in 2013), and also hairtails (42.5 kg/h in 2013) during this (2015) survey.

On the upper slope (100-200 m) anoxic water masses prevailed from about 80 m water depth and deeper into the water column, and catch rates were relatively poor. The Priacanthidae (80.3 kg/h) was by far the most dominant group followed by the mixed group of other (19.5 kg/h) species, The Brachyura crabs gave catch rates of 7.0 kg/h, followed by Triglidae (6.1 kg/h), Jellyfish (3.8 kg/h), Synodontidae (2.7 kg/h), Shrimps (2.4 kg/h) and the Nemipteridae (2.0 kg/h). In 2013 crabs gave catch rates of 24 kg/h while the Synodontidae was also considerable more important with catches of 20.5 kg/h.

On the lower slope catch rates increased slightly again. The mixed group of other species dominated with 89.8 kg/h. Sharks were relatively important with catches of 47.3 kg/h followed by Ophidiidae (32.3 kg/h), Muraenesocidae (27.1 kg/h), Jellyfish (6.9 kg/h), Shrimps (5.1 kg/h), Triglidae (4.8 kg/h), Cephalopoda (4.6 kg/h), and Brachyura (2.5 kg/h). Other species groups were of less importance. Also in this depth region there is a visible difference in the species composition compared to 2013. During that survey the brotulas was the most important with catch rates of 17.7 kg/h, Crustaceans, mainly crabs and shrimps gave catches of 15.8 kg/h and 2.5 kg/h respectively while the Elasmobranches, Sharks and rays, gave catch rates of 9.1 kg/h and 1.6 kg/h respectively.

Ayeyarwady Delta region

A total of 61 valid trawl stations were analysed in the delta region. of these 15 stations were between 20 -50 m depth, 25 between 50 - 100 m depth, 16 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 region catches declined slightly compared to the Rakhine region. The most common species group on the inner shelf (20-50 m depth) was the pelagic Engraulids with catch rates of 25.5 kg/h followed by the Synodontidae (16.5 kg/h), Sciaenids (16.1 kg/h), Shrimps (9.7 kg/h), Leiognathidae (9.3 kg/h), Lutjanids (7.0 kg/h) and Carangids (5.8 kg/h). In 2013 carangids were considerably more abundant in this depth region with 11.7 kg/h while the Engraulids were less frequent with catch rates of 5.3 kg/h. The most abundant demersal groups in 2013 was croakers (8.4 kg/h), Synodontidae (8.3 kg/h), shrimps (7.1 kg/h) and mullets (3.1 kg/h).

On the outer shelf the pelagic species was dominated by Carangids (33.5 kg/h) and the Trichiuridae (10.2 kg/h) followed by the demersal groups Synodontidae (12.9 kg/h), Nemipteridae (10.9 kg/h), Sciaenidae (8.6 kg/h) and Cephalopoda (6.8 kg/h). Also in 2013 Carangids was the most dominant species group with 18 kg/h, Cephalopods was more abundant 10.2 kg/h than this year while both mullets (9.4 kg/h), and the threadfin breams (10.4 kg/h) was frequent in the catches.

At the upper slope demersal groups were the most important. The Priacanthidae (33.0 kg/h) was very common in catches in this depth region followed by Synodontidae (22.7 kg/h). Also squids (Cephalopoda, 13.7 kg/h) were abundant, the pelagic group Carangids (5.1 kg/h) was still relatively present in catches particularly on the shallower stations in this depth region while Shrimps gave catch rates of 4.5 kg/h. In 2013 the Synodontids (16.1 kg/h) was the most dominant group in this depth region followed by the threadfin breams (9.9 kg/h) Shrimps gave catches of 8.2 kg/h

Crustaceans became very important at the lower slope. Shrimps gave catch rates of 57.0 kg/h while the Lobsters also showed relatively high catch rate with 10.8 kg/h. The Ophidiidae (18.2 kg/h) was the only commercially group of fish that was of any importance while the Elasmobranches became more important than further inshore, Sharks gave catch rates of 8.4 kg/h while 7.9 kg/h of Rays were caught. In 2013 catches of shrimps and lobsters were also good, with 33.3 kg/h and 7 kg/h respectively. Of the fish species the Ophidiidae showed catches of 2.9 kg/h while the sharks and rays was even more important than during this survey with catch rates of 21.3 and 34.7 respectively.

Tanintharyi coastal region

A total of 61 valid trawl stations were analysed in the Tanintharyi coast. of these 10 stations were between 20 -50 m depth, 21 between 50 - 100 m depth, 10 between 100 - 200 m depth, 17 between 200 – 500 m depth and 3 >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 higher than in the delta region but lower than on the Rakhine coast on the shelf, while on the slope catch rates were higher compared with both regions further north.

On the inner shelf the Leiognathidae was the most important group with catch rates of 34.4 kg/h followed by the Cephalopoda (28.8 kg/h) who showed the biggest catch rate in the survey area in this region. The following groups were Synodontidae (14.6 kg/h), Carangids (14.4 kg/h), Scombrids (6.8), Trichiuridae (6.1), Haemulidae (5.9) and the Engraulidae (5.6 kg/h). In 2013 the Cephalopods also had its highest abundance in the whole survey area in this depth region with catch rates of 16.1 kg/h while the Synodontidae showed catches of 17.2 kg/h.

On the outer shelf jellyfish became very abundant in the catches with a catch rate of 158 kg/h, which was highest in the survey area. Of other species the Synodontidae gave catches of 30.2 kg/h in this depth region followed by Cephalopoda with 19.7 kg/h and Nemipteridae with 15.6 kg/h. Of lesser importance was the Engraulidae (6.5kg/h), Priacanthidae (5.3 kg/h) and Mullidae (5.3 kg/h). In 2013 pelagic species had relatively good catch rates, mainly consisting of Carangids with catch rates of 76.5 kg/h. The cephalopods had catch rates of 9.6 kg/h, while of the demersal fish species the synodontidae dominated with 15.3 kg/h.

On the upper slope catch rates were relatively good, the most dominating group was the “other group” with catches of 77 kg/h or more than 50% of the total in this depth region. This species group consist of a number of less commercial importance species like e.g. myctophids. Of other species the Synodontidae gave catch rates of 21.6 kg/h, the Nemipteridae had catches of 14.5 kg/h. Both Rays (9.7 kg/h) and Sharks (5.6 kg/h) were more dominant on the southern slope than all other areas further north and increased in abundance towards deeper water. Also Soles (6 kg/h) showed better catch rates compared to other regions of the survey. In 2013 Rays (27 kg/h). Synodontidae (10 kg/h) and Lobsters (9.5 kg/h) dominated.

In the same way as on the upper slope, the most dominant group on the deep slope (200-500 m depth) was the “other species” with 61% (137 kg/h) of the average catch. The catch rates of other species were dominated by only a few groups; Crustaceans were represented by Shrimps, with 31.9 kg/h and Lobsters with 11.6 kg/h, while cartilaginous fish were represented with high catch rates of both Rays (21.4 kg/h) and Sharks (9.2 kg/h). All other species were of considerable less importance. In 2013 as this year 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.

During this survey three stations were made deeper than 500 m in this region. The dominating species in the catches were particularly rays and sharks with catch rates of 82.9 kg/h and 32.8 kg/h respectively, and shrimps (15.7 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	Stat.	Gear depth	Ariidae	Ariommidae	Brachyura	Carangids	Cephalopoda	Clupeids	Engraulidae	Haemulidae	Jellyfish
Rakhine Coast	0-50	16	37.4 (7.2)	6.1 (13.9)	-	0.4 (0.6)	10.8 (17.3)	5 (6.2)	0.5 (2.0)	16.7 (57.5)	9.4 (30.2)	79.4 (296.1)
Rakhine Coast	50-100	14	75.7 (8.6)	-	3.2 (8.3)	0.6 (1.3)	348.2 (1241.8)	5.1 (5.5)	-	0.1 (0.4)	0.4 (1.1)	29.2 (109.2)
Rakhine Coast	100-200	13	136.5 (20.6)	-	0.1 (0.3)	7 (18.7)	0.2 (0.6)	0.2 (0.6)	-	-	-	3.8 (11.6)
Rakhine Coast	200-500	5	395.7 (107.8)	-	-	2.5 (5.3)	-	4.6 (7.1)	-	-	-	6.9 (15.5)
Ayeyarwady Delta	0-50	15	32.8 (8.2)	1.5 (3.8)	-	2.7 (3.2)	5.8 (14.5)	4.1 (5.4)	0.3 (1.0)	25.5 (34.1)	0.6 (1.3)	-
Ayeyarwady Delta	50-100	25	70.9 (13.2)	0.4 (1.4)	-	0.8 (1.6)	33.5 (88.4)	6.8 (5.3)	0.2 (0.8)	3.2 (12.7)	0.2 (0.3)	-
Ayeyarwady Delta	100-200	16	126.1 (22.5)	-	0.2 (0.9)	0.9 (2.0)	5.1 (16.3)	13.7 (22.1)	-	-	-	-
Ayeyarwady Delta	200-500	5	367.8 (87.5)	0.8 (1.8)	-	0.4 (0.8)	-	1 (1.1)	-	-	(0.1)	-
Tanintharyi Coast	0-50	10	37.5 (6.9)	-	-	0.5 (0.6)	14.4 (19.0)	28.8 (18.3)	0.8 (1.9)	5.6 (8.9)	5.9 (12.1)	1.7 (4.0)
Tanintharyi Coast	50-100	21	77.9 (13.0)	-	-	1 (1.8)	2.5 (3.1)	19.7 (44.3)	-	6.5 (29.7)	1.2 (3.8)	158.4 (702.8)
Tanintharyi Coast	100-200	10	138.6 (33.4)	-	-	0.5 (0.8)	0.1 (0.2)	3.6 (4.5)	-	-	-	-
Tanintharyi Coast	200-500	17	330.6 (71.6)	-	-	(0.1)	-	3.5 (3.9)	-	-	-	-
Tanintharyi Coast	500-1000	3	616 (170.2)	-	-	-	-	1 (0.9)	-	-	-	-

Cont.

Region	Leiognathidae	Lobsters	Lutjanidae	Mullidae	Muraenesocidae	Nemipteridae	Ophidiidae	Polynemidae	Priacanthidae	Rays	Sciaenidae
Rakhine Coast	53.4 (50.8)	0.1 (0.3)	2.8 (4.5)	1.4 (2.9)	0.1 (0.1)	7.2 (9.0)	-	1.4 (5.5)	1.6 (3.5)	4.6 (11.7)	5.3 (20.1)
Rakhine Coast	2 (4.1)	-	0.3 (1.0)	2.8 (6.1)	(0.1)	22.5 (31.8)	-	-	12.6 (21.2)	(0.2)	0.6 (1.3)
Rakhine Coast	-	-	0.8 (2.8)	(0.1)	0.6 (1.5)	2 (7.2)	-	-	80.3 (174.1)	-	-
Rakhine Coast	-	-	1.1 (2.5)	-	27.1 (30.0)	-	32.3 (18.5)	-	-	0.3 (0.8)	0.1 (0.3)
Ayeyarwady Delta	9.3 (16.7)	0.4 (1.4)	7 (27.0)	0.2 (0.5)	4.1 (6.4)	3.7 (5.3)	-	1.1 (1.8)	0.1 (0.4)	3.6 (10.6)	16.1 (29.2)
Ayeyarwady Delta	1.5 (3.8)	-	4.2 (18.8)	2.2 (3.9)	0.6 (1.9)	10.9 (12.1)	(0.2)	0.6 (1.9)	2 (4.8)	2.3 (7.2)	8.6 (23.1)
Ayeyarwady Delta	(0.2)	0.1 (0.4)	0.3 (1.1)	0.3 (1.3)	0.1 (0.4)	8.7 (8.1)	0.3 (1.0)	-	33 (114.2)	2.4 (4.8)	0.5 (2.1)
Ayeyarwady Delta	-	10.8 (14.3)	-	-	-	(0.1)	18.2 (17.0)	-	0.7 (0.9)	7.9 (9.3)	-
Tanintharyi Coast	34.4 (42.0)	0.1 (0.4)	0.8 (2.2)	3.9 (4.1)	(0.1)	4.6 (7.3)	-	-	(0.1)	-	0.3 (0.7)
Tanintharyi Coast	2.3 (9.3)	0.5 (2.0)	1.9 (5.3)	5.3 (6.7)	0.5 (1.3)	15.6 (18.8)	-	-	5.3 (11.2)	0.9 (1.5)	0.4 (1.9)
Tanintharyi Coast	-	0.5 (1.0)	1.8 (4.0)	0.9 (2.6)	-	14.5 (31.9)	0.1 (0.2)	-	5 (8.0)	9.7 (24.5)	-
Tanintharyi Coast	-	11.6 (20.4)	-	-	0.2 (0.9)	-	4.1 (6.4)	-	1.9 (2.3)	21.4 (40.1)	-
Tanintharyi Coast	-	0.2 (0.4)	-	-	0.8 (1.4)	-	1 (1.5)	-	-	82.9 (94.0)	-

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 for the 2013 survey (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. The area calculations have been used also for this survey.

Table 5.2. Calculated areas in NM² 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. Note that due to the nature of these surveys these estimates must be considered indexes (or relative). It is not a true reflection of the absolute biomass of all species in the survey area.

The Total biomass (t) estimated from the survey was approximately 420 000 tonnes, of this 105 000 tonnes were found on the Rakhine coast, 126 000 tonnes were found in the Ayeyarwady Delta region and 190 000 tonnes was found on the Tanintharyi coast.

On the Rakhine coast the shelf showed the highest abundance with 23 000 tonnes registered on the inner shelf and 54 000 tonnes found on the outer shelf. Carangids had their highest abundance in any region of the survey on the other shelf. On the slope the depth zone between 100-200 m is hypoxic and only specialised animals thrive in such conditions, the biomass in this area was the lowest for the whole survey. A biomass of 5000 tonnes, dominated by Priacanthidae was found. Further offshore on the deeper slope the biomass increased to 23 000 tonnes.

Further south in the Ayeyarwady Delta region the inner shelf had a biomass of 41 000 tonnes while the outer shelf showed a biomass of 46 000 tonnes. On the upper slope the biomass decreased to 26 000 tonnes, and even further on the lower slope, to 13 000 tonnes.

The southern region of the survey, the Tanintharyi coast showed an estimated 28 000 tonnes of biomass on the inner shelf. On the outer shelf the biomass increased considerably to 82 000 tonnes, the highest in any region of the survey area. However, note that this figure includes about 43 000 tonnes of jellyfish. It is often hypothesised that jellyfish are associated with overfished areas but little concrete evidence exists. Also the slope in this region showed higher biomass figures compared to these depth regions further north. On the upper slope the biomass decreased to about 31 000 tonnes while at the lower slope a biomass estimate of 48 000 was estimated. Particularly crustaceans and cartilaginous fish contributed to this high biomass.

In 2013 the total biomass estimate was 280 000 tonnes. Of this the Rakhine coastal zone had an estimate of 60 000 tonnes, while the Deltaic coast gave a total biomass estimate of 101 000 tonnes, and the Tanintharyi coast showed an estimate of 112 000 tonnes.

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

Region	Depth int.	Ariidae		Ariommidae		Brachyura		Carangids		Cephalopoda		Haemulidae		Jellyfish		Leiognathidae		Lobsters		
		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)	t/nm ²	Biom. (t)	
Rakhine Coast	0-50	0.20	527	-	-	0.01	35	0.37	985	0.17	442	0.31	827	2.50	6703	1.79	4800	0.00	8	
	50-100	-	-	0.10	289	0.02	54	11.31	32355	0.17	484	0.01	31	0.96	2750	0.06	183	-	-	
	100-200	-	-	0.00	2	0.23	279	0.01	8	0.01	10	-	-	0.12	144	-	-	-	-	
	200-500	-	-	-	-	0.08	229	-	-	0.15	432	-	-	0.23	647	-	-	-	-	
Gulf of Mottama	0-50	0.05	425	-	-	0.10	858	0.20	1796	0.13	1159	0.02	159	-	-	0.31	2708	0.01	115	
	50-100	0.02	151	-	-	0.03	251	1.09	10969	0.23	2282	0.01	60	-	-	0.05	483	-	-	
	100-200	-	-	0.01	43	0.03	167	0.17	890	0.43	2309	-	-	-	-	0.00	5	0.00	16	
	200-500	0.03	48	-	-	0.01	25	-	-	0.03	58	0.00	2	-	-	-	-	0.37	647	
Tanintharyi Coast	0-50	-	-	-	-	0.02	84	0.47	2476	0.96	5025	0.20	1028	0.06	299	1.15	6021	0.00	21	
	50-100	-	-	-	-	0.03	267	0.09	687	0.66	5325	0.04	323	5.37	43403	0.08	606	0.02	121	
	100-200	-	-	-	-	0.02	99	0.00	25	0.13	776	-	-	-	-	-	-	0.02	112	
	200-500	-	-	-	-	0.00	6	-	-	0.12	745	-	-	-	-	-	-	0.42	2588	
Sum				1151		335		2355		50191		19046		2431		53947		14806		3628

Table 5.3 cont.

Region	Depth int.	Lutjanidae		Mullidae		Muraenesocidae		Nemipteridae		Ophidiidae		Polynemidae		Priacanthidae		Rays		Sciaenidae		
		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)	t/nm ²	Biom. (t)	
Rakhine Coast	0-50	0.09	241	0.05	137	0.00	5	0.23	624	-	-	0.05	120	0.05	139	0.15	402	0.18	468	
	50-100	0.01	29	0.09	266	0.00	3	0.72	2058	-	-	-	-	0.41	1182	0.00	3	0.02	54	
	100-200	0.03	30	0.00	1	0.02	23	0.07	78	-	-	-	-	2.57	3097	-	-	-	-	
	200-500	0.05	129	-	-	1.00	2848	-	-	1.12	3200	-	-	-	-	0.01	40	0.01	14	
Gulf of Mottama	0-50	0.25	2177	0.01	62	0.12	1097	0.13	1106	-	-	0.05	469	0.01	44	0.09	832	0.51	4486	
	50-100	0.14	1438	0.07	734	0.02	211	0.36	3619	0.00	10	0.02	211	0.07	664	0.08	784	0.27	2755	
	100-200	0.01	59	0.01	59	0.00	16	0.28	1532	0.01	59	-	-	1.07	5745	0.08	426	0.02	97	
	200-500	-	-	-	-	-	-	0.00	2	0.61	1081	-	-	0.02	41	0.27	468	-	-	
Tanintharyi Coast	0-50	0.03	142	0.13	671	0.00	5	0.15	802	-	-	-	-	0.00	5	-	-	0.01	47	
	50-100	0.06	501	0.18	1430	0.02	129	0.52	4210	-	-	-	-	0.18	1430	0.03	251	0.01	105	
	100-200	0.06	354	0.03	186	-	-	0.47	2905	0.00	19	-	-	0.16	1006	0.35	2141	-	-	
	200-500	-	-	-	-	0.01	50	-	-	0.14	894	-	-	0.07	403	0.74	4593	-	-	
Sum				5099		3547		4388		16937		5263		801		13756		9940		8028

Table 5.3 cont.

Region	Depth int.	Serranidae		Sharks		Shrimps		Soles		Stromateidae		Synodontidae		Triglidae		Total		Region total
		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)	Biom. (t)
Rakhine Coast	0-50	0.01	13	-	-	0.04	118	0.01	21	0.01	19	0.19	506	-	-	8.65	23143	
	50-100	0.00	3	0.01	26	0.04	106	0.00	11	-	-	1.09	3128	0.01	31	18.69	53494	
	100-200	0.00	1	0.01	12	0.08	90	0.00	4	-	-	0.09	102	0.20	236	4.04	4867	
	200-500	-	-	1.74	4977	0.17	489	-	-	-	-	0.02	46	0.16	449	8.17	23394	104897
Gulf of Mottama	0-50	-	-	0.08	726	0.33	2938	0.00	27	0.01	97	0.70	6159	-	-	4.64	41024	
	50-100	0.02	151	0.03	251	0.09	855	0.03	302	0.00	20	0.43	4313	0.00	30	4.54	45595	
	100-200	0.04	205	0.05	254	0.15	831	0.02	119	-	-	0.74	3981	0.02	102	4.85	26172	
	200-500	-	-	0.29	512	2.00	3530	0.01	16	-	-	0.04	78	-	-	7.53	13307	126098
Tanintharyi Coast	0-50	0.00	21	-	-	0.11	551	0.01	58	-	-	0.49	2570	-	-	5.41	28370	
	50-100	0.02	137	0.03	234	0.10	816	0.08	614	-	-	1.01	8146	0.01	48	10.11	81691	
	100-200	0.03	205	0.19	1161	0.07	447	0.21	1297	-	-	0.75	4643	-	-	5.06	31420	
	200-500	-	-	0.32	1955	1.11	6859	0.11	683	-	-	0.01	74	0.01	68	7.78	48278	189759
Sum				736		10108		17630		3151		136		33746		966		420754

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 try to highlight the main trends in fish diversity from the vessel trawl catches.

A total of 587 teleost species belonging to 145 families were recorded during the survey. With regard to the cartilaginous fishes, 26 shark species belonging to 12 families, 24 ray species from 10 families, and 3 chimaera species from two families were identified. A total of 372 different taxonomic entities were recorded in the Rakhine Coast, while 504 and 501 entities were identified in the delta area and Tanintharyi coast, respectively. Table 5.4 shows the number of different entities caught by bottom trawl in each depth region. The table shows that the most species rich area was the 50-100 m depth stratum in the Delta area.

Table 5.4. Number of different species entities caught by bottom trawl in each depth stratum.

Depth/region	Rakhine coast	Ayeyarwady Delta	Tanintharyi coast
20-50	200	153	138
50-100	129	229	190
100-200	76	159	144
200-500	48	99	183
Total	372	504	501

As a measure of the importance of each species in the trawl catches within each depth stratum and region, an index of relative importance (%IRI) was used to rank the most common species:

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

Where:

%Ni = number individuals of each species i divided by the total number of individuals per stratum and region, expressed as a percentage

$\%W_i$ = weight of each species i divided by the total weight of individuals per stratum and region, expressed as a percentage

$\%F_i$ = number of hauls in which each species i occurs divided by the total number of hauls per stratum and region, expressed as a percentage

S is the total number of species j in all trawl hauls in a given stratum or region

This index is based on the IRI index that combines and represents simultaneously the three above mentioned indexes.

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

The results of the analysis by region showed that the most common species (groups) in the Rakhine coastal zone were *Trichiurus lepturus*, *Priacanthus hamrur*, Jellyfish, *Saurida tumbil*, *Gazza minuta*, *Nemipterus japonicus*, *Benthosema fibulatum*, *Decapterus sp.*, and *Stolephorus indicus*.

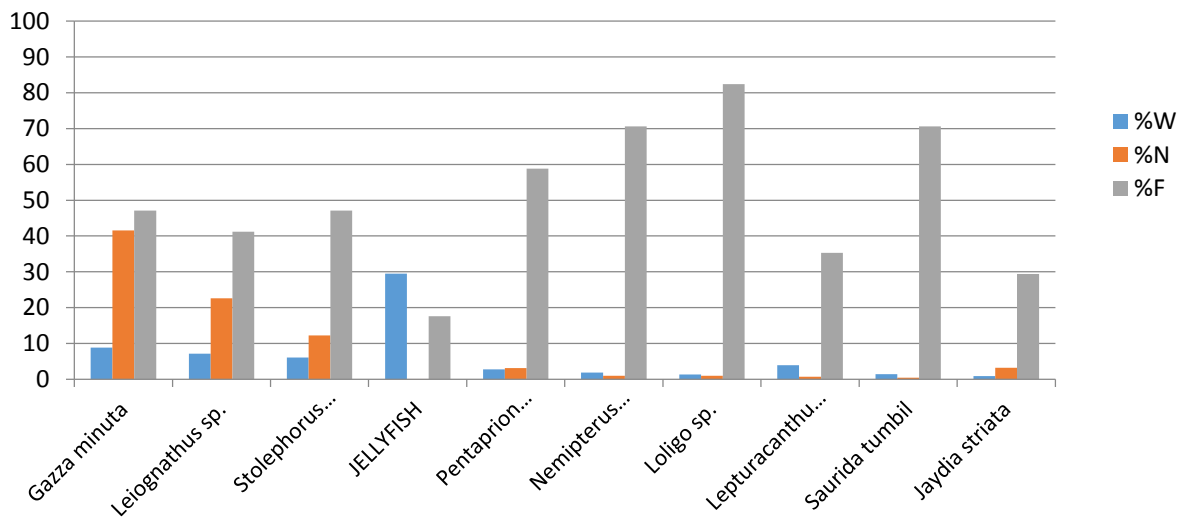
In the Ayeyarwady Delta region the most common species (groups) were *Saurida undosquamis*, Shrimps, *Loligo sp.*, *Nemipterus japonicus*, Small shrimps, *Stolephorus indicus*, *Acropoma japonicum*, *Coilia dussumieri*, and *Priacanthus hamrur*.

On the Tanintharyi coast the most common species (groups) were Shrimps, *Loligo sp.*, Jellyfish, *Saurida undosquamis*, *Myctophidae*, *Synagrops adeni*, Small shrimps, *Satyrichthys adeni*, *Nemipterus bipunctatus*, *Siganus canaliculatus*.

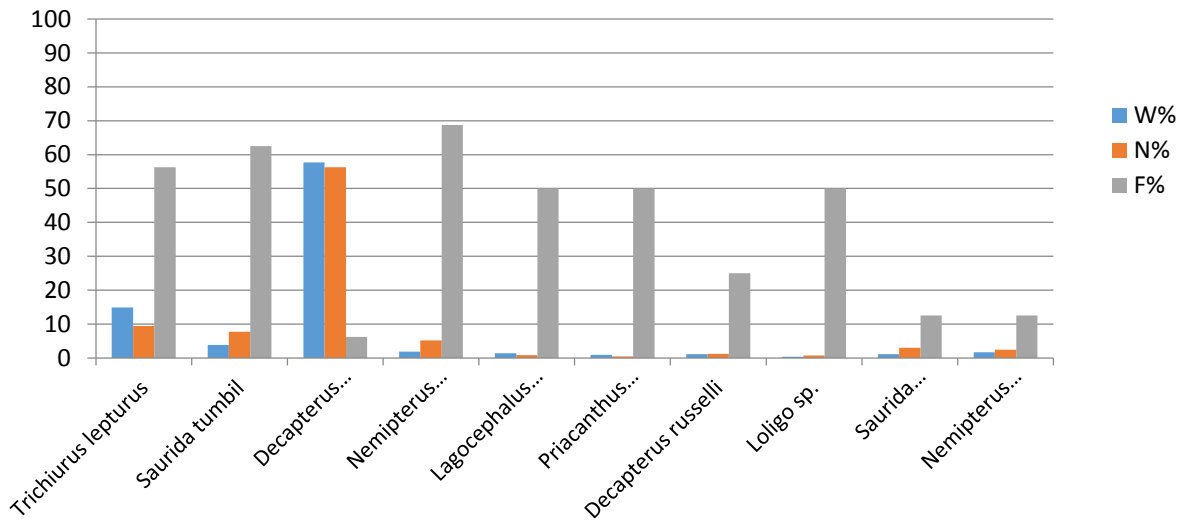
The relative numeric abundance (N), the relative weight (W) and the commonness (F) of the 10 most important species (%IRI) for each stratum were extracted and are shown in the following figures. The figures illustrate the substantial change in species composition between the different strata for each region.

a) Rakhine coast

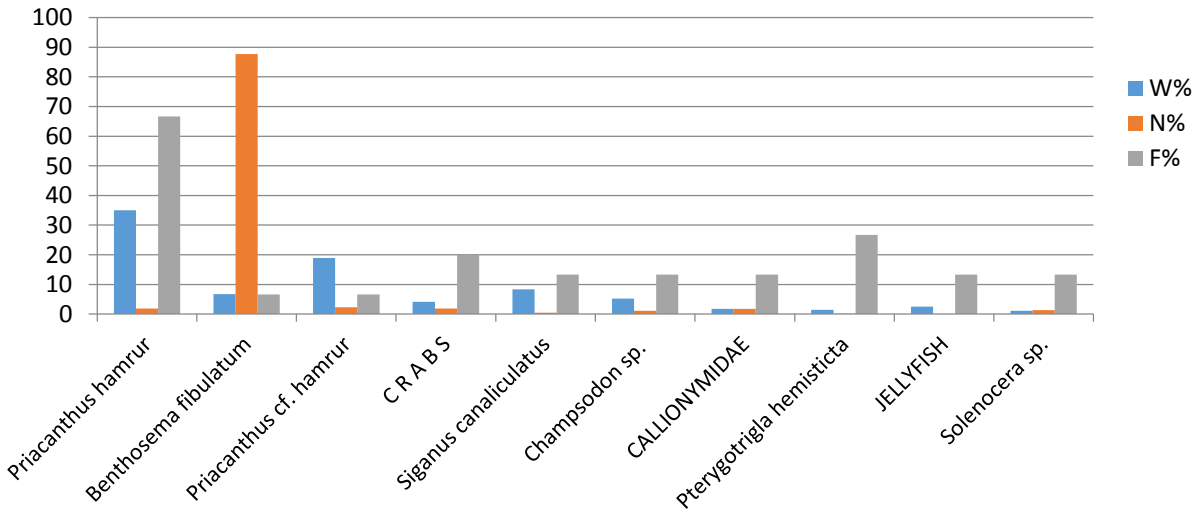
0-50 m



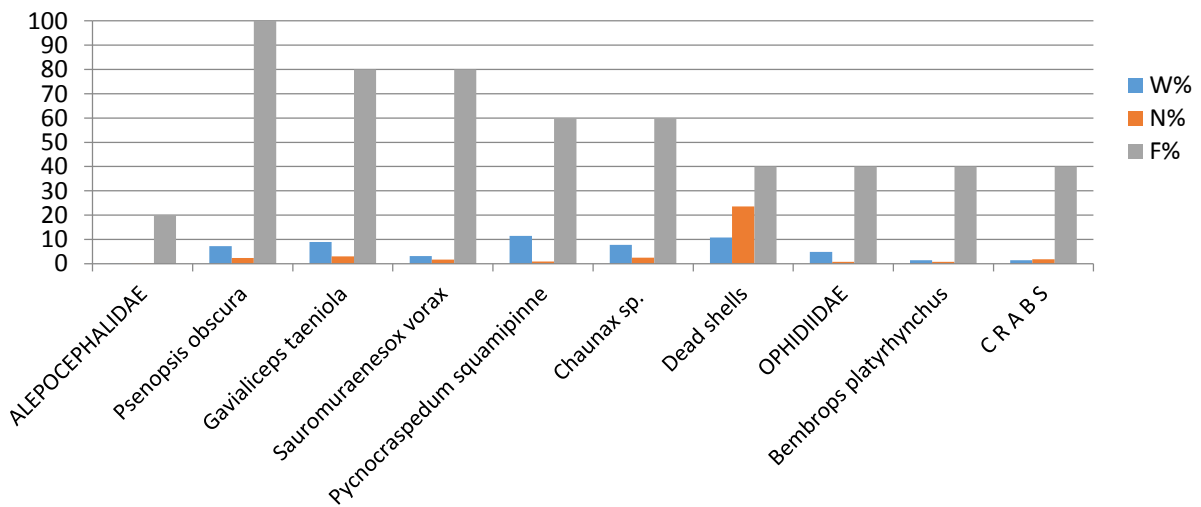
50-100 m



100-200 m

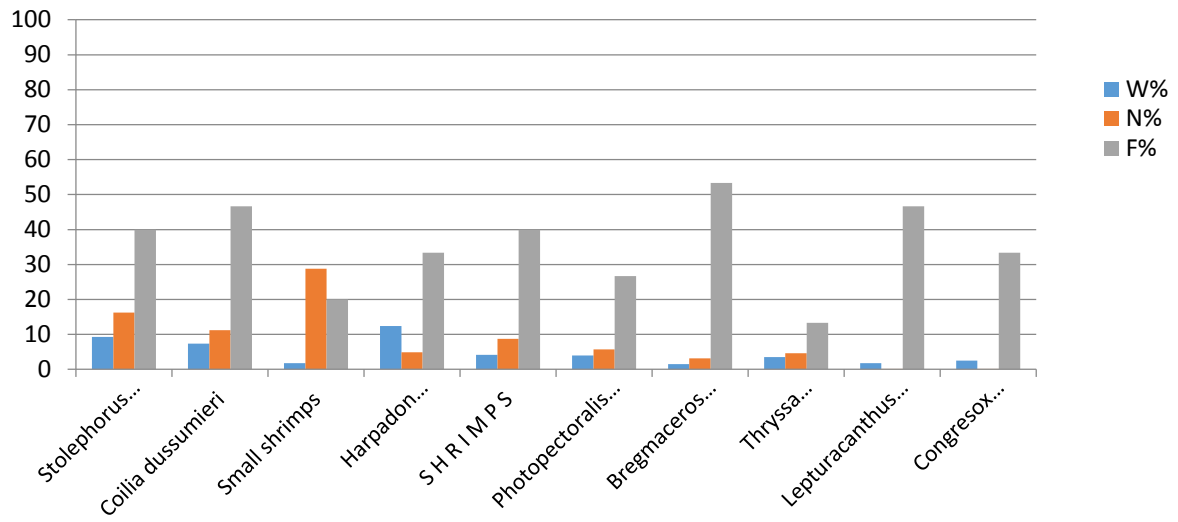


200-500 m

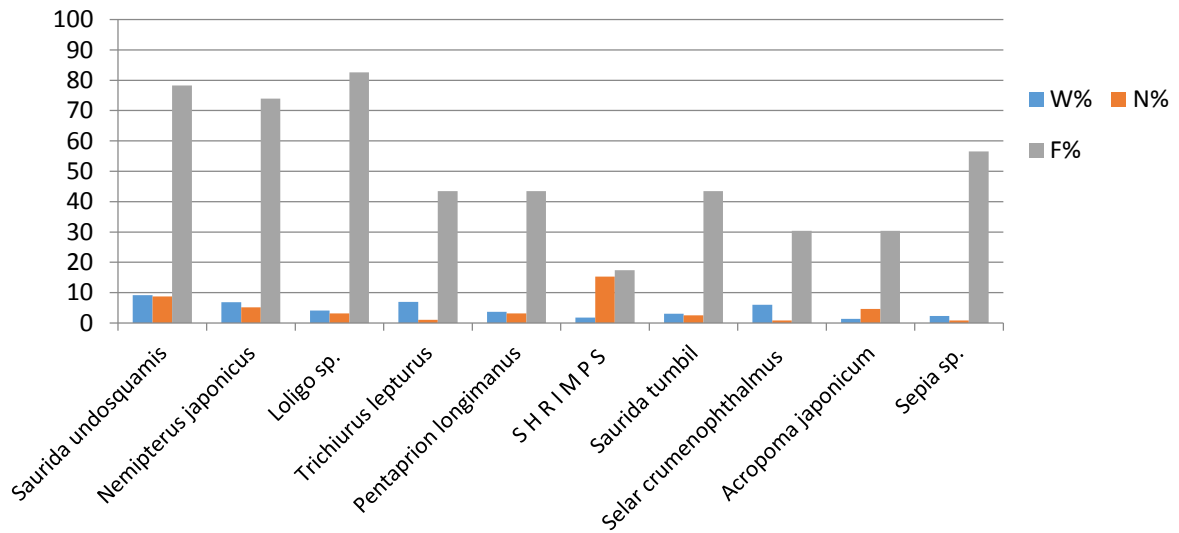


b) Deltaic coastal region

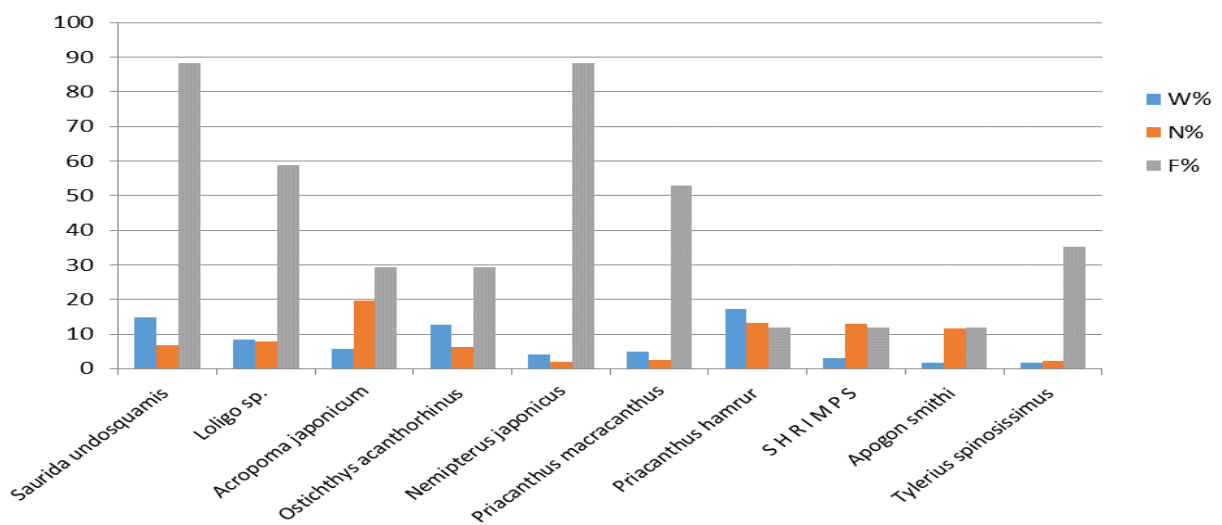
0-50 m



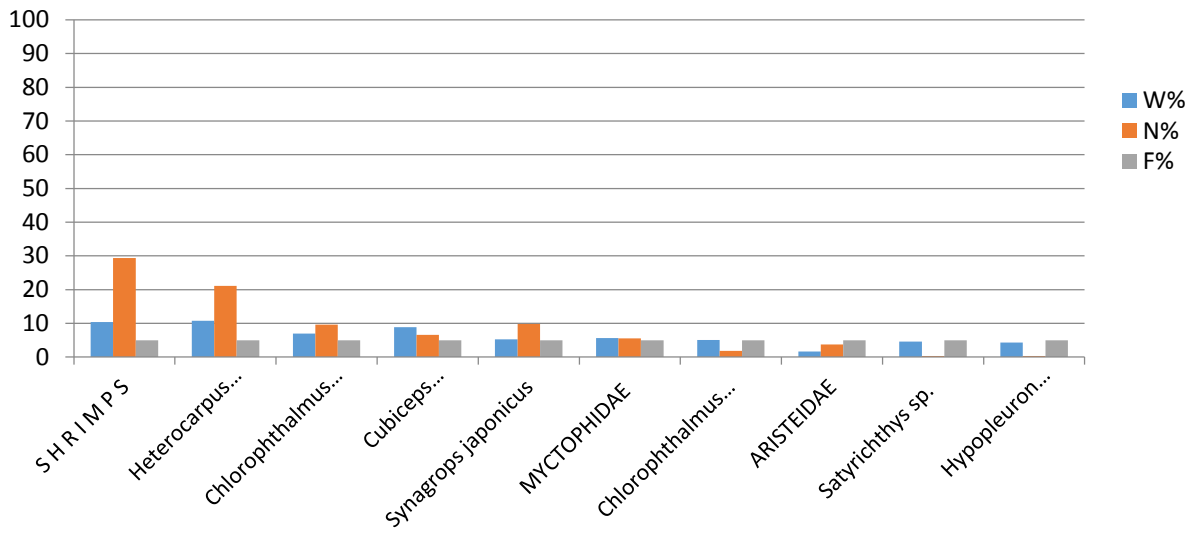
50-100 m



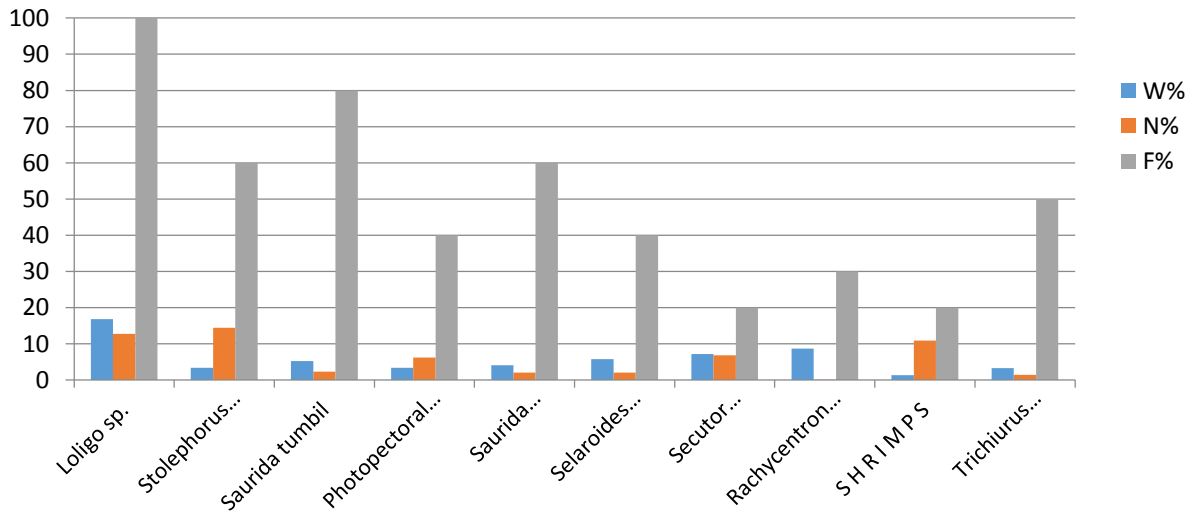
100-200 m



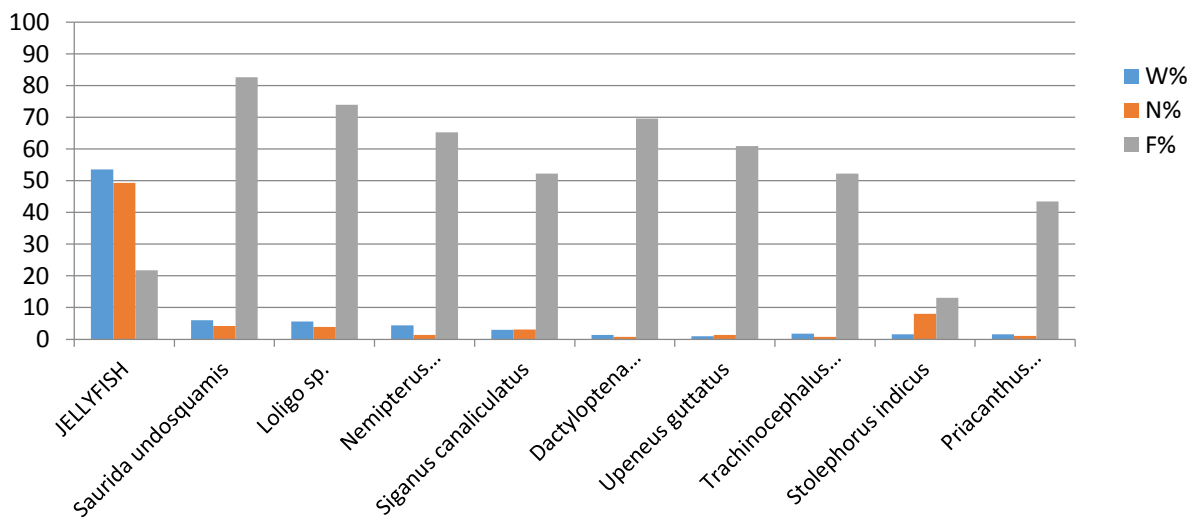
200-500 m



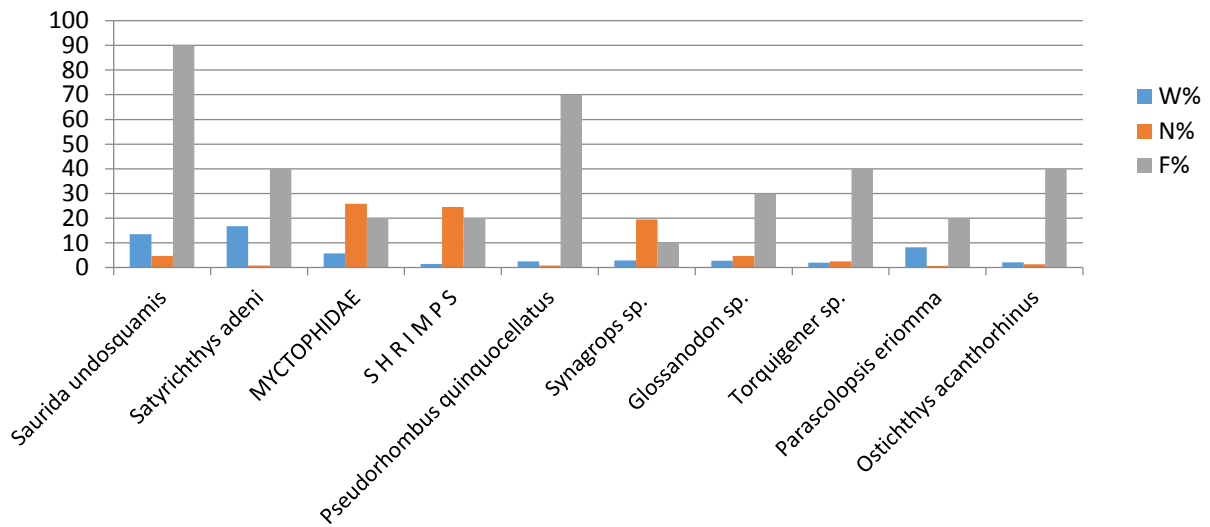
c) Tanintharyi coastal region, 0-50 m



50-100 m



100-200 m



200-500 m

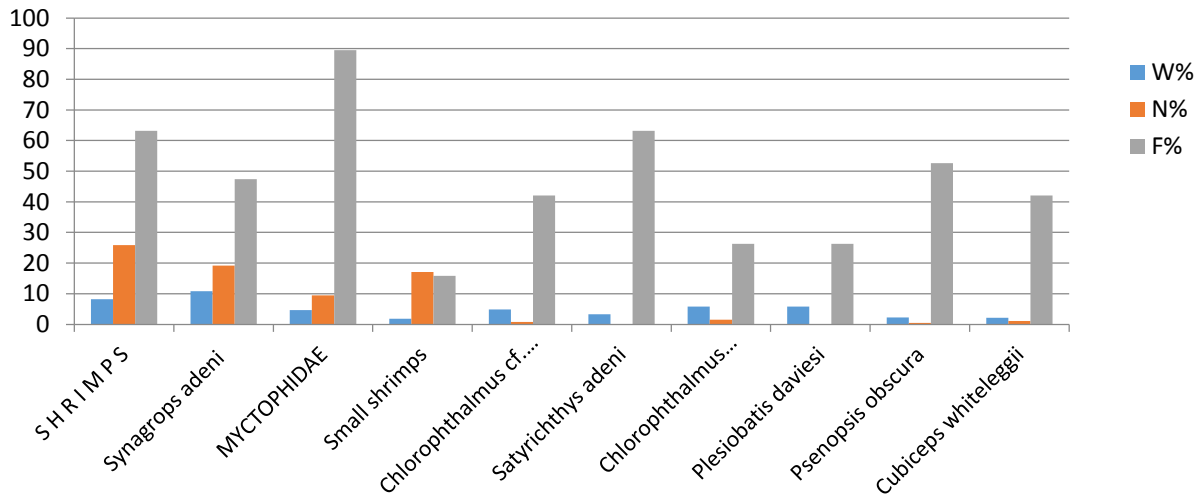


Figure 5.1. Index of relative importance for the 10 most important species or species groups for the depth strata 20-50 m, 50-100 m, 100-200 m and 200-500 m in the Rakhine coastal region (a), the Deltaic coast (b) and the Tanintharyi coast (c).

5.4 Taxonomy and genetics

A number of specimens belonging to various taxonomic groups (ca. 800) were collected during the survey. The latter have been photographed, tissue sampled, fixed and shipped to specialists around the globe for more detail study. The information derived from the survey as well as feedback from the specialists will serve as baseline data to produce a species identification guide to the marine and brackish water resources of Myanmar. The guide will be prepared under the direction of the FishFinder Programme, Marine and Inland Fisheries Services (FIRF) of the Food and Agriculture Organization of the United Nations (FAO).

CHAPTER 6 SUMMARY AND CONCLUSIONS

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 Rakhine 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.

6.1 Environment

Chlorophyll a levels were generally low to moderate, depending on location and depth. Chlorophyll concentrations in surface-near layers were generally highest at the stations near the coast.

Nutrient concentrations generally varied strongly with depth, and particularly nitrate and silicate concentrations spanned great ranges. Nitrate and silicate levels were generally very low in the surface, and increased with depth. Nutrient concentrations in the surface-near layers were generally higher at near-shore stations. Mixing processes is an important factor limiting primary production by nutrients. Nitrate, phosphate and silicate are necessary for phytoplankton to grow. Because of gravitation sinking of particulate material (such as plankton, dead or faecal material), the nutrients are removed from the euphotic zone, but can be replenished by mixing by e.g. river run off or upwelling of deeper water. During the season the survey was carried out, and as pointed out in the results section of this report, river run-off likely is an important contributor to supply primary growth during this season. Copepods dominate in the overall picture from the zooplankton biomass samples, contributing as a major food organism for small fish in the Myanmar waters.

6.2 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 approx. 20°00' N in the north to the border with Thailand at 10°00' N in the south, see Figure 1.1. This is slightly further north than during the 2013 survey. The survey was not, as was the cases in 2013, hindered by presence of bamboo rafts in the shallow part of the survey area in the Ayeyarwady coastal zone, and the vessel was therefore able specially in this region, to cover slightly closer to the coast. Regions inshore 20 m depth was not covered, and the reported abundance estimates does not include those areas even though we are aware that these are important fishing grounds. 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 were separated into two species groups, Pelagic 1 (Clupeoids species) and Pelagic 2 (carangids and associated species). These estimates were based on an average fish length of 10 cm used to make comparison with historical data easier. Based on this a total estimate of 193 000 tonnes were estimated compared with 109 000 in 2013. Of this 108 000 was estimated to be Pelagic 1 species while 84 000 was estimated to be Pelagic 2 species. This can be compared with 35 000 tonnes of Pelagic 1 species and 74 000 tonnes of Pelagic 2 species in 2013. The

results show as with the demersal survey results a small but clear positive trend for both species groups. As during 2013 the highest abundance of pelagic fish was found in the Tanintharyi delta region.

The total swept area biomass estimate (Table 7.1) based on valid bottom trawl hauls was estimated to be 421 000 tonnes compared with 280 000 tonnes in 2013, an increase of 141 000 tonnes. This is a considerable increase within the 1.5 years from our previous survey, and the increase is consistent in all regions of Myanmar. The Rakhine coastal zone had an estimate of 105 000 compared with 60 000 tonnes in 2013. The Deltaic coast gave a total biomass estimate of 126 000 compared with 101 000 tonnes in 2013 and the Tanintharyi coast showed the highest overall biomass estimate of 190 000 compared with 112 000 tonnes in 2013. However, it is worth noticing that the amount of jellyfish included in the 2015 estimate is high. It increased from almost 0 (<1000 tonnes) to 54 000 tonnes. High jellyfish population is a concern several places in the world as this is considered a “dead-end” since the jellyfish have few predators and are also not (with few exceptions) useful for human consumption.

Table 7.1. Summary of biomass estimates from the different regions and depth strata estimated during the 2013, and the present survey.

Depth/Region	Rakhine coast		The Deltaic coast		The Tanintharyi coast	
	2013	Present	2013	Present	2013	Present
20-50 m	31 000	23 000	31 000	41 000	12 000	28 000
50-100 m	19 000	54 000	40 000	46 000	47 000	82 000
100-200 m	4 900	4 900	19 000	26 000	10 000	31 000
200-500 m	5 200	23 000	11 000	13 000	43 000	48 000
Total	60 000	105 000	101 000	126 000	112 000	190 000

It is promising to see that even with the subtraction of the biomass of jellyfish the estimates in general are higher than in 2013. As mentioned in the introduction to this report a number of management measures have been put in place by the Myanmar government since the 2013 survey. What we see this year may well be the first signs that these are having a positive effect on the resource situation.

6.3 Fish Ecology and biodiversity.

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. A strong depth separation in relation to the same is also observed. The ecosystem in general still show 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. The introduction of relatively large biomass of jellyfish in some areas may be seen as signs of the same. These results should be corroborated by any additional information that may be available as regards trends in catch and effort statistics.

6.4 Recommended follow up work

The present survey together with the 2013 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. With the completion of this second survey we have gained new and important information also on how productivity and fish abundance may be subject to seasonal cycles and migrations.

Key recommendations in relation to the scientific work include:

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.

Several years ago FAO took the initiative to prepare a fish identification guide for Myanmar. However, the guide book is still pending. This work has been resumed and the book will when completed improve species identification for both official and recreational use in this country. The work will be carried out in close cooperation with national institutions in Myanmar.

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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R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 6
 DATE :02/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 19°24.06
 start stop duration duration Lon E 92°56.92
 TIME :01:27:00 01:57:01 30.0 (min) Purpose : 3
 LOG : 4757.91 4759.36 1.4 Region : 10310
 FDEPTH: 71 71 Gear cond.: 0
 BDEPTH: 71 71 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 2.9 kn
 Sorted : 27 Total catch: 26.99 Catch/hour: 53.94

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Saurida undosquamis	12.19	316	22.60
Loligo sp.	7.20	274	13.34
Nemipterus japonicus	7.08	480	13.12
Sepia sp.	6.80	48	12.60
Saurida tumbil	5.80	220	10.74
Upeneus moluccensis	2.84	92	5.26
Lagocephalus guentheri	2.52	50	4.67
Sea snakes	1.36	2	2.52
Champsodon sp.	1.12	296	2.07
Octopus sp.	1.04	6	1.93
Fistularia petimba	0.88	26	1.63
Siganus canaliculatus	0.88	26	1.63
Pentaptrion longimanus	0.76	26	1.41
Sphyræna forsteri	0.64	4	1.19
Seriolina nigrofasciata	0.40	2	0.74
Trichiurus lepturus	0.36	8	0.67
OGCOEPHALIDAE	0.36	2	0.67
Secutor insidiator	0.32	50	0.59
Priacanthus hamrur	0.28	6	0.52
Jaydia queketti	0.28	24	0.52
Rastrelliger faughni	0.22	2	0.41
Rastrelliger brachysoma	0.22	2	0.41
Ariosoma gnanadosi	0.16	12	0.30
Upeneus guttatus	0.12	4	0.22
Trachinocephalus myops	0.12	2	0.22
Paraperctis alboguttata	0.02	2	0.04
Jaydia striata	0.00	8	0.00
Rogadius pristiger	0.00	4	0.00
Total	53.94		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 9
 DATE :02/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 19°10.71
 start stop duration duration Lon E 93°17.49
 TIME :10:14:57 10:45:00 30.1 (min) Purpose : 3
 LOG : 4820.66 4822.23 1.6 Region : 10310
 FDEPTH: 40 41 Gear cond.: 0
 BDEPTH: 40 41 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.1 kn
 Sorted : 0 Total catch: 28.41 Catch/hour: 56.73

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Gazza minuta	32.83	50152	57.87
Pomadasyds kaakan	7.91	12	13.94
Saurida tumbil	3.51	174	6.20
Nemipterus japonicus	3.23	30	5.70
Lagocephalus lunaris	2.32	22	4.08
Lagocephalus guentheri	2.00	18	3.52
Loligo sp.	1.52	106	2.68
Lepturacanthus savala	1.24	26	2.18
Netuma bilineata	0.64	2	1.13
Aurigequula longispina	0.44	2	0.77
Loligo sp.	0.36	14	0.63
Fistularia petimba	0.24	8	0.42
Pentaptrion longimanus	0.16	10	0.28
Selaroides leptolepis	0.12	2	0.21
Priacanthus tayenus	0.12	2	0.21
Siganus canaliculatus	0.08	0	0.14
Ostorhinchus fasciatus	0.02	4	0.04
Total	56.73		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 10
 DATE :02/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 19°6.31
 start stop duration duration Lon E 93°7.89
 TIME :12:16:28 12:46:30 30.0 (min) Purpose : 3
 LOG : 4833.54 4834.98 1.4 Region : 10310
 FDEPTH: 78 77 Gear cond.: 0
 BDEPTH: 78 77 Validity : 0
 Towing dir: 0° Wire out : 190 m Speed : 2.9 kn
 Sorted : 33 Total catch: 134.97 Catch/hour: 269.67

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Lagocephalus guentheri	74.33	1271	27.56
Priacanthus hamrur	36.44	631	13.51
Sphyræna pinguis	30.21	615	11.20
Saurida tumbil	28.29	599	10.49
Upeneus vittatus	19.34	599	7.17
Nemipterus japonicus	16.78	1119	6.22
Saurida undosquamis	14.87	192	5.51
Decapterus russelli	12.15	232	4.50
Sepia sp.	8.47	48	3.14
Trachinocephalus myops	5.27	40	1.96
Metapenaeus tenuipes	4.48	200	1.66
Upeneus guttatus	2.88	104	1.07
Jaydia queketti	2.72	240	1.01
Octopus sp.	2.72	64	1.01
Aluterus monoceros	2.56	8	0.95
Fistularia petimba	1.60	8	0.59
Rastrelliger brachysoma	1.60	6	0.59
Selar crumenophthalmus	1.44	24	0.53
Brachypterois serrulata	1.00	2	0.37
Rogadius asper	0.80	48	0.30
Paraperctis alboguttata	0.64	16	0.24
Pomadasyds kaakan	0.64	8	0.24
Saurida elongata	0.24	8	0.09
Antennarius hispidus	0.10	2	0.04
Uraspis sp.	0.08	148	0.03
Rastrelliger faughni	0.04	2	0.01
Jaydia striata	0.00	2	0.00
Apogon smithi	0.00	2	0.00
Total	269.67		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 11
 DATE :02/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 19°3.15
 start stop duration duration Lon E 93°6.87
 TIME :13:41:13 14:11:13 30.0 (min) Purpose : 3
 LOG : 4839.26 4840.86 1.6 Region : 10310
 FDEPTH: 109 114 Gear cond.: 0
 BDEPTH: 109 114 Validity : 0
 Towing dir: 0° Wire out : 270 m Speed : 3.2 kn
 Sorted : 26 Total catch: 79.26 Catch/hour: 158.52

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Champsodon sp.	84.12	13626	53.07
CALLIONYMIDAE	34.80	22620	21.95
'Spider crab'	9.24	1542	5.83
Priacanthus hamrur	8.16	168	5.15
Metapenaeus tenuipes	7.32	1902	4.62
Saurida longimanus	4.32	216	2.73
Cynoglossoides sp.	4.32	180	2.73
Bathymyrus echinorhynchus	3.36	138	2.12
Pterygotrigla hemisticta	1.08	66	0.68
Sphyræna putnamae	0.60	12	0.38
Acropoma japonicum	0.48	36	0.30
Decapterus smithvanizi	0.36	12	0.23
Upeneus moluccensis	0.24	6	0.15
SCORPAENIDAE	0.06	6	0.04
BOTHIDAE	0.06	12	0.04
Total	158.52		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 8
 DATE :02/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 19°17.94
 start stop duration duration Lon E 93°25.89
 TIME :08:20:10 08:50:12 30.0 (min) Purpose : 3
 LOG : 4808.52 4810.01 1.5 Region : 10310
 FDEPTH: 21 23 Gear cond.: 0
 BDEPTH: 21 23 Validity : 0
 Towing dir: 0° Wire out : 60 m Speed : 3.0 kn
 Sorted : 22 Total catch: 66.48 Catch/hour: 132.83

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
JELLYFISH	79.92	0	60.17
Lepturacanthus savala	35.10	494	26.43
Scomberomorus koreanus	3.24	18	2.44
Chirocentrus nudus	2.08	12	1.56
Alepes djedaba	1.90	124	1.43
Scomberomorus commerson	1.84	4	1.38
Lagocephalus guentheri	1.68	28	1.26
Siganus javus	0.92	56	0.69
Loligo sp.	0.84	12	0.63
Stolephorus indicus	0.82	232	0.62
Osteogeneiosus militaris	0.72	2	0.54
Saurida tumbil	0.64	2	0.48
Leiognathus sp.	0.60	28	0.45
Pomadasyds argenteus	0.48	4	0.36
Ilisha striatula	0.44	8	0.33
Pampus argenteus	0.40	2	0.30
Nemipterus japonicus	0.36	4	0.27
Leiognathus sp.	0.30	18	0.23
Loligo sp.	0.28	14	0.21
Calappa lophos	0.16	2	0.12
Terapon jarbua	0.12	2	0.09
Total	132.83		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 12												R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 16											
DATE :02/05/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 18°55.93												DATE :03/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°33.18											
start stop duration												start stop duration											
TIME :16:34:41 16:56:17 21.6 (min)												TIME :08:46:22 09:16:32 30.2 (min)											
LOG : 4860.81 4862.08 1.3												LOG : 4940.79 4942.40 1.6											
FDEPTH: 40 40												FDEPTH: 89 88											
BDEPTH: 215 181												BDEPTH: 89 88											
Towing dir: 0° Wire out : 0 m												Towing dir: 0° Wire out : 250 m											
Sorted : 6 Total catch: 141.38												Sorted : 0 Total catch: 729.01											
CATCH/HOUR % OF TOT. C SAMP												CATCH/HOUR % OF TOT. C SAMP											
SPECIES weight numbers												SPECIES weight numbers											
Siganus canaliculatus 212.17 8397 54.02 8												Trichiurus lepturus 1169.69 23419 80.68 13											
Benthesemaea fibulatum 180.56 1552778 45.98 9												Nemipterus randalli 127.28 4646 8.78 11											
Total 392.72 100.00												Saurida tumbil 64.91 3818 4.48 12											
R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 13												R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 17											
DATE :02/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°52.27												DATE :03/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°37.61											
start stop duration												start stop duration											
TIME :20:26:19 20:56:28 30.1 (min)												TIME :10:46:49 11:17:01 30.2 (min)											
LOG : 4884.44 4886.06 1.6												LOG : 4953.27 4954.90 1.6											
FDEPTH: 47 49												FDEPTH: 30 29											
BDEPTH: 47 49												BDEPTH: 30 29											
Towing dir: 0° Wire out : 130 m												Towing dir: 0° Wire out : 90 m											
Sorted : 30 Total catch: 113.06												Sorted : 33 Total catch: 81.03											
CATCH/HOUR % OF TOT. C SAMP												CATCH/HOUR % OF TOT. C SAMP											
SPECIES weight numbers												SPECIES weight numbers											
Gazza minuta 74.03 14066 32.90												Lepturacanthus savala 61.29 1148 38.07 14											
Bregmaceros mcllellandi 44.90 1305 19.95												Gazza minuta 34.85 2440 21.65											
Pentapriion longimanus 27.38 2189 12.17												Arius venosus 15.14 34 9.40											
Nemipterus japonicus 20.86 1043 9.27												Pomadasy kaakan 14.94 30 9.28											
Jaydia striata 15.60 3900 6.93												Lutjanus johnii 4.77 6 2.96											
Priacanthus sp. 13.61 72 6.05												Chirocentrus dorab 4.25 8 2.64											
Lutjanus madras 6.37 271 2.83												Mene maculata 3.77 36 2.34											
Saurida undosquamis 4.30 183 1.91												Metapenaeus sp. 3.38 165 2.10											
Small shrimps 2.71 1190 1.20												Plotosus canius 2.74 2 1.70											
Small crabs 1.91 247 0.85												Pennahia anea 2.38 20 1.48											
CALLIONYMIDAE 1.75 2452 0.78												Lutjanus quinquelineatus 2.19 2 1.36											
Upeneus moluccensis 1.75 40 0.78												Valamugil buchanani 2.07 28 1.28											
Lepturacanthus savala 1.67 10 0.74												Loligo sp. 1.47 40 0.91											
Mene maculata 1.51 16 0.67												Himantura walga 1.23 16 0.77											
Pseudorhombus duplicioellatus 1.43 103 0.64												Nemipterus japonicus 0.83 2 0.52											
Sepia sp. 1.39 30 0.62												Panulirus polyphagus 0.83 2 0.52											
Metapenaeus sp. 0.84 30 0.37												SQUILLIDAE 0.72 46 0.44											
Octopus sp. 0.72 6 0.32												Stolephorus indicus 0.64 159 0.39											
Penaeus monodon 0.72 6 0.32												Terapon theraps 0.60 2 0.37											
Ariusoma sp. 0.60 4 0.27												Upeneus sp. 0.52 89 0.32											
SQUILLIDAE 0.48 72 0.21												Charybdis feriata 0.40 16 0.25											
Sea snakes 0.32 2 0.14												Nemipterus mesopriion 0.40 4 0.25											
Fistularia petimba 0.16 32 0.07												Portunus sanguinolentus 0.36 4 0.22											
Lethrinus lentjan 0.00 2 0.00												Thryssa setirostris 0.32 26 0.20											
Pseudorhombus argus 0.00 2 0.00												Antennarius hispidus 0.16 2 0.10											
Upeneus sulphureus 0.00 2 0.00												Plotosus lineatus 0.12 2 0.07											
Total 225.00 100.00												Apogon smithi 0.12 8 0.07											
R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 14												R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 18											
DATE :02/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°49.64												DATE :03/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°14.25											
start stop duration												start stop duration											
TIME :23:00:48 23:30:33 29.7 (min)												TIME :14:50:47 15:10:15 19.5 (min)											
LOG : 4894.12 4895.62 1.5												LOG : 4980.89 4981.69 0.8											
FDEPTH: 109 109												FDEPTH: 469 463											
BDEPTH: 109 109												BDEPTH: 469 463											
Towing dir: 0° Wire out : 275 m												Towing dir: 0° Wire out : 1080 m											
Sorted : 14 Total catch: 13.95												Sorted : 40 Total catch: 169.07											
CATCH/HOUR % OF TOT. C SAMP												CATCH/HOUR % OF TOT. C SAMP											
SPECIES weight numbers												SPECIES weight numbers											
Jaydia striata 25.90 2306 92.04												Echinorhinus brucus 92.70 3 17.79											
Bregmaceros mcllellandi 0.85 266 3.01												Dead shells 77.53 7753 14.88											
Priacanthus hamrur 0.44 6 1.58												Dead shells 77.53 7753 14.88											
Saurida undosquamis 0.32 16 1.15												Gavialiceps taeniola 53.71 749 10.31											
Small crabs 0.16 101 0.57												Chaunax sp. 53.59 801 10.29											
CALLIONYMIDAE 0.16 101 0.57												Chaunax sp. 53.59 801 10.29											
Bathymyrus echionorhynchus 0.12 4 0.43												Pycnocrasedum squamipinne 31.16 222 5.98											
Upeneus moluccensis 0.08 2 0.29												Psenopsis obscura 24.59 345 4.72											
Upeneus sulphureus 0.08 2 0.29												Psenopsis obscura 24.59 345 4.72											
Sepia sp. 0.02 2 0.07												Saurumraenesox vorax 12.39 114 2.38											
Total 28.14 100.00												Iago omanensis 9.71 15 1.86											
R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 15												R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 19											
DATE :03/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°29.75												DATE :03/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°15.60											
start stop duration												start stop duration											
TIME :06:50:33 07:20:37 30.1 (min)												TIME :16:44:26 17:13:41 29.3 (min)											
LOG : 4930.44 4932.00 1.6												LOG : 4989.56 4991.07 1.5											
FDEPTH: 161 167												FDEPTH: 127 132											
BDEPTH: 161 167												BDEPTH: 127 132											
Towing dir: 0° Wire out : 440 m												Towing dir: 0° Wire out : 300 m											
Sorted : 22 Total catch: 303.80												Sorted : 0 Total catch: 13.90											
CATCH/HOUR % OF TOT. C SAMP												CATCH/HOUR % OF TOT. C SAMP											
SPECIES weight numbers												SPECIES weight numbers											
Priacanthus hamrur 560.37 20502 92.44 10												Siganus canaliculatus 9.15 394 32.09											
JELLYFISH 41.90 0 6.91												Solenocera sp. 8.41 7731 29.50											
Decapterus smithvanizi 2.23 84 0.37												Priacanthus tayenus 6.07 193 21.29											
Neoepinnula orientalis 0.56 28 0.09												Bregmaceros mcllellandi 4.88 4098 17.12											
shrimps, small, non comm. 0.56 144 0.09												Total 28.51 100.00											
UNIDENTIFIED FISH 0.56 335 0.09												Total 28.51 100.00											
Total 606.19 100.00												Total 521.02 100.00											

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 20
 DATE :03/05/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 18°17.05
 start stop duration Lon E 93°44.10
 TIME :18:01:43 18:35:42 34.0 (min) Purpose : 1
 LOG : 4994.34 4996.10 1.8 Region : 10310
 FDEPTH: 10 12 Gear cond.: 0
 BDEPTH: 107 99 Validity : 0
 Towing dir: 0° Wire out : 70 m Speed : 3.1 kn
 Sorted : 0 Total catch: 0.38 Catch/hour: 0.67

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Chirocentrus nudus	0.49	2	73.68
Selar crumenophthalmus	0.14	4	21.05
Stolephorus indicus	0.04	2	5.26
Total	0.67		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 21
 DATE :03/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°19.05
 start stop duration Lon E 93°49.32
 TIME :19:37:35 20:08:11 30.6 (min) Purpose : 3
 LOG : 5001.28 5002.88 1.6 Region : 10310
 FDEPTH: 68 72 Gear cond.: 0
 BDEPTH: 68 72 Validity : 0
 Towing dir: 0° Wire out : 190 m Speed : 3.1 kn
 Sorted : 27 Total catch: 106.12 Catch/hour: 208.08

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Nemipterus japonicus	35.45	5851	17.04
Saurida undosquamus	27.14	1467	13.04
Lagocephalus guentheri	23.53	424	11.31
Pentaprion longimanus	18.35	275	8.82
Priacanthus tayenus	14.43	361	6.94
Bregmaceros maclellandi	13.65	4369	6.56
Leiognathus longispinis ***	11.14	776	5.35
Cantherhines sp.	9.57	24	4.60
Sepia sp.	9.41	149	4.52
Upeneus sulphureus	8.63	604	4.15
Jaydia striata	8.00	1035	3.84
Sphyræna obtusata	7.84	212	3.77
Decapterus macrosoma	4.24	102	2.04
Lutjanus lutjanus	3.61	102	1.73
Loligo sp.	3.29	78	1.58
Fistularia petimba	2.59	35	1.24
Octopus sp.	2.20	35	1.06
Shrimps, small, non comm.	1.41	384	0.68
C R A S	1.25	125	0.60
Trichiurus lepturus	1.25	24	0.60
Metapenaeus tenuipes	1.10	39	0.53
Total	208.08		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 22
 DATE :03/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°21.49
 start stop duration Lon E 93°51.65
 TIME :21:06:48 21:36:57 30.1 (min) Purpose : 3
 LOG : 5008.03 5009.63 1.6 Region : 10310
 FDEPTH: 41 42 Gear cond.: 0
 BDEPTH: 41 42 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.2 kn
 Sorted : 26 Total catch: 83.62 Catch/hour: 166.41

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Pentaprion longimanus	71.64	4299	43.05
Nemipterus japonicus	31.28	750	18.80
Leiognathus sp.	22.21	430	13.35
Jaydia striata	13.01	107	7.82
Lethrinus lentjan	7.08	16	4.26
Priacanthus tayenus	5.25	209	3.16
Lutjanus lutjanus	2.43	20	1.46
Loligo sp.	2.15	36	1.29
Upeneus guttatus	1.79	84	1.08
Saurida tumbil	1.71	60	1.03
Selaroides leptolepis	1.55	36	0.93
Sepia sp.	1.31	8	0.79
Metapenaeus affinis	1.19	46	0.72
Sargocentron rubrum	1.00	8	0.60
Epinephelus sexfasciatus	0.96	6	0.57
Penaeus monodon	0.80	12	0.48
Stolephorus indicus	0.60	24	0.36
Fistularia petimba	0.24	6	0.14
Pomadasy argenteus	0.20	2	0.12
Epinephelus radiatus	0.00	2	0.00
Carangoides malabaricus	0.00	2	0.00
Pterocaesio digramma	0.00	2	0.00
Dipterygionotus balteatus	0.00	2	0.00
Xiphocheilus typus	0.00	2	0.00
Total	166.41		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 23
 DATE :04/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°12.25
 start stop duration Lon E 94°16.21
 TIME :02:36:10 03:06:50 30.7 (min) Purpose : 3
 LOG : 5043.31 5044.84 1.5 Region : 10310
 FDEPTH: 36 39 Gear cond.: 0
 BDEPTH: 36 39 Validity : 0
 Towing dir: 0° Wire out : 125 m Speed : 3.0 kn
 Sorted : 36 Total catch: 218.16 Catch/hour: 426.93

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Stolephorus indicus	231.55	25444	54.24
Gazza minuta	83.84	24305	19.64
Trichiurus lepturus	19.49	164	4.57
Megalaspis cordyla	18.79	35	4.40
Lutjanus erythropterus	11.04	12	2.59
Nemipterus japonicus	8.22	106	1.93
Mene maculata	7.75	188	1.82
Sepia sp.	7.75	12	1.82
Parastromateus niger	7.28	47	1.71
Saurida tumbil	6.58	23	1.54
Scomberomorus guttatus	5.40	12	1.27
Pomadasy argyreus	3.52	23	0.83
Carangoides hedlandensis	2.58	12	0.61
Carangoides hedlandensis	2.35	12	0.55
Selaroides leptolepis	2.35	12	0.55
Rachycentron canadum	1.64	12	0.39
Sargocentron rubrum	1.64	12	0.39
Saurida undosquamus	1.41	35	0.33
Upeneus sondaicus	1.17	12	0.28
Terapon theraps	1.17	12	0.28
Lagocephalus guentheri	0.70	12	0.17
Aurigequula fasciata	0.70	12	0.17
Eubleekeria jones	0.00	2	0.00
Carangoides hedlandensis	0.00	2	0.00
Pomadasy argenteus	0.00	2	0.00
Equulites leuciscus	0.00	2	0.00
Carangoides malabaricus	0.00	2	0.00
Total	426.93		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 24
 DATE :04/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 18°3.07
 start stop duration Lon E 93°58.96
 TIME :07:04:01 07:34:27 30.4 (min) Purpose : 3
 LOG : 5068.64 5070.20 1.6 Region : 10310
 FDEPTH: 88 88 Gear cond.: 0
 BDEPTH: 88 88 Validity : 0
 Towing dir: 0° Wire out : 250 m Speed : 3.1 kn
 Sorted : 55 Total catch: 2510.68 Catch/hour: 4950.40

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Decapterus punctatus	4661.98	139859	94.17
Saurida tumbil	170.52	12789	3.44
Priacanthus blochii	78.00	1360	1.58
Acropoma cf. argentistigma	15.42	1542	0.31
Nemipterus japonicus	14.51	726	0.29
Small crabs	4.53	363	0.09
Champsodon sp.	2.72	363	0.05
Lepidotrigla alcocki	2.72	272	0.05
Total	4950.40		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 25
 DATE :04/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 17°57.75
 start stop duration Lon E 93°51.29
 TIME :08:56:30 09:26:34 30.1 (min) Purpose : 3
 LOG : 5080.20 5081.77 1.6 Region : 10310
 FDEPTH: 157 154 Gear cond.: 0
 BDEPTH: 157 154 Validity : 0
 Towing dir: 0° Wire out : 410 m Speed : 3.1 kn
 Sorted : 0 Total catch: 9.21 Catch/hour: 18.38

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Solenocera sp.	14.37	10057	78.18
Priacanthus tayenus	3.23	168	17.59
Bathylupei sp.	0.44	96	2.39
Small crabs	0.28	24	1.52
Pterygotrigla arabica	0.06	2	0.33
Total	18.38		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 26
 DATE :04/05/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 17°46.68
 start stop duration Lon E 93°48.56
 TIME :14:47:25 15:08:54 21.5 (min) Purpose : 1
 LOG : 5105.23 5106.28 1.1 Region : 10310
 FDEPTH: 68 20 Gear cond.: 0
 BDEPTH: 1524 1489 Validity : 0
 Towing dir: 0° Wire out : 0 m Speed : 2.9 kn
 Sorted : 0 Total catch: 4.44 Catch/hour: 12.40

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Psenes cyanophrys	4.63	6257	37.39
JELLYFISH	3.74	0	30.18
Loligo sp.	1.51	329	12.16
MYCTOPHIDAE	1.12	413	9.01
Leptocephalus	0.95	154	7.66
Decapterus sp., juvenile	0.34	117	2.70
PARALEPIDIDAE	0.11	17	0.90
AUXIS sp., juvenile	0.00	3	0.00
ARGONAUTIDAE	0.00	3	0.00
CENTROLOPHIDAE, juvenile	0.00	6	0.00
Xiphiasia matsubari	0.00	3	0.00
CARANGIDAE, juvenile	0.00	11	0.00
Priacanthus sp., juvenile	0.00	28	0.00
Total	12.40		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 34
 DATE :05/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 17°23.56
 start stop duration duration Lon E 94°9.19
 TIME :09:52:27 10:22:35 30.1 (min) Purpose : 3
 LOG : 5219.74 5221.20 1.5 Region : 10310
 FDEPTH: 173 171 Gear cond.: 0
 BDEPTH: 173 171 Validity : 0
 Towing dir: 0° Wire out : 430 m Speed : 2.9 kn
 Sorted : 15 Total catch: 45.12 Catch/hour: 89.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
C R A B S	68.22	23197	75.93	
Priacanthus hamrur	21.63	514	24.07	30
Total	89.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 35
 DATE :05/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 17°8.96
 start stop duration duration Lon E 94°6.27
 TIME :16:11:17 16:41:32 30.2 (min) Purpose : 3
 LOG : 5265.62 5267.06 1.4 Region : 10310
 FDEPTH: 767 777 Gear cond.: 0
 BDEPTH: 767 777 Validity : 0
 Towing dir: 0° Wire out : 1600 m Speed : 2.9 kn
 Sorted : 24 Total catch: 100.21 Catch/hour: 198.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Gavialiceps taeniola	53.19	637	26.74	
Ophiuroidea	42.67	0	21.45	
Sea cucumber	30.57	89	15.37	
BYTTIIDAE	18.06	169	9.08	0
Alepocephalus sp.	14.09	139	7.09	
Physiculus sp.	11.71	208	5.89	
Empterus sp.	10.32	30	5.19	
MACROURIDAE	9.92	79	4.99	
Aristeus virilis	5.68	510	2.85	
NETTASTOMATIDAE	0.99	4	0.50	
Cruriraja andamanica	0.89	2	0.45	
Apristurus sp.	0.79	4	0.40	
Fishing gears	0.00	2	0.00	
IPNOPIIDAE	0.00	0	0.00	
JELLYFISH	0.00	0	0.00	
MURAENESOCIDAE	0.00	0	0.00	
NEMICHTHYIDAE	0.00	0	0.00	
NOTACANTHIDAE	0.00	0	0.00	
PARALEPIDIDAE	0.00	0	0.00	
CHIMAERIDAE	0.00	0	0.00	
Plastic	0.00	0	0.00	
Total	198.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 36
 DATE :05/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 17°8.38
 start stop duration duration Lon E 94°12.14
 TIME :21:27:58 21:58:12 30.2 (min) Purpose : 3
 LOG : 5280.32 5281.98 1.6 Region : 10310
 FDEPTH: 136 136 Gear cond.: 0
 BDEPTH: 136 136 Validity : 0
 Towing dir: 0° Wire out : 360 m Speed : 3.3 kn
 Sorted : 1 Total catch: 0.86 Catch/hour: 1.71

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Iago omanensis	1.67	2	97.67	
Priacanthus hamrur	0.04	6	2.33	
Total	1.71		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 37
 DATE :05/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 17°6.54
 start stop duration duration Lon E 94°14.71
 TIME :22:44:10 23:14:32 30.4 (min) Purpose : 3
 LOG : 5286.44 5288.07 1.6 Region : 10310
 FDEPTH: 76 78 Gear cond.: 0
 BDEPTH: 76 78 Validity : 0
 Towing dir: 0° Wire out : 210 m Speed : 3.2 kn
 Sorted : 26 Total catch: 52.14 Catch/hour: 103.01

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida longimanus	59.03	6257	57.31	32
Nemipterus japonicus	20.07	944	19.49	31
Priacanthus hamrur	4.35	95	4.22	
Iago omanensis	4.31	36	4.18	
Lepturacanthus savala	3.95	12	3.84	
GOBIIDAE	3.32	367	3.22	
Parapterois heterura	2.57	482	2.49	
Portunus sp.	1.90	146	1.84	
Shrimps, small, non comm.	1.78	126	1.73	
Rhynchoconger sp.	0.99	28	0.96	
Acanthocheila sp.	0.47	43	0.46	
APOGON sp.	0.28	24	0.27	
Sea snakes	0.00	2	0.00	
Total	103.01		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 38
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 17°4.50
 start stop duration duration Lon E 94°22.41
 TIME :04:20:37 04:50:37 30.0 (min) Purpose : 3
 LOG : 5306.47 5307.93 1.5 Region : 10310
 FDEPTH: 42 44 Gear cond.: 0
 BDEPTH: 42 44 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.9 kn
 Sorted : 0 Total catch: 112.38 Catch/hour: 224.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus sp.	149.60	1424	66.56	
Loligo sp.	13.60	480	6.05	
Alectis indica	9.12	8	4.06	
Pentapron longimanus	7.36	336	3.27	
Saurida tumbil	7.16	64	3.19	33
Saurida undosquamis	5.92	72	2.63	34
Trichiurus lepturus	5.76	80	2.56	
Leiognathus berbis	4.48	904	1.99	
Carangoides malabaricus	4.00	16	1.78	
Secutor sp.	3.68	744	1.64	
Nemipterus randalli	2.88	40	1.28	
Sea snakes	2.80	2	1.25	
Aurigequula longispina	2.08	32	0.93	
Alectis ciliaris	1.60	8	0.71	
C R A B S	1.60	128	0.71	
Priacanthus hamrur	1.20	16	0.53	
Stolephorus indicus	0.72	24	0.32	
Fistularia petimba	0.64	16	0.28	
Lutjanus quinquelineatus	0.48	8	0.21	
Small crabs	0.08	8	0.04	
Total	224.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 39
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°45.24
 start stop duration duration Lon E 94°20.00
 TIME :07:51:18 08:21:27 30.1 (min) Purpose : 3
 LOG : 5331.43 5333.09 1.6 Region : 10310
 FDEPTH: 24 30 Gear cond.: 0
 BDEPTH: 24 30 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 3.3 kn
 Sorted : 4 Total catch: 97.22 Catch/hour: 193.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus sp.	124.94	49974	64.58	
Scomperomorus commerson	16.88	6	8.72	
Saurida tumbil	14.69	529	7.59	
Secutor sp.	12.24	2529	6.33	
Stolephorus indicus	6.53	1755	3.37	
Megalaspis cordyla	4.18	4	2.16	
Gerres filamentosus	2.63	18	1.36	
Trichiurus lepturus	2.45	287	1.27	
Nemipterus japonicus	1.95	22	1.01	35
Aurigequula longispina	1.67	24	0.86	
Alectis ciliaris	1.11	2	0.58	
Upeneus sulphureus	0.82	40	0.42	
Trichiurus lepturus	0.64	10	0.33	
Epinephelus cotoides	0.60	2	0.31	
Lutjanus lutjanus	0.48	10	0.25	
Lagocephalus guentheri	0.40	8	0.21	
Lutjanus malabaricus	0.32	2	0.16	
Epinephelus latifasciatus	0.24	2	0.12	
Atropus atropus	0.20	2	0.10	
Loligo sp.	0.18	6	0.09	
Priacanthus sp.	0.12	8	0.06	
Cynoglossus sp.	0.08	2	0.04	
Sardinella gibbosa	0.08	2	0.04	
Pomadasys sp.	0.08	2	0.04	
Plastic cans-jars etc	0.00	2	0.00	
Total	193.47		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 40
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°47.18
 start stop duration duration Lon E 94°8.79
 TIME :09:49:22 10:19:28 30.1 (min) Purpose : 3
 LOG : 5343.53 5344.95 1.4 Region : 10310
 FDEPTH: 69 68 Gear cond.: 0
 BDEPTH: 69 68 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 2.8 kn
 Sorted : 29 Total catch: 29.32 Catch/hour: 58.45

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	19.22	116	32.88	
Nemipterus japonicus	13.40	353	22.92	37
Nemipterus nematophorus	5.50	136	9.41	38
Arionma indicum	5.42	50	9.28	
Loligo sp.	3.55	128	6.07	
Fistularia petimba	1.99	16	3.41	
Secutor sp.	1.83	151	3.14	
sepia sp.	1.63	8	2.80	
Saurida tumbil	1.55	0	2.66	
Saurida undosquamis	1.12	46	1.91	
Lagocephalus guentheri	1.04	10	1.77	
Nemipterus sp.	0.76	58	1.30	39
Upeneus guttatus	0.56	16	0.95	
Stolephorus indicus	0.36	106	0.61	
LEIOGNATHIDAE	0.36	58	0.61	
Cynoglossus sp.	0.16	18	0.27	
Pomadasys argyreus	0.00	2	0.00	
Total	58.45		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 41
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°47.24
 start stop duration Lon E 94°2.15
 TIME :11:31:40 12:01:45 30.1 (min) Purpose : 3
 LOG : 5352.34 5353.94 1.6 Region : 10310
 FDEPTH: 155 161 Gear cond.: 0
 BDEPTH: 150 161 Validity : 0
 Towing dir: 0° Wire out : 370 m Speed : 3.2 kn
 Sorted : 26 Total catch: 25.54 Catch/hour: 50.94

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Priacanthus hamrur	21.06	41.35	41
Champsodon sp.	17.55	34.46	42
Pterygotrigla arabica	5.35	10.49	40
SYNAPHOBANCHIDAE	3.39	6.66	
Sea snakes	1.08	2.11	
Ariomma indicum	0.92	1.80	
Bathymyrus echinorhynchus	0.84	1.64	
Saurida undosquamis	0.20	0.39	
Cynoglossus carpenteri	0.16	0.31	
Lagocephalus guentheri	0.16	0.31	
Decapterus kurroides	0.12	0.23	
Nemipterus japonicus	0.12	0.23	
Total	50.94	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 42
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°25.88
 start stop duration Lon E 93°56.91
 TIME :16:07:24 16:37:26 30.0 (min) Purpose : 3
 LOG : 5386.18 5387.65 1.5 Region : 10310
 FDEPTH: 274 280 Gear cond.: 0
 BDEPTH: 274 280 Validity : 0
 Towing dir: 0° Wire out : 670 m Speed : 2.9 kn
 Sorted : 20 Total catch: 120.28 Catch/hour: 240.32

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Neoharriota pinnata	81.12	33.75	
GOBIIDAE	35.64	14.83	43
Psenopsis obscura	24.94	432	
Pycnocrostepus squamipinne	23.18	9.64	
Uroconger lepturus	20.94	823	
Bythaelurus hispidus	18.54	328	44
Solenocera choprai	14.07	913	
Eridacnis radcliffei	7.19	176	45
Pterygotrigla arabica	6.55	104	46
Bembrops caudimaculata	4.80	88	
Bembrops platyrhynchus	3.04	56	
Chlorophthalmus corniger	0.32	16	
Ammodytoides zanthrops	0.00	0	
Total	240.32	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 43
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°29.63
 start stop duration Lon E 94°0.32
 TIME :17:54:08 18:24:52 30.7 (min) Purpose : 3
 LOG : 5394.28 5395.94 1.7 Region : 10310
 FDEPTH: 125 121 Gear cond.: 0
 BDEPTH: 125 121 Validity : 0
 Towing dir: 0° Wire out : 340 m Speed : 3.2 kn
 Sorted : 0 Total catch: 11.22 Catch/hour: 21.91

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
SYNAPHOBANCHIDAE	6.05	254	27.63
Pterygotrigla hemisticta	5.12	338	23.35
Cynoglossus lingua	2.38	62	10.87
Psenopsis obscura	2.03	33	9.27
Priacanthus hamrur	1.64	62	7.49
Loligo sp.	1.09	4	4.99
Iago omanensis	0.98	21	4.46
Saurida tumbil	0.74	18	3.39
Sauromuraenesox vorax	0.66	41	3.03
Chelidoperca sp.	0.43	18	1.96
Octopus sp.	0.31	4	1.43
Callionymus sp.	0.31	14	1.43
Parascolopsis boesemani	0.12	4	0.53
Synagrops sp.	0.04	8	0.18
Total	21.91	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 44
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°27.58
 start stop duration Lon E 94°4.61
 TIME :19:31:06 20:01:25 30.3 (min) Purpose : 3
 LOG : 5402.02 5403.69 1.7 Region : 10310
 FDEPTH: 67 67 Gear cond.: 0
 BDEPTH: 67 67 Validity : 0
 Towing dir: 0° Wire out : 170 m Speed : 3.3 kn
 Sorted : 4 Total catch: 27.84 Catch/hour: 55.09

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Nemipterus japonicus	25.82	2840	46.88
Saurida tumbil	9.20	685	16.70
S H R I M P S	4.49	303	8.15
Priacanthus hamrur	3.36	101	6.11
Trichiurus lepturus	2.73	16	4.96
APOGONIDAE	2.47	596	4.49
Pennahia anea	2.30	16	4.17
Sepia sp.	1.46	4	2.66
SYNAPHOBANCHIDAE	1.35	146	2.44
Nemipterus bipunctatus	1.11	133	2.01
Brachyterois serrulata	0.46	12	0.83
Antennarius striatus	0.16	2	0.29
Terapon jarbua	0.16	2	0.29
Cantherhines multilineatus	0.02	2	0.04
Total	55.09	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 45
 DATE :06/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°27.00
 start stop duration Lon E 94°8.23
 TIME :20:58:04 21:28:24 30.3 (min) Purpose : 3
 LOG : 5409.20 5410.81 1.6 Region : 10310
 FDEPTH: 40 41 Gear cond.: 0
 BDEPTH: 40 41 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.2 kn
 Sorted : 0 Total catch: 34.84 Catch/hour: 68.92

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Nemipterus nematophorus	16.46	285	23.88
Lutjanus lutjanus	13.77	427	19.98
Terapon jarbua	4.75	32	6.89
Nemipterus bipunctatus	3.88	59	5.63
Sphyraena obtusata	3.88	59	5.63
Leiognathus sp.	2.85	657	4.13
Priacanthus tayenus	2.61	87	3.79
Saurida tumbil	2.45	16	3.56
Sepia sp.	2.29	12	3.33
Parupeneus heptacanthus	2.22	158	3.21
Siganus canaliculatus	2.06	44	2.99
Cantherhines multilineatus	1.50	8	2.18
Abalistes stellatus	1.35	8	1.95
Pennahia anea	1.19	8	1.72
Pentapriion longimanus	1.11	103	1.61
Xenoccephalus australis	0.79	14	1.15
SYNAPHOBANCHIDAE	0.79	4	1.15
Carangoides plagiotaenia	0.73	16	1.06
Lutjanus quinquelineatus	0.63	16	0.92
S H R I M P S	0.59	28	0.86
Congresox talabon	0.47	4	0.69
Charybdis feriata	0.38	2	0.55
APOGONIDAE	0.36	51	0.52
Lagocephalus lunaris	0.36	4	0.52
Pterois russelli	0.28	20	0.40
Fistularia petimba	0.28	12	0.40
Halietaea sp.	0.26	2	0.37
Pterocasio tessellata	0.24	40	0.34
Grammolites sp.	0.24	8	0.34
Plotosus canius	0.12	79	0.17
Trixiphichthys weberi	0.06	2	0.09
Total	68.92	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 46
 DATE :07/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°7.38
 start stop duration Lon E 94°4.12
 TIME :01:40:34 02:10:36 30.0 (min) Purpose : 3
 LOG : 5442.86 5444.36 1.5 Region : 10310
 FDEPTH: 36 35 Gear cond.: 0
 BDEPTH: 36 35 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
 Sorted : 48 Total catch: 47.56 Catch/hour: 95.02

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Rhinoptera javanica	20.78	2	21.87
Stolephorus indicus	18.26	647	19.22
Leiognathus brevirostris	9.71	1942	10.22
Saurida tumbil	6.11	56	6.43
Mene maculata	5.63	24	5.93
Nemipterus japonicus	5.43	76	5.72
Eubleekeria jones	3.72	22	3.91
Megalaspis cordyla	3.56	18	3.74
Chirocentrus nudus	3.00	10	3.15
Caranx ignobilis	2.64	26	2.78
Lutjanus lutjanus	2.40	70	2.52
Sphyraena jello	2.08	22	2.19
Loligo sp.	1.64	60	1.72
Abalistes stellatus	1.40	2	1.47
Parastromateus niger	1.40	2	1.47
Octopus sp.	1.24	6	1.30
Pentapriion longimanus	0.96	52	1.01
Psettodes erumei	0.88	2	0.93
Panulirus polyphagus	0.64	2	0.67
Sepia sp.	0.60	2	0.63
Trichiurus lepturus	0.48	4	0.50
Pomadasyd kaakan	0.44	4	0.46
Dipterygionotus sp.	0.32	72	0.34
Pomadasyd maculatus	0.28	8	0.29
Bothidae - juvenile	0.24	22	0.25
Priacanthus macracanthus	0.24	8	0.25
Pomadasyd argyreus	0.20	0	0.21
Jaydia striata	0.16	32	0.17
Terapon jarbua	0.16	2	0.17
Penaeus monodon	0.12	2	0.13
Scyllarides delfosii	0.12	2	0.13
Fistularia petimba	0.12	4	0.13
Rastrrelliger kanagurta	0.04	2	0.04
Siganus canaliculatus	0.04	8	0.04
Total	95.02	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 47
 DATE :07/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°10.24
 start stop duration Lon E 93°57.69
 TIME :03:26:02 03:56:57 30.9 (min) Purpose : 3
 LOG : 5451.99 5453.66 1.7 Region : 10310
 FDEPTH: 74 76 Gear cond.: 0
 BDEPTH: 74 76 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 3.2 kn
 Sorted : 46 Total catch: 46.39 Catch/hour: 90.02

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Selar crumenophthalmus	39.16	586	43.50
Trichiurus lepturus	14.79	60	16.43
Loligo sp.	6.44	644	7.16
Rastrrelliger faughni	5.63	64	6.25
Mene maculata	5.16	25	5.73
Saurida tumbil	4.93	268	5.48
Aluterus monoceros	2.83	2	3.15
Sepia sp.	2.17	2	2.41
Nemipterus japonicus	2.13	60	2.37
Stolephorus indicus	1.40	50	1.55
Uraspis sp.	1.20	10	1.34
Sphyraena forsteri	0.82	4	0.91
Photopectoralis aureus	0.76	82	0.84
Photopectoralis bindus	0.74	78	0.82
Megalaspis cordyla	0.62	2	0.69
Upeneus moluccensis	0.43	4	0.47
Decapterus russelli	0.43	6	0.47
Siganus canaliculatus	0.35	6	0.39
Penaeus monodon	0.04	2	0.04
Total	90.02	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 48
 DATE :07/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°11.80
 start stop duration Lon E 93°53.63
 TIME :06:18:08 06:48:23 30.3 (min) Purpose : 3
 LOG : 5464.40 5465.98 1.6 Region : 10310
 FDEPTH: 136 140 Gear cond.: 0
 BDEPTH: 136 140 Validity : 0
 Towing dir: 0° Wire out : 330 m Speed : 3.1 kn

Sorted : 12 Total catch: 27.67 Catch/hour: 54.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pterygotrigla arabica	25.96	516	47.31	
Pterygotrigla hemisticta	15.25	337	27.79	56
Priacanthus hamrur	8.59	125	15.65	
Bathymyrus echionorhynchus	1.80	52	3.29	
Acropoma japonicum	1.39	83	2.53	
Saurida tumbil	0.83	38	1.52	
Iago omanensis	0.63	10	1.16	
Sauromuraenesox vorax	0.38	52	0.69	
Chelidoperca sp.	0.04	2	0.07	
Total	54.88		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 49
 DATE :07/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°13.15
 Lon E 93°45.08
 TIME :09:22:00 09:52:09 30.1 (min) Purpose : 3
 LOG : 5483.94 5485.45 1.5 Region : 10310
 FDEPTH: 453 461 Gear cond.: 0
 BDEPTH: 453 461 Validity : 0
 Towing dir: 0° wire out : 920 m Speed : 3.0 kn
 Sorted : 22 Total catch: 47.50 Catch/hour: 94.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pycnocrasedum squamipinne	63.20	191	66.86	
Histioteuthis sp.	6.89	20	7.28	
Aristeus virilis	6.37	330	6.74	
Chaunax sp.	3.50	32	3.71	
Munida sp.	3.18	163	3.37	
Hoplostethus sp.	2.11	32	2.23	
Sauromuraenesox vorax	1.63	16	1.73	
ALEPOCEPHALIDAE	1.27	8	1.35	
Neopinnula orientalis	1.23	24	1.31	
Gavialiceps taeniola	1.11	24	1.18	
Malacocephalus laevis	1.00	40	1.05	
Iago omanensis	0.84	4	0.88	
Starfish	0.48	119	0.51	
Satyrichthys investigatoris	0.44	4	0.46	
C R A B S	0.40	28	0.42	
Neoscopelus microchir	0.36	8	0.38	
Lestrolepis intermedia	0.36	28	0.38	
Coloconger raniceps	0.16	4	0.17	
Coryphaenoides sp.	0.00	2	0.00	0
Coryphaenoides sp.	0.00	2	0.00	0
Total	94.53		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 50
 DATE :07/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 16°0.23
 Lon E 93°41.18
 TIME :16:01:24 16:22:57 21.6 (min) Purpose : 3
 LOG : 5514.77 5515.92 1.1 Region : 10310
 FDEPTH: 40 42 Gear cond.: 6
 BDEPTH: 40 42 Validity : 5
 Towing dir: 0° wire out : 110 m Speed : 3.2 kn
 Sorted : 15 Total catch: 29.42 Catch/hour: 81.91

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sea cucumber	16.04	28	19.58	
Diodon holocanthus	15.70	11	19.17	
Lethrinus lentjan	14.09	123	17.20	58
Aluterus monoceros	8.46	6	10.33	
Aluterus scriptus	6.68	6	8.16	
Sepia sp.	4.34	11	5.30	
Gymnocranius griseus	4.34	6	5.30	
Carangoides bajad	3.73	11	4.55	
Arothron immaculatus	2.56	11	3.33	
Lactoria sp.	1.95	6	2.38	
Octopus sp.	1.11	6	1.36	
Ablabys sp.	0.95	6	1.16	
Lutjanus bengalensis	0.89	11	1.09	
Siganus luridus	0.33	6	0.41	
Parupeneus macronemus	0.22	6	0.27	
Nemichthys sp.	0.17	6	0.20	
Ostorhinchus gularis	0.11	17	0.14	
Naso sp.	0.11	6	0.14	
SYNANCEIIDAE	0.10	6	0.12	
Apogonidae - juvenile	0.01	6	0.01	0
Total	81.91		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 51
 DATE :07/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 15°55.23
 Lon E 93°47.99
 TIME :19:01:02 19:31:21 30.3 (min) Purpose : 3
 LOG : 5533.36 5534.93 1.6 Region : 10310
 FDEPTH: 114 112 Gear cond.: 0
 BDEPTH: 114 112 Validity : 0
 Towing dir: 0° wire out : 270 m Speed : 3.1 kn
 Sorted : 24 Total catch: 76.67 Catch/hour: 151.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida tumbil	28.02	1734	18.47	59
Lepidotrigla pec blue line	19.95	356	13.15	
Nemipterus japonicus	19.59	570	12.91	60
Acropoma sp.	16.86	0	11.11	
Rhynchoconger sp.	10.33	184	6.81	
Pristipomoides sp.	10.21	101	6.73	
Pterygotrigla hemisticta	7.01	332	4.62	
Parascopopsis aspinosa	6.53	83	4.30	
Xenopodus australis	6.17	77	4.07	
Congrox talabonoides	5.34	2	3.52	
Ostichthys acanthorhinus	3.09	71	2.03	
Grammolites sp.	2.73	59	1.80	
C R A B S	2.49	148	1.64	
Priacanthus hamrur	2.37	42	1.57	
Haliutaea sp.	2.02	89	1.33	
Lophiomus setigerus	2.02	4	1.33	
Octopus sp.	1.66	71	1.10	
Laeps sp.	1.19	190	0.78	
S H A R K S	1.01	2	0.67	
Galappa sp.	0.87	4	0.57	
Trichiurus lepturus	0.53	2	0.35	
Acanthocephala sp.	0.47	12	0.31	
Bregmaceros maclellandi	0.47	107	0.31	
Parapercis alboguttata	0.42	18	0.27	
Psettodes erumei	0.36	12	0.23	
Total	151.72		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 52
 DATE :07/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 15°53.25
 Lon E 93°56.88
 TIME :21:10:39 21:41:07 30.5 (min) Purpose : 3
 LOG : 5547.24 5548.80 1.6 Region : 10310
 FDEPTH: 71 67 Gear cond.: 0
 BDEPTH: 71 67 Validity : 0
 Towing dir: 0° wire out : 175 m Speed : 3.1 kn
 Sorted : 10 Total catch: 28.09 Catch/hour: 55.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus nematophorus	23.22	626	41.97	61
Priacanthus hamrur	7.80	104	14.10	
Saurida tumbil	6.05	177	10.93	
Upeneus sp.	3.66	132	6.62	
Octopus sp.	1.54	20	2.78	
Sepia sp.	1.30	14	2.35	
BOTHIDAE	1.26	205	2.31	
Pennahia anea	1.26	10	2.28	
S H R I M P S	1.18	445	1.44	
Bembrops sp.	0.91	32	1.64	
Penaeus monodon	0.91	8	1.64	
UNIDENTIFIED FISH	0.73	77	1.32	
Haliutaea sp.	0.73	8	1.32	
Pseudorhombus quinquocellatus	0.63	2	1.14	
Lagocephalus lunaris	0.59	6	1.07	
Decapterus tabl	0.55	8	1.00	
C R A B S	0.55	55	1.00	
Epinephelus heniochus	0.45	4	0.82	
Trichiurus lepturus	0.39	4	0.71	
Rhynchoconger sp.	0.39	12	0.71	
Decapterus sp.	0.35	2	0.64	
Terapon jarbua	0.35	2	0.64	
Xenopodus australis	0.28	2	0.50	
Haliutaea sp.	0.14	4	0.25	0
Fistularia petimba	0.08	2	0.14	
Total	55.31		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 53
 DATE :07/05/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 15°55.22
 Lon E 93°58.59
 TIME :22:14:58 22:45:25 30.4 (min) Purpose : 1
 LOG : 5550.50 5551.95 1.4 Region : 10310
 FDEPTH: 10 12 Gear cond.: 0
 BDEPTH: 62 57 Validity : 0
 Towing dir: 0° wire out : 75 m Speed : 2.9 kn
 Sorted : 0 Total catch: 4.23 Catch/hour: 8.33

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Parastromateus niger	6.11	8	73.29	
Loligo sp.	1.02	30	12.29	
Rastrelliger brachysoma	0.75	8	8.98	
Chirocentrus sp.	0.45	2	5.44	
Total	8.33		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 54
 DATE :07/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 15°55.12
 start stop duration Lon E 94°5.03
 TIME :23:51:27 00:23:28 32.0 (min) Purpose : 3
 LOG : 5558.00 5559.65 1.6 Region : 10310
 FDEPTH: 37 38 Gear cond.: 0
 BDEPTH: 37 38 Validity : 0
 Towing dir: 0° Wire out : 100 m Speed : 3.1 kn
 Sorted : 46 Total catch: 139.05 Catch/hour: 260.64

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Gazza minuta	85.90	32.19	
Netuma thalassina	41.05	15.75	
Gymnathorax dorsalis	23.67	9.08	
Loligo sp.	19.12	7.34	
Aurigequula fasciata	15.63	6.00	
Trichiurus lepturus	7.65	2.93	
Metapenaeus tenuipes	7.54	2.89	
Lagocephalus guentheri	7.54	2.89	
Rhinoptera javanica	7.09	2.72	
Selar crumenophthalmus	6.19	2.37	
Selaroides leptolepis	5.62	2.16	
Octopus sp.	4.50	1.73	
Saurida tumbil	4.16	1.60	63
Nemipterus japonicus	4.16	1.60	64
Chirocentrus nudus	3.26	1.25	
Priacanthus hamrur	2.92	1.12	
Congresox talabon	2.59	0.99	
Jaydia striata	2.14	0.82	
Saurida undosquamis	1.91	0.73	62
Stiganus canaliculatus	1.91	0.73	
Atule mate	1.46	0.56	
Terapon theraps	1.46	0.56	
Sphyræna pinguis	1.35	0.52	
Brachypleura novaezeelandiae	1.24	0.47	
Pennahia anea	0.73	0.28	
Lagocephalus lunaris	0.67	0.26	
Halieutaea sp.	0.56	0.22	
Upeneus sulphureus	0.34	0.13	
Photopectoralis bindus	0.17	0.06	
Aurigequula fasciata	0.11	0.04	0
Total	260.64	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 55
 DATE :08/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 14°40.97
 start stop duration Lon E 93°23.08
 TIME :14:39:44 15:09:51 30.1 (min) Purpose : 3
 LOG : 5668.69 5670.14 1.4 Region : 10320
 FDEPTH: 374 376 Gear cond.: 0
 BDEPTH: 374 376 Validity : 0
 Towing dir: 0° Wire out : 880 m Speed : 2.9 kn
 Sorted : 50 Total catch: 118.14 Catch/hour: 235.34

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Heterocarpus tricarlinatus	90.44	38.43	
Hypopleuron caninum	34.86	14.81	66
Physiculus cf. yoshidae	30.84	13.10	67
ARISTEIDAE	15.06	6.40	
MYCTOPHIDAE	14.44	6.14	
Chlorophthalmus cf. acutifrons	13.35	5.67	68
RAJIDAE	6.97	2.96	
Bythaelurus hispidus	6.35	2.70	65
Chlorophthalmus corniger	4.94	2.10	
Netuma bilineata	3.94	1.68	
Chaunax sp.	2.69	1.14	
Lophiomus setigerus	1.89	0.80	
Ophidion sp.	1.35	0.58	
Satyricthys sp.	1.12	0.47	
Benthobatis moresbyi	1.08	0.46	
Tydemania navigatoris	1.00	0.42	
Neobythites cf. steatiticus	1.00	0.42	
Neoscopelus microchir	0.80	0.34	
Histioteuthis sp. *	0.60	0.25	
Octopus sp.	0.50	0.21	
Bembradum roseum	0.40	0.17	
Psenopsis obscura	0.28	0.12	
Astronesthes sp.	0.28	0.12	
Macrorhamphosodes cf. uradoi	0.22	0.09	
Pomadasy maculatus	0.18	0.08	
OMMASTREPHIDAE	0.18	0.08	
Setarches longimanus	0.14	0.06	
Plectrogenium nanum	0.10	0.04	
Coelorinchus cf. argentatus	0.10	0.04	
Rexea bengalensis	0.10	0.04	
Ostracoberyx dorygenys	0.10	0.04	
PLEURONECTIFORMES	0.04	0.02	
Malthopsis sp.	0.02	0.01	
Polyipnus asper	0.00	0.00	
Peristedion weberi	0.00	0.00	
Total	235.34	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 56
 DATE :08/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 14°23.52
 start stop duration Lon E 93°22.51
 TIME :19:05:51 19:36:30 30.6 (min) Purpose : 3
 LOG : 5692.47 5694.06 1.6 Region : 10320
 FDEPTH: 77 77 Gear cond.: 0
 BDEPTH: 77 77 Validity : 0
 Towing dir: 0° Wire out : 200 m Speed : 3.1 kn
 Sorted : 5 Total catch: 34.21 Catch/hour: 66.97

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Lethrinus rubrioperculatus	14.25	110	21.28
Sepia sp.	6.54	4	9.76
Priacanthus macracanthus	6.26	235	9.35
Acropoma japonicum	6.26	423	9.35
Dactyloptena orientalis	5.91	6	8.83
Lutjanus vitta	4.11	70	6.14
Arothron sp.	3.45	2	5.14
Loligo sp.	3.13	125	4.68
APOGONIDAE	2.66	689	3.98
Ammodytoides cf. renniei	2.35	658	3.51
Abalistes filamentosus	2.31	4	3.45
Synodus randalli	1.72	227	2.57
Heterocarpus tricarlinatus	1.25	204	1.87
Pseudobalistes fuscus	1.10	2	1.64
Ostorhinchus gularis	0.94	117	1.40
Sea cucumber	0.86	2	1.29
Gymnocranius griseus	0.78	47	1.17
Decapterus macrosoma	0.78	31	1.17
Octopus sp.	0.63	8	0.94
Pristipomoides sp.	0.47	16	0.70
Satyricthys sp.	0.47	16	0.70
Parapenaeus sp.	0.31	8	0.47
Parapercis cf. sexfasciata	0.31	23	0.47
Parupeneus heptacanthus	0.06	2	0.09
Ammodytoides sp.	0.04	4	0.06
Fishing gears	0.00	0	0.00
Total	66.97	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 57
 DATE :08/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°58.76
 start stop duration Lon E 93°18.55
 TIME :22:38:58 23:09:14 30.3 (min) Purpose : 3
 LOG : 5721.19 5722.53 1.3 Region : 10320
 FDEPTH: 62 68 Gear cond.: 0
 BDEPTH: 62 68 Validity : 0
 Towing dir: 0° Wire out : 170 m Speed : 2.7 kn
 Sorted : 0 Total catch: 18.56 Catch/hour: 36.79

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Loligo sp.	11.77	511	32.00
Loxodon macrorhinus	9.28	4	25.22
Lutjanus griseus	5.47	18	14.87
Parageleus cf. tengi	5.43	2	14.76
Dactyloptena orientalis	4.12	4	11.21
Priacanthus hamrur	0.32	2	0.86
Ammodytoides zanthrops	0.14	26	0.38
Decapterus macrosoma	0.10	8	0.27
Lutjanus lutjanus	0.08	2	0.22
Selaroides leptolepis	0.06	4	0.16
Synodus randalli	0.02	4	0.05
Total	36.79	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 58
 DATE :09/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 14°31.35
 start stop duration Lon E 93°44.43
 TIME :05:17:56 05:48:30 30.6 (min) Purpose : 3
 LOG : 5776.40 5777.77 1.4 Region : 10320
 FDEPTH: 265 272 Gear cond.: 0
 BDEPTH: 265 272 Validity : 0
 Towing dir: 0° Wire out : 620 m Speed : 2.7 kn
 Sorted : 0 Total catch: 201.65 Catch/hour: 395.79

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
S H R I M P S	90.68	12247	22.91
Chlorophthalmus corniger	69.72	6006	17.61
Synagrops japonicus	53.94	6253	13.63
Satyricthys sp.	48.05	177	12.14
Chlorophthalmus cf. acutifrons	31.56	824	7.97
Neopinnula orientalis	17.19	624	4.34
Puerulus sewelli	16.92	273	4.27
Peristedion sp.	15.54	71	3.93
Cubiceps whiteleggii	13.74	550	3.47
Saurida undosquamis	5.89	47	1.49
Lophiodon mutilus	4.71	24	1.19
Squalus hemipinnis	4.00	12	1.01
Zenopsis nebulosa	3.53	4	0.89
Plesiobatis daviesi	3.49	2	0.88
Hypopleuron caninum	2.83	82	0.71
'Spider crab'	1.88	12	0.48
Owstonia weberi	1.49	6	0.38
Priacanthus macracanthus	1.41	10	0.36
Chascanopsetta lugubris	1.22	18	0.31
Rexea bengalensis	0.94	82	0.24
Bembrrops caudimacula	0.94	12	0.24
Eridacnis radcliffei	0.94	26	0.24
Bathymyrus echionorhynchus	0.94	24	0.24
Rhynchoconger sp.	0.79	2	0.20
Lestrolepis sp.	0.71	12	0.18
Cynoglossus sp.	0.71	12	0.18
Setarches longimanus	0.71	35	0.18
Owstonia sp.	0.47	24	0.12
Erythrocles schlegelii	0.29	4	0.07
Xyrias revulsus	0.20	2	0.05
Parascopopsis boesemani	0.16	2	0.04
Halimochirus sp.	0.12	12	0.03
Tydemania navigatoris	0.04	4	0.01
OGCOEPHALIDAE	0.04	4	0.01
Total	395.78	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 59
 DATE :09/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°40.56
 start stop duration Lon E 93°44.93
 TIME :07:24:06 07:55:34 31.5 (min) Purpose : 3
 LOG : 5788.02 5789.69 1.7 Region : 10320
 FDEPTH: 89 87 Gear cond.: 0
 BDEPTH: 89 87 Validity : 0
 Towing dir: 0° Wire out : 270 m Speed : 3.2 kn
 Sorted : 27 Total catch: 26.86 Catch/hour: 51.23

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Loligo sp.	11.63	477	22.71
Saurida undosquamis	7.32	219	14.30
Decapterus macrosoma	6.45	97	12.58
RHINOBATIDAE	6.10	2	11.91
Pentapriion longimanus	4.69	235	9.16
Priacanthus hamrur	4.04	124	7.89
Sepia pharaonis	2.90	10	5.66
Nemipterus japonicus	2.21	57	4.32
Uraspis sp.	1.56	8	3.05
Nemipterus bipunctatus	1.14	21	2.23
Fistularia petimba	0.80	36	1.56
Abalistes stellatus	0.69	2	1.34
Upeneus vittatus	0.50	34	0.97
Nemipterus zysron	0.42	11	0.82
Lophiomus setigerus	0.31	2	0.60
Seriolina nigrofasciata	0.23	2	0.45
Selar boops	0.15	4	0.30
Parupeneus heptacanthus	0.08	2	0.15
Total	51.23		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 60
 DATE :09/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°1.63
 start stop duration Lon E 93°45.55
 TIME :10:59:56 11:26:04 26.1 (min) Purpose : 3
 LOG : 5815.44 5816.72 1.3 Region : 10320
 FDEPTH: 77 74 Gear cond.: 0
 BDEPTH: 77 74 Validity : 0
 Towing dir: 0° Wire out : 200 m Speed : 2.9 kn
 Sorted : 25 Total catch: 125.26 Catch/hour: 287.62

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Saurida undosquamis	112.24	7483	39.02
Selaroides leptolepis	91.85	1929	31.93
Abalistes stellatus	41.33	69	14.37
Decapterus russelli	13.78	211	4.79
Nemipterus japonicus	7.35	37	2.55
Sepia pharaonis	5.74	5	2.00
Rhinobatos cf. schlegelii	4.18	2	1.45
Nemipterus zysron	3.67	9	1.28
Cyclichthys spilostylus	2.99	2	1.04
Loligo sp.	1.84	110	0.64
Decapterus smithvanizi	1.47	28	0.51
Rastrelliger faughni	1.19	18	0.42
Total	287.62		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 61
 DATE :09/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°10.42
 start stop duration Lon E 93°47.62
 TIME :12:56:11 13:26:13 30.0 (min) Purpose : 3
 LOG : 5828.30 5829.82 1.5 Region : 10320
 FDEPTH: 80 80 Gear cond.: 0
 BDEPTH: 80 80 Validity : 0
 Towing dir: 0° Wire out : 210 m Speed : 3.1 kn
 Sorted : 27 Total catch: 59.27 Catch/hour: 118.38

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Priacanthus hamrur	23.97	671	20.25
Saurida undosquamis	18.30	439	15.45
Nemipterus japonicus	12.94	471	10.93
Dactyloptena orientalis	10.95	232	9.25
Upeneus guttatus	9.11	419	7.69
Abalistes stellatus	7.11	12	6.01
Sepia sp.	6.23	48	5.26
Octopus sp.	5.99	360	5.06
Rogadius pristiger	3.28	208	2.77
Nemipterus zysron	3.04	84	2.56
Trachinocephalus myops	2.80	88	2.36
Lepidotrigla sp.	2.08	88	1.75
Paraperis alboguttata	1.60	60	1.35
S H R I M P S	1.44	220	1.21
Photopectoralis aureus	1.20	288	1.01
Saurida tumbil	1.12	4	0.94
Rhinobatos cf. schlegelii	1.04	2	0.88
Ariosoma sp.	1.04	40	0.88
Loligo sp.	0.88	24	0.74
Parupeneus heptacanthus	0.88	16	0.74
Bregmaceros maclellandi	0.80	2197	0.67
Pseudorhombus elevatus	0.40	4	0.34
sea snakes	0.40	2	0.34
Samaris cristatus	0.28	12	0.24
Small crabs	0.24	72	0.20
Parascloopsis eriomma	0.24	4	0.20
Haliutaea sp.	0.20	4	0.17
Saurechelys sp.	0.18	12	0.15
CALLIONYMIDAE	0.16	8	0.13
Gymnothorax reticularis	0.16	4	0.13
Synodus indicus	0.16	4	0.13
Cynoglossus puncticeps	0.12	12	0.10
Lagocephalus scleratus	0.08	4	0.07
Total	118.38		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 62
 DATE :09/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°38.49
 start stop duration Lon E 93°52.17
 TIME :16:49:45 17:14:53 25.1 (min) Purpose : 3
 LOG : 5859.94 5861.16 1.2 Region : 10320
 FDEPTH: 53 56 Gear cond.: 0
 BDEPTH: 53 56 Validity : 0
 Towing dir: 0° Wire out : 150 m Speed : 2.9 kn
 Sorted : 29 Total catch: 192.30 Catch/hour: 459.13

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Lethrinus lentjan	108.30	21	23.59
Abalistes stellatus	83.37	100	18.16
Lutjanus lutjanus	60.17	1561	13.10
Nemipterus bipunctatus	34.09	487	7.43
Gymnocranius elongatus	22.06	72	4.80
Gymnura poecilura	19.10	2	4.16
Sargocentron rubrum	17.19	115	3.74
Priacanthus sagittarius	16.90	158	3.68
Neotrygon kuhlii	16.62	17	3.62
Rhynchostracion nasus	15.76	43	3.43
Nemipterus zysron	10.31	143	2.25
Tetrosomus gibbosus	9.45	57	2.06
Lutjanus madras	8.60	72	1.87
Lutjanus quinquelineatus	6.45	86	1.40
Parupeneus heptacanthus	6.02	43	1.31
Saurida undosquamis	5.16	143	1.12
Pterocaesio lativittata	4.01	186	0.87
Sphyræna forsteri	3.87	14	0.84
Fistularia petimba	1.86	57	0.41
Priacanthus sagittarius	1.60	2	0.35
Priacanthus sp.	1.58	2	0.34
Pinjalo lewisi	1.00	29	0.22
Heniochus diphreutes	1.00	29	0.22
Pristipomoides sp.	0.88	2	0.19
Rogadius pristiger	0.72	29	0.16
Lactoria cornuta	0.62	2	0.14
Lagocephalus scleratus	0.57	29	0.12
Ostorhinchus fleurieu	0.57	43	0.12
BOTHIDAE	0.43	14	0.09
Ariosoma sp.	0.21	2	0.05
Pseudorhombus elevatus	0.21	2	0.05
Aesopia cornuta	0.14	5	0.03
POMACENTRIDAE	0.14	14	0.03
Ostorhinchus fasciatus	0.14	29	0.03
Apogon sp.	0.00	2	0.00
Cynoglossus cynoglossus	0.00	2	0.00
Ostorhinchus nigrocincta	0.00	5	0.00
Pristipomoides typus	0.00	2	0.00
Total	459.13		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 63
 DATE :09/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°38.31
 start stop duration Lon E 94°13.12
 TIME :20:19:39 20:34:16 14.6 (min) Purpose : 3
 LOG : 5886.95 5887.64 0.7 Region : 10320
 FDEPTH: 40 40 Gear cond.: 0
 BDEPTH: 40 40 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 2.8 kn
 Sorted : 12 Total catch: 56.98 Catch/hour: 233.84

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Lutjanus lutjanus	51.55	804	22.04
Lutjanus madras	30.86	279	13.20
Photopectoralis aureus	27.91	4186	11.93
Lutjanus johnii	20.85	4	8.92
Pentapriion longimanus	17.40	575	7.44
Neotrygon kuhlii	15.43	25	6.60
Apogon smithi	14.77	2216	6.32
Nemipterus bipunctatus	10.51	263	4.49
Nemipterus japonicus	9.85	279	4.21
Aurigequula longispina	9.19	7715	3.93
Panulirus polyphagus	4.84	8	2.07
Saurida undosquamis	4.76	213	2.04
Ophichthus lithinus	1.72	8	0.95
Alepes djedaba	1.64	49	0.70
Bembrops platyrhynchus	1.64	49	0.70
Sphyræna forsteri	1.56	4	0.67
SEPIIDAE	1.40	4	0.60
Priacanthus sagittarius	1.31	4	0.56
Lutjanus malabaricus	1.31	4	0.56
Pterocaesio chrysozona	1.15	66	0.49
Stolephorus indicus	0.98	164	0.42
Pseudorhombus quinqueocellatus	0.70	4	0.30
Atule mate	0.70	4	0.30
Thenus orientalis	0.57	4	0.25
SQUILLIDAE	0.49	82	0.21
Pterois russelii	0.25	4	0.11
Total	233.84		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 64
 DATE :09/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°15.64
 start stop duration Lon E 94°9.46
 TIME :22:59:39 23:29:48 30.1 (min) Purpose : 3
 LOG : 5910.25 5911.86 1.6 Region : 10320
 FDEPTH: 53 54 Gear cond.: 0
 BDEPTH: 53 54 Validity : 0
 Towing dir: 0° Wire out : 150 m Speed : 3.2 kn
 Sorted : 65 Total catch: 291.31 Catch/hour: 579.91

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Selaroides leptolepis	425.51	6169	73.38
Trichiurus lepturus	49.09	100	8.47
Chirocentrus nudus	28.67	107	4.94
Saurida tumbil	18.81	161	3.24
Scomberomorus guttatus	12.90	18	2.22
Nemipterus nematophorus	9.50	125	1.64
Sepia sp.	6.37	18	1.10
Apogon aureus	5.75	573	0.99
Loligo sp.	4.30	269	0.74
Dussumieria acuta	3.76	46	0.65
Sphyræna pinguis	3.22	36	0.56
Photopectoralis bindus	3.05	223	0.53
Pentapriion longimanus	1.97	107	0.34
Metapenaeus tenuipes	1.71	54	0.30
Stolephorus indicus	1.27	36	0.22
Brachypleura novaezeelandiae	1.17	169	0.20
Pomadasys maculatus	0.98	10	0.17
Rastrelliger kanagurta	0.84	8	0.14
sea snakes	0.56	2	0.10
Ophichthus sp.	0.48	2	0.08
Total	579.91		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 65
 DATE :10/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°55.50
 start stop duration Lon E 94°7.98
 TIME :02:23:22 02:54:18 30.9 (min) Purpose : 3
 LOG : 5933.13 5934.66 1.5 Region : 10320
 FDEPTH: 71 73 Gear cond.: 0
 BDEPTH: 71 73 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 3.0 kn

Sorted : 30 Total catch: 30.17 Catch/hour: 58.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Upeneus moluccensis	10.28	233	17.57	89
Rastrelliger brachysoma	8.54	66	14.58	
Trichiurus lepturus	6.40	12	10.94	
Selar crumenophthalmus	5.35	52	9.15	91
Saurida tumbil	5.35	54	9.15	94
Sepia sp.	4.97	10	8.49	
Nemipterus nematophorus	2.56	29	4.38	92
Pentaprion longimanus	2.41	130	4.11	
Saurida undosquamis	2.13	58	3.65	93
Priacanthus hamur	1.75	12	2.98	
Nemipterus japonicus	1.40	6	2.39	
Parupeneus heptacanthus	1.26	17	2.15	
Sphyræna forsteri	1.20	14	2.06	
Loligo sp.	1.09	43	1.86	
Sea snakes	0.93	2	1.59	
Fistularia petimba	0.89	8	1.52	
Decapterus sp.	0.50	6	0.86	
Siganus canaliculatus	0.47	6	0.80	
Saurida longimanus	0.35	19	0.60	
Priacanthus macracanthus	0.23	4	0.40	
Nemipterus peronii	0.19	2	0.33	
Epinephelus areolatus	0.19	4	0.33	
Parascolopsis aspinosa	0.06	6	0.10	
Lagocephalus scleratus	0.02	2	0.03	
Total		58.53	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 66
 DATE :10/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°37.72
 start stop duration Purpose : 3
 TIME :04:59:48 05:30:09 30.3 (min) Region : 10320
 LOG : 5951.90 5953.43 1.5 Gear cond.: 0
 FDEPTH: 89 90 Validity : 0
 BDEPTH: 89 90 Speed : 3.0 kn
 Towing dir: 0° Wire out : 210 m Catch/hour: 109.80
 Sorted : 28 Total catch: 55.52

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus macrosoma	50.15	566	45.68	96
Decapterus kurroides	18.19	376	16.57	95
Loligo sp.	9.49	455	8.65	
Nemipterus japonicus	6.80	127	6.20	97
Trichiurus lepturus	6.64	8	6.05	
Saurida undosquamis	5.38	486	4.90	98
Tentoriceps cristatus	3.40	47	3.10	
Priacanthus macracanthus	2.69	36	2.45	
Haliæutæa sp.	1.62	8	1.48	
Decapterus russelli	1.07	24	0.97	
Rastrelliger faughni	0.95	12	0.86	
Parupeneus heptacanthus	0.71	8	0.65	
Acropoma japonicum	0.63	55	0.58	
Epinephelus heniochus	0.53	2	0.49	
Parascolopsis aspinosa	0.47	8	0.43	
Epinephelus areolatus	0.44	2	0.40	
Cyclichthys sp.	0.28	4	0.25	
Portunus sp.	0.20	4	0.18	
Kumococius rodericensis	0.14	2	0.13	
Total		109.80	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 67
 DATE :10/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°27.29
 start stop duration Purpose : 3
 TIME :07:19:51 07:50:07 30.3 (min) Region : 10320
 LOG : 5967.29 5968.94 1.6 Gear cond.: 0
 FDEPTH: 115 117 Validity : 0
 BDEPTH: 115 117 Speed : 3.3 kn
 Towing dir: 0° Wire out : 290 m Catch/hour: 67.97
 Sorted : 17 Total catch: 34.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida undosquamis	52.80	579	77.69	100
Nemipterus japonicus	5.47	79	8.05	99
Decapterus macrosoma	2.85	32	4.20	
Sepia sp.	2.30	36	3.38	
Parascolopsis aspinosa	1.19	16	1.75	
Satyrichthys adeni	0.95	4	1.40	
Cyclichthys orbicularis	0.79	2	1.17	
Ostichthys archiepiscopus	0.48	8	0.70	
Ebosia falcata	0.44	16	0.64	
Lepidotrigla cf alcocki	0.44	20	0.64	
Chelododon sp.	0.12	12	0.17	
Torquigener sp.	0.10	2	0.15	
Malthopsis sp.	0.04	12	0.06	
Total		67.97	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 68
 DATE :10/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°3.73
 start stop duration Purpose : 3
 TIME :18:29:12 19:00:06 30.9 (min) Region : 10320
 LOG : 6027.38 6028.86 1.5 Gear cond.: 0
 FDEPTH: 455 459 Validity : 0
 BDEPTH: 455 459 speed : 2.9 kn
 Towing dir: 0° Wire out : 980 m Catch/hour: 81.38
 Sorted : 0 Total catch: 41.91

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Heterocarpus sp.	16.78	1006	20.62	
Bythaelurus hispidus	13.20	330	16.23	
S H R I M P S	12.66	3417	15.56	
MYCTOPHIDAE	8.00	559	9.83	
Hypopleuron caninum	4.43	8	5.44	
Benthobatis moresbyi	4.31	8	5.30	
Neoharriotta pinnata	4.31	2	5.30	
Alepocephalus sp.	2.72	23	3.34	
ARISTEIDAE	2.49	307	3.05	
Polymixia berndti	2.41	27	2.96	
Chlorophthalmus cf. acutifrons	2.02	27	2.48	
Glyptothidium sp.	1.55	47	1.91	
Neoscopeilus microchir	1.32	47	1.62	
Histioteuthis sp. ?	0.85	4	1.05	
Nephropsis sp.	0.54	27	0.67	
Chaunax sp.	0.47	8	0.57	
Ateleopus sp.	0.47	4	0.57	
Metanephrops sp.	0.43	8	0.52	
Photocetes sp.	0.39	8	0.48	
Coelorrinchus sp.	0.39	31	0.48	
Synagrops adeni	0.31	8	0.38	
CERATIIDAE	0.31	19	0.38	
Promethichthys prometheus	0.19	2	0.23	
Pasiphaea sp.	0.16	16	0.19	
Bathyluella sp.	0.16	8	0.19	
Saethes longimanus	0.16	4	0.19	
OPHICHTHIDAE	0.12	4	0.14	
Stereomastis sp.	0.12	4	0.14	
Coloconger raniceps	0.10	4	0.13	
SICYONIIDAE	0.04	4	0.05	
Total		81.38	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 69
 DATE :10/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°10.09
 start stop duration Purpose : 3
 TIME :20:40:40 21:11:10 30.5 (min) Region : 10320
 LOG : 6038.01 6039.60 1.6 Gear cond.: 0
 FDEPTH: 127 127 Validity : 0
 BDEPTH: 127 127 Speed : 3.1 kn
 Towing dir: 0° Wire out : 330 m Catch/hour: 61.50
 Sorted : 16 Total catch: 31.25

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida undosquamis	10.39	173	16.90	101
Parascolopsis ertomma	8.89	35	14.46	
Neomiphon aurolineatus	8.42	87	13.70	
Lophomus setigerus	5.20	8	8.45	
Snyderina yamanokami	4.33	55	7.04	
Lipocheilus carnolabrum	4.33	24	7.04	
Roa jayakari	3.38	75	5.50	
Pterygotrigla arabica	2.76	87	4.48	
Parascolopsis tanyactis	2.52	43	4.10	
Satyrichthys adeni	2.36	12	3.84	
Nemipterus japonicus	2.36	31	3.84	
Centroberyx druzhinini	2.13	8	3.46	
Hapalogenys mucronatus	0.87	4	1.41	
BOTHIDAE	0.71	55	1.15	
Histioporus typus	0.55	4	0.90	
Loligo sp.	0.55	12	0.90	
Lestrolepis intermedia	0.47	47	0.77	
Erythrocles schlegelii	0.31	4	0.51	
CALLIONYMIDAE	0.31	31	0.51	
Neomerinthe sp.	0.24	4	0.38	
Torquigener sp.	0.24	8	0.38	
Neomerinthe sp.	0.12	2	0.19	
Dipturus cf. johannisdavesi	0.06	2	0.10	
Total		61.50	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 70
 DATE :11/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°36.43
 start stop duration duration Lon E 94°27.19
 TIME :01:42:54 02:12:58 30.1 (min) Purpose : 3
 LOG : 6071.94 6073.40 1.5 Region : 10320
 FDEPTH: 89 88 Gear cond.: 0
 BDEPTH: 89 88 Validity: 0
 Towing dir: 0° Wire out : 220 m Speed : 2.9 kn
 Sorted : 40 Total catch: 39.70 Catch/hour: 79.24

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Halieutaea sp.	16.49	8	20.81
Cantherhines multilineatus	7.64	8	9.65
Nemipterus japonicus	7.23	166	9.12
Selar crumenophthalmus	7.19	96	9.07
Epinephelus heniochus	5.11	2	6.45
Saurida undosquamis	4.27	82	5.39
Charybdis feriata	3.71	4	4.69
Fistularia petimba	3.47	10	4.38
Loligo sp.	3.35	190	4.23
Nemipterus nematophorus	3.31	44	4.18
Saurida tumbil	3.27	523	4.13
Dactyloptena orientalis	2.79	2	3.53
Acropoma japonicum	2.20	200	2.77
Champsodon sp.	1.56	279	1.96
Octopus sp.	1.00	2	1.26
Gazza minuta	0.90	307	1.13
Snyderina yamanokami	0.72	16	0.91
Brachypleura novaezeelandiae	0.64	82	0.81
Parascolopsis aspinosa	0.64	12	0.81
Siganus canaliculatus	0.62	2	0.78
Decapterus macrosoma	0.60	20	0.76
Uraspis helvola	0.48	2	0.60
Saurida longimanus	0.40	36	0.50
Tentoriceps cristatus	0.40	4	0.50
Epinephelus areolatus	0.24	2	0.30
Portunus sp.	0.24	4	0.30
Pterois russelii	0.16	2	0.20
Upeneus moluccensis	0.12	4	0.15
Okamejei cf. powelli	0.12	2	0.15
Narcine cf. brevislabiata	0.12	4	0.15
Roa jakakari	0.12	4	0.15
Lophiomus setigerus	0.08	2	0.10
Pterygotrifla arabica	0.04	2	0.05
Erythrocles schlegelii	0.02	2	0.03
Total	79.24	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 71
 DATE :11/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°55.94
 start stop duration duration Lon E 94°28.85
 TIME :04:36:35 05:07:27 30.9 (min) Purpose : 3
 LOG : 6093.47 6095.10 1.6 Region : 10320
 FDEPTH: 58 58 Gear cond.: 0
 BDEPTH: 58 58 Validity: 0
 Towing dir: 0° Wire out : 160 m Speed : 3.2 kn
 Sorted : 0 Total catch: 50.29 Catch/hour: 97.75

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Mene maculata	37.61	150	38.48
Pentaprion longimanus	12.17	851	12.45
Saurida tumbil	9.52	295	9.74
Photopectoralis bindus	7.58	910	7.76
Trichurus lepturus	5.05	58	5.17
Lagocephalus inermis	4.31	2	4.41
Loligo sp.	3.81	159	3.90
Selar crumenophthalmus	3.03	17	3.10
Nemipterus japonicus	2.22	17	2.27
Saurida undosquamis	2.18	62	2.23
Carangoides malabaricus	1.75	12	1.79
Nemipterus nematophorus	1.48	19	1.51
SNAKE	1.32	2	1.35
Megalaspis cordyla	1.09	4	1.11
Lagocephalus guentheri	0.93	8	0.95
Chirocentrus nudus	0.93	4	0.95
Stolephorus indicus	0.58	21	0.60
Platyrrhina sp.	0.51	2	0.52
Fistularia petimba	0.27	8	0.28
Siganus canaliculatus	0.23	2	0.24
Brachypleura novaezeelandiae	0.19	29	0.20
Zebrias sp.	0.17	2	0.18
Cantherhines multilineatus	0.16	2	0.16
Dactyloptena orientalis	0.16	2	0.16
Pomadasy maculatus	0.16	2	0.16
Upeneus moluccensis	0.16	6	0.16
Photopectoralis aureus	0.10	31	0.10
Decapterus sp.	0.08	2	0.08
Plastic	0.00	2	0.00
Total	97.75	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 72
 DATE :11/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°14.79
 start stop duration duration Lon E 94°31.06
 TIME :07:38:00 08:08:08 30.1 (min) Purpose : 3
 LOG : 6115.61 6117.21 1.6 Region : 10320
 FDEPTH: 47 46 Gear cond.: 0
 BDEPTH: 47 46 Validity: 0
 Towing dir: 0° Wire out : 135 m Speed : 3.2 kn
 Sorted : 0 Total catch: 22.04 Catch/hour: 43.89

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Parastromateus niger	16.13	20	36.75
Megalaspis cordyla	10.95	54	24.95
Saurida tumbil	3.70	20	8.44
Nemipterus japonicus	2.99	28	6.81
Siganus canaliculatus	2.39	88	5.44
Loligo sp.	1.75	100	3.99
Pomadasy maculatus	1.45	26	3.31
Scomberoides commersonianus	1.39	2	3.18
Saurida undosquamis	0.60	10	1.36
Nemipterus sp.	0.56	6	1.27
Nemipterus nematophorus	0.54	6	1.23
Nemipterus peronii	0.44	2	1.00
Lagocephalus lunaris	0.30	4	0.68
Fistularia petimba	0.22	4	0.50
Stolephorus indicus	0.18	6	0.41
Pentaprion longimanus	0.10	12	0.23
Brachypleura novaezeelandiae	0.10	10	0.23
Ostorhinchus fasciatus	0.10	40	0.23
Total	43.89	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 73
 DATE :11/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°37.11
 start stop duration duration Lon E 94°34.05
 TIME :11:26:37 11:56:38 30.0 (min) Purpose : 3
 LOG : 6141.17 6142.76 1.6 Region : 10320
 FDEPTH: 22 26 Gear cond.: 0
 BDEPTH: 22 26 Validity: 0
 Towing dir: 0° Wire out : 60 m Speed : 3.2 kn
 Sorted : 34 Total catch: 71.09 Catch/hour: 142.09

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Stolephorus indicus	59.64	2107	41.97
Photopectoralis bindus	28.54	3825	20.09
Secutor insidiator	9.91	851	6.98
Loligo sp.	6.40	4	4.50
Pomadasy maculatus	5.20	344	3.66
Lagocephalus guentheri	4.96	80	3.49
Saurida tumbil	4.48	40	3.15
Megalaspis cordyla	4.04	14	2.84
Nemipterus japonicus	3.84	76	2.70
Lagocephalus scleratus	2.40	4	1.69
Lactarius lactarius	2.00	32	1.41
Pennahia anea	1.64	44	1.15
Siganus canaliculatus	1.52	72	0.87
Lepturacanthus savala	1.28	20	0.90
Lagocephalus lunaris	1.24	28	1.07
Carangoides coeruleopinnatus	0.98	2	0.69
Scomberomorus commerson	0.88	16	0.62
Sphyraena pinguis	0.72	24	0.51
Drepane punctata	0.48	4	0.34
Alectis ciliaris	0.44	2	0.31
Thryssa mystax	0.40	20	0.28
Dussumieria acuta	0.32	20	0.23
Rastrelliger brachysoma	0.32	4	0.23
Caesio caerulaurea	0.24	4	0.17
Apogon smithi	0.16	36	0.11
Rastrelliger faughni	0.08	8	0.06
Total	142.09	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 74
 DATE :11/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°29.31
 start stop duration duration Lon E 94°52.47
 TIME :14:40:51 15:11:04 30.2 (min) Purpose : 3
 LOG : 6166.69 6168.20 1.5 Region : 10320
 FDEPTH: 22 23 Gear cond.: 0
 BDEPTH: 22 23 Validity: 0
 Towing dir: 0° Wire out : 60 m Speed : 3.0 kn
 Sorted : 40 Total catch: 121.11 Catch/hour: 240.46

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Stolephorus indicus	111.03	62172	46.17
Photopectoralis bindus	31.33	12747	13.03
Lepturacanthus savala	17.04	167	7.08
Secutor insidiator	8.22	762	3.42
Nemipterus japonicus	8.10	292	3.37
Metapenaeus sp.	7.62	322	3.17
Octopus sp.	7.62	77	3.17
Gazza minuta	7.03	774	2.92
Muraenesox cinereus	6.55	18	2.72
Jaydia poecilopterus	5.24	1882	2.18
Pennahia cf. ovata	4.77	0	1.98
Squilla sp.	4.77	167	1.98
Pennahia anea	4.17	60	1.68
Johnius cf. dussumieri	2.92	12	1.21
Small shrimps	2.50	399	1.04
Siganus canaliculatus	2.03	101	0.84
Upeneus sulphureus	1.73	36	0.72
Harpisquilla harpax	1.43	48	0.59
Thryssa setirostris	1.31	208	0.54
Gymnothorax dorsalis	1.19	6	0.50
Saurida undosquamis	0.60	18	0.25
Thryssa mystax	0.48	18	0.20
Sepia sp.	0.48	30	0.20
Psettodes erumei	0.36	6	0.15
Thryssa setirostris	0.30	24	0.12
Lactarius lactarius	0.30	6	0.12
Polydactylus sextarius	0.30	6	0.12
Dussumieria acuta	0.30	24	0.12
Zebrias sp.	0.24	12	0.10
Scomberomorus commerson	0.24	12	0.10
Cynoglossus arel	0.18	6	0.07
Bregmaceros mccllellandi	0.12	36	0.05
Coclella punctata	0.12	12	0.05
Total	240.46	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 75
 DATE :11/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°19.44
 start stop duration duration Lon E 94°50.83
 TIME :17:03:21 17:33:29 30.1 (min) Purpose : 3
 LOG : 6183.06 6184.64 1.6 Region : 10320
 FDEPTH: 36 36 Gear cond.: 0
 BDEPTH: 36 36 Validity: 0
 Towing dir: 0° Wire out : 110 m Speed : 3.1 kn
 Sorted : 13 Total catch: 25.68 Catch/hour: 51.10

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Apogon sp.	7.48	5612	14.64
Shrimps, small, non comm.	6.69	533	13.08
Nemipterus bipunctatus	5.73	131	11.21
Pennahia anea	3.34	20	6.54
Sepia sp.	3.18	135	6.23
Lepturacanthus savala	3.06	36	6.00
Thryssa mystax	2.95	382	5.76
Sardinella gibbosa	2.63	72	5.14
Siganus canaliculatus	2.23	127	4.36
Charybdis feriata	1.83	24	3.58
SQUILLIDAE	1.83	346	3.58
Metapenaeus tenuipes	1.83	92	3.58
C R A B S	1.75	334	3.43
Stolephorus indicus	1.59	478	3.12
Dussumieria acuta	1.43	28	2.80
Octopus sp.	1.27	4	2.49
Myrophis sp.	0.84	4	1.64
Pomadasy maculatus	0.64	32	1.25
Upeneus bensasi	0.40	8	0.78
Portunus sanguinolentus	0.24	4	0.47
Polydactylus sextarius	0.16	4	0.31
Total	51.10	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 82
 DATE :12/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°35.59
 start stop duration Lon E 95°7.76
 TIME :16:04:06 16:34:07 30.0 (min) Purpose : 3
 LOG : 6347.45 6348.92 1.5 Region : 10320
 FDEPTH: 78 84 Gear cond.: 0
 BDEPTH: 78 84 Validity : 0
 Towing dir: 0° Wire out : 210 m Speed : 2.9 kn
 Sorted : 26 Total catch: 51.80 Catch/hour: 103.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pentaptrion longimanus	25.10	1731	22.32	
Nemipterus nematophorus	22.39	480	21.62	
Saurida undosquamis	12.47	220	12.05	134
Upeneus moluccensis	11.11	204	10.73	135
Dactyloptena orientalis	6.24	88	6.02	
Neocentropogon affinis	5.36	364	5.17	
Brachypleura novaezeelandiae	3.80	568	3.67	
Seriolina nigrofasciata	2.96	4	2.86	
Sepia sp.	2.32	60	2.24	
Zebrias sp.	1.60	12	1.54	
Uroconger lepturus	1.36	64	1.31	
Octopus sp.	1.20	68	1.16	
Apogon smithi	1.12	112	1.08	
Terapon jarbua	1.08	4	1.04	
C R A B S	0.80	16	0.77	
Uranoscopus affinis	0.80	4	0.77	
Pennahia anea	0.80	16	0.77	
Fistularia petimba	0.64	24	0.62	
Sirembo jerdoni	0.60	36	0.58	
Narcine cf. breviflabiata	0.56	4	0.54	
Monocentris japonica	0.48	4	0.46	
Upeneus bensasi	0.40	20	0.39	
Cyclichthys orbicularis	0.40	4	0.39	
Pterois russelli	0.36	4	0.35	
Neobythites sp.	0.32	20	0.31	
Pseudorhombus dupliciocellatus	0.32	4	0.31	
Hoplichthys citrinus	0.32	16	0.31	
Trixiplichthys weberi	0.24	12	0.23	
CYNOGLOSSIDAE	0.24	32	0.23	
CALLIONYMIDAE	0.16	16	0.15	
Total		103.53	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 83
 DATE :12/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°54.11
 start stop duration Lon E 95°10.06
 TIME :19:20:47 19:51:05 30.3 (min) Purpose : 3
 LOG : 6370.41 6372.00 1.6 Region : 10320
 FDEPTH: 61 62 Gear cond.: 0
 BDEPTH: 61 62 Validity : 0
 Towing dir: 0° Wire out : 170 m Speed : 3.1 kn
 Sorted : 22 Total catch: 64.32 Catch/hour: 127.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pennahia anea	46.20	325	36.29	136
Nemipterus japonicus	35.04	1366	27.52	137
Acropoma japonicum	13.30	3326	10.45	
Bregmaceros maclellandi	6.89	2684	5.41	
Saurida undosquamis	4.99	291	3.92	138
S H R I M P S	4.75	3183	3.73	
Trichiurus lepturus	4.69	172	3.68	
Sepia sp.	2.38	107	1.87	
Lagocephalus guentheri	2.38	36	1.87	
Rhynchoconger sp.	1.54	107	1.21	
Uroconger lepturus	1.07	30	0.84	
Haliuetaea sp.	0.71	6	0.56	
Leiognathus equulus	0.71	101	0.56	
Decapterus russelli	0.59	6	0.47	
Neomerinthe folgori	0.48	42	0.37	
Neocentropogon affinis	0.36	36	0.28	
Brachypleura novaezeelandiae	0.36	36	0.28	
Fistularia petimba	0.36	30	0.28	
Charybdis feriata	0.32	2	0.25	
Siganus canaliculatus	0.12	6	0.09	
Acanthocepola sp.	0.06	6	0.05	
Antennarius hispidus	0.04	2	0.03	
Total		127.32	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 84
 DATE :12/05/15 GEAR TYPE: PT NO: 1 POSITION:Lat N 14°58.63
 start stop duration Lon E 95°10.73
 TIME :20:45:54 21:17:22 31.5 (min) Purpose : 1
 LOG : 6378.14 6380.02 1.9 Region : 10320
 FDEPTH: 12 12 Gear cond.: 0
 BDEPTH: 52 49 Validity : 0
 Towing dir: 0° Wire out : 70 m Speed : 3.6 kn
 Sorted : 0 Total catch: 16.32 Catch/hour: 31.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Loligo sp.	13.38	963	43.01	
Dussumieria acuta	9.38	290	30.15	139
Stolephorus indicus	3.32	465	10.66	
Decapterus kurroides	2.48	27	7.97	140
Lepturacanthus savala	1.53	10	4.90	
Rastrelliger brachysoma	1.03	8	3.31	
Total		31.12	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 85
 DATE :12/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°7.37
 start stop duration Lon E 95°10.29
 TIME :22:24:17 22:54:23 30.1 (min) Purpose : 3
 LOG : 6387.64 6389.15 1.5 Region : 10320
 FDEPTH: 38 37 Gear cond.: 0
 BDEPTH: 38 37 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 20 Total catch: 77.02 Catch/hour: 153.53

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Thryssa vitrirostris	65.06	18334	42.38	
Pennahia anea	20.41	702	13.30	
Octopus sp.	7.77	8	5.06	
Bregmaceros maclellandi	7.50	2177	4.88	
Metapenaeus tenuipes	6.54	518	4.26	
SQUILLIDAE	6.46	1116	4.21	
S H R I M P S	5.74	1515	3.74	
Apogon sp.	5.74	817	3.74	
Photopectoralis bindus	5.10	1228	3.32	
Nemipterus japonicus	4.94	112	3.22	141
Sepia sp.	3.83	207	2.49	
Lagocephalus lunaris	2.87	24	1.87	
Lepturacanthus savala	2.71	72	1.77	
Ostorhinchus fasciatus	2.39	319	1.56	
Loligo sp.	1.28	40	0.83	
Polydactylus sextarius	0.96	48	0.62	
Portunus sanguinolentus	0.96	8	0.62	
Lactarius lactarius	0.96	64	0.62	
Pomadasyd maculatus	0.80	40	0.52	
Lophomus setigerus	0.48	8	0.31	
Stolephorus indicus	0.48	48	0.31	
Saurida tumbil	0.24	8	0.16	
Siganus canaliculatus	0.16	8	0.10	
Uranoscopus affinis	0.16	8	0.10	
Total		153.53	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 86
 DATE :13/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°15.60
 start stop duration Lon E 95°35.31
 TIME :06:15:43 06:40:57 25.2 (min) Purpose : 3
 LOG : 6454.85 6456.27 1.4 Region : 10320
 FDEPTH: 38 41 Gear cond.: 0
 BDEPTH: 38 41 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 3.4 kn
 Sorted : 10 Total catch: 96.70 Catch/hour: 229.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Johnius sp.	78.48	1046	34.13	
Pennahia sp.	36.62	4114	15.93	
Congresox talabonoides	22.59	17	9.82	
Cynoglossus arel	16.17	214	7.03	
Sepia sp.	15.22	2283	6.62	
Photopectoralis bindus	11.41	6159	4.96	
Jaydia striata	8.09	2426	3.52	
Portunus sanguinolentus	6.66	24	2.90	
HARPISQUILLIDAE	5.23	1356	2.28	
Nemipterus japonicus	4.99	71	1.17	
S H R I M P S	4.52	595	1.96	
Lagocephalus guentheri	3.33	48	1.45	
Uruconger cf. lepturus	3.09	95	1.34	
Lactarius lactarius	2.38	24	1.03	
Polydactylus sextarius	2.14	143	0.93	
Lepturacanthus savala	1.90	190	0.83	
Loligo sp.	1.90	48	0.83	
Apogon smithi	1.66	95	0.72	
Trypauchen sp.	1.66	143	0.72	
Pomadasyd maculatus	0.71	24	0.31	
Parachaeturichthys ploynema	0.71	71	0.31	
Gymnothorax sp.	0.48	2	0.21	
Total		229.96	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 87
 DATE :13/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°5.12
 start stop duration Lon E 95°30.19
 TIME :08:22:09 08:52:18 30.1 (min) Purpose : 3
 LOG : 6468.43 6469.95 1.5 Region : 10320
 FDEPTH: 60 64 Gear cond.: 0
 BDEPTH: 60 64 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 3.0 kn
 Sorted : 19 Total catch: 41.24 Catch/hour: 82.07

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Megalaspis cordyla	34.95	199	42.58	142
Nemipterus japonicus	12.02	203	14.65	
Lepturacanthus savala	10.99	179	13.39	
Sphyrna obtusata	6.53	6	7.95	
Saurida tumbil	5.81	641	7.08	
Acropoma japonicum	2.39	716	2.91	
Photopectoralis aureus	1.75	299	2.13	
Lagocephalus guentheri	1.43	12	1.75	
Loligo sp.	1.35	68	1.65	
Selar crumenophthalmus	1.35	8	1.65	
Aluterus monoceros	1.03	2	1.26	
Terapon jarbua	0.88	4	1.07	
Pomadasyd maculatus	0.48	4	0.58	
Siganus canaliculatus	0.40	8	0.48	
Brachypleura novaezeelandiae	0.32	24	0.39	
Cynoglossus cynoglossus	0.24	12	0.29	
HARPISQUILLIDAE	0.16	16	0.19	
Total		82.07	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 102
 DATE :16/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°22.28
 start stop duration Lon E 96°33.85
 TIME :12:04:17 12:34:22 30.1 (min) Purpose : 3
 LOG : 7078.73 7080.36 1.6 Region : 10320
 FDEPTH: 111 104 Gear cond.: 0
 BDEPTH: 111 104 Validity : 0
 Towing dir: 0° wire out : 260 m Speed : 3.3 kn
 Sorted : 49 Total catch: 49.45 Catch/hour: 98.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Saurida undosquamis	32.46	32.92	178
Nemipterus japonicus	17.15	17.39	179
Loligo sp.	8.30	8.41	
Sorsogona melanoptera	3.51	3.56	
Acropoma japonicum	3.31	3.36	
Lophiomus setigerus	3.11	3.15	177
Lepidotrigla cf. punctipectoralis	3.11	3.15	
Okamejei cf. powelli	2.79	2.83	
Pasiphaea sp.	2.75	2.79	
Uranoscopus affinis	1.67	1.70	
Narcine breviliabata	1.64	1.66	
Priacanthus macracanthus	1.64	1.66	
Serfollina nigrofasciata	1.56	1.58	
Synodus macrops	1.52	1.54	
Portunus sp.	1.52	1.54	0
Sepia sp.	1.52	1.54	
Parasclopsis aspinosa	1.22	1.23	
Arnoglossus sp.	1.20	1.21	
Diodon holocanthus	1.12	1.13	
Dactyloptena orientalis	0.94	0.95	
Octopus sp.	0.92	0.93	
Portunus sp.	0.80	0.81	
Carybdis sp.	0.72	0.73	
Cephalopsetta ventrocellatus	0.46	0.47	
Histioteerus tyus	0.40	0.40	
Siganus canaliculatus	0.40	0.40	
Upeneus bensasi	0.32	0.32	
Fistularia petimba	0.28	0.28	
Gymnothorax reticularis	0.26	0.26	
Callionymus cf. margaretae	0.26	0.26	
Cantherhines multilineatus	0.24	0.24	
Aseraggodes sp.	0.24	0.24	
Neocentropogon affinis	0.22	0.22	
Pseudorhombus quinquecellatus	0.20	0.20	
Tylerius spinosissimus	0.20	0.20	
Champsodon sp.	0.20	0.20	
Aesopia cornuta	0.14	0.14	
Jaydia queketti	0.08	0.08	
Ashtoret lunaris	0.08	0.08	
Cociella cf. hutchinsi	0.08	0.08	
Trachinocephalus myops	0.08	0.08	
Upeneus moluccensis	0.04	0.04	
Total	98.60	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 103
 DATE :16/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°51.52
 start stop duration Lon E 96°35.41
 TIME :15:41:58 16:12:03 30.1 (min) Purpose : 3
 LOG : 7108.81 7110.18 1.4 Region : 10320
 FDEPTH: 70 72 Gear cond.: 0
 BDEPTH: 70 72 Validity : 0
 Towing dir: 0° wire out : 180 m Speed : 2.7 kn
 Sorted : 0 Total catch: 38.00 Catch/hour: 75.82

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trichiurus lepturus	17.00	22.42	
Small shrimps	16.10	21.24	
Pennahia ovata	13.65	18.00	
Johnius dussumieri	6.05	7.97	
Acropoma japonicum	4.91	6.47	
Metapenaeus tenuipes	4.49	5.92	
Polydactylus sextarius	3.71	4.89	
Thryssa dussumieri	2.51	3.32	
Bregmaceros maclellandi	1.74	2.29	
Halleutaea sp.	1.44	1.89	
Nemipterus japonicus	1.26	1.66	
Cynoglossus lingua	0.64	0.84	
HARPISQUILLIDAE	0.48	0.63	
Dussumieria acuta	0.44	0.58	
Pomadasy maculatus	0.40	0.53	
Sepia sp.	0.24	0.32	
Lophiomus setigerus	0.20	0.26	
Bathycongrus sp.	0.16	0.21	
OPHIDIIDAE	0.12	0.16	
Lagocephalus inermis	0.08	0.11	
Lagocephalus lunaris	0.08	0.11	
Ostorhinchus fasciatus	0.06	0.08	
Siganus canaliculatus	0.04	0.05	
Neenchelys sp.	0.04	0.05	
Total	75.82	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 104
 DATE :16/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°10.50
 start stop duration Lon E 96°37.22
 TIME :19:06:52 19:37:04 30.2 (min) Purpose : 3
 LOG : 7131.63 7133.21 1.6 Region : 10320
 FDEPTH: 29 29 Gear cond.: 0
 BDEPTH: 29 29 Validity : 0
 Towing dir: 0° wire out : 90 m Speed : 3.1 kn
 Sorted : 12 Total catch: 40.55 Catch/hour: 80.56

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Small shrimps	25.03	31.07	
Harpadon nehereus	20.74	25.75	
Otholithoides pama	7.75	9.62	
UNIDENTIFIED FISH	6.75	8.38	
Coilia dussumieri	6.68	8.29	
Congrosex talabon	5.34	6.53	
Johnius carouna	3.34	4.14	
Bregmaceros maclellandi	2.50	3.11	
Trichiurus lepturus	0.77	0.96	
Charybdis feriata	0.48	0.59	
Polydactylus sextarius	0.48	0.59	
C R A B S	0.42	0.52	
HARPISQUILLIDAE	0.42	0.52	
Portunus sanguinolentus	0.36	0.44	
Sea snakes	0.16	0.20	
Chrysochir aureus	0.12	0.15	
Polynemus paradiseus	0.08	0.10	0
Bathycongrus sp.	0.06	0.07	
Amblyotrypauchen arctocephalus	0.06	0.07	
Total	80.56	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 105
 DATE :18/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°9.46
 start stop duration Lon E 96°58.45
 TIME :15:19:43 15:49:47 30.1 (min) Purpose : 3
 LOG : 7320.40 7321.18 0.8 Region : 10320
 FDEPTH: 29 30 Gear cond.: 0
 BDEPTH: 29 30 Validity : 0
 Towing dir: 0° wire out : 100 m Speed : 1.5 kn
 Sorted : 11 Total catch: 71.99 Catch/hour: 143.64

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Harpadon nehereus	66.84	46.53	
Plotosus cantus	32.84	22.86	
S H R I W P S	13.17	9.17	
Trichiurus lepturus	4.19	2.92	
Trypauchen pelaeos	3.99	2.78	
C R A B S	3.39	2.36	
Coilia dussumieri	2.99	2.08	
Polynemus melanochir melanochir	2.39	1.67	
Osteogeneiosus militaris	1.67	1.17	
Congrosex talabonoides	1.68	1.17	
Arius venosus	1.66	1.15	
HARPISQUILLIDAE	1.40	0.97	
Opisthopterus tardoore	1.40	0.97	
Chrysochir aureus	1.40	0.97	
Otholithoides pama	1.20	0.83	
Polynemus paradiseus	0.80	0.56	
Scoliodon cf. macrohynchos	0.72	0.50	
Pampus argenteus	0.60	0.42	
Bregmaceros maclellandi	0.40	0.28	
Polydactylus sextarius	0.20	0.14	
Total	143.64	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 106
 DATE :18/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°46.11
 start stop duration Lon E 96°55.98
 TIME :18:37:04 19:07:18 30.2 (min) Purpose : 3
 LOG : 7344.06 7345.60 1.6 Region : 10320
 FDEPTH: 51 53 Gear cond.: 0
 BDEPTH: 51 53 Validity : 0
 Towing dir: 0° wire out : 150 m Speed : 3.1 kn
 Sorted : 34 Total catch: 98.09 Catch/hour: 194.69

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Pennahia ovata	98.60	50.65	181
Lepturacanthus savala	21.44	11.01	
Polydactylus sextarius	8.93	4.59	
Brachypleura novaezeelandiae	7.20	3.70	
Coilia dussumieri	6.91	3.55	
Cynoglossus lingua	6.67	3.43	
Nemipterus japonicus	6.31	3.24	
Johnius cf. dussumieri	5.12	2.63	180
Acropoma japonicum	4.64	2.39	
Harpadon sp.	3.87	1.99	
Parastromateus niger	3.02	1.55	
MYCTOPHIDAE	2.98	1.53	
Osteogeneiosus militaris	2.02	1.04	
Thryssa vittirostris	1.91	0.98	
Congrosex talabonoides	1.79	0.92	
Priacanthus macracanthus	1.37	0.70	
Chrysochir aureus	1.31	0.67	
Epinephelus sexfasciatus	1.19	0.61	
Jaydia queketti	1.19	0.61	
Small shrimps	0.95	0.49	
Muraenesox bagio	0.65	0.34	
Small crabs	0.65	0.34	
Trypauchen microcephalus	0.60	0.31	
Uroconger lepturus	0.60	0.31	
Uranoscopus affinis	0.48	0.24	
Saurida tumbil	0.48	0.24	
Neomerinthe sp.	0.42	0.21	
Cociella cf. hutchinsi	0.42	0.21	
Loligo sp.	0.42	0.21	
Bregmaceros maclellandi	0.42	0.21	
squillidae	0.36	0.18	
Sepia sp.	0.36	0.18	
Lagocephalus lunaris	0.36	0.18	
Neenchelys sp.	0.36	0.18	
Pomadasy maculatus	0.36	0.18	
Metapenaeus sp.	0.24	0.12	
Dussumieria acuta	0.12	0.06	
Total	194.69	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 107
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°24.27
 start stop duration Lon E 96°52.93
 TIME :21:25:47 21:56:49 31.0 (min) Purpose : 3
 LOG : 7366.22 7368.03 1.8 Region : 10320
 FDEPTH: 73 81 Gear cond.: 0
 BDEPTH: 73 81 Validity : 0
 Towing dir: 0° Wire out : 190 m Speed : 3.5 kn
 Sorted : 28 Total catch: 58.30 Catch/hour: 112.73

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Sepia sp.	19.03	572	16.88
Nemipterus japonicus	16.55	2185	14.68
Saurida undosquamis	16.47	336	14.61
Dactyloptena orientalis	9.20	81	8.16
Small crabs	4.87	487	4.32
Pentapriion longimanus	4.80	228	4.25
Rhinobatos cf. schlegelii	4.10	4	3.64
Upeneus guttatus	3.64	151	3.22
Seriolina nigrofasciata	2.71	8	2.40
Siganus canaliculatus	2.55	70	2.26
Narcine cf. brevilabiata	2.36	8	2.09
Cociella cf. hutchinsi	2.05	104	1.82
Cyclichthys orbicularis	1.93	15	1.72
Aluterus monoceros	1.86	8	1.65
Parapercis alboguttata	1.86	70	1.65
Upeneus moluccensis	1.62	23	1.44
Small shrimps	1.55	77	1.37
Fistularia petimba	1.51	50	1.34
Samaris cristatus	1.35	50	1.20
Saurida tumbil	1.24	4	1.10
Portunus sanguinolentus	1.01	4	0.89
Leiognathus brevirostris	1.01	189	0.89
Brachypterois serrulata	0.97	23	0.86
Halieutaea sp.	0.85	4	0.75
Cynoglossus sp.	0.73	66	0.65
Parascloopsis aspinosa	0.73	27	0.65
Polydactylus sextarius	0.70	15	0.62
Octopus sp.	0.62	19	0.55
Trachinocephalus myops	0.54	23	0.48
Pristipomoides sp.	0.50	8	0.45
Gymnothorax reticularis	0.50	8	0.45
Brachypleura novaezeelandiae	0.46	66	0.41
Lophiomus setigerus	0.46	12	0.41
Uranoscopus affinis	0.39	4	0.34
Inimicus caledonicus	0.39	4	0.34
Cociella hutchinsi	0.35	12	0.31
Thryssa vitrirostris	0.23	27	0.21
Loligo sp.	0.23	8	0.21
Aesopia cornuta	0.23	12	0.21
Pseudotriacanthus strigilifer	0.19	4	0.17
Pterois russelii	0.15	8	0.14
Antennarius hispidus	0.12	4	0.10
Hoplichthys citrinus	0.12	12	0.10
Minous cocineus	0.00	12	0.00
Total	112.73		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 108
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°0.72
 start stop duration Lon E 96°49.40
 TIME :00:25:00 00:47:10 22.2 (min) Purpose : 3
 LOG : 7390.78 7391.69 0.9 Region : 10320
 FDEPTH: 90 94 Gear cond.: 0
 BDEPTH: 90 94 Validity : 0
 Towing dir: 0° Wire out : 230 m Speed : 2.5 kn
 Sorted : 0 Total catch: 22.70 Catch/hour: 61.43

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Trichiurus lepturus	33.40	54	54.36
Loligo sp.	7.69	260	12.51
Saurida undosquamis	3.41	273	5.55
Dactyloptena orientalis	2.27	14	3.70
Halieutaea sp.	2.27	11	3.70
Nemipterus japonicus	1.57	38	2.56
Portunus sp.	1.57	171	2.56
Acropoma japonicum	1.41	130	2.29
Priacanthus macracanthus	1.19	8	1.94
Seriolina nigrofasciata	1.19	3	1.94
Aluterus monoceros	1.14	5	1.85
Portunus sp.	0.87	14	1.41
Brachypleura novaezeelandiae	0.62	35	1.01
Upeneus guttatus	0.60	22	0.97
Parascloopsis aspinosa	0.38	16	0.62
Starfish	0.30	30	0.48
Photopectoralis aureus	0.27	38	0.44
Jaydia queketti	0.22	14	0.35
Sphyræna pinguis	0.16	3	0.26
Brachypterois serrulata	0.11	3	0.18
Sorsogona melanopectera	0.11	5	0.18
Champsodon sp.	0.11	57	0.18
Minous cocineus	0.11	3	0.18
Ostorhinchus fasciatus	0.08	24	0.13
Samariscus sp.	0.08	5	0.13
Parapercis alboguttata	0.05	3	0.09
Siganus canaliculatus	0.05	3	0.09
Egglestonichthys melanopectera	0.05	3	0.09
Neomerinthe sp.	0.05	3	0.09
Samaris cristatus	0.03	3	0.04
Chelidoperca sp.	0.03	3	0.04
Cynoglossus lingua	0.03	3	0.04
Psettina sp.	0.03	3	0.04
Pseudotriacanthus strigilifer	0.03	5	0.04
Total	61.46		100.04

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 109
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 13°47.44
 start stop duration Lon E 96°48.39
 TIME :02:40:26 03:10:28 30.0 (min) Purpose : 3
 LOG : 7405.88 7407.16 1.3 Region : 10320
 FDEPTH: 93 97 Gear cond.: 0
 BDEPTH: 93 97 Validity : 0
 Towing dir: 0° Wire out : 250 m Speed : 2.6 kn
 Sorted : 0 Total catch: 10.13 Catch/hour: 20.24

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Nemipterus bipunctatus	7.11	86	35.14
Selar crumenophthalmus	1.92	38	9.48
Saurida undosquamis	1.92	116	9.48
Trachinocephalus myops	1.72	24	8.49
Cyclichthys spilostylus	1.64	2	8.09
Sepia sp.	1.48	10	7.31
Trichiurus lepturus	1.20	2	5.92
Loligo sp.	1.20	40	5.92
Parupeneus heptacanthus	0.58	2	2.86
Nemipterus randalli	0.54	12	2.67
Parascloopsis aspinosa	0.30	4	1.48
Priacanthus macracanthus	0.20	4	0.99
Pseudorhombus quinnoocellatus	0.16	2	0.79
Lepidotrigla cf. punctipectoralis	0.10	2	0.49
Siganus canaliculatus	0.06	2	0.30
Samaris cristatus	0.06	2	0.30
Upeneus guttatus	0.06	2	0.30
Total	20.24		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 110
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 13°54.94
 start stop duration Lon E 97°12.08
 TIME :07:15:56 07:44:05 30.1 (min) Purpose : 3
 LOG : 7440.95 7442.39 1.4 Region : 10320
 FDEPTH: 72 72 Gear cond.: 0
 BDEPTH: 72 72 Validity : 0
 Towing dir: 0° Wire out : 190 m Speed : 2.8 kn
 Sorted : 28 Total catch: 108.90 Catch/hour: 216.79

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Selar crumenophthalmus	109.89	768	50.69
Trichiurus lepturus	56.24	135	25.94
Decapterus russelli	17.92	215	8.26
Muraenesox bagio	9.44	12	4.35
Saurida undosquamis	4.36	273	2.01
Nemipterus nematophorus	3.70	36	1.71
Loligo sp.	2.81	117	1.29
Rastrelliger kanagurta	1.95	12	0.90
Halieutaea sp.	1.75	8	0.81
Nemipterus bipunctatus	1.31	6	0.61
Narcine cf. brevilabiata	0.78	10	0.36
Priacanthus sagittarius	0.76	10	0.35
Nemipterus japonicus	0.74	2	0.34
Parupeneus heptacanthus	0.72	4	0.33
Chirocentrus nudus	0.66	6	0.30
Siganus canaliculatus	0.64	6	0.29
Epinephelus areolatus	0.58	6	0.27
Upeneus guttatus	0.52	24	0.24
Dactyloptena orientalis	0.40	4	0.18
Brachypleura novaezeelandiae	0.40	60	0.18
Uraspis helvola	0.24	2	0.11
Leiognathus brevirostris	0.24	28	0.11
Parapercis alboguttata	0.12	6	0.06
Callionymus cf. margaretae	0.10	6	0.05
Pentapriion longimanus	0.10	6	0.05
Sorsogona melanopectera	0.10	4	0.05
Samaris cristatus	0.10	6	0.05
Zebrias sp.	0.06	6	0.03
SYNGNATHIDAE	0.06	2	0.03
Parascloopsis aspinosa	0.06	6	0.03
Plotosus lineatus	0.04	2	0.02
Upeneus moluccensis	0.04	4	0.02
Total	216.79		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 111
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°17.98
 start stop duration Lon E 97°12.37
 TIME :10:24:19 10:54:51 30.5 (min) Purpose : 3
 LOG : 7464.26 7465.63 1.4 Region : 10320
 FDEPTH: 53 45 Gear cond.: 0
 BDEPTH: 53 45 Validity : 0
 Towing dir: 0° Wire out : 150 m Speed : 2.7 kn
 Sorted : 0 Total catch: 35.56 Catch/hour: 69.86

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Selar crumenophthalmus	48.33	511	69.18
Loligo sp.	8.25	37	11.81
Nemipterus bipunctatus	3.42	35	4.89
Atule mate	2.36	12	3.37
Saurida undosquamis	1.30	37	1.86
Rastrelliger kanagurta	1.14	6	1.63
Saurida tumbil	0.98	4	1.41
Parupeneus heptacanthus	0.98	6	1.41
Priacanthus hamrur	0.71	14	1.01
Cyclichthys orbicularis	0.51	2	0.73
Siganus canaliculatus	0.43	4	0.62
Halieutaea sp.	0.39	2	0.56
Decapterus russelli	0.35	6	0.51
Engyprosope sp.	0.31	8	0.45
Trachinocephalus myops	0.16	8	0.22
Fistularia petimba	0.08	2	0.11
Carangoides malabaricus	0.08	2	0.11
CALLIONYMIDAE	0.08	4	0.11
Total	69.86		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 112
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°40.29
 start stop duration Lon E 97°15.93
 TIME :13:33:33 14:04:31 30.9 (min) Purpose : 3
 LOG : 7487.48 7489.33 1.9 Region : 10320
 FDEPTH: 57 57 Gear cond.: 0
 BDEPTH: 57 57 Validity : 0
 Towing dir: 0° Wire out : 150 m Speed : 3.6 kn
 Sorted : 0 Total catch: 97.20 Catch/hour: 188.44

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Coilia sp.	43.11	4311	22.88	
S H R I M P S	31.02	14268	16.46	
Pennahia anea	25.43	2047	13.50	
Saurida tumbil	17.06	620	9.05	
Thryssa sp.	16.75	397	8.89	
Trichiurus lepturus	12.10	171	6.42	
Loligo sp.	6.82	171	3.62	
Ostorhinchus fasciatus	5.58	70	2.96	
Johnieops macrorhynchus	5.12	39	2.72	
Portunus sp.	4.03	729	2.14	
Stolephorus indicus	3.72	853	1.98	
Sepia sp.	3.41	186	1.81	
Chiloscyllium sp.	2.83	2	1.50	
Saurida undosquamis	2.17	62	1.15	
Uranoscopus affinis	2.17	16	1.15	
Lagocephalus guentheri	2.17	78	1.15	
Polydactylus sextarius	1.55	78	0.82	
Pampus argenteus	1.43	4	0.76	
Ophichthus sp.	1.01	8	0.53	
Ophichthus sp.	0.31	2	0.16	0
Octopus sp.	0.27	4	0.14	
Plotosus sp.	0.19	2	0.10	
Zebrias sp.	0.10	4	0.05	
Upenus cf. tragula	0.04	2	0.02	
Minous monodactylus	0.02	2	0.01	
Engyproson grandisquama	0.00	2	0.00	
Total	188.44		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 113
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°53.27
 start stop duration Lon E 97°16.28
 TIME :15:49:35 16:19:37 30.0 (min) Purpose : 3
 LOG : 7502.26 7504.61 2.4 Region : 10320
 FDEPTH: 28 29 Gear cond.: 0
 BDEPTH: 28 29 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 4.7 kn
 Sorted : 5 Total catch: 47.10 Catch/hour: 94.11

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Harpadon nehereus	23.98	4795	25.48	
S H R I M P S	22.70	28595	24.12	
Coilia dussumieri	15.02	4795	15.97	
Congresox talabonoides	11.47	14	12.19	
Portunus sp.	9.59	959	10.19	
Pennahia cf. ovata	5.43	1407	5.77	
Otolithoides biauritus	2.24	208	2.38	
Bregmaceros mccllellandi	1.60	687	1.70	
SQUILLIDAE	0.96	224	1.02	
Chrysochir aureus	0.64	16	0.68	
Polydactylus sextarius	0.48	160	0.51	
Total	94.11		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 114
 DATE :19/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 15°11.10
 start stop duration Lon E 97°17.15
 TIME :18:11:50 18:42:14 30.4 (min) Purpose : 3
 LOG : 7520.52 7521.44 0.9 Region : 10320
 FDEPTH: 31 30 Gear cond.: 0
 BDEPTH: 31 30 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 1.8 kn
 Sorted : 34 Total catch: 54.23 Catch/hour: 107.03

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Harpadon nehereus	52.52	9454	49.07	
Coilia dussumieri	11.84	4855	11.06	
Portunus sp.	8.59	2753	8.02	
Metapenaeus tenuipes	7.11	1776	6.64	
Polynemus melanochir melanochir	6.38	45	5.96	
Scoliodon cf. macrohynchus	5.09	30	4.76	
Small shrimps	5.03	93257	4.70	
Johnius cf. dussumieri	4.74	1184	4.43	
Otolithoides biauritus	1.18	36	1.11	
Osteogeneiosus militaris	0.99	178	0.92	
Sillaginopsis panijus	0.83	6	0.77	
Bregmaceros mccllellandi	0.59	296	0.55	
setipinna tenuifilis	0.39	28	0.37	
Scatophagus argus	0.32	2	0.30	
SQUILLIDAE	0.30	148	0.28	
secutor insidiator	0.30	89	0.28	
Otholithoides pama	0.24	16	0.22	0
Pampus argenteus	0.12	4	0.11	
Muraenesox bagio	0.12	2	0.11	
Takifugu oblongus	0.12	2	0.11	
Terapon theraps	0.10	2	0.09	
Opisthopterus tardoore	0.06	6	0.06	
Polydactylus plebeius	0.04	4	0.04	
Trypauchen microcephalus	0.04	30	0.04	
Parastromateus niger	0.02	2	0.02	
Polynemus paradiseus	0.00	2	0.00	
Total	107.03		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 115
 DATE :20/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°53.62
 start stop duration Lon E 97°35.58
 TIME :00:15:19 00:45:22 30.1 (min) Purpose : 3
 LOG : 7576.73 7578.98 2.3 Region : 10320
 FDEPTH: 29 29 Gear cond.: 0
 BDEPTH: 29 29 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 4.5 kn
 Sorted : 13 Total catch: 125.64 Catch/hour: 250.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Harpadon nehereus	67.09	1414	26.74	
Coilia dussumieri	64.29	6853	25.63	
Scoliodon cf. macrohynchus	40.33	200	16.08	
Himantura walga	39.29	120	15.66	
Arius venosus	11.50	120	4.58	
Acetes sp.	4.31	7547	1.72	
Pampus argenteus	3.83	144	1.53	
Trichiurus lepturus	3.11	192	1.24	
Osteogeneiosus militaris	2.88	168	1.15	
S H R I M P S	2.88	695	1.15	
Portunus sp.	2.64	791	1.05	
Johnieops macrorhynchus	2.64	72	1.05	
Pennahia ovata	1.44	431	0.57	
Lagocephalus lunaris	0.80	2	0.40	
Plotosus lineatus	0.84	2	0.33	
Chrysochir aureus	0.72	48	0.29	
Thryssa mystax	0.72	120	0.29	
Takifugu oblongus	0.68	2	0.27	
SQUILLIDAE	0.48	72	0.19	
Sillaginopsis panijus	0.20	2	0.08	
Total	250.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 116
 DATE :20/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 14°17.04
 start stop duration Lon E 97°33.95
 TIME :05:51:47 06:22:02 30.3 (min) Purpose : 3
 LOG : 7621.56 7622.80 1.2 Region : 10320
 FDEPTH: 57 57 Gear cond.: 0
 BDEPTH: 57 57 Validity : 0
 Towing dir: 0° Wire out : 155 m Speed : 2.5 kn
 Sorted : 0 Total catch: 35.95 Catch/hour: 71.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	16.94	204	23.76	
Loligo sp.	12.10	387	16.97	
Saurida tumbil	9.92	115	13.91	
Arius venosus	6.78	69	9.51	
Saurida undosquamis	4.80	58	6.73	
Atropus atropus	4.76	26	6.68	
Harpadon sp.	2.82	73	3.95	
Siganus canaliculatus	1.90	26	2.67	
Coilia borneensis	1.63	113	2.28	
Rastrelliger kanagurta	1.19	8	1.67	
Muraenesox cinereus	1.11	2	1.56	
Nemipterus japonicus	0.91	10	1.28	
Lagocephalus guentheri	0.87	6	1.22	
Polydactylus sextarius	0.81	6	1.14	
Nemipterus nematophorus	0.73	14	1.03	
Epinephelus sexfasciatus	0.60	2	0.83	
Ostorhinchus gularis	0.56	244	0.78	
Johnius cf. dussumieri	0.50	2	0.70	
Himantura walga	0.44	2	0.61	
Scolopsis taenioptera	0.36	6	0.50	
Coilia dussumieri	0.32	54	0.45	
Small crabs	0.30	18	0.42	
Brachypleura novaezeelandiae	0.22	18	0.31	
Sepia sp.	0.12	2	0.17	
Priacanthus sagittarius	0.10	2	0.14	
Plotosus lineatus	0.08	2	0.11	
Pentaprius longimanus	0.08	6	0.11	
Photopectoralis bindus	0.08	36	0.11	
Osteogeneiosus militaris	0.08	4	0.11	
Elates ransonettii	0.06	6	0.08	
Sorsogona melanoptera	0.06	2	0.08	
Apogon truncatus	0.04	2	0.06	
Xiphocheilus typus	0.04	2	0.06	
Selaroides leptolepis	0.02	2	0.03	
Total	71.31		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 117
 DATE :20/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 13°54.91
 start stop duration Lon E 97°31.85
 TIME :09:03:31 09:33:33 30.0 (min) Purpose : 3
 LOG : 7644.40 7645.82 1.4 Region : 10320
 FDEPTH: 61 62 Gear cond.: 0
 BDEPTH: 61 62 Validity : 0
 Towing dir: 0° Wire out : 165 m Speed : 2.8 kn
 Sorted : 29 Total catch: 29.47 Catch/hour: 58.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Loligo sp.	9.15	459	15.54	
Saurida tumbil	8.99	629	15.27	
Lepturacanthus savala	8.63	86	14.66	
Saurida undosquamis	7.07	839	12.01	
Nemipterus nematophorus	3.91	38	6.65	
Brachypleura novaezeelandiae	2.84	653	4.82	
Photopectoralis bindus	2.28	2966	3.87	
Muraenesox cinereus	1.72	4	2.92	
Selar crumenophthalmus	1.68	8	2.85	
Narcine breviliabata	1.68	4	2.85	
Atropus atropus	1.48	10	2.51	
Priacanthus macracanthus	1.16	10	1.97	
Apogon smithi	1.16	108	1.97	
Nemipterus japonicus	1.00	18	1.70	
Osteogobius militaris	0.76	10	1.29	
Siganus canaliculatus	0.72	12	1.22	
Sepia sp.	0.68	2	1.15	
Inimicus caledonicus	0.48	2	0.81	
Epinephelus heniochus	0.40	2	0.68	
Small crabs	0.40	30	0.68	
Lagocephalus guentheri	0.32	2	0.54	
Himantura walga	0.30	2	0.51	
Decapterus sp.	0.28	2	0.48	
Fistularia petimba	0.24	4	0.41	
Pentapirion longimanus	0.20	8	0.34	
Aurigequula longispina	0.16	2	0.27	
Xiphocheilus typus	0.16	2	0.27	
Cynoglossus arel	0.16	2	0.27	
S H R I M P S	0.16	120	0.27	
Trachinocephalus myops	0.16	2	0.27	
Champsodon sp.	0.12	2	0.20	
Upeneus moluccensis	0.12	6	0.20	
SCORPAENIDAE	0.06	4	0.10	
Stolephorus indicus	0.06	2	0.10	
Parapenaeus sp.	0.04	2	0.07	
Metapenaeus sp.	0.04	2	0.07	
SQUILLIDAE	0.04	4	0.07	
Uranoscopus affinis	0.04	2	0.07	
Upeneus guttatus	0.04	2	0.07	
Total	58.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 118
 DATE :20/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 13°24.00
 start stop duration Lon E 98°7.00
 TIME :15:34:59 16:05:03 30.1 (min) Purpose : 3
 LOG : 7697.55 7698.88 1.3 Region : 10330
 FDEPTH: 34 34 Gear cond.: 0
 BDEPTH: 34 34 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 2.7 kn
 Sorted : 11 Total catch: 73.91 Catch/hour: 147.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
S H R I M P S	20.67	10741	14.02	
Stolephorus indicus	19.83	1646	13.45	
Photopectoralis aureus	16.20	5992	10.99	
Saurida tumbil	15.08	1034	10.23	
Lepturacanthus savala	9.50	168	6.44	
Lagocephalus sp.	7.82	56	5.30	
Jaydia queketti	7.54	601	5.11	
Nemipterus mesoprion	6.70	126	4.55	
Sepia sp.	4.75	192	3.22	
Bregmaceros maclellandi	3.63	615	2.46	
Loligo sp.	3.35	210	2.27	
Sardinella longiceps	2.79	140	1.89	
Upeneus guttatus	2.79	126	1.89	
Rastrelliger brachysoma	2.79	154	1.89	
Nemipterus marginatus	2.51	154	1.70	
Elates ransonettii	2.51	475	1.70	
Siganus canaliculatus	2.51	168	1.70	
SQUILLIDAE	2.23	349	1.52	
Thryssa mystax	1.96	279	1.33	
Sardinella gibbosa	1.96	42	1.33	
Alepes kleinii	1.68	42	1.14	
Rhynchoconger sp.	1.40	56	0.95	
Terapon theraps	1.12	126	0.76	
Octopus sp.	1.12	28	0.76	
Nemipterus hexodon	0.98	14	0.66	
Dactyloptena orientalis	0.84	14	0.57	
Dussumieria acuta	0.84	28	0.57	
C R A B S	0.84	182	0.57	
Ilisha sp. *** PRSIL00	0.56	14	0.38	
Epinephelus bleekeri	0.24	2	0.16	
Muraenesox cinereus	0.24	2	0.16	
Acanthocephala abbreviata	0.20	4	0.14	
CALLIONYMIDAE	0.14	42	0.09	
Brachypleura novaezeelandiae	0.14	14	0.09	
Total	147.48		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 119
 DATE :20/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 13°24.43
 start stop duration Lon E 97°28.17
 TIME :20:48:10 21:18:17 30.1 (min) Purpose : 3
 LOG : 7735.78 7737.38 1.6 Region : 10330
 FDEPTH: 78 81 Gear cond.: 6
 BDEPTH: 78 81 Validity : 5
 Towing dir: 2° Wire out : 210 m Speed : 3.2 kn
 Sorted : 20 Total catch: 48.59 Catch/hour: 96.79

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida undosquamis	25.27	1629	24.04	
Nemipterus japonicus	11.16	1673	11.53	
Photopectoralis bindus	8.76	1052	9.06	
Upeneus guttatus	6.22	127	6.42	
Epinephelus areolatus	6.06	169	6.26	
Sepia sp.	4.94	88	5.10	
Brachypleura novaezeelandiae	4.70	657	4.86	
Epinephelus bleekeri	4.06	2	4.20	
Rhinobatos cf. schlegelii	3.35	4	3.46	
Siganus canaliculatus	2.71	72	2.80	
Cyclichthys orbicularis	2.43	6	2.51	
Paraperis alboguttata	2.31	92	2.39	
Pentapirion longimanus	2.23	104	2.31	
Sorsogona melanoptera	1.99	131	2.06	
Narcine cf. breviliabata	1.75	4	1.81	
Octopus sp.	1.55	14	1.61	
Psettina sp.	1.27	80	1.32	
Terapon jarbua	1.04	40	1.07	
Dactyloptena orientalis	0.88	16	0.91	
Osteogobius militaris	0.80	4	0.82	
Cynoglossus cynoglossus	0.80	88	0.82	
Priacanthus macracanthus	0.68	4	0.70	
Parapenaeus sp.	0.68	4	0.70	
Hoplichthys citrinus	0.64	100	0.66	
Parascolopsis aspinosa	0.36	32	0.38	
Apogon smithi	0.48	20	0.49	
Fistularia petimba	0.48	16	0.49	
Zebrias sp.	0.28	12	0.29	
Metapenaeus tenuipes	0.28	12	0.29	
OPHICHTHIDAE	0.24	8	0.25	
Rhynchoconger sp.	0.22	2	0.23	
Total	96.79		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 120
 DATE :21/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°24.63
 start stop duration Lon E 97°5.75
 TIME :00:10:38 00:40:43 30.1 (min) Purpose : 3
 LOG : 7757.80 7759.05 1.3 Region : 10330
 FDEPTH: 88 93 Gear cond.: 0
 BDEPTH: 88 93 Validity : 0
 Towing dir: 0° Wire out : 210 m Speed : 2.5 kn
 Sorted : 0 Total catch: 10.60 Catch/hour: 21.14

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida undosquamis	5.35	38	25.28	197
Nemipterus bipunctatus	4.91	32	23.21	198
Sepia sp.	3.87	14	18.50	
Loligo sp.	3.07	94	14.53	
Trachinocephalus myops	2.35	16	11.13	
Lagocephalus guentheri	0.60	2	2.83	
Seriolina nigrofasciata	0.52	4	2.45	
dactyloptena orientalis	0.28	2	1.32	
BOTHIDAE	0.20	10	0.94	
Total	21.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 121
 DATE :21/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°24.31
 start stop duration Lon E 96°45.03
 TIME :03:56:33 04:26:33 30.0 (min) Purpose : 3
 LOG : 7778.69 7780.04 1.4 Region : 10330
 FDEPTH: 104 104 Gear cond.: 0
 BDEPTH: 104 104 Validity : 0
 Towing dir: 0° Wire out : 250 m Speed : 2.7 kn
 Sorted : 0 Total catch: 19.19 Catch/hour: 38.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Loligo sp.	11.36	828	29.60	
Cyclichthys orbicularis	6.64	6	17.30	
Abalistes stellatus	5.08	4	13.24	
Saurida undosquamis	3.52	24	9.17	199
Sepia sp.	2.68	2	6.98	
Dactyloptena orientalis	2.04	34	5.32	
Priacanthus macracanthus	1.80	2	4.69	
Nemipterus bipunctatus	1.40	8	3.65	
Torquigener sp.	0.70	10	1.82	
Parupeneus heptacanthus	0.60	2	1.56	
Seriolina nigrofasciata	0.52	4	1.35	
Nemipterus japonicus	0.40	6	1.04	
Rhynchostracion nasus	0.40	6	1.04	
Lagocephalus gloveri	0.34	2	0.89	
Fistularia petimba	0.26	8	0.68	
Parascolopsis aspinosa	0.22	2	0.57	
Tosarhombus longimanus	0.18	8	0.47	
Trachinocephalus myops	0.14	4	0.36	
Upeneus guttatus	0.10	4	0.26	
Total	38.37		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 122
 DATE :21/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°4.81
 start stop duration Region : 10330
 TIME :15:28:09 15:58:13 30.1 (min) Purpose : 3
 LOG : 7838.33 7839.88 1.6 Gear cond.: 0
 FDEPTH: 248 250 Validity : 0
 BDEPTH: 248 250 Speed : 3.1 kn
 Towing dir: 0° wire out : 600 m Catch/hour: 105.83
 Sorted : 13 Total catch: 53.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Satyricthys adeni	23.94 54	22.62	
Neoharrlotia pinnata	16.48 2	15.57	
Chlorophthalmus atlanticus	13.41 233	12.67	
S H R I M P S	11.25 3939	10.63	
Squalus hemipinnis	10.10 38	9.54	
Pseudorhombus sp.	7.54 42	7.13	
Synagrops adeni	4.91 862	4.64	
Cubiceps whiteleggii	4.67 263	4.41	
Okamejei cf powelli	2.87 18	2.71	
Pterygotrigla arabica	2.51 36	2.38	
MYCTOPHIDAE	2.04 186	1.92	
Haliutaea sp.	1.44 6	1.36	
Bembrops sp.	1.20 18	1.13	
Chlorophthalmus cf. corniger	1.08 126	1.02	
Neopinnula orientalis	0.72 6	0.68	
Lepidotrigla sp.	0.60 24	0.57	
Macrorhamphosodes sp.	0.36 36	0.34	
Cyttopsis rosea	0.36 6	0.34	
Pterygotrigla cf. macrorhynchus	0.24 12	0.23	
Setarches longimanus	0.12 30	0.11	
Total	105.83	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 123
 DATE :21/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°3.21
 start stop duration Region : 10330
 TIME :17:46:02 18:16:17 30.3 (min) Purpose : 3
 LOG : 7850.40 7851.99 1.6 Gear cond.: 0
 FDEPTH: 129 121 Validity : 0
 BDEPTH: 129 121 Speed : 3.2 kn
 Towing dir: 0° wire out : 320 m Catch/hour: 94.23
 Sorted : 32 Total catch: 47.51

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Parascalopsis eriomma	21.48 75	22.80	
Squalus hemipinnis	9.40 14	9.98	
Parascalopsis aspinosa	9.22 30	9.79	
Snyderina yamanokami	7.14 159	7.58	
Rhinobatos cf. schlegelii	5.83 12	6.19	
Priacanthus macracanthus	5.65 69	6.00	
Saurida undosquamis	5.30 24	5.62	
Lipochelilus carnolabrum	3.57 6	3.79	
Ostichthys kaianus	2.80 4	2.97	
Hapalogenys merguensis	2.74 16	2.90	
Satyricthys adeni	2.68 6	2.84	
Dactyloptena orientalis	2.32 10	2.46	
Pristiglenys sp.	2.08 6	2.21	
Sphyræna forsteri	2.02 6	2.15	
Roa jakakari	1.79 30	1.89	
Uranoscopus affinis	1.31 4	1.39	
Proscyllium magnificum	1.31 4	1.39	
Scorpaenopsis sp.	1.19 6	1.26	
Negemianthe sp.	1.17 20	1.24	
Priacanthus sagittarius	1.07 4	1.14	
Parapercis sp.	0.89 28	0.95	
Pseudorhombus quincoellatus	0.77 6	0.82	
Centroberyx sp.	0.77 10	0.82	
Brotula multibarata	0.71 6	0.76	
Histioteerus tyus	0.42 4	0.44	
Decapterus russelli	0.36 12	0.38	
Monocentris japonica	0.24 4	0.25	
Ostorhinchus cf. talboti	0.00 2	0.00	
Total	94.23	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 124
 DATE :21/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°4.22
 start stop duration Region : 10330
 TIME :22:36:34 23:06:39 30.1 (min) Purpose : 3
 LOG : 7889.86 7891.36 1.5 Gear cond.: 0
 FDEPTH: 95 100 Validity : 0
 BDEPTH: 95 100 Speed : 3.0 kn
 Towing dir: 0° wire out : 250 m Catch/hour: 84.92
 Sorted : 0 Total catch: 42.56

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Saurida undosquamis	24.60 269	28.97	200
Nemipterus bipunctatus	21.73 186	25.59	201
Loligo sp.	7.84 210	9.23	
Upeneus guttatus	5.87 251	6.44	
Dactyloptena orientalis	5.51 96	6.48	
Synodus cf. indicus	3.77 114	4.44	
Trachinocephalus myops	3.29 40	3.88	
Arothron stellatus	2.87 2	3.38	
Nemipterus japonicus	1.08 30	1.27	
Uraspis helvola	1.08 12	1.27	
Sorsogona melanoptera	1.02 62	1.20	
Lactoria cf. diaphana	0.80 20	0.94	
Pseudorhombus quincoellatus	0.76 6	0.89	
Cephalopsetta ventrocellatus	0.66 56	0.78	
Priacanthus macracanthus	0.52 6	0.61	
Rhinobatos cf. schlegelii	0.52 2	0.61	
Uranoscopus affinis	0.40 2	0.47	
Parascalopsis aspinosa	0.36 6	0.42	
Aesopia cornuta	0.32 8	0.38	
TETRAODONTIDAE	0.28 4	0.33	
Lagocephalus gloveri	0.24 2	0.28	
Cyclichthys orbicularis	0.24 4	0.28	
Parapercis albo guttata	0.20 4	0.23	
Fistularia petimba	0.16 4	0.19	
Octopus sp.	0.16 2	0.19	
C R A B S	0.12 42	0.14	
Upeneus moluccensis	0.12 2	0.14	
Snyderina yamanokami	0.08 2	0.09	
uroconger lepturus	0.08 2	0.09	
Temera hardwickii	0.08 2	0.09	
Trixiophichthys weberi	0.08 2	0.09	
Samaris cristatus	0.08 2	0.09	
Tosarhombus longimanus	0.02 2	0.02	0
Total	84.92	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 125
 DATE :22/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°3.56
 start stop duration Region : 10330
 TIME :01:40:39 02:10:43 30.1 (min) Purpose : 3
 LOG : 7911.86 7913.49 1.6 Gear cond.: 0
 FDEPTH: 84 86 Validity : 0
 BDEPTH: 84 86 Speed : 3.3 kn
 Towing dir: 0° wire out : 210 m Catch/hour: 94.70
 Sorted : 23 Total catch: 47.46

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Nemipterus bipunctatus	28.33 303	29.92	202
Saurida undosquamis	21.15 267	22.33	203
Siganus canaliculatus	19.16 399	20.23	
Loligo sp.	7.98 351	8.43	
Priacanthus macracanthus	7.98 156	8.43	
Sepia sp.	2.59 8	2.74	
Lagocephalus guentheri	1.60 12	1.69	
Lophiodes mutilus	1.44 4	1.52	
Upeneus guttatus	0.72 24	0.76	
Trachinocephalus myops	0.64 8	0.67	
Decapterus russelli	0.48 16	0.51	
Pterois russelli	0.48 2	0.51	
Samaris cristatus	0.32 4	0.34	
Dactyloptena orientalis	0.32 4	0.34	
Tentoriiceps cristatus	0.32 4	0.34	
Trixiophichthys weberi	0.24 4	0.25	
Uraspis secunda	0.24 4	0.25	
Rhinobatos cf. schlegelii	0.24 2	0.25	
Tosarhombus longimanus	0.24 8	0.25	
Parascalopsis aspinosa	0.16 4	0.17	
Plotosus lineatus	0.08 2	0.08	
Total	94.70	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 126
 DATE :22/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°3.42
 start stop duration Region : 10330
 TIME :04:32:25 05:03:48 31.4 (min) Purpose : 3
 LOG : 7934.27 7935.90 1.6 Gear cond.: 0
 FDEPTH: 66 68 Validity : 0
 BDEPTH: 66 68 Speed : 3.1 kn
 Towing dir: 0° wire out : 170 m Catch/hour: 42.13
 Sorted : 0 Total catch: 22.05

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Saurida undosquamis	7.87 82	18.68	
Trichiurus lepturus	6.38 61	15.15	
Lagocephalus guentheri	4.55 21	10.79	
Siganus canaliculatus	4.20 82	9.98	
Seriolina nigrofasciata	3.25 4	7.71	
Loligo sp.	2.87 155	6.80	
Priacanthus macracanthus	3.33 48	5.53	
Rhinobatos cf. schlegelii	1.95 2	4.63	
Nemipterus japonicus	1.91 10	4.54	
Nemipterus bipunctatus	1.68 21	3.99	
Pentaprius longimanus	1.45 80	3.45	
Rastrelliger kanagurta	1.41 11	3.36	
Selar crumenophthalmus	0.82 6	1.94	
Photopectoralis aureus	0.65 48	1.54	
Alectis ciliaris	0.36 2	0.86	
Aluterus monoceros	0.34 13	0.82	
Decapterus russelli	0.10 4	0.23	
Total	42.13	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 127
 DATE :22/05/15 GEAR TYPE: BT NO: 26 POSITION:Lat N 13°5.30
 start stop duration Region : 10330
 TIME :07:35:29 08:05:50 30.4 (min) Purpose : 3
 LOG : 7956.84 7958.33 1.5 Gear cond.: 0
 FDEPTH: 45 44 Validity : 0
 BDEPTH: 45 44 Speed : 3.0 kn
 Towing dir: 0° wire out : 110 m Catch/hour: 126.84
 Sorted : 32 Total catch: 64.18

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight numbers			
Secutor insidiator	58.18 4996	45.87	
Trichiurus lepturus	13.04 261	10.28	
Saurida undosquamis	12.33 352	9.72	
Saurida tumbil	10.67 245	8.41	
Loligo sp.	9.80 138	7.73	
Penaeus vannamei	5.61 32	4.43	
Upeneus moluccensis	5.30 237	4.18	
Letogonathus equulus	2.77 194	2.18	
Sepia sp.	1.58 4	1.25	
UNIDENTIFIED FISH	1.54 2	1.22	
Pedophthalmus vigil	1.26 24	1.00	
Gazza minuta	1.26 95	1.00	
Atule mate	1.03 24	0.81	
Stolephorus indicus	0.79 150	0.62	
Mene maculata	0.75 12	0.59	
Sphyræna pinguis	0.43 6	0.34	
Brachypleura novaezeelandiae	0.16 32	0.12	
Siganus canaliculatus	0.16 32	0.12	
Jaydia poecilopterus	0.16 16	0.12	
Total	126.84	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 134
 DATE :23/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 12°42.99
 start stop duration Lon E 96°36.50
 TIME :04:22:35 04:52:36 30.0 (min) Purpose : 3
 LOG : 8092.19 8093.57 1.4 Region : 10330
 FDEPTH: 522 520 Gear cond.: 0
 BDEPTH: 522 520 Validity : 0
 Towing dir: 0' wire out : 1020 m Speed : 2.8 kn
 Sorted : 14 Total catch: 180.13 Catch/hour: 359.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Hexatrygon brickelli	183.82	12	51.07	
Centrophorus sp.	85.51	24	23.76	
Small shrimps	26.37	9231	7.33	
Satyricthys adeni	23.98	36	6.66	
NOMEIDAE	7.67	827	2.13	
Neoharriotta pinnata	7.07	2	1.97	
Chimera sp.	5.39	6	1.50	
Cubiceps whiteleggi	2.52	300	0.70	
Neopinnula orientalis	2.22	66	0.62	
Haliutaea sp.	2.22	6	0.62	
Synagrops japonicus	1.92	42	0.53	
Tetronarce sp.	1.80	210	0.50	
NEOSCOPELIDAE	1.20	36	0.33	
Coelorinchus quadricristatus	1.14	12	0.32	
MYCTOPHIDAE	0.96	36	0.27	
Coloconger sp.	0.90	12	0.25	
Bathycongrus sp.	0.90	60	0.25	
Alepocephalus sp.	0.78	6	0.22	
Satyricthys sp.	0.72	36	0.20	
Macrorhamphosodes uradoi	0.72	60	0.20	
BOTHIDAE	0.48	36	0.13	
Zenopsis nebulosa	0.48	6	0.13	
Bathypterois sp.	0.36	30	0.10	
OGCOEPHALIDAE	0.24	12	0.07	
PARALEPIDIDAE	0.18	18	0.05	
Chauliodus sp.	0.18	18	0.05	
Synaphobranchus sp.	0.12	6	0.03	
Synagrops adeni	0.06	12	0.02	
Plastic	0.00	2	0.00	
Fishing gears	0.00	2	0.00	
Howella sp.	0.00	6	0.00	
Total	359.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 135
 DATE :23/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 12°21.98
 start stop duration Lon E 96°37.31
 TIME :11:43:37 12:14:11 30.6 (min) Purpose : 3
 LOG : 8128.90 8130.31 1.4 Region : 10330
 FDEPTH: 523 506 Gear cond.: 0
 BDEPTH: 523 506 Validity : 0
 Towing dir: 0' wire out : 1100 m Speed : 2.8 kn
 Sorted : 0 Total catch: 20.84 Catch/hour: 40.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aristeus virilis	12.64	1794	30.90	
BYTTIDAE	4.47	34	10.94	
Alepocephalus sp.	2.90	27	7.10	
Neoscopelus sp.	2.90	57	7.10	
Hypopleuron caninum	2.63	10	6.43	
SYNBRANCHIDAE	2.55	24	6.24	
Coelorinchus cf. quadricristatus	2.00	49	4.89	
C E P H A L O P O D A	1.84	18	4.51	
Synagrops japonicus	1.26	31	3.07	
Cruriraja andamanica	1.02	6	2.50	
Neopinnula orientalis	0.94	29	2.30	
Metanephrops sp.	0.75	26	1.82	
NETTASTOMATIDAE	0.71	8	1.73	
MORIDAE	0.67	10	1.63	
Heterocarpus tricarlinatus	0.47	31	1.35	
Bathypterois sp.	0.43	24	1.06	
Tydemania navigatoris	0.39	49	0.96	
Diretmoides parini	0.37	8	0.91	
Physiculus sp.	0.31	2	0.77	
Apristurus sinensis	0.24	8	0.58	
Coryphaenoides sp.	0.22	2	0.53	
SICYONIIDAE	0.20	20	0.48	
MYCTOPHIDAE	0.18	22	0.43	
Iago garricki	0.16	2	0.38	0
Benthobatis moresbyi	0.14	2	0.34	
Cubiceps pauciradiatus	0.14	20	0.34	
Chauliodus sp.	0.14	14	0.34	
Bathurocongrus sp.	0.12	12	0.29	
Photoneustes sp.	0.06	2	0.14	
Halimochirurgus sp.	0.04	6	0.10	
Macrorhamphosodes cf. uradoi	0.02	10	0.05	
Total	40.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 136
 DATE :23/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 12°21.60
 start stop duration Lon E 96°51.47
 TIME :14:32:09 15:02:54 30.8 (min) Purpose : 3
 LOG : 8145.16 8146.52 1.4 Region : 10330
 FDEPTH: 257 252 Gear cond.: 0
 BDEPTH: 257 252 Validity : 0
 Towing dir: 0' wire out : 670 m Speed : 2.7 kn
 Sorted : 18 Total catch: 195.24 Catch/hour: 380.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chlorophthalmus cf. acutifrons	124.88	4433	32.78	
S H R I M P S	59.32	20168	15.57	
Puerulus sewelli	43.79	613	11.49	
Satyricthys adeni	28.84	53	7.57	
RAJIDAE	19.71	2	5.17	
Setarches longimanus	19.20	3262	5.04	
Cubiceps whiteleggi	15.61	780	4.10	
Coelorinchus cf. argentatus	12.49	500	3.28	
Pycnocraspedum squamipinne	11.24	156	2.95	
Priacanthus macracanthus	6.24	94	1.64	
Bythaelurus sp.	5.62	94	1.48	
Chascanopsetta lugubris	4.37	125	1.15	
MYCTOPHIDAE	4.06	749	1.07	
Bythaelurus hispidus	3.75	47	0.98	
Glyptothidium sp.	3.75	687	0.98	
Bembrops caudimacula	3.75	31	0.98	
Psenopsis obscura	3.12	94	0.82	
Lophiomus setigerus	3.12	16	0.82	
Linuparus trigonus	1.64	4	0.43	
Cruriraja andamanica	1.09	8	0.29	
Lepidotrigla sp.	0.94	16	0.25	
Synagrops adeni	0.94	16	0.25	
Cynoglossus gracilis	0.70	47	0.18	
Poecilopsetta sp.	0.62	47	0.16	
Glossanodon sp.	0.62	16	0.16	
Lophichthys sp.	0.62	16	0.16	
Xyrius revulsus	0.31	2	0.08	
Peristedion truncatum	0.31	16	0.08	
Pterygotrigla arabica	0.16	16	0.04	
Halimochirurgus alcocki	0.16	31	0.04	
Total	380.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 137
 DATE :23/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 12°22.53
 start stop duration Lon E 97°1.65
 TIME :16:23:33 16:53:55 30.4 (min) Purpose : 3
 LOG : 8156.68 8158.06 1.4 Region : 10330
 FDEPTH: 162 154 Gear cond.: 0
 BDEPTH: 162 154 Validity : 0
 Towing dir: 0' wire out : 380 m Speed : 2.7 kn
 Sorted : 22 Total catch: 100.08 Catch/hour: 197.72

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida undosquamis	80.01	1264	40.47	
Satyricthys adeni	30.19	36	15.27	
Torquigener sp.	16.83	948	8.51	
Squalus hemipinnis	15.81	12	7.99	
Pseudorhombus quinquecellatus	14.82	302	7.49	
Okamejei cf. powelli	7.35	89	3.72	
Nemipterus japonicus	6.16	89	3.12	
Ostichthys acanthorhinus	5.57	332	2.82	
Cociella cf. hutchinsi	3.56	89	1.80	
Lophiomus setigerus	3.32	12	1.68	
Platyrrhina sp.	2.37	30	1.20	
Callionymus sp.	2.13	160	1.08	
Bleekeria kallioplepis	1.54	83	0.78	
Scyllioides sp.	1.30	18	0.66	
Setarches longimanus	1.19	107	0.60	
Portunus sp.	1.13	71	0.57	
Haliutaea sp.	0.93	6	0.47	
Xyrius revulsus	0.67	2	0.34	
Arnoglossus sp.	0.65	41	0.33	
Octopus sp.	0.59	12	0.30	
Sepia sp.	0.59	18	0.30	
Peristedion weberi	0.59	41	0.30	
Monocentris japonica	0.36	2	0.18	
Symphysanodon sp.	0.06	6	0.03	
Total	197.72		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 156
 DATE :26/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 11°22.41
 start stop duration Lon E 96°52.87
 TIME :02:41:19 03:14:44 33.4 (min) Purpose : 3
 LOG : 8541.95 8543.55 1.6 Region : 10330
 FDEPTH: 300 298 Gear cond.: 0
 BDEPTH: 300 298 Validity : 0
 Towing dir: 0° wire out : 720 m Speed : 2.9 kn
 Sorted : 23 Total catch: 229.14 Catch/hour: 411.38

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Plesionobatis daviesi	141.65	11	34.43
Chlorophthalmus cf. acutifrons	76.70	1605	18.64
Psenopsis obscura	50.84	1077	12.36
Synagrops adeni	30.16	3199	7.33
S H R I M P S	23.27	7680	5.66
Rexea bengalensis	19.39	539	4.71
Heptranchias perlo	14.90	5	3.62
Satyrichthys adeni	13.57	22	3.30
Loligo sp.	7.54	97	1.83
Puerulus sewelli	6.57	158	1.60
Synagrops japonicus	6.46	194	1.57
Bythaelurus hispidus	6.46	65	1.57
Rexea prometheoides	5.82	65	1.41
Cubiceps whiteleggii	3.23	65	0.79
Coelorrinchus quadricristatus	1.72	65	0.42
Priacanthus macracanthus	1.51	11	0.37
Chascanopsetta lugubris	0.86	22	0.21
Xyrias revulsus	0.54	2	0.13
Iago garricki	0.18	0	0.04
Total	411.38		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 157
 DATE :26/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 11°5.70
 start stop duration Lon E 96°35.84
 TIME :13:02:19 13:32:23 30.1 (min) Purpose : 3
 LOG : 8595.02 8596.47 1.4 Region : 10330
 FDEPTH: 459 457 Gear cond.: 0
 BDEPTH: 459 457 Validity : 0
 Towing dir: 0° wire out : 960 m Speed : 2.9 kn
 Sorted : 13 Total catch: 89.23 Catch/hour: 178.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Hexatrygon brickelli	68.20	6	38.31
Plesionobatis daviesi	32.32	4	18.16
Aristeus virilis	26.22	7075	14.73
Myctophid sp. B	7.90	1568	4.44
ALEPOCEPHALIDAE	7.06	162	3.97
Polyipnus asper	5.51	826	3.09
S H R I M P S	5.39	539	3.03
Neoscopelus microchir	4.67	120	2.62
Bythaelurus hispidus	4.19	42	2.35
BYTTIIDAE	3.83	245	2.15
Gavialiceps taeniola	3.59	42	2.02
Heterocarpus tricarlinatus	2.39	132	1.34
Coelorrinchus cf. argentatus	1.68	132	0.94
Squalus sp.	1.08	2	0.61
Cubiceps whiteleggii	0.96	24	0.54
Chascanopsetta lugubris	0.84	6	0.47
Malacocephalus sp.	0.72	6	0.40
Chlorophthalmus acutifrons	0.72	6	0.40
Tydemania navigatoris	0.36	36	0.20
Synagrops japonicus	0.24	6	0.13
Chauliodus sp.	0.12	12	0.07
Benthodesmus sp.	0.06	2	0.03
Total	178.04		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 158
 DATE :26/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 11°1.75
 start stop duration Lon E 96°53.93
 TIME :16:38:57 17:09:32 30.6 (min) Purpose : 3
 LOG : 8616.67 8618.11 1.4 Region : 10330
 FDEPTH: 325 320 Gear cond.: 0
 BDEPTH: 325 320 Validity : 0
 Towing dir: 0° wire out : 780 m Speed : 2.8 kn
 Sorted : 36 Total catch: 35.52 Catch/hour: 69.69

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Plesionobatis daviesi	17.27	2	24.77
Small shrimps	12.87	4632	18.47
Chlorophthalmus cf. acutifrons	9.97	200	14.30
OMMASTREPHIDAE	8.12	67	11.66
Eridacnis radcliffei	4.55	96	6.53
Coelorrinchus sp.	3.61	163	5.18
Psenopsis obscura	3.53	49	5.07
MYCTOPHIDAE	2.98	1130	4.28
Puerulus sewelli	2.79	29	4.00
Chlorophthalmus corniger	0.90	86	1.30
Tydemania navigatoris	0.59	78	0.84
Metanephropsis arafurensis	0.45	0	0.65
Neobythites sp.	0.35	6	0.51
Bythaelurus hispidus	0.35	24	0.51
Bembradium roseum	0.20	8	0.28
Antigonia cf. rubescens	0.20	4	0.28
Gavialiceps taeniola	0.18	10	0.25
Bathymyrus echinorhynchus	0.18	2	0.25
Chascanopsetta lugubris	0.16	8	0.23
Satyrichthys adeni	0.12	2	0.17
Lophiomus setigerus	0.08	2	0.11
Macrorhamphosodes alcocki	0.08	10	0.11
Setarches longimanus	0.06	4	0.08
Ariosoma sp.	0.04	2	0.06
Polymixia berndti	0.04	2	0.06
Poecilopsetta sp.	0.04	4	0.06
DICERATIIDAE	0.00	2	0.00
Total	69.69		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 159
 DATE :26/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 11°3.28
 start stop duration Lon E 97°22.72
 TIME :20:21:02 20:51:26 30.4 (min) Purpose : 3
 LOG : 8646.09 8647.51 1.4 Region : 10330
 FDEPTH: 113 112 Gear cond.: 0
 BDEPTH: 113 112 Validity : 0
 Towing dir: 0° wire out : 270 m Speed : 2.8 kn
 Sorted : 0 Total catch: 64.71 Catch/hour: 127.72

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
R A Y S	78.95	2	61.81
Saurida undosquamis	9.04	118	7.08
Engyprosope sp.	7.62	229	5.97
Torquigener sp.	6.91	414	5.41
Neopeinnula orientalis	3.47	105	2.72
Monocentris japonica	3.39	30	2.66
Uranoscopus affinis	2.37	18	1.85
Centroberyx druzhinini	1.97	16	1.55
OMMASTREPHIDAE	1.42	16	1.11
Uranoscopus kaianus	1.42	6	1.11
Trachinocephalus myops	1.38	12	1.08
Tetrosomus reipublicae	1.14	8	0.90
Sepia sp.	0.99	6	0.77
Octopus sp.	0.91	16	0.71
Synodus sp.	0.79	32	0.62
Hapalogenys merguensis	0.75	2	0.59
Chelidoperca pleurospilus	0.75	89	0.59
Priacanthus hamrur	0.75	6	0.59
Bleekeria kailolepis	0.55	103	0.43
Priacanthus sagittarius	0.51	2	0.40
Parascopopsis aspinosa	0.45	2	0.36
Nemipterus japonicus	0.43	28	0.34
Parupeneus heptacanthus	0.41	2	0.32
Sargocentron rubrum	0.24	12	0.19
Sorsogona melanoptera	0.24	6	0.19
Snyderina yamanokami	0.20	2	0.15
Hoplichthys citrinus	0.16	14	0.12
Ariosoma sp.	0.12	4	0.09
Ophidion sp.	0.08	4	0.06
Paraperca cf. sexfasciata	0.06	2	0.05
Synodus cf. randalli	0.04	2	0.03
Acanthaphritis barbata	0.04	6	0.03
Synodus macrops	0.04	4	0.03
Priacanthus sp.	0.04	2	0.03
Aulotrachichthys sp.	0.04	2	0.03
Cynoglossus puncticeps	0.04	2	0.03
Uranoscopus oligolepis	0.00	2	0.00
Total	127.72		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 160
 DATE :26/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 11°1.85
 start stop duration Lon E 97°34.01
 TIME :22:17:06 22:47:18 30.2 (min) Purpose : 3
 LOG : 8658.73 8660.36 1.6 Region : 10330
 FDEPTH: 83 81 Gear cond.: 0
 BDEPTH: 83 81 Validity : 0
 Towing dir: 0° wire out : 245 m Speed : 3.2 kn
 Sorted : 27 Total catch: 54.98 Catch/hour: 109.23

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Siganus canaliculatus	22.89	588	20.95
Saurida undosquamis	19.87	246	18.19
Trachinocephalus myops	11.05	127	10.11
Nemipterus bipunctatus	9.70	60	8.88
Sepia sp.	7.87	20	7.20
Parapterois heterura	6.68	87	6.11
Dactyloptena orientalis	5.72	68	5.24
Priacanthus hamrur	5.25	40	4.80
Upeneus guttatus	5.25	211	4.80
Centroberyx druzhinini	2.70	20	2.47
Fistularia petimba	1.99	4	1.82
Charybdis feriata	1.71	4	1.56
Loligo sp.	1.11	16	1.02
Decapterus smithvanizi	0.79	16	0.73
Cyclichthys orbicularis	0.75	16	0.69
Sorsogona melanoptera	0.72	48	0.65
Sargocentron rubrum	0.72	4	0.65
Parupeneus heptacanthus	0.72	4	0.65
Galappa sp.	0.64	4	0.58
Torquigener sp.	0.60	28	0.55
Callionymus cf. margaretae	0.56	12	0.51
Uranoscopus affinis	0.52	8	0.47
C R A B S	0.52	77	0.47
Tetrosomus reipublicae	0.40	4	0.36
Ariosoma sp.	0.32	4	0.29
Synodus sp.	0.24	4	0.22
Arothron stellatus	0.00	2	0.00
Total	109.23		100.00

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 167
 DATE :27/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°40.47
 start stop duration Lon E 97°0.05
 TIME :18:32:30 19:02:50 30.3 (min) Purpose : 3
 LOG : 8806.31 8808.03 1.7 Region : 10330
 FDEPTH: 329 329 Gear cond.: 0
 BDEPTH: 329 329 Validity : 0
 Towing dir: 0° wire out : 790 m Speed : 3.4 kn
 Sorted : 19 Total catch: 18.73 Catch/hour: 37.05

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Chlorophthalmus cf. acutifrons	8.15	22.00	
S H R I M P S	7.83	21.14	
OMMASTREPHIDAE	6.49	17.51	
Psenopsis obscura	3.60	9.72	
Puerulus sewelli	3.09	8.33	
Priacanthus hamrur	1.13	3.04	
Chascanopsetta lugubris	0.91	2.46	
Squalus cf. hemipinnis	0.87	2.35	
Satyricthys adeni	0.73	1.98	
Bythaelurus hispidus	0.71	1.92	
Lophiodes mutilus	0.55	1.49	
Coelorinchus cf. argentatus	0.51	1.39	
Glyptothidium sp.	0.38	1.01	
Octopus sp.	0.28	0.75	
Ophidion sp.	0.24	0.64	
Tydemania navigatoris	0.22	0.59	
MYCTOPHIDAE	0.22	0.59	
Neopinnula orientalis	0.18	0.48	
Zenopsis nebulosa	0.16	0.43	
Ateleopus sp.	0.16	0.43	
Synagrops adeni	0.10	0.27	
Hoplichthys filamentosus	0.08	0.21	
Halimochirurgus alcocki	0.08	0.21	
Dactyloptena orientalis	0.08	0.21	
Cyttopsis rosea	0.08	0.21	
Rexea bengalensis	0.06	0.16	
Bembradium roseum	0.06	0.16	
Bemrops caudimacula	0.06	0.16	
Triphichthys weberi	0.06	0.16	
Total	37.05	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 168
 DATE :27/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°44.70
 start stop duration Lon E 96°40.90
 TIME :22:40:14 23:10:19 30.1 (min) Purpose : 3
 LOG : 8830.81 8832.36 1.6 Region : 10330
 FDEPTH: 399 400 Gear cond.: 0
 BDEPTH: 399 400 Validity : 0
 Towing dir: 0° wire out : 900 m Speed : 3.1 kn
 Sorted : 17 Total catch: 43.69 Catch/hour: 87.18

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
S H R I M P S	25.70	29.48	
Atlantoraja cyclophora	18.56	21.29	
Polyipnus asper	12.77	14.65	
Setarches longimanus	7.98	9.16	
Iago sp.	4.47	5.13	
MYCTOPHIDAE	2.47	2.84	
Chlorophthalmus cf. acutifrons	2.39	2.75	
Neoscopelus microchir	2.00	2.29	
Benthodesmus sp.	1.84	2.11	
Lophiodes mutilus	1.56	1.79	
Tydemania navigatoris	1.12	1.28	
Chaunax sp.	1.12	1.28	
Myctophum fissunovi	1.04	1.19	
Satyricthys investigatoris	1.04	1.19	
Neopinnula orientalis	0.88	1.01	
Malacocephalus laevis	0.80	0.92	
Rexea bengalensis	0.40	0.46	
Pterygotrigla cf. macrorhynchus	0.24	0.27	
Coelorinchus cf. argentatus	0.24	0.27	
Cyttopsis rosea	0.20	0.23	
Metanephrops sp.	0.20	0.23	
Metanephropsis arafurensis	0.12	0.14	
Ostracoberyx dorygenys	0.06	0.07	
Total	87.18	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 169
 DATE :28/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°20.04
 start stop duration Lon E 96°24.24
 TIME :03:54:28 04:24:56 30.5 (min) Purpose : 3
 LOG : 8867.36 8868.84 1.5 Region : 10330
 FDEPTH: 802 823 Gear cond.: 0
 BDEPTH: 802 823 Validity : 0
 Towing dir: 0° wire out : 1600 m Speed : 2.9 kn
 Sorted : 46 Total catch: 45.85 Catch/hour: 90.29

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
Hexatrygon brickelli	59.07	65.43	
S H R I M P S	7.52	8.33	
Gavialiceps taeniola	2.44	2.70	
Cruriraja andamanica	2.36	2.62	
Xenomystax sp.	2.28	2.53	0
Tydemania navigatoris	1.89	2.09	
Coelorinchus quadricristatus	1.77	1.96	
Xenomystax sp.	1.71	1.90	
Neopinnula orientalis	1.38	1.53	
Talisma sp.	1.26	1.40	
OMMASTREPHIDAE	1.10	1.22	
Gonostoma sp.	1.08	1.20	
Polyipnus asper	0.91	1.00	
Alepocephalus sp.	0.71	0.79	
Coryphaenoides sp.	0.59	0.65	
Benthobatis moresbyi	0.59	0.65	
Bathypterois atricolor	0.51	0.57	
Coelorinchus sp.	0.43	0.48	
Satyricthys investigatoris	0.39	0.44	
Alrovanadia sp.	0.24	0.26	
Avocettina sp.	0.20	0.22	
Scombrobrax heterolepis	0.20	0.22	
Bathypogonius sp.	0.18	0.20	
Hypopleuron caninum	0.18	0.20	
Diceratias spl	0.16	0.17	
MYCTOPHIDAE	0.16	0.17	
Anoplogaster cornuta	0.12	0.13	
Cubiceps baxteri	0.10	0.11	
Neoscopelus microchir	0.10	0.11	
Chauliodus sp.	0.10	0.11	
Diceratias sp2	0.08	0.09	
Halimochirurgus alcocki	0.08	0.09	
Gephyroberyx darwini	0.06	0.07	
Astronesthes sp.	0.06	0.07	
PARALEPIDIDAE	0.06	0.07	
Glyptothidium sp.	0.06	0.07	
Bufoceratias wedli	0.06	0.07	
Ostracoberyx dorygenys	0.04	0.04	
Satyricthys adeni	0.04	0.04	
MICROSTOMATIDAE	0.02	0.02	
Hopllostethus melanopus	0.00	0.00	
Total	90.29	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 170
 DATE :28/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°21.85
 start stop duration Lon E 96°44.83
 TIME :11:20:20 11:50:37 30.3 (min) Purpose : 3
 LOG : 8904.14 8905.70 1.6 Region : 10330
 FDEPTH: 379 376 Gear cond.: 0
 BDEPTH: 379 376 Validity : 0
 Towing dir: 0° wire out : 900 m Speed : 3.1 kn
 Sorted : 24 Total catch: 120.82 Catch/hour: 239.33

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
weight	numbers		
MYCTOPHIDAE	53.88	22.51	
S H R I M P S	44.69	18.67	
Plesiobatis daviesi	25.20	10.53	
Dipturus cf. johannisdaviesi	18.62	7.78	
Neopinnula orientalis	11.09	4.63	
Setarches longimanus	9.83	4.11	
Squalus megalops	7.76	3.24	
Hypopleuron caninum	7.61	3.18	
Astronesthes sp.	6.34	2.65	
Myctophum fissunovi	6.34	2.65	
Polyipnus asper	6.02	2.52	
Loligo sp.	5.23	2.19	
Ophidion sp.	4.91	2.05	
Chlorophthalmus cf. acutifrons	4.28	1.79	
Psenopsis obscura	3.80	1.59	
Cubiceps whiteleggii	3.64	1.52	
Tydemania navigatoris	3.49	1.46	
Metanephropsis arafurensis	3.05	1.27	241
Lestrolepis intermedia	3.01	1.26	
Priacanthus macracanthus	1.35	0.56	
Rexea bengalensis	1.11	0.46	
Chaunax sp.	1.11	0.46	
Cyttopsis rosea	1.11	0.46	
Satyricthys investigatoris	1.11	0.46	
Brama sp.	0.95	0.40	
Lophiodes mutilus	0.87	0.36	
Ariosoma sp.	0.87	0.36	
BYIIDAE	0.79	0.33	
Chlorophthalmus corniger	0.48	0.20	
Coelorinchus cf. argentatus	0.32	0.13	
Neoscopelus microchir	0.24	0.10	
Bemrops platyrhynchus	0.24	0.10	
Mephisto fraserbrunneri	0.00	0.00	
Iago sp.	0.00	0.00	
Total	239.33	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 176
DATE :29/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°3.64
start stop duration Lon E 97°45.91
TIME :14:23:06 14:53:08 30.0 (min) Purpose : 3
LOG : 9087.72 9089.09 1.4 Region : 10330
FDEPTH: 74 73 Gear cond.: 0
BDEPTH: 74 73 Validity: 0
Towing dir: 0° Wire out : 181 m Speed : 2.7 kn
Sorted : 31 Total catch: 69.20 Catch/hour: 138.26

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 178
DATE :29/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°1.13
start stop duration Lon E 97°7.92
TIME :20:54:03 21:24:19 30.3 (min) Purpose : 3
LOG : 9131.94 9133.42 1.5 Region : 10330
FDEPTH: 306 308 Gear cond.: 0
BDEPTH: 306 308 Validity: 0
Towing dir: 0° Wire out : 720 m Speed : 2.9 kn
Sorted : 23 Total catch: 40.11 Catch/hour: 79.50

Table with 5 columns: SPECIES, CATCH/HOUR, weight, numbers, % OF TOT. C, SAMP. Lists various fish species and their catch data for station 176.

Table with 5 columns: SPECIES, CATCH/HOUR, weight, numbers, % OF TOT. C, SAMP. Lists various fish species and their catch data for station 178.

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 177
DATE :29/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°2.91
start stop duration Lon E 97°22.78
TIME :18:01:51 18:31:58 30.1 (min) Purpose : 3
LOG : 9113.41 9114.92 1.5 Region : 10330
FDEPTH: 181 182 Gear cond.: 0
BDEPTH: 181 182 Validity: 0
Towing dir: 0° Wire out : 450 m Speed : 3.0 kn
Sorted : 30 Total catch: 93.57 Catch/hour: 186.39

R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 179
DATE :30/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°1.68
start stop duration Lon E 96°46.41
TIME :00:17:37 00:48:53 31.3 (min) Purpose : 3
LOG : 9153.71 9155.18 1.5 Region : 10330
FDEPTH: 374 373 Gear cond.: 0
BDEPTH: 374 373 Validity: 0
Towing dir: 0° Wire out : 800 m Speed : 2.8 kn
Sorted : 17 Total catch: 70.86 Catch/hour: 135.96

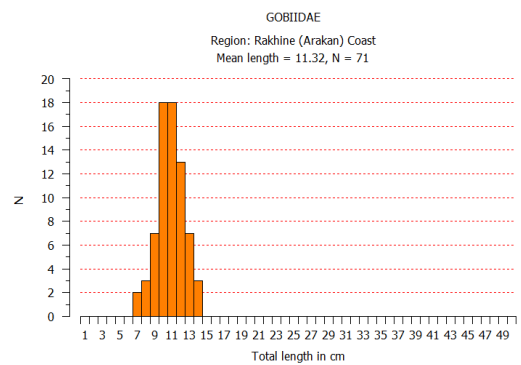
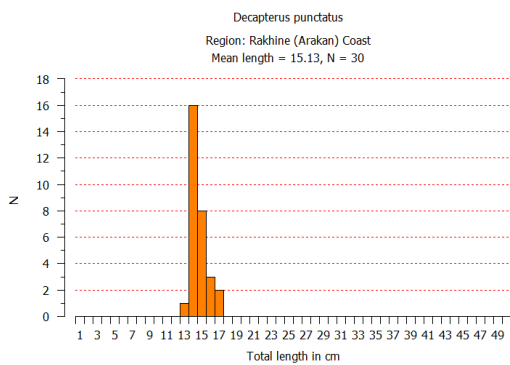
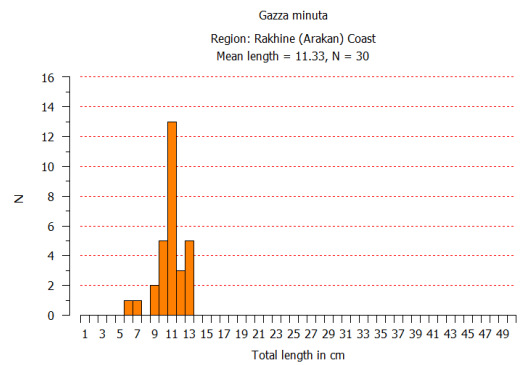
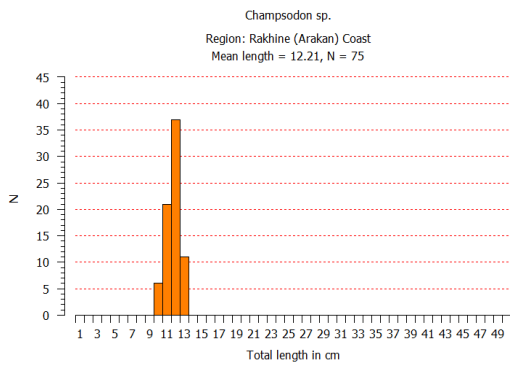
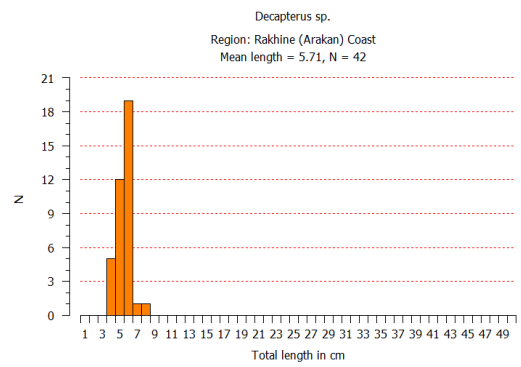
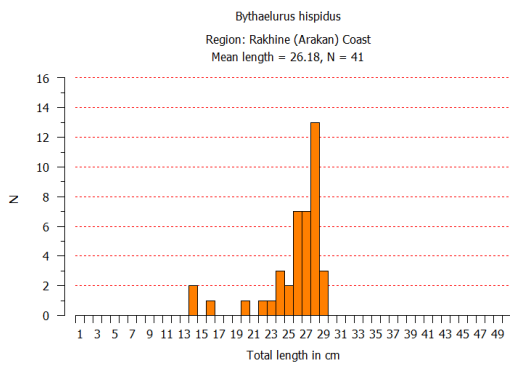
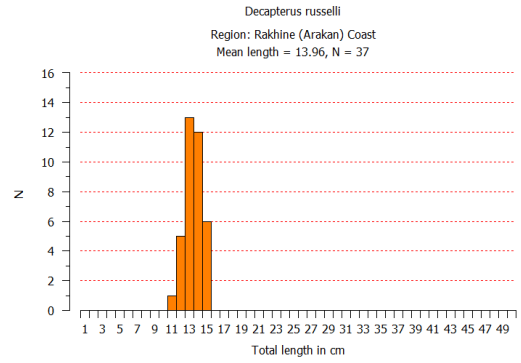
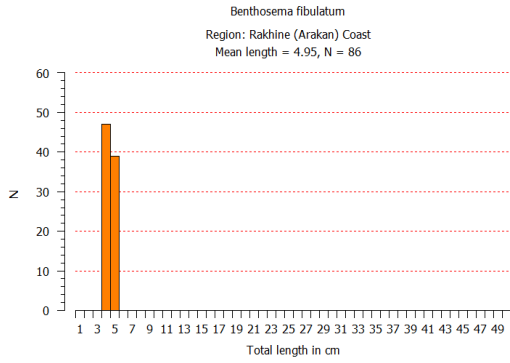
Table with 5 columns: SPECIES, CATCH/HOUR, weight, numbers, % OF TOT. C, SAMP. Lists various fish species and their catch data for station 177.

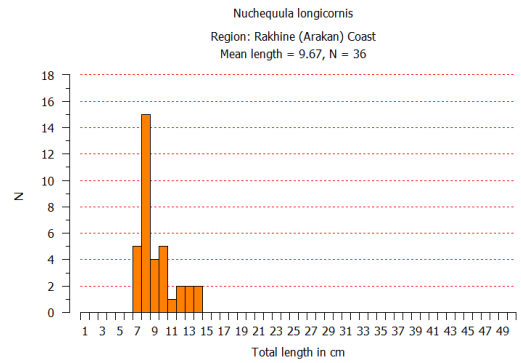
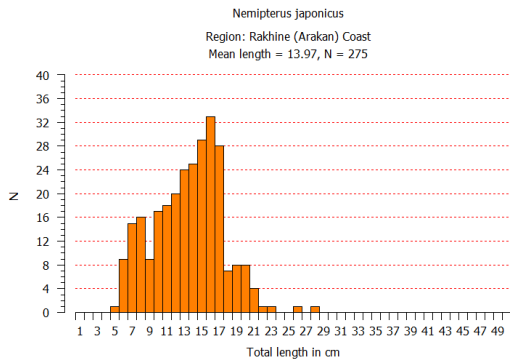
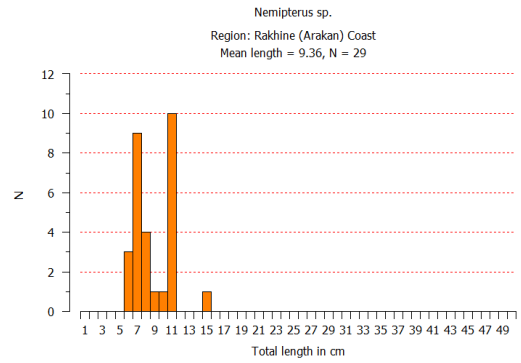
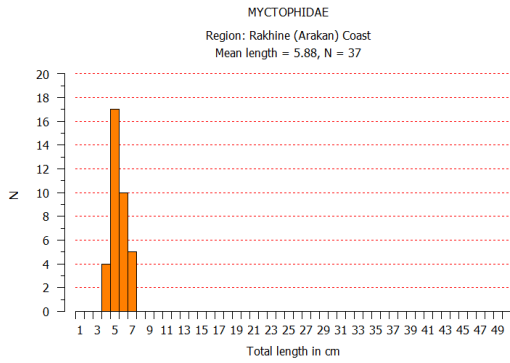
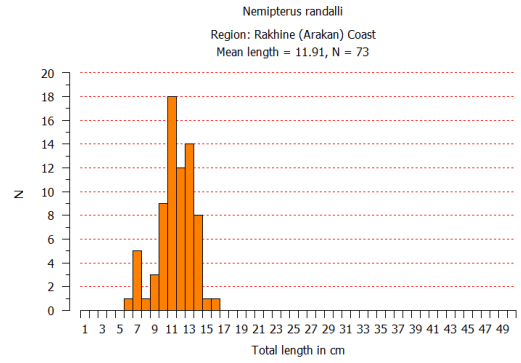
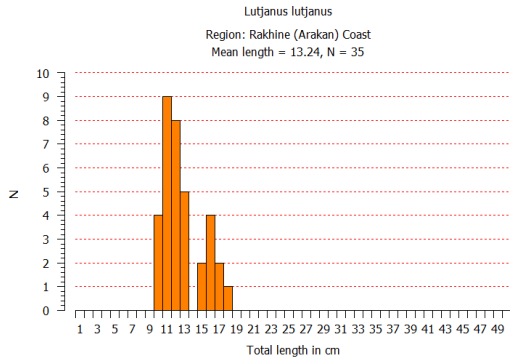
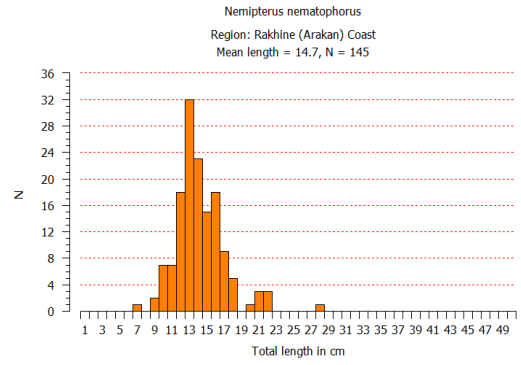
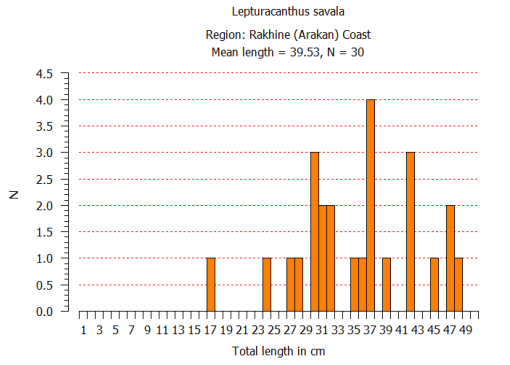
Table with 5 columns: SPECIES, CATCH/HOUR, weight, numbers, % OF TOT. C, SAMP. Lists various fish species and their catch data for station 179.

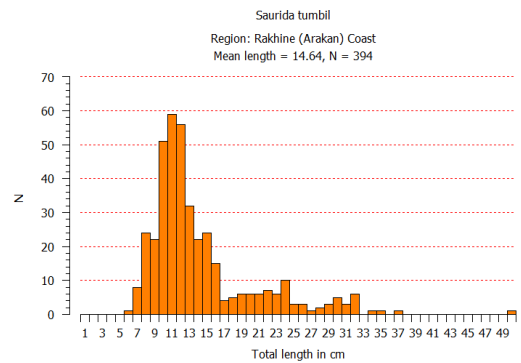
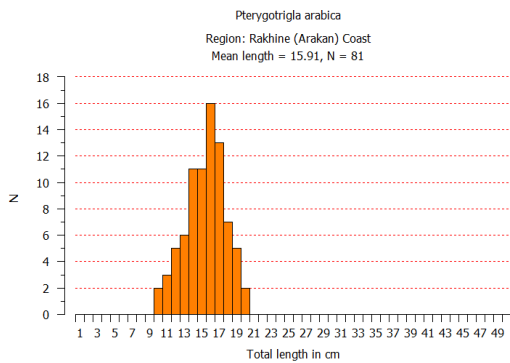
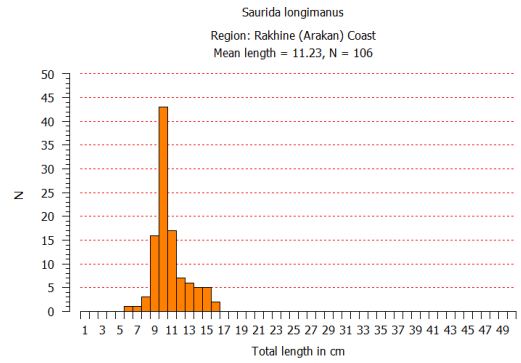
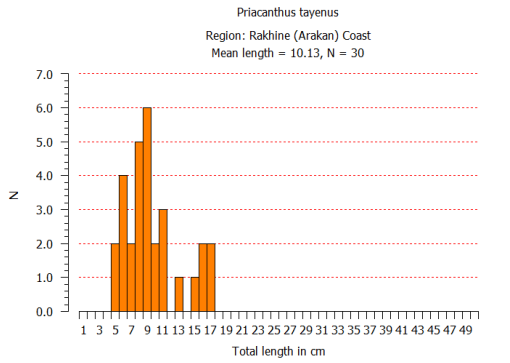
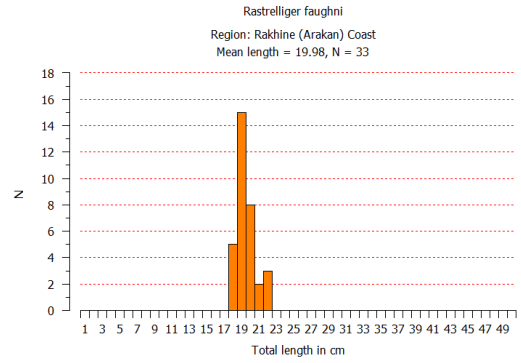
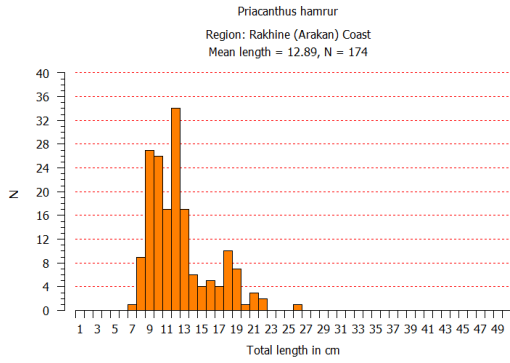
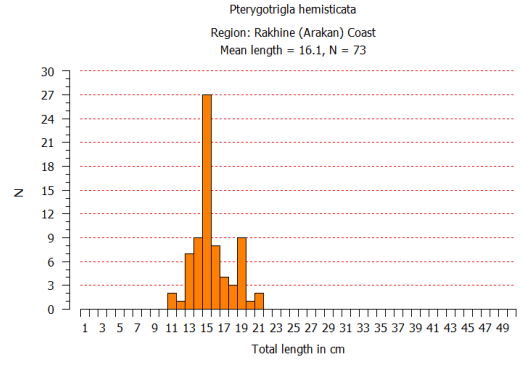
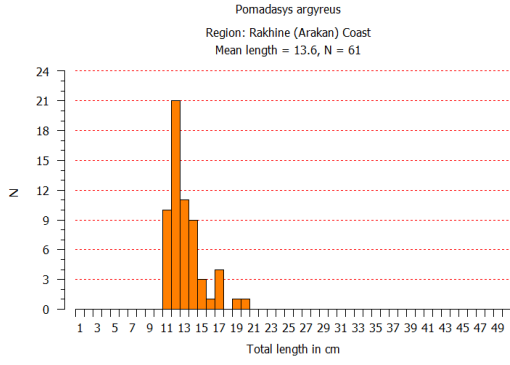
R/V Dr. Fridtjof Nansen SURVEY:2015404 STATION: 180
DATE :30/05/15 GEAR TYPE: BT NO: 27 POSITION:Lat N 10°2.02
start stop duration Lon E 96°25.95
TIME :06:34:16 07:04:32 30.3 (min) Purpose : 3
LOG : 9189.92 9191.38 1.5 Region : 10330
FDEPTH: 503 485 Gear cond.: 0
BDEPTH: 503 485 Validity: 0
Towing dir: 0° Wire out : 1050 m Speed : 2.9 kn
Sorted : 36 Total catch: 73.08 Catch/hour: 144.86

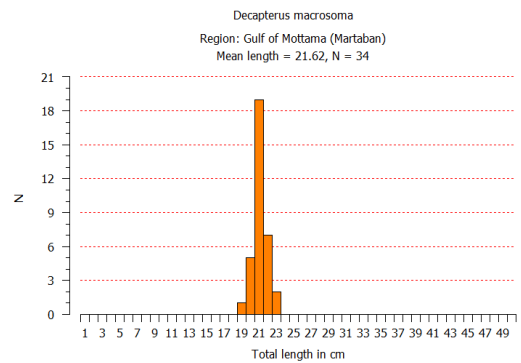
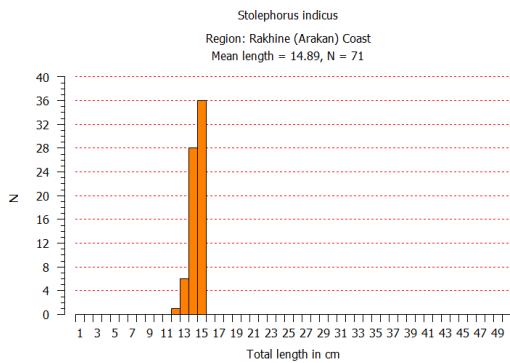
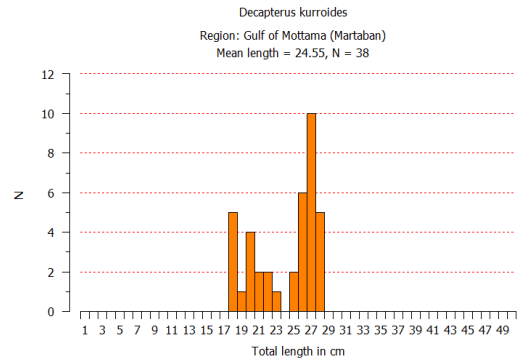
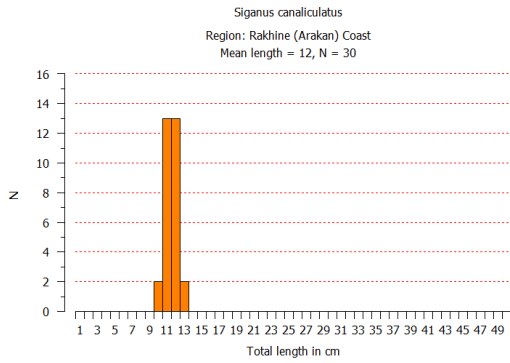
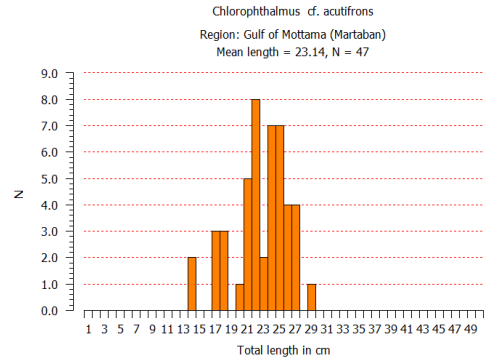
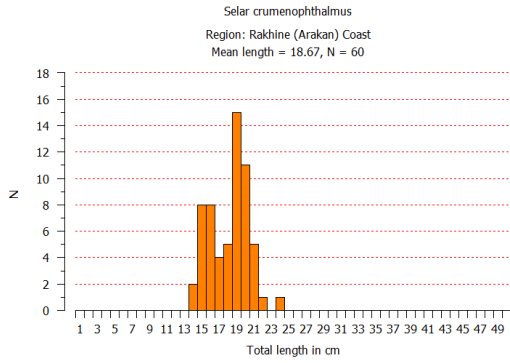
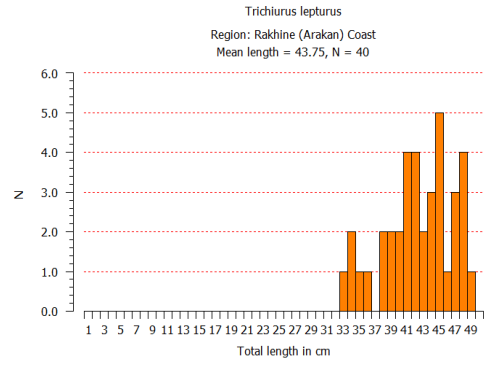
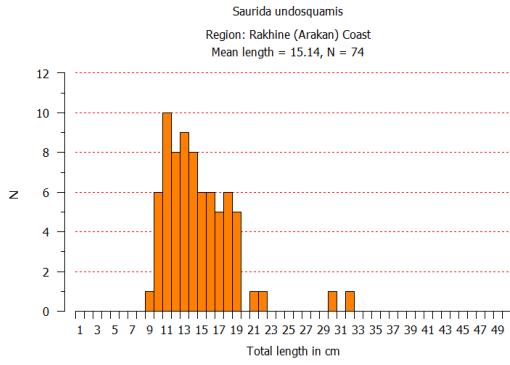
Table with 5 columns: SPECIES, CATCH/HOUR, weight, numbers, % OF TOT. C, SAMP. Lists various fish species and their catch data for station 180.

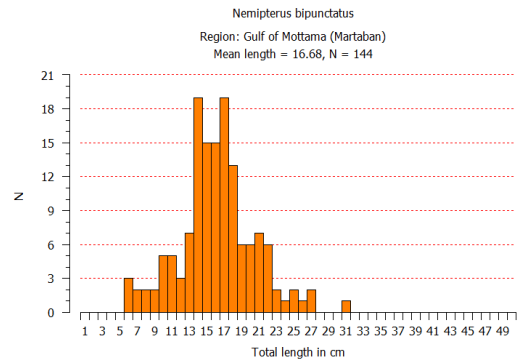
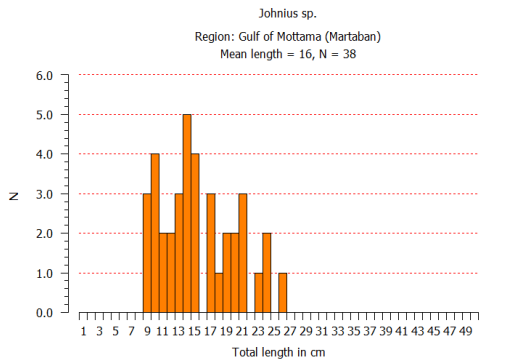
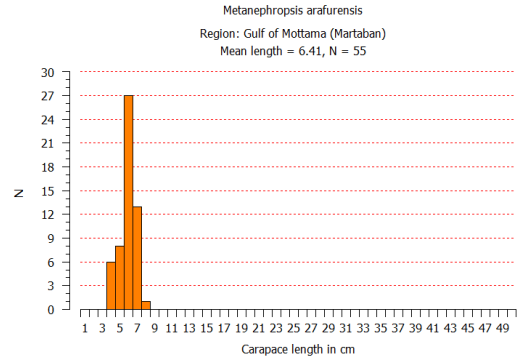
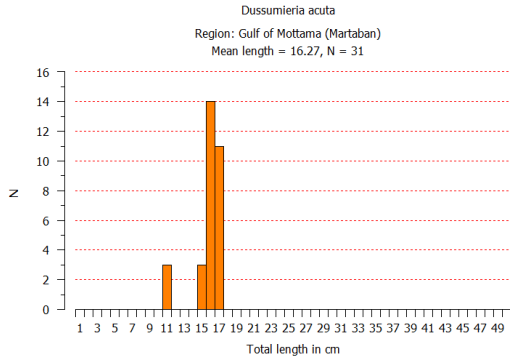
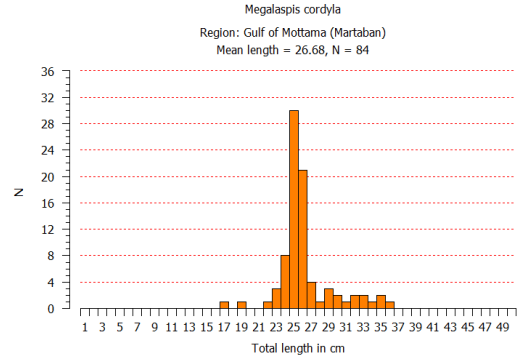
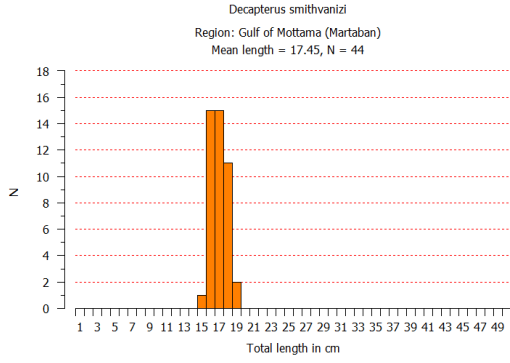
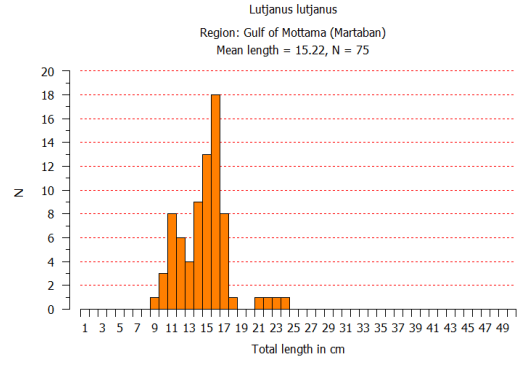
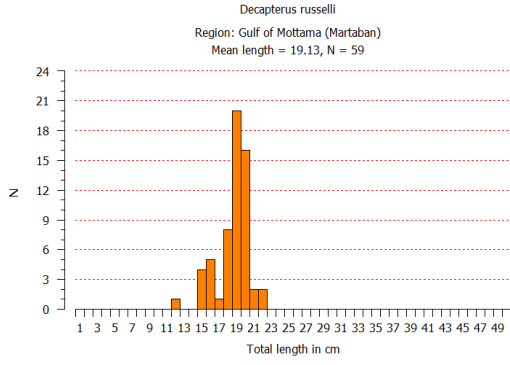
LENGTH DISTRIBUTION OF MAIN SPECIES

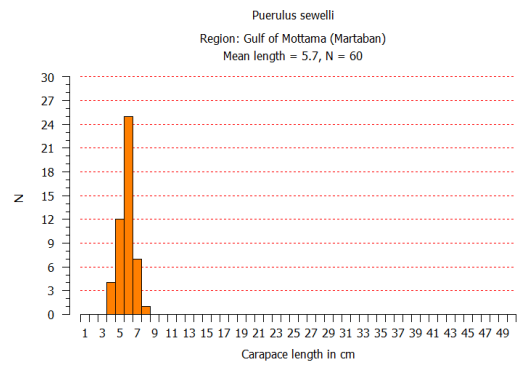
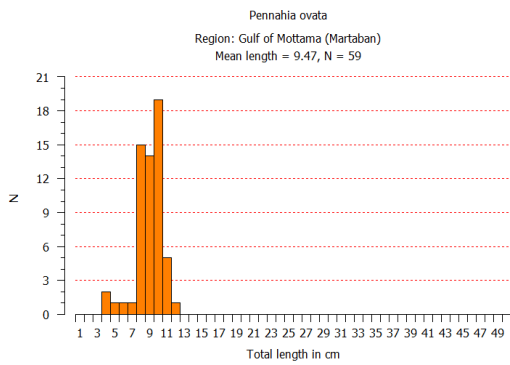
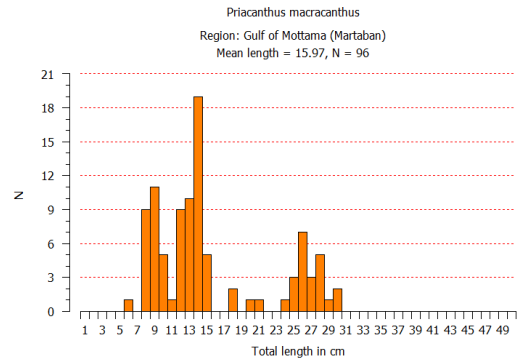
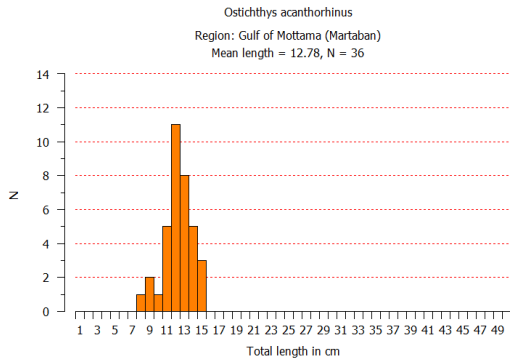
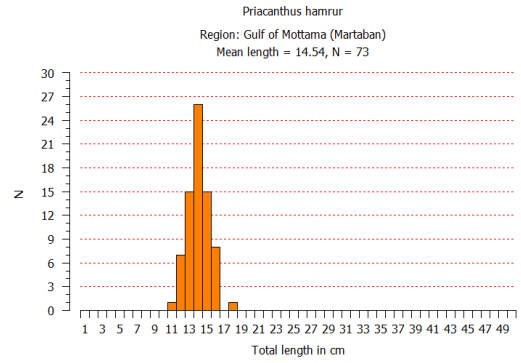
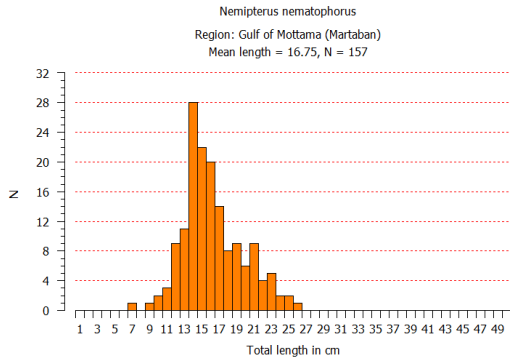
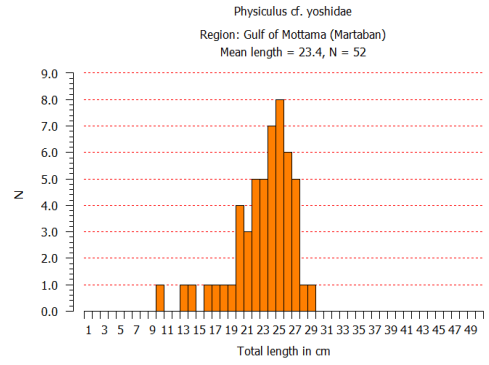
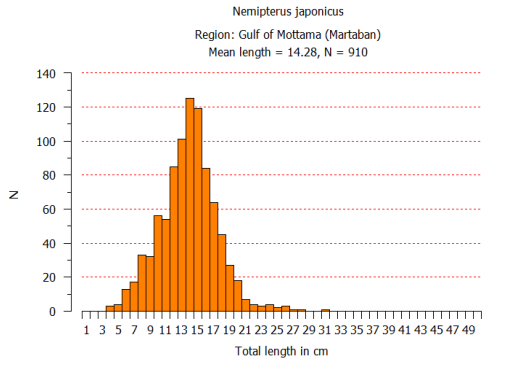


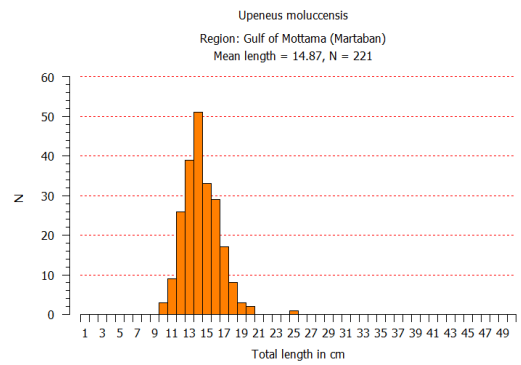
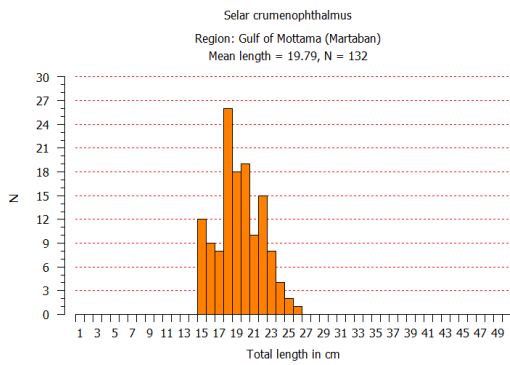
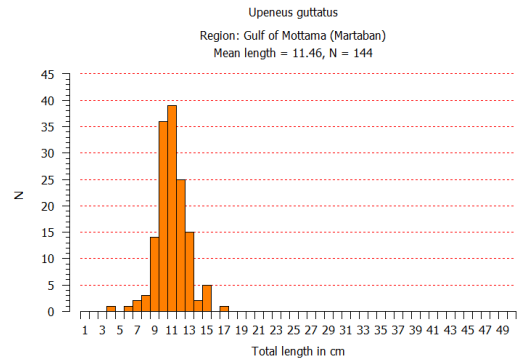
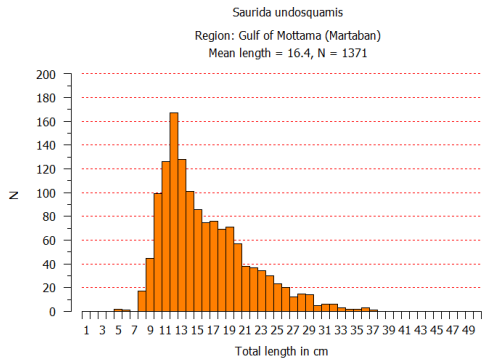
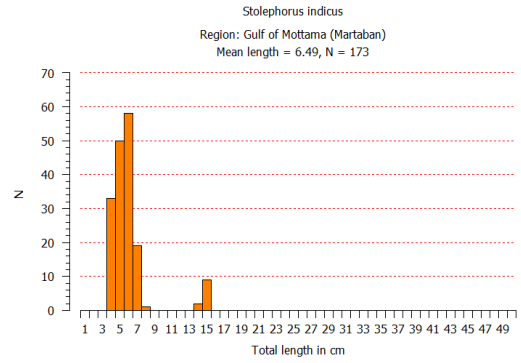
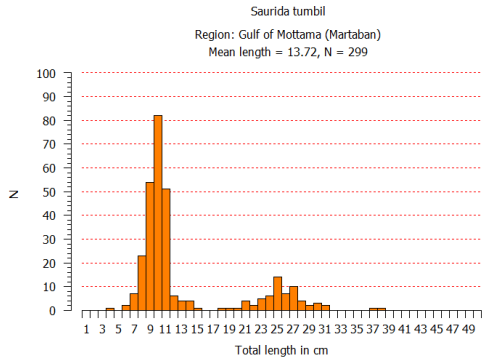
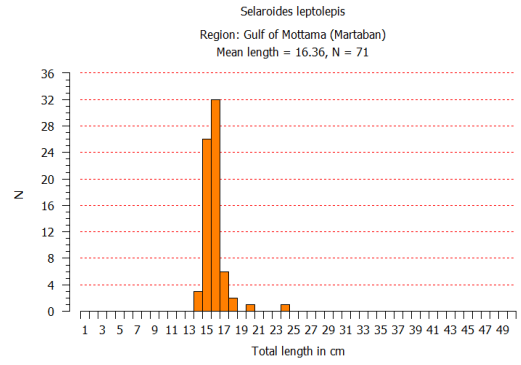
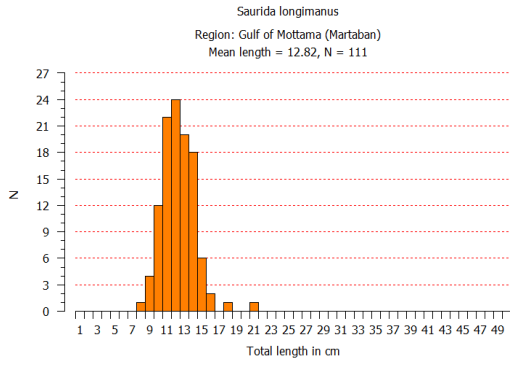


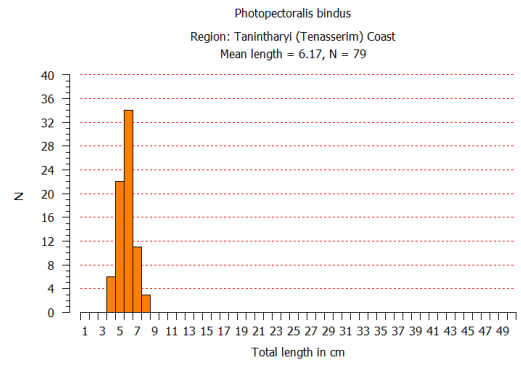
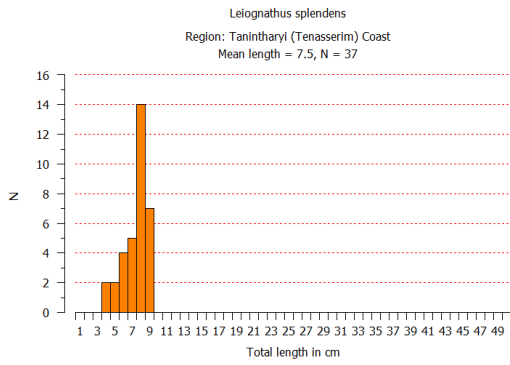
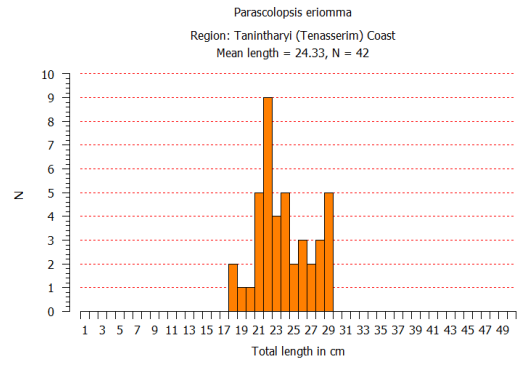
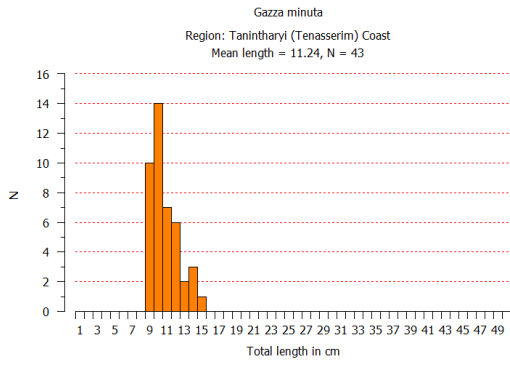
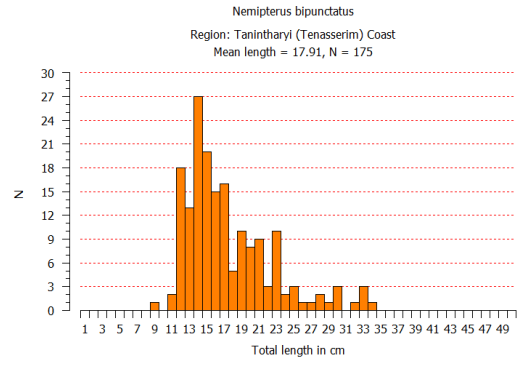
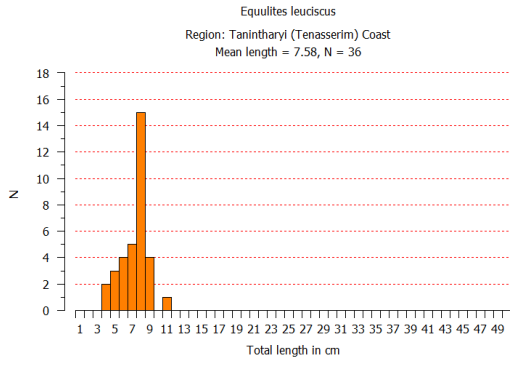
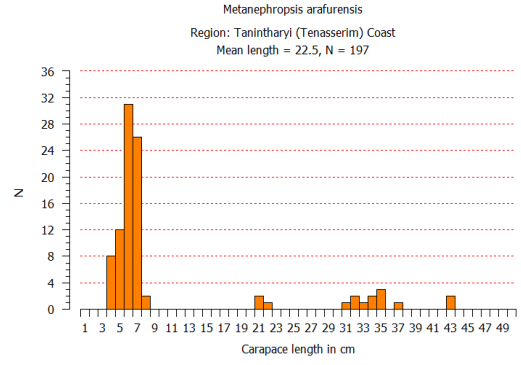
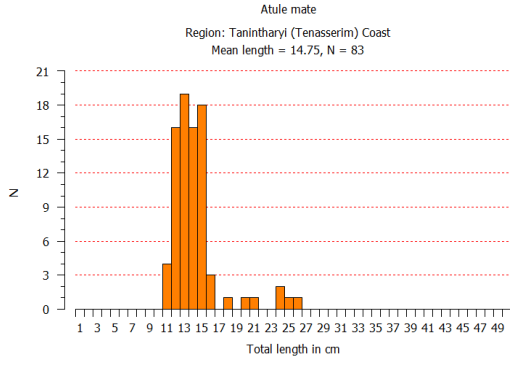


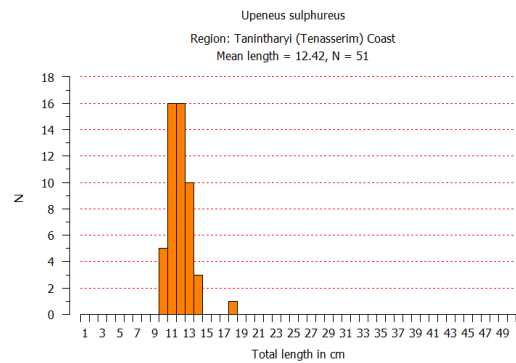
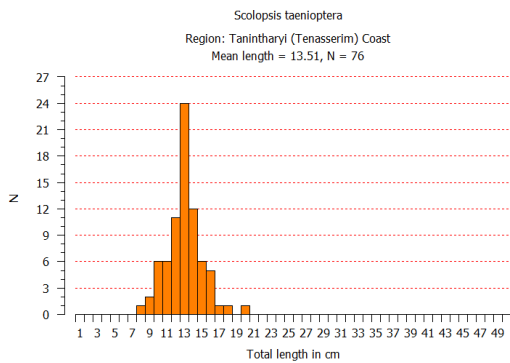
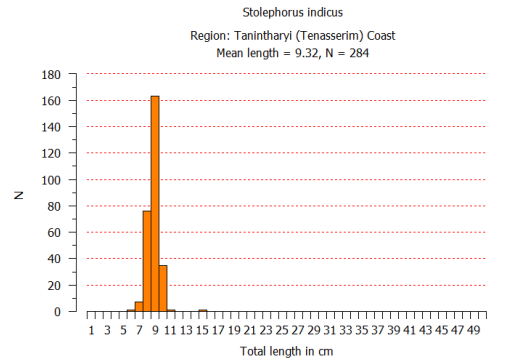
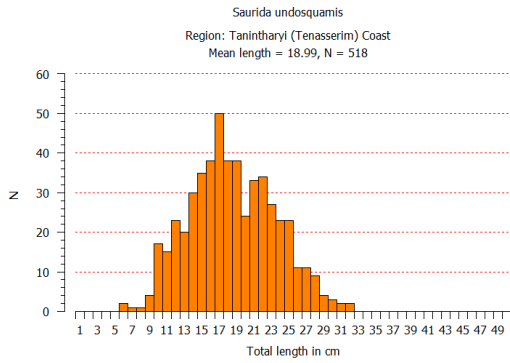
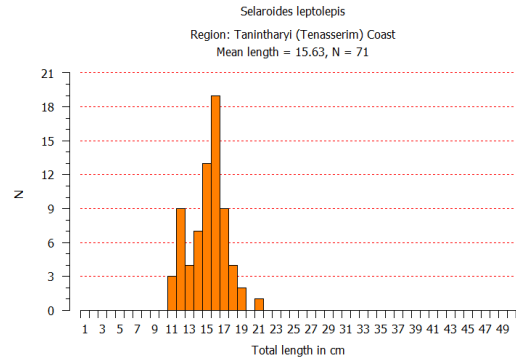
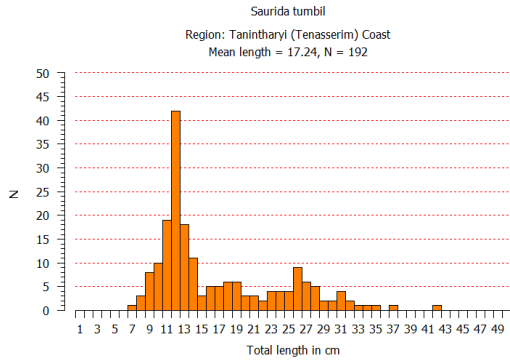
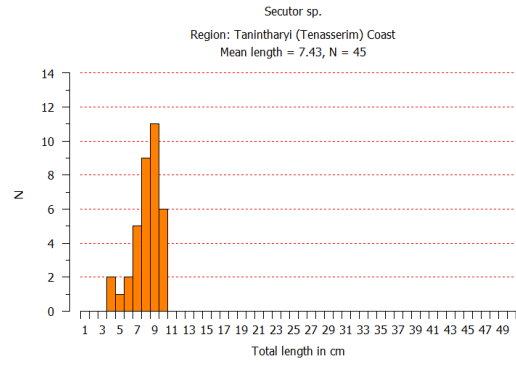
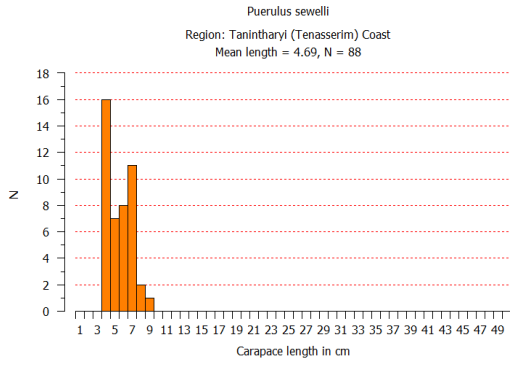












ANNEX III. INSTRUMENTS AND FISHING GEAR USED

Echo sounder

The SIMRAD ER60/38 kHz scientific sounder was used during the survey for fish abundance estimation. The LSSS Integrator system was used to scrutinise the acoustic records. The echosounder was calibrated in Angola 21/2-15 with the following results.

DRIFTSJOURNAL 1		Calibration with reference sphere		Rev:2006
Vessel :	F/F Dr. Fridtjof Nansen	Date :	21.02.2015	
Echosounder	DFNer60-2	Area:	Baia dos Elefantes	
Sphere :	CU-60	TS _{sphere} :	-33.60 dB	
		(adjusted for sound velocity or t	Bottom depth	34 m
Calibration Version 2.1.0.12				
Comments:				
Reference Target:				
TS	-33.60 dB	Min. Distance		20.00 m
TS Deviation	5.0 dB	Max. Distance		25.00 m
Transducer: ES38B Serial No. 38000				
Frequency	38000 Hz	Beamtype		Split
Gain	25.83 dB	Two Way Beam Angle		-20.6 dB
Athw . Angle Sens.	21.90	Along. Angle Sens.		21.90
Athw . Beam Angle	6.66 deg	Along. Beam Angle		6.60 deg
Athw . Offset Angle	0.04 deg	Along. Offset Angl		0.11 deg
SaCorrection	-0.56 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	-50.0 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		1536.0 m/s
Beam Model results:				
Transducer Gain =	25.11 dB	SaCorrection =		-0.60 dB
Athw . Beam Angle =	7.38 deg	Along. Beam Angle =		7.43 deg
Athw . Offset Angle =	0.04 deg	Along. Offset Angle=		0.06 deg
Data deviation from beam model:				
RMS = 0.12 dB				
Max = 0.36 dB No. = 19 Athw . = -0.2 deg Along = -0.2 deg				
Min = -0.41 dB No. = 30 Athw . = 4.7 deg Along = -0.2 deg				
Data deviation from polynomial model:				
RMS = 0.09 dB				
Max = 0.50 dB No. = 19 Athw . = -0.2 deg Along = -0.2 deg				
Min = -0.22 dB No. = 239 Athw . = 4.3 deg Along = -1.0 deg				

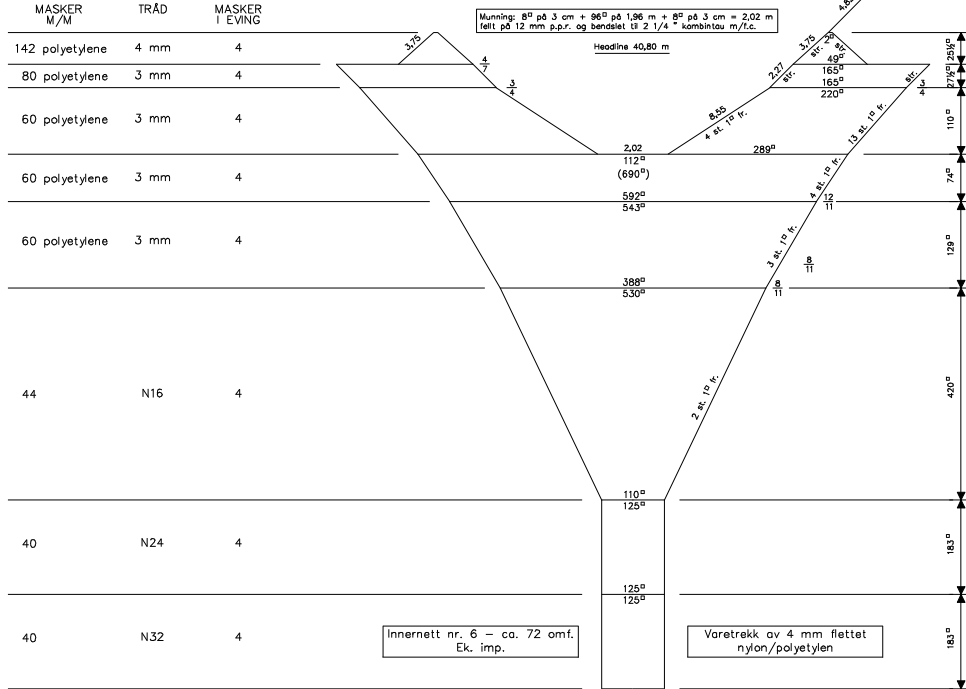
Fishing gear

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

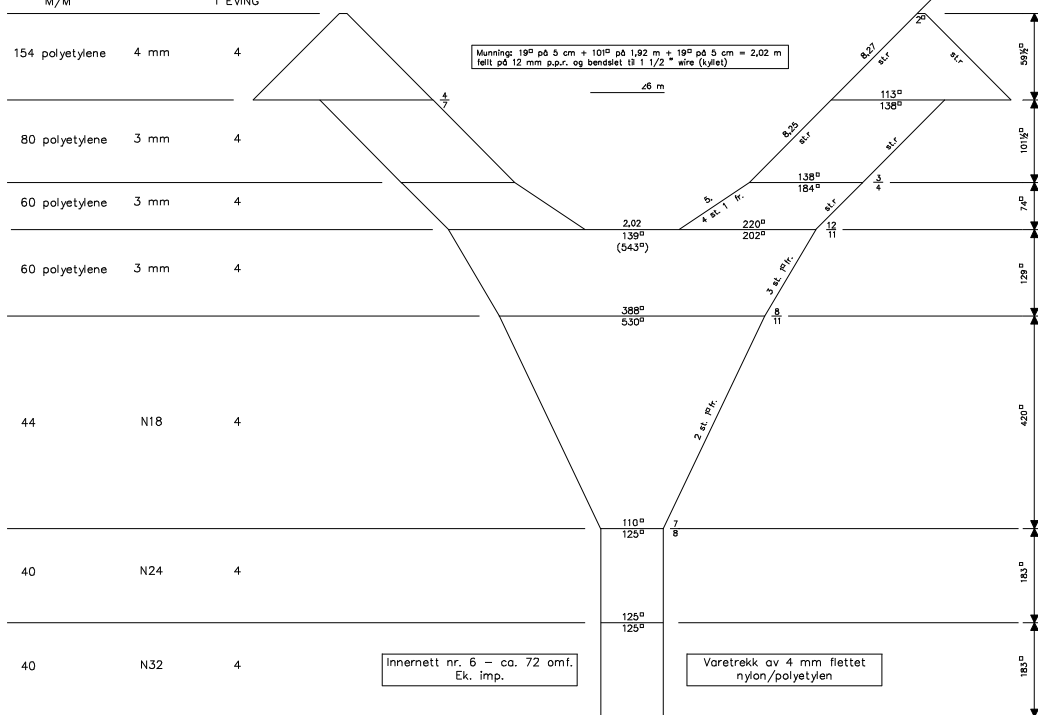
The bottom trawl has a headline of 31 m, footrope 47 m and 20 mm mesh size in the cod end with an inner net of 10 mm mesh size (see drawings below). The estimated opening is 6 m (observed 5.7) and distance between wings during towing about 18 m. The sweeps are 40 m long. The trawl is equipped with a 12" rubber bobbins gear. The doors are of 'Thyborøn' combi type, 7.81 m², 1670 kg, their distance while trawling about 45 - 55 m on average, depending on the depth (least distance at low depths). This distance can be kept constant (about 50 m) at all depths by the use of a 9.5 m strap between the wires at 130 m distance from the doors, normally applied at depths greater than 80 m.

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

REKETRÅL "GISUND SUPER"
OVERDEL



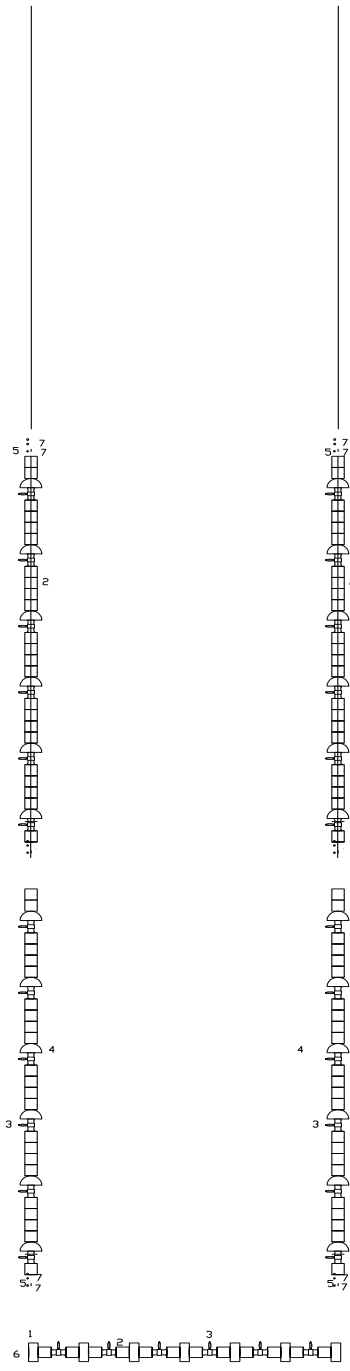
REKETRÅL "GISUND SUPER"



DEKIN L TROH
N AHC MM6
M28

M25
R A E G E D

M25
R A E G E D



ANNEX IV EQUATIONS

Biomass index

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

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

where

L is the number of strata,

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

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

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

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

The total biomass in the area is calculated by

$$B = \bar{y}_{st} \cdot total\ area \quad (2)$$

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

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

where

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

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

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