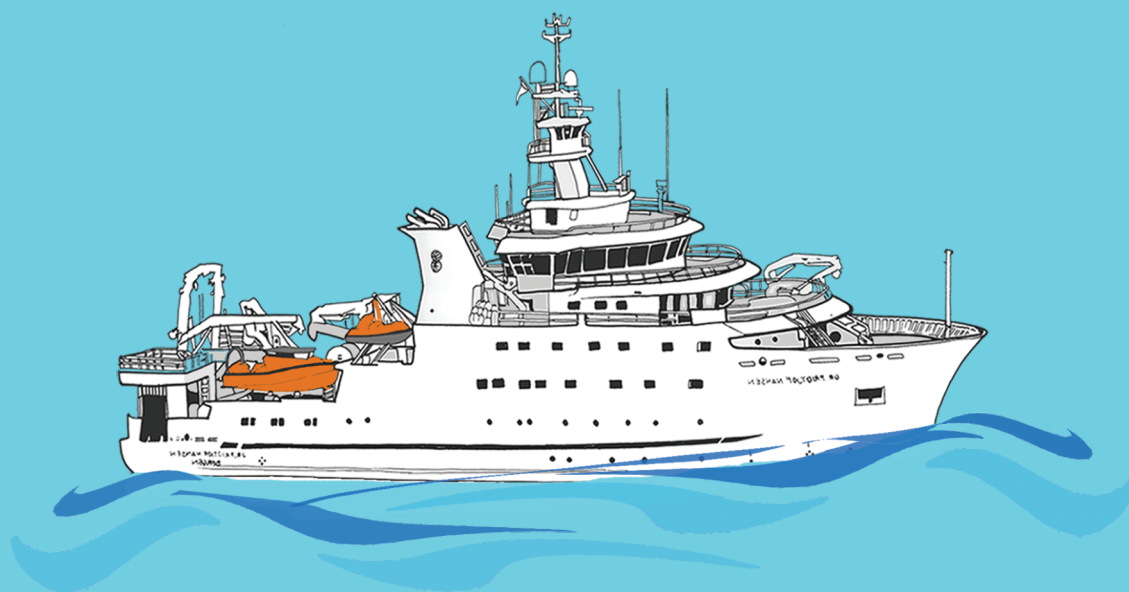


NORAD-FAO PROGRAMME
GCP/GLO/690/NOR

CRUISE REPORTS *DR FRIDTJOF NANSEN*
EAF-Nansen/CR/2018/11



SURVEY OF FISHERY RESOURCES AND ECOSYSTEMS OF THE BAY OF BENGAL

Myanmar

24 August – 29 September 2018



**Department of Fisheries
Ministry of Agriculture,
Livestock and Irrigation, Myanmar
FAO, Italy**

**Institute of Marine Research
Bergen, Norway**

The EAF-Nansen Programme

The EAF-Nansen Programme "Supporting the application of the Ecosystem Approach to Fisheries Management considering climate and pollution impacts" (GCP/GLO/690/NOR) aims to further strengthen the knowledge base and the overall institutional capacity for the implementation of the Ecosystem Approach to Fisheries (EAF) in developing countries, with additional attention to the impact of climate variability and change, pollution and other anthropogenic stressors.

The programme, that started implementation in May 2017, builds on earlier phases, and is governed by an agreement between the Food and Agriculture Organization of the United Nations (FAO), the Institute of Marine Research (IMR), Norway and the Norwegian Agency for Development Cooperation (Norad). The three pillars of the new programme are: Science, Fisheries management, and Capacity development. A new state of the art research vessel, *Dr Fridtjof Nansen* is an integral part of the programme. A science plan, covering 11 research themes, guides the programme scientific work.

The programme works in partnership with countries, regional organizations, other UN agencies as well as other partner projects and institutions.

Le Programme EAF-Nansen

Le Programme EAF-Nansen "Appuyer la mise en œuvre de l'approche écosystémique de la gestion des pêches en tenant compte des impacts du climat et de la pollution" (GCP/GLO/690/NOR), vise à renforcer la base de connaissances et la capacité institutionnelle pour la mise en œuvre de l'approche écosystémique des pêches (AEP) dans les pays en développement, en accordant une attention particulière aux effets de la variabilité et du changement climatique, de la pollution et d'autres facteurs de stress anthropiques.

Le programme, qui a débuté en mai 2017, s'appuie sur les phases précédentes et est régi par un protocole d'accord entre l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO), l'Institut de recherche marine (IMR) de Norvège et l'Agence norvégienne de Coopération au développement (Norad). Les trois piliers du nouveau programme sont: la science, l'aménagement de la pêche et le développement des capacités. Un navire de recherche à la pointe de la technologie, le nouveau *Dr Fridtjof Nansen*, fait partie intégrante du programme. Un plan scientifique, couvrant 11 thèmes de recherche, guide les travaux scientifiques du programme.

Le programme travaille en partenariat avec les pays, les organisations régionales, d'autres agences des Nations Unies ainsi que d'autres projets et institutions partenaires.

Michalsen, K., Krakstad, J-O., Kvalsund, M., Isari, S., Ensrud, T., Sundby, S., Lødemel, H., Htun Thein, Psomadakis, P.N. 2018. Survey of fishery resources and ecosystems of the Bay of Bengal, Myanmar, 24 August – 29 September 2018. NORAD-FAO PROGRAMME GCP/GLO/690/NOR, CRUISE REPORTS DR FRIDTJOF NANSEN, EAF-Nansen/CR/2018/11

CRUISE REPORTS *DR FRIDTJOF NANSEN*

**SURVEY OF FISHERY RESOURCES AND ECOSYSTEMS OF THE
BAY OF BENGAL**

Myanmar

24 August – 29 September 2018

by

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EXECUTIVE SUMMARY

This survey was part of a regional coverage of the Bay of Bengal planned in connection with a regional meeting held in Colombo (Sri Lanka) in August 2017. While the survey had an overall ecosystem coverage, it also tried to address specific national priorities. This survey is the third with the R/V *Dr Fridtjof Nansen* in recent years in Myanmar waters.

When compared to earlier surveys, the overall fish biomass was generally low, at the level of the 2013 survey and with differences in the distribution pattern possibly due to seasonal environmental fluctuations.

Overall, the hydrographic conditions indicated strong stratification of water masses. The outflow of major rivers affects upper water layers contributing to stratification. This condition is not favourable to productivity. On the other hand, the inputs of nutrients from the rivers enhance productivity locally.

Hypoxic watermasses are common on the shelf edge at intermediate depths. On the Rakhine coast water masses are anoxic (<0.1 ml/l) between 100 – 400 m.

Abundance of pelagic and demersal fish are reported for depths between 20- 500 m.

The total estimate of pelagic fish is 165 000 tonnes, at similar levels of 2015 (193 000 tonnes) and 2013 (109 000 tonnes). Overall results are comparable to 2013 and 2015, with some differences in the distribution interpreted as a seasonal effect.

The total swept-area biomass estimate was 274 000 tonnes, again at similar levels as in 2013 (273 000 tonnes) and somewhat lower than in 2015 (367 000 tonnes).

The ecosystem in general still shows strong signs of overfishing as also indicated by a general lack of long-lived species and considerably lower biomass estimates compared with the findings from the four surveys in 1979 and 1980 (Strømme *et al* 1981).

The three main coastal zones of Myanmar (namely the Rakhine Coast, the Ayeyarwady Delta and Tanintharyi Coast) are very different in their ecology, and have a high level of diversity compared to other tropical regions surveyed with the R/V *Dr Fridtjof Nansen*. Follow up work on specimens collected has resulted in the identification of a relatively high number of new species. A total of 1016 taxa were recorded during the survey. Bony fishes were by far the most represented taxonomic group with 745 species/taxa. Overall, the species richness is highest in the Tanintharyi coast, while if looking at the depth strata separately, the most species rich area was the 100 -200 m depth stratum in the Ayeyarwady Delta area.

Low abundance of fish eggs was found during the cruise, particularly in the southern Rakhine region, which did not make possible to fully address one of the main objectives of this survey related to the identification of critical habitats.

CHAPTER 1 INTRODUCTION

This survey was planned as part of a synoptic coverage of the Bay of Bengal marine resources and ecosystems to be conducted by the R/V *Dr Fridtjof Nansen* in 2018 as part of the EAF-Nansen Programme (2017-2021). In connection with this phase of the Programme, a Science Plan has been developed that addresses 11 different topics within three main lines of research related to resources, impacts of oil/mining activities and pollution on resources and ecosystems and climate change. Therefore, in addition to providing key information on the abundance and distribution of main pelagic stocks, the survey programme was designed to also support the research projects under the EAF-Nansen science plan. Within this framework, the survey scope and objectives for the Bay of Bengal were discussed and agreed to during a regional meeting held in Colombo (Sri Lanka) in August 2017. A post-survey meeting was held in Yangon on 19-21 February 2019 and the survey report addresses comments and suggestions provided in that connection.

This report is intended to document the scientific scope of the survey, the sampling methods used and to provide preliminary results. A broader set of results are expected as part of the activities under the EAF-Nansen Science Plan and will be published separately.

The Union of Myanmar has 2832 km of coastline and possesses rich marine fisheries resources. The fisheries sector is deemed to be particularly important for livelihoods, as it is the second largest contributor to employment opportunities and income in the primary sector after agriculture, providing direct employment to an estimated 3 million people. The marine waters in Myanmar also display very high biodiversity. Myanmar plans to set up strategies and priority action plans for the sustainable use, and equitable sharing of benefits deriving from natural resources and biodiversity.

Studies on marine wildlife including population size, distribution, migratory patterns, threats and conservation status in marine waters of Myanmar are rather limited. The R/V *Dr Fridtjof Nansen* carried out two surveys in the period 1979-1980 (Strømme et al. 1981). In December 2013, a third survey was carried out in Myanmar by the second "*Dr Fridtjof Nansen*". The results indicated among others that fish biomass had declined substantially, and species composition dramatically changed since the surveys in 1979 and 1980. Consequently, the fourth survey (May 2015) came about after a request from the former 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. The present represents the fifth survey (August-September 2018), carried out by the third R/V *Dr Fridtjof Nansen*. This survey was also motivated by the need for checking whether early signs of improvement could be seen following the management measures put in place in later years. Identification of critical habitats as spawning and nursery areas of important commercial species was an additional important objective together with capacity development in marine research of young scientists.

1.1 The survey area

Myanmar continental shelf covers approximately 230,000 km² and is wider in the central and southern parts than in the northern Rakhine region. 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, the Ayeyarwady Delta and Tanintharyi Coast. Parts of the coast are heavily influenced by fresh water from the many rivers that flow to the coast. These rivers influence the water mass structure, especially in the shallow central delta area with strong stratification in the upper water layers. The shallow delta area, and the shallow region in the southern part of the Andaman Sea near the Malacca Strait is also influenced by strong tidal forcing (Rizal *et al.* 2012). A second vertical gradient is found between 50 and 100 m depth in the entire coastal region of Myanmar. Below approximately 100 m depth water masses are dominated by the massive oxygen minimum zone (OMZ) of the northern Indian Ocean. The OMZ is extending to more than 700 m depth in this part of the Indian Ocean. The OMZ is strongly structuring vertical distribution of marine life.

1.2 Aims and objectives

The area surveyed in 2018 by the R/V *Dr Fridtjof Nansen* included the continental shelf and upper slope of East Africa (continental) (Leg 1), the Mascarene Bank (Leg 2) and parts of the Bay of Bengal region (Leg 3). Transfer of the vessel between the different legs were used as an opportunity to carry out studies of specific oceanographic features and mesopelagic communities. Although standard sampling was carried out throughout, the survey objectives were somewhat different for the different legs. Sampling protocols are standardized to the extent possible to allow comparability across larger geographic scales. Figure 1 provides an overview of the surveys undertaken as part of Leg 3.

Leg 3 started in Colombo (Sri Lanka) on 21 June 2018 and covered the continental shelf and upper slope of Sri Lanka until 17 June. After completion of the survey off Sri Lanka the vessel moved northwards to complete oceanographic sampling in the international waters of the Bay of Bengal. In Bangladesh, the main emphasis was on pelagic resources while in Myanmar the focus was on spawning areas and distribution of eggs and larvae. Off Thailand the priority was to investigate the deep waters of the Andaman Sea.

Leg 3 has a broad ecosystem approach and aims at gaining understanding of ecosystem status in general and of specific ecosystem components and attributes. Sampling was undertaken in relation to hydrographic conditions (physical and chemical), plankton, egg and larvae, jellyfish, demersal, pelagic and mesopelagic resources, and bottom sediment. Opportunistic sampling for pollution (microplastics and food safety) was undertaken throughout the survey. In addition to providing data for ecosystem monitoring, specific priorities are addressed in the different countries based on suggestions provided at a meeting with representatives from the involved countries, in Colombo in 2017.

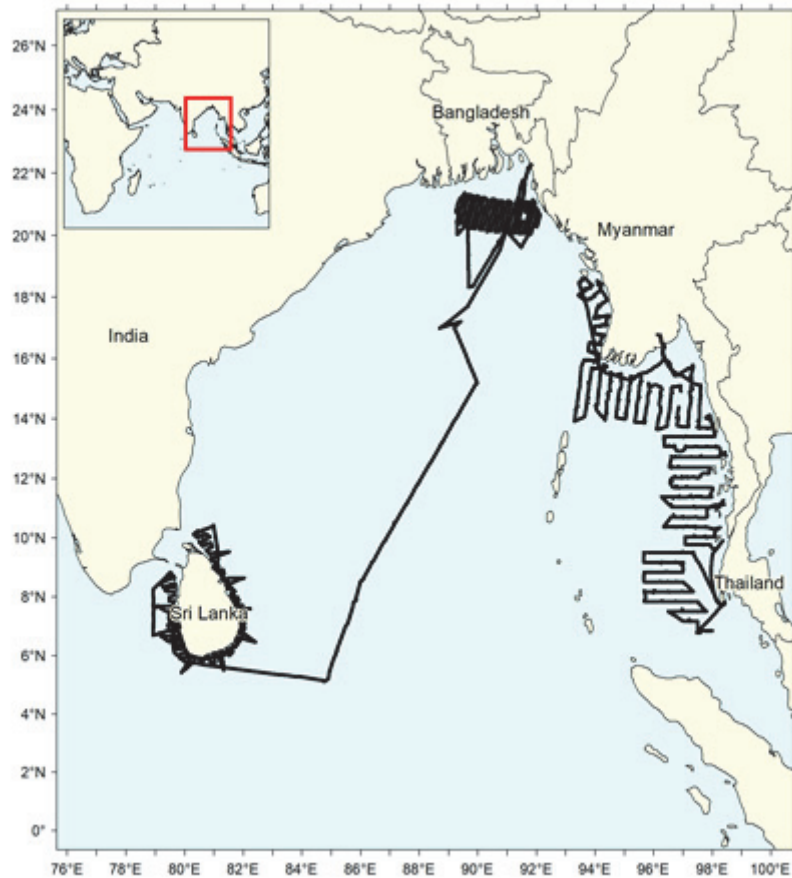


Figure 1. Survey programme for the R/V *Dr Fridtjof Nansen* in the Indian Ocean, Leg 3, 2018.

The detailed planning of the *R/V Dr Fridtjof Nansen* survey in Myanmar (leg 3.4) was conducted in meetings between representatives from the EAF-Nansen Programme, DoF and the University of Yangon, Myeik, Patheingyi and Mawlamyethar at a presurvey meeting in Yangon on the 24 and 25 May 2018. The design of the survey was similar to the course track and sampling stations of the 2013 and 2015 ecosystem survey to make the three surveys as comparable as possible. Based on the sampling priorities and discussions the main objectives of the survey in Myanmar were set as follows:

Hydrography:

- To map the hydrographic/environmental conditions in the survey area (temperature, salinity, oxygen, chlorophyll, nutrients and pH values-acidity). Obtain information on the oxygen concentrations and ocean acidification state and calcium carbonate saturation horizon, relevant for calcifying organisms.

Phytoplankton, zooplankton, ichthyoplankton and jellyfish:

- To establish as far as possible, the distribution, abundance and composition of phyto- and zooplankton, and species composition of fish eggs and larvae (data to be used, in part, to understand acoustic backscatter from zooplankton that

can be used to refine TS for fish and jellyfish targets)

- Where possible conduct experiments on newly hatched larvae to describe developmental stages and improve their identification and to identify egg and larvae optimal environmental windows.
- To collect samples of jellyfish for a) morphological identification and taxonomic studies, b) genetic studies for the purposes of confirming identity, determining population structure and establishing regional and global connectivity, c) histological examination of reproductive maturity to determine reproductive synchronicity and semelparity within populations and individuals, and d) stable isotope analysis to determine trophic position and role.

Pelagic and demersal resources:

- To obtain information on abundance, distribution (also by size) using acoustic and swept area methods, with a systematic grid survey strategy
- To collect biological samples of priority species
- To collect samples for levels of environmental contaminants, nutrients, parasites and microorganisms with regards to food safety and pollution.
- To collect information on the stage of maturity as support to identification of spawning time and spawning areas.

Microplastics and marine debris:

- Record occurrence of marine debris (surface)
- Map occurrence of microplastics in surface waters and describe associated neustonic communities

1.3 Narrative and survey effort

The vessel left Yangon on 24 August at 08:00 local time (local time = UTC+6.5 hours), but had to wait until 12:00 local time before she could sail down the river and sail to the northern part of the survey area to the start position at 18°29' N and 93°25'E (outside Munaung Island), 120 NM southeast of the start of the 2015 survey. This position was reached just after midnight on 26 August. The coverage of the Rakhine region was completed on 31 August at 01:00. The coverage of the next region, the Ayeyarwady Delta coastal zone (Gulf of Mottama) started immediately and continued until the vessel had to call for a shift of scientific personnel on 10 September. The vessel returned to the survey area on 15 September and continued with the last transect in the delta region. The coverage of the Tanintharyi coast commenced on 16 September and was completed on 28th September at 14:00. The vessel then sailed to the drop of point off the city Kaw Thoug where most of the Myanmar crew left the boat. The vessel then steamed to Phuket for crew change and offloading of the Norwegian scientists. A total of 30 scientists and technicians from Myanmar, Thailand, India and Norway participated in each of the two parts of the survey. The full list of the participants and their affiliations is given in Annex I and Annex II, respectively.

The survey followed the same design as in 2013 and 2015, however with higher station density and with additional sampling in selected inshore and shallow-water areas. 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 shallow water stations were carried out during daytime to reduce the effect of diel migration on the estimate but because of time constraints this was not always practically possible. Additional egg and ichthyoplankton sampling was conducted in pre-selected shallow areas assumed to be potential spawning grounds. Three stations, set out in a triangle, were sampled using CTD, WP2 and the Manta trawl. 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, 75 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.

For acoustic and swept-area abundance estimation, the coast was divided into three regions. The first region (the southern Rakhine coastal zone) included the area south of Munaung Island to Mawtin Point. Region two, the Ayeyarwady Delta, covered the central Myanmar region, while region three, the Tanintharyi coast, covered the area from Htarwe to the border with Thailand. Table 1 summarises the survey effort in each of the regions. The cruise tracks with bottom-trawls and pelagic trawl stations are illustrated in Figure 2, while the hydrographic stations and the position of the environmental transects are displayed in Figure 3.

Table 1. 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 region.

Region	Nautical miles	Bottom trawls valid per depth region						Pelagic trawls	CTD	Plankton*	Sediment
		Total	>20	>50	>100	>200	>500				
Rakhine coast	950	31	9	9	9	4	0	3	51	12	30
Ayeyarwady Delta	2003	50	13	21	12	3	1	10	94	26	50
Tanintharyi coast	1794	59	8	21	11	16	3	2	76	18	58
Total	4747	140	30	51	32	23	4	15	221	56	138

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

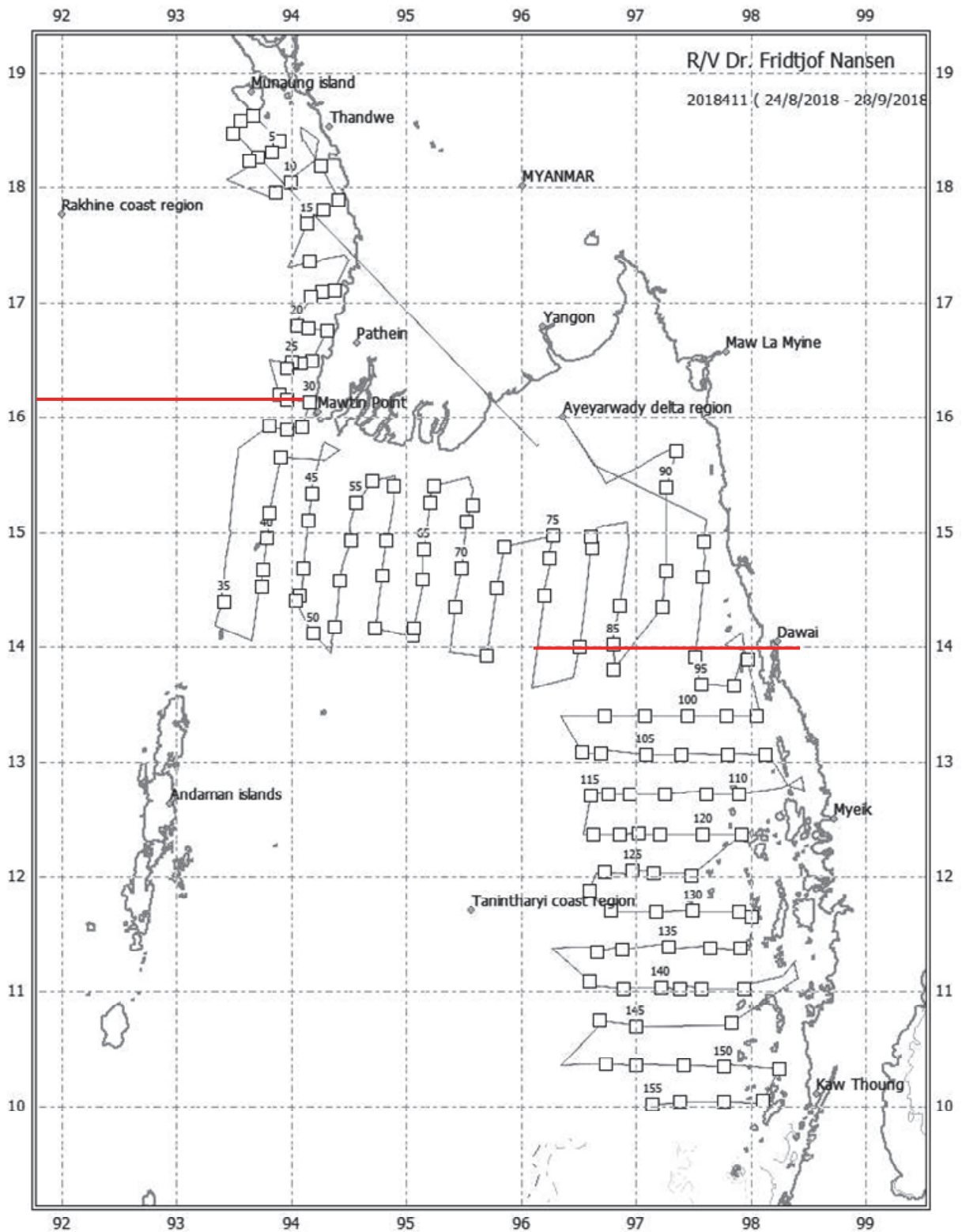


Figure 2. Course track with bottom (\square) and pelagic (Δ) trawl stations. The 50 m, 100 m and 500 m depth contour are indicated. The red lines indicate the separation between the three main regions.

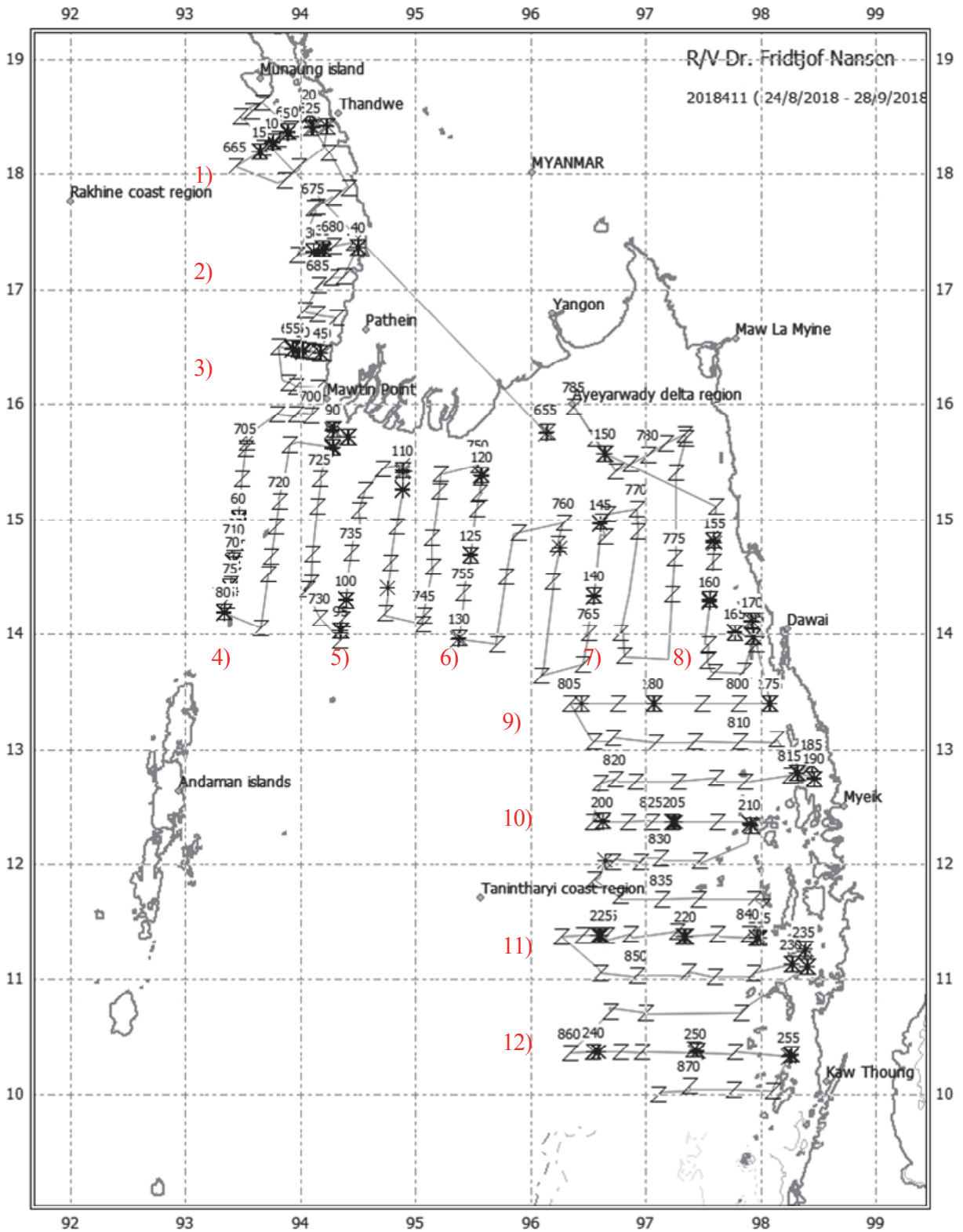


Figure 3. Course track with hydrographic (Z) stations. The 50 m, 100 m and 500 m depth contour are indicated. The numbers 1-12 indicate the sequence of environmental transects.

CHAPTER 2 METHODS

2.1 Hydrographic continuous sampling

2.1.1 Meteorological observations

Meteorological data were logged continuously from the AANDERAA Smartguard meteorological station and included wind direction and speed, air pressure, relative humidity, air temperature and solar radiation. All data were logged to the Nansis tracklog system and averaged every 60 sec.

2.1.2 Thermosalinograph

The SBE 21 Seacat thermosalinograph ran continuously during the survey, obtaining samples of sea surface (at 4 m depth) recording salinity and relative temperature every 10 seconds. An attached in-line C3 Turner Design Submersible Fluorometer measured turbidity and chlorophyll-*a* levels.

2.1.3 Current speed and direction measurements (ADCP)

Two hull-mounted Acoustic Doppler Current Profiler (VMADCP) from RD Instruments ran during the survey. The frequency of the VMADCP are 75 and 150 kHz. The system was run in narrow band mode and data were averaged in 16 and 4 m vertical bins at 75 and 150 kHz respectively and stored on files for post survey processing.

2.2 Environmental transect sampling

A series of environmental transects including biological and hydrographic sampling were undertaken every third acoustic transect, i.e. 60 NM apart (“environmental transects”). Samples were taken at the inshore end of the transects, usually at a water depth of between 25 and 30 m, usually at the 100 m isobath and at the outer end of the transects, i.e. at 500 m bottom depth. These stations were referred to as “super-stations”. Additional CTD stations were added at 75 m and 200 m depth and at 20 and 50 m depths whenever the distance between stations exceeded 5NM. The samples collected on these transects are shown in Figure 4.

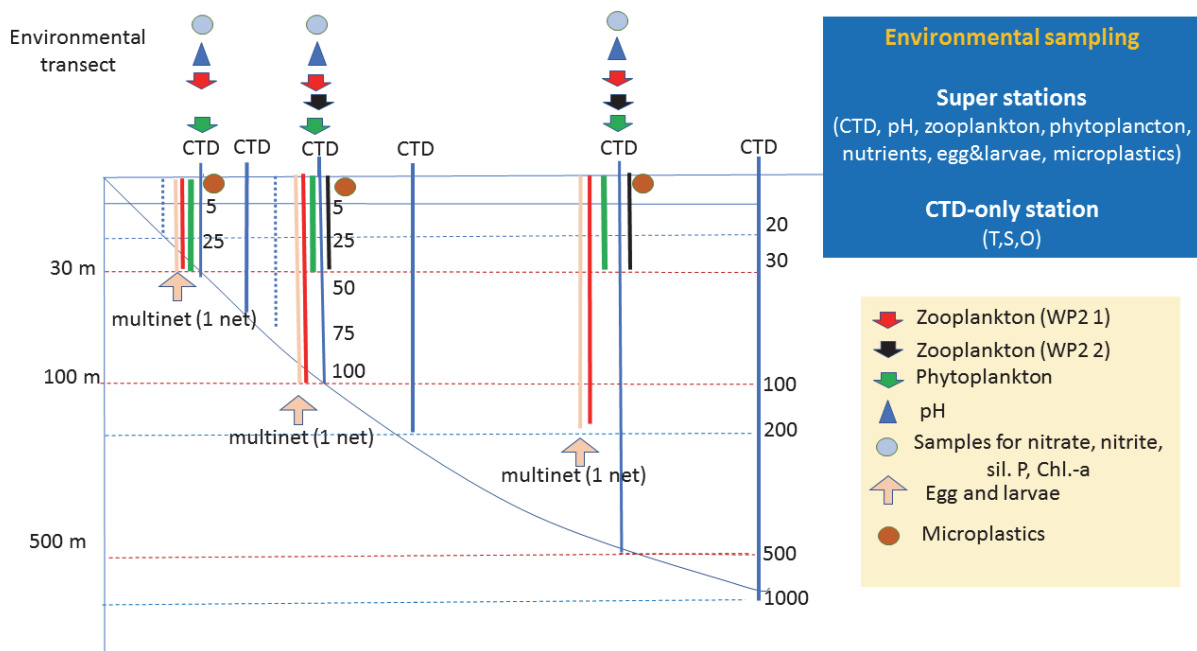


Figure 4. Sampling diagram showing the depth and the equipment used at the super stations transects (environmental transects), from the inshore (left side) towards the deep 500 m stations (right side).

2.2.1 CTD sensors – temperature, salinity, oxygen and fluorescence

Vertical temperature and salinity profiles were obtained by a Seabird 911 CTD containing an SBE 3plus temperature sensor, SBE 4C conductivity sensor and a Digiquartz® pressure sensor. In addition, *in situ* concentrations of dissolved oxygen were measured using a CTD-mounted SBE 43 oxygen sensor. Real time logging and plotting was performed using the Seabird Seasave software. Attached to the CTD was also an uncalibrated Chelsea Mk III Aquatracka fluorometer, which measures *in situ* fluorescence on a relative scale and a Photosynthetic Active radiation (PAR) sensor, measuring downwelling irradiance (in micromole photons m⁻²).

The salinity calculated from the CTD conductivity sensor was validated using a Portasal Salinometer 8410A from OSIL on board the vessel. The average offset between measured salinity and sensor data was $+0.02 \pm 0.002$ (18 samples). This comparison was made between the sensor data from the bottle files. These data are produced from salinity sensor number 1. A comparison between salinity sensor 1 and 2 showed that sensor 1 was approximately +0,02 higher than sensor 2. This sums up that salinity sensor 2 is the most accurate of the two sensors. The oxygen sensor was validated via Winkler titration (Grasshoff *et al.* 1983) also performed on the vessel. The average offset between measured oxygen and sensor data was $0,1 \pm 0.08$ (76 samples).

2.2.2 Sampling depth

The Nansen is equipped with a CTD rosette holding up to 12 ten-litre Niskin bottles and one CTD rosette holding up to 24 ten-litre Niskin bottles. The 12-bottle rosette was used during this cruise. The standard sampling depths varied between the two surveys: in the first part of the survey standard sampling depths were 5, 10, 20, 30, 50, 75, 100, 150, 200, 300, 400 and 500m. In the second survey water samples were also taken on CTD station at 1000 m depth and at one occasion at 2000m depth. The standard sampling depths were 5, 25, 50, 75, 100, 150, 200, 300, 400, 500, 750, 1000, 1500 and 200m, keeping one sample bottle free for sampling at the depth of fluorescence maximum. The water samples were used to determine chlorophyll *a*, pH, alkalinity, salinity, oxygen and for nutrient analyses (nitrate, nitrite, silicate and phosphate) as described below.

2.2.3 Ocean acidification parameters (pH and alkalinity)

Seawater samples (250 ml) from the CTD-mounted Niskin-bottles were collected in borosilicate glass bottles using silicone tubing to reduce air exchange. Both pH and alkalinity were analysed on board the vessel. pH was determined spectrophotometrically using a diode array spectrophotometer and a pH sensitive indicator, m-cresol purple in 2 mM solution, as described by Clayton and Byrne, 1993; Chierici *et al.*, 1999. Alkalinity was measured by titration with acid (0.05M HCl) and changes in pH were measured with an electrode (potential in mV) using tiamo software. Both pH and alkalinity were measured in triplicates. Further processing of the data will be done on land at IMR and will provide more information on the marine carbonate system and parameters for ocean acidification.

2.2.4 Nutrient samples

Seawater samples (20 ml) for nutrient analyses (nitrate, silicate and phosphate) were collected from the Niskin water bottles. The samples were stored in 20 ml polyethylene vials, and conserved either with 0.2 ml chloroform, and kept cool and dark in a refrigerator or frozen due to lack of Chloroform. The analyses will be made on shore by IMR, using a modified Alpkem Autoanalyzer C (O I Analytical, USA) and following standard procedures (Grasshoff, 1965). Storage may introduce loss of accuracy of the results, especially when the concentrations of nitrate, silicate and phosphate are low, such as in surface samples from the productive season. Samples from deep water are more stable, because most of the nutrients in the deep occur in their inorganic form.

2.3 Phytoplankton sampling

Chlorophyll-*a* (an indicator of phytoplankton biomass) was sampled routinely. Water samples (typically 265ml) from selected depths were filtered using a 0.7µm filtration system (Munktell glass-fibre filters Grade: MGF, vacuum 200 mm Hg) and stored at 20°C until analysis onboard. The assay was performed by extraction with 90% acetone followed by centrifugation, and the measurements using a fluorometer (model 10 AU, Turner Designs Inc., Sunnyvale, Ca., USA), according to Welshmeyer (1994) and Jeffrey and Humphrey (1975).

Qualitative phytoplankton samples were collected at super-stations as described above. At each super-station, qualitative phytoplankton samples were collected with a net (35 cm in diameter and mesh-size of 10 μm (Figure), hauled vertically at a speed of 0.1 ms^{-1} from the depth of 30 m to the surface (from ca. 5 m above bottom at the 30 m stations). These samples are not quantitative but used to establish the taxonomic composition of the phytoplankton community.

2.4 Mesozooplankton sampling

Mesozooplankton was collected with a WP2-net along the super-station hydrographic transects at stations positioned at bottom-depths of approximately 30 m, 100 m and 500 m. The WP2-net (56 cm diameter, mesh size 180 μm , (Figure 5), (Fraser 1966, Anonymous 1968) was hauled vertically at a speed of $\sim 0.5 \text{ ms}^{-1}$ at each station. At the shallowest and intermediately deep stations (bottom-depths of 30 m and 100 m, respectively) the sampling strata were from near-bottom to the surface (deepest sampling depths of ~ 25 and 90 m, respectively). At the stations with bottom-depth of ~ 500 m or greater, the sampling stratum was from the depth of 200 m to the surface.

Furthermore, a second sample with the WP2 net was collected from the upper 30 m at the stations with bottom depths of 100 m and 500 m. The purpose of these additional samples was to enable a direct comparison of the zooplankton composition and concentrations in the uppermost layer of the water-column along the bottom-depth gradient. Each zooplankton sample was divided into two equal parts using a Motoda plankton splitter (Motoda 1959). The first part of the sample was size-fractionated by using a series of sieves with the decreasing mesh-sizes of 2000 μm , 1000 μm and 180 μm , and the zooplankton retained on each sieve were dried on aluminium trays at $\sim 60 \text{ }^\circ\text{C}$ for 24 h. These samples will be dried once more and weighed on shore after the cruise at IMR for estimation of biomasses for the different size-groups. The second part of the sample was preserved in seawater with a final solution of 4% formaldehyde buffered with borax for subsequent species identification and quantification, also at IMR.

2.5 Ichthyoplankton sampling

Ichthyoplankton sampling (fish eggs and larvae) was conducted at the super-stations using Hydrobios Midi Multinet (0.25 m^2 mouth area), fitted with one net of 405 μm mesh size (Figure 5). The net was towed obliquely from the bottom (ca. 5 m above the bottom) or a maximum depth of 200 m to the surface with a towing speed of 1.5 m/sec. After the haul, the sample was divided in two parts by use of a Motoda plankton splitter (Motoda 1959). One half of the sample was sieved on a 180 μm mesh, transferred in a 100 mL bottle and preserved immediately in 96% ethanol for processing when on land. The other half was examined under the microscope on board. All fish larvae were sorted and placed in cool filtered sea water. Plankton examination was done thoroughly and in small amounts; during this process the rest of the sample was kept cool (using ice packs, fridge etc). When sorting was finished, the plankton sample was preserved in 4% borax buffered formaldehyde in labelled 100 mL bottles. The sorted larvae were distinguished in taxa/morphotypes and

counted. Representative photos were taken under the microscope for each morphotype before the larvae were preserved in 96% ethanol in Eppendorf vials. The sample was also scanned for eggs. Distinct morphotypes of eggs were distinguished and attempts were made to follow the embryonic development. During this process photos were taken under the microscope. Samples collected by the Manta trawl (see section 2.6) were also examined for isolating fish eggs and larvae distributed in the surface layer of the water column. The process followed was the same as in the Multinet samples.

2.5.1 Ichthyoplankton sampling in putative spawning grounds (“triangles”)

Apart from the superstations, ichthyoplankton sampling was conducted in two shallow (ca. 20 m depth) putative spawning grounds “triangles”, one in Rakhine area and another in the Ayeyarwady Delta. Three stations were selected at the edges of each “triangle” for CTD profiles and vertical WP2 tows. Three Manta trawls covered the sides of each area. Samples from WP2 and Manta trawls were examined on board for fish eggs and larvae, as described above.

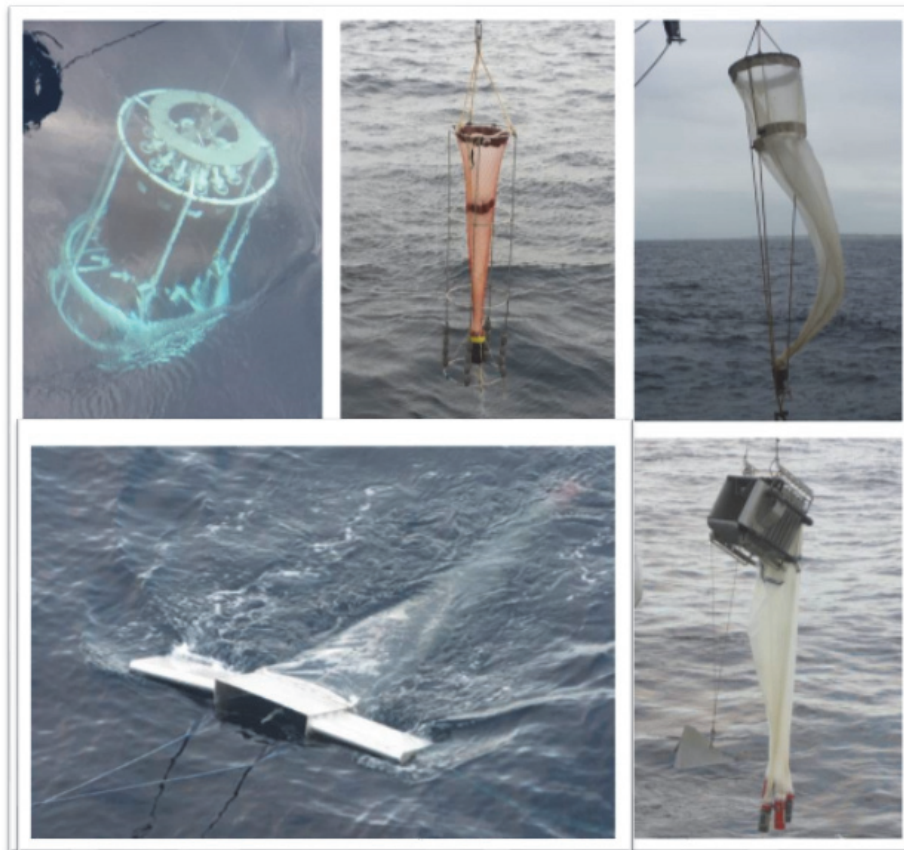


Figure 5. Plankton sampling equipment. Top: CTD with Niskin bottles used to collect water for microzooplankton analysis, Phytoplankton net, WP2 net. Bottom: Manta trawl, Multinet rigged for oblique tow. Image credits: Jenny Huggett.

2.6 Microplastics and marine debris

Microplastics are small pieces of plastic marine debris normally less than 5 mm long. Microplastics were collected along the hydrographic transects at all super-stations. At each station, the surface layer was sampled with a Manta-trawl, with a rectangular opening of 19 cm × 61 cm (HxW), mesh-size 335 µm and two wings to keep it balanced and at the surface during the tow. Trawls were hauled horizontally at a speed of ~1.5 ms⁻¹ for 15 minutes. The counts of a manual flowmeter attached in the lower part of the trawl opening were recorded at the start and end of each trawl. Trawling was performed some meters away from of the starboard side, about mid-ship, attempting to avoid the wake of the vessel.

Once the Manta-trawl was back on the ship, the samples were washed in filtered seawater over a sieve with a mesh-size 180 µm. Microplastic particles were sorted from the sample under a stereomicroscope, and the sorted sample was then checked once more to reduce the risk of overlooking the smallest plastic particles. All assumed plastic items were then placed on a gridded petri dish for examination under the stereomicroscope, photographed and, to the extent possible, also measured and described (e.g. length, shape, type and colour). The sorted microplastics were washed with distilled water and dried in pre-weighed aluminium-trays in a drying cabinet at 30 °C. The trays were packed in aluminium foil and stored in room-temperature until transport to the laboratory of IMR, where they will be studied in more detail. After removing the plastics, the remaining part of the samples - mainly biological material - was preserved in formalin for studies of neuston at IMR after the cruise.

2.7 Sediment sampling

Sediment from bottom trawls: stainless steel cylinders were 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 on deck and preserved for further analyses of biological, sedimentological and chemical composition. In addition, 6 box corer stations were conducted at the two eastern environmental transects in the Ayeyarwady Delta area (at 30, 60 and 100 m depths). These samples will be used in studies of the sedimentation process.

2.8 Food safety sampling

Whole fish, fillet and different organs from various fish that are regularly consumed in the four countries were sampled during this survey and preserved. All the samples will be analysed for a wide variety of nutrients and contaminants at IMR, Bergen, as listed below. Tissue samples from mackerel samples will also be analysed for the parasite *Kudoa*.

Some of the samples will also be analysed for correspondence between the microbiota and the metal content of the gut. One pelagic fish sample and two mesopelagic fish samples will be analysed for the content of microplastic particles.

2.9 Biological trawl sampling

2.9.1 Fish sampling and preservation

Demersal trawl hauls were taken randomly within each of the depth strata between 20-50 m, 50-100 m, 100-200 m and between 200-500 m depth. Extra trawl stations were conducted whenever the distance between trawl stations exceeded 20 nm. Demersal trawls were used for swept-area biomass estimation, while pelagic hauls were taken for target identifications of acoustic signals and randomly throughout the survey at night. ANNEX describes the acoustic instrumentation and the fishing gear used during the survey.

When on deck, the catch was sorted, and subsamples taken to measure number and weight by species. At all trawl hauls, length measurements were taken for all prioritized fish species (Annex IV) with an Electronic Fish Meter (SCANTROL) connected to a customized data acquisition system (Nansis) running on a Windows PC. The total length of each fish was recorded to the nearest 1 cm below (rounding down to nearest cm). In addition, various biological samples were collected for selected commercial species in the three main regions in Myanmar (according to species listed in Table 2). Thirty individuals of each of these fish species were frozen for later examination of stomach content, sex, maturity, and age. A schematic presentation of the sampling procedure is given in Annex V. To identify potential spawning areas, maturity stage (Annex VI) was checked for all individuals. If mature individuals occurred a subsample of 30 were collected for further collection of female gonads. Dorsal fin clips of selected species in selected areas were also collected. 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 VII. Pooled length frequency distributions raised to catch per hour of selected species by region are shown in Annex VIII.

2.9.2 Jellyfish collection and preservation

Jellyfish were collected and subsequently weighed. When the total catch was considered too big, the entire catch (fish, jellyfish, etc.) was sub-sampled. Hereafter, all jellyfish specimens caught, or representative random samples thereof, if too numerous, were identified to the lowest possible taxon.

Jellyfish specimens that were in a good condition was photographed (top and bottom sections). Hereafter, a small piece of the oral arm tissue was removed and preserved in 96% ethanol (EtOH) and stored at -20°C. After 24 hours, the 96% EtOH was drained from each sample and then replaced with new 96% EtOH, the sample was then stored at -20°C until analyses. Tissue samples stored in EtOH were collected for genetic studies, aimed at determining the population structure, determining the species and establish regional and global connectivity.

The rest of the specimen was preserved in 10% formalin and placed in a cooler on board for long-term storage. These samples formed part of a greater morphological identification and taxonomic study. In addition to this, jellyfish specimens of a variety of sizes that were in good condition were rinsed with freshwater, and individually oven dried at 40°C and then frozen at -20°C for stable isotope and fatty acid analyses. These specimens were collected to

determine the trophic position and ecological role of jellyfish within their ecosystem. All specimens were accompanied by a wet label with identifiable details (station, specimen id, date, species, etc).

Due to limited space and storage material, five – ten of the best representatives of *Rhizostoma* and *Chrysaora* species (species of interest) caught in each trawl were stored as explained above. When species that were not of interest were caught, samples were treated as explained above, but this was only carried out if the species got caught for the first time. This specimen then served as a type specimen. Hereafter, only presence was noted.

2.10 Acoustic sampling

2.10.1 Sonar data

A Simrad SH90 Sonar recorded data continuously during the survey for post processing after the survey. The sonar was set to a frequency of 26 kHz, in FM Normal mode. The sonar was operated using bow up/180 deg. operation mode with the bearing of the vertical beams 90 deg., perpendicular to the vessel direction with a range of 450 m and with the horizontal beams set to 450 m with a tilt angle of 3 deg. The filters built into the sonar software to improve the school representation (i.e. AGC, RCG and ping to ping) were set to default values except for the Noise filter, which was turned off.

The settings including range and tilt was kept the same during all the surveying except during trawling operations where the sonar was at times used actively to focus in on targets.

No other sonars were used during the survey.

2.10.2 Echo sounder

Acoustic data were recorded using a Simrad EK80 Scientific Split Beam Echo Sounder equipped with keel-mounted transducers at nominal operating frequencies of 18, 38, 70, 120, 200 and 333 kHz. The last calibration was conducted outside Walvis Bay at the last part of the previous survey, although the sounders were calibrated in Bergen on the 23rd January 2017. ANNEX III gives the details of the acoustic settings used during the survey.

2.10.3 Allocation of acoustic energy to species group

Acoustic data were logged and post-processed on board using the latest acoustic data post-processing software, the Large-Scale Survey System (LSSS) Version 2.0.

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 based on established echogram features. Ground truthing and estimation of mean length and weight were accomplished by means of targeted pelagic and demersal trawling. The target groups used during the survey can be found in Table 2. Ground truthing and estimation of mean length and weight were accomplished by means of targeted pelagic and demersal trawling. In cases where the integrated echo contained more than one category of fish (see Table 2), the mean s_A -value allocated to each category was in the same ratio as their contribution to the abundance in trawls in that area.

The acoustic backscatter was scrutinized daily and allocated to the various target groups. The s_v threshold used when sardinellas occurred to filter out other species and plankton was -45 dB, or in regions where the plankton layer was extremely dense and even lower threshold had to be used. For Pelagic I, Pelagic II and “other pelagic species” -50 dB was used. To identify mesopelagic layers a threshold of -60 dB was used. To identify jellyfish layers a threshold of -60 dB was used for high concentrations, while -70 dB was used for more dispersed layers. Biomass estimates can only be estimated for those acoustic groups in which length and weight were recorded.

Table 2. Allocation of acoustic densities to species groups. Note only main genera/species are listed.

Group	Taxon	Genera/Species	
Pelagic species 1	Clupeidae	<i>Dussumieria</i> spp. <i>Ilisha</i> spp. <i>Sardinella</i> spp. <i>Anodontostoma chacunda</i>	
	Engraulidae	<i>Coilia</i> spp. <i>Stolephorus</i> spp. <i>Setipinna</i> spp. <i>Thryssa</i> spp.	
Pelagic species 2	Carangidae	<i>Alectis</i> spp. <i>Atule mate</i> <i>Atropus atropos</i> <i>Caranx</i> spp. <i>Carangoides</i> spp. <i>Decapterus</i> spp. <i>Scomberoides</i> spp. <i>Megalaspis cordyla</i> <i>Parastromateus niger</i> <i>Uraspis</i> spp.	
		Scombridae	<i>Rastrelliger</i> spp. <i>Scomberomorus</i> spp.
		Sphyraenidae	<i>Sphyraena</i> spp.
		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	Calanoida		
	Euphausiidae		
	Other plankton		

*The group “Other demersal species” contains all acoustic targets of typical demersal character. No attempt is made to separate these into different families.

2.11 Estimation of biomass

2.11.1 Estimation of pelagic species biomass (acoustic method)

The target strength (TS) function used to convert mean area backscattering coefficient s_A (m^2/NM^2) at 38 kHz to number of fish corresponds to:

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

$$\text{or} \quad CF = \frac{10^{7.2}}{4\pi} \cdot \bar{L}^{-2} \quad (2)$$

$$\text{and on the simplest form} \quad CF = \frac{1.2612 \cdot 10^6}{\bar{L}^2} \quad (3)$$

where CF is the reciprocal back scattering strength (or the so-called conversion factor from acoustic density to fish biomass) and \bar{L}^2 is the mean of squared fish lengths. This target strength function was originally established for North Sea herring but has later been attributed to clupeids in general (Foote *et al.*, 1986; Foote, 1987).

No specific target strength relations presently are available for the species at hand, and equation (3) has therefore been applied consequently for all targeted species in this time series. The biomass was calculated by multiplying the number of fish by the expected length at weight, estimated by regression of the log-length (total) against total weight. Separate length-weight relationships were worked for each region (north, central, south), pooling all data within each region.

The boundaries of encountered fish aggregations (post strata) were determined by means of contouring within the inner and outer zero-value limits of the transect lines. The strata contours were digitised using Nansis Maptool Version 2.1.4. Sub-stratification was used to isolate areas of similar densities, using the following pre-defined, standard categories:

- 1: $0 < s_A < 300$;
- 2: $300 \leq s_A < 1000$;
- 3: $1000 \leq s_A < 3000$;
- 4: $3000 \leq s_A < 10000$;
- 5: $10000 \leq s_A < \infty$ (m^2/NM^2)

The basis for contouring is averages of five 1 NM values along transects. At the end of transects and in connection with trawl stations the averaging may include fewer (from 1 to 4 single NM observations). This is a source of bias, but this bias is limited due to observations within strata having similar values. Other sources of bias of concern are the shallow distribution pattern of some species (above integration limit), vessel avoidance behaviour by

especially clupeoids (Misund and Aglen, 1992) and inshore distribution (at depths <20 meters). All estimates should consequently be considered as relative indices of abundance.

For a stratum representing a distribution of a target group, the following basic data are needed for the estimation of abundance;

- 1) the average s_A -value for the region,
- 2) the surface area (usually square nautical miles, NM^2), and,
- 3) a representative length distribution of the fish in the region.

The combination of low s_A value recorded for PEL1 and PEL2, few individuals caught in the bottom trawl catch and few pelagic trawls made the splitting by length groups unreliable. Therefore, a theoretical mean length of 10 cm was used to convert the s_A values by stratum to number of fish.

2.11.2 Estimation of biomass of demersal fish (Swept-area)

In the bottom trawl survey, stock biomasses were estimated by the swept-area method with catch per haul as the index of abundance (see Strømme 1992). In most hauls the trawling time (with the gear at the bottom) was around 30 min. The area swept by the trawl net within 30 minutes trawl time was 0.015 NM^2 and it corresponds to an average horizontal trawl opening of 18.5 m efficient net width, towing at 3.0 knots. Diagrams of the bottom trawl used are shown in Annex VI. The general formula to estimate biomass B, using this method is:

$$B = \frac{A}{a} \cdot \frac{\bar{X}}{q} \quad (6)$$

A is the total area surveyed, a is the swept area of the net per haul, \bar{X} is the average catch per haul (the index of abundance) and q (trawl catchability) is the proportion of fish in the path of the net that are actually caught. The density of the resource is estimated as biomass per unit area. In a stratified survey of k non-overlapping strata, if the mean catch per haul in stratum i and its variance are denoted by \bar{X}_i and s_i^2 respectively, then an unbiased estimate of the population mean \bar{X} is the stratified mean \bar{X}_{st} , which is given by:

$$\bar{X}_{st} = \frac{1}{N} \sum_{i=1}^k N_i \bar{X}_i = \sum_{i=1}^k W_i \bar{X}_i \quad (7)$$

where $W_i = \frac{N_i}{N} = \frac{A_i}{A}$ is the relative size of the i^{th} stratum (A_i is the area of the i^{th} stratum and A is the total area surveyed). The variance of the stratified mean is given by

$$\text{var}(\bar{X}_{st}) = \sum_{i=1}^k W_i^2 \text{var} \bar{X}_i = \sum_{i=1}^k W_i^2 \frac{s_i^2}{n_i} \quad (8)$$

where n_i is number of hauls in the i^{th} stratum and n is the total number of hauls in the survey. Table 3 shows the areas used in the swept-area method to estimate biomass for the different regions. A stratified semi-random design was used with depth and area as stratification factors. Estimated total biomass by species/group was obtained by summing estimates for each depth stratum.

Table 3. Calculated areas in NM^2 of the different depth strata regions covered by the survey, and the percentage of each depth strata to the total for each region. The region between 0-20 m depth was not surveyed.

Depth range	Rakhine (nm^2)	Delta (nm^2)	Tanintharyi (nm^2)	Rakhine (%)	Delta (%)	Tanintharyi (%)
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	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	39373	29273	100	100	100

For conversion of catch rates (kg/hour) to fish densities (t/NM^2), the effective fishing area was considered as the product of the wing spread and the haul length, or distance over the bottom, as measured by means of the SCANMAR® equipment based on GPS readings. The area swept for each haul was thus 18.5 m (traditionally applied wing spread for the “Nansen” bottom trawl) times the distance trawled, raised to NM^2/hour . The catchability coefficient (q), i.e. the fraction of the fish encountered by the 18.5 m horizontal opening of the trawl that was actually caught, was assumed equal to 1 meaning that all the fish in the path of the trawl was caught. . Catchability may vary depending on the type of gear used and the type of species (e.g., gears with bobbins are apparently less efficient for species such as flat fishes and octopus, while gears without bobbins and with footrope touching the bottom are more efficient for benthic species). These estimates have therefore to be considered as indices of abundance. Mean fish densities by species and strata, were calculated by the swept-area module in Nansis.

CHAPTER 3 RESULTS: HYDROGRAPHY AND WEATHER

3.1 Underway sampling

Underway hydrographical sampling takes place along the track of the vessel. This includes the meteorological weather station, the thermosalinograph and their current speed and direction measurements (ADCP). ADCP data will not be reported as part of this report but will be reported separately at a later stage.

3.1.1 Meteorological data recordings

Wind speed and direction were recorded from the vessels weather station located in the mast above the wheelhouse and these are illustrated in Figure 6. As seen from the figure the wind direction was shifting from strong winds from north west (south easterly directed) in the beginning of the survey to a more eastward direction in the Ayeyarwady Delta region with decreasing intensity eastwards. Another period of stronger south easterly winds was experienced in the Myeik area. The southern region experienced calm weather conditions. Survey activities were somewhat affected by weather conditions especially in the north where some of the plankton stations had to be omitted.

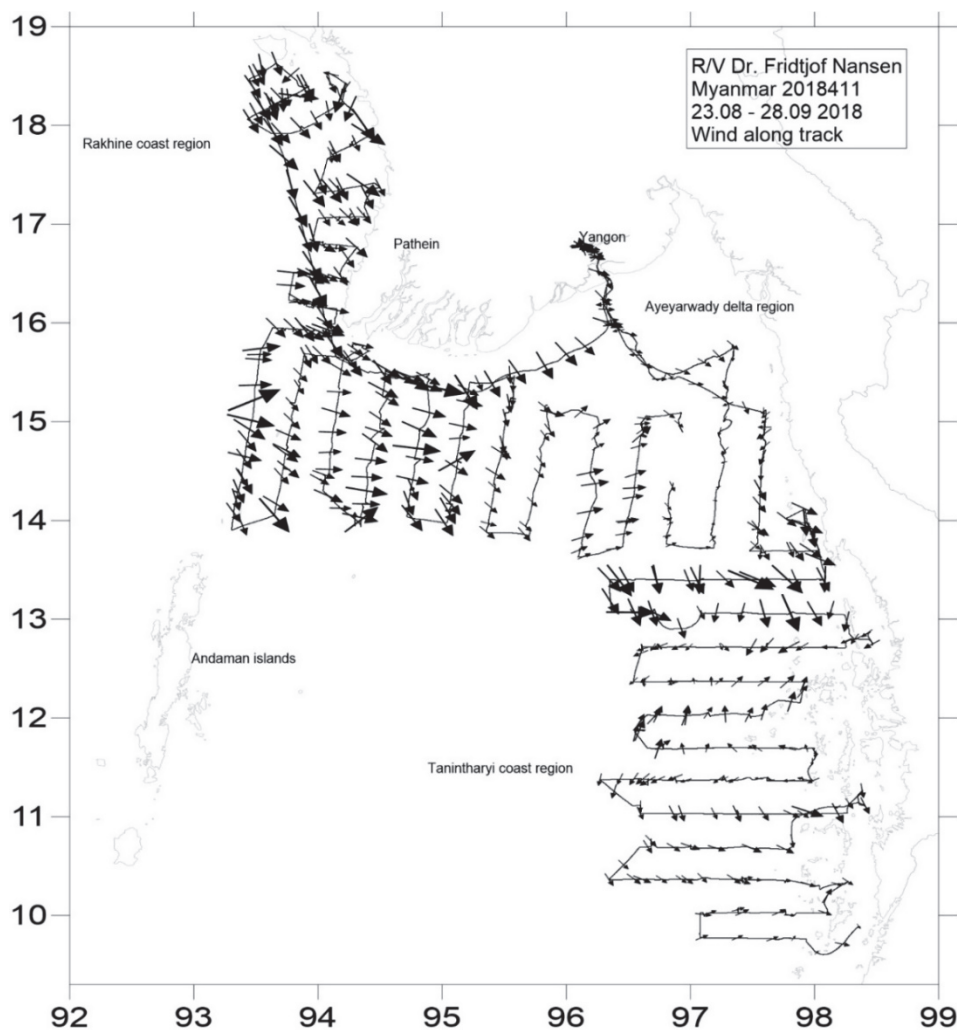


Figure 6. Wind speed and direction as recorded from the vessels weather station.

3.1.2 Thermosalinograph and near-surface hydrography

The horizontal distributions of near-surface temperature, salinity, oxygen and fluorescence, all measured at depth of 5 m from the CTD, are presented in Figures 7 - 10.

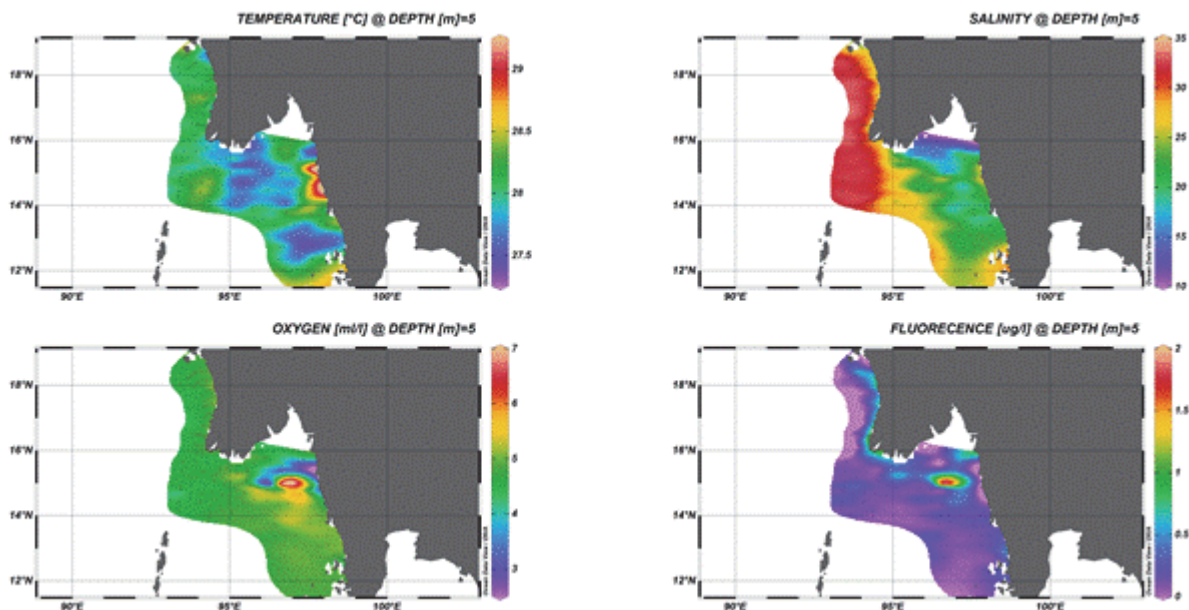


Figure 7. Horizontal near-surface (5 m depth) distributions of temperature, salinity, oxygen and fluorescence for the whole Myanmar coastal area. Station positions are indicated as black dots. Produced with the software Ocean Data View (v 5.0), interpolating by DIVA gridding (Ocean Data View, Schlitzer, R., <http://odv.awi.de>, 2015).

Rakhine coastal zone

The conditions in the Rakhine region was generally windy, averaging 16.0 ± 5.4 (St.Dev.) m/s (max:40.5 m/s) (Figure 6). The direction was typically from SW ($211^\circ \pm 30^\circ$ (St.Dev.)).

Near-surface temperature (5m depth) along the Rakhine coastal zone ranged from 27.8°C to 28.4°C. Surface temperature was even across the shelf, but with slightly cooler water near the river mouths and a slightly warmer area between 17°N and 18°N (Figure 7 and 8).

Near-surface salinity ranged between ~32.2 offshore to 27.5 inshore. Lowest salinity was found in a band following the coast. The distribution was relatively homogenous across latitude in Rakhine. The temperature and salinity distribution indicate downwelling and low primary production.

The oxygen levels measured in the surface layer at depth of 5 m were generally quite high, between ~4.5 - 5 ml/l, and showed low variability.

The near-surface relative fluorescence ranged from 0 to 0.8. The highest levels were found close to the coast in areas with lower salinity, with the downwelling observed this indicate that the source of the nutrients driving this primary production are the rivers.

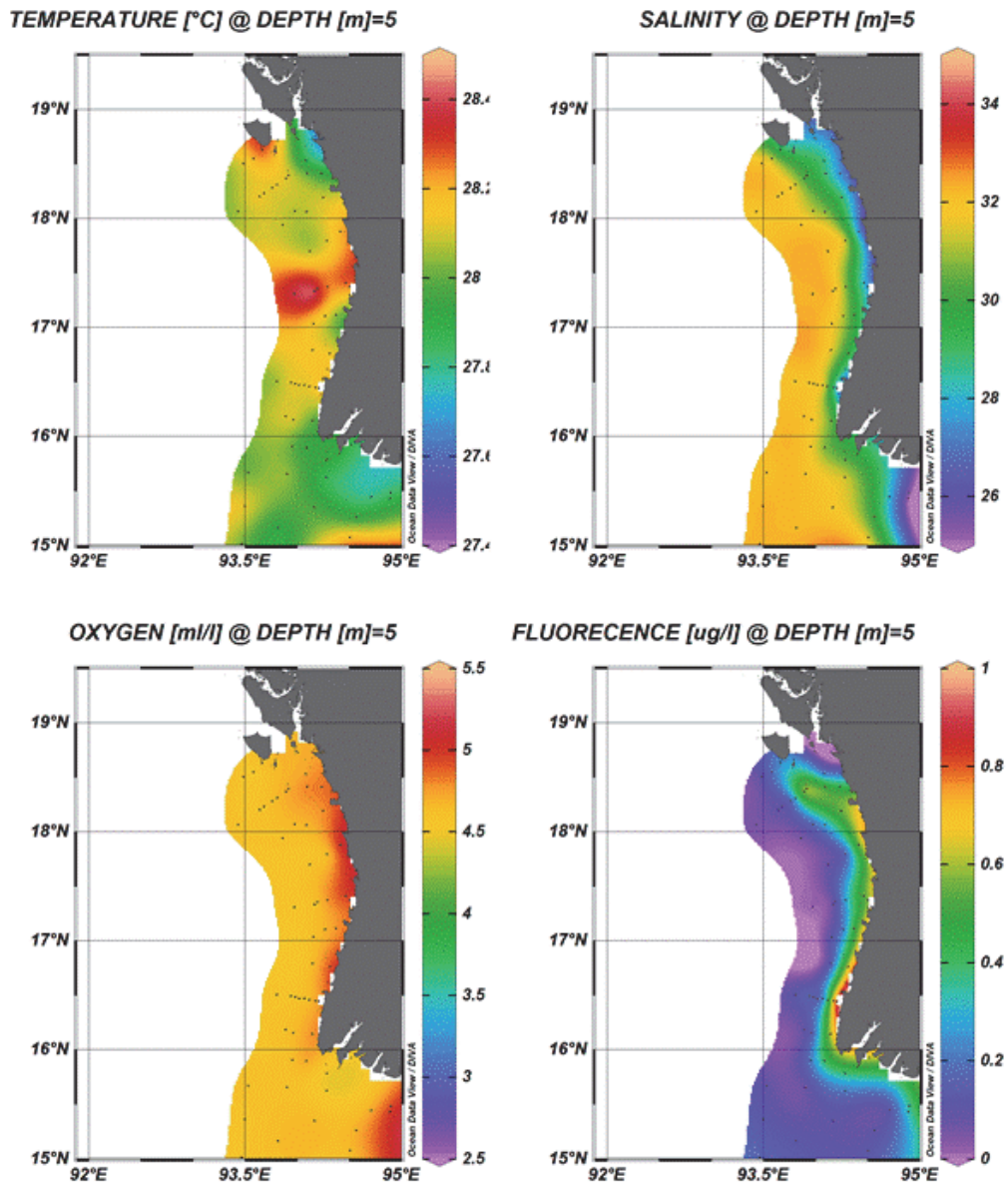


Figure 8. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Rakhine coastal region. Station positions indicated as black dots. Note variable colour scales for the different figures.

Ayeyarwady Delta region

The wind speed in this area averaged around 11.4 ± 5.9 (St.Dev.) m/s and the maximum recorded speed was 44.8 m/s. The wind was strongest in the western part of the area, decreased towards the east. The prevailing wind direction was from west south-west ($232^\circ \pm 49^\circ$ (St.Dev.)) but with weaker and more variable winds in the east, also turning, coming from the north and east.

Near-surface temperatures (5 m depth) ranged from 28.5°C in the southwestern part of the Ayeyarwady Delta region to 27.6°C in the central, cooler part of the delta (Figure 7 and 9). Further towards the east temperatures increased again both toward the inner river delta in the north east and towards the south east where temperatures were $>29^\circ\text{C}$.

The most saline water masses, around 32, were associated with the warmer water masses intruding in the western part of the region, while gradually lower salinities were experienced towards the east and especially the inner delta where surface salinities as low as 12 was observed.

Oxygen-concentrations at depth of 5 m in the Ayeyarwady Delta region was generally high, around 5 ml/l, with one patch of higher oxygen observed on the east coast of the delta, followed by slightly lower oxygen, ranging between 3-4 ml/l slightly north of this.

Fluorescence (index on relative scale) was generally low < 0.5 in most of the Ayeyarwady Delta region. However, a slight increase can be observed in a north west - south east direction, coinciding with salinity values around 20. One patch of increased fluorescence was found in this area with values towards 2.

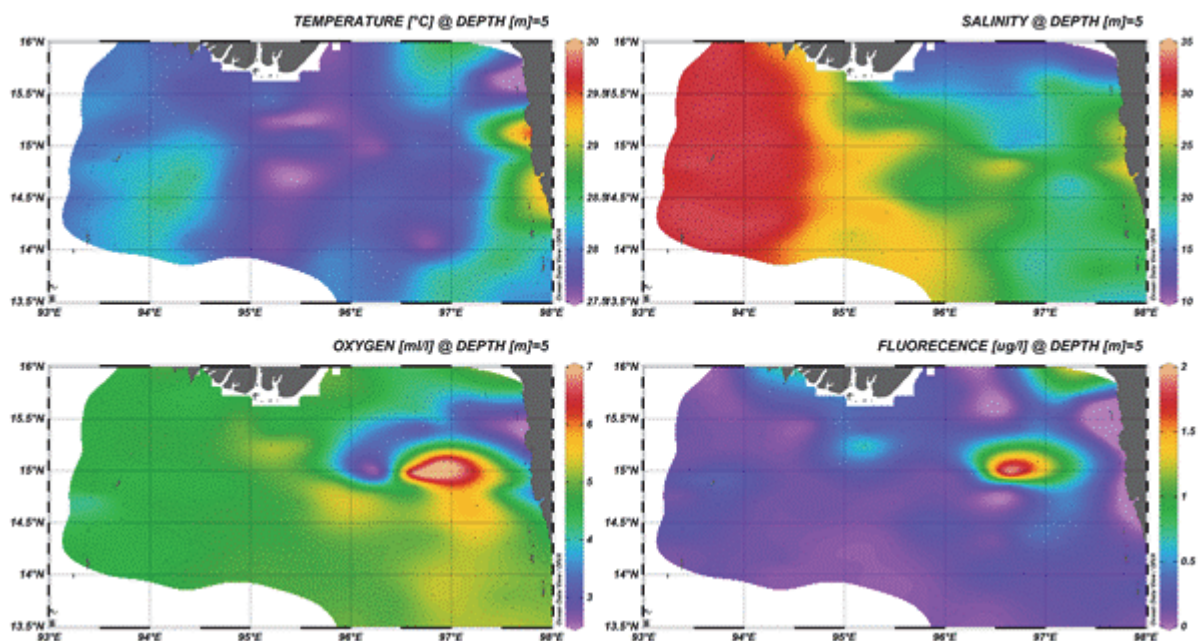


Figure 9. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Ayeyarwady Delta region. Station positions indicated as black dots. Note variable colour scales for the different figures.

Tanintharyi coastal region

Temperatures at 5 m depth in the Tanintharyi coastal region showed relatively high small-scale variability especially along the coast, ranging between 27.5°C and 29°C, with a tendency of increasing temperatures towards the south (Figure 7 and 10). The salinity was low with considerable freshwater influence in the northern part of the region from 14°N to 12°N with more saline water masses in the southern area intruding northwards inshore and offshore. Oxygen concentrations were relatively high with values around 5 ml/l in most of the region decreasing towards the southern and the more oceanic water masses. Fluorescence concentrations were generally low in the surface in most of the region but increasing considerably in the southern most stations along the coast. This increase coincided with

higher numbers of echo registrations in the water column and with an increasing number of fishing vessels.

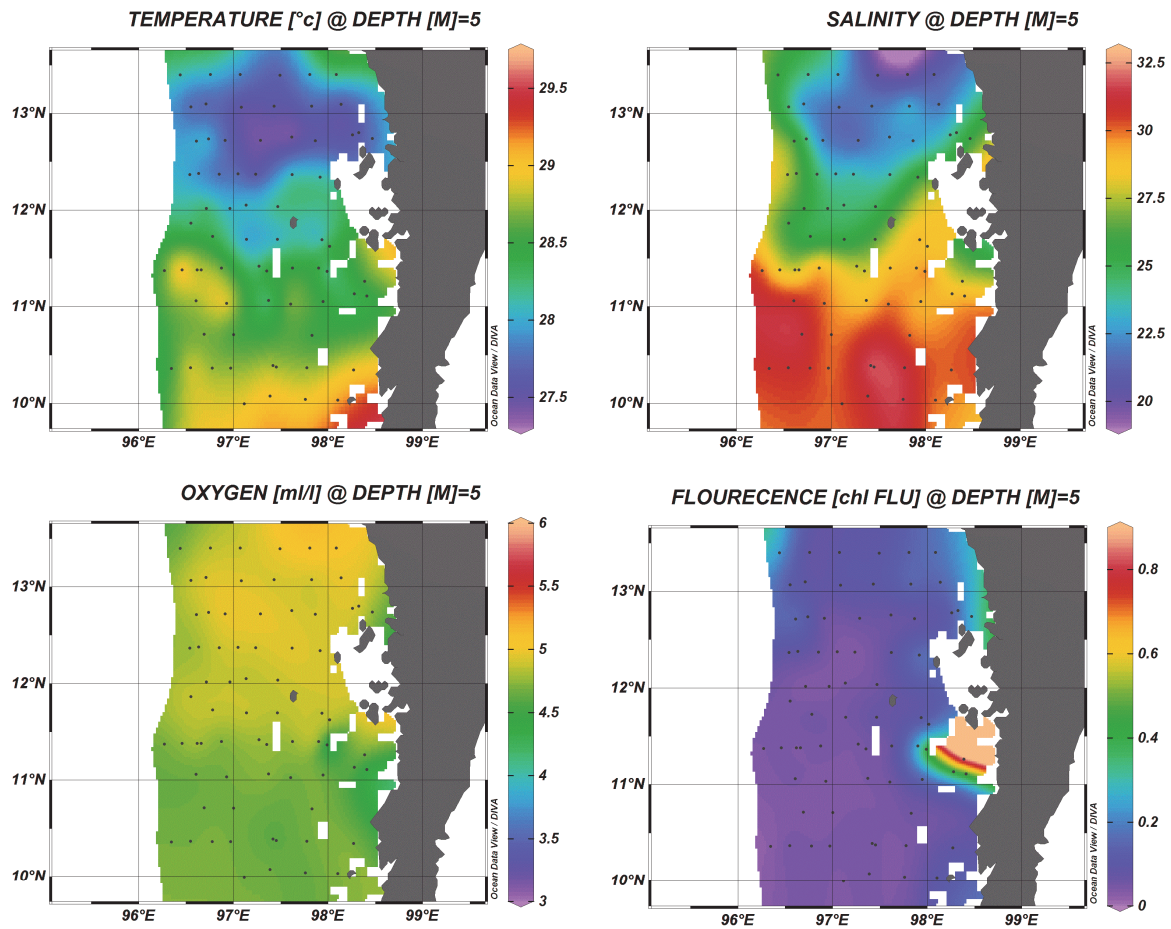


Figure 10. Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Tanintharyi coastal region. Station positions indicated as black dots.

3.2 Hydrographic stationary sampling

3.2.1 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.

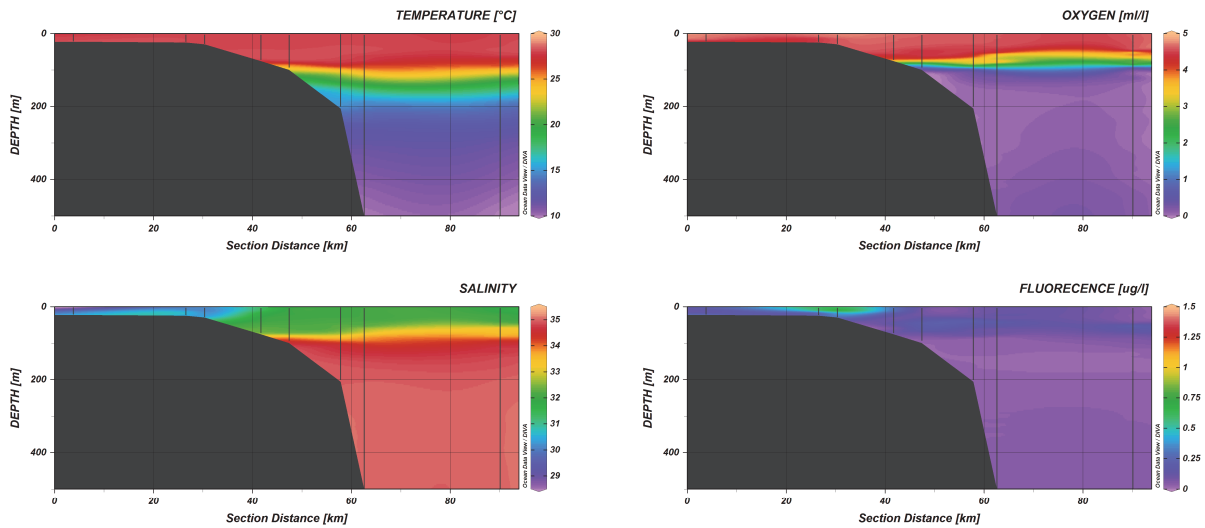
Rakhine coastal region

The survey started further south than the 2015 survey and three environmental transects were made along the Rakhine coast (Figure 11). The figure shows from north to south the hydrographic transects off 1. Tandwe, 2. Dome Hill and 3. North of Mawtin Point (See Figure 3 for positions and numbers of the transects).

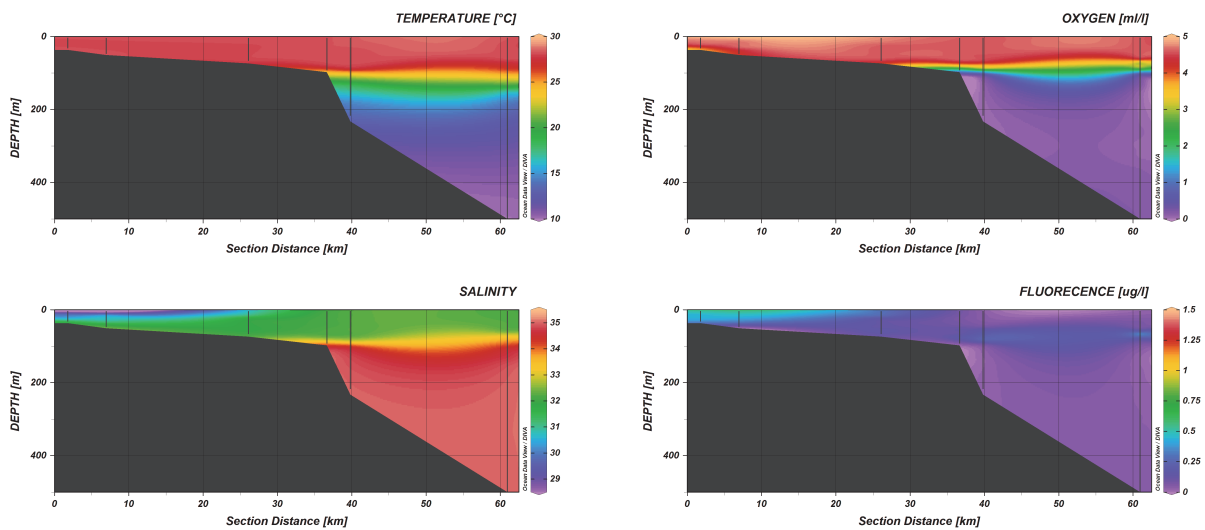
In the Rakhine region, the sections are similar in appearance. The shelf down to ~90 m depth was generally dominated by warm ($>25^{\circ}$) medium to low salinity water (33-28, lowest values inshore at the surface) with relatively high oxygen concentration ($>4\text{ml/l}$) and low fluorescence increasing at the inner shelf and southwards along the transects. Below the

thermocline there are typically no fluorescence maximum and temperatures decrease gradually to ~10°C at 500 m depth and <7°C at 984 (CTD max depth). Salinity is vertically linear at 35.0 below 200 m depth. Water masses are anoxic (<0.1 ml/l) between 100 – 400 m depth before the oxygen increases slightly to 0.8 ml/l at 1000 m depth.

Transect 1



Transect 2



Transect 3

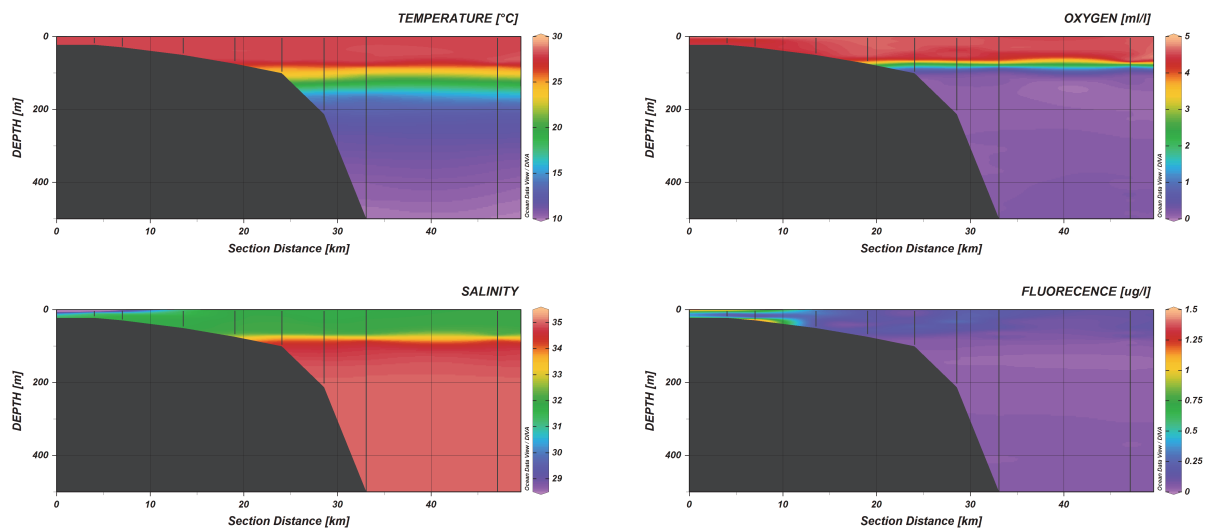
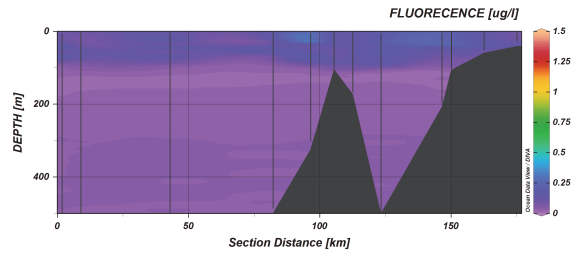
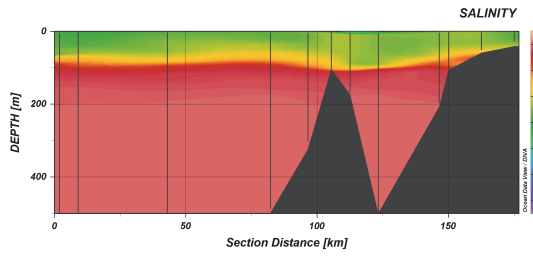
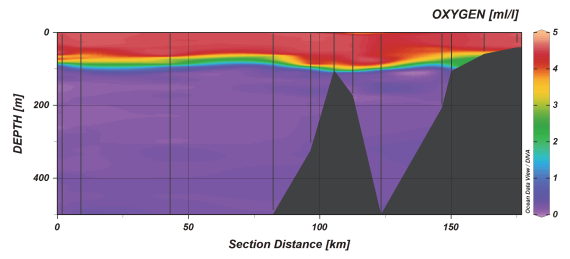
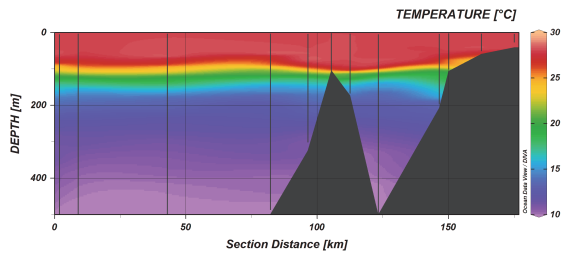


Figure 11. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Rakhine coastal region, sections 1-3. Transect numbers corresponds to the numbers in Figure 3. CTD stations indicated by white vertical lines. Produced with the software Ocean Data View, interpolating by DIVA gridding (Ocean Data View (v 5.0), Schlitzer, R., <http://odv.awi.de>, 2015).

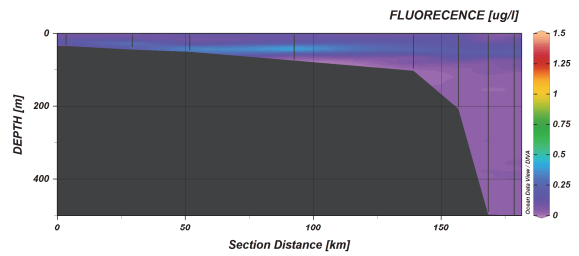
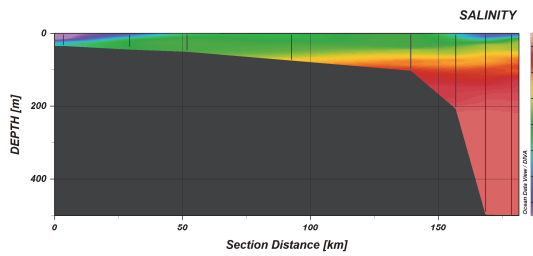
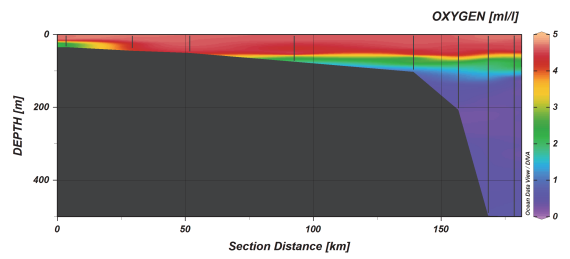
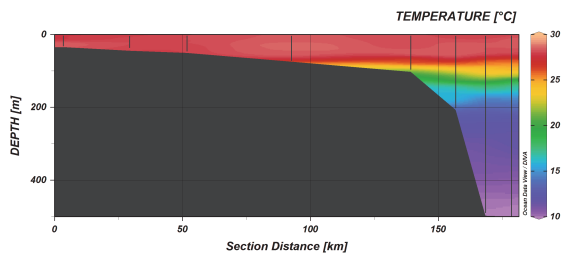
Ayeyarwady Delta region

Five hydrographic transects were made across the shelf of the Ayeyarwady Delta region (Figure 12). The figure shows the hydrographic transects off 6. Nicobar, 7. Patheine -west, 8. Patheine-east, and 9. Yangon (See Figure 3 for position of the transects). Surface temperatures along these transects were high, typically $\sim 28.5^{\circ}\text{C}$ above the thermocline. The thermocline was around 100 m depth in the west and decreasing slightly towards the east to around 75 m depth. The surface water was relatively stable with little variations between transects. At 100 m depth, temperatures were typically still $>20^{\circ}\text{C}$. Temperatures at 500 m were $\sim 10^{\circ}\text{C}$. The profiles generally showed low salinity above the thermocline with values decreasing from west (32-34) towards the east (13 –28). Intermediate salinities were found just above the thermocline while highest salinity waters (around 35.0) was found below the thermocline. Oxygen concentrations were high in the surface layers (typically $\sim 4\text{-}5$ ml/l), decreasing with depth. A strong oxycline was found at depths of 60-100 m. Below this, of the shelf, the water masses were hypoxic with O_2 levels <0.5 down to 500 m depth. The fluorescence- was general very low but with slightly elevated levels in the eastern part of the region on the inner shelf.

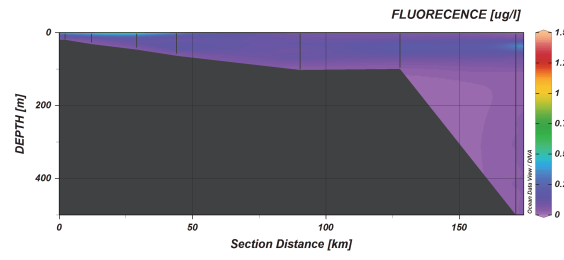
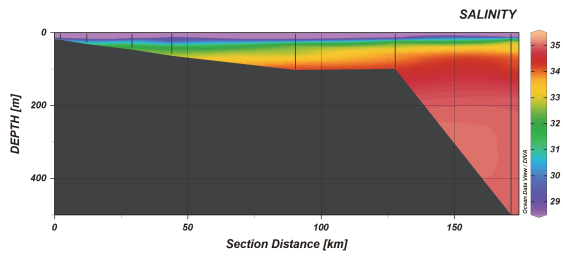
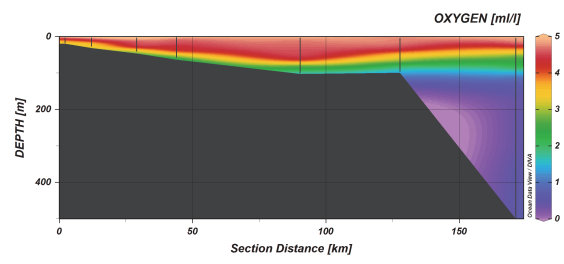
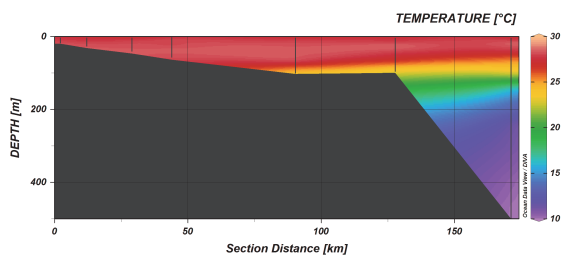
Transect 4



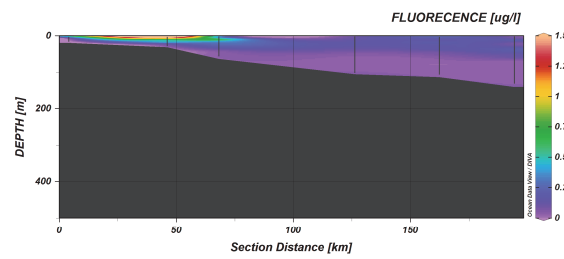
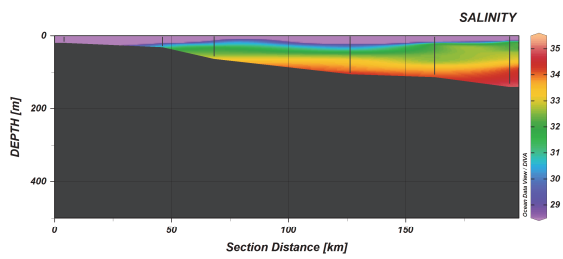
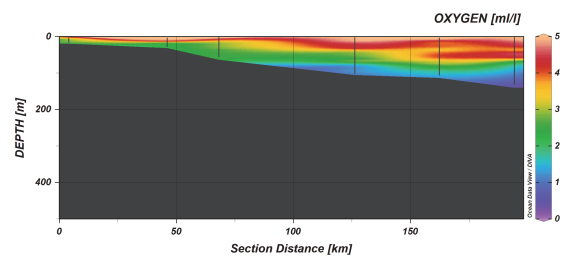
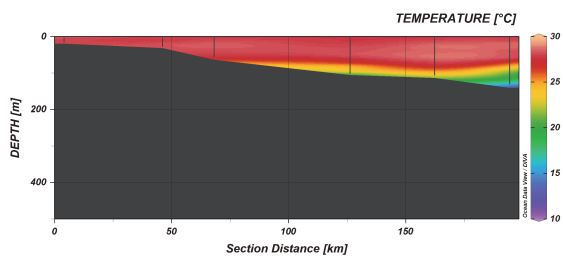
Transect 5



Transect 6



Transect 7



Transect 8

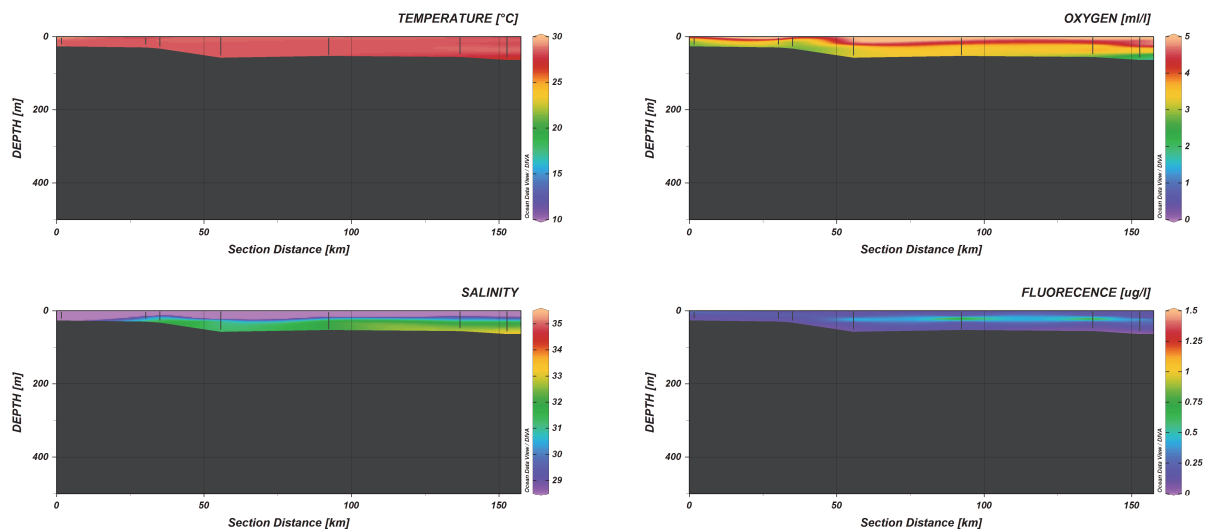


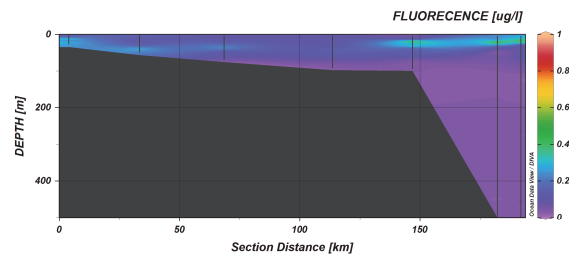
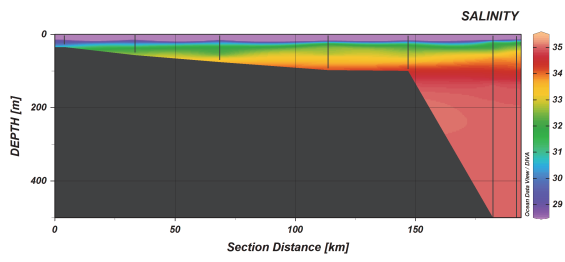
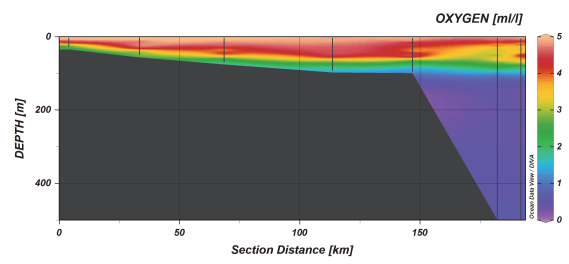
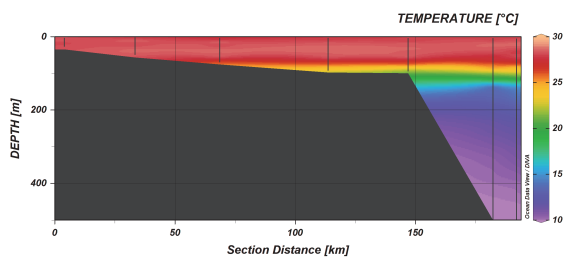
Figure 12. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Ayeyarwady Delta region, transects 4-8 (see Figure 3 for transect position).

Tanintharyi coastal zone

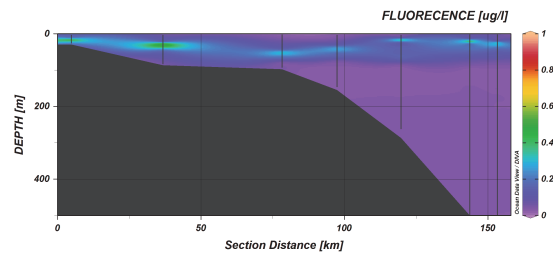
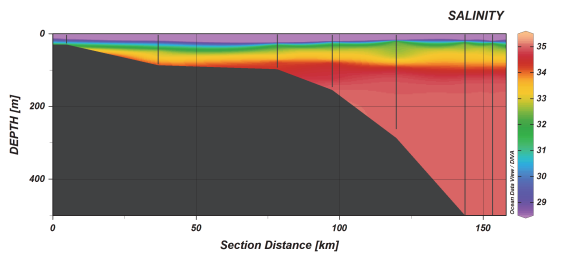
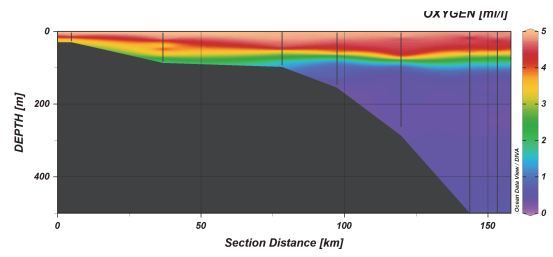
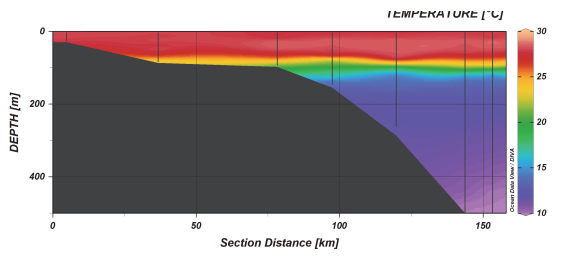
Four hydrographic transects were made across the shelf of the Tanintharyi coastal region (Figure 13). The figure shows the hydrographic transects off 9. Pe Det, 10. Tapo, 11. Bokpyin and 12. Kampong Lama (See Figure 3 for position of the transects). The three northernmost transects in this region were generally similar, with high surface temperature and oxygen and low surface salinity increasing southwards. The thermocline was around 80 m depth, very pronounced in the northern part of the region, becoming slightly less defined in the south. The oxygen dropped rapidly at the same depth decreasing to levels below 1 ml/l at 100 m depth with minimum values < 0.5 ml/l around 200 m depth, increasing slightly in deeper waters.

Temperature at 100 m depth offshore ranged from <20°C to 23°C at 100 m, with a small lifting of cooler water masses at the shelf edge, especially at the section 10 “Transect Tapo”. Indicating some shelf edge turbulent processes. However, the water masses on the shelf are stable with no indication of upwelling, but with indications of coastal mixing in the southern part of the region. The temperatures at 500 m was around 9°C. The profiles showed low salinity in the upper 20 m with values <30 m.

Transect 9



Transect 10



Transect 11

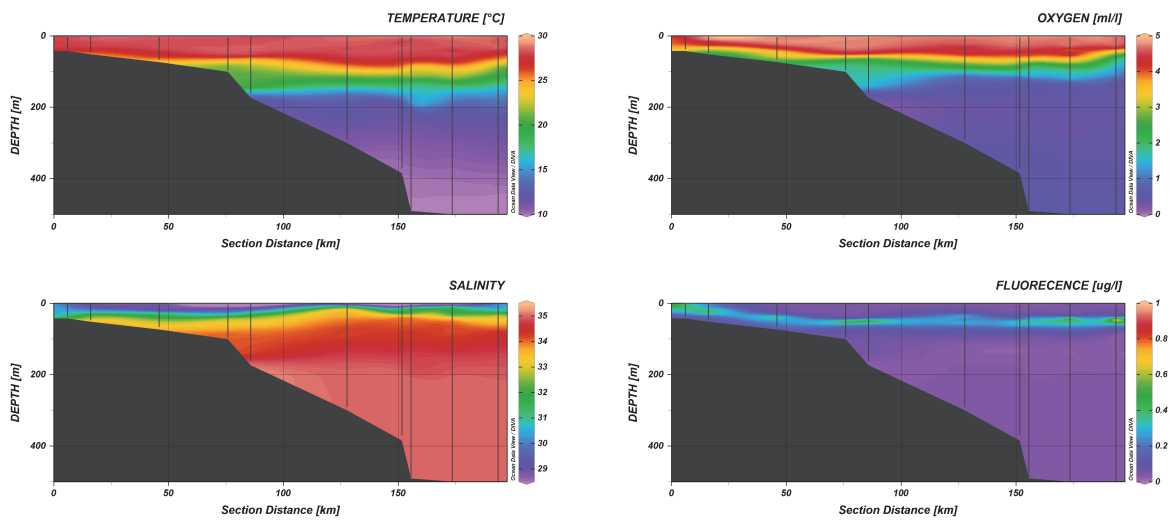


Figure 13. Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Tanintharyi region. Transects 9 to 11. See figure 3 for transect position.

3.3 Water Chemistry (pH, Nutrients and Chlorophyll)

Measured values of water chemistry parameters from the CTD rosette are found in Annex XII. The table presents measured pH, nitrate ($\mu\text{mol/l}$), phosphate ($\mu\text{mol/l}$), silicate ($\mu\text{mol/l}$), nitrite ($\mu\text{mol/l}$), Chlorophyll a ($\mu\text{g/l}$), Phaeophytin ($\mu\text{g/l}$). The text below present a short summary of some key observations.

The measured pH showed a strong vertical stratification with highest pH in the surface and lowest pH in the deeper waters throughout the region. The highest surface pH (8.15) were measured in the delta region (Figure 14).

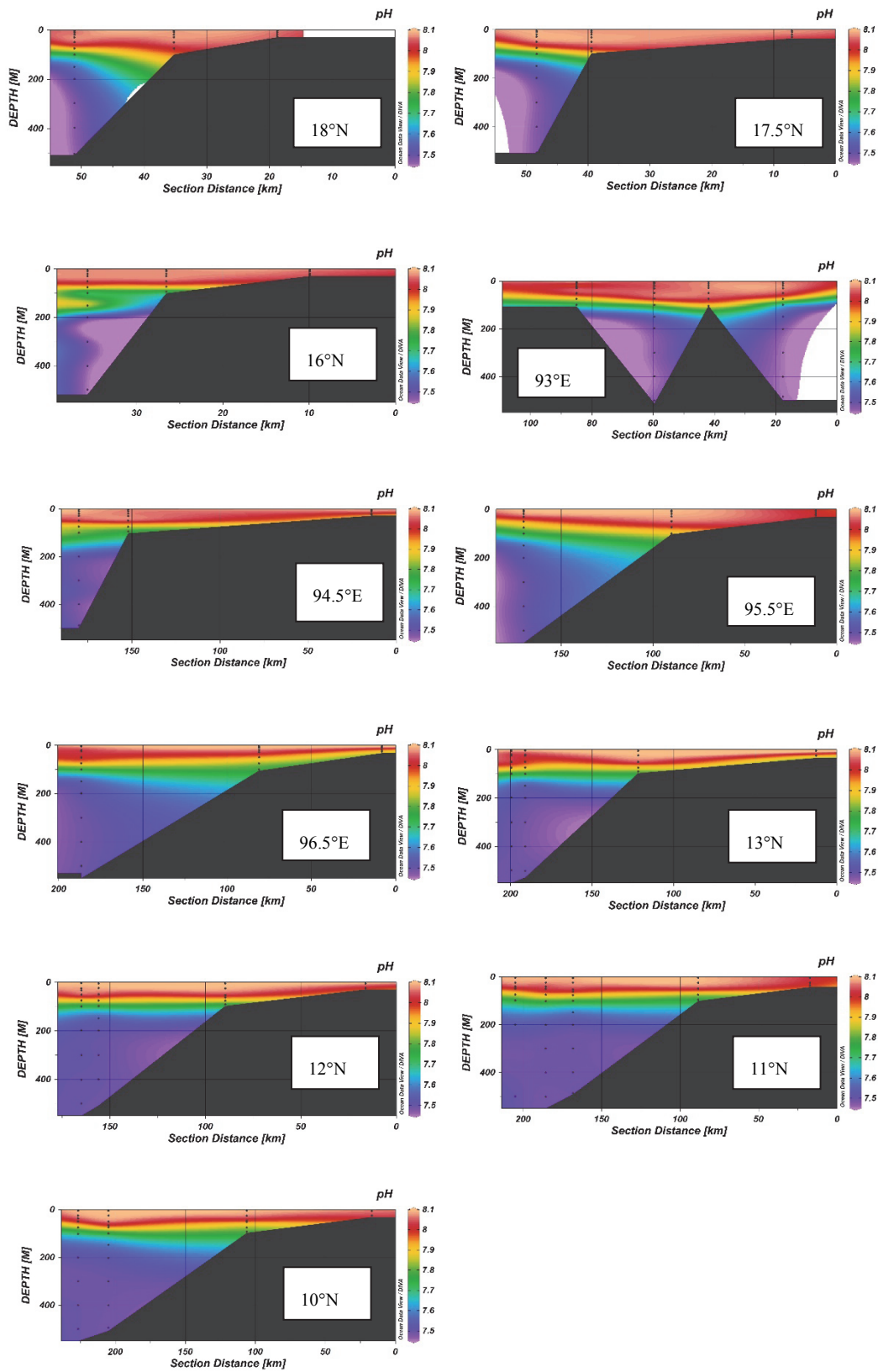


Figure 14. Cross shelf distribution of pH at all the environmental transects carried out as part of the survey.

3.3.1 Nutrient samples

Nutrients were in general depleted in the surface, except in the Tanintharyi coastal region. In the delta region higher concentrations were observed at 10 and 20 meters, while in the rest of the region water masses were depleted down to at least 50 meters. Figure 15 shows the recordings of Nitrate illustrating the elevated values in southern Myanmar.

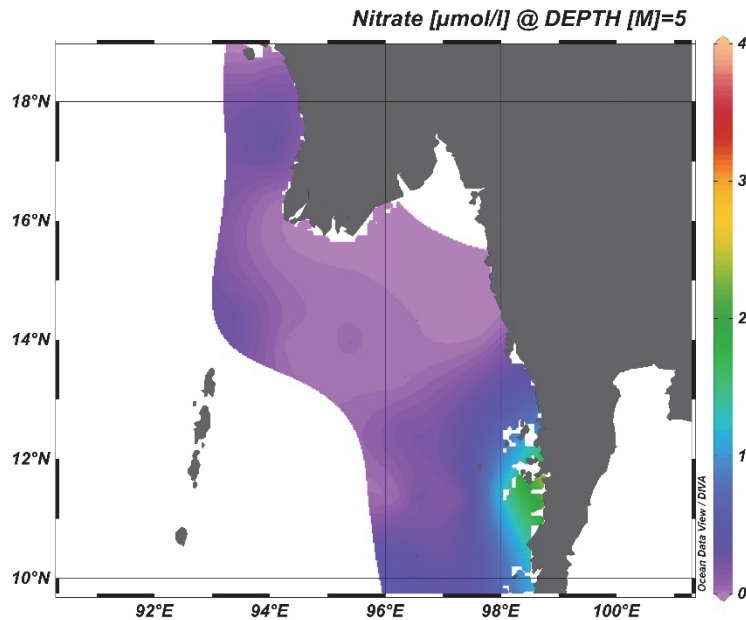


Figure 15. Surface recordings of nitrate in Myanmar showing elevated levels especially in the southern Tanintharyi coastal region.

3.4 Measurement on neutral buoyancy of fish eggs

Live fish eggs collected from the manta nets were inserted in a salinity gradient column system (Coombs, 1981) mounted in the climate lab on board to measure egg neutral buoyancy in terms of salinity, a basic variable to determine vertical egg distribution (Sundby and Kristiansen, 2015). Also, eggs artificially fertilized from running fish from the trawl catches were used for measurements of egg neutral buoyancy. The present density gradient column system is a modified equipment from the equipment from Martin Instruments Ltd. installed onboard the second R/V *Dr Fridtjof Nansen* in 1995. The new system is custom made at IMR, Bergen. In the Nansen Programme the salinity gradient system was first applied to measure neutral buoyancy in Cape hake eggs in the Northern Benguela as basis for understanding vertical and transport mechanisms for Cape hake offspring (Sundby et al., 2001), and for similar studies on sardine eggs in the Benguela system (Stenevik et al. 2001; Stenevik et al. 2003). The present custom-made system is made in polycarbonate with a temperature-controlled water jacket that is illuminated from the sides. The water jacket can be drained from the bottom. The three glass columns are identical to the ones of the Martin Instruments Ltd, i.e. 85 cm high containing 1600 ml. Figure 16 shows the salinity gradient column system installed in the climate lab onboard. Temperature was kept approximately constant during the cruise ranging from 21.7 to 22.3 °C.

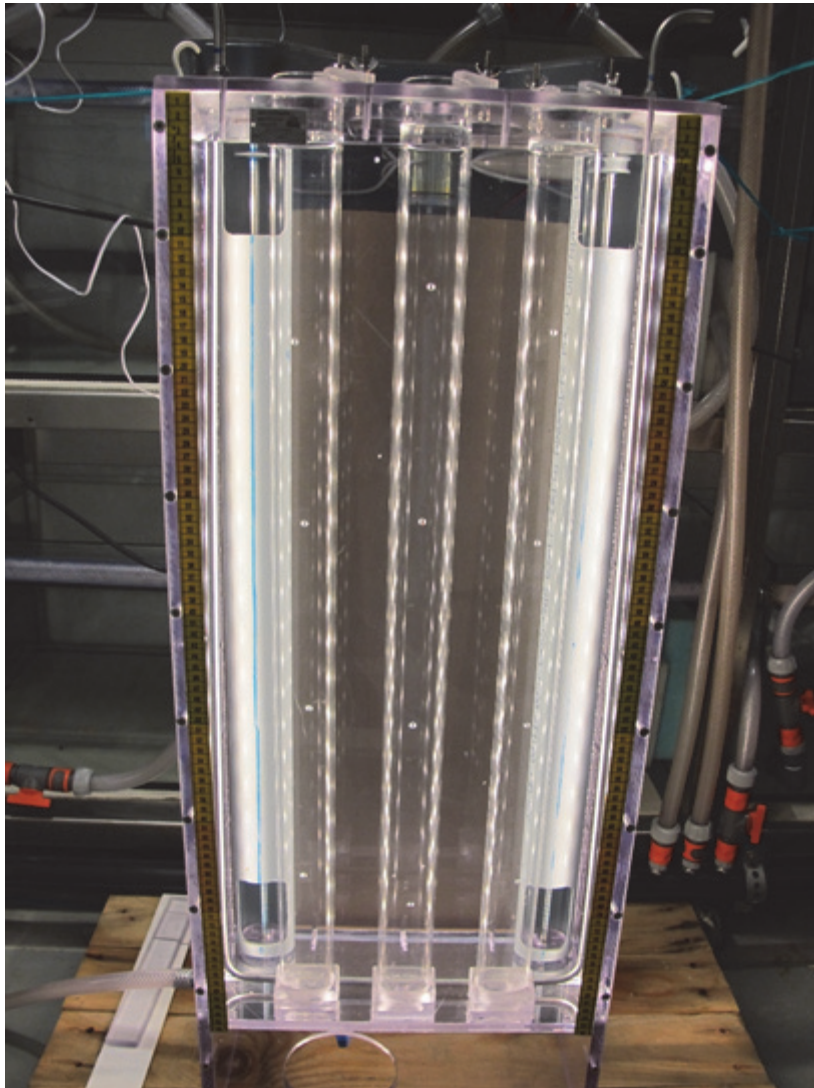


Figure 16. The salinity gradient column system consisting of three glass columns in a temperature-controlled water jacket constructed from polycarbonate. Glass beads of high-precision densities for calibration of the gradients are seen floating in various height levels in each of the columns.

The linear salinity gradients in the glass columns are based on a low and high-saline seawater solutions that are jointly inserted from the bottom of the columns. The pumping of the high and low-saline seawater solutions is provided by an electronic pump system manufactured by H&D Fitzgerald Ltd (<https://density.co.uk/products/column-fillers/>) (Figure 17). It is for the first time used at sea in the present cruise. The system consists of two electronically controlled peristaltic pumps, one for the low-saline and one for the high-saline solution. Initially, only the low-saline solution is fed into the bottom of the column. Increasing amount of high-saline solution is gradually fed into the bottom of the column. The result of the filling procedure is linear salinity gradient through the glass column. This is the first time that filling of columns are done at sea in a rolling and pitching ship. The filling after the traditional method demands for completely calm laboratory conditions and is only possible to conduct before the ship is leaving port.

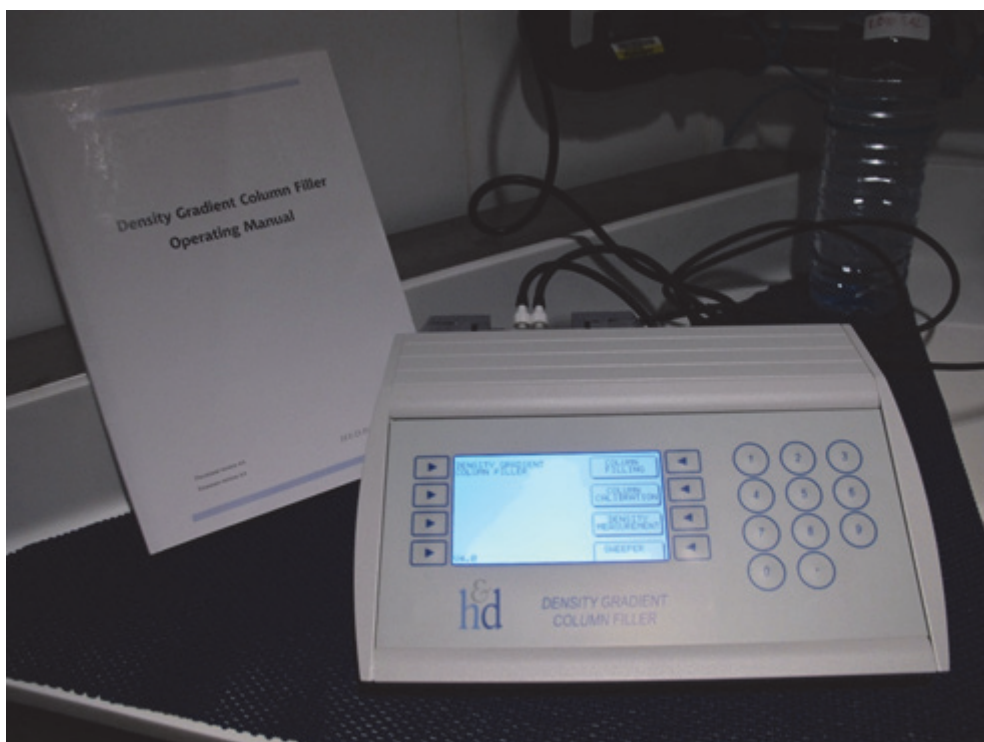


Figure 17. The Density Gradient Column Filler manufactured by H&D Fitzgerald Ltd (<https://density.co.uk/products/column-fillers/>) is an electronic pump system to make the linear salinity gradients in the glass columns. It is for the first time applied at sea onboard a rolling and pitching ship.

The low-saline and high-saline stock solutions were prepared by taking seawater from the 4m-depth intake of the research vessel. Salinity of the intake is measured by a Seabird thermosalinograph. Low-saline and high-saline solutions were made by respectively adding distilled water and dried sodium chloride to the seawater.

The salinity gradients are checked for precision and linearity by inserting glass beads of high-precision densities. Glass floats (also delivered by H&D Fitzgerald Ltd., <https://density.co.uk/products/gradient-column-floats/>) have density uncertainty of $\pm 0.1 \text{ kg/m}^3$ or 0.0001 g/cm^3 .

CHAPTER 4 RESULTS: PLANKTON

The plankton sampling grid of the survey consisted of 36 superstations distributed across 11 environmental transects perpendicular to the coast (Figure 18). A total of 22 superstations were sampled for Leg. 3.4a: Rakhine coast and Ayeyarwady Delta regions and 14 superstations in Leg 3.4b: Tanintharyi coast.

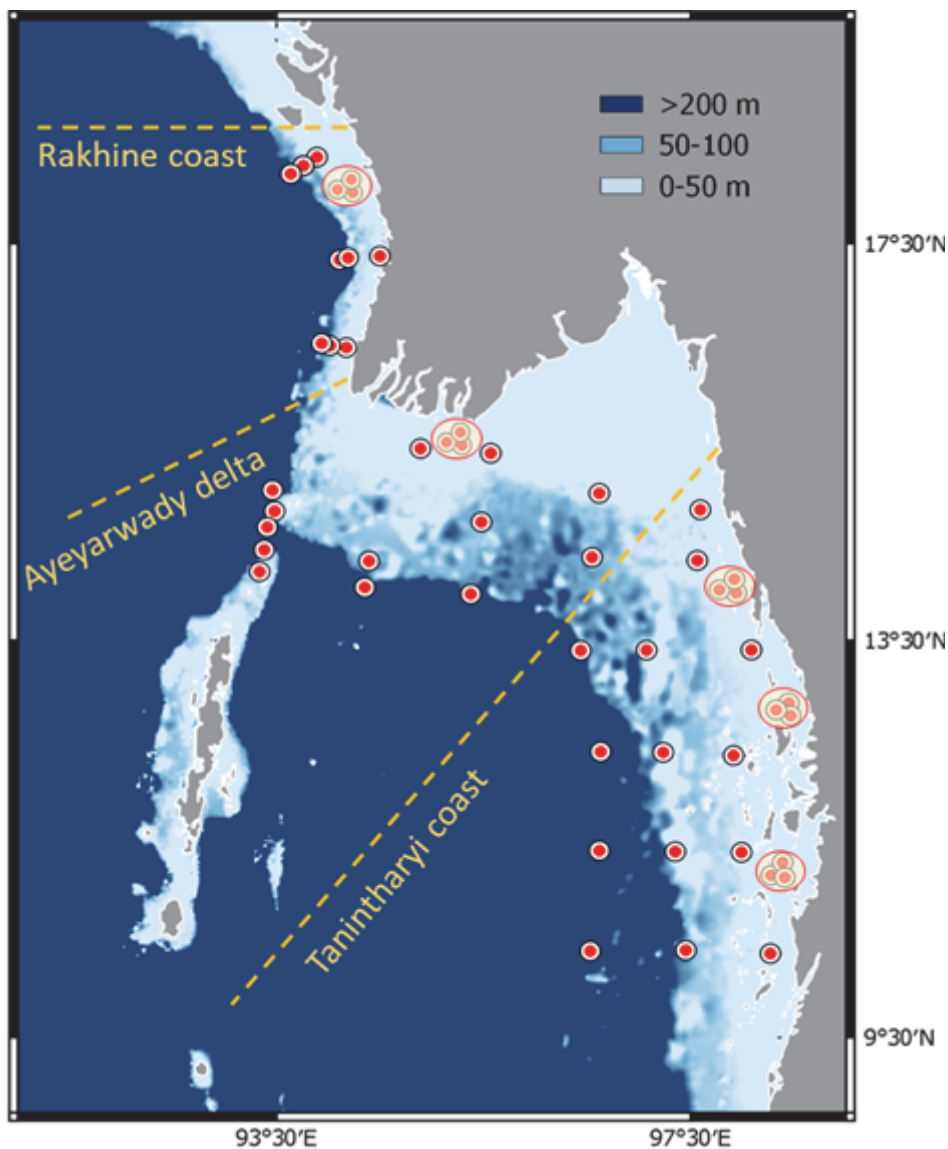


Figure 18. Plankton sampling grid in the entire survey (Leg. 3.4a and 3.4b). Superstations are shown in single red dots present, while stations situated in putative spawning triangles have been encircled in yellow highlighted areas.

4.1 Phytoplankton

Adverse weather conditions did not allow the deployment of the phytoplankton net in a considerable number of stations during the first Leg. Phytoplankton was sampled in 16 out of a total 22 superstations located in Rakhine coast and Ayeyarwady Delta region, while 13 samples were collected from the 14 superstations in Tanintharyi coast. Table 4 provides an

overview of the samples collected per area and the responsible Myanmar institution for the species taxonomic identification.

Table 4. Overview of phytoplankton samples collected in the both legs of the survey.

Leg	Region	Samples	Responsible institution
3.4a	Rakhine coast	6	University of Pathein
	Ayeyarwady Delta	10	Mawlamyine
3.4b	Tanintharyi coast	13	Myeik University
	Total samples	29	

4.2 Mesozooplankton

A total of 59 WP2 samples were collected over the entire grid of superstations. Thirty-seven collections were made during Leg 3.4a and 22 during the Leg3.4b. Most samples were collected either from coastal stations or the surface layer (30 m) of deeper stations. Fewer samples were collected down to 100 m and 200 m depth. An overview of the WP2 collections, the depth strata sampled and the responsible institutions for further taxonomic analysis of the samples are provided in Tables 5 and 6.

Table 5. Overview of WP2 samples collected at superstations in the both legs of the survey.

Leg	Area	Samples	Responsible institution
3.4a	Rakhine coast	15	University of Pathein
	Ayeyarwady Delta	22	Mawlamyine
3.4b	Tanintharyi coast	22	Myeik University
	Total samples	59	

Table 6. Overview of WP2 samples collected at superstations in the both legs of the survey.

Leg	Area	ca. 0-30 m	0-100 m	0-200 m
3.4a	Rakhine coast	9	3	3
	Ayeyarwady Delta	13	5	4
3.4b	Tanintharyi coast	15	4	4

Besides the superstations, additional WP2 sampling was performed at the periphery of five selected coastal areas (Figure 18). These areas were considered as potential fish spawning grounds (“spawning triangles”) and their sampling resulted in 15 zooplankton collections (6 samples in Leg 3.4a and 9 samples in Leg 3.4b). In Leg 3.4a, WP2 samples collected in “triangles” were entirely fixed in formalin after stereoscopic examination for fish egg and larvae. In Leg 3.4b, stereoscopic examination for fish egg and larvae was followed by splitting the samples in two parts. One half was fixed in formalin, while the remaining was sized fractionated and used for dry weight estimations.

Total zooplankton biomass over the superstation grid ranged between 0.5 and 18 g m⁻². Mean values of zooplankton biomass per subregion and size fraction are presented in Figure 19.

Averaged values were higher in Ayeyarwady Delta and Tanintharyi coast compared to Rakhine coast, but this was mainly due to the high contribution of the larger size fraction (>2000 μm) at certain shallow stations. The horizontal distribution pattern of zooplankton biomass reveals the high values at the station 768 and the 788, with 10 g m^{-2} and 18 g m^{-2} respectively (Figure 20, left panel). Future stereoscopic observations will reveal the taxon composition of these samples.

Disregarding the large size fraction in all subregions (Figure 20, right panel), zooplankton biomass values were much lower, ranging between 0.3 and 4.4 g m^{-2} . Spatial differentiation in the zooplankton biomass distribution was observed within subregions. In Rakhine coast, southern stations presented relatively higher values, while in Ayeyarwady Delta biomass values were relatively higher in offshore stations. In Tanintharyi coast, an increase in biomass values was evident towards the Southern stations. Zooplankton biomass measurements presented here, coupled with density measurements and will be associated with the hydrography in the area in future data processing.

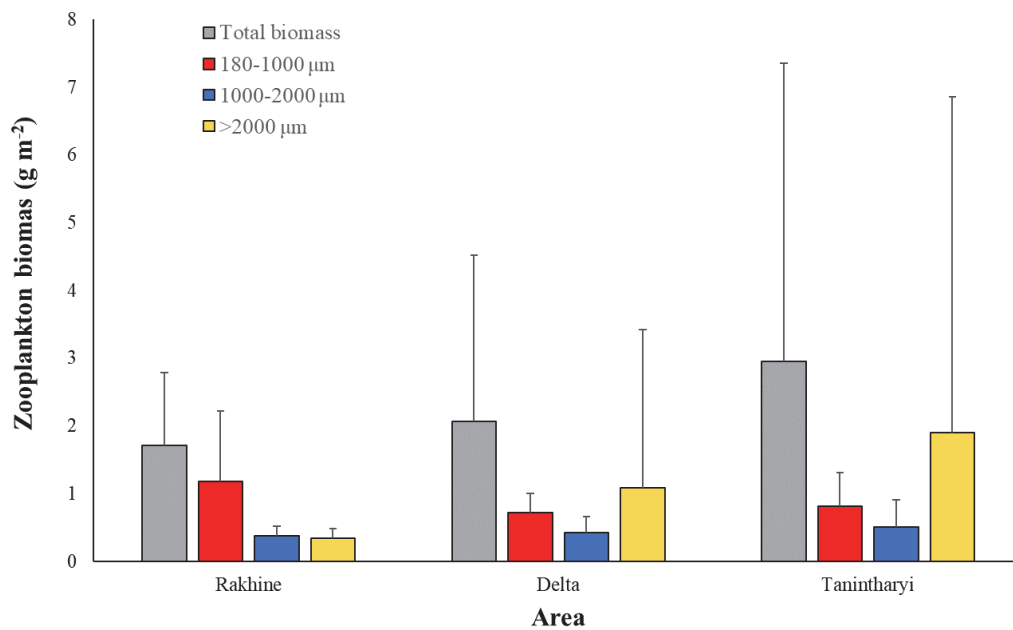


Figure 19. Mean values of zooplankton biomass per subregion. Total biomass (g m^{-2}) and size fractionated values are presented (error bars are standard deviations).

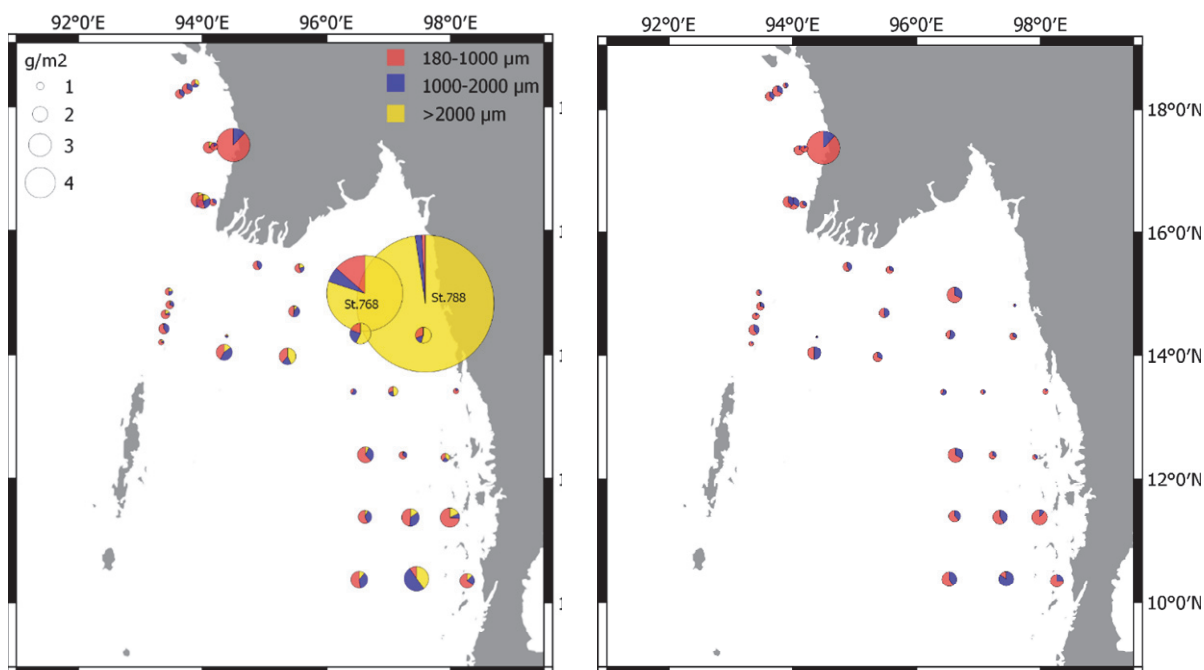


Figure 20. Left panel: Horizontal distribution of total zooplankton biomass and contribution of its size fraction. Right panel distribution of zooplankton biomass disregarding the larger fraction. Values have been linearly scaled for both panels (scale bar up to 4 g m^{-2}).

4.3 Ichthyoplankton

4.3.1 Net sampling of eggs and larvae

A total of 36 multinet tows were conducted for sampling fish larvae and eggs. The number of samples per area and Leg as well as the responsible institution for the ichthyoplankton taxonomic analysis have been summarized in Table 7.

Table 7. Overview of multinet samples collected at superstations in the both legs of the survey.

Leg	Area	Samples	Responsible institution
3.4a	Rakhine coast	9	University of Patheingyi
	Ayeyarwady Delta	13	Mawlamyine
3.4b	Tanintharyi coast	14	Myeik University
	Total samples	36	

In most stations the entire samples were examined under the microscope on board. Larval fish and eggs were sorted out, counted and photographed. A total of 530 fish larvae were sorted out from the multinet collections onboard during Leg 3.4a, while only 19 during Leg 3.4b.

Ichthyoplankton was additionally sorted out from 36 Manta trawls collected at the superstations simultaneously with the multinet. Fifteen additional manta trawls conducted at the periphery putative spawning (“triangles”) were also examined for fish eggs and larvae.

Sorting process of the entire manta samples resulted in higher number of fish larvae in both Legs. Specifically, a total of 1147 larvae were isolated in Leg 3.4b and 273 larvae in Leg 3.4a. It is uncertain if the high differentiation in larval number between the two Legs reflects real differences in larval fish stocks between subregions, or perhaps is associated with limited capacity in sorting process during the second Leg. This issue will be clarified when the re-examination of samples will be completed under laboratory conditions in land. Due to this uncertainty the following preliminary results involve only the Leg 3.4a.

Larval catches were low in most of the stations, with only rare exceptions (Table 8). Preliminary data from onboard counts and species observations are presented in Figure 21 Larval abundance values (larvae m⁻²) based on multinet samples were overall low in the area. This was particularly evident for the offshore stations of the Rakhine area, while relatively higher values were recorded at the offshore stations of the Ayeyarwady Delta region. These sampling sites were characterised by increased larval abundances and higher species richness due to the contribution of larvae of mesopelagic fish taxa (e.g. *Vinciguerria* sp., myctophid larvae) and anguilliform larvae in the community. In depth taxonomic identification of larval fish will be done by the Universities of Patheingyi and Mawlamyine for samples collected in the Rakhine and Ayeyarwady Delta region, respectively.

Table 8. Number of larvae isolated from the multi-multinet samples collected in each environmental transect of the Rakhine coast and Ayeyarwady Delta (in Leg. 3.4a). Depth of targeted stations is indicated as “shallow” (ca. 30 m), “intermediate” (ca. 100 m) and “deep” (>200 m). Transects are enumerated from north to south in Rakhine coast and from west to east in Ayeyarwady Delta.

MULTINET	Rakhine area				Delta area		
	1st TRANSECT	2nd TRANSECT	3rd TRANSECT	4th TRANSECT	5th TRANSECT	6th TRANSECT	7th TRANSECT
SHALLOW	6	32	18	8	3	19	9
INTERMEDIATE	34	38	28	0	47	35	184
INTERMEDIATE				17			
DEEP	8	0	0	4	63	31	
DEEP				12			

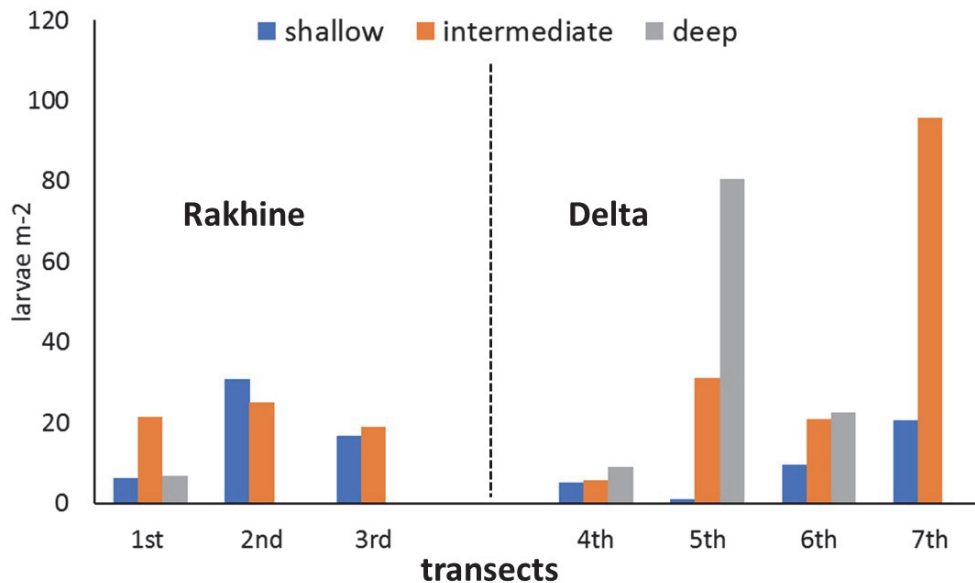


Figure 21. Larval abundances (larvae m⁻²) calculated by midi-multinet catches in the distinct transects in the two sampling areas (Rakhine and Ayeyarwady Delta) of the Leg 3.4a. Station depth is indicated as “shallow” (ca. 30 m), “intermediate” (ca. 100 m) and “deep” (>200 m). Transects are enumerated from north to south in Rakhine coast and from west to east in Ayeyarwady Delta.

Larval counts and abundance values in the Manta tows were generally low as presented in Table 9 and Figure 21. However, increased values were observed in a shallower station of the northern Rakhine region and in the samples collected around the 1st putative spawning triangle. Manta collections were generally dominated by larvae of later developmental stages (transforming stages) mostly belonging to the order Beloniformes (families Hemiraphidae, Exocoetidae, Belonidae), Mugiliformes (Family Mugilidae), Perciformes (Family Mullidae). Representatives of the order Clupeiformes were only observed in one Manta trawl in the 1st Triangle and the adjacent shallow superstation of the first environmental transect (Rakhine area).

Table 9. Number of larvae isolated from the manta samples collected in each environmental transect for the Rakhine and delta area in Leg. 3.4a. Depth of targeted stations is indicated as “shallow” (ca. 30 m), “intermediate” (ca. 100 m) and “deep” (>200). Transects are enumerated from north to south in Rakhine coast and from west to east in Ayeyarwady Delta.

MANTA							
DEPTH	1st TRANSECT	2nd TRANSECT	3rd TRANSECT	4th TRANSECT	5th TRANSECT	6th TRANSECT	7th TRANSECT
SHALLOW	186	42	3	5	6	11	0
INTERMEDIATE	3	20	5	13	328	27	8
INTERMEDIATE				2			
DEEP	4	7	11	7	91	4	
DEEP				4			

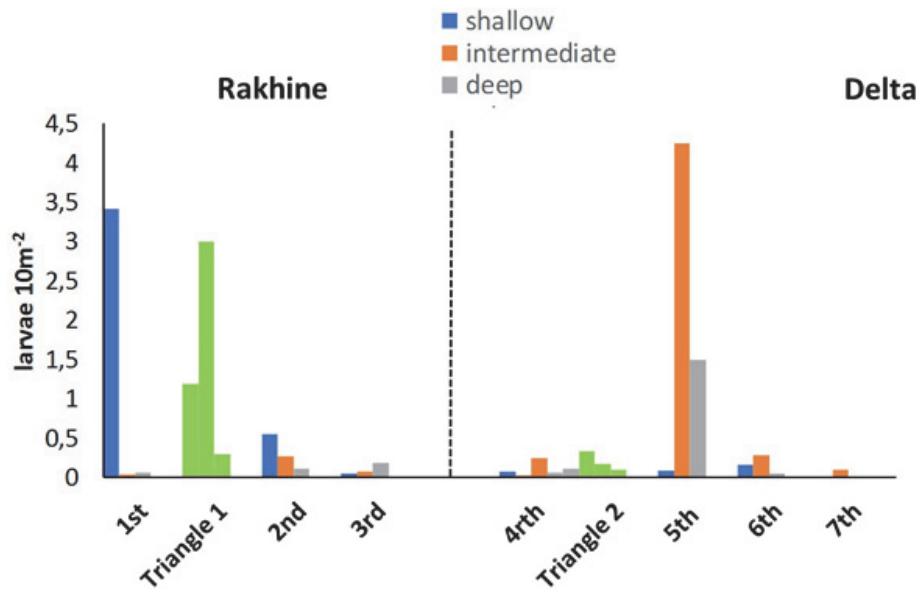


Figure 22. Larval fish abundances (larvae 10m⁻²) in Manta plankton collections in the distinct transects of Rakhine and Ayeyarwady delta area during Leg 3.4a. Depth of station sampled is indicated as “shallow” (ca. 30 m), “intermediate” (ca. 100 m) and “deep” (>200 m). Shallow stations at the putative spawning triangles are in presented in green. Transects are enumerated from north to south in Rakhine coast and from west to east in Ayeyarwady Delta.

The number of eggs encountered in the net sampling was limited in both Legs. Only few exceptions occurred i.e. St. 867 of Leg 3.4b were isolated 110 eggs. This probably highlights the fact that the sampling period did not coincided with the spawning season of the major fish species in the area.

Few eggs caught in the Manta trawl during Leg 3.4a were used to follow the embryonic development aiming at the easier taxon identification. Figure 23 shows five distinct egg morphotypes caught around the 2nd triangle situated in the Ayeyarwady Delta. Among them, morphotype 1 was characterized by segmented yolk, large perivitelline space and a diameter ca. 3.5 mm. This morphotype hatched after - day incubation at 25°C to an Anguilliform larva (Figure 24). Other morphotypes either did not hatched at all or the hatched larva died immediately after hatching without allowing the development of characteristics useful for taxon identification (Figure 25).



Figure 23. Five different egg morphotypes collected by a Manta trawl in the delta area during Leg 3.4a.

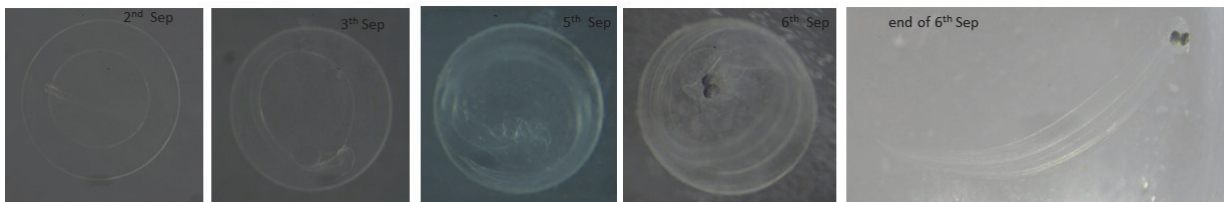


Figure 24. Embryonic development of the egg Morphotype 1 to an eel larva.

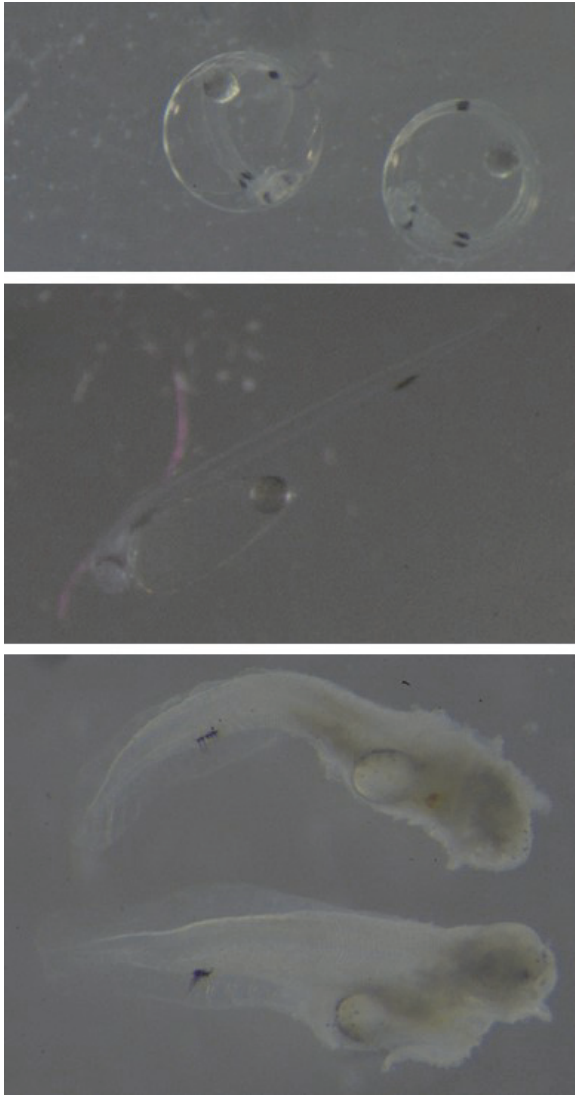


Figure 25. Embryonic development of the egg Morphotype 2 to a yolk sac larva.

4.4 Microplastic and debris

Microplastics were found in 21 out of the 22 Manta trawls of the Leg 3.4a. The length distribution microplastics and their spatial distribution are presented in Figure 26. Most of the items found were less than 5 mm in length and the highest numbers were recorded in the shallowest stations of the Rakhine area (Figure 27).

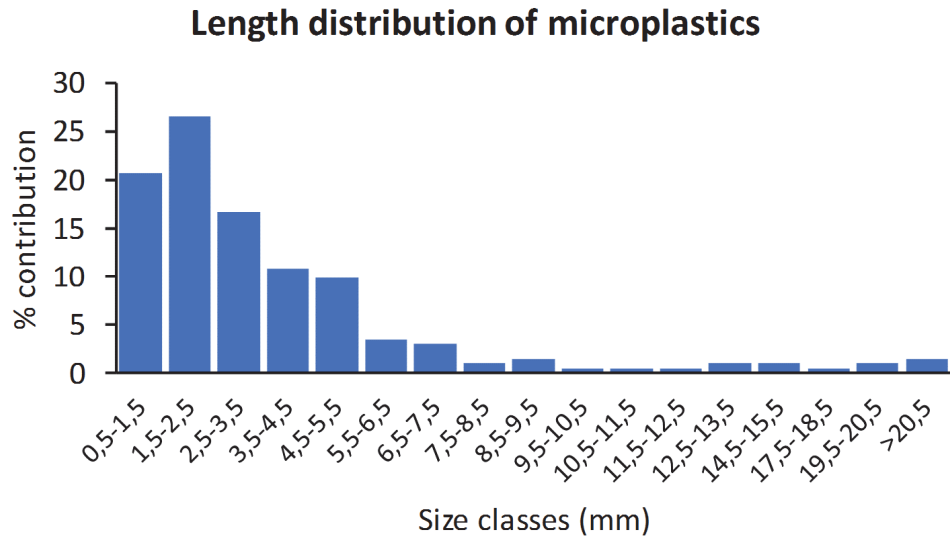


Figure 26. Length distribution of the microplastics sorted out from the Manta samples of Leg. 3.4a.

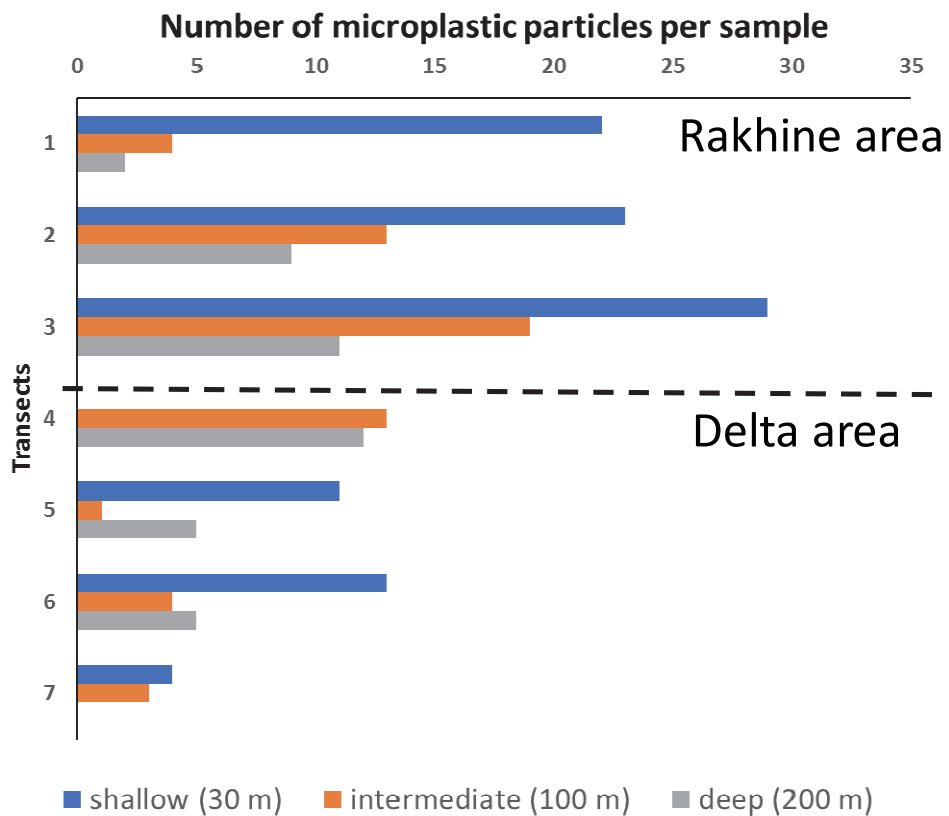


Figure 27. Number of microplastics encountered in the Manta samples collected during Leg. 3.4a. Depth of station is indicated as “shallow” (ca. 30 m), “intermediate” (ca. 100 m) and “deep” (>200 m).

CHAPTER 5 RESULTS: DISTRIBUTION AND ABUNDANCE OF PELAGIC FISH

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.

Pelagic fish distribution and abundance were 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 Engraulidae, while the Pel 2 species belong to the families Carangidae, Scombridae, Sphyraenidae and Trichiuridae. Table 2 gives an overview of the most common genera/species belonging to each of these families. The Pel 1 species are typically separated from the Pel 2 species based on their relative composition in the trawl catches and the fact that these two groups have a much different backscattering signal.

The data are presented for three main regions: 1. Rakhine coast, 2. the Ayeyarwady Delta coast and 3. the Tanintharyi coast. The biomass estimates presented in this report include the geographic region covered by the vessel and do 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 s_A values and biomass estimates for the two species groups per region can be found in Table 10.

5.1 Rakhine coastal zone

Pelagic1

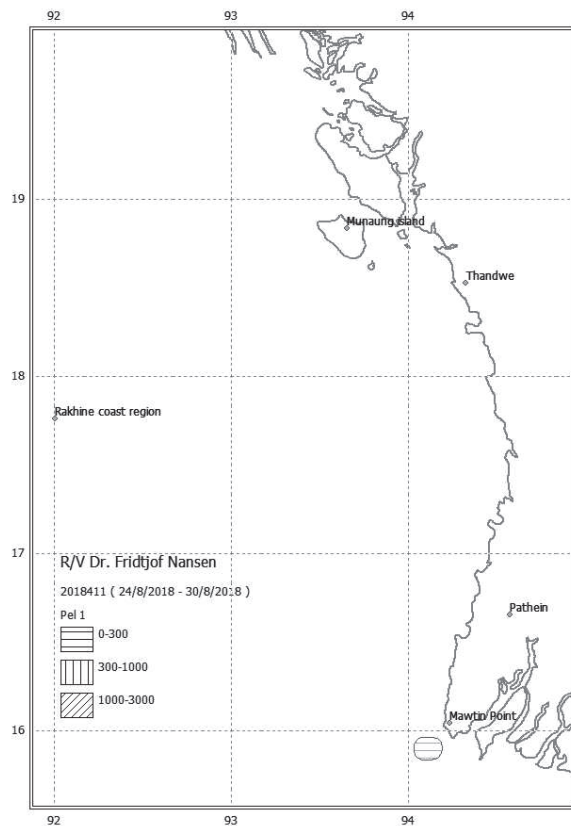
Clupeoid species were recorded acoustically in low densities in one area in the southern part of the region, off Mawtin point (Figure 5.1). In addition, some few scattered clupeoids were found in trawl catches throughout the area but were not detected acoustically. A total acoustic abundance index of <1 000 tonnes of fish was estimated based on a set (average) total length of 10 cm (Table 10). This is considerably lower than the estimate of 21 thousand tonnes in 2015 and the estimate in 2013 of 10 000 tonnes. Length frequencies of commonly caught species can be found in Annex II.

Pelagic2

The distribution of these species was more dispersed than during the 2013 and 2015 survey. The Pelagic2 species were found in low density over most of the Rakhine coast, with the main concentration inshore (Figure 28). During the survey, only 10 000 tonnes of this group of fish was observed. This is lower than the index of 19 000 tonnes found in 2015 and the 23 000 tonnes of fish recorded in 2013. The estimates are based on a set (average) total length of 10

cm (Table 10). However, the production along this coast was also considerably less than during the previous surveys.

a)



b)

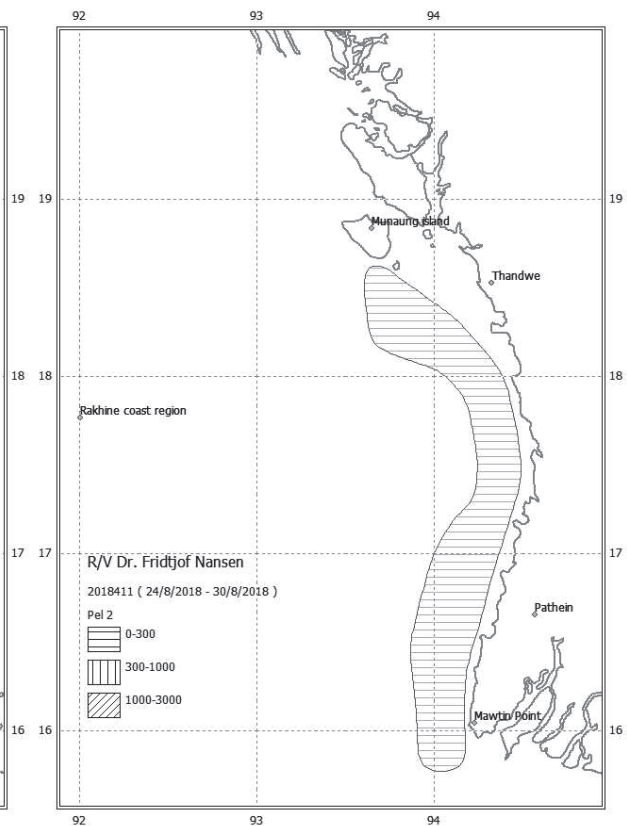


Figure 28. Distribution of acoustic backscattering of a) Pel 1 and b) Pel 2 species along the Rakhine coast.

5.2 Ayeyarwady Delta region

From the trawl catches it is noticeable that the species composition during the survey this year differed considerably from the findings in the 2013 and 2015 survey. This is believed to be related to the seasonality in fish distribution in the region.

Pelagic1

Low densities of Pel 1 were found scattered mainly in the eastern part of the delta area on the inner shelf (Figure 29). A total abundance of 6 400 tonnes was estimated based on a set (average) total length of 10 cm (Table 10). In 2015, 36 000 tonnes of fish were found while in 2013 18 000 tonnes were estimated in the same region.

Pelagic2

The distribution of these species was found in low density over most of the delta area (Figure 29). A total biomass of 124 000 tonnes was estimated compared to 50 000 tonnes in 2015 and 34 000 tonnes in 2013. The abundance in the delta region was the highest estimate of the

three regions during the surveys. Abundance of fish was estimated based on a set (average) total length of 10 cm (Table 10).

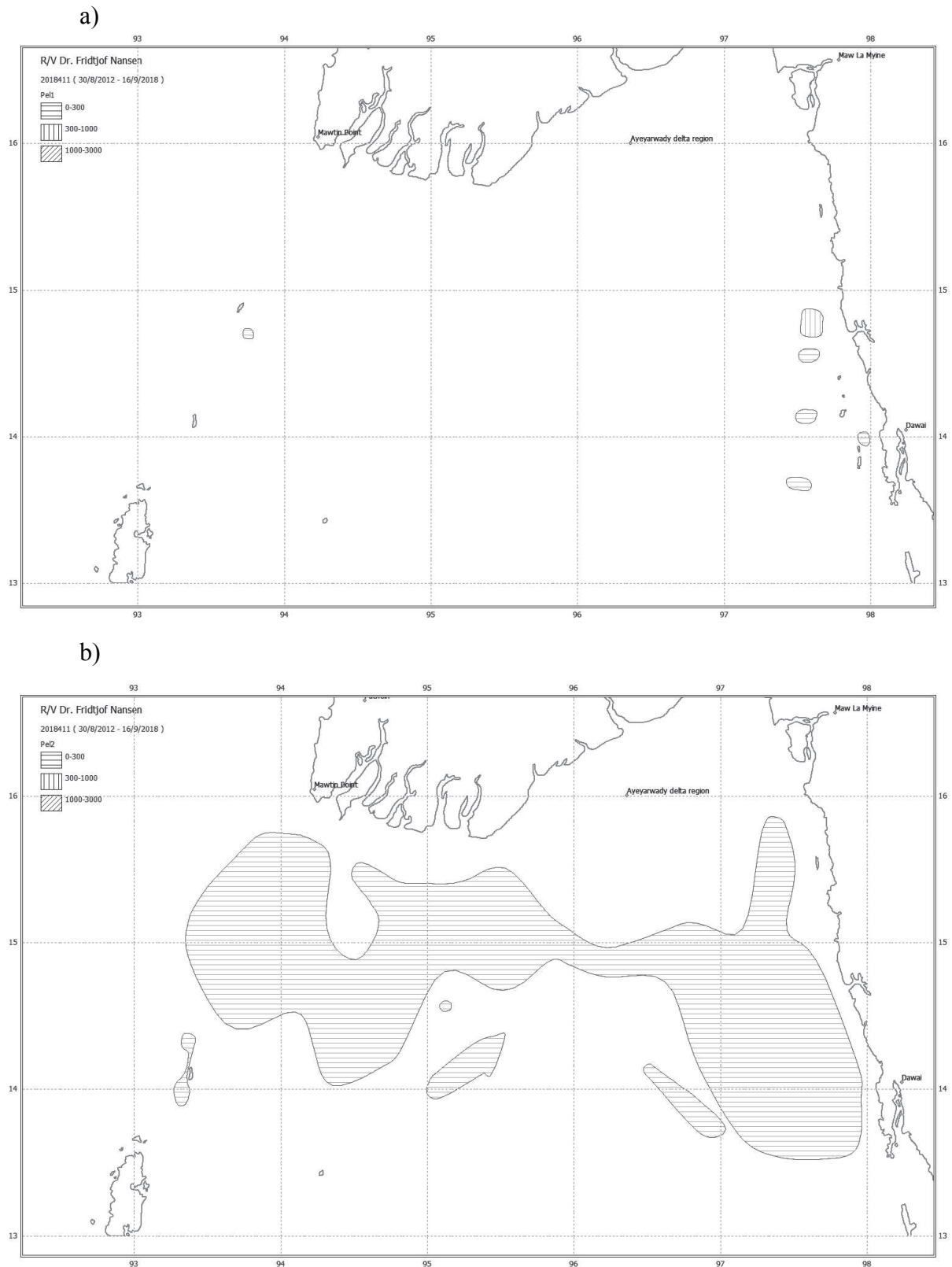


Figure 29. Distribution of acoustic backscattering of a) Pel 1 and b) Pel 2 species in the 5.2 Ayeyarwady Delta.

5.3 Tanintharyi coastal region

Pelagic1

A total of six small low-density distribution areas were defined in this region (Figure 30). The very low and scattered densities of clupeoid fish encountered make the biomass estimation somewhat unreliable. Several trawl catches gave low densities of this group of species while no fish was identified acoustically. A total acoustic abundance index of 5 000 tonnes was estimated (Table 10). This is the lowest of the three recent estimates.

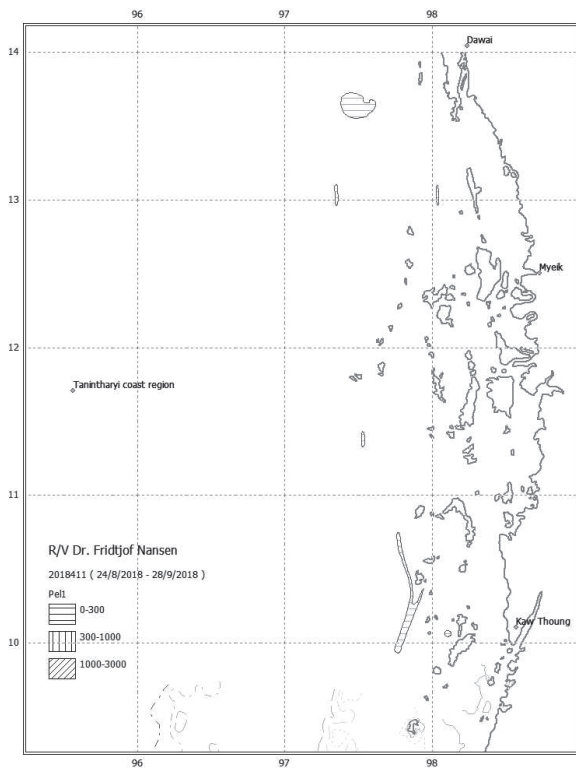
Pelagic2

The distribution of these species was found in low density across most of the shelf and in a separate low-density area in deeper water. (Figure 30). The total estimate was 29 000 tonnes. The region had relatively high fishing activity inshore, to a large extent on pelagic fish. In 2015 an acoustic abundance index of 15 000 tonnes was recorded while in 2013 this was 17 000 tonnes of fish. Length frequencies of commonly caught species can be found in Annex VIII.

Table 10. Biomass estimates (tonnes) of pelagic fish during the survey, Pel 1- clupeid and engraulid species, and Pel 2- carangid, scombrid, sphyraenid and trichiurid species.

	Pel 1				Pel 2			
	Rakhine	Delta	Tanintharyi	Total	Rakhine	Delta	Tanintharyi	Total
Area (NM ²)	61	250	113	424	3207	15 157	8 193	27373
Stratum	1	6	5	12	1	4	2	7
Avg. < <i>s_A</i> >:	26	131	215	145	25	35	25	27
Biomass:	193	6 439	4 989	11621	9 849	114 107	29 462	153418

a)



b)

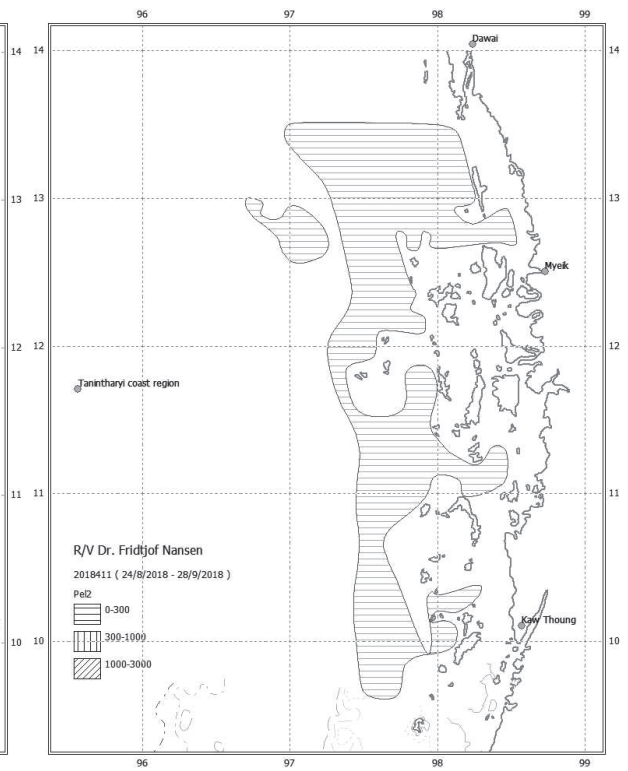


Figure 30. Distribution of acoustic backscattering of a) Pel 1 and b) Pel 2 species in the Tanintharyi region.

CHAPTER 6 RESULTS: SWEPT 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 with standard deviations are presented per region and depth strata for main taxonomic groups found during the survey, with English name and scientific name in parenthesis. These species groups include: sea catfishes (Ariidae), cusk-eels (Ophidiidae), carangids (Carangidae), cephalopods (Cephalopoda), clupeids (Clupeidae), crabs (Brachyura), croakers (Sciaenidae), anchovies (Engraulidae), groupers (Serranidae), grunts (Haemulidae), hairtails (Trichiuridae), ponyfishes (Leiognathidae), lobsters (Nephropidae, Palinuridae and Scyllaridae), goatfishes (Mullidae), pike congers (Muraenesocidae), rays (Batoidea), mackerels (Scombridae), sea snakes (Elapidae), sharks (Selachii), shrimps (Caridea and Dendrobranchiata), snappers (Lutjanidae), flatfishes (Bothidae, Cynoglossidae, Psettodidae, Soleidae, Citharidae), butterflyfishes (Stromateidae), lizardfishes (Synodontidae), threadfins (Polynemidae), threadfin breems (Nemipteridae), ariommas (Ariommatidae), jellyfish (Scyphozoa), bigeyes (Priacanthidae), gurnards (Triglidae), other species (Table 11). The group of other species includes species considered non-commercial and all species not belonging to 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, few trawls were taken in deep water at depths >500 m. It should be noted that the R/V *Dr Fridtjof Nansen* cannot operate in waters shallower than 20 m. while Myanmar has a relatively wide shelf shallower than 20 m. For this reason a considerable amount of fish may be inshore of the area covered by the vessel.

The trawl positions are mapped in Figure 2. Station information and catch per trawl and species (kg/h) are presented in Annex VII.

6.1 Catch rates

Catch rates are presented per region; 1. Rakhine coast 2. Ayeyarwady Delta coast and 3. The Tanintharyi coast. The mean catch rates were generally low throughout the survey, and lower than in both the 2013 and 2015 surveys. Along the Rakhine coast the depth zone between 200- 500 m depth (169 kg/h) gave the highest catches. In the Ayeyarwady Delta region, it was also the deep water that gave the largest catches with 245 kg/h, while on the Tanintharyi coast the depth stratum between 500 -1000 m had highest catch rates with 285 kg/h. This depth strata were not sampled in the other regions. As Figure 31 shows there is a clear tendency of increasing catches with increasing depth and a minimum on the outer shelf, this differs to some extent to the previous surveys.

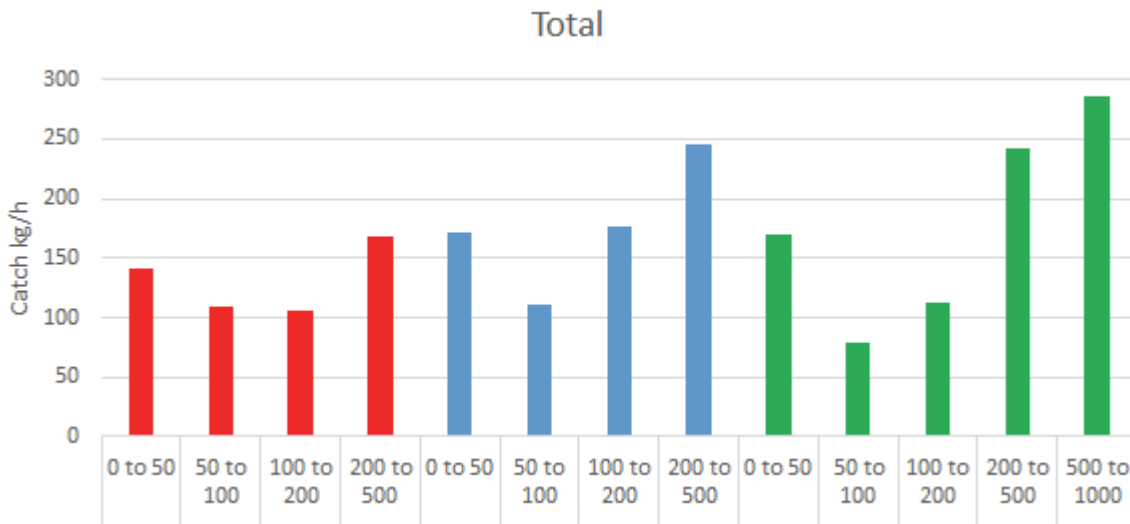


Figure 31. Catch rates per region and depth strata during the 2018 survey: Results from Rakhine (red), from Gulf of Mottama (blue) and from Tanintharyi Coast (green).

Rakhine coastal zone

A total of 31 valid trawl stations were analysed along the Rakhine coast. Of these, 9 stations were between 20 -50 m depth, 9 between 50 - 100 m depth, 10 between 100 - 200 m depth and 3 between 200 – 500 m depth. Table 11 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 the family Trichiuridae (22.9 kg/h) followed by the Leiognathidae (22.6 kg/h), these have been important groups also in the 2013 and 2015 surveys. All other groups gave less than 10 kg/h in average catch. Of the more abundant groups were shrimps (9.2 kg/h) Nemipteridae (7.5 kg/h), rays (6.9 kg/h), Engraulidae (6 kg/h), Carangidae (5.9 kg/h), Sciaenidae (5.9 kg/h), Haemulidae (4.1 kg/h), Lutjanidae (3.7 kg/h), Priacanthidae (3 kg/h), Mullidae (2.7 kg/h), Ariidae (2.6 kg/h) and Clupeidae (1.9 kg/h). Generally, most groups have had declining catch rates in this area compared with both 2013 and 2015 survey. In 2015 jellyfish was frequent in the catches with 79 kg/h followed by Leiognathids (53 kg/h) and several pelagic groups such as engraulids (17 kg/h), hairtails (13 kg/h), and carangids (11 kg/h).

Further from the coast, at the outer shelf (50-100 m bottom depth) the Leiognathidae (16.2 kg/h) dominated followed by the Synodontidae (15.5 kg/h) and the Nemipteridae (14.0 kg/h) and the Carangids (10.0 kg/h). All other groups had catch rates of less than 10 kg/h; Trichiuridae (8.2 kg/h), Echinodermata (4.1 kg/h), Cephalopoda (3.5 kg/h), Lutjanidae (3.1kg/h), Gerreidae (3.1kg/h), Sphyraenidae (2.7 kg/h), Scombrids (2.5 kg/h), Apogonidae (2.4 kg/h), Tetraodontidae (2.2kg/h) Sciaenidae, (1.9 kg/h), Mullidae (1.9 kg/h) and shrimps (1.8 kg/h). Several other groups were found in even lower quantities. The overall catch rate in this depth region was considerably higher in 2015 than in 2013 and both years had higher catch rates than during this survey, particularly because of the comparably higher catches of pelagic fish (carangids and hairtails).

On the upper slope (100-200 m), anoxic water masses prevailed from about 90 m water depth and deeper as during the two previous surveys. Catch rates were poor, but comparable to further inshore, although, the species composition was considerably different, dominated by non-commercial demersal species. Triglidae (35.5 kg/h) was the most common group in this depth region followed by Nemipteridae (14.4 kg/h). Other common groups, but with lower catch rates were the Synodontidae (7.8 kg/h), Priacanthidae (6.9 kg/h), Acropomatidae (6.4 kg/h), Gobiidae (5.3 kg/h), Muraenesocidae (5.0 kg/h), Shrimps (4.5 kg/h), Sharks (3.4 kg/h), Champsodontidae (3.1 kg/h), Congridae (2.7 kg/h) and Apogonidae (2.4 kg/h).

On the lower slope catch rates were, unexpectedly, the highest along the Rakhine coast. Only few species were found in this depth. Of these the family of Triglidae has the highest catch rates with (53.2 kg/h), followed by crabs (*Brachyura*, 43.4 kg/h), Sharks (23.3 kg/h), Cephalopoda (9.3 kg/h), Acropomatidae (4.7 kg/h), Gempylidae (3.5 kg/h), Shrimps (3.5 kg/h), Chlorophthalmidae (1.5 kg/h), Congridae (1.4 kg/h) and Ophidiidae (1.2 kg/h). Species composition differed from what was observed in 2015 and 2013, and especially Triglidae was more dominant than previously.

Ayeyarwady delta region

A total of 46 valid trawl stations were analysed in the delta region. Among these, 14 stations were between 20 -50 m depth, 21 between 50 - 100 m depth, 12 between 100 - 200 m depth and 3 between 200 – 500 m depth, and one trawl was deeper than 500 m. Table 11 shows the average catch rates of the main groups caught during the survey. During this survey the delta region had the highest catch rates of all regions, and catches were generally higher than in the 2013 and 2015 surveys.

In the delta region catches generally increased compared to the Rakhine region. The most common species group on the inner shelf (20-50 m depth) were the Synodontidae (29.7 kg/h), followed by Trichiuridae (20.6 kg/h), Engraulidae (17.8 kg/h) and shrimps (14.0 kg/h). Also important but with lower catch rates were the Lactariidae (7.1 kg/h), Sciaenidae (6.8 kg/h), *Brachyura* (5.8 kg/h), Ariidae (4.7 kg/h), Clupeids (4.1 kg/h), Cephalopoda (3.6 kg/h), Nemipteridae (2.9 kg/h), Rays (2.7 kg/h), Carangids (2.5 kg/h), Lutjanidae (3.0 kg/h) and Sharks (1.9 kg/h). In 2015 the engraulids was the most important group with catch rates of 25.5 kg/h followed by synodontids (16.5 kg/h) and sciaenids (16.1 kg/h), while in 2013, carangids were considerably more abundant in this depth zone with 11.7 kg/h while engraulids were less abundant with catch rates of 5.3 kg/h.

On the outer shelf, the Synodontidae (14.8 kg/h), the Apogonidae (12.9 kg/h) and the Trichiuridae (10.5 kg/h) were the most common groups followed by Nemipteridae (9.6 kg/h), Carangids (5.9 kg/h), Mullidae (5.2 kg/h), Sciaenidae (4.8 kg/h), Cephalopoda (4.6 kg/h), Priacanthidae (3.8 kg/h), Shrimps (3.0 kg/h), Balistidae (2.5 kg/h), Tetraodontidae (2.4 kg/h), Rays (2.0 kg/h), Gerreidae (1.4 kg/h), *Brachyura* (1.3 kg/h) and Sharks (0.9 kg/h). In 2015 the pelagic families Carangidae (33.5 kg/h) and Trichiuridae (10.2 kg/h) were dominant, followed by the demersal groups Synodontidae (12.9 kg/h), Nemipteridae (10.9 kg/h). Also, in 2013, carangids were the most dominant species group with 18 kg/h, while Cephalopoda

(10.2 kg/h), Mullidae (9.4 kg/h), and Nemipteridae (10.4 kg/h) were also frequent in the catches.

On the upper slope, demersal groups were the most important as during previous surveys. The most dominate species groups were the Synodontidae (27.4 kg/h), the Cephalopoda (15.6 kg/h) and the Trichiuridae (11.6 kg/h), while several other groups were also important in the catches; Nemipteridae (9.3 kg/h), Carangids (9.1 kg/h), Rays (8.7 kg/h), Priacanthidae (8.2 kg/h), Acropomatidae (7.0 kg/h), Shrimps (5.0 kg/h), Scorpaenidae (4.2 kg/h), Brachyura (3.4 kg/h), Sphyraenidae (2.2 kg/h), Tetraodontidae (2.2 kg/h), Muraenesocidae (1.9 kg/h), Bothidae (1.7 kg/h), Champsodontidae (1.6 kg/h) and Fistulariidae (1.6kg/h). In 2015 the Priacanthids (33.0 kg/h) were most dominant in the catches in this depth region followed by Synodontidae (22.7 kg/h) and Cephalopoda, (13.7 kg/h). In 2013, synodontids (16.1 kg/h) dominated followed by the threadfin breams (9.9 kg/h).

On the lower slope the Acropomatidae (49.0 kg/h) was the most important group, followed by Shrimps (36.7 kg/h), Sharks (27.5 kg/h), Lobsters (23.6 kg/h), Chlorophthalmidae (21.7 kg/h), Peristediidae (18.9 kg/h), Rays (6.4 kg/h), Gempylidae (5.2 kg/h), Ophidiidae (5.0 kg/h), Priacanthidae (4.4 kg/h), Uranoscopidae (3.0 kg/h), Synodontidae (2.5 kg/h) and the Myctophidae (2.1 kg/h). As during this survey crustaceans were very important both in 2015 and 2013. In 2015 shrimps gave catch rates of 57.0 kg/h, while lobsters (10.8 kg/h) also had reasonable catch rates. Ophidiids, (18.2 kg/h) were the only bony fishes of some importance. Sharks and rays had catch rates of 8.4 kg/h and 7.9 kg/h, respectively. In 2013, catches of shrimps and lobsters were also good, with 33.3 kg/h and 7 kg/h, respectively. Among bony fishes, Ophidiidae showed catches of 2.9 kg/h, while sharks and rays had catch rates of 21.3 kg/h and 34.7 kg/h.

Tanintharyi coastal region

A total of 56 valid trawl stations were analysed in the Tanintharyi coast. Among these, 7 stations were between 20 - 50 m depth, 20 stations between 50 - 100 m depth, 10 stations between 100 - 200 m depth, 16 stations between 200 – 500 m depth and 3 stations >500 m depth. Table 11 shows the average catch rates of the main groups caught during the survey.

On the inner shelf relatively large quantities of garbage was found, 77.3 kg/h on average, considerably more than any of the fish categories. However, this is partly due to one big catch. Of the fish species leiognathids were the most important group with catch rates of 15.6 kg/h, followed by Synodontidae (11 kg/h) and cephalopods (8 kg/h). Other important groups were Carangidae (6.8 kg/h), Nemipteridae (6.5 kg/h), Engraulidae (6.3 kg/h) and shrimps (4.1 kg/h). In 2015 leiognathids were the most important group (34.4 kg/h), followed by cephalopods (28.8 kg/h) while in 2013, cephalopods yielded the highest catch rates (16.1 kg/h), while Synodontidae showed catches of 17.2 kg/h.

On the outer shelf, there was a decline in catch rates compared with depth strata inshore and offshore from this region. The most common groups of species were Cephalopoda (11.1 kg/h), Nemipteridae (9.4 kg/h), Synodontidae (8.4 kg/h), Lutjanidae (4.6 kg/h), Carangidae (4.5 kg/h), Monacanthidae (4.2 kg/h) and Priacanthidae (3.5 kg/h). In 2015 jellyfish was very abundant, (158 kg/h), followed by Synodontidae (30.2 kg/h), Cephalopoda (19.7 kg/h) and

Nemipteridae (15.6 kg/h). In 2013, pelagic species showed relatively good catch rates, mainly consisting of carangids with catch rates of 76.5 kg/h. Among demersal fishes synodontids dominated with 15.3 kg/h.

On the upper slope, catch rates increased. The dominant groups were Rays (36.2 kg/h) with highest catch rates during the survey, followed by Peristediidae (19.4 kg/h) and the group of “Other” species (11.6 kg/h), while Synodontidae (8.2 kg/h), Carangidae (7.5 kg/h), Bothidae (4.9 kg/h), Lobsters (3.8 kg/h), Priacanthidae (3 kg/h), Sharks (2.7 kg/h) were also common groups in the region. In 2015 the “other group” was most dominant with catches of 77 kg/h followed by Synodontidae and Nemipteridae with catch rates of 21.6 kg/h, 14.5 kg/h, respectively. Catches of both rays (9.7 kg/h) and sharks (5.6 kg/h) were also relatively high.

On the deep slope (200-500 m depth) catches increased further. The region shows relatively high diversity. Myctophidae dominated with (38.9 kg/h), followed by the group of “Other” (31.9 kg/h) and Shrimps (30.1 kg/h). These groups were followed by Peristediidae (23.1 kg/h), Chlorophthalmidae (22.2 kg/h), Priacanthidae (21.1 kg/h), Rays (14.2 kg/h), Lobsters (11.6 kg/h), Gempylidae (9.2 kg/h), Cephalopoda (8.5 kg/h), Scorpaenidae (6.6 kg/h), Sharks (5.7 kg/h). In 2015 the “other species” dominated with 61% (137 kg/h) of the average total catch, shrimps and lobsters were important with 31.9 kg/h and 11.6 kg/h respectively, while cartilaginous fishes were represented by rays (21.4 kg/h) and sharks (9.2 kg/h).

During the present survey, as in 2015, three stations were made deeper than 500 m in this region. The dominating groups in the catches were jellyfish (229 kg/h) followed by rays (26 kg/h), “other” (8.2 kg/h) and sharks (5.8 kg/h). In 2015 rays and sharks was also very common with catch rates of 82.9 kg/h and 32.8 kg/h respectively.

Table 11. Mean catch rates in (kg/hour) and Std. Dev (in parenthesis) of main species groups caught in valid swept area bottom trawl hauls, per region and depth zone.

Region	Depth	#Sta.	Gear depth	JELLYFISH	Synodontidae	Shrimps	Rays	Triglidae	Trichiuridae	WASTE	Nemipteridae
Rakhine	20 – 50	9	31.6 (6.8)	1.3 (1.6)	1.5 (3.3)	9.2 (6.4)	6.9 (14.4)	- -	22.9 (42.8)	- -	7.5 (19.0)
Rakhine	50 – 100	9	72.5 (7.9)	0.0 (0.1)	15.5 (8.1)	1.8 (2.7)	0.6 (1.7)	0.0 (0.0)	8.2 (9.6)	- -	14.2 (13.9)
Rakhine	100 – 200	10	140.0 (27.0)	1.0 (3.2)	7.8 (12.9)	4.5 (5.2)	- -	35.5 (61.5)	0.1 (0.3)	- -	14.4 (23.5)
Rakhine	200 – 500	3	318.0 (123.6)	0.8 (1.4)	- -	3.5 (5.3)	- -	53.2 (79.9)	- -	- -	0.1 (0.1)
Ayeyarwady	20 – 50	14	34.7 (9.0)	0.1 (0.3)	29.7 (63.4)	14.0 (22.2)	2.7 (6.8)	- -	20.6 (36.5)	- -	2.9 (5.1)
Ayeyarwady	50 – 100	21	72.6 (12.1)	0.2 (0.6)	14.8 (35.5)	3.0 (4.3)	2.0 (6.7)	0.6 (3.0)	10.5 (18.5)	- (0.0)	9.6 (9.9)
Ayeyarwady	100 – 200	12	121.3 (17.7)	0.9 (3.1)	27.4 (20.9)	5.0 (14.5)	8.7 (17.5)	0.8 (2.1)	11.7 (18.2)	- -	9.3 (7.5)
Ayeyarwady	200 – 500	3	289.3 (36.4)	0.8 (1.4)	2.5 (4.4)	36.7 (21.0)	6.4 (9.2)	0.9 (1.6)	0.1 (0.1)	- -	- -
Tanintharyi	20 – 50	7	36.2 (6.0)	2.6 (5.9)	11.0 (13.1)	4.1 (6.2)	0.1 (0.3)	- -	3.7 (6.6)	77.3 (204.6)	6.5 (7.8)
Tanintharyi	50 – 100	20	74.6 (12.8)	0.2 (1.0)	8.4 (7.1)	1.1 (2.0)	0.5 (1.2)	- -	2.1 (4.6)	- (0.0)	9.4 (17.0)
Tanintharyi	100 – 200	10	138.8 (33.9)	- -	8.2 (6.1)	1.0 (2.9)	36.2 (52.6)	0.1 (0.4)	0.0 (0.1)	- -	1.8 (2.3)
Tanintharyi	200 – 500	16	327.7 (66.3)	1.3 (4.8)	0.5 (1.5)	30.1 (31.8)	14.2 (22.6)	0.5 (1.7)	1.3 (3.9)	0.0 (0.0)	0.0 (0.1)
Tanintharyi	500 – 1000	3	569.8 (82.1)	228.9 (277.1)	- -	4.3 (1.8)	26.0 (29.0)	- -	- -	- -	- -

Table 11 cont.

Acropomatidae	Sharks	Cephalopoda	Peristediidae	Priacanthidae	Leiognathidae	Brachyura	Carangidae	Chlorophthalmidae	Myctophidae	Lobsters	Engraulidae
- -	1.0 (2.9)	1.6 (2.1)	- -	3.0 (9.0)	22.6 (29.7)	0.2 (0.3)	5.9 (7.9)	- -	- -	0.3 (0.5)	6.0 (11.7)
- -	0.5 (1.4)	3.5 (4.8)	- -	1.6 (3.6)	16.2 (16.6)	0.9 (1.5)	10.0 (23.2)	- -	- -	0.7 (1.4)	0.7 (1.1)
6.4 (10.3)	3.4 (6.2)	0.5 (1.1)	- -	6.9 (6.5)	- -	0.1 (0.2)	1.4 (2.4)	- -	- -	0.4 (1.2)	- -
4.7 (7.9)	23.3 (26.7)	9.3 (11.5)	- -	0.3 (0.3)	- -	43.4 (74.6)	- -	1.5 (2.5)	- -	0.1 (0.1)	- -
0.1 (0.4)	1.9 (5.8)	3.6 (4.0)	- -	0.6 (1.5)	1.1 (2.4)	5.8 (12.9)	2.5 (3.0)	- -	- -	0.2 (0.6)	15.2 (27.9)
0.7 (1.8)	0.9 (3.3)	4.6 (6.5)	0.0 (0.1)	3.8 (8.2)	0.5 (1.4)	1.3 (2.9)	5.9 (7.8)	- -	0.2 (1.0)	0.2 (0.9)	0.6 (1.8)
7.0 (18.4)	- -	15.6 (31.3)	1.1 (2.6)	8.2 (9.9)	- (0.0)	3.4 (7.3)	9.1 (18.9)	- -	0.0 (0.1)	- -	0.0 (0.0)
49.0 (84.6)	27.5 (47.6)	0.2 (0.2)	18.9 (32.7)	4.4 (7.7)	- -	0.9 (0.3)	- -	21.7 (33.8)	2.1 (2.4)	23.6 (31.9)	- -
- -	- (0.0)	8.0 (10.7)	- -	1.9 (4.0)	15.6 (31.5)	0.9 (1.2)	6.8 (8.0)	- -	- -	0.4 (0.9)	6.3 (11.1)
0.0 (0.0)	0.4 (1.8)	11.1 (36.5)	0.0 (0.1)	3.5 (5.9)	1.3 (4.8)	0.1 (0.4)	4.5 (6.0)	- -	- -	- -	0.1 (0.2)
0.2 (0.5)	2.7 (5.1)	1.0 (1.2)	19.4 (33.7)	3.0 (3.0)	- -	0.0 (0.1)	7.5 (16.0)	0.2 (0.3)	1.2 (2.8)	3.8 (10.9)	- -
4.6 (8.7)	5.7 (6.6)	8.5 (13.8)	23.1 (53.8)	21.1 (54.8)	- -	0.1 (0.2)	0.1 (0.2)	22.2 (27.6)	38.9 (50.3)	11.6 (11.8)	- -
0.0 (0.0)	5.8 (3.9)	1.0 (0.2)	0.6 (0.5)	0.0 (0.1)	- -	0.1 (0.2)	0.1 (0.2)	0.2 (0.2)	0.3 (0.1)	0.5 (0.2)	- -

Table 11 cont.

Region	Depth	Sciaenidae	Apogonidae	Gempylidae	Lutjanidae	Mullidae	Ophidiidae	Tetradontidae	Muraenesocidae	Scorpaeninae	Siganidae
Rakhine	20 – 50	5.9 (6.2)	1.7 (2.6)	- -	3.7 (5.6)	2.7 (6.4)	- -	0.4 (0.8)	1.4 (4.0)	0.1 (0.2)	0.2 (0.3)
Rakhine	50 – 100	1.9 (3.1)	2.4 (3.9)	- -	3.1 (6.9)	1.9 (2.9)	- -	2.2 (2.4)	- -	0.5 (0.7)	0.2 (0.2)
Rakhine	100 – 200	- -	2.4 (7.2)	0.0 (0.1)	0.3 (0.5)	0.0 (0.0)	- -	0.0 (0.0)	4.9 (11.2)	0.0 (0.1)	0.0 (0.0)
Rakhine	200 – 500	- -	- -	3.5 (1.3)	- -	- -	1.2 (1.0)	- -	- -	- -	- -
Ayeyarwady	20 – 50	9.4 (15.1)	0.4 (0.8)	- -	2.4 (8.9)	1.0 (2.0)	- -	1.8 (2.4)	0.9 (2.0)	0.1 (0.1)	6.1 (16.5)
Ayeyarwady	50 – 100	4.8 (8.8)	12.9 (54.1)	- -	0.8 (3.2)	5.2 (9.9)	0.0 (0.0)	2.4 (3.7)	0.4 (1.9)	0.1 (0.2)	3.7 (11.8)
Ayeyarwady	100 – 200	1.4 (4.3)	0.2 (0.4)	- -	0.2 (0.5)	0.1 (0.2)	0.3 (0.8)	2.2 (1.7)	1.9 (6.4)	4.2 (9.3)	1.2 (2.9)
Ayeyarwady	200 – 500	- -	- -	5.2 (8.6)	- -	- -	5.0 (2.7)	- -	- -	0.3 (0.3)	- -
Tanintharyi	20 – 50	3.9 (6.9)	2.1 (2.4)	- -	0.1 (0.2)	1.0 (1.4)	- -	2.8 (5.7)	2.0 (4.5)	0.1 (0.1)	0.2 (0.3)
Tanintharyi	50 – 100	0.6 (1.7)	0.8 (2.5)	- -	4.6 (18.4)	2.4 (3.1)	- (0.0)	0.8 (1.6)	0.9 (2.8)	0.2 (0.4)	0.7 (1.5)
Tanintharyi	100 – 200	- -	0.0 (0.1)	0.2 (0.5)	0.0 (0.0)	0.7 (1.5)	0.1 (0.1)	1.0 (2.9)	- -	0.4 (0.7)	0.0 (0.0)
Tanintharyi	200 – 500	- -	0.5 (2.0)	9.2 (11.9)	- -	- -	4.7 (6.5)	- (0.0)	0.1 (0.3)	6.6 (16.0)	- -
Tanintharyi	500 – 1000	- -	- -	0.2 (0.2)	- -	- -	3.2 (0.9)	- -	0.4 (0.5)	0.1 (0.1)	- -

Table 11 cont.

Bothidae	Congridae	Scombrids	Haemulidae	Sphyraenidae	Lactariidae	Gobiidae	Macrouridae	Clupeidae	Gerreidae	Uranoscopidae	Other	Total
0.1 (0.3)	0.6 (0.8)	0.7 (1.3)	4.1 (8.7)	0.4 (0.9)	0.4 (0.5)	0.1 (0.3)	- -	1.9 (3.5)	1.4 (2.7)	- -	22.0 (37.7)	141.9
0.1 (0.3)	0.3 (0.6)	2.5 (4.3)	0.7 (1.3)	2.7 (3.4)	0.0 (0.1)	0.1 (0.2)	- -	0.2 (0.4)	3.1 (5.7)	0.2 (0.4)	4.6 (6.5)	109.1
0.5 (0.8)	2.7 (5.6)	0.0 (0.1)	- -	0.0 (0.1)	- -	5.3 (16.0)	- -	- -	0.1 (0.3)	0.8 (2.0)	2.0 (3.7)	106.4
0.0 (0.0)	1.4 (1.4)	- -	- -	- -	- -	0.3 (0.5)	- -	- -	- -	0.5 (0.9)	22.0 (18.2)	168.9
0.3 (1.2)	0.0 (0.0)	1.0 (1.8)	0.7 (2.1)	0.3 (0.5)	7.1 (18.3)	0.0 (0.1)	- -	4.1 (8.6)	0.7 (1.9)	- -	25.6 (30.6)	172.0
0.1 (0.4)	0.7 (2.0)	0.2 (0.4)	- -	0.6 (2.1)	- -	- (0.0)	- -	0.1 (0.3)	1.4 (4.7)	0.1 (0.2)	11.7 (29.4)	111.3
1.6 (3.5)	1.1 (1.6)	0.1 (0.4)	- -	2.2 (7.4)	- -	1.4 (3.5)	- -	- -	- (0.0)	1.4 (2.7)	43.2 (111.8)	177.4
0.8 (1.3)	0.8 (0.7)	- -	- -	- -	- -	- -	0.4 (0.2)	- -	- -	3.0 (4.4)	33.6 (48.7)	244.9
0.1 (0.2)	0.2 (0.6)	2.0 (2.0)	2.2 (4.5)	0.2 (0.3)	- -	0.1 (0.2)	- -	0.6 (1.6)	0.1 (0.1)	0.0 (0.0)	2.6 (3.1)	169.9
0.6 (1.5)	0.1 (0.3)	1.1 (2.2)	0.4 (1.0)	1.5 (6.1)	- -	0.0 (0.0)	- -	0.0 (0.1)	0.0 (0.1)	0.3 (0.6)	11.6 (37.9)	78.3
4.9 (5.9)	0.0 (0.1)	2.0 (6.3)	- -	- -	- -	- (0.0)	- -	- -	- -	0.3 (0.6)	11.6 (14.5)	113.5
1.9 (2.1)	1.4 (3.6)	- (0.0)	- -	- -	- -	- -	2.1 (2.5)	- -	- -	0.3 (1.0)	31.9 (40.5)	242.7
0.0 (0.1)	0.4 (0.4)	0.0 (0.0)	- -	- -	- -	- -	4.6 (1.4)	- -	- -	- -	8.2 (3.9)	285.2

6.2 Biomass index

For the calculation of the biomass index, a calculation of the areas of the different depth strata and regions covered by the survey was made for the 2013 survey, this was also used for this survey.

The biomass estimates of the various demersal groups of fish and invertebrates can be found in Table 12 while a summary can be found in Table 15 and Figure 32. 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 indices (or relative). The reported biomass is comparable with levels reported at previous surveys with R/V *Dr Fridtjof Nansen*.

The total swept area biomass (t) estimated from the survey was approximately 290 000 tonnes, of this, 33 000 tonnes were found on the Rakhine coast, 143 000 tonnes were found in the Ayeyarwady delta region and 114 000 tonnes were found on the Tanintharyi coast. Negligible densities of jellyfish were recorded, mainly on the Tanintharyi coast.

On the Rakhine coast the shelf showed the highest abundance with 11 000 tonnes recorded on the inner shelf and 11 000 tonnes found on the outer shelf. On the slope the depth zone between 100-200 m is hypoxic and only few species adapted to such conditions are present in this environment and the biomass in this area was the lowest as compared to other regions (4 700 tonnes). Further offshore on the deeper slope the biomass increased slightly to 6 300 tonnes.

Further south in the Ayeyarwady delta region the inner shelf had a biomass of 58 000 tonnes while the outer shelf showed a biomass of 40 000 tonnes. On the upper slope the biomass decreased to 31 000 tonnes, and even further on the lower slope, to 14 000 tonnes.

At the Tanintharyi coast an estimate of 30 000 tonnes of biomass was registered on the inner shelf. On the outer shelf the biomass decreased to 22 000 tonnes. On the upper slope the biomass decreased to about 10 000 tonnes while at the lower slope a biomass estimates of 50 000 was estimated.

This year very little jellyfish was found in the trawl catch compared with the 2015 survey. The estimated biomass excluding jellyfish was 274 000 tonnes (Figure 32). This is below the 2015 estimate of 367 000 tonnes but at the same level as the 2013 estimate of 273 000 tonnes. The biomass this year was however centred in the delta region to a larger extent than during the previous surveys. The biomass along the Rakhine Coast was lower than all previous estimates. It should be noted that the northern part of this region was not covered in 2018 and this may have affected the average catch rates (although the area calculations used are the same as in 2013 and 2015). The delta region gave an estimate of 143 000 tonnes, the highest in recent years while the estimate on the Tanintharyi coast was again lower than the 2013 and 2015 estimates.

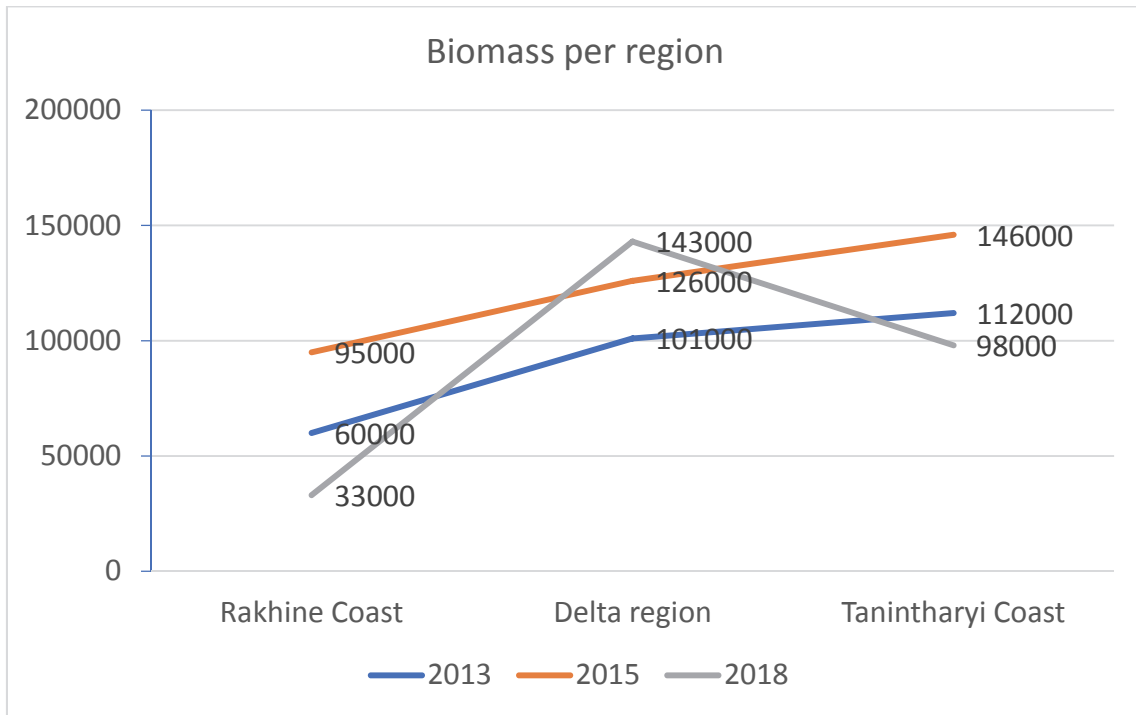


Figure 32. Swept area biomass estimates for the three regions in Myanmar in 2018 compared with the 2013 and 2015 estimates. Note that all jellyfish has been subtracted from testimates.

Table 12. Biomass estimates for the main species groups.

	Depth	#stations	Acropomatidae		Apogonidae		Ariidae		Brachyura		Carangidae		Cephalopoda		Chlorophthalmidae		Clupeidae		Engraulidae		Gempylidae						
			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)	t/nm 2	Biom. (t)	t/nm 2	Biom. (t)			
Rakhine Coast	0 to 50	9	-	-	0.05	134	0.07	187	0.01	27	0.18	482	0.05	134	-	-	0.06	161	0.19	509	-	-					
	50 to 100	9	-	-	0.08	229	-	-	0.03	86	0.32	916	0.12	343	-	-	0.01	29	0.03	86	-	-					
	100 to 200	10	0.23	277	0.07	84	-	-	-	-	0.05	60	0.02	24	-	-	-	-	-	-	-	-					
	200 to 500	3	0.16	178	-	-	-	-	1.48	1649	-	-	0.3	334	0.05	56	-	-	-	-	0.11	123					
Gulf of Mottama	0 to 50	14	-	-	0.01	88	0.16	1416	0.22	1947	0.11	973	0.15	1327	-	-	0.12	1062	0.69	6106	-	-					
	50 to 100	21	0.02	201	0.5	5027	0.02	201	0.05	503	0.2	2011	0.17	1709	-	-	0.02	201	0.02	201	-	-					
	100 to 200	12	0.23	1241	0.01	54	-	-	0.11	593	0.28	1510	0.53	2859	-	-	-	-	-	-	-	-					
	200 to 500	3	1.54	2721	-	-	-	-	0.03	53	-	-	0.01	18	0.69	1219	-	-	-	-	0.16	283					
Tanintharyi Coast	0 to 50	7	-	-	0.07	2	378	-	-	0.03	157	0.23	1206	0.27	3	1432	-	-	0.02	105	0.21	3	1117	-	-		
	50 to 100	20	-	-	0.03	0.00	242	-	-	0.00	4	32	5	1253	0.37	5	3030	-	-	0.00	0.00	1	8	2	16	-	-
	100 to 200	10	0.00	7	0.00	19	1	3	-	-	0.00	1	3	3	0.03	4	92	5	14	-	-	-	-	8	22		
	200 to 500	16	0.15	9	0.01	987	6	99	0.02	124	0.00	0.00	12	2	0.28	4	1763	2	4544	-	-	-	-	7	1906		
Sum				5624		6339		1928		5062		9057		13066		5832		1565		8035		2333					

Table 12 cont.

	Depth	Lactariidae		Leiognathidae		Lobsters		Lutjanidae		Mullidae		Myctophidae		Nemipteridae		Peristediidae		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)	t/nm 2	Biom. (t)	t/nm 2	Biom. (t)
Rakhine Coast	0 to 50	0.01	27	0.69	1847	0.01	27	0.11	294	0.09	241	-	-	0.25	669	-	-	0.09	241	0.21	562	0.17	455
	50 to 100	-	-	0.56	1603	0.02	57	0.1	286	0.07	200	-	-	0.48	1374	-	-	0.05	143	0.02	57	0.07	200
	100 to 200	-	-	-	-	0.01	12	0.01	12	-	-	-	-	0.56	674	-	-	0.24	289	-	-	-	-
	200 to 500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	11	-	-	-	-
	Sum																						
Gulf of Mottama	0 to 50	0.22	1947	0.08	708	0.01	88	0.08	708	0.04	354	-	-	0.15	1327	-	-	0.02	177	0.24	2124	0.23	2035
	50 to 100	-	-	0.01	101	0.01	101	0.02	201	0.17	1709	0.01	101	0.33	3318	-	-	0.13	1307	0.07	704	0.17	1709
	100 to 200	-	-	-	-	-	-	0.01	54	-	-	-	-	0.3	1618	0.04	216	0.27	1456	0.28	1510	0.05	270
	200 to 500	-	-	-	-	0.75	1325	-	-	-	-	0.07	124	-	-	0.59	1043	0.14	247	0.22	389	-	-
	Sum																						

	Depth	Lactariidae		Leiognathidae		Lobsters		Lutjanidae		Mullidae		Myctophidae		Nemipteridae		Peristediidae		Priacanthidae		Rays		Sciaenidae	
		t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.
		2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)
Tanintharyi Coast	0 to 50	-	-	0.52	2733	0.01	68	0.00	16	0.03	184	-	-	0.21	1128	-	-	0.06	325	0.00	21	0.12	677
	50 to 100	-	-	0.04	339	-	-	0.17	1446	0.08	646	-	-	0.33	2723	1	8	0.12	978	0.01	145	0.02	178
	100 to 200	-	-	-	-	0.12	345	-	-	0.02	57	0.04	117	0.05	160	1	1850	0.10	277	1.19	6	3248	-
	200 to 500	-	-	-	-	0.39	2439	-	-	-	-	1.30	8119	0.00	6	4	4990	0.72	4506	0.46	5	2886	-
Sum			1974		7330		4463		3018		3392		8460		12998		8106		9958		11647		5524

Table 12 cont.

	Depth	Scombrids		Scorpaenidae		Sharks		Shrimps		Siganidae		Synodontidae		Tetraodontidae		Trichiuridae		Triglidae		Total	
		t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.	t/nm	Biom.
		2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)	2	(t)
Rakhine Coast	0 to 50	0.02	54	-	-	0.03	80	0.29	776	0.01	27	0.05	134	0.01	27	0.63	1687	-	-	4.23	11324
	50 to 100	0.08	229	0.02	57	0.02	57	0.06	172	-	-	0.52	1488	0.07	200	0.28	801	-	-	3.71	10618
	100 to 200	-	-	-	-	0.12	144	0.16	193	-	-	0.28	337	-	-	-	-	1.32	1589	3.91	4708
	200 to 500	-	-	-	-	0.75	836	0.11	123	-	-	-	-	-	-	-	-	1.82	2027	5.63	6272
Gulf of Mottama	0 to 50	0.04	354	-	-	0.14	1239	0.41	3628	0.22	1947	1.28	11327	0.05	442	0.63	5575	-	-	6.58	58226
	50 to 100	0.01	101	-	-	0.03	302	0.11	1106	0.14	1408	0.5	5027	0.08	804	0.35	3519	0.02	201	3.94	39613
	100 to 200	-	-	0.13	701	-	-	0.17	917	0.04	216	0.91	4909	0.07	378	0.38	2050	0.02	108	5.82	31393
	200 to 500	-	-	0.01	18	0.86	1520	1.2	2120	-	-	0.08	141	-	-	-	-	0.03	53	7.83	13836
Tanintharyi Coast	0 to 50	0.06	351	0.00	10	-	-	0.13	719	0.00	31	0.36	1920	0.09	488	0.12	645	-	-	5.84	30641
	50 to 100	0.03	307	0.00	48	0.01	113	0.03	9	0.02	194	0.28	2287	0.02	210	0.06	541	-	-	2.71	21940
	100 to 200	0.06	171	0.01	35	0.09	255	0.03	8	0.00	3	0.27	752	0.03	87	0.00	5	0.00	3.81	10353	
	200 to 500	-	-	0.22	1397	1.01	1179	1.01	7	0.01	-	6	99	-	-	0.04	267	0.01	7	8.17	50736
Sum			1567		2267		5725		16484		3825		28421		2636		15090		4095		289660

6.3 Species diversity

A total of 1016 taxa were recorded during the survey. Bony fishes were by far the most represented taxonomic group with 745 species/taxa followed by crustaceans (128), molluscs (63), cartilaginous fishes (59), echinoids (7), reptiles (5), holothurians (4), scyphozoans (2), anthozoans (2) and crinoids (1).

Three hundred and thirteen (313) taxa were recorded in the Rakhine Coast, while 618 and 626 were identified in the Ayeyarwady delta area and Tanintharyi coast, respectively. Table 13 shows the number of different taxa caught by bottom trawl in each depth stratum by region. The table shows that the species richness is highest in the Tanintharyi coast (626) and the most species rich area was the 100-200 m depth stratum (322) in the Ayeyarwady delta area.

Table 13. Number of different taxa caught by bottom trawl in each depth stratum.

Depth/region	Rakhine coast	Ayeyarwady delta area	Tanintharyi coast
20-50	164	238	159
50-100	156	322	276
100-200	99	206	191
> 200	38	147	278
Total number of taxa	313	618	626

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:

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

Where:

$\%N_i$ = 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.

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

The results of the analysis by region showed that the most important species/taxa in the Rakhine coastal zone were *Lepidotrigla* sp., *Pterygotrigla hemisticta*, *Lepturacanthus savala*, *Synagrops* sp., *Nemipterus japonicus*, *Saurida tumbil*, *Photopectoralis bindus*, *Priacanthus hamrur*, *Saurida lessepsianus*, *Selar crumenophthalmus*.

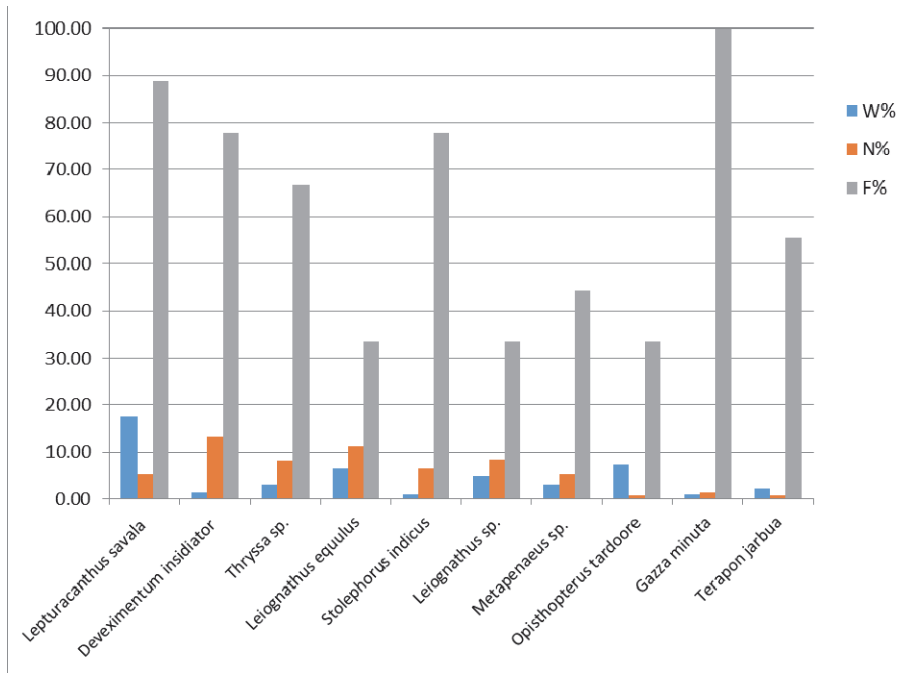
In the Ayeyarwady Delta coast the most common species/taxa were *Siganus canaliculatus*, *Lepturacanthus savala*, *Saurida undosquamis*, *Acetes* sp., *Bregmaceros* sp., *Solenocera* sp., *Metapenaeus* sp., *Nemipterus japonicus*, *Priacanthus macracanthus* and *Synagrops* sp.

On the Tanintharyi coast the most important species/taxa were Myctophidae, *Priacanthus macracanthus*, *Loligo* sp., *Chlorophthalmus acutifrons*, *Saurida lessepsianus*, *Satyrichthys laticeps*, *Plesionika* sp., *Siganus canaliculatus*, *Plesiobatis daviesi* and *Puerulus sewelli*.

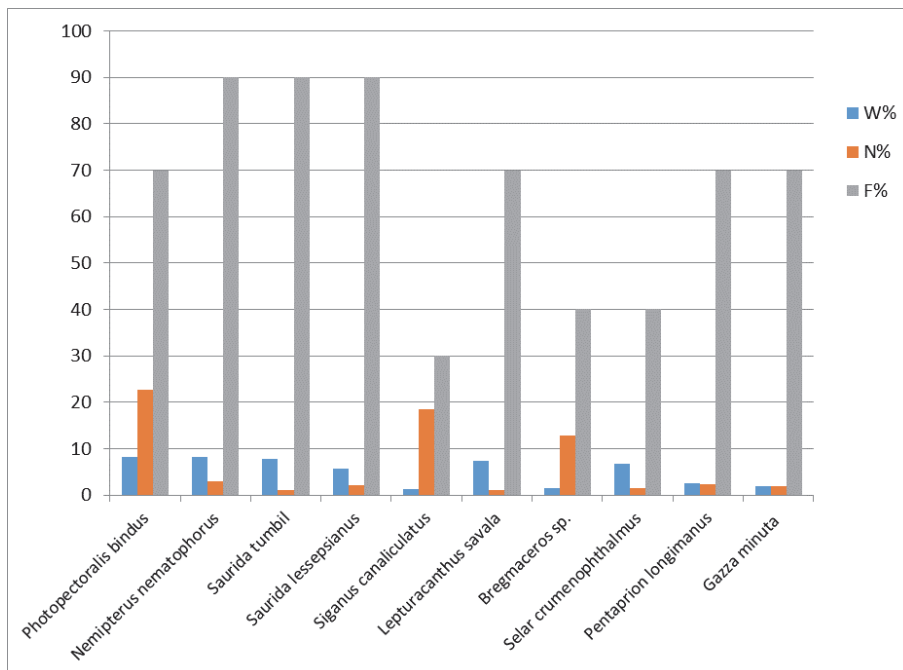
The relative numeric abundance (N), the relative weight (W) and the frequency of occurrence (F) of the 10 most important species (%IRI) for each stratum were extracted and are shown in Figure 33. The figures illustrate the substantial change in species composition between the different strata for each region.

a) Rakhine coast

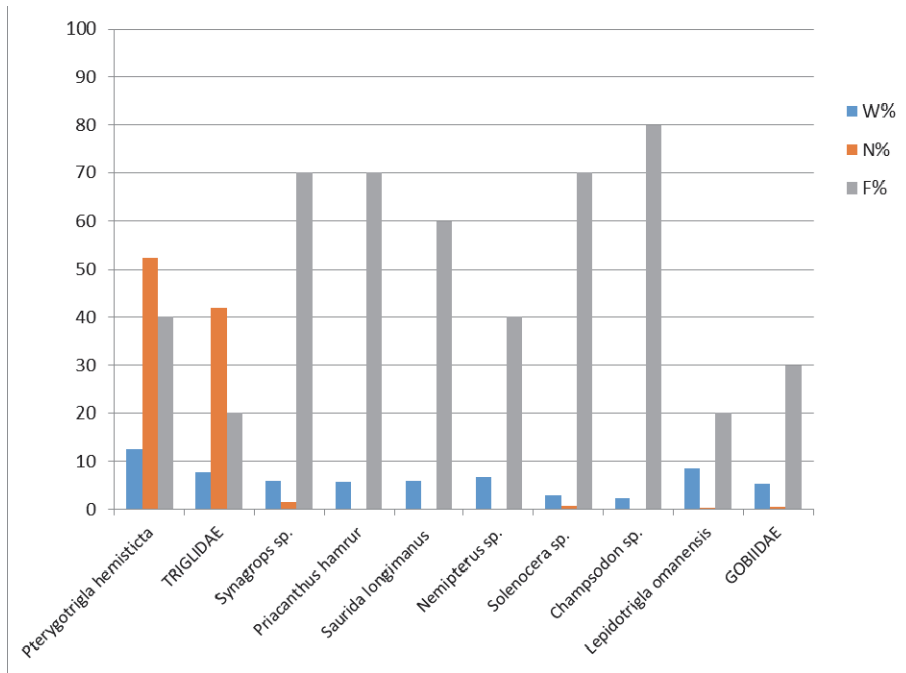
0-50 m



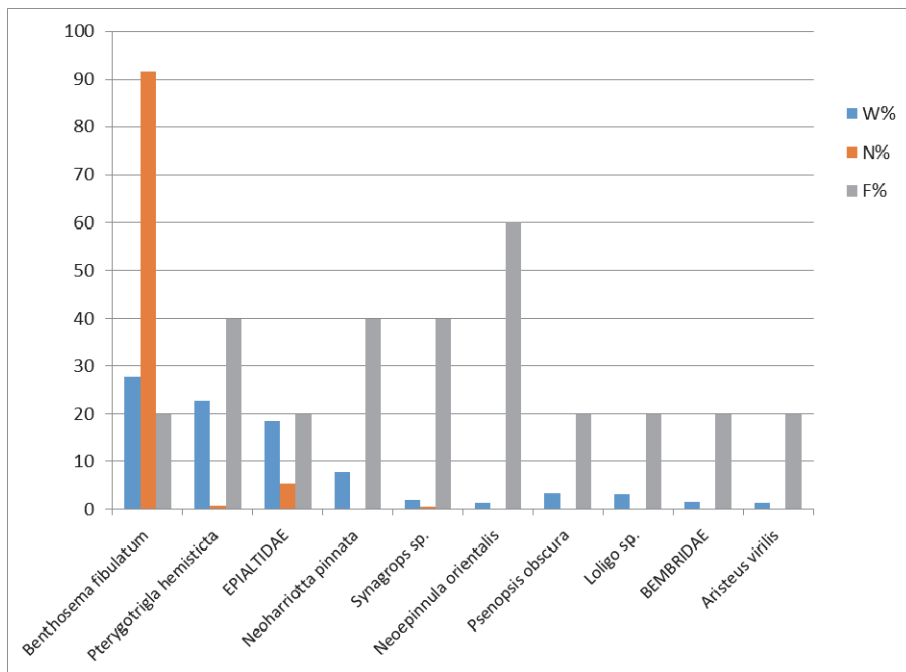
50-100 m



100-200 m

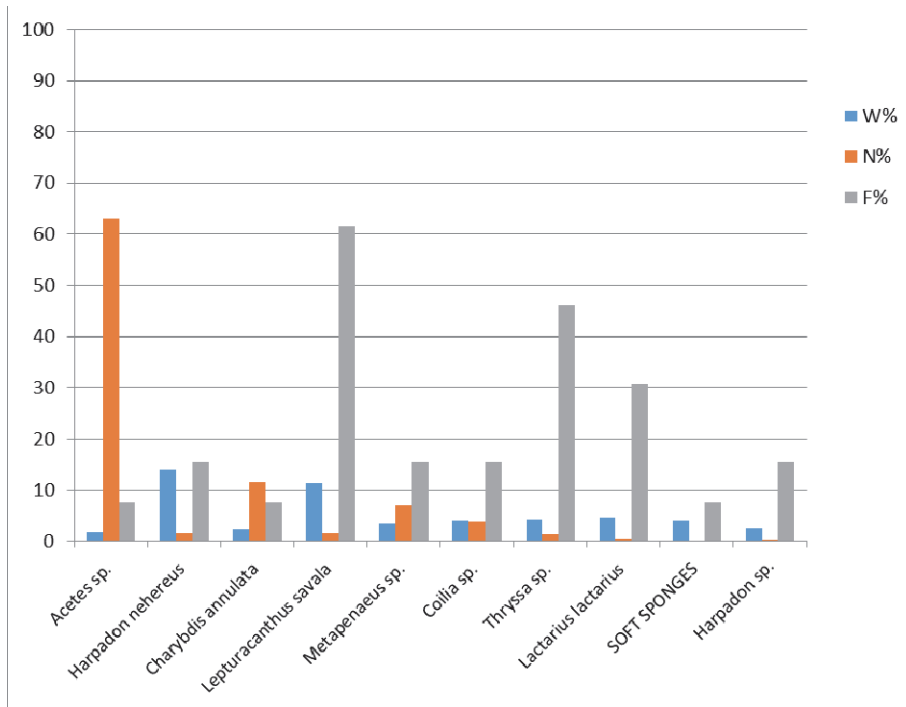


> 200 m

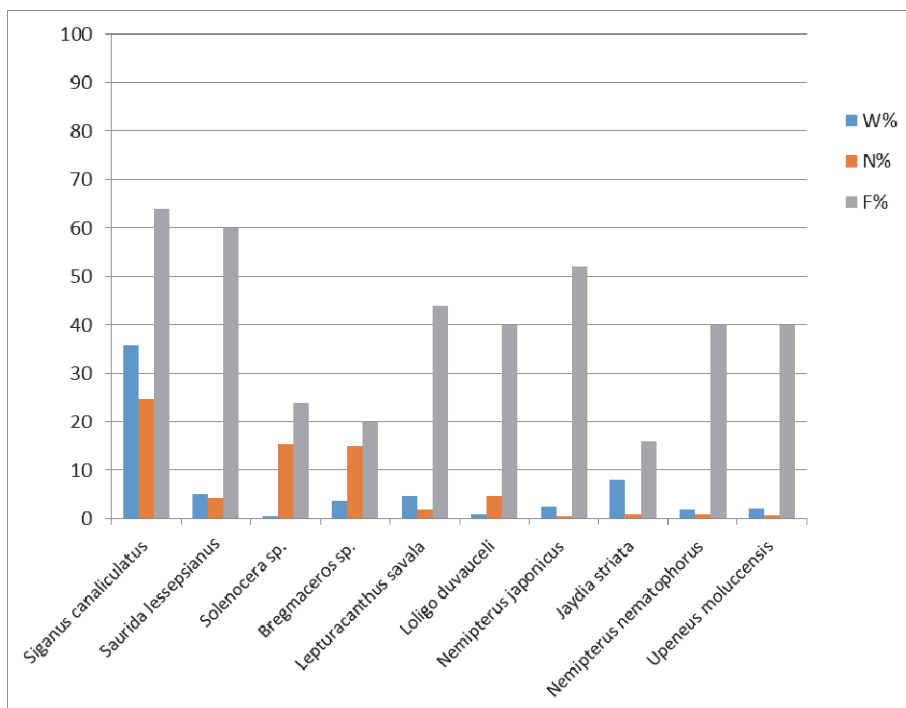


b) Ayeyarwady delta coastal region

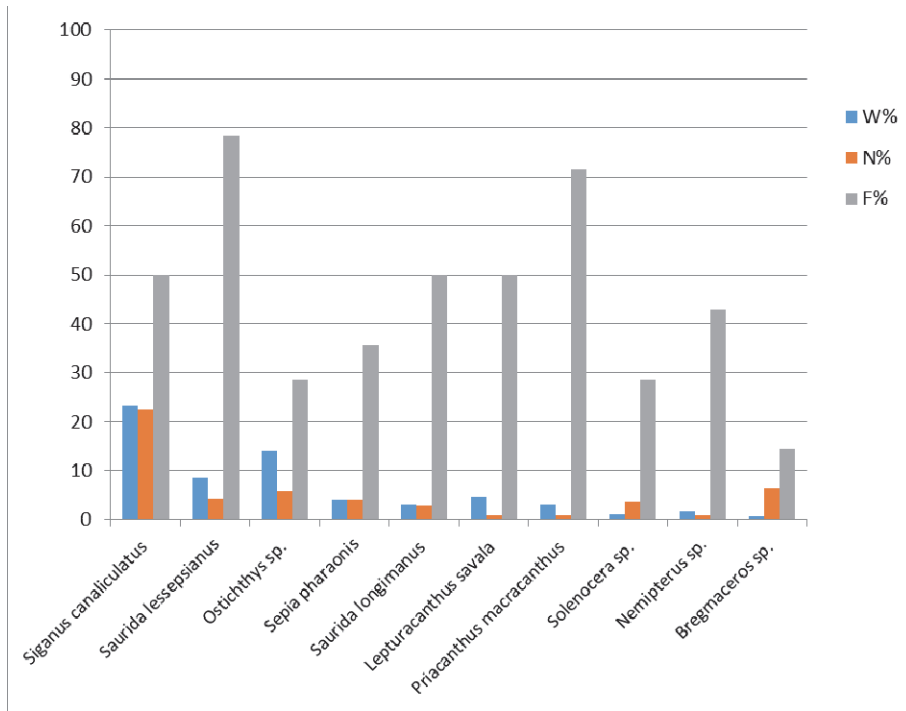
0-50 m



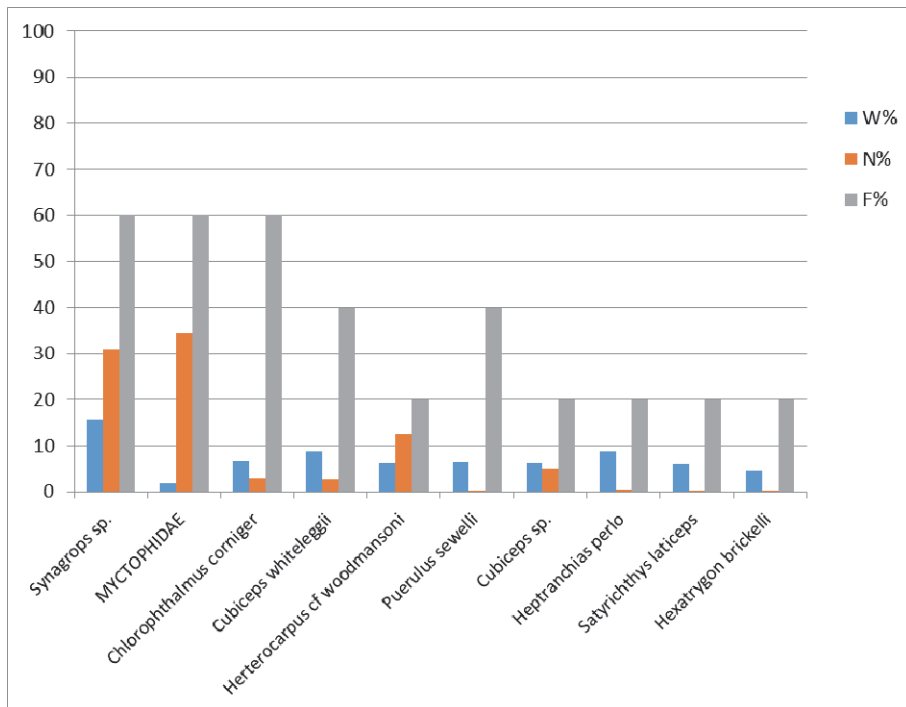
50-100 m



100-200 m

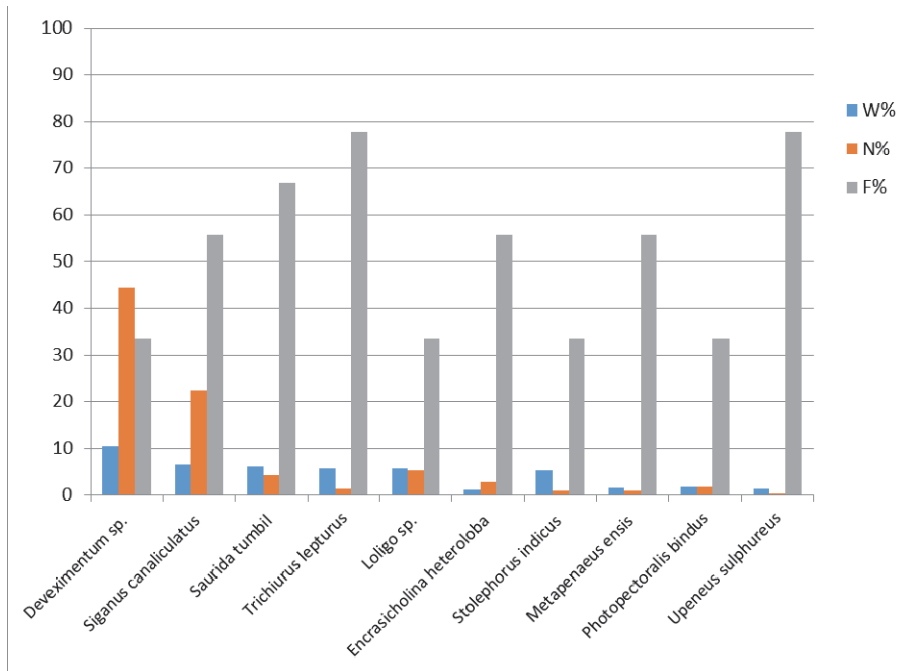


> 200 m

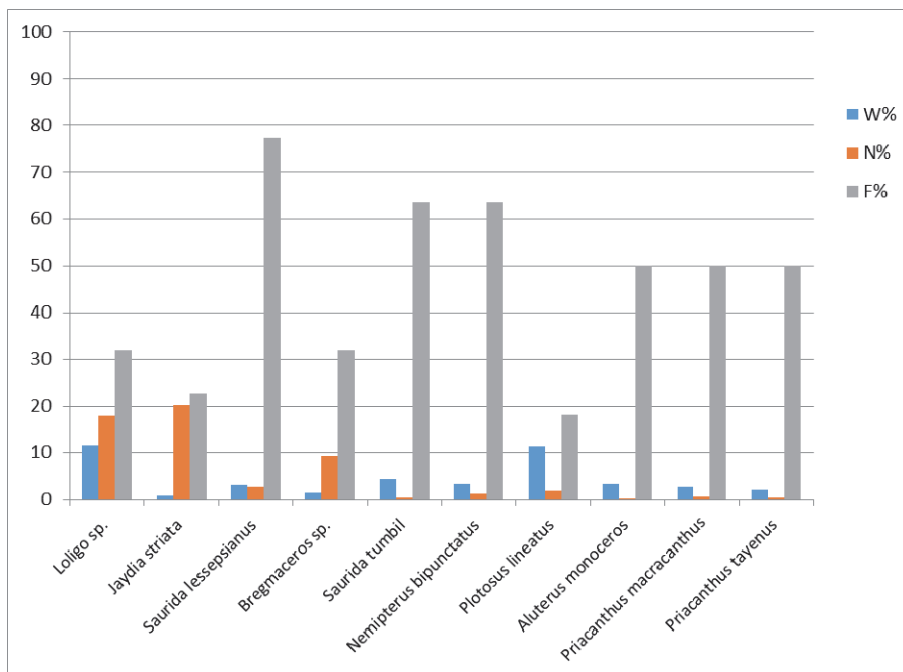


c) *Tanintharyi* coastal region

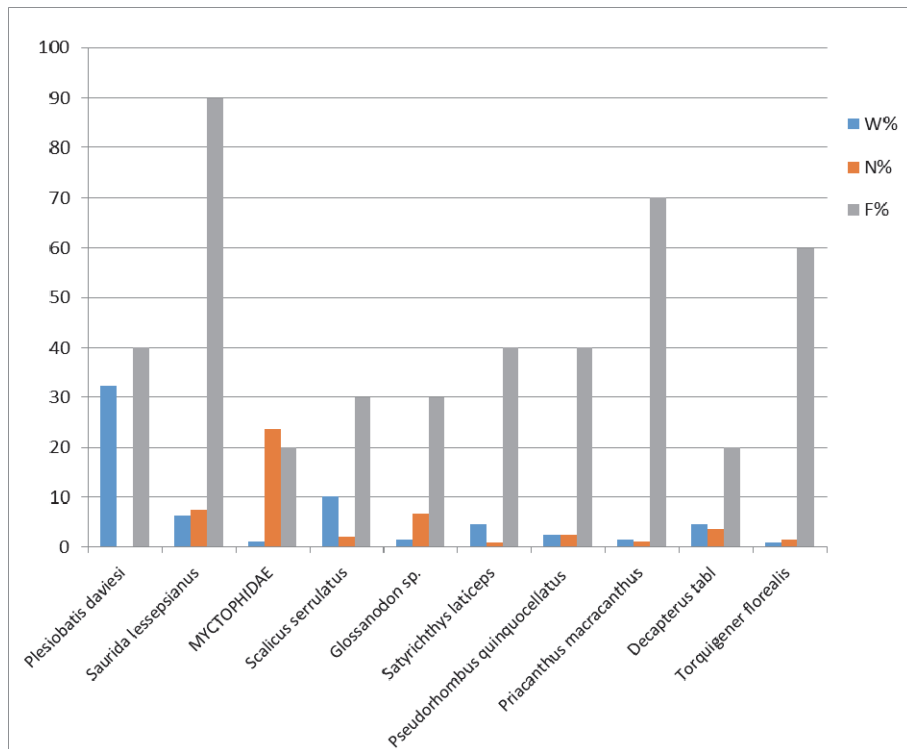
0-50 m



50-100 m



100-200 m



> 200 m

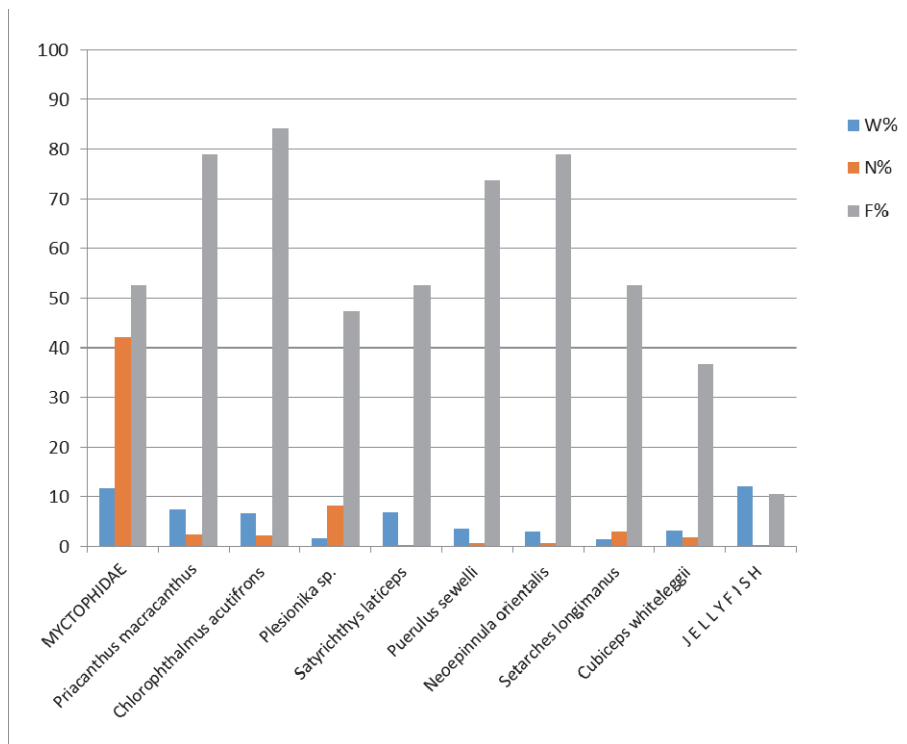


Figure 33. Index of relative importance for the 10 most important species or species groups for the depth strata 20-50 m, 50-100 m, 100-200 m and 200-500 m in the Rakhine coastal region (a), the Ayeyarwady delta coast (b) and the Tanintharyi coast (c).

Comparison in the number of species/taxa identified by region between the 2013, 2015 and 2018 surveys (Figure 34) shows an increasing trend. Although the surveys were conducted in different seasons and changes in the faunal structure and composition could have been influenced by seasonality, the main reason for this increment is most likely the improved capacity of the staff on board the *R/V Dr Fridtjof Nansen* to identify different species in the catches. Training on board and the production of a FAO national species identification guide contributed to achieve this result.

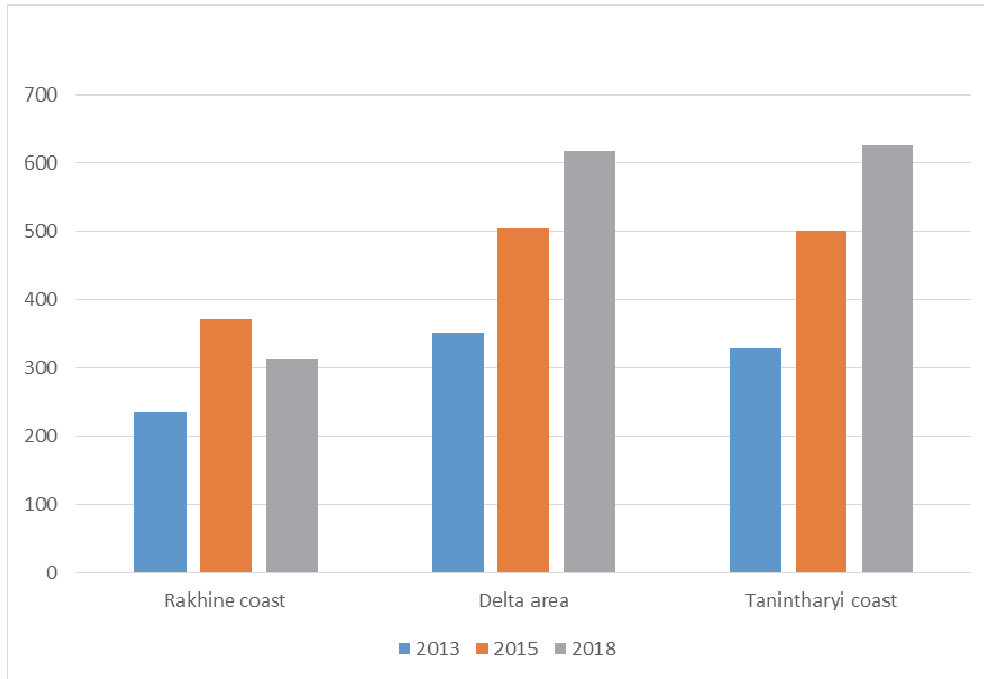


Figure 34. Number of identified species/taxa by region and survey.

Comparison between the 2018, 2015 and 2013 surveys (Figure 35) shows some differences in the percentage in weight of families/groups in the catches.

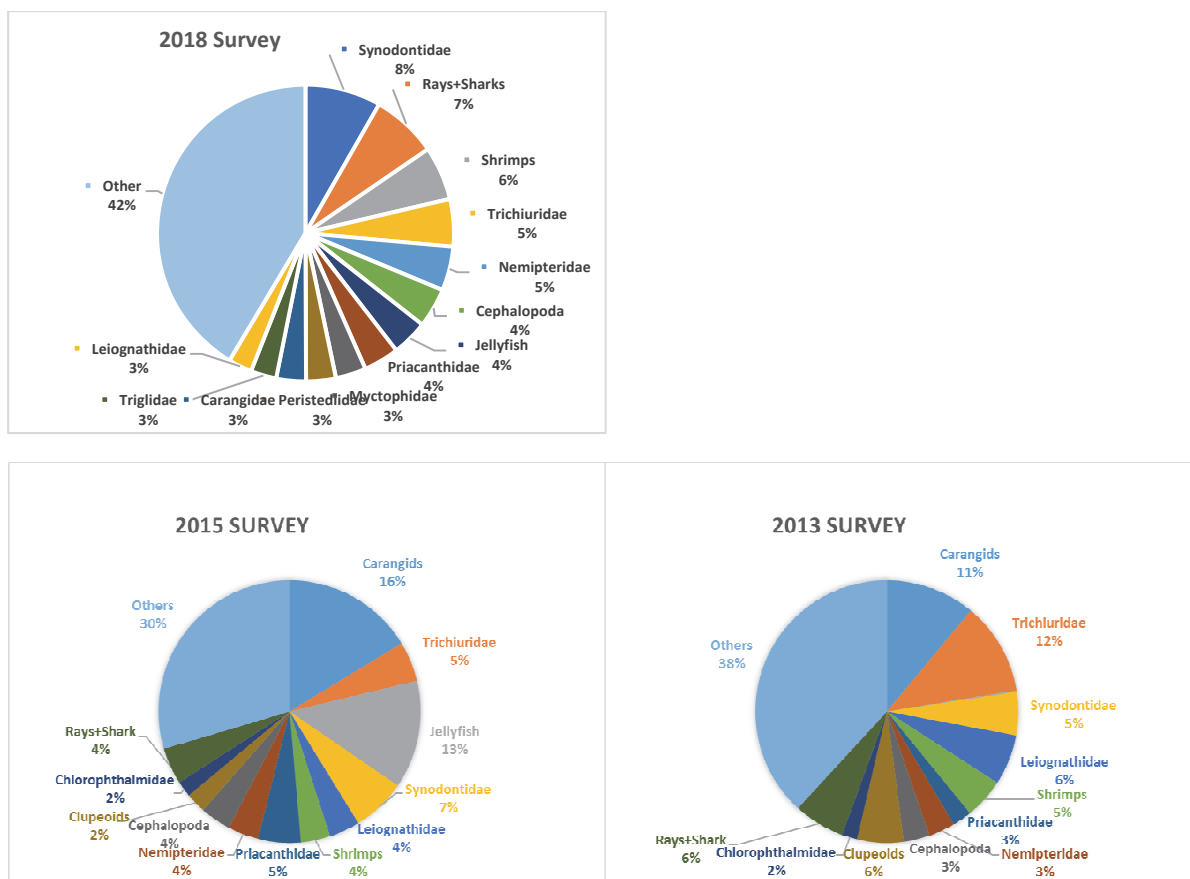


Figure 35. Differences in percentage in weight of families/groups in the catches between the 2018, 2015 and 2013 surveys (all regions combined). Figure based on catches in kg/h.

6.4 Taxonomy and genetics

Several specimens belonging to various taxonomic groups were collected during the survey. The latter have been photographed, tissue sampled, fixed and shipped to specialists around the globe for more detailed studies. 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 7 RESULTS: ADDITIONAL EXPERIMENTS

7.1 Sediment samples

All sediment samples were offloaded with the Myanmar participants at end of Leg 1 and 2 respectively. The samples were divided by region and will be analysed at local University; at the Yangon University for data collected from the Rakhine coast and the Ayeyarwady delta region, and at the Kawthaung University for data collected from the Ayeyarwady delta and southern area (Leg 1 and 2 respectively).

7.2 Food safety

Samples for food safety were collected during the survey and sent to IMR in Bergen. The data will be analysed after the survey and results published through an international effort that includes participants from Myanmar.

7.3 Measurements on egg neutral buoyancy on live eggs from plankton nets

Limited material of live fish eggs was available for measurements of egg buoyancy, because few species were observed spawning during the cruise. A batch of live unidentified eggs, slightly larger than 1 mm in diameter, was caught in the manta trawl at the triangle stations south of Munaung Island (station 669, 23 m depth 27.08.2018 18:08) during a wind force of 5 m/s. The eggs were inserted in the salinity gradient column and appeared to have an initial average neutral buoyancy in terms of salinity at 27.39. The average buoyancy decreased during development and was 26.62 9 hours later (red triangles in Figure 36). Column temperatures were 22.0 and 22.4 °C, respectively. The decrease in buoyancy during egg development is a good indication of viable eggs, particularly as this development was after the lens stage when embryo starts the major development. Lighter eggs during this stage is a sound marker of improved osmoregulation (Jung et al. 2014), while decreased buoyancy (i.e. heavier eggs) during this stage implies deficient performance on osmoregulation that subsequently is mortal.

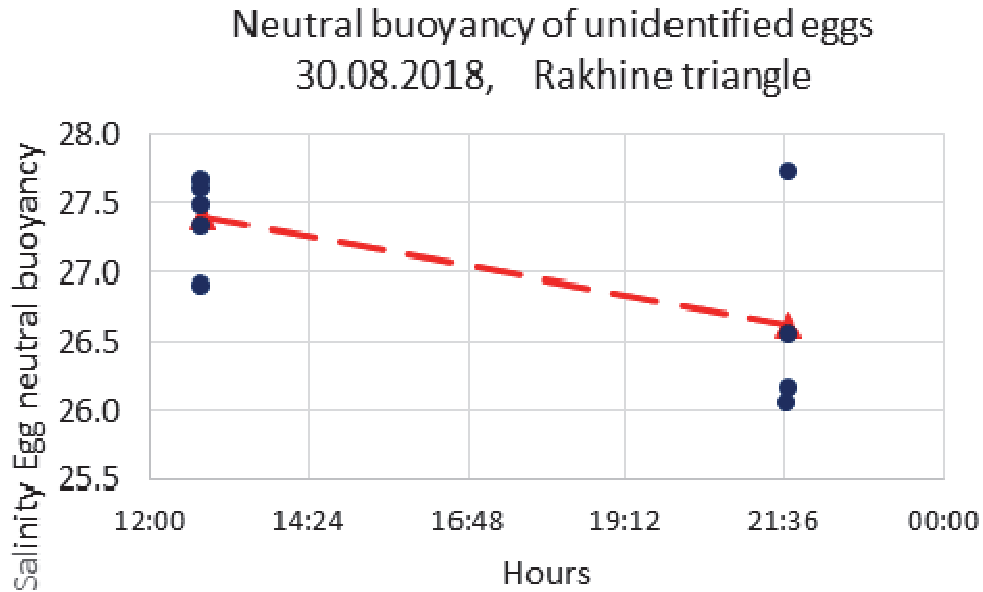


Figure 36. Neutral buoyancy of 6 unidentified fish eggs caught in the manta trawl in the sampling triangle south of Munaung Island. Eggs were inserted in the column on 30.08.2018. First observation of egg neutral buoyancy at 12:48. Second observation at 21:40. Blue circles: individual eggs. Red triangles: Mean value of the egg batch.

The salinity in the surface layer of the triangle where the eggs were caught was ranging from 28.5 (sta. 669) to 30.2 (sta. 659). At 20 m depth salinity was ranging between 30.2 and 30.6. The vertical salinity profile is shown in Figure 37. It implies that the unidentified eggs are lighter than the ambient surface waters and will therefore be pelagically distributed, i.e. with increasing concentration towards the surface where the steepness of the increasing concentration is determined by the vertical mixing of the water column and mainly determined by the wind-induced mixing (Sundby 1983). According to Sundby (1983) it is possible to model the vertical distribution of the eggs. Figure 37 shows modelled vertical distribution of the eggs under three different situations of wind mixing, at 2 m/s, 7 m/s and at 12 m/s.

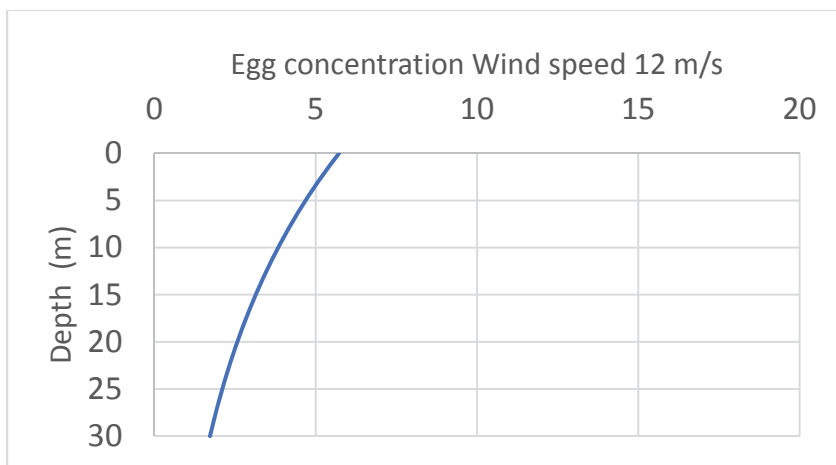
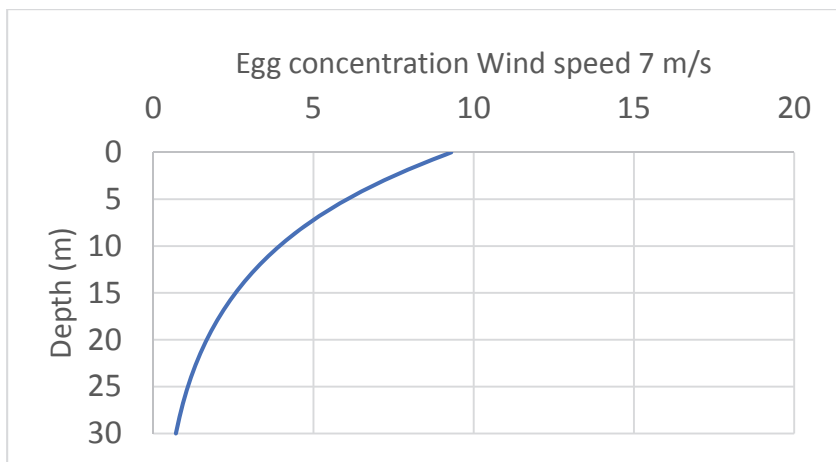
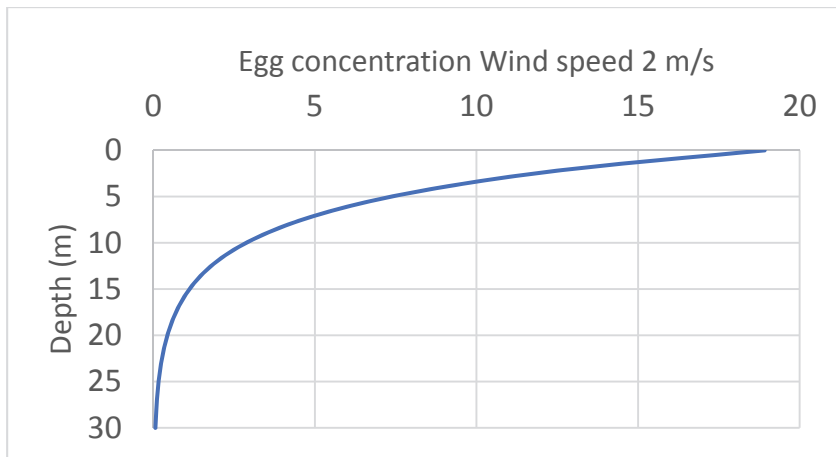


Figure 37. Modelled vertical distribution of the buoyancy-measured eggs (above figure) collected from the Manta trawl in the Rakhine triangle. The modelled scenario is for three different situations of wind-induced vertical mixing: 2 m/s, 7 m/s, and 12 m/s.

Two newly spawned Anguilliform eggs, were caught in the manta trawl (mesh size 335mm) at station 723 at 02.09.2018 09:34 (15°43'N 094°24,8'E). One egg was stored in the plankton lab at about 26 °C. It hatched at 06.09.2018 18:30. The eggs had initially a large fraction of perivitelline space. As they developed the perivitelline space became substantially smaller. The other egg was inserted in salinity gradient column No 3 and developed at 21.1-22,3 °C. Initially, it floated near the surface and then gradually sank through the column. However, it floated up again when embryo developed and perivitelline space was reduced. At 07.09.2018 17:10 it was observed in the column at salinity neutral buoyancy of 27,31. Salinity at sampling point (station 723) was 30.85 at 15 m depth. However, farther east nearer the brackish water plume in the delta salinity was below 25 at 4 m depth implying that these eggs must be at depth floating below the brackish water layer. The development in buoyancy is shown in Figure 38. The increase in density in the morning of 9 September 2018 is an indication of hatching is approaching, and larvae started moving. During the final stage before hatching egg was increasing in density and had salinity neutral buoyancy of 30.58 prior to hatching at 10.09.2018 09.

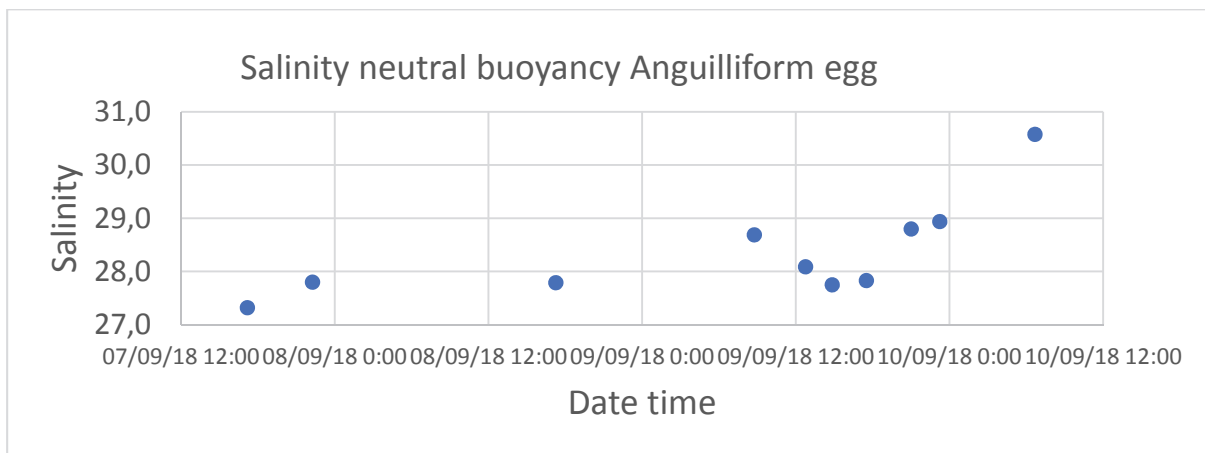


Figure 38. Development in neutral buoyancy in Anguilliform egg caught in Manta trawl at station 723, at 02.09.2018 09:34 (15°43'N 094°24,8'E). Hatching occurred 10.09.2018 09. Arrow show the hatching time.

According to the buoyancy measurements of the Anguilliform egg, caught in high-saline water southwest of the brackish water plume in the Ayeyarwady delta region, these eggs would be pelagically distributed as in Figure 39. However, when they are transported towards northeast by the SW monsoon, they would be diving down under the brackish water plume (Figure 39).

Effect of salinity structure on distribution of pelagic eggs in the Ayeyarwady Delta

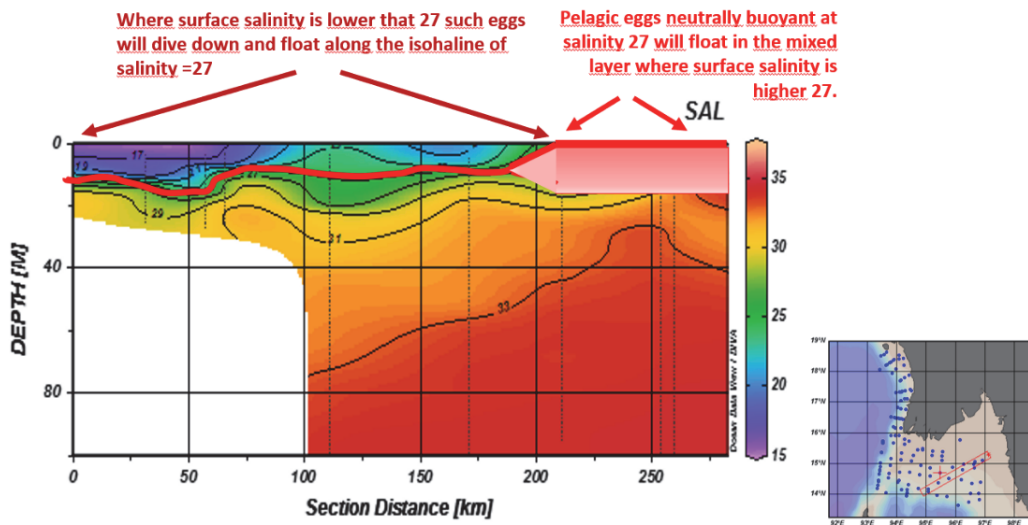


Figure 39. Section of salinity in the Ayeyarwady delta. In the SW part of the section (right part of the section) Anguilliform eggs would be pelagically distributed (blue shading). In the NE part of the section such eggs would be distributed epipelagically along the isohaline coinciding with egg neutral buoyancy of about salinity 27.

Experiments on artificial fertilization of eggs

Experiments on artificial fertilization of mature fish from the trawl catches were conducted with the objectives 1) to support identification of wild-caught eggs in the plankton samples, and 2) measure egg buoyancy in identified species.

On 06.09.2018 (UTC 16:33) ripe and running males of Savali hairtail (*Lepturacanthus savala*) were caught in trawl haul 68 south of the river delta in the northern Andaman Sea. One female in a nearly running stage was also caught. Artificial fertilization was tried on the eggs from this female. However, none of the eggs appeared to be in live conditions. All eggs inserted in column 2 sank rapidly to the bottom of the column.

At trawl haul 72 in the evening of 06.09.2018 ripe and running males and females of the species *Saurida undosquamis* were caught but fertilization was not successful. At a new trawl haul 07.09.2018 16:00 more fish nearly mature was caught. Neither this time was any of the artificially fertilized eggs developed viable.

In conclusion, artificial fertilization was not further attempted because of lack of ripe and running fish.

Concluding remarks on buoyancy, vertical distributions of fish eggs and spawning

Myanmar waters are stratified year around. It implies that fish eggs are expected to be distributed both 1) pelagically, i.e. distributed in the mixed layer with increasing concentration towards the surface depending on buoyancy and wind mixing, and 2) epipelagically where they would float in depth at isohalines corresponding to their salinities of neutral buoyancies. Particularly, in the Ayeyarwady delta it would be expected to find fish

eggs epipelagically distributed. Benthic eggs are less abundant in the world's oceans, and in Myanmar waters such eggs would be expected to be limited to inshore waters, since hypoxic waters are extending high up in the water column and may occasionally occur at the outer shelf of depths as shallow as 100 m. Differently from eggs from vertebrates, eggs from invertebrates (i.e. crustaceans) do not osmoregulate. Therefore, such eggs would not keep constant specific gravity, but would attain same internal salinity as the ambient. Invertebrate eggs will there be heavier than the surrounding seawater and would be expected to be found at the bottom. To avoid exposure to occasions of hypoxia it is, therefore, expected that invertebrate eggs should be primarily be found inshore at shallow depths.

Low abundance of fish eggs was found during the cruise, particularly in the southern Rakhine region. Also, abundance of ripe and running fish in the trawl hauls was low. Hence, both the ichthyoplankton and the trawl sampling are consistent indicating that August-September is off spawning season. This is also confirmed by literature on spawning fish. Table 14 shows historic literature on spawning periods of fish in Myanmar waters and waters of the East Coast of India. Also, this literature confirms the finding of the cruise.

Table 14. Historic information on spawning times in Myanmar water and waters of the east coast of India.

Spawning seasons in the Northeastern Indian Ocean														
Reference	Area	Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DES
Sajina et al (2011)	East coast India	Horse mackerel (<i>Megalaspis cordela</i>)			x	x	x							
Dan (1977)	Andhra coast, Eastern India	Catfish (<i>Tachysurus tenuispinis</i>)					x	x	x	x	x			
Radhakrishnan	East coast India	Indian mackerel (<i>Rastrelliger canagurta</i>)					x	x	x	x	x			
Sawakima et al (2001)	East coast India	<i>Priacanthus hamrur</i>							x	x	x			
Abdussamad et al (2004)	Kakinda east coast India	Cuttlefish (<i>Sepia aculeata</i> and <i>Sepia pharaonis</i>)	x	x	x							x	x	x
Nair et al (2006)	Kakinda; east coast India	Ribbonfish (<i>Trichiurus lepturus</i>)	x	x	x								x	x
Najmuden et al (2004)	Gulf of Mannar	Abalone (<i>Haliotis varia</i>)			x	x	x							
Hossain et al (2015)	Bay of Bengal Bangladesh	Hilsa shad (<i>Tenualosa ilish</i>)										x	x	
Krajangdara and Watanabe (2004)	Andaman Sea Thailand	Red frog crab (<i>Ranina ranina</i>)	x	x									x	x
Rangarajan (1971)	Andaman Sea	Snapper (<i>Lutianus kasmira</i>)	x	x	x								x	x
Venkatasubba (1983)	Bay of Bengal	Lizard fishes (<i>Saurida</i> spp)	x	x	x							x	x	x
Kongjandtre et al (2010)	Thailand reefs	<i>Favia</i> spp			x	x								
Somvanshi (2002)	Andaman Sea	Yellowfin Tuna (<i>Thunnus albacares</i>)	x	x	x	x							x	x
Nootmorn (2004)	Thailand Eastern Indian Ocean	Bigeye tuna	x	x	x	x	x	x						x
Sukramongkol et al (2006)	Andaman Sea Thailand	Squids (<i>Loligo duvauceli</i> and <i>L. chinensis</i>)	x	x	x	x	x	x					x	x
Marichamy (1971)	Andaman Sea	Spotted herring (<i>Herklotsichthys punctatus</i>)					x	x				x	x	
Marichamy (1970)	Andaman Sea	Anchovy (<i>Thrissina baelama</i>)	x						x	x			x	x
Koolkaya et al (2006)	Andaman Sea Thailand	Mud crab (<i>Scylla olivacea</i>)										x	x	x

More observations on fish and higher frequency of nearly ripe and running fish were found in the Ayeyarwady delta than in the Rakhine area. Also, higher primary production is found year around in Ayeyarwady delta indicating that spawning might be more extended through the year here. However, neither here August-September could not be high season for spawning.

CHAPTER 8 SUMMARY AND CONCLUSIONS

This cruise is the third with the R/V *Dr Fridtjof Nansen* in recent years. A new vessel has replaced the previous vessel but there is no reason to believe that this influences the results in any way. This third cruise demonstrates even more strongly that the seasonal fluctuations in this region with large scale spatial differences both in the marine environment and in the distribution and abundance of different fish species along the coast. The tree regions are very different in their ecology, and have an enormous biodiversity compared to other tropical regions visited by the vessel. During the last surveys several new species of marine fish have been discovered and it is expected that also this survey will reveal new fish species from the coast of Myanmar. Fish biomass is generally low, at the level of the 2013 survey, and this is a concern.

8.1 Environment

The wind was strong from northwest in the northern part of the survey area shifting to a more eastward direction in the Ayeyarwady delta region with decreasing intensity eastwards. Most of the southern region experienced calm weather conditions except for some stronger south easterly winds in the Myeik area.

Near-surface temperature (5m depth) typically ranged from 27.5 – 29°C, with relatively stable conditions on a broader scale. The warmer temperatures were generally found towards the east and south in coastal areas while slightly cooler water was typically observed near the river mouths. Water masses are generally uniform in the surface layer with a thermocline as deep as 75-100 m. Strong effects of river outflow are seen in some areas affecting upper surface water masses. Near-surface salinity were generally low, but highest along the Rakhine coast ranging from 32.2 offshore to 27.5 inshore. Salinity declined eastwards into the Ayeyarwady delta region with values as low as 12 observed in the inner eastern part. More saline water masses were observed in the south intruding northwards inshore and offshore.

Hypoxic watermasses are common on the shelfedge at intermediate depths. On the Rakhine coast water masses are anoxic (<0.1 ml/l) between 100 – 400 m.

The near-surface relative fluorescence ranged from 0 to 0.8 in most of the survey area with slight increases offshore. The main source of nutrients driving primary production in the period of the survey are most probably the rivers. Altering the waterflow may therefore affect production along the coast. One high concentration patch was observed in the Ayeyarwady delta region while a slight increase in fluorescence was observed in the far south – east of the survey area. coinciding with higher numbers of echo registrations in the water column and with an increasing number of fishing vessels.

As indicated also from the fluorescence levels, nutrients were generally depleted in the surface waters, except in the Tanintharyi coastal region where slightly elevated nitrate values were observed.

8.2 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 covering the shelf of Myanmar from 18°29' N in the north to the border with Thailand at 10°00' N in the south, see Figure 1 and 2. This is slightly further south than the 2013 and 2015 surveys. Areas inshore 20 m depth were not covered, and the reported abundance estimates does not include those areas even though we are aware that these are important fishing grounds.

The total estimate of pelagic fish is 165 000 tonnes. In 2015 a total estimate of 193 000 tonnes were recorded while in 2013 109 000 tonnes were reported. Of this, 11 000 tonnes were estimated to be Pelagic 1 species while 153 000 was estimated to be Pelagic 2. Overall results are comparable to 2013 and 2015, with some differences in the distribution interpreted as a seasonal effect. Historically the pre-monsoon season has shown better catch rates offshore than the post monsoon period during which this survey took place.

The total swept area biomass estimate (Table 15) based on valid bottom trawl hauls was 274 000 tonnes, again at similar level as in 2013 (273 000 tonnes) and somewhat lower than in 2015 (367 000 tonnes) (Figure 32, table 15). In 2018 it was the Ayeyarwady delta region that had highest biomass, and this differed from the previous surveys. Historically the pre-monsoon season has shown better catch rates offshore than in the post monsoon period. In 2015 high jellyfish concentrations were observed along the coast. This was not a problem to the same extent in 2018.

Table 15. Summary of biomass estimates from the different regions and depth strata estimated during the 2013, 2015 and the present survey.

Depth/ Region	Rakhine coast			The Ayeyarwady delta coast			The Tanintharyi coast		
	2013	2015	2018	2013	2015	2018	2013	2015	2018
20-50 m	31 000	16 000	11 000	31 000	41 000	58 000	12 000	28 000	30 000
50-100 m	19 000	51 000	11 000	40 000	46 000	40 000	47 000	38 000	22 000
100-200 m	4 900	4 700	4 700	19 000	26 000	31 000	10 000	31 000	10 000
200-500 m	5 200	23 000	6 300	11 000	13 000	14 000	43 000	48 000	50 000
Total	60 000	95 000	33 000	101 000	126 000	143 000	112 000	146 000	114 000

In 2015 it was noted in the survey report that it was encouraging to see that the estimates in general were higher than in 2013. The results from this survey seem to indicate that seasonal fluctuations may explain differences in biomass estimates. As mentioned in the introduction to this report several management measures were put in place by the Myanmar Government since the 2013 survey, it is not possible to separate the effect of these to the seasonal effect of increased available biomass in the pre monsoon season, especially given the lack of reliable

catch statistics. There are no indications that the measures taken so far have any significant positive effect in terms of biomass.

8.3 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 considerably lower biomass estimates compared with the findings from the four surveys in 1979 and 1980 (Strømme et al 1981).

A total of 1016 taxa were recorded during the survey. Bony fishes were by far the most represented taxonomic group with 745 species/taxa. Overall, the species richness is highest in the Tanintharyi coast, while if looking at the depth strata separately, the most species rich area was the 100 -200 m depth stratum in the Ayeyarwady delta . An increase in reported taxa from the surveys is not a consequence of increased biodiversity but an increased ability of the Myanmar scientists to identify the species encountered as part of the survey.

8.4 Egg and Larvae

Low abundance of fish eggs was found during the cruise, particularly in the southern Rakhine region. Also, abundance of ripe and running fish in the trawl hauls were scarce. Hence, both the ichthyoplankton and the trawl sampling are consistent indicating that August-September is off-spawning season. This is also confirmed by literature on spawning fish. Table 14 shows historic literature on spawning periods of fish in Myanmar waters and waters of the East Coast of India. Also, this literature confirms the finding of the cruise.

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ANNEX I. LIST OF PARTICIPANT LIST FROM 24 AUG TO 11 SEPT 2018

Vessel : "Dr. Fridtjof Nansen" Cruise no: 2018411						
Departure date: 24.08.18				Port of departure: Yangon		
Arrival date: 11.09.18				Port of arrival: Yangon		
Port of call:						
Survey area: Myanmar						
Objectives:						
	Participants	Background	e-mail address	Sex	Institution	Country
1	Kathrine Michalsen	Cruise leader	kathrine@hi.no	F	IMR	Norway
2	Merete Kvalsund	Fish lab		F	IMR	Norway
3	Tor Ensrud	Chemical oceanography		M	IMR	Norway
4	Svein Sundby	Physical oceanography		M	IMR	Norway
5	Stamatina Isari	Team leader plankton		F	IMR	Norway
6	Endre Johnsen	Food safety		M	IMR	Norway
7	Jan Frode Wilhelmsen	Instrument engineer		M	IMR	Norway
8	Olaf J. Sørås	Instrument engineer		M	IMR	Norway
9	Mya Than Tun	Taxonomist	myathantundof@gmail.com	M	WCS	Myanmar
10	Htun Thein	Local cruise leader	htunthein.akyab@gmail.com	M	DoF	Myanmar
11	Kyaw Swar Oo	Water chemistry	kyawswaroodof97@gmail.com	M	DoF	Myanmar
12	Saw Aung Htet	Water chemistry	sawaunghtet2012@gmail.com	M	DoF	Myanmar
13	Saw Soe Moe Thu	Fisheries biology	soemoethudawphya@gmail.com	M	Yangon	Myanmar
14	Soe Win	Fisheries biology	soewinn67@gmail.com	M	DoF	Myanmar
15	Chit Aung Thu	Fisheries biology	chitaungthu.dof@gmail.com	M	DoF	Myanmar
16	Aung Aung Htiak	Fisheries biology	uaungaunghtaik@gmail.com	M	Mawlamyine	Myanmar
17	Zayar Min	Fisheries biology	zayarmintica@gmail.com	M	DoF	Myanmar
18	Bhone Myint Aung	Fisheries biology	ppaing35@gmail.com	M	DoF	Myanmar
19	Sakda Arbsuwan	Fisheries biology	sakdaarbsuwan@gmail.com	M	DoF	Thailand
20	Nirun Choosuan	Fisheries biology	nirun222@hotmail.com	M	DoF	Thailand
21	Ziza War	Plankton biology	zizawahwah@gmail.com	F	DoF	Myanmar
22	Thet Yu Yu Swe	Plankton biology	thetyuyuswe@gmail.com	F	DoF	Myanmar
23	Aung Myho Hsan	Plankton biology	ms.aungmyohsan.ms@gmail.com	M	Mawlamyine	Myanmar
24	Thu Thu Min	Plankton biology	thuthumin36@gmail.com	F	Patheingyi	Myanmar
25	Thura Htun	Plankton biology	thuratun28@gmail.com	M	Patheingyi	Myanmar
26	Khin May Chit Maung	Plankton biology	khinmaymaung1@gmail.com	F	Myeik	Myanmar
27	Ye Min Aung	Plankton biology	rayminaung1@gmail.com	M	DoF	Myanmar

28	Thaung Htut	Food safety	thtut@wcs.org	M	WCS	Myanmar
29	Captine Su Mon Oo			F	Navy	Myanmar
30	Kalli Valappil Akhilesh	Fisheries biology	akhikv@gmail.com	M	CMFRI, India	India
Project no. 15113-35						

Contact information; +47 55906460 and +47 99548548 (vessel)

DISTRIBUTION: Captain 'Dr. F. Nansen', Institute of Marine Research, Local Cruise leader, Ships agent, Nansen archive, Kathrine Michalsen, Gabriella Bianchi, EAF- Nansen SharePoint

List of acronyms; IMR – Institute of Marine Research

List of institution abbreviations:

IMR - Institute of Marine Research

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

DoF - Department of fisheries, Thailand

MLMU- Mawlamyine University, Mon State

MU- Myeik University

YGNU- Yangon University

NAVY - Myanmar Navy Hydrographic office

CMFRI - Central Marine Fisheries Research Institute

ANNEX II. LIST OF PARTICIPANT LIST FROM 14 SEPT TO 29 SEPT

Vessel : "Dr. Fridtjof Nansen" Cruise no: 2018411						
Departure date: 14.09.18				Port of departure: Yangon		
Arrival date: 29.09.18				Port of arrival: Kawthuang		
Port of call:						
Survey area: Myanmar						
Objectives:						
	Participants	Background	e-mail address	Sex	Institution	Country
1	Jens-Otto Krakstad	Cruise leader		M	IMR	Norway
2	Merete Kvalsund	Team leader fish		F	IMR	Norway
3	Ines Bernardes	Team leader fish		F	IMR	Norway
4	Helene Lødemel	Chemical oceanography		F	IMR	Norway
5	Bahar Mozfar	Team leader plankton		F	IMR	Norway
6	Endre Johnsen	Food safety		M	IMR	Norway
7	Geir Landa	Instrument engineer		M	IMR	Norway
8	Hege Rognaldsen	Instrument engineer		F	IMR	Norway
9	Peter Psomadakis	Taxonomist		M	FAO	Italy
10	Htun Thein	Localcruise leader	htunthein.akyab@gmail.com	M	DoF	Myanmar
11	Zaw Myo Hein	Water chemistry	zawmyohein09@gmail.com	M	Myeik	Myanmar
12	Yin Yin Than	Water chemistry	yinyinthan.fg@gmail.com	F	DoF	Myanmar
13	Ziza War	Plankton biology	zizawahwah@gmail.com	F	DoF	Myanmar
14	Chit Aung Thu	Fisheries biology	chitaungthu.dof@gmail.com	M	DoF	Myanmar
15	Aung Aung Hteik	Fisheries biology	uaungaunghtaik@gmail.com	M	Mawlamyine	Myanmar
16	Zayar Min*	Fisheries biology	zayarmintica@gmail.com	M	DoF	Myanmar
17	Bhone Myint Aung	Fisheries biology	ppaing35@gmail.com	M	DoF	Myanmar
18	Yae Min Aung	Fisheries biology	rayminaung1@gmail.com	M	DoF	Myanmar
19	Somkiat Ketnaray	Fisheries biology	somkiat77570@gmail.com	M	DoF	Thailand
20	Napat Mahasawat	Fisheries biology	somkiat77570@gmail.com	M	DoF	Thailand
21	Saw Soe Moe Thu*	Water chemistry	soemoethudawphya@gmail.com	M	Yangon	Myanmar
22	Nyi Nyi Tun	Plankton biology	nyihun7@gmail.com	M	DoF	Myanmar
23	Saw Aung Htet	Plankton biology	kmaungmaw@gmail.com	M	DOF	Myanmar
24	Aung Myo Hsan	Plankton biology	ms.aungmyohsan.ms@gmail.com	M	Mawlamyine	Myanmar
25	Wint Yee Paing	Plankton biology	wintyee.wy@gmail.com	F	Pathein	Myanmar
26	Su Su Hlaing	Plankton biology	drsusuhlaingmlm@gmail.com	F	Myeik	Myanmar
27	Khin Maung Naing	Plankton biology	kmn42181176@gmail.com	M	Pathein	Myanmar

28	Thaung Htut	Food safety	thtut@wcs.org	M	WCS	Myanmar
29	Captine Su Mon Oo	Fisheries Biology		F	Navy	Myanmar
30	K.R.Sreenath	Fisheries Biology	lecologiste@gmail.com	M	MFRI	India
Project no. 15113-35						

Contact information; +47 55906460 and +47 99548548(vessel)

DISTRIBUTION: Captain 'Dr. F. Nansen', Institute of Marine Research, Local Cruise leader, Ships agent, Nansen archive, Kathrine Michalsen, Gabriella Bianchi, EAF- Nansen SharePoint

List of acronyms;

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ANNEX III. DESCRIPTION OF ACOUSTIC INSTRUMENTS AND FISHING GEAR

Acoustic instruments

The Simrad EK80/18, 38, 70,120, 200 and 333 kHz scientific sounder was run during the survey. Scrutinizing was done in LSSS using the data from the 38-kHz transducer. Last standard sphere calibrations were checked on the 23.01.2017 in Sandviksflaket, Bergen, Norway using Cu64 for the 18 kHz, Cu60 for the 38 kHz, WC38.1 for the 70, 120 and 200 kHz, and the WC22 for the 333 kHz. The details of the settings for the 38-kHz echo sounder were as follows:

Transceiver2 menu (38 kHz)	
Transducer depth	5 8 m
Absorption coeff.	8.3 dB/km
Pulse duration	medium (1,024ms)
Bandwidth	2.43 kHz
Max power	2000 Watt
2way beam angle	20,6dB
gain	26,95 dB
SA correction	0.03 dB
Angle sensitivity	21.9
3 dB beamwidth	6.22° along ship 6.28 athwart ship
Alongship offset	0.10°
Athwardship offset	0.06°

Bottom detection menu Minimum level 50 Db

Fishing gear

The vessel has one small four-panel Åkrahamn pelagic trawl, one MultPelt 624 trawl (Figure 1, new in 2017) and one 'Gisund super bottom trawl'. The multpelt trawl was not used during the survey due to a problem on the winch system. The smallest pelagic trawl has 8 to 12 m vertical opening under normal operation, whereas the MultPelt 624 trawl has 25 to 35 m opening.

The bottom trawl has a 31-m headline and a 47-m footrope fitted with a 12" rubber bobbins gear. The codend has 20 mm meshes, and has an inner net with 10 mm mesh size. The vertical opening is about 5.5 m. The distance between the wing tips is about 18 m during towing. The sweeps are 40 m long. The trawl doors are 'Thyborøen' combi, 8 m² and weigh 2000 kg. The door spreading is about 45 m when using restraining rope. Trawling was conducted for species identification only and no restraining rope was therefore used during the survey.

The SCANMAR system was used during 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 interdistance and angle, while a height sensor is fitted on the bottom trawl to measure the trawl opening and provide information on clearance and bottom contact.

The all trawls are equipped with a trawl eye that provides information about the trawl opening and the distance of the footrope to the bottom. A pressure sensor is used to show the depth on the headline.

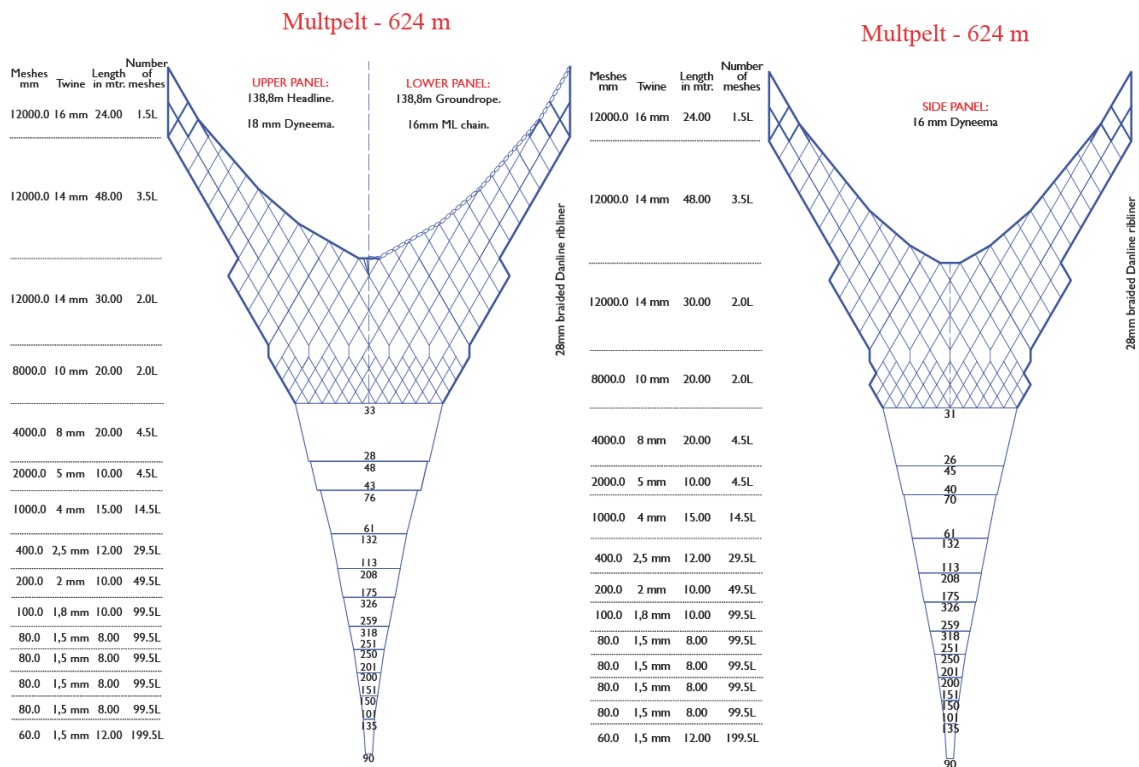


Figure 3.1. Schematic drawing of the MultPelt 624.

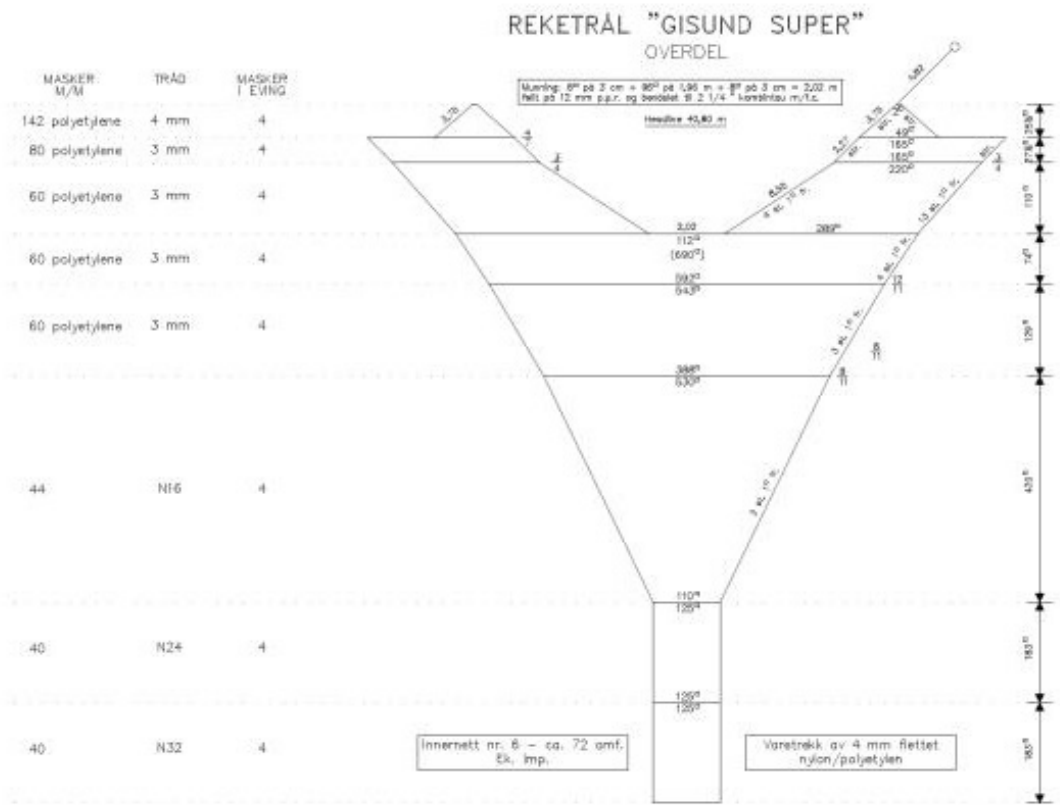
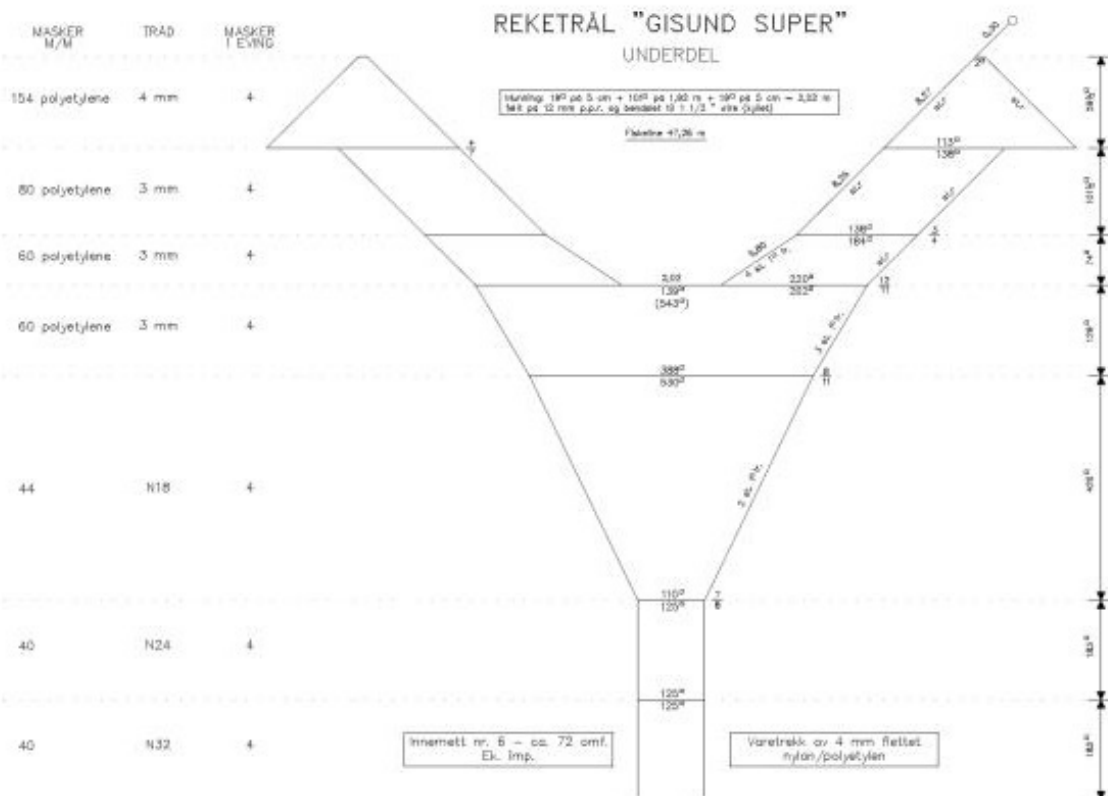


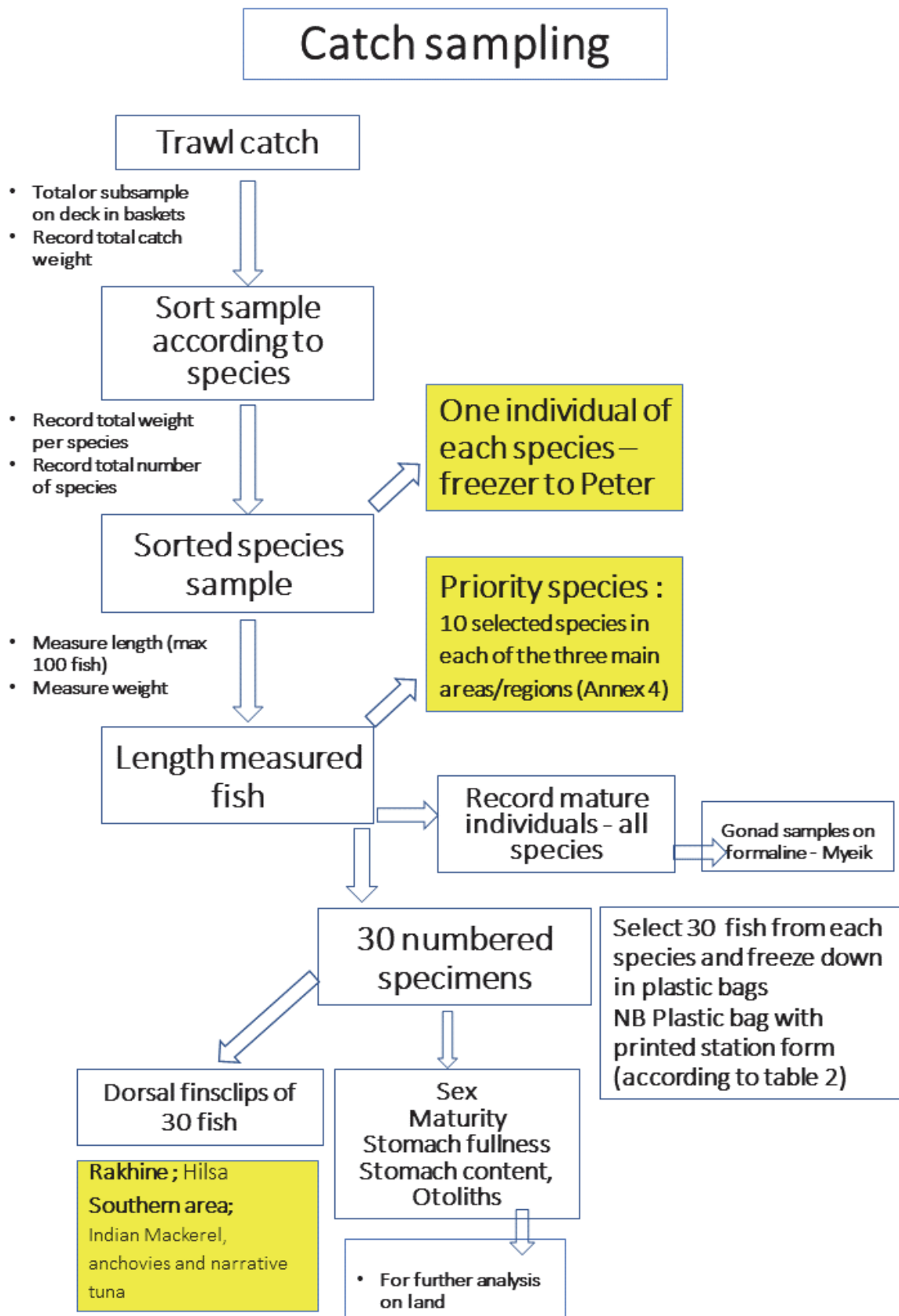
Figure 3.3. Schematic drawing of the Super Gisund bottom trawl.

ANNEX IV. TARGET SPECIES SELECTED FOR LENGTH MEASUREMENTS

Species number	Species code	Species name
1	ARDNE11	Netuma bilineata
2	ARDOS01	Osteogeneiosus militaris
3	CARSC02	Scomberoides commersonianus
4	LATLA01	Lates calcarifer
5	CLUTE03	Tenuالosa ilisha
6	CYGCY27	Cynoglossus lingua
7	HAEP07	Pomadasyys kaakan
8	LETLE28	Lethrinus ornatus
9	LETLE02	Lethrinus lentjan
10	LUTLU06	Lutjanus bohar
11	LUTLU10	Lutjanus johnii
12	LUTLU15	Lutjanus malabaricus
13	LUTLU20	Lutjanus russelli
14	MULUP05	Upeneus sulphureus
15	MUXCY02	Congresox talabon
16	MUXCY01	Congresox talabonoides
17	NEMNE03	Nemipterus japonicus
18	PLNLE01	Leptomelanosoma indicum
19	CLUIL04	Ilisha megaloptera
20	PSEPS02	Psettodes erumei
21	SCICH01	Chrysochir aureus
22	SCIJO05	Johnius amblycephalus
23	SCIOT01	Otolithes ruber
24	SCIPE04	Pennahia anea
25	SCIPR01	Protonibea diacanthus
26	SCMRA01	Rastrelliger kanagurta
27	SCMSM03	Scomberomorus commerson
28	SCMSM04	Scomberomorus guttatus
29	SCMAU01	Auxis thazard
30	SCMEU02	Euthynnus affinis
31	SCMKA01	Katsuwonus pelamis
32	SCMTH02	Thunnus albacares
33	SCMTH05	Thunnus tonggol
34	SERCH01	Cromileptes altivelis
35	SEREP08	Epinephelus areolatus
36	SEREP06	Epinephelus bleekeri
37	SEREP07	Epinephelus tauvina
38	STRPA01	Pampus argenteus
39	STRPA02	Pampus chinensis
40	TRILT01	Lepturacanthus savala
41	TRITR01	Trichiurus lepturus
42	SYNSA02	Saurida tumbil
43	SYNSA03	Saurida undosquamis
44	SYNSA04	Saurida elongata
45	MULUP01	Upeneus bensasi
46	MULUP03	Upeneus moluccensis
47	NEMNE01	Nemipterus bipunctatus

Species number	Species code	Species name
48	CARME01	Megalaspis cordyla
49	CLUDU01	Dussumieria acuta
50	LACLA01	Lactarius lactarius
51	LOBPA32	Puerulus sewelli
52	SYNTR01	Trachinocephalus myops
53	SPHSP07	Sphyraena jello

ANNEX V. SCHEMATIC PRESENTATION OF THE SAMPLING PROCEDURE



ANNEX VI. MATURITY STAGE

Stage	State	Description
I	Immature	Ovary and testis about 1/3rd length of body cavity. Ovaries pinkish, translucent, testis whitish. Ova not visible to naked eye.
II	Maturing virgin and recovering spent	Ovary and testis about ½ length of body cavity. Ovary pinkish, translucent, testis whitish, symmetrical. Ova not visible to naked eye.
III	Ripening	Ovary and testis is about 2/3rds length of body cavity. Ovary pinkish yellow colour with granular appearance, testis whitish to creamy. No transparent or translucent ova visible.
IV	Ripe	Ovary and testis from 2/3rds to full length of body cavity. Ovary orange-pink in colour with conspicuous superficial blood vessels. Large transparent, ripe ova visible. Testis whitish-creamy, soft.
V	Spent	Ovary and testis shrunken to about ½ length of body cavity. Walls loose. Ovary may contain remnants of disintegrating opaque and ripe Ova, darkened or translucent. Testis bloodshot and flabby

ANNEX VII. RECORDS OF FISHING STATIONS

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 1
 DATE :26/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°28.72
 start stop duration Lon E 93°29.18
 TIME :00:43:08 01:10:46 27.6 (min) Purpose : 3
 LOG : 9522.45 9523.63 1.2 Region : 10310
 FDEPTH: 166 173 Gear cond.: 0
 BDEPTH: 166 173 Validity : 1
 Towing dir: 0° Wire out : 415 m Speed : 2.6 kn
 Sorted : 0 Total catch: 11.98 Catch/hour: 26.01

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Synagrops sp.	15.41	9247	59.27	
Solenocera sp.	6.86	3430	26.38	
Priacanthus sp.	3.30	67	12.69	
Champsodon sp.	0.35	269	1.34	
Bregmaceros sp.	0.04	48	0.17	
Ariosoma sp.	0.04	2	0.17	
Total	26.01		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 2
 DATE :26/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°34.91
 start stop duration Lon E 93°33.23
 TIME :03:10:46 03:41:30 30.7 (min) Purpose : 3
 LOG : 9535.27 9536.67 1.4 Region : 10310
 FDEPTH: 84 82 Gear cond.: 0
 BDEPTH: 84 82 Validity : 1
 Towing dir: 0° Wire out : 210 m Speed : 2.7 kn
 Sorted : 0 Total catch: 53.70 Catch/hour: 104.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus bindus**	31.63	4745	30.17	
Lepturacanthus savala	13.47	187	12.85	
Saurida tumbil	11.71	86	11.17	
Gazza minuta	11.21	715	10.69	
Leiognathus lineolatus	7.61	4993	7.26	
Saurida undosquamis	6.21	168	5.92	
Nemipterus japonicus	5.47	176	5.21	
Saurida elongata	3.51	344	3.35	
Sphyrna lewini	2.36	2	2.25	
Charybdis feriata	1.87	12	1.79	
Sphyrna sp.	1.68	27	1.60	
Nemipterus nematophorus	1.37	31	1.30	
Sepia acuelata	1.17	4	1.12	
Portunus sanguinolento	0.86	4	0.82	
Lagocephalus lunaris	0.82	10	0.78	
Sphyrna putnamae	0.82	4	0.78	
Sepia sp.	0.80	4	0.76	
Portunus pelagicus	0.78	4	0.74	
Nemipterus peronii	0.43	4	0.41	
Metapenaeus sp.	0.39	39	0.37	
Uroteuthis (Photololigo) duvau	0.21	16	0.30	
Penaeus semisulcatus	0.27	4	0.26	
Apogon 'big'	0.08	8	0.07	
Total	104.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 3
 DATE :26/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°37.41
 start stop duration Lon E 93°39.96
 TIME :05:20:58 05:51:10 30.2 (min) Purpose : 3
 LOG : 9547.55 9548.96 1.4 Region : 10310
 FDEPTH: 30 31 Gear cond.: 0
 BDEPTH: 30 31 Validity : 1
 Towing dir: 0° Wire out : 120 m Speed : 2.8 kn
 Sorted : 0 Total catch: 32.49 Catch/hour: 64.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Metapenaeus sp.	13.11	819	20.32	
Muraenesox cinereus	12.12	4	18.78	
Lepturacanthus savala	7.43	111	11.51	
Johnieops sp.	7.33	407	11.36	
Pomadasy argenteus	3.81	6	5.91	
JELLYFISH ***	3.72	85	5.76	
Solenocera sp.	2.56	350	3.97	
Arius maculatus	2.15	6	3.32	
HARPISQUILLIDAE	1.79	193	2.77	
Panulirus polyphagus	1.37	4	2.12	
Himantura walga	1.35	6	2.09	
Moolgarda perusii	0.81	20	1.26	
Epinephelus sexfasciatus	0.75	2	1.17	
Shrimps unidentified	0.72	199	1.11	
Dussumieria acuta	0.62	16	0.95	1
Penaeus monodon	0.56	8	0.86	
Thryssa setirostris	0.54	54	0.83	
Siganus canaliculatus	0.50	18	0.77	
Pampus argenteus	0.48	6	0.74	
Lutjanus lutjanus	0.40	24	0.62	
Portunus sanguinolento	0.34	6	0.52	
Parastromateus niger	0.32	4	0.49	
Charybdis feriata	0.22	2	0.34	
Apogon 'big'	0.20	60	0.31	
Secutor ruconius	0.18	52	0.28	
Cynoglossus sp.	0.18	6	0.28	
Lagocephalus spadiceus	0.18	2	0.28	
Upeneus sulphureus	0.14	4	0.22	
Stolephorus indicus	0.12	8	0.18	
Thryssa mystax	0.11	68	0.18	
Metapenaeus lysianassa	0.10	32	0.15	
Sphyrna obtusata	0.08	2	0.12	
Gazza minuta	0.08	6	0.12	
Secutor insidiator	0.04	4	0.06	
Kumococius rodericensis	0.04	2	0.06	
Loligo sp.	0.04	2	0.06	
Sepiella inermis	0.02	2	0.03	
Equulites leuciscus	0.02	4	0.03	
Leiognathus bindus**	0.02	4	0.03	
Taenioides esquirel	0.02	2	0.03	
Total	64.54		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 4
 DATE :26/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°24.38
 start stop duration Lon E 93°53.78
 TIME :09:05:18 09:35:23 30.1 (min) Purpose : 3
 LOG : 9571.75 9573.40 1.6 Region : 10310
 FDEPTH: 27 24 Gear cond.: 0
 BDEPTH: 27 24 Validity : 1
 Towing dir: 0° Wire out : 120 m Speed : 3.3 kn
 Sorted : 0 Total catch: 62.24 Catch/hour: 124.15

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Neotrygon kuhlii	44.34	4	35.72	
Carangoides armatus	20.23	98	16.29	4
Lethrinus lentjan	13.92	28	11.21	2
Secutor insidiator	10.53	5266	8.48	
Cyclichthys spilostylius	7.42	6	5.98	
Lutjanus johnii	4.55	2	3.66	
Carangoides sp.	3.29	2	2.65	
Scomberomorus guttatus	2.93	2	2.36	3
Scomberoides commersonianus	2.13	6	1.72	
Gerres filamentosus	1.93	18	1.56	
Elops machnata	1.76	2	1.41	
Chirocentrus nudus	1.64	8	1.32	
Gerres erythrourus	1.26	6	1.01	
Ostracion rhinorhynchus	1.10	2	0.88	
Stolephorus indicus	1.04	199	0.84	
Drepane punctata	0.88	4	0.71	
Lutjanus russellii	0.86	6	0.69	
Lepturacanthus savala	0.82	18	0.66	
Saurida tumbil	0.72	4	0.58	
Tetrosomus gibbosus	0.52	2	0.42	
Lactarius lactarius	0.48	2	0.39	
Alectis indica	0.42	6	0.34	
Gazza minuta	0.38	4	0.31	
Nemipterus peronii	0.28	2	0.22	
Arothron immaculatus	0.22	2	0.18	
Ephippus orbis	0.22	2	0.18	
Pardachirus pavoninus	0.14	2	0.11	
Saurida undosquamis	0.14	6	0.11	
Solenocera sp.	0.02	2	0.02	
Total	124.15		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 5
 DATE :26/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°18.53
 start stop duration Lon E 93°49.85
 TIME :11:36:35 12:06:21 29.8 (min) Purpose : 3
 LOG : 9582.27 9583.74 1.5 Region : 10310
 FDEPTH: 69 70 Gear cond.: 0
 BDEPTH: 69 70 Validity : 1
 Towing dir: 0° Wire out : 180 m Speed : 3.0 kn
 Sorted : 0 Total catch: 61.41 Catch/hour: 123.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus bindus**	24.20	2342	19.54	
Saurida undosquamis	18.47	125	14.92	5
Pentapriion sp.	14.52	585	11.72	
Apogon 'big'	10.93	2	8.83	0
Leiognathus sp.	8.15	424	6.58	
Lagocephalus lunaris	8.07	97	6.51	
Upeneus moluccensis	7.14	218	5.76	6
Scomberomorus commerson	6.80	4	5.49	8
Nemipterus nematophorus	3.83	44	3.09	
Sphyrna sp.	3.19	28	2.57	9
Gerres filamentosus	3.07	24	2.48	
Nemipterus japonicus	2.78	48	2.25	
Stolephorus indicus	2.18	464	1.76	
Carangoides malabaricus	1.73	32	1.40	
Alectis ciliaris	1.25	4	1.01	
Dussumieria acuta	1.17	32	0.94	7
Selar crumenophthalmus	1.13	8	0.91	
Priacanthus tayenus	1.09	24	0.88	
Fistularia sp.	1.05	40	0.85	
Nemipterus peronii	0.89	12	0.72	
Sepia sp.	0.73	8	0.59	
Apogon 'big'	0.69	65	0.55	
Lepturacanthus savala	0.36	4	0.29	10
Abalistes stellaris	0.28	4	0.23	
Siganus canaliculatus	0.16	4	0.13	
Total	123.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 6
 DATE :26/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°15.87
 start stop duration Lon E 93°42.57
 TIME :15:55:42 16:25:40 30.0 (min) Purpose : 3
 LOG : 9599.84 9601.18 1.4 Region : 10310
 FDEPTH: 129 124 Gear cond.: 0
 BDEPTH: 129 124 Validity : 1
 Towing dir: 0° Wire out : 300 m Speed : 2.7 kn
 Sorted : 0 Total catch: 39.44 Catch/hour: 78.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus bathybius	25.46	2462	32.25	
Ariosoma sp.	18.21	748	23.07	
Lepidotrigla sp.	6.96	803	8.82	
Solenocera sp.	6.36	2121	8.06	
Priacanthus hamrur	4.60	80	5.83	
Pterygotrigla hemisticta	4.24	530	5.38	
Synagrops sp.	3.68	1841	4.67	
Cynoglossus sp.	2.88	144	3.65	
Saurida undosquamis	1.60	108	2.03	53
Iago omanensis	0.72	12	0.91	
GOBIIDAE	0.68	88	0.86	
Lophiomus setigerus	0.56	8	0.71	
Lepturacanthus savala	0.54	2	0.68	
Callionymus spiniceps	0.36	28	0.46	
Ariomma indicum	0.36	4	0.46	
Halietaea sp.	0.32	44	0.41	
Arnoglossus sp.	0.20	36	0.25	
Neopinnula orientalis	0.16	8	0.20	
Champsodon sp.	0.16	16	0.20	
Ostichthys sp.	0.16	20	0.20	
Aseraggodes sp.	0.16	20	0.20	
Uranoscopus affinis	0.16	8	0.20	
Octopus aegina	0.12	4	0.15	
Siganus canaliculatus	0.12	4	0.15	
Pseudorhombus quinquecellatus ***	0.08	4	0.10	
Sepia sp	0.04	4	0.05	
Brachypterois serrulata	0.02	4	0.03	
Total	78.93		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 7
 DATE :26/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°14.08
 start stop duration Lon E 93°38.04
 TIME :18:26:07 18:56:15 30.1 (min) Purpose : 3
 LOG : 9610.45 9612.07 1.6 Region : 10310
 FDEPTH: 463 457 Gear cond.: 0
 BDEPTH: 463 457 Validity : 1
 Towing dir: 0° Wire out : 1095 m Speed : 3.2 kn
 Sorted : 0 Total catch: 34.66 Catch/hour: 69.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
NETTASTOMATIDAE	10.59	133	15.35	
ANGUILLIFORMES	10.32	66	14.95	
Aristeus virillis	9.56	1024	13.85	
Neoharriotta pinnata	9.24	2	13.39	
Squalus megalops	8.10	30	11.74	
Chaunax sp.	7.11	159	10.30	
OMMASTREPHIDAE	5.68	18	8.22	
Neopinnula orientalis	3.31	62	4.79	
J E L L Y F I S H	2.41	18	3.49	
Pycnocraspedum squamipinne	1.51	24	2.19	
CHAUNACIDAE	0.38	4	0.55	
Dicrolene nigricaudis	0.26	14	0.38	
Priacanthus hamrur	0.24	4	0.35	
Metanephropsis arafurensis	0.24	26	0.35	
SYNAXIDAE	0.08	52	0.12	
Plastic	0.00	12	0.00	
Total	69.02		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 8
 DATE :26/08/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 18°11.28
 start stop duration Lon E 93°37.55
 TIME :21:59:27 22:31:58 32.5 (min) Purpose : 1
 LOG : 9619.85 9621.32 1.5 Region : 10310
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 548 574 Validity : 3
 Towing dir: 0° Wire out : 140 m Speed : 2.7 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 9
 DATE :27/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°57.72
 start stop duration Lon E 93°51.37
 TIME :04:24:44 04:54:56 30.2 (min) Purpose : 3
 LOG : 9663.32 9664.76 1.4 Region : 10310
 FDEPTH: 156 163 Gear cond.: 0
 BDEPTH: 156 163 Validity : 1
 Towing dir: 0° Wire out : 400 m Speed : 2.9 kn
 Sorted : 0 Total catch: 27.60 Catch/hour: 54.83

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Synagrops sp.	31.41	9423	57.28	
Priacanthus hamrur	13.41	441	24.46	
TRIGLIDAE	4.23	131	7.72	
CONGRIDAE	3.04	36	5.54	
Decapterus sp.	2.38	36	4.35	
Nettastoma sp.	0.36	6	0.65	
Total	54.83		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 10
 DATE :27/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°2.68
 start stop duration Lon E 93°59.29
 TIME :06:12:16 06:42:30 30.2 (min) Purpose : 3
 LOG : 9674.59 9676.16 1.6 Region : 10310
 FDEPTH: 88 88 Gear cond.: 0
 BDEPTH: 88 88 Validity : 1
 Towing dir: 0° Wire out : 245 m Speed : 3.1 kn
 Sorted : 0 Total catch: 66.50 Catch/hour: 131.95

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selar crumenophthalmus	57.08	720	43.26	13
Lepturacanthus savala	13.39	40	10.15	
Dussumieria acuta	9.90	200	7.50	12
Saurida undosquamis	8.71	232	6.60	15
Sphyræna obtusata	8.15	97	6.18	14
Saurida tumbil	6.93	28	5.26	16
Carangoides chrysophrys	5.81	2	4.41	
Megalaspis cordyla	4.37	20	3.31	11
Alectis indica	4.01	4	3.04	
Lagocephalus spadiceus	2.64	18	2.00	
Gazza minuta	2.46	62	1.86	
Terapon jarbua	1.85	18	1.40	
Sphyræna sp.	1.31	12	0.99	
Saurida elongata	1.09	123	0.83	
Lagocephalus lunaris	0.89	6	0.68	
Sphyræna putnamae	0.83	4	0.63	
Rastrelliger kanagurta	0.54	6	0.41	
Nemipterus nematophorus	0.30	6	0.23	
Pentaprion sp.	0.27	16	0.20	
Uraspis uraspis	0.26	4	0.20	
Upeneus sulphureus	0.21	6	0.16	
Nemipterus japonicus	0.18	4	0.14	
Abalistes stellaris	0.18	4	0.14	
Antennarius sp.	0.18	4	0.14	
Lepidotrigla sp.	0.12	4	0.09	
Siganus canaliculatus	0.09	4	0.07	
Leiognathus bindus**	0.09	10	0.07	
ECHENEIDAE	0.06	6	0.05	
Leiognathus sp.	0.03	6	0.02	
Apogon 'big'	0.03	4	0.02	
Total	131.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 11
 DATE :27/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 18°11.24
 start stop duration Lon E 94°14.88
 TIME :15:53:21 16:24:10 30.8 (min) Purpose : 3
 LOG : 9739.50 9741.04 1.5 Region : 10310
 FDEPTH: 38 38 Gear cond.: 0
 BDEPTH: 38 38 Validity : 1
 Towing dir: 0° Wire out : 122 m Speed : 3.0 kn
 Sorted : 0 Total catch: 30.58 Catch/hour: 59.57

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Himantura walga	6.12	27	10.27	
Gazza minuta	4.32	183	7.26	
Portunus sanguinolentus	3.90	39	6.54	
Lepturacanthus savala	3.66	66	6.15	60
Nemipterus japonicus	3.27	62	5.49	58
Sepia acuelata	3.19	8	5.36	
Penaeus monodon	2.84	27	4.77	
Arius maculatus	2.84	8	4.77	54
Neotrygon kuhlii	2.81	4	4.71	
Upeneus sulphureus	2.73	62	4.58	57
Johnieops sp.	2.73	199	4.58	
Pomadasy sp.	2.53	58	4.25	
Metapenaeus sp.	2.38	117	3.99	
Selar crumenophthalmus	1.83	16	3.07	61
Pomadasy kaakan	1.71	4	2.88	59
Megalaspis cordyla	1.44	8	2.42	56
Chirocentrus nudus	1.29	4	2.16	55
Leiognathus fasciatus ***	1.25	132	2.09	
Ariosoma sp.	1.25	23	2.09	
Conger sp.	1.05	4	1.77	
Lutjanus madras	1.01	16	1.70	
Otolithes ruber	1.01	4	1.70	
Stolephorus indicus	0.78	23	1.31	
Aesopia cornuta	0.66	4	1.11	
Saurida undosquamis	0.66	4	1.11	
Apogon 'big'	0.58	125	0.98	
Lutjanus lutjanus	0.55	23	0.92	
Bregmaceros sp.	0.39	117	0.65	
Opisthopterus tardoore	0.35	113	0.59	
Thryssa sp.	0.23	23	0.39	
Terapon jarbua	0.19	4	0.33	
Total	59.57		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 12
 DATE :27/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°53.69
 start stop duration Lon E 94°24.54
 TIME :19:28:27 19:50:17 21.8 (min) Purpose : 3
 LOG : 9761.50 9762.83 1.3 Region : 10310
 FDEPTH: 30 27 Gear cond.: 0
 BDEPTH: 30 27 Validity : 1
 Towing dir: 0° Wire out : 135 m Speed : 3.7 kn
 Sorted : 0 Total catch: 58.01 Catch/hour: 159.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus splendens	43.19	1824	27.10	
Pomadasy sp.	22.42	247	14.07	63
Penaeus merguensis	10.14	478	6.36	
Leiognathus equulus	9.89	198	6.21	
Sphyrna lewini	6.76	3	4.24	
Johnius coitor	6.51	511	4.09	62
Secutor ruconius	5.36	1236	3.36	
Archamia sp.	5.19	1945	3.26	
Lepturacanthus savala	3.79	140	2.38	
Lutjanus madras	3.71	49	2.33	
Lutjanus russellii	3.05	16	1.91	
Pomadasy argenteus	2.88	16	1.81	
Thryssa mystax	2.72	305	1.71	
Otolithes ruber	2.64	66	1.66	64
Secutor insidiator	2.23	338	1.40	
Scomberoides commersonianus	2.14	8	1.34	
Carangoides malabaricus	2.14	8	1.34	
Chiloscyllium punctatum	2.06	5	1.29	
Lutjanus fulviflamma	1.90	8	1.19	
Lutjanus lutjanus	1.81	66	1.14	
J E L L Y F I S H	1.65	25	1.03	
Thryssa vitrirostris	1.40	107	0.88	
Pomadasy multimaculatus	1.40	25	0.88	
Metapenaeus lysianassa	1.32	321	0.83	
Gerres filamentosus	1.32	8	0.83	
Stolephorus indicus	1.15	387	0.72	
Cynoglossus lingua	1.07	16	0.67	
Sardinella gibbosa	0.91	25	0.57	
Thenus orientalis	0.91	8	0.57	
Pinjalo sp.	0.58	8	0.36	
Terapon theraps	0.58	8	0.36	
Saurida undosquamis	0.58	8	0.36	
Lutjanus malabaricus	0.58	8	0.36	
Upeneus sondaicus	0.49	8	0.31	
CONGRIDAE	0.49	16	0.31	
Portunus sanguinolento	0.49	33	0.31	
Gazza minuta	0.41	58	0.26	
Trachinocephalus myops	0.33	33	0.21	
Thryssa sp.	0.33	49	0.21	
Abalistes stellaris	0.33	8	0.21	
Parapenaeopsis sp.	0.33	91	0.21	
Penaeus canaliculatus	0.33	8	0.21	
Upeneus sulphureus	0.25	8	0.16	
Sillago sihama	0.25	25	0.16	
Portunus pelagicus	0.16	8	0.10	
Sepiella inermis	0.16	8	0.10	
Polydactylus sp.	0.16	8	0.10	
Equulites leuciscus	0.16	115	0.10	
Heteromycteris sp.	0.16	16	0.10	
Leiognathus bindus**	0.08	41	0.05	
Cynoglossus cynoglossus	0.08	8	0.05	
Lactarius lactarius	0.08	8	0.05	
Callionymus spiniceps	0.08	8	0.05	
Leiognathus leuciscus**	0.08	8	0.05	
Chelonodon patoca	0.08	8	0.05	
Bregmaceros sp.	0.04	16	0.03	
Plastic	0.00	5	0.00	
Total		159.35	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 13
 DATE :27/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°48.39
 start stop duration Lon E 94°16.74
 TIME :22:09:39 22:40:33 30.9 (min) Purpose : 3
 LOG : 9775.56 9777.24 1.7 Region : 10310
 FDEPTH: 64 65 Gear cond.: 0
 BDEPTH: 64 65 Validity : 1
 Towing dir: 0° Wire out : 205 m Speed : 3.2 kn
 Sorted : 0 Total catch: 43.61 Catch/hour: 84.65

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida tumbil	19.49	163	23.02	17
Priacanthus tayenus	11.06	221	13.07	
Sepia acuelata	9.32	35	11.01	
Nemipterus nematophorus	7.03	194	8.30	
Nemipterus peronii	6.76	109	7.98	20
Apogon "big"	5.63	29	6.65	
Lutjanus madras	4.43	39	5.23	
Pentaprisson sp.	4.37	262	5.16	
Penaeus notialis	2.56	12	3.03	
Sphyrna sp.	2.25	23	2.66	
Scomberoides commersonianus	2.21	8	2.61	
Lagocephalus lunaris	2.21	16	2.61	
Pomadasy kaakan	1.32	39	1.56	
Atule mate	1.13	31	1.33	18
Fistularia petimba	0.85	23	1.01	
Saurida sp.	0.82	136	0.96	
Terapon jarbua	0.50	4	0.60	
Penaeus semisulcatus	0.47	8	0.55	
Carangoides malabaricus	0.39	12	0.46	
Leiognathus longispinis ***	0.27	8	0.32	
Scorpaenopsis sp.	0.27	16	0.32	
Decapterus kurroides	0.23	4	0.28	
Saurida undosquamis	0.23	12	0.28	
Lutjanus lutjanus	0.19	4	0.23	
Xiphochelilus typus	0.16	35	0.18	
Octopus sp.	0.16	4	0.18	
Upeneus cf. tragula	0.12	4	0.14	
Metapenaeus sp.	0.12	8	0.14	
Lagocephalus sp.	0.12	4	0.14	
Total		84.65	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 14
 DATE :28/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°44.10
 start stop duration Lon E 94°8.03
 TIME :00:46:11 01:15:54 29.7 (min) Purpose : 3
 LOG : 9789.87 9791.16 1.3 Region : 10310
 FDEPTH: 117 122 Gear cond.: 0
 BDEPTH: 117 122 Validity : 1
 Towing dir: 0° Wire out : 295 m Speed : 2.6 kn
 Sorted : 0 Total catch: 110.14 Catch/hour: 222.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pterygotrigla hemisticta	106.87	745626	48.05	
TRIGLIDAE	75.85	598841	34.10	
J E L L Y F I S H	10.10	2	4.54	
Saurida longimanus	5.78	370	2.60	21
Priacanthus tayenus	4.48	8	2.02	
Solenocera sp.	4.24	1309	1.91	
Decapterus smithvanizi	2.26	30	1.02	24
Laeops sp.	1.70	158	0.76	
Lophius sp.	1.45	18	0.65	
Chelidoperca sp.	1.21	73	0.54	
Scolopsis sp.	1.21	48	0.54	
Pentaprisson sp.	1.09	48	0.49	
Fistularia petimba	1.09	24	0.49	
Pristipomoides sp.	1.09	12	0.49	
Nemipterus japonicus	0.85	24	0.38	
Chelidoperca investigatoris	0.85	73	0.38	
Callionymus spiniceps	0.61	48	0.27	
Octopus sp.	0.48	24	0.22	
Saurida tumbil	0.36	2	0.16	23
Rastrelliger brachysoma	0.26	2	0.12	22
Acropoma argentistigma	0.24	12	0.11	
Atule mate	0.22	4	0.10	
Champsodon sp.	0.12	12	0.05	
Total		222.43	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 15
 DATE :28/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°41.29
 start stop duration Lon E 94°7.88
 TIME :02:42:34 03:12:47 30.2 (min) Purpose : 3
 LOG : 9797.43 9798.90 1.5 Region : 10310
 FDEPTH: 260 258 Gear cond.: 0
 BDEPTH: 260 258 Validity : 1
 Towing dir: 0° Wire out : 670 m Speed : 2.9 kn
 Sorted : 0 Total catch: 147.92 Catch/hour: 293.69

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pterygotrigla hemisticta	145.14	3024	49.42	
EPIALIDAE	129.45	20438	44.08	
Synagrops sp.	13.90	2402	4.73	
Neopinnula orientalis	2.38	218	0.81	
Echeneis naucrates	1.43	2	0.49	
CONGRIDAE	1.39	60	0.47	
Total		293.69	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 16
 DATE :28/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°21.51
 start stop duration Lon E 94°9.47
 TIME :10:34:08 11:03:35 29.4 (min) Purpose : 3
 LOG : 9842.13 9843.56 1.4 Region : 10310
 FDEPTH: 203 173 Gear cond.: 0
 BDEPTH: 203 173 Validity : 1
 Towing dir: 0° Wire out : 450 m Speed : 2.9 kn
 Sorted : 0 Total catch: 29.03 Catch/hour: 59.16

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Priacanthus hamrur	16.14	300	27.28	25
Congresox talabon	15.65	6	26.46	27
Solenocera sp.	13.15	5633	22.22	
Synagrops sp.	10.58	2643	17.88	
Pterygotrigla hemisticta	2.38	98	4.03	
Acropoma argentistigma	0.71	31	1.21	
Champsodon sp.	0.49	98	0.83	26
Bregmaceros sp.	0.06	18	0.10	
Total		59.16	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 17
 DATE :28/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°6.43
 start stop duration Lon E 94°22.20
 TIME :19:32:37 19:53:05 20.5 (min) Purpose : 3
 LOG : 9892.92 9894.02 1.1 Region : 10310
 FDEPTH: 43 42 Gear cond.: 0
 BDEPTH: 43 42 Validity : 1
 Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
 Sorted : 0 Total catch: 47.84 Catch/hour: 140.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus splendens	39.53	3592	28.18	
Priacanthus hamrur	26.98	469	19.23	
Bregmaceros sp.	10.56	2261	7.53	
Lepturacanthus savala	7.80	94	5.56	
Pennahia anea	6.69	94	4.77	66
Nemipterus japonicus	6.28	170	4.47	
Metapenaeus ensis	5.81	413	4.14	
Lutjanus erythropterus	5.51	12	3.93	65
Lutjanus madras	5.19	56	3.70	
Penaeus monodon	2.90	35	2.07	
Terapon jarbua	2.82	12	2.01	
Lutjanus lutjanus	2.40	73	1.71	
Sepia acuelata	2.26	9	1.61	
Gazza minuta	2.11	152	1.51	
Portunus sanguinolento	1.99	21	1.42	
Arius maculatus	1.76	6	1.25	
MURAENOLEPIDAE	1.29	23	0.92	
Lutjanus russellii	1.26	6	0.90	
Mene maculata	1.17	12	0.84	
Secutor insidiator	0.82	106	0.59	
Thryssa sp.	0.82	129	0.59	
Lactarius lactarius	0.76	32	0.54	
Apogon 'big'	0.70	164	0.50	
Upeneus sulphureus	0.56	18	0.40	
STOMATOPODA	0.47	47	0.33	
Leiognathus leuciscus**	0.35	23	0.25	
Megalaspis cordyla	0.29	3	0.21	
Sardinella gibbosa	0.26	6	0.19	
Antennarius sp.	0.23	12	0.17	
Penaeus semisulcatus	0.23	6	0.17	
Moolgarda perusii	0.18	6	0.13	
Leiognathus bindus**	0.12	23	0.08	
Epinephelus sexfasciatus	0.09	3	0.06	
Solenocera sp.	0.06	6	0.04	
Parapenaeopsis sp.	0.03	3	0.02	
Total	140.29		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 18
 DATE :28/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°6.03
 start stop duration Lon E 94°15.71
 TIME :21:36:14 22:07:28 31.2 (min) Purpose : 3
 LOG : 9905.34 9906.89 1.6 Region : 10310
 FDEPTH: 66 67 Gear cond.: 0
 BDEPTH: 66 67 Validity : 1
 Towing dir: 0° Wire out : 190 m Speed : 3.0 kn
 Sorted : 0 Total catch: 63.06 Catch/hour: 121.15

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus nematophorus	39.65	713	32.73	69
Saurida tumbil	18.41	146	15.19	71
Saurida undosquamis	9.05	234	7.47	68
Leiognathus oblongus	7.92	1483	6.53	
Bregmaceros sp.	5.76	3458	4.76	
Fistularia petimba	4.15	115	3.43	
Penaeus semisulcatus	3.29	77	2.71	
Sepia acuelata	3.15	13	2.60	
Pennahia anea	3.11	23	2.57	67
Portunus sanguinolento	2.86	19	2.36	
Leiognathus equulus	2.07	21	1.71	
Apogon 'big'	1.92	200	1.59	
Metapenaeopsis stridulans	1.92	523	1.59	
Saurida longimanus	1.65	215	1.36	70
Metapenaeus affinis	1.40	56	1.16	
Lepturacanthus savala	1.38	31	1.14	
SCORPAENIDAE	1.38	115	1.14	
Lutjanus erythropterus	1.11	2	0.92	
Pomadasyd kaakan**	1.00	2	0.82	
Psettodes erumei	0.96	2	0.79	
Penaeus monodon	0.94	6	0.78	
Lutjanus russellii	0.86	2	0.71	
Terapon jarbua	0.81	4	0.67	
Sphyræna obtusata	0.71	8	0.59	
Epinephelus heniochus	0.69	2	0.57	
Gazza minuta	0.54	15	0.44	
Priacanthus hamrur	0.50	8	0.41	
Lagocephalus lunaris	0.50	4	0.41	
Stolephorus indicus	0.46	100	0.38	
Pentaprison sp.	0.38	38	0.32	
Upeneus sulphureus	0.37	8	0.30	
Abalistes stellaris	0.27	4	0.22	
Sepia sp.	0.23	13	0.19	
Lagocephalus spadiceus	0.19	2	0.16	
Thryssa sp.	0.15	23	0.13	
Metapenaeopsis spp.	0.15	31	0.13	
'Mole crab'	0.15	2	0.13	
Leiognathus bindus**	0.15	8	0.13	
CITHARIDAE	0.15	38	0.13	
Lutjanus lutjanus	0.12	4	0.10	
Calappa sp.	0.12	4	0.10	
Ophichthus sp.	0.10	10	0.08	
Pseudorhombus sp.	0.08	8	0.06	
Uranoscopus cognatus	0.08	8	0.06	
Thenus orientalis	0.08	2	0.06	
LAGANIDAE	0.08	69	0.06	
Siganus canaliculatus	0.06	2	0.05	
Trachypenaeus sp.	0.04	23	0.03	
Charybdis natator	0.04	6	0.03	
Total	121.15		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 19
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 17°3.01
 start stop duration Lon E 94°9.81
 TIME :00:13:01 00:36:59 24.0 (min) Purpose : 3
 LOG : 9917.46 9918.42 1.0 Region : 10310
 FDEPTH: 104 106 Gear cond.: 0
 BDEPTH: 104 106 Validity : 1
 Towing dir: 0° Wire out : 250 m Speed : 2.4 kn
 Sorted : 0 Total catch: 57.90 Catch/hour: 144.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus japonicus	68.69	5885	47.39	31
Saurida longimanus	32.04	1812	22.11	30
Champsodon sp.	20.23	180	13.96	
Iago sp.	4.23	18	2.92	
Parasclopsis rufomaculatus	3.90	190	2.69	32
Octopus sp.	2.60	140	1.80	
Ariosoma sp.	2.55	105	1.76	
MURICIDAE	1.93	120	1.33	
GOBIIDAE	1.90	215	1.31	
Acropoma sp.	1.55	105	1.07	
LOPHIIDAE	1.45	15	1.00	
Priacanthus hamrur	1.23	8	0.85	29
Sepiella sp.	0.80	20	0.55	
Abalistes stellaris	0.45	3	0.31	
Pseudorhombus dupliciocellatus ***	0.45	20	0.31	
Decapterus smithvanizi	0.28	3	0.19	28
SCORPAENIDAE	0.15	40	0.10	
Portunus sp.	0.15	25	0.10	
Squilla sp.	0.10	15	0.07	
Bregmaceros sp.	0.10	20	0.07	
Lagocephalus sp.	0.10	5	0.07	
Uranoscopus cognatus	0.05	5	0.03	
Total	144.93		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 20
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°48.30
 start stop duration Lon E 94°2.41
 TIME :04:32:28 04:58:25 25.9 (min) Purpose : 3
 LOG : 9948.72 9949.95 1.2 Region : 10310
 FDEPTH: 156 153 Gear cond.: 0
 BDEPTH: 156 153 Validity : 1
 Towing dir: 0° Wire out : 410 m Speed : 2.8 kn
 Sorted : 0 Total catch: 38.70 Catch/hour: 89.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pterygotrigla arabica	52.44	1512	58.60	73
Priacanthus hamrur	17.20	388	19.22	74
Champsodon sp.	8.95	1031	10.00	
Decapterus smithvanizi	7.49	153	8.37	72
Ariosoma sp.	1.04	35	1.16	
Saurida longimanus	0.83	49	0.93	
Cynoglossus sp.	0.28	7	0.31	
MURAENIDAE	0.28	42	0.31	
Sphyræna obtusata	0.28	7	0.31	
Synagrops sp.	0.21	28	0.23	
Chelidoperca sp.	0.21	7	0.23	
Solenocera sp.	0.14	69	0.16	
Ophichthus sp.	0.07	7	0.08	
Nemipterus nematophorus	0.07	7	0.08	
Plastic	0.00	2	0.00	
Wood, paper, cardboard	0.00	5	0.00	
Total	89.48		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 21
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°46.89
 start stop duration Lon E 94°8.74
 TIME :06:13:43 06:43:48 30.1 (min) Purpose : 3
 LOG : 9957.72 9959.35 1.6 Region : 10310
 FDEPTH: 69 69 Gear cond.: 0
 BDEPTH: 69 69 Validity : 1
 Towing dir: 0° Wire out : 210 m Speed : 3.3 kn
 Sorted : 0 Total catch: 37.14 Catch/hour: 74.08

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus bindus**	13.88	1542	18.74	
Scomberomorus commerson	11.85	2	15.99	
Saurida undosquamis	7.34	197	9.91	49
Saurida tumbil	5.41	36	7.30	47
Leiognathus equulus	4.65	48	6.27	48
Leiognathus oblongus	4.01	547	5.41	
Lepturacanthus savala	3.83	32	5.17	
Pomadasy kaakan	3.73	2	5.04	
Nemipterus japonicus	2.97	36	4.01	51
Nemipterus nematophorus	2.35	28	3.18	52
Carangoides armatus	1.44	8	1.94	
Panulirus polyphagus	1.36	2	1.83	
Pentaprion sp.	1.26	78	1.70	
Gazza minuta	0.86	14	1.16	
Lagocephalus spadiceus	0.78	4	1.05	
Lagocephalus lunaris	0.66	8	0.89	
Gerres filamentosus	0.60	4	0.81	
Saurida longimanus	0.60	94	0.81	50
Leiognathus longispinis ***	0.58	12	0.78	
Priacanthus hamrur	0.56	10	0.75	
Siganus canaliculatus	0.44	16	0.59	
Platycephalus sp.	0.44	14	0.59	
Stolephorus indicus	0.42	28	0.57	
Loligo duvaucelii	0.38	38	0.51	
Dussumieria acuta	0.38	12	0.51	
Carangoides coeruleopinnatus	0.34	2	0.46	
Champsodon sp.	0.32	24	0.43	
Carangoides malabaricus	0.28	4	0.38	
Upeneus vittatus	0.26	2	0.35	
Penaeus semisulcatus	0.26	4	0.35	
Thenus orientalis	0.24	2	0.32	
Sepia acuelata	0.22	2	0.30	
Rastrelliger kanagurta	0.20	2	0.27	
Alectis ciliaris	0.20	2	0.27	
Small squids	0.14	42	0.19	
Sphyrna sp.	0.12	2	0.16	
Uranoscopus cognatus	0.10	4	0.13	
Calappa sp.	0.10	4	0.13	
Upeneus moluccensis	0.10	4	0.13	
MURAENIDAE	0.10	16	0.13	
Minous coccineus	0.08	2	0.11	
Metapenaeus ensis	0.06	6	0.08	
EPIALTIIDAE	0.04	4	0.05	
Ariosoma sp.	0.04	2	0.05	
LAGANIDAE	0.04	22	0.05	
Pterygotrigla arabica	0.02	2	0.03	
Pseudorhombus sp.	0.02	8	0.03	
Apogon 'big'	0.02	4	0.03	
STOMATOPODA	0.02	2	0.03	
Neomerinthe sp.	0.02	2	0.03	
Total	74.08		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 22
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°45.34
 start stop duration Lon E 94°18.45
 TIME :08:40:28 09:12:29 32.0 (min) Purpose : 3
 LOG : 9973.42 9975.36 1.9 Region : 10310
 FDEPTH: 30 31 Gear cond.: 0
 BDEPTH: 30 31 Validity : 1
 Towing dir: 0° Wire out : 130 m Speed : 3.6 kn
 Sorted : 0 Total catch: 30.75 Catch/hour: 57.64

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	23.88	470	41.43	
MURAENIDAE	7.20	2	12.49	
Metapenaeus ensis	6.24	506	10.83	
Scomberomorus guttatus	2.96	6	5.14	33
J E L L Y F I S H	2.81	69	4.88	
Leiognathus bindus**	1.61	302	2.80	
Penaeus monodon	1.46	24	2.54	
Lactarius lactarius	1.37	4	2.37	
Penaeus notialis	1.29	51	2.24	
Thryssa encrasicholoides	1.22	191	2.11	
Pennahia anea	0.90	19	1.56	34
Dussumieria acuta	0.90	30	1.56	35
Portunus sanguinolento	0.86	13	1.50	
Moolgarda perusii	0.82	22	1.43	
Thryssa vitrirostris	0.81	43	1.40	
STOMATOPODA	0.79	62	1.37	
Leiognathus splendens	0.75	52	1.30	
Diodon sp.	0.36	2	0.62	
Gazza minuta	0.34	37	0.59	
Bassanago albescens	0.21	6	0.36	
Apogon 'big'	0.19	41	0.33	
Secutor ruconius	0.15	15	0.26	
Leiognathus oblongus	0.11	15	0.20	
Sepiella inermis	0.09	6	0.16	
Johnieops sp.	0.07	15	0.13	
G A S T R O P O D S	0.07	6	0.13	
Loligo duvaucelii	0.06	4	0.10	
Solenocera sp.	0.04	4	0.07	
Secutor insidiator	0.04	7	0.07	
Small squids	0.02	9	0.03	
Pomadasy sp.	0.02	2	0.03	
Total	57.64		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 23
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°29.83
 start stop duration Lon E 94°10.67
 TIME :11:17:59 11:48:21 30.4 (min) Purpose : 3
 LOG : 9990.82 9992.57 1.8 Region : 10310
 FDEPTH: 34 29 Gear cond.: 0
 BDEPTH: 34 29 Validity : 1
 Towing dir: 0° Wire out : 130 m Speed : 3.5 kn
 Sorted : 0 Total catch: 34.86 Catch/hour: 68.89

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	23.87	332	34.65	
Platax teira	10.40	4	15.09	
Sepia sp	6.09	24	8.84	
Metapenaeus sp.	3.48	190	5.05	
Thryssa sp.	3.16	316	4.59	
Ilisha megaloptera	2.73	63	3.96	
Opisthopterus tardoore	2.17	198	3.16	40
Rhinoptera javanica ***	1.88	2	2.73	
Terapon jarbua	1.76	14	2.55	38
Penaeus monodon	1.50	24	2.18	
Moolgarda perusii	1.46	36	2.12	
Megalaspis cordyla	1.32	10	1.92	
Portunus sanguinolento	1.30	12	1.89	
Secutor insidiator	1.19	257	1.72	
Jaydia striata	1.15	47	1.66	
Gazza minuta	0.59	55	0.86	
Lactarius lactarius	0.59	28	0.86	39
Upeneus sulphureus	0.57	10	0.83	36
HARISQUILLIDAE	0.51	55	0.75	
J E L L Y F I S H	0.51	10	0.75	
Netuma thalassina	0.38	2	0.55	
Scomberoides commersonianus	0.38	2	0.55	
Pennahia anea	0.36	28	0.52	
Johnieops sp.	0.32	36	0.46	
Lutjanus madras	0.28	2	0.40	
Gymnotherax sp.	0.18	2	0.26	
Ariosoma sp.	0.16	4	0.23	
Cylichthys orbicularis	0.12	2	0.17	
Siganus canaliculatus	0.12	4	0.17	
Lagocephalus lunaris	0.10	2	0.14	
Apogon lineatus	0.08	12	0.11	
SCORPAENIDAE	0.08	8	0.11	
Solenocera sp.	0.08	16	0.11	
Stolephorus indicus	0.04	2	0.06	37
Plastic	0.00	2	0.00	
Total	68.89		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 24
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°28.64
 start stop duration Lon E 94°4.86
 TIME :14:46:44 14:56:38 9.9 (min) Purpose : 3
 LOG : 4.66 5.08 0.4 Region : 10310
 FDEPTH: 68 67 Gear cond.: 0
 BDEPTH: 68 67 Validity : 1
 Towing dir: 0° Wire out : 170 m Speed : 2.6 kn
 Sorted : 0 Total catch: 26.07 Catch/hour: 158.00

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
LAGANIDAE	36.36	27273	23.01	
Bregmaceros sp.	16.42	4927	10.40	
Nemipterus nematophorus	15.76	521	9.97	45
Octopus sp.	10.06	12	6.37	
MELONGENIDAE	8.91	485	5.64	
Pennahia anea	7.94	67	5.02	43
Upeneus sulphureus	6.36	158	4.03	46
Trichurus sp.	4.73	55	2.99	44
Nemipterus japonicus	4.67	97	2.95	
Cynoglossus sp.	4.61	30	2.92	
Saurida tumbil	4.42	42	2.80	42
Panulirus polyphagus	4.18	6	2.65	
Saurida undosquamis	4.12	121	2.61	41
Metapenaeus sp.	4.12	182	2.61	
Sepia sp	3.64	18	2.30	
Thryssa sp.	2.79	273	1.76	
Gazza minuta	1.70	170	1.07	
Ariosoma sp.	1.58	79	1.00	
Leiognathus equulus	1.58	6	1.00	
Uranoscopus cognatus	1.33	36	0.84	
PORTUNIDAE	1.21	97	0.77	
Apogon quadrifasciatus**	1.09	121	0.69	
SCORPAENIDAE	1.09	473	0.69	
Dussumieria sp.	1.09	6	0.69	
Ilisha sp.	1.03	12	0.65	
Pseudorhombus duplucioellatus ***	0.91	73	0.58	
CITHARIDAE	0.73	145	0.46	
Secutor sp.	0.73	236	0.46	
Jaydia striata	0.67	103	0.42	
HEMISQUILLIDAE	0.55	73	0.35	
GOBIIDAE	0.55	24	0.35	
Lagocephalus lunaris	0.42	6	0.27	
Fistularia petimba	0.36	12	0.23	
Stolephorus indicus	0.36	73	0.23	
Zebrias quagga	0.36	12	0.23	
Lactarius lactarius	0.36	18	0.23	
Pentaprion sp.	0.24	12	0.15	
Nettastoma sp.	0.24	24	0.15	
Lagocephalus sp.	0.24	12	0.15	
Grammolites sp.	0.18	36	0.12	
Trypauchen sp.	0.18	36	0.12	
Cepola sp.	0.12	12	0.08	
Total	158.00		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 25
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°28.80
 start stop duration Lon E 94°0.09
 TIME :17:21:26 17:51:46 30.3 (min) Purpose : 3
 LOG : 12.48 13.88 1.4 Region : 10310
 FDEPTH: 123 129 Gear cond.: 0
 BDEPTH: 123 129 Validity : 1
 Towing dir: 0° Wire out : 300 m Speed : 2.8 kn
 Sorted : 0 Total catch: 140.35 Catch/hour: 277.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepidotrigla omanensis	86.42	6647	31.14	
GOBIIDAE	50.73	8454	18.28	
Congresox talabon	33.42	10	12.04	
Nemipterus bathybius	29.76	1145	10.72	
TRIAKIDAE	18.00	326	6.48	
Pterygotrigla hemisticta	15.23	860	5.49	
Xenopthalmus australis	6.43	69	2.32	
Psenopsis obscura	5.64	148	2.03	
Saurida longimanus	4.75	316	1.71	
Cynoglossus sp.	3.86	129	1.39	
Panulirus polyphagus	3.66	10	1.32	
Lophiomus setigerus	3.36	30	1.21	
BOTHIDAE	2.37	227	0.86	
Parascopopsis rufomaculatus	1.78	79	0.64	
Hydrophis cyanocinctus	1.58	2	0.57	
Lipochelilus carnolabrum	1.38	10	0.50	
MURAENOLEPIDAE	1.29	49	0.46	
Ariosoma sp.	1.29	30	0.46	
Solenocera sp.	1.09	554	0.39	
Chelidoperca sp.	1.09	59	0.39	
SQUILLIDAE	0.89	89	0.32	
Acanthoepola sp.	0.79	30	0.29	
Callionymus spiniceps	0.69	40	0.25	
Synagrops sp.	0.59	129	0.21	
Neoniphon aurolineatus	0.49	30	0.18	
Sepia pharaonis	0.40	10	0.14	
EPIALTIIDAE	0.30	20	0.11	
Priacanthus hamrur	0.30	10	0.11	
Total	277.55		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 26
 DATE :29/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°25.59
 start stop duration Lon E 93°57.41
 TIME :19:40:50 20:11:05 30.3 (min) Purpose : 3
 LOG : 23.05 24.61 1.6 Region : 10310
 FDEPTH: 241 229 Gear cond.: 0
 BDEPTH: 241 229 Validity : 1
 Towing dir: 0° Wire out : 565 m Speed : 3.1 kn
 Sorted : 0 Total catch: 72.55 Catch/hour: 143.89

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Neoharrissotta pinnata	45.98	12	31.95	
Psenopsis obscura	23.56	559	16.38	
Loligo sp.	22.08	42	15.34	
Pterygotrigla hemisticta	14.52	244	10.09	
BEMBRIDAE	11.84	280	8.23	
TRIAKIDAE	6.43	196	4.47	
Neoepinnula orientalis	4.94	143	3.43	
Chlorophthalmus sp.	4.34	930	3.02	
Ariosoma gnanadossi	2.86	67	1.98	
OPHIDIIDAE	1.67	24	1.16	
Xenopthalmus australis	1.55	12	1.08	
GOBIIDAE	0.83	65	0.58	
Herterocarpus cf woodmansonii	0.71	226	0.50	
Priacanthus hamrur	0.65	6	0.45	
INACHIDAE	0.60	30	0.41	
Callionymus spiniceps	0.54	30	0.37	
Synagrops sp.	0.30	60	0.21	
Parascopopsis rufomaculatus	0.18	6	0.12	
Ophichthus sp.	0.12	12	0.08	
Solenocera sp.	0.09	30	0.06	
Nemipterus bathybius	0.06	6	0.04	
BOTHIDAE	0.06	6	0.04	
Total	143.89		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 27
 DATE :30/08/18 GEAR TYPE: PT NO: 8 POSITION:Lat N 16°12.61
 start stop duration Lon E 93°50.16
 TIME :03:30:10 03:55:45 25.6 (min) Purpose : 1
 LOG : 63.93 65.48 1.5 Region : 10310
 FDEPTH: 200 230 Gear cond.: 0
 BDEPTH: 409 448 Validity : 3
 Towing dir: 0° Wire out : 780 m Speed : 3.6 kn
 Sorted : 0 Total catch: 97.46 Catch/hour: 228.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Benthoosema fibulatum	228.51	399894	100.00	
Total	228.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 28
 DATE :30/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°11.71
 start stop duration Lon E 93°53.73
 TIME :05:18:22 05:49:09 30.8 (min) Purpose : 3
 LOG : 71.96 73.47 1.5 Region : 10310
 FDEPTH: 133 144 Gear cond.: 0
 BDEPTH: 133 144 Validity : 1
 Towing dir: 0° Wire out : 350 m Speed : 2.9 kn
 Sorted : 0 Total catch: 13.96 Catch/hour: 27.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Metapenaeus sp.	12.75	6374	46.86	
Priacanthus hamrur	7.82	72	28.74	175
Uranoscopus sp.	1.38	14	5.09	
Apogon 'big'	0.86	55	3.15	
Saurida longimanus	0.62	45	2.29	176
INACHIDAE	0.53	41	1.93	
Cynoglossus sp.	0.51	18	1.86	
MURAENIDAE	0.51	33	1.86	
SQUILLIDAE	0.31	31	1.15	
Solenocera sp.	0.25	39	0.93	
Iago sp.	0.25	14	0.93	
Pterygotrigla arabica	0.23	21	0.86	
Parascopopsis rufomaculatus	0.21	8	0.79	
Small squid	0.18	2	0.64	
Ariosoma sp.	0.18	6	0.64	
Callionymus spiniceps	0.16	10	0.57	
Nemipterus bathybius	0.12	2	0.43	
OMMASTREPHIDAE	0.10	2	0.36	
Lophiomus setigerus	0.06	2	0.21	
Champsodon sp.	0.06	18	0.21	
Synagrops sp.	0.04	12	0.14	
Chelidoperca sp.	0.04	2	0.14	
Lepidotrigla omanensis	0.04	2	0.14	
Acropoma argentistigma	0.01	6	0.04	
Total	27.20		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 29
 DATE :30/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°9.69
 start stop duration Lon E 93°57.70
 TIME :07:06:11 07:36:30 30.3 (min) Purpose : 3
 LOG : 80.77 82.24 1.5 Region : 10310
 FDEPTH: 73 75 Gear cond.: 0
 BDEPTH: 73 75 Validity : 1
 Towing dir: 0° Wire out : 205 m Speed : 2.9 kn
 Sorted : 0 Total catch: 29.61 Catch/hour: 58.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	29.89	168	51.00	
Leiognathus bindus**	6.39	2397	10.91	
Leiognathus equulus	5.62	57	9.59	
Sphyræna putnameae	4.00	4	6.82	
Gazza minuta	2.08	59	3.55	
Sphyræna forsteri	1.78	16	3.04	
Saurida tumbil	1.29	10	2.20	
Scomberoides commersonianus	1.13	4	1.93	
Lagocephalus lunaris	1.07	10	1.82	
Selar crumenophthalmus	0.69	6	1.18	177
Nemipterus nematophorus	0.67	12	1.15	179
Nemipterus japonicus	0.61	8	1.05	178
Saurida longimanus	0.51	71	0.88	180
Chirocentrus nudus	0.46	2	0.78	
Megalaspis cordyla	0.38	2	0.64	
Saurida undosquamis	0.32	10	0.54	
J E L L Y F I S H	0.28	2	0.47	
Loligo duvaucelii	0.26	32	0.44	
Lagocephalus spadiceus	0.20	2	0.34	
Alectis ciliaris	0.18	2	0.30	
Terapon jarbua	0.16	2	0.27	
Dussumieria acuta	0.12	2	0.20	
Sphyræna obtusata	0.12	2	0.20	
Platycephalus sp.	0.10	2	0.17	
Siganus canaliculatus	0.10	4	0.17	
MURICIDAE	0.06	6	0.10	
STOMATOPODA	0.04	4	0.07	
Stolephorus indicus	0.04	2	0.07	
Apogon 'big'	0.02	2	0.03	
Fistularia petimba	0.02	4	0.03	
MELONGENIDAE	0.02	2	0.03	
STROMBIDAE	0.02	2	0.03	
Plastic	0.00	2	0.00	
Total	58.61		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 30
 DATE :30/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 16°8.12
 start stop duration Lon E 94°9.05
 TIME :09:17:10 09:48:48 31.6 (min) Purpose : 3
 LOG : 94.90 96.91 2.0 Region : 10310
 FDEPTH: 20 20 Gear cond.: 0
 BDEPTH: 20 20 Validity : 1
 Towing dir: 0° Wire out : 120 m Speed : 3.8 kn
 Sorted : 0 Total catch: 162.52 Catch/hour: 308.29

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	134.55	1123	43.64	
Opisthopterus tardoore	81.83	27	26.54	75
Plicofollis platystomus	16.10	144	5.22	80
Terapon jarbua	11.80	104	3.83	
Pennahia anea	8.99	116	2.92	77
Plotosus canius	8.54	21	2.77	
Otolithes ruber	6.73	83	2.18	76
Rhinoptera javanica ***	5.88	2	1.91	
Johnius coitor	4.31	53	1.40	79
Metapenaeus ensis	3.51	341	1.14	
J E L L Y F I S H	3.40	57	1.10	
Portunus sanguinolento	3.34	25	1.08	
Thryssa sp.	2.62	374	0.85	
Sphyræna putnamae	2.54	2	0.82	
Sardinella albella	2.37	99	0.77	82
Chirocentrus dorab	1.84	2	0.60	
Conger sp.	1.48	6	0.48	
Eleutheronema tetradactylum	1.06	11	0.34	81
Siganus canaliculatus	0.91	34	0.30	
Penaeus monodon	0.87	13	0.28	
Lagocephalus lunaris	0.57	6	0.18	
Dussumieria acuta	0.51	13	0.17	78
Scomberoides commersonianus	0.46	2	0.15	
Saurida tumbil	0.44	2	0.14	
Metapenaeus lysianassa	0.42	97	0.14	
Gazza minuta	0.40	17	0.13	
Cynoglossus lingua	0.34	23	0.11	
MURAENIDAE	0.34	4	0.11	
HARPISQUILLIDAE	0.34	17	0.11	
Penaeus notialis	0.27	11	0.09	
Stolephorus indicus	0.23	17	0.07	
Leiognathus equulus	0.17	6	0.06	
Moolgarda perusii	0.17	4	0.06	
Megalaspis cordyla	0.17	2	0.06	
Sardinella gibbosa	0.15	4	0.05	
Alectis ciliaris	0.13	2	0.04	
Sepiella inermis	0.11	6	0.04	
Lactarius lactarius	0.09	6	0.03	
Lagocephalus spadiceus	0.08	4	0.02	
Unidentified Bivalve	0.08	2	0.02	
Loligo duvaucelii	0.08	4	0.02	
STOMATOPODA	0.06	2	0.02	
Parapenaeopsis sp.	0.02	2	0.01	
Total		308.29	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 31
 DATE :30/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°55.16
 start stop duration Lon E 94°5.02
 TIME :12:32:21 13:02:42 30.4 (min) Purpose : 3
 LOG : 115.77 117.30 1.5 Region : 10310
 FDEPTH: 37 37 Gear cond.: 0
 BDEPTH: 37 37 Validity : 1
 Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
 Sorted : 0 Total catch: 148.92 Catch/hour: 294.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Leiognathus equulus	71.78	4994	24.39	
Nemipterus peronii	41.74	1421	14.18	
Thryssa sp.	29.72	2875	10.10	
Metapenaeus sp.	18.34	1294	6.23	
Nemipterus japonicus	16.13	251	5.48	85
Saurida tumbil	10.28	174	3.49	87
Sardinella gibbosa	9.80	219	3.33	83
Terapon jarbua	9.64	245	3.28	
Gerres sp.	8.10	43	2.75	
Upeneus sulphureus	7.91	253	2.69	86
Ilisha melastoma	7.59	219	2.58	
Stolephorus indicus	7.27	2433	2.47	84
Upeneus moluccensis	6.96	156	2.36	
Jaydia striata	6.01	409	2.04	
Upeneus sp.	4.74	16	1.61	
Pennahia anea	4.11	30	1.40	
Gazza minuta	3.48	156	1.18	
MURAENIDAE	3.14	4	1.07	
Dussumieria acuta	2.85	93	0.97	90
Carangoides sp.	2.73	10	0.93	
Alectis indica	2.43	2	0.83	
Sepia sp	2.37	14	0.81	
Lagocephalus lunaris	2.35	38	0.80	
Solenocera sp.	1.90	314	0.64	
Pomadasyd kaskan	1.74	4	0.59	
Secutor insidiator	1.26	253	0.43	
Pseudorhombus dupliciocellatus ***	1.03	16	0.35	
Apogon quadrifasciatus**	0.95	95	0.32	
GOBIIDAE	0.95	95	0.32	
Grammolites sp.	0.95	504	0.32	
CLUPEIDAE	0.95	24	0.32	
Psettodes erumei	0.91	2	0.31	
Ariosoma sp.	0.87	47	0.30	
Rastrelliger kanagurta	0.81	4	0.28	89
Sphyræna putnamae	0.77	2	0.26	88
SCORPAENIDAE	0.63	32	0.21	
Cynoglossus sp.	0.63	16	0.21	
Charybdis cruciata	0.34	2	0.11	
Pomadasyd maculatus	0.16	16	0.05	
Total		294.31	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 32
 DATE :30/08/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°55.48
 start stop duration Lon E 93°59.63
 TIME :14:46:55 15:17:25 30.5 (min) Purpose : 1
 LOG : 127.10 128.49 1.4 Region : 10310
 FDEPTH: 5 25 Gear cond.: 0
 BDEPTH: 60 64 Validity : 3
 Towing dir: 0° Wire out : 120 m Speed : 2.7 kn
 Sorted : 0 Total catch: 27.76 Catch/hour: 54.61

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sardinella gibbosa	32.97	655	60.37	91
Selar crumenophthalmus	5.17	35	9.47	
Scomberoides tol	4.49	26	8.21	97
Scomberoides tala	3.56	2	6.52	96
Rastrelliger kanagurta	2.10	16	3.85	95
Atule mate	1.99	12	3.64	
Sphyræna putnamae	1.75	4	3.21	
Megalaspis cordyla	1.12	6	2.85	
Chirocentrus dorab	0.35	2	0.65	92
Dussumieria acuta	0.35	6	0.65	93
Loligo sp.	0.22	43	0.40	
Siganus canaliculatus	0.18	6	0.32	
Sphyræna obtusata	0.16	2	0.29	
Champsodon sp.	0.06	51	0.11	
Ilisha melastoma ***	0.06	2	0.11	
Saurida tumbil	0.04	2	0.07	94
Thryssa sp.	0.02	4	0.04	
Bregmaceros sp.	0.02	4	0.04	
Total		54.61	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 33
 DATE :30/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°53.68
 start stop duration Lon E 93°57.20
 TIME :16:13:01 16:43:47 30.8 (min) Purpose : 3
 LOG : 131.39 133.00 1.6 Region : 10310
 FDEPTH: 70 71 Gear cond.: 0
 BDEPTH: 70 71 Validity : 1
 Towing dir: 0° Wire out : 180 m Speed : 3.1 kn
 Sorted : 0 Total catch: 64.15 Catch/hour: 125.05

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus nematophorus	14.85	246	11.88	99
Nemipterus japonicus	13.33	90	10.66	
Lutjanus madras	13.02	101	10.41	100
Saurida tumbil	7.52	51	6.02	102
Leiognathus equulus	6.78	62	5.42	104
Lepturacanthus savala	6.47	35	5.18	
Pennahia anea	6.20	43	4.96	101
Sargocentron rubrum	5.38	55	4.30	
Rhinoptera javanica ***	5.03	2	4.02	
Aphanes rutilans	4.72	31	3.77	
Pristipomoides sp.	4.05	4	3.24	
Alectis ciliaris	3.55	4	2.84	
Bregmaceros sp.	2.88	1082	2.31	
Pentapriion sp.	2.85	125	2.28	
Rastrelliger kanagurta	2.73	19	2.18	103
Lutjanus lutjanus	2.53	47	2.03	
Upeneus sulphureus	2.26	51	1.81	98
Branchiostegus sawakinensis	1.83	2	1.47	
Epinephelus heniochus	1.79	6	1.43	
Saurida undosquamis	1.72	51	1.37	
Cociella sp.	1.48	35	1.18	
Pterois russellii	1.33	16	1.06	
Sepia aculeata	1.25	4	1.00	
Lagocephalus guentheri	1.13	4	0.90	
Scomberoides tol	1.09	4	0.87	
Priacanthus hamrur	1.05	4	0.84	
Sphyræna obtusata	0.97	12	0.78	
Conger sp.	0.90	4	0.72	
Fistularia petimba	0.82	23	0.65	
Atule mate	0.82	4	0.65	
Lutjanus russellii	0.74	2	0.59	
Gazza minuta	0.58	12	0.47	
Siganus canaliculatus	0.47	16	0.37	
Metapenaeus ensis	0.39	31	0.31	
Terapon theraps	0.35	8	0.28	
Leiognathus oblongus	0.27	35	0.22	
Terapon jarbua	0.23	4	0.19	
Sardinella gibbosa	0.19	4	0.16	
Apogon 'big'	0.19	31	0.16	
Thryssa sp.	0.18	12	0.14	
Uranoscopus cognatus	0.16	4	0.12	
Scorpaenodes sp.	0.16	12	0.12	
STROMBIDAE	0.16	4	0.12	
Ilisha sp. *** PRSIL00	0.12	4	0.09	
Bassanago albescens	0.08	4	0.06	
BOTHIDAE	0.08	12	0.06	
Parapenaeopsis sp.	0.08	74	0.06	
Pseudorhombus sp. ***	0.08	4	0.06	
Saurida longimanus	0.08	35	0.06	
CONGRIDAE	0.04	12	0.03	
Solenocera sp.	0.04	4	0.03	
Leiognathus bindus**	0.04	12	0.03	
Total		125.05	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 34
 DATE :30/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°55.46
 start stop duration Lon E 93°47.99
 TIME :19:00:55 19:31:04 30.1 (min) Purpose : 3
 LOG : 148.33 149.96 1.6 Region : 10310
 FDEPTH: 114 111 Gear cond.: 0
 BDEPTH: 114 111 Validity : 1
 Towing dir: 0° Wire out : 320 m Speed : 3.2 kn
 Sorted : 0 Total catch: 41.95 Catch/hour: 83.48

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Apogon 'big'	22.85	2211	27.37	
Saurida longimanus	21.49	921	25.74	
Nemipterus bathybius	12.10	567	14.49	
Iago omanensis	11.00	16	13.18	
Saurida undosquamis	10.11	366	12.11	
Decapterus smithvanizi	1.11	20	1.33	
Sea snakes	0.92	2	1.10	
Lepturacanthus savala	0.68	2	0.81	
Hydrophis atriceps	0.52	2	0.62	
Ariosoma sp.	0.36	14	0.43	
BOTHIDAE	0.32	40	0.38	
Champsodon sp.	0.32	48	0.38	
Scomberoides tol	0.30	2	0.36	
Parapercis alboguttata	0.28	12	0.33	
Lophiomus setigerus	0.28	2	0.33	
Parascopopsis rufomaculatus	0.26	26	0.31	
Pseudorhombus sp.	0.24	8	0.29	
Sphyræna obtusata	0.12	2	0.14	
Upeneus sulphureus	0.10	2	0.12	
TETRAODONTIDAE	0.08	4	0.10	
Ebosia falcata	0.04	2	0.05	
Sepiella inermis	0.02	8	0.02	
Total	83.48		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 35
 DATE :31/08/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°23.41
 start stop duration Lon E 93°24.36
 TIME :17:15:16 17:45:22 30.1 (min) Purpose : 3
 LOG : 261.54 262.60 1.1 Region : 10320
 FDEPTH: 79 75 Gear cond.: 0
 BDEPTH: 79 75 Validity : 1
 Towing dir: 0° Wire out : 199 m Speed : 2.1 kn
 Sorted : 0 Total catch: 38.16 Catch/hour: 76.07

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SOFT SPONGES	31.26	36	41.09	
Sargocentron sp.	6.98	46	9.17	
Abalistes filamentosus	5.48	4	7.21	
Ostracion rhinorhynchus	3.91	6	5.14	
Iago omanensis	2.83	4	3.72	
J E L L Y F I S H	2.79	14	3.67	
Anothron stellatus	2.71	2	3.56	
Sepia pharaonis	2.47	12	3.25	
Pseudobalistes fuscus	2.29	4	3.01	
Anothron hispidus	2.23	2	2.94	
Gymnocranius sp.	2.21	6	2.91	
Lethrinus sp.	1.89	4	2.49	
Priacanthus sagittarius	1.79	24	2.36	
Apogon 'big'	1.73	30	2.28	
Parapriacanthus ransonneti	1.57	787	2.07	
Siganus canaliculatus	0.88	30	1.15	
Fistularia sp.	0.50	4	0.66	
Synodus sp.	0.48	100	0.63	
Lutjanus bengalensis	0.36	4	0.47	
Sepioteuthis lessoniana	0.36	2	0.47	
Sargocentron rubrum	0.32	26	0.42	
Parapercis sp.	0.30	54	0.39	
Parapenaeopsis sp.	0.30	64	0.39	
Lutjanus madras	0.22	12	0.29	105
Diodon eydouxi	0.06	2	0.08	
Portunus sp.	0.04	6	0.05	
Callionymus spiniceps	0.02	2	0.03	
TETRAODONTIDAE	0.02	2	0.03	
Scorpaenopsis sp.	0.02	12	0.03	
Parascopopsis rufomaculatus	0.02	2	0.03	
Upeneus sp.	0.02	2	0.03	
Total	76.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 36
 DATE :31/08/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°17.43
 start stop duration Lon E 93°20.83
 TIME :19:01:08 19:31:12 30.1 (min) Purpose : 1
 LOG : 269.76 271.01 1.3 Region : 10320
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 70 58 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 2.5 kn
 Sorted : 0 Total catch: 0.49 Catch/hour: 0.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	0.66	4	67.35	
Parapriacanthus ransonneti	0.32	198	32.65	
Total	0.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 37
 DATE :01/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°31.49
 start stop duration Lon E 93°44.03
 TIME :05:54:20 06:24:45 30.4 (min) Purpose : 3
 LOG : 348.12 349.72 1.6 Region : 10320
 FDEPTH: 271 226 Gear cond.: 0
 BDEPTH: 271 226 Validity : 1
 Towing dir: 0° Wire out : 660 m Speed : 3.2 kn
 Sorted : 0 Total catch: 305.24 Catch/hour: 602.05

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Synagrops sp.	146.63	27493	24.35	
Cubiceps whiteleggii	82.54	2527	13.71	107
Heptanchias perlo	82.37	373	13.68	
Chlorophthalmus corniger	60.71	2495	10.08	
Puerulus sewelli	60.36	316	10.02	
Herterocarpus cf woodmansoni	60.18	11284	10.00	
Satyricthys laticeps	56.63	213	9.41	
Neopinnula orientalis	15.09	373	2.51	106
Priacanthus macracanthus	13.31	249	2.21	
Saurida undosquamis	7.63	53	1.27	
Physiculus sp.	3.55	89	0.59	
Holcomycteronus sp.	2.84	89	0.47	
Chascanopsetta lugubris	2.31	18	0.38	
Plesiobatis daviesi	2.23	2	0.37	
Owstonia nudibucca	1.78	18	0.29	
C R A B S	1.24	36	0.21	
Psenopsis obscura	1.07	18	0.18	
Halimochirurgus centriscooides	0.89	71	0.15	
Coelorinchus sp.	0.18	18	0.03	
Trichirus sp.	0.18	18	0.03	
Malacocephalus sp.	0.18	18	0.03	
Holcomycteronus sp.	0.18	36	0.03	0
Laeops sp.	0.00	0	0.00	
Ateleopus indicus	0.00	0	0.00	
Pterygotrigla macrorhynchus	0.00	0	0.00	
Gephyroberyx japonicus	0.00	0	0.00	
Tydemania navigatoris	0.00	0	0.00	
Pyramodon sp	0.00	0	0.00	
Waste General	0.00	2	0.00	
HOMOLIDAE	0.00	0	0.00	
Chaunax apus	0.00	0	0.00	
Lophiomus setigerus	0.00	0	0.00	
Lophiodes mutilus	0.00	0	0.00	
Chaunax multilepis	0.00	0	0.00	
MYCTOPHIDAE	0.00	0	0.00	
Chlorophthalmus acutifrons	0.00	0	0.00	
Malthopsis annulifera	0.00	0	0.00	
Bembrops caudimacula	0.00	0	0.00	
Peristedion liorhynchus	0.00	0	0.00	
Total	602.05		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 38
 DATE :01/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°40.51
 start stop duration Lon E 93°45.09
 TIME :08:22:10 08:53:34 31.4 (min) Purpose : 3
 LOG : 362.61 364.23 1.6 Region : 10320
 FDEPTH: 87 84 Gear cond.: 0
 BDEPTH: 87 84 Validity : 1
 Towing dir: 0° Wire out : 270 m Speed : 3.1 kn
 Sorted : 0 Total catch: 40.33 Catch/hour: 77.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Rhinobatos formosensis	30.58	2	39.67	
Selar crumenophthalmus	20.61	231	26.73	108
Priacanthus macracanthus	8.93	86	11.58	111
Saurida undosquamis	4.05	82	5.26	112
Uraspis uraspis	3.67	23	4.76	109
Sepia pharaonis	2.39	8	3.10	
Trichirus sp.	1.38	8	1.79	
Upeneus bensasi	0.90	40	1.17	110
Seriolina nigrofasciata	0.76	2	0.99	
Abalistes stellaris	0.65	4	0.84	
Priacanthus hamrur	0.61	4	0.79	
Pentaprion sp.	0.54	55	0.69	
Parupeneus heptacanthus	0.48	4	0.62	
Nemipterus zysron	0.38	6	0.50	
Lepturacanthus savala	0.27	2	0.35	
Tentoriceps cristatus	0.25	2	0.32	
Nemipterus bipunctatus	0.17	4	0.22	
Nemipterus bathybius	0.15	4	0.20	
Decapterus russelli	0.10	2	0.12	
Siganus canaliculatus	0.08	2	0.10	
Upeneus moluccensis	0.08	4	0.10	
Octopus sp.	0.06	2	0.07	
Loligo duvaucelii	0.02	2	0.02	
Selar crumenophthalmus	0.00	0	0.00	113
Total	77.09		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 39
 DATE :01/09/18 GEAR TYPE: PT NO: 8 POSITION:Lat N 14°43.47
 start stop duration Lon E 93°44.81
 TIME :10:00:26 10:43:47 43.4 (min) Purpose : 1
 LOG : 369.24 372.83 3.6 Region : 10320
 FDEPTH: 10 30 Gear cond.: 0
 BDEPTH: 81 72 Validity : 3
 Towing dir: 0° Wire out : 280 m Speed : 5.0 kn
 Sorted : 0 Total catch: 52.73 Catch/hour: 72.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Siganus canaliculatus	72.91	2667	99.91	
Decapterus macrosoma	0.07	1	0.09	
Fishing gears	0.00	1	0.00	
Total	72.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 40
 DATE :01/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°57.33
 start stop duration Lon E 93°46.99
 TIME :12:19:07 12:48:43 29.6 (min) Purpose : 3
 LOG : 383.68 385.02 1.4 Region : 10320
 FDEPTH: 69 72 Gear cond.: 0
 BDEPTH: 69 72 Validity : 1
 Towing dir: 0° Wire out : 180 m Speed : 2.7 kn
 Sorted : 0 Total catch: 59.48 Catch/hour: 120.57

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Abalistes stellaris	36.69	51	30.43	
Uraspis helvola	17.11	4	14.19	
Nemipterus bathybius	17.11	497	14.19	117
Priacanthus macracanthus	9.24	20	7.67	
Gymnocranius sp.	6.65	18	5.51	
Sepia pharaonis	6.28	2	5.21	
Selar crumenophthalmus	4.18	34	3.46	116
Decapterus sp.	3.32	30	2.76	115
Sepia latimanus	2.96	18	2.45	
Diodon sp.	2.64	2	2.19	
Metapenaeus sp.	1.89	36	1.56	
Grammatobothus polyophthalmus	1.05	14	0.87	
Bregmaceros sp.	1.03	49	0.86	
SNAKE	0.89	2	0.74	
Rhynchostracion nasus	0.87	4	0.72	
Parupeneus heptacanthus	0.85	4	0.71	114
Tetrosomus gibbosus	0.81	4	0.67	
Uranoscopus sp.	0.81	2	0.67	
Apogon fleurieu	0.73	41	0.61	
Solenocera sp.	0.67	20	0.55	
OPHICHTHIDAE	0.61	4	0.50	
MURAENIDAE	0.61	4	0.50	
HOLOCENTRIDAE	0.49	4	0.40	
Satyricthys sp.	0.45	2	0.37	
Starfish	0.41	2	0.34	
Parapriacanthus ransonneti	0.36	32	0.30	
Neotrygon caeruleopunctata	0.24	2	0.20	
Lagocephalus sp.	0.24	4	0.20	
Cistopus sp.	0.18	4	0.15	
Portunus hastatus	0.18	34	0.15	
Citharus sp.	0.18	12	0.15	
Trachurus trachurus	0.18	4	0.15	
Loligo duvaucelii	0.18	6	0.15	
Platycephalus sp.	0.10	4	0.08	
Champsodon sp.	0.06	6	0.05	
Octopus sp.	0.06	2	0.05	
Dipterygonotus balteatus	0.06	6	0.05	
Siganus corallinus	0.04	2	0.03	
Mephisto sp.	0.04	4	0.03	
Lutjanus lutjanus	0.02	8	0.02	
Pentapirion sp.	0.02	2	0.02	
Tydemania navigatoris	0.02	2	0.02	
Sargocentron rubrum	0.00	0	0.00	
Ostorhinchus nigrocinctus	0.00	0	0.00	
Pseudorhombus dupliciocellatus ***	0.00	0	0.00	
Total	120.53		99.97	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 41
 DATE :01/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°10.18
 start stop duration Lon E 93°48.16
 TIME :14:29:03 14:59:08 30.1 (min) Purpose : 3
 LOG : 397.25 398.55 1.3 Region : 10320
 FDEPTH: 79 80 Gear cond.: 0
 BDEPTH: 79 80 Validity : 1
 Towing dir: 0° Wire out : 200 m Speed : 2.6 kn
 Sorted : 0 Total catch: 49.38 Catch/hour: 98.46

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dactyloptena macracantha	14.64	219	14.86	
Lepidotrigla sp.	13.52	60	13.73	
Naucrates ductor	10.01	8	10.17	
Saurida undosquamis	8.93	491	9.07	119
Upeneus sp.	7.62	495	7.74	
Abalistes stellaris	6.74	12	6.84	
Sepia sp.	5.66	8	5.75	
Nemipterus bipunctatus	4.95	64	5.02	
Upeneus moluccensis	3.63	112	3.69	118
Platycephalus sp.	3.31	231	3.36	
Rhinobatos sp.	3.23	4	3.28	
Pentapirion sp.	2.71	148	2.75	
Trachinocephalus sp.	2.67	72	2.71	
Nemipterus sp.	1.91	52	1.94	
Decapterus sp.	1.64	28	1.66	
MURAENIDAE	1.36	4	1.38	
Sepiella sp.	1.20	36	1.22	
Selar crumenophthalmus	1.00	8	1.01	
Cistopus sp.	0.48	16	0.49	
Lagocephalus suezensis	0.44	12	0.45	
Priacanthus sagittarius	0.40	4	0.41	
Solenocera sp.	0.36	96	0.36	
Synodus sp.	0.32	24	0.32	
Bregmaceros sp.	0.32	319	0.32	
Ariosoma sp.	0.32	8	0.32	
Samariscus sp.	0.16	8	0.16	
Minous sp.	0.16	8	0.16	
Paraperis sp.	0.12	8	0.12	
CALLIONYMIDAE	0.12	4	0.12	
Fistularia petimba	0.12	4	0.12	
Dipterygonotus balteatus	0.12	12	0.12	
Portunus sp.	0.08	20	0.08	
NETTASTOMATIDAE	0.08	4	0.08	
MONACANTHIDAE	0.04	4	0.04	
Apogon sp.	0.04	8	0.04	
Parapriacanthus ransonneti	0.04	8	0.04	
Cynoglossus sp.	0.04	4	0.04	
Total	98.46		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 42
 DATE :01/09/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°23.07
 start stop duration Lon E 93°51.28
 TIME :16:52:27 17:27:24 35.0 (min) Purpose : 1
 LOG : 413.68 415.25 1.6 Region : 10320
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 65 65 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 2.7 kn
 Sorted : 0 Total catch: 16.90 Catch/hour: 29.01

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Auxis thazard	12.53	26	43.20	120
Rastrelliger kanagurta	6.30	46	21.72	123
Selar crumenophthalmus	5.67	65	19.53	122
Decapterus macrosoma	3.12	55	10.77	121
Chirocentrus dorab	0.46	2	1.60	
Siganus canaliculatus	0.41	12	1.42	
Loligo duvaucelii	0.26	70	0.89	
Dussumieria acuta	0.14	2	0.47	
Dipterygonotus balteatus	0.07	21	0.24	
Parapriacanthus ransonneti	0.05	38	0.18	
Total	29.01		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 43
 DATE :01/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°39.03
 start stop duration Lon E 93°54.14
 TIME :19:42:56 20:13:04 30.1 (min) Purpose : 3
 LOG : 432.30 433.81 1.5 Region : 10320
 FDEPTH: 46 46 Gear cond.: 0
 BDEPTH: 46 46 Validity : 1
 Towing dir: 0° Wire out : 145 m Speed : 3.0 kn
 Sorted : 0 Total catch: 88.79 Catch/hour: 176.76

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
SOFT SPONGES	85.60	0	48.43	
Lutjanus lutjanus	33.28	1561	18.83	125
Abalistes stellaris	16.40	22	9.28	
Ostracion sp.	8.12	24	4.60	
Decapterus macarellus	7.39	32	4.18	124
Nemipterus furcosus	3.58	48	2.03	126
Cyclichthys orbicularis	3.19	6	1.80	
Thenus orientalis	2.17	12	1.23	
Upeneus bensasi	1.99	64	1.13	
Diodon holocanthus	1.43	2	0.81	
Pentapirion sp.	1.35	48	0.77	
Atule mate	1.19	12	0.68	128
Nemipterus bipunctatus	1.19	24	0.68	
Nemipterus zysron	1.11	16	0.63	
Apogon fleurieu	1.11	167	0.63	
Sphyræna flavicauda	1.09	6	0.62	
Siganus canaliculatus	1.04	32	0.59	
Trachinocephalus myops	0.92	44	0.52	127
Selar crumenophthalmus	0.54	4	0.30	129
Sphyræna sp.	0.48	2	0.27	
Bregmaceros sp.	0.48	358	0.27	
Lagocephalus scleratus	0.42	16	0.24	
Penaeus canaliculatus	0.42	10	0.24	
Saurida undosquamis	0.40	8	0.23	
Priacanthus hamrur	0.38	2	0.21	
Dactyloptena sp.	0.30	4	0.17	
Echeneis naucrates	0.26	4	0.15	
Pterocoesio chrysozona	0.24	8	0.14	
Carangoides armatus	0.18	2	0.10	
Synodus sp.	0.16	8	0.09	
Lutjanus madras	0.12	2	0.07	
Parapriacanthus ransonneti	0.08	32	0.05	
Dipterygonotus balteatus	0.06	22	0.03	
BOTHIDAE	0.04	8	0.02	
Pristotis obtusirostris	0.04	2	0.02	
Total	176.76		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 44
 DATE :01/09/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 15°40.17
 start stop duration Lon E 93°58.43
 TIME :21:47:36 22:18:20 30.7 (min) Purpose : 1
 LOG : 445.75 447.18 1.4 Region : 10320
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 56 52 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 2.8 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 45
 DATE :02/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°20.29
 start stop duration Lon E 94°10.34
 TIME :08:50:12 09:23:07 32.9 (min) Purpose : 3
 LOG : 521.66 522.18 0.5 Region : 10320
 FDEPTH: 45 45 Gear cond.: 0
 BDEPTH: 45 45 Validity : 1
 Towing dir: 0° Wire out : 160 m Speed : 0.9 kn
 Sorted : 0 Total catch: 38.51 Catch/hour: 70.21

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Rhinoptera javanica	13.13	4	18.70	
Aurigequula longispina	8.81	119	12.54	192
Pentaptrion sp.	6.98	252	9.95	193
Nemipterus peronii	6.09	69	8.67	191
Chirocentrus nudus	4.83	9	6.88	132
Sea snakes	4.63	9	6.60	
Sepia pharaonis	4.08	4	5.82	
Aluterus monoceros	3.85	5	5.48	
Seriolina nigrofasciata	3.01	2	4.28	
Mene maculata	2.24	18	3.19	
Saurida tumbil	2.19	13	3.12	
Abalistes stellaris	1.80	13	2.57	
Saurida undosquamis	1.55	71	2.21	134
Nemipterus furcosus	1.39	9	1.97	
Loligo duvauclii	1.33	363	1.90	
Carangoides malabaricus	1.02	7	1.45	130
Atule mate	0.88	5	1.25	131
Nemipterus bipunctatus	0.77	9	1.09	
Rachycentron canadum	0.33	5	0.47	133
Carangoides hedlandensis	0.31	2	0.44	
Fistularia petimba	0.31	7	0.44	
Thenus orientalis	0.29	4	0.42	
Photopectoralis bindus	0.15	5	0.21	
Dussumieria acuta	0.13	2	0.18	
Sphyræna forsteri	0.09	2	0.13	
Pseudorhombus quinuoocellatus ***	0.04	4	0.05	
Brachypleura novaezeelandiae	0.00	0	0.00	
Siganus canaliculatus	0.00	0	0.00	
Total	70.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 46
 DATE :02/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°6.26
 start stop duration Lon E 94°8.83
 TIME :11:04:13 11:34:34 30.4 (min) Purpose : 3
 LOG : 535.76 537.27 1.5 Region : 10320
 FDEPTH: 64 64 Gear cond.: 0
 BDEPTH: 64 64 Validity : 1
 Towing dir: 0° Wire out : 190 m Speed : 3.0 kn
 Sorted : 0 Total catch: 28.16 Catch/hour: 55.65

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida tumbil	14.45	69	25.96	135
Nemipterus japonicus	8.89	81	15.98	136
Naucrates ductor	5.93	6	10.65	
Atule mate	4.21	28	7.56	137
Lagocephalus guentheri	3.62	10	6.50	
Lepturacanthus savala	1.86	2	3.34	
Sepia sp.	1.68	12	3.02	
Nemipterus nematophorus	1.62	28	2.91	
Selar crumenophthalmus	1.52	14	2.73	
Rachycentron canadum	1.26	2	2.27	
Psettodes erumei	1.17	4	2.10	
Saurida undosquamis	1.15	32	2.06	
Sphyræna forsteri	1.07	2	1.92	
Scomberoides tol	1.05	4	1.88	
Siganus canaliculatus	1.01	24	1.81	
Atule sp.	0.77	6	1.38	
Loligo sp.	0.69	83	1.24	
Scomberoides commersonianus	0.67	2	1.21	
Penaeus monodon	0.55	2	0.99	
Pentaptrion sp.	0.40	22	0.71	
Fistularia petimba	0.40	10	0.71	
Abalistes stellaris	0.38	2	0.67	
Mene maculata	0.26	2	0.46	
Pterois sp.	0.20	2	0.36	
Ostracion sp.	0.14	2	0.25	
MURICIDAE	0.14	2	0.25	
Leiognathus fasciatus ***	0.14	2	0.25	
Unidentified crab	0.12	6	0.21	
Upeneus bensasi	0.12	4	0.21	
Grammolites sp.	0.10	2	0.18	
Congrosex sp.	0.06	2	0.11	
Sand doller	0.04	2	0.07	
Ostorhinchus fasciatus	0.02	4	0.04	
SEPIOLIDAE	0.00	0	0.00	
MURICIDAE	0.00	0	0.00	0
Charybdis (Charybdis) hellerii	0.00	0	0.00	
Epinephelus areolatus	0.00	0	0.00	
Apogonichthoides pharaonis	0.00	2	0.00	
Scorpaenopsis neglecta	0.00	0	0.00	
Neomerinthe sp.	0.00	0	0.00	
Upeneus moluccensis	0.00	0	0.00	
Total	55.65		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 47
 DATE :02/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°41.45
 start stop duration Lon E 94°5.82
 TIME :14:35:52 15:05:57 30.1 (min) Purpose : 3
 LOG : 560.85 562.05 1.2 Region : 10320
 FDEPTH: 84 84 Gear cond.: 0
 BDEPTH: 84 84 Validity : 1
 Towing dir: 0° Wire out : 220 m Speed : 2.4 kn
 Sorted : 0 Total catch: 54.21 Catch/hour: 108.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Siganus canaliculatus	16.71	700	15.46	
Saurida undosquamis	13.96	106	12.91	138
Nemipterus nematophorus	9.77	199	9.04	140
Lepturacanthus savala	9.33	64	8.63	
Saurida tumbil	8.77	193	8.12	
Nemipterus japonicus	7.10	80	6.57	139
Solenocera sp.	6.42	26325	5.94	
Metapenaeus sp.	5.58	419	5.17	
Pentaptrion sp.	4.71	281	4.35	
Ophichthus sp.	3.43	20	3.17	
Bregmaceros sp.	3.35	347	3.10	
Loligo sp.	2.51	207	2.32	
Pennahia anea	2.23	12	2.07	141
Penaeus monodon	1.42	6	1.31	
Charybdis (Charybdis) hellerii	1.36	16	1.25	
Upeneus moluccensis	1.26	68	1.16	
Cistopus sp.	1.16	36	1.07	
Ostorhinchus fasciatus	1.12	586	1.03	
Cylichthys orbicularis	1.10	6	1.01	
Sepiella sp.	0.96	40	0.89	
Saurida longimanus	0.84	42	0.77	
Parasclopsis aspinosa	0.80	24	0.74	
Cociella sp.	0.52	12	0.48	
NARCINIDAE	0.46	2	0.42	
Octopus sp.	0.40	40	0.37	
Aesopia cornuta	0.30	2	0.28	
Squilla sp.	0.28	14	0.26	
Epinephelus areolatus	0.28	2	0.26	
SCORPAENIDAE	0.24	20	0.22	
Fistularia petimba	0.24	8	0.22	
Upeneus sp.	0.20	8	0.18	
Ariosoma sp.	0.16	6	0.15	
Minous coccineus	0.16	12	0.15	
Leiognathus sp.	0.14	28	0.13	
CALLIONYMIDAE	0.14	42	0.13	
Brachypleura novaezeelandiae	0.14	42	0.13	
Brotula multibarata	0.14	2	0.13	
Portunus hastatus	0.14	56	0.13	
Acropoma sp.	0.14	209	0.13	
Chelidoperca sp.	0.10	8	0.09	
Decapterus sp.	0.06	2	0.06	
Jaydia striata	0.00	0	0.00	
Decapterus macrosoma	0.00	0	0.00	
Neenchelys cheni	0.00	2	0.00	
Bregmaceros mcLellandi	0.00	0	0.00	
Arnoglossus japonicus	0.00	0	0.00	
Cistopus indicus	0.00	0	0.00	
Uroconger lepturus	0.00	0	0.00	
Jaydia smithi	0.00	0	0.00	
Total	108.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 48
 DATE :02/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°27.31
 start stop duration Lon E 94°4.19
 TIME :17:07:44 17:38:24 30.6 (min) Purpose : 3
 LOG : 576.21 577.65 1.4 Region : 10320
 FDEPTH: 112 115 Gear cond.: 0
 BDEPTH: 112 115 Validity : 1
 Towing dir: 0° Wire out : 290 m Speed : 2.8 kn
 Sorted : 0 Total catch: 38.41 Catch/hour: 75.19

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Octopus sp.	11.94	166	15.88	
Nemipterus bathybius	9.20	137	12.24	142
Priacanthus macracanthus	8.22	78	10.93	
Saurida undosquamis	6.77	135	9.01	143
Sepia pharaonis	5.09	245	6.77	
Siganus canaliculatus	4.80	157	6.38	
Charybdis miles	3.82	59	5.08	
Okameji cf. powelli	3.03	10	4.04	
Trachinocephalus myops	2.25	49	2.99	
Haliutæa stellata	2.25	147	2.99	
Synagrops sp.	1.96	313	2.60	
Pseudorhombus duplucioocellatus ***	1.66	29	2.21	
Ariosoma sp.	1.66	29	2.21	
Xenopeltus australis	1.27	49	1.69	
Parasclopsis aspinosa	0.98	20	1.30	
Ebosia falcata	0.98	88	1.30	
Aseraggodes sp.	0.98	69	1.30	
Saurida longimanus	0.88	78	1.17	
Penaeopsis sp.	0.78	196	1.04	
Upeneus tragula	0.69	29	0.91	
Snyderina yamanokami	0.69	10	0.91	
Minous monodactylus	0.59	29	0.78	
Rhinobatos lionotus	0.59	10	0.78	
Psettina sp.	0.59	59	0.78	
Solenocera choprai	0.54	39	0.72	
CALLIONYMIDAE	0.49	98	0.65	
Acanthocephala indica	0.49	20	0.65	
Ebosia sp.	0.49	10	0.65	
Gymnothorax reticularis	0.39	10	0.52	
SOLENIIDAE	0.39	29	0.52	
Squilla sp.	0.20	10	0.26	
Epinephelus radiatus	0.20	10	0.26	
BOTHIDAE	0.20	20	0.26	
Neoniphon aurolineatus	0.10	10	0.13	
Herterocarpus cf woodmansonii	0.05	117	0.07	
Total	75.19		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 49
 DATE :02/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°24.20
 start stop duration Lon E 94°22.11
 TIME :19:04:55 19:35:32 30.6 (min) Purpose : 3
 LOG : 584.10 585.60 1.5 Region : 10320
 FDEPTH: 321 316 Gear cond.: 0
 BDEPTH: 321 316 Validity : 1
 Towing dir: 0° Wire out : 735 m Speed : 2.9 kn
 Sorted : 0 Total catch: 32.74 Catch/hour: 64.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aristeus virilis	19.68	2107	30.66	
Plesiobatis daviesi	16.07	2	25.05	
Holcomycteronus sp.	5.65	18	8.80	
MYCTOPHIDAE	4.68	286	7.30	
Linuparus trigonus	3.53	16	5.50	
Chlorophthalmus corniger	2.44	139	3.33	
OPHIDIIDAE	1.45	45	2.26	
Physiculus sp.	1.31	18	2.05	
Uroconger lepturus	1.22	18	1.89	
Ophidion sp.	1.02	39	1.59	
Xenopcephalus australis	0.94	4	1.47	
Rhinobatos formosensis	0.69	2	1.07	
Polymixia berndti	0.67	22	1.04	
C R A B S	0.61	4	0.95	
Callionymus spiniceps	0.59	73	0.92	
SCORPAENIDAE	0.53	22	0.82	
MURAENIDAE	0.43	12	0.67	
Cubiceps whiteleggii	0.29	8	0.46	
Coelorinchus sp.	0.29	14	0.46	
Cyttopsis sp.	0.28	0	0.44	
Solea sp.	0.27	10	0.43	
Chlorophthalmus acutifrons	0.25	6	0.40	
Halieutaea stellata	0.24	2	0.37	
MACROURIDAE	0.22	12	0.34	
Okameji cf. powelli	0.18	2	0.27	
OPHICHTHIDAE	0.16	2	0.24	
Hymenocephalus sp.	0.16	27	0.24	
Bathyclupea sp.	0.14	4	0.21	
Octopus sp.	0.14	4	0.21	
Chaunax sp.	0.14	6	0.21	
Halieutaea sp.	0.08	6	0.12	
CHARYBDIS sp.	0.06	4	0.09	
Synagrops sp.	0.02	10	0.03	
Malthopsis sp.	0.02	2	0.03	
Astronesthes sp	0.02	8	0.03	
SOLEIDAE	0.02	4	0.03	
BOTHIDAE	0.01	4	0.02	
Myctophum sp.	0.00	2	0.00	
Invertebrate	0.00	2	0.00	
J E L L Y F I S H	0.00	78	0.00	
Total	64.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 50
 DATE :02/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°7.27
 start stop duration Lon E 94°11.07
 TIME :22:58:48 23:28:35 29.8 (min) Purpose : 3
 LOG : 608.22 609.78 1.6 Region : 10320
 FDEPTH: 552 552 Gear cond.: 0
 BDEPTH: 552 552 Validity : 1
 Towing dir: 0° Wire out : 1300 m Speed : 3.1 kn
 Sorted : 0 Total catch: 73.37 Catch/hour: 147.82

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Hexatrygon brickelli	44.33	4	29.99	
Centroporus granulosus	16.80	6	11.37	
Bathyrocongrus sp.	8.46	64	5.72	
Coryphaenoides macrolophus	7.21	85	4.88	
Aristeus alcocki	7.13	854	4.82	
OCTOPODIDAE	6.85	16	4.63	
Neoscopelus microchir	5.96	97	4.03	
Dipturus sp.	5.52	2	3.73	
Neoharriotta pinnata	4.63	2	3.13	
Centroporus granulosus	4.55	2	3.08	
Gavialiceps taeniola**	4.43	48	3.00	
Diaphus sp.	3.75	290	2.54	
Acanthephyra eximia	3.51	298	2.37	
Hypopleuron caninum	3.14	4	2.13	
Caelorinchus flabellispinis	2.50	73	1.69	
Talismania sp.	2.14	16	1.44	
Heterocarpus chani	2.10	113	1.42	
Nephropsis stewarti	1.85	56	1.25	
ARCHITEUTIDAE	1.77	28	1.20	
Pasiphaea unispinosa	1.33	89	0.90	
Metanephropsis arafurensis	0.89	16	0.60	
Sponges	0.85	8	0.57	
Jellyfish	0.77	52	0.52	
Bythaelurus sp.	0.73	8	0.49	
Benthoema sp.	0.64	125	0.44	
Aristaeomorpha sp.	0.48	56	0.33	
Chauliodus sp.	0.48	60	0.33	
Cruriraja andamanica	0.44	2	0.30	
Coloconger raniceps	0.40	4	0.27	
GLYPHOCRANGONIDAE	0.40	44	0.27	
Bathypterois sp**	0.36	24	0.25	
Apristurus sp.	0.34	2	0.23	
Cyttopsis sp.	0.32	2	0.22	
Chaunax sp.	0.28	8	0.19	
Ophidiidae 'spot nose'	0.28	12	0.19	
Polychaetes sp.	0.24	12	0.16	
OPHIDIIDAE	0.24	4	0.16	
Argyropelecus affinis	0.20	12	0.14	
PERISTEIIDAE	0.20	8	0.14	
Malthopsis sp.	0.16	8	0.11	
Benthoetis yangi	0.14	2	0.10	
Starfish	0.12	12	0.08	
OGCOEPHALIDAE	0.12	8	0.08	
Dicroleone sp.	0.12	8	0.08	
CIDARIDAE	0.12	8	0.08	
ARISTEIDAE	0.12	4	0.08	
Chlorophthalmus acutifrons	0.12	4	0.08	
NETTASTOMATIDAE	0.08	4	0.05	
Halieutaea sp.	0.08	8	0.05	
Unidentified crab	0.04	8	0.03	
CARIDEA	0.04	8	0.03	

Upeneus sp. 0.02 2 0.01
 Acanthephyra fimbriata 0.00 2 0.00
 Apristurus investigatoris 0.00 2 0.00
 Coelophrys micropa 0.00 2 0.00
 Stigmatoteuthis hoylei 0.00 2 0.00
 Malacocephalus laevis 0.00 2 0.00
 Chaunacops 0.00 2 0.00
 Gonostoma sp. 0.00 2 0.00
 Dysomma sp. 0.00 2 0.00
 Olophoris gracillirostris 0.00 2 0.00
 Alepocephalus sp. 0.00 2 0.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 51
 DATE :03/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°10.25
 start stop duration Lon E 94°22.28
 TIME :05:14:57 05:45:44 30.8 (min) Purpose : 3
 LOG : 639.07 640.72 1.7 Region : 10320
 FDEPTH: 125 124 Gear cond.: 0
 BDEPTH: 125 124 Validity : 1
 Towing dir: 0° Wire out : 380 m Speed : 3.2 kn
 Sorted : 0 Total catch: 41.87 Catch/hour: 81.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Decapterus smithvanizi	41.31	524	50.63	194
Saurida undosquamis	19.95	306	24.46	144
Parasclopsis eriomma	4.37	14	5.35	
Sepia pharaonis	4.07	74	4.99	
Ostichthys japonicus	2.47	2	3.03	
Torquigener florealis	2.10	49	2.58	
Lipochelus carnotlabrum	1.68	4	2.05	
Cyclichthys orbicularis	1.42	2	1.74	
Nemipterus bathybius	1.40	23	1.72	
Priacanthus hamrur	0.51	4	0.62	
Lepidotrigla omanensis	0.35	18	0.43	
Roa jakakari	0.29	8	0.36	
Fistularia petimba	0.29	4	0.36	
Satyrichthys laticeps	0.27	2	0.33	
Centroberyx druzhinini	0.23	2	0.29	
Decapterus kurroides	0.23	4	0.29	
Pseudanthias pillai	0.23	8	0.29	
Priacanthus macracanthus	0.21	2	0.26	
Siganus canaliculatus	0.08	4	0.10	
Arnoglossus cf. japonicus	0.08	4	0.10	
Pterygotrigla arabica	0.02	2	0.02	
Sacura sanguinea	0.00	2	0.00	
Total	81.59		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 52
 DATE :03/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°35.15
 start stop duration Lon E 94°25.17
 TIME :10:05:28 10:35:08 29.7 (min) Purpose : 3
 LOG : 668.16 669.81 1.6 Region : 10320
 FDEPTH: 91 88 Gear cond.: 0
 BDEPTH: 91 88 Validity : 1
 Towing dir: 0° Wire out : 260 m Speed : 3.3 kn
 Sorted : 0 Total catch: 52.85 Catch/hour: 106.91

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	50.57	269	47.30	146
Ilisha sp.	9.10	42	8.51	145
Priacanthus macracanthus	6.90	36	6.45	
Siganus canaliculatus	5.44	330	5.09	
Nemipterus japonicus	5.20	65	4.86	147
Selar crumenophthalmus	4.45	32	4.16	
Metapenaeopsis spp.	3.24	293	3.03	
Acropoma argentistigma	3.03	3641	2.84	
Saurida undosquamis	2.87	71	2.69	148
Priacanthus hamrur	1.92	10	1.80	
Nemipterus nematophorus	1.88	42	1.76	
Parasclopsis aspinosa	1.88	18	1.76	
Terapon jarbua	1.72	6	1.61	
Loligo sp.	1.68	49	1.57	
CHARYBDIS sp.	1.56	30	1.46	
Decapterus sp.	1.48	20	1.38	
Photopectoralis aureus	1.11	935	1.04	
Penaeus monodon	0.63	4	0.59	
Lophius sp.	0.63	2	0.59	
Zebrias sp.	0.45	2	0.42	
Sphyraena obtusata	0.20	2	0.19	
Fistularia petimba	0.18	6	0.17	
Uraspis secunda	0.16	2	0.15	
Pterois sp.	0.16	2	0.15	
Chaetodon sp.	0.08	28	0.08	
Synodus sp.	0.08	6	0.08	
CITHARIDAE	0.06	10	0.06	
Antennarius hispidus	0.04	2	0.04	
Dussumiera sp.	0.04	2	0.04	
Upeneus moluccensis	0.04	4	0.04	
Epinephelus epistictus	0.04	4	0.04	
Epinephelus heniochus	0.04	4	0.04	
Jaydia smithi	0.02	4	0.02	
Ostorhinchus fasciatus	0.02	2	0.02	
Katsuwonus pelamis	0.00	2	0.00	
Total	106.91		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 53
 DATE :03/09/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°47.71
 start stop duration Lon E 94°26.90
 TIME :12:28:27 12:58:23 29.9 (min) Purpose : 1
 LOG : 681.41 682.81 1.4 Region : 10320
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 65 65 Validity : 3
 Towing dir: 0° Wire out : 130 m Speed : 2.8 kn
 Sorted : 0 Total catch: 191.95 Catch/hour: 384.80

CALLIONYMIDAE 0.12 20 0.20
 Parachaeturichthys ploynema 0.12 12 0.20
 Solenocera sp. 0.12 16 0.20
 STOMATOPODA 0.06 4 0.10
 SYNGNATHIDAE 0.01 2 0.02
 Plastic 0.00 4 0.00
 Total 59.19 100.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Siganus canaliculatus	377.48 13016	98.10	
SNAKE	2.21 4	0.57	
Scomberomorus guttatus	1.84 4	0.48	149
Scomberoides tol	1.36 12	0.35	0
Scomberoides commersonianus	0.86 4	0.22	
Scomberoides tol	0.54 2	0.14	
Rastrelliger kanagurta	0.36 2	0.09	
Loligo duvaucelii	0.14 2	0.04	
Total	384.80	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 56
 DATE :03/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°26.75
 start stop duration Lon E 94°41.94
 TIME :22:44:59 23:12:11 27.2 (min) Purpose : 3
 LOG : 749.71 751.08 1.4 Region : 10320
 FDEPTH: 36 37 Gear cond.: 0
 BDEPTH: 36 37 Validity : 1
 Towing dir: 0° Wire out : 130 m Speed : 3.0 kn
 Sorted : 0 Total catch: 132.23 Catch/hour: 291.58

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Ilisha melastoma	44.81 3067	15.37	
Caretta caretta	44.10 2	15.13	
Pennahia anea	42.34 1233	14.52	
Thryssa sp.	37.75 3279	12.95	
Lactarius lactarius	30.87 1215	10.59	
Lepturacanthus savala	21.26 77	7.29	156
Solenocera sp.	12.70 1762	4.36	
Sepiella sp.	5.64 247	1.94	
Trichurus sp.	5.07 135	1.74	
Portunus sp.	3.88 668	1.33	
Squilla sp.	3.53 247	1.21	
Netuma thalassina	2.91 9	1.00	
Parapanaeopsis sp.	2.82 5	0.97	
Dussumieria acuta	2.82 93	0.97	
Ilisha elongata	2.73 35	0.94	
Pampus argenteus	2.51 9	0.86	
Jaydia striata	2.47 1303	0.85	
Megalaspis cordyla	1.90 13	0.65	
Nemipterus japonicus	1.85 26	0.64	
Penaeus monodon	1.76 22	0.61	
Leiognathus sp.	1.76 494	0.61	
Congresox sp.	1.65 7	0.57	
Polydactylus sextarius	1.63 26	0.56	
Metapenaeus ensis	1.50 84	0.51	
Lagocephalus lunaris	1.46 26	0.50	
Opisthopterus tardoore	1.23 35	0.42	
Metapenaeus lysianassa	1.06 245	0.36	
Saurida tumbil	0.88 4	0.30	
Scomberoides commersonianus	0.88 4	0.30	
Bregmaceros sp.	0.71 318	0.24	
Loligo sp.	0.71 71	0.24	
J E L Y F I S H	0.66 2	0.23	
Sardinella gibbosa	0.57 4	0.20	
Sphyræna obtusata	0.49 4	0.17	
Terapon theraps	0.26 4	0.09	
Pomadasyd kaakan	0.26 4	0.09	
Cynoglossus arel	0.26 9	0.09	
Dendrophysa sp.	0.26 4	0.09	
Fistularia petimba	0.22 4	0.08	
Antennarius sp.	0.22 4	0.08	
SCORPAENIDAE	0.22 9	0.08	
Nemipterus marginatus	0.18 4	0.06	
Upeneus moluccensis	0.18 2	0.06	
Eubleekeria jones	0.18 9	0.06	
Portunus pelagicus	0.18 4	0.06	
Alectis ciliaris	0.09 4	0.03	
Siganus canaliculatus	0.09 9	0.03	
CITHARIDAE	0.04 9	0.02	
Total	291.58	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 54
 DATE :03/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°55.86
 start stop duration Lon E 94°30.96
 TIME :14:29:02 14:48:48 19.8 (min) Purpose : 3
 LOG : 693.77 694.67 0.9 Region : 10320
 FDEPTH: 57 57 Gear cond.: 0
 BDEPTH: 57 57 Validity : 1
 Towing dir: 0° Wire out : 150 m Speed : 2.8 kn
 Sorted : 0 Total catch: 60.72 Catch/hour: 184.28

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Siganus canaliculatus	52.63 2504	28.56	
Nemipterus nematophorus	22.58 410	12.25	153
Pennahia anea	15.39 146	8.35	154
Nemipterus japonicus	13.02 164	7.07	152
Congresox sp.	8.56 27	4.64	
Apogon smithi	6.83 683	3.71	
Metapenaeus sp.	6.37 2000	3.46	
Saurida tumbil	6.10 27	3.31	150
Bregmaceros sp.	5.92 1818	3.21	
Jaydia striata	5.01 1363	2.72	
Zebrias sp.	5.01 64	2.72	
Apogon cf. quadrifasciatus	4.55 455	2.47	
Penaeus sp.	3.64 137	1.98	
CITHARIDAE	3.64 819	1.98	
Saurida undosquamis	3.10 73	1.68	151
Unidentified crab	2.73 725	1.48	
MURAENIDAE	2.55 18	1.38	
Sepia sp.	2.00 9	1.09	
Ilisha sp.	2.00 9	1.09	
Ariosoma sp.	1.82 64	0.99	
UNIDENTIFIED FISH	1.82 137	0.99	
Sepiella sp.	1.37 88	0.74	
Upeneus moluccensis	1.09 18	0.59	
Priacanthus sp.	1.00 9	0.54	
Squilla sp.	0.91 137	0.49	
Sand doller	0.91 91	0.49	
SCORPAENIDAE	0.73 55	0.40	
Polydactylus sextarius	0.73 9	0.40	
Lutjanus bengalensis	0.64 9	0.35	
Fistularia petimba	0.55 9	0.30	
Unidentified squid	0.46 46	0.25	
Uranoscopus cognatus	0.36 9	0.20	
CEPOLIDAE	0.18 9	0.10	
Priacanthus hamrur	0.09 9	0.05	
Total	184.28	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 57
 DATE :04/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°24.17
 start stop duration Lon E 94°52.99
 TIME :02:27:59 03:01:01 33.0 (min) Purpose : 3
 LOG : 770.59 772.41 1.8 Region : 10320
 FDEPTH: 31 32 Gear cond.: 0
 BDEPTH: 31 32 Validity : 1
 Towing dir: 0° Wire out : 130 m Speed : 3.3 kn
 Sorted : 0 Total catch: 190.44 Catch/hour: 345.84

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Nemipterus japonicus	17.56 510	29.67	
Saurida tumbil	11.85 90	20.02	155
Bregmaceros sp.	7.65 1912	12.92	
Metapenaeus ensis	3.54 279	5.99	
Sepia acuelata	2.79 12	4.71	
Saurida undosquamis	2.03 60	3.43	
Lagocephalus sp.	1.95 2	3.30	
Portunus pelagicus	1.85 6	3.13	
Portunus sanguinolento	1.00 4	1.68	
Fistularia petimba	0.84 18	1.41	
Scomberoides commersonianus	0.66 2	1.11	
Siganus canaliculatus	0.56 16	0.94	
Citharus sp.	0.48 44	0.81	
Muraenesox sp.	0.46 2	0.77	
Pentaprion sp.	0.44 20	0.74	
Nemipterus marginatus	0.44 8	0.74	
Sphyræna obtusata	0.42 4	0.71	
Leiognathus longispinis ***	0.36 4	0.61	
Lepturacanthus savala	0.36 4	0.61	
Pomadasyd multimaclulatus	0.34 6	0.57	
Lagocephalus spadiceus	0.34 10	0.57	
Trachypenaeus sp.	0.32 48	0.54	
Portunus sp.	0.30 52	0.50	
Lagocephalus lunaris	0.30 2	0.50	
Sardinella gibbosa	0.28 4	0.47	
Metapanaeopsis spp.	0.28 88	0.47	
Charybdis feriata	0.26 2	0.44	
Terapon theraps	0.22 4	0.37	
SEPIOLIDAE	0.22 20	0.37	
Ostorhinchus pleuron	0.20 52	0.34	
SCORPAENIDAE	0.18 10	0.30	
Platycephalus sp.	0.16 4	0.27	
Leiognathus bindus**	0.16 60	0.27	

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Lepturacanthus savala	119.85 5993	34.66	
Lactarius lactarius	63.85 2234	18.46	
Arius dussumieri**	44.24 153	12.79	
Ilisha melastoma ***	32.03 112	9.26	
Thryssa sp.	13.62 1634	3.94	
Dussumieria acuta	11.00 316	3.18	158
Sepiella sp.	9.37 42	2.71	
Polydactylus sextarius	8.39 142	2.43	
Opisthopterus tardoore	7.52 163	2.17	
Trichurus sp.	5.56 467	1.61	
Pampus chinensis	4.43 7	1.28	
Pampus argenteus	3.96 15	1.14	
Pennahia anea	3.81 76	1.10	157
Scomberoides commersonianus	3.18 13	0.92	
Gazza minuta	2.94 730	0.85	
Metapenaeus ensis	2.18 294	0.63	
Lagocephalus lunaris	1.85 24	0.54	
Atropus sp.	1.18 5	0.34	
Penaeus monodon	1.09 11	0.32	
Pomadasyd maculatus	0.98 33	0.28	
Nemipterus japonicus	0.87 11	0.25	
Metapenaeus sp.	0.76 33	0.22	
Terapon theraps	0.76 22	0.22	
HARPISQUILLIDAE	0.65 54	0.19	
Portunus sanguinolento	0.54 11	0.16	
SCORPAENIDAE	0.33 11	0.09	
Loligo sp.	0.33 33	0.09	
Upeneus sulphureus	0.33 11	0.09	
Solenocera sp.	0.11 11	0.03	
Antennarius sp.	0.11 11	0.03	
Total	345.84	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 58
 DATE :04/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°55.85
 start stop duration Purpose : 3
 TIME :06:22:53 06:53:08 30.3 (min) Lon E 94°49.23
 LOG : 800.35 801.92 1.6 Region : 10320
 FDEPTH: 57 59 Gear cond.: 0
 BDEPTH: 57 59 Validity : 1
 Towing dir: 0° Wire out : 165 m Speed : 3.1 kn
 Sorted : 0 Total catch: 18.75 Catch/hour: 37.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus japonicus	15.65	393	42.09	160
Leiognathus bindus**	5.95	4463	16.00	
Saurida elongata	3.05	14	8.22	
Loligo duvaucelii	2.38	161	6.40	
Sepia pharaonis	1.69	2	4.53	
Saurida undosquamis	1.49	26	4.00	159
Sepia acuelata	1.07	2	2.88	
Lagocephalus lunaris	1.07	8	2.88	
Lagocephalus spadiceus	1.01	10	2.72	
Saurida longimanus	0.61	85	1.65	
Scomberoides commersonianus	0.56	2	1.49	
Charybdis feriata	0.50	2	1.33	
Portunus sanguinolento	0.50	2	1.33	
Nemipterus nematophorus	0.42	6	1.12	
Atropus atropus	0.38	4	1.01	
Leiognathus longispinis ***	0.24	24	0.64	
Penaeus monodon	0.16	2	0.43	
Lepturacanthus savala	0.12	12	0.32	
Siganus canaliculatus	0.08	2	0.21	
Thryssa sp.	0.06	4	0.16	
Pentaprion sp.	0.06	2	0.16	
Metapenaeus ensis	0.04	2	0.11	
STOMATOPODA	0.04	4	0.11	
Gazza minuta	0.04	16	0.11	
Citharus sp.	0.02	2	0.05	
CALLIONYMIDAE	0.01	2	0.03	
Total	37.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 59
 DATE :04/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°37.41
 start stop duration Purpose : 3
 TIME :09:20:22 09:48:32 28.2 (min) Lon E 94°47.54
 LOG : 820.12 821.62 1.5 Region : 10320
 FDEPTH: 74 74 Gear cond.: 0
 BDEPTH: 74 74 Validity : 1
 Towing dir: 0° Wire out : 210 m Speed : 3.2 kn
 Sorted : 0 Total catch: 30.93 Catch/hour: 65.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Upeneus moluccensis	18.06	420	27.42	161
Nemipterus japonicus	15.55	121	23.61	162
Saurida undosquamis	4.69	98	7.11	165
Lagocephalus spadiceus	4.56	13	6.92	
Selar crumenophthalmus	3.98	28	6.05	166
Uraspis uraspis	2.90	19	4.40	195
Lepturacanthus savala	2.39	49	3.62	
Saurida elongata	2.30	13	3.49	164
Nemipterus nematophorus	2.04	36	3.10	163
Scomberoides tol	1.87	6	2.85	
Scomberoides commersonianus	1.62	6	2.46	
Sphyrnaea forsteri	1.21	4	1.84	
Saurida longimanus	1.17	147	1.78	
Loligo duvaucelii	1.04	104	1.58	
Atule mate	0.45	2	0.68	
Photopectoralis aureus	0.38	102	0.58	
Pentaprion sp.	0.30	15	0.45	
Leiognathus bindus**	0.26	55	0.39	
Dussumieria acuta	0.23	6	0.36	
Priacanthus hamrur	0.19	2	0.29	
Rastrelliger brachysoma	0.17	2	0.26	
Fistularia petimba	0.11	2	0.16	
Octopus sp.	0.09	2	0.13	
Siganus canaliculatus	0.09	2	0.13	
Citharus sp.	0.09	13	0.13	
Sepia sp.	0.06	2	0.10	
Metapenaeus ensis	0.02	4	0.03	
MAJIDAE	0.02	6	0.03	
Unidentified crab	0.02	2	0.03	
STOMATOPODA	0.01	2	0.02	
Total	65.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 60
 DATE :04/09/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°19.65
 start stop duration Purpose : 1
 TIME :12:38:29 13:19:06 40.6 (min) Lon E 94°45.53
 LOG : 843.80 845.98 2.2 Region : 10320
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 103 104 Validity : 3
 Towing dir: 0° Wire out : 150 m Speed : 3.2 kn
 Sorted : 0 Total catch: 328.60 Catch/hour: 485.38

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Siganus canaliculatus	433.09	12984	89.23	167
Selar crumenophthalmus	44.17	532	9.10	168
Rastrelliger kanagurta	3.40	30	0.70	
Scomberoides tol	2.07	15	0.43	
Rachycentron canadum	1.48	15	0.30	
Sphyrnaea obtusata	1.18	15	0.24	
Total	485.38		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 61
 DATE :04/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°9.90
 start stop duration Purpose : 3
 TIME :15:05:13 15:24:37 19.4 (min) Lon E 94°43.69
 LOG : 856.00 857.06 1.1 Region : 10320
 FDEPTH: 122 127 Gear cond.: 0
 BDEPTH: 122 127 Validity : 1
 Towing dir: 0° Wire out : 330 m Speed : 3.3 kn
 Sorted : 0 Total catch: 80.78 Catch/hour: 249.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sepia sp.	31.93	740	12.78	
Scomberoides commersonianus	29.21	121	11.69	
Scomberoides tol	26.24	96	10.50	
Saurida longimanus	22.28	223	8.91	
Okamejei cf. powelli	21.04	220	8.42	
Saurida undosquamis	13.12	517	5.25	
Nemipterus japonicus	12.38	297	4.95	169
Parapterois heterura	10.64	554	4.26	170
Octopus cyaneus	9.90	173	3.96	
Siganus canaliculatus	9.41	34	3.76	
Uranoscopus sp.	9.16	220	3.66	
Peristedion sp.	6.93	46	2.77	
Cociella sp.	5.94	22	2.38	
SOLEIIDAE	5.07	384	2.03	
Haliutaea sp.	5.07	384	2.03	
Pterygotrigla arabica	4.95	272	1.98	
Lagocephalus sp.	4.70	220	1.88	
Parascloopsis rufomaculatus	4.46	195	1.78	
Synagrops sp.	2.48	347	0.99	
Ostichthys sp.	2.48	149	0.99	
Lepidotrigla spiloptera	2.48	99	0.99	
CALLIONYMIDAE	1.98	387	0.79	
Callionymus spiniceps	1.49	170	0.59	
Laeops sp.	1.24	223	0.50	
Dactyloptena orientalis	1.24	25	0.50	
Charybdis riversandersoni	1.05	12	0.42	
Erisphex sp.	0.74	74	0.30	
Cynoglossus sp.	0.74	74	0.30	
MYCTOPHIDAE	0.37	118	0.15	
Acanthocephala sp.	0.25	6	0.10	
Pristipomoides sp.	0.25	25	0.10	
Symphurus sp.	0.25	74	0.10	
MONACANTHIDAE	0.19	6	0.07	
Bembras sp.	0.19	6	0.07	
Roa jakayari	0.12	6	0.05	
Total	249.96		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 62
 DATE :04/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°5.70
 start stop duration Purpose : 3
 TIME :19:50:26 20:10:34 20.1 (min) Lon E 95°2.96
 LOG : 891.11 892.09 1.0 Region : 10320
 FDEPTH: 309 293 Gear cond.: 0
 BDEPTH: 309 293 Validity : 1
 Towing dir: 0° Wire out : 715 m Speed : 2.9 kn
 Sorted : 0 Total catch: 22.94 Catch/hour: 68.34

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Heterocarpus sp.	21.90	1564	32.04	
Xenopeltus australis	7.98	18	11.68	
Aristaeomorpha sp.	6.67	164	9.77	
Pycnocrospedum squamipinne	3.75	18	5.49	
Linoparus somniosus	2.74	9	4.01	
Pterygotrigla macrorhynchus	2.68	15	3.92	
J E L Y F I S H	2.47	15	3.62	
Puerulus sewelli	2.44	15	3.57	
Penaeopsis sp.	1.67	179	2.44	
Chlorophthalmus acutifrons	1.64	33	2.40	
Lophiomus setigerus	1.49	6	2.18	
Lobianchia sp.	1.40	104	2.05	
Coloconger raniceps	1.34	12	1.96	
Nephrops sp.	1.22	158	1.79	
Uroconger lepturus	1.22	18	1.79	
Talismania sp.	0.89	12	1.31	
Ophichthus sp.	0.80	9	1.18	
Callionymus spiniceps	0.74	86	1.09	
Metanephropsis arafurensis	0.54	33	0.78	
Setarches guentheri**	0.48	18	0.70	
HOMOLIDAE	0.39	21	0.57	
Rexea bengalensis	0.39	6	0.57	
Synagrops sp.	0.33	57	0.48	
Neoscolepis microchir	0.30	45	0.44	
Physiculus sp.	0.30	6	0.44	
Charybdis sp.	0.30	6	0.44	
Myctophum sp.	0.27	164	0.39	
Chlorophthalmus corniger	0.21	12	0.31	
MURAEOLLEPIDAE	0.21	3	0.31	
Ophidion sp.	0.21	36	0.31	
Octopus sp.	0.15	3	0.22	
Hymenoccephalus sp.	0.15	24	0.22	
Malacocephalus laevis	0.12	3	0.17	
Raja miraletus	0.12	3	0.17	
Haliutaea sp.	0.12	24	0.17	
Cocotrops sp.	0.09	3	0.13	
Histioteuthis sp.	0.09	3	0.13	
OMMASTREPHIDAE	0.09	6	0.13	
Pterygotrigla arabica	0.09	6	0.13	
Laeops sp.	0.09	9	0.13	
Gadella sp.	0.09	9	0.13	
Tydemania sp.	0.06	3	0.09	
SICYONIIDAE	0.06	18	0.09	
Polyipnus indicus	0.03	18	0.04	
Cantherhines sp.	0.01	3	0.02	
Chaunax sp.	0.01	3	0.01	
Leiognathus sp.	0.00	3	0.00	
Total	68.34		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 63
 DATE :04/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°10.10
 start stop duration Lon E 95°3.85
 TIME :21:40:26 22:11:35 31.1 (min) Purpose : 3
 LOG : 899.05 900.50 1.4 Region : 10320
 FDEPTH: 117 116 Gear cond.: 0
 BDEPTH: 117 116 Validity : 1
 Towing dir: 0° Wire out : 295 m Speed : 2.8 kn
 Sorted : 0 Total catch: 142.92 Catch/hour: 275.38

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sepia pharaonis	91.91	2730	33.38	
Saurida undosquamis	60.12	1135	21.83	
Ostichthys sp.	19.65	12	7.14	
Raja miraletus	16.18	69	5.88	
Octopus sp.	15.65	405	5.68	
Pseudorhombus quinuoceollatus ***	11.21	289	4.07	
Platycephalus sp.	8.44	58	3.06	
Neoniphon aurolineatus	7.28	35	2.64	
SOLEIDAE	5.20	301	1.89	
Fistularia petimba	5.16	2	1.88	
Lepturacanthus savala	4.39	12	1.60	
Lophiomus setigerus	3.93	23	1.43	
Paraperis alboguttata	3.70	46	1.34	
Callionymus spiniceps	3.01	289	1.09	
Ariosoma sp.	2.66	69	0.97	
Dactyloptena orientalis	2.20	46	0.80	
SCORPAENIDAE	1.62	58	0.59	0
Synodus sp.	1.50	162	0.55	
Haliutaea sp.	1.50	81	0.55	
Priacanthus macracanthus	1.27	12	0.46	
Pseudorhombus sp. ***	1.16	150	0.42	
Priacanthus hamrur	1.04	12	0.38	
Trachinocephalus myops	1.04	35	0.38	
Parascopopsis boesemani	0.92	231	0.34	
SCORPAENIDAE	0.81	35	0.29	
Chelonodotops sp.	0.69	46	0.25	
Heterocarpus sp.	0.69	46	0.25	
Nemipterus bathybius	0.69	12	0.25	
Lepidotrigla sp.	0.58	23	0.21	
Ebosia sp.	0.58	23	0.21	
Ophichthus sp.	0.35	12	0.13	
Pterygotrigla arabica	0.23	12	0.08	
Total	275.38		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 64
 DATE :05/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°35.64
 start stop duration Lon E 95°8.30
 TIME :02:07:42 02:37:33 29.8 (min) Purpose : 3
 LOG : 931.31 932.80 1.5 Region : 10320
 FDEPTH: 82 76 Gear cond.: 0
 BDEPTH: 82 76 Validity : 1
 Towing dir: 0° Wire out : 260 m Speed : 3.0 kn
 Sorted : 0 Total catch: 38.53 Catch/hour: 77.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pentaprion sp.	21.39	885	27.61	
Lagocephalus guentheri	10.09	48	13.03	
Lepturacanthus savala	6.68	46	8.62	174
Nemipterus nematophorus	5.29	50	6.83	172
Okameji cf. powelli	3.40	24	4.39	
Scomberoides tol	3.28	14	4.23	
Priacanthus macracanthus	3.12	26	4.02	
Upeneus moluccensis	3.02	2	3.89	171
Selar crumenophthalmus	2.90	24	3.74	
Scomberoides sp.	2.71	22	3.50	
Saurida undosquamis	2.07	207	2.67	
CALLIONYMIDAE	1.99	378	2.57	
Scomberomorus guttatus	1.29	2	1.66	173
Lophiomus sp.	1.13	4	1.45	
Platyrrhina sp.	0.97	2	1.25	
Decapterus smithvanizi	0.76	14	0.99	
Rhinobatos sp.	0.72	4	0.93	
Naucrates ductor	0.60	2	0.78	
Sphyrna forsteri	0.58	6	0.75	
Dussumieria elopsoides	0.58	10	0.75	
Scomberoides commersonianus	0.56	2	0.73	
Haliutaea sp. A	0.56	22	0.73	
Sepiella sp.	0.50	14	0.65	
Fistularia petimba	0.50	16	0.65	
Haliutaea stellata	0.42	40	0.55	
Lagocephalus spadiceus	0.30	2	0.39	
Loligo sp.	0.30	48	0.39	
Charybdis sp.	0.24	2	0.31	
Dactyloptena orientalis	0.16	4	0.21	
Upeneus sp.	0.16	6	0.21	
Siganus canaliculatus	0.16	4	0.21	
Citharus sp.	0.12	16	0.16	
SCORPAENIDAE	0.12	6	0.16	
Pseudorhombus sp.	0.12	2	0.16	
Starfish	0.10	6	0.13	
Leiognathus sp.	0.08	4	0.10	
SOLEIDAE	0.06	8	0.08	
TRIACANTHIDAE	0.06	2	0.08	
Laeops sp.	0.06	8	0.08	
Tydemania sp.	0.06	4	0.08	
Metapenaeus sp.	0.04	6	0.05	
Cantherhines multilineatus	0.04	2	0.05	
Parapterois heterura	0.04	2	0.05	
Lagocephalus sp.	0.02	2	0.03	
Unidentified crab	0.02	2	0.03	
Champsodon sp.	0.02	4	0.03	
Hoplichthys sp.	0.02	2	0.03	
Cistopus sp.	0.02	2	0.03	
Scolopsis sp.	0.02	2	0.03	
Total	77.47		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 65
 DATE :05/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°51.54
 start stop duration Lon E 95°8.69
 TIME :04:45:22 05:15:25 30.1 (min) Purpose : 3
 LOG : 948.34 949.93 1.6 Region : 10320
 FDEPTH: 64 61 Gear cond.: 0
 BDEPTH: 64 61 Validity : 1
 Towing dir: 0° Wire out : 17 m Speed : 3.2 kn
 Sorted : 0 Total catch: 32.46 Catch/hour: 64.81

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	24.00	256	37.03	
Sphyrna lewini	15.09	8	23.29	197
Nemipterus japonicus	8.57	128	13.22	
Scomberoides commersonianus	3.37	16	5.21	
Saurida undosquamis	2.88	70	4.44	
Lagocephalus lunaris	2.28	24	3.51	
Lagocephalus spadiceus	1.96	10	3.02	
Ilisha sp. *** PRSIL00	1.08	8	1.66	
Pennahia anea	0.86	6	1.32	
Selar crumenophthalmus	0.64	4	0.99	
Saurida longimanus	0.54	64	0.83	
Terapon jarbua	0.40	2	0.62	
Atropus atropus	0.38	4	0.59	
Siganus canaliculatus	0.34	8	0.52	
Priacanthus hamrur	0.30	2	0.46	
Leiognathus bindus**	0.28	76	0.43	
Pedophthalmus vigil	0.22	2	0.34	
Metapenaeus ensis	0.20	18	0.31	
Dussumieria acuta	0.14	4	0.22	
Alectis indica	0.14	2	0.22	
Brachyterois serrulifer	0.12	6	0.18	
Uranoscopus affinis	0.12	4	0.18	
Apogon 'big'	0.12	14	0.18	
Antennarius hispidus	0.10	2	0.15	
Cantherhines multilineatus	0.10	4	0.15	
Starfish (pentagon)	0.08	4	0.12	
Platycephalus sp.	0.08	2	0.12	
Minous coccineus	0.08	2	0.12	
G A S T R O P O D S	0.06	2	0.09	
Pentaprion sp.	0.06	2	0.09	
Loligo duvaucelii	0.06	12	0.09	
Citharus sp.	0.06	10	0.09	
Upeneus sulphureus	0.02	4	0.03	
STOMATOPODA	0.02	2	0.03	
Portunus sp.	0.02	2	0.03	
Callionymus spiniceps	0.02	4	0.03	
Champsodon sp.	0.02	6	0.03	
Octopus sp.	0.02	2	0.03	
Total	64.81		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 66
 DATE :05/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°15.58
 start stop duration Lon E 95°12.18
 TIME :08:32:31 08:38:54 6.4 (min) Purpose : 3
 LOG : 975.03 975.32 0.3 Region : 10320
 FDEPTH: 31 31 Gear cond.: 0
 BDEPTH: 31 31 Validity : 1
 Towing dir: 0° Wire out : 150 m Speed : 2.7 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 67
 DATE :05/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°23.97
 start stop duration Lon E 95°13.96
 TIME :10:05:10 10:35:17 30.1 (min) Purpose : 3
 LOG : 984.41 986.46 2.0 Region : 10320
 FDEPTH: 22 21 Gear cond.: 0
 BDEPTH: 22 21 Validity : 1
 Towing dir: 0° Wire out : 120 m Speed : 4.1 kn
 Sorted : 0 Total catch: 154.93 Catch/hour: 308.62

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Metapenaeus sp.	77.93	51432	25.25	
Lepturacanthus savala	76.65	3833	24.84	
Harpadon sp.	55.14	2432	17.87	
Terapon theraps	13.55	319	4.39	
Sepiella inermis	10.52	946	3.41	
OPHICHTHIDAE	9.72	64	3.15	
Otolithes ruber	9.08	32	2.94	
Pennahia anea	8.45	207	2.74	
Arius sp.	8.45	16	2.74	
Scomberoides commersonianus	6.53	32	2.12	
Thryssa sp.	6.06	2018	1.96	
Pampus argenteus	5.10	16	1.65	
Lactarius lactarius	3.82	112	1.24	
Lagocephalus lunaris	3.51	48	1.14	
Portunus gradicator	3.19	590	1.03	
Charybdis feriata	3.03	32	0.98	
STOMATOPODA	1.91	175	0.62	
Ilisha sp. *** PRSIL00	1.75	96	0.57	
Sardinella albella	1.59	32	0.52	
Lagocephalus spadiceus	1.35	48	0.44	
Siganus canaliculatus	0.96	32	0.31	
Loligo duvaucelii	0.16	16	0.05	
Coilia dussumieri	0.16	64	0.05	
Parastromateus niger	0.02	16	0.01	
Total	308.62		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 68
 DATE :05/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°14.08
 start stop duration Lon E 95°34.61
 TIME :16:17:49 16:33:03 15.2 (min) Purpose : 3
 LOG : 1022.71 1023.49 0.8 Region : 10320
 FDEPTH: 47 47 Gear cond.: 0
 BDEPTH: 47 47 Validity : 1
 Towing dir: 0° Wire out : 150 m Speed : 3.1 kn
 Sorted : 0 Total catch: 19.10 Catch/hour: 75.20

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	10.55	146	14.03	
Solenocera sp.	9.92	472	13.19	
Thryssa sp.	9.09	299	12.09	
Congresox sp.	7.28	12	9.69	
Johnieops sp.	6.93	102	9.21	
Pennahia anea	5.79	272	7.70	
Charybdis sp.	5.24	524	6.96	
Bregmaceros sp.	2.48	1736	3.30	
Portunus sanguinolento	2.40	16	3.19	
TONNIDAE	1.97	4	2.62	
Charybdis cruciata	1.89	16	2.51	
Acropoma sp.	1.65	2480	2.20	
Jaydia sp.	1.65	744	2.20	
Sardinella melanura	1.42	28	1.88	
Cynoglossus arel	1.26	16	1.68	
Polydactylus sextarius	1.18	39	1.57	
Upeneus moluccensis	0.91	20	1.20	
Terapon thersaps	0.59	12	0.79	
Setipinna taty	0.59	24	0.79	
Sepiella sp.	0.55	165	0.73	
Actinoptilum	0.39	16	0.52	
Lagocephalus guentheri	0.39	12	0.52	
MURICIDAE	0.31	16	0.42	
CARANGIDAE	0.28	827	0.37	
Lactarius lactarius	0.24	8	0.31	
Trypauchen sp.	0.08	8	0.10	
MURAENIDAE	0.08	8	0.10	
Apogon smithi	0.04	4	0.05	
Charybdis natator	0.04	4	0.05	
Total	75.20		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 71
 DATE :06/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°21.12
 start stop duration Lon E 95°25.59
 TIME :03:11:19 03:42:02 30.7 (min) Purpose : 3
 LOG : 1085.68 1087.19 1.5 Region : 10320
 FDEPTH: 104 105 Gear cond.: 0
 BDEPTH: 104 105 Validity : 1
 Towing dir: 0° Wire out : 270 m Speed : 3.0 kn
 Sorted : 0 Total catch: 36.32 Catch/hour: 70.98

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	24.31	92	34.25	188
Saurida undosquamis	20.52	125	28.91	189
Nemipterus sp.	5.08	92	7.16	
Priacanthus macracanthus	4.57	33	6.44	
Fistularia petimba	3.97	27	5.59	
Lagocephalus guentheri	3.52	18	4.68	
Priacanthus hamrur	3.21	20	4.52	
Rastrelliger kanagurta	1.25	4	1.76	187
Nemipterus japonicus	1.19	10	1.68	186
Scorpaenoides tol	0.70	2	0.99	
Tentoriceps cristatus	0.45	4	0.63	
Parascalopsis aspinosa	0.41	4	0.58	
Pseudorhombus sp. ***	0.39	4	0.55	
Upeneus bensasi	0.35	16	0.50	
Loligo sp.	0.29	104	0.41	
Cantherhines multilineatus	0.25	4	0.36	
Lagocephalus inermis	0.23	4	0.33	
Charybdis sp.	0.12	14	0.17	
Trypauchen microcephalus	0.06	6	0.08	
Platycephalus sp.	0.06	2	0.08	
Lagocephalus sp.	0.06	2	0.08	
CITHARIDAE	0.04	4	0.06	
GOBIIDAE	0.04	2	0.06	
Pentaprion sp.	0.02	2	0.03	
Leiognathus sp.	0.02	2	0.03	
SCORPAENIDAE	0.02	2	0.03	
Acropoma sp.	0.02	2	0.03	
Lepidotrigla sp.	0.02	2	0.03	
Total	70.98		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 69
 DATE :05/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°5.62
 start stop duration Lon E 95°31.55
 TIME :18:30:07 18:41:44 11.6 (min) Purpose : 3
 LOG : 1033.03 1033.58 0.5 Region : 10320
 FDEPTH: 62 61 Gear cond.: 0
 BDEPTH: 62 61 Validity : 1
 Towing dir: 0° Wire out : 170 m Speed : 2.8 kn
 Sorted : 0 Total catch: 0.00 Catch/hour: 0.00

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

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 72
 DATE :06/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°55.55
 start stop duration Lon E 95°41.59
 TIME :11:22:02 11:48:56 26.9 (min) Purpose : 3
 LOG : 1140.10 1141.48 1.4 Region : 10320
 FDEPTH: 173 168 Gear cond.: 0
 BDEPTH: 173 168 Validity : 1
 Towing dir: 0° Wire out : 450 m Speed : 3.1 kn
 Sorted : 0 Total catch: 242.48 Catch/hour: 540.85

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Ostichthys sp.	379.18	4929	70.11	
Plesiobatis sp.	55.76	2	10.31	
Saurida undosquamis	52.55	366	9.72	190
Priacanthus macracanthus	18.38	181	3.40	
Lophiomus sp.	7.67	9	1.42	
Satyrichthys laticeps	5.80	9	1.07	
Histiopertus typus	5.09	18	0.94	
Lagocephalus sp.	4.19	9	0.78	
Okamejei cf. powelli	3.93	9	0.73	
Haplagenys sp.	1.78	18	0.33	
Chelidoperca sp.	1.25	36	0.23	
Gymnothorax sp.	0.98	9	0.18	
Sepiella sp.	0.89	18	0.16	
Antigonia sp.	0.89	9	0.16	
Lepidotrigla sp.	0.80	9	0.15	
Scallicus serrulatus	0.71	54	0.13	
Synagrops sp.	0.54	54	0.10	
SCORPAENIDAE	0.18	9	0.03	
Starfish	0.09	18	0.02	
C R A B S	0.09	9	0.02	
BERYCIDAE	0.09	9	0.02	
Total	540.85		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 70
 DATE :05/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°41.51
 start stop duration Lon E 95°28.95
 TIME :21:39:03 22:14:45 35.7 (min) Purpose : 3
 LOG : 1058.86 1060.66 1.8 Region : 10320
 FDEPTH: 104 102 Gear cond.: 0
 BDEPTH: 104 102 Validity : 1
 Towing dir: 0° Wire out : 270 m Speed : 3.0 kn
 Sorted : 0 Total catch: 48.94 Catch/hour: 82.30

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pennahia anea	14.83	256	18.02	181
Nemipterus bathybius	9.85	178	11.97	185
Lepturacanthus savala	9.42	104	11.44	
Nemipterus japonicus	6.73	81	8.17	184
Nemipterus nematophorus	4.37	114	5.31	183
Acropoma sp.	4.04	77	4.90	
GOBIIDAE	3.90	547	4.74	
Sepia acuelata	3.67	22	4.45	
Saurida longimanus	3.36	94	4.09	182
Lagocephalus inermis	3.16	2	3.84	
Priacanthus macracanthus	1.92	27	2.33	
Metapenaeus ensis	1.61	175	1.96	
Branchiostegus sawakinensis	1.60	2	1.94	
Priacanthus hamrur	1.31	27	1.59	
Cynoglossus arel	1.21	10	1.47	
Trypauchen microcephalus	1.14	124	1.39	
Congresox talabon	1.08	3	1.31	
Lagocephalus spadiceus	1.01	7	1.23	
Parascalopsis tanyactis	0.91	27	1.10	
Ariosoma sp.	0.91	37	1.10	
Narcine prodorsalis	0.84	7	1.02	
Lophiomus setigerus	0.81	3	0.98	
Polydactylus sextarius	0.77	13	0.94	
Apogon quadrifasciatus**	0.67	71	0.82	
Solenocera sp.	0.57	50	0.69	
Pseudorhombus quinquocellatus ***	0.50	64	0.61	
Brachypterois serrulifer	0.50	44	0.61	
Bregmaceros sp.	0.37	59	0.45	
Tylerius spinosissimus	0.34	61	0.41	
Champsodon sp.	0.20	13	0.25	
Sphyræna obtusata	0.20	3	0.25	
Pseudorhombus sp. ***	0.13	7	0.16	
Jaydia striata	0.13	3	0.16	
Portunus gradiator	0.08	3	0.10	
Liagore sp	0.07	7	0.08	
Samaris sp.	0.07	3	0.08	
Neocentropogon affinis	0.00	3	0.00	
Sea cucumber	0.00	10	0.00	
Total	82.30		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 73
 DATE :06/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°30.76
 start stop duration Lon E 95°47.22
 TIME :16:00:27 16:21:05 20.6 (min) Purpose : 3
 LOG : 1177.85 1178.91 1.1 Region : 10320
 FDEPTH: 126 131 Gear cond.: 0
 BDEPTH: 126 131 Validity : 1
 Towing dir: 0° Wire out : 320 m Speed : 3.1 kn
 Sorted : 0 Total catch: 58.92 Catch/hour: 171.28

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Neocentropogon sp.	31.98	2878	18.67	
Priacanthus macracanthus	31.86	273	18.60	
Saurida undosquamis	23.60	599	13.78	
Congresox talabon	22.09	6	12.90	
Nemipterus bathybius	18.20	355	10.62	
Ariosoma sp.	4.65	58	2.72	
Lepturacanthus savala	4.65	29	2.72	
Solenocera sp.	4.13	512	2.41	
Sepiella sp.	3.08	64	1.80	
Charybdis sp.	2.91	198	1.70	
Portunus sp.	2.56	29	1.49	
Okamejei cf. powelli	2.33	12	1.36	
Brotula sp.	2.33	6	1.36	
Pseudorhombus sp.	2.21	35	1.29	
Platycephalus sp.	2.09	17	1.22	
Lagocephalus sp.	1.22	256	0.71	
Ophichthus sp.	1.22	12	0.71	
Octopus chierchiae	1.16	23	0.68	
Acropoma sp.	1.10	145	0.64	
Minous sp.	1.05	41	0.61	
Charybdis cruciata	1.05	6	0.61	
Dactyloptena orientalis	0.99	6	0.58	
CITHARIDAE	0.99	76	0.58	
Uranoscopus cognatus	0.76	35	0.44	
Apogon queketti	0.64	76	0.37	
Trachypenaeus sp.	0.64	215	0.37	
HARPISQUILLIDAE	0.47	17	0.27	
Cynoglossus arel	0.35	6	0.20	
Chelidoperca sp.	0.23	29	0.14	
Ostichthys sp.	0.17	12	0.10	
Lophiomus sp.	0.12	6	0.07	
GOBIIDAE	0.12	17	0.07	
Jaydia striata	0.12	17	0.07	
Hoplichthys sp.	0.12	6	0.07	
Congresox sp.	0.06	12	0.03	
Starfish	0.06	6	0.03	
Plastic	0.00	3	0.00	
Total	171.28		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 74
 DATE :06/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°52.83
 start stop duration Lon E 95°51.22
 TIME :18:56:01 19:26:09 30.1 (min) Purpose : 3
 LOG : 1201.52 1203.05 1.5 Region : 10320
 FDEPTH: 104 113 Gear cond.: 0
 BDEPTH: 104 113 Validity : 1
 Towing dir: 0° Wire out : 305 m Speed : 3.0 kn
 Sorted : 0 Total catch: 156.28 Catch/hour: 311.01

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Acropoma argentistigma	65.07	4649	20.92	
Saurida longimanus	55.40	1787	17.81	
Solenocera sp.	22.81	2444	7.33	
Portunus gradicator	17.79	2541	5.72	
Champsodon sp.	17.31	1154	5.57	
Metapenaeus sp.	16.96	7266	5.45	
Nemipterus japonicus	15.88	203	5.11	196
Bregmaceros sp.	15.04	5015	4.84	
Lepturacanthus savala	13.49	143	4.34	
GOBIIDAE	11.10	1282	3.57	
J E L L Y F I S H	10.87	12	3.49	
Metapenaeus ensis	10.75	1075	3.46	
Charybdis sp.	8.00	418	2.57	
Saurida undosquamis	4.30	72	1.38	
Ariosoma sp.	3.22	215	1.04	
Priacanthus hamrur	2.87	24	0.92	
Uranoscopus cognatus	2.63	48	0.84	
Neocentropogon affinis	1.91	215	0.61	
Lophiomus setigerus	1.67	12	0.54	
Pennahia anea	1.67	24	0.54	
Polydactylus sextarius	1.43	24	0.46	
SCORPAENIDAE	1.31	227	0.42	
Lagocephalus inermis	1.31	12	0.42	
Cynoglossus arel	0.96	48	0.31	
Jaydia queketti	0.96	36	0.31	
Citharus sp.	0.84	60	0.27	
STROMBIDAE	0.84	12	0.27	
Parascalopsis tanyactis	0.60	12	0.19	
Pterois russelii	0.60	12	0.19	
STOMATOPODA	0.60	72	0.19	
Sepia sp.	0.60	24	0.19	
Tylerius spinosissimus	0.60	96	0.19	
Platycephalus sp.	0.60	12	0.19	
Trypauchen microcephalus	0.36	24	0.12	
Penaeus monodon	0.30	2	0.10	
Loligo duvaucelii	0.12	12	0.04	
Hellenus hastatoides	0.12	36	0.04	
Myctophum sp.	0.12	119	0.04	
Liagore sp.	0.01	12	0.00	
Metapenaeopsis barbata	0.01	12	0.00	
Plastic	0.00	2	0.00	
Total	311.01		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 75
 DATE :07/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°58.50
 start stop duration Lon E 96°16.74
 TIME :03:05:59 03:40:08 34.2 (min) Purpose : 3
 LOG : 1260.66 1262.14 1.5 Region : 10320
 FDEPTH: 72 80 Gear cond.: 0
 BDEPTH: 72 80 Validity : 1
 Towing dir: 0° Wire out : 200 m Speed : 2.6 kn
 Sorted : 0 Total catch: 313.08 Catch/hour: 549.91

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Jaydia striata	248.43	898	45.18	
Bregmaceros sp.	112.41	22482	20.44	
Lepturacanthus savala	56.21	2448	10.22	
Loligo duvaucelii	25.85	7080	4.70	
Pennahia anea	17.21	179	3.13	198
Johnieops sp.	16.02	112	2.91	
Charybdis sp.	11.24	2248	2.04	
ARIIDAE	7.80	7	1.42	
Acropoma sp.	7.03	3021	1.28	
Terapon theraps	6.18	91	1.12	
Ariosoma sp.	5.62	225	1.02	
Solenocera sp.	4.50	450	0.82	
MYCTOPHIDAE	4.50	6745	0.82	
Aristeidae	4.50	1686	0.82	
PALINURIDAE	4.22	7	0.77	
Octopus sp.	3.65	7	0.66	
Thryssa sp.	3.37	337	0.61	
Osteogeneiosus militaris	3.09	7	0.56	
HARPISQUILLIDAE	2.25	112	0.41	
Charybdis cruciata	2.11	14	0.38	
Priacanthus hamrur	1.05	14	0.19	
Decapterus kurroides	0.91	7	0.17	
Polydactylus sextarius	0.63	21	0.11	
Sepiella inermis	0.63	63	0.11	
Nemipterus japonicus	0.49	7	0.09	
Total	549.91		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 76
 DATE :07/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°46.43
 start stop duration Lon E 96°14.45
 TIME :05:27:35 05:47:56 20.3 (min) Purpose : 3
 LOG : 1274.93 1275.98 1.1 Region : 10320
 FDEPTH: 109 121 Gear cond.: 0
 BDEPTH: 109 121 Validity : 1
 Towing dir: 0° Wire out : 310 m Speed : 3.1 kn
 Sorted : 0 Total catch: 39.12 Catch/hour: 115.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Lepturacanthus savala	62.77	248	54.40	202
Sphyraena obtusata	25.72	330	22.29	200
Acropoma sp.	5.60	431	4.86	
Loligo duvaucelii	3.78	870	3.27	
Branchiostegus sawakinensis	3.54	6	3.07	
Priacanthus macracanthus	3.04	41	2.63	199
Champsodon sp.	1.89	77	1.64	201
Lagocephalus spadiceus	1.86	3	1.61	
Nemipterus japonicus	1.21	9	1.05	
Dussumieria acuta	1.12	18	0.97	
Osteogeneiosus militaris	1.09	3	0.95	
Saurida longimanus	1.03	32	0.89	
Charybdis feriata	0.68	6	0.59	
Nemipterus nematophorus	0.53	3	0.46	
Portunus sanguinolento	0.50	3	0.43	
Ariomma indicum	0.50	3	0.43	
Saurida undosquamis	0.15	3	0.13	
Charybdis sp.	0.15	3	0.13	
Parascalopsis tanyactis	0.12	3	0.10	
Thryssa vitrirostris	0.09	6	0.08	
ARISTEIDAE	0.03	3	0.03	
Total	115.40		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 77
 DATE :07/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°26.84
 start stop duration Lon E 96°11.93
 TIME :08:32:00 09:03:46 31.8 (min) Purpose : 3
 LOG : 1296.23 1297.80 1.6 Region : 10320
 FDEPTH: 121 136 Gear cond.: 0
 BDEPTH: 121 136 Validity : 1
 Towing dir: 0° Wire out : 340 m Speed : 3.0 kn
 Sorted : 0 Total catch: 56.71 Catch/hour: 107.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida undosquamis	23.53	234	21.97	205
Lepturacanthus savala	20.43	111	19.08	206
Priacanthus macracanthus	18.73	117	17.49	204
Nemipterus bathybius	7.10	85	6.63	209
Lophiomus setigerus	5.10	11	4.76	
Decapterus smithvanizi	5.06	42	4.73	210
Decapterus kurroides	4.12	28	3.84	203
Acropoma sp.	3.46	189	3.23	
Parascalopsis tanyactis	3.15	28	2.94	208
Hapalogenys merguensis	2.59	21	2.42	207
Neoniphon aurolineatus	1.91	19	1.78	
Loligo duvaucelii	1.87	431	1.75	
Uraspis uraspis	1.83	11	1.71	
Cociella punctata	1.68	11	1.57	
Brotula sp.	1.51	2	1.41	
Charybdis sp.	0.94	11	0.88	
Sphyræna obtusata	0.77	8	0.72	
Tylerius spinosissimus	0.64	8	0.60	
Lipochelus carnotabrum	0.59	4	0.55	
Epinephelus epistictus	0.43	2	0.41	
Neocentropogon affinis	0.34	15	0.32	
Priacanthus hamrur	0.28	4	0.26	
Saurida longimanus	0.28	19	0.26	211
Sepia pharaonis	0.13	4	0.12	
CIDARIDAE	0.11	9	0.11	
Halioteuthis sp.	0.11	2	0.11	
Fistularia petimba	0.09	2	0.09	
Hoplichthys sp.	0.06	4	0.05	
Cephalopsetta ventrocellatus	0.06	2	0.05	
SOLEIDAE	0.04	2	0.04	
Ebosia falcata	0.04	2	0.04	
Pseudanthias sp.	0.04	2	0.04	
STROMBIDAE	0.04	2	0.04	
BOTHIDAE	0.02	2	0.02	
Total	107.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 78
 DATE :07/09/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°42.94
 start stop duration Lon E 96°6.83
 TIME :14:00:18 14:37:37 37.3 (min) Purpose : 1
 LOG : 1342.45 1343.85 1.4 Region : 10320
 FDEPTH: 5 5 1.4 Gear cond.: 0
 BDEPTH: 750 845 Validity : 3
 Towing dir: 0° Wire out : 150 m Speed : 2.2 kn
 Sorted : 0 Total catch: 41.57 Catch/hour: 66.83

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Cubiceps sp.	48.36	3675	72.36	
MYCTOPHIDAE	10.80	24849	16.17	
OMMASTREPHIDAE	7.46	180	11.16	
Leptocephalus	0.19	154	0.29	
MELANOSTOMIATIDAE	0.02	2	0.02	
Total	66.83		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 79
 DATE :07/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°00.02
 start stop duration Lon E 96°30.18
 TIME :21:07:59 21:30:58 23.0 (min) Purpose : 3
 LOG : 1388.84 1390.08 1.2 Region : 10320
 FDEPTH: 116 120 Gear cond.: 0
 BDEPTH: 116 120 Validity : 1
 Towing dir: 0° Wire out : 365 m Speed : 3.2 kn
 Sorted : 0 Total catch: 18.26 Catch/hour: 47.67

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Fistularia petimba	9.19	3	19.28	
Saurida undosquamis	7.91	337	16.60	212
Trachinocephalus myops	7.83	159	16.43	214
Xenoccephalus australis	2.61	8	5.48	
Bleekeria sp.	2.45	193	5.15	213
Dactyloptena orientalis	1.96	18	4.11	
Cantherhines multilineatus	1.85	18	3.89	
Pseudorhombus quinqueocellatus ***	1.85	21	3.89	
Cyclichthys spilostylus	1.57	3	3.29	
Parascalopsis aspinosa	1.38	13	2.90	
Charybdis riversandersoni	0.97	18	2.03	
Orbiraja powelli	0.94	3	1.97	
Torquigener florealis	0.94	23	1.97	
Cephalopsetta ventrocellatus	0.89	8	1.86	
Tetrosomus concatenatus	0.73	8	1.53	
Priacanthus macracanthus	0.65	3	1.37	
Nemipterus japonicus	0.50	13	1.04	
Saurida longimanus	0.37	42	0.77	
Uranoscopus affinis	0.37	3	0.77	
Matuta planipes	0.34	65	0.71	
Engyprosope sp.	0.29	21	0.60	
Solenocera sp.	0.23	84	0.49	
Ariosoma sp.	0.23	10	0.49	
Upeneus bensasi	0.21	8	0.44	
Sepia pharaonis	0.21	5	0.44	
Solenocera choprai	0.18	16	0.38	
Cynoglossus sp.	0.18	8	0.38	
Amphioctopus rex	0.16	3	0.33	
Sepia aculeata	0.13	23	0.27	
Loligo duvaucelii	0.13	3	0.27	
Siganus canaliculatus	0.08	3	0.16	
Ophidion sp.	0.08	3	0.16	
Minous radiatus	0.05	3	0.11	
Neocentropogon affinis	0.05	5	0.11	
Jaydia queketti	0.03	3	0.05	
MAJIDAE	0.03	3	0.05	

Portunus hastatus 0.03 5 0.05
 Callionymus sp. 0.03 5 0.05
 Photopectoralis aureus 0.03 3 0.05
 Siganus canaliculatus 0.01 3 0.03
 RANINIDAE 0.00 3 0.01
 Synodus macrops 0.00 3 0.00
 Charybdis sp. 0.00 3 0.00
 Ariosoma sp. 0.00 3 0.00
 Xiphonectes hastatoides 0.00 3 0.00
 Fishing gears 0.00 3 0.00
 Total 47.67 100.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 80
 DATE :07/09/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 13°58.72
 start stop duration Lon E 96°29.07
 TIME :22:10:20 22:35:53 25.6 (min) Purpose : 1
 LOG : 1392.43 1393.63 1.2 Region : 10320
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 121 119 Validity : 3
 Towing dir: 0° Wire out : 150 m Speed : 2.8 kn
 Sorted : 0 Total catch: 0.04 Catch/hour: 0.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Siganus canaliculatus	0.09	2	100.00	
Total	0.09		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 81
 DATE :08/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°52.04
 start stop duration Lon E 96°36.99
 TIME :07:26:33 07:56:52 30.3 (min) Purpose : 3
 LOG : 1453.81 1455.31 1.5 Region : 10320
 FDEPTH: 64 65 Gear cond.: 0
 BDEPTH: 64 65 Validity : 1
 Towing dir: 0° Wire out : 135 m Speed : 3.0 kn
 Sorted : 0 Total catch: 21.51 Catch/hour: 42.58

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	9.84	687	23.11	
Congresox talabon	6.18	10	14.50	
Solenocera sp.	6.10	523	14.32	
Pennahia anea	5.01	42	11.76	
Pennahia ovata	3.86	123	9.07	216
Acropoma sp.	3.40	2043	8.00	
Polydactylus sextarius	2.43	42	5.72	215
Sepiella inermis	0.81	111	1.91	
Orbiraja powelli	0.69	2	1.63	
ARISTEIDAE	0.55	301	1.30	
Priacanthus macracanthus	0.49	2	1.16	
Decapterus smithvanizi	0.36	6	0.84	
Charybdis ferata	0.36	2	0.84	
Portunus sanguinolento	0.34	2	0.79	
Scomberoides tol	0.34	2	0.79	
MELONGENIDAE	0.32	14	0.74	
Penaeus monodon	0.32	2	0.74	
Pseudorhombus quinqueocellatus ***	0.24	2	0.56	
Loligo duvaucelii	0.16	16	0.37	
Torquigener sp.	0.16	4	0.37	
Cantherhines multilineatus	0.14	2	0.33	
Coilia dumsumieri	0.14	34	0.33	
Matuta planipes	0.10	18	0.23	
Myctophum sp.	0.08	333	0.19	
G A S T R O P O D S	0.06	4	0.14	
Kurtus indicus	0.06	16	0.14	
Leiognathus bindus**	0.04	2	0.09	
STOMATOPODA	0.02	8	0.05	
Bleekeria sp.	0.00	2	0.00	
Lactarius lactarius	0.00	2	0.00	
Bregmaceros mccllellandi	0.00	2	0.00	
Total	42.58		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 82
 DATE :08/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°57.85
 start stop duration Lon E 96°36.47
 TIME :09:36:50 10:06:47 29.9 (min) Purpose : 3
 LOG : 1463.30 1464.43 1.1 Region : 10320
 FDEPTH: 34 33 Gear cond.: 0
 BDEPTH: 34 33 Validity : 1
 Towing dir: 0° Wire out : 130 m Speed : 2.3 kn
 Sorted : 0 Total catch: 35.38 Catch/hour: 70.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chrysochir aureus	23.88	7959	33.70	
Otolithoides biauritus	12.50	6250	17.64	
Aristeidae	10.90	4686	15.38	
Leptomelanosoma indicum	6.99	30	9.87	217
Trichiurus lepturus	4.25	136	5.99	
Otolithoides pama	2.66	6	3.76	218
Johnius borneensis	2.18	2	3.08	
Solenocera sp.	2.08	593	2.94	
Johnius coitor	1.40	40	1.98	
Pampus argenteus	0.56	2	0.79	
Sepiella inermis	0.46	48	0.65	
Pennahia sp.	0.40	8	0.57	
Lagocephalus lunaris	0.32	2	0.45	
Portunus sanguinolento	0.30	2	0.42	
Lagocephalus spadiceus	0.26	16	0.37	
Osteogeneiosus militaris	0.24	2	0.34	
Harpadon sp.	0.22	4	0.31	
Terapon theraps	0.18	2	0.25	
Drepane longimana	0.16	16	0.23	
Bregmaceros mcllellandi	0.16	112	0.23	
Uroteuthis duvaucelii	0.16	48	0.23	
Polydactylus sextarius	0.14	2	0.20	
Grammolites scaber	0.12	2	0.17	
Kurtus indicus	0.10	20	0.14	
Portunus iridescens	0.08	28	0.11	
Charybdis feriata	0.04	2	0.06	
Harpioquilla harpax	0.04	6	0.06	
Uroconger lepturus	0.04	2	0.06	
Megalaspis cordyla	0.02	32	0.02	
Arcania sp.	0.01	2	0.01	
Ashtoret lunaris	0.01	2	0.01	
Chrysochir aureus	0.00	2	0.00	0
Otolithoides biauritus	0.00	2	0.00	0
Total	70.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 83
 DATE :08/09/18 GEAR TYPE: PT NO: 4 POSITION:Lat N 14°53.78
 start stop duration Lon E 96°56.23
 TIME :19:51:38 20:09:24 17.8 (min) Purpose : 1
 LOG : 1501.70 1501.70 0.0 Region : 10320
 FDEPTH: 10 10 Gear cond.: 0
 BDEPTH: 39 39 Validity : 3
 Towing dir: 0° Wire out : 150 m Speed : 0.0 kn
 Sorted : 0 Total catch: 24.24 Catch/hour: 81.89

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selar crumenophthalmus	44.19	446	53.96	
Siganus canaliculatus	17.26	307	21.08	
Atule mate	7.70	51	9.41	220
Rastrelliger faughni	6.49	44	7.92	219
Decapterus macrosoma	2.13	135	2.60	
Sphyræna forsteri	1.18	27	1.44	
Sphyræna pinguis	1.08	20	1.32	
Loligo duvaucelii	0.95	132	1.16	
Megalaspis cordyla	0.61	3	0.74	
Lagocephalus spadiceus	0.10	3	0.12	
Photopectoralis aureus	0.07	14	0.08	
Stolephorus indicus	0.07	3	0.08	
Saurida lessepsianus	0.07	27	0.08	
Plastic	0.00	3	0.00	
Total	81.89		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 84
 DATE :08/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°21.47
 start stop duration Lon E 96°51.41
 TIME :22:25:36 22:55:42 30.1 (min) Purpose : 3
 LOG : 1542.34 1543.95 1.6 Region : 10320
 FDEPTH: 79 79 Gear cond.: 0
 BDEPTH: 79 79 Validity : 1
 Towing dir: 0° Wire out : 200 m Speed : 3.2 kn
 Sorted : 0 Total catch: 63.87 Catch/hour: 127.32

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Upeneus moluccensis	43.22	708	33.94	221
Pennahia anea	19.42	337	15.25	223
Nemipterus nematophorus	16.90	905	13.28	222
Saurida undosquamis	8.69	289	6.83	224
Polydactylus sextarius	6.70	185	5.26	
Nemipterus japonicus	5.62	60	4.42	
Cylichthys orbicularis	2.99	24	2.35	
Epinephelus areolatus	2.83	4	2.22	
Saurida tumbil	2.55	16	2.00	
Priacanthus tayenus	2.51	36	1.97	
Solenocera sp.	2.23	558	1.75	
Psettodes erumei	1.79	2	1.41	
Xiphonectes hastatoides	1.28	191	1.00	
Sepiella sp.	1.08	40	0.85	
Priacanthus macracanthus	1.04	8	0.81	
Narcine brasiliensis	1.00	8	0.78	
Sea snakes	0.96	2	0.75	
Brachypleura novaezeelandiae	0.80	167	0.63	
Metapenaeopsis spp.	0.68	167	0.53	
Lepturacanthus savala	0.60	32	0.47	
Metapenaeopsis palmensis	0.60	203	0.47	
Sepia acuelata	0.54	2	0.42	
Fistularia petimba	0.48	4	0.38	
Decapterus russelli	0.44	4	0.34	
Octopus cyaneus	0.36	32	0.28	
CIDARIDAE	0.36	4	0.28	
Grammolites sp.	0.36	163	0.28	
Siganus canaliculatus	0.32	4	0.25	

Jaydia striata 0.16 92 0.13
 Minous sp. 0.12 20 0.09
 Pentapriion sp. 0.12 12 0.09
 Chromis sp. 0.08 8 0.06
 Plotosus lineatus 0.08 2 0.06
 Photopectoralis bindus 0.08 4 0.06
 Starfish, mixed 0.08 12 0.06
 Ariosoma sp. 0.08 8 0.06
 Decapterus sp. 0.06 4 0.05
 Apogon smithi 0.04 10 0.03
 Trypauchen sp. 0.04 4 0.03
 Chelidoperca sp. 0.04 4 0.03
 Apogon 'big' 0.02 4 0.01
 Apogon quadrifasciatus** 0.00 4 0.00
 Ostorhinchus fasciatus 0.00 0 0.00
 Kumococius rodericensis 0.00 0 0.00
 Pterois russelli 0.00 0 0.00
 Plastic 0.00 2 0.00
 Brachypterois serrulata 0.00 0 0.00
 Uroconger lepturus 0.00 0 0.00
 Total 127.32 100.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 85
 DATE :09/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°1.22
 start stop duration Lon E 96°48.42
 TIME :02:02:07 02:31:23 29.3 (min) Purpose : 3
 LOG : 1567.73 1569.40 1.7 Region : 10320
 FDEPTH: 95 89 Gear cond.: 0
 BDEPTH: 95 89 Validity : 1
 Towing dir: 0° Wire out : 280 m Speed : 3.4 kn
 Sorted : 0 Total catch: 36.53 Catch/hour: 74.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichiurus lepturus	51.25	301	68.44	227
Saurida undosquamis	8.57	230	11.44	226
Priacanthus macracanthus	2.09	12	2.79	
Loligo sp.	2.05	287	2.74	
Nemipterus nematophorus	1.70	33	2.27	
Upeneus moluccensis	1.52	45	2.03	225
Sepia acuelata	1.23	2	1.64	
NARCINIDAE	1.00	8	1.34	
Acropoma japonicum	0.98	88	1.31	
Decapterus macrosoma	0.61	8	0.82	
Nemipterus japonicus	0.57	4	0.77	
Fistularia petimba	0.51	6	0.68	
Priacanthus tayenus	0.51	2	0.68	
Portunus sp.	0.41	37	0.55	
Rastrelliger faughni	0.39	4	0.52	
Brachypleura novaezeelandiae	0.33	35	0.44	
Parascolopsis aspinosa	0.25	6	0.33	
Priacanthus hamur	0.25	2	0.33	
Stolephorus indicus	0.20	6	0.27	228
Polydactylus sextarius	0.12	2	0.16	
Photopectoralis aureus	0.06	12	0.08	
Starfish	0.06	2	0.08	
Sepiella sp.	0.04	2	0.05	
Charybdis (Charybdis) hellerii	0.04	2	0.05	
Ostorhinchus fasciatus	0.02	2	0.03	
Squilla sp.	0.02	2	0.03	
Samariscus sp.	0.02	4	0.03	
Neomerinthe sp.	0.02	2	0.03	
Octopus chierchiaie	0.02	2	0.03	
Lagocephalus sp.	0.02	4	0.03	
Sorsogona melanoptera	0.00	2	0.00	
Total	74.88		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 86
 DATE :09/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°47.98
 start stop duration Lon E 96°48.43
 TIME :06:04:47 06:35:04 30.3 (min) Purpose : 3
 LOG : 1586.64 1588.50 1.9 Region : 10320
 FDEPTH: 91 95 Gear cond.: 0
 BDEPTH: 91 95 Validity : 1
 Towing dir: 0° Wire out : 265 m Speed : 3.7 kn
 Sorted : 0 Total catch: 20.02 Catch/hour: 39.66

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pristipomoides multidentis	14.86	12	37.46	
Nemipterus bipunctatus	7.29	67	18.38	230
Parupeneus heptacanthus	5.03	28	12.69	229
Uraspis uraspis	4.67	32	11.79	231
Uroteuthis duvaucelii	1.35	184	3.40	
Remora remora	1.19	2	3.00	
Priacanthus macracanthus	1.11	10	2.80	
Aluterus monoceros	1.05	2	2.65	
Saurida undosquamis	0.99	22	2.50	
Upeneus bensasi	0.65	26	1.65	
Seriolina nigrofasciata	0.42	2	1.05	
Trichiurus sp.	0.34	2	0.85	
Parascolopsis aspinosa	0.28	4	0.70	
Sepia pharaonis	0.14	2	0.35	
Saurida longimanus	0.12	2	0.30	
Nemipterus japonicus	0.06	2	0.15	
Engyprosopon maldivensis	0.06	2	0.15	
Synodus hoshinonis	0.06	2	0.15	
Parascolopsis aspinosa	0.00	0	0.00	
Brachypleura novaezeelandiae	0.00	0	0.00	0
Sea snakes	0.00	2	0.00	
Total	39.66		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 87
 DATE :09/09/18 GEAR TYPE: PT NO: 8 POSITION:Lat N 13°46.77
 start stop duration Lon E 97°11.82
 TIME :09:47:52 10:37:36 49.7 (min) Purpose : 1
 LOG : 1615.00 1618.61 3.6 Region : 10320
 FDEPTH: 10 40 Gear cond.: 0
 BDEPTH: 77 78 Validity : 3
 Towing dir: 0° Wire out : 280 m Speed : 4.4 kn
 Sorted : 0 Total catch: 360.00 Catch/hour: 434.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Siganus canaliculatus	434.35	15202	100.00	232
Total	434.35		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 88
 DATE :09/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°20.78
 start stop duration Lon E 97°13.64
 TIME :15:06:57 15:20:13 13.3 (min) Purpose : 3
 LOG : 1651.27 1651.73 0.5 Region : 10320
 FDEPTH: 42 43 Gear cond.: 0
 BDEPTH: 42 43 Validity : 1
 Towing dir: 0° Wire out : 130 m Speed : 2.1 kn
 Sorted : 0 Total catch: 21.74 Catch/hour: 98.37

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Siganus canaliculatus	23.80	593	24.20	
Trachinocephalus myops	7.24	127	7.36	
Upeneus sulphureus	7.19	186	7.31	233
Sepia pharaonis	6.88	5	6.99	
Ablennes hians	6.47	9	6.58	
Saurida tumbil	5.97	50	6.07	235
Nemipterus bipunctatus	5.16	54	5.24	234
Laeops sp.	4.57	683	4.65	
Paramonacanthus sp.	4.34	317	4.42	
Bregmaceros sp.	3.85	7692	3.91	
Rastrelliger kanagurta	2.99	18	3.04	
Saurida undosquamis	2.31	140	2.35	
Polydactylus sextarius	2.26	36	2.30	
Priacanthus tayenus	1.86	27	1.89	
CALLIONYMIDAE	1.72	90	1.75	
Selar crumenophthalmus	1.72	18	1.75	
Uraspis helvola	1.36	9	1.38	
Loligo sp.	1.31	285	1.33	
Priacanthus macracanthus	1.04	9	1.06	
PERCOPHIDAE	1.00	9	1.01	
Penaeus monodon	0.86	14	0.87	
Sepiella sp.	0.86	14	0.87	
Metapenaeopsis spp.	0.50	348	0.51	
Sphyræna obtusata	0.41	5	0.41	
Portunus hastatus	0.41	27	0.41	
SNAKE	0.36	5	0.37	
Unidentified squid	0.32	45	0.32	
Decapterus sp.	0.32	5	0.32	
SOLEIDAE	0.32	14	0.32	
Trachypenaeus sp.	0.27	59	0.28	
Squilla sp.	0.18	9	0.18	
Apogon smithi	0.09	36	0.09	
Leiognathus sp.	0.09	27	0.09	
Upeneus bensasi	0.09	9	0.09	
Zebrias quagga	0.09	5	0.09	
PENAEIDAE	0.05	136	0.05	
Crinoidea	0.05	5	0.05	
Ariosoma sp.	0.05	5	0.05	
Apogon 'big'	0.05	9	0.05	
Plastic	0.00	5	0.00	
Total	98.37		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 89
 DATE :09/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°40.40
 start stop duration Lon E 97°15.91
 TIME :17:56:46 18:16:55 20.1 (min) Purpose : 3
 LOG : 1672.93 1673.93 1.0 Region : 10320
 FDEPTH: 59 60 Gear cond.: 0
 BDEPTH: 59 60 Validity : 1
 Towing dir: 0° Wire out : 180 m Speed : 3.0 kn
 Sorted : 0 Total catch: 83.40 Catch/hour: 248.35

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida undosquamis	163.74	8617	65.93	236
Pennahia anea	14.02	107	5.65	
Upeneus bensasi	8.19	1132	3.30	
Stolephorus indicus	7.41	1111	2.99	
Acetes sp.	5.27	0	2.12	
Ophichthus lithinus	4.29	9	1.73	
Ariosoma sp.	3.84	45	1.55	
Penaeus japonicus	3.75	80	1.51	
Conger sp.	3.57	36	1.44	
Platycephalus sp.	3.31	116	1.33	
Terapon theraps	2.86	54	1.15	
Polydactylus sextarius	2.68	54	1.08	
Trachypenaeus sp.	2.23	420	0.90	
Trichurus sp.	2.14	71	0.86	
Decapterus russelli	1.97	36	0.79	
Upeneus sulphureus	1.70	45	0.68	
Lagocephalus spadiceus	1.61	36	0.65	
Saurida elongata	1.55	89	0.62	
Portunus sanguinolentus	1.43	9	0.58	
Cantherhines multilineatus	1.16	161	0.47	
Loligo duvauclii	0.98	63	0.40	
Charybdis natator	0.98	9	0.40	
Rogadius sp.	0.98	125	0.40	
Pseudorhombus quinuoocellatus ***	0.89	9	0.36	
Metapenaeopsis barbata	0.80	331	0.32	
Portunus hastatus	0.80	116	0.32	
Aristeidae	0.63	125	0.25	
Sepia sp	0.54	80	0.22	
Parapercis sp.	0.54	54	0.22	
Saurida longimanus	0.45	27	0.18	
NETTASTOMATIDAE	0.45	18	0.18	
Parapenaeopsis sp.	0.45	54	0.18	
Leiognathus oblongus	0.36	80	0.14	
Engyprosoon sp.	0.36	54	0.14	

Encrasicholina punctifer	0.36	125	0.14
Euprymna sp.	0.36	36	0.14
APOGONIDAE	0.27	63	0.11
Opistognathus sp.	0.27	9	0.11
Octopus sp.	0.18	18	0.07
Ilisha melastoma ***	0.18	9	0.07
Callionymus spiniceps	0.18	9	0.07
Dussumieria acuta	0.09	9	0.04
Thryssa vitrirostris	0.09	98	0.04
Jaydia sp.	0.09	9	0.04
Zebrias altipinnis	0.09	9	0.04
Leiognathus bindus**	0.09	9	0.04
Apogon quadrifasciatus**	0.09	27	0.04
Bleekeria kallolepis	0.04	9	0.02
STOMATOPODA	0.04	18	0.02
Trichonotus sp.	0.01	9	0.00
Saurenchelys sp.	0.00	0	0.00
Bleekeria cf. mitsukurii	0.00	0	0.00
Stolephorus insularis	0.00	0	0.00
Total	248.35		100.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 90
 DATE :10/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°23.73
 start stop duration Lon E 97°16.00
 TIME :02:07:24 02:38:17 30.9 (min) Purpose : 3
 LOG : 1725.39 1726.94 1.6 Region : 10320
 FDEPTH: 25 26 Gear cond.: 0
 BDEPTH: 25 26 Validity : 1
 Towing dir: 0° Wire out : 110 m Speed : 3.0 kn
 Sorted : 0 Total catch: 239.82 Catch/hour: 465.82

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Harpadon nehereus	233.09	9512	50.04	237
Coilia sp.	77.70	27193	16.68	
Charybdis annulata	49.14	83542	10.55	
Thryssa sp.	20.10	1787	4.32	
Nematopalaemon sp.	15.64	1564	3.36	
PLOTOSIDAE	11.65	8	2.50	
Parapenaeopsis uncta	11.17	1340	2.40	
Lepturacanthus savala	7.58	350	1.63	
Coilia sp.	6.70	447	1.44	0
Scoliodon laticaudus	4.86	45	1.04	
Osteogeneiosus militaris	3.88	35	0.83	
Chrysochir aureus	3.69	78	0.79	
Cynoglossus sp.	2.33	39	0.50	
Nematopalaemon tenuipes	2.23	2234	0.48	
Johnieops sp.	2.23	223	0.48	
Otolithes sp.	2.08	2	0.45	
Congresox talabon	2.04	4	0.44	
Pampus argenteus	1.75	58	0.38	
Terapon theraps	1.75	19	0.38	
Sillaginopsis sp.	1.24	8	0.27	
Saurida undosquamis	1.17	19	0.25	
Himantura sp.	1.11	12	0.24	
Raconda russelliana	0.78	97	0.17	
Polynemus paradiseus	0.78	58	0.17	
Squilla sp.	0.56	2	0.12	
NETTASTOMATIDAE	0.39	19	0.08	
Atropus atropus	0.19	19	0.04	
Plastic	0.00	19	0.00	
Total	465.82		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 91
 DATE :10/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 15°42.46
 start stop duration Lon E 97°20.70
 TIME :05:14:43 05:40:56 26.2 (min) Purpose : 3
 LOG : 1749.18 1749.69 0.5 Region : 10320
 FDEPTH: 23 24 Gear cond.: 0
 BDEPTH: 23 24 Validity : 1
 Towing dir: 0° Wire out : 120 m Speed : 1.2 kn
 Sorted : 0 Total catch: 80.50 Catch/hour: 184.21

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Harpadon nehereus	78.26	1712	42.48	
Himantura bleekeri	22.88	2	12.42	
Scoliodon laticaudus	21.51	320	11.68	
Thryssa sp.	13.96	1675	7.58	
Aristeidae	12.81	3494	6.96	
Coilia dussumieri	7.78	1556	4.22	
Portunus sp.	7.55	3236	4.10	
Lepturacanthus savala	4.58	343	2.48	
Nemapteryx nenga	3.43	69	1.86	
Otolithoides pama	2.97	938	1.61	
Scomberomorus commerson	2.52	23	1.37	
Polynemus paradiseus	2.06	183	1.12	
Parapenaeopsis sp.	1.83	252	0.99	
Pangasius	1.14	5	0.62	
Trypauchen microcephalus	0.23	23	0.12	
Lagocephalus spadiceus	0.23	23	0.12	
Sillaginopsis panijus	0.23	23	0.12	
Stolephorus sp.	0.11	23	0.06	
Kurtus indicus	0.11	23	0.06	
Scatophagus argus	0.00	2	0.00	0
Charybdis natator	0.00	2	0.00	
Scatophagus argus	0.00	2	0.00	
Panna heterolepis	0.00	2	0.00	
Bregmaceros maclellandi	0.00	2	0.00	0
Choenerinus naritus	0.00	0	0.00	
Bregmaceros maclellandi	0.00	2	0.00	
Total	184.21		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 92
 DATE :15/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°54.89
 start stop duration Lon E 97°35.68
 TIME :23:55:47 00:25:20 29.5 (min) Purpose : 3
 LOG : 2085.00 2086.75 1.8 Region : 10320
 FDEPTH: 30 30 Gear cond.: 0
 BDEPTH: 30 30 Validity : 1
 Towing dir: 0° Wire out : 90 m Speed : 3.6 kn
 Sorted : 0 Total catch: 48.18 Catch/hour: 97.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Acetes sp.	39.77	477238	40.64	
Thryssa dussumieri	7.64	790	7.80	244
Lepturacanthus savala	7.11	238	7.26	238
Ilisha megaloptera	6.80	49	6.95	245
Pilotosus canius	4.98	4	5.09	
Unidentified	3.88	16	3.96	
Lagocephalus lunaris	3.41	83	3.49	240
Unidentified	3.37	2	3.45	
Ilisha melastoma	3.21	158	3.28	239
Dussumieria acuta	1.93	63	1.97	246
Scomberomorus guttatus	1.93	8	1.97	247
Arius venosus	1.71	14	1.74	241
Pampus argenteus	1.48	4	1.52	
Takifugu oblongus	1.42	2	1.45	
Congresox talabon	1.10	2	1.12	
Chrysochir aureus	1.08	6	1.10	
UNIDENTIFIED FISH	0.93	1121	0.95	
Ashtoret lunaris	0.81	43	0.83	
Sepiella inermis	0.67	43	0.68	
Saurida tumbil	0.63	20	0.64	248
Uroteuthis duvaucelii	0.55	26	0.56	
Kurtus indicus	0.47	75	0.48	242
Parapenaeopsis sp.	0.47	73	0.48	
Metapenaeopsis toloensis	0.37	43	0.37	
Johnius macropterus	0.30	6	0.31	
Coilia dussumieri	0.30	53	0.31	243
Rachycentron canadum	0.30	2	0.31	
Penaeus canaliculatus	0.30	8	0.31	
Leptomelanosoma indicum	0.26	2	0.27	
Cynoglossus arel	0.18	4	0.19	
Unidentified	0.14	10	0.15	
Portunidae	0.10	18	0.10	
Atropus atropos	0.08	2	0.08	
Penaeus canaliculatus	0.04	2	0.04	0
Solenocera crassicornis	0.04	4	0.04	
Megalaspis cordyla	0.04	2	0.04	
Terapon theraps	0.02	2	0.02	0
Terapon theraps	0.02	2	0.02	
Total	97.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 93
 DATE :16/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 14°37.04
 start stop duration Lon E 97°34.82
 TIME :03:55:42 04:26:06 30.4 (min) Purpose : 3
 LOG : 2104.68 2106.04 1.4 Region : 10320
 FDEPTH: 57 58 Gear cond.: 0
 BDEPTH: 57 58 Validity : 1
 Towing dir: 0° Wire out : 165 m Speed : 2.7 kn
 Sorted : 0 Total catch: 21.31 Catch/hour: 42.06

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Uroteuthis duvaucelii	9.73	582	23.13	250
Lagocephalus lunaris	7.54	197	17.93	
Lagocephalus guentheri	5.82	144	13.84	
Saurida undosquamis	5.51	170	13.09	249
Upeneus sulphureus	3.39	111	8.07	
Arius maculatus	2.35	18	5.58	
Lepturacanthus savala	2.03	45	4.83	
Saurida tumbil	1.89	24	4.50	251
Portunus pelagicus	1.20	4	2.86	
Atropus atropos	1.11	6	2.63	
Terapon theraps	0.43	4	1.03	
J E L L Y F I S H	0.36	2	0.84	
Thryssa dussumieri	0.20	16	0.47	
Leiognathus bindus**	0.12	6	0.28	
Nemipterus japonicus	0.12	2	0.28	
Sepiella inermis	0.10	6	0.23	
Ilisha melastoma	0.08	2	0.19	
Elates ransonettii	0.06	2	0.14	
Leiognathus fasciatus ***	0.02	4	0.05	
Total	42.06		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 94
 DATE :16/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°54.73
 start stop duration Lon E 97°30.50
 TIME :11:36:56 12:07:20 30.4 (min) Purpose : 3
 LOG : 2154.17 2155.71 1.5 Region : 10320
 FDEPTH: 62 59 Gear cond.: 0
 BDEPTH: 62 59 Validity : 1
 Towing dir: 0° Wire out : 170 m Speed : 3.0 kn
 Sorted : 0 Total catch: 71.40 Catch/hour: 140.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Priacanthus tayenus	36.83	537	26.13	257
Saurida tumbil	15.24	130	10.81	255
Saurida lessepsianus	14.33	377	10.17	256
Nemipterus nematophorus	14.29	186	10.14	254
Sphyræna obtusata	9.83	79	6.97	
Nemipterus japonicus	9.49	126	6.74	259
Upeneus sulphureus	7.91	201	5.62	253
Pennahia anea	5.80	32	4.12	252
Lagocephalus guentheri	3.79	18	2.69	
Aluterus monoceros	3.24	6	2.30	
Sepia pharaonis	2.80	2	1.99	
Jaydia queketti	2.09	81	1.48	
UNIDENTIFIED FISH	2.05	1232	1.46	
Decapterus macrosoma	1.86	22	1.32	260
Rastrelliger brachysoma	1.58	10	1.12	258
Metapenaeus ensis	1.34	67	0.95	
Trichurus sp.	1.30	12	0.92	
Parapenaeopsis sp.	0.91	57	0.64	

Bregmaceros maclellandi 0.91 355 0.64
 Selar crumenophthalmus 0.79 6 0.56
 PORTUNIDAE 0.71 2 0.50
 Sepia australis 0.51 10 0.36
 Penaeus monodon 0.47 6 0.34
 Panulirus polyphagus 0.36 2 0.25
 Siganus canaliculatus 0.36 6 0.25
 Uroteuthis sp. 0.32 22 0.22
 Charybdis natator 0.28 4 0.20
 Acanthocephala krusensterni 0.24 10 0.17
 Brachyteropsis serrulifer 0.24 10 0.17
 Fistularia petimba 0.20 2 0.14
 Solenocera crassicornis 0.16 14 0.11
 Dussumieria acuta 0.14 2 0.10
 Pilotosus lineatus 0.08 4 0.06
 Leiognathus equulus 0.08 2 0.06
 Pedophthalmus vigil 0.08 2 0.06
 Uroconger lepturus 0.08 2 0.06
 Citharus sp. 0.08 14 0.06
 Metal waste 0.06 2 0.04
 Neomerinthe sp. 0.04 4 0.03
 Paramonacanthus sp. 0.04 8 0.03
 Unidentified 0.04 2 0.03
 Total 140.92 100.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 95
 DATE :16/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°40.26
 start stop duration Lon E 97°33.96
 TIME :17:02:23 17:32:58 30.6 (min) Purpose : 3
 LOG : 2183.13 2184.65 1.5 Region : 10330
 FDEPTH: 62 60 Gear cond.: 0
 BDEPTH: 62 60 Validity : 1
 Towing dir: 0° Wire out : 180 m Speed : 3.0 kn
 Sorted : 0 Total catch: 42.52 Catch/hour: 83.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus nematophorus	19.50	363	23.38	264
Congresox talabon	12.44	20	14.91	
Saurida tumbil	9.79	51	11.74	263
Saurida undosquamis	7.06	194	8.47	
Priacanthus tayenus	3.57	47	4.28	
Nemipterus japonicus	3.53	45	4.23	
Trichurus sp.	2.88	37	3.46	
Solenocera sp.	2.08	300	2.49	
Sepia aculeata	2.06	20	2.47	
Upeneus sulphureus	1.71	41	2.05	261
PENAEIDAE	1.63	1395	1.95	
Siganus canaliculatus	1.51	29	1.81	
Pennahia anea	1.47	20	1.76	262
Citharus sp.	1.16	232	1.39	
LIMULIDAE	0.96	2	1.15	
Johnieops sp.	0.94	4	1.13	
Penaeus monodon	0.90	6	1.08	
Brevitrygon heterura	0.86	2	1.03	
Uroconger lepturus	0.84	51	1.01	
Brachyteropsis serrulata	0.77	33	0.92	
Uranoscopus affinis	0.69	22	0.82	
Harpioquilla harpax	0.69	45	0.82	
Parapenaeopsis sp.	0.69	22	0.82	
Zebrias quagga	0.55	4	0.66	
Metapenaeus ensis	0.53	29	0.63	
Sphyræna obtusata	0.53	6	0.63	
Selar crumenophthalmus	0.45	2	0.54	
Bregmaceros sp.	0.39	345	0.47	
Neomerinthe sp.	0.33	27	0.40	
Portunus sanguinolento	0.31	2	0.38	
Kumococcus rodericensis	0.31	14	0.38	
Conger sp.	0.31	10	0.38	
Charybdis feriata	0.22	22	0.26	
Arcania sp.	0.22	22	0.26	
Saurenelchys sp.	0.22	22	0.26	
Charybdis natator	0.22	4	0.26	
Cynoglossus arel	0.20	2	0.24	
Ophichthus sp.	0.18	2	0.21	
Jaydia sp.	0.12	24	0.14	
Parachaeturichthys ploynema	0.12	10	0.14	
Bregmaceros maclellandi	0.10	24	0.12	
Xiphocheilus typus	0.08	4	0.09	
Acanthocephala krusensterni	0.08	2	0.09	
Uroteuthis (Photololigo) duvau	0.04	8	0.05	
Euprymna sp.	0.04	6	0.05	
Minous coccineus	0.04	2	0.05	
Portunus hastatus	0.04	4	0.05	
Fussinus sp.	0.02	2	0.02	
Ariosoma sp.	0.02	2	0.02	
Ostorhinchus sp.	0.02	2	0.02	
Jaydia striata	0.02	2	0.02	
Total	83.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 96
 DATE :16/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°39.97
 start stop duration Lon E 97°51.00
 TIME :20:12:09 20:33:43 21.6 (min) Purpose : 3
 LOG : 2203.15 2204.24 1.1 Region : 10330
 FDEPTH: 43 41 Gear cond.: 0
 BDEPTH: 43 41 Validity : 1
 Towing dir: 0° Wire out : 120 m Speed : 3.0 kn
 Sorted : 21 Total catch: 41.38 Catch/hour: 115.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pennahia anea	18.58	278	16.14	
Saurida tumbil	17.02	256	14.79	266
Saurida undosquamis	11.13	300	9.67	
Priacanthus tayenus	10.79	122	9.38	
Epinephelus sexfasciatus	5.56	11	4.83	
Nemipterus hexodon	3.67	22	3.19	
Nemipterus marginatus	3.45	100	3.00	
Solenocera sp.	2.73	345	2.37	
Terapon jarbua	2.61	22	2.27	
Saurida longimanus	2.28	239	1.98	
Bregmaceros sp.	2.28	434	1.98	
Lagocephalus guentheri	2.28	67	1.98	
Upeneus sulphureus	2.28	50	1.98	265
Parapenaeopsis sp.	2.23	612	1.93	0
Kumococius rodericensis	2.11	100	1.84	
Nemipterus japonicus	2.11	28	1.84	
CONIDAE	2.06	61	1.79	
Congresox talabon	1.95	17	1.69	
Elates ransonettii	1.84	195	1.59	
Conger sp.	1.61	33	1.40	
Charybdis feriata	1.45	6	1.26	
Sepia acuelata	1.45	17	1.26	
Diagramma pictum	1.39	8	1.21	
Upeneus sulphureus	1.34	45	1.16	0
Portunus sanguinolento	1.00	3	0.87	
Hellenus hastatoides	0.95	83	0.82	
Sinobatis brevicauda	0.89	6	0.77	
Sphyræna pinguis	0.83	6	0.72	
Metapenaeus ensis	0.78	128	0.68	
Euprymna sp.	0.67	11	0.58	
Carangoides hedlandensis	0.67	11	0.58	
Jaydia sp.	0.61	328	0.53	
Uroteuthis (Photololigo) duvau	0.61	95	0.53	
Nemipterus nematophorus	0.61	6	0.53	
Pseudorhombus quinquecellatus ***	0.56	28	0.48	
Cynoglossus arel	0.50	17	0.43	
Charybdis sp.	0.50	11	0.43	
GOBIIDAE	0.45	33	0.39	
Parapenaeopsis sp.	0.33	56	0.29	
Penaeus semisulcatus	0.28	6	0.24	
Aesopia cornuta	0.17	6	0.14	
Acanthocephala krusensterni	0.17	6	0.14	
SQUILLIDAE	0.11	11	0.10	
Trichurus sp.	0.11	6	0.10	
Saurenhelys sp.	0.06	6	0.05	
Squilla sp.	0.06	3	0.05	
Total	115.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 97
 DATE :17/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°53.30
 start stop duration Lon E 97°58.03
 TIME :07:31:18 07:51:14 19.9 (min) Purpose : 3
 LOG : 2269.63 2270.66 1.0 Region : 10320
 FDEPTH: 27 27 Gear cond.: 0
 BDEPTH: 27 27 Validity : 1
 Towing dir: 0° Wire out : 115 m Speed : 3.1 kn
 Sorted : 0 Total catch: 54.34 Catch/hour: 163.51

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Siganus lineatus	45.14	11284	27.60	270
Trichurus sp.	25.64	972	15.68	
Siganus canaliculatus	13.84	9226	8.47	269
Encrasicholina punctifer	10.83	199	6.62	
Dussumieria elopsoides	10.53	90	6.44	
Saurida longimanus	8.49	187	5.19	271
Pomadasydys kaakan	7.79	6	4.77	
Lagocephalus guentheri	6.74	126	4.12	272
Scomberomorus commerson	6.20	21	3.79	
Priacanthus tayenus	4.93	36	3.02	
Sepia pharaonis	3.61	3	2.21	
Penaeus semisulcatus	3.25	18	1.99	
Saurida tumbil	2.71	18	1.66	
Upeneus sulphureus	2.71	102	1.66	267
Leiognathus bindus**	1.50	211	0.92	
Terapon jarbua	1.44	6	0.88	
Terapon theraps	1.32	6	0.81	
Gerrus erythrouros	1.20	6	0.74	
Sphyræna obtusata	1.05	3	0.64	
J E L Y F I S H	0.90	12	0.55	
Lagocephalus lunaris	0.72	6	0.44	
Selar sp.	0.65	18	0.40	
Sepia esculenta	0.42	3	0.26	
Seriolina nigrofasciata	0.36	6	0.22	
Saurida sp.	0.36	12	0.22	
DASYATIDAE	0.24	6	0.15	
Siganus sp.	0.18	6	0.11	268
GOBIIDAE	0.12	6	0.07	
Elates ransonettii	0.12	12	0.07	
Metapenaeus sp.	0.12	12	0.07	
Charybdis sp.	0.12	12	0.07	
Citharus sp.	0.06	6	0.04	
Epinephelus sexfasciatus	0.06	6	0.04	
Ostorhinchus fasciatus ***	0.06	12	0.04	
Carangoides sp.	0.06	6	0.04	
Total	163.51		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 98
 DATE :17/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°23.90
 start stop duration Lon E 98°2.98
 TIME :13:17:41 13:37:45 20.1 (min) Purpose : 3
 LOG : 2306.01 2307.00 1.0 Region : 10330
 FDEPTH: 40 37 Gear cond.: 0
 BDEPTH: 40 37 Validity : 1
 Towing dir: 0° Wire out : 150 m Speed : 3.0 kn
 Sorted : 0 Total catch: 60.59 Catch/hour: 181.14

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida tumbil	28.94	203	15.98	
Trichurus sp.	17.46	0	9.64	274
Secutor insidiator	16.14	0	8.91	276
Pomadasydys kaakan	12.35	9	6.82	
Congresox sp.	11.96	12	6.60	
Lagocephalus guentheri	9.57	24	5.28	
Metapenaeus ensis	9.45	526	5.22	
Nemipterus marginatus	8.61	143	4.75	
Nemipterus mesoprius	8.61	407	4.75	
Solenocera sp.	7.17	143	3.96	
UNIDENTIFIED FISH	6.58	24	3.63	
Lagocephalus lunaris	5.86	36	3.23	
Jaydia poecilopterus	4.19	526	2.31	273
Nemipterus hexodon	3.47	36	1.91	
Sepiella inermis	3.23	323	1.78	
Rastrelliger kanagurta	2.51	24	1.39	
Panulirus polyphagus	2.27	12	1.25	
Charybdis feriata	2.27	12	1.25	
Cynoglossus arel	1.91	12	1.06	
Thryssa dussumieri	1.79	143	0.99	
Nemipterus japonicus	1.55	24	0.86	
Unidentified	1.55	0	0.86	
Uroteuthis (Photololigo) duvau	1.55	60	0.86	
Suggrundus macracanthus	1.43	36	0.79	
Johnieops sp.	1.43	12	0.79	
Pecten sp.	1.08	72	0.59	
Upeneus sulphureus	0.96	24	0.53	
Harpisquilla harpax	0.96	36	0.53	
Citharus sp.	0.72	84	0.40	
Siganus canaliculatus	0.72	12	0.40	
Antennarius striatus	0.72	24	0.40	
Pennahia ovata	0.60	36	0.33	
Elates ransonettii	0.60	72	0.33	
Bregmaceros mccllellandi	0.60	526	0.33	
Jaydia striata	0.60	550	0.33	275
Unidentified	0.48	12	0.26	
Pennahia sp.	0.48	12	0.26	
Penaeus semisulcatus	0.36	12	0.20	
Alectis indica	0.12	12	0.07	
Atropus atropus	0.12	12	0.07	
Charybdis natator	0.12	12	0.07	
Saurenhelys sp.	0.06	12	0.03	
Total	181.14		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 99
 DATE :17/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°24.28
 start stop duration Lon E 97°46.86
 TIME :16:07:47 16:27:16 19.5 (min) Purpose : 3
 LOG : 2326.28 2327.25 1.0 Region : 10330
 FDEPTH: 58 58 Gear cond.: 0
 BDEPTH: 58 58 Validity : 1
 Towing dir: 0° Wire out : 175 m Speed : 3.0 kn
 Sorted : 0 Total catch: 27.47 Catch/hour: 84.57

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus nematophorus	16.56	376	19.59	278
Saurida tumbil	10.93	80	12.92	
Saurida undosquamis	10.62	117	12.56	
Priacanthus tayenus	8.90	120	10.52	
Pennahia anea	6.99	46	8.26	
Alectis ciliaris	6.40	6	7.57	
Lagocephalus guentheri	4.83	12	5.72	
Metapenaeus ensis	2.52	154	2.99	
Nemipterus japonicus	2.28	34	2.69	277
Pomadasydys kaakan	1.57	3	1.86	
Saurida longimanus	1.48	160	1.75	
Sepia pharaonis	1.45	3	1.71	
Apogon coccineus	1.26	62	1.49	
Uroconger lepturus	0.86	3	1.02	
Kumococius rodericensis	0.80	22	0.95	
Congresox sp.	0.80	3	0.95	
Stolephorus sp.	0.80	219	0.95	
Brachyterois serrulata	0.74	37	0.87	
Bregmaceros mccllellandi	0.71	163	0.84	
Terapon sp.	0.71	3	0.84	
Brachyterois sp.	0.55	3	0.66	
Sepiella inermis	0.40	34	0.47	
Citharus sp.	0.37	46	0.44	
Upeneus sulphureus	0.28	6	0.33	
Loligo sp.	0.28	18	0.33	
Inimicus cuvieri	0.28	3	0.33	
Siganus canaliculatus	0.25	6	0.29	
Charybdis sp.	0.15	3	0.18	
Uroteuthis (Photololigo) duvau	0.15	3	0.18	
Mene maculata	0.15	9	0.18	
Triphichthys weberi	0.12	6	0.15	
Fistularia petimba	0.09	3	0.11	
Citharus sp.	0.06	3	0.07	0
Paramonacanthus sp.	0.06	6	0.07	
Trichurus sp.	0.06	3	0.07	
Cepola sp.	0.06	3	0.07	
Aseraggodes sp.	0.03	3	0.04	
Total	84.57		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 100
 DATE :17/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°23.99
 start stop duration Lon E 97°27.15
 TIME :19:45:54 20:05:58 20.1 (min) Purpose : 3
 LOG : 2350.48 2351.62 1.1 Region : 10330
 FDEPTH: 79 77 Gear cond.: 0
 BDEPTH: 79 77 Validity : 1
 Towing dir: 0° Wire out : 235 m Speed : 3.4 kn
 Sorted : 0 Total catch: 13.68 Catch/hour: 40.90

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Parupeneus heptacanthus	5.53	33	13.52	281
Priacanthus tayenus	5.32	48	13.01	
Saurida lessepsianus	4.57	239	11.18	
Trichiurus sp.	3.02	6	7.38	
Nemipterus bipunctatus	2.24	24	5.48	
Aluterus monoceros	2.24	6	5.48	
Sepia pharaonis	2.09	3	5.12	
Upeneus bensasi	1.67	129	4.09	279
Parupeneus sp.	1.43	69	3.51	280
Nemipterus japonicus	1.35	48	3.29	
Dactylopterus volitans	1.29	15	3.14	
Nemipterus nematophorus	1.26	60	3.07	
Saurida tumbil	1.26	6	3.07	
Siganus canaliculatus	1.14	27	2.78	
Cyclichthys spilostylus	0.63	3	1.54	
Muraenesox cinereus	0.60	3	1.46	
Lutjanus lutjanus	0.60	9	1.46	
Narcine brasiliensis	0.54	3	1.32	
Plotosus lineatus	0.48	33	1.17	
Synodus hoshinonis	0.42	27	1.02	
Carangoides malabaricus	0.33	3	0.80	
Pentaptrion sp.	0.33	15	0.80	
Solenocera choprai	0.24	27	0.58	
Jaydia striata	0.24	120	0.58	
Parupeneus sp.	0.18	6	0.44	
Saurechelys sp.	0.18	18	0.44	
Upeneus sp.	0.18	269	0.44	
Bregmaceros sp.	0.18	209	0.44	
Platycephalus sp.	0.18	15	0.44	
Sepia acuelata	0.18	15	0.44	
Pterois russelii	0.12	3	0.29	
Nemipterus mesoprion	0.12	3	0.29	
Champsodon sp.	0.09	51	0.22	
Xenophera sp.	0.09	3	0.22	
Triphichthys weberi	0.06	3	0.15	
Parascloopsis aspinosa	0.06	6	0.15	
Ophichthys sp.	0.06	3	0.15	
Exhipolymata hastatoides	0.06	9	0.15	
Octopus sp.	0.06	3	0.15	
Saurida sp.	0.06	3	0.15	
Psettina sp.	0.06	3	0.15	
Arnoglossus japonicus	0.06	3	0.15	
Ixa sp.	0.03	3	0.07	
Decapterus sp.	0.03	6	0.07	
Paramonacanthus tricuspis	0.03	3	0.07	
Callionymus spiniceps	0.03	3	0.07	
Total	40.90		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 101
 DATE :17/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°23.95
 start stop duration Lon E 97°4.34
 TIME :23:58:18 00:28:13 29.9 (min) Purpose : 3
 LOG : 2379.64 2381.11 1.5 Region : 10330
 FDEPTH: 96 89 Gear cond.: 0
 BDEPTH: 96 89 Validity : 1
 Towing dir: 0° Wire out : 300 m Speed : 2.9 kn
 Sorted : 0 Total catch: 8.86 Catch/hour: 17.78

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Sepia pharaonis	3.23	8	18.18	
Nemipterus bipunctatus	2.77	52	15.58	
Uroteuthis duvaucelii	1.69	157	9.48	
Trichiurus sp.	1.69	2	9.48	
Trachinocephalus myops	1.30	16	7.34	
Decapterus macrosoma	1.26	56	7.11	
Carangoides malabaricus	0.98	14	5.53	
Saurida undosquamis	0.90	8	5.08	
Aluterus monoceros	0.70	4	3.95	
Priacanthus hamrur	0.62	2	3.50	
Nemipterus japonicus	0.50	14	2.82	
Uranoscopus sp.	0.46	4	2.60	
Saurida sp.	0.44	38	2.48	
UNIDENTIFIED FISH	0.36	18	2.03	
Priacanthus tayenus	0.18	2	1.02	
Upeneus bensasi	0.18	10	1.02	
Plotosus lineatus	0.10	6	0.56	
Fistularia petimba	0.08	2	0.45	
Sepia acuelata	0.08	2	0.45	
Rastrelliger kanagurta	0.07	2	0.40	
Neomerinthe sp.	0.06	2	0.34	
Citharus sp.	0.04	8	0.23	
Fishing gears	0.04	2	0.20	
Bregmaceros sp.	0.02	20	0.11	
Plastic	0.01	4	0.05	
Total	17.77		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 102
 DATE :18/09/18 GEAR TYPE: BT NO: 0 POSITION:Lat N 13°24.11
 start stop duration Lon E 96°43.35
 TIME :05:07:35 05:38:33 31.0 (min) Purpose : 3
 LOG : 2406.34 2407.81 1.5 Region : 10330
 FDEPTH: 102 102 Gear cond.: 0
 BDEPTH: 102 102 Validity : 1
 Towing dir: 0° Wire out : 290 m Speed : 2.9 kn
 Sorted : 0 Total catch: 6.95 Catch/hour: 13.47

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida sp.	2.64	21	19.57	286
Nemipterus bipunctatus	1.92	17	14.24	282
Uranoscopus sp.	1.78	2	13.24	
Upeneus bensasi	1.36	56	10.07	285
Loligo duvaucelii	1.12	186	8.35	
Trachinocephalus sp.	0.95	19	7.05	284
Cyclichthys sp.	0.74	4	5.47	
Parupeneus heptacanthus	0.50	2	3.74	
Fistularia petimba	0.47	17	3.45	
Torquigener flavimaculosus	0.43	10	3.17	
Aluterus monoceros	0.29	2	2.16	
Decapterus sp.	0.29	6	2.16	283
Carangoides malabaricus	0.25	4	1.87	
Tetrosomus gibbosus	0.25	4	1.87	
Parascloopsis aspinosa	0.17	2	1.29	
Priacanthus tayenus	0.16	2	1.15	
Dactylopterus volitans	0.08	2	0.58	
Synodus macrops	0.04	2	0.29	
Triphichthys weberi	0.04	2	0.29	
Total	13.47		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 103
 DATE :18/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 13°5.09
 start stop duration Lon E 96°31.50
 TIME :15:26:58 15:57:10 30.2 (min) Purpose : 3
 LOG : 2467.16 2468.50 1.4 Region : 10330
 FDEPTH: 248 244 Gear cond.: 0
 BDEPTH: 248 244 Validity : 1
 Towing dir: 0° Wire out : 640 m Speed : 2.7 kn
 Sorted : 0 Total catch: 65.20 Catch/hour: 129.54

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Satyricthys sp.	37.87	64	29.23	
Puerulus sewelli	21.77	238	16.81	
Plesionika sp.	12.72	4705	9.82	
Squalus sp.	8.62	18	6.66	289
Pseudorhombus quinuoocellatus ***	7.47	40	5.77	
Pterygioteuthis sp.	7.39	151	5.71	
Chlorophthalmus acutifrons	6.04	675	4.66	
Plesiobatis daviesi	5.90	2	4.56	
Bythaelurus hispidus	3.95	48	3.05	288
Neospiñula orientalis	3.18	48	2.45	
OMMASTREPHIDAE	2.30	119	1.78	
Myctophum sp.	1.83	151	1.41	
Priacanthus macracanthus	1.35	16	1.04	
Glossanodon sp.	1.19	40	0.92	
Octopus sp.	1.03	16	0.80	
Cubiceps whiteleggii	1.03	32	0.80	
Eridacnis radcliffei	1.01	40	0.78	287
Ostichthys sp.	0.75	6	0.58	
Setarches sp.	0.75	46	0.58	
Rexea bengalensis	0.64	8	0.49	
Polyipnus indicus	0.48	342	0.37	
Acanthapthritis barbata	0.40	24	0.31	
Pterygotrigla macrorhynchus	0.40	16	0.31	
Chlorophthalmus corniger	0.24	16	0.18	
Ophichthys parilis	0.24	8	0.18	
Macrorhamphosus sp.	0.24	48	0.18	
UNIDENTIFIED FISH	0.24	32	0.18	
Aristeus sp.	0.16	8	0.12	
Heterocarpus sp.	0.16	16	0.12	
Fishing gears	0.12	4	0.09	
Argonauta sp.	0.10	2	0.08	
Astronesthes sp.	0.08	8	0.06	
Benthodesmus sp.	0.08	24	0.06	
Acanthapthritis barbata	0.08	24	0.06	
Auis sp.	0.04	8	0.03	
Coelorrinchus sp.	0.04	8	0.03	
Total	129.89		100.28	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 104
 DATE :18/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 13°3.99
 start stop duration Lon E 96°41.78
 TIME :18:11:03 18:42:35 31.5 (min) Purpose : 3
 LOG : 2479.99 2481.60 1.6 Region : 10330
 FDEPTH: 125 119 Gear cond.: 0
 BDEPTH: 125 119 Validity : 1
 Towing dir: 0° Wire out : 340 m Speed : 3.1 kn
 Sorted : 0 Total catch: 39.15 Catch/hour: 74.50

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Saurida lessepsianus	11.19 78	15.02	291
Pseudorhombus quinqueocellatus ***	8.41 93	11.29	
Squalus sp.	7.57 10	10.17	
Ostichthys convexus	5.08 10	6.82	
Priacanthus macracanthus	4.68 21	6.28	292
Satyricthys laticeps	3.37 4	4.52	
Rhinobatos sp.	3.16 15	4.24	
Fistularia petimba	2.63 6	3.52	
Pseudorhombus sp. ***	2.44 32	3.27	
Ostichthys sp.	2.40 6	3.22	
Hapalogenys merguensis	2.28 10	3.07	
Synodus randalli	1.96 2	2.63	
Pristigenys refulgens	1.94 4	2.61	
Parascloopsis aspinosa	1.69 19	2.27	293
Snyderina guentheri	1.58 34	2.12	
Nemipterus japonicus	1.47 36	1.97	290
Proscyllium magnificum	1.41 4	1.89	
Lepidotrigla longipinnis	1.27 27	1.71	
Ibacus novemdentatus	1.14 10	1.53	
Chilomycterus reticulatus	0.91 2	1.23	
Monocentris japonica	0.80 8	1.07	
Sepia acuelata	0.76 21	1.02	
Bleekeria kallelepis	0.72 63	0.97	
Priacanthus sagittarius	0.70 2	0.95	
Tetrosomus gibbosus	0.67 8	0.89	
Trachinocephalus myops	0.63 10	0.84	
Parascloopsis eriomma	0.48 4	0.64	
Cantherhines multilineatus	0.36 4	0.49	
Psettina variegata	0.34 23	0.46	
Synodus macrops	0.30 13	0.41	
Ariosoma sp.	0.29 4	0.38	
Roa jayakari	0.29 6	0.38	
Callionymus spiniceps	0.25 29	0.33	
Neomerinthe sp.	0.23 10	0.31	0
CHarybdis sp.	0.19 6	0.26	
Decodon sp.	0.15 6	0.20	
Aseraggodes cyaneus	0.15 13	0.20	
Ophidion sp.	0.13 6	0.18	
Parapercis alboguttata	0.10 8	0.13	
Auxis sp.	0.08 13	0.10	
Decapterus sp.	0.08 2	0.10	
Arnoglossus japonicus	0.06 6	0.08	
Cynoglossus sp.	0.06 2	0.08	
Neomerinthe sp.	0.06 6	0.08	
Plectranthias sp.	0.02 4	0.03	
Torquigener florealis	0.02 2	0.03	
Gymnothorax sp.	0.02 2	0.03	
Total	74.50	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 105
 DATE :18/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 13°3.60
 start stop duration Lon E 97°5.03
 TIME :22:57:52 23:19:45 21.9 (min) Purpose : 3
 LOG : 2516.83 2517.99 1.2 Region : 10330
 FDEPTH: 104 99 Gear cond.: 0
 BDEPTH: 104 99 Validity : 1
 Towing dir: 0° Wire out : 270 m Speed : 3.2 kn
 Sorted : 0 Total catch: 42.90 Catch/hour: 117.64

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Decapterus tabl	30.63 192	26.04	295
Rastrelliger faughni	19.91 206	16.92	294
Epinephelus bleekeri	8.72 3	7.41	
Decapterus sp.	7.93 93	6.74	297
Nemipterus bipunctatus	6.47 71	5.50	
Cyclichthys orbicularis	6.09 11	5.17	
Seriolina nigrofasciata	4.88 8	4.15	
Abalistes stellaris	3.48 3	2.96	
Upeneus bensasi	2.96 145	2.52	
Priacanthus macracanthus	2.77 27	2.35	
Sargocentron rubrum	2.55 11	2.17	
Rhinobatos lionotus	2.47 11	2.10	
Saurida lessepsianus	2.22 25	1.89	
Decapterus macrosoma	1.97 33	1.68	
Parupeneus heptacanthus	1.67 14	1.42	
Ostracion rhinorhynchus	1.45 5	1.24	
Trachinocephalus sp.	1.37 19	1.17	
Dactyloptena orientalis	1.34 27	1.14	
Satyricthys sp.	1.32 3	1.12	
Synodus hoshinonis	1.29 41	1.10	
Platyrrhininae	1.07 3	0.91	
Parascloopsis aspinosa	0.90 14	0.77	
Uroteuthis (Photololigo) duvau	0.74 154	0.63	
Tetrosomus gibbosus	0.52 11	0.44	
Pseudorhombus sp.	0.49 3	0.42	
Ostorhinchus gularis	0.33 123	0.28	
Sepiella inermis	0.33 3	0.28	
Engyprosoon sp.	0.33 14	0.28	
Acanthaphritis barbata	0.25 11	0.21	
Pseudorhombus sp.	0.19 3	0.16	0
Sepia prashadi	0.16 3	0.14	
Etelis sp.	0.14 3	0.12	
Psettina sp.	0.14 3	0.12	
Callionymus spiniceps	0.11 11	0.09	
OCTOPODIDAE	0.08 5	0.07	
Parapercis alboguttata	0.08 3	0.07	
Snyderina guentheri	0.08 3	0.07	
Champsodon sp.	0.05 47	0.05	
Lagocephalus sp.	0.03 3	0.02	
Siganus sp.	0.03 14	0.02	
Sicyonia sp.	0.03 3	0.02	
Megalaspis cordyla	0.03 3	0.02	
Bleekeria cf. mitsukurii	0.03 3	0.02	
Fishing gears	0.00 16	0.00	

Total 117.64 100.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 106
 DATE :19/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 13°3.72
 start stop duration Lon E 97°23.78
 TIME :01:59:43 02:30:27 30.7 (min) Purpose : 3
 LOG : 2538.60 2540.11 1.5 Region : 10330
 FDEPTH: 88 90 Gear cond.: 0
 BDEPTH: 88 90 Validity : 1
 Towing dir: 0° Wire out : 260 m Speed : 2.9 kn
 Sorted : 0 Total catch: 19.41 Catch/hour: 37.90

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Priacanthus macracanthus	26.36 351	69.55	
Nemipterus bipunctatus	4.53 76	11.95	298
Parupeneus heptacanthus	2.15 12	5.67	
Decapterus sp.	0.94 10	2.47	
Saurida lessepsianus	0.78 10	2.06	
Loligo sp.	0.68 215	1.80	
Sargocentron melanospilos	0.47 2	1.24	
Decapterus macrosoma	0.39 2	1.03	
Decapterus tabl	0.39 2	1.03	
Siganus canaliculatus	0.35 8	0.93	
Rhinobatos lionotus	0.31 2	0.82	
Monocentris japonica	0.23 2	0.62	
Rastrelliger kanagurta	0.12 12	0.31	
Upeneus bensasi	0.08 2	0.21	
Kurtus indicus	0.08 2	0.21	
Engyprosoon sp.	0.04 2	0.10	
Total	37.90	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 107
 DATE :19/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 13°3.36
 start stop duration Lon E 97°23.87
 TIME :05:26:11 05:56:03 29.9 (min) Purpose : 3
 LOG : 2562.38 2563.87 1.5 Region : 10330
 FDEPTH: 65 63 Gear cond.: 0
 BDEPTH: 65 63 Validity : 1
 Towing dir: 0° Wire out : 200 m Speed : 3.0 kn
 Sorted : 0 Total catch: 10.47 Catch/hour: 21.04

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Lagocephalus guentheri	5.95 22	26.36	
Sepia pharaonis	3.22 2	15.28	
Saurida tumbil	2.71 16	12.89	299
Carangoides malabaricus	1.47 18	6.97	
Parupeneus heptacanthus	1.33 8	6.30	
Loligo sp.	1.21 231	5.73	
Aluterus monoceros	1.17 2	5.54	
Siganus canaliculatus	1.15 22	5.44	
Saurida lessepsianus	0.82 26	3.92	301
Priacanthus macracanthus	0.58 8	2.77	
Nemipterus bipunctatus	0.50 18	2.39	300
Selar crumenophthalmus	0.46 6	2.20	
Selaroides leptolepis	0.42 2	2.01	
Sphyrna forsteri	0.24 2	1.15	
Priacanthus tayenus	0.14 2	0.67	
Pentapriion sp.	0.08 4	0.38	
Total	21.04	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 108
 DATE :19/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 13°3.59
 start stop duration Lon E 98°7.65
 TIME :08:23:16 08:53:59 30.7 (min) Purpose : 3
 LOG : 2583.16 2584.67 1.5 Region : 10330
 FDEPTH: 42 42 Gear cond.: 0
 BDEPTH: 42 42 Validity : 1
 Towing dir: 0° Wire out : 140 m Speed : 2.9 kn
 Sorted : 0 Total catch: 22.31 Catch/hour: 43.56

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Saurida lessepsianus	6.01 158	13.81	
Rastrelliger brachysoma	4.45 43	10.22	305
Pampus argenteus	3.77 2	8.65	
Deveiximentum sp.	3.75 2085	8.61	
Saurida tumbil	3.14 2942	7.22	304
Sepia acuelata	3.08 18	7.08	
Priacanthus tayenus	2.30 31	5.29	
Nemipterus mesopriion	2.30 51	5.29	
Upeneus sulphureus	2.25 62	5.15	302
Nemipterus japonicus	1.62 25	3.72	
Rastrelliger kanagurta	1.44 16	3.32	303
Nemipterus isacanthus	1.35 12	3.09	
Nemipterus sp.	0.88 4	2.02	
Metapenaeus ensis	0.84 41	1.93	
Photopectoralis aureus	0.80 1121	1.84	
Lagocephalus guentheri	0.66 10	1.52	
Saurida longimanus	0.66 51	1.52	
Siganus canaliculatus	0.49 12	1.12	
Parastromateus niger	0.49 4	1.12	
Encrasicholina heteroloba	0.47 72	1.08	306
Selar crumenophthalmus	0.45 2	1.03	
Panulirus polyphagus	0.43 2	0.99	
Pedophthalmus vigil	0.43 8	0.99	
Atropus atropus	0.35 2	0.81	
Sphyrna forsteri	0.29 4	0.67	
Alectis indica	0.18 2	0.40	
Lagocephalus lunaris	0.16 2	0.36	
Rastrelliger faughni	0.14 2	0.31	
Acanthocephala krusensterni	0.14 2	0.31	
Jaydia poecilopterus	0.08 12	0.18	
B I V A L V E S	0.08 20	0.18	
Carangoides armatus	0.06 2	0.13	
Unidentified crabs	0.02 2	0.04	
Total	43.56	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 109
 DATE :19/09/18 GEAR TYPE: PT NO: 7 POSITION:Lat N 12°47.55
 start stop duration Lon E 98°17.44
 TIME :16:40:41 17:10:18 29.6 (min) Purpose : 3
 LOG : 2640.34 2641.92 1.6 Region : 10330
 FDEPTH: 0 0 Gear cond.: 0
 BDEPTH: 58 44 Validity : 0
 Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
 Sorted : 0 Total catch: 8.93 Catch/hour: 18.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Uroteuthis duvaucelii	14.79	310	81.74	
Trichurus sp.	1.20	43	6.61	
Rhinobatos sp.	0.41	2	2.24	
Citharus sp.	0.41	2	2.24	
Elates ransonettii	0.41	2	2.24	
Unidentified crab	0.41	2	2.24	
Deveximentum sp.	0.28	1106	1.57	
Priacanthus tayenus	0.14	2	0.78	
Siganus canaliculatus	0.06	2	0.34	
Hippocampus kuda	0.00	2	0.01	
Total	18.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 110
 DATE :19/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°43.22
 start stop duration Lon E 97°53.56
 TIME :20:52:22 21:23:42 31.3 (min) Purpose : 3
 LOG : 2668.31 2669.68 1.4 Region : 10330
 FDEPTH: 67 70 Gear cond.: 0
 BDEPTH: 67 70 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 2.6 kn
 Sorted : 0 Total catch: 42.75 Catch/hour: 81.87

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Bregmaceros sp.	20.15	6245	24.61	
Jaydia striata	10.69	14961	13.05	
Lutjanus sp.	7.28	2	8.89	
Nemipterus nematophorus	6.51	90	7.95	307
Saurida lessepsianus	4.71	169	5.75	
Solenocera choprai	3.98	437	4.87	
Pomadasy kaakan**	3.96	4	4.84	
Priacanthus macracanthus	3.05	42	3.72	
Pennahia anea	2.76	11	3.37	
Sepia pharaonis	2.03	2	2.48	
Metapenaeus ensis	1.69	283	2.06	
Nemipterus marginatus	1.63	11	1.99	
Terapon jarbua	1.53	6	1.87	
Loligo sp.	1.40	77	1.71	
Parapenaeopsis sp.	1.23	444	1.50	
Citharus sp.	1.05	0	1.29	
Priacanthus tayenus	0.92	8	1.12	
Lutjanus lutjanus	0.90	11	1.10	
Congresox talabon	0.80	2	0.98	
Saurida tumbil	0.63	4	0.77	
Lepturacanthus savala	0.44	6	0.54	
Dussumieria acuta ***	0.36	6	0.44	
Deveximentum sp.	0.34	6	0.42	
Uroconger lepturus	0.33	17	0.40	
Kumococius rodericensis	0.31	10	0.37	
Pentaprion sp.	0.31	13	0.37	
Sorsogona melanoptera	0.27	36	0.33	
Leiognathus equulus	0.25	4	0.30	
Gymnothorax sp.	0.21	6	0.26	
Lagocephalus lunaris	0.21	2	0.26	
Upeneus sulphureus	0.19	4	0.23	
Brachypterois serrulata	0.17	10	0.21	
Sphyræna pinguis	0.17	2	0.21	
Kumococius rodericensis	0.13	2	0.16	0
Siganus canaliculatus	0.11	4	0.14	
Conger sp.	0.11	6	0.14	0
Acanthocephala krusensterni	0.11	4	0.14	
Antennarius hispidus	0.10	2	0.12	
Carangoides malabaricus	0.10	2	0.12	
Leiognathus bindus**	0.10	6	0.12	
Saurenchelys sp.	0.10	4	0.12	
Aseraggodes cyaneus	0.08	8	0.09	
Euprymna sp.	0.08	38	0.09	
Cynoglossus sp.	0.08	2	0.09	
Odontodactylus cultrifer	0.08	4	0.09	
Portunus gradiator	0.08	54	0.09	
Sepia pharaonis	0.06	2	0.07	
Stolephorus indicus	0.04	2	0.05	
Neomerinthe sp.	0.04	4	0.05	
Conger sp.	0.02	2	0.02	
UNIDENTIFIED FISH	0.02	2	0.02	
Johnius dussumieri	0.00	2	0.00	
Waste General	0.00	2	0.00	
Total	81.87		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 111
 DATE :19/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°43.45
 start stop duration Lon E 97°36.85
 TIME :23:49:10 00:19:33 30.4 (min) Purpose : 3
 LOG : 2685.27 2686.81 1.6 Region : 10330
 FDEPTH: 74 73 Gear cond.: 0
 BDEPTH: 74 73 Validity : 0
 Towing dir: 0° Wire out : 205 m Speed : 3.1 kn
 Sorted : 0 Total catch: 10.40 Catch/hour: 20.55

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Saurida tumbil	7.84	26	38.17	308
Nemipterus bipunctatus	3.04	36	14.81	309
Sepia pharaonis	2.23	2	10.87	
Priacanthus tayenus	1.70	20	8.27	
Saurida lessepsianus	1.46	12	7.12	
Muraenesox cinereus	0.97	4	4.71	
Uranoscopus cognatus	0.65	2	3.17	
Aluterus monoceros	0.49	4	2.40	
Abalistes stellaris	0.41	4	2.02	
Trachinocephalus sp.	0.32	8	1.54	
Lutjanus lutjanus	0.28	4	1.35	
Siganus canaliculatus	0.26	6	1.25	
Uroteuthis sp.	0.22	51	1.06	
Carangoides sp.	0.22	2	1.06	
Dactyloptena orientalis	0.16	2	0.77	
Solenocera sp.	0.10	16	0.48	
Bregmaceros maclellandi	0.06	12	0.29	
Citharus sp.	0.04	16	0.19	
Portunus sp.	0.02	6	0.10	
Charybdis natator	0.02	2	0.10	
Metapenaeus tenuipes	0.02	4	0.10	
Paramonacanthus tricuspis	0.02	2	0.10	
Engyprosoon sp.	0.01	2	0.05	
Siganus sp.	0.01	34	0.05	
Fishing gears	0.00	2	0.00	
Total	20.55		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 112
 DATE :20/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°43.21
 start stop duration Lon E 97°15.27
 TIME :03:51:40 04:22:22 30.7 (min) Purpose : 3
 LOG : 2711.65 2713.01 1.4 Region : 10330
 FDEPTH: 91 87 Gear cond.: 0
 BDEPTH: 91 87 Validity : 0
 Towing dir: 0° Wire out : 270 m Speed : 2.7 kn
 Sorted : 0 Total catch: 8.99 Catch/hour: 17.58

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Abalistes stellaris	6.30	8	35.82	
Fistularia petimba	4.42	18	25.14	
Aluterus monoceros	3.25	4	18.46	
Nemipterus bipunctatus	0.82	10	4.67	
Diodon holocanthus	0.78	2	4.45	
Saurida lessepsianus	0.63	6	3.56	
Trachinocephalus sp.	0.39	4	2.22	
Carangoides sp.	0.31	2	1.78	
Carangoides bajad	0.23	2	1.33	
Selar crumenophthalmus	0.16	2	0.89	
Bregmaceros bathymaster	0.12	18	0.67	
Citharus sp.	0.12	10	0.67	
Uroteuthis sp.	0.04	12	0.22	
Rhynchoconger sp.	0.01	2	0.06	
Ashtoret lunaris	0.01	2	0.06	
Total	17.58		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 113
 DATE :20/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°43.21
 start stop duration Lon E 96°56.88
 TIME :07:22:22 07:55:00 32.6 (min) Purpose : 3
 LOG : 2733.27 2734.93 1.7 Region : 10330
 FDEPTH: 108 118 Gear cond.: 0
 BDEPTH: 108 118 Validity : 0
 Towing dir: 0° Wire out : 280 m Speed : 3.1 kn
 Sorted : 0 Total catch: 63.88 Catch/hour: 117.43

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Plesiobatis daviesi	91.76	4	78.15	
Saurida lessepsianus	9.52	149	8.11	310
Cylichthys spilostylus	9.19	11	7.83	
Rhinobatos lionotus	4.19	2	3.57	
Trachinocephalus sp.	0.99	15	0.85	
Satyricthys cf. adeni	0.51	2	0.44	
Parapriacanthus ransonneti	0.33	4	0.28	
Pseudorhombus dupliocellatus ***	0.22	4	0.19	
Starfish white 5 arms	0.15	2	0.13	
Bleekeria sp. 'long jaw'	0.13	13	0.11	
Octopus sp.	0.13	4	0.11	
Sepia aculeata	0.13	4	0.11	
Torquigener florealis	0.07	2	0.06	
Synodus sp.	0.06	6	0.05	
Decapterus sp.	0.04	4	0.03	
Total	117.43		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 114
 DATE :20/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°43.28
 start stop duration Lon E 96°45.36
 TIME :09:58:47 10:28:26 29.6 (min) Purpose : 3
 LOG : 2747.17 2748.66 1.5 Region : 10330
 FDEPTH: 310 306 Gear cond.: 0
 BDEPTH: 310 306 Validity : 0
 Towing dir: 0° Wire out : 750 m Speed : 3.0 kn
 Sorted : 0 Total catch: 141.41 Catch/hour: 286.15

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Myctophum sp.	77.71	13599	27.16	
MYCTOPHIDAE	40.47	10118	14.14	
Plesionika sp.	32.38	11870	11.31	
Chlorophthalmus cf. acutifrons	30.11	372	10.52	
Histioteuthis sp.	25.90	24	9.05	
OCTOPODIDAE	16.19	16	5.66	
Priacanthus macracanthus	12.30	130	4.30	
Puerulus sewelli	6.48	121	2.26	
Squalus sp.	5.83	32	2.04	
Bythaelurus hispidus	5.02	81	1.75	
Solenocera sp.	4.21	599	1.47	
Lestrolepis intermedia	3.89	397	1.36	
Symbolophorus sp.	3.24	971	1.13	
OMMASTREPHIDAE	2.91	97	1.02	
Satyricthys laticeps	2.43	8	0.85	
Chascanopsetta lugubris	2.27	49	0.79	
Glyptophidium sp.	1.62	73	0.57	
Hypopleuron caninum	1.62	32	0.57	
Neopinnula orientalis	1.46	16	0.51	
Rexea bengalensis	1.13	8	0.40	
Cubiceps whiteleggii	0.97	32	0.34	
Gephyroberyx cf. japonicus	0.97	16	0.34	
Pterygotrigla macrorhynchus	0.97	49	0.34	
Setarches longimanus	0.81	57	0.28	
Eridacnis radcliffei	0.81	24	0.28	
Heterocarpus sp.	0.65	40	0.23	
Platymera gaudichaudii	0.49	16	0.17	
Coelorinchus sp.	0.49	24	0.17	
ACROPOMATIDAE	0.49	57	0.17	
Malacocephalus laevis	0.32	8	0.11	
Astronesthes sp	0.32	40	0.11	
BERYCIDAE	0.32	8	0.11	
Antigonia rubescens	0.32	0	0.11	
Melanolagus bericoides	0.16	8	0.06	
Satyricthys sp.	0.16	8	0.06	
Starfish	0.16	16	0.06	
HOMOLIDAE	0.16	8	0.06	
Brama sp.	0.16	8	0.06	
Neobythites sp.	0.16	8	0.06	
PARALEPIDIDAE	0.08	16	0.03	
Pyramodon sp	0.01	8	0.00	
Setarches guentheri	0.01	8	0.00	
Total	286.15		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 115
 DATE :20/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°42.94
 start stop duration Lon E 96°36.53
 TIME :13:01:00 13:31:03 30.1 (min) Purpose : 3
 LOG : 2762.89 2764.34 1.4 Region : 10330
 FDEPTH: 527 526 Gear cond.: 0
 BDEPTH: 527 526 Validity : 0
 Towing dir: 0° Wire out : 1230 m Speed : 2.9 kn
 Sorted : 0 Total catch: 286.02 Catch/hour: 571.09

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
J E L L Y F I S H	539.10	270	94.40	
Centrophorus granulosus	6.15	2	1.08	
Caelorinchus flabellispinis	5.81	70	1.02	
Glyptophidium argenteum	3.87	176	0.68	
Cubiceps cf. pauciradiatus	3.35	210	0.59	
Talismania sp.	3.35	32	0.59	
Aristaeopsis edwardsiana	1.12	134	0.20	
ARISTEIDAE	1.08	28	0.19	
Octopus sp.	0.68	8	0.12	
Bathypterois atricolor	0.64	40	0.11	
Satyricthys laticeps	0.56	2	0.10	
Satyricthys investigatoris	0.52	12	0.09	
Diceratias cf. bispinosus	0.52	6	0.09	
Ruvettus pretiosus	0.40	2	0.07	
Chlorophthalmus acutifrons	0.40	6	0.07	
MYCTOPHIDAE	0.36	26	0.06	
Neosopelus microchir	0.32	6	0.06	
Halimochirus sp.	0.28	24	0.05	
Gavialiceps taeniola	0.28	2	0.05	
Coryphaenoides macrolophus	0.28	10	0.05	
Tydemania sp.	0.24	22	0.04	
OMMASTREPHIDAE	0.24	12	0.04	
Linuparus sp.	0.20	2	0.03	
Gonostoma sp.	0.20	10	0.03	
Bythaelurus sp.	0.16	8	0.03	
Dicrolene sp.	0.12	2	0.02	
Polymixia fusca	0.12	2	0.02	
Histioteuthis reversa	0.12	6	0.02	
Glyptophidium sp.	0.12	2	0.02	0
EPIGONIDAE	0.10	2	0.02	
Nephropsis stewarti	0.08	4	0.01	
Chascanopsetta lugubris	0.08	2	0.01	
Pasiphaea unispinosa	0.08	6	0.01	0
Pleistacantha ori	0.04	2	0.01	
Lestrolepis intermedia	0.04	4	0.01	
Setarches longimanus	0.04	2	0.01	
Heterocarpus sp.	0.04	24	0.01	
Macrorhamphosodes sp.	0.00	2	0.00	
Cypselurus sp.	0.00	2	0.00	
Coelophrys cf. micropa	0.00	2	0.00	
Total	571.09		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 116
 DATE :20/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°22.39
 start stop duration Lon E 96°37.45
 TIME :19:00:36 19:32:06 31.5 (min) Purpose : 3
 LOG : 2796.13 2797.59 1.5 Region : 10330
 FDEPTH: 519 518 Gear cond.: 0
 BDEPTH: 519 518 Validity : 0
 Towing dir: 0° Wire out : 1100 m Speed : 2.8 kn
 Sorted : 0 Total catch: 48.95 Catch/hour: 93.27

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Hexatrygon brickelli	54.76	2	58.71	
Cubiceps pauciradiatus	6.88	389	7.37	
J E L L Y F I S H	5.89	13	6.31	
Caelorinchus flabellispinis	4.15	118	4.45	
Cruriraja andamanica	2.06	10	2.21	
Aristeus mabahissae	2.00	236	2.15	
Hypopleuron caninum	1.81	2	1.94	
Aristaeopsis edwardsiana	1.70	99	1.82	
Neosopelus microchir	1.66	36	1.78	
Chimera sp.	1.39	2	1.49	
Cubiceps whiteleggii	1.20	74	1.29	
Gavialiceps taeniola	0.93	67	1.00	
Heterocarpus chani	0.91	61	0.98	
Pasiphaea unispinosa	0.80	95	0.86	
Nephropsis stewarti	0.69	44	0.74	
Glyptophidium argenteum	0.67	38	0.72	
Loligo sp.	0.53	6	0.57	
Gonostoma sp.	0.51	25	0.55	
Sea cucumber purple	0.50	2	0.53	
Benthobatis yangi	0.44	2	0.47	
Bentosema fibulatum	0.40	225	0.43	
Dicrolene sp.	0.32	4	0.35	
Bathypterois quadrifilis	0.29	29	0.31	
Apristurus sp.	0.27	6	0.29	
Xenomystax trucidans	0.25	4	0.27	
Tydemania sp.	0.19	19	0.20	
Malacocephalus laevis	0.17	2	0.18	
Chauliodus sloani	0.17	17	0.18	
Polymixia sp.	0.17	2	0.18	
Setarches longimanus	0.15	2	0.16	
Idioteuthis sp.	0.15	10	0.16	
Physiculus sp.	0.15	4	0.16	
OMMASTREPHIDAE	0.11	11	0.12	
Acanthephyra fimbriata	0.11	23	0.12	
Chlorophthalmus acutifrons	0.11	2	0.12	
Monomitopus sp.	0.11	8	0.12	
Neobythites sp.	0.10	2	0.10	
Bufoferatias wedli	0.08	2	0.08	
Malacocephalus laevis	0.08	6	0.08	0
PARALEPIDIDAE	0.06	2	0.06	
Auxis sp.	0.06	6	0.06	
Heterocarpus sibogae	0.06	6	0.06	
Polycheles typhlops	0.04	6	0.04	
Halimochirus centriscooides	0.04	4	0.04	
Howella brodiei	0.02	2	0.02	
Satyricthys investigatoris	0.02	2	0.02	
Photoneustes sp.	0.02	2	0.02	
Coryphaenoides macrolophus	0.02	2	0.02	
Triplophos sp.	0.02	4	0.02	
Diceratias cf. bispinosus	0.02	2	0.02	
Astronesthes sp.	0.02	2	0.02	
Coelophrys cf. micropa	0.02	2	0.02	
Total	93.27		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 117
 DATE :20/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°22.12
 start stop duration Lon E 96°51.08
 TIME :23:47:43 00:17:41 30.0 (min) Purpose : 3
 LOG : 2816.95 2818.36 1.4 Region : 10330
 FDEPTH: 265 273 Gear cond.: 0
 BDEPTH: 265 273 Validity : 0
 Towing dir: 0° Wire out : 650 m Speed : 2.8 kn
 Sorted : 0 Total catch: 501.34 Catch/hour: 1003.34

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Priacanthus macracanthus	221.91	5404	22.12	
Satyricthys laticeps	213.74	288	21.30	
Symbolophorus sp.	134.49	36504	13.40	
Psenopsis sp.	77.81	3458	7.76	
Pandalus sp.	65.32	16619	6.51	
Chlorophthalmus acutifrons	63.88	1633	6.37	
Puerulus sewelli	42.75	336	4.26	
Heterocarpus woodmasoni	38.43	7877	3.83	
ACROPOMATIDAE	28.82	4515	2.87	
Ateleopus indicus	23.54	216	2.35	
Hypopleuron caninum	18.73	144	1.87	
Bythaelurus hispidus	15.85	240	1.58	
Psenopsis obscura	10.09	408	1.01	
Neopinnula orientalis	9.61	168	0.96	
BOLITAENIDAE	6.28	10	0.63	
Tetronance sp.	6.24	24	0.62	
OMMASTREPHIDAE	4.32	168	0.43	
Coelorinchus mycterismus	3.84	96	0.38	
Chascanopsetta lugubris	3.84	96	0.38	
Synagrops sp.	3.84	96	0.38	
Cruriraja andamanica	3.36	72	0.34	
Gephyroberyx cf. japonicus	1.44	48	0.14	
Malacocephalus laevis	0.96	24	0.10	
Lestrolepis sp.	0.48	24	0.05	
Chlorophthalmus corniger	0.48	48	0.05	
Citharus sp.	0.48	24	0.05	
Glyptophidium sp.	0.48	24	0.05	
Cyttopsis sp.	0.48	24	0.05	
Chironema chryseres	0.48	24	0.05	
Eridacnis radcliffei	0.48	24	0.05	
Heterocarpus chani	0.48	24	0.05	
CHIROTUEUTHIDAE	0.20	2	0.02	
ARISTEIDAE	0.04	2	0.00	
Congresox sp.	0.04	2	0.00	
Macrorhamphosodes platycheilus	0.02	24	0.00	
Pyramodon sp	0.02	24	0.00	
Champsodon sp.	0.02	48	0.00	
Plectrogenium	0.02	4	0.00	
Plesionika sp.	0.02	8	0.00	
Total	1003.34		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 118
 DATE :21/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°22.64
 start stop duration Lon E 97°1.17
 TIME :02:33:25 03:04:07 30.7 (min) Purpose : 3
 LOG : 2831.11 2832.40 1.3 Region : 10330
 FDEPTH: 166 158 Gear cond.: 0
 BDEPTH: 166 158 Validity : 0
 Towing dir: 0° Wire out : 420 m Speed : 2.5 kn
 Sorted : 0 Total catch: 43.87 Catch/hour: 85.71

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Plesiobatis daviesi	36.14	2	42.17	
Satyrichtys sp.	26.22	27	30.59	
Heterocarpus woodmasoni	9.34	1245	10.90	
Erythrocles schlegelii	3.67	16	4.29	
Saurida lessepsianus	2.62	55	3.05	
Priacanthus macracanthus	1.99	39	2.33	
Nemipterus sp.	1.64	18	1.91	
Lophiomus setigerus	0.94	6	1.09	
Chlorophthalmus cf. acutifrons	0.74	14	0.87	
Pseudorhombus quinuoquellatus ***	0.59	12	0.68	
Octopus sp.	0.59	12	0.68	
Ateleopus indicus	0.47	8	0.55	
OMMASTREPHIDAE	0.23	6	0.27	
Neoniphon aurolineatus	0.23	20	0.27	
Torquigener florealis	0.12	6	0.14	
Puerulus sewelli	0.08	2	0.09	
Ophidion sp.	0.04	2	0.05	
Cubiceps whiteleggii	0.04	2	0.05	
Pyramodon sp.	0.02	2	0.02	
Total	85.71		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 120
 DATE :21/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°22.31
 start stop duration Lon E 97°34.73
 TIME :09:08:06 09:38:08 30.0 (min) Purpose : 3
 LOG : 2864.03 2865.60 1.6 Region : 10330
 FDEPTH: 86 87 Gear cond.: 0
 BDEPTH: 86 87 Validity : 0
 Towing dir: 0° Wire out : 230 m Speed : 3.1 kn
 Sorted : 0 Total catch: 98.61 Catch/hour: 197.02

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Plotosus lineatus	170.83	1532	86.71	
Decapterus sp.	7.39	118	3.75	
Rastrelliger kanagurta	6.55	70	3.33	315
Carangoides malabaricus	2.90	46	1.47	
Saurida lessepsianus	2.14	26	1.09	
Selar crumenophthalmus	1.80	14	0.91	
Cantherhines multilineatus	1.44	10	0.73	
Priacanthus macracanthus	1.06	6	0.54	
Seriolina nigrofasciata	0.62	2	0.31	
Elagatis bipinnulata	0.60	2	0.30	
Selaroides leptolepis	0.50	4	0.25	
Trichiurus sp.	0.42	4	0.21	
Nemipterus japonicus	0.22	4	0.11	
Megalaspis cordyla	0.18	4	0.09	
Loligo duvaucelii	0.14	18	0.07	
Fistularia petimba	0.12	4	0.06	
Parasclopsis eriomma	0.06	2	0.03	
Upeneus bensasi	0.04	2	0.02	
Tydemania sp.	0.02	2	0.01	
Total	197.02		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 119
 DATE :21/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°22.31
 start stop duration Lon E 97°12.44
 TIME :04:50:38 05:17:25 26.8 (min) Purpose : 3
 LOG : 2842.17 2843.31 1.1 Region : 10330
 FDEPTH: 100 99 Gear cond.: 0
 BDEPTH: 100 99 Validity : 0
 Towing dir: 0° Wire out : 250 m Speed : 2.6 kn
 Sorted : 0 Total catch: 136.99 Catch/hour: 306.92

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pristipomoides typus	75.10	94	24.47	
Parasclopsis rufomaculatus	37.06	273	12.07	
Parasclopsis eriomma	34.82	161	11.34	
Sphyraena forsteri	27.54	69	8.97	311
Decapterus sp.	22.85	101	7.45	313
Cantherhines multilineatus	17.88	132	5.83	0
Epinephelus corallicola	10.13	4	3.30	
Parupeneus heptacanthus	9.95	58	3.24	312
Epinephelus areolatus	9.14	43	2.98	
Aluterus monoceros	8.72	31	2.84	
Cyclichthys spilostylus	7.84	7	2.55	
Pristipomoides multidens	6.56	22	2.14	
Wattsia mossambica	5.91	13	1.93	
Rhinobatos sp.	4.95	7	1.61	
Priacanthus sagittarius	4.66	11	1.52	
Parasclopsis cf. eriomma	4.03	65	1.31	314
Sepia latimanus	3.58	4	1.17	
Chaetodon robustus	2.42	9	0.79	
Halimochirurgus centriscoideus	2.29	2	0.74	
Sargocentron rubrum	2.15	16	0.70	
Seriolina nigrofasciata	2.11	2	0.69	
Diodon holocanthus	2.06	4	0.67	
Lutjanus quinquelineatus	0.90	4	0.29	
Carangoides malabaricus	0.63	2	0.20	
Bodianus leucostictus	0.58	9	0.19	
Heniochus diphreutes	0.52	2	0.17	
Tydemania sp.	0.45	45	0.15	0
Monocentris japonica	0.45	4	0.15	
Cantherhines multilineatus	0.43	4	0.14	
Ophichthys sp.	0.31	7	0.10	
Chromis sp.	0.31	11	0.10	
Plectranthias sp.	0.29	2	0.09	
Plectorhinchus gibbosus	0.16	4	0.05	
Fistularia petimba	0.04	2	0.01	
Pseudorhombus quinuoquellatus ***	0.04	2	0.01	
Plectranthias sp.	0.02	2	0.01	0
Macrorhamphosodes platycheilus	0.02	2	0.01	
Tydemania sp.	0.02	2	0.01	
Total	306.92		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 121
 DATE :21/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°22.00
 start stop duration Lon E 97°55.34
 TIME :12:14:43 12:44:09 29.4 (min) Purpose : 3
 LOG : 2885.58 2887.11 1.5 Region : 10330
 FDEPTH: 32 30 Gear cond.: 0
 BDEPTH: 32 30 Validity : 0
 Towing dir: 0° Wire out : 120 m Speed : 3.1 kn
 Sorted : 0 Total catch: 14.77 Catch/hour: 30.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Pennahia anea	6.44	100	21.39	
CORAL	2.98	2	9.88	
Saurida tumbil	2.45	41	8.12	
Metapenaeus ensis	2.41	124	7.99	
Penaeus merguensis	2.04	71	6.77	
Apogon smithi	1.59	112	5.28	
Encrasicholina heteroloba	1.20	206	3.99	
Pomadourys maculatus**	0.98	8	3.25	
Trichiurus sp.	0.94	10	3.11	
Jaydia sp.	0.73	63	2.44	
Lagocephalus inermis	0.73	2	2.44	
Secutor insidiator	0.73	367	2.44	
Jaydia poecilopterus	0.57	29	1.90	
Portunus pelagicus	0.57	2	1.90	
Nemipterus japonicus	0.53	10	1.76	
Bregmaceros mccllellandi	0.53	106	1.76	
Nemipterus marginatus	0.45	10	1.49	
Alectis indica	0.45	8	1.49	
Jaydia striata	0.41	94	1.35	
Upeneus sulphureus	0.37	10	1.22	
Aluterus monoceros	0.33	2	1.08	
Ophichthys sp.	0.33	2	1.08	
Trichiurus sp., juvenile	0.33	326	1.08	
Lutjanus lutjanus	0.20	2	0.68	
Sepiella inermis	0.16	2	0.54	
Decapterus macrosoma	0.16	4	0.54	
Plotosus canius	0.16	2	0.54	
Solenocera sp.	0.12	18	0.41	
Cynoglossus arel	0.12	2	0.41	
Jaydia sp.	0.12	6	0.41	0
Siganus canaliculatus	0.12	4	0.41	
Leiognathus bindus**	0.12	12	0.41	
Deveiximentum sp.	0.12	6	0.41	
Bregmaceros sp.	0.08	122	0.27	
Saurida lessepsianus	0.08	2	0.27	
Solenocera choprai	0.06	4	0.20	
Uranoscopus kaianus	0.06	22	0.20	
Uroteuthis (Photololigo) duvau	0.04	27	0.14	
Elates ransonettii	0.04	2	0.14	
Metapenaeopsis spp.	0.04	12	0.14	
Rastrelliger kanagurta	0.04	6	0.14	
Citharus sp.	0.04	4	0.14	
Acanthocephala krusensterni	0.04	2	0.14	
Brachyteropsis serrulifer	0.04	4	0.14	
Mene maculata	0.02	6	0.07	
Unidentified	0.02	2	0.07	0
Atropus atropus	0.00	2	0.01	
Total	30.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 122
 DATE :21/09/18 GEAR TYPE: PT NO: 7 POSITION:Lat N 12°10.84
 start stop duration Lon E 97°53.30
 TIME :15:05:46 15:26:24 20.6 (min) Purpose : 3
 LOG : 2899.70 2900.81 1.1 Region : 10330
 FDEPTH: 5 5 Gear cond.: 0
 BDEPTH: 36 42 Validity : 0
 Towing dir: 0° Wire out : 140 m Speed : 3.2 kn
 Sorted : 0 Total catch: 10.01 Catch/hour: 29.10

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Loligo sp.	10.03	3343	34.47	
Gazza minuta	7.33	221	25.17	
Siganus canaliculatus	2.62	6541	8.99	316
Sphyræna obtusata	1.34	15	4.60	
Terapon jarbua	1.10	3	3.00	
Encrasicholina sp.	0.99	416	3.40	
Pennahis anea	0.99	15	3.40	
Saurida lessepsianus	0.64	12	2.20	
Cantherhines multilineatus	0.61	9	2.10	
Trichiurus sp.	0.47	6	1.60	
Portunus pelagicus	0.38	3	1.30	
Jaydia poecilopterus	0.35	20	1.20	
Metapenaeus ensis	0.29	17	1.00	
Chirocentrus dorab	0.23	3	0.80	
Uranoscopus kaianus	0.23	6	0.80	
Nemipterus marginatus	0.20	6	0.70	
Upeneus sulphureus	0.20	6	0.70	
Lagocephalus inermis	0.17	3	0.60	
Penaeus notialis	0.15	6	0.50	
Rastrelliger kanagurta	0.12	29	0.40	
Apogon smithi	0.09	6	0.30	
Sarda orientalis	0.09	6	0.30	
Encrasicholina heteroloba	0.06	15	0.20	
Rastrelliger sp.	0.06	9	0.20	
Deveximentum insidiator	0.06	26	0.20	
Cynoglossus arel	0.06	3	0.20	
Citharus sp.	0.06	3	0.20	
Decapterus macrosoma	0.06	9	0.20	
Bregmaceros maclellandi	0.03	6	0.10	
Solenocera sp.	0.03	3	0.10	
Solenocera choprai	0.03	3	0.10	
Jaydia striata	0.03	6	0.10	
Sardinella lemuru	0.03	3	0.10	
Total	29.10		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 123
 DATE :21/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°06.4
 start stop duration Lon E 97°28.94
 TIME :18:51:14 19:21:38 30.4 (min) Purpose : 3
 LOG : 2930.77 2932.20 1.4 Region : 10330
 FDEPTH: 81 81 Gear cond.: 0
 BDEPTH: 81 81 Validity : 0
 Towing dir: 0° Wire out : 200 m Speed : 2.8 kn
 Sorted : 0 Total catch: 30.89 Catch/hour: 60.99

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Dactyloptena orientalis	11.53	243	18.91	
Saurida lessepsianus	11.19	296	18.36	317
Aluterus monoceros	7.94	18	13.01	
Engyprosoon maldivensis	5.88	255	9.65	
Nemipterus bipunctatus	5.25	103	8.61	318
Trachinocephalus myops	3.79	81	6.22	
Upeneus bensasi	2.80	124	4.60	
Parupeneus heptacanthus	2.01	10	3.30	
Priacanthus tayenus	1.93	22	3.17	
Uranoscopus affinis	1.66	10	2.72	
Siganus canaliculatus	0.91	22	1.49	
Decapterus sp.	0.87	12	1.42	
Synodus hoshinonis	0.75	30	1.23	
Cyclichthys sp.	0.71	14	1.17	
Jelly squid	0.63	2	1.04	
Parascloopsis aspinosa	0.55	8	0.91	
Uraspis sp.	0.39	2	0.65	
Metapenaeus ensis	0.32	85	0.52	
Parapercis alboguttata	0.28	8	0.45	
Kumococcus rodericensis	0.28	16	0.45	
Chirocentrus dorab	0.28	2	0.45	
Apogon 'big'	0.20	20	0.32	
Penaeus notialis	0.18	4	0.29	
Sardinella sp.	0.12	4	0.19	
Solenocera crassicornis	0.10	71	0.16	
Encrasicholina devisi	0.10	2	0.16	
Solenocera choprai	0.08	8	0.13	
Bregmaceros sp.	0.06	51	0.10	
Photopectoralis aureus	0.06	4	0.10	
Saurenchelys sp.	0.04	4	0.06	
Pterois russellii	0.04	2	0.06	
Charybdis sp.	0.02	4	0.03	
Haliutaea sp.	0.02	2	0.03	
Rastrelliger sp.	0.02	4	0.03	
Total	60.99		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 124
 DATE :21/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°1.91
 start stop duration Lon E 97°9.12
 TIME :22:14:22 22:44:12 29.8 (min) Purpose : 3
 LOG : 2952.07 2953.45 1.4 Region : 10330
 FDEPTH: 131 132 Gear cond.: 0
 BDEPTH: 131 132 Validity : 0
 Towing dir: 0° Wire out : 330 m Speed : 2.8 kn
 Sorted : 0 Total catch: 77.78 Catch/hour: 156.38

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Plesiobatis daviesi	72.75	2	46.52	
Satyrichthys laticeps	32.21	109	20.60	
Saurida lessepsianus	8.40	181	5.37	
Squalus sp.	8.28	6	5.30	
Pseudorhombus duplicioccellatus ***	8.16	97	5.22	
Mustelus sp.	6.35	2	4.06	
Dactyloptena orientalis	4.50	86	2.88	
Priacanthus macracanthus	3.94	36	2.52	
Psettina sp.	1.49	28	0.95	
Cociella sp.	1.37	18	0.87	
Uranoscopus kaianus	1.17	4	0.75	
Cephalosetta ventrocellatus	1.09	12	0.69	
Thenus orientalis	1.05	36	0.67	
Raja sp.	0.88	2	0.57	
Callionymus spiniceps	0.68	36	0.44	
Bleekeria cf. mitsukurii	0.56	26	0.36	
Sparisoma sp.	0.52	12	0.33	
Decapterus macrosoma	0.44	8	0.28	
Parascloopsis aspinosa	0.44	8	0.28	
Torquigener florealis	0.36	20	0.23	
Lophiomus setigerus	0.32	2	0.21	
Samaris sp.	0.28	36	0.18	
Sepia acuelata	0.24	20	0.15	
Acanthaphritis barbata	0.20	20	0.13	
Trachinocephalus myops	0.16	2	0.10	
Decapterus sp.	0.12	2	0.08	
Engyprosoon maldivensis	0.08	6	0.05	
Priacanthus tayenus	0.08	2	0.05	
Siganus canaliculatus	0.08	2	0.05	
Octopus sp.	0.08	2	0.05	
Nemipterus japonicus	0.04	2	0.03	
Haliutaea coccinea	0.02	2	0.01	
Portunus sp.	0.00	2	0.00	
CARANGIDAE	0.00	2	0.00	
Portunidae	0.00	6	0.00	
Ophidion sp.	0.00	2	0.00	
Muraenesox sp.	0.00	2	0.00	
Total	156.38		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 125
 DATE :22/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°2.97
 start stop duration Lon E 96°57.70
 TIME :01:05:47 01:35:58 30.2 (min) Purpose : 3
 LOG : 2967.89 2969.42 1.5 Region : 10330
 FDEPTH: 264 261 Gear cond.: 0
 BDEPTH: 264 261 Validity : 0
 Towing dir: 0° Wire out : 630 m Speed : 3.0 kn
 Sorted : 0 Total catch: 274.20 Catch/hour: 545.13

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Myctophum sp.	109.74	32922	20.13	
Cubiceps whiteleggii	92.05	4473	16.89	
R A Y S	65.49	8	12.01	
Satyrichthys laticeps	65.05	125	11.93	
Plesionika spinipes	44.73	7952	8.21	
Psenopsis obscura	39.76	1292	7.29	
Neopinnula orientalis	20.87	477	3.83	
Priacanthus macracanthus	18.09	408	3.32	
Puerulus sewelli	15.35	250	2.82	319
Chlorophthalmus acutifrons	13.32	298	2.44	
Heterocarpus woodmasoni	7.95	1034	1.46	
Jaydia smithi	7.95	1113	1.46	
Solenocera sp.	7.95	20	1.46	
Linuparus somniosus	6.96	10	1.28	
Coelorinchus mycterismus	6.16	129	1.13	
Ateleopus sp.	4.17	30	0.77	
Bythaelurus hispidus	3.78	50	0.69	
Chlorophthalmus corniger	2.98	209	0.55	
Hypopleuron caninum	2.78	20	0.51	
Owstonia sp.	2.19	10	0.40	
Brachyterois serrulifer	0.80	189	0.15	
Glyptothidium sp.	0.80	60	0.15	
Neoniphon aurolineatus	0.80	10	0.15	
Synagrops bellus	0.80	20	0.15	
Muraenesox sp.	0.60	20	0.11	
Plotosus lineatus	0.60	10	0.11	
Chascanopsetta lugubris	0.40	20	0.07	
Rhynchoconger sp.	0.40	10	0.07	
Gephyroberyx cf. japonicus	0.40	10	0.07	
Laeops macrophthalmus	0.24	20	0.04	
Lophiodes mutilus	0.20	10	0.04	
Aristaeomorpha sp.	0.20	20	0.04	
Lestrolepis intermedia	0.20	20	0.04	
Arnoglossus japonicus	0.20	10	0.04	
Uroteuthis sp.	0.20	10	0.04	
Euprymna sp.	0.20	10	0.04	
Tydemania sp.	0.20	20	0.04	
Parascombrops sp.	0.20	10	0.04	
Heterocarpus chani	0.10	50	0.02	
Haliutaea coccinea	0.10	10	0.02	
Peristedion weberi	0.10	10	0.02	
Halmochirurgus centriscoides	0.10	109	0.02	
Total	545.13		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 126
 DATE :22/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 12°2.89
 start stop duration Lon E 96°43.22
 TIME :04:25:15 04:55:54 30.6 (min) Purpose : 3
 LOG : 2987.34 2988.81 1.5 Region : 10330
 FDEPTH: 362 365 Gear cond.: 0
 BDEPTH: 362 365 Validity : 0
 Towing dir: 0° Wire out : 820 m Speed : 2.9 kn
 Sorted : 0 Total catch: 157.11 Catch/hour: 307.66

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Setarches longimanus	56.79	8420	18.46	
Benthoosema sp.	35.72	8522	11.61	
MYCTOPHIDAE	34.46	5452	11.20	
Solenocera crassicornis	27.57	6141	8.96	
Aristaeomorpha sp.	26.32	1692	8.55	
Heterocarpus cf woodmasoni	21.31	2256	6.93	
JELLYFISH	19.07	16	6.20	
Heterocarpus sibogae	15.04	1629	4.89	
Howella brodiei	12.53	3509	4.07	
Chlorophthalmus acutifrons	9.24	110	3.00	0
Neoscopelus microchir	6.89	188	2.24	
Neopinnula orientalis	6.50	86	2.11	
Priacanthus macracanthus	6.42	47	2.09	
Satyricthys laticeps	5.95	6	1.93	
Xenomystax trucidans	4.39	125	1.43	
Histioteuthis sp.	4.31	4	1.40	
Polyipnus indicus	3.13	564	1.02	
Satyricthys milleri	2.29	14	0.74	0
Synagrops sp.	2.04	78	0.66	
Eridacnis radcliffei	1.66	18	0.54	
Aristeus virillis	1.25	63	0.41	
Holcomycteropus sp.	0.70	2	0.23	
Histioteuthis sp.	0.59	8	0.19	0
Bembrops sp.	0.55	8	0.18	
Lestrolepis intermedia	0.47	37	0.15	
Cubiceps pauciradiatus	0.39	23	0.13	
Trichiurus sp.	0.39	16	0.13	
Trichiurus sp.	0.35	2	0.11	0
Rexea bengalensis	0.31	16	0.10	
Neobythites sp.	0.16	6	0.05	
Parascombrops sp.	0.16	8	0.05	
Halieutaea sp.	0.12	2	0.04	
Satyricthys milleri	0.12	2	0.04	
Polymixia fusca	0.08	2	0.03	
Nephropsis stewarti	0.08	4	0.03	
Astronesthes sp.	0.08	14	0.03	
Bathyclupea hoskynni	0.06	2	0.02	
SEPIOLIDAE	0.04	2	0.01	
Photonectes sp.	0.04	2	0.01	
Chascanopsetta lugubris	0.02	2	0.01	
GALATHEIDAE	0.02	2	0.01	
Leptocephalus	0.02	2	0.01	
Tydemania sp.	0.02	2	0.01	
Total	307.66		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 127
 DATE :22/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°52.63
 start stop duration Lon E 96°35.72
 TIME :08:37:41 09:08:11 30.5 (min) Purpose : 3
 LOG : 3010.36 3012.04 1.7 Region : 10330
 FDEPTH: 618 711 Gear cond.: 0
 BDEPTH: 618 711 Validity : 0
 Towing dir: 0° Wire out : 1550 m Speed : 3.3 kn
 Sorted : 0 Total catch: 97.21 Catch/hour: 191.17

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
JELLYFISH	141.59	169	74.07	
Rays and sharks	18.01	2	9.42	
Centrophorus granulosus	6.69	2	3.50	
Caelorinchus flabellispinis	2.91	14	1.52	
Benthoatops sp.	2.46	4	1.29	
Zameus (Scymnodon) squamulosus	2.44	2	1.28	0
Acanthephyra eximia	2.36	3304	1.23	
Alepocephalus sp.	1.59	10	0.83	
Glyptothidium argenteum	1.51	51	0.79	
SOLENERCERIDAE	1.36	191	0.71	
Xenomystax trucidans	0.83	8	0.43	
Histioteuthis sp.	0.77	4	0.40	
Dicrolene sp.	0.65	6	0.34	
Heterocarpus sp.	0.61	35	0.32	
Satyricthys milleri	0.59	4	0.31	
Gonostoma sp.	0.57	24	0.30	
Coryphaenoides macropodus	0.43	10	0.23	
Diceratias cf. bispinosus	0.43	4	0.23	
Pasiphaea unispinosa	0.41	29	0.22	
Polycheles typhlops	0.35	12	0.19	0
MAJIDAE	0.31	12	0.16	
CARANGIDAE	0.31	69	0.16	
Onychoteuthis sp.	0.28	16	0.14	
Chauliodus sloani	0.28	29	0.14	
MYCTOPHIDAE	0.28	16	0.14	
Melanonus zugmayeri	0.28	4	0.14	
Apristurus cf. investigatoris	0.28	4	0.14	
Heterocarpus sp.	0.24	8	0.12	0
Neobythites sp.	0.24	10	0.12	
Cruriraja andamanica	0.22	2	0.11	
Tydemania sp.	0.20	14	0.10	
Cubiceps kotlyari	0.20	4	0.10	
Histioteuthis sp. *	0.20	12	0.10	
Polycheles typhlops	0.18	8	0.09	
Benthoatops yangi	0.16	10	0.08	
Rexea bengalensis	0.16	4	0.08	
Talimania sp.	0.14	2	0.07	
Sea snakes	0.14	2	0.07	
Priacanthus macracanthus	0.12	2	0.06	
Shrimps, small, non comm.	0.12	12	0.06	
Neoscopelus microchir	0.10	2	0.05	
Lestrolepis japonica	0.04	4	0.02	
Halieutaea coccinea	0.04	2	0.02	
Setarches longimanus	0.04	6	0.02	
Coelophrys micropa	0.02	2	0.01	
Howella cf. brodiei	0.02	6	0.01	
Lestrolepis intermedia	0.02	2	0.01	
Leptocephalus	0.02	4	0.01	

Nemichthys scolopaceus 0.02 2 0.01
 Total 191.17 100.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 128
 DATE :22/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°42.57
 start stop duration Lon E 96°46.88
 TIME :12:45:23 13:15:07 29.7 (min) Purpose : 3
 LOG : 3033.86 3035.43 1.6 Region : 10330
 FDEPTH: 324 322 Gear cond.: 0
 BDEPTH: 324 322 Validity : 0
 Towing dir: 0° Wire out : 725 m Speed : 3.2 kn
 Sorted : 0 Total catch: 45.56 Catch/hour: 91.95

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chlorophthalmus acutifrons	23.61	262	25.68	
Aristeus sp.	18.24	3344	19.84	
Puerulus sewelli	10.98	161	11.94	
Myctophid sp. A	7.10	509	7.73	
Olophorus gracilirostris	5.81	517	6.32	
Neopinnula orientalis	4.56	75	4.96	
Priacanthus macracanthus	3.23	36	3.51	
Polyipnus indicus	2.91	2470	3.16	
Coelorinchus mycterismus	2.70	79	2.94	
Heterocarpus woodmasoni	2.58	274	2.81	
Metanephropsis arafurensis	1.94	40	2.11	
Hypopleuron caninum	1.74	8	1.89	
Malacocephalus laevis	0.65	6	0.70	
Linoparus somniosus	0.57	2	0.61	
Neobythites sp.	0.52	10	0.57	
OMMASTREPHIDAE	0.52	16	0.57	
Tydemania sp.	0.48	42	0.53	
Setarches longimanus	0.40	18	0.44	
Neoscopelus microchir	0.36	32	0.40	
Glyptothidium sp.	0.32	14	0.35	
Eridacnis sp.	0.32	12	0.35	
Ateleopus indicus	0.32	2	0.35	
Chascanopsetta lugubris	0.28	2	0.31	
Squalus sp.	0.24	4	0.26	
Bythaelurus sp.	0.20	4	0.22	
Poecilopsetta sp.	0.16	12	0.18	
Pterygotrigla macrorhynchus	0.12	10	0.13	
Trachipterus sp.	0.12	10	0.13	
Physiculus roseus	0.12	2	0.13	
Chlorophthalmus corniger	0.12	8	0.13	
Macrorhamphosodes platycheilus	0.08	10	0.09	
Bembrops sp.	0.08	2	0.09	
Histioteuthis sp. *	0.08	2	0.09	
Chaunax sp.	0.08	2	0.09	0
Lophiodes mutilus	0.06	2	0.07	0
Bathyclupea hoskynni	0.04	2	0.04	
Nemichthys scolopaceus	0.04	2	0.04	
Lophiodes mutilus	0.04	2	0.04	
Gonostoma sp.	0.04	2	0.04	
Exocoetus sp.	0.04	2	0.04	
Chaunax multilepsis	0.04	2	0.04	
Cubiceps whiteleggii	0.04	2	0.04	
Leptocephalus	0.02	2	0.02	
Samariscus maculatus	0.00	4	0.00	
Polymixia sp.	0.00	2	0.00	
GALATHEIDAE *	0.00	2	0.00	
Total	91.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 129
 DATE :22/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°41.82
 start stop duration Lon E 97°10.15
 TIME :17:57:09 18:17:19 20.2 (min) Purpose : 3
 LOG : 3067.27 3068.32 1.1 Region : 10330
 FDEPTH: 197 205 Gear cond.: 0
 BDEPTH: 197 205 Validity : 0
 Towing dir: 0° Wire out : 450 m Speed : 3.1 kn
 Sorted : 0 Total catch: 21.81 Catch/hour: 64.88

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Satyricthys laticeps	18.68	30	28.79	
Bembras lesliednappi	13.51	384	20.82	
Neopinnula orientalis	6.43	125	9.90	
Saurida lessepsianus	5.80	48	8.94	
Pseudorhombus quinqueocellatus ***	3.75	62	5.78	320
Neoniphon aurolineatus	3.75	65	5.78	
Macrorhamphosodes platycheilus	3.18	30	4.91	
Plesionika sp.	2.71	384	4.17	
Tydemania sp.	1.61	176	2.48	
Glossanodon sp.	0.83	42	1.28	
Priacanthus macracanthus	0.74	6	1.15	
Parascolopsis rufomaculatus	0.48	110	0.73	
Coccorella sp.	0.42	3	0.64	
Arnoglossus japonicus	0.39	15	0.60	
Scallicus serrulatus	0.27	9	0.41	
Chascanopsetta lugubris	0.27	12	0.41	
Chlorophthalmus acutifrons	0.24	3	0.37	
Psenopsis obscura	0.24	3	0.37	
Arnoglossus sp.	0.21	12	0.32	
Cruriraja andamanica	0.18	3	0.28	
Lophiodes mutilus	0.18	3	0.28	
MYCTOPHIDAE	0.15	9	0.23	
Cubiceps kotlyari	0.12	3	0.18	
Puerulus sewelli	0.09	9	0.14	
Haliporoides triarthrus	0.09	3	0.14	
Benthoosema fibulatum	0.06	21	0.09	
Glyptothidium sp.	0.06	3	0.09	
Satyricthys milleri	0.06	3	0.09	
Neomerinthe sp.	0.06	3	0.09	
Heterocarpus sibogae	0.06	12	0.09	
Torquigener florealis	0.06	3	0.09	
Pterygotrigla macrorhynchus	0.06	3	0.09	
Coelorinchus simorhynchus	0.06	3	0.09	
Xenomystax trucidans	0.03	3	0.05	
Samariscus sp.	0.03	3	0.05	
Aseraggodes sp.	0.03	3	0.05	
Chlorophthalmus sp.	0.03	15	0.05	
Total	64.88		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 130
 DATE :23/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°41.97
 start stop duration Lon E 97°29.63
 TIME :22:18:38 22:48:27 29.8 (min) Purpose : 3
 LOG : 3093.59 3094.95 1.4 Region : 10330
 FDEPTH: 79 80 Gear cond.: 0
 BDEPTH: 79 80 Validity : 0
 Towing dir: 0° Wire out : 205 m Speed : 2.7 kn
 Sorted : 0 Total catch: 28.15 Catch/hour: 56.64

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trachinocephalus sp.	13.58	165	23.98	
Nemipterus bipunctatus	9.24	60	16.30	321
Dactylopterus volitans	8.19	137	14.46	
Priacanthus macracanthus	5.73	50	10.12	
Cylichthys orbicularis	2.80	34	4.94	
Tydemania sp.	2.05	274	3.62	
Uranoscopus affinis	2.05	20	3.62	
Saurida tumbil	1.49	4	2.63	
Neotrygon caeruleopunctata	1.37	2	2.42	
Aluterus monoceros	1.33	10	2.34	
Priacanthus sp.	1.17	10	2.06	
Upeneus bensasi	1.05	30	1.85	
Callionymus spiniceps	1.03	64	1.81	
Selar crumenophthalmus	0.87	4	1.53	
Lagocephalus guentheri	0.82	4	1.46	
Carangoides malabaricus	0.72	10	1.28	
Fistularia petimba	0.50	14	0.89	
Engyprosoon maldivensis	0.44	28	0.78	
Upeneus sulphureus	0.30	2	0.53	
UNIDENTIFIED FISH	0.30	6	0.53	
Decapterus sp.	0.28	24	0.50	
Abalites stellaris	0.18	2	0.32	
Matuta planipes	0.12	32	0.21	
Cantherhines multilineatus	0.12	2	0.21	
Arnoglossus sp.	0.12	8	0.21	
Arothron stellatus	0.10	2	0.18	
Psettina sp.	0.10	2	0.18	
Siganus canaliculatus	0.08	2	0.14	
Nemichthys scolopaceus	0.08	2	0.14	
Tripterus sp.	0.08	2	0.14	
Gymnothorax reticularis	0.08	2	0.14	
Pentaprisson sp.	0.06	2	0.11	
Solenocera choprai	0.06	4	0.11	
Saurida lessepsianus	0.06	2	0.11	
CHarybdis sp.	0.04	14	0.07	
Ariosoma sp.	0.02	2	0.04	
Samariscus maculatus	0.02	2	0.04	
Pontocaris sp.	0.00	2	0.00	
Total	56.64		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 131
 DATE :23/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°41.64
 start stop duration Lon E 97°53.98
 TIME :02:23:00 02:52:33 29.5 (min) Purpose : 3
 LOG : 3121.35 3122.89 1.5 Region : 10330
 FDEPTH: 61 56 Gear cond.: 0
 BDEPTH: 61 56 Validity : 0
 Towing dir: 0° Wire out : 160 m Speed : 3.1 kn
 Sorted : 0 Total catch: 34.93 Catch/hour: 70.95

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Trichurus lepturus	14.46	175	20.38	322
Deveiximentum insidiator	11.25	4093	15.86	
Leiognathus sp.	8.75	9193	12.34	
Saurida lessepsianus	6.26	158	8.82	
Trichurus lepturus	5.32	89	7.50	323
Saurida longimanus	3.94	262	5.55	
Loligo sp.	3.66	217	5.15	
Dactyloptena orientalis	3.57	59	5.04	
Saurida tumbil	3.17	16	4.47	
Scomberoides tala	2.97	2	4.18	
Leiognathus sp.	1.26	819	1.77	0
Pomadasy kaakan	1.10	2	1.55	
Dussumieria acuta	1.06	16	1.49	
Mene maculata	0.97	14	1.37	
Priacanthus macracanthus	0.73	6	1.03	
Lagocephalus inermis	0.65	2	0.92	
Rastrelliger brachysoma	0.53	4	0.74	
Selar crumenophthalmus	0.37	2	0.52	
Fistularia petimba	0.16	4	0.23	
Acropoma argentistigma	0.12	37	0.17	
Nemipterus nematophorus	0.12	2	0.17	
Tydemania sp.	0.12	16	0.17	
Cruriraja andamanica	0.08	2	0.11	
Izanami curtispina	0.08	22	0.11	
Gazza minuta	0.08	2	0.11	
Trachinocephalus sp.	0.04	2	0.06	
Octopus sp.	0.04	2	0.06	
Engyprosoon sp.	0.04	6	0.06	
Jaydia sp.	0.04	2	0.06	
Bythaelurus hispidus	0.00	2	0.00	
Stolephorus indicus	0.00	2	0.00	
Decapterus macrosoma	0.00	2	0.00	
Fishing gears	0.00	2	0.00	
Total	70.95		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 132
 DATE :23/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°39.19
 start stop duration Lon E 98°0.13
 TIME :06:42:43 07:13:25 30.7 (min) Purpose : 3
 LOG : 3135.74 3137.29 1.5 Region : 10330
 FDEPTH: 39 40 Gear cond.: 0
 BDEPTH: 39 40 Validity : 0
 Towing dir: 0° Wire out : 115 m Speed : 3.0 kn
 Sorted : 0 Total catch: 84.76 Catch/hour: 165.60

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Deveiximentum sp.	63.54	32823	38.37	
Stolephorus indicus	26.02	274	15.71	324
J E L Y F I S H	15.79	2	9.53	
Leiognathus bindus**	10.32	1196	6.23	
Trichurus sp.	6.92	53	4.18	
Gazza minuta	6.33	891	3.82	
Megalaspis cordyla	5.80	23	3.50	
Loligo duvaucelii	4.57	410	2.76	
Parastromateus niger	4.34	6	2.62	
Encrasicholina heteroloba	4.22	844	2.55	325
Dussumieria acuta ***	4.16	100	2.51	
Leiognathus equulus	3.99	70	2.41	
Ilisha melastoma	2.40	59	1.45	
Leiognathus fasciatus ***	1.64	23	0.99	
Atule mate	1.64	12	0.99	
Saurida lessepsianus	1.11	35	0.67	
Pomadasy sp.	0.82	6	0.50	
Rastrelliger kanagurta	0.70	6	0.42	
Rastrelliger faughni	0.70	6	0.42	
Pterois russellii	0.35	6	0.21	
Jaydia sp.	0.23	23	0.14	
Total	165.60		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 133
 DATE :23/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°22.32
 start stop duration Lon E 97°54.41
 TIME :11:12:25 11:42:03 29.6 (min) Purpose : 3
 LOG : 3160.44 3161.91 1.5 Region : 10330
 FDEPTH: 55 58 Gear cond.: 0
 BDEPTH: 55 58 Validity : 0
 Towing dir: 0° Wire out : 165 m Speed : 3.0 kn
 Sorted : 0 Total catch: 35.15 Catch/hour: 71.18

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Uroteuthis duvaucelii	16.52	2479	23.22	
Saurida tumbil	14.13	75	19.86	
Lepturacanthus savala	6.88	77	9.67	
Saurida lessepsianus	2.96	77	4.15	
Leiognathus bindus**	2.92	648	4.10	
Metapenaeus ensis	2.55	166	3.58	
Decapterus macrosoma	2.51	32	3.53	
Rastrelliger kanagurta	2.31	10	3.24	
Upeneus sulphureus	2.31	49	3.24	
Congresox talabon	1.78	2	2.50	
Nemipterus japonicus	1.62	26	2.28	
Jaydia striata	1.46	194	2.05	
Lagocephalus guentheri	1.42	8	1.99	
Jaydia truncata	1.30	81	1.82	
Deveiximentum insidiator	0.97	178	1.37	
Metapenaeopsis stridulans	0.97	162	1.37	
Octopus sp.	0.89	2	1.25	
Jaydia smithi	0.77	43	1.08	
Pomadasy kaakan	0.65	2	0.91	
Psettodes erumei	0.65	2	0.91	
Terapon jarbua	0.57	2	0.80	
Sepia pharaonis	0.53	2	0.74	
Johnieops sp.	0.45	2	0.63	
Sphyræna obtusata	0.40	4	0.57	
Ophichthys sp.	0.36	2	0.51	
Penaeus longistylus	0.32	16	0.46	
Penaeus semisulcatus	0.28	2	0.40	
Carangoides malabaricus	0.28	6	0.40	
Alepes djedaba	0.24	2	0.34	
Epinephelus sexfasciatus	0.24	2	0.34	
Gazza minuta	0.24	6	0.34	
Priacanthus tayenus	0.24	4	0.34	
Euprymna berryi	0.16	16	0.23	
Priacanthus macracanthus	0.16	2	0.23	
Solenocera choprai	0.12	12	0.17	
Zebrias synapturoides	0.12	2	0.17	
Dussumieria acuta ***	0.12	2	0.17	
Kumococcus rodericensis	0.12	4	0.17	
Terapon theraps	0.12	2	0.17	
Cynoglossus arel	0.08	2	0.11	
Dactyloptena orientalis	0.08	2	0.11	
Ilisha megaloptera	0.08	2	0.11	
Engyprosoon grandisquama	0.08	4	0.11	
Jaydia poecilopterus	0.08	10	0.11	
Uranoscopus kaianus	0.04	2	0.06	
Brachypterois serrulifer	0.04	2	0.06	
Bregmaceros sp.	0.02	16	0.02	
Citharus sp.	0.00	2	0.00	
Fishing gears	0.00	2	0.00	
Total	71.18		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 134
 DATE :23/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°22.52
 start stop duration Lon E 97°38.65
 TIME :15:00:04 15:30:26 30.4 (min) Purpose : 3
 LOG : 3186.69 3188.27 1.6 Region : 10330
 FDEPTH: 73 74 Gear cond.: 0
 BDEPTH: 73 74 Validity : 0
 Towing dir: 0° Wire out : 180 m Speed : 3.1 kn
 Sorted : 0 Total catch: 32.87 Catch/hour: 64.96

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus bipunctatus	14.31	296	22.03	
Trichurus sp.	5.85	16	9.00	
Saurida tumbil	5.73	28	8.82	
Saurida lessepsianus	3.75	215	5.78	
Engyprosoon maldivensis	3.52	186	5.42	
Synodus jaculum	3.28	259	5.05	
Parupeneus heptacanthus	2.77	14	4.26	
Selar crumenophthalmus	2.69	22	4.14	
Upeneus bensasi	2.65	126	4.08	
Siganus canaliculatus	2.57	83	3.95	
Decapterus sp.	2.33	47	3.59	
Sepia pharaonis	2.25	2	3.47	
Rogadius sp.	2.13	14	3.29	
Sphyræna obtusata	1.86	20	2.86	
Uroteuthis (Photololigo) duvau	1.58	166	2.43	
Priacanthus macracanthus	1.50	16	2.31	
Seriolina nigrofasciata	1.30	2	2.01	
Saurida longimanus	1.15	206	1.76	
Lagocephalus guentheri	0.87	4	1.34	
Muraenesox sp.	0.71	4	1.10	
Diodon holocanthus	0.67	12	1.03	
Trachinocephalus sp.	0.59	61	0.91	
Dactyloptena orientalis	0.32	6	0.49	
Solenocera sp.	0.16	2	0.24	
Upeneus sulphureus	0.12	2	0.18	
Teixeirichthys jordani	0.12	4	0.18	
Parascalopsis aspinosa	0.08	2	0.12	
Acropoma argentistigma	0.04	18	0.06	
Dipterygonotus balteatus	0.04	4	0.06	
Citharus sp.	0.02	2	0.03	
Jaydia striata	0.00	2	0.00	
Total	64.96		100.00	

Satyricthys laticeps	9.86	22	1.87
Coelrorinchus mycterismus	6.96	209	1.32
Plectranthias sp.	6.68	1057	1.27
Plesionika spinipes	6.68	1781	1.27
Heterocarpus woodmasoni	6.12	1266	1.16
Solenocera sp.	5.56	223	1.06
Heterocarpus tricarínatus	5.56	223	1.06
OCTOPODIDAE	5.41	2	1.03
Synagrops sp.	4.45	167	0.85
Parascombrops sp.	3.34	612	0.63
Iago sp.	3.34	14	0.63
Chlorophthalmus corniger	1.11	83	0.21
Heterocarpus sibogae	1.11	278	0.21
Eridacnis radcliffei	1.11	28	0.21
Metanephropsis arafurensis	0.60	16	0.11
Heptranchias sp.	0.56	14	0.11
Chiroteuthis sp.	0.44	4	0.08
Ariosoma gnanadossi	0.44	6	0.08
Xyrias revulus	0.38	8	0.07
Ariosoma sp.	0.32	4	0.06
Platymaia sp.	0.32	2	0.06
Chascanopsetta lugubris	0.24	4	0.05
Gephyroberyx japonicus	0.24	2	0.05
Lophiodes mutilus	0.16	2	0.03
Lestrolepis intermedia	0.16	2	0.03
Pseudorhombus quinquecellatus ***	0.12	2	0.02
Scallicus serrulatus	0.08	2	0.02
Lepidotrigla longipinnis	0.08	2	0.02
Halimochirurgus centriscoides	0.04	2	0.01
Rexea bengalensis	0.04	2	0.01
Halleutaea sp.	0.04	4	0.01
Antigonía rubescens	0.04	14	0.01
Arnoglossus japonicus	0.02	2	0.00
GALATHEIDAE *	0.00	2	0.00
Pterygotrigla macrorhynchus	0.00	2	0.00
Samariscus maculatus	0.00	2	0.00
Total	526.31		100.00

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 137
 DATE :24/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°20.45
 start stop duration Lon E 96°39.30
 TIME :03:45:16 04:16:40 31.4 (min) Purpose : 3
 LOG : 3261.36 3263.01 1.6 Region : 10330
 FDEPTH: 393 393 Gear cond.: 0
 BDEPTH: 393 393 Validity : 0
 Towing dir: 0° Wire out : 920 m Speed : 3.2 kn
 Sorted : 0 Total catch: 51.00 Catch/hour: 97.45

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 135
 DATE :23/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°22.95
 start stop duration Lon E 97°16.68
 TIME :19:42:31 20:13:18 30.8 (min) Purpose : 3
 LOG : 3211.34 3212.87 1.5 Region : 10330
 FDEPTH: 175 179 Gear cond.: 0
 BDEPTH: 175 179 Validity : 0
 Towing dir: 0° Wire out : 430 m Speed : 3.0 kn
 Sorted : 0 Total catch: 102.73 Catch/hour: 200.25

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Scallicus serrulatus	109.20	218	54.53	
Puerulus sewelli	34.11	392	17.03	
Saurida lessepsianus	19.06	404	9.52	326
Pseudorhombus quinquecellatus ***	16.57	250	8.27	
Lophiodes mutilus	5.91	41	2.95	
Priacanthus macracanthus	2.85	33	1.42	
Cociella punctata	2.69	25	1.34	
Parascombrops sp.	1.44	288	0.72	
Ostichthys sp.	1.15	29	0.57	
Neopinnula orientalis	1.07	18	0.54	
Ophichthys sp.	1.03	4	0.52	
Samaris cristatus**	0.90	49	0.45	0
Setarches longimanus	0.58	60	0.29	
Ibacus novemdentatus	0.51	8	0.25	
Trichurus sp.	0.45	2	0.22	
Cubiceps kotlyari	0.45	10	0.22	
Bembrops sp.	0.41	10	0.20	
Dactylopterus volitans	0.35	6	0.18	
Benthoosema fibulatum	0.33	109	0.17	
Acanthaphritis barbata	0.21	23	0.11	
Glossanodon sp.	0.19	16	0.10	
Parascalopsis sp.	0.18	8	0.09	
Brachirus annularis	0.12	4	0.06	
Torquigener florealis	0.10	6	0.05	
CALLIONYMIDAE	0.08	6	0.04	
Samariscus sp.	0.08	6	0.04	
Samaris cristatus**	0.06	2	0.03	
Psenopsis obscura	0.06	2	0.03	
Upeneus bensasi	0.04	4	0.02	
Ophidion sp.	0.02	2	0.01	
Pyramodon sp.	0.02	2	0.01	
Psettina sp.	0.02	2	0.01	
Cociella sp.	0.02	6	0.01	
Total	200.25		100.00	

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
BATHYTEUTHIDAE	29.69	96	30.47	
Solenocera sp.	12.31	5660	12.63	
Histioteuthis sp.	6.21	166	6.37	
Chlorophthalmus acutifrons	4.30	48	4.41	
Synagrops sp.	4.13	122	4.24	
Xenocephalus australis	3.99	13	4.10	
Polyipnus indicus	3.63	726	3.73	
Priacanthus macracanthus	3.21	73	3.29	
Glyptophidium sp.	3.19	10	3.27	
Satyricthys milleri	3.13	29	3.22	
Neoscolepus microchir	2.79	65	2.86	
Aristeus alcocki	2.41	84	2.47	
Astronesthes sp.	2.18	363	2.24	
Loligo sp.	1.62	8	1.67	
Ruvettus pretiosus	1.11	4	1.14	
UNIDENTIFIED FISH	0.99	27	1.02	
Halleutaea coccinea	0.94	10	0.96	
Iago sp.	0.92	8	0.94	
Metanephropsis arafurensis	0.90	23	0.92	
Setarches longimanus	0.84	38	0.86	
Hymenocephalus heterolepis	0.80	80	0.82	
Iago garricki	0.69	11	0.71	
MYCTOPHIDAE	0.69	38	0.71	
Puerulus sewelli	0.69	6	0.71	
Polymixia sp.	0.61	8	0.63	
Parascombrops sp.	0.46	38	0.47	
Tydemania sp.	0.46	50	0.47	
Histioteuthis sp. *	0.38	8	0.39	
Neopinnula orientalis	0.34	11	0.35	
Halimochirurgus centriscoides	0.31	34	0.31	
Conger sp.	0.31	8	0.31	
Lestrolepis intermedia	0.31	19	0.31	
Coelrorinchus mycterismus	0.31	31	0.31	
Hymenocephalus heterolepis	0.27	8	0.27	
Neobythites sp.	0.25	11	0.25	
PARALEPIDIDAE	0.23	13	0.24	
Gephyroberyx japonicus	0.21	2	0.22	
Zenopsis nebulosa	0.21	2	0.22	
Dicrolene sp.	0.19	4	0.20	
Chascanopsetta lugubris	0.19	8	0.20	
Octopus sp.	0.15	2	0.16	
Cubiceps kotlyari	0.11	4	0.12	
Scallicus serrulatus	0.11	4	0.12	
Bembrops sp.	0.10	2	0.10	
Benthoosema fibulatum	0.08	27	0.08	
Ariosoma sp.	0.08	2	0.08	
Leptocephalus	0.08	8	0.08	
Benthoosema sp.	0.08	38	0.08	
Cyttopsis sp.	0.06	2	0.06	
Setarches guentheri**	0.04	4	0.04	
Lophiomus sp.	0.04	2	0.04	
Metanephropsis sp.	0.04	4	0.04	
Bregmaceros sp.	0.04	11	0.04	
HOMOLIDAE	0.04	4	0.04	
Polymixia sp.	0.04	4	0.04	
Total	97.45		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 136
 DATE :24/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°21.97
 start stop duration Lon E 96°52.92
 TIME :00:10:50 00:41:02 30.2 (min) Purpose : 3
 LOG : 3240.63 3242.22 1.6 Region : 10330
 FDEPTH: 303 301 Gear cond.: 0
 BDEPTH: 303 301 Validity : 0
 Towing dir: 0° Wire out : 700 m Speed : 3.2 kn
 Sorted : 0 Total catch: 264.82 Catch/hour: 526.31

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chlorophthalmus acutifrons	105.73	2351	20.09	
Myctophum sp.	86.81	26043	16.49	
Priacanthus macracanthus	45.35	988	8.62	
Cubiceps whiteleggii	42.57	1252	8.09	
Plesiobatis daviesi	39.39	4	7.48	
Puerulus sewelli	26.31	272	5.00	327
Psenopsis obscura	25.88	515	4.92	
Neopinnula orientalis	24.21	515	4.60	
Glyptophidium sp.	22.26	111	4.23	
Tetronarce sp.	19.24	8	3.66	
Bythaelurus hispidus	16.97	376	3.22	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 138
 DATE :24/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°5.61
 start stop duration Lon E 96°35.91
 TIME :14:18:48 14:48:30 29.7 (min) Purpose : 3
 LOG : 3314.58 3316.11 1.5 Region : 10330
 FDEPTH: 465 465 Gear cond.: 0
 BDEPTH: 465 465 Validity : 0
 Towing dir: 0° Wire out : 1120 m Speed : 3.1 kn
 Sorted : 0 Total catch: 52.95 Catch/hour: 107.01

Sorted : 0 Total catch: 0.00 Catch/hour: 0.00
 SPECIES CATCH/HOUR % OF TOT. C SAMP
 weight numbers
 NOCATCH 0.00 0 0.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Hexatrygon brickelli	25.38	4	23.72
Plesiobatis daviesi	18.19	2	17.00
Gavialiceps taeniola**	14.23	129	13.30
Talismania sp.	10.63	200	9.93
Coelorrinchus mycterismus	5.42	186	5.06
Aristeus mabahissae	4.69	251	4.38
Neoscopelus microchir	4.49	93	4.19
MYCTOPHIDAE	3.07	461	2.87
Glyptothidium argenteum	2.30	101	2.15
Benthodesmus sp.	1.98	40	1.85
Bythaelurus hispidus	1.90	24	1.78
Heterocarpus chani	1.78	105	1.66
JELLYFISH	1.70	6	1.59
Plesionika sp.	1.62	784	1.51
Heterocarpus sibogae	1.46	154	1.36
PERISTEDIIDAE	1.29	32	1.21
Loliolus sp.	0.97	16	0.91
Pasiphaea unispinosa	0.65	32	0.60
Apristurus sp.	0.57	4	0.53
Chauliodus sloani	0.57	105	0.53
Aristaeomorpha foliacea	0.49	16	0.45
Nemichthys scolopaceus	0.40	14	0.38
Synagrops japonicus	0.36	8	0.34
Malacocephalus laevis	0.36	4	0.34
Plesionika quasigrandis	0.32	40	0.30
Ateleopus indicus	0.24	4	0.23
Cyttopsis rosea	0.24	6	0.23
Photonectes sp.	0.24	8	0.23
Neobythites sp.	0.24	10	0.23
Myctophum sp.	0.16	4	0.15
Polyipnus indicus	0.16	73	0.15
Shrimps unidentified	0.16	40	0.15
Hoplostethus sp.	0.12	2	0.11
Histioteuthis sp. *	0.12	4	0.11
Poecilopsetta colorata	0.08	2	0.08
Penes cyanophrys	0.08	6	0.08
Physiculus roseus	0.08	2	0.08
OMMASTREPHIDAE	0.08	2	0.08
Tydemania navigatoris	0.08	40	0.08
Leptocephalus	0.04	2	0.04
Decapterus sp.	0.04	2	0.04
Satyricthys milleri	0.02	2	0.02
Diceratias cf. bispinosus	0.00	2	0.00
Total	107.01	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 141
 DATE :24/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°1.69
 start stop duration Lon E 97°22.95
 TIME :22:54:29 23:26:52 32.4 (min) Purpose : 3
 LOG : 3366.30 3368.09 1.8 Region : 10330
 FDEPTH: 112 113 Gear cond.: 0
 BDEPTH: 112 113 Validity : 0
 Towing dir: 0° Wire out : 310 m Speed : 3.3 kn
 Sorted : 0 Total catch: 108.52 Catch/hour: 201.09

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Plesiobatis daviesi	148.24	4	73.72
Decapterus tabl	27.54	397	13.69
Torquigener florealis	9.23	185	4.59
Cyclichthys pilostylus	3.85	9	1.92
Saurida lessepsianus	2.93	33	1.46
Epinephelus areolatus	2.67	7	1.33
Priacanthus sagittarius	1.89	2	0.94
Tetrosomus sp.	0.74	4	0.37
Loligo sp.	0.74	2	0.37
Decapterus macrosoma	0.74	9	0.37
Pterois miles	0.63	0	0.31
Centroberyx druzhinini	0.37	2	0.18
Nemichthys scolopaceus	0.26	2	0.13
Tetrosomus concatenatus	0.22	2	0.11
Psettina sp.	0.19	7	0.09
Pseudorhombus duplicioellatus ***	0.19	6	0.09
Chascanopsetta lugubris	0.11	4	0.06
Psettina variegata	0.07	52	0.04
Priacanthus macracanthus	0.07	4	0.04
Synodus indicus	0.07	2	0.04
RANINIDAE	0.04	2	0.02
Sepia acuelata	0.04	2	0.02
Sepiella sp.	0.04	2	0.02
Synodus indicus	0.04	4	0.02
Trachinocephalus myops	0.04	2	0.02
Chlorophthalmus corniger	0.04	2	0.02
Acanthaphritis barbata	0.04	2	0.02
CALLIONYMIDAE	0.04	2	0.02
Heterocarpus sibogae	0.04	9	0.02
Total	201.09	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 139
 DATE :24/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°1.83
 start stop duration Lon E 96°53.53
 TIME :17:55:52 18:26:48 30.9 (min) Purpose : 3
 LOG : 3335.80 3337.31 1.5 Region : 10330
 FDEPTH: 332 327 Gear cond.: 0
 BDEPTH: 332 327 Validity : 0
 Towing dir: 0° Wire out : 800 m Speed : 2.9 kn
 Sorted : 0 Total catch: 40.82 Catch/hour: 79.19

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 142
 DATE :25/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°1.80
 start stop duration Lon E 97°34.10
 TIME :01:21:49 01:50:42 28.9 (min) Purpose : 3
 LOG : 3381.61 3383.07 1.5 Region : 10330
 FDEPTH: 83 83 Gear cond.: 0
 BDEPTH: 83 83 Validity : 0
 Towing dir: 0° Wire out : 220 m Speed : 3.0 kn
 Sorted : 0 Total catch: 11.46 Catch/hour: 23.81

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Chlorophthalmus acutifrons	12.61	233	15.92
Psenopsis obscura	11.48	233	14.50
Neoscopelus microchir	9.93	838	12.54
Puerulus sewelli	7.95	83	10.04
MYCTOPHIDAE	7.64	846	9.65
Setarches longimanus	4.42	733	5.59
Bythaelurus sp.	4.33	45	5.46
Neopinnula orientalis	3.41	89	4.31
Solenocera crassicornis	3.10	559	3.92
Shrimps unidentified	2.33	528	2.94
Chascanopsetta lugubris	1.71	47	2.16
Linuparus somniosus	1.63	4	2.06
Chlorophthalmus corniger	1.63	97	2.06
Tydemania navigatoris	1.28	128	1.62
Coelorrinchus mycterismus	0.93	27	1.18
Glyptothidium sp.	0.74	31	0.93
Cubiceps pauciradiatus	0.70	19	0.88
Monomitopus sp.	0.47	8	0.59
Satyricthys milleri	0.35	4	0.44
Solenocera choprai	0.31	16	0.39
Nemichthys scolopaceus	0.27	8	0.34
Xenomystax trucidans	0.27	19	0.34
Macronhamphosodes platycheilus	0.27	31	0.34
Lestrolepis intermedia	0.19	12	0.24
Paralepididae	0.16	4	0.20
Synagrops japonicus	0.16	4	0.20
GALATHEIDAE	0.16	27	0.20
Poecilopsetta colorata	0.12	4	0.15
PARASCORPIDIDAE	0.12	23	0.15
Astronesthes sp	0.08	8	0.10
Rexea bengalensis	0.08	4	0.10
Coryphaenoides macrolophus	0.08	4	0.10
Chaunax multilepis	0.08	8	0.10
Polyipnus indicus	0.08	16	0.10
Talismania sp.	0.08	4	0.10
Decapterus sp.	0.06	6	0.07
Total	79.19	100.00	

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Aluterus monoceros	5.36	4	22.51
Cyclichthys pilostylus	4.11	2	17.28
Decapterus macrosoma	3.41	87	14.31
Saurida lessepsianus	2.62	21	10.99
Rastrelliger kanagurta	1.75	17	7.33
Serioliina nigrofasciata	1.62	2	6.81
Arothron stellatus	1.08	2	4.54
Parupeneus heptacanthus	1.08	6	4.54
Selar crumenophthalmus	1.04	12	4.36
Priacanthus macracanthus	0.46	4	1.92
Trachinocephalus myops	0.42	4	1.75
Nemipterus bipunctatus	0.37	6	1.57
Loligo sp.	0.12	62	0.52
Cyclichthys orbicularis	0.12	2	0.52
Parapterois heterura	0.12	2	0.52
Fistularia petimba	0.12	4	0.52
Total	23.81	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 140
 DATE :24/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°1.94
 start stop duration Lon E 97°12.72
 TIME :21:06:37 21:11:40 5.0 (min) Purpose : 3
 LOG : 3354.70 3354.95 0.2 Region : 10330
 FDEPTH: 286 283 Gear cond.: 0
 BDEPTH: 286 283 Validity : 5
 Towing dir: 0° Wire out : 710 m Speed : 2.9 kn

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 143
 DATE :25/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 11°1.57
 start stop duration Lon E 97°56.53
 TIME :04:20:30 04:51:01 30.5 (min) Purpose : 3
 LOG : 3403.83 3405.32 1.5 Region : 10330
 FDEPTH: 58 60 Gear cond.: 0
 BDEPTH: 58 60 Validity : 0
 Towing dir: 0° Wire out : 160 m Speed : 2.9 kn
 Sorted : 0 Total catch: 94.30 Catch/hour: 185.45

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP
	weight numbers		
Loligo sp.	165.23	13044	89.10
J E L L Y F I S H	4.48	2	2.42
Selar crumenophthalmus	4.15	43	2.24
Scomberomorus commerson	3.93	4	2.12
Megalaspis cordyla	3.68	14	1.98
Saurida lessepsianus	0.94	26	0.51
Sea snakes	0.75	4	0.40
Tentoriiceps cristatus	0.63	12	0.34
Saurida tumbil	0.55	2	0.30
Rastrelliger kanagurta	0.26	2	0.14
Echeneis naucrates	0.24	2	0.13
Aluterus monoceros	0.16	2	0.08
Decapterus macrosoma	0.14	8	0.07
Nemipterus bipunctatus	0.10	4	0.05
Torquigener florealis	0.08	4	0.04
Hippocampus kuda	0.06	2	0.03
Serioliina nigrofasciata	0.04	2	0.02
Atropus atropus	0.02	2	0.01
Priolepis sp.	0.02	2	0.01
Total	185.45	100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 144
 DATE :25/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°43.80
 start stop duration Lon E 97°49.56
 TIME :17:04:02 17:24:09 20.1 (min) Purpose : 3
 LOG : 3505.62 3506.68 1.1 Region : 10330
 FDEPTH: 69 68 Gear cond.: 0
 BDEPTH: 69 68 Validity : 5
 Towing dir: 0° Wire out : 190 m Speed : 3.2 kn
 Sorted : 0 Total catch: 23.79 Catch/hour: 70.94

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Priacanthus tayenus	21.77	340	30.69	
Scomberoides commersonianus	14.55	3	20.51	
Saurida tumbil	11.18	39	15.76	334
Saurida lessepsianus	5.22	1479	7.36	336
Nuchequula germeoides	2.27	680	3.19	
Nemipterus japonicus	1.94	83	2.73	333
Upeneus guttatus	1.61	107	2.27	
Ostorhinchus gularis	1.55	608	2.19	
Sepia latimanus	1.25	3	1.77	
Nemipterus bipunctatus	1.22	45	1.72	335
Jaydia smithi	1.19	250	1.68	
Parapercis albobuttata	1.19	45	1.68	
Rogadius sp.	0.83	66	1.18	
Sphyræna obtusata	0.75	9	1.05	
Trichiurus lepturus	0.60	48	0.84	
Muraenesox bagio	0.57	3	0.80	
Bregmaceros sp.	0.48	262	0.67	
Charybdis sp.	0.48	155	0.67	
Carangoides malabaricus	0.33	6	0.46	
Lagocephalus guentheri	0.30	3	0.42	
Carangoides coeruleopinnatus	0.24	3	0.34	
Champsodon sp.	0.24	95	0.34	
SEPIIDAE	0.24	298	0.34	
Synodus hoshinonis	0.24	24	0.34	
Jaydia truncata	0.12	12	0.17	
Parascopelus aspinosa	0.12	12	0.17	
Decapterus macrosoma	0.12	3	0.17	
Ostorhinchus nigrocincta	0.12	12	0.17	
Brachypleura novaezeelandiae	0.09	9	0.13	
Selaroides leptolepis	0.09	3	0.13	
Solenocera choprai	0.03	6	0.04	
Pentaprion longimanus	0.03	3	0.04	
Total	70.94		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 145
 DATE :25/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°41.69
 start stop duration Lon E 96°59.98
 TIME :23:25:21 23:34:41 9.3 (min) Purpose : 3
 LOG : 3558.72 3559.18 0.5 Region : 10330
 FDEPTH: 331 329 Gear cond.: 0
 BDEPTH: 331 329 Validity : 0
 Towing dir: 0° Wire out : 825 m Speed : 3.0 kn
 Sorted : 0 Total catch: 45.23 Catch/hour: 290.86

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Myctophum sp.	67.91	9415	23.35	
Plesionika sp.	37.04	16669	12.74	
Setarches sp.	34.98	6997	12.03	
Tetronarce sp.	32.80	6	11.28	
Chlorophthalmus acutifrons	20.84	360	7.16	
Heterocarpus woodmasoni	14.41	1749	4.95	
Puerulus sewelli	11.19	116	3.85	
Parascombrops sp.	10.29	1441	3.54	
ARIIDAE	9.26	6	3.18	
Lestrolepis intermedia	9.26	772	3.18	
Neopinnula orientalis	7.33	180	2.52	
Astronesthes sp.	5.14	977	1.77	
Priacanthus tayenus	3.60	51	1.24	
Heterocarpus sibogae	3.09	360	1.06	
Psenopsis obscura	3.09	51	1.06	
Neoscopelus microchir	3.09	926	1.06	
Satyricthys laticeps	2.83	6	0.97	
Chascanopsetta lugubris	2.32	39	0.80	
Saurida tumbil	1.93	6	0.66	
Glyptothidium sp.	1.54	71	0.53	
Hypopleuron caninum	1.16	6	0.40	
Muraenesox cinereus	1.16	6	0.40	
Ophidion sp.	1.03	19	0.35	
Parapercis albobuttata	0.64	13	0.22	
Halleutaea coccinea	0.64	45	0.22	
Ateleopus indicus	0.51	13	0.18	
Synagrops japonicus	0.51	19	0.18	
Neobythites sp.	0.51	6	0.18	
Ariosoma sp.	0.39	6	0.13	
Priacanthus macracanthus	0.39	19	0.13	
Coelorinchus mycterismus	0.26	6	0.09	
Rexea bengalensis	0.26	19	0.09	
Squalus sp.	0.26	6	0.09	
Tydemania navigatoris	0.13	6	0.04	
Symphurus sp.	0.13	26	0.04	
Xiphonectes hastatoides	0.13	13	0.04	
Arnoglossus japonicus	0.13	6	0.04	
Nemipterus japonicus	0.13	6	0.04	
Saurida lessepsianus	0.13	6	0.04	
Pterygotrigla macrorhynchus	0.13	6	0.04	
Halimochirus centriscoides	0.13	6	0.04	
Macrorhamphosodes platycheilus	0.13	6	0.04	
Small shrimps	0.05	257	0.02	
Total	290.86		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 146
 DATE :26/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°45.10
 start stop duration Lon E 96°40.87
 TIME :02:56:23 03:27:53 31.5 (min) Purpose : 3
 LOG : 3584.16 3585.70 1.6 Region : 10330
 FDEPTH: 404 405 Gear cond.: 0
 BDEPTH: 404 405 Validity : 0
 Towing dir: 0° Wire out : 960 m Speed : 2.9 kn
 Sorted : 0 Total catch: 89.46 Catch/hour: 170.40

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Neopinnula orientalis	44.50	610	26.11	
Priacanthus macracanthus	17.98	181	10.55	
Benthodesmus sp.	15.85	259	9.30	
Histioteuthis sp.	8.23	150	4.83	
Chlorophthalmus acutifrons	7.16	74	4.20	
Neoscopelus microchir	5.79	181	3.40	
Setarches guentheri**	5.49	394	3.22	
Puerulus sewelli	5.41	70	3.17	
Astronesthes sp.	5.33	838	3.13	
Halleutaea coccinea	5.18	61	3.04	
Hypopleuron caninum	4.88	15	2.86	
Cubiceps whiteleggii	4.27	91	2.50	
Sthenoteuthis sp.	3.81	30	2.24	
Chascanopsetta lugubris	3.66	46	2.15	
Plesionika sp.	3.66	777	2.15	
Plesiobatis daviesi	3.43	2	2.01	
Heterocarpus chani	3.05	312	1.79	
Myctophum sp.	3.05	541	1.79	
Heterocarpus sibogae	2.74	349	1.61	
Satyricthys laticeps	2.44	8	1.43	
Chiroteuthis sp.	2.44	15	1.43	
Bythaelurus hispidus	1.37	32	0.80	
Synagrops japonicus	1.22	38	0.72	
Ruvettus pretiosus	0.99	4	0.58	
Heterocarpus tricarlinatus	0.76	152	0.45	
Polyipnus indicus	0.76	236	0.45	
Decapterus macrosoma	0.76	69	0.45	
Sthenoteuthis oualaniensis	0.61	2	0.36	
Xenomystax trucidans	0.46	15	0.27	
Coelorinchus mycterismus	0.46	30	0.27	
Halimochirus centriscoides	0.46	30	0.27	
Ateleopus indicus	0.46	8	0.27	
Myctophum sp.	0.46	152	0.27	0
Satyricthys sp.	0.38	6	0.22	
Metanephrops andamanicus	0.30	4	0.18	
ACROPOMATIDAE	0.30	23	0.18	
Bembrops sp.	0.30	8	0.18	
Squalus sp.	0.30	2	0.18	
Neobythites sp.	0.30	6	0.18	
Tydemania navigatoris	0.15	15	0.09	
Hymenocephalus heterolepis	0.15	8	0.09	
Ostracoberyx dorygenys	0.15	15	0.09	0
Satyricthys sp.	0.15	15	0.09	
Pocillopsetta sp.	0.15	8	0.09	
Samariscus maculatus	0.15	15	0.09	
Aristeus alcocki	0.15	15	0.09	
Plesiopeneus edwardsianus	0.15	15	0.09	
Solenocera choprai	0.15	8	0.09	
HOMOLIDAE	0.04	2	0.02	
Total	170.40		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 147
 DATE :26/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°21.86
 start stop duration Lon E 96°44.36
 TIME :12:16:03 12:46:12 30.1 (min) Purpose : 3
 LOG : 3640.50 3642.11 1.6 Region : 10330
 FDEPTH: 384 380 Gear cond.: 0
 BDEPTH: 384 380 Validity : 0
 Towing dir: 0° Wire out : 940 m Speed : 3.2 kn
 Sorted : 0 Total catch: 33.37 Catch/hour: 66.42

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Chlorophthalmus acutifrons	10.51	139	15.82	
Heterocarpus sp.	7.80	414	11.75	
Plesiobatis daviesi	7.80	2	11.75	
Myctophum sp.	7.16	1146	10.79	
Neoscopelus microchir	5.25	231	7.91	
Plesionika sp.	4.78	1003	7.19	
Bythaelurus hispidus	3.26	64	4.91	
Puerulus sewelli	2.19	22	3.30	
Heterocarpus sibogae	2.07	255	3.12	
Benthodesmus sp.	1.79	52	2.70	
Polyipnus indicus	1.75	430	2.64	
Hypopleuron caninum	1.43	4	2.16	
Neopinnula orientalis	1.43	22	2.16	
Histioteuthis sp.	1.11	14	1.68	
Priacanthus macracanthus	0.96	8	1.44	
Chaunax apus	0.84	26	1.26	
Cyttopsis nosea	0.80	20	1.20	
Satyricthys laticeps	0.76	2	1.14	
Lophiodes triradiatus	0.68	2	1.02	
Satyricthys milleri	0.56	12	0.84	
Neobythites sp.	0.52	8	0.78	
Coelorinchus mycterismus	0.48	16	0.72	
Malacocephalus laevis	0.48	2	0.72	
Setarches longimanus	0.48	16	0.72	
Scalicus orientalis	0.20	10	0.30	
Chascanopsetta lugubris	0.16	22	0.24	
Chlorophthalmus corniger	0.16	8	0.24	
Halleutaea fumosa	0.16	2	0.24	
Bembrops sp.	0.16	4	0.24	
Astronesthes sp.	0.16	32	0.24	
Ariosoma gnanadossi	0.12	2	0.18	
Samariscus maculatus	0.12	4	0.18	
Unidentified squid	0.10	2	0.15	
PARALEPIDIDAE	0.08	4	0.12	
Ostracoberyx dorygenys	0.04	4	0.06	
Lestrolepis intermedia	0.04	2	0.06	
Gonostoma sp.	0.01	32	0.01	
Total	66.38		99.94	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 148
 DATE :26/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°21.75
 start stop duration Lon E 97°0.12
 TIME :15:42:04 16:12:09 30.1 (min) Purpose : 3
 LOG : 3659.81 3661.36 1.5 Region : 10330
 FDEPTH: 354 357 Gear cond.: 0
 BDEPTH: 354 357 Validity : 0
 Towing dir: 0° Wire out : 880 m Speed : 3.1 kn
 Sorted : 0 Total catch: 29.12 Catch/hour: 58.07

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Puerulus sewelli	13.36	173	23.01	
Chlorophthalmus acutifrons	9.33	160	16.07	
Neopinnula orientalis	8.93	16	15.38	
Psenopsis obscura	6.10	104	10.51	
Plesionika sp.	2.87	989	4.95	
Heterocarpus chani	2.87	144	4.95	
Bythaelurus hispidus	2.63	70	4.53	
Heterocarpus sibogae	2.23	223	3.85	
Neoscolopelus microchir	1.60	251	2.75	
Squalus sp.	1.20	6	2.06	
Priacanthus macracanthus	1.04	12	1.79	
Myctophum sp.	0.64	112	1.10	
OMMASTREPHIDAE	0.52	12	0.89	
Setarches guentheri	0.48	6	0.82	
Histioteuthis sp.	0.48	6	0.82	
Hypopleuron caninum	0.48	4	0.82	
Neobythites sp.	0.44	2	0.76	
Octopus sp.	0.40	8	0.69	
Satyrichthys milleri	0.40	6	0.69	
Scalicus serrulatus	0.36	12	0.62	
Chascanopsetta lugubris	0.36	30	0.62	
Chlorophthalmus corniger	0.36	16	0.62	
Polyipnus indicus	0.32	80	0.55	
Coeloroichthys mycterismus	0.16	16	0.27	
Bembrops sp.	0.16	2	0.27	
Ophichthus sp.	0.12	6	0.21	
Lophiodes mutilus	0.08	2	0.14	
Chaunax apus	0.04	2	0.07	
Lestrolepis intermedia	0.04	2	0.07	
Ostracoberyx dorygenus	0.04	2	0.07	
Glyptothidium argenteum	0.04	2	0.07	
Total	58.07		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 149
 DATE :26/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°21.44
 start stop duration Lon E 97°25.10
 TIME :21:23:13 21:53:27 30.2 (min) Purpose : 3
 LOG : 3695.32 3696.74 1.4 Region : 10330
 FDEPTH: 181 183 Gear cond.: 0
 BDEPTH: 181 183 Validity : 0
 Towing dir: 0° Wire out : 460 m Speed : 2.8 kn
 Sorted : 0 Total catch: 58.00 Catch/hour: 115.12

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Glossanodon sp.	17.47	969	15.17	
Satyrichthys laticeps	16.91	22	14.69	
Saurida lessepsianus	14.09	169	12.24	337
Ostichthys acanthorhinus	9.25	85	8.03	
MYCTOPHIDAE	8.73	2906	7.59	
Pseudorhombus dupliciocellatus ***	6.55	127	5.69	
Bembrops sp.	6.43	85	5.59	
Priacanthus proluxus	6.39	52	5.55	
Proscyllium magnificum	3.37	24	2.93	
Octopus sp.	2.70	64	2.34	
Priacanthus macracanthus	2.22	20	1.93	
Parascopopsis eriomma	1.91	48	1.66	
Chelidoperca pleurospilus	1.91	111	1.66	
Setarches longimanus	1.91	270	1.66	
Psenopsis obscura	1.79	9	1.55	
Scalicus serrulatus	1.63	40	1.41	
Snyderina guentheri	1.53	34	1.33	
Zenopsis nebulosa	1.27	16	1.10	
Antigonia ovalis	0.99	18	0.86	
Loligo sp.	0.95	16	0.83	
Tydemania navigatoris	0.95	105	0.83	
Ibacus novemdentatus	0.79	32	0.69	
Plectranthias sp.	0.54	87	0.47	
Hapalogenys merguensis	0.54	4	0.47	
Acanthaphritis barbata	0.52	52	0.45	
Platyrrhina sp.	0.52	2	0.45	
Synagrops japonicus	0.48	16	0.41	
Sepia acuelata	0.48	32	0.41	
Ophidion sp.	0.44	10	0.38	
Ostracoberyx dorygenus	0.32	48	0.28	
Orbiraja powelli	0.28	2	0.24	
Neomerinthe sp.	0.16	4	0.14	
Marleyella bicolorata	0.16	8	0.14	
Callionymus meridionalis	0.16	16	0.14	
Synchiropus altivelis	0.14	12	0.12	
Samariscus huysmani	0.14	14	0.12	
Physiculus sp.	0.12	6	0.10	
Chlorophthalmus acutifrons	0.12	2	0.10	
Decodon pacificus	0.10	4	0.09	
Setarches longimanus	0.06	2	0.05	0
Arnoglossus japonicus	0.06	4	0.05	
Parapercis sp.	0.04	2	0.03	
Gobiidae	0.02	4	0.02	
Chlorophthalmus sp.	0.02	4	0.02	
Total	115.12		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 150
 DATE :27/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°20.71
 start stop duration Lon E 97°46.06
 TIME :02:05:27 02:25:31 20.1 (min) Purpose : 3
 LOG : 3722.31 3723.28 1.0 Region : 10330
 FDEPTH: 69 69 Gear cond.: 0
 BDEPTH: 69 69 Validity : 0
 Towing dir: 0° Wire out : 185 m Speed : 2.9 kn
 Sorted : 0 Total catch: 21.20 Catch/hour: 63.41

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Aluterus monoceros	34.04	12	53.68	
Galeocerdo cuvier	8.14	3	12.83	
Rastrelliger faughni	7.06	75	11.13	338
Saurida tumbil	2.63	12	4.15	
Nemipterus bipunctatus	2.03	33	3.21	
Platyrrhina sp.	1.79	12	2.83	
Decapterus russelli	1.73	45	2.74	339
Tydemania navigatoris	1.26	162	1.98	
Carangoides sp.	1.08	15	1.70	
Bembrops sp.	0.60	6	0.94	
Scalicus serrulatus	0.54	12	0.85	
Uroteuthis duvaucelii	0.54	33	0.85	
Parupeneus heptacanthus	0.48	3	0.75	
Saurida lessepsianus	0.42	3	0.66	
Priacanthus macracanthus	0.24	3	0.38	
Abalistes stellatus	0.18	3	0.28	
Rastrelliger kanagurta	0.18	3	0.28	
Upeneus guttatus	0.12	3	0.19	
Teixeirichthys jordani	0.12	6	0.19	
Samariscus sp.	0.06	3	0.09	
Poecilopsetta colorata	0.06	3	0.09	
Ophidion sp.	0.06	3	0.09	
Snyderina guentheri	0.06	3	0.09	
Plectranthias sp.	0.00	3	0.00	
Total	63.41		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 151
 DATE :27/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°19.56
 start stop duration Lon E 98°14.89
 TIME :06:10:18 06:36:54 26.6 (min) Purpose : 3
 LOG : 3755.52 3756.78 1.3 Region : 10330
 FDEPTH: 36 33 Gear cond.: 0
 BDEPTH: 36 33 Validity : 0
 Towing dir: 0° Wire out : 110 m Speed : 2.8 kn
 Sorted : 0 Total catch: 275.13 Catch/hour: 620.59

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Fishing gears	541.35	5	87.23	
Loligo sp.	36.50	2030	4.91	
Selaroides leptolepis	19.40	7	3.13	341
Stolephorus indicus	8.57	505	1.38	340
Ostorhynchus pleuron	5.59	1119	0.90	
J E L Y F I S H	2.44	2	0.39	
Rastrelliger kanagurta	1.80	23	0.29	
Photopectoralis bindus	1.71	135	0.28	
Aluterus monoceros	1.49	2	0.24	
Scomberoides commersonianus	1.47	5	0.24	
Saurida tumbil	1.15	16	0.19	
Encrasicholina heteroloba	1.08	1083	0.17	
Nemipterus zysron	1.04	20	0.17	
Sepia sp	0.99	2	0.16	
Lutjanus lutjanus	0.45	189	0.07	
Rastrelliger brachysoma	0.41	2	0.07	
Sphyrna forsteri	0.38	2	0.06	
Paramonacanthus tricuspidis	0.23	86	0.04	
Decapterus sp.	0.18	25	0.03	
Gerres macracanthus	0.11	2	0.02	
Antennatus nummifer	0.11	7	0.02	
Nemipterus peronii	0.05	2	0.01	
Apogonichthys pharaonis	0.05	7	0.01	
Centrophorus uyato	0.02	2	0.00	
Acanthaphritis barbata	0.02	2	0.00	
Total	620.59		100.00	

R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 152
 DATE :27/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°2.99
 start stop duration Lon E 98°6.16
 TIME :09:58:26 10:08:27 10.0 (min) Purpose : 3
 LOG : 3779.92 3780.46 0.5 Region : 10330
 FDEPTH: 26 26 Gear cond.: 0
 BDEPTH: 26 26 Validity : 0
 Towing dir: 0° Wire out : 90 m Speed : 3.2 kn
 Sorted : 0 Total catch: 5.50 Catch/hour: 32.93

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Selaroides leptolepis	10.24	353	31.09	
Loligo sp.	9.10	246	27.64	
Nemipterus bipunctatus	4.07	66	12.36	
Saurida lessepsianus	2.87	66	8.73	
Rastrelliger faughni	1.74	24	5.27	
Plotosus lineatus	1.02	1317	3.09	
Nemipterus zysron	0.90	12	2.73	
Stolephorus indicus	0.84	48	2.55	
Megalaspis cordyla	0.72	359	2.18	
Teixeirichthys jordani	0.60	30	1.82	
Gerres oyena	0.30	6	0.91	
Antennatus nummifer	0.18	6	0.55	
Upeneus margarethae	0.12	6	0.36	
Paramonacanthus tricuspidis	0.12	60	0.36	
Lutjanus lutjanus	0.06	12	0.18	
UNIDENTIFIED FISH	0.06	6	0.18	
Total	32.93		100.00	

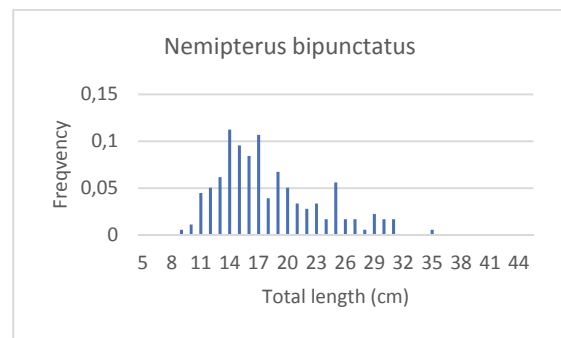
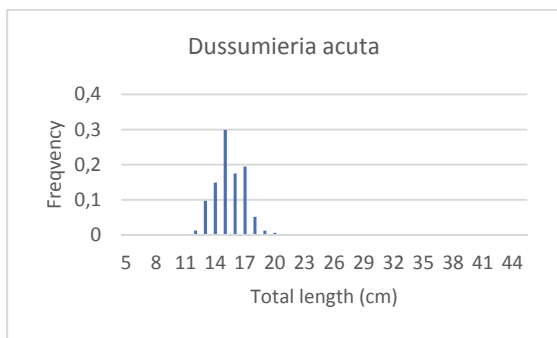
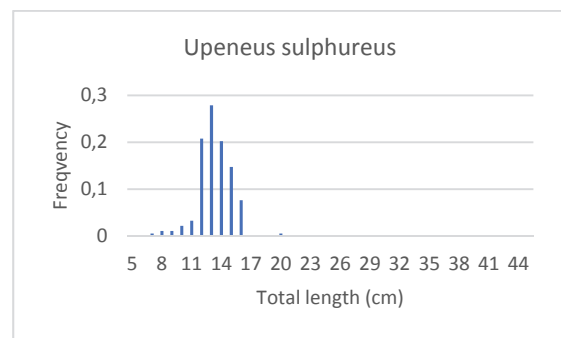
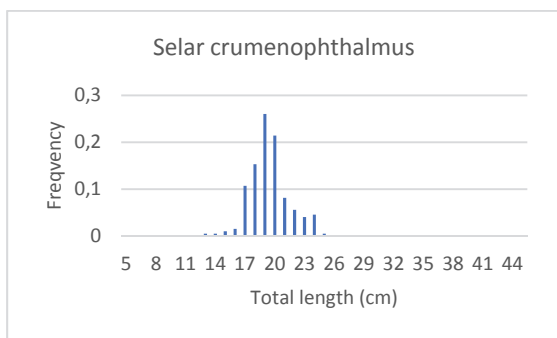
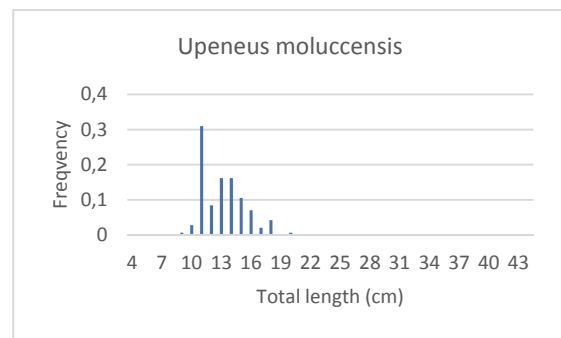
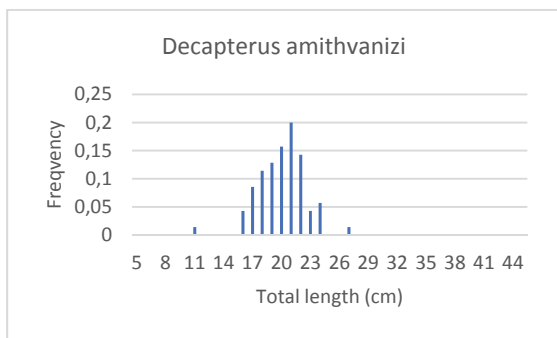
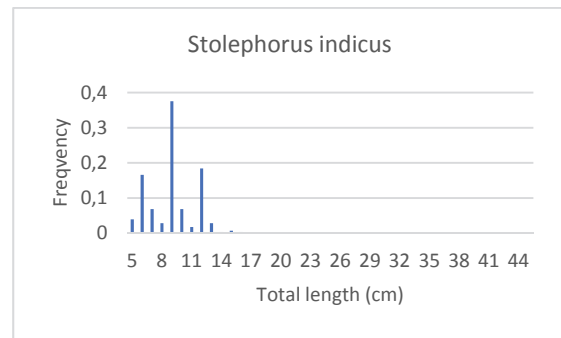
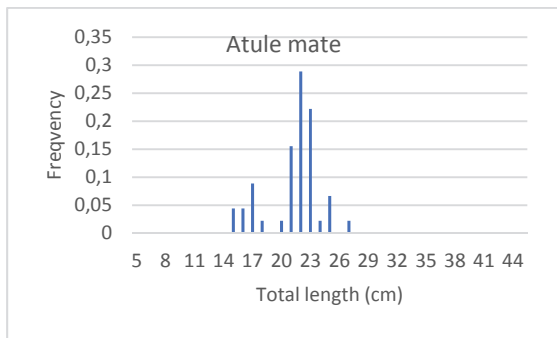
R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 153
 DATE :27/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°2.18
 start stop duration Lon E 97°46.02
 TIME :12:45:29 13:05:13 19.7 (min) Purpose : 3
 LOG : 3803.34 3804.34 1.0 Region : 10330
 FDEPTH: 72 73 Gear cond.: 0
 BDEPTH: 72 73 Validity : 0
 Towing dir: 0° Wire out : 185 m Speed : 3.0 kn
 Sorted : 0 Total catch: 19.07 Catch/hour: 57.99

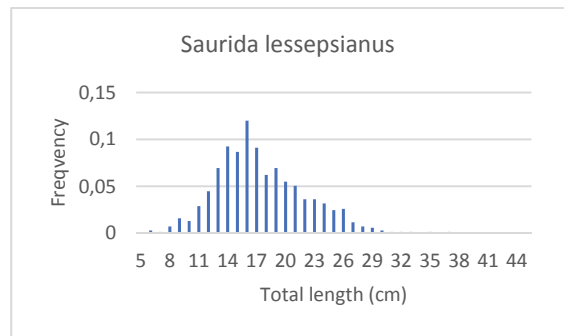
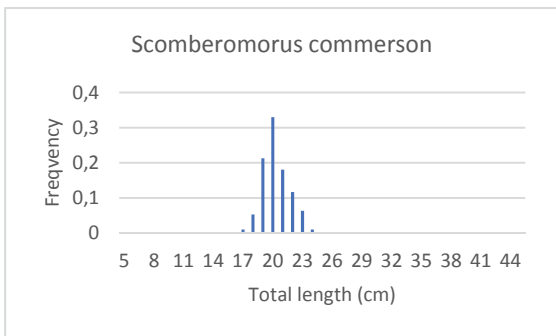
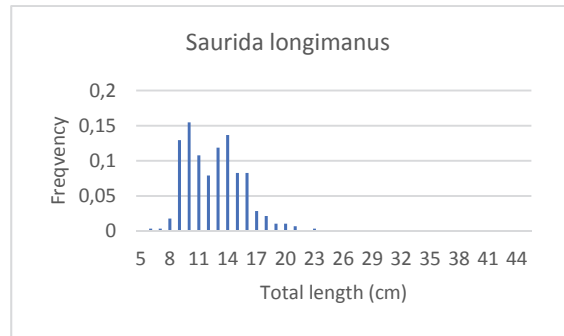
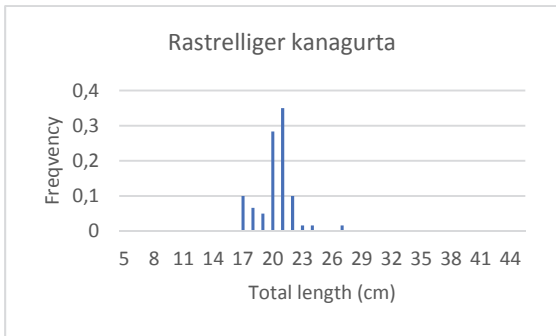
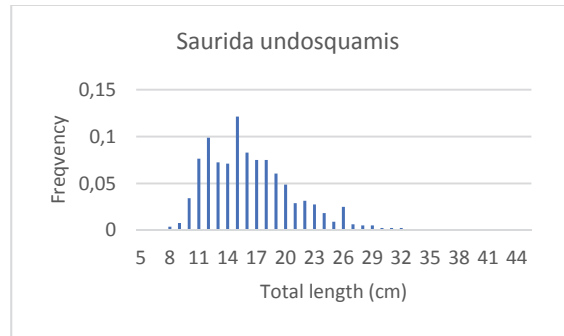
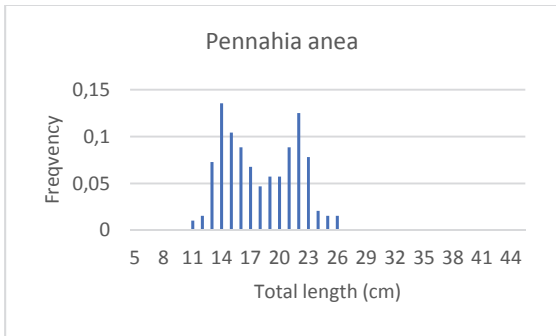
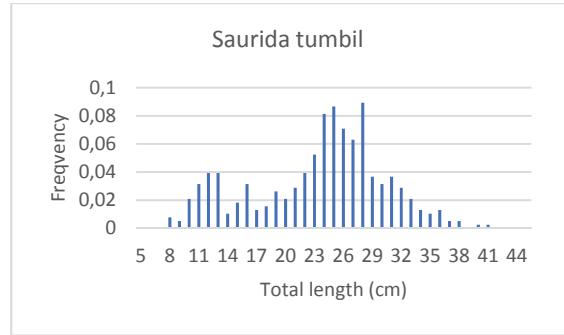
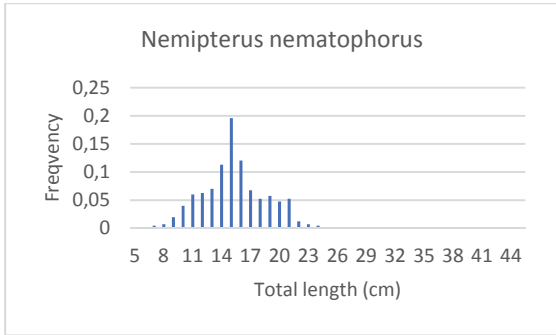
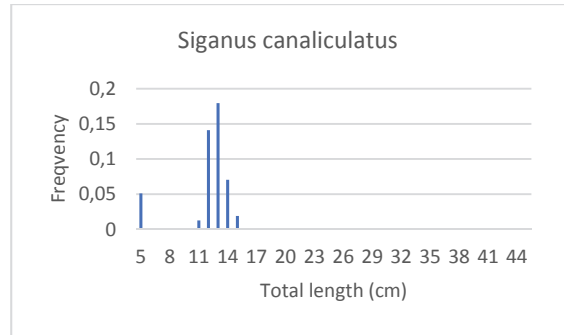
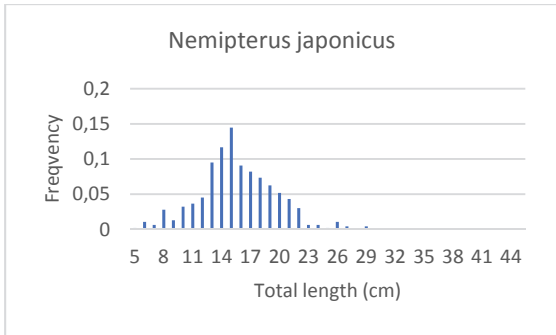
SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Nemipterus bipunctatus	10.40	374	17.93	
Upeneus guttatus	6.33	335	10.91	
Siganus canaliculatus	6.14	134	10.59	
Synodus hoshinonis	6.14	392	10.59	
Teuicichthys jordani	4.32	40	7.45	
Saurida tumbil	3.95	3	6.82	
Rogadius sp.	3.22	225	5.56	
Saurida lessepsianus	2.62	40	4.51	
Sepia pharaonis	2.49	3	4.30	
Solenocera choprai	2.01	283	3.46	
Sea snakes	1.95	3	3.36	
Priacanthus macracanthus	1.22	15	2.10	
Engyprosonon maldivensis	1.09	106	1.89	
Cyclichthys orbicularis	0.91	15	1.57	
Parapercis alboguttata	0.85	40	1.47	
Decapterus russelli	0.79	18	1.36	
Penaeus longistylus	0.73	15	1.26	
Selar crumenophthalmus	0.67	9	1.15	
Trachinocephalus sp.	0.61	30	1.05	
Selaroides leptolepis	0.43	27	0.73	
SCORPAENIDAE	0.30	12	0.52	
Pterois russellii	0.24	6	0.42	
Solenocera sp.	0.18	30	0.31	
Stolephorus indicus	0.12	6	0.21	
Samaris cristatus**	0.12	6	0.21	
Plotosus lineatus	0.06	33	0.10	
Charybdis natator	0.06	15	0.10	
Paramonacanthus tricuspis	0.03	9	0.05	
Total	57.99		100.00	

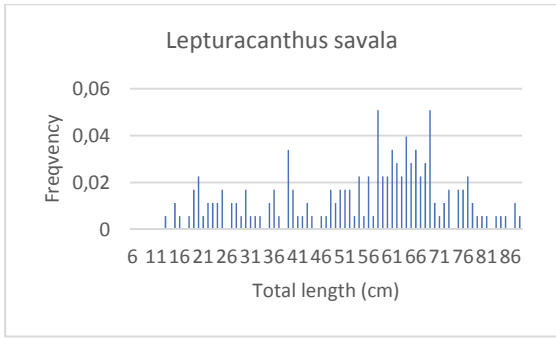
R/V Dr. Fridtjof Nansen SURVEY:2018411 STATION: 154
 DATE :27/09/18 GEAR TYPE: BT NO: 1 POSITION:Lat N 10°2.70
 start stop duration Lon E 97°22.75
 TIME :16:03:55 16:34:01 30.1 (min) Purpose : 3
 LOG : 3829.35 3830.95 1.6 Region : 10330
 FDEPTH: 184 184 Gear cond.: 0
 BDEPTH: 184 184 Validity : 0
 Towing dir: 0° Wire out : 440 m Speed : 3.2 kn
 Sorted : 0 Total catch: 26.94 Catch/hour: 53.70

SPECIES	CATCH/HOUR		% OF TOT. C	SAMP
	weight	numbers		
Ostichthys sp.	23.40	171	43.58	
UNIDENTIFIED FISH	3.67	10	6.83	
MYCTOPHIDAE	3.35	670	6.24	
Bembrops sp.	3.11	34	5.79	
Pseudorhombus quinquecellatus ***	2.51	20	4.68	
Unidentified	2.51	251	4.68	
Scaliscus serrulatus	2.03	40	3.79	
Psenopsis obscura	1.46	32	2.71	
Neopinnula orientalis	1.12	18	2.08	
Plectranthias sp.	1.12	157	2.08	
Snyderina guentheri	1.08	20	2.00	
Saurida lessepsianus	0.92	12	1.71	
Histiogaster typus	0.76	4	1.41	
Glossanodon sp.	0.68	28	1.26	
Satyricthys laticeps	0.66	2	1.22	
Chlorophthalmus corniger	0.62	153	1.15	
Physiculus sp.	0.50	16	0.93	
Chelidoperca sp.	0.44	12	0.82	
Unidentified	0.42	6	0.78	
Hapalogenys merguensis	0.40	2	0.74	
Antigonia rubescens	0.38	6	0.71	
Plesionika quasigrandis	0.26	52	0.48	
Parapercis alboguttata	0.22	4	0.41	
Priacanthus hamrur	0.20	4	0.37	
Unidentified	0.20	12	0.37	
Antigonia sp.	0.20	6	0.37	
Decapterus sp.	0.18	4	0.33	
Brachypterois serrulata	0.16	6	0.30	
Synagrops japonicus	0.14	4	0.26	
Rexea bengalensis	0.14	4	0.26	
Parascopopsis sp.	0.12	16	0.22	
Sepia aculeata	0.12	8	0.22	
Leptocephalus	0.10	54	0.19	
Unidentified	0.10	6	0.19	
Loligo sp.	0.08	2	0.15	
Decodon sp.	0.08	6	0.15	
Nemipterus bipunctatus	0.08	2	0.15	
Siganus canaliculatus	0.06	2	0.11	
Cubiceps sp.	0.06	2	0.11	
Samaris sp.	0.04	4	0.07	
Ophichthys sp.	0.02	2	0.04	
Poecilopsetta colorata	0.02	2	0.04	
Setarches longimanus	0.02	2	0.04	
Total	53.70		100.00	

ANNEX VIII. LENGTH DISTRIBUTION OF MAIN SPECIES







ANNEX IX. EQUATIONS FOR CALCULATION OF BIOMASS INDEX OF DEMERSAL FISH

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,

$W_i = \frac{\text{area}_i}{\text{total area}}$ 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

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

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

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

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):

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

ANNEX X. OVERVIEW OF DATA COLLECTION AND HANDOVER OF DATA TO PARTNERS

Overview of data collection and handover of data to partners							
2018411		after the survey, to local cruise leader	at the post survey meeting, to local cruise leader	upon request	not collected/stored	analysed by partner country	analysed by Sci.Plan
Data types	Data						
Track log	continuous GPS data	x					
Diary	event information	x					
Acoustic data	EK 60 raw data		x				
Acoustic data	EK60 processed (report files like list com scatter)		x				
Acoustic data	EK80, raw data			x			
Acoustic data	MS70			x			
Acoustic data	ME70				x		
Acoustic data	SU90			x			
Acoustic data	SH90				x		
Acoustic data	SBP300				x		
Acoustic data	EM302				x		
Acoustic data	EM710				x		
Physics	CTD probe (C, t, d, O, Fl, light)	x					
Physics	CTD Underway				x		
Physics	ADCP 75kHz	x					
Physics	ADCP 150kHz	x					
Physics	LADCP				x		
Physics	Thermosalinograph (c, t, Fl, turb)	x					
Physics	Weather st (T, w dir., w speed, solar ir, humid)	x					
Chemistry	Nutrients		x				
Chemistry	pH			x			x
Chemistry	Total alkalinity			x			x
Chemistry	Chlorophyll		x				

Overview of data collection and handover of data to partners							
2018411		after the survey, to local cruise leader	at the post survey meeting, to local cruise leader	upon request	not collected/stored	analysed by partner country	analysed by Sci.Plan
Data types	Data						
Biology	Trawl catch data (Nansis data base)	x	x				
Biology	Zooplankton biomass		x				
Pollution	Microplastics						x
Pollution	Microplastics (pictures)						
Geology	Sediment (trawl)						x
Geology	Grab					x	
Observation platforms	VAMS				x		
Observation platforms	WBAT				x		
Observation platforms	Deep vision				x		

ANNEX XI. OVERVIEW OF SAMPLES COLLECTED, PORT OF OFF-LOADING AND CONTACT PERSON

Gear/equipment	Analyses	Samples	Preservation	Port of offloading	Type of transportation	Institution address	Contact person Leg 3.4 (e-mail, phone no)	Deadline for analysis
Niskin bottles on CTD		Nutrients	0.2 ml chloroform (keep cool)	Simonstown	Airfreight	Institute of Marine Research, P.O. Box 1870 Nordnes, Bergen, Norway	David Cervantes	Post survey meeting
Niskin bottles on CTD		Chlorophyll a	Frozen (-18 to -20 C, best -80)		Onboard or airfreight	IMR	David Cervantes	Post survey meeting
Phytoplankton net	Species identification	phytoplankton taxonomy	4% formaldehyde /lugol	Yangon; from Rakhine and Delta area Kawthaung; from delta and southern area	Local participant.	Rakhine: Pathein Delta: Mawlamyine Southern area; Myeik	Thuta Tun/Cherry Aung Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun	Post survey meeting
WP2 (180 µm) 30 m 1/2 split, split 1		Zooplankton Biomass	dried	Phuket or Simonstown	Airfreight	Institute of Marine Research, P.O. Box 1870 Nordnes, Norway	Stamatina Isari	Post survey meeting
WP2 (180 µm) 30 m 1/2 split, split 2	Species identification	Zooplankton Taxonomy	4% formaldehyde	Yangon; from Rakhine and Delta area Kawthaung; from delta and southern area		Rakhine: Pathein Delta: Mawlamyine Southern area; Myeik	Thuta Tun/Cherry Aung Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun	Post survey meeting
WP2 (180 µm) from the two deepest super stations		Zooplankton Biomass	dried	Phuket or Simonstown	Airfreight	Institute of Marine Research, P.O. Box 1870 Nordnes, Norway	Stamatina Isari	Post survey meeting
WP2 (180 µm) from the two	Species identification	Zooplankton Taxonomy	4% formaldehyde	Yangon; from Rakhine and Delta		Rakhine: Pathein Delta: Mawlamyine	Thuta Tun/Cherry Aung	Post survey meeting

Gear/equipment	Analyses	Samples	Preservation	Port of offloading	Type of transportation	Institution address	Contact person Leg 3.4 (e-mail, phone no)	Deadline for analysis
deepest super stations				area Kawthaung; from delta and southern area		Southern area; Myeik	Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun	
Multinet (Midi, 1 or 5 x 405 µm), oblique tow from max 200 m, 1/2 split, split 1	Species identification incl genetics	Zooplankton, Ichthyoplankton	96% ethanol	Yangon; from Rakhine and Delta area Kawthaung; from Delta and southern area		Rakhine: Pathein Delta: Mawlamyine Southern area; Myeik	Thuta Tun/Cherry Anung Aung Myo San Su Su Hlaing	
Multinet (Midi, 1 or 5 x 405 µm), oblique tow from max 200 m, 1/2 split, split 2 sorted	Species identification	Ichthyoplankton egg	Photos of fish larvae + in 4% formaldehyde	Yangon; from Rakhine and Delta area Kawthaung; from Delta and southern area		Rakhine: Pathein Delta: Mawlamyine Southern area; Myeik	Thuta Tun/Cherry Aung Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun	
Multinet (Midi, 1 or 5 x 405 µm), oblique tow from max 200 m, when split 2 is not sorted	Species identification	or bulk sample	4% formaldehyde	Yangon; from Rakhine and Delta area Kawthaung; from delta and southern area		Rakhine: Pathein Delta: Mawlamyine Southern area; Myeik	Thuta Tun/Cherry Aung Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun	
Manta trawl (375 µm): surface tow for 15 mins	Abundance and chemical composition	Microplastics	Photographed and frozen	Simonstown		IMR	Grøsvik	
Manta trawl (375 µm): surface tow for 15 mins	Species identification	Neuston community identification or bulk samples	96% Ethanol	Simonstown		IMR	Stamatina Isari	

Gear/equipment	Analyses	Samples	Preservation	Port of offloading	Type of transportation	Institution address	Contact person Leg 3.4 (e-mail, phone no)	Deadline for analysis
Small surface water pump inlet (2 m) 300 µm	Abundance and chemical composition	Microplastic samples and neuston community	96% Ethanol	Yangon and Kawthaung	participant	Rakhine and Delta area: Mawlamyine University Southern area: Myeik University	Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun	
Large surface water pump (inlet 2m) 405 µm	Distribution and taxonomy	neuston community	4% formaldehyde	Yangon and Kawthaung	participant	Yangon University/DOF	Kay Lwin Htun/Htun Thein	
Trawl samples	Species identification	Jellyfish whole individual	Dried + frozen	Simonstown	car	South-Africa	Mark Gibbons	
Trawl samples	Genetic analyses	Jellyfish arm	96% Ethanol + frozen	Simonstown	car	South-Africa	Mark Gibbons	
Trawl samples	Genetic analyses	Jellyfish the rest	4% formaldehyde	Simonstown	car	South-Africa	Mark Gibbons	
Trawl samples	Genetic analyses	Jellyfish the rest	4% formaldehyde	Kawthaung	participant	DOF	Htun Thein	
Trawl samples	Genetic analyses (stock identity) Hilsa in Rakhine Indian Mackerel, anchovies and narrative tuna in southern area. No genetics in the Delta area	Fin clips of priority species	96% Ethanol	Kawthaung	participant	DOF	Htun Thein	
Trawl samples	Morphometric analyses, Diet analyses, age reading (50 individuals of 10 species) and histology	whole fish specimens, otoliths and gonads	Frozen	Yangon; from Rakhine and Delta area Kawthaung; from Delta and southern area		Rakhine: Pathein Delta: Pel 1 + Trichiuridae to Mawlamyine Pel 2 to Pathein Southern area; Myeik DOF demersal fish, all area	Thuta Tun/Cherry Aung Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun Htun Thein	
Trawl samples	Histology, gonads	gonads	4% formaldehyde	Yangon: Rakhine	participant	Yangon University	Kay Lwin Htun	

Gear/equipment	Analyses	Samples	Preservation	Port of offloading	Type of transportation	Institution address	Contact person Leg 3.4 (e-mail, phone no)	Deadline for analysis
				and Delta area Kawthaung; Southern area		Myeik University	Su Su Hlaing/Nyo Nyo Tun	
Trawl samples	Taxonomy (course)	whole specimens for morphometric analysis (Taxonomic course, Myanmar)	Frozen	Kawthaung;	airfreight	DOF	Htun Thein/Peter Psomadakis	
Trawl samples	Museum collection	Whole specimen Museum collection	frozen	Yangon Simonstown	airfreight	FAO	Peter Psomadakis	
Trawl samples	Museum collection	Fin clips or other flesh sample museum collection from each specimen	96% Ethanol	Simonstown	airfreight	FAO	Peter Psomadakis	
Trawl samples	chemical composition	Food safety samples	freeze dried / vacuum packed	Simonstown	airfreight	IMR	Marian Kjelleevold	
Trawl samples	chemical composition	fish liver - food safety	Frozen -80	Simonstown	airfreight	IMR	Marian Kjelleevold	
Trawl sediment pipe	Biological	Trawl cylinder sediment	Frozen	Yangon; from Rakhine and Delta area Kawthaung; from delta and southern area	Participant	Rakhine: Pathein Delta: Mawlamyine Rakhine & Delta: Yangon Southern area; Myeik	Thuta Tun/Cherry Aung Aung Myo San/San Thar Htun Su Su Hlaing/Nyo Nyo Tun Kay Lwin tun	
Trawl sediment pipe (for environmental transects in the Delta area only)	chemical analyses	Trawl cylinder sediment	Frozen	Yangon; from Delta area	Participant	Yangon University	Kay Lwin Htun	

Gear/equipment	Analyses	Samples	Preservation	Port of offloading	Type of transportation	Institution address	Contact person Leg 3.4 (e-mail, phone no)	Deadline for analysis
Box corer	Sediment particles	Sediment samples	frozen	Yangon; from Delta area		Patheingyi University	Thuta Tun/Cherry Aung	

ANNEX XII. RESULTS FROM ANALYSES OF WATER CHEMISTRY PARAMETERS

Station	Lat. N	Lon. E	Depth (m)	pH	nitrate (μmol/l)	phosphate (μmol/l)	silicate (μmol/l)	nitrite (μmol/l)	Chlorophyll a (μg/l)	Phaeophytin (μg/l)
660	18.371	93.890	26	8.058	0.11	0.06	8.11	0.23	1.76	0.50
660	18.371	93.890	19	8.053	0.18	0.03	8.53	0.32	1.76	0.56
660	18.371	93.890	10	8.059	0.09	0.03	8.54	0.27	1.83	0.43
660	18.371	93.890	4	8.067	0.14	0.03	4.30	0.10	1.92	0.40
662	18.284	93.890	91	7.851					0.19	0.16
662	18.284	93.760	75	8.007	2.13	0.18	4.74	0.32	0.35	0.16
662	18.284	93.760	50	8.072	0.00	0.00	1.16	0.20	0.77	0.20
662	18.284	93.760	30	8.077	0.00	0.00	1.57	0.19	0.51	0.13
662	18.284	93.760	20	8.074	0.14	0.30	1.84	0.09	0.40	0.10
662	18.284	93.760	9	8.085	0.17	0.00	1.50	0.04	0.30	0.07
662	18.284	93.760	5	8.079	0.07	0.00	1.70	0.14	0.29	0.08
664	18.202	93.637	502	7.461	27.63	2.30	43.09	0.07		
664	18.202	93.637	397	7.469	16.78	1.60	29.17	0.04		
664	18.202	93.637	297	7.475	23.54	1.95	31.92	0.00		
664	18.202	93.637	199	7.525	15.57	1.58	25.07	0.18	0.00	0.06
664	18.202	93.637	150	7.574	19.14	1.61	20.33	0.01	0.01	0.03
664	18.202	93.637	100	7.730	13.98	1.12	10.31	0.08	0.03	0.06
664	18.202	93.637	75	7.948	0.00	0.01	3.56	0.12	0.19	0.04
664	18.202	93.637	50	8.057	0.00	0.00	1.80	0.38	0.37	0.14
664	18.202	93.637	30	8.078	0.00	0.00	1.34	0.13	0.28	0.09
664	18.202	93.637	20	8.063	0.01	0.00	1.31	0.07	0.26	0.09
664	18.202	93.637	10	8.044	0.00	0.00	1.54	0.08	0.12	0.03
664	18.202	93.637	5	8.072	0.15	0.00	1.38	0.09	0.27	0.08
677	17.336	94.108	506	7.474	34.79	2.61	47.71	0.08		
677	17.336	94.108	400	7.473	34.77	2.54	43.69	0.06		
677	17.336	94.108	300	7.472	29.72	2.25	35.79	0.07		
677	17.336	94.108	200	7.506	30.30	2.29	32.10	0.05	0.01	0.04
677	17.336	94.108	151	7.563	26.80	2.09	25.61	0.06	0.01	0.02
677	17.336	94.108	100	7.760	15.52	1.18	11.11	0.11	0.07	0.09
677	17.336	94.108	75	7.961	3.97	0.34	7.27	0.28	0.73	0.24
677	17.336	94.108	50	8.066	0.00	0.00	1.29	0.07	0.34	0.05
677	17.336	94.108	30	8.092	0.00	0.00	1.30	0.07	0.26	0.04
677	17.336	94.108	20	8.086	0.00	0.00	1.36	0.05	0.20	0.03
677	17.336	94.108	9	8.085	0.00	0.00	1.46	0.11	0.17	0.02
677	17.336	94.108	5	8.090	0.47	0.15	1.48	0.05	0.12	0.01
679	17.356	94.190	90	7.948	2.57	0.28	3.72	0.15	0.21	0.13
679	17.356	94.190	77	8.023	0.87	0.12	2.33	0.22	0.42	0.12
679	17.356	94.190	51	8.081	0.11	0.00	0.99	0.01	0.37	0.06
679	17.356	94.190	31	8.082	0.19	0.00	1.49	0.00	0.25	0.00
679	17.356	94.190	20	8.086	0.09	0.00	1.56	0.00	0.24	0.05
679	17.356	94.190	10	8.074	0.03	0.00	1.59	0.05	0.25	0.04
679	17.356	94.190	5	8.079	0.12	0.00	1.68	0.04	0.25	0.04
682	17.374	94.498	31	8.038	0.65	0.10	7.26	0.86	1.37	0.48
682	17.374	94.498	21	8.064	0.12	0.00	4.40	0.07	1.46	0.34
682	17.374	94.498	10	8.083	0.07	0.00	6.54	0.00	0.34	0.09
682	17.374	94.498	5	8.068	0.20	0.02	6.32	0.09	1.23	0.38

Station	Lat N	Lon E	Depth (m)	pH	nitrate (μmol/l)	phosphate (μmol/l)	silicate (μmol/l)	nitrite (μmol/l)	Chlorophyll a (μg/l)	Phaeophytin (μg/l)
690	16.452	94.174	25	8.049	0.37	0.11	5.43	0.52	0.81	0.58
690	16.452	94.174	20	8.054	0.36	0.06	4.82	0.56	0.96	0.11
690	16.452	94.174	10	8.048	0.58	0.10	6.76	0.53	0.93	0.39
690	16.452	94.174	5	8.074	0.28	0.06	15.53	0.11	2.66	0.58
693	16.471	94.016	95	7.736	11.16	1.04	8.03	0.08	0.09	0.04
693	16.471	94.016	74	7.927	4.37	0.37	5.94	0.14	0.20	0.11
693	16.471	94.016	50	8.061	0.10	0.00	1.48	0.18	0.59	0.11
693	16.471	94.016	30	8.068	0.07	0.00	2.22	0.05	0.36	0.07
693	16.471	94.016	20	8.071	0.06	0.00	2.84	0.02	0.25	0.06
693	16.471	94.016	10	8.070	0.14	0.00	2.87	0.01	0.21	0.05
693	16.471	94.016	5	8.075	0.07	0.00	2.89	0.04	0.20	0.05
695	16.495	93.935	498	7.454	35.33	2.60	48.94	0.00		
695	16.495	93.935	402	7.465	34.28	2.52	44.52	0.00		
695	16.495	93.935	301	7.480	33.21	2.46	39.71	0.00		
695	16.495	93.935	200	7.507	29.34	2.21	33.17	0.00	0.02	0.00
695	16.495	93.935	151	7.893	8.96	0.70	13.05	0.00	0.30	0.08
695	16.495	93.935	99	7.688	19.30	1.51	12.49	0.00	0.05	0.10
695	16.495	93.935	75	7.939	5.22	0.42	6.35	0.07	0.17	0.12
695	16.495	93.935	51	8.045	0.45	0.05	3.93	0.55	0.45	0.02
695	16.495	93.935	30	8.073	0.04	0.00	2.21	0.00	0.05	0.08
695	16.495	93.935	20	8.070	0.15	0.00	2.79	0.08	0.28	0.00
695	16.495	93.935	10	8.073	0.10	0.00	2.71	0.08	0.64	0.04
695	16.495	93.935	5	8.069	0.05	0.00	2.78	0.08	0.16	0.26
707	15.015	93.460	484	7.455	35.63	2.65	47.98	0.02		
707	15.015	93.460	400	7.451	35.36	2.58	45.62	0.02		
707	15.015	93.460	301	7.453	33.63	2.49	39.81	0.02		
707	15.015	93.460	201	7.476	32.41	2.38	35.14	0.02	0.00	0.02
707	15.015	93.460	150	7.532	28.84	2.18	29.60	0.02	0.01	0.03
707	15.015	93.460	100	7.641	18.17	1.47	14.30	0.02	0.04	0.07
707	15.015	93.460	75	7.935	3.55	0.29	4.63	0.02	0.18	0.15
707	15.015	93.460	51	8.045	0.63	0.00	2.20	0.02	0.49	0.15
707	15.015	93.460	30	8.069	0.08	0.05	1.57	0.02	0.47	0.07
707	15.015	93.460	20	8.080	0.13	0.00	1.78	0.02	0.53	0.08
707	15.015	93.460	9	8.068	0.17	0.00	1.82	0.02	0.49	0.07
707	15.015	93.460	5	8.066	0.13	0.00	1.83	0.02	0.56	0.08
709	14.803	93.430	103	7.921	4.78	0.37	5.00	0.12	0.17	0.17
709	14.803	93.430	75	8.039	0.73	0.05	1.76	0.06	0.31	0.16
709	14.803	93.430	50	8.056	0.12	0.00	1.32	0.05	0.39	0.11
709	14.803	93.430	30	8.072	0.17	0.00	1.33	0.03	0.44	0.11
709	14.803	93.430	20	8.077	0.15	0.00	1.26	0.03	0.45	0.12
709	14.803	93.430	11	8.074	0.10	0.00	1.30	0.03	0.49	0.09
709	14.803	93.430	4	8.069	0.18	0.00	1.34	0.03	0.46	0.14
711	14.643	93.430	501	7.472	35.86	2.62	49.23	0.06		
711	14.643	93.430	399	7.453	35.65	2.57	46.83	0.06		
711	14.643	93.430	300	7.468	34.20	2.47	40.92	0.06		
711	14.643	93.430	198	7.489	31.90	2.38	34.75	0.06	0.00	0.03
711	14.643	93.430	150	7.547	28.86	2.19	29.88	0.06	0.01	0.03
711	14.643	93.430	100	7.801	12.86	1.02	10.28	0.06	0.18	0.13
711	14.643	93.430	74	8.053	0.90	0.06	2.85	0.06	0.46	0.17
711	14.643	93.430	50	8.053	0.90	0.06	3.31	0.06		
711	14.643	93.430	31	8.048	0.84	0.05	3.19	0.06	0.68	0.08
711	14.643	93.430	20	8.037	0.81	0.04	3.13	0.06		
711	14.643	93.430	10	8.059	0.85	0.05	3.19	0.06		
711	14.643	93.430	6	8.045	0.87	0.06	3.20	0.06		

Station	Lat N	Lon E	Depth (m)	pH	nitrate (μmol/l)	phosphate (μmol/l)	silicate (μmol/l)	nitrite (μmol/l)	Chlorophyll a (μg/l)	Phaeophytin (μg/l)
713	14.414	93.380	100	7.731	17.10	1.34	15.54	0.06	0.05	0.06
713	14.414	93.380	75	7.885	8.29	0.67	8.19	0.06	0.12	0.17
713	14.414	93.380	51	8.042	1.83	0.11	3.85	0.06	0.22	0.10
713	14.414	93.380	29	8.055	0.37	0.06	2.58	0.06	0.66	0.13
713	14.414	93.380	20	7.812	0.37	0.03	2.53	0.06	0.33	0.16
713	14.414	93.380	11	8.047	0.39	0.04	2.66	0.06	0.67	0.12
713	14.414	93.380	5	8.053	0.46	0.03	2.59	0.06	0.52	0.20
715	14.414	93.380	25	8.053	0.00	0.00	1.88	0.06	0.29	0.09
715	14.414	93.380	20	8.051	0.05	0.00	1.93	0.06	0.29	0.08
715	14.414	93.380	10	8.056	0.01	0.00	1.97	0.06	0.28	0.08
715	14.414	93.380	5	8.076	0.07	0.08	1.93	0.06	0.21	0.05
732	14.035	94.355	488	7.492	33.83	2.46	45.36	0.06		
732	14.035	94.355	400	7.480	33.28	2.41	42.06	0.06		
732	14.035	94.355	300	7.497	32.87	2.39	37.82	0.06		
732	14.035	94.355	200	7.523	30.26	2.25	33.54	0.06	0.00	0.03
732	14.035	94.355	100	7.816	14.30	1.12	12.91	0.06	0.05	0.07
732	14.035	94.355	75	7.868	9.16	0.81	13.98	0.06	0.09	0.14
732	14.035	94.355	50	8.031	1.36	0.14	3.11	0.18	0.50	0.20
732	14.035	94.355	30	8.066	0.02	0.02	2.17	0.06	0.27	0.11
732	14.035	94.355	21	8.082	0.00	0.00	2.96	0.06	0.22	0.02
732	14.035	94.355	10	8.089	0.00	0.00	3.14	0.06	0.21	0.04
732	14.035	94.355	5	8.094	0.00	0.00	3.16	0.06	0.17	0.02
734	14.300	94.392	95	7.773	10.81	0.94	14.49	0.19	0.04	0.07
734	14.300	94.392	75	7.863	9.37	0.79	11.11	0.08	0.08	0.05
734	14.300	94.392	50	8.060	0.02	0.03	2.52	0.20	0.08	0.05
734	14.300	94.392	30	8.068	0.00	0.00	3.16	0.07	0.31	0.06
734	14.300	94.392	20	8.064	0.02	0.00	3.17	0.06	0.30	0.06
734	14.300	94.392	10	8.068	0.01	0.00	3.22	0.07	0.33	0.03
734	14.300	94.392	5	8.069	0.07	0.00	1.96	0.06	0.38	0.08
740	15.434	94.889	26	7.959	4.02	0.34	14.20	0.20	0.20	0.06
740	15.434	94.889	21	7.992	3.05	0.25	11.72	0.21	0.28	0.10
740	15.434	94.889	10	8.082	0.16	0.06	17.70	0.11	0.31	0.11
740	15.434	94.889	5	8.068	0.62	0.11	29.30	0.07	0.67	0.12
751	15.387	95.567	25	8.007	2.76	0.26	12.10	0.46	0.16	0.10
751	15.387	95.567	20	8.010	3.02	0.26	11.52	0.31	0.13	0.09
751	15.387	95.567	10	8.000	3.73	0.34	32.82	0.82	0.48	0.17
751	15.387	95.567	5	8.000	4.94	0.42	41.40	0.42	0.49	0.18
754	14.693	95.477	100	7.888	9.74	0.76	9.99	0.16	0.10	0.13
754	14.693	95.477	74	7.978	4.07	0.32	4.54	0.38	0.18	0.19
754	14.693	95.477	50	8.071	0.09	0.00	1.95	0.04	0.29	0.12
754	14.693	95.477	30	8.080	0.06	0.00	1.98	0.04	0.09	0.01
754	14.693	95.477	20	8.089	0.06	0.00	3.64	0.04	0.32	0.09
754	14.693	95.477	10	8.101	0.02	0.00	7.71	0.03	0.27	0.08
754	14.693	95.477	5	8.093	0.11	0.00	9.92	0.02	0.28	0.06

Station	Lat N	Lon E	Depth (m)	pH	nitrate (μmol/l)	phosphate (μmol/l)	silicate (μmol/l)	nitrite (μmol/l)	Chlorophyll a (μg/l)	Phaeophytin (μg/l)
756	13.968	95.375	500	7.493	23.89	1.83	35.02	0.05		0.02
756	13.968	95.375	400	7.499	30.58	2.21	40.05	0.05		0.02
756	13.968	95.375	300	7.494	32.67	2.36	38.75	0.05		0.02
756	13.968	95.375	200	7.533	30.00	2.21	33.11	0.05		0.03
756	13.968	95.375	150	7.575	26.03	1.94	28.88	0.06	0.07	0.01
756	13.968	95.375	100	7.761	13.03	1.03	12.23	0.05	0.05	0.08
756	13.968	95.375	75	7.849	11.24	0.85	10.20	0.08	0.11	0.21
756	13.968	95.375	51	7.930	5.41	0.44	5.76	0.33	0.44	0.30
756	13.968	95.375	31	8.047	0.06	0.03	2.16	0.16	0.65	0.18
756	13.968	95.375	19	8.081	0.05	0.00	2.01	0.04	0.45	0.10
756	13.968	95.375	10	8.095	0.09	0.00	4.00	0.02	0.31	0.03
756	13.968	95.375	5	8.091	0.05	0.00	5.01	0.03	0.23	0.01
766	14.339	96.546	100	7.789	15.57	1.35	24.68	0.05	0.04	0.06
766	14.339	96.546	76	7.824	10.05	0.94	19.93	0.11	0.04	0.04
766	14.339	96.546	50	7.942	4.82	0.39	12.55	0.12	0.15	0.06
766	14.339	96.546	30	8.058	0.20	0.04	3.71	0.80	0.41	0.09
766	14.339	96.546	20	8.054	0.64	0.08	7.31	0.56	0.56	0.12
766	14.339	96.546	10	8.111	0.01	0.00	9.87	0.01	0.41	0.08
766	14.339	96.546	5	8.106	0.00	0.00	9.37	0.06	0.34	0.06
768	14.984	96.615	26	7.924	5.41	0.49	16.21	0.26	0.36	0.69
768	14.984	96.615	20	7.931	5.48	0.49	16.54	0.31	0.36	0.49
768	14.984	96.615	10	8.046	0.95	0.12	9.92	0.90	0.92	0.21
768	14.984	96.615	5	8.149	0.29	0.04	13.57	0.36	1.44	2.26
788	14.817	97.591	25	7.957	4.07	0.41	15.34	0.47	0.49	0.38
788	14.817	97.591	15	7.962	3.57	0.34	17.36	0.56	0.64	0.23
788	14.817	97.591	10	7.984	2.56	0.25	20.43	0.68	0.66	0.18
788	14.817	97.591	5	8.032	1.15	0.07	25.00	0.24	0.60	0.11
790	14.306	97.562	49	7.987	2.91	0.29	11.15	0.20	0.53	0.30
790	14.306	97.562	34	7.989	2.80	0.26	10.51	0.28	0.57	0.18
790	14.306	97.562	24	8.010	0.68	0.06	6.95	0.16	1.64	0.11
790	14.306	97.562	10	8.115	0.10	0.00	9.48	0.07	0.54	0.08
790	14.306	97.562	5	8.160	0.09	0.00	16.32	0.07	0.46	0.03
792	13.768	97.539	55		6.00	0.55	14.89	0.08	0.24	0.10
792	13.768	97.539	22		0.23	0.00	4.64	0.08	0.83	0.25
792	13.768	97.539	10		0.17	0.00	8.48	0.05	0.33	0.09
792	13.768	97.539	5		0.15	0.00	14.54	0.07	0.42	0.13
795	13.979	97.939	20		0.82	0.18	11.42	0.32	2.59	0.58
795	13.979	97.939	15		0.39	0.12	10.56	0.08	1.97	0.24
795	13.979	97.939	10		0.21	0.03	14.17	0.04	0.59	0.12
795	13.979	97.939	5		0.10	0.00	20.90	0.06	0.49	0.06
796	14.011	97.775	25		2.58	0.32	14.52	0.48	2.77	0.72
796	14.011	97.775	20		0.90	0.17	11.22	0.26	4.38	0.41
796	14.011	97.775	15		0.29	0.03	8.10	0.06	1.49	0.07
796	14.011	97.775	10		0.22	0.00	12.53	0.04	0.58	0.08
796	14.011	97.775	5		0.00	0.01	18.67	0.05	0.55	0.02
797	14.118	97.921	25		4.75	0.57	24.94	0.76	1.37	0.31
797	14.118	97.921	20		2.26	0.33	16.96	0.50	2.14	0.56
797	14.118	97.921	11		0.04	0.02	14.31	0.03	0.82	0.12
797	14.118	97.921	5		0.00	0.00	18.09	0.01	0.57	0.03
799	13.405	98.085	25	7.935	3.93	0.48	19.41	0.92	0.81	0.27
799	13.405	98.085	5	8.154	0.16	0.00	14.81	0.05	0.43	0.06

Station	Lat N	Lon E	Depth (m)	pH	nitrate (μmol/l)	phosphate (μmol/l)	silicate (μmol/l)	nitrite (μmol/l)	Chlorophyll a (μg/l)	Phaeophytin (μg/l)
802	13.403	97.072	91	7.815	13.11	1.09	15.75	0.08	0.04	0.06
802	13.403	97.072	74	7.886	9.27	0.78	11.66	0.09	0.10	0.09
802	13.403	97.072	51	8.070	0.18	0.00	2.12	0.08	0.42	0.12
802	13.403	97.072	25	8.089	0.19	0.00	2.41	0.08	0.46	0.12
802	13.403	97.072	5	8.127	0.18	0.00	12.23	0.08	0.31	0.04
804	13.400	96.437	501	7.496	33.47	2.54	52.97	0.05		
804	13.400	96.437	400	7.482	33.65	2.48	46.34	0.04		
804	13.400	96.437	300	7.488	32.20	2.39	41.27	0.03		
804	13.400	96.437	200	7.511	31.47	2.27	35.32	0.07		
804	13.400	96.437	150	7.533	29.57	2.18	33.31	0.06		
804	13.400	96.437	100	7.768	16.75	1.30	15.76	0.08	0.05	0.07
804	13.400	96.437	75	7.924	8.39	0.62	7.35	0.14	0.10	0.11
804	13.400	96.437	50	7.982	4.76	0.36	9.82	0.15	0.09	0.04
804	13.400	96.437	25	8.032	1.15	0.10	7.11	0.58	0.60	0.26
804	13.400	96.437	22	8.021	1.43	0.16	8.97	0.59	1.08	0.30
804	13.400	96.437	4	8.092	0.00	0.00	8.18	0.05	0.69	0.08
805	13.401	96.347	1000	7.506	34.65	2.64	72.34	0.05		
805	13.401	96.347	729	7.500	34.60	2.62	63.44	0.04		
805	13.401	96.347	499	7.491	34.00	2.50	49.52	0.05		
805	13.401	96.347	400	7.497	31.97	2.49	45.10	0.05		
805	13.401	96.347	300	7.498	32.23	2.40	39.34	0.05		
805	13.401	96.347	198	7.526	30.89	2.28	34.81	0.00		
805	13.401	96.347	100	7.765	16.71	1.33	15.91	0.03	0.06	0.09
805	13.401	96.347	75	7.939	7.76	0.60	6.97	0.16	0.15	0.13
805	13.401	96.347	51	8.040	1.27	0.15	3.22	0.61	0.20	0.11
805	13.401	96.347	24	8.032	1.49	0.15	6.10	0.51	0.49	0.23
805	13.401	96.347	21	8.021	0.76	0.16	8.34	0.62	0.98	0.49
805	13.401	96.347	5	8.087	0.00	0.01	6.55	0.02	0.59	0.43
822	12.368	96.540	999	7.512	35.85	2.66	78.01	0.06		
822	12.368	96.540	750	7.508	33.60	2.57	66.78	0.03		
822	12.368	96.540	500	7.501	33.26	2.49	48.52	0.06		
822	12.368	96.540	402	7.501	32.89	2.41	42.48	0.06		
822	12.368	96.540	300	7.506	31.99	2.37	38.55	0.07		
822	12.368	96.540	198	7.516	30.28	2.32	35.75	0.07		
822	12.368	96.540	100	7.744	17.95	1.39	18.63	0.09	0.02	0.05
822	12.368	96.540	75	7.900	8.84	0.71	10.79	0.13	0.06	0.12
822	12.368	96.540	51	8.073	0.31	0.01	1.95	0.31	0.08	0.11
822	12.368	96.540	34	8.068	0.61	0.02	3.38	0.15	0.44	0.49
822	12.368	96.540	25	8.076	0.36	0.00	3.61	0.06	0.78	0.65
822	12.368	96.540	4	8.109	0.26	0.00	4.91	0.06	0.16	0.13
823	12.379	96.629	500	7.495	33.82	2.49	46.99	0.05		
823	12.379	96.629	401	7.500	33.29	2.50	41.63	0.06		
823	12.379	96.629	300	7.504	32.77	2.42	37.82	0.02		
823	12.379	96.629	199	7.516	30.17	2.36	35.92	0.05		
823	12.379	96.629	149	7.541	29.01	2.27	33.52	0.07	0.00	0.04
823	12.379	96.629	98	7.762	16.70	1.36	18.15	0.06	0.02	0.05
823	12.379	96.629	76	7.908	8.74	0.72	9.55	0.10	0.08	0.14
823	12.379	96.629	49	8.052	0.87	0.10	2.41	0.45	0.21	0.30
823	12.379	96.629	25	8.082	0.20	0.00	2.27	0.03	0.28	0.32
823	12.379	96.629	5	8.119	0.12	0.00	4.04	0.05	0.18	0.18

Station	Lat N	Lon E	Depth (m)	pH	nitrate (μmol/l)	phosphate (μmol/l)	silicate (μmol/l)	nitrite (μmol/l)	Chlorophyll a (μg/l)	Phaeophytin (μg/l)
860	10.363	96.344	999	7.506	34.58	2.67	78.46	0.06		
860	10.363	96.344	750	7.505	33.53	2.56	66.43	0.07		
860	10.363	96.344	500	7.498	32.25	2.50	49.27	0.04		
860	10.363	96.344	400	7.498	31.74	2.45	43.06	0.08		
860	10.363	96.344	300	7.494	30.71	2.39	38.91	0.08		
860	10.363	96.344	200	7.517	29.59	2.27	34.12	0.06		
860	10.363	96.344	101	7.704	16.10	1.24	15.27	0.09	0.03	0.09
860	10.363	96.344	75	7.853	11.80	0.92	10.63	0.13	0.09	0.37
860	10.363	96.344	50	8.017	2.32	0.23	2.43	0.30	0.39	0.63
860	10.363	96.344	37	8.043	1.24	0.14	3.26	0.32	0.64	0.84
860	10.363	96.344	25	8.080	0.51	0.01	2.66	0.10	0.31	0.32
860	10.363	96.344	5	8.095	0.41	0.00	2.66	0.06	0.16	0.07
861	10.370	96.545	495	7.488	33.68	2.50	47.43	0.06		
861	10.370	96.545	401	7.491	32.43	2.46	43.26	0.06		
861	10.370	96.545	300	7.498	32.42	2.42	39.21	0.08		
861	10.370	96.545	203	7.522	30.54	2.29	34.28	0.07		
861	10.370	96.545	148	7.591	27.11	2.04	27.86	0.07		
861	10.370	96.545	100	7.742	17.28	1.39	16.10	0.12		
861	10.370	96.545	75	7.949	1.94	0.55	5.53	0.18		
861	10.370	96.545	65	8.016	0.99	0.28	2.97	0.26		
861	10.370	96.545	50	8.068	0.27	0.06	1.75	0.20		
861	10.370	96.545	25	8.094	0.53	0.00	1.87	0.08		
861	10.370	96.545	5	8.100	0.33	0.00	2.72	0.00		
865	10.379	97.451	92	7.807	15.46	1.21	17.69	0.14	0.12	0.18
865	10.379	97.451	76	7.829	13.90	1.13	16.43	0.12	0.11	0.25
865	10.379	97.451	52	7.945	7.55	0.60	9.18	0.33	0.27	0.35
865	10.379	97.451	47	8.007	3.74	0.31	5.37	0.38	0.36	0.43
865	10.379	97.451	27	8.072	0.21	0.01	1.79	0.09	0.28	0.28
865	10.379	97.451	5	8.091	0.39	0.00	2.07	0.06	0.13	0.09
867	10.345	98.268	26	8.039	0.56	0.13	5.68	0.33	1.29	1.04
867	10.345	98.268	6	8.064	0.18	0.08	4.62	0.09	0.62	0.48

