REPORTS ON SURVEYS WITH THE R/V "DR. FRIDTJOF NANSEN"

A SURVEY OF THE FISH RESOURCES OF BURMA, SEPTEMBER - NOVEMBER 1979

by

Odd Nakken[x)] and Sann Aung[xx)]

x) Institute of Marine Research, Bergen
xx) Peoples Pearl and Fisheries Corporation, Rangoon

March 1980

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1. INTRODUCTION

According to an agreement between the government of Burma, The United Nations Food and Agricultural Organization (FAO) and the Norwegian agency for development aid (NORAD) the fishery research vessel "Dr. Fridtjof Nansen" ~~will~~ is to undertake two surveys of the Burmese waters. The first survey was carried out between 25 September and 18 October 1979, the second will take place in March - April 1980. An analysis of the results from both surveys will be presented in June 1980. The present report is a presentation of processed data and preliminary results from September - November 1979. The following scientific personell participated:

Institute of Marine Research, Bergen	Peoples Pearl and Fisheries Corporation, Rangoon
O. Nakken (Cruiseleader)	Sann Aung (Teamleader)
S. Brattås	Soe Tin
J. Maude	Myo Aung
K. Strømsnes	
	Department of Fisheries, Rangoon
	Sein Lwin
	The Burmese Navy
	Sann Muint

The FAO-teamleader Mr. Davidson Thomas, joined the vessel between 23 October and 2 November.

The above staff took part in observational work and carried out analysis and processing of observations to the extent ~~which it could be done~~ possible onboard the vessel. Further evaluation of the observations and preparation of the present report was done at the Institute of Marine Research, Bergen.

The figures are drawn by K. Strømsnes and modified for reduction by A. Raknes.

2. MATERIALS AND METHODS

2.1 Vessel and equipment

The R/V "Dr. Fridtjof Nansen" is a 150-foot stern trawler with a main engine of 1500 horsepower. The vessel is equipped for acoustic surveying, bottom- and midwater trawling, hydrography and plankton observations.

The acoustic equipment consisted of two scientific sounders (120 and 38 kHz), two echointegrators, a searchlight sonar (18 kHz) and a netsonde (50 kHz). The bottom trawl was a high opening shrimp trawl, 1800 meshes (40 mm mesh size) in circumference, the lengths of headline and groundrope being 96 feet and 63 feet respectively. The pelagic trawl was 1600 meshes (200 mm mesh size) in circumference, with four equal panels (sides), particularly designed for catching small pelagic fish. Both trawls had a small meshed inner-net of meshsize 1 cm in the codends.

Hydrographic observations were carried out with Nansen bottles with which temperature readings and samples for salinity and oxygen determinations were collected at standard depths. The salinity was determined with an inductive salinometer and dissolved oxygen by the Winkler method.

2.2. Operation of the acoustic instruments

Each of the two echosounders was operated in conjunction with one echointegrator and the two acoustic systems had the following settings:

	38 kHz	120 kHz
Basic range	0-100 or 0-250	0-100
Transmitter	Ext. (10/1)	1/1
Bandwidth and pulselength	Narrow, 0.6 m sec	Narrow, 0.6 m sec
TVG and gain	20 log R - 20 dB	20 log R - 0 dB
Recorder gain	4	3
Integrator treshold	8	8

	38 kHz	120 kHz
Integrator gain	20 (x 10)	20 (x 10)
Depth intervals (according to bottom depths)	4-25 and 25-bottom 4-50 and 50-bottom 4-100 and 100-bottom	4-25 and 25-bottom 4-50 and 50-bottom

The sonar was running continuously at basic ranges 2000 or 1250 m, sweeping 60 degrees to each side. The gain settings of the sonar were adjusted according to the reverberation conditions in the water masses.

2.3 Sampling and processing of acoustic data

Continuous watch was kept on the acoustic systems and whenever the echo recordings changed ~~its~~ their characteristics, trawling was carried out for identification and biological sampling purposes. The outputs of the echointegrators were grouped in four types of recordings - pelagic fish, demersal fish, mesopelagic fish and plankton - according to the trace patterns on the echogram and the composition of the trawl catches. Average values over 5 nautical mile distances were calculated for each type of recording and plotted in maps, and arithmetic mean values were made within each 30 x 30 nautical mile square. An echo abundance index for each square was calculated by multiplying the mean integrator output with the area of the square. Echo abundance indices for any area can now easily be arrived at by summation.

The number of sonar contacts for each 5 nautical mile sailing distance were noted in the acoustic log and plotted in maps together with the visual surface spottings.

During the first days of operation, a checking procedure was carried out in order to secure reliable and adequate sampling of acoustic data. This work resulted in the system settings given above, and in addition it was decided that the echo integrator outputs from the 120 kHz system should be used to obtain indices of echo abundance of fish. The reason for this is explained by the observations given in the following table which shows corresponding echointegrator

outputs at 38 and 120 kHz for different types of scattering layers:

Frequency	Scattering layer of small pelagic fish									
38	29	37	45	69	140	34	150	157	48	108
120	27	26	30	50	114	41	98	119	17	106

	Scattering layer of planktonic organisms						
38	8	9	12	33	31	28	33
120	1	2	2	4	3	3	4

These observations show that the two systems gave almost equal outputs ($M_{120} \approx 0.8\ M_{38}$) as long as the recordings consisted of small pelagic fish, while plankton layers contributed much more to the 38 kHz system than to the 120 kHz system. Consequently, even moderate concentrations of plankton would mask weak fish echoes in the 38 kHz system; a feature which was frequently observed throughout the survey. The echo abundance indices of fish were therefore calculated from the 120 kHz data which were much less influenced and biased by planktonic scattering. It is believed that the observed frequency differences were caused by resonance scattering phenomena, but neither the identity nor the size distribution of the planktonic scatterers is known.

2.4 Sampling and processing of biological data

All catches were sorted into species to the extent which time permitted, and measurements of total length (cm below) were collected for the predominant species. Weight and maturity observations were also made for selected species. Many samples were preserved in formaldehyde or frozen for later analyses at PPFC as well as for scientific and processing/ marketing purposes.

3. RESULTS

3.1 Description of work

The area of operation was covered twice and the coverages during the two cruises are shown in Figs. 1 and 2 (a and b).

During the first cruise the operations started at the Burma - Bangladesh border in the north, and the area was covered with transects approximately 30 nautical miles apart south to the border between Burma and Thailand. The transects started approximately at the 15 m contour counterline and had a maximum seaward extension of 110 nautical miles. Seven hydrographic sections were worked, three off Arakan, two in the Delta area and two off the Tenasserim coast. A total of 70 trawl stations were carried out for sampling and identification purposes.

During the second cruise the effort was concentrated within areas which on cruise no. 1 were found to be of particular interest concerning fish distribution and abundance. Thus, along at the Arakan coast most of the work was done in the areas off Sandoway and further south; in the Delta area the areas with bottom depths between 15 and 80-100 m were extensively surveyed, as ~~so~~ were also the nearshore areas off Tavoy; and finally, exploratory fishing with bottom trawl was conducted at the deep water trawling ground off the Tenasserim coast. No hydrographic observations were made during the second cruise, but a total of 97 trawl stations were carried out. The results will to a large extent be considered areawise; the Burma waters being divided into three subareas:

1. The Arakan coast, North of 16° N
2. The Delta area, Between 14° N and 16° N
3. The Tenasserim coast, South of 14° N.

3.2 Hydrography (Figs. 3,4 and 5)

Fig. 3 shows the salinity distribution at ~~in~~ 5 m depth. The salinities in the upper layer were particularly low in the Delta region where the large Irrawaddy and Salween rivers have their outlets. Northward along the Arakan coast the

surface layer salinity increased gradually. The salinity distributions in Figs. 3 and 4 ~~are~~ thus ~~leaving~~ give the impression of a low-salinity coastal current flowing to the west in the Delta area and bending northward along the Arakan coast; the current being maintained by the freshwater influx to the Delta area.

The upper 75 m of the entire area was characterized by temperatures between 27 and 30°C, by salinities lower than 34 o/oo and oxygen contents between 4.0 and 5.0 ml/l ~~within the entire area~~. Below 75 m the temperature and the oxygen content decreased rapidly with depth. Off Arakan the oxygen content was observed to have a minimum between 150 and 300 m and values below 0.2 ml/l were observed here. Further south, in the Andaman sea, the lowest oxygen contents (just below 0.7 ml/l) were observed at depths of 200 m or more and no distinct intermediate minimum were found.

In most of the sections, and particularly in the Delta areas (section IV and V), the oxygen isolines showed a tendency to run parallel to the bottom at depths between 50 and 100 m. Even small changes in the direction of the isolines, for instance related to seasonal changes in the dynamic stability of the water masses, may thus lead to large variations in oxygen content over vast bottom areas.

3.3 Surface observations and sonar contacts

The visual observations made at the surface are summarized in Fig. 6 together with the sonar contacts.

Off Arakan observations of whales (probably sperm whale) were made during both cruises. Dolphins were observed far offshore at the southern Tenasserim coast during cruise no. 1, and during the second cruise a very large school was sighted at approximately 16° N. The observations of tunalike fishes include both tunas, larger carangiids and Spanish mackerels, and it is believed that perhaps Spanish mackerels were most frequently observed.

During cruise no. 1 some rather weak sonar contacts were obtained in the open ocean off the Arakan coast. These echoes were probably caused by schools of flying fish. None of the schools could be observed on the echosounder and small schools of flying fish "took off" when the vessel approached the targets.

The visual observations of small pelagic fish included sardinella, mackerel (Rastrellinger sp.) and scads (Decapterus sp.). Although anchovies probably made up the larger portion of the pelagic fish biomass, and most of the sonar echoes originated from anchovies both in the areas off Arakan and off Tavoy, schools of anchovies were probably ~~scarcely~~ seldom sighted at the surface as the individuals in the surface schools mostly appeared to be considerably larger than most of the anchovies within the area.

3.4. Bottom conditions.

Fig. 7 shows the bottom conditions as observed along the cruisetracks by the 38 kHz echosounder. Bottom type 1 is suitable for all kind of bottomtrawls, while on bottom type 2 only trawls with bobbins can be operated successfully. The bottom types 3 and 4 do not permit bottom trawling at all.

Off Arakan, the slope was too steep and the slope bottom too rough to permit bottom trawling at depths greater than 120 - 150 m. This was also experienced in the north and western parts of the Andaman Sea, while south of 13° N the bottom trawl was operated successfully down to 450 - 500 m depth in an area with even and ~~smoothly~~ steeping bottom at depths between 200 and 500 m (Fig. 7b). This area was limited by a steep slope to the west, starting at depths between 450 and 500m, and a ribbon of very rough bottom to the east at depths between 200 and 300 m. The observations (Fig. 7b) ~~were~~ thus indicating a large deep water trawling ground from 13° N and southward, probably extending to the south beyond Burmese waters.

In many places, particularly off Arakan, isolated small rocks or mud volcanoes were observed in areas with even flat bottom. These irregularities were detected by the sonar, and during bottom trawling the sonar was ~~therefore~~ frequently used to map the bottom conditions ahead of the vessel in order to avoid gear damage.

3.5. Distribution and abundance of pelagic fish.

Figs. 8 and 9 show the distributions of echointegrator values originating from pelagic fish. In Fig. 8 the values in brackets are either taken from the other cruise or interpolated, in order to be able to work out abundance indices for the entire coast for both coverages.

3.5.1 The Arakan coast.

During both cruises recordings of pelagic fish were obtained along the coast south of Cheduba Island ($18^{o}40'$ N). Further north recordings were scarce. The fish - mainly anchovies (Stolephorus sp.), juvenile sardinella and mackerel - ~~was~~ were observed in small schools and scattering layers in 0 - 30 m depths over bottom depths between 20 and 60 m. The schools were quite small and gave no significant sonar echoes. ~~In~~ Fig. 9a ~~is~~ presented the distribution of pelagic fish observed during the second cruise. The highest densities were found off the southern part of the Arakan coast and the seaward extension was limited to 12 - 15 nautical miles. At the outer parts of the continental shelf and/or further seawards no recordings of pelagic fish were made during any of the two cruises.

The catch rates of pelagic fish were low. ~~In~~ With pelagic trawl the best catch rate off Arakan was 450 kg/hour, the catch consisting of a mixture of Indian anchovy and ilisha. One bottom trawl haul showed a catch of 800 kg/hour of moustached thryssa ~~in mixture~~ mixed with demersal species, but on ~~an~~ average the catch rates of pelagic fish were less than 150 kg/hour ~~in~~ with pelagic trawl and less than 75 kg/hour in the bottom trawl hauls (Table 1).

Length distributions of the pelagic species are given in Table 2.

3.5.2 The Delta and Tenasserim areas.

During both cruises a dense scattering layer was observed at 50 - 90 m depths over bottom depths of 80 - 110 m in the Delta area. The layer, which ascended to the surface at dusk, was mainly composed of small squids, juvenile lantern fish and small pelagic shrimps, and "common" pelagic fish species contributed only insignificantly to the recordings. Isolated and small concentrations of anchovies and sardines were observed at several localities in the Delta area between the 20 and 50 m contour lines. Further offshore the pelagic fish recordings were scarce and originated from small schools of scad (Decapterus sp.) and mackerel.

During the first cruise very dense concentrations of pelagic fish were observed within a limited nearshore area off Tavoy at bottom depths between 20 and 50 m. The fish, mainly anchovies, sardinella and mackerel, were recorded as dense schools from the surface down to 20 - 30 m depth. Some of the schools were excellent sonar targets and were recorded at ranges of 1500 - 2000 m. The largest were estimated to amount to several hundred tons of fish. During the second cruise the recordings in this area were considerably more scattered. This might partly have been caused by a northward migration between the two coverages, as indicated by the high density patch at 14° N (Fig. 9b), and partly by the pelagic fish being distributed more close to the bottom during the last coverage when a bottom trawl haul in the area gave a catch rate of 10 tons per hour of anchovies (Thryssa sp.).

Further southward along the coast of Tenasserim, recordings of pelagic fish were scarce and scattered. During cruise no. 1 some small schools of scad (Decapterus sp.) were observed in offshore areas. In the near shore areas, surface schools of tunalike fish were quite frequent south of 12° N (Fig. 6a).

On an average the catch rates of pelagic fish were low, both in the pelagic and in the bottom trawl hauls, less than 40 kg

per hour in the Delta area and less than 70 kg per hour along the Tenasserim coast (Tables 4 and 7).

Length distributions of pelagic fish in the Delta and Tenasserim areas are given in Tables 5 and 6, 8 and 9.

3.6. Distribution and abundance of demersal fish.

Figs. 10 and 11 show the distributions of echo integrator values originating from demersal fish. The values in brackets ~~are~~ were arrived at in the same way as for pelagic fish.

Tables 1, 4 and 7 present average catch per hour trawling of each fish family (or group) according to depth in the ~~3~~ three areas.

3.6.1 The Arakan coast (Fig. 11a, Table 1).

Echo recordings of demersal fish were limited to waters with bottom depths shallower than 50 m. In deeper waters echo traces indicating demersal fish were ~~scarcely~~ seldom observed and the bottom trawl catches were quite low (Table 1). The increased catch in the depth statum 76 - 150 m in Table 1 ~~were~~ was mainly caused by one haul on the northern border of the area which amounted to 470 kg/hour. The mean value over four ~~4~~ hauls - excluding the highest - amounted to 55 kg/hour, a figure which fits better in with the values obtained both in the deeper and shallower depth slices. Thus, both the echo-recordings and the catches indicated that the highest concentrations of demersal fish were found in the nearshore shallow water areas and that the densities ~~were~~ became quickly reduced with increasing depth or distance from the shore.

The composition of the catches is given in Table 1. Grunts (Pomadasyidae), pomfrets (Stromateidae) and croakers (Sciaenidae) made up the bulk of the food fishes in the catches, but also ponyfishes (Leiognathidae) and sharks and rays contributed largely. The length distributions (Table 3) show that smallsized fish were predominant both for grunts and croakers.

3.6.2 The Delta area (Fig. 11b, Table 4).

Comparing the two distribution maps in Fig. 11 it may look as if the recordings of demersal fish in the Delta area were more scattered than off the Arakan coast. The main difference between the integrator outputs in the two areas was that the Arakan coast was characterized by relatively high concentrations within a few limited areas, while in the Delta region the demersal fish recordings represented by "medium" integrator outputs 5 - 15 mm/n.mil covered considerably larger areas, thus resulting in higher indices of total abundance of fish. This was also reflected in the trawl catches with bottom trawl (Table 4), which showed considerably higher values than those experienced off the Arakan coast, particularly within the depth zones deeper than 26 m. The predominant species in the catches were croakers, sharks and rays and polenemus, while ponyfish and grunts contributed much less than off Arakan. Length distributions of the fish are given in Tables 5 and 6.

3.6.3 The Tenasserim coast (Figs. 11b and Table 7).

The observations indicated that the densities of demersal fish along the Tenasserim coast were considerably less than in the Delta area. The bulk of the catches in bottom trawl hauls was ponyfish (Table 7), while croakers, grunts, snappers and other quality fishes were caught in much less quantities than in the two other subareas. However, the coverage within the large landlocked areas of the Tenasserim coast were poor during both surveys, and the results arrived at with "Dr. Fridtjof Nansen" may not reflect the true picture in the many fjords and straits in the area. The Crocodile fish (Peristedion weluri) were observed in many catches between 150 and 300 m, but the average catch rate of 140 kg/hour in Table 7 was mainly contributed to by one large haul.

Length distributions of the fish are shown in Tables 8 and 9.

3.7 Crustaceans

3.7.1 Shrimps in shallow waters.

Off the Arakan coast the catches of shrimps were strictly limited to nearshore shallow waters. The best catch rate recorded was 70 kg/hour at 15 m depth just north of Sandoway. The shrimp catches decreased rapidly with depth and distance from the coast and at 25 - 30 m bottom depth the catch rates were between 0 and 10 kg/hour. An intensively trawled area near Sandoway gave an average catch rate of 13 kg/hour. For the total Arakan coast the average was 17 kg/hour within the depth zone 10 - 25 m (Table 1).

In the Delta area the average catch rates were higher within all depth zones than off Arakan (Table 4). But here the shrimp catches in the shallow water areas - less than 75 m bottom depth - were dominated by small sized white shrimps which have little or no commercial value, and catch rates up to 150 kg/hour of these animals were experienced. In the one deep water haul (Table 4) made within this area the catch composition was similar to the observations made in corresponding depths off Tenasserim.

The catch rates of shrimps in shallow waters off Tenasserim showed a similar trend as off Arakan; a marked decrease with depth and distance from the coast (Table 7).

3.7.2 Deep sea shrimps and lobster (Puerulus sewellii).

As mentioned previously, a number of trawl hauls were carried out on a deep water trawling ground off the Tenasserim coast. The average catch rates obtained are presented in the last three columns in Table 7. Both deep sea lobster and shrimps were present in most of the hauls, and the best catches occured at bottom depths between 260 and 330 m; the maximum catch rates being 28 kg/hour of lobster and 150 kg/hour of shrimps. Both the size and quality of the shrimps appeared to be commercially acceptable. The deep sea lobster varied considerably in length (Table 11) and the length distribution had two distinct modes. A number of the largest lobsters (> 13 cm) were ovigerous females.

3.8 Biomass of fish.

Preliminary estimates of fish biomass were worked out on the basis of the acoustic observations and the catch rates with the bottom trawl.

3.8.1 Acoustic estimates.

Indices of echoabundance were calculated for each subarea with the following results:

Indices of echoabundance (mm. m.m.^{2})

	PEL. FISH		DEM. FISH	
AREA	CR. 1	CR. 2	CR. 1	CR. 2
Arakan	29 300	78 800	28 200	36 500
Delta	77 400	83 300	34 600	49 300
Tenasserim	62 600	36 500	33 700	39 100
Total	169 300	198 600	96 500	124 900

In order to convert these indices to fish biomass they must be multiplied with a conversion factor, C, which is dependent on the characteristics of the acoustic equipment and the scattering properties of the fish. For the 38 kHz system onboard "Dr. Fridtjof Nansen" BLINDHEIM et.al. (1980) have used C = 8 tonnes/mm n.m.^{2} for fish which were 40 cm in length and weighing 1.0 kg. When considering the 120 kHz system, this corresponds to a C-value of 10 tonnes/mm n.m.^{2} according to the relation obtained between the outputs of the two systems during the setting-up procedure.

Now, since the scattering cross section of fish increases proportionally to length squared, and weight of fish increases proportional to the cube of the length, the scattering cross-section per unit weight decreases linearly with length. Adopting the above mentioned value for C, this gives:

$$C = 10 \frac{L}{40} = \frac{L}{4} \qquad \text{(tonnes/mm nm}^2\text{)}$$

where L is mesured in cm.

The length frequency distributions (Tables 2, 3, 5, 6 and 8, 9) show large variations in length ranges, but it appears that most of both the pelagic and demersal specimens were small sized. Choosing an overall average length of pelagic

fish to be 8 cm and the corresponding value for demersal fish to be 16 cm this lead to:

C (pel) = 2 tonnes/mm nm^2 and C (dem) = 4 tonnes/mm nm^2

When these factors were multiplied with the total abundance indices from cruise no. 2 we arrived at the following estimates of biomass:

Pelagic fish biomass = 400 000 tonnes
Demersal fish biomass = 500 000 tonnes

These estimates should be considered as a first approximation and used with utmost care. They are, as we have seen, extremely sensitive to lenght variations and more data on species composition and lenght distribution are needed in order to increase the confidence in the results.

Most probably both estimates are too low. Due to the near bottom dead zone of the echo sounder - 0.5 to 1.0 m within most of the area - an unknown quantity of demersal fish was not recorded by the echo sounder. The larger pelagic species were recorded only to a minor extent, and the surface schools of small pelagics were not included in the estimate. It should also be kept in mind that, particularly in the Delta area and at the coast of Tenasserim, large shallow water and landlocked areas were not covered by the survey.

2.8.2 Estimates based on catch rates.

The catch rates in bottom trawl hauls showed large variations and although the number of hauls was quite high, their distribution cannot be considered even enough to allow for estimating an of biomass from catch rates for the entire coast. However, both within a limited area off Sandoway at the Arakan coast, and in the Delta area, the conditions for a reasonable estimate based on observed catch rates were fulfilled.

The Sandoway area extended 40 nautical miles along the coast from 18° N to 18°40' N between bottom depths of 15

and 35 m, the average seaward extension thus being approximately 18 nautical miles.

The Delta area extends 40 nautical miles in the north-south direction, extending from 95° E to 97° E, thus being 120 nautical mile long. The bottom depths varied from 20 to 90 m.

The details of the calculation are summarized below.

Area	nm^2	Number of hauls	Average catch rates kg/hour	Swept area (nm^2)	Density tonnes/ nm^2	Biomass tonnes
Sandoway	700	12	420	0.03	13.2	9000
Delta	5000	27	530	0.03	17.1	85000

The groundrope of the bottom trawl was 21 m long and it is assummed that the trawl was 18,5 m wide in the opening (this corresponds to 0.01 nautical miles). It is further assumed that all fish in front of the trawl opening were caught, and that the distance covered during one hour was 3 nautical miles. As the standard trawling speed was 2.9 - 3.2 knots this last assumption probably holds good.

The estimates of biomass arrived at represent the total catch composition in the bottom trawl hauls, which also include some pelagic species. But Tables 1 and 4 show that these contributions were low.

The two areas investigated represent only a small fraction of the total shelf waters of Burma, and it is difficult to judge wether the results support those arrived at from the acoustic data or not. Bearing in mind that the acoustic estimate amounts to 500 000 tonnes of demersal fish within the total investigated area, the amount of 85 000 tonnes within the Delta area appears to be a bit low.

It should be noted that these numbers includes all species and sizegroups, and that more observations on species and

length compositions within the different areas are needed in order to arrive at more reliable estimates of biomass, as well as estimates of possible yield. A more detailed analysis and discussion of stock sizes and potential yields will be undertaken after the spring survey in March - April.

LITTERATURE

BLINDHEIM, J., de BRUIN, G.H.P. and SÆTERSDAL, G. 1980. A survey of the coastal fish resources of Sri Lanka, April - June 1979. Report no. II. Reports on Surveys with the R/V "Dr. Fridtjof Nansen". Bergen, February 1980.

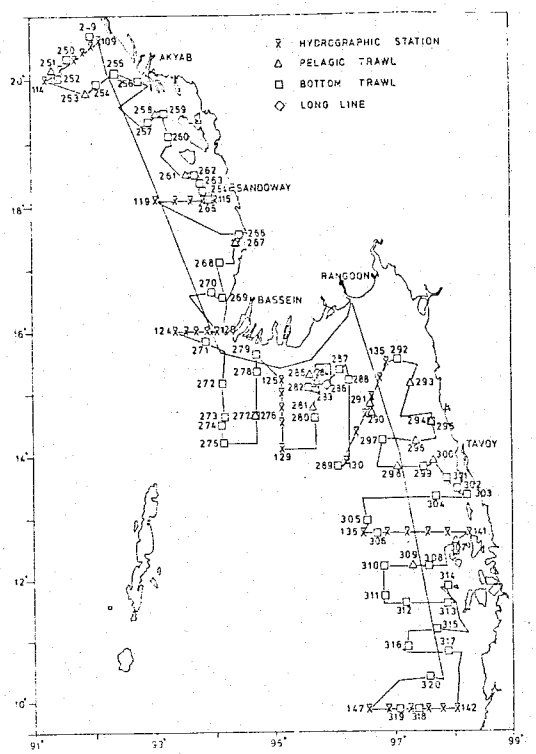

Fig. 1. Survey routes and stations 25 Sep - 18 Oct 1979.

Fig. 2. Survey routes and stations 23 Oct - 18 Nov 1979.
a) Arakan b) Delta and Tennasserim.

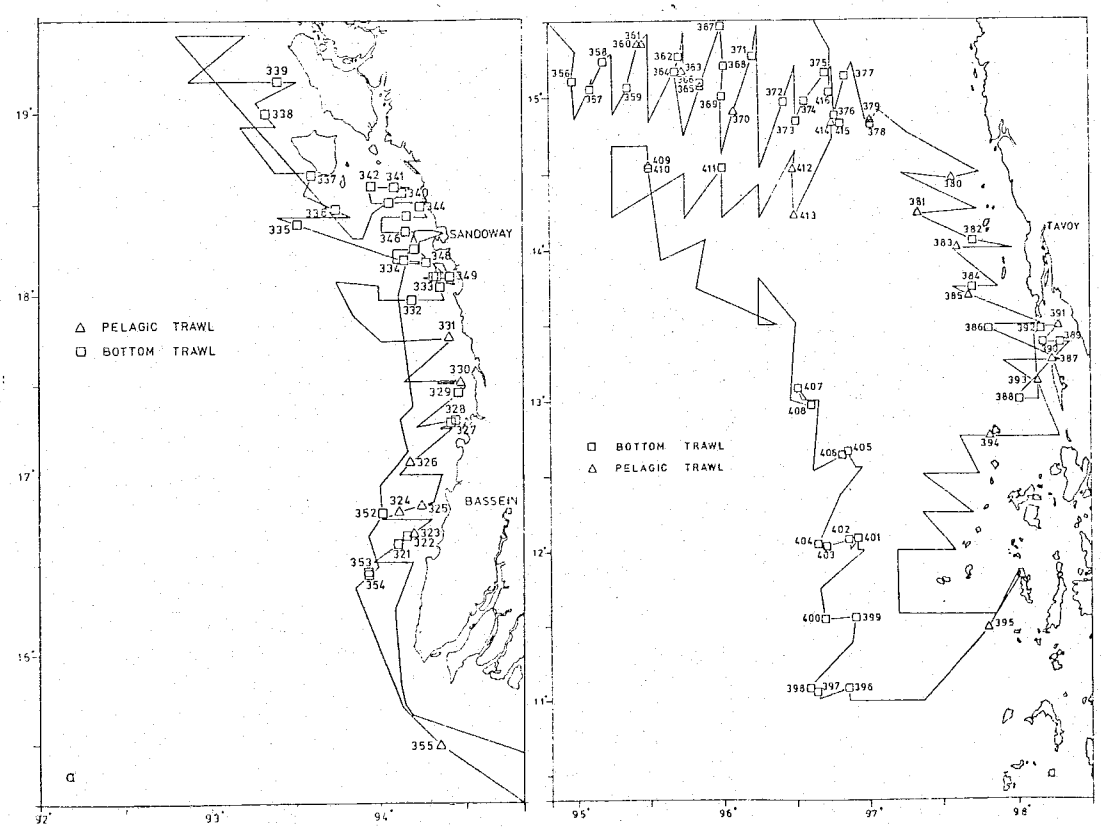

Fig. 3. Distribution of salinity (o/oo) at 5 m ~~depth~~ 25 Sep - 18 Oct 1979.

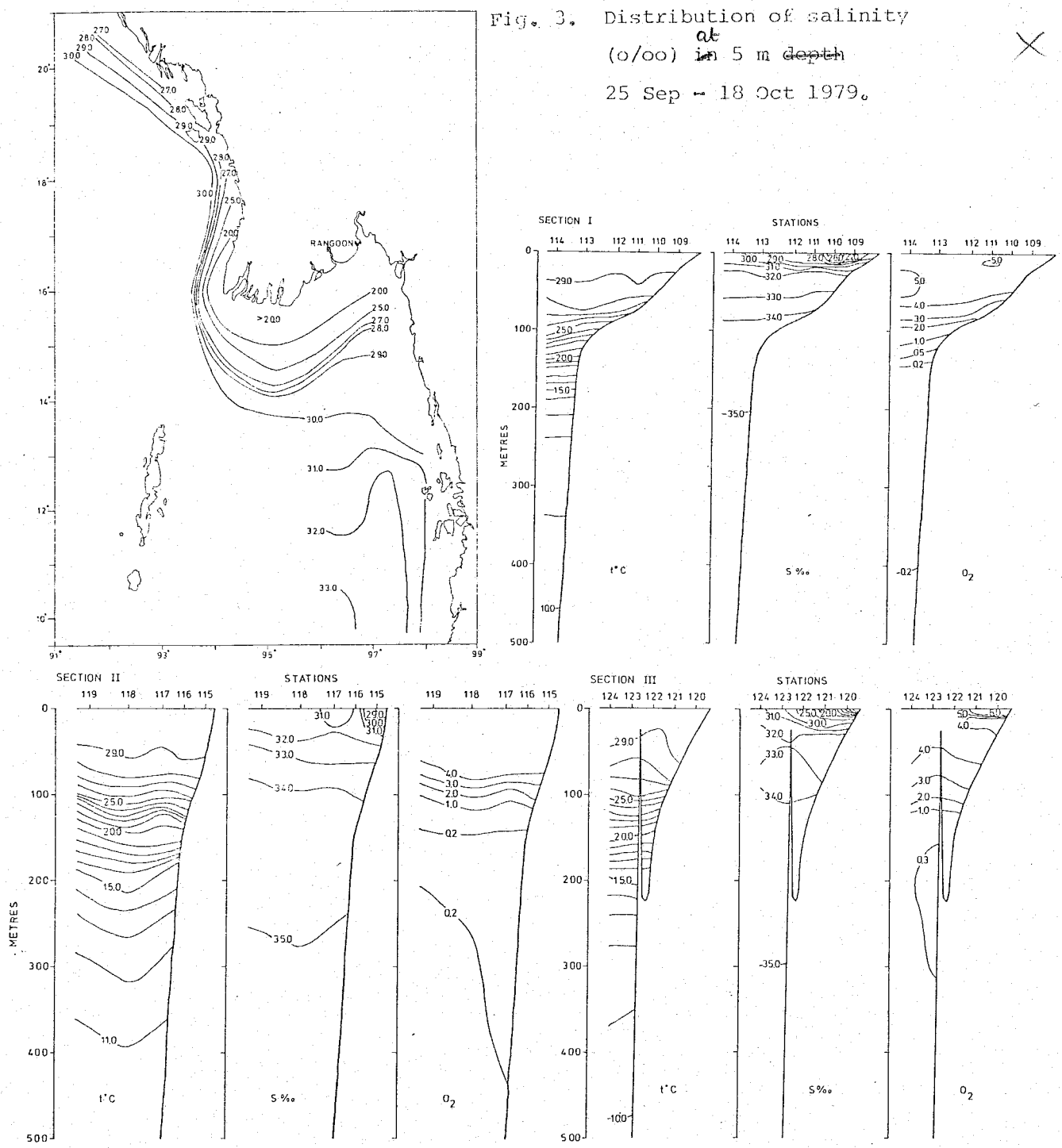

Fig. 4. Distribution of temperature (t°C), salinity (o/oo) and oxygen (ml/l) in three sections of the Arakan coast 25 Sep - 18 Oct 1979.
I) Off Akyab II) Off Sandoway III) Off Bassein

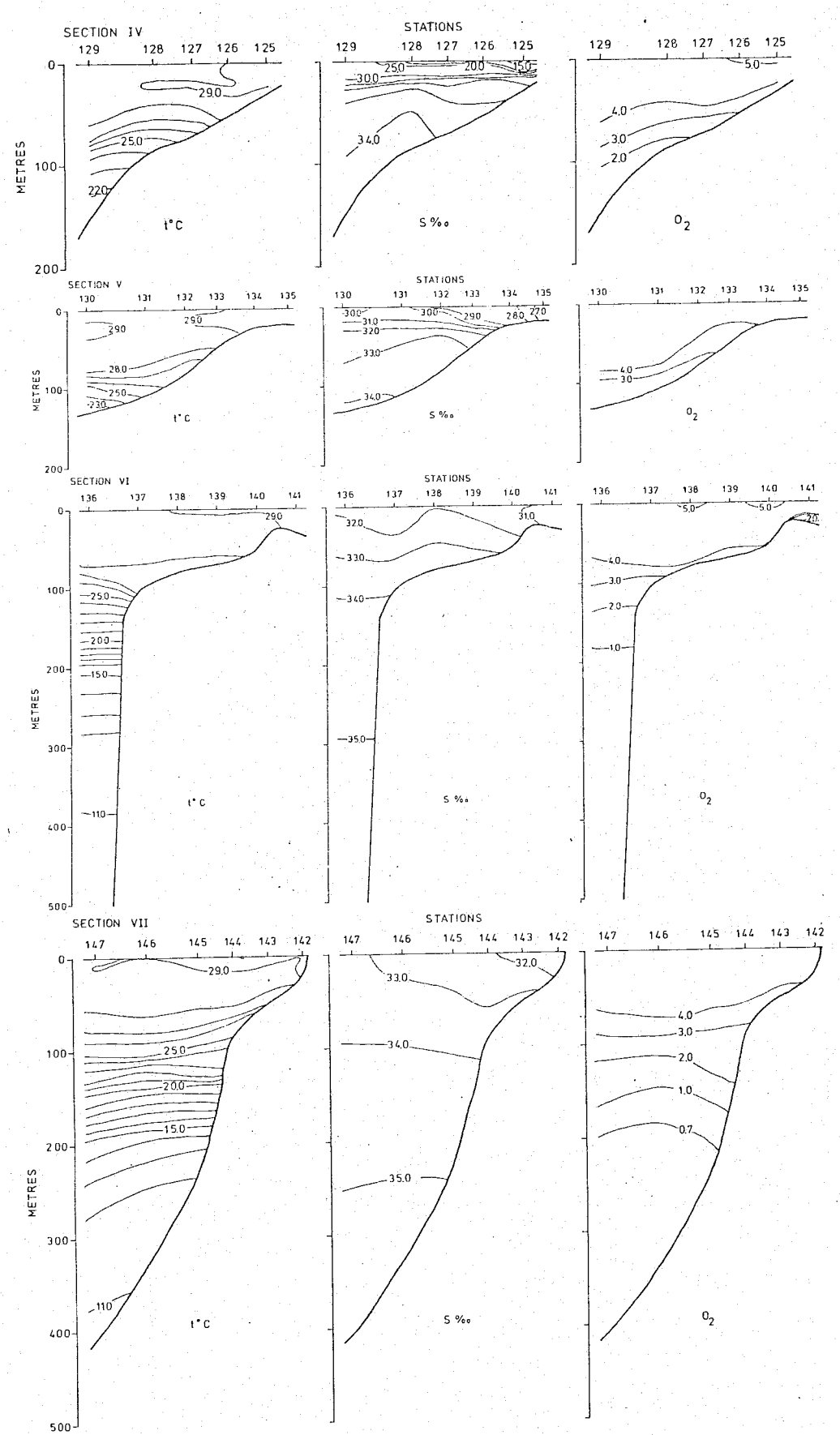

Fig. 5. Distribution of temperature ($t^{o}C$), salinity (o/oo) and oxygen in the Delta and Tenasserim areas 25 Sep – 18 Oct 1979.

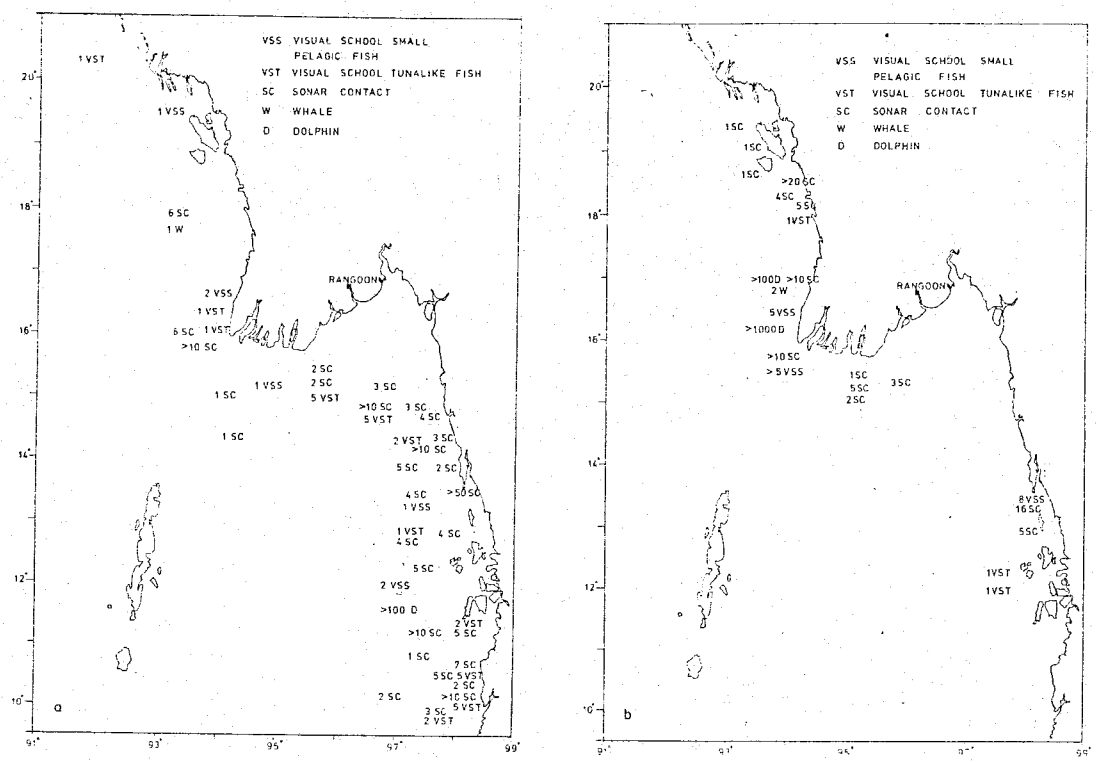

Fig. 6. Surface spotting and sonar contacts.
a) 25 Sep - 18 Oct 1979, b) 23 Oct - 18 Nov 1979.

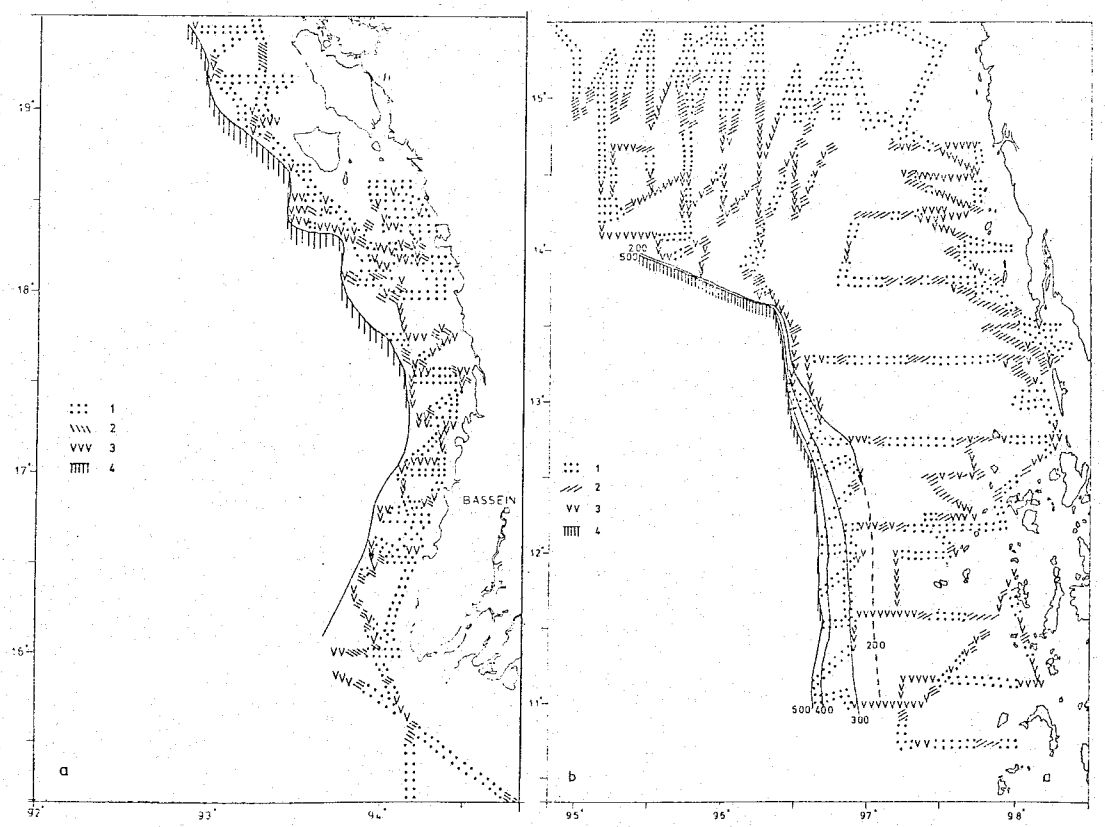

Fig. 7. Bottom conditions. a) Arakan area b) Delta and Tennasserim areas. 1. Even flat bottom, 2. Uneven bottom, 3. Very rough bottom, 4. Steep slope.

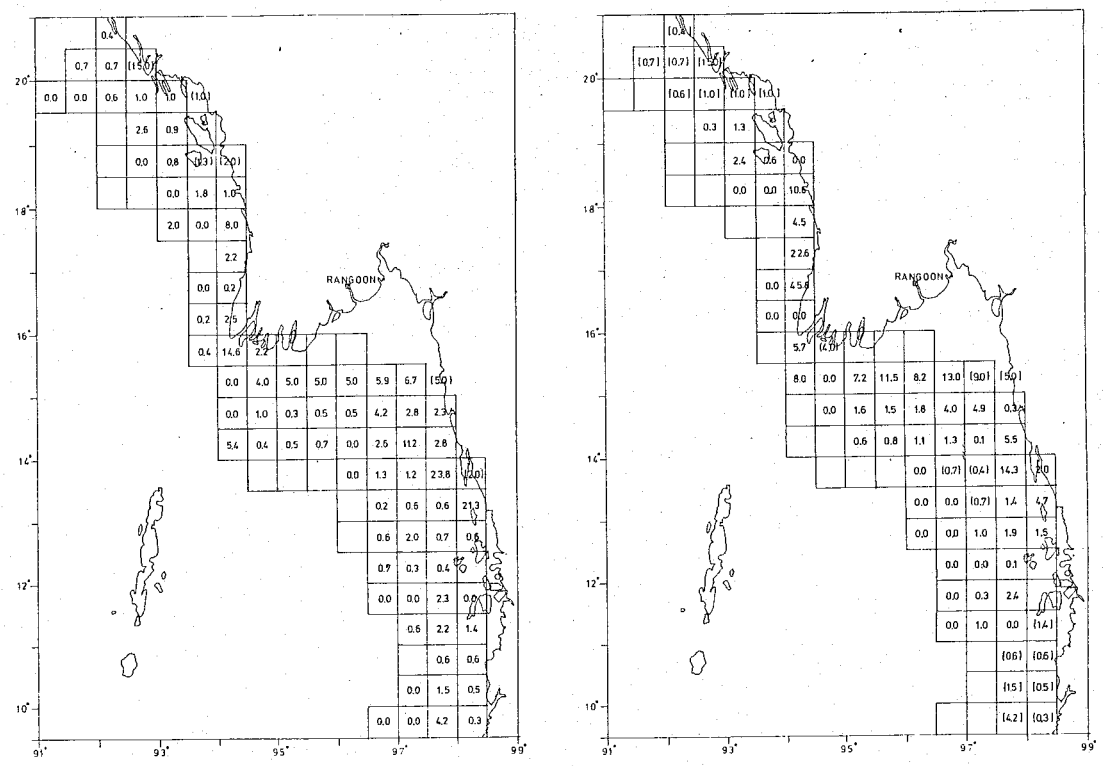

Fig. 8. Pelagic fish. Average integrator outputs (mm/nm) within half degree squares. a) 25 Sep - 18 Oct, b) 23 Oct - 18 Nov.

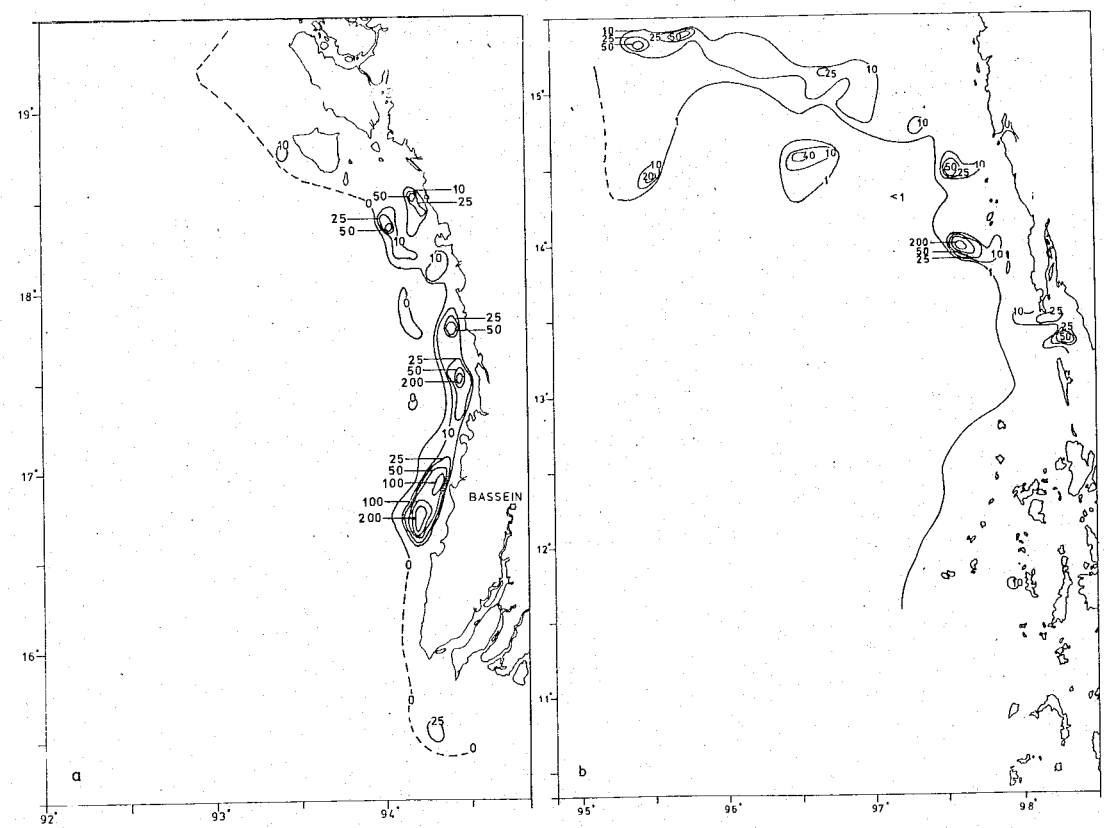

Fig. 9. Pelagic fish. Distribution of integrator outputs (mm/nm) originating from pelagic fish 23 Oct - 18 Nov.
a) Arakan b) Delta and Tenasserim.

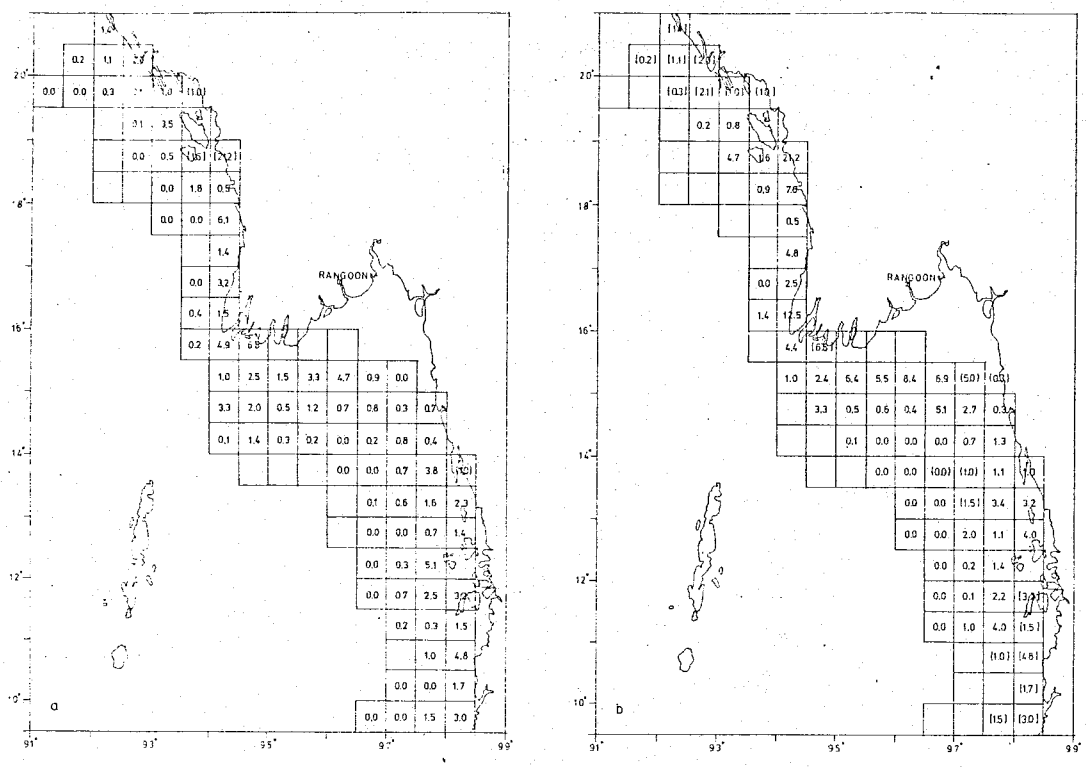

Fig. 10. Demersal fish. Average integrator outputs (mm/nm) within half degree squares.
a) 25 Sept - 18 Oct, b) 23 Oct - 18 Nov.

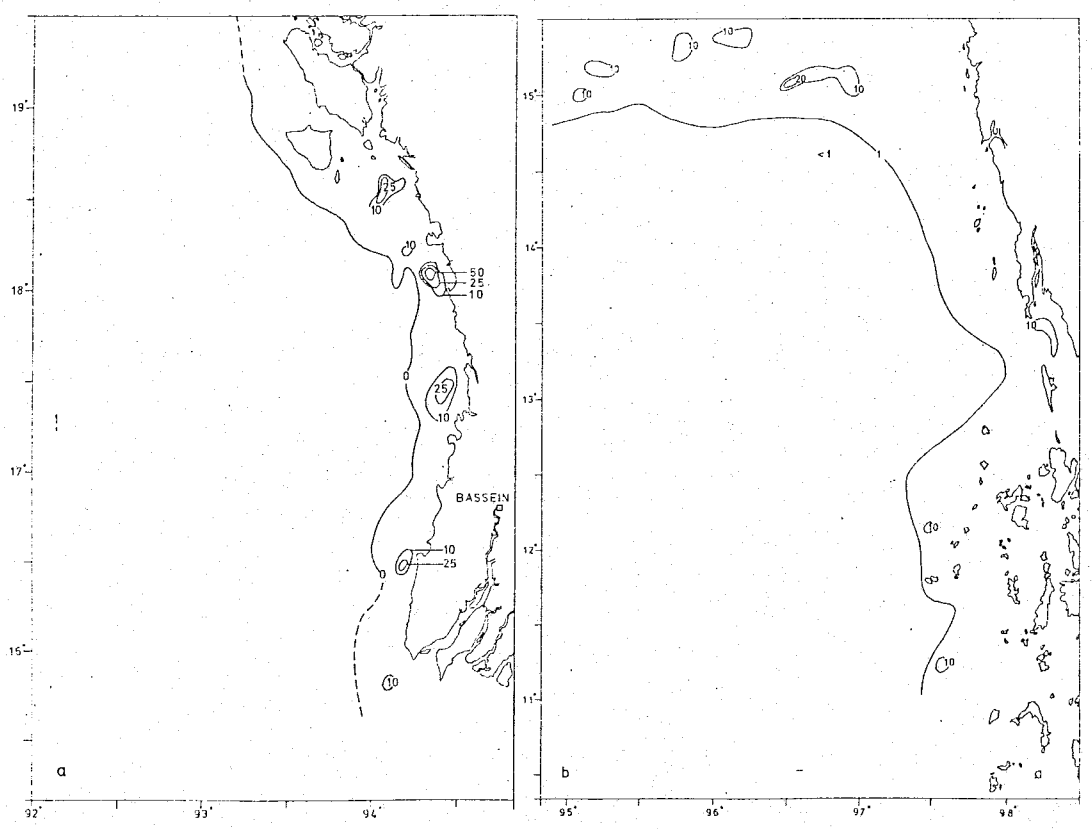

Fig. 11. Demersal fish. Distribution of integrator outputs (mm/nm) originating from demersal fish 23 Oct - 18 Nov.
a) Arakan area, b) Delta and Tenasserim areas.

TABLE 1. Average catchrates (kg per hour) in bottom trawl. Arakan coast.

FAMILY	DEPTH IN METRES 10-25	26-50	51-75	76-150	151-250	251-350	351-500
ARIIDAE	9	2		1			
CARANGIDAE	8	6	4	31			
CLUPEIDAE	38	9					
ENGRAULIDAE	1	1					
LEIOGNATHIDAE	59	35	6	< 1			
LUTJANIDAE	4	8	18				
MULLIDAE	4	8	1	1			
MURAENESOCIDAE	8	4					
NEMIPTERDAE	2	3	8	8			
POLYNEMIDAE	5						
POMADASYIDAE	98	49		5			
SCIAENIDAE	36	50		4			
SCOMBRIDAE	12	15	2	3			
STROMATEIDAE	62	2			1	189	
SYNODIDAE	4	8	6	10	< 1		
TRICHIURIDAE	4	14	< 1	< 1			
SHARKS/RAYS	62	1		3			
SHRIMPS	17	4	< 1	< 1	< 1	6	
PUERULUS SEWELLI							
BROTULIDAE					< 1	2	
CHLOROPHTHALMIDAE						14	
GEMPYLIDAE						58	
MYCTOPHIDAE					< 1		
PERISTEDIDAE							
MOLLUSC						28	
MISCELLANEOUS	38	43	21	70	12	35	
TOTAL	471	x 262	67	138	16	332	
NUMBER OF HAULS	9	x 19	4	5	2	2	

x One haul yielding 16 tons per hour trawling of CLUPEIDAE, ENGRAULIDAE, POMADASYIDAE, SCIAENIDAE and TRICHIURIDAE is excluded. This haul will rise the total average catch with approximately 800 kg pr hour.

Y

Arakan

TABLE 2. Length frequency distributions

Species	Length in cm																	N
	≤ 5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 ≥		
Decapterus maruadsi (Round scad)	1	4	8	1				3	17	24	16	5	1					80
Dussumieria acuta (Rainbow sardine)		5	117	100	56	25	34	8	2	13	60	70	45	30	11	2		578
Opisthopterus tardoore (Tardoore)		14	13	15	13	38	40	39	16	15	18	11	12	12	7	6		269
Sardinella brachysoma (Deepbody sardinella)				1	4				22	74	69	9	1					180
Sardinella gibbosa (Gold striped sardinella)	2	4	58	307	183	28				7	22	6						617
Stolephorus bataviensis (Batavian anchovy)	75	24	11	1														111
Stolephorus indicus (Indian anchovy)	193	212	67	6			7	7										492
Thryssa mystay (Moustached thryssa)					9		3	10	21	7	4	1	1					56
Upeneus sulphureus (Yellow goatfish)								1	26	20	24	14	4	7	1			97
Deepsea fishes																		
Epinnula orientalis (Snake mackerel)										3	4	4	14	4	7	14		50
Centrolophus niger												4	24	14	7	1		50

Arakan

TABLE 3. Length frequency distributions

Species	Length in cm																	N
	≤ 5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85 ≥	
Carangoides chrysophrys (Longnose cavalla)	26																	26
Ilisha elongata (Elongate ilisha)	347	80	21	114	142	16												770
Ilisha melastoma (Indian ilisha)		13	40															53
Lactarius lactarius (False trevally)	77	383	98	38	33	2												631
Lutjanus sanguineus (Blood snapper)								2	1	4	6	3						16
Lutjanus argentimaculatus (Mangrove red snapper)								1				1	1					3
Nemipterus japonicus (Japanese threadfin bream)		17	157	23	2													199
Nempiterus nematophorus (Doublewhip threadfin bream)		128	55	1														184
Pomadysis hasta (Lined silvered grunt)	158	935	365	33	23	84	19	36	11	4								1668
Atrobucca nibe (Black mouth craker)	2	18	91	71	180	19	4											385
Johnius belangerii (Belangers croaker)	12	31	44	1														88
Otholites ruber (Tiger-toothed croaker)	9	9	21	8	13	13	16	7	9	5								110
Pennahia macrophthalmus (Bigeyed croaker)	7	99	41	4														151
Rastrelliger kanagurta (Indian mackerel)	230	16	3	4														253
Scomberomarus guttatus (Indo-pacific Spanish mackerel)					1	10	7	22	14	7	3							64
Pampus argenteus (Sliver pomfret)			3	33	39	2												77

TABLE 4. Average catch rates (kg per hour) in bottom trawl. Delta area.

FAMILY	DEPTH IN METRES 10-25	26-50	51-75	76-150	151-250	251-350	351-500
ARIIDAE	22	34	13	15			
CARANGIDAE	1	6	7	1			
CLUPEIDAE	3	10	4	1			
ENGRAULIDAE	31	5	8	<1			
LEIOGNATHIDAE		25	2	3			
LUTJANIDAE		5	66	9			
MULLIDAE		11	3	6			
MURAENESOCIDAE	27	26	54	6			
NEMIPTERDAE		15	7	11			
POLYNEMIDAE	123	14	<1				
POMADASYIDAE		8	3				
SCIAENIDAE	124	135	36	14			
SCOMBRIDAE		7		5			
STROMATEIDAE	1	10	9	<1			
SYNODIDAE		9	2	8			
TRICHIURIDAE	33	38	21	11			
SHARKS/RAYS	73	124	48	6			
SHRIMPS	77	56	26	5		44	
PUERULUS SEWELLI						6	
BROTULIDAE						12	
CHLOROPHTHALMIDAE						33	
GEMPYLIDAE						6	
MYCTOPHIDAE						8	
PERISTEDIDAE							
MOLLUSC							
MISCELLANEOUS	57	130	17	38		33	
TOTAL	572	668	327	140		142	
NUMBER OF HAULS	7	12	8	7	0	1	

Delta

TABLE 5. Length frequency distributions

Species	Length in cm																	N
	≤ 5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 ≥		
Decapterus maruadsi (Round scad)											2	15	19	13	5			54
Dussumieria acuta (Rainbow sardine)		5	15															20
Opisthopterus tardoore (Tardoore)								2	9	8	19	7	4	3	2			54
Sardinella gibbosa (Gold striped sardinella)	11	13	33	11	2	3				2	15	22	14	4				130
Stolephorus indicus (Indian anchovy)	33	13	13	17	11													87
Thrissina baelama (Baelama anchovy)	2	4	6	12	7	4	9	2	3	2	1							52
Thryssa mystax (Moustached thryssa)			3	6		48	21	2										80
Upeneus moluccensis (Goldband goat fish)						1	8	9	23	20	21	18	10	4				114

Delta

TABLE 6. Length frequency distributions

Species	Length in cm																	N
	≤ 5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85 ≥	
Carangoides chrysophrys (Longnose cavalla)		3	175	74	1													253
Ilisha elongata (Elongate ilisha)	1	3	13	36														53
Ilisha melastoma (Indian ilisha)	26	2																28
Lactarius lactarius (False trevally)	38	65	2															105
Lutjanus sanguineus (Blood snapper)										3	3	1						7
Lutjanus argentimaculatus (Mangrove red snapper)								1		7	4	4	1					16
Lutjanus johnii (John's snapper)									5	51	42	2						100
Nemipterus japonicus (Japanese threadfin bream)	19	139	122	52	10													342
Nemipterus nematophorus (Doublewhip threadfin bream)		151	95	7														253
Polynemus indicus (Threadfin)			4		23	8	21	6	10	23	15	13	4	3	13	7	14	164
Pomadysis hasta (Lined silver grunt)						7	4											11
Atrobucca nibe (Black mouth croaker)	3	9	5	6		1												24
Chrysochir aureus (Reeve's croaker)	6	29	52	55	68	152	431	7										800
Otolithes ruber (Tiger-toothed croaker)						1	26	1										28
Pennahia macrocephalus (Big-head pennah croaker)		3	30	31														64
Pennahia macrophthalmus (Bigeye croaker)	5	22	46	27														100
Rastrelliger kanagurta (Indian mackerel)	1	11	40	63														115
Scomberomarus guttatus (Indo-Pacific Spanish mackerel)					1	3	29	18	1									52
Pampus argentus (Silver pomfret)			18	101	147	34												300
Formio niger (Black pomfret)				5	5	5												15

TABLE 7. Average catch rates (kg per hour) in bottom trawl. Tenasserim coast.

FAMILY	DEPTH IN METRES 10-25	26-50	51-75	76-150	151-250	251-350	351-500
ARIIDAE	20	7	11				
CARANGIDAE	19	10	12	14			
CLUPEIDAE	29	2	<1				
ENGRAULIDAE	x34	<1					
LEIOGNATHIDAE	166	22	6				
LUTJANIDAE	1	2	21				
MULLIDAE	14	16	20	3			
MURAENESOCIDAE	13	9	2				
NEMIPTERDAE	6	16	31	4			
POLYNEMIDAE	11	1					
POMADASYIDAE	32	8	10	15			
SCIAENIDAE	39	28	29	71			
SCOMBRIDAE	6	1	4				
STROMATEIDAE	6	1			<1	30	5
SYNODIDAE	7	3	14	2	87		
TRICHIURIDAE	21	9	4	8			
SHARKS/RAYS	22	21	3		29	4	13
SHRIMPS	19	2	3		7	50	24
PUERULUS SEWELLI					6	13	4
BROTULIDAE					8	2	1
CHLOROPHTHALMIDAE						34	33
GEMPYLIDAE					1	7	4
MYCTOPHIDAE					11	13	3
PERISTEDIDAE					140	18	2
MOLLUSC MISCELLANEOUS	91	23	40	59	28	34	24
TOTAL	x556	182	211	176	318	206	113
NUMBER OF HAULS	x5	8	6	2	3	12	6

xOne haul which yielded 10 tons per hour trawling, mainly ENGRAULIDAE, is omitted.

Tenasserim

TABLE 8. Length frequency distributions

Species	Length in cm																	N
	≤ 5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 ≥		
Alepes oljeddaba (Djeddaba crevalle)										1	1	1	5	18	8	6		40
Decapterus maruadsi (Round scad)	37	7								9	42	42	2					139
Dussumieria acuta (Rainbow sardine)				6	19	69	33	26	74	40	11	6	1	1				256
Sardinella gibbosa (Gold striped sardinella)				3	6	7	20	8	2									46
Stolephorus indicus (Indian anchovy)	2	29	107	95	27													260
Thryssa dussumieria	142	63	13	15	13	17	3		1									267
Deep sea fishes																		
Epinnula orientalis (Snake mackerel)											2	10	11	16	17	53		109
Chlorophalmus agassizi								1	3	18	39	39	56	61	41	49		307
Palinurichthys sp.										8	12	50	28	4				102
Cubiceps natalensis						10	23	21	42	17	22	32	9					176
Puerulus sewelli (Deepsea lobster)	15	59	54	109	183	258	71	110	165	171	143	122	104	88	42	12		1706

Tenasserim

TABLE 9. Length frequency distributions

Species	Length in cm																		N
	≤ 5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85 ≥		
Carangoides chrysophrys (Longnose cavalla)	22	42	32	15	2														113
Ilisha elongata (Elongate ilisha)	110																		110
Ilisha melastoma (Indian ilisha)	4	23	7	3															37
Lactarius lactarius (False trevally)	11																		11
Lutjanus sanguineus (Blood snapper)										3	5	3							11
Lutjanus argentimaculatus (Mangrove red snapper)								1	1	3	4	3							12
Nemipterus japonicus (Japanese threadfin bream)	8	114	258	53	7														440
Polynemus indicus (Threadfin)															2	1	1		4
Pomadysis hasta (Lined silver grunt)	1	106	17	26	17	28	24												219
Atrobucca nibe (Black mouth croaker)	3	29	138	43	1	1													215
Pennahia macrocephalus (Big-head pennah croaker)		22	49	25															96
Pennahia macrophthalmus (Big eye croaker)	4	12	18	11															45
Scomberomarus guttatus (Indo-Pacific spanish mackerel)						1	4	8	1	2									16
Formio niger (Black pomfret)				19	33	2	1												55
Deep sea fish																			
Peristedion weberi (Crocodile fish)				3	1	5	12	14	20	19	3								77

TABLE 10. Average catch rates (kg per hour) in bottom trawl. Whole Burma coast.

FAMILY	DEPTH IN METRES 10-25	26-50	51-75	76-150	151-250	251-350	351-500
ARIIDAE	16	13	9	1			
CARANGIDAE	8	7	8	13			
CLUPEIDAE	24	8	2	<1			
ENGRAULIDAE	19	2	4	<1			
LEIOGNATHIDAE	65	29	4	2			
LUTJANIDAE	2	6	40	4			
MULLIDAE	5	11	8	4			
MURAENESOCIDAE	16	12	24	3			
NEMIPTERDAE	2	10	15	9			
POLYNEMIDAE	46	5	<1				
POMADASYIDAE	50	28	5	4			
SCIAENIDAE	67	72	26	19			
SCOMBRIDAE	7	10	2	4			
STROMATEIDAE	28	5	4	<1	<1	49	5
SYNODIDAE	3	7	7	8	52		
TRICHIURIDAE	18	20	11	7			
SHARKS/RAYS	56	43	22	4	18	3	14
SHRIMPS	38	20	12	3	4	44	24
PUERULUS SEWELLI					4	10	3
BROTULIDAE					<1	3	1
CHLOROPHTHALMIDAE					5	31	33
GEMPYLIDAE					1	16	4
MYCTOPHIDAE					6	11	3
PERISTEDIDAE					84	14	2
MOLLUSC						4	
MISCELLANEOUS	93	66	26	52	22	34	24
TOTAL	563	374	230	140	198	219	113
NUMBER OF HAULS	21	39	18	14	5	15	6

NB. The two biggest hauls (10 and 16 tons/hour) are not included.

TABLE 11. Length-weight relationships. Mean length (cm) and weight (kg) of samples.

Scomberomorus guttatus			Scomberomorus commerson			Pampus argenteus			Otolithes ruber			Chrysochir aureus			Pomadysis hasta					
n	T.L cm	Wt. kg	n	T.L cm	Wt. kg	n	T.L cm	Wt. kg	n	T.L cm	Wt. kg	n	T.L cm	Wt. kg	n	T.L cm	Wt. kg	n	T.L cm	Wt. kg
1	30	0.20	1	65	1.90	1	21	0.14	1	29	0.31	1	19	0.06	14	10	0.023	2	47	1.460
1	31	0.25	1	70	2.00	3	22	0.20	1	30	0.33	2	20	0.08	16	11	0.025	1	48	1.400
2	32	0.25	2	71	1.80	1	23	0.19	1	31	0.35	1	22	0.10	33	12	0.036	1	49	1.500
2	33	0.25	1	73	2.15	2	24	0.24	1	32	0.45	1	23	0.10	50	13	0.045	1	50	1.750
1	34	0.30	1	77	3.05	1	25	0.24	1	33	0.42	2	25	0.16	26	14	0.059	2	52	1.850
2	35	0.35	1	79	2.70	2	26	0.31	1	34	0.53	1	28	0.20	16	15	0.070	1	59	2.000
1	36	0.30	1	85	4.45	3	28	0.38	4	35	0.55	1	29	0.23	12	16	0.092	1	62	2.300
2	37	0.35	1	88	4.30	1	29	0.43	7	36	0.59	3	30	0.28	8	17	0.110			
2	38	0.40	1	193	4.50	2	30	0.54	6	37	0.61	2	31	0.36	5	18	0.126			
2	39	0.44	1	100	5.20	1	31	0.48	4	38	0.66	1	32	0.35	2	24	0.210			
1	41	0.46	1	110	8.00				3	39	0.78	1	33	0.40	3	25	0.266			
2	42	0.55	1	116	9.60				2	40	0.70	6	34	0.40	1	26	0.290			
5	43	0.56							3	41	0.83	9	35	0.50	5	27	0.340			
4	44	0.55							2	42	0.84	12	36	0.53	3	28	0.375			
5	45	0.63							4	43	0.98	10	37	0.56	1	29	0.380			
4	46	0.58							3	44	0.94	12	38	0.57	5	30	0.428			
1	47	0.67							2	45	1.07	9	39	0.57	6	31	0.468			
5	48	0.73										3	40	0.67	2	32	0.540			
2	49	0.66										1	41	0.75	7	33	0.545			
3	50	0.90										1	42	0.80	8	34	0.585			
1	51	1.00										1	45	0.85	9	35	0.639			
1	52	0.86													8	36	0.715			
2	53	1.13													3	37	0.747			
2	55	1.10													2	38	0.940			
1	58	1.20													1	39	0.860			
															1	40	1.000			
															4	41	0.970			
															2	42	1.115			
															2	43	1.180			
															1	44	1.150			
															1	45	1.350			
															2	46	1.300			
57			13			17			46			80			268			1336		

Puerulus sewelli		
n	T.L	Wt.
42	6	0,0045
50	7	0.0062
92	8	0.0086
159	9	0.0161
217	10	0.0170
42	11	0.0254
74	12	0.0323
126	13	0.0426
128	14	0.0501
107	15	0.0624
102	16	0.0821
83	17	0.1010
73	18	0.1179
34	19	0.1483
4	20	0.1500
5	21	0.1833

(TABLE 11. continued) Length-weight relationships. Mean length (cm) and weight (kg) of samples.

Lutjanus argentimaculatus			Lutjanus sanguineus			Lutjanus johnii			Lutjanus bohar			Lutjanus malabaricus			Polynemus indicus					
n	T·L cm	Wt. kg	n	T·L cm	Wt. kg	n	T·L cm	Wt. kg	n	T·L cm	Wt. kg	n	T·L cm	Wt. kg	n	T·L cm	Wt. kg	n	T·L cm	Wt. kg
1	44	1.30	1	36	0.65	1	47	1.30	1	50	2.20	1	38	0.70	1	16	0.04	1	80	4.26
1	45	1.60	2	44	1.20	1	84	1.50	1	51	2.40	2	39	0.80	1	19	0.09	4	81	4.32
1	46	1.30	2	47	1.40	4	50	1.80	3	53	2.40	1	41	0.80	2	21	0.09	3	82	4.16
3	50	1.80	1	50	1.90	8	51	1.90	3	55	2.50	1	42	1.00	1	26	0.18	2	84	4.70
1	51	1.80	1	51	1.70	8	52	2.00	2	56	2.60	2	52	1.90	1	27	0.19	2	85	4.75
4	53	2.00	4	52	1.85	14	53	2.10	3	57	2.90	1	53	1.90	3	28	0.18	2	86	5.25
1	54	1.90	2	53	1.95	11	54	2.30	1	58	3.10	1	56	2.30	1	46	0.90	2	87	5.36
2	55	2.20	1	54	2.40	11	55	2.30	1	59	3.00				1	51	1.20	1	90	5.30
2	57	2.80	3	55	2.40	20	56	2.40							3	52	1.21	1	94	6.20
1	58	3.00	2	56	2.28	8	57	2.60							2	54	1.35	1	98	6.50
1	59	2.50	4	57	2.50	5	58	2.70							2	55	1.45	1	106	13.10
1	60	3.10	5	58	2.45	6	59	2.70							1	56	1.50	2	110	13.10
3	62	3.10	4	59	2.85	3	60	2.80							4	57	1.50	1	117	14.90
4	63	3.40	4	60	3.05	1	61	2.90							1	59	1.50			
1	64	3.60	2	61	3.05	1	62	2.80							1	60	1.80			
1	65	4.30	6	62	3.10										1	61	1.70			
1	67	4.50	1	65	3.80										1	62	1.90			
1	69	4.30	1	68	4.50										3	63	1.96			
															1	64	2.10			
															1	65	2.20			
															1	67	2.40			
															1	68	2.40			
															2	69	2.48			
															2	70	2.60			
															1	72	2.65			
															1	74	3.10			
															1	76	3.20			
															1	78	3.60			
															2	79	3.85			
Tot.30			46			102			15			9						67		

A SURVEY OF THE MARINE FISH RESOURCES OF BURMA.

Table I. Record of fishing operations

Research Vessel: R/V DR. FRIDTJOF NANSEN.

BTR: Bottom trawl, PTR: Pelagic trawl, LL: Longline.

Date	Time Start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total Catch,kg)	Mean weight (kg)
27.9	1020	249	BTR	25	20-25	20°34'	92°10'	357.3	357.3	Carcharrhinidae(sharks) (70.0)	1.50
										Arius thalassinus(52.5)	0.20
										Rays(42.0)	1.60
										Pampus argenteus(35.0)	0.25
										Ilisha sp.(30.0)	0.08
										Ponnchia(26.4)	0.12
										Johnius (18.4)	0.70
27.9	1605	250	BTR	87	87-84	20°18'	91°44'	no catch	-	-	-
27.9	2030	251	PTR	140	0	20°05'	91°26'	1.1	2.2	Myctophids(1.0)	-
										Bregmaceros(0.1)	-
27.9	2320	252	BTR	154	154-151	20°02'	91°24'	½ litre	-	Fry and small shrimps	-
28.9	0540	253	PTR	500	50	19°45'	91°56'	0.5	1.0	Eel larvae	-
28.9	0900	254	BTR	115	115-132	19°54'	92°08'	312.0	468.0	Decapterus maruadsi (97.5)	0.06
										Priacanthus macracanthus(78.0)	0.04
										Small crabs(75.4)	-
										Saurida sp.(lizard fish)(29.9)	0.02
28.9	1300	255	BTR	35	39	20°07'	92°24'	210.5	421.0	Lepturacanthus savala(74.9)	-
										Atrobucca nibe(58.9)	0.29
										Ilisha sp. (18.2)	0.13
										Pomadasys hasta (13.1)	0.49
										Pampus argenteus(11.4)	0.44
28.9	1740	256	BTR	14	14-15	19°57'	92°48'	410.7	410.7	Pomadasys hasta(70.4)	0.17
										Sharks and rays(56.0)	2.24
										Atrobucca nibe(36.0)	0.17
										Johnius belangerii(27.6)	0.05
										Lutjanus argentimaculatus(22.6)	3.23
										Chrysochir aureus(21.0)	0.44
										Polynemus indicus(20.5)	20.50

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total Catch (kg)	Catch per hour(kg)	Dominant species(Total Catch,kg)	Mean weight (kg)
29.9	0635	257	BTR	76	76-74	19°18'	92°59'	102.2	201.4	Sphyraena longimarus(21.6)	0.18
										Argyreps spinifer(15.4)	0.37
										Nemipterus sp.(14.3)	1.19
										Pomadasys hasta(13.4)	0.08
29.9	0855	258	PTR	36	20	19°24'	93°03'	2 litre	4 litre	Fish fry (dominant sp.Myctophids)	-
29.9	1250	259	BTR	36	37-32	19°24'	93°13	0.3	0.3	Pentaprion longimanus(0.15)	0.02
										Gerres filamentosus(0.10)	0.03
29.9	1703	260	BTR	33	33	19°05'	93°18'	30.6	30.6	Lepturacanthus savala(6.8)	0.76
										Formio niger(4.6)	0.16
										Alepes djeddaba(4.4)	0.15
										Scomberomorous guttatum(3.9)	0.56
										Pony fishes(3.9)	0.01
30.9	0450	261	PTR	94-102	40	18°28'	93°37'	11.5	23.0	Bregmaceros macclellandi-fry(10.0)	-
										Barracuda(1.0)	0.20
30.9	0642	262	BTR	79	79-87	18°29'	93°38'	43.1	86.2	Scomberomorus commersonii(8.6)	2.87
										Sphyrhena obtusata(6.0)	2.00
										Rastrelliger kanagurta(5.6)	0.16
										Pentaprion longimanus(5.5)	0.02
										Scomberomorus guttatus(4.4)	0.88
30.9	1015	263	BTR	65	65-67	18°19'	93°49'	24.5	49.0	Lutjanus sanguineus(13.0)	3.25
										Pentaprion longimanus(5.1)	0.03
										Carangoides chrysophrys(3.3)	1.10
										Nemipterus japonicus(1.5)	0.07
30.9	1130	264	BTR	68	68-61	18°19'	93°47'	104.5	104.5	Pentaprion longimanus(31.0)	0.03
										Lutjanus sanguines(16.9)	1.88
										Nemipterus japonicus(12.4)	0.10
										Nemipterus nematophorus(8.8)	0.05
										Saurida tumbil (7.6)	0.19

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position		Total catch (kg)	Catch per hour(kg)	Dominant species(Total Catch,kg)	Mean weight
						Lat. N	Long E				
30.9	2236	265	BTR	39	39-37	18°05'	94°03'	33.3	66.6	Leiognathus sp.(7.0)	0.04
										Pomadasys hasta(6.2)	0.09
										Saurida tumbil(5.5)	0.13
										Sciaenids(4.4)	0.21
1.10	1625	266	BTR	35	35-32	17°31'	94°30'	87.1	237.4	Lutjanus argentimaculatus (15.6)	3.90
										Drepane punctata(14.7)	0.86
										Gazza minuta(7.4)	0.03
										Sphyraena barracuda(7.0)	1.16
1.10	1953	267	PTR	53	0	17°31'	94°27'	40.5	60.8	Stolephorus sp.(juvenile) (27.2)	-
										Dussumeria acuta(juvenile)(5.6)	-
2.10	0127	268	BTR	118	118-125	17°04'	94°18'	3.1	5.2	Sphyrna zygaena (1.0)	1.00
										Saurida sp.(0.8)	0.02
2.10	0632	269	BTR	32	32-33	16°38'	94°13'	211.9	429.0	Pomadasys hasta(46.2)	0.15
										Ilisha elongata(37.4)	0.15
										Lutjanus argentimaculatus(28.6)	3.58
										Congresox talabon(27.4)	2.74
2.10	1005	270	BTR	306	306-276	16°38'	93°59'	59.7	298.5	Mollusks (15.0)	-
										Centrolophus niger(13.1)	0.06
										Epinnula orientalis(11.6)	0.05
3.10	0302	271	BTR	70	70-76	15°49'	93°53'	39.6	87.9	Carangoides chrysophrys(9.4)	0.12
										Lutjanus bohar(7.5)	2.50
										Sharks(5.0)	2.50
										Pomadasys hasta(2.8)	0.22
3.10	0845	272	BTR	58	58-59	15°09'	94°11'	195.8	195.8	Lutjanus sanguineus(42.3)	2.82
										Pentaprion longimanus(27.0)	0.04
										Nemipterus japonicus(17.1)	0.14
										Carangoides chrysophrys(16.5)	0.19
										Scoliodon walbahmi(15.5)	1.72

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total Catch,kg)	Mean weight
3.10	1309	273	BTR	89	89-83	14°33'	94°13'	186.8	186.8	Pentaprion longimanus(18.3)	0.03
										Upeneus molluccensis(17.4)	0.05
										Lutjanus sanguineus (16.0)	2.67
										Carcharhinus sp.(15.3)	15.30
										Nemipterus japonicus(12.3)	0.08
3.10	1520	274	BTR	95	95-87	14°30'	94°10'	69.8	67.7	Leiognathus sp.(juvenile)(15.7)	-
										Pentaprion longimanus(6.9)	-
										Nemipterus nematophorus	0.07
3.10	1955	275	BTR	348	348-360	14°10'	94°18'	70.9	141.8	Chlorophthalmus agassizi(16.5)	0.11
										Shrimps(16.6)	-
										Cataetyx messieri(6.2)	-
4.10	0236	276	PTR	70	15	14°36'	94°45'	5.0	8.6	Bregmaceros larvae(5.0)	-
4.10	0345	277	BTR	72	72	14°36'	94°45'	68.0	68.0	Carangoides chrysophrys(15.8)	0.12
										Nemipterus nematophorus(9.7)	0.06
										Nemipterus japonicus(6.5)	0.12
										Saurida tumbil(5.6)	0.17
4.10	0823	278	BTR	34	34	15°18'	94°47'	233.0	465.9	Rays(110.0)	10.00
										Arius thalassomus(17.7)	0.80
4.10	1115	279	BTR	15	15-16	15°35'	94°46'	284.7	269.4	Rays(100.0)	25.00
										Arius venosus(31.9)	0.23
										Chrysochir aureus(23.8)	0.21
										Lepturacanthus savala(20.3)	0.07
5.10	0747	280	BTR	104	104-121	14°35'	95°43'	164.1	164.1	Lepturacanthus savala(30.4)	0.84
										Arioma indica(24.4)	0.06
										Rastrelliger kanagurta(24.0)	0.09
5.10	1033	281	PTR	107	85-100	14°42'	95°41'	no catch	-	-	-

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
5.10	1438	282	BTR	92	92	15°03'	95°40'	94.6	177.2	Pennahia macrocephalus(26.4)	0.02
										Lepturacanthus savala(20.0)	0.26
										Lutjanus argentimaculatus(9.4)	3.13
5.10	1735	283	PTR	92	60	15°05'	95°40'	no catch	-	-	-
5.10	1912	284	PTR	-	0	15°06'	95°38'	22.2	44.4	Lepturacanthus savala(10.4)	0.17
										Myctophids(7.2)(juvenile)	-
5.10	2130	285	PTR	30	10	15°17'	95°39'	96.9	581.4	Shrimps(39.0)	-
										Lepturacanthus savala(22.2)	0.14
										Sciaenids(11.7)	0.09
7.10	0500	286	LL	-	-	15°05'	95°57'	no catch	-	-	-
7.10	1038	287	BTR	20	20	15°20'	96°08'	396.4	744.2	Polynemus indicus(214.0)	1.00
										Chrysochir aureus(46.3)	0.72
										Harpadon nehereus(36.6)	-
7.10	1420	288	BTR	28	27	15°10'	96°19'	237.2	431.1	Chrysochir aureus(66.0)	0.51
										Polynemus indicus(46.2)	0.78
7.10	2320	289	BTR	156	164	13°47'	96°07'	321.6	565.4	Peritedion weberi(124.8)	0.26
										Saurida undosquamis(118.8)	0.07
8.10	0633	290	PTR	83	35	14°41'	96°36'	no catch	-	-	-
8.10	0938	291	PTR	53	38	14°50'	96°39'	105.6	105.6	Shrimps(36.0)	-
										Lepturacanthus savala(11.4)	0.13
										Lepturacanthus savala(juvenile)(10.2)	0.01
										Raconda russelliana(9.6)	0.04
										Scomberomorus guttatus(9.3)	3.10
8.10	1545	292	BTR	20	20	15°31'	97°06'	157.7	315.4	Harpadon nehereus(28.5)	0.08
										Chrysochir aureus(22.0)	0.88
										Arius chelatus (18.0)	3.60
										Harpadon nehereus(juvenile)(15.0)	0.01

(Table I. continued)

Date	Time Start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight (kg)
8.10	2055	293	PTR	22	0	15°06'	97°17'	156.8	315.7	Lepturacanthus savala(40.5)	0.05
										Harpadon nehereus(juvenile)(32.5)	-
										Harpadon nehereus (16.8)	0.02
9.10	0350	294	BTR	40	40-41	14°30'	94°41'	69.9	139.8	Pennahia macropthalmus(11.1)	0.14
										Psettodes erumei(7.8)	2.60
										Lepturacanthus savala(5.2)	
9.10	0500	295	PTR	39	23-18	14°31'	97°41'	64.7	129.4	Ilisha megaloptera(50.1)	0.01
										Stolephorus batavicnsis (6.6)	-
9.10	0928	296	PTR	45	0	14°12'	97°23'	1.0	2.0	All larvae form(1.0)	
										Rastrelliger	
										Sphryaena	
										Fisturelia	
										Sardinella	
9.10	1352	297	BTR	73	73	14°13'	96°51'	42.7	85.4	Rastrelliger kanagurta(10.0)	0.11
										Lutjanus sanguineus (7.7)	2.57
										Lethrinus sp.(3.8)	1.27
										Nemipterus sp.(3.0)	3.00
9.10	1930	298	PTR	84	80	13°48'	97°07'	54.2	54.2	Leiognathus elongatus(30.9)	-
										Dactyloptena orientalis(6.6)	0.08
9.10	2320	299	BTR	59	59	13°48'	97°31'	172.3	344.6	Atrobucca nibe(28.0)	0.08
										Nemipterus japonicus (19.6)	0.08
										Upeneus sulphurius(16.4)	0.04
10.10	0107	300	PTR	50	17-30	13°53'	97°42'	551.1	1181.0	Stolephorus indicus(juvenile)(369.6)	-
										Scoliodon sorrakonah (94.6)	2.15
										Scomberomorus commersonii(57.2)	5.20

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
10.10	0455	301	BTR	38	38	13°38'	97°55'	2102.7	4205.4	Jelly fish(2000.0)	-
										Nemipterus japonicus(35.8)	0.12
										Alepes djeddaba(16.8)	0.06
										Leiognathus sp.(14.7)	0.15
10.10	0734	302	BTR	22	22-23	13°27'	98°06'	139.2	278.4	Arius sp.(11.6)	0.77
										Carangoides malabarius(10.2)	0.10
										Pomadasys hasta(7.4)	0.09
										Scomberomorus guttatus(7.0)	1.00
10.10	0932	303	BTR	26	26-29	13°21'	98°13'	74.6	74.6	Leiognathus bindus(14.2)	-
										Aetomylaeus nichofii(11.0)	1.00
										Gazza minuta(9.8)	0.03
										Trichiurus lepturus (7.9)	0.61
10.10	1453	304	BTR	55	55-57	13°20	97°45'	186.7	130.0	Upeneus sulphurous(50.0)	-
										Carangoides malabaricus(19.7)	0.16
										Saurida tumbil (18.5)	0.17
										Nemipterus japonicus(18.3)	0.12
11.10	0635	305	BTR	341	341	12°56'	96°31'	104.4	169.6	Shrimps(16.4)	0.01
										Chlorophthalmus agassi(12.6)	0.04
										Ray(30.0)	30.00
11.10	0635	306	BTR	300	300-406	12°43'	96°468	667.2	380.0	Peristedion adeni(146.4)	1.02
										Cubiceps natalensis(114.4)	0.04
										Chlorophthalmus agassizi(97.6)	0.05
										Diaphus sp.(84.8)	-
11.10	2055	307	PTR	47	45	12°36'	98°03'	0.3	0.8	Fish larvae	-
										-Stolephorus	
										-Dussumieria	
										-Bregmaceros	
12.10	0157	308	BTR	77	77	12°12'	97°38'	150.1	310.7	Atrbucca nibe (69.0)	0.12
										Pomadasys opercularis(12.4)	3.10
										Lethrinus leutjanus(10.7)	1.78

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
12.10	0455	309	PTR	86	50-40	12°12'	97°20'	1.9	3.3	Fish larvae (1.4)	-
										-Bregmaceros	
										-Sardinella	
										-Eel larvae	
										-Horse mackerel larvae	
										Sphyraena obtusata(0.3)	0.05
12.10	0838	310	BTR	249	249-250	12°13'	96°51	281.5	281.5	Peristedion weberi(174.8)	0.69
										Synagrops sp. (27.6)	-
12.10	1310	311	BTR	277	277-276	11°41'	96°53'	75.9	75.9	Shrimps(21.9)	-
										Peristedion weberi(11.8)	0.79
										Palinurichthys sp.(11.1)	0.06
12.10	1843	312	BTR	203	203	11°37'	97°12'	52.7	108.9	Saurida undosquamis(24.0)	0.08
										Peristedion weberi(12.8)	0.58
										Squatina sp.(10.0)	5.00
12.10 } 13.10 }	2350	313	BTR	46	46	11°34'	97°50'	165.6	331.2	Atrobucca nibe (57.6)	0.13
										Pomadasys opercularis(16.0)	0.25
										Pentaprion longimanus(14.4)	0.03
										Leignathus equulus(11.2)	0.09
13.10	0400	314	BTR	47	49-47	11°50'	97°56'	85.0	145.6	Leiognathus equulus(33.0)	0.06
										Carangoides chrysphrys(7.5)	0.06
										Arius thalassinus(7.2)	0.48
14.10	1547	315	BTR	66	66-65	11°08'	97°45'	12.3	12.3	Lethrinus leutjanus(2.3)	0.46
										Lutjanus sanguineus(4.5)	4.50
										Rhynchobatus djeddensis(2.9)	2.90
14.10	2212	316	BTR	296	296	10°52'	97°14'	103.7	103.7	Puerulus sewelli(28.2)	0.04
										(Deep sea lobster)	
										Myctophid(22.5)	0.05
										Palinurichthys sp.(19.0)	0.04

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
15.10	0425	317	BTR	42	42-44	10°45'	97°55'	37.65	73.2	Leiognathus bindus (5.5)	0.05
										Upeneus sulphureus (3.3)	0.05
										Sharks (12.3)	2.50
15.10	1743	318	PTR	225	196-120	09°52'	97°21'	42.5	67.1	Myctophum(40.5)	-
										-Thysitoides marleyi	
										-Paralepidid	
15.10	2113	319	BTR	325	325-323	09°52'	97°05'	30.7	30.7	Puerulus sewelli(7.5)	0.03
										(Deep sea lobster)	
										Neoscopelus macrolepidotus(7.4)	0.01
										Palinnurichthys sp.(5.9)	0.06
16.10	1014	320	BTR	81	81-83	10°21'	97°37'	42.7	42.7	Decapterus maruadi(27.0)	0.26
										Saurida undosquamis(5.0)	0.04
										Triacanthodes sp. (4.4)	0.01
24.10	1553	321	BTR	55	55-63	16°36'	94°06'	55.6	104.3	Lutjanus sanguineus(15.7)	1.96
										Leiognathus sp.(12.0)	0.01
										Saurida tumbil(6.7)	0.18
24.10	1730	322	BTR	43	43-48	16°40'	94°10'	109.7	219.4	Scomberomorus commersoni(33.2)	2.21
										Lepturacantus savala(13.1)	0.40
										Leiognathus sp.(11.9)	0.01
24.10	1858	323	PTR	43	0	16°40'	94°11'	223.2	446.4	Ilisha elongata(young)(133.7)	0.03
										Stolephorus indicus(39.9)	0.03
24.10	2250	324	PTR	95	0	16°46	94°06'	12.6	25.1	Leiognathus sp.(juvernile)(5.0)	-
										Sphyraena obtusata(4.9)	0.06
25.10	0057	325	PTR	39	0	16°49'	94°16'	107.4	201.4	Stolephorus bataviensis(70.4)	-
										Sardinella sp.(28.8)	0.01
25.10	0550	326	PTR	83	45	17°04'	94°11'	0.1	0.2	Decapterus maruadsi(0.07)	0.01
25.10	0905	327	BTR	32	32-30	17°16'	94°27'	38.0	75.9	Leiognathus sp.(12.0)	-
										Saurida tumbil	0.16

(Table I.continued)

Date	Time Start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
25.10	1115	328	BTR	36	36-41	17°17'	94°27'	99.8	99.8	Pomadasys hasta(22.2) Sardinella gibbosa(14.1)	0.05 0.01
25.10	1518	329	BTR	48	48-55	17°28'	94°27'	147.1	147.1	Lutjanus sanguinaus(21.2) Saurida tumbil(13.6) Congresox talabonoides	2.65 0.17 5.20
25.10	1910	330	PTR	37	0	17°30'	94°29'	184.2	368.4	Stolephorus indicus(67.8) Ilisha elongata(62.4) Sardinella sp.(41.4)	- - 0.01
25.10) 26.10)	2400	331	PTR	42	0	17°45'	94°25'	160.5	321.0	Sardinella sp.(63.0) Caesio sp.(44.0)	0.04 0.14
26.10	0905	332	BTR	61	60	17°58'	94°12'	3.0	5.9	Scomberomorus guttatus(young)(3.0)	0.59
26.10	1139	333	BTR	28	28-30	18°02'	94°22'	956.6	1851.7	Otolithes ruber(281.0) Pomadasys hasta(243.8)	0.68 0.08
26.10	1437	334	BTR	38	38	18°11'	94°10'	219.7	399.5	Leiognathus splendeus(105.0)	0.01
26.10	2000	335	BTR	192	183	18°23'	93°31'	5.1	5.1	Arius thalassinus(2.4) Cubiceps sp.(0.90)	0.34 0.03
26.10	0115	336	BTR	48	48-45	18°28'	93°45'	63.0	118.1	Pentaprion longimanus(11.3) Saurida tumbil (9.5) Cuttle fish(young)(6.5)	0.02 0.15 -
27.10	0412	337	BTR	37	37-49	18°39'	93°37'	154.4	289.5	Atrobucca nibe(69.6) Pomadasys hasta(39.6)	0.12 0.10
27.10	0940	338	BTR	33	32	18°59'	93°20'	6.1	12.2	Pomadasys hasta(1.3) Shrimps(1.2) Leiognathus bindus(0.7)	0.65 0.01 0.02

(Table I. continued)

Date	Time Start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position LongE	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch, kg)	Mean weight
27.10	1334	339	BTR	23	23-19	19°10'	93°25'	128.1	240.1	Congresox tabalonoides(28.7)	3.58
										Sarninella brachysoma(23.7)	0.03
										Leiognathus sp.(20.1)	0.02
28.10	1050	340	BTR	14	14-18	18°38'	94°08'	313.3	626.5	Pampus argenteus(55.9)	0.25
										Pomadasys hasta(54.0)	0.09
28.10	1247	341	BTR	14	14-11	18°35'	94°06'	437.7	795.7	Pampus argenteus (211.5)	0.23
										Pomadasys hasta(65.7)	0.08
28.10	1445	342	BTR	24	24-21	18°35'	93°50'	130.3	244.4	Leiognathus sp.(37.5)	0.02
										Pomadasys hasta(32.2)	1.04
28.10	1703	343	BTR	24	24-26	18°31	94°04'	379.8	759.7	Pomadasys hasta(100.1)	0.12
										Leiognathus sp.(74.5)	0.02
										Rays(112.0)	8.00
28.10	1910	344	BTR	17	-	18°28'	94°15'	85.9	171.7	Shrimp (21.0)	-
										Pomadasys hasta (12.2)	0.76
										Otolithes ruber(10.5)	0.07
										Johnius sp.(9.6)	0.02
28.10	2125	345	BTR	29	29-27	18°25'	94°10'	86.9	173.8	Leiognathus sp.(35.0)	-
										Pomadasys hasta(17.4)	0.06
										Scomberoides commersonianus(10.8)	3.58
29.10	0025	346	BTR	33	33-35	18°20'	94°10'	93.1	174.6	Pomadasys hasta(18.6)	0.03
										Pennahia macrophthalmus(12.0)	0.06
										Saurida tumbil(11.7)	0.13
29.10	0300	347	BTR	33	33-31	18°14'	94°13'	113.9	227.8	Leiognathus sp.(31.5)	0.07
										Pomadasys hasta(25.5)	0.05
										Pentaprion longimanus(15.0)	0.25
										Pennahia macrophthalmus(12.0)	0.06
29.10	0631	348	BTR	30	30-34	18°10'	94°17'	74.3	148.8	Pomadasys hasta(14.1)	0.28
										Leiognathus sp.(7.8)	-

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
29.10	0837	349	BTR	17	17	18° 05'	94° 25'	410.2	820.4	Leiognathus sp.(214.5)	0.01
										Pomadasys hasta(51.9)	0.10
29.10	1029	350	BTR	23	33-27	18° 05'	94° 20'	no catch	-	-	-
29.10	1143	351	BTR	33	33-27	18° 05'	94° 20'	8000.0	16000.0	Pomadasys hasta(1151.5)	0.03
										Otolithes ruber(1107.2)	0.52
										Thryssa mystax(791.9)	0.02
										Arius sp.(752.9)	0.45
1.11	0415	352	BTR	219	219-210	16° 47'	94° 01'	26.1	26.1	Molluscs(9.5)	-
										Cynoglossus sp.(4.5)	0.03
										Shrimp(3.7)	-
1.11	0855	353	BTR	320	320-300	16° 26'	93° 56'	no catch	-	-	-
1.11	1017	354	BTR	305	302-312	16° 25'	93° 55'	330.5	660.9	Palinurichthys(188.5)	0.05
										Epinnula orientalis(57.5)	0.03
1.11	1706	355	PTR	38	surface	15° 30'	94° 20'	30.0	60.0	Stolephorus indicus(17.7)	-
										Sardinella gibbosa(4.7)	-
2.11	0350	356	BTR	39	39-38	15° 06'	94° 59'	214.0	428.0	Atrobucca nibe(65.0)	0.12
										Nemipterus japonicus(24.1)	0.06
2.11	0840	357	BTR	38	38-36	15° 04'	95° 05'	796.3	1592.5	Pennahia macrocephalus(318.5)	0.23
										Sphyraena obtusata(143.7)	0.09
2.11	1035	358	BTR	30	30-31	15° 13'	95° 12'	517.6	1035.2	Lepturacanthus savala(154.0)	0.16
										Lactarius lactarius(138.0)	0.28
2.11	1520	359	BTR	47	47-50	15° 03'	95° 21'	698.2	1269.5	Leiognathus bindus(25.4)	0.01
										Upeneus sulphureus(21.5)	0.03
										Skate and ray(485.0)	242.50

(Table I. continued)

Date	Time Start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
2.11	1835	360	PTR	24	0	15° 20'	95° 26'	134.3	268.6	Scomberomorous commersoni(50.8)	6.35
										Sardinella gibbosa(25.0)	0.04
										Ilisha elongata(19.5)	0.17
2.11	2015	361	PTR	21	0	15° 21'	95° 26'	160.5	321.0	Thryssa mystax(96.0)	0.01
										Leiognathus sp.(29.5)	0.01
										Ilisha melastoma(22.2)	0.02
3.11	0423	362	BTR	30	30-37	15° 16'	95° 43'	379.9	651.3	Pennahia macrophthalmus(67.5)	0.13
										Pampus argenteus(51.4)	0.36
										Dasyatis bleekeri(42.3)	0.25
3.11	0823	363	PTR	57	40	15° 10'	95° 43'	175.0	349.8	Trichiurus sp.(47.2)	0.04
										Pampus argenteus(35.4)	0.33
3.11	0935	364	BTR	56	56-58	15° 10'	95° 41'	218.4	436.8	Congresox talabonoides(66.7)	4.76
										Pampus argenteus(30.6)	0.85
										Solenocesa(shrimp)(26.8)	-
3.11	1445	365	PTR	67	50-65	15° 04'	95° 52'	45.3	71.5	Lepturacanthus savala(19.9)	0.26
										Larvae mixed(10.0)	-
										-Leiognathus	
										-Myctophid	
										-Apogonid	
3.11	1830	366	BTR	60	60	15° 05'	95° 52'	112.4	224.7	Congresox talabonoides(31.8)	2.89
										Chrysochir aureus(14.9)	0.99
										Arius thalassinus(13.7)	0.60
3.11	2302	367	BTR	18	18	15° 28'	96° 00'	200.9	401.8	Polynemus indicus(38.9)	12.97
										Rays(50.0)	16.67
										Congresox tabalonoides(13.3)	13.30
4.11	0135	368	BTR	23	23-22	15° 12'	96° 01'	257.2	482.5	Chrysochir aureus(93.7)	0.38
										Polynemus inidcus(76.1)	3.62
										Shrimp white(27.6)	-

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch, kg)	Mean weight
4.11	0355	369	BTR	79	79-71	14° 58'	96° 00'	103.1	167.2	Congresox talabonoidas(28.0)	3.50
										Atrobucca nibe(14.6)	0.12
										Pennahia macrocephalus(10.6)	0.11
4.11	1056	370	PTR	91	86	14° 54'	96° 05'	988.0	1976.0	Myctophidae(juvenile)(546.0)	-
										Lepturacanthus savala(215.8)	0.49
										Sharks(156.0)	6.06
4.11	1345	371	BTR	22	22	15° 16'	96° 13'	578.6	1157.2	Shrimp white(147.4)	-
										Chrysochir aureus(106.1)	0.55
										Polynemus indicus(78.6)	4.91
4.11	2340	372	BTR	48	48-50	14° 57'	96° 26'	131.5	246.9	Chrysochir aureus(42.0)	0.18
										Congresox talabonoidas(32.0)	3.20
										Pennahia macrophthalmus(16.0)	0.06
5.11	0435	373	BTR	60	60-69	14° 52'	96° 31'	132.3	240.4	Scianidae(22.4)	0.30
										Murafnesox sp.(18.0)	3.60
										Rays(60.6)	0.67
5.11	0646	374	BTR	33	33-42	14° 58'	96° 34'	135.9	273.7	Shrimp(40.0)	-
										Opisthopterus tardoore(34.8)	0.02
										Sharks(16.8)	0.14
5.11	0936	375	BTR	25	25	15° 09'	96° 43'	179.5	359.0	Lepturacanthus savala(58.8)	-
										Harpadon nehereus(31.2)	-
										Congresox talabonoidas(28.8)	9.60
5.11	1340	376	BTR	41	41-34	14° 52'	96° 46'	491.6	983.1	Shrimp white(160.0)	-
										Chrysochir aureus(34.8)	0.48
5.11	1650	377	BTR	24	24-25	15° 08'	96° 51'	127.7	283.4	Chrysochir aureus(38.2)	0.58
										Polynemus inidcus(26.0)	4.33

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species(Total catch,kg)	Mean weight
5.11	2055	378	BTR	43	43-41	14° 49'	97° 01'	100.4	200.8	Congresox talaboncides(11.1)	3.70
										Shrimp(7.2)	-
										Rays(55.0)	2.75
5.11	2205	379	PTR	39	20-39	14° 49'	96° 58'	119.9	143.9	Small shrimp(80.0)	-
										Lepturacanthus savala(14.0)	0.18
										Opisthopterus tardoore(8.8)	0.02
6.11	0535	380	PTR	51	50-51	14° 28'	97° 35'	no catch		-	-
6.11	1535	381	PTR	51	35-45	14° 13'	97° 20'	4.1	9.8	Fish larvae(3.3)	-
										Scomberomorous guttatus(0.8)	-
6.11	1906	382	BTR	35	32	14° 06'	97° 45'	145.0	290.0	Nemipterus japonicus(17.7)	0.08
										Saurida tumbil(16.4)	0.16
										Rays(64.0)	4.00
6.11	2339	383	PTR	40	22-10	14° 00'	97° 38'	91.4	182.8	Stolephorus indicus(68.4)	0.01
										Dussumieria acuta(15.0)	0.02
7.11	0430	384	BTR	49	49-47	13° 45'	97° 43'	117.6	220.5	Pennahia macrophthalmus(35.6)	0.12
										Upeneus sulphureus(26.8)	0.03
										Nemipterus japonicus(13.6)	0.06
7.11	0732	385	PTR	49	34	13° 41	97° 42'	53.0	90.7	Scomberomorus guttatus(21.5)	5.38
										Fish larvae(30.0)	-
										-Rastrelliger kanagurta	
										-Leiognathus sp.	
										-Nemipterus sp.	
7.11	1445	386	BTR	51	51-49	13° 29'	97° 48'	86.3	162.0	Nemipterus japonicus(29.7)	0.11
										Arius Thalassinus(15.3)	0.51
										Lepturacanthus savala(9.9)	0.28
7.11	1953	387	PTR	49	0	13° 15'	98° 15'	86.7	130.6	Rastrelliger kanagurta(26.6)	0.14
										Formio niger(21.7)	0.40
										Ilisha malastoma(9.9)	-
										Stolephorus indicus(9.9)	-

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species, (Total catch,kg)	Mean weight
8.11	0118	388	BTR	50	50-42	13°00'	98°01'	155.5	311.0	Pennahia macrophthalmus(47.6) Congresox talabonoides(36.3) Nemipterus japonicus(16.0)	0.11 2.27 0.06
8.11	0722	389	BTR	35	21	13°22'	98°18'	161.5	323.0	Leiognathus sp.(44.0) Upeneus sulphureus(18.0) Ray(20.0)	0.01 0.03 3.33
8.11	0928	390	BTR	27	24	13°22'	98°12'	540.4	1080.8	Leiognathus sp.(362.3) Stolephorus indicus(49.0)	0.01 0.01
8.11	1131	391	BTR	12	12-13	13°28'	98°16'	604.4	771.4	Pomadasys hasta(94.4) Kurtur inidcus(81.6) Reconda russellianna(76.7)	0.15 0.01 0.02
8.11	1333	392	BTR	23	23-22	13°28'	98°10'	5000.0	10000.0	Thryssa dussumieri(4544.7) Lactarius lactarius(239.2)	0.01 0.04
8.11	2018	393	PTR	22	22	12°53	98°08'	97.5	195.0	Stolephorus indicus(26.5) Ilisha elongata(19.0)	- 0.01
9.11	0052	394	PTR	58	58-56	12°45'	97°50'	5.0	9.6	Fish larvae mixed(3.9) Lepturacanthus savala(0.8)	- 0.80
11.11	1230	395	PTR	68-62	40-45	11°29'	97°49'	112.6	173.2	Squids(42.8) Leiognathid(34.3)	- -
11.11	2045	396	BTR	329	329-331	11°04'	97°51'	92.3	92.3	Chlorophthalmus agassizi(28.1) Puerulus sewalli(27.5) (Deep sea lobster)	0.05 0.05
12.11	0003	397	BTR	400	400-403	11°04'	96°38'	66.4	64.5	Shrimps(20.3) Chlorophthalmus agassizi(5.5) Myctophum sp.(4.8)	- 0.11 0.02
12.11	0503	398	BTR	487	487-500	11°05'	96°36'	21.2	42.4	Shrimp(5.6) Thalasoma sp.(2.9) Shrimp(rostrum normal)(2.5)	- 0.07 0.02

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species, (Total catch, kg)	Mean weight
12.11	1010	399	BTR	270	270-282	11° 32'	96° 52'	397.5	397.5	Peristedion weberi(96.0)	0.62
										Shrimp(90.0)	-
										Palinurichthys sp.(67.2)	0.05
12.11	1305	400	BTR	350	350-359	11° 32'	96° 42'	245.1	245.1	Chlorophthalmus agassizi(113.9)	0.02
										Cubiceps natalensis(26.4)	0.05
										Epinnula orientalis(23.0)	0.06
12.11	1940	401	BTR	267	265	12° 00'	96° 56'	58.8	58.8	Shrimp(medium)(32.5)	-
										Puerulus sewelli(17.0)	0.06
12.11	2225	402	BTR	300	302	12° 03'	96° 49'	206.3	206.3	Shrimp(50.4)	0.01
										Neoscopelus macrolepidotus(35.0)	0.02
										Chlorophthalmus agassizi (31.5)	0.05
13.11	0200	403	BTR	367	367-373	12° 02'	96° 42'	40.4	40.4	Shrimps(33.2)	-
										Chlorophthalmus agassizi(6.1)	0.10
13.11	0440	404	BTR	455	455-450	12° 03'	96° 40'	81.3	81.3	Squalus sp.(17.0)	5.67
										Shrimp(10.8)	-
										Prawn(8.5)	0.02
13.11	1120	405	BTR	262	262-260	12° 38'	96° 53'	475.8	475.8	Shrimps(154.8)	-
										Chlorophthalmus agassizi(142.2)	0.04
										Cubiceps natalensis(72.0)	0.02
13.11	1335	406	BTR	291	291-287	13° 38'	96° 49'	364.2	364.2	Shrimp and prawn(134.4)	-
										Chlorophthalmus agassizi(72.0)	0.04
										Cubiceps natalensis(57.6)	0.03
13.11	2025	407	BTR	320	321	13° 04'	96° 32'	98.5	98.5	Chlorophthalmus agassizi(28.8)	0.03
										Shrimp(26.8)	0.01
13.11	2300	408	BTR	371	371-373	12° 59'	96° 36'	209.7	209.7	Chlorophthalmus agassizi(75.0)	0.05
										Squalus sp.(56.4)	4.70
										Shrimp(43.2)	-

(Table I. continued)

Date	Time start	St. No.	Gear type	Bottom depth (m)	Gear depth (m)	Position Lat N	Position Long E	Total catch (kg)	Catch per hour(kg)	Dominant species. (Total catch, kg)	Mean weight
14.11	2023	409	BTR	84	84-83	14° 32'	95° 30'	40.7	81.8	Pentoprion longimanus(9.7)	0.02
										Saurida tumbil(6.4)	0.08
										Upeneus sulphureus(5.7)	0.04
14.11	2145	410	PTR	82	60-65	14° 32'	95° 30'	8.8	11.6	Bregmaceros(young)(3.3)	-
										Sphyraena obtusata(1.5)	0.06
										Saurida undosquamis(1.5)	0.01
										Upeneus sulphureus(0.9)	0.01
15.11	1040	411	BTR	104	104-101	14° 31'	96° 00'	21.3	42.7	Saurida tumbil(15.0)	0.06
										Priacanthus sp.(1.7)	0.16
										Skate(1.6)	0.53
										Nemipterus japonicus(1.2)	0.03
16.11	0110	412	PTR	93	65-67	14° 31'	96° 29'	69.9	69.9	Decapterus(41.6)	0.04
										Leiognathus sp.(24.5)	-
16.11	0500	413	PTR	108	35-55	14° 13'	96° 29'	4.6	7.8	Leiognathus elongatus(3.9)	0.01
										Rastrelliger kanagurta(0.6)	0.30
16.11	1039	414	BTR	66	66-78	14° 45'	96° 45'	419.1	838.1	Lutjanus johnii(200.8)	2.28
										Congresox talabonoides(59.0)	2.81
16.11	1205	415	BTR	69	69-59	14° 49'	96° 48'	509.7	509.7	Congresox talabonoides(81.9)	2.48
										Shrimps(51.8)	0.01
										Arius thalassinus(49.0)	0.88
										Lepturacanthus savala(46,2)	0.06
16.11	1455	416	BTR	29	29-33	15° 02'	96° 44'	436.1	436.1	Congresox talabonoides(161.1)	1.12
										Shrimps(69.3)	0.01
										Chrysochir aureus(63.0)	0.24