

Reports on Surveys with the
R/V Dr Fridtjof Nansen

UNDP/FAO Programme GLO/82/001

"DR. FRIDTJOF NANSEN" SURVEYS OF PAKISTAN FISHERY
RESOURCES, SEPTEMBER 1983 TO JUNE 1984
SUMMARY OF FINDINGS



Institute of Marine Research, Bergen

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This summary report is prepared as a contribution to the
Pakistan National Workshop on Fisheries Policy and Planning, 1986.

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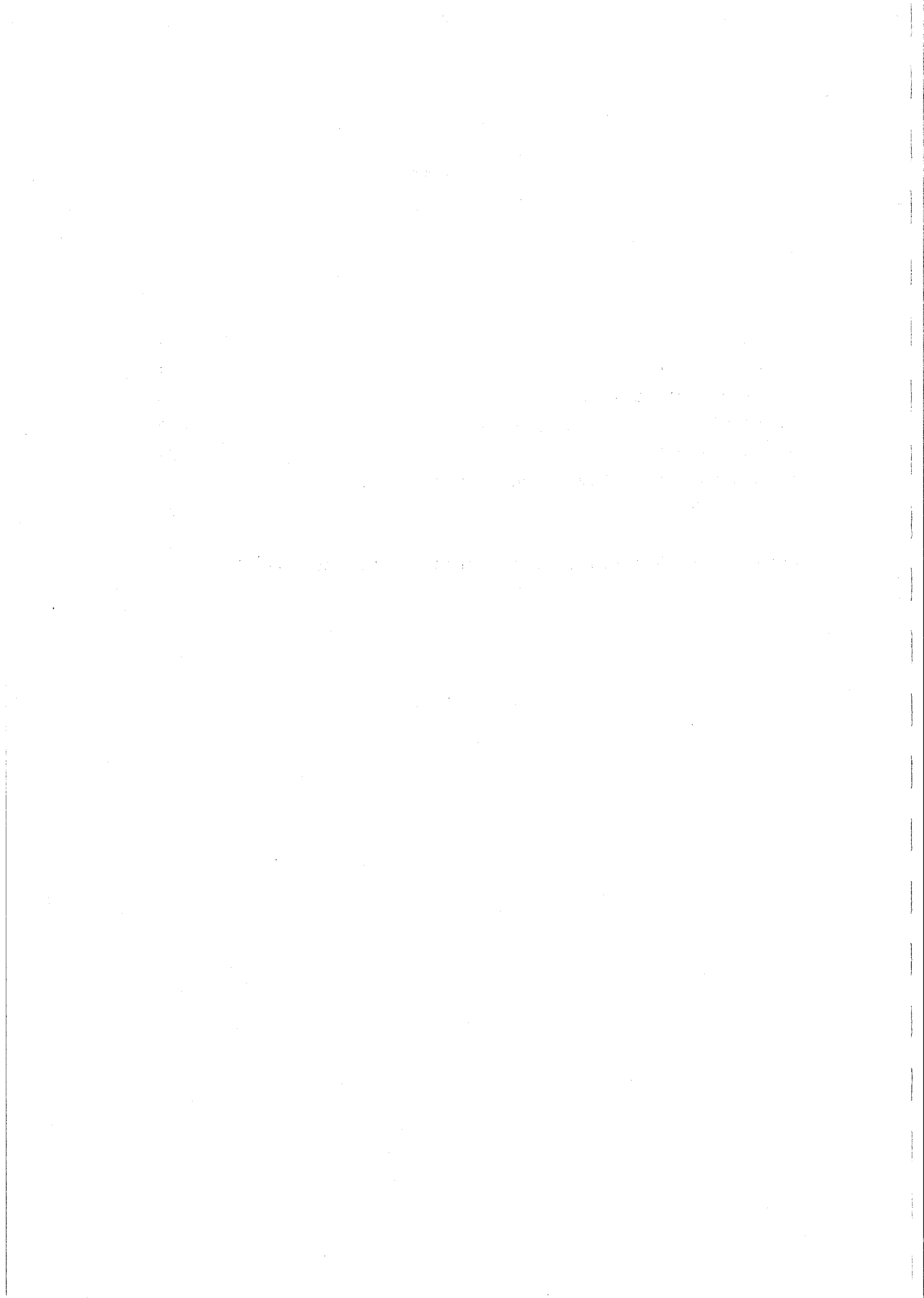
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1. INTRODUCTION

As part of the UNDP/FAO programme GLO/82/002 the R/V "Dr. Fridtjof Nansen" undertook three surveys of Pakistan waters between September 1983 and June 1984:

Survey I	5-16 September 1983
Survey II	20 January-2 February 1984
Survey III	2-12 June 1984

The research work was conducted in a cooperation between the Institute of Marine Research, Bergen and the Marine Fisheries Department, Karachi. The survey coverage was in each case about the same with transects 10-15 n.m. apart from the 15-20 m depth line out to 5-10 n.m. off the slope of the continental shelf. The distance sailed was about 2000 n.m. in each survey. Figure 1 shows cruise tracks, hydrographical profiles and fishing stations from survey I. The coverage was similar in the other surveys. In addition to fish biomass estimation by acoustic instrumentation, in each cruise between 40 and 90 trawl fishing stations were worked for sampling and bottom fish assessments. About 20 hydrographic stations were occupied in four transects each cruise. Preliminary cruise reports were issued after the completion of each survey.

2. HYDROGRAPHY

General features

During the NE monsoon the water movement to the north of the Equator are generally from east to west. This circulation pattern starts developing in November, reaches its greatest

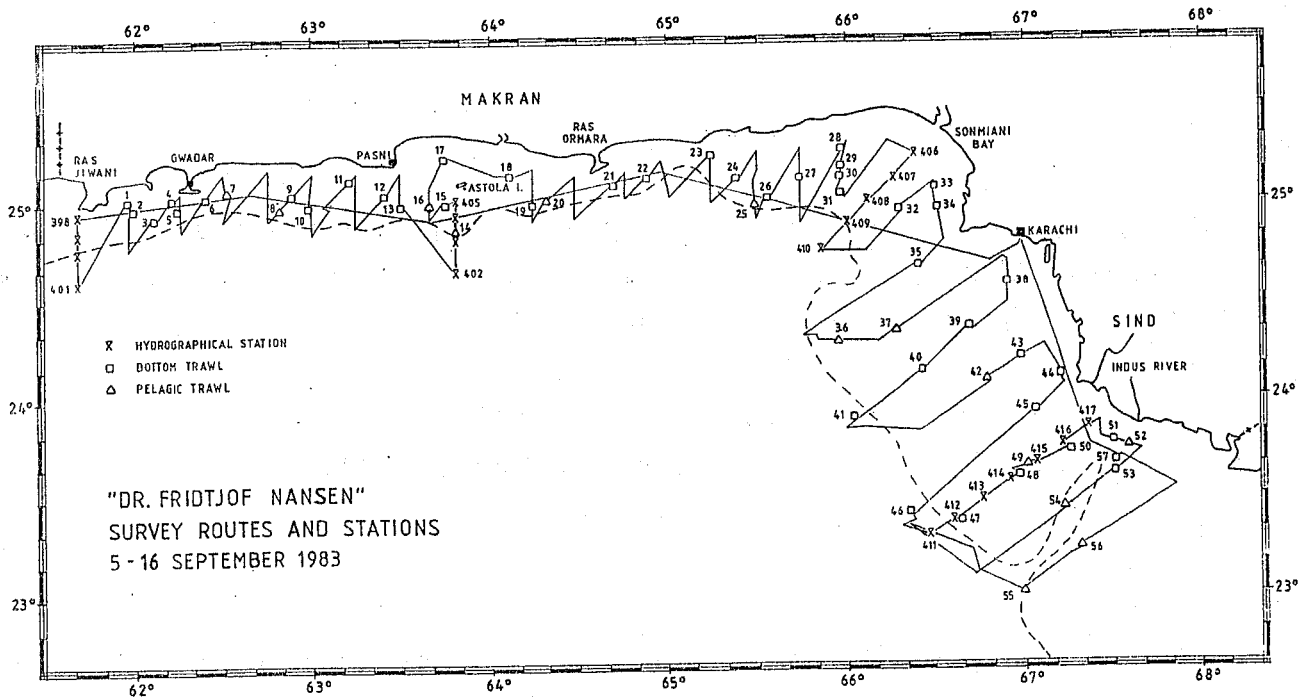


Fig. 1. Cruise tracks, hydrographic profiles and fishing stations from Survey I.

strength in February and subsides in April. The coast of Pakistan, however, is most of the year influenced by the high-salinity surface water formed by the strong excess of evaporation in the central and northern Arabian Sea. This results in eastflowing current along the Makran coast and southflowing along the Sind coast. From November to January low salinity water from the Bay of Bengal flows along the western coast of India and penetrates into the coastal waters of Pakistan and a reverse current pattern occasionally occur.

Situation during the present investigations

Figs. 2-4 show the vertical distribution of temperature, salinity and oxygen in three sections off the Pakistan coast in September, June and January. The sections from September and June represent the SW monsoon situation while that from January represent the NE monsoon type of distribution.

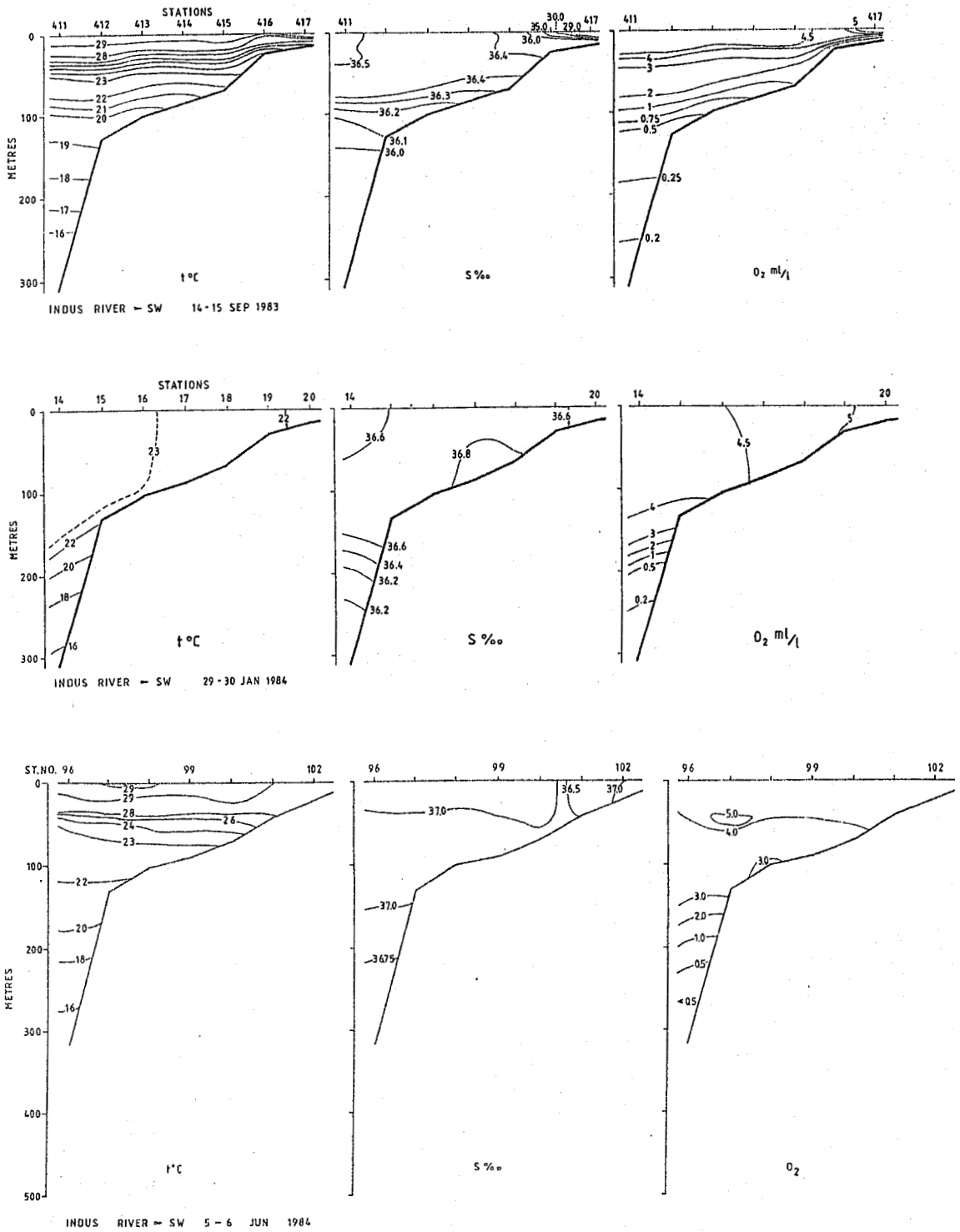


Figure 2 . Hydrographic section: Indus River - SW.

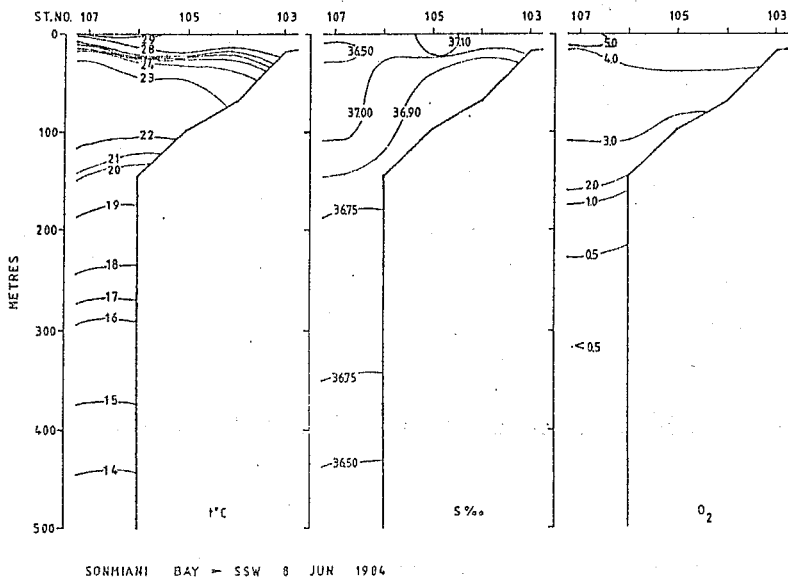
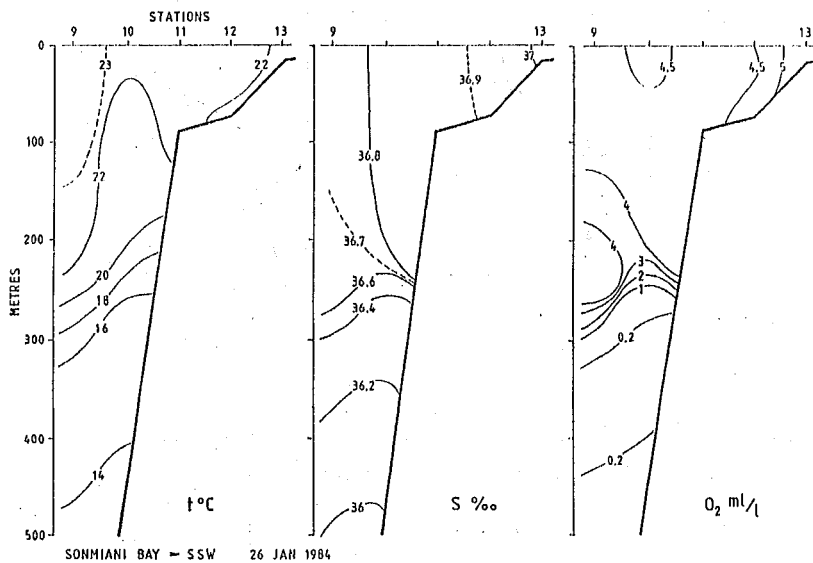
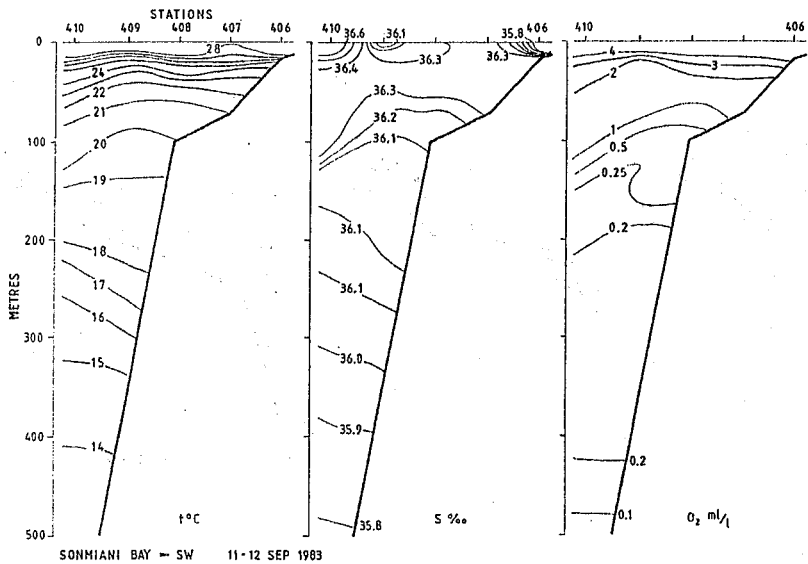


Figure 3.
Hydrographic section:
Sonmiani Bay - SSW.

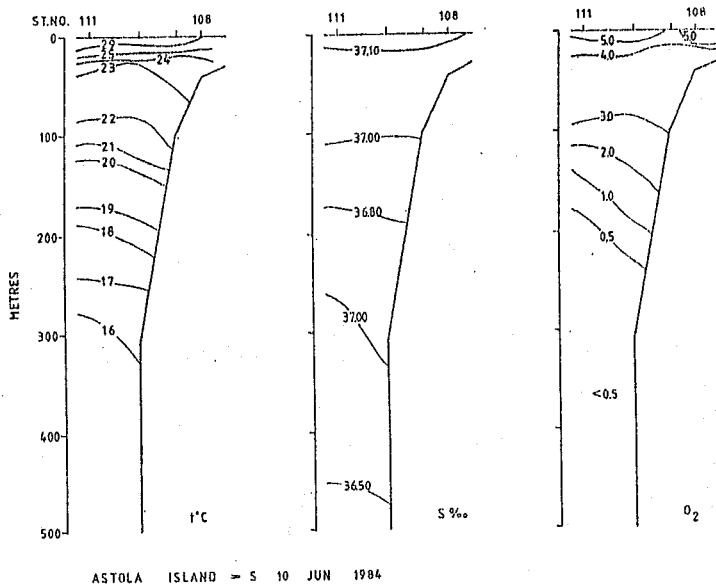
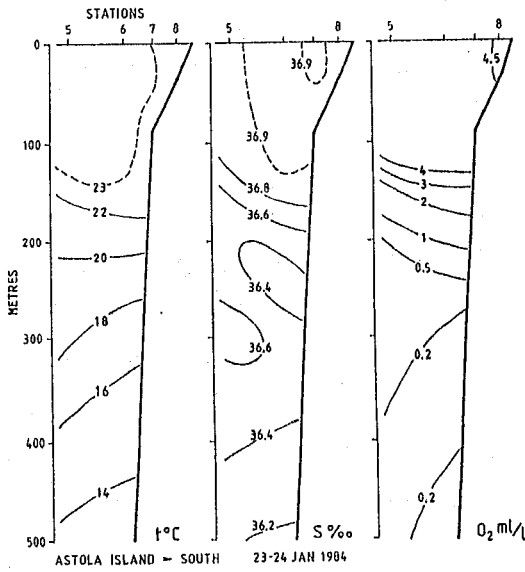
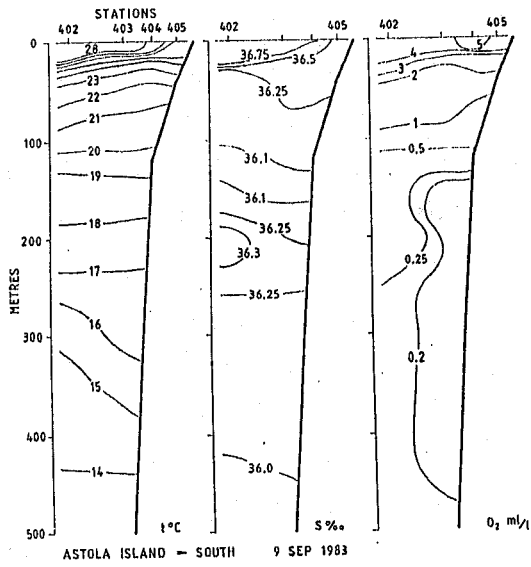


Figure 4 .

Hydrographic section:
Astola Island - S.

The surface temperature during the SW monsoon season is 28°-29°C while during the NE monsoon it is 22°-23°C. In January there is a homogeneous, well-mixed upper layer reaching to about 150 m compared to about 20 m in June and September. Off the Sind coast the effect of the fresh water outflow from the River Indus can clearly be seen in the September section (Fig. 2). A similar effect was observed during the same month in Sonmiani Bay (Fig. 3).

In September water of low oxygen contents covered substantial parts of the continental shelf. Along the Makran Coast the 2ml/l isoline was observed at 20-30 m depth (Figs. 3-4) while off the Indus delta the fresh water outflow caused this isoline to reach to about 15 m. In June the 2 ml/l isoline was situated around 150m and in January from 150 to 250m. As a result of the increased vertical mixing in January, water of oxygen content higher than 4 ml/l was occupying the upper 100 m.

3. FISH DISTRIBUTION

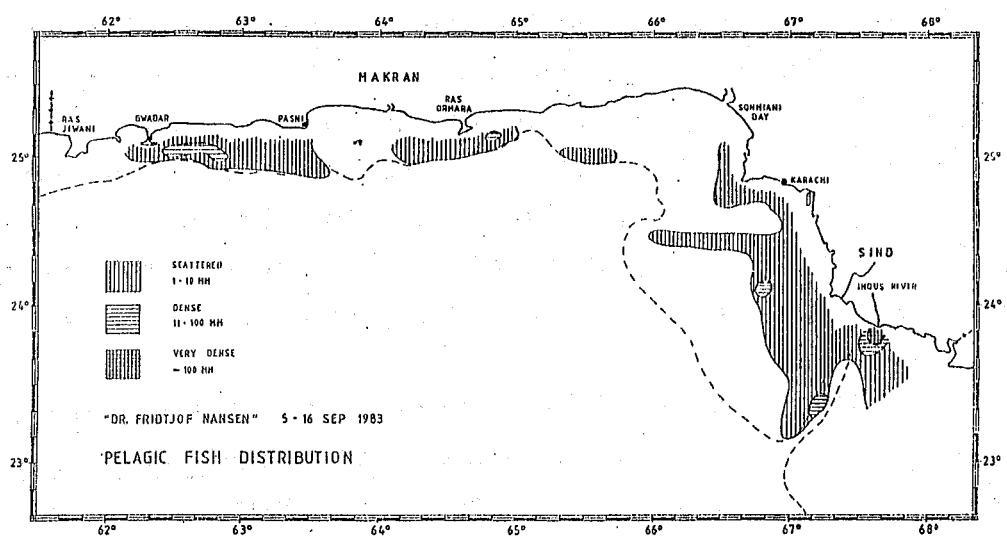
The acoustic observations and the trial fishing of the surveys can provide descriptions of the distribution of the fish. These are roughly classified in "small pelagic schooling fish" and "predominantly demersal (bottom) fish". The acoustic method is unfortunately not well suited for assessment of large pelagic fish such as tunas and these are not included.

3.1 Small pelagic fish

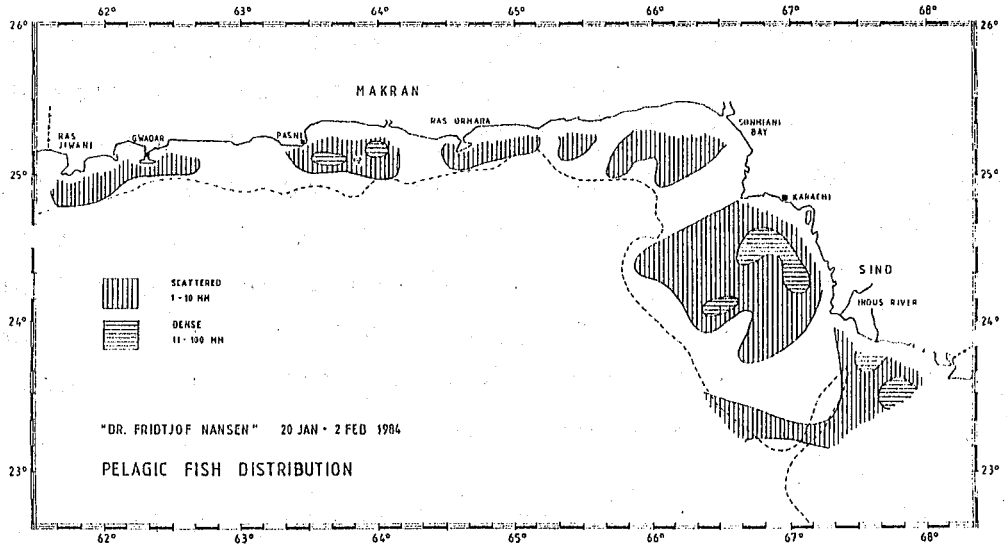
Among these the following are important:

Anchovies or sardine-like fish which include sardinellas, rainbow sardine, a.o. Jack mackerels of various species. Spanish mackerels. Ponyfish and hairtails which occur in abundance both in mid water and at the bottom.

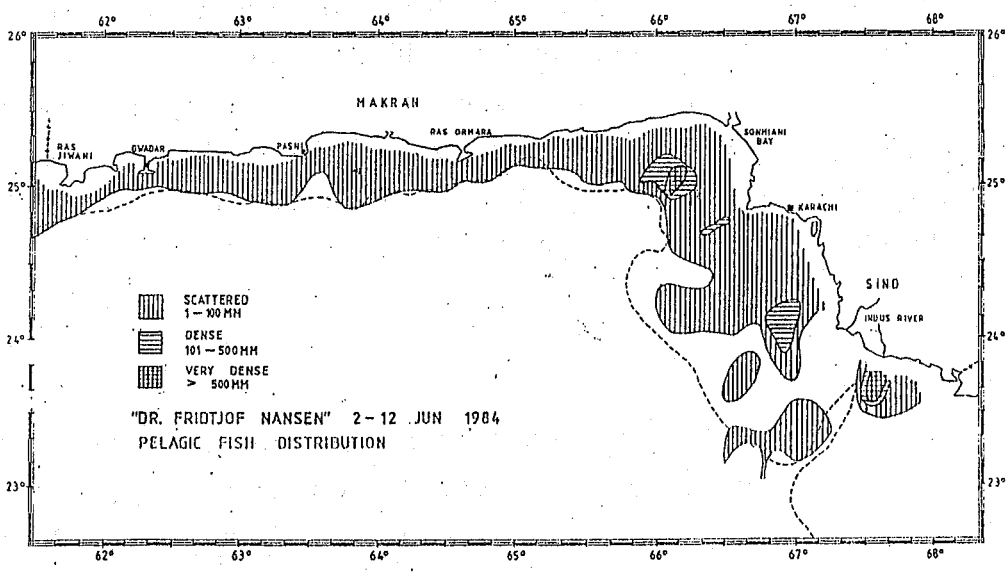
Figure 5 shows the distribution of the small pelagic fish during the three surveys. In all of the coverages the fish was found distributed within the shelf areas and no recordings were made further offshore.



Survey I



Survey II



Survey III

Figure 5. Relative distribution of the various types of small pelagic fish. (The scales are not directly comparable between the surveys.)

3.1.1 First survey

The predominant species at the Makran coast was rainbow sardine (Dussumieria acuta). The fish occurred in scattering layers and small schools in daytime at depths between 20-40 m, just off the bottom. During nighttime it was observed both as scattering layers and small schools at the surface. It ranged in length from 18-20 cm. Catch rates of rainbow sardines up to 3.7 tonnes per hour were obtained in pelagic night hauls.

Other pelagic fish species were scarce in the Makran area, but scads (Decapterus spp.) and hardtail scad (Megalaspis cordyla) were caught in limited numbers at some few trawl stations.

Off Sind concentrations of pelagic fish were found in three localities. At the inner end of the Indus Swatch very dense recordings of anchovy (Stolephorus sp.) were obtained in mixture with juvenile rainbow sardine. The fish was distributed in large schools or scattering layers at depths between surface and 20 m over 30-40 m bottom depth, but the extension of the area was limited to 2-3 square nautical miles. Quantities of bottom fishes - rays, sharks, grunts and croakers - were feeding on these concentrations.

Scattering layers and small schools of rainbow sardine, ranging from 10-20 cm in length, were observed in two localities off Sind at bottom depths between 60 and 80 m. During the day the fish occurred in small schools close to the bottom, at night it dispersed into a scattering layer at 30-40 m depth. In the Sind area the maximum catch rate of pelagic fish was about 500 kg per hour in the pelagic trawl.

3.1.2 Second survey

Along the Makran coast the recordings of pelagic fish were scattered. Around Astola Island some good recordings of the scad (Decapterus russelli) and the anchovy (Thryssa sp.) were made.

Also along the Sind coast the recordings of pelagic fish were generally low with a few exceptions. South of Karachi some dense concentrations of the anchovy (Stolephorus sp.) were observed. At the southernmost coast some good recordings of sardinella (Sardinella sindensis) were made. The two other areas of some more dense recordings were made up by ponyfish (Leiognathus sp.).

3.1.3 Third survey

Along the Makran coast pelagic fish distribution was scattered. The anchovies Thryssa mystax, T. vitrirostris, T. dussumieri, rainbow sardine (Dussumieria acuta) blacktip sardinella (S. elanura), ponyfish (Gazza minuta) and spanish mackerels (Scomberomorus commersoni, S. guttatus) were frequently recorded in the catches.

Somewhat denser concentrations were recorded in the Sonmiani Bay, where a pelagic trawl station gave an almost clean catch of ponyfish (Leiognathus sp.). In the inner end of the Indus Swatch the denser pelagic recordings probably contained a mixture of Indian oil sardine (Sardinella longiceps), goldstripe sardinella (S. gibbosa), anchovy (Thryssa dussumieri), rainbow sardine (Dussumieria acuta), scad (Decapterus russelli), ponyfish (Leiognathus sp., Gazza minuta) and Spanish mackerel (Scomberomorus koreanus), which all were present in the bottom trawl catches in the area.

In the denser concentrations off Sind and outside Karachi, the indian ilisha (Ilisha melastoma), ponyfish (Leiognathus sp.), rainbow sardine (Dussumieria acuta), anchovy (Thryssa sp., T. dussumieri, T. vitrirostris), barracuda (Sphyraena putnamiae), gold-stripe sardinella (S. gibbosa), and indo-pacific spanish mackerel (Scomberomorus guttatus) were present both in pelagic and bottom trawl catches.

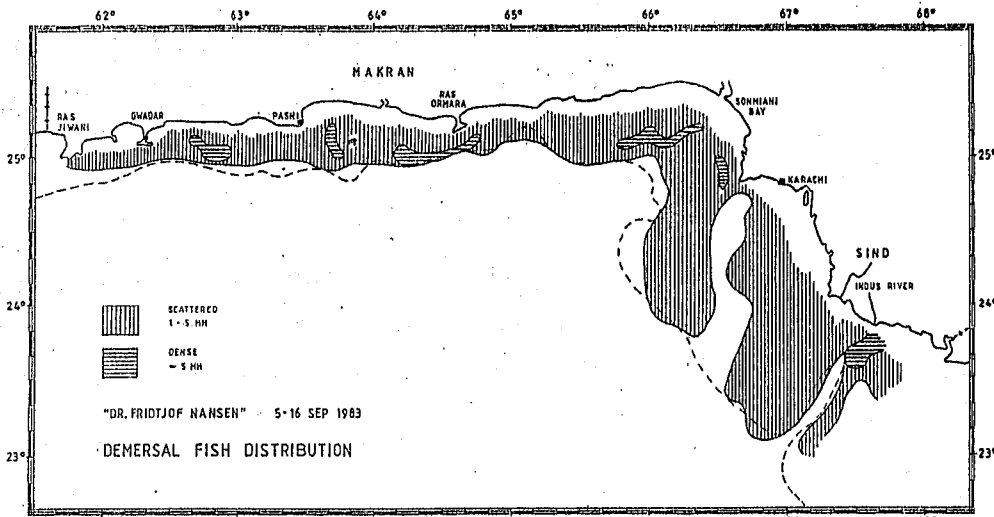
3.2 Bottom fish

The most common demersal fish in Pakistan waters are hairtails (Trichiuridae), (also common in mid-water) croakers (Sciaenidae), grunts (Pomadasyidae) rays, catfishes (Ariidae), brems (Nemipteridae) and jack mackerels (Carangidae). A large number of other types of fish also occur. Figure 6 shows the relative distribution of the bottom fish as recorded during the three surveys. (See page 11).

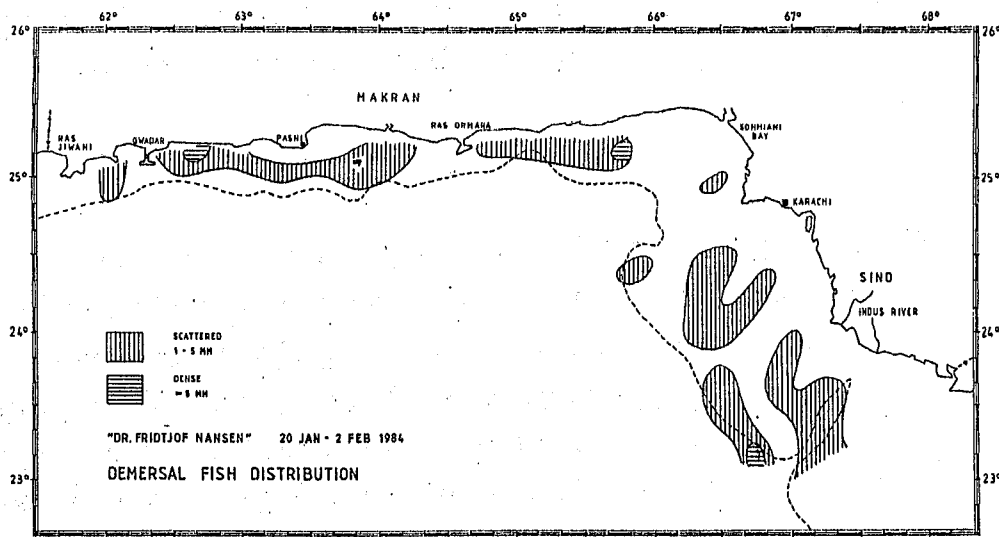
3.2.1 First survey

Relatively dense patches were observed several places along the Makran coast while the recordings off Sind were more scattered. At the Makran coast the concentrations of bottom fishes were predominated by hairtails (Trichiurus lepturus and Lepturacanthus savala) which made up the bulk of the catches in the area. The hairtails were observed as weak scattering layer both at the bottom and in midwater over bottom depths ranging from 25-30 m to the edge of the shelf. Grunts (Pomadasy sp. and croakers (Otholithes ruber a.o.) were also frequently caught in the bottom trawl hauls but in significantly less quantities than hairtails. Catch rates up to 6 tonnes per hour trawling were experienced.

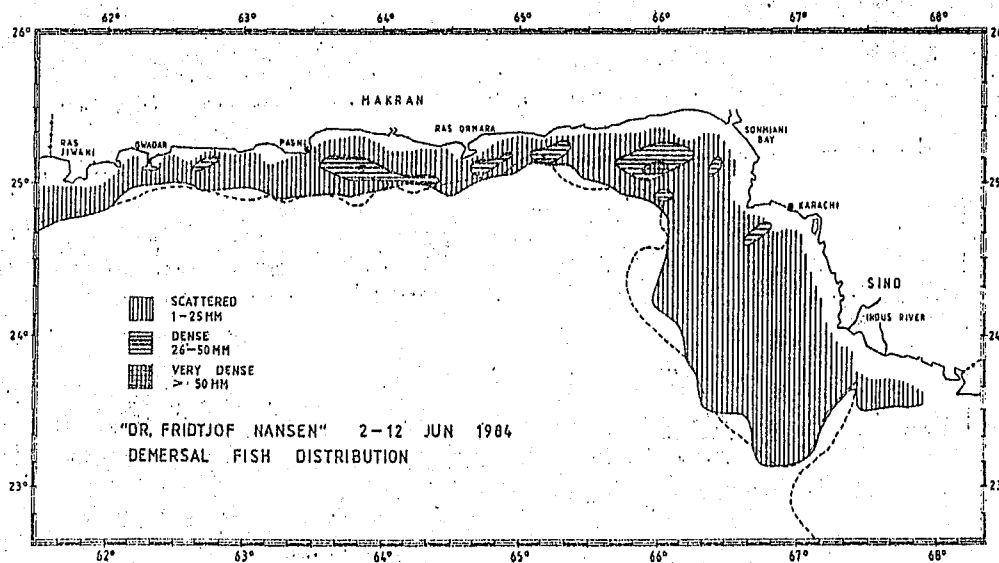
Off Sind, both the recording and the catches of bottom fish were more variable than at the Makran coast. In most of the investigated area the abundance was found to be low, and dense patches of fish were found only at two localities, in southern Sonmiani Bay and at the inner end of the Indus Swatch. In Sonmiani Bay catfish was the predominant scatterer, while small-sized croakers and grunts together with hairtails and rays made up the bulk of the catches off the Indus delta. Catch rates up to 16 tonnes per hour were obtained in bottom trawl hauls. On the outer banks off Sind, catch rates were low and variable and the threadfin bream (Nemipterus japonicus) was a major constituent.



Survey I



Survey II



Survey III

Figure 6. Relative distribution of various types of bottom fish. (The scales are not directly comparable between the surveys.)

3.2.2 Second survey

The catches along the Makran coast were dominated by rays and catfish (Arius sp.). The seabream (Argyrops spinifer), grunts (Pomadasys hasta), Pomadasys stridens and sharks also made significant contributions to the catches.

In Sonmiani Bay the catfish (Arius sp.) dominated the catches. Significant contributions came from the threadfin bream (Nemipterus japonicus) and the false trevally (Lactarius lactarius).

Along the Sind coast the catches of bottom fish were nearly exclusively made up by the threadfin brems (Nemipterus metopias and N. japonicus with the first as the most important.

3.2.3 Third survey

Along the eastern part of the Makran coast catch rates were relatively higher and hauls up to 7.5 tonnes per hour trawling were experienced. The hairtails (Trichiurus lepturus), catfish, seabreams (Acanthopagurus sp.) and croakers (Pennahia sp.) dominated the catch. Except for one trawl station, giving 4 tonnes per hour trawling, fish density on the western Makran coast was low. The larger catch in this area contained about 30% grunters (Pomadasys commersoni) with trevallies (Lactarius lactarius), croaker (Otolithes ruber) and catfish, as secondary components.

The recordings all along the Sind coast were generally scattered while limited areas with higher densities were found in the Sonmiani Bay.

At the Sind coast, the concentrations of bottom fish were dominated by hairtails (Trichiurus lepturus), threadfin bream (Nemipterus japonicus), catfish (Arius sp.), grunters (Pomadasys maculatus), lizardfish (Saurida tumbil), Indian driftfish (Ariomma indica), croakers (Argyrosomus sp.), snappers (Lutjanus malabaricus) and groupers (Epinephelus

diacanthus). Catch rates were generally low, 100-500 kg per hour trawling, with a maximum at St. no. 113, outside Karachi, of 1.6 tonnes pr. hour.

In the Sonmiani Bay the bottom trawl catches was dominated by the threadfish bream (Nemipterus japonicus), hairtails (Trichiurus lepturus), croaker (Otolithes ruber), and catfish (Ancharius brevibarbis). Catch rates of 0.5-1.1 tonnes per hour trawling were usual in this area.

4. Results of fishing operations

A summary of all fishing stations during the three surveys is as follows:

	Makran Coast			Sonmiani Bay Sind Coast		
	Survey			Survey		
	I	II	III	I	II	III
<u>Bottom trawl</u>						
No. Stations	25	47	15	19	37	15
Mean catch kg.	1390	723	2206	2197	537	468
<u>Pelagic trawl</u>						
No. Stations	6	1	4	8	10	7
Mean catch kg.	2356	430		517	490	167

One should note that the fishing operations as part of an acoustic survey first of all represent efforts to identify the resources. The results and especially the mean catches cannot therefore be interpreted as indications of catch rates of a commercial fishery. This would normally be concentrated in areas of the highest available catch rates. The results of this trial fishing particularly those from bottom trawling give, however, good indications of the composition of the fish resources and the highest catch rates may indicate the rates to be expected from a fishery.

When placed arbitrarily, bottom trawl hauls can also be used to estimate the total biomass of demersal resources. Such a system was worked during part of Survey II, and these data will here be used only for indicating the overall composition of the resources and not as indications of the catches.

4.1 Composition by families in pelagic trawl hauls

Table 1 shows the catch data for the 36 hauls with the pelagic trawl from all surveys. Jellyfish and a few incidental species are excluded. Hairtails, lantern fish, ponyfish, sardine-like fish and jacks occurred in more than 20 percent of the hauls, but also anchovies had a wide occurrence. The bulk of the catches consisted of sardine-like fish and hairtails, 28% each, followed by ponyfish with 16%. The sardine-like fish also gave the highest mean catch, nearly 900 kg/hr. This was the result of two large catches of rainbow-sardine (Dussumieria acuta) off the Makran Coast. Catch rates in pelagic trawl is, however, of relatively limited interest. Also the catch composition will largely be determined by choice of targets for this type of aimed fishing. Thus in previous surveys anchovies have dominated the pelagic catches.

Table 1. Distribution of catches by families in 36 pelagic trawl hauls.

Family	% incidence in total no. of hauls	Mean catch	% of total catch
Sardine-like fish (Clupeidae)	22	868	28
Hairtails (Trichiuridae)	39	490	28
Ponyfish (Leiognatidae)	25	434	16
Lanternfish (Myctophidae)	39	125	7
Jacks (Carangidae)	22	126	4
Anchovies (Engraulidae)	14	155	3
Breams (Nemipteridae)	3	400	2

4.2 Composition by families in bottom trawl hauls, all surveys

An indication of the occurrence of the most common types of bottom fishes in the whole area of the Pakistan shelf is provided by Table 2, which includes the data from all the 157 bottom trawl hauls from all surveys. Hairtails is the most common form occurring in 3/4 of all catches and representing about 1/4 of the total catch. Croakers is found in about 60 percent of the catches and represent 14 percent of the total catch. Grunts follow with 70 percent occurrence and 10 percent of the total catch. These three families of fishes alone represent nearly 50 percent of the total catch. Also rays, catfishes, and breams have both a wide distribution and are relatively abundant, while jacks and seabreams also have a relatively wide distribution, but are less abundant. More than 14 other families are represented each within 1-2 percent of

Table 2. Distribution of most common family groups in catches of 157 bottom trawl hauls.

	% incidence in total no. of hauls	Mean catch	% of total catch
Hairtails (Trichiuridae)	74	344	24
Croakers (Sciaenidae)	61	243	14
Grunts (Pomadasyidae)	70	159	10
Rays	59	156	9
Catfishes (Ariidae)	57	153	8
Breams (Nemipteridae)	62	120	7
Jacks (Carangidae)	56	65	3
Seabreams (Sparidae)	64	50	3
Mean total catch		1054	

the total catches, some of which are commercially important, such as sharks, barracudas, groupers, congers etc.

4.3. Distribution and composition of bottom trawl catches, Makran Coast

Table 3 gives the composition of catches by family groups and by sizes of catches from Survey I. Also the mean catch of various types of fish and the means by depth strata is estimated, together with the overall mean.

Table 3. Distribution of catches by family groups, Makran Coast, Survey I. Demersal trawl.

	% incidence in total no. of hauls	Mean catch	% of total catch	Mean catch in bottom depth strata			
				No. hauls: 7 <20m	14 20-50m	4 50-100m	0 >100m
Hairtails (Trichiuridae)	96	935	73	75	1165	1394	0
Croakers (Sciaenidae)	76	220	14	34	137	502	0
Catfishes (Ariidae)	72	42	2	71	18	2	0
Grunts (Pomadasyidae)	60	47	2	30	34	0	0
Rays	52	50	2	55	19	0	0
Seabreams (Sparidae)	56	48	2	38	25	12	0
Congers	16	87	1	20	15	0	0
Groupers	40	22	1	4	11	9	0
Sharks	28	25	1	2	11	1	0
Shrimp	20	34	1	1	12	0	0
Other fish		37	1				
Mean total catch		1247		361	1491	1943	0

The by far dominant group is hairtails occurring in nearly all catches and representing more than 70 percent of the total catch. The highest mean catches about 1.4 tonnes are obtained

in the depth strata 50-100 m. Also most of the other groups listed are widely distributed, but only croakers represent an appreciable part of the catch, 14 percent, again with highest catch rates in the 50-100 m depth range. The overall mean catch is 1.2 tonnes/hr., but nearly 2 tonnes/hr. in the 50-100 m depth range. The three highest catches about 9 tonnes/hr., 6.7 tonnes/hr. and 6.3 tonnes/hr. consisted of hairtails.

Table 4 gives similar data for Survey III. Again hairtails and croakers are most common and abundant, but catfishes and grunts also make up appreciable parts of the catches followed by rays,

Table 4. Distribution of catches by main family groups, Makran Coast, Survey III. Demersal trawl.

	% incidence in total no. of hauls	Mean catch	% of total catch	Mean catch in bottom depth strata			
				No. hauls: 5 <20m	8 20-50m	2 50-100m	0 >100m
Hairtails (Trichiuridae)	87	725	29	343	995	51	0
Croakers (Sciaenidae)	87	478	19	375	531	45	0
Catfishes (Ariidae)	67	396	12	207	391	0	0
Grunts (Pomadasyidae)	80	254	9	340	169	0	0
Rays	87	109	4	88	122	2	0
Seabreams (Sparidae)	73	104	4	159	44	0	0
Threadfin breems (Nemipteridae)	27	224	3	0	3	437	0
Shrimp	33	168	3	1	105	0	0
False trevallies (Lactaridae)	73	67	2	85	33	0	0
Pike congers (Muraenesocidae)	60	80	2	55	62	3	0
Groupers (Serranidae)	47	101	2	80	48	2	0
Mean total catch		2207		3118	1971	869	0

seabreams and threadfin breams. The mean total catch rate was 2.2 tonnes, but with higher catch rates in the shallow water range (<20 m). The highest catch rates included two of 7.5 tonnes/hr. of hairtails, croakers and others and two of 4 tonnes, one of hairtails, croakers and others and one of grunts, false trevally and others, all in shallow waters.

4.4 Distribution and composition of bottom trawl catches, Sonmiani Bay and Sind Coast

Table 5 gives the distribution by families of the bottom trawl hauls from this eastern part of the Pakistan shelf during Survey I.

Table 5. Distribution by family groups, Sind Coast, Survey I, demersal trawl, 19 hauls.

	% incidence in total no. hauls	Mean catch	% of total catch	Mean catch in bottom depth strata				
				No. of hauls:	2 <20m	7 20-50m	7 50-100m	3 >100m
Croakers (Sciaenidae)	79	638	23		118	724	597	30
Grunts (Pomadasyidae)	47	966	21		9	868	371	0
Rays	32	963	14		0	134	691	0
Hairtails (Trichiuridae)	63	330	10		6	152	413	0
Catfishes (Ariidae)	21	572	6		3	326		0
Jacks (Carangidae)	32	293	4		0	90	161	0
Threadfinns (Polynemidae)	37	255	4		6	222	31	0
False trevally (Lactaridae)	47	129	3		3	99	66	0
Breams (Nemipteridae)	53	122	3		0	14	149	25
Indian halibuts (Psettodidae)	21	289	3		0	108	57	0
Seabreams (Sparidae)	26	130	2		0	76	17	0
Mean of total catch		2197			181	3066	2753	216

In these catches croakers and grunts dominate (together 44 percent) and are also widely spread on the shelf. Rays and hairtals are also common followed by catfishes and jacks. The mean total catch rate is 2.2 tonnes/hr. but about 3 tonnes/hr. in the depth ranges 20-50 m and 50-100 m. The highest catch rates, 16 tonnes/hr. were obtained in two hauls off the Indus delta giving mainly croakers, grunts and hairtails.

Table 6 shows the catch data for the most common groups in Survey III. Compared with Survey I catch rates are very low, reduced by 3/4 or 4/5.

Table 6. Distribution by family groups, Sind Coast, Survey III, demersal trawl, 15 hauls.

	% incidence in total no. hauls	Mean catch	% of total catch	Mean catch in bottom depth strata			
				No. of hauls:	1 <20m	4 20-50m	7 50-100m
Threadfin breams (Nemipteridae)	60	172	22	0	0	122	230
Hairtails (Trichuridae)	87	80	15	1	157	38	48
Croakers (Sciaenidae)	40	137	12	82	185	0	8
Anchovies (Engraulidae)	27	83	5	0	83	0	0
Grunts (Pomadasyidae)	60	35	5	21	22	29	1
Catfishes (Ariidae)	47	38	4	12	62	1	1
Jacks (Carangidae)	67	30	4	0	5	27	30
False trevally (Lactaridae)	33	38	3	0	42	3	0
Pony fish (Leiognatidae)	47	30	3	0	2	22	15
Rays	47	31	3	12	47	0	3
Sharks	53	23	3	0	33	8	0
Snappers (Lutjanidae)	20	44	2	0	21	0	15
Lizardfish (Synodontidae)	47	24	2	0	0	20	7
Mean of total catch		468		183	812	340	404

Threadfin breams, hairtals and croakers are most common and represent about 50 percent of the catch, but a very large number of other groups, more than 27 are represented in the catches. The indications are that at this season, even the forms of high abundance are not found in aggregations. The highest catch rates 1.5, 1.0 and 0.7 tonnes pr. hour were obtained in Sonmiani Bay giving hairtails, threadfin breams and croakers.

4.6 Discussion of the composition of the fish fauna of the Pakistan Shelf

Judged by the limited information from the fishing trials with pelagic trawl, sardine-like fish, hairtails, ponyfish and anchovies represent the bulk of fish found in mid-water. Previous surveys have as mentioned above shown anchovies to be perhaps the most abundant component of the pelagic community. There is, however, no clear distinction of forms belonging to the pelagic and the demersal communities, especially in shallow waters. Hairtails, ponyfish, jacks and anchovies are commonly caught both in pelagic and in demersal trawls.

The most common group of fish on the Pakistan shelf is the hairtails. They dominate the bottom trawl catches especially on the Makran Coast with relatively high catch rates, means frequently exceeding 1 tonne/hr. both in the post-monsoon (1st survey) and monsoon-period (3rd survey). Hairtails occur commonly also on the eastern part of the shelf, but in less abundance, particularly in the monsoon period when bottom fish in general seems inclined to scatter.

The next most common form along the whole coast is croakers for which mean catch-rates at times exceeded 500 kg/hr. The third place in distribution and abundance is more or less shared between grunts, rays, catfishes and threadfin breams. Other important representatives in the fauna with a wide distribution, but less general abundance are sea breams, jacks, congers, groupers, sharks and snappers. Shrimps occur in many catches, but the type of trawl used is not well adapted to shrimp fishing and the data are thus not suited for an analysis of this commercially important group.

5. ASSESSMENT OF BIOMASS

The surveys provide data for quantitative estimates of the fish usually expressed as tonnes of standing biomass. The most important data derive from the acoustic system, but the trawling programme of Survey II also provide a basis for an estimate of demersal fish biomass.

5.1 The acoustic method and its limitations

The most favourable conditions for acoustic research are when the main fish biomass aggregates in dense concentrations, the various species does not form spatial mixtures, and the presence of plankton does not screen the fish registrations on the echosounder. Unfortunately the conditions in Pakistan are far from any of these ideal conditions. Most of the biomass forms scattered distributions, with only very few dense patches; at most locations the variety of species is great and at times the plankton screens hinder an accurate estimation of the rather scattered fish densities. All this are factors which lowers the precision of the acoustic estimates. By survey repetition one can, however, partly offset these limitations. In addition to the three surveys described in this report, results from a number of similar previous surveys are available for comparison.

5.2 The acoustic estimates of biomass

The total estimates by regions and surveys are given in Table 7.

Table 7. Total estimates of biomass, survey I - III (thousand tonnes).

	Makran Coast	Sonmiani Bay Sind Coast	Total
Survey I - 5-16 Sep 83	450	600	1050
Survey II - 20 Jan-2 Feb 84	150	500	650
Survey III - 2-12 June 84	300	700	1000

The total of all Pakistan is estimated to 1050, 650 and 1000 thousand tonnes during the three surveys respectively, average 900 thousand tonnes.

Split on regions the Makran coast is estimated to hold 450, 150 and 300 thousand tonnes during the three surveys and the corresponding figures for the region from Sonmiani Bay to Sind Coast are 600, 500 and 700 thousand tonnes. Average estimates are 300 thousand tonnes for the Makran Coast and 600 thousand tonnes for Sonmiani Bay - Sind.

We have no supporting information to explain the decrease in biomass during the second survey, which in fact goes contrary to the expected seasonal tendency based on previous surveys. Part of the decrease can be due to a migration of fish outside the Pakistan EEZ. It seems very likely, in fact, that some of Pakistans fish stocks, particularly from the pelagic community are shared with neighbouring states.

It might also be possible, however, that the resources are considerably underestimated during the second survey due to bias introduced through the survey setup. As the first and last survey are in closer agreement, we consider them as more representative for the actual biomass level. To conclude the general biomass picture, we suggest the following figures as representative for the level of the resources. Rounded figures, thousand tonnes:

Makran Coast	Sonmiani Bay Sind Coast	Total
350	650	1000

Due to the dominant presence of hairtails both in the pelagic and in the demersal fish communities it has been difficult to split the total biomass into the categories small pelagic fish and demersal fish as usually done in the course of the surveys. Through a post-analysis of the acoustic records and the composition in the catches we have set up approximate figures to

express the relative weight of small pelagic and demersal fish in the total fish estimates. These are shown in Table 8.

Table 8. Approximate ratios in percent between pelagic and demersal biomass by regions and surveys.

	Makran Coast	Sonmiani Bay Sind Coast	Total
Survey I	65:35	65:35	65:35
Survey II	80:20	90:10	87:23
Survey III	50:50	70:30	65:35

Average rounded figures based on the first and last survey will be:

	Makran Coast	Sonmiani Bay Sind Coast	Total
Small pelagic	55%	65%	60%
Demersal	45%	35%	40%

Applying these ratios to the total biomass figures above, one comes up with the following estimates. Thousand tonnes:

	Makran Coast	Sonmiani Bay Sind Coast	Total
Small pelagic	190	420	600
Demersal	160	230	400
Total	350	650	1000

As mentioned above, due to a general picture with many intermingling species both in the demersal and in the pelagic communities, the precision of these estimates are likely to be relatively low. Based on experience from similar surveys we would therefore recommend the use of a 25% range above and below these values within which the true figure is likely to be. One could also expect that this would take account of any

main factors of bias in the results. For fishery development purposes it is advisable to use the most conservative of these estimates and rather adjust these in the course of later improved estimates.

It can thus be concluded that the standing fish biomass on the Pakistan shelf in 1983/84 is estimated to have been as follows (thousand tonnes):

	Makran Coast	Sonmiani Bay Sind Coast	Total
Small pelagic	140-240	320-520	450-750
Demersal	120-200	170-290	300-500
Total	260-440	490-810	750-1250

"Dr. Fridtjof Nansen" has carried out previous surveys in Pakistan waters. In 1975-76 five coverages were made under the Indian Ocean Programme covering the whole Arabian Sea. In 1977 five surveys were carried out covering the Pakistan shelf. During the first series of surveys the total biomass varied between 330 and 1110 thousand tonnes with 620 thousand tonnes as an average. During the second series, in 1977, the total biomass was estimated from 250 to 1300 thousand tonnes, with 630 thousand as an average figure. These results have a wider range than found in the surveys described here and they include some very low estimates of biomass. These may partly reflect seasonal changes in biomass caused by fluctuations in short-lived species and by migrations outside the area. But one has also observed in this area and on the SW coast of India an on-shore as well as in off-shelf migration of fish caused by upwelling during the SW monsoon, which may bring part of the resources outside the range of the surveys. The extent of this migration is likely to vary from year to year. As a whole it is thought, therefore, that the results of previous surveys tend to support the present findings.

Estimates of average densities on the shelf can be useful in comparative studies. The shelf off Makran is 3380 nm² and that

from Sonmiani Bay to Sind is 9390 nm^2 . This gives densities of 77-129 tonnes/ nm^2 for Makran and 53-88 tonnes/ nm^2 for the Sonmiani - Sind region. Average values for the whole Pakistan shelf is 59-98 tonnes/ nm^2 .

For comparison similar studies from other regions of the world, from surveys carried out with the R/V "Fridtjof Nansen" with the same methodology, have given the following average densities (tonnes/ nm^2).

West Sahara, Senegal, Guinea:	100-110
Northeast Somalia	: 90
Mauritania	: 75
Ivory Coast, Ghana	: 60-80
Tanzania, Mocambique	: 30-40
Burma, Bangladesh	: 25
Kenya	: 18

The shelf off Pakistan thus belongs among the richer regions in terms of standing stock per unit area.

5.3 Trawl survey estimates

During the second survey, upon request from Department of Fisheries, Karachi, a programme of non-aimed trawling at preselected locations was carried out. 82 stations were worked and on the basis of these, an estimate of the demersal biomass have been calculated by the swept-area method. Applying a catchability coefficient equal to 1.0, i.e. assuming that all the fish in the path of the trawl are caught, one obtains a total estimate of 250 thousand tonnes of demersal fish for the shelf off Pakistan. Pelagic fish have been excluded from the calculations when present in the bottom trawl catches. A catchability coefficient equal to 1.0 tends to give quite conservative estimates. In addition, some of the demersal fish is outside the 6 meter vertical bottom interval swept by the bottom trawl. Thus the 250 thousand tonnes estimated from the trawl survey is in fair agreement with the 260-440 tonnes of demersal fish estimated from the acoustic surveys.

6. EVALUATION OF THE RESOURCE POTENTIALS OF PAKISTAN

The biomass estimates represent important information for evaluating the total potentials of the resources. For this purpose the composition of the biomass needs to be considered and compared to that of the catches. The available data permit only a rough assessment. If the main forms covering up to 70-80 percent of the biomass is included, the composition will be as follows:

Total fish biomass (1000 tonnes) and its main components:

Pelagic community	Demersal community
<u>450-750</u>	<u>300-500</u>
Anchovies	Hairtails
Sardine-like fish	Croakers
Hairtails	Catfishes
Ponyfish	Grunts
	Rays
	Breams

The officially reported fish landings of Pakistan for 1981 are shown by main groups of species in Table 9.

Fish landings do not necessarily reflect the composition of the catches since undesirable forms are often discarded at sea. Thus a considerable part of the fish by-catch in the 30 000 tonnes shrimp fishery must be discarded, and the total catch of demersal fish is probably appreciably higher than the recorded landings. Information on this by-catch should be taken into account in further evaluations.

For the pelagic forms, however, one can note that the total landings of these types (oil sardine, mackerel, carangids, jacks, barracudas) amounts to less than 80 000 tonnes. This may be compared with a total biomass estimate of between 450 and 750 000 tonnes for small pelagic fish. Within this total group there is no doubt a considerable potential for increased catches. The additional potential would first of all be for anchovies, but there is likely to be underutilized resources also within the sardine types of fish.

Table 9. Nominal landings of marine fish in Pakistan by main species or groups 1981, (Source Table E4, FAO Yearbook of Fishery Statistics vol. 52).

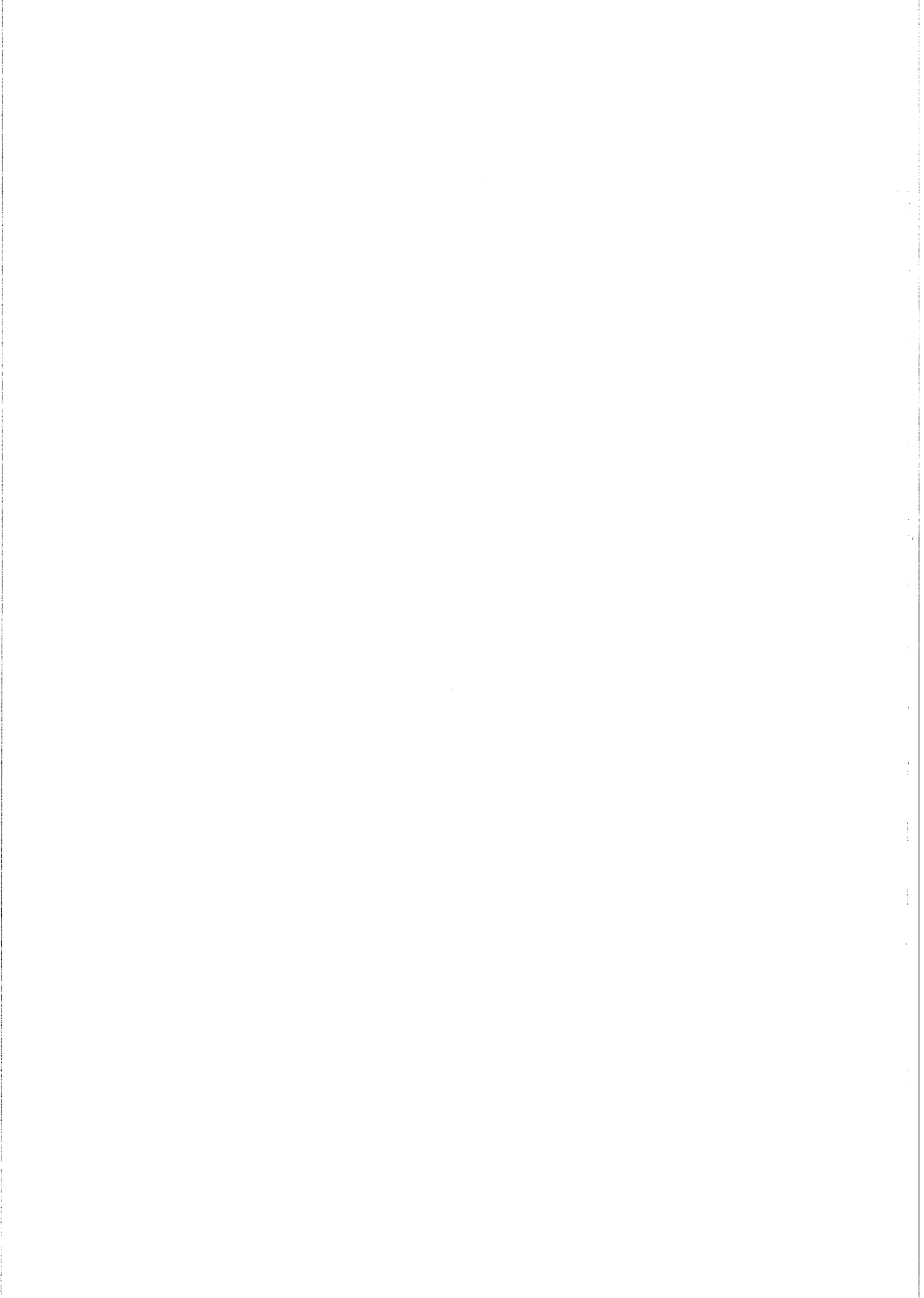
	Tonnes	%
Indian oil sardine	56 346	22
Skates and rays	44 705	17
Natantia decapods (shrimp)	30 000	11
Sharks	18 193	7
Croakers, drums	16 657	6
Sea catfishes	10 269	4
Dorab wolf-herring	9 581	4
Kawakawa Euthynnus	8 212	3
King mackerel	7 490	3
Mulletts	7 018	3
Carangids (not identified)	5 807	2
Largehead Hairtail	5 000	2
Grunts	4 339	2
Jacks, crevalles	3 987	2
Hilsa	3 923	1
Barracudas	3 606	1
Black pomfret	3 273	1
Groupers	3 300	1
Seabreams	3 099	1
Conger eels	3 065	1
Snappers	2 313	1
Fourfinger threadfin	2 002	1
Others	9 354	4
Total marine catch	261 539	

For the demersal forms the 1981 landings of the six most common forms which comprise about 3/4 of the biomass of 300-500 000 tonnes, was about 80 000 tonnes. Even if some of these forms are part of a shrimp by-catch and discards, there is still likely to be room for significant increases of catch within this group. The additional potential would first of all be for hairtails, but there is likely to be room for increased catches also of croakers, catfishes, grunts and breams.

The survey information do not permit any evaluation of the state of exploitation of the most common forms in the Pakistan fishery, such as oil sardine, rays, shrimp and sharks. The conclusions that have been drawn above are of a general nature. In order to be of use in a fishery development context they should be supplemented by more specific information on the resources, their catchability and distribution in time and space. Some of the detailed catch data from the surveys are appended to this report. Similar data are available from previous surveys. The descriptions of the distribution of the resources presented under Section 3 above may also be of interest in this context.

APPENDIX

Fishing Stations



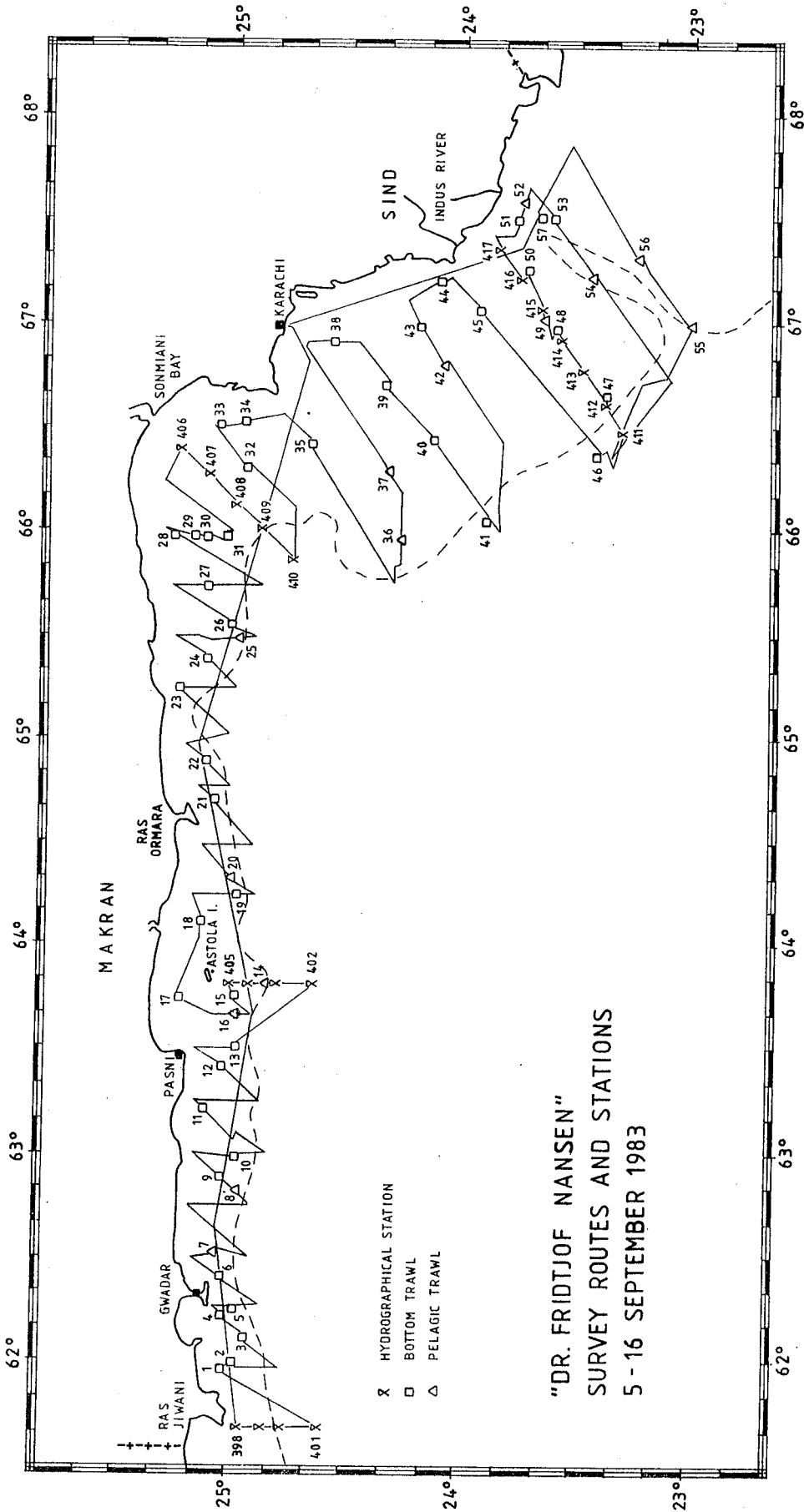


Fig. 1. Survey routes and stations. "Dr. Fridtjof Nansen"s fisheries resources survey, Pakistan, 5-16 September 1983.

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ANNEX I : Details of fishing stations with dominant species.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
07.09	0640	1	BT	25	25	N25 01'	E061 58'	331,3	662,6	Lepturacanthus savala CARCHARHINIDAE Pomadasys hasta Arius sp	382,40 92,40 86,40 48,40	57,7 13,9 13,0 7,3
07.09	0830	2	BT	47	47	N24 59'	E062 01'	65,9	137,8	Lepturacanthus savala Sepia pharaonis Rhizoprionodon acutus Epinephelus undulatus	52,00 36,60 22,60 16,80	37,7 26,8 16,4 12,1
07.09	1150	3	BT	80	80	N24 56'	E062 06'	44,5	89,0	Otolithoides biauritus Lepturacanthus savala Arius sp SEPIIDAE JELLYFISH	41,00 10,80 7,20 6,00 10,00	46,0 12,1 8,0 6,7 11,2
07.09	1335	4	BT	19	19	N25 02'	E062 11'	153,9	307,8	Pomadasys hasta Rhinoptera sp. Lutjanus argentimaculatus Acanthopagrus sp.	98,60 42,80 30,60 26,00	32,0 13,9 9,9 8,4
07.09	1515	5	BT	37	37	N24 59'	E062 14'	143,5	287,0	Pomadasys hasta Lepturacanthus savala Gymnura sp. Rhizoprionodon acutus	119,00 94,40 23,20 19,20	41,4 32,8 8,0 6,6
07.09	1620	6	BT	28	28	N25 03'	E062 24'	74,0	148,0	Arius sp Rhinoptera sp. Lepturacanthus savala SHRIMPS	26,00 20,00 14,20 4,40	41,1 19,4 20,8 6,4
07.09	2125	7	PT	40	10	N25 04'	E062 30'	566,6	1932,2	Dussumieria acuta Lepturacanthus savala Rhizoprionodon acutus	1800,00 60,00 31,40	93,1 4,1 1,6
08.09	0325	8	PT	40	10	N24 59'	E062 49'	2174,0	4348,0	Dussumieria acuta Decapterus russelli	3720,00 560,00	65,5 12,8
08.09	0505	9	BT	22	22	N25 03'	E062 53'	1220,1	2440,2	Nibea albida MURAENESOXIDAE Gymnura sp. Otolithes ruber	1560,00 160,00 141,20 100,70	63,9 7,3 5,7 4,1
08.09	0825	10	BT	38	38	N24 59'	E062 57'	3126,1	6312,2	Lepturacanthus savala	6000,00	95,0

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DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
08.09	1225	11	BT	15	15	N25 08'	E063 13'	76,1	152,2	Gymnura sp. Lepturacanthus savala Epinephelus diacanthus Arius sp	72,00 40,00 30,00 7,60	47,3 26,2 19,7 4,9
08.09	1705	12	BT	20	20	N25 03'	E063 25'	138,9	277,8	Lepturacanthus savala Arius sp Carangoides talamparoides Argyrops spinifer	120,00 83,80 12,50 11,90	43,1 30,1 4,4 4,2
08.09	1945	13	BT	34	34	N24 59'	E063 29'	1590,3	3180,6	JELLYFISH Lepturacanthus savala	3000,00 74,92	94,3 2,3
09.09	0405	14	PT	>500	30	N24 49'	E063 49'	420,0	840,0	MYCTOPHIDAE	840,00	100,0
09.09	0805	15	BT	68	68	N24 59'	E063 46'	617,8	1235,6	Pennahia sp. Lepturacanthus savala	664,00 564,00	53,7 45,6
09.09	1005	16	PT	80	20	N24 58'	E063 40'	10,0	20,0	JELLYFISH	20,00	100,0
09.09	1225	17	BT	12	12	N25 15'	E063 45'	594,5	1189,0	Arius sp Acanthopagrus sp. Lepturacanthus savala Gymnura sp.	348,00 238,00 192,00 140,00	29,2 20,0 16,1 11,7
09.09	1550	18	BT	12	12	N25 09'	E064 07'	46,6	93,2	MURAENESOXIDAE Lepturacanthus savala Gymnura sp. Arius sp	60,00 40,00 28,00 6,20	64,3 42,9 30,0 6,6
09.09	1855	19	BT	25	25	N24 59'	E064 15'	525,7	1051,4	SCIAENIDAE Parapenaeopsis stylifera Epinephelus diacanthus Argyrops spinifer JELLYFISH	100,00 86,40 69,00 49,00 566,00	9,5 8,2 6,5 4,6 53,8
09.09	2105	20	PT	19	10	N25 01'	E064 20'	3333,6	6667,2	Lepturacanthus savala Krill Scomberoides commersonianus Megalaspis cordyla	6000,00 300,00 130,80 130,40	89,9 4,4 1,9 1,9
10.09	0315	21	BT	16	16	N25 06'	E064 42'	198,8	397,6	Arius sp MURAENESOXIDAE Otolithes ruber Gymnura sp.	120,00 80,00 72,00 50,00	30,1 20,1 18,1 12,5

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DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
10.09	0650	22	BT	27	27	N25 08'	E064 54'	290,2	580,4	Lepturacanthus savala Argyrops spinifer Pomadasys hasta Dasyatis sp	328,80 124,00 69,00 16,00	56,6 21,3 11,8 2,7
10.09	1135	23	BT	17	17	N25 15'	E065 15'	29,5	59,0	Gymnura sp. Otolithes ruber Rhinoptera sp. Pomadasys hasta Parapenaeopsis stylifera	19,40 10,80 6,80 6,40 6,00	32,8 18,3 11,5 10,8 10,1
10.09	1455	24	BT	23	23	N25 09'	E065 24'	104,7	209,4	Lepturacanthus savala Nibea albida Pomadasys hasta Krill	140,00 29,20 8,00 10,00	66,8 13,9 3,8 4,7
10.09	1955	25	PT	200	70	N25 00'	E063 30'	165,0	330,0	Lepturacanthus savala	330,00	100,0
10.09	2205	26	BT	33	33	N25 01'	E065 32'	87,9	16,7	Trichiurus lepturus Arius sp Otolithes ruber Saurida tumbil	6,49 5,85 ,81 ,75	38,8 35,0 4,8 4,4
11.09	0145	27	BT	24	24	N25 07'	E065 45'	56,7	113,4	Arius sp Otolithes ruber Otolithes ruber Argyrops spinifer	41,40 33,20 15,00 8,20	36,5 29,2 13,2 7,2
11.09	0645	28	BT	14	14	N25 17'	E065 59'	165,0	330,0	Trichiurus lepturus Lactarius lactarius Pomadasys hasta Arius sp	224,80 73,60 12,40 6,30	68,1 22,3 3,7 1,9
11.09	0855	29	BT	35	35	N25 12'	E065 58'	4553,4	9106,8	Trichiurus lepturus	9000,00	98,8
11.09	1015	30	BT	65	65	N25 08'	E065 58'	2554,6	5109,2	Trichiurus lepturus	5000,00	97,8
11.09	1410	31	BT	97	97	N25 03'	E065 58'	673,0	1346,0	SCIAENIDAE Nemipterus japonicus	1300,00 46,00	96,5 3,4
12.09	0440	32	BT	70	70	N24 57'	E066 19'	187,4	374,8	Nemipterus japonicus SCIAENIDAE Saurida tumbil Trichiurus lepturus	135,00 105,00 75,00 22,60	36,0 28,0 20,0 6,0

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DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
12.09	0740	33	BT	38	38	N24 04'	E066 31'	181,4	362,8	Trichiurus lepturus Lactarius lactarius Pomadasys hasta Gymnura sp.	271,20 52,80 20,40 4,40	74,7 14,5 5,6 1,2
12.09	0930	34	BT	31	31	N24 58'	E066 32'	1265,4	2530,8	Arius sp Pomadasys hasta Trichiurus lepturus Pomadasys opercularis	2000,00 202,80 50,00 38,00	79,0 8,0 1,9 1,5
12.09	1355	35	BT	73	73	N24 40'	E066 25'	71,9	143,8	Trichiurus lepturus Nemipterus japonicus Sphyaena obtusata Leiognathus sp	56,00 37,00 18,00 13,80	38,9 25,7 12,5 9,5
12.09	1950	36	PT	115	10	N24 17'	E065 58'	140,0	280,0	MYCTOPHIDAE Sphyaena obtusata Champsodon sp. Echeneis sp	242,00 25,60 7,20 4,40	86,4 9,1 2,5 1,5
12.09	2245	37	PT	74	55	N24 21'	E066 17'	1001,5	2003,0	Nemipterus japonicus JELLYFISH	400,00 1600,00	19,9 79,8
13.09	0415	38	BT	22	22	N24 36'	E066 55'	181,8	363,6	Pomadasys hasta Argyrosomus hololepidotus Sciaenidae. unidentified Protonibea diacanthus	157,50 32,80 27,00 26,20	43,3 9,0 7,4 7,2
13.09	0715	39	BT	77	77	N24 21'	E066 43'	110,1	220,2	Trichiurus lepturus	216,80	98,4
13.09	1015	40	BT	87	87	N24 08'	E066 26'	106,1	212,2	Trichiurus lepturus Ariomma indica Nemipterus japonicus Seriolina nigrofasciata	196,00 4,60 4,40 3,10	92,3 2,1 2,0 1,4
13.09	1410	41	BT	244	244	N23 55'	E066 03'	213,0	426,0	Champsodon sp. Synagrops adeni SCIAENIDAE	352,00 52,00 19,20	82,6 12,2 4,5
13.09	2050	42	PT	57	20	N24 05'	E066 49'	169,2	338,4	Dussumieria acuta Sardinella sindensis JUVENILE FISHES JELLYFISH	210,00 22,50 15,00 87,00	62,0 6,6 4,4 25,7

CRUISE NO. 1. 5-16. SEPTEMBER 1983.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
13.09	2305	43	BT	44	44	N24 13'	E066 59'	141,1	282,2	Apogon sp Polynemus sp. Psettodes erumei Metapenaeus monoceros	65,00 60,00 24,00 20,00	23,0 21,2 8,5 7,0
14.09	0155	44	BT	16	16	N24 08'	E067 12'	36,8	73,6	SHRIMPS Otolithes ruber Umbrina sp. Trichiurus lepturus	20,00 19,20 10,00 6,00	27,1 26,0 13,5 8,1
14.09	0455	45	BT	40	40	N23 56'	E067 04'	500,4	1501,2	Pomadasys maculatus Sciaenidae. unidentified Psettodes erumei Johnieops sp.	597,60 352,80 216,00 158,40	39,8 23,5 14,3 10,5
14.09	1110	46	BT	299	299	N23 25'	E066 22'	32,4	64,8	Champsodon sp. Nibea albida Harpodon nehereus Panulirus polyphagus	28,20 17,00 12,40 2,00	43,5 26,2 19,1 3,0
14.09	1600	47	BT	124	124	N23 25'	E066 38'	78,0	156,0	Nemipterus sp. Pennahia argentata Acropoma japonicum Champsodon sp.	76,00 54,00 12,60 7,80	48,7 34,6 8,0 5,0
14.09	2000	48	BT	83	83	N23 36'	E066 58'	487,2	974,4	Nemipterus japonicus PLATYCEPHALIDAE Lepidotrigla sp SEPIIDAE	754,80 73,10 42,50 27,20	77,4 7,5 4,3 2,7
14.09	2145	49	PT	69	10	N23 40'	E067 04'	246,4	492,8	Leiognathus sp Decapterus russelli	467,20 22,56	94,8 4,5
15.09	0030	50	BT	27	27	N23 45'	E067 15'	231,6	463,2	Pomadasys maculatus SHRIMPS Otolithes ruber Pomadasys hasta	286,00 24,00 50,40 16,40	61,7 5,1 10,8 3,5
15.09	0440	51	BT	18	18	N23 47'	E067 30'	144,6	289,2	SCIAENIDAE Argyrosomus hololepidotus Johnieops sp. Pomadasys hasta	104,00 75,40 22,80 15,00	35,9 26,0 7,8 5,1

CRUISE NO. 1. 5-16. SEPTEMBER 1983.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR	HR
15.09	0635	52	PT	24	15	N23 45'	E067 35'	365,4	730,8	Stolephorus sp Dussumieria acuta Rhizoprionodon oligolinx Pomadasys hasta Trichiurus lepturus	346,50 157,50 102,00 88,80 78,00	47,4 21,5 13,9 12,1 10,6
15.09	0855	53	BT	57	57	N23 37'	E067 29'	8000,0	16000,0	Dasyatis sp Trichiurus lepturus Pomadasys hasta Johnieops sp.	4000,00 2400,00 2400,00 1600,00	25,0 15,0 15,0 10,0
15.09	1230	54	PT	82	64	N23 22'	E067 13'	1,3	2,6	Saurida undosquamis Ariomma indica C E P H A L O P O D A Decapterus sp.	1,00 ,60 ,40 ,04	38,4 23,0 15,3 1,5
15.09	2215	55	PT	89	1	N23 01'	E066 58'	6,1	12,2	MYCTOPHIDAE Sphyraena obtusata Champsodon sp. Decapterus Macarellus	11,00 ,40 ,30 ,20	90,1 3,2 2,4 1,6
16.09	0240	56	PT	31	16	N23 15'	E067 20'	139,8	279,6	Trichiurus lepturus Lactarius lactarius Sphyraena obtusata JELLYFISH	18,00 12,00 7,20 240,00	6,4 4,2 2,5 85,8
16.09	0915	57	BT	43	43	N23 40'	E067 31'	7980,0	15960,0	Otolithes cuvieri Pomadasys maculatus Pomadasys hasta Polynemus sp.	3164,00 2618,00 2100,00 1414,00	19,8 16,4 13,1 8,8

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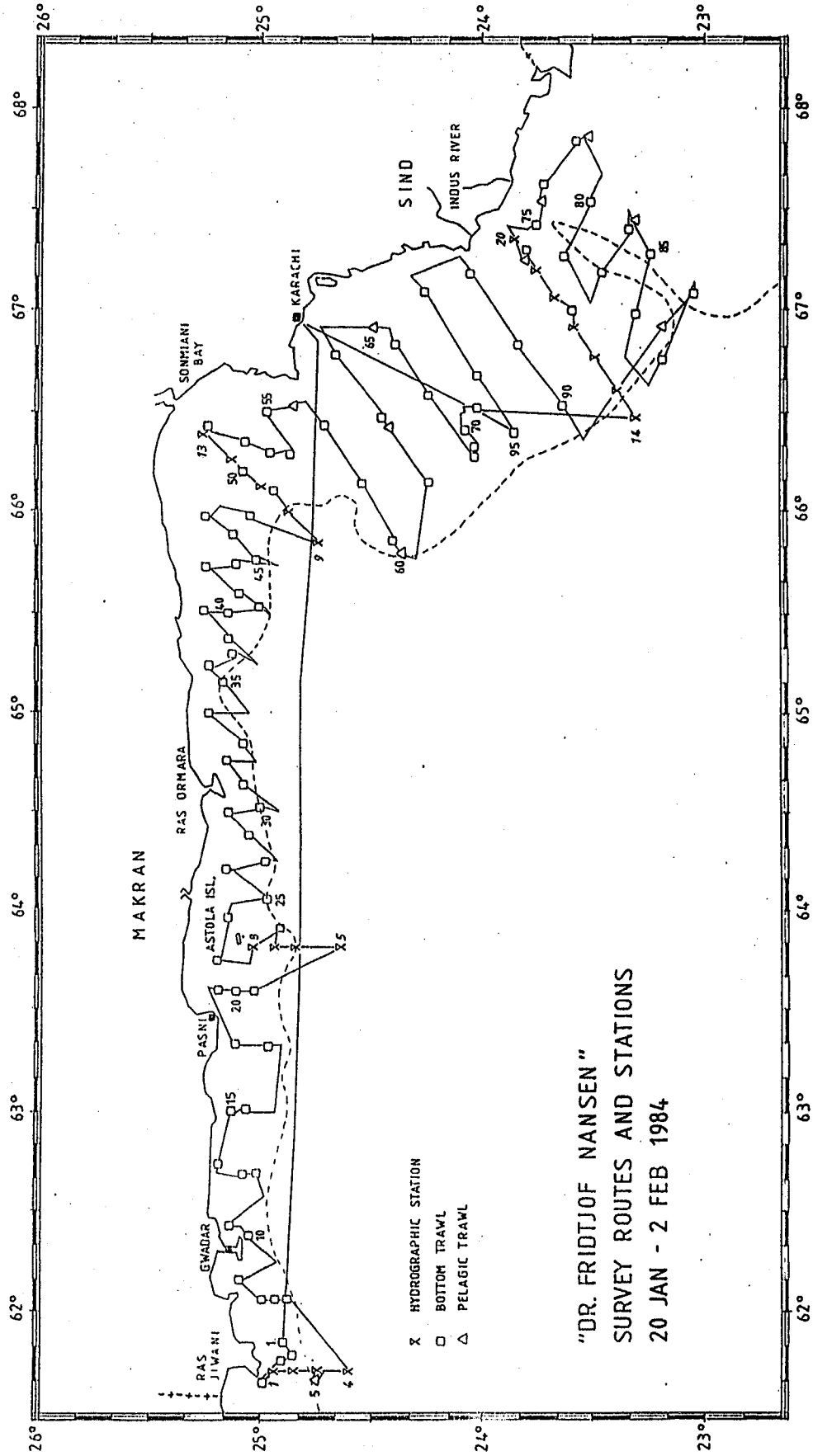


Fig. 1. Survey routes and stations. "Dr. Fridtjof Nansen"s fisheries resources survey, Pakistan, 20 Jan - 2 Feb 1984. Add 57 to fishing station no.

CRUISE NO. 2. 20 JAN - 2 FEB 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
21.01	1335	58	BT	78	78	N24 54'	E061 50'	263,6	527,2	Pomadasys maculatus Apolectus niger Rhonciscus stridens SHARK	211,20 66,00 51,60 41,00	40,0 12,5 9,7 7,7
21.01	1530	59	BT	125	125	N24 51'	E061 47'	172,6	345,2	Acropoma japonicum SHARK Arius sp Gymnura sp.	156,00 58,00 31,00 21,80	45,1 16,8 8,9 6,3
21.01	1700	60	BT	67	67	N24 54'	E061 45'	869,4	1738,8	DASYATIDAE Thryssa vitrirostris Pampus argenteus Trichiurus lepturus	315,00 264,00 202,60 200,00	18,1 15,1 11,6 11,5
21.01	1850	61	BT	9	9	N25 00'	E061 40'	128,1	256,2	Argyrosonus sp. Nemipterus japonicus Pampus argenteus Otolithes ruber	46,80 28,80 25,00 22,80	18,2 11,2 9,7 8,8
21.01	2305	62	PT	>500	40	N24 46'	E061 42'	215,0	430,0	MYCTOPHIDAE Trichiurus lepturus	420,00 10,00	97,6 2,3
22.01	0505	63	BT	110	110	N24 54'	E062 06'	290,0	580,0	Nemipterus metopias Trichiurus lepturus Johnieops sp. Rhizoprionodon acutus	312,00 60,00 45,00 36,00	53,7 10,3 7,7 6,2
22.01	0645	64	BT	69	69	N24 57'	E062 06'	291,7	583,4	Nemipterus metopias Carangoides malabaricus Pomadasys maculatus Rhizoprionodon acutus	209,60 44,80 44,80 30,20	35,9 7,6 7,6 5,1
22.01	0825	65	BT	41	41	N24 59'	E062 05'	696,8	1393,6	Carangoides chrysophrys Rachycentron canadus DASYATIDAE Scomberoides commersonianus	377,00 360,00 320,00 71,40	27,0 25,8 22,9 5,1
22.01	1030	66	BT	14	14	N25 06'	E062 10'	42,3	84,6	LOLIGINIDAE Gymnura sp. Alectis indicus Scomberomorus guttatus	30,00 10,00 6,00 5,60	35,4 11,8 7,0 6,6
22.01	1330	67	BT	18	18	N25 30'	E062 22'	34,3	68,6	GYMNURIDAE Pteromylaeus bovinus Scomberomorus commersoni LOLIGINIDAE Arthron stellatus	15,20 13,20 13,00 12,60 12,00	22,1 19,2 18,9 18,3 17,4

CRUISE NO. 2. 20 JAN - 2 FEB 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
22.01	1455	68	BT	15	15	N25 09'	E062 26'	349,3	698,6	<i>Epinephelus tauvina</i> <i>Argyrops spinifer</i> <i>Cheimerius nufar</i> <i>Dasyatis uarnak</i>	146,00 133,80 72,00 70,00	20,8 19,1 10,3 10,0
22.01	1740	69	BT	35	35	N25 02'	E062 42'	39,5	79,0	<i>Rhizoprionodon acutus</i> <i>Loligo sp</i> <i>Argyrops spinifer</i> <i>Pomadasys hasta</i> <i>Sphyaena jello</i>	20,60 20,00 9,80 9,00 9,00	26,0 25,3 12,4 11,3 11,3
22.01	1920	70	BT	20	20	N25 07'	E062 42'	323,7	647,4	<i>Pomadasys stridens</i> <i>Argyrops spinifer</i> <i>Decapterus russelli</i> <i>Cheimerius nufar</i>	136,00 108,00 62,00 31,00	21,0 16,6 9,5 4,7
22.01	2135	71	BT	16	16	N25 11'	E062 46'	359,3	718,6	<i>Pomadasys stridens</i> <i>Pomadasys sinuosus</i> <i>Argyrops spinifer</i> <i>Nemipterus metopias</i>	134,00 56,00 55,80 40,00	18,6 7,7 7,7 5,5
23.01	0130	72	BT	16	16	N25 08'	E063 01'	1180,0	2360,0	<i>Pomadasys stridens</i> <i>Paranibea semiluctuosa</i> <i>Epinephelus diacanthus</i> <i>Pomadasys hasta</i>	644,14 388,70 161,04 149,92	27,2 16,4 6,8 6,3
23.01	0320	73	BT	19	19	N25 05'	E063 02'	810,5	1621,0	<i>Pomadasys hasta</i> <i>Nemipterus metopias</i> <i>Argyrops spinifer</i> <i>Arius sp</i> SHARK	365,30 297,86 179,84 168,60 168,60	22,5 18,3 11,0 10,4 10,4
23.01	0755	74	BT	24	24	N24 59'	E063 18'	93,6	187,2	<i>Arius sp</i> <i>Rhizoprionodon acutus</i> LOLIGINIDAE <i>Nemipterus metopias</i>	54,40 40,00 19,60 11,60	29,0 21,3 10,4 6,1
23.01	0945	75	BT	15	15	N25 07'	E063 18'	280,3	560,6	<i>Argyrops spinifer</i> <i>Gymnura sp.</i> <i>Diagramma picta</i> <i>Scomberomorus commersoni</i>	159,00 100,00 43,40 39,60	28,3 17,8 7,7 7,0
23.01	1205	76	BT	13	13	N25 11'	E063 37'	92,1	184,2	<i>Gymnura sp.</i> <i>Dasyatis sp</i> <i>Rhizoprionodon acutus</i> <i>Argyrops spinifer</i>	74,60 28,60 28,00 10,50	40,4 15,5 15,2 5,7
23.01	1400	77	BT	17	17	N25 07'	E063 36'	419,0	838,0	<i>Decapterus russelli</i> <i>Rhizoprionodon acutus</i> <i>Argyrops spinifer</i> MYLIOBATIDAE	551,00 89,60 49,00 43,00	65,7 10,6 5,8 5,1

CRUISE NO. 2. 20 JAN - 2 FEB 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
23.01	1545	78	BT	26	26	N25 01'	E063 36'	242,0	484,0	LOLIGINIDAE Decapterus russelli Megalaspis cordyla Rhizoprionodon acutus	214,00 140,00 40,60 29,60	44,2 28,9 8,3 6,1
23.01	2255	79	BT	103	103	N24 56'	E063 48'	448,2	896,4	Nemipterus metopias Johnius sp. Nemipterus japonicus Polynemus sp.	318,00 309,00 93,00 33,00	35,4 34,4 10,3 3,6
24.01	0250	80	BT	13	13	N25 13'	E063 45'	2500,0	5000,0	Arius sp R A Y S Decapterus russelli Thryssa sp	2400,00 2400,00 80,00 60,00	48,0 48,0 1,6 1,2
24.01	0500	81	BT	15	15	N25 09'	E063 59'	171,2	342,4	Arius sp Rhizoprionodon acutus Decapterus russelli Epinephelus malabaricus	61,40 53,00 49,98 41,80	17,9 15,4 14,5 12,2
24.01	0725	82	BT	75	75	N24 59'	E064 04'	167,3	334,6	Dasyatis uarnak LOLIGINIDAE Arius sp Rhizoprionodon acutus	70,00 48,00 34,00 30,00	20,9 14,3 10,1 8,9
24.01	1020	83	BT	10	10	N25 10'	E064 14'	329,1	658,2	Arius sp Trichiurus lepturus Gymnura sp. Carangoides malabaricus	170,00 166,00 110,00 73,00	25,8 25,2 16,7 11,0
24.01	1215	84	BT	35	35	N24 59'	E064 14'	142,1	284,2	LOLIGINIDAE Gymnura sp. Rhizoprionodon acutus Scomberomorus commersoni	160,00 35,40 21,40 15,40	56,2 12,4 7,5 5,4
24.01	1420	82	BT	19	19	N25 03'	E064 23'	282,5	565,0	CARCHARHINIDAE MYLIOBATIDAE Pomadasys hasta Scomberoides commersonianus	198,60 71,60 66,00 35,20	35,1 12,6 11,6 6,2
24.01	1550	83	BT	9	9	N25 10'	E064 30'	204,8	409,6	Lactarius lactarius R A Y S Trichiurus lepturus SHARK	204,00 100,00 42,00 23,40	49,8 24,4 10,2 5,7
24.01	1810	87	BT	28	28	N25 00'	E064 31'	440,0	880,0	Pomadasys maculatus Trichiurus lepturus Pomadasys stridens Gymnura sp.	360,00 230,00 130,00 40,00	40,9 26,1 14,7 4,5

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DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
24.01	2040	88	BT	18	18	N25 04'	E064 38'	172,8	345,6	Nemipterus sp. Trichiurus lepturus Acanthopagrus berda PLATYCEPHALIDAE	93,00 72,00 63,60 25,00	26,9 20,8 18,4 7,2
24.01	2215	89	BT	14	14	N25 10'	E064 46'	101,4	202,8	Arius sp Otolithes ruber Trichiurus lepturus Saurida sp.	80,00 24,00 20,00 16,00	39,4 11,8 9,8 7,8
25.01	0035	90	BT	46	46	N25 05'	E064 52'	526,2	1052,4	Lactarius lactarius Pomadasys maculatus Johnieops sp. Nemipterus metopias	315,40 216,60 140,60 125,40	29,9 20,5 13,3 11,9
25.01	0250	91	BT	15	15	N24 15'	E065 00'	144,4	433,2	Pomadasys sp. Nemipterus metopias Argyrops spinifer Pomadasys hasta	121,50 42,00 37,50 31,50	28,0 9,6 8,6 7,2
25.01	0655	92	BT	46	46	N25 10'	E065 11'	291,0	582,0	Pomadasys hasta Argyrosomus hololepidotus Lactarius lactarius Otolithes ruber	144,00 140,00 53,60 49,60	24,7 24,0 9,2 8,5
25.01	0845	93	BT	18	18	N25 15'	E065 15'	122,1	244,2	Trichiurus lepturus Pomadasys commersonni Pomadasys hasta Dasyatis jenkinsii	96,00 64,60 25,40 14,00	39,3 26,4 10,4 5,7
25.01	1045	94	BT	46	46	N25 07'	E065 18'	98,0	196,0	Gymnura sp. Carangoides chrysophrys Pteromylaeus bovinus Argyrops spinifer LOLIGINIDAE	80,00 30,60 28,00 22,00 20,00	40,8 15,6 14,2 11,2 10,2
25.01	1330	95	BT	23	23	N25 10'	E065 24'	127,2	254,4	GYMNURIDAE Argyrops spinifer Alutera monoceros Trichiurus lepturus	64,80 62,00 55,60 36,00	25,4 24,3 21,8 14,1
25.01	1530	96	BT	13	13	N25 16'	E065 32'	165,1	330,1	Arius sp Argyrops spinifer Pampus argenteus Trichiurus lepturus	115,20 90,20 30,00 30,00	34,8 27,3 9,0 9,0
25.01	1705	97	BT	22	22	N25 08'	E065 30'	323,3	646,6	Trichiurus lepturus Gymnura sp. Pomadasys stridens Pomadasys hasta	420,00 120,00 22,40 17,00	64,9 18,5 3,4 2,6

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DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
25.01	1855	98	BT	41	41	N25 00'	E065 31'	216,4	432,8	Pomadasys maculatus Otolithes cuvieri Lactarius lactarius Nemipterus metopias	98,00 86,40 65,60 46,40	22,6 19,9 15,1 10,7
25.01	2110	99	BT	21	21	N25 07'	E065 38'	472,0	944,0	Dasyatis jenkinsii Epinephelus malabaricus Arius sp Pteromylaeus bovinus	400,00 160,00 150,00 70,00	42,3 16,9 15,8 7,4
25.01	2325	100	BT	16	16	N25 16'	E065 45'	738,8	1477,6	Arius sp R A Y S Argyrosomus hololepidotus Otolithes ruber	850,00 180,00 120,00 119,00	57,5 12,1 8,1 8,0
26.01	0125	101	BT	23	23	N25 07'	E065 45'	871,9	1743,8	Arius sp Lutjanus sp Argyrosomus hololepidotus Pomadasys hasta	1600,00 51,00 47,40 24,00	91,7 2,9 2,7 1,3
26.01	0405	102	BT	68	68	N25 01'	E065 48'	214,6	429,2	Nemipterus japonicus Johnieops sp. Otolithes ruber R A Y S	120,00 62,40 48,00 40,00	27,9 14,5 11,1 9,3
26.01	0550	103	BT	63	63	N25 07'	E065 53'	300,0	600,0	Lactarius lactarius Pomadasys hasta Nemipterus metopias Nemipterus japonicus	193,20 95,00 56,00 43,40	32,2 15,8 9,3 7,2
26.01	0740	104	BT	16	16	N25 19'	E066 00'	111,0	222,0	Scomberomorus guttatus Trichiurus lepturus LOLIGINIDAE Arius sp	100,60 38,20 29,00 19,00	45,3 17,2 13,0 8,5
26.01	1000	105	BT	98	98	N25 02'	E066 00'	249,4	498,8	Lactarius lactarius Pampus argenteus Trichiurus lepturus Arius sp	164,80 120,80 50,00 40,00	33,0 24,2 10,0 8,0
26.01	1540	106	BT	103	103	N24 57'	E066 06'	774,2	1548,4	Dasyatis jenkinsii Pomadasys hasta Johnius belangerii Otolithes cuvieri	800,00 116,00 92,00 90,00	51,6 7,4 5,9 5,8
26.01	1815	107	BT	83	83	N25 04'	E066 12'	210,4	420,8	Lactarius lactarius Trichiurus lepturus Nemipterus metopias Nemipterus japonicus	110,00 60,00 53,00 45,00	26,1 14,2 12,5 10,6

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DATE	TIME	STN	GEAR	DEPTH (M)	POSITION		CATCH (KG)	WEIGHT (KG)	DOMINANT SPECIES
					LATIT.	LONGIT.			
27.01	0740	108	BT	15	15	N25 16' E066 25'	203,8	203,8	Trichiurus lepturus Nemipterus japonicus Arius sp Argyrops spinifer
27.01	1000	109	BT	61	61	N25 06' E066 22'	455,0	455,0	Trichiurus lepturus Apolectus niger Nemipterus japonicus Lactarius lactarius
27.01	1205	110	BT	69	69	N24 59' E066 19'	286,7	286,7	Trichiurus lepturus Pomadoury hasta LOLIGINIDAE Pteromylaeus bovinus
27.01	1432	111	BT	72	72	N24 54' E066 18'	540,3	540,3	Trichiurus lepturus Carangoides chrysophrys Arius sp Scorbrooides commersonianus
27.01	2150	112	BT	39	39	N24 59' E066 30'	210,4	420,8	Nemipterus metopias Saurida tumbil Nemipterus japonicus Platycephalus sp.
27.01	2305	113	PT	30	1	N24 52' E066 31'	2,6	5,2	Trichiurus lepturus Upeneus vittatus LOLIGINIDAE FISH LARVAE
28.01	0045	114	BT	41	41	N24 44' E066 27'	315,8	631,6	Argyrops spinifer Nemipterus japonicus Nemipterus metopias Saurida tumbil
28.01	0340	115	BT	106	106	N24 32' E066 08'	450,0	900,0	Nemipterus metopias Saurida tumbil Nemipterus japonicus Otolithes ruber
28.01	0715	116	BT	145	145	N24 24' E065 52'	501,7	1003,4	Trichiurus lepturus Nemipterus metopias Rhizoprionodon acutus APOGONIDAE
28.01	0915	117	PT	250	120	N24 22' E065 48'	12,5	25,0	MYCTOPHIDAE Trichiurus lepturus LOLIGINIDAE Tentoriceps cristatus

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DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR	HR
28.01	1325	118	BT	86	86	N24 16'	E061 11'	612,9	1225,8	Selar crumenophthalmus Nemipterus metopias Ariomma indica Decapterus russelli	352,00 308,00 209,00 176,00	28,7 25,1 17,0 14,3
28.01	1635	119	PT	74	40	N24 27'	E066 27'	100,0	200,0	Leiognathus sp LOLIGINIDAE	170,00 30,00	85,0 15,0
28.01	1810	120	BT	67	67	N24 28'	E066 29'	245,0	490,0	Nemipterus metopias Pomadasys hasta Nemipterus japonicus Saurida sp.	116,80 68,30 52,00 51,20	23,8 13,9 10,6 10,4
28.01	2125	121	BT	31	31	N24 39'	E066 47'	102,5	205,0	Nemipterus japonicus Argyrops spinifer Pomadasys hasta Platycephalus sp.	40,00 39,60 30,00 21,00	19,5 19,3 14,6 10,2
29.01	0025	122	PT	29	25	N24 29'	E066 55'	170,0	340,0	Stolephorus sp Trichiurus lepturus Scomberomorus guttatus Loligo sp	247,70 60,00 12,60 10,00	72,8 17,6 3,7 2,9
29.01	0215	123	BT	58	58	N24 24'	E066 51'	127,2	254,4	Nemipterus japonicus Gazza minuta Trichiurus lepturus Pomadasys hasta	100,00 65,00 18,00 11,20	39,3 25,5 7,0 4,4
29.01	0455	124	BT	80	80	N24 15'	E066 36'	118,3	236,6	Nemipterus japonicus Platycephalus sp. Nemipterus metopias Argyrosomus hololepidotus	76,80 30,00 30,00 16,80	32,4 12,6 12,6 7,1
29.01	0755	125	BT	97	97	N24 03'	E066 19'	162,6	325,2	Decapterus russelli Nemipterus metopias Carangoides chrysophrys Epinephelus episticus	110,00 97,00 28,00 11,00	33,8 29,8 8,6 3,3
29.01	1010	126	BT	105	105	N24 01'	E066 18'	381,0	381,0	Nemipterus metopias Rhizoprionodon acutus Epinephelus diacanthus Sphyraena obtusata	189,90 37,50 32,70 16,20	49,8 9,8 8,5 4,2
29.01	1400	127	BT	88	88	N24 04'	E066 24'	603,9	603,9	Nemipterus metopias Decapterus russelli Saurida tumbil LOLIGINIDAE	243,00 135,00 36,00 30,60	40,2 22,3 5,9 5,0

CRUISE NO. 2. 20 JAN - 2 FEB 1984

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
29.01	1715	128	PT	72	72	N24 01'	E066 32'	75,0	150,0	Leiognathus sp	150,00	100,0
30.01	0425	129	BT	83	83	N23 37'	E067 01'	221,2	442,4	Nemipterus metopias Nemipterus japonicus Saurida tumbil Platycephalus sp.	88,40 78,20 69,70 62,90	19,9 17,6 15,7 14,2
30.01	0800	130	BT	22	22	N23 48'	E067 17'	67,8	135,6	LOLIGINIDAE Argyrops spinifer SEPIIDAE Alutera monoceros	22,00 18,60 13,70 13,20	16,2 13,7 10,1 9,7
30.01	0910	131	PT	21	1	N23 48'	E067 18'	1,0	2,0	JELLYFISH SNAKE	1,00 1,00	50,0 50,0
30.01	1220	132	BT	19	19	N23 46'	E067 27'	45,7	91,4	Argyrops spinifer Saurida tumbil Acanthopagrus berda SHARK	48,80 16,60 10,00 4,00	53,3 18,1 10,9 4,3
30.01	1405	133	PT	48	35	N23 44'	E067 33'	1500,0	3000,0	Leiognathus sp Mobula diabolus	2900,00 100,00	96,6 3,3
30.01	1605	134	BT	19	19	N23 43'	E067 38'	44,7	89,4	LOLIGINIDAE Argyrops spinifer Acanthopagrus berda Plectorhynchus nigrus Sardinella sindensis	17,40 17,20 15,60 12,60 11,80	19,4 19,2 17,4 14,0 13,1
30.01	1825	135	BT	14	14	N23 34'	E067 50'	168,3	336,6	Epinephelus malabaricus C R A B S SHARK Lepturacanthus savala	240,00 32,00 12,00 10,60	71,3 9,5 3,5 3,1
30.01	1935	136	PT	17	1	N23 33'	E067 50'	450,0	900,0	Sardinella sindensis Stolephorus sp SHARK	864,00 20,00 16,00	96,0 2,2 1,7
30.01	2230	137	BT	23	23	N23 30'	E067 33'	45,5	91,0	Dasyatis jenkinsii TRIACANTHIDAE SEPIIDAE TETRAODONTIDAE	28,60 14,60 7,60 6,50	31,4 16,0 8,3 7,1
31.01	0140	138	BT	60	60	N23 38'	E067 15'	202,8	405,6	Lactarius lactarius Nemipterus japonicus Leiognathus sp Otolithes ruber	100,80 61,20 42,00 37,20	24,8 15,0 10,3 9,1

CRUISE NO. 2. 20 JAN - 2 FEB 1984

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR	HR
31.01	0500	139	BT	82	82	N23 27'	E067 12'	212,0	424,0	Nemipterus metopias Nemipterus japonicus Platycephalus sp. Saurida sp.	137,60 86,40 68,80 62,40	32,4 20,3 16,2 14,7
31.01	0705	140	BT	25	25	N23 20'	E067 23'	134,1	268,2	Arius sp Megalaspis cordyla LOLIGINIDAE TETRAODONTIDAE	96,00 43,40 24,00 18,50	35,7 16,1 8,9 6,8
31.01	0850	141	PT	25	10	N23 18'	E067 25'	58,0	174,0	Leiognathus sp Rhizoprionodon oligolinx FISH LARVAE Scomberoides commersonianus	135,00 22,80 9,00 5,40	77,5 13,1 5,1 3,1
31.01	1110	142	BT	96	96	N23 14'	E069 17'	98,2	1178,4	Otolithes cuvieri Argyrosomus hololepidotus Johnius sp. Polynemus sextarius	448,80 385,20 100,80 48,00	38,0 32,6 8,5 4,0
31.01	1330	143	BT	107	107	N23 19'	E066 58'	592,5	1185,0	Sphyraena obtusata Ilisha sp. LOLIGINIDAE Nemipterus metopias	572,00 225,20 127,60 114,40	48,2 19,0 10,7 9,6
31.01	1750	144	BT	135	135	N23 12'	E066 47'	836,5	1673,0	Nemipterus metopias Acropoma japonicum SCIAENIDAE Pomadasys hasta	729,00 351,00 162,00 70,20	43,5 20,9 9,6 4,1
31.01	2300	145	BT	113	113	N23 03'	E067 06'	119,0	238,0	Nemipterus metopias Nemipterus japonicus Otolithes cuvieri Polynemus heptadactylus	108,00 49,00 28,00 28,00	45,3 20,5 11,7 11,7
01.02	0125	146	PT	130	40	N23 12'	E066 55'	52,0	104,0	MYCTOPHIDAE Sphyraena sp. Krill	80,00 4,00 20,00	76,9 3,8 19,2
01.02	0715	147	BT	117	117	N23 38'	E066 32'	309,0	618,0	Nemipterus metopias Rhizoprionodon acutus Nemipterus japonicus Epinephelus diacanthus	364,00 48,00 37,40 28,20	58,8 7,7 6,0 4,5
01.02	0950	148	BT	84	84	N23 50'	E066 50'	52,2	104,4	Trichiurus lepturus Lutjanus argentimaculatus Loligo sp Nemipterus metopias Ariomma indica	20,60 13,20 12,00 11,10 11,00	19,7 12,6 11,4 10,6 10,5

CRUISE NO. 2. 20 JAN - 2 FEB 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
01.02	1310	149	BT	19	19	N24 03'	E067 10'	47,0	94,0	Acanthopagrus berda Loligo sp Gynura sp. Saurida tumbil	46,00 15,00 13,00 7,00	48,9 15,9 13,8 7,4
01.02	1645	150	BT	19	19	N24 17'	E067 06'	340,0	1360,0	Stolephorus sp Sardinella sp. Acanthopagrus berda	1112,00 168,00 62,00	81,7 12,3 4,5
01.02	2020	151	BT	83	83	N24 02'	E066 40'	128,5	257,0	Nemipterus metopias Nemipterus japonicus Saurida sp. Platycephalus sp.	63,60 44,40 42,96 28,20	24,7 17,2 16,7 10,9
01.02	2325	152	BT	108	108	N23 51'	E066 23'	373,1	746,2	Nemipterus metopias Saurida tumbil Nemipterus japonicus Otolithes cuvieri	585,00 39,00 37,60 30,00	78,3 5,2 5,0 4,0

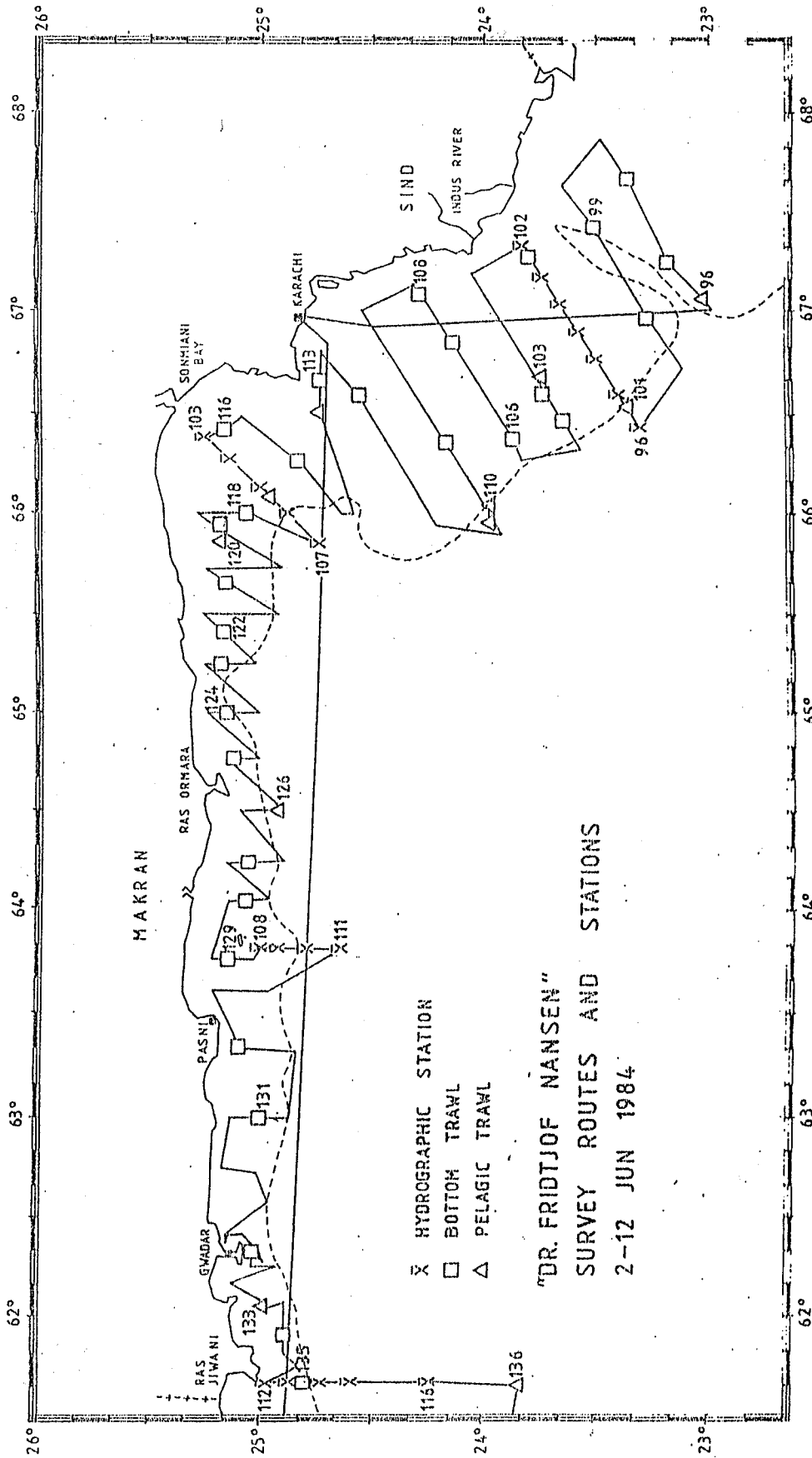


Fig. 1. Survey routes and stations. "Dr. Fridtjof Nansen"s fisheries resources survey, Pakistan 2 - 12 June 1984.

CRUISE NO. 3. 2 - 12 JUNE 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
04.06	2110	96	PT	127	45	N23 02'	E067 04'	11,2	22,4	MYCTOPHIDAE Sardinella longiceps Trichiurus lepturus Leiognathus sp	15,00 2,60 1,80 1,60	66,9 11,6 8,0 7,1
04.06	2330	97	BT	81	81	N23 11'	E067 15'	,0	,0	N O C A T C H	,00	,0
05.06	0315	98	BT	23	23	N23 22'	E067 40'	234,2	468,4	SHRIMPS Trichiurus lepturus Polynemus sextarius Arius sp R A Y S	88,00 72,00 48,00 43,20 100,00	18,7 15,3 10,2 9,2 21,3
05.06	0815	99	BT	60	60	N23 31'	E062 25'	276,5	553,0	Carangoides malabaricus Saurida tumbil Nemipterus japonicus Spyraena putnamiae	96,00 80,00 72,00 56,00	17,3 14,4 13,0 10,1
05.06	1235	100	BT	112	112	N23 17'	E066 57'	124,8	249,6	Trichiurus lepturus Nemipterus japonicus Ariomma indica Dussumieria acuta	100,00 68,00 20,00 16,00	40,0 27,2 8,0 6,4
05.06	1800	101	PT	183	30	N23 23'	E066 32'	20,0	40,0	MYCTOPHIDAE	40,00	100,0
06.06	0140	102	BT	20	20	N23 50'	E067 19'	91,6	183,2	Argyrosonus sp. Krill Pomadasyd bayanus Formio niger	69,80 32,00 21,20 12,80	38,1 17,4 11,5 6,9
06.06	0715	103	PT	93	60	N23 46'	E066 39'	,0	,0	N O C A T C H	,00	,0
06.06	0830	104	BT	93	93	N23 47'	E066 79'	73,6	147,2	Trichiurus lepturus Nemipterus japonicus Ariomma indica CARCHARHINIDAE	60,00 30,00 18,60 12,00	40,7 20,3 12,6 8,1
06.06	1030	105	BT	115	115	N23 40'	E066 28'	102,3	245,5	Nemipterus japonicus Lutjanus malabaricus Epinephelus diacanthus Argyrops spinifer	86,40 46,80 20,16 18,72	35,1 19,0 8,2 7,6
06.06	1513	106	BT	105	105	N23 52'	E066 23'	95,4	715,5	Nemipterus japonicus Selar crumenophthalmus Leiognathus sp Trichiurus lepturus	536,25 48,75 33,75 31,50	74,9 6,8 4,7 4,4

CRUISE NO. 3. 2 - 12 JUNE 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
06.06	1845	107	BT	67	67	N24 09'	E066 51'	141,3	282,6	Pomadasys hasta Leiognathus sp Ilisha melastoma Nemipterus japonicus	140,00 62,20 14,40 12,20	49,5 22,0 5,0 4,3
06.06	2120	108	BT	22	22	N24 18'	E067 04'	310,2	620,4	Trichiurus lepturus Harpodon sp. Gyanura sp. Muraenesox bagio	140,00 57,40 56,00 56,00	22,5 9,2 9,0 9,0
07.06	0350	109	BT	86	86	N24 12'	E066 21'	155,9	311,8	Nemipterus japonicus METAPENAEIDAE Saurida tumbil Platycephalus sp.	180,00 40,00 21,00 17,00	57,7 12,8 6,7 5,4
07.06	0715	110	PT	240	70	N23 59'	E066 00'	2,0	4,8	Benthoosema pterotum	4,80	100,0
07.06	0845	111	PT	240	75	N23 59'	E065 59'	3,0	6,0	Benthoosema pterotum	6,00	100,0
07.06	1540	112	BT	52	52	N24 34'	E066 35'	178,1	356,2	Trichiurus lepturus Gazza minuta Pomadasys hasta Leiognathus sp	85,20 44,40 42,00 38,40	23,9 12,4 11,7 10,7
07.06	1855	113	BT	31	31	N24 44'	E066 40'	393,1	1572,4	Trichiurus lepturus Otolithes ruber Lactarius lactarius Thryssa sp	400,00 336,00 160,00 104,00	25,4 21,3 10,1 6,6
07.06	2030	114	PT	33	1	N24 45'	E066 31'	518,4	1036,8	Trichiurus lepturus SHRIMPS Thryssa sp Spyraena putnamiae	240,00 160,00 160,00 160,00	23,1 15,4 15,4 15,4
08.06	0155	115	BT	90	90	N24 51'	E066 15'	363,6	727,2	Nemipterus japonicus Trichiurus lepturus Lepidotrigla bentuviai Platycephalus sp.	546,00 96,20 20,80 20,80	75,0 13,2 2,8 2,8
08.06	0505	116	BT	33	33	N25 10'	E066 26'	292,5	585,0	Otolithes ruber Ancharius brevibarbis Thryssa vitrirostris Torpedo marmorata	192,00 126,40 88,00 32,00	32,8 21,6 15,0 5,4
08.06	0945	117	PT	93	70	N25 01'	E066 08'	15,5	62,0	Leiognathus sp Benthoosema pterotum	60,00 2,00	96,7 3,2

CRUISE NO. 3. 2 - 12 JUNE 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
08.06	1535	118	BT	95	95	N25 05'	E066 00'	544,7	1089,4	<i>Nemipterus japonicus</i> <i>Trichiurus lepturus</i> <i>Lagocephalus</i> sp <i>Argyrosomus hololepidotus</i>	666,40 95,20 85,00 84,00	61,1 8,7 7,8 7,7
08.06	1830	119	BT	26	26	N25 12'	E065 56'	324,0	648,0	<i>Trichiurus lepturus</i> <i>Pennahia</i> sp. <i>Megalaspis cordyla</i> <i>Pomadasys hasta</i>	200,00 90,00 55,80 54,00	30,8 13,8 8,6 8,3
08.06	1955	120	PT	18	1	N25 16'	E065 58'	29,9	89,7	<i>Scomberomorus commersoni</i> <i>Scomberomorus guttatus</i> <i>Lactarius lactarius</i> <i>Spyraena putnamiae</i> <i>Trichiurus lepturus</i>	23,40 18,00 10,80 9,90 9,00	26,0 20,0 12,0 11,0 10,0
09.06	0130	121	BT	20	20	N25 10'	E065 40'	96,7	193,4	<i>Acanthopagrus</i> sp. <i>Trichiurus lepturus</i> <i>Ancharius brevibarbis</i> <i>Pomadasys commersoni</i>	48,00 40,00 30,40 20,00	24,8 20,6 15,7 10,3
09.06	0640	122	BT	22	22	N25 11'	E065 24'	2000,0	4000,0	<i>Trichiurus lepturus</i> <i>Pennahia</i> sp. <i>Ancharius brevibarbis</i> DASYATIDAE	1600,00 520,00 400,00 312,00	40,0 13,0 10,0 7,8
09.06	0955	123	BT	27	27	N25 12'	E065 14'	2499,7	7499,1	<i>Trichiurus lepturus</i> <i>Ancharius brevibarbis</i> <i>Pomadasys commersoni</i> <i>Pennahia</i> sp.	4500,00 1500,00 247,20 232,80	60,0 20,0 3,2 3,1
09.06	1330	125	BT	19	19	N25 10'	E065 00'	648,7	1297,4	<i>Trichiurus lepturus</i> <i>Pennahia</i> sp. <i>Muraenesox bagio</i> <i>Ancharius brevibarbis</i>	300,00 300,00 120,00 96,00	23,1 23,1 9,2 7,3
09.06	1900	124	BT	14	14	N25 07'	E064 46'	1891,0	7564,0	<i>Trichiurus lepturus</i> <i>Pennahia</i> sp. <i>Ancharius brevibarbis</i> SHRIMPS	1600,00 1372,40 800,00 800,00	21,1 18,1 10,5 10,5
09.06	2205	126	PT	330	160	N24 57'	E064 29'	15,0	30,0	<i>Trichiurus lepturus</i> Salps SHRIMPS <i>Benthoosema pterotum</i>	20,00 4,00 2,00 3,00	66,6 13,3 6,6 10,0
10.06	0230	127	BT	20	20	N25 04'	E064 15'	499,2	998,4	<i>Pennahia</i> sp. <i>Ancharius brevibarbis</i> GYMNURIDAE <i>Thryssa mystax</i>	427,80 296,00 67,00 44,60	42,8 29,6 6,7 4,4

CRUISE NO. 3. 2 - 12 JUNE 1984.

DATE	TIME START	STN No.	GEAR TYPE	DEPTH (M)		POSITION		CATCH (KG)		DOMINANT SPECIES	WEIGHT (KG)	
				BOTTOM	GEAR	LATIT.	LONGIT.	TOTAL	PR HR		PR HR	%
10.06	0640	128	BT	15	15	N25 07'	E064 02'	1480,0	2960,0	Trichiurus lepturus Pennahia sp. Epinephelus diacanthus Ancharius brevibarbis	1000,00 600,00 300,00 300,00	33,7 20,2 10,1 10,1
10.06	0940	129	BT	15	15	N25 10'	E063 45'	2000,0	4000,0	Pomadasys commersonni Lactarius lactarius Otolithes ruber Acanthopagrus sp.	1220,00 388,00 357,40 273,00	30,5 9,7 8,9 6,8
10.06	2030	130	BT	16	16	N25 07'	E063 20'	437,2	874,4	Ancharius brevibarbis Argyrosomus hololepidotus JELLYFISH MYLIOBATINAE	400,00 130,00 100,00 60,00	45,7 14,8 11,4 6,8
11.06	0115	131	BT	23	23	N25 01'	E063 00'	385,0	770,0	Pennahia sp. Ancharius brevibarbis Polynemus sextarius Torpedo marmorata	176,00 94,60 77,00 77,00	22,8 12,2 10,0 10,0
11.06	1105	132	BT	31	31	N25 04'	E062 22'	75,0	150,0	Pomadasys hasta Acanthopagrus sp. Lactarius lactarius Torpedo marmorata	40,40 25,20 14,18 14,00	26,9 16,8 9,4 9,3
11.06	1650	133	PT	63	1	N24 57'	E062 04'	5,5	11,0	JELLYFISH Loligo sp	10,00 1,00	90,9 9,0
11.06	1935	134	BT	94	94	N24 54'	E061 57'	323,9	647,8	Nemipterus japonicus Lagocephalus spadiceus Sepia sp Fistularia sp	208,00 24,00 19,20 19,20	32,1 3,7 2,9 2,9
11.06	2335	135	BT	30	30	N24 53'	E061 42'	203,2	406,4	Pomadasys maculatus Pennahia sp. Torpedo marmorata Pomadasys stridens	129,60 128,00 56,00 43,20	31,8 31,4 13,7 10,6
12.06	0855	136	PT	>500	300	N23 51'	E061 37'	40,0	80,0	Benthoosema pterotum Cubiceps cubiceps	72,00 8,00	90,0 10,0