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Number 7.

RESULTS OF EXPLORATORY SURVEY AROUND THE ANDAMAN ISLANDS

By

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C O N T E N T S

FOREWORD

The regions around the Andaman, Nicobar Islands is the least studied for potential fisheries resources around the country. However there have been evidence to reckon that marine fisheries is one of the important areas for the speedy economic development of the islands. In order to take up a systematic study by adopting modern fishing methods to assess the marine fishery resources in this region, a base of the Exploratory Fisheries Project was opened at Port Blair in the year 1971. Three vessels, viz., M.T. Matsya Vigyani, M.V. Meena Khojini and M.V. Meena Prayas were deployed for the fisheries survey. Varied fishing techniques like bottom trawling, purse seining, long lining, hand-lining and trolling were conducted with the above vessels. The results obtained from these fishing operations during 1971-1976 have been presented and an attempt has been made to process these data to bring out meaningful inferences. The information given in this bulletin are only of a preliminary nature. However they partly fill a vacuum which otherwise exists in respect of information on the commercially exploitable fisheries resources in this region. This bulletin also points to the fact that a large amount of work is still to be done in this region. The survey operations now being conducted by the Exploratory Fisheries Project from Port Blair base are within many constraints. These constraints tell upon the results of operations. Many proposals are under the examination of Government of India to remove the above constraints.

The earlier bulletins in the series issued by the Exploratory Fisheries Project have covered the studies on the West coast and East coast of India.

It is hoped that this bulletin will be of use to the various agencies responsible for fisheries development in this region as well as private entrepreneurs who look for data to make investment decision with regard to industrial fisheries.

Bombay
dated 26/1/78

M.Swaminath
Director
Exploratory Fisheries Project
Bombay

ACKNOWLEDGEMENTS

I am thankful to Prof. P.C. George, Joint Commissioner for Fisheries, who first suggested the preparation of a detailed report of the results of the survey done in the Andamans. I am deeply indebted to Dr. S.N. Dwivedi, former Director, Exploratory Fisheries Project for his constant encouragement and support without which this work could not have been completed. I also thank him for going through the manuscript and offering his critical comments. I am thankful to Sri M. Swaminath for his interest in the bulletin and for arranging for its publication. My thanks are also due to Sri J. Mangala Doss, the officers and crew of the fishing vessels M.V.Matsyavigyani, M.V. Meena Khojini and M.V.Meena Prayas for conducting the fishing operations and collecting the data. I also thank Sri P.J. Joseph, who assisted me in analysing the data and Sarvashri S.C. Dutta and G.V.S.R. Murthy for the secretarial assistance rendered.

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INTRODUCTION

The present bulletin, one in the continuing series of Bulletin of the Exploratory Fisheries Project of the Ministry of Agriculture presents an analytical review of Exploratory Fishing around Andaman Islands by the fishing vessels of the Exploratory Fisheries Project, Port Blair base. It also embodies a report on the first ever organised marine resources survey carried out in this region. The data presented in this bulleyin are based on the results of operation of the fishing vessels M.V.Matsyavigyani, M.V.Meena Khojini and M.V. Meena Prayas from October, 1971 to March, 1976. Besides providing a preliminary systematic assessment of the fishery resources of the island group, this report highlights the amount of work that is still to be done in this area.

The Andaman Nicobar group of islands constitutes perhaps the least studied regions around the country. Though there have been general reports (Menon et al 1971, Sen 1973, Kumaran 1973, Marichamy 1974), based mostly on indirect evidence, precise information of a commercial nature on the fisheries resources is not available. Therefore any assessment based on practical investigation will be of considerable value. The bulletin, it is hoped, will at least provide the initial information in this regard. It is also hoped that this will be of assistance to those who contemplate in investing capital in fishing industry in this region.

2. HISTORICAL ACCOUNT

The earliest account of the fishery resources of these islands came from the results of the trawler Golden Crown (1908 to 1909). It 'indicated a good potential' around the Andaman islands but no specific data are traceable. Subsequent to this, there is no record of any regular survey or exploitation. But towards the end of the forties (1947 ?) a private company called Andamarine Development Corporation Ltd., was set up for exploiting the fishery resources of these islands. Their master fisherman W.R. Burgess stated that the 'potentialities are enormous'. The company started operation with an Australian built fishing boat fitted with a diesel engine, a flat bottomed patrol launch and two dinghies. This did not succeed. Records of the time or reason for the closure of the company are not available. In 1951 another fishing operation was started but without success. In 1952 during the first five year plan period a fisheries research officer was appointed to start a planned programme of development. Later a nucleus of a fisheries department was established but the pace of development remained slow.

Apart from the tribals who are not professionsals in the true sense, since they do not fish for profit, there is no endemic community of fishermen in these islands. During the subsequent period the Government initiated a fishermen settlement scheme, under which fishermen mainly from the southern states of India were brought to the islands. There has also been some voluntary migration of fishermen from Andhra Pradesh.

During 1965, under the 'accelerated development of Andamans scheme' an inter-departmental team recommended introduction of mechanised fishing. A fleet of 160 mehcanised craft was planned for introduction with a target fish production of 2,200 tonnes per annum. But due to administrative reasons the plan was not implemented. The survey team of the Indian Institute of Foreign Trade visited the islands in 1967 and in their report (1970) recommended a fleet of 115 fishing boats to increase the production to 13,000 tonnes.

The National Council of Applied Economic Research conducted a techno-economic survey of the Andaman and Nicobar Islands in 1967 and in their report (1969) noted the importance of fisheries for the economic development of these islands and suggested the formation of Fisheries Development Corporation to undertake survey, draw up a programme for utilising the fish catch and explore the expert possibilities.

Realising the importance of building up infrastructure for fisheries development, the Government of India launched a scheme for providing landing and berthing facilities for fishing vessels at Port Blair. A Rs.67.18 lakhs scheme was initiated and the same has recently been completed.

The infrastructure facilities at Port Blair as well as other centres in these islands are far from satisfactory but are steadily being built up now. During the period of this survey several handicaps have come in the way of a better utilisation of the fishing vessels and available technical man power. The operational constraints experienced during the period of investigation are detailed in Annexure IV.

In the year 1971 the Government of India established a base of the Exploratory Fisheries Project at Port Blair. The data presented in this bulletin are the results of this venture.

A more detailed account of the historical status, progress of development of fisheries together with a summary of our knowledge of the hydrography and ecology of the islands is given in the Report of the Technical Team on Development of Fisheries in Andaman and Nicobar Islands published in 1976. Relevant extracts of this report are given in Appendix I.

3. AREA OF STUDY

The area of study (Fig. 1) extends mainly along the eastern seaboard of the Andaman group of islands with a cursory examination of a part of the south western coast of South Andaman. The Andaman group of islands consists of over 200 islands extending between lat. 10°30' N and lat. 13°40' N.

The northern most island in the group is the Land Fall island which is 900 km from the mouth of the Hooghly. The principal islands are from north to south, the North Andaman, Middle Andaman, South Andaman, Baratang, Rutland and Little Andaman as well as the Richie's archepelago east of South Andaman.

The Andaman group of islands form a part of the broken chain of islands extending from Burma to almost the Indonesian group of islands. The other group is the Nicobars which are separated from the Andaman group by the dreaded 10 degree channel. The southernmost tip of the Nicobar group i.e. Pygmalion point is only 150 km from Sumatra (Basic Statistics - Andaman Administration, 1975).

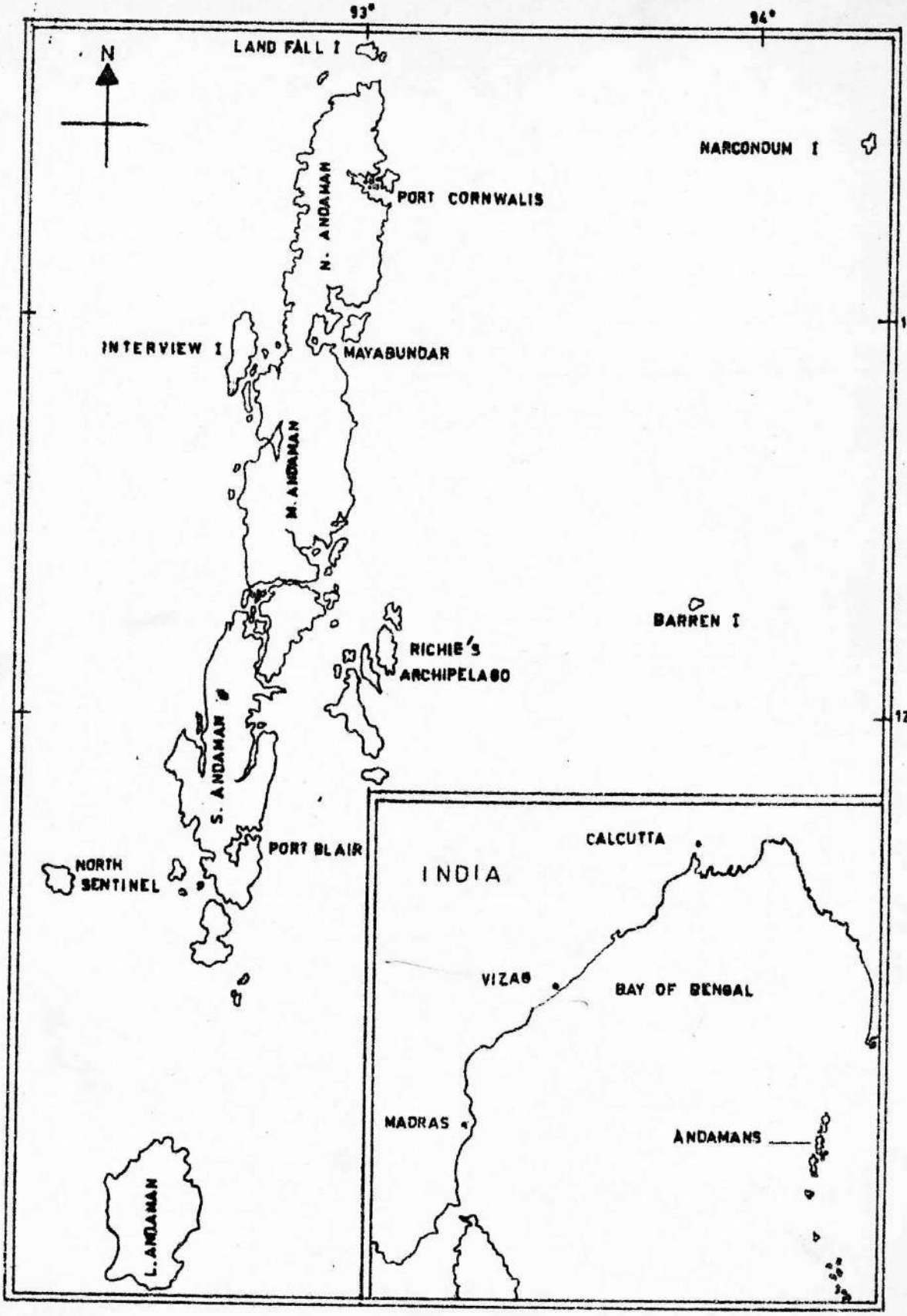

FIG:1. AREA OF STUDY

The landscape of the Andamans is characterised by low range of hills and narrow valleys with rather narrow coastal stretches. Steep ridges and valleys with perennial streams and rivers are found in Middle and North Andaman. The climate is typically tropical with heavy rain received from both the south west and north east monsoons. The temperature is equitable the range being 23°-30° C. The average annual rain fall is around 3000 mm. The pattern of fluctuation of monthly mean averages of temperature and rainfall are shown in fig. 11. A greater part of the Islands is covered by tropical forests.

The islands are characterised by fringing coral reefs and in some cases atoll formations with their lagoons. The islands being of a typical oceanic nature and of volcanic origin, the continental shelf is either very narrow or non-existant around some of the islands. It is, however, noted that the shelf on the western side of the islands is much wider than on the east coast reaching about eight nautical miles at certain points (Fig. 2). The length of the coast line of the Andaman and Nicobar islands has been variously estimated to be of the order of five hundred to two thousand five hundred kilometres. The picture gets very much distorted because of the extreme undulation of the coast with several bays and inlets. But the most likely figure is around fourteen hundred kilometres. The total shelf area available for exploitation is around 16,000 sq. km. Of this, only a mere twelve hundred square kilometres are being exploited at present.

4. VESSELS AND GEAR EMPLOYED

During the course of the period of study, three fishing vessels were utilised for the work. M.V. Matsyavigyani, an imported 32.28 m vessel operated from October, 1971 to March, 1973. She conducted only bottom trawling.

M.V. Meena Khojini, a 17.5 m indigenously constructed vessel operated from Port Blair during the whole period. She conducted bottom trawling, hand lining for Kalava and purse seining.

M.V. Meena Prayas, another indigenously constructed 17.5 m vessel also operated during the whole period of study. She carried out exploratory bottom trawling, long lining and trolling.

The details of specifications of these vessels are given in earlier bulletins of the Exploratory Fisheries Project and same are reproduced in Annexure I.

The following gears were used by the different vessels for bottom trawling.

M.V. Matsyavigyani	M.V. Meena Khojini & M.V. Meena Prayas
45 metre two seam fish trawl with rectangular otter boards 800 kg weight each	24 metre two seam fish trawl with oval otter boards of 180 kgs each

(For designs - See Bull.Expl.Fish.Proj. No.4)

Long lines were fabricated out of twisted cotton fishing lines of 8 mm having a breaking strength of about 180-190 kg. The glass floats were from imported stock.

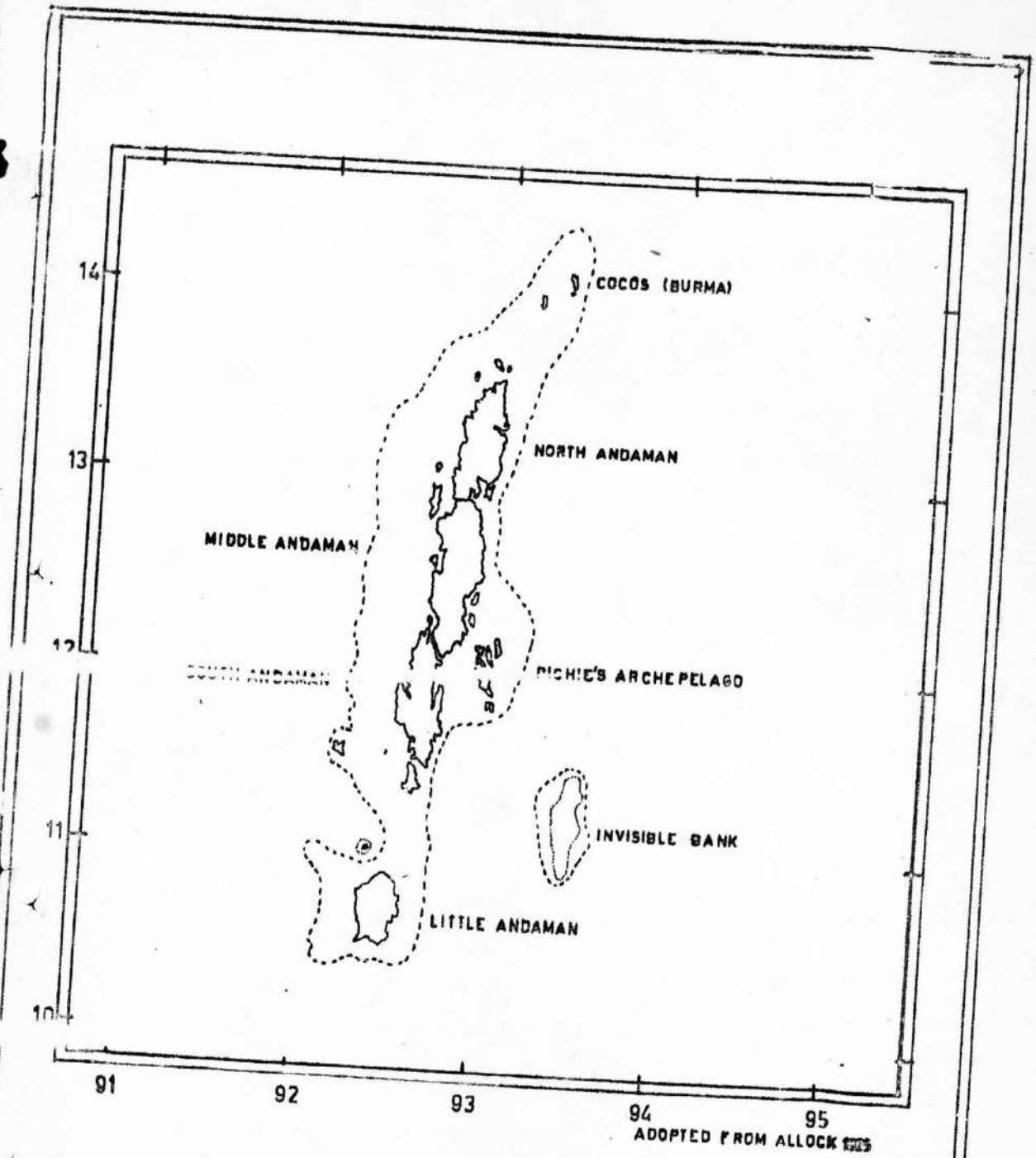

FIG.2. CONTINENTAL SHELF AROUND ANDAMANS.

Kalava line rollers were fabricated as per design at the Integrated Fisheries Project, Cochin.

Trolling lines were of 6 mm twisted nylon twine. Jigs of different designs were used.

5. DISTRIBUTION AND INTENSITY OF SAMPLING

During the period under report, a total fishing effort of 2420 hours 18 minutes (including scouting ~~time~~) was put in by the three fishing vessels, M.V. Matsyavigyani, M.V. Meena Khojini and M.V. Meena Prayas in 32 small squares of seven major areas (Table I). The number of fishing days, fishing effort, catch and the distribution by areas and methods are shown in Figs. 3 & 4. The total fishing effort was made up of five types of fishing methods mentioned earlier viz. bottom trawling, ling lining, purse seining, hand lining for kalava and trolling. During her stay of 18 months at Port Blair, M.V. Matsya-vigyani conducted only bottom trawling. M.V.Meena Khojini conducted bottom trawling, Kalava hand lining and purse seining whereas M.V. Meena Prayas carried out bottom trawling, long lining and trolling. Of the total fishing effort, more than 50 percent was expended in bottom trawling (1117 hours). Next in order were long lining (609 hours), trolling (243 hours), kalava hand lining (137 hours) and purse seining (315 hours).

For convenience of analysis and facility for reference the area of study is divided into major and minor squares. Each major area represents a square of 3600 sq. nautical miles with 1° latitude and 1° longitude as its sides. This major area is sub-divided into 36 small squares of 100 square nautical miles each with 10 minutes of latitude and 10 minutes of longitude as its sides (fig.3).

The areas surveyed by the three vessels together with the effort in each small square are shown in Fig. 4.

TABLE I Areawise distribution of fishing effort(Hours)

Area	Bottom Trawling	Trolling line	Hand lining	Kalava line	Purse seine	Total
10-92/3E	-	-	15.55	-	-	15.55
10-92/4D	4.25	-	-	-	-	4.25
10-92/4E	-	-	19.15	-	-	19.15
10-92/5D	-	-	1.00	-	-	1.00
10-92/5E	1.30	-	-	-	-	1.30
Sub-total	5.55	-	36.10	-	-	42.05
10-93/3A	-	-	7.52	-	-	7.52
11-92/1E	-	-	25.45	-	-	25.45
11-92/1F	-	-	-	-	6.30	6.30
11-92/2E	-	-	-	3.05	-	3.05
11-92/3E	3.15	16.00	10.50	14.40	-	44.45
11-92/3F	-	-	-	2.00	-	2.00
11-92/4E	-	20.00	91.15	33.56	4.23	149.35
11-92/4F	-	-	195.47	-	-	195.47
11-92/5A	-	-	-	-	-	-
11-92/5E	54.20	6.40	28.10	29.44	-	118.54
11-92/5F	-	47.20	174.45	-	-	222.10
11-92/6E	936.31	109.35	11.49	-	2.00	1059.55
11-92/6F	11.00	-	-	-	-	11.00
Sub-total	1005.06	199.40	538.21	83.24	12.55	1839.26

(Table contd...)

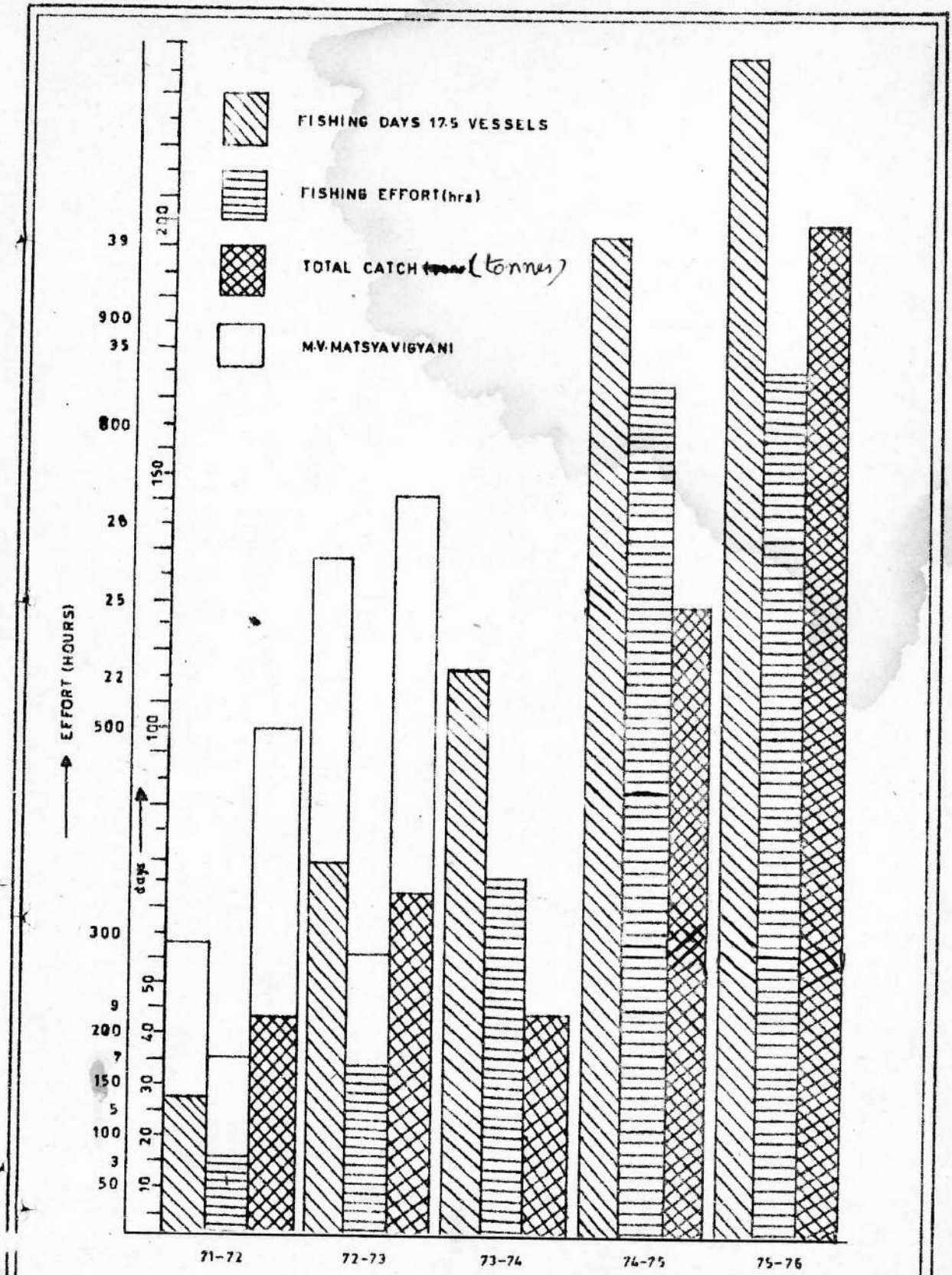

FIG:3. SHOWING FISHING DAYS EFFORT AND CATCH.

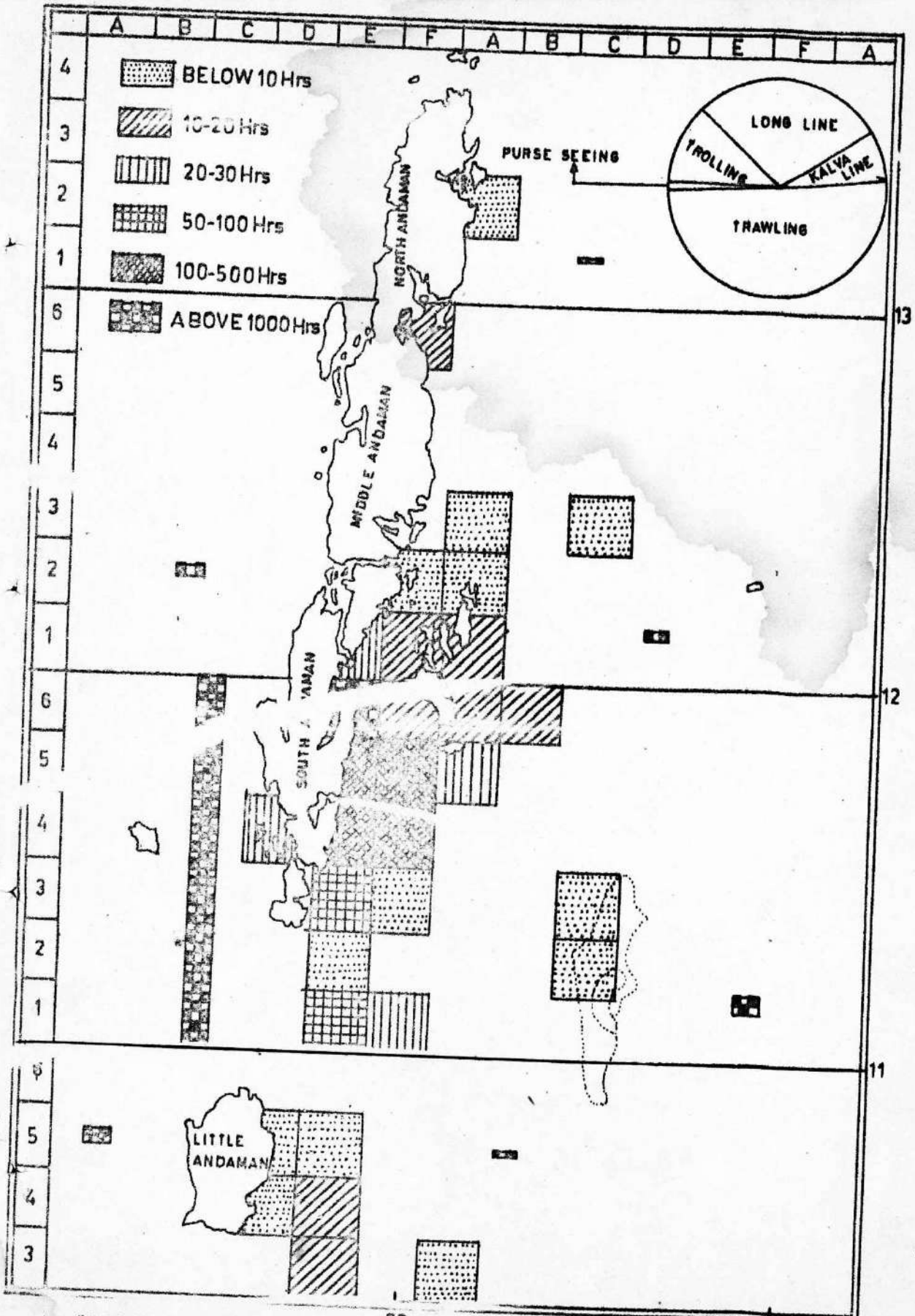

FIG4. DISTRIBUTION OF EFFORT BY AREAS AND METHODS.

Table contd....

Area	Bottom trawling	Trolling	Long lining	Kalava hand lining	Purse seining	Total
11-93/2C	-	18.00	-	-	-	18.00
11-93/3C	-	12.00	-	-	-	12.00
11-93/5A	4.00	13.05	6.05	27.45	1.40	52.35
11-93/6A	10.30	-	-	1.00	-	11.30
11-93/6B	-	-	12.15	-	-	12.15
Sub-total	14.30	43.05	18.20	28.45	1.40	106.20
12-92/1E	51.35	-	-	-	-	51.35
12-92/1F	30.55	-	-	-	-	30.55
12-92/2F	4.00	-	-	-	-	4.00
12-92/6F	3.30	-	-	1.00	-	4.30
Sub-total	90.00	-	-	1.00	-	91.00
12-93/1A	-	-	-	20.10	-	20.10
12-93/2A	-	-	-	1.00	-	1.00
12-93/3A	-	-	-	2.30	-	2.30
12-93/3C	-	-	5.40	-	-	5.40
Sub-total	-	-	5.40	23.40	-	29.20
13-93/2A	1.15	-	3.00	-	-	4.15
Grand total:	1116.46	242.45	609.23	136.49	14.35	2120.18

11-92/4D
11-92/6E
11-92/1F
11-92/4E

An effort of 300 hours of scouting for shoals (Purse seining)

Bottom trawling was carried out in 5 major squares only, i.e. 10-92, 11-92, 11-93, 12-92 and 13-93. The number of small squares covered was thirteen. Long lining was conducted in six major squares, trolling in two major areas, kalava line in four major areas. Purse seining was done only in two major areas.

Of all the major areas 11-92 was the most intensively surveyed followed by 11-93. More than 100 hours of effort was put in the following small squares: 11-92/6E, 5F, 4F, 4E and 5E.

Only in one small square between 50 and 100 hours of effort was put in and in all the remaining areas less than 50 hours of effort was spent.

6. RESULTS OF EXPLORATORY FISHING

6.1. Bottom trawling

Bottom trawling was the first method to be tried in the Andamans by the project vessels. Even though the bottom topography suggested a restricted area for operating bottom trawl, particularly on the east coast, the method was attempted since the vessels were fully equipped for the same. All the three vessels were employed for this work.

The continental shelf in this region is very narrow extending only from 3 to 8 km off the east and west of the islands with steep slopes which are not very suitable for bottom trawling. However, the same may be more in the intervening sea between islands in the north-south direction. Apart from that, long stretches of the coast line have fringing reef formations and as such the hazards for bottom trawling are very great. So initially certain time had to be spent

for echograph survey to locate patches of relatively uniform sea bottom, where trawling could be safely done. The nature of the bottom in the areas where survey was carried out is shown in Fig. 5. During the course of work it was found that due to the steep declivity, it is hard to locate patches where trawling could be done continuously for more than 1½ hours without encountering underwater obstructions.

6.1.1. Catch composition

The Andaman Nicobar waters are qualitatively very rich in fish fauna. Over 400 species are reported from these areas. But only about 60 species are commercially important (Annexure II) of which most of them are commonly represented in trawl catches.

The composition of the trawl catches and their seasonal distribution are shown in Fig. 6 and 7. The groupings in the different diagrams are slightly different from each other in that in the later years greater sub-divisions were followed. The composition of elasmobranchs varied from 18.1% to 27.4%, cat fish from 1.15% to 6.8%, perches 0.95% to 6.4%. The miscellaneous group constituted nearly 65 to 75% of the total catch in the first three years. During the first three years, the data collected were limited to elasmobranchs, cat fish, perches, big miscellaneous and small miscellaneous fish and did not yield enough information for drawing meaningful conclusions regarding other species grouped under the latter two categories. During 1975-76, the data were collected for more groups such as leiognathids, sciaenids, nemipterids, upeneoids, lizard fish and other small fishes. The later sub-grouping of small miscellaneous as done in 1975-76 shows that leiognathids constitute 28.8% of the miscellaneous group, sciaenids stand next with 12.9% followed by upeneoids, nemipterids, lizard fish etc. Other small

fishes constitute the rest of the miscellaneous class. The percentage of quality fish therefore is negligible, the bulk being the elasmobranchs and small miscellaneous fishes. The catch composition of important groups in different periods are given below:-

CATCH COMPOSITION GROUPWISE (%) IN DIFFERENT PERIODS

Year	Elasmo-branchs	Cat fish	Perches	Big Miscella-neous	Small Misce-llaneous
1972	18.1	2.6	1.5	-	77.8
1973	27.4	1.2	6.4	-	65.0
1974-75	23.7	6.8	1.3	0.7	67.8
1975-76	23.4	3.3	1.0	0.4	*71.9

* During 1975-76, the break up of 71.9 for Small Miscellaneous fish is as follows:-

Leiognathids	:	28.8%
Sciaenids	:	12.9%
Nemepterids	:	2.5%
Upeneoids	:	10.0%
Lizard fish	:	1.0%
Others	:	15.7%

6.1.2 Seasonal variation and relative abundance

The relative catch rates of the three vessels for different areas and seasons have been studied (Tables II to VI). The same are presented graphically in Fig. 8 to 10 also. A study of the catch rates of 17.5 m vessels indicate certain trends. One peak representing high catches always occurs during the months January-April after the north east monsoon. This period coincides with the pre-south

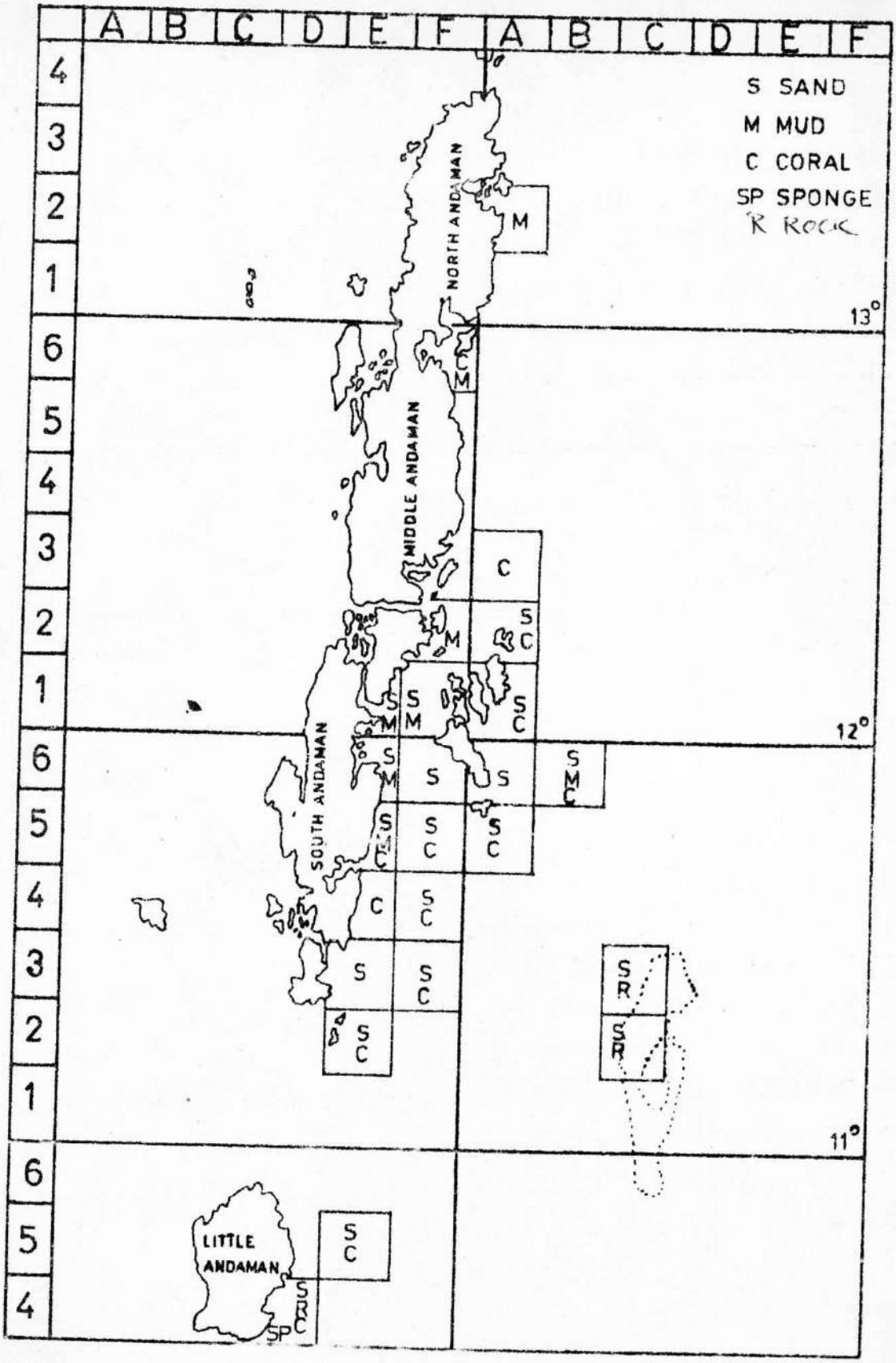

FIG:5. SHOWING THE NATURE OF BOTTOM

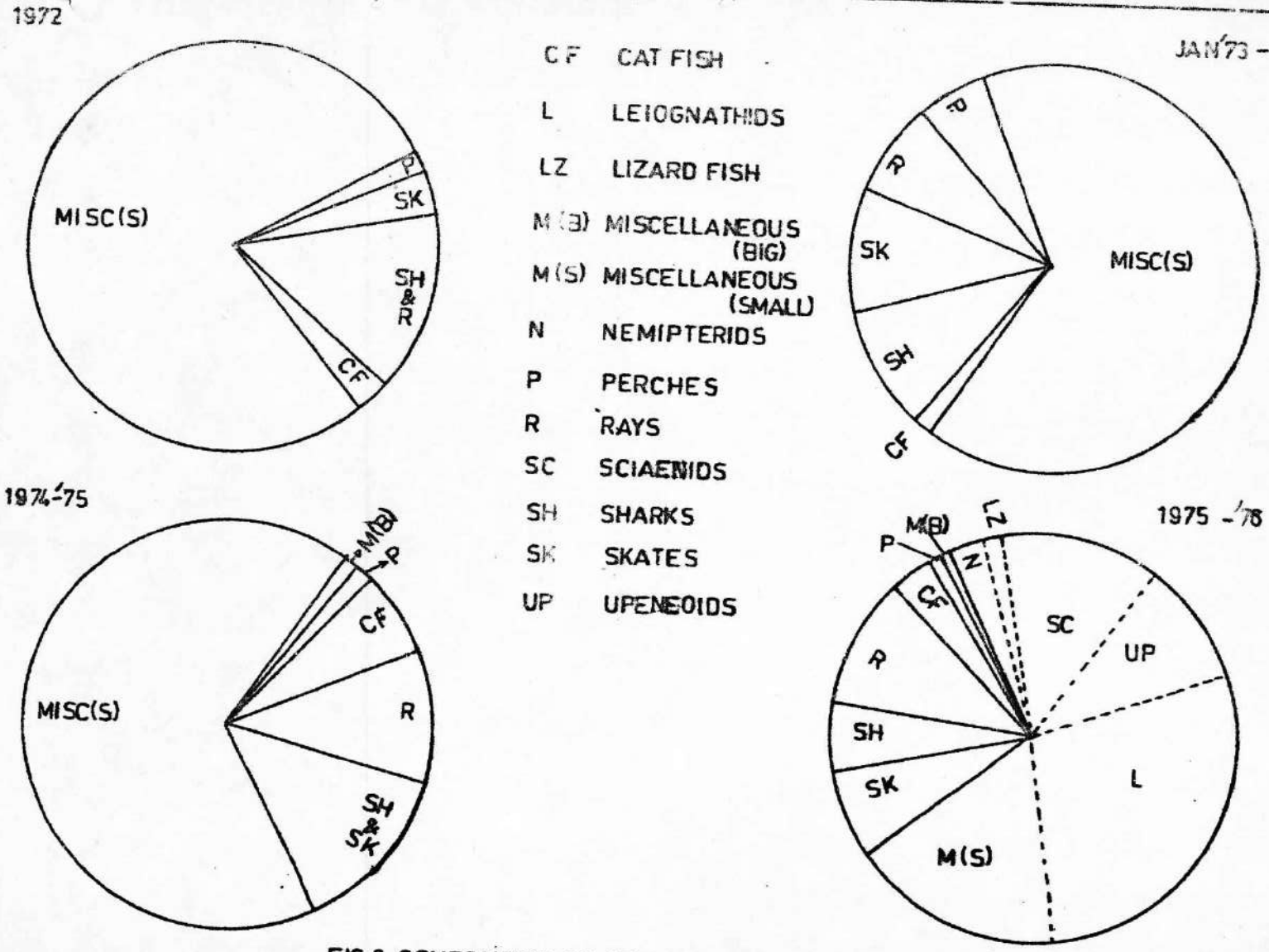

FIG.6. COMPOSITION OF TRAWL CATCHES

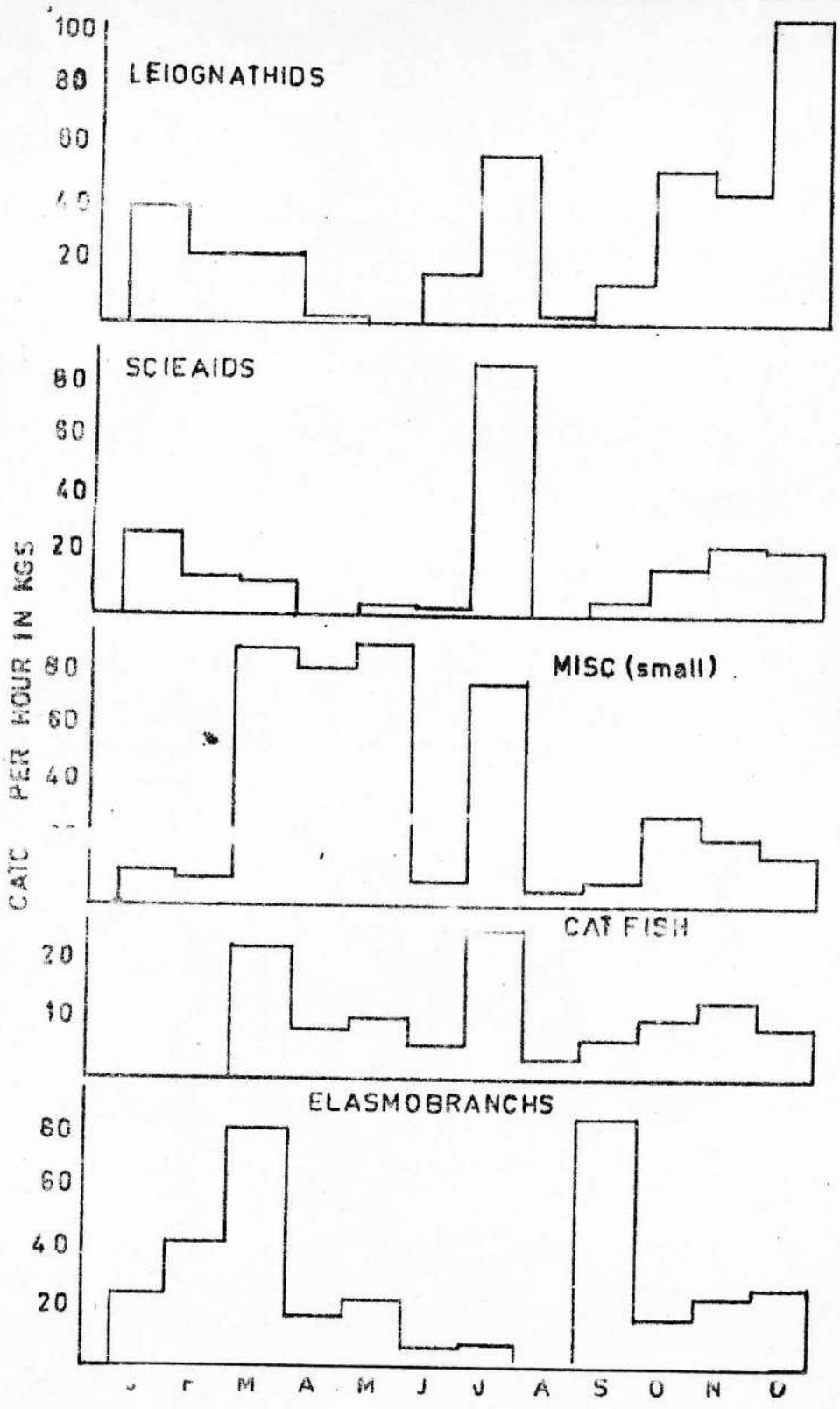

FIG. 7. SEASONAL VARIATION OF MAINGROUPS

TABLE II Catch per hour of bottom trawling obtained by M.V.Matsyavigyani (1971-1973)

Areas	Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
10-92/5E	1973	-	-	620	-	-	-	-	-	-	-	-	-
10-92/4D	1973	-	-	304	-	-	-	-	-	-	-	-	-
11-92/5E	1971	-	-	-	-	-	-	-	-	-	-	154	-
11-92/6E	1971	-	-	-	-	-	-	-	-	-	-	147	30
	1972	165	43	107	188	198	-	-	-	-	-	262	167
	1973	134	163	140	-	-	-	-	-	-	-	-	-
11-92/6F	1972	-	-	-	-	-	-	-	-	-	-	-	37
	1973	31	-	-	-	-	-	-	-	-	-	-	-
11-93/5A	1973	18	-	-	-	-	-	-	-	-	-	-	-
11-93/6A	1973	31	-	-	-	-	-	-	-	-	-	-	-
12-92/1E	1972	64	-	70	-	-	-	-	-	-	-	50	-
12-92/1F	1971	-	-	-	-	-	-	-	-	-	-	-	98
	1972	1181	-	-	-	-	-	-	-	-	-	-	68
	1973	50	-	16	-	-	-	-	-	-	-	-	-

TABLE III Catch per hour of bottom trawling obtained by M.V.Meena Khojini

Areas	Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
10-92/4D	1974	-	17.52	-	-	-	-	-	-	-	-	-	-
11-92/3E	1974	-	-	-	-	-	-	-	-	-	-	155.69	-
11-92/5E	1971	-	-	-	-	-	-	-	-	-	64	-	-
	1972	-	-	5	17	-	-	-	-	-	-	-	-
	1974	-	-	-	-	-	-	-	-	-	-	230.38	87.23
	1976	-	-	116.46	-	-	-	-	-	-	-	-	-
11-92/6E	1971	-	-	-	-	-	-	-	-	-	85	107	-
	1972	110	139	148	104	46	-	-	199	84	-	-	-
	1974	133	266	60.14	-	-	145.93	-	-	-	-	-	-
	1976	93	79	99.78	-	-	-	-	-	-	-	-	-
11-92/6F	1972	-	-	-	-	32	-	-	-	-	-	-	-
	1974	21	-	-	-	-	-	-	-	-	-	-	-
	1975	-	-	-	-	-	456	-	-	-	-	-	-
12-92/1E	1972	-	-	69	78	142	-	-	-	-	-	-	-
	1974	175	-	-	-	-	-	-	-	-	-	-	-
12-92/1F	1974	73	-	-	-	-	-	-	-	-	-	-	-
12-92/2F	1974	19	-	-	-	-	-	-	-	-	-	-	-
12-92/6F	1974	-	-	-	-	-	-	-	-	-	-	-	81.71
13-93/2A	1974	-	-	-	-	-	-	-	-	-	-	-	64.00

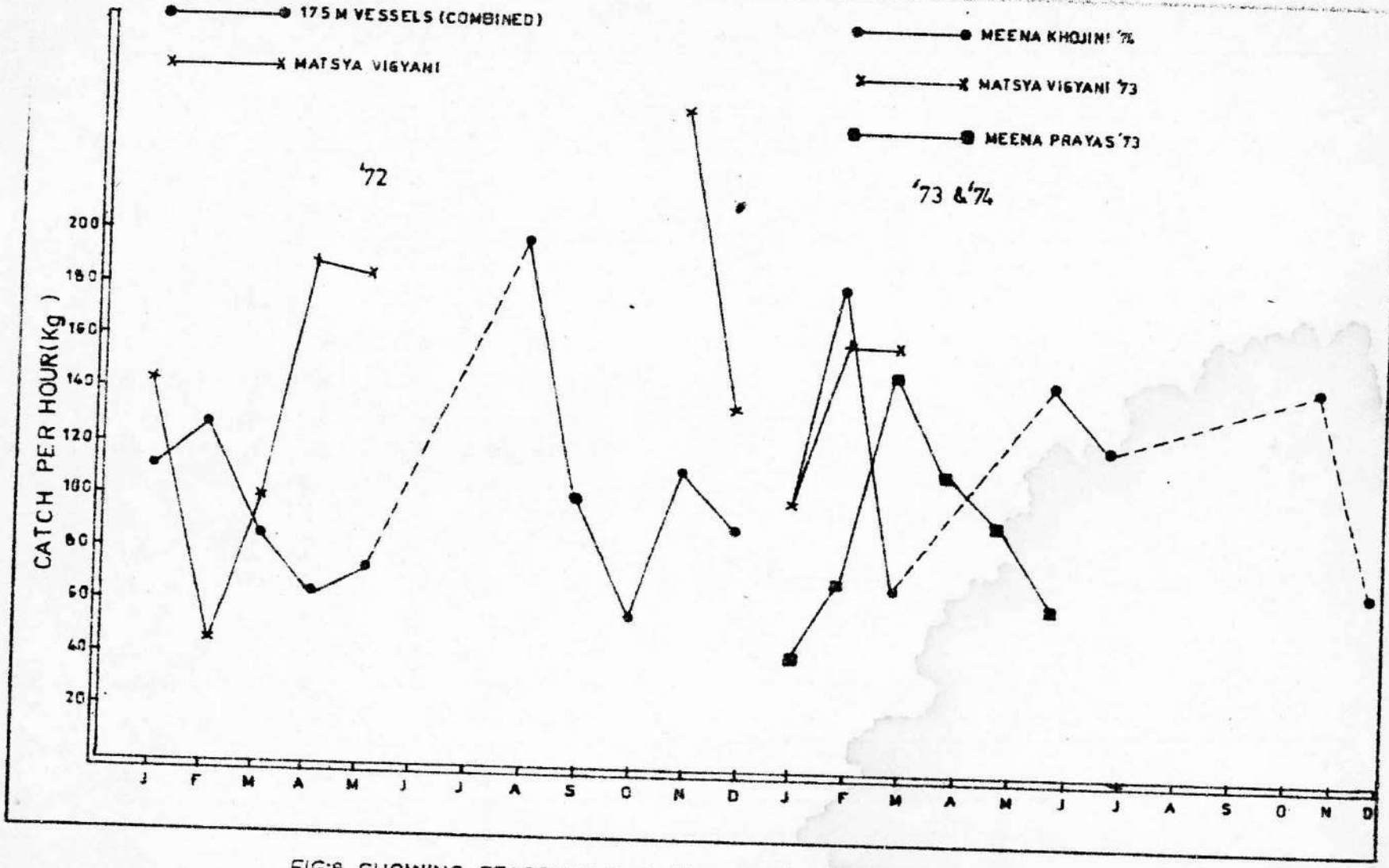

FIG:8. SHOWING SEASONAL VARIATION IN TRAWL CATCHES

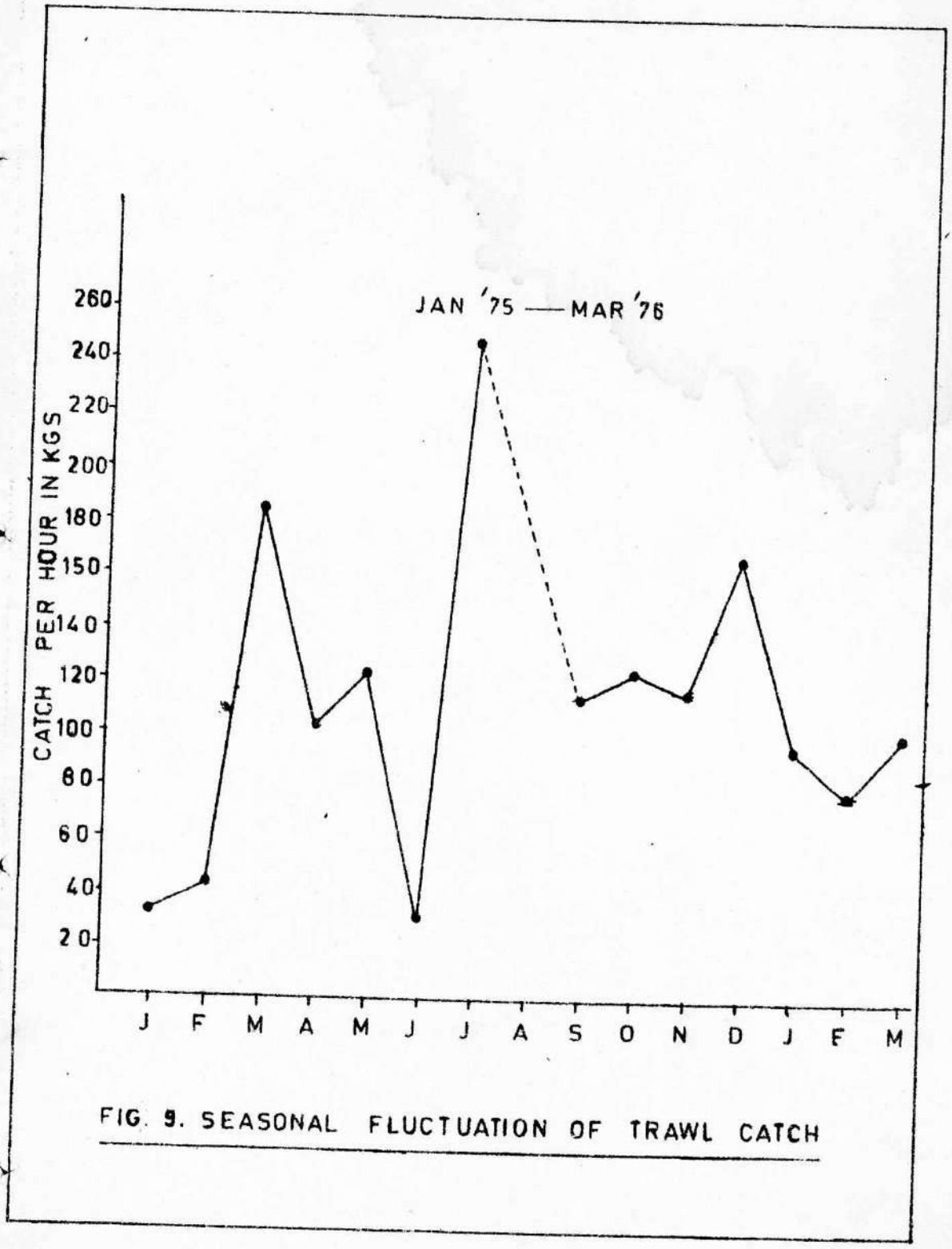

FIG. 9. SEASONAL FLUCTUATION OF TRAWL CATCH

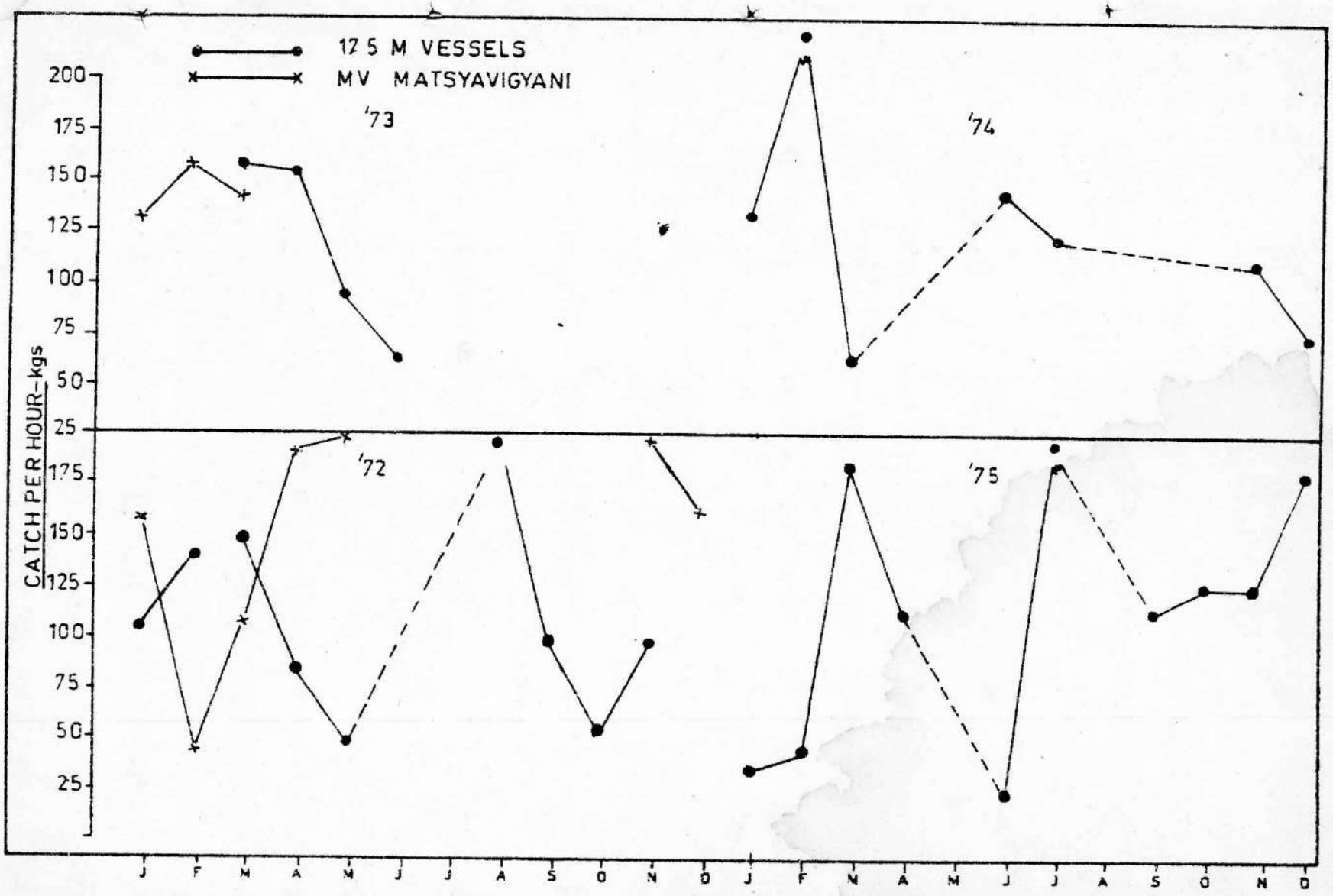

FIG.10.SHOWING CATCH PER HOUR OF 17.5M.VESSES AND MATSYAVIGYANI ALL AREAS

TABLE IV Catch per hour of bottom trawling obtained by M.V.Meena Prayas (1971-1974)

Areas	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
10-92/4D	1973	-	-	300	-	-	-	-	-	-	-	-	-
11-92/5E	1972	-	-	-	47	-	-	-	-	-	-	-	-
	1973	-	74	-	-	-	-	-	-	-	-	-	-
11-92/6E	1972	-	-	-	55	50	-	-	-	121	57	98	-
	1973	-	-	159	154	96	63	-	-	-	-	-	-
11-92/6F	1972	-	-	-	-	-	-	-	-	-	-	330	89
	1973	41	-	-	16	-	-	-	-	-	-	-	-
11-93/6A	1973	-	-	-	34	-	-	-	-	-	-	-	-
12-92/1E	1972	-	-	-	-	89	-	-	-	-	-	80	-
12-92/1F	1972	-	-	-	-	-	-	-	-	-	-	102	-
	1973	-	-	-	39	-	-	-	-	-	-	-	-
12-92/2F	1972	-	-	-	-	-	-	-	-	-	-	107	-

TABLE V Summary of operation of M.V.Matsyavigyani (1971-73)

Month	1971			1972			1973		
	Effort (Hr.Min.)	Catch (kg)	Catch/hour (kg)	Effort (Hr.Min.)	Catch (kg)	Catch/hour (kg)	Effort (Hr.Min.)	Catch (kg)	Catch/hour (kg)
January	-	-	-	29-15	7105	142.9	24-30	2581	106.2
February	-	-	-	15-15	662	43.4	8-15	1345	165.0
March	-	-	-	23-15	2255	97.0	28-25	3428	121.3
April	-	-	-	2-00	377	188.5	-	-	-
May	-	-	-	37-00	6785	183.3	-	-	-
June	-	-	-	-	-	-	-	-	-
July	-	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-	-	-
October	0-30	-	-	-	-	-	-	-	-
November	9-55	970	101.5	15-45	3920	248.9	-	-	-
December	10-15	217	21.3	30-00	4043	134.7	-	-	-
Total:	20-40	1187	58.1	152-30	25147	164.9	61-10	7354	120.6

TABLE VI Summary of operation of 17.5 m vessels (October 1971 - March '76)

Month	1971			1972			1973			1974			1975			1976		
	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour
January	-	-	-	18.15	2010	110.1	22.20	910	41.0	36.05	3628	100.55	4.20	158	36.4	43.05	4039	93.8
February	-	-	-	19.45	2547	128.9	16.15	1195	74.0	15.40	2867	183.07	2.10	95	43.7	49.50	3934	79.4
March	-	-	-	39.45	3305	83.9	22.25	3405	152.0	7.00	421	60.1	9.20	1725	185.0	47.40	4657	98.2
April	-	-	-	78.15	4904	62.7	14.55	1695	113.6	-	-	-	36.00	4024	112.0	-	-	-
May	-	-	-	32.35	2361	72.5	14.05	1355	96.0	-	-	-	10.00	1226	122.6	-	-	-
June	-	-	-	-	-	-	6.00	380	63.0	12.25	1812	145.8	7.25	230	30.8	-	-	-
July	-	-	-	-	-	-	-	-	-	17.20	2139	123.2	3.10	803	259.0	-	-	-
August	-	-	-	5.00	996	199.2	-	-	-	-	-	-	-	-	-	-	-	-
September	-	-	-	33.35	3352	100.0	-	-	-	-	-	-	9.30	1073	113.0	-	-	-
October	9.15	656	70.5	3.15	185	57.0	-	-	-	-	-	-	46.30	5707	124.0	-	-	-
November	-	-	-	22.30	2515	111.7	-	-	-	28.50	4303	149.0	27.10	3120	114.8	-	-	-
December	2.15	205	91.1	4.15	380	89.4	-	-	-	13.50	987	71.4	8.10	1378	168.0	-	-	-

west monsoon months, when the temperature of the sea water starts rising. Then there is generally low catch in the month of May followed by uncertain catch for next three to four months. The high catch rate recorded from the area 11-92/6E during August 1972 (199.2 kg/hour) and July 1975 (259 kg/hour) need further investigation, because the effort put in was low (Table VI). However, in June and July high rates were recorded. During September - October, the catches are generally low. From November onwards the catch rates trend to improve. But there is apparently no consistent pattern. A catch rate of 100 kg/hour and above was recorded during four months in 1972, two months in the first half of 1973, five months in 1974 and seven months in 1975.

The catch rates from area 11-92/6E (Table VII and Fig. 11) where sampling was intensive is also more or less similar. The highest rate obtained by the vessels was 383 kg/hour in July 1975. The results of operation of 17.5 m vessels were analysed and studied in relation to the environment by Sudarsan (1977 M.S). A direct relationship exists between the trawl catches salinity, temperature and standing crop of plankton. On the other hand, an inverse relationship exists between the rainfall and trawl catches.

The operational results of M.V.Matsyavigyani are, however, very erratic. She was operating mainly in deeper areas and the results have been very poor. The highest catch rate recorded was 1181 kg/hour from areas 12-92/1F when a school of nearly four tonnes of red snapper was caught in a single haul (Table II). A catch rate of 620 kg/hour was also recorded from 10-92/5E and 304 kg/hour from 10-92/4D off little Andaman operating around 40 metres. The main constituent of the catch was perches. M.V. Meena Prayas also recorded a catch of

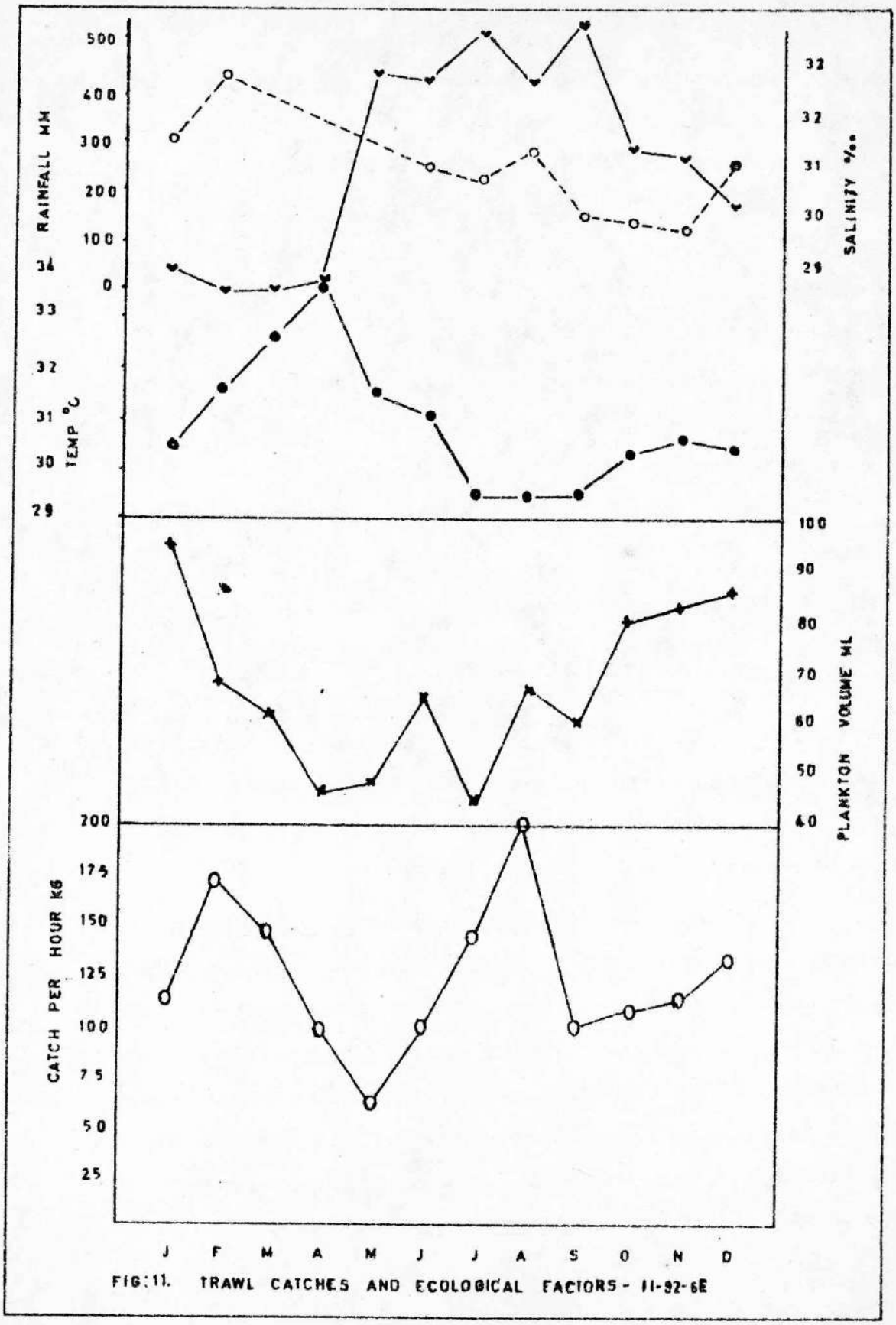

FIG:11. TRAWL CATCHES AND ECOLOGICAL FACTORS - II-92-6E

TABLE VII Summary of operation of 17.5 m vessels in the intensively surveyed area 11-92/6E (October 1971 - March '76)

Month	1971			1972			1973			1974			1975			1976		
	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour	Effort	Catch	Catch /hour
January	-	-	-	18.20	2010	110.1	-	-	-	17.20	2399	132.7	4.20	158	36.49	43.05	4039	93.0
February	-	-	-	20.15	2817	139.9	-	-	-	10.25	2775	266.3	2.10	95	43.78	49.05	3934	79.0
March	-	-	-	22.00	3260	148.2	21.05	3355	159.4	7.00	421	60.1	9.20	1726	184.99	47.40	4657	99.7
April	-	-	-	46.30	3849	83.1	5.00	770	154.0	-	-	-	36.00	4024	111.77	-	-	-
May	-	-	-	30.35	1495	48.0	14.05	1355	96.4	-	-	-	1.35	-	-	-	-	-
June	-	-	-	-	-	-	6.00	380	63.2	12.25	1812	145.9	4.55	116	23.58	-	-	-
July	-	-	-	-	-	-	-	-	-	17.20	2139	123.2	1.40	636	383.13	-	-	-
August	-	-	-	5.00	996	199.2	-	-	-	-	-	-	-	-	-	-	-	-
September	-	-	-	34.35	3397	98.9	-	-	-	-	-	-	9.29	1073	113.07	-	-	-
October	3.15	275	85	3.15	185	52.3	-	-	-	-	-	-	45.32	5072	125.24	-	-	-
November	-	-	-	12.45	1255	98.4	-	-	-	21.05	2334	110.7	25.20	3120	123.17	-	-	-
December	1.55	205	107	-	-	-	-	-	-	6.45	507	75.11	7.40	1378	179.66	-	-	-

300 kg/hour from 10-92/4D(Table IV). The overall catch rate of M.V.Matsya-vigyani for the whole period has been only 148.8 kg/hour. The highest monthly catch rates obtained in different small squares together with the corresponding month as well as the total effort expended are shown in Fig. 12.

6.1.3 Depthwise distribution

The depthwise distribution of trawl catches for the year 1972 is shown in Table VIII. The varietywise and depthwise distribution of fish during the year 1975-76 in respect of M.V. Meenakhojini is shown below. A comparison of the catch/hour yields of different regions is also shown in the table below:-

Species	20-39 (Depth range in metres)	40-59	60-79
	Catch/hour in kg		
Elasmobranchs	17.3	25.7	25.4
Leiognathids	-	35.6	33.1
Sciaenids	-	12.9	18.3
Upeneoids	-	11.8	12.0
Cat fish	3.3	3.8	3.2
Nemiptenids	-	3.0	3.1
Perches	-	1.5	0.8
Lizard fish	-	0.7	1.7
Other quality fish	1.0	0.9	0.2
Miscellaneous fish	90.1	11.3	2.2
	111.7	107.2	100.0

(Reproduced from Bull. Expl. Fish. Proj. No. 4)

TABLE VIII Depthwise catch details of "M.V. Meena Khojini", "M.V.Meena Prayas" and "M.T.Matsyavigyani" for the year 1972

"M.V.Meena Khojini"				"M.V.Meena Prayas"				"M.T.Matsyavigyani"			
Depth range (m)	Fishing effort (hrs)	Catch (kg)	Catch /hr (kg)	Depth range (m)	Fishing effort (hrs)	Catch (kg)	Catch /hr (kg)	Depth range (m)	Fsihing effort (hrs)	Catch (kg)	Catch /hour (kg)
30-35	7-15	185	25.5	20-25	3-50	561	14.2	30-35	15-55	3225	201.5
36-40	41-00	4601	112.2	30-35	6-25	722	111.0	36-40	6-45	492	70.6
41-45	37-50	3060	80.5	40-45	34-10	1486	43.7	41-45	8-30	755	88.8
46-50	49-40	4779	96.2	46-50	20-10	1474	73.7	46-50	38-30	6330	164.9
51-55	8-05	687	86.0	51-55	14-50	1099	73.3	51-55	29-45	4160	138.6
56-60	9-55	530	53.0	56-60	16-00	2351	147.0	56-60	29-35	7378	250.1
61-05	4-00	890	222.5	66-70	2-15	50	22.2	61-65	23-30	2807	119.4
21-75	1-45	80	40.0	...	...	...	...	...	...	...	...

It may be seen that the highest catch rate of 111.7 kg/hour for all fish was obtained from 20-39 metres depth belt, which consisted mainly of miscellaneous fish, elasmobranchs, leiognathids, upeneids, cat fish, perches, lizard fish etc. showed no significant variation in their catch rates from 40-59 and 60-79 metre depth belts where these varieties were predominant.

A comparative study of the catch rates obtained by 17.5 m trawlers during 1975-76 in different regions of India also shows that Andamans is equally rich. The catch/hour obtained by 17.5 m trawlers from different depth zones of various regions are furnished below.

Depth range (m)	Catch/hour in kg				
	Andaman & Nicobar waters	North west coast	South west coast	Lower east coast	Upper east coast
0-19	-	48	47	79	249
20-39	112	126	119	119	163
40-59	107	140	153	92	61
60-79	100	131	77	-	136
80-99	-	49	-	-	-

Reproduced from Bull. No.4 (Bull.Expl.Fish.Proj.)

6.2 Long lining

The Indian Ocean region is known to be rich in scombroid resources with a total estimated landing of 1,40,000 tonnes from this area (FAO World Conference on Tuna 1970). Jones et. al (1960) have highlighted the importance of this aspect. Moreover, foreign fishing vessels, mostly long liners, are often sighted close to the Andaman and Nicobar Islands. It was decided to conduct long lining as a regular programme of the base in 1972. M.V. Meena Prayas which was earlier used for long lining work off Tuticorin was pressed into service. Long lining was started towards the end of 1973.

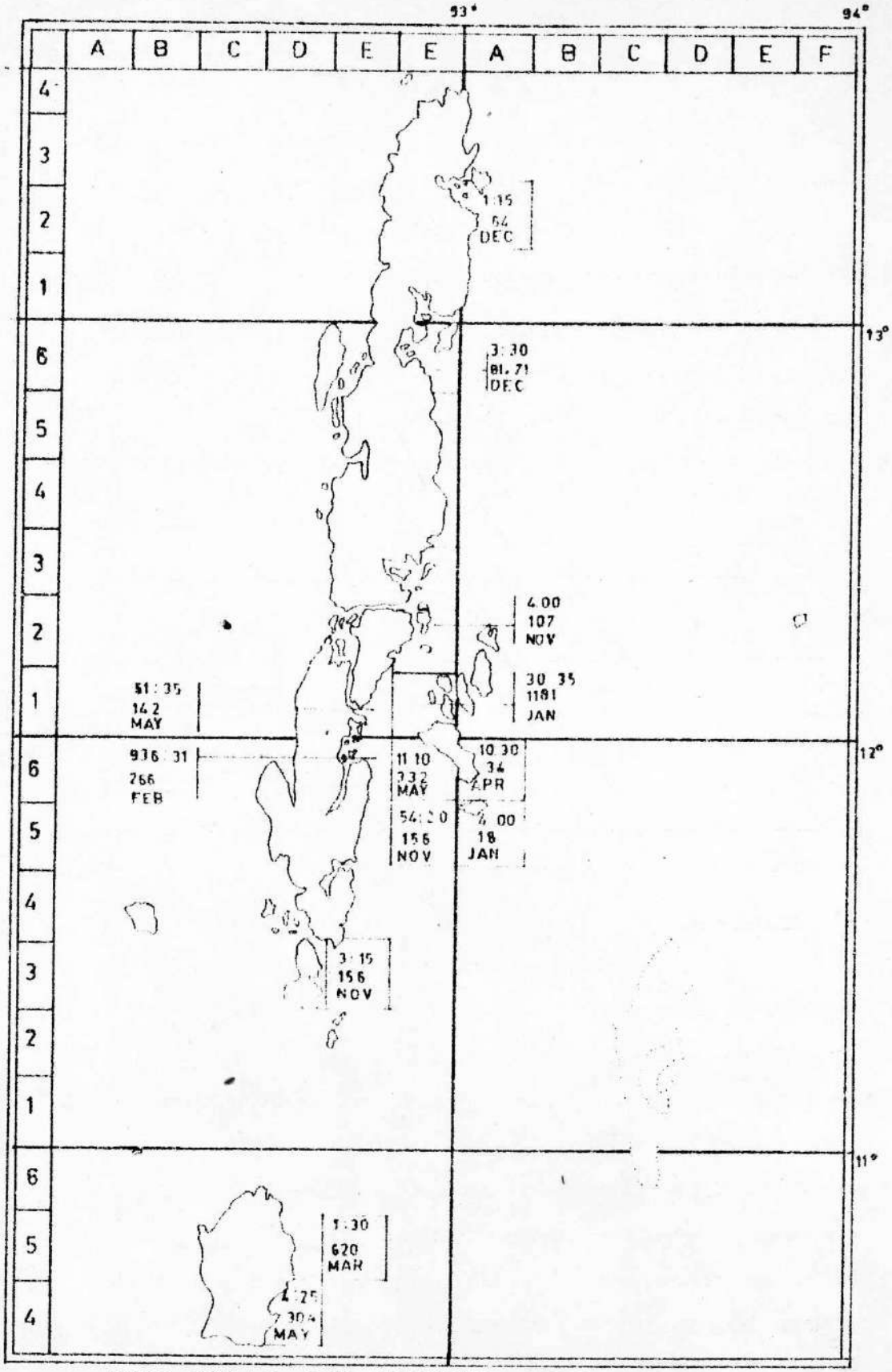

FIG12 AREAS AND RESULTS – BOTTOM TRAWLING

During the period from August 1973 to March 1976, a total effort of 609 hours were expended in the major areas 10-92, 10-93, 11-92, 11-93, 12-93 and 13-93 with the maximum effort in 11-92. Sampling was done altogether in 15 small squares.

The number of days of long lining, the number of baskets used in different years and the catch obtained is shown in Fig. 13. The areas where long lining was done are shown in Fig. 14, together with the total effort and average monthly hooking rate. A summary of the operational results as well as the monthwise and areawise hooking rates and the fish caught are shown in Table IX to XI. The overall hooking rate during 1973-74 was 1.48%, during 1974-75 4.59% and 2.94% during 1975-76. During 1974-75 the survey was extended to wider areas. It may be seen from Table X that the hooking rates were quite satisfactory in certain areas particularly in 11-92/1E, 11-93/6F, 10-92/4E, 11-92/6A and 11-92/6F but during the year 1975-76 the hooking rate dropped very much because most of the fishing was conducted in shallow waters only.

Monthwise, hooking rates were highest during April and May 1974 and July 1974 with 6.32, 15.90 and 15.88 per cent respectively. The overall hooking rates of 4.59% in 1974-75 and 2.94% in 1975-76 were mainly due to the high percentage of sharks. The scombroid catch was low, the hooking rate being 0.47% in 1974-75 and 0.7% in 1975-76 (Table X). This was mainly because of the fact that fishing had to be restricted to areas close to the coast due to operational constraints.

Charcharius spp. was the most common variety of sharks caught. Thresher sharks (Alopias Vulpinus) which are known to prey upon lesser tunas were also caught quite frequently, indicating a fairly good concentration of tuna in the area.

TABLE IX Summary of operation of tuna long lining during 1974-75

Month	Area surveyed in sq.km	No.of baskets	Effort hr.min.	Catch kg	Hooking rate
April '74	76.2	57	22.25	929	6.32
May '74	40.5	39	11.55	1453	15.90
June '74	-	-	-	-	-
July '74	111.2	58	32.45	1588	15.88
Aug. '74	146.8	225	43.20	1616	3.11
Sep. '74	136.0	204	39.57	1719	3.23
Oct. '74	33.7	52	9.55	500	3.47
Nov. '74	114.1	125	33.35	964	3.52
Dec. '74	88.0	110	26.55	449	1.64
Jan. '75	-	-	-	-	-
Feb. '75	24.9	37	7.20	96	1.72
Mar. '75	130.0	151	38.15	2264	4.90
Total:	901.5	1058	266.22	11578	4.59
	Average weight of fish per successful hook-				47.65 kg
Aug. '75	225.08	325	66.20	1698	1.91
May '75	168.47	191	49.55	1221	2.3
Feb. '76	248.61	289	73.15	2311	3.46
Mar. '76	289.34	337	88.10	3093	4.1
Total:	931.50	1142	274.40	8323	2.94
	Average weight of fish per successful hook - 54.3 kg				

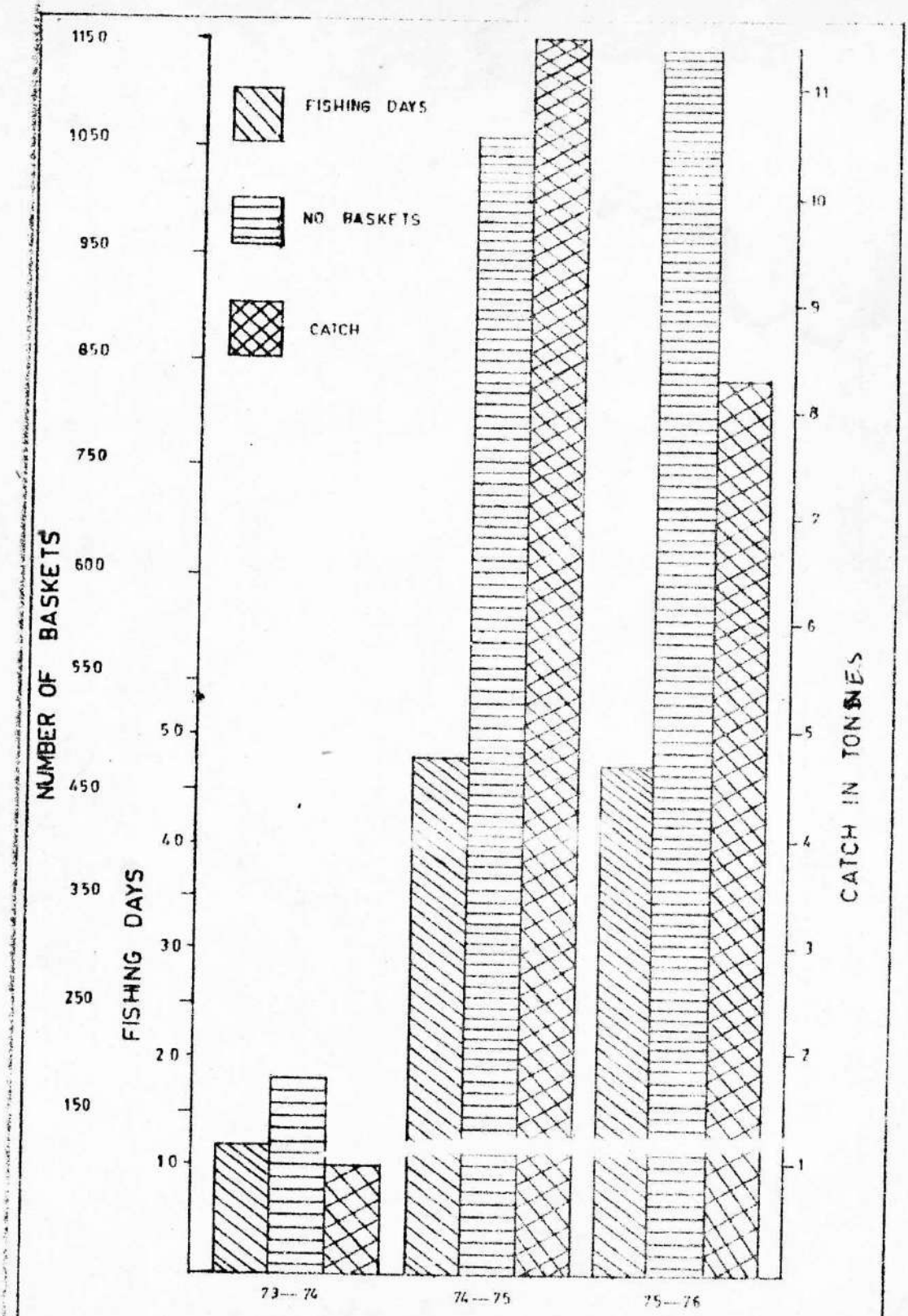

FIG:13. SUMMARY OF LONG LINING

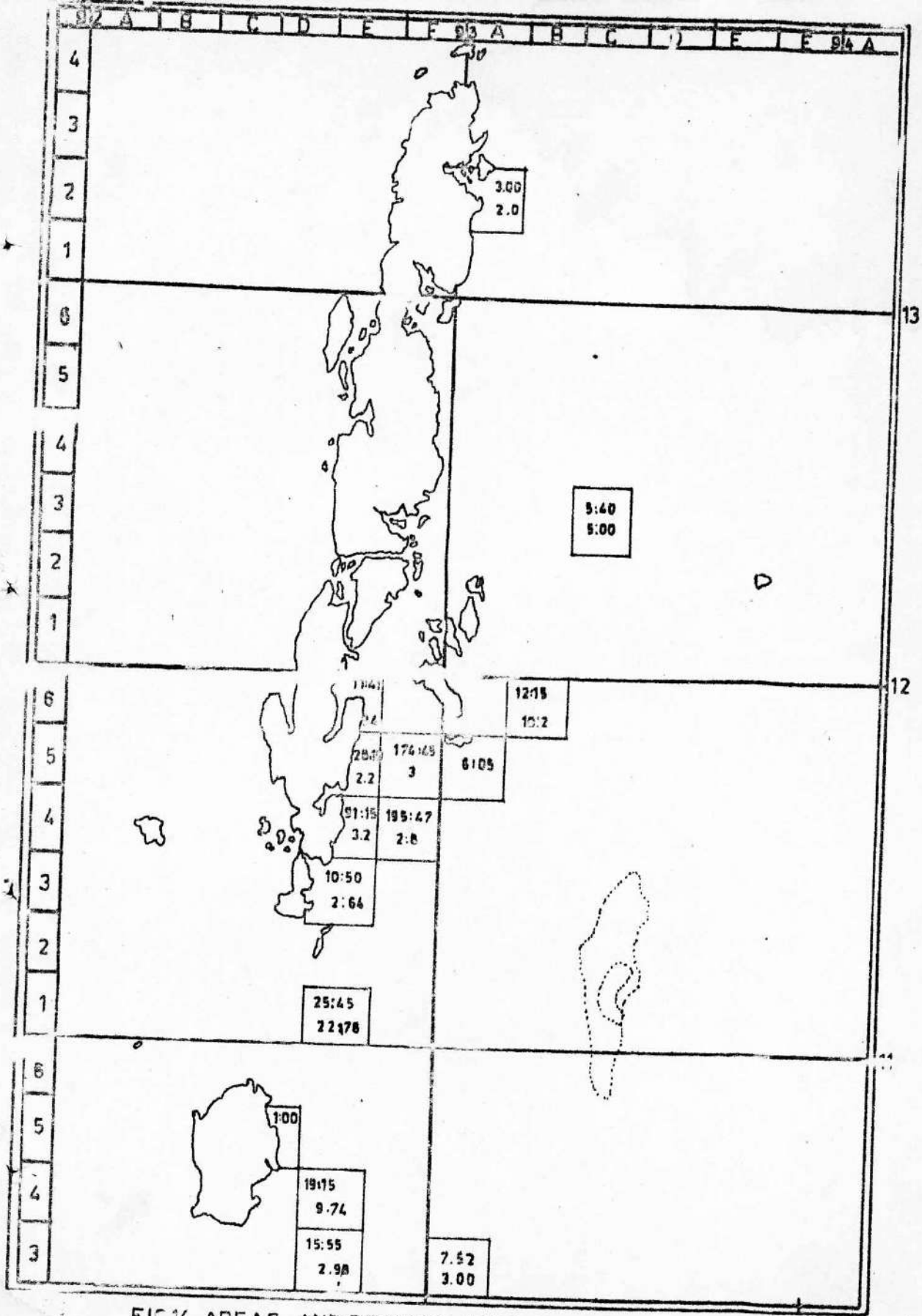

FIG 14. AREAS AND RESULTS - LONG LINING

TABLE X Areawise results of tuna long lining during 1974-75 and 1975-76

Area/ Sub-area	No.of hooks operated	No.of fish caught	No.of shark	No.of scombroid (Tuna)	No.of others	Hooking rate % Shark	Scombroid (Tuna)	Others	Total
								(a) 1974-75	
10-92/3E	235	7	7	-	-	2.98	-	-	2.98
10-92/4E	195	30	19	10	1	9.74	5.13	0.51	15.38
11-92/1E	180	41	41	-	-	22.78	-	-	22.78
11-92/3E	114	4	-	-	4	-	-	3.51	3.51
11-92/4E	1880	57	44	8	5	2.34	0.43	0.27	3.04
11-92/5E	220	5	5	-	-	2.27	-	-	2.27
11-92/4F	1250	41	39	2	-	3.12	0.16	-	3.28
11-92/5F	726	16	12	4	-	1.65	0.55	-	2.20
11-92/6E	95	9	9	-	-	9.47	-	-	9.47
11-93/6F	50	11	11	-	-	22.00	-	-	22.00
11-92/6A/6B	245	26	25	-	1	10.20	-	0.41	10.61
13-93/2A	100	2	1	1	-	1.00	1.00	-	2.00
Total:	5290	249	213	25	11	4.03	0.47	0.21	4.59
								(b) 1975-76	
11-92/3E	75	1	1	-	-	1.3	-	-	1.3
11-92/4E	870	30	25	2	3	2.9	0.2	0.3	3.4
11-92/4F	1575	38	22	11	5	1.4	0.7	0.3	2.4
11-92/5E	275	6	3	1	2	1.1	0.4	0.7	2.2
11-92/5F	2990	98	66	23	9	2.2	0.8	0.3	3.3
Total:	5805	173	117	37	19	2.0	0.7	0.3	3.0

Reproduced from Bull. 2 & 4 (Bull.Expl.Fish.Proj.)

TABLE XI Monthwise results of tuna long lining (Aug. '73 - March '76)

Month	No.of hooks	Catch (kg)	Sharks	Marlin/Sail fish	Tuna	Others	Area surveyed	Overall hooking rate (%)
Aug. '73	125	100	2	-	-	-	84.1	1.60
Sep. '73	170	80	1	-	-	-	33.9	0.58
Nov. '73	650	741 (?)	10	1	-	-	61.2	1.70
Total	945	921					179.2	1.48
Apr. '74	285	929	18	-	-	-	76.2	6.32
May '74	195	1453	19	7	2	2	40.5	15.90
Jul. '74	290	1583	46	-	-	-	111.2	15.88
Aug. '74	1125	1616	31	2	3	1	146.8	3.11
Sep. '74	1020	1719	30	1	1	1	136.10	3.23
Oct. '74	260	500	9	-	-	-	33.7	3.47
Nov. '74	625	964	21	5	-	3	114.1	3.52
Dec. '74	550	449	7	2	-	-	88	1.64
Feb. '75	185	96	1	-	-	2	24.9	1.72
Mar. '75	755	2264	31	-	-	7	130.0 ?	4.90
Total	5280	11756					901.5	4.59
Apr. '75	1625	1698	17	6	1	7	225.08	1.91
May '75	955	1221	14	-	7	1	168.47	2.3
Feb. '76	1445	2311	28	18	-	4	248.61	3.46
Mar. '76	1685	3093	57	5	-	7	289.34	4.10
Total	5710	8323					931.50	2.94

Of the scombroids, the marlins and sail fish were the most common. During the year 1975-76 hooking rate of marlins recorded was 1.5% from the area 11-92/4E.

Hooking rate of tuna was very low as mentioned above. Closer to Port Blair harbour, a yellowfin tuna weighing 32 kg was caught which was the biggest specimen ever caught during the operations. Juveniles of yellowfin and skipjack were caught frequently.

Various types of bait like mackerel, sardines, Decapterus spp. dhoma, shark meat, turtle meat, dolphin flesh, venison were used during the survey operations. The hooking rates were better whenever fresh mackerel bait was used. Non-availability of fresh bait as well as suitable frozen bait was often a problem in Andamans. Appropriate arrangement for a regular supply of bait is an essential pre-requisite for development of this fishery in the Islands.

6.3. Trolling

Trolling lines were operated from M.V.Meena Prayas mainly as an auxiliary method during the years 1973-74 and 1974-75. A total effort of 243 hours was expended in the areas 11-92 and 11-93. The areas where the trolling was done together with the effort is shown in Fig. 15.

Trolling was mostly done while steaming out to the fishing grounds for long lining. Sometimes only trolling lines were operated whenever no suitable bait was available for long lining. The number of lines operated varied from 6-12 with an average of 10 lines. Sampling was done in two major squares.

The results of trolling are summarised in Tables XII to XVI. The catch per hour for the entire period varied from 0 to 56.33 kg. Areawise, the best results were obtained from 11-92/4F, 12-92/4E, 12-92/6D and 11-92/4E. Monthwise, the best results were obtained in April and May, 1974.

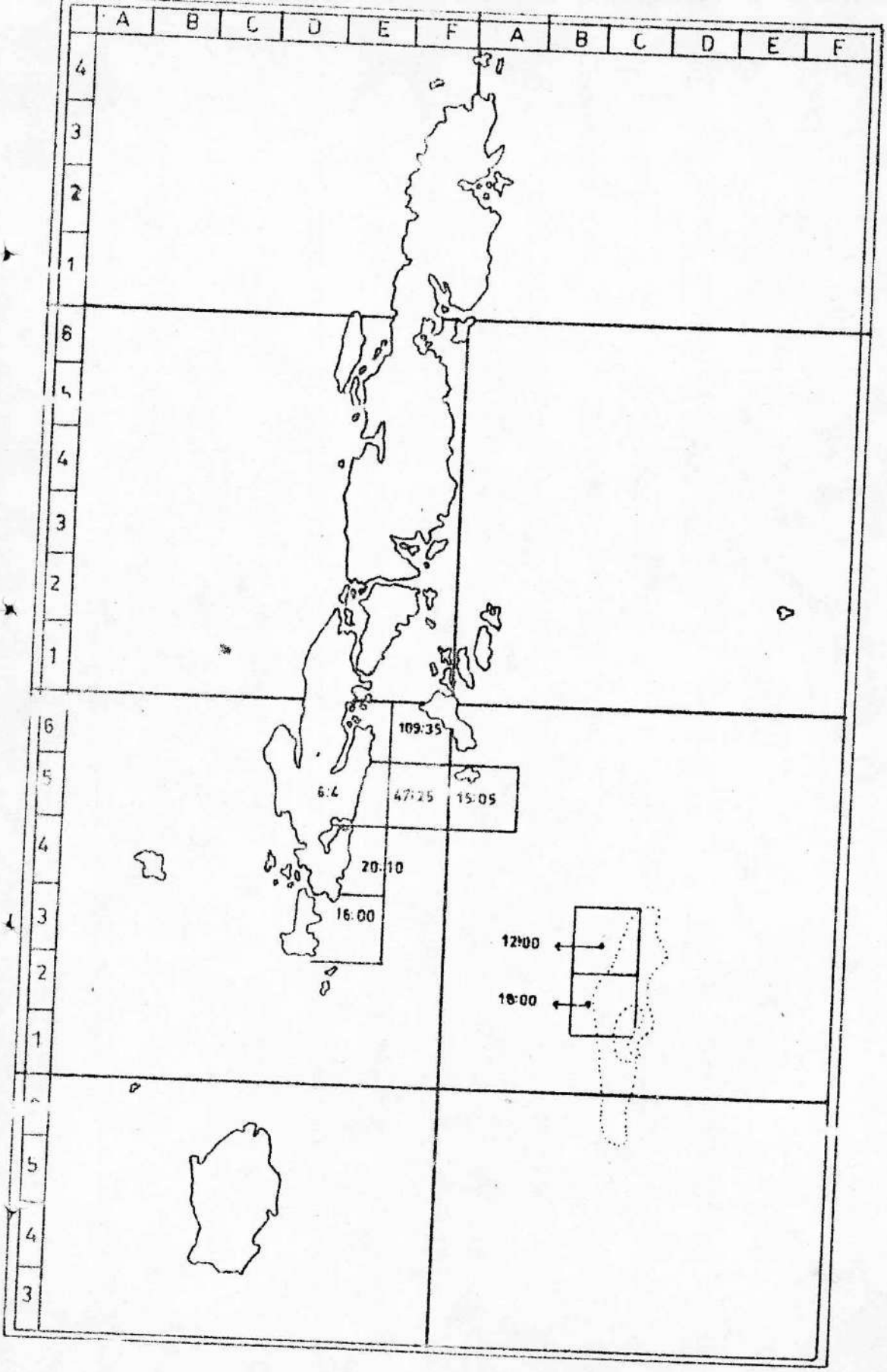

FIG:15. AREAS AND EFFORT - TRC LINE

TABLE XIII Monthwise results of trolling line (April 1975 - March '76)

Month	Effort hrs.Min.	Catch (kg)	Tuna	Carangids	Seer fish	Barracuda	Shark	Perches	Miscellaneous	Catch/ hour
Apr. '75	7-30	19	12	-	-	6	-	-	1	2.5
May '75	40-35	103	74	12	11	-	-	-	6	2.5
Jun. '76	73-40	60	15	12	15	12	-	6	-	0.8
Feb. '76	24-35	12	11	-	-	-	-	1	-	0.5
Mar. '76	11-20	-	-	-	-	-	-	-	-	-
Total:	157-40	194	112	24	26	18	-	7	7	1.23
Percentage:			(59.7)	(12.4)	(13.4)	(9.3)	-	(3.7)	(3.7)	

TABLE XIV Areawise results of trolling line (April 1973 - March '75)

Area/ sub-area	Fishing effort (hrs.min.)	Total catch (kg)	Tuna	Carangids	Perches	Seer fish	Barracuda	Shark	Miscellaneous	Catch/hour
					1973-74					
11-92/6F	18-15	14	-	-	14	-	-	-	-	0.77
11-92/4F	20-55	88	5	-	-	-	-	-	83	4.20
11-92/3A	9-10	-	-	-	-	-	-	-	-	-
Total:	48-20	102	5	-	14	-	-	-	83	2.11
					1974-75					
11-92/3E	14	18	-	10	-	-	-	-	8	1.29
11-92/4E	122	612	126	247	14	81	49	-	95	5.24
11-92/5E	135	254	12	112	3	38	9	10	70	1.76
11-92/1F	6	-	-	-	-	-	-	-	-	-
11-92/5F	41	57	7	7	-	-	-	-	43	1.39
11-92/6F	19	-	-	-	-	-	-	-	-	-
11-92/6D	5	30	6	-	-	9	9	-	6	6.00
12-92/4E	42	481	22	75	53	46	10	216	59	11.45
11-93/1A	5	-	-	-	-	-	-	-	-	-
11-93/5A	66	183	39	45	4	15	43	-	37	2.77
11-93/6A	30	83	4	50	-	-	-	-	29	2.77
Total:	485	1718	216	546	74	189	120	226	347	3.55

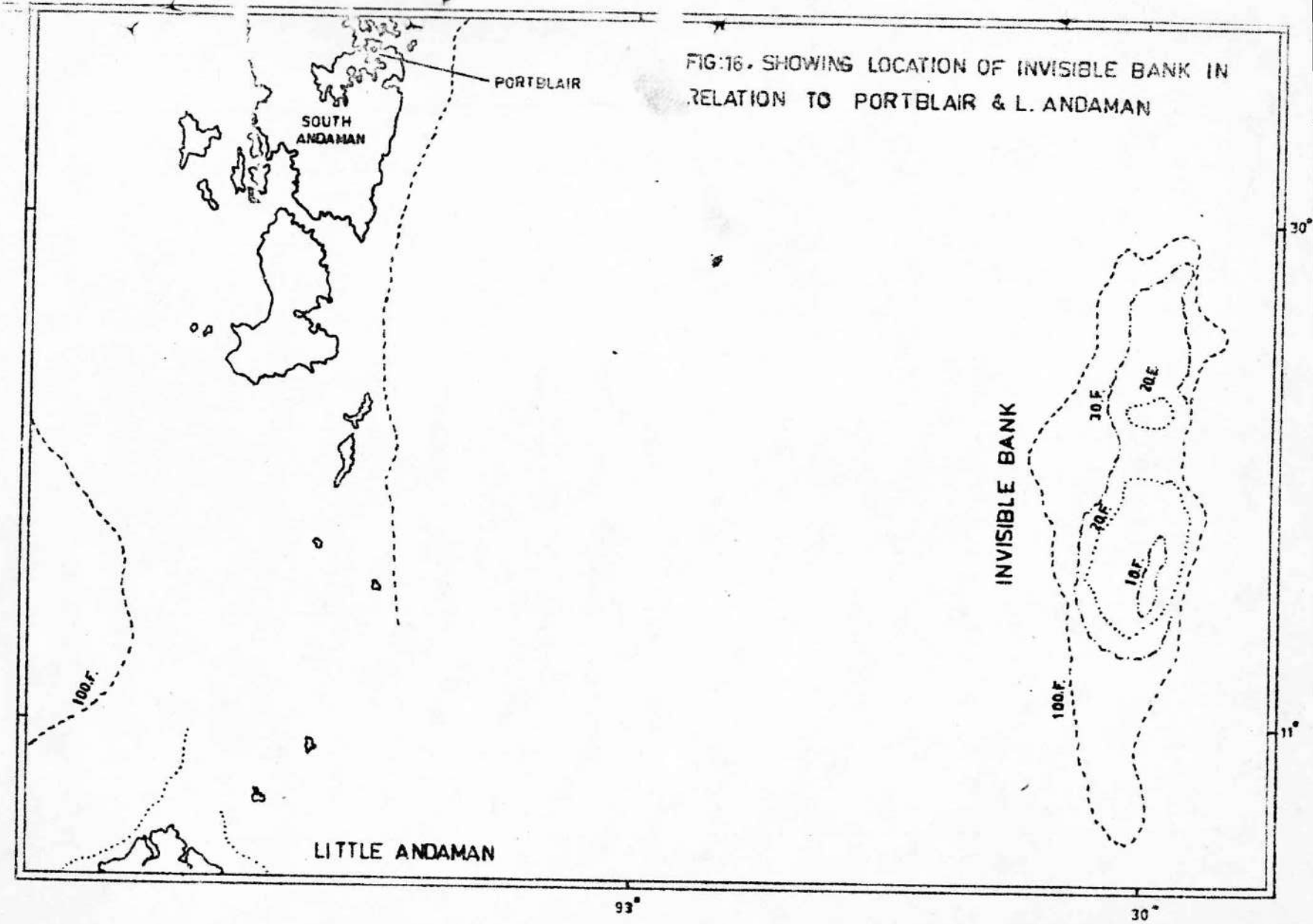

FIG:16. SHOWING LOCATION OF INVISIBLE BANK IN RELATION TO PORTBLAIR & L. ANDAMAN

TABLE XV Areawise results of trolling line (1975-76)

Area/sub-area	Fishing effort (hrs.)	Total catch (kg)	Tuna (kg)	Carangids (kg)	Perches (kg)	Seer (kg)	Barracuda (kg)	Shark (kg)	Miscellaneous (kg)	Catch/hour
11-92/2D	8.75	11	2	5	-	-	-	-	4	1.26
11-92/3E	16.00	1	-	-	1	-	-	-	-	0.06
11-92/4E	24.33	10	-	-	-	10	-	-	-	0.40
11-92/4F	1.20	68	68	-	-	-	-	-	-	56.33
11-92/5E	11.55	-	-	-	-	-	-	-	-	-
11-92/5F	6.25	-	-	-	-	-	-	-	-	-
11-93/5A	34.67	47	23	7	4	4	6	-	3	1.36
11-93/5F	47.42	46	15	12	2	5	12	-	-	0.97
11-92/6A	6.40	11	4	-	-	7	-	-	-	1.72
Total	156.57	194	112	24	7	26	18	-	7	1.24

TABLE XVI Percentage composition by varieties obtained by trolling

Carangids	.. 28.0 %
Miscellaneous	.. 18.7 %
Tuna	.. 16.5 %
Seer fish	.. 13.7 %
Shark	.. 10.8 %
Barracuda	.. 7.2 %
Perches	.. 4.0 %
Total catch per hour	.. 2.92 kg

Though the areas as normally demarcated are not very relevant for the typical species like skipjack, barracuda and carangids and others, it is found that the areas east and south of Port Blair were very rich in carangids with some of them weighing more than 20 kg apiece. Off the Little Andamans a barracuda weighing 22 kg was also caught.

Trolling was found particularly successful for schooling species like skipjack. For instance, in 11-92/4F, a catch of 68 kg was obtained with an effort of 1.33 hours. Hooking of 23 specimens took place in less than 10 minutes time emphasising the need to chase a school and run through it.

While discussing the results of trolling lines operation, it is very necessary to highlight the richness of the invisible bank in major area 11-93 (Fig.16). The bank has an area of about 250 sq. miles. This is a submerged bank over which the depth of the waters varied from 10-100 fathoms. The vessel M.V. Meena Prayas made 3 trips to this area in April/May 1974. Trolling was done for 3 days and Hand line was operated on the night of 4/5th May 1974 while the boat was at anchor. The results which were extremely encouraging are given in the

table below:-

Date	Effort (hrs)	Catch (kg)	Tuna	Caran-gids	Barra-cuda	Shark	Seer	Rui	Perches	Catch/ hour
19.4.74	7.00	283	59	126	19	37	27	15	-	40.43
25.4.74	11.15	232	28	111	27	-	27	25	14	26.22
3.5.74	4.00	100	15	45	10	2[illegible]	20	10	-	25.00
4/5.5.74	10.00	320	-	22	-	216	-	5	77	32.00

It is seen that both by trolling line and hand line the catch per hour has been very high, even though in this trip only 6-8 lines were tried. In trolling lines 'A' grade fish was caught. The number of lines operated could easily be increased to 10 or 12 thereby further increasing the yield. The rocky nature of the bottom indicated that 'kalava' fishing by lines and rollers as well as traps might yield very good results.

6.4 Kalava hand lining

Considering the nature of the bottom which in most of the areas around the Andaman and Nicobar Islands is corally it was felt necessary to explore for the demersal fish by lines similar to 'kalava line'. The vessel M.V.Meena Khojini was rigged for this purpose. The total effort spent in this method was 137 hours. The distribution of effort spent in this method was 137 hours. The distribution of effort in the different areas is given in Table I.

'Kalava line' fishing was undertaken for four months in 1974 and six months in 1975. During the whole period not more than 5 rollers were used at a time. The overall catch/hour worked out to 4.66 kg. The highest catch was obtained in April '75 with a catch per hour of 18.3 kg from the Minerva Ledge north east of Havelock Island in the area 12-92/1[illegible]. The monthwise and areawise results of kalava lines operations are shown in Tables XVII to XIX. Further, the success

TABLE XVII Areawise results of kalava line operations (April 1974 - March '76)

Area/sub-area	Depth range (m)	Fishing effort (hrs.)	Quantity of Kalava caught (kg)	Catch/line/hour (kg)
		1974-1975		
11-92/3E	16-80	11.83	42	1.18
11-92/4E	40-80	15.83	5	0.11
11-92/5E	35-70	4.92	-	-
11-92/5A	16-120	2.67	9	1.12
11-92/6F	10-30	1.00	4	1.33
11-93/5A	11-65	13.67	76	1.85
Total	10-120	49.92	136	0.91
		1975-1976		
11-92/2E	15-60	2.25	1	0.09
11-92/3E	16-52	11.67	10	0.17
11-92/4E	10-68	19.58	56	0.57
11-92/5E	20-80	14.92	65	0.87
11-92/6E	26-95	24.92	66	0.53
11-93/1A	10-20	4.75	125	5.26
11-93/5A	10-36	12.17	43	0.71
12-93/1A	10-19	35.17	315	1.79
Total	10-95	125.43	681	1.09

Reproduced from Bull. No. 2 & 4 (Bull. Expl. Fish. Proj.)

TABLE XVIII Monthwise results of kalava line operations (October 1974 - November '75)

(Percentage shown in brackets)

Month	Catch	Shark	Perches	Tuna	Carangids	Barracuda	Miscellaneous
October '74	123	7	101	7	5	3	-
November '74	9	-	9	-	-	-	-
December '74	4	-	-	-	-	-	4
Sub-total	136	7 (5.1%)	110 (80.9%)	7 (5.1%)	5 (3.7%)	3 (2.2%)	4 (3%)
April '75	168	23	12	-	11	-	122
May '75	22	6	11	-	-	-	5
June '75	162	14	59	14	6	-	69
July '75	239	25	29	5	23	-	157
October '75	67	23	27	-	-	-	17
November '75	23	22	-	1	-	-	-
Sub-total	681	113(16.6%)	138 (20.3%)	20 (2.9%)	40 (5.9%)	-	370 (54.3%)
Grand total	817	120(14.7%)	248 (30.4%)	27 (3.1%)	45 (5.2%)	3(0.34%)	374 (43%)

TABLE XIX Monthwise results of kalava line operations

Month	Depth range (m)	Effort (hrs.min.)	Catch (kg)	Catch/hour (kg)	Area surveyed (sq. km)
Aug. '74	20-80	7-15	-	-	24.7
Oct. '74	15-120	25-05	123	4.9	85.4
Nov. '74	11-80	13-50	9	0.65	47.1
Dec. '74	10-65	3-45	4	1.07	12.7
Apr. '75	9-42	14-05	168	18.3	47.8
May '75	16-70	8-45	22	2.5	29.8
Jun. '75	8-68	22-45	162	7.1	77.5
Jul. '75	9-70	61-50	239	2.8	210.0
Oct. '75	10-95	9-50	67	6.8	33.2
Nov. '75	45-82	8-10	23	2.8	28.6
Total:	9-120	175-20	817	4.66	407.8

Overall percentage of varieties

Miscellaneous	.. 45.78 %
Perches	.. 23.02 %
Shark	.. 14.69 %
Rui	.. 7.34 %
Carangids	.. 5.5 %
Tuna	.. 3.3 %
Barracuda	.. 0.37 %

of the catch depends on the condition of the bait used. It was observed that whenever the condition of the bait was good, the catch was relatively better.

Miscellaneous fish constituted 45.78% of the total catch, sparidae being the important group. Perches and small sharks constituted 23.02 percent and 14.69% respectively. Surprisingly, typical pelagic varieties like carangids, tuna and barracuda were also obtained. This may be because the depth in these areas was not much to allow for stratification of these fishes.

Even though the catch per hour yields are not encouraging, it is advisable to continue the method with more rollers at a time with good bait. Kalava traps are also worth trying. As in the case of trolling, the Invisible Bank offers the best scope for this method also.

6.5 Purse seining

Pelagic species like sardine, anchovies and mackerel constituted 23% of the annual catches from the inshore waters in addition to tuna. The importance of purse-seining in this area becomes all the more hightened because of the fact that the scope for bottom trawling is rather limited.

Purse seining was therefore attempted during the year 1973. M. V. Meena Khojini was rigged up for the purpose. An imported purse seine net having 330 m length and 35 m depth with 20 mm stretched mesh was used. The vessel operated for 30 days between October and December 1973. During this period, schools were often sighted and sets were made in the areas. But only on one occasion a small quantity of flying fish was caught. During the month of December no schools were sighted.

Though the experimental purse seining was not successful, they provide some useful informations, namely:-

1. Large school of fish are not found in inshore waters.
2. The schooling season of mackerel in the Andaman waters coincides with mid south-west monsoon period, i.e. July-August as observed by Luther(1973).
3. The size of the net used was too small for operation in the deeper waters off these islands.
4. The size of the vessel was not adequate to operate in distant water.

7. STOCK ASSESSMENT AND ECONOMICS OF OPERATIONS

Based on an estimated organic production of 0.3 - 0.5 g/cm^2 within the 20 m belt and with a potential yield of 0.2 - 0.3% of the total potential yield in the area latitude 6.00°N - latitude 15.00°N and longitude 91.00°E to longitude 95.00°E to 50,000 metric tonnes (Kumaran 1973). Out of which 12,000 metric tonnes will be from the 200 m depth zones. Jones and Banerjee (1973) estimated the shelf area to be of the order of 16,000 sq.km and computed the standing stock of demersal fish at 4000 tonnes. Against this the computation of standing stock based on the present study works out to 44,576 metric tonnes.

The method adopted for this computation is basically that of Joseph (1974). Since the principal gear used by the 17.5 m trawlers was the 24 m fish trawl, the swept area of this trawl is taken as 0.03914 sq.km at a trawling speed of two knots. At an average of 110 kg/hour of trawling (the catch from 11-92/6E taken as standard), the total standing crop works out to 2.786 m.t/sq. km. On the basis of this, the total standing crop of the demersal fishery should be of the order of over 44,576 m.t. which is almost 10 times that of the figure arrived at by Jones and Banerjee (1973).

Economics of operations very much depend on factors like market conditions both in respect of total demand and price. So far the grounds, which are rather limited for trawling, are comparable to those in the other regions of India in the matter of abundance. But the composition of the catch reveals that quality fish forms a very small percentage. However, to a limited extent all the fish caught can be sold at an average wholesale rate of Rs.1000/- per ton. On a commercial scale the operations during one year with 250 actual fishing days at 10 hours of effort/day and catch of 110 kg/hour will fetch 275 tonnes. By judicious selection of areas and seasons (see fig. 12), this can further be improved. But in view of the fact that there is no prawn catch, it is very difficult to assume commercial viability for bottom trawling in the Andaman Islands under present conditions. It will be required to have strong technological support for processing and handling to make trawling commercially viable proposition in these islands.

Long lining for sharks with shore based small wooden vessels is likely to be profitable. A shark fishing scheme based on the working rates obtained from 17.5 m vessels was prepared in 1975 and the same is given in Annexure III.

A combination of methods from a multipurpose fishing vessel which can combine kalava traps and trolling and long lining will be the most likely proposition for the conditions of the island.

Off Little Andaman very good catches of perches were obtained on the limited hauls made. Only further work can give a clear picture of the potential. Moreover the entire Nicobar group, the whole of the west coast of the Andaman as well as large areas off the east coast are still to be surveyed.

8. SUMMARY

(1) Exploratory fishing on systematic lines was carried out for the first time around the Andaman Islands from October '71 to March '76. Sampling was done mainly on the east coast. A greater fishing effort was expended in area 11-92 particularly off South Andamans in sub-area 6E. Middle Andaman, North Andaman, Little Andaman and Invisible Bank were also covered.

(2) Five methods of fishing, viz. bottom trawling, long lining, trolling, kalava hand lining and purse seining were used. About 50 percent of the effort was put in bottom trawling. The next highest effort put in was in long lining followed by trolling and kalava lining. In purse-seining out of 315 hours, only 15 hours was accounted for by actual sets. The total effort during the survey was 2420 hours.

(3) Bottom trawling over the period of survey indicated that though the scope for this method was not of the same level as in the mainland, the catch rate of 109 kg/hour is comparable to those on the east coast and marginally better than those obtained in the lower east coast.

(4) Small miscellaneous fishes formed the most important group consisting of 65 to 85 percent of the total catch in different areas. Of this, leiognathids, sciaenids and upeneoids were quantitatively more abundant. The percentage of elasmobranchs varied from 18 to 27. Next in importance was cat fish and perches. The seasonal abundance and the variation of the catches show that the period from October to March is generally more productive than the other periods but, however, high catch rates have been obtained in July and August also. Off Middle Andamans, good catches of perches were obtained with a catch rate of 620 kgs/hour from area 10-92/5E and 304 kgs/hour in 10-92/4D by M.V. Matsyavigyani.

(5) Long lining was carried out from August 1973 onwards and the results indicated good resources of sharks and Marlines. The areas south of North Andamans and east of Little Andamans including the invisible bank recorded very good hooking rates upto 22% in certain voyages. Monthwise, April, May and July were the best months with 16% of hooking rate. Hooking rate of 1.5% for Marlin was recorded in 11-92/4E. Schools of Tuna particularly the Skipjack (Katsuwonus pelamis) were sighted quite frequently. The occurrence of Alopias vulpinus, the thresher shark is also indicative of the presence of good school of lesser tunas.

(6) Trolling lines were tried as an auxiliary method of fishing while proceeding to fishing grounds or returning to Port. Upto 56 kg/hour have been caught by this method which can be profitably used to augment the fish catches, particularly quality fish like carangids, barracuda, seer fish and tuna.

(7) The Invisible Bank which is situated about 60 miles south west of Port Blair and north east of Little Andamans to be a promising area for fishing by trolling lines, hand lines and kalava lines. By trolling line an average of 25 to 40 kg/hour of quality fish was obtained. The bottom topography of this bank suggests that intensive kalava line fishing with hand reels and lines as well as traps will be feasible.

(8) Schools of sardines and mackerels as well as skipjack and other varieties of tuna are very frequently encountered in this area. Trial fishing conducted by purse-seining has not been successful,

due to various reasons. Indications are that purse seining by larger and faster crafts utilising bigger nets and well trained crew would yield positive results. Larger vessels with higher effective speed of operation would be more effective for fast moving fishes and deeper nets are necessary for operating in the deep waters very near the coast.

(9) Based on the average catches and using the swept area method, it is estimated that there is a standing stock of nearly 45,000 m.t. of demersal fish in the shelf area of 16,000 sq.km around the islands. If the parameters like recruitment and growth over a full is taken into consideration, it would seem that the stock available for exploitation may prove to be better. The data on pelagic fishery resources are not adequate to venture any estimate.

(10) The survey was highlighted the amount of work that has still to be done in this area. The continental shelf region along the west coast of the islands which is wider than that of the east coast is not yet explored. Proper exploration of the areas along east and west coasts needs better base support in the form of bigger vessels, better dry docking and maintenance facilities, supply of adequate quantities of ice etc.

(11) Specimens of prawns have often appeared in the trawl catches and as such a special survey for prawn resources will have to be undertaken. The availability of the prawns in the shallow bays and inlets also supports the view that there may be sizable prawn resources along the coast.

(12) Shark fishing on a commercial scale has much scope in this region. The frequent occurrence of schools of skipjack also indicate that there is scope for introduction of pole and line fishing in the Andaman and Nicobar waters.

(13) To promote fishing industry in the islands it is very essential on the part of the Government to build up the required facilities such as self-contained modern fishing harbour, with repair facilities, processing and storage facilities for quality fish, provision to utilise low priced trash fish.

(14) Tuna is one of the most important pelagic species occurring in the areas off Andaman and Nicobar. Purse seining for tuna is the sophisticated type of fishing. This method can be successfully employed from Andamans with appropriately large sized purse-seiner which can operate a net of about 500 fms length.

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ANNEXURE I

SPECIFICATION OF FISHING VESSELS

Particulars	M.V.Matsyavigyani	17.5 m Trawler
Length B. P. (m)	31.80	16.3
Beam (m)	7.80	5.20
Depth amidship (m)	7.40	3.00
Hull material	Steel	Steel
Make of engine	New Schwema Schenen	Kirloskar M.A.N.
B.H.P.	578	200
G.R.T.	182.6	56.8
Crew strength	14	10
Place built	G.D.R.	India

LIST OF COMMERCIALLY IMPORTANT SPECIES OF FISHES IN ANDAMAN AND NICOBAR ISLANDS

Scientific Name	Common Name	Local Name
Sharks		
Charcharius spp.	Black shark	Badmash Machi
Chiloscyllium indicum	Cat shark	Badmash Machi
Hemigaleus balfouri	Balfour's shark	Badmash Machi
Scoliodon spp.	Dog shark	Badmash Machi
Sphyrna blochii	Hammer head	Badmash Machi
S. zygaena	Hammer head	Badmash Machi
Skates		
Rhynchobatus d jiddensis	Shovel nose	
Pristis cuspidatus	Pointed saw fish	
P. microdon	Small toothed saw fish	
Rays		
Amphotistius kuhlii	Blue spotted sting ray	Shankar
Aetobatus narinari	Spotted eagle ray	Shankar
Myliobatis nichofii	Eagle ray	Shankar
Rhinoptera javanica	Javanese cow ray	Shankar
Mobula diabolus	Davil ray	Shankar
Himantura uarnak	Whip-tail sting ray	Shankar
Teleosts		
Tylosurus spp.	Car fish	Kawa
Decapterus russelli	Scad	Kapatharni
Selar mate	Scad	Thoppi
Megalaspis cordyla	Torpedo trevally	Bangdi
Chorinemus tol	Queen fish	Chilkala kokari
Caranx sexfasciatus	Six banded trevally	Kokari
C. melampygus	Black tipped trevally	Kokari
Elegatis bipinnulatus	Rainbow runner	Rui
Sardinella melanura	Black tipped sardine	Tarni
S. jussieu	Tembang	Chapda tarni
Harengula ovalis	Spotted herring	Joy tarni
Pellona ditchela	Toother shad	Chapda Maya
Herklotsichthys punctatus	Spotted herring	Tarni
Chirocentrus dorab	Wolf herring	Churi

contd...

Scientific name	Comman name	Local name
Dussumieria spp.	Rainbow sardine	Kappa tarni/Kolu tarni
Thrissocles spp.	Short jaw anchovy	Kori
Anchoviella spp.	White bait	Maya
Hemirhamphus marginatus	Half beak	Hava bil
Leiognathus equulus	Silver belly	Chantha
Lethrinus spp.	Bream	Kathala
Lactarius lactarius	Big jawed jumper(white fish)	Saphed pomplet
Lates calcarifer	Cock-up	Gural
Lutjanus spp.	Snapper	Peela/lal vetki
Liza spp.	Silver belly	Chantha
Pomadasys spp.	Grunter	Vetki
Polynemus spp.	Tassel fish	Kuruchil
Johnius spp.	Jew fish	Rui
Otolithus spp.	Croaker	Rui
Sciaena spp.	Croaker	Rui
Epinephelus spp.	Rock cod	Gobra
Sillago sihama	Silver whiting	Vallu
Saurida tumbil	Lizard	Vallu
Sphyraena jello	Barracuda	Dandoos
Rastrelliger kanagurta	Mackerel	Bangdi
R. brachysoma	Chub Mackerel	Chappda Bangdi
Scomberomorus commersoni	Spanish Mackerel	Surmai
Indocybium guttatum	Spotted spanish Mackerel	Surmai
Acanthocybium solanderi	Wahoo	Surmai
Auxis thazard	Frigate Mackerel	Kata bangdi
Euthynnus affinis	Little tuna	Kata bangdi
Gymnosarda unicolor	Dog tooth tuna	Kata bangdi
Kutsuwonus pelamis	Skipjack	Kata bangdi
Neothunnus macropterus	Yellow fin tuna	Kata bangdi
Krishinoella tongol	Northern blue fin	Kata bangdi
Makaira spp.	Marlin	Hava bil surmai
Tetrapturus brevirostris	Short nosed marlin	Hava bil surmai
Histiophorus gladius	Sail fish	Hava bil surmai
Nemipterus japanicus		Pooma/Rani
Upeneoides spp.	Thread fin bream	Dadi Machi

ANNEXURE III

SCHEME FOR COMMERCIAL SHARK FISHING

This scheme is based on a unit consisting of five wooden fishing vessels of 10-11 M L.O.A. fitted with a 60 H.P. engine and one line hauler each. The sharks caught will be skinned (only big ones) and all the flesh will be dried and processed to remove the urea content in drum driers. The fins will be separately processed for export and the level oil will be extracted by simple method of heat extraction and the crude oil will be sent for refining to the mainland.

The economics of the project has been worked out on the basis of the following criteria:

1. Dry shark meat ... 25% of wet weight
2. Fins ... 1.75% of wet weight
3. Oil ... 5.5% of wet weight
4. Other fish like marlins, barracudas and small tuna will be marketed in the fresh form.
5. 50 baskets of long lines will be operated per day per boat and the hooking rate for sharks is taken at 5% with an average weight of shark at 50 kg.
6. Percentage of hooking rate for other fish is taken at only one percent with the average weight as 10 kg.
7. The number of fishing days for boats is taken at a conservative level of only 200 per year.

contd...

ECONOMICS OF THE SCHEME

Capital investment :

1.	5 wooden boats @ Rs.1,20,000/- each	.. Rs.6,00,000/-
2.	Line haulers @ Rs.4,000/- each boat	.. 20,000/-
3.	Cost of fishing gear @ Rs.3,000/- per boat	.. 15,000/-
4.	Sheds installation, oil vats etc.	.. 1,00,000/-
		Rs. 7,35,000/-

Running expenses :

5.	Running expense (includes fuel oil and lub) @ Rs.60/- per day per boat	.. Rs. 60,000/-
6.	Crew wages @ Rs.25,000/- per boat per year	.. 1,25,000/-
7.	Maintenance expenses @ Rs.15,000/- per boat per year	.. 75,000/-
8.	Marketing expenses @ Rs.20,000/-	.. 20,000/-
9.	Shore management	.. 20,000/-
10.	Incentive to crew approximately per annum	.. 20,000/-
		Rs.3,20,000/-
11.	Depreciation at 10% on capital cost	73,500/-
12.	Interest on total capital cost + running expenses @ 12½%	1,31,875/-
	Total investment:	12,50,375/-

contd...

REVENUE :

1. Shark landings at 625 kg per boat per day for 200 days = 6,25,000 kgs of wet fish; Dry fish i.e. ¼th of 6,25,000 kg = 1,56,250 kg @ Rs.5/- per kg	=	Rs. 7,81,250
2. Other fish @ 10 kg per day for 200 days per boat i.e. 10,000 kg (for 5 boats) @ Rs.2/- per kg	=	20,000
3. Fins @ 11 kg per boat per day for 200 days and 5 boats i.e. 11,000 kg @ Rs.30/- per kg	=	3,30,000
4. Oil of 34,370 kg @ Rs.4/- per kg	=	1,37,480
		12,68,730/-

It can be seen from the above that the gross revenue per year is 100% on the total investment of which more than 50% can be in the form of foreign exchange by way of export of fins and shark meat. Taking into account the tax concession admissible for this level of investment the project could be a very profitable one.

The above is only a boosted outline of the scheme and it is suggested that the details of the project together with the latest cost structure of the boats and export demand etc. may be got prepared by commissioning a fishery expert.

ANNEXURE-IV

Constraints for operation of fishing vessels based at Port Blair

As already mentioned fishing was not practised as a traditional occupation in the islands prior to the arrival of mainland settlers and temporary immigrants. Since the population of the islands was very small (a little over 0.1 million according to the 1971 census) there was no pressure for developing and establishing fishing as an organised industry on modern lines and, as such no infrastructure was built up till recently.

The bottlenecks experienced by the Exploratory Fisheries Project particularly in the initial years of the inception of its base at Port Blair can be broadly classified under a)lack of berthing facilities b)inadequate facilities for drydocking and running repairs c) non-availability of ice and baits d)non-availability of certificated hands e)non-availability of essential stores and engine spares and f) absence of servicing facilities for L.S.A. appliances.

Berthing facilities

In the initial period of the working of Exploratory Fisheries Project base at Port Blair, there was no wharf or jetty for berthing vessels. The vessels were anchored in stream and approach to the vessels was by a dinghy which was to be rowed for nearly 1/2 mile at times. Since the rainy season is very long at Port Blair extending to nearly 8 months spread over by the south west monsoon as well as north east monsoon seasons, transport of personnel, equipment and stores as well as unloading of fish catches in these circumstances posed serious problems. Loading of stores and unloading of catches took considerably long periods and the

vessels had to be idle for days together. This deficiency has now been rectified since the completion of the fisheries jetty at Phoenix Bay in 1974.

b) Drydocking and running repairs

The marine department, Andaman & Nicobar Islands had a slipway. But the same was out of commission. Though the dry dock owned by the Marine Department has been in use, in the initial period M.V.Matsyavigyani (32.8 m O.A.L.) could not be docked there due to some technical reasons. Hence the vessel had to be transferred to Calcutta.

The dry dock was not available whenever required for the use of fishing vessels. There was always heavy pressure on this dry dock since it was to serve the requirements of Naval Patrol Boats, passenger ferry vessels, some private cargho ships, as well as crafts belonging to other departments. All the other vessels were given priority over fishing vessels. M.V.Meena Prayas was laid up for a long period after she reached the islands. Even though prompt action was taken by the base office and tried their level best, the vessel had to wait for several months for the dock to be allotted. Similarly, when Meena khojini was disabled after she sprang a leak in the engine room, she had to wait for more than 8 months for drydocking. Even afterwards there was undue delay in completing the repairs since essential items like oxygen gas, etc. were not readily available in the islands for completing the hull repairs. Though in later years this problem was mitigated by advance action, the pace of repairs continued to be very slow.

For running repairs too, the Exploratory Fisheries Project base had to rely entirely on the Government marine dockyard where procedural delays hold up the work. There are no standard

private workshops who are capable of attending to the repairs. The base workshop of Exploratory Fisheries Project could be established only towards the end of 1974 due to non-availability of accommodation.

c) Non-availability of ice and baits

There is only one ice plant at Port Blair. It is run by the Fisheries Department of the Andaman administration. The original rated capacity of this plant was 5 tons in 24 hrs. But since the plant was too old, the effective production was far below the rated capacity. Further, due to operational problems the plant became idle over very long periods. As the plant has no ice storage capacity, at a time it can supply only the ice produced in a day. This in practice works out to about two tons. This is too inadequate a quantity for the fishing vessels to undertake long cruises. This draw back came in the way of carrying out effective fishing trips to cover reasonably extensive areas. The survey could thus be mainly done only in the areas adjacent to Port Blair.

Lack of regular supply of bait is yet another serious problem in implementing the long line programme. A steady supply of fresh mackerel could not be assured. Even when the mackerel is available often there, no certtainity of stocking the same. The cold storage at Port Blair gets out of commission often. During most of the long line season due to non-availability of ice, baits could not be kept in good condition for longer periods forcing the operation of the long lines fairly close to shore.

The non-availability of fish bait is a constraint for kalava hand line fishing also.

d)Lack of certificated hands

On several occasions, certificated hands who had proceeded to mainland on leave or on duty could not return to the islands in time due to lack of transport facilities. The sailing of passenger ships were uncertain. In such situations, the question of replacements used to pose a serious problem since there were no certificated hands available in the Islands for employment. This necessarily resulted in the laying up of the vessel for considerable periods.

e)Procurement of stores and
f)Servicing of Life Saving Appliances

For engine spares and critical stores, the Exploratory Fisheries Project base at Port Blair had to depend entirely on supplies from Calcutta or Madras. Due to lack of shipping facilities the lead time for supply of these items used to take months.

The long periods of delay in servicing of L.S.A. equipmrnts like inflatable life rafts was another factor which affected the operation of vessel.s Since there were no servicing facilities in the islands, the rafts had to be sent for mainland for the same.

However, by the end of 1975 through unceasing efforts, constant endeavour and better planning, a fairly workable procedure had been evolved in all respects and a certain degree of operational efficiency was achieved, though not entirely satisfactory. Even now, the supply of ice and time dry-docking of fishing vessels are unfortunately not in the hands of the base and continue to cause anxiety. Till a state is reached where we can have assured supplies of ice and timely drydocking of the fishing trawlers, the operations from the Port Blair base will continue to suffer.

APPENDIX I

EXTRACTS FROM THE REPORT OF THE TECHNICAL TEAM ON DEVELOPMENT OF FISHERIES IN ANDAMAN & NICOBAR ISLANDS

2.1.1 Very little work has been done so far on the Oceanography and Marine Biology of Andaman & Nicobar Waters. The earlier studies have been mostly on the fauna and some aspects of topography and hydrography of these waters. It is to the credit of Sewell (1925-1935) that the isolated and disconnected observations carried out in the global expeditions of "Challenger", "Valdivia" & "Siboga" and the Bay of Bengal survey of "Investigator" were collected and some picture on the general pattern of the sea bed and deep sea deposits, marine metereology, temperature, salinity etc. of the Andaman & Nicobar seas could be compiled in a series of articles in the "Memoirs of the Asiatic Society of Bengal" during 1925-1929. The founal features of the seas around Andamans were detailed in the various classic monographs of Alcock, Sewell, Annandale, Rao, Hors etc.

2.1.2 Subsequent work of any significance was the marine productivity work carried out by the Danish vessel 'Calathea' in 1954, which covered some parts of Andaman and Nicobar waters. Some detailed investigations on the hydrographical and planktological features of the waters were made by the International Indian Ocean Expedition during the years 1959-65, especially by the Russian Vessel 'Vitiyaz', the Indian vessel I.N.S. 'Kistna' and to some extent by 'Anton Bruun'. Though the assessment of fisheries potential was used as "an impressive argument to stimulate interest" when the programmes of the International Indian Ocean Expedition were formulated, "the actual fisheries work accomplished during the expedition itself has been disappointingly small" as succinctly put by Panikkar (1966).

4.2 Existing status of fishery

Though the Department of Fisheries of the Andaman and Nicobar Administration have listed 62 species as commercially important, they have normally taken into account only 19 groups in the statistical enumeration of the catches. (The names of the 62 species reported by the Andaman and Nicobar Administration is provided in Appendix I). Outline drawings

of these species and their main characteristics are also furnished in Appendices II & III to enable their easy identification in the field and could be used for improving the primary statistical data of catches. The annual landings of each of the 19 groups of fishes are furnished in Tables III & IV. The monthly landings of fish during the last 4 years are given in Table V. The most important constituents of the catches are, in the order of priority, perches, caranx, seer, mullets, mackerel, anchovies, sardines and silver belly. The low annual landings of sharks and rays and tunnies are due to the fact that almost the entire landing is from the middle and south Andamans due to the concentration of fishing activities in that region. There is comparatively little fishing activity in the Little and Great Nicobar Islands at present. The fishing activity in the North Andaman is also low being restricted just to two centres only. The average monthly landings of these 10 important groups of fishes in Andaman and Nicobar are furnished in Table VI. The best fishing season appearsto be the s.w. monsoon and post monsoon months of July to December. There is a distinct lowering of catches during January-April. The fishery begins to build up from May onwards. But this fluctuation is related to the fisheries of plankton feeding fishes. It could be seen from the following paragraphs that both tunny and seer do not follow this general pattern of fluctuation. In their cases, the best fishery appears to occur during the months preceding the S.W. monsoon and the fishing of these two are at the lower ebbs during the s.w. monsoon and subsequent months.

4.4 Potential

4.4.1. Idyll & Kasahara (1964) pointed out that "Even after years of active investigation there still remain large areas that are apparently productive, judging from oceanographic data, but for which knowledge of potential resources is limited. These include the Arabian sea, the Undaman sea....". Jones and Banerji (1973) gave a nominal estimate of 4000 tonnes of demersal fish calculating at the rate of 2.5 kg per hectare. On the basis of the present composition they estimated a potential yield of 8000 tonnes of pelagic fish also. Kumaran (1973) estimated a potential of 50,000 tonnes in the area of 300,000 sq. miles around the island calculating on an annual net production of 20 million tonnes of carbon and a possible yield rate of 0.2 to 0.3% only. He stated, however, that "because of the definite distribution of oceanic fishery resources and the unapproachability of certain areas together with the problem of the reef studded sea-bottom over

the major part of the shelf, the exploitable annual yield from the Andaman sea upto a depth of 200 metres may be of lesser magnitude viz., 12000 tonnes." Kumaran's estimation of 50,000 tonnes appears to be an underestimate. The 50,000 tonnes he has estimated is probably the protein weight, which has to be multiplied by 10 to give the net weight of the resources. This will give a figure of 5,00,000 tonnes, which is almost the same as that furnished by Cushing (1971) for the upwelling areas of the East Andaman sea alone. Cushing's estimate is 0.2 million tonnes during N.E. monsoon and 0.27 million tonnes for the year. There are a few observations of primary production in the area based on C14 values made by Vityaz, Galathea, Steeman Nielsen and Ramachandran Nair (1973) (Appendix IV). On the basis of their estimation, total production of carbon in an area of 129600 sq. nautical miles encompassing the Andaman and Nicobar island groups and which can be taken as the potential fishing area around the islands has been estimated. The total net weight of the resources, calculated on a projection of these data, will work out to 1.07 million tonnes. The area covered contains in it extensive areas of coralline and volcanic regions (areas of very high productivity). The fish catch rate of demersal fish on the Thailand and Malaysian regions, adjoining the Andaman seas, are comparatively very high (between 300 - 600 kg/hour). The average hooking rate of 4 to 5% in short periods of soaking time of lines in the Andaman waters as seen in the longlining experiments of Exploratory Fisheries Project substantiate the existence of a good standing stock of resources. The potential lies somewhere between these estimates from 50,000 tonnes to 1 million tonnes.

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APPENDIX II

ANNUAL LANDINGS OF MARINE FISH FROM ANDAMANS

Year	Weight in tonnes	Value in Rs.(lakhs)
1950	44	0.58
1951	65	0.56
1952	71	0.84
1953	61	0.92
1954	61	0.79
1955	69	0.89
1956	80	1.01
1957	99	1.23
1958	110	1.40
1959	107	1.36
1960	129	1.36
1961	131	1.46
1962	155	2.39
1963	159	2.19
1964	148	
1965	224	
1966	330	
1967	410	
1968	341	
1969	412	
1970	500	9.20
1971	589	12.80
1972	780	19.50
197	854	25.60
1974	920	27.50
1975	1092	33.05

Sources: 1956-1963. G.N. Mitra

1964-1968. Central Marine Fisheries Research Institute

1969-1975 Director of Fisheries, Andamans