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Number 8.

RESULTS OF EXPLORATORY FISHING CONDUCTED DURING 1977-78

OCTOBER 1978

EXPLORATORY FISHERIES PROJECT
GOVT. OF INDIA
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I N D I A

The Bulletin of the Exploratory Fisheries Project, Bombay, is published at irregular intervals as and when information of a useful nature becomes available for dissemination.

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PREFACE

The survey programmes from the twelve bases of the Exploratory Fisheries Project during 1977-78 mainly depended on the 17.5 m vessels. During this period the Exploratory Fisheries Project had the opportunity of undertaking the responsibility of coordinating the survey operations of the Polish factory trawler M.T.Murena in the implementation of the Indo-Polish Industrial Fisheries Survey along the North-West coast. The two comparatively larger vessels belonging to the Organization, namely Matsyavigyani and Meena Bharati, were deployed as supporting vessels to M.T.Murena. All the additional work was carried out by the existing man-power of the Organization. This has caused slight deviation in the main programme of survey of the Project. Like-wise the non-availability of dry dock facilities for the two vessels based at Port Blair over a long period has also affected the progress of implementation of the survey programmes. Inspite of these adverse factors, the Organization has successfully carried out the responsihilities assigned to it.

This bulletin is the result of processing and analysing of all the fishery data collected through the fishing vessels operated by the Organization during 1977-78. I am sure that the various findings from this analysis relating to the abundance of fishery resources around the country will become useful to the fishermen/state government fishery development corporations/private industry and all other end users.

The good work done by many of the officers and staff at shore and on board vessels to achieve positive results is appreciated.

I am grateful to Shri R.K. Saksena, Joint Secretary (Fy) and Prof. P.C. George, Joint Commissioner (Fy) for the special interest shown by them to assist the Exploratory Fisheries Project in its endeavour to achieve the objectives of the Organization. The officers and staff of the Extension Unit deserve congratulation for their hard work in bringing out this bulletin. Once again t I thank all the officers and staff of Exploratory Fisheries Project.

B o m b a y
30th Oct. '78

M.SWAMINATH
D I R E C T O R

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1. INTRODUCTION

The concept of exploratory survey of marine fisheries resources and the work done by the Government of India Exploratory Fisheries Project so far in this regard had been made clear through the previous publications of the Project. In this bulletin, 8th in the series, the results of exploratory survey conducted by the Project vessels during 1977-78 ~~is~~ are analysed and presented.

As has been made clear earlier, the efforts of the Project during the year under report also was mainly focussed on:

1) Extending the survey operations to areas where no fishing effort has been put in;
2) Intensifying survey operations in areas where the effort put in earlier was meagre to make any assessment on the resources position;
3) Monitoring the fishing grounds where adequate sampling effort has been put in during the past years, in order to study the fluctuations in the stock and develop and apply the concept of fishery management and forecasting;
4) Popularising the diversified fishing methods such as purse-seining, long lining, hand lining and trolling;
5) Imparting "in-vessel training"/providing work experience to the trainees who have passed out from the Central Institute of Fisheries Nautical and Engineering Training.

The Indo-Polish programme of Industrial Fisheries Survey along the north west coast of India which commenced during January 1977 successfully went through the remainder of the year and was completed by December 1977. In addition to co-ordinating the implementation of the programme, the Project's scientific and technical personnel were deputed on board the Polish Survey vessel M.T. Murena. Two larger vessels of the Project viz., M.T. Matsya-vigyani and M.V.Meena Bharati were deployed to operate as ancillary vessels to the main survey vessel. The chief findings of the Indo-Polish Survey have been analysed and presented by the Exploratory Fisheries Project in a series of six preliminary reports. Even though the findings of the ancillary vessels have been discussed in those reports, the same has been interpolated in this bulletin also wherever necessary in view of continuity of presentation of the exploratory survey results of these regions. The findings of the Polish survey vessel M.T.Murena, however, has not been taken up in the present bulletin.

2. PROGRAMME OF EXPLORATORY SURVEY - 1977-78

The programme of survey chalked out for 1977-78 is summarised and presented in Table I. One significant event during the year was movement of one 17.5 m vessel to Veraval base and commencement of systematic Exploratory Survey of Saurashtra waters from this base.

There was no much deviation from the charted programme except in the case of the two larger vessels, viz. Meena Bharati attached to Bombay base and Matsyavigyani attached to Calcutta base. These two vessels were deployed as ancillary vessels to the Polish survey vessel M.T.Murena upto December 1977. The vessel Matsyavigyani operated during the remaining period of the year from Calcutta.

3. VESSELS AND GEAR

As in the previous year the fishing fleet consisted of 19 indigenously constructed 17.5 m vessels, one 23 m indigenously constructed vessel M.F.V. Meena Bharati and two imported steel trawlers, viz. Matsyavigyani (32.28 m) and Jheenga (16.5 m). Major specification of the vessels had already been furnished in the previous bulletin (Bull. Expl. Fish. Proj. 4).

Bottom trawl was the main type of gear operated by the vessels during the year. The important types of gear operated by the 17.5 m vessels were 20 m and 24 m fish trawl and 28 m shrimp trawl whereas the bigger vessels Matsyavigyani and Meena Bharati operated 30 m and 45 m fish trawls. The design and major specification of these gears have been given in the earlier publication (Bull. Expl. Fish. Proj. 4). In addition to bottom trawling, purse-seining was conducted from Goa and Mangalore bases, and long lining and trolling from Port Blair base.

Base	Name of the vessel	Area	Type of operation/ Gear
KANDLA	Meena Udyog	21-69 23-68 21-68 22-68	Demersal trawling/ 24 m fish trawl and 28 m shrimp trawl
VERAVAL	Meena Prapi	21-69 20-69 20-70	Demersal trawling/ 28 m shrimp trawl and 24 m fish trawl
BOMBAY	Meena Bharati	18-70 18-71 18-72 17-72	Demersal trawling/ 30 m fish trawl
	Meena Sangrahak	16-72 17-72 17-71 18-71	Demersal trawling/mid-water trawling/ 28 m shrimp trawl 24 m fish trawl
GOA	Meena Ayojak	16-72 16-73 14-74	Demersal trawling and purse- seining/ 28 m shrimp trawl 24 m fish trawl and 400 m x 55 m purse-seine.
	Meena Netra	15-72 15-73 14-73	Demersal trawling/ 28 m shrimp trawl and 24 m fish trawl
MANGALORE	Meena Tarangini	13-73 13-74	Demersal trawling/24 m fish trawl
	Meena Anaveshak	12-74 11-74 11-75	Demersal trawling and purse- seining/ 24 m fish trawl 28 m shrimp trawl and 330 m x 35 m purse-seine
COCHIN	Meena Utpadak	7-77	Demersal trawling/ 24 m fish trawl and 90' shrimp trawl
	Meena Sachetak	bet. lat 11°N and 8°N	Demersal trawling/ 24 m fish trawl and 90' shrimp trawl

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Base	Name of the vessel	Area	Type of operation/Gear
TUTICORIN	Meena Niryantak	7-77	Demersal trawling/ 20 m and 24 m fish trawl
	Jheenga	9-79 8-77	Demersal trawling/ 28 m shrimp trawl and 20 m fish trawl
	Meena Saudagar	8-78 7-77	Mid-water trawling
MADRAS	Meena Sitara	14-80 10-79 10-80 11-79	Demersal trawling/ 24 m fish trawl and 28 m shrimp trawl
	Meena Gaveshak	13-80 12-79 12-80	Demersal trawling/ 24 m fish trawl and 28 m shrimp trawl
VISAKHAPATNAM	Meena Jawahar	15-80 15-81	Demersal trawling/ 28 m shrimp trawl
	Meena Shodhak	16-81 17-83 16-82	Demersal trawling/ 24 m fish trawl and 90' shrimp trawl
PARADEEP	Meena Grahi	18-84 19-84 19-85	Demersal trawling/ 28 m shrimp trawl
	Meena Prasarak	19-86 20-86 19-85	Demersal trawling/ 28 m shrimp trawl
CALCUTTA	Matsyavigyani	20-87 20-88 21-88 21-87	Demersal trawling/ 45 m fish trawl and shrimp trawl
PORT BLAIR	Meena Khojini	Andaman waters	Bottom trawling, tuna long lining and trolling
	Meena Prayas	Andaman waters	Bottom trawling/special shrimp survey and kalava fishing

Table I. Exploratory fishing programme for 1977-78

4. RESULTS OF DEMERSAL FISHERIES RESOURCES SURVEY

As mentioned earlier, 22 vessels of the Project were deployed for operation from the 12 bases. Of these the bigger vessels Matsyavigyani and Meena Bharati were based at Calcutta and Bombay respectively and the 16.5 m vessel Jheenga operated from Tuticorin base. From all other bases except Calcutta, 17.5 m vessels carried out survey operations. During the year 1977-78 the vessels have surveyed/resurveyed an area of about 33,000 sq.km by bottom trawling expending about 9526 hours of actual fishing effort and landed an incidental catch of about 1134 tons of fish and prawns.

Table II gives the summary of results of demersal fishery resources survey conducted during 1977-78. The vessels which put in maximum fishing effort were in order Jheenga belonging to Tuticorin base (793 hours), Meena Jawahar belonging to Visakhapatnam base (775 hours), Meena Utpadak belonging to Cochin base (767 hours), Meena Niryantak (772 hours), Meena Saudagar (752 hours) both belonging to Tuticorin base and Meena Sangrahak (746 hours) of Bombay base.

Meena Prapi of Veraval base, Meena Bharati of Bombay base, Meena Ayojak of Goa base, Matsyavigyani of Calcutta base, Meena Khojini of Port Blair base and Meena Sachetak of Cochin base expended a fishing effort of less than 200 hours due to various reasons. Comparing the catch/hr obtained from different bases, it was observed that Matsya-

Base	Vessel	Area surveyed	Fishing effort (hrs)	Extent of area surveyed (sq.km)	Catch/ hour (kg)
KANDLA	Meena Udyog	22-68, 21-69, 22-70, 22-69	332	1,139	114
VERAVAL	Meena Prapi	20-70, 21-70, 21-69	287	984	66
BOMBAY	Meena Bharati	18-72, 17-72	233	799	143
	Meena Sangrahak	17-72, 18-72	746	2,559	104
GOA	Meena Netra	15-73, 15-72, 14-73	555	1,904	210
	Meena Ayojak	14-73, 15-73, 16-73	253	868	169
MANGAL-ORE	Meena Tarangini	12-74, 13-74	488	1,674	88
	Meena Anaveshak	12-74, 13-74	437	1,499	47
COCHIN	Meena Utpadak	9-75, 9-76, 10-76, 10-75	767	2,631	152
	Meena Sachetak	9-76	69	237	48
TUTI-CORIN	Meena Niryantak	8-78, 8-77, 9-78, 7-77	772	2,640	118
	Meena Saudagar	8-78, 7-77	752	2,571	103
	Jheenga	8-78	793	2,720	100
MADRAS	Meena Sitara	13-80, 14-80	412	1,409	119
	Meena Gaveshak	13-80, 14-80, 11-79, 12-80	418	1,434	98
VIZAG	Meena Jawahar	17-83, 18-83, 18-84, 17-82, 16-82, 15-80, 15-81, 16-81	775	2,658	102
	Meena Shodak	17-83, 18-83, 18-84, 17-82, 15-81, 16-81	414	1,416	102
PARA-DEEP	Meena Grahi	20-86	327	1,123	168
	Meena Prasarak	20-86	339	1,163	117
CALCU-TTA	Matsyavigyani	20-88, 19-71, 20-70, 20-71, 18-71, 19-72, 17-71, 17-72, 18-72	245	840	229
PORT BLAIR	Meena Khojini	11-92, 12-92	111	382	106

Table II Catch/hour and area surveyed by the Project vessels during demersal trawl survey.

vigyani recorded the highest catch rate of 229 kg/hr followed by Meena Netra of Goa base with a catch rate of 210 kg/hr. Meena Gaveshak of Madras base, Meena Anaveshak and Meena Tarangini belonging to Mangalore base recorded catch rates less than 100 kg/hr. All the remaining vessels recorded catch rates between 100-200 kg/hr.

4.1 Species composition of the trawl catch

While studying the composition of catch obtained from different regions an attempt has been made to compare the present results with that obtained during the previous year. This analysis may be significant due to the reasons that during both these years, the areas were surveyed using the identical type of vessels and gear.

The composition of trawl catches obtained from Kandla and Veraval is given in Fig. 1.

The trawl catch of Kandla was composed mainly of dhoma (23%), elasmobranchs (22%), kati (9%), wam (7%), ghol (6%), cat fish (5%) and pomfret (3%).

The important deviation observed from the catch composition of last year were an increase in the case of rays(by 3%), kati(by 4%), ghol(by 1%) and wam(by 2%). A few varieties like dhoma (by 8%), pomfret (by 2%), bream (by 3%) exhibited a retarded trend.

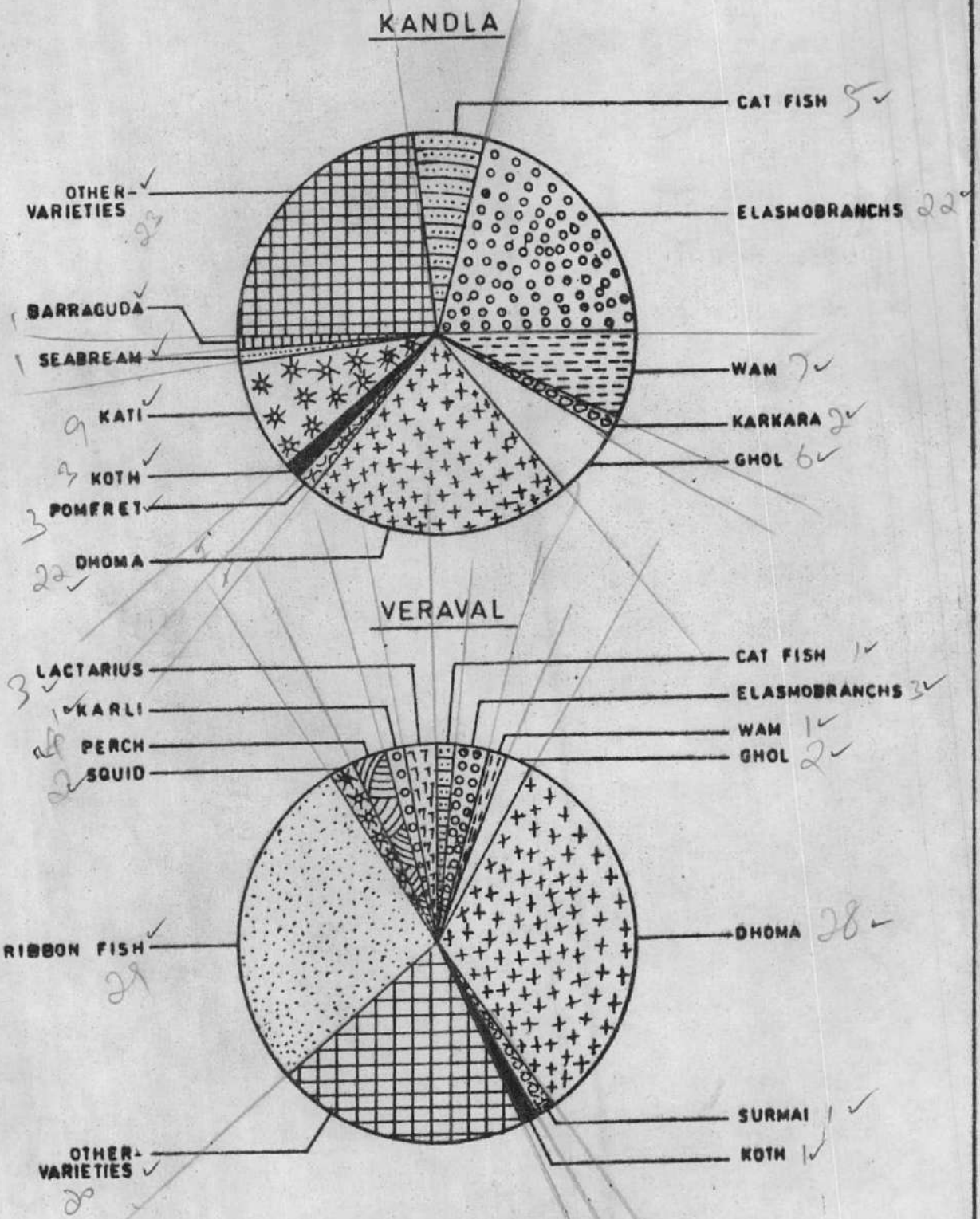


FIG. I - PERCENTAGE COMPOSITION OF IMPORTANT VARIETIES OF - FISHES FROM KANDLA & VERAVAL.

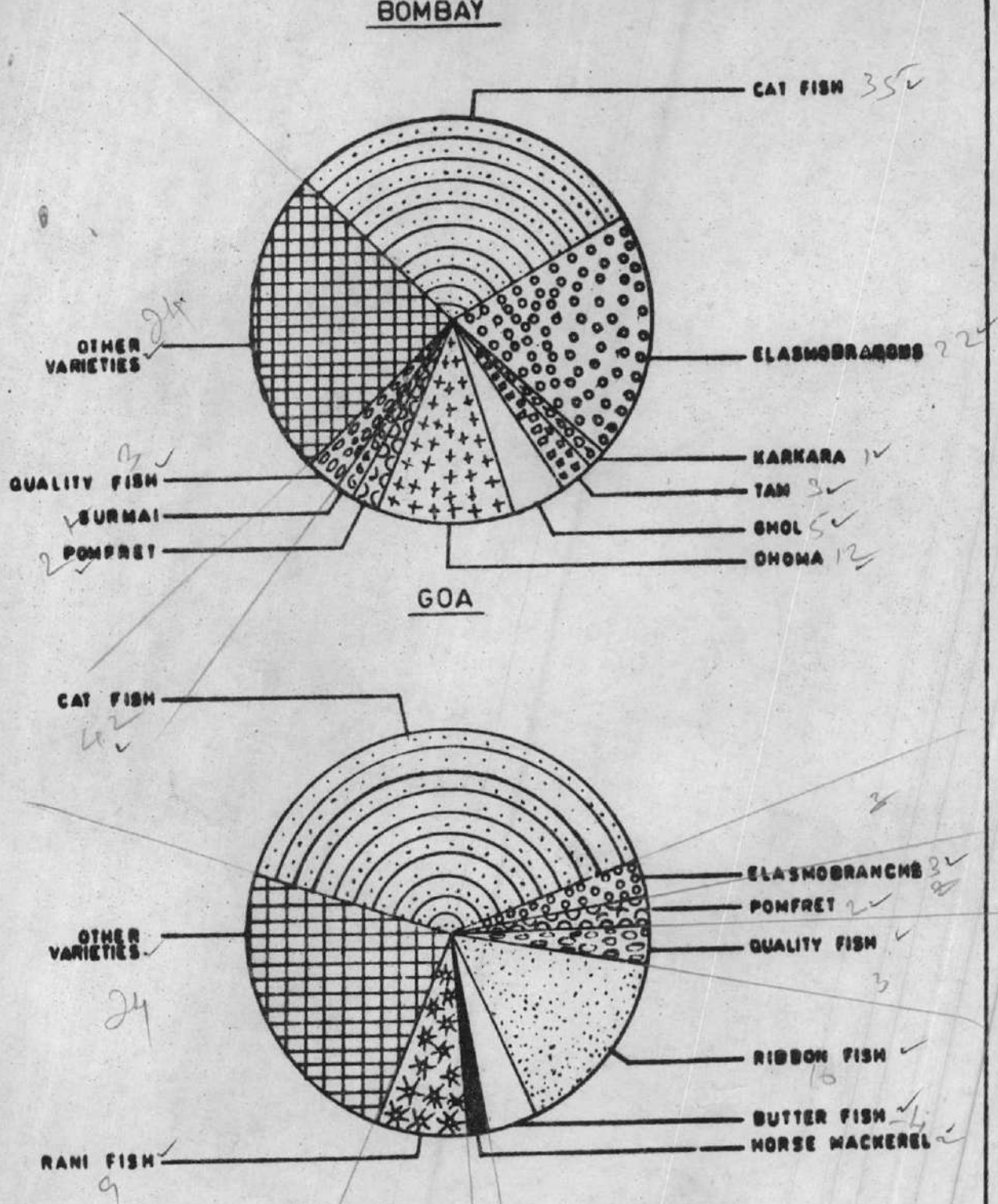


FIG. 2 - PERCENTAGE COMPOSITION OF IMPORTANT VARIETIES OF - FISHES FROM BOMBAY & GOA.

The composition of catch obtained from Veraval shows that ribbon fish occupied 29% of the catch followed by dhoma(28%), Ghol constituted 2% while cat fish and wam were present at the level of 1% each. Other varieties present in the Veraval catch were squid (2%), lobster (2.2%), perch (4%), lactarius (3%) and koth and surmai (1% each). The percentage composition registered for these six varieties from Veraval was the highest for the north west coast.

The important varieties constituting the total catch of Bombay and Goa regions are illustrated in fig. 2. The important components of Bombay catch were in order cat fish(35%), elasmobranchs (22%), dhoma (12%), ghol (5%), tam (3%), pomfret (2%), karkara and surmai (1% each). Among these, cat fish recorded 6% increase, ghol recorded 2% increase and dhoma registered 2% increase from that of the previous year. Pomfret showed a retardation by 1% while elasmobranchs maintained the same consistency.

The catch composition of Goa region showed that four main varieties viz. cat fish, ribbon fish, Nemipterus sp. and butter fish were the main constituents contributing 42%, 16%, 9% and 4% respectively. Cat fish and ribbon fish recorded an increase of 6% and 2% respectively over the previous year. Elasmobranchs and Nemipterus sp. showed a decrease of 2% and 5% respectively.

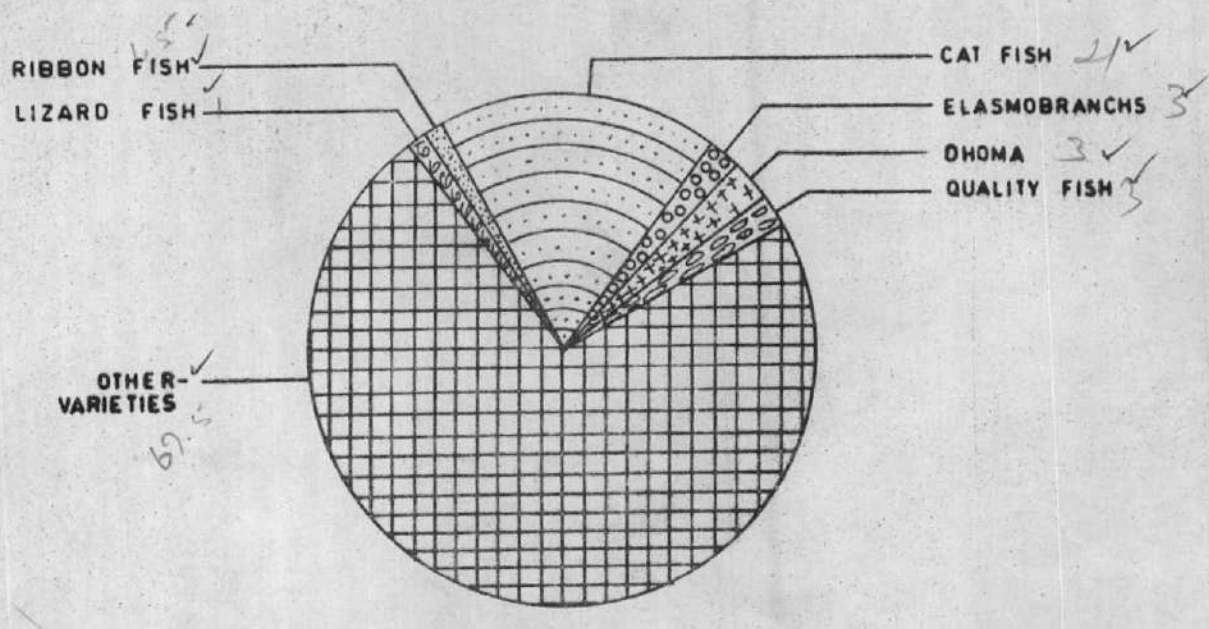
While observing the catch composition of the north

west coast as a whole it can be seen that the magnitude of elasmobranchs were identical in Kandla and Bombay regions (22%) while in Veraval and Goa, the presence of this variety was quite insignificant. However, more intensive survey has to be done off Veraval to establish this trend. Among other groups, wam, dhoma, kati and pomfret occupy comparatively major share in the trawl catches of Kandla which subsequently diminishes southwardly. Cat fish on the other hand showed a different picture with consistency increasing from Kandla towards south. Presence of interesting varieties like lobster, squid, ribbon fish and Lactarius sp. exclusively in the Veraval zone and that of Nemipterus sp. in the Goa zone is noteworthy.

Fig. 3 gives the catch composition of the two bases of the south west coast viz. Mangalore and Cochin. The main constituents of the trawl catch obtained from Mangalore were cat fish (21%), dhoma (3%), elasmobranchs (3%), ribbon fish (1.5%) and lizard fish (1%). The striking difference in the catch composition of this region from the previous year is a drastic fall in the case of ribbon fish by 29% and an increase of cat fish by 5%. The insignificant consistency of Nemipterus sp. is another noteworthy feature.

Coming to the Cochin region, cat fish was found to occupy the major share with a consistency of 33%, followed by elasmobranchs (18%), lizard fish (12%), kilimeen (Nemipterus sp.) (10%) and carangids (3%). A drastic reduction in the composition of prawns from that the previous year (2% - 0.1%) deserves special mention.

MANGALORE



COCHIN

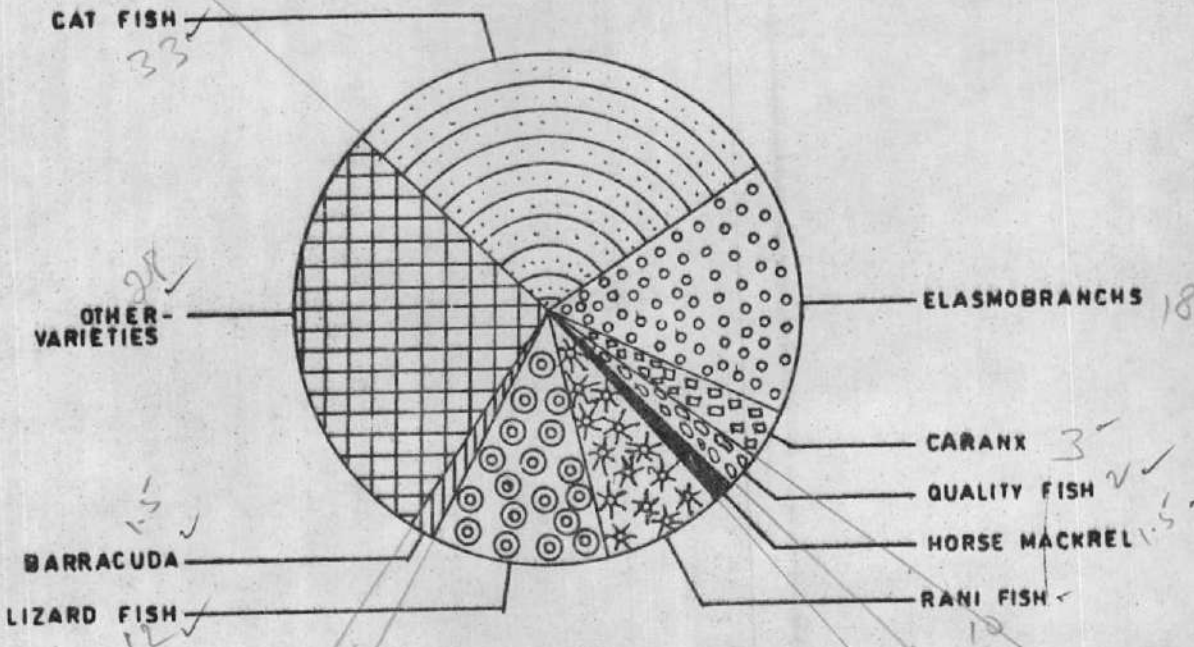


FIG. 3 - PERCENTAGE COMPOSITION OF IMPORTANT VARIETIES OF FISHES FROM MANGALORE & COCHIN

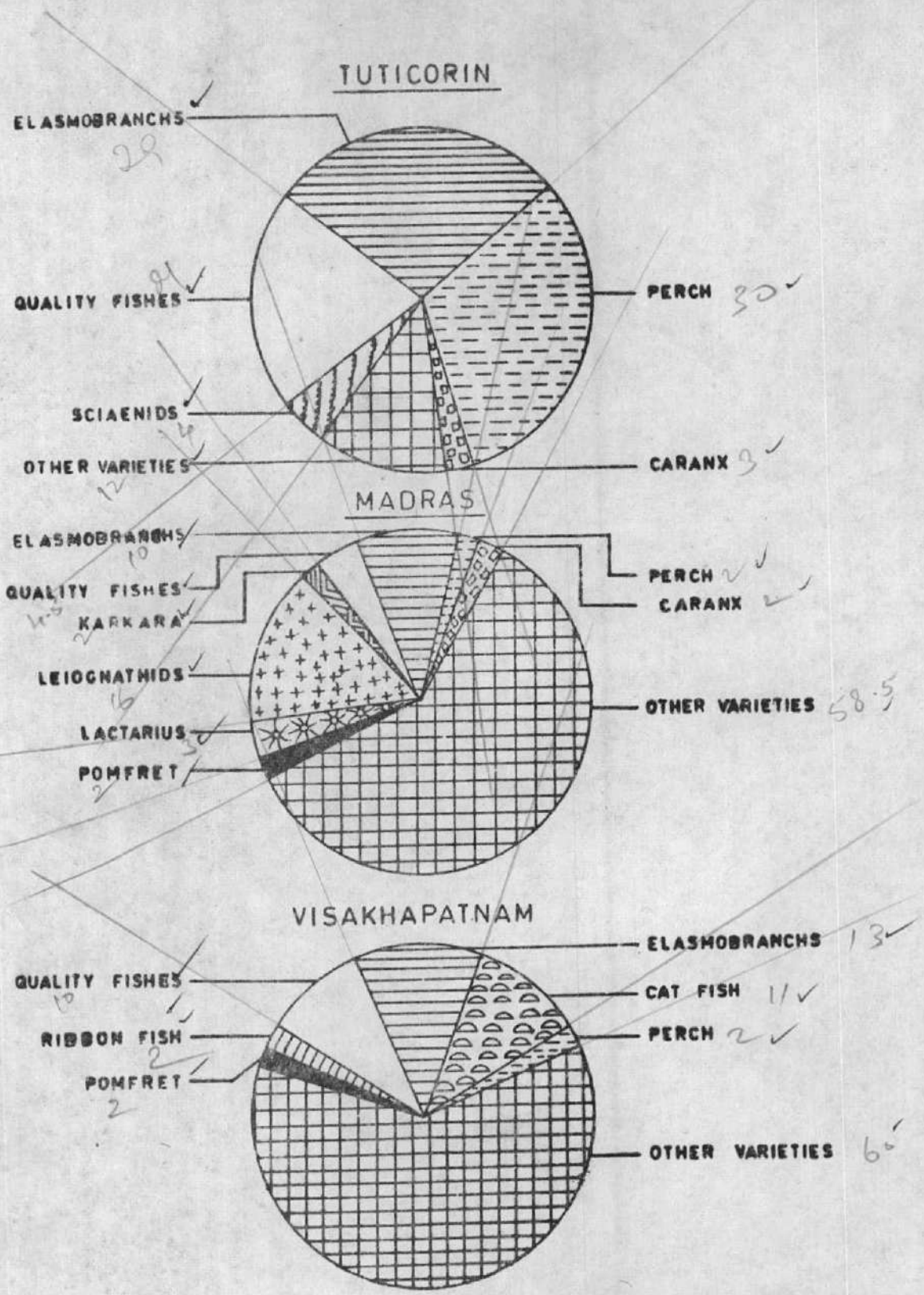


FIG. 4 PERCENTAGE COMPOSITION OF IMPORTANT VARIETIES OF FISHES FROM TUTICORIN, MADRAS & VISAKHAPATNAM.

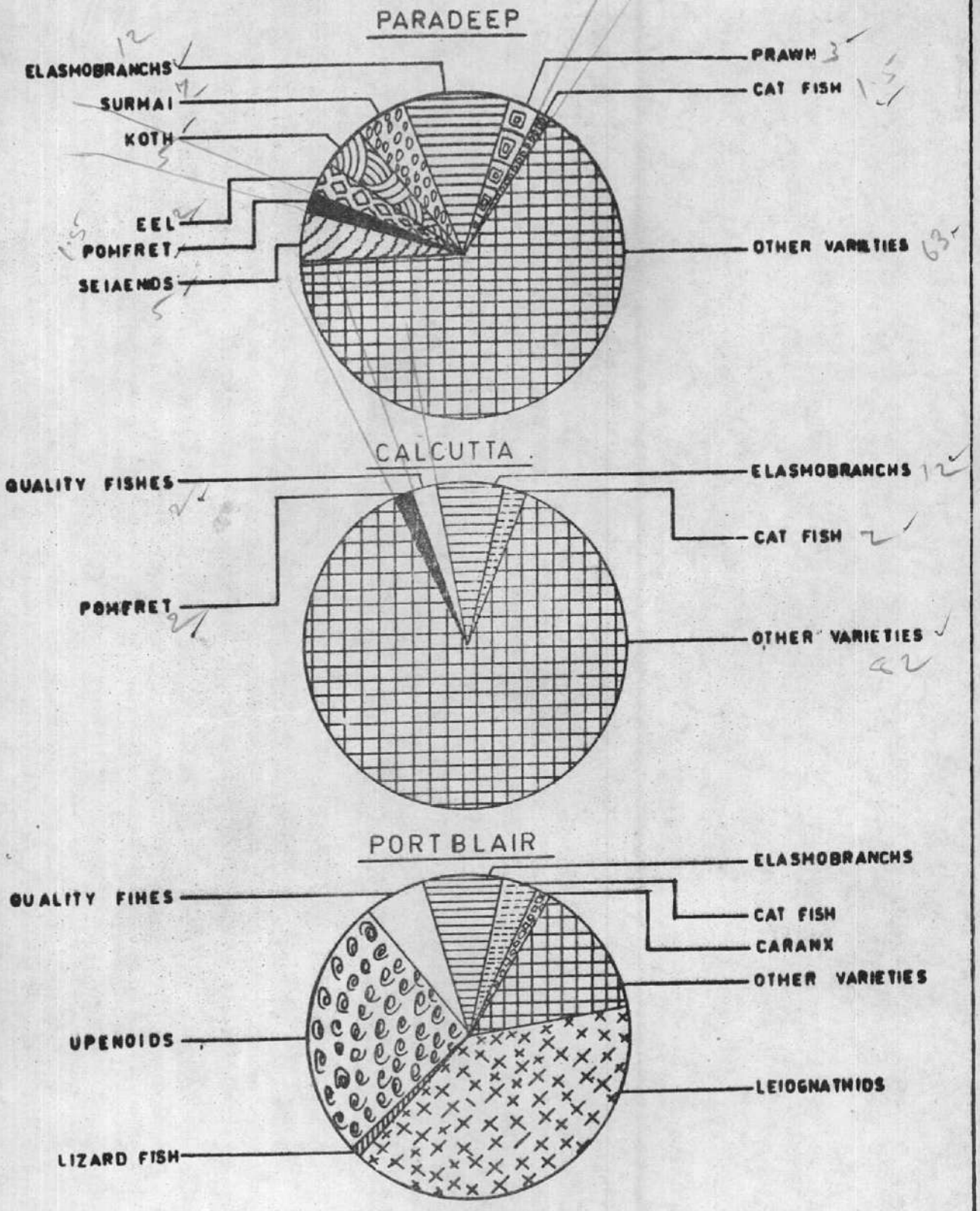


FIG. 5 - PERGENTAGE COMPOSITION OF IMPORTANT VARIETIES OF FISHES FROM PARADEEP, CALCUTTA & PORT BLAIR.

The significant variations in the composition of catch obtained from the two bases of the south west coast were - higher percentage of rays (15%), cat fish (13%) and lizard fish (11%). Caranx spp. and barracuda were represented only in the catches of Cochin at 3% and 1.4% respectively.

Fig. 4 illustrates the catch composition in Tuticorin, Madras and Vizag regions. From the fig. it can be seen that the important varieties constituting the bottom trawl catches of Tuticorin were perches (30%), rays (29%) and sciaenids (4%). A reduction is noticed in the percentage composition of perches (by 8% and rays (by 1%).

The main constituents of the trawl catch of Madras were leiognathids (16%) followed by elasmobranchs (10%), lactarius sp (3%) and carangids (2%). Elasmobranchs and leiognathids recorded an increase by 3% each over the previous year.

Cat fish (11%), elasmobranchs (13%), perches (2%), pomfret (2%) and ribbon fish (2%) were the main constituents of the trawl catches obtained from Vizag. A reduction in the percentage of cat fish(by 3%) and an increase by 3% in the case of elasmobranchs is noticed.

The catch composition of Paradeep, Calcutta and Port Blair is illustrated in fig. 5. The important varieties constituting the trawl catches of Paradeep were elasmobranchs (12%), prawn (3%), surmai (7%), koth (5%), sciaenids (5%) and eel (2%). A downward trend is noticed in the case of almost all the species except elasmobranchs which registered a 3% increase.

The important varieties occurring in the trawl catches of Calcutta region with their percentage composition were elasmobranchs (12%), cat fish (2%) and pomfret (2%).

The trawl catches of Port Blair region was mainly constituted by three groups viz. silver bellies (Leiognathids sp.)(39%), upenoids (24%) and elasmobranchs (11%). Cat fish and Nemipterus sp. contributed 3.5% and 3% respectively.

4.2 Relative abundance by area

Catch per unit of effort obtained for different species from all the major squares surveyed by four types of vessels viz. 17.5 m vessels, Jheenga, Meena Bharati and Matsyavigyani has been analysed and presented in this chapter. For convenience of presentation the whole survey area has been split up into five zones viz. north west coast, south west coast, lower east coast, upper east coast and Anadman and Nicobar Islands. The demarcation of the different zones have been given in earlier bulletin (Bull. Expl. Fish. Proj. 6).

4.2.1 North west coast

Three types of vessels viz. 17.5 m (3 vessels), Meena Bharati and Matsyavigyani operated along this coast. The vessels together expended an effort of about 2,600 trawling hours and surveyed/resurveyed an area of about 8,800 sq. km. The average catch per hour for this coast by the aforesaid three classes of vessels were 137 kg, 143 kg and 230 kg respectively.

Table III gives the areawise details of bottom trawl operation conducted along north west coast. Fourteen areas were surveyed/resurveyed by the 17.5 m vessels of north west coast expending a total fishing effort of 2150 hours. The areas intensively covered were 15-73 (695 hours), 18-72 (586 hours), 22-68 (250 hours) and 20-70 (230 hours). The effort put in the remaining areas were less than 150 hours. The areas which yielded better catch rates were 16-73 (298 kg/hr), 14-73 (282 kg/hr), 15-73(183 kg/hr) and 17-72 (162 kg/hr).

Vessel	Area	Fishing effort (hrs)	Catch/hr in Kg																	
			Elasmo-branchs	Prawn	Wam	Cat fish	Karkare	Tam	Dhoma	Chol	Pomfret	Kati	Sur-mai	Butter fish	Ribbon fish	Squid	Karli	Perch	Rani fish	All species
17.5 m trawlers	22-68	250	28.7	0.2	6.6	6.8	1.8	0.4	27.7	8.3	1.7	10.6	-	-	-	-	-	-	-	121.5
	22-70	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.2
	21-68	3	25.0	-	16.7	-	-	-	33.3	-	8.3	-	-	-	-	-	-	-	-	108.3
	22-69	31	13.5	-	3.9	2.5	-	-	1.9	1.0	-	-	-	-	-	-	-	-	-	31.5
	20-69	2	-	-	-	-	-	-	18.5	-	-	-	2.0	-	1.0	3.5	-	-	-	27.0
	20-70	230	3.2	-	0.9	0.8	-	-	21.6	1.5	0.4	0.5	0.6	-	21.6	2.7	1.1	1.3	-	70.6
	21-69	74	10.1	-	10.9	0.9	5.3	-	28.1	4.6	8.9	8.9	0.8	-	5.4	2.4	0.6	5.3	-	120.4
	21-70	14	7.0	-	0.6	0.3	-	-	10.0	1.1	0.4	-	0.7	-	33.6	3.5	0.9	5.8	-	82.1
	17-72	145	32.5	-	-	75.4	1.3	8.9	7.9	10.5	3.5	0.1	0.3	-	-	-	-	-	-	162.3
	18-72	586	23.9	-	0.2	22.6	1.6	3.2	8.4	6.1	2.7	0.4	1.7	-	-	-	-	-	-	92.8
	15-73	695	7.0	0.3	0.2	71.6	-	-	1.6	-	3.4	-	-	6.2	32.1	-	-	1.2	14.4	182.9
	15-72	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	5.0
	14-73	108	11.7	0.7	-	156.5	-	-	1.6	-	3.4	-	-	16.9	31.8	-	-	1.7	30.6	281.6
	16-73	7	1.3	4.2	-	100.0	-	-	0.8	-	-	-	-	16.7	11.8	-	-	-	50.0	298.3
Meena Bharati	17-72	72	51.6	-	-	78.3	0.9	4.9	16.0	6.0	0.7	-	0.3	-	-	-	-	-	-	166.3
	18-72	161	50.9	0.1	2.0	23.0	1.0	4.5	23.4	9.4	0.9	-	0.8	-	-	-	-	-	-	131.7

(table contd..)

(table contd..)

Vessel	Area	Fishing effort (hrs)	Catch/hr in Kg																	
			Elasmo-branchs	Prawn	Wam	Cat fish	Karkara	Tam	Dhoma	Ghol	Pomfret	Kati	Sur-mai	Butter fish	Ribbon fish	Squid	Karli	Perch	Rani fish	All species
Matsya-vigyani	17-71	3	13.3	-	3.7	8.3	27.7	12.0	-	-	2.7	-	-	-	-	-	-	-	-	87.7
	17-72	49	37.2	-	0.3	85.8	2.1	-	-	0.2	1.3	-	-	-	-	-	-	-	-	174.3
	18-71	8	18.1	-	-	39.4	-	-	-	-	6.3	-	-	-	-	-	-	-	-	107.0
	18-72	53	23.4	-	-	178.6	1.2	2.1	1.2	2.2	10.9	-	7.6	-	-	-	-	-	-	280.4
	19-71	50	15.2	-	3.2	160.6	-	13.1	50.3	2.7	3.1	-	-	-	-	-	-	-	-	306.9
	19-72	9	13.1	2.3	3.6	4.7	-	-	99.4	-	-	-	-	-	-	-	-	-	-	134.7
	20-70	20	28.0	0.7	5.0	-	-	1.5	156.6	1.2	1.3	-	-	-	-	-	-	-	-	199.5
	20-71	12	10.1	-	7.1	4.2	-	1.7	133.6	-	0.8	-	-	-	-	-	-	-	-	159.8

Table III. Area-wise catch/hour of bottom trawling - North west coast

A substantial increase in the catch rate from the previous year was noticed in the case of four areas viz. 21-69, 17-72, 15-73 and 16-73. Two areas viz. 22-69 and 18-72 showed considerable decrease from the previous year.

Meena Bharati surveyed only two areas viz. 17-72 and 18-72 and the total fishing effort put in each area was 72 hours and 161 hours respectively. The catch per hour recorded from these areas were in order 166 Kg and 132 Kg.

Eight areas along the north west coast were surveyed by Matsyavigyani expending a total fishing effort of 204 hours. An average of 50 hours each were put in areas 18-72, 19-71 and 17-72. Effort put in the rest of the areas ranged between 20 and 3 hours. Highest catch rate was recorded from the area 19-71 (307 Kg/hr) followed by 18-72 (280 Kg/hr) and 20-70 (200 Kg/hr). The rest of the areas registered a catch/hr less than 200 Kg.

Only two areas viz. 18-72 and 17-72 were surveyed by all the three classes of vessels along the north west coast. The comparative performance of these vessels in the above area are given below:

Area \ Vessels	17.5 m trawler			Meena Bharati			Matsyavigyani		
	Fishing effort (hrs)	Catch /hr (Kg)	Catch /hr /H.P	Fishing effort (hrs)	Catch /hr (Kg)	Catch /hr /H.P	Fishing effort (hrs)	Catch /hr (Kg)	Catch /hr /H.P.
18-72	586	92.8	0.46	161	131.7	0.50	53	280.4	0.48
17-72	145	162.3	0.81	72	166.3	0.63	49	174.3	0.30

On analysing the comparative efficiency of different classes of vessels it can be seen that with respect to the area 18-72 the yield per horse power obtained by these vessels did not show much variation and the index was centered around 0.5. The area 17-72 on the other hand indicated that the 17.5 m vessels are more efficient compared to the other two types. The catch per hr./h.p. obtained by 17.5 m vessel was 0.8 Kg. The table III also gives area-wise catch/hour obtained for different varieties. Comparing the catch rate obtained by different vessels the highest yielding areas for some of the important varieties are enlisted below:

Elasmobranchs	-	17-72 (33 Kg/hr)
Wam	-	21-68 (17 Kg/hr)
Cat fish	-	14-73 (157 Kg/hr)
Dhoma	-	20-70 (157 Kg/hr)
Ribbon fish	-	21-70 (157 Kg/hr)
Ghol	-	17-72 (11 Kg/hr)
Pomfret	-	21-69 (9 Kg/hr)

Squids which is gaining importance as export commodity was found fairly distributed along the north west coast. The areas which yielded significant catch rates for this variety were 20-69 (4 Kg/hr), 21-70 (4 Kg/hr), 20-70 (3 Kg/hr) and 21-69 (2 Kg/hr).

4.2.2 South west coast

Only 17.5 m vessels were available for survey along this coast. The vessels surveyed/resurveyed seven major squares along Karnataka and Kerala coast expending a total fishing effort of about 1,700 hrs. The details of area-wise fishing effort and catch/hr of important varieties are given in table IV. Maximum effort was put in areas 9-76 (515 hrs), 13-74 (492 hrs) and 12-74 (434 hrs). The highest catch/hr recorded from this region was 196 kg from the area 9-75. The area 10-75 adjoining this also recorded better catch rate (186 Kg/hr).

The area 10-75 yielded highest catch rate for elasmobranchs, cat fish, lizard fish, perches and barracuda. Area 10-76 yielded highest catch rate for prawn and pomfret while maximum yield for flat fish was obtained from the area 9-75.

The average catch/hr obtained for the whole of south west coast was 106 Kg. This shows an increase over the previous year's average of 103 Kg/hr.

4.2.3 Lower east coast

Four 17.5 m vessels and Jheenga (16.5 m) operated from Tuticorin and Madras bases. Jheenga surveyed only one major square while 17.5 m vessels surveyed/resurveyed nine major squares. Area-wise details of fishing effort and yield per unit effort obtained in respect of different varieties is given in table V. A total of 3,100 hrs of fishing effort was expended along this coast of which the majority of fishing effort

Area	Fishing effort	Catch/hour (kg)															
		Elasmo-branchs	Prawn	Lact-arius	Ribbon fish	Cat fish	Lizard fish	Dhoma	Kili-meen	Horse mack-erel	Car-anx	Flat fish	Perch	Bar-ra-cuda	Sear fish	Pom-fret	All spe-cies
12-74	434	2.1	0.1	0.3	2.1	13.1	0.5	0.7	-	-	-	-	-	-	-	-	63.6
13-74	492	1.6	0.3	0.7	0.2	15.2	1.0	1.6	-	-	-	-	-	-	-	-	72.7
8-76	7	7.2	-	-	-	20.6	2.3	-	2.9	2.0	14.0	-	-	-	-	-	61.7
9-75	125	35.8	0.1	-	-	62.1	6.6	-	29.4	0.9	6.3	2.8	0.9	1.1	-	-	196.1
9-76	515	22.2	0.2	-	-	43.7	18.7	0.3	11.0	3.8	4.4	0.7	1.1	2.0	0.3	0.5	132.9
10-75	119	43.0	0.1	0.1	-	71.0	21.9	1.4	16.6	0.4	5.0	0.9	2.7	5.0	-	0.5	185.5
10-76	37	13.2	0.6	0.4	-	30.4	18.2	-	4.1	2.6	3.6	0.1	0.1	2.0	-	1.0	106.1

Table IV Area-wise catch/hour of bottom trawling - South west coast

	Area	Fishing effort (hrs)	Catch/hour (kg) Elasmobranchs	Cat fish	Perch	Seer fish	Carangids	Sciaenids	Pomfret	Eel	Lactarius	Flat fish	Leiognathids	Moon fish	Karkara	Cuttle fish	Ribbon fish	All species
Jheenga	8-78	793	33.8	0.5	31.2	0.2	2.2	3.3	-	-	-	-	-	-	-	-	-	99.9
17.5m vessels	7-77	12	27.9	-	26.2	-	3.0	0.3	-	-	-	-	-	-	-	-	-	62.9
	8-77	27	39.7	0.7	58.9	-	2.8	1.6	-	-	-	--	-	-	-	-	-	119.4
	8-78	1493	30.0	0.6	32.3	0.1	2.4	5.5	-	-	-	-	-	-	-	-	-	111.2
	11-79	1	-	-	16.0	3.0	2.0	-	-	-	-	-	-	-	2.0	-	-	28.0
	12-80	87	21.3	-	4.0	0.2	0.9	-	0.6	-	1.5	0.6	-	2.7	0.2	-	-	76.8
	13-80	511	4.2	0.2	0.4	-	1.4	-	0.8	-	1.3	0.1	28.3	0.4	1.1	0.5	0.4	78.8
	14-80	232	23.2	-	1.8	0.2	4.8	0.4	2.3	0.1	9.7	1.2	0.1	1.1	2.3	0.2	-	188.4
	15-80	4	50.0	2.5	-	-	-	2.5	-	-	-	-	-	-	-	-	-	138.0
	15-81	14	24.1	3.9	5.4	-	-	-	-	0.2	-	-	-	-	-	-	4.0	145.4

Table V Area-wise catch/hour of trawling of important species along the Lower east coast

by 17.5 m vessels were distributed in three major areas viz. 8-78 (1493 hrs), 13-80 (511 hrs) and 14-80 (232 hrs). Jheenga expended 793 hrs in the area 8-78 and obtained an average catch/hr of 100 Kg. The highest average catch/hr obtained by 17.5 m vessels was 188 Kg from the area 14-80 followed by 146 Kg from the area 15-81 and 119 Kg from the area 8-77. The areas of highest yields for different species identified by 17.5 m vessels from this coast is enumerated below:

Perches	8-77 (59 Kg/hr)
Silver bellies	13-80 (28 Kg/hr)
Carangids	14-80 (5 Kg/hr)
Pomfret	14-80 (2 Kg/hr)

An attempt was made to survey the fishery resources of wadge bank area (7-77) from Tuticorin base by deploying two 17.5 m vessels. The attempt had to be given up temporarily due to the inadequacy of their trawl winches. The same 17.5 m vessels are being fitted with powerful hydraulic trawl winches, to commence the wadge bank survey again.

4.2.4 Upper east coast

The area-wise results of operation obtained along the upper east coast is presented in table VI. 17.5 m vesselsand Matsyavigyani were available for operation from this coast. However Matsyavigyani could expend only comparatively lesser effort as she was based at Bombay to participate in the Indo-Polish survey programme. Eight major squares were surveyed by the 17.5 m vessels and one major square by Matsyavigyani. These vessels together expended a fishing effort of about 1,890 hrs. The average catch/hr obtained by 17.5 m vessels and Matsyavigyani for this coast was 116 Kg and 215 Kg respectively. Both the classes of vessels registered a decrease in the average catch rates comared to the previous year.

It can be seen from the table that maximum fishing effort by the 17.5 m vessels was expended in area 17-83 (765 hrs) followed by 20-86 (664 hrs). The highest catch rate by 17.5 m vessels was recorded from the area 18-84 (197 Kg/hr). Excepting two areas viz. 17-82 and 17-83, all other areas registered catch rates above 100 Kg/hr. Comparing with the results obtained during the previous year it is observed that the areas 16-81, 17-82 and 17-83 registered an increase in catch rate during the year, while the areas 16-82, 18-82, 18-84 and 20-86 showed a decreasing trend.

	Area	Fishing effort (hrs)	Catch/hour(kg)												
			Elasmobranchs	Prawn	Cat fish	Perch	Sciaenids	Pomfret	Eel	Lactarius	Koth	Surmai	Karkara	Ribbon fish	All species
17.5 m vessels	16-81	17	20.0	-	8.8	18.5	1.0	-	0.5	-	-	-	-	15.0	142.0
	16-82	26	55.9	-	5.8	5.5	4.0	0.4	1.7	-	-	-	-	0.5	119.2
	16-83	2	-	-	-	-	-	-	-	-	-	-	-	-	100.0
	17-82	36	9.4	0.1	10.3	2.3	0.7	0.3	0.7	-	-	-	-	0.1	66.9
	17-83	765	5.8	0.4	10.3	0.8	0.1	2.2	0.2	-	-	-	-	2.5	72.3
	18-83	126	15.0	-	11.2	2.6	1.0	0.5	1.8	-	-	-	-	1.2	119.2
	18-84	208	29.4	0.1	18.0	5.2	2.9	0.7	1.5	-	-	-	-	0.4	196.7
	20-86	664	16.3	3.9	1.9	0.7	7.0	1.8	3.0	0.4	7.0	9.5	0.2	-	140.8
Matsya-vigyani	20-88	42	25.6	1.3	4.1	-	-	3.5	0.2	-	-	-	1.2	-	215.2

Table VI Area-wise catch/hour of trawling of important species along the Upper east coast

The areas where highest yield was recorded for different varieties are enumerated below:

Ribbon fish	(15 Kg/hr)	- 16-81
Perch	(19 Kg/hr)	
Elasmobranchs	(56 Kg/hr)	- 16-82
Pomfret	(2 Kg/hr)	- 17-83
Cat fish	(18 Kg/hr)	- 18-84
Prawn	(4 Kg/hr)	- 20-86
Sciaenids	(7 Kg/hr)	
Eel	(3 Kg/hr)	

A considerable decrease is noted in the catch rate of prawn in Paradeep region. During the year the area 20-86 yielded a catch rate of 3.9 Kg/hr against 9.5 Kg/hr recorded during the previous year.

4.2.5 Andaman and Nicobar waters

Only one 17.5 m vessel conducted bottom trawling from Port Blair base and surveyed two areas viz. 11-92 and 12-92. The total fishing effort put in was 111 hrs and the average catch/hr recorded from these areas were 109 Kg/hr. and 54 kg/hr respectively. The average catch/hr obtained for Andaman region was 106 Kg.

	Area	
	11-92	12-92
Fishing effort(hrs)	106	5
Varieties (catch/hr)		
Elasmobranchs	10.7	28.8
Cat fish	3.9	-
Perch	0.5	8.2
Carangids	1.6	-
Sciaenids	0.5	-
Lizard fish	1.5	1.0
Nemipterus sp	2.9	1.6
Upenoids	26.3	2.8
Leiognathids	43.1	6.6
All species	108.7	54.0

Table VII Area-wise catch/hour of trawling of important species along Andaman and Nicobar Islands

The details of area-wise survey results are presented in Table VII. The area 12-92 yielded a better catch rate for elasmobranchs and perches. Other important varieties like cat fish, Nemipterus sp., upenoids and leiognathids yielded better catch rates from area 11-92. It is also noted that the average catch rate obtained from the area 11-92 is slightly higher compared to the previous year.

4.3. Relative abundance by area and depth

4.3.1. North west coast

As stated elsewhere, three classes of vessels viz. 17.5 m vessels, Meena Bharati (23 m) and Matsyavigyani (32.28 m) operated along this coast. The 17.5 m vessels operated upto a depth of 80 m off Kandla and upto 60 m off Veraval and Bombay. Along Goa coast these vessels surveyed upto 80 m. The two larger trawlers, Meena Bharati and Matsyavigyani operated upto 80 m and 120 m respectively along Maharashtra and Gujarat coasts.

Of all the areas surveyed by 17.5 m vessels, the area 20-70, 21-69 and 22-69 yielded highest catch rates of 73 Kg/hr, 75 Kg/hr and 60 Kg/hr respectively from the depth belt 20-39 m while 40-59 m depth range was found more productive in the case of 22-68 (135 Kg/hr), 17-72 (201 Kg/hr), 14-73 (346 Kg/hr) and 15-73 (341 Kg/hr). Both the areas viz. 17-72 and 18-72 surveyed by Meena Bharati yielded highest catch rates of 182 Kg/hr and 136 Kg/hr respectively from the depth range of 40-59 m. Among the different areas surveyed by Matsyavigyani, 60-79 m depth belt was found most productive in the case of areas 19-71 (342 Kg/hr), 20-70 (286 Kg/hr), 18-71 (110 Kg/hr) and 18-72 (1199 Kg/hr). Highest catch rate in the case of the area 17-72 (206 Kg/hr) was obtained from 40-59 m depth range. Fig. 6 illustrates depthwise productivity of each area recorded by different vessels.

Table VIII to X presents the catch per hour of different varieties obtained from the four regions of the north west coast viz. Kandla, Veraval, Bombay and Goa.

Species	Depth range (m)					
	0-19	20-39	40-59	60-79	20-39	40-59
		KANDLA			VERAVAL	
Elasmobranchs	4.1	16.3	33.3	10.4	3.8	7.0
Pomfret	-	5.1	3.1	-	0.4	0.3
Ghol	1.0	3.7	10.0	6.5	1.6	0.8
Karkara	-	4.2	2.3	-	-	-
Koth	-	4.6	2.7	3.0	0.8	-
Wam	3.8	8.0	8.2	4.8	-	-
Sea bream	-	1.9	2.2	-	-	-
Kati	-	7.6	12.6	7.6	-	-
Cat fish	0.4	3.5	7.6	2.8	0.8	0.1
Dhoma	-	29.4	28.6	14.9	21.5	7.5
Prawn	-	0.2	0.2	-	-	-
Lactarius spp.	-	-	-	-	2.2	0.1
Ribbon fish	-	-	-	-	22.1	7.3
Surmai	-	-	-	-	0.6	1.8
Squids	-	-	-	-	2.8	4.8
TOTAL	17.2	107.3	135.6	73.7	73.2	49.9

Table VIII Catch/hour of important varieties of fishes obtained from Kandla and Veraval by 17.5 m trawlers

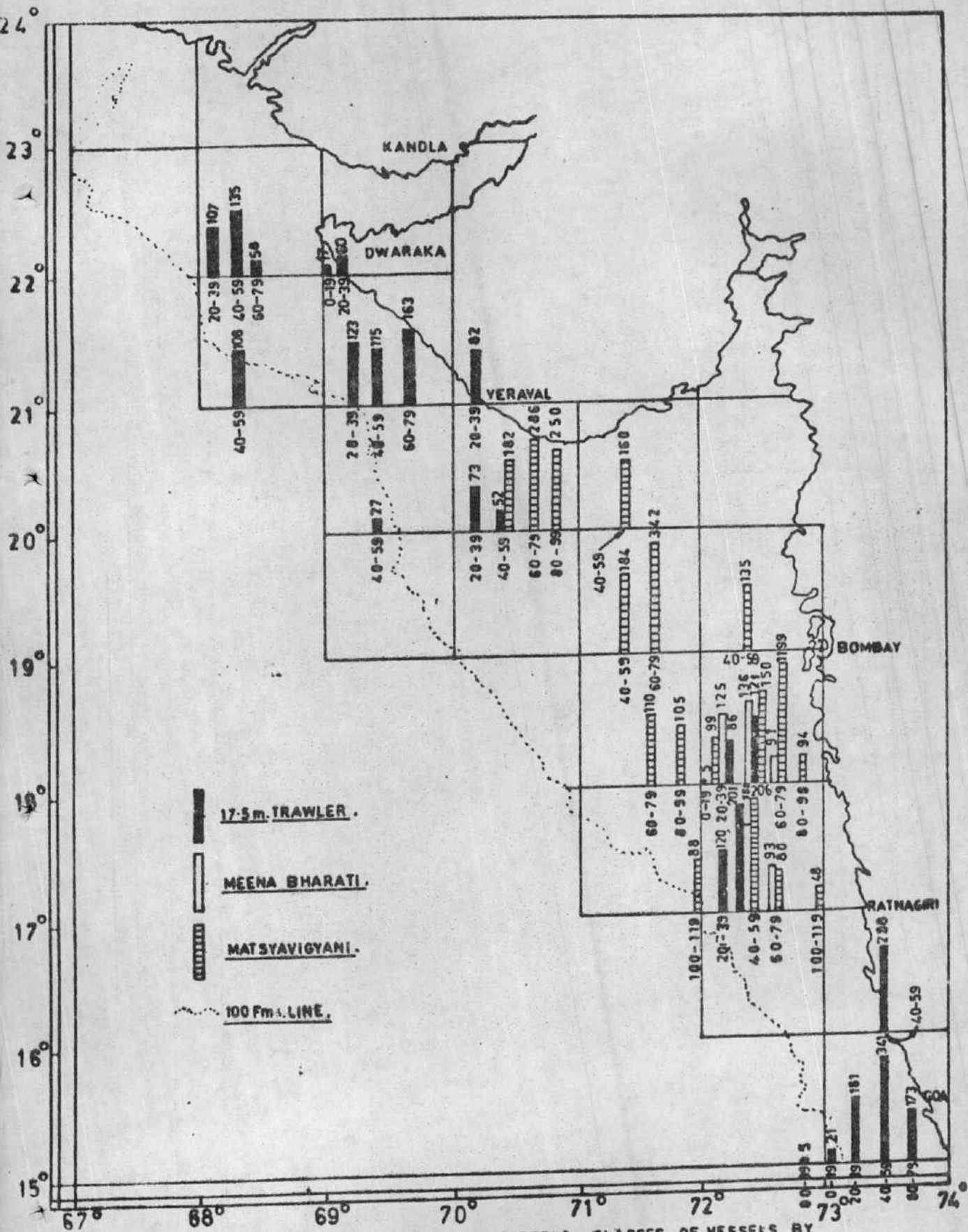


FIG. 6 - CATCH PER HOUR OF TRAWLING BY DIFFERENT CLASSES OF VESSELS BY AREA & DEPTH ALONG THE NORTH WEST COAST.

In Kandla region 40–59 m depth belt was found to be most productive with a catch rate of 136 Kg/hr. The depth belt of 20–39 m was found to be most productive in the case of pomfret (5 Kg/hr), koth (5 Kg/hr) and dhoma (29 Kg/hr). The depth belt of 40–59 m was found to give highest yield in respect of elasmobranchs (33 Kg/hr), wam (8 Kg/hr), kati (13 Kg/hr), cat fish (8 Kg/hr) and ghol (10 Kg/hr).

In Veraval region the depth belt 20–39 m was found to be productive with a catch rate of 73 Kg/hr and highest catch rates for dhoma (22 Kg/hr), ribbon fish (22 Kg/hr) and Lactarius spp. (20 Kg/hr) was also obtained from same depth range. Elasmobranchs (7 Kg/hr) and squids (5 Kg/hr) were more abundant in the 40–59 m depth belt.

In Bombay region Matsyavigyani obtained highest catch rate of 412 Kg/hr in the depth belt of 60–79 m. Elasmobranchs (29 Kg/hr), wam (3 Kg/hr) and dhoma (55 Kg/hr) yielded highest catch rates from 40–59 m depth belt while cat fish (278 Kg/hr), tam (11 Kg/hr) and ghol (3 Kg/hr) gave highest yield from 60–79 m depth belt. Karkara was found most abundant in the 100–119 m depth range (10 Kg/hr). Meena Bharati obtained highest catch rate of 151 Kg/hr in the depth range of 40–59 m. The depth range of 20–39 m yielded highest catch rate for dhoma (33 Kg/hr) and ghol (12 Kg/hr). The highest catch rates for cat fish (49 Kg/hr) and tam (6 Kg/hr) was registered from the depth range of 40–59 m. The depth belt of 60–79 m registered highest catch rate for elasmobranchs (57 Kg/hr). 17.5 m trawlers registered highest catch/hr of 151 kg from 40–59 m depth belt.

Particulars	Depth range(m)										
	0-19	20-39	40-59	20-39	40-59	60-79	20-39	40-59	60-79	80-99	100-
		17.5 m TRAWLER			MEENA BHARATI			MATSYAVIGYANI			
Elasmobranchs	0.6	24.1	30.3	42.6	51.9	56.8	0.8	29.2	22.9	8.9	8.1
Wam	-	0.2	0.1	6.6	0.7	-	-	3.3	0.6	-	1.3
Cat fish	1.3	23.3	58.9	11.0	49.4	0.3	2.9	48.8	278.3	18.3	3.1
Karkara	-	1.8	0.9	-	1.2	0.8	2.6	1.1	-	-	10.3
Tam	-	3.4	6.8	0.3	5.5	2.8	2.6	1.2	10.8	-	4.5
Dhoma	-	7.8	10.1	32.9	19.3	19.5	-	54.7	30.4	26.3	1.0
Ghol	-	5.2	11.7	11.6	8.7	0.5	0.5	0.8	3.1	-	-
Pomfret	-	2.8	3.2	-	1.1	-	6.5	2.5	3.1	16.3	1.0
Kati	-	0.4	0.3	-	-	-	-	-	-	-	-
Surmai	-	1.7	0.6	-	0.8	-	21.2	-	-	-	-
Koth	-	0.4	0.6	6.3	1.0	-	-	-	-	-	-
TOTAL	53.0	89.7	150.7	124.3	150.7	92.7	87.7	170.7	411.7	108.4	62.4

Table IX Catch/hour of prawn and important varieties of fish obtained from Bombay region by different classes of vessels.

Species	Depth range (m)				
	0-19	20-39	40-59	60-79	80-99
Elasmobranchs	0.7	8.1	7.7	12.3	-
Prawns	0.6	0.2	0.7	-	-
Wam	0.1	0.1	0.1	-	-
Cat fish	10.7	71.0	161.8	25.4	-
Jew fish	-	1.9	1.8	-	-
Butter fish	0.1	5.9	16.6	4.5	-
Ribbon fish	0.3	19.9	78.4	35.8	-
Perch	-	1.1	1.0	6.2	-
Horse mackerel	-	5.0	1.6	-	-
Rani fish	-	15.7	25.9	25.9	5
Pomfret	-	2.9	5.4	5.6	-
Lizard fish	0.1	0.7	2.2	-	-
Flat fish	-	0.7	0.3	2.1	-
Carangids	-	23.5	-	-	-
TOTAL	21.0	179.8	341.1	121.4	5.0

Table X Catch/hour of prawn and important varieties of fish from Goa region by 17.5 m trawlers

Burmai registered the highest catch/hr (2 Kg) from the depth belt 20–39 m while highest catch rate for cat fish (59 Kg/hr), tam (7 Kg/hr), dhoma (10 Kg/hr), ghol (12 Kg/hr), elasmobranchs (30 Kg/hr) and pomfret (3 Kg/hr) was registered from the depth belt of 40–59 m.

Goa region recorded the highest catch rate of 341 Kg/hr from the depth belt 40–59 m. The depth range of 20–39 m yielded the highest catch rate for horse mackerel (5 Kg/hr) and carangids (24 Kg/hr) while 40–59 m range yielded highest catch rate for cat fish (162 Kg/hr), Lactarius sp. (17 Kg/hr) and ribbon fish (78 Kg/hr). The depth range of 60–79 m was found to be most productive in the case of elasmobranchs (12 Kg/hr) and pomfret (6 Kg/hr). Rani fish (Nemipterus sp.) was found equally abundant in the depth ranges of 40–59 m and 60–79 m (26 Kg/hr). Generally speaking the depth range of 40–59 m off Goa may be identified as the most productive zone for cat fish and ribbon fish.

4.3.2 South west coast

Fig. 7 shows the catch rate obtained from different depth belts of the south west coast. The 17.5 m vessels operated from Mangalore region could cover only one depth range viz. 20–39 m while the vessels operated from Cochin base surveyed three depth zones viz. 20–39 m, 40–59 m and 100–119 m. The operation into the deeper waters by the Cochin based vessels was possible because of the availability of hydraulic trawl winches on board. Of the two areas surveyed

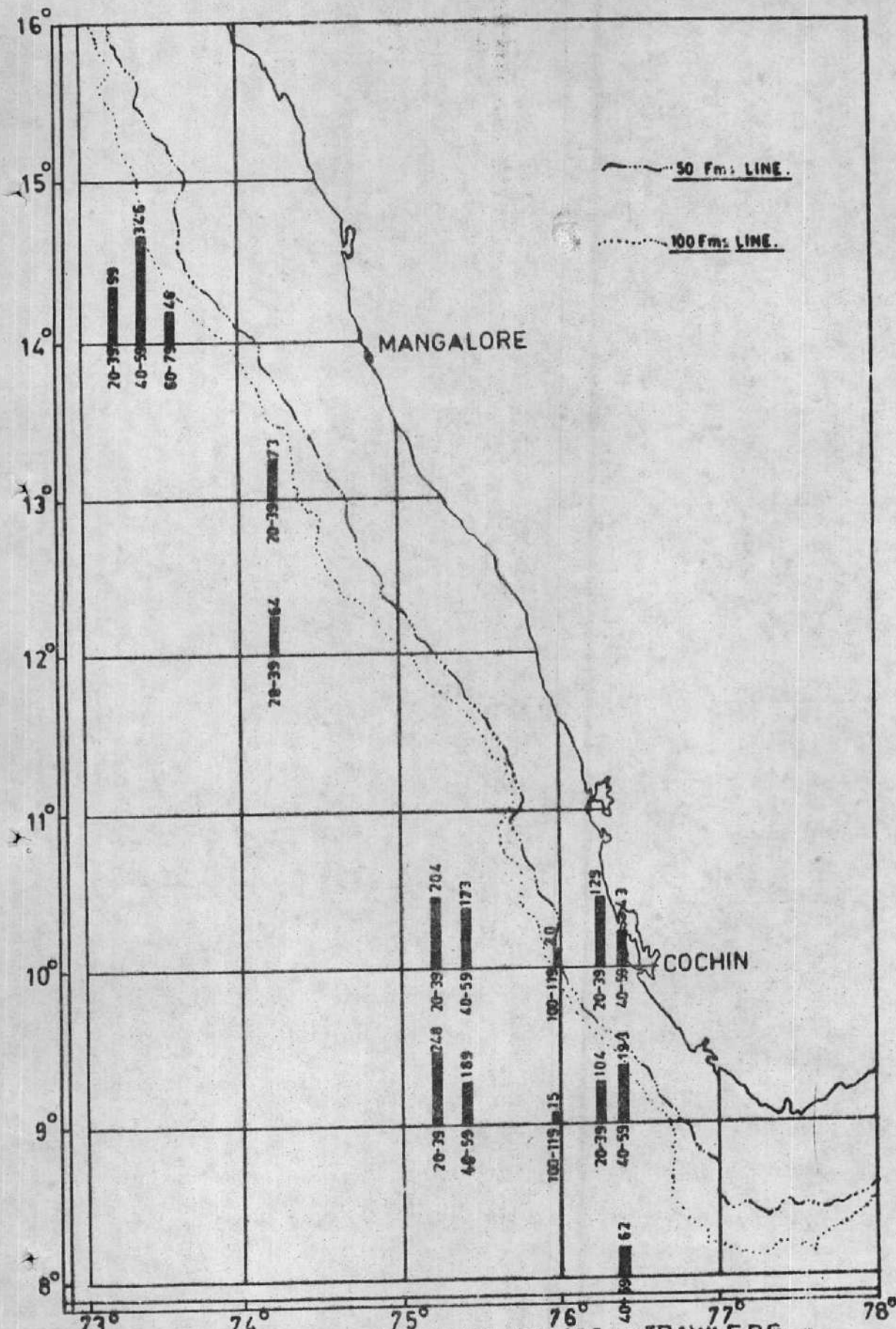


FIG. 7 CATCH PER HOUR OF TRAWLING BY 17.5 m. TRAWLERS - BY AREA AND DEPTH ALONG THE SOUTH WEST COAST

along Mangalore region the highest catch rate was obtained from the area 13-74 (73 Kg/hr) from 20-39 m depth range while a catch rate of 64 Kg/hr was recorded from the area 12-74 in the same depth belt. Among the five areas surveyed along Kerala coast only one depth range viz. 40-59 m was surveyed in the case of the area 8-76 from where a catch rate of 62 Kg/hr was recorded. Of the remaining areas 20-39 m depth range was found most productive in the case of 9-75 (248 Kg/hr), 10-75 (204 Kg/hr) and 10-76 (129 Kg/hr). The area 9-76 yielded the highest catch rate from 40-59 m depth range.

Table XI gives the catch rate of prawn and other important species obtained from this zone. As the survey along the Karnataka coast wasrrestricted to only one depth range viz. 20-39 m a comparative study in the prodctivity of the different depth belts could not be made. The average catch rate obtained from the above depth belt was 68 Kg/hr. Cat fish was found to be more productive in this depth zone with a catch rate of 14 Kg/hr. Other varieties represented in this depth zone were found negligible. A remarkable decrease in the catch rate of ribbon fish was noticed in the 20-39 m depth zone over the previous year (from 27 Kg - 1 Kg/hr).

In the Cochin region the highest catch rate of 182 Kg/hr was obtained from the depth range of 40-59 m. The depth belt 20-39 m yielded the highest catch rate in respect of

Species	Depth range(m)			
	20-39	20-39	40-59	100-119
	MANGALORE		COCHIN	
Elasmobranchs	1.7	23.4	32.6	-
Prawn	0.2	-	0.4	-
Lactarius	0.4	-	-	-
Ribbon fish	1.0	-	-	-
Kilimeen	-	20.5	5.2	-
Cat fish	14.2	29.7	81.3	-
Lizard fish	0.8	23.5	8.9	-
Horse mackerel	-	3.9	0.9	-
Flat fish	-	0.9	1.1	-
Perch	-	1.2	0.6	18.0
Barracuda	-	2.9	1.2	-
Caranx	-	4.1	5.7	-
Seer fish	-	0.3	-	-
Pomfret	-	0.7	-	-
Jew fish	-	0.7	-	-
Sciaenids	1.1	-	-	-
TOTAL	68.4	129.0	181.9	18.0

Table XI Catch/hour of prawn and important varieties of fishes obtained from Mangalore and Cochin regions by 17.5 m trawlers

kilimeen (21 Kg/hr), lizard fish (24 Kg/hr), horse mackerel (4 Kg/hr) and barracuda (3 Kg/hr) while highest catch rate for elasmobranchs (33 Kg/hr), cat fish (81 Kg/hr) and caranx (6 Kg/hr) was registered from the depth belt of 40-59 m. The depth range 100-119 m was found to be most productive in respect of perch (18 Kg/hr) and this was the only variety caught from this depth zone. An appreciable increase in the catch rate of cat fish and elasmobranchsin this depth range is noticed compared to the previous year. Prawn, which has registered a catch rate of 2.5 Kg/hr in the 20-39 m depth during the previous year was totally absent during this year in the same depth belt. And also it showed a decrease from 1.5 Kg/hr to 0.4 Kg/hr in the 40-59 m depth belt.

4.3.3 Lower east coast

As mentioned earlier four 17.5 m vessels and Jheenga operated along this coast. The 17.5 m vessels surveyed upto a depth of 80 m along this coast while Jheenga operated from Tuticorin base surveyed upto 40 m depth. It can be seen from fig. 8 that the depth range of 20-39 m was identified as the most productive region by Jheenga from where she registered a catch rate of 121 Kg/hr. Of the nine major squares surveyed by the 17.5 m vessels along this coast three squares viz. 8-77, 11-79 and 14-80 were surveyed only within the range of 20-39 m. The depth range of 20-39 m was found to be most productive in the case of area 8-78 (120 Kg/hr) and 13-80 (84 Kg/hr). In the

Species	Depth range (m)							
	0-19	20-39	40-59	60-79	0-19	20-39	20-39	40-59
	TUTICORIN						MADRAS	
	17.5 m Trawlers				Jheenga			
Elasmobranchs	31.1	27.6	21.0	62.5	31.4	39.4	15.7	4.9
Perch	31.3	36.4	24.9	33.0	24.4	48.0	1.9	0.2
Cat fish	0.5	0.7	-	-	0.5	0.3	-	0.3
Seer fish	0.1	-	-	-	0.2	-	0.1	-
Carangids	2.4	2.4	2.9	3.5	2.2	2.0	3.3	0.8
Sciaenids	5.1	6.0	0.4	-	3.2	3.4	0.2	-
Pomfret	-	-	-	-	-	-	1.9	0.1
Synagris	-	-	-	-	-	-	0.1	-
Eel	-	-	-	-	-	-	-	0.1
Lactarius	-	-	-	-	-	-	6.2	0.1
Flat fish	-	-	-	-	-	-	0.7	0.1
Leiognathids	-	-	-	-	-	-	0.1	42.2
Gerrids	-	-	-	-	-	-	-	1.1
Moon fish	-	-	-	-	-	-	11.0	0.6
Karkara	-	-	-	-	-	-	2.3	-
Cuttle fish	-	-	-	-	-	-	0.4	0.3
Mackerel	-	-	-	-	-	-	0.2	-
Polynemus	-	-	-	-	-	-	0.3	-
TOTAL	107.5	119.8	53.6	109.0	90.9	120.9	131.1	76.5

Table XII Catch/hour of prawn and important varieties of fishes obtained from Tuticorin and Madras regions

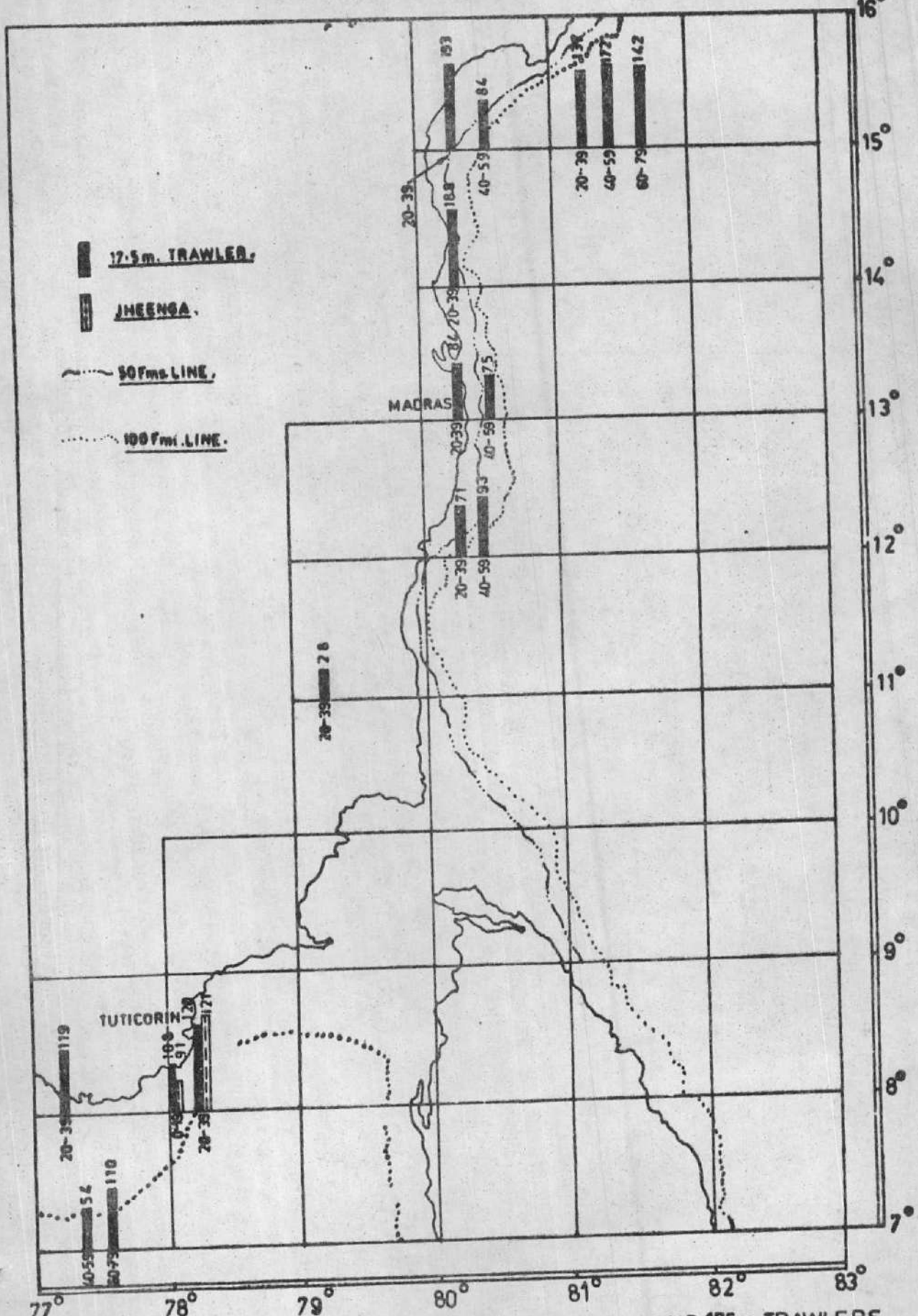


FIG. 8 CATCH PER HOUR OF TRAWLING OF JHEENGA AND 17·5m. TRAWLERS ALONG THE LOWER EAST COAST.

wadge bank area (7-77) 60-79 m depth range proved to be most productive with a catch rate of 110 Kg/hr. The area 12-80 off Madras gave comparatively better yield from the depth range of 40-59 m (93 Kg/hr).

The details of catch rates in respect of important varieties of fishes obtained from the different depth zones off Tuticorin and Madras region is given in table XII. The 17.5 m vessels as well as Jheenga recorded the highest catch rate of 120 Kg/hr from the same depth zone of 20-39 m off Tuticorin. The results obtained by the 17.5 m vessels showed that 60-79 m depth range yielding the highest catch rates for elasmobranchs (63 Kg/hr) perches (33 Kg/hr) and carangids (4 Kg/hr). 20-39 m depth range was found to be the most productive in the case of sciaenids with a catch rate of 6 Kg/hr.

The depth wise analysis of the results obtained by the 17.5 m vessels along the Madras region shows that the depth range of 20-39 m to be comparatively more productive with a catch rate of 131 kg/hr. From the table it can be seen that all varieties except Leiognathids and ribbon fish yielded the highest catch rate from the depth zone 20-39 m.

4.3.4 Upper east coast

The 17.5 m vessels surveyed/resurveyed upto a depth of 100 m from Vizag base and upto 40 m from Paradeep base. Matsyavigyani operated for a short while from Calcutta base covering the 20-39 m depth belt of West Bengal.

Fig. 8 and 9 gives the depth wise catch/hr registered in each area by the different classes of vessels. 20-39 m depth range was identified as the most productive zone by the 17.5 m vessels in the case of areas 15-80 (193 Kg/hr), 16-81 (149 Kg/hr), 17-82 (70 Kg/hr), 17-83 (78 Kg/hr), 18-83 (124 Kg/hr), 18-84 (205 Kg/hr) and 20-86 (154 Kg/hr). The areas 15-81 and 16-82 yielded highest catch rates of 172 Kg/hr and 225 Kg/hr respectively from 40-59 m depth range.

The details of depth-wise results of operation of upper east coast and Andaman and Nicobar region is given in table XIII. In respect of Vizag region as a whole the depth range of 60-79 m is found to be comparatively more productive (157 Kg/hr). In this region the depth range 20-39 m yielded highest catch rate for pomfret (2 Kg/hr) and eel (1 Kg/hr) while 40-59 m gave highest yield for elasmobranchs (13 Kg/hr). Perches (7 Kg/hr), cat fish (21 Kg/hr) and ribbon fish (5 Kg/hr) was most abundant in the 60-79 m depth zone.

The depth range of 20-39 m was comparatively more productive in Paradeep region (155 Kg/hr). Elasmobranchs (18 Kg/hr), perches (1 Kg/hr), eel (3 Kg/hr), koth (9 Kg/hr) and seer fish (11 Kg/hr) were most abundant in the 0-19 m depth range. Cat fish (3 Kg/hr), dhoma (10 Kg/hr), pomfret (2 Kg/hr) and prawn (5 Kg/hr) yielded highest catch rates from the depth range of 20-39 m.

The survey operations from Calcutta and Port Blair was restricted to a single depth range of 20-39 m and 40-59 m respectively.

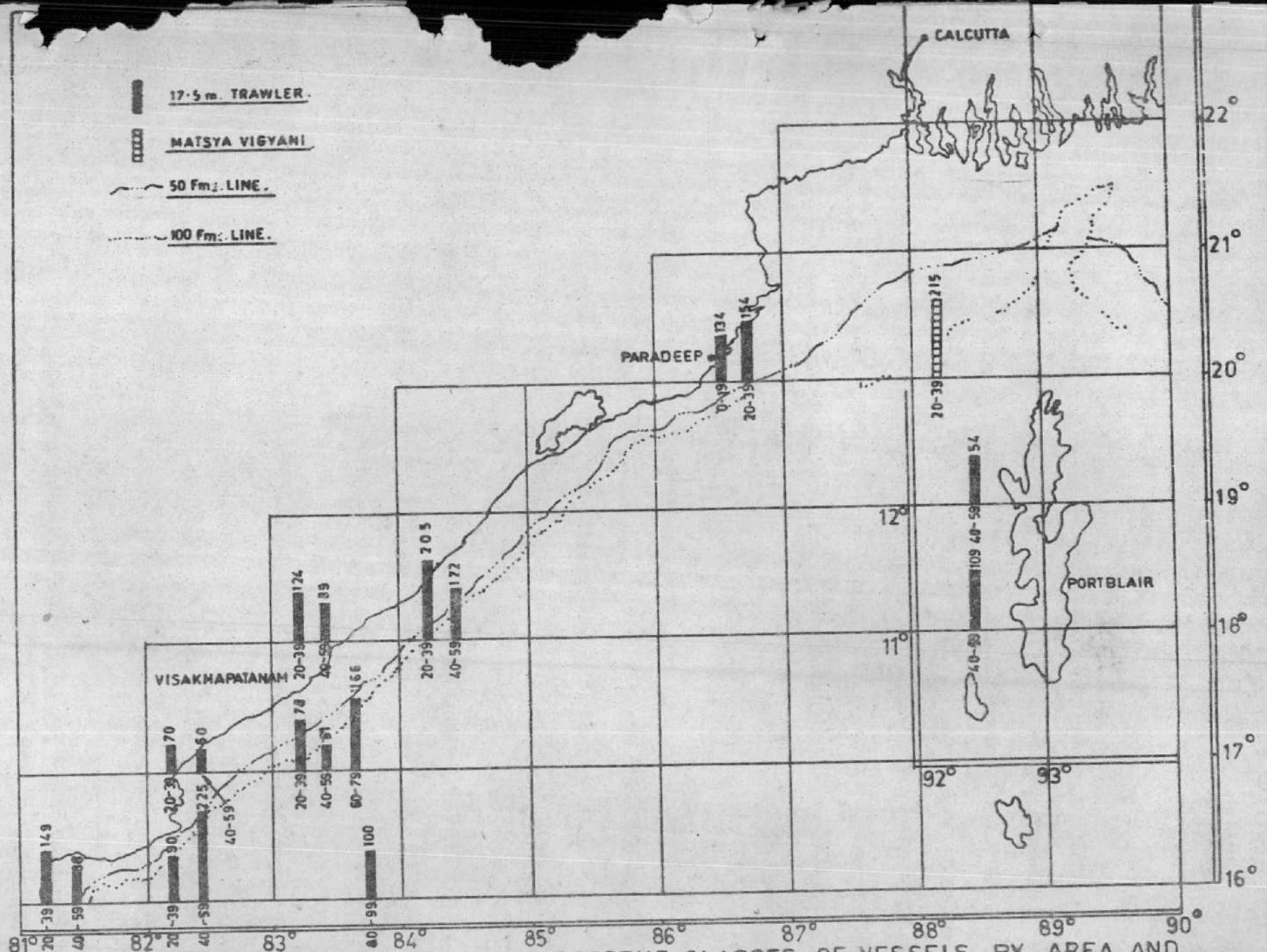


FIG.9-CATCH PER HOUR OF TRAWLING BY DIFFERENT CLASSES OF VESSELS BY AREA AND DEPTH ALONG THE UPPER EAST COAST.

Species	Depth range (m)							
	20-39	40-59	60-79	80-99	0-19	20-39	20-39	40-59
	VISAKHAPATNAM				PARADEEP		CALCUTTA	PORT BLAIR
Elasmobranchs	12.3	13.2	13.0	-	17.5	13.5	25.5	11.5
Pomfret	2.2	0.2	1.4	-	1.5	2.4	3.5	-
Perch	2.4	1.7	7.4	-	0.8	0.3	-	0.9
Carangids	-	-	-	-	-	-	-	1.5
Cat fish	11.1	12.3	21.0	-	1.4	2.9	4.1	3.7
Ribbon fish	2.5	1.0	4.6	-	-	-	-	-
Prawn	0.3	0.3	-	-	3.6	4.6	1.2	-
Sciaenids	1.0	0.3	-	-	5.8	9.6	-	0.4
Eel	0.8	0.3	-	-	3.1	2.8	0.2	-
Koth	-	-	-	-	8.9	2.9	-	-
Karkara	-	-	-	-	0.3	0.2	1.2	-
Seer fish	-	-	-	-	11.0	6.3	-	-
Sciaenids(big)	-	-	-	-	-	-	0.9	-
Leiognathids	-	-	-	-	-	-	-	41.5
Nemipterids	-	-	-	-	-	-	-	2.8
Lizard fish	-	-	-	-	-	-	-	1.5
Upenoids	-	-	-	-	-	-	-	25.2
Barracuda	-	-	-	-	-	-	-	0.4
Gerrids	-	-	-	-	-	-	-	1.0
TOTAL	113.8	80.7	156.5	100.0	134.3	154.5	215.2	106.2

Table XIII Catch/hour of important varieties of fishes obtained from 17.5 m vessels from Visakhapatnam, Paradeep, Calcutta and Port Blair

4.3.5 Regional abundance by depth

The average catch/hr recorded by the 17.5 m trawlers from the different depth zones of the five regions is tabulated below:

Depth range (m) \ Region	North west coast	South west coast	Lower east coast	Upper east coast	Andaman & Nicobar
	(Catch/hr in Kg)				
0–19	19	–	108	134	–
20–39	122	89	126	120	–
40–59	199	182	75	81	106
60–79	103	–	110	15	–
80–99	5	–	–	100	–
100–119	–	18	–	–	–

Of the five depth zones surveyed along the north west coast highest yield was registered from 40–59 m depth range (199 kg/hr). Yield from all other depth ranges was found to be poorer compared to the previous year. Along south west coast also the depth range of 40–59 m was found to be most productive with an average catch/hr of 182 kg. The

depth zone of 100–119 m was surveyed during this year along this coast and a catch/hr of 18 Kg was registered. Along lower east coast highest yield was obtained from 20–39 m zone (126 Kg/hr). Of the remaining zones 0–19 m and 60–79 m ranges registered an improvement over the previous year. Along upper east coast the highest catch rate (134 Kg/hr) was recorded from 0–19 m belt. An additional zone of 80–99 m was surveyed during this year. Yield from the first four ranges was poorer than that of the previous year. Along Andaman and Nicobar Islands, survey operation were conducted only in one depth range, viz. 40–59 m, from where the catch rate obtained (106 Kg/hr), shows a slight improvement over the rate obtained during the previous year.

Generally speaking, the highest yielding zones remained unchanged from the previous year in the case of lower east coast, upper east coast and Andaman and Nicobar Islands, while it was shifted to the next shallower zone in the case of north west coast and to deeper zone in the case of south west coast.

4.4 Seasonal variation in catch

4.4.1. Quantitative variation

Of the twenty two vessels deployed for survey during the year only nineteen 17.5 m vessels and Jheenga were available for year-round operation. Of the two larger vessels, Meena Bharati was laid up for want of some critical spare parts and operated only during June-July and January to March. The other vessel Matsyavigyani operated partly from Bombay and the rest of the period from Calcutta. Hence the month-wise fluctuation in catch rates obtained by 17.5 m vessels and Jheenga alone are analysed in this chapter. The quantitative variation is illustrated in fig. 10 to 13.

Two 17.5 m vessels operated along Gujarat coast, one each from Kandla and Veraval bases. These vessels did not conduct survey operations during June - September and December due to lack of infrastructural facilities. The vessel based at Kandla recorded its highest average catch rate of 269 Kg/hr during the month of October. An increase is recorded over the previous years' average catch rate. Lowest catch rate (13 Kg/hr) was recorded during the month of May. On the other hand the vessel operated from Veraval base obtained the highest catch rate during the month of May (165 Kg/hr). The lowest catch rate recorded by this vessel (25 Kg/hr) was during the month of April.

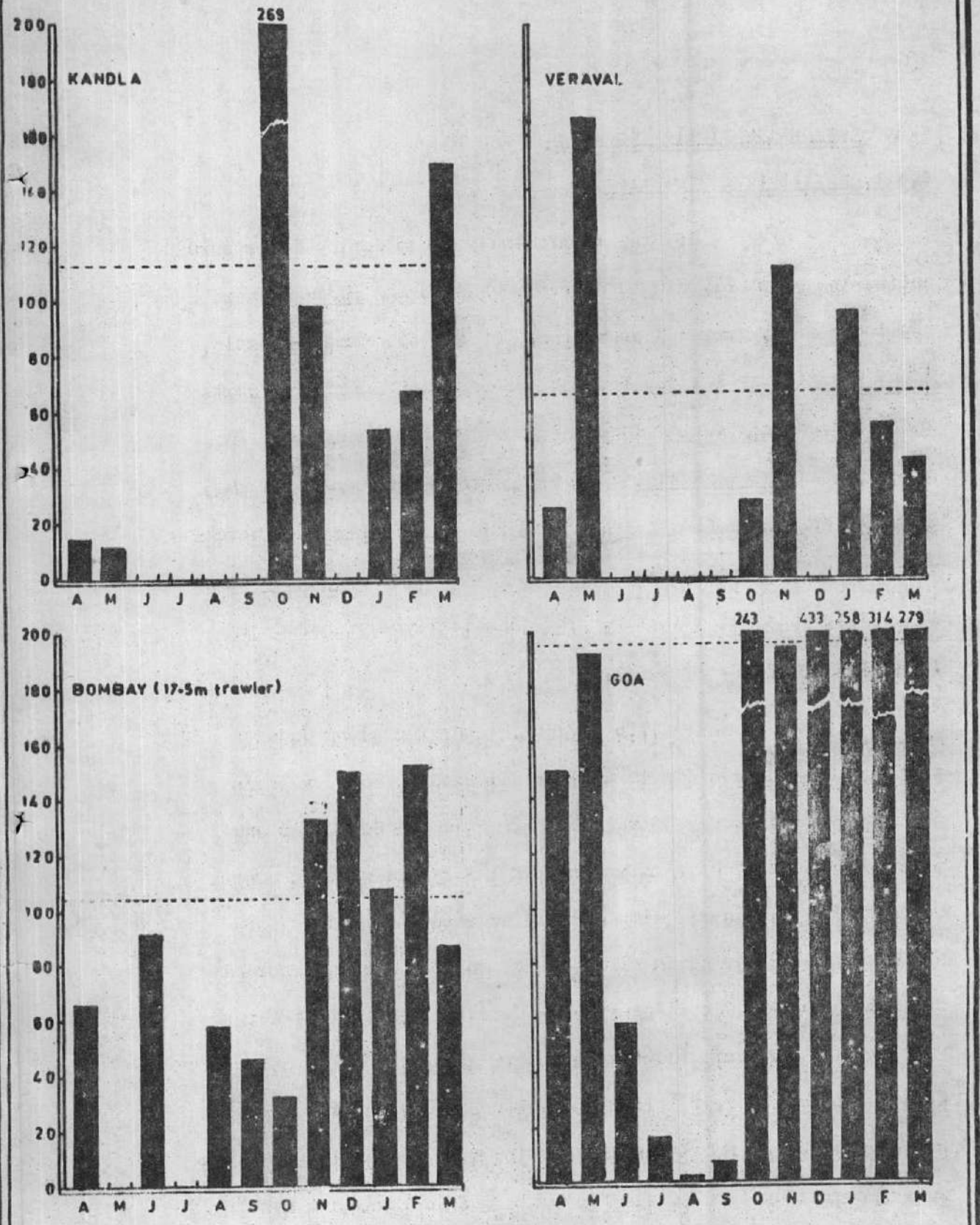


FIG.10 MONTHLY FLUCTATION IN CATCH PER UNIT EFFORT-NORTH-WEST COAST

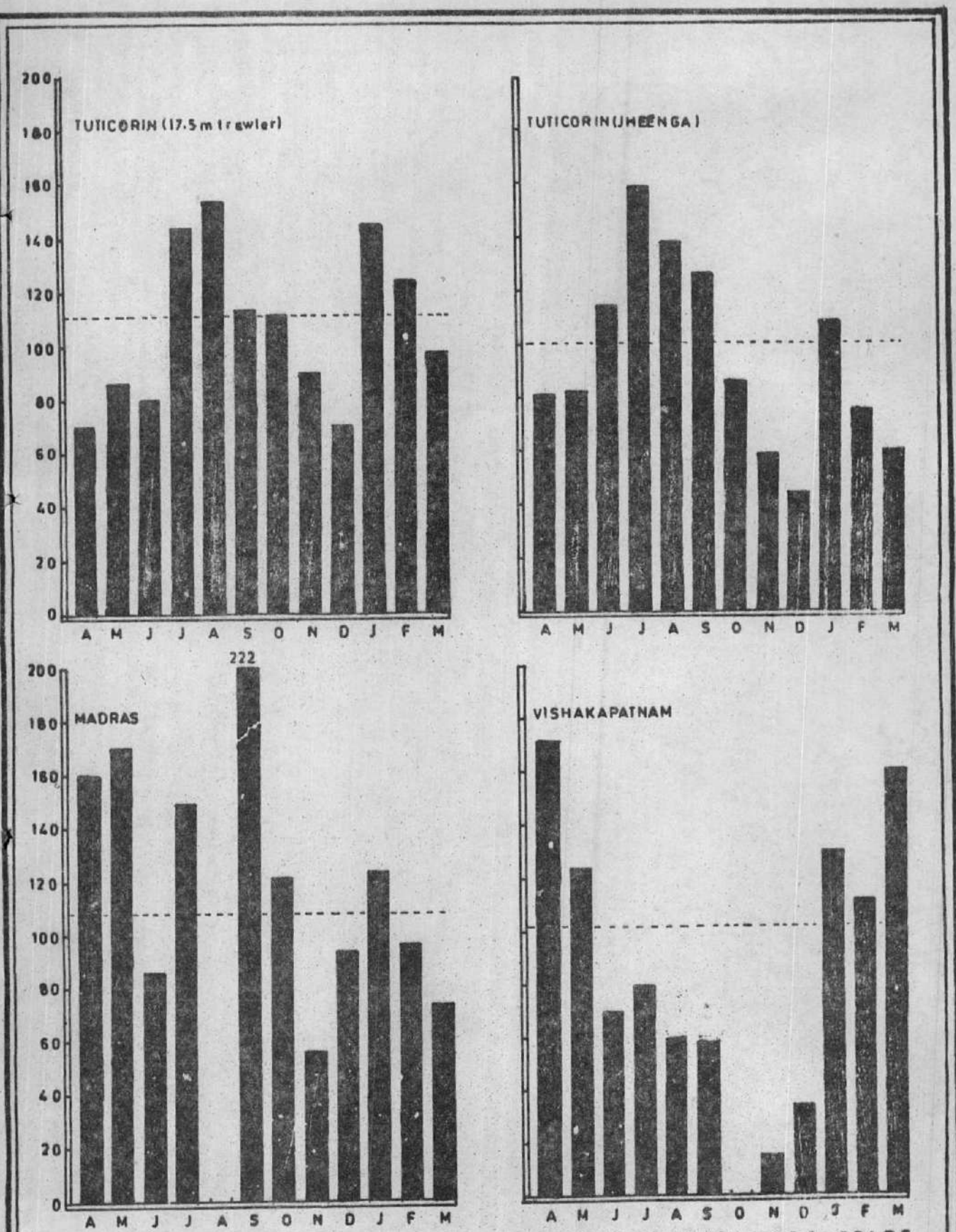


FIG.11 MONTHLY FLUCTATION IN CATCH PER UNIT EFFORT- EAST-COAST BASES

One 17.5 m vessel operated from Bombay throughout the year except during May and July. The highest catch/hr obtained by this vessel was 151 Kg during the month of February. During the month of November and December also the catch rates were fairly high (150 Kg/hr, and 132 Kg/hr respectively). The lowest catch rate of 33 Kg/hr was recorded during the month of October. It is interesting to note that during the previous year also the vessel registered its highest catch rate during the month of February, though the rate was little higher (203 Kg/hr).

The 17.5 m vessels operated from Goa recorded the highest catch rate of 433 Kg/hr during the month of December. During the months of October, November and January to March the catch rate was comparatively higher ranging between 200 and 300 Kg/hr. The highest catch rate recorded from this base in the previous year was 253 Kg in the month of February. There is a substantial increase in the catch rate compared to the previous year during the post-monsoon months.

The vessels operated from Mangalore recorded highest catch rate during the month of March (151 Kg/hr). During all other months the catch rate obtained was less than 100 Kg/hr. April was found to be the most productive month for Cochin region during which a catch rate of 250 Kg/hr was recorded followed by October (233 Kg/hr).

During all other months except July, August and January, the catch rate recorded was between 100-200 Kg/hr.

From Tuticorin base two 17.5 m vessels and Jheenga operated throughout the year. The former recorded highest catch rate during the month of August (154 Kg/hr) while Jheenga obtained best results during the month of July (158 Kg/hr). The findings of the present year is well in conformity with that of the previous year. Highest catch rate obtained from Madras was during the month of September (221 Kg/hr). The catch rate obtained is poorer compared to the previous year. The observation made during the previous year that the catch rate is generally poor during November-December in Madras holds good during the current year also.

The 17.5 m vessels operated from Vizag registered the highest catch rate during the month of April (171 Kg/hr) followed by March (160 Kg/hr). From this base also the catch rate obtained was poorer than that of the previous year.

The 17.5 m vessels attached to Paradeep base did not conduct survey operations during the months of May, June, October and November. Of the remaining months, December was found to be the most productive month registering a catch rate of 251 Kg/hr. A drastic fall in the catch rate is observed in this region. During the previous year the highest catch rate recorded was 409 Kg/hr.

From Calcutta and Port Blair bases the vessels conducted only few months operation and hence the month-wise fluctuation has not been studied here.

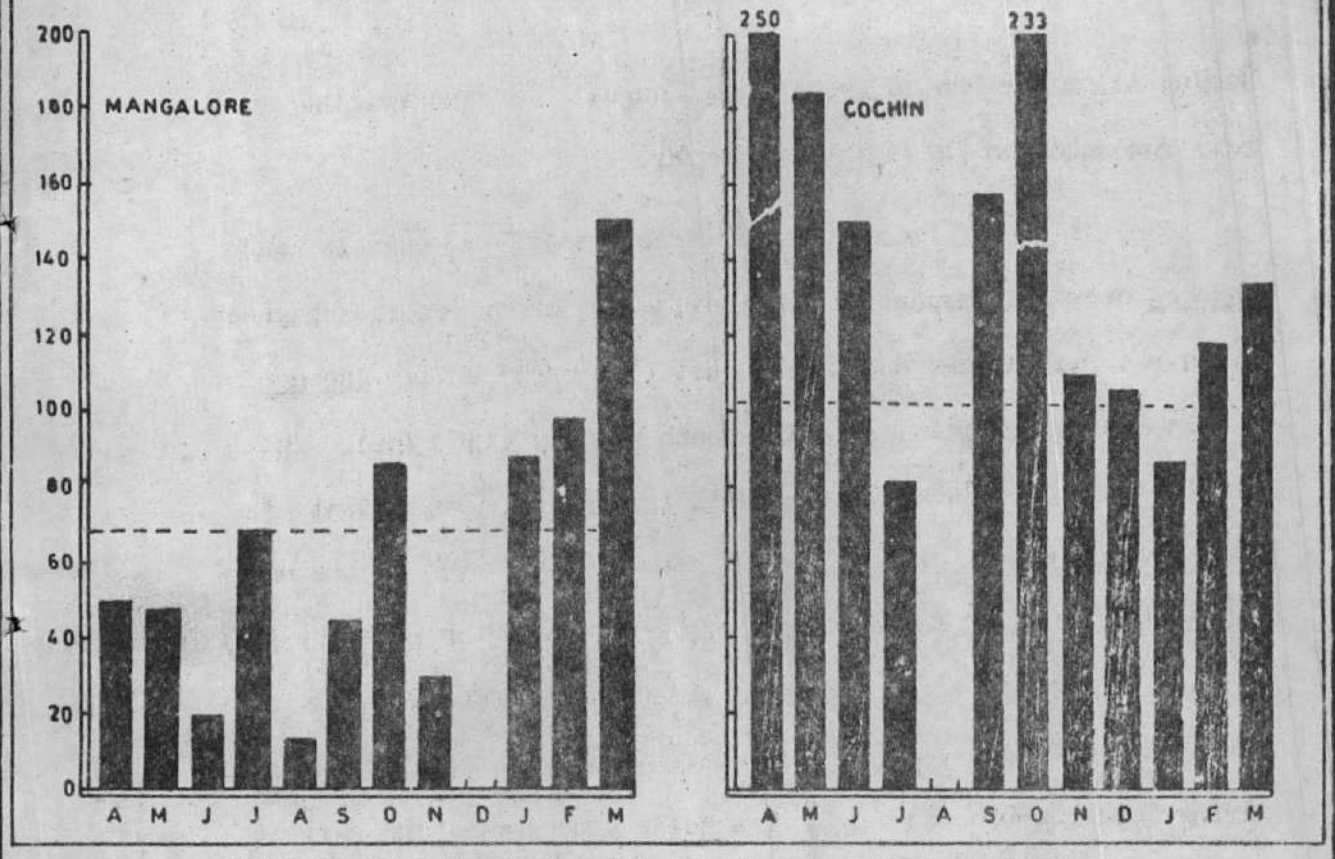


FIG.12 MONTHLY FLUCTATION IN CATCH PER UNIT EFFORT SOUTH-WEST COAST.

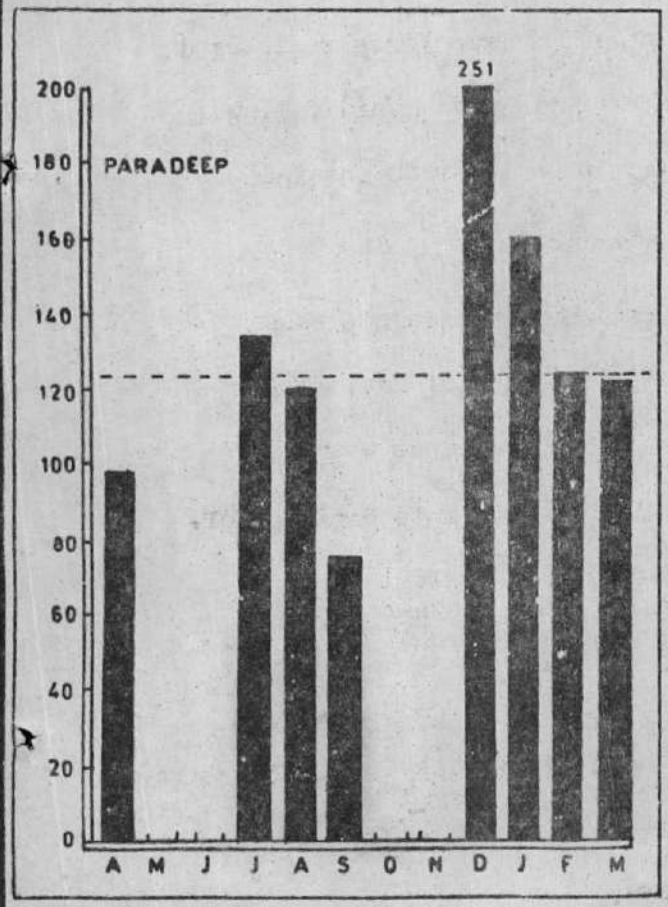


FIG.13 MONTHLY FLUCTATION IN CATCH PER UNIT EFFORT PARADEEP BASE

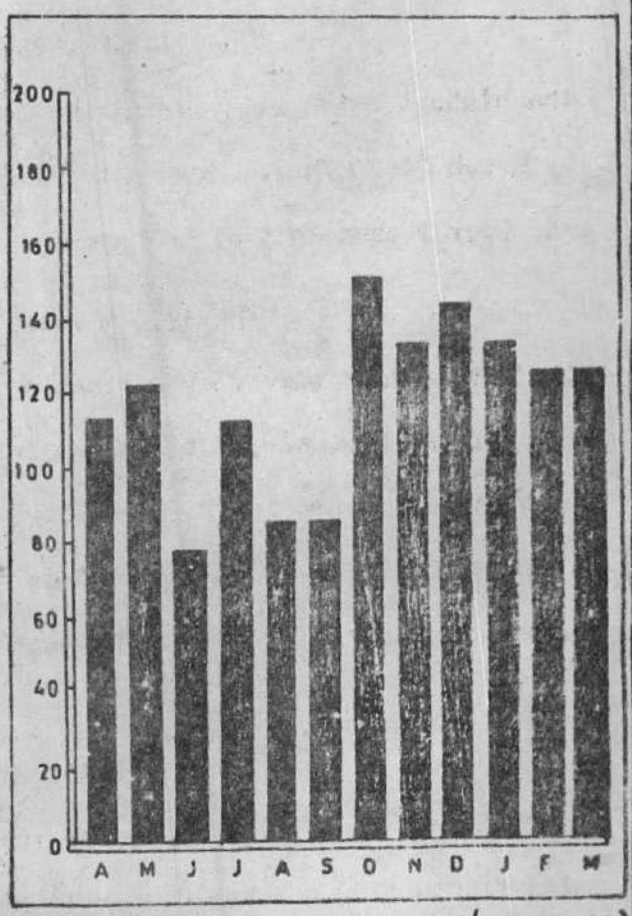


FIG.14 AVERAGE MONTHLY CATCH RATES (ALL BASES)

4.4.2. Qualitative variation

The trend of month-wise fluctuation in the catch rates of some of the varieties which constitute the major bulk of trawl catches is discussed in this chapter. An attempt is also made to identify the best fishing season in each region based on the findings of the present year.

From Kandla region survey operations were not conducted during the monsoon months. The months during which highest yield was obtained for some of the major varieties is given below:

January - Koth (9 Kg/hr).

March - Ghol (15 Kg/hr) ; kati (14 Kg/hr); cat fish (12 Kg/hr) ; elasmobranchs (47 Kg/hr).

October - Karkara(10 Kg/hr); wam (14 Kg/hr); sea bream (6 Kg/hr) ; dhoma (63 Kg/hr).

From the foregoing the months of March and October can be identified as best fishing season in Kandla for bottom fish.

In Veraval region also fishing was restricted to seven months during the year. The highest yielding months for different varieties is given below:

January - Perches (25 Kg/hr) and ghol (4 Kg/hr)

March - Ribbon fish(16 Kg/hr)

May - Cat fish (2 Kg/hr) and dhoma(73 Kg/hr)

November - Cuttle fish(15 Kg/hr); Lactarius spp (21 Kg/hr) and kati (17 Kg/hr).

November and January are found to be the most productive months in this region.

Though three classes of vessels operated from Bombay base only 17.5 m vessels surveyed almost throughout the year except during May and July. The different varieties recorded maximum catch rates as shown below:

January	-	Dhoma (16 Kg/hr)
February	-	Cat fish (59 Kg/hr) and pomfret (6 Kg/hr)
June	-	Elasmobranchs (54 Kg/hr) and wam (3 Kg/hr)
December	-	Tam (10 Kg/hr) and ghol (20 Kg/hr)

From Goa region the vessels operated throughout the year, though the operations were interrupted to a great extent during monsoon months. The trend of fluctuation in catch rates of different varieties of fishes at a glance shows that the post-monsoon period is comparatively more productive. Perch (7 Kg/hr), horse mackerel (19 Kg/hr), Nemipterus sp(33 Kg/hr) and pomfret (14 Kg/hr) gave highest yield during the month of January. Ribbon fish (213 Kg/hr) was most abundant during December; cat fish (206 Kg/hr) during February and elasmobranchs and butter fish (18 Kg/hr each) during the month of March. January to March can therefore be identified as the most favourable fishing season in this region.

From Mangalore base survey operations were carried out during all the months. February - March was found to

be more productive period for bottom fish. In respect of prawns, highest yield was obtained during the month of July. The details of yield is given below:

February - Lactarius (4 Kg/hr); sciaenids (5 Kg/hr)
March - Cat fish (36 Kg/hr).

From Cochin region various varieties registered highest yields during different months as shown below:

January - Perch (3 Kg/hr)
February - Barracuda(5 Kg/hr)
March - Horse mackerel (8 Kg/hr)
April - Elasmobranchs (65 Kg/hr)
June & July - Prawns (2 Kg/hr)

Generally the post-monsoon months are found to be comparatively more productive months. In Tuticorin region most of the species gave highest yield during July-August as revealed by the results obtained by 17.5 m vessels and Jheenga.

17.5 m vessels

August - Elasmobranchs (46 Kg/hr)
perches (62 Kg/hr)
January - Carangids (4 Kg/hr); sciaenids (10 Kg/hr)

Jheenga

July - Elasmobranchs (54 Kg/hr)
perches (65 Kg/hr) and
squids (10 Kg/hr)

From the foregoing July-August period can be identified as most productive months in Tuticorin region.

In Madras region highest catch rates for different varieties were registered during isolated months.

However the general trend shows that most of the varieties clustering in April - June period.

January	-	Pomfret (3 Kg/hr)
April	-	Elasmobranchs (25 Kg/hr)
June	-	Perch (4 Kg/hr), carangids (4 Kg/hr)
October	-	Lactarius (13 Kg/hr)
December	-	Leiognathids (90 Kg/hr)

From Vizag and Paradeep regions survey operations were not conducted during the month of October and November. In Vizag region, the period March - May has been found comparatively more productive as shown below:

April	-	Elasmobranchs (21 Kg/hr), cat fish (26 Kg/hr) perch (6 Kg/hr), squids (5 Kg/hr)
May	-	Eel (2 Kg/hr), pomfret (11 Kg/hr)

In Paradeep region the month of December was found to be most productive in respect of majority of varieties. Prawns however registered appreciable catch rates during April (14 Kg/hr) December (12 Kg/hr) and July (9 Kg/hr).

The highest catch rate obtained in respect of important groups of fishes were as follows:-

January	-	Koth (15 Kg/hr)
July	-	Cat fish (5 Kg/hr)
August	-	Elasmobranchs (28 Kg/hr)
December	-	Dhoma(25 Kg/hr), pomfret (44 Kg/hr) perch(3 Kg/hr) and eel (5 Kg/hr)

The month-wise fluctuation in respect of Calcutta and Port Blair are not studied due to inadequacy of data.

5. RESULTS OF PELAGIC FISHERY RESOURCES SURVEY

Survey of pelagic fishery resources was continued during the year under report also. In this programme, purse-seining was conducted from Mangalore and Goa bases while long-lining and trolling were conducted from Port Blair base. The observations made are discussed in the ensuing.

5.1. Purse-seining

During the year one 17.5 m vessel each conducted purse-seining operations from Goa and Mangalore bases expending an effort of 331 hrs and 448 hrs (including searching time) respectively.

Purse-seining was conducted from Goa during November-February. A total of 8 sets were made in area 15-73 off Goa. The catch per set obtained was 478 Kg. Of the different months the highest yield was recorded during the month of November (758 Kg/set) followed by January (505 Kg/set). The catch comprised exclusively of sardines.

From Mangalore base purse-seining was conducted from October-March. A total of 25 sets were made in two area viz. 12-74 and 13-74 off Karnataka. The average catch/set of 324 Kg obtained from this region was comparatively lesser than that obtained from Goa (478 Kg/set) during this year. Of the two areas surveyed the area 12-74 excelled with a catch rate of 516 Kg/set. This area has registered an increase over the previous year while the area 13-74 recorded a drastic fall in the yield from 1325 to 117 Kg/set.

Region	Month	Sets made No.	Sets made Effort (hrs)	Time spent for searching	Total fishing effort	Total catch	Species composition(kg) Mackerel	Sardine	Cat fish	Misc	Catch/set
GOA	November	3	7.00	50.00	57.00	2275	-	2255	-	20	758
	December	4	9.58	104.00	113.58	1040	-	1040	-	-	260
	January	1	2.50	112.25	114.75	505	-	505	-	-	505
	February	-	-	45.50	45.50	-	-	-	-	-	-
Sub-total		8	19.08	311.75	330.83	3820	-	3800	-	20	478
MANGALORE	October	-	-	32.00	32.00	-	-	-	-	-	-
	November	6	6	78.00	84.00	689	679	-	-	10	115
	December	4	5	106.00	111.00	711	73	466	-	172	178
	January	9	10.5	66.00	76.50	4707	45	4610	12	40	523
	February	2	2.00	102.00	104.00	-	-	-	-	-	-
	March	4	4.00	36.00	40.00	2000	-	2000	-	-	500
Sub-total		25	27.50	420.00	447.50	8107	797	7076	12	222	324

Table XIV Month-wise results of purse-seining

Particulars		Area 12-74	13-74	15-73
Sets made	No.	13	12	8
	Effort (hrs)	14.50	13	19.08
Time spent for searching (hrs)		102	318	311.75
Total fishing effort (hrs)		116.50	331	330.83
Total catch (Kg)		6707	1400	3820
Species				
Mackerel		45	752	-
Sardine		6610	466	3800
Cat fish		12	-	-
Miscellaneous fish		40	182	20
Catch/set (Kg)		516	117	478

Table XV Area-wise results of purse-seining from Goa and Mangalore

About 90% of the catch obtained from the area 12-74 was constituted by sardines while 50% of the catch from the area 13-74 comprised of mackerel. The highest yielding months off Mangalore was found to be January (523 Kg/set) and March (500 Kg/set) respectively.

One reason for the poor result was due to the fact that majority of the pelagic fish shoals were found in the shallow waters, where operation by vessels of 17.5 m size was prohibited during last year. The details of month-wise and area-wise results of purse-seining of both the bases are given in Tables XIV and XV respectively.

3.2 Long lining

The vessel Meena Prayas (17.5 m) conducted long lining operations from Port Blair during April - July expending about 200 hrs of fishing effort. The survey was carried out in 5 sub-areas of the major area 11-92 by operating a total of 4600 hooks. Total catch landed was about 4 tons, the main constituents being sharks, marlin, perches and tuna. Highest hooking rates were registered from the areas 11-92, 4E, 5E and 5F (2.2 to 2.7%). The sub-area 6 F was found to be comparatively poorer. Results of long lining operation is summarised and presented in table below:

Area/ sub-area	Fishing effort (hrs)	No.of hooks ope-rated	Total catch landed (Kg)	Hooking rate %	No.of fish caught			
					Shark	Marlin	Tuna	Perches & others
11-92/								
4E	21.76	625	620	2.2	13	1	-	-
4F	26.27	640	335	1.7	8	2	-	-
5E	44.08	960	772	2.6	20	3	1	1
5F	97.82	2250	2243	2.7	46	13	-	2
6F	3.75	125	28	0.8	1	-	-	-
Total	193.68	4600	3998	2.4	88	19	1	3

5.3 Trolling

Trolling was carried out by the vessel Meena Prayas from Port Blair during the month of July. A total fishing effort of 85 hrs was distributed in five small squares of area 11-92 and one small square of area 12-92. Positive results were recorded from only two small squares viz. 11-92 4E and 5E. The main species hooked were perches and seer fish. The results of operation are summarised and presented below:

Area/ Sub-area	No.of lines operated	Depth range (m)	Fishing effort (hrs)	Total catch (Kg)	Perch No.	Perch Wt. (Kg)	Seer fish No.	Seer fish Wt. (Kg)	Misc. No.	Misc. Wt. (Kg)
11-92/										
3E	16	73-90	16.16	-	-	-	-	-	-	-
4E	36	75-80	28.83	2	-	-	-	-	1	2
4F	15	120	4.00	-	-	-	-	-	-	-
5E	22	60-90	16.50	24	2	5	1	16	2	3
6E	16	50	13.00	-	-	-	-	-	-	-
12-92/										
1E	8	50	6.58	-	-	-	-	-	-	-

6. SUMMARY

Results of fisheries resources survey conducted by the Project during the year 1977-78 are analysed and presented in this bulletin.

Twenty two vessels conducted demersal fishery resources survey from twelve bases. The vessels together expended a fishing effort of 9526 hrs and surveyed/resurveyed an area of about 33,000 sq. km along the Indian coast generally upto a depth of 75 m and on some areas upto a depth of 120 m using fish trawls and shrimp trawls of various constructions. During the course of survey the vessels landed an incidental catch of 1,134 tonnes of fish and prawns.

The composition of trawl catch, the relative abundance in each area and bathymetrical and seasonal fluctuation in the catch rates of important groups were analysed for each region. A comparison with the results obtained during the previous year was also attempted wherever found necessary.

In Kandla region the varieties constituting the major bulk of catch were dhoma, elasmobranchs and kati. Of all the areas surveyed, the area 20-68 was found to yield highest catch rate (122 Kg/hr). The depth belt of 40-59 m was found to be the most productive zone in this region from where a catch rate of 136 Kg/hr was recorded. The highest yield from this region was obtained during the month of October (269 Kg/hr). The months of March and October were found to be best fishing season in this region.

In Veraval region the major bulk of the catch was constituted by ribbon fish and dhoma. The area 21-69 was found to yield highest catch rate (120 Kg/hr). The depth belt of 20-39 m was found to be most productive (72 Kg/hr). Highest catch rate of 165 Kg/hr was recorded during the month of May. The month of November and January was found to be the best fishing season in

respect of most of the varieties.

In Bombay region cat fish, elasmobranchs, dhoma and ghol constituted the major bulk of the catch. The area 18-72 surveyed by three different types of vessels was found to yield the highest catch rate. The depth belt of 60-79 m was found to be the most productive range from where a catch/hour of 412 Kg was recorded. The highest catch/hour of 151 Kg by 17.5 m vessels was registered during the month of February. February, June and December were the months when maximum yield in respect of important groups of fishes were recorded.

Cat fish, ribbon fish, Nemipterus sp. and butter fish were the main constitutents of the trawl catch obtained from Goa. The area 16-73 was found to be most productive along this coast with a catch rate of 298 Kg/hr. The highest catch rate of 341 Kg/hr was recorded from the depth belt of 40-59 m. The highest catch/hr of 433 Kg/ was recorded during the month of December. January - March was identified as most favourable fishing season in this region.

In Mangalore region cat fish, dhoma and elasmobranchs constituted the main bulk of trawl catch. The area 13-74 was found to be the most productive in this region with a catch rate of 73 Kg/hr. Only one depth range viz. 20-39 m was surveyed by the vessels of this base from where a catch rate of 68 Kg/hr was recorded. The highest catch rate was recorded during the month of March (151 Kg/hr). The period February-March was found to be the most favourable season for fish while the highest yield for prawns was recorded during the month of July.

Cat fish, elasmobranchs, lizard fish and kilimeen (Nemipterus sp.) constituted the main bulk of the trawl catches of Cochin region. The area 9-75 was found to be most productive with a catch rate of 196 Kg/hr. The depth belt of 40-59 m was found to yield the highest catch in this region (182 Kg/hr). The month of April yielded the highest catch rate of 250 Kg/hr. The post-monsoon months were generally found yielding better catch rates for fish varieties while monsoon months (June-July) were found yielding better catch rates for prawns.

The main components of trawl catch obtained from Tuticorin region were perches, rays and sciaenids. The area 8-77 was found to be most productive by 17.5 m vessels with a catch rate of 119 Kg/hr. The fishing operations were mainly restricted upto 40 mts in most of the areas. The depth range of 20-39 m was found to be comparatively more productive zone. An attempt was made to survey the wadge bank area by employing the 17.5 m vessels from Tuticorin and Cochin. The programme had to be given up owing to the inadequate winch capacity of the vessels. The vessels are however being fitted out with powerful hydraulic winches. The preliminary survey done showed that the 60-69 m depth range to be comparatively more productive with a catch rate of 110 Kg/hr. The month of July-August yielded comparatively better catch rates from this region.

Leiognathids, elasmobranchs and Lactarius spp were found to be the major components of trawl catch obtained from Madras region. The area 14-80 gave the highest yield (188 Kg/hr). The depth range of 20-39 m was found to be comparatively more productive with a catch rate of 131 Kg/hr. The highest catch/hr was obtained during the month of September (221 Kg/hr). April-June period was found to be most favourable period for trawling.

In Vizag region cat fish, elasmobranchs, perch and pomfret were the main components of trawl catch. The area 18-84 was found to be comparatively more productive with a catch rate of 197 Kg/hr. The depth range of 60-79 m was found to be comparatively more productive with a catch rate of 157 Kg/hr. The vessels registered highest catch rate during the month of April (171 Kg/hr) followed by March. The period March-May was found to be peak season for major groups.

Elasmobranchs, prawn, surmai, koth and sciaenids were the main constituents of trawl catch obtained from Paradeep region. The area 20-86 was alone surveyed along this coast and catch/hr registered was 141 Kg. The depth range of 20-39 m was found to be comparatively more productive in this region. Of the eight months of survey carried out, the month of December gave the highest yield of 251 Kg/hr. The same month was found to be comparatively more productive in respect of major groups.

Operations were discontinuous from Calcutta and Port Blair bases. Elasmobranchs, cat fish and pomfret were the main groups netted from Calcutta region. The survey was carried out only in the depth belt of 20-39 m of a single area viz. 20-88 off West Bengal from where a catch rate of 215 Kg/hr was registered.

Leiognathids, upenoids and elasmobranchs were the main constituents of trawl catch obtained from Port Blair. The area 11-92 gave the highest yield of 190 Kg/hr. The depth belt of 40-59 m alone was surveyed from this base. Month-wise fluctuations in the quality and quantity of trawl catches of Calcutta and Port Blair were not studied due to limitation of data.

Pelagic fishery resources survey has been continued during the year under report also conducting purse-seining from Goa and Mangalore bases and long lining and trolling from Port Blair base.

Purse-seining was conducted from Goa and Mangalore bases from two 17.5 m vessels expending a total effort of 779 hrs (including searching time). Along Goa coast an average catch per set of 478 kg was recorded while in Mangalore region the average catch/set recorded was 324 Kg. The highest yielding months off Goa was found to be November (758 Kg/set) followed by January 505 (Kg/set). The catch was comprised exclusively of sardines. The highest yielding months in respect of Mangalore region was January (523 Kg/set) and March (500 Kg/set) respectively. The catch was constituted of sardines and mackerel.

Long-lining was conducted from Port Blair from one 17.5 m vessel during April-July. A total effort of 200 hrs was expended operating 4600 hooks. The highest hooking rate ~~of (0.9 Kg)~~ was registered from the area 11-92 4E and 5F.

Trolling was carried out from Port Blair during the month of July expending a total fishing effort of 85 hrs. The main species hooked were perches and seerr fish.