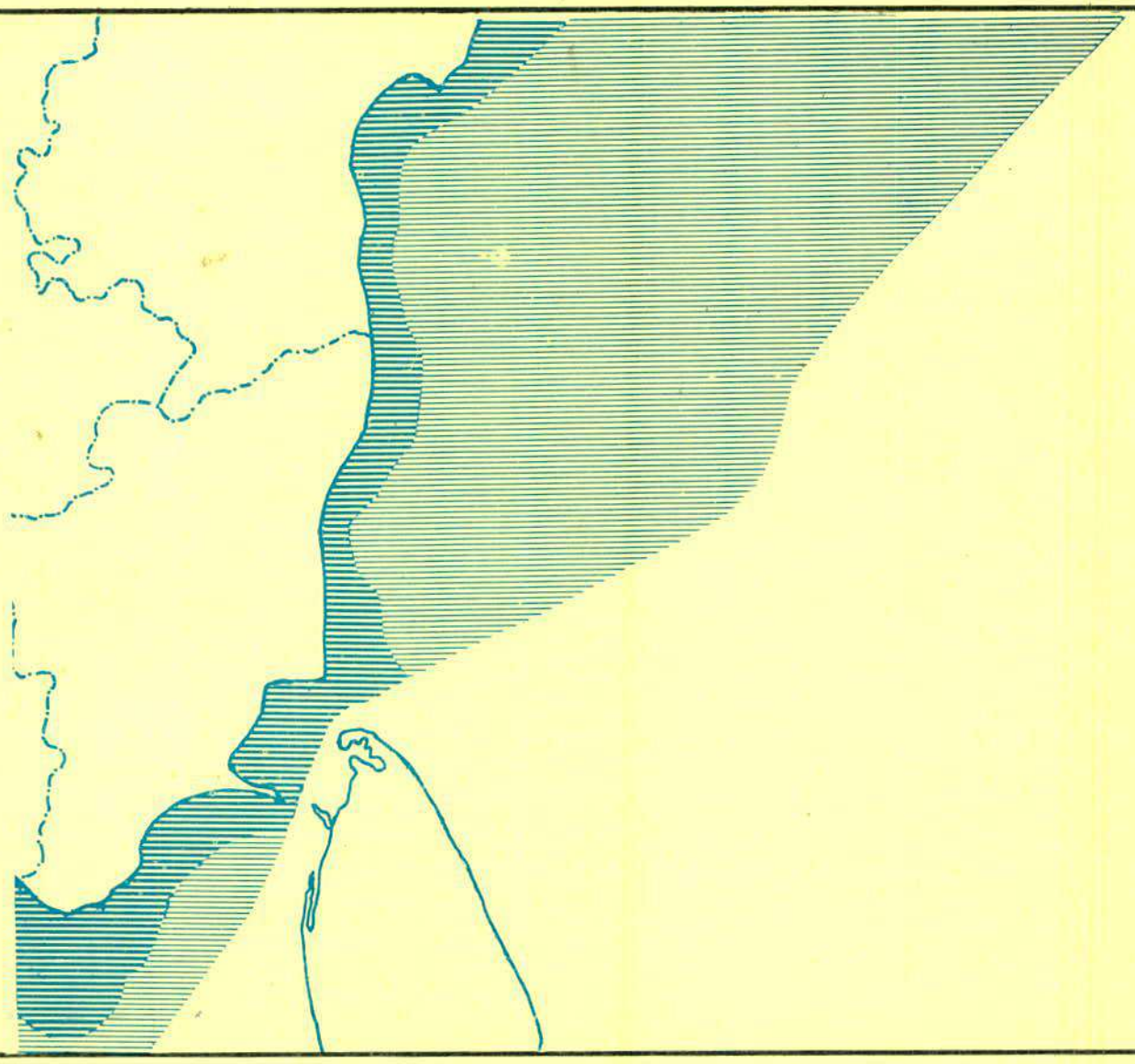
Bulletin 21

MARINE FISHERY RESOURCES OFF THE LOWER EAST COAST OF INDIA



FISHERY SURVEY OF INDIA
Government of India
(Ministry of Food Processing Industries)
Bombay

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1. INTRODUCTION

Resources information is vital for development planning, whether the resources proposed to be exploited are living or non-living. It is more so in the case of living resources as they are always in a dynamic state and if unexploited, the exploitable part is recycled to the ecosystem. On the other hand, in advanced stage of development, if the level of exploitation is not regulated it could lead to endangering the resource. Further, resources information is required by the fishermen and the fishing industry for effective exploitation of the stocks, the financing institutions for funding decisions and the Government agencies for development planning, investment decisions etc.

Organised attempt to explore the marine fisheries resources of lower east coast was first made in 1958 by the Fishery Survey of India (FSI) from its Tuticorin Base [1/] although several sporadic attempts had been made by other agencies earlier in this regard. This Base conducted exploratory/experimental fishing in the Gulf of Mannar and the Wadge Bank untill 1987. Another Base established at Madras in 1972, carried out exploratory survey of the resources along the Coromandel coast which is still continuing. The work of these two Bases of FSI has had definite impact on introduction and development of modern fishing methods and deepsea fishing in the region. The results of the resources surveys carried out by these Bases of FSI are pesented in this paper with an assessment on the fishery potential of lower east coast of India.

The authors are grateful to Dr. D. Sudarsan, Director General, Fishery Survey of India, Bombay for his keen interest and encouragement in this study and to Shri M.E. John, Sr. Fisheries Scientist for his assistance in preparation of this paper.

2. LOWER EAST COAST - THE COASTLINE AND CONTINENTAL SHELF

The lower east of India between lat. 8°N and 16°N has a coastline of about 1340 km in length including 907 km long Tamil Nadu coast, 31 km of Pondicherry coast and 402 km long southern Andhra Pradesh districts of Nellore and Prakasam. But the continental shelf is rather narrow for most part especially along the Coromandel coast. The shelf area is about 41,400 km^2 . There are four distinct regions (Fig.1). The Coromandel coast between lat. 10°N and 16°N has a narrow shelf for most part except along the northern stretches and off Point Calimere, where the shelf extends over a vast area. The Palk Bay is a broad expanse of shallow and generally muddy area. The Gulf of Mannar has a moderately wide shelf with an area of about 5500 km^2. The Wadge Bank situated south of Cape Comorin is a well known ground and has a shelf area of about 10,500 km^2.

1/ The FSI was earlier known as Deep Sea Fishing Station during 1946-74 and as Exploratory Fisheries Project in the years 1974-84. The Bases of FSI were known as Offshore Fishing Stations (1946-74).

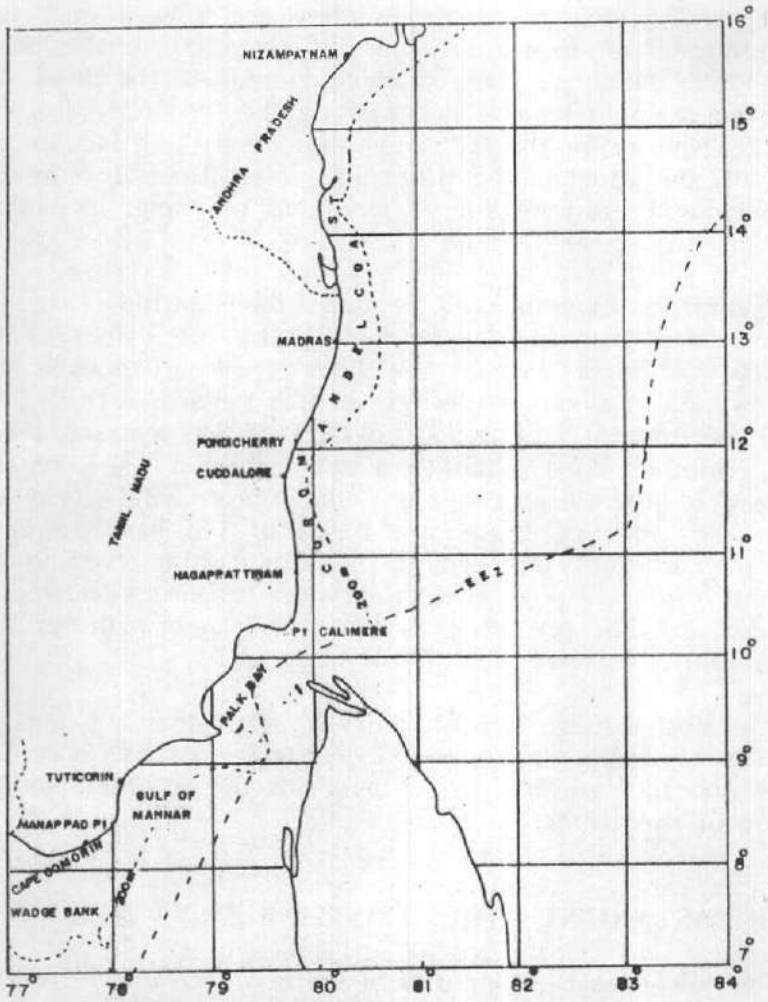

Fig. 1. Coastline, continental shelf and EEZ along lower east coast

The continental slope along the coast in 200-300m depth range has an area of about 4000 km^2.

3. PRESENT STATUS OF MARINE FISH PRODUCTION ALONG LOWER EAST COAST

The lower east coast contributes about 18% to the marine fish production of the country, of which Tamil Nadu State contributes about 15.3%. The landings during 1980-1988 period fluctuated between 2.15 to 2.73 lakh tonnes per annum with average of 2.57 lakh tonnes. Demersal group of fishes formed about 55% and pelagic species 45%. The fishery exploited by a fleet of 2,627 mechanised boats and 43,343 non-mechanised crafts (as in 1980), is mostly confined to the inner shelf area upto about 50/60 m depth.

The average marine fish production per km of the coastline of the state during 1980-1988 was 283.8 tonnes per annum. This production rate is below the all India average of 309.9 tonnes per km of coastline and less than most of the states on the west coast (see Annexure I). Review of the fishery separately for the Coromandel coast reveals that landing from this region is only about 28.5% of the total landing in the state against the coastline length of about 41%. The rate of production per km of Coromandel coastline is only 195.4 tonnes per annum, less than 2/3rd of the all India average.

The annual marine fish production per unit area of the continental shelf off the entire Tamil Nadu coast is about 6.3 tonnes per sq.km. against the all India average of 4.3 tonnes per sq.km. This is, however, due to the vast expanse of productive grounds off Krishnapatnam, Palk Bay, Gulf of Mannar and off Cape Comorin.

The details of fish landing in the different regions and districts along the Tamil Nadu coast is given in Table 1.

Table 1. Annual marine fish production (tonnes) from different districts and regions of lower east coast (1983-1988)

Region		District 1/	Annual 2/ average landing	Total landing for the region	Demersal component @ 55% of total landing
Wadge Bank & Gulf of Mannar	TAMIL NADU	Kanyakumari	37,260		
		Tirunelveli	41,344	1,08,974	59,936
		Ramanathaparam(53%)	30,370		
Palk Bay		Ramanathapuram(47%)	27,052		
		Pudukottai	32,156	77,583	42,671
		Thanjavoor (39%)	18,375		
Coromandel coast		Thanjavoor (61%)	28,839		
		South Arcot	18,630		
		Madras	11,995	1,18,029	64,916
		Chengalpattu	9,187		
		PONDICHERRY	20,030		
	A.P.	Nellore	14,274		
		Prakasam	15,074		
Total			3,04,586	3,04,586	1,67,523

1/ Figures in brackets indicate the percentage of landing from the district apportioned to the region on the basis of proportion of the coastline.

2/ Annual average landing of the states for 1983-1988 (Min. of Agriculture) apportioned to the districts following the percentage of district-wise landing (1981-1984) as computed from Dharmaraja **et al.** (1987) for Tamil Nadu and Alagaraja **et al.** (1987) for the coastal districts of southern Andhra Pradesh

4. RESOURCES SURVEYS ALONG LOWER EAST COAST

There had been sporadic attempts to explore the fishery resources along the lower east coast, especially along Tamil Nadu, since 1901. The early attempts made in this regard are summarised by several authors and more recently by Joseph **et al.** (1976). The Tuticorin Base of FSI has surveyed the demersal fishery resources in the Gulf of Mannar and the Wadge Bank utilising a wide range and type of fishing vessels and fishing gears. The details of the vessels and major specifications of fishing gears used are presented in Tables 2 and 3. It will be seen that in the early years only small trawlers were available for survey. These vessels had limited capabilities in terms of depth and distance they could cover. Therefore, the early surveys can at best be called only as experimental fishing for locating fishing grounds and evolving suitable fishing gears. However, with the acquisition by the FSI of 20 identical indigenously built steel trawlers of 17.5 m OAL, it was possible to conduct the surveys on a sound footing all over the Indian coast. The 17.5 m vessels made a remarkable contribution to our knowledge of the demersal resources all along and off the Indian coast upto a depth of 40 fathoms (73m). Subsequently the Tuticorin Base conducted an extensive survey of the Wadge Bank and Gulf of Mannar with the largest of the survey vessels in the FSI fleet namely **Matsya Nireekshani** during 1983-85.

The Madras Base of FSI established in 1972, conducted a comprehensive survey of the demersal resources of the Coromandel coast from Point Calimere to Machilipatnam (between lat. 10°N and 16°N) with two 17.5m vessels. These surveys were supported by a larger vessel **Kalyani V.** As a result of these surveys, we have now a clear picture of the demersal resources of this part of the Tamil Nadu coast. The Base was equipped with two survey vessels **Matsya Jeevan** (36.5m OAL) and **Matsya Harini** (32.5m OAL) during 1982-83. Matsya Jeevan, a combination trawler, has been conducting survey of the demersal resources between lat. 10°N and 16°N upto a depth of 300 m and the survey is being continued. Matsya Harini, a purse-seiner-cum-long liner was commissioned in 1984 for tuna survey along the Coromandel coast upto a distance of 200 miles (EEZ). Though these larger vessels made some early attempts to conduct pelagic trawling and purse-seining, these attempts were not successful.

5. RESULTS OF RESOURCES SURVEYS

The early attempts to introduce mechanised fishing in the country and experimental fishing with an assortment of fishing vessels with different types of fishing gears cannot be considered as exploratory fishing or resources surveys. However, these fishing experiments conducted prior to the seventies, presented by Pai and Pillai (1973) and Joseph **et al.** (1976), have added considerably to our knowledge of the resources also.

Exploratory fishing by the 17.5 m vessels between the years 1971 and 1980 was well designed and implemented. Considerable amount of data was generated and their results, presented by Joseph (1980), give

Table 2. Major specifications of vessels deployed for fishery resources survey along lower east coast from Tuticorin and Madras Bases

Sl. No.	Name of vessel	Year built	Country built	OAL (m)	Hull material	Make of engine	B.H.P.	G.R.T.
Tuticorin Base								
1.	Meena Lochani	1954	Japan	13.7	Wood	Yanmar 4 LDG	42	9.9
2.	Meenakshi	1954	Japan	10.1	Wood	Yanmar 3 LDG	42	9.9
3.	Sardinella	1954	Japan	10.1	Wood	Yanmar 3 LDG	42	9.9
4.	Sagar Sundari	1954	Japan	10.1	Wood	Yanmar 3 LDG	42	9.9
5.	Sagar Kumari	1954	Japan	10.5	Wood	Yanmar 3 LDG	42	9.9
6.	Jheenga	1958	Holland	16.5	Steel	Caterpillar	153	48.6
7.	Meena Prayas	1969	India	17.5	Steel	Kirloskar M.A.N.	200	56.8
8.	Meena Niryantak	1970	India	17.5	Steel	Kirloskar M.A.N.	200	56.8
9.	Meena Bharati	1965	India	20.9	Steel	M.A.N.	262	69.1
10.	Matsya Nireekshani	1979	Holland	40.5	Steel	B & W Alpha	2030	329.3
Madras Base								
11.	Meena Sitara	1970	India	17.5	Steel	Kirloskar M.A.N.	200	56.8
12.	Meena Gaveshak	1970	India	17.5	Steel	Kirloskar M.A.N.	200	56.8
13.	Kalyani V	1955	Japan	27.8	Steel	Hayashikane	300	123.2
14.	Matsya Harini	1980	India	32.5	Steel	Caterpillar	750	257.9
15.	Matsya Jeevan	1982	India	36.5	Steel	Caterpillar	825	327.2

Table 3. Major specifications of sampling gears used for survey of fishery resources along lower east coast

Sl. No.	Type of gear	Head rope length(m)	Foot rope length(m)	Mesh size(mm) Wings	Mesh size(mm) Codend	Weight of otter board (kg)
Medium sized vessels						
1.	15m shrimp trawl	15.0	20.0	50	36	70
2.	12m fish trawl	12.0	17.6	120	50	70
3.	16m fish trawl	16.0	18.5	120	50	150
4.	20m fish trawl	20.0	27.5	120	50	150
5.	24m fish trawl	24.0	32.0	140	50	180
6.	28m shrimp trawl	28.0	32.5	50	36	180
7.	42.5m shrimp trawl	42.5	46.9	50	36	180
8.	30m fish trawl	30.0	39.0	140	80	240
9.	35m fish trawl	35.0	42.0	140	80	240
10.	45m fish trawl	45.0	58.0	140	80	300
Large vessels						
11.	27.5m fish trawl	27.5	25.5	140	40	850
12.	45m shrimp trawl	45.0	50.0	50	40	850
13.	34m fish trawl	34.0	51.0	400	80	1350
14.	Tuna longline (5 branches/ basket)	Float line - 28m Main line - 50m Branch line - 22m Tuna hook - 3.6Sun				

a comprehensive picture of the demersal resources upto a depth of 40 fathom (73m). The results of survey of the Gulf of Mannar and the Wadge Bank by **Matsya Nireekshani** operated from Tuticorin Base during the period 1983-85, presented by Sivaprakasam (1986), has yielded valuable information on the demersal resources of these two regions upto a depth of 500 m. The Wadge Bank has earlier been surveyed by the same vessel from Cochin Base and the results are presented by Anon (1984) and Joseph **et al.** (1987)

Results of exploratory fishing by 17.5 m vessels from Madras Base along the Coromandel coast, presented by Joseph (1980) gives detailed information on the demersal resources upto a depth of 73 m from Point Calimere to Machilipatnam. The survey was extended upto 300m depth by **Matsya Jeevan** and as a result we have a wealth of information on the demersal resources of the continental shelf and the slope. Tuna longline survey by **Matsya Harini** upto the 200 mile EEZ boundary indicated encouraging results.

The results of resources surveys conducted by the Fishery Survey of India have been presented in various publications of the FSI. A list of such publications containing data pertaining to the lower east coast is furnished in Annexure II.

5.1 DEMERSAL RESOURCES

5.1.1 Demersal resources of inner continental shelf as surveyed by 17.5m vessels

Gulf of Mannar

The demersal resources of the Gulf of Mannar as surveyed by 17.5 m vessels from Tuticorin Base during 1971-80 are presented in Table 4 and Fig. 2. It will be seen that perches are the most important resource

Table 4. CPUE of major species/groups in different depth zones off Tuticorin coast obtained by 17.5 m vessels during 1971-80

Species/groups	Depth range (m)			
	0-20	20-40	40-60	60-79
Fishing hrs.	4316	5151	229	10
CPUE (kg/hr)				
Elasmobranchs	25.7	27.4	17.0	19.5
Cat fish	0.4	0.5	1.6	-
Seer fish	-	-	-	-
Carangids	1.7	1.3	0.3	-
Barracuda	0.1	0.1	-	-
Perches	30.7	42.1	31.0	5.7
Upeneids	0.1	-	-	-
Sciaenids	1.8	1.4	2.3	-
Prawns	0.2	0.5	-	-

Source: Joseph (1980)

forming 36% followed by sharks, skates and rays (26%). Other species formed very low percentage. The catch rates were also good. The peak season is during July-October (Table 5).

Coromandel Coast

The results of survey by 17.5 m vessels from Madras Base during the same period are presented in Table 6 and Fig.3. It will be seen that silver bellies are the most dominant group (21%), followed by sciaenids (7%), perches (6), elasmobranchs (6%) etc. While quality fish such as

pomfrets, big jawed jumper, carangids etc. were available in small percentage (2% each), Misc. fish formed the bulk (48%). There are two distinct seasons from January to April and July to October (Table 5).

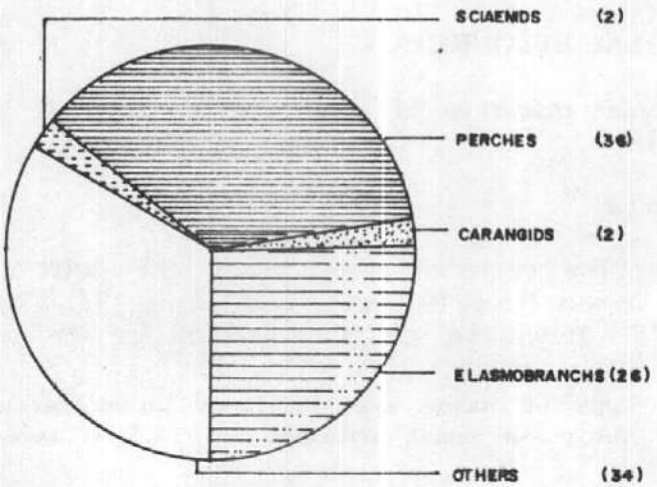

Fig. 2. Percentage occurrence of major groups of fishes from Tuticorin region as obtained by 17.5m vessels during 1971-80

Source: Joseph (1980)

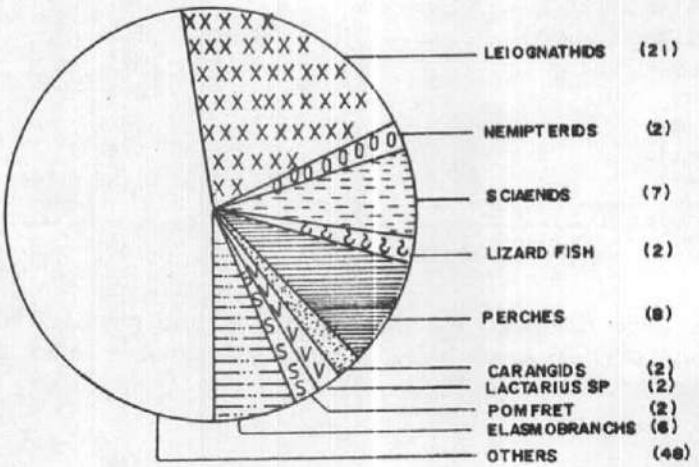

Fig. 3. Percentage occurrence of major groups of fishes from Madras region as obtained by 17.5m vessels during 1971-80

Source: Joseph (1980)

Table 5. Seasonal variation in the CPUE (kg/hr) obtained by 17.5m vessels along Tuticorin and Madras coasts during 1971-80

Month	Tuticorin coast	Madras coast
January	98	135
February	77	173
March	72	129
April	86	107
May	100	92
June	101	100
July	127	154
August	153	99
September	169	155
October	111	115
November	96	70
December	78	96

Source: Joseph (1980)

Table 6. CPUE (kg/hr) of major species/groups in different depth zones along Coromandal coast obtained by 17.5 m vessels during 1971-80.

Species/groups	Depth range (m)			
	0-20	20-40	40-60	60-80
Fishing hrs.	253	3778	3329	68
Elasmobranchs	11.6	9.2	4.1	3.3
Lactarius sp.	3.5	3.7	0.8	1.1
Nemipterus spp.	1.8	1.1	2.5	0.6
Leiognathids	14.6	26.4	24.2	12.4
Sciaenids	13.2	11.5	5.4	7.9
Lizard fish	1.7	1.7	4.3	-
Perches	9.4	15.7	2.2	1.2
Flat fish	0.4	0.6	0.1	-
Pomfret	1.0	2.6	0.2	0.8
Carangids	1.2	1.1	2.1	-
Moon fish	0.4	0.4	-	-
Ribbon fish	-	-	0.2	-
Prawns	0.3	0.3	0.1	-

Source: Joseph (1980)

5.1.2 Demersal resources of the continental shelf and slope as surveyed by larger vessels

Wadge Bank

The demersal resources of the Wadge Bank upto 300m depth as surveyed by **Matsya Nireekshani** are presented in Table 7. It will be seen that perches and file fish (balistids), formed about 50-60% of the catch upto 100m depth. Deepsea resources include **Nemipterus** spp. reaching maximum concentration in 100-200m depth, scad, Bulls eye **(Priacanthus** spp.) etc. all of which show distinct habitat preferences. Crabs form an important component in 100-200m. Carangids were available in all depths upto 200m. The catch per unit effort of the demersal resources obtained from different areas/depth zones are given in Fig.4.

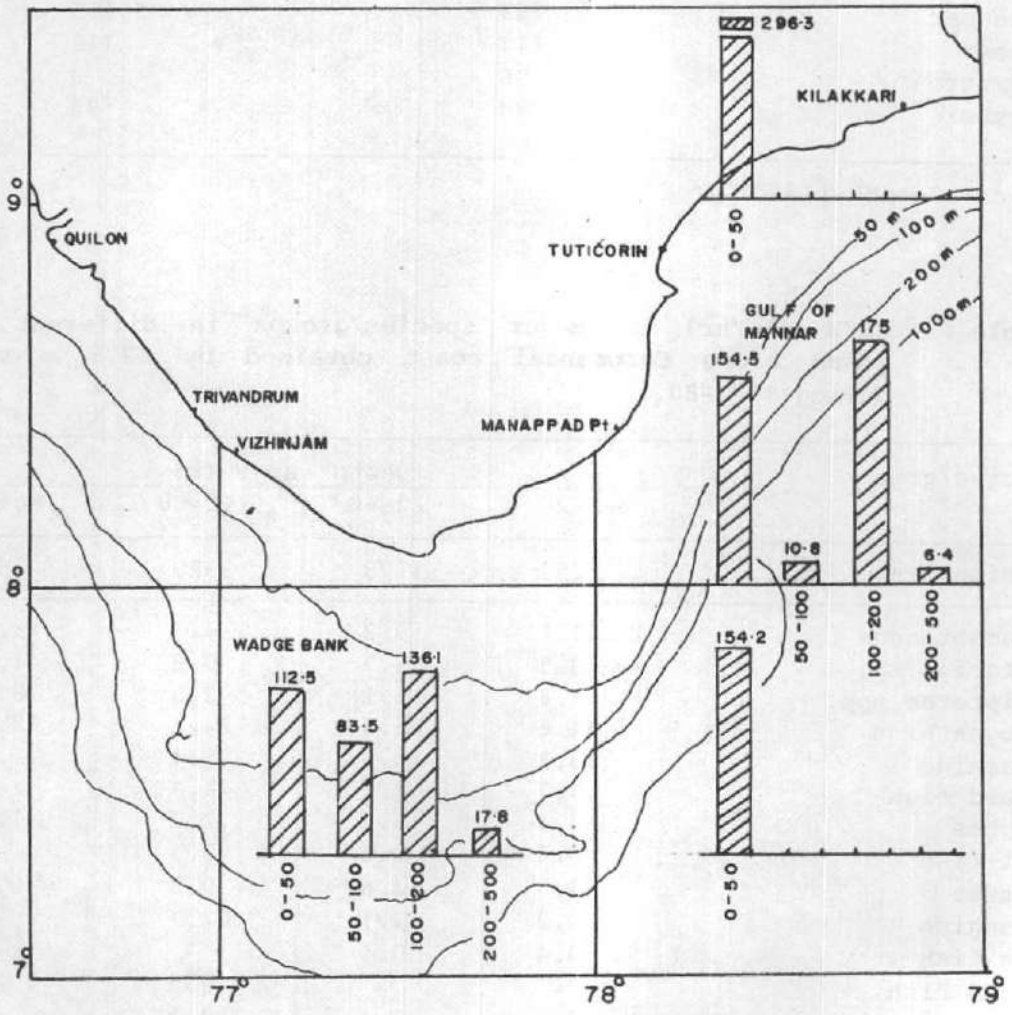

Fig. 4. CPUE (kg/hr) of demersal resources in various depth ranges of Wadge Bank and Gulf of Mannar obtained by Matsya Nireekshani during Oct 1983 to March 1985

Table 7. CPUE (kg/hr) of demersal fish in various depth ranges in Wadge Bank and Gulf of Mannar as surveyed by Matsya Nireekshani during October'83 to March 1985.

Area	WADGE BANK				GULF OF MANNAR					
Depth range (m)	7-77 & 8-77 combined				7-78	8-78				9-78
	20-50	50-100	100-200	200-500	20-50	20-50	50-100	100-200	200-500	20-50
Fishing effort (hrs)	240.5	132.7	118.7	104.1	100.0	491.0	5.5	615.1	559.9	204.0
Sharks & skates	3.4	1.3	1.4	2.5	5.5	2.2	0.9	4.3	-	3.0
Rays	7.6	5.1	2.6	-	22.1	21.6	-	7.1	-	13.5
Barracuda	4.5	0.2	-	-	7.0	3.9	-	47.3	-	7.0
Cat fish	0.7	-	-	-	1.7	3.9	-	0.3	-	24.0
Perches	33.9	20.4	7.6	-	44.4	51.6	-	0.4	-	92.1
Pomfrets	0.2	-	-	-	0.1	1.5	-	-	-	22.5
Caranx	8.1	4.0	4.4	-	9.1	24.0	-	4.3	-	10.0
Decapterus spp.	6.9	7.3	23.5	-	2.8	5.4	-	4.5	0.2	-
Ariomma indica	-	-	-	-	-	-	-	6.2	-	-
Nemipterus spp.	9.4	2.5	66.7	-	7.4	2.7	0.9	9.5	0.2	-
Priacanthus spp.	1.7	1.7	8.9	1.1	-	-	-	4.9	1.0	-
Lizard fish	2.5	1.2	2.6	-	1.7	1.2	-	1.0	-	-
Balistids	29.6	32.6	-	-	22.4	-	-	-	-	-
Silver belly	0.2	0.1	-	-	0.4	7.5	-	1.9	-	67.9
Clupeids	-	-	-	-	-	3.3	-	-	-	15.3
Mackerel	0.8	1.2	-	-	12.1	1.1	-	0.2	-	1.3
Moon fish	-	-	-	-	-	5.1	-	-	-	10.1
Ribbon fish	-	-	-	-	-	-	-	4.3	0.1	-
Crabs	-	-	11.6	-	-	-	-	66.9	-	-
Squids & cuttle fish	3.1	2.1	1.4	-	1.7	1.2	4.5	5.1	-	0.1
Others	9.7	3.8	5.5	14.2	15.8	18.3	4.5	7.1	4.9	29.5
Total	122.3	83.5	136.2	17.8	154.2	154.5	10.8	175.3	6.4	296.3

Source: Sivaprakasam (1986)

Gulf of Mannar

The demersal resources as surveyed by **Matsya Nireekshani** are presented in Table 7. The area 7-78 lying southeast of Manappad is an extension of the Wadge Bank as could be seen by the dominance of perches and file fish. Rays also abound in this area. Mackerel, carangids and barracuda are other quality species in this area. The area 8-78 off Manappad to Tuticorin presents an interesting picture of the resource. The coastal belt upto 50m yields good catch rates and is rich in perches (33%), carangids (15.5%) etc. The 50-100m depth zone is rocky and not very much amenable for trawling. The depth range of 100-200m yielded the highest catch rate of 175.3 kg/hr. Interestingly, crabs formed bulk of the catch 38.2% (8.5% in Wadge Bank), followed by barracuda (27%). The depth 200-500m yielded poor catch. The area 9-78 off Kilakkarai - Mandapam was very rich and yielded the highest catch rate of 296.3 kg/hr. The catch was dominated by quality fishes (perches 31.1%, pomfrets 7.6%, **Caranx** spp. 3.4%). Silver bellies formed a high percentage (22.9%) next only to the perches.

Coromandel coast

The results of demersal resources survey upto 300m depth by **Matsya Jeevan** are presented in Table 8 and Fig.5. It will be seen that the total catch rates are very low in the southern latitudes, which gradually increase towards northern latitudes. It was 159.4 kg/hr in lat. 14°N and reached the highest figure of 198.7 kg/hr in lat. 15°N. The lat. 14°N referred here represents area between lat. 14°N and 15°N, and lat. 15°N refers to area between lat. 15°N and 16°N and so on. But for sake of convenience it is referred as lat. 14°N, lat. 15°N and so on.

The latitude 10°N off Point Calimere has the widest shelf area. The catch rates increase with increasing depth. The highest catch rate was 103 kg/hr in 200-300m depth in the Pedro Bank where deepsea prawns (5.2%) and deepsea lobster (0.5%) occur. The perches dominated the catch upto 100m depth. Carangids formed an important item.

Latitude 11°N off Cuddalore-Pondicherry has the narrowest shelf. Silver bellies dominated the catch (30%) in shallow waters upto 50m, while perches dominated the catch in 50-200m depth.

In latitude 12°N south of Madras, the catch rates increased steadily with increasing depth, reaching the highest figure of 267 kg/hr in 200-300m depth. Carangids, silver bellies, mackerel and scad dominated the catch in the 0-50m depth. Scad and mackerel were the major constituents in the next depth range. Deepsea resources such as the Big-eye (**Priacanthus** spp.) dominated the catch (81.6%) in 100-200m and Black ruff (**Centrolophus** sp.) in 200-300m forming 92.9% of catch.

Latitude 13°N north of Madras also presents a picture similar to that of 12°N, with catch rates increasing with increasing depth. Mackerel dominated the catch followed by silver bellies and carangids in the depths 0-50m and 50-100m. The depths 100-200m and 200-300m were dominated by the deepsea fishes, **Priacanthus** spp. and **Centrolophus** sp. respectively.

Table 8. Species-wise CPUE obtained in bottom trawl survey by Matsya Jeevan along Coromandel coast, 1983-88

Latitude	10°N				11°N				12°N				13°N				14°N				15°N			
Depth zone (m)	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300
Sampling hours	405	297	297	164	229	155	4	-*	740	635	207	50	174	243	52	61	101	139	74	34	204	233	60	31
CPUE (kg/hr)																								
Sharks & skates	3.6	0.9	0.2	0.8	2.8	1.6	-	0.4	0.3	0.6	-	-	0.61	2.0	-	2.1	7.8	4.9	2.0	-	6.2	2.2	1.2	1.6
Rays	7.4	4.8	-	-	7.0	10.6	-	-	1.1	0.6	0.3	-	0.9	0.4	3.4	-	7.4	2.7	-	-	16.1	2.0	3.1	--
Barracuda	0.3	0.3	-	-	0.3	0.5	-	-	0.6	1.1	-	-	0.6	0.8	4.5	-	12.6	2.8	-	-	4.6	6.1	0.3	-
Cat fish	0.4	0.2	-	-	2.5	2.0	-	-	3.0	1.8	--	-	1.7	0.9	-	-	1.5	3.1	9.4	-	6.5	8.6	18.3	-
Perches	21.7	20.4	0.1	-	4.8	12.7	10.5	-	1.9	2.2	-	-	1.7	1.0	-	-	6.3	6.2	14.1	-	21.0	5.0	8.9	-
Pomfret	-	-	-	-	0.1	-	-	-	0.2	-	-	-	1.7	0.3	-	-	0.2	0.1	-	-	1.3	45.6	-	-
Caranx	5.8	4.5	-	-	6.2	2.9	-	-	8.0	4.4	-	-	6.4	4.4	-	-	11.7	6.7	10.9	-	20.3	15.8	10.5	-
Decapterus spp.	2.2	9.2	18.0	0.7	2.7	7.2	-	0.4	4.2	11.1	9.8	-	2.3	5.3	0.1	-	1.4	12.7	-	-	1.1	-	-	-
Nemipterus spp.	0.1	1.1	7.1	-	1.2	0.8	3.7	-	1.9	5.9	5.4	-	1.5	1.8	6.4	-	4.6	18.1	10.3	-	5.5	15.0	22.7	0.1
Silver belly & gerrids	1.5	0.2	0.1	-=	14.9	8.8	0.5	-	7.3	4.7	-	-	8.1	9.6	-	-	48.9	35.5	2.2	-	54.9	3.2	10.9	-
Clupeids	0.2	-	-	-	0.1	0.2	-	-	2.9	5.6	-	-	6.1	0.5	-	-	5.9	6.7	-	-	2.8	5.9	-	-
Mackerel	0.7	0.5	-	-	2.8	3.1	-	-	4.4	6.8	-	-	9.0	17.4	-	-	11.7	48.7	-	-	5.5	1.9	-	-
Ribbon fish	-	-	-	-	0.1	-	-	-	-	0.2	-	-	0.1	0.1	-	-	-	-	3.8	-	0.5	37.1	-	-
Horse mackerel	0.1	-	-	-	0.2	0.7	-	-	0.2	0.4	-	-	1.9	0.8	-	-	0.1	0.4	3.0	-	1.2	6.4	-	-
Seer fish	0.5	0.1	-	-	0.2	0.2	-	-	0.8	0.1	-	-	0.8	0.5	-	-	0.6	0.3	-	-	1.8	2.4	-	-
Ghol	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	16.1	-	2.7	5.4	2.6	-
Smaller sciaenids	0.1	-	-	-	1.5	0.1	-	-	0.8	0.9	0.1	-	0.7	1.1	-	-	-	0.8	10.2	-	12.2	17.8	12.5	-
Ariomma indica	-	-	0.1	1.3	-	-	-	0.6	0.1	1.9	0.4	-	0.1	1.1	0.7	0.3	3.8	11.1	50.3	-	0.8	20.4	1.3	-
Priacanthus spp.	-	0.1	12.0	0.2	-	-	-	7.6	-	2.9	135.0	15.4	1.8	2.8	48.6	14.5	1.9	3.9	34.1	33.6	0.5	1.9	28.7	4.5
Centrolophus sp.	-	-	3.1	17.8	-	-	-	132.8	-	-	13.0	247.8	-	-	7.1	132.7	-	0.4	5.7	63.2	-	36.2	11.9	49.1
Other deepsea fishes	-	-	17.5	75.6	-	-	-	38.8	-	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	0.1
Squids & cuttle fish	0.4	0.2	0.3	0.4	2.0	1.5	-	0.2	1.1	2.6	-	-	1.9	2.3	-	4.9	1.4	6.4	1.1	-	0.5	0.1	-	-
Deepsea prawn	-	-	2.9	5.4	-	-	-	3.6	-	-	0.8	1.7	-	-	0.4	0.9	-	-	0.8	1.6	-	-	1.3	0.8
Deepsea lobster	-	-	-	0.6	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other fishes	0.9	1.8	2.1	-	1.0	3.2	-	0.1	3.0	3.9	0.4	0.1	2.9	2.9	9.7	0.3	12.5	8.5	0.8	0.1	13.4	6.3	21.9	0.5
Total	45.9	44.3	63.5	102.8	50.4	56.1	14.7	184.8	41.8	57.7	165.2	267.0	50.8	56.0	80.9	155.7	140.3	180.0	174.8	98.5	179.4	245.3	156.1	56.7

* No sampling. Mean CPUE of lat. 10°N and 12°N of the same depth zone adopted

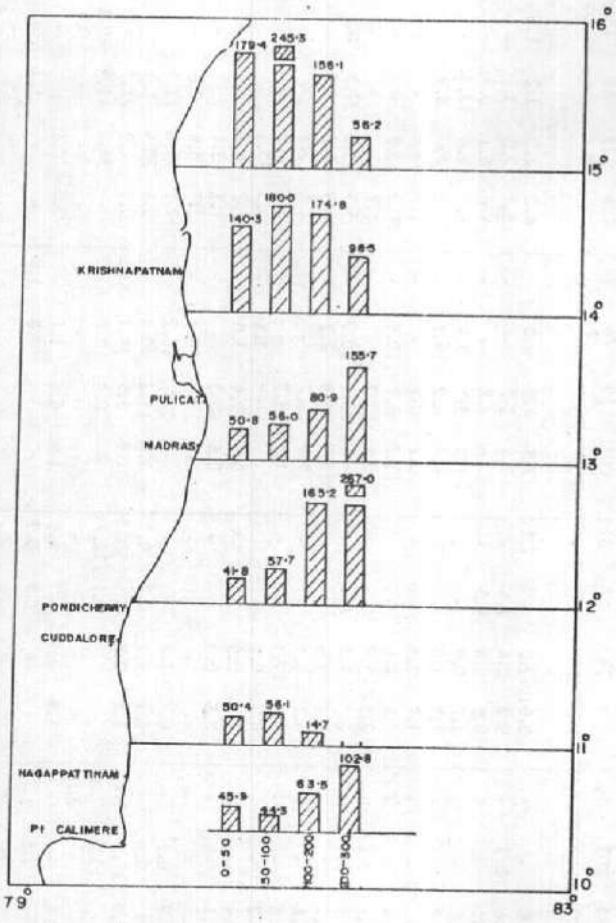

Fig. 5. CPUE (kg/hr) of demersal resources in various latitudes/depth ranges along Coromandel coast obtained by Matsya Jeevan during April'83 - March 1988

Latitude 14°N off Krishnapathan presents an interesting picture. The depths 0-200m are very rich, the catch rate reaching the highest figure in the depth 50-100m and lowest in 200-300m. The 0-50m depth zone is dominated by silver bellies, 50-100m by mackerel and 100-200m by Indian drift fish **(Ariomma indica).** 200-300m abounds in deepsea species **Centrolophus** sp. and **Priacanthus** spp.

In latitude 15°N south of Nizampatnam, the picture is similar to that in 14°N. The depth 0-50m is dominated by silver bellies (30.4%) followed by perches and carangids. Pomfrets are dominant with 18.6% in the depth range 50-100m followed by ribbon fish and **Centrolophus** sp. **Priacanthus** spp. dominated the 100-200m depth zone with 56.9%. 200-300m depth was dominated by **Centrolophus** sp. (80.7%).

It may be mentioned here that shrimp trawls were not used in this survey in the inshore regions and hence the CPUE values of coastal shrimps could not be collected.

5.2 OCEANIC RESOURCES

The oceanic resources of the Coromandel coast between lat. 10°N and 15°N upto the 200 mile EEZ were surveyed by **Matsya Harini** by tuna long lining during the years 1985-88. The area-wise and latitude-wise results are furnished in Table 9. It will be seen that tunas, mostly yellowfin, occurred in all the areas. Hooking rate of "all fish" and of tunas obtained in squares of 1° lat. x 1° long. are respectively given in Fig. 6 and 7.

Table 9. Results of tuna longline survey by Matsya Harini in the EEZ along Coromandel coast between July'85 and March 1988

Lat.-Long.	Hooks operated	Hooking rate (%)				
		Total	Tuna	Billfishes	Sharks	Others
10°-80°	2775	3.35	2.27	0.14	0.82	0.12
10°-81°	2125	3.01	0.89	0.33	1.78	0.01
Lat. 10°	4900	3.20	1.67	0.22	1.24	0.07
11°-80°	16945	2.95	0.43	0.72	1.61	0.19
11°-81°	7050	2.10	0.61	0.43	0.96	0.10
11°-82°	3500	6.65	2.94	0.31	2.28	1.12
11°-83°	1000	10.10	2.90	0.20	7.00	-
Lat. 11°	28495	3.32	0.87	0.58	1.72	0.15
12°-80°	27025	3.65	1.02	0.47	1.92	0.24
12°-81°	21650	2.80	0.80	0.49	1.41	0.10
12°-82°	8000	4.25	1.07	0.47	2.52	0.19
12°-83°	3000	4.60	0.76	1.03	2.66	0.15
Lat. 12°	59675	3.47	0.93	0.51	1.85	0.18
13°-80°	16500	2.43	0.77	0.41	1.13	0.12
13°-81°	16905	3.15	1.46	0.40	1.18	0.11
13°-82°	8625	2.55	1.28	0.25	0.95	0.07
13°-83°	5000	2.80	1.18	0.32	1.18	0.12
13°-84°	1000	4.80	2.90	1.20	0.70	0.00
Lat. 13°	48030	2.79	1.19	0.38	1.11	0.11
14°-80°	5425	1.05	0.29	0.23	0.33	0.20
14°-81°	5750	2.05	0.83	0.31	0.78	0.13
14°-82°	5750	1.82	0.27	0.40	1.06	0.09
14°-83°	4000	2.82	1.25	0.22	1.35	-
14°-84°	2500	1.68	0.56	0.12	1.00	-
14°-85°	1500	3.20	1.66	0.60	0.73	0.21
Lat. 14°	24925	1.93	0.67	0.30	0.85	0.11
Total	166025	3.01	0.98	0.45	1.45	0.13

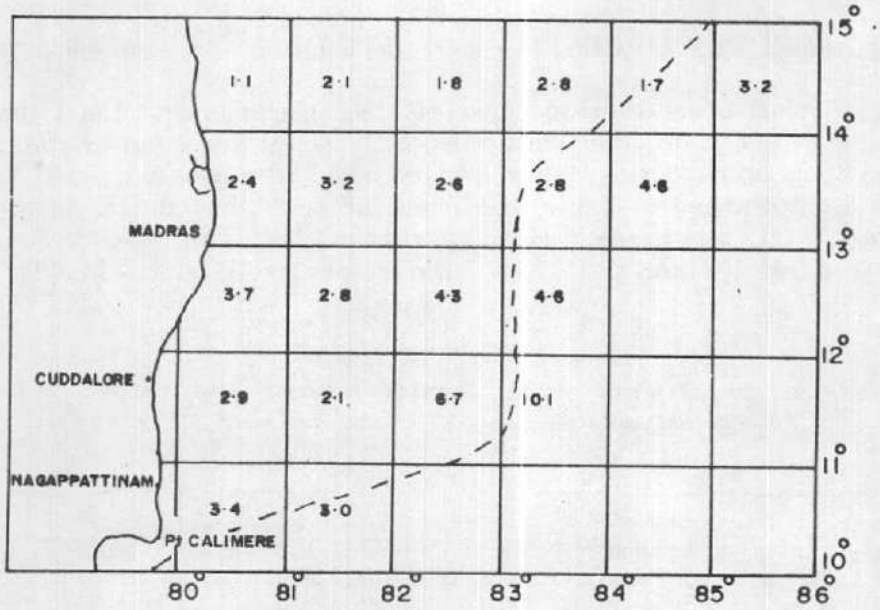

Fig. 6. Hooking rate (%) of 'All fish' - areawise- obtained in tuna longline survey along south east coast

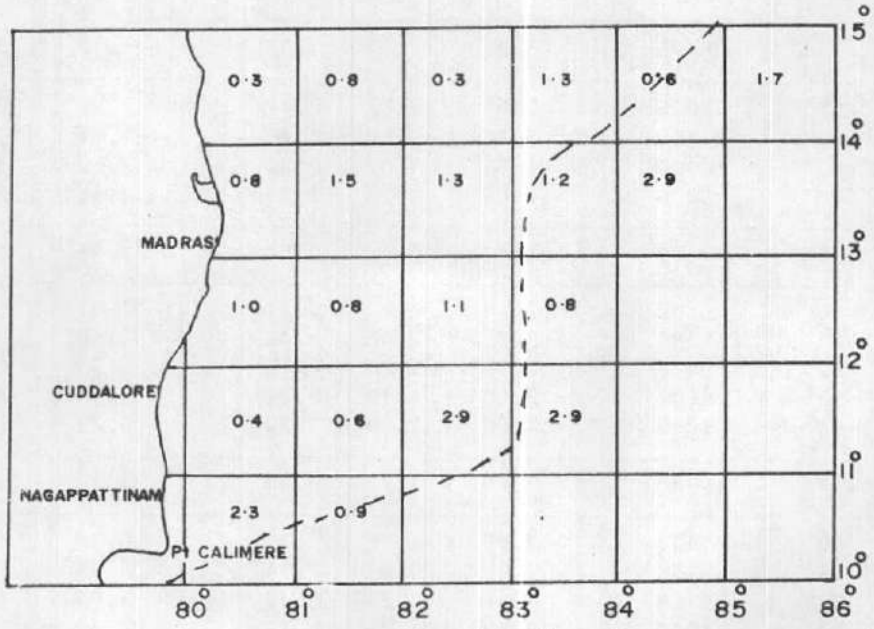

Fig. 7. Hooking rate (%) of tunas - areawise- obtained in tuna longline survey along south east coast

High hooking rates (1.7% to 2.9%) for tuna were obtained in areas 10-80, 11-82, 11-83, 13-84 and 14-85. Table 10 shows that along the lower east coast, the season for tunas starts from December and lasts till April (also see Fig.8). Table 11 presents the percentage composition of the tuna longline catch. It will be seen that the tunas form 32.7% of the catch by number and 35% by weight. Among the tunas, 99.7% are formed by yellowfin and 0.3% by skipjack by weight. Sharks form 45% of the catch and bill fishes 19.2% by weight (Fig. 9).

Table 10. Seasonal variation in the tuna longline catch in the EEZ along Coromandel coast obtained by Matsya Harini between July'85 and March 88

Month	No.of hooks operated	Hooking rate (%)				
		Total	Tuna	Bill fishes	Shark	Others
April	12950	2.7	1.43	0.16	1.05	0.06
May	12425	1.93	0.65	0.31	0.86	0.11
June	13750	1.54	0.28	0.50	0.67	0.09
July	16320	1.59	0.06	0.57	0.80	0.16
August	19250	1.79	0.13	0.46	1.07	0.13
September	19980	2.61	0.06	0.63	1.67	0.25
October	5750	2.66	0.03	0.78	1.63	0.22
November	3000	0.80	0.06	0.20	0.03	0.51
December	11750	3.81	2.17	0.22	1.35	0.07
January	14500	5.04	2.54	0.20	2.11	0.19
February	13100	5.77	1.62	0.69	3.35	0.11
March	23250	4.10	1.87	0.42	1.73	0.08

Table 11. Composition of tuna longline catch in the EEZ along Coromandel coast between lat. 10°-15°N obtained by Matsya Harini between July'85 and March'88 (in percentage)

Species	Yellow-fin tuna	Skip-jack	Marlin	Sail fish	Sword fish	Shark	Others
By number	31.8	0.9	7.1	7.5	0.2	48.2	4.3
By weight	35.0	0.1	10.3	8.6	0.3	45.0	0.7

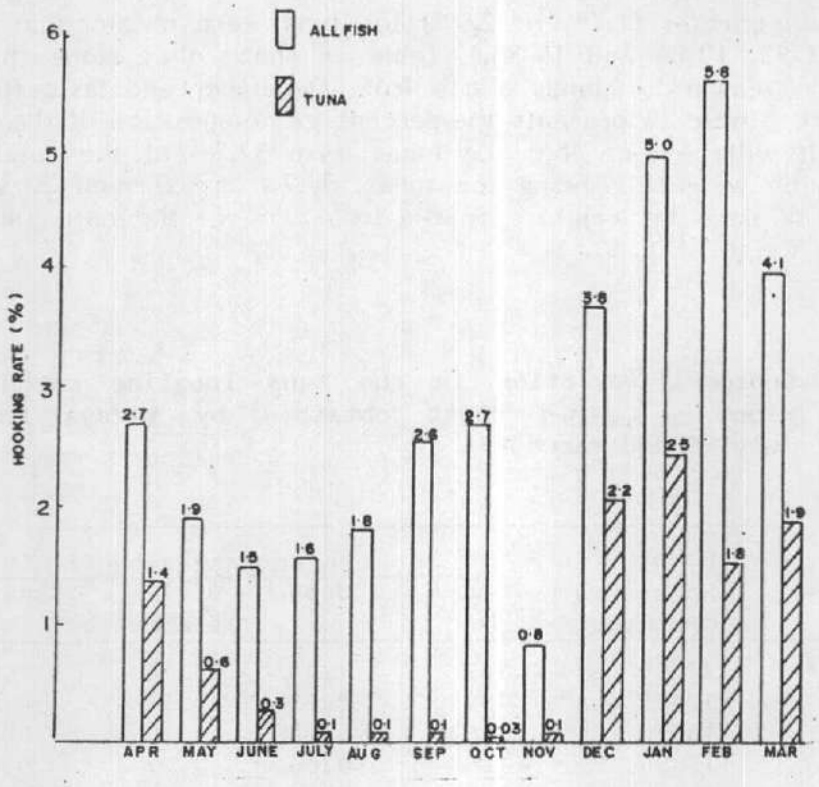

Fig. 8. Seasonal variation in the hooking rate (%) of 'All fish' and tunas obtained in longline survey along the lower east coast of India

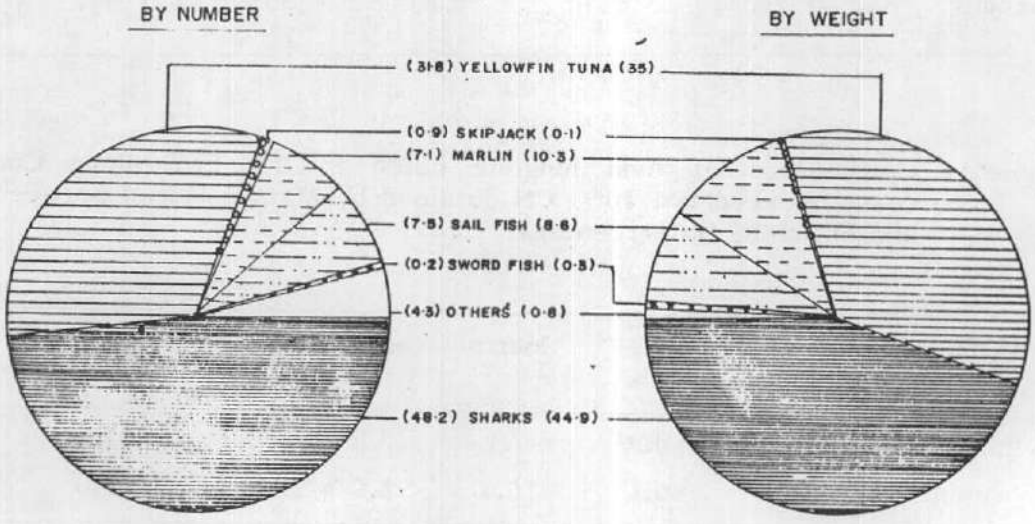

Fig. 9. Percentage composition of tuna longline catch along the lower east coast of India

6. MARINE FISHERY POTENTIAL ALONG LOWER EAST COAST

The fishery potential of different regions of the lower east coast of India has been studied by several authors. The estimates of the fishery potential by various authors are summarised in Table 12.

The Wadge Bank is one among the extensively investigated areas. The potential yield of demersal and pelagic resources of the Bank has been estimated by George **et al.** (1977) as 87,750 tonnes. Among the various assessments of demersal component of this region, the biomass estimate of 38,665 tonnes by Sivaprakasam (1986) is based on the most recent trawl survey (1983-85). The biomass of the Gulf of Mannar stock also has been estimated by the same author as 24,115 tonnes. The details of assessment from the different latitudes/longitudes and depth zones are given in Table 13. These assessments pertain to 20-200m depth zone whereas the estimates in the present paper envisage coverage of demersal stocks in the entire continental shelf and slope. Computation of biomass for the 0-20m depth range is made assuming the same rate of CPUE obtained in the 20-50m depth zone of the respective regions. Further, for the continental slope, the biomass estimated by Sudarsan **et al.** (1988) for 200-300m depth belt is adopted. The combined estimate of biomass for the Wadge Bank - Gulf of Mannar region is made as 97,631 tonnes (Table 14). Assuming that the current production is derived mostly from 0-50m depth zone and that the crustacean landing is more or less at the MSY level, the potential yield of demersal resources in Wadge Bank and Gulf of Mannar is estimated as 83,724 tonnes.

As regards the fishery potential of Palk Bay, no estimate is available. However, the Bay is more or less fully exploited and it is reasonable to assume that the current production of about 42.7 thousand tonnes of demersal resources as equivalent to the potential yield.

The biomass in the Coromandel coast is assessed based on trawl survey results obtained by Matsya Jeevan presented in Table 8. Summary description of parameters used for calculation of swept area, stock density and potential yield are given in Table 15. The density of the important species/groups in the different latitudes and depth zones is given in Table 16 and the corresponding standing stock estimates are given in Table 17. The biomass in continental shelf (0-200m) is assessed as 72,051 tonnes and in the slope (200-300m) 10,366 tonnes. Having regard to the current production, which is mainly harvested from within the 50m depth contour, the potential yield for shelf and slope together works out to 79,761 tonnes (Table 18).

It can be seen from Tables 14 and 18 that the demersal stocks within 50m contour is almost fully exploited in the lower east coast with a possible additional yield of about 5,800 tonnes from Wadge Bank and Gulf of Mannar. The aggregate potential yield of demersal resources from different depth zones of Wadge Bank, Gulf of Mannar and Coromandel coast is estimated as 206.2 thousand tonnes and the additional harvestable yield as 38.6 thousand tonnes which is to come mostly from the outer continental shelf and slope (Table 19).

Table 12. Estimates of fishery potential along the lower east coast

Author	Region	Resource	St. Stock(t)	Pot. yield (t)	Method of assessment
Shomura in Gulland (1971)	Wadge Bank	Demersal	-	7,000	
George et al (1977)	Wadge Bank 1/	Demersal & pelagic	1,80,000	87,750	Organic productivity and fish production
	Wadge Bank 2/	Demersal	73,000	-	Acoustic survey
Antony Raja (1980)	Wadge Bank 3/	Demersal	-	8,400	
	Pedro Bank	Demersal	-	450	
Joseph et al (1987)	Wadge Bank	Demersal	38,330	19,165	Swept area
Sivaprakasam (1986)	Wadge Bank	Demersal	38,665	26,832	Swept area
	Gulf of Mannar	Demersal	24,115	17,057	Swept area
Anon (1976)	Gulf of Mannar	Demersal & pelagic	1,27,000 to 9,70,000	-	Acoustic survey
Jones and Banerji (1973)	Tamil Nadu and Pondicherry coast	Demersal	-	50,000	Organic productivity
Joseph et al (1976)	South east coast: 0-75m	Demersal	1,24,232	74,539	Swept area
George et al (1977)	South east coast: 0-50m	Demersal & pelagic	-	4,78,000	Organic productivity and current yield
	50-200m	Demersal & pelagic		1,96,000	
Antony Raja (1980)	South east coast 4/	Demersal & pelagic	-	-	Tertiary productivity
Joseph (1982)	South east coast	Demersal	-	2,31,300	Swept area
Williams (1981)	Tamil Nadu (EEZ)		-	3,50,000	
Joseph (1987)	South east coast: 0-200m	Demersal & pelagic	-	4,11,000	Swept area and current yield
Alagaraja (1987)	South east coast: 0-50m	Demersal & pelagic	-	5,00,000	
	50-200m	Demersal & pelagic	-	2,50,000	
Dharmaraja et al (1987)	Tamil Nadu coast	Demersal & pelagic	-	3,25,000	Maximum contribution approach
Sudarsan et al (1989)	South east coast EEZ	Oceanic & allied species	-	3,000	Longline survey
Sudarsan et al (1990)	South east coast: 0-50m	Demersal & pelagic	-	4,01,300	Swept area and current yield
	50-200m	Demersal & pelagic	-	97,800	
	200-300m	Demersal	-	3,100	

1/ Based on Cushing (1971) 2/ Based on PFP survey 3) Based on Mendis (1965)

4/ Based on Cushing (1971) and assuming 75% of tertiary production as potential yield

Table 13. Biomass of demersal resources in different area/depth strata of Wadge Bank and Gulf of Mannar

Region	Area	Depth strata (m)	Area (sq.km)	CPUE (kg/hr)	Biomass (t/sq.km)	Total biomass (t)
WADGE BANK	8-77	20-50	1496	146.3	4.146	6202.9
		50-100	280	93.7	2.655	743.5
	7-77	20-50	2045	146.3	4.146	8479.2
		50-100	3551	93.7	2.655	9429.7
		100-200	2926	166.5	4.719	13807.2
Total		20-200	10298	-	3.754	38662.5
GULF OF MANNAR	7-78	20-50	417	145.6	4.126	1720.7
		50-100	265	93.7*	2.655	703.7
		100-200	206	175.3**	4.968	1023.0
	8-78	20-50	2075	157.0	4.449	9232.7
		50-100	598	93.7*	2.655	1588.0
		100-200	1373	175.3	4.968	6821.3
	8-79	100-200	164	175.3**	4.968	814.8
	9-78	20-50	128	296.3	8.397	1074.9
		50-100	15	93.7*	2.655	39.8
	9-79	20-50	118	296.3***	8.397	990.9
		50-100	39	93.7*	2.655	103.6
Total		20-200	5398	-	4.467	24113.4

* Due to inadequate sampling, CPUE of Wadge Bank taken

** Due to absence of sampling, CPUE of the area 8-78 taken

*** Due to absence of sampling, CPUE of the area 9-78 taken

Source: Sivaprakasam (1986)

Table 14. Biomass, potential yield and additional harvestable yield of demersal resources in the Wadge Bank and Gulf of Mannar

Depth zone (m)	Biomass	Current yield (1983-1988)	Potential yield	Additional harvestable yield
0-20	34003	50056 + 9880 *	55880 + 9880 *	5824
20-50	27701 1/			-
50-100	12608 1/	-	6304	6304
100-200	22466 1/	-	11233	11233
200-300	853 2/	-	427	427
Total	97631	59936	83724	23788

* Crustaceans (The crustacean landing in Tamil Nadu is apportioned to different regions following the proportion of total marine landing from the respective regions)

Source: 1/ Sivaprakasam (1986)

2/ Sudarsan **et al.** (1988)

Table 15. Summary description of parameters used for estimation of swept area, stock density and potential yield.

Length of gear head rope	: 27m
Wing spread of the net	: 40%
Average trawling speed	: 3.5 knots
Catchability coefficient	: 0.5
Potential yield: Exploited stock*	: 0.5 (Y + MB)
Unexploited stock:	0.5 MB
Natural mortality coefficient, M = 1	

* Stock within 50m depth treated as exploited and outside 50m as unexploited

Table 16. Density (kg/sq.km) of demersal stocks along Coromandal coast based on survey by Matsya Jeevan during 1985-88

Latitude / Depth zone (m)	10°N				11°N				12°N				13°N				14°N				15°N			
	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300	<50	50-100	100-200	200-300
Sharks & skates	103	26	6	23	80	46	-	11	9	17	-	-	17	57	-	60	223	140	57	-	177	63	34	46
Rays	211	137	-	-	200	303	-	-	31	17	9	-	26	11	97	-	211	77	-	-	460	57	89	-
Barracuda	9	9	-	-	9	14	-	-	17	31	-	-	17	23	129	-	360	80	-	-	131	174	9	-
Cat fish	11	6	-	-	71	57	-	-	86	51	-	-	49	26	-	-	43	89	269	-	186	246	523	-
Perches	620	583	3	-	137	363	300	-	54	63	-	-	49	29	-	-	180	177	403	-	600	143	255	-
Pomfret	-	-	-	-	3	-	-	-	6	-	-	-	49	9	-	-	6	3	-	-	37	1303	-	-
Caranx	166	129	-	-	177	83	-	-	229	126	-	-	183	126	-	-	334	191	311	-	580	451	300	-
Decapterus spp.	63	263	514	20	77	206	-	11	120	317	280	-	66	151	3	-	40	363	-	-	31	-	-	-
Nemipterus spp.	3	31	203	-	34	23	106	-	54	169	154	-	43	51	183	-	131	517	294	-	157	429	649	3
Silver belly & gerrids	43	6	3	-	426	251	14	-	209	134	-	-	231	274	-	-	1397	1014	63	-	1568	91	311	-
Clupeids	6	-	-	-	3	6	-	-	83	160	-	-	174	14	-	-	169	191	-	-	80	169	-	-
Mackerel	20	14	-	-	80	89	-	-	126	194	-	-	257	497	-	-	334	1391	-	-	157	54	-	-
Ribbon fish	-	-	-	-	3	-	-	-	-	6	-	-	3	3	-	-	-	-	109	-	14	1060	-	-
Horse mackerel	3	-	-	-	6	20	-	-	6	11	-	-	54	23	-	-	3	11	86	-	34	183	-	-
Seer fish	14	3	-	-	6	6	-	-	23	3	-	-	23	14	-	-	17	9	-	-	51	69	-	-
Ghol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	460	-	77	154	74	-
Smaller sciaenids	3	-	-	-	43	3	-	-	23	26	3	-	20	31	-	-	-	23	291	-	349	509	357	-
Ariomma indica	-	-	3	37	-	-	-	17	3	54	11	-	3	31	20	9	109	317	1437	-	23	583	38	-
Priacanthus spp.	-	3	343	6	-	-	-	217	-	83	3857	440	51	80	1389	414	54	111	974	960	14	54	820	129
Centrolophus sp.	-	-	89	509	-	-	-	3794	-	-	371	7079	-	-	203	3791	-	11	163	1806	-	1034	340	1403
Other deepsea fishes	-	-	500	2160	-	-	-	1109	-	-	-	57	-	-	-	-	-	-	-	-	-	-	-	3
Squids & cuttle fish	11	6	9	11	57	43	-	6	31	74	-	-	54	66	-	140	40	183	31	-	14	3	-	-
Deepsea prawn	-	-	83	154	-	-	-	103	-	-	23	49	-	-	11	26	-	-	23	46	-	-	37	23
Deepsea lobster	-	-	-	17	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other fishes	26	51	60	-	29	91	-	3	86	111	11	3	83	83	277	9	357	243	23	3	383	180	626	14
Total	1312	1267	1816	2937	1441	1604	420	5280	1196	1647	4719	7628	1452	1599	2312	4449	4008	5141	4994	2815	5123	7009	6758	1621

Table 17. Biomass of demersal resources along Coromandel coast latitude-wise and depth-wise based on survey by Matsya Jeevan during 1983-88

(in tonnes)

Latitude	10°N				11°N				12°N				13°N				14°N				15°N			
Depth zone (m)	< 50	50-100	100-200	200-300	< 50	50-100	100-200	200-300	< 50	50-100	100-200	200-300	< 50	50-100	100-200	200-300	< 50	50-100	100-200	200-300	< 50	50-100	100-200	200-300
Area (sq.km)	2560	1280	1510	360	1800	675	260	205	2325	2100	725	725	1825	785	415	450	2040	525	395	120	5210	625	470	220
Sharks & skates	264	33	9	8	144	31	-	2	21	36	-	-	31	45	--	27	455	74	23	-	922	39	16	10
Rays	540	175	-	-	360	205	-	-	72	36	7	-	47	9	40	-	430	40	-	-	2397	36	42	-
Barracuda	23	12	-	-	16	9	-	-	40	65	-	-	31	18	54	-	437	42	-	-	683	109	4	-
Cat fish	23	12	-	-	128	38	-	-	200	107	-	-	89	20	-	-	88	47	106	-	969	154	246	-
Perches	1587	746	5	-	247	245	78	-	126	132	-	-	89	23	-	-	367	93	159	-	3126	89	119	-
Pomfret	-	-	-	-	5	-	-	-	14	-	-	-	89	7	-	-	12	2	-	-	193	814	-	-
Caranx	425	165	-	-	319	56	-	-	532	265	-	-	334	99	-	-	681	100	123	-	3022	282	141	-
Decapterus spp.	161	337	776	7	139	139	-	2	279	666	203	-	120	119	1	-	82	191	-	-	162	-	-	-
Nemipterus spp.	8	40	307	-	61	16	28	-	126	355	112	-	78	40	76	-	267	271	116	-	818	268	305	-
Silver belly & gerrids	110	8	5	-	767	169	4	-	486	281	-	-	422	215	-	-	2850	532	25	-	8169	57	146	-
Clupeids	15	-	-	-	5	4	-	-	193	336	-	-	318	11	-	-	345	100	-	-	417	106	-	-
Mackerel	51	18	-	-	144	60	-	-	293	407	-	-	469	390	-	-	681	730	-	-	818	34	-	-
Ribbon fish	-	-	-	-	5	-	-	-	-	13	-	-	5	2	-	-	-	-	43	-	73	663	-	-
Horse mackerel	8	-	-	-	11	14	-	-	14	23	-	-	99	18	-	-	6	6	34	-	177	114	-	-
Seer fish	36	4	-	-	11	4	-	-	53	6	-	-	42	11	-	-	35	5	-	-	266	43	-	-
Ghol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	182	-	401	96	35	-
Smaller sciaenids	8	-	-	-	77	2	-	-	53	55	2	-	37	24	-	-	-	12	115	-	1818	318	168	-
Ariomma indica	-	-	5	13	-	-	-	3	7	113	8	-	5	24	8	4	222	166	568	-	120	364	18	-
Priacanthus spp.	-	4	518	2	-	-	-	44	-	174	2796	319	93	63	576	186	110	58	385	115	73	34	385	28
Centrolophus sp.	--	-	134	183	-	-	=	778	-	-	269	5132	-	-	84	1706	-	6	64	217	-	646	160	309
Other deepsea fishes	-	-	755	778	-	-	-	227	-	-	-	41	-	-	-	-	-	-	-	-	-	-	-	1
Squids & cuttle fish	28	8	14	4	103	29	-	1	72	155	-	-	99	52	-	63	82	96	12	-	73	2	-	-
Deepsea prawn	-	-	125	55	-	-	=	21	-	-	17	36	-	-	5	12	-	-	9	6	-	-	17	5
Deepsea lobster	-	-	-	6	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other fishes	67	65	91	-	52	61	-	1	200	233	8	2	151	65	115	4	728	128	9	1	1995	113	294	3
Total	3359	1623	2744	1056	2594	1082	110	1082	2781	3458	3422	5530	2648	1255	959	2002	8175	2699	1973	339	26692	4381	2096	357

Table 18. Biomass, potential yield and additional harvestable yield of demersal resources in the Coromandel coast (lat. 10°-15°N)

(in tonnes)

Depth zone(m)	Biomass	Current yield (1983-88)	Potential yield	Additional harvestable yield
0-50	46249	52800 + 12152*	49525 + 12152*	(-) 3275 -
50-100	14498	-	7249	7249
100-200	11304	-	5652	5652
200-300	10366	-	5183	5183
Total	82417	64952	79761	14809

* Crustaceans

Table 19. Summary statement of estimates of potential yield and additional harvestable yield of demersal resources in the different regions of lower east coast.

('000 tonnes)

Region	Continental* shelf/slope	Current yield (1983-1988)	Potential yield	Additional harvestable yield
Wadge Bank & Gulf of Mannar	Shelf	59.9	83.3	23.4
	Slope	-	0.4	0.4
	Sub total	59.9	83.7	23.8
Palk Bay		42.7	42.7	-
Coromandel coast	Shelf	65.0	74.6	9.6
	Slope	-	5.2	5.2
	Sub total	65.0	79.8	14.8
Total		167.6	206.2	38.6

* Continental shelf taken as 0-200m depth and slope as 200-300m

No attempt is made in this study to assess the pelagic fishery potential. Sudarsan **et al.** (1990) have recently worked out the potential yield of pelagic resources along the lower east coast as 274 thousand tonnes. By adopting this estimate the total fishery potential of the continental shelf and slope along the lower east coast is assessed as 480.2 thousand tonnes. A summary of the assessment made herein is given below.

('000 tonnes)

Resource	Depth zone (m)				Total
	0-50	50-100	100-200	200-300	
Demersal	170.1	13.6	16.9	5.6	206.2
Pelagic*	213.0	32.0	29.0	-	274.0
Total	383.1	45.6	45.9	5.6	480.2

* Adopted from Sudarsan **et al.** 1990

7. PROSPECTS OF DEEPSEA FISHING ALONG LOWER EAST COAST

With the resources surveys conducted by the Fishery Survey of India presented above the picture of the inshore, offshore and deepsea demersal resources and the oceanic resources of the lower east coast is becoming increasingly clear. The picture of resources availability and its potential amply re-assures the scope for development of deepsea fishing industry in the region. The major development opportunities that emerge are:

1. The Wadge Bank offers excellent demersal resources of choice groups such as perches, carangids, seabreams, squids etc. which are of export value.

2. The Gulf of Mannar also offers excellent demersal resources such as perches, carangids, crabs, barracudas etc.

3. The area off Point Calimere (10°N) is likely to prove to be important grounds for deepsea prawns and deepsea lobster, as seen from the results of training cruises of M.V.Red Snapper and M.V.Skipper II of CIFNET (unpublished).

4. The latitudes 14°N and 15°N on the northern stretches of the lower east coast are rich grounds of quality fishes like perches, pomfrets, mackerels, carangids, barracuda, ribbon fish etc. with high catch rates.

5. The tunas, billfishes and pelagic sharks offer good scope for tuna long lining off the Coromandel coast.

Our charter experience has proved beyond doubt that deepsea fishing will be technically and financially feasible in Indian waters. The chartered vessels have operated extensively along the south east coast for demersal species and for tunas.

The economic viability of deepsea fishing will depend upon the size of the catch, the quality of the species and the value realisation. It will be seen from the resources picture depicted above that the region has fishery resources of choice fish species such as perches, squids, cuttle fish, pomfret, tuna etc. which have ready export market. It has been said that our country with a large population will be one among the major markets for fish, provided adequate infrastructure is built up for storage at the production and delivery points and necessary transport facilities are made available for regular supply of fresh fish to the interior areas which are starved of fish supply.

It has been estimated that the Wadge Bank can support 25 deepsea fishing vessels and the Gulf of Mannar about 15 vessels for demersal resources alone (Sivaprakasam, 1986). The Coromandel coast can support an equal number (40) of deepsea fishing vessels (based on an annual catch of 500 tonnes per vessel), besides about 20 tuna longliners for exploiting the oceanic resources. However, the berthing facilities for deepsea fishing vessels are awfully inadequate and are available only at Madras and no other fishing harbour in the state can accommodate deepsea fishing vessels of draughts more than 3.0 m. Drydocking facilities for these vessels, are totally absent and the vessels have to depend upon shipyards at Visakhapatnam or Cochin for annual drydocking repairs. The success of deepsea fishing in India would very much depend upon the building up of basic infrastructure for berthing, drydocking, servicing, storage, transport and marketing.

By deepsea fishing we have herein considered operations beyond 50m i.e. assumed as the limit. of traditional and mechanised boats. Along the lower east coast it has been found that the depth range 50-100m are generally more productive than the coastal waters 0-50m for demersal resources. Beyond this depth, the major constituents of demersal resources are **Nemipterus** spp., **Decapterus** spp., **Priacanthus** spp., **Centrolophus** sp., **Chloropthalmus** spp., **Ariomma indica** etc. which are low value fishes. However, the oceanic resources are mostly high value species such as yellow-fin tuna, bill fishes etc. Deepsea fishing ventures should therefore aim at exploiting the deepsea demersal resources and the oceanic resources.

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Annexure-I

Marine fish production per unit of coastline and continental shelf in different States/U.T.

State/U.T.	Length of coastline (km)		Area of continental shelf ('000 sq.km)		Average annual fish production 1983-1988 (tonnes)		Average fish production (tonnes) per km of coastline		per sq.km of shelf	
Gujarat	1215		99		307122		252.8		3.1	
Maharashtra	653		105		326609		500.2		3.1	
Goa	160		10		45073		281.7		4.5	
Karnataka	280		25		145301		518.9		5.8	
Kerala	570		36		344133		603.4		9.6	
Tamil Nadu:										
South of Pt. Calimere	532	907	27	41	184107	257394	346.1	283.8	6.8	6.3
Coromandel coast	375		14		73287		195.4		5.2	
Pondicherry	31		1		15821		510.4		15.8	
Andhra Pradesh	974		31		131691		135.2		4.2	
Orissa	476		24		55387		116.4		2.3	
West Bengal	157		23		51938		330.8		2.3	
All India*	5423		395		1680469		309.9		4.3	

* excluding the Island groups.

ANNEXURE-II

FSI publications containing information on the fishery resources of the lower east coast of India

1. Bulletin No.2 - Annual Report 1974-75
2. Bulletin No. 4 - Results of Exploratory Fishing conducted during 1975-76 (1976)
3. Bulletin No.5 - Results of Demersal Fisheries Resources survey along the East Coast of India (1976)
4. Bulletin No.6 - Results of Exploratory Fishing conducted during 1976-77 (1977)
5. Bulletin No.8 - Results of exploratory fishing conducted during 1977-78 (1978)
6. Bulletin No.9 - Results of exploratory fishing conducted during 1978-79 (1979)
7. Bulletin No.10 - Comparative study of the demersal fishery resources of the Indian waters as assessed by the 17.5m trawlers (1980)
8. Bulletin No.12 - Demersal fishery resources of Wadge Bank (1987)
9. Bulletin No.13 - Important observations on deepsea fish resources made during 1983-84 (1984)
10. Bulletin No.14 - Some observations on potential fishery resources from the Indian Exclusive Economic Zone (EEZ)
11. Bulletin No.15 - A study of the demersal resources of the Wadge Bank and Gulf of Mannar (1986)
12. Bulletin No.17 - Further studies on tuna resources in the Indian Exclusive Economic Zone (1988)
13. Bulletin No.18 - An appraisal of the marine fishery resources of the Indian Exclusive Economic Zone (1988)
14. Bulletin No.20 - Marine Fishery Resources potential in the Indian Exclusive Economic Zone - An update (1990)
15. Recent advances in fisheries resources survey along east coast. FSI Newsletter Vol.IV No.2. Special Number (1983)
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18. Results of exploratory survey of fisheries resources of Wadge Bank - Progress report No.3 (1983)
19. Chart - Demersal trawl fishery chart of Wadge Bank (1984)
20. Atlas - Atlas of tunas, billfishes and sharks in the Indian EEZ and adjacent oceanic regions (1988)

21. Occasional Paper No.1 - On the location of large shoals of Rainbow runner, **Elagatis bipinnulata** (Carangidae) off Cape Comorin (1986)

22. Occasional paper No.4 - What is in store in the deep sea? Results of explorations into the demersal fishery resources of Indian Exclusive Economic Zone (1986)