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Demersal finfish resources in certain areas of the EEZ of southwest and southeast coast of India

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ABSTRACT

Bottom trawling data from the cruises of the *FORV Sagar Sampada* undertaken during 1989-91 in the middle and outer shelf waters of the southern EEZ, at 97 stations within a depth zone of 30 to 130 m, showed catch rates of 3 to 14000 kg/hr. The highest rate of 14 t/hr was recorded at lat. 11°N/75° 23. 4' E, followed by 5.5t/hr at 8°54'N N/76° 19.6' E off the southwest coast, whereas the abundance was comparatively less off the southeast coast. The average catch rate per hour off the southwest was 724 kg and off the southeast it was 405 kg. The important demersal finfishes available were: threadfin breams (72%), major perches (5%), rays, carangids and goatfish (4% each) off the southwest; and carangids (29%), major perches (23%), rays (19%), threadfin breams (10%) and goatfish (5%) off the southeast. The depth belt of 41-80 m off both the coasts was found to be more productive than deeper regions. The results indicate that the potential yield from the depth zone of 50-100 m off the southwest coast is 2.6×10^5 tonne, which is much higher than the previous estimates of up to 1.5×10^5 tonne. The single largest group (80%) in this zone is threadfin breams, followed by bull's eye, lizard fishes and flatheads.

INTRODUCTION

Marine fish production from the southern coastal fishing grounds of India within about 50 m depth contour has been stagnating around 1×10^6 tonne, which is almost close to the estimated potential of 1.3×10^6 tonne. This production trend from the coastal zone, which is subjected to very intensive exploitation with some demersal stocks already indicating signs of overexploitation or near it, provides little opportunity for further enhancing the yield. However, beyond 50 m depth, an estimated 5×10^5 tonne are available (Anon, 1991). Some of the earlier investigations on the occurrence,

availability and abundance of major demersal and pelagic fishery resources in the nonconventional fishing grounds in the EEZ of southern India are by Silas (1969), Oommen (1974, 1980), James *et al.*, (1987). Sudarsan *et al.*, (1988) and James & Pillai (1989). The present paper deals with the geographical, bathymetric and seasonal availability and abundance of important demersal finfish resources in the middle and outer shelf waters of the southern EEZ, based on the trawling data from the cruises of the *FORV Sagar Sampada* during 1989-92.

MATERIALS AND METHODS

The study is based on the bottom trawling operations of the *FORV Sagar Sampada* in cruise nos: 56 through 91. The area covered ranged from lat. 7° to 15°N and long. 73° to 82°E, (Fig.1). The vessel has occupied 295 stations, of which bottom trawling was possible only in 97 stations in depths varying from 3 to 130 m. Usually trawling was undertaken for about one hour in each station. The catch was sorted out and analysed in the laboratory of the vessel for total biomass and species composition. Random samples were used from each station for length measurements of various species and other biological needs.

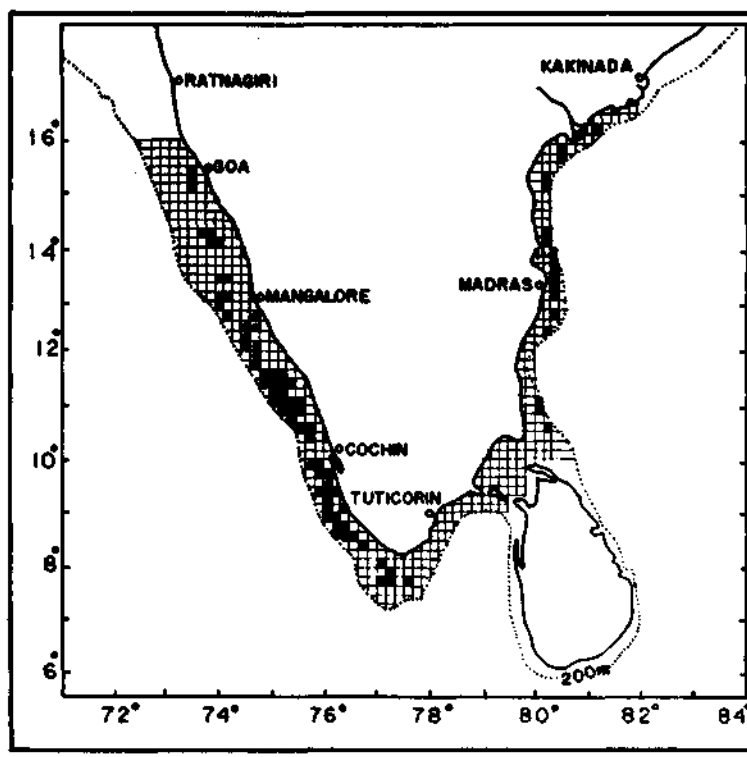

Fig.1 - Map showing the various stations (295 in number) occupied by *FORV Sagar Sampada* during 1989-92, out of which bottom trawling was undertaken in 97 stations

For analysing and processing the data, the area was demarketed into fishing grids of 1° latitude x longitude squares, each representing an area of 12373 km^2. For studying the bathymetric distribution and abundance of the stock biomass, the data were analysed for depth ranges (i) up to 50 m depth and (ii) 50-100 m depth, for each latitudinal zone. Due to the profound influence of southwest monsoon on the distribution and abundance of most of the major fishery resources in Indian waters, the calendar year has been classified into premonsoon (February to May months), monsoon (June to August) and postmonsoon (September to January), in order to understand the seasonal abundance of the resources.

RESULTS

Geographical abundance

The areawise availability and abundance of demersal finfish resources in each 1° lat x long fishing grid are presented in Tables 1 and 2. The results have indicated that the southwest coast has an average catch rate of 72 kg/hr while the southeast has a rate of 405 kg/hr, the former showing about 78% more production potential than the latter. The important groups of fishes obtained in the bottom trawl catches were: threadfin breams (72%) off the southwest coast and carangids (29%) and major perches (23%) off the southeast.

Off the southwest coast, dense grounds of demersal finfishes located in the areas, in lat. °N/long °E (in kg/hr in parentheses) are: 11°/75° (2165), 9°/76° (1609) and 11°/75° (1124), composed mostly of threadfin breams (*Nemipterus japonicus*, *N. mesoprion*), bull's eye (*Priacanthus hamrur*, *P. tayena*, *P. macrocanthus*) and goat fishes. The areas 7°/77°, 8°/76° and 11°/76° have shown abundance of more than 500 kg/hr. In the area 7°/77° which is a part of the Wadge Bank, the resources were composed mainly of major perches and percoid fishes (*Plectorhynchus crassipinna*, *P. lineatus*, *Epinephelus tauvina*, *Pristipomoides*). Some higher levels of abundance in certain specific stations occupied are: 14 t/hr in 11°N/75° 23.4'E, 10 t/hr in 9°19'N/76°02 'E, 7t/hr in 10°30'N/75°40.5'E, 5.5t/hr in 8°54'N/76° 19.60'E and 5 t/hr in 9° 0.4' N/76° 0.4'E. Off the southeast, the fishing area 10°N/80°E has recorded the highest catch of 1,033 kg/hr, with major perches (*Pristipomoides typus*, *Epinephelus*, *Lutjanus*) forming the bulk. The areas 14°N/80°E and 15°N/80°E have yielded catch rates of 650 and 465 kg/hr respectively with goatfishes, carangids and rays forming the bulk in the former and threadfin breams and bull's eye in the latter.

Bathymetric/seasonal availability and abundance

The bathymetric availability and average abundance of demersal finfish resources as well as the major component species are presented in Tables 3 and 4. Analyses of the above data have indicated that for the southwest zone as a whole, the depth range of 50 to 100 m is more productive, with an average catch rate of 1390 kg/hr than the range up to 50 m depth which has yielded about 580 kg/hr. Threadfin breams have

Table 1 - Areawise average abundance of demersal finfish resources (kg/hr) in the southwest sector of the E E Z of India

Major groups/ species	Area in lat. °N/long. °E.													Gross Average
	7°/77°	8°/76°	8°/77°	9°/75°	9°/76°	10°/75°	11°/74°	11°/75°	12°/74°	13°/74°	14°/73°	14°/74°	15°/73°	
Sharks	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Skates	50	-	1	-	-	-	-	-	-	-	-	-	-	4
Rays	310	-	-	-	14	-	-	-	-	-	-	-	-	25
Carangids	-	22	10	18	15	20	-	8	-	5	190	-	18	24
Rastrelliger kanagurta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver bellies	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Threadfin breams	-	707	30	261	1391	1037	100	1794	185	235	60	5	500	485
Lizard fishes	-	4	3	7	12	-	-	9	23	-	-	150	50	20
Upeneus spp	-	1	-	42	-	1	-	255	23	-	30	-	-	27
Sphyraena spp	-	-	-	-	1	1	-	4	-	-	-	-	-	-
Priacanthus spp	-	-	-	-	1	21	13	231	145	25	70	5	83	30
Perches	384	6	-	7	1	-	-	25	5	-	-	-	-	33
Platycephalus spp	-	-	-	-	1	1	-	1	184	-	-	-	-	14
Flat fishes	-	-	4	-	1	-	-	1	-	-	-	-	-	-
Trichiurus spp	-	-	-	-	-	-	-	-	21	-	-	-	10	1
Cat fishes	-	-	-	-	-	-	-	-	1	-	-	-	31	2
Other finfish	9	9	-	23	1	1	98	3	1	-	-	5	7	13
Miscellaneous	52	12	2	2	171	41	23	40	62	30	62	35	60	46
Total	805	761	50	260	1611	1123	234	2373	650	295	412	200	759	724

Table 2 - Areawise average abundance of demersal finfish resources (kg/hr) in the southeast sector of the E E Z of India

Major groups/ species	Area in lat.° N/long.° E						Gross average
	10°/80°	11°/80°	12°/80°	13°/80°	14°/80°	15°/80°	
Sharks	-	-	-	-	-	-	-
Skates	-	-	-	-	-	-	-
Rays	-	-	156	7	187	2	58
Carangids	457	-	3	3	306	-	128
Rastrelliger kanagurta	227	-	-	-	-	-	38
Silver bellies	-	-	-	-	-	-	-
Threadfin breams	1	-	-	2	1	268	45
Lizard fishes	1	-	-	1	-	5	1
Upeneus spp	-	-	-	1	107	8	19
Sphyraena spp	-	-	-	-	33	-	-
Priacanthus spp	-	-	-	-	-	75	6
Perches	303	25	-	15	-	-	12
Platycephalus spp	-	-	-	-	-	-	57
Flat fishes	-	-	2	1	-	19	4
Trichiurus spp	-	-	-	-	-	8	1
Cat fishes	-	-	-	-	-	-	-
Other finfishes	5	-	16	-	-	-	5
Miscellaneous	41	5	1	38	16	86	31
Total	1035	30	178	68	650	471	405

formed the most important single component in this depth zone followed by bull's eye, lizard fishes, flatheads, major perches and goatfishes. The study has also shown that the abundance is higher in deeper grounds along almost all the latitudinal zones, except lat, 7° and 12° N.

The seasonal availability and abundance of the major resources off the southwest zone are given in Table 5. It may be seen from the same that maximum abundance was during the monsoon season, with the average catch rate ranging between 1443 kg/hr along lat. 8°N and 2824 kg/hr along lat. 11°N. This is mainly due to the concentration

Table 3 - Bathymetric availability and average abundance of demersal finfish resources (kg/hr) along different latitudinal zones (°N) in the southwest sector of the E E Z of India, and at depths <50 m and 51-100 m.

Major groups/ species	Latitudes (°N)/Depth(m)																Gross average	
	7°		8°		9°		10°		11°		12°		13°		14°		15°			
	<50	51-100	<50	51-100	<50	51-100	<50	51-100	<50	51-100	<50	51-100	<50	51-100	<50	51-100	<50	51-100	<50	51-100
Sharks	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	1	-
Skates	-	75	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Rays	-	464	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	68
Carangids	-	-	-	21	9	18	44	5	2	8	-	2	10	-	95	-	92	50	20	15
Rastrelliger kanagurta	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver bellies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Threadfin breams	-	-	-	630	40	1721	82	1760	6	1992	900	98	470	-	33	-	-	1500	179	1100
Lizard fishes	-	-	-	5	5	11	-	-	833	18	100	23	-	-	90	-	-	150	25	30
Upeneus spp	-	-	-	1	-	20	-	46	-	-	-	27	-	-	15	-	-	-	106	14
Sphyraena spp	-	-	-	-	-	-	2	-	-	6	-	-	-	-	-	-	-	-	-	1
Priacanthus spp	-	-	-	-	2	-	5	8	59	30	300	123	-	-	38	-	25	250	59	59
Perches	1000	134	-	6	90	3	1	1	-	29	-	5	-	-	-	-	-	-	136	25
Platycephalus spp	-	-	-	-	1	-	-	-	-	1	-	210	-	-	-	-	-	-	1	30
Flat fishes	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-
Trichiurus spp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	2
Catfishes	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	42	-	6	-
Other finfishes	-	14	-	-	1	-	-	1	-	-	-	-	-	-	3	-	-	-	-	2
Miscellaneous	-	21	-	16	36	42	5	14	169	54	50	52	20	-	34	-	65	40	48	36
Total	1000	708	-	682	185	1825	139	1835	1075	2139	1350	542	500	-	308	-	224	2000	582	1392

Table 4 - Bathymetric availability and average abundance of demersal finfish resources (kg/hr) along different latitudinal zones (°N) in the southeast sector of the E E Z of India,and at depth <50 m and 51-100 m

Major groups/ species	Latitudes (°N)/Depth(m)												Gross average	
	10°		11°		12°		13°		14°		15°			
	<50 (*)	51-100	0-50 (*)	51-100	<50	51-100 (*)	<50	51-100	<50	51-100 (*)	<50 (*)	51-100	<50	51-100
Sharks		-		-	-		-	-	-			3	-	1
Skates		-		-	-		-	-	-			-	-	-
Rays		-		-	155		-	10	187			-	114	3
Carangids		455		-	3		3	5	306			-	104	115
R. kanagurta		227		-	-		-	-	-			-	-	-
Silver bellies		-		-	-		-	-	-			-	-	-
Threadfin breams				-	-		-	4	1			267	-	68
Lizard fishes		-		-	-		-	1	-			3	-	1
Upeneus spp		-		-	-		2	1	107			8	37	2
Sphyraena spp		-		-	-		-	-	33			-	11	-
Priacanthus spp		-		-	-		-	-	-			-	-	-
Perches		347		25			1	23	-			78	-	118
Platycephalus spp		-		-			-	-	-			-		-
Flat fishes		-		-	2			1	-			5	1	1
Trichiurus spp		-		-	-		-	-	-			8	-	2
Cat fishes		-		-	-		-	-	-			-	-	-
Other finfishes		-		-	-		-	-	-			-	-	-
Miscellaneous		5		5	20		66	32	16			93	33	34
Total		1034		30	178		71	77	650			467	300	345

(*) Not operated

Table 5 - Seasonal average abundance of demersal finfish resources along different latitudinal zones in the southwest sector of the E E Z of India (A = Premonsoon, B = Monsoon, C = Postmonsoon)

Major groups/species	Latitudes in °N														
	7°			8°			9°			10°			11°		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Sharks	-	(*)	-	-	-	-	-	-	-	(*)	-	-	18	3	-
Skates	-		150	3	-	-	-	-	-		-	-	-	-	-
Rays	227		475	-	-	5	-	-	-		-	-	-	-	-
Carangids	-		-	3	44	-	13	7	49		-	66	-	7	8
R. kanagurta	-		-	-	-	-	5	-	-		-	-	-	-	-
Silver bellies	-		-	-	-	-	1	-	-		-	-	-	-	-
Threadfin breams	-		-	30	1397	2	1	1351	15		2333	123	10	2687	107
Lizard fishes	-		-	11	-	1	17	8	1		-	-	-	10	5
Upeneus spp	-		-	3	-	-	-	-	67		-	-	2800	-	1
Sphyraena spp	-		-	-	-	1	-	-	-		-	3	-	9	-
Priacanthus spp	-		-	-	-	-	-	2	-		5	64	176	39	2
Perches	582		4	16	-	-	-	2	3		-	1	-	40	-
Platycephalus spp	-		-	-	-	-	-	-	-		-	-	-	1	-
Flat fishes	-		-	1	-	-	3	-	-		-	2	-	2	-
Trichiurus spp	-		-	-	-	-	-	-	-		-	-	-	-	-
Cat fishes	-		-	-	-	-	-	-	-		-	-	-	-	-
Other finfishes	13		2	21	-	9	6	3	2		-	5	-	-	10
Miscellaneous	56		27	212	1	9	28	46	44		-	20	196	27	111
Total	875		658	300	1442	26	74	1419	141		2338	282	3200	2824	241

(*) Not operated

Contd....

Table 5 — *Contd....*

Major groups/ species	Latitudes in °N												Average		
	12°			13°			14°			15°					
	A	B	C	A	B (*)	C	A	B (*)	C	A	B (*)	C	A	B	C
Sharks	-	-	1	-		-	-		-	-		-	2	1	-
Skates	-	-	-	-		-	-		-	-		-	-	-	18
Rays	-	-	-	-		-	-		-	-		-	28	-	53
Carangids	2	3	2	10		-	5		99	50		3	10	10	25
R. kanagurta	-	-	-	-		-	-		-	-		-	-	-	-
Silver bellies	-	-	-	-		-	-		-	-		-	-	-	-
Threadfin breams	488	202	3	470			15		38	1500		-	308	1328	32
Lizard fishes	50	8	40	-		-	75		15	150		-	38	2	7
Upeneus spp	2	2	34	-		-	88		5	-		-	362	-	12
Priacanthus spp	150	1	-	-		50	15		35	250		-	70	8	12
Perches	-	-	9	-		-	3		-	-		-	15	7	2
Platycephalus spp	-	245	-	-		-	-		-	-		-		-	-
Flat fishes	-	-	-	-		-	-		-	-		-	-	41	-
Trichiurus spp	-	-	-	-		-	-		-	-		-	1	-	-
Cat fishes	-	2	2	-		-	-		-	-		47	-	-	5
Other finfishes	3	-	-	-		-	-		1	-		25	6	1	6
Miscellaneous	32	244	290	20		40	25		33	-		64	82	55	66
Total	728	707	381	500		90	226		226	2000		139	922	1442	261

(*) Not operated

of threadfin breams composed of *Nemipterus mesoprion* and *N. japnonicus* along the said latitudes. The highest catch rate of 3200 kg/hr along lat. 11°N was recorded during premonsoon, brought about mostly by concentration of goatfishes and bull's eye. But, along lat. 7°N and 13 to 15°N, the abundance was better during premonsoon than during postmonsoon, there being little coverage during the monsoon. Along lat. 7°N, perches and percoid fishes composed of *Plectorhynchus crassipinna, P. lineatus, Lutjanus lineolatus, Epinephelus tauvina* and *Lethrinus nebulosus* as well as rays (*Dasyatis kuhli*) have dominated the catches during premonsoon. The important groups in the catches in the latitude during postmonsoon were skates and rays.

Estimation of potential yield

Since the vessel has conducted trawling mostly above 50 m depth zone, the potential yield has been estimated for the 50-100 m depth ranges of the southwest coast from lat. 7° to 15°N and of the southeast coast from lat. 10° to 14°N. Off the southwest coast, the potential in the above zone is estimated to be about 0.26×10^6 tonne. Of this, threadfin breams (*N. mesoprion* and *N. japonicus*) has been the single largest group with an estimated harvestable yield of 2.1×10^5 tonne, amounting to about 79% of the total demersal finfishes. Elasmobranchs composed mostly of skates and rays is estimated to be about 14000 t. The bull's eye contributed by *Priacanthus hamrur, P. tayena* and *P. macrocanthus* has a potential yield of 11000 t. The other demersal finfishes for which the sustainable potential has been estimated are in tonnes: flatheads, 56000; lizard fishes, 5500; major perches, 4700; goatfishes, 2500 tonne.

Off the southeast coast the potential trawlable yield from the 50 - 100 m depth is estimated to be only about 16000 t. Major perches formed the single largest component, with a potential of 4800 t. The important species/genera are: *Pristipomoides typus, Epinephelus, Lutjanus* and *Siganus*. This is followed by carangids, 4000 t; threadfin breams, 2782 t and mackerel 2520 t.

DISCUSSION

The total exploitable resources estimated by George *et al.* (1977) for the 50 - 200 m depth zone off Kerala, Karnataka and Goa is 3.25×10^5 tonne. According to Sudarsan *et al.* (1988), a potential of 1.41×10^5 t is obtainable from the 50 - 100 m depth zone between lat. 8° and 15° N off the southwest coast. The potential for the shelf and slope beyond 50 m depth estimated by the Working Group on revalidation (Anon, 1991) is 112300 t for the southwest and 39000 t for the southeast. Of this, the component for the 50 - 100 m depth range is calculated to be only 63000 and 13400 t only respectively. But, the present estimates of 2.6×10^5 tonnes, based on larger fishing coverages is significantly higher than those of Sudarsan *et al.* (1988) and Anon (1991).

As may be seen from the results presented, this higher estimate of the potential is mostly due to dense concentrations of threadfin breams in the 50 - 100 m depth realm

along certain latitudinal zones of the southwest coast (about 80%). Earlier, James & Pillai (1989) have reported high concentrations of this resource off the southwest coast during June - August period. The resource estimates for bull's eye, lizard fishes, flatheads, etc are more or less comparable to those of Sudarsan *et al.* (1988) and Anon (1991).

Inspite of the recent fishing efforts by some mechanised trawlers beyond 50 m and up to about 70 m depth during certain seasons of the year, the outer shelf beyond 50 m along both the coasts still remains almost unexploited. The present studies have indicated larger concentrations of demersal finfish resources such as threadfin breams, bull's eye, lizard fishes, etc, forming rich harvestable grounds in the 50 - 100 m depth belt off both the southwest and southeast coasts.

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