

**Proceedings of the  
Second Workshop on  
Scientific Results of  
*FORV Sagar Sampada***

Editors

***V.K. Pillai  
S.A.H. Abidi  
V. Ravindran  
K.K. Balachandran  
Vikram V. Agadi***



**Department of Ocean Development  
Government of India  
New Delhi  
1996**

© 1996, Department of Ocean Development

Department of Ocean Development (DOD)  
Government of India  
Mahasagar Bhavan, Block No-12  
C.G.O. Complex, Lodi Road  
New Delhi-110 003  
India

ISBN : 81-900656-0-2

### Citation Styles

#### *For entire volume*

Pillai, V.K. Abidi, S.A.H., Ravindran, V., Balachandran, K.K. & Agadi, V.V. (Eds.) 1996. *Proceedings of the Second Workshop on Scientific Results of FORV Sagar Sampada*, (Department of Ocean Development, New Delhi), pp. 564.

#### *For individual article*

Goswamy, S.C. & Shrivastava, Y. 1996. Zooplankton standing stock, community structure and diversity in the northern Arabian Sea, In: *Proceedings of the Second Workshop on Scientific Results of FORV Sagar Sampada*, edited by V.K. Pillai, S.A.H. Abidi, V. Ravindran, K. K. Balachandran & V.V. Agadi, (Department of Ocean Development, New Delhi), pp. 127-137.

---

### Designed and Printed by:

Publications & Information Directorate  
Council of Scientific & Industrial Research  
Pusa Campus, New Delhi-110 012  
India

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

P. Bensam, V.N. Bande, S. Sivakami, K.V. Somasekharan Nair, N. Gopinatha Menon, Grace Mathew, P. Devadoss, P. Nammalwar, P.U. Zacharia, M. Feroz Khan, P. Jayasankar, G. Mohanraj, P. Livingston, V. Gandhi, A. Raju, S. Srinivasarangan, V. Rengaswami & S.G. Raju

Central Marine Fisheries Research Institute, P.B. No - 1603, Cochin - 682 014

### **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  $2.6 \times 10^5$  tonne, which is much higher than the previous estimates of up to  $1.5 \times 10^5$  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  $1 \times 10^6$  tonne, which is almost close to the estimated potential of  $1.3 \times 10^6$  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  $5 \times 10^5$  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.

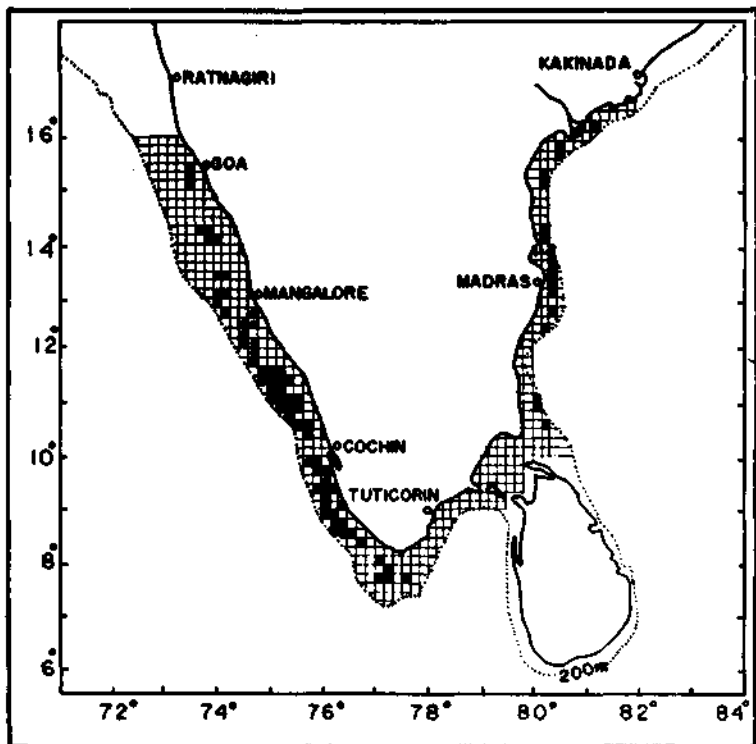


Fig.1 - Map showing the various stations (295 in number) occupied by *FORV Sagar Sampada* during 1989-92, out of which bottom trawling was undertaken in 97 stations

For analysing and processing the data, the area was demarketed into fishing grids of  $1^\circ$  latitude x longitude squares, each representing an area of  $12373 \text{ km}^2$ . 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  $1^\circ$  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.  $^\circ\text{N}/\text{long } ^\circ\text{E}$  (in kg/hr in parentheses) are:  $11^\circ/75^\circ$  (2165),  $9^\circ/76^\circ$  (1609) and  $11^\circ/75^\circ$  (1124), composed mostly of threadfin breams (*Nemipterus japonicus*, *N. mesoprion*), bull's eye (*Priacanthus hamrur*, *P. tayena*, *P. macrocanthus*) and goat fishes. The areas  $7^\circ/77^\circ$ ,  $8^\circ/76^\circ$  and  $11^\circ/76^\circ$  have shown abundance of more than 500 kg/hr. In the area  $7^\circ/77^\circ$  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  $11^\circ\text{N}/75^\circ 23.4'\text{E}$ , 10 t/hr in  $9^\circ 19'\text{N}/76^\circ 02'\text{E}$ , 7 t/hr in  $10^\circ 30'\text{N}/75^\circ 40.5'\text{E}$ , 5.5 t/hr in  $8^\circ 54'\text{N}/76^\circ 19.60'\text{E}$  and 5 t/hr in  $9^\circ 0.4'\text{N}/76^\circ 0.4'\text{E}$ . Off the southeast, the fishing area  $10^\circ\text{N}/80^\circ\text{E}$  has recorded the highest catch of 1,033 kg/hr, with major perches (*Pristipomoides typus*, *Epinephelus*, *Lutjanus*) forming the bulk. The areas  $14^\circ\text{N}/80^\circ\text{E}$  and  $15^\circ\text{N}/80^\circ\text{E}$  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°17'	8°16'	8°17'	9°15'	9°16'	10°15'	11°14'	11°15'	12°14'	13°14'	14°13'	14°14'	15°13'	
Sharks	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Skates	50	-	1	-	-	-	-	-	-	-	-	-	-	4
Rays	310	-	-	-	14	-	-	-	-	-	-	-	-	25
Carangids	-	22	10	18	15	20	-	8	-	5	190	-	18	24
<i>Rastrelliger kanagurta</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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
<i>Upeneus</i> spp	-	1	-	42	-	1	-	255	23	-	30	-	-	27
<i>Sphyræna</i> spp	-	-	-	-	1	1	-	4	-	-	-	-	-	-
<i>Priacanthus</i> spp	-	-	-	-	1	21	13	231	145	25	70	5	83	30
Perches	384	6	-	7	1	-	-	25	5	-	-	-	-	33
<i>Platycephalus</i> spp	-	-	-	-	1	1	-	1	184	-	-	-	-	14
Flat fishes	-	-	4	-	1	-	-	1	-	-	-	-	-	-
<i>Trichiurus</i> 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
<i>Rastrelliger kanagurta</i>	227	-	-	-	-	-	38
Silver bellies	-	-	-	-	-	-	-
Threadfin breams	1	-	-	2	1	268	45
Lizard fishes	1	-	-	1	-	5	1
<i>Upeneus</i> spp	-	-	-	1	107	8	19
<i>Sphyraena</i> spp	-	-	-	-	33	-	-
<i>Priacanthus</i> spp	-	-	-	-	-	75	6
Perches	303	25	-	15	-	-	12
<i>Platycephalus</i> spp	-	-	-	-	-	-	57
Flat fishes	-	-	2	1	-	19	4
<i>Trichiurus</i> 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 ( $^{\circ}$ 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 ( $^{\circ}$ N)/Depth(m)																Gross average			
	7 $^{\circ}$		8 $^{\circ}$		9 $^{\circ}$		10 $^{\circ}$		11 $^{\circ}$		12 $^{\circ}$		13 $^{\circ}$		14 $^{\circ}$		15 $^{\circ}$		<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
<i>Rastrelliger kanagurta</i>	-	-	-	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
<i>Upeneus</i> spp	-	-	-	1	-	20	-	46	-	-	-	27	-	-	15	-	-	-	106	14
<i>Sphyaena</i> spp	-	-	-	-	-	-	2	-	-	6	-	-	-	-	-	-	-	-	-	1
<i>Priacanthus</i> 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
<i>Platycephalus</i> spp	-	-	-	-	1	-	-	-	-	1	-	210	-	-	-	-	-	-	1	30
Flat fishes	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-
<i>Trichiurus</i> 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 ( $^{\circ}$ 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 ( $^{\circ}$ N)/Depth(m)										Gross average			
	10 $^{\circ}$		11 $^{\circ}$		12 $^{\circ}$		13 $^{\circ}$		14 $^{\circ}$		15 $^{\circ}$		<50	51-100
	<50 (*)	51-100	0-50 (*)	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	
<i>R. kanagurta</i>	227	-	-	-	-	-	-	-	-	-	-	-	-	
Silver bellies	-	-	-	-	-	-	-	-	-	-	-	-	-	
Threadfin breams	-	-	-	-	-	4	1	-	-	-	267	-	68	
Lizard fishes	-	-	-	-	-	1	-	-	-	-	3	-	1	
<i>Upeneus</i> spp	-	-	-	-	2	1	107	-	-	-	8	37	2	
<i>Sphyræna</i> spp	-	-	-	-	-	-	33	-	-	-	-	11	-	
<i>Priacanthus</i> spp	-	-	-	-	-	-	-	-	-	-	-	-	-	
Perches	347	-	25	-	1	23	-	-	-	-	78	-	118	
<i>Platycephalus</i> spp	-	-	-	-	-	-	-	-	-	-	-	-	-	
Flat fishes	-	-	-	2	-	1	-	-	-	-	5	1	1	
<i>Trichiurus</i> 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
<i>R. kanagurta</i>	-	-	-	-	-	-	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
<i>Upeneus</i> spp	-	-	-	3	-	-	-	-	67	-	-	-	2800	-	1
<i>Sphyræna</i> spp	-	-	-	-	-	1	-	-	-	-	-	3	-	9	-
<i>Priacanthus</i> spp	-	-	-	-	-	-	-	2	-	-	5	64	176	39	2
Perches	582	-	4	16	-	-	-	2	3	-	-	1	-	40	-
<i>Platycephalus</i> spp	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Flat fishes	-	-	-	1	-	-	3	-	-	-	-	2	-	2	-
<i>Trichiurus</i> 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														
	12°			13°			14°			15°			Average		
	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
<i>R. kanagurta</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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
<i>Upeneus</i> spp	2	2	34	-	-	-	88	-	5	-	-	-	362	-	12
<i>Priacanthus</i> spp	150	1	-	-	-	50	15	-	35	250	-	-	70	8	12
Perches	-	-	9	-	-	-	3	-	-	-	-	-	15	7	2
<i>Platycephalus</i> spp	-	245	-	-	-	-	-	-	-	-	-	-	-	-	-
Flat fishes	-	-	-	-	-	-	-	-	-	-	-	-	-	41	-
<i>Trichiurus</i> 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. japonicus* 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  $0.26 \times 10^6$  tonne. Of this, threadfin breams (*N. mesoprion* and *N. japonicus*) has been the single largest group with an estimated harvestable yield of  $2.1 \times 10^5$  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  $3.25 \times 10^5$  tonne. According to Sudarsan *et al.* (1988), a potential of  $1.41 \times 10^5$  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  $2.6 \times 10^5$  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).

In spite 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.

### REFERENCES

- Anon. 1991. Report of the working group on revalidation of the potential marine fisheries resources of the Exclusive Economic Zone of India, (MPEDA, Cochin) pp. 57.
- George, P.C., Antony Raja, B.T. & George, K.C. 1977. *Fishery resources of the Indian Economic Zone*, (Marine Products Export Development Authority, Cochin).
- James, P.S.B.R. Alagarwamy, K., Rao, K.V.N., Muthu, M.S., Rajagopalan, M.S., Alagaraja K. & Mukundan, C. 1987. Potential Marine fishery resources of India, *CMFRI Sp. Pub.* 30 : 44- 74.
- James, P.S.B.R. & Pillai, V.N. 1989. Fishable concentrations of fishes and crustaceans in the offshore and deep sea areas of the Indian Exclusive Economic Zone based on observations made onboard *FORV Sagar Sampada*, In: *Proc. First Workshop Scient. Result. FORV Sagar Sampada*, edited by K.J. Mathew, (CMFRI, Cochin) 201-213.
- Joseph, K.M. & John, M.E. 1987. Potential marine fishery resources. *CMFRI Sp. Pub.* 30: 18-43.
- Oommen, V.P. 1974. A brief account of the topography and fishery potential of the south west coast of India, *Mahasagar - Bull. Natn. Inst. Oceanogr.* 7 (1 & 2): 33 - 39.
- Oommen, V.P. 1989. Results of the exploratory fishing in Quilon Bank and Gulf of Mannar, *Bull. No.4*. (Integrated Fishery Project, Cochin) pp. 49.
- Silas, E.G. 1969. Exploratory fishing by *R.V. Varuna*, *CMFRI Bull.* 12: 1-86.
- Sudarsan, D., Sivaprakasam, T.E., Somavanshi, V.S., John, M.E., Nair, K.N.V. & Antony Joseph, 1988. An appraisal of the marine fishery resources of the Indian Exclusive Economic Zone, *Bull. Fish. Surv. India*, 18: 1-85.

\* \* \*