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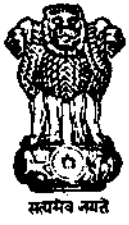

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Distribution and abundance of elasmobranchs in the Indian EEZ

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ABSTRACT

Elasmobranchs were present in 100 trawling stations of depth up to 170 m, along the Indian EEZ, where the *FORV Sagar Sampada* carried out fishing operations during her first hundred cruises. Abundance and distribution of sharks, skates and rays in the different latitudinal zones are discussed. The catchable potential of this resource up to the 50 m depth zone has been estimated as 64934 tonne. Elasmobranchs being on exploitable resource, the potential yield beyond 50 m in the EEZ is estimated as 88985 m tonne. Though the maximum catch was obtained from the southwest area, the maximum c.p.u of elasmobranchs was observed to be along the northwest region.

INTRODUCTION

Elasmobranchs form one of the promising resource that could be exploited from the EEZ of India. The potential yield estimated for this resource, as per the latest revalidation is 65000 metric tonne within 50 m depth and 103000 metric tonne beyond 50 m. Sudarsan *et al.* (1988) based on exploratory surveys gave quantitative assessment of rays along the outer continental shelf and slope of the southwest coast. Ninal *et al.* (1992) gave an account of the elasmobranch resources in the southeast and south-west coasts and the Wadge Bank. An attempt was made to put together the information on the distribution and abundance of elasmobranchs from the trawling surveys by *FORV Sagar Sampada* in the EEZ of India.

MATERIALS AND METHODS

Data on catch and effort were collected during the period 1985- 1991 in cruises 1-90, using various high speed trawel nets operated from *FORV Sagar Sampada*. Elasmobranchs that occurred in 100 trawling station were analysed for species composition, length frequency, sex, maturity etc. For the sake of analysis of the data, the entire area surveyed was divided into northwest, southwest, northeast, southeast and the Andaman regions. Depth- wise distribution and abundance of the resources were assessed by grouping into depth zones of 0-50 m, 51-100 m, 101-150 m and depth beyond 150 m. Standing stock was estimated using the "swept area" method of Gulland (1971).

RESULTS

Sharks and rays contributed equally to the skates formed only a meagre percentage. Among sharks *Carcharinus* spp predominated *Amphotistius kuhli* and *Dasyatis* spp were the predominant species of rays. The potential yield for elasmobranchs, estimated in the present study was 65000 metric tonne, which agrees with the figures given by the latest revalidation committee though lower than those given by James *et al.* (1986).

Geographical abundance

Geographical distribution and abundance of elasmobranchs are given in Tables 1-3. The highest catch rate of 2191 kg/hr was recorded off the coast of Kutch area, followed by 625 kg/hr of rays in the Wadge Bank region. Good concentration of rays were located off Cochin in the depth zone 51-100 m and also off Quilon. At depth of 48 m fairly rich grounds were located off Cape Comorin in the Wadge Bank region with catch rates varying from 120 kg to 145 kg/hr. Sharks were present in good concentration off Cape Comorin and off Mangalore in the depth zone 0-50 m and also at in the Quilon Bank region as well as the Wadge Bank region in the 51-100 m depth zone. Along the northwestern region of the EEZ, dense concentrations of rays were located off Bombay, Veraval coasts with catch rates varying from 100-150 m kg/hr. Rich ground for sharks were also noticed along the Ratnagiri coasts. On the northwest coast, off Kandla the entire trawl catch was constituted by rays; of Veraval 69% of the catch was shared by sharks and rays.

In the southeastern region and in the Gulf of Mannar (Table 2) elasmobranchs were abundant in the shallow regions. Off Manappad good concentrations of sharks were observed. High density pockets were reckoned off Madras and Cuddalore with catch rates 264 kg/hr and 130 kg/hr respectively. Fairly rich grounds for rays were located at 11°39'N, 79°54'E and 14°05'N, 80°23'E. Along the northeastern region, a higher concentration of sharks and rays were noticed in the shallow depths of up to 50 m than in the deeper realms. High catch rates ranging from 89 kg/hr to 123 kg/hr of sharks were obtained off Machilipatnam and Kakinada area and off Paradeep coasts. Rich

Table 1— Latitudewise abundance (in kg) of elasmobranchs in the western region of the EEZ of India at different depth zones

Latitude (°N)	Southwest coast Sharks	Rays	Skates	Total	Latitude (°N)	Northwest coast Sharks	Rays	Skates	Total
	Depth 0-50 m					*Depth 0-50 m*			
7°	134	130	-	264	15°	-	11	-	11
8°	39	35	-	74	17°	5	-	-	5
9°	2	150	-	153	21°	16	105	-	121
12°	-	15	1	15					
13°	300	-	-	300					
	Depth 51-100 m					*Depth 51-100 m*			
7°	84	750	10	844	18°	219	-	-	219
8°	178	327	53	558	20°	17	151	-	168
9°	250	-	-	250	22°	-	2119	-	2119
	Depth 101-150 m								
7°	-	48	-	48					
8°	-	85	9	94					
13°	-	6	-	6					
	Depth 151 m and beyond								
8°	-	-	68	68					

Table 2— Latitudewise abundance (in kg) in the eastern regions of the Indian EEZ in different depth zones

Southeast coast					Northeast coast				
Latitude (N)	Sharks	Rays	Skates	Total	Latitude (°N)	Sharks	Rays	Skates	Total
		Depth 0-50 m					*Depth 0-50 m*		
8°	200	-	-	200	15°	94	3	-	97
11°	-	300	3	303	16°	104	150	-	254
12°	394	-	-	394	17°	-	3	-	3
14°	-	219	-	219	19°	128	144	-	272
					20°	12	50	160	222
		Depth 51-100 m					*Depth 51-100 m*		
13°	-	40	-	40	15°	2	-	-	2
14°	11	-	-	11	16°	4	4	-	8
					17°	128	-	-	123
					18°	-	-	0.5	0.5
					19°	30	10	-	40
					20°	-	82	80	162
							Depth 101-150 m		
					16°	-	2	-	2

Table 3— Latitudewise abundance (in kg) of elasmobranchs in the Andaman-Nicobar regions of the Indian EEZ at different depth zones

Latitude	Sharks	Rays	Skates	Total
		0-50 m		
12°	-	40	93	133
14°	7	-	-	7
		51-100 m		
6°	22	220	-	242
8°	15	20	-	35
10°	215	787	-	1002
11°	10	-	-	10
12°	18	80	2	100
13°	178	-	80	258
		101-150 m		
12°	7	-	25	32

grounds for skates were located at 20°N, 87°E with catch rates ranging from 50 to 110 kg/hr.

High density pockets were located in the sea around Andaman -Nicobar area (Table 3). In the depth zone 51-100 m at 10° 43′N, 92°15.5′. E, the catch was exclusively of rays. High production rate of rays were obtained from 06°42′N, 93°56′E and 10°27′N and 92°32′E, respectively. High catch rate of 151 kg/hr was obtained from 13°10′N, 92°37′E and 10°27′N, 92°31′E.

Seasonal abundance

In the southwestern regions of the Indian EEZ (Table 4) sharks as well as rays were more abundant during January-March and October- December months. Along the northwest coast, good concentrations of sharks occurred during October-December and rays were abundant during July-September period.

In the southeastern regions (Table 5) abundance of sharks were noticed during April-September months, but rays were abundant during January-March and October-December period. In the seas around Andaman-Nicobar Islands, sharks showed a seasonal abundance during first and third quarters while rays occurred in good concentrations during January-June period (Table 6).

Table 4— Seasonal abundance (in kg) of elasmobranchs in the western region of Indian EEZ

	Southwest				Northwest				
Depth	Season	Sharks	Rays	Skates	Depth	Season	Sharks	Rays	Skates
0-50 m	Jan-Mar	300	150	1	0-50 m	Jan-Mar	-	-	-
	Apr-Jun	2	51	-		Apr-Jun	-	-	-
	Jul-Sep	173	79	-		Jul-Sep	5	-	-
	Oct-Dec	-	50	-		Oct-Dec	16	116	-
51-100 m	Jan-Mar	327	935	-	51-100 m	Jan-Mar	14	151	-
	Apr-June	-	-	3		Apr-Jun	-	-	-
	Jul-Sep	-	145	-		Jul-Sep	19	2191	-
	Oct-Dec	352	297	85		Oct-Dec	203	-	-
101-150 m	Jan-Mar	-	85	-					
	Apr-Jun	-	48	-					
	Jul-Sep	-	-	-					
	Oct-Dec	-	6	9					
150 m and above	Jan-Mar	-	-	-					
	Apr-Jun	-	-	-					
	Jul-Sep	-	-	-					
	Oct-Dec	-	-	68					

Table 5— Seasonal abundance (in kg) of elasmobranchs in the Eastern region of the Indian EEZ

Depth	Season	Sharks	Rays	Skates
		Southeast		
0-50 m	Jan-Mar	-	519	-
	Apr-Jun	394	-	-
	Jul-Sep	200	-	3
	Oct-Dec	-	-	-
51-100 m	Jan-Mar	11	-	-
	Apr-Jun	-	40	-
	Jul-Sep	-	-	-
	Oct-Dec	-	-	-
		Northeast		
0-50 m	Jan-Mar	183	6	-
	Apr-Jun	-	-	110
	Jul-Sep	15	150	-
	Oct-Dec	140	194	50
51-100 m	Jan-Mar	128	2	-
	Apr-Jun	-	4	0.5
	Jul-Sep	36	10	-
	Oct-Dec	-	80	80

Table 6— Seasonal abundance (in kg) of elasmobranchs in the Andaman-Nicobar regions of the Indian EEZ

Depth	Season	Sharks	Rays	[illegible]s
0-50 m	Jan-Mar	-	-	-
	Apr-Jun	7	40	-
	Jul-Sep	-	-	-
	Oct-Dec	-	-	-
51-100 m	Jan-Mar	56	807	-
	Apr-Jun	178	-	80
	Jul-Sep	214	80	2
	Oct-Dec	10	220	-

Depthwise distribution and abundance

From the present study it could be discernible that along the western half of the Indian EEZ as well as in the seas around Andamans (Tables 1, 3), elasmobranchs are more abundant in the depth zone 51-100 m than in the shallower waters. On the contrary, in the eastern half of the EEZ of India (Table 2) 85% of the catch came from the shallower regions of depth less than 50 m.

Very high catch rates of 625 kg/hr were obtained from the 51-100 m depth zone on the southwest coast. (Table 1). The highest catch per hour available in the present study also came from the 51-100 m in the northwestern region. From the same depth strata, 600 kg/hr was obtained from the Andaman region (Table 3). From the eastern half, the highest catch rate of 300 kg/hr was obtained from the depth zone 0-50 m off Cuddalore. Hardly 2% of the catches were obtained beyond 100 m depth.

DISCUSSION

Seasonal abundance in the present study shows a similar pattern as observed by Ninan *et al.* (1992) along the southwest coast, including the Wadge Bank with high catch rate during September- March months. Devadoss *et al.* (1989) also noticed a similar pattern of seasonal abundance and has correlated this with the availability of pelagic fish stock like sardines mackerels etc during this period. Along the southeast coast there is more concentration of elasmobranchs, especially of sharks in the shallower strata during April-October months. Devadoss *et al.* (1989) observing a similar pattern of abundance attributes this to the availability of food, especially the pelagic shoaling fishes during this period.

From the present study it could be concluded that highly productive grounds for elasmobranchs were available in many localised areas especially over the northwestern region and also along the Andaman-Nicobar regions which are practically unexploited, in addition to the already known grounds on the southwest and southeast regions. These grounds if exploited in a judicious manner, offer possibilities of developing into usable fisheries.

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