

FISHERY, DISTRIBUTION AND ABUNDANCE OF BIG EYE TUNA IN THE SEAS AROUND INDIA

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In Indian Ocean Bigeye tuna *Thunnus obesus* (Lowe, 1839) is found mainly north of Latitude 30°S. Bigeye tuna production from the Indian Ocean has reached to a level of 116.5 thousand tonnes during 1996 (Fig.1). Till 1991 production of the species in Indian Ocean was mainly from Western Indian Ocean (Area 51) contributing approximately 70% of the total production. In recent years from 1992 onwards the production in Eastern Indian Ocean increased substantially, mainly due to increased longline catches from Indonesia. There onwards the production in Indian Ocean is almost equal from both the areas. In Indian waters production of BET is 1650 tonnes (1996) Western Indian Ocean mainly Arabian Sea contributes about 97% of the catches (Fig.2).

Tuna longline surveys in the Indian EEZ and adjacent waters have indicated availability of the species in the Southern Latitudes (0°-10°N). Annual potential yield of Oceanic resources in the Indian Seas has been estimated as 246 thousand tonnes from subsurface and surface fishery (Sudarsan, et.al, 1990). Potential estimates for BET is 300 tonnes annually from subsurface fishery. Yellowfin tuna is identified as principle component from oceanic realms.

Commercial exploitation of the species was initiated by chartered vessels during 80's and later by Leased, Joint Venture and Indian Owned Vessels.

RESULTS OF LONGLINE SURVEYS

Tuna longline surveys conducted by FSI survey vessels in oceanic region has revealed availability of the bigeye tuna stocks mainly in areas south of Latitude 10° N (Sudarsan et.al., 1988). The hooking rates is reported to be in the range of 0.12% to 0.4%.

Bigeye tuna forms 10.42% of catch by number in the north equatorial waters between Lat. 00 -6° N (Varghese et.al., 1984) and 3.2% in Lat.5° - 10° N (Sudarsan et.al., 1988). Observed weight of the species ranges from minimum 19 kg to maximum of 74 kg with mean weight of 51.6 kg. John and Sudarsan (1993) based on earlier studies by various authors stated that decreasing CPUE over the years for bigeye tuna in surveys is primarily due to lower level of efforts in southern latitudes where the species is known to occur in relatively higher concentration.

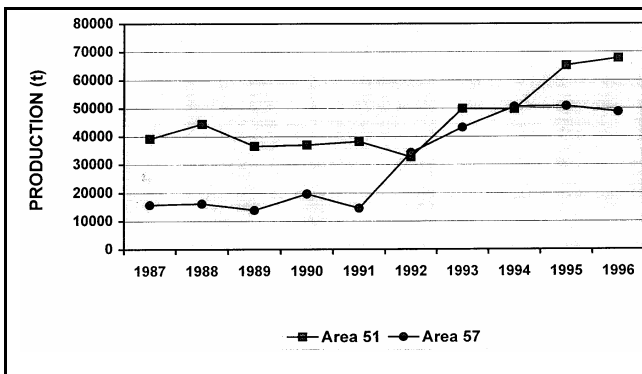


Fig 1. Trends in BET production in Indian Ocean

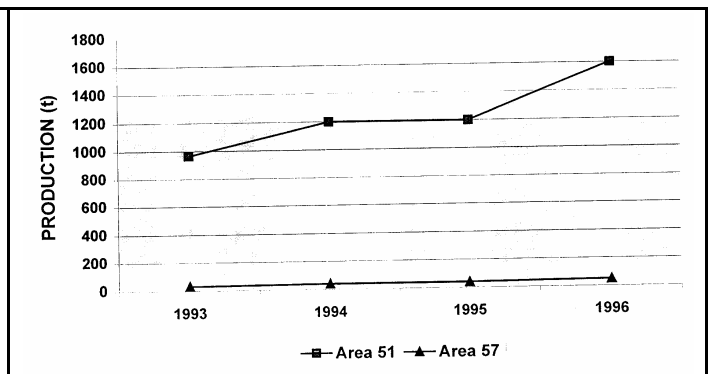


Fig 1. Trends in BET production in Indian Seas

RESULTS OF CHARTERED FISHING

Chartered fishing scheme in India was introduced in the year 1985. The scheme witnessed phenomenal growth in subsequent period. Having fulfilled the objectives to large extent the scheme was gradually phased out in favour of Joint Ventures and Indian owned vessels. Results under this scheme have been discussed by several authors. Yearwise effort,

catch, Bigeye tuna catch and CPUE is presented in Table-i. Total catches under the scheme reached maximum of 12571 tonnes in the year 1990 where a total of 19.82 million hooks were operated. These vessels mainly targetted yellowfin tuna using surface longlining and concentrated fishing efforts in the northern latitudes where Bigeye tuna stocks are known to be rather low. Therefore, the Bigeye tuna formed only 1.16% (1988) to 7.28% (1987) of the total catch. Maximum catch per day of 0.12 ton/day catch was obtained in the year 1991 and

1994. Aggregate hooking rate (kg/1000 hooks) ranged from 5.8 kg to 55.8 with average of 19.89 kg/1000 hooks. The percentage of Bigeye tuna in all tuna catches was of the order of 1.72 to 12.24%. Bigeye tuna catches by these vessels was mainly from Lat. 6° - 10° N and Long 70° - 80° E.

FISHING BY INDIAN OWNERSHIP AND JOINT VENTURE VESSELS

Taking advantages from the liberal policy and institutional

finance, Indian fishing industry has taken up tuna fishing with 100% export orientation. In the earlier years, following the chartered vessels fishing strategy, the vessels operating under Indian ownership, Joint venture and leased schemes targeted Yellowfin tuna and operated in northern latitudes. Catch statistics from these vessels are presented in Table .2. In 1994 Bigeye tuna catches by these vessels reached maximum of 1076 t. The catch comprised of Bigeye tuna (72.7%), Yellowfin tuna (11.4%), bill fishes (10.1%) and others (5.8%).

TABLE 1. BIG EYE TUNA CATCHES ALONG WITH PERCENTAGE AND CPUE OBTAINED BY CHARTERED LONGLINERS IN THE INDIAN SEAS

Year	Efforts	Total catch	All tuna	BIG EYE TUNA				
	(Million)	(tonnes)	(tonnes)	Catch (tonnes)	% in total catch	% in tuna catch	Catch/ fishing day	Catch (kg)/ 1000 hooks
1985	0.04 (29)	7	3	-	-	-	-	-
1986	1.54 (1062)	1903	925	86	4.52	9.29	0.08	55.8
1987	1.23 (647)	906	539	66	7.28	12.24	0.10	53.7
1988	1.57 (840)	947	638	11	1.16	1.72	0.01	7.0
1989	6.26 (3281)	3986	2947	56	1.40	1.90	0.02	8.9
1990	19.82 (9187)	12571	10608	256	2.04	2.41	0.03	12.9
1991	7.18 (2869)	5198	4127	343	6.79	8.31	0.12	47.8
1992	7.92 (3282)	5671	4488	139	2.45	3.09	0.04	17.6
1993	5.24 (2049)	2768	2133	62	2.24	2.91	0.04	11.8
1994	3.88 (1394)	2579	1508	164	6.36	10.87	0.12	42.3
1995	6.84 (2452)	3353	2015	40	1.19	1.98	0.02	5.8

TABLE 2. CATCH STATISTICS OF INDIAN OWNED, JOINT VENTURE & LEASED VESSELS FROM 1989 TO 1998

(Unit: MT)

Year	Yellowfin tuna	Bigeye tuna	Bill fishes	Others	Total
1989	19	-	9	31	59
1990	4	-	7	62	73
1991	35	-	13	107	155
1992	11	-	14	84	109
1993	219	866	43	150	1278
1994	169	1076	150	85	1480
1995(P)	169	1076	150	85	1480
1996(P)	162	-	100	53	315
1997(P)	136	-	141	42	319
1998(P)	1120	18	712	134	1984

The high percentage of Bigeye tuna caught by these vessels in contrast to chartered vessels is significant.

1. Operation during 1993-94

Voyage wise catch data, effort, area of operation and weight frequencies of Bigeye tuna to a limited extent are available in respect of two Indian vessels Vaishnavi . I & II for the year 1993-1994. The vessels exclusively fished for bigeye tuna using deep longlining in northern equatorial waters. Results on some aspect are analysed and presented as follows.

a) *Bigeye tuna catches*: Details of 3 cruises by each vessels undertaken are presented in Table-3. Bigeye tuna formed 81.6% of the total catch (Fig.3) and 88.2% of the total tuna catches. In all the cruises hooking rate for bigeye tuna ranged from 1.71 to 1.78% with aggregate of 1.75% (54.8 kg/100 hooks).

b) *Fishing area*: Fishing efforts distribution available for one cruise indicates that the vessels operated in Lat.0°-25°N and Long.45°-90°E. It is observed that the vessels mainly operated in Latitude 0° to 10°N with highest concentration in Longitude 75° - 80°E in area 51. Apart from this the vessels spent significant efforts in Longitude 55 to 65 E also.

c) *Monthwise CPUE*: Month wise hooking rates for BET obtained are presented in table 4 (2 voyages). Data for July, Aug and September months are not available. October and April recorded the minimum hooking data of 1.60 and 1.67% respectively. In all the other months hooking rate was in the range of 1.74 to 1.8 1% (Fig.4). Earlier John and Sudarsan (1993) observed that Bigeye tuna CPUE is significantly high in Lat 10° - 15° N. They worked out average hooking rate for bigeye tuna based on 1986-88 data as 0.53% in Lat **0°-5°N**, 0.41% in Lat. 5°-10°N and 0.04% in Lat 10°-15°N from Taiwan deep longline operation in Indian Ocean. The CPUE obtained by these vessels from October to June indicates availability of bigeye tuna stocks for commercial exploitation round the year in the north of equatorial waters in Indian

Ocean.

d) *Size Composition*: The catches comprised of 3 weight classes viz 15-25 Kg, 25-40 Kg and above 40 Kg. By number 40+ class dominated the catches constituting 39.5% of the total catches, followed by 32.7% of smallest class (15-25 Kg) (Fig.5). By weight 40+ class significantly contributed (55.9%) to the total catches. Size frequency in terms of weight is presented in Fig.6. It is seen that 40 + class dominated the catches in all the months from November 93 to May 94, whereas 15-25 Kg class dominated during June. Smallest 15-25 Kg group was the next dominant group during all the months. Weight frequencies otherwise did not show any significant fluctuations.

Earlier Miyabe (1988) indicated that age composition of bigeye tuna in longline fishery for 1965-85 has been remarkably constant over the years. The largest component is age 4 fish followed by age 5, age 3 and age 6 fishes. Silas and Pillai (1982) presented the mean weight of the species taken by Japanese longline fishery from different sectors in the Indian Ocean and observed that bigeye tuna in the seas around India are relatively larger size

2. Operation during 1995-97

Operations details on 5 leased longline vessels available were analysed. Area of operation was mainly confined in Bay of Bengal (Area 57) in Lat.5° to 20°N and Long.80°-100°E. The vessels targetted their efforts for yellowfin tuna by surface longlining. Maximum efforts were in Lat.10°-15°N and Long.85°-95°E. Efforts in Lat.5°-10°N were at comparatively low level with 76 fishing days in Long.90°-95°E and 2 fishing days in 95°-100°E. The CPUE obtained for bigeye tuna was maximum 24 kg/fishing day in Lat.5°-10°N (Fig.9).

TABLE-3 BIG EYE TUNA CATCHES REPORTED BY INDIAN OWNED VESSELS DURING 1993-1 994

Voyage period	Fishing days	Efforts (000 hooks)	Total Catch (t)	Total tuna Catch (t)	BIGEYE TUNA			
					Catch (t)	% in total catch	% in tuna catch	Hooking rate (kg)/100 hooks
15.03.93	324	572.0	397.9	368.5	323.6	81.3	87.8	56.6
06.93								(1.71)*
16.10.93	263	473.4	326.3	303.1	268.0	82.1	88.4	53.7
31.03.94								(1.78*)
01.04.94	140	252.0	166.6	153.2	135.8	81.5	88.7	52.8
03.07.94								(1.77)*
Total	728	1297.4	890.9	824.8	729.4	81.6	88.2	54.8 (1.75)*

* Hooking rate No./100 hooks

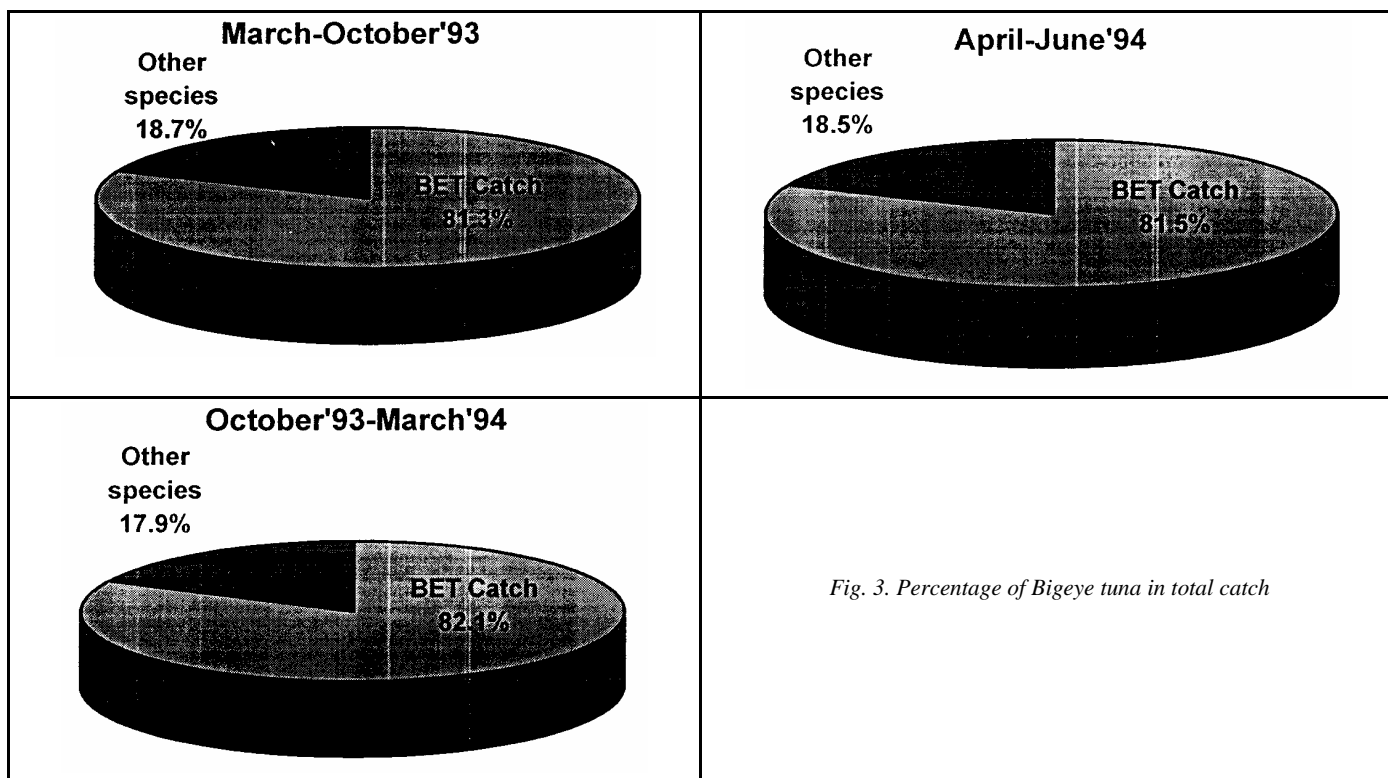


Fig. 3. Percentage of Bigeye tuna in total catch

Table 4. Monthwise hooking rate (%) for Bigeye tuna obtained by Indian owned vessels

Vessel VAISHNAVI - I & VAISHNAVI - II

Voyage 16.10.93-31.03.94 and 01.04.94 . 03.07.94

Month	Hooks operated('000)	BET Catch(No.)	Hooking rate(%)
October'93	14.4	231	1.60
November	93.6	1692	1.81
December	90	1598	1.78
January'94	95.4	1700	1.78
February	82.8	1486	1.79
March	95.4	1740	1.82
April	88.2	1473	1.67
May	91.8	1593	1.74
June	73.8	1384	1.87
Total	725.4	12897	1.78

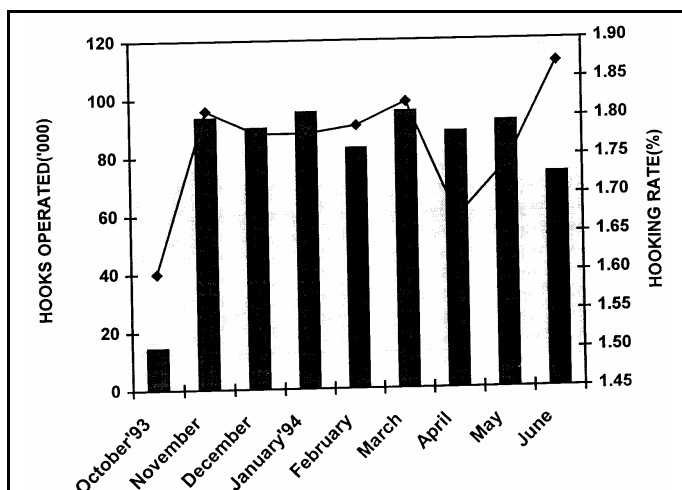


Fig. 4. Monthwise effort & CPUE obtained for bigeye tuna by Indian owned vessels

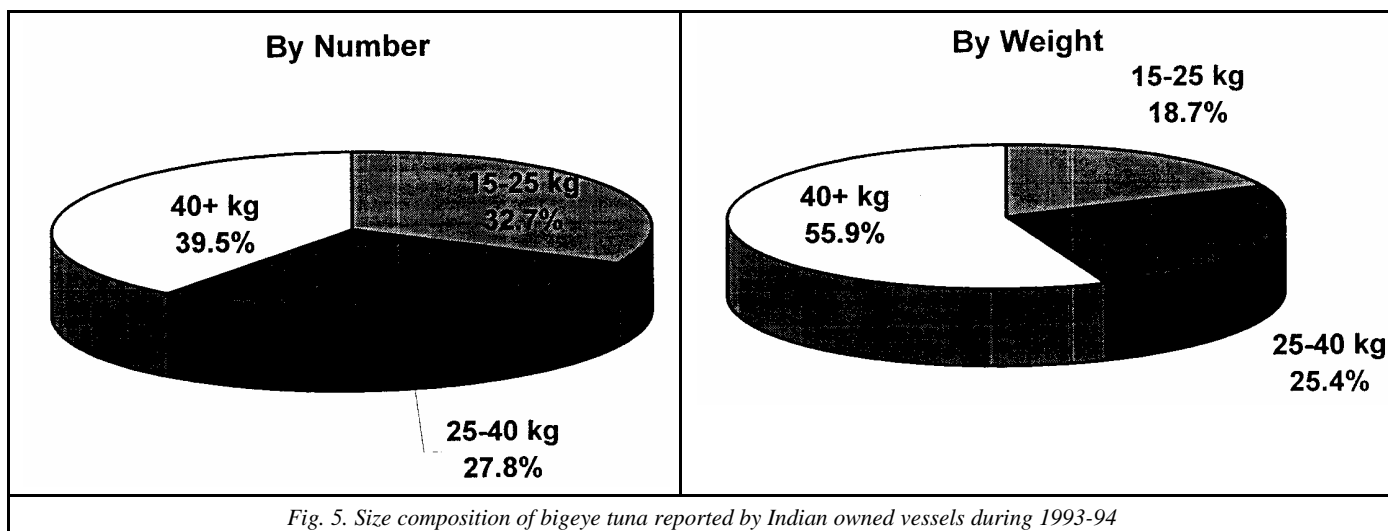


Fig. 5. Size composition of bigeye tuna reported by Indian owned vessels during 1993-94

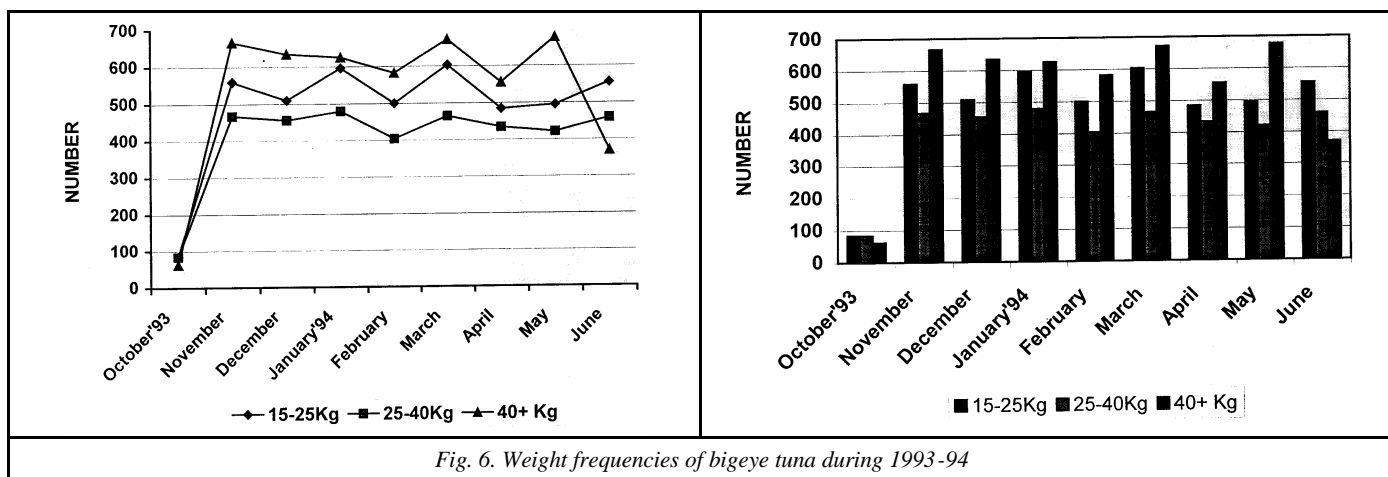


Fig. 6. Weight frequencies of bigeye tuna during 1993-94

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