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BY-CATCHES OF TUNA LONG LINING CONDUCTED IN INDIAN EEZ.

V.S. Somvanshi, S. Varghese, S.A. Rajkumar, P. Chalapati Rao & K. Gopalakrishnan.

Fishery Survey of India
Mumbai
India

Introduction:

Exploratory survey activities using long lining and targeting tunas have yielded considerable information on the by-catches. The Fishery Survey of India during the years 2000-2004 has carried out the exploration of tunas in the Indian EEZ along West coast of India and around Andaman and Nicobar Islands. During the exploration, a large number of by-catches species were reported. The by-catch species belong to the major fish groups *viz.* sharks, billfishes, and others represented mainly by barracuda, seer fish etc.(Bhargava *et al.,* 2002 & John *et al.,* 2005). Recently, Somvanshi *et al*. (1999) based on declared catches by Indian owned joint venture and leased longline vessels during 1998 indicated a CPUE of 2 t per fishing day consisting of only 4.6% of sharks. In this paper an attempt has been made to present the results of exploratory fishery survey conducted during 2000-2004 with particular reference to the hooking rates and composition of tuna and the by-catch species groups. The paper also provides information on seasonal variations in the hooking rates of tuna and by-catch species groups.

Materials and method:

The survey vessels, *Yellow Fin* and *Blue Marlin,* were deployed for tuna long lining in Arabian Sea (Lat.8º –23º N and Long.65º –76ºE) and in Andaman and Nicobar Waters(Lat.4-18ºN and Long.89º-96ºE) respectively. These vessels employed the conventional multi-filament long lining gear with 5 hooks per basket. The hooks used were of 7 sun size. During the five year period 2000-04, the vessels had a target for 14 to 16 days per month for sampling for long lining. The tunas and by-catch species caught during the operation were identified and analyzed for estimation of hooking rate. The hooking rate of each of this group of species were compared for their annual variations, catch composition and seasonal variations.

Results:

By-catches have been found belonging to three major categories – sharks, billfishes and other species. The species of the sharks identified were *Carcharhinus dussumieri, C.limbatus, C.melanopterus, Galeocerdo cuvieri, Rhizoprinodon acutus, C.sorrah, C.macloti, Lamiopsis temmincki, Scoliodon laticaudus, Sphyrna lewini, Isurus oxyrinchus, C.longimanus, Prionace glauca and C.albimarginatus.* Billfishes were constituted by marlins (*Tetrapterus audax, Makaira mazara and M.indica),* Sailfish – *(Istiophorus platypterus)* and swordfish (*Xiphias gladius).* The other species were represented by seer fish (S*comberomorus commerson),* Wahoo (*Acanthocybium solandri),* Dolphin fish (*Coryphaena hippurus)* and Barracuda (*Sphyraena barracuda).* Among the target species of tunas, yellowfin, bigeye and skipjack were commonly caught during the surveys.

The result of the data analysis for the tuna, sharks, billfish and other species are presented to know annual variation of their hooking rates, catch composition and seasonal variations. These results are as follows:

Hooking rates :

The hooking rates obtained for tunas and the by-catches of sharks, billfish and other species on yearly basis for the period 2000-2004 in respect of Arabian Sea are depicted in Table 1 and Fig.1. It may be seen that from the Arabian Sea the annual hooking rates of tunas was found to vary from 0.1 to 0.75%. Among the by-catch group of species, the billfishes was found to yield high hooking rate (0.09 – 0.28 %) whereas the sharks were found to give the hooking rate of 0.05 –0.26% per annum. The other species such as barracuda, seer fish, Wahoo, dolphin fish species together have yielded the annual hooking rate of 0.01 – 0.10%. Thus, it could be concluded from the Table 1 that the hooking rate of by-catch species was higher than that of hooking rate of targeted species of tunas, excepting the year 2003 where in the tunas were caught at higher hooking rate than the by-catch species. The annual aggregate hooking rate of the by-catch species together was found to fluctuate between from 0.21 and 0.54%.

The hooking rates in respect of Andaman and Nicobar Waters for the tuna and by-catch species during the period 2000-2004, are provided in Table 2 and Fig.2. It may

be observed from the Fig.2 that the annual aggregate hooking rate of tunas were varying from 0.09 to 0.26%. The by-catch species group, sharks yielded hooking rate of 0.2 –

0.46%, billfishes 0.3 –0.13% and others 0.08 – 2.33%. The annual aggregate hooking rate for the by-catch species together was found to be higher (0.46 – 0.89%) than that of targeted species of tunas (0.09 – 0.26%) during all the years. Comparing the hooking rates of tunas and by-catch species obtained from the two regions, it may be concluded that the hooking rate of tunas in the Arabian Sea were higher than that of the Andaman and Nicobar waters. Conversely the hooking rate of by-catch species groups together was found to be higher in Andaman and Nicobar waters than that of Arabian Sea.

Catch composition:

The catch composition obtained during the period 2000-2004 for the tunas and the by-catch species of sharks, billfishes and other species from the Arabian Sea and Nicobar waters is given in Fig.3 and 4 respectively. It may be seen that the catches from the Arabian Sea had the highest proportion of tunas (46%) and among the by-catches the billfishes formed 27%, sharks 19% and other species 8% of the catches by long lining. In the case of Andaman and Nicobar waters the tunas constituted to 24% whereas the by-catch species of sharks formed 45%, other species 21% and billfishes 10% of the catches landed by the long lining. It may be therefore concluded that the two regions have different catch composition, in that the tunas were found dominant in their composition to the extent of 46% in Arabian Sea whereas the sharks were highest contributor in Andaman & Nicobar waters (45%). In general the proportion of the by-catch species in Andaman & Nicobar waters has greater magnitude than in Arabian Sea.

Seasonal variations:

The monthly aggregate hooking rates of tunas and by-catch groups of shark, billfishes and other species during the five year period 2000-04 are depicted in Figs. 5 and 6 for Arabian Sea and Andaman and Nicobar waters respectively. It may be seen from the Fig.5 that in the Arabian Sea, the tunas and by-catch species have two peak seasons of varying magnitudes during different months for each of them. The season for most of the species was more pronounced during the March-May than the subsequent peak during August to October. In the Andaman and Nicobar waters as seen in the Fig.6,
there appears to be three peak seasons of different magnitudes spread over different months. In general, the peak seasons for sharks and other species of by-catch groups and

tunas were found to follow a common trend in their month-wise hooking rates, the major season extending from October to March.

Conclusion:

In the two regions of the Indian EEZ, the Arabian Sea and Andaman and Nicobar waters, the results of exploratory survey by the tuna long lining during the period 2000-2004 reveal the following important findings.

(i) The hooking rate for the by-catch species together was found to be higher in Andaman and Nicobar waters than that of in Arabian Sea.

(ii) The by-catch in general and sharks in particular were observed to be in higher proportion in Andaman and Nicobar waters than in the Arabian Sea.

(iii) There have been two peak seasons in Arabian Sea and three peak seasons in Andaman and Nicobar waters of the various groups of by-catch species.

References:

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Table 1 : Hooking rate for major groups of species in Arabian Sea

Latitude	Longitude	Year	Hooks	Tunas	By catches			
					Sharks	Bill fishes	Others	All

08^0-23^0N	65^0-76^0	2000	89475	0.31	0.26	0.28	0.01	0.54
		2001	57775	0.19	0.09	0.08	0.04	0.21
		2002	52675	0.33	0.05	0.19	0.10	0.33
		2003	41875	0.75	0.11	0.26	0.08	0.45
		2004	48225	0.10	0.05	0.09	0.07	0.21

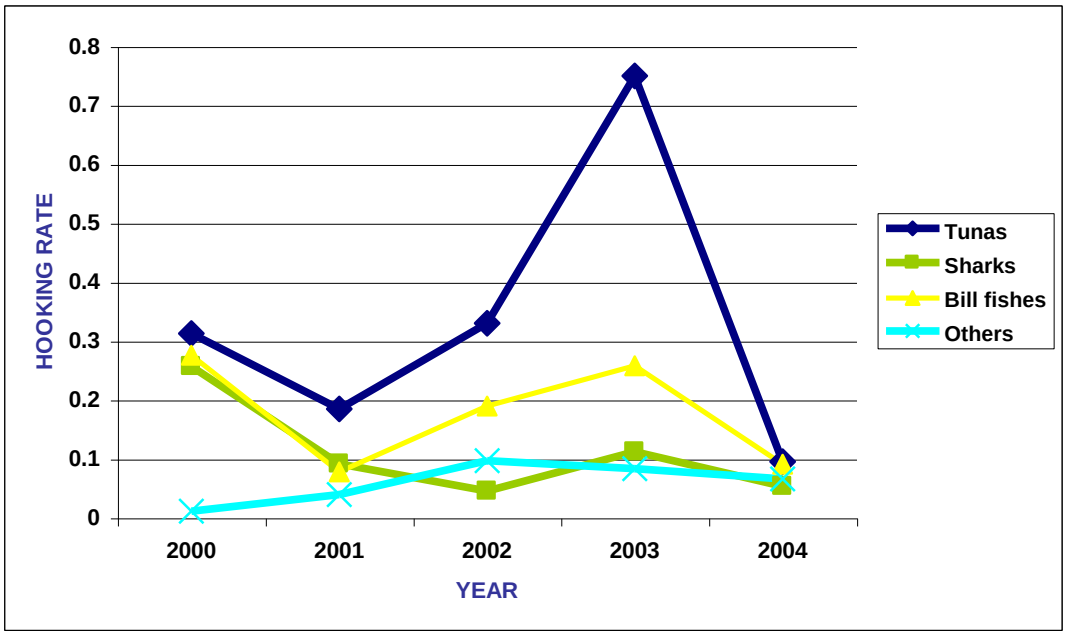

Fig. 1 : Hooking rate for major groups of species in Arabian Sea (Lat : 08^0-23^0N ; Long : 65^0-76^0 E)

Table 2 : Hooking rate for major groups of species in Andaman & Nicobar waters

Latitude	Longitude	Year	Hooks	Tunas	By catches			
					Sharks	Bill fishes	Others	All
04^0N-18^0N	89^0-96^0	2000	46917	0.09	0.41	0.03	0.08	0.52
		2001	38950	0.22	0.30	0.06	0.11	0.46
		2002	71875	0.26	0.46	0.10	0.33	0.89
		2003	51590	0.18	0.28	0.13	0.11	0.52
		2004	49055	0.21	0.33	0.08	0.17	0.57

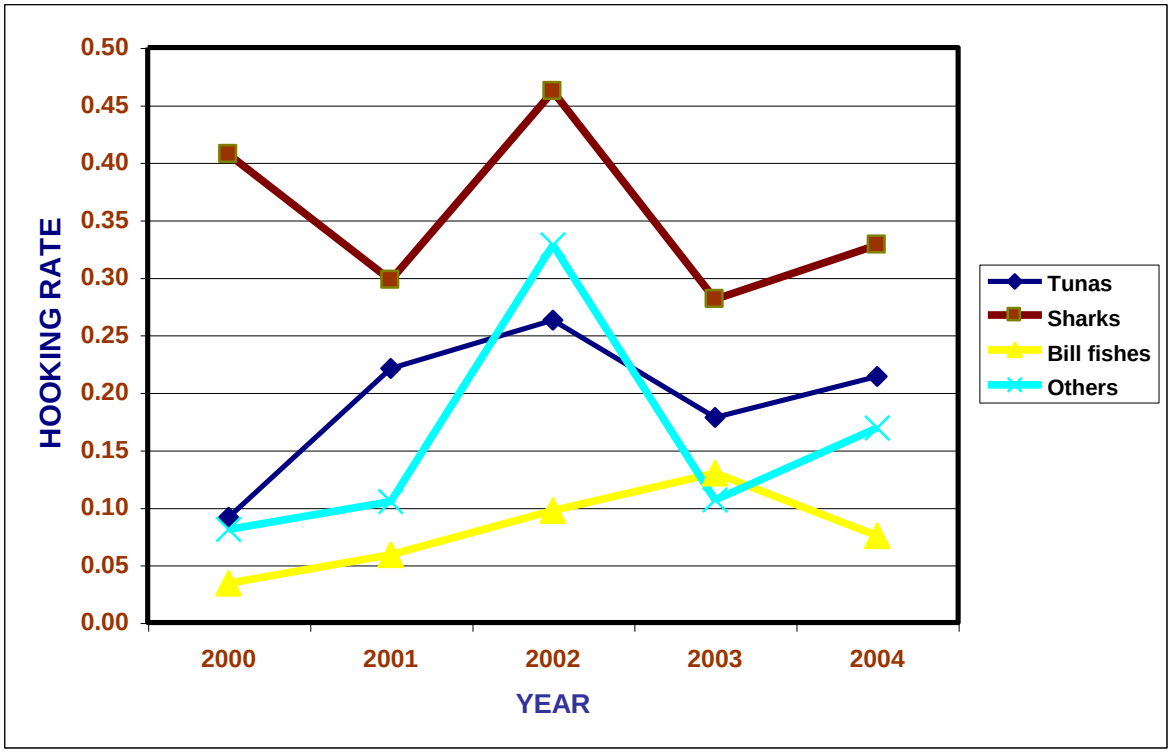

Fig. 2 : Hooking rate for major groups of species in Andaman & Nicobar waters (Lat :04^0-18^0N ; Long: 89^0 – 96^0 E)

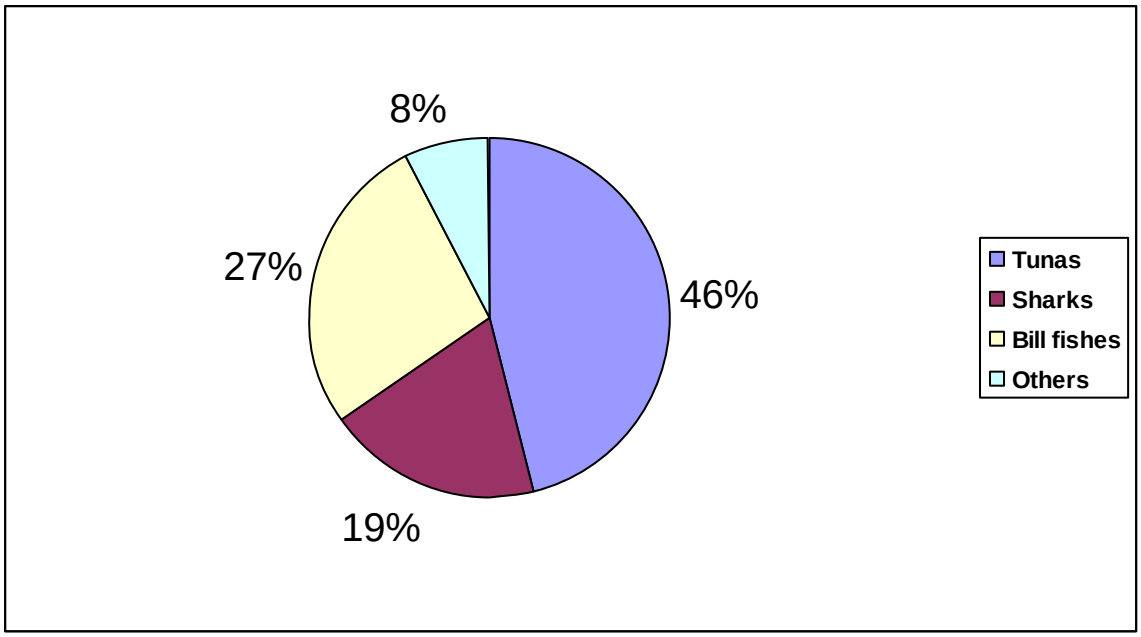

Fig.3: Catach compostion obtained during 2000-04 in Arabian Sea (Lat : 08^0-23^0N ; Long : 65^0-76^0 E)

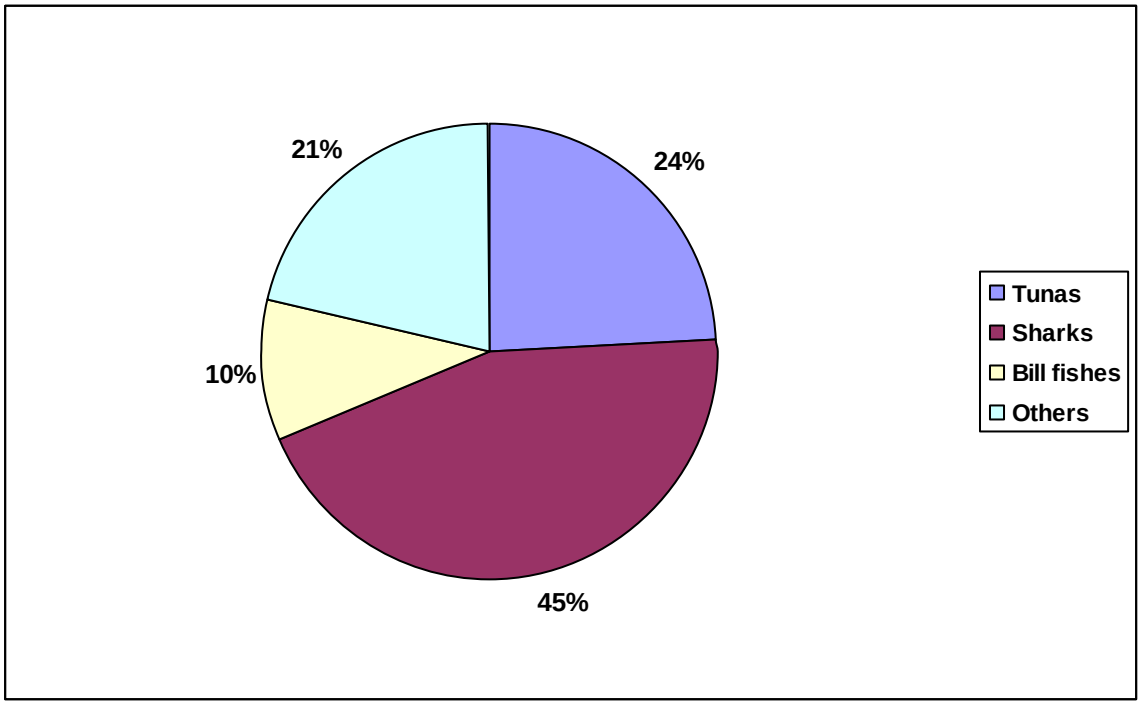

Fig. 4 : Catch composition obtained during 2000-04 in Andaman & Nicobar waters Lat :04^0-18^0N ; Long: 89^0 - 96^0 E

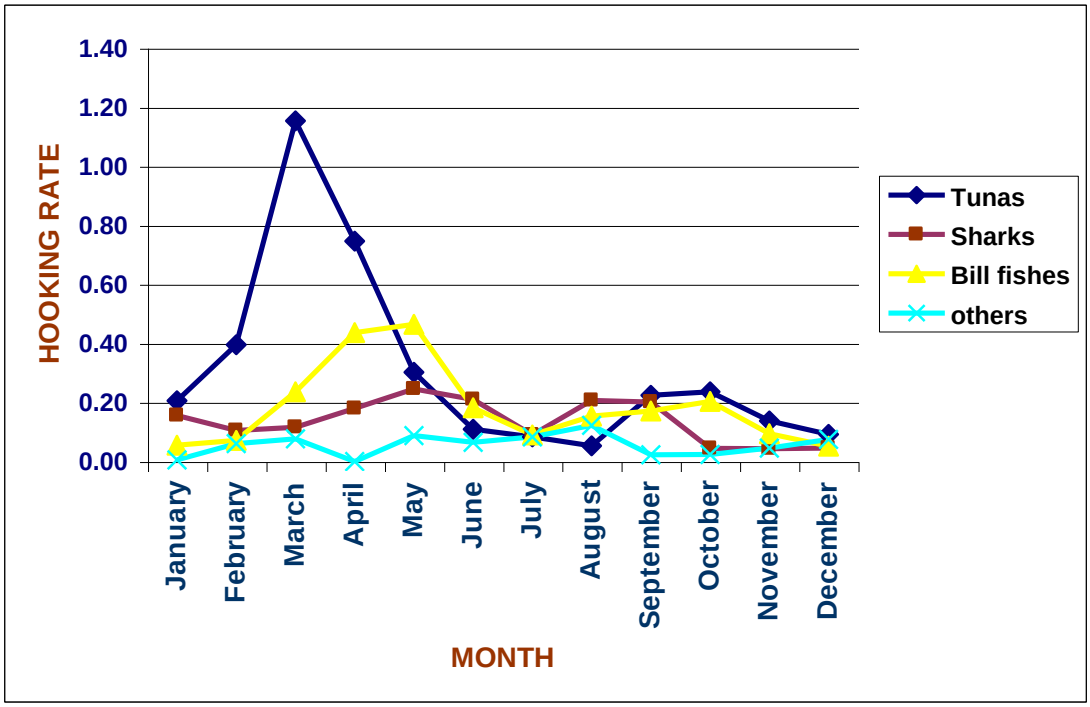

Fig. 5 : Monthly hooking rate in Arabian Sea during 2000-04 (Lat : 08^0-23^0N ; Long : 65^0-76^0 E)

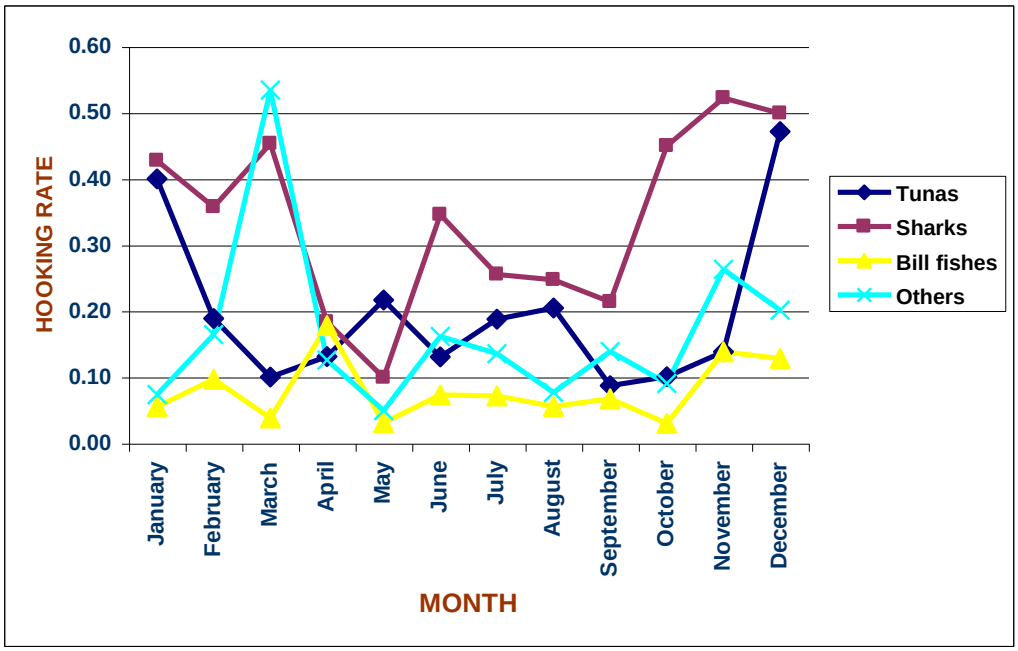

Fig.6: Monthly hooking rate in Andaman & Nicobar waters during2000-04 (Lat :04^0-19^0N ; Long: 89^0 - 96^0 E)