SOME ASPECTS OF THE DISTRIBUTION AND BIOLOGY OF THE INDO-PACIFIC SAILFISH, *ISTIOPHORUS PLATYPTERUS* (SHAW AND NODDER, 1792), IN INDIAN WATERS

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ABSTRACT

The Indo-Pacific sailfish, Istiophorus platypterus, is an epipelagic oceanic species, occurring as a bycatch in tuna longline fishing. Annual production in the Indian Ocean is about 2153 t, of which 460 t (21.4%) is contributed by the longline fishery in India. Studies of the distribution and biology of the species are very limited. Tuna longline fishing by chartered vessels and the recent resources surveys in Indian seas have generated valuable data on sailfish.

Results of longline fishing by chartered vessels in Indian waters indicate that sailfish form 2.64% of total catch, with an average CPUE of 17.16 kg/1000 hooks. Season-wise, the first and second quarters of the year are observed to be more productive, and the spatial distribution pattern shows a general tendency of higher hooking rates near continental borders.

Results from resources surveys around Andaman & Nicobar Islands indicate high hooking rates during the third and fourth quarters, with average annual hooking rates of 1.43 fish/1000 hooks (45.76 kg/1000 hooks). The length (lower jaw to fork) ranged from 135 to 245 cm, with two modal classes. The mean weight was observed to be 32 kg.

The study indicates that the Indian seas, particularly the Andaman & Nicobar waters, are productive areas for sailfish.

INTRODUCTION

The Indo-Pacific sailfish, *Istiophorus platypterus,* (Shaw and Nodder, 1792) is an epipelagic oceanic species widely distributed in the tropical and temperate waters of the Pacific and Indian Oceans. Its latitudinal range in the Indian Ocean is up to 45^{o}S in the western Indian Ocean and 35^{o}S in the eastern Indian Ocean (Nakamura, 1985). The species is often taken as bycatch in longline fishing. It is also caught with surface gillnets, troll lines and handlines.

The annual production of sailfish in the Indian Ocean is in the order of 2153 t (IPTP, 1994), of which 460 t (21.4%) is reported from the longline fishery in India. Other major producers in the Indian ocean are Oman, Pakistan and Sri Lanka, where the catches are obtained predominantly in the drift gillnet fishery. It has been observed that the species shows strong tendency to approach continental coasts, islands and reefs (Nakamura, 1985). In India too, the sailfish occurs in coastal fishery. Silas and Rajagopalan (1967) and Balan (1978) have reported on the occurrence of sailfish in the gillnet fishery off Tuticorin on the southeast coast and Calicut on the southwest coast. However, no separate statistics are available from the coastal fishery.

The annual production of sailfish from longline fishery in the Indian Ocean (1990-1992 average), as per the IPTP Data Summary for 1992 (IPTP, 1994), is 504 t, of which 460 t (91.3%) is reported from India, which suggests that the seas around India are important fishing grounds for the species.

Studies on the distribution and biology of sailfish are rather limited compared to other oceanic resources. In the Indian Ocean, Morrow (1964), Ueyanagi (1974), Howard and Starck (1975), Wetherall *et al.* (1979), Yoshida (1981) and IPTP (1988) have described some aspects of the distribution and abundance of the stock. Beardley *et al.* (1975) and Nakamura (1985) have discussed some of the biological aspects of the species. In Indian waters, Sudarsan *et al.* (1988) have indicated the distribution pattern of the species based on longline surveys conducted during 1983-1988, but with extremely limited sampling in Andaman & Nicobar waters. The tuna longline fishery by chartered vessels and the recent resources surveys have generated substantial data on

Table 1. *Catch of sailfish in tuna longline fishing by chartered vessels in Indian waters, 1988-1994*

Year	*Hooks (million)*	*Total catch (t)*	*Sailfish catch (t)*	*% of total catch*	*CPUE (kg/1000 hooks)*
1988	1.57	947	62.17	6.57	39.60
1989	6.26	3,986	96.01	2.41	15.34
1990	19.82	12,571	259.40	2.06	13.09
1991	7.18	5,198	178.56	3.44	24.87
1992	7.92	5,671	155.80	2.75	19.67
1993	5.24	2,768	50.80	1.84	9.69
1994	3.88	2,579	87.22	3.38	22.48
Total	51.87	33,720	889.96	2.64	17.16

Table 2. **Seasonal variability in CPUE of sailfish caught in tuna longline fishing by chartered vessels in Indian waters, 1992-1993.**

Season	*Hooks (thousands)*	*Total catch (t)*	*Sailfish catch (t)*	*% of total catch*	*CPUE (kg/1000 hooks)*
Jan-March	2,717.3	1,974	63.43	3.21	23.34
April-June	2,135.6	1,898	68.34	3.60	32.00
July-Sept	5,362.0	3,634	60.59	1.67	11.30
Oct-Dec	2,535.0	1,316	13.99	1.06	5.52
Total	12,749.9	8,822	206.35	2.34	16.18

sailfish in Indian seas. Some of the observations are presented in this paper.

DATA USED

Data from two distinct sources are used in this study, viz., (1) catch-and-effort data of chartered foreign vessels operated in Indian waters during the period from 1988 to 1994. The fishery covered all the regions of the Indian EEZ and fishing effort during the period was of the order of 52 million hooks. Details of fishing under the charter scheme are discussed by Somvanshi and John (1995). (2) Data from tuna longline surveys conducted by Fisheries Survey of India (FSI) vessels in Andaman & Nicobar waters during 1989-1994. The sampling effort in the survey was 3,21,500 hooks.

While the catch data of the chartered vessels is in terms of weight, the results of the surveys are presented by number. The CPUE is expressed in terms of catch per 1000 hooks.

Results from chartered fishing

Annual catch, effort and CPUE of sailfish caught during the 1988-1994 period are given in Table 1. The total effort of 51.87 million hooks yielded an aggregate catch of 889.96 t of sailfish, which formed 2.64% of total catch, and the average CPUE works out to 17.16 kg/1000 hooks.

Year-to-year variability of high magnitude was observed in the occurrence of the species, with its percentage contribution ranging from a low of 1.84% during 1993 and a high of 6.57% during 1988 (Table 1). The corresponding fluctuation in CPUE was from 9.69 to 39.6 kg/1000 hooks.

Seasonal variability in the percentage contribution and CPUE is given in Table 2. The CPUE was observed to be relatively high (23-32 kg/1000 hooks) during the first and second quarters. The lowest CPUE (5.52 kg/1000 hooks) was recorded in the last quarter.

The spatial distribution pattern (Figure. 1) indicated a general tendency of higher hooking rates near the continental borders. Higher CPUE are observed along the northeast coast during the first quarter and along the northwest coast during the second quarter. It may, however, be seen that the picture of seasonal distribution patterns in different regions is incomplete as the vessels follow a fishing strategy following yellowfin tuna, the target species in the fishery.

Results from resources surveys

Results of tuna longline surveys in Andaman & Nicobar waters indicating the catch, effort, percentage contribution and CPUE of sailfish are given in Table 3. Sampling by an aggregate of 3,21,500 hooks yielded 461 sailfish, representing 5.38% of total catch, and the overall hooking rate was 1.43 per 1000 hooks. With an average weight of 32 kg per fish the catch rate works out to 45.76 kg/1000 hooks.

Except for 1991, when the sampling effort was extremely low, the hooking rate ranged from 1.11 in 1990 to 1.76 in 1993 (Table 3). The percentage contribution of sailfish in total catch was as high as 8.2-8.91 % during 1989-1990.

Table 3. **Catch of sailfish obtained in tuna longline survey in Andaman & Nicobar waters, 1989-1994.**

Year	*Hooks (thousands)*	*Total catch (no.)*	*Sailfish catch (no.)*	*% of total catch*	*CPUE (kg/1000 hooks)*
1989	31.6	561	50	8.91	1.58
1990	37.8	512	42	8.20	1.11
1991	15.2	352	6	1.71	0.40
1992	92.5	2,462	154	6.26	1.67
1993	50.6	1,421	89	6.26	1.76
1994	93.8	3,264	120	3.68	1.28
Total	321.5	8,572	461	5.38	1.43

Table 4. **Seasonal variability in CPUE of sailfish caught on tuna longlines in Andaman & Nicobar waters,1991-1995.**

Season	*Hooks (thousands)*	*Total catch (no)*	*Saillfish catch*	*% in total catch*	*CPUE (No./1000 hooks)*
Jan - Mar	97.7	2,774	116	4.18	1.19
Apr - Jun	56.5	1,323	59	4.46	1.04
Jul - Sept	53.3	1,424	89	6.25	1.67
Oct - Dec	113.9	3,051	197	6.46	1.73
Total	321.4	8,572	461	5.38	1.43

Seasonal variability in catch rate (Table 4) indicated highest hooking rates (1.67-1.73) during the third and fourth quarters and moderate hooking rates (1.04-1.19) during the first and second quarters. The quarterly distribution pattern of the stock as indicated by hooking rate in each 1° latitude x 1° longitude. area is given in Figure 2.

Biological observations

The length-frequency studies conducted from November 1993 to February 1995 showed that the specimens ranged in length (lower jaw to fork) from 135 cm to 245 cm, with the majority of individuals (75%) in the 190-245 cm range. The two prominent modal classes observed were at 190-205 cm and 215-235 cm (Table 5, Figure 3).

The weight of the fish caught in the survey ranged from 10 to 53 kg, and the overall mean weight was 32 kg. The annual and seasonal variability in the mean weight are given in Figures 4 and 5. Compared to the yearly mean values of 17-27 kg from the Taiwanese longline fishery and 25-30 kg. from the Japanese longline fishery in the Indian Ocean (Wetherall *et al.*, 1979), the average size of sailfish obtained from Andaman & Nicobar waters is relatively larger.

DISCUSSION

Considering the abundance indices of sailfish observed from the Taiwanese longline fishery (Wetherall *et al.*, 1979) and the Japanese longline fishery (Silas and Pillai, 1982) in the northern Indian Ocean, the average catch rate of 17.16 kg/1000 hooks reported from the chartered fishery appears to be an underestimate. This is possibly due to the fact that some of the vessels have not recorded sailfish separately, which was apparent from their voyage reports. Had this not been the case, the production figures of sailfish from Indian waters would have been of higher magnitude.

The surveys indicated an appreciable catch rate of 1.43 fish per 1000 hooks (45.76 kg/1000 hooks) from Andaman and Nicobar waters. The distribution atlas of oceanic resources published by the FSI (Sudarsan *et al.*, 1988) has indicated higher CPUE of sailfish in the Andaman & Nicobar waters. It is observed from the present study that while the catch rate of sailfish around the mainland is relatively high (22-23 kg/1000 hooks) during the first and second quarters, the Andaman & Nicobar waters give a higher catch rate (>45 kg/1000 hooks) in every quarter and a significantly higher catch rate (>53 kg/1000 hooks) during the third and fourth quarters.

The study shows that the Indian seas, particularly Andaman & Nicobar waters, are productive areas for sailfish. These are comparable with the Madagascar region and the northern Australian waters for sailfish in the Indian Ocean.

Table 5. **Length frequency of sailfish from Andaman & Nicobar waters**

Year & month	*1993*	*1993*	*1994*	*1994*	*1994*	*1994*	*1994*	*1995*	
Length group	*11*	*12*	*1*	*3*	*8*	*10*	*11*	*2*	*Total*
130.00-135.00	0	0	0	0	0	0	0	0	0
135.00-140.00	0	0	0	0	0	0	0	1	1
140.00-145.00	0	0	0	0	0	0	0	0	0
145.00-150.00	0	0	0	0	0	0	0	0	0
150.00-155.00	0	0	0	0	2	0	0	0	2
155.00-160.00	0	0	0	0	0	0	0	1	1
160.00-165.00	0	1	0	0	0	0	1	2	4
165.00-170.00	0	0	0	0	0	0	0	0	0
170.00-175.00	0	1	0	0	0	0	0	0	1
175.00-180.00	0	0	1	1	0	0	0	1	3
180.00-185.00	0	1	1	1	0	0	2	0	5
185.00-190.00	0	2	0	0	0	0	0	0	2
190.00-195.00	2	2	0	1	0	0	0	0	5
195.00-200.00	2	2	2	1	0	0	1	0	8
200.00-205.00	3	4	0	0	0	1	0	0	8
205.00-210.00	1	4	0	0	0	0	0	0	5
210.00-215.00	1	0	1	0	2	0	2	0	6
215.00-220.00	2	1	0	1	0	0	0	0	4
220.00-225.00	0	1	0	1	0	1	2	0	5
225.00-230.00	0	2	0	0	3	1	1	0	7
230.00-235.00	0	0	1	1	0	0	0	0	2
235.00-240.00	1	0	0	0	0	1	0	0	2
240.00-245.00	0	0	0	1	2	0	1	0	4
Total	12	21	6	8	9	4	10	5	75

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***Figure 1**. Distribution of fishing effort and CPUE of sailfish obtained in tuna longline fishing by chartered vessels during 1992-1993.*

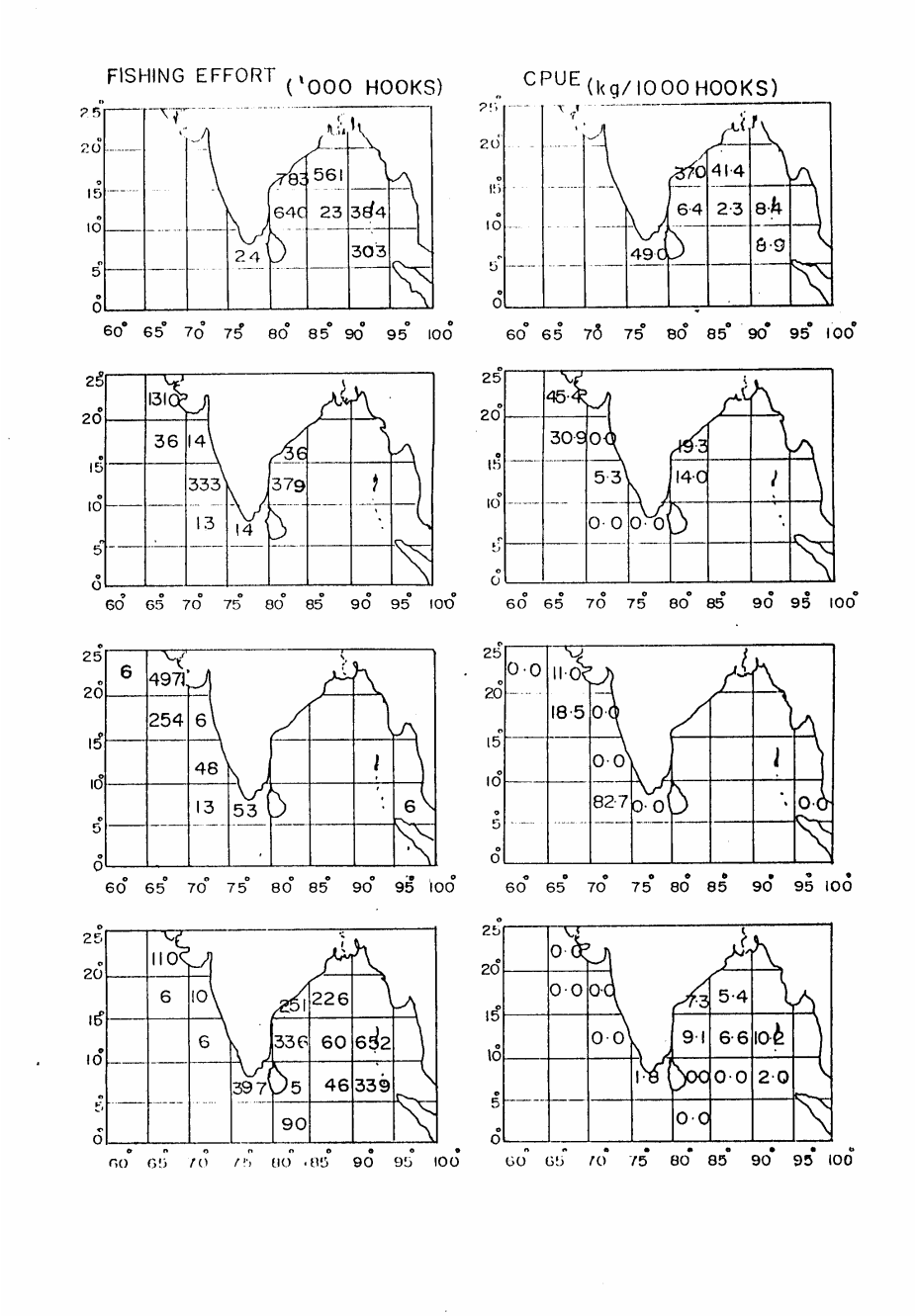

***Figure 2**. Distribution of sampling effort and CPUE of sail fish obtained in tuna longline survey in Andaman and Nicobar waters dring 1989-1995 (up to June 1995).*

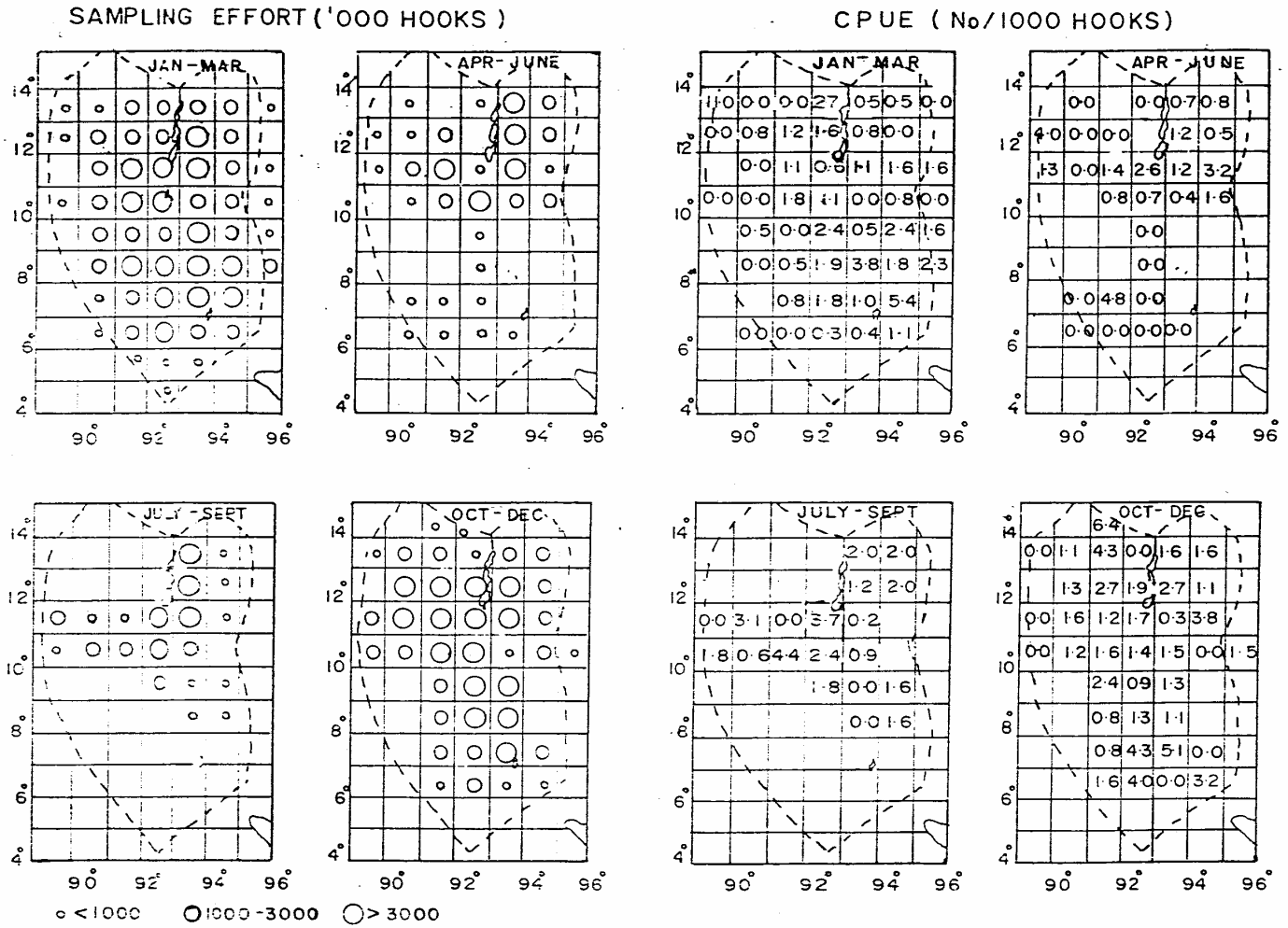

Figure 3. *Length-Frequency distribution of sail fish in Andaman and Nicobar waters: Nov 93-Feb 1995.*

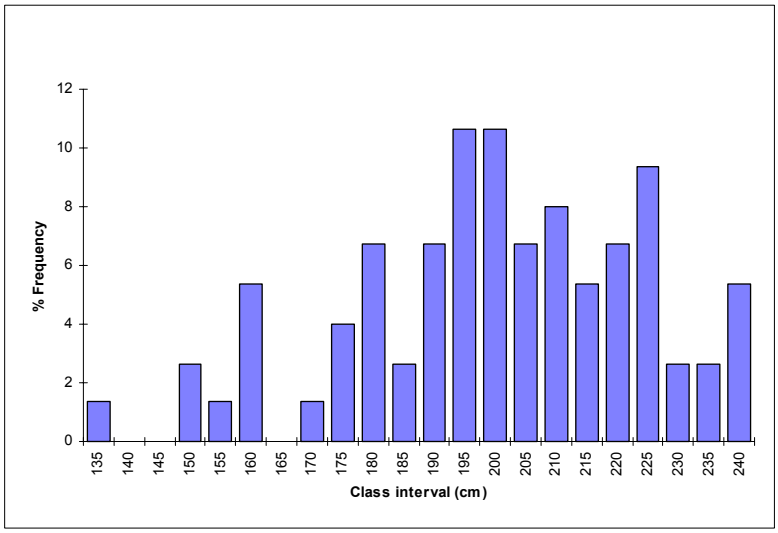

Figure 4. *Annual variability in weight of sail fish from Andaman and Nicobar waters.*

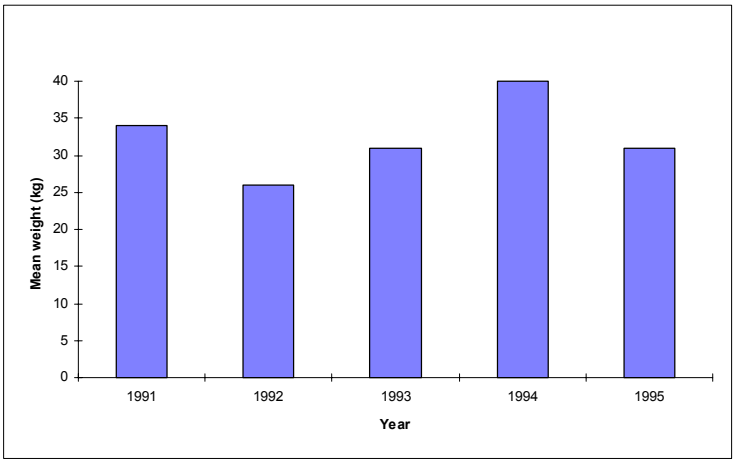

Figure 5. *Seasonal variability in weight of sail fish from Andaman and Nicobar waters.*