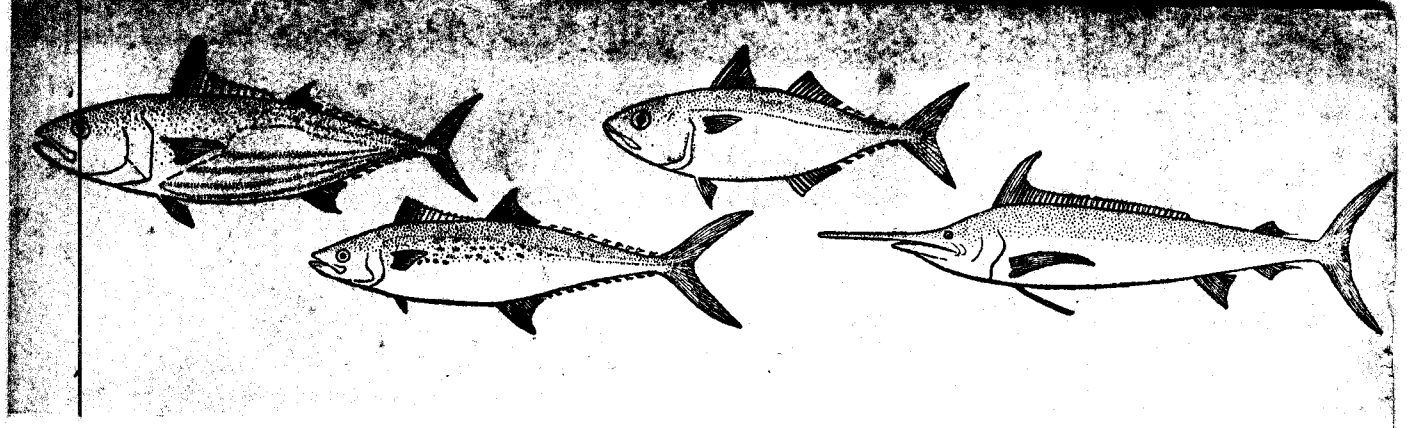
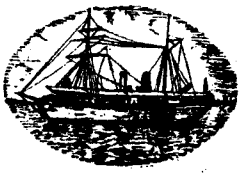


SYMPOSIUM ON

SCOMBROID FISHES

PART III



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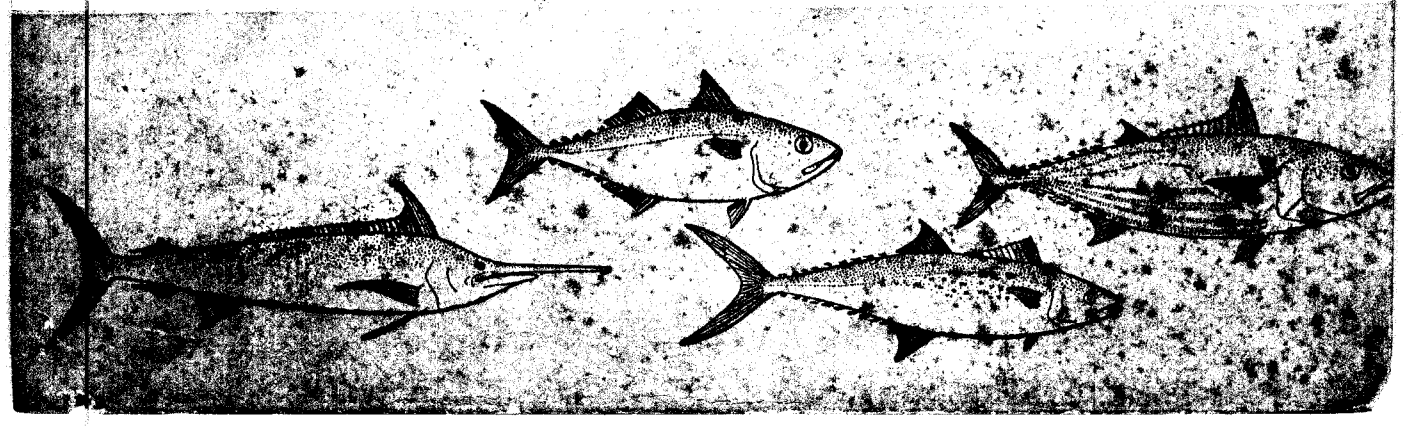
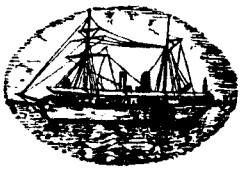


PROCEEDINGS OF THE

SYMPOSIUM
ON
SCOMBROID FISHES

HELD AT MANDAPAM CAMP FROM JAN. 12-15, 1962

PART III



SYMPOSIUM SERIES I

MARINE BIOLOGICAL ASSOCIATION OF INDIA

MANDAPAM CAMP

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ON THE SAILFISH AND MARLINS OF THE TUTICORIN COAST*

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INTRODUCTION

Billfishes (Istiophoridae and Xiphiidae) form part of the marine fishery resource commercially exploited by some nations, notably Japan, from parts of the Indo-Pacific. Most of the fishery for billfishes from various parts of the Indian Ocean is carried out by the Japanese and Catch statistics published from Japan (Ann. 1959) indicate the occurrence of rich fishing grounds for billfishes even within a few miles off the Indian coasts during certain seasons. However, little attention has been paid by Indian workers towards the study of the billfishes occurring in the Indian seas, and as such hardly any data is available about their seasonal occurrence, species composition, method of capture etc., along our coast.

Since Day (1878) recorded three species of billfishes, namely, *Histiophorus gladius* (Broussonet), *H. immaculatus* Ruppell, and *Histiophorus brevirostris* Playfair from the Indian coasts the notable contributions on this group have been those by Hornell (1917) who gave some preliminary data on billfish landings at Tuticorin ; and Jones (1959 a, b, 1960) who described larvae and juveniles of billfishes from Indian waters. Deraniyagala (1952) records *Tetrapturus indicus* Cuvier, *Tetrapturus tenuirostratus* Deraniyagala, *Istiophorus gladius* Broussonet, *Makaira indica* Deraniyagala, *M. mitsukurii* (Jordan and Snyder) and *Xiphias gladius* Linnaeus from Ceylon waters while Munro (1955) recognizes only five species, *Histiophorus gladius*, *Tetrapturus brevirostris* (Playfair), *Makaira mitsukurii* (Jordan and Snyder), *Makaira indica* (Cuvier), and *Xiphias gladius* from Ceylon waters. There is considerable confusion in the nomenclature used to denote the various species of billfishes from different oceans and this is made all the more difficult on account of the pantropical distribution of some of the species ; the marked changes during growth and lack of data of good series of specimens of each species from different areas. Besides, the indiscriminate use of popular names for different species has tended to add to the confusion. Elsewhere (Jones and Silas, 1962) an attempt has been made to straighten out the nomenclature of the species of billfishes occurring in the Indian seas, and based on these findings, the following species were found to occur along the Tuticorin coast, Gulf of Mannar (Plates I and II).

Species Name	*Vernacular name* (Tamil)
1. *Istiophorus gladius* (Broussonet)	Thalapathu
2. *Makaira indica* (Cuvier)	
3. *Makaira nigricans* Lacépéde	Kopparaikulla
4. *Tetrapturus audax* Philippi	
5. *Tetrapturus tenuirostratus* Deraniyagala	

Hornell's aforesaid work (1917) as well as the icthyological literature of Ceylon fishes indicates the occurrence of the broadbill swordfish *Xiphias gladius* Linnaeus in the Gulf of Mannar,

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although we have not come across this species during the course of 18 months (1960-61) of observations of billfish landings at Tuticorin. In view of the paucity of data on billfishes from Indian waters, it is hoped that the observations made herein will be of interest to future workers.

Method of Capture, Season of Occurrence and Size Composition

The occurrence of billfishes along Tuticorin coast coincides with active fishing for other Scombroid fishes from May-June to September (Fig. 1). However, stray catches are made during

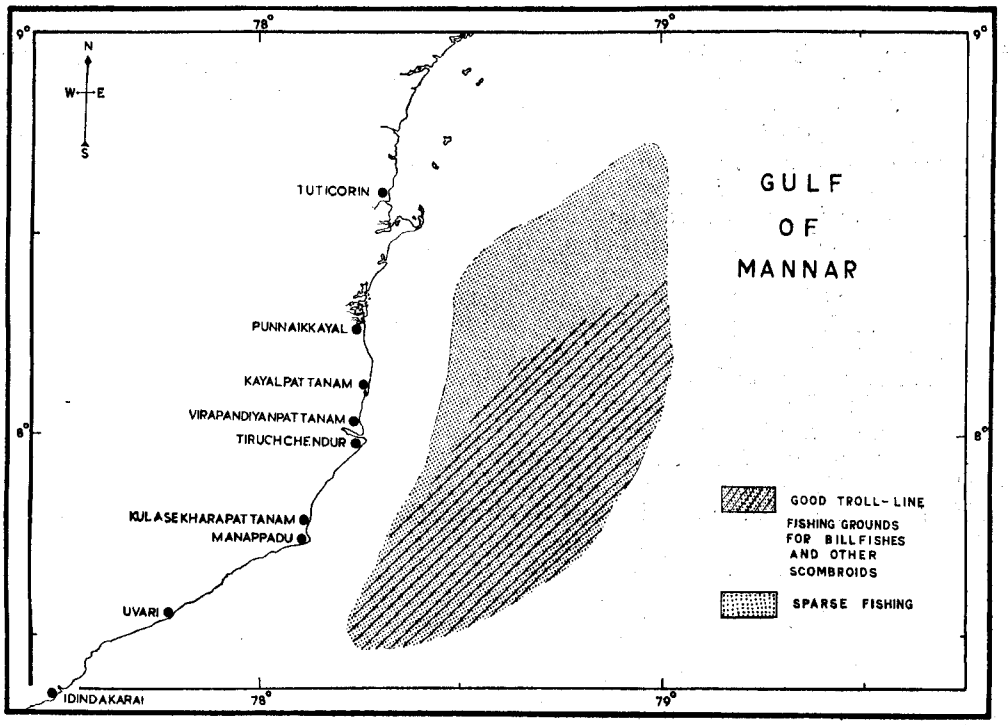
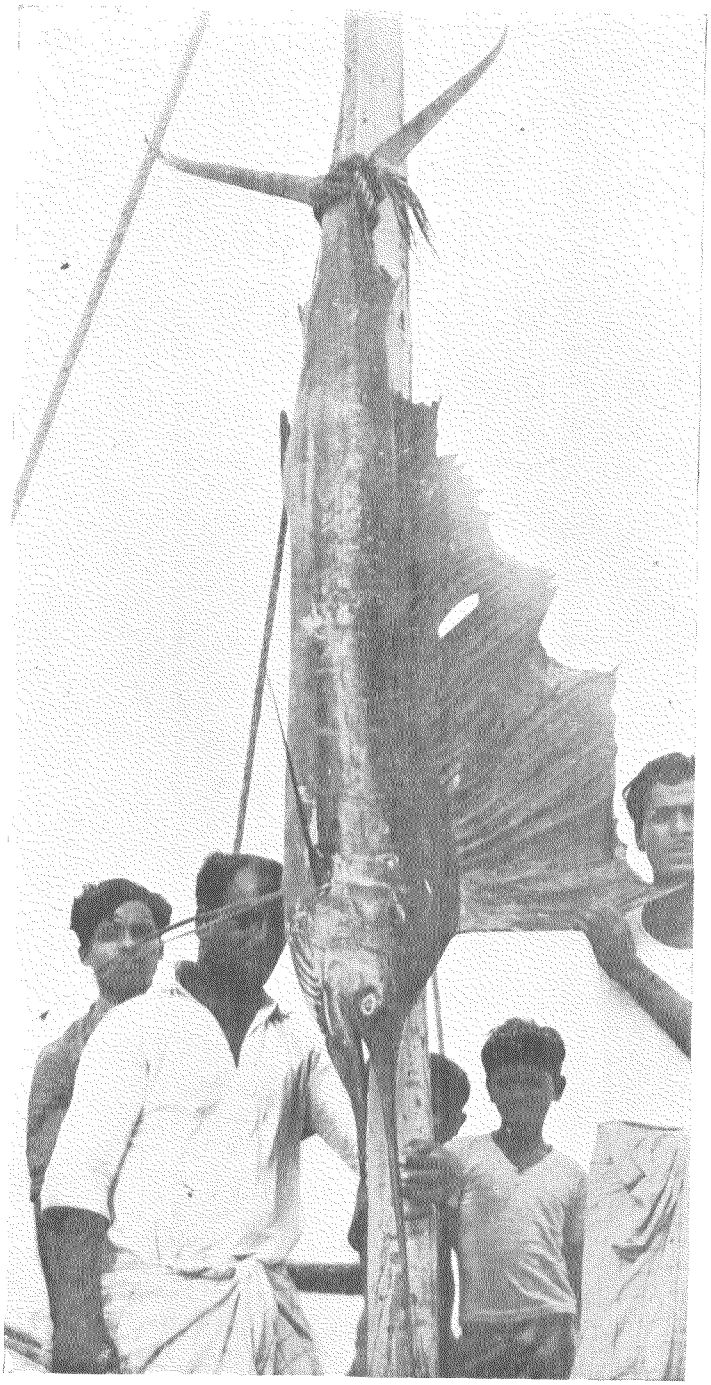


FIG. 1. Map of Tuticorin coast and part of Gulf of Mannar showing the area in which troll line fishing is carried out at present.

off season by returning boats engaged in handline fishing in the vicinity of Thollayiram Paar using one or two troll lines provided the wind conditions are favourable. For a detailed account of trolling in the Tuna fishing grounds of Tuticorin, reference may be made to Silas (1962). But for Hornell's (1917) observations, there is no published data about the seasonal occurrence of billfishes along Tuticorin coast and the data given by him (Fig. 2) when compared with our observations for 1960-61 (Fig. 3) indicates differences in the seasons of occurrences of these fishes. The 1960-61 period shows July-September and November-February to be the fishing seasons for billfishes with a distinct peak for August. Wind conditions may be unfavourable for trolling from late September to the middle of November and a second minor peak in billfish catch is noticed between November and February. The 1913-15 data shows that most of the landings were confined to the latter period, namely, November-February, while in other months the landings were negligible. The causative factors for such changes from time to time may be :

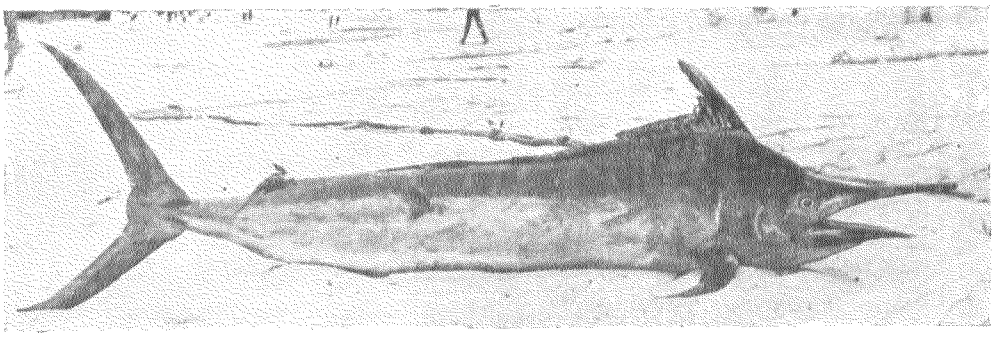
(1) Unpredictable weather conditions.



1. Sailfish *Istiophorus gladius* (Broussonet)

2. Black marlin, *Makaira indica* (Cuvier) : side of the body. Note the scalation.

3. *Makaira indica*, lateral view.



4. Blue marlin, *Makaira nigricans* (Lacépède).

(2) More intensive inshore fishing using Gill nets, Drift nets etc., during November-February at present and the likely depletion of prey species or the deflection of shoals of prey species to offshore waters and the consequent shifting of predator species to such areas.

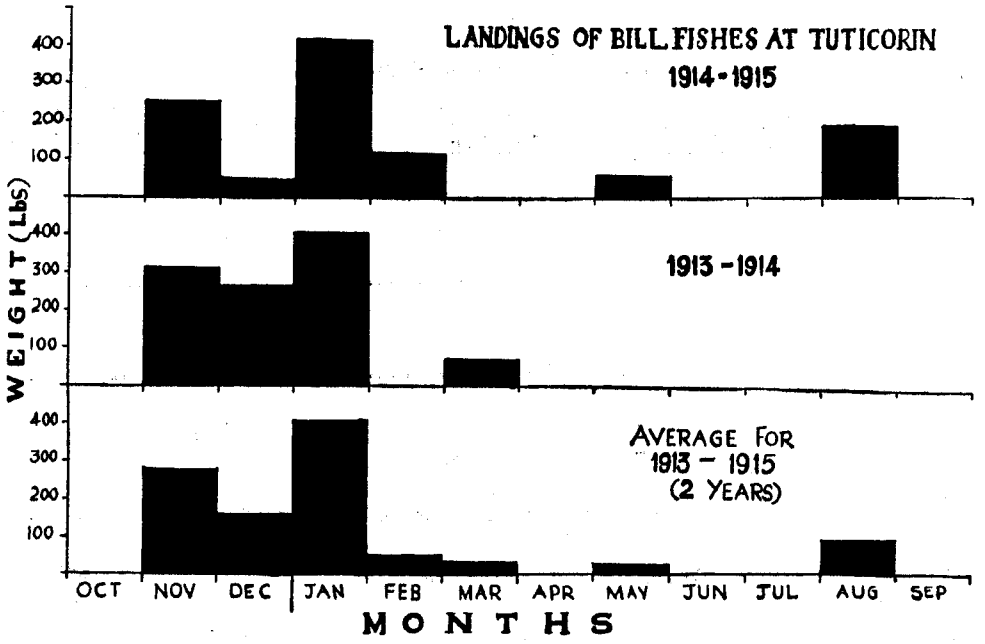


FIG. 2. Landings of billfishes at Tuticorin for the 1913-15 period, based on data given by Hornell (1917). Note that in both years most of the landings were during the November-January months.

(3) In the absence of proper observations on the hydrographical conditions in the trolling ground it may be difficult to point to any ecological factor which influences the season of occurrence of billfishes off Tuticorin coast.

(4) Lack of incentive for troll fishery during certain months when fishermen could have alternate profitable occupations is another very important factor reflecting on the total annual landings. More on this point has been discussed elsewhere (Silas, 1962).

From Fig. 3 it will be seen that three of the five species of billfishes have been caught during both seasons, namely, July-September and November-February. During 1960-61, the black marlin and the blue marlin were not landed during the November-February season, but in view of the availability of the sailfish, striped marlin and short-nosed spearfish during these months, it is likely that the former two could also occur during these months. Of the five species, the sailfish *I. gladius* is the commonest and from observations made by one of us (E.G.S.) as well as talks with colleagues from other Fishery centres along the West coast of India such as, Cape Comorin, Colachel, Vizhingam, Malpe and Ratnagiri, it would appear that wherever billfishes are landed, the sailfish predominates in numbers.

As regards size compositions, very little can be deduced from the meagre data available. However, we find that there is a tendency for a smaller size group of sailfish to occur during the November-February period off Tuticorin (Fig. 4). Weight-wise the black marlin appears to be the largest of these species and those caught off Tuticorin were all over 200 cms. long while the spearfishes were the smallest ranging from 90 to 125 cms. Measurements of sailfish and marlins caught off Tuticorin Coast are presented in Appendix.

DESCRIPTION OF INTERNAL ORGANS

Istiophorus gladius (Broussonet)

Sailfish

Material: 14 specimens ; 4 examined for internal organs.

Description of internal organs from a specimen of length 2030 mm. and weight 35.4 Kg. (78 lbs.) is as follows : The liver is distinctly bilobed and the right lobe is elongate and extends to about

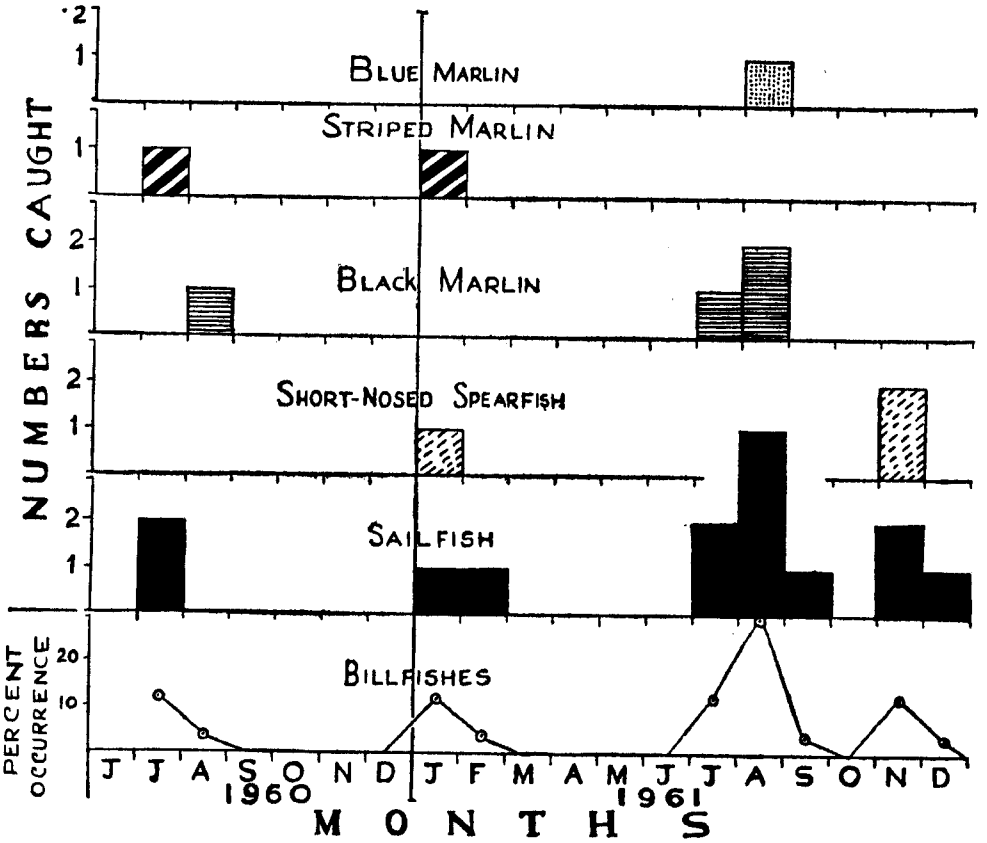


FIG. 3. Number of billfishes (species-wise and total) caught during the period of 18 months from July 1960—December 1961, off Tuticorin.

$\frac{1}{3}$rd the length of the visceral cavity to the point where the loop of the intestine passes along the posterior end of the pyloric caeca. The left lobe is about half the length of the right lobe and the liver on the whole is thinner and pale yellow in colour. The gall bladder is conspicuously long extending posteriorly well beyond the loop of the intestine. The spleen is greatly enlarged and is of about the same length as the caecum when viewed from ventrally. The empty stomach occupies about $\frac{1}{3}$rd the peritoneal cavity and extends posteriorly to the mid-distance between posterior end of spleen and vent. A dissection of the empty stomach shows 16-17 conspicuous mucous folds at its mid-length while these ridges converge to 9-10 at the oesophageal end. It is likely that in the distended condition the stomach may extend still further back. The loop of the intestine is in level with the posterior end of the spleen.

The examination of 4 stomachs showed 3 empty and one in which 2 partly digested clupeid fishes (*Sardinella* sp.) were present.

None of the specimens of sailfish show mature condition of the gonads.

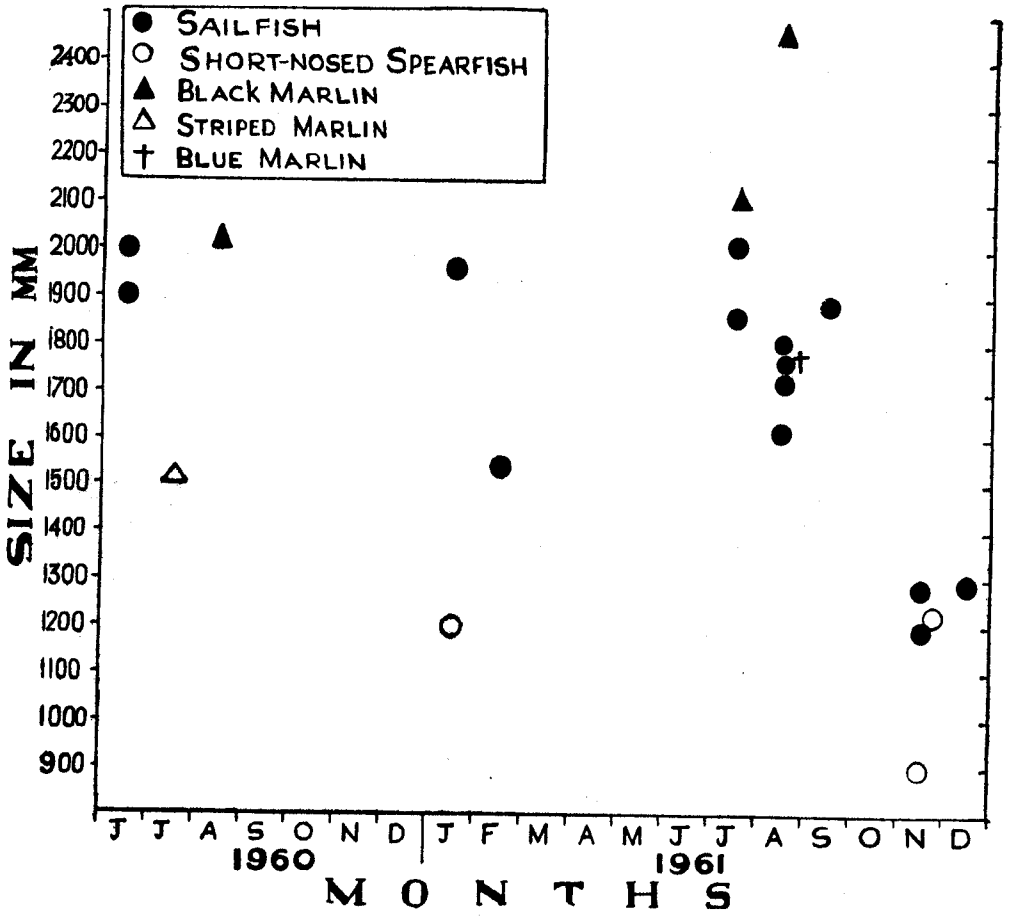


FIG. 4. Total lengths from tip of lower bill to fork of species of billfishes landed at Tuticorin (22 specimens) for the period July 1960—December 1961.

Makaira indica (Cuvier)

Black marlin

Material : 3 specimens ; 2 examined for internal organs.

Description of internal organs from a specimen of length 2445 mm. and weight 79·4 Kg. (175 lbs.) is as follows : Liver is conspicuously large and massive and the right lobe is slightly longer than the left lobe and covers the right side of the caecum almost completely. *Unlike* in *Istiophorus* the gall bladder and spleen are shorter, and the former does not extend to the loop of the intestine. The shape of the spleen is more or less triangular. The stomach is large and when empty occupies more than ⅓rd the peritoneal cavity and extends posteriorly to above the vent. In the distended condition it is likely that the stomach may extend still backwards. Dissection shows 10 thick prominent mucous ridges at the mid-length of the stomach while 9 such

ridges are seen at the oesophageal end. When compared to *I. gladius* the intestine is relatively shorter in this species.

Two of the stomachs examined were empty.

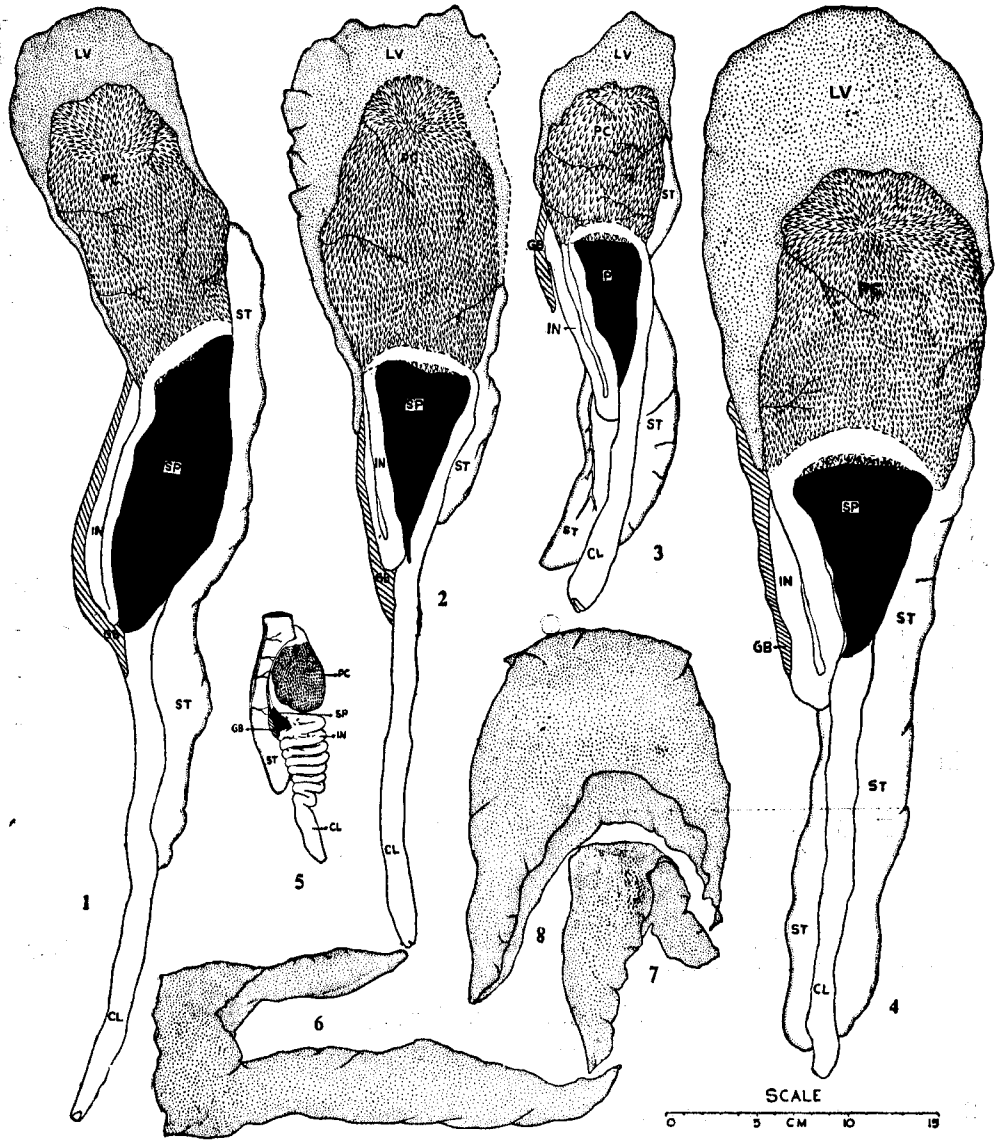


FIG. 5. Visceral organs of: (1) The sailfish *Istiophorus gladius*, 2030 mm. 78 lbs.; (2) the blue marlin *Makaira nigricans* 1785+ mm. 112 lbs.; (3) the short nosed spearfish *Tetrapturus tenuirostratus* 1231 mm. 28 lbs.; (4) the black marlin *Makaira indica*, 2445 mm. 175 lbs.; (5) the broadbill swordfish *Xiphias gladius* (after Suyehiro, 1942); Liver of: (6) *I. gladius*; (7) *Tetrapturus tenuirostratus*; (8) *M. indica*. All taken from material mentioned above. CL = Colon; GB = gall bladder; IN = intestine; LV = liver; PC = pyloric caecae; SP = spleen; ST = stomach)

Makaira nigricans (Lacépéde)

Blue marlin

Material : 1 specimen, also examined for internal organs.

Partial description of a specimen of length 1785 mm. and weight 50.8 Kg. is as follows : Postmortem colour is steel blue in the upper half of the body, greyish laterally becoming lighter on the ventral side and belly whitish. 15-20 pale blue vertical stripes with a posteriorly directed loop along its centre were noticeable when fresh, but faded rapidly. The colour pattern is almost identical to that figured for *M. mazara* by Nakamura (1938). This condition is distinctly different from that seen in the striped marlin where the vertical bands are more distinct and numerous. Another character which aided in the identification of this species is the anterior height of the first dorsal which is hardly $\frac{1}{4}$th the depth of the body ; while in the striped marlin (*Tetrapturus audax*) this may be equal or greater than the height of the body. The specimen has been mounted and displayed in the museum of the Central Marine Fisheries Research Institute.

The examination of the viscera of the specimen shows the liver to be thinner, but the right lobe to be relatively longer extending beyond the caecum. The left lobe was partly damaged but when reconstructed it reaches to $\frac{2}{3}$rd the length of the pyloric caeca on the left side. The gall bladder is long and extends to well beyond the loop of the intestine, but the spleen which is triangular in shape does not surpass this point. One very characteristic feature appears to be the stomach which is short and hardly reaches to opposite the angle of the first loop of the intestine. The short stomach seen in this specimen shows similarity for that described for *Makaira mitsukurii* (the striped marlin) by Suyehiro (1942), but in the latter he mentions the presence of about 15 folds of mucous membrane in the stomach wall. Dissection of the stomach of our specimen showed 12 longitudinal ridges in the mid-portion. While this may be a minor difference, it will be worthwhile if careful observations are made on the disposition of the visceral organs in the blue marlin and striped marlin occurring in Indian seas.

The stomach of the above specimen was found to contain some unidentifiable pulpy matter along with few remains of squids.

Tetrapturus audax (Philippi)

Striped marlin

Material : 2 specimens.

The identity of this species is based on a specimen landed on 26 July 1960 which was measured and photographed. Unfortunately it was not possible to collect the visceral organs for detailed examination, nor obtain similar data for the second specimen.

Tetrapturus tenuirostratus Deraniyagala

Indian long-nosed Spearfish

Material : 3 specimens ; soft parts described from a specimen 1231 mm. weighing 13.72 Kg. (28 lbs.).

The popular name ' Short-nosed spearfish ' applied to *Tetrapturus angustirostris* Tanaka, will not apply to the Indian specimens as these have a longer bill, the distance from its tip to that of the lower jaw being contained about two times in the length of the bill. For a taxonomic discus-

sion of the specimens referred to here as *Tetrapturus tenuirostratus* reference is invited to Jones and Silas (1962).

The liver is relatively smaller and the right lobe which is longer extends to hardly ⅓rd the length of the pyloric caeca. The gall-bladder is relatively shorter extending to hardly half the length to the loop of the intestine. The spleen which is more or less triangular also falls short of the angle of the loop of the intestine. One conspicuous feature is the large stomach which in a partly filled state extends to above the level of the vent. The stomach as a whole appears to be thin walled and dissection shows very weak mucous ridges or folds at the mid-length of the stomach while 9 low ridges are noticed at the oesophageal end.

The stomach contained digested remains of about 10 clupeids.

A specimen, of about same length caught at Vizhingam on 29-11-61 shows similar disposition of the visceral organs, except that the right lobe of the liver is slightly longer.

Relative Weight of Visceral Organs

The weights of the visceral organs in relation to body weight is one aspect of the study of the biology of sailfishes and marlins on which emphasis is laid (La Monte, 1955, Krumholz, 1958). In this preliminary study it was possible to analyse only the data for eight specimens belonging to four species and this is tabulated below.

Table

Percentages of total body weight made up by different organs

	I. gladius			*M. mazara* (1)	*M. indica* (1)	*T. tenuirostratus* (1)
	Max.	*Min.*	*Average* (4)			
Viscera minus air-bladder and kidney	6.09	3.96	5.13	3.83	3.57	4.80
Spleen	0.10	0.23	0.21	0.11	0.09	0.12
Liver	0.83	0.42	0.64	0.33	0.90	0.65
Pyloric caeca and intestine ..	2.3	2.5	2.36	..	0.96	1.6
Stomach (empty)	1.2	1.7	1.46	..	1.07	1.6

* Separate weights for gall-bladder and gonads are not given, but weight of viscera given in column 1 is inclusive of these.

While the data is meagre, there is an indication that weight for weight the liver is relatively heavier in the black marlin *M. indica* while the spleen appears to be so in the case of *I. gladius*.

The nature and disposition of the visceral organs in the five species examined is shown in Fig. 5. In *Xiphias gladius* which has not been examined, the intestine is more or less coiled, zigzaging 7 or 8 times before running straight for a short distance to the vent (Fig. 5) a condition not met with in other billfishes.

General Observations

Billfishes are caught off Tuticorin with the same type of baits (*Sardinella* spp.) or artificial lures as used for other scombroids during the troll fishing season. Experienced fishermen inform us that it is rarely ever that they see the fish at the surface with the dorsal fins showing above water. On rare occasions the fish have been noticed pursuing the moving lure and take it, the first indication of the bite being a small tug on the line and the next moment the fish leaps out of water. On the average during good fishing periods three or four out of five fishes taking the bait are lost on account of the line snapping due to the initial shock ; the hooks straightening ; or the bite being ineffective due to the too fast sailing of the boat. The absence of ' trolling springs ' to act as shock absorbers on the lines is one of the main draw backs ; another being the difficulties in controlling the speed of the boat which often may exceed 12 knots and prove extremely difficult for hauling in lines as well as hazardous for those operating the lines.

Most of the points raised in the case of Tuna Fishery off Tuticorin coast (Silas, 1962) are also applicable to billfish fishery in this area. The distance of the fishing grounds off Tuticorin is such that each day nearly 60% to 70% of the time out is spent in trying to reach the fishing grounds and returning back. Boats operating from Virapandianpattanam 35 km. South of Tuticorin have the advantage of three to four hours less of travel to and fro, but during the period of observation fishing at Virapandianpattanam was at a stand still on account of the slum in the dryfish trade.

Fluctuations in price for billfishes at Tuticorin may be of interest. Hornell (1917) gave the price of billfish (swordfish) per pound as 1 anna (=6 ps). When the dryfish trade with Ceylon was flourishing, in 1960 the auction rate for billfish when landed would go as up high as 50 to 70 ps. per pound while the market rate for the fresh fish was about Rs. 1.25. During the 1961 season, the few billfishes caught fetched very low prices and the auction price at the landing place hardly went up to 25 ps. per pound while the market rate for fresh fish was about 75 ps. In 1960 Rs. 80 was obtained for 1 cwt. of dryfish (rate for billfish), but current rates have dropped to Rs. 35.

As for the habits of the fish one interesting thing was that none of the fishermen could recollect having heard of damage to boats in that area due to ' attacks ' from billfishes. In fact, when a fish is hooked and brought alongside the boat, two simultaneous actions are carried out, the first gaffing and immediately the bill of the fish is held tightly which action, the fishermen say, immobilises the fish. Accidents of wounds caused to fishermen at this stage are extremely rare.

We are informed that in 1959 two families of fisherfolk at Tuticorin were affected (no fatalities) as a result of eating parts of the viscera including the stomach of the black marlin *M. indica*. On account of this event which is still fresh in the minds of many, the visceral organs of billfishes cut on the beach are not taken for cooking, unlike those of the yellowfin, the little tunny, and the northern bluefin tuna.

There is considerable scope for the improvement of the troll-line fishery for billfishes and related fishes off Tuticorin if trolling could be carried out from mechanised fishing boats as well as if slight improvements could be effected to the existing methods used. It is hoped that the billfish fishery of Tuticorin Coast will recover when suitable outlets are found for the disposal of fresh as well as dry fish in the interior markets.

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APPENDIX

MEASUREMENTS (MM.) OF SAILFISH AND MARLINS CAUGHT OFF TUTICORIN

Istiophorus gladius

1. Date	7-7-60	27-7-60	28-1-61	2-2-61	18-7-61	28-7-61
2. Sex	..	..	..	..	..	Male
3. Wt. (lbs)	..	..	..	..	..	75
4. Body Length	2210	2375	1964	1540	1860	2060
5. 1st Pre-dorsal length	(with bill) -400	(with bill) -400	360	..	378	403
6. 2nd ,, ,,	..	..	..	..	1560	1690
7. Pre-pectoral length	..	..	440	..	461	460
8. Pre-pelvic length	..	..	..	..	485	500
9. 1st Pre-anal length	..	..	1215	..	1180	1290
10. 2nd Pre-anal length	..	..	1615	..	1575	1700
11. Or. of D(1) to origin of P.(1)	..	..	..	..	..	230
12. Or. of D(1) to origin of P(2)	..	..	..	..	..	320
13. Or. of D(2) to origin of A(2)	..	..	..	..	..	190
14. Or. of P(2) to Vent	..	..	..	..	..	680
15. Greatest depth of body	..	..	307	222	315	330
16. D. of body at origin D(1)	..	..	..	..	..	300
17. D. of body at origin of A(1)	..	..	..	..	..	251
18. Wdth. of body at origin of P(1)	..	..	..	..	..	110
19. Head length	..	..	..	365	453	460
20. Snout length	..	..	..	..	542	..
21. Bill length	..	..	521	..	..	..
22. Maxillary length	..	..	..	..	..	..
23. Orbit diameter	..	..	48	42	49	50
24. Tip of mandible of tip of bill	..	..	320	260	318	370
25. Ant. ht. of D(1)	..	..	430	336	..	270
26. Length of Middle D.spine	..	..	700	..	..	890
27. Length of P(1)	..	..	442	264	430	450
28. Length of P(2)	..	..	585	462	590	640
29. Caudal Spread	..	..	..	..	..	800
30. Dorsal Spine nos.	..	..	47	47	47	47
31. Interdorsal gap.	..	..		..	38	30

APPENDIX—(*Continued*)

Istiophorus gladius

1.	4-8-61	17-8-61	19-8-61	25-8-61	11-9-61	21-11-61	23-11-61	11-12-61
2.	..	Female	..	Male	..	..	Female	..
3.	..	56	..	36	..	..	78	28
4.	2200 with bill -400	1760	1730	1615	1880	1200	2030	1290
5.		395	400	337	410	..	410	320
6.	..	1500	1440	1400	1525	..	1640	1080
7.	..	425	..	370	415	..	453	290
8.	..	455	..	405	465	..	520	360
9.	..	1100	1200	1007	1120	..	1260	900
10.	..	1480	1440	1337	1515	..	1640	1130
11.	..	210	..	205	..	..	..	..
12.	..	290	..	260	..	..	..	..
13.	..	160	..	145	..	..	..	..
14.	..	550	..	515	..	..	..	..
15.	..	290	..	253	..	..	320	205
16.	..	273	..	250	..	..	..	..
17.	..	210	..	173	..	..	..	..
18.	..	110	..	..	..	..	..	..
19.	..	430	440	348	430	..	450	283
20.	..	..	445	187	..	..	370	..
21.	..	..	..	422	..	..	770	damaged
22.	..	..	..	210	..	..	..	..
23.	..	40	50	40	48	..	50	30
24.	..	280	220	257	..	..	400	..
25.	..	440	380	323	450	..	460	..
26.	..	770	640	630	820	..	700	..
27.	..	390	360	336	390	..	420	210
28.	..	575	480	525	560	..	620	420
29.	..	680	530	575	..	..	800	410
30.	..	47	47	46	46	..	46	46
31.	30	39	20	36	..	..	..	..

APPENDIX—(*Continued*)

	Makaira indica			*Makaira nigricans*			*Tetrapturus audax*	*Tetrapturus tenuirostratus*	
1.	17-7-61	18-8-61	23-8-61	11-8-60	21-1-61	25-8-61	26-7-60	14-11-61	29-11-61
2.	..	..	Female	..	..	Male	..	Male	..
3.	..	..	175	..	..	112	..	28	..
4.	2100	..	2445	2400 -400	1200	1785	1775 -130	1231	900
5.	480	..	510	..	..	405	..	259	
6.	1670	..	1605	..	..	1405	..	963	..
7.	530	..	539	..	..	456	..	304	..
8.	553	..	560	..	..	483	452	334	..
9.	1270	..	1220	..	..	1132	1073	724	..
10.	1680	..	1640	..	..	1438	1420	954	..
11.	..	..	350	..	..	306	..	187	..
12.	..	..	410	..	..	370	..	238	..
13.	..	..	234	..	..	220	..	140	..
14.	..	..	510	..	..	504	..	..	..
15.	462	..	416	..	196	359	329	235	200
16.	..	..	385	..	..	348	..	217	..
17.	..	..	335	..	..	324	..	205	..
18.	..	..	..	..	..	205	..	..	..
19.	512	480	520	..	303	438	..	308	..
20.	570	..	252	..	..	210	288	145	..
21.	..	..	605	..	..	442	..	302	..
22.	..	..	325	..	..	275	..	..	..
23.	60	55	57	..	..	43	54	35	..
24.	310	..	365	..	120	237	..	162	..
25.	280	..	..	..	175	280	348	174	..
26.	..	..	58	..	..	70	..	107	..
27.	445	..	580	..	..	405	338	215	..
28.	250	..	310	..	..	285	268	268	..
29.	..	..	880	..	..	755	..	480	..
30.	..	..	36	..	..	37	..	38	..
31.	..	..	..	..	..	..	..	..	..