AN ANALYSIS OF BILLFISH LANDINGS IN THE PELAGIC FISHERIES IN SRI LANKA

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INTRODUCTION

With the expansion of the fishing range of the large pelagic fishing fleet in early 1980s (Dayaratne, 1993), a substantial increase of billfish catches, from around 4,000 t in 1984 to 11,000 t in 1993, was realised, highlighting their importance in the offshore fisheries in Sri Lanka. The present production level makes up about 7% of the total large pelagics landed in the island and around 32% of the total billfish landed in the Indian Ocean (Anon,1995).

Studies of billfish and their fisheries around Sri Lanka are limited and mainly based on the landings made from the coastal waters, prior to the development of offshore fisheries. Jinadasa (1985) reported on the species composition, size range and abundance of sailfish and marlin caught in the waters off Negombo, on the west coast of Sri Lanka. Fisheries for billfish in southern and western coastal waters have been studied by Joseph and Amarasiri (1986), Maldeniya *et al.* (1987) and Foster (1987).

This paper analyses the landings of billfish made in large pelagic fisheries during the period 1990-1994.

MATERIALS AND METHODS

The information on billfish landings was gathered through a sampling programme jointly conducted by the National Aquatic Resources Agency (NARA) and the Indo-Pacific Tuna Development and Management Programme (IPTP). Sampling covered an area from Negombo in the west to Hambanthota in the south (Dayaratne and Maldeniya, 1990). Data for 1994 were collected through the sampling programme established under an FAO Technical Cooperation Programme (NARA/TCP/FAO Project 2251) This programme enabled the sampling activities to be extended to the east coast.

Fish landings were sampled at 11 major centres scattered along the coast in different areas: west (Negombo), south-west (Beruwala, Galle), south (Weligama, Mirissa, Dondra, Kottegoda, Kudawella and Tangalle), east (Kalmunai) and north-east (Trincomalee).

As there are many types of vessel and gear combinations contributing to the billfish landings in the island, analyses were made separately for different combinations.

RESULTS

Fishing gear and effort

Billfish is not the target group in any of the local commercial fisheries directed toward large pelagics. They form an important incidental catch in gillnets, longlines and troll lines. Vessels operating these gears are primarily engaged in catching tunas. Traditional vessels, 6-7 m boats with outboard motors and 9-m boats, operate one-day fishing in coastal waters, <30 km from the shore, while >10-11 m boats and those over 10 m generally operate multi-day fishing in the offshore and deep-sea area.

Catch per unit effort (CPUE)

The estimated annual average CPUEs (kg/boat night) of billfish by all gear and vessels are given in Table 1.

The overall average catch rates realised in the west, southwest and south in the present period of study range between 30.1 and 12.2 kg/boat night. However, the highest and lowest CPUEs, 66.2 and 9.6 kg/boat night, were realised in the east and north-east, but the study in these areas was limited to one year. Although there were annual fluctuations of CPUE in all areas, an exceptionally high value was reported from south-west in 1993 and low values in the south-west, south and south-east in 1994. In the west the CPUE of billfish showed an increasing trend from 1990 to 1994 but no clear trends in other areas.

The estimated average CPUE of billfish by all gears according to vessel type are summarized in Table 2. The catch rates of 9-11 m and >11 m boats operating in offshore and deep-sea areas were considerably higher than those of vessels operating in the coastal areas. Although there were no data to compare the performance of 9-11 m and >11 m class boats in all areas, higher rates were reported for the >11-m class of boats in the south and south-east from 1990-1992 than for the 9-11 m class of boats.

Table 1. Average annual CPUE (kg/boat night) of billfish, by area

Year	*West*	*South-west*	*South*	*South-east*	*East*
1990	6.4	25.5	15.4	-	-
1991	11.4	31.2	14.6	-	-
1992	14.6	22.7	13.8	-	-
1993	14.5	69.9	15.0	-	-
1994	17.6	5.6	13.8	66.2	9.6
Average	12.2	30.1	13.8	66.2	9.6

Table 2. Average CPUE for different classes of boats

Vessel class	*Area*	*1990*	*1991*	*1992*	*1993*	*1994*
6-7 m	West	0.2	0.0	1.4	0.8	24.1
boats,	South-west			0.0		0.0
outboar	South	0.0	0.9	0,0	15.2	0.0
d motor	East	-	-	-	-	0.0
	North-east	-	-	-		--
9-11 m	West	5.7	9.8	13.9	13.6	16.8
boats	South-west	25.5	31.2	22.8	69.9	6.9
	South	9.9	13.5	20.0	15.5	7.0
	East	-	-	-	-	67.4
	North-east	-	-	-	-	0.0
>11 m	West	9.3	12.9	15.5	16.6	19.7
boats	South-west					4.4
	South	43.9	51.0	23.1	8.9	6.9
	East	-	-	-	-	-
	North-East	-	-	-	-	10.0

Table 3. *Average CPUE for different gears. GN: gillnets; G*L: gillnets and longline; G*L*OT: gillnets, longline and other gear*

Vessel class	*Gear*	*West*	*South-west*	*South and South-east*	*East*	*North-east*
9-11 m boats	GN	13.0	0.9	14.8	67.3	0.0
	G*L	15.6	34.8	17.6	-	-
	G*L*OT	22.7	55.9	20.1	-	-
>11 m boats	GN	17.6	0.0	5.9	-	19.7
	G*L	16.9	6.0	20.4	-	10.7
	G*L*OT	22.9	-	0.0	-	--

Variations in overall average catch rates for the period 1992-1994, with respect to different gear combination used, are given in Table 3.

Vessels of the same type operating gillnets together with longlines or with another ancillary gear such as troll lines or handlines had higher catch rates than those operating gillnets alone. However, the highest rate has been reported from Kalmunai, in the east, for gillnet fishery alone.

Species composition

The percentage composition by species of the total billfish catch rates?? realized by all type of vessels and gear combination for the period of 1991-1994 are summarized in Table 4. This allows a comparison of the relative abundance of different species caught in different areas of the island.

Five species of billfish have been identified in the local commercial catches during the study period. Among marlins, the most common species in the catches is blue marlin (*Makaira nigricans*) in all areas except the south-west, followed by black marlin (*M. indica*), while the striped marlin (*Tetrapturus audax*) is caught in small quantities and only in the west. Sailfish (*Istiophorus platypterus*) and swordfish (*Xiphias gladius*) are the only non-marlin species in the billfish catches. Relatively low percentages of swordfish were reported from the south, south-east, east and north-east areas. It was estimated that about 17.4%, 69.4%, 0.3% 12.9% of the total island

Table 4. Percentage species composition of billfish catch rates in different areas.

Species	*West*	*South-west*	*South*	*East*	*North-east*
Sailfish	20.4	14.2	22.1	15.5	18.4
Blue marlin	46.9	15.7	58.5	81.4	75.3
Black marlin	8.0	28.2	7,6	0.3	0.0
Striped marlin	0.1	0.0	0.0	0.0	0.0
Swordfish	24.6	41.8	11.9	2.8	6.3

Table 5. *Percentage species composition of billfish for different gears*

Area	*Gear*	*Sailfish*	*Blue marlin*	*Black marlin*	*Swordfish*
west	DN	18.2	52.0	6.1	23.7
	D*L	17.4	48.3	6.3	27.9
south-west	DN	100.0	0.0	0.0	0.0
	D*L	16.3	9.2	27.6	46.3
south &	DN	18.8	33.6	38.9	9.4
south-east	D*L	22.3	60.9	1.1	15.6
east	DN	15.5	81.3	0.3	2.8
	D*L	-	-	-	-
north-east	DN	23.4	72.1	0.0	4.6
	D*L	15.5	76.7	0.0	6.8

billfish catch in 1994 consisted of sailfish, blue marlin, black marlin and swordfish, respectively.

The percentage composition by species the overall billfish catch rates estimated for the period of 1992-1994 for different fisheries are given in Table 5. A higher percentage of swordfish was reported from the driftnet/longline combination fishery in all areas than from fishing with driftnets alone.

Seasonal variation

Quarterly variation of catch rates of billfish in different areas for the period 1992-1994 are given in Figure 1. Relatively higher catch rates of sailfish are reported in the second and third quarters in all areas, and marlins are reported in the fourth and first quarters.

Size composition

The length-frequency distribution of the total landed sailfish, swordfish and blue marlin in 1993 are given in Figure 2. The size range of the sailfish varies from 60 to 300 cm FL (tip of lower jaw to the fork) and swordfish ranged from 50 to 260 cm FL. Due to their large size, marlins were usually cut open at sea for the purpose of storage. This has greatly reduced the amount of length-frequency data available. The blue marlin catch ranged from 110 cm to 270 cm FL.

Catch and catch composition

Estimated production of billfish by all vessels and gear combinations are given in Table 6.

The catches of billfish as a percentage to the total pelagic catch in different areas are given Table 7.

The highest contribution of billfish was reported from the east, followed by the south-west.

DISCUSSION

The estimates of billfish landings have reached 13,435 t in 1994 as compared to 2414 t in 1984-85 (Joseph and Amarasiri, 1986). This is mainly due to increased use of combination gear and expansion of the fishing range more and more towards offshore and deep-sea areas. The present estimate is based on data collected from the local commercial catches. If the landings by tuna longliners of companies permitted by the Government to fish beyond the EEZ of Sri Lanka were incorporated, this figure would be an underestimate.

A comparatively high billfish catch rate was observed on the east and south-west coasts of the island. Joseph and Amarasiri (1986), Maldeniya *et al.* (1987) and Foster (1987) also recorded high catch rates in the south-west area. The catches of the east coast which were taken within the coastal waters by drift gillnetting consisted of a high percentage of marlin and sailfish. During the present study it was noted that the use of driftnets with short (1-2 m) buoy lines is quite popular in the east. Fishermen believe billfish, sailfish and marlin are more surface inhabiting and become easily vulnerable to entanglement with surface drifting gillnets. However, no data are available to compare the catches of gillnets operated at different depths. As there is no sport fishery for billfish in Sri Lanka, these areas, especially the east coast, could be considered for the development of a sport fishery targeting billfish, in order to promote marine tourism.

Table 6. *Production of billfish (t) in different areas of Sri Lanka.*

Year	*Area*	*Sailfish*	*Blue marlin*	*Black marlin*	*Striped marlin*	*Swordfish*	*Total*
1992	West	187	685	133	1	344	1350
	South-west	310	221	626	0	182	1339
	South	763	2576	119	0	322	3780
	East	-	-	-	-	-	-
	North-east	-	-	-	-	-	-
1993	West	227	393	140	0	301	1061
	South-west	581	3	1631	0	3503	5718
	South	1409	1634	839	0	696	4578
	East	-	-	-	-	-	-
	North-east	-	-	-	-		-
1994	West	189	519	5	0	266	979
	South-west	986	4001	0	0	713	5700
	South	547	2035	0	0	395	2977
	East	546	2865	11	0	98	3520
	North-east	48	195	0	0	16	259

Table 7. *Percentage composition of billfish in the large pelagic catches of different areas.*

Years	*West*	*South-west*	*South*	*East*	*North-east*
1992	7.5	11.3	7.9	-	-
1993	6.2	26.8	10.1	-	-
1994	7.7	22.4	11.3	44.1	9.9

The occurrence of shortbill spearfish in the commercial catches has been reported by Sivasubramaniam (1965), Joseph and Amarasiri (1986), Maldeniya, *et al.* (1987) and Foster (1987) but was not reported during the present study period. In a study conducted off Negombo, in the west, Jinadasa (1985) obtained a species composition of 65% marlin, 31% sailfish and 4% swordfish for the gillnet and longline combination fishery. Among marlin, striped marlin (49%) dominated the catches. In the present study the catch of billfish in the west showed a high percentage of blue marlin (46.9%) and swordfish (24.6%). This is probably because of the increase in the use of combination gears with gillnets and the shift of the fishing area to offshore and deep-sea waters. De Bruin (1970) observed more sailfish, shortbill spearfish, striped marlin and black marlin in the gillnet catches made within the shelf and more swordfish being caught beyond the shelf.

Figure 1. *Quarterly variation in catch rates of billfish in different areas.*

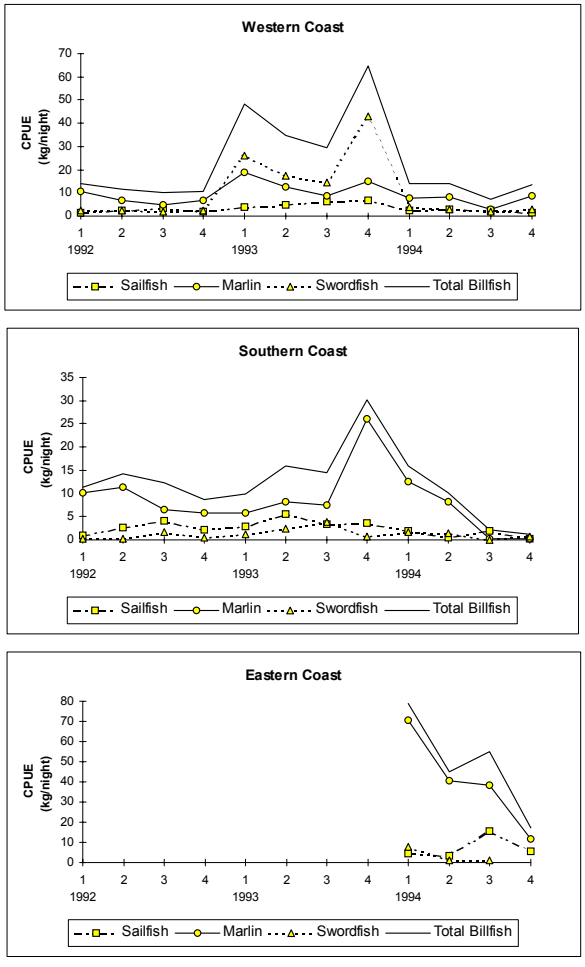
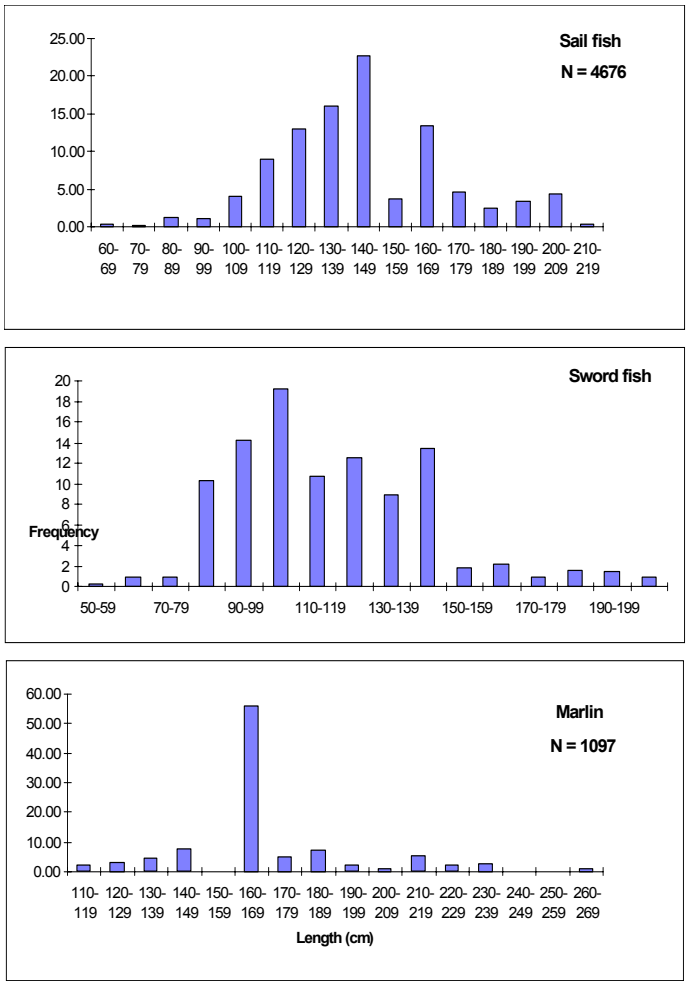


Figure. 2 : *Length frequency distribution of billfish landed in 1993.*



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