SMALL BOAT TUNA LONGLINE FISHERY NORTH-WEST COAST OF SRI LANKA

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INTRODUCTION

Studies made by Sivasubramanium (1971) and Maldeniya and Joseph (1988) over the past three decades revealed that surface-inhabiting young and immature yellowfin tuna enter the coastal waters of Sri Lanka and migrate along the west coast towards the northwest. While migrating they grow in size and then apparently spread into the deeper layers off the northwest coast. These young fish support the surface fisheries in the western coastal waters of the island (Sivasubramanium, 1970; Maldeniya and Joseph, 1985).

The longline fishery came into existence in Sri Lanka in the late 1950s, when each one of the 9-m, 3.5-t motorised boats introduced in 1957 was provided with a line with 100 hooks (De Zylva, 1958). The gear was directed at deep-swimming large tuna and other species. For a number of reasons, such as declining hook rates coupled with the high price and unavailability of suitable bait, interest in this form of fishing soon waned. The fishermen were increasingly compelled to use pieces of tuna, swordfish, dolphin, *etc*. as bait. As a result landings of tuna declined and sharks dominated the catches. The fishery was gradually transformed into a drift longline fishery for sharks.

Exporting chilled large tunas, such as yellowfin and bigeye, has become an attractive venture in recent years. As a result, longlining for tuna has regained popularity in Sri Lanka. Since the late 1980s, longline fishing for tunas has been conducted in offshore and deep-sea waters through joint ventures by large vessels (>30m LOA),.and this has catalysed the small-boat fishermen into entering the fishery .

MATERIALS AND METHODS

Longline fishing for tunas in the northwest coastal waters of Sri Lanka has been carried out since the early 1990s by 6-7 m fibreglass boats powered by 25-40 hp outboard motors, during the inter-monsoon season from end of February up to May. These boats usually fish with small-mesh gillnets, but at the end of the southwest monsoon they divert their effort into longlining for large tuna inhabiting the sub-surface waters. The fishery is based in Kandakuliya (N 8°20, E 79° 40') because of the operational and marketing facilities available there.

During 1993-1995, information on fishing area, fishing vessels and engine power, time of fishing, number of hooks and bait used, and catch and length composition were collected from fishing vessels once a week through random sampling and also by interviewing fishermen.

Figure 1. *Tuna longline used in the coastal waters*.

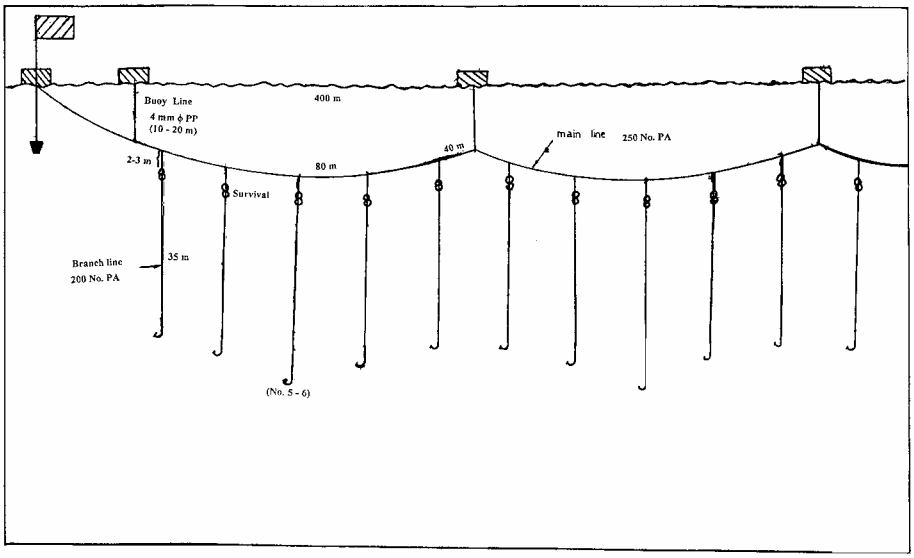

Table 1. Estimated monthly fishing effort, 1993-1995.

Year	*1993*				*1994*			*1995*	
No. of fishing days	74				60			40	
Months	Feb	Mar	Apr	May	Mar	Apr	May	Feb	Mar
Average number of boats/day	12	94	55	10	50	31	4	53	40
Total effort /month	167	2,350	1,375	63	1,238	775	48	1,325	600
No. of hooks	10,521	48,050	86,625	3,969	77,994	48,825	3,024	83,475	37,800

RESULTS

Fishing gear and operation

The design of the tuna longlines used by small boats is shown in Figure 1. Generally the gear is rigged with monofilament lines to fish at depths of 50-75 m. Locally-made cube shape regiform blocks (300x300x150 mm) or G-7 type buoys with a flagged pole are attached to each end of the line. A 1-2 kg cement block is attached to the bottom of the flagged pole to keep it upright.. The construction of the gear is similar to that of the offshore tuna longlines, but the offshore boats use 1000-1500 hooks, whereas the small boats at Kandakuliya use 50-70 hooks per boat.

Boats usually have a crew of two. They set out around 3 or 4 a.m. and travel 20 to 25 km from the shore to the fishing ground. The lines are deployed with baited hooks before dawn, at the edge of the shelf or over the continental slope. Herrings, flying fish or Indian mackerel (whole fish) are the main bait species used. Lines are left in the water about 6-8 hours and hauled manually around noon or 1 p.m. While in the water, the lines are periodically checked for catch. Successful hooking is indicated by submerged buoys, and corresponding branch lines are soon hauled out and the fish removed to prevent shark damage.

FISHING EFFORT

Table 1 shows the fishing effort, in boat days and number of hooks, during the fishing season in different years. During 1993 a relatively greater number of boats was engaged in the longline tuna fishery, and the fishing season was longer than in the other years. The security situation prevailing in the area and the ban on the use of high-powered outboard motors (40 hp and over) since late 1993 has affected fishing activities in the area.

Figure 2. *Length-frequency distribution of yellowfin tuna caught in the inshore longline fishery, 1993-1995.*

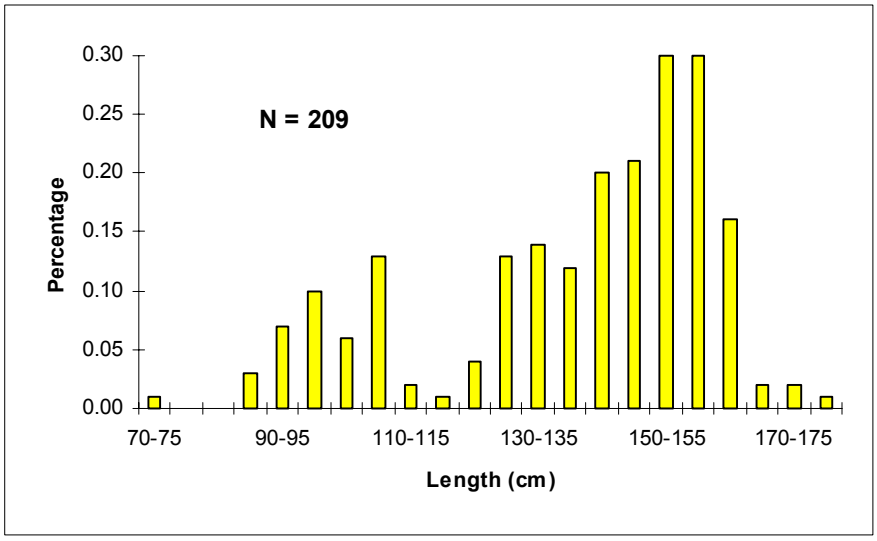

Table 2. Estimated average monthly CPUE and production, 1993-1995.

Year	*1993*				*1994*			*1995*	
Months	*Feb*	*Mar*	*Apr*	*May*	*Mar*	*Apr*	*May*	*Feb*	*Mar*
Total CPUE (kg/boat)	127.2	138.8	62.3	16.1	64.5	44.9	22.3	57.2	43.7
Species CPUE:									
Yellowfin	123.5	131.2	51.3	13.3	58.3	40.8	20.2	53	38.3
Bigeye	1.8	3.4	4.9		1.1	1.3		2.8	1.7
Shark	1.9	2.6	1.3	2.9	2.4	2.8	2.1	1.9	3.7
Others		1.7	4.5		2.7				
Total CPUE (number/100 hooks)	3.7	4.1	2.3	0.6	1.7	1.6	3.4	1.7	2.0
Species CPUE:									
Yellowfin	3.3	3.6	1.7	0.4	1.3	1.2	3.2	1.2	1.5
Bigeye	0.1	0.1	0.1		0.02	0.1		0.1	0.1
Shark	0.3	0.2	0.1	0.2	0.1	0.3	0.3	0.3	0.3
Others		0.3	0.4		0.3				
				Production (t)					
Yellowfin	20.9	308.3	71	0.8	72.2	32.6	1	70.2	23
Bigeye	0.3	8	6.7		1.4	1		3.7	1
Sharks	0.3	6.1	1.8	0.2	3	2.2	1	2.5	2.2
Others		4	6.2		3.3				
Total production	21.5	326.2	85.7	1.0	79.9	34.8	1.1	75.8	26.2

CATCH PER UNIT EFFORT (CPUE) AND FISH PRODUCTION

The estimated monthly average CPUE, in both kg/boat day and number/100 hooks, in 1993-1995 is given in Table 2. The average monthly CPUE in kg/boat day varied in a similar manner in all three years. Relatively higher CPUE was reported at the beginning of the fishing season and declined towards the end. The average CPUE in number/100 hooks was 2.9, 1.8, and 1.7for 1993, 1994, and 1995, respectively. However, monthly CPUE reported by both methods during 1994 and 1995 was lower than in 1993.

The vessels set a total of 154920, 123660, and 115500 hooks during the fishing season in 1993, 1994 and 1995;respectively, for a total catch of 434.4, 115.8, and 102 t. More than 90% of the catch in 1993 and 1994, and 80% in 1994, consisted of yellowfin tuna. Sharks made up over 5% of the catch in all three years, and bigeye tuna was encountered occasionally.

SIZE DISTRIBUTION

The length-frequency distribution of yellowfin tuna taken in the inshore longline fishery is illustrated in Figure 2. Yellowfin in the size range of 71-176-cm fork length (FL) are caught in this fishery, and more than 90% are above 100 cm FL. The mean weight of yellowfin landed varies from 41.3 to 57.1 kg for the three years.

DISCUSSION

In the present study, the mean hook rate for yellowfin tuna was significantly higher than the hook rate of 1% reported from the coastal and offshore waters in the northwest areas of Sri Lanka during 1968-1996 (Sivasubramanium, 1971). During the late 1960s coastal longline fishing was carried by 9-m boats. Fishing was conducted at night, using the same varieties of bait fish as are used today. The catches consisted of 20% tuna,7% spearfish and 72% sharks. In contrast, recent catches consisted of 80-90% yellowfin tuna. The gear design presently in use may have influenced the vulnerability of tuna. The bait varieties used by the small-boat fishermen are less costly and available locally, whereas the offshore and deep-sea fishing boats use standard bait varieties such as squid and saury. Use of such varieties may improve the performance of the coastal fishery. The size distribution of the yellowfin tuna catch show that it consists entirely of fish of age 3 and above (Figure 2). This indicates that the coastal longline fishery is sustained mainly by seasonally migrating yellowfin tuna moving towards the northwest (Sivasubramanium, 1970,1971; Maldeniya and Joseph, 1988).

The small-boat coastal longline fishery for tuna has developed little over the past years. The civil disturbances and the ban on the use of high-powered outboard motors in this area have restricted the range of the fishery and affected its performance. Since the boats make one-day fishing trips, they are in a better position to produce high-quality fish than the offshore multi-day boats. Quality fish is in high demand for the export market and fetches high

prices; however, proper handling and storing of the fish are also important. The boats presently used are not equipped for storing the catch, which is kept on deck exposed to the sun, without icing. Also, the fishermen haul the lines in by hand and bring the catch aboard with the aid of hook. The lack of care taken during capture and handling make the catch unsuitable for the export market. Proper technology for catching and handling the fish is needed to enhance the demand for these catches. The success of tuna longlining depends on covering a large area and setting more gear to fish. Use of larger 9-11 m boats in the fishery would increase the number of hooks while maintaining the quality of the catch. Furthermore, these boats could improve their fishery's performance by expanding its range.

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