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A PRELIMINARY ANALYSIS OF THE FLYINGFISH FISHERY OFF KANDAKULIYA IN SRI LANKA

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ABSTRACT

A preliminary analysis of the flyingfish fishery in Kandakuliya of the Kalpitiya Peninsula is presented. The study is based on a survey carried out during the periods September 1991 to April, 1992 and September 1992 to April 1993.

Fishing operations were mainly carried out by 5.0 - 5.5-m FRP boats, using small meshed gillnets during the daytime. The mesh size of the gillnets range from 29-48 mm. Fishing operations were limited to the region 20-30 km from the shore.

Total catch, effort and catch per unit effort (CPUE) showed seasonal variations. Peak catches were observed from November to January. Mean CPUE varied from 110 to 155 kg/boat/day from 1991 to 1993. The total annual production from this fishery is about 1500 MT/year.

This fishery is dependent on 9 species of flyingfish of which Hirundichthys oxycephalus contributes up to 46 % of the catch. Species composition changes seasonally.

INTRODUCTION

Flyingfishes of families Exocoetidae and Hemiramphidae are found in all warm tropical and sub tropical areas. They live in epipelagic zone, feeding mainly on zooplankton (Longhurst and Pauly, 1987). When disturbed, they are capable of leaving the water and gliding close to the water surface on a pair of modified pectoral fins. Flyingfish fisheries are of little significance globally but they do support locally important artisanal fisheries in certain parts of the Caribbean (Mahon et al., 1986; Berkes, 1987), South Asia (Arora and Banergy 1957; Rao and Basheeruddin, 1973; Pajot, 1991), Southeast Asia (Martin, 1938; Longhurst and Pauly, 1987) and the South Pacific (Dalzell and Lewis, 1988).

Fishery for flyingfish in Kandakuliya is an important seasonal fishery carried out in the northwestern coastal waters of Sri Lanka. Flyingfish have been fished throughout the last decade mainly by the fishermen who have migrated from the other areas of the west coast such as Wennappuwa and Chilaw. In Kandakuliya the fishing season starts in the middle of September and lasts till end of April of the following year. In addition to Kandakuliya, fishing activities targeting flyingfishes are also carried out to a lesser extent in the other areas of the West Coast such as Negombo and Chilaw. Although a detailed study has been conducted on the flyingfish fishery in the East Coast of Sri Lanka (Jinadasa, 1971,1972,1983,1984 and 1991) information on the fishing activities for flyingfish in the West Coast is scanty. Therefore, the present study was undertaken as a preliminary investigation to study the flyingfish fishery in Kandakuliya to make recommendations for management of the fishery.

The present report is based on a study conducted at a major fish-landing centre in the Kalpitiya Peninsula (Kandakuliya) during the periods September 1991 to April, 1992 and September, 1992 to April, 1993. This was a component of an integrated study program on the Puttalam Estuarine System and the associated coastal region undertaken by the National

Aquatic Resources Research and Development Agency (NARA) with the financial assistance from the Swedish Agency for Research Co-operation with Developing Countries (SAREC). During the present investigation total production of the fishery, fishing effort and its variation, variation in the catch rates, variation in the species composition of the catches were studied. A description of the types of the fishing crafts; gear, area and distance of operation are also included.

MATERIALS AND METHODS

Catch/effort data were collected by making regular fortnightly field visits in the afternoon between 1.00 - 6.00 p.m. to the major fish landing centre in the Kalpitiya Peninsula (Kandakuliya) during the study period (Figure 1). More than 20 % of the boats operated were sampled randomly. The necessary information such as specifications of the crafts and gear, horse power of the engines, the total catch and its species composition were recorded

The total number of boats operated/day was considered as the unit of measure of the total effort of this fishery. These values were derived for each month by averaging total number of boats operated on sampling dates. This was used in estimating total effort and the total production of the fishery.

The average catch/boat/day was considered as the catch per unit effort for each month. Total catch for a sampling day was estimated by multiplying the average catch per unit effort/day by total number of boats operated on a sampling day. Total catch for a month was estimated by multiplying the average total catch per sampling day by number of fishing days for that month. The total number of fishing days for a month was obtained after interviewing fishermen and found vary from 20-26 during the study period.

Due to the following reasons the average catch in kg per operation is considered as the catch per unit effort. Every fishing craft uses approximately the same number (94 -106, Mean 98, SD 3.3) and size (1500 mesh in length and 110 mesh in width) of gillnets per fishing operation. The true fishing time is almost the same (03 hours) throughout the study. The number of fishermen involved in fishing operations is always two and the fishermen usually have one fishing operation per day.

Species composition of catches was analyzed for each month separately, to study the variation pattern. These values were tabulated as percentage of the total catch. Using FAO identification sheets (Fischer and Bianchi, 1984) flyingfish species were identified.

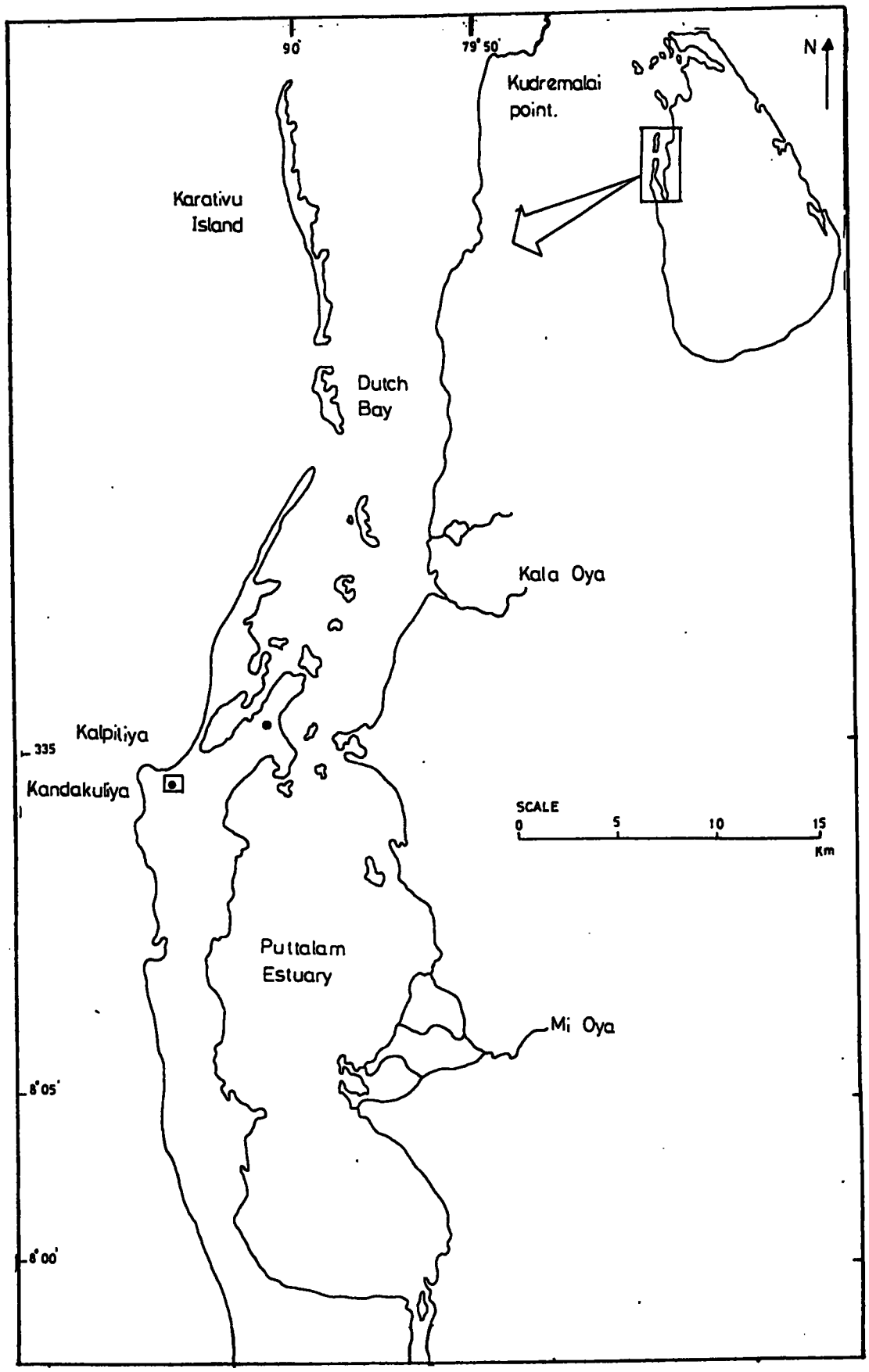

Figure 1. Geographical location of the fishing base in the Kalpitiya Peninsula

RESULTS

- ***Crafts and gear***

In the study area 5-5.5 M fibre glass boats (FRP) are used for operations. These crafts are powered by out board motor engines of HP varying from 25-40. Specifications of the fishing craft and gear used in the flyingfish fishery are given in Table 1.

Table 1
Specifications of the fishing craft and gear used in the flyingfish fishery

Fishing Craft	Number of net pieces in single operation			Range of mesh size (stretched mm)	H.P. of the engine	Number of fishing trips/boat/day
	Range	Mean	Std. Deviation			
Mechanized FRP boats	94 - 106	98	3.3	29 - 48	25 - 40	1

The nets used are drift gillnets which are made up of nylon PA multifilament twine. Each net consist of a number of equal size net pieces (each piece is 1500 mesh long and 110 mesh wide). The size of the gillnets are determined by number of these net pieces. Since the fishermen target flyingfish spp. found in the surface water layers, the breadth of the gillnet is reduced compared to those used in the small meshed gillnet operations.

Table 2

Catch data collected during the study period

Month	Number of sampling days	Mean No. of boats sampled/ day	Mean No. boats operated/day	Catch/boat/day (Kg)	Total catch (MT)
Sep-91	2	22	84	107	216
Oct	3	21	85	116	237
Nov	3	18	72	70	121
Dec	2	20	62	277	412
Jan-92	2	14	45	114	124
Feb	2	12	34	76	62
Mar	3	16	33	81	64
Apr	2	8	13	34	10
Sep-92	3	9	9	149	32
Oct	3	20	29	162	112
Nov	2	22	73	183	321
Dec	2	20	78	215	402
Jan-93	2	28	83	147	293
Feb	3	14	43	77	79
Mar	3	22	76	245	464
Apr	3	14	15	54	20

- ***Monthly variation in effort***

Monthly variation pattern of the effort (Average number of FRP boats operated/day for each month) seems to differ from year to year (Figure 2). In the 1991-1992 period highest monthly effort was recorded in the month of October 1991 and the effort was decreased as the fishing season proceeds. However, in the 1992-1993 period one peak period was observed (November 1991 to January 1992). The mean value of average number of boats operated/day was 54 (SD = 26.3) for the fishing season 1991/92 and for the fishing season 1992/93 it has decreased to 51 (SD = 30.4), decrease was however not significant at the 95% level of significance (t value = 0.1934, Zar, 1984).

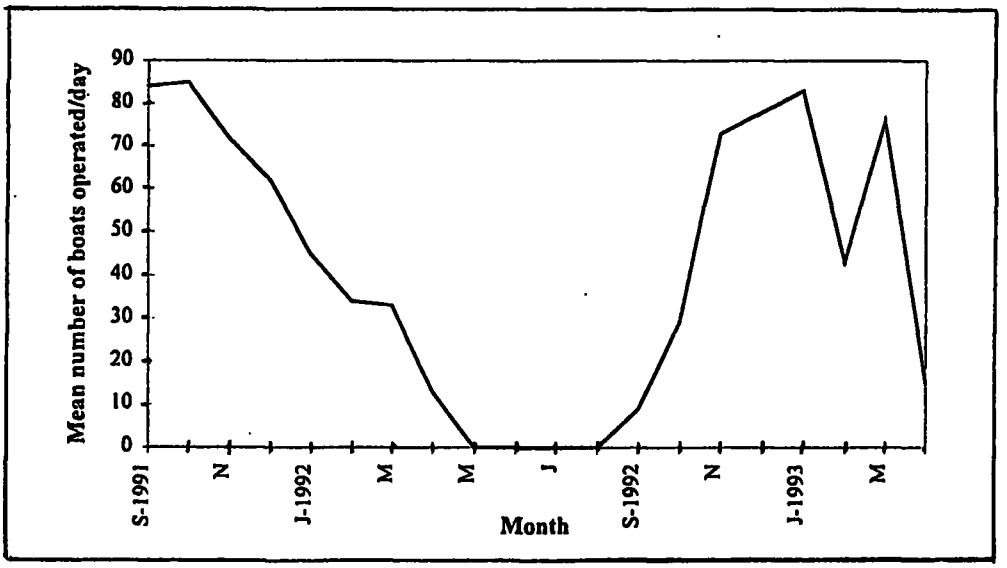

Figure 2. Monthly variation of the effort

- ***Seasonal variation in the catch per unit effort***

The seasonal variation pattern of CPUE seems to differ from year to year (Figure 3). In the 1991 - 1992 fishing season peak catches were observed in the month of December 1991, while in the 1992 - 1993 period two peaks were observed. One in December 1992 and the other in March 1993. Highest catch rate during the study period was observed in the month of December 1991 - 1992 period (277 kg/boat/day). The mean value of average CPUE was 109.63 (SD=72.96) for the fishing season 1991/1992 and for the fishing season 1992/1993 it has increased to 155.13 (SD=66.09) increase was however not significant at the 95% level of significance (t value = 1.3073, Zar, 1984).

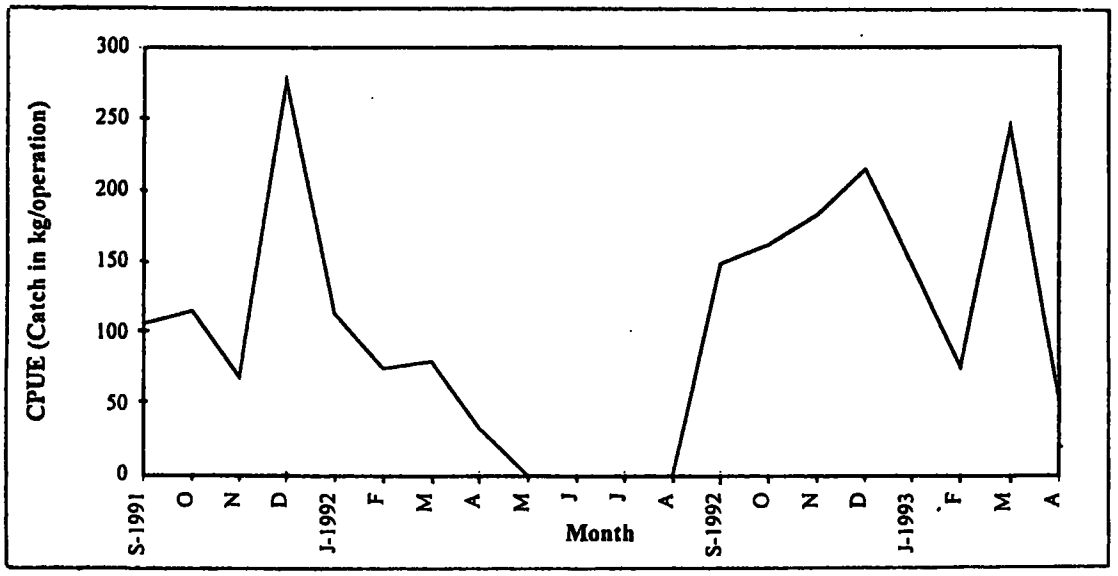

Figure 3. Seasonal variation in the catch per unit effort (CPUE)

- ***Monthly variation in the total production***

Figure 4 shows the monthly variation pattern of the total production. The seasonal variation pattern of the total production seems to differ from year to year. In the 1991 - 1992 period highest monthly catch was observed in December 1991, whereas in the 1992 - 1993 period two peaks were observed, in December 1992 and March 1993 respectively. During the present study highest monthly catch was observed in the month of March 1993 (464 MT). The production obtained for the period 1992 - 1993 (1724 MT) was relatively higher than that for the period 1991-1992 which was 1246 MT.

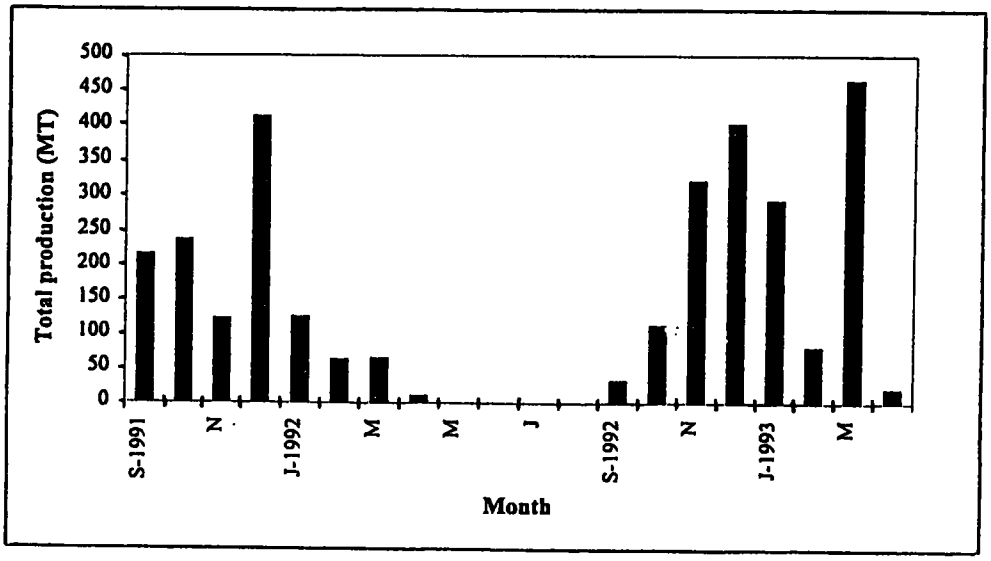

Figure 4. Monthly variation in the total production

- ***Species composition of the catch***

A total of 9 fish species belonging to two different families were identified among the catches (Table 3). Of these, six fish species are considered as important depending on their contribution to the total production of the fishery. This fishery is mainly carried out to target Flyingfish species in the off shore waters. However, few fish species belong to family Hemiramphidae, which are coastal inhabitants, were also seen among the catches.

Monthly variation in the species composition by weight for the study period are given in Table 4 and 5. In most of the months *H. oxycephalus* dominates the catch followed by *Oxyporhamphus* spp. (Family - Hemiramphidae). The contribution by other fish species seems to vary from month to month.

Table 3

List of the fish species identified in the catches of the flyingfish fishery

Family	Scientific Name	English Name
Exocoetidae	*Hirundichthys oxycephalus*	Bony flyingfish
	Hirundichthys coromandelensis	Coromandel flyingfish
	Cheilopogon nigricans	African flyingfish
	Cheilopogon suttoni	Sutton's flyingfish
	Cheilopogon cyanopterus	Margined flyingfish
	Cheilopogon furcatus	Spotfin flyingfish
	Cypselurus poecilopterus	Yellowing flyingfish
Hemiramphidae	*Oxyporhamphus spp.*	
	Hyporhamphus limbatus	Cogaturi halfbeak

Table 4

Monthly variation of the percentage species composition of the catches for the 1991-1992 period

Species	Sept-91	Oct	Nov	Dec	Jan-92	Feb	Mar	Apr
H. oxycephalus	47	27	38	29	60	47	33	43
C. nigricans	4	2	2	4	-	11	18	11
C. suttoni	4	7	4	11	2	-	4	-
C. cyanopterus	-	-	2	-	-	2	-	2
C. poecilopterus	-	7	1	-	-	-	5	2
Oxyporhamphus spp.	18	16	4	-	13	16	11	-
Others	27	41	49	56	25	24	29	42

Table 5

Monthly variation of the percentage species composition of the catches for the 1992-1993 period

Species	Sept-92	Oct	Nov	Dec	Jan-93	Feb	Mar	Apr
H. oxycephalus	48	64	43	31	61	19	78	63
C. nigricans	3	12	3	4	1	2	4	3
C. suttoni	-	-	-	3	3	2	-	10
C. cyanopterus	-	-	-	2	-	-	-	4
C. poecilopterus	3	6	3	2	-	-	-	-
Oxyporhamphus spp.	19	2	15	16	7	40	3	3
Others	27	26	36	42	28	37	15	17

- *Size composition*

The length frequency distribution of the *Hirundichthys oxycephalus* (the dominant flyingfish variety seen among the catches) is given in Figure 5. The size range of the *Hirundichthys oxycephalus* varies from 17 to 23.8 cm TL (from tip of the lower jaw to the lower caudal fin lobe).

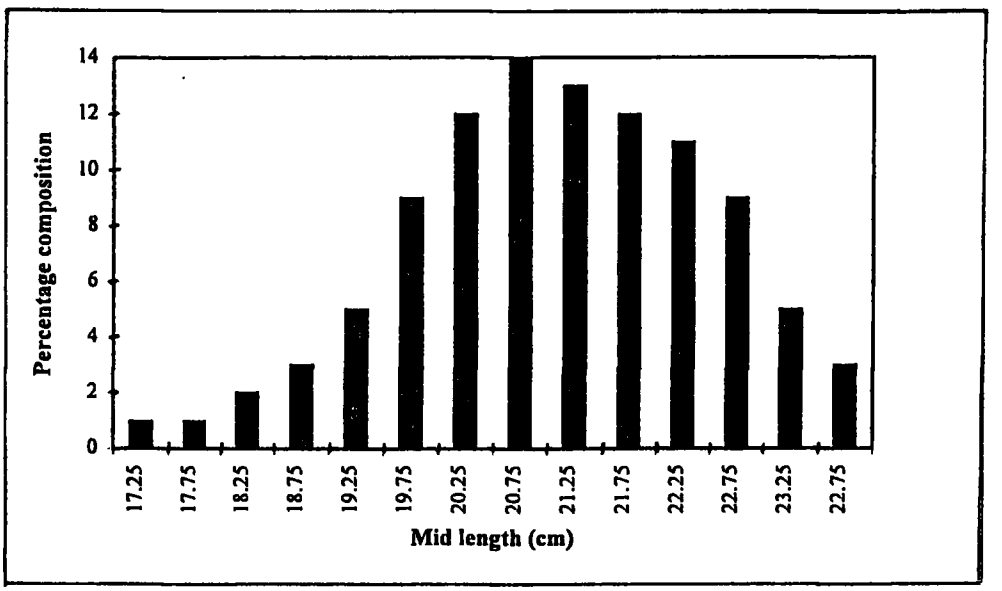

Figure 5. Length frequency distribution of Hirundichthys oxycephalus

DISCUSSION

The seasonal variation pattern of the catch rates seems to differ from year to year. This difference could probably be related to the oceanographic factors such as monsoonal currents, which have direct relationship with the migration and distribution of the small

pelagic stocks (Jayawardane and Dayaratne, 1993). In addition the monthly variation of CPUE probably indicates a variation of relative abundance of fish stocks from month to month. Even with a relatively high fishing effort, the catch per unit effort has remained high, especially in the months of December 1991, December 1992 and March 1993 indicating a greater relative abundance of the stocks.

Average CPUE values for the flyingfish fishery in Kandakuliya for the periods 1991-1992 and 1992-1993 were 110 Kg/boat/day and 155 kg/boat/day respectively. The present catch rates have not shown much difference when compared to the catch rates from the experimental fishing for flyingfish during the periods 1989, 1990 and 1991 in the Coromandel Coast of India (Pajot and Prabakaradu, 1993). Average catch rates from the experimental fishing in the Coromandel Coast of India for the years 1989, 1990 and 1991 were 185 kg/boat/day, 98 kg/boat/day and 72 kg/boat/day (average 118 kg/boat/day) respectively.

In the study area total annual production from the flyingfish fishery obtained for the period 1991-1992 was 1246 MT which was comparatively lower than the production obtained for the period 1992-1993 which was 1724 MT. This could have been probably due to the high average catch rate recorded in the 1992-1993 period which lead to a remarkable high production in the 1992-1993 fishing season.

Present study revealed that the flyingfish species *Hirundichthys oxycephalus* contributed almost 46% of the catch of the flyingfish fishery. In addition to the above species the other major contributor to the total catch was *Oxyporhampus* spp. (Family - Hemiramphidae). However, the contribution by other fish species seems to vary from month to month. Species identified by the present study when compared to that of the studies carried out by Jinadasa (1972) in the East Coast of Sri Lanka and Pajot and Prabhakaradu (1993) in the Coromandel Coast of India showed a marked difference. Eleven species of flyingfish have been identified in Ceylon waters by Jinadasa (1971). According to the above authors Coromandel Flyingfish (*Hirundichthys coromandelensis*) was the most abundant flyingfish species in the respective study areas. Although the Coromandel Flyingfish was recorded during the present investigation it's contribution to the total catch was found to be insignificant.

The fishery for flyingfish in Kandakuliya is mainly responsible for flyingfish catches in the West Coast of Sri Lanka. As revealed during the present investigation, towards the latter part of the fishing season this fishery is mainly conducted to provide bait for the trolling line fishery in the Kandakuliya area targeting large yellowfin tuna. This fishery could therefore be developed to provide bait for the trolling line fishery and tuna long line fishery even in the other areas of the country. This had been experimented even as a live bait for trolling line fishery (Jinadasa, 1984). However, prior to expansion of the fishing effort it is always advisable to conduct a detailed investigation to study the distribution, migration, reproductive behavior and the stock abundance of the major flyingfish varieties. Findings of the present investigation would be useful as baseline information for such a detailed study of this species.

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