

EXPLOITATION OF SMALL PELAGIC FISH RESOURCES BY THE PURSE SEINERS IN THE SOUTHWEST COAST OF SRI LANKA*

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ABSTRACT

Purse seine fishing in the southwest coast of Sri Lanka became popular since 1982 and the number of units has increased to 29 in 1984. In 1987 there were 50 purse seiners operating in this region. A study of the purse seine fishery and its impact on other small scale fisheries were initiated in 1985. This paper presents the results of a survey for the period 1985 to 1987.

Purse seine fishery is carried out only during the calm months, from October to April. 3½ tonnes boats with inboard engines are used in this fishery. The length of the nets range from 150-210 metres with an average depth of about 50 m and with a mesh size range of 16-23 mm.

The average catch per unit effort for purse seines for 1985 and 1986 was about 185.7 kg/boat. The total production by the purse seine fishery in this area in 1987 was about 250 t. This contributes to about 30% of the total small pelagic fish production in this region.

Amblygaster sirm dominates the purse seine catches. Other important species are *Decapterus russelli*, *Restrelliger kanagurta* and *Loligo singhalensis*. Length frequency distribution studies of *A. sirm* show that the purse seines undertake fishing in the same area as the small mesh gill netters in this region.

INTRODUCTION

PURSE SEINE is an efficient fishing gear that is used to exploit pelagic fish stocks. Purse seining is usually carried out at night with light attraction. This type of fishing was first successfully tried out in Sri Lanka in 1972 by the UNDP/Sri Lanka fishery development project.

Purse seining in the southwest coast of Sri Lanka (Hikkaduwa/Ambalangoda) area began somewhere in early 1980's with one or two purse seiners (Fig. 1). In 1984 this number increased to 29 and in 1987 there were 59 purse seiners operating in the Galle DFEO division

(District Fishery Extension Office). Due to the rapid expansion of the purse seiners in this region conflicts have arisen between the purse seiners and others using the same fish resources viz. the small mesh gill netters and the beach seines. These two types of gear are less efficient than the purse seines, but are used to fish the same stocks in this area. Purse seining is also a cost efficient method in that with less expenditure on fuel and labour, more fish can be caught. This was the reason for such rapid expansion of this particular fishing gear. However, to control this fishery before it is too late, it is necessary to understand the nature of the fish stocks that are being fished by this gear and the present level of exploitation.

A study was therefore initiated in 1985 and this paper presents some preliminary observa-

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tion on the seasonal variation pattern in catch rates, species composition, production, etc.

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MATERIAL AND METHODS

The present study was carried out in Hikkaduwa/Ambalangoda areas in the Galle DFEO division during 1985 to 1987 (Fig. 1). In 1987 there were 59 purse seiners operating in this region. Of these 34 were operated in Hikkaduwa area, 19 in Ambalangoda and 6 in Balapitiya.

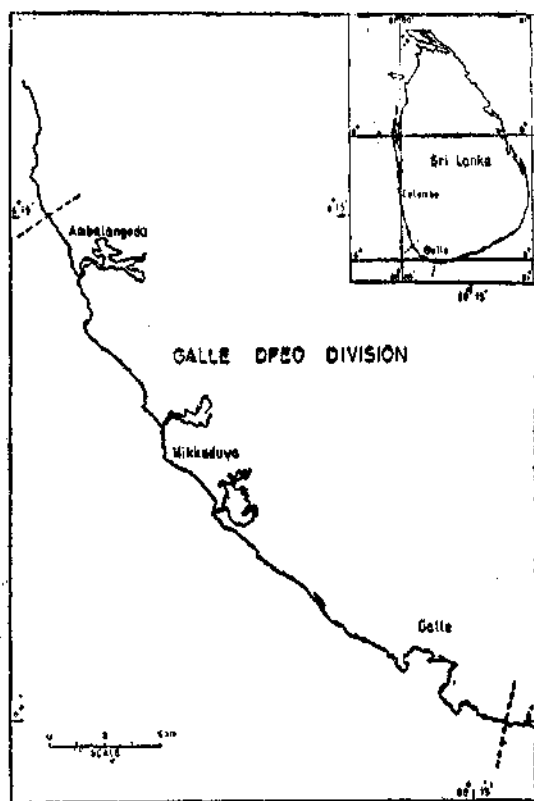


FIG. 1. The study area in Sri Lanka.

In the study area, purse seining is carried out by using 3½ tonners with a crew of about 10 members. The size of the net is 150-210 m

in length and 50 m in depth. The mesh sizes of the nets used in Hikkaduwa/Ambalangoda areas are usually 23 mm and 16 mm. Fishing is carried out at moonless nights by using lights powered by portable generators to attract the fish. Fishermen in this area usually use 1500 watt lights. The area fished by the purse seiners has a depth range of 30-80 m.

Sampling was carried out at two main landing sites in Hikkaduwa and Ambalangoda. These places were visited 4 days a month to collect information on catch and effort. The length measurements of the important species were taken at the landing sites.

RESULTS

Seasonal variation pattern

In the southwest coast of Sri Lanka purse seine fishing is carried out only during the calm months of the year (i.e. from October to April). Thus the fishery is highly seasonal and last only for 6-7 months during one season. In this fishery catch per haul is considered as the catch per unit effort.

At the beginning, the catch per unit effort (CPUE) for the two areas Hikkaduwa and Ambalangoda were treated separately. Fig. 2 shows the monthly variation pattern of catch per unit effort for the two successive fishing seasons. As the CPUE values are not normally distributed, the non-parametric statistical test were used for analysis. Mann-Whitney test (Zar, 1984) was carried out to compare the CPUE of Hikkaduwa and Ambalangoda areas. Results are given in Table 1.

TABLE 1. Mann-Whitney test to compare the CPUE value of Hikkaduwa/Ambalangoda area

Fishing season	Value of Mann-whitney Statistic U	Critical value U 0.05	Level of significance
1985-1986	17	23	Not significant
1986-1987	20	23	Do

There was no significant difference between the CPUE of Hikkaduwa and Ambalangoda in both fishing seasons. Hence these values were combined and a similar test was carried out to compare the CPUE values for the two seasons. The value obtained for the Mann-Whitney statistic (U) is 26. This was not significant at 0.05 level, but a significant difference was observed at 0.02 level.

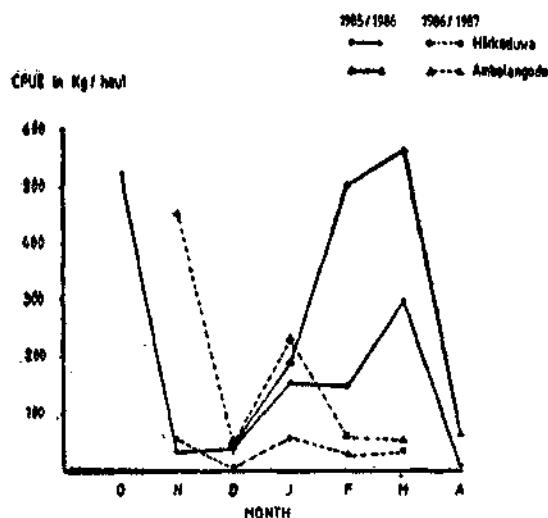


FIG. 2. The monthly variation of CPUE for purse seine fishery in Hikkaduwa/Ambalangoda areas.

During the 1985-1986 fishing season, higher catch rates were found at the beginning of the season (*i.e.* in October) and just before the end of the season (*i.e.* in March) (Fig. 3). Highest catch rates of about 450 kg/boat were observed during 1985-86. The average catch per unit effort for this season was about 185.7 kg/boat.

The variation pattern in catch rates during 1986-87 is somewhat different from that of the previous year. Fishing began in November with a very high catch rate especially in Ambalangoda area. However, the catch rates for other months were very poor compared to that of the previous seasons. The mean catch

rates for this season has dropped to 94.1 kg. This is about 50% drop in catch rate. The present catch rates were low when compared to those obtained by experimental fishing. In 1972-73 period purse seine with a slightly different size (234 m length and 30 m depth) operated in the SW region has obtained catch rate of 360 kg per operation (Pajot, 1977). In 1973-74 period operation with slightly small nets (170 m length, 30 m depth) have resulted in catch rates of about 413 kg/set (Joseph, 1975).

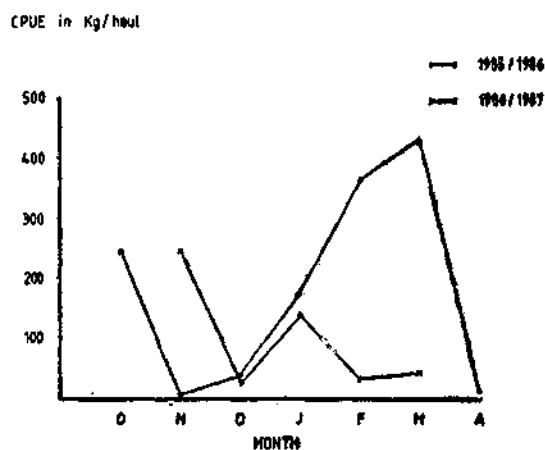


FIG. 3. The monthly variation of CPUE for purse seine fishery in the southwest region.

Production by purse seines

In 1985, when the present study was initiated, the number of purse seiners in the Galle DFEO division were 44. This has now increased to about 59 in 1987. However, the total number of purse seines operated per day varied from time to time. Fig. 4 shows the variation pattern of the effort (No. of boats operated per day) and the total production by these boats. The average of the total no. of boats operated per day was 16 (s.d. = 7.7) for the season 1985-86 and for the season 1986-87 it has increased to 22 (s.d. = 1.87). This increase was however not significant at the 95% level of significance (t value = 0.48, Zar, 1984).

The average CPUE estimated for different fishing seasons was used to calculate the total annual production. The estimated production for the two fishing seasons in 1985-86 and 1986-87 are 298 t and 210 t respectively. The total purse seine production contributed to about 30% of the total small pelagic fish production in the Galle DFEOD division.

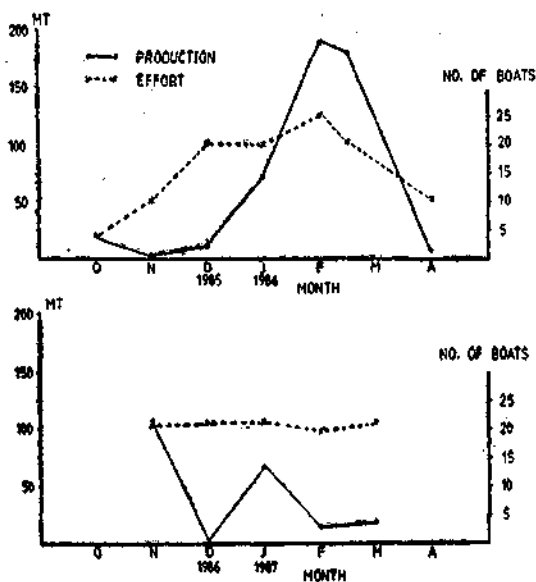


FIG. 4. The monthly variation of effort and production for purse seine fishery.

Species composition of the purse seine catch

In Hikkaduwa/Ambalangoda areas, purse seine fishery is carried out to exploit mainly the small pelagic fish resources. Although this is a multispecies fishery, the number of species caught by this gear is not so high as those reported for the small meshed gillnet fishery (Dayaratne, 1984). The main species caught in the fishery are herring (mainly *Amblygaster sirm*), Indian mackerel (*Rastrelliger kanagurta*), Indian scad (*Decapterus* spp.), and squids (*Loligo singhalensis*). Occasionally large number of frigate mackerel (*Auxis* spp.) are also caught by this gear. Among others identified are sardines (*Sardinella* spp.), queenfish (*Chorinemus* sp.) and seerfish (Scombridae). Fig. 5 shows

the seasonal change in species composition of the catches for the two successive years. The dominant species in this fishery is the *Amblygaster sirm*. In general, the contribution by this species is quite high except in few months. For the 1985-86 fishing season the percentage composition of this species ranged from 15-73%. However for the 1986/87 season the contribution by this species was high in

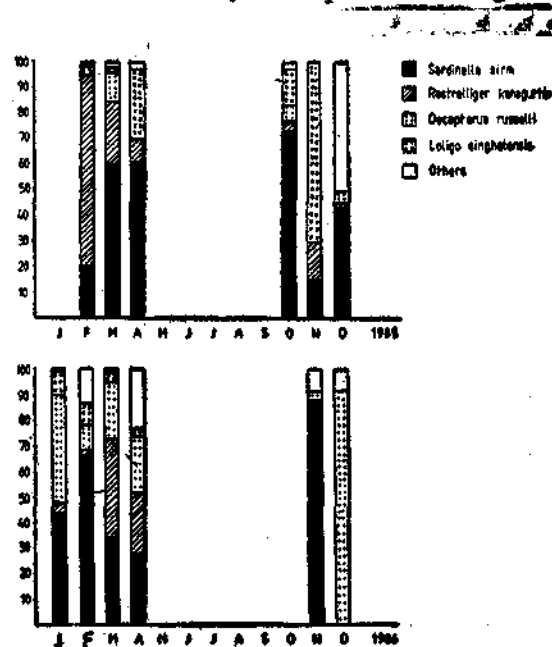


FIG. 5. The monthly variation in species composition of the purse seine fishery.

certain months (e.g. 87% in November) and almost nil catches were observed in some other months (in December).

The other important species caught in this fishery were the mackerels. The Indian mackerel (*Rastrelliger kanagurta*) and the Indian scad (*Decapterus russelli*) together contribute about 30% of the total catch. Another important variety was the squid (*Loligo singhalensis*) a neritic species which is highly vulnerable to light attraction.

The species composition of the catches of the present fishery when compared with that

of the experimental fishing carried out by the UNDP/FAO project in 1973 showed a marked difference. According to Joseph (1973) 68% of the catch was composed of sardines (*Sardinella* spp.), 7% herring (*Amblygaster sirm*), 8% anchovies, 4% red-bait and the rest was composed of other species, such as mackerels, squids and silver bellies. The catches of the present fishery consist mainly of herrings (*A. sirm*), Indian mackerels (*R. kanagurta*) and Indian Scad (*D. russelli*). Sardines (*Sardinella gibbosa*) and red-bait (*Dipterygonotus leuogrammicus*) were rarely seen among the catches.

relatively low when compared to that of purse seining. However during the lean period for purse seine the catches by handlining was high. The average catch rate for handlining was 18.5 kg/boat and 20.4 kg/boat for the two fishing seasons in 85/86 and 86/87 respectively. Unlike in purse seining, the fish caught by the handlining were mainly demersal varieties. Species belonging to the Families Lethrinidae, Lutjanidae and Pomodasyidae were the major contributors. In addition to the demersals, the pelagic varieties that were usually caught by the seiners were also caught by handlining e.g. Indian mackerel and Indian scads.

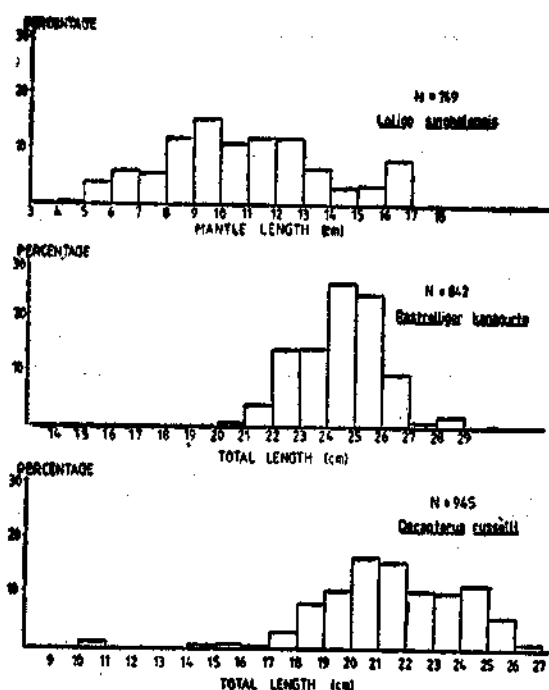


FIG. 6. Length frequency distribution of *Lotigo singhalensis*, *Rastrelliger kanagurta* and *Decapterus russelli* from purse seines.

Incidental catches

Fishermen engaged in purse seining in this area are also in a habit of carrying out handlining operations while they are out at sea. The observed catch rates for hand lining was

Other fisheries in the study area

The small pelagic fish resources in Hikkaduwa/Ambalangoda areas are also exploited by other fisheries such as small mesh gillnet fishery and beach seine fishery. The small mesh gillnets in this area are operated by 5-6 m FRP boats and mechanised and nonmechanised dug out canoes (orus). Small mesh gillnet with 28 mm and 32 mm mesh are used for sardines and a mesh of 51-64 mm are used for mackerel and others. The mean catch per boat per day of FRP craft was estimated at 55.8 kg and 43.9 kg in 1985 and 1986. For the traditional crafts the CPUE were 17.6 kg and 29.8 kg for 1985 and 1986 respectively.

The estimated annual production by the small mesh gillnets operated by FRP boats were 133 t and 105 t for the years 1985 and 1986 respectively. These nets operated by the traditional fishing craft (oru) has produced a total of 42.2 t and 71.5 t for the years 1985 and 1986 respectively. Thus the estimated total average production by this fishery was 175.8 t/annum. This production is about 20% of the total small pelagic fish production in the GalleDFEO division. The other important fishery for small pelagics in this area was the traditional beach seine fishery. This fishery was however not

monitored due to lack of transport facilities and manpower.

Size composition

Length frequency distributions of the important species caught by purse seines are shown in Fig. 6 and 7. As the purse seine is a relatively less selective gear compared to other gears such as gillnets, the size frequency distributions of most of the species has a wide range (Fig. 6).

The length frequency distribution of the most common species i.e. *Amblygaster sirm* caught by purse seine and by the small mesh gillnets are shown in Fig. 7. It was observed that the size range of *A. sirm* caught by these two gears are more or less the same. This is a clear indication that both purse seine and small mesh gillnets fish in the same area. Although gillnet is a highly selective gear the similar size range of *A. sirm* in purse seines and gillnets is a clear indication that fishermen have selected the best suitable mesh to catch the available size of sardine in this area. The narrow size range of *A. sirm* in both these gears could probably be due to a possible migration of certain size class to the fishing area and also probably due to the schooling by size.

DISCUSSION

The seasonal variation pattern of the catch rates seem to differ from year to year. In the 1985-86 fishing season, peak catch rates were observed in October and March, whereas in 1986-87 the peak catches were observed in November and January. This difference could probably be related to the difference in the onset of monsoon. However in both years high catch rates were observed at the beginning of the fishing season.

Although the number of boats operated for purse seining were more or less the same for the two successive fishing seasons, the total production by this fishery has decreased. The year to

year variation in production is characteristic of many pelagic fish stocks specially the short lived species such as herrings and sardines.

In Sri Lanka, the inshore small scale fisheries provide the bulk of the fish catch, but the knowledge of the resource and level of exploitation is poor especially in the southwest coast.

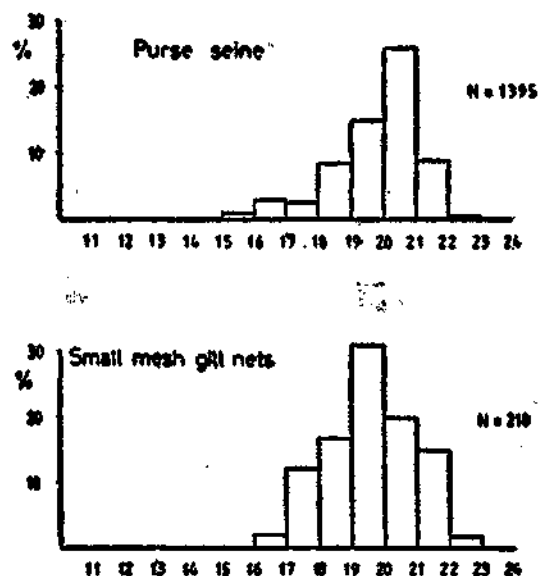


FIG. 7. Length frequency distribution of *Amblygaster sirm*.

Therefore, it is important to consider whether our fish resources could support an expanded purse seine fishery in the inshore coastal waters on a sustained basis. It is reported that the purse seiners operated in Hikkaduwa/Ambalangoda area are fishing in near shore waters within 7 mile from the shore. As the small pelagic stocks in this area are also fished by the beach seiners and small mesh gill netters, conflicts have already arisen between the purse seiners and the others using traditional fishing methods.

Considering all these facts the Ministry of Fisheries introduced the purse seining net fishing regulation under the fisheries ordinance (Extraordinary Gazette No. 473/46 dated

19-01-1987). These regulations include a licence fee, restriction to fishing gear (length, meshsize, power of the light) and area of operation. The number of permits to be issued to each DFEO division were limited. The number of purse seiners in Hikkaduwa/Ambalangoda area were allowed to remain at the present level.

The purse seine fishery and the small mesh gillnet fishery in the Hikkaduwa/Ambalangoda areas seem to fish the same 'stocks'. As the status of the stocks exploited by the purse seiners are not yet assessed, continuous monitoring of the fishery has to be carried out so that the number of permits issued to the seiners could be controlled.

REFERENCES

- JOSEPH, B. D. L. 1973. Preliminary Report on Experimental fishing with Purse Seine and Lampara nets for small pelagic fish varieties around Sri Lanka. *Bull. Fish. Res. Sin. Cey.*, 25.
- 1975. Purse seining for small pelagic fish around Sri Lanka. *Ibid.*, 26.
- PAJOT, G. 1977. Exploratory fishing for live-bait and commercially important small pelagic species. *UNDP/Sri Lanka fishing development project SRL/72/051*.
- DAYARATNE, P. 1984. Fisheries biology of small pelagic fish in the west coast of Sri Lanka. *Ph.D. Thesis, University of Bergen Norway*.
- ZAR, J. H. 1984. *Biostatistical analysis*. Prentice-Hall inc. Englewood cliffs, N.J.