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STUDIES ON THE EXPLOITATION OF TRENCHED SARDINE *AMBLYGASTER SIRM* (WALBAUM) OFF THE NEGOMBO COAST

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Abstract: *Amblygaster sirm* (Family: Clupeidae) constitutes > 40% of the small pelagic fish production in the western coastal waters of Sri Lanka. Using the catch and effort statistics from 1980 to 1981 and from 1983 to 1988, the maximum sustainable yield and optimum fishing effort for this species were calculated to be 3512.39 mt/year and 337 boats/day respectively. To optimally exploit fishery, the size at first capture of *A. sirm* should be maintained at 16.00 cm total length and gill nets with a stretched mesh size of over 2.5 cm have to be used. At present, *A. sirm* appears to be heavily over-exploited.

Key words: *Amblygaster sirm,* maximum sustainable yield.

INTRODUCTION

Amblygaster sirm (Family: Clupeidae) dominates fish catches in the west coast of Sri Lanka throughout the year.[1] It is frequently found in the catches of gill nets and purse seines and occasionally in beach seines operated at a depth range of 5-70 m.[2] Recent statistics indicate that this species constitutes > 40% of the small pelagic fish production in the west coast of Sri Lanka.[3] In the small meshed gill nets operated in this region, *A. sirm* is observed to be the most abundant species.[4] These gill nets, with mesh sizes ranging from 2.3 cm to 3.8 cm stretched mesh, are mostly operated by 5-7 cm fibre reinforced plastic boats powered by 10-25 hp out-board engines.[5] In the recent past, some studies on the status of the gill net fishery of *A. sirm* in Sri Lanka have been carried out. These include investigations on craft and gear, catch and effort statistics,[4,6] growth parameters,[7] selectivity patterns,[5,7,8] length frequency distributions, mortalities[1,5,6,7] and yield per recruit isopleths.[1]

However information on the maximum sustainable yield, optimum fishing effort and optimum size at first capture of this species in Sri Lanka are not available. This paper deals with (a) the effects of changing the size at first capture, (b) maximum sustainable yield and (c) optimum fishing effort, for *A. sirm* in the small meshed gill net fishery in the west coast of Sri Lanka.

METHODS AND MATERIALS

Sampling of the catch was carried out once a week at the fish landing site at Negombo for a period of four years from September 1984 to August 1988 (Fig. 1). On each sampling day, total number of boats operating gill nets for *A. sirm* was recorded and 5% of them were randomly selected for the collection of detailed statistics on catch and effort. The catch and effort statistics were used in

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Schaefer's surplus yield model[9] to estimate the maximum sustainable yield and optimum effort. The catch and effort statistics collected by Siddeek *et al.*[6] in 1980/81 and 1983/84 were also used. Beverton and Holt's yield per recruit model[10] was used to estimate the relative yield per recruit at different sizes of first capture and at different exploitation rates. In this analysis, the values used for natural mortality coefficient and growth coefficient were 1.30 $year^{-1}$ and 1.25 $year^{-1}$ respectively.[7]

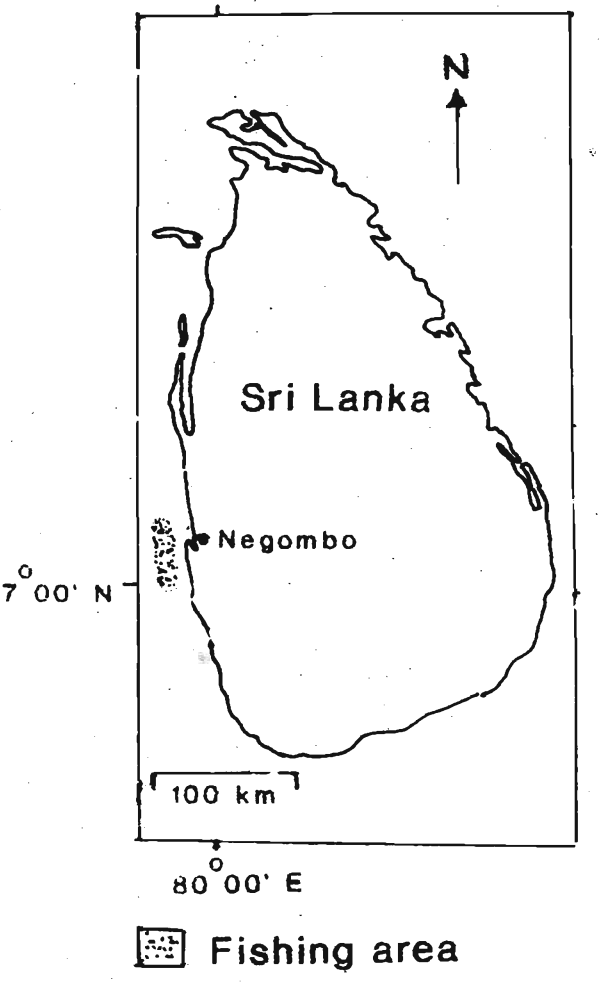

Figure 1: Fishing area and the landing site.

RESULTS

The catch and effort statistics of *A. sirm* in the coastal waters around Negombo during the study period are summarized in Table 1.

The monthly variation of yield, fishing effort and catch per unit effort (CPUE) during the study period are shown in Figure 2.

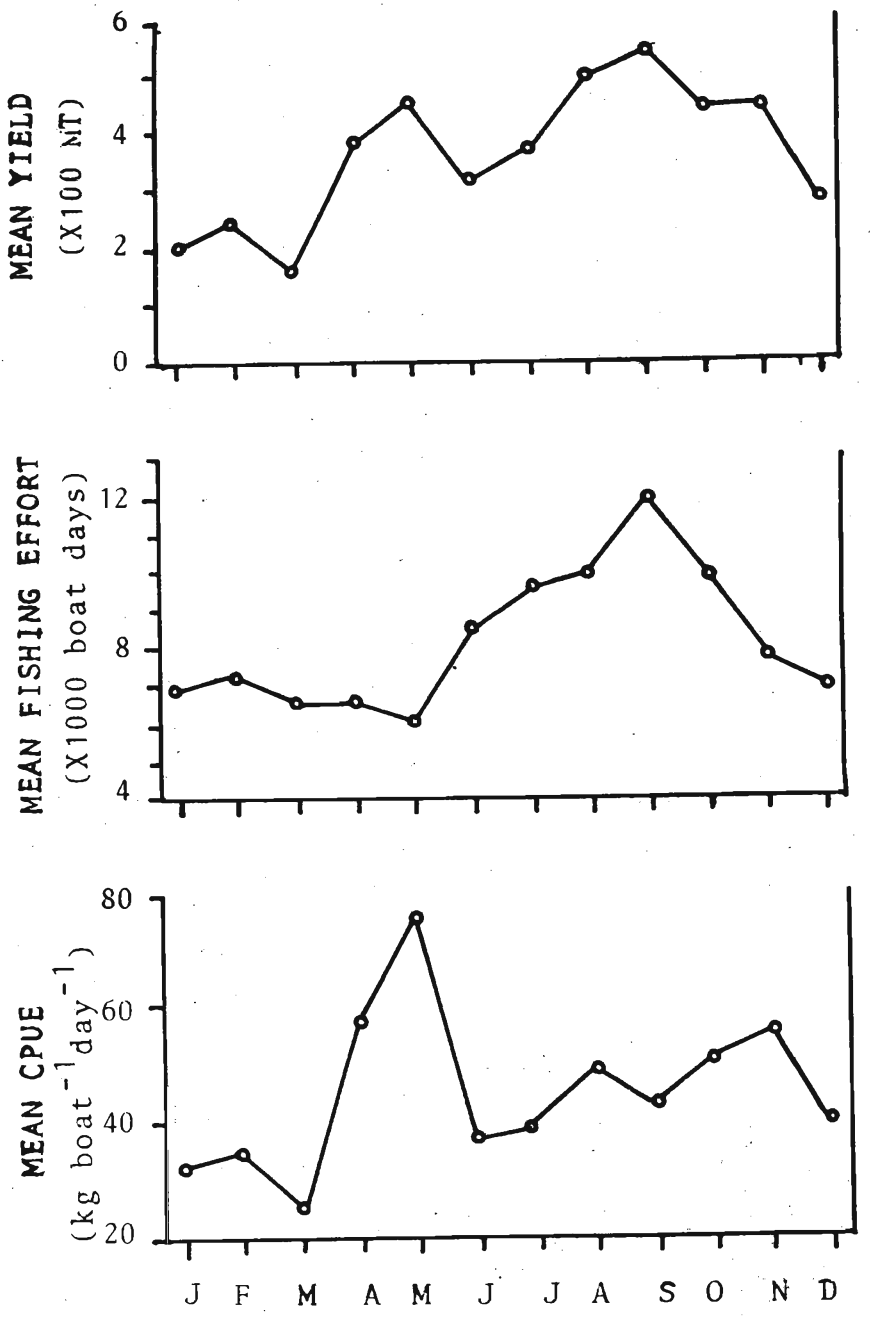

Figure 2: Monthly variation of the yield, fishing effort and CPUE of *A. sirm* fishery during the study period.

Table 1: Catch and effort statistics of *A. sirm* fishery in the coastal waters around Negombo.

Year	Annual yield (mt)	Mean no.of boats operated daily	Annual effort (boat days)	Catch per unit effort (CPUE) (kg boat^{-1} day^{-1})
1984	3497.6	444	117370	29.8
1985	3533.3	547	144510	24.5
1986	2469.3	407	107595	23.0
1987	2921.5	407	107488	27.2
1988	4907.0	377	99615	49.3

The results of the analysis carried out using Schaefer's model are summarized in Table 2.

Table 2: Results of the analysis of catch and fishing effort using Schaefer's model.

Intercept of the regression line	79.07
Slope of the regression line	-4.45×10^{-4}
Correlation coefficient	0.83
n	6
Level of significance	<0.05
Optimum effort (boats day^{-1})	336
Maximum sustainable yield (mt year^{-1})	3512.4

The variation patterns of relative yields per recruit with exploitation rate for different sizes at first capture are shown in Figure 3. It is evident that at the optimum exploitation rate of 0.5,[11] the maximum yield per recruit is obtained when the size at first capture is 16.0 cm.

DISCUSSION

Results show that the annual yield, fishing effort and catch per unit effort varied markedly during the study period. The increased catch observed in 1985 could be mainly attributed to the increased fishing effort in this year. The increased fishing effort observed in 1985 is probably due to the influx of fishermen from the northern and eastern regions of the island subsequent to the 1983/84 communal disturbances. Apart from the variation of fishing effort, several other biological and social factors affect the small scale fisheries in most developing countries.[12]

Competition from other fisheries which use more efficient gear for the same stock is a problem faced by small scale fisheries. No beach seines operated and purse seines were prohibited in this region during the study period. However in 1986, a few purse seines were observed to illegally operate in the coastal waters

off Negombo and these may have caught considerable amounts of trenched sardines.[13] The decrease in catch per unit effort (CPUE) of *A. sirm* from gill nets observed in 1986 may be due to the operation of the purse seines. Therefore, in the management of this fishery it is necessary to take steps to stop the encroachment by vessels operating more efficient types of gear such as purse seines.

Analysis carried out using the Schaefer's model indicates that the optimum fishing effort is less than the present level. Therefore, the mean number of boats operated daily need to be decreased to about 337 for sustainable exploitation of *A. sirm* in this region.

The results show that from November to May, the mean number of boats operated daily is less than the optimum. However, despite the lower fishing effort the catch was observed to be high in April, May and November. Therefore, it appears that the fishing effort could be increased in these months and be reduced in months such as June, July and September in which the CPUE is low. In addition, since the catch is low from December to March, the fishing effort in these months could also be reduced. In this way, the number of boats operated daily can be reduced to the optimum. In order to minimize unemployment consequent to reduced fishing of *A. sirm*, it is recommended that fishing in deep sea and off-shore regions is encouraged.

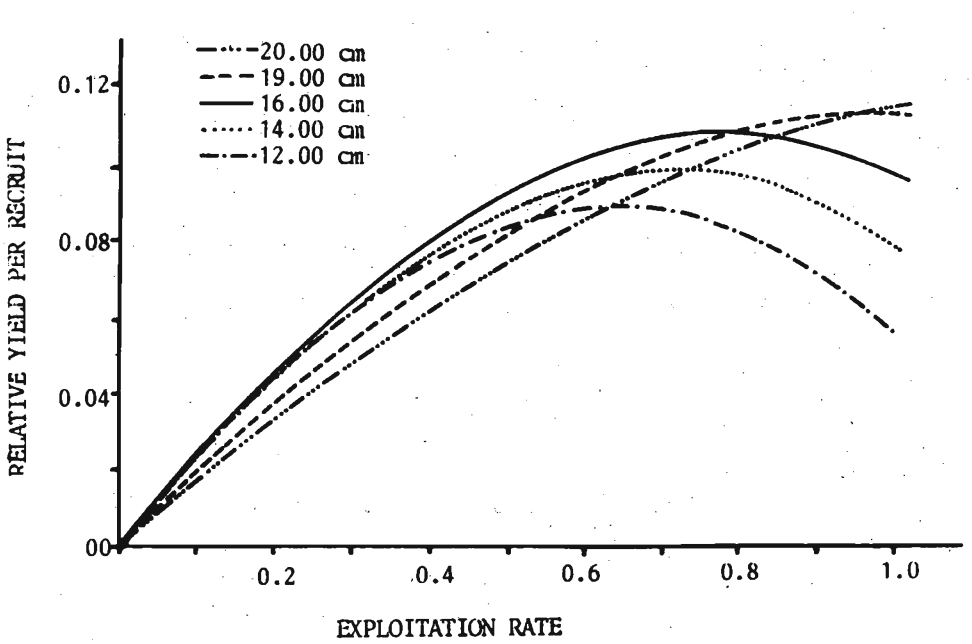

Figure 3: Variation of relative yield per recruit with exploitation rate for different sizes at first capture.

Studies on the selectivity patterns of the gill nets operated for *A. sirm* indicate that gill nets of mesh sizes above 2.7 cm stretched mesh have an optimum selection length > 16.0 cm.[5] The actual mesh sizes of gill nets used for *A. sirm* fishery varied from 2.3 cm to 3.8 cm.[5] Therefore, for a sustainable exploitation of this fishery resource, it is necessary to discourage the use of gill nets that have mesh sizes < 2.7 cm stretched mesh.

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