J. Nat. Aq. Res. Ag. Sri Lan. 32 (1985) 147 - 150

STATUS OF THE SARDINE STOCKS ON THE WEST COAST OF SRI LANKA

by

PAULINE DAYARATNE

National Aquatic Resources Agency

ABSTRACT

Yiled per recruit isopleth was derived for *Amblygaster sirm* from the gillnet fishery on the west coast of Sri Lanka. A maximum yield per recruit of 0.6g. could be obtained with an instantaneous fishing mortality of 4 to 5 and by keeping the age at first capture 0.4 to 0.5 yrs. The estimated fishing mortality and the age at first capture of the Sardines in the gillnet fishery during the study period seem to produce 80% of the maximum possible yield from the fishery.

INTRODUCTION

Sardines together with other small pelagic fish species contribute about forty percent of the total fish catch in Sri Lanka. In Negombo and Chilaw areas on the west coast of Sri Lanka the fishery is based on small meshed gillnets. Three species of sardines *Amblygaster sirm* (Walbaum, 1792), *Sardinella gibbosa* (Bleeker, 1849) and *Sardinella albella* (Valenciennes, 1847) contribute to about 70 to 80% of these small pelagic fish catches (Dayaratne 1984). Although there is a seasonal variation in the species composition of these catches, *A. sirm* seem to dominate the catches in Negombo and Chilaw, throughout the year.

Gillnet fisheries for small pelagic fish had been carried out for the last few decades but the data on catch and effort are available only for a few years. Over the recent years there has been a rapid increase in the effort resulting in an intensive exploitation of these resources. As such there is an urgent need to study the present state of these resources. The present paper describes the yield per recruit isopleth for the most important species *Amblygaster sirm* of the small mesh gillnet fishery. The effects of changes in fishing mortality (no. of boats) and the age at first capture (mesh size) are also discussed.

MATERIALS AND METHODS

The materials for the present study were collected during a survey at Negombo and Chilaw from March 1979 to July 1981. The catch and effort data, the species composition of the catches, fishing depth, the size of mesh and other relevant information were also obtained.

The total catch from this fishery in Negombo and Chilaw areas was used to estimate the fishing mortality. The age of *Amblygaster sirm* was esitmated by using the primary growth rings in the otoliths (Dayaratne, 1984). The growth parameters of the Von Bertallanffy growth equation was obtained by using the length at age data, back calculated data and also from length frequency distributions by using an ELEFAN Program (Pauly and David, (1981).

Estimate of natural mortality (M)

The formula

$\log M = 0.0066 - 0.279 \log L_\infty + 0.6543 \log K - 0.4631 \log T$ of Pauly (1980) was used to estimate the natural mortality. Where K and L_∞ are the growth parameters of the Von Bertallanffy growth equation and for *A. sirm* the values as obtained by Dayaratne (1983) are as follows $K = 3.7$ $L_\infty = 22$ cm. The annual mean surface temperature of sea was taken at 28° C.

The natural mortality value obtained for clupeid by using the above equation were consideed to be an overestimate. Therefore, the M value for *A. sirm* was multiplied by 0.8 as suggested by Pauly (1980).

Estimate of fishing mortality (F):

Assuming that the mean weight is the same in the stock the catch equation:

$$C = \frac{NF}{F+M}(1 - e^{-(F+M)})$$

was used to estimate the fishing mortality.

The biomass of small pelagic fish off the west coast of Sri Lanka was estimated at 10,000 t in 1980 (Blindheim and Fϕyn, 1980). The total annual catch obtained from the catch data was around 5000 t.

Estimate of (tc) age at first capture :

The most commonly used mesh sizes in this fishery are 28mm and 30mm stretched (Dayaratne, 1984). The lowest end of the selection range of the gillnet was used to estimate the length at first capture. This was transformed into age by using the growth equation obtained for *A. sirm* (Dayaratne, 1983).

RESULT AND DISCUSSION

The result obtained for M, F and to are as follows :

M	F	to	
2.12	2.0	28 mm mesh size	0.4
		30 mm mesh size	0.5

Fig. 1 shows the resultant yield isopleth for *A. sirm*. Accordingly, the maximum yield per recruit will be about 0.6 g. when the age at first capture is 0.4 to 0.5 years. Yields very close to the maximum can be obtained by using an instantaneous fishing mortality of 4 to 5. Even an instantaneous fishing mortality of 2.5 would produce about 80% of the maximum yield per recuit.

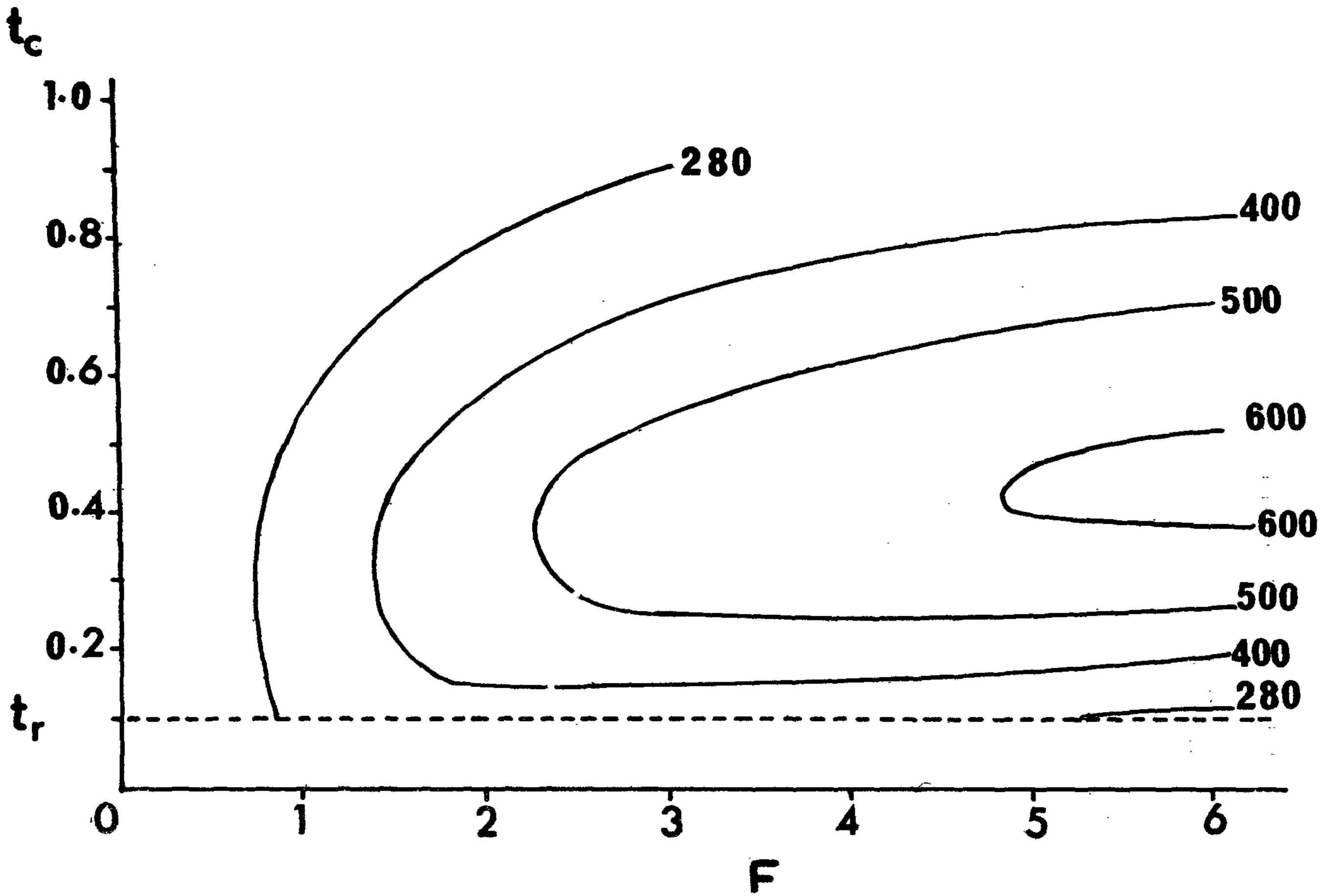

Fig. 1: Yield per recruit isopleth for *Amblygaster sirm.* the yield is given in mg. F is fishing mortality, t_c age at first capture and t_r age of recruitment.

The present level of instantaneous fishing mortality is close to the optimal one, although some increase may be allowed, without the risk of growth overfishing. It is very difficult to assess the risk of recruitment overfishing, because the stock recruitment relationship is not known for any *Amblygaster* stock. But it is unlikely that a reduction in spawning stock size, of the order expected to take place in *A. sirm* will have any harmful effects on recruitment.

The estimated age at first capture for the most commonly used mesh sizes of the present fisheries is 0.4 - 0.5. The presently used mesh size and their selection seem to give a t_c close to the optimal one and therefore should not be changed.

In a multispecies fishery, the state of the stocks of the dominant species may be taken as an indication of the state of the whole fishery. Therefore, as indicated by the present study the small meshed gillnet fishery seem to be in good balance with the production and that great change in the age at first capture or in the fishing mortality should not be recommended.

This fishery takes negligible amounts of fry and juveniles of other fish species. The by-catch problem which is very serious in many tropical shallow water trawl fisheries is absent in this fishery.

Therefore, the small meshed gillnet fishery could be considered as a relatively good method to exploit the small pelagic fish resources in the coastal waters. The results of the present study indicate a possibility for a slight increase in fishing effort. However it is advisable to maintain the fishing effort of this fishery at the present level as there has been an increase in fishing effort since 1981. According to Siddeek et al (in press) the fishing mortality of *A. sirm* has increased by 70% from 1980/81 to 1983/84.

ACKNOWLEDGEMENTS

I wish to thank Dr. M. S. M. Siddeek and Mr. B. D. L. Joseph of NARA, for their comments on the manuscript.

REFERENCES

BEVERTON, R. J. H. and HOLT, S. J., 1957.
On the dynamics of exploited fish population. Fishery invest., Lond., Ser. 2, 19.

BLINDHEIM, J. and FØYN, L. 1980.
A survey of the coastal fish resources of Sri Lanka, Report No. III, Jan. - Feb. 1980, Reports on surveys with the R/V Dr. Fridtjof Nansen". Institute of Marine Research Bergen.

DAYARATNE, P. 1983.
Age and growth studies of four *Sardinella* spp. from Sri Lanka by using primary growth rings in otoliths. M.Sc. Thesis, University of Bergen, Norway.

DAYARATNE, P. 1984.
Fisheries Biology of some small pelagic fish species (Clupeoides) from the west coast of Sri Lanka. Ph.D. Thesis University of Bergen, Norway.

PAULY, D., 1980.
On the inter relationships between natural mortality, growth parameters and mean environmental temperature in 175 fish stocks. J. Cons. Int. Explor. Mer. 39: 175-192.

PAULY, D., 1980.
A selection of simple methods for the Assessment of tropical fish stocks. FAO. Fish. Circ., (729): 54 P.

PAULY, D. and DAVID, N., 1981.
ELEFAN I, a BASIC program for the objective extraction of growth parameters from length frequency data. Meersforsch, 28: 205-211.

SIDDEEK, M. S. M., JOSEPH, L. JAYASURIYA, P. M. A. and FERNANDO W. P. N., 1984.
A preliminary analysis of length frequency data of *S. sirm* from Negombo, Sri Lanka using ELEFAN Program (Manuscript).