Selectivity in Trawl

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1. Introduction

Trawl is a conical bag, made from several panels of webbing. The bag like body of the net, tapers into a narrow tubular structure called cod end which forms the terminal part. The net is towed along the bottom of the sea or through column waters with its mouth open. The fish or prawn, which encounter the net, enters through the mouth and finally collected in the cod end.

The size and shape of the cod end mesh determines the size of fish to be retained in the net. Hence the size of the cod end mesh is the deciding factor in choosing the species to be caught. Therefore, trawl selectivity means the selective action of the cod end. Since the trawl catches all the size groups and species, this gear belongs to the category of non-selective gear. A change in the size of mesh can regulate the fish size to be removed. Fishes below a certain size passes through the cod end and escapes.

The Operation of trawls with small meshed conventional cod end prevents the escape of juveniles and undersized, due to the fact that its lumen remains closed under tow. The continued use of this non-selective gear results in indiscriminate removal of resources, which ultimately lead to depletion of stock. In order to conserve the stock, it is unavoidable to initiate appropriate management measures so as to prevent the capture of young ones. This enables the juveniles to grow and reproduce for providing a sustained yield.

The efforts so far made to stimulate the escape of fish by increasing the size of diamond mesh were not successful. The rigging pattern of codend was also changed for better opening of the mesh. But all these attempts were in vain. Recent attempts to incorporate square mesh in the codend was a break-through

in the field of conservation as these meshes remained open under stress, facilitating the escape of small and juvenile fishes (fig.1).

2. Method for assessing selectivity of codend:

The fishery managers should know the extent of escape from the codend as well as retention, in order to predict the future stock levels. This phenomenon of estimating the efficiency of codend in catching the desired size group and eliminating the undersized and juveniles is known as the selectivity of codend (Fig.2)

Various methods have been adopted to measure the selectivity of cod end.

2.1 Covered cod end method

In this method, the codend is covered with a small meshed cover. The fishes retained and those escaped represent the total population encountered. This method has proven to be the simplest and reliable technique (fig.3)

The cover seems to mask the meshes of the cod end itself, thereby reducing the quantum of escape. In order to overcome this problem, a new cover has been designed with two semi-rigid ring, which hold it away from the cod end. This arrangement showed a marked increase in measured selectivity.

2.2 Alternate tow method

Alternate hauls are made with experimental and small meshed cod end. The difference in the catch of two cod ends represent the escapement from large mesh codend. This is an indirect method, and for better selectivity data, the hauls should be made in identical conditions and the fish stock must be similar.

2.3 Trouser codend:

Two codends (double), with different mesh size (experimental and small meshed) were attached to a trawl. The difference in the catch of two codends

represent the escapement. In some cases, the codends are made of two types of meshes, and are provided with covers to assess comparative filtering efficiency of the two types (fig.4).

The validity of techniques other than cover cod end method is doubtful due to difficulties in ensuring that equal numbers of each size have been actually entered the two codends to be compared. The data have to be adjusted by some method to remove the effect of inequalities in total numbers entering the two codends. The adjustments and assumptions in these experiments admit rather serious sources of errors.

2.4 Twin trawling

The codend cover affects the escape of fish due to reduced water flow through codend or deterring fish due o the visibility of the cover (Fig.6).

An alternate technique is twin trawling in which identical nets with test cod end and small meshed cod end are towed simultaneously. If both trawls encounter the same population then the estimates of fish escaped from test cod end be made and selectivity assessed. The measured selectivity with twin trawl system is higher than other systems. But this is subjected to the geometry of the net and fishing efficiency remaining identical. But this is not always the case and hence unacceptable variability may result.

2.5 Square mesh panel

In a multispecies fishery a combination of diamond and square mesh codend will be more effective for measuring selectivity. In this method square mesh panel is incorporated in the diamond mesh codend. The size groups retained in control codend and the one with square panel was assessed, for measuring selectivity (Fig.5).

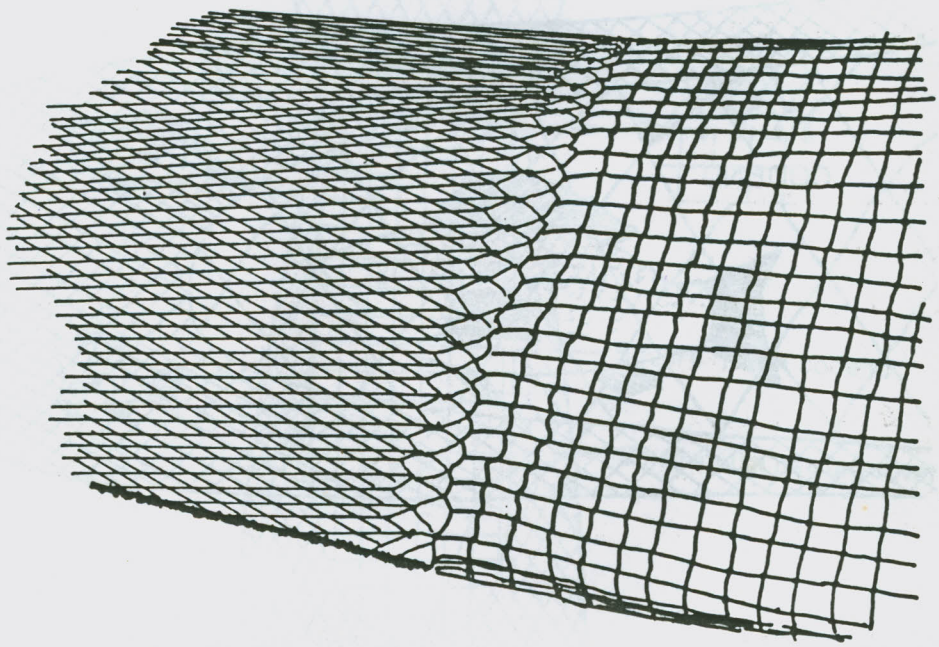


Fig. I Joining diamond and square meshes shown in a stretched position

Fig.2. COVERED CODEND

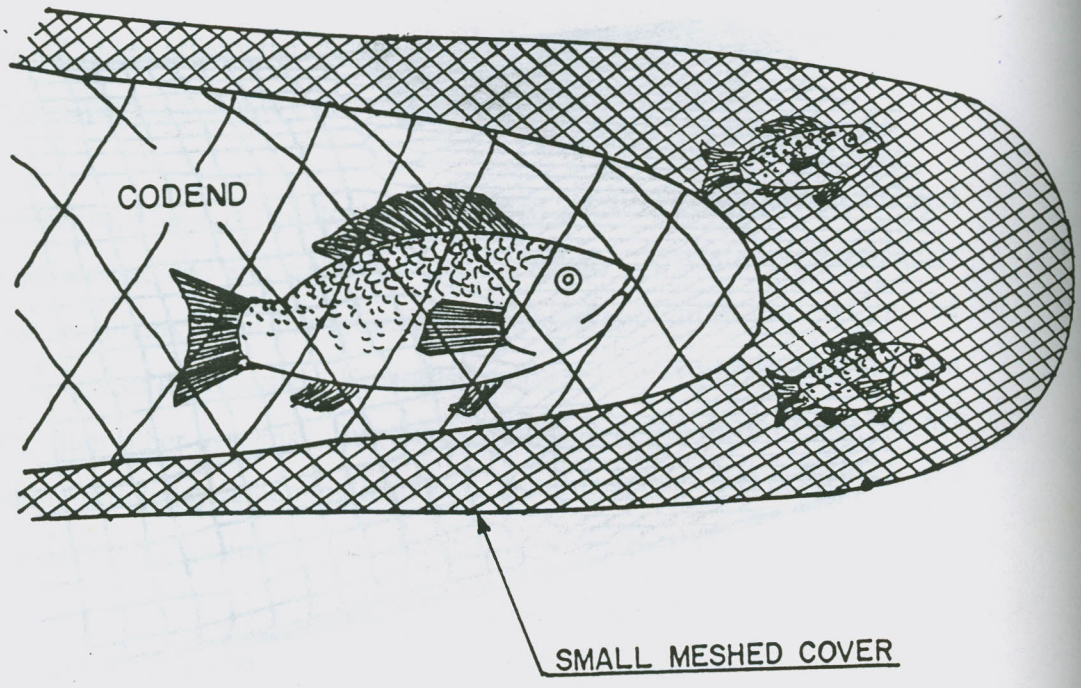


Fig. 3. SQUARE MESH CODEND WITH COVER

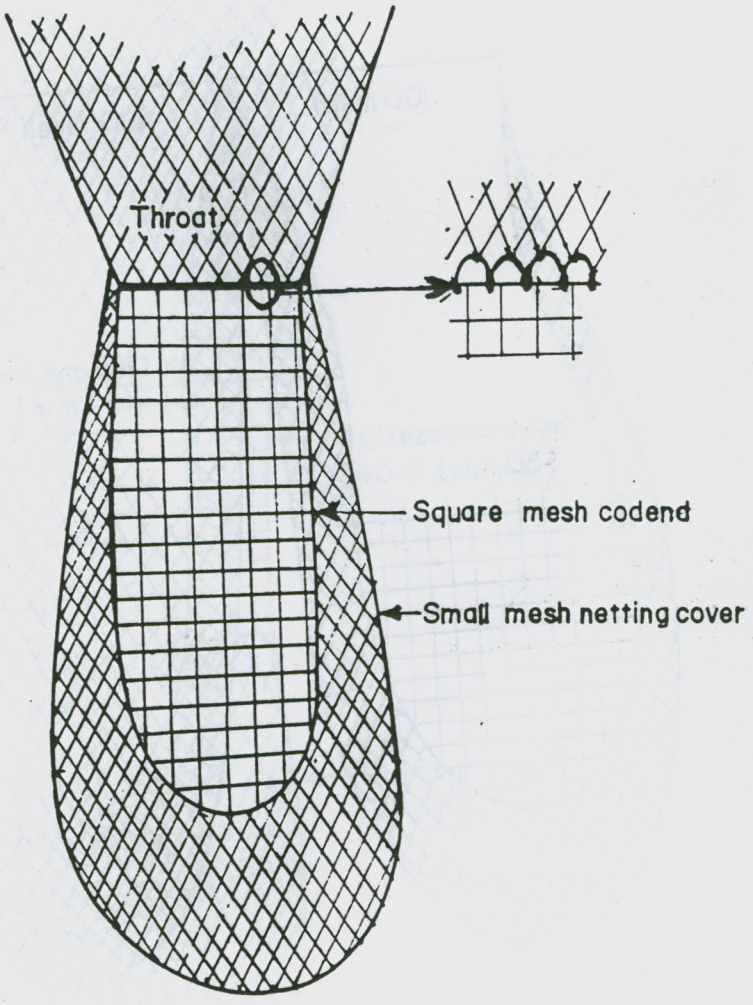


Fig. 4. TROUSER COD-END WITH SQUARE AND DIAMOND ME

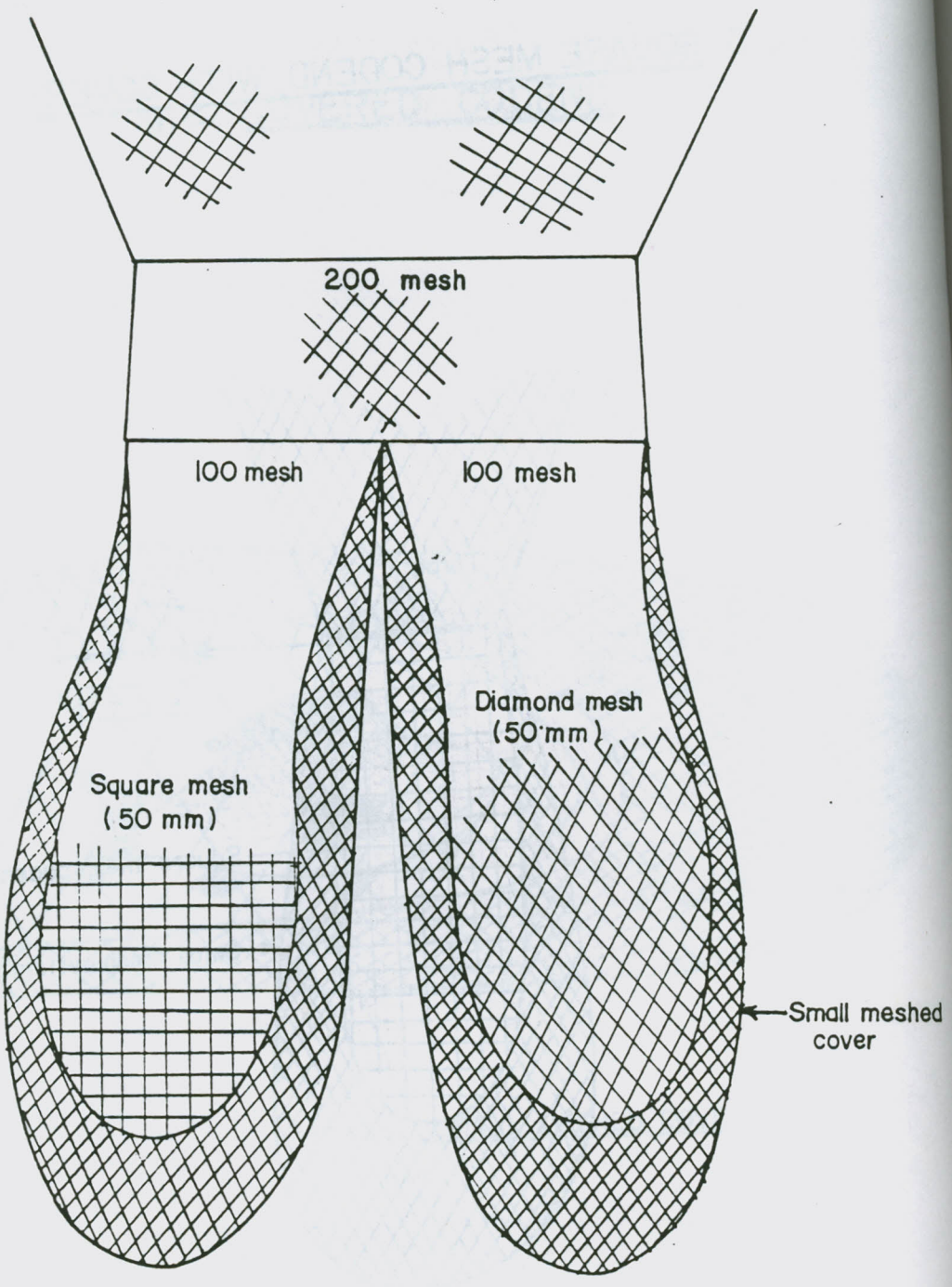


Fig.5. DIAMOND MESH CODEND WITH SQUARE MESH WINDOW

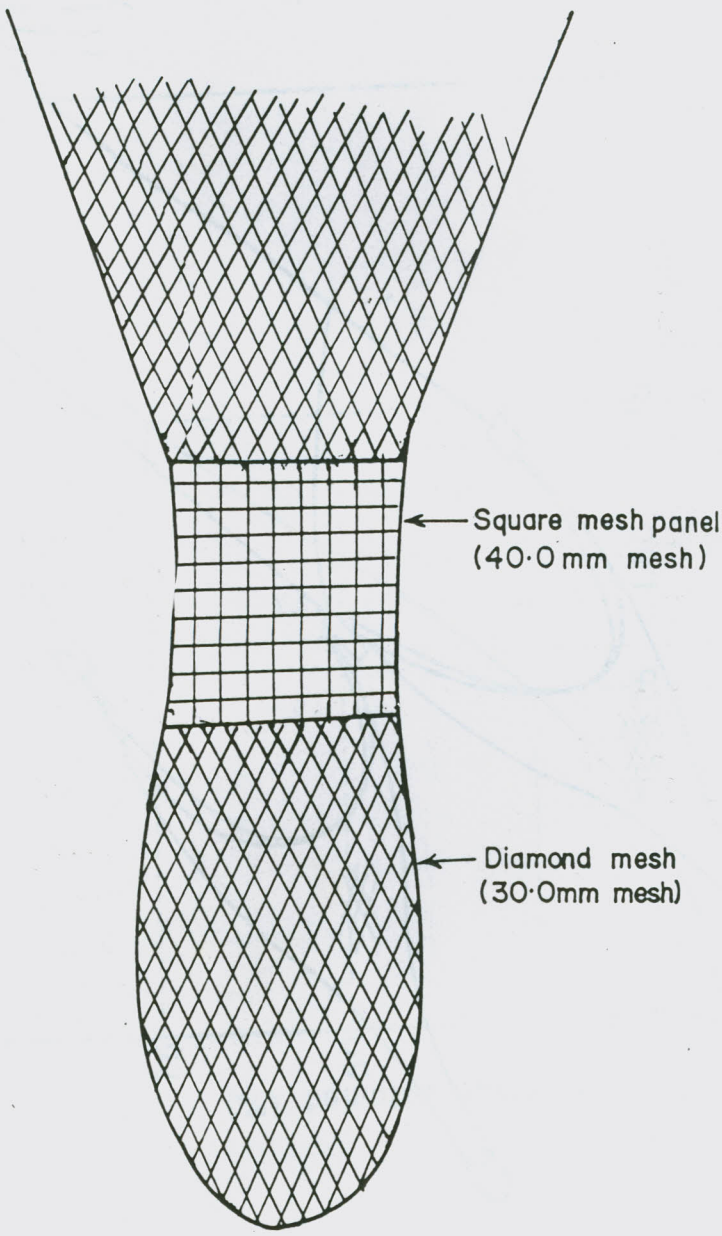
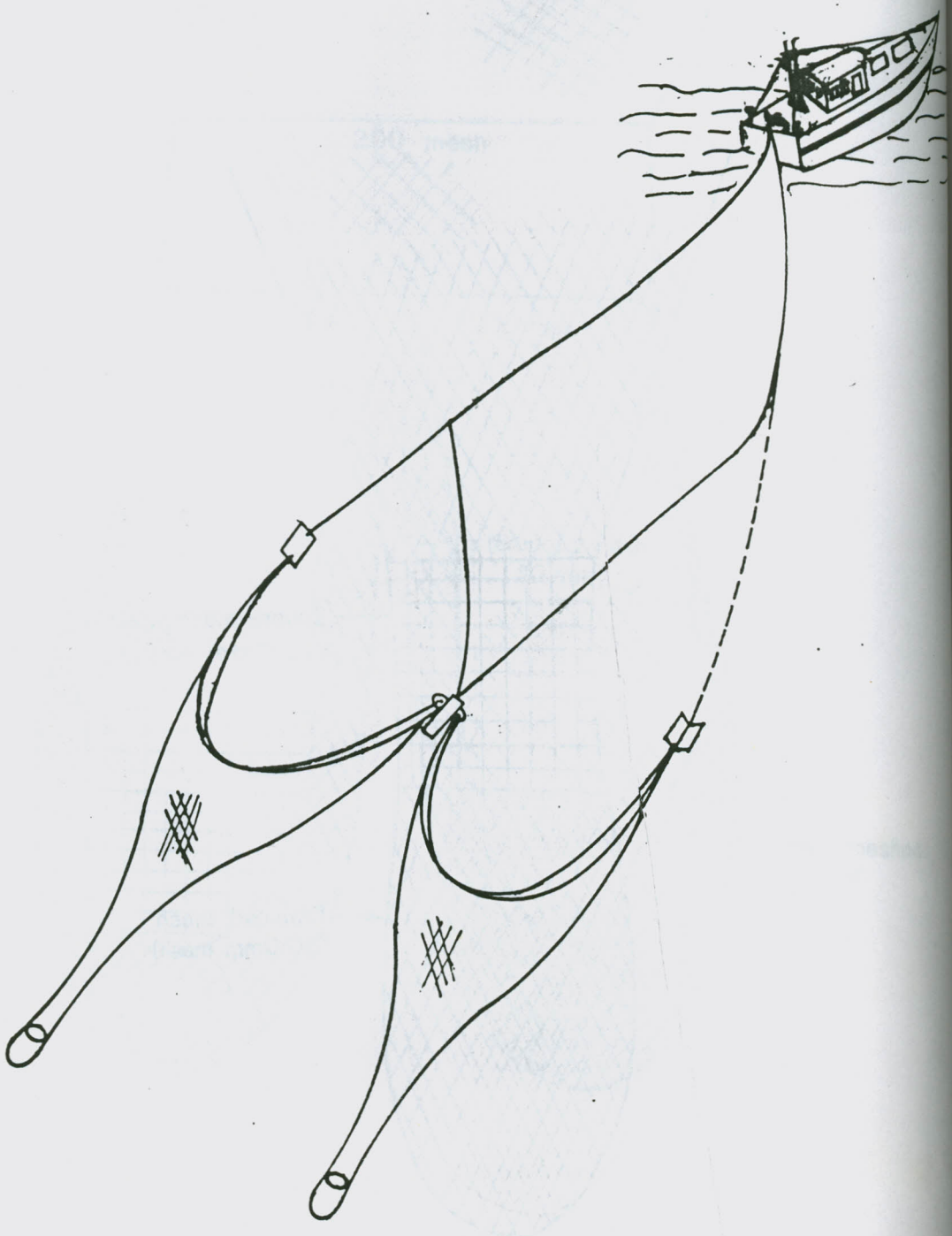


Fig. 6. TWIN TRAWLING.



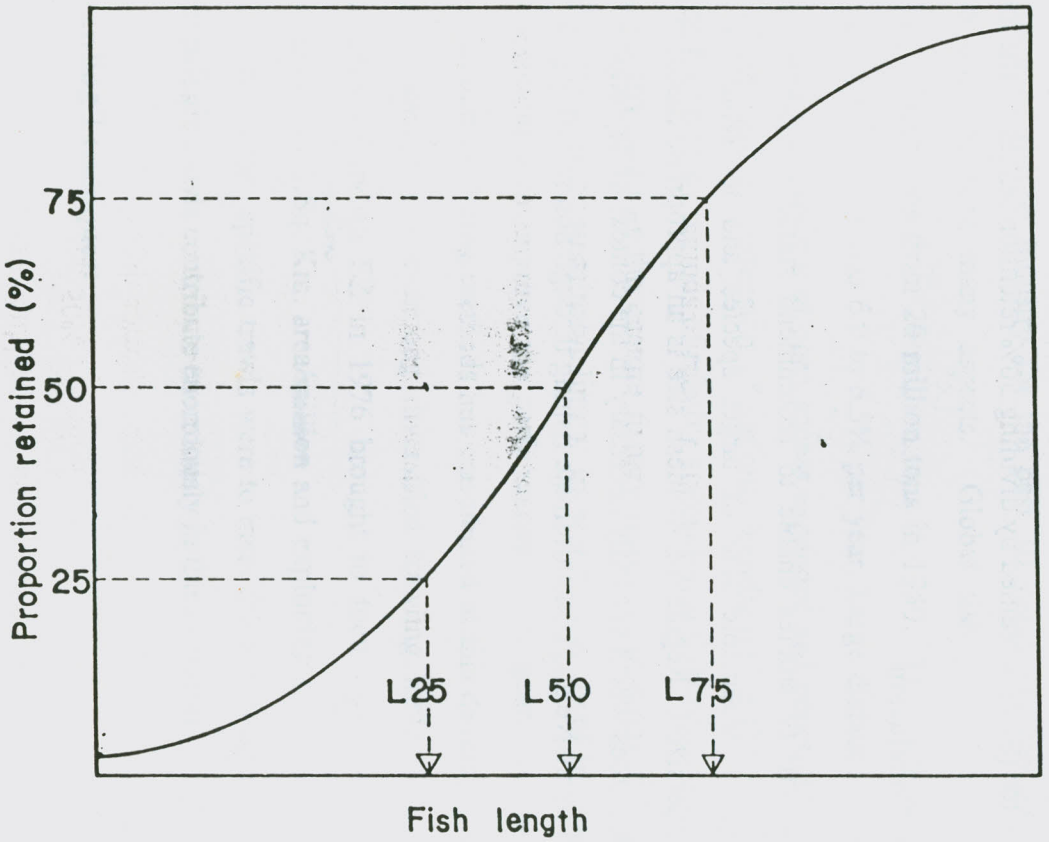


Fig. 5K Selection ogive showing the proportion of encountered fish retained by the gear vs. fish length.

3 Determination of selectivity parameters

In principle, the larger the mesh size, the greater is the chance of small fish to escape, some escape and some are caught. When this probability is plotted against fish size, usually the length, an 'S' shaped curve (ogive) is obtained, which completely describes the selectivity of a towed gear (Fig.7). The result of selectivity experiments could be presented in terms of two parameters which summarise the ogive, the 50% retention length, (L_{50}) and the selection range (SR), L_{50} is the fish length corresponding 50% chance of capture and SR is the length between 25% and 75% capture probabilities on the ogive. The selection factor (SF) is obtained by dividing 50% retention length by the mesh size.

4 Conclusion

Selectivity studies enable to recommend suitable mesh size for harvesting legally acceptable size of target species and to avoid the juveniles and undersized. Regulation of mesh size is an appropriate measure for conserving resources which is highly necessary in the context of depletion of resources due to intensive and indiscriminate fishing through non selective gear like trawls.