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Results of Fishing Experiments with Square Mesh in the codend of demersal trawls

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Abstract : Fishing experiments are conducted with alternate haul technique and trouser codend method using square mesh codend in contrast to conventional diamond mesh codend in demersal trawls with 30 mm and 20 mm mesh size to assess the comparative retention and escapement of juveniles of both fin fish and shell fish to suggest conservation measures for the trawl industry for better management. Results indicate that more number of smaller size groups of fin fish and shell fish escaped from square mesh codend than that of diamond mesh codend. It is more evident in the case of small mesh size codend with 20 mm mesh and operated in shallow waters. In the case of 30 mm mesh codend, selection was not so significant between square mesh and diamond mesh as the size of mesh is sufficient enough to provide escapement for juveniles. The size of mesh is more critical rather than the shape of mesh with increasing mesh size in larger meshes. Moreover, juveniles are less represented in offshore and deeper waters. Fabrication, rigging and construction of square mesh codend, trouser codends and fitting of covers for collection of escaped fishes are briefly mentioned.

Introduction

Pope (1966) has reported that the shape of mesh in the codend of trawls affect the selectivity. The flow of water also depends on the shape of the mesh. For improving the filtering efficiency of mesh, the mesh has to remain open facilitating more water flow and easy escape of young ones of fish. This can be achieved by using square mesh codend as this will remain open while in operation contrast to the conventional diamond mesh, which under tow becomes rigid and its lumen narrows down resulting in the prevention of escape of fish. The superiority of squaremesh over diamond mesh to help escape of juvenile fish has been studied by many workers (Robertson 1982, 1983 (a), 1983 (b), 1984 and 1986, Robertson and Polanski, 1984, Robertson *et al.*, 1986, Robertson and Stewart, 1986, Kunjipalu and Varghese, 1988, 1989, Kunjipalu *et al.*, 1994 (a) (b), Varghese *et al.*, 1996. Hence an attempt was made to assess the comparative efficiency of two shapes of mesh to suggest suitable one for the industry.

Materials and Methods

Investigations were conducted in two phases as alternate haul technique using detachable codends of both square mesh and diamond mesh as described by Kunjipalu *et al.* (1994 a) and with trouser codend (Kunjipalu *et al.*, 1994 b). Fabrication, construction and rigging of squaremesh codend and fitting of cover are shown in figures 6-9. Selectivity curves and mesh selection lengths were found out based on the methods suggested by Gulland (1969).

Results and Discussion

A total of 55 observations were made under phase 1 with alternate haul technique using 30 mm and 20 mm mesh

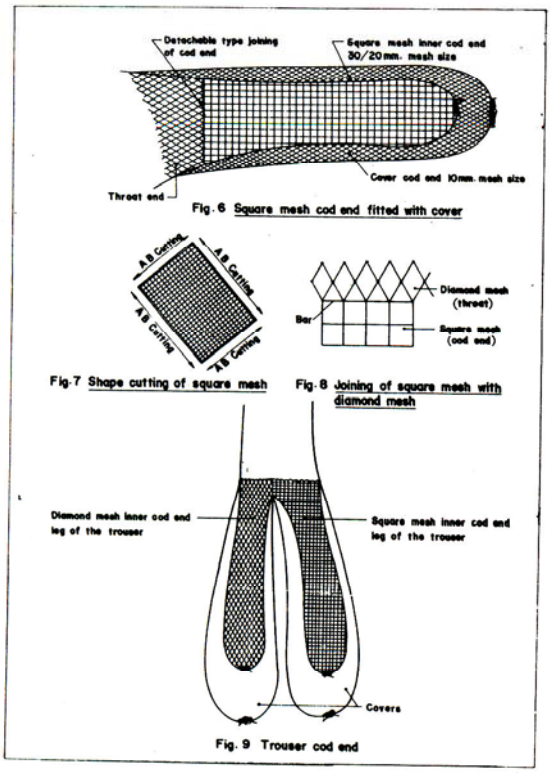

Fig. 6 Square mesh cod end fitted with cover

Fig. 7 Shape cutting of square mesh

Fig. 8 Joining of square mesh with diamond mesh

Fig. 9 Trouser cod end

size both in diamond and square shape during 1988-91. Table 1 gives the total catch obtained as retention and escapement with regard to diamond and square mesh of 20 mm and 30 mm mesh size. In the second phase altogether 105 observations were made with trouser codend technique with 30 mm and 20 mm mesh size in diamond and square shape during 1992-94. A summary of data on the results with total catch as retention in codend and escapement in respective covers in diamond and square legs of the codends with 20 mm and 30 mm mesh size are furnished in Table 2. The percentage escapement with regard to diamond mesh and square mesh in 20 mm and 30 mm with reference to twelve common fin fishes, four penaeid prawns and two species of common squid and cuttle fish of economic importance are presented in Figs. 1-5.

As seen from Tables 1 and 2, total catch as both retention in inner codend and escapement in cover were more in the case of square mesh codend when compared to diamond mesh codend irrespective of mesh size. Increased catch rates of square mesh codend is attributed to better water flow and filtration through square mesh compared to diamond mesh codend, which prevent easy water flow and slows down filtration.

The escapement was very less in the case of 20 mm mesh size codend, whether it is diamond or square in shape, when compared to 30 mm mesh size. Thus it was found that the size of mesh is very critical in deciding the selectivity of most of the fishes studied (Figures 1-3). On

Table 1. **Total catch as retention in codend and escapement in cover in diamond and square mesh codends of 20 mm and 30 mm mesh size in alternate haul technique during 1988-91.**

Codend Mesh size	Diamond mesh			Square mesh		
mm	Total Catch (Kg)	Retention (Kg)	Escapement (Kg)	Total Catch. (Kg)	Retention (Kg)	Escapement (Kg)
20	67.800	63.050	4.750	88.260	79.100	9.160
30	535.400	410.500	124.900	680.600	494.300	186.300

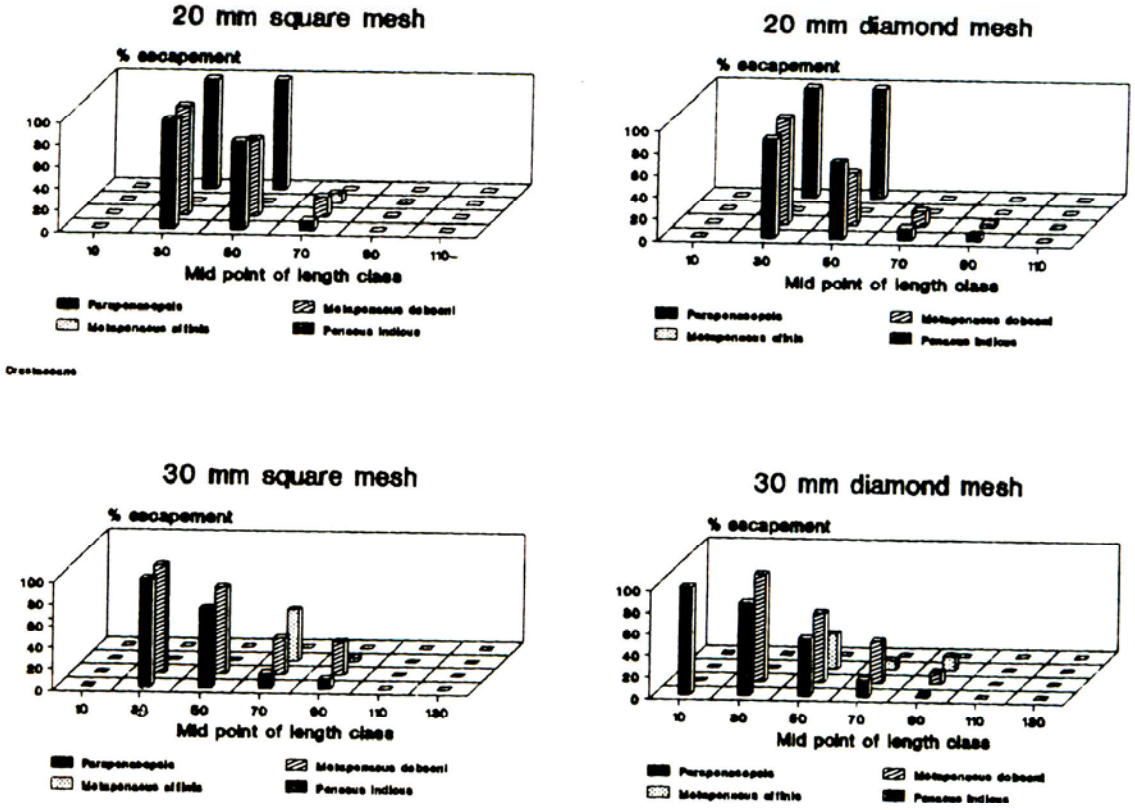

Fig. 1. Percentage escapement of different size gropus of prawns in 20 mm and 30 mm Square Mesh and Diamond Mesh cod ends

Table 2. **Total catch as retention in codend and escapement collected in cover in diamond and square meshcod ends of 20 mm and 30 mm mesh size in trouser codend experiments during 1992-94.**

Codend Mesh size	Diamond mesh			Square mesh		
mm	Total Catch (Kg)	Retention (Kg)	Escapement (Kg)	Total Catch (Kg)	Retention (Kg)	Escapement (Kg)
20	166.683	148.639	18.044	340.679	284.340	56.339
30	245.354	200.402	44.952	382.177	306.995	75.182

the other hand 30 mm mesh size, as it is sufficiently large enough, percentage escapement of some species like *Dussumeria* and *Ambassis* showed variation (Figs. 2 & 3) which can be attributed to the morphometric

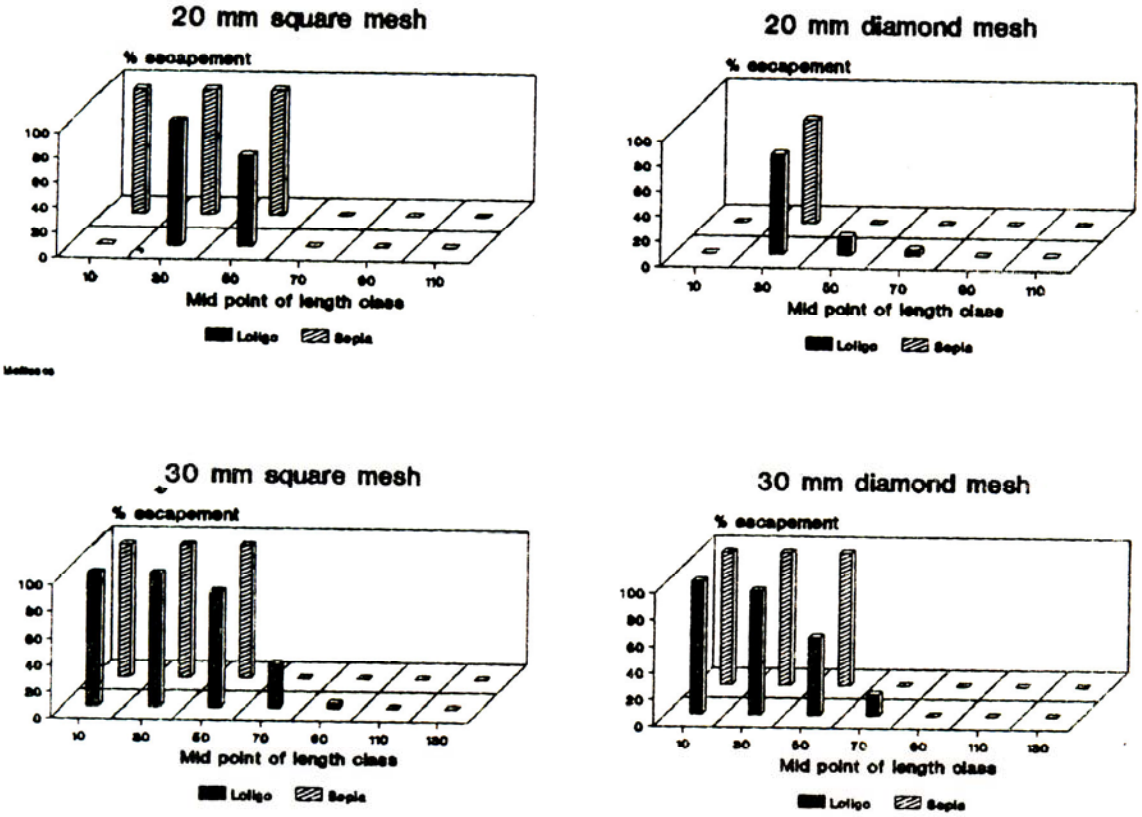

Fig. 2. Percentage escapement of different size gropus of Cephalopods (squid and cuttle fish) in 20 mm and 30 mm Square Mesh and Diamond Mesh cod ends

characteristics of the fish. Similar observations were earlier reported by Kunjipalu *et al.* (1994 a and b)

The escapement of each species of fish depends also on the morphometric features of the fish. The shape of mesh helps in the process of escapement. But the more important factor is the size of mesh as smaller the mesh lesser the escapement as observed in the case of 20 mm mesh codend. Hence, further studies are being carried out with three different mesh sizes in square mesh to find out the selectivity of mesh size with respect to square mesh codend in demersal trawls for coastal waters.

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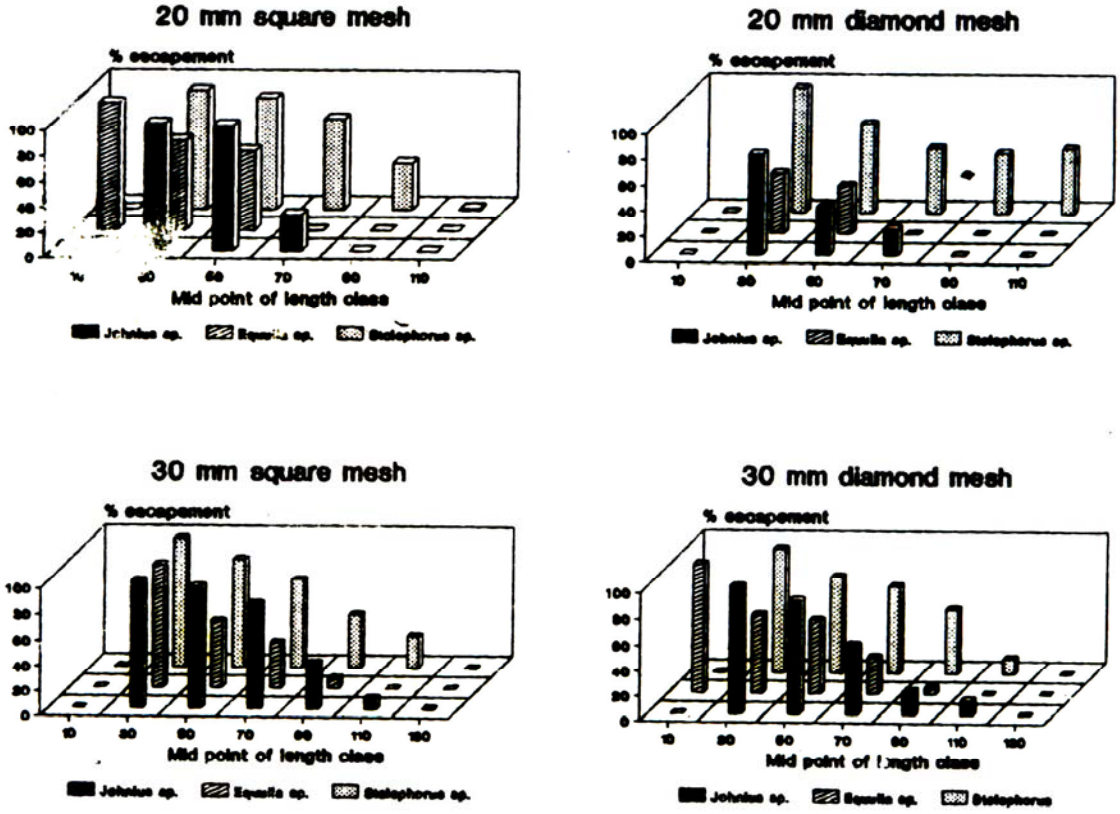

Fig. 3. Percentage escapement of different size gropus of Fin fishes - Johnius spp; Leiognathus spp. and Stolephorus spp. in 20 mm and 30 mm Square Mesh and Diamond Mesh cod ends

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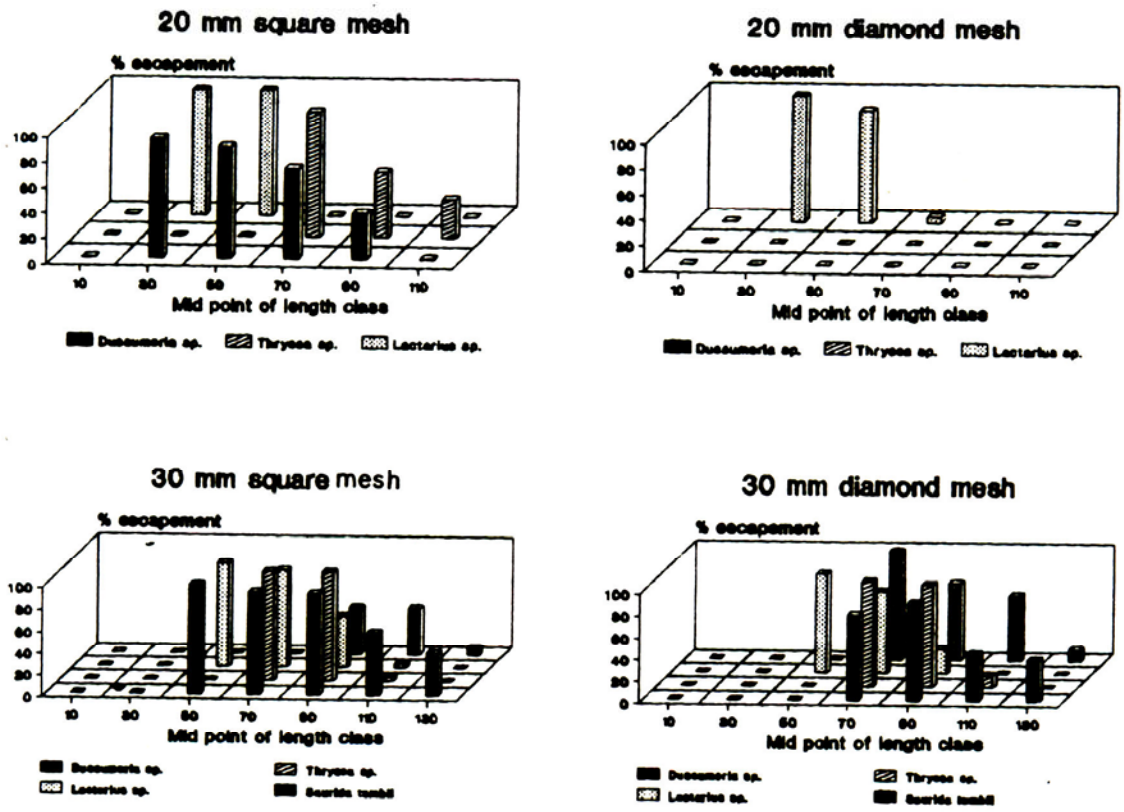

Fig. 4. Percentage escapement of different size gropus of Fin fishes - Dussumeria acuta, Thryssa spp, Lactarius spp, Saurida tumbil in 20 mm and 30 mm Square Mesh and Diamond Mesh cod ends

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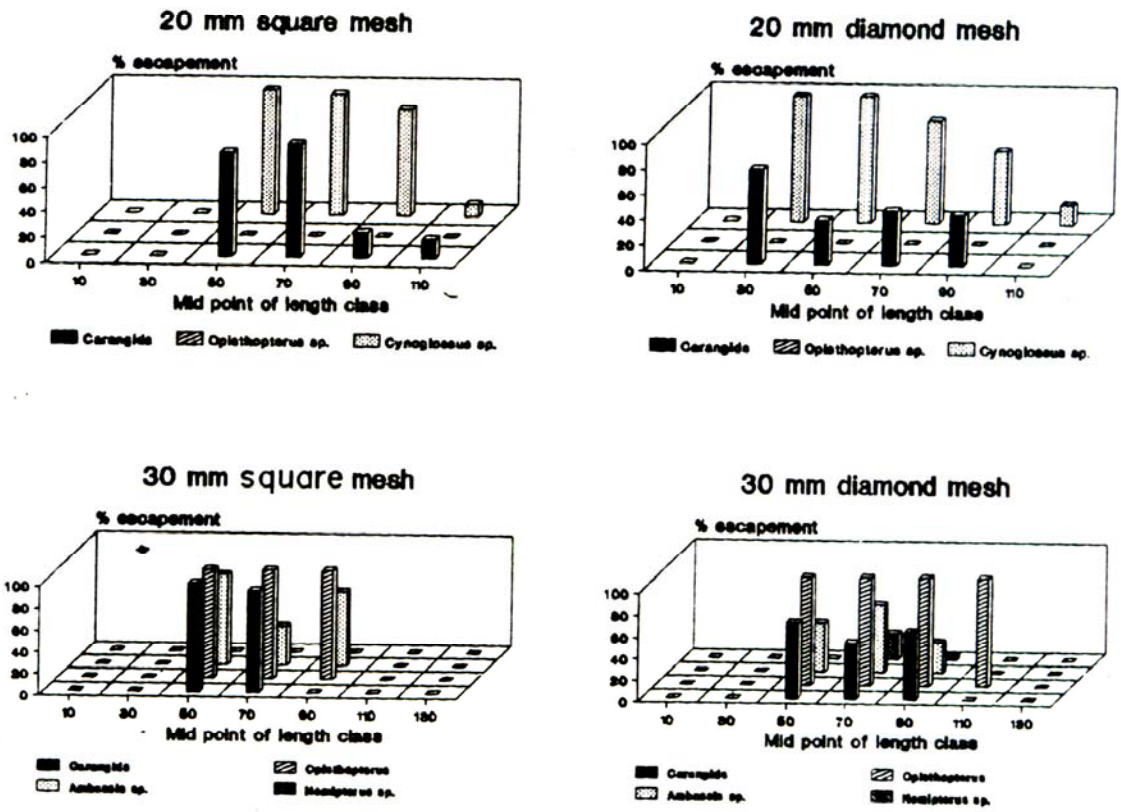

Fig. 5. Percentage escapement of different size gropus of Fin fishes - Carangids, Opisthopterus spp., Cynoglossus spp. Ambassis spp. and Nemipterus spp. in 20 mm and 30 mm Square Mesh and Diamond Mesh cod ends

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