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# Studies on Square Mesh Codend in Trawls-II Observations with 20 mm Mesh Size

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Investigations were carried out to study comparative escapement of different sizes of fish and prawns from diamond and square mesh codends of 20 mm mesh size. Both the codends were covered with small meshed (10 mm) webbing to collect the fish which escaped through the codends. The mean selection length and selection factor for four species of fish (*Johnius* spp., *Leiognathus* spp., *Dussumeria acuta, Thryssa purava*) and two species of prawns (*Parapenaeopsis stylifera* and *Metapenaeous dobsoni*) were worked out for both the codends. The mean selection length was greater for square meshes indicating the superiority of this type of mesh over the conventional mesh in releasing more juveniles of the species studied.

**Key words : Trawl selectivity, selection factor, conservation, mesh regulation.**

The mesh size of the codend of trawls is chosen so as to exploit the desired size groups and avoid capture of juveniles in order to conserve the fishery resources. The conventional diamond mesh, under tow becomes stretched and its lumen narrows down resulting in the prevention of escape of fish. Chun Chun *et al.* (1991) observed that the diamond mesh becomes narrow at the middle of the codend causing the mesh lumen to be almost closed during trawling and hence the benefit of mesh regulation is insufficiently attained. Robertson & Stewart (1986) observed that the codend when filled assumes bulbous shape and the fish escape through a small area of open meshes in front of the bulb, while forward of this point most of the meshes are stretched and closed. Pope (1966) stated that the shape of mesh affects the selectivity of codend. Further, the flow of water also depends on the shape of mesh. Hence 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 codends as this will remain open while in operation. The superiority of square mesh over diamond mesh in facilitating escapement of juvenile fish has been proven by many workers (Robertson, 1982; 1983a,b; 1984 & 1986; Robertson & Polanski, 1984; Robertson *et al.*, 1986; Robertson & Stewart, 1986 Kunjipalu & Varghese, 1989 and Kunjipalu *et al.*, 1994).

The present study is a continuation of earlier studies (Kunjipalu *et al.*, 1994) to find out the impact of using square mesh codend in place of conventional codend of the same mesh size.

## Materials and Methods

Diamond and square mesh codends of 20 mm, fabricated out of 1 mm dia PE were attached to the throats of 17 m two-seam trawl and 22 mm shrimp trawls. Both the codends were covered with nylon webbing

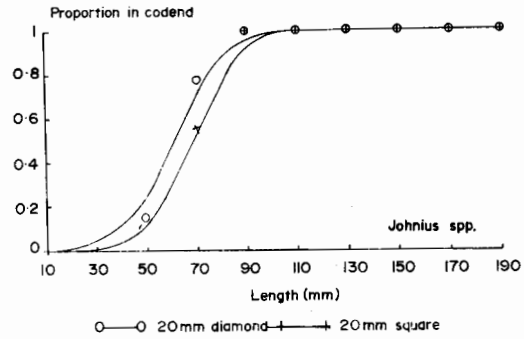
of 10 mm mesh size for collecting the fish that escaped through the codend. The nets were operated during 1988-90 fron the Departmental vessel Fishtech VI, 9.0 m OAL, fitted initially with a 50 hp engine and subsequently with a 37 hp engine.

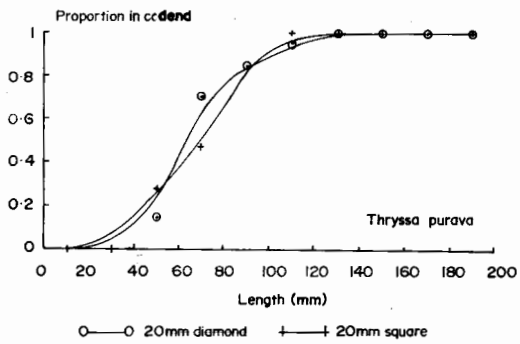
Twenty five hauls each were made alternately with square and diamond mesh codends under identical conditions, providing equal chances for both. The catch composition as well as length frequency of dominant species obtained during each haul in the codend and cover were recorded and the data were processed to determine the mean selection length $L_{50}$ and selection factor, b as described by Kunjipalu *et al.* (1994) based on methods described by Gulland (1969). Four species of finfish viz. *Johnius* spp., *Leiognathus* spp. *Dussumeria acuta*, and *Thryssa purava* and two species prawns

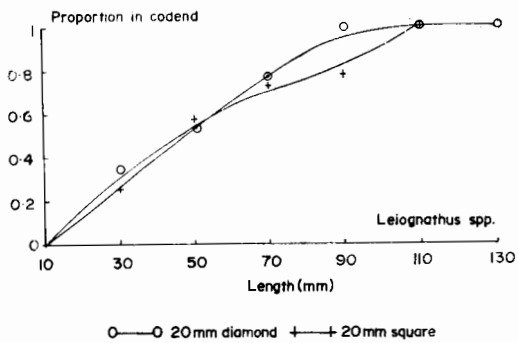
Table 1. Percentage escapement of different length classes of species groups from 20 mm diamond and square mesh codends

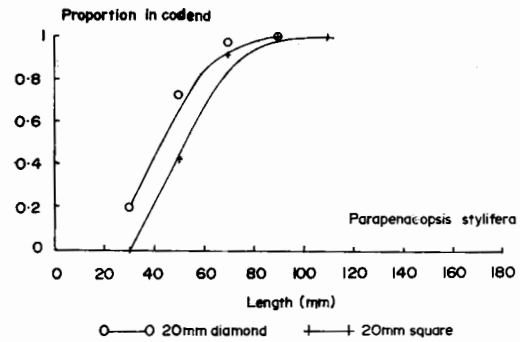
| Midpoint of length class, mm | Percentage escapement | |
|---|---|---|
| | Diamond mesh | Square mesh |
| a) *Johnius* spp. | | |
| 30 | 100 | 100 |
| 50 | 81 | 100 |
| 70 | 22 | 44 |
| 90 | 0 | 0 |
| 110 | 0 | 0 |
| 130 | 0 | 0 |
| 150 | 0 | 0 |
| 170 | 0 | 0 |
| 190 | 0 | 0 |
| c) *Dussumeria acuta* | | |
| 50 | 100 | - |
| 70 | 60 | 71 |
| 90 | 29 | 36 |
| 110 | 0 | 0 |
| 130 | 0 | 0 |
| 150 | 0 | 0 |
| 170 | - | 0 |
| e) *Parapenaeopsis stylifera* | | |
| 30 | 81 | 100 |
| 50 | 28 | 58 |
| 70 | 3 | 9 |
| 90 | 0 | 0 |
| 110 | - | 0 |

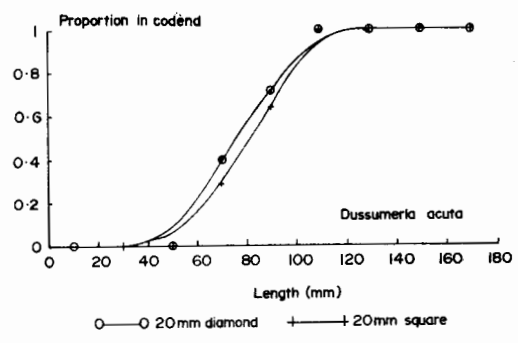
| Midpoint of length class, mm | Percentage escapement | |
|---|---|---|
| | Diamond mesh | Square mesh |
| b) *Leiognathus* spp. | | |
| 30 | 67 | 75 |
| 50 | 47 | 43 |
| 70 | 24 | 28 |
| 90 | 0 | 23 |
| 110 | 0 | 0 |
| 130 | 0 | - |
| d) *Thryssa purava* | | |
| 30 | 100 | 100 |
| 50 | 86 | 72 |
| 70 | 30 | 53 |
| 90 | 16 | 14 |
| 110 | 5 | 0 |
| 130 | 0 | 0 |
| 150 | 0 | 0 |
| 170 | 0 | 0 |
| 190 | 0 | - |
| f) *Metapenaeous dobsoni* | | |
| 50 | 45 | 72 |
| 70 | 16 | 23 |
| 90 | 7 | 0 |
| 110 | 0 | 0 |



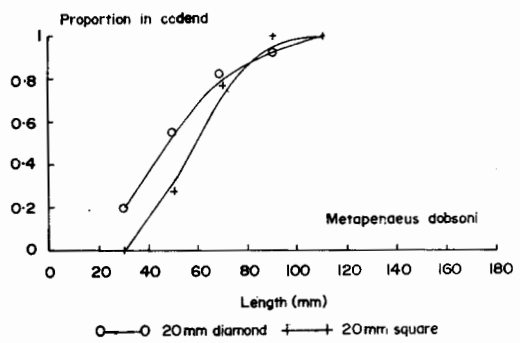




Fig. 1. Selectivity curves for square and diamond mesh codends for different fish and prawn species studied.

viz., *Parapenaeopsis stylifera* and *Metapenaeus dobsoni* were selected for the studies.

## Results and Discussion

Table 1 shows the percentage escapement of different length classes of species groups from 20 mm diamond and square mesh codends. Fig. 1 gives the selection curves of species groups for diamond and square condend.

The length at which 25% of fish are retained ($L_{25}$), length at which 50% are retained ($L_{50}$: Mean selection length), length at which 75% are retained ($L_{75}$), selection range ($L_{75}$ - $L_{25}$) and selection factor ($L_{50}$/ mesh size) in respect of two types of codends for the different species are furnished in Table 2.

As evident from Table 2 and Fig. 1, mean selection lengths were greater for square mesh for all species studied, thus showing that 20 mm square mesh can release more juveniles compared to diamond mesh of same size. Kunjipalu *et al.* (1994) while comparing the selectivity of 30 mm square mesh and diamond mesh observed that mean selection length in respect of *Dussumeria acuta* and *Saurida tumbil* was greater for square meshes. However, mean selection length obtained by Kunjipalu *et al.* (1994) in respect of fishes *Johnius* spp., *Thryssa purava, Leiognathus* spp. and prawns *Parapenaeopsis stylifera* and *Metapenaeous dobsoni* were smaller in square mesh codend. Based on a preliminary study, Kunjipalu *et al.* (1989) showed that percentage of smaller size groups of fishes retained by square mesh (20 and 30 mm size) was lower compared to conventional diamond mesh. Pillai *et al.* (1994) observed that percentage escapement of smaller size groups of *Nemipterus* sp., *Decapterus* sp., *Priacanthus* sp. and *Saurida* sp. were more in square mesh (40 and 50 mm mesh size) compared to diamond meshes of same size. Thus it seems possible that capture of juveniles and subadults of many species could be controlled by using square mesh of appropriate size in the codends. However, further studies covering all species of commercial importance are required for optimisation of the mesh size with respect to fishing areas, in order to give final recommendations on the use of square mesh codend as a management measure.

Table 2. Selection lengths corresponding to 25%, 50% and 75% retentions, selection ranges and selection factors

| Name of fish | Shape of codend mesh | $L_{25}$ mm | $L_{50}$ mm | $L_{75}$ mm | Selection range | Selection factor |
|---|---|---|---|---|---|---|
| *Johnius* spp. | Diamond | 50.00 | 61.60 | 73.30 | 23.30 | 3.08 |
| | Square | 58.30 | 68.80 | 79.10 | 20.80 | 3.44 |
| *Leiognathus* spp. | Diamond | 29.30 | 47.40 | 67.90 | 38.60 | 2.37 |
| | Square | 26.50 | 53.60 | 80.00 | 53.50 | 2.68 |
| *Dussumeria actua* | Diamond | 62.90 | 77.80 | 94.30 | 31.40 | 3.88 |
| | Square | 67.10 | 81.40 | 95.70 | 28.60 | 4.07 |
| *Thryssa puruva* | Diamond | 51.50 | 67.30 | 79.20 | 27.70 | 3.37 |
| | Square | 49.20 | 67.70 | 84.60 | 35.40 | 3.39 |
| *Parapenaeopsis* | Diamond | 32.90 | 42.30 | 55.00 | 22.10 | 2.12 |
| *stylifera* | Square | 42.10 | 53.30 | 66.40 | 24.30 | 2.62 |
| *Metapenaeous* | Diamond | 33.60 | 49.80 | 65.70 | 32.10 | 2.49 |
| *dobsoni* | Square | 45.00 | 58.00 | 72.10 | 27.10 | 2.94 |

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