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Advantages of square mesh codend on the conservation of demersal fisheries in Indian EEZ

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ABSTRACT

Square mesh in the codend play an important role on the selectivity of trawl gear and the conservation of resources. Comparative fishing trials between the square mesh and diamond mesh codends were carried out in deeper waters from *FORV Sagar Sampada*. The length frequency measurements of the important species of fish caught in both the codends showed the supremacy of square mesh by retaining more bigger fish and eliminating under sized and juvenile fishes, than the diamond mesh.

INTRODUCTION

The size and shape of codend mesh play a prominent role on the selectivity of gear and conservation of fishery resources. Any fishing gear which aims to conserve the fish stock should effectively catch only the target species of high quality and legally accepted size, using minimum quantity of fuel. The profit from trawling will be less, if large quantity of under sized fish are caught. So the mesh size for the codend, is to be regulated by which the escapement of fishes smaller than the minimum permitted size is facilitated in order to conserve the resources. According to Robertson (1986) limiting the destruction of juvenile fish is one way of conserving the stock of important demersal species. Earlier studies suggested increase of mesh size for better selectivity.

Panicker & Sivan (1965) recommended increase of codend mesh size to 40 mm stretched for shrimp fishing. The capacity of codend to allow the under sized fish to escape depends on the size, shape and unobstructed opening of the mesh. The conventional diamond mesh tends to close during the drag when the codend fills up and the tension on the mesh bar increases (Fonteyne & M'Rabet, 1992). Unlike the diamond mesh a square mesh is not distorted by water pressure, the netting retains its original shape and the mesh is kept open fully (Stewart & Robertson, 1985). The use

of square mesh also enables better filtering capacity thereby reducing drag. Selectivity experiments with square mesh codend have shown that the square mesh are more effective for round fish, than diamond mesh (Robertson, 1983; Robertson & Stewart, 1986). But the square mesh has not much influence on selectivity in the case of flat fish (Fonteyne & M'Rabet, 1992). Investigations to study the effect of square mesh codend on selectivity revealed that square mesh codend of 30 mm mesh size is more selective in eliminating under sized fishes when compared to the diamond mesh codend. The present communication deals with investigations on square mesh and diamond mesh (40 and 50 mm mesh size) to study the selectivity on demersal fishes in deeper waters.

MATERIALS AND METHODS

Codends with square mesh and diamond mesh of 40 and 50 mm mesh size (Fig. 1) were fabricated with 2.5 mm diam. polyethylene twine as described by Robertson (1986). The 40 mm square and diamond mesh codends were attached to a 38 m hybrid trawl and 50 mm square mesh and diamond mesh codends to 50 m high speed demersal trawl (Panicker, 1990; Panicker *et al.* 1993). Both diamond and square mesh codends were attached together as twin codend for simultaneous observation. Fishing trials were carried out from *FORV Sagar Sampada* during cruise nos 99 and 105, in the depth range of 50 to 200 m, along the west coast. Length frequency measurements of the samples of important species such *Nemipterus* sp., *Decapterus* sp., *Priacanthus* sp., *Saurida* sp. and squids from square mesh and diamond mesh were recorded.

RESULTS AND DISCUSSION

Percentage composition of length group of important species caught in the square mesh and diamond mesh codends of 40 mm and 50 mm mesh size are given in Table 1. It is evident from the data that smaller size group of fishes of all species are more in diamond mesh codend than in square mesh codend, the latter retained larger size

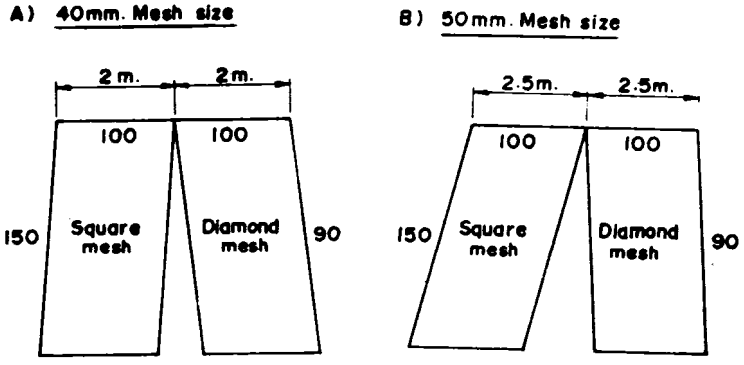

Fig. 1— Design details of square mesh and diamond mesh codends

Table 1— Percentage composition of length group of important species caught by square mesh and diamond mesh codends of 40 mm and 50 mm mesh size

Length group (mm)	40 mm mesh size		50 mm mesh size	
	Square mesh	Diamond mesh	Square mesh	Diamond mesh
		Nemipterus sp.		
81-100	Nil	10.7	Nil	0.3
101-120	0.7	9.3	Nil	10.2
121-140	43.3	28.0	20.1	30.0
141-160	28.6	33.3	42.2	31.3
161-180	18.0	13.4	26.9	20.4
181-200	5.3	1.3	7.4	6.5
201-220	1.9	4.0	2.8	0.3
221-240	2.0	Nil	0.3	0.3
>241	Nil	Nil	0.3	Nil
		Priacanthus sp.		
101-120	12.0	24.8	1.0	12.3
121-140	32.8	36.0	27.5	38.2
141-160	35.2	24.0	60.9	44.7
161-180	18.4	13.6	6.0	2.4
181-200	0.8	0.8	2.4	1.6
201-220	0.8	0.8	1.6	0.8
		Decapterus sp.		
121-140	Nil	23.0	Nil	Nil
141-160	67.0	66.0	Nil	16.6
161-180	23.1	9.1	19.1	27.5
181-200	10.0	2.0	62.6	50.9
201-220	Nil	Nil	18.3	5.0
		Saurida sp.		
101-120	42.0	44.0	10.4	30.8
121-140	24.0	28.0	32.0	35.4
141-160	25.0	22.0	38.4	25.6
161-180	9.0	6.0	14.4	6.4
181-200	Nil	Nil	4.6	1.8

Contd....

Table 1 — *Contd....*

Length group (mm)	40 mm mesh size		50 mm mesh size	
	Square mesh	Diamond mesh	Square mesh	Diamond mesh
		Sciaenids		
161-180	-	-	5.0	18.0
181-200	-	-	26.0	35.0
201-220	-	-	41.0	27.0
221-240	-	-	24.0	18.0
>241	-	-	4.0	2.0
		Squids		
101-120	12.3	33.0	20.5	49.4
121-140	26.7	10.6	45.3	29.2
141-160	13.2	13.2	16.4	13.4
161-180	26.6	24.6	12.6	6.2
181-200	21.2	18.6	5.2	1.8

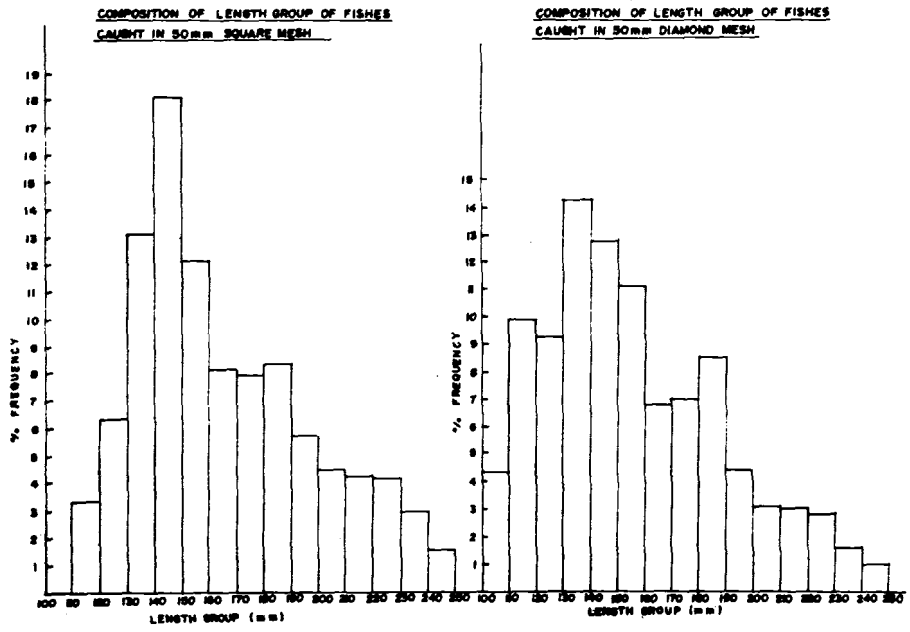

Fig. 2—Composition of length groups of fishes caught in 50 mm square and diamond mesh codend

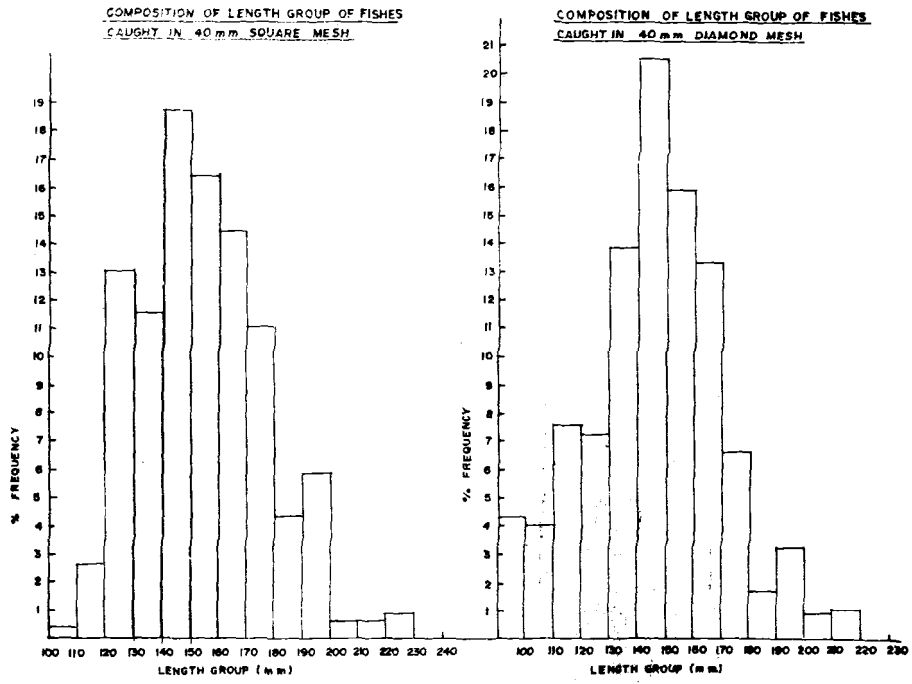

Fig. 3—Composition of length group of fishes caught in 40 mm square and diamond mesh codends

Table 2— Analysis of the data on square mesh and diamond mesh codend of 40 mm mesh size

Species	Mean		Std.devn.		CV.		SK	
	SM	DM	SM	DM	SM	DM	SM	DM
Nemipterus sp.	140.8	145.9	23.4	28.1	16.6	19.3	0.18	0.004
Decapterus sp.	214.8	209.9	52.3	20.6	24.4	9.8	0.38	0.01
Priacanthus sp.	179.0	179.0	7.5	7.8	4.2	4.3	0.15	0.19
Squids	163.8	145.7	25.1	28.4	15.3	19.5	-0.20	-0.21

	Q1		Q2		Q3	
	SM	DM	SM	DM	SM	DM
Nemipterus sp.	140.8	134.7	153.7	147.1	172.3	159.6
Decapterus sp.	201.3	189.1	210.0	208.1	229.3	227.2
Priacanthus sp.	173.5	173.5	176.9	177.7	181.5	183.9
Squids	130.0	121.4	163.7	160.0	186.4	185.0

SM: square mesh; DM: diamond mesh; CV: coefficient of variation;
SK: Bowley's coefficient of skewness; Q1, Q2 & Q3: quartiles

Table 3— Analysis of the data on square mesh and diamond mesh codends of 50 mm mesh size

Species	Mean		Std.devn.		CV.		SK.	
	SM	DM	SM	DM	SM	DM	SM	DM
Nemipterus sp.	156.1	151.6	19.2	22.8	12.3	15.0	0.41	0.09
Decapterus sp.	195.7	196.4	12.0	15.6	6.1	8.5	0.02	-0.23
Priacanthus sp.	151.2	143.5	15.2	17.0	10.0	11.8	0.12	-0.11
Saurida sp.	147.7	135.4	17.0	16.7	11.5	12.3	-0.004	0.13
Sciaenids	220.8	208.8	13.5	17.9	6.1	8.6	0.02	-0.02
Squids	138.8	132.6	23.1	20.8	16.6	15.7	0.30	0.31

	Q1		Q2		Q3	
	SM	DM	SM	DM	SM	DM
Nemipterus sp.	148.9	134.0	161.1	149.1	173.1	167.0
Decapterus sp.	209.5	192.3	219.5	208.2	230.0	223.4
Priacanthus sp.	142.3	134.4	148.5	144.4	156.4	152.5
Saurida sp.	135.4	123.1	146.7	133.6	157.9	147.3
Sciaenids	209.5	192.3	219.5	208.5	220.0	223.4
Squids	125.9	16.5	137.9	125.7	160.4	143.2

SM: square mesh; DM: diamond mesh; CV: coefficient of variation; SK:Bowley's coefficient of skewness; Q1, Q2 & Q3: quartiles

groups of all important species. The percentage composition of different size groups of all varieties of fish caught in the square mesh and diamond mesh codend of 40 and 50 mm mesh size are given in Figs, 2,3. The length of different varieties of fishes varied from 90 to 250 mm. In the first 25% length point up to 130 mm, the 50 mm square mesh accounted only 9.6% and 40 mm square mesh 15.6%, whereas 50 mm diamond mesh landed 23.6% and 40 mm diamond mesh 23.1% establishing supremacy of square mesh in eliminating under sized fish. In the case of bigger size groups of fish also the percentage is more in square mesh compared to diamond mesh.

The data was statistically analysed with a view to assess the efficiency of the square mesh netting as a conservation measure over the diamond mesh. Length frequency data of the representative samples of catch from square and diamond mesh codends were made separately for all important species mentioned earlier. Estimate of mean and standard deviation; coefficient of variation; first, second and third quartiles and Bowley's coefficient of skewness were calculated from the length frequency distribution of each variety of the fish caught in the square and diamond mesh codends of 40 and 50 mm mesh size and are presented in Tables 2,3, respectively. The coefficient of variation gives an idea as to in which net the catch composition is more uniform; the first, second and third quartiles give the 25%, 50% and 75% length points of the frequency distribution and Bowley's coefficient of skewness gives whether the fre-

quency distribution is skewed to the left, right or symmetrical. The results of the analysis of the data clearly indicate the supremacy of square mesh in the conservation of most varieties of fish except in the case of squids, where both square and diamond mesh codends are equally efficient in retaining similar size group.

Between the two mesh sizes of square mesh, the data indicate that 50 mm square mesh codend allowed more under sized fish to escape, when compared to the 40 mm mesh size, thereby providing better efficiency in selectivity and conservation.

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