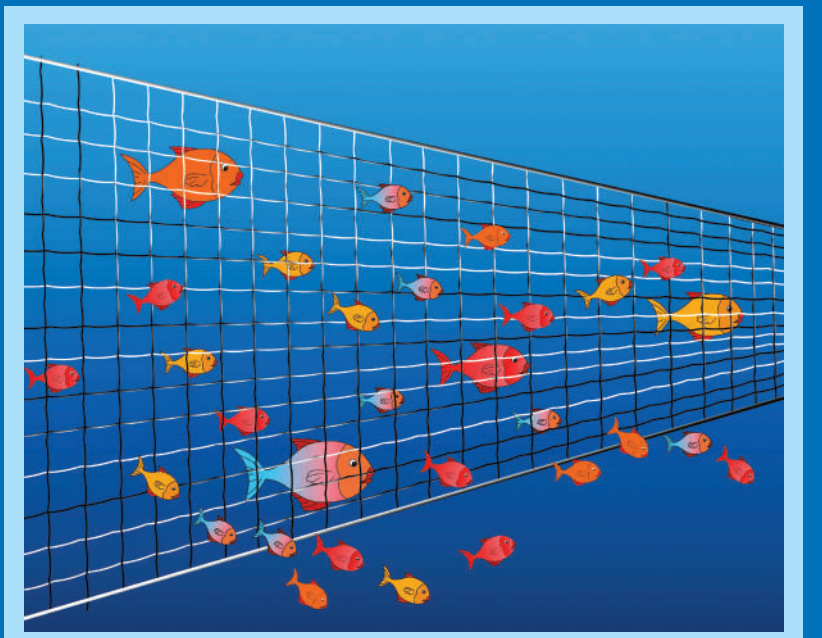
RELEVANCE OF SQUARE MESH COD-ENDS IN FISHERIES

A HANDBOOK



NETFISH - MPEDA

(Ministry of Commerce & Industry, Govt. of India)

Square mesh cod-end distribution by NETFISH at Munambam

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(Ministry of Commerce & Industry, Govt. of India)
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PREFACE

Fishing is an age old practice which started from time immemorial. Ever since the introduction of synthetic fibre in the production of fishing nets, only diamond mesh nettings are used in the fishing sector. The advent of issues like overfishing, juvenile fishing and subsequent discussions on conservation of fish resources, sustainable fishing and responsible fishing followed by research in various fishing methods has brought to light the fact that square mesh cod-ends would be better than diamond netting with respect to conservation of the fish resources. Studies conducted on comparison of square and diamond mesh nettings came up with ample explanation about the advantages of square mesh over diamond mesh. However, the introduction of square mesh nettings in fisheries sector has not been taking place due to unknown reasons even though the advantages of square mesh over diamond mesh are quite known to fisher folk. In this juncture, concerted attempt is needed by all agencies concerned so as to familiarize the usage of square mesh cod-ends in trawl fishing, the major fishing practice in Indian waters.

BACKGROUND

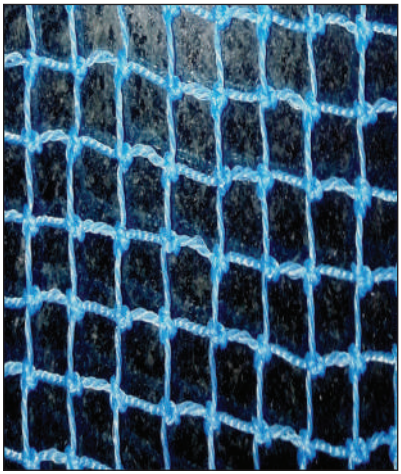
Introduction of trawling in fishing sector was aimed primarily at the capture of demersal fish resources including shrimps that live close to the sea bottom. Bottom trawls are designed to attain relatively high vertical opening so as to engulf maximum number of bottom dwelling and off-bottom fishes. Various scientific studies were conducted on trawl fishing using different meshes, particularly on fish escapement and fish retention in nets. Trawl fishing has emerged as the most destructive way of fishing which inflict heavy perturbations to the sea bottom and destroy marine benthic ecosystems by way of removing the entire living communities as well as changing the sediment structure. It has been reported that large quantity of juveniles and sub adults are destroyed by trawl fishing. The shape of the mesh in trawl net affects the flow of water. Robertson (1983) observed that the diamond mesh cod-end when filled assumes bulbous shape and the fish can escape only through a small area of open meshes in front of the bulb.

Hence, for improving the filtering efficiency of mesh, the mesh has to be open while dragging so as to facilitate more water flow and easy escapement of juvenile fishes. This can be achieved by using square mesh cod-ends as it will remain open during the entire fishing operation. The superiority of square mesh over diamond mesh in facilitating escapement of juvenile fish has been proven by many workers. They reported that capture of juveniles and sub-adults of many species could be controlled by using square mesh of appropriate size in the cod-ends. Central Institute of Fishing Technology (CIFT) under ICAR conducted many studies in this line and proved that square mesh cod-ends were highly effective for the escapement of juvenile and sub-adult fishes.

DIAMOND MESH VS. SQUARE MESH

Square mesh cod-ends are found to be highly useful in sea as it has many advantages over diamond mesh cod-ends. The major differences between the two nettings are as follows.

Diamond mesh cod-end	Square mesh cod-end
1. Shrink while dragging by the pulling pressure on rope into mere minimum size	**1.** Retain the original mesh size during dragging
2. Need more pulling power due to the shrinking of mesh size and subsequent clogging of materials in the cod-ends	**2.** Need less pulling pressure as no shrinkage while dragging. Save diesel, as less pulling is required
3. Large quantity of juvenile fishes and sub adults are trapped	**3.** Juveniles and sub adults escape due to the retention of mesh size
4. Much time is needed for sorting of catch due to the accumulation of more by-catch	**4.** Less sorting time due to less quantity of by-catch



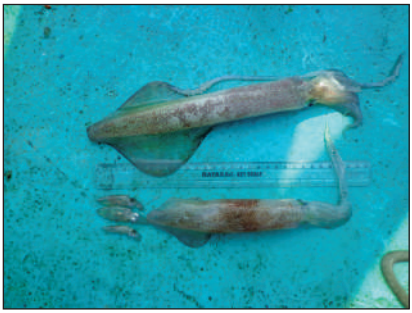
RESULTS OF THE STUDIES CONDUCTED BY NETFISH

NETFISH conducted onboard trials in Kochi off Munambam in a commercial trawl vessel where comparisons were made by using square mesh and diamond mesh cod-ends. It was found that square mesh cod-ends have significant advantage over diamond cod-ends in trawl fishing. The major findings were as follows:

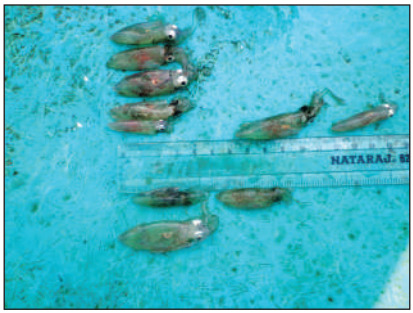
1. There was a saving of 2 litres diesel/hour while using square mesh cod-ends and thereby gets saving of around Rs. 1800/ day and Rs. 2.7 lakhs/year (by 150 active fishing days) in each trawl boat.
2. Most of the juvenile fishes and other biota escaped through square mesh which reduced the by-catch in trawl.
3. Fishes of market size only were retained while using 25 mm square mesh cod-ends.
4. No much damage was found to the fish in cod-ends as there was little by–catch in square mesh cod ends.
5. Less time was taken for sorting the catch accumulated in square mesh cod –ends.

6. Due to reduced by-catch in the cod-ends, pulling pressure needed for dragging was less in trawl with square cod–ends and thereby boat engine gets more life

7. There is improved eye appeal to the fish in cod-ends since all are in the marketable size group with minimum by-catch.



Size variation of squid caught in 25 mm diamond mesh



Squid which escaped 25 mm square mesh but got caught in 25 mm diamond mesh and 16 mm square mesh covers

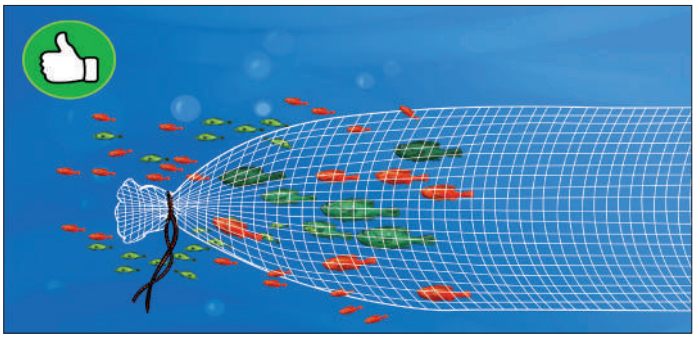
Mackerel which escaped 25 mm square mesh but got caught in 25 mm diamond mesh

Table 1. Comparison of mean length frequency of fishes caught using different cod ends

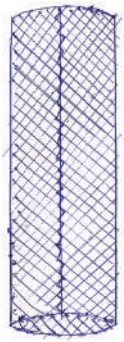
No.	Fish Caught	25 mm Diamond mesh cover		25 mm Square mesh cod-end		16 mm Square mesh cover	
		Size (cm)	Frequency (%)	Size (cm)	Frequency (%)	Size (cm)	Frequency (%)
1	Anchovies	4-6 6-8	74.4 % 25.6 %	Nil	-	5-7 7-9 9-11	78.6 % 7.1 % 21.4 %
2	Seer fish	Nil	-	20-30 30-40	20 % 80 %	Nil	-
3	Mackerel	5-7	100 %	13-15 15-17 17-19	11.1% 77.8 % 11.1 %	Nil	-
4	Moon fish	Nil	-	9-11 11-13	68.8 % 31.2 %	Nil	-
5	Squid	1-3 3-5	66.7 % 33.3 %	3-5 7-9 9-11 11-13	18.2 % 9.1 % 36.4 % 36.4 %	1-3 3-5	86.2 % 13.8 %

WHAT HAPPENS WHILE USING SQUARE MESH COD-ENDS?

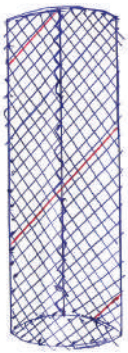
1) Cod-ends will not shrink while dragging and therefore juveniles and sub- adult fishes can escape through the open meshes.
2) Brings less by-catch comprising juvenile and sub adults of commercially important and less important fish and other biota in sea.
3) Catches marketable size of fish only in the net which fetches better price.
4) Give good eye appeal to the catch as large sized fishes are mostly retained in the catch.
5) Promote sustainable fishing by allowing juvenile to escape and grow.
6) Lesser diesel consumption for pulling the net and thereby save around Rs. 1800 per boat per day and also enhance engine life.
7) Can save around 2.7 lakh rupees per 150 active fishing days yearly by each vessel.
8) Nets will not be damaged much as in the case of diamond meshed cod-ends.



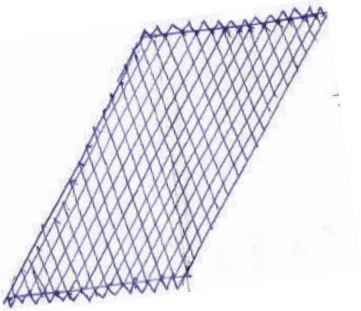
THE METHODOLOGY TO CONVERT DIAMOND MESH NET TO SQUARE MESH NET IS AS ILLUSTRATED BELOW.



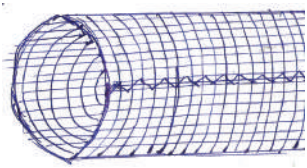
Step1. Take the required size of diamond net and join its edges as shown in the figure



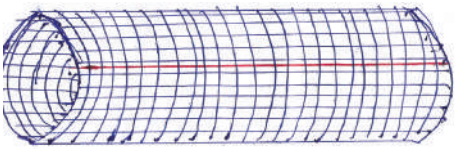
Step 2: Do bar cut around from top to bottom in spiral shape as shown by red lines in the figure



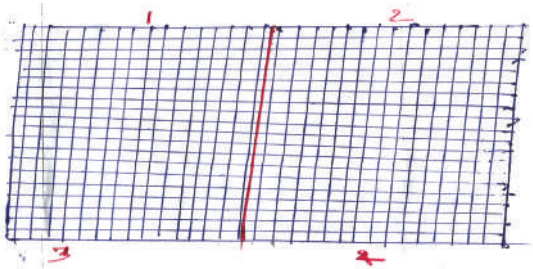
After bar cutting we will get the net piece as shown in the figure



Step 3: Join the bars between the meshes at the ends as shown



Step 4: Again do bar cut in the direction shown by red line in the figure



Step 5: Do one more bar cut in the middle of the net (shown by red line here) and then lace #1 & #4 ends or #2 & #3 ends to get a square mesh panel

MANUFACTURERS OF SQUARE MESH COD-ENDS

At present, square mesh cod-ends are manufactured commercially only by a few Net Factories in India. They will supply square mesh cod-ends upon orders. The approximate cost for fabricating a square mesh cod-end of length 10m, width 4.5 m tapering to 3.5m at the end, mesh size 35mm and twine thickness 2mm is nearly ten thousand rupees.

Contacts:

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AMENDMENTS ON MFRAS

Considering the results of the scientific studies that square mesh can be the best method to reduce the destruction of juveniles and sub adults in trawl fishing, many state governments have initiated to amend the existing Marine Fisheries Regulation Acts (MFRAs) by incorporating the implementation of square mesh cod-ends in trawl fishing. Govt. of Gujarat has made 40 mm square mesh cod end mandatory in trawl gears. Similarly, Maharashtra & Karnataka Governments too have imposed 35 mm square mesh in trawl net cod ends. Kerala is in the path of making square mesh cod-ends mandatory in trawl nets. The Govt. of Kerala has notified Minimum Legal Size (M.L.S.) for 58 species after consultation with the stake holder groups. Similar attempts are expected from other states as well.

SQUARE MESH COD-END FAMILIARIZATION PROGRAMMES BY NETFISH

NETFISH conducts many programmes for familiarization of square mesh cod-ends in trawl fishing in all maritime states in India. Awareness classes and onboard trials are conducted to

Square mesh fabrication training conducted by NETFISH in Kollam

convince fishermen about the advantages of square mesh cod-ends. Hands on training programmes are conducted in all maritime states for net menders and fishermen on converting diamond mesh nets to square mesh nets with the technical support of ICAR-CIFT. Besides these programmes, square mesh cod-ends are also supplied to the fishermen to do the trials by themselves. Much emphasis is given by these programmes to the conservation of the fish resources towards attaining sustainable fishing in our coasts. Nevertheless, the use of diamond mesh still prevails in the fisheries sector. Strict implementation of square mesh cod-ends in trawl nets is highly imperative so as to save the depleting marine resources in our waters.

Square mesh fabrication training conducted by NETFISH in Munambam

END NOTE

Letting the young ones of fishes to grow in their natural environment up to their adult stage is one of the prime requirements for the sustainability of marine fishery resources, considering the fact that today's juveniles are tomorrow's fish wealth. Following responsible and eco-friendly fishing methods by fishers is the need of the hour for the healthy survival of the fishing industry which in turn is inevitable for the food security, health security, job security and financial stability of the fishers and other stakeholders groups in the sector.

MINIMUM LEGAL SIZE (M.L.S.) IN FISHERIES

Prepared as per the Govt. of Kerala Orders - G.O.(P)No.40/15/F & PD dtd. 24.7.2015 & G.O.(P)No. 11/2017/ F & PD dtd. 17.5.2017 - notifying M.L.S for 58 fish species caught off Kerala coast

No:	Common name	Malayalam name	Species name	M.L.S. (cm/g)
Pelagic Finfishes				
1	Indian oil sardine	Mathi/ Neichala	*Sardinella longiceps*	10 TL
2	Indian mackerel	Ayala	*Rastrelliger kanagurta*	14 TL
3	Little tuna	Kera Choora	*Euthynnus affinis*	31 FL
4	Frigate tuna	Eli Choora / Urulan Choora	*Auxis thazard*	25 FL
5	Skipjack tuna	Varayan Choora	*Katsuwonus pelamis*	35 FL
6	Yellowfin tuna	Kera Choora	*Thunnus albacares*	50 FL
7	Bullet tuna	Eli Choora	*Auxis rochei*	18 FL
8	Bonito	Neimeen Choora	*Sarda orientalis*	35 FL
9	Longtail tuna	Kaara Choora	*Thunnus tonggol*	44 FL
10	Dogtooth tuna	Pallan Choora	*Gymnosarda unicolor*	50 FL
11	King seer	Neimeen / Aykoora	*Scomberomorus commerson*	50 FL
12	Spotted seer	Seela Neimeen	*Scomberomorus guttatus*	37 FL
13	King fish	Motha	*Rachycentron canadum*	61 FL
14	Dolphin fish	Cycle Chain / Pulli Motha	*Coryphaena hippurus*	38 FL
15	Ribbon fish	Paambaada / Thalayan	*Trichiurus lepturus*	46 TL
16	Horse mackerel	Vaangada	*Megalaspis cordyla*	19 TL
17	Big-eye scad	Ayilakkanni	*Selar crumenophthalmus*	16 TL
18	Indian scad	Thiryaan / Chembaan	*Decapturus russelli*	11 TL
Demersal Finfish				
19	Malabar sole	Maanthal / Nangu	*Cynoglossus macrostomus*	9 TL
20	Threadfin bream (yellow)	Kilimeen / Puthiyaapla Kora	*Nemipterus japonicas*	12 TL
21	Threadfin bream (red)	Kilimeen / Puthiyaapla Kora	*Nemipterus randalli*	10 TL
22	White fish	Parava / Adaavu	*Lactarius*	10 TL
23	Greater Lizard fish	Arana Meen	*Saurida tumbil*	17 TL
24	Lizard fish	Arana Meen	*Saurida undosquamis*	10 TL
25	Silver pomfret	Vella Aavoli	*Pampus argenteus*	13 TL
26	Black pomfret	Karutha Aavoli / Maachaan	*Parastromateus niger*	17 TL
27	Bull's eye	Kalava Kuttan	*Priacanthus hamrur*	14 TL
28	Tiger toothed croaker	Kora	*Otolithes ruber*	17 TL
29	Lesser tiger toothed croaker	Pallikora	*Otolithes cuvieri*	16 TL

No:	Common name	Malayalam name	Species name	M.L.S. (cm/g)
30	Sin croaker	Mattikora	*Johnius sina*	11 TL
31	Karut croaker	Kuttankora	*Johnius carutta*	15 TL
32	Belanger's croaker	Kora	*Johnius belangerii*	14 TL
33	Pale spotfin croaker	Kuttankora	*Johnius glaucus*	15 TL
34	Blotched croaker	Koruka	*Nibea maculata*	14 TL
35	Bigeye croaker	Kora	*Pennahia anea*	13 TL
36	Spiny cheek grouper	Kalava	*Epinephelus diacanthus*	18 TL
37	Scaly whipray	Mukkathirandi	*Himantura imbricata*	14 DW
38	Pointed nose sting ray	Thirandi	*Himantura jenkinsii*	61 DW
39	Long-tailed butterfly ray	Perumthirandi	*Gymnura poecilura*	29 DW
40	Grey sharp nose shark	Paal Sraavu	*Rhizoprionodon oligolinx*	53 TL
Crustaceans				
41	Crucifix crab	Kurishu Njandu	*Charybdis feriatus*	5 CW
42	Spotted crab	Kavalan Njandu	*Portunus sanguinolentus*	7 CW
43	Blue crab	Kavalan Njandu	*Portunus pelagicus*	9 CW
44	Flower tail prawn	Poovalan Chemmeen	*Metapenaeus dobsoni*	6 TL
45	Kiddi prawn	Karikkadi Chemmeen	*Parapenaeopsis stylifera*	7 TL
46	Speckled prawn	Choodan Chemmeen	*Metapenaeus monoceros*	11 TL
47	Jinga prawn	Kazhanthan Chemmeen	*Metapenaeus affinis*	9 TL
48	Oriental narwhal shrimp	Deepsea Pullan	*Plesionika quasigrandis*	8 TL
49	Arabian red	Red Ring	*Aristeus alcocki*	13 TL
50	Scalloped spiny lobster	Kadal Konju	*Panulirus homarus*	200 g
51	Mud spiny lobster	Kadal Konju	*Panulirus polyphagus*	300 g
52	Ornate spiny lobster	Kadal Konju	*Panulirus ornatus*	500 g
53	Sand lobster	Adippan	*Thenus unimaculatus (T. orientalis)*	150 g
Molluscans				
54	Indian squid	Koonthal / Olakkanava	*Uroteuthis photololigo duvauceli*	8 DML
55	Pharaoh cuttlefish	Kanava	*Sepia pharaonis*	11 DML
56	Ocellate octopus	Neerali / Kinavalli	*Amphioctopus neglectus*	5 DML
57	Short-neck clam	Kalli Kakka	*Paphia malabarica*	2 APM
58	Black clam	Karutha Kakka	*Villorita cyprinoides*	2 APM

TL – Total Length, **FL** – Fork Length, **SL** – Standard Length, **CW** – Carapace width of crabs, **DW** – Disc width of rays **DML** – Dorsal Mantle Length in the case of cephalopods, **APM** – Anterior Posterior Measurement or length of bivalves

"Today's Juveniles are Tomorrow's Wealth"
"Use Square mesh cod-ends for Sustainable Fishing"

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