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Coastal Gill Nets of Kerala - Changes in Three Decades

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This communication discusses various changes that have taken place in the material used, design aspects and operational methods of gill nets in coastal Kerala for the past three decades. Natural fibres have been replaced totally by man made fibres. With the advent of motorization, fleet length of nets and range of operation have also been increased to cover deep and distant waters. The need for exploiting desired species resulted in the evolution of nets of suitable mesh size and twine size of varying thickness. The conventional single walled gill nets for crustaceans are gradually being replaced by multi-walled. Encircling gill nets for mackerel and sardine have given way to drift nets.

High costs of energy are having serious negative impacts on fishing and particularly on the incomes of individuals involved in this industry. Additional attention is needed in research and development activities that will reduce negative impacts of rapidly increasing fuel costs on fishing activities. An important step in this process is the sorting and identification of these alternatives that are realastic, economical and practical. Gill netting among artisanal fishing methods is one of the alternatives and this method has survived the test of time. It is estimated that gill netting constitutes 20% of the different fishing methods employed all over the world. This study made on the changes that have a taken place in gill nets for the capture of different fishery resources in Kerala coast for the past three decades, is aimed at throwing some light on the need based changes that have taken place in respect of material used, method of operation , quantum of netting used with the advent of motorisation and specification in capture of desired species of fish by way of mesh size, twine size variation. Gill nets that survived due to various changes during the past three decades and those which were introduced in recent years are described.

Gill net for mackerel fishing

Mackerel is a highly migratory species and this habit makes them vulnerable to gill nets usually set across the direction of the migrating fish. Gill nets for mackerels can be operated as anchored floating nets to catch midwater fish and as free drifting nets to catch surface as well as midwater fish. Another successful method in the earlier period and found throughout the Kerala coast north of Alapuzha in the late fifties, was encircling gill nets for mackerel which had a fishing height of more than 10.0 m. Satyanarayana & Sadanandan (1962) have found 13.1 m to be the maximum fishing height and that the nets were operated in deeper waters for mackerel. The depth of these net in operation depends on the swimming habits and the depth of the fishing area. When the gear was operated as encircling gill nets, the foot rope touched the bottom. Operation as encircling gill net took place only when large shoals of mackerel were sighted. A minimum of two boats are required and sometimes more than two boats took part. 4 to 5 pieces of net consisting of 800 to 1000 meshes in length with a take up of 50 to 70% were used when operated as drift net and 8 to 9 pieces per boat when operated in an encircling manner. While encircling, the boats move closely and proceed towards the shoal taking a position facing the shoal in its swimming direction. The nets of the two vessels are secured and at a given signal, they are simultaneously shot encircling the shoal as

quickly as possible. After encircling the shoal, the boats come closer to complete the process. The fishermen make all kinds of scaring noise by beating on the sides of the boats and the fish move rapidly in all direction to be eventually gilled. This fishing method is not quite common at present and may be due to the reason that appreciable thick shoals of mackerel are not encountered in the shallow coastal waters of Kerala. Only drift gill nets are in vogue and this has necessiated the reduction in fishing height of the units. Lately, country craft were mechanised with outboard engines. This has brought about an appreciable change in the length of fishing nets operated at a time.

The properties of gill nets which may influence its efficiency are gear construction, mesh size and shape which in turn is influenced by changing and the resultant slack of the netting. By the use of the correct mesh size and a high degree of unifirmity in the size of all meshes, the gear becomes highly selective and forms an important factor in the management of a fish population. There may be no other gear which is as selective as a gill net in taking fish of a uniform mesh size, (von Brandt, 1984). In the late 1950s the mesh size for mackerel gill net was found to be uniform almost throughout the Kerala coast at 50 mm. At present it ranges between 50 and 52 mm, at different centres.

The efficiency of the present day gill net has increased several times by replacement of natural fibres to synthetic fibres (PA multifilament twines) and especially by transparent monofilament (PA) or monotwines (twines made of monofilaments of Polyamide and Polyethylene - PE). Type of material, thickness, knots and colour in relation to surrounding are factors affecting the visibility. Another important factor is that it should have the greatest possible softness and the lowest possible swelling from immersion in water. Cotton No.20/4/1 and 20/3/1 used till 1950s have given way to PA multifilament twines and PA monofilament. This has caused gill net fishery to

Table 1. *Mackerel gill net*

Station	Period	Material	Mesh size (in mm)	Fishing height (in m)	Depth of operation (in m)	Type of operation	Craft size (in m)	Whether mech./non mechanised	Season	Total length of netting (in m)
Ernakulam	1958	Cotton 20/4/1	50.8	10.4	-	Encircling	-	No	September to March	191.10 286.68
	1990-91	PA monofilament	52	4.7 to 6.7	1.0	Drift gill net	6.9	No	In all seasons	220 to 280
	1958	Cotton 20/4/1	50.8	10.1	17.6 - 33.0	Encircling	-	No	Oct-March	167.22 - 185.80
Alapuzha	1990-91	PA monofilament	50	13.94	40-50	Drift gill net	9.9	Motorised with 8HP OB engine	November-May	800
Kollam	1958	Cotton 20/4/1	50.8	11.4	17.6 - 26.4	"	-	No	September-June	141.15 - 169.38
	1990-91	PA monofilament	52	4.53		"	6.4	Non-mot	June, July, August, December & January	200 to 300
		Nylon	57	6.97						
Thiruvananthapuram	1958	Cotton 20/4/1	51.8	18.9	17.6 - 33.0 m	"	-	No	September-May	249.44
	1990-91	PA mono. Nylon	44	5.6 16.5	100 m	"	7.21	Motorised canoe with 8 hp engine	July-August	280 to 1400
Azhikode	1958	Cotton 20/4/1	50	12.45	17-20	encircling	8.5	Manual	October - April	108 to 136

Table 1. Continued

Station	Period	Material	Mesh size (in mm)	Fishing height (in m)	Depth of operation (in m)	Type of operation	Craft size (in m)	Whether mech/non mechanised	Season	Total length of netting (in m)
Chavakkad	1991	Nylon 210x1x2	52	12.50	25-30	Drift	10.9	Motorised / Manual	Sept.-April	700 to 800
Calicut	1958	Cotton 20/3/1	50	9.00	11-16	Encircling	9.5 - 10.6	Manual	April - June	60 - 165
	1991	Mono-filament 0.23 mm	60	4.5	15-20	Drift	10.9	Motorised	March-August	650-850
		Nylon 210x1x2	60							
Cannanore (Thalassery)	1958	Cotton 20/3/1	63	13.00	110-140	Encircling	9.1	manual	Sept.-Dec.	106-120
Cannanore	1991	Nylon 210x1x2	50	60	20-25	Drift	11.4	Motorised	Oct.-Feb.	600-700
Kasargod	1958	Cotton 20/4/1	50	11.25	13-20	Encircling	9.1-10.6	Manual	Oct.-Jan.	170-195
Kasargod	1991				Nil					

expand considerably in recent years as they meet the condition of contrasting as little as possible with any surroundings even if the water colour should change. It was also proved possible to fish in clear water and during day time (von-Brandt, 1984).

Table 1 illustrates the various changes, taken place from 1958 to 1991 in the type of craft used, fishing gear material, construction and type and depth of operation for mackerel gill net.

Table 2 *Sardine gill net*

Station	Period	Material	Mesh size (in mm)	Fishing height (in m)	Depth of operation (in m)	Type of operation	Craft size (in m)	Whether mech/non mechanised	Season	Total length of netting (in m
Ernakulam	1958	Cotton 20/4/1	38	5.94	8-12	Encircling	9.14-9.75	No	Sept.-Aug.	168.12-224.16
	1990-91	PA monofilament	38	3.40	11-12	Drift gillnet	6.7	"	Oct. - Dec.	193 to 325
Alapuzha	1958	Hemp, Cotton 20/4/1,5/1 or 40/4/1	27.8	5.94	17.60 - 22.00	Encircling	10.66	"	June - Sept.	175.90 - 221.08
	1990-91	Nylon	42	5.45	15 or more	Drift gillnet	6.8	"	Sept.-Feb.	294
Kollam	1958	Cotton 20/3/1	25.4	4.69	17 .60-26.40	Encircling	Dug out 9	"	Nov.-March	282.48
	1990-91	Nylon	32-35	4.6-4.9	-	Drift gillnet	7 .21	"	June-Aug.	320-400
Thiruvananthapuram	1958	Cotton 20/3/2	26.2	4.97	17.60-33.00	Drift net	Kattama-ram 6.4	"	Aug.-Dec & May-June	187.08
	1990-91	Nylon	38	9.5	Upto 7 0 m	Drift gillnet	5.16	"	Dec.-Feb	198 (200)
Vadakara	1958	Cotton 20/3/1	30.0	5.2	4.4-11.0	Encircling	7.1-7.6	Manual	Jan.-Mar.	104-130
Kasargod	1991	Nylon 210x1x2	35.0	5.6	20-25	Drift	7.2	Manual	Dec.Mar.	300-400

Gill net for sardines

The gear has also changed from encircling to drifting as was the case with mackerel gill nets. The only exception was Thiruvananthapuram area, where the gear continues to be operated as drift. Satyanarayana & Sadanandan (1962) have also described sardine gill nets of 38 mm mesh size made of cotton 20/3/1. Joseph & Sebastian (1964)have found 33.4 mm mesh size as the optimum compared to 28.0 mm, 38.6 mm and 41.8 mm. Mechanisation of the craft for this type of fishing by outboard engine has not so far been taken up. This may either be due to nearness of fishing ground or reservation of this fishing to the non- mechanised sector. Length of fishing fleet which was up to 300 m, now reaches up to 1200 m. As in the case of mackerel gill net, the material for construction has changed. The details of changes, taken place as regards this gear are given in Table 2.

Gill net for seer and tuna

These gill nets are operated as drifting gear either at the bottom or in the column waters and this practice has not changed over the period of three decades from 1958. The material and mesh size have changed. Sreekrishna *et al.* (1972) and Sulochanan *et al.* (1975) have recommended 104 mm and 150 mm respectively for *Scomberomorus guttatus and S. commersoni*. The fishing

Table 3. *Gillnet for seer and tuna*

Station	Period	Material	Mesh size (in mm)	Fishing height (in m)	Depth of operation (in m)	Type of operation	Craft size (in m)	Whether mech./non mechanised	Season	Total length of netting (in m)
Ernakulam	-	-	-	-	-	-	-	-	-	-
Alapuzha	1958	Hemp.3/1	128	4.53	22.00-39.60	Drift gillnet	8.53-9.14	No	Aug. - Dec.	193.80 to 258.40
	1990-91	Nylon 210x6x3	90-110	9.48	25 and above	Drift (entangling)	12.25	Motorised	Aug.-Sept. to May Best-Oct., Nov.	1720 2150
Kollam	1958	Hemp 3/1	141	4.71	11 to 17	Bottom Drift	27.75 - 31.45	Non-mech	Sept.-Nov.	157
	1990-91	Nylon 210x6x3	93	10.27	7 to 90	Drift (entangling)	-	Yes 8 hp	Aug.-Oct.	2910
Thiruvananthapuram	1958	Hemp 4/1	175	5.85	25 to 30	Bottom drift	5.79 to 6.7	Non-mech.	Nov.-March	256
	1990-91	Nylon 210x6x3	100-130	15.1	Upto 120	Drift gillnet	7.36 9.61	Non-mech. (mech. also very common)	June, July Aug.	Upto 1120 for motorised boat. Non motorised 280
Chavakkad	1958	Hemp.3/1	110	4.5	5-10	Drift	8.5-9.0	Manual	Aug.to Dec.	400
	1990-91	Nylon 210x6x3	90	10.0	20-30	Drift	10.9	Motorised	Sept. to Dec.	900-1100
Puthiyappa	1958	Hemp.4/1	130	5.0	5-15	Drift	9.0	Manual	Aug.-Feb	450
	1991	Nylon 210x 5x3	90	7-8	25-35	Drift	10.9	Motorised	Oct.to Jan.	700-900
Thalassery	1958	Hemp. 4/1	130	4.5	12-15	Drift	7.5-9.0	Manual	Sept.-Feb.	350
Cannanore	1991	Nylon 210x6x3	90	10.5	40-50	Drift	11.4	Motorised	Sept.-Dec.	900-1000

Table 4 *Lobster gillnet*

Station	Period	Material	Mesh size (in mm)	Fishing height (in m)	Depth of operation (in m)	Type of operation	Craft size (in m)	Whether mech/non mechanised	Season	Total length of netting (in m)
Kollam	1958	Hemp 3/1	112.5 m	2.4 m	9.25-12.95	Bottom set	Dug out/ plank built	No	Aug.-Nov.	155
	1990-91	Nylon	106	4.1	-	Set	6.4	Non-mechanised	Aug.-Oct.	190 to 320
		PA mono-filament	85	2.7	-	"				

Table 5 *Anchovy gillnet*

Station	Period	Material	Mesh size (in mm)	Fishing height (in m)	Depth of operation (in m)	Type of operation	Craft size (in m)	Whether mech/non mechanised	Season	Total length of netting (in m)
Thiruvananthapuram	1958	Cotton 40/4/1	15	3.65	11.00 to 26.4	Drift	Catamaran	Non-mechanised	Aug.-June	70
	1990-91	Nylon	14	2.8 to 6.4	30-40	Drift	Catamaran boat 7.1	"	May to Sept.	80 to 380

Table 6 *Shark gillnet*

Station	Period	Material	Mesh size	Fishing height (m)	Depth of operation (m)	Total length	Type of operation	Craft LOA (m)	Propulsion	Season
Azhikode	1958	Hemp 7/4	250-350	3.7	10-14	-	Column set	8 - 8.5	Manual	June-Mar.
Chavakkad	1991	Nylon 210x24x3	230-250	7.0	20-25	350	"	10.1	Motorised	Nov.-Mar.

height ranged from 7 to 15.1 m. This is obviously due to the change in the area of operation to distant waters facilitated by motorization. Increase in the total length of netting has also resulted due to this facility.

The details have been incorporated in Table 3.

Lobster gill net

This gear prevalent in Kollam and Vizhinjam area and operated as bottom set gill net, has not undergone any change in operation. In backwaters, it is used as surface drift net. 10 to 20 units of these nets are operated by 3 to 4 fishermen from non-mechanised dug-out or plank-built canoes. The details are given in Table 4.

Anchovy gill net

Anchovy gill netting, popular in late 1950s in Varkala and Vizhinjam coasts of Thiruvananthapuram District continues to be so at present. Cotton 40/4/1 and 20/4/1 were the material used and PA multifilament twines are used now. Size of mesh has not undergone any mentionable change but the depth of operation has been stepped up. This method is also exclusively earmarked for fishermen using non-mechanised craft or canoes of size, 6.0 to 7.1 m OAL. Details pertaining to the gear are given in Table 5.

Table 7 *Introduction*

Station	Period	Material	Mesh size (in mm)	Fishing height (in m)	Depth of operation	Type of operation	Craft size (in m)	Whether mech/non mechanised	Season	Total length of netting (in m)
				1. Trammel net						
Kollam	1990-91	Nylon	40/270	3.5 m (inner) 2.3 m (outer)	50-75	Entangling	10.8	8 hp Yamaha	All seasons	475 Oct.-Nov.
Thiruvananthapuram	1990-91	Nylon	48/520	3.5 m (inner) 2.8 m (outer)	50 m	"	3 kgs	No	Mar.-Sept.	120 m
				Not recorded in 1958						
				2. Prawn gillnet						
Puthiappe	1990-91	PA mono filament	50 52	6.7	12-15	Drift gillnet	8.45	Non-mech	June-Aug. Best last week of July & Aug.	280
Malippuram	1991	PA mono	33	3.15 to 4.2	10-12	"	5.8	"	Nov.to April	220 to 300
				Not recorded in 1958						
				3. Pomfret gill net						
Chavakkad	1991	PA multi-filament 0.23 mm	100	6.5-8.0	15-20	Bottom set	10.9	Motorised	Oct.-Jan.	600-700
Kannur	1991	PA mono 0.23 mm	105	6.5-7.0	20-25	"	"	"	Nov.-Jan.	500-700
Kasargod	1991	PA mono 0.23 mm	120	9.5	15-20	"	"	"	Nov.-Feb.	700-750
				Not recorded in 1958						
				4. Mullet gill net						
Ernakulam	1991	PA mon-filament	32	4.24	8	Drift gillnet	6.9	No	All months except monsoon	300
Alapuzha	1991	Nylon	32	5.9	20-25	"	6.8	No	Round the year	64
				Not recorded in 1958						
				5. White Sardine gillnet (Kowala coval)						
Kasargod	1991	Nylon 210x1x2	24.0	2.0	5-10	Drift	7.3	Manual	Feb.-Mar.	350 m

Shark gill net

The gear could be seen in operation from Chavakkad and are made of material nylon 210x24x3. Fishing height and the depth of operation has been increased over the ages and operated as column set. The details are incorporated in Table 6.

Introduction of specific gear

1. Trammel net

Multiwalled gill nets or trammel nets made of PA multifilament twines are gaining popularity in Kollam and Thiruvananthapuram areas mainly for the capture of prawns. The gear consists of an inner core

of webbing usually of smaller mesh size 40.0 to 48.0 mm and outer layers of webbing of mesh size ranging from 250.0 to 270.0 mm. The outer webbing has a hung depth of 2.5 m to 2.8 m whereas the inner webbing has 3.5 m. This arrangement also facilities formation of pockets by the force excerted by the encountered fish.

2. Prawn gill nets

This gear is found prevalently in use in Vypeen Island and is practised among fishermen of non-mechanised sector. The total length of the net ranges from 200.0 to 300.0 m.

3. Pomfret gill net

Pomfret gill net is at present catching up with the artisanal fishermen of North Kerala. Panicker *et al.* (1978) have found 126.0 mm to be the optimum mesh size with a hanging coefficient 0.60, for the capture of *Pampus argenteus*.

4. Gill net for white sardine (*Kowala coval*)

This gill net is found common in Kasargod area. The period of operation is during dawn when the fish is said to migrate at a faster speed in the shallow waters (5-10 m). The method is restricted to non-mechanised sector and the gear is operated as surface drift.

5. Gill net for Mullet

The fishing season is round the year with the exception of monsoon. The details of the above described five types of gear which were not in vogue during 1958 are given in Table 7.

The efficiency of gill nets have improved with the introduction of synthetic netting material, change in design to suit the fishery and motorization of craft. Such changes are not uniform in respect of all the net types perhaps due to non-availabilty of required type of material. The operation of specific gear for exploiting the desired species is an indication that the fishermen are well aware of the nature of the fishery that existed in a particular area in a given season, as well as receptive to newly introduced materials and techniques. Motorization of the craft enabled to extend the fishing activity to newer grounds and to increase the fleet length.

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