PART I

GENERAL

FISHING GEAR IN FRESHWATER RESERVOIRS OF INDIA*

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Consequent on the great emphasis given to irrigation, power generation and flood control, several river valley reservoirs have been formed. The fact that these reservoirs support a fairly rich fishery potential needs no special mention. The total reservoir water area in the country is 6.4 lakh h. a. (16 lakh acres) and the yield is 5 to 8 kgm/h. a. in certain reservoirs, rising up to 40 kgm/h. a. in some of the highly productive ones. (Jhingran 1969).

Fishing gear in common use are gill nets of entangling type, the typical amongst them being Rangoon nets. The gear, as the name signify, was possibly based on a concept the Telugu fishermen of Godavari delta obtained from Burma. Subsequently, the gear was introduced in Mettur reservoir by the Department of fisheries, Madras for the deep water fishing experiments. The gear soon gained popularity and the basic design was adapted for fishing in almost all reservoirs in the country.

A typical Rangoon net has a length of 50 metres and a hung depth of 3.9 metres. The hanging coefficient is 0.5 and the mesh size 50 mm. bar.. The net has a head rope with floats. To increase the entangling capacity there is no foot rope. 8 to 10 such units are operated at a time. The nets are usually laid in the evening and the catches removed next morning. Rangoon nets exclusively used for Catla are known as 'Thoppa valai' and have a mesh size ranging from 100-130 mm. bar. A net of smaller mesh size (40 mm.bar), known as 'Kenda valai', is used for *Cirrhina cirrhosa* in Mettur reservoir.

Cotton twines of specification 20's/1/3 and 20's/2/2 were used for the webbing of Rangoon nets. With the advent of synthetic twines, the nets are now made with nylon multifilament twines of specification 210 D/1/3 and 210 D/2/2. In the 'Thoppa valai', the twines are of a slightly bigger in size, being 210 D/3/3 and 210 D/4/3.

Another indigenous gear used in reservoir fishing is 'Udu valai'. This net is also of the entangling type but having only a comparatively reduced fishing height and usually operated in shallow marginal areas for small varieties of fish. The average size of the net is 40 metres length and 6 meshes of 35 mm. bar in depth. The material now used is nylon twines of specification 210D/1/3. Both head rope with floats and foot rope with sinkers are present. 5 to 6 such units normally constitute a fleet. The nets are operated during the twilight hours in the morning or the evening.

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TABLE I

DETAILS OF GILL NETS AT DIFFERENT CENTRES

Centre	Twine size	Mesh bar mm.	Length of shot in m.	Depth in m.	No. of shots.	Catch composition
Tungabadra	210/1/3	52	45	5.70	10	Major carps and Cat fish
do	210/1/3	35	40	0.34	5-6	Small fish
Bhavanisagar	210/1/3	100	20	–	6	Barbus dubious
Mettur	210/2/3	20	40	–	2-3	Small fish
Hiracud	210/2/3	75	50	6.00	20	Major carps and cat fish
Gobindasagar	210/2/3	50	50	3.00	10	Gid
Gandhisagar	210/2/3	50	30	3.00	9	Calbasu

Table I presents the details of gill nets used at different centres.

Simple long lines, hand lines and pole and line are other common gear used in reservoir fishing. Stringed and stringless cast nets are used in the shallow periferal areas of certain reservoirs. Poisoning and dynamiting are also practiced in hilly tracts.

IMPROVED GILL NETS

The presence of numerous underwater obstructions limits the use of active gear in most of the Indian reservoirs. Passive gear like the set gill nets, are apparently the only types possible. The first attempt to increase the efficiency of lacustrine gill nets was done by Gulbadamov (1962). The author, after exprimental studies in Mettur, Krishnarajasagar and Tungabhadra reservoirs, recommended two designs of gill nets namely "Sebul No. I and Sebul No. II". Although these are also simple gill nets, the rigging is different in as much as the net webbing is properly hung both from head and foot ropes at close intervals through a row of selvedge meshes. Ranganathan and Venkataswamy (1967) after critically examining the design of the "Sebul" nets, particularly the mesh size, by comparative fishing in Bhavanisagar Reservoir, have expressed the view that appreciable superiority cannot be claimed by "Sebul" over Rangoon nets on ordinary days.

Selection of an appropriate mesh size will depend upon the predominant size group of commercially dominant species of fish in the reservoir. Baranov (1960) considers mesh size to be a function of the length of fish. This author suggests the following formula for determination of the mesh size.

$$a = Kl$$

where a is the mesh bar, l the length of fish and K a co-efficient specific for the given fish. The co-efficient is determined on the basis of the difference in the gill, gilled and maximum girth of fish.

Following Baranov's method Nayar *et. al. (op. cit.)* determined the mesh size suitable for fishing *Labeo calbasu* in Gandhisagar dam as 53 mm. bar. Similarly, 50 mm. bar nets havebeen found to be more effective for the commercially significant size group of *Lebeo diplostomus* in Gobindasagar. In the

Hiracud reservoir Sulochanan *et. al.* (1966) found nets of 75 mm. bar to be suitable for Silondia and Catla.

In simple gill nets capture is normally effected by the fish enmeshing in a single mesh. von Brandt (1964) has recorded that for relatively large fishes, the mechanism of capture is more by entangling than by gilling. In the Hiracud reservoir a study has shown that 77% of fish (carps) were captured by entangling while only the balance were caught by gilling (Sulochanan *et. al. op. cit.*). To increase the entangling capacity, the webbing should have more slackness. Provision of vertical lines to the net or framing of the nets enable to increase the slackness in the webbing.

Fig:1. DESIGN OF A SIMPLE GILL NET

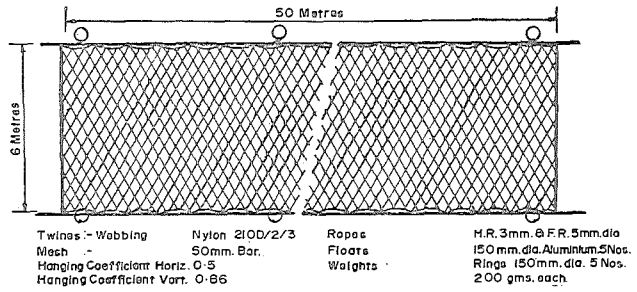


Fig:2. DESIGN OF A VERTICAL LINE GILL NET

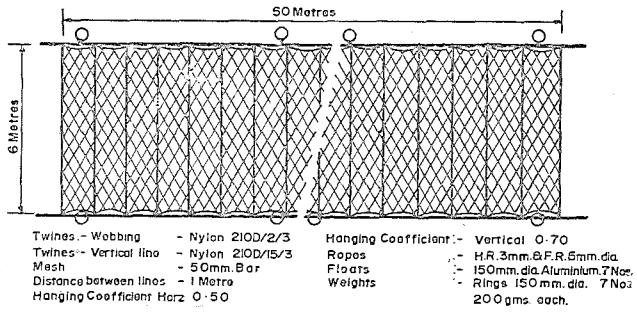
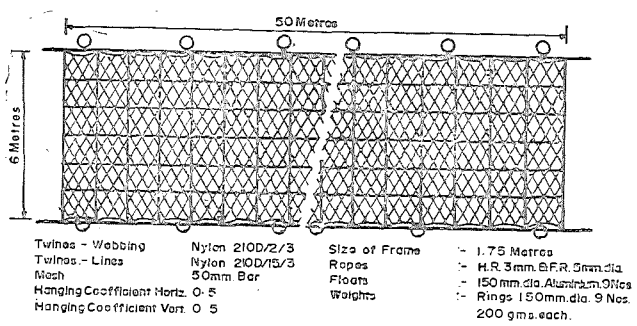


Fig:3. DESIGN OF A FRAMED GILL NET



In a simple gill net (Text Fig. 1) with a horizontal hanging co-efficient of 0.5, the resultant vertical co-efficient is 0.86 and the net has thus minimum slackness. In a vertical line net (Text Fig. 2) the slackness is increased by making the verticle co-efficient to 0. 7. In a framed net (Text Fig. 3) maximum slackness is obtained by making the vertical co-efficient also 0. 5.

Comparative studies with the three types of nets namely simple gill net, vertical line net and framed net in the Hiracud reservoir have shown the apparent superiority of framed nets. The increase in catch recorded was from 1.4 times to 4.76 times. (Sulochanan *et. al. op. cit.*).

The size of frame was subsequently standardised. The following Table-II shows the catch details of framed nets of different frames for 3 consecutive years in Hiracud reservoir.

TABLE II

Frame size in metres	Catch in Kg/1000 sq. m. of net		
	1968	1969	1970
1 00	2.884	3.113	4.139
1.25	4.229	4.869	4.671
1.50	3.764	4.585	4.975
1.75	6.235	7.504	6.636
2.00	3.232	4.044	5.484

It should be clear from the above Table that the net with 1.75m. frame was superior over the others.

Trammeling technique was also tried in Hiracud reservoir. During 1969 output of trammel nets (Text. Fig. 4) with outer webbing five times greater than that of inner webbing was found to be more when compared to nets having ratio of 1:3 ratio and 1:4. During 1970, however, the catches of nets of 1:3 ratio was more than the other two. The results are tabulated in Table-III.

Fig:4. DESIGN OF A TRAMMEL NET

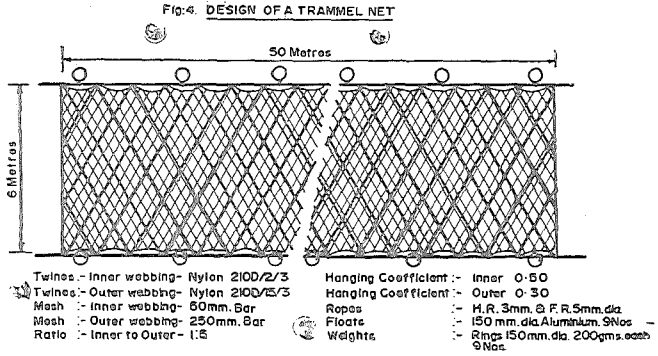


TABLE III

Ratio of inner mesh to outer mesh	Catch in Kg/1000 sq m of net	
	1968	1970
1:3	4.052	4.261
1:4	3.712	3.386
1:5	6.229	3.576

In the Gobindasagar reservoir monofilament gill nets were found to be superior to nets were made with twines of multifilament yarn as would be evident from the following two Tables.

TABLE IV

CLEAR ZONE

Type of twine	No. of operations.	Weight of fish in kg.	Catch in kg/ 1000 sq. m. of webbing.
Monofilament	75	481.80	49.4
Multifilament	75	344.80	35.4

TABLE V

TURBID ZONE

Type of twine	No. of operations.	Weight of fish in kg.	Catch in kg/ 1000 sq. m. of webbing
Monofilament	147	2180.3	114.1
Multifilmaent	147	1354.4	70.8

The effect of colour was also tested in Gobindasagar and Hiracud reservoirs. Nets dyed in different shades viz. blue, green, orange and yellow were operated with an undyed net in Gobindasagar. The results are tabulated in Table-VI.

TABLE VI

Colour of net	Total weight in kgms.	Catch in kgms 1000 sq. m.
White (control)	977.35	38.9
Blue	641.43	55.1
Green	606.65	66.9
Orange	971.15	83.4
Yellow	978.90	85.5

Twines of yellow and orange dominated over other shades of colour.

In the Hiracud reservoir the studies so far conducted have shown that there is a better output with green nets followed by yellow.

The time of gilling also showed some interesting details. The data gathered from Hiracud reservoir during the years 1968 and 1969 are tabulated in Table VII.

TABLE VII

Period of night	Percentage Composition by weight			
	Scale fish		*Cat fish*	
	1968	1969	1968	1969
First half	20.52	7.53	18.23	19.89
Second	27.00	31.06	34.25	41.52

It would be evident from the Table that the majority of fish was caught during the second half of the night. It is, therefore, only reasonable to assume that the fish in the reservoir are more active during the twilight hours of the morning.

The size of the fleet of nets also vary from reservoir to reservoir. 8 to 10 nets are operated having a total length of 800 to 1000 metres. The standard shots have a length of 100 metres each. Andreev

(1962) has suggested that in standardising the size of a shot, the efficiency in handling and the possibility of repairs without hampering fishing operations should be given due consideration. CIFT has generally adopted the size of a standard shot as 50 metres length 6 metres hung depth. Determination of the optimum mesh size for the different species and different size groups, determination of optium fishing height and standardisation of a viable fishing fleet in different reservoirs are still the main problems to be tackled from the point of view of gear technology.

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