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Gill net Selectivity and Fishing Pressure on Indian Major Carp in Thirumoorthy Reservoir, Tamil Nadu

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ABSTRACT

In present study attempts has been made to document the fishing crafts and gears which operated in Thirumoorthy reservoir, Tamil Nadu. This investigation revealed, the post monsoon season had higher catch per unit effort of 11kg/boat/day by gillnet fishing and about 20 to 30kg/day in cast net. C*atla catla* has the dominant fish species and accounted about 58% followed by *Cirrhinus mrigala* (29%), *Labeo rohita* (12%) and *Cyprinus carpio* (2%) against the total landings. However, three species including the Tilapia, Rohu and Mrigala were found to constitute fishery in the cast net with mean CPUE of 20 to 30 kg per day.

Keywords: gillnet, cast net, reservoir fisheries, catch and effort.

INTRODUCTION

Inland fisheries have an important role which provides employment, income generation, contributing to gross domestic production. In India, 19370 of reservoir has been noticed which consist of 19134 small reservoirs, 180 medium reservoirs and 56 larger reservoirs. The area of small reservoir has been accounted of 47.11% to the total area of reservoir, a highest number of small reservoir was found in Tamil Nadu (8906 including tanks) with area of 0.36 million hectare. The fish production was found to be higher of 48.50 kg/ha/yr in small reservoirs, followed by 13.74 kg/ha/yr in medium reservoirs and 12.66 kg/ha/yr in larger reservoirs, 22.63 kg/ha/yr in pooled[12]. This productivity varies with size of water bodies and influenced by the environmental parameters includes water, soil[9,12]. The gear suitability influences the fish catch in capture fisheries. A number of fishing gears has operated by inland fishermen, varied with water bodies, ecology, topography; natural habit and biological characteristics of the fishes[2,7,12]. Gill net is one the major fishing gears are operating about 80 per cent in inland water bodies. It is a passive gear, set gillnet is apparently the only type of fishing gear suitable for reservoir gill net fishing[5].

Thirumoorthy reservoir is situated in Tirupur District (Lat 10° 47'26.09" and Long 77°0 15'71.44") of Tamil Nadu in Western Ghats near Udumalpet with the total water spread area of 454 ha. The present fish production is 36.76 kg/ha against expected production rate of 132.16 kg/ha in this reservoir (TNFDC). The fishing gear operational detail of the Thirumoorthy reservoir was not documented. As a consequence there is a need to find out the appropriate fishing gear for sustainable fishing with the hypothesis the catch and effort of different fishing gear was similar. Therefore, the present study was

carried out to provide baseline information on the operational and technical details of different fishing gears in this reservoir.

MATERIAL AND METHODS

Primary data collection was done different fishers by using survey sheets and also on site observation of fishing gear information's including technical characteristics of design, operation, and catch details for the gillnet and cast net. The secondary information has been sourced the Tamil Nadu Fisheries Development Corporation, Thirumoorthy reservoir. This present study was carried out during the period from October, 2012 to April, 2013.

RESULTS

In Thirumoorthy reservoir, fishing activities has been by gillnet and cast net. Gillnet is a common fishing gear and classified with target species based on the mesh size alike catla, rohu, mrigala and common carp gill net. Coracle is being used for fishing in this reservoir. It is a saucer shaped country craft made up of split bamboo mat, and not by the fishing craft. The internal area of the coracle ranged from 2 to 2.5diameters. It is a simple, low-priced and durable. The FRP coracles also have been used for fishing in reservoir have internal area ranging from 1.5 to 2 diameters.

Design and technical details of the gill nets

The technical details of set gill nets (different target species) in Thirumoorthy Reservoir are presented in table 1. Set gillnet was found that dominant fishing gear and having with length of 300m which constant. The number of meshes was ranged from 3000 to 4500 and this based on mesh size of 110 to 280mm. The number of mesh size was found to be lower of catla than those of rohu, mrigala, and common carp net as similar for length and weight. The number of meshes was registered of 30 and 35mm for catla net and 50 mm for rohu, mirgal and common carp net with horizontal hanging coefficient of 0.5 and vertical hanging coefficient of 0.86.

Table 1: Technical details of commercial gill nets operated in Thirumoorthy Reservoir

Sl. No	Particulars	Catla gill net	Rohu gill net	Mrigala gill net	Common Carp gill net
1	Webbing material	Nylon	Nylon	Nylon	Nylon
2	Twine Thickness	0.4 mm	0.3 mm	0.3 mm	0.3 & 0.4 mm
3	No. of meshes in length	3000	4500	4500	4500
4	No. of meshes in breadth	30 & 35	50	50	50
5	Mesh size	180, 200, 220, 240, 260 & 280 mm	110 and 120 mm	110 and 120 mm	120 and 180 mm
6	Horizontal hanging co-efficient	0.5	0.5	0.5	0.5
7	Vertical hanging co-efficient	0.86	0.86	0.86	0.86
8	No. of floats	15	15	15	15
9	Specifications of float	20 g of Thermocole	20 g of Thermocole	20 g of Thermocole	20 g of Thermocole
10	No. of sinker	60	60	60	60
11	Specifications of sinker	5 g lead	5 g lead	5 g lead	5 g lead
12	Type of mounting	Reeving	Reeving	Reeving	Reeving

The operational depth of the gillnets were found to be of 5-10 m, this diverse due to natural habit and target of the species. The maximum depth 10 m was required to operate the mrigala and common carp net with thickness of 0.3 to 0.4 mm and minimum of 5 m for catla with thickness. This varies avoid breakages of meshes by more strengthened fishes including Catla. Whereas, 15 pieces of thermocole (20 grams) are used as floats while 60 numbers of cement stones or led beads (5 grams) were used as sinkers. Polypropylene twines were used as head rope, foot rope besides for rigging purpose. The design details of the gill nets used in Thirumoorthy reservoir are described in Figure 1.

Design and technical details of cast nets

The net was fabricated with 0.5 mm Polyamide monofilament webbing with mesh size of 75 mm. About 1.25 kg of monofilament webbing was used to fabricate a cast net. The bottom circumference of cast net covered 6 m^2 with the total height of the net being 3.5 m. A 5 m long and 5 mm 5 thickness of Polypropylene rope was used as hauling line which spilt into 30 lines through the webbing up to the bottom to facilitate the casting and hauling. About 250 pieces of iron rings each weighing about 20 g were found attached in the foot rope of the cast net to facilitate quick sinking of gear to the bottom. The dry weight of a cast net along with all of its accessories weighed about 6.5 kg. The design details of the cast nets used in the Thirumoorthy Reservoir is given in Figure 2.

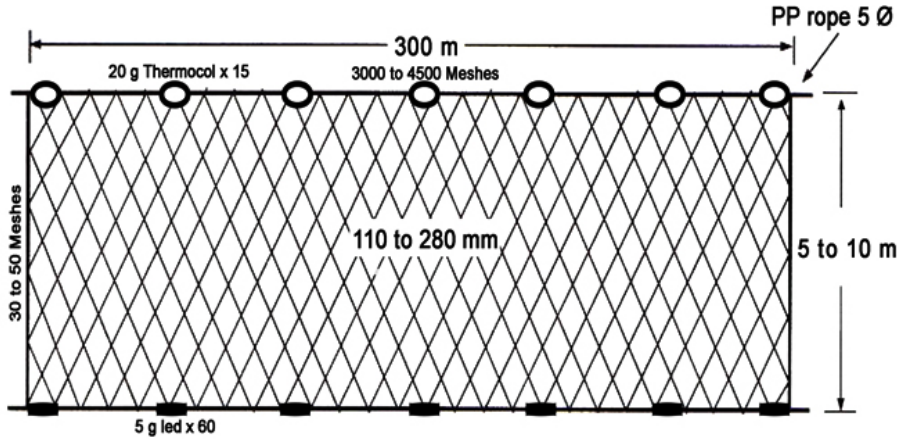

Fig. 1: Design details of gill nets operated in Thirumoorthy Reservoir

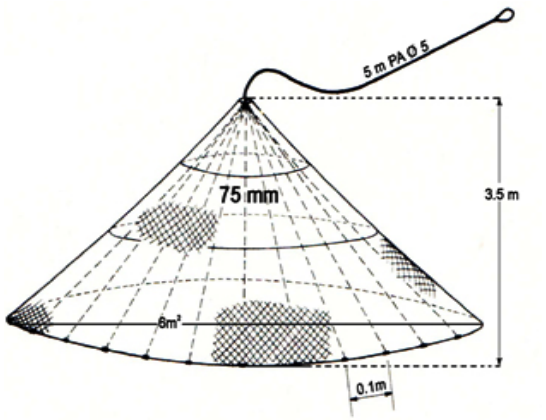

Fig. 2: Design details of cast net operated in Thirumoorthy Reservoir

Operational details of gill nets

In Thirumoorthy reservoir, there are five units of licensed fisherman groups were involved in gill net fishing with sum of 25 nets per day. Gill nets were found operated either from a saucer shaped bamboo coracles or from FRP coracles. Each coracle was operated by one fishing unit consist of two fishermen and each gill net unit composed of five gill nets. Nets were kept in soaking condition throughout the day and lifted for the collection of fishes twice in a day one at about 5 am and another at about 7 pm. Night catches were iced for selling on the next day morning and day time catches were

directly sold without icing. If any damages observed in nets than only the net was hauled from reservoir and mending will be carried out by fisherwomen of concerned fishing unit.

Four species of fishes, such as *Catla catla, Labeo rohita, Cirrhinus mrigala* and *Cyprinus carpio* constituted the commercial fishery of Thirumoorthy reservoir. Apart from them, other species such as tilapia, silver carp and minor carps were also sporadically found contributed to the gill net catches of the reservoir. The catch per unit effort was estimated based on the weight of fish caught per coracle per day. The details on the estimated catch per unit effort for Catla, Rohu, Mrigala and Common carp by gill nets and their CPUE are given in table 2.

Seasonal variations of gill net in catches

Species wise landing and catch per unit effort by gillnet during 2011-12 in Thirumoorthy reservoir was recorded and presented in table 2. The C*atla catla* was accounted about 58% and this followed by *Cirrhinus mrigala* (29%), *Labeo rohita* (12%) and *Cyprinus carpio* (2%) against the total landings. The catch and effort data revealed that, were seasonal variations observed. The maximum CPUE of 11.66 was recorded during the month of January-2012. The catch rate was higher from November to January exceeding CPUE of 11 kg/ boat/day of this share of catla was higher. This can be evidenced from the table 2. The minimum CPUE of 5.07 kg/boat/day was observed in the month of September. During other months CPUE showed moderate level of fish landings ranging from 7.34 to 9.61 kg/boat/day. It could be evident that the catch was higher during late monsoon.

Operational details and catch efficiency of cast nets

Cast nets were used in the shallow regions of the reservoirs, while operating is, in conical shape. Among five licensed fishing units, one fishing unit alone carried out both gill netting and cast netting. Cast nets were operated from the shore region only due to lack adequate knowledge about the fishing ground, and not suit for all part of the reservoir. During shooting the bottoms of the net changed into circle shape however it controlled by hauling rope. After 5 minutes of soaking period, net was hauled with central controlled rope and trapped fishes enable to escape from this net. However, three species such as Tilapia, Rohu and Mrigala were found to constitute fishery in the cast net. The

Table 2: species landing and CPUE by gillnet in Thirumoorthy Reservoir druing April, 2011-March, 2012

	Total landings in weight (kg)				Catch Per Unit Effort				
Month	***Catla catla* (kg)**	***Labeo rohita* (kg)**	***Cirrhinus mrigala* (kg)**	***Cyprinus carpio* (kg)**	***Catla catla* (kg)**	***Labeo rohita* (kg)**	***Cirrhinus mrigala* (kg)**	***Cyprinu scarpio* (kg)**	**All carps (kg)**
April -2011	279.90	91.6	303	59.5	1.99	0.65	4.72	0.42	7.78
May-11	603.55	37.1	63	7.6	4.31	0.26	0.84	0.05	5.46
June -11	794.00	64.1	93	6.0	5.67	0.45	1.18	0.04	7.34
July -11	537.00	192	349	4.5	4.13	1.47	3.48	0.03	9.11
Aug -11	290.10	279.4	440	9.0	2.07	1.99	3.81	0.06	7.93
Sep -11	280.00	171.6	243	9.5	1.86	1.14	2.01	0.06	5.07
Oct -11	1131.0	86.7	85	9.0	8.07	0.61	1.00	0.06	9.74
Nov -11	803.50	143.5	422	41.0	6.18	1.10	3.92	0.31	11.51
Dec -11	974.40	211.7.	344	67.0	6.49	1.41	3.03	0.44	11.37
Jan -2012	1004.5	260.6	324	75.8	6.69	1.73	2.74	0.50	11.66
Feb -12	686.90	161.6	538	13.0	4.57	1.07	3.89	0.08	9.61
March-12	493.40	114.3	696	-	3.28	0.76	5.22	-	9.26
Total	7878.25	1602.5	3900	301.9	55.31	12.64	35.84	2.05	105.84

mean CPUE of Cast net varied from 20 to 30 kg per day.

Sharing system of fish catch and other benefits to the fisherman

Licensed fishermen were alone found allowed to carry out fishing in Thirumoorthy Reservoir. They were monitored and controlled by the Tamil Nadu Fisheries Development Corporation (TNFDC). TNFDC provided interest free loan to the sum of Rs. 10,000/- to meet out investment towards the purchase of webbing, gear accessories and coracle. For every 10 kg of fish caught, the fisherman groups got one kilogram of fish as their share. Further they got a remuneration of Rs 19 for every one kilogram of fish they supply to TNFDC. The current market price of prime quality fish was found to be Rs 110/kg. Each licensed fisherman's have been provided with an Identity card and were entitled to enjoy all benefits under the fisherman welfare schemes of Government of Tamil Nadu.

DISCUSSIONS

Different fishing gears were employed in the reservoir of India, among passive gear as gillnet prominent and apparently suitable fishing gear[5]. Dimbaza Reservoir (South Africa), 60 % of the total catches was contributed by gill nets with different mesh sizes such as 44, 60 and 75 mm[1]. With constant number of meshes in length, horizontal hanging coefficient, number of sinkers and its weight accompanied by varying mesh size ranged from 120 to 160 mm which operated in Aliyar reservoir of Tamil Nadu[13]. The length and breadth of set gillnet where operated in Thirumoorthy reservoir, more or less similar to the hilsa gillnet[4]. Gillnets are made of polyamide monofilament, the present finding coherent figure with reports of George (2002)[3], and Ramesan and Ramchandran (2005)[7]. In Ganga fishery of Bihar, dissimilar fishing gears were operated among gill nets found to be having higher contributed about 68 % of the total fish catch followed by traps (15 %), seine (7 %) and other gears (10 %)[10].

George et al. (1975) studied the catch efficiency of different coloured fishing gear; found that, yellow coloured gillnet dominated in CUPE followed by orange, green and white in Govindusagar reservoir[2], though white coloured gillnet was prominently operated in Thirumoorthy reservoir and majorly contributed to overall production of the reservoir. In contest of gillnet design, framed gillnet more efficient when compared to simple gillnet because during soaking framed gillnet withstand in its position if more disturbance occur. Fishing monsoon season was the major factor influencing the fish catching efficiency, which reported in the Hirakude and Govindasagar reservoir, as similarly catch per unit effort was higher in the month of November in Thirumoorthy reservoir[2]. However, cast net, low catch, is non-selective fishing gear and difficult to operate in deeper part of the reservoir. Cast net was not notably contributed to inland fish production in freshwater bodies[10]. The efficiency of gillnet was decided through light transparency which influence fish behaviour and assumed that fishes are more vulnerability in the reservoir at second half of the night during the twilight hours were fishes are more active.

Selvaraj and Murugesan, 1990 found that, annual total landing was increased from 864.25(1964-65) to 11837.50 kg (1984-85) with an average yield of Kg/ha/yr of 26.21kg in Alliyar reservoir[8]. The present study reservoir, fish production has of 36.76 kg/ha/yr with total annual landing of 13380.75 kg during the period of 2012-13. It showed that, higher fish landing than Aliyar reservoir (small reservoir). Because, it more efficient in converting solar energy of 1.803%[11]. Sugunan, 1995 documented that Fish production g m^{-2} yr^{-1} was 3.456 for Thirumoorthy reservoirs[12]. The estimated mean fish production potential at 0.5 % of energy conversion works out to 268.1kg/ha/car for Thirumoorthy reservoirs[9].

CONCLUSIONS

The present study concluded, the fishing gear of gillnet and cast net is operating in Thirumoorthy reservoir of Tamil Nadu. For gillnet, mesh size and number of meshes in depth were decided by species selectivity. *Catla catla* was major landing fish species by gillnet than Labeo *rohita, Cirrhinus mrigala* and *Cyprinus carpio*. The carps landing was higher in late monsoon season of Tamil Nadu during the month of October to March, this can be evidenced from CPUE

of respective all carp species in same duration. The cast net is being operated in this reservoir and with CPUE about of 20 to 30 kg per day but this not suitable to operate entire reservoir due to lack of suitable fishing ground and moreover is a sampling gear. To promote the reservoir fisheries, TNFDC provided interest free loan to meet out investment towards the purchase of webbing, gear accessories and coracle. Each licensed fisherman's have been provided with an Identity card and were entitled to enjoy all benefits under the fisherman welfare schemes of Government of Tamil Nadu.

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