Shore Seine for Reservoirs-Part II. Studies on Optimum Mesh Size

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Fish landings by shore seines operated in the Hirakud Reservoir were analysed species wise and their morphometrical details were recorded. Based on the above investigation proportionality coefficients in respect of important species of fish were worked out in order to determine the optimum mesh size as this was important from the conservation point of view. This communication discusses the significance of mesh regulation for shore seines.

The conservation as well as judicial exploitation of a fishery are governed by the mesh size of the gear under operation in a particular environment. Hence due emphasis should be given to this aspect while designing a fishing gear. George *et al.* (1983) have described the design of shore seines for reservoirs. The effect of mesh size on the fishery in respect of trawls and gill nets were extensively studied by many workers. (Russel & Edser, 1926; Buchanan-Wallaston, 1927; Hodgson, 1933; Baranov, 1948; Jensen, 1949; Holt, 1957; Oslen, 1959; Nomura, 1961; Aoyama, 1961; Joseph & Sebastian, 1964; Panicker & Sivan, 1965; Sulochanan *et al.,* 1968 and 1975; David *et al.,* 1969; Sreekrishna *et al.,* 1972; Hamley, 1975 Panicker *et al.,* 1978; Akio Fujushi, 1980 and Mruthyunjaya, 1982).

Shore seines are widely used in certain reservoirs in recent years. The operation of small meshed shore seines in large scale in these reservoirs resulted in indiscriminate capture of the young ones of commercially important fishes. Continued operation of such nets adversely affected the fishery potential of the reservoirs. The present investigation was undertaken to assess the impact of shore seining on the fishery so as to suggest suitable mesh size for the exploitation of the desired species and size group.

Materials and Methods

Morphometrical details and weight of individual species caught by shore seines operated in Hirakud Reservoir was recorded net wise along with mesh size, period of operation and total catch of different species.

The nets were grouped into two major categories with reference to mesh size, namely, 5 mm to 12.5 mm and above 12.5 to 38 mm. Length frequency measurement were made in respect of *Catla catla, Silonia silondia, Mystus seenghala, Cirrhina mrigala, Wallago attu, Rohtee cotio, Gudusia chapra, Eutropichthys vacha, Labeo reba, Cirrhina reba, Notopterus chitala* and *Sciaenid* sp. Percentage frequency curves in respect of five species of fish were drawn and the proportionality coefficient for these fishes were worked out. A total of 279, observations were made during the course of this study.

Results and Discussion

The length frequency distribution of twelve species of fish is given in Table 1 and the percentage frequency curves in respect of *C. catla, L. rohita, C. mrigala, W. attu* and *R. cotio* are presented in Figs. 1a to 1e.

According to Baranov (1948) the mesh size is proportional to modal length of the fish caught by it.

$$\text{ie. } a = kl$$

where a, is the mesh bar in mm, k, is the proportionality coefficient and 1, the modal length in mm.

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The proportionality coefficient 'k' can be calculated using the formula,

$$k = \frac{2a_1 a_2}{lo\ (a_1 + a_2)}$$

where a_1 and a_2 are the mesh bar lengths of small and large meshed nets respectively, lo, the length of fish in mm, caught in equal proportion in both the nets. The factor lo, can be obtained from the percentage frequency curves of each fish. Though the frequency curves drawn for most of the fishes have shown moderate skewness, to estimate 'k' values, they are assumed to be near symmetry. The average mesh bar size of

Table 1. *Percentage of length frequency distribution of different species of fish*

Length cm	*Wallago attu* (Schneider)		*Cirrhina mrigala* (Day)		*Silonia silondia* (Hamilton)		*Mystus seenghala* (Sykes)	
	Small mesh	Large mesh	Small mesh	Large mesh	Small mesh	Large mesh	Small mesh	Large mesh
0–5			0.40	—	—	—	1.40	5.90
5–10			6.40	—	0.20	—	22.20	7.90
10–15			51.90	17.60	19.40	23.80	35.80	—
15–20	11.70	0.50	37.30	55.90	56.20	43.00	2.00	—
20–25	21.80	4.10	2.60	14.70	14.40	12.80	3.00	0.40
25–30	35.80	11.50	—	2.90	5.50	10.40	3.90	7.00
30–35	14.90	11.30	1.40	—	2.40	2.90	10.50	30.00
35–40	4.70	13.40	—	5.90	1.40	3.60	11.20	22.10
40–45	6.30	36.70	—	3.00	0.30	2.90	6.00	14.20
45–50	4.80	22.50	—		0.20	0.60	4.00	12.50
	Catla catla (Hamilton)		*Sciaenid* spp.		*Rohtee cotio* (Day)		*Gudusia chapra* (Hamilton)	
0–5	4.40	—	0.50	—	30.20	16.20	61.90	—
5–10	26.80	—	75.40	54.50	56.80	33.30	34.00	66.90
10–15	39.90	5.20	11.40	7.20	4.30	4.00	4.00	22.40
15–20	15.80	26.80	12.20	31.40	7.10	36.60	0.10	5.90
20–25	8.30	17.40	0.50	6.90	1.50	8.60	—	4.80
25–30	3.00	13.00			0.10	1.30		
30–35	1.00	14.50						
35–40	0.60	13.00						
40–45	—	8.70						
45–50	0.20	1.40						
	Labeo rohita (Hamilton)		*Eutropichthys vacha* (Hamilton)		*Labeo reba* (Hamilton)		*Notopterus chitala* (Hamilton)	
0–5	4.90	—	—	—	8.80	0.50	0.30	0.20
5–10	28.70	3.80	5.90	—	54.40	38.10	2.00	0.70
10–15	39.80	7.70	12.90	10.90	7.30	5.50	5.60	0.70
15–30	13.80	10.30	33.60	62.40	17.60	19.30	13.90	1.70
20–25	5.20	26.90	22.50	22.70	11.40	33.70	16.90	2.90
25–30	4.50	21.80	18.60	1.90	0.50	2.50	13.90	16.50
30–35	1.90	19.30	6.50	2.10	—	0.40	22.50	30.10
35–40	0.80	5.10					18.60	29.40
40–45	—	3.80					6.30	17.80
45–50	0.40	1.30						

small meshed nets was taken as 8.25 mm (a_1) and that of large meshed nets as 19.5 mm (a_2) for working out 'k' values. The 'k' values in respect of five species of fish are given in Table 2. In the case of remaining species, the 'k' values could not be calculated due to no shift in mode. The mesh bar for individual species of desired length can be computed by multiplying the length of the fish with the corresponding proportionality coefficient.

Mruthyunjaya (1982) stated that Alvi nets are destructive gears as its operation will remove all variety of fish irrespective of size. It was observed that in certain periods namely, September to November, a greater percentage of juveniles especially of major carps of size range 5 mm to 25 mm, are removed by shore seining in the Hirakud Reservoir (Table 1). Hence in order to avoid the capture of these immature fishes, it is necessary to impose restrictions on the mesh size of shore seines. But such regulations throughout the year will adversely affect the

Table 2. *Proportionality coefficient 'k' in respect of five species of fish*

Name of fish	a_1	a_2	lo	k
Catla catla	8.25	19.5	180	0.0644
Wallago attu	8.25	19.5	325	0.0357
Cirrhina mrigala	8.25	19.5	150	0.0773
Labeo rohita	8.25	19.5	170	0.0682
Rohtee cotio	8.25	19.5	120	0.0966

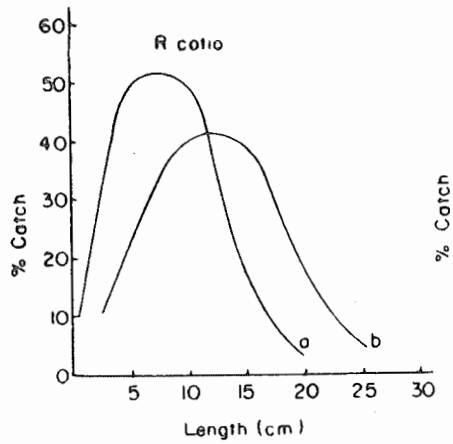

Fig. 1a

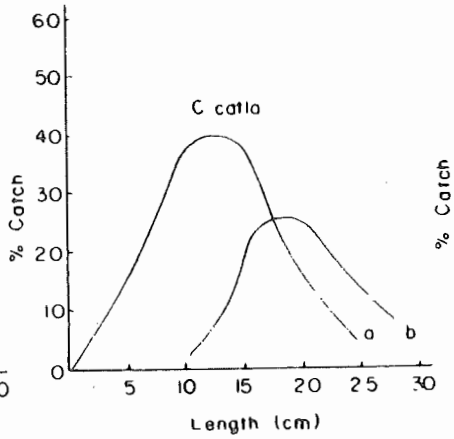

Fig. 1b

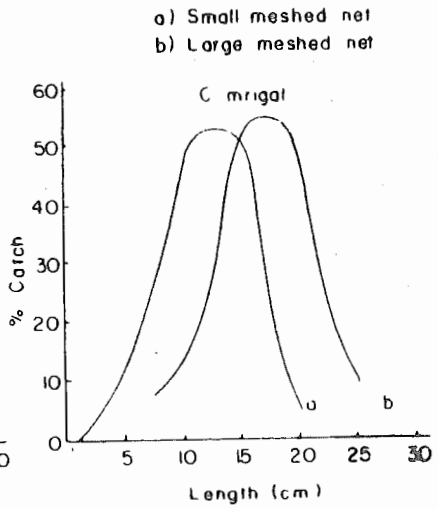

Fig. 1c

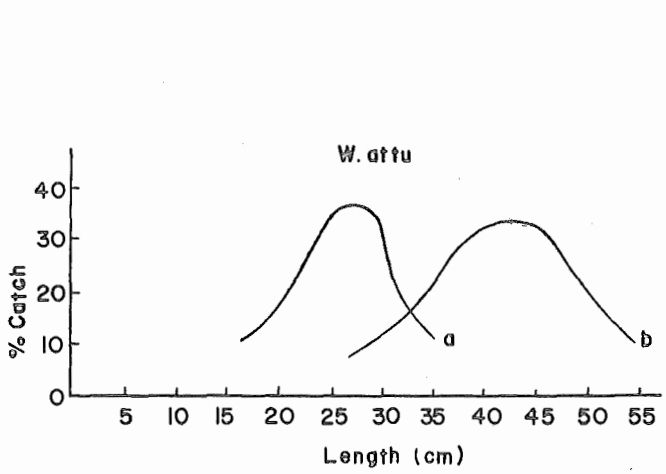

Fig. 1d

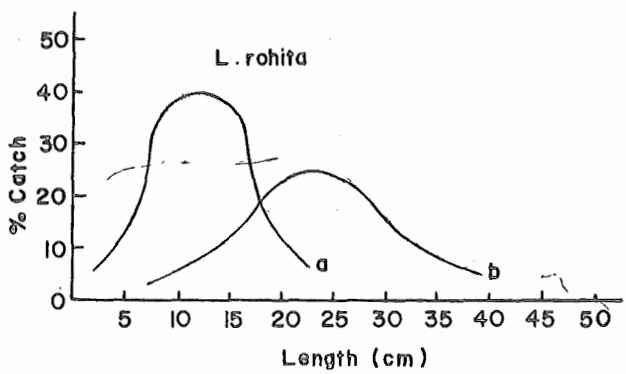

Fig. 1e

Figs. 1a to 1e. Percentage frequency curves of small and large meshed nets for selected speciès

total returns of fishermen due to the fact that adults of trash fishes with a maximum growth of 25 to 30 cm forming fairly good percentage of the catch will be excluded.

Indiscriminate exploitation leading to depletion of stock can be avoided by fixing correct mesh size (Panicker *et al.,* 1978). Srikrishna *et al.* (1972) emphasised the importance of mesh size for obtaining maximum sustainable yield. According to Hamley (1975) selection of proper mesh size aids in obtaining maximum yield protecting small fish. Seasonal operation of large meshed shore seines resulting in the exclusion of the adults of unwanted fishes is unavoidable in preventing the capture of juvenile carps. Since the occurrence of the juveniles of major carps is seasonal it is sufficient to restrict the size of the mesh during this period as mentioned elsewhere.

Determination of mesh size based on the present study will enable to prevent indiscriminate capture of the young ones of certain major carps thereby avoiding depletion of their stock in reservoir fishery.

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