

Harvestable Size of Indian Major Carp (*Cirrhinus mrigala*, Ham. 1822) in Vallabhsagar Reservoir, Gujarat (India)

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ABSTRACT

The present paper the harvestable size of Indian major carp, mrigal (*Cirrhinus mrigala*, Ham. 1822) from Vallabhsagar reservoir (Gujarat) was described and scale samples were collected during March to August 2013. Results shows that age classes (1+, 2+, 3+, 4+, 5+, 6+) and length (27.08 cm, 38.18 cm, 46.79 cm, 53.30 cm, 62.83, 71.40 cm) were observed. The results revealed that mrigal from Vallabhsagar can be harvested at +1 to +2 year of age at the length range 27.08 cm to 38.18cm. Such kind of study on Indian major carp (mrigal) from Vallabhsagar reservoir (Gujarat) was attempted and such information would be helpful to increase the biomass production of fishes and help to manage the water body to maintain the sustainability.

Keywords: Age study, Harvestable size, Vallabhsagra and Mrigal

Analysis of harvestable size of fish provide the information on theoretical age till that size (length and weight) gain per unit of time is more but it reduces thereafter. So, the harvesting the fish at calculated harvestable size have the applicability to increase total biomass production and useful for sustainable fisheries (Johal and Kingra, 1989; Jhingran, 1991 and Ujjania, 2003). A notable contribution for calculating the harvestable size of Indian major carps was made by Johal and Tondon (1997) from three reservoirs of north India, Singh *et al.* (1998) from Jaisamand Lake, Rajasthan, Jain (2000) from Siliser reservoir, Alwar (Rajasthan), Bhatia and Dua (2004) from Harike wetland, India, Verma *et al.* (2008) from Rana Pratap Sagar, Rajasthan, Raghav (2009) studied in reservoirs of Chattisgarh, Planiswamy *et al.* (2011) studied in culture based reservoir and Ujjania and Soni (2018) describe the theoretical harvestable size of Indian major carps from Vallabhsagar reservoir (Gujarat). Thus, in the present paper, harvestable size of *Cirrhinus mrigala* was calculated and such information would be helpful to increase the biomass production and supportive to manage the water body to maintain the sustainability.

MATERIALS AND METHODS

For the age determination scale samples from 140 fish specimens were collected during March to August 2013 from the Vallabhsagar reservoir which was constructed across the Tapi River in 1972 in Tapi district of Gujarat. From each fish specimen about 5-6 scales were collected in paper envelop with keynote information like, total length in cm, standard length in cm, weight in gm, date of collection fish species etc.

For the further analysis, scales were inundated in 1% KOH solution for 5-10 minute and wash with tap water to remove deposited materials and mucous. Dried, clean and transparent scales were examined for scale radius (S) and radius of each annuli ($S_1, S_2, S_3, S_4, \dots, S_n$) with the help of 4P scale reader (Ujjania *et al.* 2014). These scale readings were used to calculate the length at formed annuli (Bagenal and Tesch, 1978).

The length increments (%) at descending (A) and ascending (B) order were also calculated and for the estimation of harvestable size, graph between calculated length increments (A and B) along Y-axis and age classes along X-axis was plotted. The

intercept of these variables and correspondent age class is considered the harvestable size.

RESULTS AND DISCUSSION

The results shows that age classes (1+, 2+, 3+, 4+, 5+, 6+) and length (27.08 cm, 38.18 cm, 46.79 cm, 53.30 cm, 62.83, 71.40 cm) were observed for each age class respectively (Table 1).

Table 1: Back-calculated length and it's increments for harvestable size

Parameters	Age groups					
	1+	2+	3+	4+	5+	6+
Length (L)	27.08	38.18	46.79	53.30	62.83	71.40
Annual length increments (H)	27.08	10.89	8.61	6.52	9.53	8.57
A	37.93	53.48	65.53	74.66	88.00	100.00
B	100.00	40.22	31.78	24.06	35.18	31.63

A-% of length increment in descending order and B-% of length increment in ascending order



Fig. 1. Harvestable size estimation of mrigal

The harvestable size was estimated from these back calculated lengths and percentage of length increments which indicate the harvesting age of the fish. According to current investigation the studied fish mrigal can be harvested at 1+ to 2+ year of age (Fig. 1) and at this age the length of fish was 27.08 cm to 38.18 cm (Table 1). The findings of current study are equal or more than the legal limit (> 30 cm length) of commercial fishing in northern India (Jhingran, 1991). Johal and Tandon (1987) also reported of minimum harvestable size in the range of 44.9 – 54.0 cm for *L. rohita* from the reservoirs of northern India. Jain (2000) reported the harvestable size 53.5 cm for *C. mrigala* respectively from Siliser

reservoir, Alwar (Rajasthan) which was quite high than the findings of present study. Mrigal attained theoretical harvestable size at age of 1 and 1.5 year of age and 46.00 cm in Aasan Pond which were situated in southern Rajasthan (Ujjania, 2003). Ujjania and Soni (2018) were also reported +1 to +2 year of age and at this age the length range 40.78-50.99 for mrigal harvesting.

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