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Study on Age and Growth of Indian Major Carp (*Labeo rohita)* from the Ganga River

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ABSTRACT

Labeo rohita forms the most prestigious culturable fishery with highly preferred by consumers in India and Bangladesh. The fish samples of *L. rohita* were collected monthly during September 2018 to August 2019 in the Ganga River at Prayagraj, Uttar Pradesh. The age composition varied from 0+ to 11+ yr. This result demonstrated that the peak of length attained in 1st year of *L. rohita* life and their growth increment was 34.6 cm and moderate in the subsequent years. The minimum growth increment was observed in 11th year of the life with 0.7 cm. The growth increments in *L. rohita* was recorded as 18.6 cm, 13.9 cm, 9.5 cm, 6.2 cm, 4.0 cm, 3.7 cm, 2.3 cm, 1.9 cm and 1.8 cm for 2+ to 10+ age classes, respectively. The slow growth increment was observed in second year of the life cycle. *L. rohita* is fully matured in second year of the life cycle.

Keywords: Age, growth increment, Ganga river *Labeo rohita*, **Stock.**

INTRODUCTION

Globally, fishes are vital organisms and they are forming ecosystem services and maintaining food web organization (Cooke *et al,* 2016; Dwivedi *et al,* 2018a). *Labeo rohita* is commonly known as Rohu. *L. rohita* is a commercially exploited fish species from the Ganga river and most dominated organism in the composite fish culture from the Ganga basin including India and Bangladesh (Jha *et al,* 2015; Dwivedi *et al,* 2018b). It is constituted commercial fishery in the Ganga, Yamuna, Brahmaputra rivers, many reservoirs and wetlands (Dwivedi *et al,* 2011; Tripathi *et al,* 2017; Kaur *et al,* 2018). It is mostly inhabit in the riverine water and work as a key stone species from the rivers (Nautiyal and Dwivedi 2019). The distribution of *L. rohita* is India, Nepal, Laos, Bangladesh and Pakistan. It is a quick growing fish but its growth increment is comparatively slower in contrast to other Indian major carp (*Catla catla)*.

Age and growth is an essential element for understanding the habitat suitability, food supply, fishing pressure, pollution load, competition (Example food, space and breeding ground) with other fish species especially exotic species and life history of any fish species (Mayank and Dwivedi, 2015; Tiwari *et al,* 2016, 2020, Dwivedi *et al,* 2017; Ujjania and Soni, 2018). The knowledge on age and growth of *L. rohita* in the restoration and conservation point of view is absolutely very significant. Therefore, the main aim was to make available information on age and growth patterns of *L. rohita* from the middle stretch of the Ganga River.

MATERIALS AND METHODS

Present study was conducted in the Ganga river at Prayagraj, Uttar Pradesh (Map 1). At Prayagraj, the Ganga river presented zig-zag condition which is generate a lot of fishing sites and many pools and gorge. Fish samples of *L. rohita* were

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collected monthly during September 2018 to August 2019. Overall, 537 specimens of *L. rohita* were collected from the Ganga river at Prayagraj. For each specimen, total length was measured to the nearest 0.1 cm. The scale method has been used for estimation of age and growth in the present investigations. The key scales were removed from the row above lateral line and below dorsal fin region (Mayank *et al,* 2018). The scales were cleaned in 5% KOH solution to remove adhering- tissues and finally washed in distilled water. The scales were then pressed while drying in order to avoid their curling. The season with minimum width in the terminal part of the anterior field of the scale was designated as the period of ring formation. Since this condition occurred only once a year, the ring was designated as annuli. Total length and growth rate were recorded as differences between-at-age.

Map 1: Map of Prayagraj is showing two big river Ganga and Yamuna

RESULTS AND DISCUSSION

The Ganga River presented a course of water flow in the zig-zag design at Prayagraj, Uttar Pradesh (Map 1). This condition of the river is creating a lot of fishing sites and many pools and gorges. These pools and gorges are providing shelters for large size *Labeo rohita* fishes. These pools and gorges are un-fished or unexploited by fishers/fishermen. These pools and gorges are also providing suitable feeding and breeding ground in nearby areas of the river.

The scales of *L. rohita* are of typical cycloid type. An over-all depiction of growth increment of *L. rohita* has been estimated by the study of its scales. Alternate opaque and translucent zones were clearly recorded in the scale. This result showed that the peak of length attained in 1st year of fish life and their growth increments were 34.6 cm and moderate in the subsequent years. The minimum growth increment was observed in 11th year of the life with 0.7 cm. On the basis of sampled specimen in the length range from 14.3 to 97.2 cm show that the fish attained the mean length 53.2 cm in 2+, 67.1cm in 3+, 76.6 cm in 4+, 82.8 cm in 5+, 86.8 cm in 6+, 90.5 cm in 7+, 92.8 cm in 8+, 94.7 cm in 9+ and 96.5 cm in 10+ age classes (Table 1). The growth increments in *L. rohita* was observed as 18.6 cm, 13.9 cm, 9.5 cm, 6.2 cm, 4.0 cm, 3.7 cm, 2.3 cm, 1.9 cm and 1.8 cm for 2+ to 10+ age classes, respectively. The old age group (9+, 10+ and 11+) fishes were recorded few specimens. In case of 11+ ages, only single fish specimen was recorded in the monsoon season only. The slow growth increment was observed in third year of the life cycle.

The size composition14.3 to 97.2 cm of *L. rohita* showed that the fishes have more potential for struggle with other species. *L. rohita* is matured in second year. It is well known that the growth potential is used for the gonad development. In fishes, the availability of food provides energy for the development of gonads, and the reproductive cycle is one of the events that can cause very slow growth increment in the matured or old age fishes. The old age fishes have very high fecundity rate in respect to their body weight or age. This high fecundity rate checks the growth increment of old age fishes. The percentage of growth increments varied from age to age in the fishes. The percentage decreased gradually from 1+ year to 11+ yr (Table 1).

In present findings, the fishes were reported up to 11+ yr old, which are very close to the maximum recorded age of 10 yr old by Khan and Jhingran (1975). 8+ yr old fishes, *L. rohita* were reported

Table 1. Age and growth of *Labeo rohita* from the Ganga River at Prayagraj, Uttar Pradesh.

Age	Size ranges (cm)	Mean length (cm)	Growth increment (cm)	Percentage of growth increment
0	14.3-28.5			
1+	24.8-41.4	34.6	34.6	35.60
2+	36.5-62.4	53.2	18.6	19.13
3+	57.0-71.3	67.1	13.9	14.30
4+	68.5-83.7	76.6	9.5	9.77
5+	79.6-85.0	82.8	6.2	6.3
6+	84.8-90.6	86.8	4.0	4.11
7+	88.3-91.5	90.5	3.7	3.81
8+	90.2-93.2	92.8	2.3	2.37
9+	92.0-94.8	94.7	1.9	1.95
10+	94.0-97.0	96.5	1.8	1.85
11+	97.2	97.2	0.7	0.72

in the Betwa and Sharda rivers (Mir *et al,* 2013). Older stock of *L. rohita* was recorded very minute in the total stock from the Ganga river. Similar findings have been recorded by Sarkar *et al* (2006). Johal and Tandon (1985) stated that the growth of *L. rohita* varied form water bodies to water bodies or river to river. In general, immature fishes grow very rapidly but when they attained their maturity after that they show very slowly grow in their non-reproductive time (Example non-reproductive time means after spawning to first start of gonad development) especially found in that fishes which breed once in a year (Dwivedi *et al,* 2011; Mayank and Dwivedi, 2015; Ujjania and Soni, 2018). There is a positive correlation between the growth gate of fish and water temperature, alkalinity and the higher growth rate has been attributed by high availability of natural food, high alkalinity of water and high feeding intensity of the fish. The environmental and social changes are also very important facts which moderate the age and growth of fishes and fisheries (Waters *et al,* 2016; Arthington *et al,* 2016; Mayank *et al,* 2018; Nautiyal and Dwivedi, 2019; Alam *et al,* 2020).

CONCLUSION

It may be concluded that the stock of *L. rohita* suffering from overexploitation because the frequency of harvested old age fishes is very poor at Prayagraj. It is quick growing fish in first three years (1st, 2nd and 3rd) .Therefore, there is need to use fishing gear in a more selective mode so that the fish *L. rohita* gets chance for breeding two times (example below 4+ age classes fishes fishing should be restricted) before harvesting.

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