

# Age structure of non-native fish species, *Cyprinus carpio* (Linnaeus, 1758) from the tributary of the Ganga river, India

## Abstract

*Cyprinus carpio* (e.g. culture and wild/capture) constitute a large part of daily meal of human population in Indian sub-continent. It shows benthic and sedentary behavior. Age structure of *C. carpio* was studied during February 2019 to January 2020 from fish landing centre at Sirsa, Prayagraj, Uttar Pradesh, India. The key scales were studied for estimation of age structure in the present study. A total of 548 fish specimens in length ranges between 97 to 687 mm and age classes of 0+ to 9+ were observed. Age structures were determined for male, female and pooled samples separately. The 1+ age group was most dominating stock with shared 23.53%, 24.64% and 24.09% in case of male, female and pooled samples, respectively. The age group 2+ was second dominating age class and this age class more attracted to fishermen for the exploitation. In case of pooled sample, 1+ age group was also dominated compared to 2+ and 3+ age groups. The old age groups of fishes were shared very minute proportion in the total stock. Present study was also indicated that the female fishes live longer than male from the Tons river at Prayagraj, India.

**Keywords:** age structure, *cyprinus carpio*, stock, male fishes, female fishes, tons river

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## Introduction

Fisheries of the Ganga river basin (Example non-native species-*Cyprinus carpio* (Common carp) and *Oreochromis niloticus* (Nile Tilapia) are very vital for the livelihood of fishers/fishermen near the river bank and fish sellers, India.<sup>1-4</sup> Fishes play a key role in the productivity of aquatic ecosystems while non-native fishes may change ecosystem functioning directly.<sup>5-7</sup> The quantity in respect of number of the fish caught in many of the world's rivers is declining and species assemblages are being modified with the disappearance of some native species and the established of exotics.<sup>8-12</sup>

*C. carpio* is a large size and fast growing fish species with are netted in large numbers from the rivers, reservoirs and lakes.<sup>13-17</sup> It is back bone of capture fishery in the Ganga basin, India.<sup>18-19</sup> A lot of freshwater ecosystems suffer from dense stock of *C. carpio*.<sup>5, 20-21</sup> It is one of the most economically important fish species in the globe. *C. carpio* prefer larger and slow moving water bodies with soft sediments.<sup>12,22</sup> They are highly liberal and hardy fish that thrive in a wide variety of aquatic habitats.<sup>3, 23-24</sup>

*C. carpio* is commonly also called an ecological pest because it can change ecological characteristics. These characters have supports to the introduction of the species in many parts of Asia and Europe. *C. carpio* is reformed to their own set of local ecological base, climatic conditions and fish composition (Example homogenize native fish communities).<sup>21, 25-26</sup> They are altering biodiversity (example biodiversity of fishes). It is dominating species from the Ganga river, Yamuna river and its tributaries, India.<sup>17,27</sup> The study would help the fishery managers and planners in management of *C. carpio* fishery in respect of Indian major carp (*Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*) of the river.

## Material and methods

The Tons river is a right bank tributary of the Ganga river which forms confluence at Sirsa near Meja in the Prayagraj district, Uttar Pradesh. The fish samples of *C. carpio* were collected during February 2019 to January 2020 from fish landing centre at Sirsa, Prayagraj, Uttar Pradesh, India. Fishes were collected using a variety of methods including gill nets, drag nets, cast nets and hook and lines. Samples of key scales from 548 fish specimens in the length ranges between 97 to 687 mm were examined for determination of age class and age structure. The total length of each fish (in mm, from the tip of snout and the end of longest caudal fin rays) was measured and recorded. The key scales were removed from the region just below the dorsal fin (3 to 4 rows) and above the lateral line.<sup>28-31</sup>

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. The total length and growth rate were recorded as differences between-at-age. The number of fishes in each age class was converted into percentage to obtain age structure.

## Result and discussion

Age structures were determined for male, female and pooled samples separately from the Tons river at Prayagraj, India. Age classes of *C. carpio* varied from 0+ to 9+ years. The 1+ age group was most dominating stock with shared 23.53% and 24.64% in case of male and female, respectively (Table 1). The age group 2+ was second

dominating age class and this age class more attracted to fishermen for exploitation. After 2+ age group exploitation was decreased with increase of the age of fishes.

In case of male, age classes 0+, 2+, 3+, 4, 5+, 6+ and 7 + were shared 7.35%, 20.95%, 18.38%, 13.60%, 7.35%, 4.41% and 2.57%, respectively (Table 1, Figure 1a). In case of female, age classes 0+, 2+,

3+, 4, 5+, 6+, 7+, 8+ and 9+ were contributed 6.16%, 21.74%, 18.84%, 14.13%, 8.33%, 3.26%, 1.81%, 0.72% and 0.36%, respectively (Table 1, Figure 1b). The old age groups of fishes were shared very minute proportion, in male, female and pooled samples. Present study was also indicated that the female fishes live longer than male from the Tons river at Prayagraj, India. In pooled samples, 1+ age group was also dominated compared to 2+ and 3+ age groups (Table 1).



Figure 1a Age structure of *Cyprinus carpio* from the Tons river, India (Male samples).



Figure 1b Age structure of *Cyprinus carpio* from the Tons river, India (Female samples).

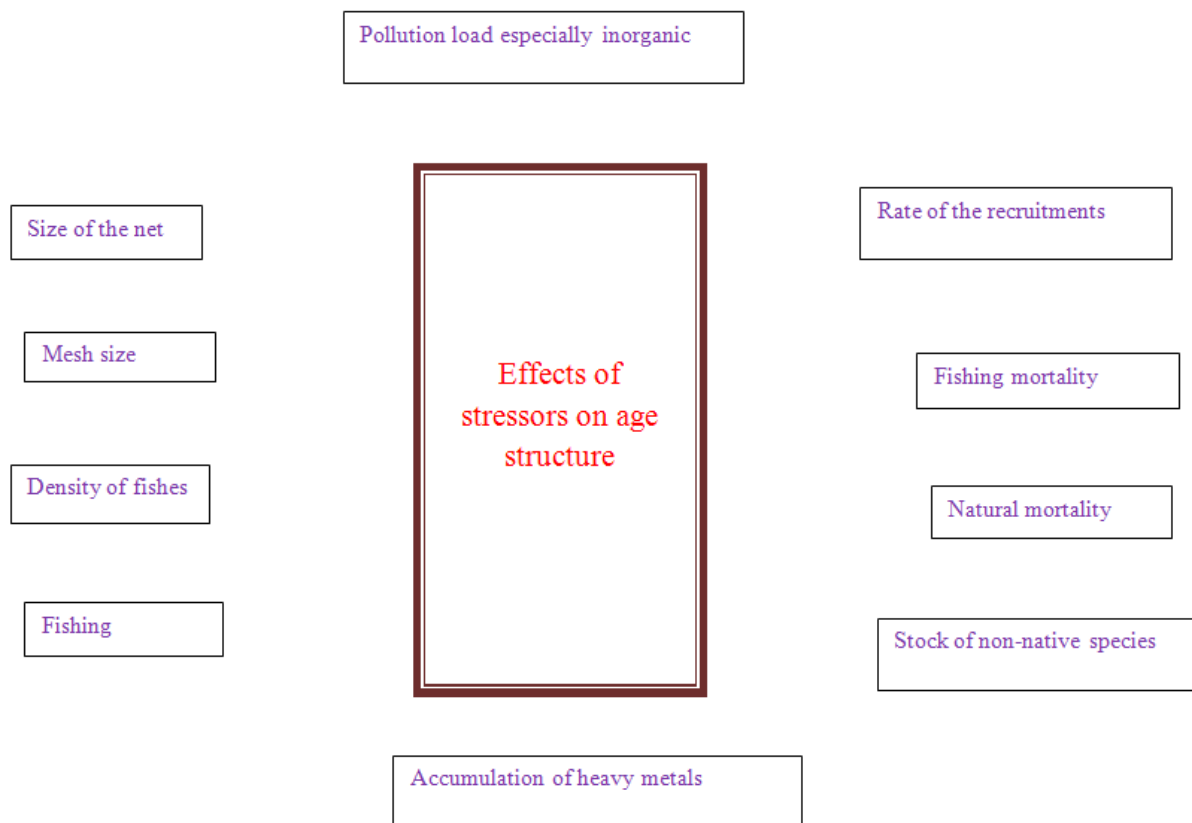
Table 1 Age structure of *Cyprinus carpio* from the tons river at Prayagraj, India

Age classes	No. of male	Percentage	No. of female	Percentage	No. of Pooled sample
0+	20	7.35	17	6.16	37
1+	64	23.53	68	24.64	132
2+	57	20.95	60	21.74	117
3+	50	18.38	52	18.84	102
4+	37	13.60	39	14.13	76
5+	20	7.35	23	8.33	43
6+	12	4.41	9	3.26	21
7+	7	2.57	5	1.81	12
8+	3	1.11	2	0.72	5
9+	2	0.73	1	0.36	3
<b>Total</b>	<b>272</b>		<b>276</b>		<b>548</b>

Basic frameworks for the altering of age structure of fishes in the lotic environment in the Tons river. The conceptual framework process runs by ecological condition, ecosystem function and ecosystem services. Habitat change and loss is one of the most important drivers for the decreasing of age structure. Note that altered age structure was also recorded by invasion of non-native fish species (Figure 2). The size of the net and size of the mesh was very effective factors for the decreasing of the age structure of *C. carpio* from the Tons river, India. A lot of fishers were used very small mesh size of the net with very

large size of the net. In this type of fishing, directly effect on the stock of juveniles and brooders. For healthy stock and heavy recruitment, the number of juvenile and brooder should be greater than middle age class samples.<sup>11,32-33</sup>

The large and old age fishes protect for reaping ecology and fishery productivity in the large water bodies especially streams and rivers.<sup>34-36</sup> The state of the age structure is a valuable indicator of how the fished stocks are reacting to the pressures of fishing and stressors.<sup>37-39</sup>



**Figure 2** Basic frameworks for altering of age structure of fishes. The conceptual framework process runs by ecological condition, ecosystem function and ecosystem services. Habitat change and loss is one of the most important drivers for the decreasing of age structure.

## Conflicts of interest

The author declares that there are no conflicts of interest.

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