

Variations in the catchability and remarkable size-spectra stability of *Cyprinus carpio* (Linnaeus, 1758) with reference of ecology from the Tons river, Central India

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Abstract

Freshwater fishes are showing a remarkable seasonality in the catch/landing in respect of size and total production. During study period 548 specimens of *Cyprinus carpio* were collected in February 2019 to January 2020 from fish landing centre at Sirsa in the lower stretch of the Tons river at Prayagraj, Uttar Pradesh, India. The size of fishes varied from 97 to 687 mm (total length) which indicated the suitable ecological condition for *C. carpio*. The maximum size of fishes indicated that the stock of *C. carpio* in the Tons river was in healthy condition. The 251-290 mm size group was most dominated (16.42%) compared to 211-250 mm (14.78%) and 291-330 mm (12.96%) in total exploited stock. The lower size group was maximum exploited with 57.83% from the Tons river at Prayagraj. Higher size group contributed minute proportion with 4.74% in the exploited stock. The exploitation pattern was systematic in all size groups. Current exploitation pattern is systematic and healthy form with environmentally friendly sourcing of food.

Keywords: Ecological condition; Size composition; stock; exploitation pattern; ecosystem; Tons river; *Cyprinus carpio*

Introduction

The increasing demand for healthy food has resulted in a continuous declining of wild stock of fishes with drastic changes in the size-spectra of fishes. The human activities have strongly altered size, age, sex ratio, fecundity, feeding nature and biodiversity of fishes from the freshwater ecosystems over the world especially riverine division [1-3]. Fish size composition is an essential component of river and stream ecosystem and represents an evident of structure, function, depth and health of stream/river [4-5]. Mostly large size and perennial rivers has large size of fishes in lotic water bodies [6-9]. The fish exploitation is an economic activity governed by social needs, food security and pressures [10-14]. Freshwater fishing is a chief foundation of income and protein for the riverine populations of most tropical regions [15-20]. *Cyprinus carpio* (Linnaeus, 1758) or Common carp is an omnivorous and bottom feeder fish species. It is distributed throughout countries in Asian countries as like India, Pakistan, Bangladesh, Burma

and Nepal and also globally spread [21-22].

C. carpio is considered one of the world's most invasive organisms [23-24]. It is economically important fish species from the Tons river and also Ganga river system, and supports an important commercial fishery in rivers, reservoirs, lakes and even in culture ponds [25]. It is a non-native fish species for India. Non-native fishes are helping for homogenization of fish faunas, increasing of diversity and create pressure (example food, space, breeding ground, oxygen, infection and survival of organisms) for indigenous species or native species [26-30]. The fish are often key elements in the environmental planning [31-34]. The present study was thus undertaken to estimate size composition and health of the stock of *C. carpio* from the Tons river at Prayagraj, Uttar Pradesh, Central India. This study will help in formulating the fishery management policies of *C. carpio* from the Tons river and to update the knowledge in this field.

Material and Methods

Five hundred forty eight specimens of *Cyprinus carpio* were collected from February 2019 to January 2020 in fish landing centre at Sirsa from the lower stretch of the Tons river at Prayagraj, Uttar Pradesh, India. Size composition of fishes (total length) varied from 97 to 687 mm which indicated the suitable ecological condition for *C. carpio*. Drag net, cast net, gill net and hook and line were used by fishers/fishermen to catch the fishes in the river. A total of 548 fish samples (male and female) were collected and analyzed. The total length (mm) from the tip of snout to the end of caudal fin rays was measured by measuring scale. The obtained data from the river was classified into a series of size groups of 40 mm intervals. The number of samples calculated according to size group then converted into percentage.

Climate and Characteristics of the River

The climate of Tons river is marked by mild cold during winter and intensive heat during summer. The monsoon season is July to September month. Sometimes winter rainfall is also recorded. The Tons river is essentially a hilly stream arising in the Kaimur hills of the Vindhyan range, Madhya Pradesh, India. The Tons river drain the Bundelkhand geographic region of central India. Bundelkhand lies between the Indo-Gangetic Plain to the north and the Vindhya Range to the south. It is a tributary of the Ganga, which forms confluence at Sirsa near Meja in the Prayagraj district. Tons river lies between latitude 24° 0' to 25° 16' 54" North and longitude 80° 26' 45" to 82° 04' 57" East. It banks are lined by deep ravines

and the bed is rocky. Agriculture and human settlements were the major land use category in its catchment.

Result and Discussion

The maximum total length of *C. carpio* was indicated that the ecological condition of the Tones river most suited for fishes. Current exploitation pattern is systematic and healthy form with environmentally friendly sourcing of food. The size composition of *C. carpio* was varied from 97 mm to 687 mm of total length of fishes with majority between 251 to 290 mm from the lower stretch of the Tons river at Prayagraj, Uttar Pradesh, India (Figure 1). The large size of fishes also recorded in the Tons river in respect of river length. The maximum exploitation was recorded in 251 to 290 mm size group with 16.42%. Minimum exploitation was observed with 0.18% in 651-690 mm size group. Exploitation is an economic activity governed by social needs and pressures. Lower size groups 91-130 mm, 131-170 mm 171-210 mm, 211-250 mm and 251-290 mm were shared in exploited with 5.83%, 8.94%, 11.86%, 14.78% and 16.42%, respectively. Middle size groups 291-330 mm, 331-370 mm, 371-410, 411-450 mm and 451-490 mm were shared in exploitation 12.96%, 8.39%, 7.48%, 5.29% and 3.28%, respectively. Higher size groups 491-530 mm, 531-570 mm, 571-610 mm, 611-650 and 651-690 mm were contributed in exploitation with 2.19%, 1.28%, 0.73%, 0.36% and 0.18%, respectively (Figure 1). Higher size group shared sizeable proportion with 4.74% in exploited population (Figure 2). The lower size group was maximum exploited compared to middle and higher size groups from the lower stretch of the Tons river at Prayagraj.

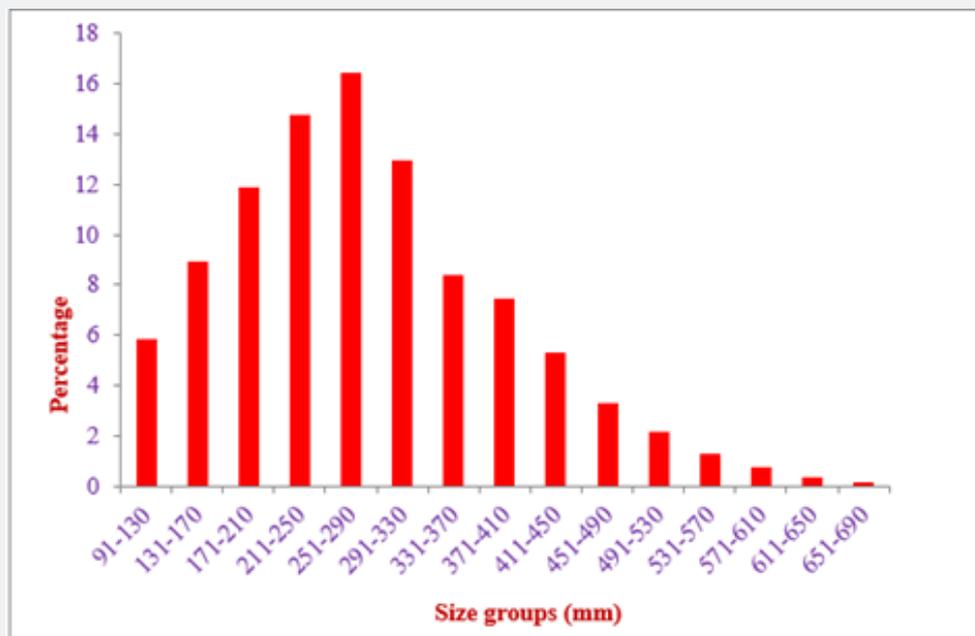


Figure 1: Size composition and exploitation pattern of *C. carpio* from the Tons river at Prayagraj, Uttar Pradesh.

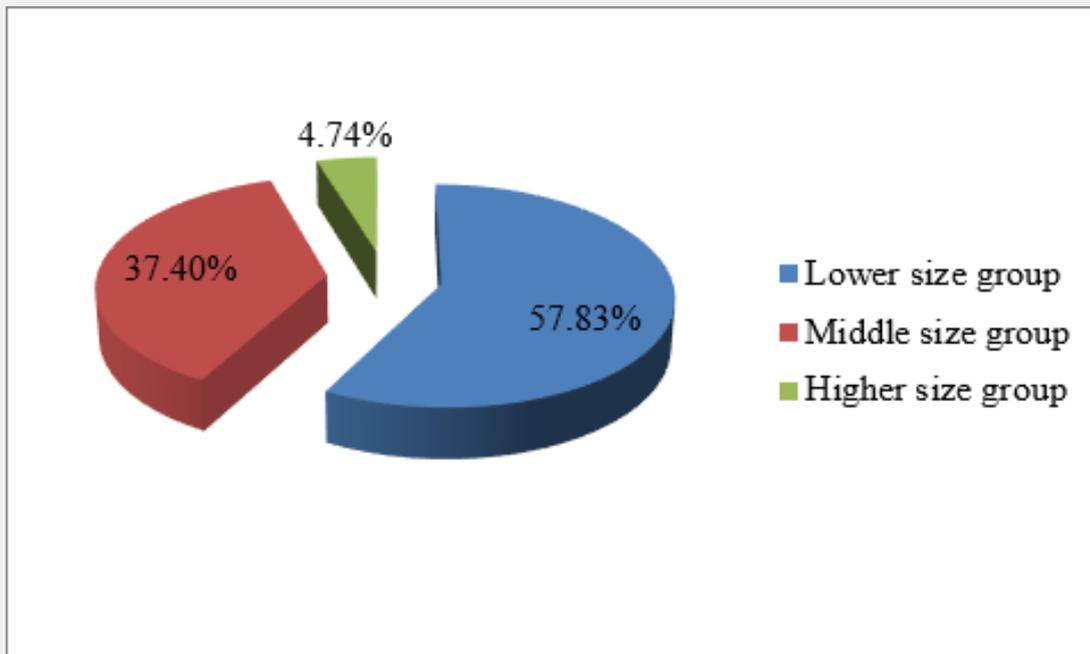


Figure 2: Exploitation pattern of *C. carpio* according to major group-wise from the Tons river at Prayagraj, Uttar Pradesh.

The experienced mature female fish stock was healthy in the river in monsoon season but very high fishing pressure we observed in this season. On the basis of data, it is observed that lower size group was maximum exploited with 57.83% at Prayagraj. Middle size group was exploited with 37.40%. If exploitation is systematic then it is indication of healthy and heavy recruitment in near future. The results also indicated that the exploitation was systematic in lower size group to higher size group. The over exploitation and non-targeted fishing is the biggest problem of riverine fishery [35-37]. The fishing pressure, mesh size, size of nets and fishing technique (example degree) are responsible for increasing or decreasing of total size of fishes and recruitment in the lotic ecosystems [38-42]. Fishing pressure changes the biodiversity, size composition, growth rate, age composition, sex ratio, income of fisher and maturation [43-45]. Non-native fishes are also changed selectivity of gear due to nature, dwelling behaviour and ecological condition [46-47]. The growths of fishes are slightly checked by heavy metals accumulation in the body of fishes [48-50]. *C. carpio* is also damage to stock of indigenous fish species in the lotic ecosystem [51-54].

Conclusion

It may be concluded that the present research work provides an important baseline study of this fish (*C. carpio*). Size composition indicated that the stock of *C. carpio* from the Tons river was in healthy condition and exploitation was also systematic form. The maximum total length of *C. carpio* was indicated that the ecological condition of the Tones river most suited for fishes. Pres-

ent condition was recorded due to sustainable exploitation of this species in the river [55-57] stated that the when sustainably harvested or farmed, inland fish can be considered part of the green food movement for more environmentally friendly sourcing of food. Their ecological conditions and life history behaviour make them a successful invader. The Ganga river system is one of the most invaded freshwater ecosystems (Example *Cyprinus carpio* and *Oreochromis niloticus*) [58-59].

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