

**Research article**

Size composition and exploitation structure of Indian major carp, *Cirrhinus mrigala* (Hamilton, 1822) from the Ganga river, India

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ABSTRACT**ARTICLE INFO**

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Fisheries management system is based on the principle of the sustainable use of a renewable living resource. Studies were undertaken during March 2014 to February 2015 from the middle stretch of the Ganga river, India. 423 fish specimens were examined of *Cirrhinus mrigala* for determination of size composition and exploitation structure. The size composition of *C. mrigala* varied from 19.2 to 92.4 cm. On the basis of pooled sampled specimen in the length ranges from 16.8 to 92.4 cm showed that the 37.1 to 43.0 cm fishes most exploited compared to other size groups. The 91.1 to 97.0 cm fishes shared very little proportion in the exploitation. The lower size group of fishes more constituted compared to middle and higher size groups.

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INTRODUCTION

Cirrhinus mrigala is a very fast growing big sized carp (Mayank and Dwivedi 2015a) and commonly known as mrigala. Freshwater rivers, reservoirs, jheels, tanks and beels are the natural habitats of mrigala. Riverine fisheries are important as it provides nutritional food and employment for millions of people around the world (Dwivedi *et al.* 2014a). It is an excellent species for pond culture in India, Burma, Bangladesh, Nepal and Pakistan (Dwivedi *et al.* 2004, 2016). *C. mrigala* is a backbone of culture fishery practices in the India (Mayank *et al.* 2015). It shares a good production in commercial catches of the rivers Ganga, Yamuna, Brahmaputra, Godavari and other tributaries (Chondar 1999, Dwivedi and Nautiyal 2014b, Mayank and Dwivedi 2015b).

Fish is a rich source of protein, vitamins and minerals (Tiwari *et al.*, 2014). New knowledge on the role of omega-3 fatty acids in human physiology and their high contents in fish has added a new dimension to their importance in health and nutrition. Fishes are important as they indicate the ecological processes and the producer-consumer interactions (Dwivedi *et al.*, 2015, Tiwari *et al.*, 2016). Exploitation of fishes in river and streams are an economic activity governed by social needs and pressures (Dwivedi and Nautiyal 2012, Dwivedi *et al.*, 2014b, Imran *et al.*, 2015, Pathak *et al.*, 2015, Mayank and Dwivedi 2016). Various studies were performed by Jhingran (1959), Kamal (1969), Khan and Singh (2013) and Mayank *et al.*, (2015) in *C. mrigala* from the different rivers and same river. But size composition and population structure study is not conduct from the Ganga river. The present study was thus

undertaken to estimate the size composition and population structure of *C. mrigala* from the Ganga river, India. This study will help in formulation the fishery management policies of *C. mrigala* and Indian major carp in the Ganga river and culture sector.

MATERIAL AND METHODS

The 423 fish samples of *Cirrhinus mrigala* were collected at random during March 2014 to February 2015 from the middle stretch of the Ganga river (Teliyanganj fish market), India. This market represents the fishes of middle stretch of the Ganga river at Allahabad. Size of fishes was measured by simple measuring scale. Total length (TL) of fishes was measured from tip of the snout to the largest fin rays of caudal fin. Collected data were classified at 6 cm intervals and size composition varied from 19.2 to 92.4 cm size groups. The number of samples calculated according to size group then converted into percentage.

RESULTS AND DISCUSSION

The size composition of *C. mrigala* varied from 19.2 to 92.4 cm. On the basis of pooled sampled specimen in the length ranges from 16.8 to 92.4 cm showed that the 37.1 to 43.0 cm fishes most exploited compared to other size groups (Table 1). The 91.1 to 97.0 cm fishes shared minimum proportion in the exploitation. The lower size group of fishes more constituted compared to middle and higher size groups. The size groups 19.1 to 25.0, 25.1 to 31.0 and 31.1 to 37.0 cm fishes shared 8.04%, 11.11% and 12.06%, respectively from the lower stretch of the Ganga

river at Allahabad, India. The exploitation of *C. mrigala* also indicated that the mature fishes more exploited compared to immature fishes. *C. mrigala* is mature in second year of the life cycle (Mayank *et al.* 2016). In the present study, mature fishes more exploited than immature. This type of exploitation is systematic for stable stock in the Ganga river.

Imran *et al.*, (2015) reported that the 32.1-35.0 cm size group of *Labeo calbasu* was dominated in exploitation (17.61%) compared to 29.1-32.0 (13.64%) and 26.1-29.0 cm (11.93%) in exploited population. She also reported that the middle size group was maximum exploited at Allahabad. In general, middle size group of fishes in riverine/natural stocks are more exploited than other size groups (Nikolskii 1980, Pathak *et al.* 2015, Mayank and Dwivedi 2015a, Tripathi *et al.* 2015). Dwivedi *et al.* (2006) recorded lower size group of *L. calbasu*, maximum exploited in the Ghaghara river at Faizabad. Kamal (1969) estimated lower and middle age groups of *C. mrigala* were highly exploited from the river Yamuna at Allahabad. Middle size group of *Eutropiichthys vacha* was maximum exploited from the Ganga river at Allahabad Tripathi *et al.*, (2015).

It may be concluded that the stock of *C. mrigala* was stable from the Ganga river at Allahabad. Present size composition was decreased compared to earlier but exploitation structure was systematic.

Table 1: Size composition and exploitation structure of *Cirrhinus mrigala* from the Ganga river, India

Size composition (cm)	Number of fishes	Exploitation (%)
19.1-25.0	34	8.04
25.1-31.0	47	11.11
31.1-37.0	51	12.06
37.1-43.0	71	16.78
43.1-49.0	53	12.53
49.1-55.0	39	9.22
55.1-61.0	31	7.33
61.1-67.0	27	6.38
67.1-73.0	21	4.96
73.1-79.0	19	4.49
79.1-85.0	16	3.78
85.1-91.0	11	2.60
91.1-97.0	3	0.71

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