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Feeding profile of Common carp, *Cyprinus carpio* (Linnaeus 1758) from the Ganga River, India

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Abstract

Cyprinus carpio is broadly cultured in the Ganga river basin due to its plasticity nature (survival rate/tolerance potential), growth rate, high market demand, consumer preference and seed availability. They are also highly available in the Ganga river system with other exotic fish species as like Nile tilapia, *Oreochromis niloticus*. In order to the study of food and feeding habit of common carp, *Cyprinus carpio* samples were collected from the commercial catches during 2021 from March to May from the Ganga river at Prayagraj, Uttar Pradesh. The analysis of gut content of the *Cyprinus carpio* revealed that the average food items 50.30% of plant items and 46.91% of animal items and remaining 2.77% of unidentified items. The analysis of the gut content of *Cyprinus carpio* indicated that the omnivorous feeding nature from the Ganga river at Prayagraj, Uttar Pradesh.

Keywords: *Cyprinus carpio*, Food and feeding, omnivorous, Prayagraj.

Introduction

The Freshwater fishes are important and valued property for income, human food, sport and ornament. Fishes are most important indicators of environmental health of the water bodies (Singh *et al.* 2010, Dwivedi & Nautiyal 2010, Dwivedi *et al*. 2014, Graham *et al.* 2015; Vilizzi *et al.* 2015, Tripathi *et al*. 2017, Gopesh *et al.* 2021, Mishra *et al.* 2021). Fishes are an integral component of stream and river systems and represent a visible measure of stream/river ecosystem structure and function (Henning *et al.* 2008, Nautiyal & Dwivedi *et al.* 2010, Villéger *et al.* 2014, Mayank & Dwivedi 2015, Daga *et al.* 2015). Fishes can also be used as indicators over a temporal ranges varying from minutes to decades and spatially from a local scale measured in meters to entire river catchments (Mayank *et al*. 2015, Dwivedi *et al.* 2016, 2017, Tripathi *et al.* 2017).

Common carp, *Cyprinus carpio* is an exotic or Non-native fish species for India (Dwivedi *et al*. 2018a, Mishra & Dwivedi 2020). Non-native fish species are responsible for reduction of fish lenght, damage breeding ground and change food web structure and population structure of indigenous fish species and also earlier introduced fish species (Rahel 2000, Weber *et al.* 2010, Dwivedi & Mishra 2021) The native distribution of *C. carpio* covers a large area from Eurasia east ward across Russia and China (Christopher 2008, Villéger *et al.* 2014) in still or slowly flowing waters, lakes, reservoirs and permanent wetlands, commonly with silt bottoms (Kottelat & Freyhof 2007). *C. carpio* was one of the first species to be introduced into other countries from its native origin of Asia and Europe). The introduction of *C. carpio* in African freshwater ecosystems began in South Africa in its largest impoundment of Lake Gariep (Henning *et al.* 2008).

C. carpio is widely cultured in the Ganga river basin due to its plasticity nature (example survival rate, poor water quality), growth rate, high market demand, consumer preference and very easily seed availability (Jha *et al*. 2015, Tripathi *et al.* 2017). Its survival and growth are superior in polluted water (Tiwari & Dwivedi 2014, Dwivedi *et al.* 2015). It is considered an esteemed food fish and cultured along with Indian major carps in India (Tiwari *et al.* 2017, Imran *et al.* 2015, Mishra *et al* 2021). They are also highly available in the Ganga and Yamuna rivers with other exotic fish species *O. niloticus* (Dwivedi *et al.* 2018b, Mayank *et al.* 2015).

A study on stomach content analysis is vital in given that useful information of fish diets, role of fish in their habitat and to inducement stock assessment models. Feeding behavior of fishes varied from

season to season and year to year (Roshni *et al.* 2016, Mayank & Dwivedi 2017). Food plays one of the most vital roles in the life history of fishes by way of controlling their abundance, growth, maturation, fecundity and migration (Tripathi *et al.* 2013). Variations in the seasonal and diurnal availability of the preferred food organisms of various species of fish in any region may govern the horizontal and vertical movements of the fish stocks.

Many investigators have studied the food and feeding habits of *C. carpio* in its area of native distribution (Hana & Manal 1988, Magalhaes 1993, Adamek & Sukop 2003, Ali *et al.* 2010, Mustafizur *et al.* 2010) and non-native place (Dwivedi *et al.* 2018c). But there is no published information about food and feeding habit of *Cyprinus carpio* var. *communis* from the Ganga river. The present study was aimed to highlight the food and feeding habit of *Cyprinus carpio* from the Ganga river at Prayagraj, Uttar Pradesh. This study will help in formulating the fishery management policies with respect of climate changes and restoration of Indian Major Carp (*Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*) of *Cyprinus carpio* var. *communis* in the Ganga river at Prayagraj, U. P.

Material and methods

In order to study the food and feeding habit of common carp, *Cyprinus carpio* samples were collected from the commercial catches during fishing in the year 2021 from March to May from the Ganga river at Prayagraj, Uttar Pradesh. All the fish specimens were weighed separately and then gutted for the collection of gut contents and preserved in 8% formalin.

The collected guts were weighed and their content emptied in the watch glass. The sample were analysed qualitatively as well as quantitatively estimation, volumetrically (Pillay 1952) and occurrence method (Hynes 1950) for evaluating the relative importance of all food items. The various items were examined and sorted out using a binocular microscope and thus identified. Standard taxonomical keys were consulted for identification of plankton, oligochaetes, insects and other invertebrates (Pennak 1978, Edmondson). The percentage occurrence of different items of food in different months was determined by summing the total number of occurrence of all items from which the percentage occurrence of each item was calculated.

Result and discussion

The analysis of the gut content of *Cyprinus carpio* indicated that the omnivorous feeding nature from the Ganga river at Prayagraj, Uttar Pradesh. The analysis of gut content of the *C. carpio* revealed that the average food items 50.30% of plant items, 46.91% of animal items and remaining 2.77% of unidentified items (Table 1).

The animal food items were shared by protozoan, insect legs. On the average the total contribution of animal food was 46.91% of which 18.20% of protozoan, 20.06% rotifer and 8.64% of the insect legs (Table 2). The total shared of plant Matter was 50.30% consisted of green algae, diatom, Desmids and freshwater sponge. The plant matter average of 13.58% green algae, 19.44% of desmids, 16.35% of diatom and 0.92% of fresh water sponge in the total food items (Fig. 1, Table 2).

The plant component revealed its peak contribution during March (53.64%) while minimum in May (43.82%). Among the animal food items, present throughout the sampling period with maximum and minimum contribution in May 53.93% and March 41.72%, respectively (Table 1). Unidentified recorded peak contribution during March 4.63% while in May contributed only (2.24 %).

The green algae was maximum in March (13.90%) and minimum in April (13.09%). The desmides maximum in March (22.51%) and minimum in May (14.60%) while the insect leg was also maximum in the month of March with 10.11% and minimum in May with 7.94% (Table 2). The diatom was maximum in April (17.85%) and minimum in May (15.73%). The fresh water sponge is maximum in March (1.32%) and maximum in April (1.19%). The Protozoa was maximum in May with 20.22% and minimum in March with 16.55% while the rotifer was maximum in May (23.59%) and minimum in March (17.21%) (Table 2).

Saikia & Das (2008) reported that the gut contents of C. carpio in Indian lakes largely contain algae, zooplankton (Cladocera, Copepoda, Rotifera), benthic organisms (Diptera mainly Chironomidae

larvae), plant residues and mud. Magalhaes (1993) found zooplankton, phytoplankton, detritus and mud in the digestive tract of *C. carpio* in the Iberian stream. The same author also reported that the most common zooplanktonic organisms observed in the gut contents of the fish were Cladocera (35.7%), Copepoda (23.8%), Rotifera (4.3%) and non zooplanktonicostracods (3.8%) by volume. According to Magalhaes (1993), the most frequently observed benthic organisms in the gut were Diptera and Oligochaeta.

Ali *et al.* (2010) reported that zooplankton, phytoplankton and benthic organisms were apparent in the gut of *C. carpio* from Hirfanli Dam, Turkey. According to the same authors, out of the animal based organisms that constituted 33.8% of the total volume food consumed 56.7% was due to zooplankton while 43.3% was composed of benthic organisms. Philip (2006) reported that *C. carpio* consumed large quantities of mollusks and annelids. Sahtout *et al.* (2018) observed that the *C. carpio* was omnivorous in Foum El-Khanga Dam, Souk- Ahras, Algeria.

It may be concluded that the resource use efficiency and feeding nature of *C. carpio* is more fluctuated from the Ganga river, Uttar Pradesh. The analysis of the gut content of *C. carpio* indicated that the omnivorous feeding nature. The analysis of gut content revealed that the average food items 50.30% of plant items, 46.91% of animal items and 2.77% of unidentified items. Data also indicated that the *C. carpio* stock in near future would be increased (e.g. by size and age) from the Ganga river due to feeding plasticity. The food web of the Ganga river supported to omnivorous fishes as like *C. carpio* and *Oreochromis niloticus* (Nile tilapia).

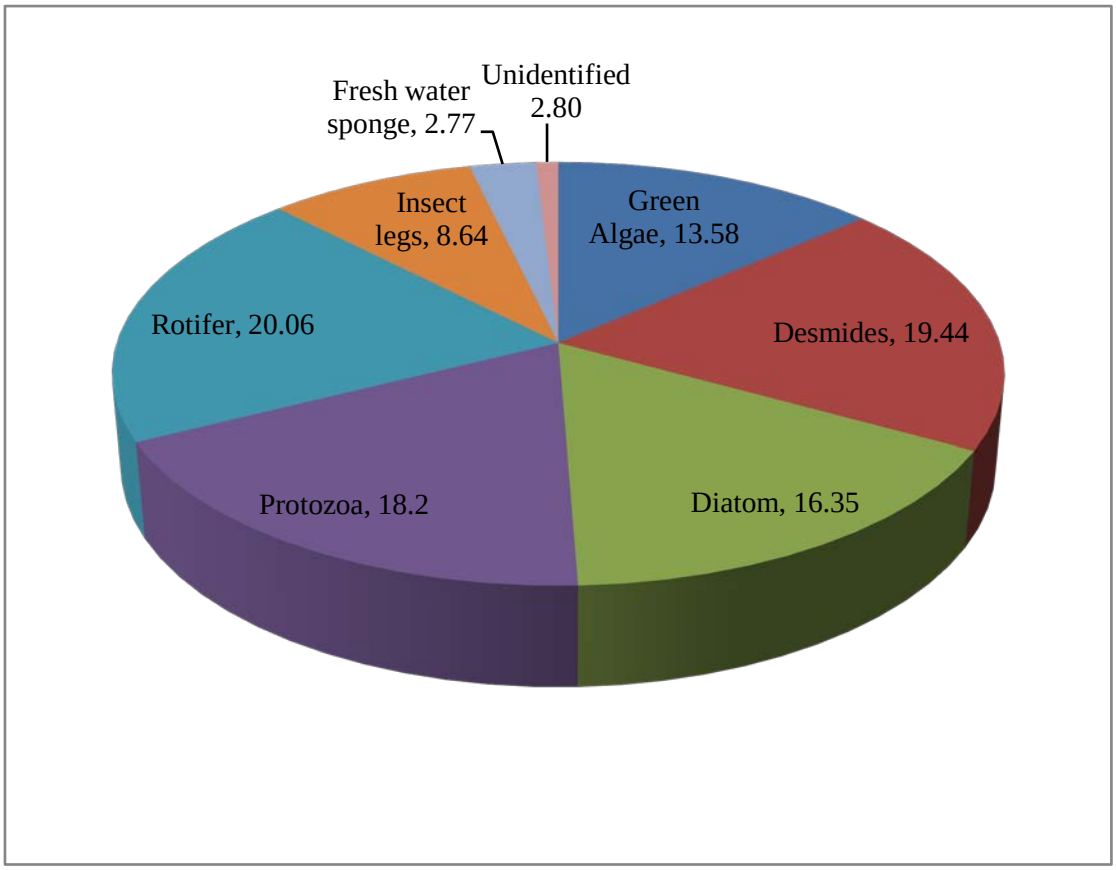
Table 1. Monthly percentage of different food components in the gut of *Cyprinus carpio* from the Ganga river at Prayagraj

Groups	March		April		May		Average
	Number of items	Percentage	Number of items	Percentage	Number of items	Percentage	
Plants	81	53.64	43	51.19	39	43.82	50.30
Animal	63	41.72	41	48.80	48	53.93	46.91
Unidentified	7	4.63	0	0	2	2.24	2.77
Total	151		84		89		

Table 2. Monthly percentage of different food component in the gut of *Cyprinus carpio* from the Ganga river at Prayagraj

Food items	March		April		May		Average
	Number of items	Percentage	Number of items	Percentage	Number of items	Percentage	
Green algae	21	13.09	11	13.09	12	13.48	13.58
Desmides	34	22.51	16	19.04	13	14.60	19.44
Diatom	24	15.89	15	17.85	14	15.73	16.35
Protozoa	25	16.55	16	19.04	18	20.22	18.20
Rotifers	26	17.21	18	21.42	21	23.59	20.06
Insect legs	12	7.94	7	8.33	9	10.11	8.64
Fresh water sponge	2	1.32	1	1.19	0	0	0.92
Unidentified	7	5.48	0	0	2	2.26	2.80

Fig. 1 Percentage of different food items in the gut of *Cyprinus carpio* at Prayagraj



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