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## Food and feeding habit of Indian major carp Bhakur (*Catla catla*) from Meeranpur lake, Sultanpur, Uttar Pradesh

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### Abstract

The growth of a fish is influenced by the quality and quantity of food materials available and consumed. Any variation in quality and quantity of food materials will affect the growth rate of the fish. These variations of natural food materials in a water body are under the influence of several abiotic and biotic factors. The gut content analysis provides the information on food components and feeding habit of fish which is an important aspect for fish culture. In the present study, the qualitative and quantitative analysis of gut content of Indian major carp *Catla catla* from Meeranpur lake of district Sultanpur, Uttar Pradesh, India, were conducted during August 2018 to July 2019. The results on gut content shows that qualitative changes in food component were not found but quantitative changes were observed during the investigation period. In the present study the gut content mainly consists of Crustaceans (33.58%), Rotifers (18.74%), Bacillariophyceae (16.07%), Chlorophyceae (8.84%), Protozoans (6.80%), Myxophyceae (6.12%), Aquatic Insects (4.86%), Aquatic Plant materials (4.59%), and Decayed Organic matter present in negligible amount (0.41%) in Bhakur (*Catla catla*). The findings suggests that the experimental fish Bhakur (*Catla catla*) is mainly planktophagus and is more suitable for fresh water rich in planktons. The details have been discussed in this paper.

**Keywords:** Bhakur (*Catla catla*), food and feeding habit, gut contents, Meeranpur lake

### 1. Introduction

Food and Feeding habits of fishes are important factors for selection of fish for culture to avoid competition for food and live in association to utilize all the available food (Dewan and Saha, 1979) [4]. Bhakur (*Catla catla*) is one of the most preferred and rapid growing fish among the Indian major carps and it is accepted as a potential fresh water species in different parts of the world including India, Pakistan, Bangladesh and other southern Asian countries. The magnitude of fish population in a region is the function of food potentialities and are varies with the species, seasons, food availability, food preference, maturity stage and spawning season of the fish (Krishna, *et al.* 2016) [14]. Fishes have become adapted to a wide variety of food. The food of fry and fingerlings are generally different from that of the adult fish. Fishes are highly adaptable in their feeding habits and utilize the readily available food. The experimental fish Bhakur (*Catla catla*) are plankton feeder, they basically feeds on planktons and detritus material (Hora and Pillay, 1962) [7].

The qualitative and quantitative food analysis of fish in their natural habitats enhances the understanding of the growth, abundance, productivity of water body (Nansimole, *et al.* 2014) [16] and used to describe food habits and feeding patterns of fishes (Ekpo, *et al.* 2014) [6]. The feeding intensity of mature fish decreases during the spawning season as compared to the non-spawning season. The relationship between the food component and fish is essential for the production and exploitation of the fish stocks (Sunder, *et al.* 1990) [20]. It is not possible to collect sufficient information of food and feeding habit of fish in their natural habitat without studying its gut contents (Hyslop, 1980) [10]. The food and feeding habit of different fish varies from month to month or season to season due to changes in the availability of food components. Studies on the food and feeding habit of different fishes have been made by many workers like Khan, 1947 [13]; Hynes, 1950 [9]; Karim and Hossain, 1972 [12]; Doha, 1974 [5]; Jhingran, 1983 [11]; Bhuiyan and Haque, 1984 [1]; Bhuiyan and Islam, 1990 [2], 1991 [3]; Hossain, *et al.* 1991 [8]; and Pandit *et al.* 2018 [18].

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The thorough knowledge of food and feeding habits of fishes provides keys to select such species of fish for culture and produce an optimum yield by utilizing all the available potential food of the water bodies without any competition. The collection of much information about food and feeding habit of fish is necessary for successful fish culture. The present study deals with the food and feeding habit of Bhakur (*Catla catla*), observe the gut contents and the relationship between weight of gut and the weight of the fish. The present study will be useful in determining the stocking density on the basis of natural food available in the lake.

## 2. Materials and Methods

The specimens of experimental fish Bhakur (*Catla catla*) were collected from Meeranpur lakes of district Sultanpur during August 2018 to July 2019. The month wise collection and investigation were made to study the food and feeding habit of the fish. The specimens were collected with the help of fisherman. Just after collection 10% formalin solution was injected in to the gut of all the fishes in order to stop digestion of food items. All the experiments were carried out in the laboratory of the Post Graduate Department of Zoology, Ganpat Sahai P.G. College Sultanpur, Uttar Pradesh.

The feeding intensity was assessed by visual estimation volumetrically (Pillay, 1952) [19] based on the distension of the gut and the quantity of food contained in it. The various gut conditions based on degree of fullness are expressed as gorged, full, 3/4 full, 1/2 full, 1/4 full, trace and empty by occurrence method (Hynes, 1950) [9]. The gut was then cut open and contents were analysed under binocular microscope for the food composition, preference and relative importance of various food items following the volumetric estimation method (Pillay, 1952) [19]. For evaluating the relative importance of food items, the index of preponderance (Natarajan and Jhingran, 1961) [17] was obtained by using following formula:

$$\text{Index of preponderance} = \frac{V_1 \times O_1}{\sum V_1 \times O_1} \times 100$$

Where,  $V_1$  = Volume of percentage

$O_1$  = Occurrence of percentage

## 3. Results and Discussion

The analysis of food and feeding habits of 144 samples of fish Bhakur (*Catla catla*) are illustrated in Table 1 and 2. Table 1 illustrates the fullness and emptiness of gut of fish and Table 2 illustrates the Grading of various food items of gut contents of fish Bhakur (*Catla catla*) during investigation period from August 2018 to July 2019.

The gut of 144 fishes were analyzed of which 62.86% contained food and the rest 37.14% were without food, which varies from month to month. The highest percentage of empty gut was in the month of June 2019 (58.68%) and the lowest percentage of empty gut was in the month of August 2018

(23.68%). The highest percentage of full gut was found in the month of August 2018 (76.32%) and the lowest percentage of full gut was found in the month of June 2019 (41.32%) (Table 1). The condition of feeding was also related to maturity of fish. The immature fishes were found to feed with almost equal intensity throughout the year. These findings clearly indicated that the feeding intensity of juvenile fishes is more. Similar findings has been observed by Khan, 1947 [13]; Dewan and Saha, 1979 [4] and Kumar, *et al.* 2015 [15].

**Table 1:** Feeding activity of Bhakur (*Catla catla*) based on the number of fish, percentage of fullness and emptiness of gut during August 2018 to July 2019.

Months	Number of fish	Percentage of gut fullness	Percentage of gut emptiness
AUG	10	76.32	23.68
SEP	14	75.16	24.84
OCT	13	72.38	27.62
NOV	15	73.27	26.73
DEC	11	56.18	43.82
JAN	16	44.26	55.74
FEB	14	68.42	31.58
MAR	12	69.84	30.16
APR	10	67.32	32.68
MAY	09	61.24	38.76
JUN	08	41.32	58.68
JUL	12	48.56	51.44
Mean ± SD	12 ± 2.44	62.86 ± 12.41	37.14 ± 12.41

The Percentage composition (by Volume and Occurrence), Preponderance and Grading of the various food items found in the gut content of Bhakur (*Catla catla*) are enumerated in Table 2. The findings revealed that the food items found in the gut of Bhakur (*Catla catla*) consists of Aquatic plant materials, Chlorophyceae, Bacillariophyceae, Myxophyceae, Protozoans, Rotifers, Crustaceans, Aquatic insects and Decayed organic matter.

The Crustaceans (Cladocerans and Copepods) formed the main item of gut contents forming 19.36% by volume and 22.65% by occurrence in the gut contents of Bhakur (*Catla catla*). Rotifers formed the next important food items in the gut contents forming 16.34% by volume and 14.98% by occurrence. Bacillariophyceae (diatoms) is another important food items in the gut contents forming 16.68% by volume and 12.58% by occurrence. Chlorophyceae (green algae and desmids) formed a part of gut by constituting 9.42% by volume and 12.26% by occurrence. The Myxophyceae (blue-green algae) in the gut contents of Bhakur (*Catla catla*) were 9.12% by volume and 8.76% by occurrence. The percentage of Protozoans in the gut contents were 13.57% by volume and 6.54% by occurrence. Aquatic insects and their instars formed 8.74% by volume and 7.26% by occurrence. The remnants of macrovegetation were represented by 5.36% by volume and 11.19% by occurrence. Decayed and semidecayed organic matter constituted only 1.41% by volume and 3.78% by occurrence.

**Table 2:** Grading of various food items of gut contents of Bhakur (*Catla catla*), collected during August 2018 to July 2019 from Meeranpur Lake of district Sultanpur (U.P.)

Food Items	% Composition of food items		$V_1 \times O_1$	Preponderance	Grading
	Volume ( $V_1$ )	Occurrence ( $O_1$ )			
Aquatic Plant materials	5.36	11.19	59.978	4.59	VIII
Chlorophyceae	9.42	12.26	115.489	8.84	IV
Bacillariophyceae	16.68	12.58	209.834	16.07	III
Myxophyceae	9.12	8.76	79.891	6.12	VI

Rotifers	16.34	14.98	244.773	18.74	II
Protozoans	13.57	6.54	88.748	6.80	V
Crustaceans	19.36	22.65	438.504	33.58	I
Aquatic Insects	8.74	7.26	63.452	4.86	VII
Decayed Organic matter	1.41	3.78	5.330	0.41	IX
			$\sum V_1 \times O_1 = 1306$		

From the present study on the food and feeding habit of Indian major carp Bhakur (*Catla catla*), it appears that the basic food of this fish in Meeranpur lake is mainly comprised of Crustaceans (33.58%), Rotifers (18.74%), Bacillariophyceae (16.07%), Chlorophyceae (8.84%), Protozoans (6.80%), Myxophyceae (6.12%), Aquatic insects (4.86%) and Aquatic plant materials (4.59%). The decayed organic matter formed a negligible amount (0.41%) in the gut content of Bhakur (*Catla catla*).

Earlier, Hora and Pillay (1962) [7] assigned Bhakur (*Catla catla*) as a plankton and detritus feeder and reported it to consume primarily phytoplankton and zooplankton, decayed micro-vegetation and detritus. However, reported that the adult Bhakur (*Catla catla*) feeds mainly on algae, crustaceans, some plants, rotifers and aquatic insects and hence he categorized the same as a plankton feeder.

#### 4. Conclusion

The analysis of gut contents showed the availability and preference of food items by the fish helps to find out the feeding habit of fish and accordingly fisheries management in the water body. In the present study zooplanktons was the dominant food component followed by phytoplanktons and aquatic plant materials in fish gut. On the basis of these observations, it can be concluded that the experimental fish Bhakur (*Catla catla*) is plankton feeder and feeds primarily on zooplanktons. This result agrees with Kumar *et al.* (2015) [15] and Pandit *et al.* (2018) [18].

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