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## Feeding ecology of carp fishes and cat fishes captured from Gomati River stretch at Lucknow, Uttar Pradesh, India

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### Abstract

Important aspects, related to an individual's life cycle directly dependent on its feeding behavior. In fish biology, growth, reproduction, survival and role of fishes in aquatic ecosystem is depend on amount and type of food selected by them. Preference of fishes over common food items lead to feeding competition, that may affect the population dynamics of fishes. In this study, food habits of carp and cat fishes were determined on the basis of gut content analysis. The overall diversity of food items in the diet of fish species suggests a response to interspecific as well as more prevalent intraspecific competition in the river environment. Outcomes suggested that carp fishes and cat fishes may adapt to omnivorous nature, although carp fishes feed mainly on phytoplankton and cat fishes on zooplanktons and others.

**Keywords:** River, Carp fishes, Cat fishes, Feeding, Food items

### 1. Introduction

In fishery, biological investigation of food of the fishes has been become very important because it regulates or at least influence the occurrence, growth and migration of fish. Feeding habits of fish help to know the inter-specific relationship and the productivity of the water bodies <sup>[1]</sup>. Nutrition and feeding influence growth, reproduction, and health of fish and their response to physiologic and environmental stressors <sup>[2]</sup>. Studies on the food and feeding habits indicate the species niche in the ecosystem, their food preferences and food spectrum overlaps <sup>[3]</sup>. Fishes play significant role in aquatic system. The degree, they affect processes, however, depends on their abundance, modes of feeding, and abiotic conditions (e.g., nutrient loading from the water-shed and sedimentation rates) <sup>[4]</sup>. Earlier work on taxonomical and biological investigation of fresh water fishes which provide a complete list of food items was done by a number of authors like, <sup>[5, 6, 7]</sup>. In particular, little is known about the relation between predator size and specific variations of prey in relation to fish size. According to <sup>[8]</sup>, food habits and feeding ecology research are a fundamental tool to understand fish roles within their ecosystems since they indicate relationships based on feeding resources and indirectly indicate community <sup>[9]</sup>, which allows inferring competition and predation effects on community structure <sup>[10]</sup>. In this study, we investigate the feeding behavior of fishes through gut content analysis and compared the reported feeding component between the selected fishes and also focused on inter as well as intraspecific competition between them.

### 2. Materials and Methods

The study stretch of Gomti River in Lucknow (Uttar Pradesh), was divided into three major sections, viz. upstream (Gau Ghat and Guriya Ghat), midstream (Hanuman Setu and Paper mill Colony) and downstream (Gomti Barrage and Pipara Ghat). Fish samples were collected in the pre-monsoon and post-monsoon seasons from Gomati River and specimen of Carp fishes (*Labeo bata*, *Notopterus chitala*, *Chagunius chagunio*) and cat fishes (*Mystus aor*, *Mystus singhala*, *Mystus vittatus*) were identified on the basis of combination of number of characteristics, viz, the general body shape, the structure and situation of fins, the fin count, the absence and present of barbells, the distribution of scales on the body and the general coloration of body <sup>[11]</sup>. The abdomen of each of the identified fish was opened and the shape of the gut loops was recorded. The alimentary canal was removed carefully from the esophagus

to the anal pore and preserved in 20% formalin. To study the food of fishes, the gut contents were thoroughly washed into a Petri dish and examined under microscope for identification of

various group of animals and plants (for micro-organisms) and by naked eyes (for macro-organisms). As far as possible, various food items were identified up to orders and families.

**Table 1:** Food items present in gut content of fishes

Food items	Carp Fishes			Cat Fishes		
	<i>L. bata</i>	<i>N. chitala</i>	<i>C. chagunio</i>	<i>M. aor</i>	<i>M. singhala</i>	<i>M. vittatus</i>
<b>Phytoplankton</b>						
<b>Bacillariophyceae</b>	+	+	+	-	-	-
<i>Amphora sp.</i>	+	-	+	+	-	-
<i>Cymbella</i>	+	+	+	-	-	-
<i>Cocconeis sp.</i>	+	+	+	-	-	-
<i>Fragilaria sp.</i>	+	+	+	-	-	-
<i>Nitzschia sp.</i>	+	+	+	-	-	-
<i>Navicula sp.</i>	+	+	+	-	-	-
<i>Syendra sp.</i>	+	+	+	-	-	-
<b>Chlorophyceae</b>						
<i>Clamydomonas sp.</i>	+	+	+	-	-	-
<i>Chorella bulgaris</i>	+	+	+	-	-	-
<i>Chaetophora</i>	+	+	+	-	-	-
<i>Comerium reniformis</i>	+	+	+	-	-	-
<i>Cosmerium sp.</i>	+	+	+	-	-	-
<i>Closterium sp.</i>	-	+	-	-	-	-
<i>C. cucumis</i>	+	+	+	-	-	-
<i>C. acrosun</i>	-	-	-	-	-	-
<i>C. moniliferum</i>	+	-	+	+	-	+
<i>Hydrodictyon sp.</i>	+	+	+	-	-	-
<i>H. reticulatum</i>	+	+	+	+	-	-
<i>Microspora sp.</i>	+	+	+	-	-	-
<i>Nitella sp.</i>	+	+	+	-	+	-
<i>Oedogonium sp.</i>	+	+	+	-	-	-
<i>Pediastrum sp.</i>	+	+	+	-	-	-
<i>Pandorina morum</i>	+	+	+	-	-	-
<i>Protococcus sp.</i>	+	+	+	+	+	+
<i>Schizomeris sp.</i>	+	+	-	-	-	+
<i>Ulothrix sp.</i>	+	+	+	-	-	-
<i>Volvox sp.</i>	+	+	+	-	-	-
<b>Cyanophyceae</b>						
<i>Anabaena spriorides</i>	+	+	+	-	-	-
<i>A. sphaerica</i>	+	+	+	-	-	-
<i>A. circinalis</i>	+	+	+	-	-	-
<i>Anabaenoopsis</i>	+	+	+	+	-	-
<i>Microcystis aeruginosa</i>	+	+	+	-	-	-
<i>M.flos-aquea</i>	+	+	+	-	-	-
<i>Nostoc sp.</i>	+	-	+	+	-	+
<i>Oscillatoria princeps</i>	+	+	+	-	-	-
<i>O. splendid</i>	+	+	+	-	-	-
<i>O. planktonica</i>	+	+	+	-	-	-
<i>Ravularia manginii</i>	+	+	+	-	-	-
<i>Raptidiopsis indica</i>	+	+	+	-	-	-
<b>Zooplankton</b>						
Chloroperlidae	-	-	-	+	+	+
Perlidae	-	-	-	+	+	+
<i>Perl sp.</i>	-	-	-	-	-	-
<i>Neoperla sp.</i>	-	-	-	-	+	+
Trichoptera (larvae)	-	-	-	+	+	+
<b>Hemiptera (adults)</b>	-	-	-	+	+	+
Gerridae	-	-	-	+	+	+
<i>Gerrise sp.</i>	-	-	-	+	+	+
<i>Halobates sp.</i>	-	-	-	+	+	+
<i>Corixi dae</i>	-	-	-	+	+	+
<i>Corixe sp.</i>	-	-	-	+	+	+
<i>Nepidae</i>	-	-	-	+	+	+
<i>Nepa sp</i>	-	-	-	+	+	+
<b>Coleoptera (adults &amp; larvae)</b>	-	-	+	+	+	+
Dytiscidae	-	-	-	+	+	+

<i>Beroaus sp.</i>	-	-	-	-	-	-
Gyrinidae	+	+	+	+	+	+
Gyrinus	-	-	-	-	-	+
<b>Diptera (larvae)</b>	+	+	+	+	+	+
Blapharoceridae (larve)	-	-	-	+	+	+
<i>Chironomus viccrius</i>	+	+	+	+	-	+
<i>C.socius</i>	+	+	+	+	+	+
<i>C. cubicularus</i>	+	+	+	+	+	+
Leptidae	+	+	-	+	+	+
Simuliinae	-	-	+	-	-	-
<i>Simulium sp.</i>	+	+	+	+	+	+
<b>Crustacea</b>	-	-	-	+	+	+
<i>Orthetrum sp</i>	-	-	-	+	+	+
<i>Cardina sp.</i>	-	-	-	+	+	+
<i>Gammarus sp.</i>	-	-	-	+	+	+
Macrobrachium	-	-	-	+	+	+
<b>Odonata (nymphs)</b>	-	-	-	+	+	+
<i>Tramea sp.</i>	-	-	-	+	+	+
Coenagrionidae	-	-	-	+	+	+
Calopterygidae	-	-	-	+	+	+
Gomphidae	-	-	-	+	+	+
Lestidae	-	-	-	+	+	+
<i>Lestes praemorsa</i>	-	-	-	+	+	+
<i>L. thoracica</i>	-	-	-	+	+	+
<b>Annelids</b>	-	+	-	+	+	+
<i>Allolobophore sp.</i>	-	-	-	+	+	+
<i>Lumbricus sp.</i>	-	-	-	+	+	+
<b>Nematodes</b>	-	-	-	+	+	+
Unidentifie nematodes	-	-	-	+	+	+

**Note:** (+) = Presence of food items, (-) = Absence of food items

### 3. Results

Result of feeding behavior (Table 1) revealed that carp fishes like *Labeo bata*, *Notopterus chitala*, *Chagunius chagunio* preferentially feed on phytoplanktons. We found that members of chlorophyceae was abundant in the gut content of carp fishes. Except some food items, these fishes showed common feeding preference over the members of bacillariophyceae, chlorophyceae and cyanophyceae. Carp fishes less actively feed on zooplanktons. Out of number of zooplankton, dipterans was abundant in the gut content of carp fishes. Cat fishes vigorously feed on zooplanktons. In the gut content of cat fishes, except some members of chlorophyceae, they hardly feed on other members of phytoplanktons. Result of gut content analysis (Table 1) indicated that cat fishes were excellent feeder of zooplanktons.

### 4. Discussion

We observed feeding ecology of carp and cat fishes in Gomati River. Carp and cat fishes chiefly feed on phytoplankton and zooplankton respectively. On the basis of feeding behavior, we conclude about common feeding preference of carp and cat fishes, interspecific and intraspecific competition between them and their shifting to omnivorous nature. Braga RR *et al.* [12] overviewed that previously, most fish feeding ecology studies were concerned with achieving a basic description of food habits. This trend has long since shifted towards a more theoretical ecosystem approach aimed at understanding community structure [13, 14], interspecies interactions such as competition [15, 16], niche overlap [17, 18], trophic level [19], and food web structure [20]. In our study, we found that, *M. aor*, *M. singhala* and *M. vittatus* feed mainly on Diptera larvae, Hemiptera adults, Coleoptera, odonata etc. further, most of these species had other food groups on which they feed

exclusively. *M. singhala* and *M. aor* feed mainly on nematodes and crustacean and *M. vittatus* feed on *Nostoc sp.* *L. bata*, *C. chagunio* and *N. chitala* feed mainly on phytoplankton such on chlorophyceae, cyanophyceae etc. These species had at least one or two other food groups on which they feed exclusively. Diet of carp fishes hardly overlap with cat fishes except dipterans feeding. Lvler VS (1961) [21] described two types of food competition in fish interspecific competition between different species and intraspecific competition within a species. The result of our study explains the intraspecific food competition between six fish species, which have a similar diet with overlapping of food organisms. Food consumed by the different size of fishes revealed that the interspecific food composition may be time dependent because fish feed on the different species at different time of the year. The overall diversity of food contents in the diet of fish species suggests a response to interspecific competition which was less intense. In general, Carp fishes are herbivorous in nature and cat fishes are carnivorous in nature but due to seasonal variations, common feeding between their species members, these fishes may adapt to omnivorous nature. Environment protection has attracted the attention of the wide section of people all over the world and now it has become a global issue among scientists and researchers working in this area. Unfortunately, several pollutants are being regularly discharged in large quantities into the environment especially into the aquatic environment even some of them are unknown and unidentified but must be affecting the biota. Affected biotic component may also be responsible for the shifting of feeding behavior in fishes.

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