

Food and Feeding Habits of Fishes of the Genera *Tor*, *Puntius* and *Barilius*

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The paper deals with the studies on the food and feeding habits of *Tor*, *Puntius* and *Barilius* species. In case of *Tor tor* and *Tor putitora* the gut contents were examined from juvenile to adult stages. Their fry and fingerlings feed mostly on plankton, of which the zooplankton form a higher percentage of food. But the adults of *Tor* feed on a large variety of food including insects, insect larvae, higher plants, algae, and diatoms, etc. The percentage of these food items varies in different months of the year. *Puntius* species (*P. chilinoides*) and *P. hexastichus* and *Barilius* species (*B. bendelisis*, *B. vagra*, *B. barila* and *B. barna*) are also omnivorous. However, in *B. vagra* the percentage of animal food material was found more than in other species of this fish.

Introduction

The literature on the food and feeding habits of Indian hillstream fishes, particularly from Garhwal Himalaya is scanty. Food and feeding habits of some freshwater fishes have been described by Chacko and Kuriyan (1948), Das and Moitra (1955, 56, 58), Dixit and Bisht (1972), George (1965), Hynes (1950), Jyoti and Malhotra (1975), Kapoor (1953), Kamal (1964,66,67), Khanna

and Pant (1964), Malhotra (1967), Misra (1953), Mookerjee (1944), Moitra (1956) and Subla and Das (1970), etc. Recently Badola and Singh (1978) have examined the food and feeding habits of *Schizothorax* species from this region. The present paper deals with the food and feeding habits of *Tor*, *Puntius* and *Barilius* species found in Garhwal Himalaya.

Material and Methods

During the course of the study the following fishes have been examined:

Species	Family	Habitat (Rivers/ streams)
1. <i>Tor tor</i> (Ham.)	Cyprinidae	Alaknanda & Nayar
2. <i>Tor putitora</i> (Ham.)	„	Alaknanda & Nayar
3. <i>Puntius chilinoides</i> (McClelland)	„	Nayar, Khanda Gad, Dhondprayag Gad etc.
4. <i>Puntius hexastichus</i> (McClelland)	„	Nayar, Khanda Gad, etc.

5. <i>Barilius bendelists</i> (Ham.)	„	Alaknanda, Nayar, Khanda Gad, Dangchaura Gad, etc.
6. <i>Barilius vagra</i> (Ham.)	„	Khanda Gad, Nayar, Dangchaura Gad, Dhondprayag Gad, etc.
7. <i>Barilius barna</i> (Ham.)	„	Alaknanda, Nayar, Khanda Gad, Dangchaura Gad, etc.
8. <i>Barilius barila</i> (Ham.)	„	Dangchaura Gad, Alaknanda, Nayar, Khanda Gad, etc.

These fishes were collected in different months of the year 1976-77 from the above rivers and streams of this area. The fry and fingerlings of *T. tor* and *T. putitora* were collected from backwaters of the Alaknanda from November to January. The size of fry and fingerlings ranges from 1.5 to 7.2 cm in length. After catching, the fish and fry were immediately dissected out and the entire alimentary canal was preserved in 10% formalin solution. The intestinal bulb and rectum were carefully exposed and their contents washed into different petri dishes. The washed gut contents were preserved in different specimen tubes for further study.

For the qualitative study of the food of each species, its gut content was carefully examined under low and high power of a microscope. In order to find out the percentage composition of food, points were given to each item and then converted into percentage (table 1). The gut contents were examined every month of the year. However, in this paper the observations made in August, December and April, representing the rainy, winter and summer seasons respectively of the year are given. The fry and fingerlings of *T. tor*, and *T. putitora* were examined in the months of November to January, when they were found in abundance. For this purpose about 60 specimens of each species were examined.

Results

Tor tor: The mouth of *T. tor* is wide and situated at the anterior end of the snout and bounded by thick upper and lower lips. During feeding both the lips become protruded and form a funnel-like structure to take the food material, like a suction pump. It is a column and bottom feeder and scraps food by the hard jaws. This species is omnivorous and feeds on (i) algae belonging to *Chlorophyceae* (*Spirogyra* sp., *Cladophora* sp., *Hydrodictyon* sp., *Microspora* sp., *Ulothrix* sp., *Protococcus* sp., *Hormedium* sp. etc.), *Myxophyceae* (*Oscillatoria* sp. & *Rivularia* sp.), *Bacillariophyceae* (*Melosira* sp., *Cymbella* sp., *Diatoma* sp., *Navicula* sp., *Gomphonema* sp., *Amphora* sp., etc.); (ii) insects and their larvae, which include the *Odonata* (*Epicordula* sp., *Cordula* sp. and *Macromia* sp.), *Ephemeroptera* (*Caenis* sp., *Ephemerella* sp., *Baetis* sp. etc.), *Plecoptera* (*Neoperla* sp., *Isoperla* sp.), *Zygoptera* (*Lestes* sp., *Enallagma* sp.), *Trichoptera* (*Leptocella* sp., *Glossosoma* sp. and *Limnephilus* sp.), and *Diptera* (*Dexa* sp. and *Tabanus* sp.). In late summer and rainy season when food becomes scarce in snow-fed rivers, these fishes feed to some extent on higher plants and other small fishes. The alimentary canal in rainy season is almost empty and the rectum shows the presence of parts of insect larvae, fish scales and filaments of higher plants.

Table 1 Percentage value of each food item in different seasons of the year 1976-77

Name of species	Insect & their larvae	Crustaceans	Algae	Diatoms	Higher plants	Fish Scales	Worms	Sand & detritus	Remarks
<i>Tor tor</i> (fry)	71	3	12	6	—	—	—	8	Surface feeder
<i>Tor tor</i> (adult)									
Aug.	68	—	—	—	10	7	1	14	Column feeder
Dec.	42	—	32	11	—	2	1	12	
April	45	—	36	12	—	1	1	5	
<i>Tor putitora</i> (fry)	73	2	10	4	—	—	—	11	Surface feeder
<i>Tor putitora</i> (adult)									
Aug.	63	—	—	—	10	7	2	18	Column feeder
Dec.	40	—	36	12	—	1	2	9	
April	42	—	39	11	—	1	—	7	
<i>Puntius chinoides</i>									
Aug.	82	—	1	—	1	—	2	14	Column feeder
Dec.	76	—	11	5	—	—	—	8	
April	73	—	11	6	—	—	1	9	
<i>Puntius hexastichus</i>									
Aug.	83	—	1	1	—	—	1	14	Column feeder
Dec.	75	—	8	7	—	—	1	9	
April	79	—	6	4	—	—	—	11	
<i>Barilius bendelisis</i>									
Aug.	61	—	1	—	—	—	1	37	Surface feeder
Dec.	40	1	36	12	—	—	1	10	
April	12	1	31	10	—	—	—	16	
<i>Barilius barna</i>									
Aug.	59	—	3	1	—	—	—	37	Surface feeder
Dec.	42	2	30	12	—	—	2	12	
April	41	—	36	8	—	—	1	14	
<i>Barilius barila</i>									
Aug.	65	—	2	1	—	—	2	30	Surface feeder
Dec.	40	1	35	15	—	—	1	8	
April	45	2	32	8	—	—	1	12	
<i>Barilius vagra</i>									
Aug.	68	—	1	—	—	—	2	29	Surface feeder
Dec.	75	3	8	4	—	—	1	9	
April	82	1	6	3	—	—	1	7	

— =absence

Tor putitora : This species shows the same nature of food and feeding habits as described for *T. tor*.

Fry and Fingerlings : The fry and fingerlings of *T. tor* and *T. putitora* feed on zooplankton (insect larvae and crustaceans)

and phytoplankton (*Ulothrix*, *Spirogyra*, *Oscillatoria*, *Navicula*, *Synedra*, *Gomphonema*, etc.). The insect larvae constitute a higher percentage (71 to 73%) of food and the algae comes on second number (10-12%). The fry and fingerlings of *T. tor* and

T. putitora are surface feeders. These juvenile stages prefer the slow running and semi-stagnant waters, where plankton is available in abundance.

Puntius chilinoides: The *P. chilinoides* is omnivorous and feeds on insects and their nymphs, mainly of *Plecoptera*, *Ephemeroptera*, *Odonata*, *Zygoptera*, *Trichoptera* and *Diptera*, etc. In their food the insects and nymphs are in higher percentage (82%) while the green algae (*Microspora*, *Spirogyra*, *Ulothrix* & *Cladophora*) and diatoms come on the second and third place respectively. This species is bottom and column feeder and scraps the food materials from the stones and rocks with its hard upper and lower jaws. The mouth is crescentic subterminal and suctorial.

Puntius hexastichus: It exhibits the same nature of food and feeding habits as seen in *P. chilinoides*. Both the species do not prefer big rivers such as Alaknanda, Ganga and Bhagirathi and are always found in high altitude clear streams and remain hidden under stones and rocks.

Barilius bendelisis, *B. barna*, *B. barila*: These species are omnivorous and feed on nymphs of May fly (*Ephemeroptera*) Damselfly (*Zygoptera*) Caddisfly (*Trichoptera*), *Diptera* and Beetles (*Coleoptera*). These nymphs and insects are found in higher percentage in rainy season. The algae comprising the Chlorophyceae (*Spirogyra*, *Zygnema*, *Ulothrix*, *Microspora*, *Caracium*, etc.), Myxophyceae (*Oscillatoria* & *Rivularia*) and Bacillariophyceae (*Cymbella*, *Diatoma*, *Fragilaria*, *Synedra*, *Gomphonema*, etc.) also form a good percentage of their food. However, *B. vagra* feeds rarely on algae and diatoms and its main food consists of insect larvae. All the four species of *Barilius* are surface feeders. These species prefer well aerated and clear streams.

Discussion

The study of food and feeding habits of fishes has a special significance in ecological studies. Nikolsky (1963) has divided food of fishes into four categories according to the relationship between the fishes and their food. These categories are : (a) basic food, which comprises the main part of the gut contents, (b) secondary food, which is also frequently found in the gut contents but in small amounts, (c) incidental food, which is rarely found in the gut contents, and (d) obligatory food, which the fish consumes when the basic food is not available. The basic food items of *Tor* species during the rainy season are insects and their larvae while in winter and summer their basic food consists of both insect larvae and algae. However, owing to the temporary scarcity of basic food material during rainy season, *T. tor* and *T. putitora* may have to feed on other small fishes which may be considered as their obligatory food. This provides an explanation for the presence of fish scales in the gut contents of these fishes in August. According to Karamchandani et al. (1967, as quoted by Jhingran 1975), the food of Narmada *Tor* consists of macrovegetation (41.7%), filamentous algae (12.3%), molluscs (10.6%), and insects (8.0%). Variations in the food constituents of the same fish under varying ecological conditions are already known (Moitra 1956), in view of which the differences in the feeding of Narmada *Tor* and Garhwal *Tor* are understandable.

According to Sehgal et al. (1971, as quoted by Jhingran, 1975) the fry and fingerlings of mahseer subsisted on algae (Bacillariophyceae), decayed organic matter, green algae, and insects, etc. But our results indicate that the main and secondary food of the fry and fingerlings of the *Tor* in

Garhwal region are insect larvae and algae respectively.

The two species of *Puntius* reported in this paper are column feeder and their main and secondary food are insect larvae and algae respectively. This statement also holds good for *Barilius* species included in this paper. However, in *B. vagra* the percentage of animal food material was found more than in other species of this fish. All the four species of *Barilius* are surface feeders.

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