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Food and Feeding Habit of *Garra nasuta* of Basistha River, Guwahati, Assam

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Abstract

Garra nasuta (McClelland, 1838), an ornamental hill stream fish of Assam is an herbivorous fish feeding primarily on algae. The Relative Length of Gut (RLG) of the test species is 7.71- 9.6. RLG values show a slight increase with fish size, this is indicative that larger fish may have a greater digestive capacity. The Hepato somatic index (HSI) indicates the feeding intensity. The average HSI of the test species is 10.89 for all sizes. The positive trend of HSI in *Garra nasuta* (McClelland, 1838) indicating a high availability of food resources in the habitat. The GR configurations of the test fish species are modified into flat and round plate- like structure provided with short conical teeth for rasping. The contraction and expansion of the opercular chamber helps in the grinding of the food staff into a paste

Keywords: *Garra nasuta* (McClelland, 1838), Relative gut length, Hepato somatic index, food and feeding habit

1. Introduction

Food is an important factor for growth. The knowledge of feed of fish is vital for the culture of fish. The growth process is specific for each species of fish, as for any other organism. Growth is a specific adaptive property, ensured by the unity of the species and its environment. The food spectra of an individual species changes along as the animal grows as well at different seasons and locality. Nature offers a great variety of food to fishes including nutrients in solution and hosts of different plants and animals. Little is known of the direct uptake of soluble nutrients by fishes. Fishes has adapted to a wide variety of foods such as feeding on planktons, plants, animals including larval form, blood of other fishes in parasitic fishes. Food and feeding habit of fishes are significant biological factors for choosing a group of fish for culture in ponds.

Garra is a genus of the largest Indian fresh water fish family- Cyprinidae. Cyprinidae family fishes are primarily food fish. The fish muscles are rich in proteins and micronutrients and hence serves as nutritive as well as a cheap source of protein (Basudha and Visvanath 1999). The genus Garra is found in the hill streams of Asia and Africa. In Northeastern India the *Garra gotyla* (Gray,1830) is found in all the states while *Garra nasuta* (McClelland, 1838) is found in Arunachal Pradesh, Assam, Meghalaya and Mizoram. *Garra nasuta* (McClelland, 1838) is commonly known as Khasi Garra and according to the IUCN Red Data, it is listed as Least Concern. The fishes of the genus are adapted to live in swift- flowing mountain streams with the help of small sucking disc on the lower lip that enables the fish to hold fast in strong current. In addition, the fish presses its body firmly against the bottom and further increases the surface in contact by the large paired fins. This modification helps the fish to live in mountain and hill streams as well as rapids.

Food and feeding habit of fishes are significant biological factors for choosing a group of fish for culture in ponds (Dewan and Saha, 1979). Food and feeding habit of different fishes have been made by many researchers like Moffet and Hunt (1943), Khan (1947), Karim and Hossain (1972), Doha (1974), Dewan and Saha (1979), Bhuiyan and Islam (1990), Reddy and Rao (1993), Akpan and Isangedhi (2005),

Khabade(2015), Tamlurkar (2018), Naganyal and Saxena (2019), Paul (2020). It was indeed Dey and Sarmah (2003), who made empirical studies on the nutrition of some native ornamental fish species of N.E. India hitherto remain unattended. In recent years *Garra* species has been recognized as an ornamental fish. In north east India, the ornamental fish trade is dependent on wild catch. For culture of ornamental fish, scientific knowledge of the feeding habit and food is important.

2. Methodology

The study was conducted from June 2020 to July 2022. Fish species were collected from the river Basistha of Kamrup (M) district of Assam.

For victual spectra study, an average of c 50 fishes per season was collected and preserved in 8-10% formaldehyde. A total of 200 fishes were analyzed during the period of study.

The gut content of test species was analyzed after Hynes (1950), and Lagler (1952, 1956). On an average of c 50 fishes per season is analyzed for victual spectra. The gut of each fish is cut open lengthwise on the ventral side by means of a pair of scissors and the entire gut was carefully removed from end to end. The entire alimentary canal was separated and spread on a board and the length of the alimentary canal was recorded with a graduated scale.

The entire digestive tube was cut open lengthwise and the contents were emptied into petri-dishes for analysis and the different food items were separated. The large food items were isolated and identified and the smaller food constituents were identified with the aid of microscope. All the food items were ascertained up to the genus or the family level, depending upon the completeness of the organism and the extent of digestion. If digestion has progressed to an advanced state making identification difficult, it was treated as digested matter. The food items were identified according to authoritative sources. The number of empty and guts with food were also observed.

The relative length of the gut (RLG) exhibits the precise relation between the gut dimension to the actual body length. The RLG was analysed after Jacobshagen (1913) using the formula, where GL – gut length and TL – total length of the fish in cm.

The hepato-somatic index (HSI), which is an estimation of the feeding intensity of the fish, was calculated by the formula, where w and W are the weight of the gut content and the fish respectively.

The feeding behaviour of the test species is also precisely investigated in the aquaria. Responses and reactions of the test specimens towards their food elements introduced into the eco-system are visually analyzed. The modus operandi of food capture and other related changes of the fish are precisely documented in aquarium condition.

The gills of the test species are dissected out and studied under the microscope to find out gill raker condition and correlated with food habit after Nikolsky (1963).

3. Result and Discussion

Relative length of gut

The relative length of gut (RLG) of the test species *Garra nasuta* (McClelland, 1838) studied is purported below in Table 1

SL	SIZE (TL cm)	GL(cm)	RLG (cm)	Range	Average	SD
1.	10.5	99.9	9.51	7.71- 9.62	8.83	0.61
2.	9	81.2	9.02			
3.	5.5	49.6	9.01			
4.	6.3	48.6	7.71			
5.	5.1	46.1	9.03			
6.	5.3	42.4	8.00			
7.	6.4	59.1	9.23			
8.	5.7	49.2	8.63			
9	5.2	44.6	8.57			
10.	6.1	58.7	9.62			

RLG values show a slight increase with fish size, this is indicative that larger fish may have a greater digestive capacity.

The HSI of *Garra nasuta* (McClelland, 1838) is studied and recorded below in a tabular form.

SL	TL (cm)	HSI	HSI RANGE	HSI MEAN	SD
1.	6.8	10.57			

2.	5.9	12.08	8.98-11.67	10.89	0.81
3.	6.4	10.66			
4.	10.5	11.03			
5.	9	10.90			
6.	5.3	8.98			
7.	5.5	10.93			
8.	6.3	11.67			
9.	5.7	11.17			
10.	6.1	10.90			

HSI shows a weak relationship with fish size.

Lineament of Feeding of *Garra nasuta*

Garra nasuta (McClelland, 1838) is a bottom feeder. Feeding among the pebbles of the river bed

Gill raker exposition

Particulars	Garra nasuta (McClelland, 1838)
Size range of fish	5.9 – 10.6 cm
No. of gill raker/gill arch	09
Length of gill lamellae	0.3 – 1. 2 cm
Length of gill arch	0.7 – 1.8 cm.

The RLG of the test species is 7.71- 9.6. True herbivores have an indices above 3, Das & Moitra (1956a). Therefore, it is inferred that the test species is herbivorous. Low and high RLG indices purport for the carnivores and herbivores respectively with an intermediate value prevailing for the omnivores. This is for the obvious fact that long intestine of the herbivores helps in the digestion and absorption of the vegetable matters than the carnivores whose diet is easily assimilated consisting of animal matter.

The Hepato-somatic Index (HSI) is widely used to infer feeding activity and nutrient availability in aquatic environments. The Hepato-somatic index (HSI), considered as an exponent of feeding intensity. The positive trend of HSI in *Garra nasuta* (McClelland, 1838) indicating a high availability of food resources in the habitat. This observation aligns with studies highlighting the correlation between HSI and environmental productivity (Nikolsky, 1963).

The gill rakers (GR) of fishes are variously modified (Das & Moitra, 1956, a,b, 1968); Kozhina 1958; Nikolsky, 1963; and Das & Nath, 1965), according to the feeding habits of the fish. In herbivores, GR are thin and long and closely set to serve a sieving function, GR are modified into flat and round platelike structure provided with short conical teeth for rasping. The GR configurations of the test fish species *Garra nasuta* (McClelland, 1838) are modified into flat and round plate- like structure provided with short conical teeth for rasping. The movement of the operculum along with the GR convert the food items into a paste.

Gill raker morphology plays a critical role in feeding efficiency and reflects dietary preferences (Das & Moitra, 1956, 1968; Kozhina, 1958; Nikolsky, 1963). The GR of *Garra nasuta* exhibit flat and rounded plate-like structures with short conical teeth. The structural adaptations of the GR are characteristic of rasping food. These feeding behaviour enables the coarse food to be broken down into a paste for the process of efficient digestion and aligns with the positive HSI trend. This is an adaptation for fast flowing water bodies where during the rainy season the water becomes turbid.

The food consists primarily of Algae of the Family Chlorophyceae- Volvox, Spirogyra, Family Myxophyceae- Oscillatoria, Nostocaceae- Nostoc but in certain cases plant materials have also been detected which is supposed to be secondary food item. Presence of sand particles are considered as incidental food.

4. Conclusion

The feeding habit of *Garra nasuta* indicates a positive trend in feeding intensity with a consistently high hepato somatic index across all individuals. The analysis confirms that the test species is herbivorous.

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