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# Food and Feeding habits of two Hill stream Fishes *i.e. Rasbora daniconius* and *Noemachielus botia* in selected streams of Southern Rajasthan, India

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# Abstract

The food preferences depend greatly on the nature of food available in the living habitat, environmental conditions, size or sexual stages of fish as well as inter and intra specific competition. During present investigation the food and feeding habits of Rasbora daniconious and Noemachielus botia were studied. Observations on the food and feeding habits of Rasbora daniconius revealed that it is a surface or sub surface feeder and omnivorous mainly feeding on insects and their larvae, microcrustaceans and rotifers which formed 64.5% as animal food. Plant food includes green algae, diatoms and plant parts which constituted 33.5% of total food. In contrast the observations on the food and feeding habits of Noemachielus botia revealed that it is a bottom feeder and carniomnivorous that mainly feeds on microcrustaceans and insect larvae. The animal food formed 65.3% and plant food constituted 19.9% of total food items.

Keywords: Food & Feeding habits, Rasbora daniconius, Noemachielus botia, omnivorous, carniomnivorous.

#### Introduction

Food is the basic requirement to all the organisms for various biological activities like growth, development and reproduction which take place at the expense of energy. A sound knowledge of food habits of fishes is a prerequisite for an understanding of their general biology, including vital aspects such as growth, breeding and migration<sup>1</sup>. The food and feeding habits of fish vary with the time of the day, season, size of fish, various ecological factors and different food substances present in the water body<sup>2</sup>.

The natural food of fishes has been classified under four groups<sup>3</sup> i.e.; i. main food or natural food which the fishes prefer under favorable condition and on which they thrive best, ii. secondary food is consumed by the fish when available, iii. incidental food enters the gut of fishes by chance with other items, and is rarely seen in the gut, iv. emergency and obligatory food is ingested by fishes in order to survive under unfavorable conditions when the natural or basic food is not available. Natural fish food may be broadly divided into four categories *viz.*, i. plankton ii. nekton, iii. benthos and iv. detritus.

Depending upon the variety of food items, fishes have been classified as i. euryphagic (feeding on a wide range of food items) or ii. stenophagic (feeding on a few different types of food items), and iii. monophagic (feeding on only a single food item). Thus, most of the fishes fall under the category of euryphagic fishes<sup>4</sup>. Recent work on food and feeding habits of different fishes has done by several workers<sup>5-16</sup>.

# **Materials and Methods**

During present investigation specimens were collected from selected streams of Aravalli region. Soon after collection, the live fishes were killed and 10% formalin solution was injected into the guts of the fishes in order to inhibit further digestion and rotting of the food items.

The fish specimen was dissected out and the stomachs were detached from the gut and weight of stomach was recorded and it was preserved in 4 % formalin. The stomach contents were collected in a glass vial making up the volume to 1 ml to determine different food items eaten by the fish both qualitatively and quantitatively.

The stomach contents were analyzed by following the methods viz, percent numerical count and percent frequency occurrence methods<sup>2</sup>.

Fi = 100 ni / n

Where: Fi = frequency of occurrence of the i food item in the sample; ni = number of stomachs in which the i item is found; n = total number of stomachs with food in the sample.

An important fact assessed by the examination of the stomach is the state or the intensity of feeding. This is judged by the degree of distension of the stomach or by the quantity of food that is contained in it. The distension of the stomach is judged and classified as 'gorged or distended', 'full', '3/4full', '1/2full',1/4 full, trace etc by eye estimation. The feeding intensity or gastro-somatic index (GSI) was calculated using the following formula<sup>17</sup>.

$$GSI = \frac{Weight of the gut}{Total weight of the fish} x 100$$

The present study deals with food and feeding of two hill stream fishes *i.e. Rasbora daniconius* and *Noemachielus botia*.

#### **Results and Discussion**

**Rasbora daniconius:** Total 35 specimens having a standard length ranges between 4.5 to 12.0 cm and weight 1.2 to 10.0 gms were collected during present study.

The gut content analysis revealed the presence of the following food items (Table-1 and Figure-1). i. **Insect Larvae**: Formed 15.5 % of the food item. ii. **Insects:** Constituted 13.5 % of the total food item consumed. iii. **Microcrustaceans**: Formed 31.3 % of the food composition. It included Copepodes and Cladocerans. iv. **Rotifers**: Formed 4.2%. v. **Green algae**: 12.5 % of the consumed food was algal matter. vi. **Diatomes**: Constituted 9.8 %. vii. **Plant matter**: Formed 11.2 % of the total food items. It comprised of parts of leaves, stems and roots of aquatic plants and semi digested vegetable matter. viii.

**Miscellaneous items**: Formed 2.0%. It included all other items in the gut like shell matter, crustacean and insect appendages, and unidentified materials.

The highest value of numerical percentage was shown by microcrustaceans (31.3%) followed by insect larvae (15.5%), insects (13.5%) and the lowest value was for miscellaneous items (2%). Observations on the food and feeding habits of *Rasbora daniconius* revealed that it is a surface or sub surface feeder and omnivorous that mainly feeds on insects, insect larvae and microcrustaceans. Insects, insect larvae, micro crustaceans and rotifers formed 64.5% as animal food and plant food includes green algae, diatoms and plant parts constituted 33.5% of total food item.

The overall feeding intensity 31.94 % stomachs were found full, 17.78 % were 3/4 full, 19.44 % were ½ full, 18.61% were ¼ full and 12.22% contained only trace amounts during the study period. None of the guts were gorged or empty. Fishes with full, 3/4 full and ½ full stomachs were considered to feed actively and fishes with ¼ full and trace amount stomachs were considered to feed inactively. The overall percentage occurrence revealed that 69.16% fish showed active feeding during the study period (Figure-2).

Table-1

Mean contribution of different food items of *Rasbora daniconius* on the basis of percentage numerical count and percentage frequency occurrence method (Total 35 specimens)

S.N.		Food item	Average % Numerical Count	Average % Frequency Occurrence	
	Animal Food				
А.	1.	Insects	13.5	71.42	
	2.	Insects larvae	15.5	91.42	
	3.	Cladocerans	18.8	62.85	
	4.	Copepods (Cyclops)	12.5	74.28	
	5.	Rotifers	4.2	34.28	
В.	Plant Food				
	1.	Green algae	12.5	51.42	
	2.	Diatoms	9.8	45.71	
	3.	Plant matter	11.2	40.0	
С.	Miscellaneous (unidentified matter)		2.0	48.57	



Figure-1 Average annual food items of *Rasbora daniconius* 

The gastrosomatic index of different months was observed. The Table-3 depicts intensity of feeding (in%) in various months showed that R. daniconius feed at different rate in various months. The pronounced high feeding intensity during post monsoon months (September-October) was observed when the gastrosomatic index were 5.15 and 4.75 respectively, 88.71% specimens showed active feeding, most of stomachs were full and contained good amount of food, while the feeding intensity was generally low during July and August (GSI 1.98 and 2.10 respectively) when stomachs contained poor amount of food. The feeding intensity was improved in January and February as the gastrosomatic indeces were recorded 3.45 and 3.65 respectively. Maximum number of stomachs were observed with poor food in the month of July which happens to be peak maturity period of the gonads of the fish and due to monsoon period. The result also agreed with the findings in Notopterus notopterus<sup>18</sup>, in Anabas testudineus<sup>19</sup>, in Xenentodon cancila<sup>20</sup>, in Aspidoparia morar<sup>21</sup>, in Nandus nandus<sup>22</sup>, in Rhinomugil corsula<sup>23</sup>, in Trachurrus trachurus<sup>24</sup>, and in Pseudosciaena polyactis<sup>25</sup>.

The occurrence of low feeding in other fishes coincide with their peak breeding has been reported by several workers<sup>26-29</sup>. The low feeding rate during the months of March and April was due to some factors other than breeding, it may be due to non availability of food or due to abiotic factors such as temperature and turbidity.

*Noemachielus botia:* Total 38 specimens having a standard length ranges between 4.0 to 5.5 cm and weight 1.0 to 2.5 gms were collected during present study.

The gut content analysis revealed the presence of the following food items (Table-2 and Figure-2). i. **Benthic microinvertebrates**: formed 46.5 % of the food consumed. It

comprised of cladocerans and copepods. ii. **Insect larvae & nymhs**: 18.8 % of total consumed food materials. It constituted ephemeropteran larva and nymph and Chironomous larva. iii. **Algal matter**: formed 12.3% of the gut content was algal matter. iv. **Detritus**: was 13.5 % of consumed food. v. **Plant parts**: 7.6 % of consumed food. It comprised of parts of leaves, stems and roots of aquatic plants and semi digested vegetable matter.

**Miscellaneous items**: Formed 1.3 % .It included all other items in the gut like shell matter, crustacean and insect appendages, and unidentified materials.

The observation revealed that the highest numerical percentage was shown by microcrustaceans (46.5%) followed by insects larvae (18.8%), algal matter (12.3%) and the lowest value was for miscellaneous items (1.3%). Observations on the food and feeding habits of *N.botia* revealed that it is a bottom feeder and carniomnivorous that mainly feeds on microcrustaceans and insect larvae. The animal food formed 65.3% and plant food includes constituted 19.9% of total food item.

The overall feeding intensity 34.55% stomachs were found full, 22.25% were 3/4 full, 22.77% were ½ full, 11.51% were ¼ full and 8.9% contained only trace amounts during the study period. None of the guts were gorged or empty. Fishes with full, 3/4 full and ½ full stomachs were considered to feed actively and fishes with ¼ full and trace amount stomachs were considered to feed inactively. The overall percentage occurrence revealed that 79.58% fish showed active feeding during the study period (Figure-2).

The gastrosomatic index of different months was observed. The Table-4 deplicts intensity of feeding (in %) in various months shows that *Noemachielus botia* does not feed at the same rate.

Table	-2
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# Mean contribution of different food items of *Noemachielus botia* on the basis of percentage numerical count and percentage frequency occurrence method (Total 38 specimens)

S.N.		Food item	Average % Numerical Count	Average % frequency occurrence
	Animal Food			
А.	1.	Benthic microinvertebrates	29.5	65.78
	2.	Insects larvae & nymphs	41.8	84.21
B.	Plant Food			
	1.	Algal matter	12.3	42.10
	2.	Plant matter	8.6	21.05
	3.	Detritus	6.5	31.57
C.	Misc	ellaneous(unidentified matter)	1.3	15.78

 Table-3

 Feeding intensity and gastro-somatic indices of *Rasbora daniconius* in different months

Months	No. of stomachs examined	Average GSI	Full %	<sup>3</sup> 4 Full %	½ Full %	<sup>1</sup> ⁄4 Full %	Trace amount %
May-13	32	3.15	25%	12.5%	31.25%	21.87%	9.38 %
June	28	2.85	32.14%	21.43%	21.43%	17.86%	7.14%
July	31	1.98	9.67%	12.90%	16.12%	3.22%	29.03%
Aug.	34	2.10	11.76%	14.70%	20.58%	32.35%	20.58%
Sep.	30	5.15	53.33%	20%	13.33%	6.67%	6.67%
Oct.	32	4.75	43.75%	25%	21.87%	6.25%	3.12%
Nov.	31	3.85	35.48%	25.81%	16.12%	12.90%	9.67%
Dec.	34	2.65	2.94%	14.70%	23.52%	20.59%	11.76%
Jan14	28	3.45	39.28%	17.86%	14.28%	10.71%	17.86%
Feb.	24	3.65	50.0%	20.83%	16.67%	8.33%	4.17%
Mar.	26	2.95	30.77%	15.38%	19.23%	23.07%	11.53%
Apr.	30	2.6	30%	13.33%	16.67%	26.67%	13.33%

Months	No. of stomachs	Average GSI	Full %	<sup>3</sup> 4 Full %	<sup>1</sup> ⁄2 Full %	<sup>1</sup> /4 Full %	Trace amount %
May-13	30 <b>2</b>	3.2	36.67	26.67	20	10	6.67
June	32	2.8	21.87	12.5	31.25	18.75	15.62
July	31	3.9	32.25	12.9	32.25	16.13	6.45
Aug.	34	4.1	41.17	26.47	17.65	8.82	5.88
Sep.	28	1.4	3.57	7.14	28.57	28.57	32.14
Oct.	35	3.1	31.43	22.85	25.71	14.28	5.71
Nov.	28	3.8	35.71	28.57	21.43	7.14	7.14
Dec.	32	2.7	25	34.37	25	6.25	9.37
Jan14	30	3.2	26.67	33.34	23.34	10	6.67
Feb.	34	3.1	35.29	23.53	26.47	8.82	5.88
Mar.	32	3.5	56.25	21.87	9.37	6.25	6.25
Apr.	36	5.6	61.11	16.67	13.89	5.55	2.78

 Table-4

 Feeding intensity and gastro-somatic indices of Noemachielus botia in different months



Figure-2 Average GSI of different months of *Rasbora daniconius* 



Figure-3 Average annual food items of *Noemachielus botia* 



Average GSI of different months of *Noemachielus botia* 

# Conclusion

Gut content analysis showed that the *Rasbora daniconius* is an opportunistic omnivore, feeds on various planktons and insect larvae whereas the fish *Noemachielus botia* is carniomnivorous that mainly feeds on microcrustaceans and insect larvae.

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