

Original Article**Seasonal Occurrence of Food and Feeding Habit of *Labeo bata*(Hamilton) (Cypriniformes : Cyprinidae)**Md. Abdur Razzaq Joadder¹**Abstract**

Food and feeding habits of fishes have a great significance in aquaculture practices. It helps to select such species of fishes for culture which will utilize all the available potential food of the water bodies without much competition with one another but will live in association with other fishes. This paper deals with the feeding intensity and food habits of *L. bata*. Food and feeding habit of freshwater minor carp *Labeo bata* (120 to 250 mm total length) were studied. The fish is a herbivore, feeding mainly on algae (22.32 %), higher plant parts (31.26 %), protozoans (7.42 %), crustaceans (15.33 %), insects (3.56 %), muds, sand, debris and detritus (16.32 %) and unidentified food materials (3.99%). [Journal of Science Foundation, 2014;12(1):7-15]

Keywords: *Labeo bata*, food, feeding habit, feeding season, length

Introduction

Food is the main source of energy and plays an important role in determining the population levels, rate of growth and condition of fishes. *Labeo bata* is a freshwater minor carp and locally known as Bhangana, Bhanga, Bata etc. It is found in rivers, canals, haors, baors, beels, ponda and ditches in Bangladesh. This fish is also distributed in India (Day, 1878). Its body length is 120 to 250 mm. The fish is considered to be one of the most important fish for its taste and high nutritive value.

Feeding is the dominant activity of the entire life cycle of fish (Royce, 1972). The success of good scientific planning and management of various fish species largely depends on the knowledge of their biological aspects in which food and feeding habits include a valuable portion. Nutrition of fish is directly related to the quantity of fish produced. Survey of available literature reveals that works on the food and feeding habits of fishes have been done by many workers in home and abroad like Mookerjee, *et al.*, (1946), Hynes, (1950), Das and Moita, (1955), Darnell and Meiroto, (1962), Ahmed and Akhtar, (1967), Dewan and Saha, (1979), Nargis and Hossain, (1987), Bhuiyan (1987), Bhuiyan and Islam, (1988) etc. A comparative study on the food and feeding habits of *Puntius stigma*; *M. vittatus* and *N. nandus* had been reported by Ahmed, *et al.* (1993), seasonal patterns of feeding of the freshwater fish, *C. fasciata* (Bloch) had been reported by Mustafa, *et al.* (1982); food of the fry of *C. mrigala* (Hamilton) reported by Bhuiyan and Islam (1990), food of the brackish water fishes *L. parsia* (Joadder and Hossain, 2008). No published information is available on the food and feeding habit of *L. bata*. The present study is aimed to obtain some knowledge about the food and feeding habits of *L. bata* with a view to select such species for poly culture to obtain an optimum yield by utilizing all the potential food of the water bodies without much competition. This fish is a good source of protein, calcium, essential amino acids, phosphate, magnesium, iodine, iron, vitamin B complex, E and A.

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Methodology

A total number of 428 specimens of *L. bata* was collected from local (river, beel and pond) areas in Rajshahi during the period from February 2007 to January 2009. The samples were collected once in every month. Just after collection, 10% buffered formalin solution was injected into the guts of all the fishes in order to stop digestion of food items. The stomach fullness of all the specimens were noted and the stomachs were classified into full, 3/4 full, 1/2 full, 1/4 full, 1/8 full and empty. The stomach of each specimen was dissected gut with a fine scissors and stomach contents were taken. Total alimentary canal length (ACL) was measured and total weight of food items of each fish was weighted by an electronic balance (Model-400EX, MFD by A and D Co. Ltd., Korea) and from the observed results the percentages of different food items were calculated month-wise throughout the study period by using the gravimetric method (Hynes, 1950). Afterwards the undigested gut contents were separated and estimated under a simple and binocular microscope (Magnification 10x) and categorized them under different taxonomic hierarchy by following Ward and Whipple (1959), Mellanby (1963), Needham and Needham (1972).

Results and Discussion

The seasonal feeding intensity percentage of fullness, seasonal pattern of feeding, percentage occurrence of food items as observed in the present study are shown in table 1 and table 2 . Out of 428 stomachs, 237 (55.28%) were with considerable amount of food and 191 (44.72%) were with negligible amount of food.

Table 1: The monthly variation in the percentage fullness of the stomach of *L. bata*

Mon.	Yr.	stomachs exam	Fullness			Emptiness		
			Full	¾ full	1/3 full	¼ full	1/8 full	Empty
			No (%)	No(%)	No(%)	No(%)	No(%)	No(%)
Feb.	'07	21	3(14.3)	5(23.8)	3(14.3)	3(14.3)	5(23.8)	2(9.5)
	'08	18	5(27.8)	4(22.2)	2(11.1)	4(22.2)	2(11.1)	1(15.6)
Mar.	'07	13	3(23.08)	4(30.8)	1(7.7)	3(23.1)	2(15.4)	0(0.0)
	'08	17	2(11.8)	4(23.5)	4(23.5)	2(11.9)	4(23.5)	1(5.9)
Apr.	'07	22	5(22.7)	4(18.2)	3(13.6)	7(31.8)	2(9.1)	1(4.5)
	'08	19	3(15.9)	5(26.3)	3(15.8)	5(26.3)	3(15.8)	0(0.0)
May	'07	21	0(0.0)	8(38.1)	5(23.8)	3(14.3)	3(14.3)	2(9.5)
	'08	17	1(5.9)	5(29.4)	4(23.5)	4(23.5)	2(11.8)	1(5.9)
Jun.	'07	17	2(11.8)	0(0.0)	7(41.2)	3(17.6)	3(17.6)	2(11.8)
	'08	14	0(0.0)	5(35.7)	4(28.6)	2(14.3)	3(21.4)	0(0.0)
Jul.	'07	16	5(31.2)	3(18.7)	2(12.5)	3(18.8)	1(6.2)	2(12.5)
	'08	15	3(20.0)	5(33.3)	1(6.7)	2(13.3)	4(26.7)	0(0.0)
Aug.	'07	22	7(31.8)	5(22.7)	6(27.3)	2(9.1)	1(4.5)	1(4.5)
	'08	21	6(28.6)	5(23.8)	4(19.1)	3(14.3)	2(9.5)	1(4.8)
Sep.	'07	19	4(21.1)	2(10.5)	5(26.3)	1(5.3)	4(21.0)	3(15.8)
	'08	23	3(13.0)	5(21.7)	3(13.0)	6(26.1)	4(17.4)	2(8.7)
Oct.	'07	17	2(11.8)	3(17.6)	2(11.8)	5(29.4)	3(17.6)	2(11.8)
	'08	14	1(7.1)	2(14.3)	2(14.3)	3(21.4)	4(28.6)	2(14.3)
Nov.	'07	18	0(0.0)	2(11.1)	2(11.1)	6(33.3)	5(27.8)	3(16.7)
	'08	14	0(0.0)	2(14.3)	1(7.1)	4(28.6)	5(35.7)	2(5.3)
Dec.	'07	19	2(10.5)	6(31.6)	3(15.8)	5(26.3)	2(10.5)	1(5.9)
	'08	17	2(11.8)	4(23.5)	3(17.6)	4(23.5)	3(17.6)	1(4.8)
Jan.	'07	21	0(0.0)	7(33.3)	5(23.8)	3(14.3)	5(23.8)	1(0.0)
	'08	13	1(7.7)	4(30.8)	3(23.1)	2(15.4)	3(23.1)	0(0.0)
Total		428	60	99	78	85	75	31

*Note: Fullness includes full, ¾ full, ½ full stomachs. Emptiness includes ¼ full, 1/8 full and empty stomachs.

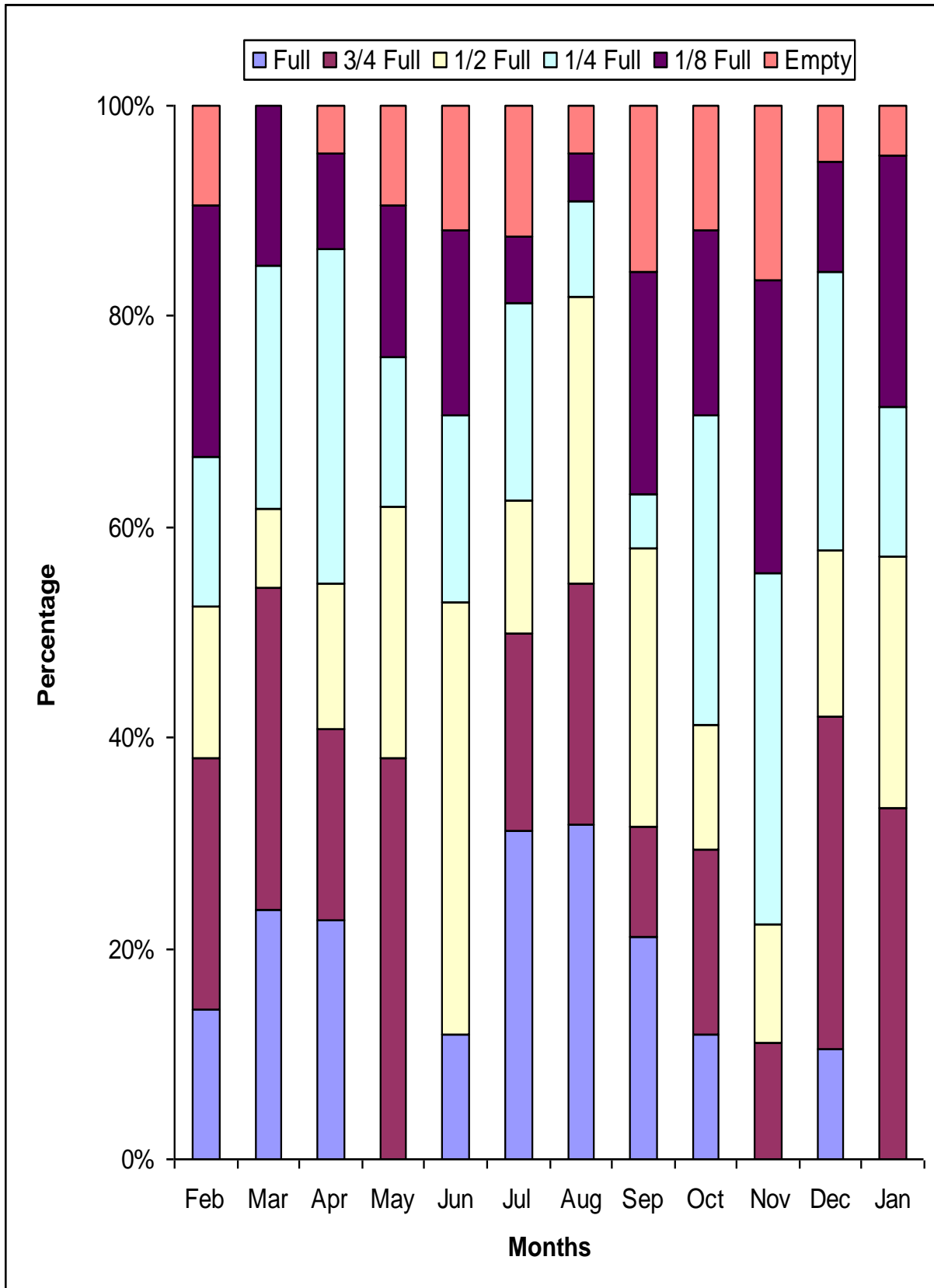


Figure 1: *L. bata*: Showing the monthwise percentage of fullness and emptiness of stomachs during (2 years observation)

Among these 60 (14.09%) were full, 99 (23.14%) were 3/4 full, 78 (18.04%) were 1/2 full, 85 (19.93%) were 1/4 full, 75 (17.52%) were 1/8 full and 31(7.28%) empty stomachs. It was observed that the highest percentage of fullness of the stomachs were in September (81.86% in 2007 and 71.43% in 2008). Afterwards the

percentage of fullness was found to decrease gradually and became the minimum in December (22.22% in 2007 and 21.42% in 2008) (Table 1). The highest percentage of emptiness of the stomachs was in December (77.78% in 2007 and 78.58% in 2008). After months the percentage of emptiness gradually decreased and the lowest percentage of emptiness in September (18.14% in 2007 and 28.57% in 2008) (Table 1 and Fig 1). The different food items as found in the stomach of *L. bata* in different months are as follows:

Algae

This item included Chlorophyceae (*Volvox*, *Ulothrix*), Cyanophyceae (*Anabaena*, *Nostoc*), Bacillariophyceae (*Diatoma*). The study period in 2007 the highest percentage of algae obtained in September (33.40% in 2007) and the lowest in June (11.70% in 2007). While that in 2008 the highest percentage was recorded in September (31.70% in 2008) and the lowest in June (10.95% in 2008). The average occurrence of algae was 22.32%. The average occurrence of Chlorophyceae was 11.31%, Cyanophyceae was 2.50%, Bacillariophyceae was 8.51% (Table 2 and Fig 2 & 3).

Higher plant parts

Leaves, stems and sometimes the roots of higher aquatic plant parts were found in the stomach contents of *L. bata*. The highest percentage of higher plant parts occurred in May (40.20% in 2007) and the lowest in August (22.50% in 2007). In the second observation the highest percentage was observed in December (39.70% in 2008) and the lowest in August (20.30% in 2008). The average percentage higher plant parts was 31.26% (Table 2 and Fig 2 & 3).

Protozoan

Protozoan mainly consisted of *Paramecium*, *Anomalina*, *Operculina*, *Euglena*, *Rotalia* and *Vorticella*. In the first observation the highest percentage of Protozoan was recorded in September (11.10 % in 2007) and the lowest in May (3.80 % in 2007). In the second observation the highest percentage was observed in January (9.90 % in 2008) and the lowest in May (3.95 % in 2008). The average percentage of Protozoan was 7.42% (Table 2 and Fig 2 & 3).

Crustaceans

This item included Copepods of *Cyclops*, *Eucyclops*, *Diaptomus* and *Calanus*, Ostracods of *Cypris* and *Eucypris*, Cladocerans of *Daphnia*, *Moina* and *Diaphanosoma*, Decapods of prawn larvae. The occurrence of crustaceans in the stomach of *L. bata* was the highest percentage in November (21.20 % in 2007) and the lowest in April (7.80 % in 2007) in the first observation while in the second observation the highest percentage in December (19.00 % in 2008) and lowest in March (7.10 % in 2008) and the average was 15.33 % (Table 2 and Fig 2 & 3).

Insects

The insect comprised a little portion of the percentage occurrence of the stomach contents of adult *L. bata*. The insects were presented by mosquito larvae, chironomid larvae and *Haliopus*. In the first observation the highest percentage of insect was recorded in the month of September, 2007 (8.40%) and lowest in March, 2007 (2.00%). In the second year observation the highest percentage of insects was noticed in the month of September, 2008 (7.70%) and lowest in December, 2008 (1.75%). The average occurrence of insects over two years observation was 3.56% (Table 2, Fig. 2 & 3)

Muds, Sand , Debris and Detritus

The maximum quantity of these materials in the first observation was recorded in July (21.30 % in 2007) and the lowest in January (11.30 % in 2008) while in the second observation the highest percentage was noticed in June (20.10 % in 2008) and the lowest in August (9.20 % in 2008) and the average was 16.12 % (Table 2 and Fig 2 & 3).

Table 2: The monthly percentage composition of the food items of *L. parsia*

Name of Month	Name of Year	Number of specimens	Food items									
			algae	Algae			Higher plant parts	Protozoans	Crustaceans	Insects	Muds, sand, debris & detritus	Unidentified Food materials
				Chloro phyceae	Cyano phyceae	Bacillario phyceae						
Feb.	'07	21	18.1	10.0	2.1	6.0	31.1	8.0	18.1	2.2	20.2	2.1
	'08	18	19.1	7.1	2.4	9.5	32.1	7.4	16.8	2.5	19.3	2.1
Mar.	'07	13	27.4	16.4	3.0	8.9	29.0	6.4	13.7	2.0	18.3	3.2
	'08	17	28.1	3.4	4.1	10.5	29.3	9.5	7.1	2.1	19.8	4.1
Apr.	'07	22	25.6	12.2	3.6	9.7	32.2	8.7	7.8	2.8	18.9	4.0
	'08	19	26.3	16.0	1.9	8.3	28.3	9.1	11.2	3.2	17.5	4.4
May	'07	21	20.8	8.4	2.2	10.1	40.2	3.8	10.5	2.1	15.7	6.9
	'08	17	18.2	10.7	3.5	3.9	39.7	3.9	15.4	3.0	16.4	3.3
Jun.	'07	17	11.7	3.1	1.5	7.1	36.4	5.2	18.8	4.1	14.2	2.4
	'08	14	10.9	6.0	2.1	2.8	39.1	6.9	17.1	2.3	20.1	2.5
Jul.	'07	16	22.1	12.3	3.1	6.7	33.5	5.2	16.2	4.3	21.3	6.4
	'08	15	21.3	8.0	2.4	10.8	34.5	5.7	14.1	5.0	15.3	4.1
Aug.	'07	22	30.1	13.8	4.2	11.0	22.5	9.4	19.1	5.2	13.1	2.6
	'08	21	29.1	17.1	1.2	10.7	20.3	9.9	18.9	6.1	9.2	4.9
Sep.	'07	19	33.4	19.0	3.1	11.2	27.8	4.4	10.1	8.4	11.5	4.3
	'08	23	31.7	15.4	2.1	14.2	26.3	6.1	12.2	7.7	13.2	2.8
Oct.	'07	17	18.5	8.5	3.7	6.3	28.8	11.1	14.7	3.3	16.9	5.9
	'08	14	18.1	8.1	1.9	8.1	29.6	9.6	13.4	2.8	19.7	6.8
Nov.	'07	18	21.1	11.0	2.1	8.0	27.1	7.3	21.2	3.8	14.2	5.2
	'08	14	20.3	9.1	2.4	8.7	27.6	6.9	17.4	4.1	17.7	6.1
Dec.	'07	19	29.1	12.6	4.3	12.1	28.5	5.7	18.1	2.0	12.6	3.9
	'08	17	27.3	16.6	3.0	7.6	32.6	4.6	19.0	1.7	12.7	2.0
Jan.	'07	21	17.6	9.9	2.0	5.7	36.7	8.9	20.9	2.1	11.4	1.9
	'08	13	13.8	7.1	1.7	4.9	38.3	9.9	16.8	2.5	14.6	2.8
Total		428										
Mean ± SD			22.32 ±6.31	11.31 ±4.05	2.50 ±0.88	8.51 ±2.77	31.26 ±5.24	7.42 ±2.27	15.33 ±3.94	3.56 ±1.79	16.12 ±3.33	3.99 ±1.40

*Note: 1st observation February 2007 to January 2008, 2nd observation February 2008 to January 2009.

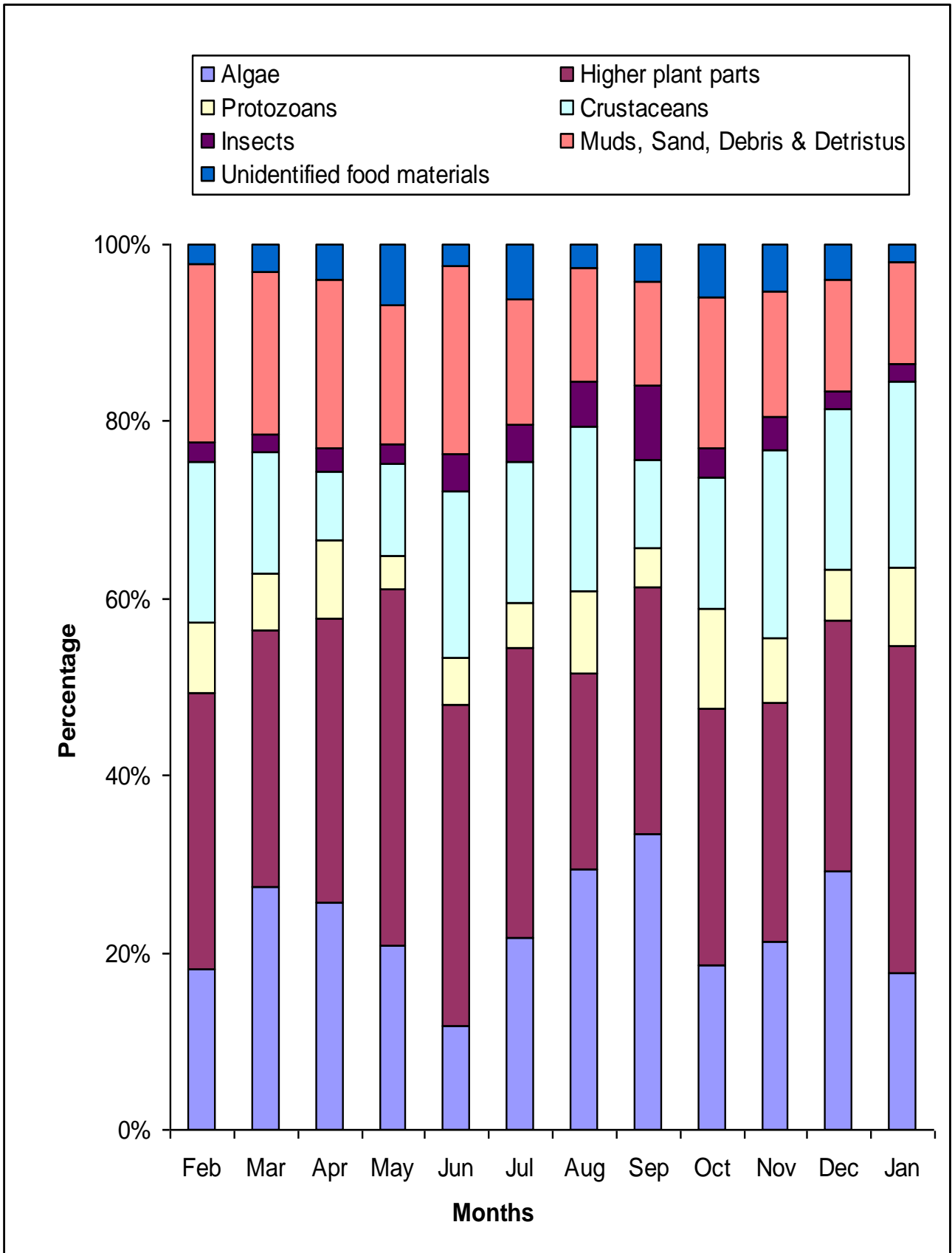


Figure 2: *L. bata*: Monthly variation in the percentage composition of different groups of food items of adult during (2 years observation)

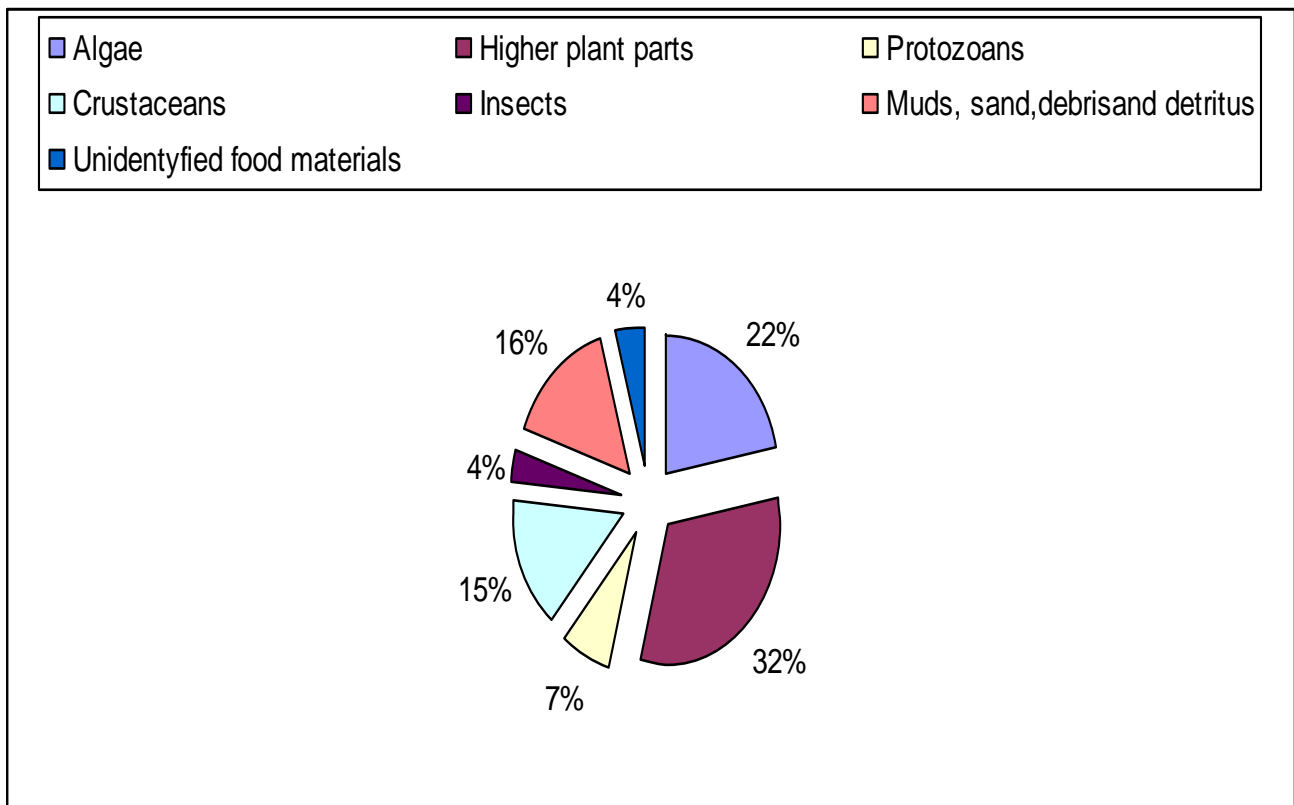


Figure 3: *L. bata* Percentage occurrence (mean) of different food items (Two years observation).

Unidentified food materials

The highest percentage of unidentified food materials was recorded in May (6.90 % in 2007) and the lowest in January (1.95% in 2008) in 2007 while the highest percentage was observed in October (6.80 % in 2008) and the lowest in December (2.00%) and average percentage was 3.99% (Table 2 and Fig 2 & 3).

Feeding in relation to sexual cycle

The intensity of feeding in case of mature fishes was found to be very poor during the months of May, June and July which is the peak spawning season of this fish. It was also observed that the maximum number of empty stomachs was recorded during the spawning season (June to August). The mature fishes showed active feeding intensities in the other months. But the immature fishes were found to feed actively during these months. Thomas (1969) stated that this low feeding activity may not be due to shortage of food items but due to the spawning season of the fish.

Relationship between total length (TL) and alimentary canal length (ACL) : The relationship between the total length and alimentary canal length was obtained (Fig. 4). The mean total length (TL) of this fish was 161.38 ± 25.25 mm and the mean alimentary canal length (ACL) was 756.25 ± 140.09 . The total length and alimentary canal length ratio was 1: 4.69.

The regression equation is $ACL = - 125.16 + 5.46 TL$ ($r = 0.984$).

The relation between the total length and alimentary canal length indicates that *L. bata* is a herbivorous fish. Like other fishes, this fish changed its food and feeding habit with the change of season. These findings agree with the works of Dewan and Saha (1979) in case of *Tilapia nilotica*, Nargis and Hossain (1987) in case of *Anabas testudineus*, Bhuiyan *et al.* (1999b) in case of *Mugil cephalus* and Joadder and Hossain (2008) in case of *Liza parsia*.

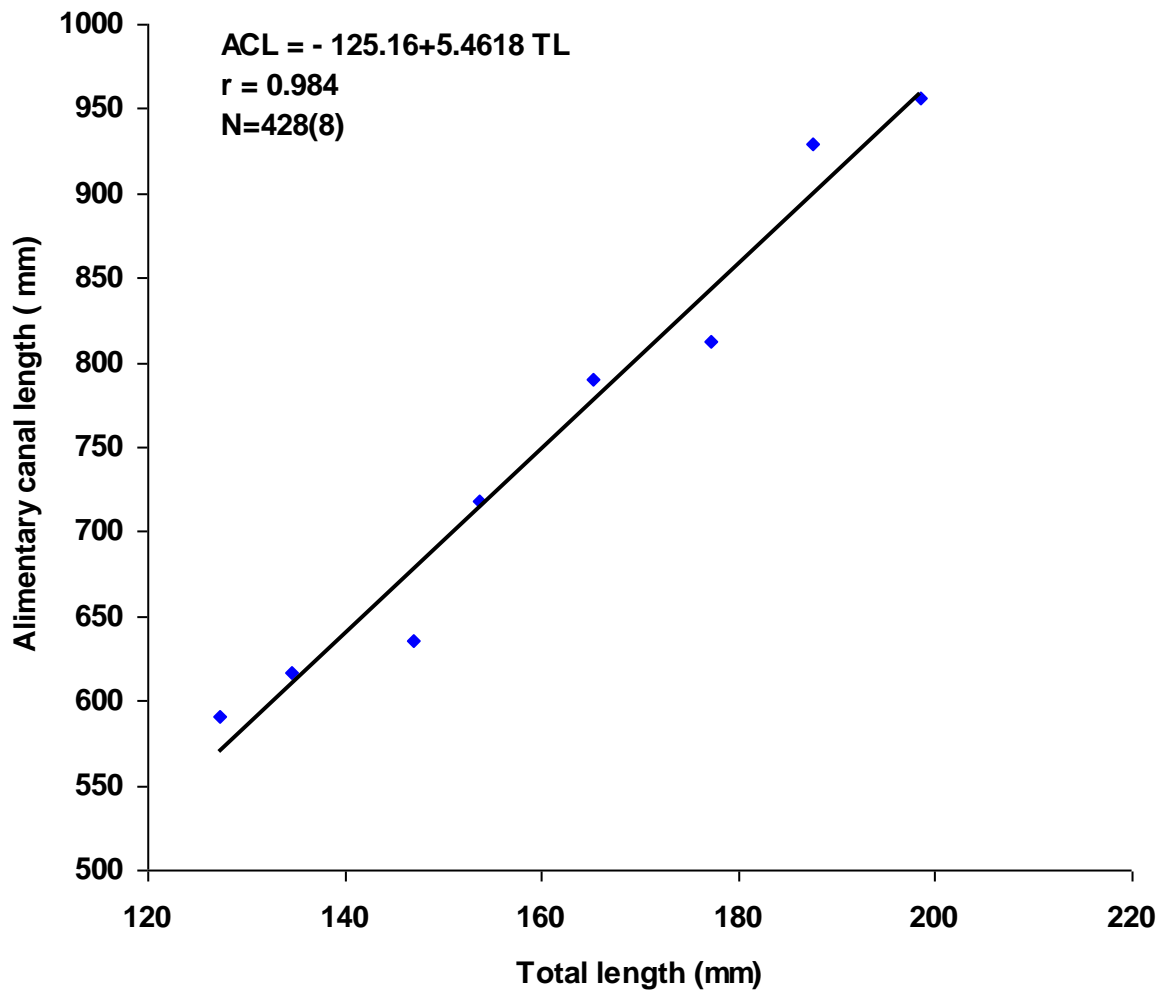


Figure 4: Relationship between Total length (TL) and Alimentary canal length (ACL) of *L. bata*

Conclusion

The present study showed different body lengths are depended upon total length. The total weight also depends upon the total length. The food and feeding habit of fishes vary from different fish consume different types of food. So the study of food and feeding habit has immense ecological values to select the culturable species and to avoid inter specific competition. The present investigation reveals that the most important food items of *L. bata* is algae, aquatic plants, protozoans and crustaceans. The fish is herbivorous in feeding habit. This research work provides an important baseline study on food and feeding habit of this minor carp (*L. bata*) from Bangladesh. The results of the study would be an effective tool for fishery biologists, managers and conservationists to initiate early management strategies and regulations for the sustainable conservation of the remaining stocks of this species in the aquaculture ecosystem.

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