

FOOD AND FEEDING HABIT OF *CYPRINUS CARPIO* VAR. *SPECULARIS*

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ABSTRACT

The study was carried out from November 2010 to August 2011. A total of 137 specimens of *Cyprinus carpio* var. *specularis* were collected from Naogaon municipal fish market, Shabi hat fish market, Niamatpur fish market and directly from the culture pond of Naogaon district. The month-wise collection and experiments were made to show the seasonal variation in food choice, and feeding habit of the fish. The highest percentage of empty stomach was in the month of April 2011 (56.67%) and the lowest percentage of empty stomach was in the month of August 2011 (26.32%). The highest percentage of full stomachs was found in the month of August 2011 (73.68%) and the lowest percentage of full stomachs was found in April 2011 (43.33%). The analysis of stomach contents of *C. carpio* var. *specularis* revealed that the food of the fish consists of aquatic plant parts (20.12%), phytoplankton (16.46%), zooplankton (19.69%), debris and detritus (22.00%), insects (6.78%) and semi-digested materials (14.83%). The highest percentage (33.26%) of aquatic plant parts were observed in June 2011 and the lowest percentage (8.80%) in December 2010. The average total length was 37.83±6.96 cm and the average alimentary canal length was 100.63±7.89 cm.

Keywords: Food and feeding habit, *Cyprinus carpio* var. *specularis*, alimentary canal

INTRODUCTION

Food and feeding habit of fish are important biological factors for selecting a group of fish for culture in ponds to avoid competition for food among themselves and live in association and to utilize all the available food (Dewan and Saha, 1979). It is virtually impossible to gather sufficient information of food and feeding habit of fish in their natural habitat without studying its gut contents. A thorough knowledge on the food and feeding habit of fishes provide keys for the selection of culturable species and the importance of much information is necessary for successful fish farming. The food habit of different fish varies from month to month. This variation is due to changes in the composition of food organisms occurring at different seasons of the year. Studies on the food and feeding habit of different fishes have been made by many workers like Moffet and Hunt (1943), Khan (1947), Hynes (1950), Karim and Hossain (1972), Doha (1974), Dewan and Saha (1979), Jhingran (1983), Bhuiyan and Haque (1984), Bhuiyan and Islam (1990, 1991), Hossain *et al.* (1991), Bhuiyan *et al.* (1997, 1998, 1999) and others. Jhingran (1983) stated that the natural food of fishes are classified under three groups (i) Main food (ii) Occasional food and (iii) Emergency food. The stimuli to food are of two kinds: (a) factors affecting the internal motivation or drive for feeding, including season, time of day, light intensity, lime and nature of last feeding, temperature and any internal rhythm that may exist;

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(b) food stimuli perceived by the sense like smell, taste, sight and the lateral line system that release and control the momentary feeding act.

The knowledge of food and feeding habit helps to select such species of fish for culture and produce an optimum yield by utilizing all the available potential food of the water bodies without any competition. The present study deals with the food mid feeding habit of *C. carpio* var. *specularis*, observe the stomach contents and the relationship between total length and alimentary canal length.

MATERIALS AND METHODS

A total of 137 specimens of *C. carpio* var. *specularis* were collected from November 2010 to August 2011. The month-wise collection and experiments were made to show the seasonal variation in food choice, and feeding habit of the fish. Just after collection 10% formalin solution was injected into the gut of all the fishes in order to stop digestion of food items. All the experiments were carried out in the laboratory of the Dept. of Fisheries, University of Rajshahi, Some fresh and live specimens were also examined.

The stomach of the fishes were dissected with the help of a simple scissors and the stomach contents were taken into a petridish and the food items were identified by (Magnification 5X, 10X) and weighted in an electronic balance. Gravimetric method (Hynes, 1950; Pillay, 1954) was followed for estimation of the percentage composition of food items.

The relationship between total length and the alimentary canal length and total length and stomach length the well known statistical formula was-

$$Y = a + bX$$

Where,

Y = alimentary canal length (ACL), X = Total length (TL), 'a' is the interception on the ordinate and 'b' is the regression co-efficient.

RESULTS AND DISCUSSION

Seasonal feeding intensity

The results of the analysis of 137 stomachs of the fishes have been presented in the Table 1 and 2 which is shown fullness of stomach of *C. carpio* var. *specularis*. Out of the 137 stomachs examined 61.88% contained food and the rest 38.22% were without food, which varied from months to month. Among these 16 were full, 24 were $\frac{3}{4}$ full, 21 were $\frac{1}{2}$ full, 21 were $\frac{1}{4}$ full and 17 were empty. The highest percentage of empty stomach was in the month of April 2011 (56.67%) and the lowest percentage of empty stomach was in the month of August 2011 (26.32%). The highest percentage of full stomachs was found in the month of August 2011 (73.68%) and the lowest percentage of full stomachs was found in April 2011 (43.33%) (Table 1).

The maximum number of $\frac{3}{4}$ full stomachs was observed in February 2011 and the minimum number of $\frac{3}{4}$ full stomachs was recorded in the month of December, 2010. The condition of feed was also related to maturity of fish. Immature fishes were found to feed with almost equal intensity throughout the year. These findings clearly indicated that the feeding intensity of juvenile fishes is increased. The rate of feeding activity based on monthly variation was also recorded by Moffet and Hunt (1943) and Khan (1947) in their study on blue gill and *Labeo rohita* respectively. Studies on the food and feeding

habits have been made by many workers like, Hynes (1950), Mustafa *et al.* (1981), Bhuiyan *et al.* (1997, 1998, 1999) etc.

Table-1: Season and feeding activity of *Cyprinus carpio* var. *specularis* (based on number of fish, percentage of fullness and emptiness)

| Year | Months | Number of fishes examined | Percentage of fullness | Percentage of emptiness |
|-----------------|--------|---------------------------|------------------------|-------------------------|
| 2010 | Nov | 18 | 72.56 | 27.44 |
| | Dec | 16 | 59.16 | 40.84 |
| 2011 | Jan | 20 | 68.27 | 31.73 |
| | Feb | 13 | 69.88 | 30.12 |
| | Mar | 14 | 65.00 | 35.00 |
| | Apr | 10 | 43.33 | 56.67 |
| | May | 12 | 64.77 | 36.23 |
| | Jun | 10 | 56.14 | 43.86 |
| | Jul | 16 | 46.00 | 54.00 |
| | Aug | 08 | 73.68 | 26.32 |
| Mean± Sd | | 137 | 61.88± 8.77 | 38.22± 9.34 |

N. B: Fullness includes full, $\frac{3}{4}$ full and $\frac{1}{2}$ full stomachs. Emptiness includes $\frac{1}{4}$ full and empty stomachs

Seasonal patterns of feeding based on percentage occurrence of food items

The findings of the study shown that the food items of *C. carpio* var. *specularis* consists of aquatic plant parts, phytoplankton, zooplankton, debris and detritus, insects and semi-digested food materials. The analysis of stomach contents of *C. carpio* var. *specularis* revealed that the food of the fish consists of aquatic plant parts (20.12%), phytoplankton (16.46%), zooplankton (19.69%), debris and detritus (22.00%), insects (6.78%) and semi-digested materials (14.83%). The highest percentage (33.26%) of aquatic plant parts were observed in June 2011 and the lowest percentage (8.80%) in December 2010. The highest percentage (25.36%) of phytoplankton was observed in January 2011 and the lowest percentage (10.13%) in June 2011. The highest percentage (26.29%) of zooplankton was observed in April 2011 and the lowest percentage (12.28%) in December 2010. The highest percentage (31.27%) of debris and detritus was observed in November 2010 and the lowest percentage (14.22%) in April 2011. The highest percentage (9.51%) of insects was found in December 2010 and the lowest percentage (4.0%) in June 2011. The highest percentage (35.61%) of semi-digested materials was found in December 2010 and the lowest percentage (6.46%) in June 2011 (Table 2 and Fig. 1). Debris and detritus parts were very dominant food item of *C. carpio* var. *specularis*. Joadder and Hossain (2008) reported that the crustaceans and molluscs were very dominant food items in *C. carpio* var. *specularis* throughout the year.

Table-2: Percentage of major food items found in the stomach of different size of *Cyprinu carpio* var. *specularis*

| Food items | Size of the fish | | |
|-------------------------|------------------|---------------------|-----------------|
| | Young (8-16cm) | Juvenile (17-29 cm) | Adult (30-90cm) |
| Phytoplankton | 13.78 | 5.53 | 5.31 |
| Algae | 18.33 | 11.38 | 12.05 |
| Aquatic plant materials | 7.18 | 10.25 | 12.36 |
| Zooplankton | 10.12 | 1.74 | 2.33 |
| Protozoans | 8.20 | 8.20 | 11.26 |
| Crustaceans | 5.30 | 6.17 | 7.13 |
| Insects | 3.07 | 2.98 | 2.76 |
| Molluscans | 14.37 | 4.92 | 5.42 |
| Debris and detritus | 18.35 | 27.36 | 28.05 |
| Sand and muds | 1.30 | 22.48 | 13.33 |

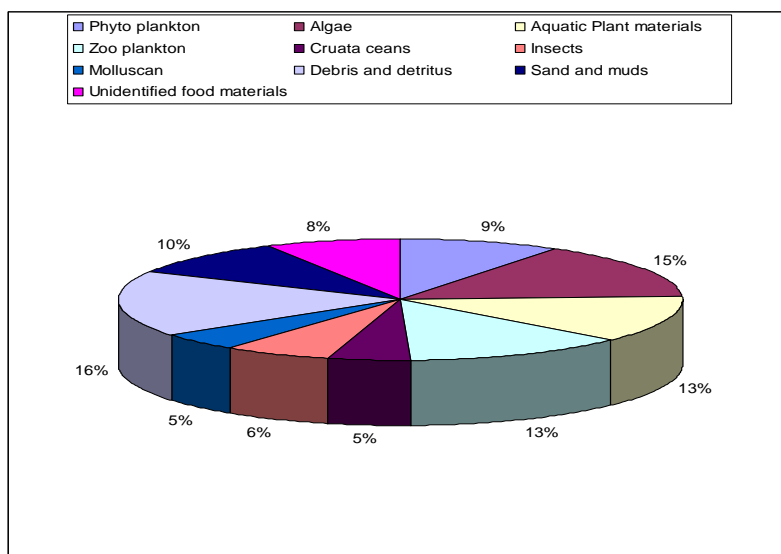


Fig. 1. Percentage occurrence of different food items of *Cyprinus carpio* var. *specularis*

Total length and alimentary canal length relationship

The alimentary canal length was larger than the total length. The average total length was 37.83 ± 6.96 cm and the average alimentary canal length was 100.63 ± 7.89 cm (Table-3). The ratio of total length and alimentary canal length was 1: 2.66. Total length (TL) and alimentary canal length (ACL) of *Cyprinus carpio* var. *specularis* were positively correlated (Table-4). The regression equation was obtained as in total length and alimentary canal length, $ACL = 19.709 + 2.1393 TL$ and the coefficient of correlation, $r = 0.853$ (Fig. 2).

Mathematical relationship between total length (TL) and alimentary canal length (ACL) was established and shown positive linear relationship. It was observed that the alimentary canal length is larger than the total length. It was recorded that the total length of various size groups was

37.83±6.96cm in average and the alimentary canal length of various size groups were 100.63±7.89 in average. The ratio of body length and alimentary canal length was recorded as 1: 2.66. The value of co-efficient of correlation, $r = 0.853$ which indicates that there is positive correlation between the variables. Joadder (2006) reported that the TL and ACL ratio of *Gagata youssoufi* was 1: 0.97, the calculated regression equation was $ACL = -2.1161 + 0.5841 TL$ ($r = 0.966$).

Table 3: The mean Total length (TL) and Alimentary canal length (ACL) ratio of the *Cyprinus carpio* var. *specularis*

| No. of examined fish | Mean ACL cm | Mean TL | TL:ACL |
|----------------------|---------------------|--------------------|----------------|
| 42 | 94.23 | 35.19 | 1:2.68 |
| 38 | 97.86 | 36.12 | 1:2.71 |
| 39 | 99.72 | 39.47 | 1:2.53 |
| 40 | 103.20 | 38.26 | 1:2.70 |
| 41 | 108.16 | 40.10 | 1:2.70 |
| Mean±SD | 100.63 ±7.89 | 37.83 ±6.96 | 1: 2.66 |

Table-4: The value of constant intercept "a" regression co-efficient "b" co-efficient of correlation "r" the ratio of ACL and TL of *Cyprinus carpio* var. *specularis*

| Relationship | | Values of "a" | Values of "b" | Values of "r" |
|--------------|-------------------------|---------------|---------------|---------------|
| Ordinance(Y) | Abscissa(X) | | | |
| Total length | Alimentary canal length | 19.709 | 2.1393 | 0.853 |

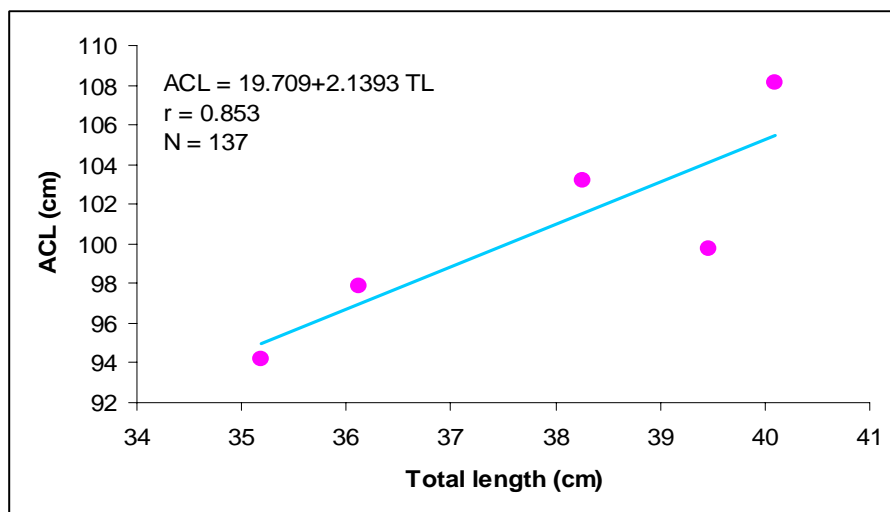


Fig. 2: Relationship between total length (TL) and alimentary canal length (ACL) of *Cyprinus carpio* var. *specularis*

Food habit

The food items of *C. carpio* var. *specularis* were classified into 6 groups. *C. carpio* var. *specularis* is mostly omnivorous in nature. Among the food items zooplankton and debris and detritus were most

dominant followed by the aquatic plant parts, phytoplankton, zooplankton, debris and detritus, insects and semi-digested food materials. In this case the nature of this fish is omnivorous because also feeds on zooplankton in culture ponds.

It was observed that the feeding intensity of *C. carpio* var. *specularis* in matured fish was poor and the feeding intensity was very poor in spawning period. The feeding intensity of immature fishes was found to feed actively. The food and feeding habits of fishes vary from month to month. This variation is due to the changes in the composition of food organisms occurring at different seasons of the year (Bhuiyan *et al.*, 1997, 1998, 1999).

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