

On the food and feeding habits of the carp *Labeo calbasu* (Hamilton, 1822) in Vadavar river of Tamil Nadu, South India.

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Abstract

The food and feeding habits of the most economically important fish *Labeo calbasu* of Vadavar river, Tamil Nadu, South India were examined between April 2010 and March 2011. Monthly percentage composition of food items in *Labeo calbasu* showed that the fish feed on various food items. The food types recorded are diatoms, blue green algae, green algae, non-motile green algae, pigmented algae, plant matter, crustacean appendages and insects, zooplankton, mollusc fragments and others which include unidentified items. There were no remarkable differences in the quantity of food items in the stomach of juvenile, male and female.

Keywords: aquaculture, fisheries, fresh water fishes, food and feeding, intensity, *Labeo calbasu*

INTRODUCTION

Food and feeding habit of fishes have a great significance in aquaculture practice. It helps to select such species of fishes for culture which will utilize all the available potential food of the water bodies without any competition with one another but will live in association with other fishes. Fish must exploit food in aquatic environment and the adaptation for these is source of some morphological traits related to feeding. Understanding the relationship between body structures and fish diet could be important for predicting their diet, how they feed and the mechanics of feeding. Studies on gut composition could provide useful information in positioning of the fishes in a food web in their environment and in formulating management strategy options in multi species fishery. The data on stomach composition of fish is vital in providing straight forward models of stomach content dynamics (Guruge, 2002).

The literature on the food and feeding habits of some Indian freshwater fishes are available viz., *Labeo rohita* (Sarphi, 1939; Das and Moitra, 1955a, 1955b; Vasist, 1960, Khan and Siddiqui, 1973); *Catla catla* (Natarajan and Jhingran, 1963); major carps (Mookherjee and Ghose, 1945); *Ophiocephalus punctatus*, *Barbus stigma* and *Callichrous bimaculatus* (Qayyum and Qasim, 1964a, 1964b and 1964c), *Mystus seenghala* (Saigal, 1964), *Labeo bata* and *Labeo goniuis* (Chatterji, 1974) *Labeo calbasu* (Mookherjee et.al., 1947; Das and Moitra,

1955 a and 1955 b) and *Puntius sarana* (Khumar and Siddiqui, 1984). In spite of considerable importance of *Labeo calbasu* as a food fish little is known about the diet of this species.

MATERIALS AND METHODS

In this study the freshwater fish orange fin labeo *Labeo calbasu* (Hamilton, 1822) (vernacular name is Karuppu chel) were collected from a branch of Kollidam river namely Vadavar river which is located in the region of 11° 15' N latitude and 79° 39' E longitude. This study area is 26 km away from Kumbakonam town on the way to Chennai. It has 22.7km length, 45 feet breadth and 18 feet depth and ends in Veeranam lake.

Fish samples were obtained from the fishermen catches using cast nets, hooks and lines. A total of 110 fishes of different size, maturity and sex groups were collected randomly during the period of April 2010 to March 2011. Immediately, after collection the fishes were preserved in 5% formalin to prevent the break down of the food materials. In the laboratory, fishes were washed, cleaned and total length in cm and total weight in g of each fish was measured and then the quantitative analysis of stomach contents of each fish was done by percentage of frequency of occurrence method (Dewan and Sliaha, 1979) and numerical method (Crisp et al., 1978). The different food items eaten by the fishes were identified under microscope by following keys given by Pennak (1953), Ward and Whipple (1959), Needham and Needham (1962) and Prescott (1962).

The gut contents of each stomach was analyzed separately. The stomach of individual fish was cut open and removed on to a petri dish with the help of very fine forceps. The percentage of occurrence of a

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particular food item was calculated on the basis of the following formula.

$$\text{Percentage of Occurrence of a food item} = \frac{\text{Number of gut where the food occurred}}{\text{Total No. of gut analysed}} \times 100$$

The intensity of feeding was determined by gastro-somatic index i.e.gut expressed as percentage of body weight.

RESULTS

The results on the stomach contents of *Labeo calbasu* are presented in Table 1 and 2. The food items were mainly diatoms, blue- green algae, green algae, non – motile green algae, mollusc fragments, plant matter and crustacean appendages and insects. The less significant food groups were zooplankton and pigmented algae.

The occurrence of food groups varied during the study period. Diatoms were the main items of the diet of the fish throughout the year as it occurred more on an average both numerically (37.7%) and by occurrence (27.4%). Diatoms were represented by *Navicula*, *Nitzschia*, *Gyrosigma*, *Synedra*, *Fragillaria*, *Pinnularia*, *Cymbella*, *Gomphonema*, *Austerionella*, *Tabellaria*, *Cyclotella*, *Surirella*, *Acanthes*, *Striatella* and *Thalassioria*. *Navicula* and *Nitzschia* were found to be dominated among the diatoms throughout the study period followed by *Gyrosigma*, *Synedra* and *Fragillaria* and some species like, *Surirella*, *Acanthes*, *Striatella*, *Thalassioria* and *Austerionella* occurring in least quantities.

Blue green algae were the next important food item with numerically (33.6%) and by occurrence (33.5%). The blue

green algae were represented by *Oscillatoria*, *Phormedium*, *Microcystic*, *Anabaena*, *Rivularia* and *Gleotrchia*. Of these except *Rivularia* and *Gleotrchia* others were highly frequent in occurrence. Green algae constituted 19.5% of the diet of *Labeo calbau* in both numerical and per cent occurrence. Green algae in the diet of the fish were *Spirogyra*, *Scendesmus*, *Ulothrix*, *Zygnema*, *Oedogonium*, *Coelastrum*, *Pediastrum*, *Ankestrodesmus*, *Mougeolia*, *Volvox colony*, *Staurastrum* and *Cladophora*. Among these *Spirogyra*, *Scendesmus*, *Zygnema*, *Pediastrum* and *Ankestrodesmus* were more frequent in the diet of the fish followed by *Mougeolia*, *Volvox colony* and *Staurastrum* and *Cladophora* were rarely eaten by the fish.

Mollusc fragments were the next preferred item of food of the fish contributing annually at an average of 12.2 % numerically and 12.2% by occurrence. The molluscan shells were not fully digested and passed out as broken pieces. Plant matter in the food item were represented by portions of aquatic plants, *Vallisneria*, *Najas* and portions of leaves and roots of unidentified plants. The plant matter contributed annually at an average 2.9 % numerically and 3.0 % by occurrence in the food intake by the fish. Crustacean appendages occurred throughout the year in the diet, except July to October 2010 and January 2011. The miscellaneous food comprised of non-motile green algae (*Dischotomosiphon*) 2.3% by numerically and 2.3% by occurrence. Pigmented algae (*Dictobryon*), zooplanktons and crustacean appendages were fed in negligible quantities through out the year.

Sexwise percentage composition of the gut contents in juvenile, male, female and pooled overall specimens are

Table 1. The monthly percentage composition of food items in *L. calbasu* calculated by numerical method in different months of the present study period.

Months	Specimens examined	Diatoms	Blue green algae	Green algae	Non-motile green algae	Pigmented algae	Plant matter	Crustacean appendages and Insects	Zoo plankton	Mollusc fragments	Un identified
Apr'2010	18	32.1	26.4	21.2	1.8	3.3	2.6	2.1	4.2	4.9	0.9
May'10	6	21.5	6.3	3.4	1.1	0.5	11.0	0.5	0.5	53.4	-
Jun'10	15	70.2	5.0	3.7	1.9	1.2	9.3	0.6	0.6	5.0	1.9
Jul'10	20	26.4	6.5	66.1	0.5	0.09	0.2	-	-	0.29	-
Aug'10	6	41.9	26.7	25.6	-	-	2.3	-	-	3.5	-
Sep'10	7	14.3	41.8	9.2	7.5	-	3.0	-	2.0	22.4	-
Oct'10	6	17.5	45.9	35.0	0.8	-	0.5	-	-	-	-
Nov'10	6	14.1	31.4	9.4	3.7	-	1.5	1.5	-	41.7	-
Dec'10	7	45.6	39.1	15.2	-	-	-	0.6	-	-	-
Jan'2011	6	18.7	53.0	27.4	-	-	-	-	-	-	0.7
Feb'11	7	7.3	62.9	7.3	0.4	-	2.1	0.4	-	15.9	3.4
Mar'11	6	21.6	59.4	10.8	4.0	-	2.7	1.3	-	-	-
% of Occurrence of average in 12 months		37.7%	33.6%	19.5%	2.3%	0.4%	2.9%	1.2%	0.6%	12.2%	0.5%

Table 2. Percentage composition of food items in *L. calbasu* based calculated by occurrence method in different months of study.

Months	No. of empty stomach	Diatoms	Blue green algae	Green algae	Non-motile green algae	Pigmented algae	Plant matter	Crustacean appendages and Insects	Zoo plankton	Mollusc fragments	Un identified
Apr'2010	7	32.0	26.6	21.2	1.8	3.2	2.6	2.1	4.2	4.8	0.9
May'10	2	21.5	6.4	3.5	1.1	1.7	11.0	0.6	0.6	53.5	-
Jun'10	1	70.3	4.9	3.7	1.8	1.1	9.9	0.6	0.6	4.9	1.8
Jul'10	4	26.3	6.5	66.1	0.5	0.09	0.19	-	-	0.3	-
Aug'10	3	42.0	26.7	25.6	-	-	2.3	-	-	3.4	-
Sep'10	1	14.2	42.0	9.1	7.1	-	3.02	-	-	22.5	-
Oct'10	-	17.5	46.0	35.0	0.8	-	0.59	-	-	-	-
Nov'10	1	14.2	31.5	9.4	-	-	1.5	1.5	-	41.8	-
Dec'10	5	45.7	39.1	15.1	-	-	-	-	-	-	-
Jan'2011	-	18.8	53.4	27.7	-	-	-	-	-	-	-
Feb'11	1	7.5	64.4	7.5	0.43	-	2.7	0.4	-	16.3	1.3
Mar'11	3	19.6	53.8	9.7	3.6	-	2.4	1.2	-	-	9.7
% of Occurrence of average in 12 months		27.4%	33.5%	19.5%	2.3%	0.5%	3.0%	0.5%	0.6%	12.2%	1.1%

Table 3. Sex-wise percentage composition of food items in *L. calbasu* in the present study area

Sex	Specimens examined	Diatoms	Blue green algae	Green algae	Non motile green algae	Pigmented algae	Plant matter	Crustacean appendages, Insects	Zooplanktons	Mollusc fragments	Unidentified
Juvenile	13	34.1	21.1	20	2.3	-	13.5	2.3	-	5.2	1.1
Male	88	22.5	25.0	40.0	0.9	0.7	9.1	0.3	0.7	7.6	0.5
Female	9	37.0	43.9	11.1	0.6	-	3.3	-	-	3.7	-
Pooled (overall)	110	24.9	27.0	35.2	0.9	0.6	2.0	0.3	0.6	7.3	0.5

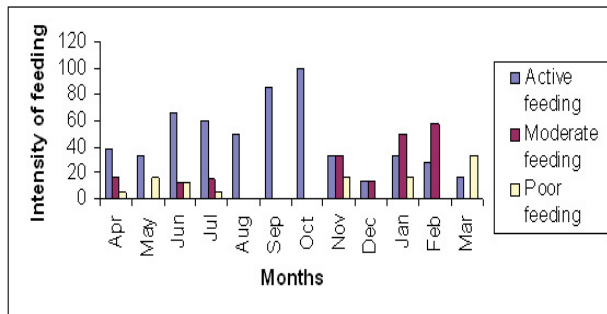


Figure 1. Feeding intensity of *L. calbasu* in different months of the study period

given in Table 3. The percentage compositions of stomach contents in juveniles of *Labeo calbasu* comprised of diatoms (34.1%), blue- green algae (21.1%), green algae (20.0%), non - motile green algae (2.3%), mollusc fragments (5.2%), plant matter (13.5%), crustacean appendages and insect (2.3%) and unidentified (1.1%) and in the male specimens as diatoms (22.5%), blue- green algae (25.0%), green algae (40.0%), non - motile green algae (0.9%), pigmented algae (0.7%) and unidentified (0.5%). The percentage composition of food items in the female *Labeo calbasu* were: diatoms (37.0%),

blue-green algae (43.9%), green algae (11.1%), non - motile green algae (0.6%), plant matter (3.3%)and mollusc fragments (3.7%). The results indicated that diatoms, blue green algae and green algae were the preferable food items of the fish. Zooplankton were the specific food items of males.

Monthwise feeding intensity of *Labeo calbasu* based on the percentage occurrence of food items are given in Fig 1. Monthwise occurrence of activity in feeding showed that *Labeo calbasu* fed actively during the 5 months period of June to October with a peak activity in October. Then, sudden decrease in feeding activity was observed in December. Moderate feeding was observed in January and February and the feeding activity and feeding remained low (poor) until June. Monthwise occurrence of empty stomachs varied widely in the range of fluctuation of 6.6% (January) to 71.4%(December).

DISCUSSION

The major food items of *Labeo calbasu* in the Vadavar river of Lower Anicut consisted of diatoms, blue green algae, green algae and mollusc fragments. Plant matter, zooplanktons, non-motile green algae and crustacean

appendages and insects were the minor food items. It was noted that the fishes gorged their gut with decayed organic matter, diatoms, blue green algae and green algae. Results of the present studies on the food of *Labeo calbasu* strongly suggested that the fish is an omnivorous. The presence of sand and mud in the gut of these fishes furnishes evidence about their feeding at the bottom. This observation is in line with the observations earlier made by Mookherjee *et al.*, (1947), who grouped this fish along with *Cirrhinus mirgala* and called it omnivorous as they found some molluscs and crustacean in its gut contents. Alikunhi (1952) found decayed organic matters in its gut. On the other hand Das and Moitra (1955a) classified it as herbivorous as they could not find any mollusc, though few crustaceans were observed. However, in the present study both molluscs and crustaceans were present in gut of the fish. Pathak (1975) classified this fish as an omnivorous and he got mollusc from its gut contents.

Larkin (1956) while commenting on the fish fauna of the ecological zones in freshwater environment, stated that the sharp demarcation of the fish fauna within these zones is not possible. He also concluded that freshwater communities would seem to be characterised by more and more breadth than height with regard to the pyramid of food chain with a complexity in horizontal organization. Therefore it becomes quite difficult to conclude whether *Labeo calbasu* feeds at one zone or other. It may be because the sharp demarcation of zones becomes difficult in shallow rivers and the fish can explore all the zones vertically very easily. Similar conclusion has been made for *Labeo bata* by Chatterji (1974).

The occurrence of diatoms, blue green algae and green algae in the gut of the fish was recorded throughout the year. The consumption of diatoms was always higher than green algae and blue green algae. The percentage of a particular species blue green algae, green algae and diatoms tended to be maximum at the time of their higher production. It may be concluded that the occurrence of different types of the food items in the gut contents of the fish in different months and year depends on their availability rather than selection by the fish. *Labeo calbasu* is a non-migratory fish and remains in one habitat throughout its life and has to adopt to the food available in the river during all seasons of the year. The more readily available food organisms are taken more by the fish.

Ivlev (1961) suggested that the tendency of a particular animal to consume certain food items selectively in comparison to other is determined by its inherent properties. Prakash (1962) found in *Salmon taht* that its food changes with its locality and time (seasons) and sometimes when the normal food was not available salmon fed on alternate food. Bhatnagar and Karam-

Chandani (1970) reported that *Labeo fimbriatus* to feed on available food showing no preference for any particular type of food. The intensity of feeding on *Labeo calbasu* high in September and October and gradually decreases after. Suseelan and Somasekharan (1969) reported similar feeding rhythm in demersal fishes of Bombay. Khan (1972) and Chatterji (1974) reported fluctuations in feeding intensity in the fishes due to maturation of their gonads.

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