

Study on morphology of digestive system and relative length of gut of *Cyprinus Carpio* from Kaigaon Toka region of Aurangabad.

Dr.Ajit .K.Gedam

Jijamata College of Arts and science.

Bhenda , Nevasa, Ahmadnagar (M.S).

mail - gajit2000@gmail.com

Contact : +918669474077

Abstract :

For a correct understanding of the feeding habits of a fish, a study of the anatomy of the organs of feeding and digestion is necessary . While observing the morphological characters of alimentary canal of *Cyprinus carpio* it is observed that the stomach is absent. The structure of digestive tract can be differentiated into three distinct regions, the anterior intestine (oesophagus, prestomach), the narrow middle intestine and the posterior broad intestine. Following the oesophagus the alimentary canal widens to form intestinal swelling. The mean alimentary canal length (ACL) was 260.0 ± 30.64 cm.

Introduction :

Studies on trophic morphology expanded following the classic work of Suyehiro (1942), Al- Hussaini (1949), and Angelescu and Gneri (1949), among others, who demonstrated that a correlation exists between the structures of the digestive apparatus and the feeding habit of fishes. Particular morphological traces give insights on the feeding ecology of a species, since these peculiarities suggest how a fish is able to feed. Wootton (1990) emphasized that there may be evolutionary convergence in the morphology of phylogenetically unrelated species that use similar food resources. Although the relationship between the morphology of the digestive apparatus and diet of fishes have been well documented (Suyehiro, 1942; Al- Hussaini, 1949; Angelescu and Gneri, 1949; Junger et al., 1989; Veragina, 1990), the morphological variations within trophic categories in tropical fishes appear to be poorly known, specially among detritivores and other benthic feeding fishes.

For a correct understanding of the feeding habits of a fish, a study of the anatomy of the organs of feeding and digestion is necessary. 'An examination of the special relations of food and feeding structures gives clues, not only to the present significance of fishes but also their past effect on life at large, showing how they must have modified the course of evolution' (Forbes, 1888). The feeding apparatus exhibits one of the most significant example of correlation, and the investigation of the food of a fish will be incomplete without a study of its alimentation. Al-Hussaini and Kholly (1954) have given an excellent review of the previous work relating to the

correlation of the structure of alimentary tracts with the feeding habits of fish. His contributions (Al-Hussaini, 1945, 1946, and 1949) and that of Angelescu and Gneri (1949) have served to elucidate some of the most interesting morphological adaptation among fishes. Practically no work on these lines has been done in any detail in India. Dharmarajan (1936), Vanajakshi (1938), Sarbahi (1940) and Mohsin (1944-46) have all dealt with the structure of the alimentary tracts of fishes or of their appendages: but have not made simultaneously a detailed study of the food of these fishes or correlated the nature of the food and the feeding habit with the morphology of the alimentary tract.

Materials and Methods :

Live fish specimen of *Cyprinus Carpio* were collected from Kaigaon Toka, Dist. Aurangabad, (M.S.) India. Immediately the specimens were fixed in 4% formaldehyde. The intestine was separated from the viscera and the length was measured from the insertion of the stomach to the urinogenital aperture and morphological studies of the various parts of the alimentary canal of *Cyprinus carpio* was carried out. To study the relationship between total length and alimentary canal length and relative length of gut, statistically by regression analysis and correlation method by Pearson correlation method, a total number of 30 specimens each of *Cyprinus Carpio* was studied.

Results and Discussion :

While observing the morphological characters of alimentary canal of *Cyprinus carpio* it is observed that the stomach is absent. The structure of digestive tract can be differentiated into three distinct regions, the anterior intestine (oesophagus, prestomach), the narrow middle intestine and the posterior broad intestine. Following the oesophagus the alimentary canal widens to form intestinal swelling. The mean alimentary canal length (ACL) was 260.0 ± 30.64 cm. (Table 4.2)

Oesophagus : During the study it was observed that the esophagus is short and extensible tube more or less cylindrical in form (Plate 11). Similar observations were reported by Al-Hussaini (1949) in carps. Similar results were observed by Moitra and Das (2002) in herbivorous fish *Cirrhinus mrigala*.

Stomach : It is observed that stomach is absent in *Cyprinus carpio* (Plate 11). Similar observations were reported by Al-Hussaini (1949) in *Cyprinus carpio*.

Intestine : It is noted that the intestine of *Cyprinus carpio* is long which coils extensively throughout the visceral cavity. The gall bladder is present on the dorsal surface of the anterior midgut, and lies between the anterior lobe of the swim-bladder and the intestinal swelling. The bile duct opens into the intestine just anterior to the gall bladder. It was observed that liver is present which has no specific shape and surrounds the intestine filling all available space in viscera. Fatty tissue fills up the spaces between the limbs of the intestine along its entire length. The rest of the visceral organs are relatively unremarkable (Plate 11). Similar observations were

reported by Al-Hussaini (1949) in carps. Similar results were observed by Moitra and Das (2002) in herbivorous fish *Cirrhinus mrigala*.

Relationship between Total length (TL) and Alimentary canal length (ACL) of *Cyprinus carpio* During the study it was observed that the mean total length (TL) of *Cyprinus carpio* was 24.0 ± 2.82 cm and the mean alimentary canal length (ACL) was 260.0 ± 30.64 cm (Table 4.2). The ratio of alimentary canal length to total length of *Cyprinus carpio* was 10.63:1. The mean relative length of gut (RLG) of *Cyprinus carpio* obtained was 10.86 ± 0.017 (Table 4.2).

For Regression Analysis

i) Dependent variable is alimentary canal length (ACL) and

ii) Independent variable is total length (TL) of *Cyprinus carpio*.

Then the regression equation (Graph 4.2) for relationship between total length (TL) and alimentary canal length (ACL) of *Cyprinus carpio* is $ACL = - 0.0265 + 10.84 TL$.

Thus as the total length (TL) increases, the alimentary canal length (ACL) increases by 10.84 per unit of total length (TL) of *Cyprinus carpio*. The Pearson correlation coefficient of alimentary canal length (ACL) and total length (TL) of *Cyprinus carpio* (r) = 0.999. The above analysis of relationship between the total length (TL) and alimentary canal length (ACL) of *Cyprinus carpio* reveals that there is positive correlation between the total length (TL) and alimentary canal length (ACL) of *Cyprinus carp*.

Table 3.2 *Cyprinus carpio* Relative Length of Gut

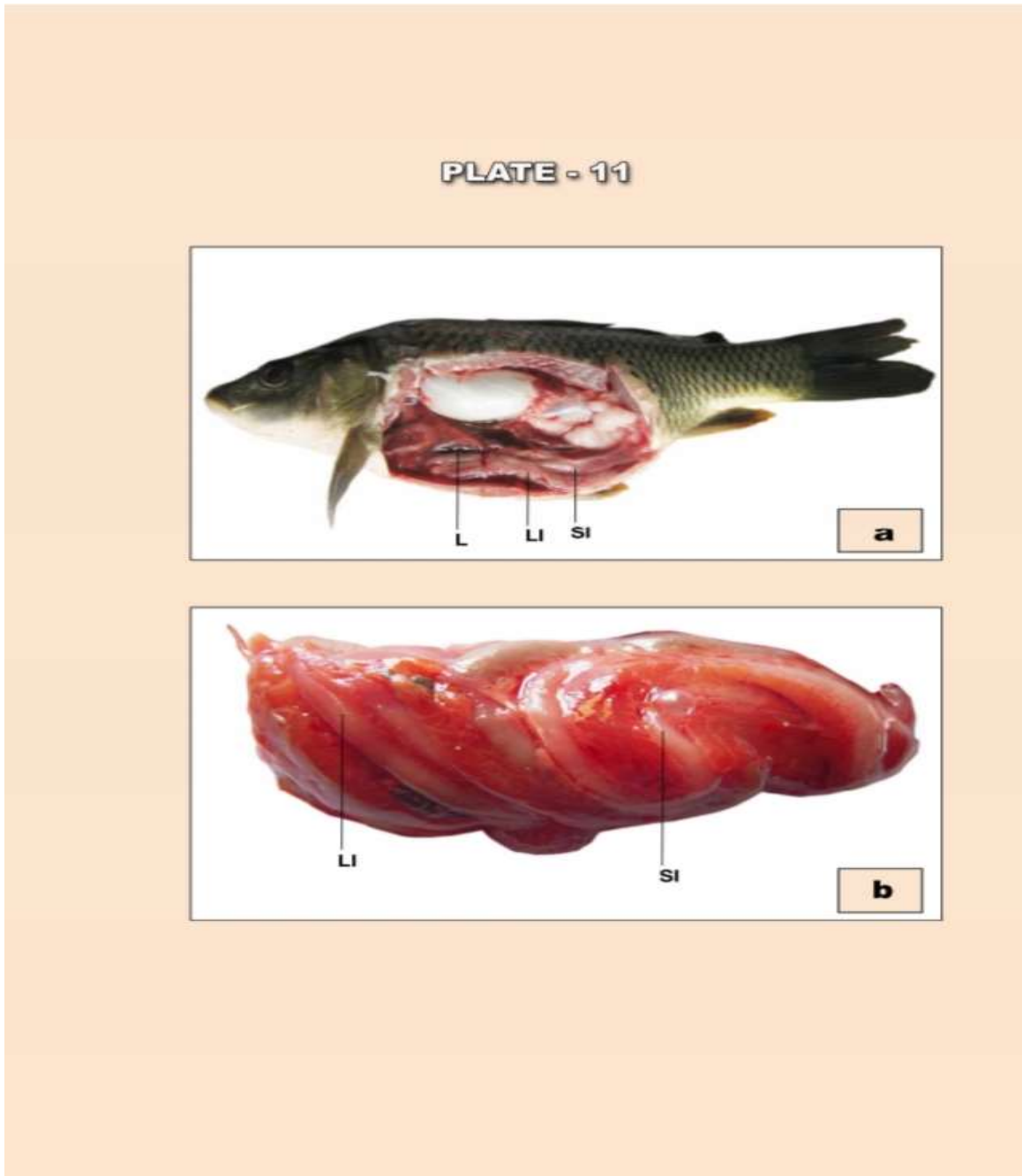
Sr.No	Total length of fish (cms)	Length of alimentary canal (cms)	Relative length of gut (RLG)=ACL/TL
1	18.5	201	10.86
2	15.2	165	10.85
3	16.5	179	10.84
4	17	184.5	10.85
5	18	195.5	10.86
6	22	239	10.86

7	19	206	10.84
8	23	249	10.82
9	23.5	255	10.85
10	21	217	10.85
11	20	241	10.85
12	22.2	215	10.85
13	19.8	206	10.85
14	19	186	10.84
15	17.2	165	10.81
16	15.2	165	10.85
17	22	239	10.86
18	23	249	10.82
19	17.5	190	10.85
20	15	162	10.80
21	15.6	169.5	10.86
22	18	195	10.83
23	16.5	179	10.84
24	16	173	10.81
25	21.5	233	10.83
26	24	260	10.83
27	23	249	10.82
28	17.2	186	10.81
29	21.6	234	10.83
30	18.8	204	10.85
Mean	19.22	204.48	10.83

Plate 11

a) In situ alimentary canal of *Cyprinus carpio* showing (L) liver, (SI) small intestine and (LI) large intestine.

b) Ex- situ alimentary canal of *Cyprinus Carpio* showing (SI) small intestine and (LI) large intestine.

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