

## **CYTO - MORPHOLOGICAL STUDY OF THE ALIMENTARY CANAL OF GOLDEN MAHSEER *TOR PUTITORA* (HAM.) FROM NAYAR**

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### **ABSTRACT**

Paper deals with the cyto morphological variation in the gastro intestinal tract of *Tor putitora*. As the fish is carni-omnivore in diet, all parts of the alimentary canal become modified according to its feeding nature. Buccopharynx shows mucous cells and taste buds, Intestinal bulb and intestine consists columnar epithelial cells, mucous cells and rectum shows thick musculature.

**Keywords :** Cytomorphology; Alimentary canal, Golden mahseer.

### **INTRODUCTION**

*Tor putitora* is commonly called as golden mahseer and is most common among other mahseer species found all along the Himalayan belt and thus synonym as Himalayan mahseer. It is most preferred sport fish, which attracts the angler around the world. Many authors described the histology of the alimentary tract of teleost fishes (Al-Hussaini, 1949, Kapoor et al 1975; Bahuguna, 1982; Sinha, 1986, 94; Badoni, 2000; etc). In the current investigation, an efforts was made to find out the cyto-morphological variations in the gastro-intestinal tract of *Tor putitora* (Ham).

### **MATERIALS AND METHODS**

Specimens of *Tor putitora* were collected from Nayar, which is a spring fed tributary of river Ganga. Different parts of the gut (buccopharynx, oesophagus, intestinal bulb, intestine and rectum) were carefully separated and thoroughly cleaned to free of any food material. Small pieces of these tissues washed in normal saline and fixed in alcoholic Bouin's for 18-22 hrs. Serial sections are cut at 5 $\mu$  and stained in hematoxylin-using eosin as counter stain (Pears, 1975).

### **RESULTS AND DISCUSSION**

In *Tor putitora*, histological features of alimentary canal seems to modify in accordance with the food and feeding habits of the fish. Since, the fish is carni-omnivore

in diet, the mucosa of buccal cavity is thrown into ridges and furrows and consists of intimately associated stratified epithelial cells of seven to nine layer of polygonal cells (Fig 1). The ridges and furrows in the mucosal region are also reported in omnivorous fishes by Badoni (2000) in *Berilius barna* and Pasha (1964) in *Mystus gulio*.

The mucous secreting cells are scattered all over the margin of stratified epithelium cells in the buccopharynx region. The secretion of these glands probably assist in forming a smooth film around the food and thus facilitate easy swallowing beside preventing an accidental mechanical injury to the wall of the buccal cavity.

Taste buds are found scattered in buccopharynx region (Fig 2). Their presence in this region is directly related to more active role during its feeding. Bhimacher (1935) divided fishes in to three groups according to the role of sense organ in feeding viz., those in which feeding is associated by sight only, those by taste (barbel taster, skin taster and mouth taster) and those in which feeding is associated by both sight and taste. Khanna (1968) opined that the taste buds are rare or absent in fishes which feed by sight only and few taste buds are present in those which feed by sight and taste. But in fishes which feed by taste only, abundant taste buds are present. According to Barrington (1957) the buccopharynx which lined by stratified epithelium and is richly supplied with mucous cells and often with taste buds has been assigned the function of seizure, control and probably selection of food. Kapoor *et. al.* (1975) regarded the main function of this region to be mucous production and gustation. In present investigation it has been observed that taste buds are present on stratified epithelium cells in the buccopharynx region in *Tor putitora*. Badoni (2000) and Bahuguna (1982) has made similar observation in some other fishes studied by them.

The presence of taste buds in buccopharynx of *Tor putitora* indicates that food is selected in this region and unwanted material is expelled out through gill slits. The presence of taste buds in the buccopharyngeal region indicates that fish is able to sense the nature of food before swallowing it, while moderate size of eyes and barbel indicates that the fish is sight feeder too.

The teleostean oesophagus has been considered a region of transition of food from the buccal cavity to stomach/intestinal bulb. The oesophageal region of *Tor putitora* consists of series of distinct tissue layers, the mucosa, the lamina propria, submucosa,

region is distinguished by the presence of comparatively larger number of goblet cells and thick musculature (Fig 6). Dawes (1929) distinguished the rectum in Plaice by the abundance of goblet cells and thick musculature. There is no any demarcation or valve between the intestine and rectum. The present observation lends support to Tandon and Goswami (1968). Bullock (1967) observed in *Gambusia affinis*, a teleost without stomach, the anterior rectum is the main site for the digestion. According to Western (1969), the rectum is concerned with the final expulsion of faeces. The later view appears to be more correct for the fish included in this study.

## REFERENCES

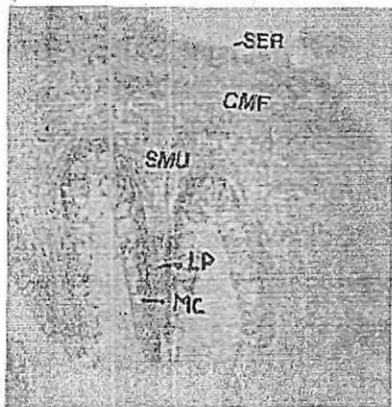
- Al-Hussaini, A.H., 1949. On the functional morphology of the alimentary tract of some fishes in relation of difference in their feeding habits : Cytology and Physiology. *Quart. J. Micro. Sci.*, 90 : 323-354.
- Badoni, K., 2000. *Gross Morpho-Histology of gusto intestinal organs of some Hill-stream Teleost (Cypriniformes)*. D. Phil. Thesis Submitted to H.N.B. Garhwal University, Srinagar (Garhwal).
- Bahuguna, S.N., 1982. *Ecological-morphology of the alimentary tract of some hill stream fishes*. D. Phil. Thesis submitted to Garhwal University, Srinagar (Garhwal).
- Barrington, E.J.W., 1957. The alimentary canal and digestion. In : "The physiology of fishes" (M.E. Brown ED.) *Academic Press. Inc. New York*. 1 (3) : 109-161.
- Bhimacher, B.S., 1935. A study on the correlation between the feeding habits and the structure of the hind brain in the Indian Cyprinoid fishes. *Proc. Royal Soc. London*. 117 B : 258-272.
- Blake, I.H., 1936. Studies on the comparative histology of the digestive tube of certain teleost fishes III. A bottom feeding fishes, The Sea robin, (*Prionotus carolinus*). *J. Morph.*, 60 : 77-102.
- Bullock, W.L., 1967. The intestinal histology of the mosquito fish *Gambusia affinis* (Bairad and Girard). *Acta. Zoologica. Stocholme.*, 48 : 1-17.
- Chaudhary, H.S. and Khandelwal, O.P., 1961. The anatomy and histology of the alimentary canal of *Oreinus plagiosomus* (Hackel). *Ann. Zoologica. Jap.* 34 : 139-152.
- Dawes, B., 1929. The histology of the alimentary tract of the Plaice (*Pleuronectes platessa*). *Quart. J. Microscopical Sci.*, 73 : 243-274.
- Dixit, R.K. and Bisht, J.S., 1972. Histo-morphology of alimentary canal of a hillstream teleost *Schizothorax richardsonii* (Gray and Hard). *Zoologische Beitrage*, 18 : 321-338.
- Girgis, S., 1952. On the anatomy and histology of the alimentary tract of a herbivorous bottom feeding cyprinid fish, *Labeo horie* (Cuvier). *J. Morph.*, 90 : 317-362.
- Islam. A.-ul., 1951. The comparative histology of the alimentary canal of certain freshwater teleosts fishes. *Proc. Ind. Acad. Sci.*, 33 B : 297-321.
- Kapoor, B.G., 1957. Oral valves of teleost. *Jap. J. Ichthyology*, 5 : 127-131.
- Kapoor, B.G., Smith, H. and Verighina, I.A., 1975. The alimentary canal and digestion in a teleost. In : *Advance in Marine Biology*, Vol. (Russel, F.S. and Yonge, M. Eds). 13. Academic Press, London 109-203.



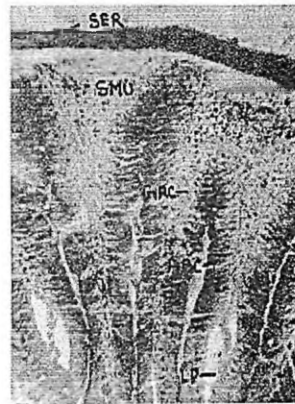
(Fig. 1)



(Fig. 2)



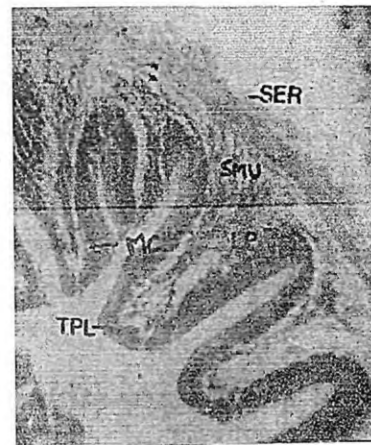
(Fig. 3)



(Fig. 4)



(Fig. 5)



(Fig. 6)

- Khanna, S.S., 1968. *An introduction of fishes*. Indian University Press and Published by central book Department, Allahabad., 1-478.
- Kuperman, B.I., Verginia, I.A. and Kuzmina, V.V., 1986. The ultrastructure of the intestinal epithelium in Burbot *Lota lota* (L.) (Gadidae) *Voprosy Ichtiologii.*, 25 : 275-282.
- Moitra, S.K. and Sinha, G.M., 1972. The structure distribution and probable function of taste buds and mucus cells in the alimentary tract during the life history of a Indian water major carp, *Cirrhinus mrigala* (Ham.) *J. Ind. Fish. Soc.*, 4 : 103-114.
- Pasha, K., 1964. The anatomy and histology of alimentary canal of an omnivorous fish *Mystus gulio* (Ham.) *Proc. Indian. Acad. Sci.*, 59 B : 211-220.
- Pearse, A.G.E., 1975. *Histochemistry, theoretical and Applied*. Vol. I Churchill Livingstone, Edinburgh.
- Siankowa, L., 1966. The surface area of the intestinal mucosal in bream *Abramis barma* (L.), *Studia Societatis. Scientiarum Torunensis, Torun -Polonia, Sectio E. (Zoologia)*, 8 : 1-53.
- Sinha, M., 1986. Functional morphology, anatomy and histology of the digestive organs of the catfish *Plotosus canius* (Ham.) *Proc. Ind. Acad. Sci.* 95 : 23-43.
- Sinha, M., 1994. Ultrastructure of the columnar absorptive cell of the intestinal mucosal in an Indian freshwater major carp, *Labeo rohita* (Ham.) In : *Advance in Fish biology and Fisheries* (H. R. Singh Eds) Hindustan Publishing corporation Delhi. 1 : 25- 32.
- Tondon, K.K. and Goswami, S.C., 1968. A comparative study of the digestive system of Channa species. *Res. Bull., (N.S.) Punjab University.*, 19 (1-2) : 13-31.
- Western, J.R.H., 1969. Studies on the diet feeding mechanism and alimentary tract in two closely related teleosts, the freshwater *Cottus gobio* (L.) and the marine *Parenophrus bubalis* Euphrasen. *Acta. Zoologica. Stockholme.* 50 : 185-205.

Fig 1. Photomicrograph of cross section of buccopharynx showing submucosa, mucosa, mucous secreting cells (Haematoxylin and Eosin 100x)

Fig 2. Photomicrograph of cross section of buccopharynx showing taste buds, mucus cells (Haematoxylin and Eosin 150x)

Fig 3. Photomicrograph of cross section of oesophagus showing thick circular muscle layer, longitudinal muscles lamina propria with mucus cells (Haematoxylin and Eosin 100x).

Fig 4. Photomicrograph of cross section of intestinal bulb showing top plate, columnar epithelial cells (Haematoxylin and Eosin 150x)

Fig 5. Photomicrograph of cross section of intestine showing musculature, columnar cells mucous cells (Haematoxylin and Eosin 100x)

Fig 6. Photomicrograph of cross section of Rectum showing thick musculature and mucous cells. (Haematoxylin and Eosin 150x)

### Abbreviations used

ABC = Absorptive cells, BM = Basement membrane, CMF = Circular muscle fibre, GRC = Granular cells, LP = Lamina propria, LMC = Longitudinal Muscle fibre, MC = Mucous cells, OMC = Opening of mucous cells, SER = Serosa, SMU = Submucosa, TB = Taste buds, TP = Top plate.