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THE MORPHOLOGY OF THE ALIMENTARY TRACT IN RELATION TO FOOD OF PLATYCEPHALIDS OF PORTO NOVO COAST (ORDER: SCORPAENIFORMES).

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ABSTRACT

The interrelationships between the morphology of the alimentary tract and the food and feeding habits in five species of flat heads (Order : Scorpaeniformes) of the family platycephalidae were studied. The nature of teeth, gill rakers and the presence or absence of pyloric appendices were noted. Based on the shape and relative lengths of different parts of the alimentary tract and the types of food concerned the fishes were grouped into, (1) fish feeders and (2) Crustacean feeders. Qualitative analysis of the food of the five species of flat heads viz. (1) *Platycephalus indicus*, (2) *Sorsogona tuberculata*, (3) *Thysanophrys carbunculus*, (4) *Grammoplites scaber* and (5) *Suggrundus rodericensis* was also made and the results are discussed.

INTRODUCTION

The alimentary canal of teleosts in relation to their feeding habits has been studied by a number of investigators. Rathke (1824) was the first to make a comparative study on the alimentary tract of 56 species of plaice, flounders, dab and turbot. Kyle (1900) brought out the importance of a study of the alimentary tract as he observed differences in the course of the alimentary tract as well as in the presence or absence of pyloric appendices in various groups of flat fishes. According to him this cannot be used in taxonomical studies, since the length of intestine depends on the specialized feeding habits. Wu (1932) observed the pyloric appendices of 20 species of flat fishes. Norman (1934) opined that the shape of the alimentary tract can be used for ascertaining the generic status, contradicting Kyle (1900) who observed distinct difference in the alimentary tract of 11 species of flat fishes, but could not relate it to food habits. Svetovidov (1934) correlated the nature of food and the number of appendices in several flat fishes. Suyehiro (1934) concluded that since the digestive organs of fishes depend on their phylogeny as well as their feeding habits and may not therefore necessarily possess similar degestive organs. Al-Hussaini (1947) found several adaptational features in the structure of the alimentary canal related to the nature of their diet in *Mulloides quriflama*. Gohar and Latif (1959) studied the gut of some scarid and labrid fishes. Ochiai (1966) used the shape of the alimentary tract as a taxonomic character confirming Norman's (1934) view. Our knowledge of the alimentary canal of the Indian teleosts is very much limited (Ramanathan *et al* 1975).

Hence the present investigation was undertaken to study the relative importance of the different parts of the alimentary tract, in five species of platycephalids occur in similar habitats. For each individual the lengths measured were of (1) buccal and pharyngeal cavity (from lips to end of the pharyngeal region), (2) Oesophagus, (3) Stomach (upto the pyloric valve), (4) intestine and rectum, and expressed as precentages of the whole uncoiled tract.

MATERIALS AND METHODS

The material for the present study consisting of 190 specimens of *platycephalus indicus*, 98 specimens of *Sorsogona tuberculata*, 123, specimens of *Thysanophrys carbunculus*, 173

specimens of *Grammoplites scaber* and 96 specimens of *Suggrundus rodericensis* were collected weekly from the commercial trawl catches landed at Parangipettai. To study the morphology of the alimentary canal of platycephalids, the nature of mouth, kinds of teeth, gill raker, number of pyloric caeca and the position of stomach, intestine and rectum have been drawn to scale in five species of platycephalids. The relative importance of the different parts of alimentary canal of platycephalids was investigated based on the method described by Groot (1971).

OBSERVATIONS AND RESULTS

The alimentary canal consists of mouth, buccal cavity, pharynx, Oesophagus, stomach, pyloric caeca, intestine and rectum.

Mouth and Buccal Cavity:

The importance of food in the daily life of a fish is obvious and is reflected in the form of the mouth, jaws, teeth and so on. These structures present more diverse modifications than any other organ of the body. The present investigation attempts to explain such modifications which are more or less intimately associated with the mode or conditions of life, the mannar of obtaining food and the nature of the diet itself. Mouth is relatively very wide in *P. indicus* than in *S. tuberculata, T. carbunculus, G. scaber* and *S. rodericensis*. The lower jaw of all platycephalids are slightly projecting forward than the upper jaw. The mouth is provided with vomerine and palatine teeth. A 'tongue' is present in all species and it is flat at the tip than behind. Teeth are of villiform type but those on upper jaw at the symphysial region pointed in a crescent shaped band on vomer and in two narrow longitudinal bands on palatines (Fig. 1). Some on vomer and palatines are slightly pointed (on vomer the pointed teeth are at the end of the cresent) only in *Platypcephalus indicus* whereas in *Sorsogona tuberculata, Thysanophrys carbunculus, Grammoplites scaber* and *Suggrundus rodericensis* the villiform teeth in jaws appear as two distinct oval patches on vomer and in two narrow elongate bands on palatines. Few teeth on vomer and palatines are pointed. Palatine teeth is relatively very much prominent and distinct in *P. indicus* whereas in others the palatine teeth are very small. The buccopharyngeal region is relatively lengthy both in *P. indicus* and *T. crabunculus* (21%) but less in *S. tuberculata* (19%) and in *G. scaber* and *S. rodericensis* 20% each.

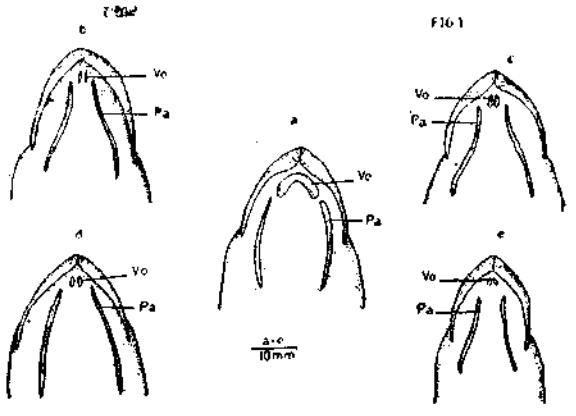

Fig. 1. Arrangement of teeth in

(a) *Platycephalus indious* (b) *Sorsogona tuberculata* (c) *Thysanophrys carbunculus* (d) *Grammoplites scaber* (e) *Suggrundus rodericensis* Vo = Vomerine teeth. pa = palatine teeh.

Pharynx :

The pharyngeal cavity is relatively narrow than the buccal cavity. Four pairs of gills hang down on either side of the pharynx. Since the platycephalids are carnivorous fishes, the roof of the pharynx is formed of a prominent thick pharyngeal pad divided by a median shallow line into the right and left lobes. The pharynx becomes narrower posteriorly and gradually attaining a cylindrical shape merging into the oesophagus. Gill rakers on first arch ranges

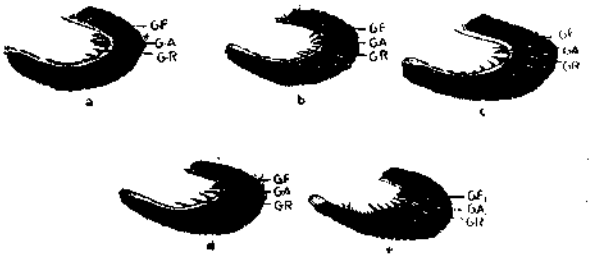

Fig. 2. The arrangement of of gill rakers on first gill arch.
(a) *Platycephalus indicus* (b) *Sorsogona tuberculata* (c) *Thysanophrys carbunculus* (d) *Grammoplites scaber* (e) *Suggrundus rodericensis*
G.F. = Gill Filament G.A. = Gill Arch
G.R. = Gill Rakers.

from 3-4 in *P. indicus*, 2-5 in *S. tuberculata*, 2-3 in *T. carbunculus*, 2–4 in *G. scaber* and 2-6 in *S. roderibensis* (Fig 2). Each gill raker is provided with numerous serrae in all the 5 species of platycephalids. These spines are microscopic in nature however there is no significant variation between them.

Oesophagus:

The oesophagus is a short, slender, cylindrical tube constituting 7% in *P. indicus*, 4% in *S. tuberculata*, 6% each in *T. carbunculus* and *G. scaber* and 5% in *S. rodericensis*. The walls of the oesophagus are thick and the mucosal folds run longitudinally. The junction of the oesophagus with the stomach is marked externally by a slight constriction. Relatively small oesophagus (4%) is evident in *S. tuberculata* of all the species studied. Another unique adaptation of oesophagus is the great distensibility.

Stomach and pyloric caeca :

The stomach is divisible into two regions the anterior cardiac region, and the posterior pyloric region in all five species of platycephalids. This difference is visible externally as well as internally. In the cardiac region is a small outgrowth of tube from posterior or anterior part of the cardiac region (Fig. 3) The stomach is relatively large and distinct in *S. rodericensis* (17%) followed by *P. indicus* and *S. tuberculata* (16%). Relatively small stomach could be seen in *G scaber* and *T. carbunculus* among the representative of platycephalids (Fig. 4). The relatively large stomach in *S. rodericensis* may be usefull to accommodate the large sized organisms on which it feeds (Fig. 3e).

Though the pyloric appendices are well developed in all the species of platycephalids, intraspecific variation is significant in this structure. The pyloric appendices usually ranges from 9 to 10 in *P. indicus*, 4 to 5 in *S. tuberculata*, 7 in *T. carbunculus*, 5 to 6 in *S. rodericensis*,

Intestine and rectum :

There is a distinct constriction between the stomach and the intestine has a single ascending loop and 2 desending loops. The intestine and

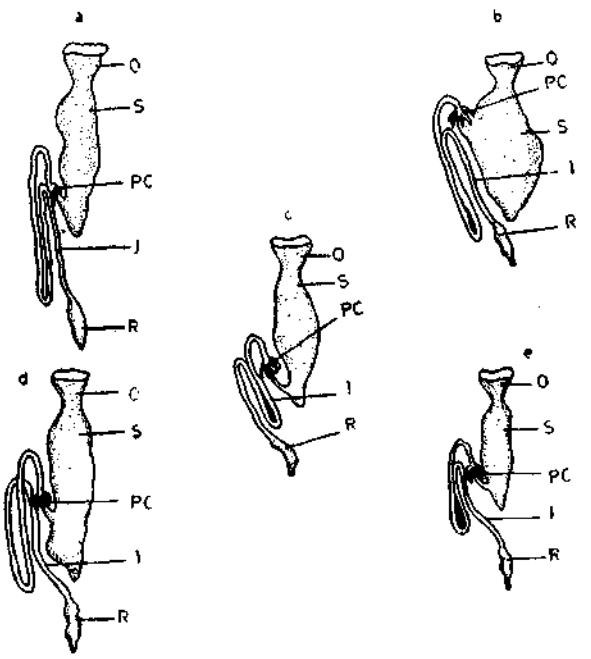

Fig. 3. Shape of the alimentary tract of
(a) *Pialycephalus indicus* (b) *Sorsogona tuberculata* (c) *Thysanoperys carbunculus* (d) *Grammoplites scaber* (e) *Suggrundus rodericensis*.
P = Pharynx O = Oesophagus S= Stomach
I = Intestine R = Rectam.

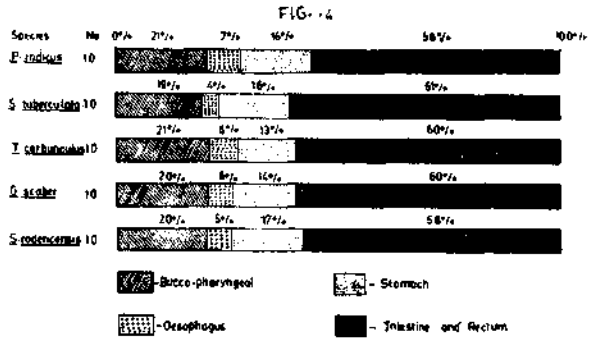

Fig 4. Relative lengths of different parts of the alimentary tract of
Platycephalus inbicus, Sorsogona tuberculata Thysanophrys carbnnculus. Grammoplites scaber. Suggrundus rodericensis.

rectum are relatively lengthy in *S. tuberculata* (61%) followed by *T. carbunculus* and *G. scaber* (60% each), *S. rodericensis* (58%), and *P. indicus* among the representatives of platycephalids (Fig. 4). The rectum is wider than intestine and its walls are also thick in nature. A narrow constriction is apparent between the rectum and intestine (Fig 3).

DISCUSSION

Norman (1934) rightly pointed out that the shape of the digestive tract provides a useful taxonomic character but he failed to correlate the shape of the digestive tract with the nature of food.

From the results of the present study on the morphology of the alimentary tract in relation to food in five species belonging to five genera of the family Platycephalidae it is possible to distinguish 2 groups of platycephalids each with its own characteristics with respect to the shape of the digestive tract, the intestinal loop and the nature of the gill rakers.

Group 1 Fish feeders—*P. indicus*, *T. carbunculus*, *G. scaber* and *S. rodericensis*.

Group 2. Crustacean feeder—*S. tuberculata*.

The above subdivision is supported by the relative dimension of the different sections of the alimentary cavities together with the oesophagus and the stomach form about 44% of the whole tract in *P. indicus*, about 42% in *S. rodericensis* and 40% each in *T. curbunculus* and *G. scaber*. However the buccal, pharyngeal cavities together with the oesophagus and stomach were insignificant in *S tuberculata* (39%). The significance of these differences could be explained if we consider the type of food taken by these fishes. *P. indicus*, *T. carbunculus*, *S. rodericensis*, and *G. scaber* are fish feeders besides smaller crustaceans in negligible amount. Since they feed mostly on fishes, they need a storing space which is evidently seen in the relatively more percentage of this region.

On the other hand S. *tuberculata* feeds predominantly on the crustaceans where a distinct stomach (39%) is not advantageous but a lengthy intestine (61%) is useful. The structure of the gill raker also gives an indication of the nature of the food consumed by the fish. Gill rakers are useful to fish feeders since they prevent the prey swallowed alive, to struggle out of the mouth. Therefore they have to be large and evidently the gill rakers are relatively well developed among the fish feeders (*P. indicus*, *T. carbunculus*, *G. scaber* and *S. rodericensis*) however not well developed and they are microscopic in *S. tuberculata* (Fig. 2).

Further Svetovidov (1934) has stated that pyloric caeca increase in number with the size of the food which is evidently true in *P. indicus* as a result of the present study but not true in other species of platycephalids. Though there is similarity in the nature of the palatine teeth among the platycephalids distinct and significant variation has been observed in the vomerine teeth of *P indicus* which is crescent shaped (Fig 1a); whereas in other species it is in the form of two small patterns (Fig. 1b, c, d, e). The well developed vomerine teeth in *P. indicus* may aid in food gathering.

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