Comparative Anatomy of Digestive System of Some Commercially Important Fishes

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Abstract

Comparative investigations were made to discuss about the type of gill raker, position of mouth, type of dentition& difference in the length of digestive tract on four commercially important edible fishes (Labeo dissumieri, Sciaenoides brunneus, Horpodonnehereus, Rastrelliger kanagurta) found throughout the globe especially included as a staple consumable food stuff in local fish markets all over in India. Depending upon the food and feeding habits, the above mentioned fishes belong to herbivore, omnivore, carnivore and planktivore respectively (Lagler et al 1903). A year long investigations were made on hundred fishes of each feeding habits which showed following changes. Based on this aspect of fishery science, the aim and objectives of the present work includes comparison of fishes with different feeding habits giving the detail study of morphometry, anatomy of digestive system.

In case of herbivores, the position of mouth was superior, in carnivores it was terminal and jaws were supported by large number of teeth. In case of carnivore, the mouth was inferior with strong canines and in planktivore, it was superior without any teeth. The gill rakers were sharp, pointed in case of carnivore to avoid the escape of pray, short and stumpy in case of omnivore and small teeth like in herbivore and long, filamentous forming a perfect sieve in planktivore to filter the planktons. When the length of digestive system were compared, it was observed that it was very short in carnivore, moderate in omnivore and about 2-3 times the body length in herbivore.

KEYWORDS : Fishes – Feeding Habits- Gill Racker – Rlg- Digestive System

Introduction

Fish must exploit food in the aquatic environment and the adaptation for these is some morphological traits in the process of feeding. To know the previous part clearly, understanding the basic relationship between the different body structures and their feeding habits especially position of mouth, type of dentition, type of gill raker and length of alimentary tract. This helps us to know the position of the fish in the aquatic food web of the ecosystem of vast aquatic fauna existing in the environment and in formulating the management strategy options in the multi species fishery.

Fishery science teaches us the structures such as morphological & anatomical depending upon the food & feeding habits of the fish. The biochemical & biometric studies conclude the correlation between morpho-anatomical structures & food& feeding habits. Based on this aspects of fishery science, the aim & objectives of the present study includes comparison of fishes with different feeding habits giving the detail study of morphometry ,anatomy of digestive system & various biometric parameters.
The following commercially important fishes were studied:-

1. *Labeodussumieri*.  
2. *Horpodonnehereus*.  
3. *Sciaenoidesbrunneus*.  
4. *Rastrelligerkanagurta*.  

**Material and method:**-

The fishes were brought from Kalwa fish market to the laboratory, then for observation of gill rackers, gill were washed with water stained with 1% eosin & observed under the dissecting microscope. The no. of teeth were counted from both jaws & total no. of gill rackers were also counted. Then the digestive tract was taken out & R.L.G. of gut was calculated for around 100 fishes of each species.

**Result and Discussion:**-

In case of *Labeodussumeiri*, the gill rackers were arranged in two rows & were short but sharp & minute for the prevention of food. The total no. of gill rackers were 230-264 confirming its herbivore feeding.

In case of *Horpodonnehereus*, the gill rackers were thin, short with sharp micro-teeth confirming its carnivore feeding.

In case of *Sciaenoidesbrunneus*, the gill rackers were short & stumpy. The total no. of gill rackers were around 122-140 confirming their omnivore feeding.

In *Rastrelligerkanagurta* gill rackers were long, filamentous forming perfect sieve conforming its planktivore feeding & the total no. of gillrackers were around 190-200.

<table>
<thead>
<tr>
<th>Name of the Fish</th>
<th>Position of Mouth</th>
<th>Feeding habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Labeodussumeiri</td>
<td>Inferior</td>
<td>Herbivorous</td>
</tr>
<tr>
<td>2. Horpodonnehereus</td>
<td>Terminal, wide open</td>
<td>Carnivorous</td>
</tr>
<tr>
<td>3. Sciaenoidesbrunneus</td>
<td>Inferior</td>
<td>Omnivorous</td>
</tr>
<tr>
<td>4. Rastrelligerkanagurta</td>
<td>Superior</td>
<td>Planktivorous</td>
</tr>
</tbody>
</table>

**Table I – 1**

Position of mouth according to the feeding habit:

<table>
<thead>
<tr>
<th>Name of the Fish</th>
<th>Type of teeth</th>
<th>Feeding habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Labeodussumeiri</td>
<td>Toothless</td>
<td>Herbivorous</td>
</tr>
<tr>
<td>2. Horpodonnehereus</td>
<td>Rows of fine, sharp pointed Teeth on both the jaws and Tongue as well</td>
<td>Carnivorous</td>
</tr>
<tr>
<td>3. Sciaendonesbrunneus</td>
<td>Molariboem teeth in both jaws</td>
<td>Omnivorous</td>
</tr>
</tbody>
</table>

**Table I – 2**
4. Rastrelligerkanagurta

Single row of small teeth

Planktivorous

Type of dentition according to the feeding habit

Table I – 3

<table>
<thead>
<tr>
<th>Name of the Fish</th>
<th>Type of gill rakers</th>
<th>Feeding habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Labeodussumeiri</td>
<td>Minute, Sharp, pointed with Micorteeth</td>
<td>Herbivorous</td>
</tr>
<tr>
<td>2. Horpodonnehereus</td>
<td>Sharp, pointed</td>
<td>Carnivorous</td>
</tr>
<tr>
<td>3. Sciaenoidesbrunneus</td>
<td>Short, stumpy</td>
<td>Omnivorous</td>
</tr>
<tr>
<td>4. Rastrelligerkanagurta</td>
<td>Long, slender</td>
<td>Planktivorous</td>
</tr>
</tbody>
</table>

Type of gill rakers according to feeding habit:


When the position of the mouth & dentition was compared of four fishes it was observed that Labeo dussumeiri had inferior mouth bordered by fleshy lips which facilitates the scraping of algae from the hard surface. Though teeth were altogether absent but sharp edges were found & pharyngeal teeth were pointed backwards confirming the herbivore nature of feeding. Similar results
were observed by Jaymala Choudhary (1989) in *Etropissursuratensis* which is a herbivore fish.

- In case of *Horpodonnehereus*, the terminal mouth was always found to be open guarded by thin lips & the teeth were present in several rows, they were pre-maxillary, vomarine, palatine & lingual teeth. Pires (1978) observed the same results in carnivore fish *Wallagoattux* confirming its carnivore feeding.

- In case of *Sciaenoidesbrunneus*, the mouth is inferior with two rows of teeth of which outer is well spaced cannies & inner row with small cannies. Usually two cannies were present in upper jaw & one in lower jaw.

- Khanna & Pant (1964) shown the same observation in *tor-tor* confirming its omnivore feeding.

- In *Rastrilligerkanagurta*, the mouth was superior & with very small teeth which were arranged in single row. Some adults were toothless. Pires confirms its planktivore feeding (1978).

- **Photographs of gill rakers:**

1. ![Gill Rakers of *Tor-Tor*](image1.png)
2. ![Gill Rakers of *Rastrilliger Kanagurta*](image2.png)
3. ![Gill Rakers of *Sciaenoides Brunneus*](image3.png)
The R.L.G. in *Labeo dussumieri* varied from 3.27 to 3.54 cm. which shows digestive length was roughly around thrice the body length confirming its herbivorous nature of feeding. (Photograph-1)

The R.L.G. of *Horpodon nehereus* varied from 0.35 to 0.45 cm. which was much less than the body length confirming its carnivore feeding. (Photograph-2)

The R.L.G. of *Sciaenoides brunneus* varied from 0.90 to 1.02 cm. which was half the body length confirming its omnivore feeding. (Photograph-3)

The R.L.G. of *Rastrelliger kanagurta* varied from 6.1 to 6.5 cm. corresponding to 13.5 to 15.1 cm. body length indicating planktivore nature of feeding. (Photograph-4)

**Conclusion:**

1. When the position of mouth was compared of four different fishes having different feeding habits it was observed that the fish under study i.e. *Labeo dussumieri*. Showed the inferior mouth as it feed on the detritious or plant material attached to the rocks conformed the herbivorous feeding, fish under study *Horpodon nehereus* showed terminal mouth, as its mouth is always kept open and it eats anything comes in the path, confirming carnivorous feeding, fish under study *Sciaenoides brunneus* showed inferior mouth as it is predatory fish, which attacks on the prey, confirming the omnivorous feeding, fish under study *Rastrelliger Kanagurta* showed the superior mouth as it feed on planktons confirming the planktivorous feeding.

2. When the structure of gill-rakers was compared of 4 different fishes having different feeding habits, it was observed that in case of *Labeo dussumieri* and *Rastrelliger kanagurta*, the gill-rakers were long, thin, filamentous forming perfect sieve to filter the plant material as well as the planktons, confirming the herbivorous and plantivorous feeding. In case of *Horpodon nehereus*, the gill- rakers are very poorly developed but
there are presence of microteeth so as to prevent the escape of food, confirming carnivorous feeding. In case of *Sciaenoides brunneus*, the gill-rakers are short and stumpy which helps to prevent the escape of food confirming the omnivorous feeding. Al Hussaini-A.H. 1964 morpho 78(1):121-153

3. When anatomically the digestive tract of the 4 different fishes having different feeding habits were compared it was observed that, when the Relative Length of Gut (R.L.G.) was taken, it was seen that in case of *Labeodussumier* the R.L.G . was around 3.27 cm confirming the herbivorous feeding, the R.L.G. of *Horpodon nehereus* was around 0.35 to 0.45 cm, confirming the carnivorous feeding, the R.L.G. of *Sciaenoides brunneus* it was around 0.90 – 1.0 cm confirming omnivorous feeding and R.L.G. of *Rastrelliger kanagurta*, was around 0.42 to 0.47 cm confirming planktivorous feeding.

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