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"Studies on the Food and feeding habit of Labeo rohitaof KaulaChaurin Begusarai District (Bihar)."

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Labeo rohitaare common fish available in the wetland of Begusarai. In the present study Labeo rohitahas been selected for the study of food and feeding behaviour. The study will be helpful for the culture and farming of Labeo rohita. The result on gut content analysis of Labeo rohita suggests that the fish feeds mainly on phytoplankton and macrovegetation.The gut content analysis of Labeo rohitarevealed that the species depend on vegetable matters, animals matter was completely absent in the gut content. On the basis of different food items present in the stomach contents, Labeo rohitamay therefore be conveniently regarded as an omnivorous fish. The preference on molluscs, crustaceans and insect matter in Labeo rohitaindicates their ability to feed throughout the water column and presence of a high percentage of detritus in the gut indicates that the fish feeds in bottom.

Key Words: *wetland (chaur),Labeo rohita,oesophagus, intestinal bulb, intestine, gut content, molluscs, crustaceans and algae*

Introduction

Begusarai is an important district of state Bihar, lies on the northern banks of river Ganga, Latitude 25°15'N & 25°44'N and longitude 85° 45'E & 86°45'E. The district covers an area of about 1918 km^2, which is water surplus area. It is drained by a number of rivers viz Ganga, Burhi Gandak, Bagmati and Balan rivers.The present study deals with the feeding behaviour of *Labeo rohita*in the kaulachaur of Begusarai district which will be further helpful in enhancing the fishery and culture practice in chaurs. The constant demand for adequate nourishment is selective agent that may greatly influence an organism existence. Fishes are adapted to wide variety of food being are herbivorous, omnivorous or carnivorous. This diversity of feeding habit is reflected in the differentiation of the alimentary tract.The study of food and feeding habit of fishes is very important in fishery biology as it relates to various activities of the fish like

shoaling, migration and the biodiversity of the water body. An understanding of the relationship between fishes and the food organismespecially the favourite fooditems and their seasonal distribution may help to locate the amount and type of food present in the chaurs. It may also provide clue for the prediction and exploitation of fish stock. Type of food & feeding habit of fishes has been classified by different workers. Schaperclaus (1933), Suyahiro (1941), Mukherjee and Das (1945) were pioneer among them.Al Hussainy (1949) & Das and Moita (1958) reported high degree of correlation between food habits & RLG of fishes. Hynes (1950), Pillay (1952) used various methods for gut content analysis of fishes. Nikolsky (1963) recognised the main categories of food.Robertson (1977) studied the feeding intensity of fishes.

Material and Methods:-

For the food and feeding habit of fishes the specimens will be collected monthly from the Kaulachaur. The guts will be dissected out & preserved in 10% formalin for further study gut content by qualitative (volumetric) and quantitative (numerical) methods. The nature relation to feeding habit has to be studied by taking the ratio of gut length and body length or relative length of the gut (RLG). In the present work *Labeo rohita*were selected to accomplish the research work. About 50 specimens of fish species were collected from wetlands(chaurs) of Begusarai district from June 2008 to March 2010.*Labeo rohita i*slocally known as rehu.The body colour is dark grey colour with orange tinge on the fins.This fish is a very popular food fish of this locality.

1. Morphology:

All the specimens were brought to the laboratory in fresh condition and cleaned thoroughly with tap water. After cleaning various morpho-anatomical characteristics of each specimen were observed carefully. For morphological and anatomical studies the fishes were dissected along the ventral side of the abdomen. Detailed morphological studies of the buccal cavity, alimentary canal and associated glands were made by examining the structure by means of a magnifying lens. Clear photographs of the exposed alimentary canal of fishes were taken with Olympus photography camera.

2. Histology:

The alimentary canal of all three fish species including oesophagus, stomach, intestine, anus and liver were investigated using normal histological methods. The selected regions of the alimentary canal were dissected out and washed thoroughly in normal saline solution. After cleaning, parts of alimentary canal were fixed in Bouin's fluid to terminate any ongoing biochemical reactions and to increase the mechanical strength of the treated tissue. Then the parts of alimentary canal were processed in ascending grades of alcohol and impregnated in paraffin wax and sections were cut with microtome using steel blades at 5-7 microns. The sections were stained by Haematoxylin (Harris, 1900) and counter stained with eosin. DPX was employed as mounting medium.

Flow Chart: Fixing of material and block preparation

1. **Different parts of alimentary canal**

Bouins fluid (24 hours)⇒ 70% alcohol (24 hours)⇒ 90% alcohol (2 changes for 30 minutes)⇒ 100% alcohol (2 changes for 30 minutes)⇒ 100% alcohol + Xylene (1:1) (15 minutes)⇒ Xylene (15 minutes)⇒ Xylene + Wax (1:1) (15 minutes)⇒ Paraffin wax (3 changes for 1 hour)⇒ Block preparation

2. **Staining procedure of sections:**

Section cutting⇒ Xylene (20 min)⇒ 100% alcohol (5 min)⇒ 90% alcohol (5 min)⇒ 70% alcohol (5 min)⇒ 50% alcohol (5 min)⇒ 30% alcohol (5 min)⇒ D/W (5 min)⇒ Haematoxylin (2-3 min)⇒ Tap water (5 min)

Acid water if excess stained (1 dip)⇒ 30% alcohol (5 min)⇒ 50% alcohol (5 min)⇒ 70% alcohol (5 min)⇒ Eosin (5 min)⇒ 90% alcohol⇒ 100% alcohol (5 min)⇒ Xylene (5 min)⇒ Mount

3. Relative length of gut (RLG):

RLG of each specimen was calculated separately. Total length (cm) of the body of each specimen was measured from tip of the snout to the longest caudal fin ray. Alimentary canal of each fish was dissected out and the total length of the alimentary canal (gut) was measured also. RLG for each specimen was calculated by following the keys of Al – Hussaini (1949).

$$RLG = \frac{\text{Total length of the alimentary canal}}{\text{Total length of the fish body}}$$

4. Gastrosomatic index (GaSI):

The feeding intensity of each specimen was determined by calculating gastrosomati index.Weight (gm) of each specimen was taken out by using simple weighing machine. Alimentary canal of each specimen was dissected out and fresh weight was taken with chemical balance. After squeezing out the food items weight of the empty gut was also taken. The value of GaSI was calculated by following Desai (1970).

$$GaSI = \frac{\text{Total weight of the food content}}{\text{Total weight of the fish}} \times 100$$

5. Gut/Stomach content analysis:

For the study of food and feeding habits, the specimens of*Labeo rohita were* collected from the KaulaChaurs of Begusarai. The fishes caught freshly and immediately preserved in 10% formalin solution for later examination. Preserved fishes were brought to the laboratory for the analysis of their gut contents. An attempt was made to identify the food items in fishes. Many crustaceans and most algae were particularly difficult to identify as they were almost digested. The extent of feeding was determined by the degree of destentation of the stomach and the amount of food present in it. The undigested gut contents were estimated under a simple and binocular microscope (Olympus, magnification 10X) methods used in the study of the food of fishes have been discussed extensively by Hynes (1950); Pillay (1952) and Hyslop (1980) and there is general agreement that no one method gives a complete picture of dietary importance (components). For this reason all the methods of gut analysis were adapted here.

Occurrence method– All the food items were shorted out and their presence and absence in the gut was recorded. The total number of guts containing that particular food item was recorded. The whole data obtained for all the food item was pooled and was expressed as a percentage of the total number of guts examined.

Volumetric Method – The contents of each gut were collected carefully in a test tube and were shaken vigorously in order to mix them together evenly. A drop of the contents of the taken on

the slide and examined under both the simple and binocular microscope (Olympus, 10X). The area occupied by each food item was estimated arbitrarily. Ten such drops from each individual sample were examined and the average of each of the item was calculated.

Non-food material (e.g., sand) was ignored in estimating the food volume. The percentage volume for each food type was summed and divided by the total number of fish in the sample.

Gravimetric method– Dry weight of the sample was determined and the results were expressed as percentage of the total. In case of many invertebrates and most algae weight were estimated from their volume as they were too small to weight directly.Weights of these food components were dertermined by following Bowen (1983). Estimated wet volume was converted to dry weight using the conversion factor as 1 mm3 = 0.1 mg.

Observation

Morphology of alimentary canal in *Labeo rohita:*

The alimentary canal of *Labeo rohita*is along coiled tube starting from the buccal cavity ending at anus.

Mouth and buccal cavity: The Bucco-pharynx is divided into two parts (i)The anterior respiratory region and (ii)The posterior narrow part and masticatoryin function. The Buccal cavity is lined by thick mucus membrane raised into minute papillae .lacks distinct tongue.

Teeth*:*Teethare completely absent from the jaws and palate but well developed inferior pharangeal teeth. The pharangeal teeth are present in three rows.

Gill rackers*: Gill rackers* are long and forms a broad sieve like structure across the gill slits for filtering the water in order to retain the food in the buccophaqrynx.

Numeros mucus secretory cells and taste buds are present

Oesophagus: It is a short and narrow tube of 2.5 cm length connecting the intestinal bulb. The internal mucosal folds are thin structure.The longitudinal valve forms an oesophageal valve. Opening of pneumatic duct is visible.

Stomach: *Labeo rohita*do not possess a true stomach. The anterior part of the intestine is swollen and thick walled forms a sac behind the oesophagus. This structure serves the storage of food and known as intestinal bulb .It is approximately 20 cm long.Gastric glands are not present

in the intestinal bulb and the mucosal folds resemble the intestine The swelling of the straight tube gradually decreasing in diameter as it extends posteriorly.

Intetine : It is thin extensively coiled tube approximately 8 meters long tube and the coiling is more complex. The intestinal limb are coiled in such away that it covers the intestinal bulb.

Rectum:

The posterior extremety of the intestine is the rectal part.Indeed there is no no such external demarcation but the mucosal folds show a mark difference between the intestine and rectumThe length of the rectal part of the tube is 5cm long.

Digestive gland:

Liver is large bilobed brownish gland.The right lobe is solid elongated structure and the left lobe is broader than the right lobe.The two lobes are not discrete all along the length but meet to form transverse connection with each other at three different spots .The gallbladder is long elongated present between the liver and the intestinal bulb. The pancreas is not a distinct organ the pancreatic tissue was found embedded in the liver.

Gut content analysis of *Labeo rohita:*

The gut content analysis of *Labeo rohita*revealed that the species depend on vegetable matters, animal matter was completely absent in the gut content.

Decayed organic matter:

The decayed organic matter formed the main item of the diet of the *L.rohita* occurring throughout the year .The decayed organic matter formed 43.78 % of the total gut content of the fish.

Vegetable matter:

The main bulk of the food was plant matter,consisting about 39.06% of the total food items present in the gut.Unidentifiable vegetable matter formed the major items.The plant matter was found throughout the year except in September and October when this item was rarely eaten by the fish .The food item was portion of aquatic plants Hydrilla, Vallisneria,Echornia, Najas and leaf and stem of unidentified aquatic plants.

Algae:

Green algae (*Chlorophyceae*): Green algae constituted about 10.04% of the total food item,it was present all the year round in the gut of *L.rohita*. Maximum percentage of green algae was present in the month of December (22.5%).Most preferable items are *Spirogyra, Oedogonium,Ankistrodesmus, Zygnema, Coelastrum, Pediustrum, Selenestrum* and *Ulothrix.*

Blue green algae:

The blue green algae were all the year round contributing an average of 7.00 % of the total food of *L.rohita, Microcystis, Anabena,* and *Oscillotoria* are common among them.

Zooplankton:

The zooplanktons were in negligible only .12% quantity in the food of *L.rohita,* Maximum was recorded in the month of September (2.4%)

RESULT & DISCUSSIONS

Morphology of alimentary canal of *Labeo rohita*:

The structure and morphometry of alimentary canal of *Labeo rohita*have been described in relation to their food and feeding habits.

The structure of alimentary canal can be generalized as follows:

Mouth moderately wide and somehow inferior.Lips are thickfleshy fringed forming a labial fold.Pharyngeal teeth are pointed and present in three rows.The gillrackers are pointed.The alimentary canal is very long thin and coiled tube.

Oesophagus:

The oesophagus is tubular and narrow. It helps to swallow the food and sendthe food to the stomach or intestinal bulb.The mucosal fold is well equiped with mucus secreting cells to lubricate the food for easy passage in the gut.

Intestinal bulb:

The posterior part of the oesophagus or anterior part of the intestine is swollen to form a typical gut of herbivorous fish known as intestinal bulb.

Intestine:

A herbivorous fish has a very long coiled intestine, the intestine of *Labeo rohita*follows the same pattern.

Rectum:

The rectum is not externally from the intestine,but internally large number of mucus cell and mucus secretiin falicitates the expultion of faecal matter.

The entire gut of *Labeo rohita*morphologically and internally supports the finding of Das and Moitra (1956), Dasgupta (2001) for herbivorous fish.

Gut contentof*Labeo rohita*:

The gut content analysis of *Labeo rohita*revealed that the species depend on vegetable matters, animal matter was completely absent in the gut content.The decayed organic matter formed 43.78 % of the total gut content of the fish,highest 58.0% was in the month of December and lowest in the month of June31.2%.Second most preferable food item was Plant matter 39.06 %, Algae10.04 %, Bluegreenalgae 07%, and Zooplankton .12%.

CONCLUSION

The results obtained from the studies made on the food and feeding behavior as well as on the morpho-histology of the fish *L.rohita* reveals that the fishes are herbivore.

The gut content analysis of this fish indicates that the fish feeds more on Plants matter (Algae, parts of higher Aquatic Plants) than Animal matter (Crustaceans etc).

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