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RESEARCH PAPER

TITLE

FOOD AND FEEDING HABITS OF A FISH (*SCHIZOTHORAX PLAGIOSTOMUS*) FROM RIVER SWAT

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Abstract

There are different types of fishes based on feeding behaviour, some are carnivorous and some are omnivorous while others are herbivorous. To find out the feeding habit of wild *Schizothorax plagiostomus*, the gut contents have been analyzed. The fish samples were collected from River Swat at Different points (Mingora, Matta, Khwazakhela, Madyan, Bahrain and Baghderai). The fish were dissected by using different dissection tools for the isolation of the entire gut. The gut contents were examined through a microscope. In the gut contents, different things have been noted such as *Spirogyra ellipsospora*, *Cladophora crispata*, *Ulothrix*, *Calothrix parietina*, *Zygnema kashmirensis*, *Anomoeoneis sphaeophora*, *Nitzschia linearis* and *Naviculoid Diatom*. Besides all these food items, detritus, some unidentified plants, larvae and other materials were also observed. It has been concluded that *S. plagiostomus* is omnivorous.

Key words: *Schizothorax plagiostomus*, River Swat, feeding, food

1. Introduction

Food is a crucial part in the life of any living thing since it provides the energy needed for an organism's growth, reproduction, other physiological processes, and development. Fishes, like other living things, need to eat in order to survive and to maintain their physiological health. Since it serves as the foundation for the creation of an effective fisheries management program for capture and

culture fisheries, the study of fish diet and feeding behavior is a field of ongoing research (Oronsay & Nakpodia, 2005). The larvae and young fry of *Anabas testudineus* consume phytoplankton and zooplankton, whereas the large fry i.e., adults consume crustaceans, worms, mollusks, algae, soft higher plants, and organic waste (Potongkam, 1972). This fish is commonly called ukabi. It is economically very important fish of India and they become sexually mature in their first year of life. This fish's natural habitat is fresh and brackish water of the southeast Asia and Indian subcontinent. The adult *A. testudineus* mostly feed on insects (Ahyaudin, 1992).

In the natural habitats of fishes there is a diversity of organisms that are consumed as a food by the fish, that are greatly different in their sizes and also taxonomy groups (Oronsay & Nakpodia, 2005). The dietary examination of fish in their natural environments improves knowledge of how these creatures develop, are abundant, produce, and are distributed (Facade & Olaniyan, 1972)

Various fish species feed upon variety of different food materials and their feeding behavior varies with the kind of available food, history of life stage and change in the season. On the basis of the gut content and preference for certain food items in their natural habitat, in fishes there are four basic groups on the bases of feeding habits such as carnivores, herbivores, omnivores and Limnivores. Fishes of each group have a different feeding style.

Carnivorous fishes use to feed on meat, earthworms, turkey red worms, daphnia,

lean chicken, tubifex worms and salmons. They also used to eat larvae such as larvae of certain mosquitoes etc. Carnivore's fishes will not eat vegetables or other herbs throughout their lives.

Herbivorous fishes are those which only feed on plants and they will not eat any type of meat etc. Mostly herbivores fishes use to feed on cucumber, pea, variety of algae's, detritus and potatoes. These ingredients must be kept frozen and must be chopped into small pieces during meal time. Algal flakes will be a good source of food for this kind of fish.

Omnivore fishes eat everything. They also eat meat and vegetables, herbs, algae etc. Another category is known as Linnivores. Such types of feeders are also known as mud-eaters. These fishes mainly feed on algae and microorganisms present in mud. (www.unaab.edu.ng). Certain fishes eat only one type of food and are known as insectivorous, larvivores, mollusks feeders, crustacean feeder and piscivorous. Species from the same genus of *Schizothorax* such as *S. eocinus* and *S. curvifrons* feeding habit is Omnivorous and they feed mostly on different (Kausar et al., 2010) *Major carps* feeding on both plants and animals, thus including in the category of carnivores (Khabade, 2015) Freshwater catfish *Rita rita* is also a carnivorous feeding fishes in wild eat both plants and animals (Rafique & Khan, 2012)

Some variation in percentage of different food items in the gut contents of *Schizothorax esocinus* and *Schizothorax curvifrons* is also sorted out were categorized into five groups; animal matter, vegetable matter, unidentified animal matter, unidentified vegetable matter and sand particles. Animal matter was represented by protozoa (Diflagia,

Arcella), Rotifera (Keratella, Monostyla), Crustacea (Cyclops, Bosmina, Canthocamptus and Diaptomus), and insect larvae of May flies, caddis flies, Chironomus larvae and appendages of insects. Fish eggs and scales were observed in the gut contents of *S. esocinus* only. Vegetable matter varied from unicellular algae to multicellular macro vegetation. Chlorophyceae (Spirogyra, Ulothrix, oedogonium), Bacillariophyceae (Fragilaria), Myxophyceae (Oscillatoria and Spirulina). Unidentified animal matter was represented by semi digested animal matter and invertebrate's eggs. Unidentified vegetable matter was represented by mucilaginous mass of muddy color. (Kausar et al., 2010)

The food and feeding habit of *Schizothorax richardsoni* is also investigated in a cold torrential stream named Neeru Ullah. During this study it was concluded that's. richardsoni is aperiiphytonic feeder and pure types of herbivorous fish. The major components in the gut contents include Bacillariophyceae, Cyanophyceae, Chlorophyceae, detritus and sand as a source of food. These fishes mainly feed on attached algae with rocks. The high percentages which were examined in all the time of investigation in their gut contents was Bacillariophyceae as a feeding source in this species. The second major component which was recorded in low percentage was Chlorophyceae. Different species from Bacillariophyceae, Chlorophyceae were considered to be their food source in wild habitat (SHEKHAR et al., 1993).

Schizothorax plagiostomus Heckel (1838) is commonly called snow trout and khont. Dorsally, this fish is grayish brown and ventrally it is yellowish in colour. The colour of caudal and dorsal fins is grayish,

while the remaining fins are pinkish (Goswami *et al.*, 2012). *Schizothorax plagiostomus* belongs to the Phylum Chordata, Sub-phylum Vertebrata and Super class is Actinopterygii. Further in classification, it belongs to the Class Pisces, Sub-class Neopterygii and Super order Ostariophysi and its Order is Cypriniformes. The name of its Family is Cyprinidae (Froese & Pauly, 2011).

2. Materials and methods

River Swat (Figure 1) is a perennial river in the northern region of Khyber Pakhtunkhwa, Pakistan. The source of River Swat lies in the mountains of Hindukush. This river begins in the region of Swat Kohistan (Kalam). A diverse fauna of fishes in this river serves as fishing industry of the region and also serves for vast diversity of birds (online, 2016).

2.1 Sampling area

The fish samples were collected from different areas of Swat including Mingora, Matta, Khwazakhela, Madyan and Bahrain.

2.2 Materials

The materials used in this research work were: Cast nets/Hooks/Rods, Formalin, Falcon tubes, Camera, Microscope, Glass slides, Stain (Giemsa stain), Bag, Dissection box, Hand gloves and Masks.

2.3 Sampling procedure

The fish collection was started from July to September 2016. For fish catching different methods and materials were used such as cast nets, hooks and rods. Some fishes were also collected from local fish market Total number of 55 fish samples of *S. plagiostomus* were collected and preserved in falcon tubes containing 10% formalin solution

2.4 Laboratory procedure

For further procedure the preserved fishes were transferred to laboratory. The fishes were then dissected by using different dissecting tools for the proper elimination of complete gut (Figure 2). After the dissection the overall gut, from esophagus to anus was removed carefully (Figure 3) and preserved in falcon tubes containing 10% formalin solution. After the preservation, the samples were put in Petri dish for proper dissection to observe the gut content (Figure 4).

By using different dissecting tools, the sample was dissected in Petri dish to obtain the contents for proper examination. The removed contents were placed on a glass slide and stained by Giemsa stain for proper visualization. After the slide preparation the contents were observed under microscope.

3. Results and discussion

There are different types of fishes on the basis of feeding behavior, some are carnivorous and some are omnivorous while others are herbivorous. To find out the feeding habit of wild *S. plagiostomus*, we have analyzed the gut contents of the fish. In the gut contents of the said fish we have seen different things such as *Spirogyra ellipsospora*, *Cladophora crispata*, *Ulothrix*, *Calothrix parietina*, *Zygnema kashmirensis*, *Anomoeoneis sphaeophora*, *Nitzschi linearis* and *Naviculoid Diatom*. Besides all these food items, detritus, some unidentified plants, larvae and other materials were also observed in their gut contents. In our finding we have demonstrated that the said fish is omnivorous in nature. Contents

which were found in the gut are given below:

The major component found in the gut contents was *Spirogyra ellipsozona* (Figure 5). In each and every slide *S. ellipsozona* was seen. (Kausar et al., 2010) worked on the gut contents of *Schizothorax eosinocus*. They find out that *Spirogyra* was also a major source of feed of *S. eosinocus*. According to (Khabade, 2015), *Major carps* are also feed on *Spirogyra*. The results show that the feeding habit of *S. plagiostomus*, *S. eosinocus*, and *Major carps* is similar. Both *Major carps* and *S. plagiostomus* are live in same habitat while *S. plagiostomus* and *S. eosinocus* are the species of same genus due to that reason they have same feeding habit.

In the gut contents of *S. plagiostomus* another food item was *Ulothrix* (Figure 6). *Ulothrix* is also a food source for this specie. (Umesh et al., 2012) also conducted the same work on *Clupisoma naziri* and they found that *Ulothrix* is also a part of daily diet of *C. naziri*. (Thakur, 1978) also worked on the gut contents of *Schizothorax niger* and noticed *Ulothrix* in the gut of the fish. Above results show that food source of *S. plagiostomus*, *Clupisoma naziri* and *S. niger* are similar. *Clupisoma naziri* and *S. plagiostomus* are live in same freshwater habitat while *S. niger* and *S. plagiostomus* share the same genus.

During the study another food item seen in the gut contents of *S. plagiostomus* was *Calothrix parietina* (Figure 7). According to (Sunder & Subla, 1984) and *Schizothorax richardsino* is also feed upon *C. parietina*. Both species (*S. richardsino* and *S. plagiostomus*) are the members of

same genus due to that reason both use *C. parietina* as a source of food.

Another food item was observed in the gut content of *S. plagiostomus* which was *Naviculoid specie* (Figure 8) *S. plagiostomus* use *Naviculoid* in their daily food. According to (Khabade, 2015) he also observed *Naviculoid specie* in the gut of *Labeo rohita*, which means that *L. rohita* use *Naviculoid* as a feed in the natural habitat. The same analysis was also done by (Kiran & Puttaiah, 2011) they also find *Navicula specie* in the stomach contents of *Salmostoma untrahi*. Both the results of *L. rohita* and *S. untrahi* were same like the result of *S. plagiostomus*, because of their similar fresh water habitat.

Another food item was also noticed during the gut content analysis of *S. plagiostomus*. which was *Zygnema specie* (Figure 9). (Mirza & Bhatti, 1999) Langer, (1995), worked on the stomach content analysis of *Schizothorax Longipinni*. He also noticed the presence of *Zygnema* in their stomach contents. Here the same results are due to the same habitat of *S. Longipinnis* and *S. plagiostomus* and also because that they belong to the same genus.

During the gut content analysis of *S. plagiostomus*, a lot number of *Anomoeoneis sphaeophora* (Figure 10) and *Nitzschi linearis* (Figure 11), were also observed Ravindranathan, (2003) worked on *Labeo rohita*. and observed that *Anomoeoneis sphaeophora* and *Nitzschi linearis* are a part of their daily food in nature the results same because both species *S. plagiostomus* and *L. rohita* have the same results because of the same habitat.

Detritus (**Figure 12**) are also found in the gut content analysis of *S. plagiostomus*. Desai, (1973) worked on the stomach content analysis of *Tor tor* fish and reported a lot of *Detritus* in their stomach same like our work. The result is same because both fishes *T. tor* and *S. plagiostomus* have the same habitat and similar in feeding habits.

Beside the above identified food particles, a lot number of other food items are also observed during the gut content analyses of *S. plagiostomus* which remains unidentified due to the unavailability of literature. These unidentified items may be present only in the gut of *S. plagiostomus* just because of geographical difference of habitat of *S. plagiostomus*, where it used to live. Also, a lot number of unidentified larvae are observed in the gut, which are shown below for further research work of researchers in future.

Conclusion

It is concluded that:

- The specie i.e., *Schizothorax plagiostomus* is omnivorous in nature.
- The food of *S. plagiostomus* were in majority of algae like *Spirogyra ellipospora*, *Cladophora crispate*, *Ulothrix*, *Calothrix parietina*, *Zygnema kashmirensis*, *Naviculoid diatom*, *Anomoeoneis sphaeophora* and some unidentified larvae.

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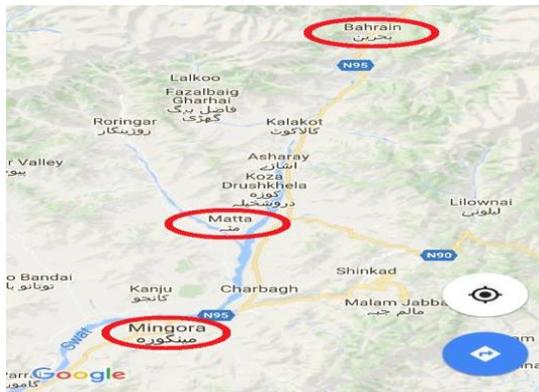


Figure 1: River swat KP, Pakistan (Google Maps)



Figure 2: *S. plagiostomus* after dissection



Figure 3: Gut of *S. plagiostomus* after dissection



Figure 4: Stomach of *S. plagiostomus*

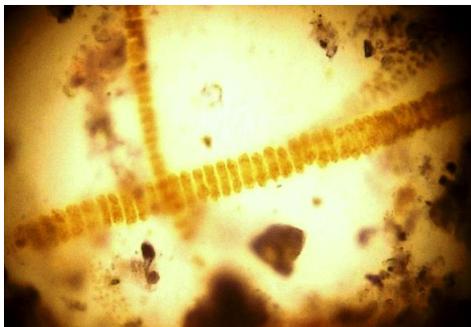


Figure 5: *Spirogyra ellipsospora*

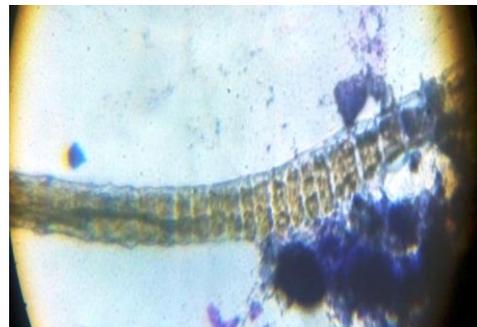


Figure 6: *Ulothrix*



Figure 7: *Calothrix parietina*

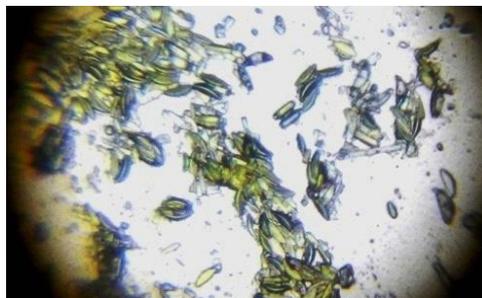


Figure 8: *Naviculoid* specie

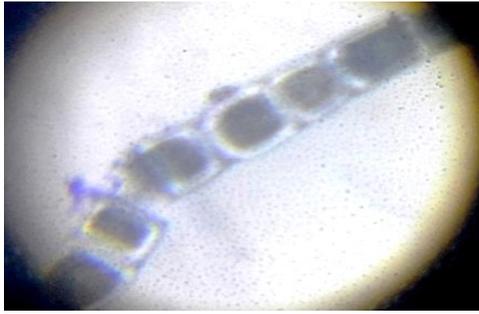


Figure 9: *Zygnema specie*

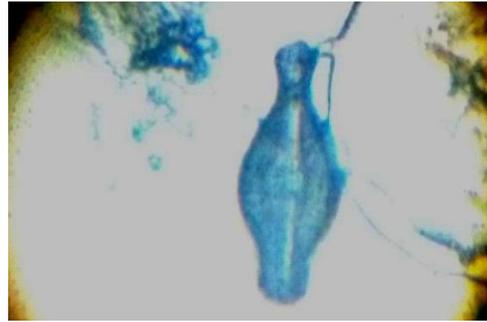


Figure 10: *Anomoeoneis sphaeophora*

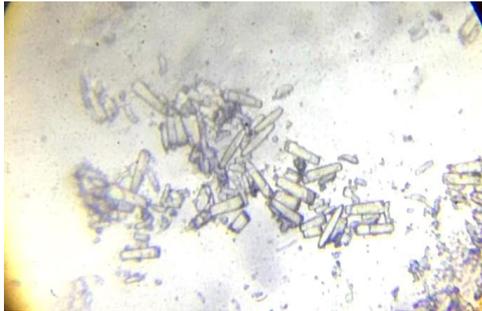


Figure 11: *Nitzschi linearis*



Figure 12: *Detritus*