STUDIES ON THE STOMACH CONTENT ANALYSIS AND FEEDING ECOLOGY OF FISHES OF RAPTI RIVER AT BALRAMPUR DISRTICT U.P. INDIA

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ABSTRACT

Stomach contents can be collected either from live or fresh died fish. Fishes were fed mainly on phytoplankton, zooplankton and macrophytes .Fish diets are measured in variety of ways. Stomach contents analysis are classified into qualitative and quantitative .Qualitative analysis of stomach content of fishes of river. In present investigation, the gut contents of some cultivated fresh water fishes of Rapti river were analyzed in the laboratory for confirming their food habits during 2017-2018. In present study, it was found that the gut contents of fish species consist of phytoplanktons, zooplanktons and decaying plant and animal organic material which confirm the feeding habits of the major carps.

IndexTerms- Stomach Content, Phytoplankton, Zooplankton, Rapti River.

I.INTRODUCTION

Water is the basic necessity for the survival of life and prosperity of civilization. It covers three fourth of Earth's surface and comprises about two-third of most of the organisms. Today, the problem of water scarcity is of great concern in the rural as well as urban areas. Rivers are the principal sources of freshwater for living creatures. Anthropogenic activities, urbanization, land reclamation and accelerated industrialization prone to majority of lotic and lentic water bodies more and more deteriorated/polluted. The distribution of aquatic organisms is influenced by physical environment, chemical quality and biological interactions. Changes in water quality affect aquatic life. Large numbers of fish are killed every year by a wide variety of pollutants from many different sources like municipal and industrial-waste. Fishes are the important group of animals' world contributing to the biodiversity of animals. The fish diversity is a branch of aquatic diversity. Fish constitutes half of the total number of vertebrates in the world. They live in almost all conceivable aquatic habitats. In Ichthyology, fish ecology & fisheries resource management, the information on diet & food habits are valuable in the decision-making process related to natural resources [1]. Fish gut content analysis provides

an important insight into feeding patterns & quantitative assessment of feeding habits is an important aspect of fisheries management. The study of the feeding habits of fish & other animals based on direct examination of stomach content has become a standard practice for many years [2]. The food and feeding habit of fishes vary from season to season, seasonal change in temperature but not influence the food consumption. The food studies may show details of the ecological relationships among organisms. The food relationships determine population levels, rates of growth and conditions of fish. Feeding of most fishes in nature may presumed to be upon bacteria, desmids, diatoms and other microscopic planktons, both plant and animal [3]. The gut content analysis gives an idea about the actual diet and feeding habit of the fish species [4].

Fish performs their various physiological activities such as growth, reproduction; restoration etc. with the help of energy obtained from the food and is highly adopted in their feeding habits with utilizing most of the readily available food components [5].According to Nansimole [6] the qualitative and quantitative dietary analysis of fish in their natural habitats enhances the understanding of growth abundance, productivity of water body.

In present paper the stomach contents of some selected fresh water fishes of Rapti river were analyzed and conforms their feeding ecology and their habits. In present study, it was found that the gut contents of fish species consist of phytoplanktons, zooplanktons and decaying plant, animal and organic material which confirms the feeding habits of the fishes.

II.MATERIALS AND METHODS

2.1Topography of the Area

The study area, Balrampur, is situated in North Terai region of Uttar Pradesh adjacent to Indo-Nepal border at 27° 16´N to 27° 32´, North altitude and 82°03´ E to 82° 22´ East longitude and an altitude of about 113 meters above the mean sea level. Rapti is the main river traversing in the area and plays a vital role in the topography and causes serious flood havoc in the rainy season. The slope of the area is from north-west to south-east. Sugarcane is one of the major crops of the district which requires large amount of water. There are three sugar factories, Balrampur Chini Mills, Bajaj Chini Mills and Tulsipur Chini Mills, situated at about 5 Km., 18 Km. and 30 Km. away from Balrampur city, respectively.

The district Balrampur lies between Nepal in the north and district Gonda in the south. Its eastern and western boundaries are common with Siddharthanagar and Shravasti districts, respectively.

2.2 Meteorology of the Study Area

A climatological data *i.e.* temperature and rainfall data for the period of January 2017 to December 2018 were obtained from Department of Climate, Government of India, situated near Rapti Bridge at Balrampur. The climate of the study area is hot and dry in summer, mild and free from frost in cold season. The monsoon commences from the second week of June and continues till mid-October. July and August are months of

maximum rain-fall (In July 2018, rain fall was as much as 538.1 mm and in August 2018, rainfall was 396.5 mm). About 90% of the annual rainfall is obtained during the monsoon months.

The monthly average of minimum temperature ranged between 4.0 to 26.5 °C and that of maximum temperature between 21.8 to 37.5 °C. During the study period maximum temperature was recorded in June and minimum in January.

The samples of experimental fishes were collected from Rapti river of Balrampur district, Uttar Pradesh, India with the help of local fisherman during investigation period. The month wise (10 samples per month) collection and analysis of gut contents were made to study the seasonal variation in food choice and feeding habit of the fish. Just after collection 10% formalin solution was injected into the gut of all the samples of fishes in order to stop digestion of food items. The gut was then cut open and all the contents were analyzed under binocular microscope for the food composition, preference and relative importance of various food items. All the experiments were carried out in the laboratory of Post Graduate Department of Zoology, P.B. P.G. College Pratapgarh, Uttar Pradesh, India.

III.RESULTS AND DISCUSSION

For the exploitation and scientific development of aquaculture, knowledge of existing fish fauna of the area is a prerequisite. Knowledge of fish diversity in particular region is essential not only for rational management of ichthyofauna of that region but also for their conservation strategies. Biodiversity is a term that has recently been widely used all ones the world. It is the variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be defined as the number of different organisms and their relative frequency.

3.1FOOD AND FEEDING HABBITS

Fishes were fed mainly on phytoplanktons, zooplanktons and macrophytes. Qualitative analysis of stomach contents of fishes of the river are given in (Table-1). It is apparent that among the 35 species *Notopterus notopterus, Notopterus chitala, Amblypharyngodon mola, Oxygaster bacaila, Ailia coila, Ompok bimaculatus, Clupisoma garua* and *Rhinomugil corsula,* were found to be omnivores. *Gudusia chapra, Setipinna phasa,Catla catla,Wallago attu, Mystus cavasius, Mystus vittatus, Mytus tengara, Rita rita, Bagarius bagarius, Heteropneustes fossilis, Clarias batrachus, Xenentodon cancila, Channa punctatus, Channa striatus, Chanda nama, Chanda ranga, Badis badis, Anabas testudineus, Colisa fasciatus, Macrognathus aculeatus* and *Mastacembelus armatus* were found to be carnivores. *Labeo rohita, Labeo calbasu, Puntius sarana* and *Puntius sophore* were found to be herbivoresand remaining species *Cirrhinus mirgala* and *Cirrhinus reba* were found to be detrivores. Our result showsthat members of chlorophyceae were abundant in the gut content ofherbivorous fishes. Except some food items, these fishes showed common feeding preference over the members of bacillariophyceae, chlorophyceae and cyanophyceae.

The annual mean percentage composition of different groups of phytoplanktons revealed to contribute nearly41.07% of Chlorophyceae, 15.72% Bacillariophyceae, 30.70% Cyanophyceae and 11.79% Euglenophyceae during the study of stomach content analysis of fishes. Species of phytoplankton were present ingut content of fishes of Rapti river (Fig 1). 7 belongs to chlorophyceae (*Pediastrum tetras, Scenedusmus armatus, Scenedusmus dimorphus, Scenedusmus quadricauda, Scenedusmus abundans, Scenedusmus obliqus* and *Chlorella vulgaris*), 6 Bacillariophyceae (*Navicula salinarum, Synedra affinis, Nitzschia filiformis, Pinnularia gibba, Naivicula grailis,* and *Synedra ulna*), 5 Cyanophyceae (*Oscillatoria sp., Spirulina sp., Raphidiopsis sp., Merismopedia sp.* and *Gloecapsa sp.*) and 4 Euglenophyceae (*Euglena viridis, Euglena oxyuris, Phacus longicauda* and *Phacus pleronectes*). Present study indicates that the major carps feed mostly on the phytoplanktons and vegetable matter. The *Labeo rohita* shows the vegetarian food habit.

The annual mean percentage composition of different groups of zooplanktons revealed to contribute nearly 35.30% of Rotifers, 29.15% Copepods, and 35.53% Cladocerans in the gut content of fishes (Fig 2).Cat fishes vigorously feed on zooplanktons. In present investigation the zooplankton were present in gut content of fishes belongs to 12 species of rotifers (*Brachinous falcatus, Brachinous, angularis, Brachinous forficula, Keratella tropica, Keratella quaerata, Keratella procurva, Lecane stichaea, Lecane bamata, Notomate polychaetus, Polyarthra vulgaris, Filinia longiseta* and *Asplanchna brightwelli*), 4 Copepoda (*Mesoclyclops leukartii, Heleodiaptomus vidaus, Allodiaptomas microbilipes* and *Phyllodiaptomus blanci*) and 8 Cladocerans (*Diaphnasama excisum, Chydorus spaericus, Ceriodaphnia cornuta, Daphnia lambottzi, Bosmina longirostris, Bosminopsis deitersi, Sida crystalline,* and *Smocephalus sp.*).

Fish diet represents an important ecological component that includes behavior, condition, habitat, energy consumptionand their specific interactions. The food, feeding habits and gut content analysis can be used to evaluate the habitat preferences, prey selection, effects of ontogeny and developing conservation strategies [7]. Gut content analysis is still the most used and diversed method with great potential for biological studies [8].The relationship between the fish and food component is essential for the production and exploitation of the fish stocks [9].

Mishra[5]studied the gut contents of Indian major carp Rohu (*Labeo rohita*) from Meeranpur Lake of district Sultanpur, Uttar Pradesh, India.According to them that rohu exhibits different feeding strategy during its growth from fingerlings to adult.

Many workers examined the qualitative and quantitative methods, compared and employed the best application in the various scenarios and for highlighting different aspects of feeding ecology [10, 7, 11, 8].

Mahesh *et.al*[12] studied the stomach analysis techniques in fishes and concluded that the gut content is not only way to know the diet but also superior source of information on many aspects of fish biology & ecology. Food content analysis can give us data which helps to resolve more complex questions of fish ecology. This vital information provides in-depth insight to the fish feeding ecology, resources availability & demands, potential competition & other aspects of fish ecology & biology, consumption or predation [11]. Individual food content provides unique information about relative importance of particular food.

Khabade[3] studied the gut contents of major carps and their food habits from Sidddhewadi lake of Tasgaon tahsil of Sangli district Maharashtra. It was found that the gut contents of major carp's species consist of phytoplanktons, zooplanktons and decaying plant and animal organic material which confirm the feeding habits of the major carps.

According to Ravindranathan[13] the major food of the carps consists of sand, mud, algae and decaying vegetation. *Labeo rohita* is a column feeder fish. The adults are herbivorous but young fry feed on zooplanktons.

Similar type of work on the foods and related aspects of these fishes was carried out by many workers [14, 15, 16, 17, 18, and 19].

Mangi and Zaibun-nisa Memon[20] analysed the gut contents of Common carp (*Cyprinus carpio*) in district Larkana, Sindh, Pakistan. The study revealed that fish consumed more food in the summer months and less in the winter months. It was concluded that the common carp was omnivorous in its feeding with considerable seasonal variations. The food and feeding habits of fish change with the time of the day, season, size of fish, different ecological factors and various food substances available in the water body [21].

The qualitative and quantitative variations of natural food materials in a water body are under the influence of several biotic and abiotic factors [22].

Srivastava *et. al*[23] studied the feeding ecology of carp fishes and cat fishes captured from Gomati River stretch at Lucknow, Uttar Pradesh, India. According to them the overall diversity of food items in the diet of fish species suggests a response to interspecific as well as more prevalent intraspecific competition in the river environment. Outcomes suggested that carp fishes and cat fishes may adapt to omnivorous nature, although carp fishes feed mainly on phytoplankton and cat fishes on zooplanktons and others.

Several pollutants are being regularly discharged in large quantities into the environment especially into the aquatic environment even some of them are unknown and unidentified but must be affecting the biota. Affected biotic component may also be responsible for the shifting of feeding behavior in fishes.

IV.CONCLUSION

Generally, on the basis of grading & comparing food contents in the fish diets, it was presumed that some food is more important than others to the growth, survival, recruitment, size structure, condition, reproductive success, or other aspects of the ecology of the fishes, thus it is crucial to describe the true importance of food contents.

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Table1: Stomach content analysis of fishes of Rapti River:

Zoological Name	Stomach content		
	Animal matter	Plant matter	Other matter
Notopterus notopterus(Pallas,1767)	++	+	++
Notopterrus chitala(Hamilton,1822)	++	+	++
Gudusia chapra (Hamilton, 1822)	++	-	-
Setipinna phasa(Hamilton, 1822)	++	-	-
Cirrhinus mrigala(Hamilton, 1822)	+	+	+++
Cirrhinus reba(Hamilton, 1822)	+	+	+++
Labeo rohita(Hamilton, 1822)	+	+++	-
Labeo calbasu(Hamilton, 1822)	-	++	++
Puntius sarana(Hamilton, 1822)	-	+++	+
Puntius sophore(Hamilton, 1822)	-	++	+
Catla catla(Hamilton, 1822)	+++	+	-
Amblypharyngodon mola(Hamilton,1822)	++	++	-
Oxygaster bacaila(Hamilton, 1822)	++	++	-
Ompok bimaculatus(Bloch., 1797)	++	++	-
Wallago attu (Bloch. and Schneider, 1801)	+++	-	-
Mystus cavasius(Hamilton, 1822)	+++	-	-
Mystus vittatus(Bloch., 1797)	+++	-	-
Mytus tengara(Hamilton, 1822)	+++	-	+
Rita rita(Hamilton, 1822)	+++	-	-
Bagarius bagarius(Hamilton, 1822)	+++	-	-
Ailia coila(Hamilton,1822)	++	++	-
Clupisoma garua (Hamilton, 1822)	++	++	-
Heteropneustes fossilis(Bloch.,1785)	+++	-	+
Clarias batrachus(Linn., 1758)	+++	-	+
Xenentodon cancila(Hamilton,1822)	+++	-	-
Rhinomugil corsula(Hamilton,1822)	++	++	-
Channa punctatus(Bloch., 1785)	+++	-	+
Channa striatus(Bloch., 1785)	+++	-	+
Chanda nama(Hamilton, 1822)	++	-	-
Chanda ranga (Hamilton, 1822)	++	-	-
Badis badis(Hamilton, 1822)	++	-	-
Anabas testudineus(Bloch., 1785)	++	-	-
Colisa fasciatus(Bloch. & Schn. 1801)	++	-	-
Macrognathus aculeatus(Bloch., 1787)	+++	-	-
Mastacembelus armatus (Lacepede, 1800)	+++	-	-

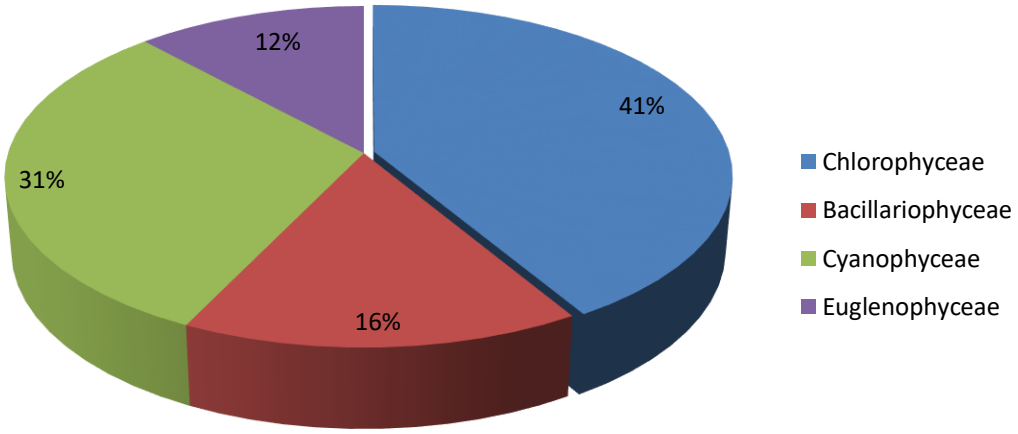

Fig 1: showing prevalence of plant content in gut of fishes of Rapti river

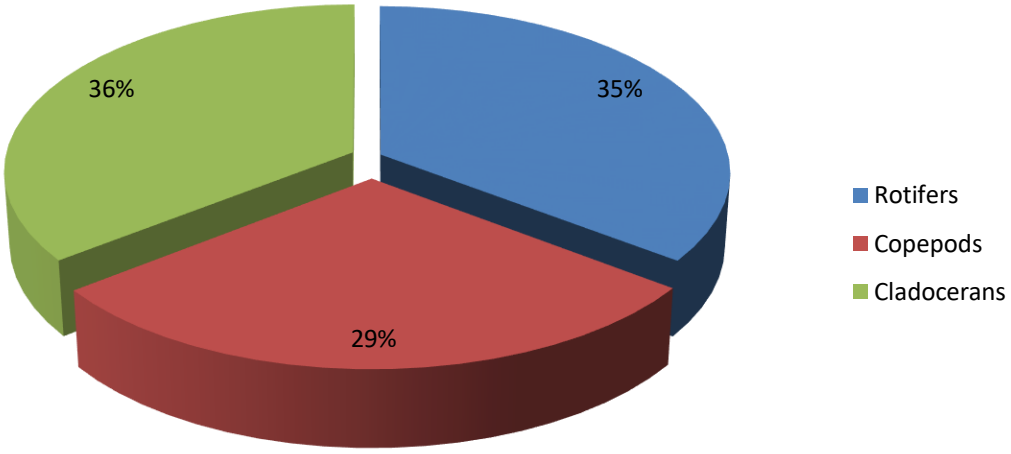

Fig 2: Showing prevalence of animal content in gut of fishes of Rapti river

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