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Journal of Advanced Scientific Research

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ISSN
0976-9595
Research Article

FISH GUT ANALYSIS OF DEMERSAL FISH SPECIES OF DILAWARA RESERVOIR OF DHAR TEHSIL OF DHAR DISTRICT, MADHYA PRADESH

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Received: 15-01-2023; Accepted: 05-03-2023; Published: 31-03-2023

 https://doi.org/10.55218/JASR.2023140309

ABSTRACT

Dilawara reservoir of Dhar, Madhya Pradesh, India; an important drinking water source of Dhar tehsil is also widely used for fishculture besides irrigation and domestic purpose. In the present study, the demersal fish fauna of Dilawara Reservoir were selected for the gut content study and included species of catfish (*Heteropneustes fossilis* and *Clarias batrachus*), minor carps (*Rasbora daniconius*, *Danio melaharicus, Puntisticto, P. sarana*): fingerlings of major and common carp, snake head (*Channa striatus, C. punctatus*), one species of clupeide (*Gadusia chapra*) and one species of Mastocembalidae (*Mastucembalus armatus*). The selection of fish species was made on their feeding habits and their availability throughout the year. The food of demersal fish species of Dilawara Reservoir varied and diversified to include, mollusks, crustaceans, annelids, insects, snails, fish, macrophytes and various algae. Gut content analysis showed that most of the fish species preyed on zooplankton benthic animals except for fishes belonging to Family Clupeidae (*Gudusia chapra*) and minor carps. Their Stomach content analysis showed that macrophytes and algae were exclusively the dominant food items observed in their stomachs and were categorized as omnivorous.

Keywords: Fish Fauna, Gut Content Analysis, Dilawara Reservoir, Diversified, Feeding Habits.

1. INTRODUCTION

Stomach content analysis provides important informations on ecological and biological aspects of fish behaviour, condition, habitat use, energy intake, inter- and intra-specific interactions. It is an essential part of the ichthyological research, fishery, and fish protection. Accurate description of fish diets and feeding habits also provides the basis for understanding trophic interactions in aquatic food webs. Conceptually, trophic relations of fishes begin with food and feeding behaviour of individuals or species. Diet composition analysis can be used to evaluate effects of ontogeny or the establishment of exotic species [1, 2]. The simplest purpose of fish stomach content analysis is to determine the most frequently consumed prey or determine whether a particular food category is present in the stomach. Assessment of food habits is also an important aspect of fisheries management and our ability to manage prey resources, increasing fish production and manipulating forage fish populations to enhance sports fisheries [2-4].

The study of the feeding habits of fish and other animals based on direct examination of stomach content has become a standard practice for many years [5]. The gut content analysis gives an idea about the actual diet and feeding habit of the fish species [6]. The direct gut content analysis carried commonly out through dissection or evacuation and examination of stomach contents is still the most used and easiest method with great potential and good enough for most biological/ecological studies [7]. Other factors *viz.,* sampling location, time of day, prey availability and even the type of gear used collect the fishes need to be considered before initiating a diet study or analyzing existing diet data for a better understanding of diet data and for accurate interpretation of fish feeding habits. Gut contents can be collected either from the live or fresh died or preserved fish [8].

The study aims to determine the food or prey items in the gut of selected families of freshwater fishes caught in Dilawara reservoir. Specifically, it was aimed to assess the frequency of occurrence, percentage of food items in the gut of the fish sample and the importance of the food items.

2. MATERIAL AND METHODS

2.1. Fish Gut Analysis

In order to find the food relationship of macro-invertebrates with fishes, few species of the already sampled fishes were selected. From all the four monitoring stations, 3-4 fishes of each type were selected, injected with 10% formalin solution to stop the digestion and were brought to the laboratory. In the laboratory, lengths of each fish were measured and were preserved in 10% formalin solution. To find the fish contents, the fishes were dissected ventrally from anal hole up to the snout and the alimentary canal was also removed cautiously and transferred to the petri dish. The length of the alimentary canal was also measured to find the relative gut length. The food contents taken out from the gut were observed microscopically and were recognized up to the possible level.

2.2. Quantitative Study of the diet

The value of Relative Gut Length (RLG) was calculated by simply taking theratio of gut length and body length [9].

RL = (Length of gut total body length/total body length) ×100

Numerical method:

%N= (Number of gut contents of the ith type/total number of gut contents) × 100

3. RESULTS AND DISCUSSION

The demersal fish fauna of Dilawara reservoir were selected for the gut content study includes species of catfish (*Heteropneustes fossilis* and *Clarias batrachus*), minor carps (*Rasbora daniconius, Danio melaharicus, Puntisticto, P. sarana*): fingerlings of major and common carp, snake head (*Channastriatus, C. punctatus*), one species of clupeide (*Gadusia chapra*) and one species of Mastocembalidae (*Mastucembalus armatus*). The selection of fish species was made on their feeding habits and their availability throughout the year. The food types which have been observed during the gut content analysis of demersal fish species have been categorized into ten classes namely decayed organic matter, macrophytes, molluscs, oligochaetes, insects, small fishes and snails, unidentified material, sand & mud, crustacians and algae. Results of the percentage of gut contents of demersalfish species have been represented in table 1 and fig. 1.

In the present study, the food items observed during the gut analysis of *Heteropneustes fossilis* include decayed organic matter (22%), macrophytes (8%), molluscs (55%), oligochaetes (13%), insects (12%), and unidentified material (5%). Food items molluscs (55%) and decayed organic matter (22%) composed the bulk of the diet and formed the most important prey. Similar findings were also reported by scientists [10, 11] who found that catfish fed on detritus, humus, and macrophytes. The study of Narejo *et al.* [12] also revealed that the feeding habit of *Heteropneustes fossilis* was found to be carnivorous with main preference of crustacean

Six broad food items were found to consistently constitute the diet of *Clarias batrachus* in Dilawara Reservoir. These food items were decayed organic matter (15%), molluscs (8%), insects (35%), and unidentified material (5%), sand &mud (5%), crustacians (22%). Insects (35%) and Crustacians (22%) were thedominant food items observed in the gut of *Clarias batrachus* species. Ramesh *et al.* [13] also carried the food analysis of *Clarias batrachus* and revealed that the food consisted of zooplankton, insect larvae, fish larvae, small shrimps and organic debris.

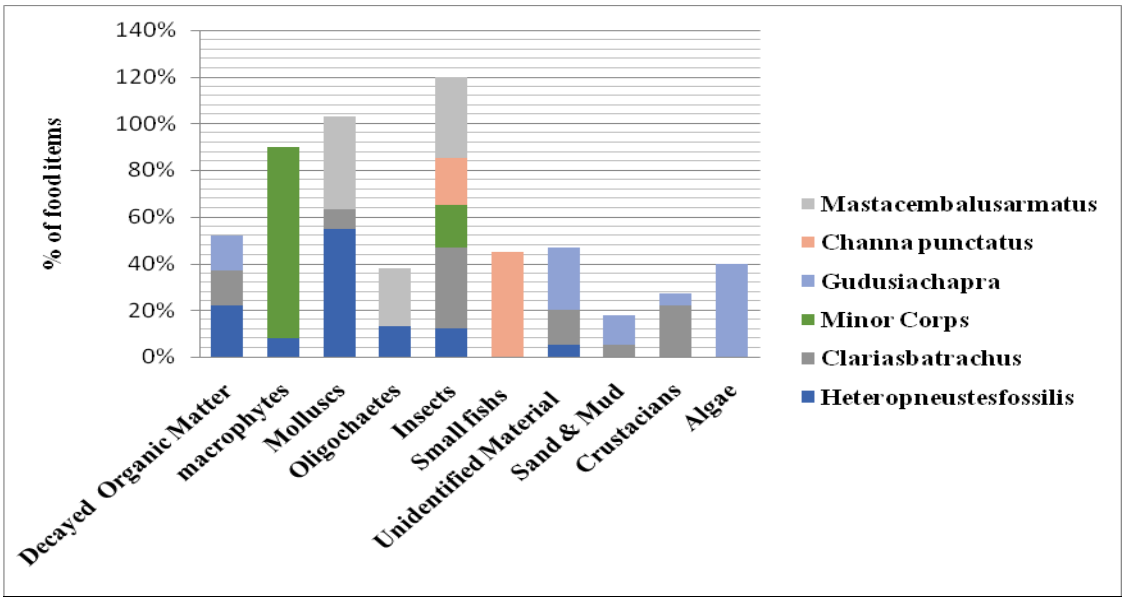
Oligochaetes (45%) and insects (55%) represented the highest proportion of food items overall in fingerlings of major corps. While the major diet of minor corps includes macrophytes (82%), and (18%) insects. The food items consumed by *Gudusia chapra* included decayed organic matter (15%), unidentified material (40%), sand & mud (13%), crustacians (5%) and algae (27%). Mangi *et al.* [14] analyzed the gut contents of Common carp (*Cyprinus carpio*) in district Larkana, Sindh, Pakistan, and concluded that the common carp was omnivorous in its feeding. Similar type of work was carried out by Verma and coworkers [15] who concluded that the major carps feed mostly on the phytoplanktons and vegetable matter. The *Labeo rohita* shows the vegetarian food habit. MIshra *et al*. [16] found that Rohu exhibits different feeding strategy during its growth from fingerlings to adult.

Gut analysis of *Channa punctatus* showed that small fishes (45%) were the dominant prey items followed by Snails and small animals (35%) and then insects (20%) However, the major food items identified during the gut analysis of *Mastacem balusarmatus* were molluscs (40), oligochaetes (20%), and insects (35%). Nazrul *et al.* [17] revealed that the *Channa punctatus* feeds on animal foods (crustaceans, molluscs, insects and fishes. Sonawane and coworkers [18] found that *Channa punctatus* was dominated by crustaceans, followed by insects, molluscs, fishes and least by plant material thus reflecting its carnivorous nature. Absar *et al.* [19] revealed that the three major food items of *M. armatus* were the small sized

teleosts, insects, and molluscs. The analyses of the relative gut length (RGL) revealed its carnivorous type of feeding habit. Sand and mud were not recorded in the stomach content agreed with the observations [20].

Table 1: Food Composition of Demersal Fish fauna of Dilawara Reservoir of the year 2017 and 2018

Fishtypes	GutComposition	
Heteropneustes fossilis	Decayedplantmaterial	22%
	Semidigestedmacrophytes	08%
	Molluscs	55%
	Oligochaetes	13%
	Insects	12%
	UnidentifiedMaterial	5%
Clarias batrachus	DecayedOrganicMatter	15%
	Sand&Mud	5%
	Insects	35%
	Molluscs	08%
	Crustacians	22%
	Unidentifiedmaterial	05%
Fingerlings of Major Corps	Insects	55%
	Oligochaetes	45%
MinorCorps	Macrophytes	82%
	Insects	18%
Gudusia chapra	DecayedOrganicmatter	15%
	Sand&Mud	13%
	Algae	40%
	Crustacians	5%
	Unidentifiedmaterial	27%
Channa punctatus	SmallFish	45%
	Insects	20%
	Snailsand Smallanimals	35%
Mastacem balusarmatus	Insects	35%
	Moulluscs	40%
	Oligochaetes	25%



Graph 1: Food composition of demersal fish fauna of Dilawara reservoir

The food of demersal fish species of Dilawara reservoir were varied and diversified to include, mollusks, crustaceans, annelids, insects, snails, fish, macrophytes and various algae. Gut content analysis showed that most of the fish species preyed on zooplankton benthic animals except for fishes belonging to Family Clupeidae (*Gudusia chapra*) and minor carps. Their stomach content analysis showed that macrophytes and algae were exclusively the dominant food items observed in their stomachs and were categorized as omnivorous. The presence of detritus suggested that some fish species fed on decomposed organic debris, small pieces of dead and decomposed plants and animals. Benthic organisms were also observed in the stomach and gut of the fishes, but they were not too abundant in terms of percentage by weight. The analysis of the trophic structure of the fishes indicate dominancy of carnivorous fishes in all sites followed by omnivorous and detrivorousfish depicting similar findings [21, 22].

4. CONCLUSION

Gut content analysis based on laboratory results showed that the fish comprised five feeding guilds: mollusks, crustaceans, annelids, insects, snails, fish, macrophytes and various algae. Most of the fish species preyed on zooplankton benthic animals except for fishes belonging to family Clupeidae (*Gudusia chapra)* and minor carps. Their stomach content analysis showed that macrophytes and algae were exclusively the dominant food items observed in their stomachs and were categorized as omnivorous.

Conflicts of interest

We declare no conflict(s) of interest related to this work.

Source of funding

The work was not supported by any kind of funding from any source

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