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Food and Feeding Habits of Two Freshwater Catfish, *Mystus cavasius* and *Xenentodon cancila* from Chambal River (M.P)

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Abstract: ***The food and feeding habits of freshwater catfish, Mystus cavasius and Xenentodon cancila were analysed on the basis of methods i.e., percent numerical count and percent frequency occurrence. The results from the analysis of gut contents of these two fresh water catfishes shows that both of the fish, M. cavasius and X. cancila depends mainly on the animal material i.e., zooplankton, crustaceans, round worms, insects, parts of insect, insects larvae and mollusc. The results from the study also reveal that plant material contributes the equal portion of the diet. M. cavasius has been categorised as eury-omnivorous as it feeds on wide range of diet including both the vegetable as well as animal diet but on the basis of biomass of food material, animal material contributes a major portion of the diet hence it may be pointed out as carnivore in its feeding habit. The gut contents of X. cancila consist of large portion of animal material in biomass and plant materials is in lesser proportion hence this comes in the category of carnivorous fish. Empty stomach were observed in May and June (pre-spawning period) due to bigger size of the gonads which occupying larger space in the body cavity and allowed a little space for the food. This may be concluded that food and feeding habits of these two fish is correlated with their natural habitat.***

Keywords: Food, feeding habits, *Mystus cavasius*, *Xenentodon cancila*, and Chambal river

1. Introduction

Food is the main source of energy and plays an important role in determining the abundance of population, rate of growth and condition of fishes. Feeding is a dominant activity of most of the organisms through their entire life cycle and same is true with the fish also [1]. The study of food and feeding habits of fishes have manifold importance in fishery biology.

Fish feed on a wide range of food material and obtain their nourishment from plant as well as animals. [2] has classified the natural food of fish under three groups, viz., (a) main food, which the fishes prefer under favourable conditions and on which they thrives best, (b) occasional food, that is well liked and consumed as and when available, and (c) emergency food, which is ingested when the preferred food items are not available and on which the fish is just able to survive. Depending upon the variety of food items, consumed by fish, [3] has classified them as (1) stenophagic- the fishes feeding on a few different types of food and (2) euryphagic- who are feeding on a variety of food materials. Thus, most of the fishes fall under the category of euryphagic fishes. Fishes are also classified according to the feeding affinities to particularly level in water bodies, where their specific food abounds [4]. The feeding intensity of a fish can be determined by gastrosomatic index. Recent work on food and feeding habits of fish has done by several workers viz., [5], [6], [7], [8], [9], [10], [11], [12] and [13].

2. Materials and Methods

Specimens of *M. cavasius* and *X. cancila* were collected from Chambal River near Rajghat, Morena in the last week of every month by using cast net with the help of fisherman. The fish specimen was dissected out and the gut was stretched out and removed from adhering viscera and mesentries by using brush and blunt forceps to prevent injury to the gut. The stomachs were detached from the gut and weight of stomach was recorded and it was preserved in 4 % formalin. Further the stomachs were dissected to collect its contents present in it. The contents were collected in a glass vial making up the volume to 1 ml to determine different food items eaten by the fish both qualitatively and quantitatively. The stomach contents were analyzed by following the methods *viz.*, percent numerical count and percent frequency occurrence [14].

3. Results

Results of the gut contents analysis of catfish, *M. cavasius* and *X. cancila* have been based on the methods *i.e.*, percent numerical count and percent frequency occurrence. The qualitative analysis of the gut contents revealed that the phytoplanktonic groups belonging to Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae are present. The animal material includes zooplankton belonging to Protozoa, Rotifera, Cladocera and Copepoda, round worms, insects, parts of insects and insects' larvae belonging to Diptera, Trichoptera, Coleoptera and Hemiptera and mollusc.

3.1 Mystus cavasius

Percentage numerical count exhibited the plant material (phytoplankton) including, Bacillatiophyceae which was the dominant group contributing (28.13 %) followed by Cyanophyceae with 16.39 %, Chlorophyceae with 7.68 % and Euglenophyceae with 5.28 % followed the dominant group (table 1). Among the food organisms the next group after the phytoplankton was insects, parts of insects and insects' larvae. The insect parts encountered their highest percentage 9.02% which was followed by insect larvae belonging to Diptera of about 6.51 %, Trichoptera with 4.79

%, Coleoptera with 3.52 %, Hemiptera with 0.82 %. Mollusca under macroinvertebrates contributed 4.16 % and roundworms contributed minimum percentage among macroinvertebrates 1.06 % (table 1). Zooplankton belonging to the members of Protozoa, Rotifera, Cladocera and Copepoda. The Copepoda was dominant zooplanktonic group encountered (7.47 %) which was followed by Protozoa with (2.03 %), Cladocera (with 0.39 %) and rotifera (with 0.20 %) was observed as the least contributing food group (table 1). The miscellaneous food items (remained unidentified) contributed of about 2.44 % of the total food groups (table 1).

By using the percentage of frequency occurrence method the food items observed from the gut of the *M. cavasius*, plant material *i.e.*, Bacillariophyceae was dominant group among phytoplankton with highest percentage of 21.94 % followed by Cyanophyceae 15.25%, Chlorophyceae 11.33 % and Euglenophyceae 8.69 %.) has been shown in table 2. Macroinvertebrates included parts of insect which occurred very frequently in all the stomachs and counted for 4.71% which was followed by Diptera larva 4.65 %, mollusca 4.59%, Trichoptera 4.26 %, Coleoptera 3.77 %, and round worms 1.43% (table 2). The miscellaneous food items which include all the unidentified remained material in the gut accounted for 3.80 % (table 2). On the basis of biomass of different food material, the macroinvertebrates were dominant.

The fish has been categorised as eury-omnivorous as it feeds on wide range of diet including both the vegetable as well as animal diet but on the basis of biomass of food material, animal material contributes a major portion of the diet hence it is considered as carnivore in its feeding habit.

3.2 Xenentodon cancila

The percent numerical composition of various food items in stomach was Chlorophyceae 11.13%, Bacillariophyceae 32.80%, Cyanophyceae 8.40%, Eugleenophyceae 5.72%, Protozoa 3.01%, Rotifera 8.63%, Cladocera 2.45%, Copepoda 8.89%, Ostracoda 0.41%, Aquatic insects 0.44%, Insects part 3.29%, Roundworm 5.4%, Crustaceans 1.07%, Molluscan 1.94%, Fishes 1.22% and Miscellaneous items 5.19% (table 3). The worm, aquatic insect, crustacean, mollusc and fishes found in the stomach contributes the maximum when biomass of food is considered.

The percentage frequency occurrence count of various food items was Chlorophyceae 12.55%, Bacillariophyceae 28.70%, Cyanophyceae 9.4%, Eugleenophyceae 5.78%, Protozoa 2.19%, Rotifera 10%, Cladocera 3.31%, Copepoda 10.39%, Ostracoda 0.55%, Aquatic insects 0.90%, Insects part 1.24%, Roundworm 4.53%, Crustaceans 2.23%, Molluscan 1.81%, Fishes 2.62% and Misscellaneous items 3.79% (table 4).

Thus, on the basis of number of items, it may be concluding that both fishes are eury- omnivorous but on the basis of biomass of food items both fishes can be easily categorised as carnivorous fish.

4. Discussion

The gut contents of *M. cavasius* and *X. cancila* were analysed on the basis of percentage numerical count and percentage frequency occurrence methods. According to the character of diet, adult fish have been classified into herbivores, if they feed on vegetable matter, carnivore, if their food comprise of animal matter, and omnivore if they subsist on mixed diet comprised of both vegetable as well as animal food. From our observations on the gut contents of *M. cavasius*, it can be concluded that this fish is a eury-omnivorous, feeding on wide range of food items *i.e.*, phytoplankton, zooplankton, insects, their larvae and their parts, roundworms and molluscans. Insects, their larvae and parts and mollusca contribute the major portion of their food on the basis of biomass. The results obtained from percentage count and frequency occurrence stated that the plant material contributes the maximum percentage of its diet followed by insects and their larvae and insect parts. *X. cancila* has been shown to feed absolutely on fish [15]. The percent numerical composition of major food groups of *X. cancila* was phytoplankton 58.05%, zooplankton 23.39%, macro-invertebrate 12.14%, macro-vertebrate 1.22% and miscellaneous items 5.19%. Phytoplankton was the dominant group with 58.05% as far as the number of organisms is concerned. The worm, aquatic insect, crustacean, molluscs and fishes found in the stomach contributed maximum when biomass of food is considered. On the basis of percent frequency occurrence composition of major groups was phytoplankton 56.43%, zooplankton 26.44%, macro-invertebrate 10.71%, macro-vertebrate 2.62% and miscellaneous items 3.79%. Thus, on the basis of analysis of gut contents it may be concluded that *X. cancila* as carnivorous in feeding habit because it feeds more on animal material in comparison to plant material.

The Similar food and feeding habits have been described by [16], [7], [8], [17], [18] and [19]. [20] has classified the *Labeo calbasu* as an omnivorous fish. According to the study of [21] has found that catfish, *Clarias gariepinus* was an omnivore feeds on phytoplankton, insects, insect larvae and pupae, fish and fish remains with preference for plankton diet. According to [22], the *Oreochromis niloticus* and *Sarotherodon galilaeus* both were omnivorous species feeding on Spirogyra, detritus, sand grains and insect parts and occupy the same ecological niche. *Gerres oblongus* was an omnivorous fish having preference for animal diet over vegetable material [23]. *Mystus gulio* have been classified as euryphagus and omnivorous in food habits [5]. [24] observed that *Barbonymus altus*, *Notopterus notopterus* and *Ompok bimaculatus* were feeding on phytoplankton, zooplankton, insects and miscellaneous food items hence come under the category of omnivorous. [7] studied that two freshwater fishes, *Ompok bimaculatus* and *O. malabaricus* were found to be omnivorous in habit, feeding mainly on vegetable matter and fish, which dominated the list with 30.04%. [19] observed that *Tilapia zilli* is an omnivorous fish with dietary preference for Algae. The food contents of *Rita rita* contained a wide range of food items including dominant groups like crustaceans and copepodes constituting (20.73%), insect (15.97%), followed by mollucs (14.76%), teleosts (12.98%) and fish eggs (8.608%) [12]. The gut contents of *Amblypharyngodon mola* had

Chlorophyceae with a percentage of 44.46 %, Bacillariophyceae with 24 %, Cyanophyceae with 11.58 %, Euglenophyceae with 8.30 %, Rotifera with 6.38 %, Crustacea with 3.07 %, unidentified species with 1.30 % and plant parts with 0.91 % according to the frequency occurrence method [25]. This observation has revealed the fact that food items eaten by the fish is dependent on food items available in the habitat and feeding intensity of fish. The present study has suggested that *M. cavasius* and *X. cancila* as eury-omnivore in its feeding habit and capable of feeding on food items of both plant and animal material with the numerical preference for the phytoplankton. However, on the basis of the biomass of the food items accounted in the gut of both fish, is inclined towards the carnivorous in feeding habit.

5. Conclusion

The study on the gut contents of *M.cavasius* and *X. cancila* were based on percentage numerical count and percentage frequency occurrence methods of food items suggested that *M.cavasius* and *X. cancila* feeds on material of plant origin as well as animal origin. Numerically these are largely dependent on the phytoplankton. Animal material including insects, parts of insects and insects larvae were equally preferred by both of the fish. If we look into the food on the basis of biomass, the animal material is in high proportion. Thus, on the basis of analysis it may be pointed out that *M.cavasius* and *X. cancila* as eury -omnivorous fishes. However on the basis of the biomass of the food items *M.cavasius* and *X. cancila* can be easily placed under a category of carnivorous fishes.

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Table 1: Mean contributions of different food items of *M. cavasius* on the basis of the percentage numerical count method

S.N o	*Food items*	*Mean contribution of food items*
A	Plant material	
1.	Phytoplankton	
A	Cyanophyceae	16.39
B	Chlorophyceae	7.68
C	Euglenophyceae	5.28
D	Bacillariophyceae	28.13
B	Animal material	
1	Zooplankton	
A	Protozoa	2.03
B	Rotifera	0.20
C	Cladocera	0.39
D	Copepoda	7.47
2	Macro invertebrates	
A	Roundworms	1.06
B	Insects and larvae	
1	Diptera	6.51
2	Trichoptera	4.79
3	Coleoptera	3.52
4	Hemiptera	0.82
5	Insect parts	9.02
3	Mollusca	4.16
C.	Miscellaneous	2.44

Table 2: Mean contributions of the different food items of *M. cavasius* on the basis of the percentage frequency occurrence method

S.N	*Food items*	*Mean contribution of food items*
A	Plant material	
1	Phytoplankton	
A	Cyanophyceae	15.25
B	Chlorophyceae	11.33
C	Euglenophyceae	8.69
D	Bacillariophyceae	21.94
B	Animal material	
1	Zooplankton	
A	Protozoa	2.96
B	Rotifera	0.39
C	Cladocera	0.93
D	Copepoda	10.08
2	Macro invertebrates	
1	Roundworms	1.43
2	Insects, their parts and larvae	
A	Diptera	4.65
B	Trichoptera	4.26
C	Coleoptera	3.77
D	Hemiptera	1.09
E	Insect parts	4.71
3	Mollusca	4.59
C	Miscellaneous	3.80

Table 3: Mean contributions of the different food items of *X. cancila* on the basis of the percentage frequency occurrence method

S. N o	*Group Name*	*Mean contribution of food items*
A	**Plant material**	
1	**Phytoplankton**	
A	Chlorophyceae	11.13
B	Bacillariophyceae	32.80
C	Cyanophyceae	8.40
D	Euglenophyceae	5.72
B	**Animal material**	
1	**Zooplankton**	
A	Protozoa	3.01
B	Rotifera	8.63
C	Cladocera	2.45
D	Copepoda	8.89
2	Ostracoda	0.41
1	**Macroinvertebrates**	
2	Aquatic insect	0.44
A	Insect part	3.29
B	Roundworm	5.40
C	Crustacean	1.07
D	Molluscan	1.94
E	**Vertebrates**	
3	Fishes	1.22
C	Miscellaneous items	5.19

Table 4: Mean contributions of the different food items of X. cancila on the basis of the percentage frequency occurrence method

S.N o	**Group Name**	**Average**
A	**Plant material**	
1		
A	**Phytoplankton**	
B	Chlorophyceae	12.55
C	Bacillariophyceae	28.70
D	Cyanophyceae	9.40
B	Euglenophyceae	5.78
1	**Animal material**	
A	**Zooplankton**	
B	Protozoa	2.19
C	Rotifera	10.00
D	Cladocera	3.31
2	Copepoda	10.39
1	Ostracoda	0.55
2	**Macroinvertebrates**	
A	Aquatic insect	0.90
B	Insect part	1.24
C	Roundworm	4.53
D	Crustacean	2.23
E	Molluscan	1.81
3	**Vertebrates**	
C	Fishes	2.62
	Miscellaneous items	3.79

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