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Food and Feeding Habits of Freshwater Catfishes (Siluriformes: Bagridae: *Mystus* sp.)

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ABSTRACT- Order siluriformes, Bagridae family of four numbers of catfish species provides information on the diets of *Mystus bleekeri, M. cavasius, M. tengara, M. vittatus* in Lower Manair reservoir. The total of 1021 fish species examined and their stomach content was analyzed. The frequency of occurrence and numerical methods were employed in this study. In the numerical analysis, crustaceans and insect parts (85.91%) constituted the most important diet of *M. bleekeri* followed by the fish remains (78.40%), plant materials (69.01%), algae/ protozoan (64.79%), molluscs (63.38%), detritus (56.81%) and sand grains (33.80%). The number of food items was enumerated for the crustaceans and insect parts in *M. bleekeri* had contained the maximum percentage (34.84%) of the content under the frequency of occurrence method followed by algae and protozoan with 20.76%, Molluscs with 18.37%, plant materials with 15.60% and sand grains with 10.44%. The result of the analysis showed that *M. cavasius, M. tengara,* and *M. vittatus* fed on similar food items. These were mainly crustaceans, molluscans, fish remains and macrophytes. Other food items include algae, detritus, sand grains. These four species are omnivorous and occupy the same ecological niche.

Key-words- Cat fish, Food and feeding, Frequency, Numerical method

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INTRODUCTION

The study of the food and feeding habits of fish species is a subject of continuous research because it constitutes the basis for the development of a successful fisheries management programmed on fish capture and culture and because the aquatic ecosystem is dynamic. The gut content is a reflection of the water quality, all other factors being constant. The natural habitats offer a great diversity of organisms that are used as food by fish, which differ in sizes (microscopic and macroscopic) and taxonomy groups [1]. The dietary analysis of fish in their natural habitats enhances the understanding of the growth, abundance, productivity and distribute on of organisms [2,3]. Condition factor is used as an index of growth and feeding intensity and decrease with increase in length [4]. It influences the reproductive cycle in fish [5] and it is an important fishery management tool in estimating the relative well being of a fish population in a particular river system.

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Studies on natural feeding of fish could provide useful information on the trophic relationships in aquatic eco-systems Abdel-Aziz and Gharib [6], which could be used in formulating management strategy options in a multi species fishery. Pius and Benedicta [7] also reported the use of stomach content in reducing intra and inter specific competition for ecological niche.

The study of the feeding habits of fish and other animals based upon analysis of stomach content has become a standard practice [8]. Stomach content analysis provides important insight into fish feeding patterns and quantitative assessment of food habits is an important aspect of fisheries management. Lagler [9] pointed out that the gut contents only indicate what the fish would feed on. Accurate description of fish diets and feeding habits also provides the basis for understanding trophic interactions in aquatic food webs. Diets of fishes represent an integration of many important ecological components that included behavior, condition, habitat use, energy intake and inter/intra specific interactions. A food habit study might be conducted to determine the most frequently consumed prey or to determine the relative importance of different food types to fish nutrition and to quantify the consumption rate of individual prey types. Each of these questions requires information on fish diets and necessitates different approaches in how one collects and analyzes data. Here, we outline qualitative and quantitative techniques used to describe food habits and feeding patterns of fishes.

For a better understanding of diet data and for accurate interpretation of fish feeding patterns, time of day, sampling location, prey availability and even the type of collecting gear used need to be considered before initiating a diet study or analyzing existing diet data.

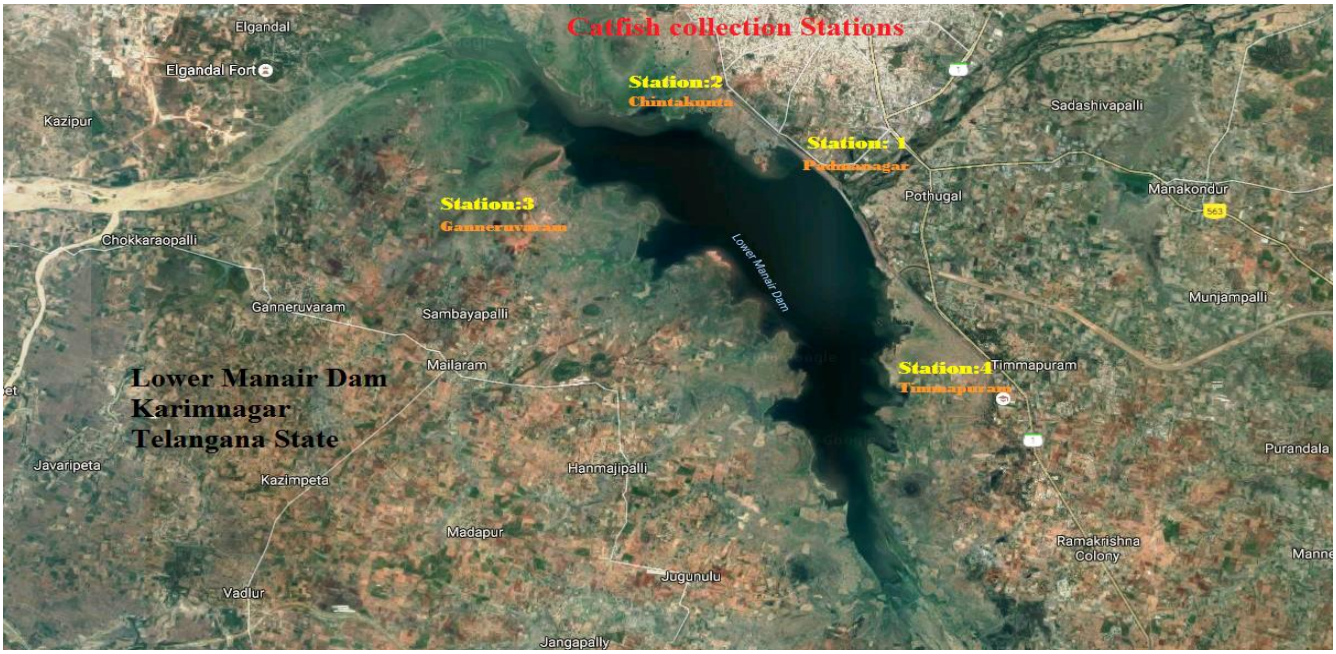


Fig. 1: Lower Manair Dam

MATERIALS AND METHODS

Study area

The Lower Manair Dam (Fig. 1) is located on the Manair River at 18°24' N latitude and 79° 20' E longitude in Karimnagar District at 146 km of Kakatiya Canal. The Manair River is a tributary of the Godavari River and the dam is built across the river at the confluence with Mohedamada River. The dam drains a catchment area of 6,464 square kilometres (2,496 sq mi), which includes 1,797.46 square kilometres (694.00 sq mi) of free catchment and the balance is intercepted catchment. The catfish samples were collected from four selected stations, i.e., S1: Padmanagar, S2: Chintakunta, S3: Ganneruvaram and S4: Timmapuram.

Sampling Procedure

Catfish specimens were collected every fortnight from June 2015 to January 2016 with the aid of the fishermen operating on the reservoir. Gears employed included gill nets, cast nets, and traps [10]. Samples were chilled in iced blocks at the point of collection before being transported to the laboratory in the Department of Zoology, Jammikunta for analysis. Identification of fish species was done using fish identification guide [11-14]. The weight of each specimen was taken using digital balance to the nearest 0.01 g after draining excess water with a pile of filter paper while standard length was measured in centimetre using a measuring board. Specimens were dissected and the gut taken out to remove the stomach. The stomach contents were emptied into a Petri dish for analysis. The analysis was done using frequency of occurrence and numerical methods

as described by Hyslop and Costal *et al.* [8,15]. In the frequency of occurrence method, the occurrence of food items was expressed as the percentage of the total number of stomach containing food. In the numerical method, the number of each food item was expressed as the percentage of the total number of food items found in the stomachs. Stomach contents were examined and the individual food organisms sorted and identified. The number of stomachs in which each item occurs was recorded and expressed as a percentage of the total number of stomachs examined. The number of individuals in each food category was recorded for all stomachs and the total was expressed as a proportion, usually a percentage, of the total individuals in all food categories [16,17].

RESULTS AND DISCUSSION

In the present investigation a total of 1021 numbers of fishes gut content were analyzed by *M. bleekeri* (266) Fig. 3, *M. cavasius* (248) Fig 4, *M. tengara* (294) Fig. 5 and *M. vittatus* (339) Fig. 6. The total standard length was measured ranged from 5.5–8.6 cm, 9.2–15.5 cm, 5.2–7.8 cm and 6.8-10.2 cm respectively. The analysis of empty stomachs of catfishes of *M. bleekeri*, out of 266 specimens examined 53 (19.93%) had empty stomach. *M. cavasius* out of 248 specimens examined 61 (24.60%) had empty stomach (Table 1). *M. tengara* out of 294 specimens examined 78 (26.53%) had empty stomach and *M. vittetus* out of 339 specimens examined 48 (14.16) empty stomach (Table 3).

In the numerical analysis, crustaceans and insect parts (85.91%) constituted the most important diet of *M. bleekeri* followed by the fish remains (78.40%), plant materials (69.01%), algae/ protozoan (64.79%), molluscs (63.38%), detritus (56.81%) and sand grains (33.80%). The catfish of *M. cavasius* diet composition of fish remains (89.84%) constituted the most important diet followed by crustaceans and insect parts (81.28%), algae/ protozoan (75.94%), plant materials (72.72%), molluscs (66.31%), detritus (62.03%) and sand grains (34.23%) (Table 2). The catfish of *M. tengara* diet composition of crustaceans and insect parts (82.40%) constituted the most important diet followed by fish remains (75.00%), plant materials (76.85%), molluscs (71.30%), algae/ protozoan (68.98%), detritus (52.78%) and sand grains (33.33%). The catfish of *M. vittetus* diet composition of crustaceans and insect parts (97.59%) constituted the most important diet followed by fish remains (95.19%), plant materials (84.54%), algae/ protozoan (72.85%), molluscs (53.61%), detritus (42.61%) and sand grains (29.55%) (Table 4 & Fig. 2).

The feeding habits were similar to this study and reported by Fagade and Olaniyan [2]. In the Lagos Lagoon and Fagade (4) on *Tilapia guineensis* from Lekki Lagoon, apart from the major food items of platonic items, invertebrate and vertebrate organisms also picked a variety of other food items. Liem [18] stated that teleost, including cichlids were able to exploit more than one source. This ability to exploit different varieties of food makes *O. niloticus* and *S. galilaeus* to be omnivorous. Several other workers had also reported on the high degree of overlap in diet of fishes from the same community [19-22].

In the present investigation the number of food items were enumerated for the crustaceans and insect parts in *M. bleekeri* had been contained the maximum percentage (34.84%) of the content under frequency of occurrence method followed by algae and protozoan with 20.76%, Molluscs with 18.37%, plant materials with 15.60% and sand grains with 10.44%. The crustaceans and insect parts in *M. cavasius* had contained the maximum percentage (27.90%) of the content under frequency of occurrence method followed by algae and protozoan with 24.51%, Molluscs with 18.64%, plant materials with 16.82% and sand grains with 12.13% Table 2. In *M. tengara* the numbers of food items were enumerated for the crustaceans and insect parts had contained the maximum percentage with 28.68% followed by sand grains with 20.95%, algae and protozoan with 18.70%, plant materials with 16.29%, molluscs with 15.387%. The crustaceans and insect parts in *M. vittetus* had contained the maximum percentage (30.93%) of the content under frequency of occurrence method followed by plant materials with 20.95%, algae and protozoan with 20.13%, Molluscs with 15.47%, and sand grains with 12.52% (Table 4. & Fig. 2).

In the present study, four species of catfishes the diet contains mainly crustaceans in all species in the reservoir during study period. Kuton and Kusemiju [23]; Gupta and Banerjee [24] noted that inter specific competition occurred among the four cichlid species in Lekki Lagoon. The detritus material was more in *M. vittetus* i.e. 42.61. Brown [25] reported that this fish species fed mainly on detritus, insects and plant materials in Ikpoba River. Ikomi [26] observed that the presence of tiny unicuspid teeth in the mouth of the fish suggested that fish species feed on plants, leaves, buds and seeds of water lilies and are thus herbivorous feeders.

Table 1: Analysis of empty stomach of *M. bleekeri* and *M. cavasius*

Month	No. of Stomach examined		No. of Empty stomach		Empty stomach (%)	
	M. bleekeri	*M. cavasius*	*M. bleekeri*	*M. cavasius*	*M. bleekeri*	*M. cavasius*
Jun-15	36	32	9	8	25.00	25.00
Jul	45	42	11	13	24.44	30.95
Aug	38	36	8	9	21.05	25.00
Sep	25	38	6	11	24.00	28.95
Oct	42	28	9	7	21.43	25.00
Nov	33	26	4	5	12.12	19.23
Dec	25	28	3	6	12.00	21.43
Jan-16	22	18	3	2	13.64	11.11

Table 2: Summary of the stomach contents of *M. bleekeri* and *M. cavasius*

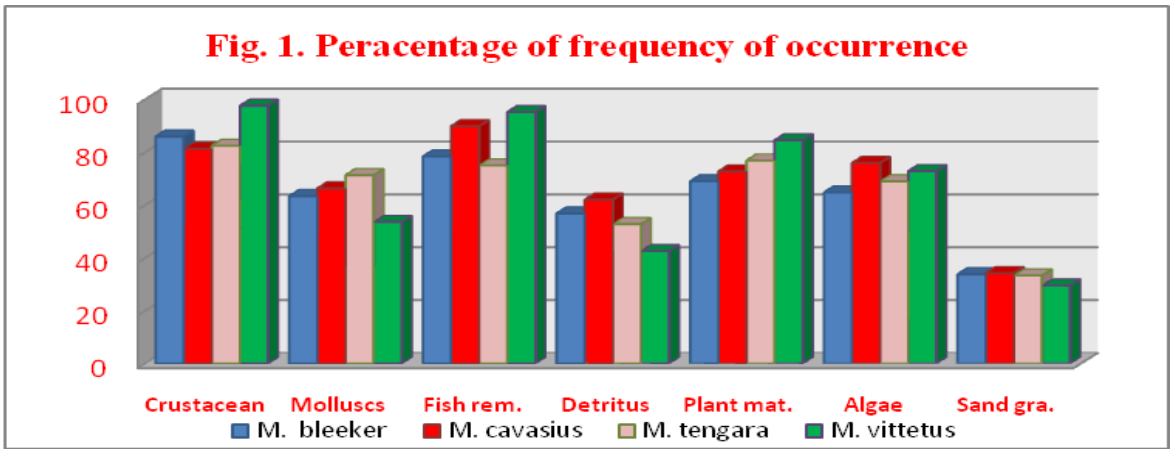
Food items	Frequency of occurrence				Numerical method			
	M. bleekeri		*M. cavasius*		*M. bleekeri*		*M. cavasius*	
	No	%	No	%	No	%	No	%
Insect parts	183	85.91	152	81.28	277	34.84	214	27.90
Molluscs	137	63.38	124	66.31	146	18.37	143	18.64
Fish remains	167	78.40	168	89.84	–	–	–	–
Detritus	121	56.81	116	62.03	–	–	–	–
Plant materials	147	69.01	136	72.72	124	15.60	129	16.82
Algae/ protozoan	138	64.79	142	75.94	165	20.76	188	24.51
Sand grains	72	33.80	64	34.23	83	10.44	93	12.13

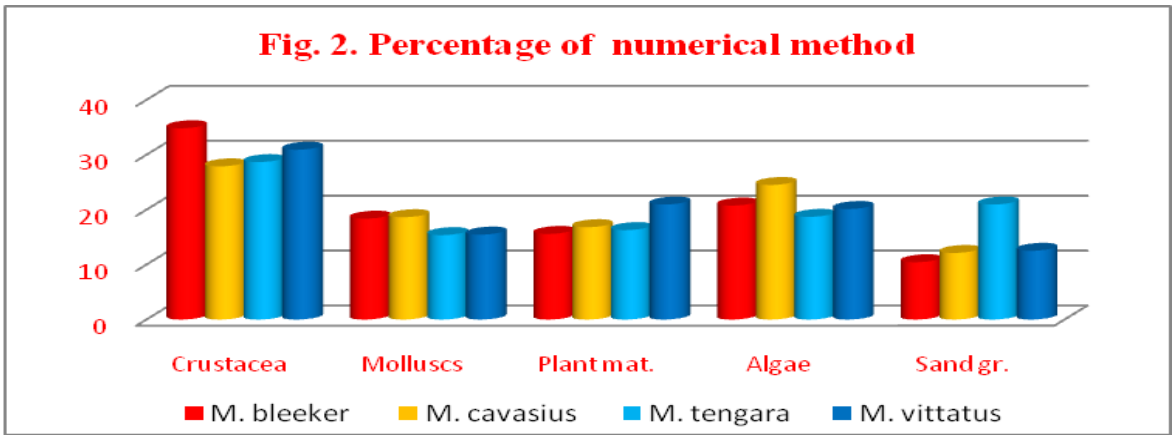
Table 3: Analysis of empty stomach of *M. tengara* and *M. vittetus*

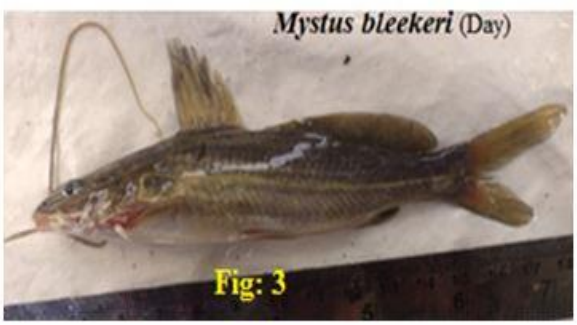
Month	No. of stomach examined		No. of empty stomach		% of empty stomach	
	M. tengara	*M. vittetus*	*M. tengara*	*M. vittetus*	*M. tengara*	*M. vittetus*
Jun-15	23	58	07	08	30.43	13.79
Jul	42	64	12	11	28.57	17.19
Aug	36	46	08	05	22.22	10.87
Sep	64	38	15	04	23.44	10.53
Oct	44	52	11	08	25.00	15.39
Nov	34	43	09	05	26.47	11.63
Dec	28	22	08	04	28.57	18.18
Jan-16	23	16	08	03	34.78	18.75

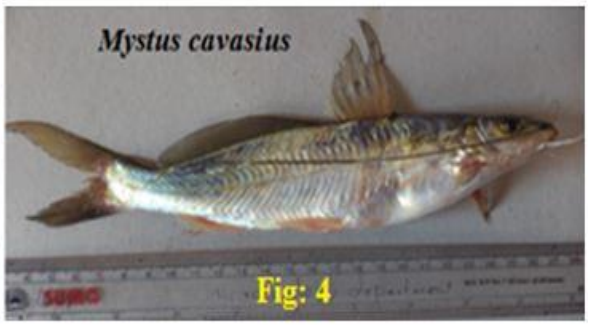
Table 4: Summary of the stomach contents of *M. tengara* and *M. vittatus*

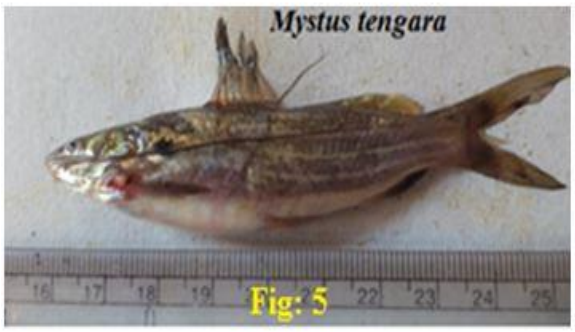
Food items	Frequency of occurrence				Numerical method			
	M. tengara		*M. vittetus*		*M. tengara*		*M. vittetus*	
	No	%	No	%	No	%	No	%
Insect parts	178	82.40	284	97.59	345	28.68	378	30.93
Molluscs/shell parts	154	71.30	156	53.61	185	15.38	189	15.47
Fish remains	162	75.00	277	95.19	–	–	–	–
Detritus	114	52.78	124	42.61	–	–	–	–
Plant materials	166	76.85	246	84.54	196	16.29	256	20.95
Algae/ protozoan	149	68.98	212	72.85	225	18.70	246	20.13
Sand grains	72	33.33	86	29.55	252	20.95	153	12.52











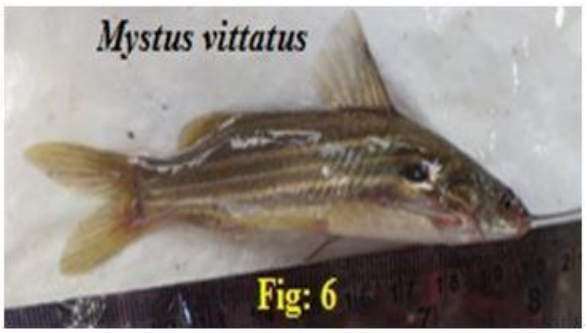


Fig. 3-6: Freshwater catfishes (*Mystus* sp.)

CONCLUSIONS

The study of the gut contents of *M. bleekeri*, *M. cavasius*, *M. tengara* and *M. vittatus* were based on percentage frequency occurrence methods and numerical method of food items suggested that feeds on crustaceans and fish remain. These are largely dependent on the animal material, including insects, fishes and plant materials were equal preferred by four species of catfishes. This observation indicated that the catfish species are suggesting omnivorous. The results revealed that a high degree of similarity in the diet of the four species, thus suggesting some varieties of food competition. The catfish species also showed high levels of trophic flexibility. This competition makes them

occupy the same ecological niche within the same river waters. The percentages of occurrence of empty stomach were relatively low for four catfish species and showed no significant difference. This observation indicates that food is available for these fish species during the study period. It could be said that the reservoir was rich in natural foods.

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