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FOOD AND FEEDING HABIT OF HETEROPNEUSTES FOSSILIS (BLOCH) OF VELLAYANI LAKE, KERALA, INDIA

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Abstract
The stinging cat fish Heteropneustes fossilis,(Bloch) is an important fish occurs in freshwater bodies like pools, tanks, lakes, streams and rivers. The present investigation is on the food and feeding habits of the stinging cat fish Heteropneustes fossilis,(Bloch)of the Vellayani Lake (8"24'09" - 8"26'30" N; 76°59'08"-76°59'47" E), Thiruvananthapuram, Kerala. The study revealed that the fish is omnivorous; feeding predominantly on animals (49.13%) followed by plant components (32.71) and inorganic particles sand and mud (18.12%). The major preferred animal components were copepods (13.42%), cladocerans (10.49%), ostracods (8.65%), insects (6.81%), fishes (5.79%) and gastropods (4.01%). Plant components were represented by Oedogonium, Closterium, Cladophora, Ulothrix and diatoms. The young ones were more active feeders than the larger size groups. The consistent occurrence of sand and mud in the stomach throughout the study period indicates that the species is a bottom grazer as well. Variation in the diet according to the size of fish indicates small changes in the preference of food items in different size categories which may favour to avoid direct competition for food between the smaller and larger size groups.

Key Words: Heteropneustes Fossilis, Vellayani Lake, Feeding Intensity, Stomach Contents.

Introduction

The stinging cat fish Heteropneustes fossilis (Bloch) is an indigenous fish of South- East-Asia, occurs in freshwater bodies like pools, tanks, lakes, streams and rivers. It is an air-breathing fish containing pharyngeal lungs as accessory respiratory organs which enables it to tolerate low oxygenated and eutrophicated water bodies. The fish is not only recognized for its delicious taste and market value but is also highly esteemed from nutritional and medicinal properties of view (Chakraborty and Nur, 2012). It is considered as a valuable food fish species and recommended as diet for the sick and convalescents. Being a lean fish it is very suitable for people for whom animal fats are undesirable (Rahman et al., 1982; Khan et al., 2003). But in recent years, the fish has become gradually been endangered as the natural habitats and breeding grounds of this fish has been severely degraded due to over exploitation, ecological changes, reduction of water bodies, application of pesticides in rice cultivation, release of chemical effluents from industrial plants and hydrological changes due to construction of flood control infrastructure (Kohinoor et al., 2012).

Fishes consume different kinds of food and they differ greatly in the nature of food they consume. It is well known biological and ecological fact that food of an animal may be directly associated with its feeding habits and habitats. Knowledge on the food and feeding habits of fishes in an ecosystem will provide an insight in to the ecology and the life history of the fish. Knowledge on feeding intensity is essential to understand the interrelationship of the fish in the ecosystem and the effects of environmental changes on the feeding pattern of the fish. Vellayani Lake (8"24'09" - 8"26'30" N; 76°59'08"-76°59'47" E), the second largest freshwater lake in Kerala state, India, is located in the outskirts of Thiruvananthapuram, the capital city of Kerala.. It has a water spread area of 450 ha and is far rich in availability and abundance of the stinging Catfish Heteropneustes fossilis locally known as 'Kaari'. The present study aimed to investigate the food and feeding habits of Heteropneustes fossilis inhabiting the Vellayani Lake, Thiruvananthapuram, Kerala.

Materials and Methods

In the present study 128 numbers of live samples of Heteropneustes fossilis of various age groups were collected by cast net from different parts of the Vellayani Lake during the period December 2017 to May 2018. The total length and weight of Heteropneustes fossilis used in the present study varied from 18cm to 31.8 cm and 11.94 g to

216.41 g respectively. After measuring the total length and total weight, the fishes were dissected out and the stomachs were removed and preserved in 4% formaldehyde solution. Each stomach was emptied into petridish and examined under microscope. Both qualitative and quantitative analyses of diet were carried out. Attempts were made to identify the food items up to the possible taxonomic level depending on the state of digestion. The food contents were assigned semi digested matter status, when the process of digestion made identification impossible. To analyse the amount of each food item in the gut, the method of Platell and Potter (2001) was modified by evenly spreading the contents from each stomach in the counting cell chamber and examining under microscope. Analysis was done using frequency of occurrence and numerical methods as described by Hyslop (1980). In the frequency of occurrence method, the occurrence of each food item was expressed as the percentage of total number of stomachs examined. The number of each food item was expressed as the percentage of total number of food items found in the stomach of all fishes examined.

To assess changes in the diet with fish size, the fishes were categorized into 4 size groups, ranging from 15 – 20 cm, 20 – 25 cm, 25-30 cm and 30 – 35 cm.

Feeding intensity was determined based on the degree of distension of stomach and the amount of food contained in the stomach. The stomachs were classified as gorged, full, ¾ full, ½ full, ¼ full, trace and empty and the fishes were classified as actively fed(gorged, full, ¾ full), moderately fed (1/2 full) and poorly fed (¼ full, trace, empty). Monthly and length group based determination of feeding intensity was carried out.

Results and Discussion

Food habits and feeding ecology research is a fundamental tool to understand the role of fishes in aquatic ecosystems since they indicate relationships based on feeding resource. Knowledge on the food and feeding habits is also helpful for successful fish culture in extensive and intensive systems. Fig 1 shows the composition (mean) of the diet of Heteropneustes fossilis in the Vellayani Lake. The fish is omnivorous; feeding predominantly on animals (49.13%) followed by plant components (32.71) and the inorganic components sand and mud (18.12%). The major preferred animal components were copepods (13.42%), cladocerans (10.49%), ostracods (8.65%), insects (6.81%), fishes (5.79%) and gastropods (4.01%). Most of these items occurred throughout the samples. Plant components were represented by phytoplanktons such as Oedogonium, Closterium, Cladophora, Ulothrix and diatoms. Inorganic particles such as sand and mud and digested materials were present as a major food constituent throughout the samples. The high concentration of sand and mud (8.34-13.2%) in the diet of Heteropneustes fossilis in the present study is indicative of its bottom feeding habits. Sand particles play a significant role in the diet of fishes of fresh water systems (Bowen, 1981). The fish are able to digest plant material due to the breaking up of the plant cell by the grinding action of the sand grains (Blaber, 1976) and it has been suggested that the function of considerable fraction of inorganic particles in the stomach contents is to act as a grinding paste in the degradation of the plant cell walls in the stomach (Thomson, 1966).

Variation in the diet Heteropneustes fossilis of Vellayani Lake according to the size of fish indicates small changes in the preference of food items in different size categories which may favour to avoid direct competition for food between the different size categories of fishes. Percentage of various food items (Numerical % and Frequency of occurrence %) in various length groups of Heteropneustes fossilis in the Vellayani Lake is presented in Table I. The frequency of occurrence of plant components decreased from 100% in the smaller size category (15-20 cm) to 68.80% in the larger (30-35 cm) category. The percentage composition of food items found in the different size groups of Heteropneustes fossilis showed that the quantity of plant components (phytoplanktons) decreased from 44.29% (15-20cm) to 20.50% (30-35cm) and the various animal components (%) increased from 44.62 (15-20cm) to 60.56% in 30-35 cm (Fig.2). Feeding on certain food item at different intensities may be an adaptation to minimize the intra specific competition for food (Wijeyaratnae and Costa, 1990; Blay, 1995).The smallest length class selectively feed on insects, copepods and cladocerans among the animal components of the habitat while with the increase in size diverse animal components entered as their diet. It was also noticed that with an increase in size

there was a rise in the occurrence of sand and mud particles in the stomach which is indicative of the increased bottom feeding habit of the fish with the increase in size and age.

Monthly variations in the abundance of food items may be a reflection of the availability of the food in the environment. Monthly numerical percentage (N %) and frequency of occurrence (F %) of various food items of Heteropneustes fossilis in the Vellayani Lake is shown in Table II. During the post monsoon months (December and January) phytoplankton dominated the food items while zooplanktons and other animal components such as copepods, cladocerans, insects and its larvae, gastropods, ostracods and fish remains formed the major components during the premonsoon (February –May) months. Numerical percentages of plant matter showed a gradual reduction from 40.20 during December to 20.32% during May. Most fish species are opportunistic feeders, feed on a wide spectrum of organisms, but switch mainly on food items abundant at space and time.

Feeding intensity of fish in relation to months and size of the fish was observed between the periods December 2017 to May 2018. Active feeding (gorged, full, ¾ full) was found in individuals from 30% (December) to 77.7 %(March).The empty stomachs were dominant during December (14.4%) followed by May (11.7%). Moderate feeding (1/2 full stomach) was observed during all the months and the percentages ranged between 20 (December) and 47.82 % (April). The highest percentage of poorly fed fishes was during December (50%). Fig.3 shows monthly variations in the feeding intensity of Heteropneustes fossilis in the Vellayani Lake.

The percentage of feeding intensity in relation to various length groups is presented in Fig.4. Observation on feeding intensity in relation to size of Heteropneustes fossilis clearly indicated that as the fish grows in size active feeding declined. Active feeding was maximum (48%) in fishes of size 15-20cm and the minimum in 30-35cm (32%). Poorly fed fishes were minimum (20%) in 15-20cm size group and maximum (30.6%) in 30-35cm. The percentages of empty stomachs increased from 0% (15-20cm) to 35.8 % (30-35cm). Narrow range of variation (32-39.6%) was found in moderate feeding intensity. Low feeding intensity in large sized fish maybe due to physiological stress associated with spawning (Sivareddy and Babu, 1989; Zacharia, 2003).

Among the food organisms of Heteropneustes fossilis in the Vellayani Lake, insect larvae and insects occurred in good numbers almost throughout the period of study. Insect larvae and pupae are mainly of chironomids. The large scale occurrence of chironomid larvae and other insects in the guts of Heteropneustes fossilis from Vellayani Lake is also indicative of the polluted nature of Lake water.

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References

1. Bowen,S.H. 1981 Digestion and assimilation of periphytic detrital aggregate by Tilapia mossambica. Trans. Amer. Fish.Soc., 110:239-245
2. Blaber, S.J.M. 1976 The food and feeding ecology of Mugilidae in the St. Lucia lake system. Biol.J.Linn.Soc.8:267-277
3. Blay, J.Jr. 1995 Food and feeding habits of four species of juvenile mullets (Mugilidae) in a tidal lagoon in Ghana. J.Fish.Biol. 46: 134-141
4. Chakraborty B.K. and N.N. Nur 2012. Growth and yield performance of shingi, Heteropneustes fossilis and koi, Anabas testudineus in Bangladesh under semi-intensive culture systems. Int. J. Agril. Res. Innov. & Tech. 2 (2): 15-24.
5. Hyslop, E.J. 1980 Stomach content analysis- a review of methods and their application. J.Fish.Biol. 17:411-429
6. Platell, M.E. and I.C. Potter 2001 Partitioning of food resources amongst 18 abundant benthic carnivorous fish species in marine waters on the lower west coast of Australia. J. Exp. Mar. Biol. Ecol., 261:31-54

7. Khan M.N,, A.K.M Saiful Islam and M.G Hossain. 2003. Marginal analysis of culture of stinging catfish (Heteropneustes fossilis, Bloch): Effect of different stocking densities in earthen ponds. Pak. J. Biol. Sci. 6(7): 666-670.
8. Kohinoor A. H.M., M.M., Khan, S Yeasmine., P .Mandol. and M.S. Islam. 2012. Effects of stocking density on growth and production performance of indigenous stinging catfish, Heteropneustes fossilis (Bloch). Int. J. Agril. Res. Innov. and Tech. 2(2): 9-14
9. Platell, M.E. and I.C. Potter 2001 Partitioning of food resources amongst 18 abundant benthic carnivorous fish species in marine waters on the lower west coast of Australia. J. Exp. Mar. Biol. Ecol., 261:31-54
10. Rahman M.A., H. Gheyasuddin., M.H Rasid. and M.F.Z. Choudhury 1982. Proximate composition and native quality of freshwater Zeol fishes of Bangladesh. Bangladesh J. Fish. 25: 37-43.
11. Sivareddy,Y. and M.Babu 1989 Studies on the feeding biology of an airbreathing fish Heteropneustes fossilis (Bloch). Journal of the Indian Fisheries Association 19: 31-36
12. Thomson,J.M. 1959 The grey mullets. Oceanogr. Mar. Biol. 4: 3021-335
13. Wijeyaratnae,M.J.S. and H.H. Costa,1990 Food and feeding of two species of Grey mullets Valamugil buchanai(Bleeker) and Liza vaigiensis inhabiting back water environments in Srilanka. IndianJ.Fish.37 (3): 211-219
14. Zacharia,P.U. 2003 Studies on the fishery, biology and population dynamics of the white fish Lactarius lactarius (Bloch and Schneider,1801)along the Karnataka coast. PhD thesis, Mangalore University, India, 188pp

Table 1 Percentage of Various Food Items (N % And F %) In Various Length Groups of Heteropneustes Fossilis In The Vellayani Lake

Food Components	Size category							
	15-20cm		20-25cm		25-30cm		30-35cm	
	N%	F%	N%	F%	N%	F%	N%	F%
Plant matter	44.29	100	38.8	100	27.88	73.53	20.25	68.80
Insects and its larvae	8.00	8.20	6.80	12.00	5.80	20.20	7.05	32.00
Copepods	17.80	34.40	6.95	25.50	13.23	40.00	16.18	36.50
Cladocerans	18.82	58.20	8.82	44.44	8.82	38.60	5.88	26.45
Ostracods	0.00	0.00	10.08	35.60	11.76	40.20	12.76	38.60
Gastropods	0.00	0.00	5.00	0.00	7.84	12.10	8.19	10.80
Fish and fish remains	0.00	0.00	5.88	14.50	6.79	13.40	10.50	20.20
Sand and mud	11.9	90.20	22.70	100	17.88	100	19.19	100

Table 2, Monthly numerical percentage (N %) and frequency of occurrence (F %) of various food items of Heteropneustes fossilis in the Vellayani Lake

Food Components	Months					
	December N% F%	January N% F%	February N% F%	March N% F%	April N% F%	May N% F%
Plant matter	40.20 100	35.18 100	28.90 100	23.12 100	22.35 100	20.32 100
Insects and its larvae	9.24 25.2	18.24 43.80	20.42 54.50	23.20 48.4	20.82 43.20	18.78 35.20
Copepods	13.52 68.0	16.42 62.30	18.50 70.20	15.16 54.40	12.14 48.16	12.36 44.50
Cladocerans	20.68 75.5	10.20 65.50	8.30 40.00	9.20 42.40	8.30 40.80	7.60 42.80
Ostracods	8.02 45.6	1.36 28.20	1.82 30.00	1.82 25.60	1.39 22.80	1.26 20.40
Gastropods	0.00 0.00	0.00 0.00	1.80 18.80	5.46 21.90	9.46 30.20	13.30 38.25
Fish and fish remains	0.00 0.00	8.42 30.66	9.56 40.40	10.24 38.42	12.78 40.42	13.18 54.20
Sand and mud	8.34 86.80	10.18 96.36	10.70 100	11.80 100	12.50 100	13.20 100

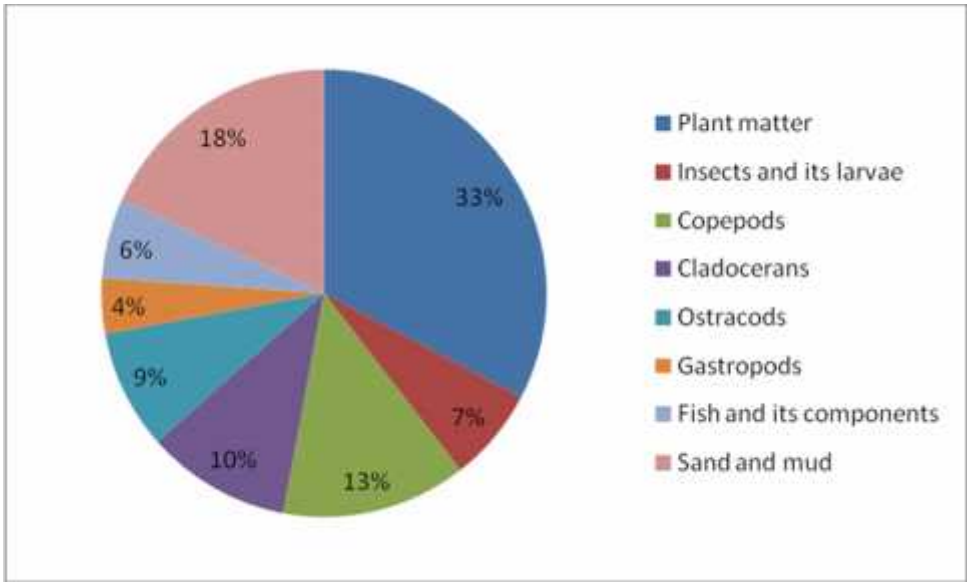

Fig 1 Composition (mean) of the diet of Heteropneustes fossilis in the Vellayani Lake

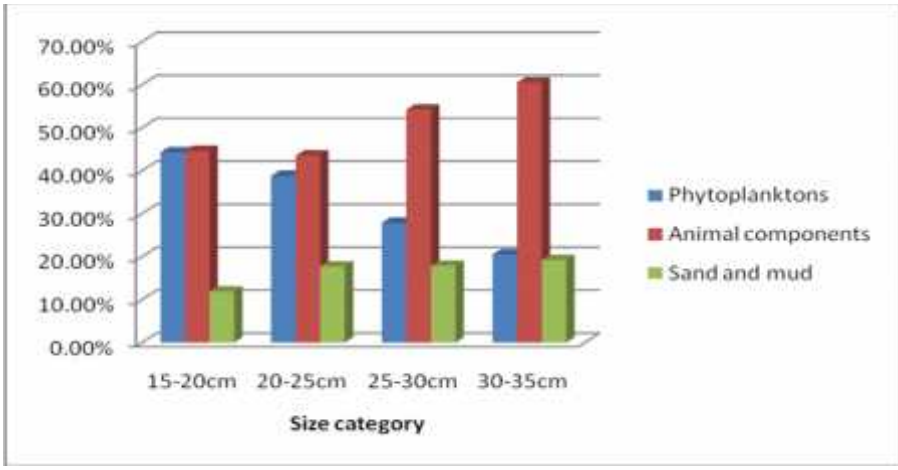

Fig 2 Size dependant variationsin the Composition (mean) of the diet of Heteropneustes fossilis in the Vellayani Lake

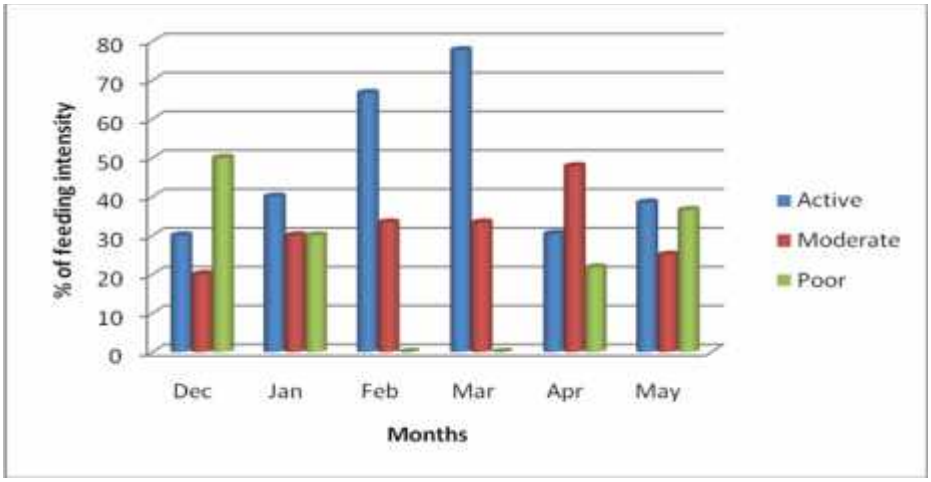

Fig.3 Monthly variations in the feeding intensity of Heteropneustes fossilis in the Vellayani Lake

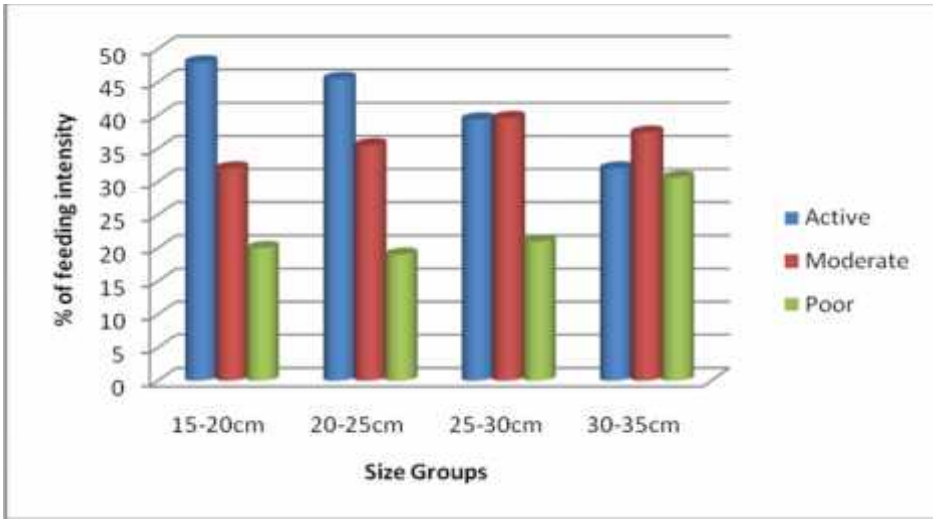

Fig.4 Size dependent variations in feeding intensity of Heteropneustes fossilis in the Vellayani Lake.