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Food and Feeding Habits of *Amblypharyngodon mola* (Hamilton) from Kaptai Reservoir, Bangladesh

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Abstract: The present experiment was conducted for twelve months from July 1999 to June 2000 to know the type and amount of food taken by *Amblypharyngodon mola* in Kaptai reservoir. To study the food and feeding habits, a total of 120 fish samples of *Amblypharyngodon mola* were collected monthly. For the analysis of gut contents two methods were followed namely occurrence and points methods. According to Index of Preponderance (IP) *A. mola* was found to be planktivorous which feed mainly on Chlorophyceae (78.77%), Bacillariophyceae (11.85%), and Debris with mud (3.09%). These food item clearly indicated that fish preferred phytoplanktonic food. The fish incidentally took the animal nature plankton foods of Rotifera and Crustacea in negligible amount, 1.58 and 0.24% respectively.

Key words: Gut contents, minor carp, *Amblypharyngodon mola*, Kaptai Reservoir, Bangladesh

INTRODUCTION

The Kaptai reservoir is the largest reservoir of Bangladesh as well as in the South-East Asia^[1]. It was created for hydroelectric power generation in 1961 by damming the river Karnafuli at Kaptai point. It was situated at 92°02'-92°27' East longitude and 22°20'-23°20' North Latitude. The area of this eutrophic lake is about 68,800 hectares. The mean depth of reservoir is 9.0 m, maximum depth 38.3 m, mean annual water level fluctuation 8.1 m^[2]. There are about 58 fish species in the lake^[3] out of which more than 33 are commercially important^[2].

Amblypharyngodon mola locally known as Mola, is found abundantly in the river, canal, pond, lake, floodplains, beels, baors and ditches of Bangladesh^[4]. Mola has high protein, vitamin and mineral contents, which may be compared favorably with the common Indian major carps. Zafri and Ahmed^[5] reported that Mola contains 200 IU of vitamin-A per gram of edible protein. Taking 3 whole Mola fish per day can save a child from blindness due to shortage of vitamin A^[6].

Food is the most important and vital factor for the growth and survival of all animals. Proper knowledge of food and feeding habits of fish is an important prerequisite for increasing fish production. The food and feeding habits of fishes vary with time of the day, size of the fish, and season of the year.

So, the present work was undertaken to determine the food and feeding habits of *A. mola* from Kaptai reservoir,

which might be helpful to the Fish Farm Managers for the increase of production of fish in the Kaptai reservoir and other water bodies of Bangladesh.

MATERIALS AND METHODS

To study the food and feeding habits, a total of 120 fish samples of *A. mola* were collected monthly during July 1999 to June 2000 from Bangladesh Fisheries Development Corporation (BFDC) fish landing center at Rangamati, Chittagong Hiltract. The fish samples were preserved in 5% buffered formalin immediately after collection and carried to the laboratory.

For the analysis of gut contents two method were followed namely occurrence and points methods^[7,8].

Occurrence Method: The number of stomach containing one or more food items was recorded^[9]. The number of food was then expressed as a percentage of all stomachs^[10,11].

Points method: In this method, each of the food items was allotted of points on the basis of quantity and all the points gained by different food items were summed up and scaled down to percentage to express them in percentage composition the guts content of all the fish examined^[7].

The relative importance of various food items was calculated using index of preponderance^[12]. Relationship between total length and gut length of the fish was calculated by least square method.

RESULTS AND DISCUSSION

The gut contents were analyzed and categorized into different food groups and so far identified up to generic levels. In the gut contents undigested, semi-digested and digested food materials were also found. Following food organisms recorded.

Chlorophyceae: *Gonatozygon*, *Zygnema*, *Cosmarium*, *Ankistrodesmus*, *Chlorella*, *Pediastrum*, *Spirogyra*, *Closterium*, *Staurastrum*, *Scenedesmus*, *Tetraedron*, *Schroederia* and *Coelastrum*.

Bacillariophyceae: *Melosira*, *Navicula*, *Fragilaria*, *Nitzschia* and *Cyclotella*.

Euglenophyceae: *Euglena* and *Phacus*

Cyanophyceae: *Anabaena*, *Microcystis*, *Aphanocapsa*, *Oscillatoria* and *Nostoc*

Rotifera: *Keratella*, *Brachionus*, *Filinia* and *Trichocerca*

Crustacea: *Cyclops*, and *Daphnia*

Debris with mud: These are the components of plant matter, sand and clay particles.

Semidigested food: Different parts of planktonic organisms like both phyto and zooplankton.

Gut contents analysis by different method

Chlorophyceae

Occurrence method: This group of food item was appeared to be 47.84% by yearly average of the total percentage of occurrence. It was most abundant and occurred regularly in the gut contents. It was represented by 14 genera e.g. *Gonatozygon*, *Zygnema*, *Cosmarium*, *Spirogyra*, *Pediastrum*, *Staurastrum*, *Chlorella*, *Closterium*, etc. The highest quantity of this food item was found in May (54.43%) and lowest in July (37.75%) (Table 1).

Points method: This food item was the most dominant group among all items. It was appeared to be 43.003% by yearly average of the total percentage of points. It attained maximum points in December (50.27%) and minimum points in July (35.4%) (Table 2).

Bacillariophyceae

Occurrence method: This food group was represented by five genera e.g. *Melosira*, *Navicula*, *Fragilaria* etc. This item appeared 16.17% by yearly average of the total

percentage of occurrence. The maximum prevalence (21.35%) recorded in December and the minimum (11.6%) in July (Table 1).

Points method: During study period yearly average of 19.14% diatoms was found in the gut contents of *A. mola*. This food items maximum (24.57%) found in November and minimum (15.06%) found in September (Table 2).

Cyanophyceae

Occurrence method: This food group was represented by five genera, e.g. *Anabaena*, *Nostoc*, *Microcystis* etc. This food group formed 5.47% by yearly average of the total percentage of occurrence. In this method the highest food was in August (11.52%) and lowest (3.21%) in April (Table 1).

Points method: The highest of this food item was recorded in August (12.76%) and lowest in the month of April (2.5%). This food item was absent in October. It formed 5.88% by yearly average of the total points (Table 2).

Euglenophyceae

Occurrence method: This food group was represented by *Euglena* and *phacus* which formed 8.47% by yearly average of the total percentage of occurrence. The highest (14.34%) amount of this food item was found in July and lowest (4.2%) in June. This food item was found in all seasons (Table 1).

Points method: This food item was highest in July (15.53%) and lowest in May (3.42%). This group formed 6.84% by yearly average of the percentage of total points (Table 2).

Crustacea

Occurrence method: The crustacean food was found in the gut of *A. mola* in all seasons except in November and December. *Cyclops* and *Daphnia* represented this group of food. It was appeared to be 2.39% by yearly average of the total percentage of occurrence. The highest quantity (3.67%) was found in January and lowest (2.35%) in May (Table 1).

Points method: In this method the highest amount was in June (4.35%) and lowest in May (1.28%). This group formed yearly average 2.63% of the total percentage of points (Table 2).

Rotifera

Occurrence method: This food item was appeared to be 5.72% by yearly average of the total percentage of occurrence which comprising 4 genera e.g. *Kerattella*,

Table 1: Monthly variations in composition of different food items by percentage of occurrence in the guts of *A. mola* in Kaptai reservoir

Months	No. of fish examined	Phytoplankton				Zooplankton		Semidigested food	Debris and mud	Unidentified species
		Chlorophyceae	Bacillariophyceae	Cyanophyceae	Euglenophyceae	Crustacea	Rotifera			
July	10	37.75	11.60	7.12	14.34	2.45	5.27	7.29	9.83	4.35
Aug	10	44.21	12.82	11.52	9.25	3.17	6.32	4.67	6.12	1.92
Sept	10	38.42	16.75	6.15	5.93	2.71	10.95	5.98	12.87	0.24
Oct	10	51.35	18.57	-	7.42	2.98	3.27	3.48	12.93	0
Nov	10	52.45	15.81	5.12	7.42	0	6.12	2.78	6.52	1.13
Dec	10	49.23	21.35	3.63	10.07	0	3.65	2.34	7.02	0
Jan	10	46.25	14.54	5.63	12.78	3.67	4.12	4.52	11.67	1.35
Feb.	10	51.86	13.21	6.25	8.25	3.12	6.08	7.15	6.05	0.56
Mar	10	50.32	16.23	4.26	8.72	2.5	4.62	5.87	8.23	0.52
Apr	10	48.57	19.82	3.21	7.45	2.61	5.78	4.25	12.55	1.32
May	10	54.43	15.25	7.65	5.89	2.35	6.79	6.36	7.08	0.88
Jun	10	49.27	18.15	5.16	4.21	3.18	5.67	5.13	11.87	0.57
Yearly average (% Occurrence)		47.843	16.175	5.475	8.478	2.395	5.72	4.985	9.395	1.07

Table 2: Monthly variations in composition of different food items by percentage of points in the guts of *A. mola* in Kaptai reservoir

Months	No. of fish examined	Phytoplankton				Zooplankton		Semidigested food	Debris and mud	Unidentified species
		Chlorophyceae	Bacillariophyceae	Cyanophyceae	Euglenophyceae	Crustacea	Rotifera			
July.	10	35.40	16.48	8.49	15.53	2.42	7.49	6.53	6.16	1.49
Aug.	10	37.87	16.68	12.76	6.89	3.73	10.29	2.59	5.79	1.39
Sept.	10	47.75	15.06	7.82	5.13	4.25	11.03	2.06	5.95	0.95
Oct.	10	45.78	16.32	0	11.02	3.98	8.73	1.37	7.8	0
Nov.	10	38.53	24.57	5.67	9.28	0	12.66	3.42	4.97	0.9
Dec.	10	50.27	23.63	4.35	10.85	0	2.95	1.45	5.5	0
Jan.	10	40.35	19.72	8.55	5.12	3.52	4.84	4.78	12.25	0.87
Feb.	10	45.38	15.54	7.18	3.59	3.45	6.96	7.35	9.66	0.89
Mar.	10	43.51	20.12	3.47	6.67	2.33	3.25	5.48	14.37	0.8
Apr.	10	45.23	17.75	2.51	4.61	2.35	5.34	8.63	12.52	1.06
May.	10	41.75	22.23	4.38	3.42	1.28	8.12	7.25	10.23	1.23
Jun.	10	44.21	21.58	5.48	0	4.35	5.17	9.12	8.16	1.84
Yearly average (% Points)		43.003	19.14	5.888	6.843	2.638	7.236	5.003	8.613	0.952

Table 3: Index of preponderance (IP) of food items in the gut contents of *A. mola*

Food groups	% of total points	% of Occurrence	% of occ. × Occurrence	IP	Grade/Rank
Chlorophyceae	43.003	47.843	2057.393	78.772	i
Bacillariophyceae	19.14	16.175	309.589	11.853	ii
Debris with mud	8.613	9.395	80.919	3.098	iii
Euglenophyceae	6.843	8.478	58.014	2.221	iv
Rotifera	7.236	5.72	41.389	1.584	v
Cyanophyceae	5.888	5.475	32.236	1.234	vi
Semidigested food	5.003	4.985	24.939	0.954	vii
Crustacea	2.638	2.395	6.318	0.241	viii
Unidentified species	0.952	1.07	1.018	0.0390	ix

Table 4: Percentage of fullness of guts of *A. mola*

Months	No. of fish examined	Fullness				
		Full gut	¼ Full gut	½ Full gut	¾ Full gut	Empty gut
July.	10	40	-	30	10	20
Aug.	10	20	20	10	50	-
Sept.	10	60	-	20	10	10
Oct.	10	30	-	30	40	-
Nov.	10	-	30	40	20	10
Dec.	10	50	20	10	-	20
Jan.	10	10	40	20	20	10
Feb.	10	40	20	-	30	10
Mar.	10	60	-	20	-	20
Apr.	10	50	20	30	-	-
May.	10	30	-	20	30	20
Jun.	10	10	40	10	20	20
Mean		33.33	15.833	20	19.166	11.67

Brachionus, *Filinia* and *Trichocerca*. The maximum amount of this item found in September (10.95%) and minimum in October (3.27%) (Table.1).

Points method: This food item was highest in November (12.66%) and lowest in December (2.95%). This group formed yearly average of 7.23% of the total percentage of points (Table 2).

Semi-digested food

Occurrence method: This item comprised of different parts of the phyto and zooplankton. It appeared 4.98% by yearly average of the total percentage of occurrence. The highest quantity of semi-digested food found in July (7.29%) and lowest in December (2.34%) (Table 1).

Points method: The highest amount was in June (9.12%) and lowest in October (1.37%). This group formed 5.003% by yearly average of the total percentage of points (Table 2).

Debris and mud

Occurrence method: This highest amount of this item was in October (12.93%) and lowest in February (6.05%).

Table 5: Relationship between fish total length (TL) and total gut length (TGL) and ratio of TL:TGL of 120 guts of *A. mola*

Length group (mm)	Mid length TL (mm)	No. of fishes	Average total gut length (TGL) mm	Log TL (X)	Log TGL (Y)	Ratio of TL: TGL
50-55	52.5	2	172.33	1.720	2.236	1 : 3.282
55-60	57.5	12	210.65	1.759	2.323	1 : 3.663
60-65	62.5	17	235.87	1.795	2.372	1 : 3.773
65-70	67.5	20	262.12	1.829	2.418	1 : 3.883
70-75	72.5	8	281.51	1.860	2.449	1 : 3.882
75-80	77.5	18	298.52	1.889	2.470	1 : 3.851
80-85	82.5	19	312.05	1.916	2.494	1 : 3.782
85-90	87.5	16	335.42	1.942	2.525	1 : 3.833
90-95	92.5	6	347.98	1.966	2.541	1 : 3.761
95-100	97.5	2	356.86	1.989	2.552	1 : 3.660
		$\Sigma f = 120$				1 : 3.737±0.178

a = 0.3549, b=1.1159, r= 0.9831

It was comprised of plant matter, sands and clay particles. It appeared 9.39% by yearly average of the total percentage of occurrence (Table 1).

Points method: This item formed 8.6% by yearly average of the total percentage of points. The highest amount was in March (14.37%) and lowest in November (4.97%) (Table 2).

Index of preponderance (IP): Index of preponderance (IP) showed that *A. mola* consumed Chlorophyceae (78.77%), Bacillariophyceae (11.85%) and Debris and mud (3.09%) and thus occupied first, second and third ranks while fourth, fifth, sixth, seventh and eighth positions were occupied by Euglenophyceae (2.22%), Rotifera (1.58%), Cyanophyceae (1.23%), Semi-digested food (0.95%) (Phytoplankton, Zooplankton, and Plant parts) and Crustacea (0.24%) (Table3). These food items clearly indicated that the fish was plankton feeder (planktivore) with preference for phytoplanktonic food.

Considering Nikolosky's^[13] assumption and according to index of preponderance phytoplankton (Chlorophyceae 78.77%, Bacillariophyceae 11.85%, Euglenophyceae 2.22% and Cyanophyceae 1.23%) occupied 94.07% thus can be treated as the basic food.

Debris with mud 3.09% can be considered as secondary food. Zooplankton and Semi digested food (Rotifera 1.58%, Crustacea 0.24% and Semi digested food 0.95%) occupied 2.77% can be regarded as incidental food.

Mookerjee and Basu^[14] reported that *A. mola* was generally surface feeder and the food consisted of unicellular and filamentous algae, protozoans and rotifers. According to Das and Moitra^[15] *A. mola* is a herbivorous fish. Mustafa^[16] reported that the main food of *A. mola* consisted of blue green algae and green algae with planktonic crustacea and rotifera. Piska *et al.*^[17] found that *A. mola* consumed algae throughout the year. In the present study the food and feeding habits of *A. mola* was partially agreed with those records.

Feeding intensity: The feeding intensity was measured by recording the condition of the gut. The gut contents were categorized as full, 3/4 full, 1/2 full, 1/4 full and empty. In the present study the feeding intensity of *A. mola* was fairly high. The percentage of feeding intensity of *A. mola* found as full 33, 3/4 full 15, 1/2 full 20, 1/4 full 19 and empty 11% (Table 4).

The relationship between Total Length (TL) and Total Gut Length (TGL): The relationship between fish total length (TL) and total gut length (TGL) of *A. mola* was $TGL = 2.264 TL^{1.1159}$, ($r = 0.9831$, $t = 15.188$) significant at 0.01 level. Total length (TL) versus gut length (TGL) ratio was 1:3.73. Gut length was more than three times longer the fish total length which also confirmed the herbivorous nature of the fish (Table 5). Das and Moitra^[15] reported that gut lengths of the herbivorous fishes are very long, coiled and thin walled. The results fully agreed with the present findings.

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