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Evaluation of Food Selection of *Catla catla* (Hamilton) Fingerling by Determining Electivity Index Grown in Earthen Ponds in Bangladesh

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Abstract: One month old fry of a planktivorous Indian major carp species, catla, *Catla catla* (Hamilton) was reared upto fingerling stage in earthen ponds in order to determine the food preference and selection using Ivlev's Electivity Index under two different treatments. Except Chlorophyceae, it showed positive selection to Cyanophyceae, Euglenophyceae, Rodophyceae, Crustacea and Rotifera. However, Catla, during its fry-fingerling stage exerted strong preference for zooplankton and almost neutral response to phytoplankton in both conditions.

Key words: Electivity index, *Catla catla,* fingerling, pond

Introduction

Among the Indian major carps, catla, a fastest growing species has high demand in the market in Bangladesh, therefore, is widely cultured in this country. The success of high fish production depends on the adequate supply of quality fish seeds for aquaculture in time of need. Despite the fact that many culture techniques of fish production have been developed, the heavy loss still remains a major hindrance mainly due to the lack of proper feeds at the early stage. The survival of fish at fry-fingerling stage can be increased by promoting the pond productivity through proper fertilization and supplementary feeding. A great deal of works on food and feeding habits of catla notably by Alikunhi (1952), Natarajan and Jhingran (1961), Dewan *et al*. (1977) and Jhingran (1991) were undertaken. There are a few researches so far done on food selection of this fish (Dewan *et al*., 1991; Wahab and Ahmed, 1991; Wahab *et al*., 1994). Considering the fact of insufficient information of this important aspect, the present investigation was undertaken to determine the pattern of food and feeding preferences of surface feeding fish, catla by calculating the electivity index in two different pond conditions, i.e., only fertilized, and fertilized and supplementary fed during their fry-fingerling stage under prevalent condition in Mymensingh area of Bangladesh.

Materials and Methods

Pond preparation and stocking of fish: Experiment was conducted at the pond facilities of the Department of Aquaculture and Management, Bangladesh Agricultural University, Mymensingh, Bangladesh. Six rain-fed earth ponds arbitrarily numbered from 1 to 6 having surface area of 0.01 hectare with an average depth of 1.5 meter were used for this study which were randomly divided for 2 sets of trials. All ponds were fertilized with urea, triple super phosphate, murate of potash and mustard oilcake at the rate of 200, 100, 50 and 500 kg ha^{-1} respectively 20 days before stocking and only urea and TSP at the rate of 100 kg ha^{-1} each 15 days after stocking of fish. Only ponds 2, 4 and 6 were supplementary fed with mustard oilcake daily. About one month old fry of catla, *Catla catla* were stocked for this trial. Six hundred fish were transferred to each pond from the faculty nursery ponds.

Plankton and gut content: Water samples for plankton observation and fish for gut content analysis were collected from each pond 5 days interval throughout the experimental period. For preservation, identification and enumeration of plankton and gut content analysis, procedures and methods after Dewan *et al.* (1991) were followed.

Electivity Index: Electivity index was calculated using the formula of Ivlev (1961) as follows:

$$E = (Pg-PW)/(PG+Pw)$$

where, Pg is the relative content of any ingredient in the ration, expressed as percentage of total ration, and Pw is the relative proportion of the similar item in the pond water. The calculated value of E ranges within +1 to -1, the positive value indicates the selection of a particular food material while negative for avoidance.

Results

Plankton population in pond water: Eight planktonic groups consisting of 54 genera were identified from pond waters throughout the study period. Apart from some rarely occurring individuals the total planktonic organisms mainly consisted of 6 groups of phytoplankton and 2 groups of zooplankton. Some 45 genera of phytoplankton belonging to Bacillariophyceae (5), Chlorophyceae (25), Cyanophyceae (9), Euglenophyceae 131, Rhodophyceae (1) and Xanthophyceae (2) were found. Nine genera of zooplankton were also identified belonging to Crustacea (3) excluding crustacean nauplii and Rotifera (6).

Gut content: Stomach contents showed a wide variety of food organisms present in the diet of *Catla catla* at fry-fingerling stage. Gut contents of the fish collected from two sets of ponds revealed similar patterns in the relative abundance of different groups of food organisms. It was observed that the diets of fish throughout the experimental period were dominated by phytoplankton qualitatively and quantitatively. Zooplankton were recorded in the gut materials as well. About 47 genera of phytoplankton and 9 genera of zooplankton were recorded in gut content of fishes.

Electivity index: Electivity indices were calculated for each food organism recovered from stomach contents of catla on samples collected over the period of study. Details of the pondwise and sampling datewise results on the gut contents and electivity indices of catla are summarized in Table 1 and 2. The fry-fingerlings of

Table 1: Pond water plankton composition (Pw%), gut plankton composition (Pg%) and electivity index CE) in fertilized ponds

	Day 5			Day 10			Day 15			Da 20		
Plankton group	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E
Bacillariophycea	2.7	1.4	-0.3	2.6	1.3	-0.3	1.5	1.6	0.0	3.6	1.6	0.5
Chlorophyceae	54.3	17.6	-0.5	39.6	14.1	-0.5	39.5	8.6	-0.6	29.3	10.8	-0.5
Cyanophyceae	26.1	73.8	0.5	38.6	53.9	0.2	21.1	72.8	0.6	54.6	38.5	0.2
Euglenophyceae	16.3	4.5	-0.6	17.1	28.1	0.2	35.7	13.0	-0.5	11.5	44.5	0.7
Rhodophyceae	0.0	0.8	0.0	0.0	0.5	1.0	0.1	0.5	0.7	0.4	1.3	0.5
Xanthophyceae	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-1.0	0.2	0.0	-1.0
Total Phytoplank	99.4	97.3	0.0	97.9	97.9	0.0	98.0	96.5	0.0	99.6	96.4	0.0
Crustacea	0.0	1.3	1.0	0.0	0.3	1.0	0.2	0.4	0.3	0.0	0.6	1.0
Rotifera	0.4	1.1	0.5	1.8	1.8	0.0	1.5	3.0	0.3	0.5	3.2	0.7
Total zoolplankto	0.4	2.4	0.7	1.8	2.1	0.1	2.7	3.4	3.1	0.5	3.8	0.8
	Day 25			Day 30			Day 35			Mean		
	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E
Bacillariophycea	2.2	1.3	-0.3	2.6	2.6	-0.3	4.5	3.3	-0.2	2.8	1.7	-0.2
Chlorophyceae	45.9	10.8	-0.6	44.2	44.2	-0.3	46.7	27.1	-0.3	44.8	15.9	-0.5
Cyanophyceae	37.1	56.7	0.2	38.5	38.5	0.1	24.7	40.1	0.2	32.7	53.9	0.2
Euglenophyceae	14.3	21.0	0.2	12.0	12.0	0.4	22.2	23.6	0.0	18.3	24.8	0.2
Rhodophyceae	0.0	4.2	1.0	0.2	0.2	0.6	0.0	1.0	1.0	0.2	1.2	0.7
Xanthophyceae	0.0	0.0	0.0	0.0	0.0	1.0	0.3	0.0	-1.0	0.0	0.1	1.0
Total Phytoplank	99.5	95.1	0.0	97.5	97.5	0.0	98.4	95.1	0.0	98.8	96.6	0.0
Crustacea	0.0	0.5	1.0	0.0	0.0	1.0	0.1	1.2	0.8	0.0	0.6	1.0
Rotifera	0.9	3.9	0.6	0.4	0.4	0.7	1.8	3.8	0.4	1.2	2.8	0.4
Total zoolplankto	0.9	4.4	0.7	0.4	0.4	0.8	1.9	5.0	0.4	1.3	3.4	0.4

Table 2: Pond water plankton composition (Pw%), gut plankton composition (Pg%) and electivity index (E) infertilized and supplementary fed ponds

	Day 5			Day 10			Day 15			Day 20		
Plankton group	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E
Bacillariophycea	1.8	2.0	0.1	2.0	1.4	-0.2	1.2	4.2	0.6	1.4	2.5	0.3
Chlorophyceae	48.7	30.5	-0.2	52.2	30.2	-0.3	46.0	14.9	-0.5	66.1	22.6	-0.5
Cyanophyceae	20.7	55.7	0.5	20.7	44.2	0.4	40.9	43.9	0.0	9.1	33.8	0.6
Euglenophyceae	21.9	10.9	-0.3	24.6	20.3	-0.1	8.9	31.3	0.6	22.9	34.5	0.2
Rhodophyceae	0.0	1.5	1.0	0.2	0.3	0.2	0.0	0.8	1.0	0.0	1.7	1.0
Xanthophyceae	0.0	0.1	1.0	0.0	0.0	0.0	1.5	0.1	-0.9	0.0	0.1	1.0
Total Phytoplank	99.8	95.3	0.0	99.7	96.4	0.0	98.5	95.2	0.0	99.9	95.2	0.0
Crustacea	0.0	3.1	1.0	0.0	1.3	1.0	0.4	1.8	0.6	0.0	0.6	1.0
Rotifera	0.1	1.7	0.9	0.2	2.3	0.8	0.7	3.0	0.6	0.7	3.0	0.6
Total zoolplankto	0.1	4.8	1.0	0.2	3.6	0.9	1.1	4.8	0.6	0.7	3.6	0.7
	Day 25			Day 30			Day 35			Mean		
	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E	Pw%	Pg%	E
Bacillariophycea	1.2	3.0	0.4	1.2	3.2	0.5	1.4	4.3	0.5	1.3	3.1	0.4
Chlorophyceae	60.5	13.4	-0.6	33.1	27.1	-0.1	31.8	22.4	-0.2	49.3	21.2	-0.4
Cyanophyceae	4.6	42.8	0.8	43.0	45.0	0.0	35.7	40.3	0.1	25.2	43.0	0.3
Euglenophyceae	32.6	34.1	0.0	21.2	18.7	-0.1	29.6	23.6	-0.1	23.5	26.6	0.1
Rhodophyceae	0.0	3.4	1.0	0.1	1.9	0.9	0.0	3.9	1.0	0.1	1.9	0.9
Xanthophyceae	0.2	0.0	-1	0.0	0.1	1.1	0.3	0.2	-0.2	0.3	0.1	-0.5
Total Phytoplank	98.9	96.7	0.0	98.6	96.0	0.0	98.8	94.7	0.0	99.6	95.9	0.0
Crustacea	0.0	0.5	1.0	0.0	0.2	1.0	0.0	0.8	1.0	0.1	1.1	0.8
Rotifera	0.8	2.6	0.5	1.2	3.7	0.5	1.1	4.6	0.6	0.7	3.1	0.6
Total zoolplankto	0.8	3.1	0.6	1.2	3.9	0.5	1.2	5.4	0.6	0.8	4.1	0.7

catla showed a little difference in electivity between two sets of ponds although there was a more or less similar trend in food selection.

In fertilized ponds catla showed positive response to Cyanophyceae, Euglenophyceae, Rodophyceae, Xanthophyceae, Crustacea and Rotifera while it responded negatively to Bacillariophyceae and Chlorophyceae when the electivity was considered plankton groupwise. As a whole, catla showed a preference for zooplankton and had a neutral response to phytoplankton.

In fertilized and supplementary fed ponds, catla had positive selection for Bacillariophyceae, Cyanophyceae, Euglenophyceae, Rodophyceae, Crustacea and Rotifera whereas, negatively for Chlorophyceae and Xanthophyceae when electivity was considered as group basis. As a whole, catla showed a positive selection for zooplankton but neutral response in case of phytoplankton in ponds treated with supplementary feed and fertilizer.

Discussion

A wide variety of phytoplankton and zooplankton in terms of number and genera were identified. The phytoplankton groups composed of Bacillariophyceae, Chlorophyceae, Cyanophyceae, Euglenophyceae, Rhodophyceae and Xanthophyceae and the zooplankton groups consisting of Crustacea and Rotifera were present. These are the typical features of plankton communities in tropical fish ponds. Plankton populations in number and genera were similar to those listed in the earlier studies carried out by several workers (Dewan, 1973; Islam *et al*., 1974; Mallah and Aminul Haque, 1978; Mumtazzuddin *et al*., 1982; Dewan *et al*., 1991). Plankton identified from stomach contents of fry-fingerling of this fish were more or less similar to the findings of Mookerjee (1944, 1945) and Jhingran (1991).

Electivity index of fish feeding was measured by using the results for the entire period of the study. This might provide a generalized idea about the feeding behaviour of the fish. Ivlev's index revealed that catla did not differ sharply in selection of food categories between the fertilized, and fed and fertilized conditions in both phases during its fry-fingerling stage.

Dewan *et al.* (1991) have noted that catla showed positive electivity for Bacillariophyceae, Hydrozoa, Rotifera and Crustacea and negative response to Chlorophyceae and Euglenophyeae but it had neutral response to Cyanophyceae. Wahab and Ahmed (1991) supported this phenomenon showed by catla by their findings. In other study Wahab *et al.* (1994) observed that catla was found to be more selective in ingesting diatoms, Crustacea and Rotifera in its fingerling stage. The fingerlings of catla in fed and fertilized ponds were unselective for phytoplankton and they fed on them irrespective of number and genera. This might be associated with high stocking rate and insufficient amounts of supplementary feed provided.

However, the present investigation recommended that catla, irrespective of fry and fingerling stages, exerted a strong preference for zooplankton and a neutral response to phytoplankton.

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