Zooplankton of Harda Baor of Meherpur District: Composition and Seasonal Succession

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Abstract: This report gives the first information on occurrence and distribution of zooplankton in Harda baor of Meherpur district during the study period from September 2006 to August 2007. A total of 64 species of zooplankton were identified, of which, 7 were protozoans, 37 rotifers, 13 copepods and 7 belonged to the cladocerans. During the present study a distinct fluctuation of zooplankton population in different months was observed. The monthly average of zooplankton was 507.25 indiv/L, of which protozoans occupied 28.08 indiv/L, cladocerans 28.67 indiv/L, copepods 80.08 indiv/L and rotifers 370.42 indiv/L respectively. The zooplankton population showed one distinct highest peak which occurred in the month of June with 1588 indiv/L. The lowest numbers of zooplankton population were recorded as 55 indiv./L in the month of September. Among zooplankton rotifers were the most dominant (73.02%) followed by copepods (15.78%), cladocerans (5.66%) and protozoans (5.54 %).

Key words: Zooplankton, composition, seasonal succession, baor, Meherpur.

Introduction

Bangladesh is abound with canals and rivers which contain large volume of fresh water in it. It has also large numbers of ponds, *beels, jheels, haors* and *baors* [1]. These water bodies support large number of different groups of economically important animals. The zooplankton are one of these groups of organisms composed of minute microscopic animals. They are important communities of aquatic ecosystem which are connected with the terminal biological production. Fresh water zooplankton are dominated by four major groups of animals. These are protozoans, rotifers, and two subclasses of crustaceans namely the cladocerans and copepods. Zooplankton constitutes important food item of many omnivorous and carnivorous fish. The larvae of carps feed mostly on zooplankton [2]. It also plays a vital role in the food chain as they are in the second tropic level as primary consumers and also as contributors to the next tropic level [3]. In Bangladesh, recently many researchers [4,5,6,7,8,9,10] worked on limnology and freshwater biology in different ecosystems but no works have been carried out from the Harda baor. So the present investigation was undertaken to observe the seasonal succession and composition of zooplankton in Harda baor of Meherpur Districts, Bangladesh.

Materials and methods

Description of the study area: The Harda baor is located at the Pirojpur Union under Sadar Upazilla of Meherpur district, which is about 16 Km eastern side of Meherpur Sadar.

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The area of this baor is 21.29 ha and it is rectangular in shape. This baor is excavated in 2005 financed by IFAD for the purpose of aquaculture. Soft muddy bottom and various bottom fauna were removed from the bottom of the baor due to excavation. During monsoon, the water depth rises upto 231 cm in the middle of the baor and it goes down to about 81 cm in the dry season. The baor consumes pesticides and fertilizers washed away from the surrounding paddy lands. Fish landing centre is at the northern side and concrete road was constructed from Chuadanga-Meherpur main road to Harda baor for quick transportation of fish.

Sampling Procedure: Monthly samples were collected from September 2006 to August 2007 between 7:30 A.M to 11:30 A.M. Collection of Zooplankton was made by sieving 40 liters of habitat water passed through a plankton net (55 μm mesh size).

Zooplankton accumulated in the container fixed at the bottom of the net and transferred it to a plastic vial. The sample was preserved in 4% formalin with few drops of glycerol, labeled and then transferred to Fisheries laboratory, Department of Zoology, University of Dhaka for further experiment. The species were identified following [1,9,10,11,12,13,14,15, 16 & 17] and the abundance of zooplankton were estimated by the following formula:

$$N = \frac{A \times C}{L}$$

Where N = Number of Zooplankton/L of original water, C = Volume of the concentrated sample in mL, L = Volume of original water expressed in Litre and A = Average number of Zooplankton / mL of water.

Results and Discussion

In total 64 species of zooplankton were documented, of which 7 were protozoans, 37 rotifers, 13 copepods and 7 belonged to the cladocerans (Table 1). During the present study a distinct fluctuation of zooplankton population in different months was observed. The monthly average of zooplankton was 507.25 indiv/L, of which, protozoans occupied 28.08 indiv/L, cladocerans 28.67 indiv/L, copepods 80.08 indiv/L and rotifers 370.42 indiv/L respectively (Table 1). The zooplankton population showed one distinct highest peak (Fig. 1) which occurred in the month of June with 1588 indiv/L (Table 1). The lowest numbers of zooplankton population were recorded as 55 indiv./L in the month of September. Patra and Azadi [18] found one peak which occurred in August from the Halda river of Bangladesh. Hossain *et al.* [19] observed two peaks in zooplankton abundance from Bashukhali-Salimpur-Kola barnal (BSKB) *beel* in Bangladesh one in May and another in September. Ehasn *et al.* [6] also showed two peaks of zooplankton in Chanda beel of Bangladesh, first peak in October and second peak in January. Das and Shrivastava [20] observed similar peaks of zooplankton from a fish tanks in Lucknow, India, one in October and another in April.

Protozoans: The Protozoans populations were the lowest (5.54%) among the identified zooplankton (Fig. 2). The monthly average of protozoan was 28.08 indiv./L. *Phacu*s sp. was the prominent group among protozoans which occurred in 10 months with monthly average of 5.58 indiv./L and absent in the month of June and July. *Euglena acus* and *Euglena oxyuris* were found in 7 months with monthly average of 9.25 indiv./L and 3.42 indiv./L respectively. *Euglena* sp. and *Euglena clavata* were observed in 5 and 4 months with monthly average of 4 indiv./L and 5.16 indiv/L respectively. *Difflugia* sp. was observed in November and August with monthly average of 0.42 indiv./L and *Volvox* sp. was found in November and February with monthly average of 0.25 indiv./L (Table 1). The highest peak of protozoans was recorded as 183 indiv/L in the month of October (Fig. 4). Hasan *et a.l* [7] also observed the highest protozoan abundance in October. Whereas, the dominancy of protozoan was noted by Chowdhury *et al.* [21] in the month of January and December from a managed semi-intensive pond in Dhaka. Seasonal variation showed that the highest peak was found in monsoon with 205 indiv./L and the lowest peak was 40 indiv./L in winter (Fig. 3). In the present study protozoan was found to be absent in the month of June and July (Fig. 4). But Chowdhury *et al.* [21] stated that protozoans were absent in the month of May and November.

Rotifers: Rotifers were the most dominant group among zooplankton which formed 73.02% (Fig. 2) of the total zooplankton with monthly average of 370.42 indiv./L. The highest abundance was found in the month of May with 957 indiv./L and the lowest number was in the month of September with 44 indiv./L (Table 1 & Fig. 4). *Brachionus calyciflorus* and *Asplanchna* sp. were found perennial with monthly average of 40.41 indiv./L and 10.58 indiv./L respectively. *Brachionus diversicornis* was recorded in 11 months with monthly average of 72 indiv./L but absent in July. The monthly average of *Brachionus forficula* was 21.16 indiv./L. But there was no individual found in May and October of this species. *Polyarthra vulgaris* was recorded in all months with monthly average of 15.41 indiv/L except January, June and July. *Trichocerca cylindrica* and *Trichocerca* sp. were recorded in 8 months with monthly average of 6.33 indiv./L and 5.83 indiv./L respectively.

The monthly average of *Trichocerca capucina* and *Trichocerca porcellus* and *Brachionus caudatus* were 7 indiv./L , 6.66 indiv./L and 18.50 indiv./L respectively which were found in 7 months. *Asplanchna priodonta* was recorded in 6 months with monthly average of 4.08 indiv./L. *Filinia terminalis* was the most dominant group which occurred in 10 months with monthly average of 114.91 indiv./L. *Brachionus nilsoni, B. calycyflorus* var. *dorcas, B. rubens, B. bidentata, B. urceolaris* and *Beauchampiella* sp. were found only 1 months with monthly average of 0.08 indiv./L (table 1). Seasonal variation showed that the highest abundance was 2764 indiv./L which found in Summer and the lowest number was 537 indiv./L in Monsoon (Fig. 2.) Among zooplankton rotifers occupied the highest position in annual abundance with monthly average of 370.42 indiv/L and its highest peak was in May with 957 indiv/L (table 1). Similar peak of rotifer was also observed by Hasan *et al.*[7] and Khan and Siddiqui [22].

Copepods: Copepods were the second largest group among zooplankton which occupied 15.78 % of the total zooplankton (Fig. 2). The highest abundance was observed in the month of June with 532 indiv./L and the lowest number was recorded in the month of September with 2 indiv./L (table 1). Patra and Azadi [18] made similar peak in Chanda beel from Bangladesh. Among copepods naupleus and metanaupleus were found in 10 months with monthly average of 38.75 indiv./L and 9.83 indiv./L respectively. *Diaptomus* sp. was the second dominant group which found in 8 months with monthly average of 19.50 indiv./L. The monthly average of *Microcyclops* sp. was 0.50 indiv/L which was observed in 4 months. *Mesocyclops leuckerti* and *Cyclops* sp. were recorded in 3 months with monthly average abundance of 1.50 indiv./L and 3.58 indiv./L respectively. *Skistodiaptomus pygmeus* was very rare group which found only 1 months with monthly abundance of 1 indiv./L (table 1). Seasonal variation showed that the highest peak was 627 indiv/L which found in summer and the lowest peak was observed in winter with 140 indiv./L (Fig. 3) During the present investigation a second peak of copepod was found in the month of July. Krishnamoorthi [23] observed two peaks, but one in spring and another in summer. In the present study the peak of copepods during summer and winter might be due to the favorable condition such as abundance of food organisms, optimal physical conditions, favorable range of pH level, dissolved oxygen and alkalinity.

Cladocerans: Cladocera was the 3rd abundant group which formed 2.50% of the total zooplankton (Fig. 2). Among different zooplankton groups the monthly average of cladocerans were 28.67 indiv./L (table 1). *Moina brachiata* was the most dominant group which found in 4 months with monthly average of 16.83 indiv./L. The highest number of *Diaphanosoma* sp. was recorded in the month of June with monthly abundance of 30 indiv./L and the lowest number was indiv./L in the month of August. *Chydorus* sp. was absent 10 months but found in January and February. *Moina* sp., *Alona* spp. and *Bosmina* sp. were the least available groups which were recorded only 1 month (table 1). Seasonal variation indicates that the highest peak was 313 indiv/L in summer and the lowest peak was 4 indiv/L in winter (Fig. 3). The monthly variation of cladocerans showed the highest peak in June with 312 indiv./L (Fig. 4). Similar findings were also reported by Patra and Azadi [18], Chowdhury *et al*. [21] from Bangladesh and Krishnamoorthi [23], Khan and Siddiqui [22] from India. Whereas, Habib *et al*.[24] stated that cladoceran was the highest in November and October. In the present study the number of cladoceran was absent in the month of October to December, April and May (Fig. 4).

Conclusion

Zooplankton constitute an important food item of many omnivorous and carnivorous fishes. The larvae of Carps feed mostly on zooplankton [2] because zooplankton provide the necessary amount of protein for the rapid growth of gonad of fishes. In the present study monthly average of 507.25 indiv/L of zooplankton was recorded. Whereas 1851.58 indiv/L of zooplankton were recorded from Chandbill *baor* of the same district [25]. In the conclusion, it could be said that the studied *baor* can be regarded as poorly productive *baor* due to low density of zooplankton and it is recommended that production from this *baor* ecosystem could be increased through proper management.

Table 1: *Monthly variations in Zooplankton abundance (indiv/L) in Harda Baor of Meherpur District during the study period from September 2006- August 2007.*

Species	2006				2007								Average
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Aprl	May	Jun	July	Aug	
Protozoans													
Euglena acus	4	101	1	1	….	….	….	1	2	….	….	1	9.25
E. clavata	….	….	….	….	….	….	53	1	5	….	….	3	5.16
E. oxyuris	….	23	1	1	….	….	3	1	11	….	….	1	3.42
Euglena sp.	2	33	….	1	….	….	11	….	….	….	….	1	4.00
Difflugia sp.	….	….	1	….	….	….	….	….	….	….	….	4	0.42
Phacus sp.	2	26	1	25	4	1	1	1	2	….	….	4	5.58
Volvox sp.	….	….	2	….	….	1	….	….	….	….	….	….	0.25
Total Protozoans	8	183	6	28	4	2	68	4	20	….	….	14	28.08
Rotifers													
Anuraeopsis fissa	6	….	….	….	….	….	….	….	….	….	….	11	1.41
Asplanchna herricki	….	1	1	1	3	6	8	….	16	….	3	….	3.25
A. priodonta	….	….	….	….	1	14	6	6	18	….	4	….	4.08
Asplanchna sp.	4	8	4	4	4	6	6	19	31	30	8	3	10.58
Brachionus angularis	7	1	….	….	6	8	….	3	2	….	….	9	3.00
B. calyciflorus	17	1	2	4	9	18	18	16	47	173	169	11	40.41
B. calyciflorus var. *dorcas*	….	….	….	….	….	1	….	….	….	….	….	….	0.08
B.rubens	….	….	….	….	….	….	….	1	….	….	….	….	0.08
B. caudatus	….	….	….	14	24	23	24	3	….	109	….	25	18.50
B. diversicornis	2	76	10	7	15	204	213	1	272	60	….	4	72.00
B. forficula	2	1	….	113	41	12	15	6	….	38	3	23	21.16
B. falcatus	2	….	….	….	….	….	….	….	….	….	3	23	2.33
B. nilsoni	….	….	….	….	….	….	….	1	….	….	….	….	0.08
B. bidentata	1	….	….	….	….	….	….	….	….	….	….	….	0.08
B. urceolaris	….	….	….	….	….	….	….	1	….	….	….	….	0.08
Brachionus sp.	….	….	….	1	….	….	….	….	….	….	….	….	0.08
Beauchampiella sp	….	….	1	….	….	….	….	….	….	….	….	….	0.08
Keratella vulga	….	….	….	3	4	1	….	….	….	….	….	….	0.67
Keratella cochlearis	*2*	….	….	….	….	….	1	….	….	….	….	….	0.25
Epiphenes sp.	….	….	….	….	….	….	….	….	….	188	….	….	15.67
Filinia terminalis	….	….	11	25	29	118	245	339	447	146	16	3	114.91
Filinia longiseta	….	….	11	11	11	16	….	3	….	….	….	….	4.33
Filinia opoliensis	….	….	….	1	….	….	….	….	….	….	….	….	0.08
Hexarthra sp.	….	….	….	3	….	….	….	….	….	….	….	1	0.33
Monostyllla closterocera	….	….	….	….	1	….	….	….	….	….	….	1	0.17
Monostylla sp.	….	….	….	….	1	….	….	….	….	….	….	1	0.17
Notholca acuminata	….	….	….	….	….	….	1	….	….	….	….	….	0.08
Notholca sp.	….	….	….	24	6	19	41	….	….	….	….	…	7.50
Polyarthra vulgaris	1	45	48	15	….	35	1	8	14	….	….	18	15.41

Species	2006				2007								Average
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Aprl	May	Jun	July	Aug	
Polyarthra sp.	....	….	….	….	1	….	….	….	….	….	….	….	0.08
Pompholyx sulcata	....	….	….	….	9	80	1	….	….	….	….	….	7.50
Platyias polycanthus	....	….	….	….	1	….	….	….	….	….	….	….	0.08
Platyias quadricornis	....	1	….	….	….	….	….	….	….	….	….	….	0.08
Trichocerca capucina	....	3	….	2	4	1	21	19	34	….	….	….	7.00
T. porcellus	....	….	14	3	13	6	4	13	27	….	….	….	6.67
Trichopcerca cylindrica	....	….	21	4	5	8	2	6	16	….	….	14	6.33
Trichocerca sp.	....	….	13	1	3	5	11	1	33	….	….	3	5.83
Total Rotifers	44	137	136	236	191	581	618	445	957	744	206	150	370.42
Diaptomus sp.	….	….	….	3	1	2	2	16	3	206	….	1	19.50
Skistodiaptomus pygmeus	….	….	….	….	….	….	….	1	….	….	….	….	0.08
Neodiaptomus sp.	….	….	….	….	….	….	….	….	….	26	….	….	2.17
Microcyclops varicans	….	….	….	….	….	….	….	….	….	….	9	….	0.75
Microcyclops rubellus	….	1	1	….	….	….	….	….	….	….	6	….	0.67
Microcyclops sp.	….	3	1	1	….	….	….	1	….	….	….	….	0.50
Mesocyclops leukerti	1	….	….	….	….	….	….	….	….	….	13	4	1.50
Mesocyclops edax	….	….	….	….	….	….	….	….	….	….	6.25	….	0.50
Mesocyclops sp.	….	….	….	….	….	1	….	….	….	….	….	8	0.75
Macrocyclops sp.	….	….	….	….	….	….	….	….	….	….	6	….	0.50
Orthocyclops modestus	….	….	….	….	….	….	….	….	….	….	6	….	0.50
Eucyclops agilis	….	….	….	….	….	….	….	….	….	….	6	….	0.50
Cyclops sp.	….	….	….	….	….	….	1	1	….	….	41	….	3.58
Nauplius	….	8	18	23	11	37	29	….	19	270	31	19	38.75
Metanauplius	1	….	10	5	4	21	20	….	2	30	3	22	9.83
Total Copepods	2	12	30	32	16	61	52	19	24	532	127	54	80.08
Cladocerans													
Alona sp.	….	….	….	….	….	….	….	….	….	4	….	….	0.33
Bosmina sp.	….	….	….	….	….	1	….	….	….	….	….	….	0.08
Cydorus sp	….	….	….	….	1	1	….	….	….	….	….	….	0.17
Diaphanosoma brachyurum	….	….	….	….	….	….	….	….	….	38	19	….	4.75
Diaphanosoma sp.	….	….	….	….	….	….	….	….	….	30	6	1	3.08
Moina brachiata	1	….	….	….	….	1	1	….	….	199	….	….	16.83
Moina sp.	….	….	….	….	….	….	….	….	….	41	….	….	3.42
Total Cladocerans	1	….	….	….	1	3	1	….	….	312	25	1	28.67
Total Zooplankton	55	332	172	296	212	647	739	468	1001	1588	358	219	507.25

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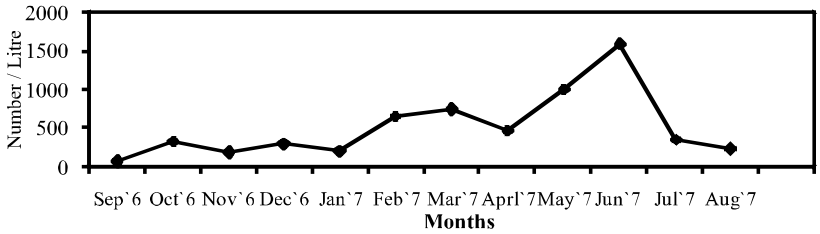

Fig. 1: *Monthly variation of zooplankton abundance in Harda baor*

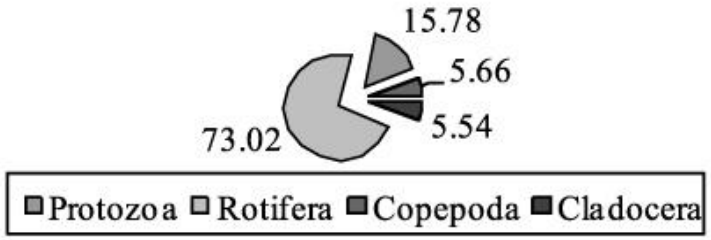

Fig. 2: *Percentage composition of different zooplankton groups in Harda baor*

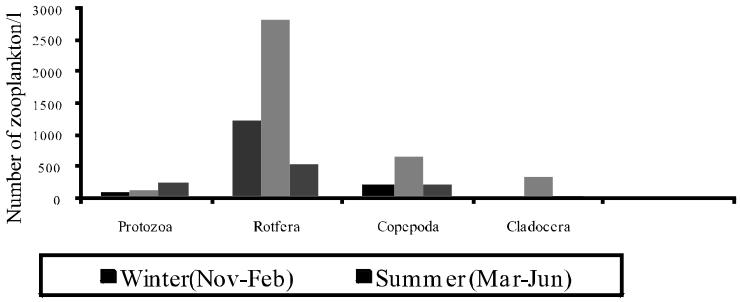

Fig. 3: *Seasonal variation of different zooplankton groups in Harda baor*

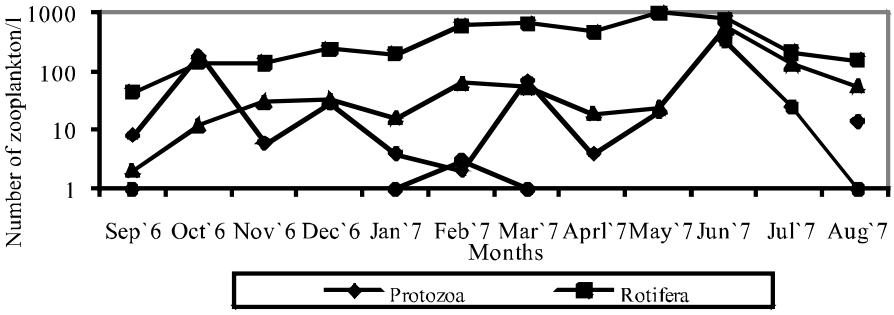

Fig. 4: *Monthly variation of different zooplankton groups in Harda baor.*

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