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DEPENDENCY ON PLANKTONS OF THE SMALL INDIGENOUS FISH SPECIES *ESOMUS DANRICUS* (HAM) IN DIFFERENT HABITATS

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Abstract

The food of *Esomus danricus* (Ham) in experimental conditions (earthen pots and ponds) was studied from June, 2000 to October, 2000. Pond water was supplied in the experimental tanks and ponds to inoculate plankton. Different kinds of organic matters (duck dropping, poultry dropping, rice straw, wheat bran) were used as nutrients for the culture of plankton. Total numerical abundances of phytoplankton production were 5669 and 3905 in the earthen pots and ponds, respectively. The phytoplanktons belonged to Diatomaceae, Myxophyceae, Chlorophyceae, Mesotaeniaceae, Oocystaceae, Desmidiceae and Characiaceae. Total numerical abundances of zooplankton were 3146 and 3785 in earthen pots and ponds, respectively. The zooplankton belonged to Rotifera, Cladocera, Ostracoda and Copepoda. Insect larvae and annelids were also found in considerable numbers. Digestive tracts of the reared fishes were examined. Total numerical abundances of phytoplankton were greater in number (4224) than those of zooplankton (460). It was observed that dependency of *Esomus danricus* on phytoplankton was greater than zooplankton .

Introduction

In aquatic ecosystem planktons are predominantly taken by fish via food chain and constitute the major source of fish nutrition.(1) Production of all fish depends upon the quality and quantity of plankton . Plankton production depends on the nutrients quality, quantity and physical conditions of water.(2,3) Different kinds of organic matters such as oil-cake, rice and wheat bran increase the planktonic growth, resulting higher fish yield. The zooplankton and phytoplankton abundance varied with the amounts of nutrients and other favorable conditions of water.(4) In our country there are some innumerable number of important small water bodies (pond, tanks, ditches and depression) are quite suitable for indigenous small fish culture.(5,6,7)

In the present study considering the importance of small indigenous fish species as important protein source; productivity of plankton and dependency of *Esomus danricus* on plankton as food are given importance. The present research therefore has been undertaken to observe the dependency on plankton of experimental fish in small water

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resources. So, if plankton production can be ensured in minipond with cheap organic matters, production of small fish like *Esomus danricus*: Cyprinidae could be generated.

Materials and Method

Present study was conducted in Zoological garden, Dhaka University campus. The artificial experimental habitats (earthen pots and miniponds) were lined with thick polythene in order to prevent water leakage.

Two earthen pots (Tank-1 and Tank-2) are identical in shape and size (3.65, 1.82 and 0.91 meter in length, width and depth, respectively). Earthen pot-1 was concreted with cement at the base but earthen pot-2 was provided with garden soil (15.24 cm in thickness).

There were three miniponds (size-length × width × depth: pond-1, 4.26 × 3.04 × 0.91 meters, pond-2, 4.26 × 3.65 x 1.21 meters and pond-3, 4.26 × 2.97 × 1.21 meters, respectively. Minipond-1 and 2 were lined with thick polythene sheet at the bottom and sides. But the third pond was lined with polythene only at the bottom. Bottom of each pond had mud of about six inches thickness. After seven days of adding organic matters, inoculation of plankton was made with 127, 127, 128, 128, 123 liters of mother water source pond water for the earthen pots (tanks) 1, 2 and minipopnds 1, 2 and 3, respectively. A constant level of water was maintained in all experimental habitats by supplying tap water to compensate the evaporated water throughout the entire study period (Table 1). The supplied pond water was found rich in plankton at the time of inoculation. From all the habitats water temperature was recorded with the help of a mercury thermometer. In the tanks and miniponds full depth of transparency was found during the study period. Studies on plankton started 14 days after culture. The artificial habitats were lined with thick polythene in order to prevent water leakage. The collection, identification and quantitative analysis of plankton was recorded according to the method of Presscott[8], Alpha[9], Tonap[10], Choudhury and Bhuyain[11] and Kabir *et al*.[12]

Special type of hand net was used to collect *Esomus danricus* from water reservoirs of Mirersarai, Karerhat and Chunati under the district of Chittagong. The experimental fish is available in the hill tract region where plankton production is very high in local small water reservoirs Rahman.[5] *Esomus danricus* is mainly depended on the plankton. The fishes were transferred immediately after catching to the plastic container with original pond water provided with small aquatic vegetation and enough facilities of aeration. The live specimen was maintained carefully in the aquaria of laboratory.

Dependency on planktons was examined by analyzing the digestive tract contents of the sampled fishes. The fishes were caught from experimental ponds with laboratory prepared net. Fishes were caught during afternoon when usually it consumes maximum plankton as food. Five fishes were used in each date for plankton abundance in the digestive tract. The fishes were chloroformed immediately after catching and dissected within five minutes. The digestive tracts were cut into small pieces (5 mm for phytoplankton and 50 mm for zooplankton analysis) and preserved in 70% alcohol immediately after dissection. The plankton of digestive tubes were identified and recorded by following the methods of Ali *et al*.[16]; Islam and Saha.[17]

Table 1. Different organic media used for plankton productivity in the small circular earthen bin, tanks and ponds.

Name of experimental habitats	Media application (amount).				Inoculations
	Duck droppings (grn).	Rice straw (gm)	Poultry droppings (grn)	Total	Water for inoculation
Tank-1	700	700	700	2100	127 litter
Tank-2	700	700	700	2100	127 "
Pond-1	750	750	750	2250	128 "
Pond-2	750	750	750	2250	128 "
Pond-3	500	500	500	1500	124 "

Results and Discussion

Total numerical abundance of phytoplankton in the earthen pots 1, earthen pots -2, pond-2 and pond-3 were 3484, 2165, 1947, 1124 and 834, respectively different dates during the study period. Among the earthen pots 1, - earthen pots 2, pond-1, pond-2 and pond-3 the highest abundance of phytoplankton were found in the earthen pots -1 and the lowest in the pond-3. In all the cases, with some variations in number, phytoplankton of seven groups (Diatomaceae, Myxophyceae, Chlorophyceae, Mesoteniaceae, Oocystaceae, Desmidiaceae and Characiaceae) were found to grow. Among them Diatomaceae and Chlorophyceae were found in considerable numbers (Fig. 1).

Among the available zooplankton Copepoda, Ostracoda, Cladocera, Rotifera, Insect larvae and Annelids were found in considerable numbers. Among the zooplankton Copepoda were highest and Rotifera was lowest in numbers . Total numerical abundance of zooplankton was 1156, 1993, 1392, 1823 and 570 in the earthen pots-1, earthen pots-2, minipond-1, 2 and 3, respectively. The highest number of zooplankton abundance was found in the earthen pots-2 and the lowest in the pond-3 (Fig. 2).

In the last week of July and in the middle of August zooplankton population was higher than other seasons[5] and the abundance of phytoplankton varied along with the physio-chemical factors of the culture habitats.[18-19] The zooplankton and phytoplankton abundance varied along with the organic matters and other favorable conditions of water[20] and inorganic fertilizers such as urea, tri-sulpher phosphate (TSP) and murate of potas (MP) play a vital role to increase the plankton production.[21]

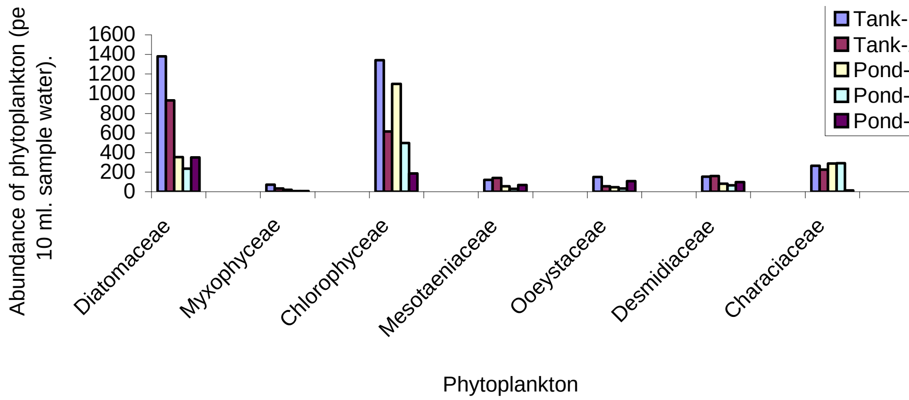

Fig. 1. Numerical abundance of phytoplanktons in the experimental earthen pot-1, 2 and ponds-1,2 and 3 in different dates of July, August and September of 2000 during the study period.

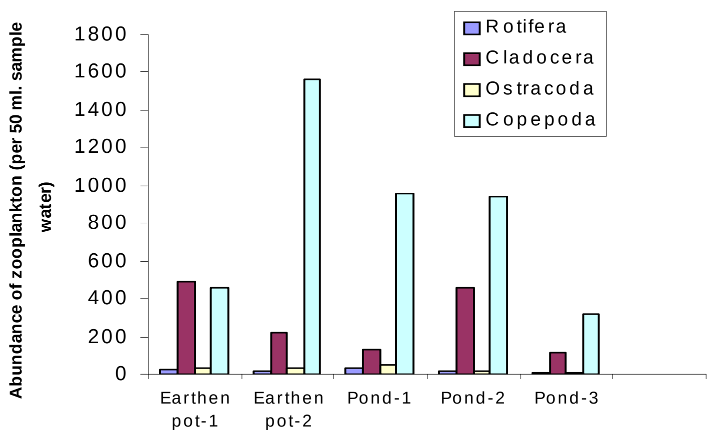

Fig. 2. Numerical total abundance of zooplanktons in the experimental earthen pots (Tanks 1, 2) and ponds 1, 2 and 3 in different dates of July, August and September of 2000 during the study period.

In the digestive tract phytoplankton of Diatomaceae, Myxophyceae, Chlorophyceae, Mosotaeniaceae, Oocystaceae, Desmidiaceae and Characiaceae groups were found in dissected sample fishes. Total aboundance of phytoplankton was 2162 and 2078 in experimental date. *Actdesmium* was highest in number in the digestive tract of the fishes in both the dates of analyses. *Closterium* was also found in considerable numbers. Myxophyceae (*Nostoc, Oscillatoria* sp.) was absent on both examination dates (Table 3). Planktons are very important food sources of small fishes Michael.[19]

Table 2. Numerical abundance of zooplanktons in the digestive tract of *E. danricus* when they were caught from the experimental ponds on October 2000.

Plankton	October-2000						October- .2000					
	1	2	3	4	5	Total	1	2	3	4	5	Total
	Digestive tract of samples fishes						Digestive tract of samples fishes					
Rotifera Rotifers	11	09	09	00	00	29	06	05	04	03	00	18
Cladocera *Daphnia* sp.	00	12	08	08	00	28	04	07	06	00	06	23
Ostracoda *Cypris* sp.	09	09	11	09	11	49	07	06	07	08	05	33
Copepoda *Cyclops* sp.	09	11	09	11	9	49	10	13	07	09	08	47
Diaptomus sp.	12	11	11	12	11	57	12	09	06	07	06	40
Insects (*Chironomus*) sp.	09	09	11	09	12	50	07	06	12	05	07	37

Table 3. Numerical abundance of phytoplankton in the digestive tract of *E. danricus* caught from the experimental ponds on October, 2000.

Plankton (Fam. & sp.)	1	2	3	4	5	Total	1	2	3	4	5	Total
Diatomaceae												
Navicula sp.	42	56	52	58	49	258	13	12	15	13	11	64
Pinnulariai sp.	48	72	47	63	47	277	16	14	17	21	09	77
Gyrosigma sp.	52	54	37	52	47	241	03	16	33	18	21	91
Gomphoenies sp.	39	49	31	46	49	214	07	16	34	15	25	97
Chlorophyceae												
Spirogyra sp.	70	27	23	29	17	166	05	95	11	58	100	269
Ulothix sp.	03	11	11	06	10	41	08	38	09	05	03	63
Spinoclosterium sp.	05	03	03	01	02	14	13	03	08	13	05	42
Chlorosarcian sp.	15	07	07	07	06	42	100	55	45	30	54	284
Erimosphaerae sp.	05	02	00	02	00	09	100	29	07	04	19	159
Volvox sp.	03	05	00	02	03	13	00	05	00	00	02	07
Phacus sp.	07	09	09	11	07	43	04	10	04	05	19	42
Closterium sp.	69	59	47	71	54	300	100	100	58	46	55	359
Ooeystaceae												
Closteriopsis longissima	11	07	09	13	10	50	03	06	08	05	05	27
Desmidiaceae												
Pleurotacnium chrenbergii	11	25	13	24	13	86	11	21	13	33	29	107
Characiaceae												
Actidesmium sp.	80	90	68	70	100	408	100	100	100	100	100	500
Total	**461**	**477**	**357**	**355**	**413**	**2162**	**483**	**520**	**362**	**339**	**457**	**2078**

All types of zooplankton available in the tanks and ponds were eaten by E. *danricus* but the traces of water flea and annelids were not found in the digestive tract on both the dates of study. Among the zooplanktons the Copepoda (*Cyclops* and *Diaptomus* sp.) was highest in number (49 and 57) on two experimental dates, respectively (Table 3). Total phytoplankton in the digestive tract of experimental fish was 4224 and the zooplankton was 460 (Table 3). Favorable food of fish larvae in the early stage was Copepoda reported by Ali *et al.*[(13)] The principal contents of the food of *Colisa fasciata* are algae, insect larvae, diatoms, protozoan, crustaceans and sand mud.[(4)]

From the present investigation it was found that this fish preferred algae in winter and diatoms and protozoan in summer. The results also indicated that *E. danricus* in all stages of its life cycle prefered phytoplankton than zooplankton as food. Different organic matters (duck droppings, rice straw and poultry droppings) were found to play significant role for plankton production in artificial culture habitats like small circular earthen bins, tank and minipond. Modest combination of organic matters is a good technique to maintain enough productivity of plankton for the culture of small fish species in small water reservoirs without doing any hazards to the nature. Harvest or culture of *Esomus danricus* could be more effective and easily maintainable in the minipond ecosystem with adequate plankton growth and production (as valuable food source).

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