

DIVERSITY, ABUNDANCE AND FLUCTUATION OF PLANKTON OF EEL (*MONOPTERUS CUCHIA*) CULTURE TANK AT REGIONAL RESERCH STATION, NAZ, GAYESHPUR, NADIA, WB

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ABSTRACT

An investigation was carried out to determine the diversity, abundance and fluctuation of plankton of the cemented eel (*Monopterus cuchia*) culture tank. Total 21 genera of phytoplankton belonging to Chlorophyceae, Myxophyceae, Bacillariophyceae and Euglenophyceae and 22 genera of zooplankton belonging to Copepoda, Cladocera, Rotifera, Ostracoda and Rhizopoda group were identified from the tank. During two years of study period, total plankton fluctuated between 20 nosl⁻¹ in July, 2006 and 1976 nosl⁻¹ in August, 2005; the phytoplankton fluctuated from 9 nosl⁻¹ in July, 2006 to 1300 nosl⁻¹ in August, 2005 and the zooplankton also varied between 9 nosl⁻¹ in July, 2006 and 842 nosl⁻¹ in April, 2006. Among phytoplankton Chlorophyceae and Myxophyceae and among zooplankton Copepoda were dominant groups. Total plankton was significantly correlated with phytoplankton and zooplankton at 1% level of significance. The phytoplankton significantly also correlated with zooplankton at 1% level of significance.

Key words:-Plankton, Plankton fluctuation, plankton abundance, cemented tank, culture tank

INTRODUCTION

Plankton is an integral part of aquatic food chain culminating in the production of fish. The qualitative and quantitative abundance of plankton and its relation to environmental condition has become prerequisite for fish production. The larvae of carps feed mostly on zooplankton [1]. According to [2], the zooplankton forms the principal source of food for fish within the water body. Several aspects of distribution and

abundance of plankton in beel have been studied by [3-6]. The physico-chemical parameters and nutrient status of water body plays an important role in governing the production of plankton which is the natural food of many species of fishes [7]. The 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 [8]. The use of density and diversity of phytoplankton and their association as biological indicators in the assessment of water quality or trophic status have been made by several workers [9-10]. The investigation carried out to determine the diversity, abundance and fluctuation of plankton population of the cemented culture tank situated at Regional Research Station, New Alluvial Zone, Gayeshpur of Nadia district, West Bengal in reference to the physico-chemical parameters.

MATERIALS AND METHODS

The investigation was carried out in cemented culture tanks present within the premises of the regional research station (RRS) of the new alluvial zone (NAZ), Gayeshpur, Nadia district of West Bengal for two years of study period from March, 2005 to February, 2007. Four cemented tanks (2m x 1m x 1m) were prepared for culture of *M. cuchia*. At first the leak-proof cemented tanks were cleaned properly. To simulate the condition of natural habitat of eel (*M. cuchia*), the culture tanks were filled with mud and other materials (lengthwise half). The different layers consisting of sand and mud, straw, banana trunks, cow dung and then mud were laid accordingly in one half of the tank lengthwise following [11]. The bottom layer was mud and sand in equal ratio. Second layer was prepared with straw which was previously cured in water for about a week. The third layer was made up of chopped banana trunks which were cured for about 7 days. The fourth layer was of dark mud coloured cow dung. The top layer was made up of mud which was sloped towards water. The thickness of each layer was 10 cm. After layering clean chlorine free ground water was introduced into the tanks, 15 cm above the top layer. These materials were allowed to decompose for about a week. The decomposition was manifested with the production of foam. The water was replaced after seven days. This was done for three times. Three weeks later fingerlings of tilapia were released into the tanks for checking the condition of water. The fingerlings survived

and the tanks were ready for the release of mud eel for culture and breeding. Water hyacinths (*Eichhornia crassipes*) were introduced into the tanks to simulate natural condition of eels and also act as the hiding place for the eels.

The plankton samples were collected at monthly intervals by filtering 50 liters of water through plankton net made of nylon blotting silk cloth of 60 μ mesh size. Samplings were made between 7 to 10 AM. Immediately after the collection of the samples, the plankton were preserved with 4% formalin solution. Each sample was stirred well before microscopic examination. One ml of sample was transferred to Sedgewick Rafter cell (S-R cell) with a wide mouth pipette. Qualitative and quantitative plankton analyses were done under the compound electronic microscope (NOVA 950 ES). Qualitative plankton analysis was done up to the genus following standard literature [12-14].

RESULTS AND DISCUSSION

Plankton collected and identified from the cemented tanks were classified into total 12 major groups. Phytoplankton were consisting of 4 major groups viz. –Chlorophyceae, Myxophyceae, Bacillariophyceae, Euglenophyceae and zooplankton were consisting of 8 major groups viz- Copepoda, Cladocera, Rotifera, Ostracoda, Rhizopoda, Protozoa, Insecta and Nematoda. Considering both the years total twenty one (21) numbers of genera of phytoplankton were identified. The group chlorophyceae encountered in the tank represented by nine (9) genera viz. *Spyrogyra*, *Ulothrix*, *Ankistrodesmus*, *Characium*, *Chlorella*, *Closterium*, *Eudorina*, *Cosmarium* and *Volvox*. Among these *Volvox*, *Spyrogyra*, *Chlorella* and *Closterium* were found comparatively more in number. Six (6) genera of Myxophyceae were encountered viz- *Oscillatoria*, *Anabaena*, *Nostoc*, *Rivularia*, *Polycyst* and *Microcystis*. Among these *Microcystis*, *Oscillatoria* and *Anabaena* were dominated. Bacillariophyceae include four (4) genera namely *Diatom*, *Diatoma*, *Synedra* and *Navicula*. Among

Euglenophyceae two (2) genera were encountered: *Euglena* and *Phachus*. Total twenty two (22) numbers of genera of zooplankton were identified for both the years. The group Copepoda includes three (3) genera viz. *Cyclops*, *Phyllodiaptomus* and *Eubranchipus*. The Cladocera encountered 5 genera represented by *Moina*, *Daphnia*, *Pleuroxus*, *Leydigia* and *Alona*. The Rotifera include 10 genera viz. *Brachionus*, *Keratella*, *Lecane*, *Monostyla*, *Mytilina*, *Notholca*, *Polyartha*, *Dichranophor*, *Farcularia*, *Euchlanis*. Among these *Brachionus* and *Keratella* were dominant. One genera of Ostracoda was identified (Cyprinotus). Three (3) genera of Rhizopoda were identified (*Centrophyxis*, *Diffflugia* and *Nebela*). Total plankton fluctuated from 153 to 1976 nos/l for 1st year and 20 to 999 nos/l for 2nd year. The average plankton and average phytoplankton recorded to be 738.09 nos/l and 341.67 nos/l for 1st year and 463 nos/l and 243.67 nos/l for 2nd year of study period respectively. During the 1st year among phytoplankton major dominating groups were found to be Myxophyceae (66.71%) followed by Chlorophyceae (21.20%) and Bacillariophyceae (11.07%). Euglenophyceae was the minor occurring group (1.02%). During 2nd year among phytoplankton, Myxophyceae (78.90%) was the most dominating group followed by Bacillariophyceae (11.29%) and Chlorophyceae (8.72%). Among the phytoplankton population Euglenophyceae was the less important group consisting of 1.09% (table 1). Similar types of observation were found as reported by the earlier workers [15-16]. The phytoplankton of the tank varied from 26 nos/l in January- February, 2006 to 1300 nos/l in August, 2005 for 1st year and for 2nd year it fluctuated from 9 nos/l in July, 2006 to 838 nos/l in October, 2006 (table 2 & 3). For the 1st year, one smaller peak in May, 2005 and higher peak during August and October, 2005 due to abundance of Mixophyceae and Bacillariophyceae. During 2nd year, smaller peak in May '06 (284 nos/l) and highest peak in October '06 (838 nos/l) were observed. Among different groups of phytoplankton Myxophyceae

was the major dominating group for the phytoplankton peak. The phytoplankton was mainly represented by Myxophyceae (*Microcystis* and *Oscillatoria*) and Chlorophyceae (*Spirogyra*, *Chlorella*, *Closterium* and *Ulothrix*). The phytoplankton diversity and dynamics of Chalta floodplain lake, Barak Valley, Assam, North East India [17]. Higher amounts of nitrate and phosphate along with high temperature were found to be associated with algal bloom [18]. Stagnation, larger quantity of organic matter, higher alkalinity, higher nutrients in the form of nitrate and phosphate support permanent bloom of microcystis [19].

The zooplankton counts were 396.42 nos/l and 219.33 nos/l for 1st year and 2nd year respectively. During 1st year, zooplankton fluctuated between 70 nos/l in November '05 and 778 nos/l in September '05 and during 2nd year, zooplankton fluctuated between 11 nos/l in July '06 and 842 nos/l in April '06. During 1st year zooplankton Copepoda was major dominating group which was constituted of 53.90% followed by Rotifera (18.50%), Rhizopoda (14.17%), Cladocera (6.94%) and Protozoa (6.26%). Minor occurring groups were identified to be Insecta (0.13%) and Ostracoda (0.10%) (table 1). Copepods were dominant in both ponds and constituted 30.47% and 43.39% of total zooplankton as reported by Rahman and Hussain (2008). During 2nd year, among zooplankton, Copepoda was major dominating group (61.09 %) followed by Rotifera (15.58%), Rhizopoda (15.01%) and Cladocera (6.65%). Ostracoda (1.29%), Insecta (0.15%) and Nematoda (0.23%) were the minor occurring groups (table 1). During 1st year, Zooplankton of the tank also showed two peaks, one during April '05 (770 nos/l) due to abundance of Copepoda (*Cyclops*, *Naupliu*) and Rotifera (*Brachionus sp.*) and another during September '05 (778 nos/l) due to the abundance of Copepoda (*Cyclops*, *Nauplius* and *Phyllodiaptomus*), Cladocera (*Moina*) and Rotifera (*Brachionus* and *Lacane*). During 2nd year, Zooplankton also showed two peaks during April '06 (842 nos/l) and during January '07 (468

nos/l) due to abundance of Copepoda (*Cyclops*, *Nauplius*) and Rotifera (*Brachionus*) groups. The copepod population was recorded at distinct peak in the month of September with their maximum in the month of June [20]. The total zooplankton ranged from 740 to 17530 nos/m³ of Ramasumudra tank were found [21]. They observed that the copepods were the dominant forms in the zooplankton of the tank. In the present study of the culture tank copepods were also the dominant among zooplankton. The presence of larval copepods throughout the period of investigation indicates continuous breeding as also reported [21-22]. 68). Among the rotifera, *Brachionus* was the dominant form found in maximum number in April for both the years. [21 & 23] also found similar results. As the organic manure was used in the tank, nutrient status might be higher which may be accelerating the development of plankton. The total plankton was significantly correlated with the phytoplankton and the zooplankton at 1% level of significance. The phytoplankton significantly also correlated with zooplankton at 1% level of significance.

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Table 1: Average and percentage of plankton of the tank.

Plankton	During 1 st Year		During 2 nd Year	
	Average Value (nos/l)	Percentage (%)	Average Value (nos/l)	Percentage (%)
A Phytoplankton				
(i) Chlorophyceae	72.42	21.20	21.25	8.72
(ii) Myxophyceae	227.92	66.71	192.25	78.90
(iii) Bacillariophyceae	37.83	11.07	2.67	1.09
(iv) Euglenophyceae	3.50	1.02	27.50	11.29
Total average phytoplankton	341.67	100.00	243.67	100.00
B Zooplankton				
(i) Copepoda	213.66	53.90	134.0	61.09
(ii) Cladocera	27.50	6.94	14.58	6.65
(iii) Rotifera	73.33	18.50	34.17	15.58
(iv) Ostracoda	0.42	0.10	2.83	1.29
(v) Rhizopoda	56.17	14.17	32.92	15.01
(vi) Protozoa	24.83	6.26	0.00	0.00
(vii) Insecta	0.50	0.13	0.33	0.15
(viii) Nematoda	0.00	0.00	0.50	0.23
Total average zooplankton	396.42	100.00	219.33	100.00
Total average plankton	738.09		463.00	

Table 2: Monthly variation of plankton of the tank during 1st year.

Parameters	Mar. '05	April '05	May '05	Jun. '05	Jul. '05	Aug. '05	Sep. '05	Oct. '05	Nov. '05	Dec. '05	Jan. '06	Feb. '06
Phytoplankton (nos/l)	53	28	480	268	214	1300	374	1298	37	82	26	26
Zooplankton (nos/l)	100	770	320	636	394	676	778	146	70	140	434	351
Total plankton (nos/l)	153	798	800	904	608	1976	1152	1444	107	222	460	377

Table 3: Monthly variation of plankton of the tank during 2nd year.

Parameters	Mar. '06	April '06	May '06	Jun. '06	Jul. '06	Aug. '06	Sep. '06	Oct. '06	Nov. '06	Dec. '06	Jan. '07	Feb. '07
Phytoplankton (nos/l)	22	30	284	168	09	310	641	838	469	69	43	42
Zooplankton (nos/l)	75	842	151	16	11	73	65	161	137	165	468	444
Total plankton (nos/l)	97	872	435	184	20	383	706	999	606	234	511	486