Study on Fish Productivity in Bichhiya River and Govindgarh Lake of district Rewa, Madhya Pradesh

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ABSTRACT

Freshwater fish populations are of major ecological and economic importance. Fish play a major economical role in structuring the benthic and zooplanktonic invertebrate communities.Primary productivity is the most important biological phenomenon in nature, which involves the trapping of radiant energy of the sun and its transformation into high potential biochemical energy by the process of photosynthesis. The productivity of freshwater fish species of Bichhiya River and Govindgarh Lake in Rewa district was studied from October 2009 to September 2010.

Keywords –Primary Productivity, Bichhiya River and Govindgarh Lake.

INTRODUCTION

Water is essential for all socioeconomic development and for maintaining healthy ecosystems. Natural surface water bodies like rivers and streams are subjected to pollution comprising of organic and inorganic constituent. [1]

Rivers are the most important sources of water to global population. Rivers provide water for industry, agriculture, commercial, aquaculture and domestic purposes. Unfortunately this important source of water is being polluted by indiscriminate disposal of sewage, industrial wastes and plethora of human activities. The significant role played by river in almost in every development programm of country hardly needs many elaborations. Lakes play an important role in the development programmes of country. They can serve as sources of drinking and for industries for agriculture, power development and fisheries. Unfortunately domestic wastes from human settlement and industrial effluents pollute majorities of our lakes and river system. [2]

A study of fresh water habitat with special reference to fish productivity useful for quick development and growth of the fishes. The importance of primary productivity is also well realised practically culture programmes. Therefore, it is essential to carry out intensive studies in the lake and river also extensive studies of the water of the region to obtain a thorough knowledge of biological productivity in waters of the region for promoting pisciculture [3]. Although various workers have contribution in the field of limnology in various parts of our country, yet most of the part of Madhya Pradesh remained neglected. Especially no extensive work has been done with the fish growth and productivity of lake and Bichiya River of Rewa Division, Madhya Pradesh is rich in fresh water resources. It is estimated that, 59,887 hectares of water body is readily available for fish culture.

MATERIALS AND METHODS

Study sites

The study area is situated between 81^0-18' east longitude and 28^0-32' north latitude and is situated on Vindhya plateau at the height of 318 meter above m. s. l. The climate is mainly sub tropical and sub humid. The average annual rainfall of the region is 82.953 mm and relative humidity is 79.36 %. Two water bodies namely Bichhiya River and Govindgarh Lake were selected for study, because of their contribution to the development of fresh water culture fishery of Rewa district. The Govindgarh Lake is located 24^0-20' 25'' longitude and 81^0-15' 20'' latitude of Rewa district while Bichhiya River is located on 24^0-10' N and 81^0-15' longitude east of Rewa town.

Sampling Station

Four sampling station were selected for physical analysis of river. They are-

Station 1st **-** The Ist station was Gurh where the river Bichhiya originated. It is about 27k.m. away From Rewa town.

Station 2nd**-** The 2nd station was established at Laxman Bag Mandir 6 km away from Rewa District.

Station 3rd **-** The 3rd station was established before Rajghat the characteristics of the station is PHE Deptt. Pumping.

Station 4th **-** The 4th station was marked on Chhotipul which is half km from Old Rewa Bus Stand.

The four sampling station were selected after preliminary observation of Lake for the purpose of present study. The four sampling site for present investigation as A, B, C and D water sample were collected from all these four station,

1st Sampling station A **-** Fort - This is a point located cast of the lake.

2nd Sampling station B – Corner of Lake

3rd Sampling station C **-** Gopal Bag - This site is situated at centre of the lake.

4th Sampling station D **-** Fish form

Primary Production

Primary Production was determined by the direct measurement of photosynthesis specially by phytoplankton. For this purpose 'Light and dark Oxygen methods' was employed.

Clear bottle (CB), a dark bottle (DB) and a clear bottle (LB) were filled with the sample water. Just before starting the experiment the oxygen of the bottle (CB) was fixed. Clear and dark bottles were suspended in water. The bottle (DB) and (LB) were allowed to remain suspended in water for 4 hrs. After that bottles were removed and their oxygen was fixed on the spot. The fish growth and productivity of river and lake was calculated by applying Ricker (1946) [4] formula.

Calculation

$$\text{Net Primary Production} = \frac{\text{LB-CB} \times 0.375}{\quad} \times t$$

PQ

0.375 was a factor for converting oxygen values to carbon values.

PQ was photosynthetic coefficient = 1.2

t = Incubation period.

The values of gross and net production were obtained in $gc/m^2/day$ using a photoperiod of 12 hours.

RESULTS AND DISSCUTION

Primary Productivity:

Water is an incredibly important aspect of our daily life. Every day we drink water, cook with water, bath in water and participate in many activities involving water. It is essential for all dimensions of life. Table 1 and 2 shows the monthly primary production.

In Bichhiyariver :

Station S_1 : At the surface level the maximum values of Net primary production was noted in December was 3.000 $gc/m^2/day$ and the minimum values at surface in August was 0.897 $gc/m^2/day$. At 1 meter depth net primary production was zero in the month of July and September. At 2 meters & 3 meters depth production were undertaken zero throughout the year. (Table 1)

Station S_2 : The maximum values of the net primary production at surface level and 1 meter depth were noted in December were 3.224 $gc/m^2/day$ and 2.984 $gc/m^2/day$ respectively. The minimum values for the same levels were 0.320 $gc/m^2/day$ and 1.436 $gc/m^2/day$ in the month of August respectively. At surface & 1 meter level net production were zero in the month of September. At the depth of 2 & 3 meters net primary production were zero in the month of September. (Table 1)

Station S_3: The highest values of the net primary productionn at the surface and 1 meter depth noted in the month of January 3.689 $gc/m^2/day$ and 3.468 $gc/m^2/day$ respectively. The lowest value at the same level were 0.825 $gc/m^2/day$ and 1.000 $gc/m^2/day$ in August and June respectively. At 2 & 3 meters depth net primary production were not detected through out the year. At surface level net production was zero in the month of September and at the 1 meter depth the production were zero in the month of August and September. (Table 1)

Station S_4 : The maximum values of the net primary production at the surface and 1 meter level noted in the month of December i.e.; 2.940 $gc/m^2/day$ and 2.144 $gc/m^2/day$. The minimum values at same levels noted in the month of August & June were 0.565 $gc/m^2/day$ and 0.338 $gc/m^2/day$ respectively. The value of net production was not noted in the month of September throughout the year, but at the 1 meter depth in the month of August and September were zero also. (Table 1)

In Govindgarhlake :

Station A : At the surface level the maximum values of net primary production noted in December was 6.822 $gc/m^2/day$ and the minimum values at the surface in August was 1.080 $gc/m^2/day$. At 1 meter depth net primary production was zero in the month of

July and September. At 2 meter depth production was noted in month of November 1.560 gc/m²/day, Dec. 2.740 gc/m²/day, in January 1.975 gc/m²/day and in March 1.975 gc/m²/day respectively and at 3 meters depth it was undertaken zero thoughout the year. (Table 2)

Station B : The maximum values of the net primary production at surface level and 1 meter depth noted in December were 4.678 gc/m²/day and 2.922 gc/m²/day day respectively. The minimum values for the same levels were .360 gc/m²/day and .936 gc/m²/day in the month of August respectively. At surface level & 1 meter level net primary production was zero in July at 2 meters depth in the month of July & September was zero. At 2 meters depth net primary production was detected in November 1.500 gc/m²/day and in December 1.610 gc/m²/day respectively.(Table 2)

Station C: The highest values of the net primary productionn at the surface and 1 meter depth noted in December 5.045 gc/m²/day and 6.000 gc/m²/day respectively. The lowest value at the same level is 560 gc/m²/dayand 1.040 gc/m²/day in the month of August respectively. At surface level net production was zero in the month of July. At 2 meters depth were noted in November 1.500 gc/m²/day, in December 1.860 gc/m²/day, and in March .260 gc/m²/day respectively. At 3 meters depth net primary productivity was not detected throughout the year. (Table 2)

Station D : The highest value of the net primary production at the surface and at 1 meter depth noted in December 6.376 gc/m²/day and 6.000 gc/m²/day respectively. The lowest values at same levels noted in August were 1.270 gc/m²/day and 0.480 gc/m²/day respectively. The value of net production was not marked in the month of July & September at surface level as well as 1 meter depth. At 2 meters depth net primary production was noted in the months of Novmber 1.450 gc/m²/day, December 2.550 gc/m²/day, and in March 1.120 gc/m²/day respectively. At 3 meters depth net primary production was not detected throughout the year. (Table 2)

Verma*et al.* (1980) [5] reported that intrafish competition might have further reduced their population. Mention may be made that fish population is greatly influenced by different biotic, abiotic components and tropic niche of aquatic ecosystems. Most of the herbivorous fishes, due to grazing effect influence the phytoplankton population of grazing is more detrimental to phytoplankton and less hazardous to zooplankton.

Table 1- Monthly data of Net primary production (gc/m²/day) of Bichhiyariver(Oct. 2009 to Sept. 2010)

Months	Station	0m.	1m.	2m.	3m.
Oct.	S_1	2.740	2.620	00	00
	S_2	2.920	2.880	00	00
	S_3	2.446	2.000	00	00
	S_4	1.098	1.026	00	00
	S_1	2.224	1.792	00	00
	S_2	2.229	2.886	00	00

Nov.	S_3	1.699	1.098	00	00
	S_4	1.233	1.008	00	00
Dec.	S_1	3.000	2.966	00	00
	S_2	3.224	2.984	00	00
	S_3	2.665	2.205	00	00
	S_4	1.779	1.670	00	00
Jan.	S_1	2.768	2.608	00	00
	S_2	2.964	2.745	00	00
	S_3	2.060	2.000	00	00
	S_4	1.220	1.000	00	00
Feb.	S_1	2.240	2.048	00	00
	S_2	2.432	2.243	00	00
	S_3	1.866	1.224	00	00
	S_4	1.078	1.050	00	00
Mar.	S_1	2.086	2.021	00	00
	S_2	2.133	2.035	00	00
	S_3	1.506	1.112	00	00
	S_4	1.024	1.006	00	00
Apr.	S_1	2.126	2.046	00	00
	S_2	2.176	2.109	00	00
	S_3	1.306	1.072	00	00
	S_4	1.114	1.005	00	00
May	S_1	1.298	1.095	00	00
	S_2	1.445	1.121	00	00
	S_3	1.053	1.003	00	00
	S_4	1.004	1.623	00	00
Jun.	S_1	1.063	1.836	00	00
	S_2	1.165	1.109	00	00
	S_3	1.025	1.002	00	00
	S_4	0.823	0.523	00	00
Jul.	S_1	1.853	00	00	00
	S_2	2.086	00	00	00
	S_3	00	00	00	00
	S_4	00	00	00	00
Aug.	S_1	0.897	1.006	00	00
	S_2	0.320	1.436	00	00
	S_3	0.360	0.268	00	00
	S_4	0.280	0.170	00	00
	S_1	1.820	00	00	00
	S_2	1.425	00	00	00

Sept.	S_3	1.257	00	00	00
	S_4	0.700	00	00	00

Table 2- Monthly data of Net primary production (gc/m²/day) of Govindgarh lake (Oct. 2009 to Sept. 2010)

Months	Station	0m.	1m.	2m.	3m.
Oct.	A	4.845	4.140	00	00
	B	3.740	2.780	00	00
	C	4.400	3.080	00	00
	D	4.621	4.000	00	00
Nov.	A	6.530	5.740	1.560	00
	B	3.320	2.000	1.206	00
	C	4.510	3.346	1.500	00
	D	5.410	2.580	1.450	00
Dec.	A	6.822	6.020	2.740	00
	B	4.678	2.922	1.610	00
	C	5.476	3.760	1.860	00
	D	6.376	6.000	2.550	00
Jan.	A	5.112	4.800	2.075	00
	B	4.440	3.500	00	00
	C	5.045	3.678	00	00
	D	5.110	3.710	00	00
Feb.	A	5.890	5.260	00	00
	B	4.108	3.670	00	00
	C	4.190	5.030	00	00
	D	5.115	4.880	00	00
Mar.	A	4.170	3.242	1.975	00
	B	3.312	2.880	00	00
	C	4.035	4.048	0.260	00
	D	4.850	4.038	1.120	00
Apr.	A	4.340	4.000	00	00
	B	2.328	2.100	00	00
	C	4.300	4.095	00	00
	D	5.070	4.620	00	00
May	A	3.040	1.695	00	00
	B	1.630	1.045	00	00
	C	2.235	1.026	00	00
	D	1.898	1.520	00	00
Jun.	A	2.165	2.144	00	00
	B	1.155	1.000	00	00
	C	2.090	1.440	00	00

	D	2.080	2.198	00	00
Jul.	A	2.170	00	00	00
	B	00	00	00	00
	C	00	00	00	00
	D	2.140	00	00	00
Aug.	A	1.080	1.156	00	00
	B	0.360	0.936	00	00
	C	0.560	1.040	00	00
	D	1.270	0.480	00	00
Sept.	A	1.875	00	00	00
	B	1.440	00	00	00
	C	1.350	00	00	00
	D	1.700	00	00	00

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