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Primary productivity in relation to phytoplankton diversity of Mahi Bajaj Sagar Dam Banswara, Rajasthan

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Abstract
An experiment was conducted to determine the primary productivity and to assess the planktonic diversity of Mahi Bajaj Sagar Dam Banswara, Rajasthan with relation to its fisheries potential. The gross primary productivity (GPP), net primary productivity (NPP) and community respiration (CR) were determined. The species identification was done under the microscope. Average value of the reservoir was observed GPP- 0.37 g C m^{-3} h^{-1}, NPP 0.21 g C m^{-3} h^{-1}, and CR 0.14 g C m^{-3} h^{-1}. The outcome of the present study from a planktonic diversity of Mahi Dam, a total of 19 species of phytoplankton was noticed. Out of 19 species of phytoplankton, 6 were from Cyanophyceae, 7 were from Chlorophyceae, 5 were from Bacillariophyceae and 1 belonged from Euglenophyceae from this Dam. Cyanophyceae is a dominant group among all. The result of the present study revealed that the water was productive. From the present study it can be suggested that the water body of the reservoir is suitable for the fisheries.

Keywords: cyanophyceae, gross primary productivity, net primary productivity, community respiration

1. Introduction
Phytoplankton is single-celled, normally microscopic (<100 um in diameter) and is autotrophs. Phytoplankton is normally present in natural water bodies and very beneficial to the ecosystem. These organisms are the main primary producers of the aquatic food web (Manickam, *et al.* 2012) [5]. Phytoplankton is the important components of the aquatic ecosystem and contributing to the bulk of primary productivity by producing organic matter which is the base of complex aquatic food webs. Further, the composition and abundance of phytoplankton can reflect the nutritional status and trophic condition of the water, (Busing, 1998) [2] and Diazpardo *et al.*, 1998) [3]. Effects of nutrients on the biomass of phytoplankton, commonly used to indicate trophic status, are usually predicted on the basis of the absolute and relative amounts of nutrients in the watershed especially phosphorus (Forsberg *et al.* 1978) [4]. The present study was aimed to assess the diversity of the phytoplankton and the primary productivity of the Mahi Bajaj Sagar.

2. Material and Methods
The present study was carried out during 15 Feb to 2 May 2018 in Mahi Bajaj Sager. The Mahi Bajaj reservoir is situated 23°37'40" N Latitude 74°32'45" E Altitude 15 Km from Banswara city. Catchments area of Dam is 13500 ha. Length of Dam is 3065 m.; Width of Dam is 20 m. The height of the Dam is 43 meter. The climate of Mahi Bajaj reservoir is sub-tropical and average rainfall 800-980mm. Average temperature 26.7ºC The morphometric features of Mahi Bajaj Sagar and the location map with Google satellite imagery in Figure 1. For the quantitative and qualitative analysis of plankton Sedgwick rafter plankton counting cell was used for plankton analysis. 1 ml of water sample was taken in Sedgwick rafter cell to for analysis of plankton analysis. Phytoplankton count in cell ml^{-1} (Standard method followed APHA, 2005). Primary productivity (Gross primary productivity GPP, Net primary productivity-NPP and Community respiration-CR) and phytoplankton of Mahi Bajaj Sagar were analyzed using standard methods (Trivedy *et al.*, 1987) [9], (APHA, 2005) [1].

2.1 Sampling stations
Five sampling stations *viz.* A (Western site), B (Southern site), C (Sothern east), D (Northern east) and E (Eastern) were fixed. For the sample collection an appropriate quantity of water

Sample (i. e. 50 liters from surface) was filtered through bolting silk no. 16 and thus obtained were preserved.

3. Results and Discussion

Among the phytoplankton, total 19 genera belonging to four major groups *i.e.* Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae were recorded during the study period in Mahi Bajaj Sagar Dam. Out of 19 genera, 6 were from Cyanophyceae, 7 were from Chlorophyceae, 5 were from Bacillariophyceae and 1 belongs from Euglenophyceae. The phytoplankton population was dominated by Cyanophyceae, Bacillariophyceae, Chlorophyceae and Euglenophyceae. The average phytoplankton density from all the five stations was observed 93.4 cell ml^{-l}. The highest phytoplankton density (115 cell ml^{-1}) was observed on the 6th week at station B. whereas the lowest (75 cell ml^{-1}) was seen in 1st week at station A and E (Tables 1.1 to 1.5).

The population of phytoplankton at station A, B, C, D and E ranged from 73 to 110, 81 to 114, 74 to 102, 79 to 96 and 75 to 113 respectively. The average values of phytoplankton were 92, 96, 86, 94 and 92. Respectively (Tables 1.1 to 1.5).

The result pertaining to gross and net primary productivities of Mahi Bajaj Sagar Dam during the study period (February to May) are presented in Table 1.1 to 1.5. In general, the GPP ranged between 0.38 to 0.42, 0.34 to 0.44, 0. 33 to 0.39, o.32 to 0.42 and o.32 to 41 g C m^{-3} h^{-1} at station A, B, C, D and E, respectively. The average value of GPP was o.37, o.38, 0.35, o.37 and o.37 respectively. (Table 1.1 to 1.5). The average mean of all stations was 0.37 g C m^{-3} h^{-1}.

The range of respective values of net primary productivity (NPP) at stations A, B, C, D and E was found 0.22 to 0.27, 0.22 to 0.27, 0.21 to 0.25, 0.18 to 0.26 and 0.20 to 0.27 g C m^{-3} h^{-1} respectively. The corresponding average value of NPP was observed 0.24, 0.24, 0.22, 0.22 and 0.23 respectively. (Tables 1.1 to 1.5). The average mean for all the stations was 0.21 g C m-3 h^{-1}.

The range of respective values of community respiration (CR) at station at A, B, C, D, and E was found 0.12 to 0.15, 0.12 to 0.18, 0.12 to 0.15, 0.12 to 0.16 and 0.12 to 0.16 g C m^{-3} h^{-1} respectively. The average values of CR were 0.13, 0.14, 0.13, 0.14 and 0.14 noticed (Table 1.1 to 1.5) respectively. However, the average mean for all the station was 0.14 g C m^{-3} h^{-1}.

The present study in accordance with the study of Mishra *et al.,* (2016) [6] where they found the average phytoplankton count in Goverdhan Sagar was 36.71 No/ml distributed among 29 genera in the order of dominance - Chlorophyceae, Bacillariophyceae, Cyanophyceae and Desmidiaceae. Similarly, another study was done by Sing S (2015) [7] where five groups of phytoplankton namely Cyanophyceae, Bacillariophyceae, Chlorophyceae, Dinophyceae, and Euglenophyceae were encountered in the reservoir.

The results of the present study in agreement with the study of Mishra *et al.,* (2016) [6] where they found similar values of an average NPP of 0.24 g C m^{-3} h^{-1} in the Pichola Lake. The respective values of net primary productivity (NPP) of the present study were found between 0.16 to 0.27 g C m^{-3} h^{-1}. The average value of NPP was 0.21 g C m^{-3} h^{-1}. Raj Kumar (2005) [8] found an average NPP of 0.31 g C m^{-3} h^{-1} in the surface waters of Daya reservoir.

4. Conclusion

From the results of the present study of primary productivity and diversity of the plankton finally it can be concluded that the Mahi Bajaj Sagar dam can be utilized for the fisheries.

5. Acknowledgment

Authors would like to thank the Dean, College of Fisheries and other teaching and non- teaching staff for supporting during the work and writing.

Table 1.1: Fortnightly Variation in Phytoplankton (ml^{-l}) and biological characteristics at the sampling station 'A' of Mahi Dam Sagar, Banswara

S. No	A major group of Phytoplankton	1	2	3	4	5	6	Avg.	Min	Max	S.D	C.V (%)
1	Cyanophyceae	31	35	39	37	44	40	37.6	31	44	4.45	10.80
2	Bacillariophyceae	21	19	19	23	26	26	22.3	19	26	3.20	13.09
3	Chlorophyceae	16	24	22	23	27	31	23.8	16	31	5.03	19.29
4	Euglenophyceae	7	8	9	8	9	8	8.16	7	9	0.75	8.41
5	Total	75	86	89	91	106	105	92	73	110	11.8	51.60
	Primary productivity (g C m^{-1} h^{-1})											
1	Gross primary productivity	0.35	0.37	0.35	0.38	0.39	0.42	0.36	0.35	0.42	0.026	7.22
2	Net primary productivity	0.22	0.22	0.23	0.27	0.27	0.26	0.24	0.22	0.27	0.024	10.03
3	Community respiration	0.13	0.15	0.12	0.12	0.13	0.16	0.13	0.12	0.15	0.016	12.63

Table 1.2: Fortnightly Variation in Phytoplankton (ml^{-l}) and biological characteristics at sampling station 'B' of Mahi Dam Sagar, Banswara

S. No	A major group of Phytoplankton	1	2	3	4	5	6	Avg	Min	Max	S.D	C.V (%)
1	Cyanophyceae	36	36	40	42	44	47	40.83	36	47	4.40	9.83
2	Bacillariophyceae	24	21	23	23	26	30	24.5	21	30	3.14	11.72
3	Chlorophyceae	17	19	20	25	28	27	22.66	17	28	4.58	18.48
4	Euglenophyce	7	8	7	8	9	11	8.33	7	9	1.50	16.49
5	Total	84	84	90	98	107	115	96.33	81	114	12.72	56.53
	Primary productivity (g C m^{-1} h^{-1})											
1	Gross primary productivity	0.34	0.38	0.36	0.39	0.42	0.44	0.38	0.34	0.44	0.037	9.81
2	Net primary productivity	0.20	0.22	0.23	0.27	0.26	0.26	0.24	0.20	0.27	0.027	11.48
3	Community respiration	0.14	0.16	0.13	0.12	0.16	0.18	0.14	0.12	0.18	0.022	15.02

Table 1.3: Fortnightly Variation in Phytoplankton (ml^{-1}) and biological characteristics at the sampling station 'C' of Mahi Dam Sagar, Banswara

S. No	A major group of Phytoplankton	1	2	3	4	5	6	Avg.	Min	Max	S.D	C.V (%)
1	Cyanophyceae	35	35	34	37	33	39	35.5	34	39	2.16	5.57
2	Bacillariophyceae	23	19	20	22	22	26	22	19	26	2.44	10.16
3	Chlorophyceae	16	20	21	21	29	28	22.5	16	29	4.00	20.32
4	Euglenophyceae	6	5	6	7	6	8	6.33	5	8	1.03	14.88
5	Total	80	79	81	87	90	101	86.33	74	102	8.38	50.95
	Primary productivity (g C m^{-1} h^{-1})											
1	Gross primary productivity	0.33	0.35	0.34	0.36	0.37	0.39	0.35	0.33	0.39	0.021	6.17
2	Net primary productivity	0.21	0.21	0.21	0.22	0.22	0.25	0.22	0.21	0.25	0.015	7.04
3	Community respiration	0.12	0.14	0.13	0.14	0.15	0.14	0.13	0.12	0.15	0.010	7.55

Table 1.4: Fortnightly Variation in Phytoplankton (ml^{-1}) and biological characteristics at the sampling station 'D' of Mahi Dam Sagar, Banswara

S. No	A major group of Phytoplankton	1	2	3	4	5	6	Avg.	Min	Max	S.D	C.V (%)
1	Cyanophyceae	34	36	38	37	37	45	37.83	34	37	3.76	9.08
2	Bacillariophyceae	24	23	22	25	24	25	23.83	22	25	1.16	4.47
3	Chlorophyceae	16	22	24	26	32	32	25.33	16	26	6.15	22.17
4	Euglenophyceae	7	7	6	7	8	8	7	6	8	0.75	9.81
5	Total	81	88	90	95	101	110	94.16	79	96	10.26	45.32
	Primary productivity (g C m^{-1} h^{-1})											
1	Gross primary productivity	0.34	0.32	0.36	0.38	0.42	0.38	0.37	0.32	0.42	0.035	9.55
2	Net primary productivity	0.22	0.18	0.23	0.23	0.26	0.24	0.22	0.18	0.26	0.026	11.72
3	Community respiration	0.12	0.14	0.13	0.15	0.16	0.14	0.14	0.12	0.16	0.014	10.10

Table 1.5: Fortnightly Variation in Phytoplankton (ml^{-1}) and biological characteristics at the sampling station 'E' of Mahi Dam Sagar, Banswara

S. No	A major group of Phytoplankton	1	2	3	4	5	6	Avg.	Min	Max	S.D	C.V (%)
1	Cyanophyceae	35	37	39	38	38	46	38.8	35	46	3.7	8.84
2	Bacillariophyceae	22	24	23	23	21	26	23.1	22	26	1.7	6.78
3	Chlorophyceae	14	23	24	26	33	35	25.8	14	35	7.5	26.7
4	Euglenophyceae	4	4	4	4	5	6	4.5	4	6	0.8	16.9
5	Total	75	88	90	91	97	113	92.3	75	113	12.4	59.3
	Primary productivity (g C m^{-1} h^{-1})											
1	Gross primary productivity	0.34	0.32	0.36	0.42	0.38	0.41	0.37	0.32	0.41	0.039	10.54
2	Net primary productivity	0.20	0.20	0.23	0.27	0.22	0.27	0.23	0.20	0.27	0.031	13.76
3	Community respiration	0.14	0.12	0.13	0.15	0.16	0.14	0.14	0.12	0.16	0.014	10.10

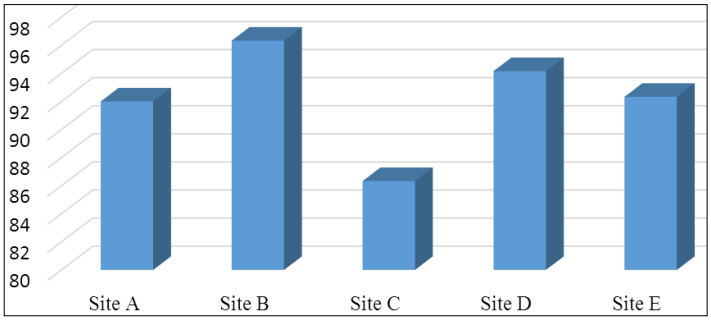

Fig 1.1: Fortnightly variation in total phytoplankton in surface water of Mahi Bajaj Sagar Dam, Banswara

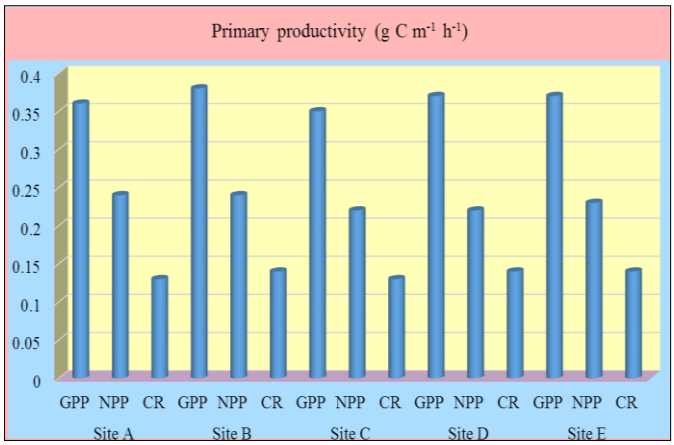

Fig 1.2: Fortnightly variation of gross primary productivity (GPP), net primary productivity (NPP) and community respiration (CR) of surface water of Mahi Bajaj Dam, Banswara

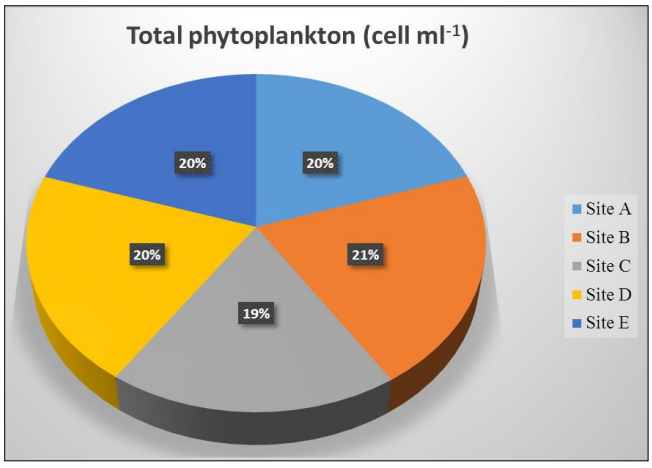

Fig 1.3: Group wise composition of phytoplankton at different stations of Mahi Bajaj Sagar Dam, Banswara

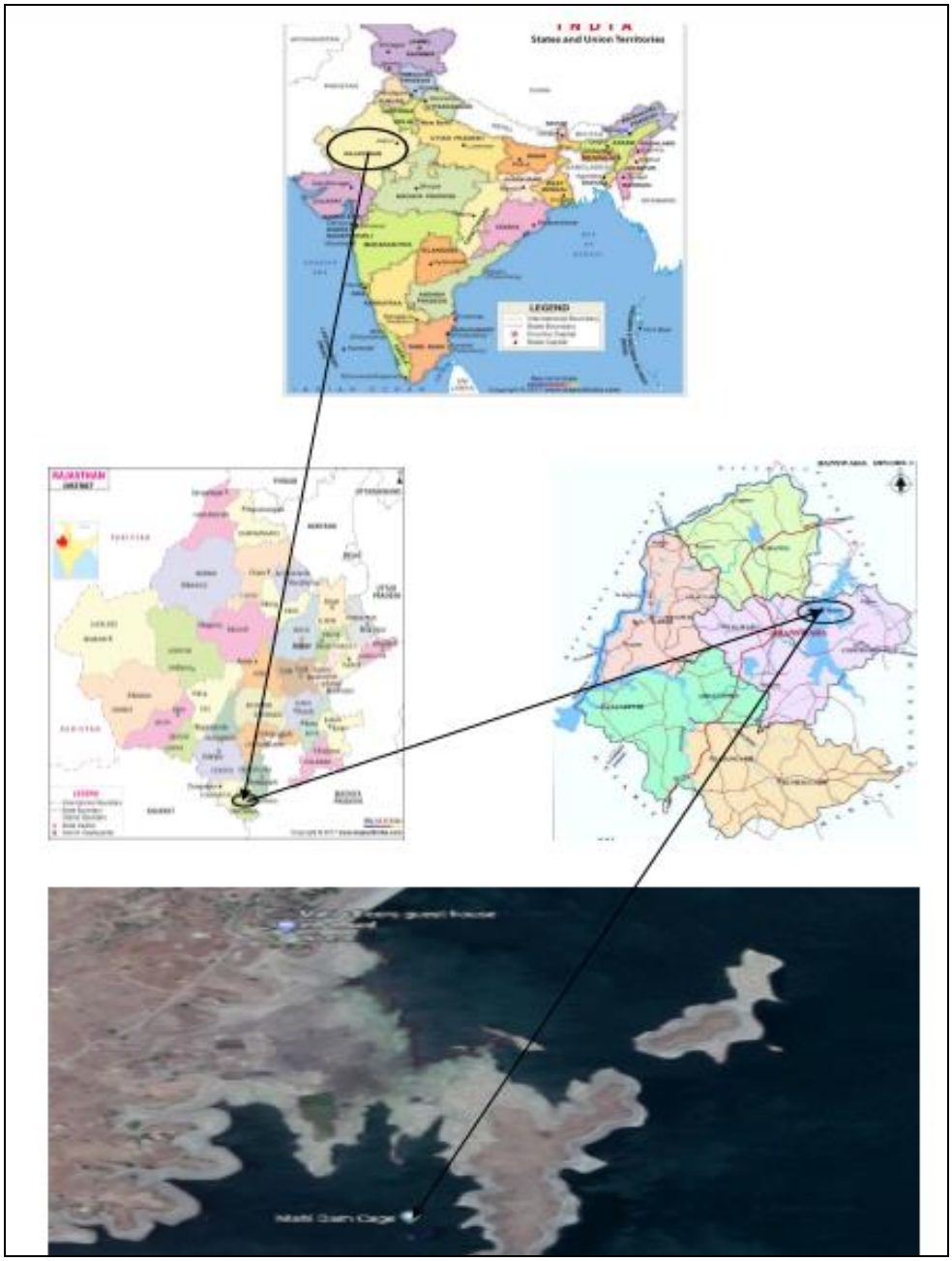

Fig 1.4: Showing the location map of the study area (Mahi Bajaj Sagar Dam)

6. References

1. APHA. Standard methods for the examination of water and wastewater 21th Edition, American Public Health Association (APHA), Washington, D.C, 2005.
2. Busing N. Seasonality of phytoplankton as an indicator of the trophic status of the large perialpine "Lago di Garda". Hydrobiologia. 1998; 3:153-162.
3. Diazpardo E, Vazquez G, Lopez-Lopez E. The phytoplankton community as a bioindicator of health conditions of Atezca Lake, Mexico. Aquaculture Ecosystem Health and Management. 1998; 1(3):257-266.
4. Forsberg C, Ryding SO, Claesson A, Forsberg A. Water chemical analyses and algal Sewage effluent and polluted lake water studies. Int Ver Limnol. 1978; 21:352–363.
5. Manickam N, Bhavan PS, Vijayan P, Sumathi, G. Phytoplankton species diversity in the Parambikulam-Aliyar irrigational canals (Tamil Nadu, India). International Journal of Pharma and Biological Science. 2012; 3:289-300.
6. Mishra V, Surnar SR, Sharma SK. Some limnological aspects of Goverdhan Sagar lake of Udaipur, Rajasthan to suggest its fisheries management. International Journal of Science, Environment and Technology. 2016; 5:2943-2948.
7. Singh S. Analysis of plankton diversity and density with a physicochemical parameters open pond in town Deeg, Bharatpur, Rajasthan. International research journal of biological science. 2015; 4(11):61-69.
8. Rajkumar. Some aspects of fish biology and fisheries potential in relation to current water quality status of Daya Reservoir. Udaipur, (Rajasthan) Ph.D. Thesis, Maharana Pratap University of Agriculture and Technology, Udaipur, 2005.
9. Rivedi RK, Goel PK, Trisal CL. Practical methods in ecology and environmental science. Environmental Publishers, Karad, (India), 1987, 340.