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Limnological Studies of Coka Dam, Papara, Satna (M.P.) with Special Reference to Phytoplankton

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Abstract

Limnological studies is very important in Rural areas, Coka Dam. This Dam was constructed in 1950 by Central scheme, the Dam is upgrade significant for pisculture, agriculture and domestic usages. About 25 villages are using the water of this Dam for domestic animals, irrigation and other proposes this paper deals with the limnological studies of Coka Dam, Papara Satna with special reference to phytoplankton.

Key-Words: Limnological phytoplankton, Coka Dam, Irrigation

Introduction

India has abundant natural resources including a number of perennial rivers besides reservoirs, tanks, dams, ponds, estuaries and brackish water lakes, swamps and paddy fields. The water from these sources is used for drinking, bathing, sanitation, to generate electricity, for irrigation, flood control, navigation, fisheries and industries etc. Water is one of the prime necessities of life. Water has become an essential commodity for the development of industries, agriculture and fisheries. The limnology implies a complete knowledge of a fresh water area including its physical, chemical and biological aspects (Knight, 1970); while pollution is a change in the environment which contribute to its deterioration (Prakash and Rawat, 1979) and acting as the most important limiting factor (Odum, 1971). Plankton specially zooplankton plays several important role in the aquatic community. Direct correlation have been established between the planktonic crop and fish production, because planktonic biomass indirectly related to the fish production. Among the planktonic communities, the zooplanktons are the main primary micro consumers of phytoplanktons and are found to be dominated by Protozoa, Copepoda and Cladocera. The water reservoirs of this region was still unexplored and no complete literature was available on this topic. With this view in mind, therefore, the present investigation of the author on Coka Dam, Papara, Satna (M.P.) was taken up.

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Material and Methods

Sampling containers, washing and preparation

A sample container must satisfy the following requirements

Selection of Sampling Stations

The success or failure of a water and other parameters survey depends largely on the planning made prior to taking the samples. The plan should includes not only the location of sampling sites, but the parameters to be determined, and the schedule to be followed (including the time of the day when sampling is to be done and frequency), but also the methods of data collection.

Selection of Sampling Stations

For the convenience of the study of Limnology of Coka Dam with special reference to its phytoplankton has been divided into five important sampling stations (sites) S_1, S_2, S_3, S_4 and S_5 of 1 Km. distance.

Physico-chemical Analysis of the Dam water

Physico-chemical analysis of water is of prime consideration to assess the quality of water for its use say for drinking, bathing, fishing, industrial processing etc.

pH (Hydrogen Ion Concentration)

pH of the soil of this tank indicates the quality of soil is in the range of acidic to alkaline.

Bulk Density

Bulk density is apparent density. It is the ratio of mass of the soil to that of its total volume the mass determined by drying to constant weight where the volume is easy to measure accurately for measurement

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of volume at the site a cylinder is used the wall remains thin practicable to minimize any complication.

True Density

This is the nature of soil particles for measurements of true density sample dried and crushed and shieved (/-2mm). 10 gm soil sample taken for the testing, and picnometer may be used for specific gravity, water used for the determination of true density in process.

Sand, Silt and Clay

The sand, silt and clay percentage test of soil of Coka Dam, Papara, Satna has been carried out by soil hydrometer. The moisture contents of soil is determined at the time of being and take the reading in hydrometer finally the soil sample pH maintained previously by using the chemical calgon and sodium carbonate. The reading finally calculated in percentage by calculation formula.

Electrical Conductivity

Electrical conductivity of the soil denotes the ion concentration in soil sample. It is measured by conductivity meter. the supernatant liquid of soil sample from its slurry is being separated and measured in conductivity meter. The reading obtained electrical conductivity of soil.

Biological investigation of the dam water

Planktonic biomass

Collection of Samples

The water samples were collected from 5 sampling sites S_1-S_5 with the helpof Ruttner's sampler and filtered through a bolting silk plankton net having a diameter of 25 cm and a length of 50 cm with a mesh size of 60 micrometer. The lower end of the cone of the plankton net was fitted to a glass tube of 50 ml capacity. 10 liters of water from the sampling stations was passed carefully through the plankton net. The filtrant was transferred to a marked glass stoppered bottles. The samples were preserved with 5% formaline solution and three drops of glycerine. The samples were further concentrated to 5 ml by centrifugation at 2,500 rpm. After sedimentation of phytoplankton the supernatant liquid was siphoned off and the sedimented portion was preserved in 4% formaldehyde.

Identification of Planktons

Planktons were counted and identified to genus and species using keys provided by Pennak (1953), Edmondson (1959), Needham and Needham (1974), Stephanson (1923). Specimens were sent to recognize taxonomic experts of Z.S.I. for confirmation of the identification.

Qualitative and quantitative analysis of plankton

The phytoplankton were systematically identified up to group level by using compound microscope, with the help of standard works Fritsch 1935, Smith 1950, Deshikachary 1959, Edmondson 1959, Prescott 1962, APHA 1976.

Results and Discussion

The Although, there are a number of major groups of phytoplankton, those relevant to the present study are Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae.

- Bacillariophyceae (diatoms) : is one of the most important groups of phytoplanktonic algae. Most species are sessile and associated with littoral substrata. Their primary characteristic is silicified cell walls and both unicellular and colonial forms are common.
- The Chlorophyceae (green algae): is an extremely large and morphologically diverse group which is mostly fresh water in distribution.
- The Cyanophyceae (also known as Myxophyceae or blue-green algae): has been among the most studied of all the groups. It is a primitive group which has both prokaryotic and eukaryotic features in its cell structure and function.
- The Euglenophyceae (euglenoid algae): forms a relatively large and diverse group but few species are truly planktonic.

Table 1: Meteorological data of Coka Dam, year 2011-12

S/No.	Months	Rainfall (mm)	No. of rainy days	Humidity (%)
1.	July	125.2	12	90
2.	August	227.2	15	94
3.	September	134.4	8	94
4.	October	0.0	2	90
5.	November	4.2	1	92
6.	December	21.2	2	93
7.	January	0.8	0	93
8.	February	0.0	0	91
9.	March	22.2	2	90

10.	April	0.0	0	**67**
11.	May	1.0	0	**53**
12.	June	152.2	9	**73**

Table 2: The details of comparative qualitative occurrence of Phytoplankton diversity at five study sites of Coka Dam during 2011-2012

S/No.	Phytoplankton & Classification	Sampling sites				
		S_1	S_2	S_3	S_4	S_5
BACILLARIOPHYCEAE						
1	*Synedra capitata*	5-6	5-6	5-6	1-6	**5-6**
2	*Navicula viridula*	1-6	1-6	1-6	1-6	**1-6**
3	*N. pupula*	4	4-6	6	2-6	**5-6**
4	*N. indica*	4	4	4	-	**4**
5	*N. cuspedata*	1-6	1-6	1-6	1-6	**1-6**
6	*N. halophila*	1-6	4-6	4-6	1-6	**4-5**
7	*N. cincta*	5-6	5-6	5-6	4-6	**5-6**
8	*Pinnularia braunii*	1-5	4	3	4-6	**2-3**
9	*P. tabellaria*	6	1-6	-	4	**1-6**
10	*Cymbella aequalis*	1-6	1-6	1-6	1-6	**1-6**
11	*Asterionella formosa*	5-6	5-6	4-6	4-6	**5-6**
12	*Fragilaria intermedia*	1-6	16	1-6	1-6	**5-6**
13	*Synedra ulna*	5-6	5-6	5-6	1-6	**5-6**
14	*Tabellaria* sps.	5-6	1-3	1-4	2-4	**1-4**
15	*Cymbella naviculiformis*	1-6	1-6	1-6	1-6	**1-6**
16	*C. cysta*	4-6	1-6	1-6	1-6	**1-6**
17	*Gomphonema* sps.	1-6	1-6	1-6	1-6	**1-6**
18	*Bacillaria* sps.	1-6	1-6	4-6	1-6	**1-6**
19	*Cyclotella* sps.	5-6	5-6	5-6	5-6	**5-6**
20	*Asterionella* sps.	4-6	4-6	-	5-6	**1-6**
21	*Diatoma* sps.	1-3	4	-	1-6	**6**
CHLOROPHYCEAE						
1	*Volvox globater*	1-6	1-6	1-6	1-6	**1-6**
2	*Pediastrum duplex*	5-6	5-6	5-6	4-6	**5-6**
3	*P. genuinum duplex*	4-6	4-6	4-6	4-6	**5-6**
4	*Scenedesmus armatus*	5-6	-	6	1-6	**4**
5	*S. bijugatus*	2-6	4	1-6	5	**1-6**
6	*S. dimorphous*	4	1-6	3-6	5-6	**6**
7	*S. quadricauda*	1-6	1-6	1-6	1-6	**1-6**
8	*Ulothrix zonata*	1-6	1-6	5-6	-	**4-6**
9	*Uronema terrestre*	4	1-6	4-6	6	**1-6**
10	*Cladophora fracta*	6	4	5	2-3	**5**
11	*Pithophora varia*	4	1-6	2-6	5	**1-6**
12	*Chaetophora elegans*	5-6	2-6	4	3-6	**2-6**
13	*Coleochate irregularis*	4	3-5	6	1-3	**3**
14	*Oedogonium pussilum*	4	6	5	1-5	**3**
15	*Zygnema majus*	1-6	1-6	1-6	1-6	**1-6**
16	*Spirogyra brunea*	1-6	1-6	1-6	1-6	**1-6**
17	*S. microspora*	6	-	2-6	1-6	**4**
18	*S. hylina*	1-6	3	1-6	-	**6**
19	*Closterium acerosum*	2-6	4	1-6	6	**1-6**
20	*C. dianae*	5-6	-	-	6	**4**
21	*Cosmarium blyttii*	5-6	1-3	1-6	4-6	**4**

22	*C. impressulum*	1-6	1-6	1-6	4-6	1-6
23	*C. subimpressuium*	4	2-6	6	1-6	-
24	*Staurastrum sebaldi*	6	1-6	4	-	5-6
25	*Eudorina* sps.	5-6	5-6	4-6	4-6	4-6
26	*Closteridium* sps.	5-6	1-3	1-6	4-6	4
27	*Closteriopsis* sps.	5-6	-	6	6	-
28	*Chlorella* sps.	1-6	1-6	4-6	1-6	4-6
29	*Crucigenia* sps.	5-6	5-6	5-6	4-6	5-6
30	*Pediastrum simplex*	1-6	1-6	1-6	1-6	1-6
31	*Sphaerocystis* sps.	1-4	4	1-3	1-3	-
CYANOPHYCEAE						
1	*Oscillatoria chalybea*	1-3	6	4-5	4	-
2	*O. curviceps*	4-6	3-6	4-6	4-6	4-6
3	*Nostoc commune*	4-6	6	4-6	4-6	4-6
4	*N. poludosum*	6	5-6	5-6	5	3-5
5	*Anabaena oryzae*	4-6	5-6	4-6	4-6	4-6
6	*A. sphaerica*	1-6	4	6	1-6	4
7	*Scytonema hofmanni*	1-5	2-6	4	1-4	6
8	*S. stuposum*	2-6	5	1-6	4	2-6
9	*Microcystis aeruginosa*	1-6	1-6	1-6	1-6	1-6
10	*Merismopedia* sps.	1-6	1-6	1-6	1-6	1-6
11	*Lyngbya* sps.	4-6	5-6	5-6	4-6	5-6
12	*Spirulina* sps.	6	5-6	5-6	4-6	5-6
EUGLENOPHYCEAE						
1	*Egulena acus*	4-6	-	1-6	4	1-6
2	*E. viridis*	6	1-6	2-6	4-6	-
3	*Phacus curvicauda*	1-6	4	3-6	5	1-5
4	*P. longicauda*	4	1-6	6	2-6	1-6
5	*P. orbicularis*	1-6	5	4-6	4	2-6

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