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"Limnological Studies on Talodhi Village Lake of tahsil Chamorshi, District Gadchiroli (M.S.), India, With Special Respect to Plankton Species Diversity"

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ABTRACT:
Regular monthly, yearly and seasonal variations of different species of plankton were found out from four sampling sites of Talodhi village lake. In the present investigation water samples were collected every month once during Nov, 2014 to Oct, 2015 between 7 to 9 a.m. at regular intervals. One year samplings were carried out to collect data on the seasonal changes in physico-chemical water quality parameters and species diversity of plankton in the Lake. The phytoplankton diversity was studied in relation to some physico-chemical parameters. The present study was to assess the water quality and to identify the importance of algal species in Talodhi village lake. Diversity of phytoplankton (58 forms), in present investigation, were identified belongs to *Chlorophyceae, Bascillariophyceae* and *cyanophyceae*. Also zooplankton (104 forms) were recorded to the different groups i.e., *Rotifera, Copepoda, Cladocera, Ostrocoda,* during study period (2014-2015) in the Talodhi village lake. The zooplankton was composed of Rotifera, Cladocera, Copepoda and Ostrocoda were encountered. The study results clearly indicate intensified eutrophication. This fragile lake ecosystem has to prevent from further eutrophication.
KEYWORDS: *Talodhi village* Lake, physico-chemical parameters & Plankton species diversity.

INTRODUCTION:

This is the *case study* of anthropogenic impacts on the hydrobiology of a Lake. In the present investigation, systematic analysis of the physico-chemical water quality parameters, phytoplankton and zooplankton density are critically examined in this paper. Biological production in any aquatic body gives direct correlation with its physico-chemical status which can be used as trophic status and fisheries resources potential (Jhingran et al., 1969). Life in aquatic environment is largely governed by physico-chemical characteristics and their stability.

Most of the rivers and lakes are being used as site for disposal of domestic wastes and therefore, existence of biotic community becomes doubtful. In India, all water bodies suffer much due to environmental pollution. The ecosystems are the recipients of wastes of human society. Algae are predominantly aquatic and found in both fresh and marine water. In aquatic system whether it is lentic or lotic phytoplankton is an important biological characteristic. It initiates food chain as producer affecting abundance and distribution of micro and macro-organisms depending directly or indirectly upon it. They bring about changes in chemical composition of water.

Zooplankton by their heterotrophic activity plays a key role in the cycling of organic materials in aquatic ecosystems and used as bioindicators. Studies on limnology of Udaipur lakes have been made covering different aspect (Vyas, 1968; Sharma et al., 1984; Sharma et al., 1996; Sharma Vipul et al., 2009; Sharma Riddhi et al., 2009).The natural hydrological cycle interacting with geochemical cycle and combination with anthropogenic activities determine the quality of water.

MATERIAL AND METHODS

Study Area: The fresh water Talodhi village lake, tahsil Chamorshi of Gadchiroli district eastern Maharashtra in India. Study year Nov, 2014- Oct, 2015 can be broadly divided into three seasons; summer season from March to May, monsoon season from June to October and winter from November to February.

PHYSICO-CHEMICAL PARAMETERS:

During the study, water samples were collected at seasonal interval during 2014-15, using clean one liter polyethylene bottle for analysis of water parameters in the laboratory from preselected sites of the Lake. The water quality parameters such as pH, free CO_2, Transparency, alkalinity (Carbonate and bicarbonate) and dissolved oxygen were measured sites. Digital pH meter HANNA-pHep was used for measuring hydrogen ion concentration (pH), TDS was measured by a standard Secchi disc of 20 cm diameter, Total dissolved solids were estimated by digital (Hold) TDS meter and results are expressed in

ppm or mg/l. However, for the COD, BOD, sulphate, phosphates and nitrate, samples were brought to laboratory in bottles of 500 ml capacity and analyzed within 24 hours. These physico-chemical parameters were analyzed following Standard Method (APHA, 1998). Prior to this, the samples were secured in refrigerator.

PHYTOPLANKTON:

Samples were collected from four sites of selected Talodhi Village Lake. Phytoplankton were observed under microscope and identified with the help of standard literature. The quantitative estimation of phytoplankton was made by Lucky's drop method. Average three counts were made and then mean was calculated. Lastly, total count per liter was calculated from the all-mean values of the sites. Identification and enumeration was done by using invertebrate microscope and freshwater plankton keys by Ward and Whipple (1966), APHA (1998).

ZOOPLANKTON:

Plankton samples were collected once in a month with the help of nylon plankton net (200 meshes/cm.). Plankton samples were obtained by filtering 50 liters of water through the net for qualitative and quantitative analysis and preserved in 4% formalin with a small amount of glycerin for further studies in 100 ml plastic bottels. Some live samples were isolated and studied in living condition. The rotifers were observed for their taxonomic identification by using key and monographs of Pennak (1978), Battish (1992), Kodarkar (1998) and Dhanpathi (2000) and has further been confirmed with the kind help from experts at Zoological Survey of India (Western Regional Station, Pune, Maharashtra). The quantitative analysis of planktons, per liter was done by Sedgwick – Rafter cell method.

SITE OBSERVATION: Problems faced by the Kurza lake.

1. Dumping of garbage by local residents.
2. Encroachment on banks.
3. Land grabbing by locals.
4. Immersion of idols on various occasions.
5. Immersions of Nirmalya (Floral offering-Pooja sahitya).
6. Introduction of sewage directly, holy bathing, cattle washing).
7. Release of detergents based water in the lakes.
8. Open defecation, etc.

RESULT AND DISCUSSION:

It is well established fact that life in water depends upon the physico-chemical characteristics. The physico- chemical parameters such as pH, dissolved oxygen, Free CO_2, pH, electrical conductance, TDS, Total hardness, total alkalinity, sulphates, phosphates, nitrates, COD and BOD were studied from four different sites. The water remained moderately alkaline (pH 7.5) while electrical conductance (0.3523 mS/cm), TDS (230.5mg/l), Total hardness (172.25mg/l) and total alkalinity (202.15mg/l) showed low mean values. Average dissolved oxygen levels were at 5.65mg/l while average nitrate and phosphate levels were 3.10 mg/l and 2.59mg/l respectively. This is in conformity with the result of Chavhan and lonkar (2010). The physico- chemical parameters such as Free CO_2, sulphates, Phosphates, Nitrates, COD and BOD were studied from 4 different stations. In the present study, maximum Free CO_2 7.31 mg/L was recorded during summer at site D whereas minimum value 2.40 mg/L in the monsoon at site A. The concentration of sulphate was minimum 5.20 mg/L at site A during winter whereas maximum 13.45 mg/L at site C during monsoon. Maximum values 0.33 mg/L, 0.27 mg/L of Phosphate at site C and Site D during monsoon. Winter minima 0.031 mg/L at site A. Maximum value 1.21 mg/L of nitrate was recorded at site C during monsoon whereas minimum value 0.25 mg/L of nitrate at site A during summer. Minimum value of BOD was observed 1.35 mg/L at site A during winter whereas maximum value 6.25 mg/L was observed at site C during monsoon.. The minimum value 3.43 mg/L of COD was observed at site A during summer whereas maximum value 9.52 mg/L of COD was observed at site C during winter. The phytoplankton diversity was studied in relation to some physico-chemical parameters. Diversity of phytoplankton (58 forms), in present investigation, were identified belongs to *Chlorophyceae, Bascillariophyceae* and *Cyanophyceae*.

Zooplankton by their heterotrophic activity plays a key role in the cycling of organic materials in aquatic ecosystems and used as bioindicators. Diversity zooplankton (104 forms), were recorded to the different groups i.e., *Rotifera, Copepoda, Cladocera,* and *Ostrocoda,* during study period (2014-2015) in the Talodhi village lake. The zooplankton was composed of *Rotifera, Cladocera*, *Copepoda* and Ostrocoda were encountered. Changes in

the aquatic environment accompanying anthropogenic pollution are a cause of growing concern and require monitoring of the surface waters and organisms inhabiting them [Vandysh,(2004)]. The study results clearly indicate intensified eutrophication of lakes. This fragile ecosystem has to prevent from further eutrophication. The lower values of Sorenson index (48.2%) and Jaccard index (31.87%) were recorded for rotifera group and higher values of these indices for the group *ostracoda* (S= 85.7% and CJ=75.%) (Table. 1).

Table no.1. List of Zooplankton recorded from the Talodhi village lake during 2014-2015.

Recorded list of Zooplankton	Recorded list of Zooplankton
PROTOZOA	54. *Filinia tetramatris*
Sub phylum – Sarcomastigophora,	55. *Testudinella patina*
Super class – Mastigophora	56. *Horella mira*
Class – Phytomastigophora,	Family – Hexarthridae
Order – Volvocida	57. *Hexarthra mira*
Family – Volvocacae	58. *Philodina*
1. *Volvox*	Cladocerans – Family – Sididae
Family – Nebelidae	59.*Diphonosoma leuchtenbergianum*
2. *Euglena acur*	60. *Diphonosoma brachyurum*
3. *Euglena sp.*	Family – Daphnidae
Class – Rhizopodea,	61. *Ceriodaphnia rigaudi*
Order - Amoebida	62. *Ceriodaphnia laticaudata*
4. *Amoeba sp.*	63. *Ceriodaphnia lacustris*
Order – Arcellinida,	64. *Ceriodaphnia acanthine*
Family – Arcellidae	65. *Daphnia lumholtzi*
5. *Arcella discoida*	66. *Daphnia ambigua*
Family – Difflugidae	67. *Daphnia dubia*
6. *Difflugia sp.*	68. *Simocephalus vetulus*
Sub-phylum Ciliophora,	69. *Scapholeberis kingi*
Class – Ciliata	Family – Moinidae
Family – Paramecidae	70. *Moina micrura*
7. *Paramecium sp.*	71. *Moina macrocopa*
Family – Peridiniaceae	72. *Moina rosea*
8. *Peridinium sp.*	Family – Bosminidae
Family – Frontonida	73. *Bosminopsis deitersi*
9. *Phacus sp.* 2 1 1 3	74. *Bosmina longirostris*
ROTIFERA	75. *Bosmina coregoni*
Family – Brachionidae	Family – *Macrotpricidae*
10. *Brachionus angularis*	76. *Macrothrix rosea*
11. *Brachionus angularis bidens*	Family – Chydoridae
12. *Brachionus calyciflorus*	77. *Chydorus globosus*
13.*Brachionus calyciflorus with post lateral spines*	78. *Chydorus gibbus*
14. *Brachionus calyciflorus with an eggs*	79. *Chydorus sphaericus*
15. *Brachionus diversicornis*	80. *Chydorus ovalis*
16.*Brachionus diversicornis with an egg*	81. *Chydorus faviformis*
17. *Brachionus quadridentatus*	82. *Leydigia*
18.*Brachionus quadridentatus with egg*	Sub Family – Aloninae
19. *Brachionus falcatus*	83. *Alona macrocopa*
20. *Brachionus falcatus with an egg*	84. *Alona karau*
21. *Brachionus forficula*	85. *Alonella nana*
22. *Brachionus caudatus*	86. *Alonella globosa*
23. *Brachionus bidentata*	87. *Alonella dentifera*
24. *Keratella tropica*	88. Phylum – Arthropoda
25. *Keratella tropica asymmetrica*	Class – Crustacea
26. *Keratella tropica heterospina*	Sub-class – Calanoida
27. *Keratella tropica with an egg*	Order – Calanoida
28. *Keratella vulga*	Family – Diaptomidae
29. *Keratella cochleris*	89. *Allodiaptomus raoi*
30. *Lopocharis salpina*	90. *Heliodiaptomus viddus*
31. *Mytilina ventralis*	91. *Phyllodiaptomus*
32. *Anuraeopsis fissa*	92. *Rhinediaptomus*
33. *Trichotria tetractis*	93. *Neodiaptomus*
34. *Trichotria similis*	Order – Cyclopoida,
Family – Lecanidae	Family – Cyclopidae
35. *Lecane luna*	94. *Cyclops leuckarti*
36. *Lecane depressa*	95. *Mesocylops hyalinus*
37. *Cephalodella mucronata*	96. *Paracyclops affinis*
38. *Cephalodella exigua*	97. *Microcyclops bicolor*
39. *Monostyla bulla*	98. *Mesocyclops leuckartii*
40. *Monostyla quradridenta*	Family – Canthocamptidae
Family – Calurinae	99. *Nauplii*
41. *Lepadella ovalis*	Ostracoda
42. *Lepadella patella*	100. *Heterocypris*
Family – Trichocercidae	101. *Cyclocypris*
43. *Tricocerca cylindrico*	102. *Stenocypris*
44 *Tricocerca longiseta*	103. *Eucypris*
	104. *Centroypris*
	Arthropoda insecta

45. *Platyias quadricornis* Family – Asplanchnidae 46. *Asplanchna herricki* 47. *Asplanchna brightwelli* 48. *Asplanchna priodonta* 49. *Asplanchnopsis* Family – Synchaetidae 50. *Polyarthra vulgaris* 51. *Family – Testudinellidae* 52. *Filinia longiseta* 53. *Filinia terminalis*	105. *Insects* 106. *Insects larva* Hemiptera 107. *Water mites* Natonectidae 108. *Arachnids water spiders*

Eutrophication of aquatic ecosystems can greatly alter the structure of zooplankton communities. Hence, zooplankton has been used as an indicator of a lake's trophic state [Sampaio et al., (2002)]. Composition and structure of zooplankton community are affected by eutrophication [Licandro and Ibanez (2000), Ostojic (2000)] and these communities have potential value as indicators of changing trophic condition [Blancher (1984), Boucherle and Zullig (1983)]. The present work was under taken to analyze the changes in zooplankton communities those which have occurred over a period due to the changed trophic status with aim of contributing to the knowledge of freshwater biodiversity in Gadchiroli region.

Conclusion: In last decade people interfere with ecosystem and over exploitation of natural resources its result that biodiversity decreases. But the losses in biodiversity and change in ecosystem service have adversely affected the well-being. The present study is relevant to limnological study, biodiversity of plankton (species) in Lake Talodhi.

Table no. 2 List of Phytoplankton recorded from the Talodhi village lake, during 2014-15.

A) CHLOROPHYCEAE	D) XANTHOPHYCEAE
1. *Volvox sp.*	32. *Chlorobotrys so.*
2. *Eudorina sp.*	33. *Botrydiopsis sp.*
3. *Pandorina sp.*	34. *Botryococcus sp.*
4. *Scenedesmus sp.*	E) MYXOPHYCEAE
5. *Chlorella sp.*	35. *Microcystis sp.*
6. *Ankistrodesmus sp.*	36. *Agmenellum sp.*
7. *Coelastrum sp.*	37. *Anabaena sp.*
8. *Spirogyra sp.*	38. *Oscillatoria sp.*
	39. *Nostoc sp.*
	40. *Spirulina sp.*
9. *Oedogonium sp.*	41. *Coccochlaris sp.*
10. *Ulothrix sp.*	42. *Gomphosphaeria sp.*
11. *Cladophora sp.*	43. *Lyngbya sp.*
12. *Chlamydomonas sp.*	F) DINOPHYCEAE
13. *Mougeotia sp.*	44. *Glenidium sp.*
14. *Pediastrum sp.*	45. *Peridinium sp.*
15. *Oocystis sp.*	46. *Ceratium sp.*
16. *Zygnema sp.*	47. *sphaerodinium sp.*
17. *Hydrodictyon sp.*	G) BACILLARIOPHYCEAE
18. *Microspora sp.*	48. *Cyclotella sp.*
19. *Spaerocystis sp.*	49. *Synedra sp.*
20. *Asterococcus sp.*	50. *Fragillaria sp.*
21. *Closteriopsis sp.*	51. *Navicula sp.*
22. *Schizomeris sp.*	52. *Pinnularia sp.*
23. *Oedocladium sp.*	53. *Nitzschia sp.*
24. *Actinastrum sp.*	54. *Asterionella sp.*
25. *Kirchneriella sp.*	55. *Amphora sp.*
26. *Nephrocytium sp.*	56. *Gomphonema sp.*
27. *Zygnemopsis sp.*	57. *Cymbella sp.*
28. *Pleodorina sp.*	58. *Bacillaria sp.*
B) DESMIDIACEAE	
29. *Cosmarium sp.*	
30. *Desmidium sp*	
31. *Sphaerozosma sp.*	

This study explains that lake Talodhi are in rich biodiversity of plankton species and need to conservation in future. This present study clearly indicated that, the seasonal changes in physico-chemical water quality parameters and species diversity of plankton in the Lake. The study results clearly indicated that the present Talodhi village lake is tending towards the eutrophication. This fragile lake ecosystem has to prevent from further eutrophication. Therefore, proper care of this lake should be taken by the local authority.

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