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Checklist of Plankton Diversity in Upper and Lower Tiger Hills Reservoir of Upper Nilgiris, Tamil Nadu, India.

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Abstract

The present study was carried out to determine the plankton diversity of Upper Tiger Hills Reservoir (11° 23'59.64" N & 76°43'42.80" E) and Lower Tiger Hills Reservoir (11° 23 49.09" N & 76° 43'41.13" E) in Udhagamandalam ,Tamilnadu,South India from September 2016 to September 2017. Among the Chlorophyceae recorded in the present study, 9 species were recorded from Upper Tiger Hill Reservoir, and 13 species of Chlorophyceae were recorded from Lower Tiger Hill Reservoir. Species of Cyanophyceae recorded from Upper Tiger Hill Reservoir and species recorded from Lower Tiger Hill Reservoir were 4 and 6, respectively. Species of Bacillariphyceae recorded from the Upper Tiger Hill Reservoir were 10 and from Lower Tiger Hill Reservoir 11. Among the Euglenophyceae recorded in the present study 2 were from Upper Tiger Hill Reservoir and 2 from Lower Tiger Hill Reservoir. Seventeen species of protozoans were recorded from Upper Tiger Hill Reservoir and 18 species of protozoans were recorded from Lower Tiger Hill Reservoir. From the Upper Tiger Hill Reservoir and Lower Tiger Hill Reservoir 4 species each of Rotifers were recorded.Species of Cladocera recorded from Upper Tiger Hill Reservoir and Lower Tiger Hill Reservoir were 3 and 4, respectively; and Copepods recorded included 4 and 6 species, respectively.

Key words: Bacillariophyceae, Chlorophyceae, Cladocera, CopepodS Cyanophyceae, Euglenophyceae, Protozoans,Rotifers, Upper and Lower Tiger Hills Reservoir.

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INTRODUCTION

Phytoplankton productivity and biomass of reservoir depends on many interrelated physic-chemical and biological factors, which in turn are functions of climatic factors, the size of the watershed basin morphometry, nature, volume of river inflow and the food, web structure (Thornton *et al*., 1990; Harris and Baxter 1996; Murugesan *et al*., 2003). Phytoplanktons are widely present in all types of water and they are beneficial to the environment depending on their numbers. They play an important role in maintaining the carbon cycle. Phytoplankton use carbon and releases oxygen in to the water and atmosphere during photosynthesis. In this activity, around 50% oxygen is released into the atmosphere. In aquatic system the major source of energy assimilation is carried out by planktons.

Biological groups are important sources of productivity in the aquatic environment and the adverse conditions make the organisms to be more sensitive to the combined effect of stressors than to a stressor (Karr,1995; Niemi and Mc Donald, 2004; Cabecinha *et al*., 2008b). Pollution due to human activity and introduction of anthropogenic pollutants in to the water bodies all over the world results in altering phytoplankton structure and biomass (Cabecinha *et al*.,2008a). Comparatively high water temperature of the reservoir favours the laterality and timings of the Microcrystal blooms during summer (Robarts,1985). An overview of previous literature reveals that the ecology of the Upper and Lower Tiger Hill Reservoirs located in and around Ooty, Tamilnadu, India is not studied yet and this paper aims to fill up this lacuna to some extent.

MATERIALS AND METHODS

Study Area

Upper and Lower Tiger Hill Reservoir

The Nilgiris is located in high altitude. It is cooler and wet than the surrounding plains. Upper Tiger Hill Reservoir is situated at the Upper Nilgiris. It was built in the year 1903 and is situated 7758 m above MSL and is functioning as a drinking water supply to the

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Fig. 1. A view of Upper Tiger Hills Reservoir, Ooty

Fig. 2. A view of Lower Tiger Hills Reservoir, Ooty

Fig. 3. Satellite View of Upper and Lower Tiger Hill Reservoirs, Ooty.

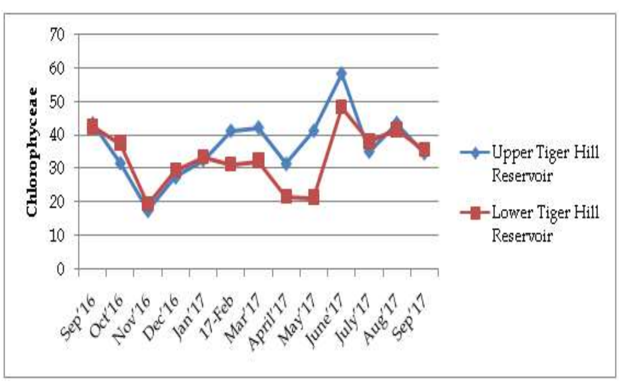

Fig. 4. Seasonal variation of Chlorophyceae during the period of investigation

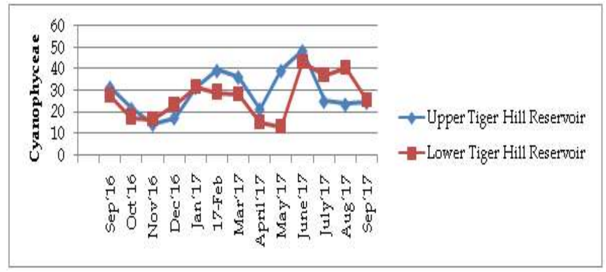

Fig. 5. Seasonal variation of Cyanophyceae during the period of investigation

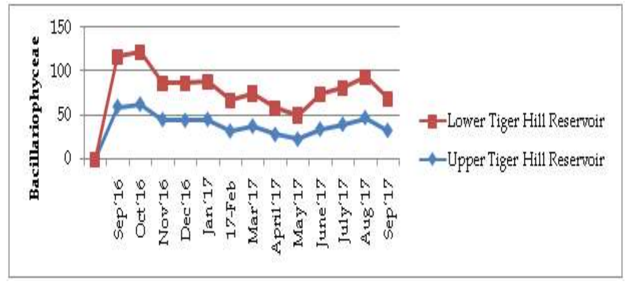

Fig. 6. Seasonal variation of Bacillariophyceae during the period of investigation

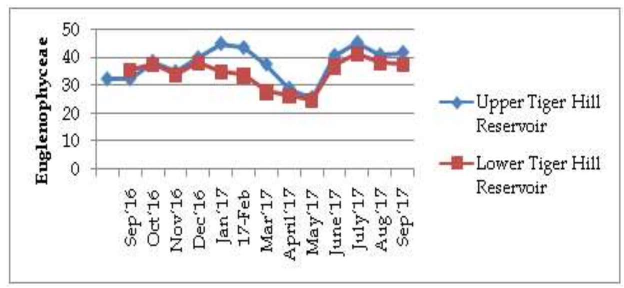

Fig. 7. Seasonal variation of Euglenophyceae during the period of investigation

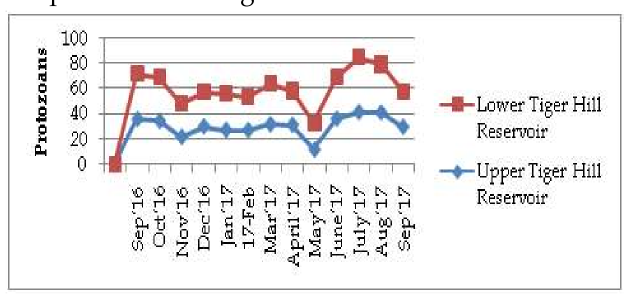

Fig. 8. Seasonal variation of Protozoans during the period of investigation

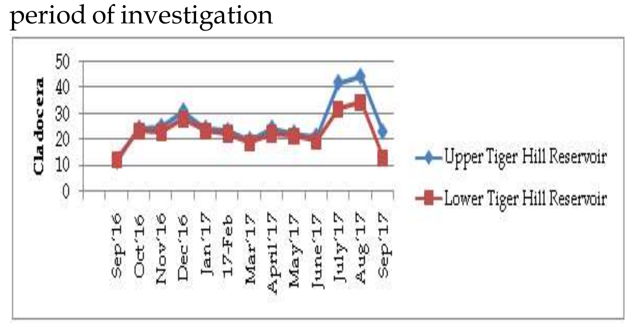

Fig. 9. Seasonal variation of Cladocera during the period of investigation

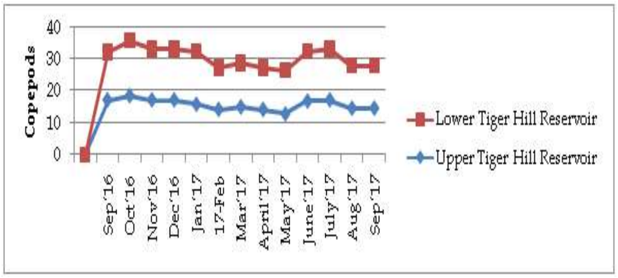

Fig. 10. Seasonal variation of Copepods during the period of investigation

town. Upper Tiger Hills Reservoir in Ooty is located at 11° 23′59.64"N & 76° 43′41.13"E 7937 above MSL.

Plankton Studies

The Plankton samples for the present study were collected once in a month from the reservoir for a period of thirteen months from September 2016 to September 2017. The collections were made early in the morning by using the standard plankton net nylobit (No.25) with a 30cm mouth diameter and a length of 1m. The samples were preserved in 4% formalin. The preserved plankton samples were observed under Olympus CX2li.

RESULTS

Phytoplankton

Distribution (presence) of Phytoplankton in the Upper and Lower Tiger Hill Reservoir is given in Table 1and seasonal variations of Phytoplankton in the Upper and Lower Tiger Hill Reservoir are shown in Fig. 5-7. Totally, 9 and 13 species of Chlorophyceae were recorded from the Upper and Lower Tiger Hill Reservoirs, respectively. The highest number of Chlorophyceae was recorded (58.5 nos/l) in the month of June 2017 and lowest was counted (17.5 nos/l) in the month of November 2016 in the Upper Tiger Hill Reservoir. The species of Cyanophyceae recorded included 4 species from Upper Tiger Hill Reservoir and 6 species from Lower Tiger Hill Reservoir. In Cyanophyceae, highestnumbers were recorded (48.5 /l) in the month of June 2017 and lowest (13.4 /l) in the month of October (2016), in the Lower Tiger Hill Reservoir. Upper and Lower Tiger Hill Reservoirs showed 10 and 11 species of Bacillariophyceae, respectively. Among Bacillariophyceae highest number was recorded (62.8 /l) in the month of October 2016 and lowest (23.1 /l) in the month of May 2017 from theUpper Tiger Hill Reservoir. Two species each of Euglenophyceae were recorded, from the Upper Tiger Hill Reservoir amd Lower Tiger Hill Reservoir .Maximum number of individuals of Euglenophyceae were recorded (45.5 /l) in the month of July 2017 and minimum (25.7/l) in the month of May 2017,

Table 1. Distribution of Phytoplanktons in two water bodies during the period of investigation.

S.No.	Scientific Name	U.T.R	L.T.R
Chlorophyceae			
1	*Chlamydomnas* Sp		+
2	*Xanthidium S* p	+	+
3	*Euastrum insigne*	+	+
4	*Pandoria unicocea*		+
5	*Ulothrix spceiosa*		+
6	*Staurodesmus*	+	+
7	*Euastrum didelta*		+
8	*Chlorella*	+	+
9	*Spirulina*	+	+
10	*Chlorococuus*	+	
11	Minutes Kutz	+	+
12	*Synechococcus*	+	+
13	*Closterium* Sp	+	+
14	*Closterium* cornu		+
Cyanophyceae			
1	*Microcystis flosaquae*	+	+
2	*Nostoc* Sp		+
3	*Lungbya* Sp	+	+
4	*Colothrix* Sp		+
5	*Oscillatoria limosa*	+	
6	Oscillatoria rube	+	+
Bacillariophyceae			
1	*Pinnularia S* p		+
2	*Fragilaria* Sp	+	+
3	*Navicula gracilus*	+	
4	*Navicula oblonga*	+	
5	*Staturneis absaroba*	+	+
6	*Pinnularia nobilis*		+
7	*Cymbella ventricosa*	+	+
8	*Tabellaria* Sp	+	+
9	*Melosira* Sp	+	+
10	*Cylindrotheca*	+	+
11	*Coceonels* Sp	+	+
12	*Scoliotropis tumida*	+	+
Euglenophyceae			
1	*Euglena* Sp		+
2	*Phaccus* Sp		+

+ indicates presence

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Table 2. Diversity and distribution of zooplankton in 2 water bodies during the period of investigation.

S.No	Scientific Name	U.T.R	L.T.R
Protozoea			
1	*Paramecium Sp*	+	+
2	*Vorticella Sp*	+	+
3	*Centropyxis aculeate*	+	+
4	*Centropyxis cassis*	+	+
5	*Euglypha ciliate*	+	+
6	*Difflugia accuminata*	+	+
7	*Nauplius*	+	+
8	*Mysis*	+	+
9	*Cypris Sp*	+	+
10	*Monia Sp*	+	+
11	*Daphin Sp*	+	+
12	*Calanus sinicus*	+	+
13	*Cyclops Sp*	+	+
14	*Euglena Sp*	+	+
15	*Encycops agilis*	+	
16	*Velign larva*	+	+
17	*Branchinus falcatus*		+
18	*Bosmina longirostris*	+	
19	*Nebella flabellulum*		+
20	*Trinemaenchelys*		+
Cladoceran			
1	*Moina Sp*	+	+
2	*Alona Sp*	+	+
3	*Daphina Sp*	+	+
4	*Chydorus Sp*		+
Copepods			
1	*Calanus sinicus*	+	+
2	*Diacyclops Sp*	+	+
3	*Cyclops Sp*	+	+
4	*Tropocyclops Sp*	+	
5	*Eucyclops agilis*		+
6	*Diaptomus Sp*		+
7	*Paralaophonte*		+

\+ indicates presence

Zooplankton

Distribution (presence) of Zooplankton in the Upper and Lower Tiger Hill Reservoir is given in Table 2.Seasonal variations of Zooplankton in the Upper and Lower Tiger Hill Reservoir are shown in Fig.8-10.Seventeen and eighteen species of protozoans were recorded from the Upper Tiger Hill Reservoir and Lower Tiger Hill Reservoirs, respectively. Highest number of protozoans were recorded (44.1 /l) in the month of July 2017 and lowest level (11.5/l) in the month of May 2017, in the Upper Tiger Hill Reservoir**.** Similarly 3 and 4 species of Cladocera were recorded from the Upper Tiger Hill Reservoir and Lower Tiger Hill Reservoir, respectively. Among Cladocera, the highest number (44.5 /l) was recorded in the month of August 2017 and lowest was (11.5/l) in the month of September 2016 from the Upper Tiger Hill Reservoir. The Upper Tiger Hill Reservoir and the Lower Tiger Hill Reservoir showed 4 and 6 species of Copepods, respectively. Maximum number of Copepods were recorded (18.4 /l) in the month of October 2016 and minimum level was recorded (12.7 /l) in the month of May 2017, from the Upper Tiger Hill Reservoir.

DISCUSSION

Phytoplanktons are important in maintaining the global carbon cycle. During photosynthesis, phytoplankton uses carbon and returns oxygen to the water and atmosphere. When plankton die, the organism sinks to the bottom of the water body taking the carbon with them, and thus creating a "carbon sink". The amount of oxygen released into the atmosphere by phytoplankton is estimated to be around 50%. In the present study 9 species of Chlorophyceae have been recorded from Upper Tiger Hill Reservoir and 13 species from Lower Tiger Hill Reservoir. 4 Cyanophyceae were recorded from Upper Tiger Hill Reservoir and 6 species from Lower Tiger Hill Reservoir. Hassan *et al*., (2010) reported minimum density of phytoplankton during monsoon and maximum density during summer in Euphrates River. Ten species of Bacillariophyceae were recorded in the Upper Tiger Hill Reservoir and 11 species from Lower Tiger Hill Reservoir. Total species of Euglenophyceae recorded in the present study were 2 species from Upper Tiger Hill Reservoir and 2 species from Lower Tiger Hill Reservoir. Sheeja (2005) reported that Chlorophyceae was predominant in a College pond at Kumbakonam, Tamilnadu, India, the Mahamaham pond and the river Kavery, whereas members of Cyanophyceae were predominant in the Arasalar. Sanjer and Sharma (1995) studied the plankton diversity in the Kawar Lake, Bihar, India and reported 20 species of Chlorophyceae belonging to 15 genera, 12 species of Cyanophyceae belonging to 8 genera and 11 species of Bacillariophyceae belongeing to 6 genera. Anjana *et al*. (2006) also reported that members of Cyanophyceae were dominant and Euglenophyceae were the least abundant species in a freshwater pond at Madhya Pradesh, India.

Zooplankton

The importance of the zooplanktons is well recognized as they have to play a vital role in the food chain and play a key role in cycling of organic matter in an aquatic ecosystem. Plankton populations on which the whole aquatic life depends directly or indirectly are largely governed by the interaction of a number of physical, chemical and biological conditions and tolerance to one or more of these conditions.In the present study the zooplankton comprised of Protozoans, Cladocera and Copepods. The Protozoans were recorded from the two water bodies. 17 species of protozoans were recorded from the Upper Tiger Hill Reservoir, and 18 species from Lower Tiger Hill Reservoir. Four species of Rotifiers were recorded from Upper Tiger Hill Reservoir and 4 species from Lower Tiger Hill Reservoir. Three species of Cladocera were recorded from the Upper Tiger Hill Reservoir and 4 species from Lower Tiger Hill Reservoir. Four species of Copepods were recorded from Upper Tiger Hill Reservoir and 6 species from the Lower Tiger Hill Reservoir.

Similar results have been been recorded from some other Indian fresh water habitats as well (Kumar *et al*.,2010; Meenakshi, 2014; Sowmiya, 2016). The population of low Cladoceran load during rainy season in the catchment area might be due to high oxygen which obstructs the growth of Cladocera population. Similar results have also been reported by various authors (Rast and Ryding,1989; Meenakshi, 2014; Sowmiya, 2016).

During the present study Copepods were recorded from two water bodies. The study also revealed their ability to survive in low temperature, high dissolved oxygen and also influenced by various types of macro-vegetation, high nitrate and phosphate levels. These species have also been documented from eutotrophic water by some other Indian workers as well. (Wanganeo and Wanganeo, 2006; Meenakshi, 2014; Sowmiya,2016).

REFERENCE

Anjali, B., Pandit, H., and Kannehere.,2006. Diversity and mobility variation of phytoplankton in kasal pond of west nimar, midya Pradesh, India. *Int. J. Curr. Res.*, 8(12): 43410- 43412.
https://doi.org/10.1016/j.ecolmodel.2009.06.011

Cabecinha, E., Joao,R.C., and Miguel,A.P., 2008a. Multi-scale approach using phytoplankton as a first step towards the definition of the ecological status of reservoir, *Ecol. Indic*, 372:1-16.

Caecinha, E., Lourenco, M., Moura, J.P., Pardal, M.A., and Carbral, J.A., 2008b. A multi-scale approach to modeling spatial and dynamic ecological patterns for reservoir water quality management, *Ecol.Model.*, 220(19): 2559-2569.

Franklin,T.1969. Phytolankton of Bhavanisagar.Madras *J.Fish.*, 5: 112-118.

Harries, G. and Baxter,G. 1996. International variability in phytoplankton biomass and species composition in a subtropical reservoir, *Freshwater Biol.*, 35(3) : 545-561.
https://doi.org/10.1111/j.1365-2427.1996.tb01768.x

Hassan, F.M., Taylor,W.D., A l-Taee,M.S., and Al- Fatlawi,H. 2010. Phytoplankton composition of Euphrates river in Al-Hindiyabarrage and Kifi city, *J.boil.* 31(3): 343-350.

Karr, J.R. 1995. Using biological criteria to project ecological health, In: Rapport, dn. J., Gaudet, C. ad Calonil (Eds.), Evaluating and monitoring the health of large scale ecosystems. Springer Verlag. New York, P. 137-152.
https://doi.org/10.1007/978-3-642-79464-3_9

Meenakhi N, 2014. Ecosystem Dynamics of Katteri Reservoir.NilgiriDistrict.TamilNadu,Ph.D. Thesis.Bharathiyar University,P.162.

Murugesan, V. K ., Rani, P. and Manoharan, S. 2003. Ecology and fisheries of selected reservoirs in Tamil Nadu, *CIFRI, Bull.*, 117:46.

Niemi, G.J. and Mc Donald, M.E. 2004, Application of ecological indicators. *Annu. Rev. Ecol. Syst.*, 35:89-111.
https://doi.org/10.1146/annurev.ecolsys.35.112202.130132

Robarts, R.S. 1985. Hypertrophy, a consequence of development. *Int. J. Environ. Stud.*, 12:72-89.

Sanjer, L.R., and Sharma, U.P. 1995. Community structure of plankton in Kawar lake, Begusarai, Bihar, II.Zooplankton. *J. Freshwater Biol.*, 7:165-167.

Sheeja, B. D. 2005. Seasonal variations in the limnological characteristics of selected aquatic ecosystems of Kaveri delta. Ph.D Thesis. Bharathidasan University, P. 167.

Sowmiya, E. 2016. Ecosystem dynamics of selected freshwater ecosystem associated with Kothayar EdathuKarai canal, Manonmaniam Sundaranar University, Ph.D Thesis. P. 181.

Sreenivasan, A., 1964. A hydrological study of a tropical impoundment, Bhavanisagar 1956-61, *Hydrobiologia*, 24(4): 514-539.
https://doi.org/10.1007/BF00142000

Sugunan, V. V. 1995. Reservoir fisheries in India.FAO Fisheries Technical Paper No.345.Food and Agriculture Organization of the United Nations, Rome, P.423.

Thornton, K. W., Kimmel,. L. and Payne, F. E.1990. Reservoir limnology, Ecological perspectives. Wiley-Inter science, New York P.246.