

A Preliminary Study on Physico-Chemical Parameters and Zooplankton Diversity of Tapi River at Utran, Surat, Gujarat

Taruni Sarang¹, Kapila Manoj²

¹Research Scholar: Department of Aquatic Biology, Veer Narmad South Gujarat University, Surat, Gujarat, INDIA

²Professor and Head: Department of Aquatic Biology, Veer Narmad South Gujarat University, Surat, Gujarat, INDIA

Email - ¹tarunisarang88@gmail.com ²kapilamanojee@yahoo.com

Abstract: *The Paper deals with the Preliminary study on Physico-chemical Parameters and Zooplankton diversity of Tapi River at Utran, Surat, Gujarat during the period of September-2015 to February-2016. For the study, water samples were collected from the pre-selected site. Different Physico- Chemical parameters such as Temperature, pH, Dissolved Oxygen, Total Dissolved solids and Total Hardness were analysed according to the guidelines of APHA. Zooplankton samples were collected and preserved by using 5% formalin. The qualitative estimation of Zooplankton were done by using standard reference materials. This investigation showed that Zooplankton found during the study were belonging to major five groups i.e. Protozoa, Cladocera, Rotifera, Copepoda and Ostracoda. Diversity of Rotifera (12 genera) was highest followed by Cladocera (8 genera) and Copepoda (5 genera). Protozoa (3 genera) and Ostracoda (3 genera) comprised similar generic diversity during the study.*

Key Words: *Temperature, Zooplankton, Protozoa, Rotifera, Utran, Tapi River*

1. INTRODUCTION:

Water is a crucial component for living organisms. Many life forms from tiny plankton to large aquatic organisms exist in the water body. The Physico-chemical characteristics of water and other environment factors play an important role for the survival of aquatic organisms. Plankton community includes small aquatic flora i.e. phytoplankton and aquatic fauna i.e. Zooplankton. They are the fundamental component of aquatic ecosystem. Zooplankton are minute organisms that play an important role in aquatic food chain by connecting the primary producers i.e. Phytoplankton and Higher consumer i.e. Fishes. Variation in Zooplankton abundance and community characteristics is very useful to evaluate the fishery status of aquatic body. Heterotrophic activity of Zooplankton plays a key role in the cycling of organic material in aquatic ecosystems [1]. The knowledge about Zooplankton abundance, their species diversity and special distribution is important in understanding trophodynamics and trophic progression of water bodies [2]. Zooplankton could be used as a biomonitoring tool because they are very sensitive organisms that give a quick response against change in aquatic environment in which they live. Zooplankton are a major element in aquatic biota, the Zooplankton community often exhibits dramatic changes in response to the change in Physico-chemical properties of aquatic biota [3]. So, the present study was planned to evaluate the Physico-chemical characteristics as well as Zooplankton characteristics of Tapi River at Utran, Surat.

2. MATERIALS AND METHODS:

Study area:

Utran is located in the Surat district on the bank of Tapi River. A gas-based thermal power plant is located in Utran. The Tapi River at Utran site is mainly polluted due to anthropogenic activity.

Physico-chemical analysis:

Physico-chemical parameters of water were analyzed once a month from September-2015 to February-2016. Water samples were collected from the Utran site. Various Physico-chemical parameters viz. Temperature, pH, Dissolved Oxygen (DO), Total Dissolved Solids (TDS) and Total Hardness (TH) were selected. Temperature and pH were measured at the site. DO was immediately fixed at the site. Physico-chemical parameters were analyzed in the laboratory by using standard methods [4].

Zooplankton analysis:

The surface water samples were collected on a monthly basis at the selected site. The Zooplankton samples were collected by filtering 50L of water using a plankton net having 20 µ mesh size. The samples were concentrated up to 100ml and preserved in 5% formalin. Qualitative estimation was done by using standard literature. [5], [6], [7] and [8].

3. RESULTS AND DISCUSSION:

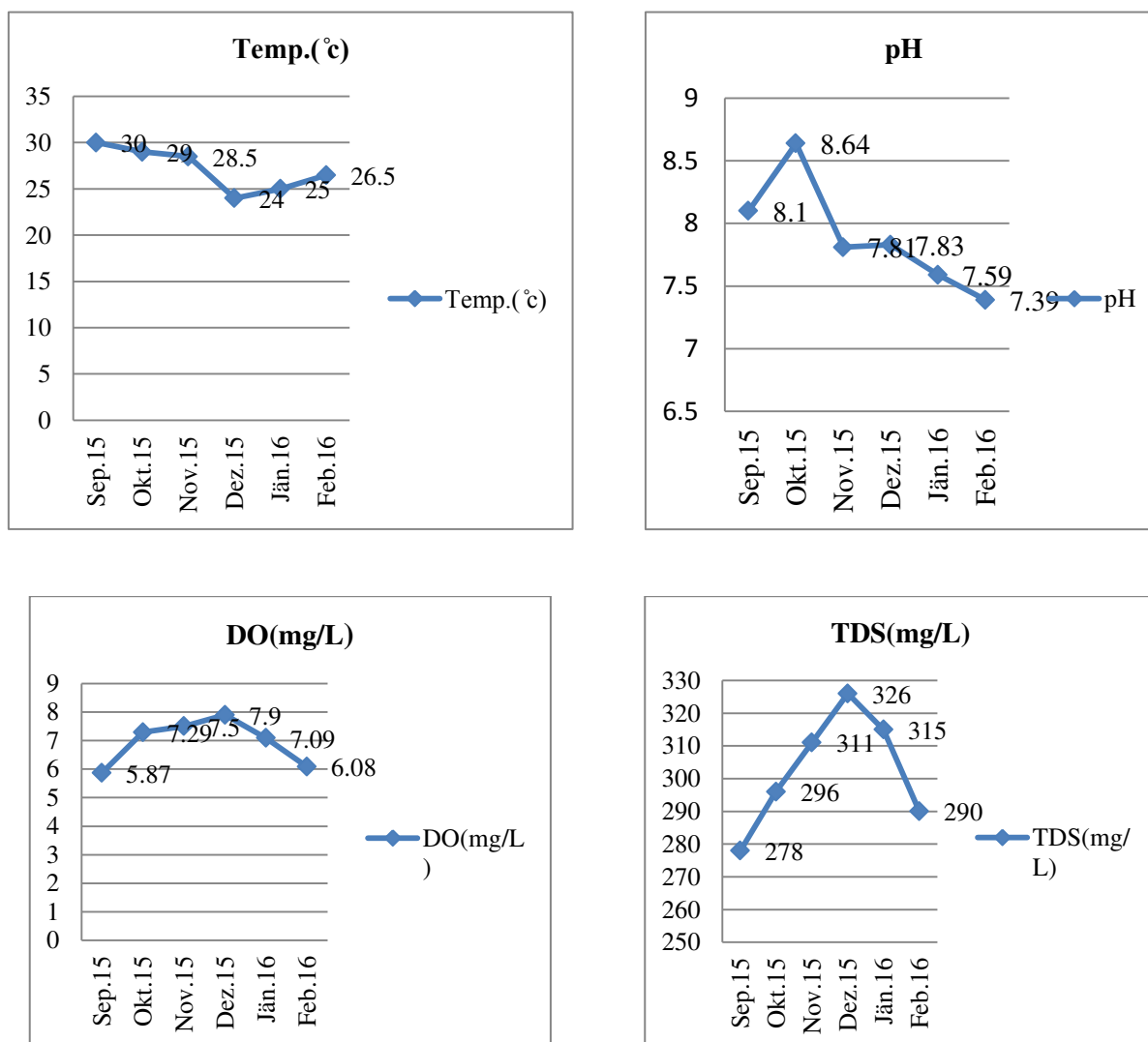
Monthly variations in Physico-Chemical Parameters of Tapi River are represented in Table-1. Temperature is one of the most important abiotic factors which influence the metabolic rate of the living organisms in aquatic

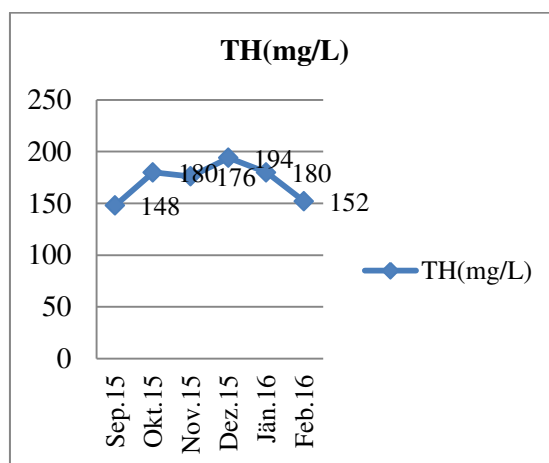
ecosystem. Temperature was varied between 24- 30°C during the study. pH plays a important role in biochemical reactions in living organisms. pH was fluctuated between 7.39- 8.64. it remained alkaline throughout the study period. Dissolved Oxygen (DO) is very essential property of water for the survival of living organisms present in waterbody. DO of Tapi River were fluctuated between 5.87-7.90 mg/L during the study period. Total Dissolved Solids (TDS) is the amount of organic and inorganic compound dissolved in to the water. It mainly consisting the inorganic compounds are Chloride, Calcium, Magnesium, Sulphate, Sodium, Potassium, Carbonates, and Bicarbonates. It ranged between 278-326 mg/L during the study. Total Hardness (TH) varied between 148-194 mg/L.

Table:1 Monthly variation in Physico-chemical Parameters of water

Month	Temperature (°C)	pH	Dissolved oxygen (mg/L)	Total Dissolved Solids (mg/L)	Total Hardness (mg/L)
September-2015	30	8.10	5.87	278	148
October-2015	29	8.64	7.29	296	180
November-2015	28.5	7.81	7.50	311	176
December - 2015	24	7.83	7.90	326	194
January-2016	25	7.59	7.09	315	180
February-2016	26.5	7.39	6.08	290	152

Figure-1 Graphical representation of monthly variation in Physico-chemical Parameters of Tapi River at Utran site





The result showed that the Zooplankton found during the study were classified into major 5 groups: Protozoa, Cladocera, Rotifera, Copepoda and Ostracoda. Rotifers consisted highest generic diversity. The taxonomic diversity of Rotifera were (38.71%) followed by Cladocera (25.80%), copepoda (16.13%), Protozoa (9.68%) and Ostracoda (9.68%) were noted. Table-2 showing the composition of Zooplankton at Utran. Figure-1 showing the graphical representation of composition of Zooplankton. Figure-2 showing Graphical representation of total Zooplankton genera. Figure-3 showing the commonly found Zooplankton in Tapi River at Utran site.

Table-2 Composition of Zooplankton

No	Group of Zooplankton	Genera	Diversity of Zooplankton % (Group level)
1.	Protozoa	3	9.68
2.	Cladocera	8	25.80
3.	Rotifera	12	38.71
4.	Copepoda	5	16.13
5.	Ostracoda	3	9.68
	Total	31	-

Figure-1 Graphical representation of composition of total Zooplankton genera

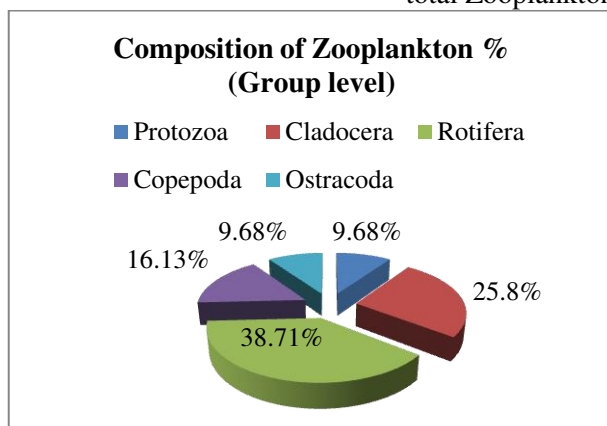
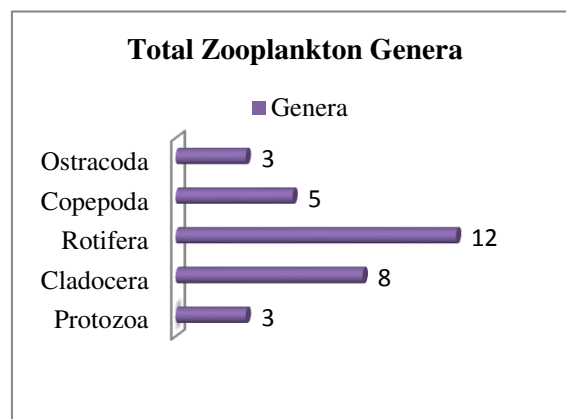


Figure-2 Graphical representation of total Zooplankton genera



Protozoa: Protozoans are microscopic and diverse group of single celled organisms. Protozoans feed on either picoplankton or nanoflagellates and nanophytoplankton according to their size [9]. Total 3 genera of Protozoa which were *Arcella sp.*, *Centropyxis sp.* and *Diffflugia sp.* were found during the study.

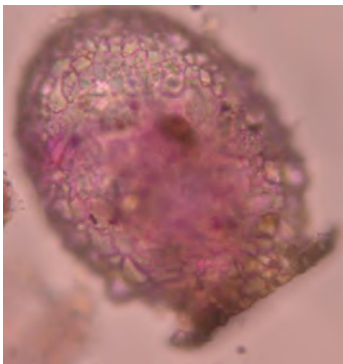
Cladocera: Cladocerans commonly known as “water –Fleas”. They are important Zooplankton community which provides food to higher aquatic organisms. Cladocerans are important food source for fry, fingerling and of many economically important fish species [10]. Total 8 genera of Cladocerans were recorded during the study. The genera observed during the study period were *Alona sp.*, *Cerodaphnia sp.*, *Chydorus sp.*, *Daphnia sp.*, *Leydigia sp.*, *Moina sp.*, *Moinodaphnia sp.* and *Macrothrix sp.*

Rotifera: Rotifers are generally named as “Wheel-animals”. Taxonomic dominance of Rotifers is common in tropical and subtropical freshwater whether it lakes, Ponds, Reservoirs, Rivers and Streams [11]. During the study, total 12 genera of Rotifers were recorded. The Rotifers were *Brachionus sp.*, *Euchlanis sp.*, *Filinia sp.*, *Keratella sp.*, *Lecane sp.*, *Monostyla sp.*, *Notholca sp.*, *Philodina sp.*, *Polyarthra sp.*, *Platytas sp.*, *Testudinella sp.*, and *Trichotria sp.*

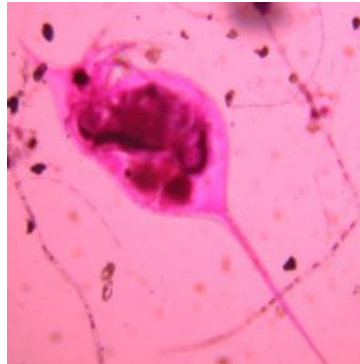
Copepoda: Copepods are small crustaceans. They are major constituents occurring in almost all waterbodies, which serve food for many fishes and play a vital role in ecological pyramids [12]. During the study, total 5 genera of copepods were noted. It included *Eucyclop sp.*, *Mesocyclop sp.*, *Naupii larvae*, *Neodiantomus sp.* and *Tropocyclop sp.*

Ostracoda: Ostracods generally known as “Seed shrimp”. Ostracods feed on a wide range of food stuff including diatoms, bacteria and detritus [13]. Total 3 genera such as *Cypris sp.*, *Cyprinotus sp.* and *Stenocypris sp.* were recorded during the study.

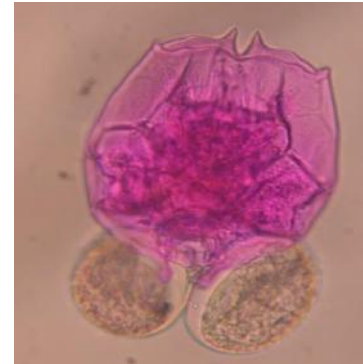
Figure-3 Commonly found Zooplankton in Tapi River at Utran site



(a) *Difflugia sp.*



(b) *Daphnia sp.*



(c) *Brachionus sp.*



(d) *Nauplius larvae*



(e) *Cypris sp.*

4. CONCLUSION:

During the study, Monthly variation in Physico-chemical parameters of Tapi River and Diversity of Zooplankton community were recorded. Total 31 genera of Zooplankton were recorded which belongs to major five taxonomic groups. The data obtained during the study would be utilized for further ecological investigation of Tapi River at Utran site. The data would be useful for the conservation and utilization of freshwater zone of Tapi River at Utran, Surat.

REFERENCES:

1. Dhembare .J.A: Statistical approaches for computing diversity and density of zooplankton with water factors in Mula Dam, Rahuri, MS, India. *European Journal of Experimental Biology*, 1(2):68-76, . (2011)
2. Sandhya Pawar : Zooplankton diversity and density in some freshwater bodies around (M.S) India, *Global Journal of Animal Scientific Research* :3(1):222-226, (2015)

3. Koli. K.B. and Muley D.V. : Study of Zooplankton Diversity and Variation with special reference to Physico-chemical parameters in Tulshi reservoir of Kolhapur District (M.S) *E-International Scientific Research Journal* :4(1):38-46, (2012)
4. APHA : Standard Methods for the Examination of Water and Wastewater 22nd edition, American Public Health Association, Washington, DC. (2012)
5. Edmondson W.T. : Freshwater Biology, 2nd edition, John Wiley and Sons, Inc., New York, (1959)
6. Battish S.K. : Freshwater Zooplankton of India. Oxford and IBH Publications, New Delhi, (1992)
7. Needham J.G. and Needham P.R.: A guide to the study of fresh water biology 5th edition . Liolden day, Inc., San Francisco , California, USA, (1962)
8. Pennak R.W.: Freshwater invertebrates of United States, New York, John Wiley & sons, Inc., pp-1-803, (1978)
9. Jose. R and Sanalkumar G.M: seasonal variations in the Zooplankon Diversity of River Achencovil. *International Journal of Scientific and Research Publication*:2(11) 1-5, .(2012)
10. Majumder. S, Dhua, R., Kar, S., Mishra,T., Mahapatra, S., Shit,S. and Patra, A. : Zooplankton diversity influenced by hydro biological parameters in some ponds of south eastern part of Bankura town of WB, India . *International Journal of Advanced Research*, Volume 3, Issue 5, pp.354-368, (2015)
11. Sampaio, E. V., Rocha, O., Matsumura-Tundisi, T. and Tundisi, J. G. : Composition and abundance of zooplankton in the limnetic zone of seven reservoirs of the parana panema river, Brazil, *Braz. J. Biol.* vol. 62, no. 3, pp. 525-545. (2002)
12. Shivashankar P. and Venkataramana G.V. : Zooplankton Diversity and their Seasonal Variations of Bhadra Reservoir, Karnataka, India *International Research Journal of Environment Sciences* Vol. 2(5): 87-91, (2013)
13. Manickam, N., Saravana Bhavan, P., Santhanam, P., Muralisankar, T., Srinivasan, V., Vijayadevan, K. and Bhuvaneswari, R. : Biodiversity of freshwater zooplankton community and physico-chemical parameters of Barur Lake, Krishnagiri District, Tamilnadu, India. *Malaya Journal of Biosciences*,2(1):1-12, (2015)