iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** I **Month of publication:** January 2018

DOI: http://doi.org/10.22214/ijraset.2018.1320

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue I, January 2018- Available at www.ijraset.com

Quantitative Assessment of Zooplanktonic Communities of Meteoritic Impact Crater lake, India

Vijaykumar B. Pawar[1], Kshama S. Khobragade[2]
[1]*Research Scholar*, [2]*Reader and Head*, Department of Environmental Science, S. B. E. S. College of Science, Aurangabad.

Abstract: ***The impact origin of the Lonar crater has been well established based on the evidence of shock metamorphosed material. An attempt has been made to evaluate quantitative assessment of zooplankton of lake. In the present investigation it is observed that Rotifers community dominant, among Cladocera, Copepoda and Ostracoda. The Rotifers includes Anuaeropsis fissa, Brachionus plicatilis, Brachionus caudatus, Brachionus pala, Keratella quadretes, Testudinella patina,Hexarthra intermidia, Polyarthra volgaris, Philodina flaviceps, Collotheca ornate, Lecane lamellate, Lecane luna, Lecane lunaris, Cephalodella catellina, Cephalodella gibba, Cephalodella adriatica, Asplanchna, Notholca acuminate, Notholca squamla, Euclanis dialatata. Lonar Lake is unique in the world for its alkalinity and salinity of the water but its alkalinity, pH and salinity goes on decrease day by day. Hence this World heritage should be preserved for its alkalinity and salinity.***
Keywords: Quantitative, Lonar crater Lake, zooplankton community

I. INTRODUCTION

Lonar lake located in Buldhana district of Maharashtra state, India. It is a circular lake occupied by saline water. It is formed by hypervelocity meteoritic impact in basaltic rock of the Deccan Traps near about 50 thousands years ago. Lonar Lake (19°58' N; 76°31' E) in Buldhana district, Maharashtra, India is a circular lake occupied by saline water (Fig.1.) It is formed by hypervelocity meteoritic impact in basalt rock of the Deccan Traps near about fifty thousand years ago. It's diameter about 1830 m. and depth is 135 m. The lake is confined from all sides by crater rim of the crater a not a single channel of water for drainage out. The water is stagnant for thousands years. The water is salty, alkaline and the lake is rich with various biotic and abiotic assemblages. It offers unique opportunities for ecological investigation. (Fig.2)

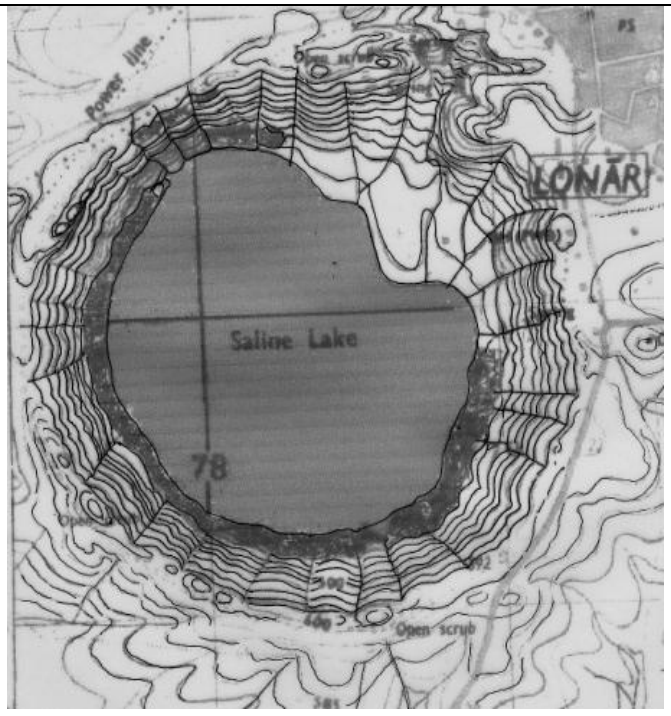

Figure 1: Counter Map of Lonar Crater rim

Figure 2: Counter Map of Lonar Crater rim

'1' – station- „A" water from Ramgaya (East),
'2' - station „B" water from Lord Shiva Temple (West),
'3' - station „C" water from Shani Temple (South)
'4' - station „D" water from Devi Temple (North)

II. MATERIALS AND METHODS

Water samples were collected from four different sampling stations in airtight and opaque polythene container. These four stations are located in reservoir such as

1) Sampling station 'A' water from Ramgaya (East),
2) Sampling station 'B' water from Lord Shiva Temple (West),
3) Sampling station 'C' water from Shani Temple (South) and
4) Sampling station 'D' water from Devi Temple (North) was established along the periphery of lake basin for one year limnological study programme.

Monthly Zooplanktonic sample were collected from the lake water during the study periods Jan 2016 to Dec 2016 from four different sampling station which will be named station 'A', station 'B', station 'C' and station 'D', located at East, West, South and North sides of the lake respectively. Zooplankton sample were collected by using the plankton net having the suitable for all planktonic communities. Sample ware preserved in 4% of formalin and brings to laboratory. Sample was observed by using Sedgwick- Rafter cell and takes their photograph by using COSLAB INVERTED MICROSCOPE and their TAB. Their identification was done by using the standard literature by Dhanapati (1974, 2000).

III. RESULTS AND DISCUSSION

During the study periods some kinds of zooplanktons was observed that is Cladocera, Copepoda, Ostracoda and Rotifera, but due to the high salinity and alkalinity of lake water the presence of Rotifers noticed throughout the study period because Rotifers constitute a major group among the zooplankton community rather than the Rotifers are not easily observed. Such communities were identified quantitatively by using the Sedgwick- Rafter cell, and also calculated their species diversity indices which are as follow.

A. Species Diversity

To measure the status of water quality we must know the species diversity indices such as Simpson index, Shannon-Weaver diversity index species evenness and richness in any water body Dabhade and Tandale(2016).

B. Shannon weaver diversity index (H)

For the seasonal fluctuations of zooplankton Shannon-Weaver diversity index (H) is used as important component. As the Shannon Weaver index is higher it indicated greater species diversity and as the species diversity is greater food chain are longer, a number of inter-specific interactions which reduced oscillation and increase stability of community to some extent Dabhade and Tandale (2016). Shannon Weaver diversity index of rotifer in 2016 mean was ranged from 1.8381± 0.10. The highest diversity was recorded in the month of November that is 1.984041 and lowest in May was 1.560359 as shown in Table No. 1.

TABLE NO. 1. SHANNON-WEAVER DIVERSITY INDEX

2016	
Month	Shannon Diversity Index (Hs)
January	1.841660

February	1.957912
March	1.836706
April	1.886954
May	1.560359
Jun	1.883272
July	1.873358
August	1.822371
September	1.714651
October	1.884988
November	1.984041
December	1.811152

C. Zooplankton Analysis

Among the zooplanktons, members of the phylum Protozoa showed their presence. It is the ciliates, which dominated in the ecosystem. The Protozoans observed during the present study were Amoeba, Paramecicum, Oxytricha, Euplotes, Prorodon and Cyclidium species. Phytoflagellates which are autotrophic did not show their presence as there was depletion in free CO_2 and dissolved oxygen.

The observations are in tune with the report put forth by Hartmut (1972) that protozoa (i.e. the ciliates) can tolerate extreme conditions of salts, pH and deficiency of oxygen; and can live in conditions where organic matter is decomposing. These members can thus be described as mesosaprobic that is, capable to live in water in which active oxidation and decomposition of organic matter is taking place.

Rotifers constitute a major group among the zooplankton community and their presence was noticed throughout the study period. This finding may be attributed to their tolerance towards the low oxygen conditions in the Lonar lake. High Rotifer population indicates pollution from organic matter due to direct entry of untreated domestic sewage from the catchment area.

Sharan (1988) put forth that the rotifers tolerate low oxygen tensions in comparisons to other species and prefer alkaline waters. Similar findings have also been reported by Dhanpati (2000). In this study, rotifers were represented by Brachionus philodina and Testudinella species.

The difference in periodical and population density of different rotifer species can be analysed by considering the nutritional ecology and biotic interactions. Rotifer species exhibit marked differences in their tolerance and adaptability to changes in the physico-chemical and biological parameters. Such changes are dramatic and sudden in the case of urban ecosystem, Pawar and Pulle, (2005).

From the class Insecta, dragonflies and mosquito larvae were observed on the surface water and a voracious predator Rhantus was observed. Rhantus though occurs at surface, is very quick in going underwater. These insects, with various devices are well adapted for aquatic conditions. But only aquatic conditions are sufficient, as the water is highly saline, their inhabitation is explained as: all the insects and crustaceans are extremely good in osmoregulation, maintaining rather constant blood concentrations in both dilute and very salty media; they are sometimes termed hypo-hyper-regulators Willmer et. al., (2000). Similar observations were made during the present study of Lonar Lake. Woodburry (1936) reported same observations for Great Salt Lake of Utah. But the absence of Artemia – a ubiquitous crustacean at Lonar lake is a striking feature. Equally striking is the absence of crustaceans – viz., Entomostraca and Cladocerans.

From vertebrates only one member was observed i.e. water duck, which is a permanent member of the Lonar lake. Certain other birds were observed, viz., Herons but these were found to come there for nesting and after a night-long rest they fly elsewhere for feeding. Absence of fish in excess saline water (salinity more than sea water) is a commonly observed fact Willmer, (2000). Still exceptions have been recorded; one of the most successful species from African alkaline lakes and the only fish to survive in lake Magadi is Oreochromis graham, a cichlid Willmer, (2000). Thus, there are examples of fish occurring in waters which are more saline than Lonar lake and are not seen at Lonar. The plausible explanation is that, a single factor never acts independently as a limiting factor but only with interaction with the others.

The less number of genera might be attributed to the fewer nutrients in the reservoir which consequently resulted in less productivity or might be due to the depletion of important factors such as dissolved oxygen and pH Ugale et.al., (2011).

The uniqueness of the Lonar lake is the high pH of lake water. It has been found that the pH is lowering down which is a serious sign for this special aquatic ecosystem. The Lonar Lake is unique in the world for its alkalinity and salinity of the water but it was seen that chlorides and salinity of the Lake water is decreasing day by day Khobragade kshama et.al., (2016).

D. Protozoans

In the present study the members of the phylum Protozoa showed their presence and it was observed that the ciliates dominated the ecosystem. The Protozoans observed during the present study were Amoeba, Paramoecium, Oxytricha, Euplotes, Prorodon and Cyclidium species. The observations are in tune with the report put forth by Hartmut (1972) that protozoa (i.e. the ciliates) can tolerate extreme conditions of salts, pH and deficiency of oxygen; and can live in conditions where organic matter is decomposing. These members can thus be described as mesosaprobic that is, capable to live in water in which active oxidation and decomposition of organic matter is taking place. Unexpectedly, the autotrophic Phytoflagellates were not observed during the present study, which may be due to the depletion of free CO_2 and dissolved oxygen required for photosynthesis.

E. Rotifers

Sharan (1988) put forth that the rotifers tolerate low oxygen tensions in comparisons to other species and prefer alkaline waters. Similar findings have also been reported by Dhanpati (2000). In the present study genus of rotifers namely Brachionus, and species of rotifer represented by Brachionus plicatilis, whereas, Mahajan (1984) have reported Brachionus philodina and Testudinella species of rotifers.

In the presence study Brachionus plicatilis only rotifer observed. This represents the highly eutrophic condition of Lonar similar observation was reported by Satyanarayan et.al., (2008).

IV. CONCLUSION

The Lonar lake has rich plankton community comprising chlorophyceae (Ankistrodemus species, Selenastrum species), cyanophyceae (Spirulina platensis, Spirulina fusiformis, Phormidium, Oscillatoria and Chroococcus species) and Bacillariophyceae (Fragillarias, Navicula,Cyclotella). Apart from zooplankton dominated by Rotifera (Brachionus plicatilis). Only one genus Brachionus may be due to uniqueness of High pH of water. Whereas Brachionus plicatilis observed in present study, Rotifers belonging to genus Brachinous are the indicators of eutrophic condition of the water body. No other zooplankton species have been reported in the lake

V. ACKNOWLEDGEMENT

The authors are thankful to Principal, S. B. E. S. College of Science, Aurangabad, and Research and Post Graduate Department of Environmental Science, S. B. E. S. College of Science, Aurangabad.

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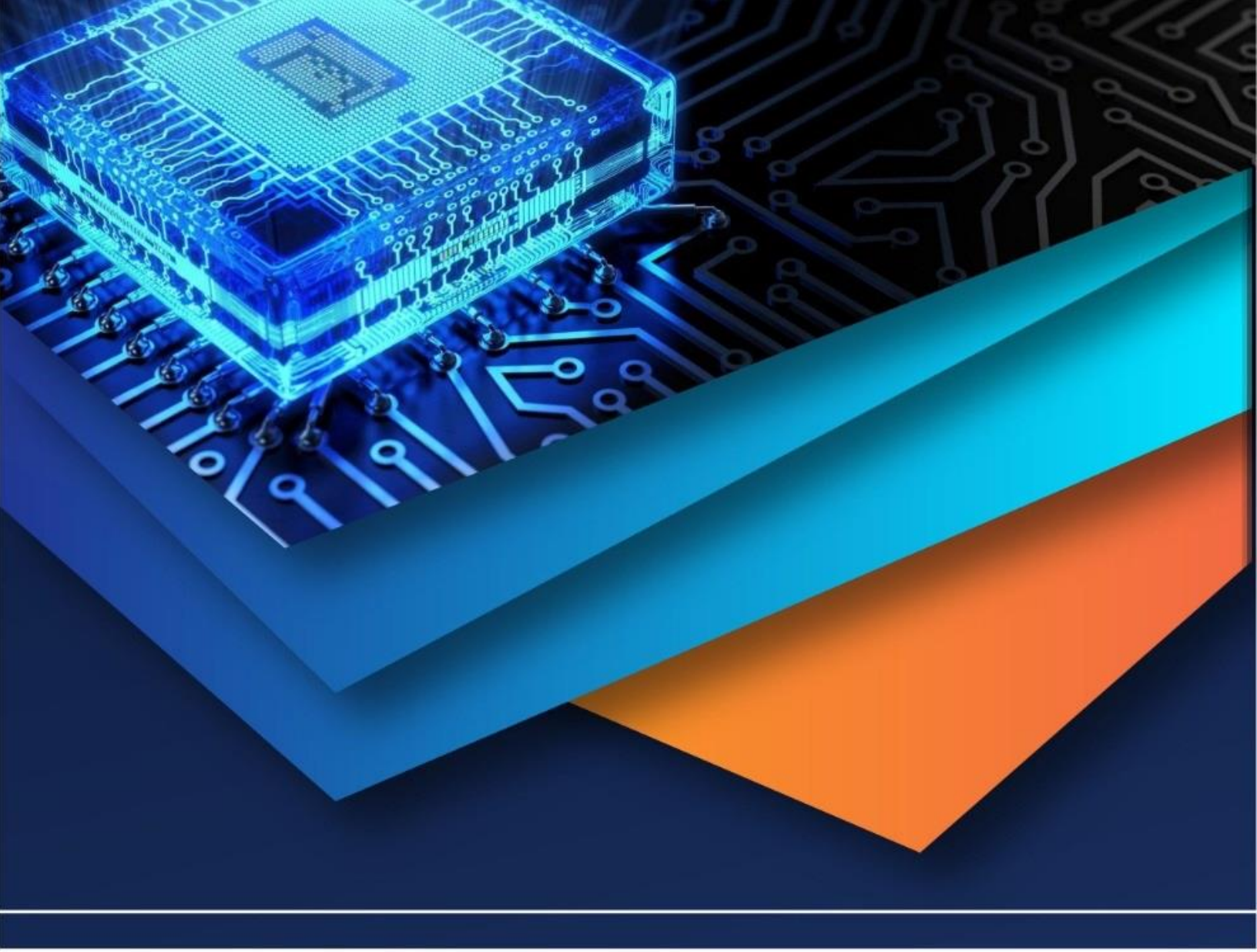

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