

Highly Saline water Tolerant Plankton Community in Lonar Crater India

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Abstract

Zooplanktons are the major community of fresh water bodies while some are in saline water. Lonar crater is one of the most saline Lake crater of India which is situated in Buldana district Maharashtra state India (19°58'N and 76°31'E). Such Crater Lake is the third largest natural salt-water lake in the world. This wet land is well known for its biodiversity. The lake brine supports typical microbial flora and fauna need to be investigated to access its value of wet-land to be recognized as Ramsar Site of India. During the present study plankton sample was analyzed. Lake water has high alkalinity and salinity then also different type of flora and fauna adapted such condition. Planktonic sample were collected from the lake water and preserved into 4% of formalin and brings to laboratory for observation. Phytoplanktons contain different type of blue green algae, green algae, diatoms, chlorophyceae and bacillariophyceae species. Luxuriant growth of Spirulina is not known anywhere except Lonar lake. Among Zooplankton Rotifers was dominant over all other. Cladocera, Copepoda and Ostracoda, are found in ephemeral ponds. The crater physical setup, its relative Geographical and Ecological isolation evolve Limnological status in a unique way. Its unusual and climatic isolation highlights the ecosystem as an ecological wonder.

Keywords: *Lonar crater Lake, plankton community,*

Introduction

Lonar crater is one of the most important biodiversity areas throughout the world ranking third. It has the uniqueness about its salinity and alkalinity. The interrelationship between the physicochemical parameters and plankton production of Lake Water and its relation with fluctuation of

zooplankton are of great importance. Zooplankton constitutes are important food item of many fishes. The larvae of carps feed mostly on zooplankton. Zooplankton also plays an important role in the food chain as they are second in tropic level as primary consumers and also as contributes to next tropic level [1].

Plankton is part of aquatic life, which is composed of tiny organisms living and drifting in the direction of water current. It acts as the main source of food for most fauna, both in lotic and lentic water ecosystems.[2] Worked on the Lonar Crater has varied micro ecosystems with unique bio-diversity. Some initial observations in this regard indicated existence of six species of algal cells, which belonged to saline water tolerant variety. A total of five water samples from different locations from Lonar Crater were collected. As the 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;[3]. The presence of species of bacteria related to water borne diseases were also found higher indicating the non-potable nature of the lake water but the spring (Dhara) water is normal and potable. Occurrence of few species of algae and fungi indicate the characteristic nature of bioflora, which needs the further investigations and interpretation. The assemblage of geological and micro-ecological attributes of Lonar lake water makes it very interesting for researchers. Different physico-chemical parameters were studied and analyzed [4].

The lake has been polluted due to anthropogenic activities like farming, subsequent use of pesticides, discharge of sewage, developmental activities over ejecta blanket, holy rituals, tourism, etc.[3]. This has created a constant threat to the ecosystem and its remarkable biodiversity; leading to the eutrophication of this lake by[5] The Lonar crater has attracted the attention of world geologists for investigation of its origin and the source of salinity of lake water; it is ecological wonder[6]. The Crater is surrounded by ejecta blanket due to which there is no any out let to release the water from the Lake. Recently, research on its geology on line with Barrington carter by Geological

Survey of India confirmed meteorite impact responsible for its origin. Uniqueness of the Crater is its salinity and alkalinity. There are micro-ecosystem, inhabited by a wide range of plant and animal life. The saline lake, marshy areas around it, freshwater streams, natural and manmade plantations, crop fields and the remnants of the original forest and scrub referred to above, all provide special niches for plants and animals.

Methodology

Lonar crater is a unique basaltic rock meteorite crater ($19^{\circ}58'N$ and $76^{\circ}31'E$), ranking third in the world. The Plankton samples will be collected for a years from four collection sites which will be named SI, SII, SIII and SIV, located at East, South, West and North sides of the lake respectively. Plankton sample were collected by using the plankton net. Sample will be preserved in 4% of formalin and brings to laboratory. Sample was observed and takes their photograph by using COSLAB INVERTED MICROSCOPE and their TAB.

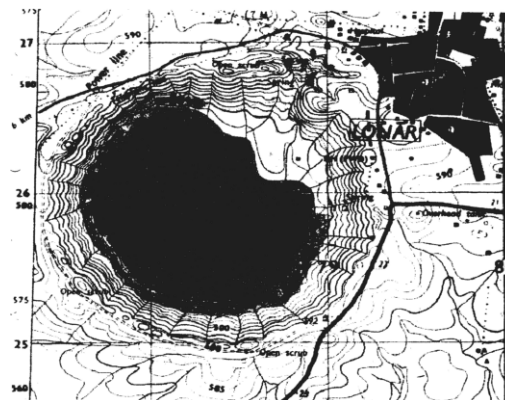


Fig. 1. Topographic Map of Lonar Crater ($19^{\circ}58'N$ and $76^{\circ}31'E$)

Results and Discussions

Lonar Lake is a unique basaltic rock impact crater. The Crater has different type of flora and fauna. Planktons are small, tiny and microscopic organisms that live in the water. They are carried by waves, tides, and currents. They have different shapes and sizes. Basically they are classifying in to two different categories; one is

plants that are known as phytoplankton and animals are known as zooplanktons. They are usually found in the shallow surface waters. Zooplanktons range in size from tiny microscopic organisms such as protozoan and rotifers, to large planktons called macro planktons such as jelly fish, shrimp and fish larvae. Planktons are very sensitive to changes in the quality of the water. They help to tell us about the environmental conditions within the water bodies. In to the Lonar Crater Lake water is highly saline as well as alkaline than also there is dance amount of phytoplankton and zooplanktons are present. During the present study following Flora and fauna was observed.

Phytoplankton

In to the saline Lake water Blue green algae and bacteria are the most striking features were observed. In to the high alkaline medium there is no any chance for the survival of such microscopic organisms than also these types of microscopic forms are extremely adapted to this condition. Luxuriant growth of *Spirulina* is not known anywhere except Lonar lake. Other than *Spirulina*, *Chlorophyceae* (Green algae): *Chlamydomonas sp.*, *Oedogonium sp.*, *Rhizoclonium sp.* *Cyanophyceae* (Blue green algae): *Anabaena sp.*, *Arthospira*, *Nostoc sphericum*, *Ocillotora*, *Spirulina subsalsa*, *Hydrodycton.sp.* *Bacillariophyceae* (Diatoms): *Asterionella*, *Closterium sp.*, *Fragillaria*, *Cyclotella*, *Navicula*, *Navicula sp.*, *Nitzschia*, *Nitzschia sp.*, Thus, the blue green algae constitute the major among phytoplankton community and particularly *Spirulina* is the dominant. The abundance of rapid multiplication of these alga are conspicuous along with other blue green algae, the *Arthospira*, *Ocillotora*, immediately after the onset of monsoon and gradually decrease as the dry spell continues until June was reported by [7]. It appears that the Lonar Lake water gets slightly diluted at S1 and S4 because of the discharge of small stream in to Lonar Lake near these stations. The dilution of lake water at these sampling points makes the water quality tolerable for the growth of algae. Therefore the algal density might have been more at Station S1 and S4 while at other stations the higher levels of salts in lake water might have been responsible for relatively low count of chlorophyceae and bacillariophyceae. The algal species of

cyanophyceae group were found to dominate the phytoplankton population in Lonar Lake. Bacillariophyceae species viz. *Fragillaria*, *Navicula* and *Cyclotella* were found to be more tolerant to saline-alkaline lake water than chlorophyceae (green algae). The most sensitive group in Lonar Lake water was chlorophyceae. The members of chlorophyceae were found to be present only at Station 1 in very negligible amount.

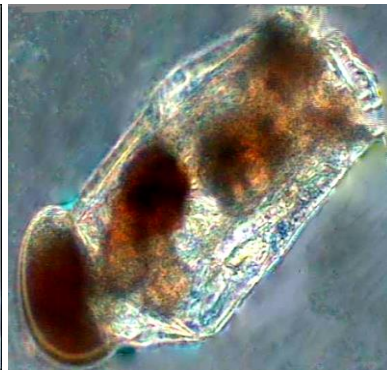
Zooplankton

The rotifers commonly termed as, "Rotifera", "Rotatoria" or "Wheel animalcules" comprise an integral link in the aquatic food chain they often form a important fraction of fresh water zooplankton and hence contribute significantly to zooplankton dynamics in this ecosystems. These microorganisms' exhibits a remarkable ability to colonize diversified fresh water biotopes, depict interesting reproductive and population dynamics strategies and certain taxa show unique ecotype variations. The rotifers also serve as valuable indicators of tropic condition of water quality [8]. The abundance of rotifers may pose a problem in water filtration. But, they also play a useful role in cleaning up pollution and natural wastes. They form a part of food chain leading to men. The rotifers are also a source of food for other animals.

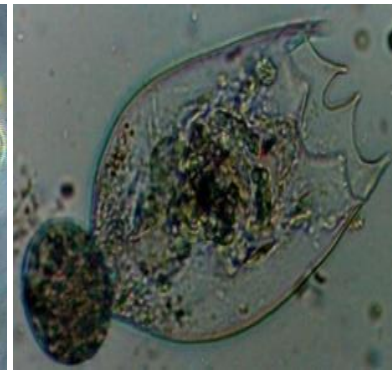
The Cladocera are found in all sorts of fresh water. Cladocera are found in all kinds of habitats like ponds, lakes, swamps, rain pools, and even in very moist soil and among the mosses and leafy liverworts [9]. Lakes and ponds contains as much larger number of forms than river do. The shallow weedy back waters of lake whose level is fairly permanent harbour a great variety of species than does any other locality. Free living copepods found in fresh and other inland water bodies are the same as those found in marine waters - the Calanoida, the Cyclopoida, and the Herpactipoida are three main suborders [10]. The Ostracoda are small bivalved crustaceans which are found in fresh water and marine environment. There are over about 1700 species of known Ostracoda, they inhabit wide variety of environments, being found almost everywhere in all types of fresh water; in lakes, pools, swamps streams, cave waters, heavily polluted areas etc.



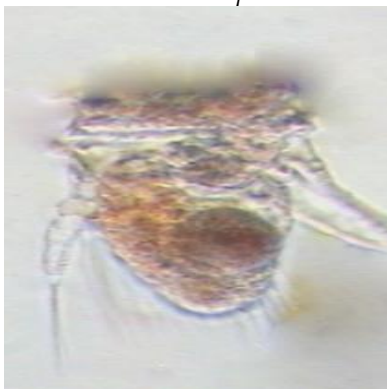
Brachionus plicatili



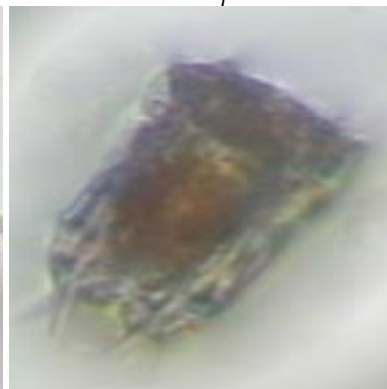
Brachionus plicatilis



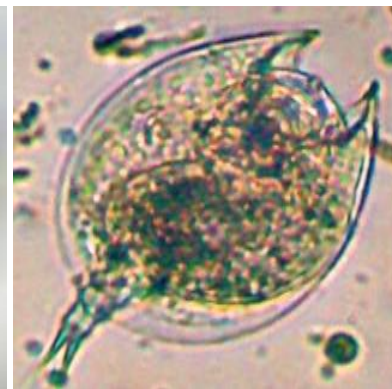
Brachionus caudatus



Hexarthra intermedia



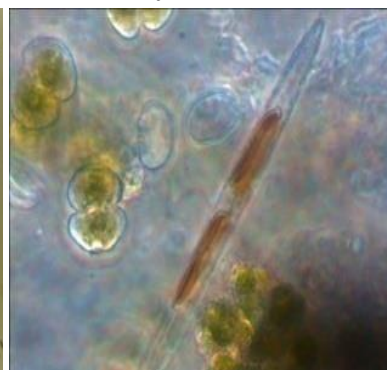
Polyarthra indica



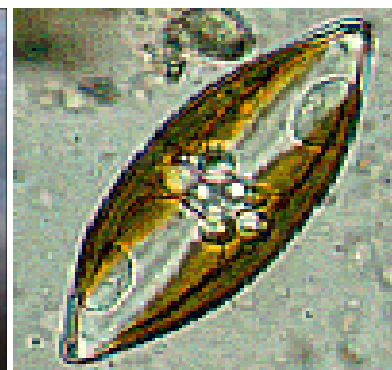
Lecane ovalis



Cyclop Sp.



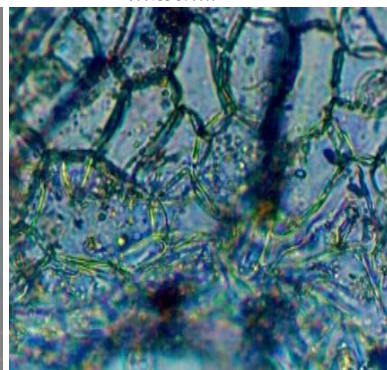
Nitzschia



Navicula



Spirulina



Hydrodycton



Chironomus species

Photo plate 1

The zooplankton community is dominated by rotifera, while cladocera and copepoda were not observed in the lake except the ephemeral ponds and ditches in the periphery of the lake basin. From the groups of zooplanktonic organisms in lake, a total of 28 taxons (Copepode 3, Cladocera 5, Rotifera 20) were determined. In addition, from the Ramgaya (Salinity >1ppt.) stream which is connected with lake a total of 23 species of zooplanktons (Copepode 3, Cladocera 6 and Rotifera 14) were examined dominant group of the lake is Rotifera and species of *Brachionus plicatilis* and *Hexarthra intermedia* were noted at all the sampling stations. In present study, species belonging to (*Cephalodella catellina*, *C. gibba*, *Colerella adriatica*, *Lecane lamellata*, *Keratella quadrata*, *Synchaeta oblonga*, *Polyarthra vulgaris*, *Lecane ovalis*), in the ephemeral ponds (Salinity 2 ppt.) around the lake basin different zooplankton communities were observed among which Cladocera (*Diaphanosoma brachyurum*, *D. magna*, *D. longiceps*, *Allona sp.*) Copepoda (*Cyplope sp.* and Harpacticoid Copepod *Canthocmpus sp.*) have been reported first time and are new records for this lake.

Among dominant groups of Rotifers, *Brachionus plicatilis* and *Hexarthra fennica* are reported characteristic species of salty waters *B. plicatilis* found in low alkaline and salty waters and characteristic pollution indicator species. Rotifers were reported dominating in hard and alkaline waters. these are indicator species of eutrophic lakes.

Besides, *Hexarthra fennica*, *B. plicatilis*, *Keratella quadrata*, *Lecane sp.* are eurithermal and eurihaline species of the lake [11]. According to Koste [12] a rotifer *C. adriatica* is a euryhaline species of the lake and generally found in waters with pH 5.5-10.5. The pH of the lake is 10.5 and is suitable habitat for this species. *Keratella quadrata* and *Polyarthra vulgaris* are the eurythermal species and inhabits in both salty and fresh waters and are known as cosmopolitan species. *Polyarthra vulgaris* mostly found in waters with high oxygen concentrations [12]. More number of species occurs during winter season [13]. Diatoms. The Bacillariophyta is the diatoms. With their exquisitely beautiful silica shells, or frustules such as that of *Odontella*, are diatoms among the loveliest

microfossils. They are also among the most important aquatic microorganisms today: they are extremely abundant both in the plankton and in sediments in brine and the freshwater ecosystems in the peripheral ponds, and because they are photosynthetic they are an important food source for macro-organisms.

Macroinvertebrates

The littoral zone of the lake was mostly eutrophic where high allochthonous inputs caused predominantly eutrophic conditions. Benthos reported includes Oligochaetes, Chironomus species, and Molluscs. These fairly large varieties of organisms living on the sediments of the lake silt, feeding on algae, bacteria and particulate detritus (Organic matter). Among the organisms occurring at this level are *Eristalis*, *Liriope*, Crane fly larvae, Dragonfly larvae, May-fly larvae, Chironomids, and mosquito larvae, Nematode worms, were observed.

Aquatic Fauna

Lonar Lake did not show the presence of zooplankton and fish species in its water body due to low dissolved oxygen and high salinity.

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References

1. Sunkad BN and Patil HS. Water quality assessment of Fort Lake of Belgaum (Karnataka) with special reference to zooplankton, *J. Envi. Bio.*, 2004, 25(1): 99-102.
2. Satyanarayan S, Chaudhari PR and Dhadse S. Limnological Study on Lonar Lake: A Unique Brackish Crater Lake in India Sengupta, M. and Dalwani, R.

(Editors). *Proceedings of Taal 2007: The 12th World Lake Conference: 2061-2066.*

3. Dabhade DS. Limnological studies on Lonar Crater Lake, Maharashtra. Ph.D. Thesis submitted to S.G.B. Amravati University, Amravati, 2006.
4. Bhawankar AS, Mudkhede LM and Shivanikar SV. Physico-Chemical Status of Kudala Dam Tq. Umari Dist. Nanded, Maharashtra, India. *J. Aqua. Biol.*, 2011, 26(1):26-30.
5. Kshama-Khobragade. limnological status of Lonar Lake with reference to Eutrophication.
(http://wldb.ilec.or.jp/data/ilec/WLC13_Papers/S7/s7-7.pdf)
6. Malu RA, Dabhade DS and Kodarkar MS. Conservation and management of Lonar Lake, An Ecological Wonder, Maharashtra, India. *World Lake Vision-Action report, International Lake Environment Committee Foundation (ILEC), Japan, 2007*, pp 208-216.
7. Badwe RM, Kumaran KPN and Rajshekher L. Eutrophication of Lonar lake, Maharashtra. *Current Science*. 1993, Vol. 65, No. 4.25.
8. Sladeczek V. Rotifers as Indicators of water quality. *Hydrobiologia*, 1983, 100: 169-201.
9. Frey DG. The non-swimming chydorid, Cladocera of wet forest, with description of a new genus and two new species. *Int. Rev. Hydrobiol.*, 1980, 65: 613-641.
10. Edmonson WT. *Fresh water Biology*, 2nd Edn. John wiley and sons. Inc., New York. 1959, 1248p.
11. Berzins B and Pejler B. Rotifer occurrence in relation to oxygen content. *Hydrobiol.* 1989, 183 : 165-172.
12. Koste W. *Die Radertiere mitteleuropas I. Tex band, 673p.* Berlin, stuttgart, 1978.
13. Abdus Saboor and Althaft K. Qualitative and quantitative analysis of zooplankton population of a tropical pond during summer and rainy season. *J. Eco. Biol.* 1995, 7 (4) 269-275.