RESTORATION OF VARHALA LAKE BY REMOVAL OF MICROCYSTIS BLOOM THROUGH INEXPENSIVE METHODS IN BHIWANDI CITY MAHARASHTRA INDIA

Abstract

Varhala lake is the second largest lake in Thane district. It is an ecologically important as per the fresh water supplying drinking water and habitat for many organisms. It is located in Bhiwandi city of Maharashtra India. Bhiwandi city is one of the commercial city and known as Manchester of India. Large Number of wastages discharged in form of domestic and commercial waste water and other activities like clothes washing and bathing using detergent and soaps. Also due to its aesthetic importance large number of idol immersion like Durga during Navratri and Lord Ganesh during Ganesh Utsav activities is also affecting the water body.

Recently due to high eutrophication and non-maintenance of debris removal heavy scum of Microcystis bloom was noticed. For restoration and to overcome the problem of Microcystis bloom removal with an inexpensive method was applied, the proposed work aims to advance the conservation of varhala lake was examined. As a result, various approaches for restoring water bodies have been suggested in this study.

Keywords: Varhala lake, eutrophication, Microcystis, inexpensive method.

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I. INTRODUCTION

Lakes are an important feature of the Earths landscape. Lakes provide range of good services for humankind. This work are going from November 2021 to till date august 2023. They provide beautiful ecosystem for water resources and plays important role in aesthetic value. Lakes are characterized as the landscape that collects water, and their life is faster than the outlet, depending on the flow of inlet water. To human needs, the lake habitats are essential resources. Lakes have mild temperatures and influence the surrounding ecosystem. We regulate stream flow, restore groundwater aquifers and the frequency of droughts by storing water. Lakes provide shelter for aquatic or semi-aquatic plants and animals, which in turn provide food for many living things, increasing landscape diversity. Due to flood prone area Bhiwandi city faced water supply problem. The city planners in late sixties and early seventies decided to convert a small pond into a lake near ancient temple of Varhala devi. This lake was converted into large water reservoir by constructing an earthen dam in early eighties. Since then, this lake witnessed drastic changes in recent years. Few years back this lake was on verge of dying, water holding capacity was reduced due to heavy siltation. Eutrophication was also increased due to which there was heavy growth of water hyacinth Eichhornia crassipes and Aquatica fistulosa Bhiwandi Nizampur City Corporation with collaboration with Maharashtra State Government .

Source- Satellite Image Google Map.

successfully adopted this lake for rejuvenation and development. Study area covered across 119 acres which lies between the latitude 19.27.97 to 77.85.79.N , and longitude 73.05.97. to 60.07.70.E covering an area of 4km and located at an altitude of 1220 meters above mean sea level. The study involves monitoring of varhala lake of Bhiwandi .The exploratory field survey was done for determining the location coordinates (longitudes and latitudes) and identifying the key issues in and around the lakes. Noteworthy research has been carried out by many Aquatic Biologist from Bhiwandi and Mumbai region like Dehadray and Sawant 1982, Recently Nandita Singh and Sumaiya, Kakavipure and Shinde, Nisar Shaikh, Shabana Momin & Sumaiya Khatib Completed their research under the Guidance of Dr. Yeorgi on Rotifer and water quality assessment. Presently this water body witnessed Blue green algal bloom which was identified as Microcystis was managed or controlled with inexpensive

methodologies and it was found to successful for certain time period and an attempt was made to find permanent and longtime protection for restrict or inhibit the further growth of such type of blooming.

II. MATERIAL METHOD

Frequent field visit where carried out to identify the present status of the lake. Water samples for studying phytoplankton and Zooplankton analysis with .25 to 1.00 micron. Mesh Size Plankton net Microcystis type of cyano-bacteria was identified as Microcystis aeruginosa Which is a species of freshwater cyanobacteria that can form harmful algal blooms of economic and ecological importance. They are the most common toxic cyanobacterial bloom in eutrophic fresh water. Cyanobacteria produce neurotoxins and peptide hepatotoxins, such as microcystin and cyano peptolin. Microcystis aeruginosa produces numerous congeners of microcystin, with microcystin-LR being the most common. Microcystis blooms have been reported in at least 108 countries, with the production of microcystin is released. This can prove to be fatal for many varieties of Animals associated with freshwater bodies. Do Immediate action was needed to manage this algal bloom for future deterioration. As per the proposed MOU Bhiwandi Nizampur City Municipal Corporation after proper approach and coordination this project was undertaken.

III. OBSERVATION

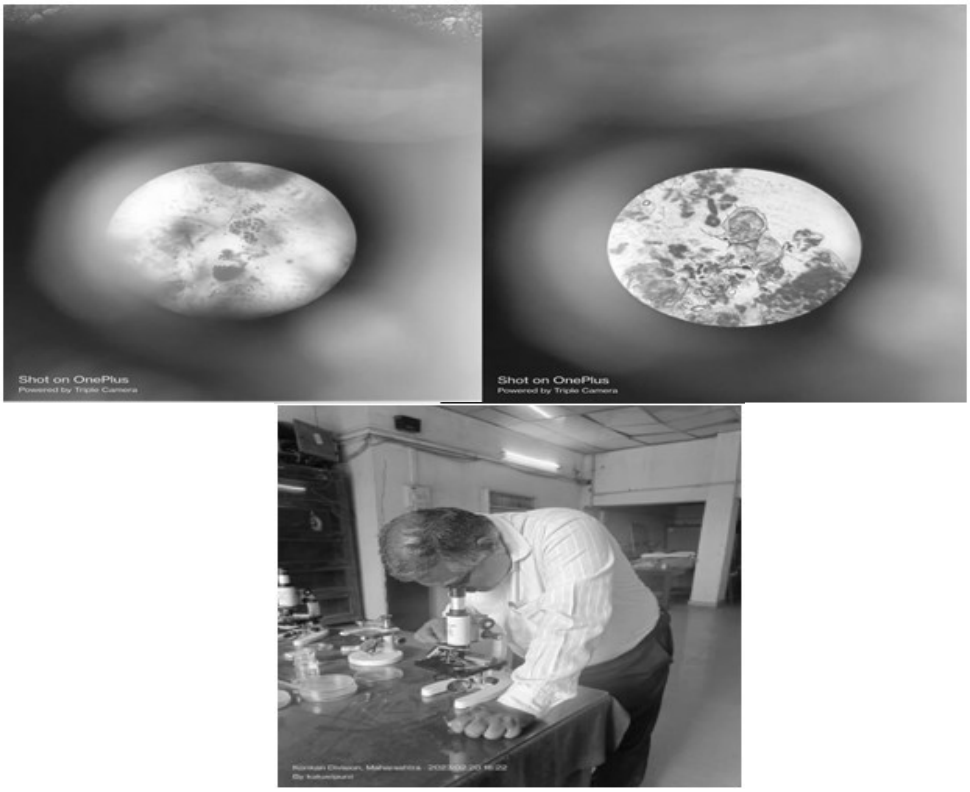

Figure 1: Microscopic examination of lake water showing Microcystis and Zooplankton

Table showing debris removed: Debris , Bottom Sediments excavated during research project

Sr no.	Name of Ghat	Debris removed (no. of dumper)	Quantity of debris in Brass	Quantity of debris in kg
1	Varhala ghat	36	72	302400
2	Fane gaon ghat	19	38	159600
3	Katekar ghat	28	56	235200
4	Total	83	166	6,97,200

In order to identify the main factors responsible for variations in water quality, increase in Microcystis growth following causes where identified:-

- Heavy siltation
- Non removal of debris accumulated from Ganesh and Durga idol immersion chat pooja, Batkamma and religious waste offered by local communities.
- Non maintenance of equipment install by post NLRCP project like Aerators
- Appropriate climate for growth of micro cystic.

Figure 2: Deteriorating Condition of Lake.

Figure 3: Monitoring Algal bloom with local authorities.

IV. RESULTS AND SUGGESTIONS

The eco-restoration of varhala lake waters was done with in collaboration Bhiwandi Nizampur city municipal corporation B.N.N. college and local authorities .which was under most critical condition, with microcystic bloom. Domestic sewage Water and Ganesh and Durga Idol as well as Anthropogenic Activities such as Offering of Nirmalya or Religious pooja waste leading to Eutrophication was the major cause of Development of cyano-bacterial blooms in this lake. This lake was undertaken for rejuvenation by Ministry of environment and forest and climate change, Maharashtra Government and Bhiwandi city municipal corporation under the scheme of NLRCP project. In which Three isolated Water bodies were constructed along three sites as Phene gaon ghat, Kamatghar Gaon and Varhala devi Ghat for Ganesh and Durga and Batkamma and Chat Pooja Festival celebration and idol immersion Also Aerators also installed but due to non-operational and Maintenance heavy Sediments was deposited in all three isolated water bodies or Ghats.

Phosphate and other nutrients was responsible for Eutrophication leading to Microcystis bloom. Varaldevi lake water is used for Aquaculture, Drinking and recreation.in past time it was used for agriculture and Bathing and drinking by local livestock. Now lake is protected by boundary wall and but still there are sources of domestic untreated sewage from nearby residential complex. It was essential and important to eradicate this Microcystis bloom with eco-friendly material and with an inexpensive method This lake is the largest water body located at the central place in Bhiwandi and known as jewel of Bhiwandi due to its significance and natural beauty. With consideration of all this points the present work was undertaken.

Studies began with different steps to improve the environmental and pollution problems. Along with reasonable issue shielding water condition, prevention of dumping waste, the passage of contaminated water. It was decided to remove the Microcystis with short term planning and increasing the water quality. This was followed by long term planning for, removing scum, setting of lab, use of trash removal, continue monitoring of committee with government officials were decided.

Figure 4: Water Quality Before and After Treatment

Photographs Indicating Manual Removing Debris and Water Sediment with Pock-Lain Machine and Microcystis Scum and Difference of Water Quality Before and After Treatment.

Cyano-L Liquid and Cyanol-Pro Bacteria Commercial Anti Cyano Bacterial Products Available Online. Was Purchased by Municipal Corporation).By Remedial Purpose . Fire Brigade and Health Department Was Called Spreading Sanitization for Killing Superficial Microcystic Scum /Bloom Without Harming Biodiversity. Little Amount Ammonium Aluminum Sulfate, Also Known as Ammonium Alum or Just Alum. Or Alum Was Also

Used for Anti- Pursuant Deo- Deront Ammonium Alum Is Not a Major Industrial Chemical or A Particularly Useful Laboratory Reagent, But It Is Cheap and Effective, Which Invites Many Niche Applications. It Is Used in Water Purification.

Lake is Restored to normal before monsoon. Now during monsoon maximum problem is solved. No scum and death of organisms reported. Fisheries is Normal. Water if filtered and treated for the use as potable purpose for Bhiwandi city(5mld.) by adjacent plant. Through Temporary and primary solutions, we able to manage Microcystis bloom and allied problems. It was also observed some fish like Rohu, Catla and Tilapia Which is major carps cultured in this lake was found engulfed large amount of Microcystis along with its normal food Further investigation and its impact on fish physiology is to be studied or investigated. It is also observed that reoccurrence of few zoo and phytoplankton's like Pediastrum, nitzchia, ,keratella , Bos mina, Scenedesmus, rotifers and diatom species were recorded which shows good indication of improvement of ecosystem. For permanent solution for management of lake for such problem long time planning is necessary. Inhibition of sewage water, Construction of damaged boundary wall, Timely removal of debris or bottom sediments, Removal of plastic and other floating debris or waste from surface water, Treatment through proper bioremediation.

Use of Aerators and its Maintenance, Use of NGO and students' participation, Installation of Research lab with proper equipment for day to day or monthly or seasonal data collection and documentation. Purchase of debris and solid waste segregation machine and Use of Funding agencies and MOU with nearby Research Institute , College and to appoint Environmental expertise is recommended to local administration. So that such water bodies can be protected and can form the role models for similar problems in and around. Finally Local awareness campaign for saving this lakes and proper disposal , collection and reusing, recycling and reducing the solid waste management is the need of time. This water bodies are precious, provide health, Wealth and key role in economy. So, let's save them for better tomorrow**.**

Figure 5: Isolated Lake Condition Before Treatment After Treatment

V. CONCLUSION

With this rejuvenation effort, the growth of aquatic invasive species like Microcystis and other weed can be controlled Water contamination can also be minimized when treated wastewater is permitted into inlets. Pollution free water in the lake surrounding area is essential to improving the growth of aquatic animals, and restoring this beautiful ecosystems. Further research and proposed activities like to investigate and the suggested remedial steps wall led to make this lakes beauty bring back to its original or natural condition and can form the model for other urban lakes or other water bodies to their original essence like, Varhala lake which was known and will be known as jewel of Bhiwandi known for its historical and cosmopolitan as well as textile city in the world.

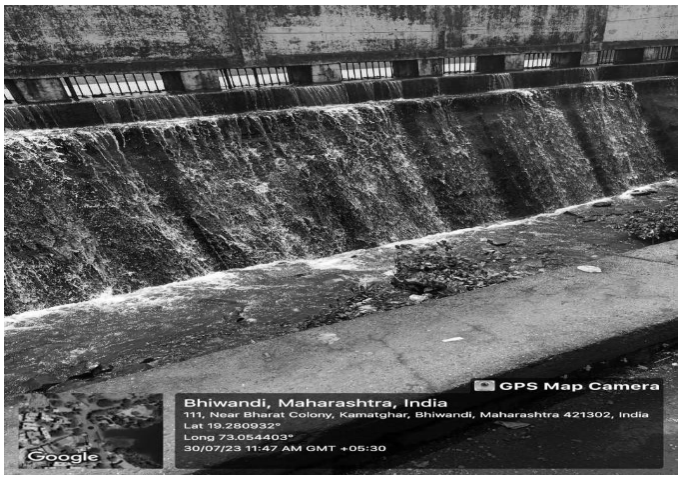

Figure 6: Though , The Lakes And Other Water Bodies Have Their Own Capacity To Rejunivate Of Its Own . If No Anthropogenic Activities Is Seen. Every Monsoon This Lake Or Water Bodies Overflow During Rainy / Monsoon Season And Brings Its Own Natural Beauty.

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