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DIVERSITY AND CONSERVATION STATUS OF INVERTEBRATE IN NIRMAL LAKE: A SEASONAL ANALYSIS, VASAI, DIST- PALGHAR (M.S.),INDIA

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ABSTRACT

The present study investigates the seasonal diversity and conservation status of invertebrate fauna in Nirmal Lake, a freshwater ecosystem located in the suburban region of Mumbai, Maharashtra. A comprehensive survey was conducted across two stations during pre monsoon and post-monsoon periods to document the occurrence and abundance of molluscs, macrozoobenthic invertebrates, and aquatic insects. A total of five molluscan species including Filopaludina bengalensis, Indoplanorbisexustus, and Tarebiagranifera were recorded, along with the brown freshwater crab Barytelphusa cunicularis and the Pagoda tiara Melanoides scabra. Insect fauna such as lake spiders (Oxyopes javanicus) and various dragonfly species were also observed. The findings showed significant seasonal and geographical differences in species abundance and distribution among sites. Some species are currently classified as "Not Evaluated," while others are classified as "Least Concern" or "Not Threatened," according to conservation status assessments based on IUCN criteria. This demonstrates the lake's ecological diversity while emphasising the necessity of additional taxonomic and conservation research. The results highlight the ecological value of Nirmal Lake as a home for a variety of invertebrate species and the necessity of routine monitoring to guide conservation plans and sustainable lake management techniques.

INTRODUCTION

All living things require water as a basic element for their bodies to function properly.Water is known as Jeevan in Sanskrit because it is the most plentiful and beneficial element in the universe.Both an essential human necessity and a valuable natural resource are clean, fresh water.The most prevalent substance in the universe is water. Nonetheless, only 3% of the water on Earth is freshwater, with the remaining 97% of the water being seawater, which is unfit even for washing(Riaz et. al., 2021).Governments everywhere are very concerned about maintaining or enhancing the quality of their water supplies.Any lake's physical and chemical properties under natural settings are controlled by a variety of elements, such as geography, geology, and inputs from rainwater, water/rock interactions, and climate variability(Kassa et. al., 2019). The resource that humans use the most to sustain themselves is water, which is used more than any other resource(Lwin and Sharma,2012).It is extremely difficult to strike a balance between the availability and demand for natural resources because of the quickening rate of large, spreading cities' growth in relation to the development and exploitation of necessary natural resources(Akhtaret. al., 2014).For the human communities that depend on lakes, the health of these ecosystems is crucial. Lakes are significant ecosystems with considerable ecological significance.One of the key water resources for irrigation, the production of hydroelectric power, water supply, navigation, and flood control is freshwater reservoirs(Kumaret. al., 2006).Freshwater lakes are valuable resources that are integral to world ecosystems. Urban lakes are important components of urban water systems since they are bigger than ponds and located in metropolitan areas. These urban lakes provide leisure areas, emergency water supply for combating fires, ecological balance, and rainfall collection, among other purposes(Prasad et. al., 2024).An important natural resource for maintaining life and a variety of human endeavours is water. However, there are worries about the decline in water quality due to the pressure that urbanisation, industrialisation, farming methods, and population growth

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have placed on water sources (Haideret. al., 2024). The degree of sensitivity and most trustworthy metrics for the construction of bioassessment programs are not well understood, despite the fact that macroinvertebrate measurements are useful tools for evaluating the health of aquatic ecosystems overall and water quality(Tampoet.al., 2021).Numerous physical and chemical characteristics are measured for water quality, and these elements are important in figuring out how many aquatic habitats have degraded, (Lilisti et. al.,2021).Furthermore, the aquatic community includes structural and functional traits and represents the health of the researched lakes, making its application in ecological studies more successful than relying solely on environmental variables.

"Zoobenthos" refers to the group of creatures that reside on or within the bottom of a body of water. Because benthic communities can provide information on environmental conditions through the sensitivity of individual species (indicator species) or because of a general feature that allows them to integrate environmental signals over an extended period of time, benthic communities are frequently used as biological indicators.The importance of benthic creatures in ecosystems is significant. Macro zoobenthos, Mei zoobenthos, and Micro zoobenthos are the three primary kinds that they fall into based on size (Tijare and Kunghadkar, 2021).

The quantity and quality of the biota in an aquatic habitat are direct reflections of the environmental conditions. The zoobenthos also plays a big part in the aquatic food chain(Pathani and Upadhyay,2006).Some of them feed fish, while others act as decimators of fish food by feeding on fish fry and larvae as well as other aquatic biotic components.The chemical, biological, and physical characteristics of water can be used to describe its quality. Water's fluctuating values are greatly influenced by the transient conditions;therefore a chemical and physical analysis is not sufficient to explain the actual state of the water. The biological approach, which involves studying the structures of aquatic species, is a generally successful strategy. Aquatic creatures such as macro zoobenthos are frequently impacted by changes in their surroundings(Rimadiyani et.al.,2019).

Aquatic macroinvertebrate assemblages and abundances differ in inlets and outlets based on the availability of nutrients in urban lakes under stress(Balachandran et. al., 2012).Filter feeders serve as both natural water purifiers and water quality indicators. However, they can be eaten by both people and animals. Particular Organic Matter (POM) and suspended algae are eliminated from the water column by bivalves. Because they filter a lot of water, mussels are susceptible to dissolved hazardous materials including heavy metals(Mohiuddin, 2015). Unfortunately habitat destruction is causing the extinction of many aquatic insects and macroinvertebrates (M Rasdiet. al., 2012). On the other hand, there is no informationrelated to the macrozoobenthic invertebrate fauna in the Nirmal lakes. The distribution and seasonal abundance of benthic macro zoo invertebrates in Nirmal Lake are the subjects of this note.

Nirmal Lake, located in Nirmal village near Vasai town, Palghar district, Maharashtra, is roughly 50 km from Mumbai. Its coordinates are 19°23′ 29′′ N and 72° 46′ 57′′ E. A public asphalt road separates the two ponds that make up Nirmal Lake, Vimal and Nirmal. The two ponds are connected by an internal drainage system.Therefore, the present study is related to the diversity of macrozoobenthic communities of Nirmal Lake.

MATERIALS AND METHODS

Random samples were taken in the current study in order to qualitatively examine the benthic macro-invertebrates from station I and II.

Collection of samples: By manually selecting larger specimens from the lake in situations. The collection in the lake is created by scooping the mud from the bottom and was sieved (0.02mm,0.2mm) to procure macrozoobenthic organism, and then giving it a water wash. Collected samples were stored in 10% formalin for further observations.Standard identifying keys were used to determine the species. Identification was done using the normal taxonomic literature that was availablefrom (Bhusnar Aet. al., 2017), (Supanekar Set.al,2021),(Patil S et.al,2021, (Zoological Survey of India2023)

RESULTS

Checklist of diversity of Macrozoobenthic invertebrate fauna of Nirmal lake (Pre-Monsson)

Sr. No	Scientific Name	Common name	Conservation status according to IUCN	No. of species at Station 1	No. of species at Station 2	No. of species at Station 3	No. of species at Station 4	No. of species at Station 5
1	*Filopaludina Bengalenesis*	banded pond snail	Not threatened.	35	40	38	20	25
2	*Indoplanorbis Excustus*	Asian freshwater limpet	Least Concern	29	33	27	30	20
3	*Tarebiagranifera*	Quilted Melania	Least Concern	25	27	30	21	20
4	*Meiniplotia scabra*	Pagoda tiara	Not Evaluted	20	24	30	19	19
5	*Barytelphusa Cunicularis*	brown freshwater crab	Currently not evaluated	00	01	00	00	00

Filopaludinabngalenesis

Indoplanorbisexcustus

Tarebiagranifera

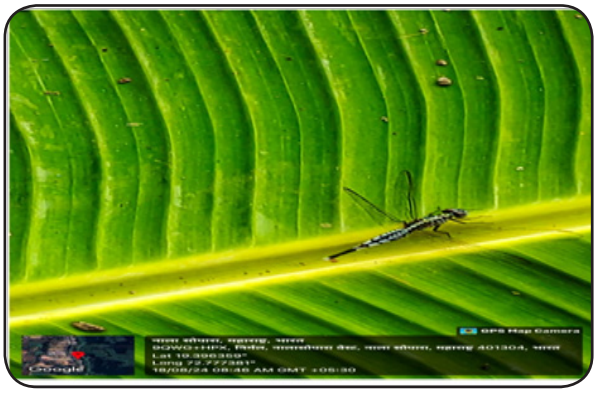
Meiniplotiascabra

Barytelphusa cunicularis

Lake Spider (Oxyopesmacilentus)

Red Dragon flies (Brachythemis contaminate)

Dragon flies(Crocothemisservilia)



Asian Pintail (Acisomapanorpoides)

Invertebrate Insect fauna of Nirmal Lake.

Sr.No	Species Name	Scientific Name
1	Lake Spider	*Oxyopesmacilentus*
2	Red Dragon flies	*Brachythemiscontaminate*
3	Dragon flies	*Crocothemisservilia*
4	Asian Pintail,	*Acisomapanorpoides*

Invertebrate Insect fauna of Nirmal Lake (All season)

Sr.No	Species Name	Scientific Name
1	Lake Spider	*Oxyopesmacilentus*
2	Red Dragon flies	*Brachythemiscontaminate*
3	Dragon flies	*Crocothemisservilia*
4	Asian Pintail	*AcisomaPanorpoides*

Checklist of diversity of Macrozoobenthic invertebrate fauna of Nirmal Lake (Monsoon).

Sr. No	Scientific Name	Common name	Conservation status according to IUCN	No. of species at station 1	No. of species at station 2	No. of species at station 3	No. of species at station 4	No. of species at station 5
1	*Filopaludina Bengalenesis*	banded pond snail	Not threatened.	27	30	25	15	15
2	*Indoplanorbisexcustus*	Asian freshwater limpet	Least Concern	24	25	21	21	18
3	*Tarebiagranifera*	Quilted Melania	Least Concern	18	17	23	15	16
4	*Meiniplotia scabra*	Pagoda tiara	Currently not evaluated	14	19	20	16	15
5	*Barytelphusa cunicularis*	brown freshwater crab	Currently not evaluated	09	10	05	00	07

Invertebrate Insect fauna of Nirmal Lake (All season)

Sr.No	Species Name	Scientific Name
1	Lake Spider	*Oxyopesmacilentus*
2	Red Dragon flies	*Brachythemis contaminate*
3	Dragon flies	*Crocothemisservilia*
4	Asian Pintail,	*AcisomaPanorpoides*

Checklist of diversity of Macrozoobenthic invertebrate fauna of Nirmal lake (Post-Monsson)

Sr. No	Scientific Name	Common name	Conservation status according to IUCN	No. of species at Station 1	No. of species at Station 2	No. of species at Station 3	No. of species at Station 4	No. of species at Station 5
1	*Filopaludina Bengalenesis*	banded pond snail	Not threatened.	34	40	30	20	28
2	*Indoplanorbisexcustus*	air-breathing freshwater snail	Least Concern	40	38	28	19	29
3	*Tarebiagranifera*	Quilted Melania	Least Concern	32	32	39	17	29
4	*Meiniplotia scabra*	Pagoda tiara	Currently not evaluated	31	35	27	12	27
5	*Barytelphusa cunicularis*	Brown Freshwater Crab	Currently not evaluated	14	14	06	00	10

DISCUSSION

Benthic organisms are ecologically significant as they serve as vital food source for fish contributing to the stability of food chain and food webs. Theirs productivity plays crucial role in maintaining ecosystem balance. The seasonal study of macrozoobenthic invertebrate diversity in Nirmal Lake during three seasonal phases—pre-monsoon, monsoon, and post-monsoon—reveals significant temporal and geographic variation in species richness and distribution.Biological

factors that impact the reproductive success of benthic macroinvertebrates and, in turn, their diversity and abundance, as well as physicochemical elements that define their habitats, dictate how benthic macroinvertebrate assemblages are organised (Ojija and Kavishe,2016).

The most common species were *Filopaludina bengalensis*, *Indoplanorbisexustus*, and *Tarebiagranifera* at all locations and seasons. Their dominance suggests a consistent ecological response to the lake's changing environmental conditions. The lower population density during the monsoon season may be due to increased water turbulence, nutrient dilution, and sedimentation patterns that might negatively impact benthic invertebrate habitat.

The IUCN-listed *Barytelphusacunicularis*, currently not evaluated species, was present during all three seasons, although its abundance was low—it was absent at a number of stations. Its sporadic prevalence may be due to anthropogenic activities and habitat fragmentation.This species should be regularly observed as an ecological indicator of habitat integrity due to its endangered status.

Oxyopesmacilentus, Brachythemiscontaminata, *Crocothemis servilia*, and *Acisomapanorpoides*are among the insect fauna that are present throughout the year, suggesting that the lake offers suitable microhabitats. The persistent presence of these insects improves the lake's capacity to support a range of invertebrate life forms and is a well-known bioindicator of aquatic ecosystem health.

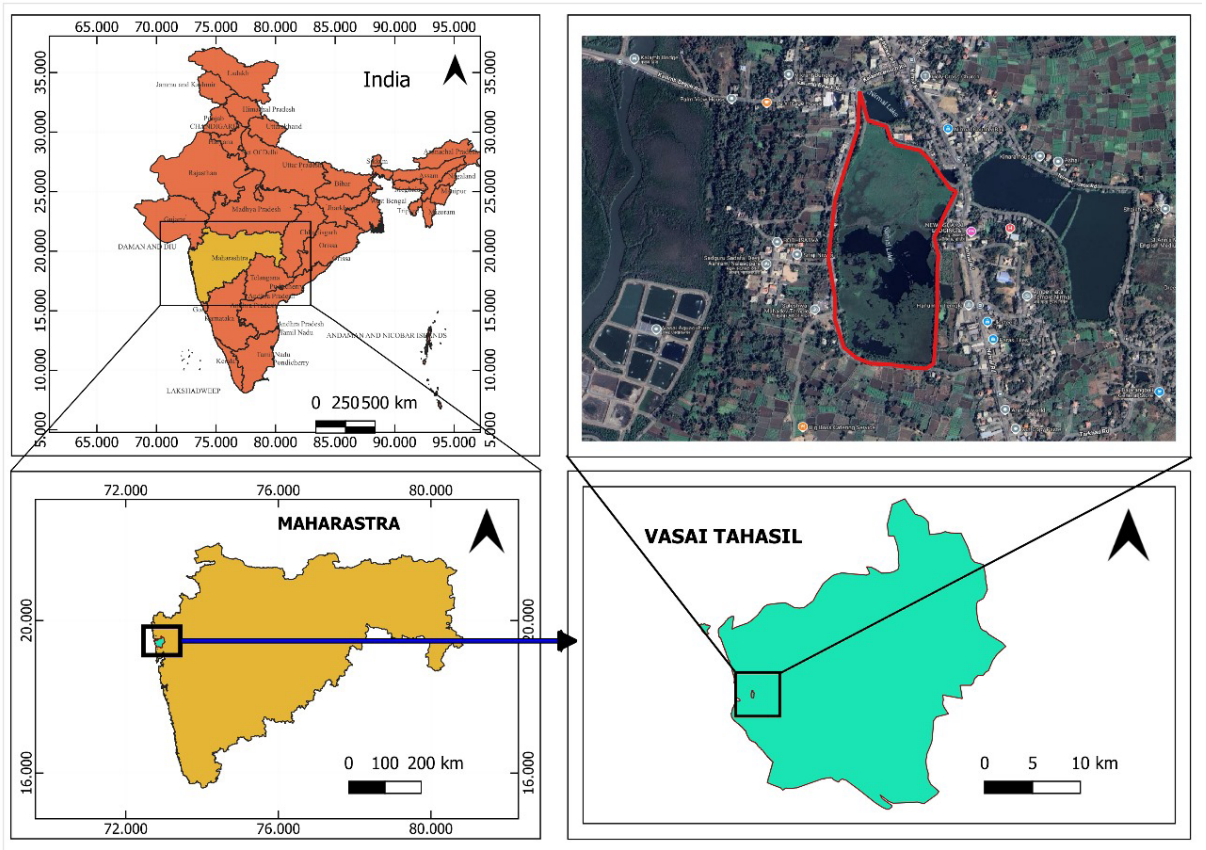
The variations between stations, which could be influenced by the plant cover, sediment type, local pollution sources, and the hydrological connectivity between the two connected lakes, illustrate the variety within Nirmal Lake. Across all seasons, Station 2 consistently observed higher macrozoobenthic abundance, which could be the consequence of better water quality, a more favourable substrate, or less human pressure. The post-monsoon recovery in the variety and abundance of many species, including *Indoplanorbisexustus* and *Meiniplotia scabra*, suggests that nutrient influx during monsoon rains may increase productivity and facilitate recolonisation.

CONCLUSION

This study attempted to characterise a few features of Nirmal Lake's macro-invertebrates. The current study is a grassroots assessment of the variety of freshwater macrofauna, which undoubtedly serves as a foundation for future researcher. Anthropogenic contributions, pilgrimage activities, and domesticate waste all have concerning effects on the macrozoobenthic invertebrate ecosystem as a whole.

The discovery of the delicate species *Barytelphusacunicularis* is noteworthy because it demonstrates that Nirmal Lake serves as a refuge for wildlife that is important for conservation. Thus, it is crucial to preserve habitat and lessen human stress. The information gathered here can be used to inform long-term monitoring and management strategies aimed at preserving the lake's biodiversity and water quality.

To support conservation efforts, future studies should integrate habitat mapping, water quality study, and assessments of anthropogenic effects. Increasing community awareness and implementing preventative measures will be essential to the long-term health of Nirmal Lake's ecology.



Map of Nirmal Lake.

Reference

1. Akhtar M,Tang Z, Mohamadi B,2014. Contamination Potential Assessment of Potable Groundwater in Lahore, Pakistan, Pol. J. Environ. Stud. 23(6), 1905-1916.
2. Balachandran C, Dinakaran S, Subash Chandran M.D. and Ramachandra. T.V, 2012. Diversity and Distribution of Aquatic Insects in Aghanashini River of Central Western Ghats, India., *Proceedings of the LAKE 2012: National Conference on Conservation and Management of Wetland Ecosystems, 06th - 09th November 2012, School of Environmental Sciences, Mahatma Gandhi University, Kottayam, Kerala*,1-10.
3. Bhusnar A, Sathe T, 2017.Biology of A Dragon fly. Crocothemis Servilia ServiliaDrury (Odonata: Libellulidae) A Predatory of Paddy Pest in Kolhapur. IOSR Jpornal of Pharmacy and Biological Science (IOSR-JPBS)(3)vol12,18-20.doi: 10.9790/3008-1203011820
4. Haider Z, Haider H, Hussain S, 2024.Water QualityAssessment forthree Different Types of Drinkingwatersource in fatacolony malanaParachinar Kurram District: Water Quality Index.Earth Sciences Malaysia 8(1) 32-40.doi: http://doi.org/10.26480/esmy.01.2024.32.40
5. Kassa Y,Tibebe D,2019. Analyses of Potential heavy metals and physico-chemical Water quality parameter on lake Tana, Ethiopia.Journal of Acedemia and Industrial Research(JAIR) 8(7).2278-5213
6. Kumar A, Qureshi T, Parashar A, Patiyal A, 2006. Seasonal variation in physico-chemical characteristics of Ranjit Sagar reservoir, Jammu & Kashmir.J. Ecophysiol. Occup. Health. 6(2006) 159-163.
7. Lilisti ,Zamdial, Dede H, BiengB,Marulak S, 2021,The structureand compositionof macrozoobenthos community in varyingwater qualities in Kalibaru Waters, Bengkulu, Indonesia.BIODIVERSITA, 22(1),106-11.doi: 10.13057/biodiv/d220115
8. LwinZ., & SharmaM. (2012). Environmental Management of the Inle Lake in Myanmar. *Hydro Nepal: Journal of Water, Energy and Environment*, *11*, 57–60. https://doi.org/10.3126/hn.v11i0.7164.
9. Mohd Rasdi Z., Fauziah,I.,Ismail R., Mohd Hafezan S., Fairuz K., Hazmi,A. D. and Che Salmah M.R.2012"Diversity of Aquatic Insects in Keniam River, National Park, Pahang, Malaysia", Asian Journal of Agriculture and Rural Development, 2(3),312-328.
10. Mohiuddin Md, Khan T, 2015, Role of Pretreatment Option for the Membrane Based Water Purification System.J Membr. Sci. Technol. 2015, 5:1. doi:10.4172/2155.
11. OjijaF,Kavishe R, 2016, A Preliminary Study on Abundance and Diversity of Aquatic Macro Invertebrates of Nzovwe Stream, in Mbeya, Tanzania,International Journal of Life Sciences Research 49(1), 29-38.
12. Pathani S,Upadhyay K, 2006, An InventoryOn Zooplankton, ZoobenthosAndFish Fauna Intheriver Ramganga (W) Of Uttaranchal, India.ENVIS Bulletin: Himalayan Ecology 14(2),33-42**.**
13. Patil S, Ghadage A, 2021, A Study and species Abundance of freshwater crabs in Sangliand Kolhapur District of Maharashtra, Res. Jr.ofAgril,Sci(-May-Jun2021) 12(3):903-906.
14. Prasad, S.; Wei, Y.; Chaminda, T.; Ritigala, T.; Yu, L.; Jinadasa, K.B.S.N.; Wasana, H.M.S.; Indika, S.; Yapabandara, I.; Hu, D.; et al. Spatio-temporal Assessment of Water Pollution for Beira Lake, Sri Lanka. Water 2024, 16, 1616. https://doi.org/10.3390/w16111616
15. Rimadiyani W, Krisanti M, Sulistiono,2019. Macrozoobenthos community structure in the WesternSegara Anakan Lagoon, Central Java, Indonesia. BIODIVERSITA 20, (6) 1588-1596.doi:10.13057/biodiv/d200615
16. Riaz M, Zafar T,Latif K, XiaoE , GhaziS, 2021, Cambrian ooids, their genesis and relationship to sea-level rise and fall: A case study of the Qingshuihe section, Inner Mongolia, China.Stratigraphy, 18(2)139–151.
17. Supanekar S, Naik M, Meshram L, Rokade A, Pawar P, 2021, Species Diversity and Abundance of Dragonflies and Damselflies (Odonata: Insecta) in and around Panvel, Navi Mumbai, Maharashtra (India), International Journal of Scientific and Research Publications, Volume 11, Issue 5, May 2021 368 ISSN 2250-3153.doi: 10.29322/IJSRP.11.05.2021
18. TampoL,Kabore I,Alhassan E,OuedaA,BawaL, BoundjouG, 2021, Benthic Macroinvertebrate as Ecological Indicators: Their sensitivity to Water Quality and Human Disturbance in a Tropical River. Frontiers in Water, 3,1-17 Article 662765.
19. Tijare R and Kunghadkar G, 2021,Effect of Physicochemical properties of water on population of Macrozoobenthos of Kunghada Bandh Lake, Dist.- Gadchiroli, Maharashtra (India).International Journal of Environment, Agriculture and Biotechnology, 6(4) 113-122.doi: 1 0.22161/ijeab.
20. Zoological Survey of India,2023.

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