*Uttar Pradesh Journal of Zoology*

***Volume 45, Issue 2, Page 95-101, 2024; Article no.UPJOZ.3282***
***ISSN: 0256-971X (P)***

# A Study on the Biodiversity of Aquatic Invertebrate Fauna of Nizamsagr Irrigation Reservoir, Kamareddy District, Telangana, India

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Author DB designed and analysed the results of the present paper. Author GSR is collected the samples and author TRR is monitored the work. All authors read and approved the final manuscript.*

***Article Information***

DOI: 10.56557/UPJOZ/2024/v45i23935

**Open Peer Review History:**
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://prh.mbimph.com/review-history/3282

***Original Research Article***

***Received: 15/11/2023***
***Accepted: 20/01/2024***
***Published: 23/01/2024***

## ABSTRACT

Nizamsagar reservoir constructed across the river Manjeera between Achampeta and Banjapalli villages of newly formed Kamareddy district of Telangana State. The River Manjeera is a tributary river of the Godavari. The height of the dam is 96 meters and length is 3 km having water capacity 30 TMC. The study revealed that a total of 27 invertebrate species belonging to three phyla: Arthropoda, Mollusca, and Annelida. Among these, the Arthropoda phylum species dominated, followed by Mollusca and Annelida. In the Mollusca phylum, the Gastropoda class exhibited rich abundance, with species like *Bithynia transsilvanica*, *Bellamya bengalensi*s, Perrysisfavidens, and Pila globose being prominent. Within the Annelida phylum, Tubifex tubifex in the Clitellata class showed the highest abundance compared to *Limnodrillus hoffmeisteri*. In the Arthropoda phylum,

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specifically in the Insecta class, there were a diverse range of species, including *Chironomus Sps*., Anophelus mosquito larvae, Culex mosquito larvae, *Sympetrum vulgatum*, and *Orthetrum cancellatum*, with the highest diversity observed.

*Keywords: Nizamsagar; invertebrates; species; season; phylum.*

## 1. INTRODUCTION

Basically, aquatic invertebrates are found in almost all types of habitats including temporary pools and permanent large lakes and rivers, even in extreme habitats such as in saline waters, petroleum pools and sewage treatment plants. In lentic water bodies like lakes and pools, the aquatic invertebrates were settled in bottom area and in lotic water bodies like rivers, these are settled under the rocks and stones and plays integral part of the aquatic food web. Most aquatic invertebrates spend their entire lives from egg to the adult stage under water. However, many insects such as mayflies, dragonflies, stoneflies, and midges are aquatic only in the immature stages. Many researches contributed their valuable findings in the aquatic Invertebrates abundance throughout the worldwide [1-5].

Without invertebrates there is no ecosystem in our planet. Because most of the activities on the earth is regulated by the interference of invertebrates for example if there is no decomposers the animal survival is not possible like this aquatic invertebrates also contribute major role in the aquatic ecosystems by regulating the aquatic food chains and food webs. The Benthos and Benthic fauna of aquatic ecosystem regulates the trophic status, for this reason the fauna is considered as Bio-indicator for pollution status. Several highly diverse taxa, such as Porifera, Platyhelminthes, Nematoda, Mollusca, and peracarid Crustacea are still poorly known [6]. Benthic macro invertebrates (BMIs) are an important tool for understanding and detecting changes in ecosystem integrity, and BMI community composition can be used to reflect cumulative impacts that cannot otherwise be detected through traditional water quality monitoring [7].

## 2. METHODOLOGY

In the present study, the aquatic invertebrate collections were made on specific dates of every month at Nizamsagar reservoir for the period from 2021 to 2023. For the collection of aquatic invertebrates including the aquatic insects, we used a conventional D-frame Sweep net, (Size of the mesh is 1.2 mm and the mouth area is 690cm3), Stovepipe sampler, Benthic corer and funnel trap etc [8,9].

## 3. RESULTS AND DISCUSSION

In the present study twenty seven species of invertebrate fauna have been observed belongs to three phyla viz, Arthropoda, Mollusca and Annelida in Nizamsagar reservoir during the year 2021-23. The data of invertebrate species is depicted in Table 1 and 2.

The observed species are *Bellamya bengalensis* (Lamarck, 1822), *Pila globosa* (Swaison, 1822), *Rachis punctatus* (Anton, 1838), *Bithynia transsilvanica* (Biez, 1853), *Indoplanorbis exustus* (Deshayes, 1834), *Gyraulus convexiusculus* (Hutton, 1849), *Lymnaea accuminata* (Lamarck, 1822), *Thiara tuberculata* (Muller, 1774), *Perrysis favidens* (Benson, 1862), *Lamellidens marginalis* (Lamarck, 1819), *Limnodrillus hoffmeisteri* (Claparede, 1862), *Tubifex tubifex* (Muller, 1774), *Hydrometra vittata* (Stal, 1871), *Limnometra fluviorum* (Fabricius, 1798), *Laccotreohes maculatus* (Fabricius, 1775), *Ranatra fuliformes* (Fabricius, 1790), *Cybister chinenesis* (Motschulsky, 1854), *Hydaticus ricinus* (Wewalkar, 1979), *Eristalis tenax* (Linnaeus, 1758), *Chironomus* Sps. (Meigen, 1803), *Sympetrum vulgatum* (Linnaeus, 1758), *Macrobrachium rosenbergii* (De. Man, 1879), *Macrobrachium. malcolmosonii* (Milne-Edwards, 1844), *Ischnura ramburii* (Selys, 1850)*Orthetrum cancellatum* (Linnaeus, 1758), *Anophelus* mosquito larvae and *Culex* mosquito larvae.

Among the total species *Bellamya bengalensis, Pila globosa, Bithynia transsilvanica, Rachis punctatus, Indoplanorbis exustus, Gyraulus convexiusculus, Lymnaea accuminata, Thiara tuberculata* belongs to Gastropoda class, *Perrysis favidens* and *Lamellidens marginalis* of bivalvia class of Mollusca phylum. *Limnodrillus hoffmeisteri* and *Tubifex tubifex* species belonging to Clitellata class of Annelida phylum and *Hydrometra vittata*, *Limnometra fluviorum*, *Laccotreohes maculatus*, *Ranatra fuliformes*,

*Cybister chinenesis*, *Hydaticus ricinus*, *Eristalis tenax*, *Chironomus* Sps. *Sympetrum vulgatum*, *Orthetrum cancellatum*, *Ischnura ramburii, Anophelus* mosqito larvae and *Culex* mosquito larvae species were observed belonging to Insecta class, *Macrobrachium rosenbergii* and *Macrobrachium. malcolmosonii* belonging to Crustacean division of *Arthropoda phylum.*

In the total invertebrate species the Arthropda phylum species are dominated followed by Mollusca and Annelida phylum in the two years of the study period of Nizamsagar reservoir. The rich abundant species belonging to Gastropoda class of Mollusca is *Bithynia transsilvanica, Bellamya bengalensis, Perrysis favidens* and *Pila globosa,* the least observed species are *Thiara tuberculata* and *Gyraulus convexiusculus.* In clitellata class of Annelida phylum *Tubifex tubifex* showed highest abundance then compared to *Limnodrillus hoffmeisteri.* In Insecta class to Arthropoda phylum *Chironomus* Sps., *Anophelus* mosqito larvae, *Culex* mosquito larvae *Sympetrum vulgatum* and *Orthetrum cancellatum* showed maximum diversity and less diverse species are *Laccotreohes maculatus*, *Hydaticus ricinus* and *Eristalis tenax* species and in Crustacea division *Macrobrachium. malcolmosonii* is the dominated sps. Followed by *Macrobrachium rosenbergii* in two years of the study period of Nizamsagar reservoir of Kamareddy district, Telangana state.

In the 2021-22, Gastropoda species recorded maximum in the Northeast monsoon Season and followed by Summer Season and Southwest monsoon season. In the same year Bivalvia species observed more in Summer Season followed by Northeast monsoon Season and Southwest monsoon season. Clitellata species observed highest in Northeast monsoon Season and followed by Summer Season and Southwest monsoon Season in the same year. Whereas, Insecta species were plenty in Northeast monsoon Season followed by Southwest monsoon season and Summer Season and Crustacea species more in Southwest monsoon season and followed by Northeast monsoon Season and Summer Season. During 2022-23 year, Gastropoda species recorded maximum in the Northeast monsoon Season and followed by Summer Season and Southwest monsoon season. In the same year Bivalvia species observed more in Summer Season followed by Northeast monsoon Season and Southwest monsoon season. Clitellata species observed highest in Northeast monsoon Season and followed by Summer Season and Southwest monsoon Season in the same year. Whereas Insecta species were maximum in Northeast monsoon Season followed by Summer Season and Southwest monsoon season.

The benthic micro invertebrate occupied the integral role in the aquatic food web and acts as determining factors for long-term productivity of the wetland [10]. In the current analysis most of Insects and Crustaceans from Arthropoda phylum, large number of Gastropods are the principle constituents of aquatic invertebrate community [11]. Very low species of Annelida phylum were also noticed in the research study. Molluscans especially Gastropods act as intermediatory hosts to some trematode parasitic species of platyhelminthes phylum. In the research study the huge abundance of Gastropods were observed in monsoon season that indicates the monsoon season is favourable to them. [12] Studied aquatic macro invertebrate fauna in Nigeria and [13] studied aquatic Entomofauna in Karimnagar district of Telangana state. Shwetha [14] Found that aquatic insects were the most commonly studied macro invertebrates in freshwater monitoring and assessment, with Hemiptera being the most dominant family. Kulkarni et al [15] Documented the abundance and diversity of aquatic insects in the Ramala reservoir in Maharashtra, observing 16 species belonging to 14 families and 4 orders.

In the total invertebrate species, the Arthropda phylum species are dominated and followed by Mollusca and Annelida phylum in the two years of the study period of Nizamsagar reservoir. The rich abundant species belonging to Gastropoda class of Mollusca is *Bithynia transsilvanica, Bellamya bengalensis, Perrysis favidens* and *Pila globosa,* the least observed species are *Thiara tuberculata* and *Gyraulus convexiusculus.* In clitellata class of Annelida phylum *Tubifex tubifex* showed highest abundance then compared to *Limnodrillus hoffmeisteri.* In Insecta class to Arthropoda phylum *Chironomus* Sps., *Anophelus* mosqito larvae, *Culex* mosquito larvae *Sympetrum vulgatum* and *Orthetrum cancellatum* showed maximum diversity and less diverse species are *Laccotreohes maculatus*, *Hydaticus ricinus* and *Eristalis tenax* species and in Crustacea division *Macrobrachium. malcolmosonii* is the dominated sps. Followed by *Macrobrachium rosenbergii* in two years of the study period of Nizamsagar reservoir of Kamareddy district, Telangana state.

**Table 1. Invertebrate fauna of Nizamsagar reservoir during the year 2021-22**

| | | Southwest Monsoon Season | | | | Northeast Monsoon Season | | | | Summer Season | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S.N.** | **Name of the Species** | **Jun_21** | **Jul_21** | **Aug_21** | **Sep_21** | **Oct_21** | **Nov_21** | **Dec_21** | **Jan_22** | **Feb_22** | **Mar_22** | **Apr_22** | **May_22** |
| 1 | *Bellamya bengalensis* (Lamarck, 1822) | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 2 | *Pila globosa* (Swaison, 1822) | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 3 | *Rachis punctatus* (Anton, 1838) | ++ | ++ | ++ | ++ | +++ | +++ | +++ | ++ | ++++ | ++++ | ++++ | +++ |
| 4 | *Bithynia transsilvanica* (Biez, 1853) | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 5 | *Indoplanorbis exustus* (Deshayes, 1834) | ++ | ++ | ++ | ++ | ++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ |
| 6 | *Gyraulus convexiusculus* (Hutton, 1849) | ++ | ++ | ++ | ++ | ++ | ++ | +++ | +++ | +++ | ++ | ++ | ++ |
| 7 | *Lymnaea accuminata* (Lamarck, 1822) | +++ | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | +++ |
| 8 | *Thiara tuberculata* (Muller, 1774) | + | ++ | + | ++ | ++ | ++ | ++ | ++ | +++ | +++ | +++ | +++ |
| 9 | *Perrysis favidens* (Benson, 1862) | +++ | +++ | ++++ | ++++ | ++++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 10 | *Lamellidens marginalis* (Lamarck, 1819) | ++ | ++ | ++ | ++ | ++ | ++ | + | + | +++ | +++ | +++ | +++ |
| 11 | *Limnodrillus hoffmeisteri* (Claparede, 1862) | | | | + | + | + | + | | | | | |
| 12 | *Tubifex tubifex* (Muller, 1774) | | | | | | | | + | + | + | + | + |
| 13 | *Hydrometra vittata* (Stal, 1871) | + | + | ++ | + | ++ | +++ | +++ | +++ | ++ | +++ | +++ | ++ |
| 14 | *Limnometra fluviorum* (Fabricius, 1798) | + | + | ++ | ++ | ++ | ++ | ++ | +++ | +++ | ++ | + | ++ |
| 15 | *Laccotreohes maculatus* (Fabricius, 1775) | + | | | | | + | | + | | + | | |
| 16 | *Ranatra fuliformes* (Fabricius, 1790) | ++ | ++ | ++ | ++ | ++ | +++ | ++ | ++ | ++ | ++ | ++ | +++ |
| 17 | *Cybister chinenesis* (Motschulsky, 1854) | + | + | + | | | | | + | | | + | + |
| 18 | *Hydaticus ricinus* (Wewalkar, 1979) | | | | | + | + | + | + | | | | + |
| 19 | *Eristalis tenax* (Linnaeus, 1758) | + | + | + | + | | | | | | | | + |
| 20 | *Chironomus* Sps. (Meigen, 1803) | ++ | +++ | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 21 | *Anophelus* mosqito larvae | +++ | +++ | ++++ | ++++ | ++++ | ++++ | +++ | +++ | + | + | | |
| 22 | *Culex* mosquito larvae | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | | | |
| 23 | *Sympetrum vulgatum* (Linnaeus, 1758) | + | ++ | + | + | + | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 24 | *M. malcolmosonii* (Milne-Edwards, 1844) | ++ | +++ | +++ | ++ | +++ | +++ | ++ | ++ | + | + | | |
| 25 | *Macrobrachium rosenbergii* (De. Man, 1879) | ++ | ++ | ++ | ++ | ++ | ++ | + | + | + | | | |
| 26 | *Ischnura ramburii* (Selys, 1850) | + | + | + | + | + | + | | | | + | + | + |
| 27 | *Orthetrum cancellatum* (Linnaeus, 1758) | + | + | ++ | + | + | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ |

*++++ High Density; +++ Moderate Density; + Low density*

**Table 2. Invertebrate fauna of Nizamsagar reservoir during the year 2022-23**

| | | Southwest Monsoon Season | | | | Northeast Monsoon Season | | | | Summer Season | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S.N.** | **Name of the Species** | **Jun_22** | **Jul_22** | **Aug_22** | **Sep_22** | **Oct_22** | **Nov_22** | **Dec_22** | **Jan_23** | **Feb_23** | **Mar_23** | **Apr_23** | **May_23** |
| 1 | *Bellamya bengalensis* (Lamarck, 1822) | ++ | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | +++ |
| 2 | *Pila globosa* (Swaison, 1822) | +++ | +++ | +++ | ++++ | ++++ | ++++ | ++++ | +++ | ++++ | ++++ | ++++ | +++ |
| 3 | *Rachis punctatus* (Anton, 1838) | ++ | ++ | ++ | + | ++ | + | + | ++ | +++ | +++ | ++++ | +++ |
| 4 | *Bithynia transsilvanica* (Biez, 1853) | ++++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 5 | *Indoplanorbis exustus* (Deshayes, 1834) | + | + | ++ | ++ | ++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ |
| 6 | *Gyraulus convexiusculus* (Hutton, 1849) | +++ | +++ | ++ | ++ | ++ | ++ | +++ | +++ | +++ | ++ | ++ | ++ |
| 7 | *Lymnaea accuminata* (Lamarck, 1822) | ++ | ++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | +++ | +++ | ++++ | +++ |
| 8 | *Thiara tuberculata* (Muller, 1774) | + | + | + | ++ | ++ | ++ | ++ | ++ | ++ | +++ | +++ | +++ |
| 9 | *Perrysis favidens* (Benson, 1862) | ++ | ++ | +++ | +++ | +++ | +++ | ++++ | +++ | ++++ | ++++ | ++++ | ++++ |
| 10 | *Lamellidens marginalis* (Lamarck, 1819) | ++ | ++ | ++ | ++ | ++ | + | ++ | + | ++ | +++ | +++ | +++ |
| 11 | *Limnodrillus hoffmeisteri* (Claparede, 1862) | | | + | + | + | | + | + | | | | |
| 12 | *Tubifex tubifex* (Muller, 1774) | + | + | | | | | | | + | + | + | + |
| 13 | *Hydrometra vittata* (Stal, 1871) | | + | + | + | + | ++ | ++ | +++ | ++ | +++ | +++ | ++ |
| 14 | *Limnometra fluviorum* (Fabricius, 1798) | + | + | + | + | ++ | ++ | ++ | +++ | +++ | ++ | + | + |
| 15 | *Laccotreohes maculatus* (Fabricius, 1775) | + | | | | | + | | + | | + | | |
| 16 | *Ranatra fuliformes* (Fabricius, 1790) | ++ | ++ | + | ++ | ++ | ++ | ++ | ++ | ++ | ++ | ++ | ++ |
| 17 | *Cybister chinenesis* (Motschulsky, 1854) | + | + | + | + | | | | + | | | + | + |
| 18 | *Hydaticus ricinus* (Wewalkar, 1979) | | | | + | + | + | + | + | | | | + |
| 19 | *Eristalis tenax* (Linnaeus, 1758) | + | + | + | | | | | | | | + | + |
| 20 | *Chironomus* Sps. (Meigen, 1803) | + | ++ | ++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | +++ | +++ | +++ |
| 21 | *Anophelus* mosqito larvae | ++ | ++ | +++ | +++ | ++++ | ++++ | +++ | ++ | + | + | | |
| 22 | *Culex* mosquito larvae | +++ | +++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | ++++ | | | |
| 23 | *Sympetrum vulgatum* (Linnaeus, 1758) | + | ++ | + | + | + | +++ | ++ | ++++ | ++++ | ++++ | ++++ | ++++ |
| 24 | *M. malcolmosonii* (Milne-Edwards, 1844) | ++ | +++ | +++ | +++ | ++ | +++ | ++ | + | + | | | |
| 25 | *Macrobrachium rosenbergii* (De. Man, 1879) | ++ | ++ | ++ | ++ | ++ | ++ | + | + | + | | | |
| 26 | *Ischnura ramburii* (Selys, 1850) | + | + | + | + | + | + | | | | + | + | + |
| 27 | *Orthetrum cancellatum* (Linnaeus, 1758) | + | + | ++ | + | + | +++ | +++ | ++++ | +++ | ++++ | ++++ | ++++ |

## 4. CONCLUSION

Molluscans presence indicates less amount of water pollution, hence these are referred as Bio-indicator species. In the present water body good number of molluscan presence was noted. The second dominant species are Insects of arthropoda phylum. In Insecta division Chironomous larvae, Anopheles and Culex mosquito larvae are the dominant species. Chironomous larvae are the major food source to aquatic animals like fishes, amphibians, and some aquatic birds and plays connecting role in between producers and consumers in the aquatic food chain. The third largest dominant species in the study period is Crustaceans species like prawns. The presence of prawns in the selected reservoir indicates a healthy trophic status.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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