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Address for correspondence:

Ganesh G. Manthena
Department of Zoology, Dr.
Babasaheb Ambedkar Marathwada
University
Email: manthani.gani@gmail.com

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Ecological Study of Edible Fish Species in Sriramsagar Reservoir

Ganesh G. Manthena¹, Premchand B. Sirsat²

¹Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University

²Dept.of Zoology, Mrs. K. S. K. College, Beed (M.S.)

Abstract

The diversity and distribution of edible fish species in the Sriramsagar Reservoir, Telanagana, India is examined through this study. Three sampling stations vannal khurd (Station-I), magidi(Station-II) and sonpet-pochampad(Station-III) were used to established. The study during January 2023 and November 2024, with the assistance of local fishermen and using gill nets and throwing nets. Sampling was conducted during this Five edible fish species- *Anguilla bengalensis*, *Labeo rohita*, *Catla catla*, *Notopterus notopterus* and *Tilapia mossambica* were identified. Seasonal and spatial variations in distribution were exhibited. Several environmental parameters like temperature, electrical conductivity, Ph, turbidity and chemical factors like nitrates, nitrites, sulphates, calcium and magnesium were analysed to assess their influence on fish populations. It is noticed that seasonal changes and environmental factors significantly affected species abundance and distribution. At Station-III, the highest diversity was recorded during summer. The main reservoir storage area catchment exhibited more pronounced seasonal fluctuations due to variations in water quality and agricultural runoff.

The comparative analysis of the above three stations revealed that fish population were more stable in deeper reservoir regions, then in catchment areas, where fluctuation of water level and nutrient concentrations were more. Fishing pressure, pollution, and habitat modification were few additional factors which influenced the species composition. The insights into the reservoirs ecological dynamics, contributing to sustainable fisheries management and conservation strategies are provided by this study. The need for continuous monitoring of water quality and fish populations is emphasized to maintain ecological balance and enhance fisheries productivity in the region. This study offers valuable insights into the ecological dynamics of the reservoir, supporting sustainable fisheries management and conservation efforts. The findings highlight the importance of ongoing monitoring of water quality and fish populations to preserve ecological balance and improve fisheries productivity in the region.

Keywords: Edible fish species, Sriramsagar Reservoir, fish diversity, seasonal variation, environmental parameters, freshwater ecosystem, Telangana fisheries, spatial variation, habitat dynamics, anthropogenic impact.

Introduction

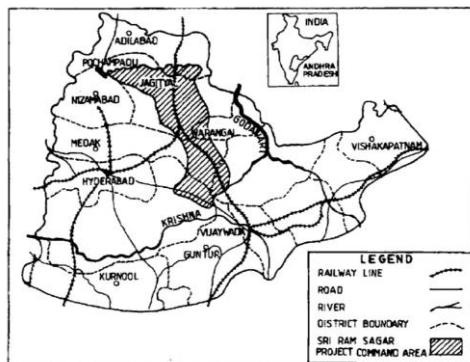
The Sriramsagar Reservoir, located in Telangana, is a crucial water body supporting irrigation, drinking water supply, and fisheries. Understanding fish diversity and the environmental parameters influencing it is essential for ecological management and sustainable fisheries. Fish is the one of the most important source of animal diet for mankind. Groombridge 1992 study reveals that there are around 24,600 species of known fishes, comprising almost half of the number of total vertebrates⁽¹⁾. Nelson (1994) has estimates a total number of fish species only 400 species are commercially viable⁽²⁾. Jayaram 1981, Jhingram 1991, Dutta 2003, Mishra 2003 have made a study on Ichthyofaunal diversity of various fresh water bodies in India⁽³⁾.

Biodiversity conservation in general and fish genetic resources in particular have become issues of great concern both globally and nationally⁽⁴⁾. From time immemorial, rivers are said to be the lifeline for living beings, as they have played a vital role in the development of human civilization, since they provide basic necessities of life, water and food, on which depends the survival of living-beings⁽⁵⁾. Freshwater ichthyological diversity is the most crucial part of biodiversity as it is difficult to be estimated and protected⁽⁶⁾. Fish are essential living components of aquatic ecosystem, serving as a vital food resource and reliable indicators of the ecological health of their habitats. Out of a total of 2,500 species of fish in India, 930 are in freshwaters and belong to 326 genera, 99 families and 20 orders; however, the rich biodiversity of freshwater fish of the Indian region has been rapidly dwindling because of increasing degradation of inland water⁽⁷⁾. Fish assemblages may differ on longitudinal gradient in streams according to various biological aspects such as species diversity, stress tolerance, habitat preferences, feeding behaviours and origin of species⁽⁸⁾.

The Indian subcontinent is home to approximately 2500 fish species including freshwater species and 1570 marine. There are 801 freshwater fishes present (Froese and Pauly 2002) ⁽⁹⁾. The adverse effects of human activities have resulted in degradation of stream and riverine ecosystem ⁽¹⁰⁾. This study focuses on the seasonal distribution of edible fish species and examines how physical and chemical factors impact their distribution.

Materials and Methods

Study Area



Sampling Stations:

The Sriramsagar Project, also referred to as the Pochampad Project, is a flood-flow initiative on the Godavari River, located in Nizamabad district, approximately 3 km from National Highway 44. This irrigation project serves the agricultural needs of several districts, including Nizamabad, Karimnagar, Warangal, Adilabad, Nalgonda, and Khammam, in Telangana. Additionally, it provides drinking water to Warangal city. The dam site also hosts a hydroelectric plant, equipped with four turbines, each with a 9 MW capacity, generating a total of 36 MW.

The study was conducted within the Godavari River basin in Nizamabad district, which experiences a tropical climate with distinct seasonal variations: the rainy season from June to October and the winter season from December to February. Sampling stations located on the main river stretch comprise pre-dam region and dam region.

Station 1 (Vannel Khurd): Located in the catchment area, characterized by shallow waters during the dry season.

Station 2 (Magidi): Another catchment area with moderate water flow.

Station 3 (Sonpet & Pochampad): The main reservoir storage area with deeper and more stable water levels.

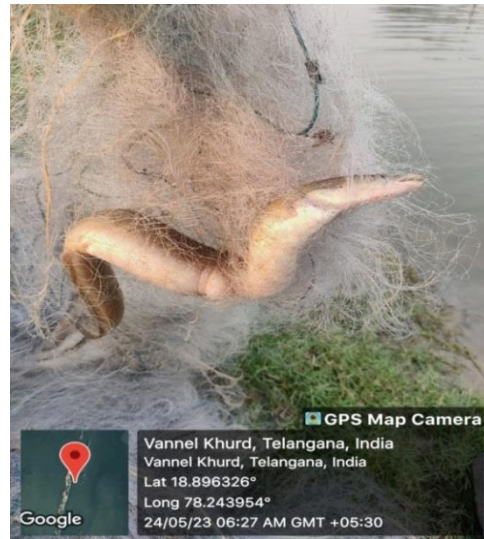
Fish Sampling

Fish samples were collected seasonally (summer, rainy, and winter) from January 2023 to November 2024. Local fishermen employed gill and cast nets for fish sampling. Fishing was done during morning periods. For morphological study, species were collected and preserved in 4% Formaldehyde solution. Fish identification based on the keys for Fishes of Indian subcontinent Talwar & Jhingram 1991; Tal and Jhin-1992,1999; Nelson,2006 ⁽¹⁰⁾. Freshwater Fishes of the Indian Region by Jayaraman ⁽¹¹⁾ was followed. morphometry and taxonomical characteristics using standard fish identification keys. Fish species identification was validated using guidelines produced by Day (1958), Talwar and Jhingran (1991), Jayaram (1999), Menon (1999) and Munro (2000)⁽¹²⁾.

Environmental Parameters

The surface water samples were collected from 3 sampling blow 6 to 8 from January to June for the collection of samples 1 liter plastic measuring jar were used. Water samples were tested for different physico-chemical as per APHA method. Physical parameters: Temperature, electrical conductivity (EC), turbidity. Chemical parameters: Total alkalinity, pH, nitrates, nitrites, sulphates, calcium, magnesium.

Results: In the present study, total of 6 fish species were recorded. Order Cypriniformes was the most specious with 03 species. It was followed by Osteoglossiformes (01 species), and Cichliformes (01 species), and Anguilliformes (01 species) (Table-1). Among the families Cyprinidae was represented by the highest number of species (03), followed by Notopteridae, Cichlidae, and Anguillidae (represented by 01 species each).All of the recorded species,02 were Omnivorous (Cirrhinus & Tilapia),02 were carnivorous (Notopterus & Anguilla),01 was planktivores (Catla), and 01 was herbi-omnivorous (Labeo).

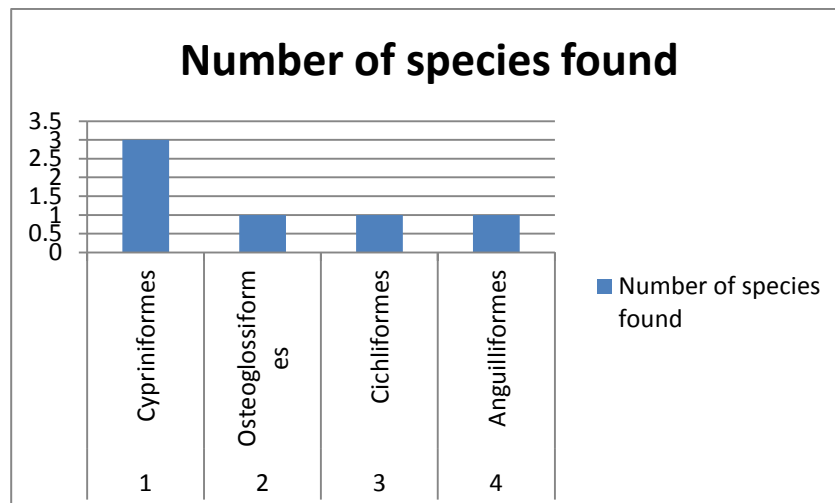


(Fig 1 & 2: Showing Collection of Fish Samples from Sampling Stations.)

In my study, the Cyprinidae family was the most dominant. Several researchers have also highlighted the significant dominance of the Cyprinidae family in their studies. 43 fish species from lower Duddhana project at Parbhani District, India were recorded by Kalyankar(2012)⁽¹³⁾. 23 fish species from Masoli reservoir District Parbhani observed by Kadam et.al,(2007)⁽¹⁴⁾. 32 fish species belonging to 25 genera and 8 families from Pharbhani District of Maharashtra were recorded by Ahirrao and Mane(2000)⁽¹⁵⁾. 23 species belonging to 07 order were Cyprinidae family is dominant species from Jawalgaon reservoir Solapur District Maharashtra were reported by Sakhare(2001)⁽¹⁶⁾. In Hirakud Prakalp Cat fish in abundance was recorded by Mahapatra,D.K.,(2003)⁽¹⁷⁾. He noticed a total of 43 species present in which 18 species were commercially important, 26 species belonging to 5 order, 7 families and 15 genera were recorded from Godavari river at Tq. Mudgal Dist. Parbhani⁽¹⁸⁾.

Table 1: Order-wise Ichthyofauna diversity of Sriramsagar Reservoir Across Three Sampling Stations.

S.No.	Order	Number of species present
1.	Cypriniformes	03
2.	Osteoglossiformes	01
3.	Cichliformes	01
4.	Anguilliformes	01



(Fig.: Order-wise number of the fish recorded in Order).

Distribution of different fish species across the sampling stations

Station 1 (May): *Anguilla bengalensis* and *Labeo rohita*.

Station 1 (January): *Notopterus notopterus*, *Tilapia mossambica*, *Labeo rohita*.

Station 2: *Catla catla*, *Tilapia mossambica* (varied by season).

Station 3: *Cirrhinus mrigala*, *Catla catla*, *Labeo rohita*.

The distribution of different fish species varied across the three sampling stations and seasons. A total of six species were identified: Labeo, Catla, Notopterus, Tilapia, Mrigala, and *Anguilla bengalensis*.

Station 1 (Vannel Khurd): During May, this station recorded *Anguilla bengalensis* and *Labeo rohita*. These species are known for their adaptability to warmer conditions and the nutrient-rich shallow waters typical of the dry season. In January, *Notopterus*, *Tilapia*, and *Labeo* were observed, likely due to increased water flow from upstream areas during the winter season.

Station 2 (Magidi): This catchment area displayed seasonal variations, with species such as *Catla* and *Tilapia* being more prominent during the post-monsoon and winter months. The seasonal influx of water from agricultural runoff might have enriched the nutrient availability, favoring these species.

Station 3 (Sonpet & Pochampad): As the main reservoir storage area, this station consistently supported larger and Ecologically significant species such as *Catla*, *Labeo*, and *Mrigala*. These species thrive in deeper, more stable water conditions with relatively lower turbidity and higher oxygen levels.

Table 2: Distribution of Fish Species Across Sampling Stations and Seasons.

Station	Season	Fish Species present	Remarks
Station-I (Vannel Khurd).	May.	<i>Anguilla bengalensis</i> , <i>Labeo rohita</i> .	Warmer conditions and nutrient rich shallow waters typical of the dry season.
	January.	<i>Notopterus</i> , <i>Tilapia</i> and <i>Labeo</i> .	Increased water flow from upstream during winter season.
Station-II (Magidi).	Post-monsoon/ Winter.	<i>Catla</i> , <i>Tilapia</i> .	Seasonal influx of water from agricultural runoff enriched nutrients availability.
Station-3 (Sonpet and Pochampad).	Year-round.	<i>Labeo</i> , <i>Catla</i> and <i>Mrigala</i> .	Stable water conditions with lower turbidity and higher oxygen levels favouring larger, commercially important species.

Environmental Parameters

Environmental parameters showed significant seasonal and spatial variations, influencing fish species distribution.

Station 1 (Vannel Khurd):

Temperature: Higher temperatures (24.3°C in June) correlated with increased activity of species like *Anguilla bengalensis*. Turbidity: Elevated turbidity during the rainy season likely limited the presence of some species.

Station 2 (Magidi):

Species like *Tilapia* prefer stable alkaline pH (7.6-8.1) as favourable conditions. High level of nitrates and nitrite due to agriculture runoff supported omnivorous fish.

Station 3 (Sonpet & Pochampad):

The water quality parameters like lower turbidity and moderate electrical conductivity (190–240 µS/cm), consistently favored larger, economically significant species.

Fish Abundance and Seasonal Trends

Labeo was the most frequently observed species, distributed across all stations and seasons highlighting its adaptability to diverse environmental conditions. Seasonal abundance ; migratory species like *Anguilla bengalensis* got spotted during summer months. On the other hand winter saw a higher abundance of *Tilapia* and *Notopterus*.

Discussion

Spatial and temporal variations in environmental factors which influenced significantly the fish distribution is highlighted in this study. It is noticed that the catchment areas- station-I and II experienced more seasonal fluctuations in water levels, which lead to the presence of migratory species like *Anguilla bengalensis* during specific months. The main reservoir station-III supports more stable population of commercially viable species like *Catla* and *Cirrhinus*.

The adaptability of certain species to warmer conditions during summer underscored the correlation between water temperature and species distribution, species diversity was influenced by higher pH levels and nutrient content in the catchment area, favouring species like *Tilapia*.

Conclusion

A detailed account of fish diversity in Sriramsagar Reservoir and the environmental factors affecting it is provided by this study. Strategies for sustainable fisheries management and conservation in the reservoir can be formulated by the findings.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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