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Research Article

A Comprehensive Review on Helminth Parasites of Freshwater Fishes in Nanded District, Marathwada Region

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Abstract

Freshwater ecosystems support diverse fish communities that are vital for local nutrition, economy, and biodiversity. However, fish health is adversely affected by parasitic helminths - including cestodes, trematodes, and nematodes- which cause tissue damage, reduced growth, reproductive impairment, and increased mortality. In the Nanded district of Maharashtra, belonging to the Marathwada region and situated along the Godavari River basin, assessments of helminth parasite occurrences have revealed a wide helminth fauna infecting several freshwater fish species. Surveys conducted in this region and adjacent parts of Marathwada show that approximately half of examined fishes harbour helminth infections, with seasonal fluctuations influenced by environmental and host factors. This review km, /compiles available literature on the diversity, seasonal prevalence, host associations, and ecological determinants of helminth infections in freshwater fishes in the Nanded district, synthesising information to highlight patterns and research gaps. The study underscores the need for integrated ecological and molecular investigations to understand helminth biodiversity and its impacts on fish health and fisheries sustainability in the region.

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1. INTRODUCTION

Helminth parasites- multicellular worms belonging to Cestoda (tapeworms), Trematoda (flukes), and Nematoda (roundworms)- are among the most widespread pathogens infecting freshwater fishes globally. These parasites exploit fish hosts at various life stages and can cause significant pathology that undermines fish health and fisheries productivity. In tropical and subtropical regions such as India, environmental conditions (temperature, humidity, water quality) further influence parasite life cycles and transmission dynamics.

India ranks among the top countries for inland fish production, with freshwater fisheries contributing substantially to dietary protein and local livelihoods. The Marathwada region of Maharashtra, characterized by seasonal rivers, reservoirs, lakes, and agricultural water bodies, sustains diverse fish communities, including economically significant species such as *Channa punctatus*, *Wallago attu*, *Clarias batrachus*, and *Mastacembelus armatus*. Nanded district- positioned in southeastern Maharashtra along the Godavari River- provides multiple freshwater habitats that facilitate interactions between fish hosts and helminth parasites.

Despite the ecological and economic importance of fish in this region, research focused specifically on helminth parasites of freshwater fishes in Nanded has been relatively limited compared with other regions of India. Historical and recent studies from Marathwada have documented helminth infections, demonstrating substantial prevalence, seasonal patterns, and environmental influences. This review synthesizes the existing literature on helminth parasites of freshwater fishes in the Nanded district, emphasizing parasite diversity, host specificity, seasonal dynamics, and ecological determinants. By integrating regional findings, this paper aims to support future research and fisheries management strategies in the region.

2. MATERIALS AND METHODS

This review is compiled from published research articles, regional survey reports, and academic theses pertaining to helminth parasites of freshwater fishes from the Nanded district of the Marathwada region and surrounding areas in Maharashtra. Key data sources included:

- Historical helminth parasite surveys across Marathwada, including Nanded localities, focusing on cestodes, trematodes, and nematodes.
- Species-specific studies reporting helminth infection patterns in freshwater fish hosts (e.g., *Channa punctatus* and *Mystus seenghala*) from the Nanded district and neighboring reservoirs.
- Broader literature on helminth parasite prevalence, intensity, and seasonality in freshwater fishes of other Indian regions for ecological comparison.

Primary data extracted from these sources included host species examined, types of helminth taxa reported, prevalence and intensity of infection, seasonal variations, and environmental factors linked to parasite distribution. Studies sampled fishes from various water bodies including rivers, reservoirs, and ponds across seasonal cycles, examining internal organs

(primarily intestines and body cavities) for parasite presence using standard parasitological techniques.

3. RESULTS

Helminth Parasite Diversity in Freshwater Fishes

Survey-based studies conducted across the Marathwada region, including several sampling locations within the Nanded district, have revealed a considerable diversity of helminth parasites infecting freshwater fishes. The helminth fauna recorded from this region comprises representatives of three major taxonomic groups: cestodes, trematodes, and nematodes. These parasites were recovered from multiple fish species inhabiting rivers, reservoirs, and other freshwater bodies connected to the Godavari river system.

Cestodes-

Cestodes were found to be the most dominant and diverse group of helminth parasites infecting freshwater fishes in the study region. Several genera of tapeworms have been reported, including *Senga*, *Gangesia*, *Proteocephalus*, *Lytocestus*, and *Silurotaenia*. These parasites were primarily recovered from the intestinal tracts of infected fishes, where they attach to the mucosal lining using specialized scolices equipped with hooks or suckers.

The most commonly infected host species included *Channa punctatus*, *Wallago attu*, *Clarias batrachus*, and *Mastacembelus armatus*. The high prevalence of cestode infections in these fishes is likely associated with their carnivorous or omnivorous feeding habits, which increase the likelihood of ingesting intermediate hosts such as copepods or other aquatic invertebrates harboring infective larval stages. In several surveys, cestodes accounted for the highest proportion of total helminth recoveries, indicating their ecological dominance among parasitic worms in freshwater fishes of the region.

Trematodes-

Digenetic trematodes constituted the second most frequently reported group of helminth parasites. Species belonging to genera such as *Allocreadium*, *Orientocreadium*, and other related fluke taxa were recorded from freshwater fishes in Nanded district and adjoining areas of Marathwada. These parasites were mainly recovered from the intestine, stomach, and occasionally from other internal organs of fish hosts.

Trematode infections were particularly common in riverine fish species, suggesting that flowing water ecosystems provide favorable conditions for the completion of their complex life cycles, which typically involve molluscan intermediate hosts. The occurrence of trematodes indicates the presence of suitable intermediate hosts and reflects the ecological complexity and biological productivity of freshwater habitats in the region.

Nematodes-

Nematode parasites were recorded at comparatively lower diversity and abundance than cestodes and trematodes. Species such as *Procamallanus* and other unidentified roundworms were detected in the digestive tracts, stomach walls, and body

cavities of examined fish hosts. Although nematodes represented the least diverse group among the helminths reported, their presence is ecologically significant, as many nematodes possess direct or indirect life cycles that enable them to persist under varied environmental conditions.

The lower richness of nematodes in freshwater fishes of Nanded district may be attributed to host specificity, habitat preferences, or limited sampling in certain ecological niches. Nevertheless, nematode infections were consistently recorded across multiple host species, confirming their role as integral components of the regional helminth fauna.

Overall, surveys conducted in the broader Marathwada region, including Nanded district, documented a total of seven genera of helminth parasites infecting freshwater fishes, comprising four cestode genera, two trematode genera, and one nematode genus. Cumulative survey data revealed that approximately 55.4% of the examined fishes were infected with one or more helminth species, with a total recovery of 689 individual helminths during a single survey cycle. This high infection rate indicates widespread helminth parasitism among freshwater fishes in the region.

Host Associations and Infection Sites

Freshwater fish species such as *Channa punctatus*, *Wallago attu*, *Clarias batrachus*, and *Mastacembelus armatus* were identified as the principal hosts for helminth parasites in the region. These fishes exhibited varying degrees of infection, ranging from light to heavy parasitic burdens, depending on host species, size, age, and feeding behavior.

Cestodes and trematodes were predominantly localized in the intestinal tract, where they compete with the host for nutrients and may cause mechanical damage to intestinal tissues. In contrast, certain nematodes were observed embedded in the stomach wall or freely residing within the body cavity. The localization of parasites in specific organs reflects their adaptation to host physiology and feeding ecology.

Carnivorous and benthic-feeding fishes demonstrated higher infection rates compared to herbivorous species. This pattern suggests that dietary habits play a crucial role in helminth transmission, as predatory fishes are more likely to consume intermediate hosts carrying infective stages of parasites.

Seasonal Variation and Environmental Influences

Helminth infections in freshwater fishes of Nanded district exhibited pronounced seasonal variations. Survey results consistently indicated higher prevalence and intensity of infections during the summer season. Elevated water temperatures during summer likely enhance parasite egg development, larval survival, and activity of intermediate hosts, thereby increasing transmission rates. Additionally, increased feeding activity and metabolic rates in fish during warmer months may further elevate exposure to infective stages.

Moderate levels of helminth infections were observed during monsoon and winter seasons. During the monsoon, increased water flow and dilution effects may reduce contact between hosts and infective stages, while in winter, lower temperatures

may slow parasite development and host metabolism. However, seasonal patterns were not uniform across all species and locations, as environmental conditions, water quality, host population structure, and parasite life cycles interact to influence infection dynamics.

Comparable studies from other freshwater regions of India report similar seasonal trends, reinforcing the view that helminth prevalence and mean abundance are strongly influenced by seasonal environmental factors. Host size, sex, reproductive status, and ecological behavior, along with abiotic parameters such as temperature and water availability, collectively shape the observed patterns of helminth parasitism.

4. DISCUSSION

The helminth fauna of freshwater fishes in the Nanded district reflects the general trend observed in tropical freshwater ecosystems: fishes act as definitive hosts for a variety of parasitic worms, with cestodes often dominating the parasite assemblage, followed by trematodes and nematodes. These parasites have complex life cycles that typically involve one or more intermediate hosts (e.g., aquatic invertebrates), which may be abundant in regional water bodies due to favorable climatic conditions.

The high overall infection prevalence (~55%) documented across Marathwada region surveys suggests that helminth parasitism is a significant ecological factor for fish populations in the area. Host feeding ecology plays an important role—carnivorous and omnivorous fishes such as snakeheads and catfishes are more likely to ingest intermediate hosts harboring infective stages, leading to heavier parasite burdens.

Seasonality plays a critical role in helminth transmission dynamics. Elevated prevalence in summer corresponds with increased metabolic rates, host activity, and parasite development in warmer water, while monsoon flooding and colder temperatures can reduce transmission efficiency. Environmental factors such as water quality (temperature, dissolved oxygen), habitat structure, and climatic extremes further modulate infection rates.

The diversity and prevalence of helminth parasites reported in Nanded and neighboring Marathwada districts also highlight the ecological complexity of parasite–host interactions in Indian freshwater systems. However, many studies primarily rely on morphological identification, and detailed molecular data remain limited. Such molecular approaches could unravel cryptic species diversity and refine understanding of host specificity and transmission pathways.

Furthermore, the economic and health implications of helminth infections in fish—such as reduced fish growth, increased susceptibility to diseases, and potential public health risks for zoonotic species—warrant attention from fisheries management and public health perspectives.

5. CONCLUSION

Helminth parasites represent a diverse and ecologically significant component of freshwater fish fauna in Nanded district and the broader Marathwada region of Maharashtra.

Cestodes, trematodes, and nematodes infect multiple fish hosts, with prevalence patterns influenced by seasonal and environmental factors. Despite valuable survey data, further research is needed to incorporate molecular identification, life-cycle studies involving intermediate hosts, and assessments of pathological and economic impacts. Improved knowledge will support sustainable fisheries management, fish health interventions, and conservation of freshwater ecosystems in the region.

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