IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

Prevalence Of Cestode Parasites In Freshwater Fish From Pali Bindusara Reservoir, Beed District (M.S.), India

[1]V. G. KHADSE and [2]V. M. JAYSHINGPURE
Department of Zoology,
[1] Milliya Art's, Science and Management College Beed.
[2] Balbhim Arts, Science and Commerce Collge, Beed.

Abstract: This study investigates the prevalence of cestode parasites in various vertebrates. These parasites are widely distributed among fish, amphibians, reptiles, birds, and mammals. While cestode infections have been extensively studied worldwide, research on their occurrence in Indian vertebrates remains limited. Understanding their impact is crucial, as they can cause severe infections, leading to significant health concerns and ecological imbalances. Among the affected species are Mastacembelus armatus, Wallago attu, and Clarias batrachus, nocturnal fish that inhabit rivers, coastal marshes, and sandy or rocky riverbeds. Like many other aquatic organisms, these fish are highly susceptible to cestode infections, which can negatively affect their health, growth, and survival. The presence of these parasites in vertebrates is particularly concerning because many of these hosts—including fish, birds, and mammals—are essential food sources for humans and hold substantial economic importance. The study's findings indicate that the helminth infestation index was lower in Wallago attu and Clarias batrachus compared to Mastacembelus armatus. The highest rates of parasitic infestations were recorded during the summer months in freshwater fish. Additionally, the study highlights the detrimental impact of anthropogenic activities since 2022, which have led to a decline in fish populations due to habitat destruction and pollution caused by illegal construction and other human activities. When infected hosts are consumed without proper cooking or preparation, cestode parasites can be transmitted to humans, leading to various health complications. Furthermore, cestode infections contribute to increased mortality rates among host species, reducing their nutritional and commercial value. The findings suggest that environmental factors and feeding habits play a crucial role in influencing the seasonal variation of parasitic infections, either directly or indirectly. Understanding the prevalence and effects of cestode infections is essential for biodiversity conservation, ensuring food safety, and minimizing economic losses in affected species.

Keywords: cestode, prevalence, Mean intensity, abundance, Beed.

Introduction

Cestodes, or tapeworms, are parasitic flatworms that infect various hosts, including humans and animals. The prevalence of cestode infections varies worldwide, influenced by hygiene, sanitation, diet, and the presence of intermediate hosts. Parasitism is a common biological phenomenon, and parasitic diseases pose significant public health challenges, particularly in tropical, socioeconomically underdeveloped regions, leading to morbidity and mortality.

Tapeworms have a head region with suckers and, in some species, hooks for attachment to the host's intestinal wall. They also possess an unsegmented region that produces new body segments. These segments contain reproductive organs and mature as they move toward the end of the worm, where fully developed proglottids release eggs in the host's feces.

The genus *Senga* was established by Dollfus under the family Ptychobothridae, with *S. besnardi* described from *Betta splendens* by Shinde and Deshmukh. Helminths significantly contribute to parasitic infections in fish, leading to reduced weight gain and high mortality rates. Parasitic infections, either alone or combined with stress, can impair host growth and reproduction, causing economic losses. They also disrupt nutrition, metabolism, and digestive functions, damage the nervous system, and may lead to gastrointestinal abrasions, increasing susceptibility to opportunistic infections.

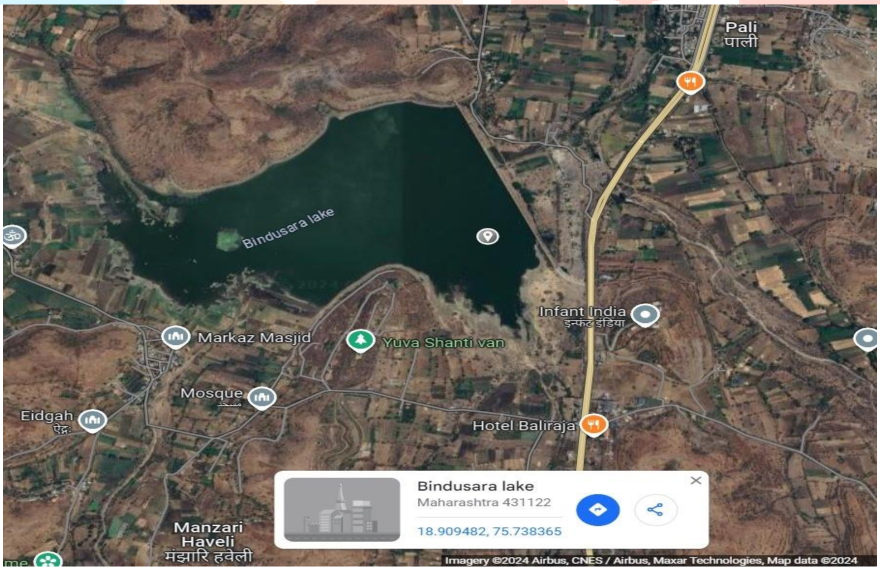
Objectives:

1. Conduct a study on selected freshwater bodies and collect a sufficient number of specimens for research purposes.
2. Identify endoparasites from the stomach and intestines of selected freshwater fish species using appropriate identification keys.
3. Determine the prevalence and comparative status of parasites in the selected fish species from two different locations, analyzing the data using bio-statistical methods.
4. Evaluate the host-parasite relationship in the selected fish species.
5. Document the collected parasites through digital photography whenever feasible.

Material and methods:

Study area-

Beed District, situated in central-western Maharashtra, is bordered by Aurangabad and Jalna to the north, Parbhani and Latur to the east, Ahmednagar and Osmanabad to the south, and Ahmednagar again to the west. It lies between latitudes 18.28°–19.28° North and longitudes 74.54°–76.57° East. The Godavari River serves as a major natural boundary, flowing along the border of Georai and Majalgaon tehsils.



Beed District is part of the Deccan Plateau, predominantly composed of black basalt rock. The Balaghat mountain range extends from Ahmednagar in the west to Beed's eastern border, dividing the district into two distinct regions. To the north lies the Gangathadi plain, also known as the "bank of Ganga-Godavari," with elevations ranging from 1,200 to 1,500 feet above sea level. In contrast, the southern region features the elevated Balaghat range, where elevations range between 2,000 and 2,200 feet.

Ashti tehsil, located in the southern part of the district, has elevations between 1,750 and 2,000 feet, sloping southward. Several hills in the region rise above 2,500 feet. Fishery activities in the district are primarily carried out in reservoirs, check dams, and major dams such as the Pali and Bindusara dams.

Collection of fish Sample: -

The fishes for the present study were collected from local fish markets and water resource such as Pali Bindusara reservoir Beed district of Maharashtra.

Identification of fish sample: -

The fishes from dams were collected using various fishing methods. After sampling, photographs of fishes were taken and collected fish samples were preserved in 10% formalin for detailed examination and Keys of Yamaguti(1959), and (1961) were used for the identification of helminths.

Ecological Analysis of Fish Parasites:

Ecological terms are studied as per the formula given by Margolis.

Prevalence Calculation: The prevalence of each parasite species is calculated as the percentage of infected fish in the sample. This is a measure of how widespread the parasite is within the fish population.

$$\textbf{Prevalence} = \frac{\text{Total No. of hosts infected}}{\text{Total No. of hosts examined}} x100$$

Intensity of Infestation: The intensity of infection refers to the number of parasites per infected fish, providing an idea of the parasite load. It can be calculated as the average number of parasites found per infected fish.

$$\textbf{Mean Intensity} = \frac{\text{Total No. of parasites collected}}{\text{Total No. of Infected Hosts}}$$

$$\textbf{Abundance} = \frac{\text{Total No. of parasites collected in a sample}}{\text{Total No. of Hosts Examined}}$$

$$\textbf{Index of Infection} = \frac{\text{No. of host infected x No. of parasite collected}}{\text{Total No. of Hosts examined}}$$

Results and Discussion:

This study aims to assess and compare the current status of freshwater bodies in the Beed region. The helminth infestation index in *Wallago attu* and *Clarias batrachus* is lower compared to *Mastacembelus armatus*. The prevalence of parasitic infections in fish varies significantly with seasonal changes, influenced by factors such as water temperature, fish behavior, host availability, and environmental conditions.

Seasonal variations impact the prevalence, intensity, and distribution of parasites in aquatic ecosystems. Warmer temperatures in summer accelerate parasite life cycles, leading to increased reproduction and growth, particularly in helminths like nematodes. Higher temperatures also promote active feeding and growth in both fish and parasites, resulting in higher infestation rates, especially in shallow or warm water environments.

During colder months, parasite life cycles slow down due to reduced metabolic rates in the aquatic environment. This decrease in activity and reproduction is particularly evident in temperature-sensitive parasites. The rainy season further alters water conditions by increasing water levels and runoff, potentially introducing new hosts and boosting parasite populations in certain areas. Rainwater can also transport parasite eggs and larvae from surrounding environments, increasing fish exposure to infection.

Prevalence, Mean Intensity, Abundance rate and Index of infection:

Out of the 120 fish specimens examined in the Beed Region, Pali Bindusara Reservoir, 40 were found to be infected with endoparasites, which were identified as Cestode. The fish species examined included *Mastacembelus armatus* (50 specimens), *Wallago attu* (35 specimens), and *Clarius Batracus* (35 specimens).

The study revealed that the prevalence of infection was highest during the summer season, followed by winter and rainy seasons. The maximum prevalence (64%) was observed in *Mastacembelus armatus* during summer, while the minimum prevalence (25%) occurred in *Wallago attu* during winter. The highest mean intensity (1.87) was recorded in *Mastacembelus armatus* in summer, while the lowest intensity (1.00) was seen in *Wallago attu.* The abundance rate was highest in *Wallago attu* during summer (2.92), whereas it was lowest in *Mastacembelus armatus* during the rainy season (1.42). The infestation index was also highest in *Mastacembelus armatus* during summer (54%) and lowest in *Wallago attu* during winter (6.75%) (Table).

Host-Parasite Relationship:

Host Species and Susceptibility: Analyze the relationship between host species and parasite infestation. Some fish species may be more susceptible to certain parasites due to their physiology, habitat preferences, or feeding behavior.

Fish Size and Parasite Load: Examine whether fish size (length/weight) correlates with parasite load. Larger fish may harbor more parasites, or younger, smaller fish might be more susceptible to infections.

Age and Immunity: Older fish may develop acquired immunity against certain parasites, reducing the parasite load. Compare parasite prevalence in different age groups within the fish population.

Discussions:

Food Safety Regulations and Public Health

The presence of parasites in fish has prompted the establishment of food safety regulations aimed at protecting consumers. These regulations typically include guidelines on proper freezing or cooking techniques to eliminate parasites before consumption. The World Health Organization (WHO) and local health authorities often monitor fish markets and aquaculture facilities to ensure that fish intended for human consumption are free from parasites. In regions where parasitic infections are common, educating the public on safe fish consumption practices, such as cooking fish to the recommended temperature or freezing it before eating, is crucial. If not addressed, the widespread prevalence of parasitic infestations could lead to an increase in foodborne diseases, potentially resulting in a public health crisis.

Fish diseases and parasite:

This study highlights the complex interplay between fish size, seasonal changes, and parasitic infestations. Larger fish are more prone to parasitic infections due to their increased surface area and internal organ capacity. Seasonal factors, such as temperature and rainfall, significantly influence parasite prevalence and intensity, with infestations peaking during warmer months.

Human-induced environmental stressors further aggravate these issues by weakening fish populations and compromising their immune systems. Additionally, the potential transmission of parasitic diseases from infected fish to humans underscores the need for continuous monitoring and management of aquatic health, especially in regions affected by pollution and environmental degradation.

Parasitic infections pose serious challenges to both aquaculture and wild fisheries, impacting fish health, economic stability, and public health. Early detection, proper fish management, and preventive measures—such as ensuring safe cooking practices—are essential in mitigating the risks associated with fish parasites.

Ongoing research into advanced treatment methods and effective parasite control strategies will be crucial for sustaining fish populations and ensuring food safety.

Conclusion:

This study underscores the intricate relationship between fish size, seasonal changes, and parasitic infestations. Larger fish tend to harbor more parasites due to their greater surface area and internal organ capacity. Seasonal variations, particularly temperature and rainfall, significantly influence parasite prevalence and intensity, with warmer months often leading to higher infestation rates.

Human-induced environmental pressures further exacerbate these challenges by weakening fish populations and compromising their immune defenses. Additionally, the potential transmission of parasitic diseases from infected fish to humans highlights the necessity for continuous monitoring and management of aquatic health, particularly in areas affected by environmental degradation and pollution.

Parasitic infections pose a major threat to both aquaculture and wild fisheries, impacting fish health, economic stability, and public well-being. Early detection, proper fish management, and preventive measures—such as safe cooking practices—are crucial in reducing the risks associated with fish parasites. Continued research into improved treatment methods and parasite control strategies will be essential for maintaining sustainable fish populations and ensuring the safety of fish consumption.

Recommendations:

- Raise awareness among fish farmers, fishers, and the general public about the importance of fish health and effective parasite management practices.
- Conduct routine health assessments of both wild and farmed fish to enable early detection of parasites, including microscopic examinations of fish skin, gills, and internal organs.
- Develop sustainable, non-chemical treatments such as biological controls or vaccines to manage fish parasite infections effectively.
- Inform the public about the risks of consuming raw or undercooked fish and promote proper cooking methods to eliminate potential parasites.
- Educate fish farmers and fishery workers on the significance of maintaining strict biosecurity measures to minimize parasite transmission.
- Quarantine new fish before introducing them into existing aquaculture populations to prevent the spread of parasites from infected fish.

OBSERVATION TABLE:

Table: Infestation index of Helminth parasites in selected freshwater species at study area with respect to seasonal variations:

Fish Species	Seasons	Prevalence rate	Mean intensity	Abundance rate	Infestation index
Mastacembelus armatus	Summer 2024	**64%**	**1.87**	**1.42**	**54**
	Rainy 2024	**41%**	**3.6**	**1.16**	**45**
	Winter 2024	**32%**	**6.3**	**1.21**	**30**
Wallago attu	Summer 2024	**25 %**	**1.00**	**2.91**	**6.75**
	Rainy 2024	**18.18%**	**5.5**	**2.18**	**5.45**
	Winter 2024	**6.66%**	**15**	**1.80**	**3.65**
Clarius Batracus	Summer 2024	**34.28 %**	**1.25**	**1.75**	**9**
	Rainy 2024	**28.50%**	**2.5**	**1.30**	**6.75**
	Winter 2024	**20.%**	**4.25**	**1.00**	**4.58**

Acknowledgement

The authors are very much thankful to the UGC for providing the financial assistance under Research and Head, Department of Zoology, Milliya arts, science and management science college Beed for providing the laboratory facilities during this work

Reference:

1. **Dollfus, R.P.H., (1934):** Sur uncestode Pseudophyllidae fresh water fishes. Parasit. 16: 441-451.
2. **parasite de poisson ornament**: Bull. Sac. Zool. France 7. Johri, G.N., 1956. A new cestode *Senga lucknowensis* 69: 476-490.
3. **Rohde, K. (1993):** *Ecology of Marine Parasites, an Introduction to Marine Parasitology*. 2nd Edition, CAB International.
4. **Markov, G.S. (1961):** Physiology of fish parasites. In: DOGIEL, V.A., PETRUSHEVESKY
5. **Yamaguti, S. (1959):** SystemaHelminthum Vol.3.The cestode of vertebrates.Interscience Publ.New York & London.1-160.
6. **Yamaguti, S. (1961):** SystemaHelminthum Vol.3.The nematodes of vertebrates.Parts I & II.Interscience publishers Inc., New York, pp.1261.
7. **Burris, V. M., & O'Donnell, M. P. (2012):** *The Nutritional Value of Fish and Shellfish.* In *Handbook of Seafood Quality, Safety, and Health Applications* (pp. 3-16).
8. **Peña-Rosas, J. P., & De-Regil, L. M. (2014):** *Omega-3 Fatty Acids and Human Health.* In *Omega-3 Fatty Acids: Chemistry, Nutritional Value and Health Benefits* (pp. 317-342)

9. **Margolis, L., Esch, G. W., Holmes, J. C., Kuris, A. M., & Schad, G. A. (1982):** *The Use of Ecological Terms in Parasitology (Report of an Ad Hoc Committee of the American Society of Parasitologists)*. Journal of Parasitology, 68(1), 131-133.
10. **MacKenzie, K., & Khare, R. (2001):** *Fish parasites and human health: Risk of zoonotic transmission*. International Journal for Parasitology, 31(4), 443-458.
11. **Mukti S., & Mangesh J. (2015):** Studies on Host-Parasite relationship between endoparasites and channa- green snake headed fish (Channa punctatus) from Palghar district. Ethical Prospects: Economy,Society and Environment, ISBN 978-93-83046-46-1: 549-555.