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Prevalence and Diversity of Helminth Parasites in Freshwater Fishes of Rameshwar Dam, Deola, M.S., India

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Abstract
The present study investigates the prevalence and diversity of helminth parasites in freshwater fishes of Rameshwar Dam, Deola, Nashik district, Maharashtra. A total of 126 fish specimens belonging to seven species were examined over a period of six months from December 2024 to May 2025. Out of 126 fish examined, 41 (32.54%) were found to be infected with helminth parasites. Three classes of helminths were recorded during the study. Trematoda showed the highest prevalence, with 23 infected fish (18.25%), followed by Nematoda with 18 infected fish (14.29%) and Cestoda with 15 infected fish (11.90%). Carnivorous and omnivorous fishes showed the highest infection rates, with *Channa punctatus* (Morakhi) exhibiting 62.50% prevalence, followed by *Clarias batrachus* (Shingala) (57.14%) and *Mystus cavasius* (Tengana) (45.45%). Herbivorous and planktivorous fishes showed minimal infection, with *Labeo rohita* (Rohu) (8.70%) and *Catla catla* (Catla) (4.00%). The summer season recorded significantly higher prevalence (44.44%) compared to the winter season (20.63%). A total of 10 helminth taxa were identified, including 3 cestodes, 4 trematodes, and 3 nematodes. The study provides baseline data for fishery management and public health awareness in this region.

Keywords: Helminth parasites, freshwater fishes, Rameshwar Dam, Deola, prevalence

Introduction
Parasitic infections represent one of the most significant biological constraints affecting freshwater fish health, aquaculture productivity, and wild fishery resources worldwide (Williams and Jones, 1994). Among the various groups of fish parasites, helminths, including cestodes (tapeworms), trematodes (flukes), and nematodes (roundworms), are particularly important due to their high prevalence, pathogenic potential, and complex life cycles that often involve multiple hosts (Kennedy, 2006). These parasites cause substantial economic losses in fisheries through direct mortality, reduced growth rates, impaired reproduction, and decreased meat quality (Bush *et al*., 1997). The mechanical damage caused by attachment organs such as hooks and suckers, combined with the metabolic demands of parasites, severely compromises fish health and survival (Paperna, 1996). In India, freshwater fishes constitute an indispensable source of high-quality protein for millions of people, particularly in rural communities (Jhingran, 1991). Maharashtra state possesses over 3,000 irrigation reservoirs that support diverse ichthyofaunal communities and provide livelihoods for thousands of fishing-dependent families (Sharma, 2008). Rameshwar Dam in Deola taluka, Nashik district, remains largely unexplored from a parasitological perspective. Deola is known for its freshwater fish diversity, including locally available species such as Morakhi (Channa punctatus), Shingala (Clarias batrachus), Tengana (Mystus cavasius), Kalabasu (Labeo calbasu), Chapati (Puntius sarana), Rohu (Labeo rohita), and Catla (Catla catla) (Talwar and Jhingran, 1991). As no comprehensive survey has been undertaken in this small dam, the present study was undertaken to establish baseline parasitological data for Rameshwar Dam using locally available fish species from this region.

Materials and Methods
Study Site
Rameshwar Dam is a small irrigation dam in Deola taluka of Nashik district, Maharashtra (20°48′N, 74°05′E), situated on a tributary of the Godavari River system. The reservoir

experiences a tropical climate with summer temperatures of 30–42°C and winter temperatures of 12–28°C. The dam has limited water spread area, supporting only small to medium-sized fish species, and local fishermen primarily depend on it for their livelihood.

Fish Collection

A total of 126 fish specimens belonging to seven locally available and cultured small fish species were collected fortnightly from December 2024 to May 2025 using cast nets (mesh sizes 10–25 mm) and gill nets (mesh sizes 30–50 mm) with the assistance of local fishermen from Deola taluka (Day, 1986). The fish species collected included only those occurring in the reservoir: Morakhi (Channa punctatus), Shingala (Clarias batrachus), Tengana (Mystus cavasius), Kalabasu (Labeo calbasu), Chapati (Puntius sarana), Rohu (Labeo rohita), and Catla (Catla catla). Sampling points were selected across three zones: the upstream shallow area, the mid-reservoir region, and the deeper zone near the dam wall. Live fish were transported to the laboratory in oxygenated plastic bags containing dam water and examined within 3–4 hours of capture.

Ethical Statement

All fish handling procedures were conducted in accordance with standard guidelines for animal welfare. Fishes were euthanized humanely prior to dissection.

Fish Identification

Fish species were identified using standard taxonomic keys including Day (1986), Jayaram (1999), and Talwar and Jhingran (1991). Local names in Marathi as per the fishermen were recorded. Morphometric measurements, including total length (cm) and body weight (g), were recorded for each specimen.

Parasite Examination

Fishes were dissected longitudinally from the anus to the lower jaw following the method described by Hine and Kennedy (1974). The alimentary canal, liver, swim bladder, heart, kidneys, spleen, gills, and body cavity were examined under a stereo zoom microscope (7×–45× magnification). Each organ was placed in a separate Petri dish containing 0.75% physiological saline. The intestine was opened longitudinally and the mucosal surface was gently scraped using a soft brush.

Parasite Processing

For cestodes and trematodes, live specimens were relaxed by gradual cooling, flattened between clean glass slides, fixed in AFA (Alcohol–Formalin–Acetic acid) for 24 hours, stained with Borax-carmine or Harris hematoxylin, dehydrated through a graded alcohol series (30%, 50%, 70%, 90%, 95%, and absolute alcohol), cleared in xylene, and permanently mounted in Canada balsam following the method of Yamaguti (1959, 1961). For nematodes, specimens were killed in hot 70% ethanol, preserved in alcohol–glycerol solution, and temporary mounts were prepared in lactophenol as per Yamaguti (1961). Identification followed Yamaguti (1959, 1961) and standard taxonomic keys (Anderson, 2000; Khalil *et al*., 1994).

Statistical Analysis

Prevalence was calculated as (Number of infected fish/Total number examined) × 100 as described by Bush *et al*. (1997). The Chi-square (χ^2) test was used for seasonal comparison using Microsoft Excel. Values with $p < 0.05$ were considered statistically significant.

Results

Out of the 126 fish specimens examined during the study period, a total of 41 fish (32.54%) were found to be infected with one or more helminth parasites. Among the three helminth classes recovered, Trematoda showed the highest prevalence with 23 infected fish accounting for 18.25% of the total examined. Nematoda infected 18 fish (14.29%), while Cestoda infected 15 fish (11.90%). Mixed infections were observed in 12 fish (9.52%), comprising dual infections (8 fish) and triple infections (4 fish). A total of 156 individual parasites were collected, comprising 42 cestodes, 68 trematodes, and 46 nematodes (Table 1).

Table 1: Overall prevalence of helminth parasites in fishes of Rameshwar Dam

Helminth Class	Infected Fish	Prevalence (%)	Total Parasites
Cestoda	15	11.90	42
Trematoda	23	18.25	68
Nematoda	18	14.29	46
Any helminth	41	32.54	156

When analyzed according to feeding habits, carnivorous and omnivorous fishes from Deola showed significantly higher infection rates than herbivorous and planktivorous species. Morakhi (Channa punctatus) showed 62.50% infection (10/16), followed by Shingala (Clarias batrachus) 57.14% (8/14), Tengana (Mystus cavasius) 45.45% (5/11), Kalabasu (Labeo calbasu) 36.84% (7/19), and Chapati (Puntius sarana) 28.57% (6/21). In contrast, herbivorous and planktivorous fishes showed very low infection rates: Rohu (Labeo rohita) 8.70% (2/23) and Catla (Catla catla) 4.00% (1/25) (Table 2).

Table 2: Host-wise prevalence of helminth parasites in fishes of Rameshwar Dam

Local Name (Marathi)	Scientific Name	Feeding Habit	No. Examined	No. Infected	Prevalence (%)
Morakhi	*Channa punctatus*	Carnivorous	16	10	62.50
Shingala/Magur	*Clarias batrachus*	Omnivorous	14	8	57.14
Tengana	*Mystus cavasius*	Omnivorous	11	5	45.45
Kalabasu	*Labeo calbasu*	Omnivorous	19	7	36.84
Chapati	*Puntius sarana*	Omnivorous	21	6	28.57
Rohu	*Labeo rohita*	Herbivorous	23	2	8.70
Catla	*Catla catla*	Planktivorous	25	1	4.00
Total	—	—	126	41	32.54

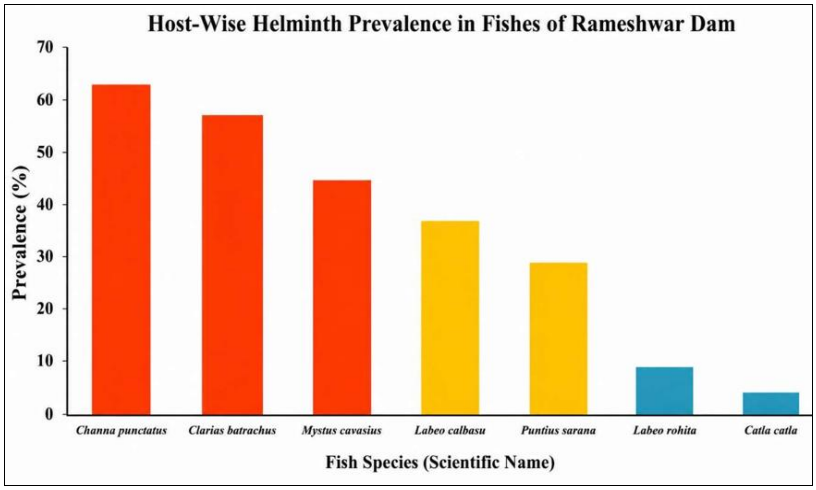

Fig 1: Host-Wise Prevalence of Helminth Parasites in Fishes of Rameshwar Dam

A total of 10 helminth taxa were identified through detailed morphological examination from the fishes of Rameshwar Dam. All scientific names are written in italics as per standard taxonomic convention. The cestode group included Gangesia sp. from Morakhi, Shingala, and Tengana; Bothriocephalus sp. from Rohu and Catla; and Lytocestus sp. from Shingala. The trematode group included Isoparorchis hypselobagri from Shingala and Tengana, Allocreadium sp. from Morakhi and Chapati, Genarchopsis sp. from Tengana and Kalabasu, and Orientocreadium sp. from Morakhi. The nematode group comprised Camallanus sp. from Morakhi, Shingala, and Tengana; Procamallanus sp. from Tengana and Kalabasu; and Rhabdochona sp. from Morakhi and Chapati (Table 3).

Table 3: Diversity of Helminth Taxa Recovered from Fishes of Rameshwar Dam

S. No.	Parasite Taxa	Class	Local Host Fish	No. of Parasites Collected
1	*Gangesia* sp.	Cestoda	Morakhi, Shingala, Tengana	18
2	*Bothriocephalus* sp.	Cestoda	Rohu, Catla	8
3	*Lytocestus* sp.	Cestoda	Shingala	16
4	*Isoparorchis hypselobagri*	Trematoda	Shingala, Tengana	28
5	*Allocreadium* sp.	Trematoda	Morakhi, Chapati	15
6	*Genarchopsis* sp.	Trematoda	Tengana, Kalabasu	12
7	*Orientocreadium* sp.	Trematoda	Morakhi	13
8	*Camallanus* sp.	Nematoda	Morakhi, Shingala, Tengana	20
9	*Procamallanus* sp.	Nematoda	Tengana, Kalabasu	14
10	*Rhabdochona* sp.	Nematoda	Morakhi, Chapati	12
Total				156

The prevalence of individual parasite taxa varied among the infected fishes (Table 4).

Table 4: Prevalence of Individual Helminth Taxa in Infected Fishes of Rameshwar Dam

Parasite Taxa	Infected Fish	Prevalence (%)
Gangesia sp.	8	6.35
Bothriocephalus sp.	4	3.17
Lytocestus sp.	5	3.97
Isoparorchis hypselobagri	9	7.14
Allocreadium sp.	7	5.56
Genarchopsis sp.	5	3.97
Orientocreadium sp.	4	3.17
Camallanus sp.	10	7.94
Procamallanus sp.	6	4.76
Rhabdochona sp.	5	3.97

Mixed infections were observed among infected fishes, including dual and triple infections (Table 5).

Table 5: Pattern of Mixed Helminth Infections in Infected Fishes of Rameshwar Dam

Infection Type	No. of Fish	Percentage
Single infection	29	70.73
Dual infections	8	19.51
Triple infections	4	9.76
Total infected	41	100

Seasonal variation in helminth infection was examined by comparing winter (December to February) and summer (March to May) data from Rameshwar Dam (Table 6). During winter, 63 fish were examined and 13 (20.63%) were found to be infected. During summer, 63 fish were examined and 28 (44.44%) were found to be infected. This difference was statistically significant ($\chi^2 = 8.12$, df = 1, $p < 0.01$), indicating that higher prevalence of helminth infection was observed during summer (Table 7).

Table 6: Seasonal prevalence of helminth parasites in fishes of Rameshwar Dam

Season	Duration	No. Examined	No. Infected	Prevalence (%)
Winter	December to February	63	13	20.63
Summer	March to May	63	28	44.44
Total	December to May	126	41	32.54

Table 7: Contingency table for Chi-square test

Season	Infected	Uninfected	Total
Winter	13	50	63
Summer	28	35	63
Total	41	85	126

$\chi^2 = 8.12$, df = 1, $p < 0.01$

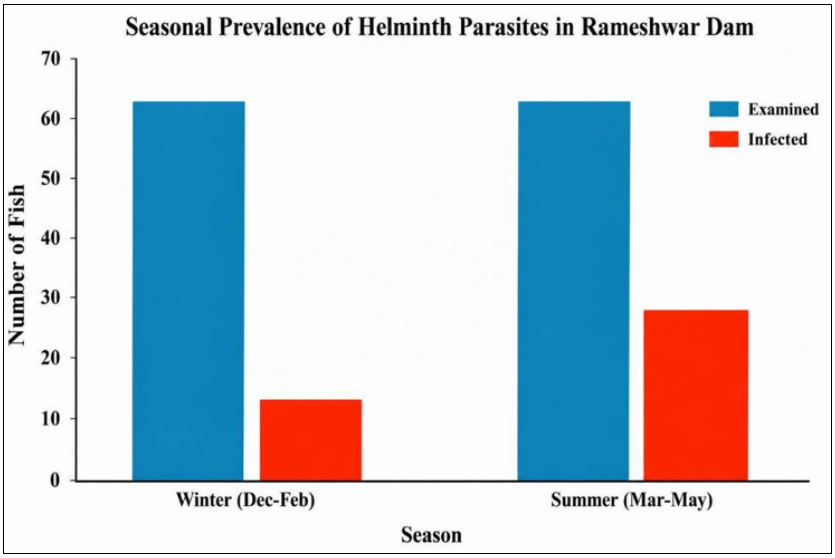

Fig 2: Seasonal Prevalence of Helminth Parasites in Fishes of Rameshwar Dam

Discussion

The overall prevalence of helminth infection recorded in the present study was 32.54%, indicating a moderate level of parasitic infestation in the freshwater fishes of Rameshwar Dam, Deola. Similar observations have been reported from other freshwater ecosystems, where helminths constitute a major component of fish parasite communities (Williams and Jones, 1994). Parasite prevalence in freshwater fishes is influenced by host feeding habits, environmental conditions, and habitat characteristics (Kennedy, 2006). The prevalence observed in the present study falls within the range reported by Nimbalkar and Deolalikar (2015) from Sukhana Dam, Maharashtra, and supports earlier findings that freshwater fishes frequently harbour diverse helminth communities (Abro *et al*., 2019; Patra *et al*., 2024). The relatively lower prevalence may be attributed to the smaller size of Rameshwar Dam, which supports lower fish densities and fewer intermediate hosts, thereby reducing parasite transmission opportunities (Dogiel, 1961). Among the helminth groups recovered, trematodes showed the highest prevalence (18.25%), followed by nematodes (14.29%) and cestodes (11.90%). Similar dominance of trematodes has been reported from other freshwater habitats where molluscan intermediate hosts are abundant (Dogiel, 1961; Kennedy, 2006). The presence of a variety of helminth taxa indicates that the reservoir supports suitable ecological conditions for parasite establishment and transmission. Marked variation in infection was observed among host species. Carnivorous and omnivorous fishes exhibited considerably higher infection rates than herbivorous and planktivorous species. Morakhi (Channa punctatus) showed the highest prevalence (62.50%), followed by Shingala (Clarias batrachus) (57.14%), Tengana (Mystus cavasius) (45.45%), Kalabasu (Labeo calbasu) (36.84%), and Chapati (Puntius sarana) (28.57%). In contrast, Rohu (Labeo rohita) and Catla (Catla catla) showed low prevalence values of 8.70% and 4.00%, respectively.

This pattern reflects the important role of trophic transmission in helminth ecology. Carnivorous fishes accumulate parasites through the consumption of infected prey and intermediate hosts, resulting in higher infection levels (Paperna, 1996; Kennedy, 2006). Similar observations have been reported by Williams and Jones (1994) and Bush *et al*. (1997). The high prevalence observed in Morakhi is also consistent with reports indicating that freshwater fishes frequently harbour diverse helminth communities (Abro *et al*., 2019; Patra *et al*., 2024). Seasonal variation was evident in the present study, with significantly higher prevalence during summer (44.44%) compared to winter (20.63%). Seasonal fluctuations in parasite infection have been widely documented in freshwater ecosystems (Dogiel, 1961; Patra *et al*., 2024). Elevated summer temperatures may accelerate parasite development, hatching, and transmission, while reduced water volume increases contact between hosts and infective stages (Kennedy, 2006). However, seasonal patterns may vary depending on parasite species and local environmental conditions (Paperna, 1996). The occurrence of Isoparorchis hypselobagri in Shingala and Tengana confirms the presence of this common catfish trematode in the region (Yamaguti, 1959). Likewise, Camallanus and Procamallanus are widely distributed nematodes of freshwater fishes (Anderson, 2000; Khalil *et al*., 1994). The cestode genera Gangesia, Bothriocephalus, and Lytocestus have also been previously reported from Indian freshwater fishes (Yamaguti, 1959), with Lytocestus commonly infecting Clarias batrachus (Nimbalkar and Deolalikar, 2015). Overall, the moderate prevalence and diversity of helminths observed in Rameshwar Dam provide important baseline information for future parasitological monitoring. Proper cooking of fish is recommended to minimize potential risks associated with fish-borne parasites (Williams and Jones, 1994; Paperna, 1996).

Conclusion

The present study revealed a moderate prevalence (32.54%) of helminth parasites in freshwater fishes of Rameshwar Dam, Deola, Maharashtra. Higher infection rates were observed in carnivorous and omnivorous fishes compared to herbivorous and planktivorous species, indicating the role of trophic transmission in parasite distribution. A total of 10 helminth taxa, comprising 3 cestodes, 4 trematodes, and 3 nematodes, were recorded. Helminth infection was significantly higher during summer than winter, suggesting the influence of seasonal environmental factors on parasite transmission. The findings provide baseline information for future parasitological studies, fish health management, and fisheries conservation in the region.

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