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THE POPULATION DYNAMICS OF HELMINTHOCOENOSIS OF FRESHWATER CAT FISH, *RITA RITA*

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Abstract

Rita rita, were intensively studied in Nizamabad district, Telangana, India. A total of 120 and 150 hosts of catfish, *Rita rita*, were examined during 1997-98 and 1998-99, respectively. A variety of helminth parasites was secured from various biotopes and maintained for identification. After staining, the trematodes and nematodes were recognized in accordance with Gulland (1988). Examination of the incidence density index of infection frequency distribution and relative densities was done according to Bailey (1959). The data was subjected to statistical analysis. The results showed five biohelminths, three trematodes, one cestode, and one nematode traced from the stomach and intestine of the host. The present research offers analyses of the parasites of catfish, *Rita rita*, on various parameters like incidence intensity density index, infection frequency distribution, and relative densities. The analysis of the data revealed that only the taxonomic group, namely the trematode group, was dominant in the host. The stomach and intestine of the host were the most dominant biotopes, which were densely populated by helminths. This similarity and variation could be attributed to several contributory factors of biotic and abiotic nature, such as the habits and habitats of the host diet and other physiological factors of the host present within the same geographical region.

Key Words: *Rita rita*, Trematodes, Nematodes, Biohelminths, Population dynamics, Relative density.

INTRODUCTION

Ecological studies at the population level offer an immediate practical solution for understanding the operation of natural processes and the interactions of abiotic and biotic environments in which they live. Further, this approach removes the conventional method of studying parasites as an isolated entity and opens a new horizon of interrelations and movements among populations and communities. Parasitism is an ecological relationship between populations of species. *Rita rita* is an air-breathing fish that is cultured in monoculture and polyculture systems. Its production is reduced due to parasitic diseases. Hence, the present study was undertaken to observe helminthic infections in fish.

MATERIALS AND METHODS

Many freshwater catfishes of *Rita rita* were collected from the Nizamabad District, Telangana, for two years during 1997–1998 and 1998–1999. A total of 120 and 150 hosts (catfish): *Rita rita* were examined during 1997–1998 and 1998–1999, respectively. The live fish were dissected, and organs such as the stomach, intestine, liver, and gall bladder were detached from the host and placed in different Petri dishes containing saline water. Various helminth parasites were collected from different biotopes and preserved for identification. Trematodes and nematodes were identified after staining. The incidence, density, index of infection, frequency distribution, and relative densities were studied according to Gulland (1988). Statistical analysis was performed according to Bailey (1959).



RESULTS

Taxonomical, Biological and Topical Structure of the Parasites

The analysis of helminth parasites revealed that in the host, *R. rita*, the helminth parasites were represented by taxonomical groups. Trematoda were characterized by three species of cestodes and one species of nematode. (Table 1).

It was revealed that in the Piscian host *R. rita*, there were five biohelminths and no geohelminths recovered (Table 2). The trematode biohelminths recovered involved two intermediate hosts, i.e., a gastropod or a bivalve as the first intermediate host and a crustacean as the second intermediate host, to complete their life cycles. In the case of cestodes, an arthropod, probably a copepod, forms the intermediate host.

In *R.rita*, the biotopes from which helminth parasites were collected were stomach and intestine.

1. The stomach formed a microhabitat for the parasites. *Orientocreadium batrachoides*, *Allocreadium thapari*, and *Procamallanus gubernaculus*, of which two were trematodes and one was a nematode.
2. Intestines form the biotope for the parasites. *Asymphyloclara ritai*, a trematode, and *Proteocephalus ritae* was a cestode.
3. The swim bladder had no infestation of parasites

Table 1. Topical Structure of Helminth Grouping of the Fish Host, *Rita rita*

Microhabitat	Parasites
Stomach	<i>Orientocreadium batrachoides</i> [T]
	<i>Allocreadium thapari</i> [T]
	<i>Procamallanus gubernaculus</i> [N]
Intestine	<i>Asymphyloclara ritai</i> [T]
	<i>Proteocephalus ritae</i> [C]

T = Trematode, N = Nematode, C=Cestode

Table 2. Synthesis of Helminth Grouping of Fish Host, *Rita rita*

Taxonomical structure	Number	Biological structure	Number	Topical structure	Number
Trematoda	3	Biohelminths	5	Stomach	3
Nematoda	1	Geohelminths	0	Intestine	2
Cestode	1				
Total	5	Total	5	Total	5

Incidence, Intensity, Density and Index of Parasites

In the Piscian host *Rita rita*, the dominance of *Procamallanus gubernaculus* was remarkably supported by its high and regular incidence corresponding to high density and high index of infection. Under the influent group, the parasitic species *Asymphyloclara ritai* can be placed corresponding to its moderate incidence, density, and index of infection. Determination



of *Allocreadium thapari*, *Orientocreadium batrachoides*, and *Proteocephalus ritae* as accessory helminthic structures was well supported by numerical data, being an irregular and unstable incidence with a low density and low index of infection. (Table 3),

In the host *Rita rita*, the nematodes represented by *Procamallanus gubernaculus* formed the dominant taxonomic group. The trematoda represented by three species, viz., *Asymphyiodara ritai*, *Allocreadium thapari*, and *Orientocreadium batrachoides*, formed the accessory group. The only cestode *Proteocephalus ritae* formed an accessory taxonomic group. (Table 4).

The analysis of the data revealed that only the taxonomic group, namely the nematode group, was dominant in the host. In the host, the stomach and intestine were the most dominant biotopes, which were densely populated, while the body cavity formed an accessory topical structure. This similarity and variation may be attributed to several contributory factors of biotic and abiotic nature, such as the habits and habitats of the host, diet, and other physiological factors of the host present within the same geographical region.

Table 3. Mean Incidence, Intensity, Density and Index of Infection of Helminth Parasites of *Rita rita*

Host	Parasite Name	Incidence	Intensity	Density	Index
<i>Rita rita</i>	<i>Asymphyiodara rita</i>	50.81	2.321	1.366	0.283
<i>Rita rita</i>	<i>Allocreadium handiai</i>	29.92	1.573	0.566	0.237
<i>Rita rita</i>	<i>Orientocreadium batrachoides</i>	29.78	1.254	0.502	0.209
<i>Rita rita</i>	<i>Proteocephalus ritae</i>	25.86	1.054	0.457	0.186
<i>Rita rita</i>	<i>Procamallanus gubernaculus</i>	72.18	3.107	2.193	1.644

Table 4. Quantitative Structure of the Helminth Grouping in the Population of *Rita rita*

Class of helminth fauna	Dominant	Influent	Accessory
Trematoda		<i>Asymphyiodara ritai</i> (T)	<i>Allocreadium thapari</i> (T) <i>Orientocreadium batrachoides</i> (T)
Cestoda			<i>Proteocephalus ritae</i> [C]
Nematoda	<i>Procamallanus gubernaculus</i> [N]		

Overdispersion

In all parasites, the variance was greater than the mean (Table 5). A large number of parasite concentrations occurred in a small number of hosts. The degree of overdispersion varied significantly in the dominant, influent, and accessory structures of the piscian host. The differences in parasite infection levels in the host-parasite system resulted in the overdispersion of the parasites throughout the host population. The greater the degree of overdispersion, the greater the mean value of the parasite.



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Table 5. Comparison of the Mean, Variance and Dispersion of the Parasitic Burden in *Rita rita* During 1997-98 and 1998-99

Parasite	Hosts Examined		Parasites Collected		Mean ($\bar{X}$)		Variance (S^2)		Dispersion ($S^2/\bar{X}$)	
	97-98	98-99	97-98	98-99	97-98	98-99	97-98	98-99	97-98	98-99
<i>A. ritai</i>	120	150	133	179	1.108	1.193	1.063	1.183	0.959	0.992
<i>A. thapari</i>	120	150	54	100	0.45	0.667	0.48	0.796	1.067	1.193
<i>O.batrachoides</i>	120	150	47	69	0.391	0.46	0.438	0.675	1.12	1.467
<i>R. rita</i>	120	150	44	63	0.366	0.42	0.399	0.564	1.09	1.343
<i>P.gubernaculus</i>	120	150	254	337	2.116	2.06	3.536	3.818	1.671	1.853

Relative Density

In the host, *Rita rita* the relative density of trematodes was high. During the years 1997–1998, it was in the range of 40.00% to 94.74% except during the months of September, October, March, April, and May. It was recorded slightly low, ranging between 19.51% and 37.88%. During the year 1998–99, the relative density pattern of trematodes was almost similar, ranging between 38.71% and 68.09%. (Table 6, Graph-1)

The relative density of cestodes in *Rita rita* was remarkably low. In 1997–98, it was found to be zero during the months of December to June. In other months, the relative density ranged from 8.47% to 22.58%. The relative density values of cestodes during 1998–99 were again low, similar to that of the previous year. The cestode burden was nil during the months of January to April and June. In other months, the relative density ranged from 1.98% to 27.42% (Table 6, Graph-3).

The relative density of nematodes in *Rita rita* was quite high during the two years of investigation. The relative density values ranged between 23.35% and 54.72% and 31.91% and 70.31% during the years 1997–1998 and 1998–1999, respectively, except during the month of June in the year 1997–1998. The relative density values were observed to reach the maximum, going up to 66.67% in the month of June of the year 1997–1998, and during the month of March, the relative density value was observed to reach the maximum, going up to 70.31% during the year 1998–99 (Table 6, Graph-2).

Table 6 - Relative Density of Trematodes in *Rita rita* during 1997-98 and 1998-99

Month & Year	Total no. of Trematodes (a)	Total Helminthic Burden (b)	Relative Density (a/b*100)
Sep-97	13	53	24.53
Oct-97	18	62	29.03
Nov-97	11	23	47.83
Dec-97	18	19	94.74
Jan-98	12	30	40.0
Feb-98	19	29	65.52
Mar-98	8	41	19.51
Apr-98	16	56	28.57
May-98	25	66	37.88
Jun-98	30	54	55.56
Jul-98	33	59	55.93
Aug-98	31	71	43.66

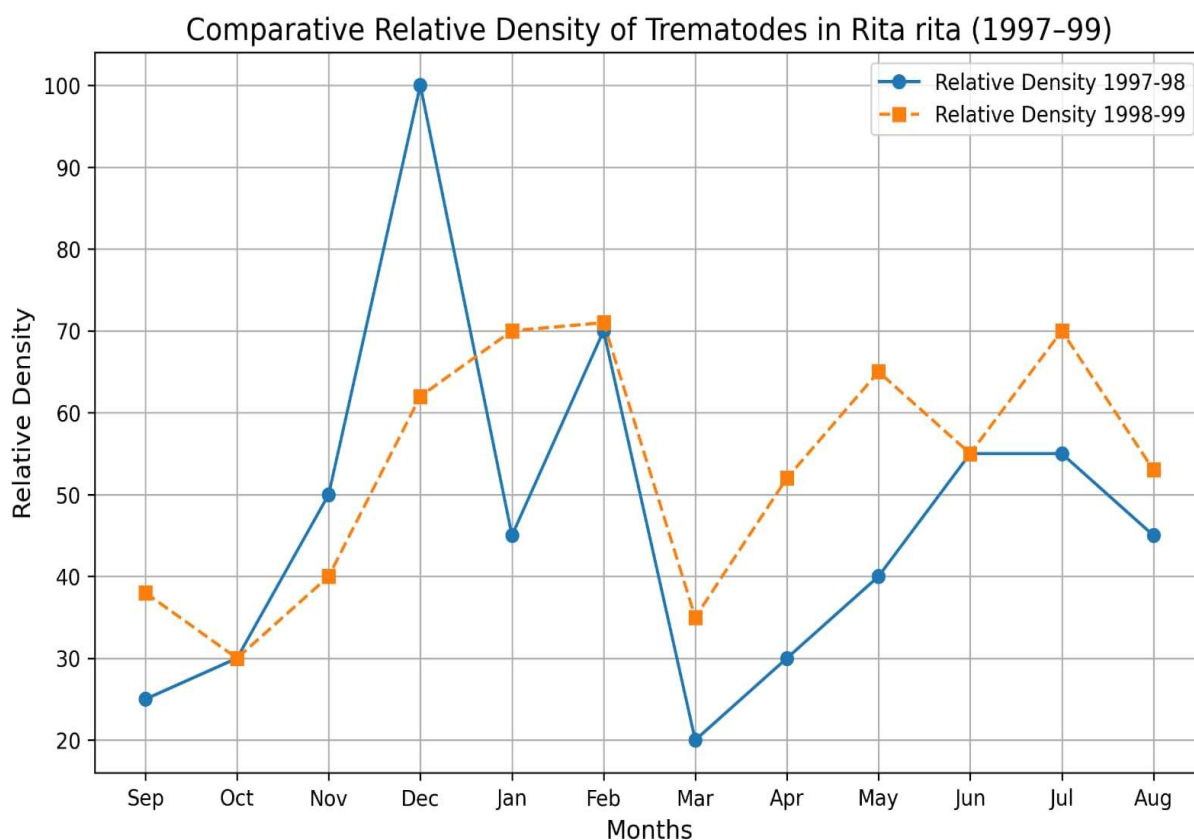


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Total	234	563	45.23
Sep-98	24	62	38.71
Oct-98	27	86	31.4
Nov-98	21	52	40.38
Dec-98	19	31	61.29
Jan-99	19	28	67.86
Feb-99	32	47	68.09
Mar-99	19	64	29.69
Apr-99	31	66	46.97
May-99	60	101	59.41
Jun-99	41	89	46.07
Jul-99	38	60	63.33
Aug-99	27	62	43.55
Total	358	748	49.73

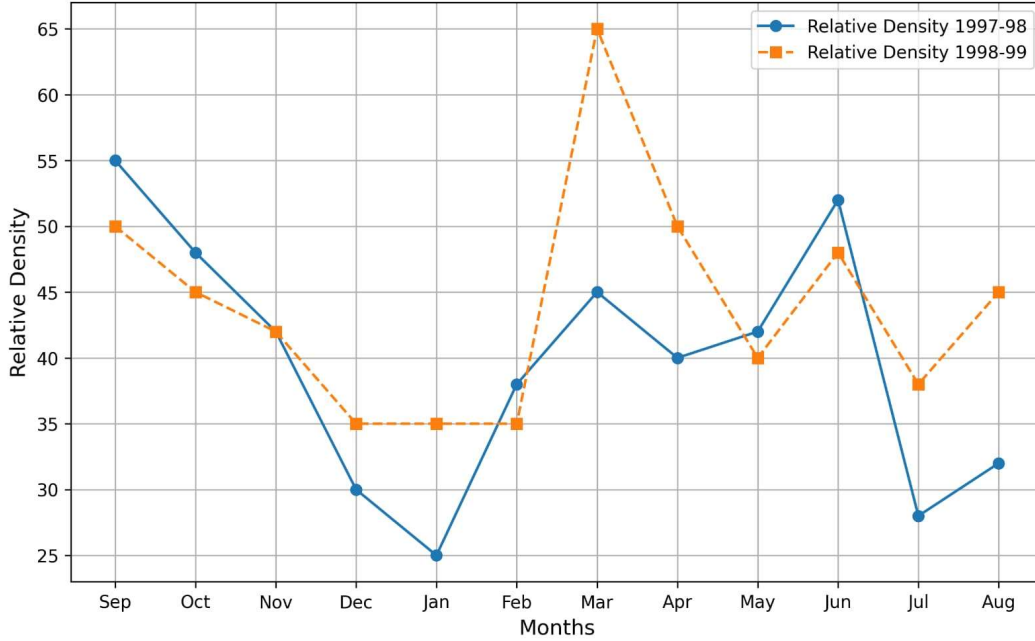
Mean of two Years = 47.48



Graph-1

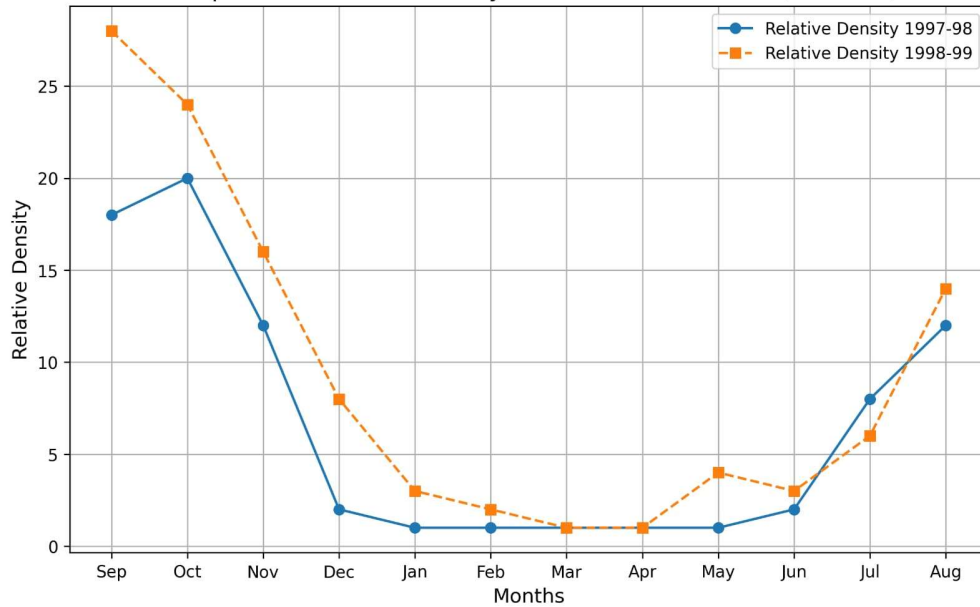


Comparative Relative Density of Nematodes in Rita rita (1997-99)



Graph -2

Comparative Relative Density of Cestodes in Rita rita (1997-99)



Graph-3



DISCUSSION

The results of the present study provide the taxonomical, biological, and topical structure of parasites surviving in host catfish.

- 1. Taxonomical grouping of parasites in fish:** Devi (1995) reported four nematodes in *Notopterus notopterus* and two nematodes and three trematodes in *Glossogobius giuris*. She reported *Spinitectus notopteri*, *S. thapari*, *S. mastacembeli*, and *Metabronema notopteri* in *N. notopterus*, and two nematodes, *Rhabdochona singhi* and *Philometra*, along with three trematodes, *Allocreadium nicolli*, *Opegaster beliyai*, and *Phyllodistomum parorchium* in *G. giuris*. She concluded that a reasonably high incidence of helminthic populations and the relative density of nematodes were high in fish. Chitikesi (1997) reported one trematode, *Gonorchopsis goppo*, and two nematodes, *Lytocetus indicus* and *Djumbangia indica*, in *Clarias batrachus*. Jyothirmayee (2001) reported four nematodes, *Spinitectus notopteri*, *S. thapari*, *S. mastacembeli*, and *Metabronema notopteri*, in *Notopterus notopterus*. Rao and Krishna (1984) stated that the relative density of trematodes was very high, moderate in nematodes, and very marginal in cestodes in *Rana tigrina*. Aruna *et al.* (1986) reported that the relative density of trematodes was very low, cestodes were moderate, and nematodes were very high in the avian host *Acridotheres tristis*. Rao *et al.* (1988) reported that the index of infection was high in nematodes, followed by trematodes and cestodes in a marine fish, *Congresox talabonoides*. In the present investigation, three trematodes, *Asymphylogdora ritai*, *Allocreadium thapari*, and *Orientocreadium batrachoides*; one cestode, *Proteocephalus ritae*; and one nematode, *Procamallanus gubernaculus*, were reported in another freshwater catfish, *Rita rita*. Regional specificity, climatic factors, and water quality could account for the differences in the number of trematodes, nematodes, and cestodes in fish among various studies.
- 2. Incidence, Intensity, Density, and Index of Parasites:** Jain *et al.* (1994) studied the intensity, density, and index of infection of *Acanthosentis antispinis* in freshwater catfish, *Mystus seenghala*, and concluded that the parasite infection levels were potentially dynamic with durability, regularity, and cyclic periodicity. In the piscian host *Rita rita*, the determination of *Procamallanus gubernaculus* as the dominant helminth structure was remarkably supported by its high and regular incidence corresponding to high density and high index of infection. Under the influent group, the parasitic species *Asymphylogdora ritai* can be placed corresponding to its moderate incidence, density, and index of infection. Determination of *Allocreadium thapari*, *Orientocreadium batrachoides*, and *Proteocephalus ritae* as accessory helminthic structures was well supported by the numerical data, being irregular and unstable in incidence with low density and low index of infection. (Table 3).
- 3. Biological Structure of the Helminths Infecting Fishes:** Devi (1995) reported that geohelminths dominated in *Notopterus* and *Glossogobius*. These geohelminths were found more in the stomach. However, in the present study, 5 biohelminths were found, and no geohelminths were found. The differences in the research observations in the studies can be depicted by the intensity of infections in fish with varied climates, temperatures, and seasons and differences in the parasitic specificity.
- 4. Quantitative Structure of the Helminth Grouping in the Population of Fishes:** Chitikesi (1997) reported that trematodes were dominant in fishes. The analysis of the data from the present study revealed that only the taxonomic group, namely the trematode group, was dominant in the host. Jyothirmayee (2001) reported that the stomach was a dominant biotope in *Rita rita* and *Notopterus notopterus*. In the present study, the stomach and intestine of the host were the most dominant biotopes, which were densely populated. The data analysis of the present study revealed numerous biotic and abiotic contributing elements, including the host's behaviour and habitat, nutrition, and other physiological characteristics within the same geographic area, that may be responsible for this similarity and variation.
- 5. Relative Density of Helminths in fishes:** The seasonal dynamics of digenetic trematodes in *Rita rita* were investigated by Chatterjee *et al.* (2026) from the Ganges River in Mirzapur, Uttar Pradesh, India. The study examined the trematode burden over a year. Of the sample size, 37.50% of the cat fish were actively infected with digenetic trematodes, with a mean intensity of 1.58 parasites per infected fish. Reshu *et al.* (2024) studied the seasonal infestation of nematodes in catfish *Rita rita* in the Gomti River in Lucknow, India. This study focused on the population dynamics of specific nematode species and reported an overall nematode prevalence of 32.61%. In the present study, of the sample size,



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25% of the catfish were actively infected with parasitic infection. On a comparative account, a lower percentage of active infection in catfish was found in studies by Chatterjee et al. (2026). The mean intensity of the parasites in *Rita rita* in the present investigation was 0.35, which is lower than that reported by Chatterjee et al. (2026). Seasonally, population thresholds followed a strict environmental gradient: highest in the rainy season (40.07%), moderate in summer (32.86%), and lowest in the winter (24.29%) (Reshu et al. (2024)). The prevalence of parasites increased at 70% in August (rainy season) and hit its lowest valleys (20%) during the dry months of January and May. (Chatterjee et al. (2026). Similar results were also found in the present study regarding the lowest prevalence of parasite, 19%, in March (dry months). However, a higher prevalence of parasites (94%) was found in December. The number of factors is the probable cause of the differences in the relative density of parasitic infections in fish during various seasons, as reported in various investigations.

CONCLUSION

Parasitism is an ecological relationship between species populations. Parasite-related diseases reduce its production. Thus, the current study was initiated to search for helminthic illnesses in the fish. A study of the helminth parasite population dynamics of freshwater catfish (*Rita rita*) was done. This similarity and variation may be caused by a variety of biotic and abiotic contributing factors, such as the host's habitats and behaviours, diet, and other physiological traits within the same geographic area.

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