Parasitic incidence in a cyprinid fish *Labeo rohita* (Ham.) at river Song in Doon valley (Uttarakhand)

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Abstract On examining 144 specimens of *Labeo rohita* (Ham.) for parasites occurrence; as many as 34 fish were found positive to harbour ciliophorans (*Trichodina* sp. and *Ichthyophthirius multifiliis* Fouquet, 1876), monogeneans (*Haplo-cleidus vachi* Tripathi, 1959 and *Dactylogyrus glossogobii* Jain, 1960), trematode (*Allocreadium mahaseri* Pandey, 1939), nematode (*Camallanus* (*Zeylanema*) *anabantis* Pearse, 1933) and acanthocephalan (*Sachalinorhynchus* sp.). Highest prevalence was shown by platyhelminthes (18.75%) followed by ciliophorans (10.41%), nematode (4.16%) and acanthocephalan (2.77%) in succession. Maximum mean intensity and abundance has been shown by *C. (Zeylanema) anabantis* Pearse, 1933 while the monogenean *H. vachi* was on the 2nd rank. On the other hand, the least intensity and abundance was shown by *Ichthyophthirius multifiliis*. The prevalence was recorded more in monsoon (52.77%) followed by post-monsoon (22.22%), summer (19.44%) and winter (8.33%) in succession. Further, the unit-wise intensity of parasites was recorded more in males than the females.

Keywords *Labeo rohita* · Parasites · Song river · Doon valley · Uttarakhand

Introduction

Labeo rohita (Ham.) is the most commonly cultured fresh water fish of India. It is considered as one of the most important fish for nutrition and high market value. As the culture practices of *L. rohita* is being enhanced at local level, there has been an increase in the incidence of disease outbreak too and it was found that it is more susceptible to diseases in comparison to exotic carps (Lilley et al. 1992). Diseases affect the normal health conditions and cause reduction in growth, abnormal health condition and thus result in great economic loss. Health of any population depends on the control of disease and maintenance of a healthy relationship between living organisms and their environment (Snieszko 1983).

The influence of parasites in relation to the length of fish has been described by many workers (Amin 1986; Zaman et al. 1986; Jha and Sinha 1990; Shomorendra et al. 2005, 2007). Besides this, Bhuiyan et al. (2007), Banu et al. (1993), Chandra et al. (1997) worked on seasonal variations in the population of a single helminth parasite associated with a particular host fish.

From India, there are scattered studies on the occurrence of helminth parasites in the fish *L. rohita* (Tripathi 1959, Gussev 1976, Malhotra and Chauhan 1984). In the adjoining country i.e., Pakistan, Bilqees and Khan (1990) reported *Laciotocus rohitali* (Trematoda: Monorchidae) from *L. rohita* collected from Kalri lake, Sind, Pakistan. As far as the community of helminth parasites in other fresh water fishes is concerned, there is a considerable study from neighbouring countries. The fishes which have been screened from parasitological point of view were *Heteropneustes fossilis* and *Clarias batrachus* (Ahmed and Sanaullah 1977), *Nandus nandus* (Golder et al. 1987), *Anabas testudineus* (Akhter et al. 1997), *Gudusia chapra* (Khanum et al. 2006), *Cyprinus carpio* (Tekin-Ozan et al. 2008) and *Mystus armatus* (Jalali

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et al. 2008) and *Rita rita* (Khanum et al. 2008). Thus, it is clear from the available literature that no comprehensive study is being made on the Parasitic fauna of *L. rohita*. Henceforth, present study is an attempt to screen parasite composition in the cyprinid fish *L. rohita* (Ham.) collected from river Song in Doon valley (Uttarakhand).

Materials and methods

During the study period (December 2008–January 2009), the fish specimens were collected from river Song at Doon valley either directly from the fishermen or caught using relevant fishing nets. In all, 212 specimens of *L. rohita* were collected while 144 specimens ranging from 10 cm to above 15 cm were examined for parasites. Firstly, the collected fishes were separated according to their sex and length, thereafter the microscopic examination was done for ecto and endoparasites and for any cyst, ulceration and scares. Then the gill filaments were dissected out of branchial cavity and placed in petri dish containing normal saline for protozoan and monogenean infestation. For the collection of endoparasites the fish was dissected in enamel tray and their visceral organs viz., stomach, intestine and gall/air bladder, besides muscles were examined for helminth parasites. All the collected parasites were processed using standard techniques while the identification of parasites was performed using standard keys and catalogues (Yamaguti 1958, 1961, 1963a, b and 1971). Ecological studies have been performed according to Bush et al. (1997). For calculation of prevalence, intensity and abundance, the following formulae were applied.

(a)

$$\text{Prevalence (\%)} = \frac{\text{No. of infected fish} \times 100}{\text{Total No. of fish examined}}$$

(b)

$$\text{Mean Intensity (unit)} = \frac{\text{No. of collected parasites}}{\text{No. of infected fish}}$$

(c)

$$\text{Abundance (unit)} = \frac{\text{Number of parasites}}{\text{Number of fish examined}}$$

Results

During the survey work, a total of 212 specimens of the fish *L. rohita* were collected, out of which 144 fishes were examined for parasitic infection. The sex ratio

(male:female) of examined fish was 1:2. As many as 34 fish specimens were found positive. With a recovery of 64 parasites, as many as 33 parasites were recovered from the gills and skin while 31 from intestine. The parasite population comprised ciliophorans, monogeneans, trematodes, nematodes and acanthocephalans. The identified species of ciliophorans were *Trichodina* sp. and *Ichthyophthirius multifiliis*; monogenea—*Haploclleidus vachi* and *Dactylogyrus glossogobii*; digenea—*Allocreadium mahaseri*; nematode—*Camallanus (Zeylanema) anabantis* and acanthocephalan—*Sachalinorhynchus* sp. (Table 1). Highest prevalence was shown by platyhelminthes (18.75%) followed by ciliophorans (10.41%), nematodes (4.16%) and acanthocephalans (2.77%) in succession.

As far as the mean intensity and abundance of the parasite species is concerned, the maximum was shown by *C. (Zeylanema) anabantis* and next to it was *H. vachi*. The least intensity and abundance was shown by *Ichthyophthirius multifiliis*. Monthly sex-wise incidence of parasites in *L. rohita* has been mentioned in Table 2. The parasitization was recorded more in female fishes than the male throughout the study period. In winter months (November–December and January), the occurrence of parasites was either nil or very less. So much so, the female exhibited no parasites in the month of April and October, while parasite occurrence was nil in males during January, March and September. When taken into consideration the data of the complete year, the prevalence was more (14.58%) in female than male (9.03%). The percentage of infection has been found to differ as per length groups of infected fishes, viz., up to 10 cm, within 11–15 cm and above 15 cm. In general, the percentage of infection/infestation was found more (64.7%) in the fishes above 15 (cm) and next to it the fishes between 11 and 15 cm contributed 29.41% parasitic incidence (Fig. 1).

Seasonal fluctuation of parasites in the selected fish has been mentioned in Fig. 2. The prevalence and abundance was more in monsoon and that too in females followed by post-monsoon, summer and winter in succession. The mean intensity (unit wise) differed season to season and there was a fluctuation if sex of the host is concerned. It was recorded more in summer season and least in monsoon.

Discussion

In the present investigation the parasitic infection/infestation in the fish *L. rohita* comprised ciliophorans, monogeneans, trematode, nematode and acanthocephala and the identified species were *Trichodina* sp., *I. multifiliis*, *H. vachi*, *D. glossogobii*, *A. mahaseri*, *C. (Zeylanema) anabantis* and *Sachalinorhynchus* sp. Further, the highest prevalence was shown by platyhelminthes followed by

Table 1 Parasites in *Labeo rohita* (Ham.) collected from river Song at Raiwala (Haridwar) during the study period

Sl. no.	Parasites classified	Genus	Site of infection	No. of infected fish	No. of collected parasite	Prevalence (%)	Mean intensity	Abundance (%)
[I]	Phylum: Ciliophora							
(i)	Class: Kinetophragminophorea Family: Trichodinidae	<i>Trichodina</i> sp.	Gills and skin	10	09	6.94	26.47	6.25
(ii)	Class: Oligohymenophorea Family: Ichthyophthiriidae	<i>Ichthyophthirius multifiliis</i> Fouquet, 1876	Gills	05	06	3.47	17.64	4.16
[III]	Phylum: Platyhelminthes							
(iii)	Class: Monogenea Family: Dactylogyridae	<i>Haploleleidus vachi</i> Tripathi, 1959	Gills	10	11	6.94	32.35	7.63
		<i>Dactylogyrus glossogobii</i> Jain, 1960	Gills and skin	09	07	6.25	20.58	4.86
(iv)	Class: Trematoda Family: Alcreadidae	<i>Allocreadium mahaseri</i> Pandey, 1939	Intestine	08	10	5.55	29.41	6.94
[III]	Phylum: Nematoda							
(v)	Class: Secernentea Family: Camallanidae	<i>Camallanus</i> (<i>Zeylanema</i>) <i>anabantis</i> Pearse, 1933	Intestine	06	12	4.16	35.29	8.33
[IV]	Phylum: Acanthocephala							
(vi)	Class: Palaeacanthocephala Family: Heteracanthocephalidae	<i>Sachalinorhynchus</i> sp.	Intestine	04	09	2.77	26.47	6.25

ciliophorans, nematodes and acanthocephalans in succession.

Shomorendra et al. (2005) observed seasonal fluctuation of five species of helminth parasites—one species each of digenetic trematode (*Astiotrema reniferum*), nematode (*C. anabantis*), acanthocephalan (*Pallisentis ophiocephali*) and two cestodes (*Djombangia penetrans* and *Capingentoides singhi*) in four fishes, namely, *Channa gachua* (Ham.), *C. striatus* (Bl.), *Clarias batrachus* (Linn.) and *Anabas testudineus* (Bloch.). Nematode and acanthocephalan showed moderate to high occurrence during different months while adult digenetic trematodes and cestodes exhibited quite low prevalence and even the infection was nil during certain months of the study period. As per their studies the variations were due to considerable change in the diet of fish host with the increasing size.

In our studies the maximum mean intensity and abundance of the parasite species was shown by *C. (Zeylanema) anabantis* and next to it was *H. vachi*. The least intensity and abundance was shown by *I. multifiliis*. The infection/infestation was recorded more in female fishes than the male throughout the study period accompanied by percentage of parasites recovered.

Arthur and Ahmed (2002) provided a checklist of parasites of fishes of Bangladesh and as per their views, *L. rohita* fish harboured protozoans (*I. multifiliis* and *Trichodina* sp.), Myxozoa (*Myxobolus* sp. and *Thelohanellus dogieli*), Digenea (*Neascus* sp. metacercaria), monogenea (*Dactylogyrus* sp.), Acanthocephalan (*Sachalinorhynchus* sp.) and Branchiura (*Argulus* sp.). Khan et al. (2003) reported *Lernaea cyprinaceae* Linnaeus, 1758 and *Rhabdochona charsddensis* (nematode) from the gills and gut of *L. rohita* respectively at Meinhart and Mini dams of Potohar region, Pakistan. In recent years, Bhuiyan et al. (2007) reported protozoan (*Trichodina*, *Chilodonella* and *Myxobolus*), monogenean (*Dactylogyrus* and *Gyrodactylus*), Digenea (*Eucreadium*), nematode (*Camallanus*) and Crustacea (*Argulus*) parasites from a fresh water fish *L. rohita* which was collected from different water bodies of Rajshahi district in Bangladesh.

Earlier, Tripathi (1959) and Gussev (1976) reported *Gyrodactylus elegans indicus* and *Dactylogyrus speciosus* respectively from *L. rohita* from India. Subsequently, Malhotra and Chauhan (1984) reported *Bothriocephalus teleostei* from the digestive tract of *L. rohita* at Khoh and Nayar river system in the Garhwal (Uttarakhand).

A study on prevalence of parasites in the Indian major carp *L. rohita* at Rajshahi district in Bangladesh by Farhaduzzaman et al. (2010) recorded the availability of ten species of parasites—seven species as ectoparasites and three species as endoparasites. Of these, the helminth parasites were five (*Dactylogyrus vastator* Nybelim, 1924, *Gyrodactylus elegans* Nordman, 1832, *Camallanus*

Table 2 Incidence of collected parasites in the fish *L. rohita* (Ham.) during the study period

Month	No. of Fish			Different length groups of infected fishes								No. parasites recovered		Prevalence (%)		Intensity (Unit)		Abundance (Unit)	
	Collected	Examined	Infected	10 (cm)		11–15 (cm)		Above 15 (cm)		M	F	M	F	M	F	M	F	M	F
				M	F	M	F	M	F										
Dec. 08	15	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Jan. 09	18	12	–	1	–	–	–	–	1	–	2	–	8.33	–	2.0	–	0.16	–	–
Feb. 09	15	12	1	1	–	–	–	1	1	2	3	8.33	8.33	2.0	3.0	0.16	0.25	–	–
Mar. 09	16	12	–	2	–	–	–	–	2	–	4	–	16.66	–	2.0	–	0.33	–	–
April 09	19	12	1	–	–	1	–	–	–	3	–	8.33	–	3.0	–	0.25	–	–	–
May 09	16	12	1	3	–	–	1	1	2	4	5	8.33	25.00	4.0	1.66	0.33	0.42	–	–
June 09	15	12	2	2	–	–	2	–	2	3	5	16.66	16.66	1.5	2.5	0.25	0.42	–	–
July 09	20	12	2	4	1	1	–	1	1	2	4	16.66	33.33	2.0	1.75	0.33	0.58	–	–
Aug. 09	23	12	4	5	–	–	1	3	3	2	6	33.33	41.66	1.5	1.60	0.50	0.67	–	–
Sept. 09	19	12	–	3	–	–	–	1	–	2	–	–	25.00	–	1.66	–	0.42	–	–
Oct. 09	20	12	2	–	–	–	–	–	2	–	3	–	16.66	–	1.5	–	0.25	–	–
Nov. 09	16	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total	212	144	13	21	1	1	4	6	8	14	25	39	9.03	14.58	1.92	1.86	0.17	0.27	–

Fig. 1 Parasitic incidence (%) in different length groups of the fish *L. rohita* (Ham.) **Fig. 2** Seasonal fluctuation of parasitic incidence in *L. rohita* during study period

ophiocephali Nicoll, 1909, *Fellodistomum agnotum* Pearse, 1933 and *Eucreadium* sp.).

While comparing the results of present investigation with those of Arthur and Ahmed (2002), Khan et al. (2003), Bhuiyan et al. (2007) and Farhaduzzaman et al. (2010) who reported parasites from *L. rohita* but from different countries adjoining India, it is gathered that there is a major difference in respect of kinds of parasites i.e., the parasites like *Mysobolus* sp., *Chilodonella* sp., *Gyrodactylus* sp., *Eucreadium* sp., *Argulus* sp., *Thelohanellus dogieli* and *Neascus* sp. have not been reported in the present study. In fact, a bit similarity is there between the present findings and the results of Arthur and Ahmed (2002) with regard to protozoan and monogenean parasites. The following parasites viz. *H. vachi*, *D. glossogobii*, *A. mahaseri* and *Saccharinorhynchus* sp. have been for the first time reported from the fish *L. rohita*.

Based on the observations as gathered in the present study, the occurrence of maximum infection/infestation in rainy season and minimum in winters can be explained on the basis that during July–August the food possibility was found more in the winter season and temperature was also high. Due to this reason the movement of the fish was increased and muddy situation made more polluted environment for the fish to acquire infestation/infection. The parasitization showed a significant positive relationship with size of the fish, while very small fishes were nearly free of parasites, this exhibit a correlation with feeding habits of the fish.

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