

Trematode infection in Coldwater fishes of Ladakh (Leh), J&K, India

Shabir Ahmad Dar¹, Fayaz Ahmad, J. A. Dar, M. R. Mir and J. A. Kuchai

Department of Zoology, University of Kashmir, Srinagar-190006 (India)

Abstract

A parasitological investigation on the trematode parasites of fishes of Ladakh (Leh) was carried out from November 2007 to April 2009 (18 months). A total of 210 fishes belonging to three species viz., *Cyprinus carpio communis*, *Schizothorax progastrus* and *S. niger* were collected and examined from different collection sites of Ladakh. A total of 3 trematode species viz., *Diplozoon kashmirensis*, *D. aegyptensis* and *Allocreadium schizothoracis* belonging to two genera were reported. It was found that out of 210 hosts examined, 58 were found infected with 81 parasites recovered in total, with an overall prevalence, mean intensity and abundance of 27.61, 1.39 and 0.38 respectively. Distribution of helminth infection and its relation with sex and size of host was analysed. The helminth infection showed no significant relationship with sex of hosts however it showed mostly significant relation to size of host.

Key words: Helminth, Trematode, Coldwater fish, Prevalence, Ladakh.

The state of Jammu & Kashmir consists three geographical divisions viz., Jammu, Kashmir and Ladakh. From the zoogeographical point of view, the territory of Ladakh, is noted for the varied types of waters, numerous closed endemic water bodies and the wealth of fish species, particularly of Indus river. The ichthyofauna of Ladakh has been studied by various workers^{14,21,22}. As far as the recent published reports are concerned, Sivakumar³² studied lotic fish fauna of Ladakh

and reported 32 species of fishes while as Bhat *et al.*⁸, who studied indigenous fish fauna of this region reported only 10 species.

The three fish species (*Cyprinus carpio communis*, *Schizothorax progastrus* and *Schizothorax niger*) selected for present examination have been studied extensively for helminth infection especially in Kashmir valley^{1,12,13,16,18,23,29}, but no published reports of trematode infection were found by authors

¹ Correspondence Author: E-mail: darshabirahmad@gmail.com; Contact: +019906831641

relating to this region which made the base for present investigation.

Ladakh – the cold desert, represents the Trans-Himalayas sector of the Himalayan mountain chain ($79^{\circ}27'16''$ to $79^{\circ}26'01''$ E and $34^{\circ}35'37''$ to $35^{\circ}24'33''$ N). It is a catchment of the Indus river (**the longest river of Indian Subcontinent**), which contains three major sub-basins: the Indus, Shyok and Zanskar of the higher Himalayas. It covers a total area of 96,701 sq. kms, divided politically into two districts viz., Kargil and Leh, comprising a population of about 2 lacs, making it one of the *highest habitable place* in the world with **lowest density** of human population.

The present work was carried out in District Leh around the Indus river. A total of two hundred and ten (n=210) fishes belonging to three species viz., *C. c. communis*, *S. progastrus*, *S. niger*, were collected and examined for helminth infection from different collection sites of Leh both from Indus river and artificial fish farms. The fish specimen were measured (standard length, cm) and sexes were also determined.

During the dissection, skin, fins, gill filaments, eyes and intestine were examined in separate petri dishes with physiological saline solution (0.65). Stereotype microscope was used to thoroughly examine different organs especially gills. The parasites collected were washed in normal saline, fixed in Carnoy's fluid and stained in aceto-alum-carmine. Measurements were taken with micrometer and expressed in mm. The parasites were identified using Yamaguti³⁴, Cheng¹¹ and Paperna³⁰. For prevalence, intensity and abundance, the nomenclature given by Bush *et al.*,⁹ was

followed. Chi square test was used. Significance was taken at p<0.05.

During the present investigation three trematode species viz., *Diplozoon kashmirensis* Kaw²³, *Diplozoon aegyptensis*, Fischthal and Kuntz¹⁷ and *Allocreadium schizothoracis* Pande²⁹, were reported from three species of fishes examined viz., *C. c. communis*, *S. niger* and *S. progastrus* respectively.

It was found that out of 210 hosts examined 58 were found infected with an overall prevalence of 27.61. Out of the 58 infected fishes, 81 parasites were recovered with mean intensity of 1.39 and abundance of 0.38 (Table 1).

Table-1. Infection level of different species of fishes examined

Host Species	FE	FI	NP	P (%)	MI	A
<i>C. c. communis</i>	138	40	54	28.98	1.35	0.39
<i>S. niger</i>	41	11	19	26.82	1.72	0.46
<i>S. progastrus</i>	31	7	8	22.58	1.14	0.25
Total	210	58	81	27.61	1.39	0.38

FE (number of fishes examined); FI (Number of fishes infected); NP (number of parasites recovered); P (Prevalence); MI (Mean Intensity); A (Abundance).

Sex wise infection :

The helminth infection in relation to sex of host was analyzed. In each fish species both male and female specimens were analyzed separately and the infection level was checked (Table 2).

Table-2. Sex wise prevalence, intensity and abundance of helminth parasites in three species of fishes.

Host	Parameter	Male	Female	Total	Chi Square (χ^2)
<i>Cyprinus carpio communis</i>	FE	56	82	138	$\chi^2=1.60$, df=1, p<0.05
	FI	16	24	40	
	NP	21	33	54	
	Prevalance (%)	28.57	29.26	28.98	
	Mean Intensity	1.31	1.37	1.35	
	Abundance	0.37	0.40	0.39	
<i>Schizothorax progastrus</i>	FE	20	11	31	$\chi^2=0.14$, df=1, p<0.05
	FI	4	3	7	
	NP	6	2	8	
	Prevalance (%)	20	27.27	22.58	
	Mean Intensity	1.5	0.66	1.14	
	Abundance	0.3	0.18	0.25	
<i>Schizothorax niger</i>	FE	24	17	41	$\chi^2=0.09$, df=1, p<0.05
	FI	6	5	11	
	NP	12	7	19	
	Prevalance (%)	25	29.41	26.82	
	Mean Intensity	2	1.4	1.72	
	Abundance	0.5	0.41	0.46	

FE (number of fishes examined); FI (Number of fishes infected); NP (number of parasites recovered)

Table 2 shows the prevalence, intensity and abundance of helminth infection in relation to sex of fish species observed. In case of *C. c. communis*, out of total 138 specimens observed, 56 male specimens were examined and 16 were found infected with a prevalence, mean intensity and abundance of 28.57%, 1.31 and 0.37 respectively. On the other hand 82 female specimens were examined and 24 were found infected with a prevalence, mean intensity

and abundance of 29.26%, 1.37 and 0.40 respectively. Although the infection rate varied in different sexes but the calculated Chi Square value ($\chi^2 = 1.60$) was found lower than the tabulated value which indicated that there is no significant relationship between helminth infection and the sex of host (Fig.1).

In case of *S. niger*, out of total 41 specimens observed, 24 male specimens were

examined and 6 were found infected with a prevalence, mean intensity and abundance of 25%, 2 and 0.5 respectively. On the other hand 17 female specimens were examined and 5 were found infected with a prevalence, mean intensity and abundance of 29.41%, 1.4 and 0.46 respectively. Although the infection rate varied in different sexes but the calculated Chi Square value ($\chi^2 = 0.09$) was found lower than the tabulated value which indicated that there is no significant relationship between helminth infection and the sex of host (Fig. 1).

In case of *S. progasterus*, out of total 31 specimens observed, 20 male specimens were examined and 4 were found infected with a prevalence, mean intensity and abundance of 20%, 1.5 and 0.3 respectively. On the other hand 11 female specimens were examined and 3 were found infected with a prevalence, mean intensity and abundance of 27.27%, 0.66 and 0.18 respectively. Although the infection rate varied in different sexes but the calculated Chi Square value ($\chi^2 = 0.14$) was found lower than the tabulated value which indicated that there is no significant relationship between helminth infection and the sex of host (Fig. 1).

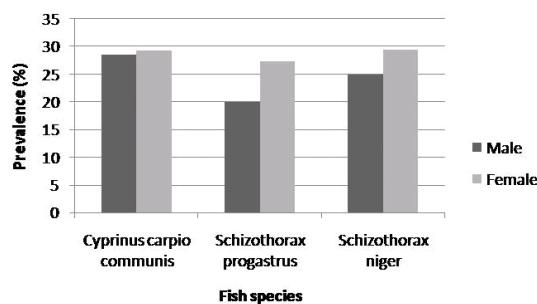


Fig. 1. Sex wise prevalence of five infected fishes

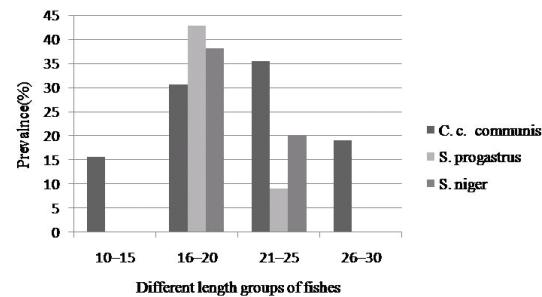


Fig. 2. Prevalence of helminth infection in different length groups of host species

Length wise infection :

The helminth infection in relation to size of host was analyzed. The fishes were selected between the length groups of 10 to 30cm, the range in which infection was found. The fishes both <10cm and >30cm were found to have less or zero infection and thus were not included for the study.

The table 3 illustrates size related variations in the infection of *C. c. communis*. The prevalence of infection among the different length groups varied significantly ($\chi^2 = 23.0$). The highest prevalence (35.48%) was recorded in length group 21 – 25 cm while as the lowest prevalence (15.7%) was recorded in length group 10 – 15cm (Fig. 2).

The table 3 illustrates size related variations in the infection of *S. progasterus*. The prevalence of infection among the different length groups varied significantly ($\chi^2 = 8.87$). The highest prevalence (42.85%) was recorded in length group 16-20 cm while as the lowest prevalence (0%) was recorded in length group 10 – 15cm (Fig. 2).

Table-3. Length wise prevalence of helminth parasites in three species of fishes

Host	Parameter	10–15	16–20	21–25	26–30	Total	Chi Square
<i>Cyprinus carpio communis</i>	FE	19	36	62	21	138	$\chi^2=23.0$, df=3, p<0.05
	FI	3	11	22	4	40	
	Prevalence	15.7	30.55	35.48	19.04	28.98	
<i>Schizothorax progastrus</i>	FE	6	14	11	-	31	$\chi^2=8.87$, df=2, p<0.05
	FI	0	6	1	-	7	
	Prevalence	0	42.85	9.09	-	22.58	
<i>Schizothorax niger</i>	FE	5	21	15	-	41	$\chi^2=8.89$, df=2, p<0.05
	FI	0	8	3	-	11	
	Prevalence	0	38.09	20	-	26.82	

FE (number of fishes examined); FI (Number of fishes infected).

The table 3 illustrates size related variations in the infection of *S. niger*. The prevalence of infection among the different length groups varied significantly ($\chi^2 = 8.89$). The highest prevalence (38.09%) was recorded in length group 16–20 cm while as the lowest prevalence (0%) was recorded in length group 10 – 15cm (Fig. 2).

Various studies revealed that parasitic infections some times correlate²⁷ and sometimes does not^{3,6,7,10} with sex of fishes. The present observations revealed that the prevalence of helminth infection in fish species examined does not show much difference and there was no significant relationship between sex of hosts and helminth infection. These observations are in conformity with Chappell¹⁰, Arme and Halton⁶, Barse⁷, and Akinsanya *et al.*³.

The prevalence of parasitic infections

correlate with fish length which also in turn corresponds to fish age as reported by Lagler *et al.*²⁴. Tables 3 reveals that prevalence of helminth infection in fish species examined increases with their standard length from 0.0% prevalence of infection of 10 – 15cm (*S. progastrus* and *S. niger*) in standard length to 42.85% prevalence of infection of 16 – 20cm (*S. progastrus*) in standard length and then decreases to 19.04% of 26 – 30cm (*C. c. communis*) and 9.09% (*S. progastrus*) of 21–25cm in standard length.

The prevalence of infection among the different length groups varied significantly. These observations are in conformity with findings of Read *et al.*,³¹ who observed that the probable reason for difference in prevalence of infection between the juvenile and the adult fish as related to their standard length may be due to change in diet from weeds, seeds, phytoplanktons and zooplanktons to insect larvae, snails, crustaceans, worms and fish in

both juveniles and adulthood respectively. The length groups 21 – 25cm and 26 – 30cm recorded decreased prevalence of infection (*S. progastrus* and *S. niger*). This may be attributed to the possible random selection of the specimens and the possible high level of immunity in larger sized fish specimens as observed by Akinsanya *et al.*³.

The high incidence of infestation obtained in adult fish is an indicator that size of the fish is important in determining the parasite load compared to juveniles. Geets and Ollevier¹⁹, Oniye and Aken’Ova²⁸ also reported that increase in the abundance of parasites with host size. Anosike *et al.*⁵ reported that number of parasites and its diversity increase with age of fish. Mohammed *et al.*,²⁵ reported prevalence was found to increase as the fish grows, and that could be attributed to the longer time of expose to the environment by body size.

The present work reveals that the helminth infection shows no relation to sex of host while as significant relationship was observed with size of host.

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