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Asian Journal of Animal and Veterinary Advances

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Asian Journal of Animal and Veterinary Advances 7 (7): 613-620, 2012
ISSN 1683-9919 / DOI: 10.3923/ajava.2012.613.620

Parasites of Three Indian Minor Carps of Rajshahi, Bangladesh

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ABSTRACT

The present study attempts to describe the parasitic infestations of three Indian minor carps (*Labeo bata, Labeo gonius* and *Cirrhinus reba*) collected from different fresh water bodies of Rajshahi district, Bangladesh during March 2007 to February 2008. A total of 480 host fishes were examined of which 370 fishes were infected by 4 protozoan (*Trichodina* sp., *Ichthyophthirius* sp., *Apiosoma* sp. and *Chilodonella* sp.), 2 monogenean (*Gyrodactylus* sp. and *Dactylogyrus* sp.), 2 crustacean (*Argulus* sp. and *Larnaea* sp.), 1 digenean (*Fellodistomum* sp.) and 1 nematoda (*Camallanus* sp.) parasitic species. These parasites were isolated from body slime, gills and intestine of the infected fishes. Among the isolated parasites *Fellodistomum* sp. was found as the highest and *Chilodonella* sp. was found as the lowest in number. Our results indicate that infection and infestation rate of parasites varied with fish size and season and found to be high in the post-monsoon and winter periods (November-March), when fish are most susceptible to parasites.

Key words: Fresh water fish, disease, parasite, Bangladesh

INTRODUCTION

Parasitic diseases are playing a vital role by causing mortality or retard growth rate of fish which lead to economic loss in the farm. Sometimes due to heavy parasite infestation, particularly the ecto-parasites damage the fish body or make wounds which facilitates portal of entry for secondary infection and fish become unfit for human consumption (Hoffman, 1967). However, five factors namely age, diet, abundance of fishes, independent number of a parasite within the fish and season, directly influence the parasite fauna of fishes (Kabata, 1985; Dogiel, 1964). Srivastava (1975) stated that the characteristic of any water body can influence and determine its parasitic fauna and when environmental conditions, such as water, food and temperature become favourable for mass reproduction of parasites, the disease may spread very quickly.

A majority of freshwater fishes carry heavy infection of parasites which cause deterioration in the food value of fish and may even result in their mortality. Besides these, there are a number of helminth parasites which are transmitted to human beings only through fish. The study of helminth parasites, its frequency and distribution in fishes, is very scant in Bangladesh. These parasites use the fish for their shelter and food and thus destruct more or less each and every organ

resulting in pathogenic effects (Lilley *et al.*, 1992). Parasites interfere with the nutrition, metabolism and secretary function of alimentary canal, damage nervous system and even upset the normal reproduction of the hosts (Rahman *et al.*, 1998a, b). The distribution of helminths of the same host and their incidence and intensity of infestation varies from one place to another. One should know these variations in infestation and the taxonomic details of these worms for proper management of the fish crop in ponds. The presence of certain helminth parasites, especially larval trematode is known to eliminate or reduce the reproduction in molluscs (Rahman and Jahan, 2005).

Crustacean is an important disease producing parasite of freshwater fishes. Hoffman (1977) while describing the pathogenicity of Argulus reported that it can kill a larval eel by a single sting which injects a cytoplasmic toxin into the host. It is also reported that this parasite creates ulceration and haemorrhagic changes to the host skin providing ready access to secondary infections by other parasites, bacteria, fungi and viruses.

Recently, Hossain *et al.* (1994a, b), Hafizuddin and Shahabuddin (1996), Akhter *et al.* (1997), Rahman *et al.* (1998a,b), Parween and Rahman (2000), Banu and Khan (2004), Rahman and Parween (2001), Alam *et al.* (2006), Akter *et al.* (2007), Bhuiyan *et al.* (2007), Uddin *et al.* (2012) and Afsharnasab *et al.* (2009) have made some attempts to explore the fauna of helminth parasites of fresh and brackish water fishes and shell fishes in Bangladesh and elsewhere. However, research on parasitic infestation and infection of freshwater minor carp in Bangladesh is scarce. Therefore, the present study was aimed to survey the parasites of Indian minor carp, collected from different fresh water bodies of Rajshahi district, Bangladesh.

MATERIALS AND METHODS

Sample collection: Samples were collected four times per month from different fresh water bodies of Rajshahi district Bangladesh from March 2007 to February, 2008. A total of 480 fish comprising Indian minor carps; *Labeo bata* (n = 180), *Labeo gonius* (n = 120) and *Cirrhinus reba* (n = 180) were used in this study. The fishes were measured to the nearest 1 cm (total length, TL) and weighed to the nearest 0.1 g (weight).

Grouping of host fishes: In the laboratory, the host fishes were divided into three groups corresponded roughly to smaller (<10 cm TL), medium (10-20 cm TL) and larger (>20 cm TL) to observe whether any relationship exits between length of fish and parasitic infestation.

Collection of parasites: External parasites from body surface, fin and gill were removed by scrapping the slime with a sharp scalpel in a drop of water on a clean dry glass slide and spreaded it evenly. A cover slip was placed over the materials. The gill arches were removed and macerated on slides and examined under a compound microscope (BX51 microscope, Olympus, Japan). In case of monogeneans, the gill were removed into petridishes containing water and gently scrapped to dislodge monogeneans. The monogeneans were removed on to clear slides with a fine pipette through a drop of water and covered with cover slip.

For endoparasites, fishes were dissected out ventrally by a sharp scalpel to observe parasites inside buccal cavity, stomach and intestine. The whole gut was removed in a watch glass containing 0.9% physiological saline afterwards cleaned several times with tap water to free from any unwanted materials. Small worms were searched initially with the help of magnifying glass by scrapping out mucus.

Identification and preservation of parasites: Parasites were identified according to the description of Yamaguti (1958, 1963), Hafizuddin and Shahabuddin (1996), Agarwal and Sharma (1988) and Bykhovskaya-Pavlovskaya *et al.* (1962). After identification only metazoan parasites were preserved in AFA (120 mL distilled water + 6 mL Ethyl Alcohol + 30 mL Formalin + 10 mL Glycerin + 0.5% neutral or methylene blue/Acetocarmine) solution for detailed study.

Estimation of parasites: Prevalence, abundance and mean density were estimated through the following formula proposed by Margolis *et al.* (1982) as:

$$\text{Prevalence} = \frac{\text{Total No. of infected fishes}}{\text{Total No. of fishes hosts examined}} \times 100$$

$$\text{Abundance} = \frac{\text{Total No. of parasites recovered}}{\text{Total No. of fish hosts examined}}$$

$$\text{Mean density} = \frac{\text{Total No. of parasites recovered}}{\text{Total No. of infected examined}}$$

Level of infestation: Level of infestation was measured as follows, low: 1-5 parasites per slide, medium: 6-10 parasites per slide, high: More than 11 parasites per slide.

RESULTS AND DISCUSSION

A total of 8 ectoparasite species i.e., 4 protozoan (*Trichodina* sp., *Ichthyophthirius* sp., *Apiosoma* sp. and *Chilodonella* sp.), 2 monogenean (*Gyrodactylus* sp., *Dactylogyrus* sp.) and 2 crustacean (*Argulus* sp. and *Larnaea* sp.) and 2 endoparasite species i.e., 1 digenean (*Fellodistomum* sp.) and 1 nematoda (*Camallanus* sp.) were identified from fish samples (Table 1).

Host wise prevalence (%), abundance and mean density of parasites: During the investigation leastwise infection, prevalence, abundance and mean density of protozoan and metazoan parasites were observed (Table 2). The seasonal monthly average prevalence of parasite in *L. bata* was highest in November (100.00%) and lowest in May and July (66.67%), abundance was highest in November (9.47) and lowest in July (4.27) and mean density was highest in May (11.50) and lowest in July (6.40) (Table 2).

Table 1: Parasites in different organs of three Indian minor carp species

Species	No. of fish examined	No. of infected fish	Range of total length (cm)	Range of total weight (g)	Parasites in different organs		
					Skin	Gill	Intestine
L. bata	180	149	5-15	50-200	*Chilodonella* sp. *Gyrodactylus* sp. *Argulus* sp. *Ichthyophthirius* sp.	*Dactylogyrus* sp. *Trichodina* sp.	*Fellodistomum* sp. *Camallanus* sp.
L. gonius	120	88	10-20	100-500	*Chilodonella* sp. *Larnaea* sp.	*Dactylogyrus* sp.	*Fellodistomum* sp.
C. reba	180	133	5-20	100-300	*Chilodonella* sp. *Gyrodactylus* sp. *Argulus* sp. *Apiosoma* sp.	*Dactylogyrus* sp. *Trichodina* sp.	*Fellodistomum* sp. *Camallanus* sp.

Table 2: Average prevalence (%), abundance and mean densities of parasites in three Indian minor carp species

Species	No. of fish examined	No. of fish infected	No. of parasites	Isolated parasites	Prevalence (%)	Abundance	Mean density	Mode of infection
L. bata	180	18	173	*Chilodonella* sp.	10.00	0.96	9.61	++
		17	146	*Gyrodactylus* sp.	9.44	0.81	8.59	+
		16	184	*Argulus* sp.	8.89	1.02	11.50	++
		14	144	*Ichthyophthirius* sp.	7.78	0.80	10.29	+
		18	159	Dactylogyrus sp.	10.00	0.88	8.83	++
		22	231	*Trichodina* sp.	12.22	1.28	10.50	+++
		21	165	*Fellodistomum* sp.	11.67	0.92	7.86	++
		19	202	*Camallanus* sp.	10.56	1.12	10.63	+++
L. gonius	120	22	225	*Chilodonella* sp.	18.33	1.88	10.23	+++
		25	167	*Larnaea* sp.	20.83	1.39	6.68	++
		22	216	*Dactylogyrus* sp.	18.33	1.80	9.82	+++
		19	108	*Fellodistomum* sp.	15.83	0.90	5.68	+
C. reba	180	17	71	*Chilodonella* sp.	9.44	0.39	4.18	+
		19	225	*Gyrodactylus* sp.	10.56	1.25	11.84	+++
		16	164	*Argulus* sp.	8.89	0.91	10.25	++
		15	220	*Apiosoma* sp.	8.33	1.22	14.67	+++
		18	160	*Dactylogyrus* sp.	10.00	0.89	8.89	++
		17	80	*Trichodina* sp.	9.44	0.44	4.71	+
		16	270	*Fellodistomum* sp.	8.89	1.50	16.88	+++
		15	198	*Camallanus* sp.	8.33	1.10	13.20	++

+ = Low infection, ++ = Medium infection, +++ = High infection

The seasonal monthly average prevalence of parasite in *L. gonius* was highest in July (100.00%) and the lowest in November, January and February (60.00%), parasites abundance was highest in July (8.00) and lowest in November (3.50) and mean density was highest in March and October (9.50) and lowest in November (5.83) (Table 2).

The seasonal monthly average prevalence in *C. reba* was highest in May and October (93.33%) and the lowest in July, August, January and February (66.67%), abundance was highest in October (9.93) and lowest in November (4.27) and mean density was highest in September (12.55) and lowest in November (6.40) (Table 2).

Comparative infestations of Prevalence mean density and Abundance of host fishes in different length groups

Prevalence: In smaller length group, the highest prevalence value (82.35%) was found in *C. reba* and lowest prevalence value (72.73%) was recorded in *L. bata*. In medium length group, the highest prevalence value (97.78%) was found in *L. bata* and lowest prevalence value (61.25%) was recorded in *C. reba*. But in larger length group, the highest prevalence value (87.50%) was found in *C. reba* and lowest prevalence value (60.00%) was recorded in *L. bata* (Table 3). Golder *et al.* (1987) reported that fishes of medium length group were more infested which is similar with the result obtained in the present study. The establishment of a host parasite system requires considering factors namely age and seasons as these factors are basically related with the physiological and ecological conditions of the host and parasites (Kennedy, 1975).

Abundance: In smaller length group, the highest abundance (9.47) was found in *L. bata* and lowest abundance (7.38) was recorded in *C. reba*. In medium length group, the highest abundance

Table 3: Comparative infestations of prevalence mean density and abundance of three Indian minor carp species

	Prevalence (%)			Mean density			Abundance		
Host fish	Smaller	Medium	Larger	Smaller	Medium	Larger	Smaller	Medium	Larger
L. bata	72.73	97.78	60.00	13.03	8.67	5.71	9.47	8.48	3.43
L. gonius	75.00	75.00	62.50	11.67	8.08	2.10	8.75	6.06	1.31
C. reba	82.35	61.25	87.50	8.96	12.69	9.46	7.38	7.78	8.28

(8.48) was found in *L. bata* and lowest abundance (6.06) was recorded in *L. gonius*. But in larger length group, the highest abundance (8.28) was found in *C. reba* and lowest abundance (1.31) was recorded in *L. gonius* (Table 3). Gussev (1976) concluded that prevalence and mean density of infestation generally increased with host size up to a point and then declined. Yeasmin (2004) noted that the intermediate length groups of *Clarias batrachus* and *Colisa fasciatus* were more infested than smaller and larger length groups.

Mean density: In smaller length group, the highest mean density (13.03) was found in *L. bata* and lowest mean density (8.96) was recorded in *C. reba*. In medium length group, the highest mean density (12.69) was found in *C. reba* and lowest mean density (8.08) was recorded in *L. gonius*. But in larger length group, the highest mean density (9.46) was found in *C. reba* and lowest mean density (2.10) was recorded in *L. gonius* (Table 3).

During the study period, the variation in species composition, prevalence, abundance, intensity and infection level of the study of host specimens might be due to host specificity, temperature, metabolic activity and suppression of natural immune system of fish. The association of parasites fauna in the host fishes in the present study are supported by the findings of Akhter *et al.* (1997), Chandra *et al.* (1997), Hossain *et al.* (2000), Rahman (2000), Rahman and Parween (2001). So, it was observed that among the different size groups of fishes, the prevalence was highest in medium length groups, abundance and mean density was highest in smaller length groups as reported by Golder *et al.* (1987).

The collected parasites were *Chilodonella* sp., *Trichodina* sp., *Ichthyophthirius* sp., *Apiosoma* sp., *Gyrodactylus* sp., *Dactylogyrus* sp., *Argulus* sp., *Larnaea* sp., *Fellodistomum* sp. and *Camallanus* sp. Whitish to yellowish cysts in the skin and gill, loss of mucus, slight haemorrhage at the base of dorsal, pectoral and caudal fin were observed in case of heavily infected fish. Subasinghe (1992) studied hatchery diseases of freshwater fish in Sri Lanka and reported heavy mortality in major carp fry and fingerlings due to ciliate ectoparasite like *Trichodina* sp., *Ichthyophthirius* sp., *Chilodonella* sp. and fluke like *Dactylogyrus* sp. during nursery operation. Moreover, Mohan (1999) reported that ectoparasites, protozoans, monogenetic trematodes, fish lice, anchor worm, endoparasitic protozoans are some of the very important pathogens that have had significant impact on the yield in carp hatcheries and seed production centres in India. Perhaps parasite acts either as a pathogen or vector for diseases (Roberts *et al.*, 1986). Although, Reungprach *et al.* (1983) found no direct relationship of ectoparasite with the occurrences of dermal lesion.

CONCLUSION

This study describes the parasitic infestations of three Indian minor carps from different fresh water bodies of Rajshahi district, Bangladesh and indicates that infection and infestation rate of

parasites varied with fish size and seasonality. This could be due to stocking density, water depth, temperature along with other physico-chemical parameters and management practices maintained. Nevertheless, more in depth research is needed to be carried out for studying parasites as well as diseases of this three minor carp species and other carp fishes to depict precise and full information of carp fish diseases in Bangladesh.

ACKNOWLEDGMENTS

Heartiest thanks to our dedicated laboratory technicians, University of Rajshahi Bangladesh for their support during the study. Thanks to University Kebangsaan Malaysia for the financial support through Young Researcher incentive grant No. GGPM-2011-057. We would also like to thank the anonymous reviewers for their very useful comments.

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