

Distribution, prevalence and intensity of protozoan and monogenean parasites of carp fingerlings in selected nursery ponds

M.K. Hossain, A.T.A. Ahmed, M.H. Khan^{*1}, S.M. Rafiquzzaman¹, F. Begum² and M. A. Islam³

Department of Zoology, Laboratory of Fisheries, University of Dhaka, Dhaka 1000, Bangladesh

¹Fresh water Station, Bangladesh Fisheries Research Institute, Mymensingh 2201

²Palli Daridra Bimochon Foundation, Mymensingh

³Department of Biochemistry and Molecular Biology, University of Rajshahi, Rajshahi

*Corresponding author

Abstract

An experiment was carried out on the distribution, prevalence and intensity of infestation of protozoan and monogenean parasites of carp fingerlings in two selected areas of Bangladesh. Six hundred and forty fingerlings of seven species viz. *Catla catla*, *Hypophthalmichthys molitrix*, *Labeo rohita*, *Ctenopharyngodon idella*, *Cyprinus carpio*, *Barbodes gonionotus* and *Cirrhinus cirrhosus* from different nursery ponds of Shambhuganj, Mymensingh, and Santaher, Bogra were examined during this investigation. This study revealed that carp fingerlings carried a large number of protozoan and monogenean parasites. Different protozoan parasites viz *Trichodina domerguei*, *Trichodina reticulata*, *Myxobolus koi*, *Chilodonella cyprini* and monogenean parasites such as *Dactylogyrus extensus*, *Dactylogyrus catlarius* and *Dactylogyroides tripathi* were identified in the experimental fishes throughout the study period. It has been observed that distribution, prevalence and intensity of parasite in carp fingerlings are species and zone specific. In case of *C. cirrhosus*, the highest prevalence of protozoan parasite viz *Trichodina domerguei* were 93.75% and 75.92% in Santhahar and Shambhuganj area respectively. Irrespective of host, the most prevalent ectoparasite was *Dactylogyrus extensus*, followed by *Myxobolus koi*, *Chilodonella cyprini* and *Dactylogyroides tripathi*. Relatively higher mortality of carp fingerlings was found at younger stage. The highest prevalent parasitic species was identified as *Trichodina domerguei* followed by *Trichodina reticulata* and *Dactylogyrus catlarius* were found 93.75% in *Cirrhinus cirrhosus*, 68.75% in *Cyprinus carpio* and 39.44% in *Hypophthalmichthys molitrix* respectively.

Key words: Protozoan, Monogenean, Ectoparasite, Carp fingerlings

Introduction

Occurrences of diseases in fish are the most devastating problem for successful

aquaculture. Large numbers of freshwater fishes are becoming severely infested with different parasites that cause much mortality of fish which ultimately hamper the total aquaculture production in country. This phenomenon not only hampers the production but also create adverse impact on our economy. The study on the fish parasites and their frequency and distribution in fishes was very scant in Bangladesh compared to the considerable progress achieved by Japan, India and other oriental countries. Some fragmentary survey type of works had been done in the past. Bashirullah (1973) was the first to make a brief survey on the helminth fauna of fish. His works were concentrated on the taxonomic aspects of trematodes and nematodes. Ahmed *et al.* (1976, 1977, 1978 & 1979) and Ahmed (1981) worked on the distribution, incidence, infection pattern and pathology of fish parasites. Carp fry and fingerlings were identified as the most susceptible and severely affected fish group during their investigation.

Little is known about the distribution, pathogenic effects and control of most of the diseases in natural population of fresh water fish. In Bangladesh, information on prevalence and extent of damage caused by ectoparasite in carp fry and fingerlings is scanty. Therefore, the study of fish parasite is one of the significant and priority areas. Keeping the above background in mind, a study on the common parasites of seven species of cyprinid fishes *viz.* silver carp (*H. molitrix* Val.), grass carp (*C. idella* Val.), common carp (*C. carpio*), thai punti (*B. gonionotus*), catla (*C. catla* Ham.), rohu (*L. rohita* Ham.) and mrigal (*C. cirrhosus* Ham.) of the family cyprinidae from some ponds of Mymensingh and Bogra districts was undertaken.

Materials and methods

Collection of samples: The present study was conducted in Mymensingh and Bogra districts. The host fishes were fingerlings of *H. molitrix*, *C. idella*, *C. carpio*, *B. gonionotus*, *C. catla*, *L. rohita* and *C. cirrhosus*. Fingerlings of different carp species were sampled on a monthly basis. The sampling was done with the help of local fish farmers using small mesh sized cast nets and dip nets from different fish ponds at Shambhuganj, Mymensingh and Santahar, Bogra.

The collected live fishes were immersed in 5% neutral formalin for preservation and brought to the laboratory of Freshwater Station, BFRI, Mymensingh and Floodplain Sub-Station, BFRI, Santahar, Bogra for detailed study of infestation of protozoan parasites and monogenean helminths in their ecological niche.

Investigation of parasites: A total of 640 fish specimens of different carp fingerlings were examined throughout the study period. Body length of the host fishes were measured by slide calipers. For the study of ectoparasites, external organ of fish such as skin, scales, fins, tails etc. were first examined with a hand lens. The gills were then dissected out from the branchial cavity and placed in a finger bowl containing 1:4000 formalin solution for an hour (Putz and Hoffman 1963, Rogers 1967). The decanted sediments were taken in a petridish and picked up by dropper which is examined under a stereoscopic microscope with 10×40, 10×60, 10×100 times magnifications. Smear and

mucosal layer were prepared through scraping of the affected fish and fixed in 10% buffered neutral formalin solution. This sample were stained with Heidenhain's iron hematoxylin and counter stained with eosin. The scraped material was diluted with a drop of clean water and then transferred to a slide with cover slip and examined first by a low magnification (30X) and then by a high magnification of microscope. Prevalence and intensity of parasites in each fish were recorded for each month. The collected parasites were fixed using the method suggested by Cable (1958). The parasites were identified with the help of methodology described by Thomas and Rogers (1970) and methods adopted by Lom (1960), Lucky (1971) and Kabata (1985). The effect of region and length of fishes were analyzed in terms of the percentage of parasites present. Level of infestations and frequency, referred to as the number of fishes infected by parasites (usually the mean), was calculated and severity of infestation was determined accordingly. Prevalence of parasites were obtained as the number of fingerlings infected divided by total number of fingerlings sampled multiplied by one hundred. Regional and organ wise distributions of the parasites were analyzed in terms of percentage. Incidence of infestation refers to the percentage of fish in a sample infested with a particular parasite species.

Results

Protozoan parasites

Trichodina domerguei was found well distributed throughout the two study areas. This parasite was found 64.77% in *H. molitrix*, 56.76% in *C. idella*, 56.25% in *C. carpio*, 34.88% in *P. gonionotus*, 64.58% in *L. rohita* and 75.92% in *C. mrigala* and 62.76% in *C. catla* in ponds of Shambhuganj, Mymensingh (Table 1) and 64.29% in *H. molitrix*, 85.0% in *C. idella*, 83.33% in *P. gonionotus*, 75.0% in *C. catla*, 77.14% in *L. rohita*, and 93.75% in *C. mrigala* in ponds of Santahar, Bogra (Table 2). *Trichodina reticulata* was recorded 1.35%, 68.75% and 9.30% in the hosts such as *C. idella*, *C. carpio*, and *P. gonionotus* respectively from Shambhuganj, Mymensingh and that was 53.85% in *C. carpio* in Santahar, Bogra (Table 1&2). *Chilodonella cyprini* was recorded 10.81%, 4.65%, 2.13% and 2.08% in *C. idella*, *P. gonionotus*, *C. catla* and *L. rohita* respectively in Shambhuganj, Mymensingh (Table 1).

It was found 10.0% in *C. idella* from Santahar area (Table 2). The prevalence of *Myxobolus koi* recorded from *H. molitrix*, *C. idella*, *C. carpio*, *C. catla*, *L. rohita* and *C. cirrhosus* was 5.63%, 17.57%, 22.92% 4.25%, 4.17% and 29.63% respectively of ponds at Shambhuganj, Mymensingh (Table 1). It was also recorded 17.86% in *H. molitrix*, 20.0% in *C. idella*, 15.38% in *C. carpio*, 50.0% in *P. gonionotus*, 8.33% in *C. catla* and 5.71% in *L. rohita* of ponds at Santahar, Bogra (Table 2). The highest percentage (50%) of *Myxobolus koi* was recorded from *P. gonionotus* in the ponds at Bogra and the lowest (4.17%) from *L. rohita* in the ponds at Mymensingh area. The highest prevalence (10.81%) of *Chilodonella cyprini* was recorded from *C. idella* in ponds at Mymensingh and lowest (2.08%) from the fish *L. rohita* in the same area. Protozoan parasites infected 86.79% *H.*

molitrix, 94.34% *C. idella*, 95.55% *C. carpio*, 94.44% *P. gonionotus*, 90.0% *C. catla*, 96.97% *L. rohita* and 100% *C. cirrhosus* in the ponds of Shambhuganj, Mymensingh (Table 3). All of the fishes except *L. rohita* were infected 100% with these parasites in Santaher area, Bogra. 93.10% *L. rohita* was infected with these parasites in that area (Table 4).

Table 1. Prevalence of parasites with site and degree of infestation in carp fingerlings in fish farm of Mymensingh

Host fishes (carp)	Length of fish (cm)	Parasites identified	Prevalence %	Site of infestation	Degree of infestation
<i>H. molitrix</i>	2.2-10.5	<i>Trichodina domerguei</i>	64.77	G.S.F	++
		<i>Dactylogyrus catlarius</i>	39.44	G.	+
		<i>Myxobolus koi</i>	5.63	G.S.	+
<i>C. idella</i>	3.5-9.5	<i>Trichodina domerguei</i>	56.76	G.S.	++
		<i>Trichodina reticulata</i>	1.35	G.S.	+
		<i>Chylodonella cyprini</i>	10.81	G.S.	+
		<i>Myxobolus koi</i>	17.57	G.	+
		<i>Trichodina domerguei</i>	56.25	G.S.	++
<i>C. carpio</i>	3.2-8.5	<i>Trichodina reticulata</i>	68.75	G.S.	++
		<i>Myxobolus koi</i>	22.92	G.S.	+
		<i>Dactylogyrus extensus</i>	72.92	G.	+++
		<i>Trichodina domerguei</i>	34.88	G.S.	+
<i>B. gonionotus</i>	2.5-8.5	<i>Trichodina reticulata</i>	9.30	G.S.	+
		<i>Chylodonella cyprini</i>	4.65	G.S.	+
		<i>Dactylogyroides tripathi</i>	23.25	G.	+
		<i>Myxobolus koi</i>	4.25	G.S.	+
<i>C. catla</i>	2.5-8.5	<i>Trichodina domerguei</i>	62.76	G.S.	++
		<i>Chylodonella cyprini</i>	2.13	G.S.	+
		<i>Dactylogyrus catlarius</i>	36.17	G.	+
		<i>Trichodina domerguei</i>	64.58	G.S.	++
<i>L. rohita</i>	2.0-10.2	<i>Myxobolus koi</i>	4.17	G.	+
		<i>Chylodonella cyprini</i>	2.08	G.S.	+
		<i>Dactylogyrus extensus</i>	28.12	G.	+
		<i>Trichodina domerguei</i>	75.92	G.S.	+++
<i>C. cirrhosus</i>	2.5-10.2	<i>Myxobolus koi</i>	29.63	G.	+

N.B: G = Gill, S = Skin, F = Fin +++ = Heavy, ++ = moderate, + = Low.

Monogenean parasites

Among the 3 species of monogenetic trematodes, *viz.* *Dactylogyrus catlarius*, *Dactylogyrus extensus* and *Dactylogyroides tripathi*, all were found in ponds at Mymensingh and only *Dactylogyrus extensus* was found in ponds at Bogra. The prevalence of *Dactylogyrus catlarius* was recorded 39.44% in *H. molitrix* and 36.17% in *C. catla* of ponds of Mymensingh (Table 1). *Dactylogyrus extensus* was found 72.92% in *C. carpio* and

28.12% in *L. rohita* from ponds of Mymensingh (Table 1) and in Bogra area *Dactylogyrus extensus* was found 37.14% in *L. rohita* (Table 2). *Dactylogyroides tripathi* was recorded 23.25% only from *P. gonionotus* in ponds of Mymensingh (Table 1).

Table 2. Prevalence of parasites with site and degree of infestation in carp fingerlings in fish farm of Bogra

Host fishes (carp)	Length of fish (cm)	Parasites identified	Prevalence %	Site of infestation	Degree of infestation
<i>H. molitrix</i>	4.0-10.2	<i>Trichodina domerguei</i>	64.29	G.S	++
		<i>Myxobolus koi</i>	17.86	G.	+
<i>C. idella</i>	4.5-9.5	<i>Trichodina domerguei</i>	85.00	G.S.F.	+++
		<i>Myxobolus koi</i>	20.00	G.	+
		<i>Chylodonella cyprini</i>	10.00	G.	+
<i>C. carpio</i>	3.5-8.2	<i>Trichodina reticulata</i>	53.85	G.S.	++
		<i>Myxobolus koi</i>	15.38	G.S.	+
<i>B. gonionotus</i>	3.0-7.2	<i>Trichodina domerguei</i>	83.33	G.S.	+++
		<i>Myxobolus koi</i>	50.00	G.	++
<i>C. catla</i>	3.5-7.8	<i>Trichodina domerguei</i>	75.00	G.S.	+++
		<i>Myxobolus koi</i>	8.33	G.	+
<i>L. rohita</i>	4.2-10.5	<i>Trichodina domerguei</i>	77.14	G.S.	+++
		<i>Dactylogyrus extensus</i>	37.14	G.	+
		<i>Myxobolus koi</i>	5.71	G.	+
<i>C. cirrhosus</i>	4.5-11.0	<i>Trichodina domerguei</i>	93.75	G.S.	+++

N.B: G = Gill, S = Skin, F = Fin +++ = Heavy, ++ = moderate, + = Low.

Monogenean parasites infected 56.60% *H. molitrix*, 5.66% *C. idella*, 77.78% *C. carpio*, 55.55% *P. gonionotus*, 48.57% *C. catla*, 40.91% *L. rohita* and 0% *C. mrigala* in the ponds of Shambhuganj, Mymensingh (Table 3). In Santaher, Bogra only 44.43% *L. rohita* was infected with these parasites (Table 4).

Table 3. Number and percentage of fishes infected by protozoan and monogenean parasites in ponds of Shambhuganj, Mymensingh

Name of the host fish	No. of fish examined	No. of fish infected with parasites	(%) of total fish infected with parasites	(%) of fish infected with protozoan parasites	(%) of fish infected with monogenean parasites
<i>H. molitrix</i>	71	53	74.65%	86.79%	56.60%
<i>C. idella</i>	74	53	71.62%	94.34%	5.66%
<i>C. carpio</i>	48	45	93.75%	95.55%	77.78%
<i>B. gonionotus</i>	43	18	41.86%	94.44%	55.55%
<i>C. catla</i>	94	70	74.47%	90%	48.57%
<i>L. rohita</i>	96	66	68.75%	96.97%	40.91%
<i>C. cirrhosus</i>	53	41	75.92%	100%	0%

Most of the parasites were recorded from gills, fin and body surface of fish. Protozoan parasites were found on the gill, fin and body slime but the monogenean parasites were recorded from the gill only (Tables 1 and 2). Degree of infestation was low, moderate and heavy. Length of fishes, site of infestation and degree of infestation in fishes are shown in Tables 1 & 2.

Table 4. Number and percentage of fishes infected by protozoan and monogenean parasites in ponds of Santaher, Bogra

Name of the host	No. of fish examined	No. of fish infected with parasites	(%) of total fishes infected with parasites	(%) of fish infected with protozoan parasites	% of fish infected with monogenean parasites
<i>H. molitrix</i>	28	20	71.43%	100%	0%
<i>C. idella</i>	20	17	85%	100%	0%
<i>C. carpio</i>	13	8	61.54%	100%	0%
<i>B. gonionotus</i>	12	10	83.33%	100%	0%
<i>C. catla</i>	36	28	77.78%	100%	0%
<i>L. rohita</i>	35	29	82.86%	93.10%	44.43%
<i>C. cirrhosus</i>	16	15	93.75%	100%	0%

Discussion

The current study was confined to ectoparasitic investigation in carp nursery operation systems belongs to two different agro-ecological regions such as Mymensingh and Bogra of Bangladesh. However, the findings clearly indicate a widely distributed pattern of protozoan and metazoan parasites in carp fingerlings throughout the entire zones. Mymensingh region was found to be more vulnerable to ectoparasitic infestation compared to Bogra, which could be due to intensified fish nursery and culture activities in Mymensingh. High stocking density, presence of excessive ammonia, poor pond hygienic etc. might act as predisposing factors for parasitic infestation (Hossain *et al.* 1994). High stocking density is favorable for horizontal transmission of parasites unlike several other disease outbreaks in animal kingdom.

During the study, trichodinid had been identified as the most dominating parasitic group followed by *Dactylogyrus* spp. among the four, in terms of prevalence and intensity of infestation irrespective of host and sampling region. Banu *et al.* (1993 and 2004) found similar patterns of parasitic distribution during their regional parasitic investigation in freshwater ponds of Bangladesh.

C. cirrhosus was identified as the most susceptible fish species in both the regions, which could be due to its bottom feeding habit and having more chances to be closer with the bottom sediment containing pathogen. Due to bottom dwelling nature, *C. cirrhosus* was identified as the most vulnerable carp species to epizootic ulcerative syndrome in Bangladesh. However, other carp and barb species are as well in risk of

EUS (Khan 2001).

Ectoparasites create skin rupture during their attachment, anchoring and feeding activities on host which facilitate the entry of environmental pathogen such as bacteria, virus, fungus and other parasites. Gill damage caused by protozoan parasite might often results in poor gill performance due to secondary infection. Ectoparasitic infestation had been identified as a potential risk factor for the occurrence of EUS in Bangladesh during a survey undertaken during 1998 to 1999 by Khan and Lilley (2002). Therefore, better health management practices and pond hygiene should be adopted in nursery operation systems of Bangladesh for producing quality fish fry.

Acknowledgements

The authors would like to express their deepest sense of gratitude to the Chairman, Department of Zoology, University of Dhaka, for his kind cooperation and providing all facilities. They must express their gratitude to Dr. M.A. Mazid, Director General, Bangladesh Fisheries Research Institute, Mymensingh, Bangladesh, for allowing the researchers to carry out the research in the Fish Disease laboratory of BFRI. Finally, they would also like to express their gratitude and thanks to the Secretary, Ministry of National Science and Technology, Bangladesh, for providing financial assistance through NST fellowship.

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(Manuscript received 13 April 2007)