Prevalence of ectoparasites in carp fry and fingerlings of Rajshahi district, Bangladesh

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Abstract The Study has been carried out to find out the prevalence of ectoparasites of carp fry and fingerlings during June 2010 to May 2011 from Rajshahi district, Bangladesh. Four groups of ectoparasites viz. myxozoan, ciliophoran, monogenean and crustacean were recorded from 560 species of endemic and exotic carps collected from Rajshahi District, Bangladesh. The highest ectoparasitic prevalence (37.5 %) has been recorded for ciliophoran group in winter and the lowest prevalence in crustacean (5 %) in summer. However, no crustacean was recorded in Rainy season (June–September). The seasonal highest ectoparasitic prevalence (25 %) was recorded during the winter season (October to January) while the lowest prevalence (11 %) in rainy season (June–September). The study shows that the carp fry and fingerlings are most susceptible to ectoparasites in winter.

Keywords Ectoparasites · Infestation · Prevalence · Carp · Fry and fingerlings

Introduction

The ectoparasites of fish constitute one of the most important problem associates with pond fish culture. Parasites investigation in farms and ponds depends on many

factors which are ideal for the propagation and development of parasitic population. In closing habitat of the fishes in the pond which leads to transporting the parasites especially those which have a direct life cycle from one fish to another by contact (Dogiel 1961). Many fishes disasters in fish farms were caused by different considerable as ectoparasites (protozoa, monogenetic trematoda and crustacea), which have direct life cycle and facilitate translocation from host to host making huge damages to fish wealth (Al-Marjan and Abdullah 2009).

The major carp farming played an important and dominating role in freshwater aquaculture of Bangladesh. The water bodies of Rajshahi district, especially ponds and ditches are mainly used for carp culture and supported potential freshwater fish production of Bangladesh. The most important prerequisite of fish production is the available of healthy fish fry and fingerlings of carps. It is evidence from available literature that parasites diseases caused significance damage in nursery system of carp mostly affecting the fry and fingerlings (Gopalkrisnan 1961). High stocking density is being maintained during carp fry nursery operations, and this density induces bio-ecological stress to fry (Passion 1984) and make the fry more susceptible to the parasitic infection (Sneisko 1974; Alam et al. 2012; Mofasshalin et al. 2012). The present study deals with ectoparasites prevalence of carp fry and fingerlings and in relation to water quality parameters.

Materials and methods

The fry and fingerlings of eight endemic and exotic carps viz., Rui (*Labeo rohita*), Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*), Bata (*Labeo bata*), Grass carp

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(*Ctenopharyoungodon idella*), *Sorpanti* (*Puntius gonionotus*), *Common carp* (*Cyprinus carpio*), *Silver carp* (*Hypophthalmichthys molitrix*) were collected from Rajshahi district, Bangladesh. A total of 560 fingerlings were studied for ectoparasitic infection. In order to observed seasonal variation, the infected fishes were collected monthly from different fish market and nursing ponds. The fishes were brought to lab and freshly examined by taking smear from skin, fins and gills. Gills were also removed, and placed in petri dish with distal water then microscopically examined. All smears were examined under a light compound microscope at 40–100× magnification (LABOMED, model Lx400, USA). Most of protozoan were identified in a direct way without any technique, by preparation of smear, and important measurement were taken for each protozoan. The Indian ink method of Lom and Vavra (1963) used to identify the myxozoan spore and for permanent slides, the air-dried smears were stained with Giemsa. Silver-impregnation method after Klein (1958) was used for ciliophoran parasites. For permanent slides for monogenetic trematodes, few drops of glycerin jelly were applied (Kritsky et al. 2004). The Crustaceans were killed and fixed with 5 % formalin for 1 h and then transferred into 80 % alcohol. Specimen was cleared with 85 % lactic acid and stained by a drop of neutral red then permanent slides prepared by using jelly glycerin (Kim 2004). Monogenean parasites were identified by following the descriptions and figures of Yamaguti (1963). Protozoan parasites were identified according to the description of Lom (1960), Lucky (1971), Kabata (1985), Hoffman (1998).

The year was divided into three main season Rainy (June–September), winter (October–January) and summer (February–May). The prevalence was calculated as number of infected fish divided by number of observed fish multiplied by hundred. The water quality parameters viz., water temperature, dissolves oxygen (DO), P^H and total hardness were measured with the help of kit box (HACH

Model HA-71A, USA) and digital water quality checker (YSI Model 63, USA).

Results and discussion

The prevalence of ectoparasites of carp fry and fingerlings in different seasons have been presented in the Table 1. Among the different groups of ectoparasites, ciliophoran has shown highest prevalence (29.66 %) throughout the year followed by myxozoan (18.8 %), monogenean (12 %) and crustacean (6.66 %). In winter (October–January), the prevalence of ectoparasites reached at 25 % and gradually decreased in summer (14 %) and Rainy (11 %). This indicates that the ectoparasitic infection changed with the change of season.

The average prevalence of each group of ectoparasites has been listed in the Table 2. All groups of ectoparasites have also been shown highest prevalence in winter followed by summer and rainy season (Table 2). The seasonal prevalence data indicate that ectoparasitic infection is high during the winter (October–January) which leads to the conclusion that biological factors of host as well as water quality are responsible for infection. Crustacean ectoparasites are present in the winter season and few are recorded in the summer and totally absent in the Rainy season. Among the monogenean, *Gyrodactylus* is not found in rainy season (June–September) (Table 1).

Since the fry and fingerlings are delicate, so they are more susceptible to infection. The water temperature, DO, P^H and hardness are four major water quality parameters that related to diseases infection as they fluctuate more rapidly. The data of these four parameters with their mean ± SD have been shown in the Table 3. The ectoparasitic prevalence has shown temperature sensitivity. Ectoparasitic prevalence increases when water temperature and hardness is the decreased (Fig. 1a, d) and optimum levels of dissolved oxygen and neutral P^H have a positive effect on the ectoparasitic prevalence (Fig. 1b, c).

Table 1 Prevalence of ectoparasite in carp fry and fingerlings in different season of the year

Months	Myxozoans	Prevalence (%)	Ciliophorans	Prevalence (%)	Monogeneans	Prevalence (%)	Crustacean	Prevalence (%)
June–September	<i>Myxobolus</i> sp.	20	<i>Trichodina</i> sp.	45	<i>Dactylogyrus</i> sp.	10	<i>Argulus</i> sp.	0
	<i>Thelohanellus</i> sp.	8	<i>Ichthyophthirius</i> sp.	5	<i>Gyrodactylus</i> sp.	0	<i>Ergasilus</i> sp.	0
October–January	<i>Myxobolus</i> sp.	35	<i>Trichodina</i> sp.	55	<i>Dactylogyrus</i> sp.	40	<i>Argulus</i> sp.	5
	<i>Thelohanellus</i> sp.	15	<i>Ichthyophthirius</i> sp.	20	<i>Gyrodactylus</i> sp.	5	<i>Ergasilus</i> sp.	25
February–May	<i>Myxobolus</i> sp.	25	<i>Trichodina</i> sp.	35	<i>Dactylogyrus</i> sp.	15	<i>Argulus</i> sp.	2
	<i>Thelohanellus</i> sp.	10	<i>Ichthyophthirius</i> sp.	15	<i>Gyrodactylus</i> sp.	2	<i>Ergasilus</i> sp.	8
Total average	Myxozoans	18.3	Ciliophorans	29.66	Monogeneans	12	Crustacean	6.66

Table 2 Seasonal fluctuation of water quality parameters in nursery pond

Seasons	Water temperature (°C)	DO (ppm)	pH	Hardness (ppm)
Rainy (June–September)	31.02	6.07	6.5	130.75
Winter (October–January)	20.56	7.83	7.6	115.50
Summer (February–May)	26.31	7.26	8.1	123.5

Table 3 Seasonal ectoparasitic prevalence (%) of carp fingerlings

Parasitic group	Rainy (June–September)	Winter (October–February)	Summer (March–May)
Myxozoans	14	25	17.5
Ciliophorans	25	37.5	25
Monogeneans	5	22.5	8.5
Crustaceans	0	15	5
Average of total parasitic prevalence	11	25	14

Fish fry-fingerlings become more susceptible to pathogen because of their immature immune system (Anderson 1974), which support the present findings. The shallow and stagnant water favours the multiplication of ciliates like

Trichodina (Kabata 1985). *Trichodina* is the most prevalent ectoparasites followed by *Dactyogyrus* (Lumanlan et al. 1992; Hossain et al. 2008; Banerjee and Bandyopadhyay 2010). These two parasites are the most common and caused mass in carp culture in Malaysia and Sri Lanka reported by Shariff and Vijiarungam (1986) and Subashinge (1992) respectively.

During the winter season, pond water level becomes decreased and water quality deteriorates. The prevalence of ectoparasites in carp fry and fingerling varied with the season, being higher during winter. Winter had already been identified as a period of high susceptibility of fish to parasites (Rahman et al. 2007; Forhaduzzaman et al. 2010; Mofasshalin et al. 2012). Since the fingerlings require more O₂ and due to lack of O₂ they become more prone to infection. High stocking density of fingerlings is another reason for ectoparasitic diseases outbreak (Hossain et al. 2008). High stock density increases the possibility of ectoparasitic contamination from one fish to another. Thus it could be concluded that the water quality has a great impact on the abundance of pathogens and their ability to survive on host. So the stocking density and water quality should be maintained to avoid parasitic infestation in nursery pond.

Fig. 1 Correlation of parasitic prevalence in three main season with different water quality parameters: **a** water temperature, **b** dissolve oxygen, **c** P^H, and **d** hardness

References

- Alam MM, Khan MA, Hussain MA, Moumita D, Mazlan AG, Simon KD (2012) Intensity of parasitic infestation in silver carp. *Hypophthalmichthys molitrix*. J Zhejiang Univ-Sci B 13(12): 1024–1028
- Al-Marjan KSN, Abdullah SMA (2009) Some ectoparasites of the common carp (*Cyprinus carpio*) in Ainkawa fish hatchery, Erbil province. J Duhok Univ 12(1):102–107
- Anderson DP (1974) Fish immunology. In: Sniezko SF, Axelrod HR (eds) Diseases of fishes. F. H. Publication, New Jersey
- Banerjee S, Bandyopadhyay PK (2010) Observation on prevalence of ectoparasites in carp fingerlings in two districts of West Bengal. J Parasit Dis 34:44–47
- Dogiel VA (1961) Ecology of the parasites of fresh water fish in parasitology of fishes. Oliver and Boyd, London, pp 1–47
- Farhaduzzaman AM, Alam MM, Hossain M, Hussain MA, Rahman MH (2010) Prevalence of parasites in the Indian major carp, *Labeo rohita* (Hamilton) in Rajshahi, Bangladesh. Univ J Zool Rajshahi Univ 28:65–68
- GopalKrisnan V (1961) Observation on a new epidemical eye disease affecting the Indian Carp *Catla catla* (Hamilton-Buchanan). Indian J Fish 8:222–232
- Hoffman GL (1998) Parasites of North American freshwater fishes. Comstock Publishing Associates, Ithaca and London 539 p
- Hossain MD, Hossain MK, Rahman MH, Akter A, Khanom DA (2008) Prevalence of ectoparasites of carp fingerlings at Santaher, Bogra. Univ J Zool Rajshahi Univ 27:17–19
- Kabata Z (1985) Paites and diseases of fish cultured in the tropics. Taylor and Francis, London
- Kim IH (2004) Copepodid stages of *Ergasilus hypnosesi* Yamaguti, (Copepoda, Poecilostomatoida, Ergasilidae) from a brackish lake in Korea. Korean J Biol Sci 8:1–2
- Klein BM (1958) The dry silver method and its proper use. J Protozool 5:99–103
- Kritsky DC, Pandey KC, Agrawal N, Abdullah SMA (2004) Monogenoids from the gills of spiny eels (Teleostei: Mastacembelidae) in India and Iraq, proposal of *Mastacembelocleidus* gen. n., and status of the Indian species of *Actinocleidus*, *Urocleidus* and *Haplocleidus* (Monogenoidea: Dactylogyridae). Folia Parasitol 51:291–298
- Lom J (1960) “*Trichodina reticulata* Hirschmann and Partsch 1955 from Crucian carp, and *T. domerguei* f. *latispina* Dogel 1940 from *Diaptomus* “ Protozoological Laboratory of the Czechoslovak academy of science, Prague. Acta Societatis Zoologicae Bohemoslovenicae Svazek xxiv-Cislo 3-1960-Str. p 246–257
- Lom J, Vávra J (1963) Mucous envelopes of spores of the subphylum Cnidospora (Doflein, 1901). Vestn Cesk Spol Zool 27:4–6
- Lucky Z (1971) Methods for the diagnosis of fish diseases. Amerind, New Delhi
- Lumanlan SC, Albaladejo JD, Bondad-Reartaso MG, Arthur JR (1992) Fresh-water fishes imported into the Philippines. In: Shariff M, Subasinghe RP, Arthur JR (eds) Diseases in Asian aquaculture I. Asian Fisheries Society, Philippines
- Mofasshalin MS, Bashar MA, Alam MM, Alam GM, Moumita D, Mazlan AG, Simon KD (2012) Parasites of three Indian minor carps of Rajshahi, Bangladesh. Asian J Anim Vet Adv 7(7):613–620
- Passion DRM (1984) Biochemical indicator in fish. In: Carins VW, Hodson VP, Nriagu JO (eds) An overview in contaminants effects in fisheries. Jhon Willy, USA
- Rahman MR, Akter MA, Hossain MD (2007) Parasitic diseases of exotic carp in Bangladesh. J Agric Rural Dev 5(1&2):127–134
- Sharif M, Vijiarungam AF (1986) Occurrence of parasites at fish breeding station in peninsular Malaysia and their control. Proc Intercont Dev Managem Trop Living Aquat. Resources, Serdang, Malaysia. 2–5 August 1983. p 68–73
- Sniezko SF (1974) The effect of environmental stress on out break of infectious diseases of fishes. J Fish Biol 6:197–208
- Subasinghe RP (1992) Hatchery disease of fresh water fishes in Sri Lanka. In: Sharif M, Subasinghe RP, Arthur JR (eds) Diseases in Asian aquaculture I. Asian Fisheries Society, Philippines
- Yamaguti S (1963) Systema Helminthum vol. Acanthocephala of vertebrates. Interscience, New York