

*Article*

**Seasonal variation of parasitic infestation in perches from beel fisheries of Bangladesh**

Md. Mamunur Rahman, Gias Uddin Ahmed, Md. Ali Reza Faruk and Kirtunia Juran Chandra

Department of Aquaculture, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

\*Corresponding author: Md. Mamunur Rahman, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh. Phone: +8801717386027; E-mail: mamunurrahman125@gmail.com

Received: 07 August 2016/Accepted: 23 August 2016/ Published: 31 August 2016

**Abstract:** Seasonal variation of water quality parameters, parasitic infestation, clinical and histological observation of two endangered perches, Baila (*Glossogobius giuris*) and Colisa (*Colisa fasciata*) were investigated from two different beels namely, Kailla beel, Mymensingh and Noli beel, Kapasia, Gazipur during June, 2014 to May, 2015. Water quality parameters did not showed much variations except temperature which was minimum and ammonia values which were maximum during winter season. During observation, investigated fishes were highly infested by digeneatic trematode followed by cestode, acanthocephala, monogeneatic trematode and protozoan parasites. Maximum prevalence, mean intensity and abundance of parasites were observed in Baila from Colisa during winter season in both areas. Minimum level of infestation were recorded during summer season in both areas. Whereas, in rainy and autumn seasons average number of parasites were noticed. Clinically it was observed that, fishes were affected with parasitic infestation, EUS, gill rot, fin and tail rot, nutritional deformities, numerous red spots and white patches in lateral and ventral regions during winter season in both beels. Major pathology in the skin and muscle were loss of epidermis, epidermis separated from dermis, necrosis of myotoms, vaccums and hemorrhage. Loss of primary and secondary gill lamellae, hypertrophy, clubbing, presence of monogenetic trematodes and hemorrhage were found in gill. Marked melanomacrophages, severe haemorrhage, vaccums, hepatocytic necrosis and fat droplets were found in liver. In kidney, numerous haemorrhagic areas, vaccums, fat droplets, coagulative necrosis and degenerated kidney tubules were seen especially in winter season. Whereas, in summer season, clinical and pathological condition of fishes gradually reduced to almost normal condition except few vaccums and hemorrhage in internal organs. Comparatively normal or reduced pathological sings in all the organs were observed in rainy and autumn seasons. Fishwise, Baila were more infested by parasites than Colisa. On the basis of sampling stations, perches of Kailla beel were more affected by parasites than perches of Noli beel.

**Keywords:** seasonal variation; perch; parasite; water quality parameters; clinical and histological observations.

**1. Introduction**

Rivers, canals, reservoirs, lakes, Oxbow lakes, floodplains and natural depressions are good and ideal habitat for small indigenous species (sis) as well as many commercially important. Small indigenous species of Bangladesh such as catfish, cyprinids, perches, eel and snake headed etc. This species of fish always remain available for daily consumption of all classes of people especially low-income groups, due to their low price, food taste, good flavor and high nutritional value. The small indigenous species (sis) of Bangladesh are generally considered to be those fishes which grow to a maximum length of about 25 cm or inches (Felts *et al.*, 1996; Hossain and Afroze, 1991). SIS has high nutritional value in terms of protein, vitamin, and minerals and these micronutrients are not commonly available in other foods (Thilsted *et al.*, 1997). These groups of fish contain large amount of

calcium and also iron and zinc (Tripathi, 1997). Moreover this small indigenous fish species are maintaining a stable and static condition of our aquatic food chain thus the biodiversity of our open water ecology have in smooth form. But natural populations of this small fish is rapidly decreasing due to over exploitation, diseases, lack of scientific management, draining out of beels, natural disaster (draught and siltation) and poor environmental conditions. Because the water quality of beels, baors, rivers and canals are decreasing day by day. As a result, fish species that breed and reared in natural waters are reducing quickly. Health condition and disease has become a major problem in fish production both in culture system and wild condition in Bangladesh (Rahman and Chowdhury 1996). Common diseases of open water fishes of Bangladesh are fungal disease, parasitic disease, protozoan disease, tail and fin rot, bacterial gill rot, dropsy, various types of nutritional disease, tumors (Chowdhury, 1993). Although the existing fishes are habituated in floodplain but snakehead, catfish etc., are recorded as rare species from flood plains and beels due to the outbreak of various diseases (Hossain and Mazid, 1995). Seasonal variation in water quality parameters such as, water temperature, dissolved oxygen, pH and ammonia play important role for the multiplication of pathogens thus causing diseases in fishes. It indicated the possible relationship between the occurrence of disease and the environmental parameters. One of the major problems of cultured and open water fishes are the parasitic infestation and disease. Parasites can cause mortalities of fishes in any stages of life. They attack fishes and destroy them or make wounds or disease on their flash, thus making inedible (Cheng, 1964). The groups of monogenea are small or medium sized trematodes which complete the life cycle on one host. The chief organ of attachment us the haptor, which is posterior, mostly parasitic on the gills, some on the body and fins. Helminths are an important group of animal parasites occurring in the adult stage usually in vertebrate hosts, practically invading every organ system of the host, and the larval stages in the invertebrate hosts. The members of the class Trematoda are parasitic flatworms known as flukes. Some flukes are external parasites that live on the skin, mouth, gills, or other outside parts of a host, but most flukes, including the ones that affect humans, are internal parasites that infect the blood and internal organs. The internal or endoparasites of fish inhabits the digestive tract or other organs in the body while external or ectoparasites attach themselves to the gills skin and fins (Saurabh, 2007). Parasites of fish constitute one of the major problems confronting the modern fish culturists, and pathological conditions arising from parasitic infections assume a high magnitude especially under crowded conditions. All fishes are potential host to many different species of parasites that cause significant mortalities among captive and wild fish stocks. Accurate identification of parasites is therefore important so that a build-up of parasite number can be prevented. Histopathological technique is one of the most important procedures for disease diagnosis in fish. It has been successfully used throughout the world. Considering the above facts the present study has been undertaken with the following objectives are to investigate the seasonal variation of water quality parameters, parasitic infestation, clinical and histological observation of two endangered perches from the two different areas.

## 2. Material and Methods

A total number of 240 both hosts and 120 from each species were examined during the study period. The fishes were collected from investigated beel nearest market and fishermen when they fishing. For parasite identification, collected fishes were killed by a blow on the head. Opercula of the fish were be removed by scissors and placed in a petridish containing clean water. Prior to removing gills external examination was made by scraping the skin and examine the smear using magnifying glass and under microscope. For internal examination, a silt was made and ventral region was opened and internal organs were removed on a petridish to collect parasites. After collection the parasites were fixed and processed following standard procedure. External and internal parasites were collected from organs like skin, muscle, gill, liver and kidneys of each of the fish. The parasites were observed under high power compound microscope for identification and photographs were recorded by a photomicroscope. Water quality parameters from Kailla beel and Noli beel were collected. Data regarding water temperature, D.O., P<sup>H</sup> and ammonia, were analyzed by respective test kits. Clinically the sampled fishes were examined by naked eye and magnifying glass to record any external signs, injury and other abnormalities. For histological observation, organs like skin and muscle, gill, liver and kidney were collected with the help of a sharp scalpel and forceps and fixed in 10% neutral buffered formalin for histopathological study. After 8 hours of fixation, the samples were trimmed in order to obtain a standard size of 1 cm<sup>3</sup> (maximum) and placed in automatic tissue processor for dehydration, clearing and infiltration. The samples were then embedded, sectioned (5-10µm thickness) and stained with haematoxylin and eosin. Then the sections were mounted with Canada Balsam and covered by cover slips and examined under a compound microscope. Photomicrograph of the stained sections was obtained by using a photomicroscope. Record of structural variations and pathologies were done from the slides and photomicrographs (Ahmed *et al.* 2009).

### 3. Results and Discussion

#### 3.1. Water quality parameters

The recorded water temperature were ranged between 15 to 34 °C. The highest temperature was recorded during summer 34 °C from Noli beel and the lowest was 15 °C during winter from Kailla beel (Table 1). Aminul (1996) stated that the water temperature ranged from 25 to 35 °C was suitable for culture of fish. Dissolve oxygen (DO) were varied between 3.87 to 5.69 ppm. The highest D.O. was 5.69 ppm seen during rainy season from Noli beel and the lowest during winter 3.87 ppm from Kailla beel (Table 1). Ahmed *et al.* (2012) found dissolved oxygen ranged from 6.0 to 8.5 mg/L from their experimental ponds behind the faculty of fisheries in BAU campus, which is more or similar in present experiment. Shamsuddin (2012) stated that dissolved oxygen ranged from 4.0 to 6.5 mg/L in his experimental ponds of Thai koi and Thai pungus at BAU campus. pH values were ranged between 6.7 to 7.8 in both beels in different seasons. However, the highest pH value was recorded during summer 7.8 from Noli beel and the lowest pH was recorded during winter 6.7 from Kailla beel. Ahmed *et al.* (2013) measured pH from their experimental ponds which were ranged from 7.10 to 8.00. Shamsuddin (2012) observed pH values varied from 7.20 to 8.50 during the study period in BAU ponds, which is almost similar with the value of present experiment. Ammonia values were ranged between 0.02 to 0.86 ppm. During the study period, maximum level of ammonia 0.93 ppm were recorded from Kailla beel during winter and minimum level of ammonia 0.02 ppm was recorded in summer from Noli beel. Ahmed *et al.* (2009) and Hasan (2014) measured ammonia level ranged from 0.56 to 0.83 mg/L and 1.001 to 1.11 mg/L in pond culture, which were much higher than the result of the present experiment. Suitable water quality parameters were shown in summer season followed by rainy and autumn seasons. Comparatively poor water quality parameters were observed during winter season.

**Table 1. Water quality parameters of different beel fisheries in various seasons.**

Seasons	Beel Fisheries	Temperature (° C)	DO (ppm)	pH	Ammonia (ppm)
Rainy	Kailla beel	31.66	5.28	6.9	0.13
(Jun-Aug)	Noli beel	30.00	5.69	7.2	0.06
Autum	Kailla beel	28.00	4.36	7.3	0.20
(Sep- Nov)	Noli beel	27.33	4.83	7.3	0.20
Winter	Kailla beel	15.33	3.87	6.7	0.93
(Dec-Feb)	Noli beel	18.33	4.46	6.9	0.75
Summer	Kailla beel	32.00	5.20	7.5	0.03
(Mar-May)	Noli beel	34.33	5.50	7.8	0.02

#### 3.2. Parasitic infestation

In rainy season, investigated fishes were infested by various parasites. Fishes of Kailla beel were highly infested by digeneatic trematode followed by monogeneatic trematode, acanthocephala and cestode. In Kailla beel, Baila was more infested than Colisa. Prevalence, mean intensity and abundance of parasites in Baila was 13.66, 1.75 and 0.23 and Calisa was 6.66, 3.00 and 0.20 respectively. In Noli beel perches were infested by same parasites. Prevalence, mean intensity and abundance of parasites in Baila 6.66, 1.50 and 0.10 and Colisa was 10.00, 1.66 and 0.16 respectively. Banerjee and Bandyopadhyay (2010) studied the prevalence of ectoparasites of carp fingerlings during different months of the year. The highest ectoparasitic prevalence (36.85%) was recorded during winter season (December–February) followed by prevalence (9.16%) recorded during rainy season (June–August). Islam *et al.* (1999) found that gills of local and exotic carp species were moderately affected during the rainy months. In autumn season, perches of Kailla beel were highly infested by digeneatic trematode followed by monogeneatic trematode, acanthocephala and cestode. In Kailla beel, Prevalence, mean intensity and abundance of parasites in Baila was 16.00, 2.00 and 0.30 and Calisa was 6.66, 2.00 and 0.13 were recorded respectively. In Noli beel, Prevalence, mean intensity and abundance of parasites in Baila 3.33, 3.00 and 0.10 and Colisa was 3.33, 2.00 and 0.06 were recorded respectively. Baila was more infested than Colisa. Mild parasitic infestation was occurs in autumn season. An increased occurrence of disease after the autumn might again be due to unfavorable environmental conditions which agree with the findings of Chandra (1987). Islam *et al.* (1999) observed that parasitological infestation and clinical signs in the investigating carps infection comparatively low during September to November. In winter season, perches of Kailla beel were highly infested by digeneatic trematode followed by monogeneatic trematode, acanthocephala and cestode. In Kailla beel, Prevalence, mean intensity and abundance of parasites in Baila was 66.66, 2.50 and 1.60 and Calisa was 38.66, 1.72 and 0.63 were recorded respectively. Perches of Noli beel were highly infested by digeneatic trematode

followed by monogeneatic trematode, acanthocephala and cestode. In Noli beel, Prevalence, mean intensity and abundance of parasites in Baila 16.66, 1.60 and 0.16 and Colisa was 13.33, 1.75 and 0.23 were recorded respectively. Baila was more infested than Colisa. Chandra (1994) reported that nematode worms occurred throughout the year in different intensities in shing. Prevalence was however, highest in December (96.86%). The lowest infection was noted in February (67.86%). In other months infection fluctuated between 75-94%. Akhter *et al.* (1997) found that in *A. testudineus* nematodes are the most dominant species and maintain a high level of infestation throughout the year particularly in the winter season. Golder and Chandra (1987) studied the incidence and intensity of infestation of helminthes parasite on *Nandus nandus* and were found to be related to sex and size of the host and also season of the year. Maximum incidence was recorded in January and intensity in September. Hossain *et al.* (2008) stated the seasonal prevalence of ectoparasites of carp fingerlings and found that winter was the most disease occurring season of the year. Basak (2004) studied parasite associated with fingerlings of *L. rohita*, *C. catla* and *C. cirrhosus* from government fish farm and found that different fish farms were more affected during the colder months of the year. The fishes were mainly affected by protozoa, monogenea, bacteria and protozoan cyst. In summer season, perches of Kailla beel were highly infested by digeneatic trematode followed by monogeneatic trematode, acanthocephala and cestode. In Kailla beel, Prevalence, mean intensity and abundance of parasites in Baila was 16.00, 2.00 and 0.30 and Calisa was 6.66, 2.00 and 0.13 were recorded respectively. In Noli beel, Prevalence, mean intensity and abundance of parasites in Baila 3.33, 3.00 and 0.10 and Colisa was 3.33, 2.00 and 0.06 were recorded respectively. Baila was more infested than Colisa. Monowara (2003) investigated infestation of monogenean flukes in *Mystus vittatus*, *M. cavasius*, *Alila coila*, *Pseudeutropius atherinoides* and *Esomus danricus* from different water bodies of Mymensingh district. She found highest prevalence (87.5%) and means intensity (17.86) in *Mystus vittatus*. The highest infestation was found in the winter and lowest in the summer. Chandra (1985) studied the incidence and intensity of infestation of *Pallisentis ophiocephali* on *Channa punctatus* and was found to be related to sex, size and seasons of the year. Infestation incidence was highest in January and lowest is March.

**Table 3. Seasonal variation of parasitological study in two endangered perches from both beels.**

Seasons	Sampling Station	Fishes	Parasites					Prevalence	Mean Intensity	Abundance
			Pro	Mono	Dig	Ces	Acen			
Rainy (Jun- Aug)	Kailla beel	Baila	1	-	4	1	1	13.33	1.75	0.23
		Colisa	-	2	4	-	-	6.66	3.00	0.20
	Noli beel	Baila	-	-	3	-	-	6.66	1.50	0.10
		Colisa	-	2	-	-	3	10.00	1.66	0.16
Autumn (Sep-Nov)	Kailla beel	Baila	-	-	5	-	-	16.00	2.00	0.30
		Colisa	2	-	2	-	-	6.66	2.00	0.13
	Noli beel	Baila	-	-	2	-	1	3.33	3.00	0.10
		Colisa	-	-	2	-	-	3.33	2.00	0.06
Winter (Dec-Feb)	Kailla beel	Baila	5	5	15	-	-	66.66	2.50	1.60
		Colisa	-	6	13	-	-	38.66	1.72	0.63
	Noli beel	Baila	-	2	6	-	-	16.66	1.60	0.16
		Colisa	3	-	4	-	-	13.33	1.75	0.23
Summer (Mar- Apr)	Kailla beel	Baila	2	-	3	-	1	10.00	2.00	0.20
		Colisa	-	-	4	-	-	6.66	2.50	0.16
	Noli beel	Baila	-	2	1	-	-	6.66	2.00	0.30
		Colisa	-	-	2	-	-	3.33	2.00	0.06

### 3.3. Clinical observations

Clinical symptoms of investigated species in different seasons of the Kailla beel and Noli beel were studied and recorded (Table 2).



**Figure 1.** *G. giuris* obtain from Noli beel showed almost normal appearance during the rainy season.

**Figure 2.** *G. giuris* collected from Kailla beel having redness of eyes, hemorrhage in gill, total caudal fin loss and scale loss from dorsal region during the winter season.



**Figure 3.** *C. fasciata* obtain from Noli beel having whitish lesion, hemorrhage in gill, total caudal fin loss and scale loss from dorsal region during the winter season.

**Figure 4.** *C. fasciata* collected from Kailla beel showed normal and healthy appearance during the summer season.

### 3.3.1. Fish in Kailla beel

During the Rainy season, it was observed that, experimented fishes were fin erosion and mild affected. In *G. giuris* rough skin, weak body and fins loss was observed in both perches during autumn. During winter season, whitish deep ulcer, large ulcer, weak body, red lesion, scale loss at some places in, fin loss and also ectoparasitic infestation in gill and endoparasitic infestation in intestine were recorded in *G. giuris* and *C. fasciata* during winter season. Healthy appearance and almost normal condition were observed during summer season. From research findings of Haque *et al.* (1999) it was observed that, large deep and whitish ulcer in the lateral and region, part of fins, scales and muscle were clinical sings of EUS affected fishes. Parveen (2001) observed that, three small indigenous fishes like *P. ticto*, *N. nandus* and *C. punctatus* from four beels of Mymensingh district, and observed that fishes were severely affected during the months of December and January.

### 3.3.2. Fish in Noli beel

Healthy appearance and almost normal condition were observed during rainy season. Numerous red spot and weak body were recorded in autumn season. During winter, rough skin, red spot, ectoparasitic and endoparasitic infestation in gill, intestine and body cavity, whitish lesion, fin erosion and discoloration of gill filament were observed in *G. giuris* and *C. fasciata*. Ahmed *et al.* (2012) reported that the Tilapia was more affected from December and January and different clinical symptoms like rough skin, scale loss, red spots and dermal lesions were noticed. Ahmed *et al.* (2007) also observed that scale loss, ill body and rough skin, minor ulcer and small red spots in December and January. From the result of the present experiment it was observed that severities of clinical signs were increased in December and January in both region. In present study, selected species was more affected followed by Kailla beel than Noli beel.

### 3.3. Histological observation

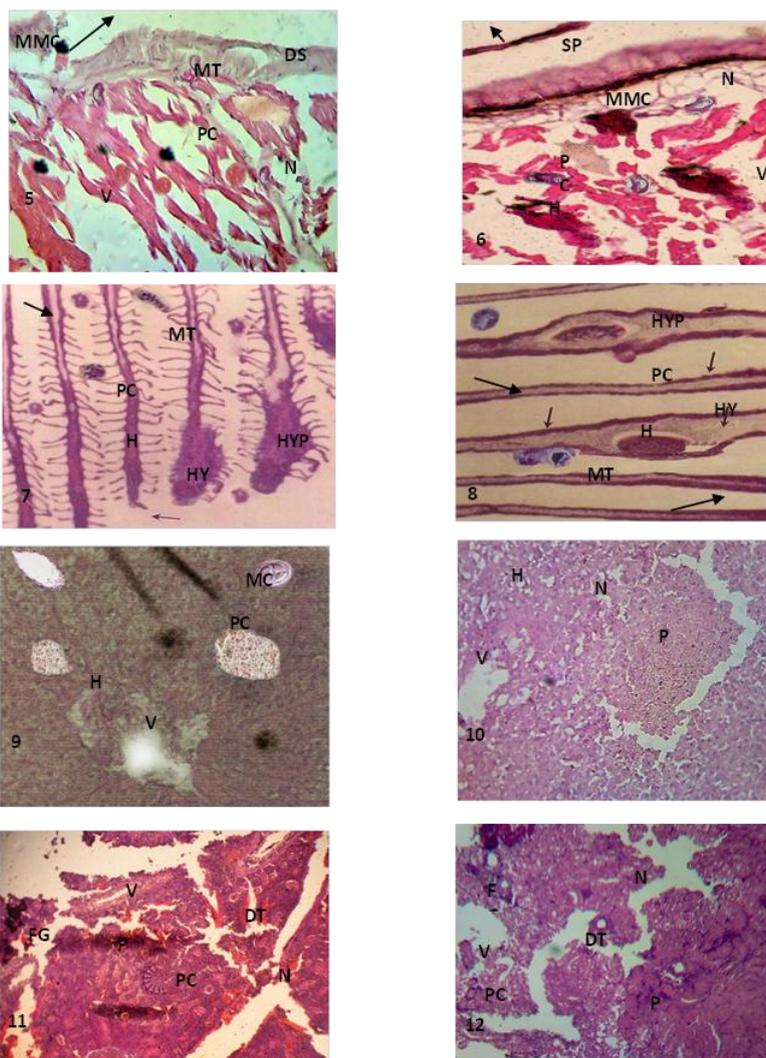


Figure 5. Cross section of affected of skin and muscle of *G. giuris* in winter from Kailla beel having epidermis lost, dermis splitted and separated from muscle, protozoan cysts, melanomacrophage, necrosis, wide vacuums and monogenetic trematode were seen (H&E x130).

Figure 6. Photomicrograph of affected skin and muscle of *C. fasciata* in winter from Noli beel having splitted dermis, monogenetic trematode, vacuums, haemorrhage, necrosis and protozoan cyst were noticed (H&E x 130).

Figure 7. Photomicrograph of affected gill of *C. fasciata* in rainy season from Kailla beel having lamellar missing with the presence of monogenetic, protozoan cysts, haemorrhage, hypertrophy and hyperplasia were seen (H&E x130)

Figure 8. Cross section of severely affected of gill of *G. giuris* in winter from Noli beel having monogenetic trematodes and protozoan cyst, Loss of secondary gill lamellae along with hypertrophy, hemorrhage and hyperplasia were noticed (H&E x 130).

Figure 9. Cross section of moderately affected of liver of *G. giuris* in Autumn from Kailla beel having parasitic cyst, microbial colony, hemorrhage, pyknosis and vacuums were observed (H&E x 130).

Figure 10. Cross section of less affected of liver of *C. fasciata* in Summer from noli beel having necrotic hepatic, hemorrhage, pyknosis and vacuums were seen (H&E x 130)

Figure 11. Photomicrograph of kidney of *G. giuris* in Rainy from Kailla beel having fungal granuloma, degenerating kidney tubules, protozoan cyst necrotic hepatic, hemorrhage, pyknosis and vacuums were observed (H&E x 130).

Figure 12. Photomicrograph of kidney of *C. fasciata* in winter from Noli beel having degenerating kidney tubules, fungal granuloma, protozoan cyst, hepatic necrosis, pyknosis hemorrhage, and vacuums (H&E x 130 were seen).

Histopathologically, it was observed in present study that all organs of fishes like gill, skin and muscle, liver and kidney was almost normal in rainy season, mild affected in autumn and severely affected during winter and infected organs were healed up to almost normal structure in summer from both water bodies. In skin and muscle of *G. giuris* and *C. fasciata* having from both beel having epidermis lost, dermis splitted and separated from muscle, protozoan cysts, melanomacrophage, necrosis, wide vacuums and monogenetic trematode were seen in winter. Ahmed *et al.* (2007) observed total loss of epidermis and dermis, many fungal granuloma, fungal hyphae, wide empty spaces, with necrotic muscles in Thai *A. testudineus*, in December and January from two different farms. Roy (2006) observed that total loss of epidermis and dermis, severe necrosis, melanomacrophages and vacuums in skin and muscle of *Puntius sophore* during December to January. During winter season, primary gill lamellae were separated, vacuum, Hemorrhage, protozoan cyst, monogenean trematode, and hypertrophy were observed in fishes of Kailla beel. Whereas, fish organs of Noli beel having hemorrhage, protozoan cyst, monogenean trematode, hypertrophy and hyperplasia were seen during winter. Konika (2011) observed less pathological changes such as hypertrophy, clubbing and few lamellar missing in *Cirrhinus cirrhosus* during November. According to Ahmed *et al.* (2012) *O. niloticus* gill had hypertrophy, hyperplasia, clubbing, hemorrhage in primary gill lamellae and secondary gill lamellae were lost during December and January. In liver of *G. giuris* in autumn from Kailla beel having parasitic cyst, microbial colony, hemorrhage, pyknosis and vacuums and liver of *C. fasciata* in Summer from Noli beel having necrotic hepatic, hemorrhage, pyknosis and vacuums were seen. Akter *et al.* (2006) also observed vacuoles, hepatic necrosis, fungal granuloma and pyknotic cells in liver of *Channa punctatus*, *Heteropneustes fossilis* and *Mystus tengara*. Internal organ like liver had highly necrotic hepatocytes, pyknotic cells, inflammatory cell during the months of December and January (Roy *et al.* 2006). In case of kidney of *G. giuris* in rainy season from Kailla beel having fungal granuloma, degenerating kidney tubules, protozoan cyst necrotic hepatic, hemorrhage, pyknosis and vacuums and kidney of *C. fasciata* in winter from Noli beel having degenerating kidney tubules, fungal granuloma, protozoan cyst, hepatic necrosis, pyknosis hemorrhage, and vacuums were seen. Mondal (2012) reported that *Anabas testudineus* had tubular degeneration, necrosis, hemorrhage, pyknosis and vacuums from fishes of Swopon Fish Farm and in Fishes of BAU Fish Farm, had tubular degeneration, necrosis, hemorrhage and vacuums in December and January. Ahmed *et al.* (2009) also observed necrosis, vacuums, hemorrhage and blood cells in kidney tubule of *Anabas testudineus* during the months of December and January. From the clinical and histopathological point of view, perches of the both beels were largely affected during the winter season and comparatively less affected in other seasons. These results agreed with other similar works of Barua (1994) and Chinabut (1994). Low or rapidly changing water temperature, rapid or prolonged depression of pH, low alkalinity and low dissolved oxygen were seasonal aggregations of fish diseases (Lilley *et al.* 1992). Results of the present study indicated that, apparently normal appearance was observed in rainy and summer seasons. Reduced level of pathological changes was found during autumn and severe pathological changes were recorded during winter season. So it could be mentioned that, prevalence of pathologies in freshwater fishes of Bangladesh might be related to seasonal variations of environmental factors especially to the lowering of water temperature. Johurul (2004) also made similar opinion that clinically fishes were susceptible to disease during the winter months of the year and also reported that internally kidney, liver and spleen were swollen and enlarged during the colder season

#### 4. Conclusions

Water quality parameters did not showed much variations except temperature was minimum and ammonia and nitrite values were maximum in winter season. During observation, perchwise Maximum prevalence, mean intensity and abundance of parasites were observed in *Glossogobius giuris* followed by *Colisa fasciata* from both beels during winter season. On the basis of sampling stations, perches of Kailla beel were more affected by parasites than perches of Noli beel and water quality parameters of noli beel also better than Kailla beel. During observation, investigated fishes were highly infested by digenetic trematode followed by cestode, acenthocephala, monogeneatic trematode and protozoan parasites. Maximum prevalence, mean intensity and abundance of parasites in investigated fishes from selected beel fisheries were recorded in winter season and minimum were observed in summer season. Whereas, rainy and autumn seasons were noticed average number of parasites. Thus, the results revealed that prevalence, intensity and abundance of parasites in *Glossogobius giuris* and *Colisa fasciata* were varied with the seasons. Overall, clinical and histological observations of fishes were indicated that, apparently normal appearance was observed in Rainy and summer seasons. Reduced level of pathological changes was found during autumn and severe pathological changes were recorded during winter season. So it could be mentioned that, prevalence of pathologies in freshwater fishes of Bangladesh might be related to seasonal variations of environmental factors especially to the lowering of water temperature. Whereas,

in summer season, the pathological condition of fish gradually healed up to normal condition except few vacuums and hemorrhage were seen in liver and kidney.

### Acknowledgment

The authors are also grate to Ministry of Education, Government of the people republic of Bangladesh for providing funds to conduct the present research.

### Conflict of interest

None to declare.

### References

- Ahmed GU, N Sultana, M Shamsuddin and MB Hossain, 2013. Growth and production performance of Monosex Tilapia (*Oreochromis niloticus*) feed with homemade feed in earthen mini ponds. *Pakistan J. Biol. Sci.*, 16: 1781-1785.
- Ahmed F, 2010. Histopathological studies of carps, catfishes and a perch experimentally infected with *Aeromonas Hydrophila* bacteria, MS Thesis, Department of Aquaculture Bangladesh Agricultural University, Mymensingh. pp. 49.
- Ahmed GU, M Dhar, MNA Khan, D Choi, 2007. Investigation of diseases of Thai Koi, *Anabas testadineus* (Bloch) from Farming Conditions in winter. *J. Life Sci.*, 17: 1309-1314.
- Ahmed GU, MM Hossain and MM Hassan, 2009. Seasonal variation of disease and pathology of a perch, *Nandus nandus* from Oxbow-lake fisheries of Bangladesh. *Ecofriendly Agriculture Journal*, 2:761-767.
- Ahmed GU, T Khatun, MB Hossain and M Samsuddin, 2012. Health condition of a farmed tilapia (*oreochromis niloticus*) in earthen ponds, Northern Bangladesh. *Bangladesh J. Fish.*, 12: 287- 293.
- Akhter M, J De silva and A Khatun, 1997. Helminth parasites of *Anabas testudineus* (Bloch) in Bangladesh. *J. Zool.*, 25:135-138.
- Akter MN, GU Ahmed and MS Hossain, 2009. Seasonal variation of gill pathology of a climbing perch in lake fisheries of Bangladesh. *International Journal of Animal and Fisheries Sciences*, 2: 208-213.
- Akter N, 2006. Study on health condition of freshwater eels from Ailee beel, Mymensingh, MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 53.
- Aminul IM, 1996. Qualities of water and soil in Aquaculture, Fish week compilation, 96. DoF Publication, Ramna, Dhaka-1000.
- Banerjee S and PK Bandyopadhyay, 2010. Observation on prevalence of ectoparasites in carp fingerlings in two districts of West Bengal. *Journal of Parasitic Diseases*, 34: 44 – 47.
- Barua G, 1994. The status of epizootic ulcerative syndrome of fish of Bangladesh. ODA Regional Seminar on Epizootic Ulcerative Syndrome at Aquatic Animal Health Research Institute, Bangkok, Thailand, 25-27 January 1994. pp. 13-20.
- Basak PC, 2004. Histopathological observations of farmed carp fingerlings of Mymensingh area. MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 51.
- Chandra KJ, 1987. Fish health monitoring and control of disease. In: Training manual of training officer, DOF, Bangladesh September 1987. BFRI, Mymensingh. Training manual No. 1, pp. 155.
- Chandra KJ, 1994. Infections concurrent infections and fecundity of *Procammallanus heteropneustus* Ali, parasite to the fish *Heteropneustes fossilis*. *Journal of Environmental Ecology*, 12: 679-684.
- Chandra KJ, 1985. Incidence and intensity of infestation of *Pallisentis ophiocephali* (Thespar) on the host *Channa punctatus* (Bloch). *Journal of Asiatic Society of Bangladesh*, 11: 47-54.
- Chinabut S, 1994. EUS in Thailand. Adaregional seminar on epizootic ulcerative syndrome at Aquatic Animal Health Research Institute, Bangkok. Thailand. January 1994. pp. 58-60.
- Chowdhury MBR, 1993. Research priorities for microbial fish disease and its control in Bangladesh. In: Proceeding of the Workshop on Research Priorities of Bangladesh for fish health, disease prevention and pathology. May 17, edited by Alam Tollervey. pp. 8-11.
- Cheng TC, 1964. The Biology of Animal parasites. W.B. Saunders Company. Philadelphia and London. pp. 369.
- Felts RA, F Rajts and M Akhteruzzaman, 1996. Small indigenous fish species culture in Bangladesh (Technical Brief), IF ADEP sub-project- 2. Development of Inland Fisheries. pp.41.
- Golder MI, KJ Chandra and AKA Rahman 1987: Helminth parasitism in *Nandus nandus* (Hamilton). *Bangladesh J. Fish.*, 10: 11-22.

- Haque MA, GU Ahmed, H Rasid, MA Sabur and MJ Islam, 1999. Histopathological study of EUS an Indian major carp *Catla catla*. Bangladesh J. Fish., 22: 85-91.
- Haque MA, MS Hossain, GU Ahmed and Z Tazri, 2009. Clinical and pathological investigation disease in some small indigenous species (SIS) from fish markets of Mymensingh. International Bioresearch, 7:1-6.
- Hossain MA and S Afroze, 1991. Small fish as a resource in rural Bangladesh. Fishbyte, 9:16-18.
- Hossain MS and MA Mazid, 1995. A manual on development of floodplain fisheries. Fisheries Research Institute, Mymensingh. pp. 2 (In Bengali).
- Hossain MD, MK Hossain, MH Rahman, A Akter and DA Khanom, 2008. Prevalence of ectoparasites of carp fingerlings at Santaher, Bogra. University Journal of Zoology of Rajshahi University, 27: 17-19.
- Hasan MT, 2014. Aqua-drugs and chemicals: impact on health and production of shrimp and fish in coastal and inland aquaculture of Bangladesh. MS Thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 50.
- Islam MJ, GU Ahmed, T Islam, MA Haque and MGA Sarkar, 1999. Gill pathology of carp's disease from farming systems of Bangladesh. Bangladesh J. Fish., 22: 113-118.
- Johurul MI, 2004. Status of disease and health management practices of *Pangasius hypophthalmus*. M.S. Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 68.
- Konika MK, 2011. Investigation on culture and health status of mrigal *Cirrhinus cirrhosus* from the farming system of Mymensingh region, MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 57.
- Lilley JH, Phillips MI, K Tonguthai, 1992. A review of epizootic ulcerative syndrome in Asia, Publ. Aquatic Animal Health Research Institute and Network of Aquaculture Centres in Asia Pacific. Bangkok, Thailand. pp. 73.
- Mondal A, 2012: Investigation on the health status of some exotic fishes from farming condition of Mymensingh area, MS thesis, Bangladesh Agricultural University, Mymensingh. pp. 64.
- Monowara M, 2003. Monogenean infestation on certain small indigenous fishes of Mymensingh, MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 53.
- Parveen R, 2001. Disease investigation of three small indigenous fishes from beel of Mymensingh, MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 51.
- Rahman MM and MBR Chowdhury, 1996. Isolation of bacterial pathogen causing an ulcer disease in farmed carp fishes of Mymensingh. Bangladesh J. Fish., 19:103-110.
- Roy MK, Ahmed GU, Akter S and N Akter, 2006. Study of health condition of small indigenous freshwater fishes of Ailee beel, Mymensingh. Progressive Agriculture, 17: 201-209.
- Subasinghe RP, 1995. Note on Fish Disease Diagnosis and Health Management Training Workshop held from 22nd to 25th February, 1995. FRI, Mymensingh. pp. 3-21.
- Shamsuddin M, 2012. Impact of aqua drugs and chemicals on health of fish. 5th Fisheries Conference & Research Fair. Bangladesh Fisheries Research Forum (BFRF). pp. 39.
- Thilsted SH, N Roos and N Hassan, 1997. The role of small indigenous fish species in food and nutrition security in Bangladesh, NAGA News letter, July December. pp.13.
- Tripathi SD, 1997. The role of fisheries and Aquaculture in improving the food and nutrition security in Bangladesh. Paper presented at the Training workshop in food nutrition security in Bangladesh. Organized by BRR/ And ENRECA project, 12 March 1997, Bangladesh.