

Seasonal Variation of Diseases of Some Small Indigenous Fishes from Oxbow Lake Fisheries of Bangladesh

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Abstract.- Disease investigation through clinical and histopathological observation of three small indigenous fishes *Channa punctatus*, *Puntius ticto* and *Nandus nandus* were carried out from Shidlong Oxbow Lake and Gangni Oxbow Lake of Mymensingh area during April 2000 to January 2001. Fish sampling were monitored on monthly basis. It was observed that most of the fishes of Shidlong Oxbow Lake were more affected than Gangni Oxbow Lake. It was also observed that, all the fishes were more or less normal in their appearance during the month of April to September in both Oxbow Lakes. But severity of infection and injury were increased in October to January. Scale loss, discoloration of gill filaments, red spot in ventral region, weak body, loss of caudal fin and several necrotic lesions on head region were found in *C. punctatus* in October to January from both Oxbow Lakes. Discoloration of gill filament, rough skin and mild dermal lesions were observed in *N. nandus* from both Oxbow Lakes in October to January. In *P. ticto* red spot in ventral region, weak body and hemorrhage in skin and gill were found in October to January. Common histopathological changes include necrosis, pyknosis, inflammation, hemorrhage, hypertrophy and hyperplasia and missing of primary and secondary gill lamella were observed. Monogenetic trematode and protozoan cysts were found in gill filaments of all the three fish species. Many fungal granuloma were observed in the skin and muscle of all the fish species during December to January in both Oxbow Lakes. From the results we can conclude that fishes were affected by Epizootic Ulcerative Syndrome (EUS) and myxoboliasis. It was found that most of the fishes of Shidlong Oxbow Lake were more affected as compared to Gangni Oxbow Lake. Among fish species, *C. punctatus* was found more affected than other fish and less affected one was *N. nandus*. Fishes of both selected Oxbow Lakes were severely affected during the month of December and January. However, diseases like trichodiniasis, myxoboliasis, dactylogyrosis, gyrodactylosis and EUS were observed in the sampled fish species.

Key words: Seasonal variation, fish, Oxbow Lake.

INTRODUCTION

Bangladesh is very rich in natural water resources in the form of rivers, reservoirs, lakes, floodplains, canals and Oxbow Lakes. The open water resources are estimated at 4.92 million hectare of which 2.833 million hectare are floodplains, 0.114 million hectare are Oxbow Lakes and 1.97 million hectare are river, estuaries, Kaptai lake, enclosure (DOF, 2001). Among freshwater species, small indigenous fishes are important group of fish, which are being successfully cultured in many places of world, particularly in the South East Asian countries. Fishes, which grow up to a length of about 25 cm or 9 inches, are called small indigenous

fishes in Bangladesh (Felts *et al.*, 1996; Hossain and Afroze, 1991). These small indigenous fishes are abundant in almost all the freshwater areas of Bangladesh. In our country small indigenous freshwater fishes naturally grow in open water resources such as rivers, Oxbow Lake, canals and flood plains. These fishes are very popular for their taste and high nutritional quality. Small indigenous fishes have high nutritional value in terms of both protein content and presence of micronutrients, vitamins and minerals (Akhteruzzaman *et al.*, 1997). But it is a matter of great regret that natural fishery resources in our country, especially small indigenous fishes have been gradually declining due to several reasons.

Disease is one of the most important problems of fish production both in culture system and wild condition of Bangladesh (Rahman and Chowdhury, 1996). Fishes have been suffering from many diseases such as Epizootic Ulcerative Syndrome

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(EUS), tail and finrot, fungal, parasitic and bacterial infections (Chowdhury *et al.*, 1999). In most cases hemorrhages, septicemia, lesions, gill damage are the common symptoms of the diseased fish (Chowdhury, 1993, 1998). With the outbreak of EUS in 1988, *Channa* spp., *Puntius* spp., *Anabas* spp., *Nandus* spp., and many indigenous species of fish were seriously affected (Barua *et al.*, 1989). Thus it is essential to investigate the cause of the occurrence of disease by using suitable techniques. Clinical investigation provides information on the nature of diseases in fish. However, histopathological technique is one of the most important procedures for disease diagnosis in fishes. It has been successfully used throughout the world. But in Bangladesh, this technique have been used for disease diagnosis of fishes in a limited extent because of lack of technical know how and laboratory facilities (Moniruzzaman, 2000). So the present work was undertaken for identifying the occurrence of diseases among small indigenous freshwater fishes like *N. nandus*, *C. punctatus* and *P. ticto* from two Oxbow Lakes of Mymensingh area.

MATERIALS AND METHODS

The present study was conducted for a period of ten months from April 2000 to January 2001. Fishes were collected from Shidlong Oxbow Lake and Gangni Oxbow Lake of Mymensingh region, Bangladesh. Shidlong Oxbow Lake was situated in Shamgonj union, Netrakona and was located about 25 km north of Bangladesh Agricultural University Campus Mymensingh. Gangni Oxbow Lake was located in Tarakanda upazila of Mymensingh district, which is 12 km north of Bangladesh Agricultural University Campus. Three small indigenous fish such as *C. punctatus*, *P. ticto* and *N. nandus* were bought from the nearest fish market which were collected from the respective Oxbow Lakes. A monthly sampling was carried out from each Oxbow Lake. Live fish were transported by separate plastic bags filled with water to the Fish Disease Laboratory of the Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh. The sampled fishes were observed by necked eye, and magnifying glass after taking out of the plastic

bags to record any infection, injury and abnormalities. Samples of fish organs such as skin, muscle and gill were dissected out and preserved in 10% buffered formalin for histopathological study. After 08 hours of fixation, the samples were trimmed into a standard size (1 cm³ maximum). Then the samples were placed in an automatic tissue processor for dehydration, clearing and infiltration (SHANDON, CIT ADEL 1000). The samples were then embedded, sectioned (5 μ m) and stained with Haematoxylin and Eosin. The sections were then examined under a compound microscope (Olympus) and photomicrograph were taken by using a photomicroscope (OLYMPUS, Model CHS, Japan).

RESULTS

Fish in Shidlong Oxbow Lake

During the month of April, May, August and September it was observed that, all the three species were almost normal and healthy in appearance. In *P. ticto*, rough skin was observed in June, scale loss at some places in November, hemorrhage in gill and scale loss from ventral region in December and January. However, in July rough skin was observed in *N. nandus* and *C. punctatus*. Rough skin and deep ulcer of ventral region were recorded in *N. nandus* in December and January (Fig. 1). Same appearance was observed in *C. punctatus* in December (Fig. 2). In *C. punctatus* scale loss and discoloration of gill filament were recorded in November, mild dermal lesion were observed in *N. nandus* at the same period.

Fish in Gangni Oxbow Lake

Healthy appearance and almost normal condition were observed during April, May, June, September and October in all the three species. During July and August rough skin was observed in *P. ticto*, same appearance were observed in *N. nandus* and *C. punctatus*. Weak body in November, hemorrhage in dorsal and dorsoventral region during December and January were observed in *P. ticto* (Fig. 3). Discolouration of gill filament during November, mild dermal lesion in December and January were recorded in *N. nandus*. In *C. punctatus* severe necrotic lesion in head region was observed in December and loss of caudal fin in January.

Fig. 1. *N. nandus* obtained from Shidlong Oxbow Lake in January. Rough skin and deep ulcer of ventral region were seen.

Fig. 2. *C. punctatus* obtained from Shidlong Oxbow Lake in December. Rough skin and deep ulcer of ventral region were seen.

Fig. 3. *P. ticto* obtained from Gangni Oxbow Lake in December. Haemorrhage in dorsal and dorsoventral region of body surface was seen.

Histopathology of fishes of Shidlong Oxbow Lake

In April and May, epidermis were normally

arranged and muscles were less affected of *P. ticto* but normal conditions were observed in *N. nandus* and *C. punctatus*. In June to August epidermis were partly or totally lost in some place of all species and dermis sloughed off in *N. nandus*. Similar result found in the month of September to November of all the species. However in December and January, a digenetic trematode (larvae) was present in dermis of *P. ticto* (Fig. 4), epidermis was lost, fungal granuloma and pyknotic cells were observed in *N. nandus* (Fig. 5). At the same time many fungal granuloma were found in *C. punctatus*.

Gills

Marked hypertrophy and hyperplasia was observed in gill lamellae. Secondary gill lamellae were missing in some places of *P. ticto*, both the gill lamellae were ruptured with blood cells of *N. nandus* during the month of June to August. At this time both the gill lamellae were missing, necrosis and monogenetic trematode were present in the gill of *C. punctatus*. In September to November, secondary gill lamellae were swollen and primary gill lamellae were almost normal in all the three species. In December and January, primary gill lamellae were swollen and many monogenetic trematode were present in gill of *P. ticto* (Fig. 6). During this period in *C. punctatus*, both the gill lamellae were hypertrophied and missing in some portion having monogenetic trematode (Fig. 7). In December and January protozoan cyst were present in secondary gill lamellae of *N. nandus*.

Histopathology of fishes of Gangni Oxbow Lake

In case of *P. ticto* during the month of April and May, skin and muscles were normally arranged, Epidermis partly lost and myotomes were irregularly arranged in June to August. In September to November, epidermis separated from dermis but muscle more or less normal. However, in December and January, epidermis totally and dermis partly lost, necrotic muscles were scattered in empty space. In *N. nandus* during the month of September to November, epidermis partly lost and muscles irregularly arranged. In December and January, epidermis were totally lost, dermis partly lost and sloughed off from muscles and dense melanocytes were observed in dermis. In *C. punctatus*, epidermis

partly lost and separated from dermis, dermis irregularly arranged and dense melanocytes were seen in epidermis in September to November. In December and January, epidermis totally lost, fungal granuloma present in dermis and muscle (Fig. 8).

Gills

In case of *P. ticto*, secondary gill lamellae were hypertrophied with many blood cells and inflammatory cells in September to November. In December and January, both the gill lamellae were hypertrophied, and many monogenetic trematode were present in secondary gill lamellae (Fig. 9). In *N. nandus* during the month of June to August, both the gill lamellae were hypertrophied and hyperplasia with many blood cells. Secondary gill lamellae swollen, many inflammatory cells and pyknotic cells were seen in September to November. In December and January, hemorrhage in both gill lamellae and secondary gill lamellae were missing in some places. In case of *C. punctatus*, primary and secondary gill lamellae were affected with many blood cells and inflammatory cells in September to November. In June to August, secondary gill lamellae have swollen only and December to January, secondary gill lamellae were missing in one side with monogenetic trematode.

DISCUSSION

In the present study it was observed that the fishes of Shidlong Oxbow Lake were more affected than Gangni Oxbow Lake. Again when we consider individual fish species, *C. punctatus* was found to be more affected than other fish, and less affected one was *N. nandus*. It was also observed that severity of infection and injury were increased in December and January. In the months of April to September, all the fishes were more or less normal of both Oxbow Lakes. Weak body, scale loss, discoloration of gill filaments, red spot in ventral region, loss of caudal fin and several necrotic lesions in head region were found in *C. punctatus* during October to January of both Oxbow Lakes. Scale loss in some places, weak body, red spot in ventral region and hemorrhage in gill, dorsal and dorsoventral region

were observed in *P. ticto* during October to January of two Oxbow Lakes. Mild dermal lesion, rough skin, deep ulcer in ventral region and discoloration of gill filaments were observed in *N. nandus* from both Oxbow Lakes in October to January. Similar findings were also observed by Moniruzzaman (2000), Khatun (1999), Hoque (1998), and Islam (1999). Ahmed and Hoque (1999) monitored that symptoms like gray white necrotic areas increased in December, January and February in various carp species of Bangladesh. Then it could be mentioned that, all the three species were almost normal and healthy in appearance during April to September but severe stress conditions were observed during October to January of both Oxbow Lakes.

Histopathologically it was observed that, all the fish species were healthy in April and May. On the other hand, minor pathological changes were recorded during June to August. In the months of September to November marked pathological changes were observed and infections were gradually increased in December and January. It was also observed that, *C. punctatus* was more affected than other species and less affected one was *N. nandus*. Again Oxbow Lake wise, fishes of Shidlong Oxbow Lake had an increased infection than Gangni Oxbow Lake. In case of *C. punctatus*, epidermis were totally lost, many fungal granuloma were present in dermis and muscle, myotomes were ruptured and missing in many places during the months of December and January in Gangni Oxbow Lake. Similar result found in *N. nandus* in Shidlong Oxbow Lake. However, in December, a digenetic trematode (larvae) was present in dermis of *P. ticto* in Shidlong Oxbow Lake. Ahmed and Banu (2001) also observed trematodes in small fish of the Oxbow Lakes of Bangladesh. Mohan and Sankar (1994) described that in EUS affected fishes of fresh and brackish water, numerous granuloma were found as a result of chronic inflammatory response with fungal hyphae. This results also agreed with the observation on EUS of freshwater fishes of South and Southeast Asia (Roberts *et al.*, 1992, 1993). Hatai *et al.* (1994) also reported fungal hyphae and many granulomas in the internal organs and musculature of EUS affected *Colisa lalia* in Japan. Thus it could be mentioned here that, presence of fungal granuloma in the muscle indicates the fishes

Figs. 4-5. Section of skin and muscle of *P. ticto* (4) and *N. nematode* (5) obtained from Shidlong Oxbow Lake in December (4) and January (5). Figure 4 shows digenetic trematode (dt) in dermis whereas in Figure 5 epidermis and part of dermis were lost (↑), fungal granuloma (fg) and pyknosis in between dermis and muscle (H & E, x125).

Fig. 6. Section of *P. ticto* obtained from Shidlong Oxbow Lake in December. Primary gill lamellae (gl) were swollen, ruptured (r) and many monogenetic trematode (mt) present in gill lamellae (H & E, x125).

Fig. 7. Section of gill of *C. punctatus* obtained from Shidlong Oxbow Lake in December. Primary and secondary gill lamellae were missing (↑), hypertrophied (hy) and having monogenetic trematode (mt) (H&E, x420).

Fig. 8. Section of skin and muscle of *C. punctatus* obtained from Gangni Oxbow Lake in December. Epidermis totally lost, fungal granuloma (fg) present in dermis and muscle (H&E x 125).

Fig. 9. Section of gill of *P. ticto* obtained from Gangni Oxbow Lake in January. Both the gill lamellae were hypertrophied (hy) and hyperplastic (Hyp) and many monogenetic trematode (mt) were present in secondary gill lamellae (H&E, X420).

were affected by epizootic ulcerative syndrome (EUS).

Gills also had an increased pathology than other organs. Both the gill lamella were hypertrophied, hyperplastic and missing in some places having many monogenetic trematode were observed in *C. punctatus* from both Oxbow Lakes in December and January. Similar results found in gill of *P. ticto* from Gangni Oxbow Lake and Shidlong Oxbow Lake. Ahmed *et al.* (1998) also observed gill pathology having monogenetic trematode in juvenile of Indian major carps. Protozoan cyst was found in secondary gill lamella of *N. nandus* from Shidlong Oxbow Lake in January. The authors identified the cysts contained a protozoan, *Myxobolus* sp. Several monogenetic trematodes, with hypertrophy, hyperplasia and missing of both the lamellae were observed in the gill of *C. punctatus* and *P. ticto* in Shidlong Oxbow Lake and Gangni Oxbow Lake. Ahmed *et al.* (1998), Islam (1999) and Moniruzzaman (2000) observed almost similar gill pathology in the gills of various carp species and some small indigenous fishes. According to Hoque (1998) gills of culturable juvenile carps had hypertrophy, hyperplasia, many myxobolus cysts attached with secondary gill lamellae and monogenetic trematode in between primary gill lamellae. Wundsch (1930) also mentioned that gill of tench was characterized by hypertrophy, hyperplasia, fusion of gill lamellae and necrosis resulting from thrombosis of vessels by fungal hyphae where the disease was named as branchiomycosis. It could be mentioned here that, common gill diseases in small indigenous fishes of Bangladesh were dactylogyrosis, myxoboliasis and trichodiniasis.

From pathological point of view, most of the fishes of both Oxbow Lakes were severely affected during the month of December and January. December and January are the coldest month of the year when water temperature reduces to nearly 10°C which diminishes production of antibody in fish. Thus sudden drop of temperature in winter season was supposed to be an important predisposing cause of diseases. The results agreed with the work of Palisoc (1990) and Chinabut (1994) in the Philippines and Thailand. In present study it was observed that, *C. punctatus* were severely affected

fish, followed by *P. ticto* and *N. nandus*. Again when we considered the different Oxbow Lakes, it was observed that most of the fishes of Shidlong Oxbow Lake were more affected than Gangni Oxbow Lake. Shidlong Oxbow Lake was the small Oxbow Lake, which was joined with many agricultural lands, and dry season water depth was very low. As a result different pesticides and insecticides stressed fishes. This may be one of the reasons of more affected fish of this Oxbow Lake. In this way these freshwater small indigenous fishes of Bangladesh were endangered day by day. Steps should be taken to protect these fishes. In the present investigation most of the examined fishes of two Oxbow Lakes were almost normal and healthy from external observations. But pathologically majority of fishes were affected by various pathogens especially EUS disease. The proper preventive and control measures would need to be taken in order to overcome the disease problems. But in our country, appropriate method to prevention and control of disease of open water fishes was not well developed. Under these conditions, proper management techniques should be adopted for open water fishery.

REFERENCES

- AKHTERUZZAMAN, M., KHAN, A.M. AND ARIEF, K.H., 1997. Observation on the production of some small indigenous fish species (SIS) in Bangladesh. *Proceedings of National Workshop on Small Indigenous Fish Culture in Bangladesh*. Rajshahi University. pp. 107-116.
- AHMED, G.U., HOQUE, M.M. AND HOQUE, M.J., 1998. Gill pathology of juveniles carps in nursery ponds. *Bangladesh J. Fish Res.*, **2**: 63-67.
- AHMED, G.U. AND HOQUE, M.A., 1999. Mycotic involvement in Epizootic Ulcerative Syndrome of freshwater fishes of Bangladesh: A histopathological study. *Asian Fish. Sci. Philippines*, **12**: 381-390.
- AHMED, G.U. AND BANU, A.N.H., 2001. *Investigation on diseases of some small indigenous freshwater fishes of Bangladesh*. Final Report. Bangladesh Agricultural Research Council.
- BARUA, G., BANU, A.N.H. AND KHAN, M.H., 1989. An investigation into the prevalence of fish disease in Bangladesh during 1988-1989. *Bangladesh J. Aquacult.*, **11**: 75-79.
- CHINABUT, S., 1994. *EUS in Thailand. ODA regional seminar on epizootic ulcerative syndrome at Aquatic Animal Health Research Institute, Bangkok*. Thailand. January 1994. pp. 58-60.

- CHOWDHURY, M.B.R., 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* (ed. A. Tollervey), pp. 8-11.
- CHOWDHURY, M.B.R., 1998. Involvement of aeromonad and pseudomonads in disease of farmed fish in Bangladesh. *Fish Pathol.*, **33**: 247-254.
- CHOWDHURY, M.B.R., ISLAM, M.A., HOSSAIN, M.I., SARKER, M.A. AND MOJUMDER, B., 1999. Involvement of aeromonads in ulcer disease in farmed fishes. *BAU Res. Prog.*, **10**: 140-146.
- DOF (DEPARTMENT OF FISHERIES), 2001. *Fish week 2001*. Department of Fisheries. Ministry of fisheries and livestock. Government of the Peoples Republic of Bangladesh, Romna, Dhaka, pp. 79.
- DYKOKA, I. AND LOM, J., 1978. Histopathological changes in fish gills infected with Myxosporidian parasites of the genus *Henneguya*. *J. Fish Biol.*, **12**: 197-202.
- FELTS, R.A., RAJTS, F. AND AKHTERUZZAMAN, M., 1996. *Small indigenous fish species culture in Bangladesh* (Technical Brief), IFADEP sub-project-2. Development of inland Fisheries. Pp. 41.
- HOSSAIN, M.A. AND AFROZE, S., 1991. Small fish as a resource in rural Bangladesh. *Fishbyte*, **9**: 16-18.
- HATAI, K., NAKAMURA, K., YUASA, K. AND WADA, S., 1994. *Aphanomyces* infection in Dwarf Gourami (*Colisa lalia*). *Fish Pathol.*, **29**: 95-99.
- HOSSAIN, M.S. AND MAZID, M.A., 1995. *A manual on development of floodplain fisheries*. Fisheries Research Institute, Mymensingh. p. 2 (In Bengali).
- HOQUE, M.A., 1998. *Histopathological study of Epizootic Ulcerative Syndrome (EUS) in Indian major Carps from Mymensingh area of Bangladesh*. M.S. thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. 56 pp.
- ISLAM, M.J., 1999. Investigation into carp diseases through histopathological observations. M.S. thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. 79 pp.
- KUMAR, D., DEY, R.K. AND SINHA, A., 1991. Outbreak of epizootic ulcerative syndrome of fish in India. In: *Aquaculture productivity lever Research Foundation* (eds. V.R.P. Sinha and H.D. Sriva).
- KHATUN, A., 1999. *Histopathological investigation of diseases in Clarias batrachus (Linn.) in Mymensingh area*. M.S. thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. 64 pp.
- MOHON, C.V. AND SANKAR, K.M., 1994. Epidemiological analysis of epizootic ulcerative syndrome of fresh and brackish water fishes of Karnataka, India. *Curr. Sci.*, **66**: 656-658.
- MONIRUZZAMAN, M.D., 2000. *Investigation on diseases of some small indigenous freshwater fishes of Bangladesh*. M.S. thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. 69 pp.
- PALISOC, F.P., 1990. Histopathology of Epizootic Ulcerative Syndrome (EUS) positive snakehead, *Ophicephalus striatus*, from Laguna Lake, Philippines, pp. 22. Abstracts from the Symposium on Diseases in Asian Aquaculture, 26-29 November 1990. Bali, Indonesia, Fish Health Section, Asian Fisheries Society, Manila.
- ROBERTS, R.J., FRERICHS, G.N. AND MILLER, S.D., 1992. Epizootic Ulcerative Syndrome (EUS) the current positions. In: *Diseases in Asian Aquaculture I*. (eds. M. Sharif, R.P. Subasinghe, J.R. Arthur), pp. 341-346. Asian Fisheries Society, Manila, Philippines.
- ROBERTS, R.J., WILLOUGHBY, L.G., CHINABUT, S.C. AND TONGUTHAI, K., 1993. Mycotic aspects of (EUS) in Asian fishes. *J. Fish Dis.*, **16**: 169-183.
- RAHMAN, M.M. AND CHOWDHURY, M.B.R., 1996. Isolation of bacterial pathogen causing an ulcer disease in farmed carp fishes of Mymensingh. *Bangladesh J. Fish.*, **19**: 103-110.
- WUNDSCH, H.H., 1930. Untersuchungen uber die kiemenfaule bei fischer. 3. Weitere Beobachtungen and *Brancheomyces demigrans* als Erreger der kiemenfaule bei hecht. *L. Fish.*, **28**: 39-401.

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