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Disease investigation of small indigenous fish species *Channa punctatus* of three fish markets in Mymensingh, Bangladesh

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Abstract: Studies were conducted to investigate the health condition of a small indigenous fish *Channa punctatus* through clinical and histopathological observations for a period of six months. The samples were collected from different fish markets of Mymensingh District. Water quality parameters *viz.*, temperature and dissolve oxygen were recorded and, clinical and histopathological study were done at monthly intervals. Normal appearances were observed during the months of October to November and also February to March from the fish samples of three fish markets. In the months of December and January, fishes were more affected having scale loss, red spots, deep dermal ulcer in Sankipara Railway Crossing and Gollpukurpar markets. Histopathologically, marked necrosis, pyknosis, haemorrhage and fungal granuloma were observed in skin and muscle. Gills of fishes from Sankipara Railway Crossing and Gollpukurpar markets had found monogenetic trematode, hypertrophy, clubbing and pyknosis in December and January. Livers of the examined fishes had no pathogen and showed less pathological signs compared to other organs. Fungal granuloma, necrosis, haemorrhage and vacuoles were found in the kidney of fishes collected from Gollpukurpar market and Sankipara Rail Crossing market. The investigated species *C. punctatus* was found more affected in Gollpukurpar and Sankipara Rail Crossing market than the fish samples of K-R market during the month of December and January. In the other months there were reduced clinical and histological symptoms in fish of all the markets.

Keywords: *Channa punctatus*; fish markets; fish diseases

1. Introduction

Channa punctatus is the spotted snakehead and known as Taki in Bangladesh. This species is distributed in Asia namely Afghanistan, Pakistan, India, Sri Lanka, Nepal, Bangladesh, Myanmar and China and mostly found in ponds, swamps, brackish water (Pethiyagoda, 1991), ditches and beels (Rahman, 1989). Adults prefer stagnant waters in muddy streams (Talwar *et al.*, 1991) and feed on worms, insects and small fish (Pethiyagoda, 1991). Snakehead is one of small indigenous fish species out of 50-60 species in Bangladesh which has maximum length of 25 cm (Felts *et al.*, 1996).

Bangladesh is blessed with a vast of open and closed water bodies like as rivers, reservoirs, lakes, floodplains, canals, haor, baor, beels etc. which are playing most prominent roles in fisheries sector and contributing tremendously in the economic development by proving employment generating, animal protein uptake, foreign currency earning, poverty alleviation and in women empowerment issues. From the last two or three decade, small indigenous fish production is gradually decreasing in inland open water capture fisheries. This decline is mainly due to over fishing, siltation in the river, the indiscriminate use of agrochemicals and destruction of fish

breeding ground and above those issues directly or indirectly facing negative effect on fish mortality, fish disease and decrease fecundity.

For selling and buying of fish, market is an import place for activities of fisherman, wholesaler, retailer and buyer. In Bangladesh, most of the fishes are selling through the fish market. Khan (1995) found some problems of fish markets in Mymensingh district like lack of storage facilities, hygienic condition, lack of weighing system, assessment of market tolls and poor transportation. Generally healthy and unhealthy fishes are kept together in the markets. The ratio of quality and affected fishes in the markets depends on the seasons. It is thus important to record affected and diseased fishes of the fish markets.

Clinical and histopathological observations are very helpful in diagnosing fish diseases. Histopathological technique is one of the most important procedure for disease diagnosis in fish. It has been successfully used throughout the world, but in Bangladesh the technique for disease diagnosis of fishes is in a limited extent (Moniruzzaman, 2000). Ahmed *et al.* (1998) and Sanullah and Ahmed (1980) studied in histopathology of fishes. The histopathological study on the gill of heavily infected fish showed hyperplastic proliferation desquamation of the epithelial lining, vascular degeneration, oedema, necrosis and dilatation of branchial blood vessels (Meguid, 1995). Thus the present investigation was undertaken in order to diagnose diseases in small indigenous freshwater fish *C. punctatus* from different fish markets of Mymensingh, Bangladesh.

2. Materials and Methods

The present investigation was conducted for a period of six months from October 2005 to March 2006. The selected experimental fish *C. punctatus* was collected from different markets of Mymensingh such as Sankipara Rail Crossing Market, Gollpukurpar Market and K-R Market. During sample collection, live snakehead were collected and carried by plastic container with clear water and brought to the Fish Disease Laboratory of the Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh. Samples were collected at monthly interval. Length (cm) and weight (gm) of each fish was measured before sampling. The sampled fishes were examined to observed external signs, any injury and other abnormal condition of body. For histopathological observation samples of fish from various organs such as skin, muscle, gills, liver and kidney were collected by a sharp scalpel and forceps and preserved in 10% neutral buffered formalin. The preserved samples were dehydrated, cleared and infiltrated in an automatic tissue processor. (SHANDON, CITADEL 1000). The samples were then embedded with melted wax, steel mold and perforated plastic holder. Sections were taken by microtome, dried and stained with haematoxyline and eosin stains. The stained sections were mounted with Canada balsam and examined under a compound microscope (Olympous). Photomicrographs of stained sections was done by using a photomicroscope, (OLYMPUS, Model CHS, Japan).

3. Results and Discussion

Some water quality parameters were recorded of maket fishes from where the fish were harvested. The average water temperature of Kailla beel and Brahmaputra River from where fishes were caught was ranged from 22^oC to 28^oC during the months of October and November. The minimum water temperature was ranged from 16^oC to 21^oC in December and January whereas the maximum water temperature was recorded as 21^oC to 29^oC in February and March. The value of DO at Brahmaputra river was ranged from 5.5 to 6.5 mgl⁻¹ in October and November, while in December, January, February and March the DO values was ranged from 5.0 to 6.5 mgl⁻¹. On the other hand, the range of DO at Kaila beel was 5.0 to 6.0 mgl⁻¹ in October and November. DO value was 4.0 to 5.0 mgl⁻¹ observed during December and January. The range of DO was 5.0 to 6.0 mgl⁻¹ recorded in February and March. Ahmed *et al.* (2009) observed that higher water temperature and DO in the summer season and lower in winter season. The water temperature, DO and hardness in fresh water bodies of Bangladesh were low during December, January and February (Ahmed and Banu, 2001). Chinabut *et al.* (1995) injected striped snakehead with *Aphonomyce invades* zoospores and showed that the inflammatory response was less pronounced, fungal invasion was more extensive and mortality rates were higher, in fish kept at 19^oC compared with 26^oC and 31^oC. Thus, it can be mentioned that, low temperature and DO were the important factors responsible for diseases in fish.

Clinically, fishes of all the markets in October and November were almost normal. During this period of *C. punctatus* were observed to have rough skin, mild scale loss, discoloration of fish and minor red spots (Table 1). Similar sign have been reported in *N. nandus* by Marma *et al.* (2007). Roy (2006) observed rough skin, scale loss in various small species of open water bodies in October and November. In December and January, deep ulcers on head region, haemorrhage, lesion on the ventral and pelvic region, eyes discoloration and weak health with dark colour, scale loss, were recorded in Sankipara Rail Crossing market (Fig. 1) and Gullpukurpar market, however, weak body and scale loss in K-R market (Table 1). During the month of December and January,

discolouration, deep ulcer, ill health, scale loss and rough skin in *C. punctatus* recorded by Hossain *et al.* (2009). Three small indigenous fishes like *P. ticto*, *N. nandus* and *C. punctatus* were examined thorough clinical, parasitological observation by Parveen (2001) which were collected from four beels of Mymensingh district and mentioned that all fishes were severely affected during the months of December and January.

Fishes, collected from Gullpukurpar market and Sankipara Railway Crossing market showed mild scale erosion, rough skin and weak body were observed in February and March whereas, fishes of K-R market were found comparatively less affected. According to Ahmed *et al.* (2009), Ahmed *et al.* (2004), Monowara (2003) and Chakma (2002), clinically fishes were found to have been less affected during the months of February and March. The K-R market was well developed with clean floor supplied fish from Brahmaputra River and surrounding areas where the fishermen sold their fish in hygienic condition that's why most of the fishes were less contaminated or clinically almost normal compare to Gullpukurpar market and Sankipara Rail Crossing market.

Table 1. Clinical signs of affected fishes at different markets in various months.

Months ⇒		October	November	December	January	February	March
Fishes	Market						
↓							
<i>Channa punctatus</i>	SRC market	AN & HA	RS& SL in some places	RS & ulcer with SL	Dc & DU in the body region	Rs & mild dermal lesion	AN & monor WB
	GPR market	AN	SL & WB	WB & RS in 'v' & 'p' region	Ulcer with SL in head region in body	Rs & mild dermal lesion	AN
	K-R market	AN & HA	AN & ill body	RS & rs	WB & SL in some places	SL in some places	HA

AN = almost normal, p = pelvic, Dc = discoloration, rs = rough skin, HA = healthy appearance, SL = scale loss, DU = deep ulcer, v = ventral, IB = ill body, WB = weak body, RS = red spots, SRC= Sankipara Railway Crossing, GP= Gollpukurpar, K-R= Kamal- Ranjit

Histopathologically in the month of October and November, epidermis was partly missing, dermis was spitted into a few parts but muscle was almost normal in fish from Gullpukurpar market. In December and January, epidermis and dermis were lost, necrotic muscle with numerous dense fungal granuloma and necrosis were observed in fish from Sankipara Rail Crossing market (Figure 2). During this period, well-developed fungal granuloma was found in the affected skin and muscle from Sankipara Rail Crossing market and Gullpukurpar market. Dermis and epidermis were arranged almost normally during the months of February and March in the fish of K-R market.

From the study of histopathology, among the three fish market *C. punctatus* were found severely affected in Sankipara Railway Crossing market in which epidermis and dermis were partly lost with visible haemorrhages and necrosis. Hossain *et al.* (2009), observed loss of dermis and muscle, severe necrosis and fungal granuloma in skin and muscle of snakeheads during the month of December and January. Ahmed *et al.* (2009) mentioned that during the month of October and November epidermis was lost, dermis partly hanged and necrotic muscle but epidermis and dermis were partly lost and fungal granuloma were developed in *C. punctatus* at Gangni oxbow lake. The result were almost similar with the works done by Marma *et al.* (2007), Patwary *et al.* (2008), Ahmed *et al.* (2005), Akter *et al.* (2006) and Roy *et al.* (2006).

Structure of gills were almost normal in October, November and March. In Sankipara Railway Crossing market and Gullpukurpar market, gill lamellae of fishes had hypertrophy, hyperplasia, pyknosis, melnomacrophage and missing in some portions having monogenetic trematodes in *C. punctatus* during the months of December and January (Figure 3). In February and March, mild necrosis was observed with secondary gill lamellae in fishes from K-R market. Gill was more affected than the other organs in the present investigation. Roy *et al.* (2006) observed that cysts, hyperplasia, lamellar clubbing and hypertrophy in EUS affected *C. punctatus*, *M. tengra* and *H. fossilis*. Parveen *et al.* (2005) observed marked hypertrophy and hyperplasia in gill lamellae of *C. punctatus* and *N. nandus* in December and January. Ahmed *et al.* (2004) also mentioned that primary and secondary gill lamellae of *C. punctatus* were hypertrophied and haemorrhagic where monogenetic trematodes were seen additionally in secondary gill lamellae during the months of December and January. Ahmed and Banu

(2001) also reported the existence of trematodes in gills of small fishes of the beel of Bangladesh especially during winter season.

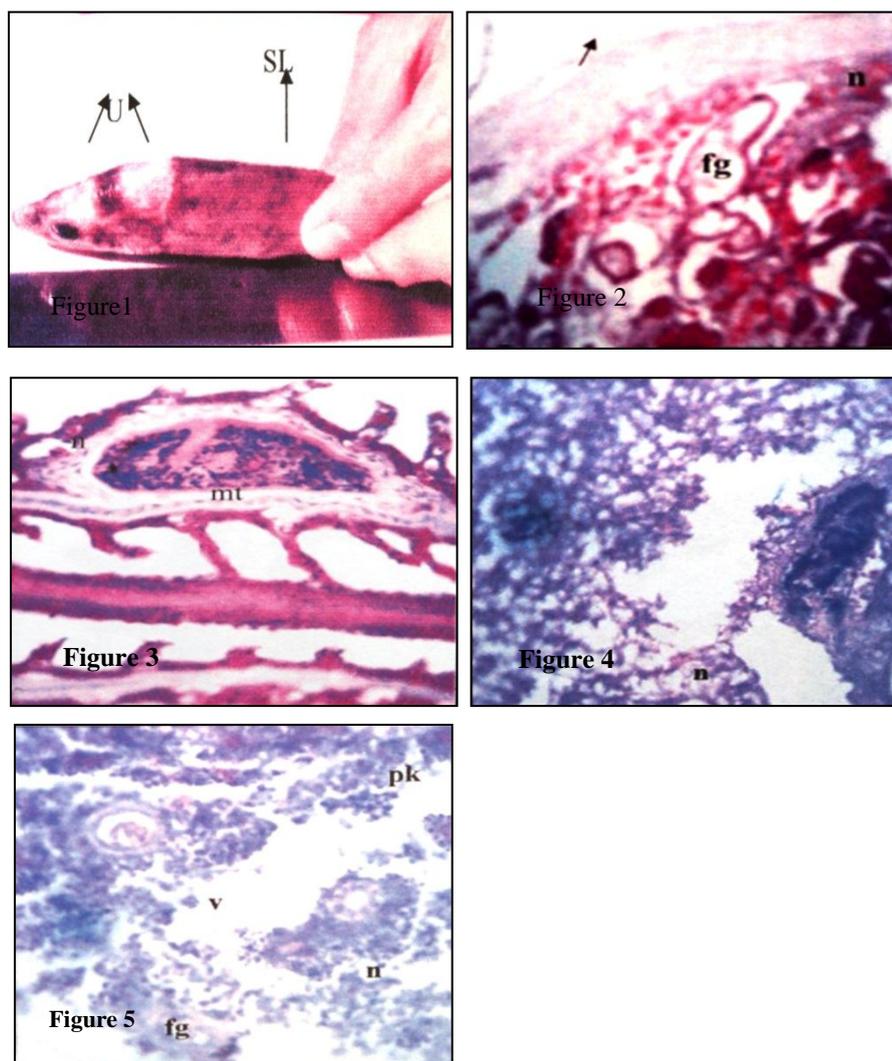


Figure 1. Photograph of *C. punctatus* sampled from Shankipara Railway Crossing market in December. Scale loss (SL), ulcer (U) was seen.

Figure 2. Section of skin and muscle of Taki in December & January from SRC market. Epidermis and dermis lost partly (↑), muscle necrotic (n) & fungal granuloma (fg) were seen. H and E x 125.

Figure 3. Section of gill of Taki in December & January from SRC market. Primary and secondary gill lamellae necrosis (n) & a monogenetic trematode (mt) were found. H and E x 440.

Figure 4. Section of liver of Taki in December & January from SRC market. Severe necrosis (n) and vacuole(v) were seen. H and E x 440.

Figure 5. Section of kidney of Taki in December and January from SRC market. Necrosis (n), pyknosis (pk), vacuoles (v) and fungal granuloma (fg) were seen. H and E x 440.

The structure of liver was almost normal in the months of October and November. Liver of *C. punctatus* had marked necrosis, vacuums, pyknosis during the months of December to January recorded in K-R market. On the other hand, *C. punctatus* had pathological changes such as severe necrotic areas, large vacuoles, inflammation and pyknosis during the months of December and January from Sankipara Rail Crossing market and Gullpukurpar market. In December and January, sever necrotic areas gave rise to large vacuums in fishes of Sankipara Rail Crossing market (Figure 4). However, in February and March, mild inflammation was seen in liver in fishes. Ahmed *et al.* (2009) observed that fungal granuloma in the liver of *C. punctatus* which indicated that the fishes were affected by epizootic ulcerative syndrome. Roberts *et al.* (1992) stated that presence of fungal hyphae in the internal organs in snakeheads during natural outbreak. Hossain *et al.* (2009), Akter *et al.* (2006) and Ahmed *et al.* (2004) found that severe necrosis of hepatocytes, pyknosis, wide vacuoles, fat droplets,

hemorrhages and fungal granuloma were evident in liver of *C. punctatus* during the months of December and January.

There were almost normal structure of kidney in the months October and November. In December and January, severe necrosis was observed in kidney tubules along with melanomacrophage, pyknosis and vacuoles in fishes from Sankipara Rail Crossing market and Gullpukurpar market (Figure 5). In February and March, minor haemorrhage and vacuoles were seen but the kidney structure was almost normal in fishes of K-R market. Roy *et al.* (2006) found that kidney tubules were necrotic having wide vacuum, blood cell, other inflammatory cells and pyknotic cells in *C. punctatus* during the months of December and January. Moniruzzaman (2000) and Hoque *et al.* (1999) observed necrosis, pyknosis, inflammation and parasites in histological section of kidney in some of open water fishes in the months of December and January. Similar pathological sign and symptoms of kidney of *C. punctatus* were reported by Alam (2004), Hossain *et al.* (2009), Ahmed *et al.* (2004) and Ahmed *et al.* (2009).

Clinically and histopathologically, fishes collect from all markets were almost normal in October and March. In this study, marked pathological changes were recorded in December and January. On the other hand, minor pathological changes were observed in November and February. Severity of abrasions and pathology was gradually decreased during February and March. The external organs like skin, muscle and gills were more affected than the internal organs like liver and kidney in most of the fishes. Similar results were reported by Ahmed *et al.* (2004) and Hatai *et al.* (1994).

4. Conclusions

This study showed that most of the fishes of Sankipara Railway Crossing market and Gullpukurpar market were disease affected but comparatively less affected fishes were observed in the K-R market. The retailers of K-R market collected fish from near the Brahmaputra river and Mohanganj. On the other hand, most of the fishes came from Kailla beel to Sankipara Railway Crossing market and Gullpukurpar market which beels was jointed with many agricultural lands. As a result fishes were stressed by different pesticides and insecticides derived from the surrounding agricultural land so that found more affected fishes in the beels. Also fish health could be deteriorate by the dirty floor and unhygienic drainage system of Sankipara Railway Crossing market and Gullpukurpar market. In the winter season specially December to January, massive pathological changes were observed in the organs of fish most of the markets. In this study, no control measure was noticed to apply to control fish disease. To avoid the disease, infrastructure facilities of fish market should be developed, application of pesticides in agriculture land should be control, well transportation facilities and scientific harvesting method should be applied.

Conflict of interest

None to declare.

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