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# HEALTH AND DISEASE STATUS OF CULTURED GULSHA (*Mystus cavasius*) AT MYMENSINGH REGION OF BANGLADESH

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## A B S T R A C T

A study was carried out for a period for four months from January to April 2019 in eight fish farms at Mymensingh region of Bangladesh. The principal objectives were to study the health status of gulsha in four months from eight farms in Mymensingh region as well as month wise pathological changes of various organs of gulsha through clinical and histopathological observations. Clinical signs of fish were reddish lesion and mild injured in different parts of body, abrasion, whitish spots etc. Gills of fish showed more pathological changes than skin, muscle and liver. Histopathologically, gills of all fish species were more affected in Nuha Aqua Farm than other seven fish farms of Mymensingh in January and February. General gill pathology of the fishes was lamellar missing, haemorrhage and hypertrophy. Pathology of skin and muscle of the fishes from different farms included epidermal missing, necrosis, vacuum and loss of muscle. Fat bodies, necrosis, vacuum and haemorrhage were the common pathology of liver in the fishes from sampled farms of Mymensingh. Mainly fat bodies, vacuum and necrosis were found in Sharnalata Agro Fisheries, Relience Aqua Farm, Nuha Aqua Farm and Manju Aqua Farm. On the contrary, haemorrhage and necrosis were noticed in Chan Mia Fish Farm, Fish Seed Multiplication Farm; Maskanda and Setu Hatchery and Aquaculture in Tarakanda. In the months of March and April different organs of gulsha fish like gill, skin, muscle and liver were recorded almost normal structure from sampled fish farms. Fish were found to be affected during colder months of January and February. But, during March and April most of the fish were found normal and healthy. From field and laboratory observations it was revealed that the study area had potentiality for gulsha culture, although necessary measures need to be taken especially during winter season.

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## INTRODUCTION

*Mystus cavasious* locally known as 'Gulsha' has been drawing attention of fish farmers in Bangladesh due to its high market value, profitable culture, good taste (Saha *et al.,* 1998). For this reason, farmers of greater Mymensingh region are culturing these fishes to a large extent. Gulsha is a carnivorous fish, feeding on insects, larvae and small fish (Islam and Azadi, 1989). The fish commands higher and more lucrative price than Indian major carps and other table fishes.

Disease has become a major problem in fish production in culture system and wild condition in Bangladesh (Rahman and Chowdhury, 1996). Due to increased production, making a large profit at a short period of time and consumer demand, farmers culture most of the species including gulsha in a very high stocking density. In pond aquaculture system, high stocking density and irregularly feed supply is very prone to disease outbreak. As a result, fishes are subjected to be stressed and diseased. A very wide range of diseases and parasites affects gulsha particularly when they are under stressed from poor environmental condition and in inadequate nutrition. Most common symptoms of diseases are hemorrhage, necrosis, pyknosis, hypertrophy, gill damage and different kinds of lesions (Ahmed *et. al*, 2004). Clinical signs and histopathology are important tools in diagnosing fish diseases. A total lack of mucus, edema, enlarged abdomen, growth of nodules on the body surface, presence of yellow, white or black spots on the skin, prolapsed anus and exopthalmia are all clinical signs of fish diseases (Plumb,1994). Histopathological study is not only used in pathogen identification but also facilitates to study of pathogenesis. The progress of disease development as well as the cause of determination of death can be studied through this technique.

Histopathological technique is one of the most important procedures for disease diagnosis in fish. It has been successfully used throughout the world. Prevention and control of diseases in aquaculture are a function of appropriate and quick disease diagnosis and proper health management. In pond aquaculture system, high stocking density and irregularly feed supply is very prone to disease outbreak. Most pond fish farmers do not have a good understanding of health and disease issues in their system.

## MATERIALS AND METHODS

### Study area

The study was consisted of both field and laboratory investigation. The field study was conducted in four upazilas of Mymensingh region during January to April (2019). The upazilas were placed in Fulbaria, Nandail, Muktagacha, Trisal and Mymensingh sadar under Mymensingh district of Bangladesh (Figure 1).

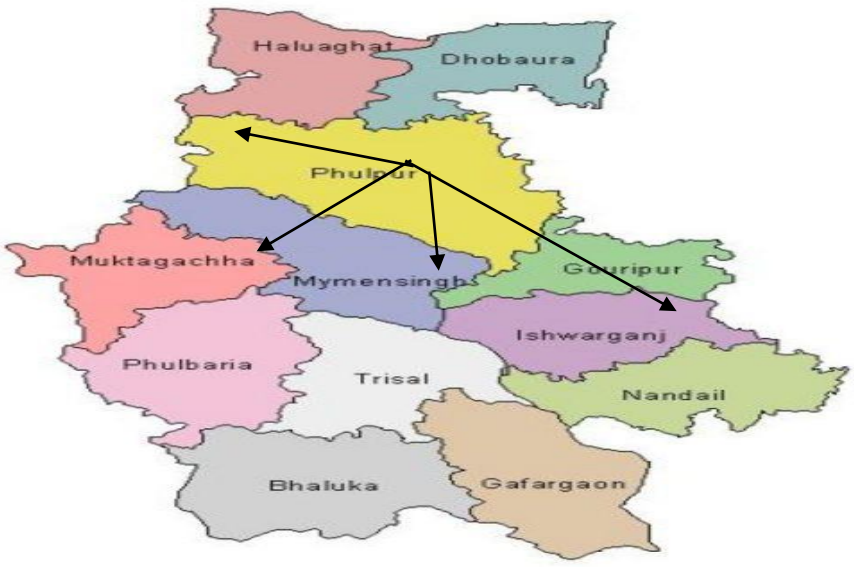



**Figure1.** Selected upazilas of the study area in Mymensingh district

**Data collection method**

Data was collected through the questionnaire interview from 8 fish farmers. A set of questionnaire was prepared. The questionnaire focused mainly on the status of farming systems of *Mystus cavasius.* For questionnaire interview a set of questionnaire was developed composed of open form of questions.

**Table 1.** List of Investigated Fish Farms in Mymensigh Region

| SL No. | Name of the Farm | Specific location of the Farm | Sample size |
|---|---|---|---|
| 1 | Sharnalata Agro Fisheries | Radhakanai, Fulbaria | 10 |
| 2 | Reliance Aqua Farm | Boilor, Trishal | 10 |
| 3 | Nuha Aqua Farm | Kumargata, Muktagacha | 10 |
| 4 | Manju Aqua Farm | Kumargata, Muktagacha | 10 |
| 5 | Fish Seed Multiplication Farm | Shambhuganj, Sadar | 10 |
| 6 | Fish Seed Multiplication Farm | Maskanda, Sadar | 10 |
| 7 | Chan Miah Fish Farm | Nandail, Sadar | 10 |
| 8 | Setu Hatchery and Aquaculture | Tarakanda, Sadar | 10 |

**Sample collection for health and disease investigation**

The sampled fishes were examined just after taking out of the container to observe external signs and record any injury, infection and other abnormal conditions of fish body through naked eye. Samples from fish muscle, gill and liver were collected by sharp scalpel and forceps and fixed in 10% buffered formalin. Then samples were dehydrated, cleared and infiltration through an Automatic Tissue Processors (Citadel-1000), sectioned and stained with hematoxylin and eosin stains. The tissue sections were examined under a photomicroscope. Thus comparisons were made based on seasons and areas following health status of gulsha.

## RESULTS

**Clinical Observations of *M. cavasius* in winter and summer season**

Reddish lesions at the ventral side of head region were recorded from fishes of Sharnalata Agro Fisheries in the month of February (Figure 2), whereas, severe reddish lesions and mild injury were observed at various parts of the body from fishes of Reliance Aqua Farm in the month of January (Figure 3). Abrasion and white spots were found from fishes of Chan Miah Fish Farm in the month of February (Figure 4), whereas, deep reddish lesions in ventral side and opercular region were found from fishes of Fish Seed Multiplication Farm in the month of January (Figure 5).

Clinically, more or less normal fish were observed from Setu Hatchery and Aquaculture and Fish Seed Multiplication Farm, Maskanda in the month of March (Figures 6 and 7). However, Normal healthy fish was observed from Nuha Aqua Farm and Sharnalata Agro Fisheries Farm in the month of April (Figures 8 and 9).


**Figure 2.** Reddish lesion (↑) at the head region of the body was observed in the month of February from Sharnalata Agro Fisheries Farm; **Figure 3.** Severe reddish lesions and mild injured (↑) at various part of body from Reliance Aqua Farm in the month of January; **Figure 4.** Abrasion and whitish spot (↑) was observed from Chan Miah Fish Farm in the month of February; **Figure 5.** Deep reddish lesion in ventral side and opercular region (↑) was recorded from Fish Seed Multiplication Farm, Maskanda in the month of January.


**Figure 6.** Almost normal fish was recorded from Setu Hatchery and Aquaculture in the month of March; **Figure 7**. More or less normal fish was found from Fish Seed Multiplication Farm, Maskanada in the month of March; **Figure 8**. Almost normal fish was found from Manju Aqua Farm in the month of March; **Figure 9**. Normal fish was found from Nuha Aqua Farm in the month of April.

**Histopathological observations of liver in winter season**

In the month of January from Shornolota Agro Fisheries Farm and Relience Aqua Farm, the liver of *M. cavasius* had fat bodies and vacuum (Figures 10 and 11). Necrosis, fat bodies and vacuum were found in the month of January from fishes of Nuha Aqua Farm, Manju Aqua Farm and Fish Seed Multiplication Farm, Shambhuganj (Figures 12, 13 and 14). On the other hand, fat bodies, vacuum and necrosis were observed in the month of January from fishes of Chan Miah Fish Farm (Figure 15). On the other hand, hemorrhage and vacuum were recorded in the month of February from fishes of Setu Hatchery and Aquaculture (Figure 17). However, mild hemorrhage and necrosis were found in the month of February from fishes of Chan Miah Fish Farm (Figure 16).

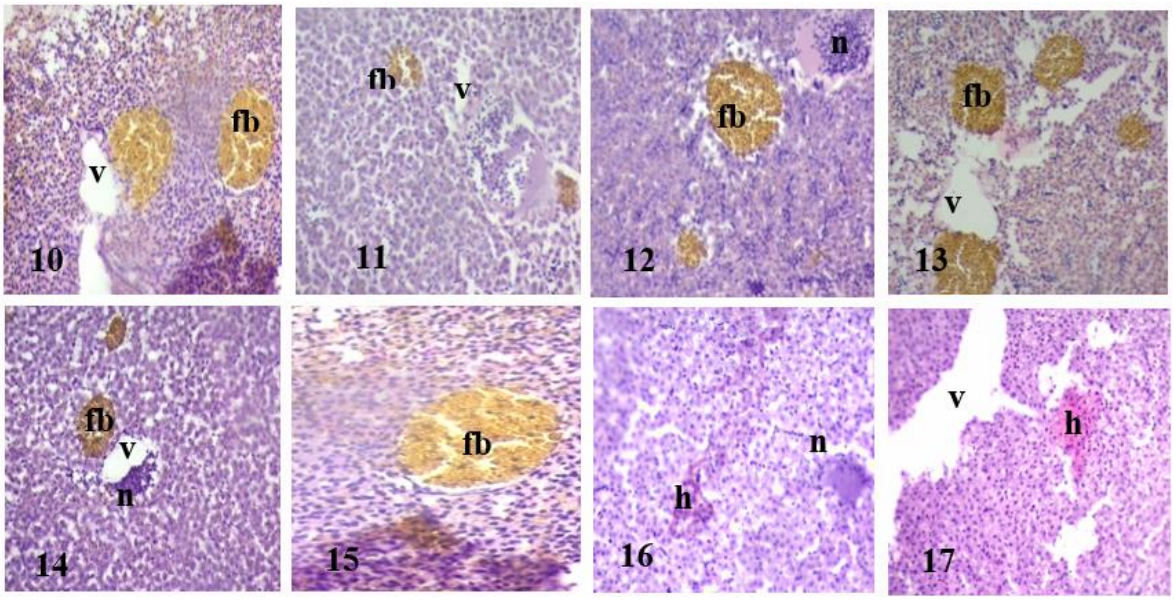



**Figure 10**. Section of liver of *M. cavasius* from Shornolata Agro Fisheries in January having fat bodies (fb) and vaccum (v). H & E × 425; **Figure 11**. Section of liver of *M. cavasius* from Reliance Aqua Farm in January having vaccum (v) and fat bodies (fb). H & E × 125; **Figure 12**. Cross section of liver of *M. cavasius* from Nuha Aqua Farm in January with necrosis (n) and fat bodies (fb). H & E × 425; **Figure 13**. Photomicrograph of liver of *M. cavasius* from Manju Aqua Farm in January with vaccum (v) fat bodies (fb). H & E × 125; **Figure 14**. Cross section of liver of *M. cavasius* from Fish Seed Multiplication Farm, Shambhuganj in January with necrosis (n), vaccum (v) and fat bodies (fb). H & E × 425; **Figure 15.** Section of liver of *M. cavasius* from Chan Miah Fish Farm in January showing fat bodies (fb). H & E × 425; **Figure 16**. Photomicrograph of liver of *M. cavasius* from Chan Miah Fish Farm in February with mild hemorrhage (h) and necrosis (n). H & E × 125; **Figure 17**. Section of liver of *M. cavasius* from Setu Hatchery and Aquaculture in February showing hemorrhage (h) and vaccum (v). H & E × 125

**Histopathological observations of liver in summer season**

In the liver of *M. cavasius* from Sharnalata Agro Fisheries Farm had identified a normal liver except vaccum in the month of March (Figure 18). Almost normal liver were found from fishes of Reliance Aqua Farm in March (Figure 19). Having almost normal liver were recorded in the month of April from fishes of Nuha Aqua Farm and Manju Aqua Farm (Figures 21 and 22). In the month of March from fishes of Fish Seed Multiplication Farm, Shambhuganj and Fish Seed Multiplication Farm, Maskanda necrosis (n) were observed (Figures 20 and 23).

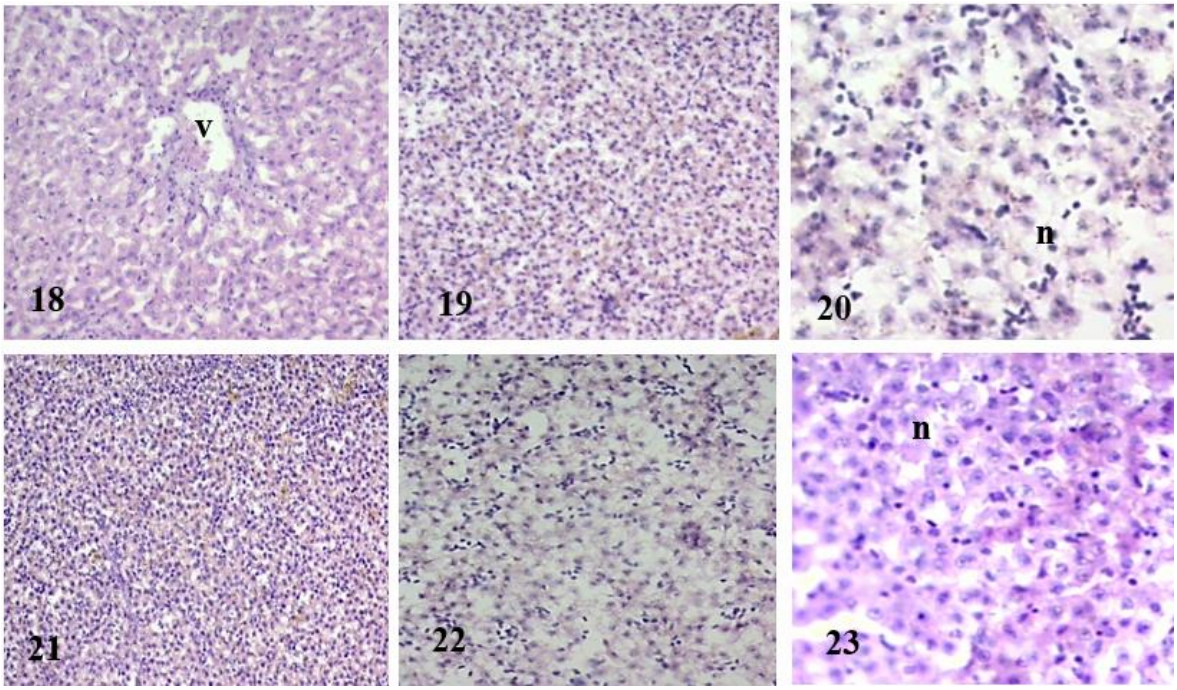



**Figure 18**. Cross section of almost normal liver of *M. cavasius* from Sharnalata Agro Fisheries having vaccum (v). H & E × 125; **Figure 19**. Photomicrograph of liver of *M. cavasius* from Reliance Aqua Farm in March having almost normal liver. H & E × 125; **Figure 20**. Section of liver of *M. cavasius* from Nuha Aqua Farm in April showing almost normal liver except necrosis (n) H & E × 425; **Figure 21**. Section of liver of *M. cavasius* from Manju Aqua Farm in April yielding almost normal liver. H & E × 125; **Figure 22**. Section of liver of *M. cavasius* from Fish Seed Multiplication Farm, Shambhuganj in March showing normal liver. H & E × 125; **Figure 23**. Cross section of liver of *M. cavasius* from Fish Seed Multiplication Farm, Maskanda in March having necrosis (n) in liver. H & E × 425

**Histopathological observations of skin and muscle in winter season**

In skin and muscle of *M. cavasius* from Sharnalata Agro Fisheries Farm in the months of January and February there were found epidermal missing, vacuum and necrosis (Figures 24 and 25). Epidermal missing, necrosis and vacuum were also noticed from fishes of Reliance Aqua Farm, Nuha Aqua Farm and Manju Aqua Farm in the months of January and February gradually (Figures 26, 27, 28 and 29).

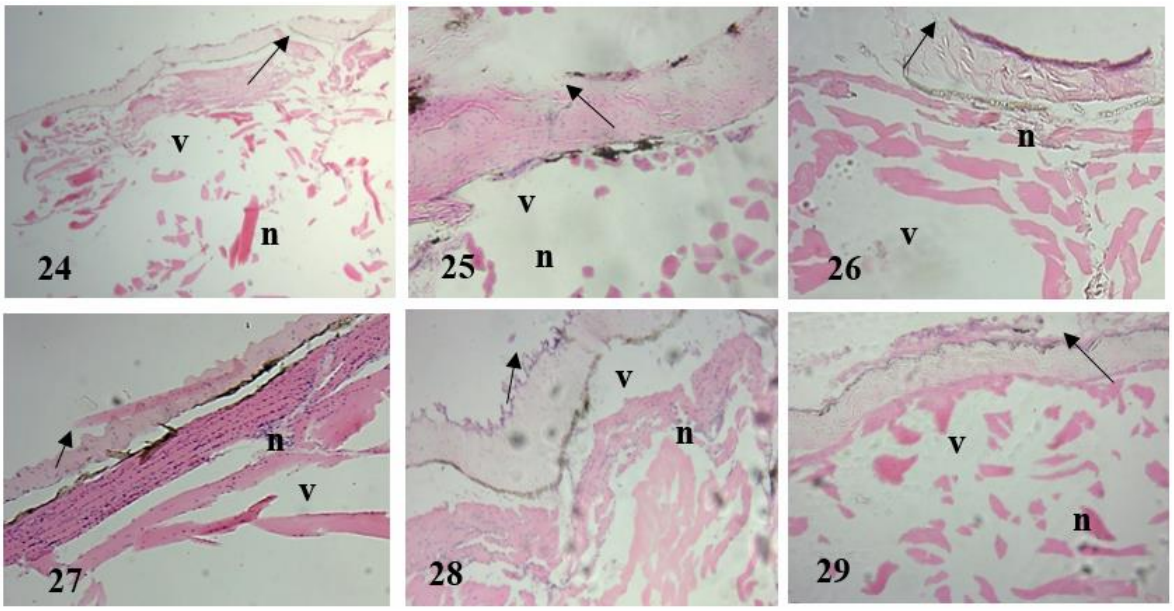
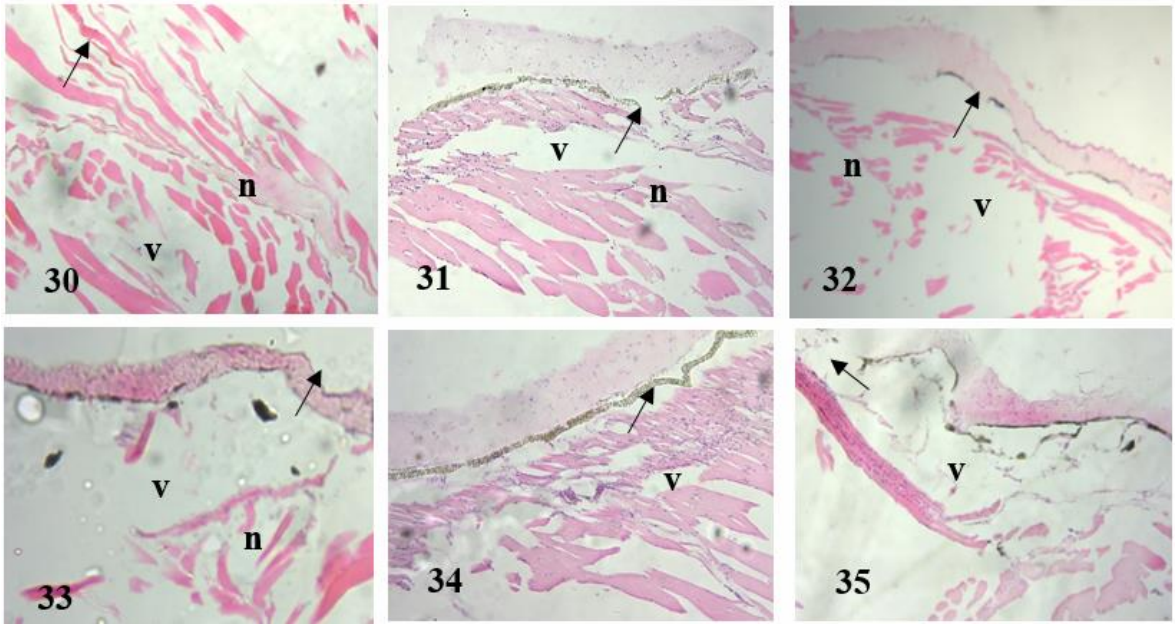



**Figure 24**. Section of skin and muscle of *M. cavasius* from Shornalata Agro Fisheries Farm in January with epidermal missing ( ), vacuum (v) and necrosis (n). H & E × 125; **Figure 25.** Cross- section of skin and muscle of *M. cavasius* from Sharnalata Agro Fisheries Farm in February showing separation of dermis from muscle ( ) and vacuum (v). H & E × 125; **Figure 26**. Photomicrograph of skin and muscle of *M. cavasius* from Reliance Aqua Farm in February with separation of dermis from muscle ( ) and vacuum (v). H & E × 125; **Figure 27**. Cross- section of skin and muscle of *M. cavasius* from Nuha Aqua Farm in January with epidermal missing ( ) necrosis (n) and vacuum (v). H & E × 125; **Figure 28**. Photomicrograph of skin and muscle of *M. cavasius* from Nuha Aqua Farm in February showing vacuum (v) and epidermal missing ( ) H & E × 125; **Figure 29**. Cross- section of skin and muscle of *M. cavasius* from Manju Aqua Farm in January yielding epidermal missing ( and vacuum (v). H & E × 125




**Figures 30, 31, 32 and 33**. Cross- section of skin and muscle of *M. cavasius* from Fish Seed Multiplication Farm, Shambhuganj, Reliance Aqua Farm Shambhuganj, Nuha Aqua Farm and Fish Seed Multiplication Farm, Maskanda respectively in January in March showing loss of epidermis ( ), necrosis (n) and vacuum (v). H & E × 125; **Figure 34**. Cross-section of skin and muscle of *M. cavasius* from Chan Miah Fish Farm in March showing separation of dermis from muscle ( ) and vacuum (v). H & E × 125; **Figure 35.** Section of skin and muscle of *M. cavasius* from Chan Miah Fish Farm in April with separation of dermis ( ) and vacuum ( ). H & E × 125

**Histopathological observation of gill in winter season**

Cyst and lamellar missing were noticed in the gill of *M. cavasius* from Sharnalata Agro Fisheries in January (Figure 36). Lamellar missing and clubbing (cb) were found in fishes of Reliance Aqua Farm in the month of January (Figure 37), whereas, lamellar missing, hypertrophy and clubbing were observed particularly from fishes of Nuha Aqua Fram and Manju Aqua Farm in january (Figures 38 and 39). On the contrary, hypertrophy and missing of gill lamellae were noticed respectively from fishes of Fish Seed Multiplication Farm, Shambhuganj, Manju Aqua Farm Maskanda in the month of February (Figures 40 and 41).

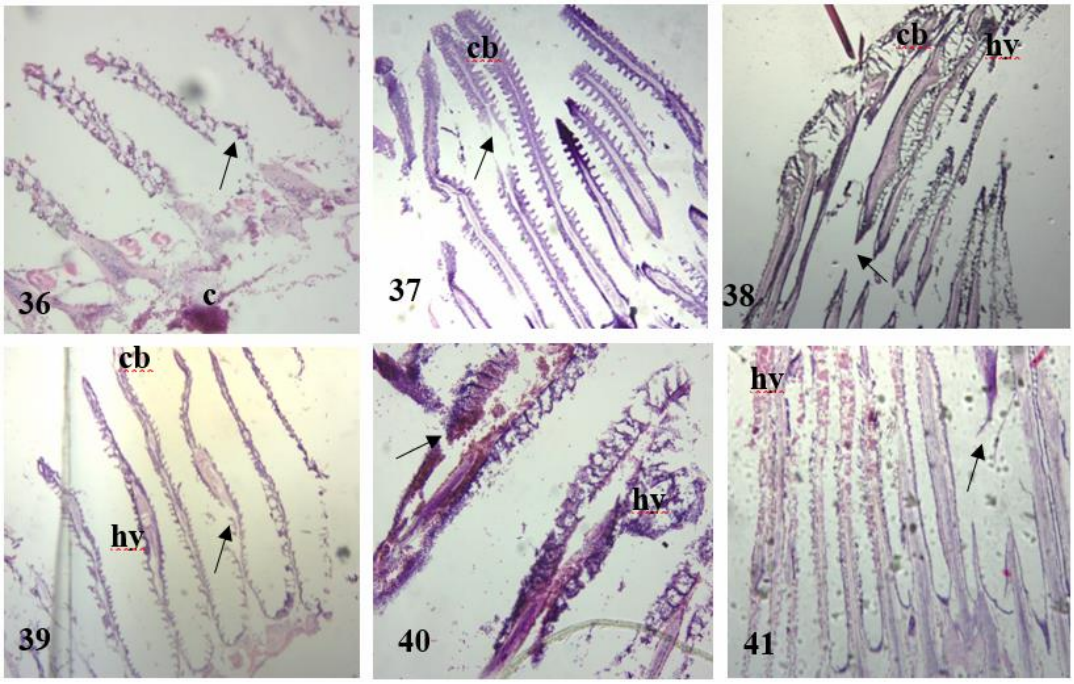



**Figure 36**. Section of gill of *M. cavasius* from Sharnalata Agro Fisheries in January with cyst (c) and lamellar missing (↗). E × 125; **Figure 37**. Cross-section of gill of *M. cavasius* from Shornalata Agro Fisheries in April January yielding lamellar missing (↗) clubbing (cb). H & E × 125; **Figure 38**. Photomicrograph of gill of *M. cavasius* from Reliance Aqua Farm in January yielding lamellar missing (↗) clubbing (cb). H & E × 125; **Figure 39**. Cross section of gill of *M. cavasius* from Nuha Aqua Fram in February with missing gill lamellae (↗), hypertrophy (hy) and clubbing (cb). H & E × 125; **Figures 40 and 41**. Photomicrograph of gill of *M. cavasius* from Fish Seed Multiplication Farm, Shambhuganj Manju Aqua Farm in January with lamellar missing (↗) and hypertrophy (hy). H & E × 125

**Histopathological observation of gill in summer season**

Almost normal gill was found in fishes of Sharnalata Agro Fisheries in April (Figure 42). Few lamellar missing and hemorrhage were observed gradually in fishes of Reliance Aqua Farm in April (Figure 43). Then, lamellar missing was noted from fishes of Nuha Aqua Farm in March (Figure 44). Lamellar missing and hypertrophy were found in fishes of Manju Aqua Farm in April (Figure 45). However, hemorrhage, hypertrophy and lamellar missing were recorded from fishes of Chan Mia Fish Farm Fish Seed Multiplication Farm, Shambhuganj in April (Figuree 46 and 47).

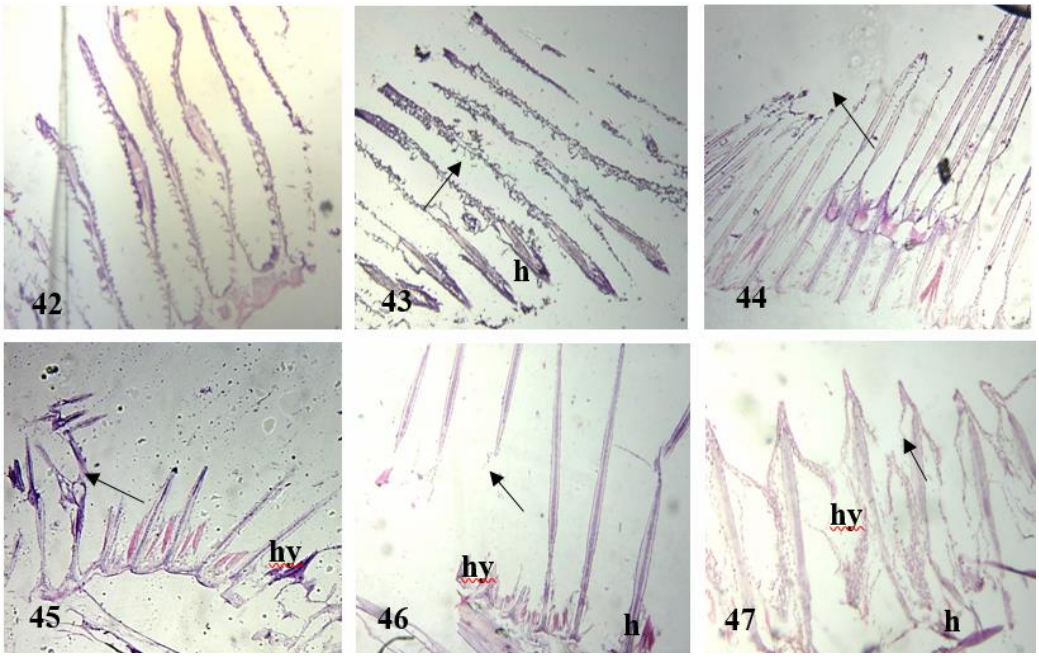



**Figure 42**. Section of almost normal gill of *M. cavasius* from Sharnalata Agro Fisheries in April. E × 125; **Figure 43**. Cross-section of gill of *M. cavasius* from Reliance Aqua Farm in March yielding lamellar missing ( ↑ ) and hemorrhage (h). H & E × 125; **Figure 44**. Photomicrograph of gill of *M. cavasius* from Nuha Aqua Farm in April yielding lamellar missing ( ↑ ) clubbing (cb). H & E × 125; **Figures 45.** Lamellar missing ( ↑ ) and hypertrophy were found in fishes of Manju Aqua Farm in April H & E × 125; **Figures 46 and 47**. Photomicrograph of gill of *M. cavasius* from Chan Mia Fish Farm Fish Seed Multiplication Farm, Shambhuganj in April with lamellar missing ( ↑ ) and hypertrophy (hy) and hemorrhage (h) H & E × 125

## DISCUSSION

Disease is a primary constraint to the growth of many aquaculture species, and is now responsible for severely impeding both economic and socio-economic development in many countries of the world. Disease problem constitute the largest single cause of economic loss in aquaculture.

From the result of the present study in January and February, 2019; Clinically, *M. cavasius* had deep reddish whitish lesions on the lateral side of the body in Sharnalata Agro Fisheries Farm and abrasions on the ventro-lateral side of thebody were seen Chan Miah Fish Farm Farm. Hossain (2008) mentioned that, clinical symptoms like scale loss, dermal lesions, loss of caudal fin were seen in December and January. Ahmed and Hoque (1999) also reported that clinical signs like gray white necrotic areas were increased in December, January and February invarious carp species in Bangladesh. In the months of March and April, lesions of fish were in healing stage from fishes of Nuha Aqua Farm and Fish Seed Multiplication Farm. In *M. cavasius,* lesions were reduced to small red patches in Setu Hatchery and Aquaculture, whereas, *M. cavasius* had rough skin, red spots, scale loss, weak body were seen from the farms during February and March. In the months of February and March, clinical signs of *M. cavsius* were still found but improved to many fold in both of the farms. Ahmed *et al*. (2000) mentioned that weak body, rough skin surface and mild haemorrhagic lesions were seen in catfish in February. According to Dutta (2009) in February, mild lesions, rough skin and scale loss were present in some fishes. Islam *et al.* (1999) and Monowara (2003) also observed that fishes were found to have been less affected during the months of March and April. The fishes of the all farms were apparently

healthy and normal appearance during April. According to Ahmed *et al*. (2011) the investigated fishes were in healthy appearance in the months of April and May. From the research finding of Uddin *et al*. (2019), external organs like gill were more affected compared to internal organ like liver and fish were more affected in the months of January and February than winter season. However, all the fishes of Sharnalata Agro Fisheries Farm were clinically more affected compared to Nuha Aqua Farm in the present investigation.

From the present study, the structure of liver in all fishes had severe necrosis, vacuums and haemorrhages in all the investigated fish farms during January and February. According to Ahmed *et al.* (2009) the liver was most affected in *A. testudineus* from the Shidlong beel, in which large protozoan cysts were observed with necrosis, pyknosis and haemorrhage in December and January. Ahmed *et al.* (2004) also found that necrosis, haemorrhage and dense pyknotic cell in *N. nandus* from Kailla beel in the months of December and January. In March, almost normal liver except few vacuums were seen from all fish species of the farms. However, in *M. cavasius* of Chan Miah Fish Farm, vacuums and bacterial colony were seen in February. From the research findings of Ahmed *et al*. (1998) it was observed that there were mild necrosis in hepatocytes in February and March. According to Mahamud (2011) pathological healing was started in liver of *A. testudineus* in February. The associations of pathologies with the fish species of the present study are supported by the finding of Khatun (2011). Liver structures were normal in all fishes during March and April. From the research findings of Ahmed *et al.* (2011) it was observed that structures of liver was almost normal in *C. carpio* during April and May. However, in the present study, liver of all investigated species were severely affected in January and February from the investigated farms compared with the months of March and April.

Histopathologically, it was observed in the present study that in *M. cavasius*, epidermis and dermis were lost and muscle had fungal hyphae, fungal granuloma, haemorrhage, necrosis, melanomacrophase and vacuums in Manju Aqua Farm and epidermal and dermal missing, muscle had fungal granuloma, haemorrhage, necrosis, melano macrophase and vacuums Fish Seed Multiplication Farm in January and February. Ahmed *et al.* (2012) observed that in skin and muscle of *Oreochromis niloticus*, necrotic muscle with fungal hyphae and fungal granuloma in Bhaluka and trace of fungal granuloma were found in Muktagacha during December and January. It was found that fungal granuloma and fungal hyphae were observed in fishes of both the farms especially during December and January. The occurrence of fungal granuloma in fish organs indicated that the fishes were affected by EUS. Ahmed *et al.* (2007) reported that fungal granuloma in the muscle of *A. testudineus* from two different farms of Mymensingh district during December and January and presence of fungal granuloma in the muscle of investigated fish indicated that the fish were affected by Epizootic Ulcerative Syndrome (EUS). They also reported fungal hyphae and many granulomas in the internal organs and musculature of EUS affected *Colisa lalia* in Japan. In the months of February and March, epidermis, dermis and muscle were almost healed up in all fishes of both the farms. Similar findings also observed in Khatun (2011). From the research findings of Ahmed *et al*. (2012) it was recorded that in February, vacuums, melanocytes and protozoan cysts were found in skin and muscle of major carps. In the months of April and May almost normal skin and muscle were found in all fishes of both the farms. Similar findings also found in Ahmed *et al.* (2011). Thus it was observed that the skin and muscle of *B. gonionotus* and *A. testudineus* were more affected than *P. hypophthalmus* in December and January in the both farms.

During January and February, pathologically in gill had hypertrophy, lamellar missing, clubbing, haemorrhage, necrosis in *M. cavasius* of Nuha Aqua Farm and gill lamellae were hypertrophied, clubbed andlamellar missing in the fishes of Manju Aqua Farm. In case of *M. cavasius*, clubbing, haemorrhage, necrosis and lamellar missing were seen in Fish Seed Multiplication Farm and primary gill lamellae had hypertrophy, necrosis and secondary gill lamellae were almost lost from fishes Chan Miah Fish Farm during January and February. Ahmed *et al.* (2012) observed that in *O. niloticus* gill had hypertrophy, hyperplasia, clubbing, haemorrhage in primary gill lamellae and secondary gill lamellae were lost during December and January. From the research findings of Ahmed *et al.* (2007) protozoan cysts, marked hypertrophy, hyperplasia and necrosis were found in *A. testudineus* from two different farms of Mymensingh district during December and January. From the research findings of Ahmed *et al.* (2011) it was found that there were almost normal gill in *C. carpio* during April and May. According to Ahmed et al. (2009) gills were almost healed up to almost normal structure in March. Khatun (2011) also observed that recovery of the gill pathology of *O. niloticus* was found during February and March. In the present research, almost normal gill was found in March and April, 2019 in case of all the investigated fishes. However, gills of all fish species were more affected in Nuha Aqua Farm than Sharnalata Agro Fisheries in January and February.

## CONCLUSION

Clinical and histopathological observation of Gulsha (*M. cavasius*) was carried out for duration of four months from January to April 2019 from the various fish farms of Mymensingh. As per clinical and histopathological observation, fish were more affected in the colder month during January and February. During March and April most of the fish were normal and healthy. Gills were the most severely affected organ followed by skin and muscle as well as liver. Major pathological changes of fish were fat bodies, necrosis, haemorrhage, vacuums, and separation of dermis from muscle, hypertrophy, lamellar missing and clubbing. More attention must be taken in winter season when environment temperature and other ecological conditions remain at unfavourable level for fish. Therefore, more precautionary measures need to be taken at the onset of winter season to prevent diseases. Further studies should be conducted on developing strategies for better health status of gulsha (*M. cavasius*) to prevent disease.

## CONFLICT OF INTEREST

The authors declare that there has no conflict of interest about this manuscript.

## ACKNOWLEDGEMENT

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