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Pathomorphological study of fish disease conditions of Assam

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Abstract
Assam is very rich in the biodiversity, which helps in the accommodation of a large verities of species in this area. The large geographical area covered by the wetlands also enhance the opportunities for the aquatic habitat. With the increasing agricultural practices, pisciculture is becoming a popular practice for livelihood. The constant finding of gross lesions in the body of fishes decrease the economical values, leading to loss to the farmers. In this we tried to find out the varies types of lesion in the body of fishes and the practices tried by the farmers to prevent the diseases. It is found that around 17 numbers of fish species were affected from 46 disease incidences in 16 numbers of districts of different regions of India. The gross lesion observed were pale white gills, red spots on the body, brownish discoloration of the skin, haemorrhage, swollen abdomen, degenerated fin and tail and ulcerative lesion. In microscopic examination we found congestion, haemorrhage and degenerative changes, necrosis in different organs of the body. Also, there was evident glomerulonephritis and depletion of lymphoid tissue.

Keywords: Pathomorphological, fish disease, Assam

Introduction
Assam is distinctly divided into three geographical regions namely Brahmaputra valley, Barak valley and Barail range and Karbi plateau. Both the valleys play a key role in the topographical land formation, hydrological balances, ecology, population distribution, culture and economy of the state. From the total geographical area of Assam 10.5% is occupied by surface water bodies. An area of 6503 km is covered by all river system counting mighty Brahmaputra. The remaining water sources like natural wetlands includes seasonal and permanent waterlogged, marshy areas sheltered around 1784 sq km [1]. Also, there are wetlands, low laying areas, derelict water bodies, beels, tanks, ponds which is covering an area of 2.86 lakhs hectres of water resources with a great potentiality of Fish production. There is a great diversity in the flora and fauna of Assam including the aquatic life. This state is domicile of great variety of Fish population, with around 217 numbers of species. Out of which 160 fish species are with more than 30% of the total freshwater fish varieties found in our region. As per the economic survey reports the state is able to produce 3.07 lakh metric tonnes during 2016-17 which still less than the estimated nutritional demand of 3.42 lakh metric tonnes [2]. Which may be a result of the unnoticed existing fish diseases of this region. As the Fresh water farming currently becoming a popular livelihood activity it is now an utmost necessity to study the pathological condition of the fishes of this area. Furthermore, Assam is located in the subtropical region but with a humid tropical climate may harbour a greater number of diseases with variety of pathological conditions. The atmospheric temperature of Assam varies greatly in different seasons resulting in disease intensity with variation of water temperature [3]. Keeping in mind all facts the present study is designed under DBT project titled "Attempt to Develop Diagnostic and Preventive Measure for Suspected Fish Viral Disease Encountered in Assam" to examine various pathological condition of different fishes using gross and histopathology as a tool.

Material and Method
The present study was taken under the DBT project titled "Attempt to Develop Diagnostic and Preventive Measure for Suspected Fish Viral Disease Encountered in Assam" during 2019-2020 in 16 districts of Assam. Current investigation was comprised of identification of different gross and microscopic changes in fish disease conditions, area, species affected. About 46 disease incidences were covered by direct visit and authentic sources for necessary necessary information and sample collection from these districts.

Samples are collected randomly from the affected water bodies as a representative of affected population and accordingly the necessary information were collected systematically. The sample from the disease outbreak area has been collected which was supported by the necessary information of the outbreak. The source and availability of water, pre stocking preparation of ponds and species of fishes were also recorded.

Detailed postmortem examination of the dead fishes was performed as per the standard procedure and gross pathological changes observed in different organs were systematically recorded. Suitable representative tissue samples showing lesions were carefully collected. Tissue samples were preserved in 10% formalin solution for histopathological examination. Fixed tissue samples in formalin were processed for routine histopathological examination and stained with Hematoxylin and Eosin (H&E) following standard procedures [5].

Result and Discussion:

During the study period a total 46 disease incidences were recorded from 16 different districts of Assam which were also having earlier disease incidences [2]. From the recorded incidences around 17 different types of species including sol (Channa striatus), (Labeo japonicus), Magur (*Clarias magur*), Mirika (*Cirrhinus mrigala*), Bhangone *(Labeo bata)*, Kuchia (*Monopterus cuchia*), Common carp (*Cyprinus carpio*), Kawoi (*Anabas testudineus*), Silver carp (*Hypophthalmichthys molitrix*), Grass carp (*Ctenopharyngodon idella*), Cheniputhi (*Puntius sarana*), Goroi (*Channa punctatus*), Rohu (*Labeo rohita*), Kandhuli (*Notopterus notopterus*), Chital (*Notopterus chitala*), Mali (*Labeo calbasu*), Singhi (*Heteropneustes fossilis*) were found to be affected which are commonly found the water bodies[6].

The water bodies from where samples were collected had a disease record of almost yearly. They used to be filled by annual or seasonal rainfall. In case many cases it was recorded a prestocking treatment were done like complete drying of the pond. Chemical treatment like use of lime, lime and fertilizer, lime and potash, lime and urea, lime along with fertilizer and urea, lime along with potash and urea were performed to decrease the disease incidences[10] (Sadler, J., & Goodwin).

The gross changes of the affected fishes include pale white gills. There were distinct variable sized red spots on the lateral sides of the body which is a typical lesion of Epizootic ulcerative syndrome (EUS) [4]. In many cases there was brownish discolouration of the skin. The haemorrhage was a consistent finding in many body organs including the skin, gill, muscle, fin and tail. It was also prominent in various visceral organs including the liver, kidney and intestines which is found in multiple bacterial and viral diseases as documented by Rodger [9]. Swollen abdomen in numbers of affected fishes were also a gross change appreciated, previously recognized in the Infectious haematopoietic necrosis (IHN) [8]. Another most commonly found observation was degenerated fin and tail. There was also prominent ulcerative lesion observed in various anatomical lesions of the body which are may be due to multifactorial disease conditions [9] (Fig 1).

In microscopic examination there were clear haemorrhage and degenerative changes in the different organs. Congestive and haemorrhagic changes were also appreciated in the skin and muscle. The muscle fibers were also showing necrosis and degeneration which are the changes we can appreciate in multiple disease with bacterial and viral origin [9] (Fig 2). Liver was having dilated sinusoidal spaces, congestion of vessels including the central vein (Fig 3). There was also coagulative necrosis recorded in several incidences. The spleen was showing focal area of haemorrhages, congested blood vessels and depletion of the lymphoid tissues earlier also documented in the disease conditions with viruses of Iridoviridae family [7] (Fig 4). In kidney nephrons were reflecting the cellular swealing, tubular degeneration, necrosis and glomerulonephritis was also recorded in many of the cases found in disease conditions like IHN and Iridoviridae diseases [7].

Fig 1: Carcass of fishes showing areas ulcers, congestion and haemorrhage

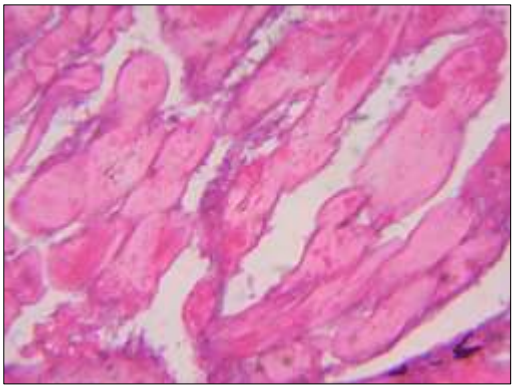

Fig 2: Microscopic section of muscle showing degenerative changes of the mucle fibres

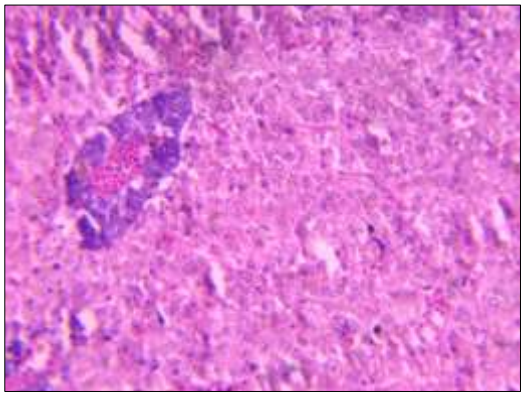

Fig 3: Microscopic section of Liver showing degenerative changes, necrosis of hepatocytes and congested blood vessel

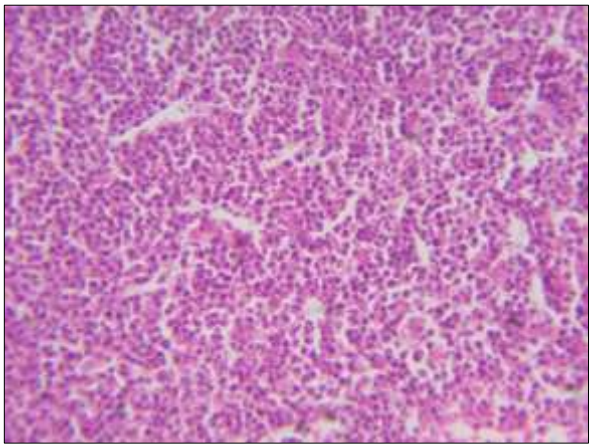

Fig 4: Microscopic section of Spleen showing areas with lymphoid depletions

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