Tissue level reactions in *Catla catla* (Hamilton-Buchanan) due to trichodinid ciliophoran, *Tripartiella* sp. infections

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**ABSTRACT**

During the course of our routine investigations on parasites and diseases of fishes, heavy mortality of the Indian major carp, *Catla catla* was encountered in fish ponds. On examination, some fishes were found severely infested with the trichodinid ciliophoran *Tripartiella* sp. Acute hyperplasia, hypertrophy of epithelial cells and fusion of gill lamellae were observed in the gill tissue of infected fish on histological and ultrastructural investigations.

**Introduction**

According to Lom and Haldar (1977) trichodinid ciliophorans are among the most common protozoans living on the gills of fishes. Occurrence of trichodinid ciliophorans belonging to the genus *Tripartiella* (Lom, 1959) has been reported extensively. In India, this genus was recognized and recorded by Mukherjee and Haldar (1982), Das and Haldar (1987) and Mitra and Haldar (2003).

Davis (1947) reported hyperplasia and necrosis of the epidermis in fishes caused by trichodinid ciliophorans. Sarig (1971) observed *Trichodina* sp., *Tripartiella* sp. and *Glassatella* sp. to be so abundant on gills and skin that they destroy the normal structure of the epithelium of host fishes. Lom (1973) extensively studied the mechanism of the injury of host cells by trichodinid ciliophorans. Das and Pal (1987) studied the histopathological changes associated with the structure of gills infected by monogenea and trichodinid ciliophorans in carps cultured in India.

In the course of our routine examinations on parasites and diseases of fishes, mortalities of the Indian major carp, *Catla catla* were encountered in fish rearing ponds. Fishes were found to be severely infested with trichodinid ciliophorans of the genus *Tripartiella*. Ultrastructural and histological investigations of gills of infected carps were carried out to find out the possible role of trichodinid ciliophorans in alteration of gill structure which might be the cause of fish mortality during severe infestations.

**Materials and methods**

Host fish, *Catla catla* were collected from ponds located in the district of North 24 Parganas, West Bengal, India.
Behaviour and chemical signs of the infected fish were recorded prior to collection of samples from the fish ponds. Fishes were brought to the laboratory in live condition, as far as possible and gill smears were prepared on grease free slides. Slides containing trichodiniid ciliophorans were separated and impregnated with dry silver impregnation technique as per Klein (1958). The preparations were examined under an Olympus phase contrast microscope at ×100 magnification using oil immersion objective and photographs were taken using an Olympus camera, (Model CH-2).

For the histological studies, gill tissues were excised from fishes and preserved in 10% neutral buffered formalin, dehydrated through graded series of alcohols, embedded in paraffin wax (Merck, 58°C – 60°C) and sections were cut at 4 – 5 μ thickness using a rotary microtome. Sections were stained with haematoxylin and eosin. Stained sections were examined under microscope and photographs taken. For the scanning electron microscopic study, gill tissues collected from fishes were quickly and carefully fixed in 2.5% glutaraldehyde buffered with 0.1 M phosphate buffer. After fixation of the gills at 4°C for 72h, the gill filaments were washed in 0.1 M phosphate buffer, dehydrated in graded series of alcohols; alcohol : acetone mixture and finally in anhydrous acetone at room temperature. The tissues were dried at critical point, coated with gold in ion coater (Model no. IB/2, Ioncoater, Japan) and then studied under a scanning electron microscope.

Results

The body of the small-sized ciliophoran is disc shaped. Adhesive discs of these specimens are finely granular and uniformly dark. The denticulate ring

![Fig. 1. Scanning electron photomicrograph of adhesive disc of Tripartiella sp. from Catla catla showing variation in appearance. (Bar = 5 μm).]

Figs. 2–3. Photomicrographs of Silver nitrate impregnated adhesive discs of Tripartiella sp. from Catla catla showing variation in appearance (× 1000) consists of uniquely shaped denticles. A finely striated border membrane surrounds the adhesive disc of this...
ciliophoran. The blade is elongated with the distal margins almost round (Figs. 1, 2 and 3).

The infected fishes were very slimy and feeble, found hovering at the surface of water near the pond margins. Gills of the fishes were pale in colour with excessive mucous production having some reddish areas indicative of severe haemorrhage. The histological changes associated with *Tripartiella* sp., infecting the gills were hypertrophy and hyperplasia of the epithelial cells of the gill lamellae (Figs. 4 and 5). Initiation of hyperplasia at the distal ends and simultaneous fusion of lamellae were also observed. Acute hyperplasia was noticeable at the distal ends of gill lamellae of host fishes due to trichodiniasis (Fig. 5).

Ultrastructural study of gills also revealed presence of *Tripartiella* sp. attached to the secondary lamellae of gill filament. Host tissue responses i.e. hyperplastic gill lamellae and mucous film were also visible (Fig. 6).

**Discussion**

The trichodinid ciliophorans are pathogenic to host fishes if present in large numbers (Lom, 1973). The histological and ultrastructural observations indicate that the infestation with trichodinid ciliophorans result in a wide range of deleterious changes ranging from hypertrophy and hyperplasia of gill epithelium to fusion...
of gill lamellae. The histological damages in the gills inhibit the normal physiological functions of the gills. Hughes (1972) observed that proliferation and swelling of gill epithelium significantly reduced the oxygen uptake capacity of gills. Heavy mucous production by fish gills as observed implicates hypoxic condition (Gardner, 1975). Lom (1973) reported the presence of stimulating substances of fish which helped trichodinids to proliferate massively. The presence of high amount of mucous might have provided a congenial environment for the ciliophorans. Tripartiella sp. firmly attaches to the host epithelium, the finely striated border membrane bites into the surface of the epithelial cells and the surface it encircles is forcibly vaulted into a sucker which causes irritation. Mass of trichodinids can seriously damage the epithelial or epidermal cells by their constant attachment and movement (Lom and Dyková, 1992). Under these circumstances the trichodinids behave like serious ectoparasites, feeding on disrupted cells and associated bacterial growth. These may even penetrate into the gill or skin tissues. Heavily infected fishes may exhibit a grayish-bluish cover formed by excessive mucous secretion, peeled epithelia and frayed fins. The excessive epithelial growth is believed to be a protective reaction, but at the same time, trichodinids feed on it and multiply in large numbers. Severely infected fishes are debilitated, sluggish, swimming beneath the water surface or near the water edge, and cease feeding. Sanmartin et al. (1991) recorded Trichodina sp. infection in young cultured Scophtalmus maximus resulting in about 26% weight loss over a 12 month period. The damage of gill tissues due to presence of this parasite might be the cause for mortality of carps often encountered.

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References


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