9. SECTION G

HISTOPATHOLOGY OF
GILL INFECTED WITH
URCEOLARIID CILIOPHORANS
9.1. INTRODUCTION

Davis (1947) reported hyperplasia and necrosis of the epidermis in fishes caused by urceolariid ciliophorans. Sarig (1971) observed *Trichodina* sp., *Tripartiella* sp. and *Glassatella* sp. to be so abundant on gills and skin that they inhibit the normal structure of the epithelium of host fishes. Lom (1973b) studied elaborately on the mechanism of the injury of host cells by urceolariid ciliophorans. Das and Pal (1987) studied the histopathological changes associated with the structure of gills inflicted by Monogenea and urceolariid ciliophorans in carps cultured in India. In the course of my routine examinations on parasites and diseases of fishes, mortalities of the Indian major carps, *Catla catla*, *Cirrhinus mrigala* and *Labeo rohita* were encountered in fish rearing ponds especially in the sewage-fed water bodies. Fishes were found to be severely infested with urceolariid ciliophorans of the genus *Tripartiella*. So the histopathological study of carp gills was undertaken to find out the possible role of urceolariid ciliophorans in the alteration of gill structure which might be the cause of fish mortality during severe infestations.

9.2. MATERIALS AND METHODS

For the histopathology and ultrastructural study of fish gills infested with urceolariid ciliophorans, *L. rohita*, *C. mrigala* and *C. catla* of size ranging from 100–700 g were collected from the Kantatala bheri. The gills were fixed in 10% formalin solution, dehydrated through alcohol grades, embedded in paraffin wax and sectioned at 4–5 μm thickness. These were stained with haematoxylin and eosin for the histopathological study (SECTION B : 4.1.2.2.2. METHODS). For the scanning electron microscopic study, sections of gills were fixed in 2.5% glutaraldehyde in 0.1M phosphate buffer, pH 7.4 for 72 h, dehydrated with alcohol and finally with anhydrous acetone. Sections were dried at critical point and coated with gold in an ion coater (Model No. IB / 2, Ioncoater, Japan) and then studied under the Scanning Electron Microscope (Model No. S530, Hitachi, Japan) (detailed procedure elaborated in SECTION B : 4.1.2.2.2. METHODS).

9.3. RESULTS

The infected fishes are very slimy and feeble, found hovering at the surface of water near the pond margins. Gills of the fishes are pale in colour, coated with mucus with some reddish areas indicative of heavy of hemorrhage. Scanning Electron Microscopic study of gills also reveals the presence of *Tripartiella bulbosa* attached to the secondary lamellae of
gill filament of *Labeo rohita* Hyperplastic gill lamellae are also visible (PLATE LII, Figure 1)

The histological changes associated with *Tripartiella bulbosa*, infecting the gills reveal hypertrophy and hyperplasia of the epithelial cells of the gill lamellae (PLATE LII, Figure 2 and 3) Initiation of hyperplasia at the distal ends and simultaneous fusion of lamellae are also observed. Acute hyperplasia is noticeable at the distal ends of gill lamellae of *L. rohita* and *C. mrigala* due to trichodiniasis (PLATE LIII, Figures 4 and 5)

9.4. DISCUSSION

The histological and ultrastructural observations indicate that the infestation with urceolariid ciliophorans result in a wide range of deleterious changes ranging from hypertrophy and hyperplasia of gill epithelium to fusion of gill lamellae. The histological changes 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 an hypoxic condition (Doudoroff and Katz, 1953, Gardner, 1975) It was observed that mortality of the fishes in the sewage water of Kantatala occurred mostly after midnight and early morning hours, when the dissolved oxygen level in water is very low. Diurnal study of physico-chemical parameters has also revealed high fluctuation of dissolved oxygen in the sewage-fed water body, which is low particularly at night or early in the morning Lom (1973) reported the presence of stimulating substances of fish which helped trichodinids to proliferate massively The presence of high amount of mucus might have provided a congenial environment for the ciliophorans to become ectoparasites. The suboptimal quality of sewage water at Kantatala with high unionized ammonia levels throughout the year, high fluctuations in dissolved oxygen and free CO₂ levels also results in the histological alterations in gill structure disturbing the respiratory functions of gills and causing the high production of mucus. The slimy layer on the gill surface favours the presence of urceolariid ciliophorans So the synergistic effect of deteriorated quality of water and presence of urceolariid ciliophorans together bring out the changes associated with gill structure It has been mentioned earlier [SECTION D] that average number of urceolariid ciliophorans is 22 throughout the year indicating stress among fishes reared in the sewage-fed water at Kantatala. Trichodinids never occur in large numbers on a healthy fish and in these cases, the irritation caused by attachment of their adhesive disc is negligible. In a *Trichodina* firmly attached to the host epithelium, the sharp run of the border membrane
bites into the surface of the epithelial cells and the surface it encircles is forcibly vaulted
into a sucker, these activates are the causes of irritation. A mass of trichodinids can then by
their constant attachment and movement seriously damage the epithelial or epidermal cells
(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 mucus secretion and 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. Debilitated fishes are sluggish,
swimming beneath the water surface or near the water edge, and cease feeding. Sanmartin
et al. (1991) recorded a Trichodina sp. infection in young cultured Scophtalmus maximus
resulting in about 26% weight loss over a 12 month period. The damage of gill tissue due to
presence of suboptimal water quality and parasites might have resulted in the mortality of
carps as often encountered.
Figures 1 - 3: Gill sections showing the histological alterations due to the trichodiniasis in fishes reared in Kantatala bheri

Figure 1: Scanning Electron Microscope: Photomicrograph showing the presence of *Tripartiella bulbosa* attached to the secondary lamellae of gill filament of *Labeo rohita*. Severe hyperplasia has led to fusion of lamellae (X 300)

Figure 2: Light Microscope: Section of gill filament of *Cirrhinus mrigala* with a *Tripartiella bulbosa* lodged in the gill lamellae (HxE stain, X 400)

Figure 3: Light microscope: Showing the presence of *Tripartiella bulbosa* between the gill lamellae of *Catla catla*. Complete fusion of secondary lamellae is also visible (HxE stain, X 400)
Figures 4 – 5: Gill sections showing the histological alterations due to the trichodiniasis in fishes reared in Kantatala bheri.

**Figure 4**: Section of gill filament showing acute hyperplasia at the bases and at the distal end of the lamellae of *Labeo rohita* due to trichodiniasis (HxE stain, X 400).

**Figure 5**: Section showing the presence of *Tripartiella bulbosa* between the gill lamellae of *Cirrhinus mrigala* (HxE stain, X 100).