

## Histological observation of gills in some fresh water fishes in relation to a specific aquatic body

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### Abstract

The microscopic structural details of gills in four fresh water fishes collected from an aquatic body (Bheema river) has been investigated in relation to some Physico-chemical characteristics of water. Among the four fishes investigated, the fish *Labeo rohita* exhibited some degenerative changes in the gill filaments whereas the other three fishes such as *Channa punctatus*, *Notopterus notopterus* and *Tilapia mossambicus* have normal structure, which indicate that the water is providing proper ecology for survival and good health condition of three fishes harboured in the aquatic body. The changes observed in the gill of *Labeo rohita* may be because of its sensitivity to some of the unwanted factors present in the aquatic medium which may be specific to the fish.

**Keywords:** fresh water fish gill histology, aquatic body

### 1. Introduction

The fresh water fish have higher salt concentration in their body than the water in which they live in the aquatic medium [7]. Fishes are constantly gaining water through osmosis and loosing salt and they make up for this by drinking water and getting ions their through their diet, in addition they actively uptake salt through gills and excrete large amount of water which is very dilute with salt. The gill structure of a particular fish collected from the aquatic body needs to be studied in relation to the water quality of the aquatic body on comparative basis. The structural differences in the gill structure in relation to water quality provide information on the health condition and their survival in a particular aquatic body as gills are one of the very important organs of the fish needed for respiration and osmoregulation. Hence, the present study on the structural differences if any, in the gills of some fishes collected from a particular aquatic body has been undertaken and reported in the present investigation.

### 2. Material and methods

The aquatic body Bheema River situated around 40 km away from Gulbarga city has been selected for collection of fish species. The fishes such as *Channa punctatus*, *Notopterus notopterus*, *Labeo rohita* and *Tilapia mossambicus* collected during the month of April with the help of fisherman and brought to the laboratory in live condition and sacrificed. The gills from all the fish were fixed in Bouins fluid for histological preparation of the slides following paraffin embedding and staining in hematoxylin and Eosine stains. The sectioned and stained slides of gills were observed under Miyopta microscope and photographed using Zeiss Primo Star Microscope. The water analysis of the water collected from Bheema river was carried out for dissolved oxygen, free carbon dioxide, chlorides, total hardness, calcium and magnesium as per the methods of APHA (1985).

### 3. Observation

The fresh water fishes such as *Channa punctatus*, *Notopterus notopterus*, *Labeo rohita* and *Tilapia mossambicus* collected

(fig.1-4). The gills are in two numbers in all the four fishes, each gill containing four pairs of semicircular gill arches and a row of microscopic primary gill lamellae on which secondary gill lamellae are arranged bilaterally (fig.1). The basement of primary lamellae is differentiated as hypertrophic zone, growth zone and the mucosal epithelium present below the hypertrophic zone (fig.1). From the growth zone growing lamellae is extended as primary gill lamellae with 2-3 layers of epithelial cells which are interspersed by mucosal epithelial cells and the capillary lumen generally tapering towards its ends. The secondary gill lamellae are devoid of mucous cells and having single layer of epithelial cells. The secondary gill lamellae also have projecting ends. The gill lamellae are normally thin delicate structures having blood sinusoids which are necessary for effective gas exchange in respiration and these are directly in contact with water.

The water collected from Bheema river was processed for some physico-chemical parameters and the analysis indicated that the dissolved oxygen -3.4mg/L., carbon dioxide- 99.0 mg/L., chlorides-178.92 mg/ L., hardness-212.0 mg/ Ll., calcium -64.12 mg /Ll., and magnesium 12.67 mg / L.

The comparative microscopic observation of gills of four fishes indicated that, as such there was not much marked changes amongst the three fishes (fig 5, 6, 8). However, some changes were noticed in the fish, *Labeo rohita* (fig.7) where in curling of secondary lamellae and mucous cells proliferation, epithelial cell detachment in the gill filaments. The blood vessels were dilated and congested along with some degenerative and necrotic changes in the gill filaments (fig.7).

### 4. Discussion

The histological study on the gills of fishes collected from a aquatic body may provide information on the health condition of the fish and help in the diagnosis of disease as the gills are primary organ which directly reflects the water pollution, contamination and disease causing factors. The changes observed in the gills structure hinders the oxygen intakes which results in mortality of fish affecting aquaculture practices. The present investigation on the histological

structure of gills in four fishes revealed that there was not much difference in the gill structure amongst the four fishes. However, in one of the fishes that is in the fish, *Labeo rohita*, gill structural changes such as secondary lamellar damages with proliferation of cells in the gill filament was noticed. Jayachandran and Pugazhendy [2] reported that there was histopathological changes in the gill tissue like epithelial hyperplasia, curling of secondary lamellae and changes in chloride cells in the fish exposed to a herbicide, Atrazine which is a synthetic herbicide and being used for controlling weeds in the water. Similar changes were noticed in the gill structure of the fish, *Labeo rohita* in the present study indicating that this fish is more sensitive to such contaminants present in the aquatic medium compared to other fishes investigated. Butchiram *et al*; [1] have also reported that exposure of fish, *Labeo rohita* to phenol at lethal and sublethal concentration caused damage to vital organs including gills. The histopathological changes in gills have been reported after exposing to a variety of noxious agents in the water [5]. Exposure to chemical contaminants can induce a number of lesions and injuries to different organs suitable for histopathological examination in searching for damages to

tissues and cells [6]. In addition to contaminants affecting the gills of fishes in the natural environment, the parasites of the aquatic medium may also affect the organs [4]. Gill parasites are common on cultured and wild fish and many of these species have long been recognised to have the potential to affect the growth, fecundity and survival of hosts [3]. It is possible that the damage observed in the gills of *Labeo rohita* in the present study may be because of one of these factors.

**5. Conclusions**

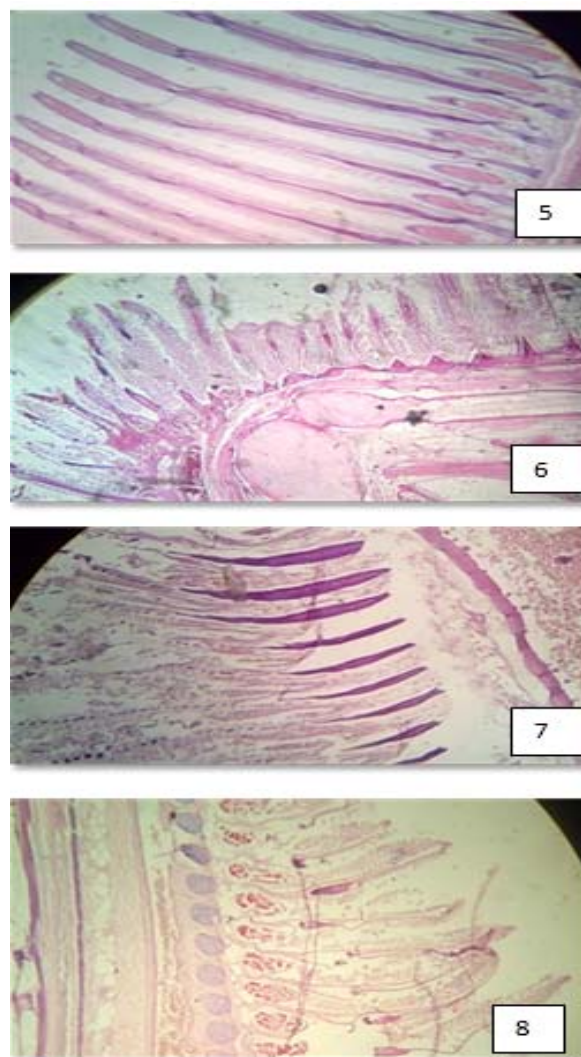
The present study indicated that among four fishes, three fish exhibited normal gill structure whereas, in one of the fish, *Labeo rohita* some degenerative changes were observed, which may be because of its sensitivity to the unwanted factors present in the aquatic body.

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**Fig.1, 2, 3 and 4:** Showing Morphology of fishes, *Channa punctatus*, *Notopterus notopterus*, *Labeo rohita* and *Tilapia mossambicus* respectively.



**Fig. 5, 6, 7 and 8:** Showing gill histological structure of the fishes, *Channa punctatus*, *Notopterus notopterus*, *Labeo rohita* and *Tilapia mossambicus* respectively .H & E, X450

## 7. References

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