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Histology of gills of *Labeo rohita* and *Hypophthalmichthys molitrix* infested by monogenean and copepod parasites

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ABSTRACT

The present study was conducted to reveal a histological analysis on the gills of *Labeo rohita* and *Hypophthalmichthys molitrix* specimens were observed to reveal the histo-pathological characteristics of the gills of these freshwater carps. The histological examination of the gills of *Labeo rohita* revealed the proliferation of bronchial tips, shortening and fusion of secondary gill lamellae, desquamation of primary and secondary gill lamellar epithelium, uplifting of respiratory epithelial wall and damaged pillar cells due to monogenetic parasites. Whereas drastic disorganization was observed to be caused due to multiple infestation by protozoan and copepod in gills of *Hypophthalmichthys molitrix* characterized by revealed the proliferation of bronchial tips, shortening, thinning and deshaping of gill lamellae's.

Keywords: Parasites, Gills, Histology, Carps, Copepod.

1. Introduction

Parasites are one of the major groups of organisms that may or may not cause infection in fishes depending on a number of factors. Parasites in fish (endo – and ecto-parasites) are a natural occurrence and common ^[1]. Fish parasites result in huge economic losses as they increase mortality and also increase farm inputs via increased treatment expenses and cause reduction in growth rate due to the parasitic disease outbreak ^[2].

Gill parasitic are common on cultured and wild fish. Many of these species have long been recognized to have the potential to affect the growth, fecundity and survival of hosts ^[3]. As, fish gills are specialized tissues for gas exchange, circulation, ion and acid-base balance, hormone production, and nitrogenous waste secretion ^[4]. Gill parasites attach to the gills of fish and feed on their host's blood and tissue ^[5]. The organs of attachment such as suckers and hooks causes extensive tissue damage and inflammation, and may render fish susceptible to secondary infection by bacteria, fungi, and viruses ^[6]. Thus, the damage to gill tissue can reduce the ability of the fish to maintain normal oxygen uptake by hindering water flow ^[5].

According to Abdelhalim ^[7] extensive tissue damage resulting from the feeding and attachment of these parasites has been reported in several species of fish. Protozoan among other parasites cause immeasurable damage to the fishing industry ^[8]. Parasites play an important role in determining the health status of the fishes ^[9]. Therefore present study was undertaken to reveal the effect of different parasites on histology of gills of freshwater carps.

2. Material and Method

2.1 Collection of Host Fishes and parasites

Host Fish (*Labeo rohita* and *Hypophthalmichthys molitrix*) were collected alive from the Shahpura Lake. Fishes were collected ones in a week for one year (during different seasons i.e. summer, rainy, post-monsoon and winter months). The hosts brought to the laboratory were subjected to a thorough investigation as per the methods employed by Cable ^[10], Meyer and Olsen ^[11]. For the purpose of collection of parasites, the gills were taken out and placed in petri dishes, containing normal saline (0.75% NaCl). They were scraped with the help of scalpel to collect the parasites attached to the gills. The parasites collected were examined in live condition.

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2.2 Histological technique

Infected gills were immediately fixed in alcoholic Bouin's fluid for 24 hours. After complete removal of picric acid, the tissue was dehydrated in an ethanol series (30%, 50%, 70%, 90% and 100%), cleared in xylene and processed for preparation of paraffin wax blocks. The tissue was then cut at 4 - 5 μm thickness by rotatory microtome and stained routinely with haematoxylin and eosin (H-E) for histo-pathological examination. Stained histo-pathological sections were examined under Olympus research microscope. Microphotography was taken both at high magnification and low magnification.

3. Results and Discussion

3.1 Histology of infected gills of *Labeo rohita* –

Histopathological examination of the gills of *Labeo rohita* infected by monogenetic parasites (Figs. 1, 2). The secondary gill lamellae got badly damaged. Pathological effect of flukes revealed the proliferation of bronchial tips, shortening and fusion of secondary gill lamellae. Desquamation of primary and secondary gill lamellar epithelium. The uplifting of respiratory epithelial wall and damaged pillar cells can also be seen (Figs. 3, 4).



Fig 1: Photograph showing the infected gills of *Labeo rohita*.

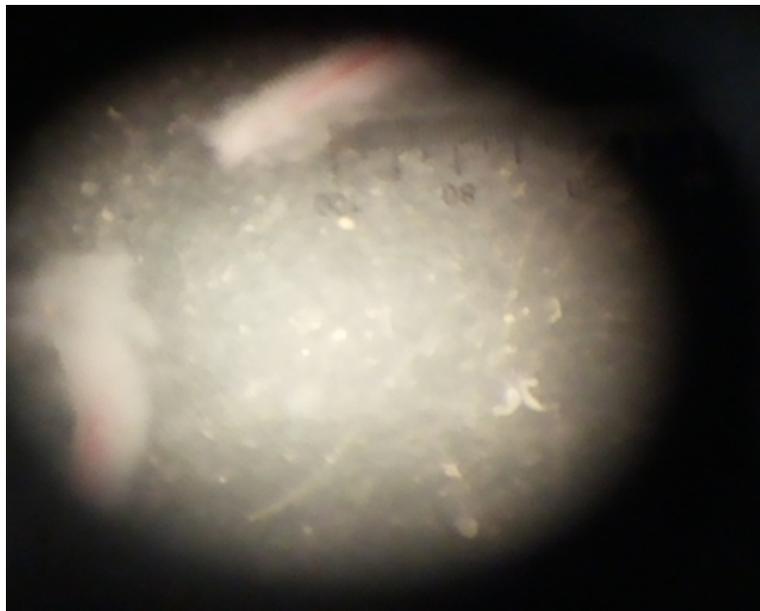


Fig 2: Photograph showing the monogenetic parasites collected from gills (arrow).

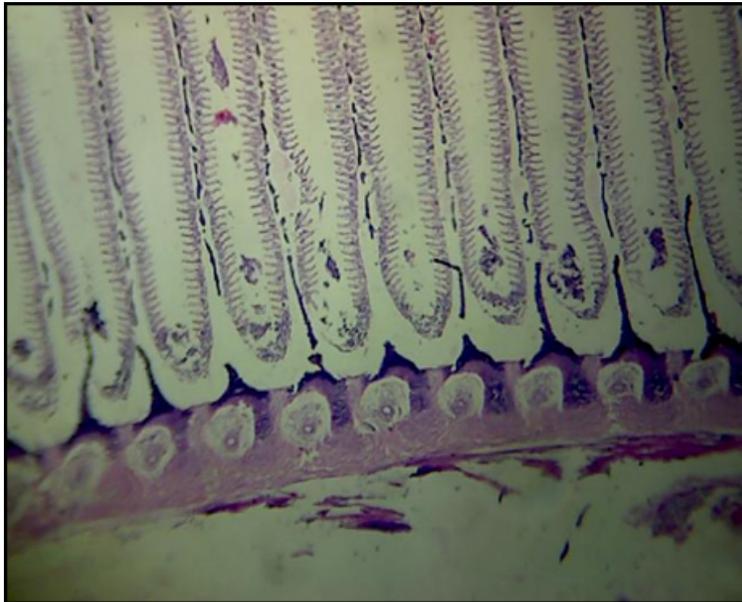


Fig 3: Microphotograph of a cross section of gills of *L. rohita* infected by *Dactylogyrus* sp. showing Epithelium uplifting (EU), damaged cartilaginous core (DCC) X100.

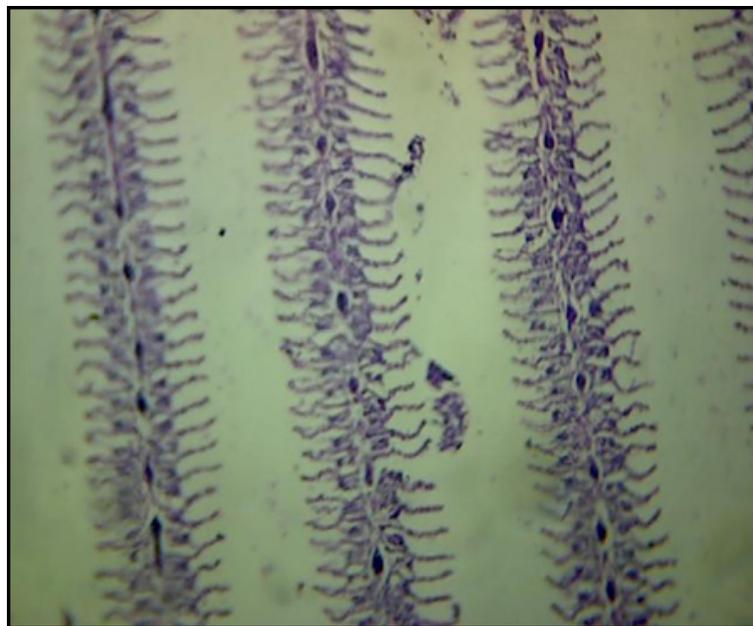


Fig 4: Microphotograph of a cross section of infected gills of *L. rohita* showing Epithelium uplifting (EU), Shortening of gill lamellae (SGL), Desquamation of secondary gill lamellae epithelium (DSGLE), Damaged cartilaginous core (DCC) X400.

3.2 Histology of infected gills of *Hypophthalmichthys molitrix*

The gills of *Hypophthalmichthys molitrix* showed multiple infections by protozoan and copepods (Figs. 5, 6) due to which gills were total destroy and damaged. Histopathological examination of the secondary gill lamellae got badly damaged. Pathological effect of parasites revealed the proliferation of

bronchial tips, shortening, thinning and deshaping of gill lamellae's. Fusion of secondary gill lamellae and desquamation of primary and secondary gill lamellar epithelium. The uplifting of respiratory epithelial wall and damaged pillar cells can also be seen (Figs. 7, 8).



Fig 5: Photograph showing copepod and protozoan parasites collected from the gills of *Hypophthalmichthys molitrix*



Fig 6: Photograph showing enlarged view of parasites collected from *H. molitrix*

According to Saleh and El-Nobi ^[12] infestation due to monogenetic trematodes is one of the most prevalent parasitic agents affecting skin and gills causing irritation and destruction of gills which leading to impairment of breathing as well as tremendous losses in aquaculture. According to Derwa ^[13]; Osman ^[14]; Younis ^[15] and El-Shahat ^[16] protozoan species *Trichodina* are extensively isolated from the gills of tilapia and catfish. Osman ^[14] and El-Shahat ^[16] isolated *Henneguya branchialis* from

the gills and suprabranchial organs of cultured catfish.

Ronald ^[17] examined Dactylogyridae is the most common gill parasite in freshwater fish especially young fish. Saleh and El-Nobi ^[12] collected *Monogenea* sp. was mainly from *Tilapia* sp., catfish, few carp sp. and few mullet sp. and stated that young stages of *Tilapia* were more susceptible to monogenesis (mainly *Dactylogyrus* and *Gyrodactylus*) than adult stages.

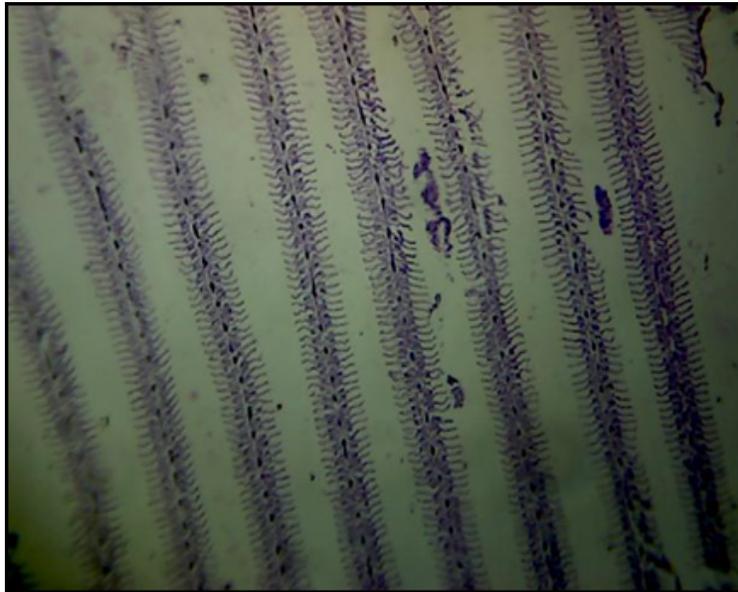


Fig 7: Microphotograph of a cross section of gills of *H. molitrix* infected by Copepod showing section of parasites X100

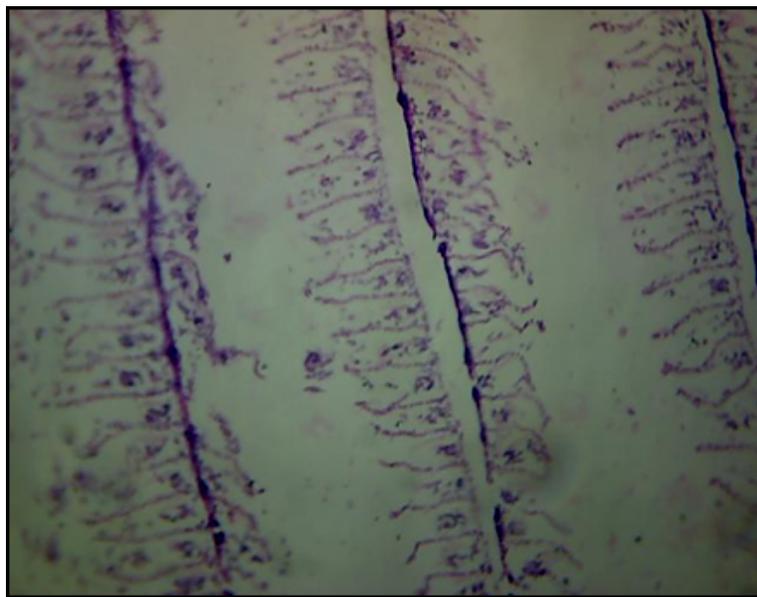


Fig 8: Microphotograph of a cross section of gill of *H. molitrix* infected by Copepod showing thinning of gill lamellae (TGL) X400

As, maximum histopathological damage were induced by scraping and sucking activities of the parasites on host tissues as revealed by the findings of Derwa^[13], Endrawes^[18], Hanna^[19], Osman^[14] and Ebtesam Tantawy^[20]. Present investigation also showed histo-pathological changes due to attachment of parasites to the primary and secondary gill lamellae.

Jalali^[21] revealed that lesions caused due to attachment and feeding of parasites may be secondarily infected with fungi and bacteria. Whereas Bychowsky^[22], Fadaei *et al.*^[23], Barzegar and Jalali^[24], Shamsi *et al.*^[25], Raissy and Ansari^[26], Raissy *et al.*^[27], Campos *et al.*^[28] revealed hyperplasia of the epithelial cells and subsequent lamellar fusion, goblet cell proliferation as well as the migration of eosinophilic

granular cells (EGCs) to gills of fishes infected with parasites. Physically or morphologically the infected fish usually become pale and has difficulty in breathing.

According to Piasecki^[29] copepods are extremely important in aquatic ecosystems; they can be a food source for small fish, intermediate hosts of fish parasites and serve as vectors of disease. Vinobada^[30] studied the histopathological changes in gills of food fishes infected by ergasilid copepod and revealed that *Ergasilus* sp. attached close to the base of the filaments near the gill arch which exerted pressure on the lateral margin of the gill filaments induced atrophy of the secondary lamellae. Present investigation also revealed the same changes on gills of *Hypophthalmichthys molitrix* due to multiple

infections by protozoan and copepod showed entire changes in histoarchitecture of gills

4. Conclusion

Histo-pathological study has been used to diagnose diseases of aquatic organisms throughout the world. Gills are the primary organ which directly reflects the water pollution, contamination and diseases causing factors. The histo-architectural change in gills hinders the oxygen intakes and in the long term causes huge mortality in aquaculture practices.

5. Reference

- Moyle PB, Cech JJ. Fishes: An introduction to ichthyology. Prentice Hall, Upper Saddle River, New Jersey, 2004, 356.
- Kayis S, Ozcelep T, Capkin E, Altinok I. Protozoan and metazoan parasites of cultured fish in Turkey and their applied treatments. The Israeli J Aquac Bamidgheh 2009; 61:93-102.
- Johnson SC, Blaylock RB, Elphick J, Hyatt K. Disease caused by the salmon louse *Lepeophtheirus salmonis* (Copepoda: Caligidae) in wild sockeye salmon (*Oncorhynchus nerka*) stocks of Alberni Inlet British Columbia. Can J Fish Aquat Sci 1996, 53:2888-2897.
- Pelster B, Bagatto B. Respiration. Fish Physiology 2010; 29:289-309.
- Ojha J, Hughes GM. Effect of branchial parasites on the efficiency of the gills of a freshwater catfish *Wallago attu*. J Zool 2001; 255:125-129.
- Dezfuli B, Sayyaf, Luisa G, Robert K, Paul J, Maurizio M. Immunohistochemistry ultrastructure and pathology of gills of *Abramis brama* from Lake Mondsee Austria infected with *Ergasilus sieboldi* (Copepoda). Diseases of Aquatic Organisms 2003; 53:257-262.
- Abdelhalim AI. Morphology and epidemiology of some parasitic copepods (Poecilostomatoida: Ergasilidae) from British freshwater fish. PhD thesis University of London 1990.
- Doglel VA, Petrushevski GK, Polyanski YI. Translated by (Kabata) Parasitology of Fishes. Oliver and Boyd Edinburgh and London 1961; 384.
- Ferguson WH. Gills and pseudobranchs In: Systemic Pathology of Fish A text and Atlas of Comparative Tissue Responses in Diseases of Teleosts. MCK, SH, F 42, 1989.
- Cable RM. An illustrated laboratory manual of parasitology. Ed 5. Burgess Publishing Minneapolis, Minnesota, 1977.
- Meyer MC, Olsen OW. Essentials of Parasitology. Ed 2, Wm. C. Brown Co. Iowa, 1975, 1-303.
- Saleh GA, El-Nobi GA. Prevalence of Monogeniasis in Tilapia fish among different systems of fish management, seasons and fish life stages with special reference to the therapeutic effect of Praziquantel at different temperatures. Zag Vet J 2003; 31(1):37-48.
- Derwa HIM. Some studies on gill affections of some freshwater fishes M Sc thesis Faculty of Veterinary Medicine Suez Canal University, 1995.
- Osman HAM. Studies on parasitic gill affections in some cultured freshwater fishes. Master thesis submitted to the Faculty of Veterinary Medicine, Suez Canal University, 2001.
- Younis AA. Effect of some Ectoparasites on

- Reproduction of *Oreochromis niloticus* Fish with Referring to Treatment. The First International Conference of the Veterinary Research Division, National Research Centre, 15-17 February 2004, 111.
- El-Shahat RA. Studies on ectoparasites of freshwater fish. Master Thesis submitted to Fac. of Vet. Med., Zagazig University, 2004.
 - Ronald S. Fish pathology. Ed 2, Bailliere Tindall, London, England, 1989.
 - Endrawes MN. Observations on some external and internal parasitic diseases in Nile catfishes. A Master thesis submitted to Dept. of fish diseases and management. Fac of Vet Medicine Zagazig Univ 2001.
 - Hanna MI. Epizootiological studies on parasitic infections in fishes cultured under different fish cultural systems in Egypt. A Master thesis submitted to Dept. of fish diseases. Fac of Vet Med Cairo Univ, 2001.
 - Ebtesam AT. Trial to control the Heterophyid and Echinostomatid Metecercariae Infecting *Oreochromis niloticus* in Aquaculture by Praziquantel 'Droncit'. The First International Conference of the Vet Res Division, NRC, 15-17 February 2004, 108-109.
 - Jalali B. Parasites and parasitic diseases of Iran's fresh water fishes Iranian Fishery Institute Publications. Tehran Iran 1997; 312- 407.
 - Bychowsky BE. Monogenetic trematodes of some fish of Iran collected by Pavlowsky EN. Trudi Zoologicheskovo Instituta Akademiy 1949; 8:870-878.
 - Fadaei F, Mokhayer B, Ghorbani H. Identification of fishes and their parasites in Choghakhor Lagoon. J Facul Vet Med Uni Tehran 2001; 56:109-113.
 - Barzegar M, Jalali B. Helminthes Acanthocephala and crustacean parasites of fishes in Vahdat reservoir. Iran J Vet Sci 2004; 2:229-234.
 - Shamsi S, Jalai B, Aghazadeh M. Infection with *Dactylogyrus spp* among introduced cyprinid fishes and their geographical distribution in Iran. Iran J Vet Res 2009; 10:70-74.
 - Raissy M, Ansari M. Histopathological changes in the gills of naturally infected *Capoeta aculeata* (Cuvier and Valenciennes, 1844) with parasites. African Journal of Biotechnology 2011; 10(68):15422-15425.
 - Raissy M, Ansari M, Moumeni M. Parasite fauna of *Aphanius vladkovii* Coad (Osteichthyes: Cyprinodontidae) in Gandoman Lagoon. Comp Parasitol 2011; 78:104-106.
 - Campos CM, Moraes JRE, Moraes FR. Histopathology of gills of *Piaractus mesopotamicus* (Holmberg, 1887) and *Prochilodus lineatus* (Valenciennes, 1836) infested by monogenean and myxosporea, caught in Aquidauana River State of Mato Grosso do Sul, Brazil. Rev Bras Parasitol Vet Jaboticabal 2001; 20(1):67-70.
 - Piasecki W, Goodwin, Andrew E, Eras, Jorge C, Nowak *et al*. Importance of Copepoda in Freshwater Aquaculture. Zoological Studies 2004; 43:193-205.
 - Vinobada P. Histopathological changes induced by ergasilid copepod infections on the gills of food fish from Batticaloa Lagoon Sri Lanka. Sri lanka J Aquat Sci 2007; 12:77-87.