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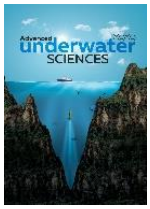

Histopathological changes in the gill tissue by some ectoparasites detected in poecilia reticulata (peters,1859)

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Keywords
Poecilia reticulate,
Ecto parasites,
Edema,
Hyperplasia,
Hyperplastic areas.

ABSTRACT

This research was carried out to reveal the histopathological changes in the gill tissues of ecto parasites found in the Poecilia reticulata species belonging to the Poecilidae family in an aquarium fish farming enterprise in Mersin. The investigation revealed that five parasites were present in the fish classified as Chilodonella hexasticha, Ichtyobodo necator, Trichodina sp. Gyrodactylus bullatarudis and Dactylogyrus extensus. In the histopathological examination of gill tissue samples prepared from parasitic fish, it was determined that the parasites were located between the gill lamellae and edema, hyperplasia, and hyperplastic areas developed in the epithelium.

1. INTRODUCTION

It is estimated that the aquarium fish industry has a market of around 900 million dollars worldwide (Evans and Lester, 2001). In recent years, great developments have been observed in aquarium fish production in Turkey. There have been significant increases in the number of goldfish producing farms and aquarists selling them. In almost every city in Turkey, there are many businesses selling aquarium fish, amateur and a small number of professional aquarium fish breeders (Alpbaz 1984: 163-193).

It is known that there are about 1000 ornamental fish species trading into the aquarium sector globally. Most of them are freshwater species. Poecilidae family that lives in freshwater has an important place among aquarium fish trading in the world (Yanar, 1998). Poecilia reticulate (Peters,1859), which belongs to the family Poecilidae, is a species originating from South America and is widely produced all over the world and has an important place among aquarium fish (Bassler, 1996:1- 267; Riehl & Baensch, 1996: 1-991; Evans, vd. 2001: 51-55).

Recently, aquarium fish are cultured mainly in Southeast Asia and exported from there to many parts of the world. In many countries where aquarium fish are imported, appropriate quarantine methods are neglected, and as a result, imported fish die due to parasitic infections during their transport or just after completing their transport. Great economic losses occur when they are included in the natural species (Şahin, 2004: 1-127).

If the stock density of fish in aquariums is high and the water quality is not suitable, a parasite that can enter the aquarium multiplies in a short time and cause high mortality rates (Al.pbaz, 1984:163-193). Problems caused by ectoparasites have an important place among aquarium fish diseases (Schperclaus, 1992: 1-707; Cengizler, 2000:1-136). Flagellates, ciliates and amoebae from protozoa parasites, trematodes, crustaceans, annelids and mollusks from metazoan parasites have been reported as ectoparasites in fish. The general effects of these parasites have been identified as irritation of the epithelial surfaces by increasing mucus production, the destruction of mucus cells, gill damage and respiratory distress due to the number of parasites (Southgate, 1993:1-447). In histopathological examinations, edema in the lamella, hypertrophy, hyperplasia, degeneration and necrosis in epithelial cells were determined according to the degree of irritation.

This investigation aimed at determining the ectoparasites encountered in the Poecilia reticulate (Peters,1859) species and the histopathological changes caused by these parasites in the gill tissues of the fish in an aquarium fish farming enterprise located in Mersin.

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2. MATERIAL and METHOD

Guppy fish samples used in this study were obtained from an enterprise engaged in aquarium fish farming in Mersin. During the research, a total of 120 fish of different ages and sizes, with an average of 10 fish per month, were examined for ectoparasites.

The fish to be examined were brought to Mersin University Faculty of Fisheries Diseases Laboratory, and the total length and weight of the fish were recorded before starting the parasite examination. In addition, the water temperature, pH and oxygen determinations were measured with the Orbego-Hellige brand water parameter meter by visiting the facility every month.

Protozoa living in fish as ecto parasites left the fish shortly after the fish died, so the fish were studied live. The gills of the individual fish used in the study were examined under a stereo microscope fallowing an examination macroscopically. The gill leaves, numbered 1, 2, 3, 4 from the outside to the inside, were cut with fine scissors in the order of operation and taken on a slide. The scraping preparations taken from the gills were diluted with ambient water and examined under a binocular microscope with a coverslip covered.

The parasites detected in the prepared preparations were fixed in 70% ethanol and kept for a while, and the parasites in the unit area were counted and recorded. Then the parasites were made into permanent preparations for storage. In the identification of Trichodina specimens, the gills, which were placed on a slide and dried in air, were detected using the Klein's silver impression method (Lom & Dykova 1992:1-26). Ichtyobodo necator specimens were stained with heamatoxylin for the determination of the types of parasites according to Thomas&Wellborn 1967:399-412, Lom 1970:153-177, Hoffman 1979: 153-157, Özer 1995: 441-454, Dove, vd.1998: 1755-1764., Martins vd.2012: 281-286 .

Histopathological sections were taken from the gills of infected fish and these sections were stained according to hematoxylin-eosin (H&E) staining methods and examined histopathologically (Ferguson, 1989: 1-260, Takashima &Hibiya, 1995: 1-195).

3. RESULTS

Parasites determined in this investigation were; Chilodonella hexasticha Kiernik, 1909 (Protozoa: Chlamydodontidae: Chilodonella), Ichtyobodo necator Henneguya, 1884 (Protozoa: Bodonidae: Ichtyobodo) Trichodina sp. Ehrenberg 1831 (Protoazoa: Urceolariidae: Trichodina), Gyrodactylus bullatarudis Turnbull, 1956 (Monogenea:Gyrodactlidae:Gyrodactylus), Dactylogyrus extensus Mueller and Van Cleave, 1932 (Monogenea:Dactylogyridae): Dactylogyrus.

In clinical examination and autopsy findings, It was observed that fish had difficulty in breathing trying to breathe on the water surface and the gills were covered with a dense mucus layer having a dark color and bleeding appearance compared to that of normal fish. Tears and ruptures were also spotted in the gill filaments, causing the edges of the gill filaments grayish. The operculum of fish was found open during the examinations.

In the histopathological examination of the gills; It was determined that the parasites settled between the gill lamellae (Figure 1, 2, 3) and hyperplastic areas developed in the lamellae (Figure 4). Edema and hyperplasia of the gill epithelium were also detected (Figure 5).

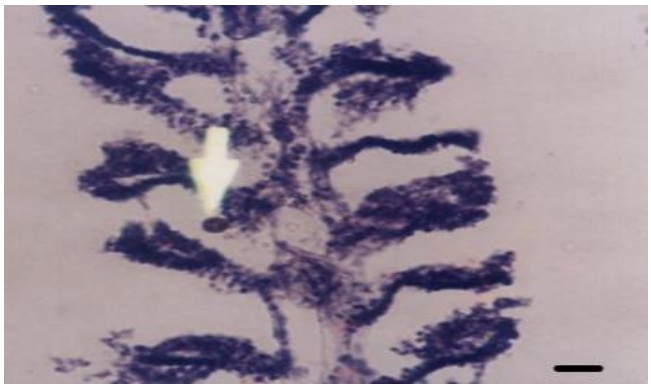

Figure 1. The image of Trichodina sp. on gill filaments (H&E). (Scale bar=50µm)

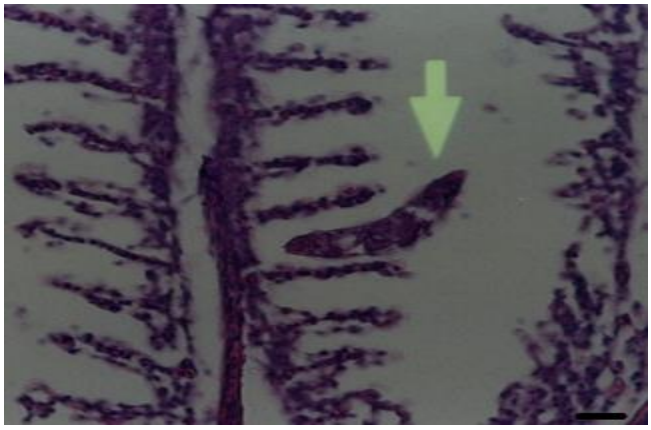

Figure2. The image of D.extensus on gill filaments(H&E). (Scale bar =100µm.)

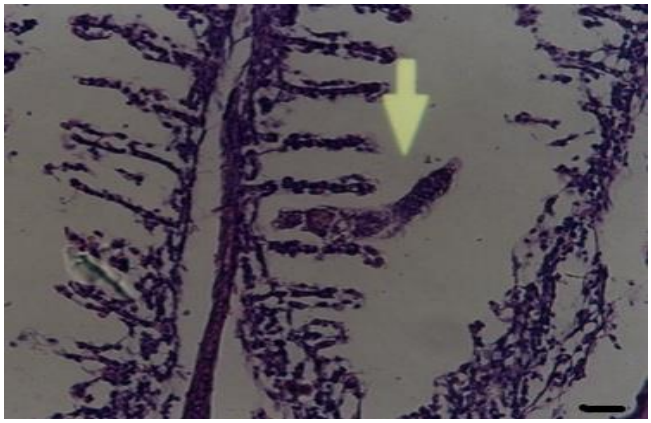

Figure 3. The image of G.bullatarudis on gill filaments(H&E).(Scale bar=100µm.)

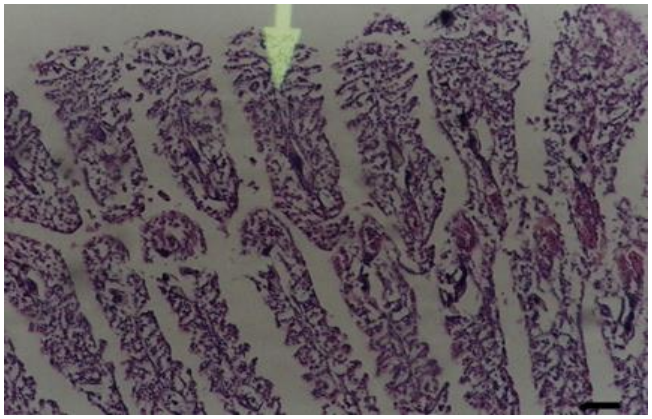

Figure 4. Hyperplastic areas in the gills (H&E) (Scale bar =100µm.)

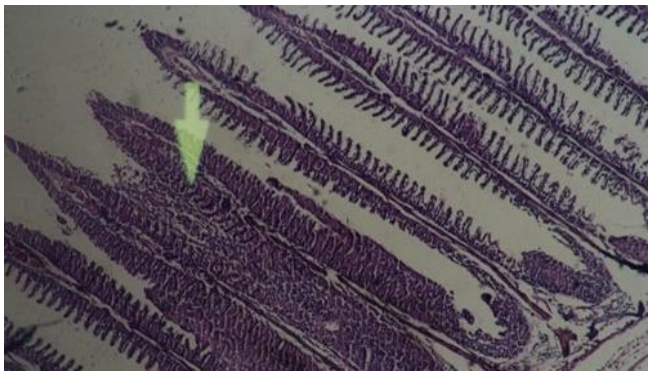

Figure 5. Hyperplasia of the gill epithelium(H&E).(Scale bar=100µm.)

4. DISCUSSION and CONCLUSION

The increase in parasitic diseases in aquarium fish farming has become an important issue that has reduced production, especially in recent years. Parasites, directly or indirectly, damage fish at different rates and cause intense mortality rates. Parasites cause damage to the gill tissue with their attachment organs such as hooks, claws and suckers, and prepare a suitable environment for the entry and reproduction of microbial disease agents. It is necessary to know well the biological characteristics of this infestation mechanism by way of understanding the cycle, the histopathological damage that the parasite causes and the selection of attachment area of the parasite in fish. (Kabata 1985: 1-318; Grabda 1991:1-306; Hibiya, 1992: 1-145).

This research was able to identify five species of parasites as Chilodonella hexasticha, Ichtyobodo necator, Trichodina sp., Gyrodactylus bullatarudis and Dactylogyrus extensus. In addition, the clinical appearance and autopsy findings of these parasite species were also investigated.

Miyazaki et al. (1986) reported that Ichtyobodo necator generally causes swelling in the gill filaments and causes increased mucus secretion in fish. Histopathological changes caused by Ichtyobodo species as hyperplasia of epithelial cells in inter lamellar regions, fusion of gill filaments and intense fusion of lamellae. In this study, on the histopathological examination of the gills of fish, it was determined that I. necator parasites settled between the gill lamellae and hyperplasia developed in the gill flaments.

Studies by the authors have shown that fish infected with the parasite C. hexasticha caused proliferation of the epithelial cells to settle between the secondary lamellae, which tends to clump together and dissolve. They also cause an increase in mucus and chloride cells. Hyperplastic epithelium may undergo dystrophic changes with enlargement of capillaries, edema, petechiae and hemorrhages (Paperna & Van As, 1983: 441-459, Shariff, 1984: 69-75, Langdon vd., 1985: 409-413). In this study, it was determined that the parasites settled between the gill lamellae and hyperplastic areas developed in the gills. In addition, edema and hyperplasia were detected in the gill epithelium.

Kayis et al. (2013) Trichodina sp. was found in the gills of severum (Heros efascatus) and both in the gills and skin of the yellow princess in Turkey. Kerek and Özdemir (2016) also detected Trichodina sp. in goldfish and in guppies. Özer, (1995) reported that Trichodina sp. caused gray bluish discoloration due to excessive mucus secretion and peeled epithelial tissue, especially in heavy infestations. Trichodina species cause epithelial hyperplasia between gill lamellae, and may also cause epithelial shedding in gill filaments (Lom & Holdar, 1977: 193-210). As a result of the clinical examination of this study, trichodina sp was found in gill of guppy fish. Also autopsy findings it was determined that the gills of the fish had a dark, bleeding appearance compared to normal, ruptures in the gill filaments, and graying at the edges.

Especially in heavy infestations of Gyrodactylus species; It has been reported that the gills are covered with a mucus mixed with dead tissue (Roberts, 1978, Kabata, 1985, Dove, et al.1998, Cone et al. 2011). Dactylogyrus species, on the other hand, cause intense mucus secretion, bruises and ulcers due to strong irritations in the gill filaments (Ribelin&Migaki 1975: 117-143, Daghigh Roohi et al., 2019: 1-6.). Dactylogyrus and Gyrodactylus species also cause deformation in gill lamellae by hyperplasia of epithelial cells and mucus cells in the gills (Wootten 2012: 415-446, Kerek & Özdemir 2016: 1-50, Durgun & Özdemir 2021: 145-157). In this study, It was determined that the parasites settled between the gill lamellae of the fish and hyperplasia developed in the gills.

In this study, the guppy, the most preferred aquarium species in Mersin province was examined for its ectoparasites using microscopic and histopathological methods and the pathological changes caused by them were revealed.

Author contributions

The authors contributed equally.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence this paper.

Statement of Research and Publication Ethics

The authors declare that this study complies with Research and Publication Ethics.

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