Kocatepe Veterinary Journal

Kocatepe Vet J. (2024) 17(1):77-80

DOI: 10.30607/kvj.1422485

CASE REPORT

First Report of *Glochidia* (Mollusca: Lamellibranchiata) Infestation in Aquarium Fish (Flowerhorn) from Iran

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ABSTRACT

Glochidia are the larva stage of bivalve mollusks (Lamellibranchiata). These temporary obligate parasites are apparent on the fins and gills and rarely on the surface of fish in spring, summer, and autumn. In spring 2018, a flowerhorn (cichlid) with spots appearing body and gills and white small mobile organisms on the floor of an aquarium were referred to the parasitology laboratory in the School of Veterinary Medicine, Science and Research Unit, Tehran Islamic Azad University. The organisms were sampled and clear in Potas 10% fixed by Glycerin gelatin and examined with a light microscope; the samples were diagnosed as *Glochidia*.

Keywords: Bivalve, Flowerhorn, *Glochidia*

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İran'dan Akvaryum Balıklarında (Flowerhorn) *Glochidia* (Mollusca: Lamellibranchiata) İstilasının İlk Raporu

ÖZ

Glochidia, Lamellibranchiata sınıfına ait çift kabuklu yumuşakçaların larva evresini temsil eder. Bu geçici zorunlu parazitler, ilkbahar, yaz ve sonbaharda balıkların yüzgeçlerinde ve solungaçlarında ve nadiren de yüzeyinde görülür. 2018 yılı ilkbaharında, bir çiçek boynuzlu (ciklet) akvaryumun içinde vücut ve solungaçlarda lekelerle birlikte akvaryum tabanında beyaz, küçük ve hareketli organizmaların görünmesi üzerine, bu durum Veteriner Fakültesi, Bilim ve Araştırma Birimi, Tahran İslam Azad Üniversitesi parazitoloji laboratuvarına yönlendirildi. Organizmalardan örnek alındı ve Potas 10%'de sabitlendi, Gliserin jel ile temizlendi ve ışık mikroskobu ile incelendi; örnekler *Glochidia* olarak tanımlandı.

Anahtar kelimeler: Çift kabuklu, Flowerhorn, Glochidia

To cite this article: Zarrabi Ahrabi S. Shirazi S. First Report of Glochidia (Mollusca: Lamellibranchiata) Infestation in Aquarium Fish (Flowerhorn) from Iran. Kocatepe Vet J. (2024) 17(1):77-80.

Submission: 20.01.2024 **Accepted**: 05.03.2024 **Published Online**: 07.03.2024
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INTRODUCTION

The flowerhorn cichlids are ornamental aquarium fish noted for their transparent colors, and glochidium (plural *Glochidia*) is a larval stage of some freshwater mussels, which are released from female mussels (Neves et al., 1985). These aquatic bivalve mollusks belong to the Uniondale family (Brodniewicz, 1968) and have calcareous bivalve shells, often with little hooks on their inner edge (Paperna, 1996). Freshwater bivalve mollusks exhibit diverse life cycle adaptations for parasitizing obligate hosts. The parasitic larval stage, referred to as *Glochidia*, is a crucial aspect of the life cycle of main freshwater mussels. *Glochidia* have the ability to temporarily attach to the outer surface of suitable hosts, commonly fish, and certain amphibians. This unique strategy serves a dual purpose, providing both nutrition and a means of dispersal for the parasite larvae. (Nikishchenko et al., 2022).

These larvae attach to the fish, utilizing structures like hooks, often targeting the gills or fins of the host fish. This attachment initiates a proliferative reaction in the surrounding area where they are attached (Şereflişan, 2021; Şereflişan, 2018; Arey, 1921; Paperna 1996). *Glochidia* encyst in the gill epithelium and undergo growth before eventually dropping off within a span of 10-30 days. The infestation caused by *Glochidia* is termed Glochidiosis (Gustafson and Iwamoto, 2005). *Glochidia* can bear a resemblance to trematode metacercarial cysts, and in instances of heavy infestation, they can rarely lead to mortality (Nedeau et al., 2005).

There is a need for more consensus regarding the pathogenic impact of *Glochidia* on fish. While some researchers argue that the parasitic larval phase does not hinder recruitment and, therefore, does not substantially affect maintaining the mussel population, high concentrations of *Glochidia* are often associated with decreased swimming ability and higher mortality rates in hosts. Additionally, the relationship is classified as parasitic due to the nutrient transfer from the fish to the mussel (Ieshko et al., 2016).

CASE HISTORY

The case belongs to an aquarium fish enthusiast and owner of a pet shop who referred a case (flowerhorn) to the parasitology laboratory at the Faculty of Veterinary Medicine, Science, and Research Unit, Tehran Islamic Azad University, in spring 2018, upon observing anomalies on the fish such as spots appearing on body and gills and also white small mobile organisms on the floor of an aquarium. As the fish were alive and economically valuable, a necropsy was not feasible. Therefore, a sample was taken from the aquarium base layer for clinical diagnosis. Sample clear in Potas 10% fixed by Glycerin gelatin and examined with a light microscope, revealed the presence of *Glochidia* larvae (Klunzinger et al., 2013), and based on clinical observations, Glochidia infestation was diagnosed on the fish. No specific drug treatment was administered to the case (Smith, 2019). The recommendation included changing the aquarium substrate and water. After one month of follow-up, clinical signs of *Glochidia* infestation were no longer observed, and the fish was successfully sold by the pet shop.

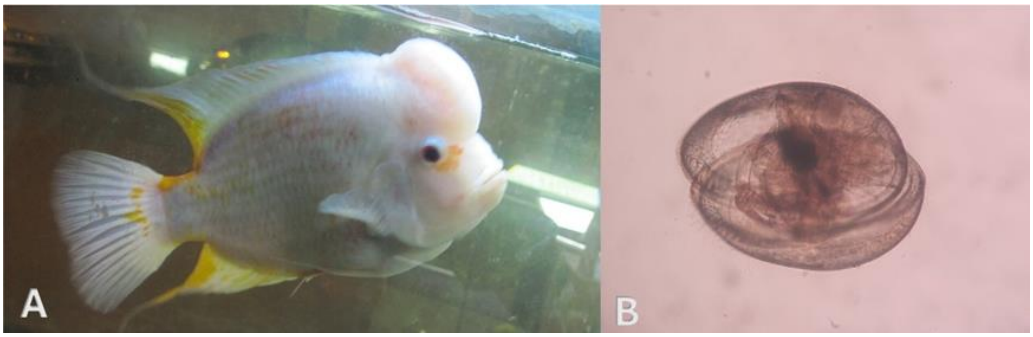

Figure 1: A- Flowerhorn aquarium fish with spots on the body, infested by *Glochidia*. B-*Glochidia* larvae were sampled from the base layer of the aquarium.

DISCUSSION

The flowerhorn fish, belonging to the Cichlid family, are man-made hybrids that do not exist in nature. They are popular ornamental fish, particularly in Southeast Asia and Iran, and are commonly kept in aquariums (Rahmati-Holasoo and Shokrpoor, 2014).

Glochidia infestation is a common occurrence in freshwater fish worldwide and can be found in various aquatic environments such as rivers, lakes, mud-bottomed pools, and ponds (Lee and Mora, 2005; Parasites Paperna, 1996).

Cases of Glochidiosis have been reported in various regions, including Poland and North America (Zieritz et al., 2012). They have developed an identification key for North and Central European Unionid mussels, contributing to understanding and recognizing these parasites in different geographic areas. (Brodniewicz, 1968; Gustafson and Iwamoto, 2005; Zieritz et al., 2012). Due to the ongoing debate and lack of consensus regarding the pathogenic impact of *Glochidial* infection on fish, it is noteworthy that some researchers have reported mortalities among certain fish strains that were experimentally infested with *Glochidia* (Ieshko et al., 2016). Research indicates that elevated rates of *Glochidia* infection can enhance swimming performance and mortality in brown trout, potentially resulting in reduced performance in heavily infested fish in their natural environment. Conversely, some studies reported no mortalities or growth retardation in *Glochidia* infected trout. Comparable outcomes were observed in the experimental infestation of Atlantic salmon parr. These divergent findings underscore the intricate nature of interactions between *Glochidia* and different fish species. The observed discrepancies in the impact of *Glochidia* infection on fish may be attributed to the existence of diverse host fish strains or variations in environmental conditions, such as temperature (Ieshko et al., 2016; Taeubert and Geist, 2013). *Glochidiosis* has been documented in both wild and farmed salmonids in locations such as the Scotland River and Virginia (Hastie and Young, 2001; Neves and Widlak, 1988). According to available references, there are no reports of Glochidiosis in ornamental fish. This could be attributed to the fact that these organisms, in their adult phase, resemble stones and do not move extensively (Nedeau et al., 2005). So, it can probably be transmitted by stones that have been brought from these sources for aquariums. This is the first report of Glochidiosis of flowerhorn in Iran.

CONCLUSION

In conclusion, most reports on Glochidiosis are related to freeliving fishes, particularly in the Salmonidae family. The probability of infestation in aquarium fishes is very low. However, it is crucial to emphasize the importance of maintaining aquarium hygiene and being cautious about transferring objects from the natural environment to the aquarium.

Conflict of Interest: The authors declared there is no conflict of interest.

Author Contribution Rates: Both authors contributed equally to all aspects of the research.

Ethics Committee Information: The current study does not require ethics approval.

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