

First Morphological Evidence of *Huffmanela* sp. (Nematoda: Trichosomoididae: Huffmanelinae) in *Brachirus orientalis* (Bloch & Schneider, 1801) from Southern Iraq

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Abstract— Given the growing interest in marine aquaculture, the current study sought to monitor and investigate some of the pathogens affecting marine fish that could pose a threat to marine aquaculture and result in high mortality rates in southern Iraq. The marine Soleidae, a species of importance in marine aquaculture because of its ease of rearing, was among a variety of marine fish that were examined. Only one of the thirty fish that were inspected had an infection rate of 3.3%, which is a very low percentage. The findings demonstrated that the nematode worm *Huffmanela* (Nematoda: Trichosomoididae: Huffmanelinae) lays its eggs in the intestinal tissues of the fish *Brachirus orientalis* (Bloch & Schneider, 1801) of the Soleidae family, which are unique sites for this kind of infection. Multiple tiny black spots, which are outward indicators of infection, were present on the serous and subcutaneous layers, characterizing the infection. *Huffmanela* species are known for their polyploid, thick-walled, and tissue-clustering eggs, which were observed both histologically and under a microscope. Additionally, pathological examinations showed that the eggs were rough, brown-shelled, oval to spindle-shaped, and encircled by localized fibrosis and tissue tears. This study adds to our understanding of the nematode biodiversity in the northern Arabian Gulf by being the first to report *Huffmanela* infection of *B. orientalis* in Iraqi marine waters.

Keywords — *Huffmanela* sp., Nematode, *Brachirus orientalis*, Iraqi marine water.

INTRODUCTION

Huffmanela spp. are nematodes of the family Trichosomoididae, subfamily Huffmanelinae whose eggs are characteristically thick-shelled melanized and deposited in the tissues of their hosts. Though the life cycle of the parasite is not fully known, it most probably infects one or more intermediate or paratenic host(s), while adult nematodes have seldom been

observed (1a,2a). They bear a veterinary and economic interest since they endanger fish health and quality of fishery products in numerous freshwater and marine fish host species. The different pathologies associated with Huffmaneloses depend on the host species, parasite burden, and tissue infected.

Egg deposition will cause inflammatory reactions, tissue damage, and sometimes fibrosis in gills, the skin, and musculature wherever their common sites of infection are. Dermal lesions reduce the damaged protective barrier and may facilitate respiratory function by providing an opportunity for infection via gill damage. The infected fish ultimately survive and fetch reduced feeding value due to factors such as reduced feeding, abnormal swimming movements, and stunted growth 3,4-6). *Huffmanela* infections are not directly zoonotic but are a problem in terms of aquaculture and wild fisheries because of their visual impact on the flesh of fish which results in consumer rejection (7,8).

Huffmanela spp. are rare in the Arabian Gulf, a region characterized by severe environmental conditions and substantial human pressure, despite having diverse fish populations. There are currently few baseline data on fish parasite fauna, particularly in Iraq's southern coastal waters. The benthic flatfish *B. orientalis*, which is of ecological and commercial interest, has not yet been discovered to be a host of *Huffmanela* spp. This study reports the first known case of *Huffmanela* sp. infection in *B. orientalis* from the marine environment in southern Iraq.

Through thorough gross and histopathological analysis, the study aims to characterize the infection's pathological features and assess any potential impacts on fish health, fishery sustainability, and regional biosecurity frameworks. The findings will help close significant knowledge gaps about parasitic diseases in Gulf marine ecosystems and support the integration of parasitic monitoring into fish health management programs.

MATERIALS AND METHODS

Given the growing interest in marine aquaculture in southern Iraq, and in order to monitor and investigate some marine fish pathogens that may pose a threat to aquaculture and contribute to high fish mortality rates, 30 specimens of *B. orientalis* (Bloch & Schneider, 1801) (Family: Soleidae) were collected from the coastal waters of Al-Faw City, Basra Governorate, southern Iraq, in 2025. The samples were transported in special refrigerated specimen cases to the Marine Vertebrate Department at the Marine Science Center, University of Basra, for laboratory testing. Measurements were taken for each sample, and its external surface and visceral cavity were examined grossly. Serous and subcutaneous tissues were among the lesion sites that were dissected and carefully sampled. Using diagnostic criteria described in previous research, *Huffmanella* was identified based on the presence of dark-pigmented eggs within host tissues and the gross morphological characteristics of the lesions (9b,10b).

RESULT AND DISCUSSION

Taxonomic Note on *Huffmanella* sp. (Nematoda:

Trichosomoididae: Huffmanelinae)
Host: *Brachirus orientalis* (Bloch & Schneider, 1801) (Family: Soleidae).

Site of infection: Serosal and subcutaneous layers of the body wall, as well as serosal surfaces of internal organs.

Locality: Southern Iraqi marine waters, northern Arabian Gulf.

Description:

Specimens of *B. orientalis* displayed numerous distinct, dark-pigmented punctate lesions (0.3–0.8 mm) embedded in the soft tissues, especially in the subcutaneous and serosal layers. High lesion loads suggested a chronic or ongoing infection. Several dark nodular lesions on the surfaces of the muscle and visceral serosa were found during a gross pathological evaluation (Figure 1), indicating parasitic involvement. Under a microscope, clusters of thick-walled, darkly melanized eggs, characteristic of the genus *Huffmanella*, were seen. The oval to spindle-shaped, dark brown eggs were embedded in their hosts' tissues. Pathological view showed localized granulomatous inflammation surrounding the eggs, often involving mononuclear cells and fibroblasts.

Diagnostic characteristics

Tissue deposition rather than external release, thick, pigmented egg shells, and the lack of embryonation were characteristics of the parasitic structures seen. These characteristics fit the diagnostic standards for *Huffmanella* species as outlined in previous research (1a, 2a).

Remarks

Two molecular tools that were not utilized in this study but are strongly recommended for future research to enhance species-level identification and examine evolutionary relationships are cytochrome oxidase I (COI) and internal transcribed spacer (ITS1) sequencing. The infection in *B. orientalis* can lead to tissue disruption, chronic inflammation, and compromised tissue integrity, all of which can negatively impact fish health and marketability. Since this is the first confirmed report of *Huffmanella* infection in *B. orientalis* from southern Iraq, it contributes to regional parasitological

biodiversity records and expands the genus's known host range and geographic distribution in the Arabian Gulf.



Figure 1. Numerous black punctate spots throughout the serosal and subcutaneous tissues of *Brachirus orientalis*, representing gross pathological lesions associated with *Huffmanella* sp. infection.

The current study broadens the genus's known host range and geographic distribution within the Arabian Gulf region by reporting the first confirmed case of *Huffmanella* infection in *B. orientalis* from the marine waters of southern Iraq. This discovery is consistent with earlier studies that discovered *Huffmanella* infections in a range of marine and estuarine fish species across the globe. However, little is known about the presence of *Huffmanella* and its impact on fish populations in the Arabian Gulf. Nematode parasites called *Huffmanella* spp. lay thick-shelled, melanized eggs in their host tissues, frequently without the adult worms being present in the tissues under investigation. This finding is consistent with the findings of this investigation. According to earlier research, the lack of adult nematodes and the fact that eggs are only found in fish tissues point to an indirect life cycle with intermediate or paratenic hosts, potentially aquatic invertebrates (1a,2a).

To fully understand the life cycle and find viable intermediate hosts in the Arabian Gulf ecosystem, more research is required. The visible black lesions in muscle and serosal tissues resulting from egg deposition raise serious aesthetic and quality concerns and may reduce the market value of the affected fish. In the Arabian Gulf, where fisheries are vital to local economies and food security, this is particularly important. The detrimental effects of parasitic infections on fish quality and marketability have been demonstrated by regional studies, such as those conducted by (11). This highlights the importance of incorporating these parasites into routine fish health monitoring programs.

The frequency and pathogenicity of *Huffmanella* infections may be impacted by the particular environmental factors of the Arabian Gulf, such as its high salinity, temperature swings, and human pressures. According to regional studies, long-term environmental monitoring is necessary to comprehend how these factors affect parasite dynamics (12). Furthermore, considering the known links between parasite prevalence and environmental deterioration, the identification of *Huffmanella* infection may function as a bioindicator of ecosystem health (13).

This study highlights the significance of incorporating parasitological surveillance into plans for environmental conservation and fisheries management in the Arabian Gulf. Future research should employ molecular diagnostic tools such as ITS1 and COI gene sequencing to accurately identify

Huffmanela species and elucidate their still-uncertain phylogenetic relationships, as the current study lacked molecular data.

The discovery of *Huffmanela* sp. in *B. orientalis* emphasizes the need for routine parasitological monitoring and molecular identification in order to clarify species taxonomy. Further investigation into the life cycle and host range of the parasite is essential to reduce its detrimental impacts on fish health and the sustainability of the fisheries in the Arabian Gulf.

CONCLUSION

The discovery of *Huffmanela* sp. in *B. orientalis*, which adds a new species to the parasitic fauna of Iraqi marine waters, highlights potential risks to fish health and commercial value. This finding emphasizes the need for more molecular research to accurately identify the parasite's species and clarify its life cycle. Treating *Huffmanela* infections in *B. orientalis* and other marine fishes is essential to preserving the ecosystem's health and the productivity of Arabian Gulf fisheries. More collaboration between researchers, environmental regulators, and fisheries stakeholders is needed to develop effective monitoring and management strategies that ensure the long-term sustainability of regional marine resources.

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N/A

Conflict of Interest

The authors declare no conflict of interest.

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