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CASE REPORT

A Case Report of Argulosis at a Recreational Fishing Dam in Lusaka, Zambia

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Abstract

This study reports the first confirmed outbreak of argulosis in Zambia, involving multiple fish species at a recreational fishing dam in Lusaka. *Argulus* spp. (fish lice), ectoparasitic crustaceans known for their broad host range and pathogenicity, were identified as the causative agents. Six fish species, both indigenous and introduced, exhibited clinical signs such as erratic swimming and surface rubbing, with post-mortem examinations revealing characteristic lesions including skin ulcers and parasite-laden gills. Morphological analysis confirmed the presence of *Argulus* spp. Environmental stressors, high fish stocking densities, and unregulated fish transfers were identified as potential drivers of the outbreak. The findings highlight the growing risk of parasite emergence in managed aquatic systems across sub-Saharan Africa. The study recommends strengthening biosecurity measures, implementing routine surveillance, establishing rapid response protocols, promoting public awareness, and advancing targeted research to mitigate future outbreaks and protect fish health and aquatic biodiversity.

Keywords: Argulosis, Fish lice, *Argulus* spp., Recreational fisheries health, Zambia

1.0 Introduction

Aquatic ecosystems are vital reservoirs of biodiversity and provide critical resources for fisheries, aquaculture, and recreational activities worldwide (Irfan and Alatawi, 2019). However, these ecosystems face increasing threats from parasitic infections, which jeopardize fish health, ecological balance, and socioeconomic value (Hernández-Delgado, 2015; Cable *et al.*, 2017). Among such parasites, *Argulus* spp. (fish lice) are ectoparasitic crustaceans notorious for causing argulosis, a disease affecting both wild and farmed fish populations (Mikheev, Pasternak and Valtonen, 2015; Kumar *et al.*, 2017; Haridevamuthu *et al.*, 2024). Argulosis is characterized by skin abrasions, hemorrhaging, secondary infections, and elevated mortality, posing significant challenges to aquaculture productivity and wild fish conservation (Mikheev, Pasternak and Valtonen, 2015; Brahmchari *et al.*, 2022; Haridevamuthu *et al.*, 2024).

While this parasite has been extensively documented in temperate regions, its impact in sub-Saharan Africa, particularly within recreational aquatic environments, remains understudied. Zambia, endowed with expansive water bodies and relies heavily on its fisheries for food security and economic sustenance. Despite this, surveillance for parasitic diseases in Zambian fisheries, especially in recreational settings, is limited. Recreational fishing dams, which attract tourism and local anglers, represent unique ecosystems where human activity, fish stocking practices, and environmental stressors may converge to facilitate disease emergence (Baipai, Basera and Chikuta, 2020; Mzyecee and Muchanga, 2023). The recent detection of argulosis at a recreational fishing dam in Lusaka, Zambia, marks an unprecedented concern for the region's aquatic health.

This study presents the first documented outbreak of argulosis in Zambia, highlighting its occurrence at a recreational dam in Lusaka. The emergence of *Argulus* spp. in this setting raises urgent questions about transmission pathways, potential ecological drivers, and risks to fish populations (Hunt, 2021). This study investigated the ectoparasite infestation by taxonomic identity of the causative agent using morphological tools, describe the clinical and pathological features of the outbreak, evaluate environmental and anthropogenic risk factors, and propose mitigation strategies to curb further spread. The findings hold relevance for fisheries managers, and conservationists aiming to balance recreational use with ecological resilience in sub-Saharan Africa's evolving aquatic landscapes.

2.0 Case Report

The recreational fishing dam located in southern Lusaka, Zambia, reported high mortality in September 2024. Moribund fish with skin lesions were collected from the dam, and transported live to the University of Zambia, School of Veterinary Medicine, Parasitology Laboratory. The fish were humanely euthanized using clove powder at 250 mg/L of water. The fish were assessed for external and internal lesions.

A complete parasitological dissection was performed, and age category, sex, standard length and body weight was noted in the dissection protocol. The macroscopic ectoparasites were collected using forceps, and fixed in 4 % formalin.

Specimens were examined under a stereomicroscope (Leica MZ6, 10–40× magnification). Morphological identification of *Argulus* spp. was conducted using taxonomic keys and descriptions focusing on diagnostic features such as: body shape and size, antennae and maxillule structure, and suctoral disc morphology.

3.0 Findings

3.1 Classification of affected species

A total of six fish species were identified and examined from the recreational dam, including *Cyprinus carpio* (Common carp), *Clarias gariepinus* (African catfish), *Oreochromis niloticus* (Nile tilapia), *Serranochromis jallae* (Nembwe), *Micropterus salmoides* (Bass), and *Sargochromis giardia* (Pink happy) as shown in Table 1. Ectoparasites were detected across multiple species, with notable infestations observed on the skin, gills, and fins.

Table 1. Common and Scientific Names of Fish Species Identified in the Recreational Dam affected with Ectoparasite Infestation.

S/N	Common Name	Scientific Name
1	Carp	*Cyprinus carpio*
2	African catfish	*Clarias gariepinus*
3	Nile tilapia	*Oreochromis niloticus*
4	Nembwe	*Serranochromis jallae*
5	Bass	*Micropterus salmoides*
6	Pink happy	*Sargochromis giardia*

3.2 Clinical Signs and Postmortem Findings

The predominant clinical signs included erratic swimming patterns and rubbing against submerged surfaces, behaviors suggestive of irritation and possible external parasitic infestation.

Post-mortem examinations revealed consistent gross pathological lesions across multiple individuals as shown in Figure 1. The most frequently observed lesions included ulcerative wounds on the operculum, particularly below the eye, as well as external wounds and ulcers along the abdominal skin and trunk musculature. In addition, macroscopic examination of the gills revealed the presence of parasitic organisms, which were further associated with pale gill coloration and excess mucus production.

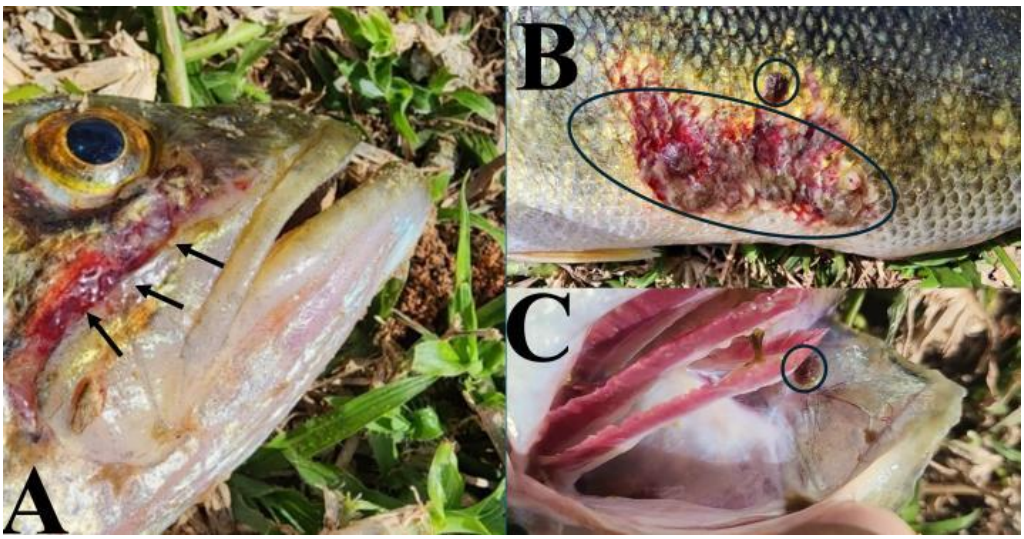

Figure 1. Gross lesions observed in fish sampled from a recreational dam. (A) Ulcerative wounds on the operculum below the eye (black arrows); (B) Extensive skin ulceration on the lateral trunk region (black ellipse); (C) Gill examination showing presence of ectoparasites (blue circle) and pale gill coloration.

3.3 Parasitological Examination

Microscopic examination of ectoparasites recovered from the gill tissues of fish sampled in the recreational dam confirmed the presence of *Argulus* spp., commonly referred to as fish lice. The parasite, identified based on its distinctive flattened, oval body and paired suckers visible under low magnification, is a crustacean ectoparasite known to attach to the skin and gills of freshwater fish as shown in Figure 2.

Figure 2. Microscopic image of *Argulus* spp. (fish louse) recovered from gill tissue of an infested fish from a recreational dam.

Discussion

This study documents the first known outbreak of argulosis in Zambia, revealing a severe *Argulus* spp. infestation in a Lusaka recreational fishing dam. The key findings show that six different fish species – including both indigenous cichlids and introduced species like common carp – harbored *Argulus* parasites on their skin, fins, and gills. Affected fish presented with classic argulosis symptoms, such as erratic swimming and surface rubbing (''flashing'') indicative of irritation (Iqbal, Mumtaz and Sajjad, 2013). Gross pathological lesions were prominent, notably ulcerative wounds on the operculum and body surface, and pale, mucus-laden gills teeming with parasites (Sahoo *et al.*, 2013). These clinical signs align with those reported in other argulosis outbreaks, where heavy *Argulus* loads induce dermal ulceration, hemorrhages, excessive mucus, anemia, and abnormal behavior (Steckler and Yanong, 2013). The confirmation of *Argulus* (fish lice) as the etiological agent establishes this parasite as a critical threat to the dam's fish population. The multi-species nature of the infestation underscores *Argulus*' broad host range and capacity to spread rapidly once introduced into a confined freshwater ecosystem.

Several environmental and anthropogenic factors likely converged to precipitate this outbreak. High host density in the dam – due to fish stocking for angling – would facilitate parasite transmission, as crowding and confinement are known to stress fish and amplify ectoparasite spread (Aalberg *et al.*, 2016). Unlike large natural water bodies where *Argulus* typically causes low-intensity, sub-lethal infections in wild fish, in this managed dam the parasite attained lethal levels (Alsarakibi, Wadeh and Li, 2014). Indeed, argulosis seldom causes mass mortality in wild populations under natural conditions, but in aquaculture or artificial impoundments, outbreaks can escalate quickly under intensive conditions (Aalberg *et al.*, 2016). Unregulated fish introductions are another probable driver (Kumar *et al.*, 2017). The dam's mix of native and exotic species suggests that *Argulus* may have been introduced via infected stock or fish transport. This mirrors findings in South Africa, where the invasive *Argulus japonicus* was unwittingly spread to new reservoirs by inter-basin water transfers, infesting all exposed fish (up to 87 lice per fish) (Avenant-Oldewage, 2001). In the present case, any transfer of fish or water from other infested sites (even via anglers' equipment or waterfowl) could have imported the parasite. Water quality fluctuations and seasonal factors also merit consideration. The

outbreak occurred during the warm-dry season, which is typically associated with peak parasite activity. Preceding environmental changes may have created conditions favorable for the proliferation and transmission of the parasites. In other regions, argulosis outbreaks often coincide with warm seasons or rainy periods that stress fish – for example, an argulosis epizootic in India occurred during the monsoon when changes in pond physicochemical parameters triggered parasite proliferation (Saravanan *et al.*, 2017). Warm temperatures generally accelerate the *Argulus* life cycle and egg hatching, so a prolonged warm spell or microclimate effect in the shallow dam water might have boosted reproduction (Steckler and Yanong, 2013). Additionally, any organic enrichment or oxygen depletion would weaken fish and compromise their immunity, making them more susceptible to heavy infestations. In sum, the dam's ecological context – high fish density, possible introduction of carriers, and suboptimal water conditions – formed a perfect storm for argulosis to emerge.

The findings from this outbreak are consistent with patterns reported in other *Argulus* infestations worldwide, while also highlighting notable regional implications. Globally, argulosis is a well-recognized problem in freshwater aquaculture and fisheries. Outbreaks of *Argulus* spp. have been reported on nearly every continent, often causing mass mortalities and economic losses in cultured fish populations (Aalberg *et al.*, 2016; Sahoo *et al.*, 2021). For instance, *Argulus* epizootics in intensive carp farms can kill large numbers of fish and incur substantial costs. One analysis from India estimated that argulosis in carp farming alone leads to ~$62 million USD in losses annually, underscoring the parasite's economic impact (Sahoo *et al.*, 2021). Similarly, a recent Argulus outbreak in the Andaman Islands (India) led to ~40% mortality in carp fingerlings, with each fish harboring an average of 90–130 lice (Saravanan *et al.*, 2017). Affected fish in that case exhibited lethargy, abnormal swimming, fin erosion, hemorrhagic spots and excess mucus – signs very much in line with what we observed in present study. Such heavy burdens (hundreds of parasites per host) are catastrophic, as also noted in the literature: severe *Argulus* infestations can debilitate fish by damaging the skin and gills, leading to osmotic imbalance, secondary infections, and eventually death (Steckler and Yanong, 2013). It is notable that the Zambian outbreak involved both cyprinids (carp) and cichlids, reflecting *Argulus*' ability to parasitize diverse taxa. This broad host susceptibility is likewise documented elsewhere – *Argulus foliaceus* and *A. japonicus* readily jump between species in multi-species fish communities (Pasternak, Mikheev and Valtonen, 2000; Aalberg *et al.*, 2016). In Europe and Asia, invasive *Argulus* species have spread via the movement of live fish (e.g. the spread of *A. japonicus* with imported carp and goldfish stocks), often establishing in ornamental ponds or aquaculture facilities and then escaping to natural waters (Hunt, 2021). By comparison, sub-Saharan Africa's documentation of argulosis has been sparse, and southern Africa had considered argulid parasites relatively rare until recent decades (Avenant-Oldewage, 2001). The present study therefore bridges a knowledge gap by providing the first confirmed record of argulosis in Zambia. It signals that African freshwater systems, under intensifying human use, are not exempt from *Argulus* incursions. Given the suitable climate and extensive fisheries in the region, there is potential for *Argulus* to become an emerging parasite of concern across adjacent countries if proactive measures are not taken.

Conclusion

The argulosis outbreak at a recreational dam in Lusaka highlights the emerging threat of *Argulus* spp. in African inland waters, traditionally associated with temperate and aquaculture systems. This event underscores the role of environmental stressors and unregulated fish movements in facilitating parasite proliferation. Key recommendations include strengthening biosecurity during fish transfers, implementing routine fish and environmental monitoring, establishing outbreak response protocols, raising public awareness, and advancing research on parasite

biology, control methods, and long-term surveillance. Prompt and integrated management is essential to safeguard fish health and biodiversity in both wild and farmed systems.

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