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DIVERSITY AND PREVALENCE OF PARASITES IN THE SKIN OF FRESH WATER FARM - RAISED *Clarias gariepinus* (Burchell, 1822) IN IBADAN, SOUTH-WESTERN NIGERIA.

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Abstract

Freshwater aquaculture environments host a wide range of parasites, many of which infect the skin of *Clarias gariepinus* being its first line of defense against ectoparasites, diseases, environmental stressors and threats. To assess the ectoparasitic infection, a study was conducted on 405 cultured *C. gariepinus* in Ibadan, Southwestern Nigeria using microscopic examination of skin smear. Ectoparasites were found among 54(13.3%) of the fish species with a significant higher prevalence in males (16.7%) compared to female (10.0%) ($p<0.05$). Protozoans (11.85%) were the most recovered parasites followed by platyhelminthes (0.74%), nematode (0.49%) and acanthocephalan (0.25%). *Oodinium* sp showed the highest parasite prevalence (4.94%), followed by *Chilodonella* sp and *Epistylis* sp (1.23 % each), while *Eimeria* sp and *Ichthyophithrius* sp each accounted for 0.99%. Monogenea sp as representative of platyhelminthes had 0.74% while *Dactylogyrus* sp in

the case of nematode had 0.49%. Despite the overall prevalence being low in this study, the health risks posed by skin ectoparasites on *C.gariepinus* cannot be ruled out, as they may negatively affect aquaculture productivity. This highlights the need for continuous investigation into parasite diversity and its relationship with fish health to ensure sustainability of aquaculture under dynamic environmental conditions.

Key words: Ectoparasites, Fish health, Freshwater, Skin, Sustainability

1.0 Introduction

Information about the diversity, prevalence and dynamics of parasites in *Clarias gariepinus* is crucial for assessing fish health, especially in relation to host factors such as sex and morphometric characteristics, as well as seasonal variations (Idris *et al.*,2025). Parasites pose significant threats to fish health management and aquaculture production, with several having zoonotic potential according to Chaudhary *et al.* (2024). Global estimates indicate that parasitic infections account for annual economic losses ranging from 1.05 and 9.58 USD billion (Shinn *et al.,* 2015). Parasites have also caused mortality leading to economic losses in fish production (Abd-EL Rahman *et al.,* 2023).

Parasite diversity in aquatic ecosystem is influenced by water quality (Ojawala *et al.,*2018; Akinsanya *et al.,* 2020; Waruiru *et al.,*2020), while ineffective pond management strategies such as improper nutrition, inadequate fish disease management, and poor stock of fish seedlings have significant association with high infection rate (Adeleke *et al.,* 2021).

Also factors such as high stocking densities according to Enyidi and Eneje (2015), inadequate disinfection exercise (Buchmann, 2022) have increased the susceptibility of fish to infection (Nnatuanya *et al.,*2023) and Kawe *et al.* (2016).

Parasitic infections in *C. gariepinus* under cultured environment can result to nutritional devaluation, diseases, reduced fish growth and diminished reproductive performance (Onyedineke *et al.,* 2010). These infections have also compromised the functions of organs such skin, eye, and fins (Abowei and Ezekiel 2011).

The fish health challenges could be aggravated by the insufficient biodiversity management strategies (Meinam *et al.,*2023), while environmental degradation, species loss and medication resistance according to Atawodi *et al.* (2025), in addition to both parasitic and pathogenic infections are major constraints to both wild and cultured fish populations (Omeji *et al.,* 2022).

Protozoan are the most common causative agents of diseases in farmed fish according to Onyiaji *et al.* (2024) and Adeyemi (2019) followed by monogeneans, trematodes, and nematodes (Atawodi *et al.,* 2025). Arthropods and leeches have also been reported as fish parasites, although their occurrence is comparatively less frequent (Adesulu, 2019).

Uncontrolled parasitism can lead to impact on fish physiology and tissue damage (Nissa *et al.,* 2022), disruption of immune functions

(Norandari and Nurdian, 2018) as well as changes in haematological parameters (Akomolede *et al.* 2025) with some species becoming zoonotic contaminants of public health concerns (Mohammed *et al.,* 2025).

Other effects include liver dysfunction, nervous system impairment, and mechanical interference with spawning, weight loss and gross distortion of the body (Adewole *et al.*, 2018). High mortality rates, reduced growth performance, poor efficient feed conversion, lower productivity, high cost of veterinary care, decrease market value of infected fish and threatened food security are all consequences of parasites on fish (Atawodi *et al.,* 2025).

The rapid urbanization and inadequate regulation of waste discharge into aquatic ecosystems according to Miladinov (2023) and Bhat *et al.*(2022), coupled with absence of routine fish inspection and weak extension services to monitor small scale fisheries and guide farmers on aquaculture procedures has been highlighted as a major constraint in sustainable fish production according to Agebi (2012) which may create significant vulnerabilities of fish species to infectious diseases due to interrelationship of the environment and the fish health.

Consequent upon the effect of parasites on fish, it becomes imperative to investigate their occurrence. Therefore, the aim of this study is to determine the diversity and prevalence of skin ectoparasites of freshwater farm-raised *Clarias gariepinus* in Ibadan Southwestern, Nigeria.

2.0 Materials and Methods

2.1 Study area

This study was conducted in Ibadan, the capital, and the most populous city of Oyo State located in Southwest geographical zone of Nigeria. Ibadan lies approximately at latitude 7.3775°N and longitude 3.9470°E (Google map, 2025). It is cosmopolitan in nature and significant due to interplay of the environmental factors, socio-economic considerations and health related issues associated with fish consumption in humans, in addition to the expanded cultivation of *Clarias* fish species in the town.

2.2 Collection of Fish Samples

A total of 405 mature *C. gariepinus* were collected as farm- raised fish species representing the common aquaculture system in the area. Samples were collected with hands protected with gloves supported by fish net capture to minimize stress and physical damage.

Collected fish were placed in black plastic keg with pond water and immediately transported to the laboratory for parasitological examination.While the fish were identified according to Olaosebikan and Raji (1988).

2.3 Parasitological examination

The collected fish samples were examined externally for visible signs of parasitic infestation such as lesions, cysts and abnormal growth on the skin and fins of the fish using both visual inspection and a magnifying hand lens. Skin mucus was scrapped using plain glass slide moistened with 0.9% physiological saline to aid the exit of the parasites according to Eleng *et al.* (2025), Olurin *et al.* (2012) and Uneke *et al.* (2015). Subsequently, a cover slip was placed on the glass slide and the smear was examined under a binocular microscope at x100 and x400 magnification (Nur *et al.*, 2020).

2.4 Identification of parasites

This was done following reference guidelines of Paperna (1996), Roberts (2001), Pouder *et al.* (2005; 2011), Klinger and Francis- Floyd (2013), Francis- Floyd *et al.* (2016), Barson and Avenant-Oldewage (2006).

3.0 Results

The outcome of this study revealed that 54 (13.3%) out of 405 *C. gariepinus* were infected. The prevalence was higher in male fish species (16.7%) while female had 10.0%. There is significant difference in prevalence between sexes of fish ($p<0.05$) (Table 1).

Table 1. Prevalence of Skin parasitic infection in *C. gariepinus* in relation to sex

Sex	**No of fish**	**Infection (%)**	**X^2**	**P-value**
Female	201	20(10.0)	3.95	0.047
Male	204	34(16.7)		
Total	405	54(13.3)		

The prevalence of skin parasites in the fish species showed that protozoans infected 48(11.85%), platyhelminthes accounted for 0.74%, while nematodes were observed in 0.49% and the lowest prevalence of 0.25% was recorded among the acanthocephalans (Table 2).

Table 2: Prevalence of Parasites differentials in the Skin of *C. gariepinus* in relation to sex

Parasite Phyla	Sex		
	Female (%) (N=201)	Male (%) (N=204)	Total (%) (N=405)
Protozoans	19(9.5)	29(14.2)	48(11.85)
Platyhelminthes	1(0.5)	2(0.98)	3(0.74)
Nematodes	0(0)	2(0.98)	2(0.49)
Acanthocephalans	0(0)	1(0.49)	1(0.25)
Total	**20(10.0)**	**34(16.7)**	**54(13.3)**

Parasite diversity in the skin of *C. gariepinus* comprised *Oodinium* sp which recorded 4.94% prevalence. This was followed by both *Chilodonella* sp and *Epistylis* sp with prevalence of 1.23% each. *Eimeria* sp and *Ichthyophithirius* sp had 0.99% each, similarly the duo of *Tetrahymena* sp and *Trichodina* sp had 0.74% prevalence each, while and *Ichthyobodo* sp recorded 0.49%. The lowest prevalence among the protozoan parasites was recorded in *Ambiphyra* sp and *Henneguya* sp with each parasite affecting 0.25% of the examined fish species. Monogenea (0.74%) was the only Platyhelminthes recovered, while *Dactylogyrus* sp with a prevalence of 0.49% represented the nematodes and *Neochynorhyncus* sp representing

acanthocephalans recorded a prevalence of 0.25%. (Table 3).

Table 3. Comparative prevalence of parasites in the skin of *Clarias gariepinus* in Ibadan

Phyla	Parasite	No of Fish infected	Prevalence (%)
Protozoan	*Eimeria* sp	4	0.99
	Ichthyophythirius sp	4	0.99
	Oodinium sp	20	4.94
	Trichodina sp	3	0.74
	Ambiphyra sp	1	0.25
	Chilodonella sp	5	1.23
	Epistylis sp	5	1.23
	Henneguya sp	1	0.25
	Ichtyobodo sp	2	0.49
	Tetrahymena sp	3	0.74
Platyhelminthes	*Monogenean* sp	3	0.74
Nematode	*Dactylogyrus* sp	2	0.49
Acathocephalan	*Neochynorhyncus* sp	1	0.25
	Total	54	13.3

3.0 Discussion

The overall prevalence of skin ectoparasites in this study was 13.3%, this outcome is lower than prevalence rates reported by Mohammed *et al.* (2025) at 35.30% ,Ayawei *et al.* (2018) at 80.4% and Mambe *et al.* (2020) with 23.36%, but higher than the prevalence reported by Ibrahim *et al.* (2024) with 0.0% and 7.5% in Fachrussyah *et al.* (2024) investigation.

The male *C. gariepinus* exhibited a higher level of skin infection than female, although the difference was statistically significant. This finding is in contrary to the report of Auta *et al.* (2019) who observed a higher infection rate in females. However, it aligns with the view of Caballero- Huertas *et al.* (2024) who suggested that the sex of fish can influence differential susceptibility to diseases.

The higher prevalence in male may be caused by increased aggression towards territorial dominance for feeding (Mushtaq, 2024), behavioural factors (Lieke *et al.,* 2020) leading to greater exposure to parasites (Dabo *et al.,* 2024).

The prevalence of parasites observed in both sexes may be attributed to the direct contact between the fish skin and the surrounding aquatic environment which increases the exposure to free- swimming and vector-borne infective stages of parasites (Tachia *et al.,* 2010). Additionally, the availability of suitable intermediate hosts to complete parasites life cycles has been a key factor

influencing parasite prevalence (Sadauki *et al.,* 2023).

Environmental factors including stocking density, pond size, and management practices have been reported to influence both the prevalence of ectoparasites and their preference for skin as primary site of infestation (Adeogun *et al.,* 2014).

Protozoans were the most prevalent parasites in this study predominantly affecting the fish skin compared to other parasite groups. These findings is consistent with reports of Mohammed *et al.* (2025) and Ayawei *et al.* (2018). The most prevalent protozoan was *Oodinium* sp which contrasts with the findings of Wogu *et al.* (2024) with the recovery of *Ichthyophthirius* sp as the most dominant species. Other parasitic protozoan occurred in decreasing order of *Chilodonella* sp, *Epistylis* sp, *Eimeria* sp and *Ichthyophthirius* sp, whereas *Ambiphyra* sp and *Henneguya* sp were the least frequently encountered.

The recovery of *Trichodina* sp in the present investigation is in agreement with the findings of Idris *et al.* (2025), but contrasts with the reports of Sadauki *et al.* (2023) who recorded no protozoan infection on the skin of *C. gariepinus*. However, the prevalence of *Trichodina* sp observed in this study is lower than both 14.38% reported by Omoare (2017) and the 5.0% recorded by Wogu *et al.* (2024).

The dominance of protozoan encountered in this investigation compared to other kind of parasitic infection might be due to a combination of factors such as susceptibility of fish to protozoan infection, wide surface area of fish skin, and compromised water quality as enumerated in the investigation of Agengo *et al.* (2024) and (Jithendran, 2014).

This investigation is consistent with Uneke *et al.* (2015) with respect to some of the protozoans recovered which included genera such as *Ichtyobodo*, *Eimeria* and *Chilodonella.* It also agrees with the reports of Ogonna *et al.* (2017) with the presence of *Trichodina* sp. Furthermore, the occurrence of *Ichthyophthrius* sp and *Epistylis* sp aligns with the findings of Afolabi *et al*. (2020), while the recovery of *Henneguya* sp is comparable to the report of Helmy *et al.* (2022) that documented this protozoan type.

Platyhelminthes recorded a low prevalence in this study which agrees with the reports of Auta *et al.* (2019) and Onajafe *et al.* (2021). Although helminths are known to habitually occur in most fresh water environment (Sadauki *et al.,* 2022b), their low prevalence on the skin may be attributed to their tendency to parasitize internal organ rather than external surfaces supporting their exclusive internal parasitic nature in fish as well as the single-host life cycle (Rozario *et al.,* 2022). In addition, improved aquaculture practice according to Ayanda, (2009), may suggest that culture water was not under pollution stress (Sadauki *et al.,* 2022a), thereby limiting parasite reproduction and transmission.

The occurrence of nematode such as *Gyrodactylus* sp in this investigation is lower than 35.3% prevalence reported by Mohammed *et al.* (2025). However, this finding is comparable to the outcome of Yisa *et al.* (2011), who also recorded nematode presence on fish skin, while Enyidi and Maduakor (2017) reported that such nematodes had cause significant health issues in fish.

The lowest acanthocephalan recorded contrasts with the findings of Amin (2013) who reported acanthocephalan was predominantly located in the intestine. Its generalized low incidence among fish parasites is consistent with the report of Kawe *et al.* (2016) which attributed the variations to seasonal influences.

4.0 Conclusion

This study recorded a low prevalence of ectoparasites in the skin of *Clarias gariepinus* suggesting relatively favourable environmental conditions for fish culture and an effective innate immune response of the fish. The study further shows there was no significant parasitic risk to the studied fish population, indicating a healthy culture system which is substantially beneficial to aquaculture productivity. However, continuous monitoring is recommended to detect early signs of infection to avert major disease outbreak due to changing environmental condition that can alter parasite- host relationship.

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