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PREVALENCE OF GASTROINTESTINAL PARASITES OF SOME FISHES BOUGHT FROM RIVERINE MARKETS IN MAKURDI, NIGERIA

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Abstract

This study investigated the prevalence and distribution of gastrointestinal parasites in *some* fishes purchased from selected riverine markets along River Benue in Makurdi, Benue State, Nigeria. Fish species were randomly purchased from fish vendors at Wadata Market, Wurukum Market, Modern Market, and North Bank Market in Makurdi at various quantities based on availability. The entire gastrointestinal tract, including the esophagus, stomach, intestine, and associated organs, was carefully removed and placed in Petri dishes containing physiological saline solution (0.85% NaCl). A total of 465 fish specimens comprising *Synodontis clarias, Hydrocynus forskalli, Mormyrus rume, Bagrus bayad, Labeo senegalensis, Synodontis schall, Clarias gariepinus, Labeo coubie, Alestes nurse* were examined. The diversity of the fish species sampled is an indication of their relative abundance in River Benue. However, *Synodontis* and C*larias* species were most frequently purchased because of their availability. The overall prevalence of intestinal parasite is 65.5 % with *Synodontis clarias and Clarias gariepinus* having the highest infestation of 23.3% and 17.4% respectively. These infestation rates are significant when compared with other seven species examined (χ^2 = 218.32; P < 0.05). Six species of intestinal parasites were seen *Camallanus, Contracaecum, Capillaria, Clinostomum, Diphyllobothrium and Eustrogyloides. Camallanus* species (46.45) was the most abundant followed by Capillaria species (19.6%). The occurrence of *Camallanus* species in the nine species of fishes was statistically significant (χ^2 = 225.13; P < 0.05. The prevalence of gastrointestinal parasites recorded among the examined fishes demonstrates that parasitic infections remain common in commercially important freshwater fishes sold in Makurdi.

Keywords: Gastrointestinal Parasites, Fishes, Prevalence.

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INTRODUCTION

Fish constitute an important component of human nutrition and represent a major source of animal protein, essential fatty acids, vitamins, and minerals, particularly in developing countries. In Nigeria, inland fisheries provide livelihood opportunities for millions of people and contribute significantly to food security. Freshwater fish species such as *Synodontis*, *Hydrocynus*, and *Mormyrus* are among the commercially important fishes frequently sold and consumed due to their high nutritional and economic value (Omeje *et al*., 2022, Junaid *et al.*, 2023). However, the productivity and quality of fish populations are often threatened by parasitic infections, especially gastrointestinal parasites, which adversely affect fish health, growth, reproduction, and marketability. Gastrointestinal parasites, including nematodes, cestodes, trematodes, and acanthocephalans, commonly infect freshwater fishes and may cause tissue damage, nutrient depletion, reduced growth rates, and increased susceptibility to secondary infections. In severe cases, parasitic infestations can lead to mortality and significant economic losses in fisheries and aquaculture industries (Kolede and Akinsanya 2022, Atawodi *et al.*, 2025) Furthermore, some fish parasites possess zoonotic potential and may constitute public health concerns when infected fish are improperly handled or inadequately cooked (Odoh *et al.*, 2019).

The occurrence and distribution of gastrointestinal parasites in fishes are influenced by several factors, including host species, feeding habits, environmental conditions, water quality, seasonality, and the availability of intermediate hosts. Species of *Synodontis* are generally omnivorous bottom feeders, while *Hydrocynus* species are predatory piscivores and *Mormyrus* species feed mainly on benthic invertebrates. These differences in feeding ecology may expose the fishes to varying levels of parasitic infection through the ingestion of infected intermediate hosts or contaminated food items. Consequently, studies on parasite prevalence among different fish species provide valuable insights into host-parasite relationships and transmission dynamics within aquatic ecosystems.

Several investigations have documented gastrointestinal parasitic infections in Nigerian freshwater fishes. Akinsanya *et al*. (2008) reported a prevalence of 38.7% gastrointestinal helminth infection in *Synodontis clarias* from Lekki Lagoon, identifying cestodes (*Proteocephalus* spp. and *Wenyonia acuminata*) and nematodes of the genus *Raphidascaroides* as the major parasites recovered. Similarly, subsequent studies revealed high gastrointestinal parasite burdens in *Synodontis* species and other freshwater fishes from different aquatic environments in Nigeria (Kolede and Akinsanya, 2022, Oladipo *et al.*, 2019). In Makurdi, a survey of freshwater fishes sold at major landing sites recorded the presence of nematodes, cestodes, trematodes, and acanthocephalans, demonstrating that market fishes can serve as reservoirs of parasitic infections (Okita *et al.,* 2020, Omeji *et al.,* 2022). Despite these studies, there is the need for consistent documentation of the status of prevalence and diversity of gastrointestinal parasites specifically infecting *Synodontis*, *Hydrocynus*, *Clarias, Mormyrus* and other species marketed in freshwater bodies in Nigeria. Studies on parasites in fish have been a great concern for over a decade now due to disease conditions, overall nutritive devaluation and huge economic loss that resulted from parasitic infections. Added to the potential of infected fish to be a source of infections to man and other animals (Inegbenosun *et al.*, 2025).

Makurdi is strategically located along the Benue River, one of Nigeria's major freshwater systems that supports extensive fishing activities. Fish marketed in the area originate from diverse aquatic habitats and are exposed to varying ecological conditions that may influence parasite transmission. Furthermore, continuous siltation, human activities and other climate change related issues threatening the survival river and its fauna needs to be monitored. Therefore, assessing the prevalence of gastrointestinal parasites in these

commercially important fish species is essential for understanding their health status, evaluating potential public health risks, and providing essential information for fisheries management and parasite control programmes. The present study was therefore undertaken to determine the prevalence and distribution of gastrointestinal parasites in *some* fishes purchased from selected riverine markets along River Benue in Makurdi, Benue State, Nigeria.

MATERIALS AND METHODOLOGY

Study Area

The study was conducted in Makurdi, the capital city of Benue State, Nigeria. Makurdi lies approximately between latitude 7°43′N and longitude 8°32′E and is traversed by the River Benue, one of the largest freshwater systems in Nigeria. The River Benue supports extensive artisanal fishing activities and serves as the major source of fish supplied to markets within the metropolis. The area experiences two distinct seasons: the rainy season (April–October) and the dry season (November–March), which influence fish abundance, parasite transmission, and the distribution of intermediate hosts.

Study Design

A cross-sectional survey design was employed to determine the prevalence and intensity of gastrointestinal parasites in selected freshwater fish species sold in Makurdi markets. The study was carried out over a period of six months, during which fish samples were purchased at regular intervals from major fish markets and landing sites within Makurdi metropolis.

Sample Collection

Fish species were randomly purchased from fish vendors at Wadata Market, Wurukum Market, Modern Market, and North Bank Market in Makurdi at various quantities based on availability. Fish specimens were transported immediately after purchase in sterile ice boxes containing crushed ice to the Parasitology Laboratory of the Department of Biological Sciences for examination. Fish species were identified using standard taxonomic keys for Nigerian freshwater fishes (Haruna *et al.*, 2024, Collins *et al.*, 2025). Each specimen was assigned a unique identification number and recorded according to species, date of collection, and market source.

Examination for Gastrointestinal Parasites

Parasitological examination was conducted following standard procedures for fish helminth investigations (Okita *et al.*, 2020, Samuel *et al.*, 2025). Each fish specimen was washed thoroughly with distilled water to remove external contaminants before dissection. The fish was placed on a dissecting tray and dissected through a ventral midline incision extending from the anal opening to the operculum. The entire gastrointestinal tract, including the esophagus, stomach, intestine, and associated organs, was carefully removed and placed in Petri dishes containing physiological saline solution (0.85% NaCl). The stomach and intestine were opened longitudinally using sterile dissecting scissors and examined under a dissecting microscope. The contents of each organ were gently scraped and washed with saline solution to facilitate the recovery of parasites. Particular attention was given to the intestinal lumen, mucosal surfaces, pyloric caeca, and stomach lining where gastrointestinal parasites are commonly located.

Recovered parasites were counted and separated according to morphological characteristics. Parasites obtained from different sections of the gastrointestinal tract were preserved separately in labelled specimen bottles containing 70% ethanol for further identification. Specimens that could not be examined immediately were fixed in 4% formalin solution pending laboratory analysis.

Parasite Identification

Recovered parasites were identified to the lowest possible taxonomic level using standard morphological and taxonomic keys. Identification was based on diagnostic features such as body shape, size, presence of hooks, suckers, segmentation, proboscis structure, buccal capsule characteristics, and reproductive organs.

Nematodes, cestodes, trematodes, and acanthocephalans were identified using the taxonomic descriptions of Pouder *et al*. (2011).

Statistical Analysis

Data obtained from the study were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarize the data. Chi-square (χ^2) test was employed to determine significant differences in parasite prevalence among fish species.

RESULTS

A total of 465 fish specimens comprising *Synodontis clarias, Hydrocynus forskalli, Mormyrus rume, Bagrus bayad, Labeo senegalensis, Synodontis schall, Clarias gariepinus Labeo coubie, Alestes nurse* were examined. The diversity of the fish species sampled is an indication of their relative abundance in River Benue. However, *Synodontis* and C*larias* species were most frequently purchased because of their availability. The overall prevalence of intestinal parasite is 65.5 % with *Synodontis clarias and Clarias gariepinus* having the highest infestation of 23.3% and 17.4% respectively. These infestation rates are significant when compared with other seven species examined ($\chi^2 = 218.32$; $P < 0.05$), (Fig. 1). Six species of intestinal parasites were seen *Camallanus, Contracaecum, Capillaria, Clinostomum, Diphyllobothrium and Eustrogyloides. Camallanus* species (46.45) was the most abundant followed by Capillaria species (19.6%). The occurrence of Camallanus species in the nine species of fishes was statistically significant ($\chi^2 = 225.13$; $P < 0.05$) (Table 1). Though *Capillaria* species was also found in the nine species of fishes, it had lower prevalence. The parasites belonging to Phylum Nematoda were more prevalent than those belonging to Platyhelminthes. Of 521 parasites recovered, 22.8% and 22.4% were recovered from *Synodontis* and *Clarias* respectively. *Bagras bayal* haboured the least number of parasites (Table 1).

The parasites encountered had no specific preference to the portion of the gastrointestinal tract they inhabited. The intestine and the stomach haboured more parasites compared to the esophagus and rectum. This difference is statistically significant ($\chi^2 = 213.23$; $P < 0.05$) (Figs 2-5).

Table 1: prevalence of gastrointestinal parasites in fishes bought from Makurdi markets

Fish species	Number examined	Number with parasites (%)	Gastrointestinal parasites species						Total
			Camallanus	*Contracaecum*	*Capillaria*	*Clinostomum*	*Diphyllobothrium*	*Eustrogyloides*	
Synodontis clarias	101	71(23.3)	53 (44.5)	21 (17.6)	27 (22.7)	12 (10.1)	0 (0.0)	6 (5.0)	119 (22.8)
Hydrocynus forskalli	54	36(11.8)	31 (59.6)	3 (5.7)	11(21.1)	3(5.7)	0(0.0)	4 (7.7)	52 (10.0)
Mormyrus rume	41	27 (8.8)	12 (50.0)	0 (0.0)	6(25.0)	0(0.0)	0(0.0)	6 (25.0)	24 (4.6)
Alestes nurse	37	23 (7.5)	17 (48.6)	6 (17.1)	9 (25.7)	0 (0.0)	3(8.6)	0 (0.0)	35(6.7)
Labeo coubie	44	29 (9.5)	26 (50.9)	3 (5.8)	11(21.5)	6 (11.7)	5 (9.8)	0 (0.0)	51(9.8)
Clarias gariepinus	79	53(17.4)	44 (37.6)	22 (18.8)	19 (16.2)	11(9.4)	9 (7.7)	12 (10.2)	117(22.4)
Synodontis schall	38	21 (6.8)	31 (63.2)	0 (0.0)	7 (10.2)	7(14.3)	0 (0.0)	6 (12.2)	51 (9.8)
Labeo senegalensis	24	17 (5.6)	17 (44.7)	5 (13.1)	7 (18.2)	9 (23.6)	0 (0.0)	0 (0.0)	38 (7.3)
Bagrus bayad	47	28 (9.2)	11 (32.3)	6 (17.6)	5 (14.7)	7 (20.5)	5 (14.7)	0 (0.0)	34 (6.5)
Total	**465**	**305 (65.5)**	**242 (46.4)**	**66 (12.6)**	**102 (19.6)**	**55 (10.5)**	**22 (4.2)**	**34 (6.5)**	**521**

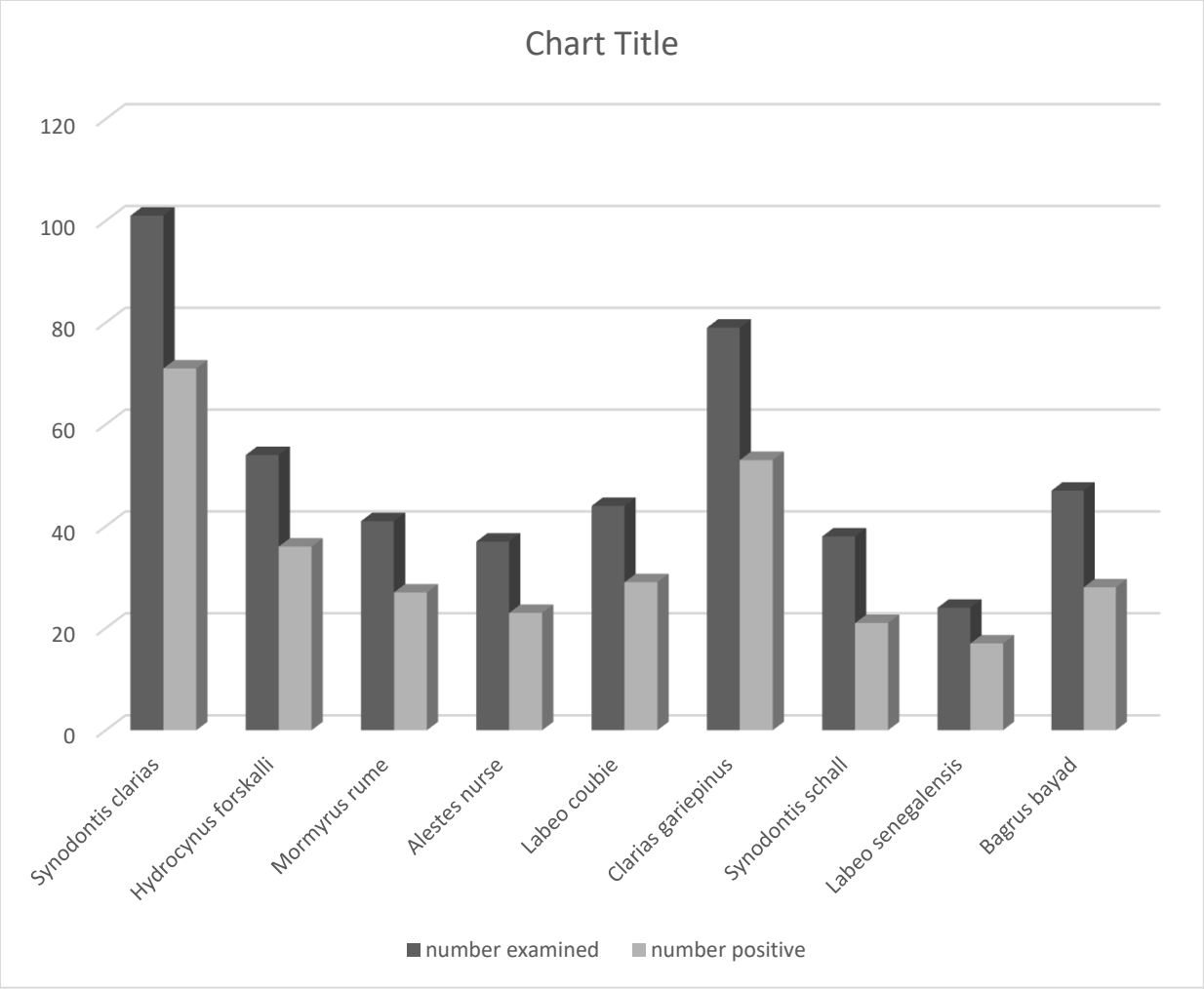

Fig. 1: Fish species examined and number found with parasites.

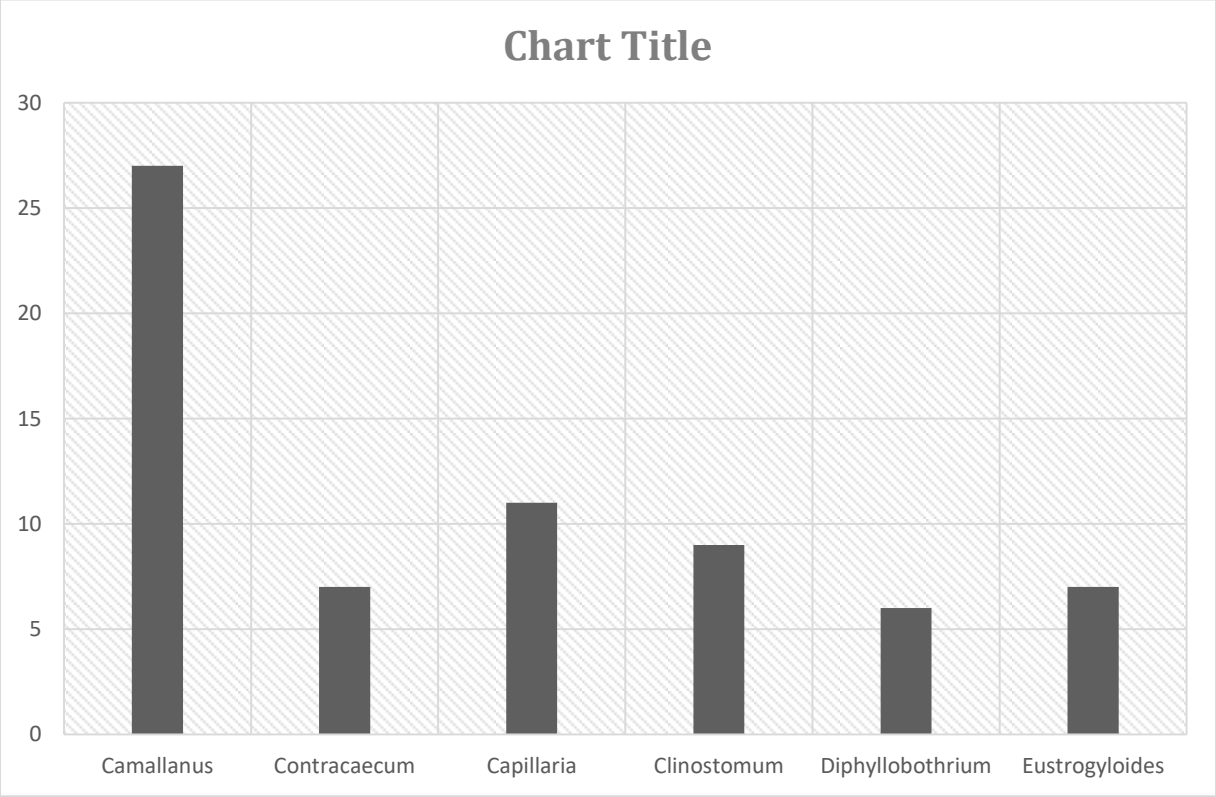

Fig 2: Occurrence of parasites in the stomach of fishes

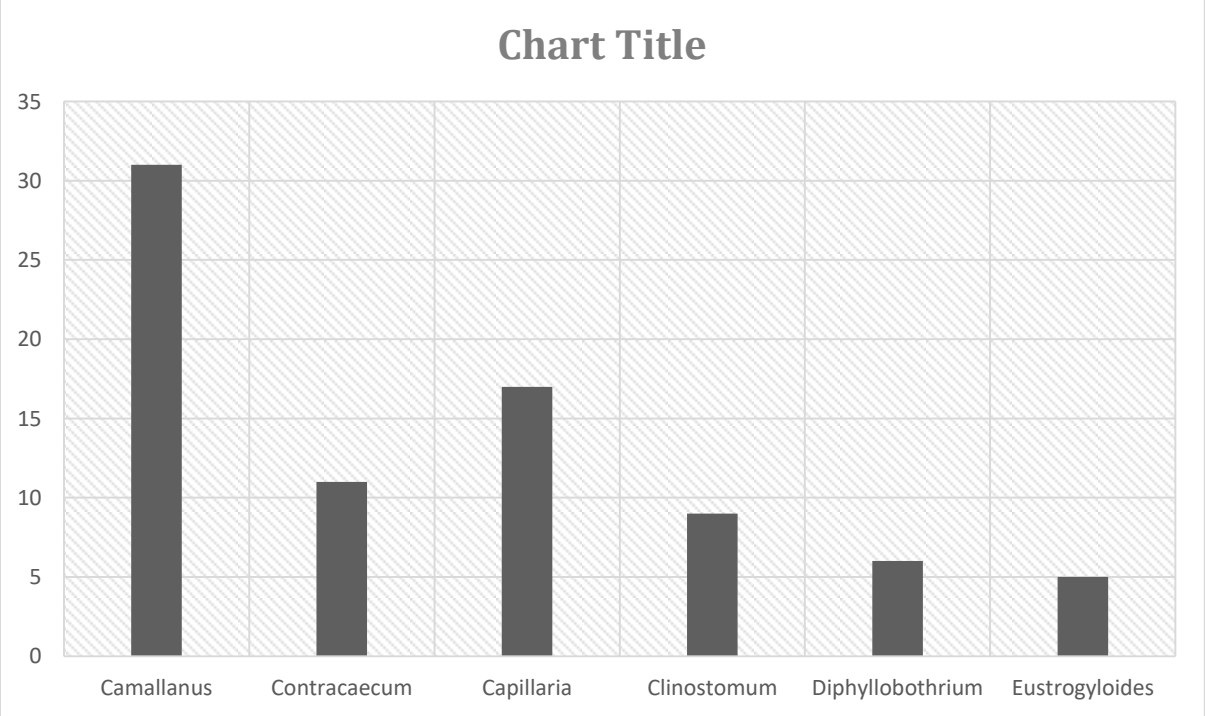

Fig 3: Occurrence of parasites in the intestine of fishes

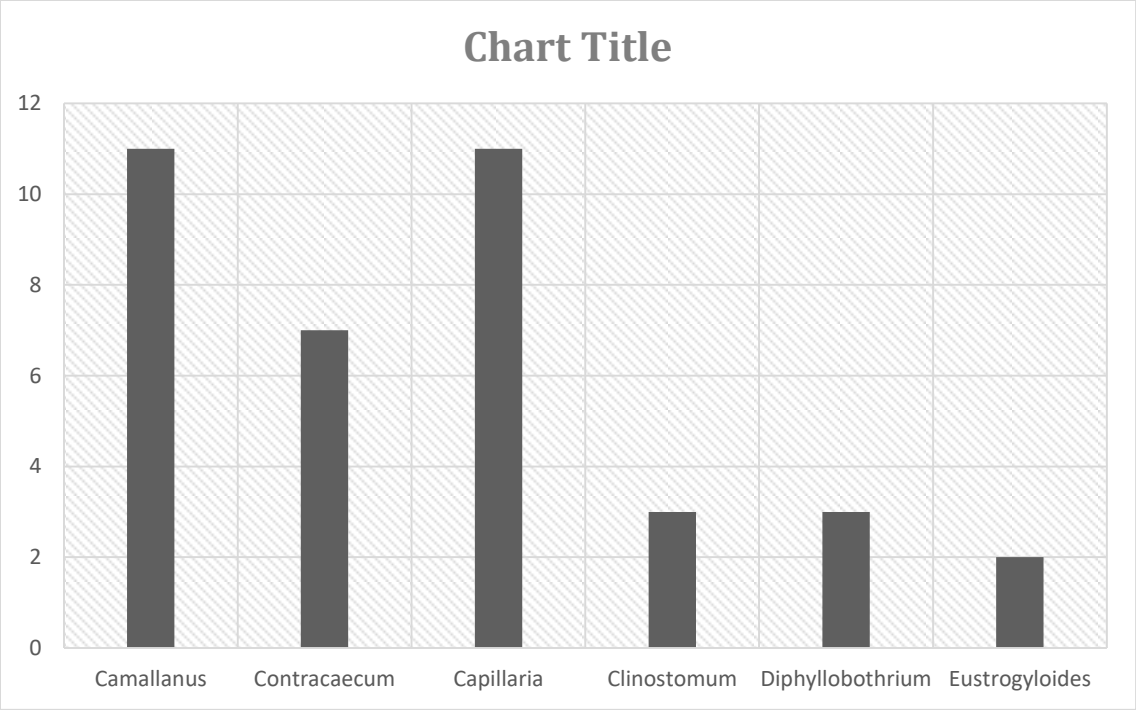

Fig 4: Occurrence of parasites in the esophagus of fishes

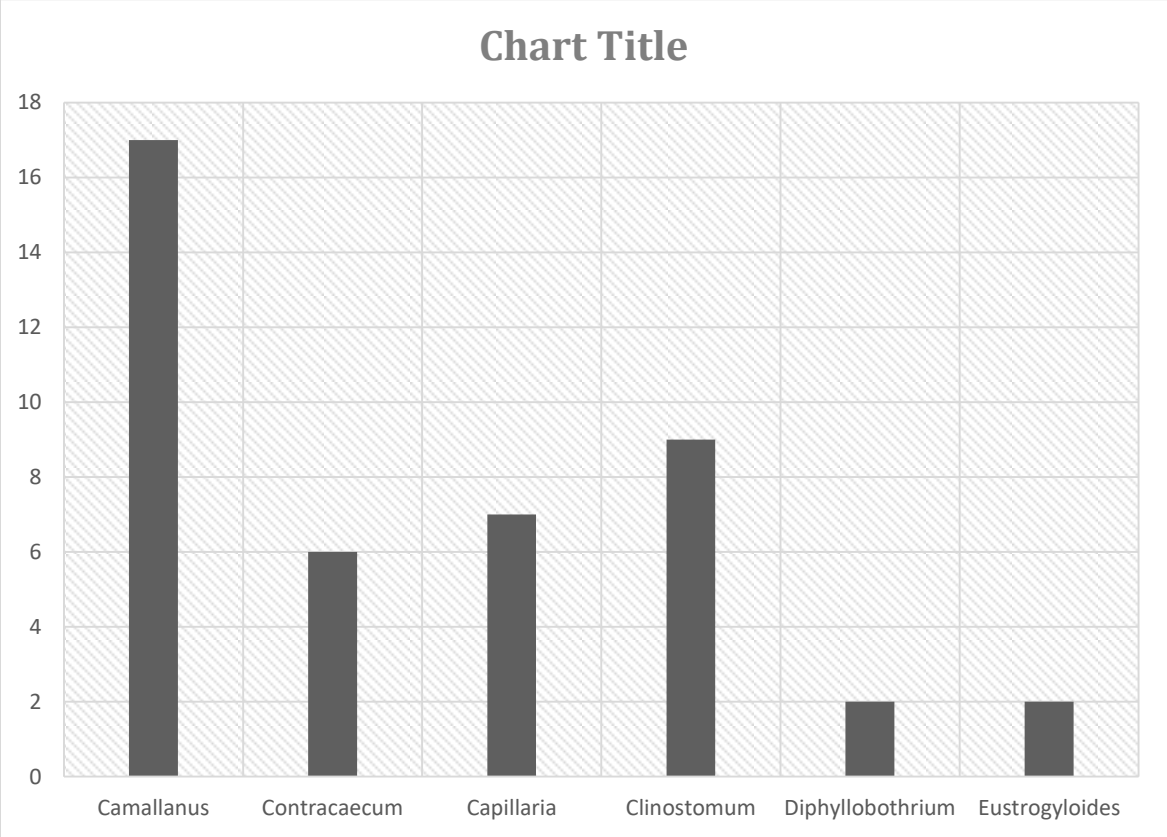

Fig 5: Occurrence of parasites in the rectum of fishes

DISCUSSION

The present study investigated the prevalence of gastrointestinal parasites in nine commercially important freshwater fish genera, *Synodontis clarias, Hydrocynus forskalli, Mormyrus rume, Bagrus bayad, Labeo senegalensis, Synodontis schall, Clarias gariepinus Labeo coubie,* and *Alestes nurse* purchased from major riverine markets in Makurdi, Benue State, Nigeria. The occurrence of gastrointestinal parasites in the examined fish species confirms that parasitism remains an important ecological and health-related factor affecting freshwater fisheries in the River Benue ecosystem. The recovery of nematodes, cestodes, trematodes, and acanthocephalans from the gastrointestinal tracts of the examined fishes is consistent with previous reports that identified these helminth groups as the predominant parasites infecting freshwater fishes in Nigeria and other tropical aquatic environments (Okita *et al.,* 2020, Omeji *et al.,* 2022, Haruna *et al.*, 2024).

The presence of infected fish in markets is not unexpected because most fish sold in Makurdi are sourced directly from the River Benue and adjoining freshwater bodies where environmental conditions favour the development and transmission of parasite infective stages. (Odoh *et al.*, 2019, Kolede and Skinsanya 2022). Freshwater ecosystems provide suitable habitats for intermediate hosts such as copepods, molluscs, annelids, and aquatic insects that play critical roles in the life cycles of many fish parasites. Consequently, fish become infected through ingestion of these intermediate hosts during feeding activities.

The predominance of nematodes among the recovered parasites agrees with findings reported in previous studies conducted in Makurdi and other parts of Nigeria where nematodes constituted the most abundant group of fish gastrointestinal parasites. Okita *et al.*(2020) reported that nematodes accounted for the highest proportion of helminth infections in freshwater fishes sold in Makurdi markets, followed by trematodes, cestodes, and acanthocephalans. Similar observations have been documented in studies from the Upper and Lower Benue River Basin, Lekki Lagoon, Jebba Lake, and Kaduna River, suggesting that nematodes are highly adapted to freshwater fish hosts in Nigerian aquatic ecosystems (Akinsanya *et al.*, 2008, Jumaid *et al.*, 2023, Collins *et al.*, 2025).

The high occurrence of nematodes may be attributed to their relatively simple transmission strategies, broad host range, and ability to exploit multiple intermediate and paratenic hosts. Species belonging to genera such as *Contracaecum*, *Procamallanus*, *Capillaria,* and *Eustrongylides* have frequently been reported in Nigerian freshwater fishes and are known to persist under diverse environmental conditions (Abubakar *et al*., 2024, Dikwa *et al.*, 2024, Atawodi *et al.,* 2025, Samuel *et al*., 2025). Their dominance in the present study may therefore reflect the ecological suitability of the River Benue system for maintaining parasite transmission cycles.

Differences observed in parasite prevalence among *Synodontis* and *clarias* may be explained largely by variations in feeding habits and habitat utilization. *Clarias* species are predatory piscivores that occupy higher trophic levels and consume smaller fishes and aquatic organisms. The phenomenon of parasite accumulation through trophic transfer has been widely documented in aquatic ecosystems and may explain elevated infection rates in predatory fish species (Odoh *et al.*, 2019) *Synodontis* species on the other hand are omnivorous bottom feeders that forage extensively on detritus, benthic invertebrates, insect larvae, molluscs, and organic debris. Such feeding behaviour exposes them to infective larval stages present in sediments and benthic intermediate hosts. Previous studies on *Synodontis clarias* from Lekki Lagoon revealed considerable gastrointestinal helminth infections associated with their benthic feeding habits (Oladipo *et al.*, 2019, Koledoye and Akinsanya, 2022, Atawodi *et al.*, 2025). Similar mechanisms may account for the infections observed in *Synodontis* specimens examined during the present study.

The stomach and intestine was identified as the principal site of parasite localization in the examined fishes. This observation agrees with previous investigations that recorded the intestine as the most heavily infected organ in freshwater fishes from Makurdi and other Nigerian aquatic systems (Okita *et al.,* 2020, Omeji *et al.*, 2022, Haruna *et al*., 2024). The intestine provides a favourable microenvironment characterized by abundant nutrients, suitable pH conditions, and extensive mucosal surfaces that facilitate parasite attachment and feeding.

The detection of zoonotic parasite groups among market fishes has important public health implications. Although most fish parasites are host-specific, some nematodes and trematodes possess zoonotic potential and may infect humans through consumption of inadequately cooked fish. Human anisakidosis, capillariasis, and other fish-borne helminth infections have been associated with the ingestion of infected fish products in different parts of the world (Odoh *et al.*, 2019, Inegbenosun *et al.*, 2025). The presence of such parasites in fish sold for human consumption highlights the need for effective fish inspection, proper cooking practices, and public awareness campaigns aimed at reducing the risk of fish-borne parasitic diseases (Okita *et al.*, 2020).

From an economic perspective, gastrointestinal parasites can adversely affect fish quality, growth performance, and market value. Infected fishes may also exhibit poor body condition and reduced consumer acceptability (Haruna *et al.,* 2024, Abubakar *et al.*, 2024, Dikwa *et al.,* 2024). Consequently, parasitic infections represent a significant constraint to fisheries productivity and profitability. The findings of the present study therefore have serious implications and relevance to fisheries management and aquaculture development within the Benue River Basin.

The findings of this study provide the current information on the parasitic fauna of *Synodontis clarias, Hydrocynus forskalli, Mormyrus rume, Bagrus bayad, Labeo senegalensis, Synodontis schall, Clarias gariepinus Labeo coubie,* and *Alestes nurse* species marketed in Makurdi. This is essential for understanding host–parasite interactions, identifying risk factors associated with infection, and designing effective control strategies. Overall, the prevalence of gastrointestinal parasites recorded among the examined fishes demonstrates that parasitic infections remain common in commercially important freshwater fishes sold in Makurdi and elsewhere in Nigeria. The observed patterns of infection were attributed to host feeding ecology, body size, and habitat characteristics. The predominance of nematodes and the concentration of parasites within the stomach and intestinal tract corroborate findings from previous studies (Jumaid *et al.*, 2023, Abubakar *et al.*, 2024, Collins *et al.*, 2025, Samuel *et al.*, 2025). Given the economic and public health significance of fish parasitism, continuous surveillance, improved fish handling practices, environmental management, and consumer education are recommended to minimize parasite transmission and ensure the safety of fish products intended for human consumption.

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