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Prevalence and intensity of parasitic fauna of selected fish species of river Taraba at Tella, Nigeria

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Abstract
Fish are exposed to various contaminants and environmental stressors in aquatic environments, making them susceptible to parasitic infections. This study aimed to assess the prevalence and intensity of parasitic infections in selected fish species of Taraba River at Tella, Nigeria. A total of 220 specimens of *O. niloticus*, *C. gariepinus*, *S. clarias*, and *S. nigrita* of varying lengths and weights were randomly collected from fishermen at different landing sites along the Taraba River between January and June 2024. Standard parasitological techniques were used in the study. The fish samples were examined, dissected, and the parasites were removed, identified, and counted. A total of six parasite species from eight genera were collected from the study area, with an overall parasite prevalence rate of 27.7. The study suggests that high levels of pollution can sustain parasite loads, which may impair fish performance and production. Therefore, pollution control and regular monitoring of water bodies should be encouraged.

Keywords: *Oreochromis niloticus, Clarias gariepinus, Syndontis clarias, Synodontis nigrita,* parasites

1. Introduction

Fish has a remarkable impact on the lives of many individuals and communities in almost all continents of the world, primarily as a major source of relatively cheap and affordable essential animal protein [1,2,3]. The fisheries sector contributes immensely to the nutritional security and food to about 200 million Africans and it also generates income for over 10 million others engaged in fish production, processing and trade [4,5]. However, fish parasites have enormously impacted on the fish thereby negatively impacting on profitability and also, a major cause of zoonotic diseases in many areas of the world [6,7,8].

In most parts of the world, fish production is mainly from the wild [9,10,11,12]. However, as the world's population grows, fish resources are being depleted at an increasing rate as a result of environmental degradation, over harvesting, water pollution and diseases, thus fish production could no longer meet the demand of the stakeholders [13,14]. Poor environmental conditions and pollution which often results in reduced immunity in fish and higher susceptibility to parasites and diseases are among the problems facing the fish sector [15,16].

Parasites across different aquatic habitats have infected fish species, inflicting injuries, which become a substrate to other opportunistic microorganisms reducing fish production as a result of the menace they cause [17,18]. Parasites have constituted a major problem confronting Fisheries subsector with pathological conditions that arise from their infection, with potentially serious consequences most especially in crowded conditions [19]. Furthermore, Studies have revealed rich parasitic fauna in freshwater fishes [20] ranging from ectoparasites to endoparasites [20] which affect fish health, growth and survival.

Parasites are prevalent in most ecosystems, with all free-living organisms potentially serving as hosts; in fact, parasitism is one of the most widespread lifestyles on Earth [21,22]. A significant concern is that parasites not only affect other animals but can also impact humans. Some parasites are zoonotic, meaning they can be transmitted from animals to humans. This transmission can occur when animals and humans coexist in close proximity, through the consumption of animal products, or by other means.

Oreochromis niloticus, *Clarias gariepinus*, *Syndontis clarias*, and *Synodontis nigrita* are among the most resilient, widely accepted, and highly valued fish species in the study area. Therefore, documenting research on parasites that may pose serious problems for these fish is crucial [23]. There is a growing recognition of parasitic diseases as a major factor negatively impacting fishing [24,15]. However, there is limited information on the parasitic status of fish families such as Cichlidae, Clariidae, and Mochokidae. This study aims to examine the parasitic fauna, its incidence, and prevalence in the study area, with the goal of identifying the parasitic load and assessing the correlation between infection, weight, and length.

2. Materials and Methods

2.1 The Study Area

River Taraba is situated at a latitude of 8°34'N and a longitude of 10°15'E, with Tella located at 8°24'N and 10°32'E (Fig.1and 2). The area surrounding River Taraba, covering approximately 100 square kilometers, has a population of about 14,326 people and an average elevation of 178 meters above sea level. The river originates from the Mambilla Plateau in the Sardauna Local Government Area of Taraba State and flows through the districts of Gashaka, Bukundi, and Gassol, which are part of the Gashaka, Bali, and Gassol Local Government Areas, respectively. Gassol's northern border is formed by the River Benue and River Taraba, with the latter flowing northward to join the River Benue.

Taraba State, like much of northern Nigeria, experiences both wet and dry seasons. The wet season typically lasts from April to October, with mean annual rainfall ranging from 1058 mm in the northern areas around Jalingo and Zing to over 1300 mm in the southern regions near Serti and Takum. The wettest months are August and September [25,26]. The dry season extends from November to March, with December and January being the driest months when relative humidity drops to around 15%. The mean annual temperature around Jalingo is about 28 °C, with maximum temperatures ranging between 30 °C and 39.4 °C, and minimum temperatures between 15 °C and 23 °C. The Mambilla Plateau exhibits climate characteristics typical of a temperate region [25,26].

Rainfall distribution and topography are the primary factors influencing vegetation patterns in Taraba State, which can be broadly classified into three types: Northern Guinea, Southern Guinea, and Mountain Grassland and forest vegetation [27,28]. The fish collection point for this study is located within the Northern Guinea savannah.

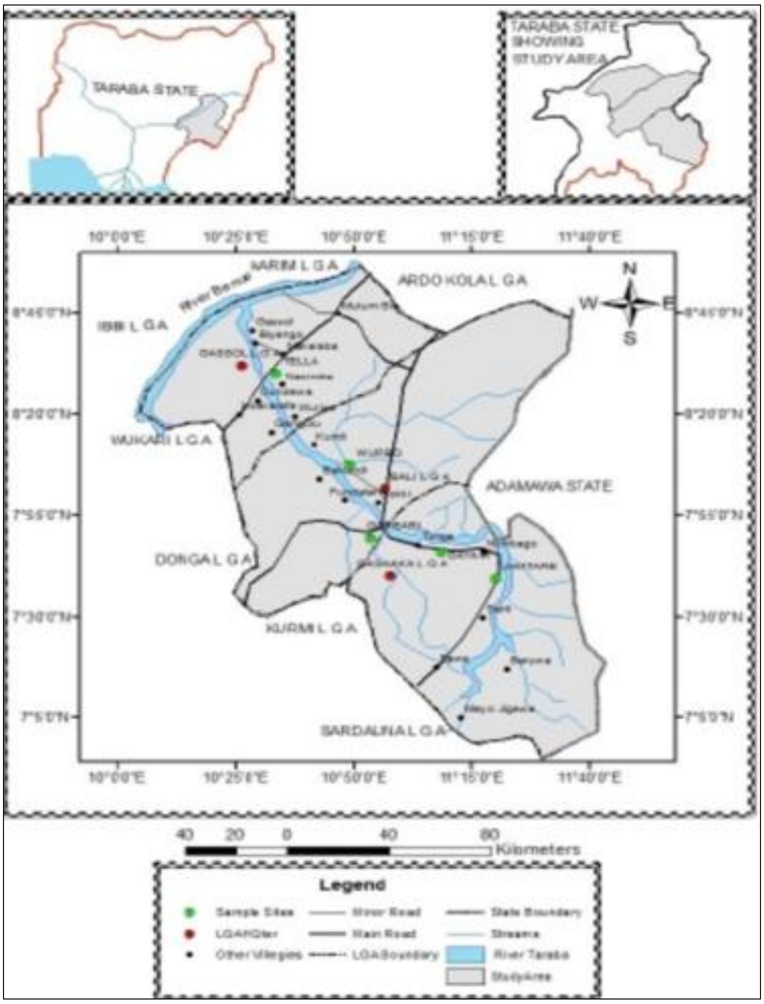

Fig 1: Map showing River Taraba

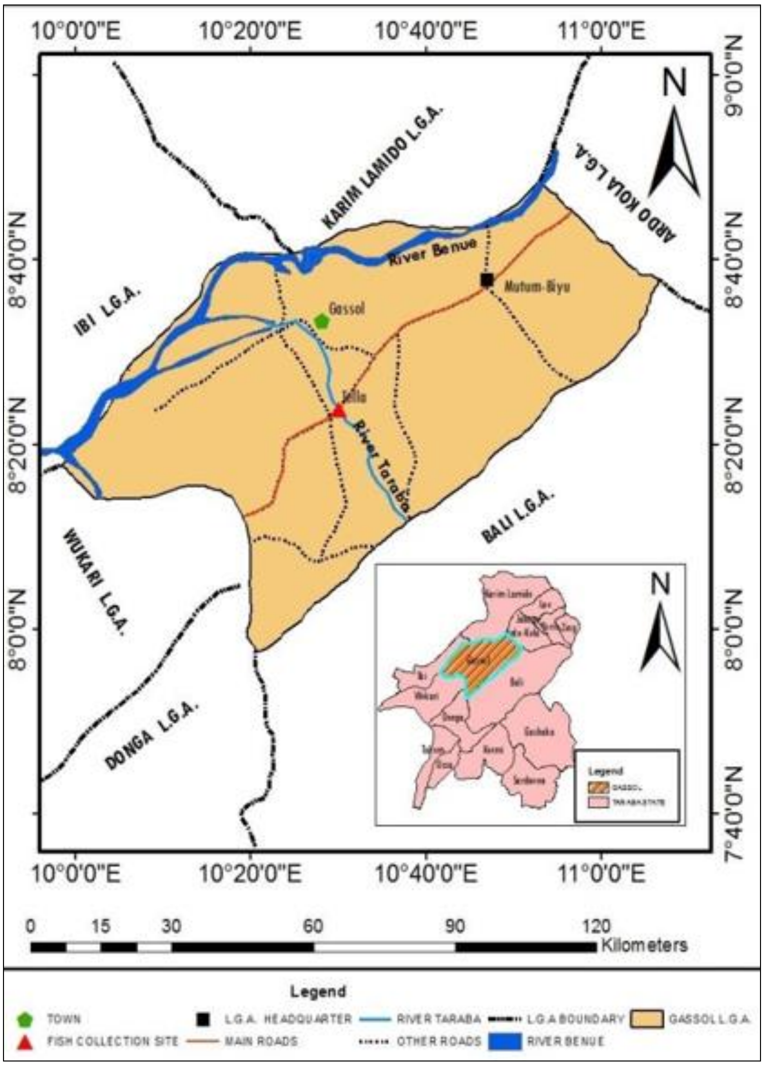

Fig 2: Map of Gassol Local Government Area showing site of fish collection

2.2 Collection and Identification of Fish Species

The fish species (*Oreochromis niloticus, Clarias gariepinus, Synodontis clarias,* and *Synodontis nigrita*) was purchased alive from the artisanal fishermen at the fish-landing site along River Taraba at Tella between January 2024 and June 2024. The fish were then placed in a water-filled plastic container and taken to the Biology laboratory of the College of Education Zing, Taraba State, Nigeria for parasitic examination. A total of 220 fish were collected and examined. Fish identification was commenced in the field. The fish species was identified using the keys described by Olaosebikan and Raji [29].

2.3 Examination of Samples for parasites

The external surfaces of the fish, including the skin and fins, were examined under a light microscope. The gills were removed and placed in separate Petri dishes, where they were inspected for parasites using a hand lens. Any parasites found were collected and fixed in buffered formalin for further processing and identification [30]. The fish was then dissected to expose the alimentary canal, which was examined for parasites as it is a region where food is most abundant for them. The gut was observed under a microscope at magnifications between 10X and 30X. The presence of worms was easily detected by their wriggling movement in the saline solution under the microscope. Identified parasites were counted, fixed, and preserved in 5% formalin. Representative samples were stained overnight with a weak solution of Erlich's haematoxylin for further analysis.

2.4 Statistical analysis

Parasite prevalence with respect to sex, size, seasons and parasite habitat(s) was carried out using chi-squared test. The analysis for parasitic infestation for finding the abundance and mean intensity was carried out by the following equations [31].

$$Prevalence\ of\ infection = \frac{Infected\ host}{Total\ host\ examined} \times 100$$

$$Abundance = \frac{\text{Total Number of individual of a parasite species}}{\text{Total Number of host examined}}$$

$$Mean\ intensity = \frac{\text{Total Number of individual of a parasite species}}{\text{Total Number of infested host}}$$

3. Results

Six classes of parasites, namely *Parasitic Crustaceans*, *Monogenean Trematodes*, *Digenean Trematodes*, *Nematodes*, *Dinoflagellate and Ciliate* were recorded from gills, skin and internal organ of fish species to include *Oreochromis niloticus, Clarias gariepinus, Synodontis clarias* and *Synodontis nigrita* of River Taraba at Tella. A total number of two hundred and twenty (220) of fish were sampled for parasitic investigation. However, a total number of 61 sampled fish with prevalence of 27.7% were infected (Table 1).

Table 1: Fish species obtained from River Taraba

Fish species	English Name	Local Name (Hausa)	N. E	N. I	Prevalence
Family Cichlidae					
Oreochromis niloticus	Nile Tilapia	"Karpasa"	65	15(24.60)	23.0
Family Clariidae					
Clarias gariepinus	Catfish	"Tarwada"	90	21(34.42)	23.3
Family Mochokidae					
Synodontis clarias	Updown Catfish	"Kurungu"	65	25(40.98)	38.4
			220	61 (100.0)	27.7

KEY = N.E: Number Examined; N.I: Number Infected; NB: Data in Parenthesis are in Percentages

The infection parameters of the parasites in their respective fish hosts are shown on Table 2. It shows that the overall prevalence of the parasites in the infected fishes was 27.7% and 146 parasites were recovered. A total of eight parasite species were recovered from the different parts of the fish species examined. The parasite fauna consisted of one species of Parasitic Crustaceans, namely *Ergasilus sarsi,* 3 species of nematodes to include *Eustrongylides sp, Procamallanus sp* and *Camallanus sp*, one species of Monogenean Trematodes, Digenean Trematodes, Dinoflagellate and Ciliate respectively. Parasitic crustaceans were only found in the *Clarias gariepinus* species while Nematodes where found in all the three species of fish studied.

Table 2: Prevalence and Abundance parasites in Fishes of River Taraba

Class of Parasite	Parasite species	Fish Hosts	N.E	N.I	N.P.R	PREV	INT.	ABUN
Parasitic Crustaceans	*Ergasilus sarsi*	*Clarias gariepinus*	90	08 (13.11)	06 (4.10)	0.8	1.54	0.04
Monogenean Trem.	*Dactylogyrus sp*	*Oreochromis niloticus*	65	09 (14.75)	13 (9.90)	1.3	1.42	0.06
Digenean Trematodes	*Posthodiplostonum sp*	*Oreochromis niloticus*	65	05 (8.19)	19 (13.01)	0.7	1.31	0.10
Nematodes	*Eustrongylides sp*	*Synodontis claias*	65	08 (13.1)	19 (13.0)	1.2	2.95	0.27
	Procamallanus sp	*Clarias gariepinus*	90	08 (13.11)	13 (9.90)	0.8	1.08	0.09
	Camallanus sp	*Clarias gariepinus*	90	06 (9.83)	32 (21.91)	0.6	3.20	0.07
		Synodontis clarias	65	08 (13.1)	31 (21.22)	1.2	4.86	0.44
Dinoflagellate	*Piscinoodinium sp*	*Clarias gariepinus*	90	04 (6.55)	04 (2.73)	0.4	1.00	0.02
		Synodontis clarias	65	04 (6.55)	06 (4.10)	0.6	1.54	0.07
Ciliate	*Potoopalina symphysodinium*	*Clarias gariepinus*	90	01 (1.63)	03 (2.05)	0.1	1.00	0.02
			220	61 (27.7)	146			

KEY: N.E – Number Examined; N.I. – Number Infected; NPR – Number of Parasite Recovered; PREV – Prevalence, INT – Intensity of Infection; ABUN –Abundance; NB: Data in Parenthesis are in Percentages

4. Discussion

Information on parasitic infestations in fish is closely tied to fish health and the understanding of ecological issues [32,26]. The five parasitic groups identified in this study—Parasitic Crustaceans, Monogenean Trematodes, Digenean Trematodes, Nematodes, and Ciliates—are consistent with observations made by Bingari [26], Ogaba [33] in the River Taraba. These findings also align with the study by Ashade *et al* [34] on parasites of selected fish species, including *O. niloticus*, from three different water bodies in Lagos State, Southwest Nigeria.

The low parasite abundance and mean parasite intensity in fish from the River Taraba at Tella could be attributed to the water current, which likely reduces the frequency of host-parasite contact, leading to a lower prevalence of infestation. It is important to note that infection rates can vary significantly across different regions, which may be influenced by factors such as the availability of intermediate hosts and the susceptibility of definitive hosts, among others [15]. Additionally, the poor condition of the river at the study area, as indicated by the water quality index may also play a role [26,33]. The overall prevalence rate of 27.7% observed in River Taraba is noted to be lower than that the studies conducted by Wanmi *et al*., [35] in a study in Jalingo found that 48.75% of fish were infected with gill parasites, including 47.5% infected with *Macrogyrodactylus congolensis* and 7.5% with *Henneguya* sp. Another study by Omeji *et al*., [36] from Upper River Benue reported an even higher prevalence of 58.5%, with significant infestations in both *Bagrus bayad* and *Protopterus annectens*. However, it was within the range of 27.7% as reported by Abiyu *et al*. [37] for species caught in the southwestern part of Lake Tana, Central Gondar, Ethiopia. Thus, prevalence appears to vary greatly depending on the locality, which may be due to factors like endemicity, availability of intermediate hosts, and the susceptibility of hosts to infection [31,15]. The relatively poor parasite fauna could largely be explained by the infrequent contact between fish and the infective stage of the parasites [15].

5. Conclusion

Fish parasitism poses a significant threat to fish production, with high levels of pollution often sustaining parasite loads, as demonstrated in this study. This can lead to diminished fish performance and reduced production. Therefore, pollution control measures and regular monitoring of water bodies should be strongly recommended.

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