



Assessment of Fish Parasites and their Predisposing Factors in Two Fresh Water Bodies in Ogbia, Bayelsa State, Nigeria.

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ABSTRACT

Fish is a substantive element for the existence of man. It constitutes a significant ingredient of human meal particularly for its protein content. However, parasitic infections on fish post threat to fish life and potential consumers globally. This investigation seeks to examine fish parasites from two fresh water bodies, Kolo creek and Ekoli River and determine visible factors increasing fish vulnerability to the threatening parasites and infections. A total of 112 fish samples were evaluated using the normal saline and preparation of blood smear respectively. The parasites were identified using the pocket naturalist guide. Parasite infestation load reported was 51.0 % with the Kolo creek have 28.6 % and 22.4% observed in Ekoli River respectively. The most prevalent parasite noticed was *Ichthyophirus* and *Ichthyobodo* species having actual incident of 18.0% each. However, the most vulnerable fish was *Claris auguillaris* (36.8 %). The study established that fish vulnerability is related to its food chain affiliation with bottom dweller having increasing risk. The study further suggests that human unhealth attitude toward the fresh water ecosystem can intensify parasitic load on fish. However, individuals with habit of consuming inadequately prepared fish food are at risk of fish to man infections.

Keywords: Ekoli River, Fish, Kolo creek, Parasite, Vulnerable, Water

1.0 INTRODUCTION

Fish is a substantive element for the existence of man. It constitutes a significant ingredient of human meal, particularly for its protein content. Fish remain the primary source of omega-3- fatty acid and micronutrient (Junaid *et al.*, 2023; Tesfaye *et al.*, 2023; Sadauk *et al.*, 2023; Bichi & Ibrahim, 2010), which form a basic requirement for growth and repairs of our cells in human body. The significance of fish in supporting human existence is beyond consumption as food, the act of fishing present a means of survival to several household in Ogbia, Individuals trading on fish also pursue it as a sole source of income in the area. Fishing and fish trading enhances rural and global economy (Shafiq *et al.*, 2023; Tesfaye *et al.*, 2023; Ito, 2017) and should be encouraged. By their way of life, fish help to keep up balance in the aquatic ecosystem and uphold water quality, serving as a primary consumer and secondary producer. Literature have shown that fish can be employed as a therapeutic ingredient in pharmacological industries (Ibrahim *et al.*, 2024; Tesfaye *et al.*, 2023; Ogbu *et al.*, 2019; Moravec & Justine, 2014). However, the sustainability of fish and its quality is threatened by parasitic invasion, putting fish consumers at risk of not only losing fish but having high chances of contacting parasitic infections.

Organisms of parasitic status constitute essential component of biodiversity, and they portray the ability to affect their host including fish in a negative manner. Parasitic invasion adversely impacts on the behaviour and the entire health status of fish. Parasitic infestation on fish can practically inflict physical deformities and

affect their market value (Shafiq *et al.*, 2023; Osimen & Anagha, 2020; Sadauki *et al.*, 2023; Itoo, 2017; Uruku & Adikwu, 2017; Justine *et al.*, 2012). Junaid *et al.*, 2023 reports that abnormality in fish resulting from parasitic infections can prompt economic losses by means of direct fish mortality, reduction in fish growth and high treatment cost. Parasitic invasion in fish can result to deformation of fragile organs (Osaji-Nwafili *et al.*, 2023; Banyigy *et al.*, 2022). According to Sadauki *et al.* (2023) helminths attack on fish can modify the organ developmental sequence and can lead to fish sterility. Parasite infestation of fish can commonly increase stress which in many cases can lead to increase cortisol level and affects immune functioning in fish species (Sadauki *et al.*, 2023; Osaji-Nwafili *et al.*, 2023; Zabel. *et al.*, 2023; Justine *et al.*, 2010) and physically render fish unfit for human consumption. According to Ibrahim *et al.* (2024) fish are vulnerable to ecto and endo parasites with detrimental effects on their development.

Studies on fish parasites are essential as they are important in aquaculture and fisheries, perpetrating economic losses. Nevertheless, continual studies are necessary to identify important factors predisposing fish to parasitic vulnerability and develop strategies on fish disease management. Fish are implicated as external agent that can aid parasite transmission to man. According to Junaid *et al.* (2023) fish parasite and diseases constitute important challenges facing the fishery world as all fish species are susceptible to several parasitic pathogens depending on fish species and physical properties of aquatic ecosystem wherein the fish inhabits. Parasitic invasion of fish impact on its

propagation and development particularly in man controlled aquatic environment. Fish rearing in human controlled aquatic system field parasite dispersal (Tesfaye *et al.*, 2023; Siuila *et al.*, 2020) and man gets trapped on consumption of raw or inadequately cooked parasite infected fish. Tesfaye *et al.* (2023) reports that fish born zoonotic infections are significant and can infect human on consuming raw or poorly cooked fish. Parasites in fish could display environmental implications as it can alter ecosystem balance in biodiversity and impact on human beings in regards of economic loses on fish farmers and traders. Nevertheless, increase reliance on fish for protein has increases the necessity for fish cultivation and have prompt investigations on fish parasite in attempt to proffering technique to prevent parasitic infections of fish and ameliorate natural protein source. Therefore, this study is aimed at assessing parasitic pathogens affecting fresh water fish and identifying factors predisposing fish to parasitic invasion in fresh water bodies.

2.0 MATERIALS AND METHODS

This study was conducted in two randomly selected fresh water bodies viz Kolo creek and Ekoli River in Ogbia, Bayelsa state. Ogbia is located in Ogbia Local Government Area of Bayelsa State. Ogbia is surrounded with swamps, creeks and rivers with fishing being a way of life in the area. Ogbia is located at latitude 14.493919 and longitude 8.367778 on GPS coordinates. The inhabitants are typical fisher men with the area experiencing two seasons annually viz dry and wets.

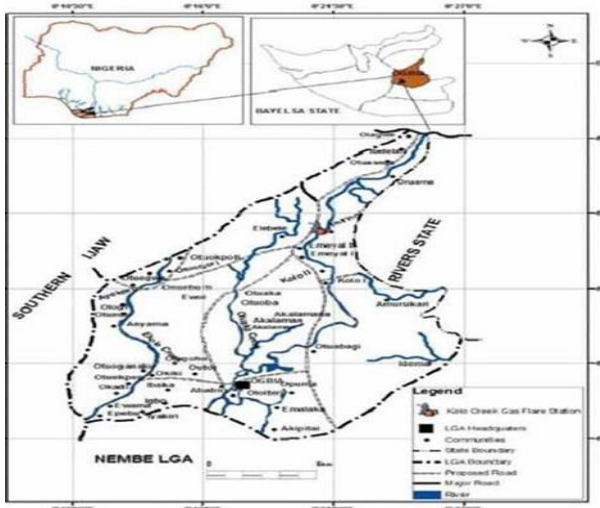


Figure 1: Map of Ogbia

2.1 FISH COLLECTION

2.1 Fish Collection

In this study, a total of 112 fish from four genera were collected along the Kolo creek and Ekoli River between June, 2024 and February, 2025. The collection of fish was aided by the fisher men catching fish within the two

sampling locations. The collected fish were properly labelled and conveyed to the laboratory in polythene bags for bioassay.

2.2 LABORATORY BIOASSAY

In the laboratory, the freshly fetched fish was killed and the length and wet weight were assessed using a metre rule and electronic weighing balance respectively. The sexes of the fish samples were noted on physical observation of the presence of nipple-like anatomical structure usually found at the back of the anus as recorded in Osaji-Nwafil *et al.* (2023). The intestines and gills of the freshly killed fish were removed into separate Petri dishes with normal saline and observed under electronic microscope with x4, x10 objectives. Blood smear was also carried on fish blood for parasitaemia.

2.3 IDENTIFICATION OF FISH

All the fish were identified to species as documented in Junaid *et al.* (2023) and Osaji-Nwafil *et al.* (2023); the pocket naturalist guide (2020) was also employed in the identification of fish.

2.4 DATA ANALYSIS

The result in this survey was presented in tables and charts. However, the data were analysed on SPSS using analysis of variance to test for significant level on fish vulnerability at $p < 0.05$, and the independent t test was used to test significant of parasite prevalent between the sampled fresh water sites.

3.0 RESULT

3.1 FISH POPULATION SAMPLED AND PARASITE LOAD

In this study, a total of 112 fish comprises of *Citharinus citharus*, *Clarotes caticeps*, *Claris augllaris* and *Oreochromis aureus* from the Kolo creek and Ekoli River. In Kolo creek, the fish sampled was 51 (54.5%) and 61 (45.5%) fish was sampled from Ekoli river respectively. Laboratory assessment revealed infective rate of 51.0% across the two sampled fresh water bodies. Nevertheless, the infective load was 28.6% at the Kolo creek and 71.4 % infective load was seen at the Ekoli River respectively.

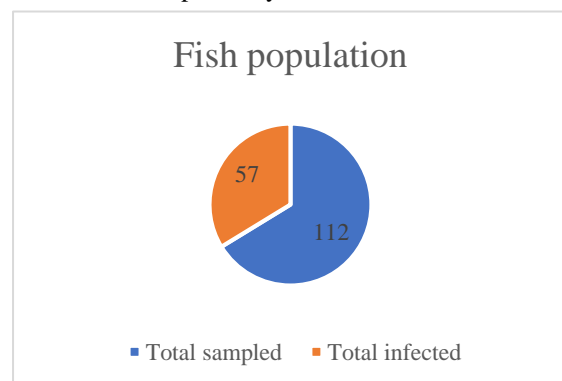


Figure 2: Infective rate of fish in Ogbia**TABLE 1: Parasite Infective Load Of Fish Per Location**

Location	Number sampled	Number infected	Percentage infected
Ekoli River	51	32	28.6
Kolo creek	61	25	22.4
Total	112	57	51.0

The fish species sampled in this study were *Citharinus citharusi* 27 (24.1%), *Clarotes caticeps* 20 (17.8%), *Claris auguillaris* 35 (31.3%) and *Oreochromis aureus* 30 (26.8%) respectively. Among the *Citharinus citharusi* 27 (24.1%) sampled in this study, 8 (25.0%) and 4 (16.0%) were infected with parasites from Kolo creek and Ekoli River respectively. The number of *Clarotes caticeps* 20 (17.8%) collected from the Kolo creek and Ekoli River had 4 (12.5%) and 2 (8.0%) infected respectively. For the *Claris auguillaris* 35 (31.3%) fetched in this study, 10 (31.3%) and 11 (44.0%) were parasitized from the Kolo creek and Ekoli River respectively. *Oreochromis aureus* 30 (26.8%) sampled had 10 (31.3%) infected from Kolo creek while 8 (32.0%) from Ekoli river were also infected with parasites respectively.

3.2 The Fish Species Sampled And Parasite Vulnerability

Table 2: Fish Species Sampled And Parasite Infectivity In Kolo Creek And Ekoli River

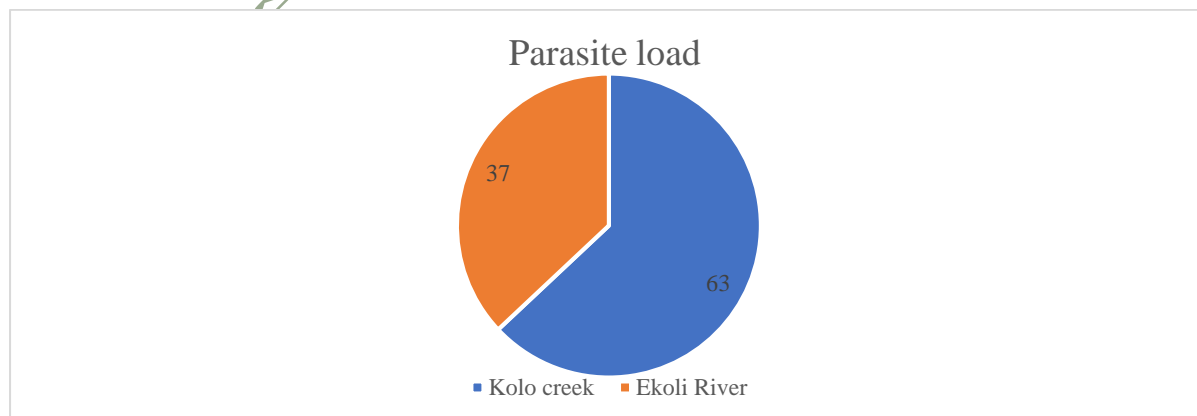
Fish species	Kolo creek		Ekoli River		Total infected (%)
	No sampled (%)	No infected (%)	No sampled (%)	No infected (%)	
<i>Clarotes laticeps</i>	13 (25.5)	8 (25.0)	14 (23.0)	4 (16.0)	12 (21.0)
<i>Cithariuns citharus</i>	10 (19.6)	4 (12.5)	10 (16.4)	2 (8.0)	6 (10.5)
<i>Claris auguillaris</i>	15 (29.4)	10 (31.3)	20 (32.8)	11 (44.0)	21 (36.8)
<i>Oreochromis aureus</i>	13 (25.5)	10 (31.3)	17 (27.9)	8 (32.0)	18 (31.6)
Total	51 (45.5)	32 (28.6)	61 (54.5)	25 (22.3)	57 (51.0)

3.3 Parasite Species Implicated In The Study

The parasites species implicated in this study were *Ichthyophirus* species, *Strongyloides* species, *Clinosstomum* species, *Ichthyobodo* species, *Capillaria* species, *Entamoeba* species, *Coccidia*, *Piscinoodium*, *Babesiosoma* species, and *Trypanosoma* species. These fish parasites were reported across the Kolo creek and Ekoli River respectively. The highest parasite load in this study happened at the Kolo creek.

Table 3: Parasite Species Implicated In The Study

Parasite	Kolo creek (%)	Ekoli River (%)	Total (%)
<i>Ichthyophirus</i>	14 (20.0)	6 (14.6)	20 (18.0)
<i>Strongyloides</i>	9 (12.9)	3 (7.3)	12 (10.8)
<i>Clinosstomum</i>	0	1 (2.4)	1 (0.9)
<i>Ichthyobodo</i>	7 (10.0)	13 (31.7)	20 (18.0)
<i>Capillaria</i>	15 (21.4)	3 (7.3)	18 (16.2)
<i>Entamoeba</i>	3 (4.3)	0	3 (2.2)
<i>Coccidia</i> ,	6 (8.6)	9 (22.0)	15 (13.5)
<i>Piscinoodium</i>	7 (10.0)	1 (2.4)	8 (7.2)
<i>Babesiosoma</i>	3 (4.3)	5 (12.2)	8 (7.2)
<i>Trypanosoma</i>	6 (8.4)	0	6 (5.4)
Total	70 (63.0)	41 (37.0)	111 (100)

**Figure 3: Parasite load in Kolo creek and Ekoli Rivers**

3.4 Parasite Infectivity In Relation To Fish Part Infested

Fish bio-assay in this study, revealed parasite inhabitation in the gills, intestine and blood of fish respectively. Blood parasites were slightly low

Table 4: FISH PART INHABITED BY PARASITES

Fish parasite	Gills (%)	Intestine (%)	Blood (%)	Total (%)
<i>Ichthyophirus</i>	3	17	0	20
<i>Strongyloides</i>	0	12	0	12
<i>Clinosstomum</i>	0	1	0	1
<i>Ichthyobodo</i>	4	16	0	20
<i>Capillaria</i>	6	12	0	20
<i>Entamoeba</i>	0	3	0	3
<i>Coccidia</i>	10	5	0	15
<i>Piscinoodium</i>	8	0	0	8
<i>Babesiosoma</i>	0	0	8	8
<i>Trypanosoma</i>	0	0	6	6
Total	31	66	14	111

3.5 Parasite Community Composition

The fish parasites recovered in this study were grouped into three animal taxa, viz protozoa, Nematoda and trematodes. The total protozoa reported was 80 (72.1 %) and nematodes were 30 (27.0) while trematode was 1 (0.9 %) respectively.

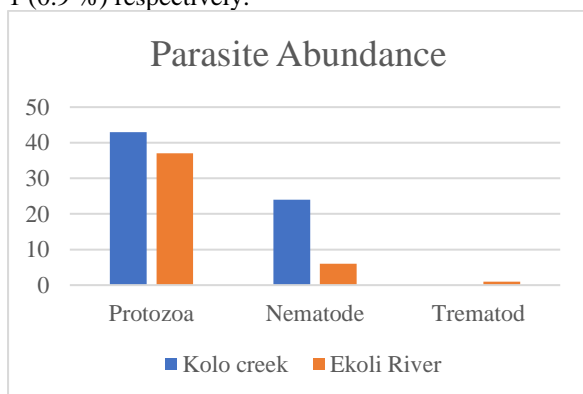


Figure 4: Parasite Community Composition Reported

4.0 DISCUSSION

The assessment of fish parasites and its predisposing factors are necessary in Ogbia kingdom. This is because fishing and fish consumption is a way of life in the locality with about 85% of the total inhabitants been fisher men and women. However, the vulnerability of eating inadequately cooked fish and other food is becoming a norm among the people of Ogbia couple with no scientific data on fish to man infections. Therefore, this study evaluates parasitic pathogens of fish and its predisposing factors from two fresh water bodies (Kolo creek and Ekoli river) in Ogbia.

Results in this study revealed that fish species inhabiting the waters of Ogbia are vulnerable to infections of parasitic pathogens. This observation is indicative that people relying on fish fetched from the Kolo creek and Ekoli River are at risk, particularly in cases of consumption of inadequately cooked fish.

The study samples 112 fish from Kolo creek and Ekoli River and recorded parasitic infectivity rate of 51 %, reporting 28.6 % in kolo creek and 23.3 % in Ekoli

River respectively. The rate of parasitic load as observed in this study can be ascribed to the prevailing water properties which can be connected to contamination due to unhealthy use of the water bodies as refuse dumpsite and direct defecation as in the case of Kolo creek and engine oil spill contamination due to dredging operations as in the case of Ekoli River. However, parasite infectivity rate in relation to sampled location was not statistically significant, $p > 0.05$. Onyiah and Aguz (2018) reports that activities that tend to alter the properties of water can affect fish and other aquatic animals and increases disease vulnerability. The parasitic load recorded in this study was relatively high. Nevertheless, it was lower than 92.3 % and higher than 31.0 % recorded in Junaid et al. (2023) and Osaji-Nwafili et al., 2023 respectively. The variation as seen in these investigations can be imputed to the nature of the fresh water body evaluated and fish species prevalent in the sampled aquatic ecosystem.

The most susceptible fish species reported in this study were *Claris aguilarius* (36.8 %) and *Oreochromis aureus* (31.6%) respectively. The high susceptibility notice in *Claris aguilarius* and *Oreochromis aureus* can be ascribed to fish food chain of affiliation and the ecological functions of the fish species in the aquatic ecosystem. Junaid et al. (2023) reports that fish feeding technique constitute a significant factor influencing fish vulnerability to parasitic pathogens in the aquatic ecosystem. *Citharius citharus* (6.0%) was least infected in this study. This observation is indicative that *Citharius citharus* exhibit restricted migration in the aquatic habitat on the thought that it can easily fall prey of much bigger fish due to its small size, and it only displays when it assumed to have cool atmosphere within the habitat void of predatory species. This life pattern reduces its chances of catching infectious parasites.

Fish parasitic pathogens implicated in this study were *Ichthyophirus* species, *Strongyloides* species, *Clinosstomum*, *Ichthyobodo* species, *Capillaria* species, *Entamoeba* species, *Coccidia* species,

Piscinoodium, Babesiosoma, Trypanosoma with Ichthyophirus species (18.0%) having the highest prevalence. This observation is in conformance with Onyish and Aguz (2018), Odoh et al. (2019) and Junaid et al. (2023). This display is indicative that fish species inhabiting the aquatic ecosystem in Nigeria are vulnerable. The scenario in this study can be imputed to the improper use of the water bodies by water coast inhabitants with no regard for the detriment of their actions. The distribution of parasites across the sampled water bodies with relatively dissimilar ecological properties suggest parasites diversity and ability to adapt and propagate without restrictions at all conditions.

The skeletal dredging operations observed at Ekoli River, suggests influence on the behaviour of fish which prompt restricted migration and reduces chances of falling prey to parasitic pathogens and reduces infection rate. However, human attitude regarding the use of the creek provided a suitable platform for parasite to thrive, making fish highly vulnerable. The present of Strongyloides and Entamoeba species which are parasites often reported in human is indicative that fish consumers in Ogbia are at risk of serious infections of public health importance.

Parasite taxa reported in this study were protozoa (72.0 %) followed by nematodes (27.0 %) and the populations of trematodes (0.9 %) was relatively negligible. The high prevalence of protozoa in this study suggests protozoal suitability in adapting survival strategies in the aquatic environment. This opinion is in adherence with Siuila et al. (2020) and Ogbu et al. (2019).

Significant factors predisposing fish to parasitic infestations as seen in this study was the unhealthy use of the water bodies by the inhabitants along the fresh water coast. Fish view waste emptied into their habitant as food; however, these waste materials in many cases are already contaminated with parasite which on consumption by fish complicate health issues. In the other scenario, these waste prompt alteration on the physico-chemical properties of the water which directly impact on fish health in a negative manner. For instance, refuse can modify water temperature and pH and can display effects on fish immunity in favour of parasitic invasion. Onyighi and Aguzie (2018) reports that increases in water temperature emanating from unhealthy use of the water always show negative effects on fish immune status and increases their vulnerability to parasitic infections.

The food chain of affiliation of fish can constitutes an important factor increasing its susceptibility. For instance, *Claris agullaris* which mainly rely on spineless bottom residing animals as food reported the

most parasitic load. This expression as seen in this study is suggesting that fish prey, inhabiting the benthic zone of the fresh water ecosystem are significant viable host of microbes pathogenic to fish. Ito (2017) and Osaj-Nwafili et al (2023) opined that invertebrate which are fish feed can be infectious in the gut of a viable definitive fish host.

5.0 CONCLUSION

Fish are vulnerable to parasitic pathogens in the aquatic ecosystem. The feeding pattern of fish and human unhealth attitude toward the aquatic ecosystem are significant variables increasing fish susceptibility to parasitic pathogens in fresh water habitant. Parasitic pathogens flourish at favourable atmosphere and can parasitize animals in the aquatic ecosystem including fish at all cost.

6.0 RECOMMENDATION

The public health sector should ensure rural enlightenment on the health risk of emptying refuse and liquid waste of all kinds into the water ecosystem. Individuals should ensure adequate cooking of fresh water food including fish before consumption to avoid the spread of fish to man parasitic disease.

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