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# *Statistical Evaluation Of The Link Between Intestinal Helminth Parasites And Sex, Weight And Length Of Clarias Gariepinus In A Coastal Community In Okitipupa Local Government Area, Ondo State*

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**Abstract – This study was conducted to determine the prevalence of gastrointestinal helminth parasites in Clarias gariepinus with the view of quantifying its helminthic burden of Clarias spp in Okitipupa. The study was carried out in three areas in Okitipupa, Nigeria, between the months of April and August 2018. A total of 83 live fishes (Clarias gariepinus) which includes 28 males and 55 females were randomly purchased from local fishermen and were subjected to examination for gastrointestinal helminth parasites. The lengths and weights of the fishes were measured prior to dissection and the parasites recovered were identified. Results indicated that 56 of the examined fishes were infected with various species of helminth parasites, giving a prevalence of 67.5%. Parasites were identified as Procamallanus laevionchus (32.5%), Rhabdochona congolensis (18.1%), Polyonchobothrium clariae (10.8%), Allocraedium species. (3.6%) and Heterophyid flukes (2.4%). The highest prevalence was recorded for nematodes (50.6%) followed by cestodes (10.8%) and trematodes (6.0%). Worthy of note, was the recovery of Heterophid flukes in this study which have not been previously reported in Nigeria and pose a great zoonotic threat. It was observed that fishes of standard length range of 20- 30cm (82.4%) were more infected than those of 30-40cm (65.0%) and 40-50cm (61.5%). The highest prevalence of infection (78.6%) was recorded in fishes with body weight of 500-600g while the lowest (58.8%) was recorded in fishes with body weight of 600-700g. The males had higher percentage prevalence (67.9%) than the females (67.3%). The result of the study indicated that the association ($P<0.05$) between the prevalence of infection, sex, length and weight of the host was not statistically significant ($\chi^2$= 0.00289, 2.24 and 1.55; degree of freedom= 1, 2 and 5 respectively). The helminths recovered were found to parasitize the stomach and intestinal lumen, the latter being more affected.**

**Keywords – Clarias gariepinus, Gastrointestinal helminths, Length, Prevalence, Sex, Weight,**

## I. INTRODUCTION

Fish provides a comparatively cheap source of animal protein for man and his livestock and attention is now being focused on fish production, both from natural water and aquaculture (Coche *et al.*, 1994; Khalil & Polling, 1997; Komatsu & Kitanishi, 2015). It is highly priced in Nigeria either as smoked, dried or fresh. *Clarias gariepinus* (Clariidae, Siluriformes) is generally classified as omnivores or predators feeding mainly on aquatic insects, fish and higher plants debris as reported for catfishes in the River Ubangui, Central African Republic (Micah, 1973; Ahmad, 2014). They have also been found to feed on terrestrial insects, molluscs and fruits. The catfishes utilize various kinds of food resources available in their habitat (Bruton, 2010). Studies on the biology, nutrition/growth and management of catfish have been carried out (Viveen *et al*., 1985; Faturoti *et al*., 1986; Jeje, 1992; Adeyemo *et al*., 1994; Banyighi *et al*., 2001; Eyo & Olatunde, 2001; Ovie & Ovie, 2002; Omeji *et al*., 2013; Emere & Dibal, 2014). *Clarias gariepinus* is generally considered as one of the most important tropical catfish species for aquaculture in West Africa (Skelton & Teugels, 1992). The Food and Agriculture Organisation describes the *C. gariepinus* as a large size African catfish (FAO, 2010). *Clarias spp*. inhabit calm fresh water ranging from lakes, streams, rivers, swamps to flood plains many of which are subject to seasonal drying. The catfish survive during the dry season due to the possession of accessory air breathing organ (Bruton, 1979; Clay, 1979; Akinsanya & Otubanjo, 2006; Ayanda & Egbamuno, 2012). *Clarias gariepinus* is considered to hold great prospect for fish farming in Nigeria (Adewumi & Olaleye, 2011). The wide geographical spread, high growth rate and the resistance to handling and stress has made *C. gariepinus* well valued in a wide number of African countries (Enas *et al*., 2013). In most part of the world, fish production is mainly from the wild.

As the world population grows, fish resources are being depleted at an increasing rate as a result of environmental degradation, over harvesting, pollution thus fish production could no longer meet the demand of the growing population. This had led to increase in the involvement of stakeholders in aquaculture. This method has also been plagued by the problems of overcrowding, poor environmental conditions and pollution which often result in reduced immunity of fish and higher susceptibility to parasites and diseases (Murray, 2005; Biu *et al*., 2014). Like humans and other animals, fishes suffer from various disease and parasite infections (Bamidele, 2015). Parasitic diseases of fish are very common all over the world and are of particular importance in the tropics (Roberts & Janovy, 2009; Soliman & Nasr, 2015). Various parasites are associated with *C. gariepinus* in the wild and cultured environment where they cause morbidity, mortality and economic losses in aquaculture practice in various parts of the world (Subashinghe, 1995; Biu *et al*., 2013).

There is an increasing awareness of the importance of parasitic diseases as one of the major detrimental factors in fish farming (Paperna, 1996; Keremah & Inko-Tariah, 2013). However, in the study area, there is a paucity of information on the parasitic status of *C. gariepinus.* There is therefore need for more research on fish helminths to bridge the gap and provide farmers with solutions to one of the biggest challenges facing this subsector.

The aim of this study is to determine the prevalence of gastrointestinal helminths parasites in the study area with the view of evaluating the relationship between infection, the sex, weight and length of *C. gariepinus*.

## II. MATERIALS AND METHODS

### Study area

The research was conducted from May to September, 2018 in Okitipupa Local Government Area of Ondo State between $6^0$ $30^i$ $8.93^{ii}$ North and Longitude $4^0$ $46^i$ $25^{ii}$ (Figure 1). The climate of the area is typically tropical, with a characteristic dry season of about 5 months (November– March) and a wet season of about 7 months (April–October). The vegetation of the area is tropical rainforest, characterized by large and tall trees. The area is surrounded by River.

### Sample collection and identification

Eighty-three (83) catfish specimens were randomly purchased live from the local fishermen in the three selected area and were transported live in a 25 litre plastic container containing water to the Parasitology Laboratory, Department of Biological Sciences, Ondo State University of Science and Technology, where they were sorted according to different sizes. Identification of the fishes was done based on external features as described by Idodo-Umeh (2003). Lengths and weights of the fishes were measured using a ruler calibrated in centimetre (cm) and digital weighing balance (Electronic Kitchen Scale, QE-KE-4), respectively. The sexes of the fishes were identified by visual examination of the urinogenital system.

### Dissection and Examination for parasite

The fishes were immobilized by cervical dislocation for easy handling prior to dissection on a dissecting board. The fishes were dissected through the abdomen by making a longitudinal slit on the ventral surface from the anus to a point level with the pectoral fins using a surgical blade. The alimentary tract was isolated stretched out and grouped into oesophagus, stomach and intestine. Sections were placed into three separate Petri dishes containing 0.6% saline.

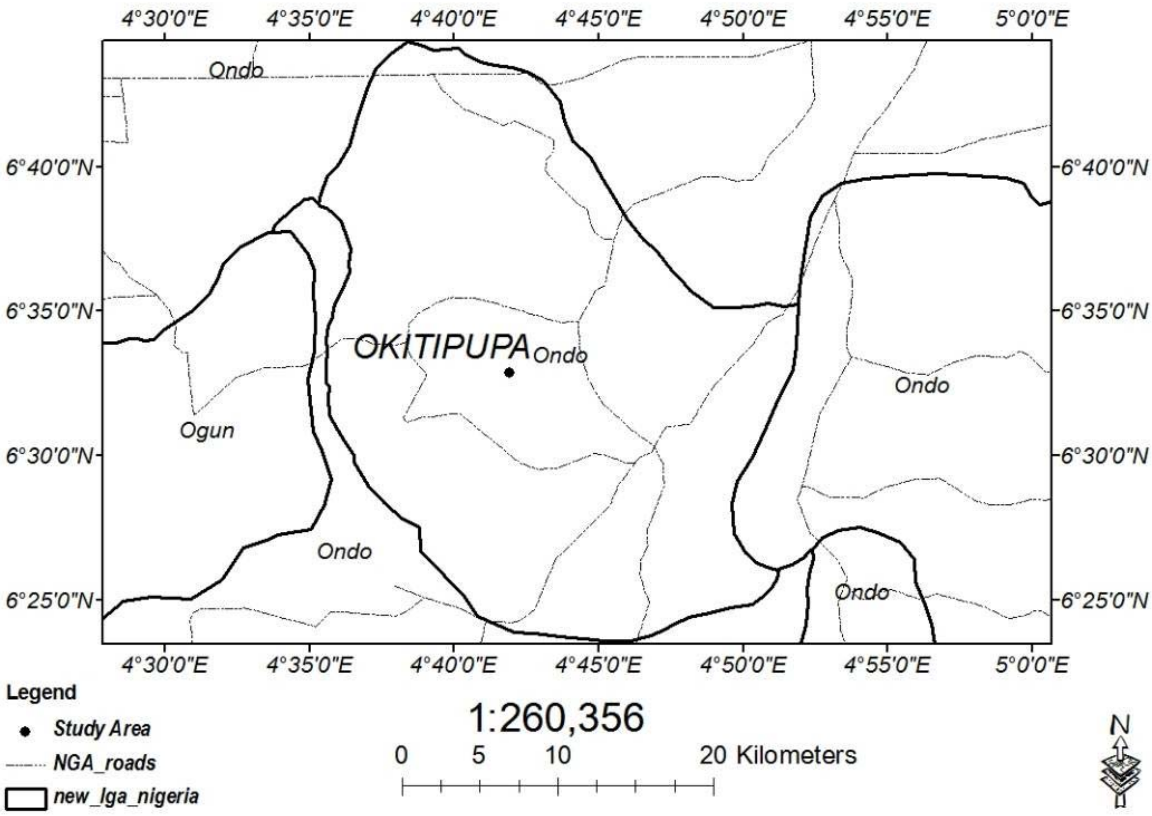



Figure 1: Map of part of Ondo State in Nigeria, showing Okitipupa town

Each section was slit longitudinally and examined for parasites under a dissecting microscope. Parasites found were counted, fixed and preserved in 10% formalin (Frimeth, 1994).

### Identification of parasites

Nematodes were cleared with lactophenol while the cestode and trematodes were stained overnight with a weak Ehrlich's haematoxylin solution and passed through graduated alcohol (30, 50, 70, 90% and absolute) for 45 min to dehydrate, cleared in methylsalicylate. The parasites (nematodes, cestode and trematodes) were mounted on a slide in Canada balsam. Parasites were identified using technique described by Chilton *et al.,* 1995, Lichtenfels *et al.,* 1994, Cheng (1973), Soulsby (1982), Paperna (1980; 1996), Williams & Jones (1994).

### Statistical analysis

Statistical Package for the Social Science (SPSS) was used for the data analysis. The overall prevalence of the parasitic infection was expressed in percentage. Data were also presented in tabulated and chart forms. Chi square was used to compute and arrived at statistical decision. $P<0.05$ was considered significant.

## III. Results

### Prevalence of the helminth parasites recovered from *C. gariepinus*

Out of the 83 *Clarias gariepinus* examined, 56 were infected, giving a prevalence of 67.5%. The gastrointestinal helminth parasites recovered comprised of two species of nematodes- *Procamallanus laevionchus* (32.5%) *and Rhabdochona congolensis* (18.1%); a species of cestode- *Polyonchobothrium clariae* (10.8%); and two species of trematodes- *Allocreadium* spp. (3.6%) and

*Heterophyidae* spp. (2.4%) (Fig 2). The nematodes had a prevalence of 50.6%, trematodes 6.0% and the only cestode had a prevalence of 10.8%. The helminths recovered were found to parasitize the stomach and intestinal lumen, the latter being more affected.

**Sexual variation in the prevalence of gastrointestinal helminth infection in *C. gariepinus***

It was observed that the male *C. garipinus* had higher prevalence (67.9%) than the female (67.3%) (Fig 3).

**Size variation in the prevalence of gastrointestinal helminth infection in *C. gariepinus***

Fishes with standard length range of 20-30cm were most infected with a prevalence of 82.4%. This was followed by fishes within the length range of 30-40cm with a prevalence rate of 65.0%. Fishes within the range of 40-50cm had the least prevalence rate of 61.5% (Table 41). **Weight variation in the prevalence of gastrointestinal helminth infection in *C. gariepinus***

The fish with body weight range between 500-600g has the highest rate of infection, with prevalence of 78.6%. The lowest prevalence rate of 58.8% was recorded in body weight range of 600-700g (Table 2).

The result of the study indicated that the association (P>0.05) between the prevalence of infection, sex, length and weight of the host was not statistically significant ($\chi2$= 0.00289, 2.24 and 1.55; degree of freedom= 1, 2 and 5 respectively).

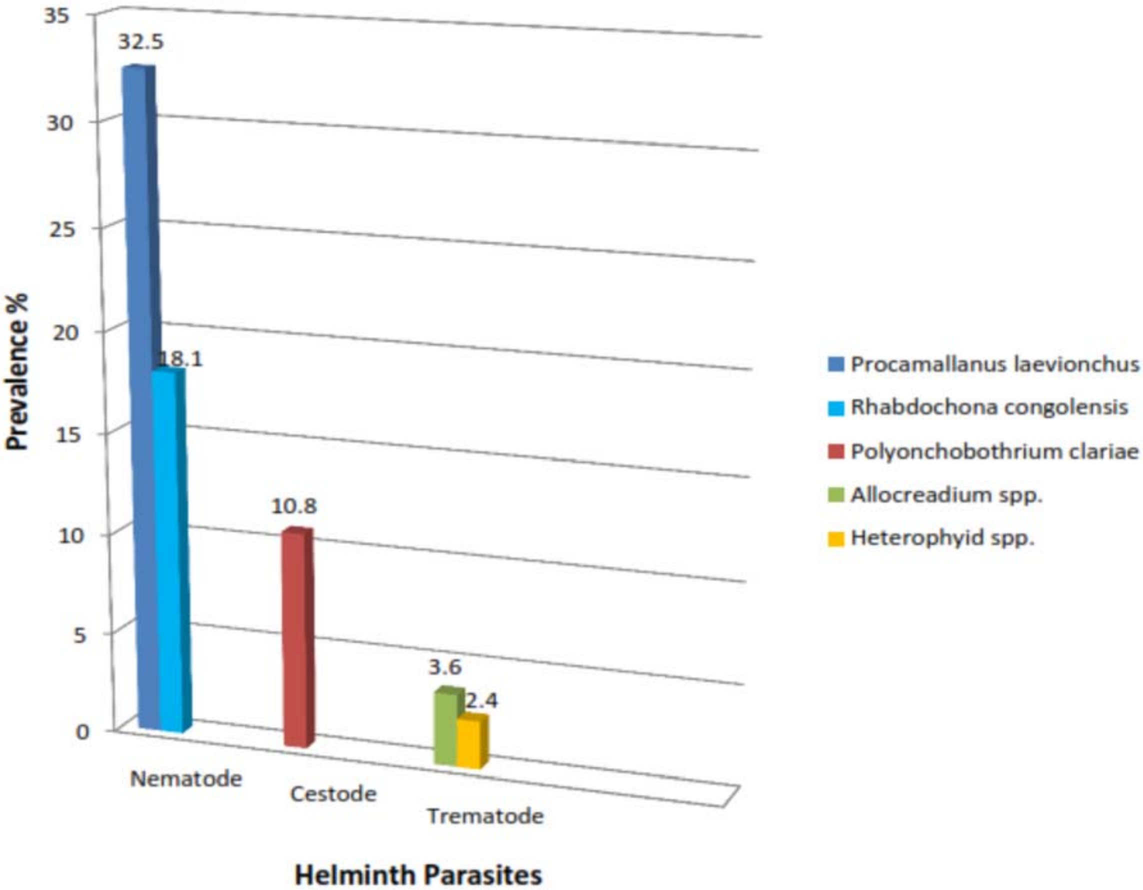
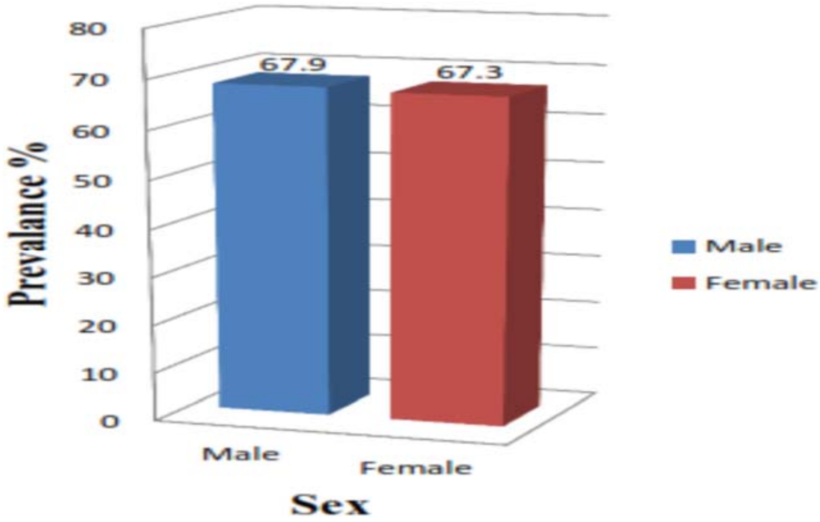



Figure 2: Prevalence of the helminth parasites recovered from *C. gariepinus*



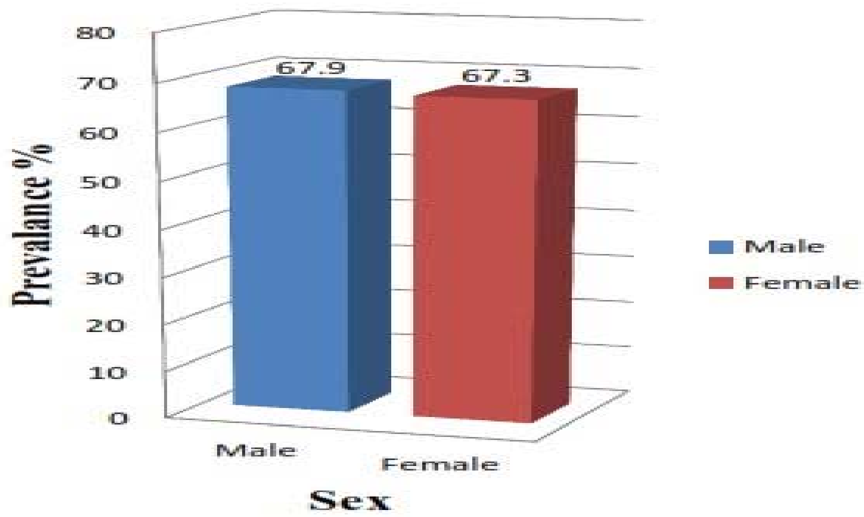




Figure 3: Sexual variation in the prevalence of gastrointestinal helminth infection in *C. gariepinus*

Table 1: Size variation in the prevalence of gastrointestinal helminth infection in *C. gariepinus*

| Standard Length (cm) | Number of fish examined | Number of fish infected | Prevalence (%) |
|---|---|---|---|
| 20 – 30 | 17 | 14 | 82.4 |
| 30 – 40 | 40 | 26 | 65.0 |
| 40 – 50 | 26 | 16 | 61.5 |
| Total | 83 | 56 | |

(P>0.05)

Table 2: Weight variation in the prevalence of gastrointestinal helminth infection in *C. gariepinus*

| Body weight (g) | Number examined | Number infected | Prevalence (%) |
|---|---|---|---|
| 200 – 300 | 5 | 3 | 60.0 |
| 300 – 400 | 13 | 9 | 69.2 |
| 400 – 500 | 24 | 16 | 66.7 |
| 500 – 600 | 14 | 11 | 78.6 |
| 600 – 700 | 17 | 10 | 58.8 |
| 700 – 800 | 10 | 7 | 70.0 |
| Total | 83 | 56 | |

(P>0.05)

## IV. Discussion

The results of this work revealed that helminth parasites are prevalent in the *C. gariepinus* sampled in Okitipupa. The helminth parasites identified are comprised of 3 groups, namely Nematoda, Cestoda and Trematoda. The nematodes, *Procamallanus laevionchus and Rhabdochona congolensis*, the cestode, *Polyonchobothrium clariae*, and the trematodes *Allocreadium spp*. and *Heterophyidae spp*. were recovered. This is in conformity with other researchers. Dan-kishiya and Zakari (2007) identified the Cestoda, Nematoda and Trematoda, in wild *C. gariepinus* in Gwagwalada, Abuja. Salawu *et al.* (2013) recorded the nematode *Procamallanus laevionchus* and the cestode *Polyonchobothrium spp*. in the digestive tracts of *Clarias gariepinus* from Ogun River and Asejire Dam in south-west Nigeria. Aliyu and Solomon (2012) also reported the nematode *Procamallanus laevionchus* and the cestode *Polyonchobothrium clariae* in *C. gariepinus* from lower Usman Dam, Abuja. Yakubu *et al.* (2002), found *C. gariepinus* infected by *Procamallanus laevionchus* in River Uke, Plateau State.

The overall prevalence of helminth parasites in this study was high (67.5%) similar to what was recorded in Abuja by Dan-kishiya and Zakari (2007), Dan-kishiya *et al.* (2013). Other researchers in Nigeria such as Anosike *et al*. (1992) recorded a prevalence rate of 59.8%. Salawu *et al*. (2013) reported a prevalence rate of 75%, Onwuliri and Mgbemena (1987) reported a prevalence of 63.0% in wild population of *C. gariepinus* and 59.8% in cultured *C. gariepinus* in Jos, Plateau State. Difference in prevalence of parasites in fish may be due to many factors. Williams and Jones (1994) suggested that parasitism differs in various aquatic ecosystems and this is determined by the interaction between biotic and abiotic factors. Fish species in good environmental conditions rarely come down with diseases (Oswald and Hulse, 1992). Reports have shown that helminths are generally found in all freshwater fishes, with their prevalence and intensity dependent on factors of parasite species and their biology, host and its feeding habits, physical factors and hygiene of the water body, and presence of intermediate hosts where necessary (Doreen *et al*., 2009; Shukerova *et al*., 2010; Hussen *et al*., 2012). Factors such as contaminated water and availability of the intermediate host prevalence recorded in this study may be due to the polluted water-bodies, environmental conditions such as high temperature, the host and its feeding habits and the availability of intermediate host (copepods, insects, molluscs etc.) which harbours the infective larval stage of some of these helminth parasites making them available to fishes in the water.

The higher prevalence of nematodes (50.6%) than cestode (10.8%) and trematodes (6.0%) revealed that nematodes were the commonest infection of catfish (*C. gariepinus*) on sale in Okitipupa, Ondo State and this is in conformity with the findings of Aliyu and Solomon (2012). Though some earlier works reported that Acanthocephalan was the commonest parasites of fresh water fishes in the tropics, none was discovered in this research. Mgbemena (1983) reported high prevalence of Acanthocephalans in fish during the dry season. The absence of acanthocephalan in this research could probably be due to the fact that it was carried out during the rainy season.

The earlier work of Goselle *et al*. (2008) and few others showed that helminths have preference for region of attachment in the alimentary canal of fish. In this study, the distribution of gastrointestinal helminth parasites in the fishes showed a clear preference for the intestine and stomach as sites of attachment which could be attributed to the availability of food in these regions. The highest prevalence of parasites in the intestine implies that it is a more preferred predilection site; this could be due to the favourable conditions that enhance their survival (Owolabi, 2008). Similar findings were reported by Auta *et al.* (1999) and Emere (2000), Aliyu and Solomon (2012).

The nematodes were recovered from both the stomach and intestine, whereas the cestode showed preference for the intestine. Nematodes have relatively developed alimentary canal and could easily move around any area of the host alimentary canal to feed on digested and semidigested food, whereas, cestodes lack alimentary system and are dependent on digested food of the host which is then absorbed through the body surfaces (Owolabi, 2008). These could probably account for their preference for these sites. The result showed a prevalence of 67.9% for the male whereas the female was 67.3%. There was no statistical significant difference in the prevalence of helminth parasite infection in the sexes of fishes. This is in contrast with reports by Aliyu and Solomon (2012); Emere (2000) and Onwuliri and Mbgemena (1987) who recorded significance difference in the prevalence of infection between harbouring the infective larval stage, predisposes both sexes to risk of acquiring the infection while feeding.

It was observed that fishes of standard length range of 20-30cm (82.4%) were more infected than those with length of 30-40cm (65.0%) and longer fishes of 40-30cm (61.5%). The prevalence of infection was higher in short fishes than in long fishes. Akinsanya *et al*. (2007) attributed this to the random selection and low level of immunity in the small sized fish.

Many parasites have been reported in different species of fish, but only a few species have the capacity to infect humans (Adams *et al*., 1997). Paperna (1998) opined that health hazards associated with fish culture may be broadly classified into two groupings: firstly, resulting from the consumption of fish products and secondly, resulting from the aquatic environment itself. The list of potential fish-borne parasitic zoonoses includes anisakiasis (due to *Anisakis simplex* larvae and *Contracaecum spp*.), liver fluke diseases such as clonorchiasis, opisthorciasis, and other intestinal trematodiasis (the heterophyids and the echinostomes) and diphylobothriasis.

Worthy of note, was the identification of Heterophid fluke in this study which has not being previously reported in Nigeria and poses a great zoonotic threat. However, the examination procedure in this study did not include examination for parasite larval stages, especially for the metacercariae of heterophids, which are the most likely to have zoonotic potential. There is lack of documented reports on human diseases acquired from fish in Nigeria. But there is report of human trematodiasis in Egypt caused by the digenetic trematodes of the families Heterophyidae. Heterophyids constitute a public health problem wherever people eat raw, salted or otherwise undercooked fish containing metacercariae (Paperna 1996; Centers for Disease Control and Prevention, 2013; Madsen *et al*., 2015). Heterophyidae was reported frequently to infect humans in Egypt. Symptoms of the infection include abdominal discomfort, nausea, headache, vomiting, diarrhoea and in severe cases, dysentery. In the far-east, heterophyiasis is a serious disease and may be fatal due to lesions in the heart, liver, lungs and the central nervous system (Paperna, 1998; Centers for Disease Control and Prevention, 2013). The seafood industry in collaboration with government agencies can implement different safety programmes to minimise these risks, including good manufacturing practices (GMPs) and hazard analysis and critical control point (HACCP) systems (Adams *et al.,* 1997).

## V. Conclusion

The present study shows the prevalence of gastrointestinal helminths with heavy parasitic burden in *C. gariepinus* sampled in Okitipupa, Ondo State. A further study to examine the larval stages of helminths especially the metercercaria of Heterophyids is advocated to forestall the zoonotic consequences in human who consume the fish as a source of protein (Massoud *et al*., 1981). Since it has been observed that helminth parasite infection of fish affects its productivity, marketability, palatability, death of a good number of fishes especially in the wild as well as the potential zoonotic effect on the consumers, it is therefore necessary to develop effective control measures and good culinary practices should be adopted to decimate the potential risks to human health (Onwuliri *et al.,* 1989; Anosike *et al.,* 1992)

## VI. Acknowledgments

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## VII. Disclosure of conflict of interest

All authors who have contributed to this work and, the preparation of the manuscript have all agreed to every part of the work and therefore, there is no conflict of interest.

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