Parasitic Helminth fauna of *Clarias gariepinus* and *Parachanna Obscura* from a reputable Fish Farm, Jos, Plateau State, Nigeria

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Abstract- Parasitic helminth fauna of *Clarias gariepinus* and *Parachanna Obscura* from a reputable fish farm, Jos, Plateau State, Nigeria was evaluated using standard parasitological procedures. 4 different parasite species belonging to 2 parasitic classes; 3 species of Cestode (*Bothriocephalus spp., Diphilobothrium latum* and *Ligula intestinalis*) and a species of Nematode, (*Camallanus spp.*) were recovered from the studied fish species. A total of 113 parasites comprising of 52(46.02%) and 61(53.95%) parasites were recovered from 89 (59.30%), comprising of 41(54.70%) and 48(64.00%) infested *C. gariepinus* and *P. obscura*, respectively. Infestation was more in *C. gariepinus* compared to *P. obscura*. There was no significant difference (p>0.05) between the rate of parasitic prevalence of *C. gariepinus* and *P. obscura*. Variation in parasitic prevalence between the sexes of *C. gariepinus* and *P. obscura*, existed, being more prevalent in male *C. gariepinus* than the female but more prevalent in the female *P. obscura* than the male. However, there was no significant difference (p>0.05) in the infection rates with respect to the sexes of the fish species. The distribution of helminth parasites in the fishes showed a notable preference for the intestine and stomach as sites of attachment which could be attributed to the availability of food in these regions. Intestine of the infested fish samples of both species had more parasites than the stomach. Larger sizes of *C. gariepinus* and *P. obscura* had more parasitic helminth load than the smaller sizes. Results of the correlation matrix for total number of parasites found on *C. gariepnius* and *P. obscura* showed that there was no significant difference (P>0.05) between total length and total number of parasites but tthere was a significant difference (P<0.05) between total length and weight and total number of parasites and weight of the samples of *C. gariepnius*. For *P. obscura*, there was a significant difference (P<0.05) between total length and weight, total length and total number of parasite and total number of parasites and weight of the fish species.

Index Terms- *Clarias gariepinus*, *Parachanna Obscura*, parasitic helminthes fauna, Length, Prevalence, Sex, Zoonotic threat

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 (Komatsu and Kitanishi, 2015). It is highly priced in Nigeria either as smoked, dried or fresh.

Clarias gariepinus 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 (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 (Omeji *et al.*, 2013; Emere and Dibal, 2014).

African snakehead, *Parachanna obscura* is an emerging aquaculture candidate in Nigeria and the sub-Saharan region as a whole. The species is preferred for its palatable fillet and strong flesh integrity. Ama-Abasi and Ogar (2013) reported that the species is high in protein and fat contents thereby making it a good healing agent for post operation patients. *Parachanna obscura* has high economic value and represents a good potential for African aquaculture
(Bolaji *et al.* 2011). It is not a fatty fish but an intermediate one (Mujinga *et al.* 2009). Because of its tasty flesh, with

only few bones, *P. obscura* is favourite food fish and constitute an extremely important part of the staple food for African people (O' Bryen and Lee 2007).

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 (Soliman and 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 (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 (Keremah and Inko-Tariah, 2013). However, paucity of information on the parasitic status of *C. gariepinus* and more especially, *P. obscura* necessitated this study with the view to determine the Helminth Bioload of *Clarias gariepinus* and *Parachanna Obscura* in the study area and quantifying the helminthic burden, evaluating the relationship between the helminthic burden and rate of infection, the sex and length of *C. gariepinus* and *Parachanna Obscura*.

II. Materials and Methods

Sample collection and identification

150 samples comprising of 75 samples each of *C. gariepinus* and *P. Obscura* were randomly purchased live from a reputable fish farm, Jos, Plateau State, Nigeria located at latitude 9° 26' 14" **N** and Longitude 9° 13' 8" E. The fish samples were transported in 25 litre of 6 plastic containers containing water to the Department of Fisheries and Aquaculture Laboratory, Joseph Sarwuan Tarka University, Makurdi where they were sorted according to different sizes with the total length and weight of the fishes been measured using a ruler in centimetre (cm) and a top loading weighing balances (Golden Mettler, Model: GW: 1.3kg, NW; 1kg - US).) in grams, respectively. The sexes of the fishes were identified by visual examination of the urinogenital system.

Dissection of fish samples, Examination and identification of parasites

The fishes were immobilized by cervical dislocation for easy handling prior to dissection on a dissecting board and 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 esophagus, intestine and stomach. Sections of the fish samples were placed into three separate Petri dishes containing 0.6% saline. Each section was slit longitudinally and examined for parasites using a Zpix microscope Mm640 connected to a laptop (6735s). Parasites found were counted, fixed and preserved in 10% formalin (Frimeth, 1994). After mounting the parasites on a slide in Canada balsam, they were later identified using technique described by Paperna (1996), Cheng (1973).

III. Statistical analysis

Chi- square was used to investigate significant differences in prevalence rate. Descriptive statistics was used to show the parasitic loads of fish associated with sex using Social Science Software (SPSS 22.0).

IV. Results

4 different parasite species belonging to 2 parasitic classes; Cestodes (*Bothriocephalus spp., Diphilobothrium latum* and *ligula intestinalis*) and Nematode, *Camallanus spp.*) were recovered from the studied fish species (Table 1). All recovered and identified parasites were found in both *C. gariepinus* and *P. obscura* with the exception of *L. intestinalis* which was recovered from only *P. obscura*

Table 1 Parasites of *C. gariepinus* and *P. obscura* from Panyam Fish Farms, Jos

Class of parasites	Parasite species	Fish Host
Cestodes	*Bothriocephalus spp.*	*Clarias gariepinus* and *Parachanna obscura*
	Diphyllobothrium latum	*Clarias gariepinus* and

		Parachanna obscura
	Ligula intestinalis	*Parachanna obscura*
Nematode	*Camallanus spp.*	*Clarias gariepinus* and *Parachanna obscura*

Table 2 shows the overall prevalence of *C. gariepinus* and *P. obscura* from a reputable fish farm, Jos. Out of the 150 samples comprising of 75 each of *C. gariepinus* and *P. obscura*, a total of 89 (59.30%) were infested with *C. gariepinus* accounting for 41(54.70%) while *P. obscura* accounted for 48(64.00%). Infestation was more in *P. obscura* compared to *C. gariepinus*. However, there was no significant difference ($p>0.05$) between the rate of parasitic prevalence of *C. gariepinus* and *P. obscura* from the reputable Fish Farm, Jos

Table 2. Overall prevalence of *C. gariepinus* and *P. obscura* from a reputable Fish Farm, Jos.

Fish species	Number of fish examined	No. (%) of infested fish
C. gariepinus	75	41(54.70)
P. obscura	75	48(64.00)
Total	150	89(59.33)
X^2		0.06
P value		0.16

X^2 = Chi square, $p>0.05$

Table 3 shows the prevalence of parasite species infestation in relation to the infested body parts of *C. gariepinus* and *P. obscura* from reputable Fish Farms, Jos. A total of 113 parasites comprising of 52(46.02%) and 61(53.95%) parasites were recovered from *C. gariepinus* and *P. obscura*, respectively. Out of the 52 (46.02%) parasites recovered from *C. gariepinus*, *Camallanus spp.* recorded the highest number/percentage parasite 26(50.00%) while the least 8(15.38%) was recorded for *Bothriocephalus spp.* Out of the 61 (53.95%) parasites recovered from *P. obscura*, while *Camallanus spp.* recorded the highest number/percentage parasite 27(44.26%), the least 5(8.20%) was recorded for *L. intestinalis.*

Generally, out of the 113 parasites recovered from the fish species, while *D. latum* recorded the highest number/percentage parasite 45(39.82%), *L. intestinalis* recorded the least number/ percentage parasite 45(4.42%)

Table 3. Prevalence of infection in *C. gariepinus* and *P. obscura* in relation to the infested body parts of the host fish from a reputable Fish Farms, Jos

Fish species	Parasite species	No. of fish infested	Prevalence	Site of infection/No. of parasites			Total No. (%) parasite	intensity
				Esophagus	Intestine	Stomach		
C. gariepinus	*Bothriocephalus spp.*	7	9.30	1	4	3	8(15.38)	1.14
	D. latum	15	20.00	0	11	7	18(34.62)	1.20
	Camallanus spp.	19	25.30	0	16	10	26(50.00)	1.37
	Total	41	54.70	1	32	20	52(100.00)	3.71
P. obscura	*Bothriocephalus spp*	13	17.30	3	7	5	15(24.59)	1.15
	D. latum	22	29.30	0	19	8	27(44.26)	1.23
	Camallanus spp.	10	13.30	0	3	11	14(22.95)	1.40
	Ligula intestinalis	3	4.00	0	5	0	5(8.20)	1.67
	Total	48	64.00	3	36	25	61(100.00)	5.45
Synopsis of each parasite								
	Bothriocephalus spp	20(22.47)	26.70	4	11	8	23(20.35)	2.29
	D. latum	37(41.57)	49.30	0	30	15	45(39.82)	2.43
	Camallanus spp	29(32.58)	38.70	0	19	21	40(35.40)	2.77
	Ligula intestinalis	3(3.37)	4.00	0	5	0	5(4.42)	1.67
	Total No.(%)	89(100.00)	59.30	4(3.54)	65(57.72)	44(38.94)	113(100.00)	9.16

% = Percentage

Table 4 shows the infestation status, percentage parasite burden and prevalence of the sexes of *C. gariepinus* and *P. obscura* from a reputable Fish Farm, Jos. Out of the 75 samples of *C. gariepinus* while 41 comprising of 27 (65.90%) male and 14(34.10%) female were infested, 34 samples comprising of 19 (55.90%) males and 15(44.10%) females were not infested. Out of the infested samples of *C. garipinus*, male had higher percentage prevalence (36.00%) than the female (18.70%). Out of the 75 samples of *P. obscura*, while 24 comprising of 17 (35.40%) infested and 7(25.90%) non infested samples were male, 51 comprising of 31(64.60%) infested and 20(74.10%) non infested samples were female. Female *P. obscura* had higher percentage prevalence (41.30%) than the male (22.70%). The study revealed that there was no significant difference ($p>0.05$) in parasite burden between the male and female *C. gariepinus* and *P. obscura*, respectively.

Table 4. The infestation status, percentage parasite burden and prevalence of the sexes of *C. gariepinus* and *P. obscura* from a reputable Fish Farms, Jos

Fish species	No.(%) of fish Examined	Infestation status		No.(% parasite burden	Prevalence
		No.(%) infested	No.(%) non infested		
C. gariepinus					
Male	46	27(65.90)	19(55.90)	29(55.80)	36.00
Female	29	14(34.10)	15(44.10)	23(44.20)	18.70
Total	75	41(54.70)	34(45.30)	52(100.00)	54.70
P. obscura					
Male	24	17(35.40)	7(25.90)	26(42.60)	22.70
Female	51	31(64.60)	20(74.10)	35(57.40)	41.30
Total	75	48(64.00)	27(36.00)	61(100.00)	64.00

No. = Number, % = Percentage

Table 5 shows the results of the size variation in the prevalence of helminth parasites of *C. gariepinus* and *P. Obscura* from a putable fish farm, Jos, Plateau State, Nigeria. For samples of *C. gariepinus*, fishes with standard length range of 42.10-46.10cm were most infected with a prevalence of 77.78% followed by fishes within the length range of 46.10-48.00cm with a prevalence rate of 70.00%. Fishes within the range of 38.10-42.10cm had the least prevalence rate of 36.36%. Highest number/percentage parasite 22(42.31%) was recorded for fishes within the range of 42.10-46.10cm while the least 5(9.62%) was recorded for fishes within the range of 38.10-42.10cm

For samples of *P. obscura*, fishes with standard length range of 29.10-31.10cm were most infected with a prevalence of 77.78% followed by fishes within the length range of 25.00-27.00cm with a prevalence rate of 52.38%. Fishes within the range of 27.10-29.10cm had the least prevalence rate of 33.33%. Highest number/percentage parasite 29(47.54%) was recorded for fishes within the range of 25.00-27.00cm while the least 7(11.48%) was recorded for fishes within the range of 27.10-29.00cm.

Table 5. Prevalence of parasite species of *C. gariepinus* and *P. obscura* with respect to length groups from a reputable Fish Farm, Jos

Fish species/Total length groups (cm)	Parasite species				
	Bothriocephalus spp.	*D. latum*	*Camallanus spp.*	*L. intestinalis*	TNP. (%) Parasite
C. gariepinus					
34.0-38.0	2(13.33)	1(7.69)	5(20.83)	0(0.00)	8(15.38)
38.1-42.0	4(26.67)	5(38.46)	2(8.33)	0(0.00)	11(21.15)
42.1-46.0	8(53.33)	3(23.08)	11(45.83)	0(0.00)	22(42.31)
46.1-48.0	1(6.67)	4(30.77)	6(25.00)	0(0.00)	11(21.15)
Total	15(28.85)	13(25.00)	24(46.15)	0(0.00)	52(100.00)
P. obscura					
25.0-27.0	7(24.14)	3(33.33)	0(0.00)	1(16.67)	8(13.11)
27.1-29.0	9(31.03)	0(0.00)	13(76.47)	0(0.00)	22(36.07)
29.1.31.0	13(44.83)	6(66.67)	4(23.53)	5(83.33)	28(45.91)
Total	29(47.54)	9(14.75)	17(27.87)	6(9.84)	61(100.00)

Results of the prevalence of parasite species of *C. gariepnius* and *P. obscura* with respect to the weight groups from a reputable Fish Farm are shown in Table 6.

For *C. gariepinus*, highest percentage parasite infestation (36.54%) was recorded for length group 616.74-666.1g, the lowest (7.69%) was recorded for length group 466.71-516.1g. no parasite was recorded for length group 416.70-466.0g.
For *P. obscura* while highest percentage parasite infestation (34.43%) was recorded for weight groups 200.1-225.0g, the lowest (9.84% each) was recorded for weight groups of 125.0-150.0g and 150.1-175.0g, respectively.

Generally, of the parasite species from *C. gariepinus* with respect to weight, while *Camallanus sp* (46.15%) accounted for the highest percentage parasite infestation, the least (25.00%) was recorded for *D. latum*. On the other hand, while *Bothriocephalus sp* (47.54%) accounted for the highest percentage parasite infestation for *P. obscura*, the least (9.84%) was accounted for *L. intestinalis*.

Table 6 prevalence of parasite species of *C. gariepnius* and *P. obscura* with respect to weight groups

Fish species/weight groups (grams)	Parasite species *Bothriocephalus spp.*	*D. latum*	*Camallanus spp.*	*L. intestinalis*	TNP. (%) Parasite
C. gariepinus					
416.70-466.70	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
466.71-516.71	0(0.00)	3(23.08)	1(4.17)	0(0.00)	4(7.69)
516.2-566.72	0(0.00)	5(38.46)	0(0.00)	0(0.00)	5(9.62)
566.73-616.73	5(33.33)	0(0.00)	4(16.67)	0(0.00)	9(17.31)
616.74-666.74	7(46.67)	1(7.69)	11(45.83)	0(0.00)	19(36.54)
666.75-716.75	3(20.00)	4(30.77)	8(33.33)	0(0.00)	15(28.85)
Total	15(28.85)	13(25.00)	24(46.15)	0.00(0.00)	52(100.00)
P. obscura					
125.0-150.0	3(10.34)	3(33.33)	0(0.00)	0(0.00)	6(9.84)
150.1-175.0	2(6.90)	1(11.11)	3(17.65)	0(0.00)	6(9.84)
175.1-200.0	11(37.93)	0(0.00)	1(5.88)	0(0.00)	12(19.67)
200.1-225.0	8(27.59)	5(17.24)	6(35.29)	2(33.33)	21(34.43)
225.1-250.0	5(17.24)	0(0.00)	7(41.18)	4(66.67)	16(26.23)
Total	29(47.54)	9(14.75)	17(27.87)	6(9.84)	61(100.00)

Results of the correlation matrix for total number of parasites found on *C. gariepnius* and *P. obscura* are as shown in Table 7. For *C. gariepnius*, there was no significant difference (P>0.05) between total length and total number of parasites but tthere was a significant difference (P<0.05) between total length and weight and total number of parasites and weight of the fish species. For *P. obscura*, there was there was a significant difference (P<0.05) between total length and weight, total length and total number of parasite and total number of parasites and weight of the fish species.

Table 7. Correlation matrix for total length, weight and number of parasites in *C. gariepnius* and *P. obscura* from a reputable Fish Farm, Jos

C. gariepnius				***P. obscura***		
	TL	WT	TNP	TL	WT	TNP
TL	1.00			1.00		
WT	0.844*	1.00		0.865*	1.00	
TNP	0.043	0.173*	1.00	0.233*	0.206*	1.00

TL = Total length, WT = Weight, TNP = Total number of parasite.
*Correlation is significant at the p<0.05 level (two tailed)

V. Discussion

Parasitic helminth fauna of *Clarias gariepinus* and *Parachanna Obscura* from a reputable fish farm, Jos, Plateau State, Nigeria was evaluated using standard parasitological procedures. The helminth parasites recovered were *Bothriocephalus spp., Diphillobothrium latum, Camallanus spp.* and *Ligula intestinalis.* Among these parasites, while *Bothriocephalus spp., D. latum* and *Camallanus spp.* were recorded from both *C. gariepinus* and *P. obscura*, *L. intestinalis* was recorded from only *P. obscura*. *Bothriocephalus spp*. was recovered from the esophagus, intestine and stomach of both infested fish samples, *D. latum* and *Camallanus spp.* were recovered from the intestine and of both species while *L. intestinalis* was recovered from the intestine of only *P. obscura*.

The recovery of these parasites in the present study is not amazing as they have been previously recovered from same fish species or other freshwater fish species from elsewhere. Afolabi *et al.,* (2020) reported *Camallanus spp.* in their comparative study of African catfish parasites from cultured and natural habitats, Bichi, and Yelwa, (2010) recovered *Bothriocephalus spp.* from *C. gariepinus* (Teugels) at Bagauda Fish Farm, Kano, Auta *et al*., (2019) recovered *Bothriocephalus spp.* from *C. gariepinus* caught in selected points along River Kaduna, Nigeria, Also, the recovery of *D. latum* and *Camallanus spp.* from the studied fish is not surprising as they have been recovered from other freshwater fish species. Absalom *et al.,* (2018) documented the presence of *D. latum* in *C. gariepinus* from River Gudi Nigerria, Solomon *et al.,* (2018) reported *Camallanus spp.* from *Bagrus bayad* from Lower River Benue Makurdi, Nigeria; Omeji *et al.,* (2018) reported *D. latum* from *Synodontis euptera* and *Auchenoglanis occidentalis* from Lower River Benue, Nigeria, Osho, (2017) reported *D. latum*, *Camallanus spp.* and *L. intestinalis* from *Parachana obscura* in River Ogun, Southwest Nigeria.

The presence of these parasites in the studied fish could cause some pathological effects such as mechanical damage (fusion of gill lamellae, tissue replacement), physiological damage (cell proliferation, immunomodulation, altered growth, detrimental behavioral responses,) and/or reproductive damage (Knudsen *et al*. 2009, Al-Jahdali and Hassanine 2010) in the fish and even reducing the market value of the infested fish. The parasites could become zoonotic if the fish are not properly cooked before consumption (Kawe *et al*., 2016).

The problem of fish infestation by parasites in the study area could be attributed to pond fertilization using organic manure from commercial farms, especially poultry. The use of organic materials as fertilizers in fish farming may not only harbor pathogenic parasites but also confers resistance to antibiotics by transferring antibiotic residuals or resistant parasites to fish especially if such manure is obtained from commercial farms (Adegoke *et al*., 2016). According to the authors, Organic fertilizers are an essential source for plant nutrients and a soil conditioner in agriculture. Due to its sources and the composition of the organic inputs as well as the type, functionality and failures of the applied treatment process, the organic fertilizer may contain various amounts of infectious agents and toxic chemicals, especially the antibiotics that can be introduced to the subsequent food chain.

The overall prevalence of helminth parasites recorded in this study (59.33%) for *C. pgariepinus* and *P. obscura* was high. In the findings of other researchers in Nigeria, such high prevalence has been reported. Anosike *et al*. (1992) recorded a prevalence rate of 59.8%, Salawu *et al*. (2013) reported a prevalence rate of 75%.

The high prevalence of parasites in the study area could be attributed to the availability of conditions that favoured parasite infestation such as pollution, the host and its feeding habits, availability of intermediate hosts, which harbour the infective larval stage of some of these helminth parasites making them available to the fish in their habitat, occasional surveillance, overcrowding of fish in the culture medium and periodic checks of the water body for parasites. This study agrees with the reported work of Enyidi and Maduakor (2017). In the fish farms, farmers are allowed to indiscriminately dispose of their waste and faecal matters therein which subsequently washed into the pond thus providing suitable conditions for parasites to flourish. Also, differences in prevalence of parasites in fish may be due to several other 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 (Osward and Hulse, 1992). Reports have also 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 (Shukerova *et al*., 2010; Hussen *et al*., 2012).

Variation in parasitic prevalence between the sexes of *C. gariepinus* and *P. obscura*, existed, being more prevalent in male *C. gariepinus* than the female but more prevalent in the female *P. obscura* than the male although, there was no significant difference ($p>0.05$) in the infection rates with respect the sexes of the fish species. This indicates that parasitic helminth infection of *C. gariepinus* and *P. obscura* from the reputable Fish Farm, Jos was independent of sex

The higher infection rate recorded for male *C. gariepinus* than the female in this study is at variance with the finding of Hassan *et al*., (2010), who reported higher infection rate in female samples of *C. gariepinus* than the male even though there was no significant difference in the infection rates between the sexes of *C. gariepinus* from Lekki Lagoon.

The higher infection rate recorded for female *P. obscura* than the male in this study is in agreement with the findings of Osho (2017) who reported that there was no significant difference in the infection rates between male and female of *P. obscura*, even though the female samples had higher rate of infection than the male. However, Oben *et al*., (2015) discovered that female samples of *P. obscura* from the lower Cross River system had significantly lower parasite burden than the male samples. Differences in the incidence of infestation between male and female fish may be due to differential feeding either by quantity or quality of food eaten or as a result of different degrees of resistance and infection (Emere, 2000).

In this study, the distribution of helminth parasites in the fishes showed a notable preference for the esophagus, intestine and stomach as sites of attachment which could be attributed to the availability of food in these regions, this agrees with the earlier work of (Goselle *et al*., 2008) and few others who showed that helminths have preference for region of attachment in the alimentary canal of fish. Never the less, intestine had higher percentage parasite infestation than the esophagus and stomach. The higher prevalence of parasites in the intestine compared to the esophagus and stomach signifies that intestine was the most preferred predilection site and this could be due to the favourable conditions and large surface area provided by the intestine which enhanced their survival (Owolabi, 2008). Similar finding was reported by (Aliyu and Solomon. 2012).

This study revealed that the larger sizes of *C. gariepinus* and *P. obscura* from the reputable Fish farm, Jos had more parasitic helminth load than the smaller sizes. The number of parasites for most of the organisms was dependent on the size of the fish. The high incidence of infestation obtained in the bigger size fish compared to the smaller fish could be an indicator that size of the fish is important in determining the parasite load. Mohammed *et al.,* (2009) reported that prevalence was found to increase as the fish grew, and that

could be attributed to the longer time of expose to the environment by body size. The differences in parasitic load could also be attributed to the random selection of the fish samples in the different length and weight groups and to the probable high level of immunity built up in the fish samples (Kawe *et al.*, 2016, (Akinsanya *et al*. (2008). Similar observation had been made by Uruku and Adikwu (2017, Omeji *et al.*, (2014)

CONCLUSION

From this study, *C. gariepinus* and *P. obscura* were infested with different helminth parasites belonging to 3 species of class cestode and a species of nematode. These two freshwater fish species with high economic values could be of serious potential health hazard to consumers if not well taken care of as food and delicacies prepared without adequate processing has the potential of infecting consumers with helminthiasis and thereby constituting health risk.

In order to avert zoonotic cases, relevant government authorities and policy makers should take note of this health issues which could become a menace to fish consumers and ensure that adequate measures are taken most especially, in the processing of these fish for consumption to ensure that the fish meets food safety standards.

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