ENDO AND ECTO PARASITE PREVALENCE AND ABUNDANCE IN SOME FISH SPECIES FROM AKOMOJE, OGUN RIVER SOUTH-WEST NIGERIA

Oghenochuko M.O[1a,b*], Ezeri, G.N.O[2b], Takeet M.I.[3c], Adeosun F.I.[4b], Disu I[5b] and Ogbia, C.F[6b]

[a]Animal Science Programme, Department of Agriculture, Landmark University, PMB1001, Omu-Aran, Kwara State, NIGERIA. Email: oghenochuko.oghenebrorhie@lmu.edu.ng[1]
[b]College of Environmental Resources Management, Federal University of Agriculture, Abeokuta, PMB 2240, Ogun State, NIGERIA. Email: godfreyezeri@gmail.com[2]; adeosunfi@yahoo.com[4]; disu.ismail@yahoo.com[5]; thorlar26@gmail.com[6]
[c]College of Veterinary Medicine, Federal University of Agriculture, Abeokuta, PMB 2240, Ogun State, NIGERIA. Email: takeetmi@funaab.edu.ng[3]
Corresponding author: oghenochuko.oghenebrorhie@lmu.edu.ng
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ABSTRACT Parasites are the second most abundant microorganisms that infect and cause disease in wild and cultured fish after bacteria. The study investigated the parasite prevalence, abundance, mean intensity and dominance in some fresh water fish from Akomoje, Ogun River, Nigeria from February to May, 2016. Eight fish species were collected and identified to the species level. Experimental fish were measured and weighed. Endo- and ecto-parasites were examined for; from Skin/scale, dorsal and caudal fins, gills, intestine and stomach of fish. Water sample was collected from shore, mid and extreme of the landing site and also analysed for parasite abundance. Prevalence of parasite in all fish species varied slightly with size. Myxozoan group revealed the highest dominance of ecto- and endo-parasites in virtually all fish species while mean intensity and abundance of Myxozoan spp. was highest in *Oreochromis niloticus* and *Hemichromis fasciatus*. Highest case of a single species of ecto- and endo-parasite in a fish sample was that of Nematode larva in *Chrysicthys nigrodigitatus* (41.43 %) and *Trichocerca* sp. (Rotifera) in *Mormyrus rume* (52.9 %).Water analysis revealed three parasite groups that were present in the sampled fish. Conclusively, Akomoje landing site of Ogun River has a rich burden of parasites.

Keywords: Endoparasites, Ectoparasites, Ogun River, Dominance, Abundance, *Oreochromis niloticus, Hemichromis fasciatus, Chrysicthys nigrodigitatus*

1. INTRODUCTION

Fish is a very important source of nutrients of animal origin for varying healthy diets. It is a cheap source of animal protein and thus within reach of the average citizen of any nation (Mohanty, 2015). Fish demand is constantly on the increase and this is due among other reasons to the ever-increasing human population, high cost of other sources of animal protein and issues of disease and infections associated with the consumption of other sources of animal protein (Tavarez-Dias & Martins, 2017). The increasing population coupled with urbanization have resulted to problem of aquatic pollution and a corresponding prevalence of parasites and diseases in wild fish populations. Increasing aquatic environmental dynamics play a key role in determining where the hosts (fish or other aquatic organisms), parasites and other

microbial pathogens exist (Zarlenga et al., 2014). According to Laffertty & Kuris (2005), change in aquatic habitat has resulted to conditions suitable for the spread of trematodes.

Furthermore, fish serves as hosts for disease-causing parasites of man and some animals. Wild fish species have high probability of parasitic infestation and other microorganisms, but in most cases, they do not cause noticeable harm to the host. Few documented evidences exist on the pathogenicity and mortality-causing ability of parasites to the fish population, which could be due to the unnoticeable negative impacts of this parasites (Roberts, 2001). For instance, *Neorickettsia helminthoeca* the causative agent of salmon poisoning of dogs and human is harboured by the trematode called *Nanophyetus salmincola*, a parasite of fish. The dogs or human get infected by ingestion of metacercaria in infected fish. Parasites infestation in wild fishes are often recognise by fishermen or consumers only when they are so obvious as to cause reduction in the aesthetic value of the fish leading to rejection of fish (Roberts, 1995).

In Nigeria, extensive study has been carried out on parasites prevalence in fish (Okoye et al., 2014; Biu et al., 2014; Ejere et al., 2014; Uruku & Adikwu, 2017; Ani et al., 2017; Abba et al., 2018) but only the study of Adeogun et al. (2014) is available in the study area. Aside the fact that very minimal study exist in the study area, none is available on the parasite prevalence in wild fish. Hence, the study was aimed to investigate and provide documented evidence on the prevalence of endo and ecto-parasites of some wild fish species in the Ogun State Nigeria.

2. MATERIALS AND METHODS

2.1 Location

Ogun River (Figure 1) was selected as the study location. The choice of Ogun River as the study site is because the study was a pilot study and nearness of location was a factor. Also, not much have been done on the parasite burden of this water body.River Ogun, situated in the South-west of Nigeria, discharges into the Lagos Lagoon. The river rises in Oyo State near Shaki at coordinate's 8°41′0″N 3°28′0″E/ 8.68333°N 3.46667°E and flows through Ogun State into Lagos State. The river is crossed by the Ikere Gorge Dam in the Iseyin local government area of Oyo State. The reservoir capacity is 690 million cubic metres (560,000 acre/ft). The reservoir abuts the Old Oyo National Park, providing recreational facilities for tourists, and the river flows through the park.

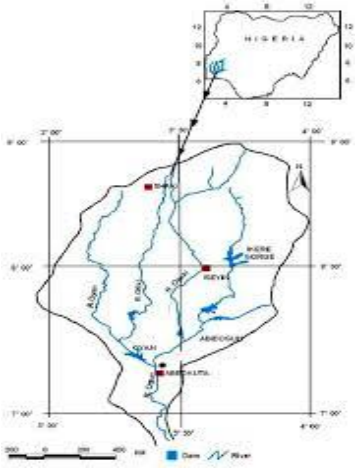

Figure 1. Map of River Ogun drainage basin (Source: Oke et al. (2012))

2.2 Collection of Fish Sample

A total of eight fish species (*Mormyrus rume, Chrysichthys nigrodigitatus, Sarotherodon galilaeus, Brycinus macrolepidous, Hemichromis fasciatus, Tilapia mariae, Tilapia zilli* and *Oreochromis niloticus*) totalling 126 fish were purchased from local fishermen from landing sites at the Ogun River and transported in bucket filled with ice for preservation to the Parasitology laboratory of the Microbiology and Parasitology Department, College of Veterinary Medicine of the Federal University of Agriculture, Abeokuta. Further laboratory examination and analysis were then carried out.

2.3 Identification of Fish Sample

The fish samples were identified by experts in the Department of Aquaculture and Fisheries Management. The physical features of the fish which includes: the fins, body form, mouth type, colour etc. were used to identify the fish samples. Fish identification key by Idodo-Umeh (2003) was then used to confirm species identity.

2.4 Laboratory Activities

2.4.1 Measurement of fish sample

Morphometric characteristics of length (total and standard) and weight (Wt) of specimens were the major parameters used to categorise the fish samples into sizes. Fish length measurement were taken using measuring board to the nearest 0.1cm Fish weights were measured by the use of a digital weighing balance (S. Mettler Electronic Compact Balance).

2.4.2 Collection and examination of specimen

Specimens were collected from the skin/scale, dorsal fin, gills and caudal fin. Skin/scale smear was collected aseptically by scrapping of the skin/scale using sterile scalpel blade, cutting the fins into separate sample bottles and refrigerated at 4^{o}C till analysis. Skin/scales, caudal fin and dorsal fin of fish specimen were observed for ecto-parasites using a light microscope.

The ventral side of the fish samples were aseptically dissected using sterile scalpel blade to expose the internal organs of the specimen. The alimentary canal of all fish samples were removed and cut into bits. The skin/scale smear, caudal and dorsal fin and contents of the gastrointestinal tract were washed into Petri-dish containing saline solution (0.9ml) to resuscitate the parasite. Stomachs and intestines were aseptically removed and dissected to reveal contents and washed into petri-dishes with normal saline. Examination of endo parasites was by the techniques of Bichi & Dawaki (2010).

2.4.3 Identification of parasite

Parasites collected were identified using their distinctive body shapes and morphological features. Resuscitated parasites were grouped and identified using taxonomic guides by Paperna (1996), counted and recorded.

2.5 Determination of Parasite Parameters

The mean intensity, abundance and dominance of the ecto-parasites from the fish species and water samples were determined according to the method of Paperna (1980).

2.5.1 Mean intensity of Parasite

$$\text{Mean intensity} = \frac{\text{Total no. of collected parasites}}{\text{No. of infected fish samples}}$$

2.5.2 Abundance of Parasite

$$\text{Abundance} = \frac{\text{Total no. of collected parasites}}{\text{No. of host fish examined}}$$

2.5.3 Dominance of Parasite

$$\text{Dominance} = \frac{\text{n}}{\text{Nsum}}$$

Where:
n= abundance of a particular species,
N sum = sum of the abundance of all parasite species found)

2.5.4 Calculation of prevalence of Parasites

$$\text{Prevalence} = \frac{\text{No.of fish infected}}{\text{No.of fish examined}} \text{ x } 100$$ ..... Ezewanji et al. (2005)

2.6 Water Analysis

Analyses of the water from three zones at the landing site were determined using sedimentation method. 10ml of the water sample was poured into a test tube and centrifuge with a centrifuge machine for 5 minute and pasteur pipette was used to take the suspended particles, placed on a clear slide and viewed under microscope X100 magnification.

2.7 Statistical Analysis

All data were presented as simple percentile incidence (%). Mean intensity of infection was presented as percentage infected fish divided by 100. Data obtained were subjected to two way analysis of variance (ANOVA). Student T-test was used to determine the significant relationship between mean intensity and abundance using Statistical Package for Social Science software.

3. RESULTS

3.1 Size Distribution and Prevalence of Parasite

Size distribution and percentage of infected fish in the study are presented in Table 1. *Chrysichthys nigrodigitatus* had the highest number of fish examined and also the highest percentage of infected fish (36 fish sample were examined of which 15.08% were infected). This was followed by *Brycinus macrolepidotus* with a total of 18 fish examined and percentage infected 4.76% and the least of which was *Mormyrus rume* having a total of 9 fish examined with a percentage of 2.38% infected.

Table 1. Size distribution and prevalence of parasite

Fish species	Length class (cm)	Mean (L±SD)	Mean (W±SD)	No. examined	No. Infected	% infected
C. nigrodigitatus	14 – 16.9	15.56±0.81	37.06±9.27	24	12	50
	17 – 17.9	18.73±0.64	66.01±9.40	10	5	50
	20 – 22.9	21.0±0.71	77.74±3.89	2	2	100
S. galilaeus	8- 13.9	12.33±1.45	47.46±12.18	8	4	50
	14 – 19.9	17.04±1.70	104.28±31.90	7	3	42.9
	2 - 25.9	21.75±2.47	78.90±59.16	2	1	50
M. rume	23 – 28.9	24.24±1.48	80.00±6.36	2	1	50
	29 – 32.9	30.83±1.86	175.40±31.83	4	0	0
	33 – 36.9	33.40±0.36	208.27±14.84	3	2	66.7
B.macrolepidotus	14 – 17.9	15.50±0.10	30.98±8.65	7	2	28.6
	18 – 21.9	19.30±0.68	76.78±15.38	6	2	33.3
	22 – 25.9	22.64±0.25	132.15±16.86	5	2	40

H. fasciatus	11 – 15.9	13.08±1.55	51.21±13.74	6	5	83.3
	16 – 20.9	18.84±1.16	78.61±9.11	5	2	40
	21 – 25.9	22.00±0.00	115.05±0.00	1	1	100
T. mariae	10 – 14.9	11.95±1.58	36.99±18.56	13	5	38.5
	20 – 24.9	22.65±0.21	197.05±14.64	2	1	50
O. niloticus	12 – 14.9	13.38±0.63	52.63±12.21	4	2	50
	15 – 18.9	16.57±1.66	82.07±35.24	3	1	33.3
T. zilli	11 – 13.9	12.21±0.88	36.04±9.18	7	4	57.1
	14 – 16.9	14.68±0.51	59.74±7.94	5	5	100
TOTAL			**126**			

3.2 Parasite Load of Fish Species Examined

Result revealed 7 parasite groups comprising of 13 parasite species from fish species sampled. Dominance was highest in *Trichocerca* sp and Nematode larva (52.94 and 41.43%) respectively. Least dominance of ecto-parasite was however recorded in *Microcystis* sp, *Oedogonium* sp, *Pediastrum* sp and *Didinium* with (1.43%) and for endo-parasite in *Ichthyophthimius* sp, *Pandorina* sp and *Polyaritha* sp respectively (0.73%) (Table 2). Least dominance of endoparasites was recorded in *Tilapia* species.

Table 2. Species composition, Mean intensity, Abundance and Dominance of Parasite and infected parts of fish.

Fish species	Parasite group	Parasite species	Infected Part	MI±SD	MA±SD	Dominance (%)
Chrysichthysnigrodigitatus	MYXOZOANS	*Microcystis* sp, *Coelosphaerium* sp, *Closterium* sp, *Oscillatoria* sp, *Polycystis* sp, *Oedogonium* sp, *Pediastrum* sp, *Zygenma* sp, *Tetraspora* sp, *Mougeotia* sp,	Skin, caudal fin	1.74±0.10[a]	0.92±0.32[b]	1.43, 8.57, 4.28, 14.29, 5.71,1.43, 1.43, 4.28, 2.86, 2.86
		Spirulina sp, *Coelosphaerium* sp, *Oedogonium* sp, *Polycystis* sp, *Pleurotaenitium* sp, *Closterium* sp, *Oscillatoria* sp, *Tetraspedia* sp	Intestine, Gill	2.47±0.83[a]	1.31±1.21[b]	0.74, 5.15, 2.21, 15.44, 2.94, 4.41, 0.74, 2.94
	NEMATODA	*Nematode egg, Colpoda* sp	Skin, caudal fin	1.89±0.10[a]	1.00±0.21[b]	41.43, 10
		Nematode egg	Intestine, stomach	0.37±0.08[a]	0.20±0.10[a]	5.15
	PROTOZOAN	*Didinium* sp	Skin, caudal fin	0.05±0.07[a]	0.03±0.01[a]	1.43
		Urostyla sp, *Synura* sp, *Frontonia* sp	Intestine, Gill	0.26±0.05[a]	0.14±0.09[a]	0.74, 1.47, 0.74

	ROTIFER	*Polyarthra* sp, *Trichocerca* sp	Intestine, Gill	2.95±0.84[a]	1.56±2.18[b]	0.74, 0.74
	CRUSTACEAN	*Eubranchipus* sp	Intestine, Gill	0.89±0.13[a]	0.47±0.39[b]	12.5
	TREMATODA	*Trematode* eggs	Intestine, Gill	0.05±0.02[a]	0.03±0.03[a]	0.74
	CESTODA	*Cestode* egg	Intestine, Gill	0.16±0.04[a]	0.08±0.06[b]	2.21
Sarotherodongalilaeus	MYXOZOANS	*Microcystis* sp, *Rivularian* sp, *Coelosphaerium* sp, *Polycystis* sp	Scale, dorsal fins	1.00±0.03[a]	0.41±0.10[a]	9.09, 9.09, 9.09,18.18
		*Closterium*sp, *Zygenma* sp, *Polycystis* sp, *Tetraspedia* sp , *Merismopedia* sp	Stomach, intestine, gills	2.20±0.17[a]	0.65±0.30[b]	20.69, 3.45, 6.89, 3.45, 3.45
	TREMATODA	*Trematodes* egg	Scale, dorsal fins	0.14±0.05[a]	0.06±0.12[a]	9.09
	PROTOZOAN	*Difflugia* sp, *Uroglena* sp, *Spirostomum* sp	Scale, dorsal fins	0.71±0.51[a]	0.41±0.10[a]	9.09, 18.18, 18.18
		Volvox sp, *Didinium* sp, *Euglena* sp, *Frontonia* sp	Stomach, intestine	3.40±1.12[a]	1.00±0.28[b]	48.27, 3.45, 3.45, 3.45
	NEMATODA	*Nematode* eggs	Stomach, intestine	0.20±0.09[a]	0.06±0.04[a]	3.45
Mormyrusrume	MYXOZOANS	*Selenastrum* sp	Skin, caudal fins	0.03±0.12[a]	0.11±0.04[a]	33.33
		Coelosphaerium sp, *Spirulina* sp	Stomach, intestine	0.50±0.10[a]	0.22±0.15[a]	2.94, 2.94

	PROTOZOAN	*Uroglena* sp, *Ichthophthrinus* sp	Skin, caudal fins			33.33, 33.34
		Volvox sp	Stomach, intestine, gills	2.00±0.23[a]	0.88±0.57[a]	23.53
	CRUSTACEAN	*Cyclops* sp, *Eubranchipus* sp	Stomach, intestine	1.50±0.32[a]	0.66±0.18[a]	11.76, 5.89
	ROTIFERS	*Trichocerca* sp	Stomach, intestine, gills	4.50±1.84[a]	2.00±0.98[b]	52.94
Brycinusmacrolepidotus	MYXOZOANS	*Polycystis* sp, *Anabaena* sp, *Tetraspora* sp	Scale, dorsal fins	1.40±0.17[a]	0.39±0.15[b]	28.57, 28.57, 42.86
		Ulothrix sp, *Aphanocapsa* sp, *Cosmarium* sp, *Pediastrum* sp, *Spirotaenia* sp, *Coelosphaerium* sp, *Epithemia* sp, *Oedogonium* sp	Stomach, intestine	2.89±1.42[a]	1.44±0.72[a]	4.26, 6.38, 2.13, 2.13,10.64, 12.77, 6.38, 10.64,
	PROTOZOAN	*Volvox* sp, *Carchesium* sp, *Dictyostelium* sp	Stomach, intestine	2.33±1.18[a]	11.67±1.34[b]	4.26, 2.13, 38.28
Hemichromis fasciatus	MYXOZOANS	*Oscillatoria* sp, *Microspora* sp, *Merismopedia* sp	Scale, dorsal fin, caudal fin	1.43±0.17[a]	0.83±0.08[a]	45.45,36.37,9.09
		Tetraspedia sp, *Coelosphaerium* sp, *Pleurotaenitium* sp,	Stomach, intestine	10.22±1.89[a]	7.67±1.74[a]	40.37, 3.67, 3.67, 10.09, 26.61

		Oedogonium sp, *Polycystis* sp				
	PROTOZOAN	*Laxodes* sp	Skin, caudal fin	0.29±0.14[a]	0.17±0.12[b]	9.09
	NEMATODA	*Nematode* larvae	Stomach, intestine	1.78±0.32[a]	1.33±0.18[a]	14.67
	TREMATODA	*Trematode* eggs	Stomach, intestine	0.11±0.10[a]	0.08±0.05[a]	0.92
Tilapia mariae	MYXOZOANS	*Tetraspora* sp, *Coelosphaerium* sp	Skin, caudal fin	1.2±0.20[a]	0.47±0.14[b]	66.67, 11.11
		Closterium sp, *Cosmarium* sp, *Polycystis*sp, *Zygenma* sp, *Tetraspedia* sp, *Coelosphaerium* sp	Stomach, intestine, gills	9.50±2.84[a]	6.33±1.26[b]	35.04, 2.19, 2.92, 1.46, 24.81, 2.92
	NEMATODA	*Tribonema* sp, *Nematode* larvae	Skin, dorsal fin	1.70±0.31[a]	0.67±0.07[b]	11.11, 11.11
	PROTOZOAN	*Pandorina* sp, *Volvox* sp, *Ichthyophthimius* sp	Stomach, intestine, gill	0.80±1.14[a]	0.53±0.24[a]	0.73, 4.38, 0.73
	ROTIFERS	*Trichocerca* sp, *Polyaritha* sp	Stomach, intestine	3.40±1.86[a]	2.27±0.10[a]	24.09, 0.73
Orechromisniloticus	MYXOZOANS	*Tetraspora* sp, *Coelosphaerium* sp	Skin, dorsal fin	2.33±0.89[a]	1.00±0.09[b]	85.71, 14.29
		Closterium sp, *Tetraspedia* sp, *Aphanocapsa* sp, *Oedogonium* sp, *Polycystis* sp,	Stomach, intestine	4.44±3.10[a]	5.71±3.01[b]	5, 31.66, 11.66, 16.67, 1.56

	PROTOZOAN	*Eudorina* sp, *Dictyostelium* sp, *Volvox* sp	Stomach, intestine	2.11±0.76[a]	2.71±0.13[a]	11.66, 6.66, 13.33
	NEMATODA	*Nematode* egg	Stomach, intestine	0.11±1.48[a]	0.14±0.21[a]	3.33
Tilapia zilli	MYXOZOANS	*Closterium* sp, *Polycystis* sp, *Tetraspedia* sp, *Ulothrix* sp, *Pediastrium* sp	Skin, dorsal fin, caudal fin	1.67±0.57[a]	1.25±0.34[a]	52.94, 17.65, 5.88, 5.88, 5.88
		Closterium sp, *Anabaena* sp, *Ulothrix* sp, *Oscillatoria* sp, *Epithemia* sp, *Microspora* sp, *Oedogonium* sp, *Tetraspedia* sp	Stomach, intestine, gills	4.44±1.48[a]	3.33±1.39[a]	18.18, 2.27, 6.82, 2.27, 11.36, 22.73, 25, 2.27
	PROTOZOAN	*Pleodrina* sp, *Dileptus* sp, *Endorina* sp	Skin, caudal fin	0.33±0.18[a]	0.25±0.11[a]	5.88, 5.88, 5,88
		Pandorina sp, *Frontonia* sp	Stomach, intestine	0.33±0.18[a]	0.25±0.72[a]	2.27, 4.56
	ROTIFERS	*Testudinella* sp	Stomach, intestine, gills	0.11±0.12[a]	0.08±0.15[a]	2.27

3.3 Distribution of Parasites in Water Body

The result revealed that Myxozoan spp. were found to be predominant. Figure 2 showed that Myxozoan spp. represented 76.00% of all the parasites while Crustaceans were least represented with only one (1) parasite species (Table 3). Protozoans recorded about 27.00% of the parasite groups with six (6) parasite species.

Table 3. Location distribution of Parasites in water from Akomoje, Ogun River

Parasite Group	Parasite species	ZONE			Total
		Shore	Middle	Extreme	
MYXOZOANS	*Oscillatoria* sp	1	1	0	2
	Spirulina sp	38	16	11	65
	Merismopedia sp	4	10	17	31
	Oedogonium sp	22	34	60	116
	Closterium sp	3	0	0	3
	Ankistrodesmus sp	0	1	0	1
	Ulothrix sp	0	0	1	1
	Zygenma sp	0	2	0	2
	Docidium sp	0	0	1	1
	Netrium sp	0	3	0	3
	Pleurotaenitium sp	1	2	0	3
PROTOZOAN	*Pandorina* sp	4	0	38	42
	Bodo sp	10	0	21	31
	Volvox sp	0	1	0	1
	Clupods sp	0	0	1	1
	Hartiminella sp	0	3	0	3
	Didinium sp	0	0	1	1
CRUSTACEAN	*Cypridops* sp	0	0	1	1
TOTAL		**83**	**73**	**152**	**308**

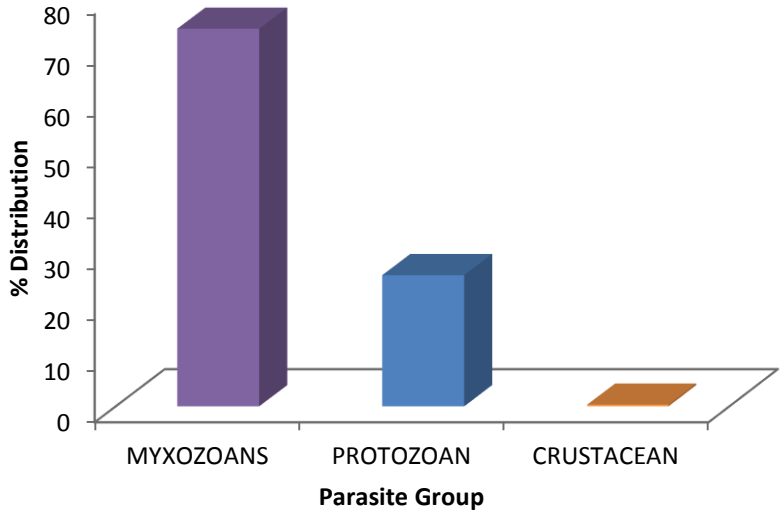

Figure 2. Percentage distribution of parasite within group in water from the study area.

4. DISCUSSION

Clear understanding of the spread and prevalence of parasites of wild fish is a recipe for formulation of effective control or elimination strategy for improving the health standard of human and profitable fish farming in Nigeria, hence this study has attempted to shed more light on the distribution and prevalence of wild fish and the parasites infecting them in Ogun State Nigeria.

The result of the study revealed the rich parasite burden of endo- and ecto-parasites in the study area. Seven parasite groups consisting of 13 species were retrieved from eight fish species analysed, is a clear indication of high parasite diversity for a landing site. Omeji et al. (2010), also reported similar result in *Heterobranchus longifilis* obtained from the wild in Benue State. High prevalence of parasites in all fish species and sizes recorded in this study could be as a result of several factors prevailing such as but not limited to host fish sex, location of removal, age and size (Bichi & Bizi, 2002) and the aquatic ecosystem (Lafferty & Kuris, 2005). It may also be as a result of increased contact between the host and parasite.

However, significant variation was observed in parasite prevalence between various sizes of the different fish species with highest prevalence in bigger fish than in the smaller fish which revealed as high as 100 % presence. Reasons could be as result of their foraging habit and the abundance food available and consumed by them. Goselle et al. (2008) reported a similar result for *Clarias gariepinus* and *Tilapia zilli* obtained from Lamingo Dam, Jos, Nigeria. Bichi & Ibrahim (2009) however reported higher prevalence in the level of both external parasites and that found in the internal organs of the *Tilapia zilli* of smaller sizes in their survey of Tiga Lake, Kano, Nigeria. Reason for this difference could be attributed to the varying distribution of parasites in the different habitat which could be due to host-parasite interaction and the water quality parameters of dissolved oxygen, temperature and pH of the fish environment (Anderson, 1992).

The highest percentage intensity of the Myxozoan spp. and its abundance in *O.niloticus* and *H. fasciatus* reported in this study is corroborated by the study of Tossavi et al. (2014), Ugbor et al. *(*2014). Also, Karvonen & Valtonen (2004) and Okoye et al. (2014) documented the richness of the tropical fresh waters in their parasitic species burdens. Indication from this result is that such parasite burden in an ecosystem may pose high risk of infection to both fish and man who might feed on the fish species which serve as secondary host of human pathogenic parasites or where fish is a transport host of zoonotic parasites. However, the studies of Ekanem et al. (2011) and Ejere et al. (2014) are not in agreement with our findings.

Generally, there will be need to characterized these parasites molecularly in future to shed more light on their genetic diversity in the study area.

5. CONCLUSION

Akomoje landing site of Ogun River has a rich burden of ecto- and endo-parasites mainly myxozoan, protozoan and crustacean.and thus we recommend that constant surveillance of the water body be carried out to know the prevalence of parasites in the water body in order to prevent possible food-borne parasitic disease outbreak. In addition, detailed study of the seasonal variations of parasites load in this water body is also recommended.

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