PARASITE FAUNA OF TILAPIA SPECIES IN THE FEDERAL UNIVERSITY OF AGRICULTURE, ABEOKUTA (FUNAAB) RESERVOIR, ABEOKUTA, OGUN STATE, NIGERIA

Khadijah O. Yusuff1 and Elizabeth. O. Ibidapo-Obe, 1
[1]Department of Agricultural Technology, School of Pure and Applied Science,
The Federal Polytechnic, Ilaro, P. M. B. 50, Ilaro, Ogun State, Nigeria.
khadijah.yusuff@federalpolyilaro.edu.ng, elizabeth.okoroafor@federalpolyilaro.edu.ng

ABSTRACT

A survey of parasite fauna of Tilapia species (Family: Cichlidae) was carried out at The Federal University of Agriculture Reservoir, Abeokuta, Ogun State. A total of 450 specimen belonging to four species were examined for parasites using standard parasitological methods, out of which 72 (16.0%) were infected with various types of parasitic fauna. A total of three hundred and sixty six parasites belonging to four groups; a flagellate protozoan (*Ichthyobodo necatrix*), a species of annelid (*Piscicola sp.*), one species of nematode (*Cucullanus sp.*) and a cestode (*Caryophyllaeides sp.*) were recovered. The result showed low prevalence of infection as well as low parasite diversity. The four species of fish sampled were *Oreochromis niloticus*, *Hemichromis fasciatus*, *Sarotherodon galilaeus* and *Tilapia zilli*. The skin, gills, stomach and intestine were the location infected and the skin supported the highest burden. The result showed that there was no significant difference between male and females with regards to infection (X^2 1.38, $P>0.05$). Also, size/age of fish did not influence the degree of infection in fishes (X^2 0.44, $P>0.05$).

Keywords: Parasite, Tilapia, FUNAAB Reservoir, Prevalence

1.0 INTRODUCTION

Tilapia has become the third most important fish in aquaculture after carp and salmon; worldwide production exceeded 1,500,000 metric tons in 2002 (Parker and Parker, 2011) and increases annually. Because of their high protein content, large size, rapid growth (6 to 7 months to grow to harvest size) and palatability (Sayed, 2006), a number of tilapiine cichlids – specifically various species of Oreochromis, Sarotherodon, and Tilapia are focus of major aquaculture efforts. Tilapia fisheries originated from Africa. It has made prodigious progress in fish culture in warm waters. Once promoted as the "miracle fish", several species of tilapia are widely distributed within the tropics during the 1950s.Up till date, enthusiasm for the species has become so high that it is described as the "aquatic chicken" or "chicken of the sea" (Cedric and Niel, 2007). However, apart from a significant disadvantage of the group (i.e., excessive reproduction in pond culture resulting in a large number of small unmarketable fish) in which several workable technologies are now available for raising some of the species or hybrids of tilapia on a profitable basis, many problems still remain to be solved in making this group serve as a future "aquatic chicken". Out of these problems, parasites and diseases need to be focused upon.

Fish are hosts to many adult parasites and larval forms, the adult of which occur in amphibians, reptiles, birds and mammals as well as predatory fish. Some of these parasites cause disease to fish, affecting their health and reproduction, making them fall easy prey to predators and some infect man. For example, *Clonorchis sinensis* causes hepatomegalias and cirrhosis (Choi et al., 2006) while *C. formosanus* has been reported to cause diarrhea, epigastric pain and indigestion (Chai et al, 2013).Very few are seriously harmful to fish. Most individual fish in wild or cultivated populations are infected with parasites but in great majority of cases, no significant harm appears to be caused to the host fish. Although, there are surprisingly few reports of parasites causing mortality or serious damage to wild fish populations, such effects often go unnoticed. Parasites in wild fish are only remarked upon when they are so obvious as to lead to rejection of fish by fishermen or consumers. In cultured fish population, however parasites often cause serious outbreaks of diseases. The presence of dense population of fish kept in particular environmental condition may favour certain parasite species so that the parasite population increases in a very high level. In Nigeria, however, parasites and the diseases caused have not received any serious attention because bulk of fish locally produced and marketed are under artisanal extensive wild fish capture (Omoniyi and Olofintoye, 2001), However, with the demand outstripping supply, intensive culture of fish is gathering momentum. Therefore, survey knowledge of the parasite fauna of indigenous fishes is needed.

2.0 MATERIALS AND METHODS

2.1 The Study Site

The Federal University of Agriculture, Abeokuta (FUNAAB) Reservoir is located at the Fisheries section of the University farm. The 3-hectare reservoir was constructed by damming a seasonal stream (Alabata Stream) in 1997.

Alabata lies within the South Western region of Nigeria, around latitude 7°10'N and longitude 3°2'E, with a prevailing tropical climate and annual rainfall of about 1037mm. The ambient temperature lies within 28°C in June and 36°C in February with an average annual temperature of 34°C. The vegetation presents an interphase between a tropical rainforest and a derived savannah. The reservoir is to provide water for other earthen ponds downstream, serve as a fishing ground and for research and educational purpose. The dominant families of fish found in the reservoir include Clariidae, Cichlidae, Bagridae, Hepsetidae, Cyprinidae and Centropomidae.

2.2 Field Procedure

At the reservoir, fish were captured using castnet of mesh size 5cm (2 fingers) and thickness of $210^{D}/9$. They were captured in the morning hours between 9:00am and 11:00am. The fishes were attracted using maggot and sometimes pelleted feed. Maggots were collected from poultry droppings nearby and pelleted feeds procured from the fish hatchery. Fishes captured were sorted out and the tilapiine groups found were transported alive to the laboratory. Other groups caught were returned to the Reservoir.

2.3 Laboratory Procedure

On getting to the laboratory, each specimen was identified and given an identification number. All the tilapias were sorted into taxonomic categories. Each specimen was further subjected to laboratory measurements. The total and standard lengths of each fish specimen were taken using a meter ruler built into a board with the head of fish pointed to left hand side. Length measurement was read to the nearest centimetre. The body weight of each specimen was taken to the nearest gram using a top loading Mettler electronic balance of Model DT 1000. The sexes of all specimens were identified.

2.4 Collection and Preservation of Parasites

In the laboratory, fish were individually examined for parasites. The skin and gills were examined with hand lens (magnification x15) for the occurrence of any ectoparasite. Subsequently, the fishes were dissected and different portion of the gut (oesophagus, stomach and intestine) were placed in saline solution which was isotonic to the endoparasite physiological medium. Extraction of parasites was done with the aid of forceps. The parasites were collected, counted and preserved in specimen bottles containing formalacetic acid (FAA) for subsequent identification. The specimen bottles were labeled with the date, location of collection and the name of the host.

2.5 Identification of Parasites

The parasites recovered were mounted on slides, viewed under the microscope (Model G 300 series) and drawn out for identification. Identification of parasites was done according to Khalil and Rolling (1997) and Ugwuzor (1987).

2.6 Statistical Analysis

Apart from descriptive statistic, chi - square test was *also* used in determining whether the distribution of parasite fauna in relation to fish size/age and sex differed in FUNAAB reservoir.

3.0 RESULTS

A total of 450 specimens of tilapine fishes from the reservoir were examined. The four species identified *were Sarotherodon galilaeus, Oreochromis niloticus, Hemichromis fasciatits* and *Tilapia zilli.* Out of which 208 were males while the remaining 294 were females. Of the 450 fishes examined, seventy two (16.0%) were infected by parasites, The number of fish examined with the number infected in each species is shown in Figure 1, *Oreochromis niloticus* had the highest level of percentage infection (37.5%), followed by *Sarotherodon galilaeus* (33.3%), *Tillapia zilli* (25%) and *Hemichromis fasciatus* (4.2%).

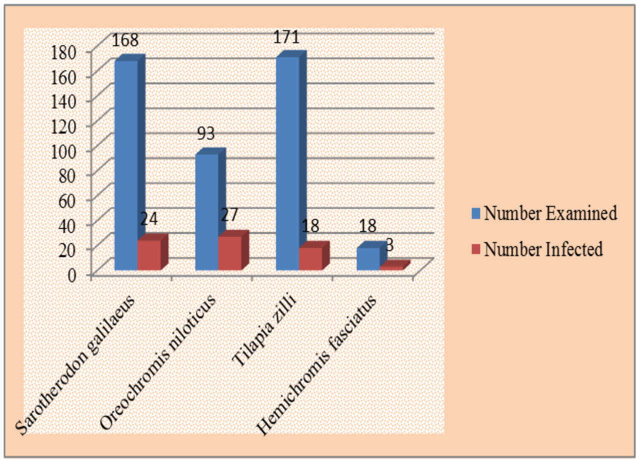

Figure 1: Fish species examined and incidence of infection

Twenty four (29.0%) out of the 224 examined were infected while T. *zilli* were least infected with eighteen (10.5%) out of the 171 samples examined. A total of three hundred and sixty six parasites belonging to four phyla; phylum Protozoa (class: Zoomastigophora), phylum Annelida (class: Hirudinea), phylum Aschelminthes (class: Nematoda) and phylum Platyhelminthes (class: Cestoda) were recovered from the skin, gills, intestine and stomach as shown in Table 1.

Table 1: Number of Parasites Recovered and Location of Recovery in Fish

Fish Species	**Ecto parasite**		**Endo parasite**	
	S	G	I	St
Sarotherodon galilaeus	63	54	-	-
Oreochromis niloticus	147	60	-	-
Tilapia zilli	12	21	3	-
Hemichromis fasciatus	-	-	-	6
Total	**222**	**135**	**3**	**6**
% of Infecton	**60.7**	**36.9**	**0.8**	**1.6**

Where S – Skin, G – Gills, I – Intestine and St – Stomach

Three hundred and fifty seven (97.5%) parasites were ectoparasites found on the skin and gills, of which 95.9% are flagellate protozoans *(Ichthyobodo necatrix)* and 1.6%, annelids *(Piscicola sp.)*. Nine (2.5%) were endoparasites found in the stomach and intestine, of which 1.6% are nematodes *(Cucullanus sp)* and 0.8% cestodes *(Caryophyllaeides sp*.). The occurrence of parasites among the fish host is shown in Table 2.

Table 2: Incidence Of Parasites Among Fish Host

Parasite	Class	% of infection	Fish species infected	No of parasites
ECTOPARASITES				
Ichthyobodo necatrix	Zoomascigophora	95.9	Sarotherodon *galilaeus*	117
			Oreochromis niloticus	201
			Tilapia zilli	33
Piscola sp.	Hirudinea	1.6	*Oreochromis niloticus*	6
ENDOPARASITES				
Cacullanus sp.	Nematode	1.6	*Hemichromis fasciatus*	6
Cary*ophyllaeides sp*.	Cestode	0.8	*Tilapia zilli*	3

Figure 2 shows the age class using the frequency distribution table. Out of the 450 fishes examined, 45 were juveniles, 312 pre-adults while the remaining 93 were adults.

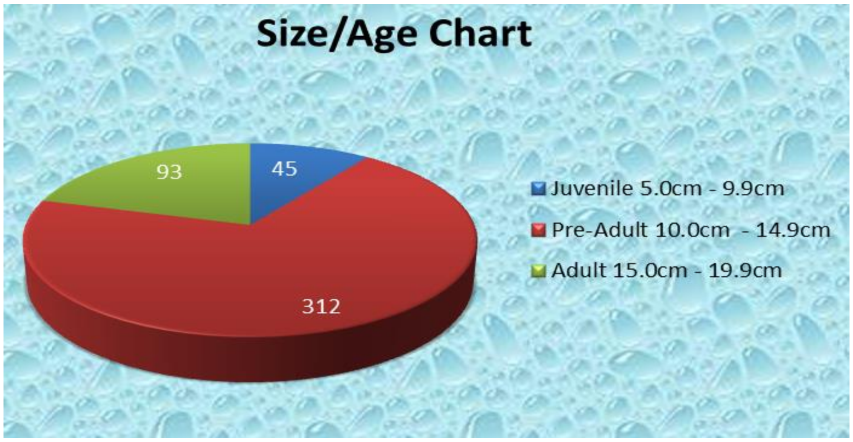

Figure 2: Size/age frequency distribution table

In relation to size of fish in Figure 3, it was observed that pre-adults were more infected than the juveniles and followed by the adults. Pre-adults have a prevalence rate of 75%, followed by adults (16.7%) and finally juveniles with 8.3% infection.

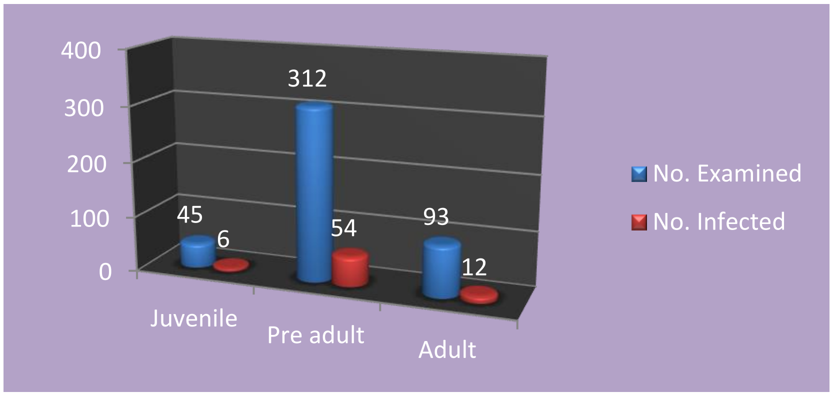

Figure 3: Relationship between host age/size and incidence of infection

The males showed 20.8% infection while females showed 13.4% as depicted in Table 3. There was no significant difference between male and females with regards to infection (X^2 1.38, P>0.05). Also, size/age of fish did not influence the degree of infection in fishes (X^2 0.44, P>0.05).

influence the degree of infection in fishes (X^2 0.44, P>0.05).

Table 3: Relationship between Sex of Host and Incidence of Infection

	MALE		FEMALE	
	Examined	Infected	Examined	Infected
Sarotherodon galilaeus	21	0	147	24
Oreochromis niloticus	51	18	42	9
Tilapia zilli	75	12	96	6
Hemichromis fasciatus	12	3	6	0
Total	**159**	**33**	**291**	**39**

4.0 DISCUSSION

The 16.0% overall infection rate observed in the present study is low particularly when compared to the 62.7% and 48.4% infection rates reported in some freshwater fish from Ekiti State, Nigeria by Omoniyi and Olofintoye (2001). In the same vein, Keremah and Inko-Tariah (2013) also reported a higher prevalence of 90% and 82% in an integrated and unintegrated fish pond on *O. niloticus* in African Region Aquaculture Centre, Aluu near Port Harcourt, Nigeria while a prevalence of 51% was reported from Okhuaihe River near Benin city by Okaka and Omoigberale (2002). However, an infection rate of 16.6% was reported from Asa River and its impoundment at Ilorin (Obano *et al*., 2010). It is worthy to note that infection rates vary greatly from one area to another, and this may not be unconnected with the fact that a number of factors like availability of intermediate hosts, and susceptibility of definite hosts amongst others determine to a large extent the rate of infection (Obano *et al*., 2010).

The results of this study shown in Table 2 revealed the occurrence of four groups of parasites infecting the cichlids in FUNAAB Reservoir. The protozoan, *Ichthyobodo necatrix* found mainly on the skin and gills accounted for 95.9% of the total parasites recovered. This goes in consonance with the findings of Donald, 2017 who also recorded highest prevalence of *Ichthyobodo necatrix* in Nile Tilapia in northern Costa Rica. This high prevalence rate may be attributable to the direct life cycles of protozoans as well as the metazoans, which are majorly ecto parasites. According to Woo, 2006 and Iyaji *et al*., 2009 all important metazoan parasites of fish have a direct life cycle, propagate rapidly and are readily transmitted among fish. *Ichthyophthirius multifiliis, also a protozoan* has been recorded to be one of the biggest responsible for significant economic losses in fish farms worldwide (Dickerson, 2006), and the second protozoan causing infections in Brazil, which proves its great adaption also in tropical areas (Wanderson et al., 2012). The infective stages are released into the water to reinfect the same host or spread through the fish population with exception of the blood protozoans. Apart from the absence of intermediate host, *Ichthyobodo* has been found to reproduce by binary fission i.e by simply dividing repeatedly into two (Southgate, 1993).

Another form of ectoparasite found on the skin was *Piscicola* sp. The low prevalence rate (1.6%) of the annelid could be due to the migratory act of leech which only derives its nourishment when the need arise using both its anterior and posterior suckers. This parasite was observed not to be host specific (Omoniyi and Olofintoye 2001). Both cestodes and nematodes (helminthes) recovered accounted for only 2.5% of infection in the fish, which is integral in the occurrence of helminth infection. This is contrary to the findings of Ibiwoye et al. (2006) who reported the prevalent rate of 22.5, 76.25 and 1.25% for nematodes, cestode and trematode in *Clarias anguillaris* in Onitsha area along River Niger.

In relation to size, the length range of 10.0 - 14.9 had highest incidence rate of 75%. This means that the post-juvenile/ pre-adult fish were more infested than the smaller and older ones. This observation corroborates the investigation of Adeyemo, (2001) on the incidence and pathogenesis of *Chrostomium tilapiae* in Oyo State farms and reported that juvenile fish were more susceptible to *C. tilapiae* infection. This is also in consonance with Akinsanya *et al.*, (2007) who reported that the smaller fish were more infested than the bigger ones. In contrast, Kudoro (1995) studied some parasites of culture fish and reported that there was a gradual increase in the percentage infection with increase in length.

The differences in the prevalence of infection between males and female have been observed by previous workers (Omoniyi and Olofintoye, 2001; Chacha and Lamtane, 2014). The observation in this study seemed to be due to the more foraging habit of the males than the female, resulting in a higher exposure to infection.

5.0 CONCLUSION

From the present study and previous reports, parasites of fish are likely to be qualitatively similar in all Nigerian freshwater but the level of their prevalence tends to vary greatly. The parasitic infection recorded in the present study is important to the fishery in the area and requires to be checked as the infection rate was significant enough to elicit some pathological effects on fishes by retarding their growth, cause death and reduce their market value. Not only this, the potential of human population becoming infected by these parasites in the reservoir exists.

REFERENCES

Adeyemo, A.O. (2001). Incidence and pathogenesis of *Chrostomum Tilapia:* A trematode parasite of *Tilapia* (*O.reochromis niloticus) Unpublished Ph.D Thesis*. University of Ibadan, 224Pp.

Akinsanya, B., Otubanjo, O.A. and Hassan, A.A. (2007). Helminth parasites of *Malapterurus electricus* Malapteruridae from Lekki Lagoon, Lagos, Nigeria, *J. Am. Sci.* 3 (3): 1-5.

Cedric, K. and Neil, W. (2007). Parasitic Disease of Tilapia, Understanding Aquaculture, - 5m Publishing, Benchmark House, England

Chacha, J.M. and Lamtane, H. (2014). Population Biology of the Metazoan Parasites Infecting Fishes from Lakes Uba and Ruwe, Lower Rufiji Floodplain,Tanzania. *Natural science* 6 (June): 700–708.

Chai, J. Y., Sohn, W. M., Yong, T. S., Eom, K. S., Min, D. Y., Lee, M. Y.,&…Rim, H. J. (2013). *Centrocestus formosanus* (Heterophyidae): Human infections and the infection source in Lao PDR. *Journal of Parasitology*, *99*(3), 531-536.

Choi, D., Lim, J. H., Lee, K. T., Lee, J. K., Choi, S. H., Heo, J. S. & Hong, S. T. (2006). Cholangiocarcinoma and *Clonorchis sinensis* infection: A case-control study in Korea. *Journal of hepatology*;*44*(6), 1066-1073.

Dickerson, H.W. (2006). *Ichthyophthirius multifiliis* and Cryptocaryon irritans (Phylum Ciliophora), In: Woo, P.T.K., editor. Fish diseases and disorders: Protozoan and metazoan infections. UK: Biddles, King's Lyn;

Donald, A., Cesar, O., Simón, M. and Ángel, A. (2017). Parasites of Nile Tilapia larvae *Oreochromis niloticus* (Pisces: Cichlidae)in concrete ponds in Guanacaste, Northern Costa Rica. SciELO vol. 9(6).

Ibiwoye, T.I.I., Nweke, S.U. and Sogbesan, A.O. (2006). Parasitic fauna of the gastrointestinal tract of *Clarias anguillaris* (Geoffrey, Pisces: Clariidae) in Onitsha Area of Nigeria. In: Proc. 20th Annual Conf. of FISON, Port Harcourt, Nigeria, Nov. 14-18, 2005, pp.266-271.

Iyaji, F.O., Etim, L. and Eyo, J. (2009). Parasite Assemblages in Fish Hosts. *Bio-Research* 7(2): 561–570.

Keremah, R. I. and Inko-Tariah, M. B. (2013). Comparative study of ectoparasites on Nile tilapia *(Oreochromis niloticus)* cultured under integrated and unintegrated pond systems. African Journal of Biotechnology; vol. 12(19):2711-2714.

Khalil. L. F. and Polling, L. (1997). Checklist of the Helminth parasites of African Freshwater fishes: University of the North, Republic of South Africa. Pp. 234

Kudoro, O.A. (1995). Some parasites of cultured fishes of Mobolaji Fish Farm. Ado-Odo *Unpublished M.Sc. Thesis* University of Ibadan, Nigeria, 88Pp.

Obano, E., Ezeri, G.N.O. and Aniye, U. K. (2010). Studies on the parasitic infectionin fish in Ovia River at Ikoro, Ovia South West Local Government Area of Edo State, Nigeria. Biosci. Res. Comm.; 22(3):37

Omoniyi, I.T. and Olofintoye, L.K. (2001). A survey of endohelminth parasites of fishes from water reservoir and Elemi-River in Ado-Ekiti, Ekiti State, Nigeria. *Bioscience Research Communications* 13 (1): 87-94.

Parker, R. and Parker, R.O. (2011). Aquaculture Science, pp 123-128, Cengage Learning. ISBN 978-1-4354-8812-0

Sayed, A.F.M. (2006). Tilapia Culture. CABI. ISBN 978-0-85199-014-9.

Southgate. Pete (1993). Disease in Aquaculture. In: Aquaculture for veterinarians: Fish husbandry and Medicine. Ed. Lydia Brown. Pergamon Press, USA. Pp. 91-130.

Ugwuzor, G.N. (1987). A survey of the helminthic parasites of fish in Imo River. *Nig. Journal of Applied Fish and hydrobiology*, 2: 25-30

Wanderson, P., Ligia, N. R., Márcia, D., Renata, M., Daniel, M. and Marcos, T. (2012). Protozoan and metazoan parasites of Nile tilapia *Oreochromis niloticus* cultured in Brazil. SciFLO vol. 17(1).

Woo, P.T. (2006). *Fish diseases and disorders volume 1, protozoan and Metazoan infections*. 2nd Edition. Edited by W.P.T.K. University of Gueiph, Canada. 802 pp.