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**Parasitic Fauna of *Oreochromis niloticus and Tilapia aureus* in Two Reservoirs on River Owena, Southwestern Nigeria**

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The parasitic fauna of *Oreochromis niloticus* and *Tilapia aureus* of the family Cichlidae was examined the Old Reservoir (OR) and New Reservoir (NR) between May 2010 to April 2012 in River Owena in Ondo State, Nigeria. Three hundred and twenty fish (320) at 20 pieces of each of the fish species were collected and examined (per season) totaling 160 pieces each, from *Oreochromis niloticus (O. niloticus)* and *Tilapia aureus (T. aureus)* for parasitic infection using standard methods. The results show that 84 males and 76 females were examined for *O. niloticus* while 55 males and 105 females *of T, aureus* were examined. However, 37 (44.05%) male and 57 (75%) females were infected in *O. niloticus* while 38 (69.09%) male and 38 (36.19%) female were also infected in *T. aureus* in the study area. The t-test between the number of infected fishes in the two reservoirs shows significant difference (P≤$\leq $0.05) between the rate of infection in *O. niloticus* and *T. aureus* (t = 0.0003) in both OR and NR. The highest parasitic prevalence and abundance of 22.50% and 0.38 were recorded for *Dactylogyrus spp*. in *O.niloticus* with the highest parasitic intensity of 1.92 seen in T. aureus. The result also reveals that OR had the higher number of infected fishes (45), total number parasite observed (178) as against 34 and 120 recorded for NR. The prevalence (56.25%), intensity (3.96) and abundance (2.23) were also high for OR as against 42.50%, 3.53 and 1.50 respectively for NR. The multiple infections recorded in the fish specimens from the two reservoirs are indication of the rich parasitic fauna of the reservoirs. It is therefore recommended that proper management of the reservoir should be adopted to reduce the occurrence of parasitic fauna of the sites which will reduce the possible transmission of parasites from fish to humans.

**Keywords**: Cichlidae, *Oreochromis niloticus,* intensity prevalence infections

**Introduction**

Parasitism in fish has been a great concern as these parasites usually exist in equilibrium with their host in a survival strategy like other animals in the wild. The incidence of parasitic infection in fish has been reported globally because fish serves as parasite reservoir and as an intermediate host to various developmental stages of parasites (Pal and Ghesh, 1985). According to Ciche *et al*. (2008), parasites changed biochemically and immunologically in order to survive inside host organism and not to be digested or killed. Fish parasites and diseases remain major problems confronting the fishery biologist (Ravichandran e*t al.,* 2007). Fish may serve as paratenic, intermediate or definitive hosts of parasites that are harmful to man and animals. However, many parasites are associated with fish species in their natural habitats, where they cause morbidity, mortality and economic losses in fish production in the world (Khalil 1971; Subashinghe, 1995). Parasites and diseases reduce fish production by affecting the physiology of fish (Kabata, 1985 cited in Fagbenro *et al*., 1993. and Adeyemo, *et al*., 2003). Several authors have worked on parasitic incidence of fish in Nigeria (Adeyemo and Falaye, 2007; Eyo *et al*., 2012). These authors discovered that in the natural environment, healthy individuals co-exist with diseased ones and in most parasitic infections, host may not be killed unless the parasitic burden is high. However, growth rate and market value of fish could be reduced by high level of fish parasitization. For public health concerns, it is necessary to identify disease reservoirs in order to have adequate knowledge of the transmission mechanism. This will help to develop an effective method of preventing the access of pathogens and their reservoirs to healthy facilities or individuals (Adeyemo and Falaye, 2007).

Some studies have been carried out on the common parasitic fauna of commerciallyimportant fishes in Nigeria. Eyo et al. (2012) reported on the parasitic infestation of Synodontis batensoda in the Rivers NigerBenue confluence and Okoye et al. (2014) studied the prevalence and seasonality of parasites of fish in Agulu Lake in South Eastern Nigeria while little research has been conducted to document the parasitic fauna of commercially-important fish species in the freshwater rivers in South Western Nigeria. This limited documentation in Nigeria emphasizes the need that more research be carried out on tropical freshwaters which have great potentials to contribute to maintaining the populations of commercially-important fish species to ensure well-informed aquaculture management. This study was conducted to present information on the parasitic fauna and the severity of infection in two important fish species- Clarias agboyiensis and Clarias gariepinus- inhabiting two reservoirs located on River Owena in Ondo State, Nigeria.

**Materials and Method**

## Study site.

## The study was carried out on the old and the new reservoirs located on Owena River. The New Reservoir is located in Ifedore Local Government Area of Ondo State Nigeria, and was established in 2006. It has central coordinates of 07.34272 N and 004.9996 E. It is about 300 m long and 9 m in the deepest parts with a capacity of 600,000 m3. It is about 7.1 km to Igbara Oke town off Ilesa-Akure Road. The Old Reservoir was established over 46 years ago along Ondo-Akure road for domestic purposes within Akure and Ondo metropolis. It has a central coordinate of 07.19866˚ N and 05.01849 ˚ E. There are two major seasons occurring over the Reservoirs: dry and wet seasons. Heavy rains bimodal characterize the wet season (May–October). The rainfall regime is characterized by double peaks (June and October); 1005 mm in June and a little above 1800 mm in October. Dry season is between November and April, while the peak of dry season is in January. The sun shines throughout the year and the average temperature is between 29.40 ºC and 31.26 ºC. At present, fish production from Old and New Reservoirs in Owena River form a significant proportion of the Akure metropolitan inland fisheries supply. It is one of the largest Rivers in the area with the new Reservoir under construction by government to supply water to the local communities, for small scale farming, industries and general house hold use.



Figure 1: Map of the study areas showing the location of the reservoirs (Inset: map of Nigeria showing the reservoir catchment areas).

## Methodology.

***Fish Sample Collection, Identification, Classification and Measurements***

## The fish samples for the study were bought from the local fishermen in two Reservoirs between the months of May 2010 to the month of April 2012 and were identified as described by Olaosebikan and Raji, (2004) to species level in the field. The live fish samples (twenty for each fish species) were transported in a plastic bucket containing clean water from river to the research laboratory of the Department of Fisheries and Aquaculture Technology, The Federal University of Technology, Akure, where the fish samples were examined for ectoparasites. Scraped mucus from the body surface of the fish were examined under low power binocular microscopes. Prior to dissection, the standard length (from the tip of the snout to the end of the base of caudal peduncle) and the total length (from the tip of the snout to the extreme end of the caudal fin) were measured using a half meter rule mounted on a dissecting board (Lowe McConnell, 1972). The weight of each fish samples was also measured to the nearest 0.1 g on a top loading Mettler balance Model Mettled Toledo PB8001. The fish were sexed and the males were distinguished from the females by the examination of the urogenital area and external morphology gonads.

## Parasite collection

The fish were sacrificed using mechanical stunning method. Each fish was treated with physiological saline to reduce desiccation and then systematically observed for parasite. Firstly, the skin, gills and fins were examined for ecto-parasites using a combination of the eyes and the hand lens. Then the skin was scraped with a scalpel and the scrapings of mucus from the skin and fin smeared on a microscope slide and examined for attached parasite. Gills were removed and placed on petri dish containing normal saline solution and examined individually under a dissecting microscope. The gastrointestinal tract of individual fish was cut open from the rectum to the esophagus and examined for endo parasites. The entire digestive system was removed and placed in a petri-dish with physiological saline solution and the gut was divided into sections. Examination of fish specimen for parasites skin, gills, gonads, livers and heart were examined with the aid of a-dissect Binocular microscope at 10 and 40 magnification. The abdominal cavity of each fish was cut open by a small incision in the mid- ventral line, extending interiorly and passing laterally to the pelvic fins. The viscera made up of the gut, liver caeca, heart, swim bladder, urinary bladder and gonad and kidney were examined separately in a petri dishes containing normal saline solution. The various tissues teared apart with dissecting needles, a normal saline solution and examined separately in petri dishes under the dissecting microscope. Parasites recovered were washed free of debris in saline fixed and preserved in 3% formal- saline. The number of parasites per fish and location were recorded (Ash and Orihel, 1991).

***Identification of parasites***

Parasites recovered were prepared as whole mounts using standard histological technique for carmines stains. They were placed in diluted acetocarmine overnight and stained. They were then washed up in tapped water. The over stained were distained in 1% acid alcohol. Thereafter, the parasites were dehydrated increasing concentration of alcohol (50%, 70%,90% and absolute). They were then cleared in a mixture of alcohol and xylene (1:1) followed by xylene alone and finally mounted Canada balsam. Prior to examination nematodes were washed from preservative with water and mounted in alactophenol using appropriate keys as provided by (Yamaguti 1961 and Khalil *et al*,1994) the parasite was sorted out into their various groups and identified to at least the generic level. Photomicrograph and drawing of the parasites were made.

**Statistical Analyses**

SPSS 21.0 for windows were used for data analysis. The descriptive statistics was used to determine the mean and standard deviation (SD). Student t-test was used to determine the statistical significance in the prevalence of parasitic infections between the study sites.

The prevalence, intensity and abundance were calculated based on the formulae described by Awharitoma and Ehigiator (2014) as shown follows:



**Results:**

Table 1 shows the distribution of parasite between *Oreochromis niloticus* (*O. niloticus)* and *(T. aureus)* in the study area. Out of 160 sampled for each of the species, 94 were infected in *O. niloticus* which gave 218 infections *and* 76 of *T. aureus* were infected which gave 142 infections. The prevalence, intensity and abundance of parasite infections were 58.75%, 2.32, and 1.36 for *O.* niloticus and 47.50%, 1.87 and 0.89 for *T. aureus* respectively. The t-test between the number of infected fishes in the two reservoirs shows significant difference (P$\leq $0.05) between the rate of infection in *O. niloticus* and *T. aureus* (t = 0.0003)in both OR and NR.

Table 1: Parasite distribution between *Oreochromis niloticus* and *Tilapia aureus* in the study areas.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fish species | No. infected | No of parasite observed | Prevalence  | Intensity | Abundance  |
| *Oreochromis niloticus* | 94 | 218 | 58.75 | 2.32 | 1.36 |
| *Tilapia aureus* | 76 | 142 | 47.50 | 1.87 | 0.89 |

No of fish examined per species = 160

Table 2 shows the number and percentage of males and females of each species examined in the study areas.

From the 160 sampled for each of the species, 84 males and 76 females were examined for *O. niloticus* while 55 males and 105 females of *T, aureus* were examined. However, 37 (44.05%) male and 57 (75%) females were infected in *O. niloticus* while 38 (69.09%) male and 38 (36.19%) female were also infected in *T. aureus* in the study area.

Table 2 The number and percentage of males and females in each fish species examined

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fish species | No. Examined | No. Infected | % Infected | % Not Infected |
| M | F | M | F | M | F | M | F |
| *Oreochromis niloticus* | 84 | 76 | 37 | 57 | 44.05 | 75.00 | 55.95 | 25.00 |
| *Tilapia aureus* | 55 | 105 | 38 | 38 | 69.09 | 36.19 | 30.91 | 63.81 |

No of fish examined per species = 160

The incidence of the parasitic fauna namely *Dactylogyrus spp* and Gyrodactylus spp (Monogenea) *Contracaecum spp* and *Capilaria spp* (Nematodes), and *Trichodina spp* (Protozoa) in the study areas is shown in Table 3. The result show that 36 species of *O. niloticus* were infected with *Dactylogyrus spp*, 03 with Gyrodactylus spp, 32 with *Trichodina spp*, 29 with *Capilaria spp* and 05 with *Contracaecum spp*. The highest observation (36) of parasitic fauna was recorded for *Dactylogyrus spp* while the lowest (03) was recorded for *Gyrodactylus spp* in the study area. However, the highest parasitic abundance, intensity and prevalence of 0.38, 1.69 and 22.50% were recorded for *Dactylogyrus spp*, while the lowest parasitic abundance, and prevalence of 0.03, 1,88 were recorded for *Gyrodactylus spp* and *Gyrodactylus spp* respectively with *Trichodina spp* and *Capilaria spp* having the lowest intensity of 1.47 each.

Also, 26 species of *T. aureus* were infected with *Dactylogyrus spp*, 04 with Gyrodactylus spp, 22 with *Trichodina spp*, 23 with *Capilaria spp* and 04 with *Contracaecum spp*. The highest observation (26) of parasitic fauna was recorded for *Dactylogyrus spp* while the lowest (04) was recorded for *Gyrodactylus spp* in the study area. However, the highest parasitic abundance of 0.24 was recorded for *Trichodina spp*, the highest prevalence of 16.25% was recorded for *Dactylogyrus spp* while the lowest Parasitic abundance (0.03) and the lowest parasitic intensity (1.25) was recorded for *Contracecum sp* with the lowest prevalence of 02.50% recorded for both *Gyrodactylus spp* and *Contracecum sp* spp respectively.

In all, the highest parasitic prevalence and abundance of 22.50% and 0.38 was recorded for *Dactylogyrus spp.* in *O.niloticus* while the highest parasitic intensity of 1.92 was recorded for *Dactylogyrus spp* in *T. aureus.* Also, the lowest parasitic prevalence (1.88) and abundance (0.03) was recorded for *Gyrodactylus spp* in *O.niloticus*, with *Tilapia aureus* having the lowest intensity of *Contracecum spp*.

Table 3: Incidence of *Dactylogyrus spp, Gyrodactylus spp, Contracaecum spp, Capilaria spp* and *Trichodina spp* in *Oreochromis niloticus* and *Tilapia aureus* in the Study Area.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Fish species | Parasite species | Class | No of fish infected | No of parasite observed | Prevalence (%) | Intensity | abundance |
| *Oreochromis niloticus* | *Dactylogyrus spp* | Monogenea | 36 | 61 | 22.50 | 1.69 | 0.38 |
| *Gyrodactylus spp* | 03 | 5 | 01.88 | 1.67 | 0.03 |
| *Trichodina spp* | Protozoa | 32 | 47 | 20.00 | 1.47 | 0.29 |
| *Capilaria spp* | Nematoda | 29 | 45 | 18.13 | 1.47 | 0.28 |
| *Contracaecum sp* | 05 | 08 | 3.13 | 1.60 | 0.05 |
| *Tilapia aureus* | *Dactylogyrus spp* | Monogenea | 26 | 50 | 16.25 | 1.92 | 0.31 |
| *Gyrodactylus spp* | 04 | 07 | 02.50 | 1.75 | 0.04 |
| *Trichodina spp* | Protozoa | 22 | 38 | 13.75 | 1.73 | 0.24 |
| *Capilaria spp* | Nematoda | 23 | 32 | 14.38 | 1.39 | 0.20 |
| *Contracaecum sp* | 04 | 05 | 02.50 | 1.25 | 0.03 |

No of fish examined per species = 160

Figure 2 compares the prevalence, intensity and abundance of parasites observer at New and Old reservoirs along Owena River. The result reveals that OR recorded the higher number of infected fishes (45), total number parasite observed (178) as against 34 and 120 recorded for NR. The prevalence, intensity and abundance were also high for OR at 56.25%, 3.96 and 2.23 respectively as against 42.50%, 3.53 and 1.50 respectively for NR.

Figure 2: Comparison of the prevalence, intensity and abundance of parasites at New and Old

Reservoirs

No of fish examined per species = 160.

**Discussion**

The study shows that the parasitic prevalence, intensity and abundance were higher in the females than the males in *Oreochromis niloticus* and *Tilapia aureus* in the two study locations. Similar observation was reported by Khanum et al. (2008), Rahman and Saidin (2011) They concluded that this might be due to lower physiological resistance of female fishes rather than their ecological conditions. However, Simkova, (2005) reported that females are more susceptible to parasite infection during breeding seasons than males. Higher prevalence of parasites in female hosts may also be due to the fact that they are equipped with a positive stimulus which may preferentially be attracting the cercariae and other helminth parasites (Gupta, 2012). Conversely, the male fish may be having a stronger in-built resistance to the infection, leading to the establishment of fewer parasites in them (Gupta, 2012).

This study also shows that the parasitic prevalence, intensity and abundance were higher in *Tilapia aureus* than in *Oreochromis niloticus* in the study area. This observation is similar to that reported by Hamadia (1991) for *T. niloticus* in lake Manzalah. The results also show that *O. niloticus* and *T. aureus* were more infected with Dactylogyrus spp than any other parasites.

**Conclusion and Recommendation**

The higher Prevalence, intensity and abundance of infection was recorded for Dactylogyrus spp and least was observed in *Contracaecum* spp. All parasites were recovered from the gills and stomach except the *Contracaecum spp* and *Trichodina spp* which were recovered from the intestine and skin of fish hosts and parasites observed were significantly difference in sites of infection. Multiple infections were recorded in several fish hosts, an indication of the rich parasitic fauna of the study sites. From the result obtained, the size of fish species played a significant role in the fish infection in both male and female fish species. It was observed that the small sizes of fish had higher load of parasites than the larger ones. It is therefore recommended that the local fishmen should avoid harvesting small size fish species and proper processing method of harvested fish be put in place to reduce transmission of parasites to humans.

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