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Parasite prevalence of *Synodontis membranaceus* from Lower River Benue

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Abstract
Parasite prevalence of 120 samples of *Synodontis membranaceus* from Lower River Benue was investigated for eight months (July 2016 - February 2017). 690 Parasites comprising *Eutrongylides excisus, Eustrongylides tubifex, Capillaria philipinensis, Contracaecum sp., Camallanus sp.* (nematode), *Cryptobia iubilans* and *Trichodina sp.* (protozoa) were isolated and identified from 73(60.83%) hosts examined. Of the parasites encountered, nematodes was more prevalent (93.19%) compared to protozoa (6.81%). Seasonal variation of parasite existed, being more prevalent in the dry season (47.28%) than the rainy season (46.96%). Male samples had higher percentage parasite infestation than the female in both rainy and dry seasons. All parasites encountered were isolated from the stomach, intestine and gills. No parasite was found on the skin, liver and kidney. Of the body parts, intestine recorded the highest percentage parasite infestation (62.60%) while gills had the least (1.59%).

Keywords: Parasite Prevalence, *Synodontis membranaceus,* nematode, protozoa, Lower River Benue

Introduction
The Mochokid catfish, *Synodontis membranaceus* is quite common in the Lower River Benue, Makurdi. It forms one of the most important commercial catches as it can be easily seen in the fish markets in Makurdi throughout the year (Akombo *et al*., 2016) [2, 4]. The flesh is of excellent flavor, either fresh or smoke-dried. It is highly regarded by consumers in Makurdi and its environs and therefore attracts a relatively high price. *S. membranaceus* in the Lower River Benue was found to be omnivorous, feeding on food items, which included artificial meal, plant remains, variety of algae, insect parts and larvae, bivalves (*Molluscs*), crustaceans, protozoa, worms, detritus, sand particle, mud and many unidentified quantities of food (Atile *et al.,* 2016) [5].

Fish has a remarkable impact in the lives of many individuals and communities in almost all continents of the world, primarily as a major source of relatively cheap and affordable essential animal protein (Okoye *et al.,* 2014) [16]. They are widely acceptable in global menu due to its palatability, low cholesterol level and tenderness of its flesh (Eyo, 2001) [10].

Health benefits of fish and fishery products are increasingly being recognized placing a high demand on fishery products (Tammy, 2002) [26]. Contrary to the increasing demand, increase in fish production has been minimal in the recent past (FAO, 2003). Among the factors that contribute to the reduction in fish production are parasitic infections and diseases (Dougnon *et al*., 2012) [7]. The economic implications of fish parasites are of great importance to man and animals because fish plays an important role in global food supplies as source of protein and its demand is expected to increase due to growing world population (Sikoki, 2013) [24].

Fish parasite is one of the most important problems confronting the fishery biologist; it is one of the factors responsible for reduction in fish production (Ravichandran *et al.,* 2007) [23]. Parasites of fish are a concern since they often produce a weakening of the host`s immune system thereby increasing their susceptibility to secondary infections, resulting in the nutritive devaluation of fish and subsequent economic losses (Onyedineke *et al.,* 2010) [20]. Parasites of fish could also constitute health hazards to humans when ingested with poorly cooked fish.

Materials and Methods

Study Area

The study was carried out in Makurdi the capital of Benue State Nigeria. The town is divided into the North and the South bank by River Benue which exists all year round, though the water volume fluctuates with season. The river overflow its bank during the rainy season (May -October) but decreases drastically in volume leaving tiny island in the middle of the river during the dry season (November - April). The highest water levels are in August to September and the lowest are in March to April (Akombo *et al.*, 2011) [3]. The river contains several species of fish which are of economic importance to the people of Benue State and Nigeria at large.

Collection of samples

120 randomly selected samples of *Synodontis membranaceus*, were purchased from the fishermen at the Wadata landing site, which is the major landing site of fish on the bank of River Benue. Fifteen (15) samples were purchased for eight months (July 2016 – February 2017) and transported fresh to the Fisheries laboratory, University of Agriculture, Makurdi in plastic jars for analysis. The sexes of the fish were identified after dissection using the procedures used by Akombo *et al.*, 2016 [2, 4]. The total and standard length of each fish was measured to the nearest 0.1 cm using a meter rule mounted on a dissecting board, while the weight was taken in grams to the nearest 0.1g using an electronic weighing balance.

Sample Analysis for Ecto and Endo Parasites

Ecto and endo parasitic examination of each of the fish for parasites was carried out using the technique of Emere and Egbe (2006) [9]. The fish samples were filleted using scalpel blade. The tissue was placed on a Petri dish and 3mls of 0.9% saline solution was added and stirred using a mounted pin. Some drops of the mixed solution was collected using dropper, placed on a slide and then covered with a cover slip and observe under a light binocular microscope. After, the gills were cut using scissors, placed in a Petri-dish and gill filaments were dissected and examined under the microscope, each of the gill was placed in 10mls of normal saline in Petri-dish, later removed and then place on a slide on which 1-2 drops of saline solution was added and observed under a binocular microscope at x100 magnification. Each specimen of the fish was cut open ventrally to expose the stomach, intestine, liver, kidney and the contents washed with distilled water into Petri-dishes containing saline solution (0.9ml) for parasite recovery. Few drops of the preparation were placed on the slide, cover with slip and examined under a light binocular microscope for endoparasites to determine their number and distribution. The pictures of the parasites were taken using digital camera attached to the laptop. The recovered parasites were counted and recorded and were later sorted out into groups and identified using taxonomic guides by Paperna (1996) [21] and pictorial guide on fish parasites by Pouder *et al*., (2005) [22].

Data Analysis

All statistical analysis was done using SPSS version 20.0. Correlation matrix was used to determine the correlation between the sexes, total length and weight of the host with total number of parasites.

Results

Out of the 120 samples of *Synodontis membranaceus* examined, 73 (60.83%) were infested with parasites while 47 (39.17%) were not. The parasites recovered were Nematodes and protozoa recovered from the stomach, intestine and gills, respectively (Table 1).

Table 1: Parasite load in *Synodontis membranaceus* from Lower River Benue

Parasite Species	Parasite load	Parasite Load %
Nematode	643	93.19
Protozoa	47	6.81
Total	690	100

Distribution, Location and Percentage Parasite in *Synodontis membranaceus*

Distribution, location and percentage parasite infestation (Fig. 1) revealed that, of the total parasites recovered from *Synodontis membranaceus*, the gills accounted for (1.59%), stomach (35.79%) while intestine (62.60%). Five (5) species of nematode (*Eustrongylides excisus, Eustrongylides tubifex, Capilaria philipinensis, Contracaecum sp, Camallanus sp*, two species of protozoa (*Trichodina sp.* and *Cryptobia iubilans*) were identified in different locations of *Synodontis membranaceus.* Among the parasites, *Eustrongylides excisus* had the highest percentage abundance in the intestine (51.73%) and (46.25%) in the stomach. *Trichodina sp*. was found only on the gills.

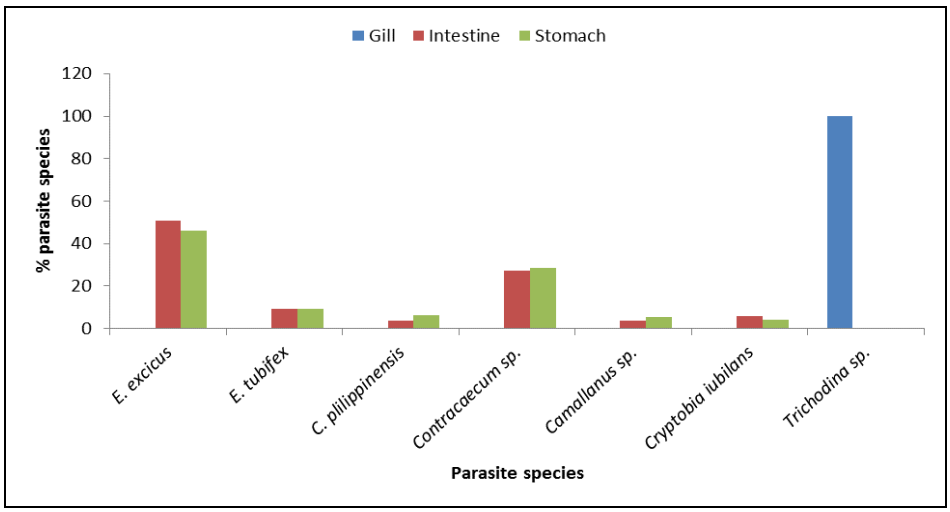

Fig 1: Percentage parasite species spectrum per body parts of *Synodontis membranaceus* during the study period

Prevalence of Parasites in relation to season and Relationship between Sex and Percentage Parasite Infestation

The results of percentage parasite in relation to season showed that seasonal variation existed, being more prevalence in the dry (47.28%) than rainy season (46.96%) (Figure 2).

Relationship between sex and percentage parasite infestations revealed that males recorded higher parasites infestation than the females in both rainy and dry seasons. In the rainy season, 50% of males and 44.8% of females were infested, while in the dry season, 48.81% of male and 45.53% of female were infested (Fig. 3).

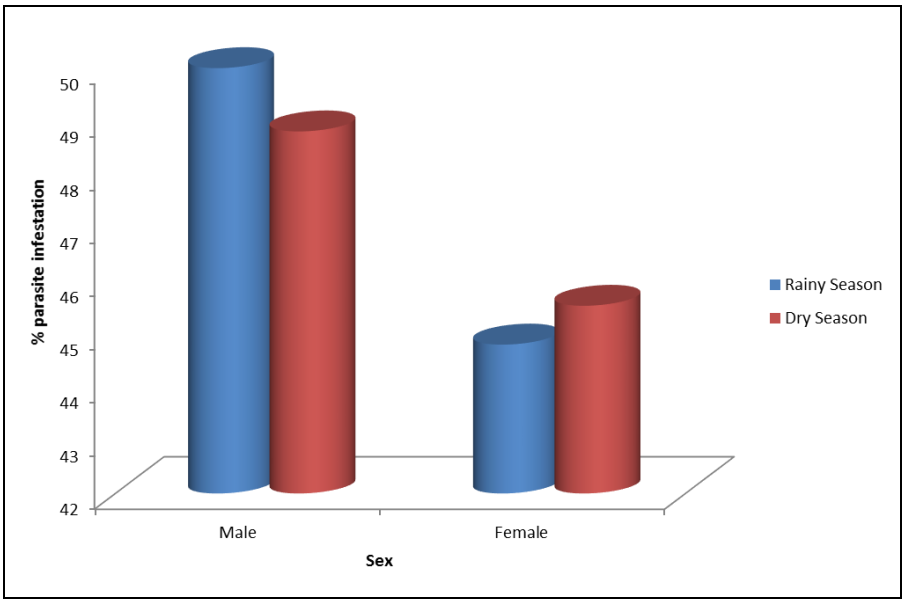

Fig 3: Relationship between sex and parasite infestation in Rainy and Dry seasons

Prevalence of Parasites in relation to Fish total Length (cm) and weight (g)

The prevalence of parasites in relation to standard length of *Synodontis membranaceus* showed that parasites were more prevalent in the length group 25.1- 33.0cm with (50.57%) in the dry season, while in the rainy season, the length group 33.1 – 41.0cm recorded the highest percentage parasite infestation (63.96%). The least parasitic infestation (4.94%) was recorded for length group 17.1 – 25.0 in the rainy season and length group 41.1 – 49.0 (10.34%) parasitic infestation in dry season (Fig.4).

From the results of the relationship between weight group and percentage parasite infestation, it was observed that the weight group 373.1 – 484.5g recorded the highest percentage parasitic load (38.82%) in the dry season, while the weight group 261 – 373.0 recorded (37.55%) parasite infestation in the rainy season. The weight group 484.6 – 596.0 recorded the least percentage parasite infestation (2.59%) and (10.34%) for both rainy and dry seasons, respectively (Fig. 5).

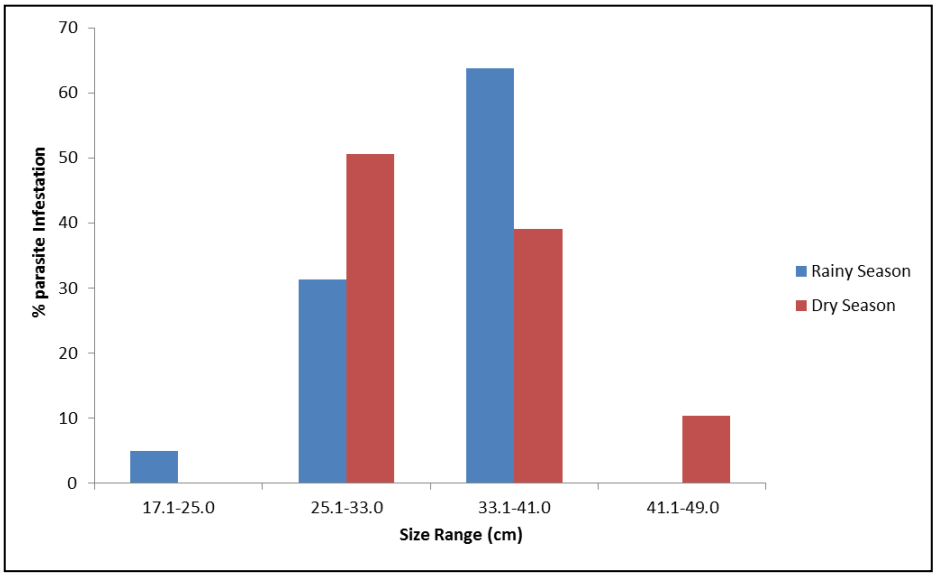

Fig 4: Relationship between length and percentage parasite infestation in *S. membranaceus*

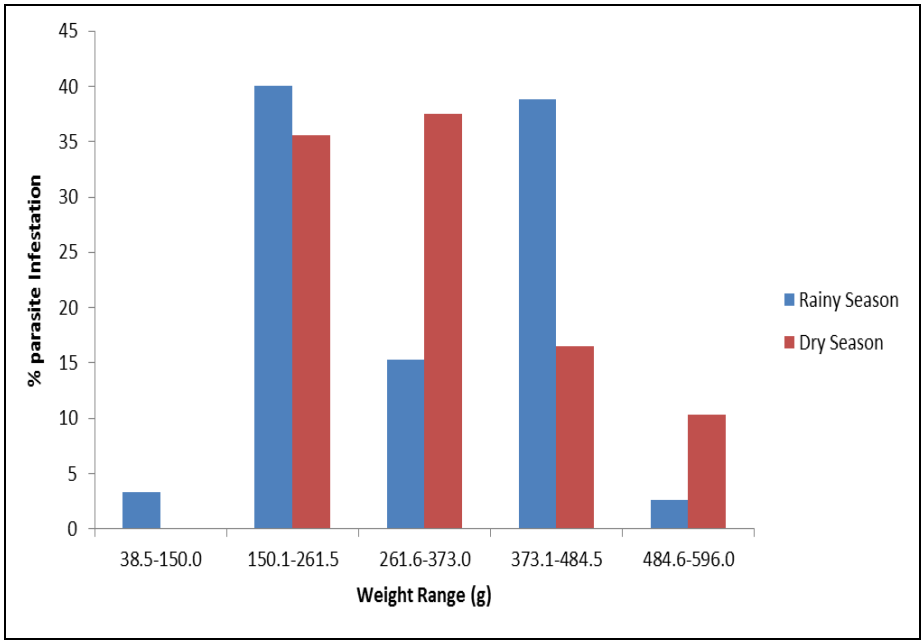

Fig 5: Relationship between weight and percentage parasite infestation in *S. membranaceus*

Discussion

Result obtained from this study, shows that nematodes and protozoa were the group of parasites observed in *S. membranaceus* from the Lower River Benue, Makurdi. six (6) species of nematode (*Eustrongylides excisus, Eustrongylides tubifex, Capilaria philipinensis, Contracaecum sp, Camallanus sp, Cryptobia iubilans*) and one species of protozoa (*Trichodina sp.*) were identified in different locations. *Capillaria philipinensis* is a parasitic nematode which causes intestinal capillariasis in man (Moravec, *et al*., 1995) [13]. Incidence and intensity of parasitism varied with the seasons being more prevalent in the dry season (47.38%) than the rainy season (46.96%). In the dry season, which roughly corresponds to the dry phase of the hydrological cycle, there was virtually no precipitation and the flow and volume of water were very much reduced, resulting in much higher contact between the parasites and host fish leading to relatively higher prevalence. Similar observations were made by Okoye *et al*., 2014 [16], Omeji *et al*., (2017) [19] in their reported work. Among the body parts of the fish, intestine had the highest parasite infestation which could be due to the favourable conditions that enhanced their survival. This agrees with the reported works of Kawe *et al*., (2016) [12], Agbabaka *et al*., (2017) [1] who made similar observations.

It was observed that the bigger fish had the highest number of parasites than the smaller ones. This could be attributed to the fact that bigger fish provides larger surface area for infection to multiply in numbers than in smaller ones. Similar observation was made by Okoye *et al*., (2016) [17], Iboh, *et al*., 2016 [11] in their reported work. This finding disagrees with the work of Usip (2013) [28], Ayuba *et al*., (2016) [6] who recorded higher parasites infestation in smaller weight groups. They attributed it to low level immunity in the smaller sized fish thus making them more susceptible to parasitic infestation.

Male fish samples recorded higher percentage parasites infestation than female fish. This could as a result of cost of sexual selection which makes males more parasitized than females due to stress in competing for mates resulting in low immunity which could have made them more susceptible to parasite than the females. This observation agrees with the reported work of Omeji *et al*., (2013) [18], Kawe *et al*., (2016) [12] who reported more parasite infestation in males *Clarias gariepinus.* This disagree with the reported work of Solomon *et al*., (2016) [25], Omeji *et al*., (2017) [19] who observed that female *Bagrus filamentosus* and *Protopterus annectens* were more infested with parasites than male in their reported works.

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