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Endoparasitic Helminths of *Bagrus bayad* from lower river Benue Makurdi, Nigeria

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Abstract
Bagrus bayad purchased from fishermen at the major landing site of Lower River Benue, Makurdi, from the months of July 2016 – February 2017 were examined for endoparasites. Out of the one 120 *Bagrus bayad* examined, 52 (43.3%) were infested and were observed to harbour 305 endoparasites. All the parasites recovered were nematodes: *Eustrongylides excisus* (65.25%), *Eustrongylides tubifex* (17.70%), *Capillaria philipinensis* (10.49%) and *Camallanus sp.* (6.56%) which were all found in the intestine and stomach. Intestine had higher percentage parasite infestation (63.61%) than the stomach (36.39%). There was higher parasite prevalence (46.81%) in dry season than the rainy season (41.10%). Female fish samples were more parasitized (24.01%) in rainy season and (27.24%) in dry season than their male counterparts of 15.43% in rainy season and 16.95% in dry season. Highest percentage parasite infestations (36.76%) in rainy and (53.33%) in dry season were recorded in the length group 49.9 – 59.7cm. ength group 20.2 – 30.0cm recorded the least (9.93%) percentage parasite infestation in rainy season and was free from parasites in the dry season. There was Variation in parasite load among the weight classes.

Keywords: endoparasitic helminths, *Bagrus bayad,* lower river Benue, Makurdi

Introduction
Bagrus bayad from the family Bagridae is common in the commercial catches of those who live along the Lower River Benue. They are generally preferred by fishermen and consumers because of their relatively large sizes. 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. Alhassan and Ansu-Darko (2011) [4] reported that *Bagrus bayad* is a benthic omnivorous feeder (bottom feeder) as they proved the presence of detritus (bottom deposit) in addition to the other food items inside the alimentary tract.

The importance of fish as a promising source of protein, especially with the rapidly increasing human population and the animal protein shortage problem all over the world, cannot be denied (Osman *et al*., 2008) [19]. They are widely accepted on the menu card and form a much cherished delicacy that cuts across socio-economic age, religious and educational barriers (Olorunfemi, 2014) [15]. Parasitism of fish and fishery is a cause of worry to fish culturists and artisanal fishermen in the in-land and coastal waters of Nigeria (Edema and Okaka, 2008) [10]. This concern is attributed to parasite induced economic losses and negative health implications manifesting in forms of poor fish productivity, poor marketability of caught fish, reduction in protein availability and reduction in job opportunities due to lack of motivation to invest in aquacultural activities by potential investors (Awharitoma and Ehigia for, 2012).

Fish parasites are important because they affect fish production particularly under culture systems, by decreasing their yield, aesthetic value, marketability, palatability and reproductive potential (Oniye *et al*., 2004) [18] and if left uncurtailed, may lead to mass mortality of fish, or in some cases, infection of man and other animals that feed on fish. Consumption of raw/ or undercooked fish by humans may as well increase the chances of parasitic zoonoses. Therefore, Consumers should take common precautions including obtaining sea food from reputable sources especially if the sea food is to be consumed uncooked. Adequate cooking is the safest way to preventing related infections to human (Butt, *et al*., 2004) [8].

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
A total of one hundred and twenty randomly selected samples of *Bagrus bayad*, 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) specimens were purchased for eight months (July 2016 – October 2016) and (November 2016 - February 2017) representing Rainy and Dry seasons respectively and transported fresh to the Fisheries laboratory, University of Agriculture, Makurdi in plastic jars for analysis. The sex of each fish was determined by

examining the genital papilla which is pointed in males and oval-shaped in females. The total length 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 endoparasites

Liver and kidney

Examination for parasites in the livers and kidneys was carried out using the method of Adam *et al.*, (2009) [1]. Impression smears were prepared from the livers and kidneys of the sampled fishes after proper dissection of the fish samples and allowed to dry for 20-30 minutes. They were later examined under microscope for parasites.

Stomachs and intestines

Examination of fish parasites in the stomachs and intestines was carried out using the techniques of Bichi and Dawaki (2010) [7]. The abdominal cavity of each fish was cut open and the gastrointestinal parts was removed and cut into parts. The gastrointestinal parts were separated from the other visceral organs and placed in petri dishes containing physiological saline. The intestines were further carefully slit open to aid the emergence of the parasites. The emergence of any worm was easily noticed by its wriggling movement in the saline solution. Some of the worms however remained permanently attached with their attachment organs to the gut walls. They were carefully removed and put into the physiological saline. The pictures of the parasites were taken using the zoom digital camera attached to the laptop computer. The recovered parasites were counted and recorded. The recovered parasites were sorted out into groups and identified using taxonomic guides by Paperna (1996) and pictorial guide on fish parasites by Pouder *et al*., (2005). The recovered parasites was counted and recorded.

Data analysis

All statistical analysis was performed with Statistical Package and Service Solution (SPSS version 20.0) for windows. 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 one hundred and twenty (120) samples of *Bagrus bayad* examined, 52 (43.3%) were infested and were observed to habour 305 end oparasites, while 68 (56.7%) were not infested. All the parasites recovered were nematodes which were found in the stomach and intestine.

Distribution, location and percentage number of parasites

Out of the total parasites recovered from *Bagrus bayad*, while the intestine accounted for 194 (63.61%), stomach 111 (36.39%) as shown in Fig. 1.

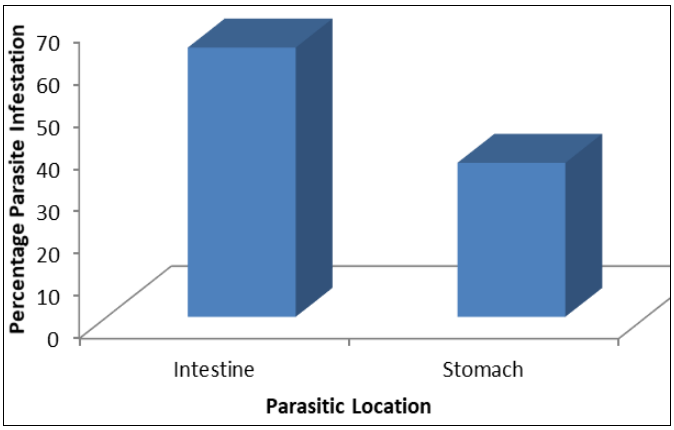

Fig 1: Parasite distribution in the Intestine and Stomach of *Bagrus bayad*

Results of the species of parasites recovered from the fish samples in this study are shown in Figure 2. Four (4) species of nematode (*Eustrongylides excisus, Eustrongylides tubifex, Capillaria philipinensis* and *Camallanus sp*, were identified in the stomach and intestine of *Bagrus bayad. E. excisus* accounted for 199 (65.25%), *E. tubifex* 54 (17.70), *Camallanus sp*. 20 (6.56%) and *C. philipinensis* 32 (10.49%).

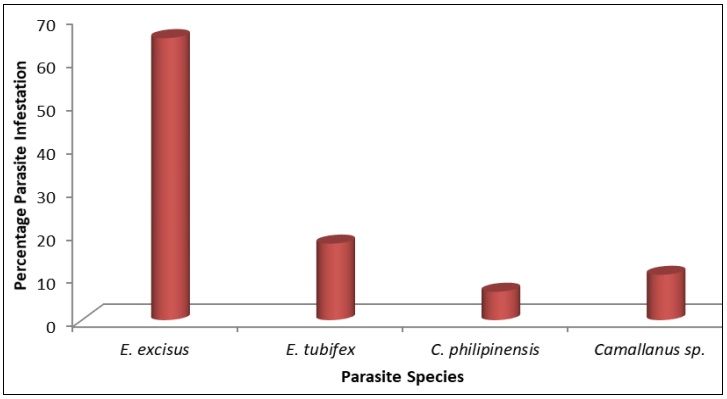

Fig 2: Percentage Parasite Species Spectrum of *Bagrus bayad* from Lower River Benue

Results of the relationship between sex and percentage parasite infestation in *B. bayad* in rainy and dry seasons from Lower River Benue are shown in Figure 3. Female *Bagrus bayad* from both seasons had more percentage parasite loads (24.01%) in rainy season and (27.24%) in dry season than the male *Bagrus bayad* (15.53%) in rainy season and (16.95%) in dry season.

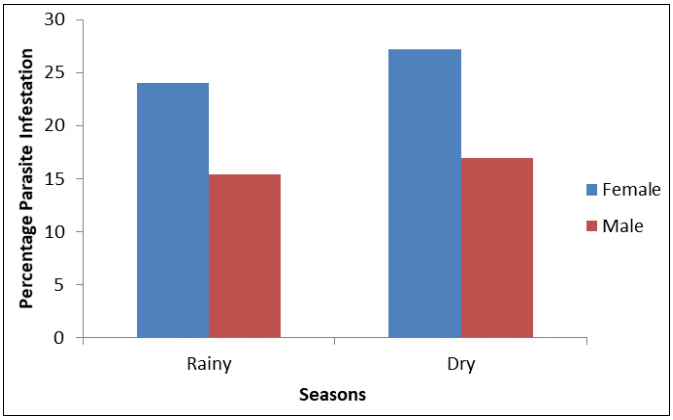

Fig 3: Relationship between sex and parasite infestation of *Bagrus bayad* in rainy and dry seasons from Lower River Benue

The size (Total length in cm), distribution and percentage parasite infestation of *B. bayad* in rainy and dry seasons from Lower River Benue are presented in Table 1 while Table 2 shows the relationship between body weight (g) and percentage parasite infestation in *B. bayad* in dry and rainy seasons from Lower River Benue.

From Table 1, the range in length of 49.9 – 59.7cm had the highest percentage parasite infestation (36.76% and 53.33%) in both rainy and dry seasons, respectively while the lowest percentage parasite infestation was recorded in the length group of 20.2 - 30cm in the rainy season and length group 40 – 49.8 in the dry season. No parasite was recorded in the length group of 20.2 - 30cm in the dry season.

From Table 2, the highest percentage parasite infestation (19.46%) in rainy season and (37.5%) in dry season were recorded in the weight range of 658.2 – 966.2g. The lowest percentage parasite infestation was recorded in the weight range of 1. 890.7 – 2198.8g in the rainy season and 49.9 – 350.0g in the dry season.

Table 1: Size (Total length in cm) distribution and percentage parasite infestation in *B. bayad* in dry and rainy seasons from Lower River Benue

Range in Length (cm)	Percentage parasite infestation (%)	
	Rainy Season	Dry Season
20.2-30.0	9.73	0.00
30.1-39.9	11.89	20.83
40.0-49.8	17.84	9.17
49.9-59.7	36.76	53.33
59.8-69.6	23.78	16.67

Table 2: Relationship between body weight (g) and percentage parasite infestation in *B. bayad* in dry and rainy seasons from Lower River Benue

Range in weight (g) Percentage Parasite Infestation (%)		
	Rainy Season	Dry Season
49.9-350.0	18.92	7.5
350.1-658.1	15.14	20.83
658.2-966.2	19.46	37.5
966.3-1274.3	20	23.33
1274.4-1582.5	14.59	10.83
1582.6-1890.6	6.49	0
1890.7-2198.8	5.4	0

Results of the correlation matrix for total number of parasites found on *B.bayad* in the rainy and dry seasons are shown in Table 3. In the rainy season, there was significant difference between total length and standard length (0.987), total length and weight (0.917), total length and total number of parasites (0.491). There was also a significant difference between standard length and weight (0.927), standard length and total number of parasite (0.496), weight and total number of parasites (0.498). However, in the dry season, there was a significant difference between total length and standard length (0.975), total length and weight (0.915), total length and total number of parasites (0.518), standard length and weight (0.909) standard length and total number of parasites (0.524), weight and total number of parasite (0.471).

Table 3: Correlation Matrix for Total Number of Parasites found on *B. bayad* for Rainy and Dry Seasons

	Rainy Season				Dry Season			
	TL	SL	WT	TNP	TL	SL	WT	TNP
TL	1.00				1.00			
SL	0.987**	1.00			0.975**	1.00		
WT	0.917**	0.927**	1.00		0.915**	0.909**	1.00	
TNP	0.491**	0.496**	0.498**	1.00	0.518**	0.524**	0.471**	1,00

**Correlation is significant at the 0.01 level (2-tailed)

Discussion

Result obtained from this study, revealed that nematodes are the parasites observed in *B. bayad* from the Lower River Benue at Makurdi. The species of parasites includes: *Eustrongylides excisus, Eustrongylides tubifex, Capillaria philipinensis* and *Camallanus sp.* The nematode, *Capillaria philipinensisis* causes intestinal capillariasis (Moravec, *et al*., 2005) [13].

Parasitic prevalence varied with seasons being more prevalent in the dry season (46.81%) than the rainy season (41.10%). 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. This finding agrees with the reported work of Ajala *et al.*, 2014 [2], Omeji *et al*., 2017 [17] on *Clarias gariepinus* and P*rotopterus annectens*, respectively.

The highest number of parasites recorded by intestine compared to the stomach could be attributed to the fact that most digestion activity takes place in the intestine which could lead to the release of parasite ova/cysts in food items. This agrees with Dankishaya *et al.,* (2013) reported higher number of parasites in the intestine than the stomach and attributed that to several factors among which is the presence of digested food there or due to the greater surface area presented by the intestine. Reduced number of the parasites in the stomach of the fish samples compared to the intestine might be due to the muscular movement of the stomach, hydrochloric acid nature of the stomach (Akinsanya *et al*., 2008) [6].

Female fishes were observed to have the higher percentage of parasites than the male. This might be attributed to the physiological state of the females and their increased rate of food intake to meet their food requirements for the development of their egg might have exposed them to more

contact with the parasites, which subsequently increased their chance of being infected. Similar observations were reported by Solomon *et al*., 2016; Ayuba *et al*., 2016 in their works. This observation disagrees with the reported work of Kawe *et al*., 2016 on *Clarias gariepinus* who reported more parasites in male samples than females.

In this work, it was observed that the bigger fish had the highest number of parasites than the smaller ones. The higher number of parasites recorded in the bigger fish could be attributed to the fact that bigger fish covers wider area in search of food than the smaller ones as such are more prone to parasites than the smaller counterparts the fact that bigger fish provides larger surface area for infection to multiply in numbers than in smaller ones. Similar observations were made by Ekanem *et al*., (2011) [11], Omeji, *et al*., 2015 [16] in their reported work. This finding disagree with the work of Ofem *et al*., (2008) [14] and Usip (2013) [21] 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.

Recommendation and conclusion

Although there are no reported cases of fish zoonosis in Nigeria, Public awareness creation activities should be conducted on zoonotic nature of fish parasites and danger of consumption of raw or undercooked fish. With increase in aquaculture practice, it is also essential to have facilities for diagnosis and treatment of fish diseases generally in the study area.

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