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Research Article

Prevalence of Gastrointestinal Parasites of Walter's duiker (*Philantomba walteri*) in Ondo State, Nigeria

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ABSTRACT

Walter's duikers were screened for gastrointestinal parasites from three different bushmeat markets in Ondo State. A total of forty gastrointestinal (GIT) samples of the duiker were collected and examined in relation to their age, location and gender. Eggs of different gastrointestinal parasites species were recovered from the intestinal tract content of the animals using the flotation and formalin-ethyl acetate sedimentation methods and the parasites eggs were identified based on their morphology. Total prevalence of 67.5% (95% CI: 52.0-79.9) was observed in the study. Seven genera of helminth parasites including two trematodes (*Fasciola* spp., *Paraphystomum* spp.), and five nematodes (*Strongyloides* spp., *Trichostrongylus* spp., *Toxocara* spp., *Haemonchus* spp., *Protostrongylus* larva) and one protozoan oocytes (*Eimeria* spp.) were identified. Among the parasite observed *Fasciola* spp. had the highest prevalence while *Trichostrongylus* spp. had the least prevalence. Based on the location of sample collection, New town had the highest parasitic rate (76.9%) while prevalence in regard to age identified growing duikers with the highest prevalence (72.7%). Males were observed to be more infected (70.4%, 95% CI: 49.8-86.3) compared to females (61.5%, 95% CI: 31.6-86.1). Gastrointestinal parasites which are of zoonotic importance were identified from the samples of gastrointestinal tracts collected from bushmeat markets. The presence and prevalence of these parasites has public health implication because the parasites could be transmitted to humans by consuming raw or under cook meat.

Keywords: *Gastrointestinal parasites, Walter's duiker, Bushmeat, Zoonosis*

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INTRODUCTION

A duiker is a small to medium-sized brown in colour antelope native to Sub-Saharan Africa. Conservation of duikers has a direct and critical relationship with their ecology. Disruption of balance in the ecosystem leads to unprecedented competition, both intraspecific and interspecific (Newing, 2001). Before intervention, the system of specialized resources in which larger duikers exploit a particular type of food and smaller duikers on another, is functional as modeled in the diurnal and nocturnal nature of the duikers. This allows the niche to be shared by others without distinct interspecific competition. Similarly, they decrease intraspecific competition by being solitary, independent and selective in eating habits. In consequence, disruption of the competitive balance in one habitat often cascades its effect on to the competitive balance in another habitat (Newing, 2001). Another critical influence that duikers have on the

environment is acting as "seed dispersers for some plants" (Redford, 1992; Wilkie *et al.*, 1998). Duikers maintain a mutualistic relationship with certain plants; the plants serve as a nutritious and abundant food source for the duikers, and simultaneously benefit from the extensive dispersal of their seeds by the duikers.

Clinical diseases in wild duikers due to the presence of parasites are rarely reported, but problems could arise under more intensive conditions (Pandey, 1990). Diseases are one of many factors threatening the existence of wild animals, some of which are infectious parasitic diseases arising from gastrointestinal parasites (Singh *et al.*, 2009; Thawait *et al.*, 2014). Parasites play an important role as one of the regulating mechanisms of population dynamics for species within an ecosystem (Tompkins *et al.*, 2002; Begon, 2007). Most free-living organisms harbour parasites of several species (Begon & Bowers, 1995), which can adversely affect their health, fecundity, foraging and consequently modify host behaviour.

In the wild, animals have a natural resistance against parasitic infections or live in a balanced system with their parasites (Borkovcova & Kopriva, 2005). Parasitological studies have been reported to be very crucial to understanding the impact of parasites on wildlife and the possibilities of inter-species transmission (Begon *et al.*, 1999). In order to assess and manage the effect of parasites on population dynamics, it is essential to evaluate their incidence and prevalence (Morner, 2002; Williams *et al.*, 2002; Junge and Louis 2005).

The changing environment and living conditions influence their ecology and increase the sensitivity to parasitic infections (Gossensa *et al.*, 2005; Singh *et al.*, 2006). Parasitic prevalence in a host population can increase directly or indirectly when it interacts with other factors such as weather condition, quantity and quality of forage or absence of large predators (Sinclair, 2007; Body *et al.*, 2011). As such, Gaston and Lawton (1988) and Gregory (1997) grouped the main potential determinants of parasite distribution in a specific host population into three factors: host individual factors (such as age, sex, body size, diet), host population factors (abundance, range, and migration), and environmental factors (habitat). The interactions between these different types of factors modulate parasite abundance in a given host population.

Parasitic infection and its complications are significant threats to wild animal's population and can act as agent of extinction (Harvell *et al.*, 2002; Jog & Watve, 2005). Although it appears that wildlife have adapted to the presence of parasites, but they have not adapted to the adverse effects of parasitism (Kashid *et al.*, 2003; Bliss, 2009; Opara *et al.*, 2010).

Due to the paucity of information on gastrointestinal parasitic infections in Walter's duiker (*Philantomba walteri*), this study therefore investigated the occurrence and prevalence of gastrointestinal parasites in Walter's duiker (*Philantomba walteri*) from three bushmeat markets in Ondo State, Nigeria.

MATERIALS AND METHODS

Study Areas: The study was carried out in Akure South, Idanre and Owo Local Government Areas (LGAs) of Ondo State, Nigeria. The state has a land area of 15,500km², and lies between Latitudes 50° 45' and 70° 52'N and Longitudes 40° 20' and 60° 5'E. The study sites are located at the heart of the state, bounded by Oso and Akoko southwest to the east, Akure north and part of Osun state to the north, Ileoluji, Okeigbo and Ondo east to the west and Edo state to the south (Fig. 1).

Sample Collection and Technique: A total of 40 gastrointestinal tract (GIT) samples of Walter's duiker (*Philantomba walteri*) consisting of 27 males and 13 females were collected randomly from three bushmeat markets; New town (13), Owenna (16) and Emure-Ile (11) (Fig. 2) using disposable hand gloves to ensure maximum protection and prevent contamination, and then transported with ice packs to the diagnostic parasitology laboratory section of the Department of Veterinary Parasitology, University of Ibadan for analysis. GIT (stomach and intestine) were then stored in

the refrigerator at 4°C until analysed for helminth ova and protozoa oocyst. Fresh faecal material was collected from the rectum into screw cap bottles, appropriately labelled and used to identify GIT parasites of Walter's duiker (*Philantomba walteri*).

Laboratory Analysis: The faecal sample analysis was done in the laboratory using the simple floatation method and Formalin-ethyl acetate sedimentation technique.

Simple Floatation Method: Two grams of faeces from each sampled duiker was weighed and mixed with 50 mL floatation solution (saturated NaCl) and stirred with a spatula in a measuring cylinder. The mixture was poured and sieved into centrifuge tube and faecal debris was discarded. The test tube containing the faecal suspension was placed in a vertical position in a test tube rack. The test tube was topped up with faecal suspension, so that it has convex meniscus at the top. Cover-slip was then placed over the test tube and was left to stand for 15 minutes after which the cover-slips were placed on microscope slides and viewed at x10 and x40 magnification as described by (Roepstorff and Nansen *et al.*, 1998).

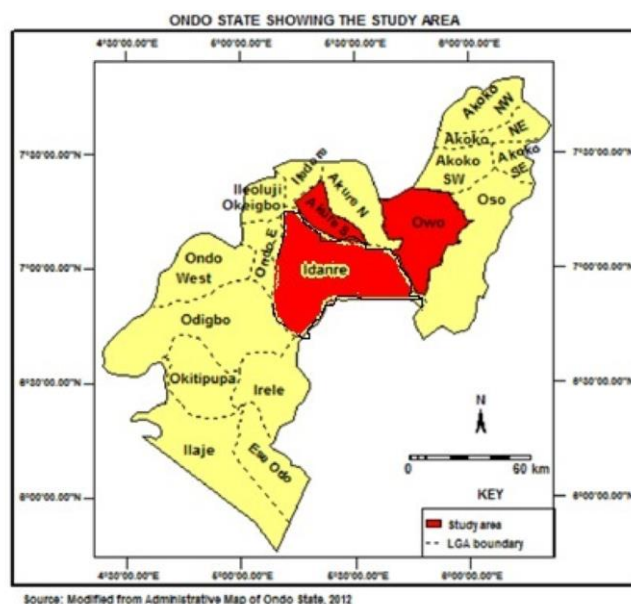


Figure 1: Map showing the study areas

Formalin-ethyl acetate Sedimentation Technique: Samples were concentrated according to the method described by Centre for Disease Control and Prevention (CDC, 2012). Approximately 2 grams of the sample was mixed in a test tube with 0.85% of normal saline solution to make up to 5 mL. About 10% formalin was then added to bring the volume in the centrifuge tube to 10 mL. About 3 mL of ethyl acetate was added and the tube was stoppered and shaken vigorously in an inverted position for 30 seconds, after which the stopper was carefully removed. The sample was then centrifuged at 2500 rpm for 2 minutes. The plug of debris was freed from the top of the tube by ringing the sides with an applicator stick. The top layer supernatant was decanted. A cotton-tipped applicator was used to remove debris from sides of the centrifuge tube.

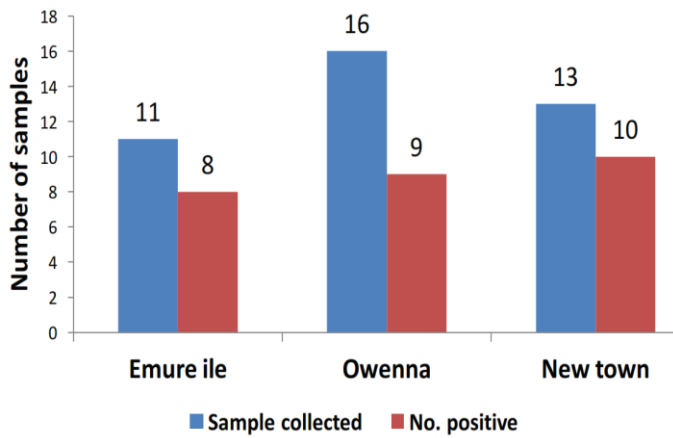


Figure 2:
Distribution of samples collected from the study locations

The concentrated specimen was re-suspended in five drops of 10% formalin. The sediments were taken up with a pipette and put on a microslide, covered with a cover slip and viewed under the microscope at X10 and X40 magnification.

Statistical Analysis: Data obtained were analyzed using the SPSS software version 20.0 using descriptive statistics such as frequency tables, charts and percentages. **Figure 2:** Distribution of samples collected from the study locations

RESULTS

From this investigation, Strongyle eggs (Plate 1a), *Cooperia* spp (Plate 1b), *Protostrongylus* spp (Plate 1c), *Eimeria* spp (Plate 1d), *Toxocara* spp (Plate 1e), adult *Haemonchus* spp (Plate 1f), *Fasciola* spp (Plate 1g), *Strongyloides* spp (Plate 1h) and *Paramphistomum* spp (Plate 1i) were the gastrointestinal parasites observed

Distribution of Samples collected from the study locations:

The total samples collected from Owenna was 16, of which nine (50%) were infected with parasites. Of the thirteen samples collected from New town, ten (76.9%) were infected with parasites and out of the eleven samples from Emure-Ile, eight (72.7%) were infected with parasites (Fig. 3).

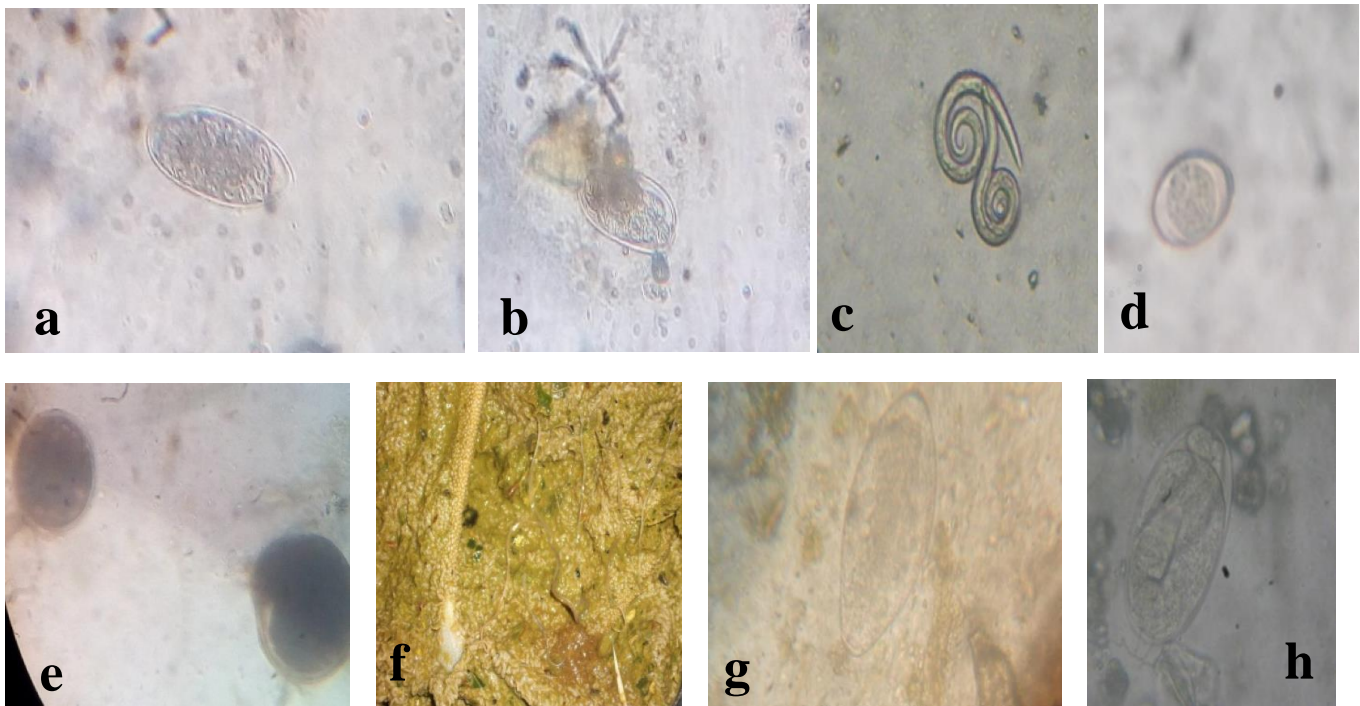


Plate 1.

Gastrointestinal parasites observed.

a. Ova of Strongyle (x40); **b.** Ova of *Cooperia* spp with smooth shell surface and similar anterior and posterior poles (x40) **c.** Larva of *Protostrongylus* spp with Fine granules and wavy pointed tail (x 40); **d.** Unsporulated *Eimeria* oocyst which is ovoid in shape containing residual bodies (x 40); **e.** Egg of *Toxocara* spp with thick albuminos Shell (x 40); **f.** Heavy infection of *Haemonchus* spp in the abomasum; **g.** *Fasciola* spp with barrel-shaped side walls thin shell and pole lid (operculum) (x 40). **h.** *Strongyloides* eggs containing first stage larva (x 40); **i.** *Paraphystomium* spp egg, pale grey to greenish and transparent with pole lid (x 40)

Prevalence of Parasite Species in the Samples: The overall occurrence of parasitic infection was 67.5%, while 32.5% were negative (Fig. 3). Specifically, nine parasite species were found in the faecal samples with the most prevalent parasite being *Fasciola* spp. (35%), *Eimeria* spp. (15%), and *Trichostrongylus* spp. (12.5%) as shown in Figure 4. Nematodes were more common compared to cestodes and protozoans in the studied duikers. Similarly, in relation to age and sex, the highest prevalence (72.7%) was observed in adult duikers, while the least was found in growing duikers (65.5%). Male duikers had a slightly higher prevalence (70.4%) than female duikers (61.5%), though the difference was not statistically significant ($p > 0.05$) (Table 1).

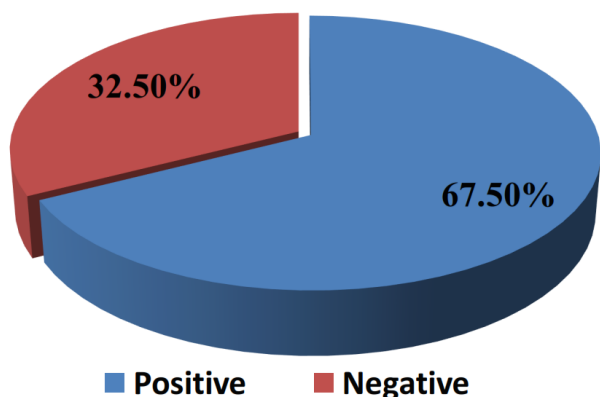


Figure 3: Overall occurrence of gastrointestinal parasites in sampled Duiker

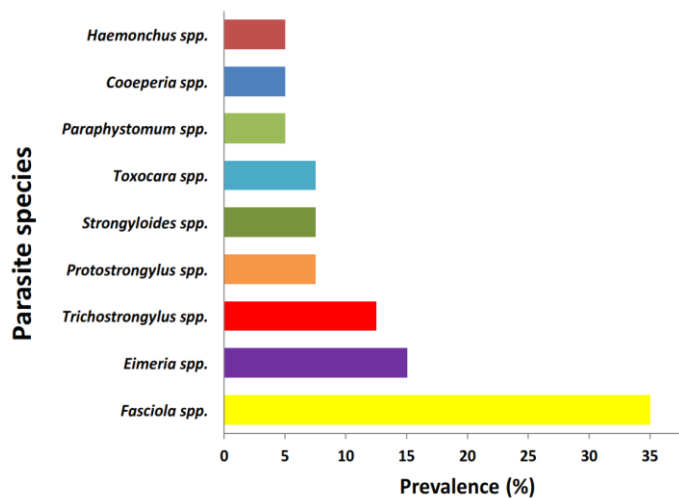


Figure 4: Prevalence of parasites in faecal samples duiker species (n = 40)

Frequency of Parasitic infection among studied duikers: Single infections were more common (48.0%) than multiple infections (20.0%) (Fig. 5). Interestingly seven male duikers (25.9%) harboured multiple parasites compared to one female duikers (7.7%). No female duikers harboured more than two parasites. Multiple infections were observed in duikers sampled from all the study locations. However, preponderance of multiple infections was observed in Owenna.

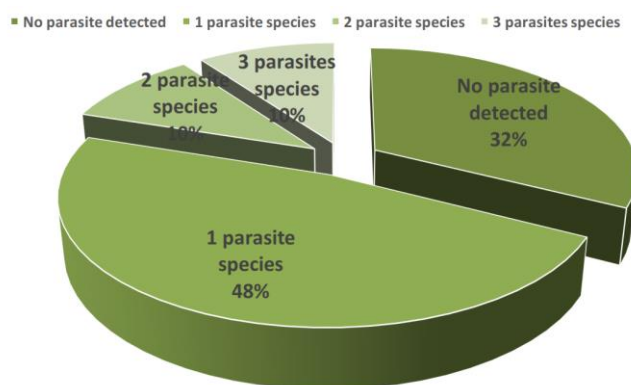


Figure 5: Pattern of parasitic infection among study duikers

Table 1: Prevalence of Parasites in Duikers in relation to age and sex (n= 40)

Variable	No. Examined	Positive	Negative	P value	χ^2 Value
Age					
Growers	11 (27.5)	8 (72.7)	3 (27.3)	0.664	0.89
Adult	29 (72.5)	19 (65.5)	10 (34.5)		
Sex					
Male	27 (67.5)	19 (70.4)	8 (29.6)	0.576	0.312
Female	13 (32.5)	8 (61.5)	5 (38.5)		
Total	40 (100)	27 (67.5)	13 (32.5)		

DISCUSSION

This study has provided quantitative data on infection with gastrointestinal parasitic fauna of Walter's duiker, a commonly consumed wild animal, which are relatively poorly studied in Nigeria. The results revealed that duikers from the wild are infected with parasites that can contaminate the environment and be a source of transmission to domestic animals and humans. This poses public health problems to humans and economic risk to farmers. The overall prevalence from this study is similar to previous study reported by Darabus *et al.* (2009). However, some studies reported lower prevalence (Byanju *et al.*, 2011; Bogale *et al.*, 2014; Bishnu, 2016) while some reported higher prevalence (Abuessaila *et al.* 2014; Thawait *et al.* 2014). The differences observed in the prevalence in these studies might possibly be due to the number of antelopes sampled, age of animal, the geographical location and the host immune status (Rahman *et al.*, 2014; Bishnu, 2016). The presence of high parasitic load of ova and oocysts of zoonotic parasites in the GIT of slaughtered duikers that were sold in bush meat markets for human consumption is an evidence of readily available infection sources of these parasites to humans in the studied area. The spectrum of observed parasites genera contains some zoonotic species as earlier reported (Darabus *et al.*, 2009; Bogale *et al.*, 2014; Bishnu *et al.*, 2014). More helminth ova were detected compared to protozoan oocysts. The disparity could be due to the fact that helminth ova are more effectively transmitted to

wild ruminants and could survive better in the environment than protozoan oocyst.

In our study, *Eimeria* was the second most prevalent intestinal parasite observed. The high prevalence of *Eimeria* spp. detected is similar to previous reports (Byanju *et al.*, 2011; Bishnu, 2016). Mixed infection of gastrointestinal parasites detected in this study suggests that preventive and control efforts by wildlife veterinarians and public health agencies should neither be directed to a single parasite nor a particular group (e.g. helminths or protozoan) but should be holistic in approach, since any of these zoonotic parasites could cause eruption of pathogenic conditions in other animals and infected humans (Odeniran & Ademola, 2016). Nematode infections in duikers was predominant, as established by this study, it could therefore be a potentially major constraint to duiker population in the study area. These are similar to the report on duikers at Weza forest (Boomker *et al.*, 1987). Also, Boomker *et al.* (1991) reported the presence of *Moniezia expansa*, larvae of *Taenia hydatigena*, and the following nematodes: *C. rotundispiculum*, *Gongylonema* sp., *Setaria* sp., *Trichostrongylus angistris*, *T. anomalus*, *T. axei*, *T. falculatus* and *T. rugatus* in blue duiker (*P. monticola*) which were not found in this study. The differences in the parasite spectrum could be due to difference in geographical location and intrinsic properties of this species. Due to the selective feeding habit of Walter's duiker, they do not seem to harbour a large variety of worms (Boomker *et al.*, 1991).

In conclusion, this study showed that Walter's duiker is a host to a range of parasites which include nematodes, trematodes and protozoa as mixed or single infections. *Fasciola*, *Eimeria* and *Trichostrongylus* were among the most prevalent heminthes in the studied species. The presence of these gastrointestinal parasites in the host may induce morbidity and mortality they could also serve as reservoir of parasites. However, the effects of these parasites on the host and their ability to establish themselves in any other animals have to be thoroughly investigated. Bushmeat handlers, such as hunters, traders and consumers, need to be informed about possible danger of infection with parasites of the bushmeat. Further research is warranted to establish the occurrence of the other zoonotic parasitic fauna in other duiker species

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