ABSTRACT
A total of ninety-four (94) fresh faecal samples of baboons (Papio anubis), Warthogs (Phacochoerus africanus) and Waterbucks (Kubus defassa) were collected from different strategic locations within Yankari Game Reserve in August, 2008. Samples were collected in sterilized specimen bottles containing 4% formalin and analyzed by simple floatation, sedimentation and concentration Mc master techniques. The sixty (63) fecal samples of baboons examined; 7(11.11%) had intestinal parasites, comprises of 260 (54.1%) metastrongylus eggs, 180 (37.50%) eggs of mites and 40 (8.33) of adult mites. A total of Seven 7 (28%) of the twenty-five (25) fecal samples of warthogs had parasites which comprised of 4,960 (98.0%) eggs of hyostrongylus eggs and 100 (2.0%) of monizia eggs. Only 2(33.3%) of the six (6) fecal samples of waterbucks had Hystrongylus eggs 180(1.1%). The infection rate was significantly higher (p<0.05) among Warthogs (98%) followed by Baboons (54.1%) and the least Waterbucks (1.1%). Exposure to posture may be the predisposing factor responsible for the prevalence rate recorded in the study area. This may posed a potential danger to visitors in Yankari Game Reserve and other wild animals. Implementation of control policy of helminthes parasites in the Reserve will reduce the prevalence of helminthes diseases.

Key words: Baboon, Intestinal parasites, Waterbuck, Warthog, Yankari Game Reserve

INTRODUCTION
Yankari Game Reserve is a wildlife park located in the South central part of Bauchi State, Nigeria; about 117km from Bauchi State capital, Nigeria. It covers an area of 2,244km² with coordinates (9°45'16"N 10°30'37"E/9.754433°N 10.510317°E). The game reserve was created in 1956; it was upgraded to a national park in 1991 and managed by the National Parks Service until 2006. It is currently under the management of Bauchi State Government. It is a home to several natural warm springs, variety of flora and fauna. (www.nigeriagalleria.com). It’s a unique heaven for aesthetic, research, conservation and tourism. Yankari was designated as the Nigeria’s largest wildlife park in 1962 (Onokerhoraye, 1985), the most popular destination for tourist, it promotes tourism and ecotourism in the country (Olokesusi, 1990; Ogunlam, 2000).

The game reserve serves as an important refuge for over 50 species of mammals like the African bush Elephant, Olive baboon, Patas and Tantalus monkey, Roan Antelope, Western Hartebeest, Lion, African buffalo, Waterbuck, Bushbuck, Hippopotamus and Warthog (Usman and Adafalu, 2010). There are over 350 species of birds in the park; 130 are resident and 50 are Palearctic migrants and others are intra-African migrants (Olokesusi, 1990).

Warthog Baboons and Waterbuck are the common wild animals in the game reserve. They feed and defecate indiscriminately. They may transfer parasites to humans through air, food or contact. Helminthes infection is the major problem causing morbidity and mortality in captive wild animals (Borghare, 2009). Studies on the prevalence of gastrointestinal parasites in wild animals were reported in Kamala Nehru park, India (Ghoshal, 1988), Zoological garden, Kerala, India (Varadharajan and Pythal, 1999), Zoological garden of Gujarat, India (Patel, 2003) and Vanvihar National park, Bhopal, India (Deshmukh, 2009). Most studies available focused on parasitic infection in domesticated animals. There has been fragmentary information that link up helminthes parasitic infection with wild animals. Particularly, the prevalence of helminthes parasites associated with wild animals in Yankari Game Reserve.

In view of the forgoing, this study was conducted in Yankari Game Reserve to determine the prevalence of gastrointestinal parasites among some selected animals.
MATERIALS AND METHODS
Sample Collection
A total of ninety four (94) freshly fecal samples of Warthogs (25), Baboons (63) and Waterbucks (6) were randomly collected at strategic location in Yankari Game Reserve. The samples were preserved in 4% formalin. Solid fecal samples were collected in a sterilized, dry, wide mouthed plastic container using polythene bags. It was labeled and handled to prevent parasitic or bacterial auto–infection (FAO, 1998).

Fecal Sample Examination
Faecal samples were brought to the Parasitology Laboratory, Faculty of Veterinary Medicine at Ahmadu Bello University Zaria for qualitative examination. Sheather’s sedimentation and floatation method (Zajac and Conboy, 2012) was used. Quantitative examination was conducted by concentration Mc master Techniques (FAO, 1998), in order to assess the intensity of different helminthes infections (FAO, 1998).

Floatation Method
A small quantity of feces (3gm) was mixed well with water (15ml). The emulsion was strained through a nylon tea strainer to remove coarse faecal material. The filtrates were poured into a centrifuge tube; centrifuged at 1500rpm for 5 minutes. The supernatant was discarded, tube was refilled with water and centrifuged 2-3 times, until the supernatant was cleared. A drop of the sediment on a clean, dry glass slide and examined under low power of the microscope.

Sedimentation method
A small quantity of feces (3gm) was mixed well with water (15ml). The emulsion was strained through a nylon tea strainer to remove coarse faecal material. The filtrate was centrifuged at 1500rpm for 5 minutes. The supernatant was discarded. The tube was refilled with water and centrifuged 2-3 minutes, until the supernatant was cleared. A drop of the sediment on a clean, dry glass slide for microscopy at (10x) of the microscope.

Concentration Mc Master Technique
Fecal samples were analysed using the Mc master egg count technique quantitatively (FAO, 1998). A total of 2gm faecal sample was weighed in a universal bottle and 5ml of water was added. They were mixed thoroughly with the aid of glass rod, distilled water was added to about 5 % of the tube, it was closed and shaken vigorously. The sample was centrifuged at 1,500rpm for 4-5 minutes and supernatant was decanted. A 6ml of floatation medium (Zinc sulphate sucrose mixture) was added, centrifuged at 1, 500rpm for 3 minutes and the supernatant was poured into another test tube. Another 6ml of floatation medium was added to the sediments, shaken vigorously and centrifuged at 1, 500rpm for 2-3 minutes. The supernatant was added together making 12ml of supernatants. Using Pasteur pipette/dropping bottles, Mc master slides were filled with the supernatant consecutively. The two wells of the slide were filled and left on bench for five minutes before egg counting. The eggs within the ruled areas of the slide were counted using a binocular microscope. The number of eggs per gram (EPG) was then calculated as: Egg count/gram = Sum of counts from the two wells X 20.
Statistical Analyses
Data obtained were statistically analysed using Chi-square. A value of p<0.05 was considered significant while proportion values of p<0.05 was not significant.

RESULTS
Waterbuck faecal samples from the overall percentage prevalence was found to harbor more intestinal parasites followed by Warthog and the least was Baboon. They showed a parasites prevalence of 33.3%, 28.0% and 11.0% respectively (Table 1). The infection rate of Hyostrongylus eggs of Warthog was highest (98%) compared to Waterbuck (1.1%). The infection rate among the wild animals studied showed a high significant difference (p<0.05).

Highest faecal sample of Baboons (Papio Anubis) was collected, followed by warthog (Phacochoerus auran) and the least quantity was of Waterbuck (Kubus deffasa); represented (Table.1). A total of sixty three (63) faecal samples of Baboons had 54.1% of Metastrongylus eggs, 37.5% mite eggs and 8.33% adult mites’ infection (Table 2). The result indicated a significant difference of infection rate (p<0.05). The twenty five (25) faecal samples of Warthogs had 98% Hysteromyalis eggs, and 2% Monizia eggs. The difference in prevalence between Hysteromyalis eggs and Monizia egg was highly significant (p<0.05) (Table.3).

The six (6) samples collected from Waterbuck had 1.1% of Hysteromyalis eggs (Table. 4). Hysteromyalis eggs had the highest prevalence rate of 98.2% in Warthog and Metastrongylus eggs 54.1% prevalence rate in Baboons.

| Table1: Prevalence (%) of Parasitic Infection in Animals of Yankari Game Reserve. |
|------------------------------------------|-----------------|-------------------|
| Animal            | Sample examined | Number of positive | Prevalence (%) |
| Baboon            | 63              | 7                 | 11.1           |
| Warthog           | 25              | 7                 | 28             |
| Waterbuck         | 6               | 2                 | 33.3           |

\[ x^2 = 11.08 \] \[ DF =2 \] \[ P< 0.05 \]

| Table 2: Prevalence of Metastrongylus eggs in Baboons (N=63) |
|----------------------|-----------------|-------------------|
| Parasite             | Positive samples | No. of eggs parasites | Prevalence (%) |
| Metastrongylus eggs  | 2               | 260               | 54.1           |
| Mites                 | 4               | 180               | 37.5           |
| Adults mites          | 1               | 40                | 8.33           |
| Total                 | 7               | 480               | 100            |

\[ x^2 =71.39 \] \[ DF= 2 \] \[ P<0.05 \]

N= Number of samples examined

| Table 3: Prevalence of Hysteromyalis eggs in Warthogs (N=25) |
|----------------------|-----------------|-------------------|
| Parasites            | Positive samples | parasite eggs | Prevalence (%) |
| Hysteromyalis eggs   | 5               | 4960             | 98.02          |
| Monizia              | 2               | 100              | 2.0            |
| Total                | 7               | 5060             | 100            |

\[ x^2 = 570.15 \] \[ DF= 1 \] \[ P<0.05 \]

N= Number of samples examined

| Table 4: Prevalence of Hysteromyalis eggs in Waterbucks (N=6) |
|----------------------|-----------------|-------------------|
| Parasite             | Positive samples | parasite eggs | Prevalence (%) |
| Hysteromyalis eggs   | 2               | 180              | 1.1            |
| Total                | 2               | 180              |

N= Number of samples examined

DISCUSSION
There is relatively high prevalence of gastrointestinal helminthes parasites in Baboons, Warthogs and Waterbucks in Yankari Game Reserve (p<0.05). This could be due the feeding habit of the wild animals coupled with favorable environment that enable the survival of helminthes parasites (Kayyu et al., 2003).

The study revealed that, Warthogs harbors Hysteromyalis eggs (98.02%) and Monizia eggs (2%). The finding agreed with Stephanie et al., (2013) who recorded strongyle nematodes (82.7%) on endangered wild Boranelephants in Sabah, Malaysia. It is also similar with the work of Abuessaila et al., (2011) who reported Trichostrongylus spp (13.5%), Strongyloides spp (7.3%) in Donkeys and 47.9% in Warthogs (Phacochoerus auran) in Radom National Park; South Darfur, Sudan. The prevalence of Hysteromyalis eggs among wild species may be attributed to climatic a condition that favors the development of the parasite (Magona and Musisi, 1999). It was suggested by O’Connor et al., (2007) and Guar et al., (1979), that mean monthly rainfall of 51mm mean maximum and a mean monthly temperature of 25°C had a greater potential to support prolonged survival of infective nematode larvae on pasture, the larvae will subsequently be transmitted to the wild animals through gazing.
The prevalence of Metastrongyulus eggs (54.1%), mite eggs (37.5%) and adult mites (8.33%). Metastrongyulus eggs recorded agreed with (Hahn et al., 2004); who reported Strongyloides and Trichuris species in free ranging baboons in Kenya. Abuessailla et al., (2011), reported a prevalence of Trichostrongylus spp (14.5%) in a Patas monkey. Similarly, Munene et al. (1998) observed Trichuris trichuria in captive and wild trapped baboons. A higher prevalence of helminth parasitic infection in monkeys 89.47% and langour 66.66% was also reported in Madhya Pradesh, Pashu (Bante, 2012). Variation of the prevalence observed in this study could be due to geographical location, host immunity and level of exposure to infective stages of the parasites (Thawai et al., 2014) and (Singh et al., 2006).

The prevalence of Hyostrongylus eggs in a Waterbuck was 33.3%. The result is similar to the findings of El-Dirdin et al., (1986) who reported a high prevalence of Hyostrongylus spp 27% in donkeys at Sennar. Kheir and Kheir (1981) also reported 37.8% prevalence of Hyostrongylus eggs in donkeys’ faecal samples in Bahr El-Arab, Southern Sudan. Similarly, 71.1% prevalence of Hyostrongylus eggs was reported by Seri et al., (2004) in donkeys (Equus asinus) at Khartoum, Sudan. It could be explained that Hyostrongylus spp is cosmopolitan in nature. Variation in prevalence observed attributed to the number of adult parasites in the gastrointestinal tract, age, and fecundity of the parasites, stage of infection, immunity, age, sex, and food abundance (WHO, 1995).

Hyostrongylus and Metastrongyulus eggs prevalence is not a peculiar infection in wild animals, zoological animals that tend to receive medical attention were reported to be vulnerable. This support the findings of Opara et al., (2010) who reported 76.6% overall prevalence of gastrointestinal parasites among thirty two wild animals at Zoological Garden, Nekede Owerri, South- East, Nigeria. Saad et al., (1983) reported a prevalence of Trichostrongylus spp in Khartoum Zoological garden, Sudan in faecal of Gazella dorcas (dorcas gazelles), Acinonyx jubatus (Cheetah Indian), Hippopotamus equines (Roan antelope) Giraffa camelopardalis (giraffe), Gazella rufifrons (Red-fronted gazelles ), Papio cynocephalus (Nubis baboons ), Cercopithecus aethiops (Vervet monkeys) and Syncerus caffer (Cape buffalo).

The work of Munene et al., (1998) examined a massive infection of Metastrongyulus spp in non human primates which caused bronchitis, pneumonia with cough and nasal congestion as the major signs leading to reduced weight gains and respiratory complications in the animals. The work of Chakraborty and Goswami, (2001) reported that Hyostrongylus spp affected pigs and other wild animals in captivity by causing poor feed utilization, reduced weight gains and the larval stages destroy glandular tissues in the stomach, which lead to catarhral gastritis with excessive secretion of mucus; sometimes with ulceration. Similarly, Ukoli, (1990) reported massive infection of Hyostrongylus spp to be fatal to young herbivores animals associated with the loss of appetite, anemia and diarrhea.

The prevalence of gastrointestinal parasites recorded in Baboons (Papio anubis), Warthogs (Phacochoerus africanus) and Waterbucks (Kubus defassa) in Yankari Game Reserve were attributed to temperature and high moisture content of the area, which favors the growth and development of larvae on pasture. This also leads in increased contact between the host and parasites (Cheesbrough, 1999) and (Murray et al., 1989). This finding is in agreement with Wadhya et al. (2011) and Ohaeri (2012); they recorded higher incidence of parasitic infection in wild animals during rainy season. The higher prevalence of Hyostrongylus eggs in Warthog and Waterbuck can be attributed to their feeding habit since they feed mainly on posture where the third stage larvae or eggs are hatched (Ilan, 2008).

**Conclusion and Recommendation**

Prevalence of gastrointestinal helminthes among wild animals in Yankari Game Reserve is alarming and of public concern. The health status of the animals should be monitored frequently. This will reduce the tendency of mortality due to diseases as evident of the stool sample examined. Proper sanitation and treatment of the grazing areas will reduce the prevailing incidence. The animals should be properly inspected to reduce the tendency of zoonotic potentialities on workers and visitors. Government should set up a research team for epidemiological investigation and prevalence of gastrointestinal parasites in animals of Yankari Game Reserve. Protection of wild animals is a key component of the Millennium Development Goal.

**REFERENCES**


Stephanie, H ; Nurzahafarina, O ;Senthivel K. S. S ; Nathal, M ;Matthew, F; and Benoit, G.(2013). First parasitological survey of Endangered Bornean elephants Elephas maximus borneensis*Endangered Species Reseach ,Vol. 21: 223–230,


Retrieved October 10, 2014 from www.nigeriagalleria.com
Retrieved February 18, 2015 from www.wcsnigeria.org/wildplaces/yankari