

## Original paper

# First incidence of ectoparasites in Abuja Zoological Parks, Abuja, Nigeria

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**ABSTRACT.** Ectoparasites are known for representing a considerable health risk to animals and humans when living close to each other. Little is known about the ectoparasites of Zoo animals in the Federal Capital Territory (FCT), Abuja. This research was conducted from December, 2017 to April, 2018. Thirty-three animals were examined from two Zoological Gardens in Abuja (The National Children's Park and Zoo, Asokoro and the Area 1 Zoo and Garden, Garki). Mites were collected from animals by two techniques; brushing and removal with forceps. All body parts were examined. Ticks were collected using tweezers and examined for morphological identification. Of the 33 examined animals, a hyena was positive for mange (*Sarcoptes scabiei*) and a male tortoise (over 90 years) was positive for African tortoise tick, *Amblyomma marmoreum* (Acari: Ixodidae) at the National Children's Park and Zoo, Asokoro. The prevalence of infections in all animals examined at the National Children's Park and Zoo, Asokoro was 8.3%. Only males (15.4%) were found to be infested. Animals < 2 years had a prevalence of 5.88% while animals > 2 years had a prevalence of 14.28%. Statistical analysis showed that there is no association in the prevalence in both sex and age as they are 0.174 and 0.540 respectively which are above  $P < 0.05$ . No ectoparasite was found in Area 1 Zoo and Garden, Garki. Ectoparasites were identified in the FCT Abuja Zoological garden for the first time. This will improve the diagnosis and control strategies for ectoparasites in the FCT.

**Keywords:** ectoparasites, zoo, *Sarcoptes scabiei*, *Amblyomma marmoreum*

## Introduction

Zoos are considered as an *ex situ* form of conservation where valuable wild animals are kept in cages or enclosures for research, conservation and ornamental purposes [1–3]. The growth and development of these zoo animals are however constrained by the proliferation of several ectoparasites (chiggers, fleas, mites, scabies, ticks) often responsible for zoonotic diseases, especially those that come in contact with the ectoparasite-infested animals [4,5]. Ectoparasites therefore have a significant impact on the health, well-being of the human and animal hosts. These impacts can either be direct, through tissue damage and blood loss or indirect, through their role as vectors of viral, bacterial, protozoa and helminthic pathogens [6].

The impaired health condition of the animals in a great number of cases exerts a negative impact on their reproduction which is of major importance in the zoos where it is a common practice to conduct specialized breeding programs in captive and endangered species [7].

Previous studies in Australia and Middle-East revealed that ectoparasites may bring about allergic reactions [8,9], destruction of body tissues, secondary bacterial infections [10] and several other life threatening ailments [11]. Routine surveillance and management of ectoparasites should therefore be a routine part of animal care in zoos, thereby improving conservation interventions, protecting public health, and advancing our knowledge of vector ecology [12,13].

In Nigeria, related studies revealed low ecto-

Table 1. Occurrence of ectoparasites in wild captive animals sampled at the National Children's Park and Zoo, Asokoro

Scientific names	Common names	No. of animals	No. examined	Ticks	Mites	Freq.
<i>Balearica regulorum</i>	Crown cranes	2	2	–	–	–
<i>Crocuta crocuta</i>	Hyena	2	2	–	1	1
<i>Pavo muticus</i>	Peacock	1	1	–	–	–
<i>Camelus dromedra</i>	Camel	1	1	–	–	–
<i>Testudo graeca</i>	Tortoise	3	3	1	–	1
<i>Panthera leo</i>	Lion curbs	2	2	–	–	–
<i>Falco peregrinu</i>	Falcons	2	2	–	–	–
<i>Equus africanus</i>	Donkey	1	1	–	–	–
<i>Equus caballus</i>	Horses	2	2	–	–	–
<i>Phaethontidae psittiformes</i>	Parrots	2	2	–	–	–
<i>Oryctolagus cuniculus</i>	Rabbits	2	2	–	–	–
<i>Plencropterus gambensis</i>	Spur duck	2	2	–	–	–
<i>Anserini anser</i>	Geese	2	2	–	–	–
Total		24	24	1	1	2

parasite infestation in Jos Zoological garden, Plateau State [14], lice (*Goniodes* spp.), lice (*Lipeurus* spp.) and tick (*Amblyomma hebreum*) in Ogba Zoo, Edo State [15] and lice (*Goniodes gigas*, *Lipeurus caponis* and *Linognathus* spp.), fleas (*Ctenocephalides* spp. and *Echinophaga* spp.), mites (*Sarcoptes* spp. and *Dermanysus gallinae*) and ticks (*Amblyomma hebraeum*, *A. variegatum*, *Boophilus* spp. and *Argas persicus*) in Makurdi Zoological garden, Benue State [14]. However, there is paucity of information on the ectoparasites of zoo animals in the FCT, Abuja zoological gardens. The objective of the present study therefore is to document the ectoparasites on captive animals in zoos in Abuja Municipal Area Council (AMAC), FCT.

## Materials and Methods

### Area of study

The study was conducted at the National Children's Park & Zoo, Asokoro District and Area 1 Zoo & Garden, Garki both in AMAC, FCT, Abuja. The city lies between latitude 8.25 and 9.20 north of the equator and longitude 6.45 and 7.39 east of Greenwich Meridian [16]. The temperature of the area ranges between 30–37°C yearly with the highest temperature experienced in the month of March/April and with a mean total rainfall approximately 1,650mm per annum [17].

### Sample size

All the 33 animals made up of; Crown cranes (2), Hyena (2), Peacock (1), *Camelus* Camel (1), Tortoise (3), Lion curbs (2), Falcons (2), Donkey (1), Horses (2), Parrots (2), Rabbits (2), Spur duck (2), Geese (2) were examined for ectoparasites between December, 2017 and April, 2018 in the two Zoological Gardens in AMAC (National Children's Park & Zoo, Asokoro and Area 1 Zoo & Garden, Garki).

### Sampling methods

All 33 animals, comprising twenty four (24) from the National Children's Park & Zoo, Asokoro and nine (9) from the Area 1 Zoo & Garden, Garki were restrained and examined for ectoparasites. The ectoparasites were collected using two techniques; brushing and removal with forceps. Dermatological and physical examinations for ectoparasites were conducted on all the examined animals [18]. All the body parts and regions of the animals were examined for possible ectoparasitic infestation eg dorsal and ventral regions, head, trunk, eyelids, chin, earlobes, ear fringes, extremities and in between the digits for mammals and dorsal and ventral regions, head, trunk, left and right wings and tail end for the birds [18].

They were examined for ectoparasites on a clean white sheet of cardboard paper. This was done by

Table 2. Sex and age-related prevalence of ectoparasites at the National Children's Park and Zoo, Asokoro

Variables	Number of animals	Number of animals infested	Prevalence	$\chi^2$	P.df
Sex					
Male	13	2	15.4%	1.85	0.1741
Female	11	–	0%		
Total	24	2	8.3%		
Age					
<2years	17	1	5.88%	0.376	0.5401
>2years	7	1	14.28%		
Total	24	2	8.3%		

thoroughly ruffling the feathers of the birds with a brush to dislodge the ectoparasites in addition to the above process, the stem of the birds were scraped to recover mites. The animal body was inspected and brushed with special attention paid to the ears, eye region, axillae and groin in the mammals, while the birds' head, neck, wing, breast, back, rump and tail feathers were ruffled by hand and carefully examined [18,19].

#### Preservation and identification

Ectoparasites collected were transferred to the laboratory in separate specimen bottle containing 70% ethyl alcohol. The ectoparasites were examined using dissecting microscope and identified using keys and illustration in [18,20].

#### Data analysis

Statistical package for social sciences (SPSS) was used for the data analysis. Data were analysed using descriptive statistics including percentages. Data were also extrapolated as charts while chi square was used to compare the level of association between sex, age and prevalence of ectoparasites infestation.  $P < 0.05$  was considered significant.

## Results

Of the 33 examined animals, only 2 (8.33%) of the animals were infected with ectoparasites; a Hyena and a Tortoise (Table 1).

Male had a higher prevalence of ectoparasite (15.4%) compared with female (0%). Older animals (>2years) had higher prevalence (14.28%) than the younger ones (<2years) (5.88%) (Table 2).

On age related prevalence, only 1 (5.88%) (<2 years) animal was positive for ectoparasitic infestation also 1 (14.28%) (>2 years) animal was

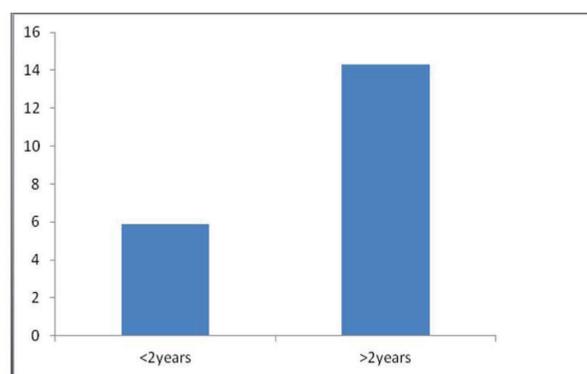


Figure 1. Bar chart showing the percentage of animals below two years that are infested (5.88%) and that above two years that are infested (14.28%)

positive for ectoparasitic infestation (Figure 1).

Out of the three tortoises examined at the National Children's Park and Zoo, Asokoro, only one tortoise was positive for tick (*Amblyomma marmoratum*) accounting for the 33.3% (Table 3).

All the 9 animals examined at the Area 1 Zoo and Garden, Garki were negative for ectoparasites (Table 4).

Statistical analysis using chi square ( $\chi^2$ ) with the value of 0.376 ( $P < 0.05$ ) shows that there is no association in the age ratio prevalence.

## Discussion

The most significant result in this preliminary study is the first documentation of ectoparasites species infesting Zoo animals in (AMAC), zoological gardens. In the study carried out, the results showed that out of the thirty three (33) animals examined, non was positive for ectoparasite at the Area 1 Zoo and Garden, Garki but two were positive for ectoparasites at the National Children's

Table 3. Frequency of ectoparasites on the twenty-four wild animals examined at the National Children's Park and Zoo, Asokoro

S/No.	Host animal	Species of parasite	No. examined	No. infested	Prevalence (%)
1	Tortoise ( <i>Testudo graeca</i> )	<i>Amblyomma marmoreum</i>	3	1	33.3
2	Hyena ( <i>Crocuta crocuta</i> )	<i>Sarcoptes scabiei</i>	2	1	50

Park and Zoo, Asokoro. One young male hyena (*Crocuta crocuta*) (aged 6 months) was positive for mite and *Sarcoptes scabiei* and a tick of the genus *Amblyomma marmoreum* (Acari: Ixodidae) was found on an old male tortoise (aged over 90 years). This concurs with the earlier studies in Jos Zoological garden, Plateau State Nigeria where low ectoparasitism was recorded [14]. The low ectoparasitism could be attributed to the presence qualified veterinary personal who routinely quarantine and treat newly introduced animals before incorporating them into the gardens as described by Woodford et al. [22]. The percentage prevalence in all the animals examined at the National Children's Park & Zoo, Asokoro was 8.3%. The prevalence in males was 15.4% and that of females was zero. Within many species, males are often more heavily parasitized than females [23].

In terms of prevalence in age, animals below two years had 5.88% while animals above two years had 14.28%. The prevalence of *Amblyomma marmoreum* tick infestation in tortoise was 33.3% while that of *Sarcoptes scabiei* mite infestation in hyena was 50%. The period of sampling or research between December 2017 and April, 2018 was a dry period where most ectoparasites (ticks, fleas, flies, lice) are rarely active [24]. The public health implications of the infestation of zoo animals with ectoparasites that are capable of transmitting human diseases are of serious zoonotic significance. There is an urgent need to treat these animals and their

environment as well as ensuring the safety of visitors to the park. Pre-introduction examination of animals is required to establish whether these animals acquired the infestation in the zoo or were imported with the ectoparasites.

In conclusions, the results in this study have provided a documentation of ectoparasites in the two Zoological Parks (The Children's Zoo and Area 1 Zoo and Garden) over the period of 4 months. Only a tick, on a tortoise and a mite, in a hyena were observed during the investigation. Despite the variability in the distribution and occurrence of the ectoparasites over the study period, no statistical difference on the diversity of the ectoparasites was established. Further surveillance across the two seasons (dry and rainy) are therefore recommended to develop a more comprehensive inventory of ectoparasites across the Zoological gardens in the AMAC, which can improve knowledge on host parasite relationship.

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Table 4. Frequency of ectoparasites in the nine animals examined at the Area 1 Zoo and Garden, Garki

S/No.	Host animal	No. examined	Ticks	Lice	Fleas	Mite
1	<i>Pavo muticus</i> (Peacock)	1	–	–	–	–
2	<i>Testudo graeca</i> (Tortoise)	3	–	–	–	–
3	<i>Catarrhini</i> spp. (Monkeys)	4	–	–	–	–
4	<i>Struthio camelus</i> (Ostrich)	1	–	–	–	–
	Total	9	–	–	–	–

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