

Medically Important Arthropods Infesting Some Exotic Birds and Mammals in the Makurdi Zoological Garden in Benue State, Nigeria

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Abstract:

This study investigated ectoparasitic fauna of some Zoo inmates in Makurdi, Nigeria. Ticks were collected using the hand picking and hair brushing methods while fleas, mites and lice were collected by combing and brushing the entire animals' body unto a white cloth soaked in chloroform. A total of 32 animals (mammals 37.5% and birds 62.5%), were examined for ectoparasites and 1110 ectoparasites were collected. The mammals accounted for 58.3% of infestation compared to 41.3% in the birds. This difference was statistically significant ($X^2 = 8.55$, $df = 1$, $P < 0.05$). Lice were the most common ectoparasites found to be infecting the Zoo animals surveyed, accounting for 46.0% of all ectoparasites collected. This variation differed significantly ($X^2 = 2.41$, $df = 3$, $P < 0.05$). The ectoparasites encountered in this study belonged to the following genera, Tick (*Amblyomma hebraeum*, *Amblyomma variegatum*, *Boophilus* and *Argas persicus*), Lice (*Goniocotes gigas*, *Lipeurus caponis* and *Linognathus*), fleas (*Ctenocephalides* and *Echinophaga gallinacea*) and mites (*Sarcoptes* and *Dermanyssus gallinae*). The zoonotic implications of the infestation of Zoo animals with ectoparasites that are capable of transmitting animal and human diseases are discussed.

Key Words: Zoo animals, Ticks, Mites, Ectoparasites, Makurdi.

Introduction:

Ectoparasites exert strong selection pressures on avian hosts by lowering nestling survival and growth, increasing the cost of sexual ornamentation, reducing future reproductive success, and decreasing long-term survival (Fitze *et al.*, 2004, Moller and Rozsa, 2005, Hamstra and Badyaev, 2009). In addition, some avian ectoparasites are of particular importance as vectors of pathogen. Extensive dermatological lesions have been reported in zoo inmates infested with ticks, fleas, mites and lice (Portas *et al.*, 2009), these play a significant role in clinical and pathological conditions in these animals. Laceration caused by ectoparasites bites could be points of entry for pathogenic organisms. Studies on wildlife caught in forest reserves in the Middle- east and Australia have reported severe skin lesions resulting from ectoparasite infestation (Vilcins *et at.*, 2003; Wallach *et al.*, 2008). The nest and cage materials provided for the comfort of

animals in captivity are also key habitat for ectoparasites species that live and reproduce within. Nest and cage conditions are known to influence host and parasite reproductive success, host-parasite interaction and composition of ectoparasite communities (Hebb *et al.*, 2000).

In order to boost the tourism potential of the Makurdi Zoological Garden, many exotic birds and antelopes have been introduced. Many of these exotic fauna were imported without routine checks at the point of entry to investigate their health status. The increasing trade of game animals has been implicated in the introduction of new arthropod vectors into new biogeographical zones. Reintroduction programmes has accelerated the spread of parasites, as animals are moved between regions, potentially introducing foreign parasites and diseases. European roe deer recently introduced into Israel were found to be infested by ticks of the genus *Rhipicephalus* and *Hyalomma* (Wallach *et al.*, 2008). Mertin and Schlater (2001) reported four new species of ectoparasites in ostriches recently imported into the USA. The epidemiological implications of such findings are critical to the prevention of human and animal health.

This study was designed to collect, examine and identify ectoparasites fauna of exotic birds and antelopes recently introduced into the Makurdi Zoological garden, determine their abundance and identify their predilection sites.

Materials and Methods:

Description of Study Area:

Makurdi, the capital of Benue state, Nigeria, is fast becoming a metropolitan centre. The town lies between latitude 7o 15/- 7o 34/ N and longitude 8o 15 – 8o 40E, within the guinea savanna vegetative belt. Makurdi is situated on the bank of the second largest river in Nigeria, River Benue. The zoological garden is located on the river bank, between the two campuses of the Benue State University in Makurdi. As part of efforts to reactivate the facility and increase patronage, the State Government transferred the management of the Zoo from the Benue State University to the Ministry of Commerce, Industry and Tourism. The Zoo covers a land area of about 5 acres. Permission to conduct the survey was sought and received from management of the zoo and the Ministry of Commerce, Industry and Tourism headquarters in Makurdi.

Sampling Methods:

Birds comprising ostriches, shoveller ducks, crown cranes, peacocks and European stocks and antelopes comprising duikers and gazelles were examined during the study. Ectoparasites were collected with the assistance of two Zoo Keepers; ticks were collected using the hand picking and hair brushing methods (Shah-Fischer and Ralph-Say, 1989). They were examined for ectoparasites on a clean white sheet of cardboard paper. This was done by 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 while forceps were used to pick the lice and ticks. 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 (Hamstra and Badyeav, 2008). Fleas, mites and lice were collected by combing, brushing and scraping suspected predilection sites unto a white cloth soaked in chloroform to prevent fleas from jumping and mites and lice from creeping away. The type of animal from which the ectoparasites were collected and predilection sites was noted and recorded on each bottle.

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 Shah-Fisher and Ralph-Say (1989) and Hopla *et al.*, (1994).

Results:

A total of 32 animals (mammals 37.5% and birds 62.5%), were examined for ectoparasites and 1110 ectoparasites were collected from 78.1% of the animals that were infested (Table 1). In ascending order, the ectoparasites collected comprised of Fleas (13.8%), mites (18.6%), ticks (21.5%) and Lice (46.0 %). The mammals accounted for 58.3% of infestation compared to 41.7% in the birds, this difference was statistically significant ($X^2 = 8.55$, $df = 1$, $P < 0.05$). Ectoparasite infestation in relation to type of animal revealed that Sitatunga was most parasitized among the mammals while ostrich led in the bird's category (Table 1). Lice were the most common ectoparasites found to be infecting the Zoo animals surveyed, they accounted 46.0% of all ectoparasites collected, this variation differed significantly ($X^2 = 2.41$, $df = 3$, $P < 0.05$). Infestation by ticks was the

second highest accounting for 21.5% while fleas and mites accounted for 13.8% and 18.6% respectively.

Ectoparasites were recovered from various body parts of the animals, while the trunk/back harboured most (32.1%) of the ectoparasites among the mammals, the feathers and under the wings were the most preferred attachment sites in birds (Table 2). The ectoparasites encountered in this study belonged to the following genera, Tick (*Amblyomma hebraeum*, *Amblyomma variegatum*, *Boophilus* and *Argas persicus*), Lice (*Goniocotes gigas*, *Lipeurus caponis* and *Linognathus*), fleas (*Ctenocephalides* and *Echinophaga gallinacea*) and mites (*Sarcoptes* and *Dermanyssus gallinae*). The abundance of these parasite genera on the animals is shown in Fig. 1.

Table 1: Prevalence rate of ectoparasites on some zoo animals in Makurdi, Nigeria

Animals	No. examined	No. infested	Types of ectoparasites (%)				Total
			Ticks	Lice	Fleas	Mites	
Sitatunga	3	3	113 (33.2)	128 (37.6)	47 (13.8)	52 (15.3)	340 (30.6)
Duiker	5	4	62 (31.1)	77 (38.7)	26 (13.1)	34 (17.1)	199 (17.9)
Gazelle	4	2	14 (12.9)	52 (48.1)	12 (11.1)	30 (27.7)	108 (9.7)
Ostrich	2	2	18 (8.6)	120 (57.1)	41 (19.5)	31 (14.7)	210 (18.9)
Shoveller Duck	4	3	4 (4.4)	70 (77.7)	-	16 (17.7)	90 (8.1)
Peacock	4	3	12 (12.5)	33 (31.7)	27 (26.0)	32 (30.7)	104 (9.4)
European stock	6	5	16 (34.8)	18 (39.1)	-	12 (26.1)	46 (4.1)
Crown crane	4	3	-	13 (100.0)	-	-	13 (1.2)
Total	32	25 (78.1)	239 (21.5)	511 (46.0)	153 (13.8)	207 (18.6)	1110

Table 2: predilection sites of ectoparasites collected from zoo animals in Makurdi, Nigeria

Animals	Type of ectoparasite	Under wings	On feathers	Comb	Groin	Back/trunk	Ears	Head	Legs	Neck	Total	(%)
Mammals	Ticks	-	-	-	79	22	78	-	-	10	189	17.0
	Lice	-	-	-	11	142	-	43	-	61	257	23.1
	Fleas	-	-	-	-	41	4	-	27	13	85	7.6
Birds	Mites	-	-	-	-	37	7	31	14	27	116	10.4
	Ticks	21	-	4	-	18	-	7	-	-	50	4.5
	Lice	61	101	-	-	71	-	-	-	11	254	22.9
Total	Fleas	17	21	10	-	-	14	-	10	6	68	6.1
	Mites	15	37	7	-	11	-	12	-	9	91	8.2
Total		114 (10.2)	159 (14.3)	21 (1.9)	90 (8.1)	356 (32.1)	89 (8.0)	93 (8.4)	51 (4.6)	137 (12.3)	1110	

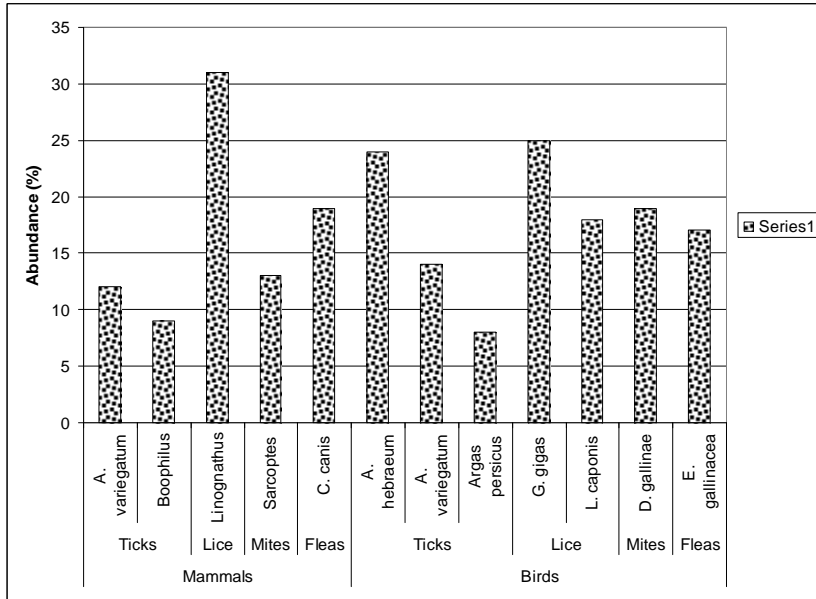


Fig. 1: Percentage abundance of ectoparasites genera on Zoo animals in Makurdi

Discussion:

Study of ectoparasite diversity and distribution provides a starting point for elucidating mechanisms of vector borne diseases in animals and humans. The heavy infestation of these animals kept for human viewing is epidemiologically significant. Ectoparasites species encountered in this study and infestation rates observed corroborates earlier studies on wildlife and suggest that these parasites have wide geographic distribution. For instance, the bird mites, *Dermanyssus* species and lice encountered in this study have also been reported in many studies elsewhere (Freed *et al.*, 2008, Hill, 2008, Hamstra and Badyaev, 2008, Dietsch 2005, Proctor and Owens, 2000). Also, ticks (*Amblyomma* species) have been reported in game animals in North America (Martins *et al.*, 1992; Martins and Schlater, 2001). Bird lice of the genus *Goniodes*, *Leperous* and tick (*Amblyomma hebraeum*) have also been reported on birds in Ogba zoo in Benin City, South Western Nigeria (Edosomwan and Amadasun 2008).

The infestation of animals kept in captivity causes extreme irritation and may lower their resistance to other infectious disease pathogens and may actually result in their death. As a result of the blood-sucking habits of

ticks, mites, lice and fleas, many infested animals suffer from anaemia, skin lacerations and moderate to high periadnexal dermatitis (Portas *et al.*, 2009, de Lope *et al.*, 1993). In addition to these clinical consequences of ectoparasite infestation, the aesthetic beauty of some of these ornamental bird and their flight behaviour may be compromised (Barbosa *et al.*, 2002; Hamstra and Badyeav, 2008; Freed *et al.*, 2008; Whiteman and Parker, 2004). Observed predilection sites of ectoparasites on birds shows that under the wings and feathers accounted for the highest infestation, Edosomwa and Amadasun (2008) however reported that the head region was more infested in birds at the Ogba zoo in Benin City, Nigeria.

The proximity of the zoological garden to the river bank which is a choice grazing ground for nomadic herdsman may help to establish and maintain a reservoir of ectoparasite population. Livestock grazed on the bank of river Benue are known to be infested with a variety of ectoparasites (Omudu *et al.*, 2006, Omudu and Amuta 2007, James – Rugu 2006). Domestic birds that often stray into the zoological garden may have been responsible for the introduction of some of the ectoparasites. Residents of apartments close to the garden practice free range livestock keeping. These domestic animals are known to harbour a wide variety of ectoparasites (James – Rugu, 2004, Omudu and Amuta 2007). This suspicions have however not been scientifically established. The poor hygienic condition in the zoo cages could enhance the incidence of ectoparasitism. Poor hygiene and cage sanitation provide habourages for ectoparasites and since animal movement is restricted could result to higher ectoparasite infestation in affected animals (Hebb *et al.*, 2000; Edosomwan and Amadasun 2008).

The zoonotic implications of the infestation of zoo animals with ectoparasites that are capable of transmitting human diseases are of serious public health concern. 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 parasites.

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المفصليات ذات الأهمية الطبية التي تصيب بعض الطيور الوافدة والثدييات بحديقة حيوانات ماكوردي بولاية بنبو بنيجيريا

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الملخص:

هذه الدراسة اهتمت بالبحث في الطفيليات الخارجية لبعض الحيوانات و الطيور الأجنبية بحديقة حيوانات ماكوردي بنيجيريا. تم جمع القراد بالالتقاط اليدوي و تحليل الشعر بينما تم جمع البراغيث و الحلم و القمل عن طريق تمشيط و تحليل جميع جسم الحيوان علي قطعة قماش مبللة بمادة الكلوروفورم. تم من خلال هذه الدراسة فحص عدد 32 حيوانا (37.5% ثدييات و 62.5% طيور) حيث تم جمع عدد 1110 طفيلا خارجيا. النسبة الأعلى للإصابة سجلت في الثدييات حيث بلغت 58.3% مقارنة مع 41.3% في الطيور. وكان هذا الفرق جوهرياً ($X^2=8.55, df=1, P<0.05$). الإصابة بالقمل كانت هي الأعلى من بين الطفيليات الخارجية في حيوانات الحديقة عند القيام بالمسح، حيث بلغت 46.0%. هذا التفاوت اختلف جوهرياً ($X^2=2.41, df=3, P<0.05$). اجناس الطفيليات الخارجية التي وجدت كانت تتبع للأجناس التالية: القراد من اجناس (أمبيليوما هيريوم، أمبيليوما فاريجاتم، بووفلس و أرقس بيرسيكس)، القمل (جونيوكوتس جيغس، ليبيرس كابونس و لينوجناش)، البراغيث (تينوسفليدز و ايكايونفاقا جالينيسي)، والحلم (ساركوبتس و درمانيسس جاليني). تم أيضا مناقشة الآثار المترتبة على إصابة حيوانات الحديقة بهذه الطفيليات الخارجية القادرة على نقل أمراض الحيوان والإنسان.

الكلمات المفتاحية: حيوانات الحديقة ، قراد ، حلم ، الطفيليات الخارجية ، ماكوردي.