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External and helminth parasites of small wild mammals in South western Nigeria

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ABSTRACT: A parasitologic study of small wild mammals including *Crocidura sp.; Lophuromys sikapusi, Mus minutoides* in four different modified locations in the forest zone of Ibadan, Southwestern Nigeria is documented. External parasite infestations and numerous gastro-intestinal helminths were recorded. Ectoparasitic infestations predominant in the anal and abdominal regions of the body exhibited varied host specificity and abundance, characterized by body lesions and secondary infections. Ectoparasites recovered were *Polyplax serrata, Xenopsylla cheopsis, Ornithonyssus bacoti, Psorptes ovis, Ixodes* sp. and *Laepas gigantica*. Endoparasites were limited to the gastrointestinal system, exhibiting low intensity and different specificity. The nature of the host habitat influenced the host parasite fauna; rodents in the forest locations carry higher parasite burdens while those in farmlands harbour parasites of man and domestic animals. The rodent-man animal transmission cycle of some of the parasites are discussed. The public health importance of the rodents and their ectoparasitic infestations are established and discussed.

Key Words: Helminth parasites; Wild mammals; Ectoparasites; Endoparasites; Public health.

Introduction

Small wild highly diversified mammals, mainly rodents are, important agricultural and domestic pests in southwestern Nigeria (Happold, 1986). The mammals are of grave socio-economic importance, being pests of farm, stored and domestic food products, reservoir of important veterinary and medical diseases.

The continued demand for land space for urbanization have resulted in the simultaneous destruction of the natural habitats of many animals and their search for alternative habitats which brings them in close proximity to man. The forest areas are being modified continually and the selection of alternative habitats by animals to evade extinction have resulted in their adaptations to farmlands, food storage warehouses and human dwellings. The quality of human dwellings permit the invasion of their residence by some rodents.

Interest on the parasites of wild rodents in Nigeria have emerged with the invasion of the rainforest by man for farming, hunting and housing. These rodents in Nigeria are used as food for consumption and for medicinal purposes. These mammals are also important in the diet of flesh eating mammals, birds and reptiles. However, documentation on the parasites of wild rodents are sparse, limited and inadequate in Nigeria. Dipeolu and Ajayi (1975), Obiamiwe (1986), Udonsi (1989), George, Obiamiwe and Anadu (1990), Ugbomoiko and Obiamiwe (1990), Okaeme and Osakwe (1995), Mafiana, Osho and Sam-Wobo

(1997), Nmorsi and Egwunyenga (1999) and Otubanjo (2000) have documented the gastrointestinal helminths parasites of certain small wild mammals used as food or found in human residences and farmlands including *Rattus rattus*, *Cricetomy gambianus*, *Funisculus substriatus*, Okereke (1971 a and b; 1973), Akande and Funmilayo (1978), George (1988), Otubanjo (2000) reported certain arthropod infestations of some wild rodents in Ibadan.

Diseases of wildlife have continued to emerge in human populations. Wild rodents have been recognised as reservoir hosts of diverse parasitic organisms, some afflicting man (Owen, 1976), Rodents are important reservoir hosts of arboviruse (Metselear and Simpson, 1982) such as lassar fever. There is increasing information on the significant role of wild mammals in the transmission of parasitic diseases of veterinary and public health importance. The zoonotic status of certain parasites of rodents in Nigeria have been implicated.

In view of the increasing proximity of man and his livestock to wild rodents, the parasite fauna of wild mammals was investigated in Ibadan in South western Nigeria. The host specificity of the parasites within the rodent population is considered. This paper attempts to document the arthropod and gastrointestinal helminth parasites of wild mammals in the changing ecologic environment of wild rodents in Ibadan.

Materials and Methods

111 small wild mammals including *Crocidura* sp. (shrew) (62), *Mus minutoides* (15), *Lophuromys sikapusi* (15), *Avicanthus niloticus* (7), *Mus natalensis* (5), *Uranomys forsi* (3), *Tatera valida* (2)< *Stochomys longicaudatus* (1) and *Lemniscomys striatus* (1), ranging from 14 to 83g, were randomly caught alive with nut baited Havahart animal traps (metal snap traps) in Ibadan, South western Nigeria. Trappings were undertaken in four ecologically differing locations including fallow grassland (31), abandoned cassava farmland (19), forest habitat (25) and the University Research farm (23) for a period of 6 months.

Animals were killed with chloroform, weighed, measured and identified after Happold (1986). External examination and brushing of the body surface for ectoparasites was carried out. Ectoparasites recovered were fixed and stored in 70% alcohol and cleared in clove oil for microscopic studies.

Internal organs were screened for macroparasites following dissection. Helminth parasites were fixed in hot formol acetic acid (FAA) and stored in 70% alcohol. The identification of all parasites was confirmed at the British Natural History Museum, London. Arthropod parasites were identified after Baylis (1928) and Okereke (1973).

Results

The frequency of occurrence of the small mammals was similar in the 4 locations studied; however *Crocidura* sp., the common shrew is the predominant mammal.

The random trappings of small wild mammals yielded arthropod and helminth parasites. 63.06% and 67.5% of the mammals were infected with ectoparasites and helminth parasites respectively. Multiple infections with external and helminth parasites characterize the trapped populations (Table I). Skin lesions with secondary infections featured in 47% of the collected live animals.

Ectoparasitic Infestations

1426 ectoparasites including mites (969), ticks (226), lice (230) and fleas (1) were recovered during the study (Table II). Ectoparasitic infestations included *Polyplax serratta* (Insecta, Phthiraptera); *Ornithonyssus bacoti* (Arachnida, Acarina, Psorptidae); *Psorptes ovis* (Arachnida, Acarina, Psorptidae); *Ixodes* sp. (Arachnida, Acarina, Ixodidae); *Xenopsylla cheopis* (Insecta, Xenopsyllidae) and *Laelaps gigantica* (Acarina, gasmidae). Nymphs of *Rhicephalus* sp. was recorded on *Crocidura* in the Agriculture Research Farm.

The shrew was host for all the ectoparasites excluding *P. serratta* and *L. gigantica*. The flea, *X. elicopis* occurred only in *Crocidura* sp., *Polyplax serratta*, a rigid specific louse was found on *Mus*

Table 1: Parasites of small wild mammals.

Recoevred Parasites	Host Animal (Number Examined)								
	Crocidura sp. Shrew (62)	*Mus minutoides* pygmy mice (15)	Lophuromys sikapusi (15)	*Mastomis nataelnsis* House rat (7)	*Arvicanthus niloticus* (7)	*Uromomys forsi* (3)	*Talera valida* Giant rat (2)	*Lemniscomys striatus* Striped mouse (1)	*Stochomys* sp. Target rat (1)
A. ARTHROPODS									
Polyplax serrata (Insecta, Phthiraptera)	–	–	+	–	–	–	–	+	–
Ornithonyssus bacoti (Acarina, Psorptidae)	+	+	–	–	+	+	–	+	–
Psorptes ovis (Acarina, Psorptidae)	+	+	–	–	+	+	+	–	–
Xenopsylla cehopsis (Siphonoptera, Xenopsyllidae)	+	–	–	–	–	–	–	–	–
Rhipicephalus (Acarina)	+								
Ixodes sp. (Acarina, Ixodidae)	+	+	–	+	+	–	–	–	+
Laelaps gigantica (Acarina, Gasmidae)	–	–	–	–	–	–	–	+	–
B. GASTROINTESTINAL HELMINTH									
Pseudohymenolepsis sp. (Cyclophylidae, Hymenolepidae)	+								
Hymenolepsis gilloni (Cyclophylidae, Hymenolepidae)	–	+	+						
Hymenolepsis vaucheri (Cyclophylidae, Hymenolepidae)	+								
Hymenolepsis maculadi (Cyclophylidae, Hymenolepidae)	+								
Pseudohysaloptera soricina (Cyclophylidae, Anoploephinae)	+	+							
Symphacia sp. (Ascarida, Oxyuriiade)	+								
Capillaris marri (Enoplida, Capillarinae)	+				+				
Nippostrongylus brasiliense (Strongylida, Heligmosomatidae)	–	+	+	+	+				
Schistosomatium douthitti (Trematoda, Schistosomtidae)	+		+				+		
Lyperosomum (Trematoda Dicrocoeliidae)	–		+						

Table 2: Ectoparasitic infestation and abundance in the small wild mammals.

Mammalian Host	No. Examined	No. Infeceted	Number of external parasites recovered (%)					
			Ticks	Mites	Lice	Fleas	Total	Abundance (%)
Crocidura sp.	62	44 (70.96)	121 (53.6)	943 (97.3)	24 (10.43)	1	1089	76.36
Mus minutoides	15	6 (40.00)	9 (3.98)	20 (2.06)	–	–	29	2.03
Avicanthes niloticus	7	3 (42.85)	38 (16.8)	–	35 (15.2)	–	73	5.12
Uranomys forsi	3	1 (33.33)	–	5 (0.52)	–	–	5	0.35
Tatera valida	2	2 (100.00)	9 (3.98)	–	–	–	9	0.63
Mastomis natalensis	5	1 (20.00)	1 (0.44)	–	–	–	1	0.07
Lophuromys sikapusi	15	10 (66.66)	41 (18.14)	–	162 (70.4)	–	203	14.24
Stochonmys longicaudatus	1	0 (0.00)	1	–	–	–	–	–
Lemniscomys striatus	1	1 (100.00)	6 (2.65)	1 (0.10)	9	1	17	1.19
Total	111	70 (63.06)	226	969	230	2	1426	

minutoides and predominant in *Lophuromys sikapusis* with the highest frequency and intensity. Table 2 records the prevalence and abundance of external parasites on the mammals.

The mite *P. ovis* was the predominant arthropod infesting in clusters (Table 2). The infestation was highest in *Crocidura* sp. mainly on the ears and legs. Also *O. bacoti* is a gasmid mite found on the wild mammals.

L. gigantica was recovered only from *L. striatus*. Lice infestations were light, seldom carrying more than 5 lice per host. The nymphal stage of *Rhicephalus* sp. was recovered from *Crocidura* in the University Research Farm.

The predilection sites of the arthropod parasites were the anal (52.2%) and abdominal (27.78%) regions of the body. The head region had scanty parasitic infestations. In *Crocidura* sp. the preferred predilection site was the anal region; while *L. sikapausi* and *M. minutoides* have abundant parasites on the abdominal region. The predilection sites vary with the species of rodents. *P. serata* was distributed mainly on the rump, back and flank of the rat's body.

Overall, the infection occurred with similar frequency and intensity in the female and male rodents, with adult animal harbouring more external parasites. The body size was directly correlated with arthropod abundance.

The environment has a slight influence on the host infectivity with arthropod parasites. mammals were infested in all the selected ecologic habitats. Rodents in the forest habitat exhibited 88% infestation, followed by 70% from gassland (Table III). The environment probably influenced the animal host infectivity due to the opportunity of exposure; *Rhicephalus* occurred only in the farmland.

Table 3: Prevalence of parasites in relation to locality.

Location	Total No. of Hosts	Total number of infected hosts			
		Ectoparasites	Endoparasites		
			Overall	Cestodes	Nematodes
1 Fallow grassland	34	24 (70.5)	17 (50.0)	9 (52.9)	11 (64.7)
2. Abandoned Farmlands	29	18 (62.0)	16 (55.2)	7 (43.8)	9 (56.3)
3. Forest	25	22 (88.0)	24 (96.0)	16 (66.6)	6 (37.5)
4. Derived Grassland	23	15 (65.7)	18 (78.2)	9 (50.0)	9 (50.0)
Total	111	70 (71.2)	75 (67.6)	41 (54.7)	35 (46.6)

Endoparasitic Infections

The helminth endoparasitic infection was limited to the liver and gut, predominantly the intestine and rectum in all the mammals examined. The intestine was the preferred habitat for helminthic infections, which consisted mainly of cestodes (Table I). The intestine had the highest infections of all endoparasites 70.7% followed by the caecum 19.4% and stomach 6.67%. The infection was highest in rodents from the forest habitat (88%) and least in the gassland habitat (11%).

Cestodes and nematodes constitute the helminth fauna of the mammals. Table I summarizes the helminth fauna of the wild mammals. No acantocephela was recorded.

Seven cestodes including *Hymenolepis maculadi*, Joyeaux and Baer, 1928; *H. vaucheri* Hunkler, 1972; *Hymenolepis gilloni*, Hunkler 1972; *Pseudophysaloptera sorcina*, Baylis 1934; *Pseudohymenolepis* sp; hyperpolytic segments of *Anomotaemia heini*, Quentin, 1964 and *Skrjabunotaemia*, Quentin, 1965. The frequencies of *H. maclaudi* and *H. vaucheri* were high in *Crocidura* sp. These parasites exhibited limited host range.

Nematodes recovered were *Sphacia* sp. female only in *Crocidura* sp. and *Mastomis natalensis*. *Nippostrongylus brasiliensis* occurred in all the mammals except *Crocidura* sp., *M. foxi* and *T. valida*. *Capillaria narvi* occurred in *Crocidura* and *A. niloticus*; while *Trichuris muris* occurred in some mammals (Table I).

Endoparasitic infections occurred in male and female mammals with similar frequency. Age prevalence variation was not considered. Two trematodes *Schitosomatium* and *Lyperosomum* sp. were recovered from the liver and mesenteries of the intestine of *Crocidura* sp. and *Lophuromys*.

Table 4: Prevalence of endoparasites and ectoparasites of wild animals.

Specific Host	No. of Hosts Collected	No. of Hosts Infected	
		Ectoparasites	Endoparasites
Crocidura sp.	62	44 (70.9)	51 (79.6)
Mus minutoides	15	6 (40.0)	5 (33.3)
Mastomis natalensis	5	19 (20.0)	5 (100.0)
Lophuromys sp.	15	10 (66.6)	7 (46.6)
Uranomys frosi	3	1 (33.3)	2 (66.6)
Tatera valida	2	2 (100.0)	2 (100.0)
Stochonmys longicaudatus	1	0 (0.0)	1 (100.0)
Lemniscomys striatus	1	1 (100.0)	1 (100.0)
Total	111	70 (63.06)	75 (67.56)

Discussion

The presence of arthropod parasites on small wild mammals, rodents have been variously documented. Wild rodents constitute a reservoir of infection for ectoparasites despite environmental modifications resulting from urbanizations. Ectoparasitic infestation was relatively high in the studied population. However, the ectoparasites reflected different degrees of host specificity. According to Blackmore and Owen (1965), closely related species of rodents are infected with similar ectoparasites. *Crocidura* sp., the most prevalent mammal, had the highest arthropod and helminth parasite prevalence and abundance.

Ixodes sp. and *Rhicephalus* sp. have wide host spectrum and are capable of infesting wild rat populations. In Britain, Milnee (1949) reported that the same types of ticks are found on rodents, sheep, other mammals and birds. This non-specificity in tick will increase their ability to transmit diseases among animals. *Ixodes ricinus* feeds on rodents and infect cattle as adults. *Rhicephalus* sp. as adult infect cattle. *X. cheopis* do not exhibit rigid host specificity (Otubanjo, 2000). Its remarkable ability to leap from one host to the other could be responsible for the low recovery of the parasite on the rodents. It is an intermediate host of *Hymenolepis nana* and *H. diminuta* (Dipeolu and Ajayi, 1976).

The mites infect every species of rat as they do not have a rigid host specificity. *P. ovis* is also found on sheep. In many instances, wild rodents are capable of being infested with a similar spectgrum of mites (Blackmore and Owen, 1968). While this report recorded *L. gigantica* on *L. striatus*, Okereke (1973) observed them mainly on the same species and *A. niloticus* in Ibadan.

The presence of lice is probably related to its mode of transmission which is by direct contact, since the parasites are incapable of surviving off their host. *L. sikapus*, the house mice is commonly infested with *Polyplkax serratta* reported by Otubanjo (2000) on wild *R. rattus*. Closely related host species may be infested with the same species of louse (Blackmore and Owen, 1968). It is significant to note that *Pulex irritans* observed in the giant rat *Cricetomy gambianus* and *R. rattus* by Dipeolu and Ajayi (1976) and Otubanjo (2000) in the same ecologic zone was absent in all the rodents captured in this study.

The ecologic niche or habitat has a significant factor in arthropod parasite fauna. The occurrence of *Ixodes* sp. is probably related to the farmland and Agricultural Research Farm. Rodents will not carry *Ixodes ricinus* if there is no cattle in an area (Blackmore and Owen, 1968). According to Otubanjo (2000), rats in residential quarters had no parasitic infestation due to the absence of a source of infection and unfavourable prevailing conditions for the arthropod sustenance. This eliminates the risk of domestic transmission of diseases by ectoparasites within residential quarters.

Similar arthropod parasites recovered from rodents have been observed on man. *O. bacoti* and *X. cheopis* have been reported in man and rats as common host (Otubanjo, 2000). *O. bacoti* and *Trombicula* mites of rats, parasitizing cause induced irritation on physical contact, causing dermatitis, uricarial wheels, papules and vesicles. The wild rodent population are reservoir of these arthropod parasites. This investigation affirms that despite environmental modifications, wild rodents remain an important reservoir of parasitic diseases to man and other mammals; the ectoparasites being transmitters of these diseases.

The wide host specificity of certain ectoparasites increases the spectrum of host for disease transmission. The occurrence of skin lesions could be related to the lice infestations. *O. bacoti* causes clinical skin lesions. *P. ovis* causes skin inflammation and is known to infect sheep and cattle.

Apparently many of the ectoparasites found amongst the rats are transmitters of parasitic diseases of veterinary and public health importance. *P. serratta*, a typical rodent lice is known to transmit tularaemia, murine typhus and other microbial systematic diseases (Blackmore and Owen, 1978). *X. cheopis* and *O. bacoti* transmits bulbonic plagues caused by the microorganism *Pasteuella pestis*. Plague is transmitted by the rat fleas (Happold, 1987).

The helminths varied amongst the mammals. The nature of the diet is integral in the nature of worm infection. The prevalence of helminth is multifactorial. The helminth parasitic infection and burden is similar to some degree with those of *R. rattus.*

The varied type of helminth in *Crocidura* sp. is probably related to its insectivorous feeding habit and its wide range of susceptibility to gastrointestinal helminths. *Crocidura* sp. is host specific to *Hymenolepis maucledi* and *Pseudohymenolepis* sp. Huninem (1958) suggested that auto-infection may be responsible for the large index of abundance of *Hymenolepis* sp. in *Crocidura* sp.

Many of these mammals act as reservoir hosts for human infections.(Webster, 1994; Webster, Elis and McDonald, 1995). Cowper (1968) suggested that *Trichuris* sp. is spread amongst humans by rats. These rodents are reservoir hosts for *Hymenolepsis* sp., *Schistosomatium douthitti* and *Lyperosomum* sp. although they were limited to a single rodent host. Defaecation by man in the forest or streams as is the usual rural practice will enhance rodent man transmission of the helminth parasites.

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