Ectoparasites of squirrels of the genus *Sciurus* from Indiana

J. O. WHITAKER, JR. and E. J. SPICKA
Department of Life Sciences
Indiana State University, Terre Haute, Indiana 47809
and
L. L. SCHMELTZ
Rt. 1, Bloomingdale, Indiana 47837

Abstract

The ectoparasites of *Sciurus niger* and *S. carolinensis* from Indiana were studied using visual observation and a potassium hydroxide hair-dissolving technique. Sucking lice were most abundant with three species found on each species of squirrel; *Enderleinellus longiceps, Neohaematopinus sciurinus* and *Hoplopleura sciuricola* on *S. niger* and *E. longiceps, N. sciuri* and *H. sciuricola* on *S. carolinensis. Hoplopleura sciuricola* is reported from gray squirrels for the first time. One flea, *Orchopeas howardi,* was predominant on both species of squirrel. Three species of ticks, *Amblyomma americanum, Dermacentor variabilis* and *Ixodes marxi,* were found on both species of squirrel, with *I. marxi* being reported from *S. niger* for the first time. About eight species of chiggers were found, none in great numbers. *Trombicula fitchi* and *Walchia americana* were most abundant. A hypopial mite, *Echimyopus nyctomys,* is reported from Sciuridae in the United States for the first time. Warble larvae, *Cuterebra* sp., were found in small numbers on both species of squirrels.

Introduction

There are relatively few records of ectoparasites of squirrels of the genus *Sciurus* from Indiana. Wilson (10) accumulated much information on ticks, sucking lice and fleas resulting from examination of 194 collections from gray squirrels and their nests, and from 47 fox squirrels. Other than this there are only scattered records. The purpose of this paper is to present information on ectoparasites and other associates found in the fur of the Fox Squirrel, *Sciurus niger,* and the Gray Squirrel, *S. carolinensis,* from Indiana.

Materials and Methods

Squirrels for this study were collected from several counties in Indiana, including a number from Vigo, Clay, Parke, Jackson and Martin counties. Many were collected during squirrel season (August through October) although a number were collected as roadkills.

Two main methods were used in collecting ectoparasites. Actual counts were made, except when large numbers of some species were present, then estimates were made. The fur of many of the squirrels was examined visually with the aid of a 10 to 70 power zoom dissecting microscope. All parts of the body were examined by lifting the hairs with dissecting needles. Special effort was made to find parasites on the rump, nape, around the bases of the legs, on the top of the head and around the ears. The second method was by dissolving the fur in potassium hydroxide as follows (see 3): The complete skin of each squirrel was placed in individual containers with about 500 ml of 5 percent KOH. After 24 hours all remaining fur was scraped from the

skin with a metal spatula. The KOH and dissolved fur was heated 1 to 4 hours on a hot plate at about 95°C under a hood. The mixture was allowed to settle overnight. Excess KOH was decanted and the remaining mixture of KOH, dissolved fur and ectoparasites was centrifuged for 5 minutes at about 1200 rpm. Again excess KOH was decanted and zinc sulfate solution was added to almost fill the centrifuge tubes. The tubes were agitated until the pellet at the bottom was completely broken up, and again centrifuged. The solution and parasites were decanted into petri dishes which were then examined with the dissecting microscope.

Fresh squirrels were examined visually after interfollicular mites were discovered by dissolving the fur. Hairs on the tail and around the anus were pulled and their follicles squeezed with microforceps.

During the early part of the study, all individuals were examined by visual observation; later all squirrels were dissolved, thus we have some comparison between the two methods.

Results and Discussion

Sucking lice were the most abundant forms found (Table 1), with three species on *Sciurus niger*, *Enderleinellus longiceps*, *Neohaematopinus sciurinus*, and *Hoplopleura sciuricola*, and three species on *S. carolinensis*, *E. longiceps*, *N. sciuri* and *H. sciuricola*, listed in order of decreasing abundance. Thus one species of *Enderleinellus* and one of *Hoplopleura* is found on both species of squirrels while different species of *Neohaematopinus* are found on the two. Wilson (10) found 1028 individuals of *N. sciuri* and 135 of *E. longiceps* on gray squirrels and 83 individuals of *E. longiceps*, 35 of *N. sciurinus* and 19 of *H. sciuricola* on *S. niger*. Thus the three species of lice on *S. niger* are in the same order of decreasing abundance on *S. niger* as indicated by both studies. But, on gray squirrels, the order of *E. longiceps* and *N. sciuri* is switched and *H. sciuricola* is added.

Essentially one flea, *Orchopeas howardi*, was found on both species of squirrels, however, one specimen of *O. leucopus*, likely accidental, was found on *S. niger*. Wilson (10) reported 1032 individuals of *O. howardi* on *S. carolinensis* and 108 on *S. niger*, as the only important flea of both species. In addition he found one individual of *Ctenocephalides felis*, and one of *Conorhinopsylla stanfordi* on *S. carolinensis* and one of *O. leucopus* on *S. niger*. Whitaker and Corthum (8) reported *O. howardi* from *S. niger* from Vigo County, but those data are incorporated in this paper.

Three species of ticks were found on both gray and fox squirrels, *Amblyomma americanum*, *Dermacentor variabilis* and *Ixodes marxi*. Wilson (10) found 17 individuals of *I. marxi* on *Sciurus carolinensis* and 22 individuals of *D. variabilis* on *S. niger*, but no individuals of *A. americanum* on either. It will be noted that a rather large number of individuals of *Amblyomma* were reported during the present study. However, all of those from *S. niger* are from squirrels from The Crane Naval Depot, in Martin County, while those from the Gray Squirrel were all from German Ridge, Perry County. Wilson (10) summarizes

the literature on this species, and found that it is primarily southeastern in the United States, occurring north sparingly to include only the southern tips of Indiana, Illinois and Ohio. Wilson (10) found it three times during his studies, on the wood thrush, man and the dog, from Brown, Tippecanoe and Harrison counties, respectively. However, the first two records could have entered the state via the host, while the latter appears to be native to Indiana. Wilson (10) expressed the opinion that *A. americanum* is a permanent, but rare resident in the southernmost counties of Indiana. That this species is apparently found mostly on *Sciurus* in southern Indiana, but is absent on squirrels we have taken over most of the rest of the state, seems to support Wilson's opinion.

About eight species of chiggers were taken, none of them in large numbers. Only *Trombicula fitchi* and *Walchia americana* occurred with any degree of regularity. However, except for *Eutrombicula alfreddugesi* and *Neotrombicula whartoni*, none of the chiggers had been previously reported from Indiana. Chiggers obtained using the hair dissolving technique were mostly in poor shape with 40 specimens being unidentifiable.

Other than chiggers, the only abundant mite on both species of squirrels was *Echimyopus nyctomys* which was taken using the dissolving technique. Fain (2) described *E. nyctomys* from hair follicles of the venter and dorsum of Sumichrast's Vesper Rat, *Nyctomys sumichrasti* (Cricetidae), from Guatemala. Our specimens may represent a new subspecies (A. Fain, pers. comm.). Individuals of *E. nyctomys* taken by hair dissolving were mascerated and not suitable for identification. Once their presence was known, a series of mites was taken from both species of squirrels by pulling hairs and squeezing hair follicles of the tail and around the anus. *Haemogamasus reidi* and *Androlaelaps casalis* are species commonly found on squirrels of the genus *Sciurus*, while *A. fahrenholzi* is one of the least host specific North American mites (9). Other mites reported on *S. carolinensis* in North America previously, but not during the present study are *Cheyletus eruditus* (1), and perhaps *Haemogamasus ambulans* (5, 6, 7, but see 9, p. 2), and *Laelaps nuttalli* (11). The only mite previously reported from *S. niger* but not taken during this study was *Eulaelaps stabularis*, taken by Morlan (4).

Two warble larvae, *Cuterebra* sp., were found in the abdominal area of one Fox Squirrel and one in the dorsum of the neck in a Gray Squirrel.

Because of the poor condition of specimens obtained, dissolving is recommended only for determining the presence of skin and hair-follicle mites. Visual searches should then be made of additional hosts to obtain identifiable specimens. In addition, hair dissolving is time consuming and KOH fumes can cause respiratory problems. Another problem with dissolving is that many specimens are lost due to chunks of sediment being caught between setae or legs thus keeping them from floating in the zinc sulfate solution.

TABLE 1. *Ectoparasites of 137 fox squirrels,* Sciurus niger, *and 47 gray squirrels,* S. carolinensis, *examined by observation of fur and by dissolving the fur in KOH. Values are given as percent of hosts infested and average number of parasites per host. Numbers of hosts, hosts infested and number of parasites are in parentheses.*

	Fox squirrels				Gray squirrels			
	Visual (104)		Dissolving (33)		Visual (24)		Dissolving (23)	
	% with par.	Av. # par./host	% with par.	Av. # par./host	% with par.	Av. # par./host	% with par.	Av. # par./host
Anoplura (Sucking lice)								
Enderleinellus longiceps	45.2 (47)	14.25 (1482)	57.6 (19)	33.21 (1096)	63.5 (15)	18.17 (436)	69.6 (16)	25.30 (582)
Neohaematopinus sciurinus	28.9 (30)	7.95 (827)	60.6 (20)	11.67 (385)	—	—	—	—
Hoplopleura sciuricola	20.2 (21)	4.7 (489)	12.1 (4)	0.39 (13)	4.2 (1)	0.04 (1)	13.0 (3)	1.57 (36)
Neohaematopinus sciuri	—	—	—	—	62.5 (15)	24.63 (591)	60.9 (14)	16.39 (377)
Siphonaptera (Fleas)								
Orchopeas howardi	38.5 (40)	1.77 (184)	21.2 (7)	0.42 (14)	54.2 (13)	0.92 (22)	52.2 (12)	1.30 (30)
Orchopeas leucopus	1.0 (1)	0.02 (2)	—	—	—	—	—	—
Ixodidae (Ticks, Acari)								
Amblyomma americanum	6.7 (7)	0.44 (46)	—	—	12.5 (3)	2.38 (57)	—	—
Dermacentor variabilis	8.7 (9)	0.14 (15)	—	—	16.7 (4)	0.33 (8)	4.4 (1)	0.04 (1)
Ixodes marxi	—	—	15.2 (5)	0.46 (15)	8.3 (2)	0.17 (4)	13.0 (3)	0.13 (3)

Trombiculidae (Chiggers, Acari)								
Trombicula fitchi	6.7	0.31	24.2	0.46	4.2	0.17	30.4	0.39
	(7)	(32)	(8)	(15)	(1)	(4)	(7)	(9)
Walchia americana	4.8	0.19	9.1	1.36	8.3	0.17	17.4	0.39
	(5)	(20)	(3)	(45)	(2)	(4)	(4)	(9)
Neotrombicula sylvilagi	1.0	0.05	—	—	—	—	—	—
	(1)	(5)						
Miyatrombicula cynos	1.9	0.02	—	—	—	—	—	—
	(2)	(2)						
Neotrombicula whartoni	—	—	27.3	2.06	—	—	13.0	0.44
			(9)	(68)			(3)	(10)
Eutrombicula alfreddugesi	—	—	9.1	0.12	4.2	0.04	13.0	0.13
			(3)	(4)	(1)	(1)	(3)	(3)
Leptotrombidium sp.	—	—	6.1	0.12	—	—	13.0	0.61
			(2)	(4)			(3)	(14)
Microtrombicula trisetica	—	—	—	—	4.2	0.04	—	—
					(1)	(1)		
Other mites (Acari)								
Haemogamasus reidi	4.8	0.11	6.1	0.24	8.3	0.42	26.1	1.04
	(5)	(11)	(2)	(8)	(2)	(10)	(6)	(24)
Androlaelaps casalis	3.9	0.09	12.1	1.42	8.3	0.67	17.4	1.91
	(4)	(9)	(4)	(47)	(2)	(16)	(4)	(44)
Androlaelaps fahrenholzi	1.9	0.04	6.1	0.09	4.2	0.04	4.4	0.04
	(2)	(4)	(2)	(3)	(1)	(1)	(1)	(1)
Dermacarus sp.	1.0	0.02	—	—	—	—	—	—
	(1)	(2)						
Echimyopus nyctomys	—	—	33.3	10.36	—	—	21.7	2.22
			(11)	(342)			(5)	(51)
Macrocheles sp.	—	—	—	—	—	—	4.4	0.04
							(1)	(1)
Diptera								
Cuterebra sp.	1.0	0.02	—	—	—	—	4.4	0.04
	(1)	(2)					(1)	(1)

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