

ADDITIONS TO THE LIST OF ECTOPARASITES OF THE MAMMALS OF INDIANA

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ABSTRACT: A total of 207 species of ectoparasites was reported in *Ectoparasites of Indiana* and in *Mammals of Indiana*, both published in 1982. The present paper summarizes information on the 36 species of mammalian ectoparasites, all mites, found since those works. Eighteen of the species are new to science. Eleven species, all new, are species of *Schizocarpus* from beavers, and eight are from Smoky and Pigmy shrews. These hosts are known from Indiana only since 1981. Six are species of the genus *Macrocheles* found during a study on that genus as it occurs on mammals of North America. The remainder are from miscellaneous hosts and mite families.

Whitaker (1982) summarized information on ectoparasites and other associates of the fur of mammals of Indiana. That work included 207 species, 140 of them not previously taken in Indiana and 29 of them new to science. The same information was published under the various host species' accounts in *Mammals of Indiana* (Mumford and Whitaker, 1982).

Since 1982, 36 additional species of ectoparasites have been found; all of them mites and 18 new to science (Table 1). The new records have all been published elsewhere. The purpose of this paper is to update both *Ectoparasites of Mammals of Indiana* and *Mammals of Indiana*.

Eight of the new records are from two species of shrews, the smoky shrew, *Sorex fumeus*, and the pygmy shrew, *S. hoyi*. These two species had just been found in Indiana when Mumford and Whitaker (1982) and Whitaker (1982) were published. Their ectoparasites have been studied since that time (Whitaker and Cudmore, 1987). In 1982, only one species of beaver mite, *Schizocarpus mingaudi*, was known from North America. Additional collections of beaver mites, *Schizocarpus*, since that time have turned up 11 new species (Fain and Whitaker, 1988; Fain, *et al.*, 1984; Whitaker, *et al.*, 1989; Whitaker and Smith, 1985). Six of the records are from studies on the genus *Macrocheles* of North American mammals (Krantz and Whitaker, 1988).

Additional notes are given below for these and other new records under their respective families.

Ameroseiidae. Elsen and Whitaker (1985) described a new genus, *Sertitympanum*, with three North American species, including *S. separationis* phoretic on *Spermophilus tridecemlineatus* from Indiana.

Cheyletidae. *Cheyletus malaccensis* was found on the wood rat, *Neotoma floridana*, by Cudmore (1986).

Chirodiscidae. Eleven new species, all *Schizocarpus*, from the beaver, *Castor canadensis*, have been found in Indiana. Originally, all beaver mites were thought to comprise one species, *S. mingaudi*. However, Dubinina (1964) discovered that mites of the Eurasian beaver, *Castor castor*, included 10 new species, besides *S. mingaudi*. We

thus initiated a study of beaver mites from Indiana and found eleven new species in addition to *S. mingaudi* (Table 1). *Schizocarpus mingaudi* occurs in Eurasia and North America, but otherwise all Eurasian species are entirely separate from all North American species. The North American species fall into four groups (Table 1), the *mingaudi* group of the head and anterior dorsum of the beaver, the *indianensis* group of the posterior dorsum, the *virgulatus* group of the venter, and the *spinifer* group (1 species, *S. spinifer*), which is very different from the other groups. *Schizocarpus spinifer* is rather uncommon and may be found on all parts of the beaver. Evolution of several species restricted to one host is highly unusual and has been termed multispeciation. Several species may be found on any one individual beaver. Species differences are based on the male sucker plates; immature females attach to the males by their own sucker plates. Adult females and immature males lack sucker plates and are similar to one another morphologically. It was originally believed that the species evolved in response to different habitats in the fur of different parts of the beaver, but we now believe that the sucker plates are of significance in species recognition, allowing the mites to link sucker plates with their own rather than another species. There is a key to the North American species of *Schizocarpus* in Whitaker, *et al.* (1989).

Glycyphagidae. Two additional species are included in the Glycyphagidae. *Glycyphagus zapus* is a new species very close to *G. newyorkensis*. It was described and its life history worked out by Fain, *et al.* (1985). *Xenoryctes nudus* was found on *Sorex longirostris* by French (1982) and also on *Sorex fumeus* (Whitaker and Cudmore, 1987).

Laelapidae. *Hypoaspis miles* is the only new laelapid. It was found on *Sorex longirostris* by French (1982).

Listrophoridae. *Prolistrophorus grassii* was the only new listrophorid reported since 1982. It was reported from *Synaptomys cooperi* from Indiana by Fain and Lukoschus (1984).

Macrochelidae. Krantz and Whitaker (1988) studied the macrochelid mites of the mammals of North America and reported six species from mammals from Indiana, including one species described as new, *Macrocheles mesochthonius*. Species of *Macrocheles* are apparently phoretic on their mammal hosts. A key to the species of *Macrocheles* occurring in North America is presented by Krantz and Whitaker (1988).

Myobiidae. Six species of myobiids are included here that were not included in *Ectoparasites of Mammals of Indiana*. Three of them, *Acanthophthirus nycticeius*, *Protomyobia blarinae*, and *P. indianensis* were described as new partly on the basis of Indiana material (Fain and Whitaker, 1986; Lukoschus, *et al.*, 1988; Fain, *et al.*, 1982). Two, *Pteracarus minutus occidentalis* and *Radfordia lemnina* (Dusbabek, 1973; Wassel, *et al.*, 1978) should have been included by Whitaker (1982) but were overlooked. *Protomyobia brevisetosa* is a common parasite of *Sorex fumeus* and is now included as a result of that host being found as a resident of Indiana (Whitaker and Cudmore, 1986).

Pygmephoridae. Three additional species of *Pygmephorus* were found in Indiana, *P. lutterloughae* on *Sorex fumeus*, *P. proctorae* on *Sorex hoyi* (Whitaker and Cudmore, 1987), and *P. spickai* on *Neotoma floridana* (Cudmore, 1986). A key to the North American pygmephorids can be found in Smiley and Whitaker (1984).

Trombiculidae. Four additional species of chiggers are included, all from the two new species of shrews found in Indiana, *Sorex fumeus* and *S. hoyi* (Whitaker and Cudmore, 1987). One, *Euschoengastia whitakeri*, was described as a new species by Wrenn (1984).

Thirty-six species are included here, bringing to 243 the number of ectoparasites

and other associates known from Indiana mammals. Eighteen of these were described as new, bringing the number new to science from Indiana to 47, all of them mites.

ERRATA

Some corrections should be inserted in the original keys of Whitaker (1982) as follows:

p. 89. Line 9 should read *Echimyopus nyctomys*, not *E. orphanus*.

p. 64. a) The second half of the first couplet in the key should indicate couplet 7 rather than 6.

b) Substitute the following new couplet for couplet 6:

6. Epigynial plate drop-shaped (widened posteriorly).....Laelapidae
Epigynial plate "V" or "U" shaped, not widened posteriorly.....
.....Macronyssidae

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Table 1. Species of mammalian ectoparasites reported from Indiana since the publication of *Ectoparasites of Mammals of Indiana* (Whitaker, 1982). Species described as new to science are designated with an asterisk (*). All species are mites (Acarina).

Species	Host	Reference
Ameroseiidae		
* <i>Sertitympanum separationis</i> Elsen and Whitaker, 1985	<i>Spermophilus</i> <i>tridecemlineatus</i>	Elsen and Whitaker, 1985
Cheyletidae		
<i>Cheyletus malaccensis</i> Oudemans, 1903	<i>Neotoma floridana</i>	Cudmore, 1986
Chirodiscidae		
<i>mingaudi</i> group		
* <i>Schizocarpus paramingaudi</i> Fain and Whitaker, 1988	<i>Castor canadensis</i>	Fain and Whitaker, 1988
<i>indianensis</i> group		
* <i>S. indianensis</i> Fain, Whitaker, and Smith 1984	<i>Castor canadensis</i>	Fain, <i>et al.</i> , 1984
* <i>S. tetrapilus</i> Fain, Whitaker, and Smith, 1984	<i>Castor canadensis</i>	Fain and Whitaker, 1988; Fain, <i>et al.</i> , 1984
* <i>S. postannulatus</i> Fain and Whitaker, 1988	<i>Castor canadensis</i>	Fain and Whitaker, 1988
* <i>S. contrarius</i> Fain and Whitaker, 1988	<i>Castor canadensis</i>	Fain and Whitaker, 1988
<i>virgulatus</i> group		
* <i>S. virgulatus</i> Fain, <i>et al.</i> , 1984	<i>Castor canadensis</i>	Fain, <i>et al.</i> , 1984

* <i>S. subvirgulatus</i> Fain, <i>et al.</i> , 1984	<i>Castor canadensis</i>	Fain and Whitaker, 1988; Fain, <i>et al.</i> , 1984
* <i>S. furcatus</i> Fain, <i>et al.</i> , 1984	<i>Castor canadensis</i>	Fain, <i>et al.</i> , 1984
* <i>S. inversus</i> Fain, <i>et al.</i> , 1984	<i>Castor canadensis</i>	Fain, <i>et al.</i> , 1984
* <i>S. posticus</i> Fain and Whitaker, 1988	<i>Castor canadensis</i>	Fain and Whitaker, 1988
<i>spinifer</i> group		
* <i>S. spinifer</i> Fain, <i>et al.</i> , 1984	<i>Castor canadensis</i>	Fain, <i>et al.</i> , 1984
Glycyphagidae		
* <i>Glycyphagus zapus</i> Fain, <i>et al.</i> , 1985	<i>Zapus hudsonius</i>	Fain, <i>et al.</i> , 1985
<i>Xenoryctes nudus</i> Fain and Whitaker, 1975	<i>Sorex hoyi</i>	Whitaker and Cudmore, 1987
	<i>Sorex fumeus</i>	Whitaker and Cudmore, 1987
	<i>Sorex longirostris</i>	French, 1982
Laelapidae		
<i>Hypoaspis miles</i> (Berlese, 1892)	<i>Sorex longirostris</i>	French, 1982
Listrophoridae		
<i>Prolistophorus grassii</i> (Radford, 1954)	<i>Synaptomys cooperi</i>	Fain and Lukoschus, 1984
Macrochelidae		
<i>Macrocheles insignatus</i> Berlese, 1918	<i>Peromyscus maniculatus</i>	Krantz and Whitaker, 1988
<i>M. mammifer</i> Berlese, 1918	<i>Rattus norvegicus</i>	Krantz and Whitaker, 1988; Whitaker, 1977

<i>M. merdarius</i> (Berlese, 1889)	<i>Rattus norvegicus</i>	Krantz and Whitaker 1988; Whitaker, 1977
* <i>M. mesochthonius</i> Krantz and Whitaker, 1988	<i>Didelphis virginiana</i>	Krantz and Whitaker, 1988
	<i>Rattus norvegicus</i>	Krantz and Whitaker, 1988
	<i>Marmota monax</i>	Krantz and Whitaker, 1988
	<i>Spermophilus franklinii</i>	Krantz and Whitaker, 1988
	<i>Spermophilus tridecem- lineatus</i>	Krantz and Whitaker, 1988
	<i>Zapus hudsonius</i>	Krantz and Whitaker, 1988
<i>M. muscaedomesticae</i> (Scopoli, 1772)	<i>Sciurus carolinensis</i>	Krantz and Whitaker, 1988
<i>M. rodriguezi</i> Oliver and Krantz, 1963	<i>Rattus norvegicus</i>	Krantz and Whitaker, 1988
Myobiidae		
* <i>Acanthopthirus nycticeius</i> Fain and Whitaker, 1987	<i>Nycticeius humeralis</i>	Fain and Whitaker, 1987
* <i>Protomyobia blarinae</i> Lukoschus, <i>et al.</i> , 1988	<i>Blarina brevicauda</i>	Lukoschus, <i>et al.</i> , 1988
<i>P. brevisetosa</i> Jameson, 1948	<i>Sorex fumeus</i>	Whitaker and Cudmore, 1987
* <i>P. indianensis</i>	<i>Sorex longirostris</i>	Fain, <i>et al.</i> , 1982; French, 1982

<i>P. minutus occidentalis</i> Dusbabek and Wilson, 1973	<i>Pipistrellus</i> <i>subflavus</i>	Dusbabek, 1973
<i>Radfordia lemnina</i> (Koch, 1841)	<i>Synaptomys</i> <i>cooperi</i>	Wassel, <i>et</i> <i>al.</i> , 1978
Pygemephoridae		
<i>Pygmephorus lutterloughae</i> Smiley and Whitaker, 1979	<i>Sorex fumeus</i>	Whitaker and Cudmore, 1987
<i>P. proctorae</i> Smiley and Whitaker, 1984	<i>Sorex hoyi</i>	Whitaker and Cudmore, 1987
<i>P. spickai</i> Mahunka, 1974	<i>Neotoma</i> <i>floridana</i>	Cudmore, 1986
Trombiculidae		
<i>Comatacarus americanus</i> (Ewing, 1942)	<i>Sorex hoyi</i>	Whitaker and Cudmore, 1987
* <i>Euschoengastia whitakeri</i> Wrenn, 1984	<i>Sorex fumeus</i>	Wrenn, 1984
<i>Euschoengastia jamesoni</i> (Brennan, 1984)	<i>Sorex fumeus</i>	Whitaker and Cudmore, 1987
	<i>Sorex hoyi</i>	Whitaker and Cudmore, 1987
<i>Neotrombicula cavicola</i> Ewing, 1931	<i>Sorex fumeus</i>	Whitaker and Cudmore, 1987
