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 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, Acanthophthirius nycticetus, 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 lemmina (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 pygmeophorids 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. orphatus.
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. Epignyal plate drop-shaped (widened posteriorly)......Laelapidae
   Epignyal plate “V” or “U” shaped, not widened posteriorly...........
   .........................................................Macronyssidae

LITERATURE CITED


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).

<table>
<thead>
<tr>
<th>Species</th>
<th>Host</th>
<th>Reference</th>
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<tbody>
<tr>
<td><strong>Ameroseiidae</strong></td>
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<tr>
<td><em>Sertitympanum separationis</em></td>
<td><em>Spermophilus tridecemlineatus</em></td>
<td>Elsen and Whitaker, 1985</td>
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<td>Elsen and Whitaker, 1985</td>
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<tr>
<td><strong>Cheyletidae</strong></td>
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<tr>
<td>Cheyletus malaccensis</td>
<td>Neotoma floridana</td>
<td>Cudmore, 1986</td>
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<td>Oudemans, 1903</td>
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<td><strong>Chirodiscidae</strong></td>
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<td>mingaudi group</td>
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<tr>
<td><em>Schizocarpus paramingaudi</em></td>
<td><em>Castor canadensis</em></td>
<td>Fain and Whitaker, 1988</td>
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<tr>
<td>Fain and Whitaker, 1988</td>
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<tr>
<td>Indianensis group</td>
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<tr>
<td><em>S. indianensis</em> Fain,</td>
<td><em>Castor canadensis</em></td>
<td>Fain, <em>et al.</em>, 1984</td>
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<tr>
<td>Whitaker, and Smith, 1984</td>
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<tr>
<td><em>S. tetrapilus</em> Fain,</td>
<td><em>Castor canadensis</em></td>
<td>Fain and Whitaker, 1988; Fain,</td>
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<td>Whitaker, and Smith, 1984</td>
<td></td>
<td><em>et al.</em>, 1984</td>
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<tr>
<td><em>S. postannulatus</em> Fain</td>
<td><em>Castor canadensis</em></td>
<td>Fain and Whitaker, 1988</td>
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<td>and Whitaker, 1988</td>
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<tr>
<td><em>S. contrarius</em> Fain and</td>
<td><em>Castor canadensis</em></td>
<td>Fain and Whitaker, 1988</td>
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<td>Whitaker, 1988</td>
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<td>Virgulatus group</td>
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<tr>
<td>1984</td>
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</table>
*S. subvirgulatus Fain, et al., 1984

*S. furcatus Fain, et al., 1984

*S. inversus Fain, et al., 1984

*S. posticus Fain and Whitaker, 1988

spinifer group

*S. spinifer Fain, et al., 1984

Glycyphagidae

*Glycyphagus zapus Fain, et al., 1985

Xenoryctes nudus Fain and Whitaker, 1975

Zapus hudsonius

Sorex hoyi

Sorex fumeus

Sorex longirostris

Laelapidae

Hypoaspis miles (Berlese, 1892)

Sorex longirostris

Listrophoridae

Prolistrophorus grassii (Radford, 1954)

Synaptomys cooperi

Macrocheleidae

Macrocheles insignatus Berlese, 1918

Peromyscus maniculatus

M. mammifer Berlese, 1918

Rattus norvegicus

Krantz and Whitaker, 1988; Whitaker, 1977
M. merdarius (Berlese, 1889) \(\text{Rattus norvegicus}\) Krantz and Whitaker 1988; Whitaker, 1977

*M. mesochthonius* Krantz and Whitaker, 1988

\(\text{Didelphis virginiana}\) Krantz and Whitaker, 1988

Rattus norvegicus Krantz and Whitaker, 1988

*M. mesochthonius* Krantz and Whitaker, 1988

\(\text{Didelphis virginiana}\) Krantz and Whitaker, 1988

\(\text{Rattus norvegicus}\) Krantz and Whitaker, 1988

*M. mesochthonius* Krantz and Whitaker, 1988

\(\text{Marmota monax}\) Krantz and Whitaker, 1988

*Spermophilus franklinii* Krantz and Whitaker, 1988

*Spermophilus tridecemlineatus* Krantz and Whitaker, 1988

*Spermophilus tridecemlineatus* Krantz and Whitaker, 1988

\(\text{Zapus hudsonius}\) Krantz and Whitaker, 1988

\(\text{M. muscaedomesticae}\) (Scopoli, 1772) \(\text{Sciurus carolinensis}\) Krantz and Whitaker, 1988

\(\text{M. rodriguezi}\) Oliver and Krantz, 1963 \(\text{Rattus norvegicus}\) Krantz and Whitaker, 1988

Myobiidae

*Acanthophthirius nycticeius* Fain and Whitaker, 1987

\(\text{Nycticeius humeralis}\) Fain and Whitaker, 1987

*Protomyobia blarinae* Lukoschus, et al., 1988

\(\text{Blarina brevicauda}\) Lukoschus, et al., 1988

P. brevisetosa Jameson, 1948

\(\text{Sorex fumeus}\) Whitaker and Cudmore, 1987

*P. indianaensis*

\(\text{Sorex longirostris}\) Fain, et al., 1982; French, 1982
<table>
<thead>
<tr>
<th>Small Mammals</th>
<th>Bats</th>
<th>Frogs</th>
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<tr>
<td><em>P. minutus occidentalis</em></td>
<td><em>Pipistrellus subflavus</em></td>
<td>Dusbabek, 1973</td>
</tr>
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<td>(Koch, 1841)</td>
<td><em>Synaptomys cooperi</em></td>
<td>Wassel, <em>et al.</em>, 1978</td>
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<td><em>Radfordia lemnina</em></td>
<td><em>Pipistrellus subflavus</em></td>
<td>Dusbabek, 1973</td>
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<td><em>Pygmephorus lutterloughae</em></td>
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<td>Whitaker and Cudmore, 1987</td>
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<td>Smiley and Whitaker, 1979</td>
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<tr>
<td><em>P. proctorae</em></td>
<td><em>Sorex hoyi</em></td>
<td>Whitaker and Cudmore, 1987</td>
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<td>Smiley and Whitaker, 1984</td>
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<td><em>P. spickai</em></td>
<td><em>Neotoma floridana</em></td>
<td>Whitaker and Cudmore, 1987</td>
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<td>Mahunka, 1974</td>
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**Pygmephoridae**

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<tr>
<td><em>Comatacarus americanus</em></td>
<td><em>Sorex fumeus</em></td>
<td>Whitaker and Cudmore, 1987</td>
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<td>(Ewing, 1942)</td>
<td></td>
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<tr>
<td><em>Euschoengastia whitakeri</em></td>
<td><em>Sorex fumeus</em></td>
<td>Wrenn, 1984</td>
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<td>Wrenn, 1984</td>
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<tr>
<td><em>Euschoengastia jamesoni</em></td>
<td><em>Sorex fumeus</em></td>
<td>Whitaker and Cudmore, 1987</td>
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<td>(Brennan, 1984)</td>
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<td></td>
<td><em>Sorex hoyi</em></td>
<td>Whitaker and Cudmore, 1987</td>
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**Trombiculidae**

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<td><em>Neotrombicula cavicola</em></td>
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<td>Whitaker and Cudmore, 1987</td>
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<td>Ewing, 1931</td>
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