

Scientific Note

An annotated checklist of fur mites (Trombidiformes: Myobiidae) housed at the Acarological Collection of the Butantan Institute

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Abstract. The fur mites (Trombidiformes: Myobiidae) are true parasites of mammals, especially bats, rodents, and marsupials. In the present study, we examined the fur mites housed at the Acarological Collection of the Butantan Institute (IBSP), Brazil, and providing an annotated checklist of the mites examined, including type species data, new host associations and new locality records.

Keywords: ectoparasites, mammals, mites, IBSP.

The Acarological Collection of Butantan Institute (IBSP), São Paulo State, Brazil, is one of the most significant representative collections of mites of medical and medical-veterinary importance for Latin America (Arzua et al. 2005). This collection was initiated in 1931 by the parasitologist Flavio da Fonseca and nowadays has more than 18,000 materials, with specimens of all mite orders. Among them, the family Myobiidae Mégnin, 1878, known as fur mites, is an important group of parasites of mammals, especially bats, rodents, and marsupials, and has a worldwide distribution, comprising 53 genera and more than 600 valid species (Bochkov et al. 2016).

The fur mites are monoxenous (one host of preference) or stenoxenous (preference for hosts within the same genus) (Dusbábek 2002; Colín-Martínez et al. 2018). To attach to the host's hairs, the first pair of legs has an adaptation into a hook shape, also known as an attachment apparatus. In some genera, two or three apical segments of the first pair of legs are fused, improving the effectiveness of this 'hook.' As well as, all the family have small stylus-shaped chelicerae and simple small palpi (Bochkov & Fain 2003). Here, we present an annotated checklist of fur mites housed in the IBSP collection, including the report of two type species, new host-association and locality records.

We examined 54 mites deposited at IBSP, preserved in 26 slides mounted with Hoyer's medium. For confirmation and identification of specimens, we initially used the myobiid genus key of Bochkov (2009). Besides, we compared the species examined with the original descriptions of the list of Eleutherengone species provided in appendix 3 by Bochkov (2009).

The information that contains the Zoological Collections is an important source of research. So, an easy way to know about some collection is summarize the information in a species list, especially when there are new locality or host-association records to be provided. After the slide examination, part of the slides came from England, that were donated in the 40' by the acarologist Charles D. Radford from the Natural History Museum, United Kingdom (NHMUK), formerly British Museum [Natural History] (BMNH) to Flavio da Fonseca, of the Instituto Butantan, Brazil. This England material includes paratypes for the species *Neomyobia magna* (Radford, 1934) and *Crocidurobia*

blairi (Radford, 1936), as well as, material for other species collected parasitizing mammals' orders Soricomorpha, Rodentia, and Chiroptera.

Regarding to the other part of material, the Brazilian material, the species housed at the IBSP collection were collected parasitizing mammals of the orders Didelphimorphia, Chiroptera, and Rodentia. It is relevant to report that murine rodents introduced in Brazil maintain the same associations with myobiid mites of the genus *Radfordia*, even outside their natural environment. The genus *Archemyobia* occurs in the neotropics and are associated with South American marsupials (Bochkov 2009). We confirm this in our examination three species were identified associated with Brazilian marsupials, confirming the pattern of association of this genus with these hosts. In the same way, we observed the same pattern reported by Bochkov (2009) to the *Ewingana* parasitizing bats of the family Molossidae.

We provided checklist in the following format: the number of specimens, life stage, access number at IBSP, host, locality, coordinates, and collection date. The host species were updated based on the IUCN (2022) and Wilson & Reeder (2005). The genera and species are arranged alphabetically.

After examining the material at the IBSP, we found eleven myobiid species from nine genera: *Amorphacarus* Ewing, 1938; *Archemyobia* Jameson, 1955; *Binuncus* Radford, 1954; *Crocidurobia* Jameson, 1970; *Eadiea* Jameson, 1949; *Ewingana* Radford, 1948; *Myobia* Heyden, 1826; *Neomyobia* Radford, 1948; and *Radfordia* Ewing, 1938. These samples comprise types and material from England and Brazil, as follow:

Myobiidae Mégnin, 1878

Amorphacarus Ewing, 1938

Amorphacarus elongata (Poppe, 1896), Fig. 1A

This species is associated with insectivorous mammals of the family Soricidae and was described initially parasitizing *Sorex araneus* Linnaeus, 1758 (Soricomorpha: Soricidae) from Europe (Poppe 1896). It is also recorded on *Sorex cinereus* Kerr, 1792 from EUA (Ewing 1938), and on *Sorex veraecrucis* Jackson, 1925, *Sorex saussurei* Merriam, 1892 from Mexico (Basurto-R. 1973; Vargas et al. 2009), and *Sorex unguiculatus* Dobson, 1890, *Sorex caecutiens* Laxmann, 1788 (Ono 1986) from Japão. Here, we provided a new record of *A. elongata* to

England on the same type-host, *S. araneus*.

Material examined. 1♀, 1 protonymph, 1 deutonymph and 1 larva, preserved in one slide (IBSP 1341); ex. *Sorex araneus* (Soricomorpha: Soricidae); Skirwith, Cumberland, England, (54° 42' 55" N; 2° 36' 27" W), 22-IV-1935.

Archemyobia Jameson, 1955

Archemyobia (Nearchemyobia) brasiliensis (Jameson & Lukoschus, 1969), Fig. 1B

This species was recorded parasitizing *Monodelphis iheringi* (Thomas, 1888) (Didelphimorphia: Didelphidae), in Porto Real (Rio de Janeiro), Brazil (Jameson & Lukoschus 1969). In this catalog, we are recording the parasitism in a new host, *Gracilinanus agilis* (Burmeister, 1854) (Didelphimorphia: Didelphidae), and a new locality record - Mossoró, Rio Grande do Norte, Brazil.

Material examined. 2♀, 1 protonymph, and 1 deutonymph (IBSP 12103); ex. *Gracilinanus agilis* (Burmeister, 1854) (Didelphimorphia: Didelphidae); Mossoró, Rio Grande do Norte, Brazil, (5° 11' 16" S; 37° 20' 38" W); 25-II-2015. 1 deutonymph (IBSP 12105); ex. *G. agilis*; Mossoró, Rio Grande do Norte, Brazil, (5° 11' 16" S; 37° 20' 38" W); 30-VII-2014.

Archemyobia (Nearchemyobia) latipilis Fain, Méndez & Lukoschus, 1981, Fig. 1C

In Brazil, this species was found in Manaus (Amazonas) parasitizing *Caluromys philander* (Linnaeus, 1758) (Didelphimorphia: Didelphidae) (Fain et al. 1981), and in Belo Horizonte (Minas Gerais) parasitizing *Didelphis albiventris* Lund, 1840 (Didelphimorphia: Didelphidae) (Fain et al. 1996). Besides, it was also found in Panama, parasitizing *Caluromys derbianus* (Waterhouse, 1841) (Didelphimorphia: Didelphidae) (Fain et al. 1981). In this checklist, we recorded a new locality record for this species in the city of São Roque (São Paulo).

Material examined. 8♀, 2♂, and 2 protonymphs preserved in 2 slides (IBSP 3012); ex. opossum (Didelphimorphia: Didelphidae); Fazenda São Joaquim, São Roque, São Paulo, Brazil, (23° 31' 46" S; 47° 08' 06" W); 11-X-1954.

Archemyobia (Nearchemyobia) pectinata Méndez, 1972, Fig. 1D

This species was collected on *Philander opossum* (Linnaeus, 1758) from Santa Rita, Panama. *Archemyobia pectinata* is probably the same as its host distribution, which is found from southern Nicaragua to Panama (Méndez 1972). In this catalog, we are recording this species in Brazil associated with an unidentified Didelphidae.

Material examined. 3♀ (IBSP 3049); ex. opossum (Didelphimorphia: Didelphidae); Bebedouro, São Paulo, Brazil, (20° 56' 58" S; 48° 28' 45" W); 1955.

Binuncus Radford, 1954

Binuncus magna (Radford, 1934), Fig. 1E

According to Uchikawa (1986) the host associations reported in literature are with bats of the genus *Pteropus* Erleben, 1777 and *Dobsonia* Palmer, 1898 (Chiroptera: Pteropodidae), however the variations observed in the species recorded require future studies. In this checklist, we include the examination of the paratypes of this species that was donated by C. D. Radford (Radford 1934), the host *Pteropus giganteus* do not occurs in England and it is probably a record from a breeding or zoo.

Type material examined. PARATYPES. 13♀ and 1 deutonymph, preserved in two slides (IBSP 1445); ex. *Pteropus giganteus* (Brünnich, 1782) (Chiroptera: Pteropodidae); Manchester, England, (53° 28' 37" N; 2° 14' 34" W); 22-XI-1933.

Crocurobia Jameson, 1970

Crocurobia blairi (Radford, 1936), Fig. 1F

This species is associated with shrews of the genus *Crocurobia* Wagler, 1832 (Soricomorpha: Soricidae) that occur in England (Jameson 1970). The mites were also found parasitizing *Crocurobia suaveolens* (Pallas, 1811) in Eurasia, *Crocurobia russula* (Hermann, 1780) in Europe, *Crocurobia sibirica* Dukelsky, 1930 in Asia, and *Crocurobia horsfieldii* (Tomes, 1856) in Asia (Radford 1936; Bochkov 2009). In the IBSP

collection, we found a paratype of this species that was donated by C. D. Radford.

Type material examined. PARATYPE. 1 ♀ (IBSP 1319); ex. *Crocurobia suaveolens* (Pallas, 1811) (Soricomorpha: Soricidae); St. Mary's Island, Isles of Scilly, Cornwall, England, (49° 55' 37" N; 6° 17' 55" W); 23-V-1934.

Eadiea Jameson, 1949

Eadiea brevihamata (Haller, 1882), Fig. 1G

This species was originally described as a parasite of *Talpa europaea* Linnaeus, 1758 (Soricomorpha: Talpidae) (Haller 1882; Radford 1936). Additional materials are also recorded on *Neurotrichus gibbsii* (Baird, 1857) (Soricomorpha: Talpidae) from Plumas County, California, USA (Jameson 1949). However, this last record was revised by Lukoschus et al. (1980) and was described as a different species, *Eadiea neurotrichus* Lukoschus, Klompen & Whitaker, 1980. We confirm the identification of the material deposited in the IBSP collection and no new records are provided in this study.

Material examined. 2♀ and 1♂ preserved in 2 slides (IBSP 1438); ex. *Talpa europaea* (Soricomorpha: Talpidae) Bridgnorth, Shropshire, England, (52° 32' 10" N; 2° 25' 29" W); 20-VII-1934.

Ewingana Radford, 1948

Ewingana (Mormomyobia) longa (Ewing, 1938), Fig. 1H

This species was associated with bats of the species *Nyctinomops macrotis* (Gray, 1840) (Chiroptera: Molossidae) in Minas Gerais, Brazil, and are also found parasitizing *Tadarida brasiliensis* (L. Geoffroy, 1824) (Chiroptera: Molossidae) in North America (Bochkov 2009; Pesenti et al. 2014) and Mexico (Guzmán-Cornejo et al. 2003). Here, we confirm the identification of the material housed at the IBSP collection, and no new records are provided.

Material examined. 1♂ (IBSP 5081); ex. *Nyctinomops macrotis* (Chiroptera: Molossidae); Ouro Preto, Minas Gerais, Brazil, (20° 17' 16" S; 43° 30' 29" W) 27-II-1957. 1 deutonymph (IBSP 5082); ex. *Nyctinomops macrotis* (Chiroptera: Molossidae); Ouro Preto, Minas Gerais, Brazil (20° 17' 16" S; 43° 30' 29" W) 27-II-1957.

Myobia Heyden, 1826

Myobia (Myobia) multivaga Poppe, 1909, Fig. 1I

This species was initially described as a parasite of your secondary host, *Mus musculus* Linnaeus, 1758 (Rodentia: Muridae), from Germany (Poppe in Fahrenholz 1909). However, following Bochkov (2009), this species has the primary host as rodents of the genus *Apodemus* Kaup, 1829 (Rodentia: Muridae) and since its original description, has been found in several countries in Europe and Asia (Bochkov 2009). In the examined material the host identity is not informed but it probably deals with rodents of the genus *Apodemus*.

Material examined. 1♀ and 1♂ preserved in 1 slide (IBSP 1318); ex. "field vole" (Rodentia: Muridae); Bridgnorth, Shropshire, England, (52° 32' 10" N; 2° 25' 29" W); 23-V-1934.

Neomyobia Radford, 1948

Neomyobia rollinatti (Poppe, 1909), Fig. 1J

The only record for this species is the information on the type series, from France and Austria, on *Rhinolophus ferrumequinum* (Schreber, 1774) (Chiroptera: Rhinolophidae) (Poppe in Fahrenholz 1909; Baker & Craven 2003; Léger 2020). The specimens examined in the IBSP collection have been collected in England in the same type host. However, the slide IBSP 1606 was damaged and no mite was found.

Material examined. 1♂ (IBSP 1605); ex. *Rhinolophus ferrumequinum* (Chiroptera: Rhinolophidae); Wookey Hole, Somerset, England, (51° 13' 37" N; 2° 40' 18" W); 05-V-1938. 1♀ (IBSP 1606); ex. *Rhinolophus ferrumequinum* (Chiroptera: Rhinolophidae); Wookey Hole, Somerset, England, (51° 13' 37" N; 2° 40' 18" W); 05-V-1938.

Radfordia Ewing, 1938

Radfordia (Radfordia) ensifera (Poppe, 1896), Fig. 1K

This species is cosmopolitan and a parasite of mice from the family Muridae. It was introduced in Brazil, and currently, there are several records of these mites in Murine mouse breeding laboratories (Gilioli et

al. 2000). Here, we provide records of this species collected parasitizing synanthropic rodents in the port region of Pelotas, Brazil.

Material examined. 2♂ and 4♀ (IBSP 11908); ex. "rodent" (Rodentia: Muridae); Port region of Pelotas Municipality, Rio Grande do Sul, Brazil, (31° 46' 19" S; 52° 20' 32" W); 28-XI-2013.

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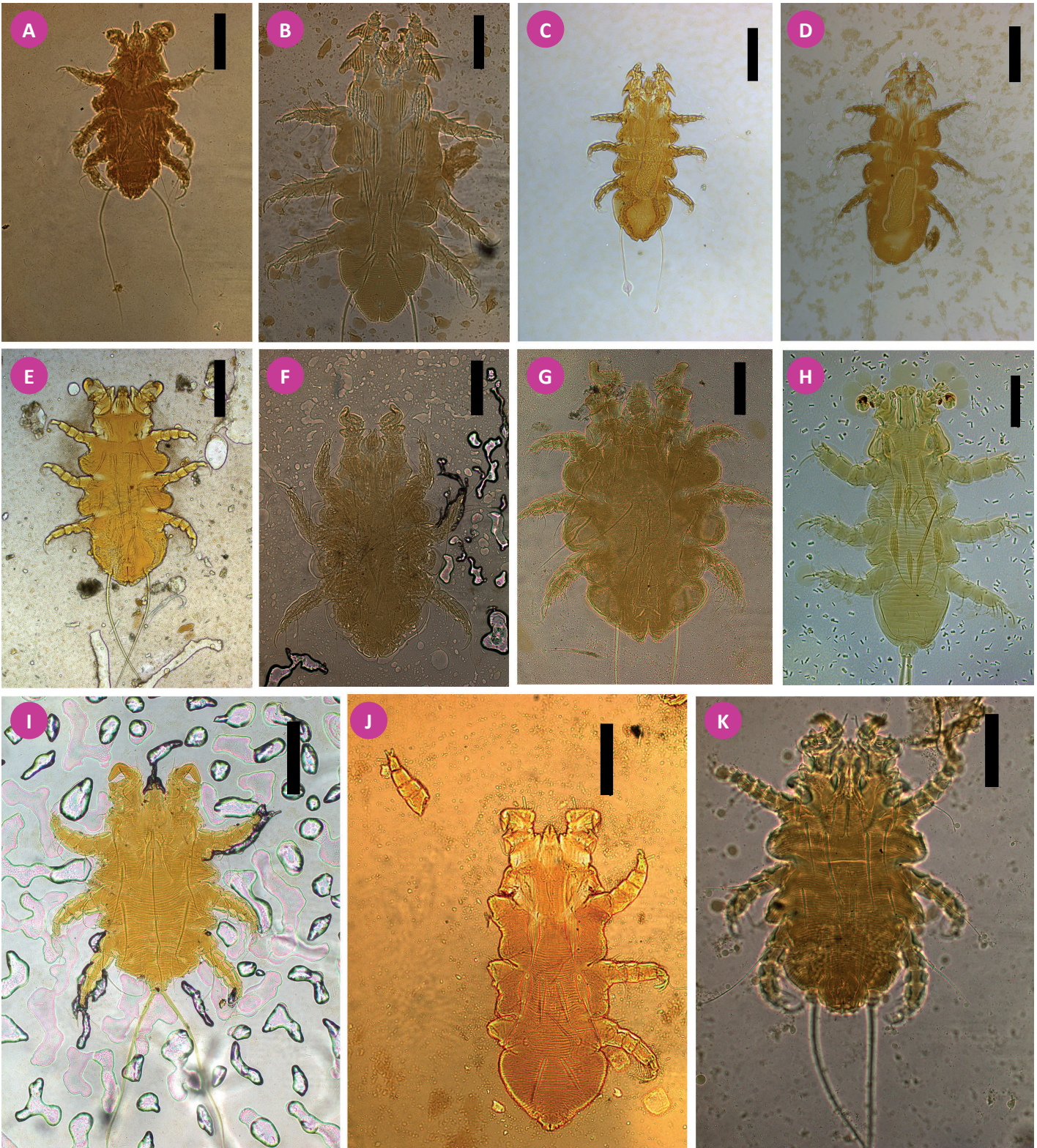


Figure 1. General view of myobiid mites of IBSP. **A.** Female of *Amorphacarus elongata* (Poppe, 1896). **B.** Female of *Archemyobia* (*Nearchemyobia*) *brasiliensis* (Jameson & Lukoschus, 1969). **C.** Female of *Archemyobia* (*Nearchemyobia*) *latipilis* (Fain, Méndez & Lukoschus, 1981). **D.** Female of *Archemyobia* (*Nearchemyobia*) *pectinata* (Méndez, 1972). **E.** Female of *Binuncus magna* (Radford, 1934). **F.** Female of *Crocidura blairi* (Radford, 1936). **G.** Female of *Eadiea brevihamata* (Haller, 1882). **H.** Female of *Ewingana* (*Mormomyobia*) *longa* (Ewing, 1938). **I.** Female of *Myobia* (*Myobia*) *multivaga* Poppe, 1909. **J.** Male of *Neomyobia rollinatti* (Poppe, 1908). **K.** Female of *Radfordia* (*Radfordia*) *ensifera* (Poppe, 1896). Scale bars: A, B, F, G, H, I, and K: 100µm.; C, D, and J: 200µm.

Authors' Contributions

ACBO, RB-S and FCJ examined the slides and collected the label data. RB-S, JSP, EMM, AN, and FCJ performed the study and RB-S and FCJ confirmed the identification of the mites. All authors wrote the manuscript.

Conflict of Interest Statement

The authors declare no potential conflict of interest.

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