

# Mites of the Genus *Pteracarus* (Acarina, Myobiidae) Taken from the Bats of the Genus *Miniopterus* (Chiroptera, Miniopteridae)<sup>1</sup>

KIMITO UCHIKAWA

*Department of Parasitology, Shinshu University School of  
Medicine, Matsumoto 390, Japan*

**ABSTRACT** — Despite the examination of a large number of specimens of various bats of the genus *Miniopterus*, any mite of the genus *Pteracarus* other than the so far known species, *P. faini* Uchikawa and *P. miniopteri* Uchikawa, was not found from them. This strongly suggests that only the two species represent the *Pteracarus* fauna of *Miniopterus*. It is proved that *P. miniopteri* is prevailing in almost whole range of *Miniopterus*, while *P. faini* is distributed in the Oriental, Australasian and eastern Palearctic regions. Based on the host records of the mites, it is suggested that the specific name *schreibersi* has been adopted indiscriminately for so many forms of the bats of the genus *Miniopterus*.

## INTRODUCTION

Some parasitological data have been introduced to the interpretation of taxonomic and phylogenetic problems in various groups of mammals and birds since the beginning of this century [1]. As appropriate indicator parasites had not been located among known species, the idea to deduce taxonomical and phylogenetic information from parasites did not occur to chiropterologists. Dusbábek [2] adopted first the parasitic mites in the phylogeny and zoogeography of bats. Uchikawa and Harada [3] evaluated the mites of the family Myobiidae parasitic on bats as indicators not less efficient than host karyotypes in the taxonomy and phylogeny of Chiroptera. The present author intends to give light on ambiguous problems in the taxonomy and phylogeny of Chiroptera, which are not always in satisfactory state, through the accumulation of parasitological data.

The author had an opportunity to examine the

bat specimens deposited in the collections of the big museums in Europe and the United States for ectoparasites. The present paper corresponding to the first part of a series of reports on acarine parasites obtained from museum bat specimens deals with the records of the mites of the genus *Pteracarus* taken from bats of the genus *Miniopterus*. Impropriety of the taxonomy of some bats will be suggested upon the parasitological data, after recording all the specific names labelled on the museum specimens of the bats *in situ* below.

The abbreviations for the museums, where the host bats are deposited and all the mite specimens dealt with in the present paper will be restored, are as follows; AMNH — American Museum of Natural History, New York; BALM — Basel Museum of Natural History, Basel; BSPM — Bishop Museum, Honolulu; BMNH — British Museum (Nat. Hist.), London; FMNH — Field Museum of Natural History, Chicago; MNHN — Museum National d'Histoire Naturelle, Paris; RMNH — Rijksmuseum van Natuurlijke Historie, Leiden; ROM — Royal Ontario Museum, Toronto; SMF — Senckenberg Museum of Frankfurt, Frankfurt; and USNM — US National Museum, Washington.

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TABLE 1. Records of *Pteracarus miniopteri* Uchikawa

Code No.	Mites	Host	Locality	Host Accession No.
#4	1♂ 1♀	<i>Miniopterus</i> sp.	Solomon	BALM 4301-24
#8	2♂ 3♀	<i>Miniopterus</i> sp.	Madagascar	MNHN (KM87-106)**
#12	1♀	<i>Miniopterus</i> sp.	Madagascar	MNHN -
#19	1♀	<i>Miniopterus</i> sp.	Central Africa	MNHN (KM140-5)**
#24	1♀	<i>Miniopterus</i> sp.	Cameroun	MNHN (KM779-83)**
#105	1♂ 3♀	<i>Miniopterus</i> sp. (A)	East Timor	AMNH -
#30	1♀	<i>Miniopterus</i> sp.	Mombasa, Kenya	BMNH 11.12.10.14-21
#32	1♀	<i>Miniopterus</i> sp.	San Christobal, Solomon	BMNH 316-7
#83	1♀	<i>Miniopterus</i> sp.	Transvaal	USNM 237550-4
#181	1♀	<i>Miniopterus</i> sp.	Morobe, New Guinea	BSPM 145397-425
#1	1♂	<i>Miniopterus</i> sp.	Morobe, New Guinea	BSPM 51235
#3	1♂	<i>Miniopterus</i> sp.	Papua, New Guinea	BSPM 28954
#180	1♂ 2♀	<i>Miniopterus</i> sp.	Morobe, New Guinea	BSPM 145366-9
#154	1♀	<i>M. australis</i>	New Caledonia	BSPM 145549 and 10 others
#6	2♂ 1♀	<i>M. australis</i>	Solomon	BALM 4257-9, -61, -63, -7, -9
#33	1♀	<i>M. fuscus</i>	Morobe, New Guinea	BSPM 53044
#45	1♂ 2♀	<i>M. fuscus</i> group	Morobe, New Guinea	BSPM 51236
#66	1♂	<i>M. fuscus</i> group	Morobe, New Guinea	BSPM 53587
#40	1♂ 2♀	<i>M. fuscus</i> group	Morobe, New Guinea	BSPM 52403
#43	4♀	<i>M. inflatus</i>	Chyulu Hills, Kenya	SMF 57588
#62	1♀	<i>M. inflatus</i>	Zaire	BMNH 59·513-5
#17	2♂ 1♀	<i>M. inflatus africanus</i>	Kenya	USNM 351014-5
#20	4♂ 1♀	<i>M. inflatus africanus</i>	Kenya	USNM 436836-9
#22	3♀	<i>M. inflatus africanus</i>	Kenya	USNM 351059
#24	1♀	<i>M. inflatus africanus</i>	Kenya	USNM 436816-35
#1	1♂ 1♀	<i>M. macrocneme</i> *	New Caledonia	BALM 1761, -63-6
#59	1♀	<i>M. macrocneme</i>	New Caledonia	FMNH 55291-321
#184	1♀	<i>M. magnater</i>	Morobe, New Guinea	BSPM 145440-3
#157	2♀	<i>M. manavi</i> *	Madagascar	BMNH 97·9·1·37
#77	1♀	<i>M. medius</i>	New Guinea	BMNH 1938·8·3·34-6
#142	1♀	<i>M. melanesiensis</i> *	San Christobal, Solomon	BMNH 67·1893
#25	2♀	<i>M. minor minor</i>	Kenya	USNM 347399
#14	1♀	<i>M. minor minor</i>	Kenya	AMNH 237341-3
#50	1♀ 1N	<i>M. natalensis</i>	Cape Province, South Africa	BMNH 76·5·24·1
#54	2♀	<i>M. natalensis</i>	Natal, South Africa	BMNH 51·21-6
#62	1♀	<i>M. natalensis</i>	Kenya	USNM 317129-38
#45	2♀	<i>M. natalensis arenarius</i>	Kenya	FMNH 67958-65
#46	3♀	<i>M. natalensis arenarius</i>	Kenya	FMNH 85467-78
#143	2♂	<i>M. oriana</i> *	Darwin, Australia	BMNH 22·10·8·1
#130	1♀	<i>M. propitristis propitristis</i>	New Guinea	AMNH 191400
—	1♀	<i>M. propitristis grandis</i>	West Irian	AMNH 109961
#16	2♂	<i>M. propitristis insularis</i>	New Guinea	AMNH 190479-82
#7	1♀	<i>M. propitristis</i>	Morobe, New Guinea	BSPM 20092
#103	1♀	<i>M. pusillus pusillus</i>	East Timor	AMNH 237834-61
#3	1♂ 1♀	<i>M. robustior</i> *	Loyalty Is.	BALM 1752-6, -9

(TABLE 1. Continued)

Code No.	Mites	Host	Locality	Host Accession No.
#37	1 ♂ 3 ♀ ♀	<i>M. schreibersi</i>	Afghanistan	SMF 38835-9
#31	1 ♂	<i>M. schreibersi</i>	Rumania	RMNH 28708-14
#52	2 ♀ ♀	<i>M. schreibersi</i>	Zambia	SMF 48029-37
#107	2 ♀ ♀	<i>M. schreibersi</i>	Papua, New Guinea	AMNH 190473-8
#100	1 ♀	<i>M. schreibersi</i>	Uganda	BMNH 64.173-4
#64	1 ♀	<i>M. schreibersi</i>	Palopo, Sulawesi	USNM 501671
#28	1 ♀	<i>M. schreibersi</i>	Algeria	RMNH 28528
#46	1 ♀	<i>M. schreibersi arenarius</i>	Ethiopia	SMF 45735
#54	1 ♀	<i>M. schreibersi arenarius</i>	Kenya	SMF 19461-2
#36	1 ♀	<i>M. schreibersi arenarius</i>	Kenya	BMNH 70.726
#37	1 ♀ 1 N	<i>M. schreibersi arenarius</i>	Kenya	BMNH 76.305
#42	1 ♂ 2 ♀ ♀	<i>M. schreibersi arenarius</i>	Kenya	BMNH 36.3.16.13-20
#41	1 ♂ 1 ♀	<i>M. schreibersi arenarius</i>	Uganda	BMNH 73.527-30
#169	1 ♀	<i>M. schreibersi arenarius</i>	Kenya	BMNH 10.4.1.27
#27	1 ♂	<i>M. schreibersi arenarius</i>	Kenya	USNM 436844
#28	1 ♀	<i>M. schreibersi arenarius</i>	Kenya	USNM 436845-58
#32	2 ♀ ♀	<i>M. schreibersi arenarius</i>	Kenya	USNM 436922
#16	1 ♂ 1 ♀	<i>M. schreibersi majori</i>	Madagascar	USNM 341718-20
#55	1 ♀	<i>M. schreibersi natalensis</i>	Zambia	BMNH 74.512-26
#47	2 ♂ ♂ 1 ♀	<i>M. schreibersi natalensis</i>	Zambia	FMNH 96270-1
#35	1 ♂ 1 ♀	<i>M. schreibersi natalensis</i>	Transvaal	USNM 156334-5
#40	4 ♀ ♀	<i>M. schreibersi natalensis</i>	Kuruman, Cape Prov.	USNM 381599-606
#41	1 ♀	<i>M. schreibersi natalensis</i>	Malelane, S. Africa	USNM 381648
#46	1 ♀	<i>M. schreibersi orianae</i>	Queensland, Australia	FMNH 60858
#42	5 ♂ ♂ 3 ♀ ♀	<i>M. schreibersi orianae</i>	Darwin, Australia	USNM 284209-14
#68	7 ♂ ♂	<i>M. schreibersi orianae</i>	Darwin, Australia	USNM 284215-30
#144	1 ♂	<i>M. schreibersi pulcher*</i>	Kurdistan, N. Iraq	BMNH 67.1230
#84	1 ♂ 1 ♀	<i>M. schreibersi villiersi</i>	Cameroun	BMNH 68.647
#165	1 ♂	<i>M. schreibersi villiersi</i>	Cameroun	BMNH 68.905-9
#10	1 ♀	<i>M. schreibersi villiersi</i>	?	AMNH 4933-5
#56	4 ♀ ♀	<i>M. scotinus</i>	Imasindrary, Madagascar	BMNH 97.9.1.41-3
#170	1 ♂	<i>M. smitjanus</i>	South West Africa	BMNH 35.9.1.78.80-82
#20	1 ♀	<i>M. tibialis</i>	Morobe, New Guinea	AMNH 195333-45
#21	1 ♂ 2 ♀ ♀	<i>M. tibialis</i>	Queensland, Australia	AMNH 161684-701
#123	1 ♂	<i>M. tibialis</i>	New Guinea	AMNH 152447-8
—	5 ♂ ♂ 1 ♀ 2 NN	<i>M. tristis tristis</i>	Philippines	ROM 39860
—	2 ♀ ♀	<i>M. tristis tristis</i>	Philippines	ROM 39668
—	1 ♀	<i>M. tristis tristis</i>	Philippines	ROM 43655
#51	1 ♀	<i>M. tristis celebensis*</i>	S. Sulawesi	AMNH 241557
#53	1 ♂	<i>M. tristis</i>	Mindanao	FMNH 56688

\*: Type specimen (s); \*\*: Maeda's private Nos.

## METHODS

Skin specimens of bats were examined for ectoparasites under the dissecting microscope, combing hair with forceps. Alcoholic specimens of every species were shaken in a bottle with alcohol and, then, picked out. Ectoparasites washed out in alcohol were collected with capillary pipettes under the dissecting microscope.

The mite specimens were prepared for microscopic examination in the author's laboratory, after bringing them back to Japan.

## RESULTS

Only the 2 species of the mites of the genus *Pteracarus*, *P. miniopteri* Uchikawa and *P. faini* Uchikawa, were recorded from bats of the genus *Miniopterus* from the Palearctic, Ethiopian, Oriental and Australasian regions, that is, the whole range of *Miniopterus* as shown in Tables 1 and 2.

Distribution of *P. miniopteri* and *P. faini* is shown in Figure 1. The previous records [4-6, 8] are also added in the figure.

TABLE 2. Records of *Pteracarus faini* Uchikawa

Code No.	Mites	Host	Locality	Host Accession No.
#145	1 ♂	<i>Miniopterus</i> sp.	Eastern Heighland, New Guinea	BSPM 21609 and others
#29	3 ♂ 1 ♀	<i>Miniopterus</i> sp.	Lake Polti, Tibet	BMNH 15.2.21.7-10
#183	1 ♂ 1 N	<i>M. magnater</i>	Morobe District, New Guinea	BSPM 145540-43
#76	1 ♂	<i>M. medius</i>	Koh Lake, Thailand	BMNH 17.2.6.4-7
#52	3 ♂ 3	<i>M. medius</i>	Malaysia	FMNH 64169-74
#98	1 ♂ 2 ♀ ♀	<i>M. schreibersi</i>	Ceylon	BMNH 59.5.31.66
#102	2 ♂ 3	<i>M. schreibersi</i>	Ceylon	BMNH 13.2.10.34-7
#94	4 ♂ 3	<i>M. schreibersi</i>	Foochow	BMNH 94.9.1.23
#61	1 ♂	<i>M. schreibersi fliginosus</i>	Kathmandu, Nepal	SMF 58389-95 58403-4

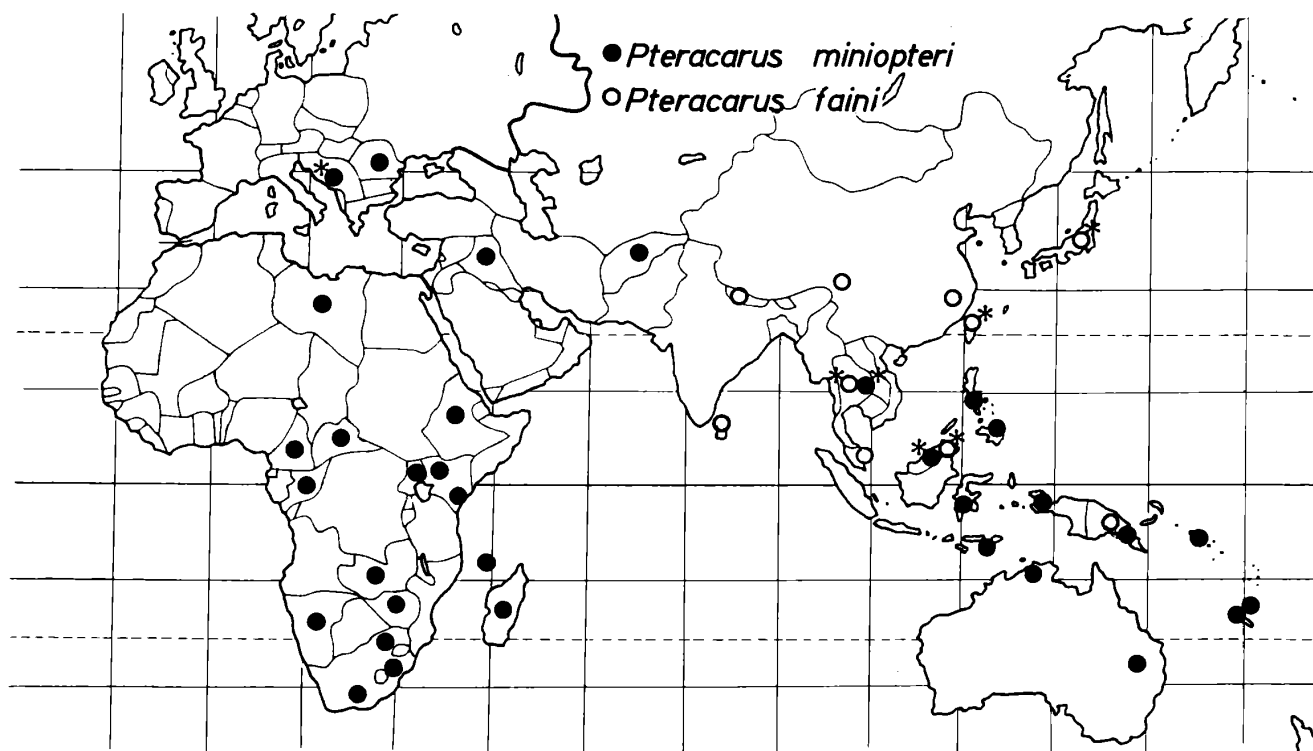


FIG. 1. Distribution map of *Pteracarus miniopteri* Uchikawa and *Pteracarus faini* Uchikawa. Asterisked records are compiled from Uchikawa [4, 5] and Uchikawa et al. [6, 8].

## DISCUSSION

The mites of the genus *Pteracarus* are known to be very conservative in speciation [3, 7], and so a species of the mites is usually shared by many allied hosts. It is reasonable to estimate that *Pteracarus* species specific to *Miniopterus* is not so numerous, yet the real number of such the species was unexpectedly small as shown in Tables 1 and 2. This strongly suggests that only the two species of mites, *P. miniopteri* and *P. faini*, represent the *Pteracarus* fauna of *Miniopterus*. In this case, 40 so far described species or subspecies of the bats of the genus *Miniopterus* can be divided into the phylogenetically different groups, hosts of *P. miniopteri* and those of *P. faini*.

Geographical distribution of *P. miniopteri* and *P. faini* is shown in Figure 1. *P. miniopteri* prevails on many kinds of bats in almost whole range of *Miniopterus*. On the other hand, *P. faini* is distributed on a few species of bats in the Oriental, Australasian and eastern Palearctic regions. African and Madagascan specimens listed in Table 1 and others, which comprized almost all the specimens of Ethiopian *Miniopterus* deposited in the visited museums were examined, but *P. faini* was not detected on them. A considerable number of species of the Oriental and Australasian bats not examined previously were also inspected in the present study. A larger part of such bats were proved not to be hosts of *P. faini* but those of *P. miniopteri* (Tables 1 and 2). Very restricted host and distributional ranges of *P. faini*, being in striking contrast to those of *P. miniopteri*, suggest that *P. faini* has stemmed out of *P. miniopteri* probably in the Oriental region following the establishment of its hosts, and that African *Miniopterus* or *Miniopterus* of Ethiopian region is monophylogenetic, while that of the Oriental, Australasian and eastern Palearctic regions is diphpylogenetic.

As shown above, the hosts of *P. miniopteri* should be regarded as being different from those of *P. faini* far beyond the species level, yet so many incredible labels were found on the bats that yielded either of the mites as recorded *in situ* in Tables 1 and 2. It is clear that the specific bat name *schreibersi* for the generic type has been

adopted indiscriminately for so many forms. The name in Table 2 should at least be revised judging from the parasitological data. *M. australis* and *M. fuscus* were known as the hosts of *P. faini* [6, 8, 9]. These bats were recorded as the hosts of the other mite in the present study as seen in Table 1. This does not mean that a bat of the genus *Miniopterus* harbors the 2 mites, but only suggests that the taxonomy of the bats is confused at present. The same is also the cases of *M. magnater* and *M. medius* that appear in both Tables 1 and 2.

In addition to such the ambiguously identified bats as mentioned above, there were so many specimens of anonymous species even in the leading museums seen in Tables 1 and 2, reflecting embarrassment in the systematics of bats of the genus *Miniopterus*. Either of the polyxenic mites of the genus *Pteracarus*, however, presents no definitive indication of taxonomic status of a given host. Some qualitatively different information on the taxonomy and phylogeny of *Miniopterus* has been deduced from the mites of the genus *Calcaromyobia* (Myobiidae), which are thought to have accomplished more advanced speciation or to be ologoxenic, as shown in successive papers [10–12]. And, adopting the mites of both the genera *Pteracarus* and *Calcaromyobia* as indicators, a further discussion as to the systematics of *Miniopterus* is given in the last paper [12].

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