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FROM *CHEIROMELES TORQUATUS*
HORSFIELD (CHIROPTERA) AND FROM
THE ASSOCIATED *ARIXEMIA* SPP.
(DERMAPTERA)

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MALAYSIAN PARASITIC MITES

I. NEW ROSENSTEINIIDAE (ASTIGMATA) FROM *CHEIROMELES TORQUATUS* HORSFIELD (CHIROPTERA) AND FROM THE ASSOCIATED *ARIXENIA* SPP. (DERMAPTERA)

BY A. FAIN¹, F. S. LUKOSCHUS² and M. NADCHATRAM³

MALAYSIA
CHIROPTERA
DERMAPTERA
ASTIGMATA
AMBULACRUM
GNATHOSOMA

ABSTRACT : Several new taxa are described in the family Rosensteiniidae in Malaysia. The adults of *Nycteriglyphus asiaticus* are described and figured. A new species is described in the genus *Cheiromelichus* Fain, *Ch. trochanteralis*. Two more new genera and species are also described : *Micronychites spinifer* and *Micronychitoides pilifer*, both genera forming a new subfamily Micronychitinae, living on Dermoptera of the genus *Arixenia* living in association with *Cheiromeles torquatus*. The parasitic role of some Nycteriglyphine species for bats is confirmed.

MALAISIE
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RÉSUMÉ : Les formes adultes de *Nycteriglyphus asiaticus* Fain sont décrites et figurées. Les nouveaux taxa suivants sont décrits : *Cheiromelichus trochanteralis* n. sp. ; *Micronychites spinifer* n. g., n. sp. ; *Micronychitoides pilifer* n. g., n. sp. ; Micronychitinae n. subfam., cette nouvelle sous-famille est parasite des Dermoptères du genre *Arixenia* vivant en association avec les chauves-souris du genre *Cheiromeles*.

INTRODUCTION

Although acarines are among the most numerous of all ectoparasites of mammals, in tropical Southeast Asia relatively few host-specific species have been collected or studied. In Malaysia, the stimulus provided by researches in the ecology and taxonomy of the vectors of scrub typhus gradually gave way to encourage studies on other groups of parasitic acari that are believed to be of potential medical importance. Consequently, much information have been amassed on Malay-

sian ticks, trombiculid mites, gamasid mites and house dust mites by the Institute for Medical Research, Kuala Lumpur. In spite of these investigations we known very little of the more specialized mites, let alone their medical importance, zoogeography, ecology and evolution.

MATERIAL EXAMINED

In 1979, it was possible for one of us (F.S.L.) to visit Malaysia at the invitation of the Director,

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Institute for Medical Research, Kuala Lumpur. He spent approximately two months from April to June to carry out full-time investigations on the lesser known, nevertheless important, mites of small mammals in collaboration with the Division of Acarology of that Institute. Approximately 300 animals were examined and numerous species of specialized mites, many of them believed to be new species, were collected.

Malaysia comprises Malaya (Peninsular Malaysia), Sarawak and Sabah (formerly British North Borneo). The collections on which these studies are based were made in Malaya, in the states of Selangor, Pahang and Negri Sembilan. Malaya lies between 1° and 7° north of the equator and contains mountains up to 2,000 m, low hilly terrain, and plains in roughly equal proportions. Although large tracts have been cleared of forest and either the top-soil has been destroyed by tin mining, or the land has been planted with rubber, oil-palm, pineapple and tea, at present approximately 50% of the tropical rain forest is still intact.

This paper, the first in a series to be published on the results, deals with the Rosenteiniidae from bats, guano and Dermaptera (Arixenoidea) of genus *Arixenia*. The adults of these peculiar apterous earwigs grow to 25-30 mm long and resemble at first aspect cockroaches. There are two species of *Arixenia* in Malaya: the most common is *A. esau* Jordan, the other species *A. jacobsoni* Burr is less common but is often associated with the former.

These earwigs are always associated with the bats *Cheiromeles torquatus* and *Tadarida* spp. (*T. mops* and *T. plicata*) and not with other bats. Interestingly, these two genera of bats are also known to roost together in tree-holes, rock crevices and caves. *A. jacobsoni* feeds on guano, but *A. esau* feeds on the skin scrapings and glandular part of the bat, dead or alive. Large numbers have been seen to crawl all over the body grazing and feeding. These earwigs are true nest-dwelling parasites. The biology of these Dermaptera has been studied by LORD MEDWAY (1958) who noted that "They are parasitized by a mite and carry the same fleas that are found on *Cheiromeles*,

which however leave the insect at once if disturbed".

The following material is described below: 1) *Nycteriglyphus asiaticus* Fain, 1963. Only the nymph of this species had been described and figured, although a female had been described without figures in an addendum (FAIN, 1963 b, p. 56). We will describe and figure here the female and the male; 2) *Cheiromelichus trochanteralis* n. sp.; 3) *Micronychites spinifer* n. g., n. sp. and *Micronychitoides pilifer* n. g., n. sp. representing a new subfamily Micronychitinae. They were found between the abdominal tergites of Dermaptera of genus *Arixenia* living in association with *Cheiromeles torquatus*.

The Nycteriglyphinae are generally considered as free-living mites feeding on bat-guano. However, these mites are frequently found on the bats themselves and in *Nycteriglyphus asiaticus* the mites were attached to the bats by means of their chelicerae so that it was necessary to cut the skin of the bats to detach them (FAIN, 1963). In the new species *Cheiromelichus trochanteralis* that we describe here the females with eggs were embedded in burrows of the skin like *Notoedres* spp. The skin of these bats showed hyperkeratinization and papillosis.

Thus it appears that at least for some species, especially those with strong chelicerae, the mites are able to become true skin parasites.

For the setae of the idiosoma we utilize here the nomenclature proposed previously (FAIN, 1963 a).

The holotypes are deposited in the British Museum (N.H.), London. Paratypes are deposited in the following institutions: Institute for Medical Research, Kuala Lumpur; Academy of Sciences, Department of Parasitology, Prague, Bernice P. Bishop Museum, Honolulu; Field Museum of Natural History, Chicago; Institut royal des Sciences naturelles, Bruxelles; Institute of Acarology, Columbus; Zoologisches Museum, Hamburg; Rijksmuseum Natural History, Leiden; U.S. National Museum, Washington, D.C. and in the collections of the authors.

SUBFAMILY NYCTERIGLYPHINAE Fain, 1963

Genus *Cheiromelichus* Fain, 1970

Only 2 species were previously known in this genus : one, the type species *Ch. malayi* Fain, 1970 from *Cheiromeles torquatus* Horsfield in Selangor, the other, *Ch. cratygnathus* Fain, 1978 from *Tadarida (Chaerephon) johorensis* (Dobson) in Kelantan, Malaya. A third species is now added to this genus.

Cheiromelichus trochanteralis nov. spec.

In the female of this species the anal, genital and femoral setae are short, with thick conical spines as in *Ch. malayi*. This new species is distinguished from the latter in both sexes by the presence of a thick and short spine on the trochanters IV, by the shape of *v i* setae which are modified as short conical spines, the narrow shape of propodonotal shield and the different disposition of the opisthogastric setae.

■ Female (fig. 1, 2) : Holotype 315 μ long (idiosoma) and 270 μ wide. In 2 paratypes 288 μ \times 255 μ et 295 μ \times 260 μ . *Dorsum* : Propodonotal shield long and narrow, bearing 2 short and thick *v i* setae. The *v e* setae are thin and barbed. There is a very small supracoxal seta situated not far from the mid portion of the shield. Setae *l 1* and *h* rather thick cylindrico-conical, forked apically and 42 and 60 μ long respectively. All other dorsal setae very thin and short, except the *l 5* very long and strong. *Venter* : Epimerae and setae as in *Ch. malayi*, they are short and thick conical spines except *d 5* very thin and short. The setae *a 1* and *a 2* are more anterior than in *Ch. malayi*. Legs as in the last species except for the following characters : presence of a short and thick spine on trochanters IV (absent in *Ch. malayi*) and absence of a triangular recurved process on dorso-internal surface of trochanters I. The genu I is produced dorsally where it bears the long dorsal seta.

Chaetotaxy of legs : Tarsi I-II with 4 short and strong spines and 5 simple setae ; tarsi III with 4 strong spines (3 subapicals and 1 median) and 3 simple or spinous setae ; tarsi IV with 5 strong spines and 1 simple seta. Other segments with the usual number of setae except trochanter IV which bears a spine contrariwise to all the other species in the family. Solenidiotaxy as in *Ch. malayi*.

■ Male (fig. 3, 4) : Allotype 270 μ long and 195 μ wide (idiosoma). *Dorsum* as in female. *Venter* : Epimerae I fused in a Y with a long sternum, other epimerae free. Ventral setae are thick spines as in the female. Genital organ strongly sclerotized situated at level of coxae IV. Legs as in female.

Host and locality.

From the Hairless bat : *Cheiromeles torquatus* Horsfield. 1824 in tree holes, Gombak Forest Reserve, Selangor, 4.v.1979 (holotype and 5 female paratypes, allotype and 1 male paratypes, 6 tritonymphs and 2 larvae paratypes). This bat is found in Malaya, Borneo, Thailand, Sumatra and Java. It is one of two species in the genus, the other species being *C. parvidens* which is only known from Sulawesi (= Celebes) and Philippines. The genus is unique among bats in many respects, including the lack of hair over most of the body, development of large throat sac and the presence of wing pouches in both sexes. *C. torquatus* is a large insectivorous bat.

Holotype in British Museum, N° 1980.8.5. 6-9.

Remarks.

1. The females with their eggs were found embedded and attached in deep furrows in the skin of the bat in the hairy region of pelvis and on the back. They had provoked thickening and hornification of the skin.
2. The species name refers to the presence of a spine on trochanter IV.

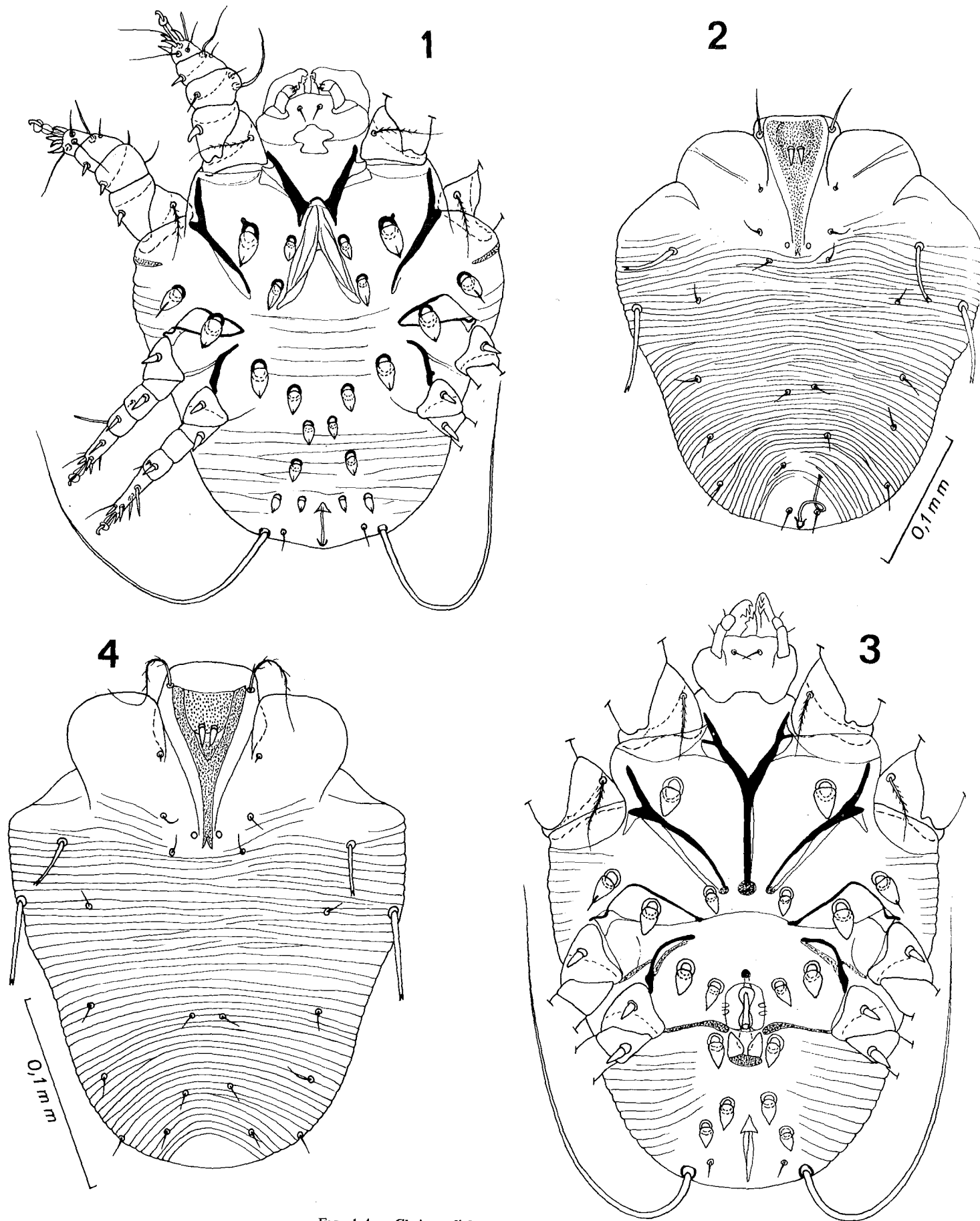


FIG. 1-4. : *Cheiromelichus trochanteralis* n. sp.
 Female holotype : 1. — Venter ; 2. — Dorsum. Male allotype : 3. — Venter ; 4. — Dorsum.

Genus *Nycteriglyphus* Zachvatkin, 1941

Nycteriglyphus asiaticus Fain, 1963

The original description and figures of this species is based on nymphs. The holotype is a tritonymph. One adult female was found on the same bat as that of the holotype but the description was already in the press and only the description of this female was given.

We redescribe here briefly the female describe for the first time the male and give figures of both sexes.

■ Female (fig. 5, 6) : A female of our series is 455 μ long (idiosoma) and 225 μ wide ; total length 495 μ (until tip of palps). Another specimen is 480 μ long (total length) and 210 μ wide. Cuticular striation rather superficial and not scaly. Dorsal setae (except *v e*) 50 to 70 μ long, all are cylindroconical with forked apex and a short barb in their apical third. Setae *v e* thin and barbed. Copulatory orifice dorsal, covered by a large sac like and striated cuticular pouch. *Venter* : Epimerae I fused in a V and united with epigynium. All ventral setae thin and short. Legs long and slender, with well-developed claws. Tarsi I-II with 3 apical or subapical short spines and 8 and 7 simple and thin setae respectively. Tarsi III with 4 spines and 3 simple setae. Tarsi IV with 5 spines and 1 simple seta. Gnathosoma

very large with very powerful chelicerae. Genu I with 2 short solenidia.

■ Male (fig. 7, 8) : A well-expanded specimen (idiosoma) measures 510 μ long and 270 μ wide. Cuticle almost bare, a few striations are visible on the opisthogaster and opisthonotum. Dorsum as in female. *Venter* : Epimerae I fused in Y, other epimerae short and free. Penis narrow, relatively long situated at level of coxae IV. Ventral setae thin and short. Gnathosoma, chelicerae and legs as in the female.

■ Eggs : The eggs attached to the skin of the bat present at one extremity a cylindrical prolongation 20 μ long and 18 μ wide serving for the attachment to the host. Some of these eggs bear inside two hemispheric and pointed formations which represent the rests of the prelarva (FAIN, 1977).

Host and locality.

The holotype and paratypes were found attached on the skin of *Cheiromeles torquatus jacobsoni* Thomas, from Lugu Simalur Is., N.W. Sumatra (bat in the British Museum).

The specimens from Malaysia were collected from *Cheiromeles torquatus*, in tree holes, Gombak Forest Reserve, Selangor, 4.v.1979 (6 females and 4 males).

SUBFAMILY MICRONYCHITINAE nov. subfam.

Definition : This new subfamily is distinguished from the Rosensteiniinae, Nycterilichinae and Nycteriglyphinae by the complicated structure of the ambulacrum, the very small size of the tarsal claws and the small development of the gnathosoma and the chelicerae. Cuticle striated and either slightly or strongly scaly. Epimerae I fused forming a V or a Y ; epimerae II either free or fused with epigynium ; epimerae III-IV free. Copulatory tube in females either absent or present but very short. Dorsal setae cylindrico-conical with apices shortly bifurcate, some bear 1 or 2

small teeth. Ventral surface of gnathosoma with 2 narrow sucking lobes. Solenidion : Tarsi 3-1-0-0. Tibiae 1-1-1-1. Genua 2-1-1-0.

Type genus : *Micronychites* n. g.

Hosts : On the abdomen of Dermaptera of the genus *Arixenia* living in the guano of bats or on bats *Cheiromeles torquatus*.

Genus *Micronychites* n. g.

Definition : Cuticle with sinuous striations only slightly scaly. Dorsum with two punctate plates,

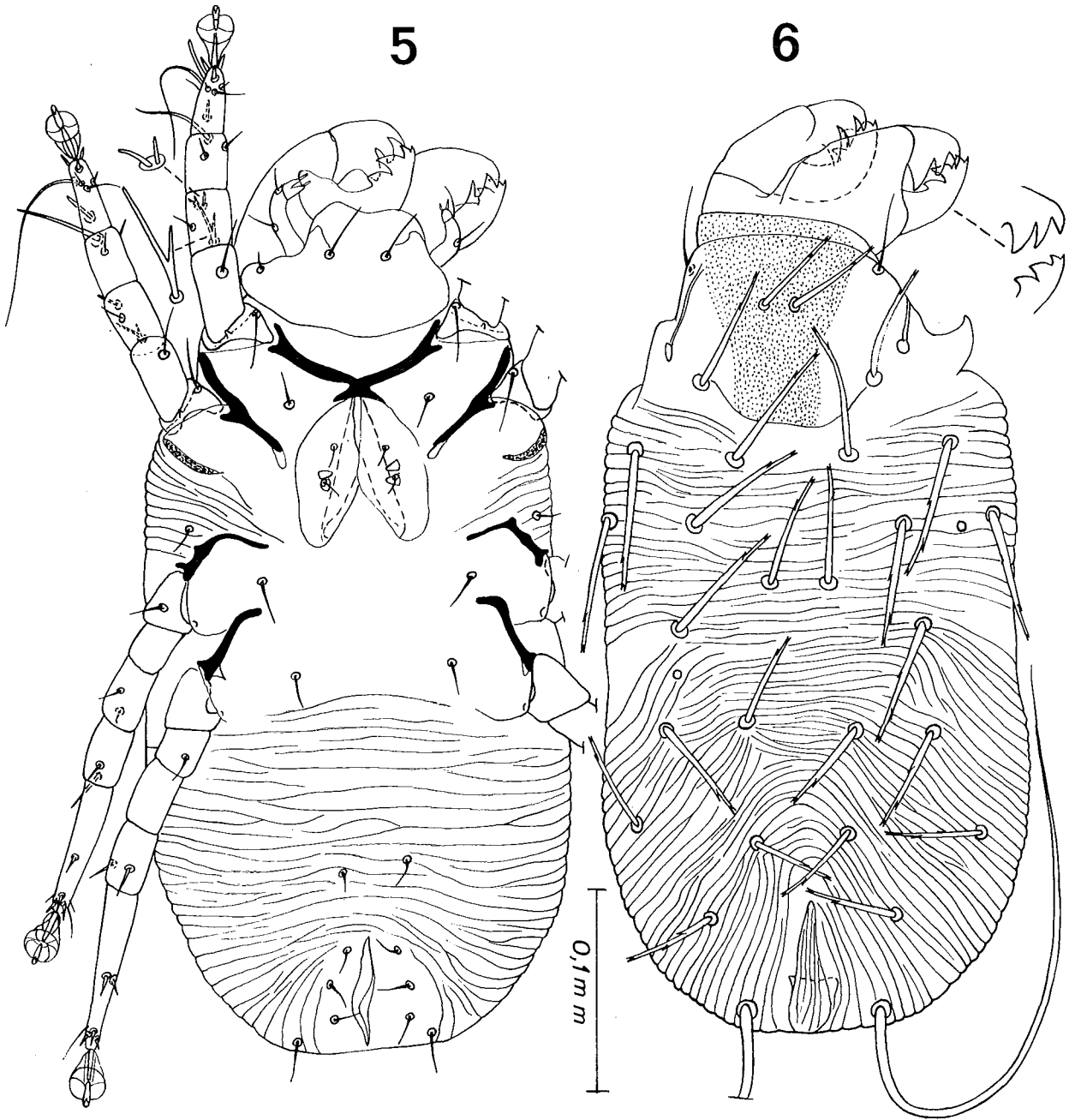


FIG. 5-6 : *Nycteriglyphus asiaticus* Fain, 1963. Female : 5. — Venter ; 6. — Dorsum.

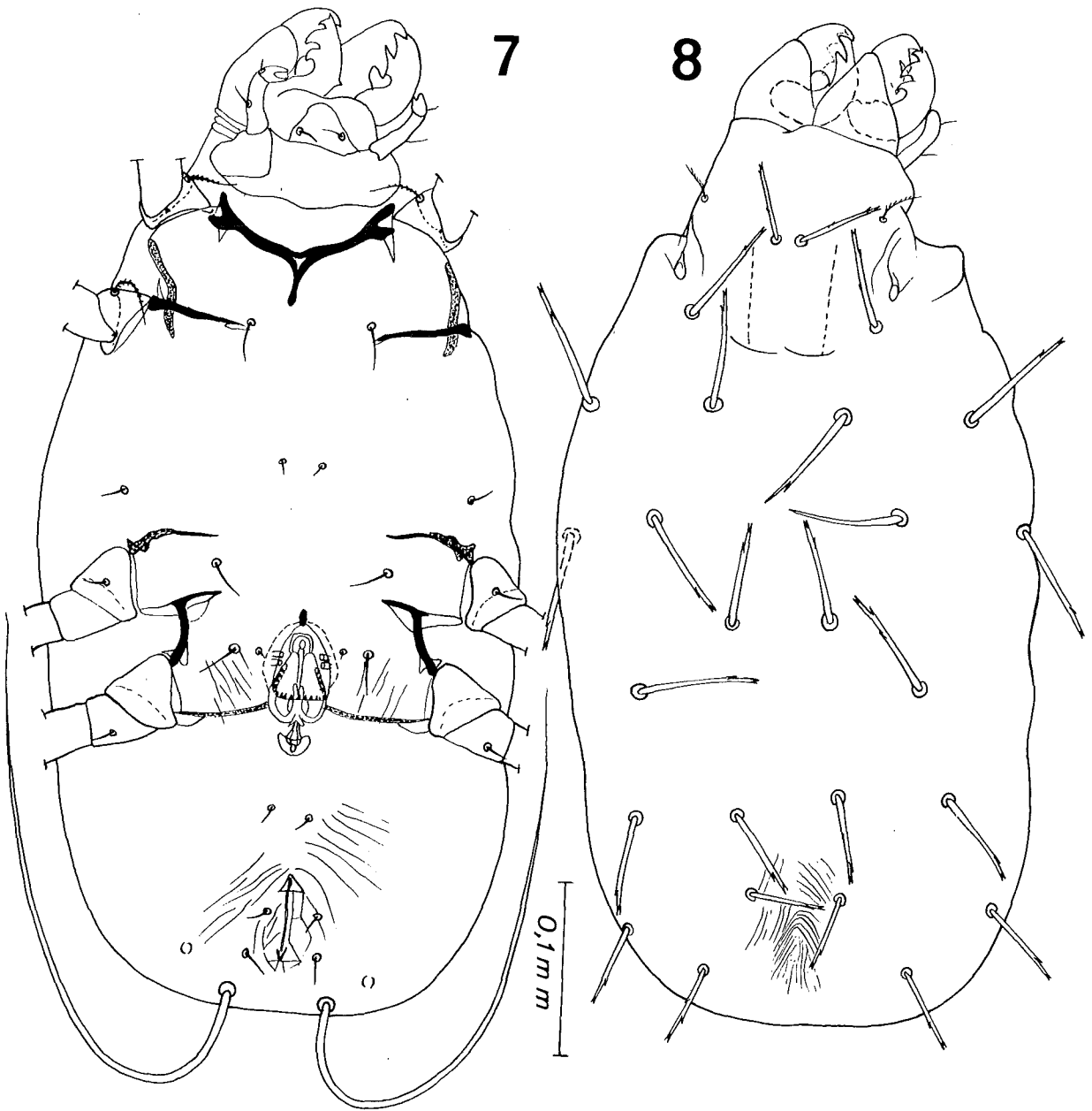


FIG. 7-8 : *Nycteriglyphus asiaticus* Fain, 1963. Male : 7. — Venter ; 8. — Dorsum.

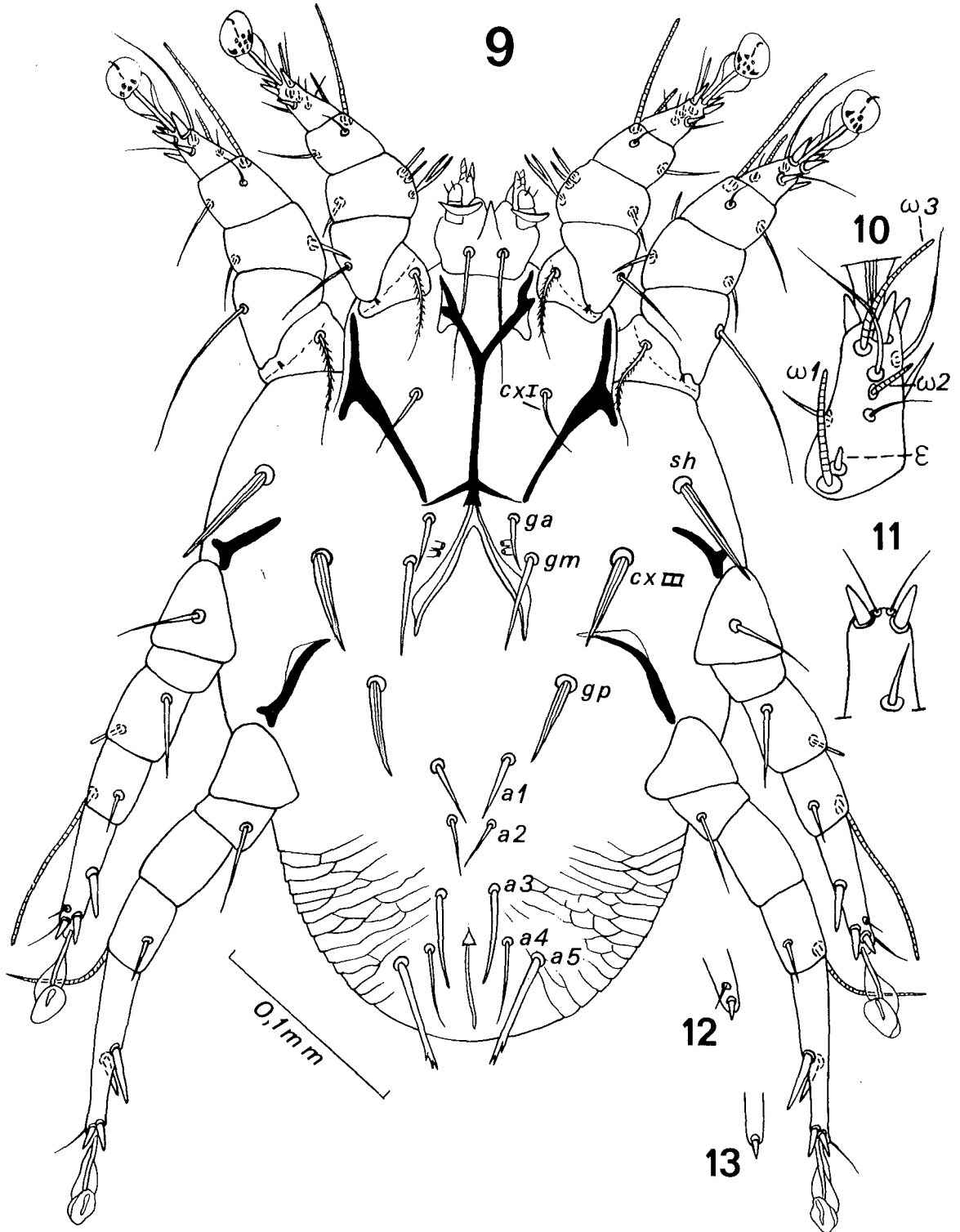


FIG. 9-13 : *Micronychites spinifer* n. sp. Female holotype : 9. — Venter ; 10. Tarsus I dorsally ; 11. — Apical half of tarsus I ventrally ; 12-13. — Apex of tarsi III and IV dorsally.

one poorly sclerotized is propodonotal, the other is a small plate situated in front of the copulatory tube. Dorsal setae except *ve* strong, cylindrico-conical, with apex furcate and either with or without a small tooth; the *ve* are thin, piliform and barbed. Ventral setae strong, the *sh*, *cx III* and *gp* are strong striated spines with attenuated apices. Epimerae II fused with the epigynum. Copulatory tube short, conical, situated dorsally not far from posterior extremity. Ventral surface of gnathosoma with 2 long setae and 2 small membranous sucking lobes. Legs well developed with a large ambulacrum ending

in a very small claw. Tarsi I in female with 3 thick spines, 2 spinous setae and 5 simple setae, tarsi II with 5 strong spines and 4 (? 5) simple setae. Tarsi III with 4 strong spines and 3 simple setae. Tarsi IV with 5 thick spines and 1 simple seta. The female is larviparous.

Type species : *Micronychites spinifer* n. sp.

***Micronychites spinifer* nov. spec.**

■ Female (fig. 9-13, 15, 19) : Holotype 378 μ long and 146 μ wide (idiosoma). In 2 paratypes : 340 \times 230 μ and 335 \times 225 μ . *Dorsum* : Cuti-

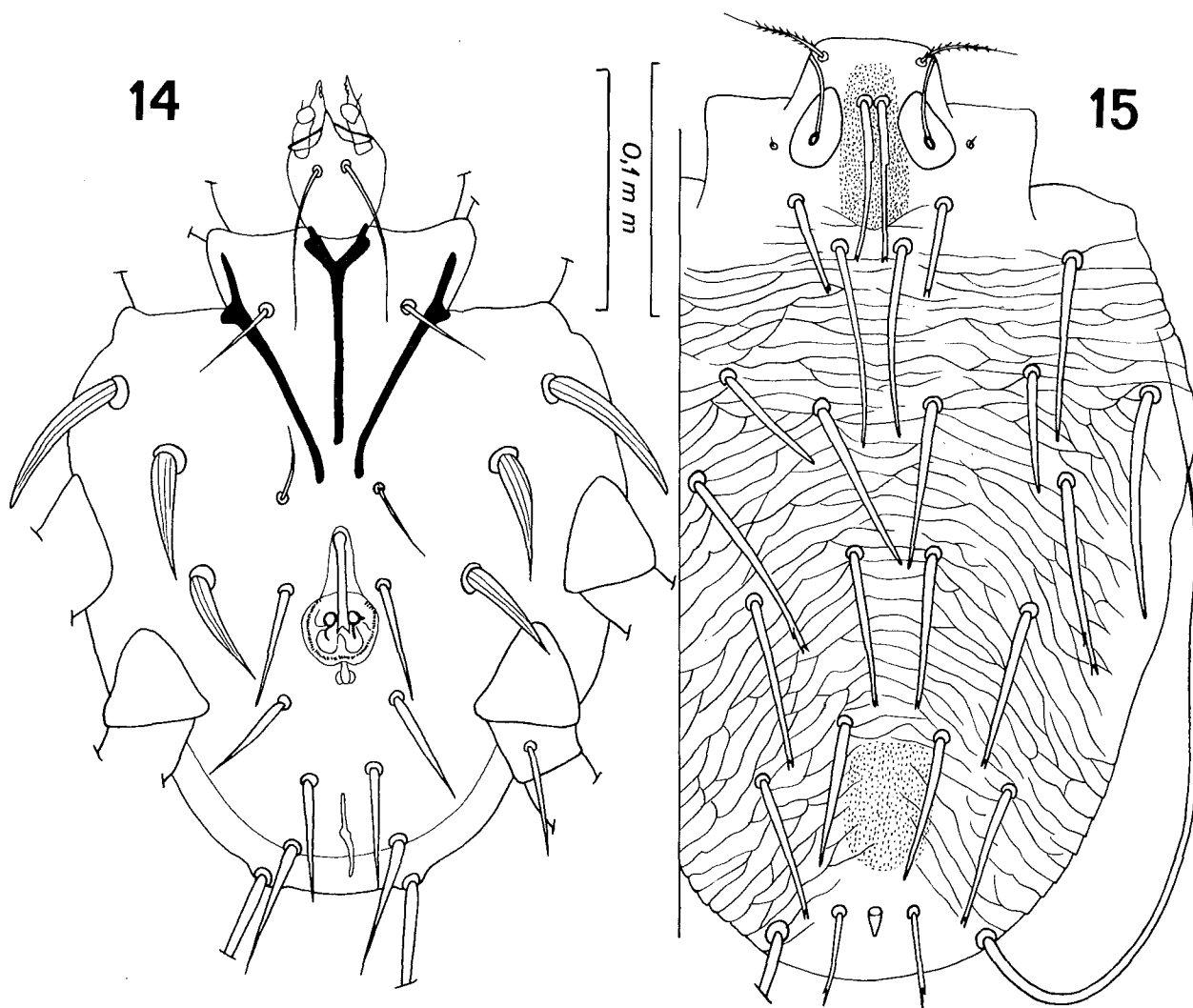


FIG. 14-15 : *Micronychites spinifer* n. sp. 14. — Male allotype ventrally ; 15. — Female dorsally.

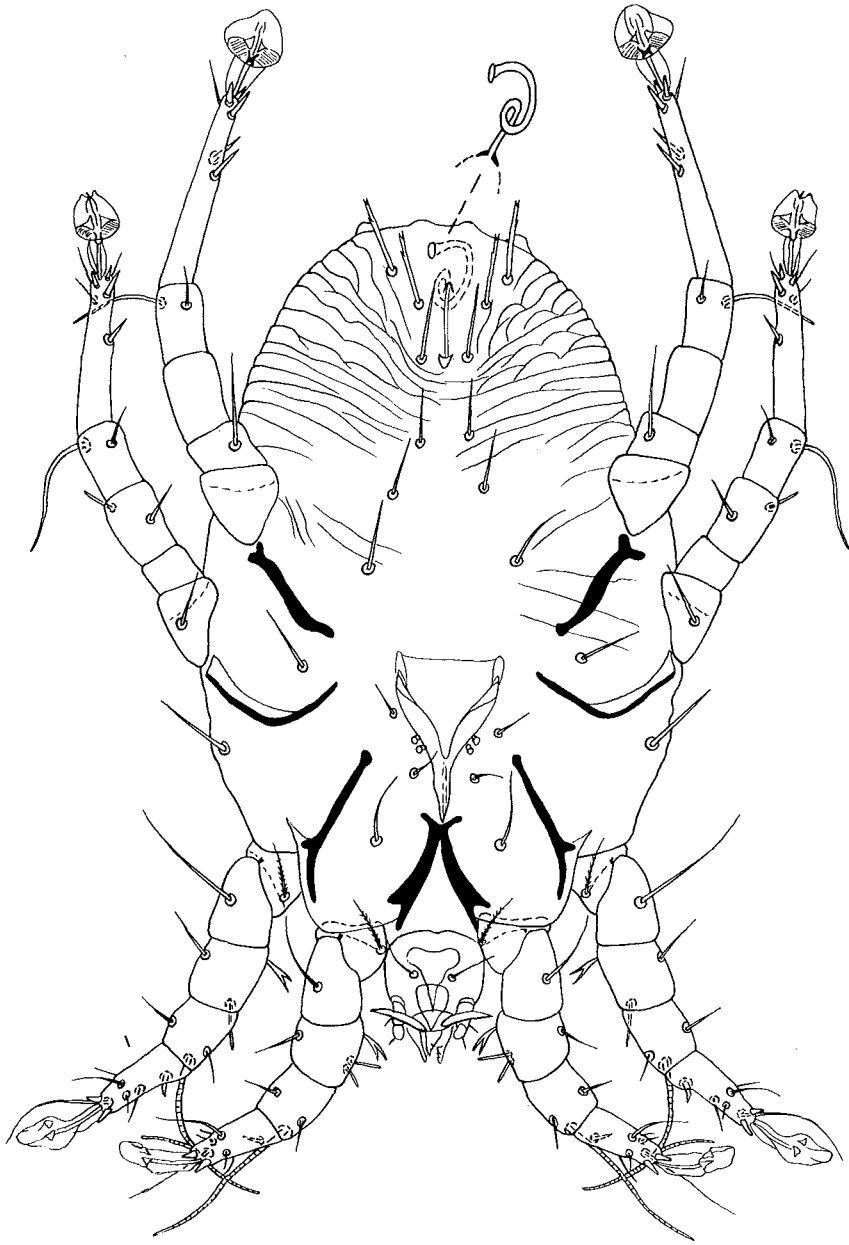


FIG. 16 : *Micronychitoides pilifer* n. sp. Female holotype ventrally.

cular striations sinuous and partly scaly. Copulatory tube dorsal, small, conical, 8-10 μ long and situated at 30 μ from posterior extremity and behind a small punctate plate. *Venter* : Setae *sh*, *cx III* and *gp* forming strong striated spines attenuated apically and 55, 45 and 42 μ long respectively. Other ventral setae spinous. Tarsi I-IV 30-30-60 and 90 μ long respectively, ending in a very small claw 3 μ long. Other characters as described above.

■ Male (fig. 14) : Allotype 308 μ long and 196 μ wide (idiosoma). Cuticle in poor condition and striations hardly visible. Dorsal and ventral setae of the same type as in female but the setae are stronger. There is a long sternum, not fused with epimerae II. Genital sclerite situated at the level of coxa IV. Gnathosoma as in the female. Legs thicker than in female. *Chaetotaxy of tarsi* : tarsi I, II and IV as in female. Tarsi III with 5 strong spines and 2 thin setae.

Host and locality.

On *Cheiromeles torquatus* (in tree holes), Gombak Forest Reserve, Selangor, 4.v.1979 (holotype and 1 paratype female). All the other specimens (10 paratypes female, allotype and 1 paratype male) were found between the abdominal tergites of *Arixenia* spp., probably *A. esau* (Dermoptera) living on the guano of these bats or on these bats. These earwigs are probably the true hosts of these mites. In all the mites from earwigs the cuticle was in poor condition and the striations are hardly visible. The bats, *Cheiromeles torquatus* live in tree-holes and the earwigs feed upon the guano of the bats, or on the bats.

Genus *Micronychitoides* nov. gen.

Definition : This genus is distinguished from *Micronychites* by the following characters (in the female) : Cuticle regularly striated with numerous cuticular scales. The striations are mostly oriented transversely in the anterior half of hysteronotum and longitudinally in posterior half. Epimerae I fused in a V, epimerae II free. Bursa

copulatrix thick, opening ventrally behind anus, without external copulatory tube. Dorsal setae cylindrico-conical, with furcate apex and a pre-apical tooth except setae *vi* which bear 2 teeth and the *ve* which are thin and barbed. Ventral setae piliiform except posterior anal setae which are similar to dorsal setae. Ventral setae of gnathosoma short, sucking lobes of gnathosoma long and narrow. Absence of posteromedian punctate plate. Tarsi I-II with 3 apical spines and 8 thin setae ; tarsi III-IV as in *Micronychites*.

Type species : *Micronychitoides pilifer* n. sp.

Micronychitoides pilifer nov. spec.

■ Female (fig. 16, 17, 20) : Holotype 316 μ long and 189 μ wide (idiosoma). In 2 paratypes 296 \times 190 μ and 300 \times 195 μ . Dorsal setae 30 to 90 μ long. Opisthogaster striated, with a few scales. Tarsi I-IV 38-42-62-82 μ . Solenidiotaxy : Tarsi 3-1-0-0. Tibiae 1-1-1-1. Genua 2-1-1-0. Other characters as above.

■ Male (fig. 18) : Allotype 224 μ long and 135 μ wide. Dorsal striations and chaetotaxy as in female but the cuticle of this specimen is in very poor condition. *Venter* : there is a long sternum fused behind with epimerae II. Genital organ forming two parts, the anterior consisting in a thick and long sheath containing the long penis starting behind the base of the sheath. Total length of penis 84 μ . All ventral setae are piliiform, except the anals which are similar as dorsals. Gnathosoma with short basal ventral setae and long and narrow sucking lobes. Tarsi I-II with 3 spines. tarsi III-IV with 5 spines.

Host and locality.

The holotype, one paratype female and the allotype male were found on the abdomen of *Arixenia* sp. probably *A. esau*, in the guano of *Cheiromeles torquatus*, in tree holes. Same locality and date as for *Micronychites spinifer*.

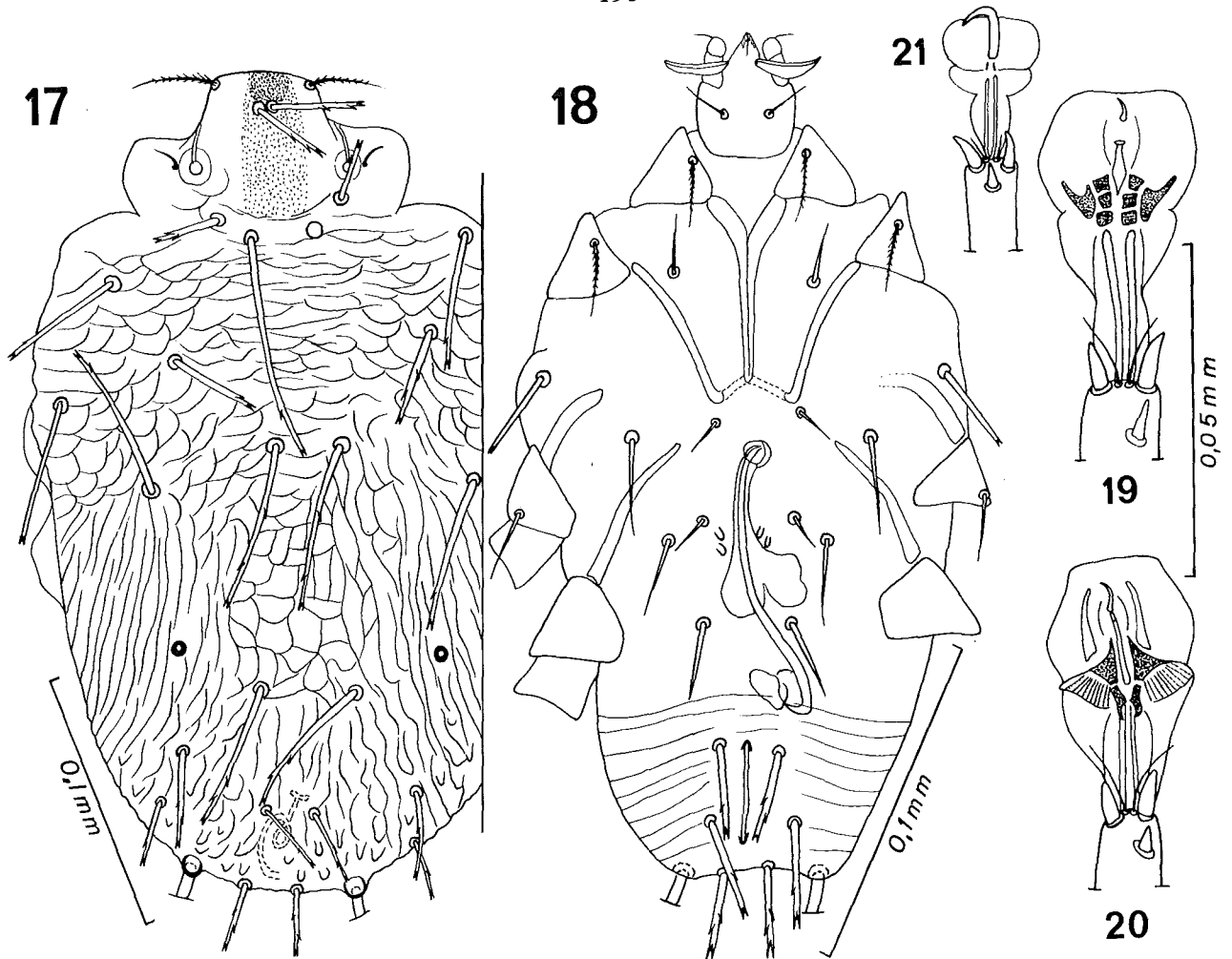


FIG. 17-21 : *Micronychitoides pilifer* n. sp. 17. — Female holotype dorsally ; 18.— Male allotype ventrally. Apex of legs II, in ventral view, in female of : 19. — *Micronychites spinifer* n. sp. ; 20. — *Micronychitoides pilifer* n. sp. ; 21. — *Nycteriglyphus tadaridae* Fain.

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