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Rafamastix plenus gen. n., sp. n. of the family *Dolichocybidae* from South America (*Acari*: *Heterostigmata*)

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ABSTRACT. *Rafamastix plenus* gen. et sp. n. of dolichocybid mites from Ecuador is described and illustrated. According to phylogenetic systematics the new generic taxon is a sister group to *Acanthomastix* - *Dolichomotes* - *Formicomotes* stock, and reveals some primitive as well as advanced features compared to early derived dolichocybid genera - *Dolichocybe* and *Pavania*.

Key words: acarology, taxonomy, *Dolichocybidae*, *Rafamastix*, new genus, new species, Neotropics.

INTRODUCTION

There has been a notable accumulation of taxonomic information on the mite family *Dolichocybidae* MAHUNKA, 1970 throughout the last decades (KRANTZ 1957, LOMBARDINI 1949, MAHUNKA 1972, SMILEY 1967, RACK 1973, SEVASTIANOV 1980, MAGOWSKI 1988 and MAGOWSKI & MOSER 1993 as examples), however, their biology, geographic distribution and host/ habitat range remain poorly known. This paper is another contribution to the knowledge of systematics of this group, and reports on the discovery of the form, which deserves generic status due to its derived characters, unique to this taxon. The new genus is to some extent more primitive than *Acanthomastix* MAHUNKA and *Dolichomotes* SMILEY, but still more derived than *Pavania* LOMBARDINI.

I dedicate this paper to the memory of Prof. Jan RAFALSKI, the outstanding expert in arachnids in general and mites in particular who was also my guide and teacher in the early days of my studies on mites.

METHODS AND NOMENCLATURE

Specimens of the new species were extracted in the Tullgren-Berlese funnel and stored in glass vials with alcohol together with all other residues. Subsequently they were mounted on a slide with Swan medium. All specimens were examined with phase contrast Olympus (BX 50) microscope equipped with a drawing attachment. Photographs were taken with Wild- Leitz Aristoplan system. Measurements of the holotype are given first; figures in parentheses, referring to the first and second paratypes respectively; all given in μm.

Morphological nomenclature follows LINDQUIST 1986, LINDQUIST 1987, LINDQUIST, KALISZEWSKI & RACK 1990 (esp. for podosomal setation) and MAGOWSKI & MOSER 1993 with some minor modifications and amendments.

DESCRIPTIONS

Rafamastix gen. nov.

DIAGNOSIS

The new genus is distinguishable by the following combination of features:

Pharynx without lateral lobes, weakly defined. No bothridial setae (sc_1) on prodorsal shield. Propodosomal venter with two and metapodosomal with four pairs of setae. Tarsi of all legs narrowed in their midlengths, over twice longer than tibiae, slim.

Type species: *Rafamastix plenus* sp. n.

DESCRIPTION

Female - the largest member of *Formicomotinae* known to date. Gnathosoma subquadrangular or slightly elongated. Pharynx weakly sclerotized, with no lateral lobes. Gnathosoma with dorsal gnathosomal setae very short, stout, displaced strongly laterad on the stylophore. Palptibia with claw and short seta, palptarsus with two solenidia and one small seta.

Prodorsal shield with three pairs of setae, sensilli lacking, bothridia almost completely reduced. Posterior margins of opisthosomal tergites with undulated edge. Dorsal setae relatively stiff but pointed (except for h_2 and h_1). Lateral platelets bearing setae c_2 displaced dorsolaterally. Setae h_2 markedly elongated in relation to h_1.

Propodosomal venter with two pairs of setae (*1b, 2a*) metapodosomal venter with four pairs of setae (contrary to *Acanthomastix* and *Dolichomotes* - *Formicomotes* complex) - *3c, 3b* (on coxal fields III) *4a* (on coxal fields IV) and *4b* located mediad of coxal fields IV in the medial area of soft integument. Aggenital platelets separate with one seta each. Pseudanal platelet discrete, no remnants of pseudanal setae preserved.

Legs stout but with tarsi much slimmer than other segments. All tarsi biclavate and uniquely to the newly erected genus - approximately four times as long as wide basally with characteristic narrowing in their midlengths; and almost three times longer than their tibiae. Nearly all tarsal setae (except solenidia) located apically on tarsi. Empodia sessile, suckerlike. Tarsus I unique among all known dolichocybids with six setae (and two solenidia) only. Setation of legs in other respects richer than in *Acanthomastix* - femora I and II with two setae each, tibia I with five setae and tibiae II-IV with four setae each (apart from solenidia and famulus). All solenidia emergent.

Males: unknown.

ETYMOLOGY

The name of the new genus is coined from the last name of the late Professor Jan RAFALSKI, to whom this paper is dedicated. The core "*-mastix*" reflects its closest relative - the genus *Acanthomastix.*

***Rafamastix plenus* species nova**

(Figs 1-10)

DIAGNOSIS

Female gnathosoma with *dgs* setae very short, stout, displaced far laterally near the base of each palpus. Pharynx very weakly sclerotized, with no distinguishable lateral lobes. Palpgenual setae almost as long as half of the stylophore length. Setae of the idiosomal dorsum smooth, relatively stiff but pointed. Setae *f* inserted on the tergite EF far posteriad of the level of setae *e*. Setae h_1 stiff, blunt, less than twice longer than the distance between their bases. Dorsal surfaces of PrS, C, EF and H tergites covered with sparse dimpled ornament often organised in small groups of 2-4. Tarsus I with six setae and two solenidia, tarsi II and III with five setae (Ta II with a solenidion additionally) and tarsus IV with four setae. Tibia I with five setae (apart from solenidia and famulus *k*); tibiae II-IV with four setae (apart from solenidion). All genua with one seta, femora I and II with two, and III- IV with one seta each. All legs homodactylous, with empodia sessile, suckerlike.

DESCRIPTION

Female body 254 (264; 245) long, 135 (175; 114) wide. Gnathosoma (Figs 1, 2): rounded subquadrangular or sightly elongated in shape, 39 (37; 30) long dorsally, 36 (30; 23) wide, i.e. slightly longer than wide. Stylophore with suture indicating the longitudinal division and equipped with weak apodeme. Dorsal gnathosomal setae, short but strong, located just on the transverse midline of the stylophore (or somewhat posteriorly in paratypes) and displaced far laterad. Movable cheliceral digits located ventrodistally and protruding ventromedially on the ventral side of gnathosoma; short - sickle-shaped, as long as 1/5 stylophore length. Subcapitulum with a pair of delicate

ventral setae, 11 (9; 9) long, about 2/3 as long as half of the subcapitulum width. Palpcoxal setae indiscernible. Pharynx very weakly defined, along the medioventral midline of gnathosoma with indistinct lateral undulation (but no lobes); its length 15 (15; 15?) and width 7 (5?; 4). Palptrochanter reduced, palpfemur fully united with palpgenu. Palpfemoral seta short stiff; palpgenual one slender, three times longer than palpfemoral, shorter than half stylophore length and shorter than palpus. Palpal tibiotarsus with small palptibial claw, one small seta (tibial), one small solenidion, one small clublike seta. Additionally, a small seta ventrodistal to claw (most probably tarsal). Palpi located obliquely (or paralelly) with ends of claws reaching well beyond the anterior edge of stylophore.

Dorsal side (Fig. 3): Idiosoma elliptical in outline, 227 (247; 224) long, with length/width proportion ranging from 2 to 1.4. Prodorsal shield (PrS) semicircular, truncated anteriorly, 85 (86; 79) long, 94 (104; 91) wide, expanding anteriorly with a concave ridge over the base of gnathosoma. Lateral edges and the posterior free margin convex, overlapping (only in holotype female) C tergite with undulated ridge. Setae v_1 35 (29; 30) long, tapering, located 26 (20; 19) apart, v_2 40 (35; 36) long, 39 (41; 38) apart and sc_2 35 (29; 30) long, slender, pointed, 78 (83; 72) apart, ca. 2.5 times shorter than the distance between their bases. Setae sc_2 approximately as long as setae v_1 but slightly shorter than the longest v_2. Setae sc_2 located on the transverse midline of the shield. A pair of pits (most probably vestigial alveoli of sc_1) located behind the bases of v_1 setae on the anterolateral edges of PrS. No apodematal structure present on the prodorsal shield. The C tergite subdivided into dorsomedial shield and lateral weakly sclerotized areas displaced dorsolaterally. Dorsomedial C shield bears a pair of setae c_1 24 (23; 20) long and 51 (50; 37) apart. Setae c_2 on discrete ventrolateral sclerites 27 (26; 27) long, slender, smooth, pointed, displaced 129 (151; 107) apart, anteriad to c_1 bases level. Tergite D with a pair of setae *d* tapering, pointed, 25 (20; 20) long, 103 (103; 96) apart. Tergite EF with setae *e* - 26 (21; 21) long located anterolaterad to *f* bases, 80 (85; 79) apart and setae *f* - 26 (26; 25) long, 40 (43; 37) apart. Both pairs tapering, pointed; seta *e* placed at a distance of 34 (37; 36) from *f* on each side. Segment H with two pairs of setae located ventroterminally - h_1 smaller, tapering, bluntly ended, 24 (29; 27) long, 15 (14; 12) apart, approximately twice longer than the distance between their bases; setae h_2 the longest of all body setae, 75 (67; 66) long, slender whiplike, 27 (30; 31) apart, ca. 2-3 times as long as h_1 and 3- 3.5 times shorter than the idiosoma length. Dorsal surfaces covered with an ornament of dimpled puncta, sparsely distributed individually (when bigger) or in groups of 2- 4 (when smaller); tergite H with its ornament inconspicuous with puncta of uniform size. Free posterior margins of tergites irregularly undulated without longitudinal striation. Due to the nature of dorsal surface ornamentation and obscuring changes of the cuticle in the mounting medium no copulatory structures remain discernible.

Ventral side (Fig. 4): Medial corners of trochanters of legs I divided by the distance of 26 (23; 17). Apodemes 1 slightly arched and without clear junction with anteromedial apodeme. The latter slightly longer than apodemes 1, ends posteriad to

the midlength of propodosomal plate. Medial extremities of trochanters II divided by the distance of 71 (68; 57). Posteriad to posteromedial ends of apodemes 2 coxal plates divided medially by the area of striated integument. Apodemes 2 curved medially, with internal nodules at anterolateral and posteromedial ends. Coxal fields II with convex posterior edges. Coxal setae *1b* 12 (10; 11) long, 41 (39; 33) apart, setae *2a* (on coxal plates II) 11 (11; 10) long, 44 (42; 41) apart. Propodosomal and metapodosomal coxal regions separated from each other by the area of soft, transversely folded integument. Anterior extremities of trochanters III divided by the distance of 90 (93; 78) and trochanters IV by the distance of 95 (102; 80). Apodemes 3 and 4 indistinctly formed, thickenings in medial ridges of coxal plates III and IV (homologous to posteromedial apodemes and apodemes 5) hardly discernible. Coxal plates III and IV divided medially by the broad area of soft, densely striated integument. Metapodosomal coxal region limited posteriorly by the concave (in paratypes straight) integumental fold, slightly overlapping aggenital - pseudanal region. Setae *3a* 11 (10; 10) long, 76 (71; 69) apart, located on coxal fields III anteriad to lateral extremities of apodemes 3, and anterolaterally to setae *3b*; the latter 10 (10; 10) long, 43 (52; 37) apart. Setae *4a* 10 (10;10) long, 53 (57; 44) apart; setae *4b* 11 (11;10) long, 18 (26; 17) apart, located posteromedially to the former, outside solid coxal fields IV. Aggenital platelets discrete, rounded, each with aggenital seta 11 (12; 11) long, 25 (32; 24) apart. Medially between aggenital platelets a big longitudinal slit formed by folds of soft, striated integument can be seen. It continues anteriorly inside the body in a form of indefinite flesh-walled channel. Pseudanal platelet small, broadly oval with minute anal slit. All setae on the ventral side slender, with blunt tips.

Legs (Figs 5-8): Empodium of leg I suckerlike, rounded, sessile, placed ventrodistally on tarsus. Empodia on tarsi of legs II, III and IV small, sessile inserted between claws on ventroapical face of the segment, much smaller than claws. Claws of all legs similar in size, sickle-shaped, those of leg I slightly weaker than on other tarsi. All tarsi about four times as long as wide basally with narrowing in their midlength; and almost three times longer than their tibiae. Tarsi articulated with tibiae in a way that suggests downward position when alive. Genua somewhat shorter than wide, (genu I markedly shorter than its length), with one thorn-like lateral seta *l'* subequal or shorter than its segment length. Femora I and II with two setae (one slender, long - *d*, one short spinelike - *l"*); femora III and IV with one short spine-like seta (provisionally denoted as *l'* due to its position along with *l'* on genua) anterolaterally. Chaetotaxy of leg segments is presented in table 1.

Leg I (Fig. 5) setation: 6(2)-6(2)-1-2 (for tarsus, tibia, genu and femur respectively, number of solenidia given in parentheses). Leg I (measured from the proximal end of femur to the top of a claw on the tarsus) 64 (64; 61) long, its tarsus 21 (25; 23) long (measured from the apex to the base). Setae *ft'* and *ft"* equally short, stick-like inserted on the dorsal face just over corresponding claws. Seta *tc'* located laterally to *ft*'s, shorter, *tc"* the longest of tarsal setae 1.5 time longer than the tarsus. Setae *pv'* and *pv"* inserted ventrally in distal 1/3 of the segment length; the former short,

spinelike, the latter slender, ca. twice longer. Solenidion ω_1 small 5 (4; 4) long, on the segment midlength, solenidion ω_2 the largest of all solenidia, clavate, stalked, prominent, 10 (9; 7) located dorsally at the base of segment. All other setae usually found among various dolichocybids, namely *pl"*, *u'*, *u"* and notably *p'* and *p"* indiscernible, and most probably absent. Tibia somewhat wider than long, with two short thorn-like setae (*l'* and *l"*) laterally, *v'* stiff, slimmer, longer, and *d* and *v"* (the longest) slender, pointed, over twice longer than the tibia length. Tibial sensory cluster located at the proximal articulation, of the shortest clavate ϕ_2 solenidion 6 (5; 6) long, famulus *k* 5 (4; 4) long, blunt, rodlike, and the largest, clavate ϕ_1 9 (8; 9) long. All solenidia of leg I with striated heads.

Table 1: *Rafamastix plenus* n. sp. - leg chaetotaxy

Ta	Tb	Ge	Fe
I: *ft' ft' tc' tc" pv' pv"* ω_1 ω_2	*d l' l" v' v"* ϕ_1 ϕ_2 *k*	*l'*	*d l"*
II: *tc' tc" pl" pv' pv"* ω	*d l' v' v"* ϕ	*l'*	*d l"*
III: *tc' tc" pl" pv' pv"*	*d l ' v' v"* ϕ	*l'*	*l'*
IV: *tc" pl" pv' pv"*	*d l' v' v"* ϕ	*l'*	*l'*

Leg II (Fig. 6, 6a) setation: 5(1)-4(1)-1-2. Leg II 69 (64; 64) long, its tarsus 27 (24; 24) long, about four times longer than wide basally with four robust spinelike setae: *pv'* smaller and *pv"*, *tc'*, *pl"* stouter) and long attenuate seta *tc"* as long as 3/4 tarsus length; all inserted close to the apex of the segment. Large ω solenidion with clavate, striated head, thicker than ω_2 on tarsus I and as big as ϕ_2 tibia I, 7 (6; 6) long, located at the base of its segment. Tibia II with two spinelike setae; *l'* thicker, *v'* almost twice longer than the former, thinner, about 1.5 time as long as its segment length; and two attenuated, pointed: *d* and *v"* of the same length, almost twice as long as *v'*. Tibial solenidion ϕ 4 (3; 3) small with striated head placed near the base of the segment.

Leg III (Fig. 7) setation: 5-4(1)-1-1. Leg III 65 (66; 64) long, tarsus III 24 (21; 21) long, almost 4 times longer than wide with four stout spine-like setae: *pv"*, *pv'* (the strongest), *pl"*, *tc'* and one long attenuate *tc"* shorter than 3/4 tarsus length; all inserted at the apex of the segment. Tibia III with three spine-like setae (*l'* and *d* thick, short while *v'* longer, slimmer), one attenuate long ventral *v"* and the solenidion ϕ, smaller and without distinct striation compared to that on leg II.

Leg IV (Fig. 8) setation: 4-4(1)-1-1. Leg IV 71 (71; 69) long, slimmer than the other ones, tarsus IV 29 (23; 24) long, about five times longer than wide basally, with three spinelike setae (*tc'* missing) and one long, attenuated seta *tc"* about 1/2 tarsus length. Tibia with three spinelike (*v'* again almost twice longer than *l'* and *d*), one attenuated seta *v"* and one solenidion ϕ as in leg III.

Males unknown.

ETYMOLOGY

The specific name "*plenus*" (Latin for "full", "fat") refers to the relatively large body size as for the member of the generally small-bodied *Formicomotinae*.

TYPE MATERIAL

Holotype - Ecuador, Pichincha, 7. XI. 1984, 3600 m., valley of the creek, (substrate unknown) leg. J. BALOGH (sample "Ecuador B 18").

The holotype female is deposited in the collection of the Zoological Department, Hungarian Natural History Museum, Budapest, Hungary.

Paratypes: two females with the same data as the holotype. One specimen remains in the collection of the Department of Animal Taxonomy and Ecology, A. Mickiewicz University, Poznań, Poland; another is deposited in the collection of Zoological Museum, Hamburg University, Hamburg, Germany.

DISCUSSION

The new generic taxon, although undoubtedly belonging to *Formicomotinae*, is still the most primitive member of the subfamily known to date. It fits well between the genera *Pavania* LOMBARDINI, 1949 and *Acanthomastix* MAHUNKA, 1972 (though closer to the latter). It differs from the former in the lack of sensilli sc_1 on the prodorsal shield, reduced number of setae on the podosomal venter (esp. on propodosoma), reduction of pseudanal region and reduced chaetotaxy of leg segments. On the other hand it is distinguished from the latter by a retention of two pairs of setae in metapodosomal venter, richer leg chaetotaxy of femora and tibiae, and from both by unusual, elongated form of leg tarsi as well as unexpectedly progressive reduction in tarsal I chaetal complement. The last two characters are provisional synapomorphies of the new genus, they need to be confirmed when more species are discovered.

The presence of four pairs of setae in the metapodosomal venter stands in conflict with the present diagnosis of the subfamily *Formicomotinae* SEVASTIANOV, 1980, however, a vast majority of characters indicate systematic closeness of the new genus to other genera in this group. On the other hand, the systematic relationships in *Dolichocybidae* at the level of subfamily - genus have not been entirely resolved yet, and require a thorough revision using both phylogenetic reconstructions based on morphology and biological data. In terms of phylogenetic systematics, this mixture of

derived and primitive characters indicates the position of *Rafamastix* as a sister group to a more derived *Acanthomastix* - *Dolichomotes* - *Formicomotes* stock. The closest kin and the outgroup to all these four genera is at present the genus *Pavania*.

The setal designation for the tarsus I of the *R. plenus* is arbitrary with respect to the fastigial setae *ft'* - *ft"*. Another possibility is that fastigials were reduced and setae which are inserted apically over the claws are indeed prorals *p'* and *p"*. However, the position of those setae is close to the level of tectals, while usually in early derived *Heterostigmata* prorals are located more distally. Differences in leg setation between *Rafamastix* and *Acanthomastix* may originate from divergent evolution, and thus the richer complement of tarsal setae in the latter does not need to be necessary the basic one for both.

Two paratype females differ in several respects from the holotype female on which the specific description was based. Paratype females (both) have their gnathosoma less quadrangular in shape, partially retracted under the anterior margin of prodorsal shield. The prodorsal shield (in contrast to holotype female) does not have undulated free posterior edge of the margin which is rather covered by a fold of integument associated with anterior part of the C tergite. Transverse stripes of intersegmental pleura are strongly plicated, as if to allow the enlargement of the body volume (physogastry?). Posterior edge of coxal plates of metapodosoma forms a straight and stiff fringe that can cover partially anterior edge of aggenital region of the opisthosoma. Apart from all the differences listed above there is also a noticeable one in the ratio h_2 / h_1; it is 2.31 and 2.44 in paratypes, while in the holotype it is 3.13. Examination of a large series of specimens may resolve the question whether the morphological gap between two groups of females exists as was previously established for *Formicomotes heteromorphus* MAGOWSKI, 1988. Due to the insufficient data on the habitat, no conclusions can be drawn on the ecological niche of the newly discovered taxon. It would not be however astonishing, if a closer relationship with invertebrate carrier were found in future, as it is often the case with other dolichocybids, and especially with members of the subfamily *Formicomotinae*.

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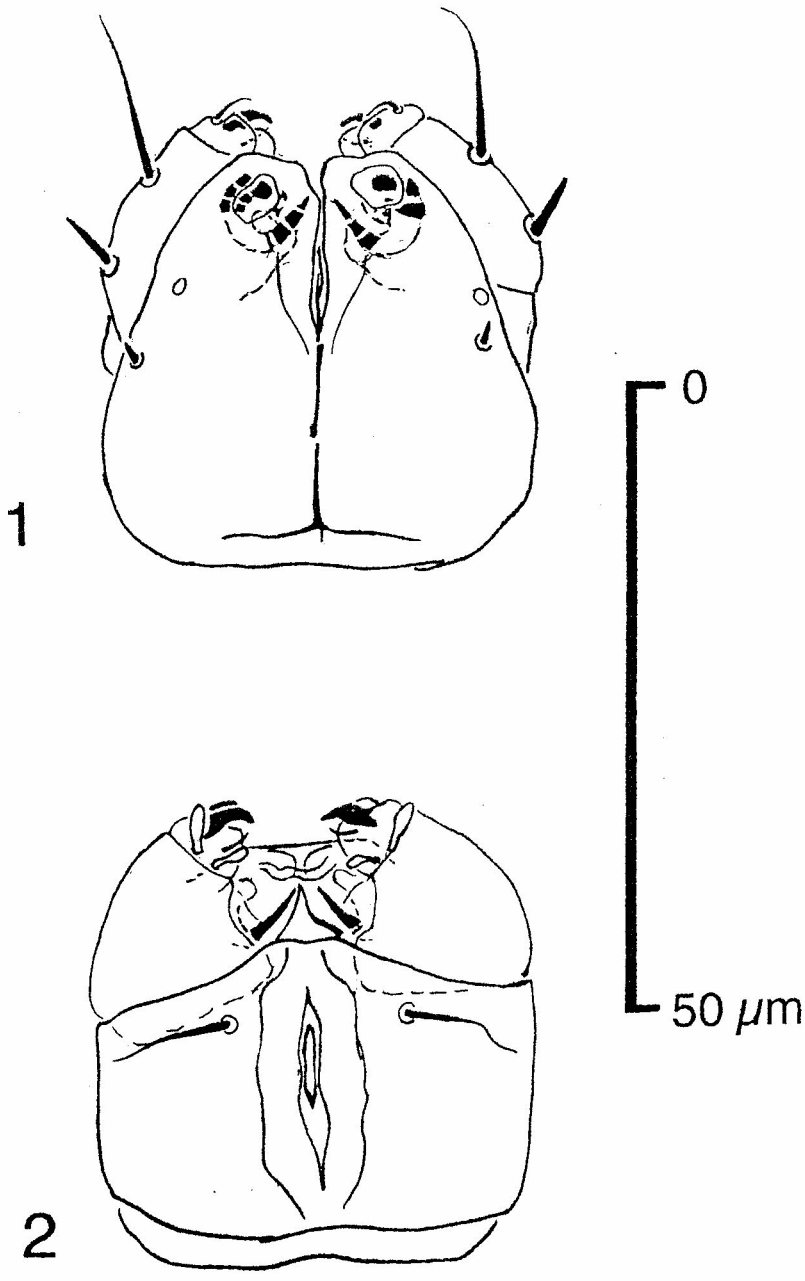
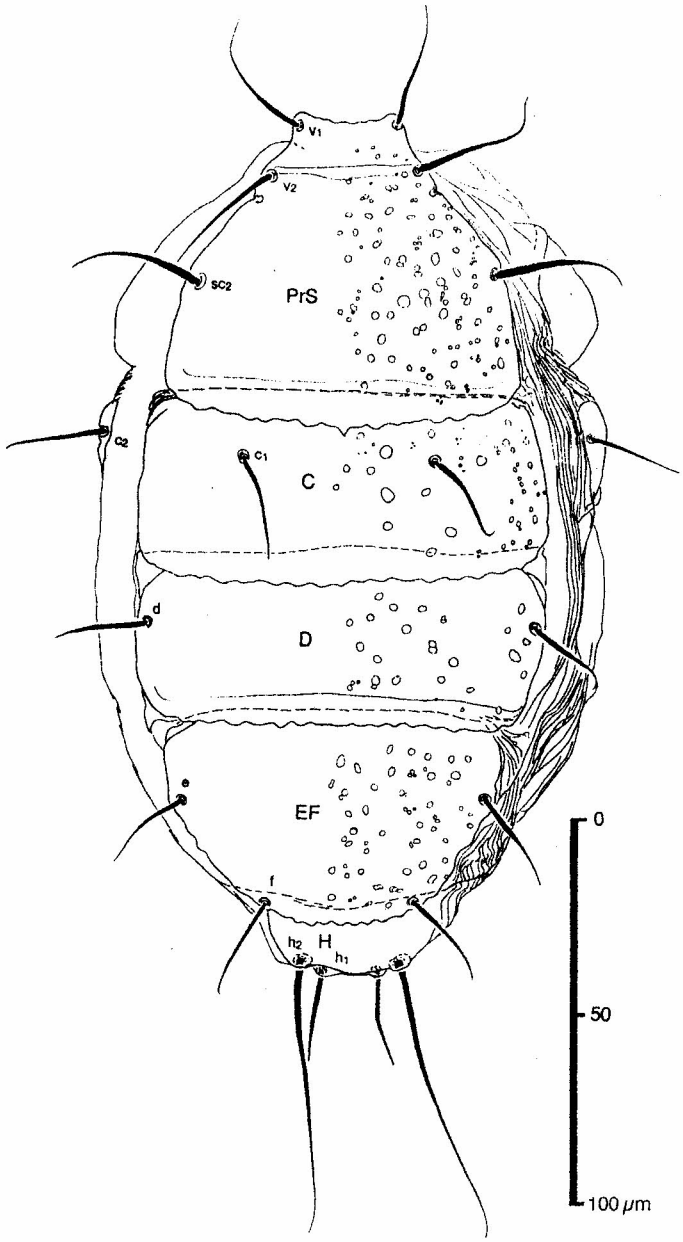
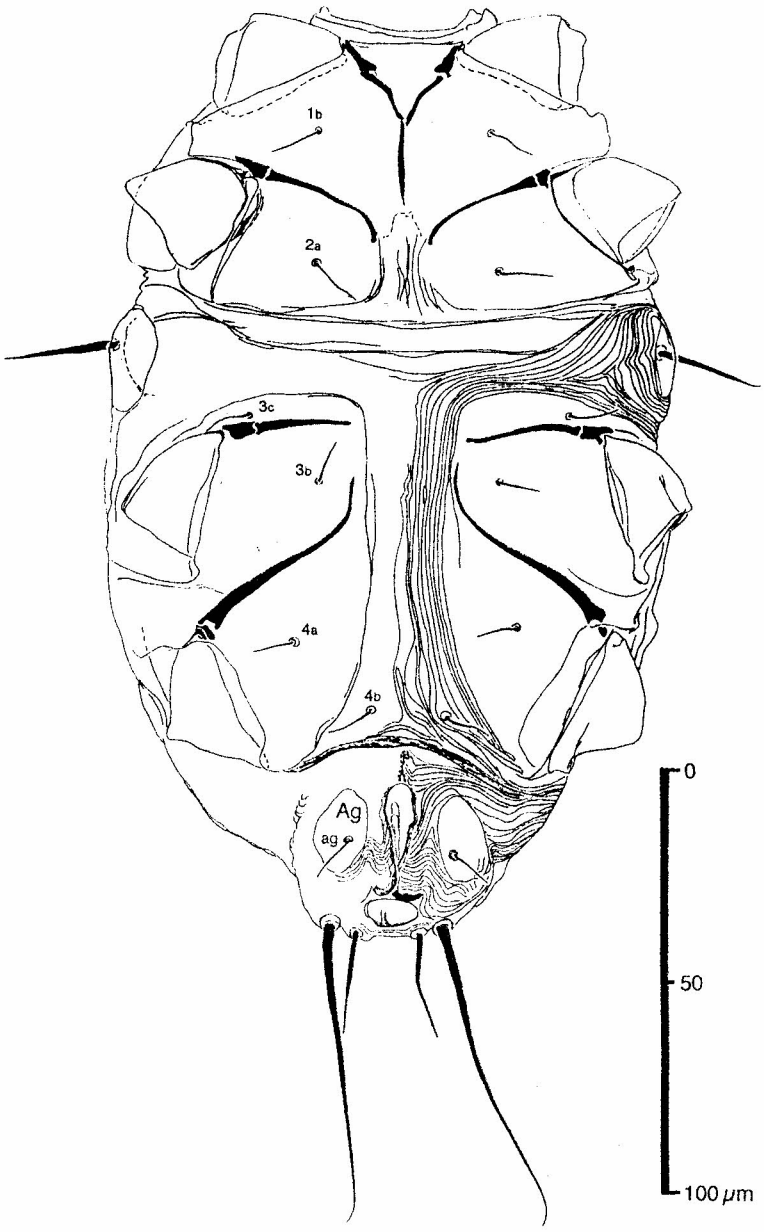


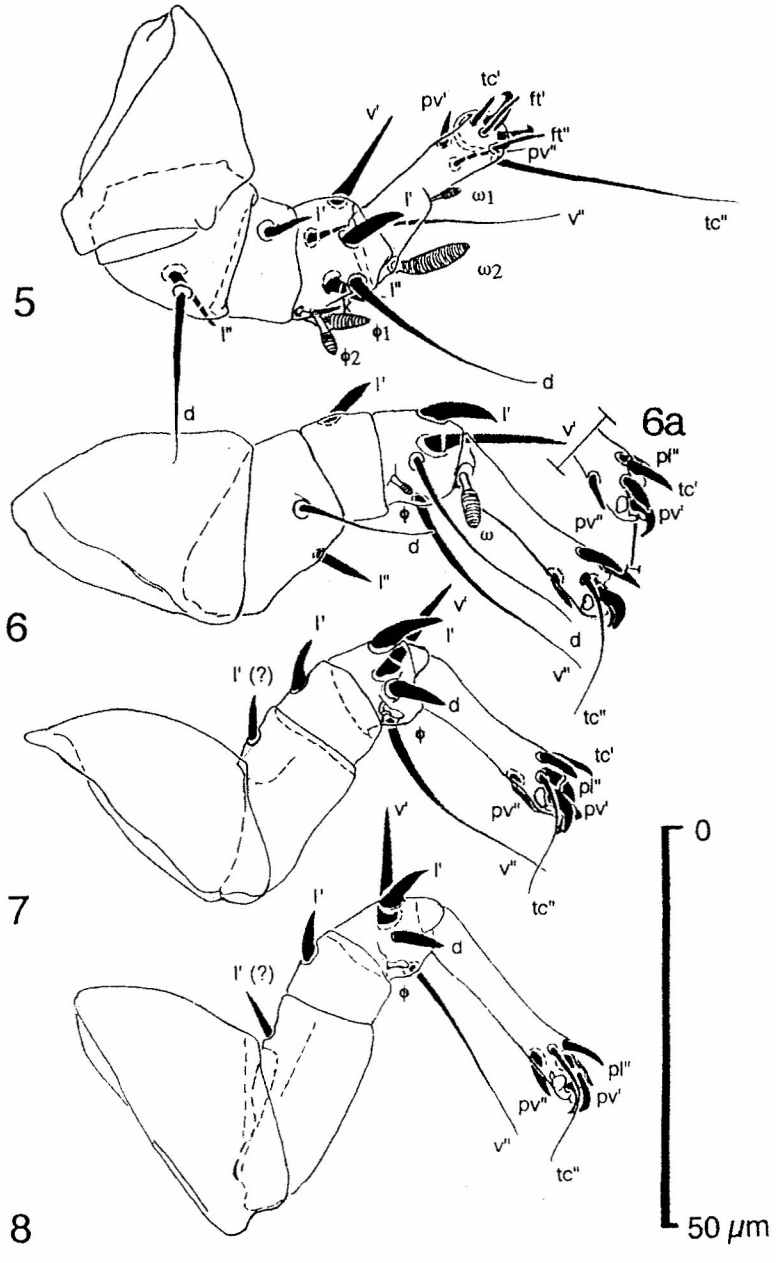
1-2. *Rafamastix plenus* sp. n. holotype female, gnathosoma: 1 - dorsal view, 2 - ventral view



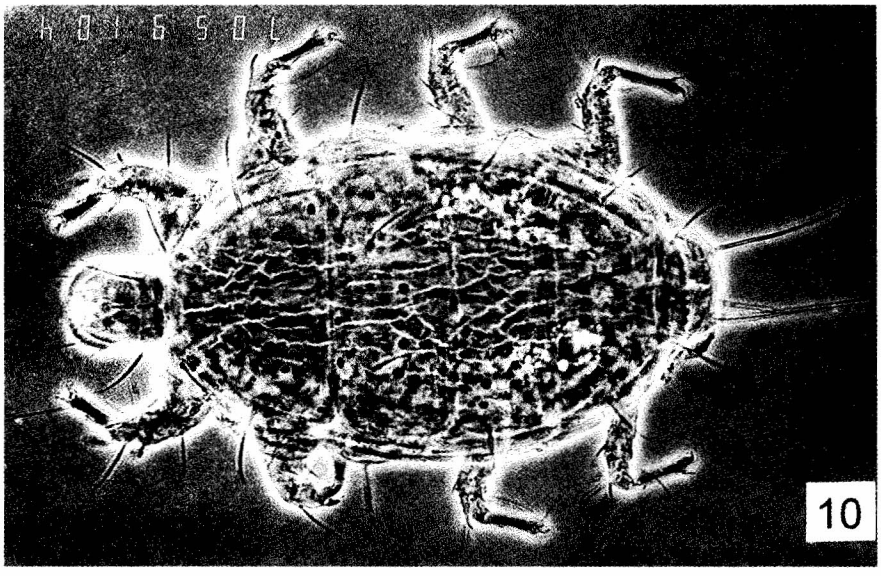
3. *Rafamastix plenus* sp. n. holotype female, dorsal side of idiosoma

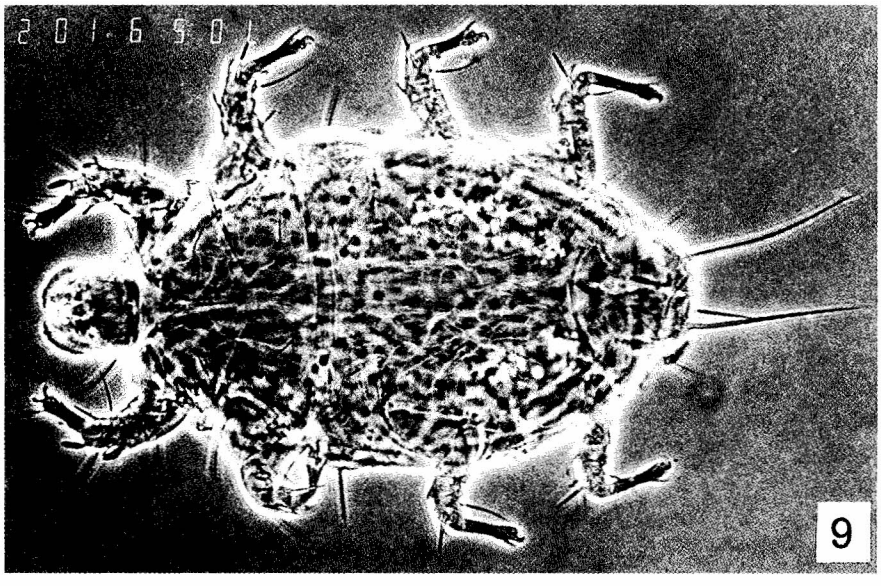


4. *Rafamastix plenus* sp. n. holotype female, ventral side of idiosoma



5-8. *Rafamastix plenus* sp. n. holotype female, legs (dorsal aspect): 5 - leg I, 6 - leg II, 6a - tarsal II apex, ventrolateral aspect, 7 - leg III, 8 - leg IV





9-10. *Rafamastix plenus* sp. n. holotype female, habitus: 9 - ventral, 10 - dorsal