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ORIBATID MITES (ACARI: ORIBATIDA) FROM VENEZUELA, II. NEW OR RARE SPECIES FROM MONTANE FORESTS

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A study on newly collected oribatids from Venezuela. Seven species are discussed, six are new to science. One new subgenus [*Rostrozetes (Rostrozetella)*] is established, belonging to the family Haplozetidae GRANDJEAN, 1936. Redescription of *Arcozetes bicuspidatus* HAMMER, 1958 is given. With 32 figures.

Key words: Acari: Oribatida, new taxa, redescription, Venezuela.

INTRODUCTION

For thoroughly knowing the orbatid mites, one of the most important tasks today is the examination of the canopy fauna of tropical rain forests. The fauna living there being associated primarily with moss and other epiphytic plants is rather inadequately known owing to its special conditions. In recent years large-scale investigations were initiated in Venezuela by an international team (e.g. PAOLETTI *et al.* 1990). Similar work had been performed by us earlier in Africa, and is just under way in Central and South America (MAHUNKA 2005) in collaboration with Prof. Dr. T. PÓCS, the renown bryologist and Dr. CS. CSUZDI, the excellent earthworm specialist.

Our primary aim is to study the oribatids, uropodids and earthworms living in the soil and bark-inhabiting moss, and further, to shed light on the similar or different species richness of the moss flora and the meso- and macrofauna of the referred continents (earlier e.g. CSUZDI 1993, ZICSI & CSUZDI 1997, 1999, MAHUNKA 2001 or newly CSUZDI 2006, KONTSCHÁN 2006). The present work in Venezuela is the second contributions after MAHUNKA 2005, and our forthcoming results will be published in several papers.

In this paper I discuss newly collected species belonging to different oribatid families, either new to science, or interesting and rare species, that are little known, or heretofore unknown in Venezuela, or for which original descriptions were inadequate. So, I give six descriptions of new species and one redescription of the type species of the genus *Arcozetes* HAMMER, 1958.

In this paper I usually follow the system of MARSHALL *et al.* (1987), with modifications by WOAS (2002) and SUBIAS (2004). In descriptions is used morphological terminology of the GRANDJEAN (e.g 1936, 1952) is used with some modifications (e.g. NORTON & BEHAN PELLETIER 1986, WOAS 2002).

LIST OF THE IDENTIFIED SPECIES

Dampfiellidae BALOGH, 1961

Beckiella costulata sp. n.
Beckiella disiuncta sp. n.

Sternoppiidae BALOGH et MAHUNKA, 1969

Sternoppia pocsiana sp. n.

Genavensiidae BALOGH, 1970

Arcozetes bicuspidatus HAMMER, 1958
Arcozetes rotundatus sp. n.

Haplozetidae GRANDJEAN, 1936

Rostrozetes (Rostrozetella) decorus sp. n.

Ceratozetidae JACOT, 1925

Guatemalozetes atypicus sp. n.

DISCUSSION OF THE STUDIED TAXA

Beckiella costulata sp. n.
(Figs 1–5)

Diagnosis: Lamellae conspicuous, strongly developed. Prodorsal surface – except the interlamellar part – smooth. Sensillus long, directed laterally, its head

lanceolate. Dorsosejugal suture absent, nine pairs of short notogastral setae present. Epimeral setae – except *1c, 3c* and *4c* – very short. Tarsus of leg IV with large, triangular elevation.

Material examined: Holotype: Estado Mérida, Parc Nacional Sierra Nevada. Andean montane rainforest dominated by *Decussocarpus* (Podocarpaceae) near the cable car station La Montaña. At 2460 m. alt. Litter and mosses. 15. Febr. 1997. Coll. S. & T. PÓCS (No. 9712[1]). 5 paratypes from the same locality. Holotype (1701-HO-05) and 4 paratypes (1701-PO-05): HNHM[2], 1 Paratypes: MHNG[3].

Description: Measurements: Length of body: 612–737 μm, width of body: 225–300 μm.

Prodorsum: Rostral apex slightly elongated. Prodorsum with well-developed, slightly curved costulae, nearly parallel, not far from each other (Fig. 5), they reach beyond the insertion of lamellar setae (Fig. 4) with distal end directed outwards. Interlamellar region and the surface of costulae foveolate. Rostral and lamellar setae setiform, distinctly barbed, interlamellar and exobothridial setae simple, thin and smooth. Sensillus long, directed slightly backwards and outwards; head simply lanceolate, smooth.

Notogaster: Dorsosejugal suture reduced, in its place only very thin lines visible (Fig. 1). Nine pairs of short notogastral setae present, setae c_2 absent. Setae *la* and *lm* setiform, smooth, *lp,* h_1 and h_2 spiniform, pilose, the remaining setae bacilliform, smooth. No essential difference in their length, only setae h_3 shorter than setae p_1–p_3.

Lateral part of podosoma: Tutorium short, pedotectum 1 small.

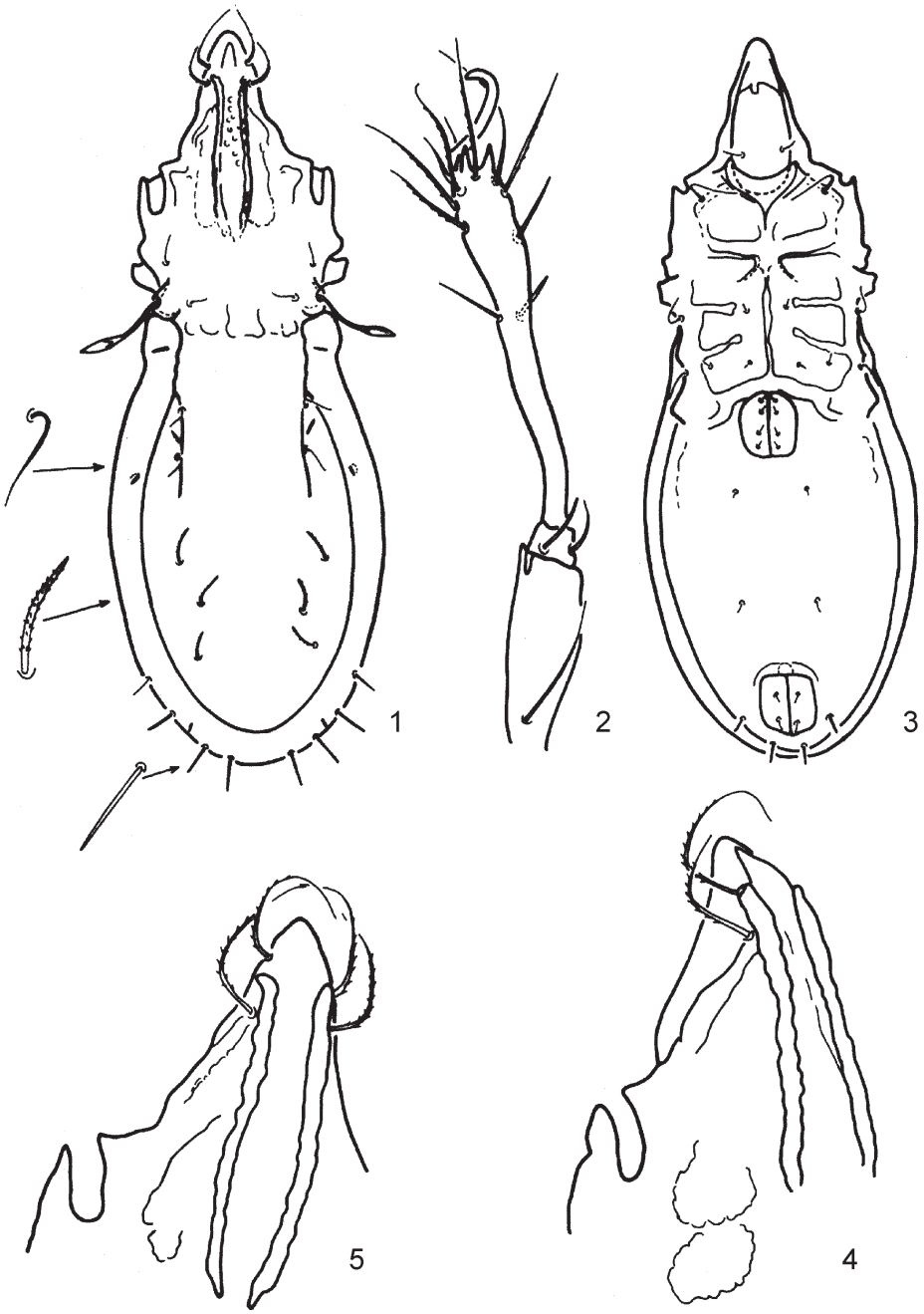
Ventral parts (Fig. 3): Infracapitulum with a small hollow anteromedially. Epimeral setal formula: 1–0–2–3. Setae *1c* much longer than the remaining ones, curving backwards. Some apodemes and borders well, others weakly developed. Longitudinal one well visible. Epimeral borders framing the epimeal region posteriorly conspicuously wide. All setae in the anogenital region short, setae *ad1* and *ad2* bacilliform, all others setiform.

Legs: Tarsus IV with a pair of large, sharply pointed elevation (Fig. 2).

Remarks: The new species is well characterised by the form of the wide and well-sclerotised lamellae. On this basis the new species belongs to species group of *Beckiella reticulofemorata* BALOGH et MAHUNKA, 1982, along with *B. opposita* MAHUNKA, 1982, *B. fratercula* BALOGH et MAHUNKA, 1978, etc. The new species is distinguished from all congeners by the conspicuous length of lamellae.

Etymology: Named after the well-developed prodorsal costulae.

1 Serial number of the collectors.
2 HNHM: deposited in the Hungarian Natural History Museum, Budapest, with identification number of the specimens in the Collection of Arachnida.
3 MHNG: deposited in the Muséum d'Histoire Naturelle, Geneva.



Figs 1–5. *Beckiella costulata* sp. n.: 1 = body in dorsal view, 2 = leg IV, 3 = body in ventral view, 4 = rostral part of the podosoma in lateral view, 5 = rostral part of the podosoma in dorsal view

Beckiella disiuncta sp. n.
(Figs 6–9)

Diagnosis: Costulae absent. Prodorsal surface with a pair of large, irregular, laterally framed fields. Sensillus short, directed laterally, its head fusiform. Dorsosejugal suture well observable, convex, ten pairs of heterogenous notogastral setae present. Epimeral setae partly flagellate, long. Tarsus of leg IV without a large, triangular elevation.

Material examined: Holotype: Estado Mérida. Secondary mesic forest N of Mérida town, on the ridge above the district of Maria Norrte, at 1800 m alt. Litter. 27. March 1997. Coll. S. & T. PÓCS (No. 9741). Four paratypes from the same sample. Holotype (1702-HO–05) and 3 paratypes (1702-PO-05): HNHM, 1 paratype: MHNG.

Measurements: Length of body: 499–700 µm, width of body: 237–287 µm.

Prodorsum: Rostral apex slightly elongate. Prodorsum with a pair of large fields, framed by thin lines medially and a pair of distinct ones laterally (Fig. 6). Costulae absent. Rostral and lamellar setae setiform, their distal end directed inwards, distinctly barbed, interlamellar and exobothridial setae simple, thin and smooth. Sensillus short, directed outward; its head roundish and finely aciculate.

Notogaster: Distinct and wide dorsosejugal suture present, curved medially and posteriorly. Ten pairs of heterogenous notogastral setae present, setae c_2 short, thin, sometimes hardly visible. Setae *la* also thin, curved, directed outwards (Fig. 8). Setae *lm* and the other setae setiform or bacilliform, well, or slightly pilose. Setae *lm, lp,* h_1 and h_2 curved, with very short bristles, the remaining ones bacilliform, rarely pilose. No essential difference in their length, only setae h_3 shorter than setae p_1–p_3.

Lateral part of podosoma: Tutorium well developed, pedotectum 1 long.

Ventral parts (Fig. 7): Infracapitulum simple. Epimeral setal formula: 1–0–2–3. Setae *1c, 3b* and *3c* much longer than the others. All apodemes and borders well developed, composing a contiguius network. Longitudinal one also well visible. All setae in the anogenital region short, adanal setae bacilliform, the others setiform.

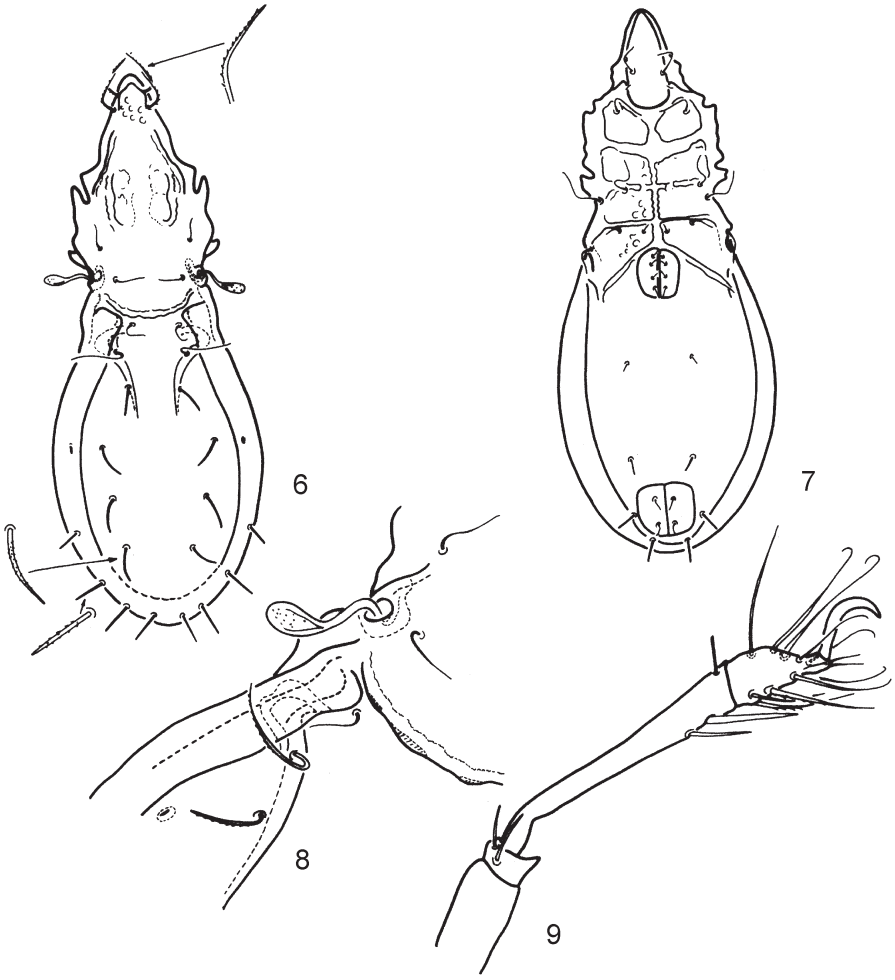
Legs: Tarsus IV simple, without apophysis or other elevation (Fig. 9).

Remarks: The new species is most similar to *B. silvai* BALOGH et MAHUNKA, 1979, however, the notogastral setae of the new species are very long, much longer than the similar ones of *B. silvai.*

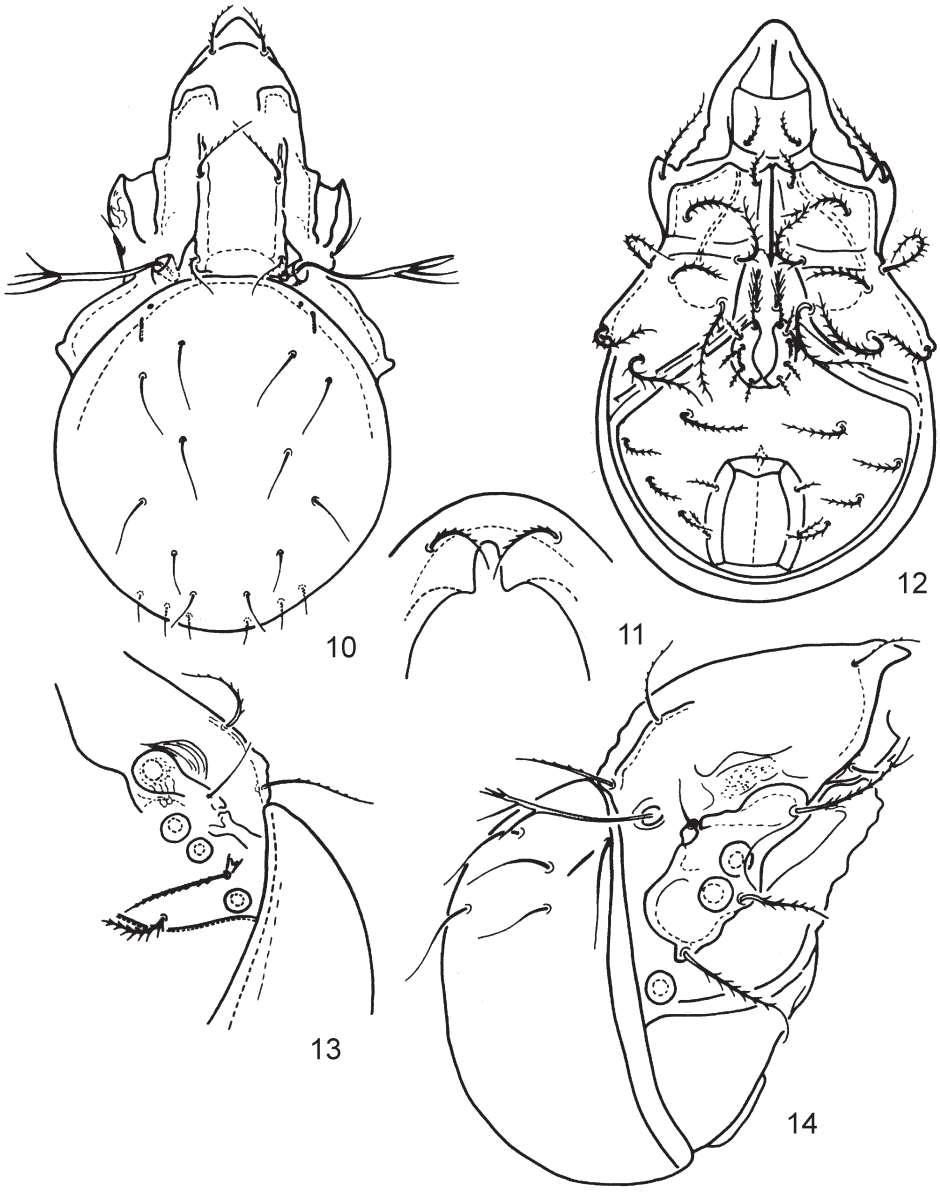
Etymology: Named after the separate large reticulate fields on the prodorsum.

Sternoppia pocsiana sp. n.
(Figs 10–14)

Diagnosis: Rostrum incised. Prodorsum well sclerotised, with long costulae. Sensillus with 4 simple and short branches. Notogastral setae simple, short. Epimeral region well framed, with characteristic plates. All epimeral setae long and conspicuously ciliate or plumose. In contrast, genital and anal setae shorter, but the aggenital and adanal ones are very long.



Figs 6–9. *Beckiella disiuncta* sp. n. 6 = body in dorsal view, 7 = body in ventral view, 8 = humeral part of the notogaster, 9 = leg IV



Figs 10–14. *Sternoppia pocsiana* sp. n.: 10 = body in dorsal view, 11 = rostral apex in frontal view, 12 = body in ventral view, 13 = lateral part of the podosoma in lateral view, 14 = lateral view of the body

Material examined: Holotype: Estado Mérida. Parque Nacional Sierra de la Culata, 12 km N of Mérida town. Mossy cloud forest at 2100 m alt. 4 March 1997. (Coll. S. & T. PÓCS) (9726). Six paratypes from the same sample. Holotype (1709-HO-05) and 5 paratypes (1709-PO-05): HNHM and 1 paratypes: MHNG.

Measurements: Length of body: 775–850 µm, width of body: 474–550 µm.

Prodorsum: Rostral apex with a deep, U-shaped incisure (Fig. 11). Prodorsal surface with a pair of long costulae, in front of them one pair of horseshoe-shaped formations (Fig. 10) and at the base of the rostral setae a thin, but distinct, arched transverse line present. Costulae reaching anterior to the insertion of the lamellar setae; rostral and lamellar setae nearly equal in length, interlamellar ones longer, all three pairs thin and well ciliate. Exobothridial setae also thin and smooth (Fig. 13). Sensilli very long, slightly dilated distally, with 4 simple distal branches, sometimes bearing some minute spines.

Notogaster: Nine pairs of simple notogastral setae present, setae *c*2 represented only by their alveoli. All other notogastral setae thin and simple, hardly ciliate. Setae *p* in postero-marginal position, somewhat shorter than the others.

Lateral part of podosoma: Well-sclerotised, a longitudinal laths observable as if a continuation of the pedotectum 1, behind the insertion of the exobothridial setae. Above the pedotectum 1 a conspicuous field consist of parallel lines (Fig. 14). Acetabula IV located far from acetabula III.

Ventral parts (Fig. 12): Setae *h* and all the other setae – except penicillate setae *4a* – with very long but sparse cilia. Two epimeral plates touching medially, their postero-median end sharply pointed and they eind, far from the genital opening. Genital opening much smaller than anal one, anterior genital setae longer than the others. All adanal setae located on the ventral plate in adanal position. Lyrifissures *iad* in adanal position, hardly observable.

Legs: Of the normal form, chaetome characteristic for the genus *Sternoppia*.

Remarks: On the basis of the simple sensilli the new species is well distinguishable from all congeners. A similar simple sensillus is known only in *Sternoppia* (*Synoppia*) *quadriseta* (BALOGH et MAHUNKA, 1969)[4], however the latter has 2 pairs of very long notogastral setae, all other setae short, but in the new species 7 pairs are much longer than the others. The other species of the genus *Sternoppia* have ramifying branches of their sensilli.

Etymology: I dedicate the new species to my friends Prof. Dr. T. PÓCS and his wife SACY PÓCS, for their joint and intensive collecting work all over the world.

Arcozetes bicuspidatus HAMMER, 1958
(Figs 19–21)

The genus, along with its type species, was described by HAMMER (1958) from Argentina (the environs of Salta). Both the description and the drawing are on the whole correct, however, having studied the holotype, some minor additions are needed.

4 I am not sure whether the genus *Synoppia* (BALOGH et MAHUNKA, 1969) is fully synonymous with the genus *Sternoppia*. Further investigation is necessary.

Lamellae are broad, almost touching, as far as I can see there is no translamella between them. The inner apex is long, the outer one is dentiform. The lamellar setae estends from a hollow near the outer apex, the insertion point being on the ventral side. The outer margin of tutorium is dentate (Fig. 20). The distal end of sensillus is strongly narrowed, almost setiform (Fig. 19). This feature is not clearly observable on the drawing, although it is one of the most significant features of both A. bicuspidatus and the species described below.

Arcozetes rotundatus sp. n.
(Figs 15–18, 22–24)

Diagnosis: Rostrum tubuliform, like a snout of a pig. Lamellae narrow, with sharply pointed apex and large teeth. Tutorium widened distally with 2–3 teeth on a distal cusp. Sensillus elongate, roundish (Fig. 19). Notogaster very large, pteromorphae also large rounded laterally. Four pairs of porose areae and ten pairs of notogastral setae distinct. Infracapitulum large, galumnoid type. Anogenital setal formula: 5–1–2–2.

Material examined: Holotype: Venezuela, Parque Nacional Henri Pittier, seasonal rain forest: 20 April, 2005 – in and around a forest stream litter and soil. Leg. Cs. CSUZDI & D. MURÁNYI (B-36). Seven paratypes from the same sample; holotype (1703-HO-05) and 5 paratypes (1703-PO-05): HNHM, 2 paratypes: MHNG.

Measurements: Length of body: 240–255 μm, width of body: 182–194 μm.

Prodorsum (Fig. 20): Rostral apex wide in dorsal view and tubuliform, like a snout of a pig in lateral view (Fig. 16). Lamellae narrow, touching but not fused medially. Their apices long, sharply pointed. Both bearing a sharp tooth, and a deep hollow, where lamellar setae (Fig. 17) insert. Rostral setae arising at apices of tutorium, these and lamellar and interlamellar setae very long. Bothridium with a very long interior apohysis (Fig. 18), sensilli fusiform, without sharply pointed distal apex.

Notogaster: Very wide, dorsosejugal region convex (Fig, 15). Pteromorphae angular anteriorly (in dorsal view). Ten pairs of distinct notogastral setae present, one pair of them arising on the pteromorphae. Four pairs of small areae porosae present (Fig. 22). They are much smaller, than those of *A. bicuspidatus* (Fig. 21).

Lateral part of podosoma: Tutorium very large and long, its distal part dilated, with some teeth on the distal cusp (Fig. 16). Some smaller teeth also visible on its lateral part. Pedotectum 1 large, convex, and smooth (Fig. 24). Exobothridial setae long. Circumpedal carina wide, well discernible, custodium long.

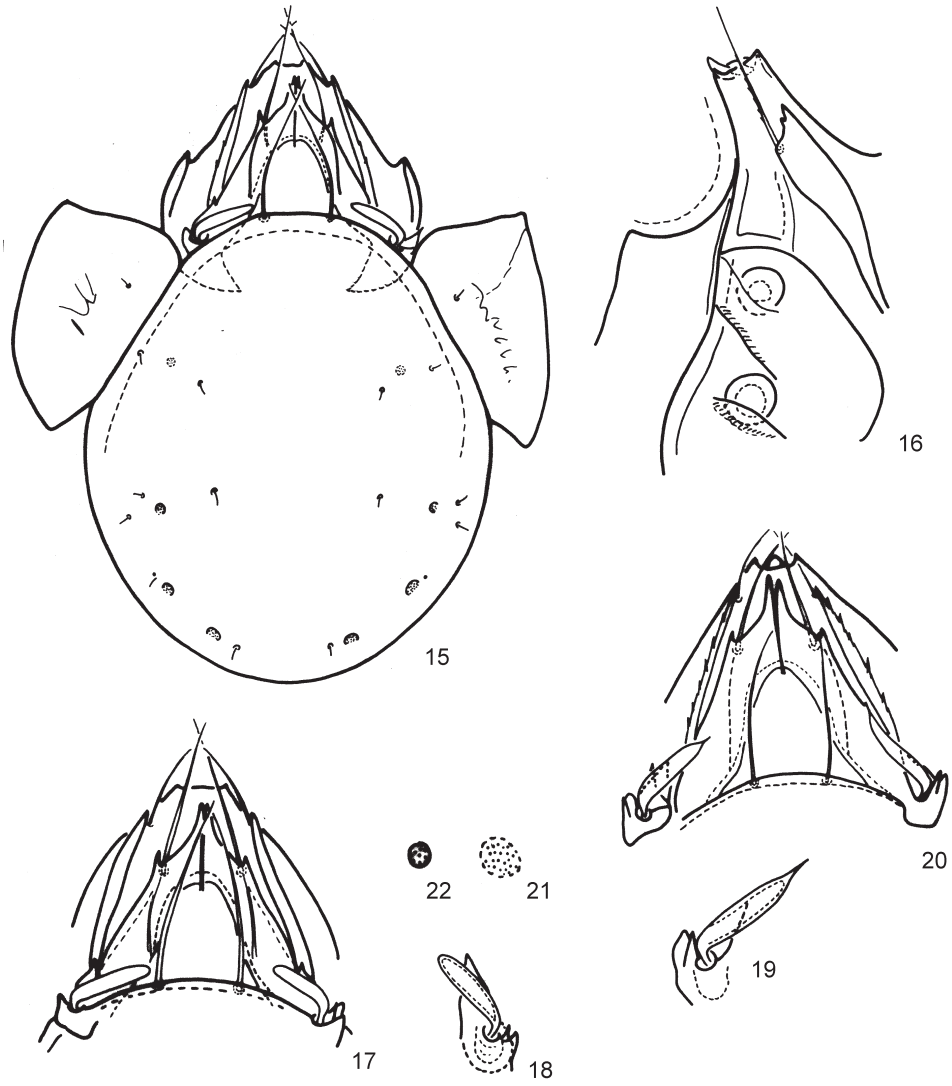
Ventral parts (Fig. 23): Infracapitulum large, anteriorly rounded, galumnatoid type. Lateral part of pedotectum 1 longitudinally striate. Discidium and custodium large. Epimeral region also of galumnatoid type. Apodemes short, epimeral setation: 1–1–2–2. Anogenital setal formula: 5–1–2–2. All setae well discernible, genital setae much longer than the anal and adanal ones.

Legs: All legs tridactylous.

Remarks: Heretofore only the type species of *Arcozetes* (*A. bicuspidatus* HAMMER, 1958) has been known. The new species is distinguishable from the type

species by the form of the sensillus (sharply pointed distal end of the distal end in the type species) (Fig. 19).

Etymology: Named after the form of the sensillus.



Figs 15–22. Distinguishing characters of *Acrozetes* species. 15–18 = *Arcozetes rotundatus* sp. n.: 15 = body in dorsal view, 16 = rostral part of the podosoma in lateral view, 17 = prodorsum in dorsal view, 18 = sensillus. 19–21 = *Arcozetes bicuspidatus* HAMMER, 1958: 19 = sensillus, 20 = prodorsum in dorsal view, 21 = porose area Aa. 22 = *Arcozetes rotundatus* sp. n., porose area Aa

Rostrozetella subgen. n.

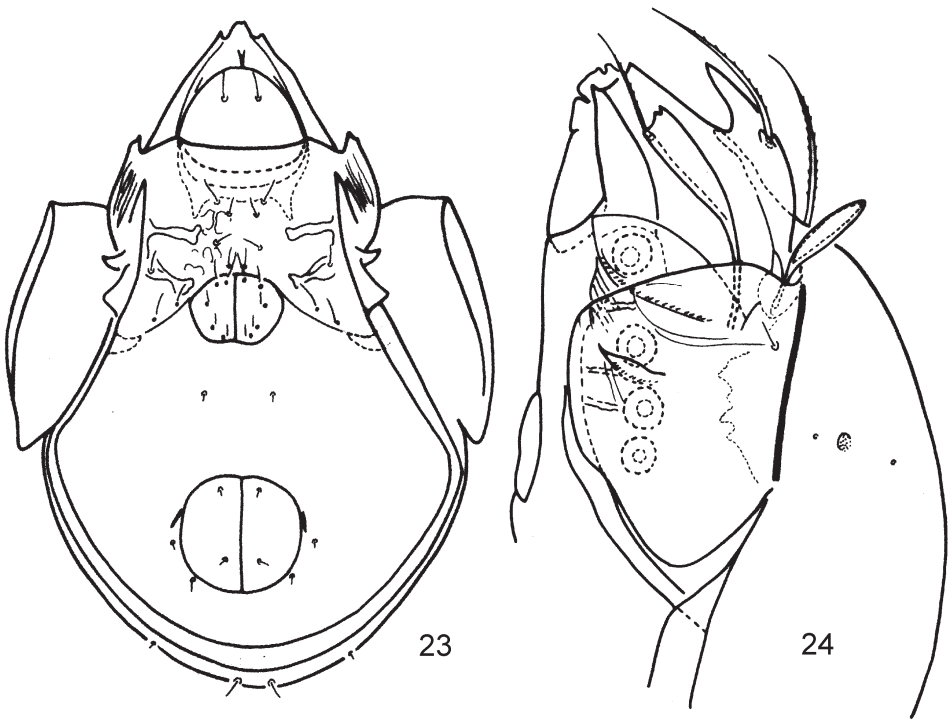
Diagnosis: Dorsosejugal suture peculiarly arched forwards, the whole median part penetrating into the interbothridial region. Fourteen pairs of notogastral setae present.

Type species: *Rostrozetes* (*Rostrozetes*) *decorus* sp. n.

Remarks: I accept the opinion of SUBIAS (2004) that *Trachyoribates* BERLESE, 1908 and *Rostrozetes* SELLNICK, 1925 are separate taxa. The new subgenus is distinguishable from the nominate subgenus by the above mentioned features.

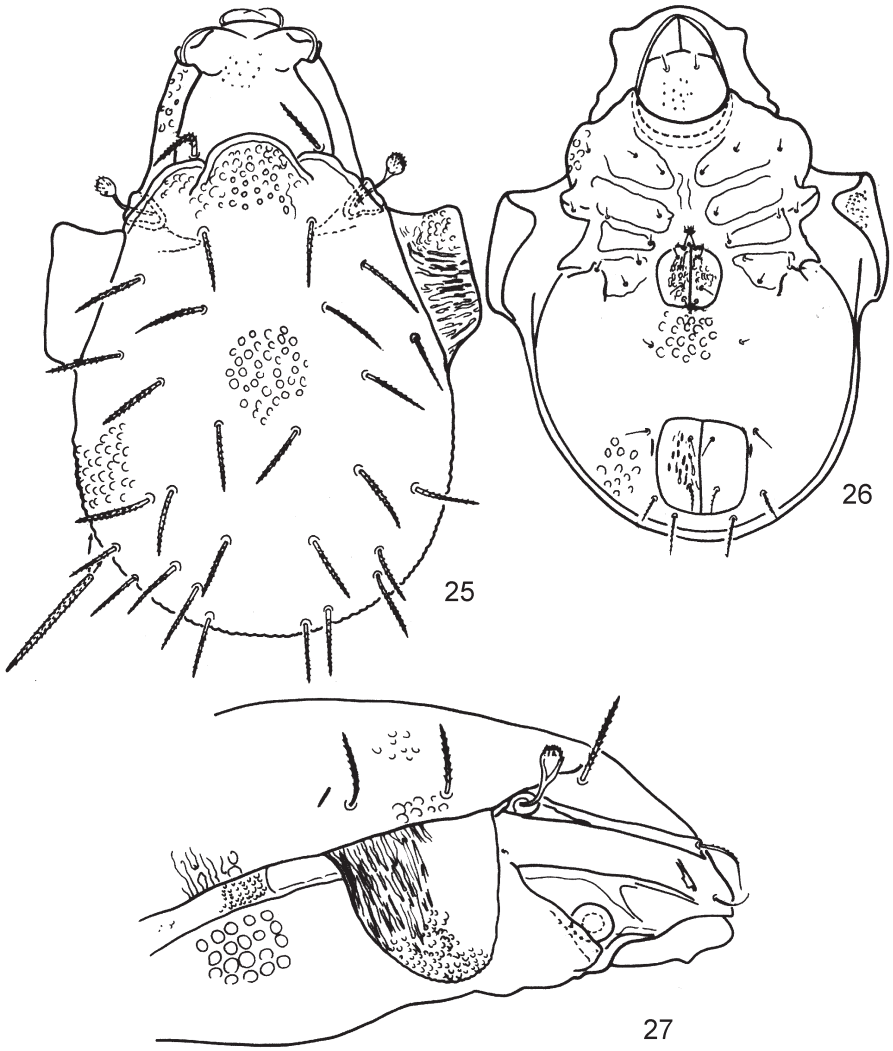
Rostrozetes (Rostrozetella) decorus sp. n.
(Figs 25–27)

Diagnosis: Rostrum wide, apex slightly convex. Lamellae run marginally, having a very short, spiniform outer apex. Rostral and lamellar setae setiform, curved inwards, interlamellar ones spiniform, straight. Sensillus with small rounded



Figs 23–24. *Arcozetes rotundatus* sp. n. 23 = body in ventral view, 24 = body in lateral view

head. Dorsosejugal region well penetrating into the interlamellar region medially. Notogastral surface covered by pustules laterally, and alveoli medially. Pteromorphae ornamented by transversal fossae basally and tubercles laterally. Fourteen pairs of spiniform notogastral setae present. Ventral regions ornamented by foveolae of different shapes in varying form. Epimeral setae conspicuously short or minute. Anogenital setal formula: 5–1–2–3.



Figs 25–27. *Rostrozetes* (*Rostrozetella*) *decorus* sp. n.: 25 = body in dorsal view, 26 = body in ventral view, 27 = lateral part of the podosoma in lateral view

Material examined: Holotype: Venezuela, Parque Nacional Henri Pittier, seasonal rain forest: 20 April, 2005 – in and around a forest stream litter and soil. Leg. Cs. CSUZDI & D. MURÁNYI (B-36). Six paratypes from the same sample; holotype (1690-HO-05) and 5 paratypes (1690-PO-05): HNHM, 1 paratype: MHNG.

Measurements: Length of body: 433–490 μm, width of body: 314–365 μm.

Prodorsum: Rostrum very wide, convex, or slightly waved anteriorly. Ornamented by small and sparse foveolae. Rostral apex bent downwards, beak-like in lateral view (Fig. 27). Lamellae running on the lateral margin, typical for the genus, their surface alveolate. Rostral and lamellar setae (Fig. 25) setiform, narrow, weakly pilose, directed inwards. Interlamellar setae spiniform, mostly straight, distinctly pilose, much shorter than lamellar setae. Sensillus short, directed outwards, with small and sparsely spiculate head. Bothridium simple, cup shaped. Exobothridial setae minute.

Lateral part of podosoma (Fig. 27): Tutorium wide, bifurcate distally, without true cusp. Rostral seta short, located far anteriorly from the tutorium. Pedotectum 1 small, hardly covering the acetabulum of leg I. Discidium broad, with sharply pointed posterior end. Circumpedal carina present.

Notogaster: Dorsosejugal suture with a peculiar median part, which penetrates into the interlamellar region. Pteromorphae very large, tongue-shaped, with some fossae and rugae in their basal part, and distinctly granulate or pustulate in the lateral part (Fig. 25). Notogastral surface without depression or hollows, foveolate anteriorly and tuberculate posteriorly. Fourteen pairs of notogastral setae, all spiniform and distinctly pilose.

Ventral regions (Fig. 26): Infracapitulum large, its anterior margin convex. Setae *h*, arising anteriorly. The shape of apodemes and epimeral borders typical for this genus, three complete transversal bands (*bo. 2, bo. sej. and bo. 3*), *bo. 4* narrower than the others. Between them a wide longitudinal connection. Epimeral surface nearly smooth. Epimeral setal formula: 3–1–3–3, all setae short, hardly observable. Ventral plate distinctly foveolate. All genital setae short and smooth, anterior setae slightly longer than the others. Anogenital setal formula: 5–1–2–3, aggenital setae minute, seate ad_1 and ad_2 located in postanal position, ad_1 the longest of all. Lyrifissure *iad* short, in adanal position.

Legs: Typical for the genus, all femora with blade-like formation, their surface partly foveolate.

Remarks: Not a variable species (BECK 1965). The peculiar sculpture on the body, length and form of the prodorsal and notogastral setae and the form of the dorsosejugal suture are constant. These characters well distinguish the species and *R. (Rostrozetella) schalleri* BECK, 1965, (comb. n.) belonging also to this subgenus, from the other *Rostrozetes* (*Rostrozetes*) species.

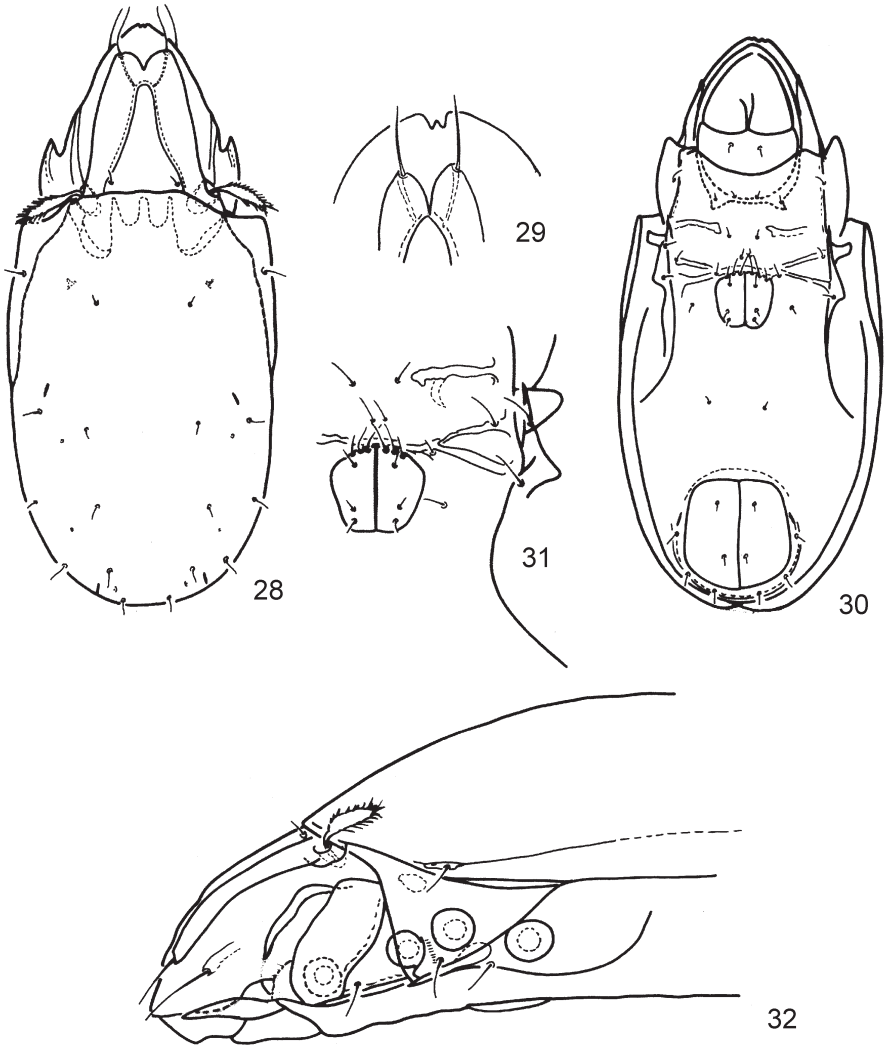
Etymology: Named for the sculpture of the notogaster and the pteromorphae.

Guatemalozetes atypicus sp. n.
(Figs 28–32)

Diagnosis: Rostral apex with small teeth, or irregularly undulate. Lamellae wide, completely fused with each other, without separate apices. A distinct, curved tutorium present. Dorsosejugal suture undulate, pteromorphae triangular. Ten pairs of short notogastral setae and 3 pairs of minute sacculi or indistinct porose ar-

eas present. Discidium and custodiumm well developed. Anogenital setal formula 6–1–2–3. Legs monodactylous.

Material examined: Holotype: Estado Mérida. Secondary mesic forest N of Mérida town, on the ridge above the district of Maria Norrte, at 1800 m alt. Litter. 27 March, 1997. Coll. S. & T. PÓCS (No. 9741). Four paratypes from the same sample. Holotype (1704-HO-05) and 3 paratypes (1704-PO-05): HNHM, 1 paratype: MHNG.



Figs 28–32. *Guatemalozetes atypicus* sp. n. 28 = body in dorsal view, 29 = rostrum in frontal view, 30 = body in ventral view, 31 = genital region, 32 = lateral part of the podosoma in lateral view

Measurements: Length of body: 301–319 μm, width of body: 144–154 μm.

Prodorsum: Rostrum divided, mostly tripartite (Fig. 29), or with some teeth. Lamellae large, their anterior part completely fused, no line between them (Fig. 28). Lamellar setae arising on their distal end, lamellar cusps absent. Interlamellar region long, it basal part, near the dorsosejugal suture, with a pair of very short interlamellar setae. Rostral and lamellar setae also simple, comparatively short, setae *le* shorter than setae *ro*.

Notogaster: Dorsosejugal suture distinct, sometimes weakly undulate. Pteromorphae immovable. Ten pairs of thin, simple notogastral setae and 3 pairs of hardly observable, minute sacculi or pori present. Posterior notogastral tectum divided, its parts overlapping.

Lateral part of podosoma (Fig. 32): Tutorium short, with curved, sharply pointed apex, narrowing distally. Rostral seta inserted far from it, on a small tubercle. Pedotectum 1 large, convex distally. Circumpedal carina gradually narrowing, not reaching to the lateral margin of the ventral plate (Fig. 29).

Ventral parts (Fig. 29): Infracapitulum triangular medially. Epimeral region distinctly framed by longitudinal lines. Apodemes and epimeral borders characteristic, *bo. sej.* and *bo. 3* fused medially and compose a transversal structure in front of the genital aperture, *bo. 4* absent. Epimeral setal formula 3–1–3–3. All setae simple, setiform, comparatively short. Setae *1c* arising near pedotectum 1. Discidium and custodium well-developed (Fig. 30). Anogenital setal formula 6–1–2–3. Anal plates framed by a crest, adanal setae arising on it. All setae of this region short and simple.

Legs: All legs monodactylous. Femur of leg IV with wide blade-like formation basally.

Remarks: On the basis of the form of the body and the sensillus, the movable pteromorphae, the anogenital setal formula, the setation of the legs and the form of the palp tarsus and its setation the new taxa is relegable to the family Ceratozetidae JACOT, 1925. From the heretofore known species it is well distinguishable by the wide lamellae, the shape of the tutorium and the form of the epimeral borders and apodemes. This combination of features is unknown in the family.

Etymology: Named after the atypical form of the rostral apex, which is undulate and bears small teeth.

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