CONTRIBUTION TO THE KNOWLEDGE OF PTYCTIMOUS MITES (ACARI: ORIBATIDA) FROM MADAGASCAR

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Three new species of ptyctimous oribatid mites, Oribotritia mahunkai sp. n., Protophthiracarus mahunkai sp. n. and Atropacarus (Hoplophorella) mahunkai sp. n., collected in various localities in Madagascar, are described and figured. The species found are representatives of three different genera, whereas one of them belongs to the superfamily of Euphtihircaroidae, family Oribotritiidae Grandjean, 1954, and the other two to the superfamily of Phthiracaroidae, family Steganacaridae Niedbala, 1986 from the Euptycitima group.

Key words: oribatid mites, Phthiracaroidae, Euphtihircaroidae, new species, Mahunka.

INTRODUCTION

Present paper includes descriptions of three new species of ptyctimous mites named in honour of Prof. Sándor Mahunka (1937–2012), who was an admirable person, a brilliant and respected zoologist, highly acclaimed world class specialist on taxonomy and systematics of soil acariform mites, with special emphasis on Acanthida, Tarsonemida and Oribatida. He has published more than 530 original scientific papers frequently dealing with the mite fauna of tropical and subtropical countries. With its enormously rich soil mite fauna, and high species and genus level endemism (NIEDBALA 2001, SCHATZ 2004), his favorite country, from this perspective, was Madagascar representing an important biodiversity hotspot. In his series of papers (MAHUNKA 1983, 1993, 1996, 1997, 1999, 2009a, b, 2010, 2011), he described many new ptyctimous mite species from different localities of Madagascar. His list of mite species recorded from this landmass (MAHUNKA 2002) contains 166 species, 105 genera and subgenera and 41 families of oribatids, including 22 species of Phthiracaroidae and 15 species of Euphtihircaroidae. Altogether, 44 species of ptyctimous mites have been recorded from Madagascar so far: 27 species belonging to the superfamily Phthiracaroidae and 17 species to Euphtihircaroidae. The scientific legacy and impact of Prof. S. Mahunka’s papers to our knowledge on soil mites is enormous and will inspire and influence generations of future acarologists, soil zoologists and ecologists.
MATERIAL AND METHODS

Dr. P. Baňař (Brno, Czech Republic) collected samples by sifting soil and litter samples from various parts of Madagascar during his expeditions in the years 2010–2012, and kindly provided us this material.

Mites were extracted from soil samples by using modified Winkler-extractors. Assorted mite specimens were preserved in 80% ethanol, mounted and cleared with 85% lactic acid for temporary slides and transferred to slides with glycerol for microscopic observation. Observations, determination, measurements, and illustrations were made using a standard light microscope equipped with a drawing attachment. All measurements are given in micrometres. Terminology used was derived from NiedbałA (2000).

Type material is partly deposited at the Department of Animal Taxonomy and Ecology, Poznań, Poland (DATE), at the Institute of Soil Biology BC ASCR, České Budějovice, Czech Republic (ISB), and at the Natural History Museum, Genève, Switzerland (NHMG).

Oribotritia mahunkai sp. n.

(Figs 1A-F)

Diagnosis – Two pairs of lateral carinae on prodorsum, dorsally marked stronger than ventrally. Sensilla short, dilated medially. Notogastral setae short, rigid, except filiform setae c₃ and p₁.

Aggenital setae a₈₁ considerably shorter than setae a₈₂. One pair of minute anal setae and three pairs of longer adanal setae; distance between setae ad₁ and ad₂ is longer than between setae ad₂ and ad₃; lyrifissures iad situated laterally at level of ad₂ setae.

Measurements of holotype – Rather large species, prodorsum length 439, width 343, height 146, sensillum 73, setae: interlamellar 94, lamellar 111, rostral 76; notogaster: length 806, width 586, height 545, setae c₁ 83, c₁/c₂ 0.5, h, 76, p₁ 68; genital and aggenital plates 207 × 116, anal and adanal plates 404 × 101.

Description – Colour light to dark brown. Body surface finely porous.

Prodorsum (Figs 1A, B) with two pairs of lateral carinae, dorsally well marked, ventrally weaker, shorter and convergent in proximal part. Sensilla (Fig. 1C) rather short, rigid, smooth, slightly dilated medially; interlamellar and rostral setae short, erect, rough; lamellar setae procumbent, filiform; exobothridial setae vestigial.

Notogaster (Fig. 1E) with short, rigid setae, except for slightly longer and filiform setae c₃ and p₁. Setae c₁ and c₃, remote from anterior margin, setae c₁ near the margin. Opening of opisthosomal gland, five lyrifissures and two vestigial setae present and positioned as normal for the genus.

Ventral region (Fig. 1D). Setae h of mentum considerably longer than distance between them. Genital plates with nine pairs of setae, setae g₁ smaller and distanced from setae g₂; two pairs of aggenital setae present, setae a₈₁ considerably shorter than setae a₈₂. Anogenital cleft tve rather long. One pair of minute anal setae and three pairs of longer adanal setae present; distance between setae ad₁ and ad₂ longer than between setae ad₂ and ad₃. Lyrifissures iad situated laterally at the level of setae ad₂.
Figs 1A–F. *Oribotritia mahunkai* sp. n.: A = prodorsum, dorsal view, B = prodorsum, lateral view, C = sensillum, D = right ventral side, E = opisthosoma, lateral view, F = trochanter and femur of leg I.

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Legs (Fig. 1F). Chaetome of legs (without tarsi): I: 1–4–5(2)–5(1), II: 1–4–4(1)–3(1), III: 3–2–3(1)–3(1), IV: 3–2–2(1)–3(1); tarsi heterotridactylous.


Comparison – The new species is characterised by the presence of lateral carinae, which are dorsally well marked, ventrally weaker, shorter, and convergent in proximal part; the aggenital setae \( a_1 \) are considerably shorter than setae \( a_2 \) and the lyrifissures \( iad \) are situated laterally at the level of \( ad_2 \) setae. The closest related Oribotritia striata Mahunka, 2009 has got a similar construction of lateral carinae, shape and length of prodorsal and notogastral setae, presence of one pair of anal and three pairs of adanal setae but is distinguishable by the longitudinal striation on the prodorsum and notogaster, presence of three pairs of aggenital setae and the lyrifissures \( iad \) are situated laterally and posteriorly of \( ad_2 \) setae.

**Protophthiracarus mahunkai** sp. n.
(Figs 2A-G)

Diagnosis – Cuticle of body deeply concave. Prodorsum with strong med-.
Figs 2A–G. *Protophthiracarus mahunkai* sp. n.: A = prodorsum, dorsal view, B = prodorsum, lateral view, C = mentum of infracapitulum, D = left genitoaggenital plate, E = left anoadanal plate, F = opisthosoma, lateral view, G = trochanter and femur of leg I.
Measurements of holotype – Prodorsum length 303, width 202, height 141, sensillum 68, setae: interlamellar 64, lamellar 35, rostral 48, exobothridial 23; notogaster: length 606, width 313, height 364, $c_1$ 68, $h_1$ 101, $p_1$ 111, $c_1/c_1 - d_1 = 0.6$; genitoaggenital plate 146 × 106 anoadanal plate 166 × 101.

Description. Colour brown. Cuticle well sculptured with very distinct, deep rounded concavities.

Prodorsum (Figs 2A, B) with strong median crista; sigillar fields abnormal, median large, lateral parts very short, rounded; posterior furrows present; lateral carinae absent. Sensilla with short, narrow pedicel, enlarged towards distal end and fusiform, rough head. Interlamellar setae short, strong, thick and covered sparsely by barbs at distal half, similar to notogastral setae; lamellar setae shorter, spiniform, rough; exobothridial setae distinct, needle-like; rostral setae, spiniform, rough, curved and directed inward.

Notogaster (Fig. 2F) with 15 pairs of thick, short setae sparsely barbed at distal half, median setae even in shape of aspergillum, shorter than dorsal setae, especially $h$, and $p$.

Setae $c_1$ and $c_2$ remote from anterior border, setae $c_3$ far from border. Vestigial setae $f_1$ not visible because of strong sculpturing. Four pairs of lyrifissures $ia$, $im$, $ip$ and $ips$ present.

Ventral region (Figs 2C,D,E). Setae $h$ of mentum minute. Genitoaggenital plates with nine pairs of genital setae with arrangement: 4+2:3. Anoadanal plates each with five rough setae, analal setae $ad$, situated near anal setae, setae $ad$, smallest.

Legs (Fig. 2G). Formulae of setae and solenidia of “complete type”. Setae $d$ of femora I remote from distal end of article.

Material examined. Holotype: MAG-037, ABT/17/2011/, Madagascar, Ambositra, Species Reserve, 20.IV.2011, 18°11’43,1”S, 47°17’19,3”E, altitude 1636 m, secondary forest, sifted sample of forest litter, leg. L. S. Rahanitriniaina, and R. Raveloson. Holotype is deposited at DATE.

Comparison – The new species is closely alike to Protophthiracarus araios Niedbała, 2001 by the shape of sensilla, length and shape of notogastral setae, directed inward rostral setae and length and position of anal and adanal setae. However, it is distinguishable by presence of longer interlamellar setae covered with spines in distal half (versus rough setae), arrangement of notogastral setae $c_1$ and $c_2$ remote from anterior margin (versus setae $c_1$ remote from margin and setae $c_2$ situated on margin), number (4) and position of lyrifissures (versus 3 pairs of lyrifissures).

**Atropacarus (Hoplophorella) mahunkai** sp. n.

(Figs 3A–F)

Figs 3A–F. *Atropacarus (Hoplophorella) mahunkai* sp. n.: A = prodorsum, dorsal view, B = prodorsum, lateral view, C = mentum of infracapitulum, D = left genitoaggenital and ano-adanal plates, E = opisthosoma, lateral view, F = trochanter and femur of leg I.
Measurements of holotype. Specimens of this species are relatively small. Prodrorsum length 147, width 104, height 68, sensillum 99, setae: interlamellar 38, rostral 45, lamellar 28; notogaster: length 255, width 172, height 159, setae: c₁ and p₁, 33, h₁, 35; genitoaggenital plate 66 × 63, anoanal plate 86 × 61.

Description – Colour brown. Surface of body covered with deep, round concavities. Prodrorsum (Figs 3A,B) with long lateral carinae, median and lateral sigillar fields joined, median with deep incision, longer than lateral fields. Sensilla long, filiform whip-shaped, rough. Interlamellar setae thick covered with dense cilia in distal half; lamellar and rostral setae strong, rough, rostrals directed inward; exobothridial setae simple, smooth.

Notogaster (Fig. 3E) with 15 pairs of setae thick, short (c₁/c₁ =0.5) densely covered with small spines in distal half, ventral setae slightly dilated; setae c₁ and c₁, remote from anterior border, setae c₁ near the border. Vestigial setae f₁ slightly anterior to setae h₁. Two pairs of lyrifissures ia and im visible.

Ventral region (Figs 3C,D). Setae h of mentum slightly longer than distance between them. Arrangement of genital setae: 4+2: 3. Anoanal plates with spiniform anal and ad₁ setae similar in length, setae ad₁ the longest and thickest but similar in shape to anal setae, setae ad₁ the shortest but similar to notogastral setae, covered with small cilia in distal half.

Legs (Fig. 3F). Chaetome of legs of “incomplete type”, setae of genua IV absent, setae d of femora I bifurcate and slightly remote from distal end of article.


Comparison – The new species is easily distinguishable by the deep concavities on the surface of body, the thick, short and densely ciliate notogastral setae, and especially by the joined sigillar fields of prodrorsum, the whip-like shaped sensilla and the bifurcated setae d of femora I.

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