New Species of the Superfamily Phthiracaroidea (Acari, Oribatida) from the Afrotropical Region

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New species of the superfamily Phthiracaroidea (Acari, Oribatida) from the Afrotropical Region

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ABSTRACT

Five new species of ptyctimous oribatid mites are described, identified and illustrated from the Afrotropical Region: *Plonaphacarus paramachadoi* sp. n. and *Protophthiracarus turianiensis* sp. n. from the Nguru Mountains of Tanzania, *Hoplophthiracarus paratryssos* sp. n. and *Atropacarus* (*Atropacarus*) *primus* sp. n. from Ranomafana National Park in Madagascar, and *Notophthiracarus dispersus* sp. n. from Vohidrazana Forest in Madagascar. A comparison with the most closely related species is also presented.

KEY WORDS: Tanzania, Madagascar, Acari, Oribatida, Phthiracaridae, taxonomy, new species.

INTRODUCTION

The major tropical wilderness areas represent important storehouses of biodiversity and play a vital role in climate stability. They also serve as controls against which we can measure the management of more devastated areas and biotopes. The montane forests of northeast Tanzania, which include the Usambara Mountains, and the rainforests and other forest types in Madagascar in particular, belong conclusively among such important biodiversity hotspots (Mittermeier *et al.* 1998; Araujo 2002).

The present contribution deals with the description of five new species of ptyctimous oribatid mites belonging to four different oribatid genera of the family Phthiracaridae: *Plonaphacarus* Niedbała, 1986; *Protophthiracarus* Balogh, 1972; *Hoplophthiracarus* Jacot, 1933; *Notophthiracarus* Ramsay, 1966; and *Atropacarus* (*Atropacarus*) Ewing, 1917. These species were found in large leaf-litter sifting samples collected by Dr P. Baňař (from Brno, Czech Republic) and Dr V. Grebennikov (from Ottawa, Canada) from various parts of the forested Usambara Mountains in northeast Tanzania as well as from many localities in Madagascar (Ewing 1917; Ramsay 1966; Balogh 1972; Niedbała 1986).

The fauna of oribatid mites from the superfamily Phthiracaroidea of the Ethiopian Region have been reviewed and discussed in detail by Niedbała (2001). In total 108 species of phthiracarid mites were recorded from the Ethiopian region, of which 73 species occur on the African mainland. Twenty-two species were recorded from Tanzania (14 endemic — 63.6%), and 20 species from Madagascar (17 endemic — 85.0%). Altogether six species from the genus *Plonaphacarus* and two species from the genus *Protophthiracarus* were previously found in soils in Tanzania, and 14 species of the genus *Notophthiracarus* were hitherto recorded from soils in Madagascar. The record of the species *Hoplophthiracarus paratryssos* sp. n. from Ranomafana National Park is the first one from this genus among the fauna of Madagascar and the record of *Atropacarus* (*Atropacarus*) *primus* sp. n., also from Ranomafana National Park, is the first record of this subgenus for the Ethiopian Region.

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MATERIAL AND METHODS

The soil and leaf litter samples were collected using a sifting method and were partly extracted by using a Winkler apparatus. All the extracted mite specimens were preserved in 85 % ethanol, then cleared in 80 % lactic acid on temporary cavity slides and mounted on temporary slides with glycerol. The determined material was preserved in vials with 80 % ethanol. Observations, figures, and measurements were made using a standard light microscope equipped with a drawing attachment. All the measurements are given in micrometres. The terminology used is based on Niedbała (1992). Type material is deposited at the Department of Animal Taxonomy and Ecology, Poznań, Poland (DATE), the Institute of Soil Biology BC ASCR, České Budějovice, in the Czech Republic (ISB) and the Natural History Museum, Geneva, Switzerland (NHMG).

TAXONOMY

Superfamily Phthiracaroidea
Family Phthiracaridae Perty, 1841
Plonaphacarus paramachadoi sp. n.

Figs 1–8

Etymology: The prefix *para* (near) is Latin and refers to the similarity of the new species with *Plonaphacarus machadoi* (Balogh, 1958).

Description:

Measurements (holotype). Prodorsum: length 252, width 202, height 91, setae: sensillus (*ss*) 53, interlamellar (*in*) 97, lamellar (*le*) 28, rostral (*ro*) 76; notogaster: length 485, width 328, height 303, notogastral setae: c_1 96, c_1/c_1-d_1=0.7, h_1 and ps_1 88; genitoaggenital plate 114×101, anoadanal plate 202×101.

Integument. Colour brown. Microsculpture of integument slightly rugged and ornamentation polygonal.

Prodorsum (Figs 1, 2). Lateral carinae distinct, rather short. Sigillar fields short. Posterior furrows indistinct. Sensilli club-like with elongated, dilated head, obtuse distally and covered with small spines. Interlamellar setae long, thick, erect, covered with small spines in distal half similar to notogastral setae. Lamellar setae short, spinose, smooth. Rostral setae stout, thick, erect, pointed distally and covered with small spines, remote from anterior border. Exobothridial setae vestigial.

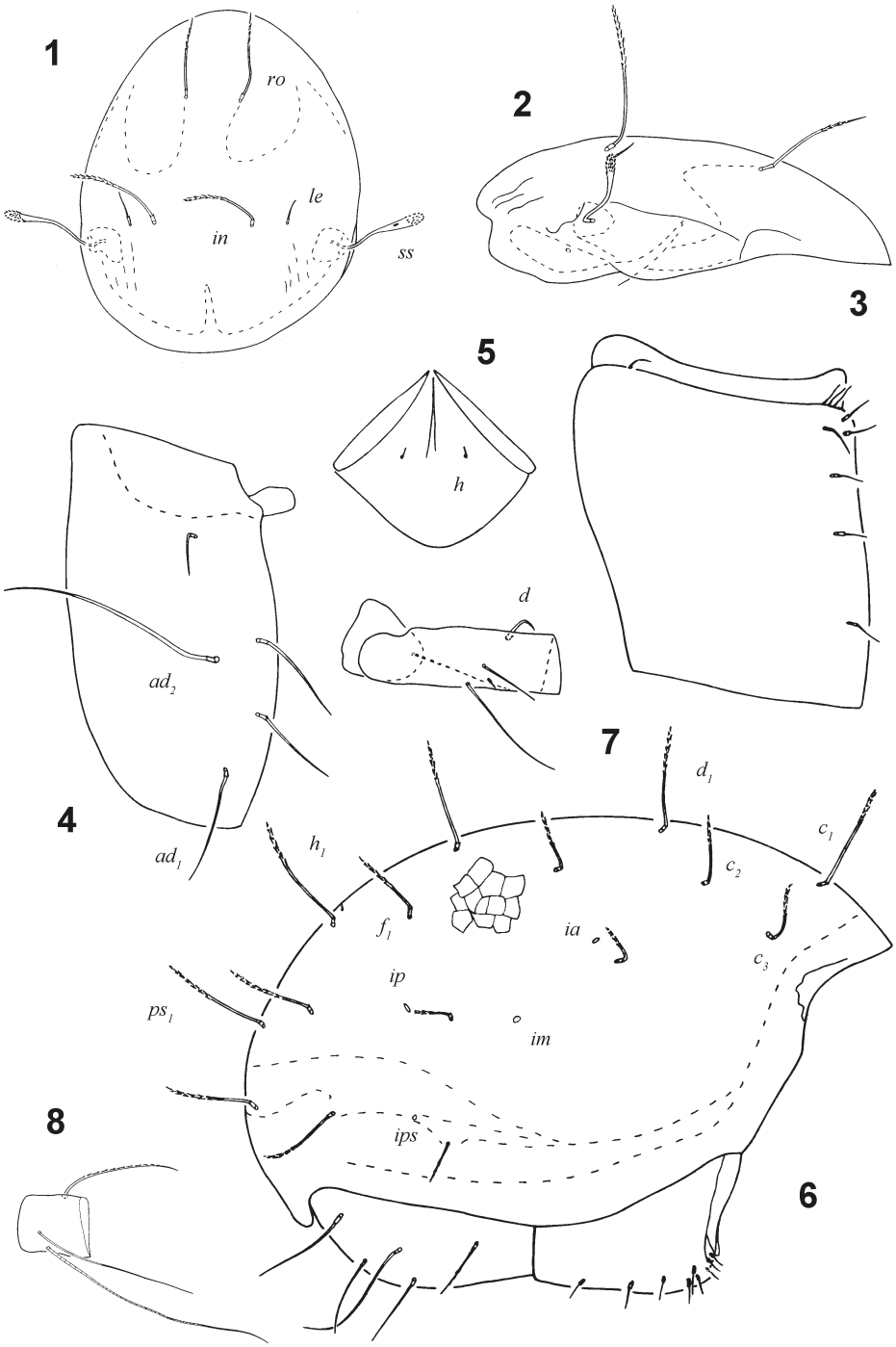
Notogaster (Fig. 6). Notogastral setae of medium length, c_1<c_1-d_1, thick, covered with spines in distal half. Setae c_1 and c_3 slightly remote from anterior margin, setae c_2 far from border. Vestigial setae f_1 located slightly anterior of setae h_1. Four pairs of lyrifissures *ia*, *im*, *ip* and *im* present.

Ventral region (Figs 3–5). Setae *h* of mentum (Fig. 5) minute. Formula of genital setae 4+2:3. Anoadanal plates with five pairs of well-developed setae, setae ad_2 the longest and bent distally, anal setae shorter than ad_1 and ad_2, but longer than ad_3, adanal setae rough, anal setae smooth.

Legs (Figs 7, 8). Chaetome of legs of "complete type", setae *d* of femora I remote from distal end of article.

Holotype: TANZANIA: Nguru Mts., Turiani, 4.xi.2010, 06°04'29"S 37°32'19"E, 1277 m, deciduous forest on steep slope, leaf litter sifting, leg. V. Grebennikov, TAN-009 (DATE).

Paratypes: 20 specimens, same locality data as Holotype, (10 DATE, 5 ISB and 5 NHMG).



Figs 1–8. *Plonaphacarus paramachadoi* sp. n. holotype: (1) prodorsum, dorsal view; (2) prodorsum, lateral view; (3) right genitoaggenital plate; (4) right anoadanal plate; (5) mentum of subcapitulum; (6) lateral view of opisthosoma; (7) trochanter and femur of leg I; (8) tibia of leg IV.

Remarks: The new species is similar to *Plonaphacarus machadoi* (Balogh, 1958) by the shape and length of setae, location of vestigial setae f_1 and presence of four pairs of lyrifissures. *P. paramachadoi* is distinguished from *P. machadoi* by the absence of alveoles on body, location of rostral setae (far from anterior part of rostrum) and minute setae *h* of infracapitular mentum (Balogh 1958).

Hoplophthiracarus paratryssos sp. n.

Figs 9–16

Etymology: The prefix *para* (near) is Latin and refers to the similarity of the new species to *Hoplophthiracarus tryssos* Niedbała, 2004.

Measurements (holotype). Prodorsum: length 217, width 151, height 101, setae: *ss* 20, *in* 71, *le* 28, *ro* 30, *ex* 25; notogaster: length 424, width 273, height 252, notogastral setae: c_1 56, c_1/c_1-d_1=0.6, h_1 and ps_1 25; genitoaggenital plate 96×71, anoadanal plate 162×78.

Description:

Integument. Colour white-yellow. Surface of body covered with fine punctation.

Prodorsum (Figs 9, 10). Distinct lateral carinae and sigillar fields. Sensilli short with thin pedicel and swollen head, rounded in lateral aspect and fusiform in dorsal aspect. Prodorsal setae short, fine, attenuate, interlamellar setae distinctly longer than lamellar and rostral setae.

Notogaster (Fig. 14). Fifteen pairs of short, fine and attenuate setae. Setae c_2 more remote from anterior border than setae c_1 and c_3. Vestigial setae f_1 situated anteriorly of h_1, setae f_2 situated anteriorly above h_3. Two pairs of lyrifissures *ia* and *im* present.

Ventral region (Figs 11–13). Setae *h* of mentum (Fig. 13) as long as distance between them. Arrangement of genital setae: 4+2:3. Anoadanal plates with rather long, fine setae, similar in length except short ad_3 setae.

Legs (Figs 15, 16). Chaetome of legs of "incomplete type", femora of legs I with three setae, setae *d* remote from distal end of segment.

Holotype: MADAGASCAR, Ranomafana National Park, 14.iv.2011, 21°15'46.1"S 47°25'13.1"E, 983 m, sifting sample of forest leaf litter, Winkler apparatus extraction, leg. L.S. Rahanitriniaina and R. Raveloson, MAG-021 (DATE).

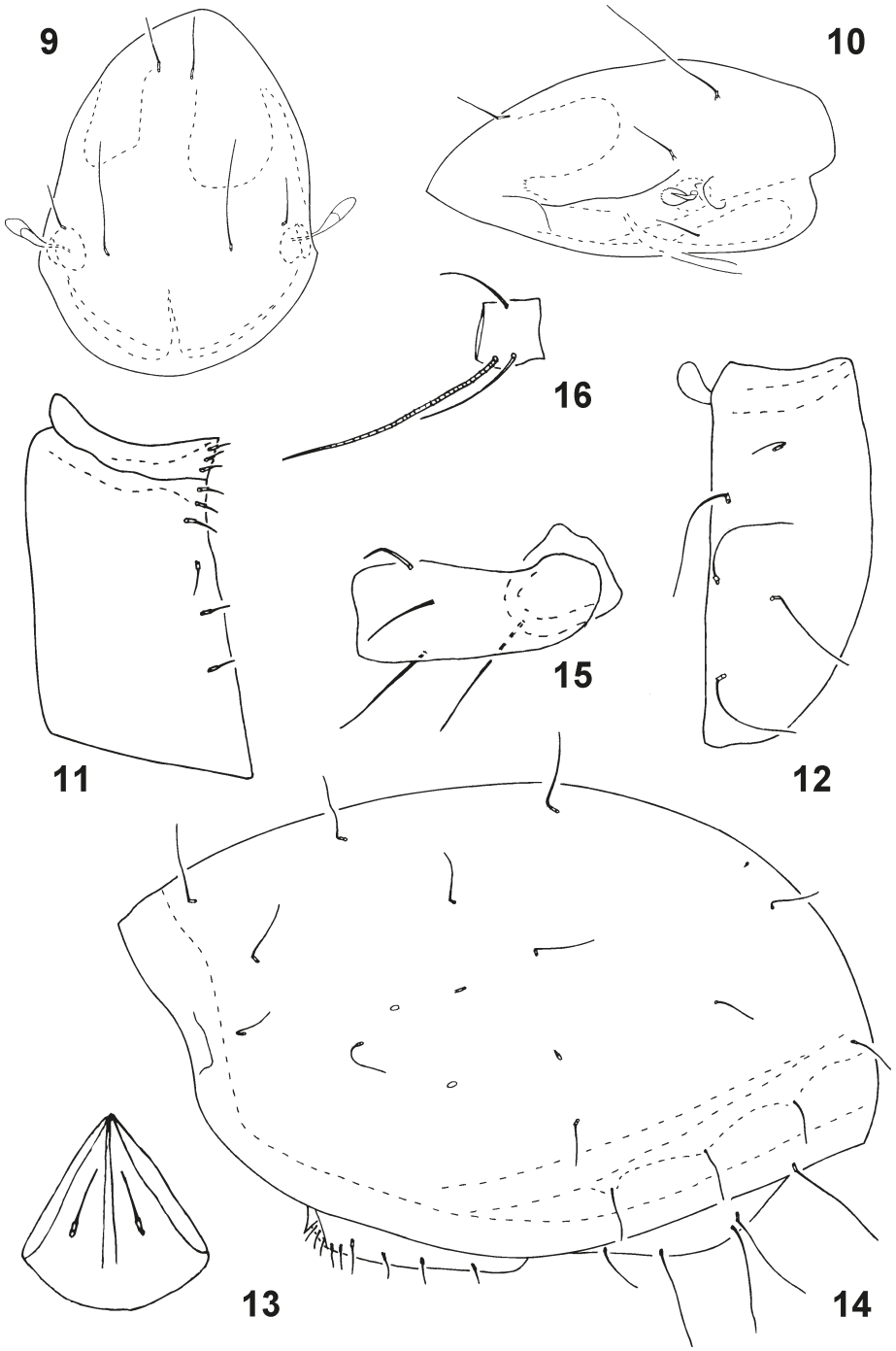
Remarks: The new species is distinguishable from congeners by the presence of smooth, attenuate setae on its body. It is similar to the Brazilian species *Hoplophthiracarus tryssos* Niedbała, 2004 in size of body, length of lateral carinae on the prodorsum, and size and length of notogastral setae, but is distinguishable by the differences in length of the interlamellar and lamellar setae, longer setae on the anoadanal plates, and especially by the unusual position of vestigial setae f_2 and the different arrangement of genital setae 4+2:3 (three setae in progenital position), versus 4:5 (five setae in progenital position in *H. tryssos*) (Niedbała 2004).

Protophthiracarus turianiensis sp. n.

Figs 17–24

Etymology: The name refers to the type locality in the vicinity of Turiani town in the Nguru Mountains.

Measurements (holotype). Prodorsum: length 480, width 328, height 247; setae: *ss* 126, *in* 96, *le* 51, *ro* 81; notogaster: length 949, width 687, height 646; notogastral setae: c_1



Figs 9–16. *Hoplophthiracarus paratryssos* sp. n. holotype: (9) prodorsum, dorsal view; (10) prodorsum, lateral view; (11) right genitoaggenital plate; (12) left anoadanal plate; (13) mentum of subcapitulum; (14) lateral view of opisthosoma; (15) trochanter and femur of leg I; (16) tibia of leg IV.

152, c_1/c_1-d_1=0.6, h_1 159, and ps_1 180; genitoaggenital plate 278×167; anoadanal plate 268×167.

Description:

Integument. Colour light brown. Surface of body alveolate and covered with strong sculpture.

Prodorsum (Figs 17, 18). Distinct median crista. Strong hump present above the bothridium which continues in lateral carinae. Posterior furrows feeble. Sigillar fields not visible because of strong integument. Sensilli long, thin, without head, with feeble spines at tip. Interlamellar setae fairly long, thick, covered with small spines at distal end. Lamellar setae spiniform, rough. Rostral setae thick, obtuse, rough, curved inwards. Exobothridial setae vestigial.

Notogaster (Fig. 23). Setae fairly long (c_1<c_1-d_1), thick, covered with small spines at distal end, some setae with spines on one side, some setae with spines on both sides. Setae of row *c* remote from anterior margin, c_2 and c_3 more remote than setae c_1. Vestigial setae f_1 and all lyrifissures not visible because of strong sculpture.

Ventral region (Figs 19–22). Genitoaggenital plates with nine pairs of setae with formula: 5(4+1):4. Anoadanal plates each with five short, rough setae, adanal setae ad_2 the longest and thickest, setae an_2 longer than setae ad_1 and an_1, setae ad_3 the shortest.

Legs (Fig. 24). Formulae of setae and solenidia of "complete type". Setae *d* on femora I slightly remote from distal end of article.

Holotype: TANZANIA: Nguru Mts., Turiani, 30.x.2010, 06°06'24"S 37°33'26"E, 677 m, deciduous forest on steep slope, leaf litter sifting, leg. V. Grebennikov, TAN-008 (DATE).

Paratypes: 4 specimens, same locality data as holotype (DATE); 4 specimens: TANZANIA: Nguru Mts., Turiani, 4.xi.2010, 06°04'29"S 37°32'19"E, 1277 m, deciduous forest on steep slope, leaf litter sifting, leg. V. Grebennikov, TAN-009 (3 ISB and 1 NHMG).

Remarks: The new species is distinguishable from congeners by the combination of the following characters: strong median crista of prodorsum, bacilliform, long, thin sensilli without head, setae of row *c* on notogaster remote from anterior margin, but setae c_1 less remote than setae c_2 and c_3.

Notophthiracarus dispersus sp. n.

Figs 25–31

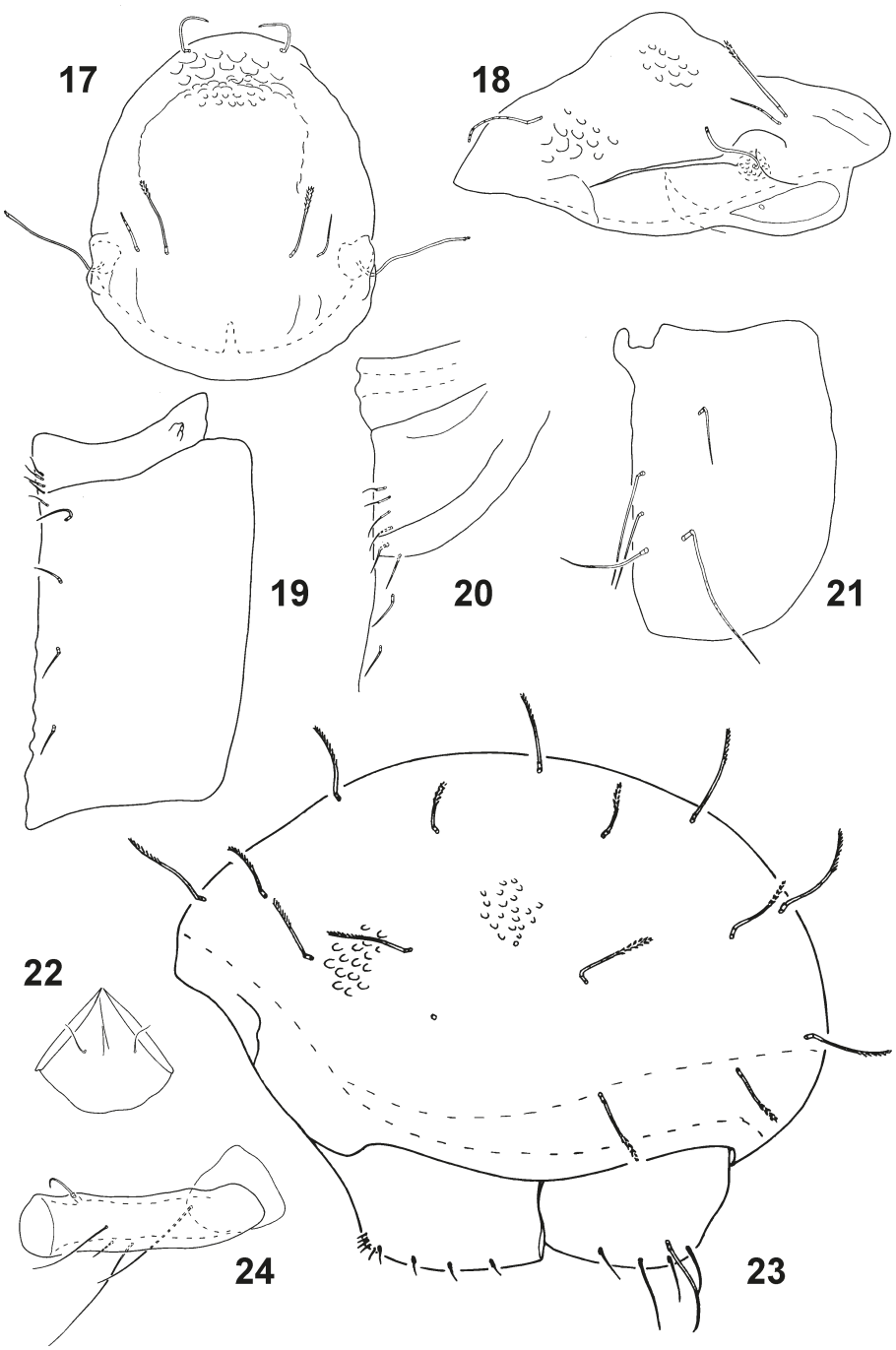
Etymology: From the Latin *dispersus* (rare, sparsely) and alludes to the sparse distribution of cilia on the interlamellar and notogastral setae.

Description:

Measurements (holotype). Prodorsum: length 525, width 353, height 227, setae: *ss* 114, *in* 353, *le* 43, *ro* 51, *ex* 38; notogaster: length 1010, width and height 687, notogastral setae: c_1 252, c_1/c-d_1=1.3, c_2 227, c_3 45, h_1 227, h_2 151, h_3 62, ps_1 247, and ps_2 202; genitoaggenital and anoadanal plates 313×151.

Integument. Colour reddish brown. Surface of body covered with dispersed small, rounded and deep concavities.

Prodorsum (Figs 25, 26). Feeble, short median crista. Lateral carinae well developed, long. Sigillar fields very narrow, median trapezoid distally and longer than laterals. Sensilli of medium length, bacilliform, covered with small spines in distal half. Interlamellar setae rigid, similar to notogastral setae, covered sparsely with small spines. Rostral setae and lamellar setae spiniform. Exobothridial setae the shortest.



Figs 17–24. *Protophthiracarus turianiensis* sp. n. holotype: (17) prodorsum, dorsal view; (18) prodorsum, lateral view; (19) left genitoaggenital plate; (20) paraxial fragment of left genitoaggenital plate; (21) left anoadanal plate; (22) mentum of subcapitulum; (23) lateral view of opisthosoma; (24) trochanter and femur of leg I.

Notogaster (Fig. 30). Notogastral setae rigid and of different lengths, dorsal setae longer than laterals, (c_1>c_1-d_1), setae c_1 and ps_1 the longest, setae c_3 and h_3 the shortest. All notogastral setae sparsely covered with small spines in distal half. Setae c_{1-3} remote from anterior margin, setae c_2 considerably more remote than setae c_1 and c_3. Vestigial setae f_1 not visible because of strong sculpture. Two pairs of lyrifissures *ia* and *im* present.
Ventral region (Figs 27–29). Setae *h* of mentum (Fig. 29) considerably longer than distance between them. Formula of genital setae: 5:4. Anoadanal plates with five pairs of rigid, rough setae, adanal setae ad_1 and ad_2 longer than anal setae, situated near to paraxial border, adanal setae ad_3 the shortest.
Legs (Fig. 31). Chaetome of legs complete. Setae *d* on femora I slightly remote from anterior end of article and bifurcated distally.

Holotype: MADAGASCAR: Beforona commune, Vohidrazana forest, 6.vi.2012, semi-deciduous forest, 18°58'30.6"S 48°30'53.4"E, 1130 m, sifting of leaf litter sample, Winkler apparatus extraction, leg. L.S. Rahanitriniaina and E.M. Rabotoson, MAG-153 (DATE).

Remarks: The new species can be distinguished from congeners by the combination of the following characters: small median crista of prodorsum, rigid interlamellar and notogastral setae sparsely covered with spines, bacilliform and ciliate sensilla, formula of genital setae 5:4, adanal setae ad_1 and ad_2 situated near paraxial border and bifurcate setae *d* on femora of legs I.

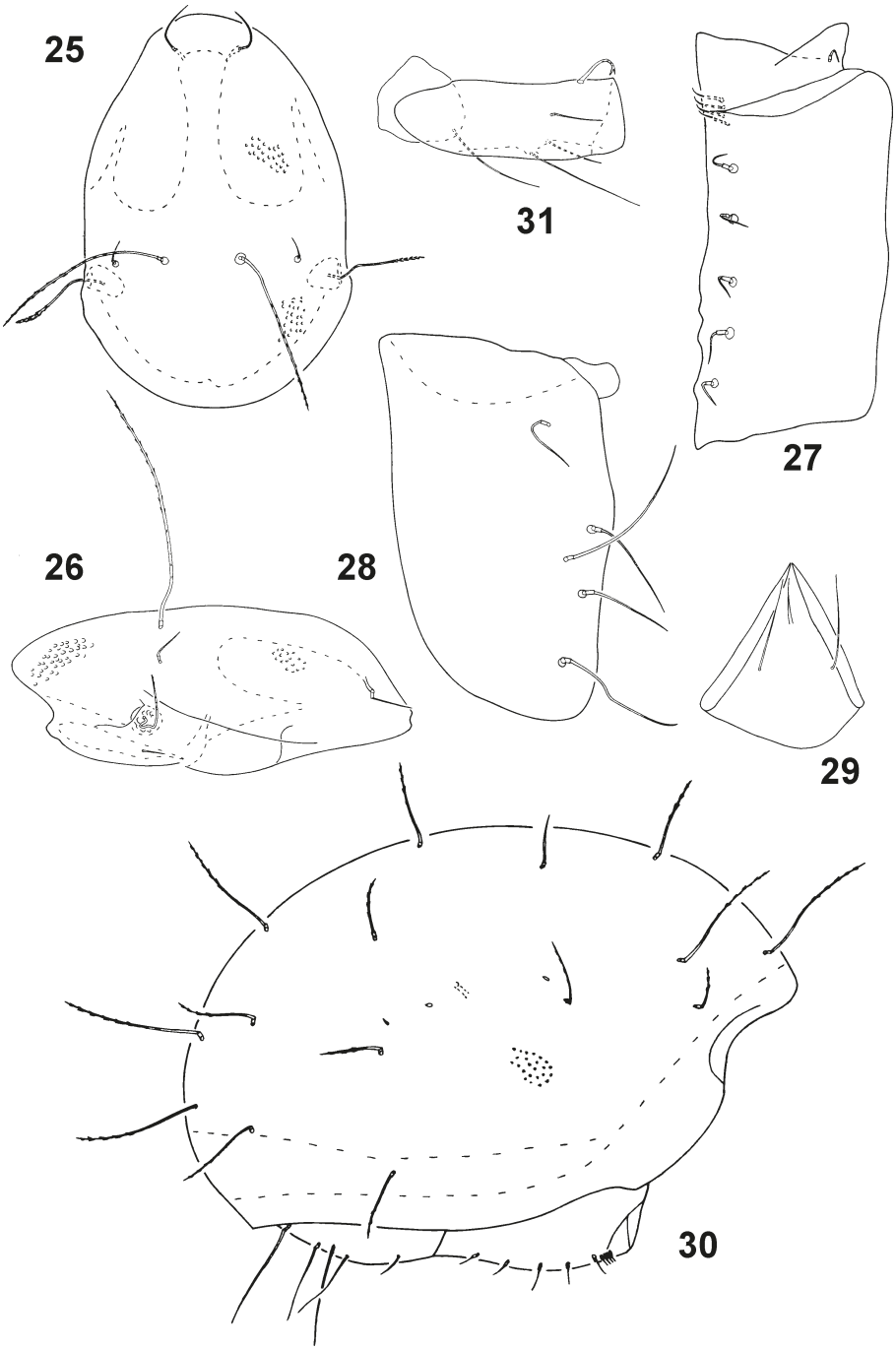
Atropacarus* (*Atropacarus*) *primus sp. n.

Figs 32–41

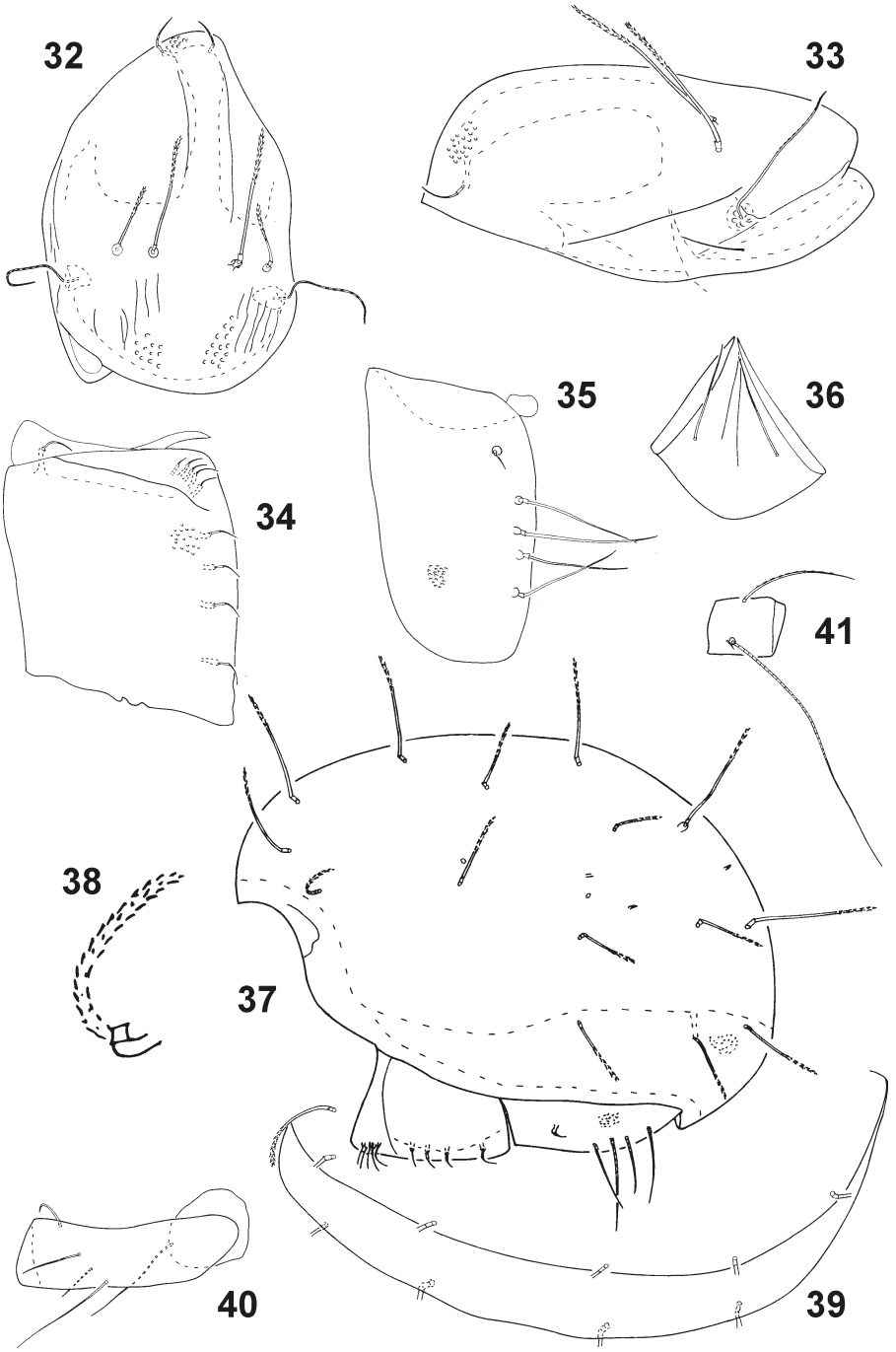
Etymology: From the Latin *primus* (first), referring to the first find of species of the subgenus *Atropacarus* in the Afrotropical Region.

Description:

Measurements (holotype). Prodorsum: length 520, width 328, height 252, setae: *ss* 172, *in* 169, *le* 101, *ro* 51, *ex* 63; notogaster: length 1030, width 606, height 616, notogastral seta c_1 and h_1 233, c_1/c_1-d_1=1.1, ps_1 164; genitoaggenital region 253×215, anoadanal region 367×215.
Integument. Colour yellow. Body surface punctated with feeble cavities on borders of body and on ventral plates.
Prodorsum (Figs 32, 33). Median crista prominent. Lateral carinae reach sinus. Posterior furrows distinct. Median sigillar field long, narrow, slightly broader anteriorly, longer than laterals. Sensilli long, filiform, rough, without head. Interlamellar and lamellar setae long, robust, covered with small spines at distal end, similar in shape to notogastral setae. Rostral setae short, spiniform, rough, directed inward. Exobothridial setae of medium length.
Notogaster (Figs 37–39). Two median cristae along the dorsal part; 15 pairs notogastral setae of medium length (c_1 > c_1-d_1), robust, covered with small spines at distal end, only shortest setae c_3 are wholly ciliated, setae c_1 located far from anterior border, setae c_2 remote, setae c_3 near the border. Vestigial setae f_1 posterior of setae h_1. Two pairs of lyrifissures *ia* and *im* present.
Ventral region (Figs 34–36). Arrangement of genital setae: 4:5. Anoadanal plate with five pairs of rough setae, four pairs arranged at paraxial border of plate and small setae ad_3 remote from border, setae ad_2 thickest and longest.
Legs (Figs 40–41). Chaetome of legs complete. Setae *d* on femora I slightly remote from distal end of article.



Figs 25–31. *Notophthiracarus dispersus* sp. n. holotype: (25) prodorsum, dorsal view; (26) prodorsum, lateral view; (27) left genitoaggenital plate; (28) right anoadanal plate; (29) mentum of subcapitulum; (30) lateral view of opisthosoma; (31) trochanter and femur of leg I.



Figs 32–41. *Atropacarus* (*Atropacarus*) *primus* sp. n. holotype: (32) prodorsum, dorsal view; (33) prodorsum, lateral view; (34) right genitoaggenital plate; (35) right anoadanal plate; (36) mentum of subcapitulum; (37) lateral view of opisthosoma; (38) seta c_3; (39) median cristae of notogaster; (40) trochanter and femur of leg I; (41) tibia of leg IV.

Holotype: MADAGASCAR: Ranomafana National Park, Vatoharanana, 4.x.2012, evergreen rain forest, 21°17'33.6"S 47°25'57.6"E, 1163 m, leaf litter sifting sample, Winkler apparatus extraction, leg. L.S. Rahanitriniaina, MAG-209 (DATE).

Paratype: MADAGASCAR: Ranomafana National Park, 1.x.2012, evergreen rain forest, 21°15'10.3"S 47°25'01.2"E, 1077 m, leaf litter sifting sample, Winkler apparatus extraction, leg. L.S. Rahanitriniaina, MAG-207 (ISB).

Remarks: Specimens of this species are relatively large. This is the first species of the subgenus *Atropacarus* found in the Afrotropical Region. This species is unique among its consubgeners by the two median cristae of the notogaster and also by the shortest setae c_3, which are wholly ciliated, while the other longer setae are covered with small spines only in the distal end.

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