



## New species of *Notophthiracarus* (Acari: Oribatida: Phthiracaroidea) from Tanzania

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Three new species of the genus *Notophthiracarus* are described, identified and figured from Uluguru Mountains of Tanzania: *Notophthiracarus quasiuluguruensis* sp. nov., *Notophthiracarus tuberculus* sp. nov., and *Notophthiracarus uluguruensis* sp. nov. A comparison with the most closely related species of the genus *Notophthiracarus* is also presented.

<http://zoobank.org/urn:lsid:zoobank.org:pub:3FBF24E7-3E2D-4686-AD57-EFEA25510BBD>

**Keywords:** Acari; ptyctimous mites; *Notophthiracarus*; taxonomy; new species; Tanzania

### Introduction

Tropical Africa, south of the Sahara Desert, and especially the area of submontane and montane forests in Tanzania and Kenya, is classified among the most important biodiversity hotspots not only in the Ethiopian region but in the whole world. Part of the Eastern Arc Mountains, the Usambara Mountains are renowned for a high concentration of endemic species and have been identified as one of the world's most threatened forest ecosystems. The area contains moist tropical montane forest above an altitude of 600 m and some of the last remaining but ecologically important lowland montane forest in East Africa (Myers et al. 2000; Brooks et al. 2002; Burgess et al. 2007; Powell et al. 2011).

Mites of the superfamily Phthiracaroidea are an important and abundant component of mesoedafon, especially in forest soils. They are macrophytophages and play an important role in secondary decomposition of organic matter in different types of soil (Luxton 1972; Hågvar 1998). Large material of ptyctimous mites were collected by Dr V. Grebennikov (from Ottawa, Canada) using siftings of various types of leaf litter in many localities in the Usambara Mountains. These samples contained three new species of the genus *Notophthiracarus* Ramsay, and their descriptions are the subject of this contribution. The superfamily Phthiracaroidea of the Ethiopian region has been reviewed and discussed in detail by Niedbala (2001). In total, 22 species of Phthiracaroidea were summarized from the fauna of Tanzania, comprising 14 endemic species (63.6% of endemism), seven pantropical species and one semicosmopolitan species. Four species belonged to the genus *Notophthiracarus* and all were endemic.

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## Material and methods

The soil and leaf litter samples were collected by using a sifting method and were partly extracted by using a Winkler apparatus. All the extracted mite specimens were preserved in 85% ethanol, then mounted and 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 that of Niedbala (2000). Type materials are partly deposited at the Department of Animal Taxonomy and Ecology, Poznań, Poland (DATE), partly at the Institute of Soil Biology BC ASCR, České Budějovice, in the Czech Republic (ISB), and partly at the Natural History Museum, Geneva, Switzerland (NHMG).

## Description of new species

### *Notophthiracarus quasiuluguruensis* sp. nov. (Figure 1)

#### *Material examined*

*Holotype.* Holotype is deposited at DATE from the *locus typicus*: TAN-016, Tanzania, Uluguru Mts, Bunduki village, 26 November 2010, 07°01'17" S, 37°39'10" E, altitude 1592 m asl, mid-altitude afro-montane deciduous forest, litter sifting, leg. V. Grebennikov.

#### *Measurements of holotype*

Prodorsum: length 243, width 197, height 96, sensillus 78, prodorsal setae: *in* 15, *le* 13, *ro* 35; notogaster: length 465, width 343, height 313, setae: *c*<sub>1</sub>, *h*<sub>1</sub> and *ps*<sub>1</sub> 56; genitoaggenital plate 126 × 109, ano-adanal plate 164 × 101.

#### *Description*

Colour light brown. Surface of body porose and with well-developed sculpture.

Prodorsum with well-developed, joined sigillar fields, with deep sinus between rostral setae; lateral carinae absent, posterior furrows feeble. Sensilli long, with pedicel narrow proximally, slightly dilated in the middle part and again narrow with small dilated head covered with minute spines. Setae needleform, rough, except exobothridial setae vestigial.

Notogaster with needleform, short notogastral setae ( $c_1/c_1 - d_1 = 0.5$ ), setae of row *c* remote from anterior border of notogaster, setae *c*<sub>2</sub> more than setae *c*<sub>1</sub> and *c*<sub>3</sub>. Two pairs of lyrifissures *ia* and *im* present. Vestigial setae *f*<sub>1</sub> and *f*<sub>2</sub> not observable.

Ventral region, setae *h* of mentum shorter than distance between them. Formula of genital setae: 5 + 4: 0; genital setae *g*<sub>1–4</sub> smaller than setae *g*<sub>5–9</sub>. Ano-adanal plates with five pairs of unequal in length of setae,  $ad_2 > an_2 > ad_3 > an_1 > ad_1$ , adanal setae *ad*<sub>1</sub> and *ad*<sub>2</sub> in unusual position, posteriorly of anal setae.

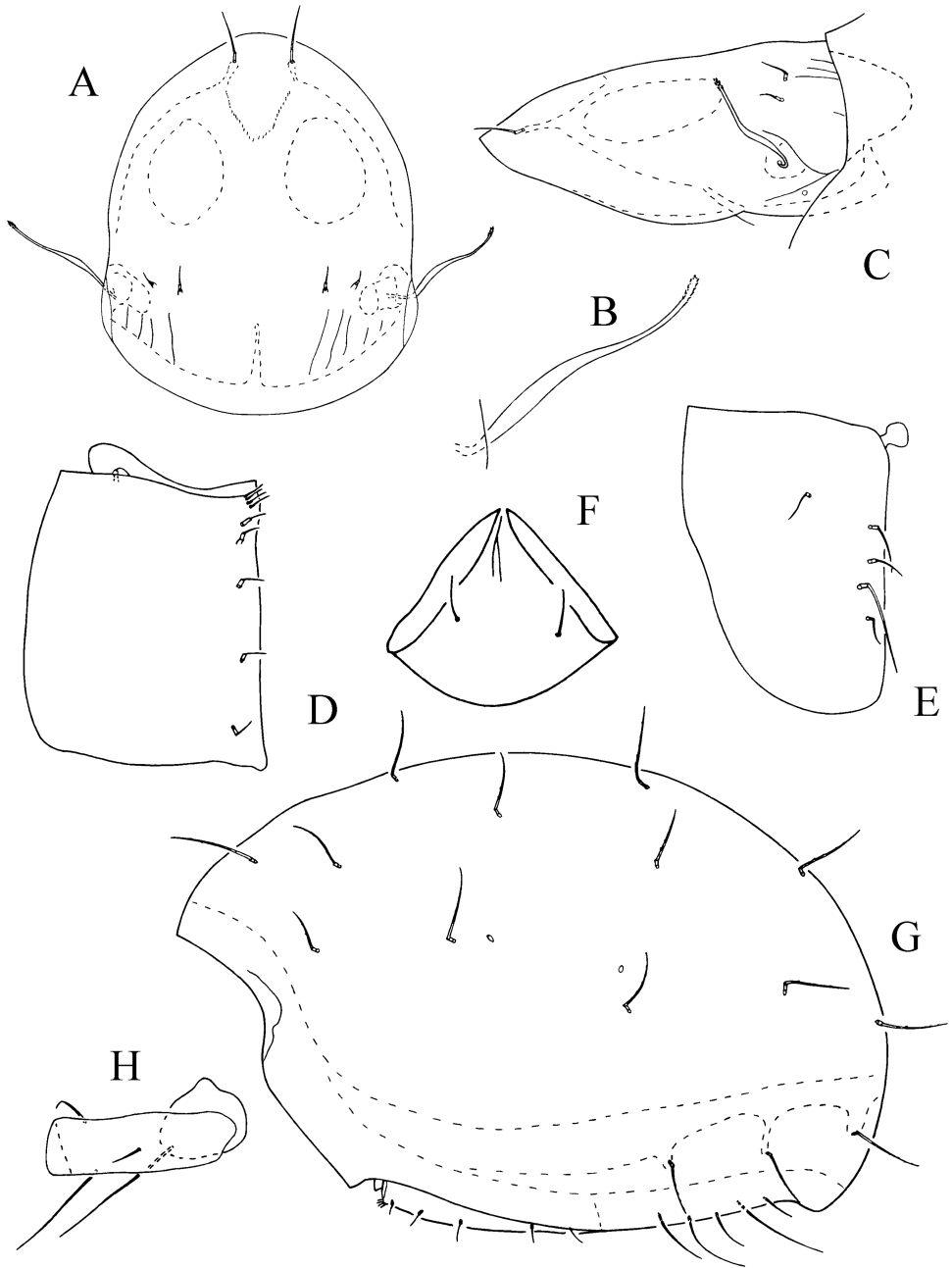


Figure 1. *Notophthiracarus quasiuluguruensis* sp. nov. (holotype): (A) prodorsum, dorsal view; (B) sensillus; (C) prodorsum, lateral view; (D) genitoaggenital plate (right side); (E) anoadanal plate (right side); (F) mentum of subcapitulum; (G) opisthosoma, lateral view; (H) trochanter and femur of leg I.

Legs, chaetome of legs of ‘incomplete type’, setae  $v'$  of femora I absent, setae  $d$  of femora I slightly remote from distal ends of the articles.

### Etymology

The prefix *quasi* is Latin meaning ‘near’ and refers to the similarity of the new species to another new species from Tanzania – *Notophthiracarus uluguruensis* sp. nov.

### Comparison

The new species is very similar to *Notophthiracarus uluguruensis* sp. nov. in the shape and length of the setae, the joined sigillar fields of the prodorsum and the unusual position of the adanal setae  $ad_1$  and  $ad_2$ . It is distinguishable by porose surface of body (versus surface covered by mosaic), the totally different shape and length of the sensilli, which are long, dilated in the middle with a small head with short spines (versus short, fusiform and rounded), shorter prodorsal setae, absence of lateral carinae of prodorsum (versus presence of carinae), considerably shorter setae  $h$  of the mentum than the distance between them (versus  $h > h - h$ ), longer  $an_2$  setae and the absence of  $v'$  setae of the femora I.

### *Notophthiracarus tuberculus* sp. nov.

(Figures 2, 3)

### Material examined

*Holotype.* Holotype is deposited at DATE from the *locus typicus*: TAN-028, Tanzania, Uluguru Mts, Tchanzema village, 11 November 2010, 07°06'50" S, 37°36'18" E, altitude 2318 m asl, mid-altitude afro-montane deciduous forest, leaf litter sifting, leg. V. Grebennikov, five paratypes deposited at DATE, three paratypes deposited at ISB and two paratypes deposited at NHMG from the locality: TAN-018, Tanzania, Uluguru Mts, Bunduki village, 23 November 2010, 07°03'23" S, 37°37'24" E, altitude 2051 m asl, mid-altitude afro-montane deciduous forest, leaf litter sifting, leg. V. Grebennikov

### Measurements of holotype

Prodorsum: length 258, width 195, height 137, sensillus 126, prodorsal setae:  $in$  40,  $le$  and  $ro$  35; notogaster: length 586, width 374, height 303, notogastral setae:  $c_1$  30,  $c_1/c_1 - d_1 = 0.1$ ; genitoaggenital plate  $152 \times 106$ , anoadanal plate  $169 \times 119$ .

### Description.

Colour brown. Surface of body, especially of notogaster covered with numerous tubercles.

Prodorsum with powerful median crista. Lateral carinae short. Sigillar fields not well observable. Posterior furrows present. Sensilli in holotype and one paratype (sample TAN-018) long, narrow, flagellate, smooth. However in nine paratypes (sample

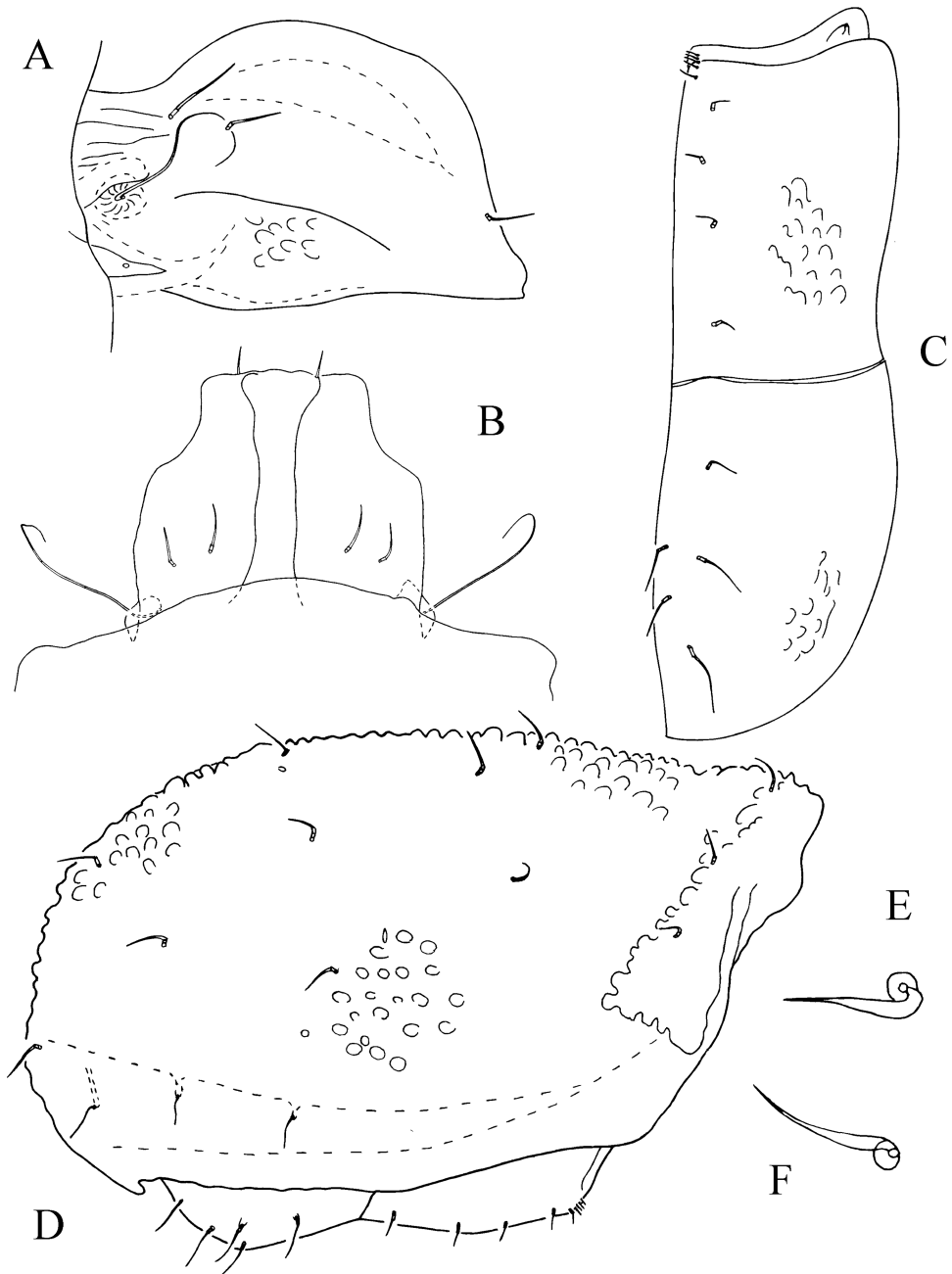


Figure 2. *Notophthiracarus tuberculus* sp. nov. (holotype): (A) prodorsum, lateral view; (B) prodorsum and anterior part of notogaster, dorsal view; (C) genitoaggenital and ano-adanal plates (left side); (D) opisthosoma, lateral view; (E) seta  $h_2$ ; (F) seta  $h_1$ .

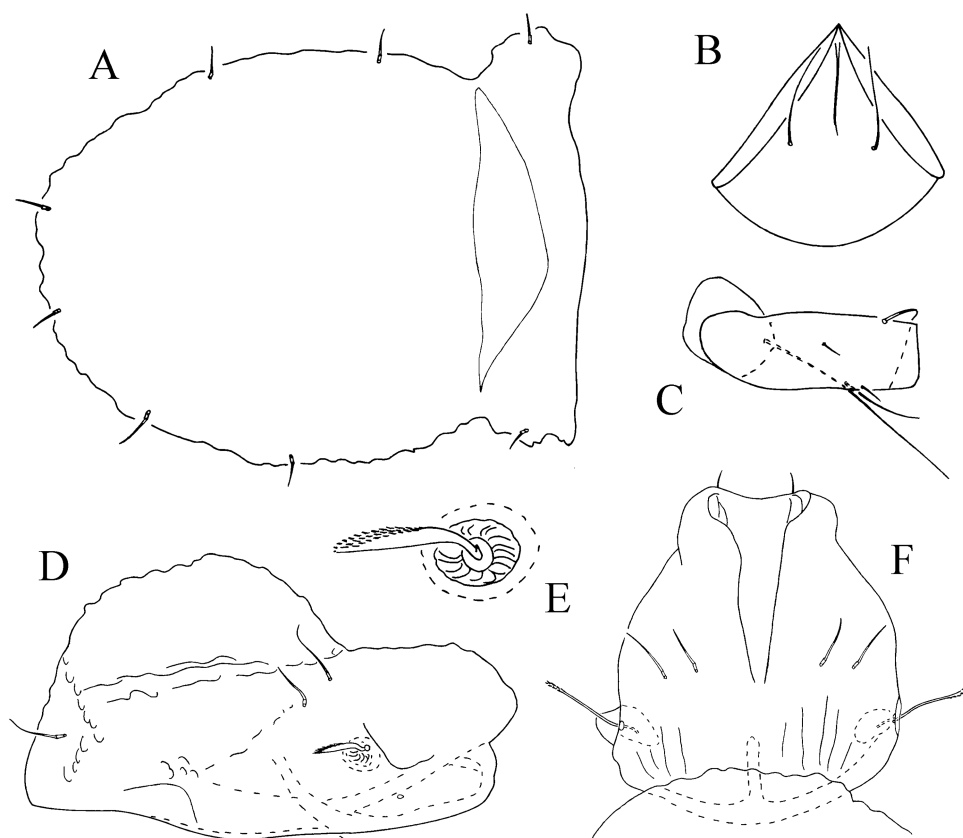


Figure 3. *Notophthiracarus tuberculus* sp. nov. (holotype and paratype): holotype: (A) notogaster dorsal view; (B) mentum of subcapitulum; (C) trochanter and femur of leg I. Paratype: (D) prodorsum, lateral view; (E) sensillus; (F) prodorsum, dorsal view.

TAN-018) sensilli baciliform, covered with small cilia in distal end (Figure 3D–F). (For the first time such a distinct difference in a single morphological feature has been observed in one population. Perhaps it is an expression of sexual dimorphism?) Prodorsal setae short, spiniform, smooth, except vestigial exobothridial setae.

Notogaster with strong anterior collar; notogastral setae short, rather smooth, spiniform, dilated proximally and whip-like distally. Setae of row  $c_{1-3}$  situated at collar. Only lyrifissures *im* visible; vestigial setae not observable.

Ventral region, setae *h* of mentum longer than distance between them. Formula of genital setae: 5: 4; genital setae  $g_{1-4}$  shorter than setae  $g_{5-9}$ ; adanal setae situated closely to paraxial border, near of anal setae, all setae of anoadanal plates short, similar in length, smooth.

Legs, chaetome of legs of ‘complete type’. Setae *d* of femora I slightly remote from distal ends of articles, setae *l'* very short.

### Etymology

The specific name *tuberculus* refers to the tubercle-covered surface of notogaster.

*Comparison*

This species is easily distinguishable from its congeners by the numerous tubercles covering of surface of the notogaster, the powerful prodorsal, median crista and all adanal setae situated near the paraxial border. Slightly similar are *Notophthiracarus rafalskii* Niedbala, 1997 from Madagascar, *Notophthiracarus samarensis* Niedbala, Corpuz-Raros et Gruezo, 2006 from the Philippines, *Notophthiracarus deminutus* Niedbala, 2006 from South Africa and *Notophthiracarus trojani* Niedbala, 2009 from Australia in the shape and length of the setae, the strong crista of the prodorsum and the situation of the setae in the anoadanal plates, but they are easily distinguishable by the absence of an anterior collar and tubercles on the surface of the notogaster (Niedbala 1997, 2006, 2009; Niedbala et al. 2006).

***Notophthiracarus uluguruensis* sp. nov.**  
(Figure 4)

*Material examined*

**Holotype.** Holotype deposited at DATE from the *locus typicus*: TAN-016, Tanzania, Uluguru Mts, Bunduki village, 26 November 2010, 07°01'17" S, 37°39'10" E, altitude 1592 m asl, mid-altitude afromontane deciduous forest, leaf litter sifting sample, leg. V. Grebennikov, five paratypes deposited at DATE and three paratypes deposited at ISB from the locality: TAN-018, Tanzania, Uluguru Mts, Bunduki village, 23 November 2010, 07°03'23" S, 37°37'24" E, altitude 2051 m asl, mid-altitude afro-montane deciduous forest, leaf litter sifting sample, leg. V. Grebennikov, two paratypes deposited at NHMG from the locality: TAN-028, Tanzania, Uluguru Mts, Tchanzema village, 11 November 2010, 07°06'50" S, 37°36'18" E, altitude 2318 m asl, mid-altitude afromontane deciduous forest, leaf litter sifting sample, leg. V. Grebennikov.

*Measurements of holotype*

Prodorsum: length 328, width 257, height 116, sensillus 43, prodorsal setae: *in* 48, *le* 40, *ro* 61, *ex* 20; notogaster: length 667, width 465, height 444, notogastral setae:  $c_1$  96,  $c_1/c_1 - d_1 = 0.6$ ,  $h_1$  68,  $ps_1$  78; genitoaggenital plate  $94 \times 76$ ; anoadanal plate  $114 \times 83$ .

*Description*

Small species. Colour brown. Well sclerotized, integument covered with feeble mosaic and punctate.

Prodorsum with distinct, joined together sigillar fields, deep sinus situated anteriorly of median field; posterior furrows present; lateral carinae distinct, not so long; sensilli with fusiform head, smooth, rounded distally; setae needleform, rough, rostral setae situated near rostrum.

Notogaster with rather short ( $c_1/c_1 - d_1 = 0.6$ ) rigid, needleform notogastral setae, covered with very short cilia, in shape as prodorsal setae. Setae  $c_1$  and  $c_2$  remote from

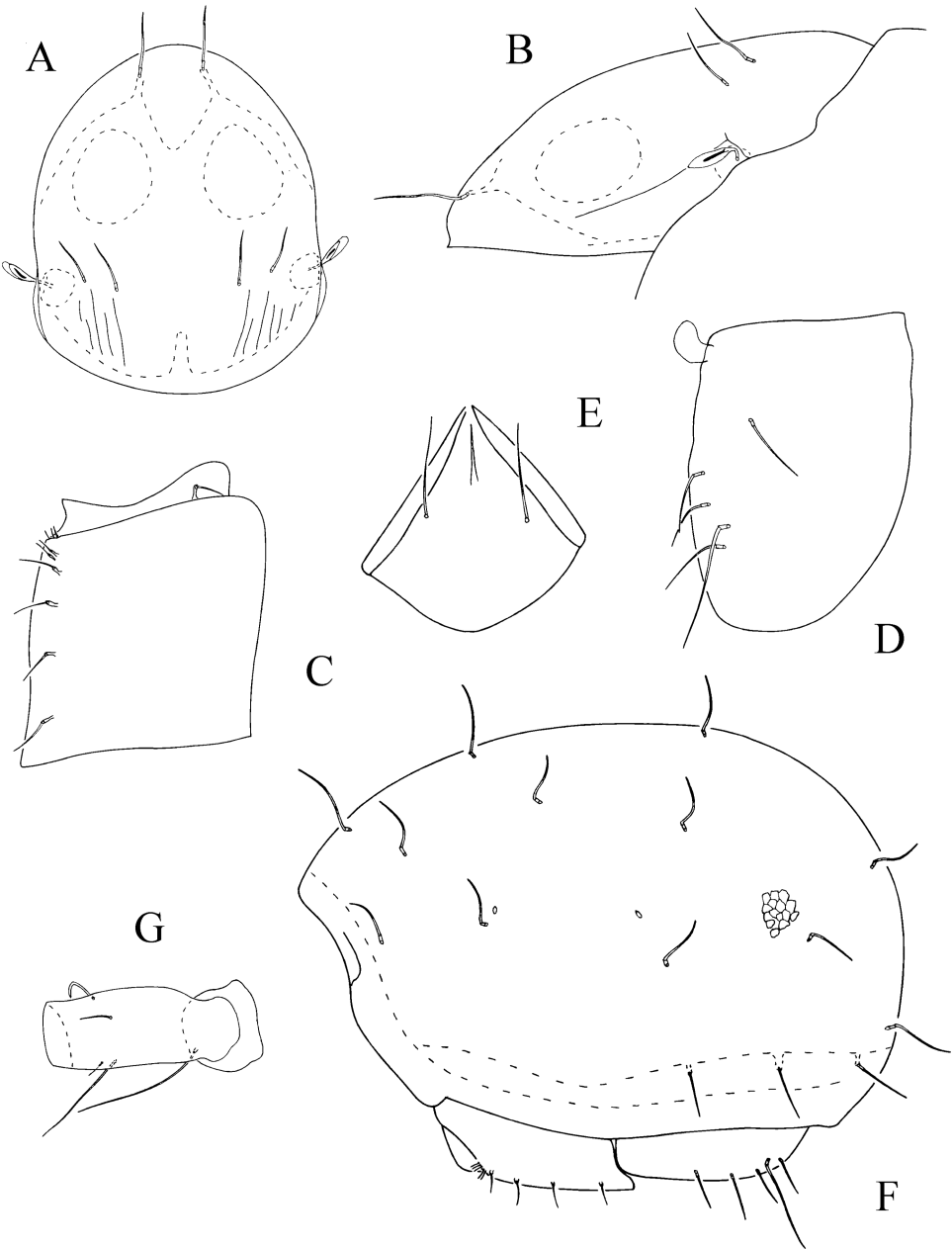


Figure 4. *Notophthiracarus uluguruensis* sp. nov. (holotype): (A) prodorsum, dorsal view; (B) prodorsum, lateral view; (C) genitoaggenital plate (left side); (D) anoadanal plate (left side); (E) mentum of subcapitulum; (F) opisthosoma, lateral view; (G) trochanter and femur of leg I.



anterior border of notogaster, setae  $c_3$  near the border. Only lyrifissures *ia* and *im* present. Vestigial setae not observable.

Ventral region, setae *h* of mentum slightly longer than distance between them. Arrangement of genital setae: 6: 3; genital setae  $g_{1-5}$  considerably smaller than setae  $g_{6-9}$ . Anoadanal plates with unusual arrangement of adanal setae, adanal setae  $ad_1$  and  $ad_2$  situated close to each other both posteriorly of anal setae, adanal setae  $ad_2$  the longest and thickest, all setae rough.

Legs setation of 'complete type'. Seta *d* on femora I distinctly remote from distal ends of segments.

### Etymology

The name of this species *uluguruensis* alludes to the locality in Uluguru Mountains.

### Comparison

The new species is easily distinguishable among the congeners from the joined sigillar fields of the prodorsum and unusual arrangement of the adanal setae  $ad_1$  and  $ad_2$  situated posteriorly of the anal setae.

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