



New and little known ptyctimous mites (Acari, Oribatida) from India

WOJCIECH NIEDBAŁA^{1,3} & SERGEY G. ERMILOV²

¹Department of Animal Taxonomy and Ecology, Adam Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland.

E-mail: wojciech.niedbala@amu.edu.pl

²Tyumen State University, Semakova 10, 625003 Tyumen, Russia. E-mail: ermilovacari@yandex.ru

³Corresponding author

Abstract

In 2012, we registered a total of 22 species, 12 genera and five families of ptyctimous mites in India. Three new species, *Apoplophora paraspinosa* Niedbala **sp. nov.**, *Oribotritia duotrisetosa* Niedbala **sp. nov.** and *Plonaphacarus kaluzi* Niedbala **sp. nov.**, are described. Some remarks on descriptions of Indian *Sumatrotritia inusitata* Mahunka, 1989, *Euphthiracarus meghalayensis* Sanyal, 1988, *Phthiracarus obscurus* Niedbala, 1986 and *Hoplophthiracarus concinuus* (Niedbala, 1982) are presented. *Hoplophthiracarus tropicus* Mondal & Kundu, 1988 is recognized as a junior synonym of the species *Hoplophthiracarus concinuus*.

Key words: Oribatida, ptyctimous mites, checklist, new species, new synonym, India

Introduction

The present study is based on total ptyctimous mite material collected by L. Dembický and O. Šauša in 2012 from India. These recorded taxa are provided in *Results* section. Three new species, belonging to the three different genera—*Apoplophora* Aoki, 1980 (Mesoplophoridae), *Oribotritia* Jacot, 1924 (Oribotritiidae) and *Plonaphacarus* Niedbala, 1986 (Steganacaridae)—are described below. The systematics, generic characters, identification keys to species of these genera was presented earlier (Niedbala 2000).

Some remarks on the descriptions of *Sumatrotritia inusitata* Mahunka, 1989, *Euphthiracarus meghalayensis* Sanyal, 1988, *Phthiracarus obscurus* Niedbala, 1986 and *Hoplophthiracarus concinuus* (Niedbala, 1982) are presented.

Taxonomic status of *Hoplophthiracarus tropicus* Mondal & Kundu, 1988 is discussed.

Material and methods

Soil litter was passed through a sifter. Ptyctimous mites were extracted into 75% ethanol using Berlese's funnels. Specimens submerged in lactic acid and mounted on temporary cavity slides for the duration of the study. Body measurements are presented in micrometers. Length of the body setae was measured in lateral aspect.

All types of new species are preserved in the collection of the Department of Animal Taxonomy and Ecology, Adam Mickiewicz University, Poznań, Poland.

List of collecting sites:

In-1: India, 28°19'32"N 95°57'31"E, Arunachal Pradesh, Hunli, 1300 m a.s.l., soil litter in forest, collected by L. Dembický and O. Šauša during 26.05–01.06.2012.

In-2: India, 27°00'48"N 92°39'08"E, Assam, Bhalukpong, 150 m a.s.l., soil litter in forest, collected by L. Dembický and O. Šauša during 01–08.05.2012.

In-3: India, 28°36'56"N 95°53'21"E, Arunachal Pradesh, Etalin, 700 m a.s.l., soil litter in forest, collected by L. Dembický & O. Šauša during 01–08.05.2012.

Results

We have found 22 species, 12 genera and five families of Indian ptyctimous mites.

Checklist of ptyctimous mites

Mesoplophoridae

- Apoplophora paraspinosa* Niedbala **sp. nov.** Locality: In-1 (2 ex.), In-3 (4 ex.)
- Apoplophora phalerata* Niedbala, 2001. Locality: In-1 (26 ex.), In-2 (9 ex.), In-3 (19 ex.)
- Apoplophora pantotrema* (Berlese, 1913). Locality: In-2 (13 ex.), In-3 (6 ex.)

Oribotritiidae

- Indotritia aspera* Niedbala, 2000. Locality: In-1 (10 ex.), In-2 (3 ex.), In-3 (7 ex.)
- Indotritia javensis* (Sellnick, 1923). Locality: In-2 (30 ex.), In-3 (3 ex.)
- Mesotritia maerkeli* Sheals, 1965. Locality: In-1 (1 ex.), In-2 (7 ex.), In-3 (2 ex.)
- Oribotritia duotrisetosa* Niedbala **sp. nov.** Locality: In-1 (1 ex.)

Euphthiracaridae

- Acrotritia ardua* (Koch, 1841). Locality: In-1 (3 ex.)
- Acrotritia sinensis* Jacot, 1923. Locality: In-1 (2 ex.), In-2 (11 ex.), In-3 (5 ex.)
- Acrotritia vestita* (Berlese, 1913). Locality: In-1 (35 ex.), In-2 (27 ex.), In-3 (35 ex.)
- Euphthiracarus meghalayensis* Sanyal, 1988. Locality: In-1 (2 ex.), In-3 (3 ex.)
- Microtritia minima* (Berlese, 1904). Locality: In-1 (7 ex.), In-3 (1 ex.)
- Microtritia tropica* Märkel, 1964. Locality: In-1 (1 ex.), In-2 (1 ex.), In-3 (4 ex.)
- Sumatrotritia inusitata* Mahunka, 1989. Locality: In-1 (11 ex.), In-3 (9 ex.)

Phthiracaridae

- Hoplophthiracarus concinnus* (Niedbala, 1982). Locality: In-1 (7 ex.), In-3 (3 ex.)
- Phthiracarus crispus* Hammer, 1972. Locality: In-1 (1 ex.)
- Phthiracarus obscurus* Niedbala, 1986. Locality: In-2 (1 ex.)

Steganacaridae

- Atropacarus (Hoplophorella) cucullatus* (Ewing, 1909). Locality: In-1 (3 ex.), In-2 (4 ex.)
- Atropacarus (Hoplophorella) hamatus* (Hammer, 1973). Locality: In-1 (8 ex.)
- Atropacarus (Hoplophorella) vitrinus* (Berlese, 1913). Locality: In-1 (3 ex.)
- Plonaphacarus kaluzi* Niedbala **sp. nov.** Locality: In-1 (4 ex.), In-3 (5 ex.)
- Plonaphacarus kugohi* (Aoki, 1959). Locality: In-1 (28 ex.)

All listed species are known from Oriental Region but seven of them are new for India: *I. aspera*, *A. sinensis*, *M. minima*, *M. tropica*, *S. inusitata*, *P. crispus*, *P. obscurus*.

Descriptions of new species

Apoplophora paraspinosa Niedbala **sp. nov.**

(Fig. 1 A–F)

Measurements of holotype. Prodorsum: length 308, width 202, height 136. Prodorsal setae: sensillum 134,

interlamellar 61, lamellar 61, rostral 68, exobothridial 51. Notogaster: length 414, width 364, height 263. Notogastral setae: c_1 66, c_3 25, e_1 88. Width of ventral plate 293; genital plates 71×63 ; anal plates 96×71 ; distance between genital and anal plates 152.

Integument. Colour dark yellow. Body surface punctate.

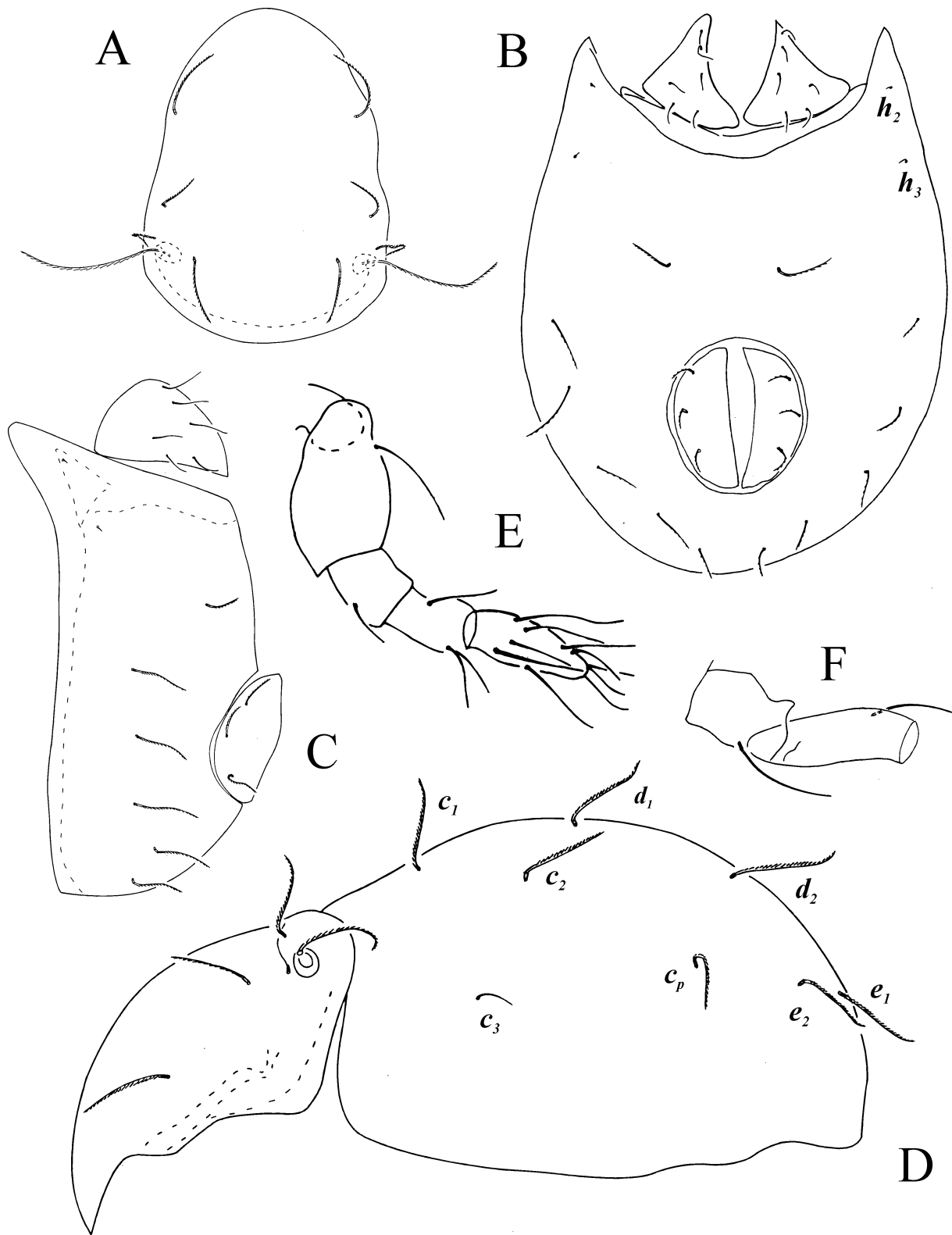


FIGURE 1A–F. *Apoplophora paraspinosa* Niedbala, sp. nov.: A, prodorsum, dorsal view; B, ventral side of opisthosoma; C, ventral side of opisthosoma, right part; D, lateral view of body; E, palp; F, trochanter and femur IV.

Prodorsum with traces of weak lateral carinae. Sensilla and prodorsal setae similar in shape, covered with 20 cilia approximately. Rostral setae longer than other prodorsal setae. Lamellar and rostral setae with similar mutual distances. Exobothridial setae long, some times longer than diameter of bothridia.

Notogaster with eight pairs of relatively strong setae covered with ca 20 cilia with exception of feeble, small and smooth c_3 setae. Setae of row c remote from anterior border, setae c_2 considerably more than others.

Ventral region with eight pairs of setae covered with 10 cilia each, except two pairs minute, smooth anterolateral setae h_2 and h_3 . One pair of anteromedian setae situated anteriorly of anal plates, three pairs in lateral position, two pairs posteriorly of anal plates. Six pairs of smooth genital setae and three pairs of ciliate anal setae present. Palp setation: 1–1–3–9(+ ω).

Legs not examined.

Material examined. Holotype and one paratype: In-1; four paratypes: In-3.

Comparison to related species. The new species is distinguishable from its congeners by the combination of the following characters: relatively short setae, sensilla similar to prodorsal setae, setae c_3 of “notogaster” small and smooth, two pairs of minute anterolateral setae h_2 and h_3 , three pairs of anal setae. This species is similar to *Apoplophora spinosa* Mahunka, 1987 from Sabah in the length of ciliate “notogastral” setae, number of eight pairs of ventral setae but the new species has short and smooth c_3 of “notogaster (versus ciliate setae), three pairs of anal setae (versus four pairs), six posterior pairs of ventral setae ciliate, similar in shape (versus spiniform posterior pairs of ventral setae, different from the others) and without apophysis on femur IV (versus very large apophysis).

Etymology. The name alludes to some resemblance to *Apoplophora spinosa* Mahunka, 1987.

***Oribotritia duotrisetosa* Niedbala sp. nov.**

(Fig. 2 A–D)

Measurements of holotype. Large species. Prodorsum: length 505, width 439, height 177. Prodorsal setae: sensillum 139, interlamellar 101, lamellar 76, rostral 94, exobothridial 114. Notogaster: length 990, width 777, height 727. Notogastral setae: c_1 190, h_1 and p_1 131, $c_1/c_1-d_1=0.9$. Genital and aggenital plates 217×126 ; anal and adanal plates 470×96 .

Integument. Colour deep brown. Body surface dotted.

Prodorsum with two lateral carinae, upper longer and stronger than lower. Sensilla and setae needle-form, flagellate, exobothridial setae the longest.

Notogaster with feeble, needle-form, flagellate setae, $c_1/c_1-d_1=0.9$. Setae of row c remote from anterior border.

Ventral region. Nine pairs of genital setae on left side and eight pairs of setae on right side; two pairs of aggenital setae similar in length. Anal plates with three pairs of minute setae, distance between setae an_3 and an_2 considerably shorter than between an_2 and an_1 ; adanal plates with three pairs of minute setae, distance between ad_3 and ad_2 slightly shorter than between ad_2 and ad_1 ; anterior anal setae an_3 and an_2 situated anteriorly of ad_3 setae; lyrifissures *iad* not visible.

Material examined. Holotype: In-1.

Comparison to related species. The new species is one of uncommon species with three pairs of anal and three pairs of adanal setae, where two anterior anal setae an_3 and an_2 are situated anteriorly of ad_3 setae. We know only three such species: *Oribotritia megale* (Walker, 1965) from Nearctic Region and *O. ampla* Niedbala, 1991 and *O. samoensis* Niedbala, 1998 from Pacific islands. Distinctive features of *O. megale* has very long interlamellar setae, rigid sensilla, different arrangement of genital setae and presence of three pairs of aggenital setae; those of *O. ampla* are one pair of lateral carinae of prodorsum and setae ag_2 longer than ag_1 ; *O. samoensis* has one pair of lateral carinae of prodorsum, minute notogastral setae and longer aggenital setae. Also, the new species is similar to *O. alajuela* Niedbala, 2003 which always has two pairs of anal setae.

Etymology. The prefix *duo* is Latin meaning “two” and refers to both anal and adanal plates being “trisetosus”.

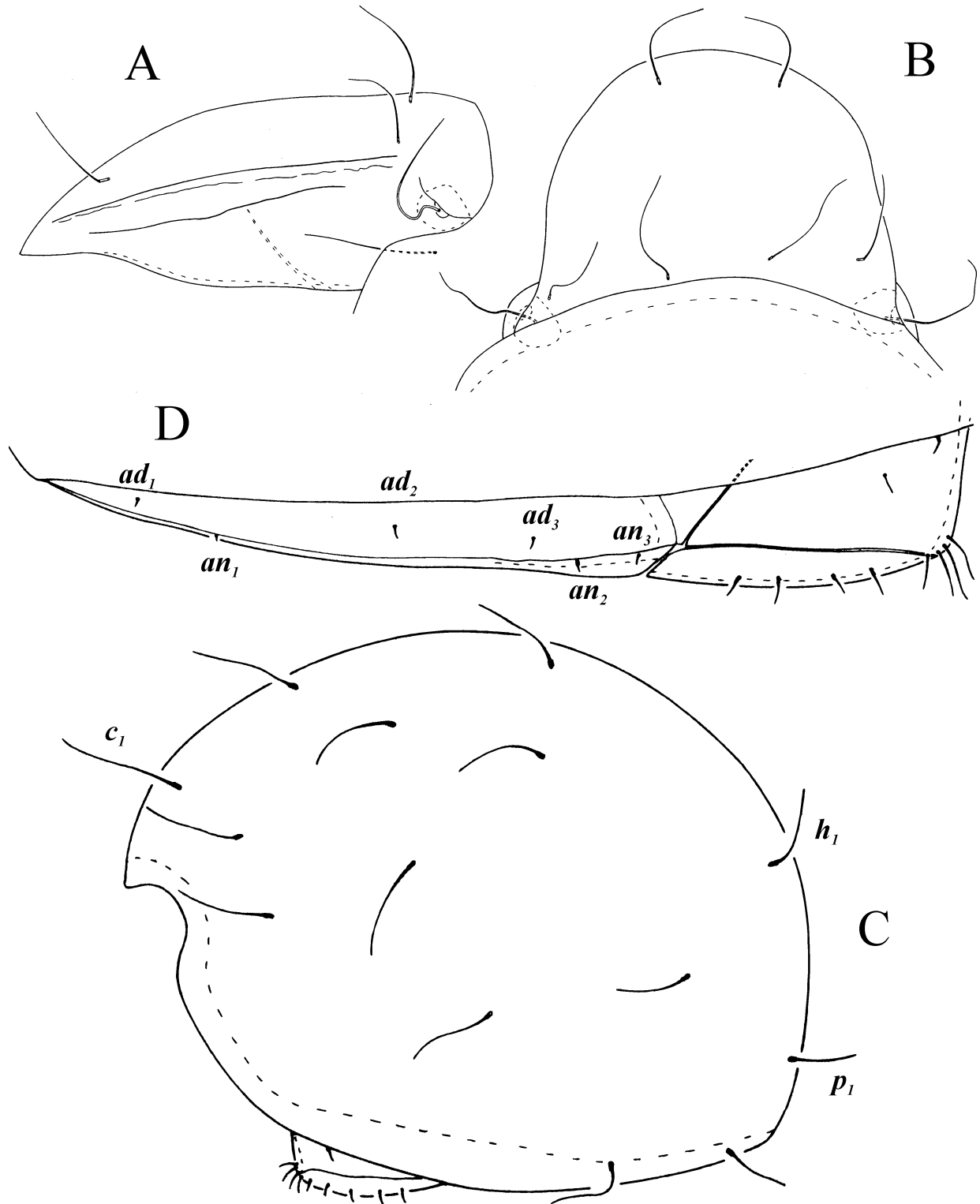


FIGURE 2A–D. *Oribotritia duotrisetosa* Niedbala sp. nov.: A, prodorsum, lateral view; B, prodorsum, dorsal view; C, lateral view of opisthosoma; D, lateral view of right side of ventral region.

Plonaphacarus kaluzi Niedbala sp. nov.
(Fig. 3 A–H)

Measurements of holotype. Prodorsum: length 379, width 268, height 151. Prodorsal setae: sensillum 76,

interlamellar 182, lamellar 136, rostral 30. Notogaster: length 707, width 535, height 555. Notogastral setae: c_1 and h_1 189, c_2 131, $c_1/c_1-d_1=0.9$. Genitoaggenital plate 177×136 ; anoadanal plate 303×116 .

Integument. Colour brown. Body covered with cerotegument. Integument weakly foveolate.

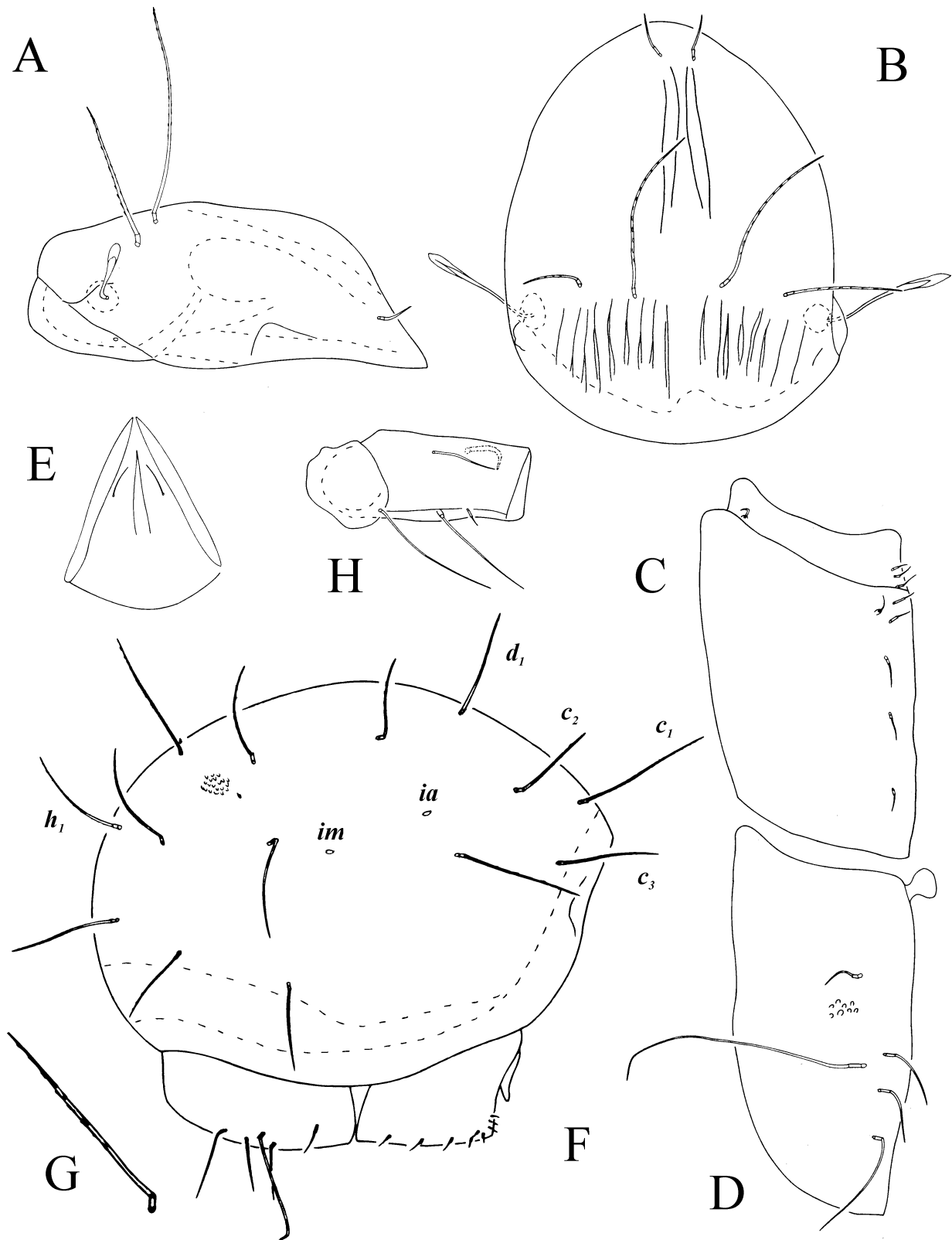


FIGURE 3A–H. *Plonaphacarus kaluzi* Niedbala sp. nov., A, prodorsum, lateral view; B, prodorsum, dorsal view; C, genitoaggenital plate; D, anoadanal plate; E, mentum of infracapitulum; F, lateral view of opisthosoma; G, seta e_1 ; H, trochanter and femur I.

Prodorsum with distinct median crista; sigillar fields indistinct. Lateral carinae absent. Sensilla with narrow pedicel and short club-like, rough head. Interlamellar and lamellar setae long, thick, erect, sparsely covered with spines, obtuse distally similar to notogastral setae. Rostral setae very short, thick, rough, spiniform. Exobothridial setae vestigial.

Notogaster with rigid setae, sparsely covered with small spines, obtuse distally, of medium size ($c_1 < c_1 - d_1$), dorsal setae longer than lateral with exception of setae cp which is as long as dorsal setae. Setae c_1 and c_3 near anterior margin, setae c_2 far from margin. Vestigial setae f_1 at the level of h_1 setae. Two pairs of lyrifissures, ia and im , present.

Ventral region. Setae h of infracapitular mentum shorter than distance between them. Formula of very short genital setae: 9(4+2:3). Anoadanal plates with rough setae, setae ad_2 longest and curved distally.

Legs setation complete. Seta d of femora I remote from distal end of article.

Material examined. Holotype and three paratypes: In-1; five paratypes: In-3.

Comparison to related species. The new species is distinguishable from congeners by presence of long and similarly shaped interlamellar and lamellar setae. In the fauna of Steganacaridae exists only one species with similar shape of these setae, similar length and shape of notogastral setae *Plonaphacarus eximius* (Niedbała, 1982) origin from Mexico. The new species differs from *P. eximius* by presence of median crista of prodorsum (versus absence of crista), the dilated head of sensilla (versus pointed distal end of sensilla), thick and spiniform rostral setae (versus needle-form rostral setae), and considerably shorter genital setae.

Etymology. The species is named after Dr. Stanislav Kalúz (Institute of Zoology, Slovak Academy of Sciences, Bratislava, Slovakia) for the given Indian ptyctimous mite material for our studying.

Remarks about known species

Sumatrotritia inusitata Mahunka, 1989

(Fig. 4 A–E)

All characters almost as in description of holotype (Mahunka 1989). Below we have listed a few additional characters and verified the description given by Mahunka (1989).

Measurements of specimen from India (Locality: In-3). Prodorsum: length 273, height 91. Prodorsal setae: sensillum 88, interlamellar 131, lamellar 154, rostral 126. Notogaster: length 505, height 409.

The specimen measured is smaller than that described by Mahunka (differences in the size of individuals occur in many species of ptyctimous mites).

Diagnosis. Prodorsum with two pairs of vestigial exobothridial setae. Genitoaggenital region with seven pairs of setae, three pairs of long setae in the antero-median part of plate and four pairs of minute setae, one in antero-paraxial position, anteriorly of suture kag and three pairs in anti-axial position, one anteriorly of suture kag (Mahunka (1989) shows the setae in the Figure 8, but does not mention their presence in the description). The minute setae (three pairs?) depicted by Mahunka are inaccurately presented. The three pairs of long setae in Fig. 8 of Mahunka are located along paraxial border of plate but in our specimens they are slightly skewed from paraxial border.

Setae h of mentum very long, considerably longer than distance between them. Femora I with four setae.

Diagnostic characters of genus *Sumatrotritia*. Bothridial scale situated dorso-posteriorly of bothridia. Two pairs of exobothridial setae. Interlamellar setae displaced towards anti-axial side of prodorsum. Two interlocking triangles present. Seven pairs of genital setae present, three of them very long, situated medially and obliquely in anterior part of plate, four others minute, situated on or near progenital plate. Each trochanter of legs with one seta.

This genus takes an intermediate place in the Euphthiracaroida classification, between *Euphthiracarus*, *Pocsia* and *Acrotritia*. In the genera *Euphthiracarus* and *Pocsia* two interlocking triangles of ventral area are present, while in *Acrotritia* one triangle. In the genus *Euphthiracarus* bothridial scale of prodorsum is positioned below bothridium, while in the genera *Pocsia* and *Acrotritia* it is above bothridium.

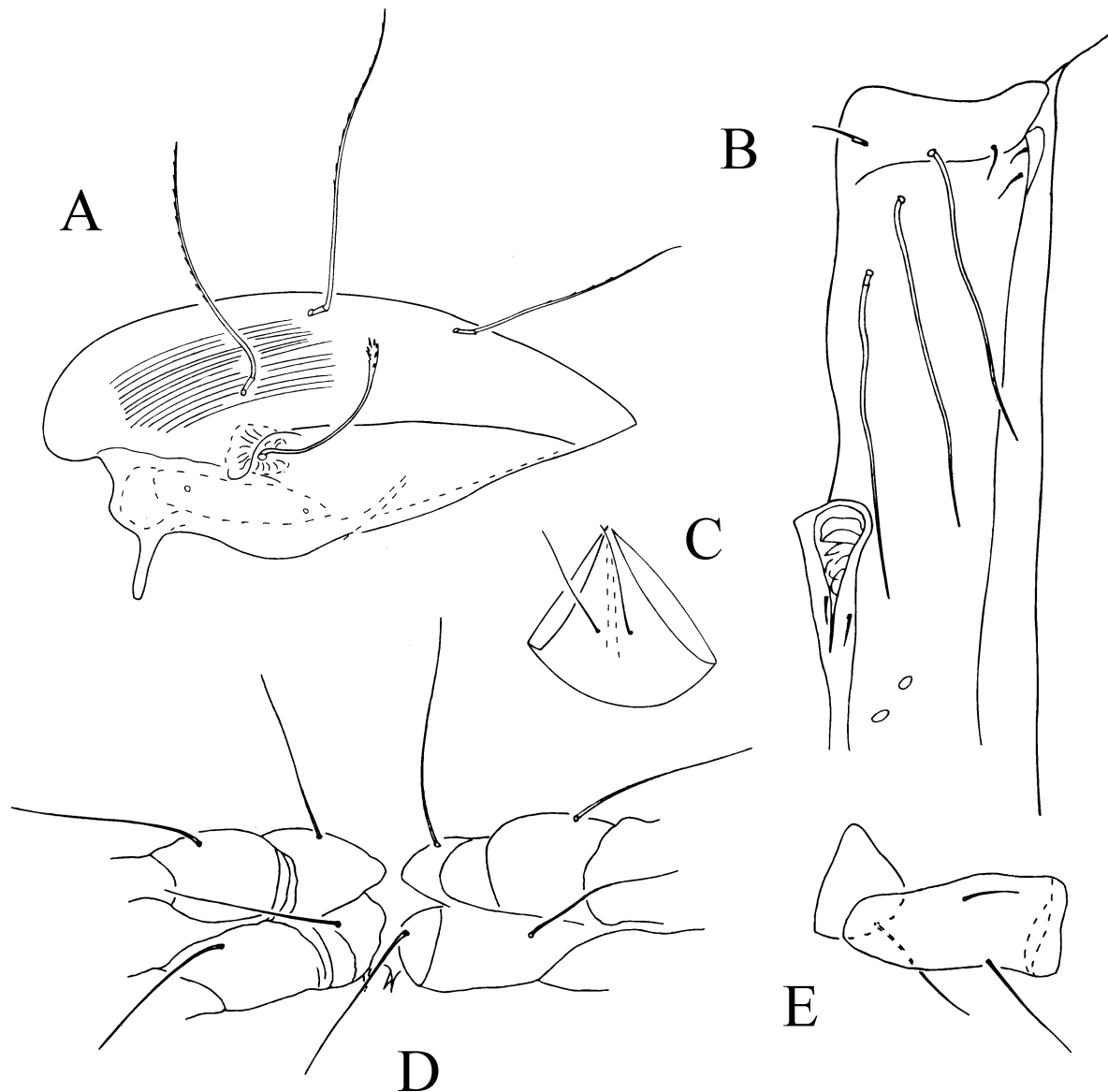


FIGURE 4A–E. *Sumatrotritia inusitata* Mahunka, 1989. A, prodorsum, lateral view; B, left side of genitoaggenital plate, C, mentum of infracapitulum, D, coxae and trochanters of legs III and IV; E, trochanter and femur I.

Euphthiracarus meghalayensis Sanyal, 1988

(Fig. 5 A–E)

Measurements of specimen from India (Locality: In-1). Prodorsum: length 308, height 121, width 212. Prodorsal setae: sensillum 101, interlamellar 164, lamellar 109, rostral 131, exobothridial 35. Notogaster: length 606, height 404, width 394. Notogastral setae: c_1 104, $c_1/c_1-d_1=0.6$, h_1 114, p_1 96. Genitoaggenital plate 252×101 ; anoadanal plate 252×76 .

Diagnosis. Colour yellow, surface of body foveolate. Prodorsum with two pairs of distinct long lateral carinae, upper shorter and weaker than lower. Sensilla without head, covered with small cilia at tip. Interlamellar and lamellar setae erect, covered with weak small spines, rostral setae rough, attenuate. Distance between lamellar setae slightly smaller than than between rostral setae. Notogastral setae rather short, $c_1 < c_1-d_1$, with weak small spines in distal half. Setae of row c remote from anterior margin, setae c_1 a little more than setae c_2 and c_3 . Seta h of infracapitular mentum very long, considerably longer than distance between them. Nine pairs of genital setae, g_{1-3} minute, $g_{4,5}$ of medium size, g_{6-9} the strongest, similar in size to ag_2 setae, aggenital setae ag_2 three times as long as

setae ag_1 . Three pairs of anal and three pairs of adanal setae present, erect and rough, with exception of anal setae an_1 and an_2 longer, attenuate and smooth, lyrifissures iad located between an_3 and ad_3 setae. Tarsi heterotridactylous.

Comparison. *Euphthiracarus meghalayensis* is distinguishable from congeners by foveolate surface of body, presence of two pairs of lateral setae, long, rough and attenuate rostral setae, sensilla without head, heterotrichy of genital and aggenital setae, anal setae an_1 and an_2 long, attenuate and smooth and tarsi heterotridactylous.

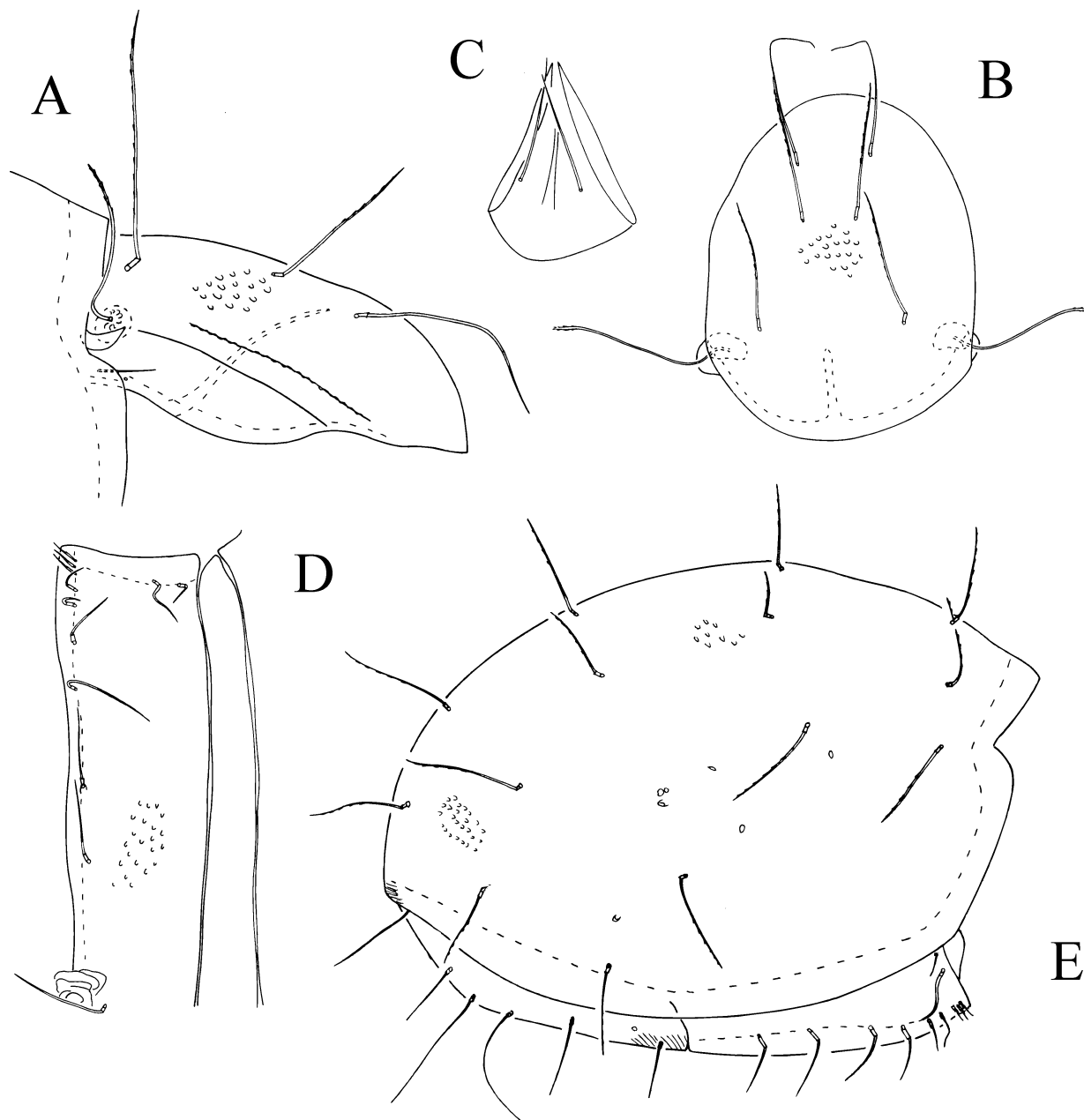


FIGURE 5 A–E. *Euphthiracarus meghalayensis* Sanyal, 1988. A, prodorsum, lateral view; B, prodorsum, dorsal view; C, mentum of infracapitulum; D, left side of genitoaggenital plate; E, lateral view of opisthosoma.

***Phthiracarus obscurus* Niedbala, 1986**

(Fig. 6 A–F)

Measurements of specimen from India (Locality: In-2). Prodorsum: length 237, height 91. Notogaster: length 465, height 313.

Remarks. Notogaster with two pairs of lyrifissures ia and im from both sides, right femur with „complete

chaetotaxy“, left femur with „incomplete chaetotaxy“, setae *v*” is absent, setae *h* of infracapitular mentum are shorter than distance between them. All other characters as in holotype.

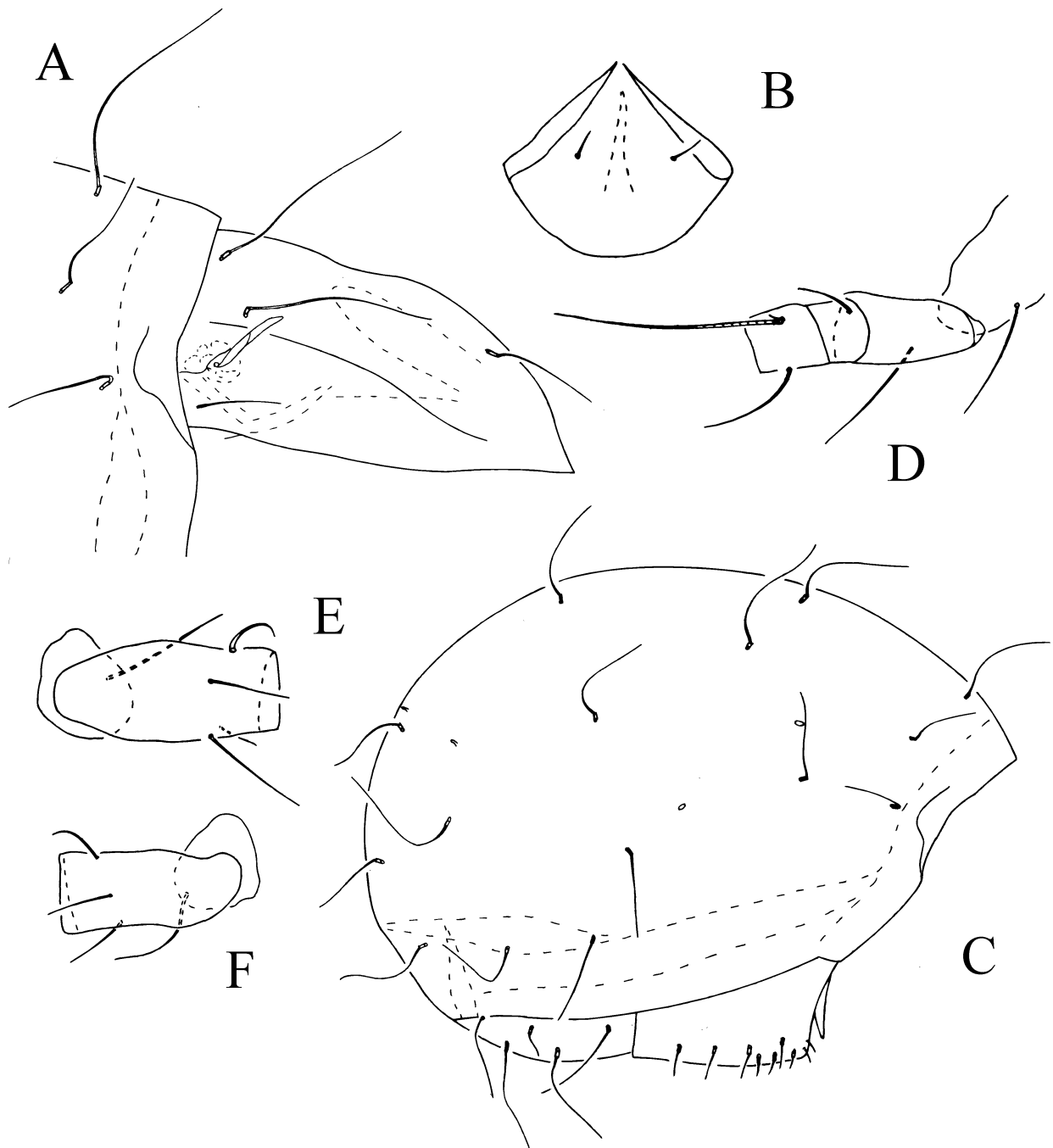


FIGURE 6A–F. *Phthiracarus obscurus* Niedbala, 1986. A, prodorsum lateral view, B, mentum of infracapitulum; C, lateral view of opisthosoma; D, femur, genu and tibia of leg IV; E, right trochanter and femur I; F, left trochanter and femur I.

***Hoplophthiracarus concinuus* (Niedbala, 1982)**

(Fig. 7 A–H)

Hoplophthiracarus tropicus Mondal & Kundu, 1988 **syn. nov.**

Measurements of specimen from India (Locality: In-1). Prodorsum: length 245, width 164, height 111. Prodorsal setae: sensillum 71, interlamellar 78, lamellar 6, rostral 33. Notogaster: length 480, width and height 303. Notogastral setae: c_1 94, $c_1/c_1-d_1=0.8$, h_1 99, p_1 91. Genitoaggenital plate 114×101 ; anoanal plate 164×96 .

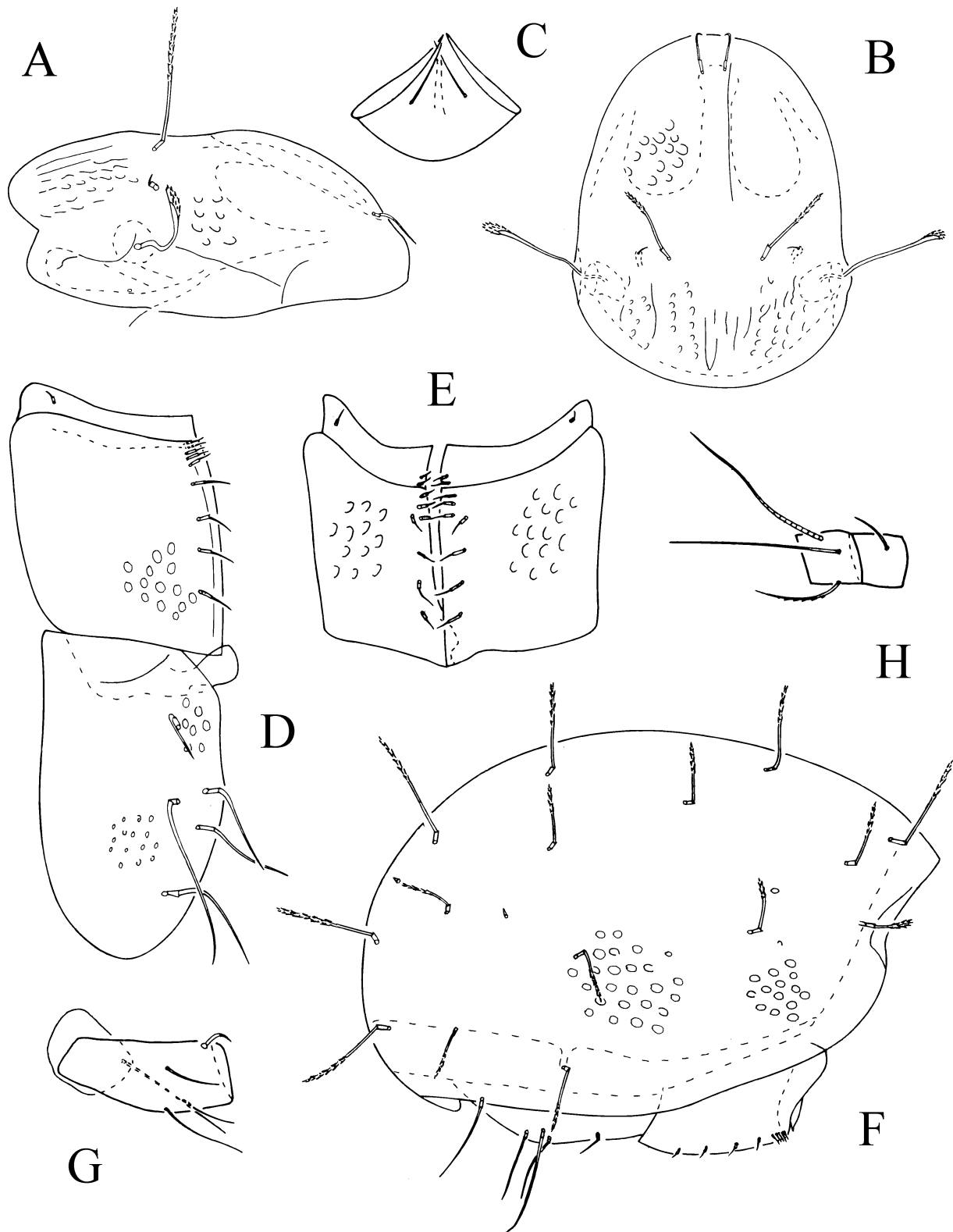


FIGURE 7A–H. *Hoplophthiracarus concimus* (Niedbala, 1982). A, prodorsum, lateral view; B, prodorsum, dorsal view; C, mentum of infracapitulum; D, genitoaggenital and anoadanal plates; E, genitoaggenital plates, another specimen; F, lateral view of opisthosoma; G, trochanter and femur I; H, genu and tibia IV.

Diagnosis. Colour dark brown; surface of body covered with deep, regular rounded foveolae. Prodorsum with distinct median crista and short, feeble lateral carinae; posterior sillons distinct; sigillar fields long and narrow; sensilla rather long with narrow pedicel and short, fusiform head covered with spines; interlamellar setae similar to

notogastral setae, rather short, thick, erect, covered with small spines in distal half; lamellar setae minute, rostral setae spiniform, rough, procumbent; exobothridial setae vestigial (short in holotype). Notogastral setae rather short, $c_1 < c_1 - d_1$, thick, covered with spines in distal half; setae c_1 slightly remote from anterior border, setae c_2 more remote, setae c_3 almost at border; vestigial setae f_1 posteriorly of setae h_1 ; two pairs of lyrifissures *ia* and *im* present. Ventral region: setae *h* of mentum longer than distance between them; arrangement of genital setae: 4+2:3; in two examined specimens setae g_6 situated laterally of setae g_5 (Fig.7 E), in four examined specimens setae g_6 situated posteriorly of setae g_5 ; anoadanal plates with rough setae ad_2 the longest, ad_3 the shortest. Chaetome of legs of "complete type".

Remark. The find of this species in Arunachal Pradesh confirms suspicion (Niedbala 2004) that *Hoplophthiracarus tropicus* Mondal and Kundu, 1988 is conspecific with *H. concinuus*. "It is indicated by the presence of deep, rounded foveoles of body surface, median prodorsal crista, shape and length of sensillia, prodorsal, notogastral, anal and adanal setae."

Acknowledgements

We gratefully acknowledge S. Kalúz, L. Dembický and O. Šauša for help with collecting Indian oribatid mites.

References

- Mahunka, S. (1989) New and interesting mites from the Geneva Museum LXV. Oribatids of Sumatra (Indonesia) I (Acari: Oribatida). *Revue suisse de Zoologie*, 96, 673–696.
- Mondal, B.K. & Kundu, B.G. (1988) Two new species of Oribatid mites (Acari) of the genus *Hoplophthiracarus* Jacot, from Darjeeling, India. *Records of Zoological Survey of India*, 85, 111–118.
- Niedbala, W. (1986) Catalogue des Phthiracaroides (Acari), clef pour la détermination des espèces et descriptions d'espèces nouvelles. *Annales Zoologici*, 40 (4), 309–370.
- Niedbala, W. (2000) The ptyctimous mites fauna of the Oriental and Australian regions and their centres of origin (Acari: Oribatida). *Genus*, supplement, 1–493.
- Niedbala, W. (2004) Supplement to the knowledge of ptyctimous mites of Oriental Region (Acari, Oribatida). *Genus*, 15, 391–423.