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Dong Liu^a, Donghui Wu^a & Jun Chen^b

^a Key Laboratory of Wetland Ecology and Environment, Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun, P.R. China

^b Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing, P.R. China

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First record of the genus *Arphthycarus* Niedbala (Acari: Oribatida: Phthiracaridae) from China, with descriptions of two new species

Dong Liu^a, Donghui Wu^a and Jun Chen^{b*}

^aKey Laboratory of Wetland Ecology and Environment, Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun, P.R. China; ^bKey Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing, P.R. China

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The oribatid mite genus *Arphthycarus* Niedbala, 1994 (Phthiracaridae) is reported in China for the first time. Two new species of *Arphthycarus* are described: *Arphthycarus baculus* sp. nov. from Hunan Province, and *Arphthycarus spiniformis* sp. nov. from Guangxi Province.

<http://zoobank.org/urn:lsid:zoobank.org:pub:A1729EB7-2C99-4BF6-94EB-229E2A743D84>.

Keywords: Oribatida; Phthiracaridae; *Arphthycarus*; new species; China

Niedbala (1994) proposed the oribatid mite genus *Arphthycarus*, with *Hoplophthiracarus latebrosus* Niedbala, 1982 as type species, and included 19 species in this genus. After this, 39 species were described (Niedbala 1997, 2000, 2001, 2003a, 2003b, 2004, 2006a, 2006b, 2006c, 2008, 2011; Niedbala and Corpuz-Raros 1998), with a distribution that excludes the Holarctic Region [however, see Subías (2004, electronically updated in 2014) for an alternative classification of these species].

Mites of *Arphthycarus* are characterized by median and lateral sigillar fields of prodorsum not fused; lamellar setae short, length ratio of lamellar setae/prodorsum < 0.18; notogaster with 15 pairs of setae, rarely neutrichous; setae c_1 usually shorter than the distance between setae c_1 and d_1 ; setae g_{7-9} displaced towards the paraxial margin of ano-adanal plate, almost in a row with setae g_{1-5} , setae g_6 remote from the margin and located anteriorly of g_5 , when it is placed posteriorly of these setae, the distance between g_6 and g_5 is shorter than that between g_5 and g_4 ; setae ad_1 remote from paraxial margin and longer than anal setae; setae ad_2 far from margin, adanal setae normal. Before our study, none of the species belonging to this genus had been reported from China (Chen et al. 2010). While studying the specimens of ptyctimous mites collected from China, we identified two new species of *Arphthycarus*. The purpose of this paper is to give detailed descriptions and illustrations of the new species.

Material and methods

Measurements and descriptions are based on specimens mounted in temporary cavity slides that were studied using a standard light microscope equipped with a drawing attachment.

*Corresponding author. Email: chenj@ioz.ac.cn

Terminology generally follows Niedbala (1992, 2000). Measurements are shown in micrometres (μm).

The specimens studied are deposited in the National Zoological Museum of China, Institute of Zoology, Chinese Academy of Sciences, Beijing (ZMCAS) and/or Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun (NIGA).

Descriptions of new species

Arphthycarus baculus sp. nov.

(Figure 1)

Diagnosis

Surface of body covered with large foveolae; sigillar fields of prodorsum and posterior furrows well developed; one pair of lateral carinae present, nearly reaching sinus; sensilla long, narrow, swollen at the end and covered with small spines; interlamellar and notogastral setae long and robust, erect and obtuse distally, densely barbed in distal half; lamellar and rostral setae spiniform, short, rough and semi-erect; exobothridial short and fine; $ss > in > ex > ro > le$; setae ps_4 situated anterior to the level of setae ad_2 ; two pairs of lyrifissures ia and im present; $h > h-h$; setae g_6 situated anteriolateral to g_5 ; setae ad_2 situated at level of setae an_1 ; setae ad_3 smooth; $ad_1 > ad_2 > an_1 = an_2 > ad_3$; setae d on femora I situated near distal end of article.

Material examined

Holotype: adult (ZMCAS, in alcohol, W-93-20), China: Hunan Province, Yizhang County, Mangshan Mountains, Pingkeng (24°58'43.18" N, 112°51'3.50" E), from litter, 17 March 1991, leg. Fu-Sheng Huang. Paratype: one adult (ZMCAS, in alcohol, W-93-20), same data as holotype.

Description

Measurements. Holotype: Prodorsum: length 250, width 170, height 90, setae: ss 80, ro 16, le 10, in 72, ex 20; distance between setae: $ro-ro$ 23, $in-in$ 55, $le-le$ 102; notogaster: length 464, width 319, height 290; setae: c_1 70, c_2 67, c_3 66, c_p 61, d_1 62, d_2 55, e_1 75, e_2 59, h_1 77, h_2 65, h_3 58, ps_1 73, ps_2 65, ps_3 55, ps_4 50; distance between setae: c_1-d_1 120, d_1-e_1 145, e_1-h_1 115, h_1-ps_1 95; ventral region: ad_1 75, ad_2 70, ad_3 37, an_1 55, an_2 55; genitoaggenital plate 132×115 , anoadanal plate 176×105 . Paratype: Prodorsum: length 240, width 165, height 100; notogaster: length 448, width 305, height 275; genitoaggenital plate 125×110 , anoadanal plate 188×105 .

Integument. Colour yellowish to brown. Surface of body covered with large foveolae.

Prodorsum (Figure 1A–C). One pair of lateral carinae (ca) present, nearly reaching sinus; sigillar fields distinct, dorsal field narrow, longer than lateral fields; posterior

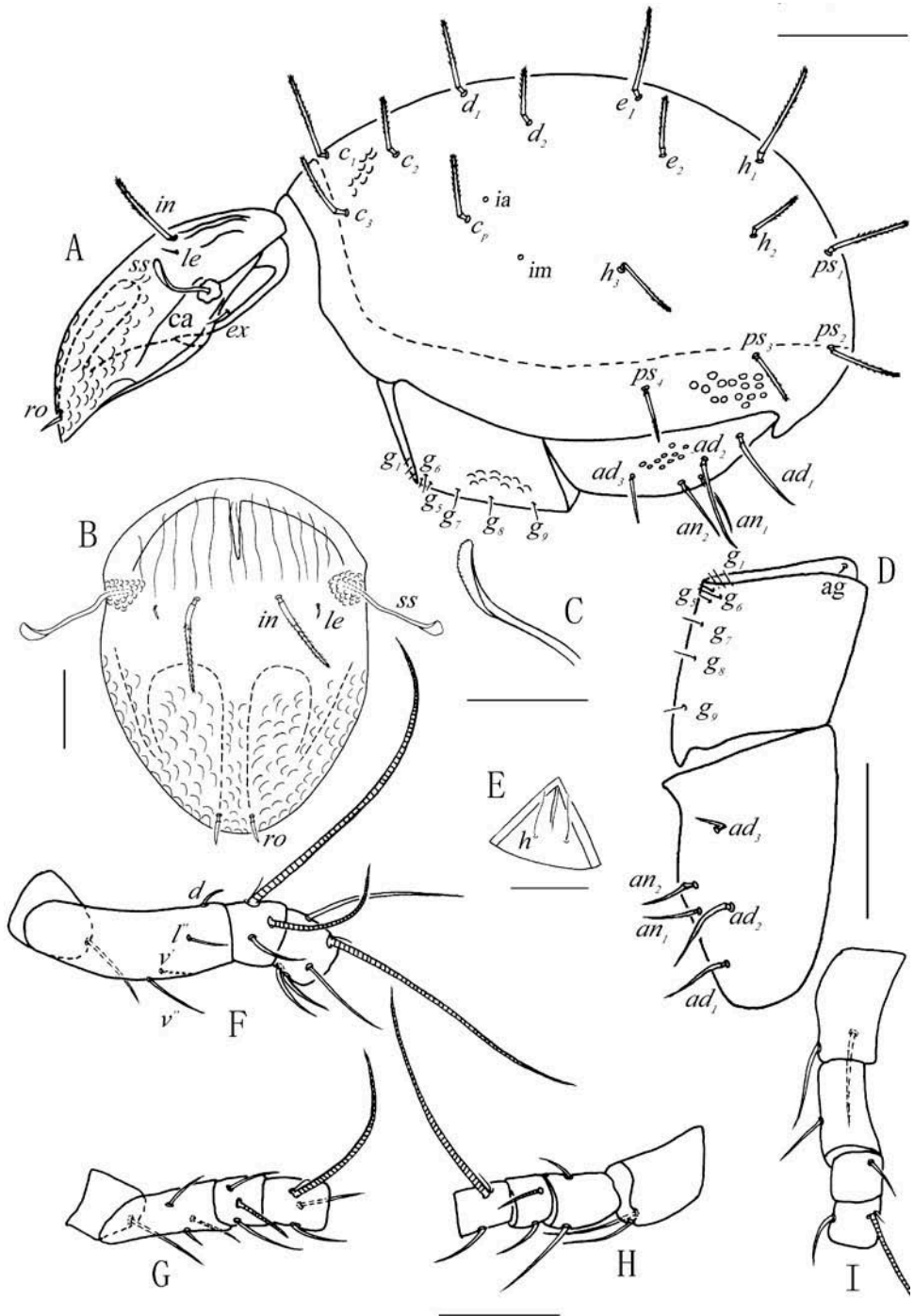


Figure 1. *Arphthycarus baculus* sp. nov. (A) Lateral view of body (legs removed); (B) prodorsum, dorsal view; (C) sensillum, dorsal view; (D) left side of ventral plate; (E) mentum of infracapitulum; (F–I) trochanter, femur, genu and tibia: (F) leg I; (G) leg II; (H) leg III; (I) leg IV. Scale bars: 100 μ m (A, D, F–I), 50 μ m (B, C, E).

furrows developed; sensilla (*ss*) long, narrow, swollen at the end and covered with small spines; interlamellar setae (*in*) bacilliform, long, robust, erect and obtuse distally, densely barbed in distal half; lamellar (*le*) and rostral (*ro*) setae spiniform, short, rough and semi-erect; rostral setae much thicker than lamellar setae; exobothridial setae (*ex*) short and fine; comparative length: $ss > in > ex > ro > le$.

Notogaster (Figure 1A). Fifteen pairs of setae present, moderately long ($c_1 < c_{1-d_1}$), similar shape to interlamellar setae, setae h_1 longest, setae ps_4 thinner and shortest; setae c_{1-3} remote from anterior border, setae c_2 more remote than c_1 and c_3 ; vestigial setae f_1 not observed; two pairs of lyrifissures *ia* and *im* present.

Ventral region (Figure 1D, E). Setae *h* of mentum longer than distance between them. Nine pairs of genital setae (*g*) present, arranged with formula: 6(4 + 2): 3. Anoadanal plates each with five setae (*ad* and *an*), pointed distally, setae ad_1 and ad_2 rough, nearly straight, longer and thicker than other setae, setae ad_3 and anal setae slightly thinner and smooth; comparative length: $ad_1 > ad_2 > an_1 = an_2 > ad_3$.

Legs (Figure 1F–I). Setal counts for leg segments (without tarsi): I: 1–4–2(2)–5(1); II: 1–3–2(1)–3(1), III: 2–2–1(1)–2(1), IV: 2–1–1–2(1); setae *d* on femora I situated near distal end of article; setae *a''* on tarsi I and setae *ft''* on tarsi II curved distally; setae *a''* on tarsi II curved distally; setae *s* and *pv'* on tarsi IV present; setae *s* on tarsi I and II absent.

Etymology

The new specific name '*baculus*' is from Latin, and refers to the bacilliform shape of the notogastral setae.

Remarks

This new species is similar to *Arphthycarus ineptus* (Niedbala, 1984) from India in the presence of two pairs of lyrifissures and similar shape of lamellar, interlamellar and notogastral setae, but can be easily distinguished from the latter species by following characters: in *A. baculus* sp. nov., surface of body covered with large foveolae; sigillar fields of prodorsum and posterior furrows well developed; lateral carinae much longer, nearly reaching sinus; head of sensilla more inflated in dorsal view and more elongate in lateral view; interlamellar and rostral setae much shorter (*in* 72, *ro* 16), $ss > in > ex > ro > le$; rostral setae thicker and rough, shorter than exobothridial setae (*ex* 20); notogastral setae much shorter (e.g. c_1 70); setae g_6 situated anteriolateral to g_5 ; setae ad_2 situated at level of setae an_1 ; setae ad_3 smooth; setae *a''* on tarsi I and tarsi II present. In *A. ineptus*, surface of body covered with small foveolae; sigillar fields of prodorsum and posterior furrows indistinct; lateral carinae short, far from sinus; head of sensilla slightly inflated in dorsal view and shorter in lateral view; interlamellar and rostral setae much longer (*in* 123, *ro* 54.2), $in > ss > ro > ex > le$; rostral setae thin and smooth, much longer than exobothridial setae (*ex* 25.2); notogastral setae much longer (e.g. c_1 108); setae g_6 situated posteriolateral to g_5 ; setae ad_2 situated at level between setae an_1 and an_2 ; setae ad_3 covered with small spines; setae *a''* on tarsi I and tarsi II absent.

This new species is also similar to *Arphthycarus pachetos* Niedbala, 2008 from Borneo by the presence of two pairs of lyrifissures, similar shape of sensilla, similar shape and length of interlamellar, lamellar and notogastral setae, but differs by following characters: in *A. baculus* sp. nov., posterior furrows of prodorsum developed; lateral carinae relatively short, not reaching sinus; dorsal sigillar field narrower than lateral ones; rostral setae much shorter (ro 16) and spiniform; $ss > in > ex > ro > le$; distance between rostral setae shorter ($in-in/ro-ro = 2.39$); setae ps_4 situated anterior to the level of setae ad_2 ; setae h of mentum not vestigial; setae ad_2 not distinctly longer than other setae of anoadanal plates; setae ad_2 situated at level of setae an_1 ; setae d on femora I situated much anterior to the level of setae v' . In *A. pachetos*, posterior furrows absent; lateral carinae very long, reaching the end of rostrum; dorsal sigillar field broader than lateral ones; rostral setae longer (ro 53) and setiform; $in > ss > ro > le > ex$; distance between rostral setae longer ($in-in/ro-ro < 1.5$); setae ps_4 situated at the level of setae ad_2 ; setae h of mentum vestigial; setae ad_2 distinctly longer than other setae of anoadanal plates; setae ad_2 situated at level between setae an_1 and an_2 ; setae d on femora I situated at the level of setae v' .

Arphthycarus spiniformis sp. nov.

(Figure 2)

Diagnosis

Surface of body foveolate; lateral carinae and median carina absent; sigillar fields weakly visible; posterior furrows present; sensilla with long and narrow pedicel and rounded head; interlamellar and notogastral setae thick and semi-erect, covered with small spines in distal half; lamellar setae minute; rostral setae spiniform, short, smooth and semi-erect; exobothridial setae short and fine; $ss > in > ro > le > ex$; vestigial setae f_1 posterior to setae h_1 ; two pairs of lyrifissures ia and im present; $h < h-h$; setae g_6 situated slightly anteriolateral to g_4 ; setae ad_2 situated between setae an_1 and an_2 , and far away from setae an_1 ; setae ad_3 smooth; $ad_2 > ad_1 > an_1 = an_2 > ad_3$; setae d on femora I situated near distal end of article.

Material examined

Holotype: adult (ZMCAS, in alcohol, N-17), China: Guangxi Province, Xing'an County, Maoershan Mts. (25°52'51.56" N, 110°29'39.54" E), from moss, 1200 m, 14 July 1985, leg. Yun-Qi Cui. Paratypes: two adults (NIGA, in alcohol), China: Guangxi Province, Lipu County (24°29'16.23" N, 110°23'42.77" E), from litter, 22 October 2012, leg. Yong-Ming Wu.

Description

Measurements. Holotype: Prodorsum: length 187, width 135, height 82, setae: ss 45, ro 22, le 12, in 43, ex 4; distance between setae: $ro-ro$ 16, $in-in$ 53, $le-le$ 86; notogaster: length 330, width 220, height 200; setae: c_1 46, c_2 43, c_3 43, c_p 45, d_1 40, d_2 35, e_1 35, e_2 40, h_1 36, h_2 45, h_3 35, ps_1 40, ps_2 45, ps_3 41, ps_4 40; distance between setae: c_1-d_1 75, d_1-e_1 105, e_1-h_1 77, h_1-ps_1 60; ventral region: ad_1 50, ad_2 56,

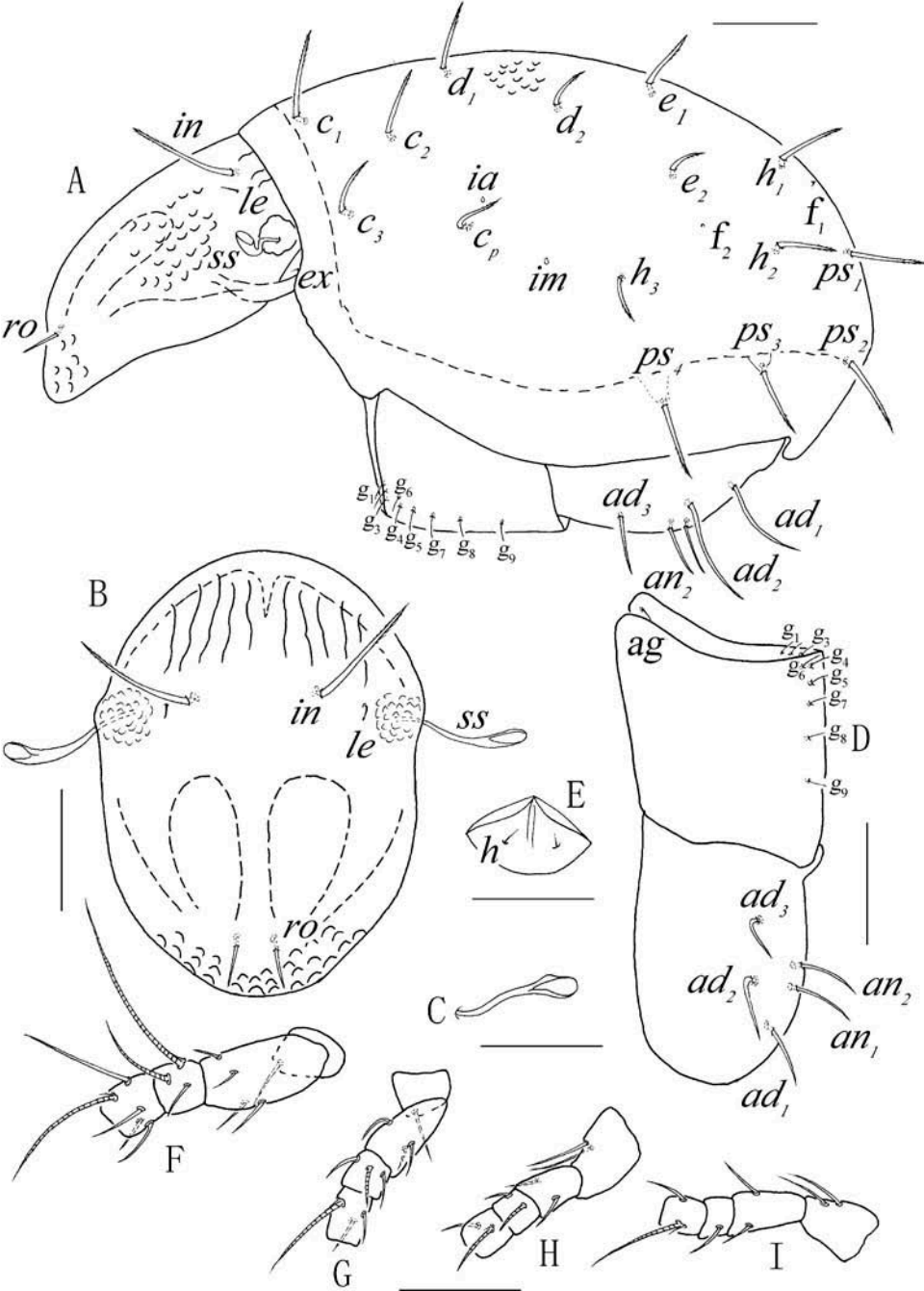


Figure 2. *Arphthycarus spiniformis* sp. nov. (A) Lateral view of body (legs removed); (B) prodorsum, dorsal view; (C) sensillum, dorsal view; (D) right side of ventral plate; (E) mentum of infracapitulum; (F–I) trochanter, femur, genu and tibia: (F) leg I; (G) leg II; (H) leg III; (I) leg IV. Scale bars: 50 µm.

ad_3 30, an_1 31, an_2 31; genitoaggenital plate 136×90 , anoanal plate 151×120 . Paratypes: Prodorsum: length 175–180, width 130–135, height 80–85; notogaster: length 320–325, width 205–215, height 190–195.

Integument. Colour yellowish. Surface of body foveolate.

Prodorsum (Figure 2A–C). Lateral carinae and median carina absent; sigillar fields weakly visible; posterior furrows present; sensilla (*ss*) with long and narrow pedicel and rounded head; interlamellar setae (*in*) thick, semi-erect and pointed distally, covered with small spines in distal half; lamellar setae (*le*) minute and smooth; rostral setae (*ro*) spiniform, short, smooth and semi-erect, thicker than lamellar setae; exobothridial setae (*ex*) short and fine; comparative length: $ss > in > ro > le > ex$.

Notogaster (Figure 2A). Fifteen pairs of setae present, short ($c_1 < c_1 - d_1$), similar shape to interlamellar setae, setae c_1 longest, setae d_2 , e_2 and h_3 shortest; setae c_{1-3} remote from anterior border, setae c_2 more remote than c_1 and c_3 ; vestigial setae f_1 posterior to setae h_1 ; two pairs of lyrifissures *ia* and *im* present.

Ventral region (Figure 2D, E). Setae *h* of mentum shorter than distance between them. Nine pairs of genital setae (*g*) present, arranged with formula: 6(4 + 2): 3. Anoanal plates each with five setae (*ad* and *an*), pointed distally, setae ad_1 and ad_2 rough, nearly straight, longer and thicker than other setae, setae ad_3 and anal setae slightly thinner and smooth; comparative length: $ad_2 > ad_1 > an_1 = an_2 > ad_3$.

Legs (Figure 2F–I). Setal counts for leg segments (without tarsi): I: 1–4–2(2)–5(1); II: 1–3–2(1)–3(1), III: 2–2–1(1)–2(1), IV: 2–2–1–2(1); setae *d* on femora I situated near distal end of article; setae *a''* on tarsi I and setae *ft''* on tarsi II curved distally; setae *a''* on tarsi II curved distally; setae *s* and *pv'* on tarsi IV present; setae *s* on tarsi I and II absent; setae *d* on tibiae IV short.

Etymology

The new specific name '*spiniformis*' is from Latin, and refers to the shape of rostral setae.

Remarks

This new species is similar to *Arphthycarus evexus* Niedbala, 2000 from Vietnam in the presence of posterior furrows on prodorsum, two pairs of lyrifissures present, vestigial setae f_1 posterior to setae h_1 , similar shape of sensilla, short and fine lamellar setae, $h < h - h$, but can be easily distinguished from the latter species by following characters: in *A. spiniformis* sp. nov., lateral carinae absent; interlamellar setae much shorter (*in* 43), $ss > in$; rostral setae shorter (*ro* 22) and semi-erect; setae g_6 situated slightly anteriolateral to g_4 ; setae ad_2 shorter and straight, situated between setae an_1 and an_2 , and far away from setae an_1 ; setae ad_3 smooth. In *A. evexus* lateral carinae distinct; interlamellar setae much longer (*in* 75.9), $in > ss$; rostral setae longer (*ro* 37.9), lying parallel to surface of prodorsum; setae g_6 situated at the level between g_4 and g_5 ,

and closer to g_5 ; setae ad_2 longer and hooked, situated posteriolateral to setae an_1 , and very close to setae an_1 ; setae ad_3 covered with small setae.

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References

- Chen J, Liu D, Wang HF. 2010. Oribatid mites of China: a review of progress, with a checklist. *Zoosymposia*. 4:186–224.
- Niedbala W. 1984. Nouveaux Phthiracaridae d’Asie (Acari: Oribatida). *J Nat Hist*. 18:829–842.
- Niedbala W. 1992. Phthiracaroidea (Acari, Oribatida). *Systematic Studies*. Warszawa: PWN-Polish Scientific Publishers.
- Niedbala W. 1994. Supplement to the classification of Phthiracaroidea, with redescriptions and descriptions of some species (Acari, Oribatida, Euptyctima). *Genus*. 5:1–152.
- Niedbala W. 1997. Contribution to the knowledge of Euptyctima (Acari: Oribatida). *Genus*. 8:81–101.
- 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. 2001. Study on the diversity of ptyctimous mites (Acari, Oribatida) and quest for centres of its origin: the fauna of the Ethiopian Region. *Monogr Up Sil Mus*. 3:1–245.
- Niedbala W. 2003a. New species of ptyctimous oribatid mites from the Neotropical Region. *Acta Zool Acad Sci H*. 49:261–269.
- Niedbala W. 2003b. Ptyctimous mites (Acari: Oribatida) of Costa Rica. *Ann Zool*. 53:259–334.
- Niedbala W. 2004. Ptyctimous mites (Acari, Oribatida) of the Neotropical Region. *Ann Zool*. 54:1–288.
- Niedbala W. 2006a. Four new species of ptyctimous mites (Acari: Oribatida) from Mesoamerica. *Ann Zool*. 56:791–797.
- Niedbala W. 2006b. Ptyctimous mites (Acari: Oribatida) of South Africa. *Ann Zool*. 56:1–97.
- Niedbala W. 2006c. Supplement to the knowledge of ptyctimous mites (Acari: Oribatida) from Australian Region. *Ann Zool*. 56:99–156.
- Niedbala W. 2008. New species of ptyctimous mites (Acari, Oribatida) from Borneo and Sumatra. *Zootaxa*. 1786:1–18.
- Niedbala W. 2011. *Arphthycarus andamanensis* sp. nov., a new species of ptyctimous mite (Acari, Oribatida) from the Andamans. *J Nat Hist*. 45:357–360.
- Niedbala W, Corpuz-Raros LA. 1998. Ptyctimous mites (Acari, Oribatida) from the Philippines. *Philipp Agric Sci*. 81:1–58.
- Subías LS. 2004. Listado sistemático, sinónimo y biogeográfico de los ácaros oribátidos (Acariformes, Oribatida) del mundo (1758-2002). *Graellsia*. 60:3–305. (Electronic update 2014: http://escalera.bio.ucm.es/usuarios/bba/cont/docs/RO_1.pdf) doi:10.3989/graelisia.2004.v60.iExtra.218