

Oribatid mites of the genera *Belba* and *Belbodamaeus* (Acari: Oribatida: Damaeidae) from Eastern Mongolia

BADAMDORJ BAYARTOGTOKH

Department of Zoology, Faculty of Biology, National University of Mongolia, Ulaanbaatar 210646, Mongolia;
e-mail: bayar@iname.com

Abstract

Two new species of oribatid mites belonging to the family Damaeidae, *Belba heterosetosa* sp. nov. and *Belbodamaeus rarituberculatus* sp. nov. are described from the eastern part of Mongolia. In addition, two known species, *Belba mongolica* and *B. crassisetosa*, previously known from central part of the country are discussed.

Key words: Acari, Oribatida, Damaeidae, new species, Mongolia

Introduction

The oribatid mite family Damaeidae shows extensive taxonomic diversity in Mongolia, and the author described or recorded about a dozen species from central and northern parts of the country (Bayartogtokh 2000a, b, c, d, 2001).

The study of the oribatid mite biodiversity of Eastern Mongolia is subject of the ongoing research as part of the biodiversity assessments in various habitats of this region, and in the course of study about ten species of damaeid mites are found. The present paper deals with descriptions of two new species belonging to the genera *Belba* and *Belbodamaeus*, and supplementary descriptions of two known species of the former genus. The species of other genera will be discussed in a future paper.

The eastern part of Mongolia is occupied mostly by very large steppe landscape with short and tall grasses, which encompassing several national parks and nature reserves. For the better understanding of the ecological processes occurring within the protected areas it is important to examine the biodiversity and composition of various soil organisms living there. Among soil microarthropods, the oribatid mites are one of the numerically dominant groups, and their descriptions should facilitate further ecological and biogeographical studies on the oribatid fauna of this region.

The morphological terminology used in this paper is based on that (with a few modifications) generally developed by Grandjean (1960) as applied by Norton (1979). Body length is measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster. Notogastral length is measured in lateral aspect, from the anterior to the posterior edge. Notogastral width refers to the maximum width in dorsal aspect. All measurements are given in micrometers, and the average measurement values are given in parentheses after the range. The line drawings were made with the aid of a camera lucida attached to a compound microscope.

***Belba heterosetosa* sp. nov.**

(Figs. 1 & 2)

Diagnosis. Medium in size, with typical characters of *Belba*. Propodolateral apophyses absent; prodorsal tubercle *Ba* well developed, tubercles *Bp*, *Da* and *Dp* absent; sensilli very thin, relatively short, slightly flagellate distally; notogastral setae thin, smooth, seta *c*₁ long, other setae relatively short, about two to three times shorter than seta *c*₁, seta *h*₁ thick, distinctly thicker than other setae; ventral tubercles *Va* and *Vp* well developed, *E2a* and *E2p* absent, tubercle *Sa* elongate triangular, *Sp* small, rounded at tip; epimeral regions III and IV with three and four setae, respectively; apodeme *apo.2* distinctly developed; tarsus I with 20, tarsus II with 17, tarsi III and IV with 15 and 13 setae, respectively; setae *d* on genua I–III and tibiae II–IV slightly shorter than their associated solenidia.

Measurements. Body length 478–547 (507) µm; length of notogaster 338–384 (366) µm; width of notogaster 331–314 (324) µm. In total five specimens were measured.

Integument. Body color reddish to yellowish brown. Surface of body and leg segments with thick granular cerotegument. Mostly without exuvial scalps, but only one paratype carrying exuvial scalps on the notogaster. Leg segments and lateral part of body with dense fungi micelles, but no adherent debris.

Prodorsum. Rostrum rounded in dorsal view, but distinctly projecting anteroventrally in lateral view. Rostral seta (*ro*) thin, medium in length, smooth. Lamellar seta (*le*) slightly longer than rostral seta, smooth. Interlamellar seta (*in*) nearly as long as lamellar seta, thin, smooth, directed posteriorly, slightly flagellate distally. Exobothridial seta (*ex*) thin, smooth, twice shorter than lamellar seta. Sensillus (*ss*) relatively short, thin, setiform along its length and flagellate distally. Bothridium irregular funnel-shaped, with large opening, directed posterolaterad. Prodorsal tubercle *Ba* well developed, situated posteromedial of bothridium. Tubercles *Bp*, *Da*, *Dp* and propodolateral apophysis *P* absent. A few microtubercles present on the prodorsum, and clustered between interlamellar setae and anteromedial of each bothridium (Fig. 1A & C).

Notogaster. Almost circular, slightly longer than wide, robust in lateral view. Setae *c*₁ relatively long and thick, darkly pigmented, about twice to three times as long as other

setae. Seta h_1 short, but much thicker than other setae of h , p and l series, and darkly pigmented. Lyrifissures ia and im and opisthosomal gland opening (gla) conspicuously developed; lyrifissures ih , ip and ips not evident. Postero-ventral margin of notogaster with small notch on its median part (Fig. 1B & C).

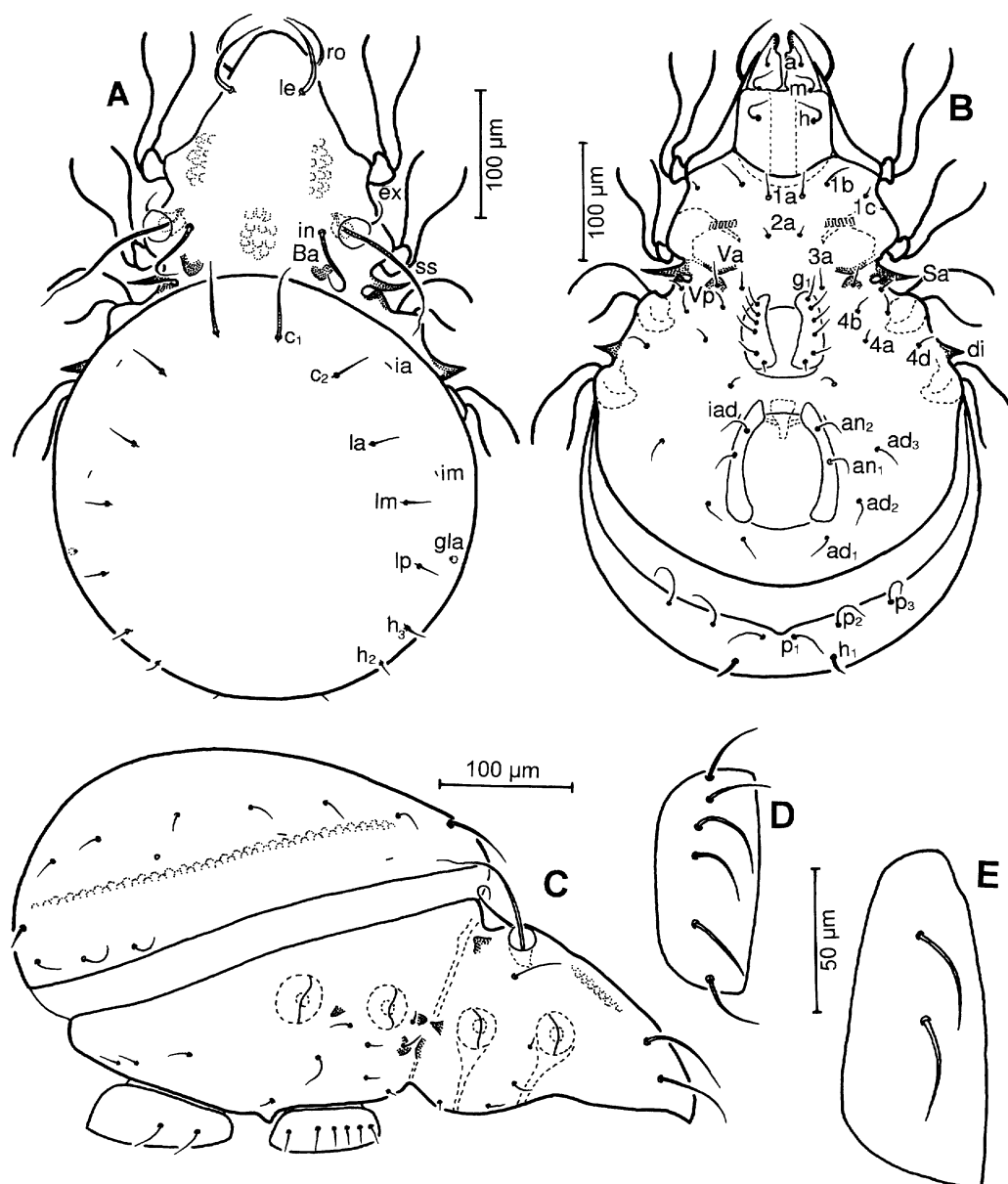


FIGURE 1. *Belba heterosetosa* sp. nov. A: Dorsal view; B: Ventral view; C: Lateral view; D: Genital plate; E: Anal plate.

Gnathosoma. Infracapitular mentum nearly as long as wide, without noticeable microtubercles. Hypostomal setae h and m of medium length, seta a short, all of them thin,

smooth (Fig. 1B). Structure of chelicera and palp typical for genus as shown by Bayartogtokh (2000).

Epimeral region. Tectum of podocephalic fossa not projected. Apodeme *apo.2* well developed. Ventrosejugal tubercles *Va* and *Vp* conspicuously developed; epimeral tubercles *E2a* and *E2p* absent. Parastigmatic tubercle *Sa* long, elongate triangular in shape and sharply projected laterally; tubercle *Sp* small, subtriangular. Tubercle *Vp* bearing epimeral seta *3b*. Discidium (*di*) well developed, subtriangular. Epimeral setal formula 3-1-3-4, all setae medium long, thin and smooth (Fig. 1B).

Ano-genital region. Structure normal for genus; ano-genital setae medium long, smooth. Adanal lyrifissures (*iad*) situated obliquely, at a level a little anterior to anal setae *an*₂ (Fig. 1B, D & E).

Legs. Trochanter of leg IV with relatively large porose area. Setae *d* on genua I–III and tibiae II–IV slightly shorter than their associated solenidia. Tarsus I with 20, tarsus II with 17, tarsi III and IV with 15 and 13 setae, respectively. Formula of leg setation (including famulus): I (1-7-4-4-20), II (1-6-4-5-17), III (2-4-3-4-15); IV (1-4-3-4-13); formula of solenidia: I (1-2-2); II (1-1-2); III (1-1-0); IV (0-1-0). Structure and setation of legs I–IV as shown in Fig. 2.

Material examined. Holotype (male): Northern slope of the Mt. Shiliin Bogd, District Dariganga, Province Suhbaatar, steppe, soils under sweet-brier, 45°28'55''N, 114°35'03''E, elevation 1687m a.s.l., 02 June 2003; four paratypes (one female and three males): District Erdenetsagaan, Province Suhbaatar, mountain-steppe, soils 0–5 cm, 46°12'58''N, 116°21'57''E, 31 May 2003, Col. B. Bayartogtokh. The holotype and two paratypes (alcohol preserved) are deposited in the collection of the Department of Zoology, National University of Mongolia, Ulaanbaatar, Mongolia and two paratypes are in the collection of the Zoological Museum of the Moscow State University, Moscow, Russia.

Remarks. The new species, *Belba heterosetosa* sp. nov. can be readily distinguished from all other known species of *Belba* by the notogastral setae, which is of different types and sizes, the short, but distally flagellate sensilli, the presence of well-developed apodeme *apo.2*, and the complete absence of ventral tubercles *E2a* and *E2p*. Among the known species of *Belba*, only *B. meridionalis* Bulanova-Zachvatkina, *B. sculpta* Mihelčič, and *B. cornuta* Wang & Norton resemble the new species in flagellate sensilli and interlamellar setae and the shape of notogaster. However, *B. meridionalis* described by Bulanova-Zachvatkina (1962) known from Turkmenistan is different from *B. heterosetosa* in the much longer notogastral and interlamellar setae, the different number of setae in femur I, and much larger body size.

The second species, *B. sculpta* described by Mihelčič (1957) and redescribed by Pérez-Iñigo (1970) from Spain is distinguishable from new species by the presence of postbothridial tubercle *Bp*, the much longer sensilli and interlamellar setae, the very long posterior notogastral setae *p*₁, the long and flagellate anal and adanal setae, and the presence of epimeral tubercle *E2a*.

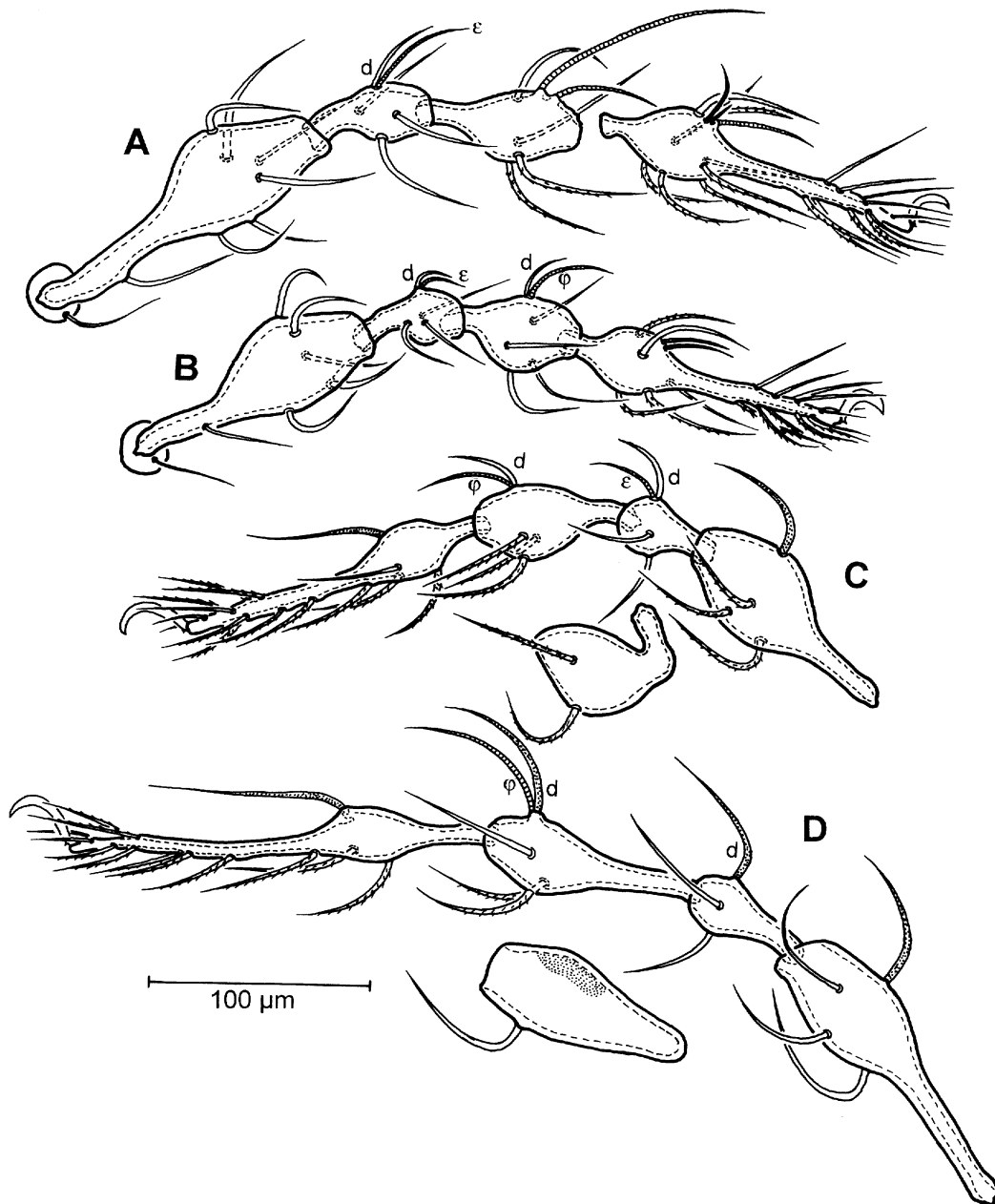


FIGURE 2. *Belba heterosetosa* sp. nov. A: Leg I (right, anti-axial); B: Leg II (right, anti-axial); C: Leg III (trochanter separately shown; right, anti-axial); D: Leg IV (trochanter separately shown; right, anti-axial).

The Chinese species, *B. cornuta* described by Wang and Norton (1995) differs from the new species in the presence of well-developed postbothridial apophysis *P*, the willow leaf-shaped notogastral setae, the very long notogastral setae p_1 , and the absence of tubercle *Ba*.

In spite of the above species, the Mongolian species, *B. prasadi* Bayartogtokh has some resemblance with *B. heterosetosa* sp. nov., but it is easily distinguishable from the latter by the far longer sensilli and interlamellar setae, the much longer and flagellate notogastral setae of *p* series, and the presence of epimeral tubercle *E2a*.

Etymology. The specific epithet "*heterosetosa*" refers to the character of different size of notogastral setae.

***Belbodamaeus rarituberculatus* sp. nov.**

(Figs. 3 & 4)

Diagnosis. Medium in size, with typical characters of *Belbodamaeus*. Propodolateral apophysis *P* well developed, subtriangular in shape, projected laterad; prodorsal tubercles *Ba*, *Bp*, *Da* and *Dp* absent; sensilli very thin, relatively short, slightly flagellate distally; spinae adnatae moderate in size; notogastral setae medium long, darkly pigmented, except very thin and light colored setae of *p* series, seta *p*₁ conspicuously longer than other setae; ventral tubercles *Va* and *Vp* well developed, *E2a* and *E2p* absent, tubercle *Sa* elongate triangular, *Sp* small, rounded at tip; apodeme *apo.2* well developed; epimeral regions III and IV with three and four setae, respectively; tarsus I with 20, tarsus II with 17, tarsi III and IV with 16 and 13 setae, respectively; setae *d* on genua I–III and tibiae II–IV distinctly longer than their associated solenidia.

Measurements. Body length 360–408 (389) μm; length of notogaster 252–264 (260) μm; width of notogaster 208–232 (223) μm. In total three specimens were measured.

Integument. Body color yellowish brown. Surface of body and leg segments with relatively thin granular cerotegument. Exuvial scalps and adherent debris absent. Leg segments and lateral part of body with fungi micelles.

Prodorsum. Rostrum rounded in dorsal view, but slightly projecting anteroventrally in lateral view. Rostral seta thin, medium in length; lamellar seta slightly longer than seta *ro*, both setae smooth. Interlamellar seta as long as lamellar seta, thin, smooth, directed posteriorly, flagellate distally. Exobothridial seta thin, twice shorter than lamellar seta. Sensillus (*ss*) relatively short, thin, setiform and slightly flagellate distally. Bothridium irregular funnel-shaped, with large opening, directed posterolaterad. Prodorsal enanthiophyses *B* and *D* absent. Propodolateral apophysis *P* well developed, subtriangular in shape, distinctly projected laterad. A few microtubercles present on the prodorsum, anteromedial of each bothridium (Fig. 3A & C).

Notogaster. Slightly longer than wide, relatively flat in lateral view. Spina adnata (*sa*) moderate in size, in dorsal aspect directed anterolaterad, but in lateral aspect directed anteroventrad. Notogastral setae medium long, darkly pigmented, except very thin and light colored setae of *p* series; seta *p*₁ conspicuously longer than other setae. Lyrifissures *ia*, *im*, *ih* and *ips*, and opisthosomal gland opening conspicuously developed; lyrifissure *ip* not evident (Fig. 3B & C).

Gnathosoma. Infracapitular mentum nearly as long as wide, without noticeable micro-tubercles. Hypostomal setae *h* and *m* of medium length, seta *a* short, all of them thin, smooth (Fig. 3B). Structure of chelicera and palp typical for family.

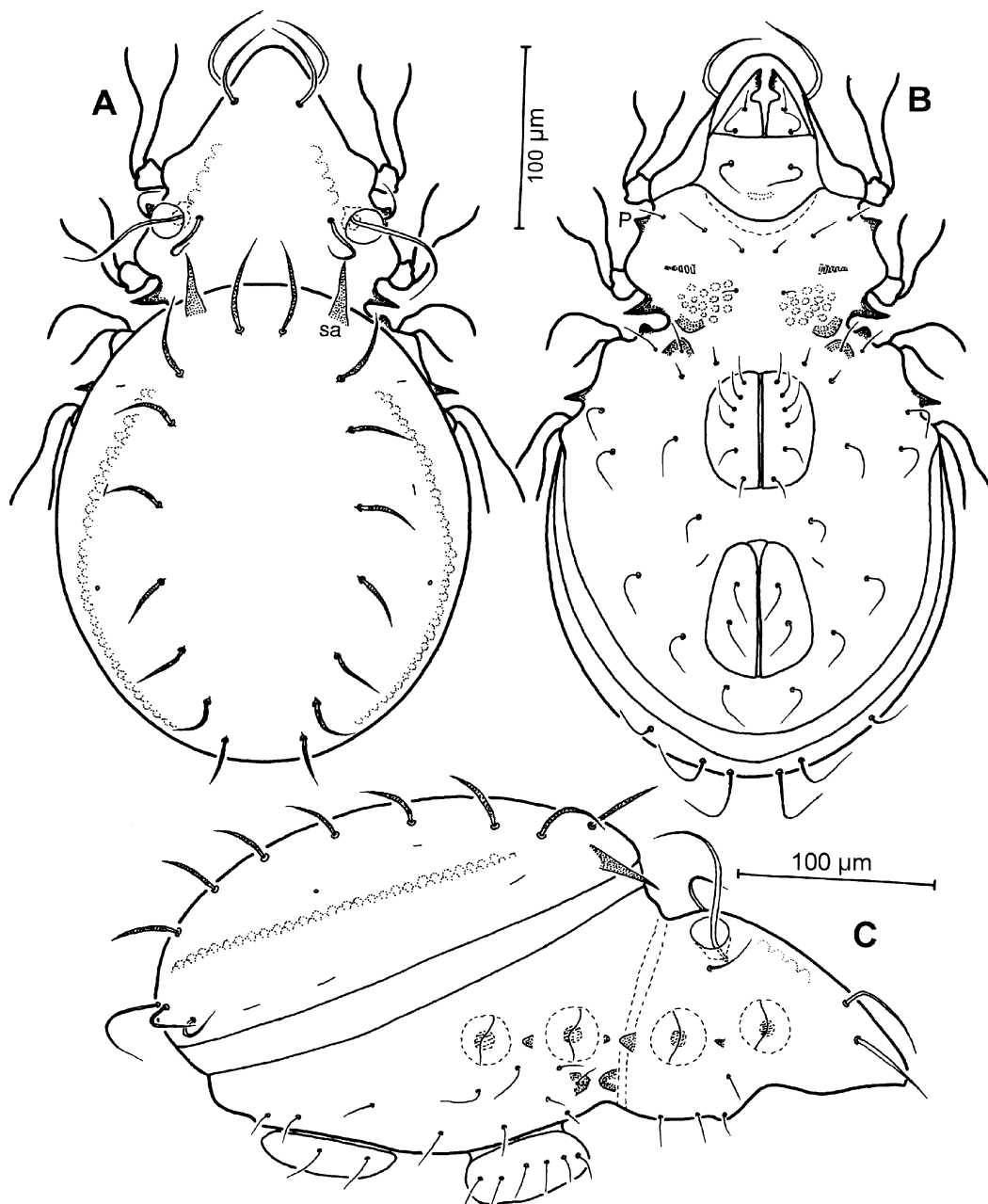


FIGURE 3. *Belbodamaeus rarituberculatus* sp. nov. A: Dorsal view; B: Ventral view; C: Lateral view.

Epimeral region. Tectum of podocephalic fossa not projected. Apodeme *apo.2* well developed. Ventrosejugal tubercles *Va* and *Vp* conspicuously developed, *Vp* bearing epimeral seta *3b*; epimeral tubercles *E2a* and *E2p* absent. Parastigmatic tubercle *Sa* long, elongate triangular in shape and sharply projected laterally; tubercle *Sp* small, rounded at tip. Discidium well developed, projected laterally. Epimeral setal formula 3-1-3-4, all setae thin and smooth (Fig. 3B).

Ano-genital region. Structure normal for genus; ano-genital setae medium long, smooth. Adanal lyrifissures situated obliquely, at a level a little anterior to anal setae *an*₂ (Fig. 3B).

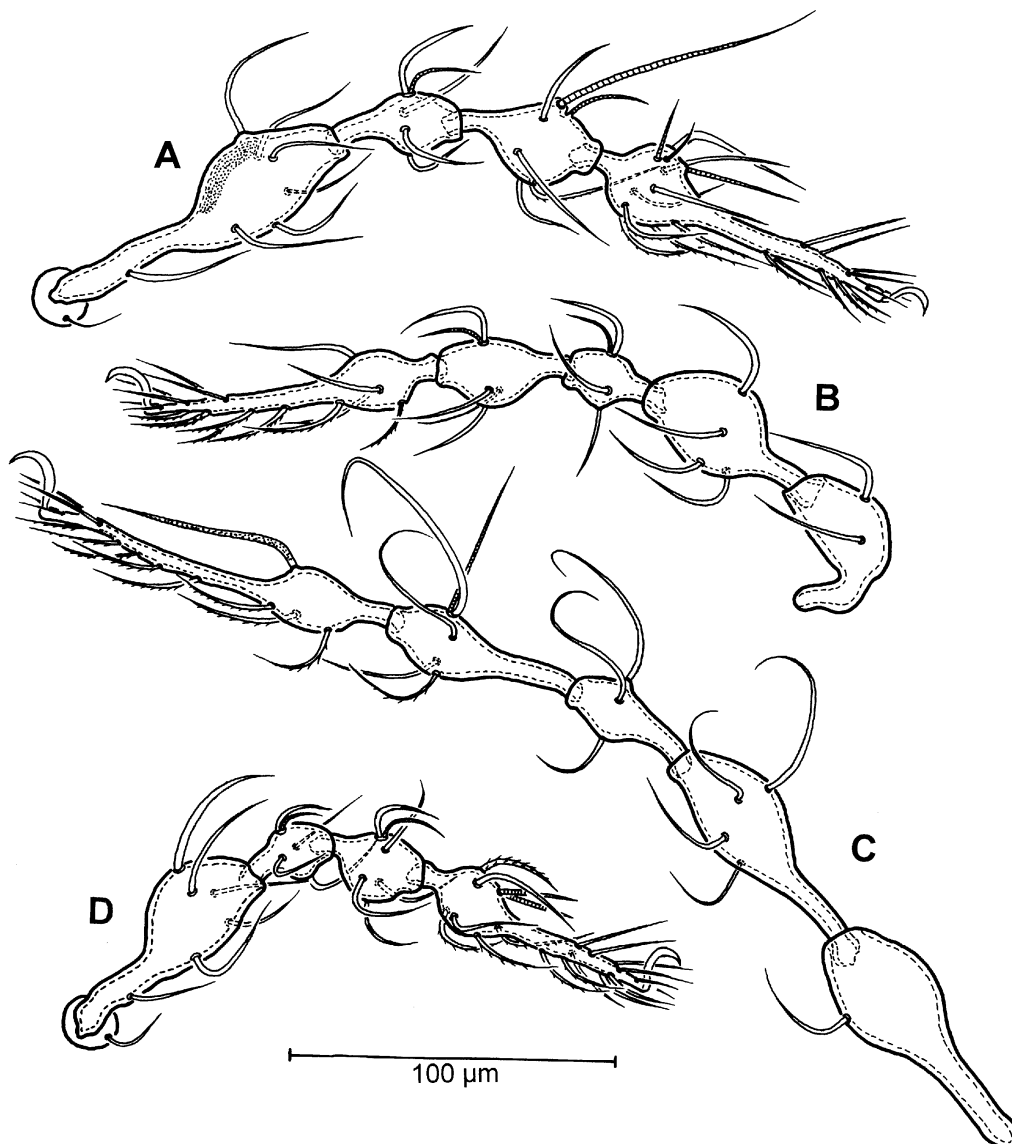


FIGURE 4. *Belbodamaeus rarituberculatus* sp. nov. A: Leg I (right, antiaxial); B: Leg III (right, antiaxial); C: Leg IV (right, antiaxial); D: Leg II (right, antiaxial).

Legs. Trochanter of leg I with relatively large porose area. Setae *d* on genua I–III and tibiae II–IV distinctly longer than their associated solenidia. Tarsus I with 20, tarsus II with 17, tarsi III and IV with 16 and 13 setae, respectively. Formula of leg setation (including famulus): I (1-7-4-4-20), II (1-6-4-5-17), III (2-4-3-4-16); IV (1-4-3-4-13); formula of solenidia: I (1-2-2); II (1-1-2); III (1-1-0); IV (0-1-0). Structure and setation of legs I–IV as shown in Fig. 4.

Material examined. Holotype (female) and two paratypes (females): District Erdenetsagaan, Province Suhbaatar, short grass steppe, soils of 0–5 cm accumulated between rocks, 46°00'02"N, 116°04'25"E, 31 May 2003, Col. B. Bayartogtokh. The holotype and one paratype (alcohol preserved) are deposited in the collection of the Department of Zoology, National University of Mongolia, Ulaanbaatar, Mongolia and one paratype is in the collection of the Zoological Museum of the Moscow State University, Moscow, Russia.

Remarks. The new species, *Belbodamaeus rarituberculatus* sp. nov. can be readily distinguished from two known species of *Belbodamaeus*, *B. tuberculatus* Bulanova-Zachvatkina and *B. marginatus* Kulijev by the complete absence of prodorsal tubercles *B* and *D*, the short, thin and distally slightly flagellate sensilli, the presence of well-developed prodolateral apophysis *P*, and the absence of the epimeral enantiophysis *E2*.

Etymology. The specific epithet "*rarituberculatus*" refers to the complete absence of tubercles of the prodorsal and epimeral enantiophyses *B*, *D* and *E2*.

***Belba mongolica* Bayartogtokh, 2000**

(Fig. 5A)

Belba mongolica Bayartogtokh, 2000: 309, figs. 23–31.

Measurements. Body length 466 µm, width of notogaster 280 µm, length of notogaster 303 µm.

Supplementary description. Body color yellowish brown, notogaster with part of exuvial scalps, and legs with fungi micelles. Prodorsum with well-developed tubercles *Aa* and *Ap*. Postbothridial tubercle *Ba* in examined material was relatively narrower than that in the type material (Fig. 5A). Structure of notogaster, ventral plates and legs is same as shown in the original description. The species was found previously only from coniferous forest in taiga zone of northern Mongolia, and it is interesting that the second locality is in so far grassland habitat in eastern part of the country.

Material examined. One specimen (male): Basin River Numrugiin Gol, District Sumber, Province Dornod, soils under willow growing on the bank of river, 47°00'39"N, 199°22'59"E, 884m a.s.l., 26 May 2003, Col. B. Bayartogtokh.

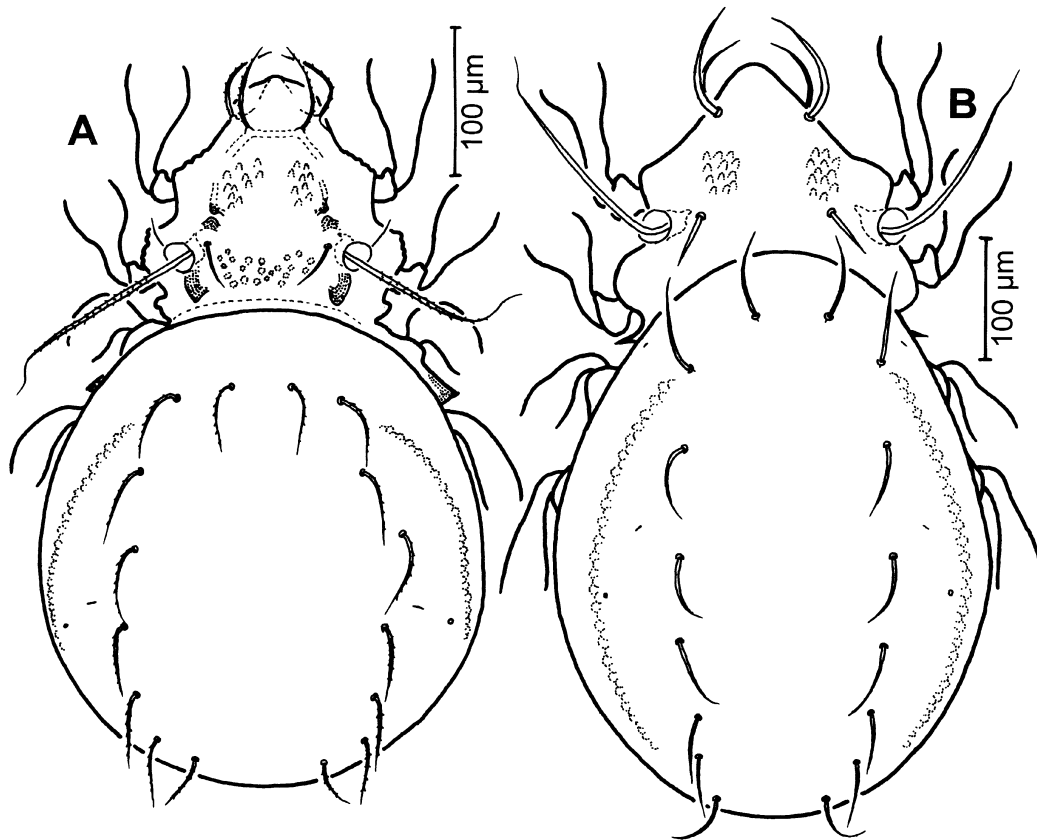


FIGURE 5. Two known species of *Belba*. A: *Belba mongolica* Bayartogtokh, 2000 (dorsal view); B: *Belba crassisetosa* Bayartogtokh, 2000 (dorsal view).

***Belba crassisetosa* Bayartogtokh, 2000**

(Fig. 5B)

Belba crassisetosa Bayartogtokh, 2000: 298, figs. 1–13.

Measurements. Body length 594 µm, width of notogaster 345 µm, length of notogaster 478 µm.

Supplementary description. Body color reddish brown, with thick cerotegument; notogaster with part of exuvial scalps, legs with fungi micelles. Prodorsal tubercles absent, but a number of distinct microtubercles present anterior of each interlamellar seta. In the material examined here have not found the elongate ridge along the insertion pores of notogastrial setae c_1 and c_2 . The other characters are well in accord with those of the type material. Until now the species was known only from type locality, which situated in the central part of the country. The present finding is also interesting that the habitat of the collection locality of this material is significantly different than type locality. The ecological require-

ments of *B. mongolica* and *B. crassisetosa* are seem to be similar that they have been found before in cool temperate forests in central and northern parts of Mongolia.

Material examined. One specimen (mail): Basin River Numrugiin Gol, District Sumber, Province Dornod, soils under willow growing on the bank of river, 47°00'39"N, 199°22'59"E, 884m a.s.l., 26 May 2003, Col. B. Bayartogtokh.

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References

- Bayartogtokh, B. (2000a) New oribatid mites of the genus *Epidamaeus* (Acari: Oribatida: Damaeidae) from Mongolia. *Species Diversity*, 5, 183–200.
- Bayartogtokh, B. (2000b) Two species of Damaeid mites (Acari: Oribatida: Damaeidae) from Mongolia, with notes on distribution of the genera *Epidamaeus* and *Dyobelba*. *Biogeography*, 2, 67–79.
- Bayartogtokh, B. (2000c) Two new species of oribatid mites of the genus *Epidamaeus* (Acari: Oribatida: Damaeidae) from Mongolia. *Acarina*, 8, 65–78.
- Bayartogtokh, B. (2000d) New oribatid mites of the genus *Belba* (Acari: Oribatida: Damaeidae) from Mongolia. *International Journal of Acarology*, 26, 297–319.
- Bayartogtokh, B. (2001) Three new soil mites of the genus *Epidamaeus* (Acari: Oribatida: Damaeidae) from Mongolia. *Zoosystema*, 23, 29–49.
- Bulanova-Zachvatkina, E.M. (1962) Oribatid mites of the family Damaeidae Berlese, 1896 (Tribe Belbini, tribe. n.). *Zoologicheskii Zhurnal*, 41, 203–216. (in Russian)
- Grandjean, F. (1960) *Damaeus arvernensis* n. sp. (Oribate). *Acarologia*, 2, 250–275.
- Mihelčič, F. (1957) Oribatiden Südeuropas VII. *Zoologischer Anzeiger*, 156, 9–29.
- Norton, R.A. (1979) Damaeidae (Acari: Oribatei) collected by the Hungarian Soil Zoological Expeditions to South America. *Folia Entomologica Hungarica*, 32, 55–64.
- Pérez-Iñigo, C. (1970) Ácaros oribátidos de Suelos de España peninsular e islas Baleares (Acari, Oribatei). *Eos*, 45, 240–317.
- Wang, H. & Norton, R.A. (1995) A new species of *Belba* and new records of *Belba* and *Porobelba* from China. *Acta Zootaxonomica Sinica*, 20, 49–59. (in Chinese)