

## Oribatid Mites of the Superfamilies Gymnodamaeidea and Plateremaeidea (Acari: Oribatida) from Steppe of Russia

Badamdorj Bayartogtokh<sup>1</sup> and Ilya Smelyansky<sup>2</sup>

<sup>1</sup>Department of Zoology, Faculty of Biology, National University of Mongolia, Ulaanbaatar 210646, Mongolia, e-mail: bayartogtokh@num.edu.mn

<sup>2</sup>Siberian Environmental Centre, P.O. Box 547, Novosibirsk 630090, Russia, e-mail: ilya@ecoclub.nsu.ru

### Abstract

Oribatid mites belonging to the superfamilies Gymnodamaeidea and Plateremaeidea collected from steppe soils of Russia are studied. Two new species, *Pedrocortesella minuta* sp. nov. and *Pleodamaeus tuberculatus* sp. nov. are described. In addition, three known species, *Licnodamaeus pulcherrimus* (Paoli, 1908) and *Plesiodamaeus glaber* Mihelèiè, 1957 are redescribed, with notes on their distributions.

**Key words:** Acari: Oribatida, Gymnodamaeidea, Plateremaeidea, new species, Russia

### Introduction

The oribatid mite superfamilies Gymnodamaeidea and Plateremaeidea are known to be rather diverse mostly in the Northern Hemisphere and most species are inhabitants of litter of forests, mosses, decaying woods and organic and mineral soil layers. However, many species of Plateremaeidea are xerophilous, and they distributed in the soils of arid habitats such as steppe and semideserts.

The present work is part of the series of studies on systematics and ecology of oribatid mites of grassland habitats of Russia, Kazakhstan and Mongolia. The description of two new species belonging to the genera *Pedrocortesella* and *Pleodamaeus* and the supplementary description of two known species of the genera *Licnodamaeus* and *Plesiodamaeus* are presented here.

Ruiz *et al.* (1990) included the species *Plesiodamaeus glaber* Mihelèiè, 1957 in the genus *Jacotella* Banks, while Woas (1992) listed this species under the genus *Gymnodamaeus* Kulczynski. However, the articulation of leg segments in species of *Jacotella* is in sockets, while that in *Plesiodamaeis*-species is not in sockets. Members of another genus, *Gymnodamaeus* have contiguous anal and genital apertures as opposed to the well separated openings in species of *Plesiodamaeus*. Moreover, all species of *Plesiodamaeus* have distinctly developed prominent folds on the posterior end of the notogaster, but not developed in the species of *Gymnodamaeus*. Therefore, we consider *Plesio-*

*damaeus* as a valid genus, although the current supraspecific classification of Gymnodamaeidea and Plateremaeidea is artificial and too restrictive.

### Material and Methods

The species were collected between 1991 and 1999 from soils in grassland habitats of the southwestern part of Russia. Descriptions or redescriptions of the species are based on adults. The type locality and habitat characteristics for each species are given in the respective "Material examined" sections.

The taxonomic terminology used in this paper is based on that (with a few modifications) developed by Grandjean (1931, 1933, 1964), as summarized and applied by Covarrubias (1968), Fernandez (1987) and Paschoal (1982). 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. Measurements are given in micrometers and the average values are given in parentheses after the ranges.

The line drawings were made with the aid of a camera lucida attached to a compound microscope "PZO SK14".

## Descriptions of Species

### *Pedrocortesella minuta* sp. nov.

(Fig. 1)

**Diagnosis.** Relatively small species, with typical characters of *Pedrocortesella*. Body and legs covered with reticulations of cerotegument with small granules; rostral setae smooth, situated on lateroventral side of prodorsum; lamellar setae smooth, inserted dorsally on rostrum; interlamellar setae not evident; sensilli with medium long stalk and distinctly widened head with rough barbs; prodorsum with no ridge; notogaster oval, slightly narrowed posteriorly; posteroventral margin of notogaster with narrow triangular incision; five pairs of notogastral setae covered with cerotegument; six pairs of genital setae; notogastral lyrifissures *ia*, *im*, *ip* and *ips* large.

**Measurements.** Body length 259-275 (266)  $\mu\text{m}$ , width of notogaster 128-134 (130)  $\mu\text{m}$ , length of notogaster 189-205 (199)  $\mu\text{m}$ .

**Integument.** Body color yellowish-brown. Surface of body, leg segments, anal and genital plates covered with very thick reticulated cerotegument with small granules. Exuvial scalps absent.

**Prodorsum.** Rostrum rounded in dorsal view, but slightly projected in lateral view. Rostral seta (*ro*) long, smooth, situated on lateroventral side of prodorsum, its alveolus clearly visible in ventral view. Lamellar seta (*le*) smooth, distinctly shorter than seta *ro*, inserted on dorsal side of rostrum. Interlamellar seta (*in*) not evident, but setal insertion clearly observable. Exobothridial seta not evident. Sensillus (*ss*) with medium long stalk and distinctly widened club-shaped head with strong and dense barbs. Bothridium (*bo*) small, poorly developed, irregular funnel-shaped, its opening directed posteriorly (Fig. 1A). Prodorsum with no ridge or apophysis.

**Notogaster.** Elongate oval viewed perpendicular to circumgastric scissure, about 1.6 times as long as wide, slightly narrowed posteriorly (Fig. 1A). Posteroventral margin of notogaster with distinct narrowly triangular incision (Fig. 1D). Five pairs of notogastral setae covered with cerotegument;  $h_1$  and  $h_2$  situated dorsally, about twice as long as other setae;  $p_1$ ,  $p_2$  and  $p_3$  on posteroventral side of notogaster. Lyrifissures *ia*, *im* and *ip* large in size, *ips* much smaller than others; *im*, *ip* and *ips* aligned almost transversely, while *ia* obliquely oriented

(Fig. 1A & D).

**Gnathosoma.** Infracapitular mentum slightly wider than long, with reticulated granular cerotegument. Hypostomal setae *h* and *a* short; seta *m* slightly longer than former setae, all of them thin and smooth (Fig. 1D). Chelicera and palp typical for genus. Fixed and movable digits of chelicera with a few blunt teeth. Palp slender, palpal setation: 0-2-1-3-9, including solenidion  $\omega$  on tarsus.

**Epimeral region.** Apodemes *apo.sj* and *apo.2* well developed; apodeme *apo.3* short. Apodeme *apo.2* nearly obliquely situated, while *apo.sj* and *apo.3* almost transversely oriented. Discidium poorly developed, slightly rounded distally. Epimeral setae short, smooth; setal formula: 3-1-3-3 (Fig. 1D).

**Ano-genital region.** Genital and anal openings well separated from each other; anal opening distinctly larger than genital setae. Six pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae. All ano-genital setae short, smooth (Fig. 1D). Adanal lyrifissure not evident.

**Legs.** Tarsi heterotridactylous, lateral claws much slender, but slightly longer than median claw. Solenidion  $\ddot{o}_1$  of tibia I very long,  $\ddot{o}_2$  short, situated in front of former solenidion. Solenidia  $\ddot{o}$  of tibiae II-IV and  $\dot{u}_1$  and  $\dot{u}_2$  of tarsi I and II medium long, subequal in length. Seta *d* of tibia I covered with cerotegument. Formula of leg setation (including famulus): I (1-5-3-4-17); II (1-3-3-4-16); III (3-3-3-4-15); IV (1-2-3-4-12); 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 and IV as shown in Fig. 1B & C.

**Material examined.** Holotype (female) and 21 paratypes (12 males and nine females): Shinbutak valley, Aytuarskaya steppe, Nature Reserve "Orenburgski", 2 km south from village Aytuar, District Kuvandyk, Province Orenburg, Russia. Steppe soils dominated by *Stipa* sp. and *Festuca valesiaca*; Col. S. V. Simak, 15 September 1999. The holotype and 16 paratypes are deposited in the collection of Zoological Museum of the Institute of Animal Systematics and Ecology, Siberian Division of the Russian Academy of Sciences, Novosibirsk, Russia, and five paratypes are deposited in the collection of the Department of Zoology, National University of Mongolia, Ulaanbaatar, Mongolia.

**Remarks.** The new species, *Pedrocortesella*

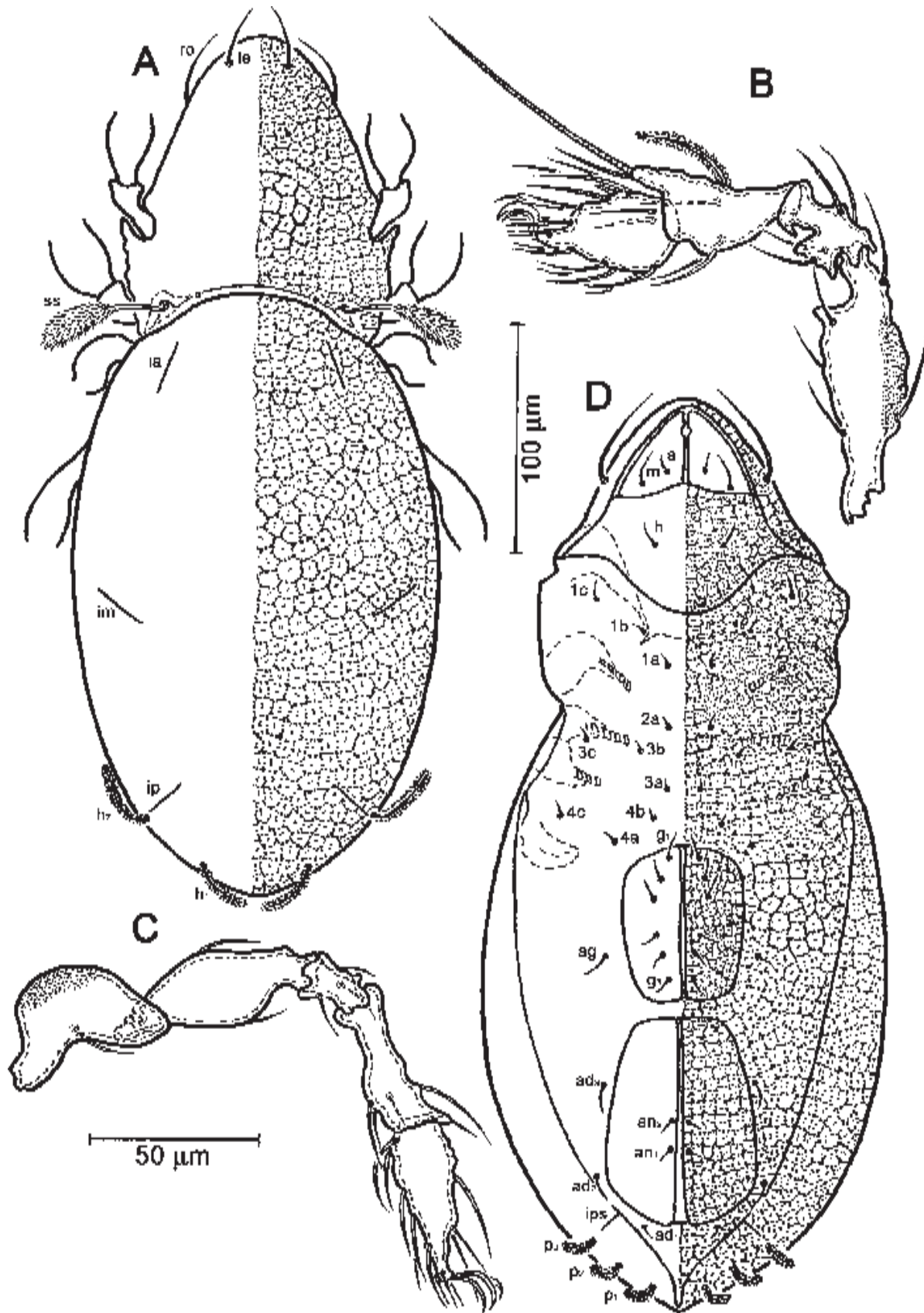


Fig. 1. *Pedrocortesella minuta* sp. nov. A: Dorsal view of idiosoma; B: Leg I (right, paraxial aspect); C: Leg IV (right, paraxial aspect); D: Ventral view of idiosoma

*minuta* sp. nov. is easily distinguishable from most other species of the genus *Pedrocortesella* in the presence of six pairs of genital setae, narrowly incised posteroventral margin of notogaster and the structure of reticulated cerotegument covering the body and legs.

Most of the known species of *Pedrocortesella* have seven pairs of genital setae. Only a few species such as *P. conundrum* Hunt, *P. kanangra* Hunt and *P. leei* Hunt, *P. inaequalis* (Balogh & Mahunka), *P. rarisetosa* Bayartogtokh & Smelyansky, *P. semireticulata* Hunt & Lee, *P. triangulata* Bayartogtokh have six pairs of genital setae as in the new species.

However, the Palaearctic species, *P. inaequalis*, described by Balogh & Mahunka (1965) differs from *P. minuta* sp. nov. in the 1) long adanal and notogastral setae  $p_1$ ,  $p_2$  and  $p_3$  covered with thick cerotegument; 2) anteriorly narrowed, but posteriorly widened notogaster; 3) small, round granules of body cerotegument; 4) presence of short, but distinctly developed interlamellar setae, and 5) much larger body size.

Another Palaearctic species, *P. triangulata* described by Bayartogtokh (2001a) from Mongolia is distinguishable from *P. minuta* sp. nov. by the 1) absence of rostral setae and presence of only three pairs of notogastral setae; 2) long adanal setae covered with cerotegument; 3) anteriorly narrowed, but posteriorly widened notogaster; 3) small, round granules of body cerotegument; 4) triangular shape of posterior portion of the ventral plate, and 5) much larger body size.

The species from Kazakhstan, *P. rarisetosa* described by Bayartogtokh and Smelyansky (2002) differs from *P. minuta* sp. nov. in the 1) more slender sensilli; 2) posteriorly widened notogaster; 3) relatively small notogastral lyrifissures *ia*, *im*, *ip* and *ips*; 4) much shorter notogastral setae  $h_1$  and  $h_2$ , and 5) smaller triangular incision of posteroventral margin of notogaster.

Two species from Australia, *P. semireticulata* described by Hunt & Lee (1995) and *P. leei* described by Hunt (1996) can be differentiated from *P. minuta* sp. nov. in the 1) arrangement of genital setae, inserted along straight line close to the inner margin of genital plate; 2) strongly developed bothridia; 3) presence of well-developed interlamellar setae; 4) far posterior position of adanal setae  $ad_3$ , and 5) much larger body size.

Two other Australian species, *P. conundrum* and *P. kanangra*, described by Hunt (1996) are

distinguishable from *P. minuta* sp. nov. by the 1) presence of six pairs of notogastral setae; 2) rostral and lamellar setae, covered with thick cerotegument; 3) presence of well-developed interlamellar setae; 4) notogastral plateaus and depressions, and 5) much larger body size.

In respect to the incised posteroventral margin of notogaster, only *P. fusca*, described by Ryabini (1986) has a similar structure as the new species, but the former species is easily distinguishable from *P. minuta* sp. nov. by the 1) punctate-foveate cerotegument of body; 2) presence of well-developed interlamellar setae and interlamellar ridge; 3) different number and arrangement of notogastral setae, and 4) much larger body size.

*Etymology*: The specific epithet, “*minuta*” refers to the small body size of this species.

#### ***Licnodamaeus pulcherrimus* (Paoli, 1908)**

(Figs. 2 & 3)

*Licneremaeus pulcherrimus* Paoli, 1908, p. 84, pl. 5, figs. 4, 36 & 53.

*Licnodamaeus pulcherrimus*: Grandjean, 1931, p. 230; Balogh, 1943, p. 42, pl. 8, figs. 10 & 11; Pérez-Iñigo, 1970, p. 266, fig. 24; 1979, p. 161; 1997, p. 89, fig. 25; Paschoal, 1987, p. 399.

*Diagnosis*. Relatively small species with typical characters of *Licnodamaeus*. Prodorsum, notogaster and ventral plate with reticulated cerotegument consisting of small granules; legs covered with round granules; lamellar setae inserted anterior to rostral seta; sensilli with short stalk and widely expanded head; prodorsum with a pair of well-developed bothridial ridges; four pairs of notogastral setae; notogastral lyrifissures *ia*, *im* and *ip* very large, *ih* and *ips* smaller than others; three pairs of adanal setae thin and smooth; prodorsal and notogastral setae covered with cerotegument.

*Measurements*. Body length 269-275 (271)  $\mu\text{m}$ , width of notogaster 122-134 (128)  $\mu\text{m}$ , length of notogaster 192-205 (199)  $\mu\text{m}$ .

*Integument*. Body color yellowish-brown. Prodorsum, notogaster and ventral plate with reticulated cerotegument consisting of small granules; legs covered with round granules. Exuvial scalps absent.

*Prodorsum*. Rostrum rounded in dorsal view, but slightly projected in lateral view. Rostral seta medium long, inserted laterad of prodorsum.



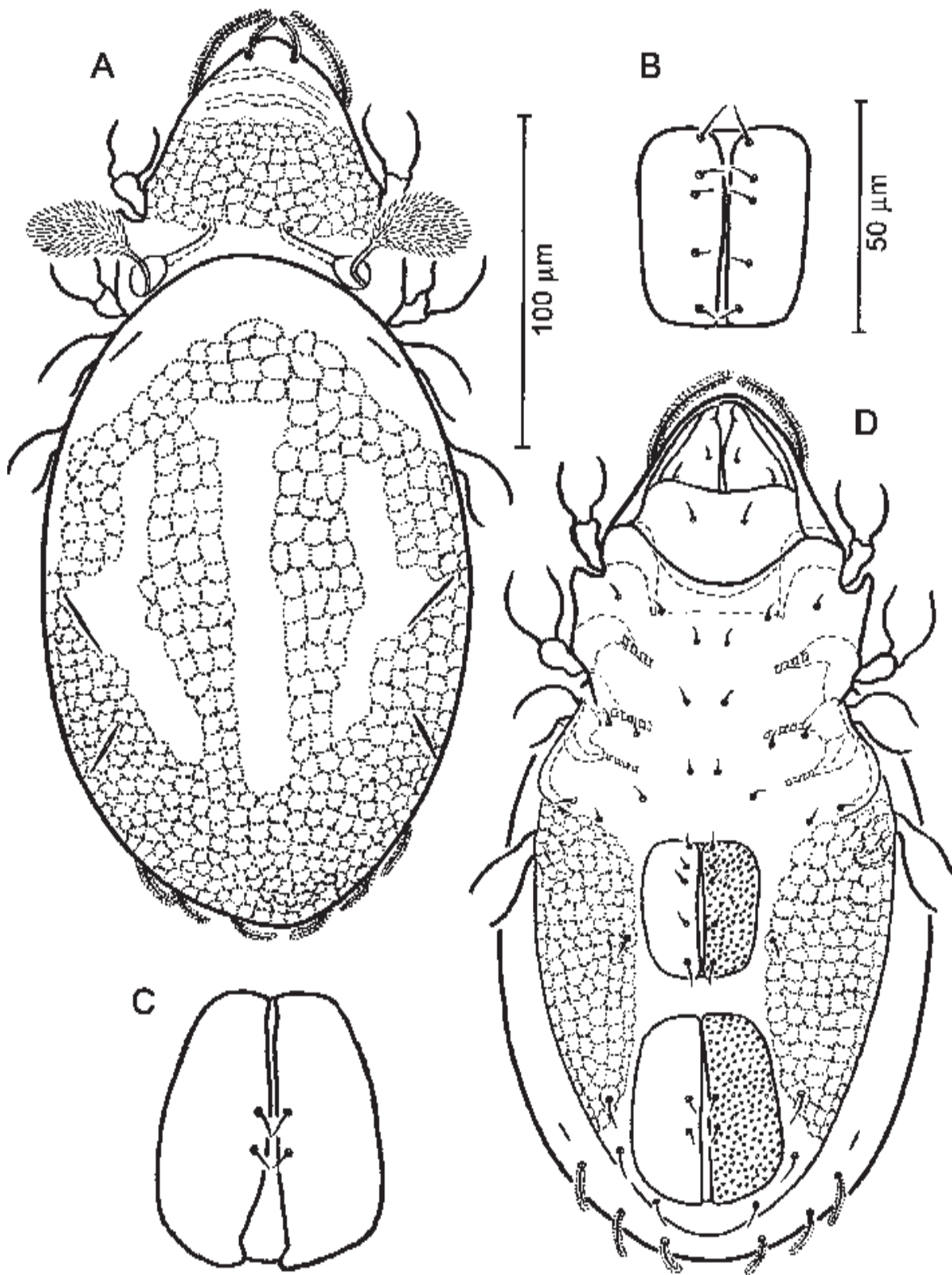


Fig. 2. *Licnodamaeus pulcherrimus* (Paoli, 1908). A: Dorsal view of idiosoma; B: Genital plates; C: Anal plates; D: Ventral view of idiosoma

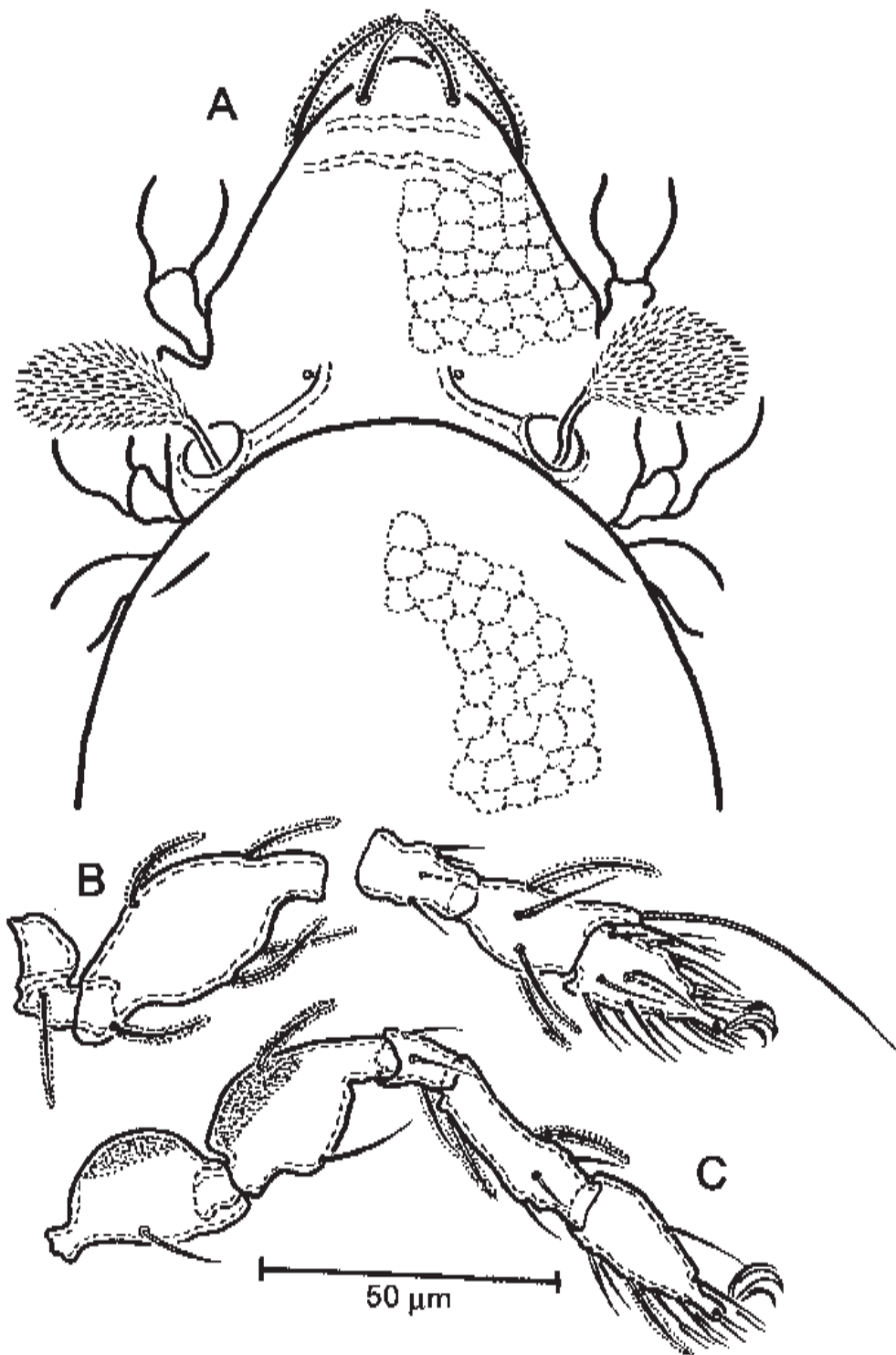


Fig. 3. *Licnodamaeus pulcherrimus* (Paoli, 1908). A: Prodorsum and anterior part of notogaster; B: Leg I (left, paraxial aspect); C: Leg IV (left, antiaxial aspect)

Lamellar seta inserted on dorsal side of rostrum and situated close to each other at the level anterior to seta *ro*. Both rostral and lamellar setae covered by cerotegument. Interlamellar seta not evident, but their insertions well visible. Exobothridial seta absent. Sensillus with short stalk and widely expanded head with strong and dense barbs. Bothridium irregular funnel-shaped, directed posteromedial. A pair of well-developed bothridial ridges arising from median side of each bothridium and reaching anteromedial to the insertions of interlamellar setae (Figs. 2A & 3A).

*Notogaster*. Oval viewed perpendicular to circumgastric scissure; about 1.5 times as long as wide. Relatively flat in lateral view and conspicuously flattened anteriorly, with elongate oval concave median and intermarginal depressions. Four pairs of notogastral setae covered with cerotegument. Lyrifissures *ia*, *im* and *ip* very large, *ih* and *ips* distinctly smaller than formers (Fig. 2A & D).

*Gnathosoma*. Infracapitular mentum slightly wider than long, without noticeable microtubercles. Hypostomal setae *a*, *h* and *m* short, thin (Fig. 2B). Chelicera and palp normal, typical for family. Fixed and movable digits of chelicera with a few blunt teeth; setae *cha* and *chb* finely barbed. Palp slender, palpal setation: 0-2-1-3-9 including solenidion  $\omega$  on tarsus.

*Epimeral region*. Apodemes *apo.2*, *apo.sj* and *apo.3* well developed. Discidium well developed, rounded distally. Epimeral setae short, smooth; setal formula: 3-1-3-3 (Fig. 2D).

*Ano-genital region*. Structure normal for the genus; genital and anal openings well separated from each other. Genital and anal plates covered with round granules. Five pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae short, smooth. Adanal lyrifissure not evident (Fig. 2D).

*Legs*. Tarsi heterotridactylous, lateral claws much slender, but nearly same in length with median claw. Articulation of tarsus-tibia, tibia-genu, genu-femur in sockets. Ventrodistal tectum conspicuously developed on trochanter IV. Solenidia  $\sigma$  of genua I and II inserted close to setae *d* and slightly shorter than the respective setae. Solenidion  $\phi_1$  of tibia I very long,  $\phi_2$  short. Solenidia  $\phi$  of tibiae II-IV and  $\omega_1$ ,  $\omega_2$  of tarsi I and II short, subequal in length. Setae *d*, *l*'', *bv*'' and *v*'' of femora I, II and IV, *v*'' of genua I and II, *d* of genua I-IV, *v*' and *v*'' of tibiae I, III and IV covered

with thick cerotegument. Formula of leg setation (including famulus): I (1-5-3-4-19); II (1-3-3-4-16); III (3-3-3-4-15); IV (1-2-3-4-12); 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 and IV as shown in Fig. 3B & C.

*Material examined*. Four specimens (3 males and one female): Shinbutak valley, Aytuarskaya steppe, Nature Reserve "Orenburgski", 2 km south from village Aytuar, District Kuvandyk, Province Orenburg, Russia. Steppe soils dominated by *Stipa sp.* and *Festuca valesiaca*; Col. S. V. Simak, 15 September 1999.

*Remarks*. The features of our material are well in accord with the original description and redescriptions by Paoli (1908), Grandjean (1931), Pérez-Iñigo (1979, 1997) and some supplementary characters are given in the present redescription.

*Distribution*. Palaearctic Region: Hungary (Balogh, 1943); Italy (Paoli, 1908; Bernini *et al.*, 1987), Spain (Grandjean, 1931; Pérez-Iñigo, 1970, 1997; Subias, 1977; Kahwash *et al.*, 1991; Subias & Gil-Martin, 1997a, b; Subias & Mingués, 2001), France (Grandjean, 1931), Switzerland (Grandjean, 1931), Poland (Niedbala & Olszanowski, 1997), Bulgaria (Csiszar & Jeleva, 1962), Austria (Schatz, 1983), Russia (Karppinen & Krivolutsky, 1982; Karppinen *et al.*, 1986, 1987; Krivolutsky, 1995, see also the "material examined" section), Georgia (Karppinen *et al.*, 1987; Murvanidze & Darejaneshwili, 2000), Ukraine (Karppinen *et al.*, 1987), Kazakhstan (Rahinbaeva, 1995), China (Aoki *et al.*, 1997; Wang *et al.*, 2002), Japan (Fujikawa *et al.*, 1993), Korea (Choi, 1997).

### *Plesiodamaeus glaber* Mihelèiè, 1957

(Figs. 4 & 5)

*Plesiodamaeus glaber* Mihelèiè, 1957, p. 55, fig. 9.

*Plesiodamaeus glaber*: Kunst, 1959, p. 57, fig. 3; Pérez-Iñigo, 1970, p. 256, figs. 13 & 14; Ayyildiz, 1988, p. 132, fig. 1.

*Jacotella glabra*: Ruiz *et al.*, 1990, p. 40; Pérez-Iñigo, 1997, p. 59, fig. 13.

*Gymnodamaeus glaber*: Woas, 1992, p. 135.

*Diagnosis*. Relatively small species, with typical characters of *Plesiodamaeus*. Body and legs covered with cerotegument consisting of round granules; lamellar setae inserted a little anterior or almost at the same level to rostral setae; sensilli

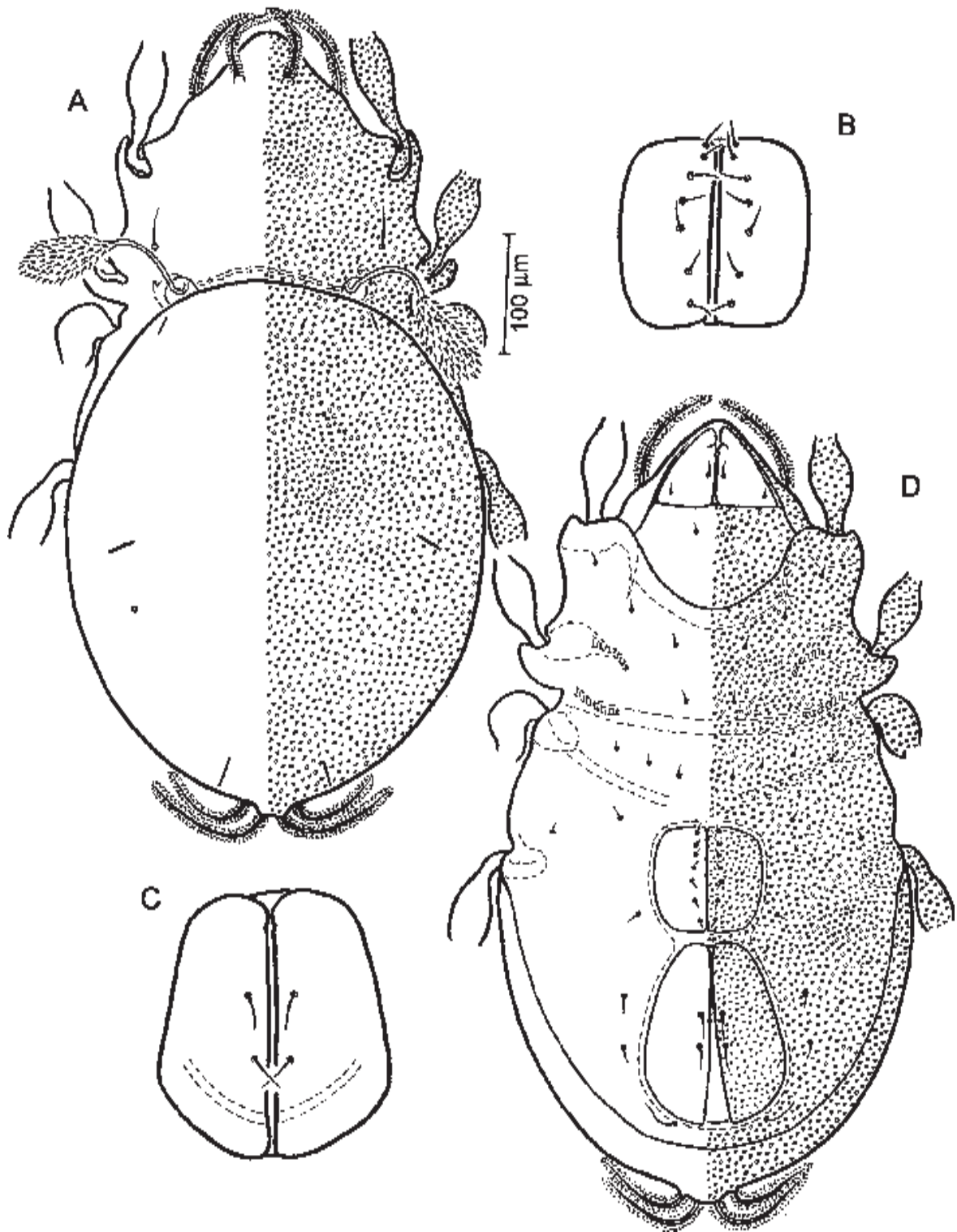


Fig. 4. *Plesiodamaeus glaber* Mihelèiè, 1957. A: Dorsal view of idiosoma; B: Genital plates; C: Anal plates; D: Ventral view of idiosoma



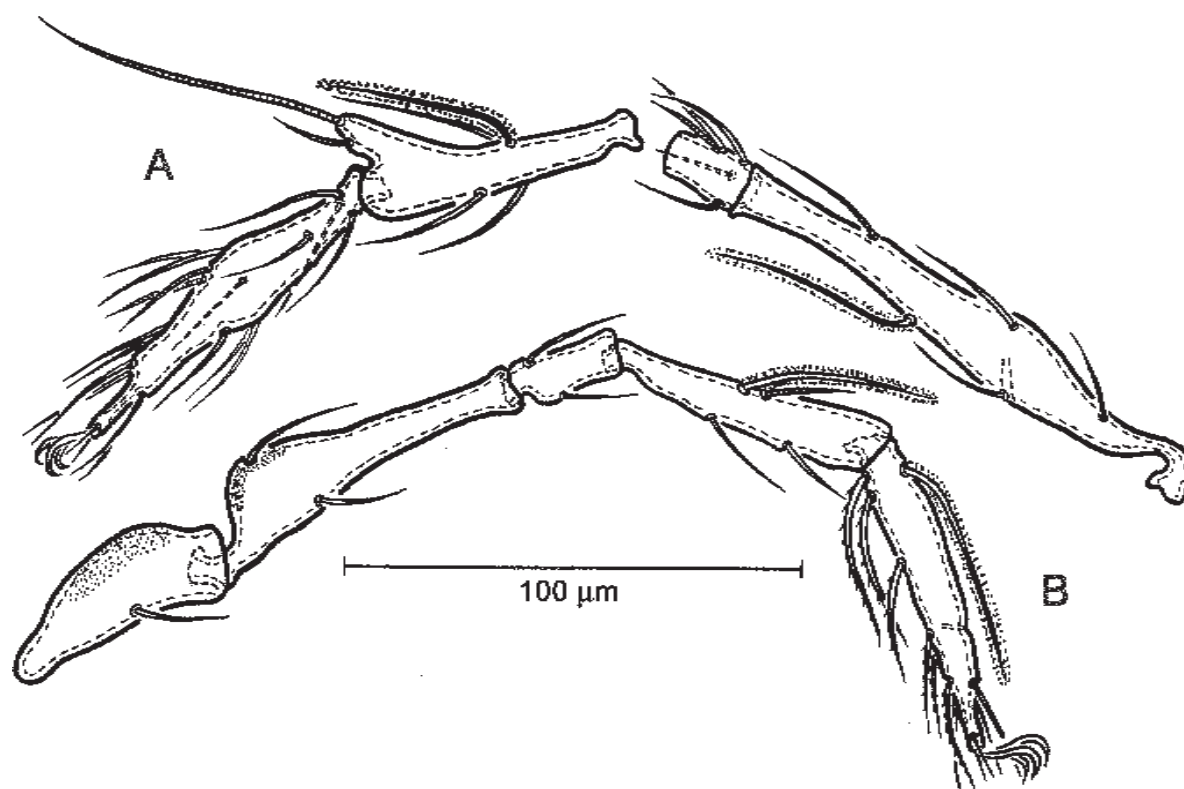


Fig. 5. *Plesiodamaeus glaber* Mihel'è, 1957. A: Leg I (left, antiaxial aspect); B: Leg IV (left, antiaxial aspect)

with long stalk and widely expanded leaf-shaped head; posterior part of notogaster with prominent folds, on which two pairs of notogastral setae inserted; both pairs of notogastral setae long, covered with cerotegument; seven pairs of genital and three pairs of adanal setae.

*Measurements.* Body length 366-379 (371)  $\mu\text{m}$ ; width of notogaster 201-213 (206)  $\mu\text{m}$ ; length of notogaster 250-268 (256)  $\mu\text{m}$ .

*Integument.* Body color yellowish-brown. Surface of body and leg segments yielding relatively thick cerotegument consisting of round granules. Exuvial scalps absent.

*Prodorsum.* Rostrum rounded in dorsal view, rostral seta moderately long, inserted laterad of prodorsum, covered with cerotegument. Lamellar seta slightly shorter than *ro*, inserted on dorsal side of prodorsum, a little anterior or almost at the same level to rostral seta. Interlamellar seta not evident, but its insertion pores well discernable. Exobothridial seta relatively long, situated anterolaterad of bothridium. Sensillus with a long stalk and a widely expanded leaf-shaped head with long and dense barbs. Bothridium irregular funnel-shaped, directed posterolaterad (Fig. 4A).

*Notogaster.* Oval, about 1.3 times as long as wide, its posterior end with prominent folds, on which two pairs of notogastral setae inserted. Both pairs of notogastral setae long, covered with cerotegument. Lyrifissures *ia*, *im*, *ih*, *ip*, *ips* and opisthosomal gland opening well developed (Figs. 4A).

*Gnathosoma.* Infracapitular mentum slightly wider than long, without noticeable microtubercles. Hypostomal setae *a*, *h* and *m* short, smooth (Fig. 4D). Chelicera typical of the family; palp slender, palpal setation: 0-2-1-3-9 including solenidion  $\omega$  on tarsus.

*Epimeral region.* Apodemes *apo.2* and *apo.sj* well developed, other apodemes not evident. Discidium not evident. Epimeral setae short, smooth; setal formula: 3-1-3-2, seta *4c* not evident (Fig. 4D).

*Ano-genital region.* Genital and anal apertures closely situated, but distinctly separated from each other. All genital, aggenital and adanal setae *ad<sub>2</sub>* and *ad<sub>3</sub>* short, smooth; anal and adanal setae *ad<sub>1</sub>* slightly longer than other ano-genital setae; setal formula: 7-1-2-3. Adanal lyrifissure not evident. Anal and genital plates covered with cerotegument

consisting of round granules (Fig. 4B, C & D).

*Legs.* Tarsi tridactylous, all claws nearly same in size. Articulation of leg segments not in sockets. Ventrodistal tectum poorly developed on trochanters III and IV. Solenidia  $\sigma$  of genua I and II inserted very close to setae *d* and slightly shorter than respective setae *d*. Solenidion  $\phi_1$  of tibia I very long,  $\phi_2$  short. Solenidia  $\phi$  of tibiae II and IV subequal in length. Solenidia  $\omega_1$  and  $\omega_2$  of tarsi I and II moderately long, approximately same in length. Formula of leg setation (including famulus): I (1-5-4-4-18); II (1-3-3-5-17) III (1-2-2-3-16); IV (1-2-2-3-12); 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 and IV as shown in Fig. 5.

*Material examined.* Six specimens (three males and three females): Confluent small valley of Dol Vyazovka (slope of western exposure), 2 km north-west from village Bolshaya Dergunovka, District Bolshaya Glushitsa, Province Samara, Russia. Dry, salty steppe soils dominated by *Stipa lessingiana* and *Festuca valesiaca*; Col. I. E. Smelyansky, 15 July 1992.

*Remarks.* Body size of specimens studied here was somewhat smaller than that of Spanish and Turkish materials studied by Mihelè (1957), Pérez-Iñigo (1970) and Ayyildiz (1988). However, the Bulgarian specimens examined by Kunst (1959) have similar body size with our specimens. Except for this point, the features of the specimens studied here accord well with those of the other European materials.

*Distribution.* Palaearctic Region: Spain (Mihelè, 1957; Pérez-Iñigo, 1970, 1997; Kahwash *et al.*, 1991; Subias & Gil-Martin, 1997a), Bulgaria (Kunst, 1959), Turkey (Ayyildiz, 1988), Russia (Bulanova-Zachvatkina, 1975; Karppinen *et al.*, 1987; Krivolutsky, 1995, and see "material examined" section), Ukraine (Karppinen *et al.*, 1986, 1987), Kazakhstan (Rahinbaeva, 1995), Turkmenistan (Karppinen *et al.*, 1986), Georgia (Karppinen *et al.*, 1987; Murvanidze & Darejaneshwili, 2000).

***Pleodamaeus tuberculatus* sp. nov.**

(Figs. 6 & 7)

*Diagnosis.* Medium sized species, with typical characters of *Pleodamaeus*. Body and legs covered with cerotegument consisting of round granules; lamellar setae inserted a little anterior to the level of rostral setae; sensilli with long stalk and nearly

club-shaped head; notogaster with a pair of small tubercles, situated posterior to each bothridium; four pairs of notogastral setae covered with cerotegument; seven pairs of genital and three pairs of adanal setae; a pair of relatively large tubercles *Sp* present anteromedial of each epimeral seta *3c*.

*Measurements.* Body length 451-506 (479)  $\mu\text{m}$ ; width of notogaster 256-292 (271)  $\mu\text{m}$ ; length of notogaster 305-341 (321)  $\mu\text{m}$ .

*Integument.* Body color yellowish-brown. Surface of body and leg segments yielding relatively thick cerotegument consisting of round granules. Exuvial scalps absent.

*Prodorsum.* Rostrum rounded in dorsal view; rostral seta moderately long, inserted laterad of prodorsum, covered with cerotegument. Lamellar seta nearly as long as *ro*, inserted on dorsal side of prodorsum, at the level a little anterior to rostral seta. Interlamellar seta minute, but well discernable, situated anteromedial of each bothridium. Exobothridial seta relatively long, situated anterolaterad of bothridium. Sensillus with a long stalk and a nearly club-shaped head with long and dense barbs. Bothridium irregular funnel-shaped, directed laterad (Fig. 6A).

*Notogaster.* Nearly circular to slight oval, scarcely longer than wide, with a pair of small tubercles, situated posterior to each bothridium. Four pairs of notogastral setae medium long, covered with cerotegument. Lyrifissure *ia* not evident, while *im*, *ip* and opisthosomal gland opening well developed, lyrifissures *ih* and *ips* small, visible only in lateral view (Figs. 6A).

*Gnathosoma.* Infracapitular mentum slightly wider than long, without noticeable microtubercles. Hypostomal setae *a*, *h* and *m* short, smooth (Fig. 7A). Chelicera typical for the family; palp slender, palpal setation: 0-2-1-3-9 including solenidion  $\omega$  on tarsus.

*Epimeral region.* Apodeme *apo.2* well developed, other apodemes absent. Discidium not evident. Epimeral setae short, smooth, setae *1c*, *3c* and *4c* slightly longer than other setae; setal formula: 3-1-3-2. A pair of relatively large tubercles *Sp* present anteromedial of each epimeral seta *3c* (Fig. 7A).

*Ano-genital region.* Genital and anal apertures relatively far from each other. Genital, aggenital and anal setae medium long, smooth, while adanal setae slightly longer than other ano-genital setae and covered with cerotegument; setal formula: 7-1-2-3. Adanal lyrifissure not evident. Anal and

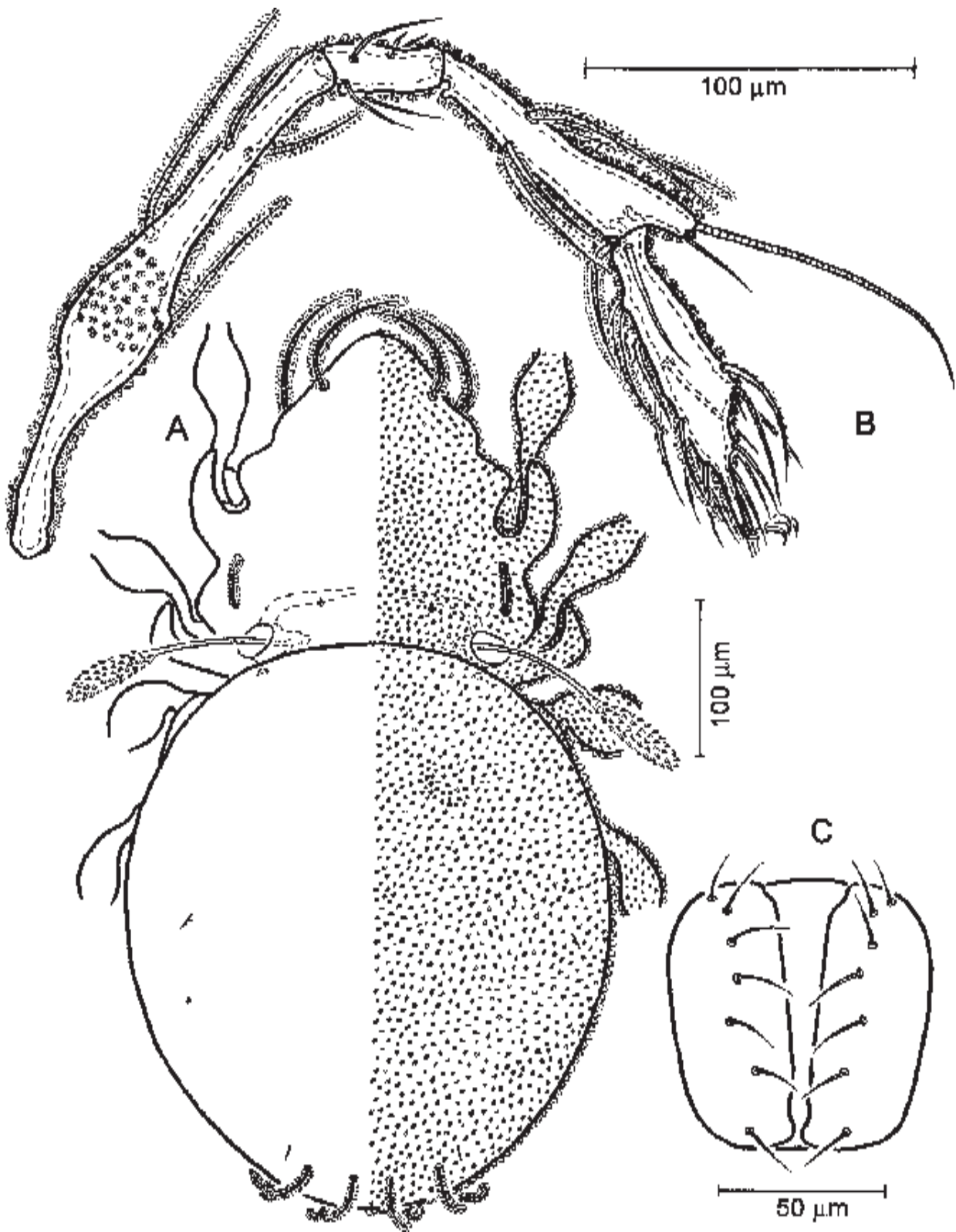


Fig. 6. *Pleodamaeus tuberculatus* sp. nov. A: Dorsal view of idiosoma; B: Leg I (left, paraxial aspect); C: Genital plates

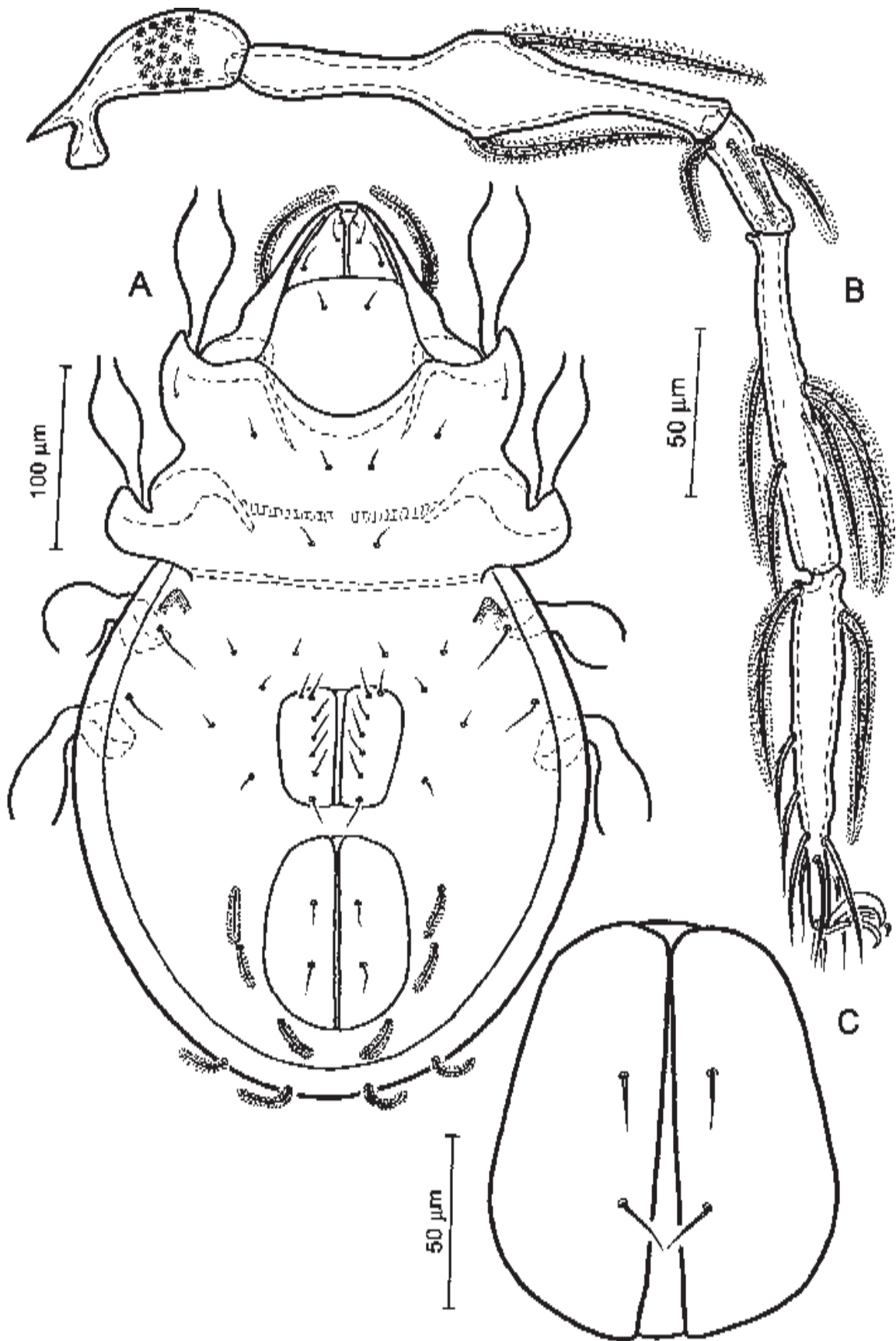


Fig. 7. *Pleodamaeus tuberculatus* sp. nov. A: Ventral view of idiosoma; B: Leg IV (right, paraxial aspect); C: Anal plates



genital plates covered with cerotegument consisting of round granules (Figs. 6C & 7C).

*Legs.* Tarsi heterotridactylous, lateral claws much slender, but slightly longer than median claw. Articulation of leg segments not in sockets. Tarsi I and II with very strong dorsodistal projections. Ventrodistal tectum poorly developed on trochanters III and IV. Solenidia  $\sigma$  of genua I and II inserted very close to setae *d* and slightly longer than respective setae *d*. Solenidion  $\phi_1$  of tibia I very long,  $\phi_2$  short. Solenidia  $\omega_1$  and  $\omega_2$  of tarsi I and II moderately long, approximately same in length. Formula of leg setation (including famulus): I (1-4-4-4-18); II (1-3-3-5-17) III (1-2-2-3-16); IV (0-2-3-4-12); 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 and IV as shown in Figs. 6B & 7B.

*Material examined.* Holotype (male) and nine paratypes (five males and four females): Mt. Mogutovaya, Zhigulevsk town, Province Samara, Russia. Quarry under birches on the limestone scarp, leaf litter; Col. I. E. Smelyansky, 25 May 1991. The holotype and six paratypes are deposited in the collection of Zoological Museum of the Institute of Animal Systematics and Ecology, Siberian Division of the Russian Academy of Sciences, Novosibirsk, Russia, and three paratypes are deposited in the collection of the Department of Zoology, National University of Mongolia, Ulaanbaatar, Mongolia.

*Remarks.* The genus *Pleodamaeus* Paschoal is represented now only by three known species. The type species *P. plokosus* (Wolley & Higgins) is known to be distributed in North America (Wolley & Higgins, 1973; Marshall *et al.*, 1987), while two other species, *P. rotundigranulatus* Bayartogtokh and *P. kazakhstanicus* Bayartogtokh & Smelyansky are known from Mongolia and Kazakhstan (Bayartogtokh, 2001b; Bayartogtokh & Smelyansky, 2002).

The new species, *Pleodamaeus tuberculatus* sp. nov. is distinguishable from North American species, *P. plokosus* by the 1) presence of seven pairs of genital setae in contrast to the six pairs in *P. plokosus*; 2) presence of well-developed tubercles on the anterolateral part of notogaster and epimeral region; 3) evenly rounded posterior margin of notogaster as opposed to the crenulated posterior margin of notogaster in *P. plokosus*; 4) lateroposterior situation of interlamellar setae in contrast to the anteroventral situation in *P. plokosus*, 5) and lacking of the reverse U-shaped ridge

anteromedial of interlamellar setae in the new species.

The Mongolian species, *P. rotundigranulatus* Bayartogtokh differs from *P. tuberculatus* sp. nov. in the 1) absence of notogastral and epimeral tubercles as opposed to the well-developed tubercles in *P. tuberculatus* sp. nov.; 2) presence of three pairs of notogastral setae instead of four pairs in *P. tuberculatus* sp. nov.; 3) more anterior situation of adanal setae *ad*<sub>2</sub> and *ad*<sub>3</sub>; 4) situation of anal setae inserted along the inner margin of anal plates as opposed to the widely space situation of those setae in *P. tuberculatus* sp. nov., and 5) far larger body size.

The species from Kazakhstan, *P. kazakhstanicus* Bayartogtokh & Smelyansky is different from *P. tuberculatus* sp. nov. in the 1) elongate oval notogaster as opposed to the nearly circular notogaster in the new species; 2) presence of five pairs of notogastral setae instead of four pairs in the new species; 3) undulated posterior margin of notogaster in contrast to the evenly rounded notogaster in the new species; 4) presence of distinctly developed tubercles on the bases of notogastral setae, and 5) absence of notogastral tubercles as opposed to the well-developed tubercles in *P. tuberculatus* sp. nov.

*Etymology:* The specific epithet, “*tuberculatus*” refers to the presence of well-developed notogastral and epimeral tubercles in this species.

## Acknowledgements

We would like to express our sincere thanks to Prof. D. A. Krivolutsky, Institute of Parasitology, Russian Academy of Sciences, Moscow, Russia and Prof. G. Weigmann, Free University of Berlin, Germany for their useful discussions and valuable comments. Thanks also due to Drs. S. V. Simak and I. I. Lyubchansky, who kindly donated their collection materials for this study.

## References

- Aoki J., Yamamoto Y., Wen Z., Wan H. & Hu S. 1997. A checklist of oribatid mites of China (Acari: Oribatida). First report. *Bull. Inst. Env. Sci. Techn. Yokohama Natn. Univ.* 23(1): 63-80. (in Japanese)
- Ayyildiz N. 1988. Erzurum ovasi oribatid akarları (Acari: Oribatida) Üzerine sistematik araştırmaları II. Yüksek oribatidler. *Doga Tu*

- Zool. D. 12(2): 131-144.
- Balogh J. 1943. Magyarország Páncélosatkái (Conspectus Oribateorum Hungariae). *A Magyar Tudományos Akadémia Kiadása*. Budapest. 202 pp.
- Balogh J. & Mahunka S. 1965. Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei 34. Acarina: Oribatei. *Annales Historico-Naturales Musei Nationalis Hungarici* 57: 451-465.
- Bayartogtokh B. 2001a. Oribatid mites of the superfamily Plateremaeoidea (Acari: Oribatida) from Mongolia. *Biologia, Bratislava* 56(2): 155-164.
- Bayartogtokh B. 2001b. A new and a little known species of gymnodamaeid mites (Acari: Oribatida: Gymnodamaeidae) from Mongolia. *Edaphologia* 67: 37-47.
- Bayartogtokh B. & Smelyansky I.E. 2002. Oribatid mites of the superfamilies Gymnodamaeidea and Plateremaeoidea from East Kazakhstan. *Zoologische Reihe*, 78(1): 71-86.
- Bernini F., Avanzati A.M. & Bernini S. 1987. Notulae Oribatologicae XXXVII. Gli Acari Oribatei del Massiccio del Pollino (Italia Meridionale): aspetti faunistici e biogeografici. *Lavori della Società Italiana di Biogeografia*, N.S. 10: 379-448.
- Bulanova-Zachvatkina E.M. 1975. Superfamily Gymnodamaeidea. In M.S. Gilyarov and D.A. Krivolutsky (eds). *A key to the soil-inhabiting mites. Sarcoptiformes*. Moscow, Nauka. p. 116-120. (in Russian)
- Choi S. 1997. Checklist of oribatid mites (Acari: Oribatida) of Korea. *Korean Arachnology* 13: 83-104. (In Korean)
- Covarrubias R. 1968. Observations sur le genre *Pheroliodes*. I – *Pheroliodes roblensis* n. sp. (Acarina, Oribatei). *Acarologia* 10: 657-695.
- Csiszar J. & Jeleva M. 1962. Oribatid mites (Acari) from Bulgarian soils. *Acta Zool. Acad. Sci. Hung.* 8(3-4): 273-301.
- Fernandez, N. 1987. Contribution à la connaissance de la faune oribatologique d'Argentine. VII. Les genres *Pheroliodes* et *Pedrocortesella*. *Acarologia* 28: 177-186.
- Fujikawa T., Fujita M. & Aoki J. 1993. Checklist of oribatid mites of Japan (Acari: Oribatida). *Journal of the Acarological Society of Japan* 2: 1-121.
- Grandjean F. 1931. Le genre *Licneremaeus* Paoli (Acariens). *Bull. Soc. zool. France* 56: 221-250.
- Grandjean F. 1933. Oribates de l'Afrique du Nord (1re Série). *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord* 24: 308-323.
- Grandjean F. 1964. *Pheroliodes wehnckeii* (Willmann) (Oribate). *Acarologia* 6: 353-386.
- Hunt G. 1996. A review of the genus *Pedrocortesella* Hammer in Australia (Acarina: Cryptostigmata: Pedrocortesellidae). *Rec. Aust. Mus.* 48: 223-286.
- Hunt G. & Lee D. 1995. Plateremaeoid mites (Arachnida: Acarina: Cryptostigmata) from South Australian soils. *Rec. West. Aust. Mus. Suppl.* 52: 225-241.
- Kahwash M.A.M., Subias L.S. & Ruiz E. 1991. Oribátidos superiores (Acari, Oribatida, Brachypylina) de Andalucía (Sur de España). *Boln. Asoc. esp. Ent.* 15: 199-213.
- Karppinen E. & Krivolutskij D.A. 1982. List of Oribatid mites (Acarina, Oribatei) of northern Palaearctic region. I. Europe. *Acta Entomol. Fenn.* 41: 1-18.
- Karppinen E., Krivolutskij D.A. & Poltavskaja M.P. 1986. List of Oribatid mites (Acarina, Oribatei) of northern Palaearctic region. III. Arid lands. *Ann. Entomol. Fenn.* 52(3): 81-94.
- Karppinen E., Krivolutskij D.A., Tarba Z.M., Stancaeva U.Ya. & Gordeeva E.W. 1987. List of Oribatid mites (Acarina, Oribatei) of northern palaeartic region. IV. Caucasus and Crimea. *Ann. Entomol. Fenn.* 53: 119-137.
- Krivolutsky D.A. (ed.). 1995. The Oribatid Mites. *Nauka*, Moscow. 224 pp. (In Russian)
- Kunst M. 1959. Bulgarische Oribatiden (Acarina) III. *Acta Univ. Carolinae, Biol.* 6(1): 51-74.
- Marshall V.G., Reeves R.M. & Norton R.A. 1987. Catalogue of the Oribatida (Acari) of Continental United States and Canada. *Mem. Ent. Soc. Can.* 139: 1-418.
- Mihelè, 1957. Oribatiden Südeuropas VII. *Zool. Anz.* 159: 44-68.
- Murvanidze M.O. & Darejaneshwili Sh.D. 2000. Checklist of oribatid mites (Acari, Oribatei) of Georgia. *Proceedings of the Institute of Zoology* 20: 119-136.
- Niedbala W. & Olszanowski Z. 1997. Acari-Roztocze, In J. Razowski (ed.): *Checklist of Animals of Poland*. Vol. IV: 247-259.
- Paoli G. 1908. Monografia del genere *Dameosoma* Berl. E generi affini. *Redia* 5: 31-91 + pls. 3-5.
- Paschoal A.D. 1982. A revision of the genus *Gymnodamaeus* (Acari, Oribatei,

- Gymnodamaeidae), with descriptions of nine new species. *Revista Brasileira de Entomologica* 26: 113-132.
- Paschoal A.D. 1987. A revision of the families Licnodamaeidae and Licnobelbidae (Acari, Oribatei) with a recharacterization of the genera Licnodamaeus and Licnobelba. *Revista Brasileira de Zoologia* 3(6): 397-403.
- Pérez-Iñigo C. 1970. Ácaros oribátidos de suelos de España peninsular e islas Baleares (Acari, Oribatei). Parte II. *Eos*. 45: 241-317.
- Pérez-Iñigo C. 1979. Contribucion al conocimiento de los oribatidos muscicolos de la Sierra de Guadarrama y de los Montes de Toledo. *Eos*. 53: 139-181.
- Pérez-Iñigo C. 1997. Fauna Iberica. Vol. 9. Acari, Oribatei, Gymnonota I. *Museo Nacional de Ciencias Naturales*, Madrid. 374 pp.
- Rahimbaeva A.K. 1995. To the fauna of oribatid mites of Kazakhstan. *Kustanay University Press*, Kustanay. 40 pp. (in Russian)
- Ruiz E., Kahwash M.A.M. & Subias L.S. 1990. Cuatro nuevos Gymnodamaeidae del Sur de Espana (Acari, Oribatida, Gymnodamaeidae). *Bol. R. Soc. Esp. Hist. Nat. (Sec. Biol.)*, 85(1-4): 39-49.
- Ryabinin N.A. 1986. Beetle mites of the genus *Pedrocortesia* (Acariformes, Oribatei) in fauna of the USSR. *Zool. Zhurn*. 65(3): 341-348. (in Russian)
- Schatz H. 1983. U.-Ordn.: Oribatei, Hornmilben. *Catalogus Faunae Austriae*, Wien, Teil IXi: 118 pp.
- Subias L.S. 1977. Taxonomía y Ecología de los Oribátidos Saxicolos y Arborícolas de la Sierra del Guadarrama (Acarida, Oribatida). *Trabajos de la Cátedra de Artrópodos Facultad de Biología, Universidad Complutense de Madrid* 24: 1-379.
- Subias L.S. & Gil-Martin J. 1997a. Systematic and biogeographic checklist of oribatids from Western Mediterranean (Acari, Oribatida). *Annali del Museo Civico do Storia Naturale "G. Doria"* 96: 459-498.
- Subias L.S. & Gil-Martin J. 1997b. Oribátidos (Acari, Oribatida) de la Sierra de Gredos (Avila). *Est. Mus. Cienc. Nat. De Alava* 12: 203-216.
- Subias L.S. & Mingues M.E. 2001. Listado sistemático de los oribátidos (Acariformes, Oribatida) del noroeste de la península Ibérica. *Graellsia* 57(1): 15-27.
- Wang H., Wen Z. & Chen J. 2002. A checklist of oribatid mites of China (I). (Acari: Oribatida). *Acta Arachnologica Sinica* 11(2): 107-127.
- Woas S. 1992. Beitrag zur Revision der Gymnodamaeidae Grandjean, 1954 (Acari, Oribatei). *Andrias* 9: 121-161.
- Woolley T.A. & Higgins H.G. 1973. Two new species of *Gymnodamaeus* from Colorado (Acarina: Cryptostigmata, Gymnodamaeidae). *Great Basin Naturalist* 33(1): 37-42.

### Хураангуй

ОХУ-ын хээрийн бүсийн хөрснөөс цуглуулсан *Gymnodamaeidae*, *Plateremaeidae* зэрэг дээд овгуудад хамаарах хуягт хачгуудыг судлан 4 зүйлийг илрүүлэв. Тэдгээрээс *Pedrocortesella minuta* sp. nov. ба *Pleodamaeus tuberculatus* sp. nov. зүйлүүдийг шинжлэх ухаанд шинээр илрүүлж бичиглэл хийсний зэрэгцээ *Licbodamaeus pulherrimus* (Paoli, 1908), *Plesiiodamaeus glaber* Mihelè, 1957 зэрэг зүйлүүдийн нэмэлт бичиглэлийг хийж, эдгээр зүйлүүдийн тархалтын талаархи бүрэн мэдээллийг оруулсан болно.

Received: March 2004

Accepted: May 2004