

New and Little Known Species of *Bipassalozetes* and Some Other Related Genera (Acari: Oribatida) from Russia and Kazakhstan

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Abstract

Oribatid mites belonging to the genera *Bipassalozetes*, *Proteremaeus*, *Oribatula* and *Eporibatula* collected from Russia and Kazakhstan are studied. A new species, *Bipassalozetes pilosus* sp. nov. is described. In addition, six known species, *Bipassalozetes reticulatus* (Mihelčič, 1957), *Bipassalozetes granulatus* (Mihelčič, 1955), *Bipassalozetes lineolatus* (Sitnikova, 1975), *Proteremaeus elongatus* (Rjabinin & Krivolutsky, 1975), *Oribatula elegantissima* Balogh & Mahunka, 1965 and *Eporibatula prominens* Bayartogtokh & Aoki, 1998 are redescribed, with notes on their distributions. The species *Bipassalozetes granulatus* (Mihelčič), *B. reticulatus* (Mihelčič) and *Eporibatula prominens* Bayartogtokh & Aoki are recorded for the first time in the fauna of Kazakhstan, and another species, *Bipassalozetes granulatus* (Mihelčič) is reported for the first time from Russia. Data on geographic distribution of each known species are given.

Key words: Acari, Oribatida, taxonomy, Russia, Kazakhstan

Introduction

The oribatid mite genus *Bipassalozetes* was proposed by Mihelčič (1957a) with *Scutovertex bidactylus* Coggi, 1900 as the type species. Representatives of this genus seem to be relatively rare and xerophilous in habit, and they have been recorded mostly from arid regions of Europe (Strenzke, 1953; Mihelčič, 1955, 1956, 1957a, b, 1966, 1967; Mihelčič & Rain, 1954; Kunst, 1957; Tarman, 1965; Vanek, 1966; Pérez-Iñigo, 1971, 1993; Mahunka, 1977; Luxton, 1990a, b), Africa (Wallwork, 1964; Engelbrecht, 1974; Mahunka, 1987a), North America (Higgins & Woolley, 1962, 1975; Wallwork, 1972; Wallwork *et al.*, 1984) and Asia (Mahunka, 1964; Sitnikova, 1975, 1982; Bayartogtokh & Aoki, 1997).

Bipassalozetes is a small genus of oribatid mites and until the present work the genus comprised of 22 nominal species and two subspecies. Most of the *Bipassalozetes* species seem to be distributed only in restricted areas or are known only from the type localities. On the basis of present knowledge the genus appears to be not represented in the Neotropical and Australian regions.

The diagnostic characters of this genus are considered to be the following: adults small to medium in size (267-491 μm in length); without true lamellae; notogaster with ten pairs of setae, but some of them minute and invisible; three or four pairs of porose areas; four pairs of genital setae; dorsal and ventral surfaces and legs covered with cerotegumental microsculpture; legs bidactylous.

Another genus studied here, *Proteremaeus* is represented by 9 species, and the members of this genus are known only from Asia. Four species are known from Siberia and the Russian Far East (Krivolutsky & Ryabinin, 1975; Behan-Pelletier, 1982; Behan-Pelletier & Ryabinin, 1991). Two other species have been described from Pakistan, and the remaining three species were found in Mongolia (Piffel, 1965; Hammer, 1977; Golosova, 1983; Bayartogtokh, 2000).

Two other genera, *Oribatula* and *Eporibatula* are closely related to each other, and the former genus is one of the largest groups of oribatid mites being represented by more than 80 species, which distributed throughout the world. The second genus, *Eporibatula* is relatively small in species richness, and known with 10 species, which found

in Europe, Asia, North and South America (Bayartogtokh & Aoki, 2000).

This work is part of an ongoing study on ecology and taxonomy of oribatid mites of Central Asia, and it deals the description of a new species, and redescriptions of six known species belonging to the genera *Bipassalozetes*, *Oribatula*, *Eporibatula* and *Proteremaeus* found in Russia and Kazakhstan.

Material and Methods

The present work is based on material collected from soils of dry steppe and desert habitats of the various regions of Russia and Kazakhstan. The type locality and habitat characterization for each species are given in the respective "material examined" sections. All specimens used for description or redescriptions are represented by adults.

The morphological terminology used in this paper is based on that (with a few modifications) generally developed by F. Grandjean (see Travé and Vachon, 1975 for references) as summarized and applied by Engelbrecht (1974) and Wallwork *et al.* (1984).

Body length is measured in lateral view, from the tip of rostrum to the posterior edge of notogaster. Notogastral length is measured in lateral aspect, from anterior to posterior edge. Notogastral width refers to the maximum width in dorsal aspect. All measurements are given in micrometers (μm), 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 "PZO SK-14".

Descriptions of Species

Bipassalozetes pilosus sp. nov.

(Figs. 1 & 2)

Diagnosis. Relatively small species with typical characters of *Bipassalozetes*. Cerotegument of dorsal and ventral sides of idiosoma consisting of very fine lines. Costulae narrow, almost parallel to each other, distance between costulae about 1.5 times as long as costular length; sensilli long, thin, but distinctly expanded distally, unilaterally barbed by six or seven barbs; rostral setae barbed; lamellar setae smooth, slightly shorter than rostral setae; interlamellar setae medium long, smooth; exobothridial setae slightly shorter than

interlamellar ones; 10 pairs of thin, smooth notogastral setae; genu IV with strongly developed ventroproximal projection.

Measurements. In total six specimens were measured: body length 297-345 (316) μm ; length of notogaster 237-282 (253) μm ; width of notogaster 134-179 (155) μm ; width of prodorsum 106-125 (114) μm .

Integument. Body color light yellowish. Cerotegument of dorsal and ventral sides of idiosoma consisting of very fine lines. On the prodorsum lines run transversely across rostral region and in translamellar region, and on lateral part of prodorsum and notogaster lines aligned in antero-posterior direction. Ventrally, ceratogenous lines transversely oriented on gnathosomal, epimeral and aggenital regions, but on lateral part of ventral plate and adanal region the lines aligned antero-posteriorly (Fig. 1).

Prodorsum. Rostrum broadly rounded; rostral setae (*ro*) medium long, relatively thick, distinctly barbed. Lamellar setae (*le*) thin, slightly shorter than *ro*, smooth. Costulae weakly developed, short, almost parallel to each other, slightly diverging posteriorly; transcostular ridge present, minimum distance between costulae longer than costular length. Interlamellar setae (*in*) about half as long as *ro*, thin, smooth, distance between bases of *in-in* slightly shorter than that of *ro-ro*. Exobothridial setae (*ex*) shorter than *in*, thin, smooth, directed anteroventrad. Sensilli long, thin, but distinctly expanded distally, with six or seven barbs on its expanded portion. Bothridia small, rounded (Figs. 1A, C).

Notogaster. Elongated oval, almost twice as long as wide; dorsosejugal suture interrupted medially. Ten pairs of relatively long, thin, smooth notogastral setae approximately same in length. Porose areas *Aa*, *A₁* and *A₂* small, round in shape, *A₃* inconspicuous; lyrifissures *im* well developed, situated anteromedial of *A₁*. Opisthosomal gland opening (*gla*) not evident. Lenticulus circular, surrounded by linear pattern (Figs. 1A & C).

Gnathosoma. Infracapitular mentum wider than long, hypostomal setae *h*, *m* and *a* short, thin, smooth. Chelicera relatively large, fixed and movable digits with few blunt teeth.

Epimeral region. Sejugal and II apodemes well developed, aligned obliquely and nearly parallel; apodeme III not evident. Epimeral setal formula 3-1-2-3, all setae smooth. Discidium rounded distally. Pedotecta I and II well developed; pedotectum I

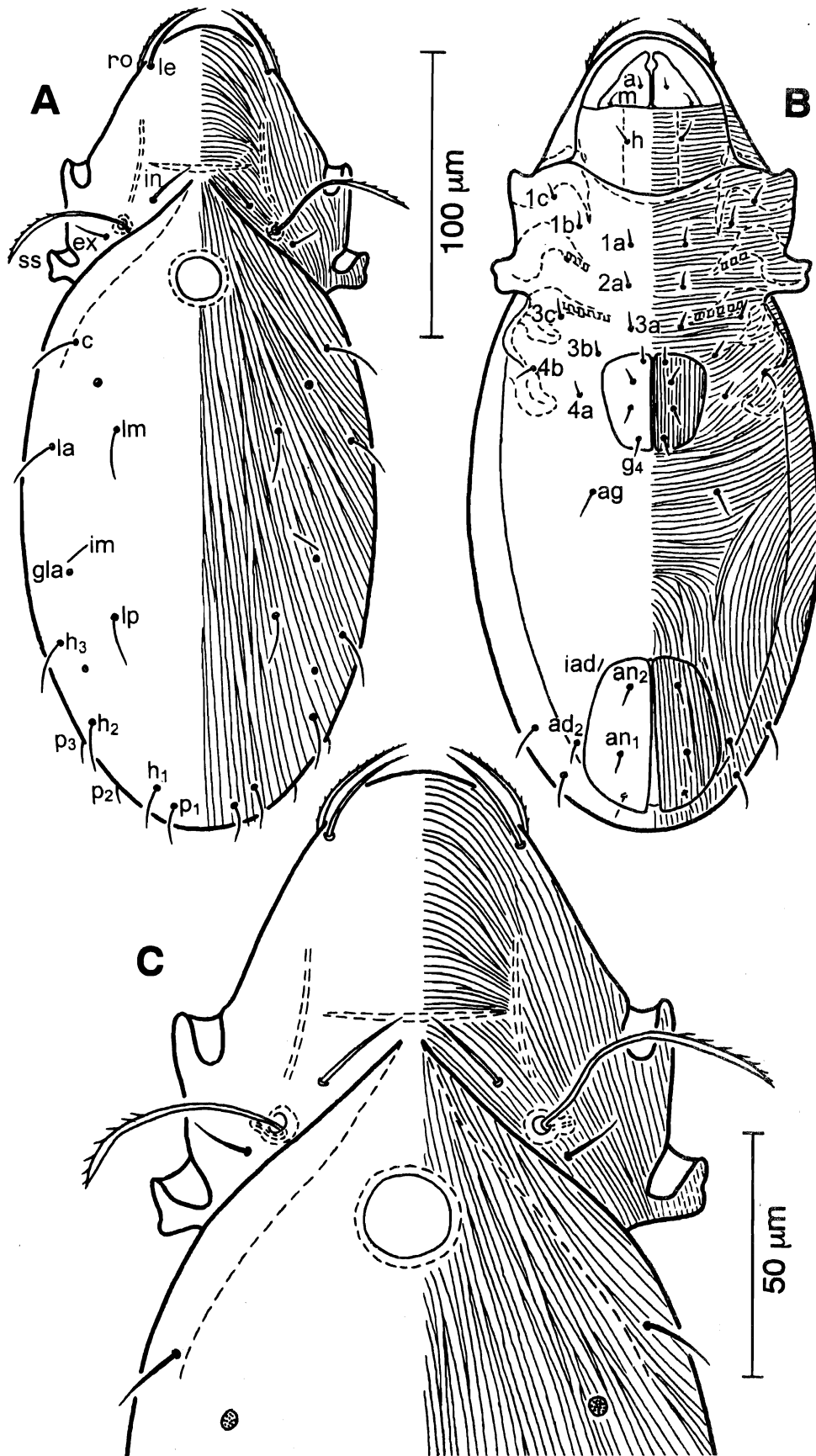


Fig. 1. *Bipassalozetes pilosus* sp. nov. A: Dorsal aspect of idiosoma; B: Ventral aspect of idiosoma; C: Prodorsum and anterior part of notogaster.

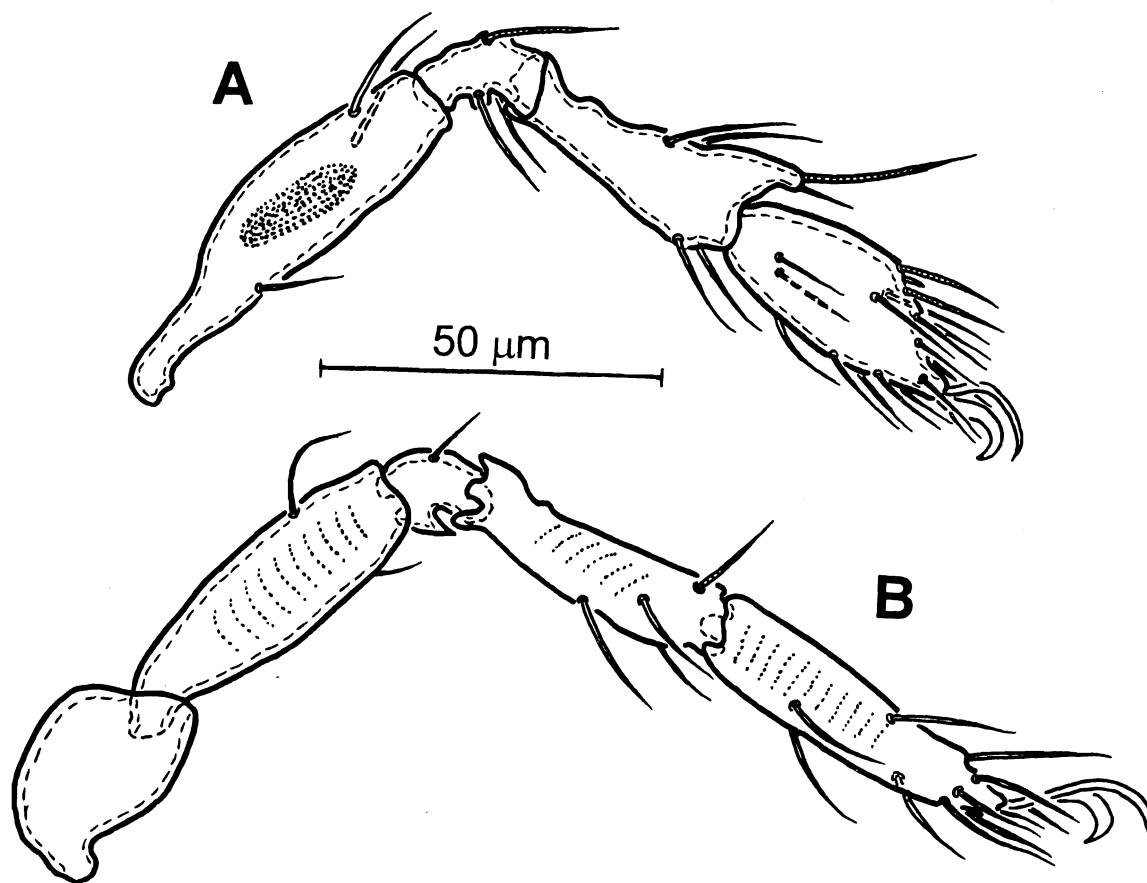


Fig. 2. *Bipassalozetes pilosus* sp. nov. A: Leg I (left, paraxial view); B: Leg IV (left, antiaxial view).

slightly projecting, pedotectum II seems bifurcate distally in dorso-ventral view (Fig. 1B).

Ano-genital region. Genital aperture conspicuously widened anteriorly; anal aperture widened posteriorly, nearly trapezoid in shape. Both genital and anal plates covered with cerotegument of longitudinal lines. Four pairs of genital, one pair of aggenital, two pairs of anal and two pairs of adanal setae thin, smooth (Fig. 1B).

Legs. All tarsi heterobidactylous, with one strong claw and other more weakly developed, longer claw located paraxial to the former. Femur I with large porose area; genu IV with very strongly developed ventroproximal projections. Structure and setation of legs I and IV as shown in Fig. 2.

Material examined. Holotype (male) and five paratypes (two males and three females): Tsuger-Els sands, District Erdzin, Tuva Republic, Russia, forbs-grassy dry steppe under light grazing, 0-5 cm soil layer, 08 September 1998, Col. S. K. Stebaeva; two paratypes: District Erdzin, Tuva Republic, Russia; forbs-grassy steppe under intensive grazing, 0-5 cm soil layer; 08 July 1998, Col. S.K. Stebaeva; one paratype: Mt. Yamalyk, District Erdzin, Tuva

Republic, Russia, top of pediment, steppe soils under *Stipa* sp., 0-5 cm layer, 11 July 1993, Col. S. K. Stebaeva. The holotype and six paratypes are deposited in the collection of the Institute of Animal Systematics and Ecology, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia, two paratypes: in the collection of the Department of Zoology, National University of Mongolia, Ulaanbaatar, Mongolia.

Remarks. There are several species of *Bipassalozetes*, which being with striated pattern of cerotegumental microsculpture. Those are *B. californicus* (Wallwork), *B. californicus orientalis* (Wallwork, Weems & Kamill), *B. deserticus* Bayartogtokh & Aoki, *B. elegans* (Sitnikova), *B. linearis* (Higgins & Woolley), *B. lineatus* (Mihelčič), *B. lineolatus* (Sitnikova), *B. neomexicanus* (Wallwork, Weems & Kamill), *B. nesebarensis* (Vanek) and *Bipassalozetes striatus* (Mihelčič).

However, the new species, *B. pilosus* sp. nov. is clearly distinguishable from most of other related species in the distally distinctly expanded sensilli, which bearing six or seven barbs on the anterior

margin of its expanded portion. Some of above mentioned species such as *B. striatus*, *B. californicus*, *B. nesebarensis* and *B. linearis* being with distally expanded sensilli.

Two North American species, *B. californicus* and *B. linearis* are differ from *B. pilosus* sp. nov in the 1) more strongly swollen head of sensilli, which have very dense barbs as opposed to the weakly expanded distal part of sensilli with a few barbs in *B. pilosus* sp. nov.; 2) complete absence of lamellar costulae as opposed to the well developed costulae in *B. pilosus* sp. nov.; 3) different arrangement of notogastral, genital and adanal setae, and 4) relatively larger body size.

The other species, *B. nesebarensis*, known from Bulgaria can be easily differentiated from *B. pilosus* sp. nov. in the short and strongly swollen head of sensilli and much dense striations on the dorsal and ventral sides of body. Another European species, *B. striatus* is distinguishable from the present new species by the 1) densely barbed sensilli; 2) more wide and reticulated structure of cerotegumental microsculpture on the dorsal and ventral sides of body; 3) lack of lamellar costulae and transcostular ridge, and different arrangement of notogastral setae and lyrifissure *im*.

Etymology. The specific epithet "*pilosus*" refers to the distally expanded sensilli, which bearing a few barbs on its anterior margin.

Bipassalozetes reticulatus (Mihelčič)

(Figs. 3 & 4)

Passalozetes reticulatus Mihelčič, 1957a: 67.

Passalozetes reticulatus: Pérez-Iñigo, 1971: 341, figs. 77-79; Sitnikova, 1982: 635; Mahunka, 1987b: 358.

Bipassalozetes reticulatus (Mihelčič): Pérez-Iñigo, 1993: 59: fig. 19; Subias & Gil-Martin, 1997; Mahunka & Mahunka-Papp, 2000: 45.

Diagnosis. Medium-sized species with typical characters of *Bipassalozetes*. Cerotegument of dorsal and ventral sides of idiosoma consisting of irregular-shaped, brown reticulations. Sensilli setiform, long, smooth; rostral and lamellar setae smooth, nearly same in length; interlamellar setae medium long, smooth; exobothridial setae slightly shorter than interlamellar setae; 10 pairs of thin,

smooth notogastral and two pairs of adanal setae.

Measurements. In total nine specimens were measured: body length 336-372 (353) μm ; length of notogaster 275-299 (286) μm ; width of notogaster 196-227 (212) μm .

Integument. Body color deep reddish brown. Cerotegument of dorsal and ventral sides of body similar to each other, consisting of irregular-shaped, dark brown reticulated tubercles. More laterally, close to the lateral margin of notogaster and along anal and genital apertures the granular reticulations becoming elongated in shape and being arranged along the margins of notogaster, anal and genital apertures. (Fig. 3).

Prodorsum. Rostrum broadly rounded; rostral and lamellar setae medium long, thin, similar in length. Costulae not developed; transcostular ridge present. Interlamellar setae about half as long as *ro*, thin, smooth, distance between bases of *in-in* approximately same to that between *ro-ro*. Exobothridial setae shorter and thinner than *in*, smooth, directed anteroventrad. Sensilli setiform, long, smooth. Bothridia small, rounded (Fig. 3A).

Notogaster. Oval, slightly narrowed posteriorly, about 1.4 times as long as wide; dorsosejugal suture interrupted medially. Ten pairs of medium long, smooth notogastral setae; all setae approximately same in length. Porose areas *Aa*, *A₁*, *A₂* and *A₃* well developed, round in shape *Aa*, about twice larger than others; lyrifissures *im*, *ip*, *ih* and *ips* well developed. Opisthosomal gland opening inconspicuous. Lenticulus circular, surrounded by linear pattern (Figs. 3A, D).

Gnathosoma. Infracapitular mentum wider than long, with reticulated tubercles as on dorsal and ventral sides of idiosoma. Hypostomal setae *h*, *m* and *a* medium long, smooth. Chelicera relatively large, fixed and movable digits with few blunt teeth. Trägårdh's organ inconspicuous; cheliceral setae *cha* and *chb* smooth (Figs. 3C, F).

Epimeral region. Sejugal and II apodemes well developed, aligned obliquely and nearly parallel; apodeme III not evident. Epimeral setal formula 3-1-2-3, all setae smooth. Discidium rounded distally. Pedotecta I and II well developed; pedotectum I slightly projecting, pedotectum II seems rounded distally in dorso-ventral view (Fig. 3D).

Ano-genital region. Genital aperture conspicuously widened anteriorly; anal aperture very slightly widened posteriorly. Both genital and anal plates covered with reticulated cerotegument. Four pairs of genital, one pair of aggenital, two pairs

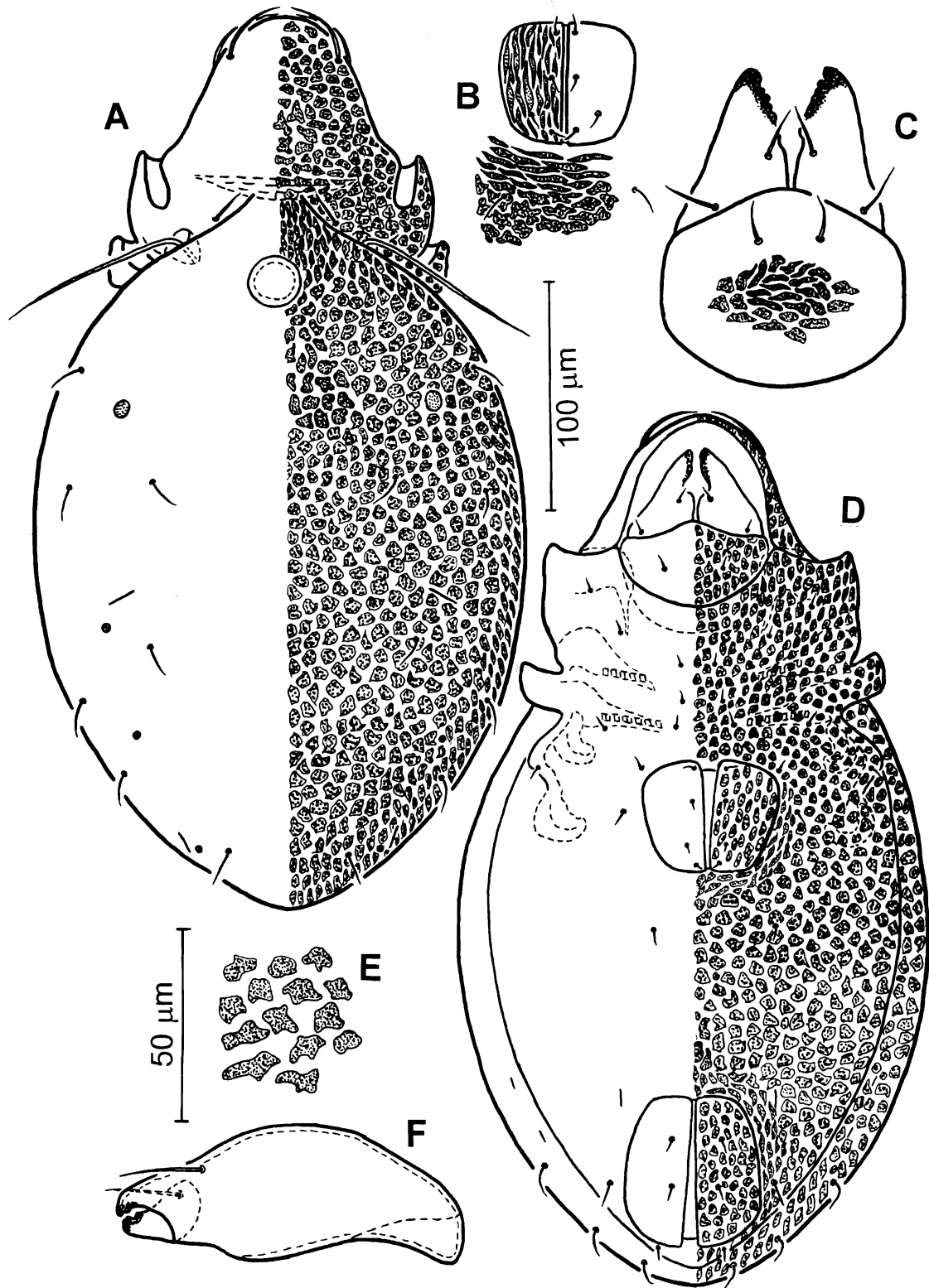


Fig. 3. *Bipassalozetes reticulatus* (Mihelčič, 1957). A: Dorsal aspect of idiosoma; B: Genital region; C: Subcapitulum; D: Ventral aspect of idiosoma; E: Cerotegument of notogaster; F: Chelicera (left, antiaxial view). Scale bar same for A, D and B, C, E, F, respectively.

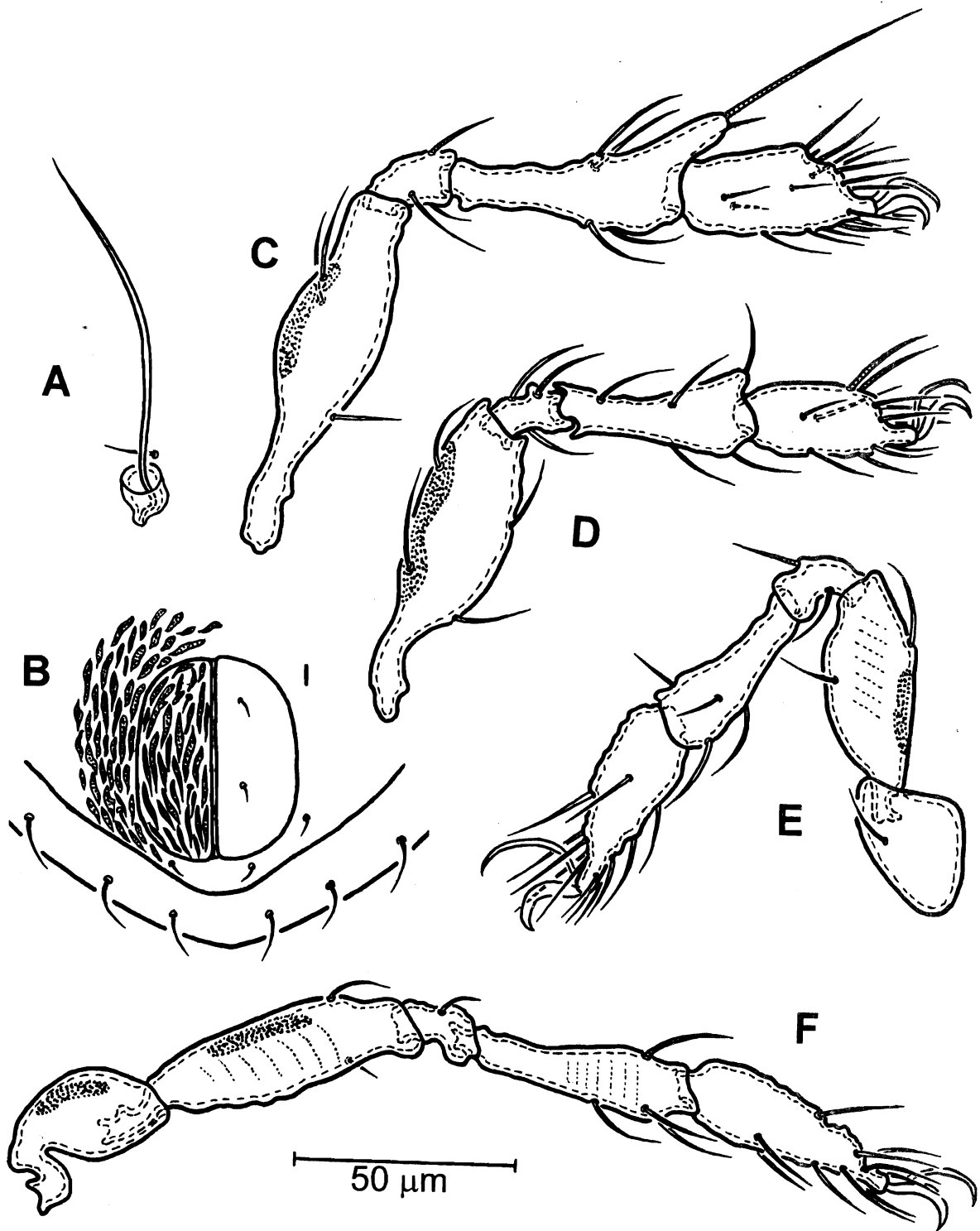


Fig. 4. *Bipassalozetes reticulatus* (Mihelčič, 1957). A: Sensillus, bothridium and exobothridial seta; B: Anal and adanal regions; C: Leg I (right, antiaxial view); D: Leg II (right, antiaxial view); E: Leg III (right, antiaxial view); F: Leg IV (left, antiaxial view).

of anal and two pairs of adanal setae thin, smooth (Figs. 3D, 4B).

Legs. All tarsi heterobidactylous, with one strong antiaxial claw and other weakly developed, longer claw located paraxial to the former. Structure and setation of legs are shown in Figs. 4C-F.

Material examined. Seven specimens: 6 km south-west from village Belenkoe, District Kamenskiy, West Kazakhstan Province, Kazakhstan; dry steppe with *Stipa lessingiana* + *Festuca valesiaca* + *Galatella villosa*, moss growing among *Stipa* and *Festuca* on the up of the hill; 18 May 1998; Col. I. E. Smelyansky; seven specimens: Uzkaya Steppe, 20 km west of village Novoegorievskoe, District Uglovskiy, Altai Territory, Russia, very gentle watershed south and southeast slope, steppe (*Puccinellia tenuissima* + *Festuca valesiaca*) on solonetz, under cushion of *Campharosma*, 20 September 2000, Col. I. E. Smelyansky; a number of records of this species (60 specimens in total) were made in Orenburg Province, Russia: Districts Orenburg, Novoorsk and Adamovka, 1991-1993, Col. I.E. Smelyansky; District Belayevka, 29 September 1992, Col. S. V. Simak.

Remarks. The character states of studied specimens are well in accord with those of the Spanish material redescribed by Pérez-Iñigo (1971, 1993), and some supplementary characters are provided in the present redescription. Only the differences between them are slightly elongated cerotegumental microsculpture in Spanish material rather than irregular shaped microsculpture in the present specimens and somewhat larger body size in the Spanish material.

Known distribution. Europe: Spain (Mihelčič, 1957a; Pérez-Iñigo, 1971, 1993; Subias & Gil-Martin, 1997); Hungary (Mahunka, 1987; Mahunka & Mahunka-Papp, 2000), Kazakhstan (present data) and Russia (present data).

Bipassalozetes granulatus (Mihelčič)

(Fig. 5)

- Passalozetes granulatus* Mihelčič, 1955: 196, fig. 1.
Passalozetes granulatus: Higgins & Woolley, 1962: 95, fig. 8; Mihelčič, 1966: 459, fig. 1; Pérez-Iñigo, 1971: 339, fig. 76; Sitnikova, 1982: 635.
Bipassalozetes granulatus (Mihelčič): Pérez-Iñigo, 1993: 60, fig. 20a.

Diagnosis. Medium-sized species with typical characters of *Bipassalozetes*. Cerotegument of dorsal side of body consisting of irregularly spaced dark granules. On the ventral side the cerotegument consists of more continuous elongated ridges. Sensilli setiform, medium long, smooth; rostral and lamellar setae thin, smooth, nearly same in length; interlamellar setae short, smooth; exobothridial setae slightly shorter than interlamellar setae; 10 pairs of thin, smooth notogastral and three pairs of adanal setae.

Measurements. Body length 326-354 (339) μm ; length of notogaster 250-281 (265) μm ; width of notogaster 177-207 (198) μm . In total eight specimens were measured.

Integument. Body color yellowish to deep reddish brown. Cerotegument of dorsal side of body consisting of irregularly spaced dark granules. On the ventral side the cerotegument consists of more continuous elongated ridges. Microsculpture of anal and genital plates same as that on ventral plate (Figs. 5B, C).

Prodorsum. Rostrum broadly rounded; rostral and lamellar setae medium long, thin, similar in length. Costulae not developed; transcostular ridge weakly developed. Interlamellar setae short, less than half length of *ro*, thin, smooth, distance between bases of *in-in* approximately same to that between *ro-ro*. Exobothridial setae slightly shorter than *in*, smooth, directed anterolaterad. Sensilli setiform, medium long, smooth. Bothridia small, rounded, directed anterolaterad (Fig. 5A).

Notogaster. Oval, posterior margin broadly rounded, about 1.3 times as long as wide; dorsosejugal suture interrupted medially. Ten pairs of medium long, smooth notogastral setae; all setae approximately same in length. Porose areas *Aa*, *A₁*, *A₂* and *A₃* well developed, round in shape. Porose areas *Aa*, *A₁* and *A₂* approximately same in size and about twice larger than *A₃*; lyrifissures *im* and *ip* well developed, while *ih* and *ips* not evident. Opisthosomal gland opening located laterad of *A₁*. Lenticulus circular, surrounded by linear pattern (Fig. 5A).

Gnathosoma. Infracapitular mentum wider than long, with lineated ridges as on ventral side of idiosoma. Hypostomal setae *h*, *m* and *a* medium long, smooth. Chelicera relatively large, fixed and movable digits with few blunt teeth. Trägårdh's organ inconspicuous; cheliceral setae *cha* and *chb* smooth.

Epimeral region. Sejugal and II apodemes well

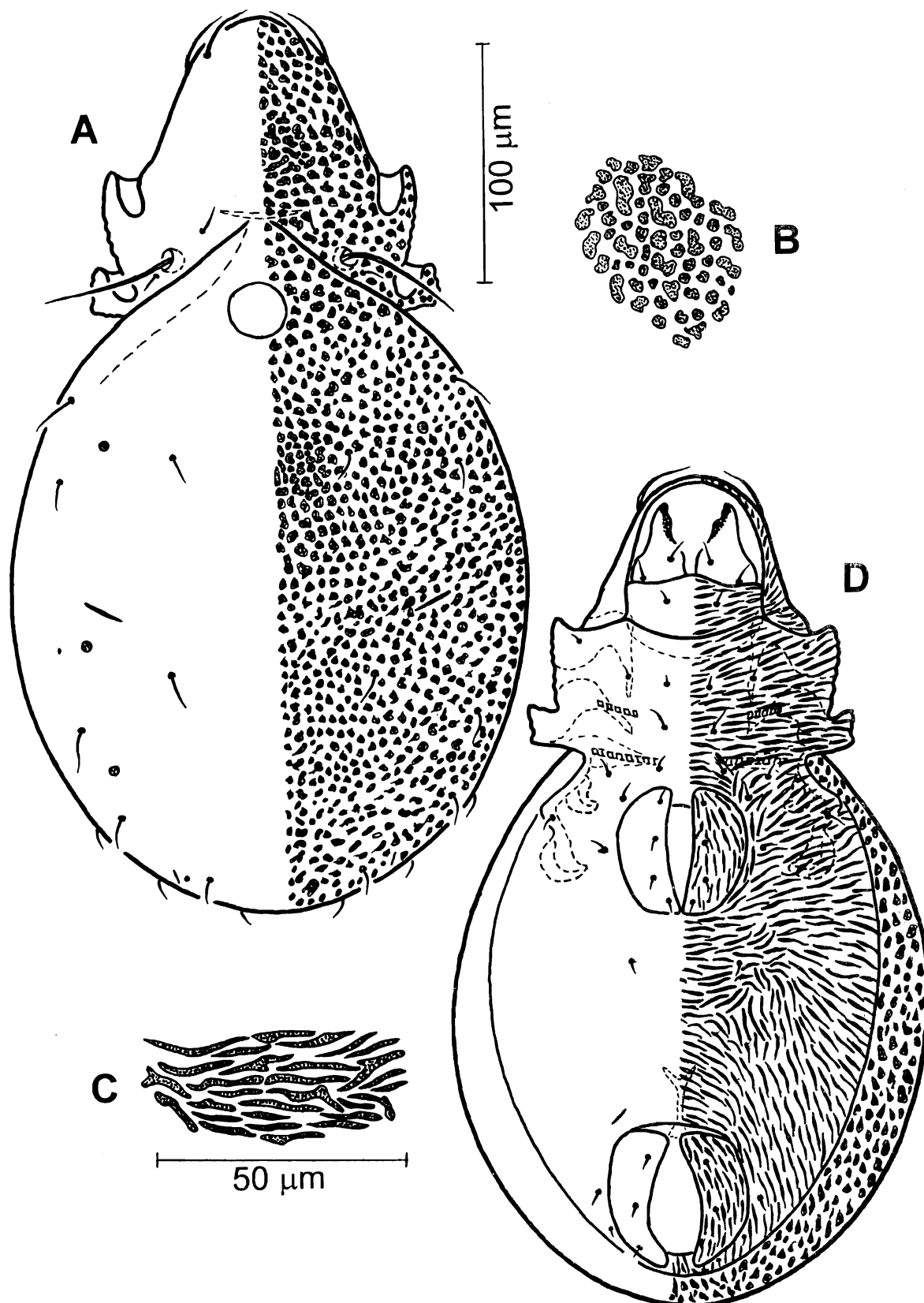


Fig. 5. *Bipassalozetes granulatus* (Mihelčič, 1955). A: Dorsal aspect of idiosoma; B: Cerotegument of notogaster; C: Cerotegument of ventral plate; D: Ventral aspect of idiosoma. Scale bar same for A, D and B, C, respectively.

developed, aligned obliquely and nearly parallel; apodeme III not evident. Epimeral setal formula 3-1-2-3, all setae smooth. Discidium rounded distally. Pedotecta I and II well developed; pedotectum I slightly projecting, pedotectum II seems slightly bifurcate distally in dorso-ventral view (Fig. 5D).

Ano-genital region. Genital aperture conspicuously widened anteriorly; anal aperture nearly rounded. Both genital and anal plates covered with elongated cerotegumental ridges. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae short, thin, smooth (Fig. 5D).

Legs. All tarsi heterobidactylous, with one strong antiaxial claw and other more weakly developed, longer claw located paraxial to the former. Femora I-IV and trochanter IV with large porose areas. Structure and setation of legs I-IV are similar to those of *B. reticulatus*.

Material examined. Nine specimens: 3 km south from village Kumak, District Novoorsk, Province Orenburg, Russia, steppe pasture with *Poa sp.* and *Taraxacum sp.*, on the edge of fresh marsh, 27 July 1991; Col. I. E. Smelyansky. Other localities: The species was very common in our collections from semi-arid habitats of Orenburg, Samara and Saratov Provinces and Altai Territory, Russia as well as from West and East Kazakhstan Provinces, Kazakhstan (more than 200 specimens in total).

Remarks. The character states of Russian specimens are well in accord with those of the Spanish material described and redescribed by Mihelčič (1955, 1966) and Pérez-Iñigo (1971, 1993), and some supplementary characters are provided in the present redescription. In his redescription based on the Spanish material, Mihelčič (1966) illustrated very long and strong ridges along the lateral margin of prodorsum, which is unique character among *Bipassalozetes* species, because of none of them do not show such structure. However, in his redescription Pérez-Iñigo (1971, 1993) did not illustrate such structure.

Known distribution. South-Western Europe: Spain (Mihelčič, 1955, 1966; Pérez-Iñigo, 1971, 1993) and Portugal (Gil & Subias, 1990), Russia: Orenburg, Samara, and Saratov Provinces and Altai Territory (present data); Kazakhstan: West Kazakhstan and East Kazakhstan Provinces (present data).

Bipassalozetes lineolatus (Sitnikova)

(Fig. 6)

Passalozetes lineolatus Sitnikova, 1975: 246, fig. 581.

Passalozetes lineolatus: Sitnikova, 1982: 631, fig. 3.

Bipassalozetes lineolatus (Sitnikova): Andrievsky *et al.*, 2002: 201.

Diagnosis. Medium-sized species with typical characters of *Bipassalozetes*. Microsculpture of cerotegument of dorsal and ventral sides of idiosoma consisting of obliquely decurrent, linear structure interspaced with small round dark granules. Sensilli long, setiform, smooth; rostral and lamellar setae smooth, nearly same in length; interlamellar setae short, smooth; exobothridial setae conspicuously shorter than interlamellar setae; 10 pairs of thin, smooth notogastral and two pairs of adanal setae.

Measurements. Body length 326-365 (346) μm ; length of notogaster 250-269 (259) μm ; width of notogaster 166-179 (171) μm . In total four specimens were measured.

Integument. Body color yellowish brown. Microsculpture of cerotegument of dorsal and ventral sides of idiosoma consisting of obliquely decurrent, linear structure interspaced with small round dark granules. Microsculpture of anal and genital plates similar to that of ventral plate (Fig. 6).

Prodorsum. Rostrum broadly rounded; rostral and lamellar setae thin, smooth, similar in length. Costulae weakly developed, about half as long as prodorsal length, almost parallel to each other; transcostular ridge distinctly developed. Interlamellar setae short, less than half length of *ro*, thin, smooth; distance between bases of *in-in* approximately same to that between *ro-ro*. Exobothridial setae shorter than *in*, smooth, directed posterolaterad. Sensilli long, setiform, smooth. Bothridia small, rounded, directed posterolaterad (Fig. 6A).

Notogaster. Oval, posterior margin rounded, about 1.5 times as long as wide; dorsosejugal suture interrupted medially. Ten pairs of medium long, smooth notogastral setae; posterior setae p_1, p_2 and p_3 slightly shorter than others. Porose areas *Aa, A_1, A_2* and A_3 well developed, round in shape. Porose areas *Aa* largest, A_3 smallest, while A_1 and A_2

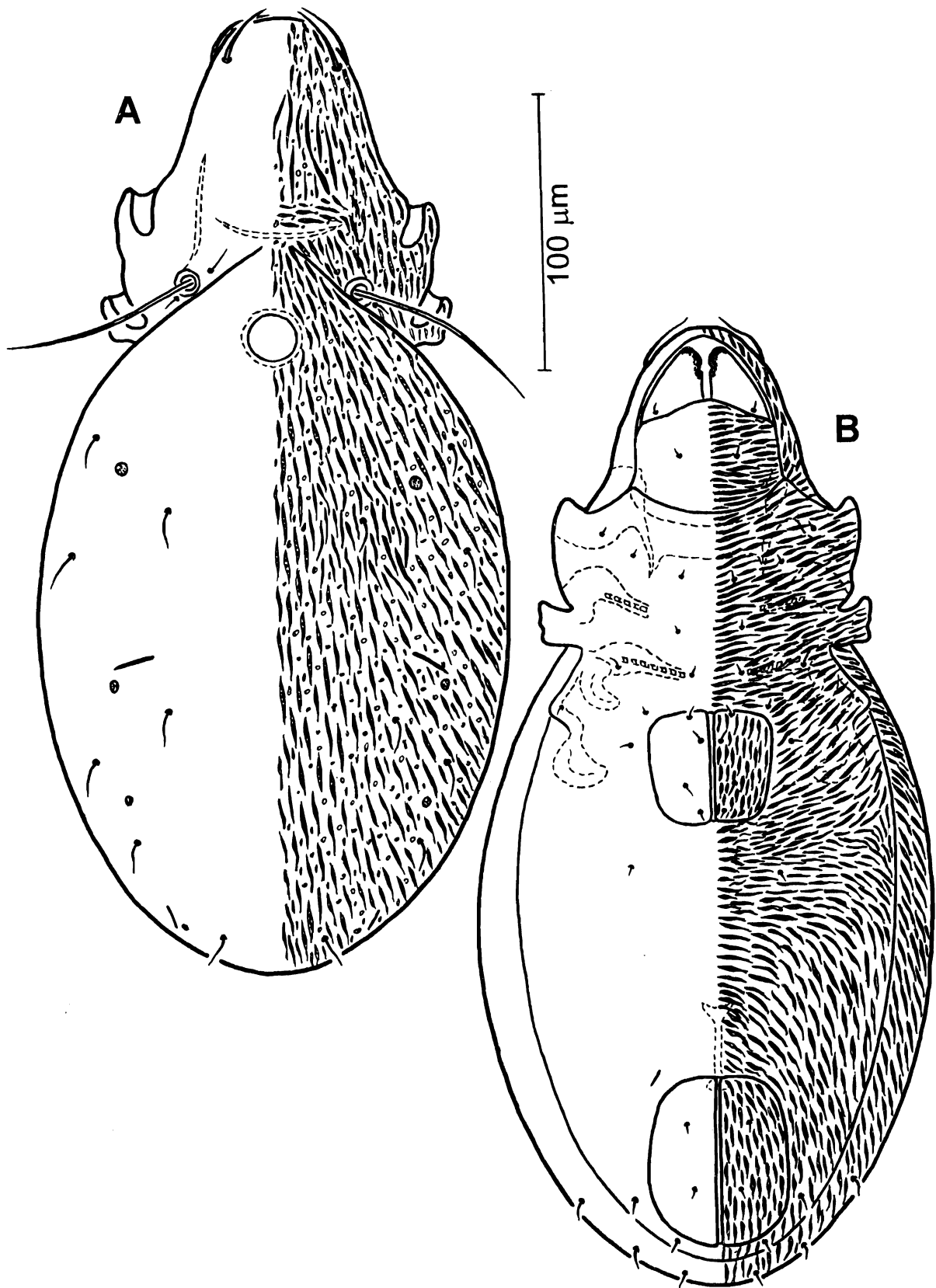


Fig. 6. *Bipassalozetes lineolatus* (Sitnikova, 1975). A: Dorsal aspect of idiosoma; B: Ventral aspect of idiosoma.

medium in size; lyrifissures *im* and *ip* well developed, while *ih* and *ips* not evident. Opisthosomal gland opening inconspicuous. Lenticulus circular, surrounded by linear pattern (Fig. 6A).

Gnathosoma. Infracapitular mentum wider than long, with transverse lineated ridges as on ventral side of idiosoma. Hypostomal setae *h*, *m* and *a* medium long, smooth. Chelicera relatively large, fixed and movable digits with few blunt teeth. Trägårdh's organ inconspicuous; cheliceral setae *cha* and *chb* smooth as in *B. reticulatus* Mihelčič.

Epimeral region. Sejugal and II apodemes well developed, aligned obliquely and nearly parallel to each other; apodeme III not evident. Epimeral setal formula 3-1-2-3, all setae smooth. Discidium rounded distally. Pedotecta I and II well developed; pedotectum I slightly projecting, pedotectum II seems slightly bifurcate distally in dorso-ventral view (Fig. 6B).

Ano-genital region. Genital aperture scarcely widened anteriorly; anal aperture slightly elongated. Both genital and anal plates covered with elongated ridges. Four pairs of genital, one pair of aggenital, two pairs of anal and two pairs of adanal setae short, thin, smooth (Fig. 6B).

Legs. All tarsi heterobidactylous, with a strong antiaxial claw and other weakly developed, longer claw located paraxial to the former. Femora I-IV and trochanter IV with large porose areas. Structure and setation of legs are similar to those of *B. reticulatus*.

Material examined. Four specimens: Kulujun sands, 7 km south-east from village Kaznakovka, District Kokpekty, East Kazakhstan Province, Kazakhstan, up of sand dune dominated with sand sagebrush (*Artemisia arenaria*), upper layer of soil and litter in cushion of *Potentilla acaulis*; 10 May 1999, Col. I. E. Smelyansky; one specimen: Sukhoi Besterek, Kulujun sands, 9 km east of village Kaznakovka, District Kokpekty, East Kazakhstan Province, Kazakhstan, gently eastern slope, psammophytous steppe dominated sand sedge and sagebrush, into feather grass tussock, 10 May 1999, Col. I. E. Smelyansky; two specimens: Kulujun sands, 7 km south-east of village Kaznakovka, District Kokpekty, East Kazakhstan Province, Kazakhstan; slope of sand dune, desert dominated sand sagebrush, into cushion of *Astragalus ammodytes*, 10 May 1999, Col. I. E. Smelyansky.

Remarks. The character states of Kazakhstani specimens are well in accord with those of the

Russian material described and redescribed by Sitnikova (1975, 1982), and some supplementary characters are provided in the present redescription. The only difference is somewhat larger body size in Russian material than the present ones.

Known distribution. Tajikistan: District Murgab (Sitnikova, 1975, 1982); Tuva Republic (Karppinen *et al.*, 1986; Andrievskiy *et al.*, 2002) and Kazakhstan: East Kazakhstan Province (Andrievskiy *et al.*, 2002 and present data).

Proteremaeus elongatus (Rjabinin & Krivolutsky)

(Fig. 7A)

Sibiremaeus elongatus Rjabinin & Krivolutsky, 1975 (in Krivolutsky & Rjabinin, 1975): 1227, fig. 1.

Proteremaeus elongatus (Rjabinin & Krivolutsky): Behan-Pelletier & Ryabinin, 1991: 564.

Diagnosis. Medium in size, with typical characters of *Proteremaeus*; costulae medium long, widely spaced from each other, nearly parallel; no transverse ridge anterior to costulae; sensilli relatively short, expanded distally into club-shaped head; rostral setae barbed; lamellar setae thin, smooth; interlamellar setae barbed, nearly as long as rostral ones; exobothridial setae short, thin, smooth; notogaster relatively wide, slightly narrowed posteriorly; ten pairs of thin, smooth notogastral setae; postanal process V-shaped.

Measurements. Body length 512-528 (521) μm ; length of notogaster 368-375 (372) μm ; width of notogaster 264-273 (268) μm .

Supplementary description. Body color yellowish brown. Dorsal and ventral plates and leg segments with relatively thin granular cerotegument. Microtuberculate on interlamellar region, lateral part of costulae and around leg acetabula. Rostrum rounded in dorsal view; rostral setae relatively thick, barbed. Lamellar setae thinner than setae *ro*, smooth. Costulae medium long, widely separated from each other, nearly parallel, distance between costulae almost equal to costular length. Transverse ridge anterior to costulae absent. Interlamellar setae relatively thick, as long as setae *ro*, barbed. Setae *le* and *in* with small porose rings basally. Exobothridial setae distinctly shorter than *in*, thin, smooth. Sensillus medium long, expanded

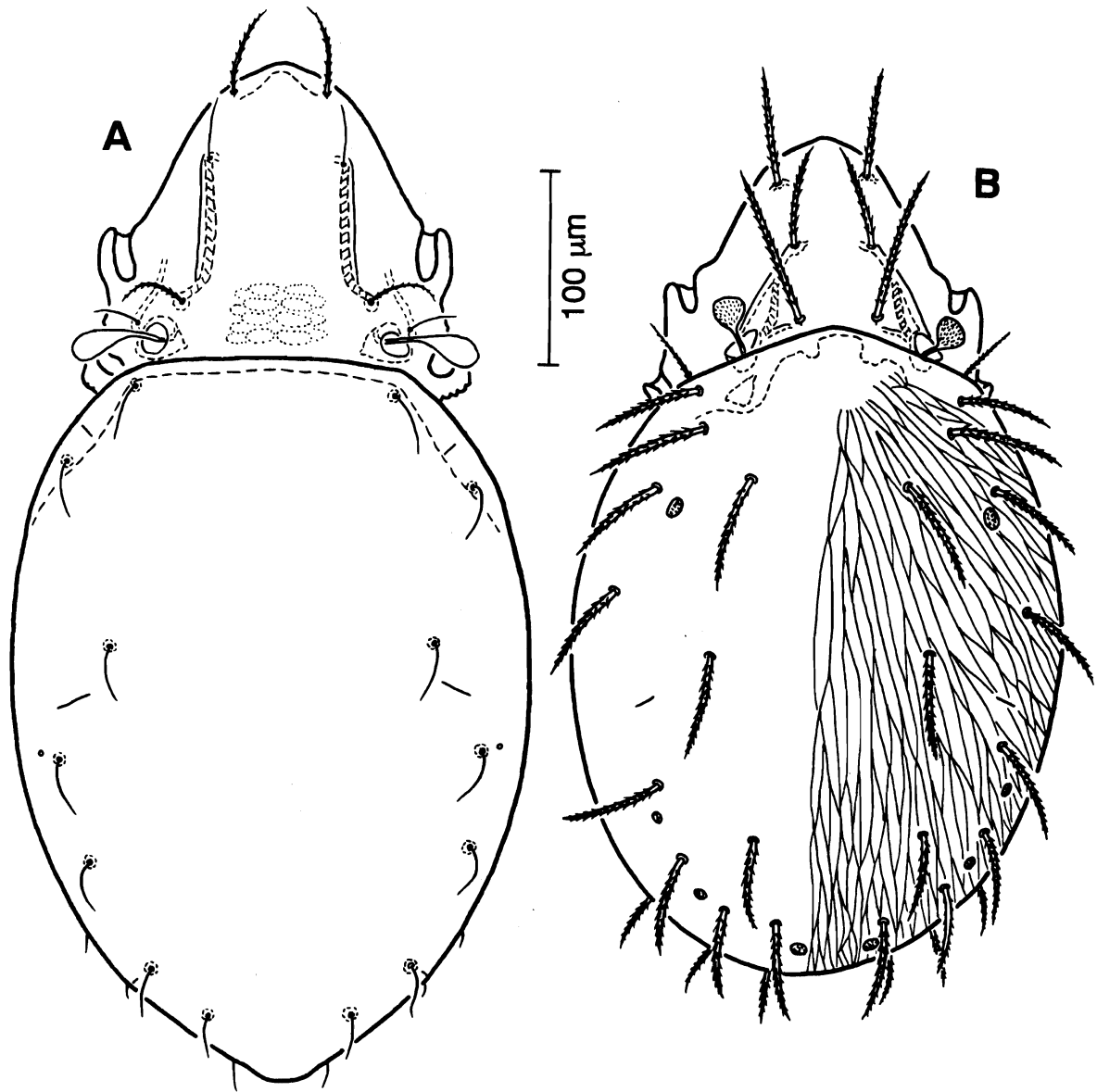


Fig. 7. Idiosoma of two oribatid mite species. A: Dorsal aspect of *Proteremaeus elongatus* (Rjabinin & Krivolutsky, 1975); B: Dorsal aspect of *Oribatula elegantissima* Balogh & Mahunka, 1965.

distally into distinctly barbed, clavate head (Fig. 7A). Notogaster oval, about 1.4 times as long as wide. Anterior margin slightly rounded, posterior margin conspicuously narrowed. Ten pairs of medium long, thin, smooth notogastral setae with small porose rings basally; setae of *ps* series slightly shorter than others. Posteromarginal sclerite not evident; postanal process relatively narrow, V-shaped.

Chelicera and palp normal for the genus; sejugal, II and III apodemes well developed. Epimeral setal formula 3-1-3-3, all setae relatively short, smooth.

Discidium well developed, subtriangular, distinctly projecting distally. Ano-genital setae short, smooth; anal and adanal setae with small porose ring basally. Structure and setation of legs typical for genus.

Material examined. Two specimens: Sangilen ridge, mouth of Ular river, larch-spruce forest, lichens on the rock, Tuva Republic, Russia; 6 August 1995; Col. S. K. Stebaeva; one specimen: Kulujun sands, 7 km south-east from village Kaznakovka, District Kokpekty, East Kazakhstan Province, Kazakhstan, up of sand dune, desert dominated with sand sagebrush (*Artemisia*

arenaria), under sagebrush (roots and caudex), 10 May 1999, Col. I. E. Smelyansky; four specimens: Hills along the bank of Alei river., 4 km north of village Ustyanka, Altai Territory, Russia, granite rocks on the slope, petrophytous steppe with Juniper shrubs, 4-5 May 2001, Col. I. E. Smelyansky.

Remarks. The character states of the present material accord well with those of the type specimens as shown by Krivolutsky & Rjabinin (1975), and some characters are given in this supplementary description. The slight differences between the present specimens and type material are the relatively short and smooth interlamellar setae in the type specimens as opposed to the long and distinctly barbed setae in the present specimens, and finely barbed sensilli in the type material rather than smooth sensilli in the present specimens.

Known distribution. Russia: Provinces Khabarovsk, Novosibirsk (Krivolutsky & Rjabinin, 1975; Krivolutsky, 1995); Tuva Republic (Andriveskiy *et al.*, 2002 and present data); Altai Territory (present data); Kazakhstan: East Kazakhstan Province (present data).

***Oribatula elegantissima* Balogh &
Mahunka**
(Fig. 7B)

Oribatula elegantissima Balogh & Mahunka, 1965: 464, figs. 24-26.

Diagnosis. Medium in size, with typical character of *Oribatula*; rostrum slightly projected; lamellae narrow, converging anteriorly, slightly narrowed toward anterior direction, with a short extension anterior to the insertion of the lamellar setae; all prodorsal setae bilaterally barbed; sensilli with clavate head with small barbs; notogaster with longitudinally or obliquely oriented striations; fourteen pairs of strong notogastral setae.

Measurements: Body length 424-436 (431) μm ; length of notogaster 325-338 (332) μm ; width of notogaster 247-258 (253) μm .

Supplementary description. Body color yellowish to reddish brown. Cerotegument rather thick, exobothridial region and lateral part of podosoma finely granulated. Rostrum slightly projected in dorsal view, but anterior margin rounded. Prodorsal setae long, thick and barbed. Lamellae narrow, converging anteriorly, slightly narrowed toward anterior direction, with a short extension anterior to the insertion of lamellar setae.

Sensilli with capitate head and short, thin stalk.

Notogaster oval, its surface with longitudinally or obliquely oriented striations. Fourteen pairs of long and thick notogastral setae densely barbed. Four pairs of porose areas; *Aa* conspicuously larger than others. Lyrifissures *ia*, *im* and *ip* well visible in dorsal view. Opisthosomal gland opening *gla* situated laterad to seta *lm* (Fig. 7B).

Apodemes *apo.sj*, *apo.1*, *apo.2* and *apo.3* well developed; epimeral setae short, thin, setal formula: 3-1-3-3. Anal and genital apertures situated far from each other, the former being distinctly larger than the latter. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae. Legs heterotridactylous, setation typical for genus.

Material examined. Two specimens: Tsuger Els sands, Tuva Republic, Russia, dry steppe with forbs and grass, light grazing, 0-5 cm layer soil, 8 July 1998, Col. S. K. Stebaeva; one specimen: Onon river, 5 km down village Nijnii Tsasuchei, Chita Province, Russia, soils on the river bank, steppe, 18 June 1995, Col. O. G. Berezina; other localities: a number of specimens are recorded in District Erdzin, Tuva Republic, Russia, Col. S. K. Stebaeva.

Remarks. All character states of the studied specimens here are well accord with those of the type material as shown by Balogh & Mahunka (1965).

Known distribution. Mongolia (Balogh & Mahunka, 1965; Bayartogtokh, 1995), Russia: Magadan Province (Poltavskaya, 1996); Chita Province (Krivolutsky, 1995 and present data); Tuva Republic (Karppinen *et al.*, 1986; Andriveskiy *et al.*, 2002 and present data).

***Eporibatula prominens* Bayartogtokh &
Aoki**
(Fig. 8)

Eporibatula prominens Bayartogtokh & Aoki, 1998: 121, figs. 1-4.

Eporibatula prominens: Bayartogtokh & Aoki, 2000: 1001, figs. 24-34.

Diagnosis. Relatively small species with typical character of *Eporibatula*; rostrum projected, anterior margin narrowly rounded; lamellae and sublamellae narrow, narrowed toward anterior direction, the former having a short extension anterior to the insertion of lamellar setae; all prodorsal setae conspicuously barbed; sensilli with club-shaped head with small barbs; thirteen pairs

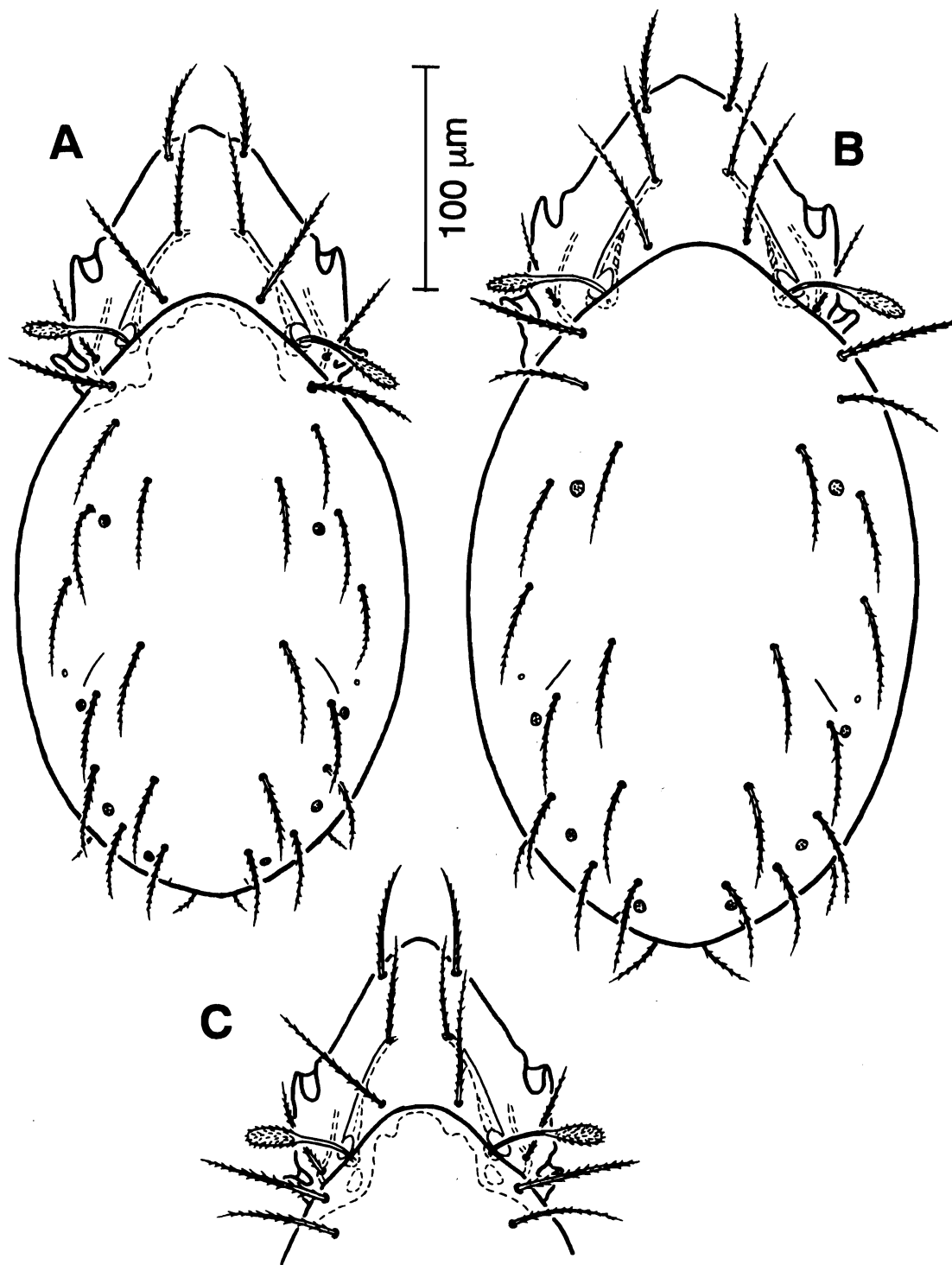


Fig. 8. *Eporibatula prominens* Bayartogtokh & Aoki, 1998. A & B: Dorsal aspect of variable forms showing variation of body size and arrangement of notogastral setae; C: Prodorsum and anterior part of notogaster.

of notogastral setae, humeral setae c_1 , thicker and slightly longer than others, with more rough barbs; notogastral seta h_2 , absent.

Measurements. Body length 347-391 (369) μm ; length of hysterosoma 268-315 (291) μm ; width of hysterosoma 174-203 (189) μm .

Supplementary description. Body color light yellowish to yellowish-brown. Cerotegument thin, exobothridial region and lateral part of podosoma finely punctate. Rostrum distinctly projected, anterior margin narrowly rounded. Prodorsal setae barbed, approximately same in length, but interlamellar setae slightly longer than others. Lamellae narrow, distinctly narrowed anteriorly. Sensilli relatively long, with club-shaped head and rather long, but thin stalk; bothridium relatively small, posterior scale well developed.

Surface of notogaster smooth, slightly narrowed anteriorly; dorsosejugal suture strongly arched, posterior margin of notogaster smoothly rounded. Thirteen pairs of notogastral setae bilaterally barbed; humeral setae c_1 , more roughly barbed, distinctly thicker and slightly longer than the others. Four pairs of very small round porose areas approximately same in size. Lyrifissures *im* and *ip* well visible in dorsal view. Opisthosomal gland opening *gla* situated laterad of *im* (Fig. 8).

Epimeral region smooth, apodemes *apo.sj* long, *apo.1*, *apo.2* and *apo.3* short. Epimeral setal formula: 3-1-3-3. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of slender adanal setae; seta ad_3 situated in preanal position; adanal lyrifissure *iad* very small, situated close to the anterior margin of anal aperture.

Material examined. Three specimens: Mt. Onchalaan, District Erdzin, Tuva Republic, Russia, northern slope, dry steppe (*Stipa+Artemisia+Koeleria*), soils under *Festuca valesiaca*, 6 June 1995, Col. S. K. Stebaeva; two specimens: Hills along the bank of Alei river near the village Ustyanka, Altai Territory, Russia, granite rocks on the south-western slope, petrophytous steppe and juniper shrubs, 4-5 May 2001, Col. I. E. Smelyansky; other localities: a number of records in other localities in District Erdzin, Tuva.

Remarks. The detailed description and redescription of this species were given by Bayartogtokh and Aoki (1998, 2000), and therefore, we present here only short characterization. In the studied specimens the size of idiosoma was significantly variable, and the arrangement of notogastral setae was also slightly different as

shown in Figs. 8A & 8B.

Known distribution. Mongolia: District Sumber, Gobisumber province; District Bayan-Unjuul, Central Province; District Bayan, Central Province (Bayartogtokh and Aoki, 1998, 2000); Russia: District Erdzin, Tuva Republic (Andrievskiy *et al.*, 2002 and present data); District Loktevskiy, Altai Territory (present data).

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References

- Andrievskiy V.S., Bayartogtokh B., Grishina L.G. & Smelyansky I.E. Oribatids of steppe ecosystems of inner Asia and adjacent areas. In V.A. Khmelev (ed.): *Steppes of Inner Asia*. Press of the Siberian Branch, Russian Academy of Sciences, Novosibirsk, pp. 201-221.
- Balogh J. & Mahunka S. 1965. Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei 34. Acarina: Oribatei. *Ann. Hist. Nat. Mus. Natn. Hung.* 57: 451-465.
- Bayartogtokh B. 1995. Oribatid mites (Acariformes: Oribatei) in the soils of Mongolia. Abstract of Ph.D. thesis. Moscow, Russian Academy of Sciences Press, 37 pp.
- Bayartogtokh B. 2000. New oribatid mites (Acari: Oribatida) of the genera *Protoribates* and *Proteremaeus* from Mongolia. *Acta Zool. Hung.* 46: 147-153.
- Bayartogtokh B. & Aoki J. 1997. Oribatid mites of the genus *Bipassalozetes* Mihelčič, 1957 (Acari: Oribatei: Passalozetidae) from Mongolia. *Acta Arachnol.* 46(2): 87-99.
- Bayartogtokh B. & Aoki J. 2000. A new and some little known species of *Eporibatula* (Acari: Oribatida: Oribatulidae), with remarks on taxonomy of the genus. *Zool. Sci.* 17(7): 991-1012.
- Behan-Pelletier V.M. 1982. Descriptions of new

- species and a new genus of Oribatei (Acari) from the Soviet subarctic. *Can. Ent.* 114: 855-871.
- Behan-Pelletier V.M. & Ryabinin N.A. 1991. Taxonomy and biogeography of *Proteremaeus* (Acari: Oribatida: Eremaeidae). *Can. Ent.* 123: 559-565.
- Engelbrecht C.M. 1974. The genus *Passalozetes* Grandjean, 1932 (Oribatei: Acari) in South Africa. *Navors. Nas. Mus. Bloemfontein* 3(2): 29-38.
- Gil J. & Subias L.S. 1990. Oribátidos del cabo de San Vicente (Portugal) (Acari: Oribatida). *Boletín de la Asociación Española de Entomología*, 14: 137-151.
- Golosova L.D. 1983. Three new species of the Oribatei from Mongolia. *Zool. Zhurn.* 62: 1902-1904. (in Russian)
- Hammer M. 1977. Investigations on the oribatid fauna of north-west Pakistan. *Biologische Skrifter* 21: 1-71 + pls. 1-34.
- Higgins H.G. & Woolley T.A. 1962. A new species of *Passalozetes* from Utah with notes on the genus (Acarina: Oribatei). *The Great Basin Naturalist* 22(4): 93-100.
- Higgins H.G. & Woolley T.A. 1975. New mites from the Yampa valley (Acarina: Cryptostigmata: Oribatulidae, Passalozetidae). *The Great Basin Naturalist* 35(1): 103-108.
- Karppinen E., Krivolutsky D.A. & Poltavskaya M.P. 1986. List of oribatid mites (Acarina, Oribatei) of northern Palaearctic region. III. Arid lands. *Ann. Ent. Fen.* 52: 81-94.
- Kunst M. 1957. Bulgarische oribatiden (Acarina) I. *Universitas Carolina, Biologica* 3(2): 133-165.
- Krivolutsky D.A. 1995. The oribatid mites. Moscow, Nauka, 224 pp. (in Russian)
- Krivolutsky D.A. & Ryabinin N.A. 1975. Relict elements in the oribatid mite fauna of Siberia. *Doklady Akademii Nauk SSSR.* 224: 393-482. (in Russian)
- Luxton M. 1990a. Oribatid mites (Acari: Cryptostigmata) from Jersey. *Ann. Bull. Soc. Jersiaise* 25(2): 360-366.
- Luxton M. 1990b. Oribatid mites (Acari: Cryptostigmata) from the Isles of Scilly. *Naturalist* 115: 7-11.
- Mahunka S. 1964. Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei. 10. *Acarina: Oribatei. Ann. Hist. Nat. Mus. Natn. Hung.* 56: 483-485.
- Mahunka S. 1977. Neue und interessante Milben aus dem Genfer Museum XXXIII. Oribatid fauna of Greece. *Rev. suisse Zool.* 84(3): 541-556.
- Mahunka S. 1987a. Oribatids from Africa (Acari: Oribatida), V. *Folia Ent. Hung.* 48: 105-128.
- Mahunka S. 1987b. A survey of the oribatids of the Kishunság National Park (Acari: Oribatida). In Mahunka S. (ed): *The Fauna of the Kishunság National Park, II.* Akadémiai Kiadó, Budapest, pp. 346-397.
- Mahunka S. & Mahunka-Papp L. 2000. Checklist of the oribatid mites of Hungary (Acari: Oribatida). *Folia Ent. Hung.* 61: 27-54.
- Mihelčič F. 1955. Beitrag zur Kenntnis der Genus *Passalozetes* Grdj. *Zool. Anz.* 155: 195-202.
- Mihelčič F. 1956. Oribatiden Subeuropas III. *Zool. Anz.* 156: 9-29.
- Mihelčič F. 1957a. Zur Systematik und Ökologie der Gattung *Passalozetes* Grandjean. *Zool. Anz.* 158: 24-26.
- Mihelčič F. 1957b. Milben (Acarina) aus Tirol und Vorarlberg. *Veröft. Mus. Ferdinand.* 37: 99-120.
- Mihelčič F. 1966. Zur Kenntnis der Milbenfauna Zentralspaniens (Acarina). *Rev. Esp. Entomol.* 61: 458-470.
- Mihelčič F. 1967. Einige neue Oribatiden aus xerothermen Boden Zentralspaniens, (Acarina). *Rev. Esp. Entomol.* 62: 516-525.
- Mihelčič F. & Rain M. 1954. Beitrag zur Geographie und Ökologie des genus *Passalozetes* Grdj. *Zool. Anz.* 153: 167-170.
- Pérez-Iñigo C. 1971. Ácaros oribátidos de suelos de España peninsular e islas Baleares (Acari, Oribatei) III. *Rev. Esp. Entomol.* 64: 263-350.
- Pérez-Iñigo C. 1993. Fauna Iberica. Vol. 3. Acari, Oribatei, Poronota. Museo Nacional de Ciencias Naturales, Madrid, 320 pp.
- Piffel E. 1965. Eine neue diagnose für die familie der Eremaeidae (Oribatei-Acari) nach zwei neuen arten aus dem Karakorum (*Proteremaeus jonasi* nov. gen., nov. spec. und *Eremaeus roissi* nov. spec.). *Österreichische Akademie Wissenschaften, Mathematisch-naturwissenschaftliche Klasse, Sitzungsberichte, Abteilung I*, 174: 363-385.
- Poltavskaya M.P. 1996. Oribatid mites of the cold steppe of the upper Kolymy. In *Problemy Pochvennoi Zoologii. Materials of I all Russian Colloquium.* Rostov, 121-122. (in Russian)
- Sitnikova L.G. 1975. Family Passalozetidae. In Gilyarov M.S & Krivolutsky D.A. (eds): *A key*

- to the soil-inhabiting mites. *Sarcoptiformes*. Nauka, Moskva, pp. 243-246. (in Russian)
- Sitnikova L.G. 1982. New species of oribatid mites of the family Passalozetidae (Oribatei, Acariformes). *Entomol. Obozr.* 61(3): 629-636. (in Russian)
- Strenzke K. 1953. *Passalozetes bidactylus* und *P. perforatus* von den schleswig-holsteinischen Kusten (Acarina: Oribatei). *Kieler Meeresforsch.* 9(2): 231-234.
- Subias L.S. & Gil-Martin J. 1997. Systematic and biogeographic checklist of oribatids from Western Mediterranean (Acari, Oribatida). *Annales del Museo Civico di Storia Naturale* 41(5): 459-498.
- Tarman K. 1965. The oribatids fauna of Macedona and Montenegro. *Publ. Zav. Ribarst. NRM.* 11(2): 138-154.
- Travé J. & Vachon M. 1975. François Grandjean 1882-1975 (Notice biographique et bibliographique). *Acarologia* 17: 1-19.
- Vanek J. 1966. Bulgarische arten der gattung *Passalozetes* Grandj., 1932 (Acari: Oribatoidea) mit der berschreibung der art *P. necebarensis* sp. n. *Vest. Ceskoslov. Spol. Zool.* 30(4): 337-341.
- Wallwork J.A. 1964. Some Oribatei (Acari: Cryptostigmata) from Tchad (1st. series). *Rev. Zool. Bot. Afr.* 70(3-4): 353-384.
- Wallwork J.A. 1972. Mites and other microarthropods from the Joshua Tree National Monument, California. *J. Zool. Lond.* 168: 91-105.
- Wallwork J.A. Weems D.C. Kamill B. 1984. *Passalozetes* spp. (Acari: Cryptostigmata: Passalozetidae) from a N. American desert. *Acarologia* 25(2): 196-202.

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