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Review of the millipede genus *Sibiriulus* Gulička, 1972, with descriptions of three new species from Altai, Siberia, Russia (Diplopoda, Julida, Julidae)

ELENA V. MIKHALJOVA¹, PAVEL S. NEFEDIEV², JULIA S. NEFEDIEVA³,
MIROSLAVA B. SAKHNEVICH⁴ & YURI V. DYACHKOV⁵

¹Institute of Biology and Soil Science, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok 690022, Russia. E-mail: Mikhaljova@biosoil.ru

²Altai State University, Barnaul 656049, Russia. E-mail: p.nefediev@mail.ru

³Barnaul branch of OJSC “GIPRODORNII”, Barnaul 656000, Russia. E-mail: j.nefedieva@mail.ru

⁴Altai State Nature Biosphere Reserve, Gorno-Altai 649000, Russia. E-mail: msaxnevich@mail.ru

⁵Altai State University, Barnaul 656049, Russia. E-mail: dyachkov793@mail.ru

Abstract

The genus *Sibiriulus* Gulička, 1963, which has hitherto been known to comprise only four species, is rediagnosed and shown to include seven species from Siberia, Russia. Three species are described here as new to science: *S. latisupremus* sp. nov., *S. baigazanensis* sp. nov., *S. aktashensis* sp. nov. The species *Sibiriulus profugus* (Stuxberg, 1876) is recorded in the fauna of the Altai Province and the Republic of Altai for the first time. All currently known species of *Sibiriulus* are keyed and mapped, including the new species.

Key words: millipede, julids, *Sibiriulus*, taxonomy, new species, key, distribution, Siberia

Introduction

The genus *Sibiriulus* Gulička, 1963, which has hitherto been known to comprise only four species, is recorded in West and Southwest Siberia (Russia) and East Kazakhstan. This genus was first erected as a subgenus of the genus *Cylindroiulus* Verhoeff, 1894, based on the single species *Cylindroiulus (Sibiriulus) dentiger* Gulička, 1963, taken from near Prokopievsk, Kemerovo Area, Siberia, Russia but already with the assumption of a generic status of this form (Gulička 1963). Nine years later, Gulička (1972) described another new species of this subgenus, *C. (S.) altaicus* Gulička, 1972 from near the Ayukol Lake, environs of the Teletskoye Lake, Republic of Altai, Siberia, Russia. Later *Sibiriulus* was raised to full genus status (Lokšina & Golovatch 1979). However, the original descriptions of these two species are too incomplete and schematic. Therefore they were redescribed based on topotypes and near topotypes (Mikhaljova 1993; Mikhaljova *et al.* 2007). In addition, the type species *C. (S.) dentiger* appears to be a junior subjective synonym of *Julus profugus* Stuxberg, 1876, a form described from between Tomsk and Kansk, Siberia, Russia (Mikhaljova 2002). Mikhaljova described two further new species (*S. multinicus* Mikhaljova, 2001 and *S. rectangulus* Mikhaljova, 2009) from the Republic of Altai and the Altai Province, Siberia, Russia (Mikhaljova & Golovatch 2001; Mikhaljova 2009). The summarized information on three species (*S. profugus*, *S. altaicus* and *S. multinicus*) can be obtained from a review covering the diplopods of the Asian part of Russia (Mikhaljova 2004).

The present study is a revision of the genus *Sibiriulus*, based not only on new material, but also on a few old specimens. As a result, one previously described species could be re-assessed and three new species added.

Material and methods

Material treated here has been shared between the collections of the Institute of Biology and Soil Science, Far

Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia (IBSS), Altai State University, Barnaul, Russia (ASU) and Zoological Museum, State University of Moscow, Russia (ZMUM), as indicated in the text. Some of published material was re-examined.

Specimens were preserved in 70% ethanol. In the process of studying the material, the gonopods and some other parts were dissected from a limited number of males and females and mounted in glycerin as temporary micropreparations. Specimens were studied and illustrated using standard stereomicroscopic and drawing equipment. Coloration of the specimens is described from alcohol material. SEM micrographs were prepared at the Centre of Collective Use “Biotechnology and Gene Engineering” of the Institute of Biology and Soil Science, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia (IBSS) using a Zeiss Evo 40 scanning electron microscope. Mounts for SEM were made through air-drying after transfer to acetone via 96% alcohol, mounting on stubs, and coating with gold and platinum. After examination, SEM material was removed from stubs and returned to alcohol, all such samples being kept at IBSS.

A “body segment formula” indicates the number of podous (including gonopod segment) and apodous segments before the telson in an individual. This formula is $x(-y)$ where x = sum of podous and apodous body segments excluding telson, y = number of apodous body segments before telson.

Specimens with 4–7 legless body segments before the telson are considered as juveniles.

The family-level classification adopted here is that of Shelley (2003).

Systematic account

Order Julida Brandt, 1833

Superfamily Juloidea Leach, 1814

Family Julidae Leach, 1814

Genus *Sibiriulus* Gulička, 1963

Cylindroiulus Verhoeff, 1894 subgenus *Sibiriulus* Gulička 1963: 518–519.

Allajulus Koch, 1847 subgenus *Sibiriulus* Gulička, 1963 according to Hoffman 1980: 110.

Sibiriulus Gulička, 1963 (full genus): Lokšina & Golovatch 1979: 387.

Type species: *Cylindroiulus (Sibiriulus) dentiger* Gulička, 1963, by original designation.

Diagnosis. The main distinguishing characters of this genus are as follows. Body pigmented; eye patches present; epicranial setae present; male genae unmodified; gnathochilarium normal, with a group of short setae approximately in the middle of the stipites, sensory bacilli at distal end of antennomere 5 and 6 few, forming no complete corolla; caudal edges of metazonites with setae; telson with a caudal not very long projection of epiproct (including a tiny claw-shaped process); male leg pair 1 unciform; male leg pairs 2 and 7 normal; gonopods consisting of pro-, meso- and opisthomere; pro- and mesomere closely attached to each other; opisthomere somewhat moved caudad (but not so far as in *Cylindroiulus*); promere flattened, caudally papillate, with a flagellum whiplike but without remnants of a telopodite; mesomere completely flattened (in *S. multinicus*) or mesomere frontally with plate; front surface of mesomere densely papillate; mesomere apex a simple or modified (with fovea, with protuberance, near hook-shaped, flattened laterally); coxite of opisthomere distinct; coxosternal region generally poorly developed; solenomere broad; velum present; phylacum present (as slender process) or absent.

By the unmodified male genae, the absence of complete corolla of sensory bacilli at distal end of antennomere 5, unciform leg pair 1 of male, normal leg pairs 2 and 7 of male, presence of metazonital setae, ozopores, lying behind suture between pro- and metazona without touching it, distinct coxite of gonopod opisthomere, flattened gonopod promere, well-developed interior parabasal spine of gonopod opisthomere, the genus seems particularly related to *Pacifiulus* Mikhailjova, 1982 from the Asian part of Russia. However, it differs from this genus chiefly by the absence of remnant of a telopodite on gonopod promere, shape of gonopod mesomere (not spoon-shaped as in *Pacifiulus*) and broad gonopod opisthomere.

On the other hand, Hoffman (1980) in his classification of millipedes listed *Sibiriulus* in the tribe *Cylindroiulini*. Read (1990) removed *Sibiriulus* from this tribe and noted that some of the characters of *Sibiriulus* species resemble those of certain *Leptoiulus* species. However, as we can see, species of *Sibiriulus* differ from them chiefly by the absence of a large basal outgrowth of the gonopod promere, the shape of the gonopod mesomere (with frontal plate and modified apex) and the small phylacum.

Description. Length of males 11–17 mm, vertical diameter 0.5–0.9 mm. Length of females 13–18.5 mm, vertical diameter 0.9–1.2 mm. Coloration from dark brown with or not reddish tinge to pale brown. Body segments, collum and head may be variably patterned. Ventral part of body lighter. Thin, dark axial line discernible on dorsum. Legs brown to pale or yellowish. Eye patches black. Antennae brown and dark brown.

1+1 epicranial setae in a transverse row. Supralabral setae 2+2 (as rule) in a transverse row, labral ones 4+7, 5+6, 6+7, 7+7, 7+8, 8+8, 8+9, 10+8, 10+10. Labrum tridentate. Eye patches roundly subquadrate, composed from 20 to 30 ocelli in adults. Antennae medium-sized, rather slender and clavate. Antennomeres 5 and 6 with an incomplete distodorsal corolla of several sensory bacilli. Gnathochilarium distally with two setae on outer edge of each stipites and with one seta closer to medial portion and with micropapillate low knob as well as with a group of short setae approximately in the middle of the stipites. Each lamella lingualis with 3–4 setae arranged longitudinally; length of setae increasing towards apex of lamellae linguales. Genae unmodified. Collum without peculiarities.

Body subcylindrical, slender, somewhat compressed laterally. Prozonite and metazonite separated by distinct suture. Prozonites smooth. Metazona with striae not reaching hind margin dorsally and laterally, but reaching hind margin ventrally. No more than 9 striae on metazonital surface between dorsal midline and ozopore. Transverse row of sparse, thin, relatively short setae at hind edge of metazonites. Metazonital setae gradually growing longer and denser toward telson. Ozopores small, lying behind suture between pro- and metazona without touching it. Telson with a short, caudal subcylindrical projection of epiproct carrying tiny claw-shaped process directed caudad and somewhat ventrad or caudad. Density of telson pubescence varied. Anal scale subtriangular, setose only along caudal edge.

Legs slender. Claw at base with a thin, setiform accessory claw ventrally. Sole pads in male legs (on tibia and postfemur) present or absent. Male leg pair 1 unciform, low papillate apically, with 2-segmented telopodites carrying strong setae ventrally. Telopoditomere 2 with rounded low knob-shaped outgrowth. The telopoditomere 1 bears greater number of setae than the telopoditomere 2 (as rule). Each coxa of leg pair 1 with a distal seta. Leg pair 2 unmodified. Penes flattened, relatively short, apically double, without setae. Male leg pair 7 normal. Ventral margins of body segment 7 with rounded lobes touching in midline. However, the two gonopod promeres close the gonopodial aperture and are the only parts of the gonopods visible in ventral view.

Gonopods consisting of pro-, meso- and opisthomere. Pro- and mesomere closely attached to each other; opisthomere somewhat moved caudad. Coxite of opisthomere distinct. However, coxosternal region generally poorly developed. Promere flattened, caudally papillate, with a flagellum as whip but without remnants of a telopodite. Mesomere completely flattened (in *S. multunicus*) or mesomere frontally with plate. Front surface of mesomere densely papillate. Mesomere distal part simple (in *S. multunicus*) or modified (with an apical fovea, with protuberance, near hook-shaped). Opisthomere with interior parabasal spine and with or without massive or short inner process. Solenomere broad. Velum present. Phylacum present (as slender process) or absent.

Vulvae oblong, with strong setae. Operculum higher than bursa, with apical incision and with setae arranged in two longitudinal rows, apical setae longest. Apex of bursa with pair of hyaline lobes, one on each side of the median cleft in the posterior median plate. Lateral and mesal bursal sclerites together with 4–18 setae. Posterior median sclerite of the bursa with 9–20 setae arranged in two more or less regular rows, apical setae longest. Number of vulval setae positively correlated with body size.

Included species. *S. profugus* (Stuxberg, 1876), *S. altaicus* Gulička, 1972, *S. multunicus* Mikhaljova, 2001, *S. rectangulus* Mikhaljova, 2009, *S. latisupremus* sp. nov., *S. aktashensis* sp. nov., *S. baigazanensis* sp. nov.

Distribution (Map). Russia: West and Southwest Siberia, East Kazakhstan.

***Sibiriulus profugus* (Stuxberg, 1876)**

Figs 1–3.

syn. *Cylindroiulus* (*Sibiriulus*) *dentiger* Gulička, 1963

Iulus (recte: *Julus*) *profugus* Stuxberg 1876: 33–34 (holotype and lectotype not designated, number of specimens (syntypes) in the type series unclear, in the Swedish Museum of Natural History, Stockholm).

Iulus profugus—Stuxberg 1876a: 316.

Iulus profugus—Lokšina & Golovatch 1979: 387; Mikhaljova 1993: 34; Mikhaljova & Golovatch 2001: 116.

Cylindroiulus (Sibiriulus) dentiger Gulička 1963: 519–521, 520: fig. 1: 1–3 (holotype male, from Prokopievsk, Kemerovo Area, Siberia, Russia, in Gulička's collection).

Cylindroiulus (Sibiriulus) dentiger—Shelley *et al.* 2000: 52.

Sibiriulus dentiger—Lokšina & Golovatch 1979: 387; Mikhaljova 1993: 13–15, 14: figs 7–14; Mikhaljova & Golovatch 2001: 106; Babenko *et al.* 2009: 182; Nefediev *et al.* 2013: 339.

non *Sibiriulus dentiger*—Nefediev 2001: 85.

Sibiriulus profugus—Mikhaljova 2002: 204–206, 202: figs 6–7; 2004: 72–75, 73: figs 114–124, 74: map 9; Mikhaljova & Nefediev 2003: 84–85; Mikhaljova *et al.* 2007: 59–60, 62, 60: fig. 7; Nefediev 2002: 41; Nefediev & Nefedieva 2007: 161; 2007a: 102–103; 2007b: 139; 2011: 100–101; Babenko *et al.* 2009: 183–184.

Material examined. 5 males, 3 females, 1 juvenile (ASU), Russia, Siberia, Tomsk Area, Tomsk District, near Zorkaltsevo, *Pinus sibirica* forest, 12 July–24 August 2006, leg. S.A. Krivets; 1 male (IBSS), Russia, Siberia, Republic of Altai, Ongudai District, Seminkii Pass, *Pinus sibirica* forest, 1800 m a.s.l., 18 August 2007, leg. A.S. Babenko; 1 male, 3 females, 2 juveniles (ASU), Russia, Siberia, Altai Province, Kosikha District, ca. 5 air-km NW of Polkovnikovo, *Betula* forest, 4 May 2009, leg. P.S. Nefediev; 1 male (ASU), Russia, Siberia, Altai Province, Kosikha District, near Ozero-Krasilovo, *Populus tremula* forest with *Betula*, *Padus avium*, tallgrasses, 19 July 2009, leg. P.S. Nefediev; 2 males, 4 females, 2 juveniles (ASU), Russia, Siberia, Altai Province, Kosikha District, near Ozero-Krasilovo, *Populus tremula* forest with *Betula*, midgrasses, 20 July 2009, leg. P.S. Nefediev; 4 males, 10 females, 2 juveniles (ASU), Russia, Siberia, Altai Province, Kosikha District, near Ozero-Krasilovo, *Betula* forest with *Populus tremula*, *Viburnum opulus*, *Padus avium*, tallgrasses, 20 July 2009, leg. P.S. Nefediev; 3 males, 1 female (ASU), 1 male, 1 female (IBSS), Russia, Siberia, Altai Province, Kosikha District, near Ozero-Krasilovo, *Salix* with *Betula* on bank of Lake Krasilovo, 22 July 2009, leg. P.S. Nefediev.

Material re-examined (specimens published by Mikhaljova 1993, Mikhaljova & Golovatch 2001). 1 female (IBSS), Russia, Siberia, Novosibirsk Area, Toguchin District, near Mirnii, 28 July 1983, leg. V.D. Bakurov; 1 male (IBSS), Russia, Siberia, Kemerovo Area, Kuznetskii Alatau State Nature Reserve, environs of mouth of Bezymyanka River, 14 July 1994, leg. A.B. Ryvkin.

Type locality. Between Tomsk and Kansk (misspelt Kainsk), Siberia, Russia.

Diagnosis. This species differs from congeners mainly by the configuration of the gonopod mesomere apex with a protuberance and the presence of a massive, curved, dentiform inner process in the distal part of the gonopod opisthomere.

Distribution. Russia: Siberia (Novosibirsk Area, Kemerovo Area, Tomsk Area, the southern part of Krasnoyarsk Province, Republic of Khakassia, Altai Province, Republic of Altai).

Remarks. This species was originally described from between Tomsk and Kansk (misspelt Kainsk), Siberia, Russia in a Swedish edition and referred to as *Iulus profugus* (recte: *Iulus*) (Stuxberg 1876), but then almost immediately redescribed in an English outlet and, again marked as a new species (Stuxberg 1876a). In both these papers, the descriptions are identical.

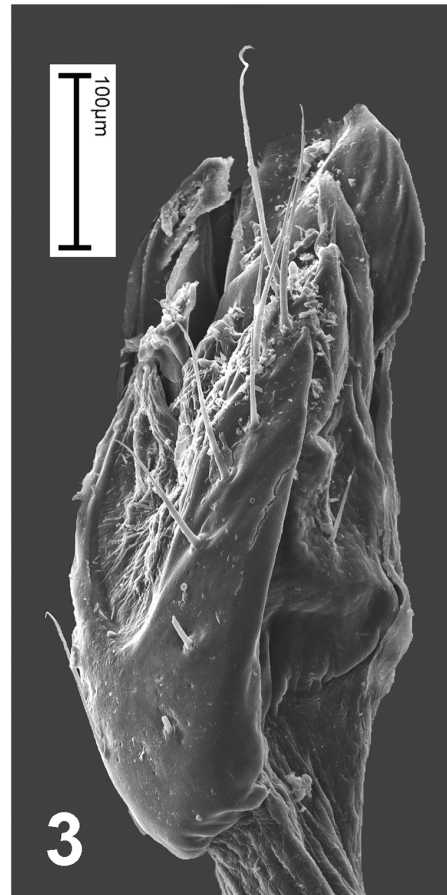
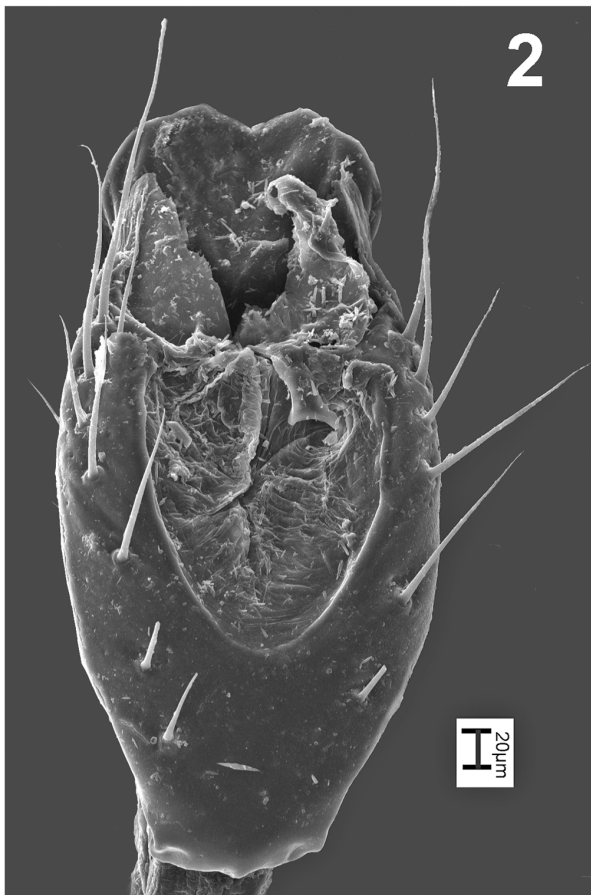
The species has since remained among *nomina dubia*. Later, formal synonymy was proposed by Mikhaljova (2002): *Iulus profugus* Stuxberg, 1876 is a senior subjective synonym of *Cylindroiulus (Sibiriulus) dentiger* Gulička, 1963, a form described from near Prokopievsk, Kemerovo Area, Siberia, Russia (Gulička 1963), elevated to genus rank (Lokšina & Golovatch 1979) and redescribed based on material from the Novosibirsk, Tomsk, Kemerovo areas and the Republic of Khakassia, Siberia, Russia (i.e. on near topotypes) (Mikhaljova 1993, 2002).

The finds in the Kosikha District and the Ongudai District are the first records of the species in the Altai Province and the Republic of Altai, respectively.

Study of above material revealed the presence of sole pads on the tibiae and postfemora of male legs as well as a group of short setae approximately in the middle of the stipites on the gnathochilarium and 4 setae arranged longitudinally on each lamella lingualis. Therefore these characters are added to the description of the species.

In addition, there are only drawings of the species vulvae (Mikhaljova 2002) (at one of these drawings tip of vulva covered with material, possibly left by the male to cork the bursal opening after copulation) but their morphological characters have never been described. Some of them are as follows: operculum with subtriangular apical incision; lateral longitudinal row of setae on operculum with 6 setae and mesal one with 4–5 setae; 13–17 setae on posterior median sclerite of the bursa; 12–13 setae on lateral and mesal sclerites of the bursa together.

Gonopods and vulvae of this species have never been shown in an SEM micrograph. Therefore they are given here (Figs 1–3).



FIGURES 1–3. *Sibirius profugus* (Stuxberg, 1876). 1, gonopds (mesal view); 2, right vulva (caudal view); 3, left vulva (lateral view).

***Sibiriulus latisupremus* sp. nov. Mikhaljova, Nefediev & Nefedieva**

Figs 4–14, 40.

Material examined. *Holotype*: 1 male (IBSS), Russia, Siberia, Altai Province, Smolenskoye District, environs of Smolenskoye village, *Populus* in floodplain of Poperechka River, 21 April 2013, leg. P.S. Nefediev and J.S. Nefedieva. *Paratypes*: 8 males, 22 females, 24 juveniles, 3 fragments (ASU), Russia, Siberia, Altai Province, Smolenskoye District, environs of Smolenskoye village, *Salix* in floodplain of Poperechka River, 27 August 2000, leg. P.S. Nefediev and J.S. Romanova; 1 male (IBSS), Russia, Siberia, Republic of Altai, Shebalino District, Kumalyr, *Larix sibirica* forest, 11 August 2006, leg. A.S. Babenko; 1 male, 2 females (ASU), Russia, Siberia, Altai Province, ca. 5 air-km NW of Aya village, environs of Lake Aichenok, *Betula* stand on bank, 6 July 2010, leg. P.S. Nefediev; 1 male, 1 female (IBSS), Russia, Siberia, Altai Province, ca. 5 air-km NW of Aya village, environs of Lake Aichenok, *Betula* forest on hill slope W from Lake Aichenok, 7 July 2010, leg. P.S. Nefediev; 5 males, 13 females, 13 juveniles (ASU), 9 males, 11 females, 9 juveniles (IBSS), together with holotype, 21 April 2013, leg. P.S. Nefediev and J.S. Nefedieva.

Material re-examined (specimens published by Mikhaljova & Nefediev 2003, Mikhaljova *et al.* 2007). 13 males, 20 females, 8 juveniles, 1 fragment (ASU), 1 male, 1 female (IBSS), 1 male, 1 female (ZMUM), Russia, Siberia, Altai Province, Smolenskoye District, environs of Smolenskoye village, bank of Poperechka River, *Salix*, 27 August 2000, leg. P.S. Nefediev; 1 male, 4 females (ASU), Russia, Siberia, Altai Province, Smolenskoye District, environs of Smolenskoye village, bank of Poperechka River, *Salix*, 31 May 2002, leg. J.S. Nefedieva.

Diagnosis. Differs from congeners mainly by the distal part of the gonopod mesomere being broad in lateral and mesal views as well as the shape of the gonopod opisthomere (its caudal surface convex (almost at a right angle), its apical part with short pointed process mesally).

Description. Male. Length about 12–13 mm, vertical diameter 0.6–0.7 mm (the overwhelming majority of males show a vertical diameter of 0.6 mm), with 42(–3), 44(–2), 44(–3), 46(–2) body segments, excluding telson. Coloration dark brown or brown. Clypeolabral region of head with light marbled spots. Collum with two transversely, large, marbled spots. Telson and segments in front of telson lighter or not. Antennae and legs brown.

Eye patches composed of at least 30 ocelli. Labral setae 8+8. Antennae in situ extending behind to segments 4–5. Length ratios of antennomeres 2–7 as 6.3:3.6:3.3:4.6:2.6:1, width ratios as 1.2:1.5:1.5:1.8:1.6:1, respectively. Distodorsal corolla of antennomeres 5 and 6 each with not less than 6 and not less than 8 sensory bacilli, respectively (Fig. 4).

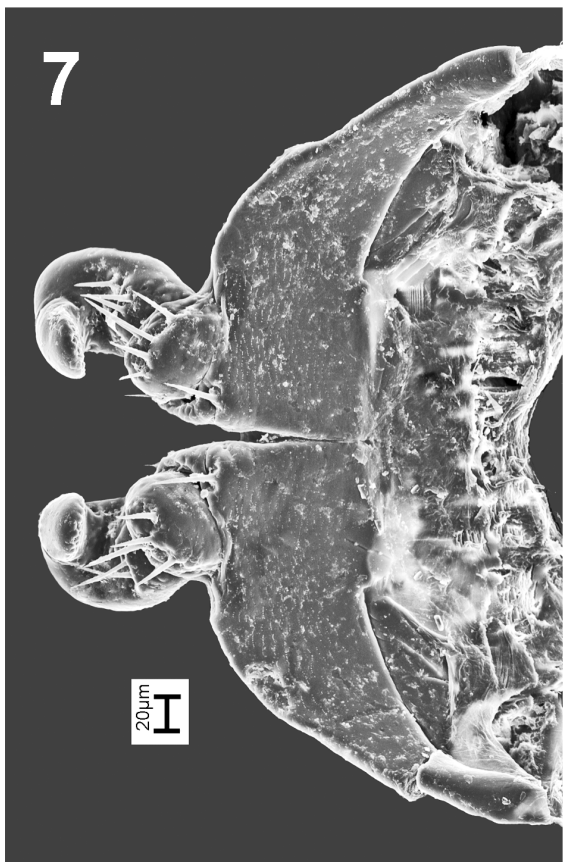
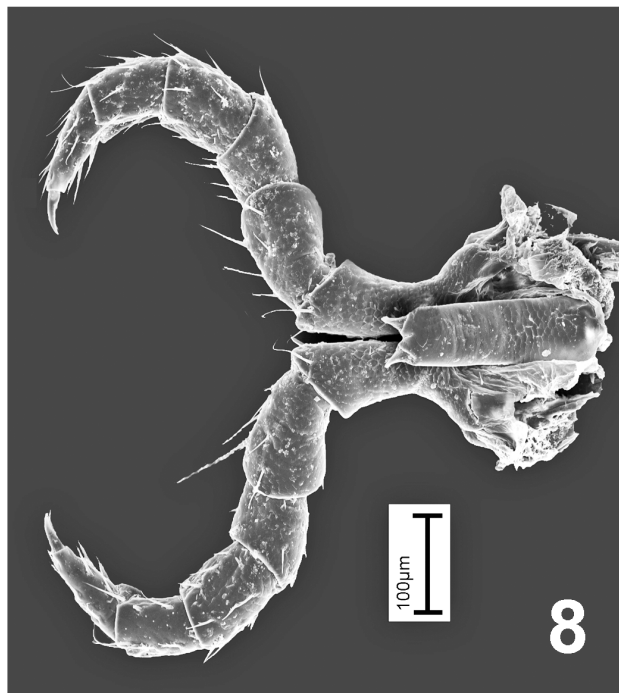
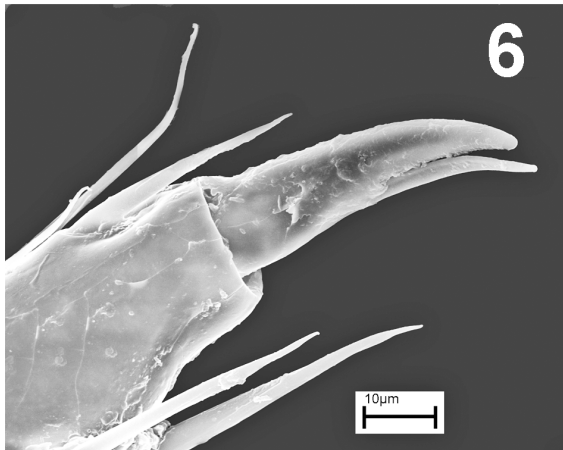
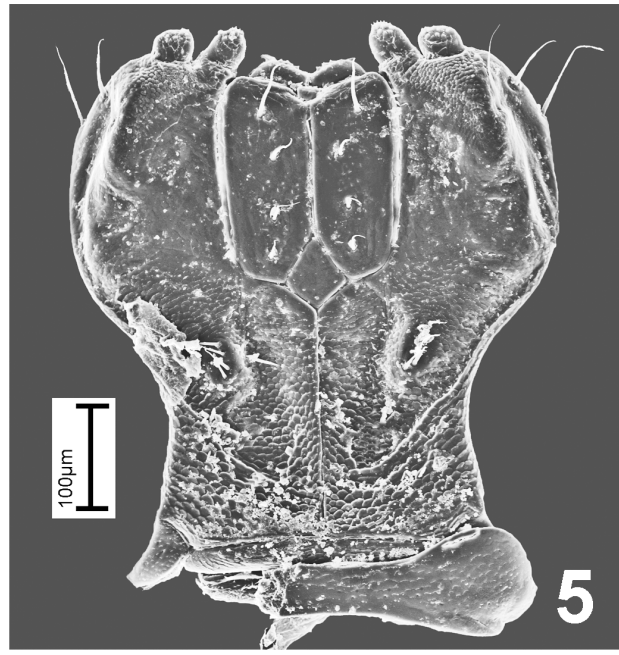
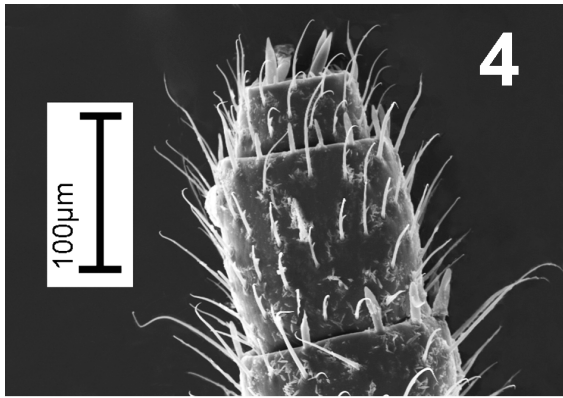
Gnathochilarium (Fig. 5) as typical of the genus. Four setae on each lamella lingualis arranged longitudinally nearly at regular intervals.

8–9 striae on metazonital surface between dorsal midline and ozopore. Short caudal projection of telson epiroct somewhat flattened dorsoventrally, covered with dense, relatively long setae, its tiny claw-shaped process directed caudad. Preanal ring of telson densely setose. Anal valves very densely setose.

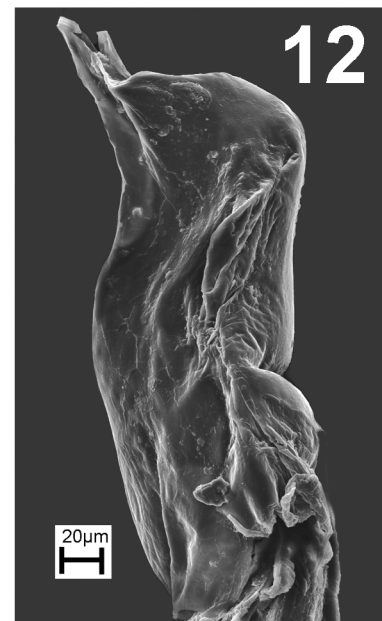
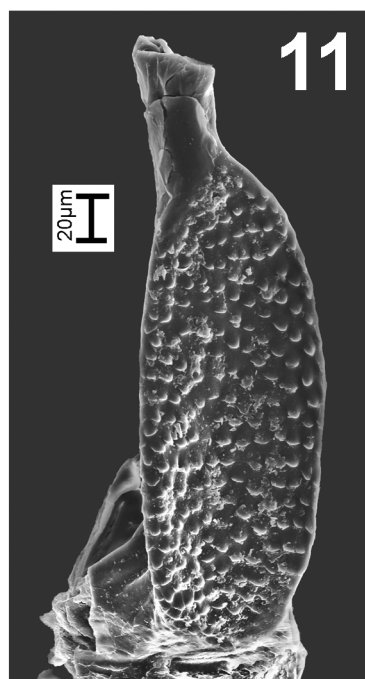
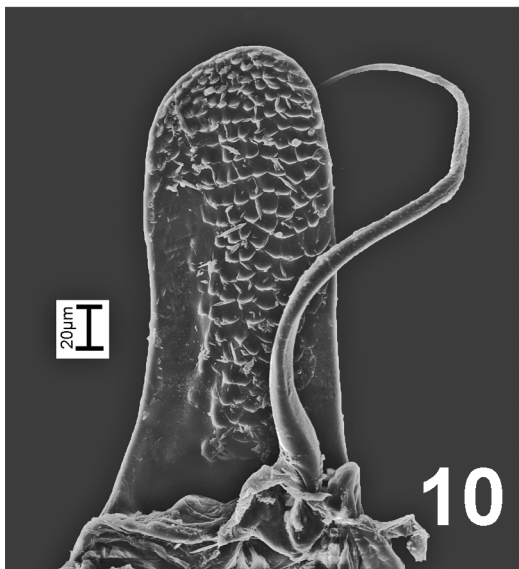
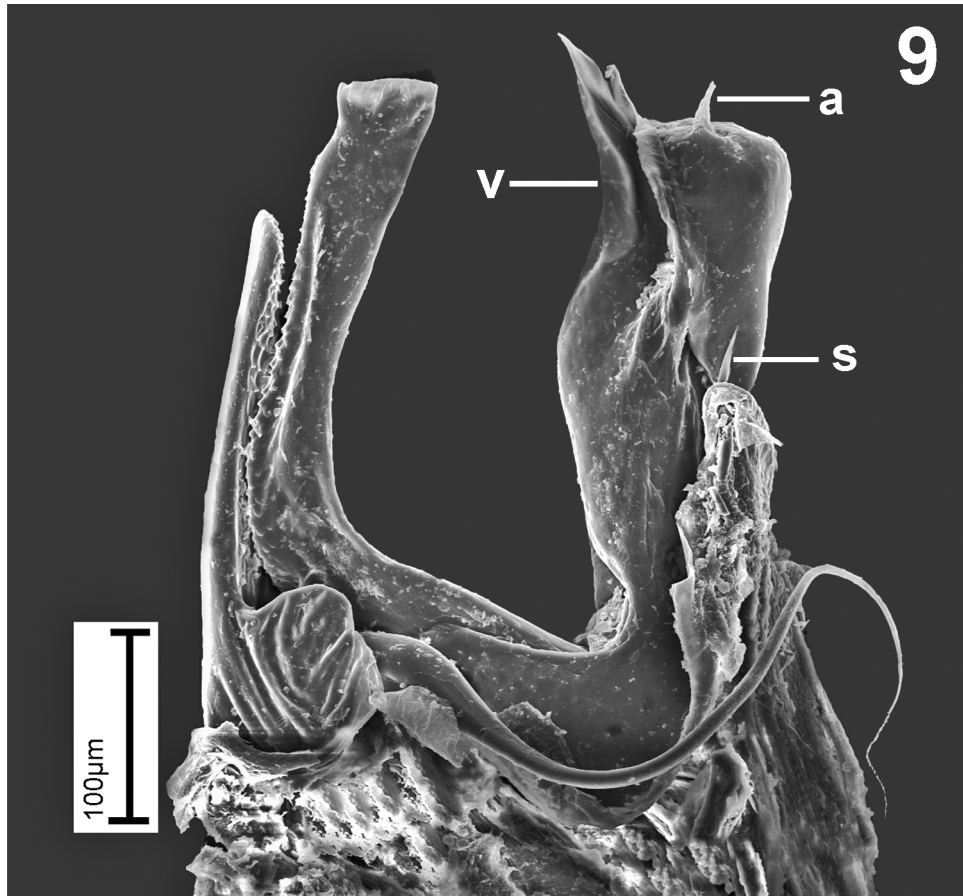
Legs with broad, very delicately serrate sole pads on tibiae and postfemora; these pads gradually growing reduced towards posterior body end to totally disappear on last legs. Claw (Fig. 6) as typical of the genus.

Leg pair 1 (Fig. 7) and leg pair 2 (Fig. 8) as typical of the genus. Penes subtriangularly notched at tip. Gonopods as in Figs 9–12. Gonopod meso- and opisthomere subequal in height but higher as compared with promere. Flattened promere (Fig. 10) with rounded apex, its caudal surface covered by papillae nearly throughout. Flagellum medium length, filiform distally. Mesomere (Fig. 11) slightly bent caudad; its front surface as plate, densely papillate, with longitudinal lowering along middle (the median lowering not conspicuous in Fig. 11 because the mesomere is somewhat twisted to the left). The mesomere distal part broad in lateral and mesal views. The mesomere apex with a broad fovea. Opisthomere (Figs. 9, 12) with convex (almost at 90°) caudal surface and with short pointed apical process (**a**) (? phylacum) mesally. Solenomere with elongated narrowed apex. Interior parbasal spine (**s**) relatively well-developed. Membranous velum (**v**) narrow with a pointed tip.

Female. Length about 14–17 mm, vertical diameter about 1.0 mm, with 44(–3), 44(–2), 45(–4), 45(–3), 46(–2), 47(–2), 48(–2) segments, excluding telson. Leg pairs 1 and 2 scarcely thicker than the other legs. Other nonsexual characters as in male.



FIGURES 4–8. *Sibiriulus latisupremus* sp. nov., male. 4, distal part of antenna; 5, gnathochilarium; 6, claw of midbody leg; 7, leg pair 1 (front view); 8, leg pair 2 and penes (caudal view).



FIGURES 9–12. *Sibirius latisupremus* sp. nov., male. 9, gonopods (mesal view); 10, gonopod promere (caudal view); 11, gonopod mesomere (front view, somewhat twisted to the left; the median lowering not conspicuous); 12, gonopod opisthomere (lateral view); a, apical process of gonopod opisthomere; s, interior parabasal spine of gonopod opisthomere; v, velum.

Vulva as in Figs 13–14. Operculum with semicircular or subtriangular apical incision. Lateral longitudinal row of setae on operculum with 4–10 setae and mesal one with 3–7 setae. 11–20 setae on posterior median bursal sclerite; 7–18 setae on lateral and mesal sclerites of the bursa together. Apical setae longest.

Juvenile. Shorter, length of examined specimens about 6.0–9.0 mm, vertical diameter about 0.5 mm, with 34(–7), 37(–5), 39(–5), 39(–4), 40(–4), 41(–5), 41(–4) segments, excluding telson.

Name. The specific epithet refers to the broad apex of gonopod mesomere (in lateral or mesal view).

Remarks. Restudy of the males and females from the Altai Province, Smolenskoye District, near Smolenskoye village, collected 27 August 2000, which were determined as *Sibiriulus multinicus* (see Mikhaljova & Nefediev 2003, Mikhaljova *et al.* 2007), shows that these specimens belong to *Sibiriulus latisupremus* **sp. nov.**



FIGURES 13–14. *Sibiriulus latisupremus* **sp. nov.**, female. 13, right vulva (lateral view); 14, left vulva (caudal view).

***Sibiriulus baigazanensis* sp. nov. Mikhaljova, Nefediev & Nefedieva**

Figs 15–22, 38.

Material examined. *Holotype*: 1 male (IBSS), Russia, Siberia, Republic of Altai, Turochak District, Altai State Nature Biosphere Reserve, near cordon Baigazan, 51°45′31.6″ N, 87°25′39.1″ E, 448 m a.s.l., *Padus avium*, *Salix caprea* and *Betula*, 3 October 2013, leg. M.B. Sakhnevich. *Paratype*: 3 females (ASU), Russia, Siberia, Republic of Altai, Turochak District, Altai State Nature Biosphere Reserve, near cordon Baigazan, 51°45′34.9″ N, 87°25′55.9″ E, 460 m a.s.l., *Padus avium* and *Sorbus sibirica*, 30 September 2013; 1 male (ASU), Russia, Siberia, Republic of Altai, Turochak District, Altai State Nature Biosphere Reserve, near cordon Baigazan, 51°45′35″ N, 87°26′02.3″ E, 482 m a.s.l., *Salix caprea*, 30 September 2013; 2 females (ASU), Russia, Siberia, Republic of Altai, Turochak District, Altai State Nature Biosphere Reserve, near cordon Baigazan, 51°45′32.1″ N, 87°25′54.8″ E, 454 m a.s.l., *Padus avium*, 1 October 2013; 1 male, 4 females (ASU), Russia, Siberia, Republic of Altai, Turochak District, Altai State Nature Biosphere Reserve, near cordon Baigazan, 51°45′34.1″ N, 87°26′03.6″ E, 490 m a.s.l., *Padus avium*, 1 October 2013; 1 male, 1 female (ZMUM), 2 females, 1 juvenile (subadult female) (ASU), Russia, Siberia, Republic of Altai, Turochak District, Altai State Nature Biosphere Reserve, near cordon Baigazan, 51°45′32.7″ N, 87°26′05.8″ E, 481 m a.s.l., *Padus avium* and *Betula*, 1 October 2013; 1 male, 2 females, 1 juvenile (subadult female) (IBSS), 1 female (ASU), together with holotype, 3 October 2013; all leg. M.B. Sakhnevich.

Material re-examined (specimens published by Mikhaljova *et al.* 2007). 1 male, 1 juvenile (subadult female), 1 fragment (IBSS), Russia, Siberia, Republic of Altai, Turochak District, Altai State Nature Biosphere Reserve, near cordon Baigazan, *Padus avium*, 3 September 2005, leg. M.B. Sakhnevich.

Diagnosis. Differs from congeners mainly by the gonopod opisthomere shape, with widely rounded caudal surface distally and short blunt apical process mesally combined with the gonopod mesomere distal part near hook-shaped in lateral or mesal views.

Description. Male. Length 14–15 mm, vertical diameter 0.8–0.9 mm, with 40(–2) [2 specimens], 41(–2) [2 specimens], 42(–3) [1 specimen] body segments, excluding telson. One of the males is broken, because it is impossible to count the numbers of its body segments. Coloration brown with dark brown spots near ozopores. Front part of body with marbled transverse spots on metazonites. Clypeolabral region of head light. Basal part of head lightly marbled. Collum with two transversely, large, marbled spots. Segments in front of telson lighter. Antennae dark brown, legs light brown.

Eye patches composed of at least 24 ocelli. Labral setae 8+8. Antennae medium-sized, in situ extending behind to segments 4–5. Length ratios of antennomeres 2–7 as 3.8:2.8:2.3:2.8:1.8:1, width ratios as 0.7:0.9:0.9:1.2:1.2:1, respectively. Distodorsal corolla of antennomeres 5 and 6 each with not less than 4 and not less than 5 sensory bacilli, respectively. Gnathochilarium as typical of the genus. Four setae on each lamella lingualis arranged longitudinally: two distal setae somewhat moved away from the two basal ones.

8–9 striae on metazonital surface between dorsal midline and ozopore. Short caudal projection of telson epiproct somewhat flattened dorsoventrally, covered with relatively long setae, its tiny claw-shaped process directed caudad. Preanal ring of telson moderately setose. Anal valves relatively densely setose.

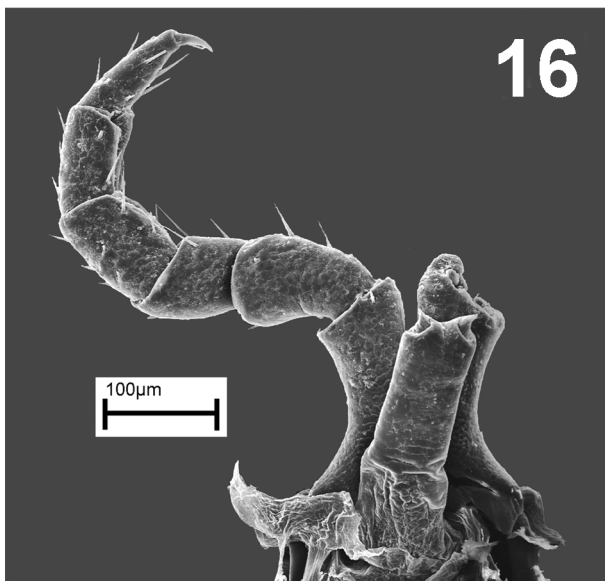
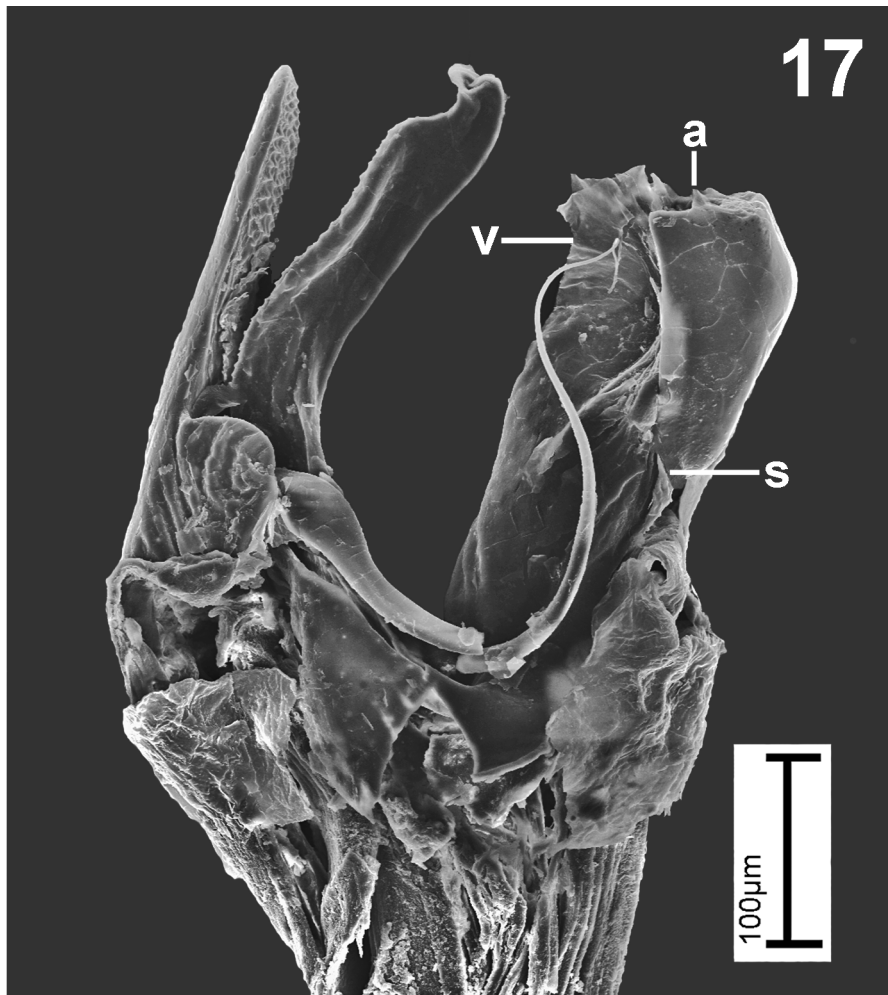
Legs with very delicately serrate sole pads on tibiae and postfemora; these pads gradually growing reduced towards posterior body end to totally disappear on last legs. Claw as typical of the genus.

Leg pair 1 (Fig. 15) and leg pair 2 (Fig. 16) as typical of the genus. Penes subtriangularly notched at tip.

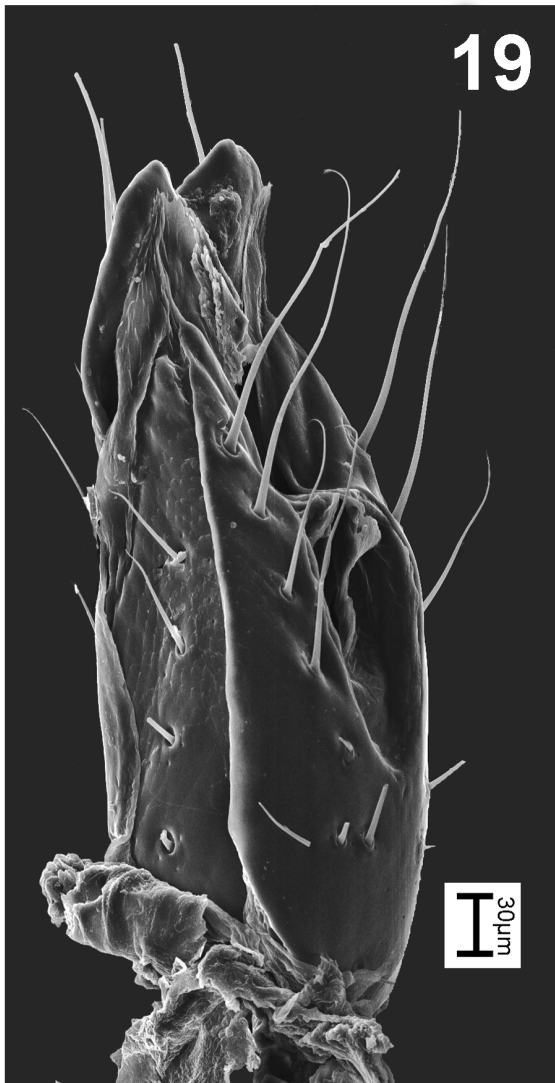
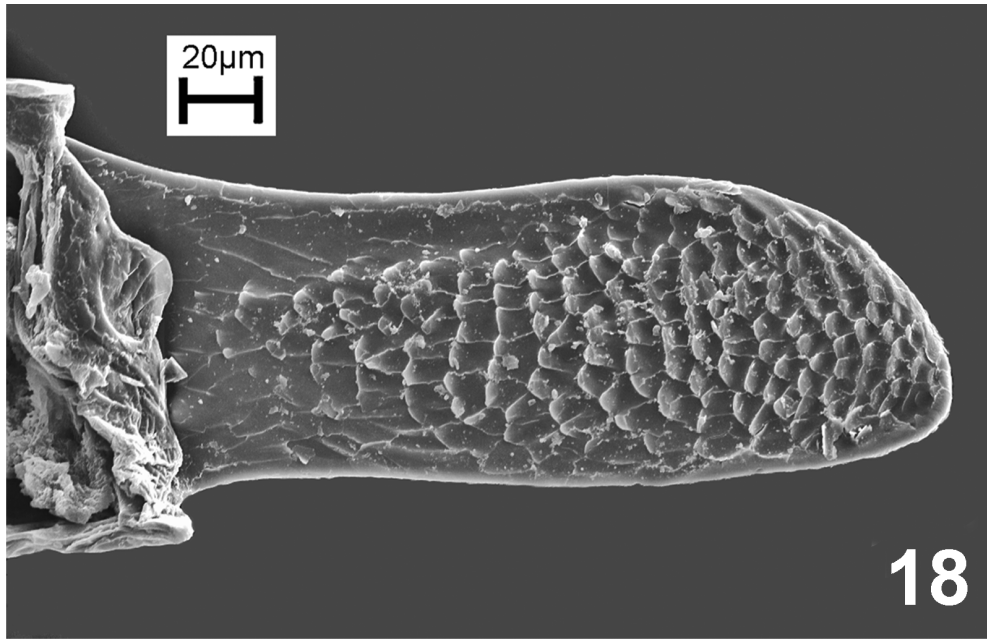
Gonopods as in Figs 17–18, 21–22. Gonopod mesomere somewhat higher as compared with promere and opisthomere. Flattened promere (Fig. 18) with oval apex, its caudal surface covered by papillae nearly throughout. Flagellum medium length, filiform distally. Mesomere (Figs 21–22) slightly bent caudad; its front surface as plate, densely papillate, with longitudinal lowering along middle; its distal part near hook-shaped in lateral and/or mesal views; its apex with a fovea. Opisthomere distally with widely rounded caudal surface and with short blunt subapical process (a) mesally. Interior parbasal spine (s) relatively well-developed. Membranous velum (v) broad notched apically.

Female. Length 15–17 mm, vertical diameter 1.0–1.2 mm, with 40(–2) [8 specimens], 41(–2) [5 specimens], 42(–3) [2 specimens] body segments, excluding telson. It is possible that females of different ages (including subadult females) are among the material. At least, specimens with bodies about 12 mm long, with 36(–2), 38(–2), 38(–3) segments excluding telson have smaller vulvae; they are listed as juveniles. Other nonsexual characters as in male.

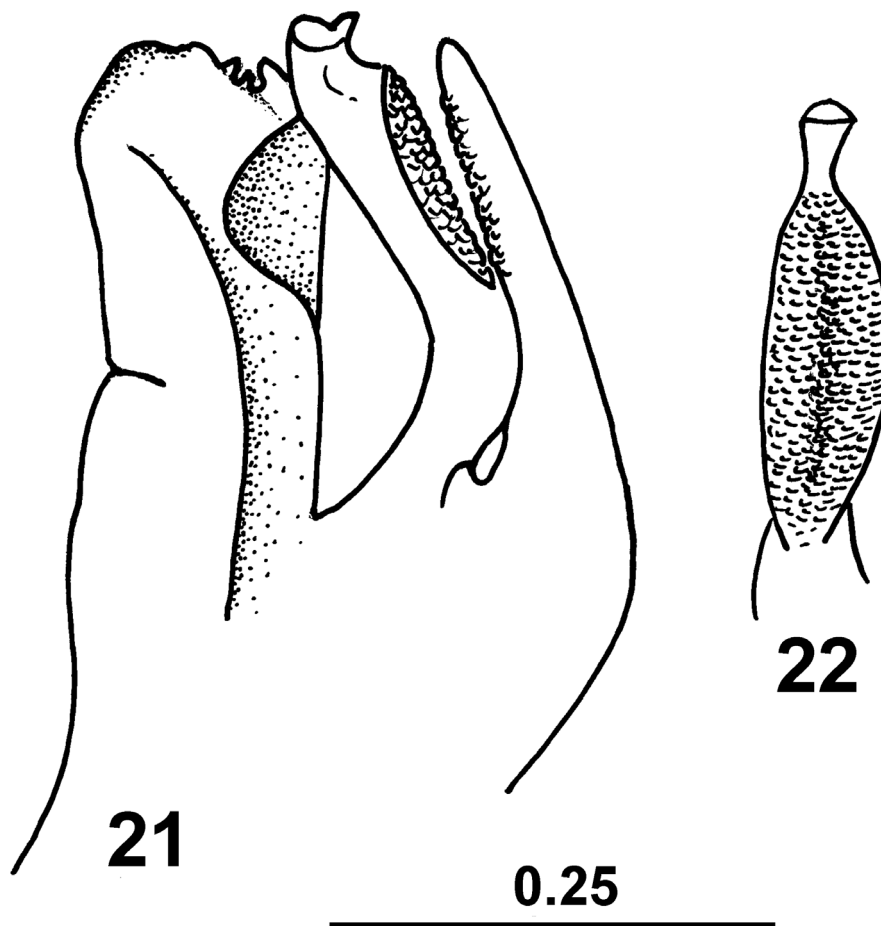
Vulva (Figs 19–20). Operculum with subtriangular apical incision. Longitudinal row of setae on operculum each with 5–7 setae; 1–3 apical setae longest. 15–19 setae on posterior median bursal sclerite; 7–10 setae on lateral and mesal sclerites of the bursa together. Bursal setae gradually elongated to apex of vulva.



FIGURES 15–17. *Sibirululus baigazanensis* sp. nov., male. 15, leg pair 1 (front view); 16, leg pair 2 and penes (caudal view); 17, gonopods (mesal view); a, apical process of gonopod opisthomere; s, interior parabasal spine of gonopod opisthomere; v, velum.



FIGURES 18–20. *Sibirius baigazanensis* sp. nov., male (18) and female (19–20). 18, gonopod promere (caudal view); 19, right vulva (lateral view); 20, left vulva (caudal view).



FIGURES 21–22. *Sibirius baigazanensis* sp. nov., male. 21, gonopods (lateral view), 22, gonopod mesomere (front view). Scale in mm.

Name. The specific epithet refers to the *locus typicus* (cordon Baigazan in Altai State Nature Biosphere Reserve).

Remarks. Restudy of the male and subadult female from the Republic of Altai, Altai State Nature Biosphere Reserve, near cordon Baigazan, 3 September 2005, which were determined as *Sibirius multicus* (see Mikhaljova *et al.* 2007), shows that the specimens belong to *Sibirius baigazanensis* sp. nov.

***Sibirius aktashensis* sp. nov. Mikhaljova, Nefediev & Nefedieva**

Figs 23–29, 39.

Material examined. *Holotype*: 1 male (IBSS), Russia, Siberia, Republic of Altai, Ulagan District, near Aktash village, Mt. Sardyma, 50°20′02″ N, 87°34′46″ E, *Larix sibirica* forest with *Pinus sibirica*, motley grass vegetation, 1790 m a.s.l., 5 August 2006, leg. P.S. Nefediev and J.S. Nefedieva. *Paratypes*: 1 male (IBSS), Russia, Siberia, Republic of Altai, Choya District, environs of Mt. Baltyrgan, chern dark coniferous taiga, 1700 m a.s.l., 3 August 2001, leg. N.V. Levina; 4 males, 1 female, 5 juveniles (ASU), 1 female (ZMUM), Russia, Siberia, Republic of Altai, Ulagan District, ca. 20 air-km NW of Aktash, Lake Taldukol, 50°26′30″ N, 87°32′09″ E, *Betula rotundifolia*, motley grass vegetation, green mosses, 1832 m a.s.l., 19 July 2006; 1 male (ZMUM), 2 males, 1 female without front part of body, 1 juvenile (IBSS), 2 males (ASU), together with holotype, 5 August 2006; 1 male, 1 female (ASU), Russia, Siberia, Republic of Altai, Ulagan District, ca. 20 air-km NW of Aktash, N part of Lake Sorulukol, 50°28′34″ N, 87°31′25″ E, *Pinus sibirica* forest with *Larix sibirica*, short grass vegetation, green mosses, 2000 m a.s.l., 7 August 2007; 1 male (ASU), Russia, Siberia, Republic of Altai, Ulagan District, ca. 20 air-km NW of Aktash, N part of Lake Sorulukol, 50°27′44″ N, 87°30′24″ E, *Betula rotundifolia*, *Salix glauca*, *Pentaphylloides fruticosa*, motley grass vegetation, green mosses, 1817 m a.s.l., 9 August 2007; all leg. P.S. Nefediev and J.S. Nefedieva.

Material re-examined (specimen published by Mikhaljova & Nefediev 2003). 1 male (ZMUM), Russia, Siberia, Central Altai, Aigulakskii Mt. Range, NW slope, middle flow of Belgebash River, pebble, 1700 m a.s.l., 2 July 2000, leg. A.V. Matalin.

Diagnosis. This species differs from congeners mainly by the structure of the gonopod opisthomere of which lateral side with relief projection in the form of hook bent forward, combined with the gonopod mesomere distal part somewhat narrowed.

Description. Male. Length about 13–15 mm, vertical diameter 0.8–0.9 mm, with 40(–2) [2 specimens], 41(–2) [4 specimens], 42(–2) [3 specimens], 43(–2) [1 specimen], 44(–2) [2 specimens], body segments, excluding telson. 2 males have been broken, so it is impossible to count the number of their body segments. Coloration brown with reddish tinge; dark brown round spot on each side of prozonite ring closer to paler venter. Each metazonite with dark brown transverse band along its front edge. Anterior portion of head brown or marbled brown, with two pale brown spots between antenna bases, vertex dark brown, occipital part marbled brown. Collum with frontal transverse dark brown band, marbled brown field occupying its dorsal and lateral portions, and hind, thin, transverse dark brown band thickened to axial line on dorsum. Legs pale brown to yellowish. Antennae dark brown.

Each eye patches composed of 24–26 ocelli on right side, 22–27 ocelli on left side of head. Supralabral setae 2+2, 3+2, labral ones 7+7, 7+8, 8+8, 8+9, 10+8. Antennae medium-sized, in situ reaching to segment 4. Length ratios of antennomeres 2–7 as 4.5:3.4:2.9:3.9:2.2:1, width ratios as 1.2:1.2:1.2:1.7:1.6:1, respectively. Distodorsal corolla of antennomeres 5 and 6 each with not less than 5 and not less than 6 sensory bacilli, respectively. Gnathochilarium as typical of the genus. Four setae on each lamella lingualis arranged longitudinally: first seta closer to tip, second seta - in medial portion and the latter two closer to promentum or all setae arranged at regular intervals.

Collum with very small striations laterally; prozonital surface of segment 7 ventrally delicately striate. 7–9 striae on metazonital surface between dorsal midline and ozopore. Short caudal projection of telson epiproct subcylindrical, its tiny claw-shaped process directed caudad and somewhat ventrad. Preanal ring covered with sparse relatively long setae. Anal valves densely setose.

Starting from leg pair 2, both tibiae and postfemora of walking legs with longitudinal sole pads, only several posteriormost legs without sole pads. Claw as typical of the genus. Leg pair 1 (Fig. 23) and leg pair 2 (Fig. 24) as typical of the genus. Penes subtriangularly notched at tip.

Gonopods as in Figs 25–29. Opistho- and promere subequal in height but somewhat lower as compared with mesomere. Flattened promere (Fig. 26) with oval apex, its caudal surface covered by papillae nearly throughout. Flagellum medium length, filiform distally. Mesomere (Fig. 27–29) slightly bent caudad; its front surface as plate, densely papillate with a longitudinal lowering along near middle. Distal part of mesomere somewhat narrowed, with an apical fovea of which front edge roundly outcurved. Opisthomere distally with convex at obtuse angle caudal surface and with short pointed subapical process (**a**) (? phylacum) mesally. Interior parbasal spine (**s**) well-developed. Solenomere laterally with relief projection (**h**) in the form of hook, bent forward (Fig. 27). Membranous velum (**v**) narrow with a blunt tip.

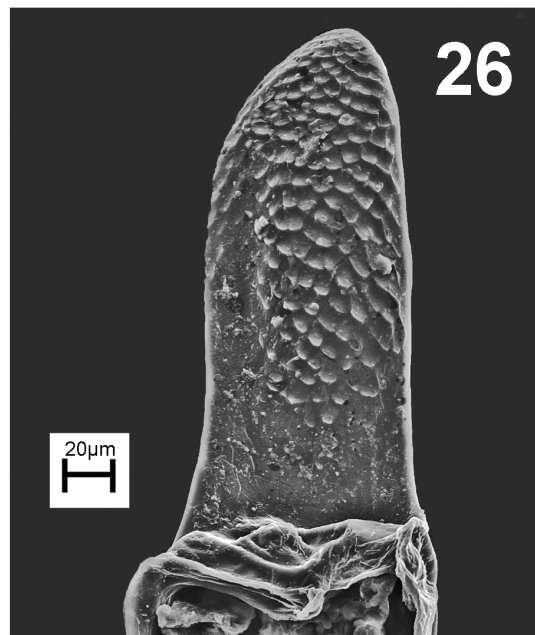
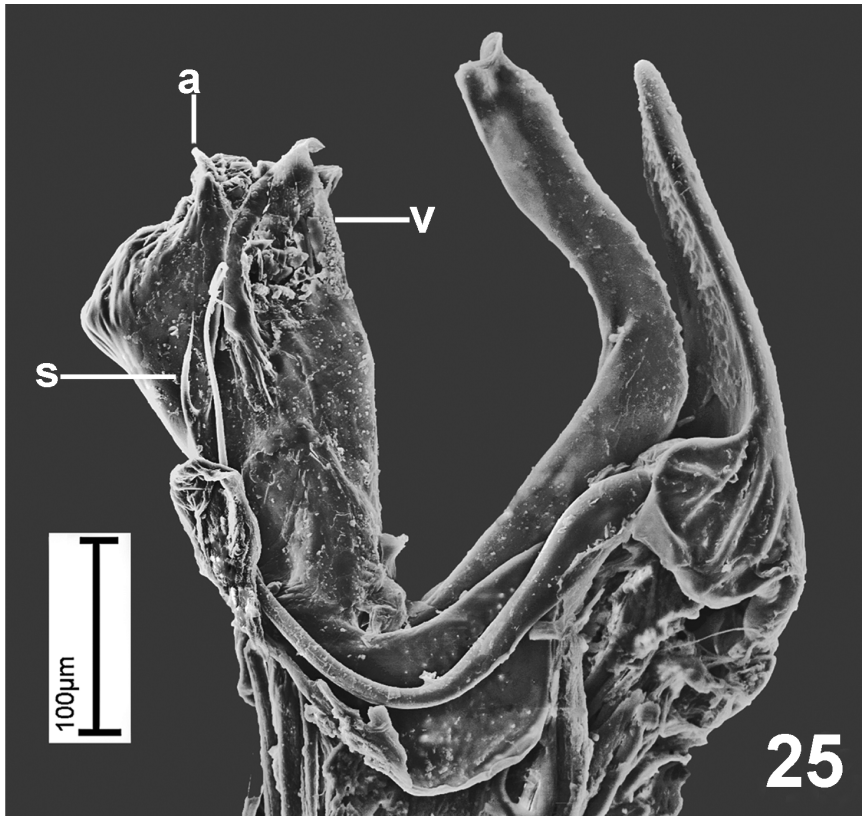
Female. Length 16–17 mm, vertical diameter 1.1 mm, with 43(–2), 43(–3), 44(–2) body segments, excluding telson. 1 female devoid of the front part of body, so it is impossible to count the number its body segments. Ocelli 23–27 on right side, 26–27 on left side of head. Labral setae 4+7, 7+7, 8+8. Collum without striae. Other nonsexual characters as in male.

Vulva. Operculum with subtriangular or rounded apical incision. Lateral longitudinal row of setae on operculum with 4–6 setae and mesal one with 2–5 setae; 2 apical setae are the longest. 14–16 setae on posterior bursal median sclerite; 7–11 setae on lateral and mesal sclerites of the bursa together. Bursal setae gradually elongated to vulva apex.

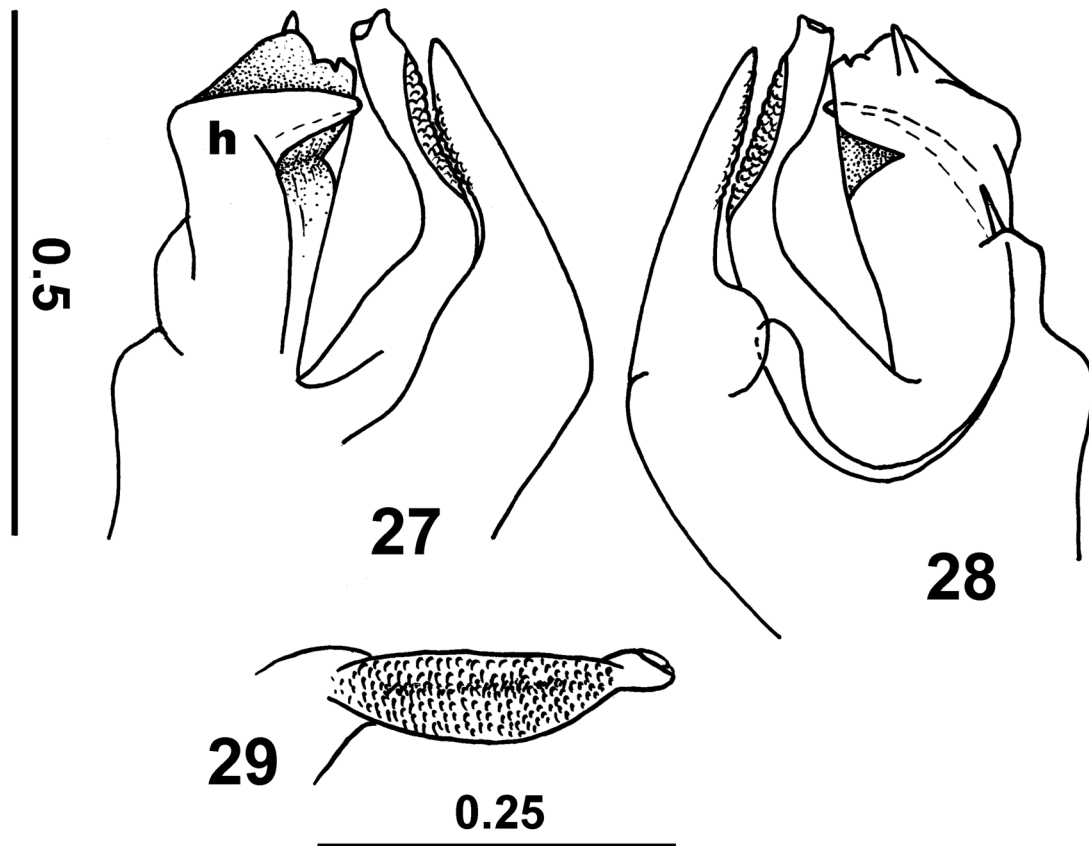
Etymology. The specific epithet refers to the *locus typicus* (environs of Aktash village).

Remarks. Restudy of a male from the Central Altai, Ulagan District, Aigulakskii Mt. Range (it is still on loan at IBSS), which was determined as *Sibiriulus multnicus* (see Mikhaljova & Nefediev 2003), shows that the male belongs to *Sibiriulus aktashensis* **sp. nov.**

Three females from the Central Altai, Ongudai District, Kyzylart Mt. Range which were also determined as *Sibiriulus multnicus* (see Mikhaljova & Nefediev 2003) require reexamination, taking into consideration the male specimens from an alpine meadow at 2,100–2,300 m a.s.l. within this territory. However, we assume that they belong to *Sibiriulus aktashensis* **sp. nov.**, taking into account the geographical evidence.



FIGURES 23–26. *Sibirulius aktashensis* sp. nov., male. 23, leg pair 1 (front view); 24, leg pair 2 and penes (caudal view); 25, gonopods (mesal view); 26, gonopod promere (caudal view); a, apical process of gonopod opisthomere; s, interior parabasal spine of gonopod opisthomere; v, velum.



FIGURES 27–29. *Sibiriulus aktashensis* sp. nov., male. 27, gonopods (lateral view); 28, gonopods (mesal view); 29, gonopod mesomere (front view); **h**, hook-shaped relief projection of gonopod solenomere. Scales in mm.

***Sibiriulus altaicus* Gulička, 1972**

Figs 30–32.

Cylindroiulus (*Sibiriulus*) *altaicus* Gulička 1972: 43–44, 44: fig. 5: 2 (holotype male, lost).

Sibiriulus altaicus—Lokšina & Golovatch 1979: 387; Mikhaljova 1993: 13; 2004: 75: fig. 125; Mikhaljova & Golovatch 2001: 106; Mikhaljova *et al.*, 2007: 57–59, 62, 58: figs 1–6. Nefediev & Nefedieva 2007: 162; 2013: 86–87.

Material re-examined (specimens published by Mikhaljova & Nefediev 2003, Mikhaljova *et al.* 2007). 1 male (IBSS), Russia, Siberia, Republic of Altai, Ulagan District, Altai State Nature Biosphere Reserve, environs of Lake Teletskoye, near cordon Chiri, mouth of Kyga River, subalpine sparse growth of *Pinus sibirica*, 1935 m a.s.l., litter, 14 August 2005, leg. P.S. Nefediev and J.S. Nefedieva; 1 female (IBSS), Russia, Siberia, Republic of Altai, Ulagan District, Altai State Nature Biosphere Reserve, cordon Chiri, mouth of Kyga River, near Ayukol hut, *Pinus sibirica* with *Abies sibirica* forest, 1270 m a.s.l., litter, 17 August 2005, leg. P.S. Nefediev and J.S. Nefedieva.

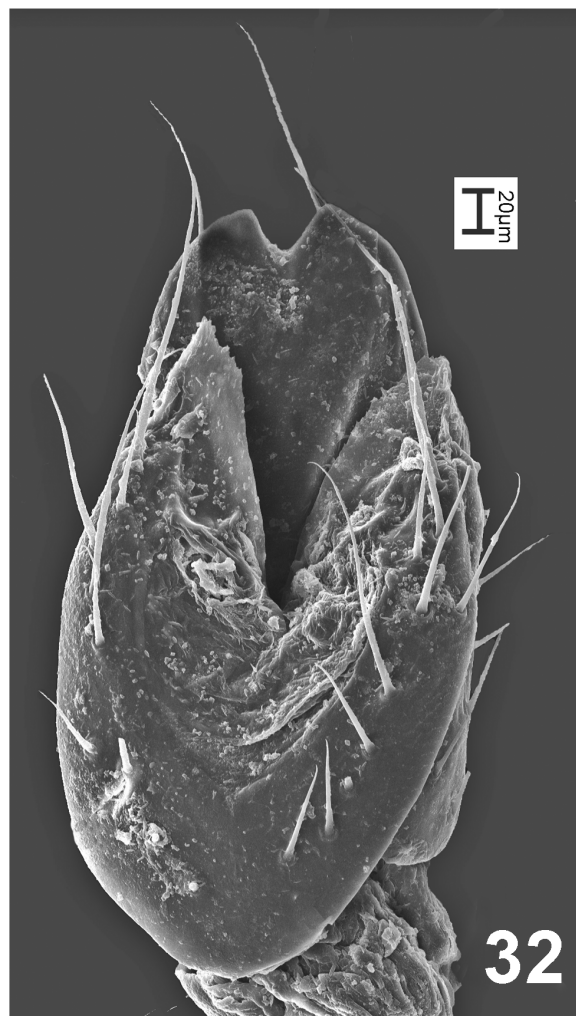
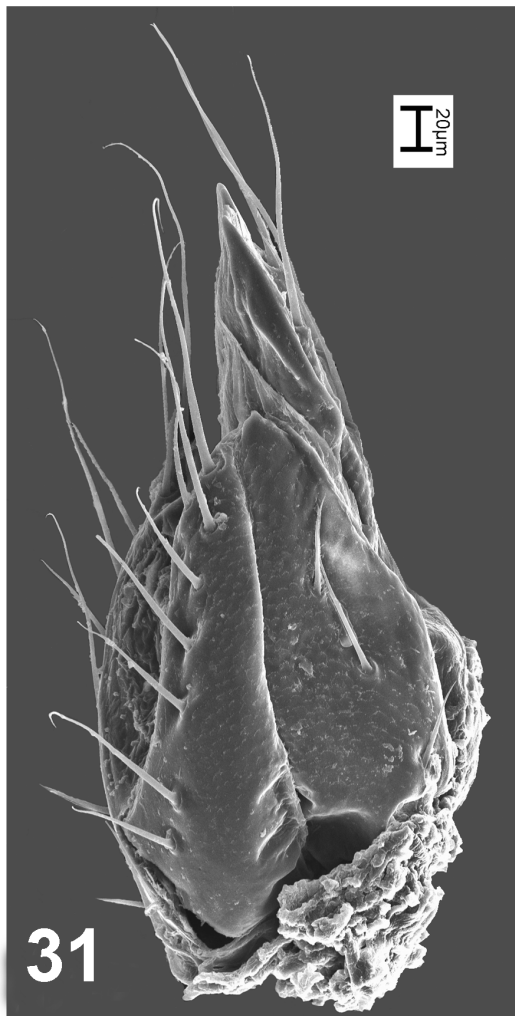
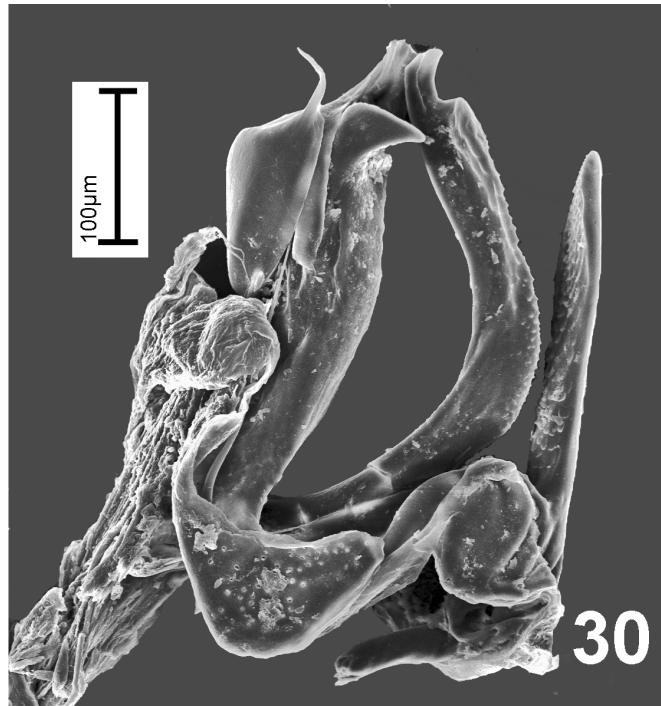
Type locality. Near Lake Ayukol, environs of Lake Teletskoye, Republic of Altai, Siberia, Russia.

Diagnosis. This species differs from congeners mainly by the presence of a straight inner process in the distal part of the opisthomere combined with the gonopod mesomere distal part near hook-shaped.

Distribution. Russia: Siberia (Republic of Altai).

Remarks. This species was originally described from near the Ayukol Lake, environs of the Teletskoye Lake, Republic of Altai, Siberia, Russia, in the subgenus *Sibiriulus* of the genus *Cylindroiulus* (Gulička 1972). Since then *Sibiriulus* has been elevated to genus status (Lokšina & Golovatch 1979). Later, the species was redescribed based on topotypes because the type material had been lost (Mikhaljova *et al.* 2007). Known only from environs of Lake Teletskoye, Republic of Altai, its *terra typica*.

The morphological characters of the species vulvae have never been presented. Some of them are as follows: operculum with subtriangular apical incision; each of two longitudinal rows on operculum with 3–5 setae; 18–20 setae on posterior bursal median sclerite; 4–8 setae on lateral and mesal sclerites of the bursa together.



FIGURES 30–32. *Sibirius altaicus* Gulička, 1972. 30, gonopods (mesal view); 31, vulva (lateral view); 32, vulva (caudal view).

Gonopods and vulvae of this species have never been shown in an SEM micrograph. Therefore they are given here (Figs 30–32).

***Sibiriulus multinicus* Mikhaljova, 2001**

Figs 33–35.

Sibiriulus multinicus Mikhaljova, 2001 in Mikhaljova & Golovatch 2001: 106–107, 106: figs 4–11 (holotype male, in the Zoological Museum of the State University of Moscow).

Sibiriulus dentiger—Nefediev 2001: 84.

Sibiriulus multinicus—Mikhaljova 2004: 70–72, 71: figs 100–113, 74: map; Mikhaljova & Nefediev 2003: 85: figs 1–6; Mikhaljova *et al.* 2007: 60–62, 61: figs 8–18; Mikhaljova *et al.* 2013: 8–9; Nefediev & Nefedieva 2007: 162; 2013: 87.

Material re-examined (specimens published by Mikhaljova *et al.* 2013). 1 female (IBSS), Kazakhstan, East-Kazakhstan Area, Katon-Karagai District, 49°08'983''N, 85°59'876''E, 1202 m a. s. l., forest-steppe, 17 August 2010, leg. K. Ulykpan; 1 male (IBSS), Kazakhstan, East-Kazakhstan Area, Katon-Karagai District, 49°08'502''N, 85°56'346''E, 1321 m a.s.l., forest-steppe, floodplain meadow near mountain stream, 27 August 2010, leg. K. Ulykpan.

Type locality. Lake Sredneye Multinskoye, near Multa, Katun State Nature Biosphere Reserve, Republic of Altai, Siberia, Russia.

Diagnosis. This species differs from congeners by the unmodified front surface (i.e. not as a plate) and apex of the gonopod mesomere as well as by the structure of gonopod opisthomere with a caudal protrusion in its middle part and by the absence of a massive inner process in the distal part of the gonopod opisthomere.

Distribution. Russia: Siberia (Republic of Altai), Kazakhstan (East-Kazakhstan Area).

Remarks. This species was originally described from the Katun State Nature Biosphere Reserve, Altai State Nature Biosphere Reserve and their environs, Republic of Altai, Siberia, Russia (Mikhaljova & Golovatch 2001). For ten years it has been assumed that the species shows a geographical variation in gonopod configuration in males from different Altai territories: near Multa, Katun State Nature Biosphere Reserve (Republic of Altai), Aigulakskii Mt. Range (Republic of Altai), near cordon Baigazan, Altai State Nature Biosphere Reserve (Republic of Altai) and Smolenskoye District (Altai Province) (Mikhaljova & Nefediev 2003; Mikhaljova *et al.* 2007). However, restudy of the material from these Altai territories shows that the variant specimens belong to new species described here. In addition, the new species have also been described on fresh material from the same or other districts. In this connection, the female paratypes and juvenile paratypes from upper reaches of the Charysh River, near delta of the Chulyshman River and the Korbu Waterfall require reexamination, taking into account the male specimens from these localities.

Gonopods and vulvae of this species have never been shown in an SEM micrograph. Therefore they are given here (Figs 33–35).

***Sibiriulus rectangulus* Mikhaljova, 2009**

Figs 36, 37.

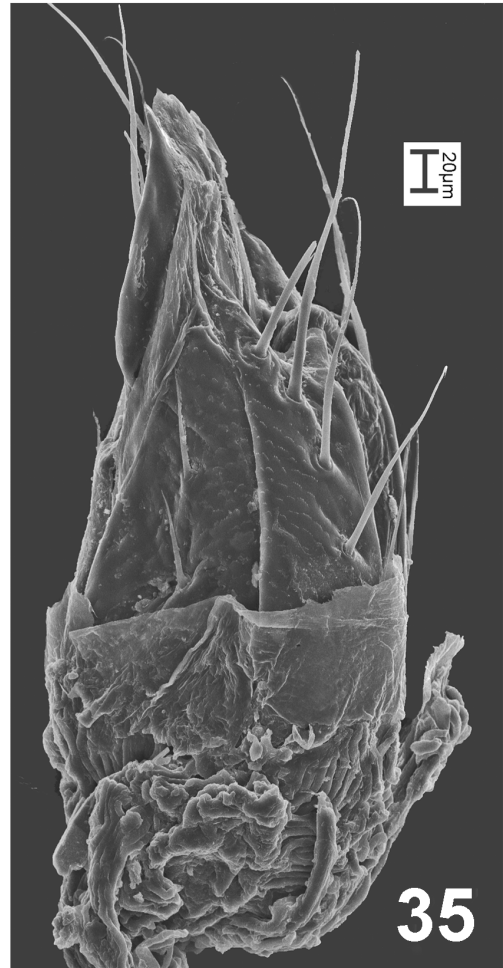
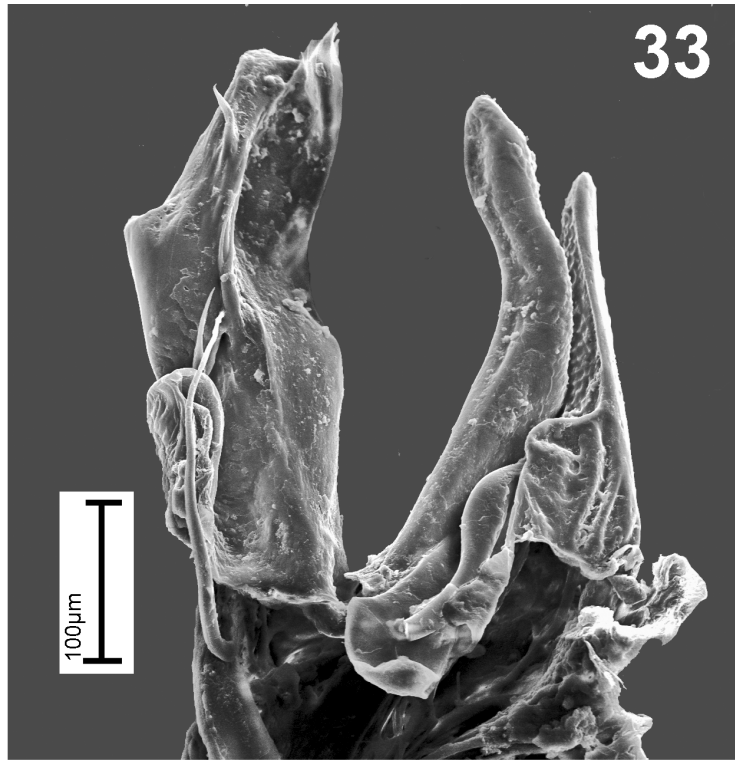
Sibiriulus rectangulus Mikhaljova 2009: 67–68, 65: figs 24–29 (holotype male, in the Institute of Biology and Soil Science of the Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, Russia).

Material re-examined: 1 female-paratype (IBSS), Russia, Siberia, Republic of Altai, Gorno-Altaiisk, *Betula* forest, 28 August 2001, leg. N.V. Levina.

Type locality. Gorno-Altaiisk, Republic of Altai, Siberia, Russia

Diagnosis. This species differs from congeners mainly by the structure of the gonopod opisthomere, with the distal part bent at a near right angle anteriorly, and with a strong inner process near the middle of the opisthomere length.

Distribution. Russia: Siberia (Republic of Altai).



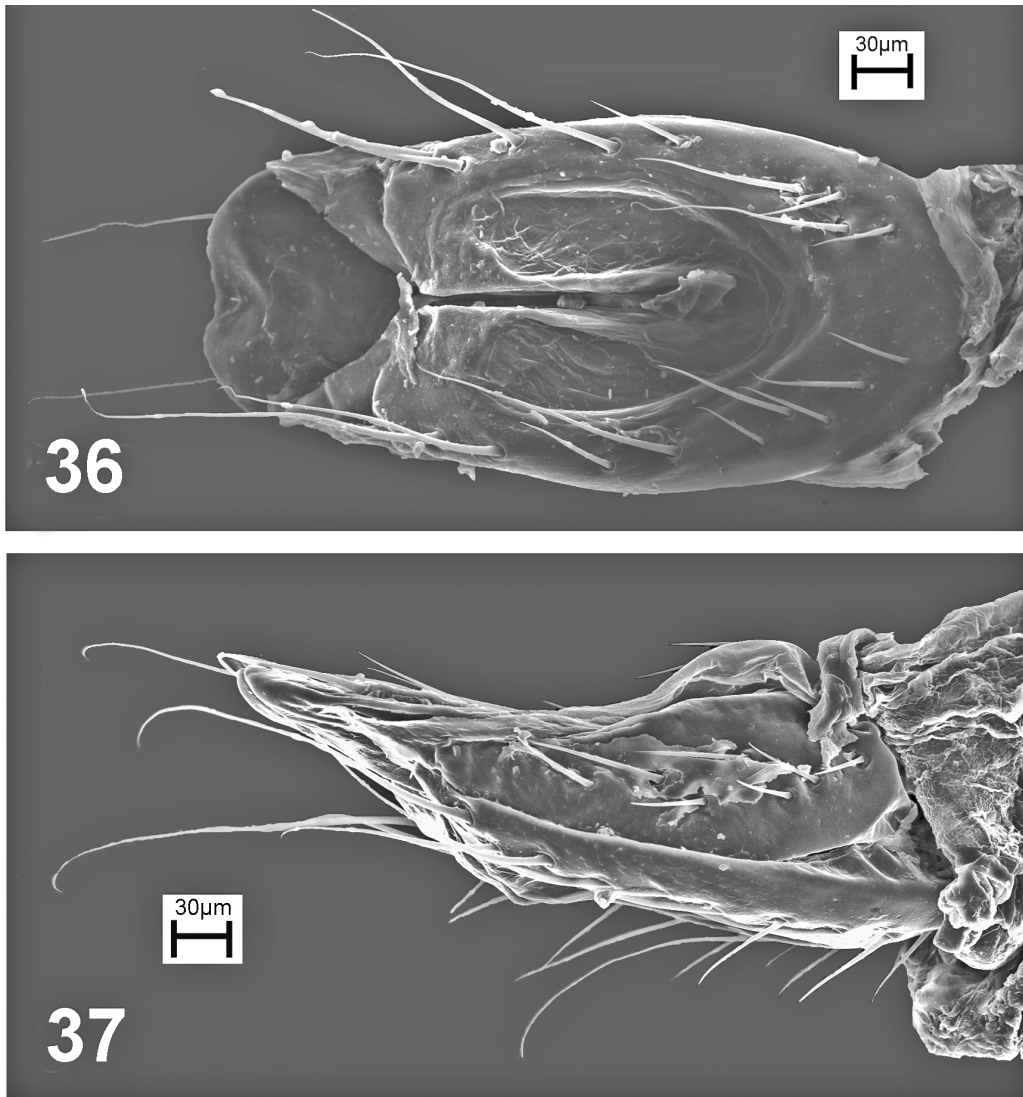
FIGURES 33–35. *Sibirulius multinicus* Mikhaljova, 2001. 33, gonopods (mesal view); 34, right vulva (caudal view); 35, left vulva (lateral view).

Remarks. This species is known only from the original description from the Republic of Altai, Siberia, Russia (Mikhaljova 2009).

Vulvae of this species have never been shown in an SEM micrograph. Therefore they are given here (Figs 36, 37).

Key to species of *Sibiriulus* (based only on males):

- 1(2) Apex of gonopod mesomere unmodified (Fig. 33).....*S. multinicus*
- 2(1) Apex of gonopod mesomere modified 3
- 3(8) Distal or middle part of gonopod opisthomere with a massive inner process. 4
- 4(5) Distal part of opisthomere bent at near right angle anteriad. Inner process of gonopod opisthomere placed nearly at middle of opisthomere length *S. rectangulus*
- 5(4) Distal part of opisthomere not bent at near right angle anteriad. Inner process of gonopod opisthomere placed in distal part of opisthomere. 6
- 6(7) Apex of gonopod mesomere caudally arcuately broadened, forming a protuberance (Fig. 1)..... *S. profugus*
- 7(6) Apex of gonopod mesomere without protuberance, near hook-shaped (Fig. 30).....*S. altaicus*
- 8(3) Distal or middle part of gonopod opisthomere without a massive inner process 9
- 9(10) Gonopod mesomere distal part broad in lateral and mesal views (Fig. 9). Apical fovea of mesomere broad *S. latisupremus* **sp. nov.**
- 10(9) Gonopod mesomere distal part different 11
- 11(12) Lateral side of gonopod opisthomere with relief projection in the form of hook bent forward (Fig. 27, **h**). Gonopod mesomere distal part not near hook-shaped (Fig. 28)..... *S. aktashensis* **sp. nov.**
- 12(11) Lateral side of gonopod opisthomere different. Gonopod mesomere distal part near hook-shaped (Fig. 17) *S. baigazanensis* **sp. nov.**



FIGURES 36–37. *Sibriulus rectangulus* Mikhaljova, 2009, female. 36, right vulva (caudal view); 37, left vulva (lateral view).



FIGURES 38–40. *Sibiriulus baigazanensis* sp. nov., male holotype (38); *Sibiriulus aktashensis* sp. nov., male paratype (39); *Sibiriulus latisupremus* sp. nov., male paratype (40). Habitus in lateral view. Photographed not to scale.



MAP. Distribution of *Sibiriulus* species. Circle—*S. profugus*; triangle—*S. latisupremus* sp. nov.; heart—*S. baigazanensis* sp. nov.; cross—*S. rectangulus*; diamond—*S. aktashensis* sp. nov.; star—*S. altaicus*; square—*S. multinicus*.

Conclusion

The genus *Sibiriulus* is represented by seven species in West and Southwest Siberia, as well as in East Kazakhstan. The distribution map shows only one of the species, *S. profugus*, being relatively widespread and occurring at various territories of the region. Six of the species are endemic to Russia. Only *S. multinicus* occurs in Russia and Kazakhstan.

Members of the genus live mainly in various forests at different altitudes, including leafy stands in river valleys as well as taiga forests. *S. multinicus* dwells not only in the forest biotopes but also is common in the forest-steppe. In addition, this species occurs in the mountain steppe and floodplain meadow. *S. aktashensis* sp. nov. has also been recorded among pebbles, and *S. profugus* in the mixed herbaceous meadow and glades.

Some of the species (*S. aktashensis* sp. nov., *S. multinicus*) are restricted to the high-montane habitats (up to 2,000 m a.s.l.), whereas other species (*S. latisupremus* sp. nov., *S. baigazanensis* sp. nov., *S. rectangulus*) prefer to live in localities up to 500 m a.s.l. The remaining congeners (*S. altaicus* and *S. profugus*) occur at various altitudes. However, the first of these species tends to inhabit mainly the high-montane biotopes whereas the second one tends to dwell mainly in the lowland territories.

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