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INTERESTING FINDINGS OF ORIBATID MITES (ACARI: ORIBATIDA) FROM A *SPHAGNUM* BOG IN WESTERN SIBERIA

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ABSTRACT: This work deals with six species of oribatid mites recovered from a sedge-moss bog (*Carex–Eriophorum–Sphagnum* association), located in the south of Western Siberia, Russia. Two species, *Banksinoma exobothridialis* and *Banksinoma longisetosa* (Thyrisomidae) are new to the fauna of Russia. This finding is interesting in regards to the biogeography and the habitat ecology of both species. Two other relatively rare species of Trhypochthoniidae have been found: *Mainothrus badius*, which is recorded for the first time in Asia; and *Trhypochthonius nigricans*, recorded for the first time in Western Siberia. In addition, Holarctic species *Suctobelbella palustris* (Suctobelbidae) and *Limnozetes ciliatus* (Limnozetidae) are reported with supplementary descriptions and illustrations. In this article, we discuss the distribution and habitat ecology of each of the above species.

KEY WORDS: Moss mites, new finding, *Sphagnum* bog, Tomsk Region.

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INTRODUCTION

Oribatid mites are primarily terrestrial and often dominate microarthropod diversity in litter and soil, where they feed mainly on plant tissue, fungi and algae (Norton and Behan-Pelletier 2009). They are also found in various aquatic habitats, such as phytotelmata, temporary and permanent pools, spring seepages and permanent meltwaters, large water bodies (i.e., streams, lakes and peatlands), brackish and marine sublittoral and littoral waters (Behan-Pelletier and Norton 2016). In particular, oribatid mites are the most abundant group of microarthropods in boreal bogs. However, although they are usually the most abundant and diverse group of invertebrates in bogs, where they play an important role as decomposers (Kuriki 2008; Seniczak 2011), oribatid mites from these habitats are poorly known.

Only about 90 oribatid mite species from 10 genera (less than 1% of all known species) are truly aquatic, with all stages of their life cycle, including reproduction, occurring in freshwater (Schatz and Behan-Pelletier 2008). However, many terrestrial oribatid species are occasionally found in aquatic habitats. This happens as they fall from trees, flushed by rain or floods (Weigmann and Deichsel 2006).

The West Siberian Lowland is the world's largest high-latitude wetland, containing over 900,000 km^2 of peatlands. The peatlands of West Siberia are of major importance to high-latitude hydrology, carbon storage and environmental history. These habitats are a major pool of stored carbon and a significant component in planetary carbon sequestration and emission calculations. Palaeoenvironmental data on the impact of the past climatic change on the peatlands can help anticipate the effects of global warming (Kremenetski *et al*. 2003). In addition to providing important ecosystem services—such as biomass production, supply of food sources and nitrogen and carbon cycling—peatlands are also heterogeneous habitats, where plants and animals must cope with increasing levels of abiotic disturbance (Liss *et al*. 2001).

Despite their importance, relatively little is known about the diversity and ecology of oribatid mites of Siberian peatlands (see Tolstikov 1998; Mikheeva 2008; Tolstikov and Petrova-Nikitina 2008).

Although there are many publications on oribatid mites recovered from various peatlands in the Holarctic region, many of these works are fragmentary and incomplete, often limited to simply listing a few species at a time. Such incomplete data cause difficulties in terms of biogeographical or ecological analyses of the fauna (see Mumladze *et al*. 2013). Thus, detailed investigations, accompanied by supplementary descriptions and illustrations, are important for clarifying the status of doubtful peatland records.

The purpose of the present study is to contribute to our understanding of the diversity of oribatid mites in the sedge-*Sphagnum* bogs of Western Siberia. Our assessment of biodiversity, community composition, biogeography, and other basic parameters of regional soil biota will provide soil

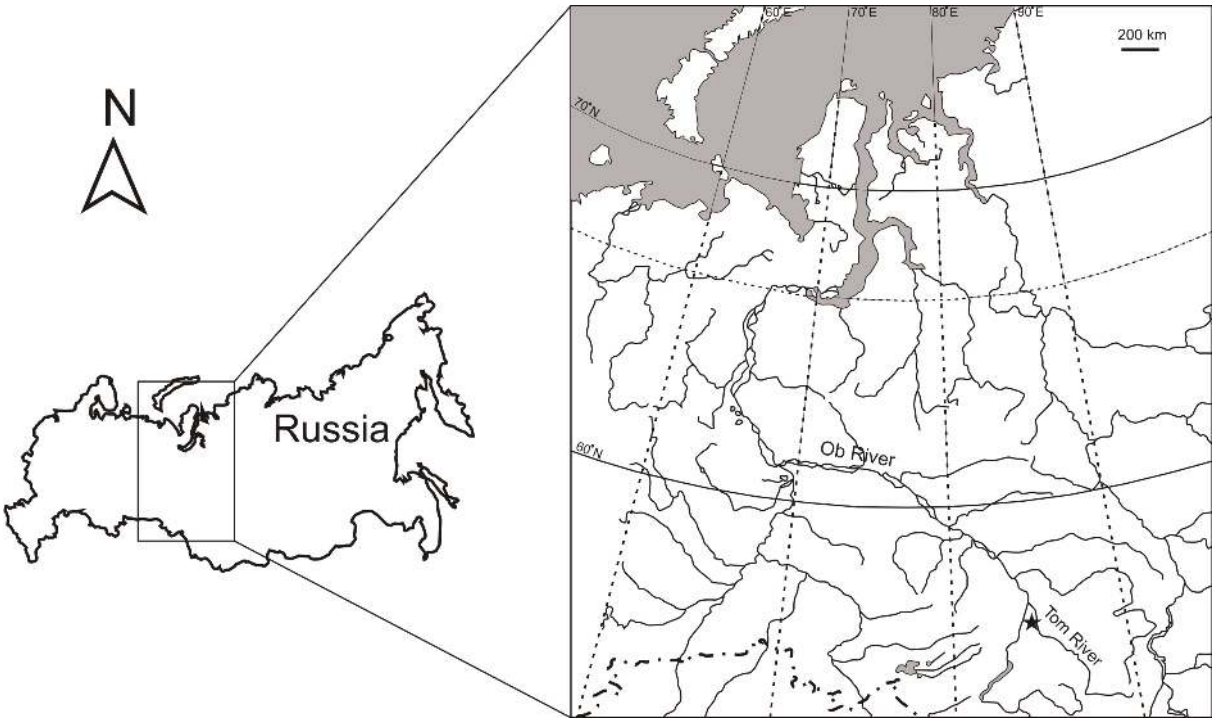

Fig. 1. Location of the sampled bog in the south of Western Siberia.

biologists a background from which to begin further, more detailed studies.

MATERIALS AND METHODS

The material was collected by the first author from a bog located about 10 km southwest of the city of Tomsk, Tomsk Region, Siberian Federal District, Russia (56º26′N, 84º50′E). The study area is located on the interfluve plain of the Ob' and Tom' Rivers, in the southern taiga forest zone (Fig. 1). Most of the area is occupied by forested peatlands, which support small scattered trees, such as larch, pine and birch. Floodplains of the Ob' and Tom' Rivers are covered mainly by sedge and grass meadows (Kremenetski *et al*. 2003). The inspected bog is dominated by oligotrophic vascular plants (*Carex rostrata, Eriophorum vaginatum*) and *Sphagnum* mosses. In slightly elevated places, the moss cover is composed mainly of *Sphagnum magellanicum*, whereas in the lower lying areas, *Sphagnum fallax* and *Sphagnum papillosum* dominate. Occasional low pines (*Pinus sylvestris*, height of 1–2 m) and shrubs (*Andromeda polifolia*, *Chamaedaphne calyculata*) are also present. The average water level in the bog is maintained at the depth of 10–15 cm below the top of the mosses during the growing season.

Samples were taken from the sedge-*Sphagnum* bog and from the area located at the border between trees, shrubs and the bog. Soil mites were extracted with the help of modified Berlese–Tullgren's funnels over the course of 5–7 days in the laboratory. Specimens were cleared in lactic acid and mounted in lactic acid on temporary cavity slides for measurement and illustration. A differential interference contrast microscope was used for examining the morphology of specimens in transmitted light. Line drawings were made using a camera lucida, attached to the compound microscope.

Body lengths were measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. Notogastral width refers to the maximum width of the notogaster. Lengths of body setae were measured in lateral aspect.

The morphological terminology used in this paper follows that of Grandjean (1932, 1964) and Norton (1977) for leg setal nomenclature, and that of Norton and Behan-Pelletier (2009) for overview.

RESULTS

This work deals with six species of oribatid mites: three are recorded in Russia for the first time, one is recorded for the first time in Asia, and two others are rather common species in the Holarctic region. Since these species are easily recognizable, we do not provide their detailed redescriptions, but rather just short diagnostic characterizations, accompanied by illustrations. Following the supplementary descrip-

tions, we discuss some aspects of the distribution and the habitat ecology for each species.

Family **Trhypochthoniidae Willmann, 1931**
Genus ***Mainothrus* Choi, 1996**
Type species: *Mainothrus aquaticus* Choi, 1996

Mainothrus badius (Berlese, 1905)

(Fig. 2)

Measurements. Adult body length: 579 μm, width of notogaster: 317 μm, length of notogaster: 406 μm. Deutonymph body length: 368–378 μm, width of gastronotum: 173–210 μm, length of gastronotum: 237–256 μm. Tritonymph body length: 422 μm, width of gastronotum: 221 μm, length of gastronotum: 288 μm.

Supplementary description. Body colour deep reddish brown. Integument finely porose, with very faint reticulate ornamentation on notogaster. Rostrum broadly rounded, rostral seta (*ro*) 42 μm in length, inserted dorsally on rostrum; lamellar seta (*le*) 44 μm long; distance between *le–le* subequal to that of *ro–ro*; interlamellar seta (*in*) 64 μm, all these prodorsal setae minutely barbed (Fig. 2A, D). Sensillus (*ss*) 58 μm long, lanceolate, with few serrations; exobothridial seta not evident, probably vestigial (Fig. 2C). Anterior margin of notogaster slightly concave, posterior margin rounded. Fifteen pairs of notogastral setae setiform, smooth; additionally f_1 represented by alveolus, inserted anteromedially to h_1 (Fig. 2B, E). Setae c_1, c_2, c_3, d_1, d_2 6-11 μm, p_2 and e_2 32–34 μm, e_1, f_2 and p_3 16–18 μm, h_1 54 μm, h_2 70 μm, h_3 20 μm, p_1 76 μm in length. Subcapitular setae setiform, smooth; seta *a* 18 μm, *m* and *h* 6–8 μm in length. Epimeral setae thin, smooth, 10–18 μm long; setal formula: 3–1–3–2, seta *4a* absent. Anterior end of genital plate slightly protruded and markedly sclerotized; five pairs of genital setae 4–6 μm long, thin, smooth; anal opening narrow, two pairs of anal and three pairs of adanal setae 8–12 μm long, thin, smooth; lyrifissures *ian* and *iad* well developed (Fig. 2B); legs tridactylous.

Material examined. Eleven adults, one tritonymph and four deutonymphs: Sedge-*Sphagnum* bog near the Timiryazyevskoe village, 10 km southwest of the city of Tomsk, Tomsk Region, Russia (56°26′30″N, 84°50′06″E), 1 October 2015, Leg. M.L. Egorova.

Remarks. The characters of the present material correspond well with those of the European and North American materials studied by Mahunka and Mahunka-Papp (1995), Weigmann (1997), Seniczak *et al*. (1998), Ermilov and Chistyakov (2007). In particular, Seniczak *et al*. (1998) studied the morphology of the juvenile stages of this species based on North American materials.

Trhypochthonius nigricans Willmann, 1928

(Fig. 3)

Measurements. Adult body length: 496 μm, width of notogaster: 304 μm, length of notogaster: 352 μm.

Supplementary description. Body colour deep reddish brown. Integument porose, with very faint reticulate ornamentation on notogaster. Rostrum rounded, rostral seta 60 μm long, barbed, pointed distally; lamellar setae 32 μm, barbed, blunt at tip; distance between *le–le* slightly greater than that of *ro–ro*; interlamellar setae 42 μm long, barbed, thicker than rostral and lamellar setae. Sensillus 34 μm long, its head rounded with distinct spines in apical part; exobothridial seta not evident, probably vestigial (Fig. 2A, C, D). Anterior margin of notogaster nearly straight, posterior margin rounded. Fifteen pairs of notogastral setae well developed, additionally f_1 represented by alveolus; seta p_2 setiform, pointed distally, 28 μm long; h_3 and p_3 very short, but thick, smooth, 10-11 μm long; other notogastral setae barbed, blunt at the tip. Setae c_1, c_2, c_3, *cp*, d_1, d_2, e_1 16–22 μm, e_2, f_2, h_1, h_2 and p_1 28-34 μm in length. Subcapitular setae setiform, smooth; seta *a* 14 μm, *m* and *h* 10–12 μm in length. Epimeral setae thin, smooth, 10–16 μm long; setal formula: 3–1–3–3. Anal and genital shields similar in length; eight pairs of genital setae 15–20 μm long, thin, smooth; one pair of anal and three pairs of adanal setae thick, smooth, 10–12 μm long; lyrifissures *ian* and *iad* well developed (Fig. 3B); legs tridactylous.

Material examined. Twelve specimens: a bog near the Timiryazyevskoe village, 10 km southwest of the city of Tomsk, Tomsk Region, Russia (56°26′23″N, 84°50′04″E), 1 October 2015, Leg. M.L. Egorova.

Remarks. The characters of the present material correspond well with those of the European and Asian materials studied by Aoki (1995), Weigmann (1997), Szywilewska-Szczykutowicz and Olszanowski (2007). In addition, Seniczak and Norton (1994) studied the morphology of the juvenile stages of this species based on North American materials.

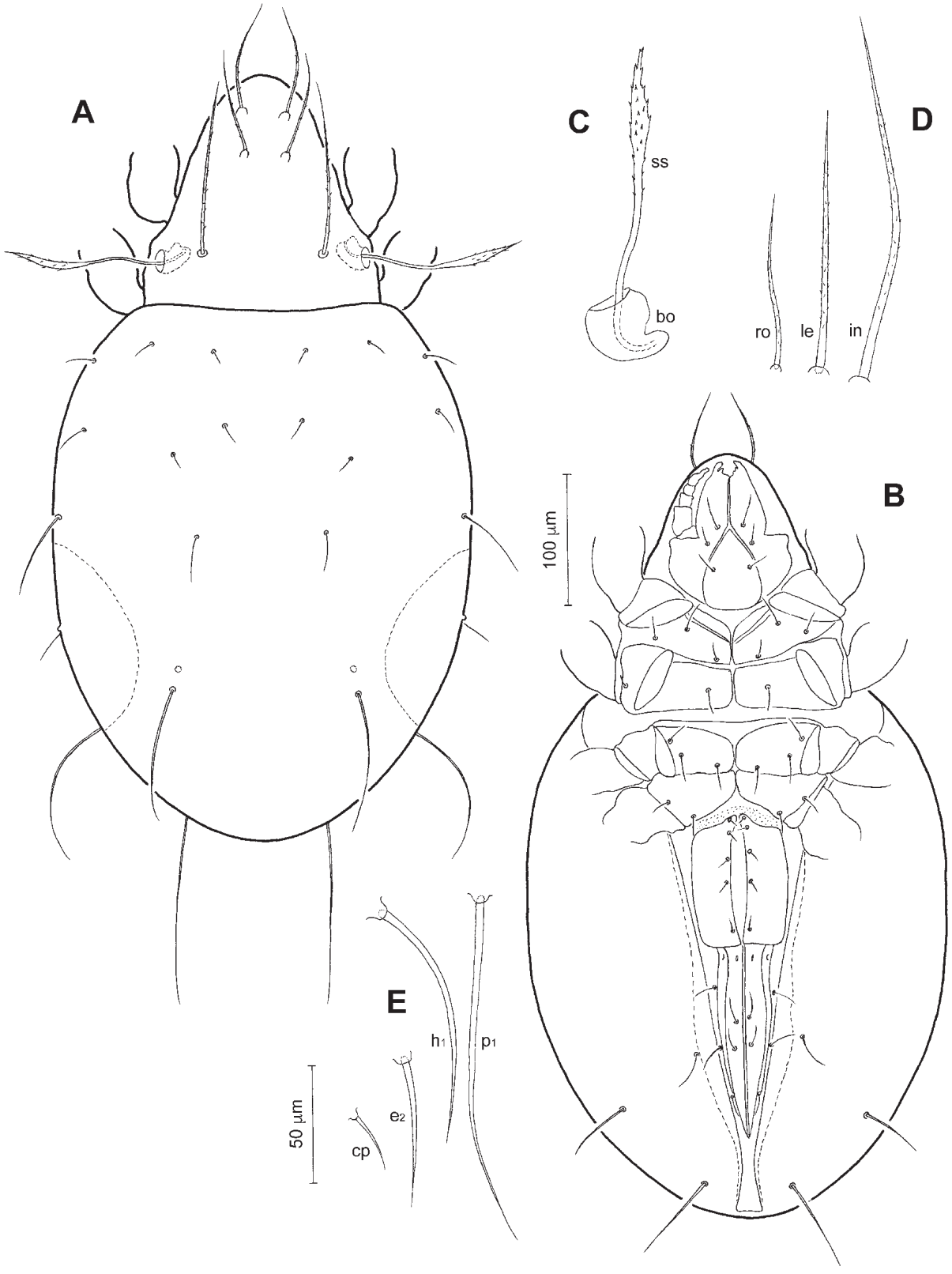

Fig. 2. *Mainothrus badius* (Berlese, 1905). A—dorsal view; B—ventral view; C—bothridium and sensillus; D—rostral, lamellar and interlamellar setae; E—notogastral setae *cp*, e_2, h_1 and p_1. A, B and C, D, E to the same scale, respectively.

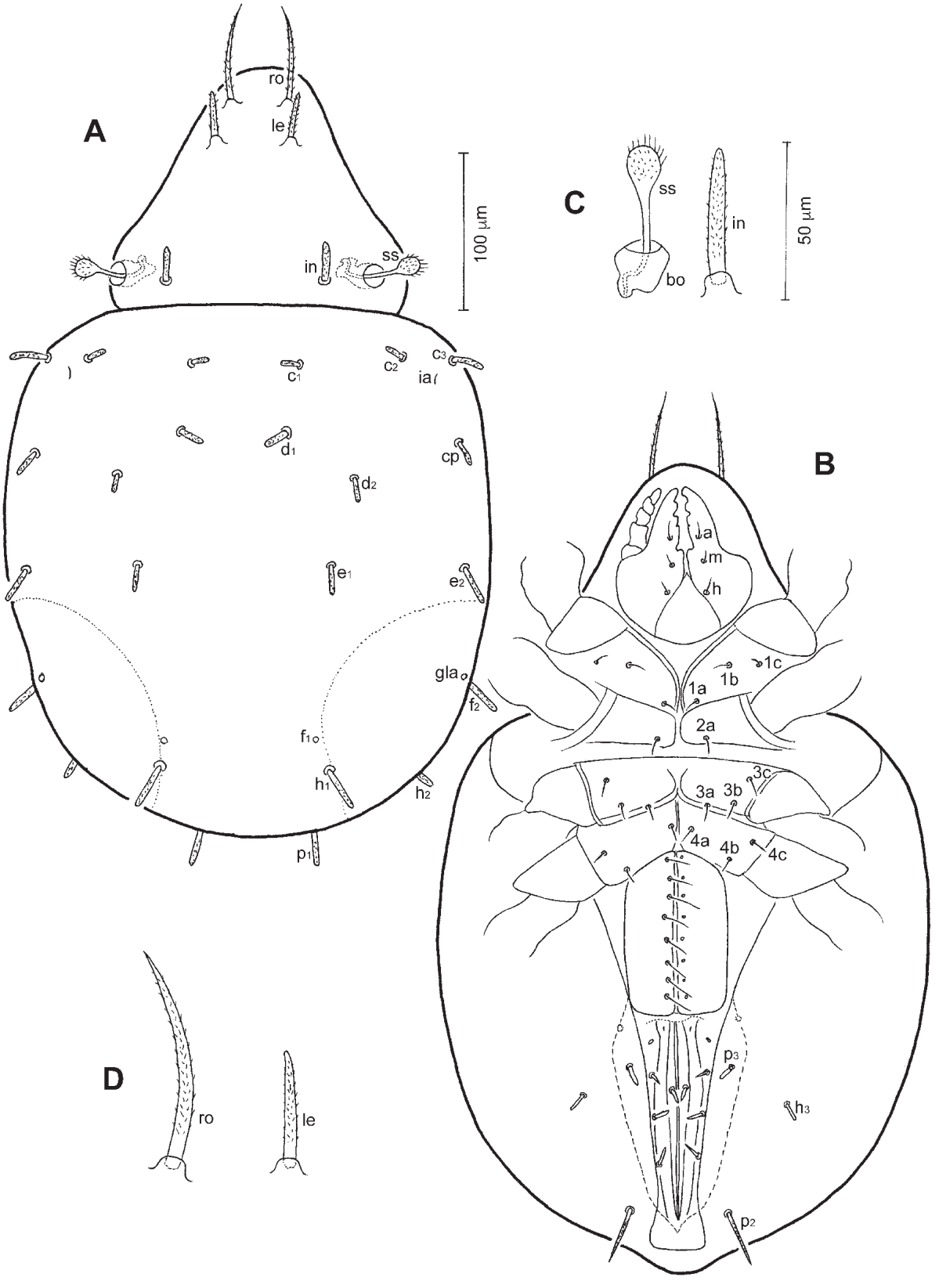

Fig. 3. *Trhypochthonius nigricans* Willmann, 1928. A—dorsal view; B—ventral view; C—bothrium, sensillus and interlamellar seta; D—rostral and lamellar seta. A, B and C, D to the same scale, respectively.

Family **Thyrisomidae Grandjean, 1954**
Genus ***Banksinoma*** **Oudemans, 1930**
Type species: *Notaspis lanceolata* Michael, 1885

Banksinoma exobothridialis **Bayartogtokh, 1997**

(Fig. 4)

Measurements. Adult body length: 384 μm, width of notogaster: 250 μm, length of notogaster: 256 μm.

Supplementary description. Body colour yellowish-brown. Integument with thin granular cerotegument, distinctly tuberculated on exobothridial region, lateral part of prodorsum and notogaster. Rostrum triangular, its tip pointed. Rostral seta thin, finely barbed, inserted dorsally close together, 72 μm long. Lamellar costulae short, but rather wide, slightly widened anteriorly; translamellar region bearing a number of conical tubercles. Lamellar seta slightly thicker than *ro*, finely barbed, 101 μm long. Interlamellar seta with fine barbs, 70 μm long. Exobothridial seta barbed, 35 μm long. Bothridium irregular cup shaped, directed anterolaterad; sensillus with distally pointed fusiform head, 71 μm long (Fig. 4A, C). Notogaster almost rounded; ten pairs of notogastral setae; *c* relatively thicker, but shorter than other setae, 29 μm long; setae p_2 and p_3 32–35 μm long; other setae 45–58 μm long. Lyrifissure *im* and opistosomal gland opening well developed (Fig. 4A). Hypostomal setae thin, smooth; setae *a* relatively shorter than moderately long *m* and *h*. Epimeral setae smooth, setal formula: 3–1–3–3. Anal and genital apertures large, situated close to each other; six pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae thin, smooth; adanal lyrifissure obliquely located close to anterolateral margin of anal aperture (Fig. 4B); legs monodactylous.

Material examined. Six specimens: Sedge-*Sphagnum* bog, 10 km southwest of the city of Tomsk, Tomsk Region, Russia (56°26′30″N, 84° 50′06″E), 1 October 2015, Leg. M.L. Egorova.

Remarks. The characters of the present material correspond well with those of the Asian materials studied by Bayartogtokh (1997, 2006), Akrami and Behmanesh (2014).

Banksinoma longisetosa **Bayartogtokh and Aoki, 1998**

(Fig. 5)

Measurements. Adult body length: 400 μm, width of notogaster: 259 μm, length of notogaster: 275 μm.

Supplementary description. Body colour yellowish-brown. Integument with thin granular cerotegument, distinctly tuberculated on exobothridial region. Rostrum triangular, not pointed, but rounded. Rostral seta thin, smooth, inserted dorsally, 60 μm long. Lamellar costulae short, but rather wide at base, narrowed anteriorly; translamella absent. Lamellar seta thin, finely barbed, 88 μm long. Interlamellar seta with fine barbs, 92 μm long. Exobothridial seta smooth, 36 μm long. Bothridium irregular cup shaped, directed anterolaterad; sensillus narrow fusiform, tapered distally, 80 μm long (Fig. 5A, D). Notogaster slightly oval; ten pairs of notogastral setae; *c* relatively thicker, but shorter than other setae, 18 μm long; setae p_1 32 μm, p_2 and p_3 19–21 μm long; other setae 40–48 μm long. Lyrifissure *im* and opistosomal gland opening well developed (Fig. 5A). Hypostomal setae thin, smooth; setae *a* relatively shorter than moderately long *m* and *h*. Epimeral setae smooth, setal formula: 3–1–3–3. Anal and genital apertures large, situated close to each other; six pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae thin, smooth; adanal lyrifissure obliquely located close to anterolateral margin of anal aperture (Fig. 5B, C); legs monodactylous.

Material examined. Thirteen specimens: Sedge-*Sphagnum* bog, 10 km southwest of the city of Tomsk, Tomsk Region, Russia (56°26′30″N, 84°50′06″E), 1 October 2015, Leg. M.L. Egorova.

Remarks. The characters of the present material correspond well with those of the materials studied by Bayartogtokh and Aoki (1998).

Family **Suctobelbidae Jacot, 1938**
Genus ***Suctobelbella*** **Jacot, 1937**
Type species: *Suctobelbella serratirostrum* Jacot, 1937

Suctobelbella palustris **(Forsslund, 1951)**

(Fig. 6)

Measurements. Adult body length: 259 μm, width of notogaster: 150 μm, length of notogaster: 163 μm.

Supplementary description. Body colour light brown. Integument smooth, only regions near to tectopedial fields with tubercles. Rostrum with two small teeth and rectangular indentation between them (Fig. 6E). Tectopedial field large, elongate oval; knob-like tubercle pentagonal. Rostral seta geniculate, ciliate unilaterally in medial part, 31 μm long. Lamellar seta setiform, smooth, 16 μm long. Interlamellar seta thin, 4 μm long (Fig. 6A). Sensil-

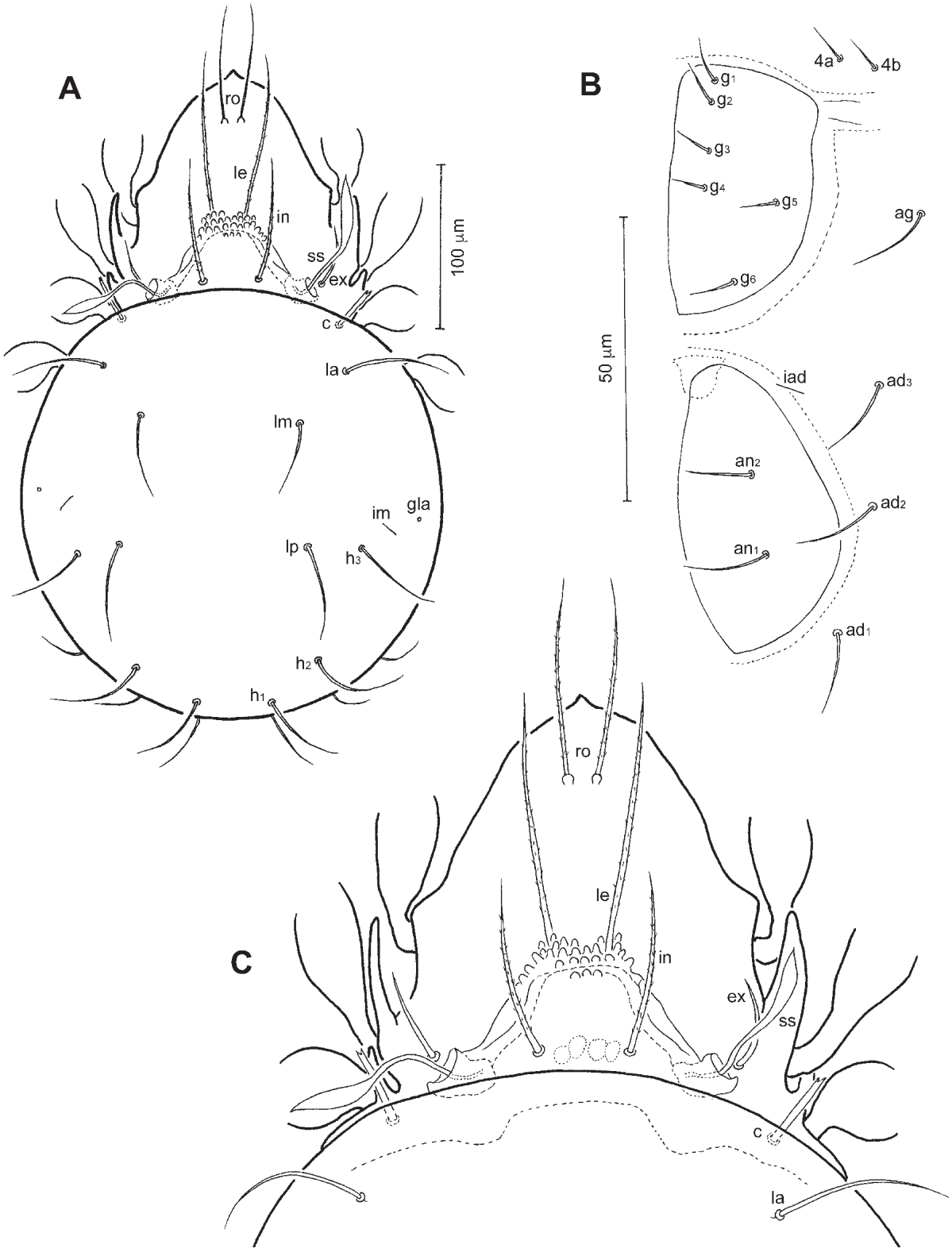

Fig. 4. *Banksinoma exobothridialis* Bayartogtokh, 1997. A—dorsal view; B—anogenital region; C—prodorsum. B, C to the same scale.

lus clavate, with long stalk and oval, smooth head narrowed distally (Fig. 6C). One pair of interbothridial and another pair of postbothridial tubercles present (Fig. 6D). Notogaster almost rounded, two pairs of humeral tubercles well developed, lateral tubercle larger than median tubercle. Nine pairs of notogastral setae thin, smooth, p_1, p_2 12–15 µm, other setae 26–28 µm long. Lyrifissure *im* and opis-

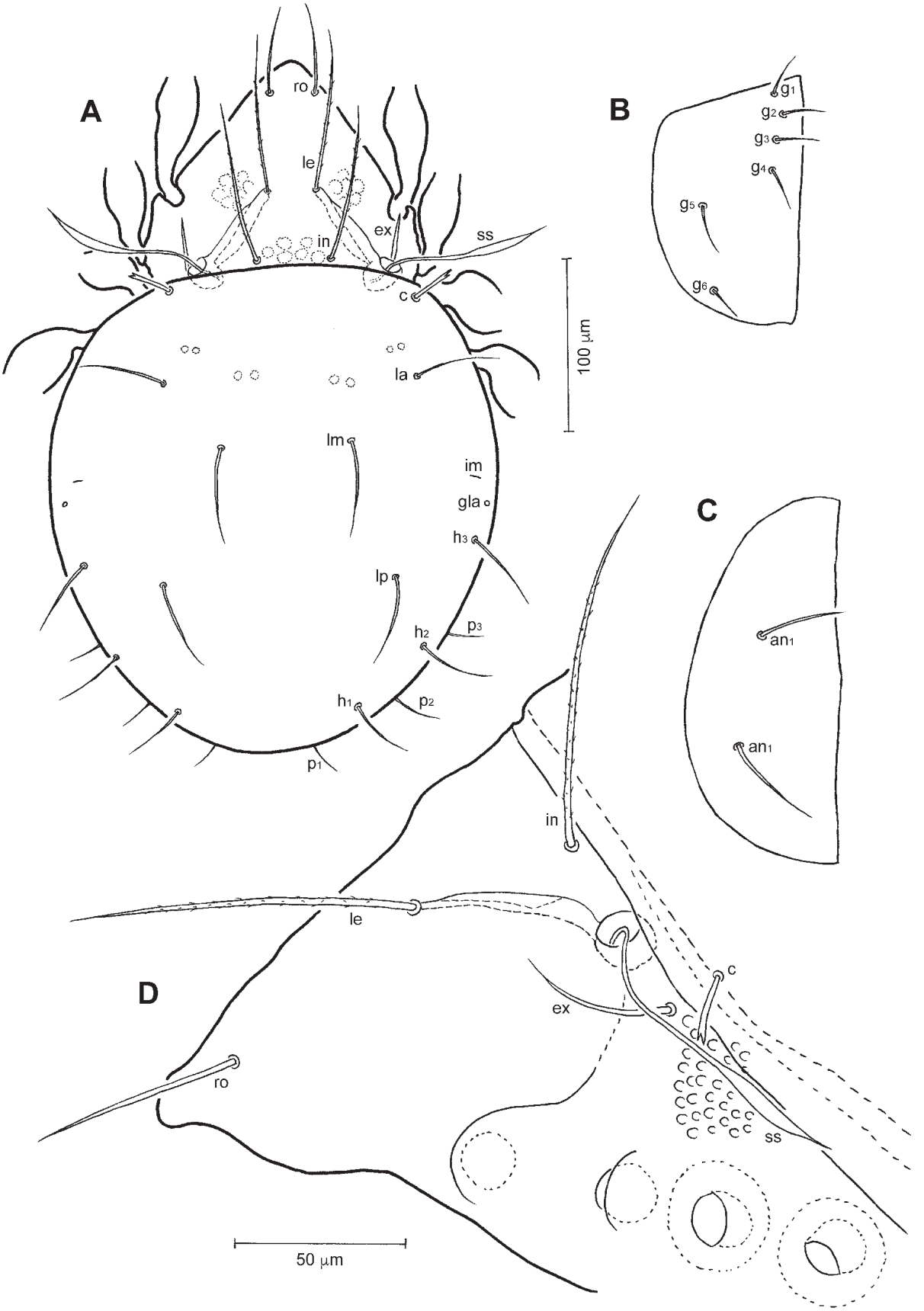

Fig. 5. *Banksinoma longisetosa* Bayartogtokh and Aoki, 1998. A—dorsal view; B—genital plate; C—anal plate; D—dorso-lateral view of prodorsum. B, C, D to the same scale.

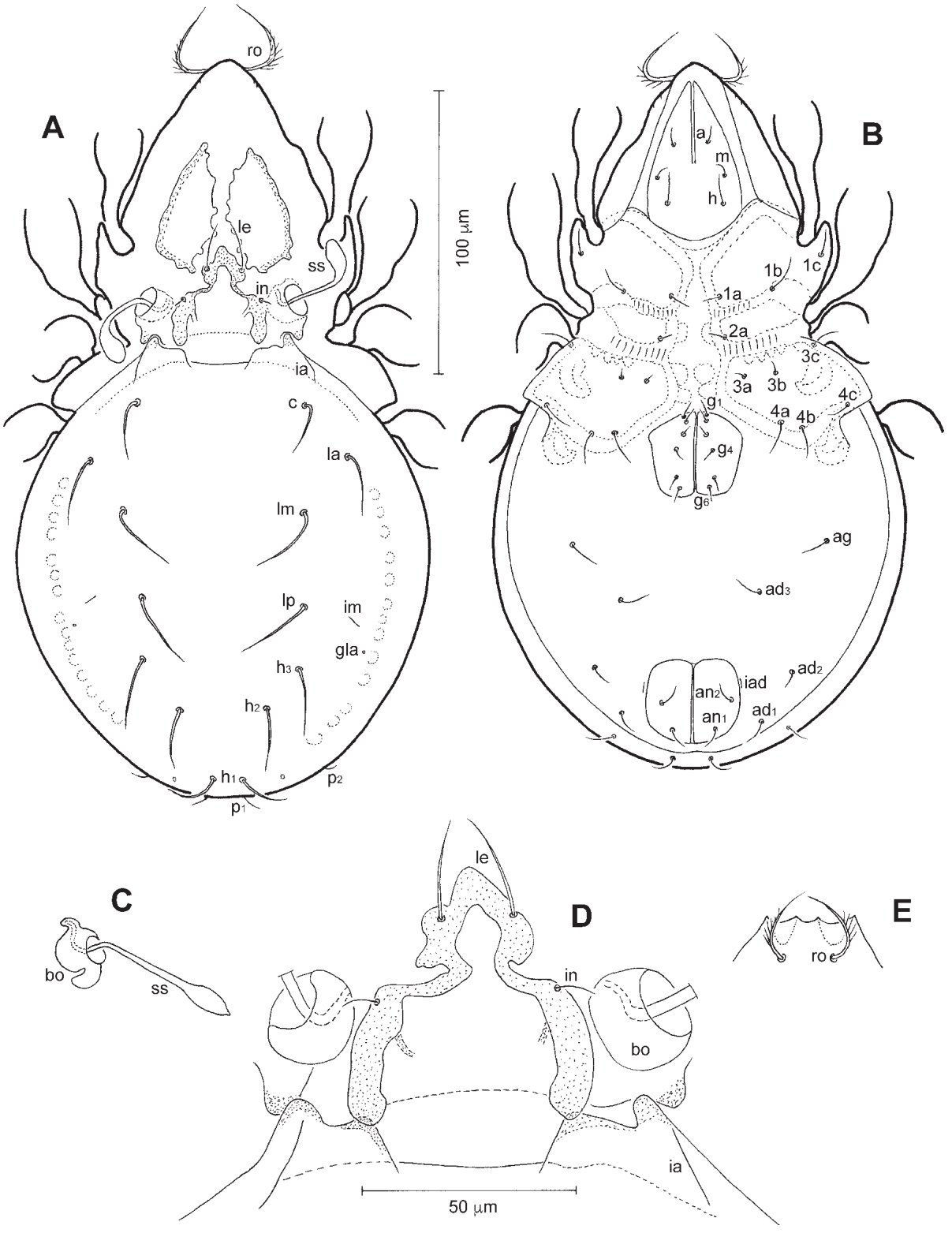

Fig. 6. *Suctobelbella palustris* (Forsslund, 1951). A—dorsal view; B—ventral view; C—bothridium and sensillus; D—interbothridial region, E—dorso-frontal view of rostrum. A, B and C, D, E to the same scale, respectively.

thonotal gland opening clearly developed (Fig. 6A). Subcapitulum longer than wide, subcapitular setae setiform, smooth; seta *h* 14 µm, *a* and m 6–9 µm long. Epimeral setae setiform, smooth, setal formula 3–1–3–3. Six pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae thin, smooth. Lyrifissures *iad* located in paraanal position (Fig. 6B); legs monodactylous.

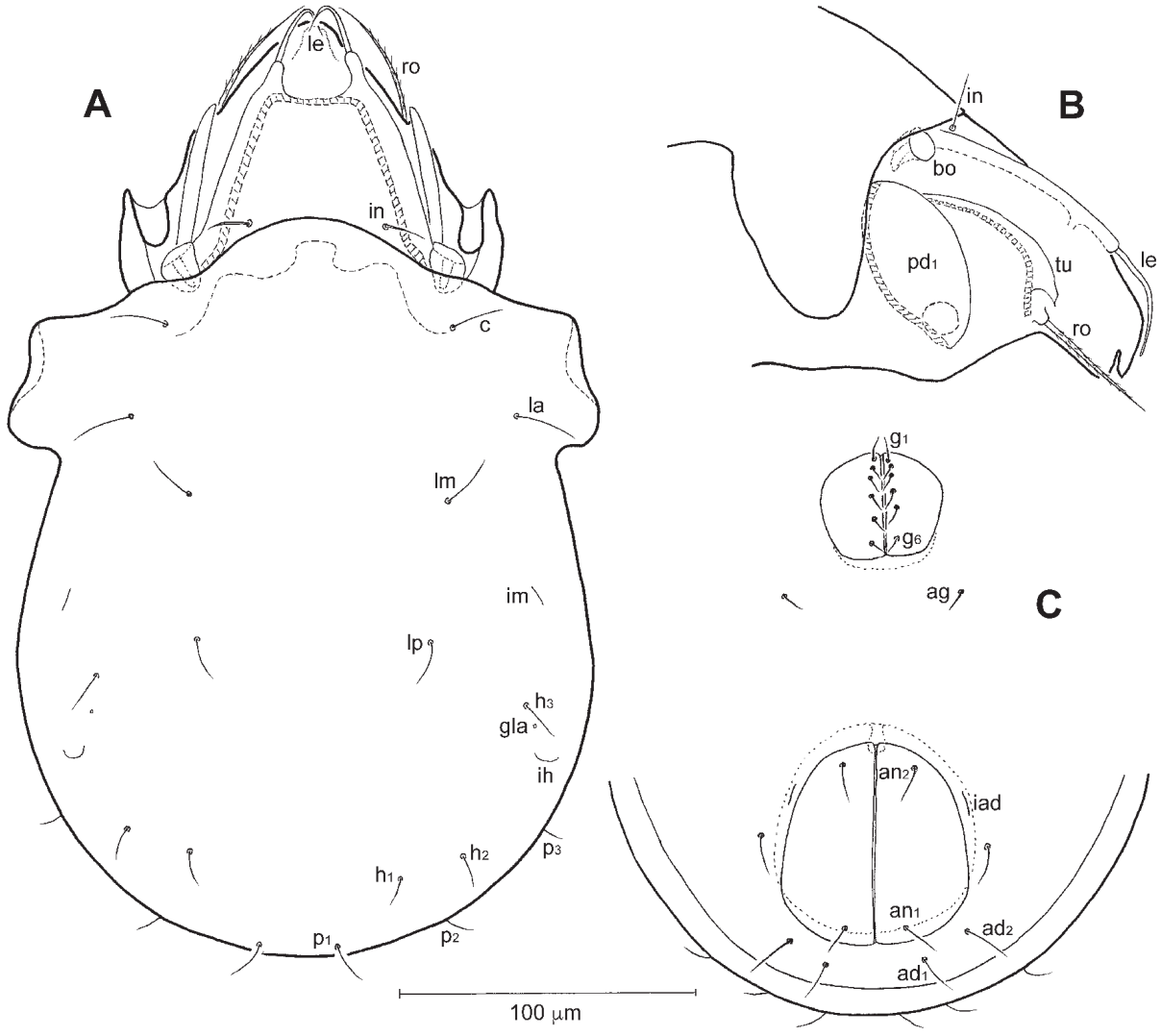

Fig. 7. *Limnozetes ciliatus* (Schrank, 1803). A—dorsal view; B—lateral view of prodorsum, C—anogenital region.

Material examined. Nineteen specimens: Sedge-*Sphagnum* bog, 10 km southwest of the city of Tomsk, Tomsk Region, Russia (56°26′30″N, 84°50′06″E), 1 October 2015, Leg. M.L. Egorova.

Remarks. The characters of the present material correspond well with those of the materials studied by Strenzke (1951), Forsslund (1953), Mahunka (1996).

Family **Limnozetidae Thor, 1937**
Genus ***Limnozetes* Hull, 1916**
Type species: *Acarus ciliatus* Schrank, 1803

Limnozetes ciliatus (Schrank, 1803)

(Fig. 7)

Measurements. Adult body length: 307–323 μm, width of notogaster: 179–198 μm, length of notogaster: 227–240 μm.

Supplementary description. Body colour deep reddish brown to dark brown. Integument tuberculate on prodorsum, lateral margin of podosoma and proximal region of pteromorph; cerotegument finely punctate. Rostrum rounded medially, with pair of lateral indentations; seta *ro* barbed, 48 μm long, curved anteromediad. Lamella slightly narrowed apically; lamellar cusp narrow; seta *le*, 45 μm long, smooth, strongly curved downwards. Translamella present, though sometime interrupted. Seta *in* thin, smooth, 20 μm long. Sensillus not developed; bothridium irregular cup-shaped, partly concealed under anterior margin of notogaster (Fig. 7A, B). Anterior and porterior margins of notogaster rounded; pteromorph subtriangular, distal margin strongly curved ventrally. Notogastral setae thin, smooth, 20–28 μm in length. Epimeral setae all thin, smooth, setal formula 3–1–2–2. Six pairs of genital, one pair

of aggenital, two pairs of anal and three pairs of adanal setae thin, smooth. Lyrifissures *iad* located in paraanal position (Fig. 7C); legs monodactylous.

Material examined. Sixty-one adults (females): Sedge-*Sphagnum* bog, 10 km southwest of the city of Tomsk, Tomsk Region, Russia (56°26′30″N, 84°50′06″E), 1 October 2015, Leg. M.L. Egorova.

Remarks. The characters of the present material correspond well with those studied by Hammer (1952), Pérez-Iñigo (1970), Weigmann (2006), Kuriki (2008), Seniczak and Seniczak (2009).

DISCUSSION

Although oribatid mites have had an association with freshwater habitats at least since the early Jurassic (Labandeira *et al*. 1997), only a few members of the oribatid lineages Desmonomata and Brachypylina made the transition from terrestrial to freshwater habitats. Yet, there is scant evidence for specific adaptations to aquatic living in these cohorts (Behan-Pelletier and Eamer 2007).

Our work examines recent finds of oribatid mites from a *Sphagnum* bog in Western Siberia in their taxonomic, biogeographical and ecological contexts. The first species studied by us, *Mainothrus badius*, is known from the Palaearctic and Nearctic regions. In particular, it has been reported previously from Europe and North America (Marshall *et al*. 1987; Mahunka and Mahunka-Papp 1995; Weigmann 1997; Seniczak *et al*. 1998). As for Russia, this species has been found in its European part: more specifically, in Karelia and Smolensk, Moscow and Nizhny Novgorod Regions (Ermilov and Chistyakov 2007). Therefore, our finding represents the first record of *M. badius* in Asia, with Western Siberia being the easternmost point of its distribution.

In North America, *M. badius* has been recovered from wet meadows with mosses and scattered low willow shrubs, as well as from *Sphagnum* mosses associated with an acid bog (Hammer 1952; Seniczak *et al*. 1998). In Europe, this species was reported from wet bogs, where it mainly occurred in moss cushions (Willmann 1931; Hammen 1959; Weigmann 1997). This species was also recorded, albeit with lesser frequency, in the *Sphagnum* mat of a dystrophic pond in Poland (Seniczak 2011). In European Russia, abundant occurrence of *M. badius* was recorded in a *Sphagnum* bog surrounded by mixed forest, composed of Scots pine (*Pinus silvestris*), silver birch (*Betula pendula*) and willows (*Salix* sp.). The above area was dominated by mosses of the genus *Sphagnum*, and other plants such as *Drosera rotundifolia*, *Oxycoccus microcarpus*, *Scheuchzeria palustris* (Ermilov and Chistyakov 2007). In addition, *M. badius* was rather abundant in the *Sphagnum* bogs of the East European Plain (Minor *et al*. 2016).

The second species examined by us—*Trhypochthonius nigricans*—is rather rare. It was originally described from moss near a lake in Germany (Willmann 1928). Later, this species was recovered from a few places in Germany, Poland and European Russia (Karelia; Moscow and Pskov Regions), where it occurred predominantly in bogs and moist forest soils (Krivolutsky 1995; Weigmann 1997; Szywilewska-Szczykutowicz and Olszanowski 2007; Weigmann and Raspotnig 2009). In Asia, *T. nigricans* is known from Central and Eastern Siberia (Golosova *et al*. 1983), and from the Kushiro Moor in Hokkaido, Northern Japan (Aoki 1995). Thus, we recorded *T. nigricans* for the first time in Western Siberia.

In North America, *T. nigricans* was recovered from *Sphagnum* bogs in New York, USA and New Brunswick, Canada (Seniczak and Norton 1994). According to the above authors, this species is probably common in the cold bogs of southeastern Canada and northeastern US. Additionally, according to Szywilewska-Szczykutowicz and Olszanowski (2007), this species was collected from the following habitats: a pine buttress in the pine-oak uplands of Texas, and grassy litters as well as a log near a pond in Kentucky. According to Seniczak (2011), this species is restricted to floating *Sphagnum* mats that occur in very wet and oligotrophic conditions. Additionally, its juveniles are most abundant in the summer, while adults are more abundant in the spring (Seniczak 2011). Although Mumladze *et al*. (2013) considers both *M. badius* and *T. nigricans* bog-specific, these are known only from a few bogs in the Holarctic region.

The third species studied by us—*Banksinoma exobothridialis*—is an Eastern Palaearctic species, previously known from Mongolia and Iran (Bayartogtokh 2010; Akrami and Behmanesh 2014). Therefore, ours is a new record of this species in Russia. In Mongolia, it inhabits cool temperate taiga forest litter and the soils of dry steppe, mountain steppe and desert oases (Bayartogtokh 2010; Bayartogtokh and Yondon 2018). In Iran, this species was found in the roadside soil, associated with *Phragmites australis* and Poaceae grasses (Akrami and Behmanesh 2014).

Another species of this genus—*Banksinoma longisetosa*—was known up to now only from Mongolia, where it inhabits birch and larch forest litter, as well as mountain steppe and meadow soils (Bayartogtokh and Aoki 1998; Bayartogtokh 2010). Hence, *Banksinoma longisetosa* has been recorded for the first time in Russia. The occurrence of both of the above species in a West Siberian bog is surprising, since they were known previously from drier habitats, located much further south (see below).

The fifth species we studied—*Suctobelbella palustris*—has a Holarctic distribution. Previously, its occurrence has been recorded in Central and Northern Europe (Germany, Hungary and Sweden) and North America (Canada). In Europe, it inhabits wet grass meadows, reed beds, floating and water-soaked *Sphagnum*, as well as floodplains of forest lakes (Strenzke, 1951; Forsslund 1953; Mahunka 1996). In North America, this species occurs in luxuriant moss and *Carex*, which grow in moist meadows, surrounded by *Betula*, *Salix* and other trees (Hammer 1952). This species was assigned to the bog-specific species group, which is rather commonly distributed in the peat bogs of the Holarctic region (Mumladze *et al*. 2013).

The last species examined by us—*Limnozetes ciliatus*—is a Holarctic taxon, widely distributed in both Nearctic and Palaearctic regions. This is a truly aquatic species, typically inhabiting wet *Sphagnum* bogs, fens and the edges of forest lakes, covered with *Sphagnum* and other mosses (Willmann 1931; Sellnick 1960; Weigmann 2006; Weigmann and Deichsel 2006; Kuriki 2008; Seniczak and Seniczak 2009). According to Mumladze *et al*. (2013), this is one of the most widespread bog-specific species of the Holarctic region. Minor *et al*. (2016) found that *L. ciliatus* prefers the *Sphagnum* microhabitat: in particular, *S. cuspidatum*, associated with higher groundwater levels. This is one of a few oribatid species dominating *Sphagnum* mats in a dystrophic pond in Poland throughout all seasons (Seniczak 2011).

Thus, the four species (*M. badius*, *T. nigricans*, *S. palustris* and *L. ciliatus*) we found in a *Sphagnum* bog of West Siberia are known to be typical inhabitants of semiaquatic environments, such as bogs, wet meadows, fens, and the edges of lotic habitats. However, the occurrence of two *Banksinoma* species in a high-latitude bog is surprising, since they previously have been recorded only in dry habitats, located in low southern latitudes: more specifically, in the soils of mountain and plain steppe and in the litter of deciduous and coniferous forests. Schatz and Behan-Pelletier (2008) state that many terrestrial oribatid species can be found in aquatic habitats as chance stragglers from the surrounding habitats. Also, after being transported by periodic or unpredictable floods, oribatid mites can survive for long periods of time by associating with drier microhabitats. Although this may be true for our species, further studies of soil mite fauna colonization of bogs after the last glaciation are necessary to answer this question. Additionally, we know that many species of oribatid mites are generalist feeders and some do not exhibit habitat specialization (Aoki 1967; Behan-Pelletier and Eamer 2007). Both of the above *Banksinoma* species might be such eurybiontic taxa, occurring in different habitat types. According to Druk and Vilkamaa (1988) and Minor *et al*. (2016), in drier bog microhabitats, hygrophilic species are replaced by tyrphophilic litter- and soil-dwellers. In such habitats, smaller deep-soil taxa appear, and eurybionts increase in abundance.

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