

Lithobius (Monotarsobius) fomichevi sp.n., a new species of lithobiid centipedes (Chilopoda: Lithobiomorpha) from Tajikistan, with a key to the Middle Asian species of the subgenus

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Abstract

Lithobius (Monotarsobius) fomichevi sp.n. is described based on eight specimens from the Pamir Mts, Tajikistan. The new species is close to *L. (M.) muminabadicus* (Zalesskaja, 1978) but differs well by the size of both the body and Tömösváry's organ and by features of female gonopods.

Keywords

Biodiversity, Central Asia, fauna, identification key, Lithobiidae, Middle Asia, taxonomy

Introduction

Knowledge of the lithobiomorph centipede fauna of Tajikistan is extensive (Zalesskaja 1978; Dyachkov 2020, 2022, 2023; Dyachkov et al. 2022), but the Pamir Mts is still insufficiently studied. To date, five lithobiomorph species are known from this territory (Dyachkov 2023), two of which belong to the genus *Lithobius (Monotarsobius)* Verhoeff, 1905. Prompted by new material, I describe a new species, *L. (M.) fomichevi* sp.n.

Materials and methods

Specimens were taken by hand or forceps and preserved in 70% ethanol. Type material is deposited in the ZMMU (abbreviations below); comparative materials from ASU were also studied. Material was examined with Olympus stereo microscopes: SZX16 and BX51; photos were taken using Olympus digital cameras: DP74 and XC50. SEM micrographs were taken applying a Hitachi TM1000 scanning electron microscope.

Terminology follows Bonato et al. (2010).

The total body length is measured from the fore margin of the cephalic plate to the rear edge of the postpedal segment. Length of tergites and sternites is measured from the middle of the front margin to the middle of the rear margin; width of tergites and sternites is measured on the widest part. Leg length excludes the claw. All measurements are given in millimeters (mm).

Plectrotaxy. Legs spinulation data are given in a tabular form. Variations in plectrotaxy within a single specimen or between specimens are presented in parentheses. The number of coxal pores is given as a formula where a sequence of Arabic numerals means the number of pores from legs 12 to 15.

The head and mouthparts were mounted in permanent slides using euparal.

All localities were mapped (Fig. 1) with SimpleMappr (Shorthouse 2010).

Identification key is prepared using Zaleskaja (1978), Dobroruka (1979), Farzalieva (2006), Pei et al. (2011), Dányi & Tuf (2012), and Dyachkov & Farzalieva (2018).

Abbreviations: a – anterior, ASU – Altai State University (Barnaul, Russia), C – coxa, coll. – collector, D – dorsal, F – femur, m – median, P – prefemur, p – posterior, S/SS – sternite/ sternites, T/TT – tergite/tergites, Ti – tibia, Tr – trochanter, Ts/Tss – tarsus/tarsi, V – ventral, ZMMU – Zoological Museum of the Moscow State University (Moscow, Russia).

Result

Lithobius (Monotarsobius) fomichevi sp.n.

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Figs 1–24, 33–34

Material. Holotype ♂ (ZMMU Rc 8446), Tajikistan, Gorno-Badakhshan Region, Bartang River Valley, N37°58'35" E71°50'21", thickets of *Betula* and *Prunus* (*Cerasus*), under stones, in soil, 2300 m, 7–8.VII.2023, coll. Yu.V. Dyachkov, A.A. Fomichev.

Paratypes: 2 ♂♂, 5 ♀♀ (ZMMU Rc 8447), same data as holotype.

Etymology. Dedicated to a friend of the author, arachnologist Alexander A. Fomichev (Barnaul, Russia), who collected numerous materials of Chilopoda from the Caucasus, Central Asia, and Russian Far East.

Diagnosis. A medium-sized (up to 9.5 mm) *Lithobius (Monotarsobius)* with 4–5 ocelli in a single row, Tömösváry's organ almost two times larger than the first ocellus; normally 20 antennal articles; forcipular coxosternite with 2+2 acute teeth and setiform prodonts; TT with rounded posterior corners; legs 15 without accessory spines; DCa present on legs 12(13)–15; number of coxal pores 2–3; male Ti15 with dorsolateral process armed with a group of setae; female with 2+2 gonopodal spurs and a simple, short, scoop-shaped pointed claw, 1st segment of gonopods without dorsal setae, 2nd segment with 2 dorsal minute setae, 3rd segment with a sole dorsal minute one.

Description. Holotype. Length: body ca. 9.5 mm long; head 0.9 mm long, 0.9 wide; T1 0.85 wide; T10 1 mm wide; legs 14 and 15 ca. 280 and 250 mm long, respectively.

Color (Fig. 2): body yellow (in alcohol 70%), cephalic plate, forcipular segment and T1 slightly darker.

Cephalic plate (Figs 3, 18): almost smooth and sparsely setose dorsally; a little broader than T1, ratio 1:0.95.

Antennae (Figs 3, 5): extending back to the end of T4, ca. 17% the length of body; composed of 20 slightly elongate articles, covered with dense, light, erect sensilla. Terminal article (Fig. 5): length to breadth ratio 1:0.4.

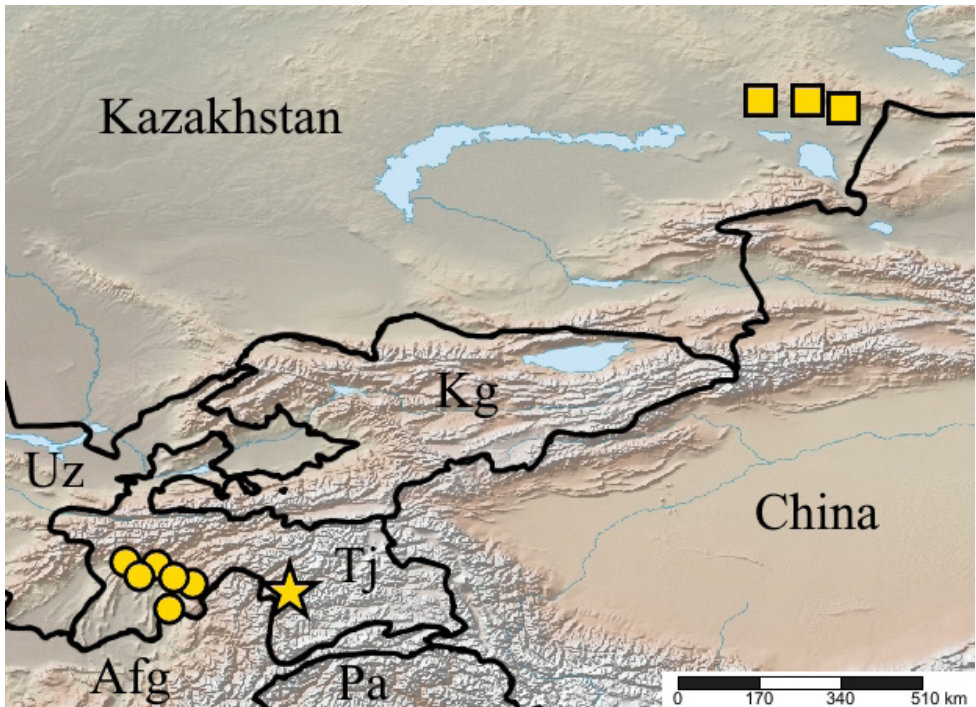


Figure 1. The distribution of *Lithobius fomichevi* sp.n. (star), *L. muminabadicus* (Zalesskaja, 1978) (oval), and *L. tarbagataicus* Farzalieva, 2006 (square). Abbreviations: Afg – Afghanistan, Kg – Kyrgyzstan, Pa – Pakistan, Tj – Tajikistan, Uz – Uzbekistan.

Ocelli (Fig. 19): 4 on each side in a single row. Tömösváry's organ almost two times larger than the first ocellus, rounded.

Forcipular segment (Figs 3–4, 17–18): anterior margin of coxosternite narrow, median diastema V-shaped; 2+2 acute identical teeth and well-expressed long setiform porodonts on small knobs. Shoulders strongly sloping behind porodonts (Fig. 4). Long to short setae in anterior part of ventral surface of coxosternite. Trochanteroprefemur, F, Ti and basal part of tarsungulum covered with few setae.

TT: almost smooth, sparsely setose along margins; with rounded posterior corners. Macro-TT poorly sinuate, micro-TT with straight posterior margins. Intermediate T (Figs 7, 8) with almost straight caudal margin, length to breadth ratio 1:0.9.

SS: smooth with short and sparse setae, SS of 14–15th segments and genital S more densely setose (Fig. 6); S1 ca. 0.9 x as wide as long, S2–3 and S6 ca. 1.1–1.2 x as wide as long, SS4–5 and S9 as long as wide, SS7–8 ca. 0.9 x as wide as long, SS9–14 ca. 1.3–1.5 x as wide as long, ultimate S 1.2 x as wide as long; posterior margin of SS 7–14 with short sutures (ca. 0.01 mm, ca. 1/7 of the median length of S).

Legs: covered with short and sparse setae, coxae of 13–15th with more dense setae (Fig. 6); legs 1–13 with clearly unipartite Ts; legs 1–13 with one true accessory spine (in addition, legs 1–13 with a seta located near spine, similar in shape to accessory spine); legs 14 with very small accessory spine and a seta located near spine. Legs 15 without accessory spines. Legs 14 and 15 slightly incrassate (Fig. 8), F, Ti and both Tss 1–2 with abundant glandular pores mesally. Distal part of 15Ti with a small dorsolateral process armed with a group of setae (ca. 15–19, Figs 9–10, 24, 33–34). Length of Ts1 and Ts2 of 15th legs ratio 1:0.5. DCa developed from legs 12 on. Leg plectrotaxy as in Table 1.

Coxal pores (Fig. 6) small, rounded, separated from one another by a distance as their own diameter, formula 2332(3).

Gonopods 1-segmented (Fig. 6), with a single seta placed at gonopodal middle.

Intraspecific variations. Most characteristics as in holotype, except as follows.

Male. Body up to 8 mm long. Ocelli: 4–5. DCa developed on legs 13–15. Leg plectrotaxy as in Table 2. Each gonopod with 1–2 setae.

Female. Body up to 9 mm long. Cephalic plate (Fig. 18) a little broader than T1, ratio 1:0.9. Antennae with 19–20 articles. Ocelli: 4–5 (Fig. 19).

Sides of labrum with fringes of numerous thin bristles; a pair of setae projecting across labral midpiece (Figs 11–12). Gnathal edge of mandible with numerous pulvilli, 4 pairs of well-developed teeth and 10–12 rather thick and serrate aciculae (Fig. 14). First maxillae: edge with more than 15 plumose bristles and simple setae as well (Figs 13, 16). Second maxillary telopodite (Fig. 15) with bristles, both simple and plumose, at tip.

Intermediate T (Fig. 20) length to breadth ratio 0.9:1.

Gonopods: densely setose ventrally, with 2+2 acute triangle spurs (inner spur smaller than external one) and a simple, short, scoop-shaped pointed claw; 1st segment without spine, 2nd segment with 2 dorsal minute spines and 3rd segment with one minute spine (Figs 21–23).



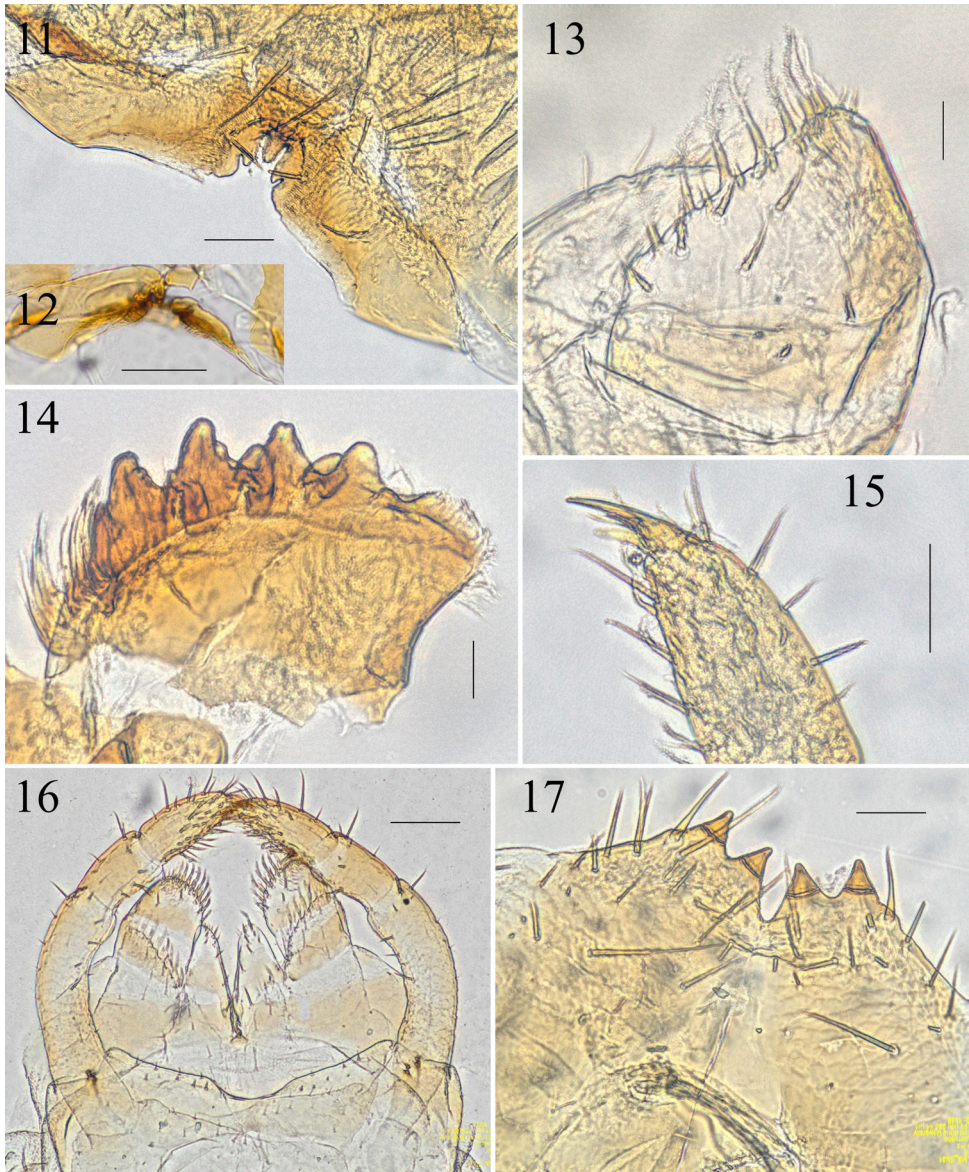
Figures 2–10. *Lithobius fomichevi* sp.n. (holotype): 2, habitus, dorsally; 3, front body fragment, dorsally; 4, forcipules, ventrally; 5, terminal antennal segments, laterally; 6, 7, rear body part, ventrally and dorsally; 8, rear body part and legs 11–15, dorsally; 9, 10, tibia 15, dorsally and laterally. Scale: 1 mm (2), 0.5 mm (3, 6–8), 0.1 mm (4, 5, 9, 10).

Distribution. Only the terra typica.

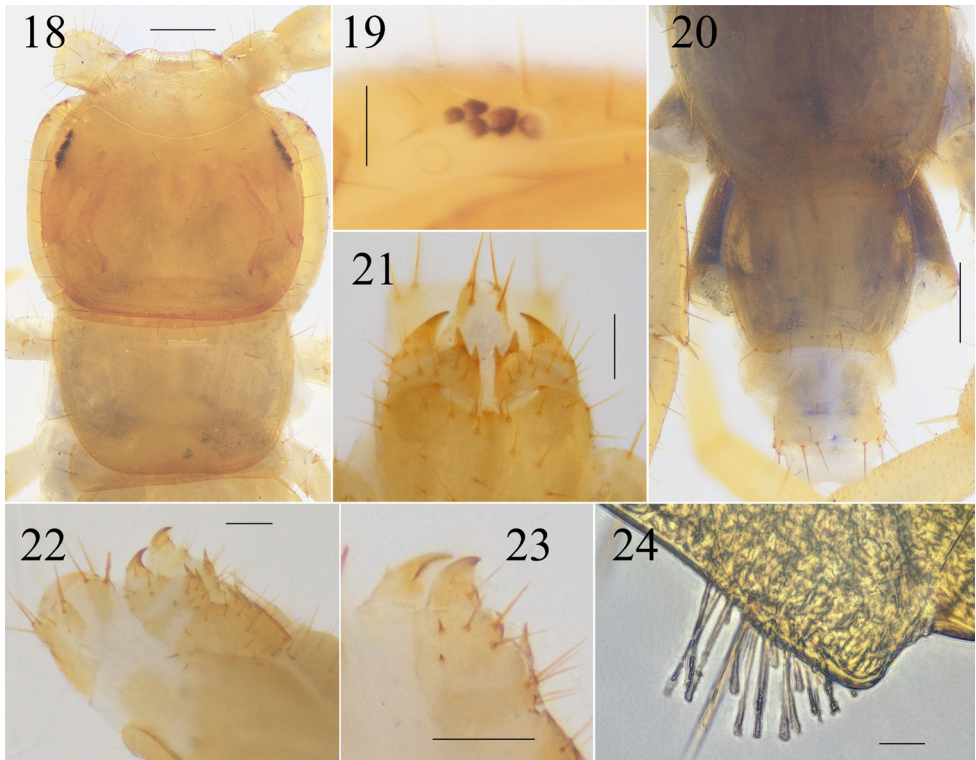
Remarks. A new species is close to *L. muminabadicus* (Zalesskaja, 1978). The main differences concern the body size (up to 9 mm vs. up to 14 mm in *L. muminabadicus*), size of Tömösváry's organ (much larger than nearest ocellus, Fig. 19, vs. similar in size as nearest one in *L. muminabadicus*, Fig. 26), and features of female gonopods: 2nd segment with 2 dorsal minute spines (vs. to 6 dorsal spines in *L. muminabadicus*, Fig. 28), 3rd segment with a single dorsal minute spine (vs. 2 dorsal spines in *L. muminabadicus*, Fig. 28), and the form of a claw (short and stout, Figs 21–23, vs. long, narrow, and curved in *L. muminabadicus*; Figs 27–28).

A new species is also close to *L. tarbagataicus* Farzalieva, 2006 by presence of setigerous dorsolateral process on male Ti15 (Farzalieva 2006: 110), but differs well by larger size of Tömösváry's organ and by simple female gonopodal claw (vs. tridentate one in *L. tarbagataicus*).

Full list of differences is in Table 3.



Figures 11–17. *Lithobius fomichevi* sp.n. (paratypes), ventrally: 11, 12, labrum; 13, terminal article of 1st maxillae; 14, mandible; 15, terminal article of 2nd maxillae; 16, maxillary complex; 17, dental margin of forcipular coxosternite. Scale: 0.1 mm (11, 12, 16), 0.05 mm (15, 17), 0.02 mm (13, 14).



Figures 18–24. *Lithobius fomichevi* sp.n. (paratypes: 18–23, female; 24, male): 18, front body fragment, dorsally; 19, ocelli and Tömösváry's organ, laterally; 20, rear body fragment, dorsally; 21, 22, 23, gonopods, ventrally, laterally, and dorsolaterally; 24, dorsolateral process on male 15 tibia, dorsolaterally. Scale: 0.2 mm (18, 20), 0.1 mm (19, 21–23), 0.02 mm (24).

A key to *Lithobius (Monotarsobius)* species known from Middle Asia

- 1 Male 2
- Female 18
- 2 14 or 15Ti with distodorsal wart 3
- 15Ti lacking distodorsal wart 12
- 3 14Ti with wart *L. insolens* Dányi & Tuf, 2012
- 15Ti with wart 4
- 4 Wart with crater 5
- Wart without crater 11
- 5 Wart with at least 3–5 setae 6
- Wart without setae *L. turkestanicus* Attems, 1904
- 6 Wart cylindrical *L. ketmenensis* Farzalieva, 2006
- Wart oval 7
- 7 Wart with a few setae *L. monocoxaporus* Dyachkov & Farzalieva, 2018
- Wart with at least 9–10 setae 8

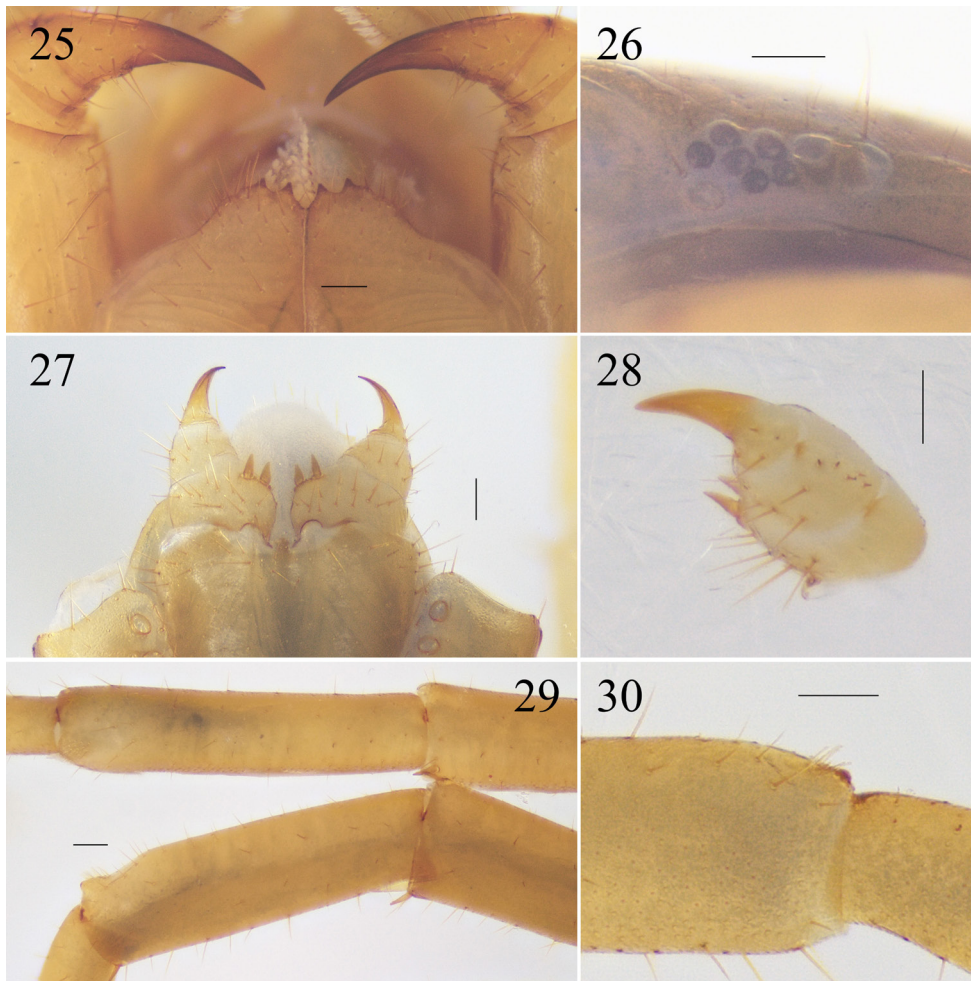
8	10–13 ocelli in 3–4 rows	9
–	7–10 ocelli in 2–3 rows	10
9	Tömösváry’s as large as nearest ocellus.....	<i>L. amplinus</i> Farzalieva, 2006
–	Tömösváry’s larger than nearest ocellus	<i>L. zhui</i> Pei, Ma, Shi, Wu, Gai, 2011
10	Forcipular coxosternite with long and strong porodons, wart with 8–10 setae, legs 15 without accessory spines, but with very small rudimentary spine visible at high magnification.....	<i>L. farzalievae</i> Dányi & Tuf, 2012
–	Forcipular coxosternite with thin setiform porodons, wart with 10–12 thin and light setae, legs 15 without accessory spines	<i>L. trisspurus</i> Dyachkov & Farzalieva, 2018
11	Tömösváry’s organ similar in size as nearest ocellus, gonopods with 1 setae	<i>L. ferganensis</i> Trotzina, 1894
–	Tömösváry’s organ larger than nearest ocellus, gonopods without setae.....	<i>L. javanicus</i> (Zalesskaja, 1978)
12	Ocelli absent	<i>L. krali</i> (Dobroruka, 1979)
–	Ocelli present	13
13	Legs 14 and 15 with posterolateral sulci.....	<i>L. canaricolor</i> Farzalieva, 2006
–	Legs 14 and 15 without posterolateral sulci	14
14	3–5 ocelli.....	15
–	7–11 ocelli.....	16
15	Tömösváry’s organ larger than nearest ocellus, 4–5 ocelli	<i>L. fomichevi</i> sp.n.
–	Tömösváry’s organ similar in size as nearest ocellus, 3 ocelli	<i>L. tuberofermatus</i> Farzalieva, 2006
16	15Ti bearing a dorsolateral process with several setae	<i>L. muminabadicus</i> Zalesskaja, 1978
–	15Ti without dorsolateral process	17
17	15Ti with group of setae on dorsodistal part.....	<i>L. crassipes</i> L. Koch, 1862
–	15Ti without group of setae on dorsodistal part	<i>L. simplis</i> Farzalieva, 2006
18	Gonopodal claw simple	19
–	Gonopodal claw bi- or tridentate	21
19	4–5 ocelli.....	20
–	7–9 ocelli.....	<i>L. muminabadicus</i> Zalesskaja, 1978
20	Gonopodal claw very curved, 2 nd gonopodal article with 2–3 dorsal setae, 3 rd one with 2 dorsal setae.....	<i>L. javanicus</i> (Zalesskaja, 1978)
–	Gonopodal claw scoop-shaped and short, 2 nd gonopodal article with 2 dorsal minute spines, 3 rd segment with a sole dorsal minute spine	<i>L. fomichevi</i> sp.n.
21	Gonopodal claw bidentate.....	22
–	Gonopodal claw tridentate.....	25

22 2+2 gonopodal spurs.....23
 – 3+3 gonopodal spurs..... *L. trisspurus* Dyachkov & Farzalieva, 2018
 23 Tömösváry’s organ two times larger than nearest ocellus
 *L. canaricolor* Farzalieva, 2006
 – Tömösváry’s organ as large as nearest ocellus.....24
 24 3 ocelli in a single row.....*L. tuberofermoratus* Farzalieva, 2006
 – 6–10 ocelli in 2–3 rows*L. ferganensis* Trotzina, 1894
 25 3rd gonopodal article with dorsal spine or setae only.....26
 – 3rd gonopodal article with one ventral and one dorsal spine
 *L. crassipes* L. Koch, 1862
 26 Ocelli present27
 – Ocelli absent..... *L. krali* (Dobroruka, 1979)
 27 1st gonopodal article with 1 dorsal spine
 *L. insolens* Dányi & Tuf, 2012
 – 1st gonopodal article without dorsal spines28
 28 2nd gonopodal article with 2 dorsal spines.....29
 – 2nd gonopodal article with 3–4 dorsal spines31
 29 Legs 15 without accessory spines, but with very small rudimentary spine
 visible at high magnification *L. farzalievae* Dányi & Tuf, 2012
 – Legs 15 without accessory spines30
 30 8–10 ocelli in 2–3 rows, 2–3 coxal pores.....*L. simplis* Farzalieva, 2006
 – 4–8 ocelli in 1–2 rows, 1 (rarely 2) coxal pore
*L. monocoxaporus* Dyachkov & Farzalieva, 2018
 31 1–11 DP and 1–10 VP almost always absent
 *L. turkestanicus* Attems, 1904
 – 1–11 DP and 1–10 VP almost always present.....32
 32 10–15 ocelli in 3–4 rows, 20–24 antennal articles.....33
 – 9–11 ocelli in 3 rows, 19–21 antennal articles
*L. ketmenensis* Farzalieva, 2006
 33 Tömösváry’s organ as large as nearest ocellus.....
 *L. amplinus* Farzalieva, 2006
 – Tömösváry’s organ larger than nearest ocellus
 *L. zhui* Pei, Ma, Shi, Wu, Gai, 2011

Table 1. *Lithobius fomichevi* sp.n. (holotype): plectrotaxy; spines in brackets are asymmetric

Leg pairs	V					D				
	C	Tr	P	F	Ti	C	Tr	P	F	Ti
1	–	–	p	amp	m	–	–	p	a	a
2	–	–	p	amp	m	–	–	p	ap	ap
3	–	–	p	amp	m	–	–	p	ap	ap
6	–	–	p	amp	m	–	–	p	ap	a

Leg pairs	V					D				
	C	Tr	P	F	Ti	C	Tr	P	F	Ti
9	-	-	mp	amp	am	-	-	amp	ap	ap
10	-	-	mp	amp	am	-	-	amp	ap	ap
11	-	-	mp	amp	am	-	-	amp	ap	ap
12	-	-	mp	amp	am	a	-	amp	p	ap
13	-	(m)	amp	amp	am	a	-	amp	p	p
14	-	m	amp	am	-	a	-	amp	p	-
15	-	m	amp	am	-	a	-	amp	-	-



Figures 25–30. *Lithobius muminabadicus* (Zalesskaja, 1978) (ASU No. 275: 25–28, female; 29–30, male; Khatlon Region, Hodzhamumin Mt.): 25, forcipules, ventrally; 26, ocelli, laterally; 27, female gonopods, ventrally; 28, right female gonopod, dorsally; 29, male 15 tibiae, dorsally; 30, distal part of male 15 tibia, laterally. Scale: 0.1 mm.

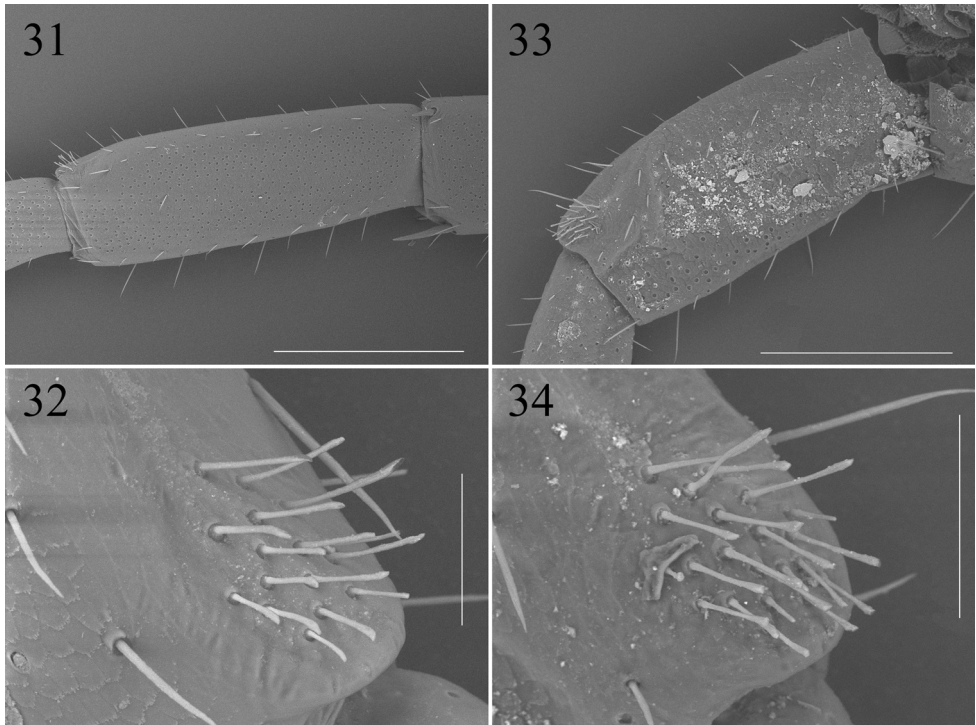
Table 2. *Lithobius fomichevi* sp.n. (paratypes): plectrotaxy; spines in brackets are asymmetric

Leg pairs	V					D				
	C	Tr	P	F	Ti	C	Tr	P	F	Ti
1	-	-	p	am	m	-	-	p	a(p)	a
2	-	-	p	am	m	-	-	p	ap	a(p)
3	-	-	p	am	m	-	-	p	ap	a(p)
4	-	-	p	amp	m	-	-	p	ap	ap
5	-	-	(m)p	amp	m	-	-	p	ap	ap
6	-	-	(m)p	amp	m	-	-	p	ap	ap
7	-	-	mp	amp	m	-	-	p	ap	ap
8	-	-	mp	amp	m	-	-	ap	ap	ap
9	-	-	mp	amp	m	-	-	ap	ap	ap
10	-	-	mp	amp	am	-	-	(a)p	ap	ap
11	-	-	mp	amp	am	-	-	(a)p	ap	ap
12	-	-	mp	amp	am	-	-	amp	(a)p	(a)p
13	-	(m)	mp	amp	am	a	-	amp	p	p
14	-	m	amp	am	-	a	-	amp	p	-
15	-	m	amp	am	-	a	-	amp	-	-

Table 3. Differences between *Lithobius fomichevi* sp.n., *L. muminabadicus* (Zalesskaja, 1978), and *L. tarbagataicus* Farzalieva, 2006

Characters	<i>L. fomichevi</i> sp.n.	<i>L. muminabadicus</i>	<i>L. tarbagataicus</i>
Body size, mm	up to 9	up to 14	up to 10.3
Ocelli	4–5 in a single row (Fig. 19)	7–9 in 2–3 rows (Fig. 26)	6–9 in 2 rows
Tömösváry’s organ	much larger than nearest ocellus (Fig. 19)	not larger (Zalesskaja 1978) or slightly larger (present data; Fig. 26) than nearest ocellus	as large as nearest ocellus
Shoulders on forcipular coxosternite	strongly sloping behind porodonts (Figs 4, 17)	smoothly sloping behind porodonts (Fig. 25)	strongly sloping behind porodonts
2 nd segment of female gonopods	with two dorsal minute spine (Figs 22–23)	with to 6 dorsal spines (Fig. 28)	2–3 dorsal spines
3 rd segment of female gonopods	with a single dorsal minute spine (Figs 22–23)	with two dorsal spines (Fig. 28)	with a single dorsal spine
Claw of female gonopod	simple, short, and stout (Figs 21–23)	simple, long, narrow (Figs 27–28)	tridentate

Characters	<i>L. fomichevi</i> sp.n.	<i>L. mumínabadicus</i>	<i>L. tarbagataicus</i>
Setae on dorsolateral process on male Ti15	15–19, relatively long with broadened ends (Figs 9–10, 24, 33–34)	9–15, relatively short with broadened ends (Figs 29–32)	relatively short with straight ends
Ratio of the length of the setose dorsolateral process to the entire length of the Ti	ca. 1 to 10	ca. 0.5 to 10	?
Length of Ts1 and Ts2 ratio of 15th legs	0.5	0.75	?
Source	present data	Zalesskaja 1978; specimens ASU No. 275 and 276: 6 ♂♂, 4 ♀♀	Farzalieva 2006



Figures 31–34. *Lithobius mumínabadicus* (Zalesskaja, 1978) (ASU No. 275; Khatlon Region, Hodzhamumin Mt.): 31, tibia of 15th leg, mesal view; 32, dorsolateral process on male 15 tibia, mesal view. *Lithobius fomichevi* sp.n. (male paratype): 33, tibia of 15th leg, mesal view; 34, dorsolateral process on male 15 tibia, mesal view. Scale: 0.05 mm (32), 0.1 mm (34), 0.3 mm (33), 0.5 mm (31).

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