



Three new species of *Pamirosa* Fomichev, Omelko & Marusik, 2024 (Araneae: Lycosidae) from Kyrgyzstan, extending the known range of Artoriinae in Central Asia

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Abstract

Three new *Pamirosa* species from Kyrgyzstan are diagnosed, described, and illustrated: *P. alaica* **sp. nov.** (male, female), *P. archalturica* **sp. nov.** (male) and *P. transalaica* **sp. nov.** (male, female). The new species represent the first records of the genus outside the type locality of the generotype, *P. kudratbekovi* Fomichev, Omelko & Marusik, 2024 (Pamir Mountains, Tajikistan). The new findings represent the northernmost records of Artoriinae. All new species were collected from screes at elevations of 3700–4200 m. A distribution map of all known *Pamirosa* species is provided. An identification key to all species is also provided. The distribution of scree-dwelling Lycosidae in Central Asia, and research prospects on this topic are discussed.

Key words: Aranei, Artoriinae, biodiversity, Central Asia, highlands, scree-dwelling wolf spiders

Introduction

The family Lycosidae Sundevall, 1833, commonly known as wolf spiders, is one of the largest and most diverse spider families, comprising 2492 species across 135 genera (World Spider Catalog 2024). This family has a global distribution, inhabiting a wide range of environments and altitudes (Jocqué & Dippenaar-Schoeman 2006; Marusik & Kovblyuk 2011). Despite its worldwide distribution, the family remains poorly studied in many parts of its range, including Central Asia, which is one of the least explored regions. The wolf spider fauna of Kyrgyzstan is underexplored and currently comprises only about 38 species in 11 genera, many of which are questionable records (Mikhailov 2024, World Spider Catalog 2024). To date, no annotated checklist exists for this spider family in Kyrgyzstan. Limited data on Lycosidae from this country can be found in Mikhailov's (2024) catalog, where Kyrgyzstan is included in the Z+I (Mountains of Middle [= Central] Asia) region. Some records are scattered across various scientific publications (Logunov 2012; Marusik *et al.* 2015, 2018; Ballarin *et al.* 2012; Logunov & Ponomarev 2020). Four species are endemic to this country (Logunov 2012; Logunov & Ponomarev 2020; Ballarin *et al.* 2012).

Until recently, members of the subfamily Artoriinae Framenau, 2007, predominantly distributed in the Australasian region, were unknown in Central Asia. The discovery and description of the monotypic genus *Pamirosa* Fomichev, Omelko & Marusik, 2024, with the type species *Pamirosa kudratbekovi* Fomichev, Omelko & Marusik, 2024 from the Muzkol Mountain Range in the Pamirs, Tajikistan, represented a significant range extension for this subfamily (Fomichev *et al.* 2024). During a 2024 expedition to Kyrgyzstan, the first author collected a series of wolf spiders that turned out to be three additional, undescribed species of *Pamirosa*. The main goals of this study are to describe these species, map the distribution of all species in the genus, provide an identification key, and discuss the distribution of scree-dwelling Lycosidae in Central Asia.

Material and methods

The examined specimens were collected by hand and preserved in 70% ethanol. They were photographed using an Olympus DP74 camera attached to an Olympus SZX16 stereomicroscope at Altai State University (Barnaul, Russia). Photographs were taken in a dish lined with white cotton at the bottom, filled with ethanol. Digital multifocus images were stacked using Zerene Stacker software (<https://zerenesystems.com/cms/stacker>). The epigynes were cleared in a KOH/water solution for one day and stained with methylene blue. The endogynes were photographed on a slide while submerged in glycerol. All measurements are given in millimeters (mm). The length of leg segments was measured on the dorsal side. Data on spination of legs are based on examination of a single specimen of each species (one side of the body). Apical spines on the metatarsi were not counted. The terminology and format of the descriptions follows Fomichev *et al.* (2024). The examined material has been deposited in the following museums: ISEA = Museum of the Institute of Systematic and Ecology of Animals, Novosibirsk, Russia (curator: Galina N. Azarkina); ZMMU = Zoological Museum of Moscow State University, Russia (curator: Kirill G. Mikhailov).

Abbreviations: *AL*—anterior lobe of basoembolic apophysis, *ALE*—anterior lateral eye, *AM*—accompanying membrane, *AME*—anterior median eye, *BA*—basoembolic apophysis, *CD*—copulatory duct, *Cn*—conductor, *CO*—copulatory opening, *CP*—cone-shaped process of distal part of embolus, *d*—dorsal, *DE*—distal part of embolus, *DP*—dorsal process of embolic division, *EP*—epigynal plate, *FD*—fertilization duct, *Fe*—femur, *Fo*—fovea, *Mt*—metatarsus, *p*—prolateral, *Pa*—patella, *PE*—proximal part of embolus, *PL*—posterior lobe of basoembolic apophysis, *PLE*—posterior lateral eye, *PME*—posterior median eye, *PO*—prolateral outgrowth of tegulum, *PP*—prolateral process of tegular apophysis, *r*—retrolateral, *Re*—posterior part of receptacle, *RG*—rod-shaped gland, *RH*—receptacle head, *RP*—retrolateral process of tegular apophysis, *RR*—retrolateral ridge of tegulum, *SD*—sperm duct, *SP*—secondary prolateral process of tegular apophysis, *SS*—stick-like setae, *St*—subtegulum, *TA*—tegular apophysis, *Te*—tegulum, *Ti*—tibia, *Tr*—terminal apophysis, *Ts*—tarsus, *TS*—stalk of tegular apophysis, *v*—ventral.

Taxonomy

Family Lycosidae Sundevall, 1833

Subfamily Artoriinae Framenau, 2007

Genus *Pamirosa* Fomichev, Omelko & Marusik, 2024

Pamirosa Fomichev, Omelko & Marusik 2024: 1006.

Type species *Pamirosa kudratbekovi* Fomichev, Omelko & Marusik, 2024, from Tajikistan.

Remarks. This hitherto monotypic genus was described based on two specimens (male and female) collected in stony scree at an altitude of 4700 m in Muzkol Mountain Range (Gorno-Badakhshan Region, Tajikistan). *Pamirosa* was placed in Artoriinae, judging from several features concerning mainly the male palp (see Fomichev *et al.* 2024 for details). The type species, *P. kudratbekovi*, was the first record of this subfamily in Central Asia. The genus differs from all other known genera of Artoriinae by the helicoid tip of the embolus and corresponding screw-shaped membranous copulatory ducts in female. *Pamirosa* is the only known genus of Lycosidae with membranous copulatory ducts.

Pamirosa alaica sp. nov.

Figs 1–3, 10–11, 16, 19–21, 28–30, 37–38, 43–45, 52–55, 60–62, 66, 71–72

Type material. KYRGYZSTAN: **Osh Region:** holotype ♂ (ISEA, 001.9171), Alay Mountain Range, Tengizbai Mountain Pass, 13 km NNW of Daroot-Korgon Village, 39°40.307'N, 72°10.309'E, scree, 3800–4200 m, 12–13.VII.2024, A.A. Fomichev; paratypes 1 ♀ (ISEA, 001.9172), 1 ♀ (ISEA, 001.9173), together with the holotype.

Etymology. The specific name is derived from Alay Mt. Range, adjective.



FIGURES 1–9. Habitus (1, 4, 7), whole palp (2, 5, 8) and its terminal part (3, 6, 9) of *Pamirosa alaica* **sp. nov.** (1–3), *P. archalturica* **sp. nov.** (4–6) and *P. transalaica* **sp. nov.** males (7–9). 1, 3, 4, 6, 7, 9—dorsal; 2, 5, 8—retrolateral. Scale bars: 1, 4, 7 = 2 mm; 2–3, 5–6, 8–9 = 0.2 mm. Abbreviations: SS—stick-like setae.

Diagnosis. The male of *P. alaica* **sp. nov.** differs from all congeners except *P. kudratbekovi* in having the tip of cymbium bent dorsally (cf. Figs 2, 11, 16 and 5, 8, 13, 15, 17–18). The male of the new species can be distinguished from that of *P. kudratbekovi* by a Γ -shaped tegular apophysis (*TA*) with ventrally-directed prolateral process (*PP*) in ventral view (vs. irregularly shaped *TA* with clearly prolateral-directed *PP*; cf. Fig. 44 and Fomichev *et al.* 2024: fig. 22). The female of *P. alaica* **sp. nov.** differs from those of *P. kudratbekovi* and *P. transalaica* **sp. nov.** by triangular fovea (*Fo*) (vs. trapezoidal; cf. Figs 53–55 and 57–59, Fomichev *et al.* 2024: figs 33–35) and by parallel heads of receptacles (*RH*) (vs. converging; cf. Figs 60–61 and 63–64, Fomichev *et al.* 2024: figs 36–37). For a more detailed list of differences between *P. alaica* **sp. nov.** and other *Pamirosa* species, see Table 11.

Description. *Male.* Total length 7.35. Carapace: 3.9 long, 3.0 wide. Opisthosoma: 3.45 long, 2.25 wide. General appearance as in Fig. 1. Coloration. Carapace dark brown. Eye field almost black. Clypeus, chelicerae, labium and sternum dark brown. Endites and coxae yellow brown. Palps brown, distal part of cymbium yellow. Legs brown, without annulations. Opisthosoma gray, with dark, brick-red colored cardiac mark. Spinnerets gray. Eye sizes and interdistances: AME 0.11, ALE 0.13, PME 0.37, PLE 0.31, AME–AME 0.14, AME–ALE 0.14, PME–PME 0.36, PLE–PLE 1.04. Width of anterior eye row 0.79, 2nd row 1.01, 3rd row 1.40. Clypeus height at AME 0.17. For legs measurements see Table 1. For legs spination see Table 2.

TABLE 1. Legs' measurements of male of *Pamirosa alaica* **sp. nov.**

	Fe	Pa	Ti	Mt	Ts	Total
Leg I	2.8	1.45	2.55	2.65	1.25	10.7
Leg II	2.85	1.45	2.45	2.65	1.2	10.6
Leg III	2.9	1.35	2.25	2.95	1.25	10.7
Leg IV	3.55	1.45	3.05	4.45	1.65	14.15

TABLE 2. Legs' spination of male of *Pamirosa alaica* **sp. nov.**

	Fe	Pa	Ti	Mt
Leg I	d1-1-1 p0-0-1	p1 r1	p1-0-0 r1-0-1 v2-2-1-2	p1-1-0 r1-1-0 v2-2-0
Leg II	d1-1-1 p1-0-1 r1-0-1	p1 r1	p1-0-0 r1-0-1 v2-2-1-2	p1-1-0 r1-1-0 v2-2-0
Leg III	d1-1-1 p1-0-1 r1-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v2-2-0
Leg IV	d1-1-1 p1-0-1 r0-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v3-0-2

Male palp as shown in Figs 2–3, 10–11, 16, 19–21, 28–30, 37–38, 43–45. Femur 2.3 times longer than tibia, with 3 dorsal and 2 prolateral spines. Patella 1.2 times longer than tibia, with 1 prolateral spine. Tibia 2.5 times shorter than cymbium, with 2 prolateral spines. Cymbium length/width ratio 1.6. Tip of cymbium flattened, bent dorsally. Subtegulum (*St*) square in retrolateral view. Tegulum (*Te*) circular, length/width ratio 0.9. Retrolateral ridge (*RR*) straight. Conductor (*Cn*) triangular in ventral view. Prolateral outgrowth of tegulum (*PO*) with converging lateral edges. Tegular apophysis (*TA*) extends 1/4 beyond conductor. Prolateral process of tegular apophysis (*PP*) ventrally-directed, spine-like in prolateral view. Retrolateral process of tegular apophysis (*RP*) semicircular. Proximal part of embolus (*PE*) almost circular, smoothly rounded. Basoembolic apophysis (*BA*) with more developed posterior lobe (*PL*). Terminal apophysis (*Tr*) with clow-like tip. Dorsal process of embolic division (*DP*) trapezoidal in dorsal view. Distal part of embolus (*DE*) tightly twisted, making two loops.

Female. Total length 8.25. Carapace: 4.2 long, 3.0 wide. Opisthosoma: 4.45 long, 3.0 wide. General appearance as in Fig. 52. Coloration as in male. Eye sizes and interdistances: AME 0.10, ALE 0.14, PME 0.36, PLE 0.30, AME–AME 0.16, AME–ALE 0.17, PME–PME 0.40, PLE–PLE 1.10. Width of anterior eye row 0.86, 2nd row 1.03, 3rd row 1.43. Clypeus height at AME 0.19. For legs measurements see Table 3. For legs spination see Table 4.

Epigyne ant internal genitalia as shown in Figs 53–55, 60–62. Fovea (*Fo*) triangular, 3 times wider than long. Copulatory ducts (*CD*) touching each other, form approximately 2 turns around fertilization ducts (*FD*). Posterior part of receptacles (*Re*) screw-shaped. Heads of receptacles (*RH*) rode-shaped, parallel.

Distribution. Known only from the type locality (Figs 71–72).

TABLE 3. Legs' measurements of female of *Pamirosa alaica* sp. nov.

	Fe	Pa	Ti	Mt	Ts	Total
Leg I	2.85	1.5	2.35	2.1	1.1	9.9
Leg II	2.85	1.5	2.25	2.2	1.15	9.95
Leg III	2.8	1.45	2.1	2.55	1.2	10.1
Leg IV	3.55	1.55	2.95	4.1	1.6	13.75

TABLE 4. Legs' spination of female of *Pamirosa alaica* sp. nov.

	Fe	Pa	Ti	Mt
Leg I	d1-1-1 p0-0-1	p1	p1-0-0 r0-0-1 v2-2-1-2	p1-1-0 r0-1-0
Leg II	d1-1-1 p0-1-1	0	p1-0-1 r1-0-1 v2-2-2	p1-1-0 r1-1-0 v2-2-0
Leg III	d1-1-1 p1-0-1 r0-1-1	p1 r1	d1-1-0 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v2-2-0
Leg IV	d1-1-1 p1-0-1 r0-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v3-0-2

***Pamirosa archalturica* sp. nov.**

Figs 4–6, 12–13, 17, 22–24, 31–33, 39–40, 46–48, 67, 71–72

Type material. KYRGYZSTAN: **Osh Region:** holotype ♂ (ISEA, 001.9174), Alay Mountain Range, Archaltur Mt. Ridge, 18 km W of Erkeshtam Village, 39°41.335'N, 73°41.024'E, scree, 3700–4000 m, 19.VII.2024, A.A. Fomichev.

Etymology. The specific name is derived from Archaltur Mt. Ridge, adjective.

Diagnosis. The male of *P. archalturica* sp. nov. differs from all known species of the genus by having the retrolateral process of the tegular apophysis (RP) hook-shaped (vs. semicircular: cf. Figs 47 and 44, 50, Fomichev *et al.* 2024: fig. 22), distal part of the embolus with a cone-shaped process (CP) and a shortened and hooked tip of embolus (vs. without a process, coiled tip; cf. Figs 40 and 38, 42, Fomichev *et al.* 2024: fig. 20). For a more detailed list of differences between *P. archalturica* sp. nov. and other *Pamirosa* species see Table 11.

Description. *Male.* Total length 7.0. Carapace: 3.75 long, 2.7 wide. Opisthosoma: 3.3 long, 2.25 wide. General appearance as in Fig. 4. Coloration. Carapace dark brown with light median stripe. Eye field black. Clypeus, chelicerae, labium and sternum dark brown. Endites and coxae yellow brown. Palps brown, cymbium yellow brown. Legs brown, without annulations. Opisthosoma gray, with contrasting brick-red colored cardiac mark. Spinnerets gray. Eye sizes and interdistances: AME 0.10, ALE 0.10, PME 0.36, PLE 0.29, AME–AME 0.14, AME–ALE 0.11, PME–PME 0.29, PLE–PLE 0.94. Width of anterior eye row 0.67, 2nd row 0.93, 3rd row 1.24. Clypeus height at AME 0.14. For legs measurements see Table 5. For legs spination see Table 6.

TABLE 5. Legs' measurements of male of *Pamirosa archalturica* sp. nov.

	Fe	Pa	Ti	Mt	Ts	Total
Leg I	2.7	1.35	2.5	2.35	1.3	10.2
Leg II	2.55	1.35	2.45	2.5	1.25	10.1
Leg III	2.55	1.2	2.1	2.6	1.25	9.7
Leg IV	3.25	1.35	2.9	3.95	1.6	13.05

TABLE 6. Legs' spination of male of *Pamirosa archalturica* sp. nov.

	Fe	Pa	Ti	Mt
Leg I	d1-1-1 p0-0-1	p1 r1	p1-0-0 r1-0-1 v2-2-1-2	p1-1-0 r1-1-0 v2-2-0
Leg II	d1-1-1 p0-0-1 r0-1-1	p1 r1	p1-0-0 r1-0-1 v2-2-1-2	p1-1-0 r1-1-0 v2-2-0
Leg III	d1-1-1 p0-1-1 r0-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v2-2-0
Leg IV	d1-1-1 p1-0-1 r0-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v3-0-2

Male palp as shown in Figs 5–6, 12–13, 17, 22–24, 31–33, 39–40, 46–48. Femur 2.4 times longer than tibia, with 3 dorsal and 2 prolateral spines. Patella 1.3 times longer than tibia, without spines. Tibia 2.4 times shorter than cymbium, with 1 dorsal spine. Cymbium length/width ratio 1.5. Tip of cymbium wide and thick, unmodified. Subtegulum (*St*) square in retrolateral view. Tegulum (*Te*) circular, length-width ratio 0.8. Retrolateral ridge (*RR*) straight. Conductor (*Cn*) square in ventral view, abrupt. Prolateral outgrowth of tegulum (*PO*) with parallel lateral edges. Tegular apophysis (*TA*) extends 1/2 beyond conductor. Prolateral process of tegular apophysis (*PP*) ventrally-directed, digitiform in prolateral view. Secondary prolateral process of tegular apophysis (*SP*) racemose, consisting of four blades. Retrolateral process of tegular apophysis (*RP*) hook-shaped, bent prolaterad. Proximal part of embolus (*PE*) semicircular, steeply curved. Basoembolic apophysis (*BA*) with anterior (*AL*) and posterior (*PL*) lobes equal in size. Terminal apophysis (*Tr*) with blunt tip. Dorsal process of embolic division (*DP*) elongated triangle-shaped in dorsal view. Distal part of embolus (*DE*) with massive cone-shaped process (*CP*) and shortened tip of embolus.

Female. Unknown.

Distribution. Known only from the type locality (Figs 71–72).

Comments. Based on all the examined characters, *P. archalturica* **sp. nov.** stands apart from all other species of the genus (Table 11). The most important feature that distinguishes this species from all others is the distal part of the embolus with cone-shaped process (*CP*) and shortened tip of embolus. The female of *P. archalturica* **sp. nov.** is unknown, but it can be assumed that it possesses shortened copulatory ducts corresponding to the shortened embolic tip in the male.

***Pamiroso transalaica* sp. nov.**

Figs 7–9, 14–15, 18, 25–27, 34–36, 41–42, 49–51, 56–59, 63–65, 68–72

Type material. KYRGYZSTAN: **Osh Region:** holotype ♂ (ISEA, 001.9557), Trans-Alay Mountain Range, 2 km ESE of Bardobo border outpost, 39°29.894'N, 73°17.455'E, large boulder scree with snow, 4100 m, 17.VII.2024, A.A. Fomichev; paratypes: 2♂ (ISEA, 001.9558), 1♀ (ISEA, 001.9559), 3♂ (ZMMU) together with the holotype.

Etymology. The specific name is derived from Trans-Alay Mt. Range, adjective.

Diagnosis. The male of *P. transalaica* **sp. nov.** differs from those of all congeners, except *P. archalturica* **sp. nov.** by unmodified tip of cymbium (cf. Figs 8, 15, 18 and 2, 11, 16, Fomichev *et al.* 2024: figs 5, 7, 9). The male of the new species can be distinguished from that of *P. archalturica* **sp. nov.** by a semicircular retrolateral process of tegular apophysis (*RP*) (vs. hook-shaped; cf. Figs 50 and 47) and by distal part of embolus (*DE*) lacking a cone-shaped process, with its apical part making two complete loops (vs. *DE* with cone-shaped process and shortened and hooked tip of embolus; cf. Figs 40 and 42). The female of *P. transalaica* **sp. nov.** differs from that of *P. alaica* **sp. nov.** by a trapezoidal fovea (*Fo*) (vs. triangular; cf. Figs 57–59 and 53–55) and by converging heads of receptacles (*RH*) (vs. parallel; cf. Figs 63–64 and 60–61). The female of the new species can be distinguished from that of *P. kudratbekovi* by circular posterior part of the receptacles (*Re*) (vs. screw-shaped; cf. Figs 63–65 and Fomichev *et al.* 2024: figs 36–38). For a more detailed list of differences between *P. transalaica* **sp. nov.** and other *Pamiroso* species see Table 11.

Description. *Male* (holotype). Total length 8.45. Carapace: 4.25 long, 3.3 wide. Opisthosoma: 4.25 long, 2.85 wide. General appearance as in Fig. 7. Coloration. Carapace dark brown, almost black. Eye field black. Clypeus, chelicerae, labium and sternum dark brown. Endites and coxae brown with yellow spots. Palps brown, distal part of cymbium yellow. Legs dark brown, without annulations. Opisthosoma dark gray, with contrasting white cardiac mark. Spinnerets dark gray. Eye sizes and interdistances: AME 0.11, ALE 0.11, PME 0.41, PLE 0.34, AME–AME 0.17, AME–ALE 0.10, PME–PME 0.36, PLE–PLE 1.14. Width of anterior eye row 0.77, 2nd row 1.01, 3rd row 1.49. Clypeus height at AME 0.14. For legs measurements see Table 7. For legs spination see Table 8.

TABLE 7. Legs' measurements of male of *Pamiroso transalaica* **sp. nov.**

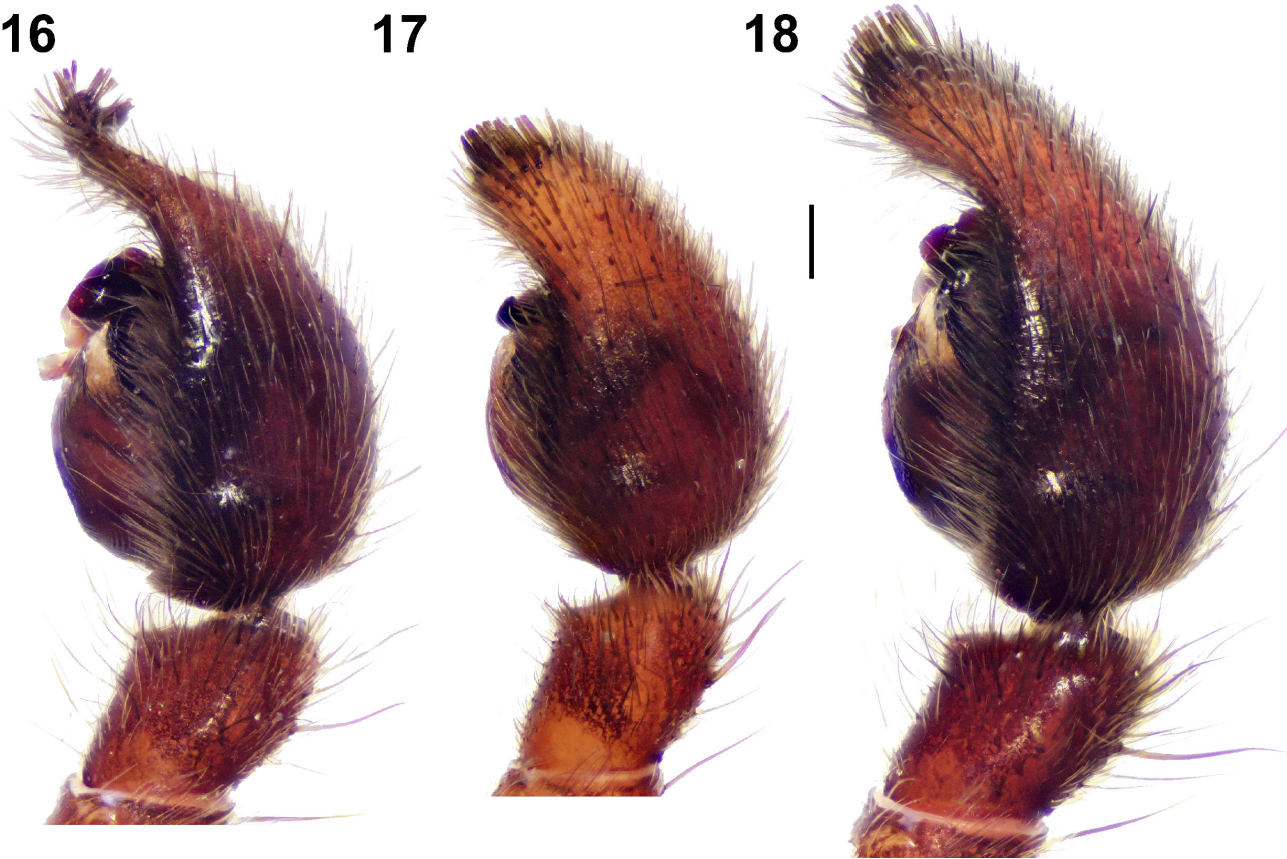
	Fe	Pa	Ti	Mt	Ts	Total
Leg I	3.2	1.6	2.95	2.8	1.45	12.0
Leg II	3.15	1.6	2.85	2.9	1.45	11.95
Leg III	3.15	1.45	2.55	3.3	1.5	11.95
Leg IV	3.8	1.6	3.35	4.75	1.9	15.4



FIGURES 10–15. Terminal part of male palp of *Pamirosa alaica* sp. nov. (10–11), *P. archalturica* sp. nov. (12–13) and *P. transalaica* sp. nov. (14–15). 10, 12, 14—ventral; 11, 13, 15—prolateral. Scale bars: 0.2 mm.

TABLE 8. Legs' spination of male of *Pamirosa transalaica* sp. nov.

	Fe	Pa	Ti	Mt
Leg I	d1-1-1 p0-0-1	p1 r1	p1-0-0 r1-0-1 v2-2-1-2	p1-1-0 r1-1-0 v2-2-0
Leg II	d1-1-1 p1-0-1 r1-0-1	p1 r1	p1-0-0 r1-0-1 v2-2-1-2	p1-1-0 r1-1-0 v2-2-0
Leg III	d1-1-1 p1-0-1 r1-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v2-2-0
Leg IV	d1-1-1 p1-0-1 r0-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v3-0-2



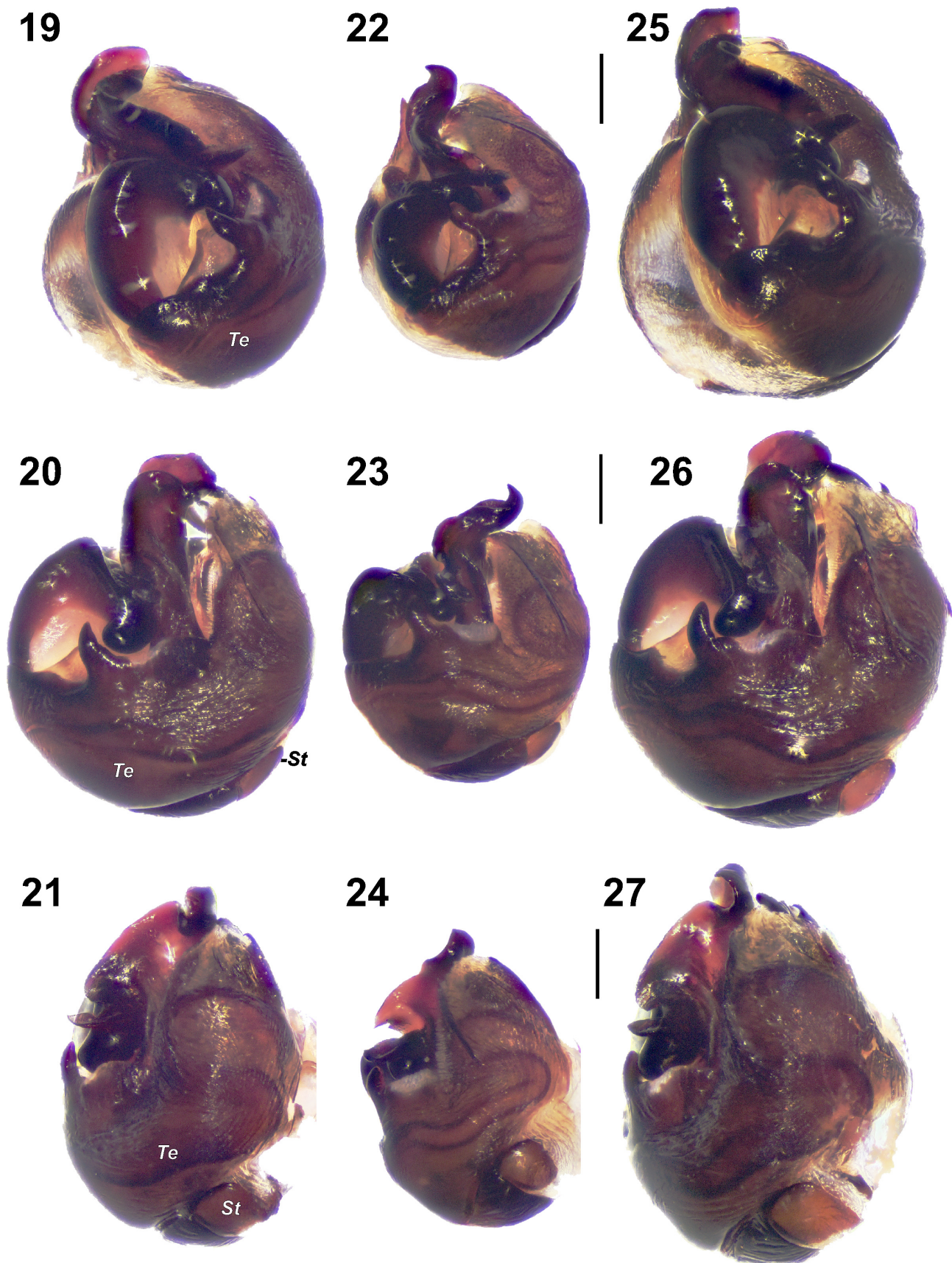
FIGURES 16–18. Terminal part of male palp of *Pamirosa alaica* sp. nov. (16), *P. archalturica* sp. nov. (17) and *P. transalaica* sp. nov. (18), retrolateral. Scale bars: 0.2 mm.

TABLE 9. Legs' measurements of female of *Pamirosa transalaica* sp. nov.

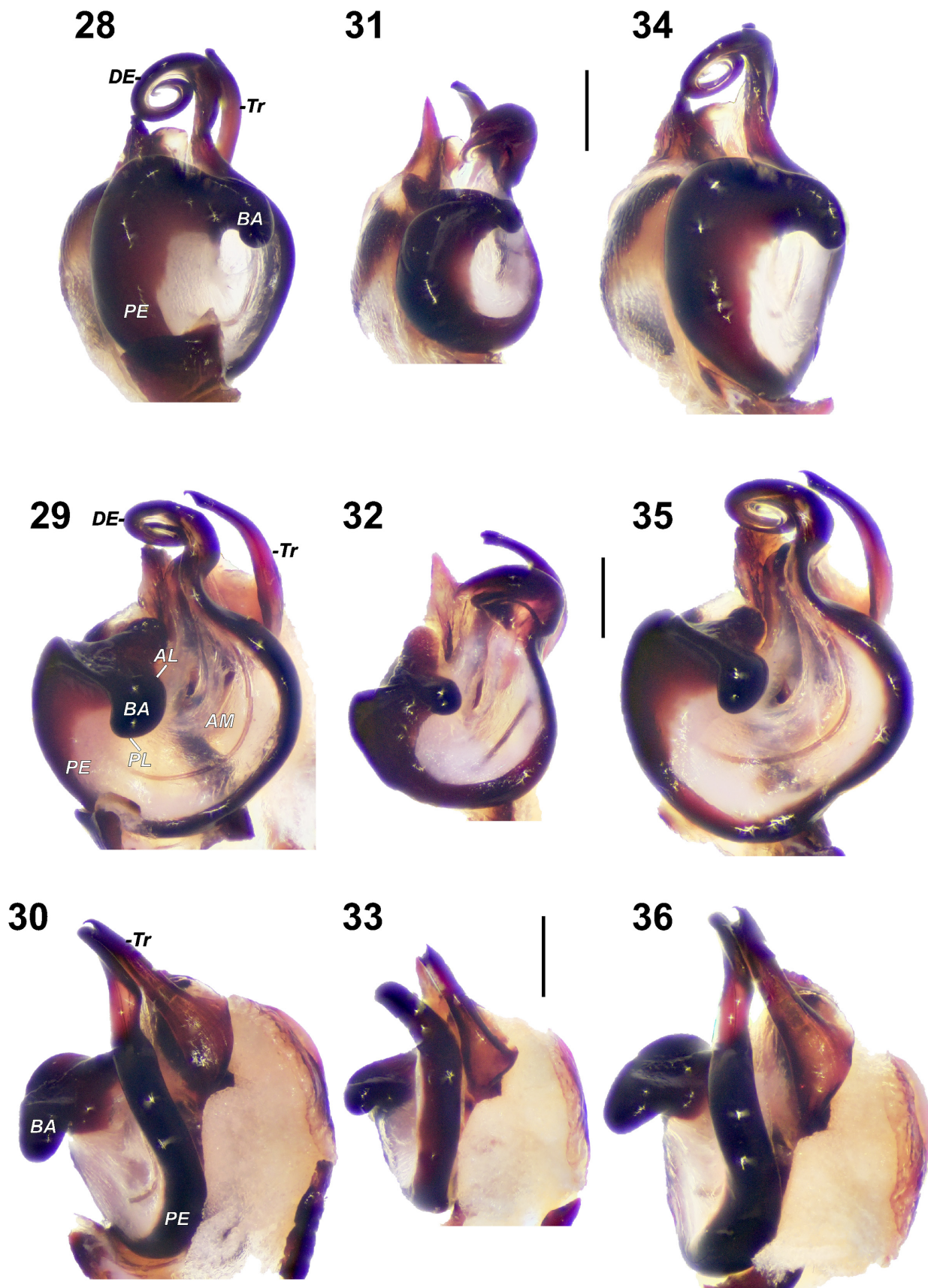
	Fe	Pa	Ti	Mt	Ts	Total
Leg I	3.2	1.7	2.75	2.5	1.35	11.5
Leg II	3.1	1.65	2.65	2.55	1.35	11.3
Leg III	3.25	1.55	2.55	3.15	1.45	11.95
Leg IV	4.0	1.75	3.45	4.7	1.85	15.75

TABLE 10. Legs' spination of female of *Pamirosa transalaica* sp. nov.

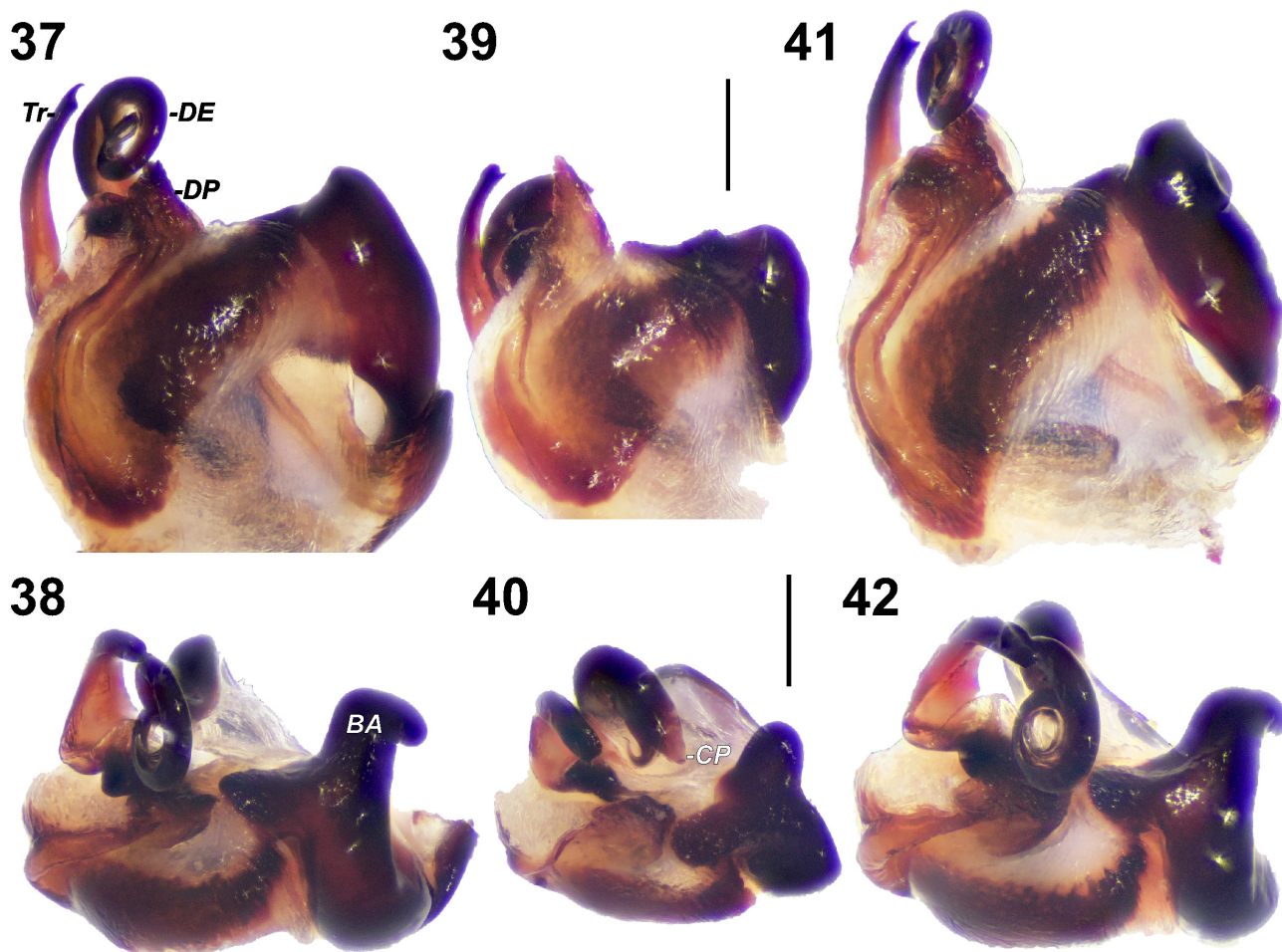
	Fe	Pa	Ti	Mt
Leg I	d1-1-1 p0-0-1	0	p1-0-0 r1-0-1 v2-2-1-2	p1-1-0 r1-1-0 v2-2-0
Leg II	d1-1-1 p1-0-1 r0-1-0	p1	p1-0-1 r1-0-1 v2-2-2	p1-1-0 r1-1-0 v2-2-0
Leg III	d1-1-1 p1-0-1 r1-0-1	p1 r1	d1-1-0 p1-0-1 r2-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v2-2-0
Leg IV	d1-1-1 p1-0-1 r0-0-1	p1 r1	d1-0-1 p1-0-1 r1-0-1 v2-2-2	d0-1-0 p1-1-0 r1-1-0 v3-0-2



FIGURES 19–27. Bulb of *Pamirosa alaica* **sp. nov.** (19–21), *P. archalturica* **sp. nov.** (22–24) and *P. transalaica* **sp. nov.** (25–27). 19, 22, 25— prolateral; 20, 23, 26—ventral; 21, 24, 27— retrolateral. Scale bars: 0.2 mm. Abbreviations: *St* —subtegulum, *Te* —tegulum.



FIGURES 28–36. Embolic division of *Pamirosa alaica* sp. nov. (28–30), *P. archalturica* sp. nov. (31–33) and *P. transalaica* sp. nov. (34–36). 28, 31, 34—prolateral; 29, 32, 35—ventral; 30, 33, 36—retrolateral. Scale bars: 0.2 mm. Abbreviations: *AL*—anterior lobe of basoembolic apophysis, *AM*—accompanying membrane, *BA*—basoembolic apophysis, *DE*—distal part of embolus, *PE*—proximal part of embolus, *PL*—posterior lobe of basoembolic apophysis, *Tr*—terminal apophysis.



FIGURES 37–42. Embolic division of *Pamirosa alaica* **sp. nov.** (37–38), *P. archalturica* **sp. nov.** (39–40) and *P. transalaica* **sp. nov.** (41–42). 37, 39, 41—dorsal; 38, 40, 42—anterior. Scale bars: 0.2 mm. Abbreviations: BA—basoembolic apophysis, CP—cone-shaped process of distal part of embolus, DE—distal part of embolus, DP—dorsal process of embolic division, Tr—terminal apophysis.

Male palp as shown in Figs 8–9, 14–15, 18, 25–27, 34–36, 41–42, 49–51. Femur 2.7 times longer than tibia, with 3 dorsal and 2 prolateral spines. Patella 1.3 times longer than tibia, with 1 prolateral spine. Tibia 3 times shorter than cymbium, with 2 dorsal spines. Cymbium length/width ratio 1.5. Tip of cymbium wide and thick, unmodified. Subtegulum (*St*) ovoid in retrolateral view. Tegulum circular, length/width ratio 0.8. Retrolateral ridge (*RR*) slightly curved retrolaterad. Conductor (*Cn*) oval in ventral view. Prolateral outgrowth of tegulum (*PO*) with parallel lateral edges. Tegular apophysis (*TA*) extends 1/4 beyond conductor. Prolateral process of tegular apophysis (*PP*) almost rectangular in prolateral view. Retrolateral process of tegular apophysis (*RP*) semicircular. Proximal part of embolus (*PE*) almost circular, with slightly indented retro-posterior margin. Basoembolic apophysis (*BA*) with more developed posterior lobe (*PL*). Terminal apophysis (*Tr*) with clow-like tip. Dorsal process of embolic division (*DP*) trapezoidal in dorsal view. Distal part of embolus (*DE*) tightly twisted, making two loops.

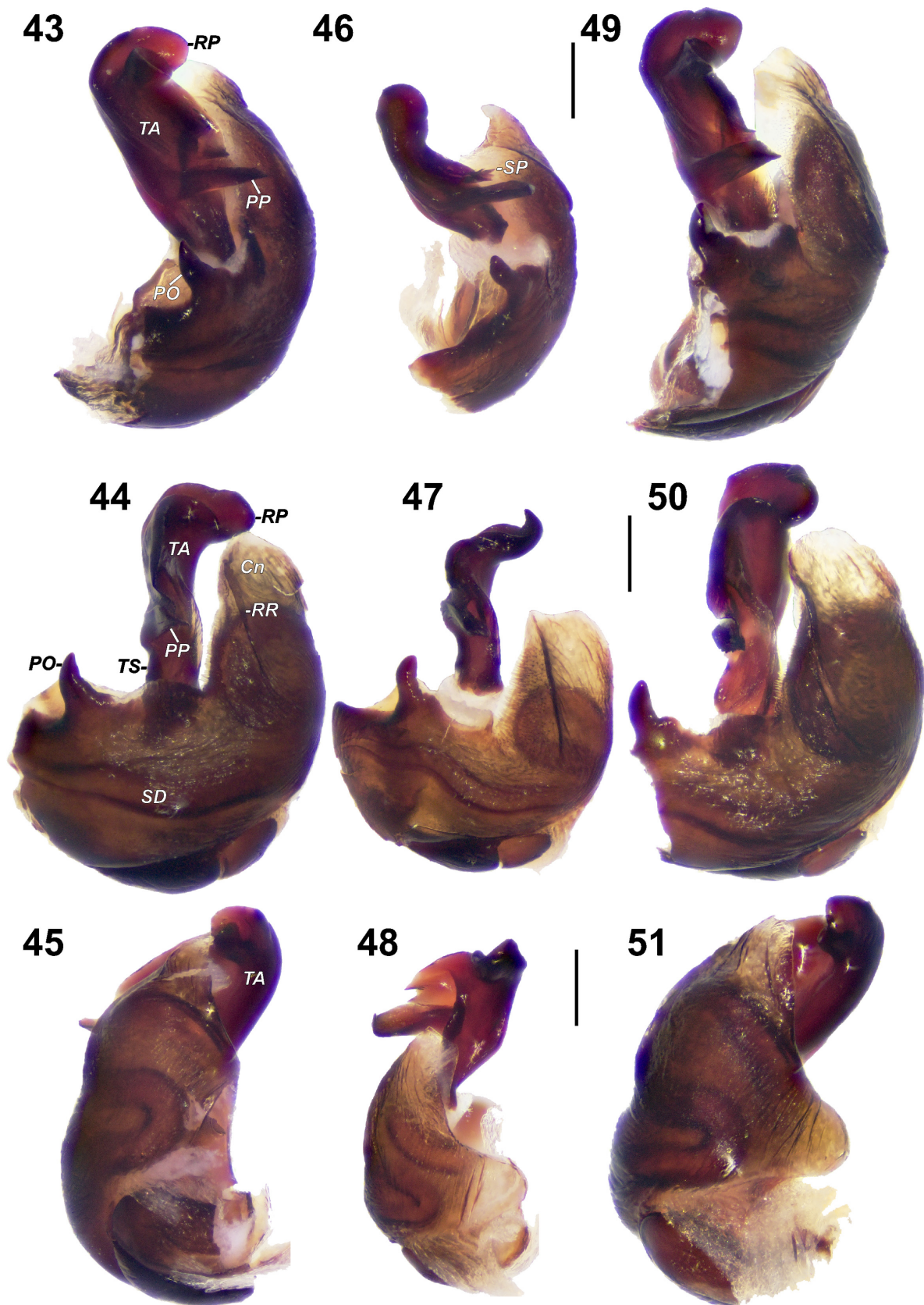
Female. Total length 11.0. Carapace: 4.5 long, 3.6 wide. Opisthosoma: 6.25 long, 4.05 wide. General appearance as in Fig. 56. Coloration as in male, but cardiac mark less contrasting. Eye sizes and interdistances: AME 0.10, ALE 0.19, PME 0.43, PLE 0.36, AME–AME 0.17, AME–ALE 0.13, PME–PME 0.39, PLE–PLE 1.21. Width of anterior eye row 0.93, 2nd row 1.09, 3rd row 1.53. Clypeus height at AME 0.20. For legs measurements see Table 9. For legs spination see Table 10.

Epigyne and internal genitalia as shown in Figs 57–59, 63–65. Fovea (*Fo*) trapezoidal, 3 times wider than long. Copulatory ducts (*CD*) not touching each other, form approximately 2 turns around fertilization ducts (*FD*). Posterior part of receptacles (*Re*) circular. Heads of receptacles (*RH*) kidney-shaped, converging.

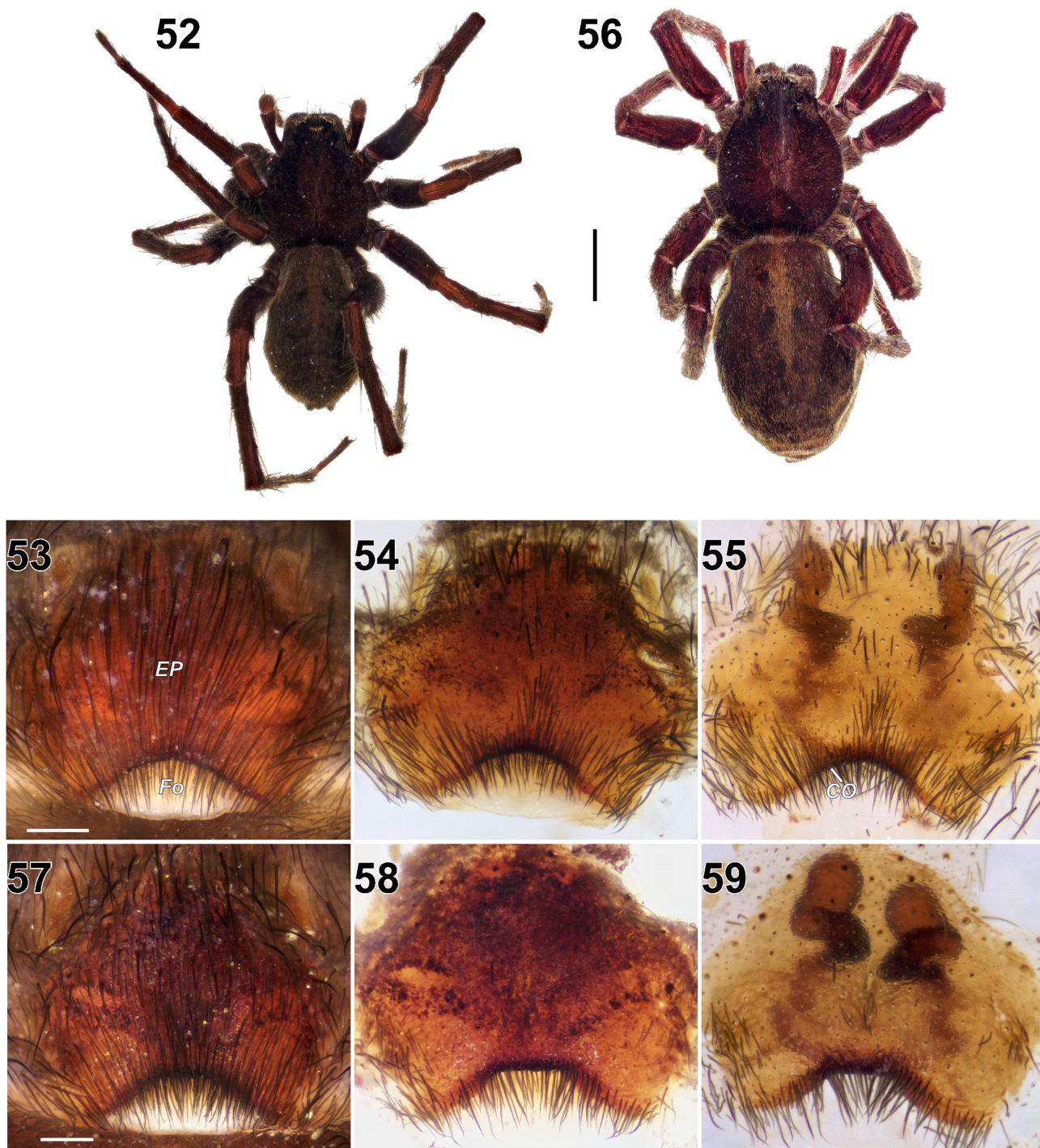
Distribution. Known only from the type locality (Figs 71–72).

TABLE 11. Distinguishing features of *Pamirosa* species.

Character	<i>P. alaica</i> sp. nov.	<i>P. archalturica</i> sp. nov.	<i>P. kudratbekovi</i>	<i>P. transalaica</i> sp. nov.
Males				
Tip of cymbium	Modified, bent dorsally	Unmodified	Modified, bent dorsally	Unmodified
Conductor (<i>Cn</i>) in ventral view	Triangular	Square	Triangular	Oval
Tegular apophysis (<i>TA</i>) in ventral view	Γ-shaped, extends 1/4 beyond conductor	Γ-shaped. extends 1/2 beyond conductor	Irregular-shaped, extends 1/3 beyond conductor	Γ-shaped, extends 1/4 beyond conductor
Prolateral process of tegular apophysis (<i>PP</i>)	Ventrally-directed, spine-like in prolateral view	Ventrally-directed, digitiform in prolateral view	Prolateral-directed, triangular in prolateral view	Prolateral-directed, almost rectangular in prolateral view
Secondary prolateral process of tegular apophysis (<i>SP</i>)	Poorly developed	Well developed	Poorly developed	Poorly developed
Retrolateral process of tegular apophysis (<i>RP</i>)	Semicircular	Hook-shaped	Semicircular	Semicircular
Proximal part of embolus (<i>PE</i>) in ventral view	Almost circular, smoothly rounded	Semicircular, steeply curved	Almost circular, smoothly rounded	Almost circular, with slightly indented retro-posterior margin
Basoembolic apophysis (<i>BA</i>)	With more developed posterior lobe	With anterior and posterior lobes equal in size	With more developed posterior lobe	With more developed posterior lobe
Tip of terminal apophysis (<i>Tr</i>)	Clow-like	Blunt	Clow-like	Clow-like
Dorsal process of embolic division (<i>DP</i>) in dorsal view	Trapezoidal	Elongated triangle-shaped	Isosceles triangle-shaped	Trapezoidal
Distal part of embolus (<i>DE</i>)	Without process, coiled	With cone-shaped process and shortened and hooked tip	Without process, coiled	Without process, coiled
Females				
Fovea	Triangular	—	Trapezoidal	Trapezoidal
Copulatory ducts (<i>CD</i>)	Touching each other, form approximately 2 turns around fertilization ducts	—	Not touching each other, form approximately 3 turns around fertilization ducts	Not touching each other, form approximately 2 turns around fertilization ducts
Posterior part of receptacles (<i>Re</i>)	Screw-shaped	—	Screw-shaped	Circular
Heads of receptacles (<i>RH</i>)	Rode-shaped, parallel	—	Elliptical, converging	Kidney-shaped, converging



FIGURES 43–51. Tegulum of *Pamirosa alaica* **sp. nov.** (43–45), *P. archalturica* **sp. nov.** (46–48) and *P. transalaica* **sp. nov.** (49–51). 43, 46, 49—prolateral; 44, 47, 50—ventral; 45, 48, 51—retrolateral. Scale bars: 0.2 mm. Abbreviations: *Cn*—conductor, *PP*—prolateral process of tegular apophysis, *PO*—prolateral outgrowth of tegulum, *RP*—retrolateral process of tegular apophysis, *RR*—retrolateral ridge of tegulum, *SD*—sperm duct, *SP*—secondary prolateral process of tegular apophysis, *TA*—tegular apophysis, *TS*—stalk of tegular apophysis.



FIGURES 52–59. Female habitus (52, 56) and epigyne (53–55, 57–59) of *Pamirosa alaica* **sp. nov.** (52–55) and *P. transalaica* **sp. nov.** (56–59). 52, 56—dorsal; 53, 57—intact, ventral; 54, 58—dissected, ventral; 55, 59—macerated, ventral. Scale bars: 52, 56 = 2 mm; 53–55, 57–59 = 0.2 mm. Abbreviations: CO—copulatory opening, EP—epigynal plate, Fo—fovea.

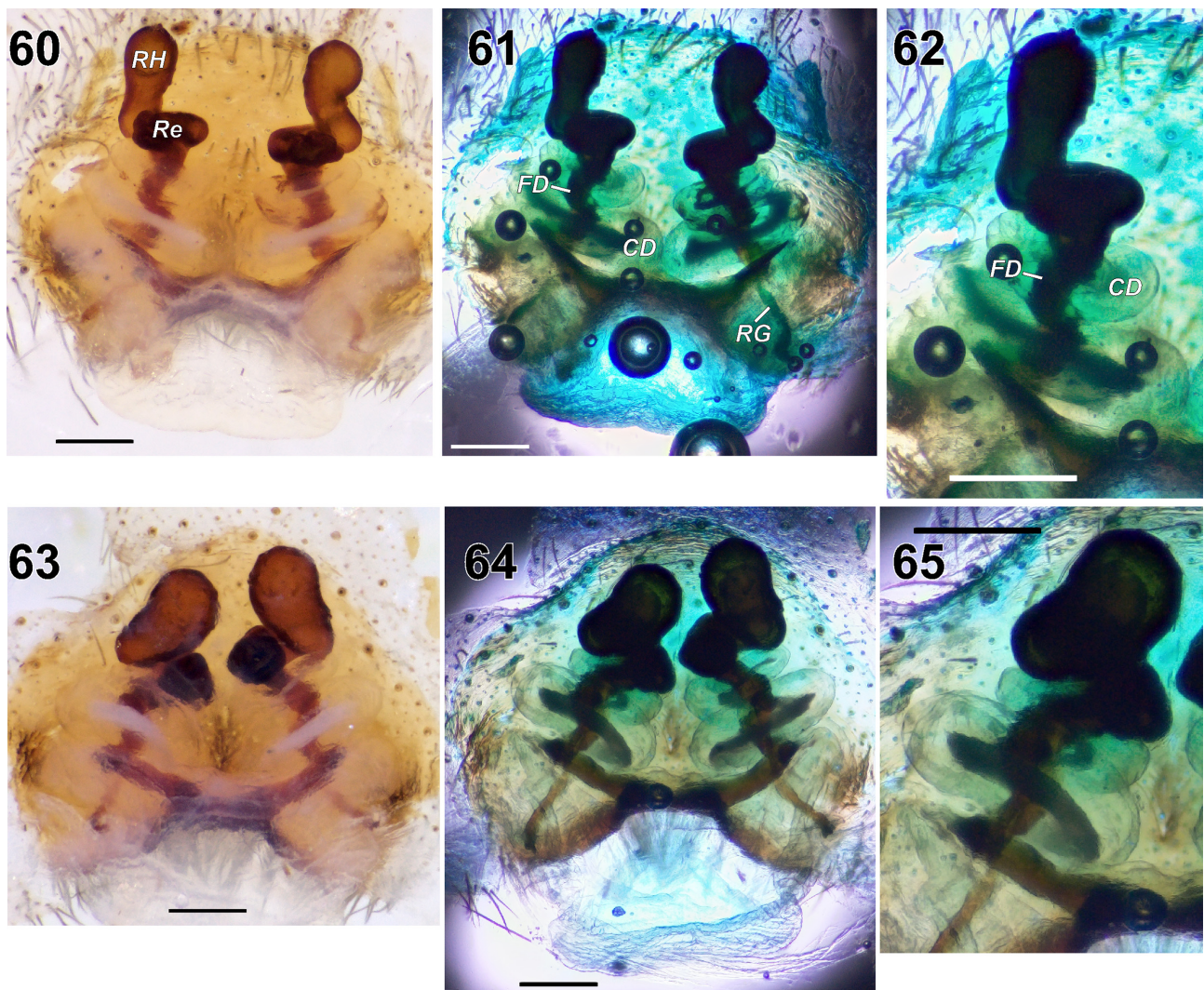
Key to *Pamirosa* species

Males

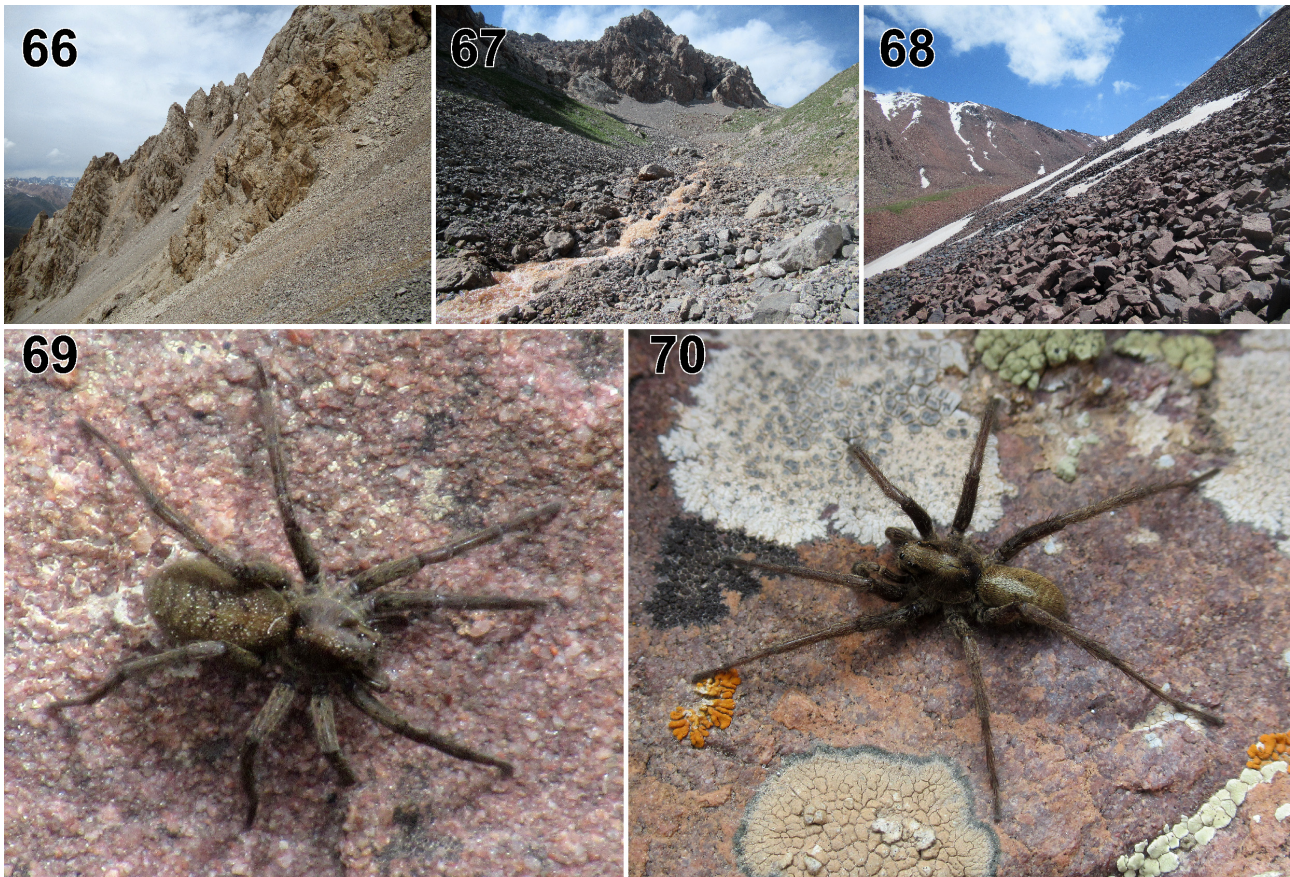
1. Tip of cymbium bent dorsally (Figs 2, 11, 16, figs 5, 7, 9 in Fomichev *et al.* 2024) 2
- Tip of cymbium unmodified (Figs 5, 8, 13, 15, 17, 18) 3
2. Tegular apophysis (*TA*) Γ -shaped, with ventrally-directed prolateral process (*PP*) (Fig. 44) *P. alaica* **sp. nov.**
- Tegular apophysis irregularly shaped with clearly prolateral-directed prolateral process (fig. 22 in the same paper) *P. kudratbekovi*
3. Retrolateral process of tegular apophysis (*RP*) hook-shaped, distal part of embolus with cone-shaped process (*CP*) tip of embolus shortened and hooked (Figs 40, 47) *P. archalturica* **sp. nov.**
- Retrolateral process of tegular apophysis semicircular, distal part of embolus without cone-shaped process with apical part making 2 complete loops (Figs 42, 50) *P. transalaica* **sp. nov.**

Females (female of *P. archalturica* **sp. nov.** is unknown)

1. Fovea (*Fo*) triangular, heads of receptacles (*RH*) parallel (Figs 53–55, 60–61) *P. alaica* **sp. nov.**
- Fovea trapezoidal, heads of receptacles converging (Figs 57–59, 63–64, figs 33–37 in the same paper) 2
2. Posterior part receptacles (*Re*) circular (Figs 63–65) *P. transalaica* **sp. nov.**
- Posterior part of receptacles screw-shaped (figs 36–38 in the same paper) *P. kudratbekovi*



FIGURES 60–65. Female internal genitalia of *Pamirosa alaica* **sp. nov.** (60–62) and *P. transalaica* **sp. nov.** (63–65). 60, 63—macerated, dorsal; 61–62, 64–65—macerated and painted, dorsal. Scale bars: 0.2 mm. Abbreviations: *CD*—copulatory duct, *FD*—fertilization duct, *Re*—posterior part of receptacle, *RG*—rod-shaped gland, *RH*—receptacle head.



FIGURES 66–70. Habitat of *Pamirosa alaica* **sp. nov.** in Tengizbai Mt. Pass (66), *P. archalturica* **sp. nov.** in Archaltur Mt. Range (67) and *P. transalaica* **sp. nov.** near Bardobo Border Outpost (68) and live female (69) and male (70) of *P. transalaica* **sp. nov.**



FIGURES 71–72. Collecting localities of *Pamirosa* spp. Diamond—*P. alaica* **sp. nov.**; inverted triangle—*P. archalturica* **sp. nov.**; triangle—*P. kudratbekovi*; square—*P. transalaica* **sp. nov.**; circle with star—*Evippa* spp.; empty circle—studied locality without Lycosidae records. The frame on Fig. 72 refers to the content of Fig. 71.

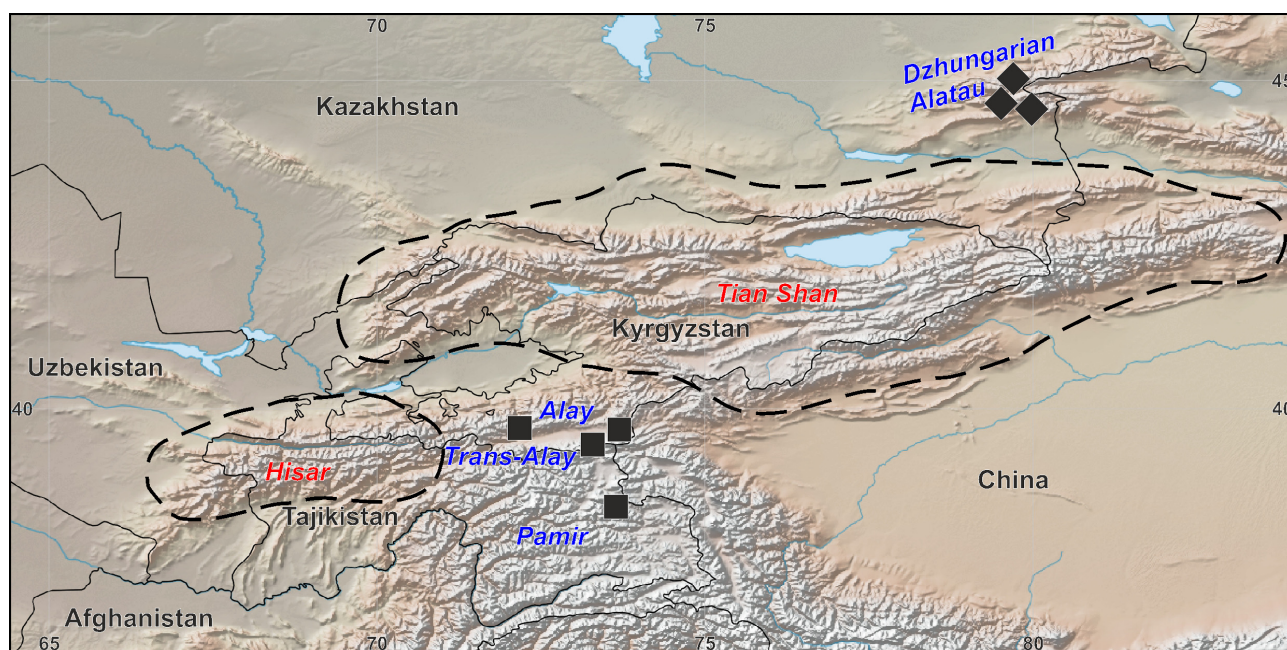


FIGURE 73. Collecting localities of scree-dwelling Lycosidae in Central Asia. Diamond—*Dzhungarocosa* spp.; square—*Pamirosa* spp.; dotted line—unexplored mountain systems. The country names are written in black font. The names of explored mountain systems are written in dark blue font. The names of unexplored mountain systems are written in red font.

Discussion

As shown by Fomichev *et al.* (2024), alpine Lycosidae exhibit an increasing level of generic endemism from north to south. This increase is accompanied by a decreased representation of widespread genera, such as *Acantholycosa* Dahl, 1908 and *Sibirocosa* Marusik, Azarkina & Koponen, 2004 (Pardosinae), which have Holarctic and East Palaearctic range, respectively. Widespread genera are replaced by others with much smaller ranges but similar lifestyle (e.g., *Dzhungarocosa* Fomichev & Marusik, 2017; *Gulocosa* Marusik, Omelko & Koponen, 2015). In this regard, when the first author set out on an expedition to the Alai/Trans-Alai, we expected to discover another undescribed genus of scree-dwelling wolf spiders. However, the highland screes of the Alai and Trans-Alai turned out to be inhabited by *Pamirosa*, the same genus as in the Pamirs. It is likely that *Pamirosa* is widespread in the highlands of Central Asia, and the number of yet-undescribed species may number in tens. Species of this genus are not easy to collect because they prefer inaccessible highlands. *Pamirosa*, like other scree-dwelling wolf spiders, is extremely mobile and easily hides from a slow-moving collector in deep crevices between stones. Another problem is the low population density of *Pamirosa* species, even in suitable habitats. In the mountains of Southern Siberia, a collector can gather dozens of scree-dwelling Lycosidae in a single day (see, for example, “Material examined” for *Acantholycosa sayanensis* Marusik, Azarkina & Koponen, 2004 in Fomichev 2021). In contrast, when searching for *Pamirosa* specimens, only a few are typically found over the course of an entire day. In some places, the ecological niche of *Pamirosa* may be occupied by large species of *Evippa* Simon, 1882 (Evippinae). At least in a number of localities in the Pamirs and Alai, when using the same methods of searching for spiders, large-sized *Evippa* species were found instead of *Pamirosa* (Figs 71–72). Similar data are available from the Hindu Kush (Afghanistan) and the Karakorum (India or Pakistan) (Miller & Buchar 1972; Sankaran & Caleb 2023). There is a significant gap in the study of high-altitude Lycosidae in the mountains of Central Asia, including Hisar Mountain Range in Tajikistan and Uzbekistan, and the Tian Shan Mountains in Kyrgyzstan and Kazakhstan (Fig. 73). Scree is abundant in these mountains, so whether *Pamirosa*, *Dzhungarocosa* or another yet-undescribed genus of wolf spiders inhabits these gaps is a promising subject for further research.

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