

Two new *Pergamasus* species (Acari: Mesostigmata: Parasitidae) from Slovakia

Kamila Ondřejková^a, Peter Fend'a^a, Lucia Švecová^a

^a Department of Zoology, Faculty of Natural Sciences, Comenius University, Ilkovičova 6, 84215 Bratislava, Slovakia.

Original research

ABSTRACT

Two new species from the territory of Slovakia are described: *Pergamasus holecova* n. sp. from the Little Carpathians and *Pergamasus saxicolis* n. sp. from the highest areas of the High Tatras. We now recognize four species groups within the subgenus *Pergamasus* s. str.: *alpinus*, *athiasae*, *beklemischevi* and *crassipes*. Both new species belong to the *beklemischevi* species group. An identification key for males and females of the *beklemischevi* species group is provided. Distribution of *beklemischevi* species group is discussed.

Keywords new species description and distribution; identification key; *beklemischevi* species group

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Introduction

Mites in the genus *Pergamasus* are relatively large predators commonly found in the upper soil layers, within litter, or in the nests of birds and small ground mammals. Within *Pergamasus*, three subgenera are recognized: *Triadogamasus*, *Thenargamasus*, and *Pergamasus* s. str. (for subgenus identification, see Hruzová and Fend'a, 2018). Athias-Henriot (1967) identified three types of spur formation on the tibia II of males within the subgenus *Pergamasus* s. str., to which Juvara-Balş (1970a) subsequently added a fourth type. Based on the number and shape of these tibial spurs, we now recognize four species groups within *Pergamasus* s. str.: *alpinus*, *athiasae*, *beklemischevi* and *crassipes*. Species within the *beklemischevi* group are characterized by males that possess two leaf-like apophyses and lack additional protuberances on tibia of their second pair of legs. Until now, this species group has included seven species found mostly in Central and Eastern Europe, with most records concentrated in the Carpathian Arc. Two new species are described in this paper.

For the genus *Pergamasus*, it is typical that males are easily distinguishable from each other, primarily based on the spurs on the second pair of legs, while the diagnostic features of females, such as the endogynium, are less reliable and often variable. For this reason, males are more suitable as holotypes.

Material and methods

The mites were collected by sieving or sampling forest litter, mosses and soil in Slovakia. Subsequently, the mites were extracted from the substrate into 70% ethanol using Berlese funnels and mounted in chloralhydrate based medium on glass slides. The mites were observed under a Zeiss Axioscope 5 microscope, photographed with a Zeiss AxioCam 208 color camera, and measured using the Labscope v. 2.9.1 software. All measurements are reported in

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Corresponding author

Lucia Švecová^{ID}:

svecova90@uniba.sk

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micrometers. If measurement of a specific individual was not possible, “NA” is indicated. Individuals were measured as follows: idiosoma length – from the most anterior point of the idiosoma to its most posterior point; idiosoma width – at the level of coxae IV; setae length – from the base (included) to the apex; length of tarsus IV – from the proximal edge of the basitarsus to the apex, excluding the ambulacrum. On the legs and pedipalps, anterior or posterolateral positioning and naming of setae and other structures (spurs, tubercles) were applied according to Evans (1963) and Evans & Till (1979). The designation of idiosomal chaetotaxy and poroidotaxy (lyrifissures) follows Lindquist & Moraza (1998), and adenotaxy (dermal glands) follows Johnston & Moraza (1991), with several adaptations for Parasitidae according to Witaliński (2020).

Results

Description of new species

Genus *Pergamasus* Berlese, 1903

Type species: *Acarus crassipes* Linnaeus, 1758

beklemischevi species group

Athias-Henriot 1967: 687 (listed as 3rd type)

Juvara-Balş 1970b: 159; 1976: 18

Pergamasus holecovae n. sp.

Zoobank: [6DAEA03A-1AD9-4FFF-B422-70F09AF5A5F7](https://doi.org/10.24349/vnn6-srsn)

Figures 1–6

Diagnosis

Male — Gnathotectum with three distinct prongs. The middle prong is the longest, wide at the base, tapering anteriorly into a short thin tip. The lateral prongs are wide and truncated. The corniculi are slender, adaxially convex in the proximal half. The cheliceral fixed digit is straight, with a small sharp or rounded tooth apically. There are 1-2 small teeth ahead of the pilus dentilis, and one rounded tooth near the pilus dentilis, followed by a ridge with 4-6 similarly small, pointed or rounded teeth. Proximally from these teeth is one larger pointed lamellar tooth. Coxa II with a distinct posterolateral tubercle located near the distal margin; trochanter II with a dorsal oval tubercle carrying a seta; femoral apophysis is slender, proximally convex, and with a concave distal margin. Genu II ventrally bears a small quadrangular apophysis, apically cross-striated, with a small anterolateral tubercle approximately halfway along the segment. Tibia II has two apophyses - an anterolateral rectangular apophysis apically cross-striated, located in the proximal half of the tibia, and a dorsal rectangular apophysis that is longitudinally striped and slightly wavy. Basitarsus II with a prominent triangular tubercle dorsally.

Female — Gnathotectum with five prongs, the central prong being the longest and most prominent. It is wider at the base and tapers considerably from the middle. The lateral prongs are shorter and thinner. Presternal plates trapezoidal, not touching each other. The epigynum is subtriangular, with a narrow anterior tip. The anterolateral margin is wavy, with a small incision at the lateral angle that gives the appearance of a tooth. The posterior edge is straight. The endogynium has a round endogynial sac without teeth, with kidney-shaped or bean-shaped spherules with smooth edges. The stipule is as long as the spherules or little bit longer, apically divided into two or more very short branches. The trabeculae are well-developed, narrow, bent backwards at the anterior end, with adaxial protrusions in the anterior third, which are long and narrow, pointing slightly posteriorly.

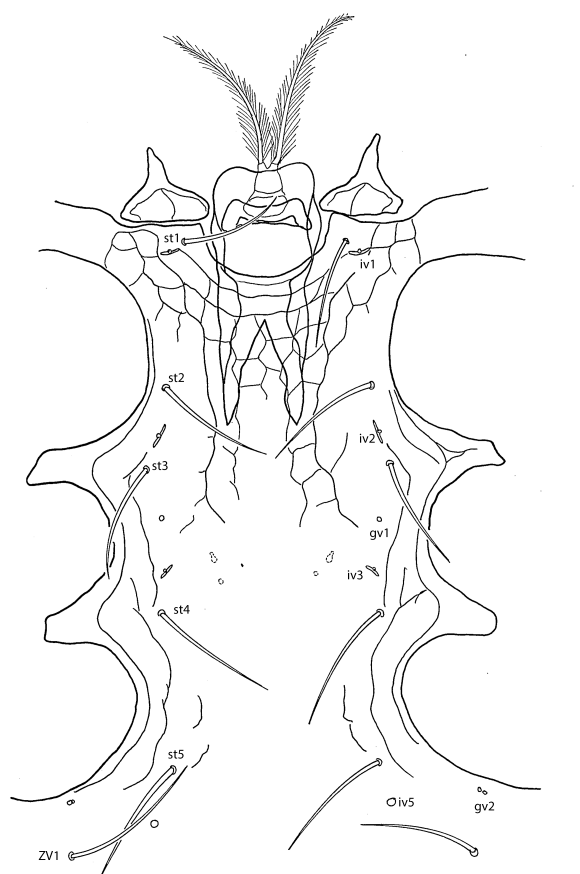


Figure 1 *Pergamasus holecovae* n. sp. Male. Sternogenital shield, presternal shields, tritosternum and genital lamina. Scale bar 50 μ m.

Description

Male (Figures 1–3)

Dorsal idiosoma — Length 1147–1296 ($n = 10$), holotype 1210, width 662–800, holotype 727. The dorsal shield is entire, bearing 21 pairs of podonotal setae; the opisthodosum is polytrichous. Setae length ($n = 5$; in parentheses holotype): j1 = 110–140 (110), j2 = 93–114 (NA), j3 = 115–122 (105), j4 = 101–116 (112), j5 = 83–116 (NA), j6 = 102–113 (NA), r3 = 83–102 (90), z1 = 35–60 (51), J1 = 89–119 (106), Z1 = 114–124 (106). The peritremes are well-developed, without villosity, extending from the posterior margin of coxae III to the setae j3. The podonotal region with 6 pairs of lyrifissures (idj4, idj6, idz1, idz3, idz6, ids4) and 4 pairs of glands (gdj2, gds4, gdz5, gdz6). The opisthonotal region with 8 pairs of lyrifissures.

Ventral idiosoma — (Figure 1) – Tritosternum with a quadrangular base, wider posteriorly, narrowing anteriorly, with two long feathered laciniae. The genital lamina anteriorly bilobed and strongly sclerotized, extending posteriorly between the bases of setae st2 and st3. Presternal plates are triangular, with narrow, more strongly sclerotized anterior tips. The sternal shield has a semicircular anterior notch, with prominent polygonal reticulation in the anterior part - between setae st1 and st3. The endopodal shields are more strongly sclerotized than the sternal shield. The sternal setae are simple. Setal lengths: st1 = 74–85 (64), st2 = 72–94 (75), st3 = 59–83 (64), st4 = 74–102 (75), st5 = 79–105 (92), ZV1 = 101–117 (101), JV1 = 93–108 (103). Lyrifissures iv1 are located posterolaterally to the setae st1; lyrifissures iv2 are between st2 and st3, slightly closer to st3; lyrifissures iv3 are about a quarter of the distance between st3 and st4, closer to st4. Distance between iv3 equal to distance between st4. Two pairs of small

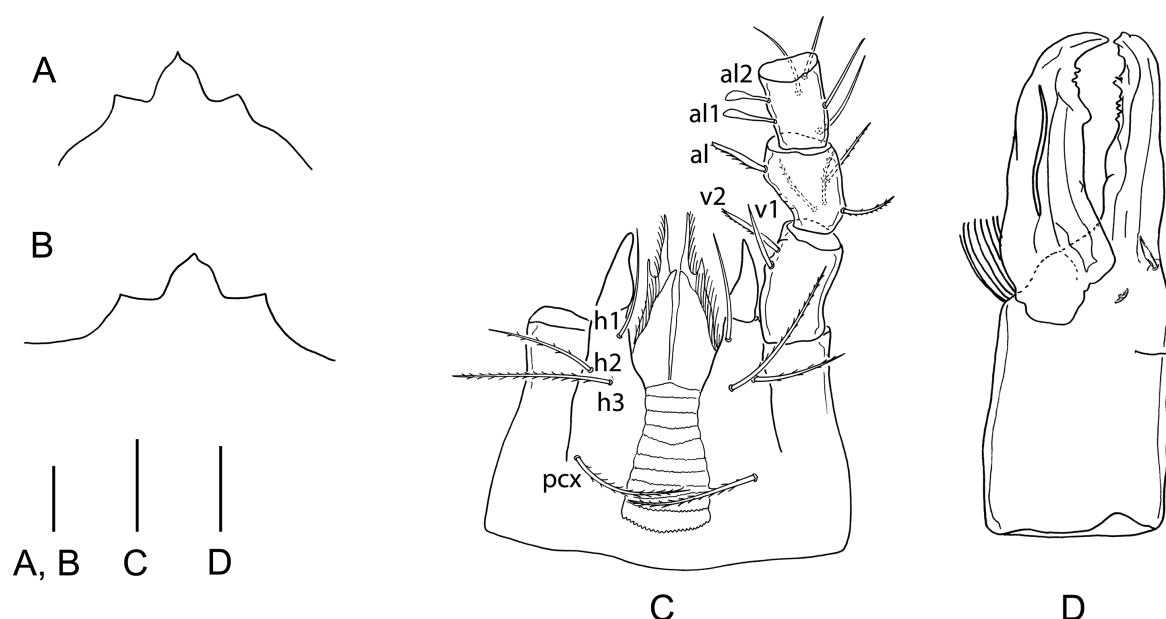


Figure 2 *Pergamasus holecovae* n. sp. Male. A, B – gnathotectum, different specimens; C – hypostome; D – chelicera, antiaxially. Scale bars 50 µm.

round (posterior ones) or oval cuticle thickenings present just below and above the level of iv3, located in the half distance between iv3 and longitudinal body axis. Gland openings gv1 in about one third of the distance between st3 and st4, closer to st3. Distance between gv1 equal to distance between st4. Glands gv2 with double openings. Lyrifissures iv5 are slightly further apart than st5. The distance between iv5 and st5 is about a half of the distance between iv5 and ZV1.

Gnathosoma — (Figure 2) – Gnathotectum (Fig. 2A, B) with three prominent prongs. The middle one is the longest, wide at the base, tapering anteriorly into a short thin tip. The lateral prongs are wide and truncated. The hypostome (Fig. 2C) has 11-12 rows of teeth; setae h1 smooth, h2 and h3 are weakly feathered; pcx setae are feathered. Setal lengths: h1 = 82–94 (105), h2 = 73–87 (85), h3 = 110–129 (132), pcx = 107–118 (96). The corniculi are slender, adaxially convex in the proximal half. The palptrochanter has weak protrusions, with setae v1 and v2 each located on a separate, small, rounded tubercle; v1 is smooth, and v2 is feathered. Chelicerae (Fig. 2D). The fixed digit is straight, with a small sharp or rounded tooth apically. There are 1-2 small teeth ahead the pilus dentilis, one big rounded or pointed tooth near the pilus dentilis, followed by a ridge with 4-6 similarly small pointed or rounded teeth. Proximally from these teeth is one larger pointed lamellar tooth. The movable digit has a slightly curved apex, with 4-5 small teeth and one large proximal tooth. The spermatotreme is long and narrow.

Legs — (Figure 3) – Tarsus I = 319–364 (343), tarsus IV = 382–407 (370). Leg I (Fig. 3A) – Seta av on coxa, al on trochanter, al1, al2, pl1, pl2, v1, pd2 on femur, al1, al2 on genu, av2, al2 on tibia pilose; trochanter with anterolateral protuberances. Leg II (Fig. 3B) – Coxa has a distinct posterolateral tubercle near the distal margin; trochanter has an anterolateral oval tubercle bearing seta al1; femoral apophysis is slender, proximally convex and with a concave distal edge; genu ventrally bears a small quadrangular apophysis and a small anterolateral protuberance in the middle of the article, genual apophysis cross-striped apically; tibia with a smaller rectangular apophysis anterolaterally and one longer, rectangular apophysis dorsally, anterolateral apophysis is cross-striped apically, located in the middle of article, dorsal apophysis is longitudinally striped and slightly wavy; basitarsus with distinct triangular hump,

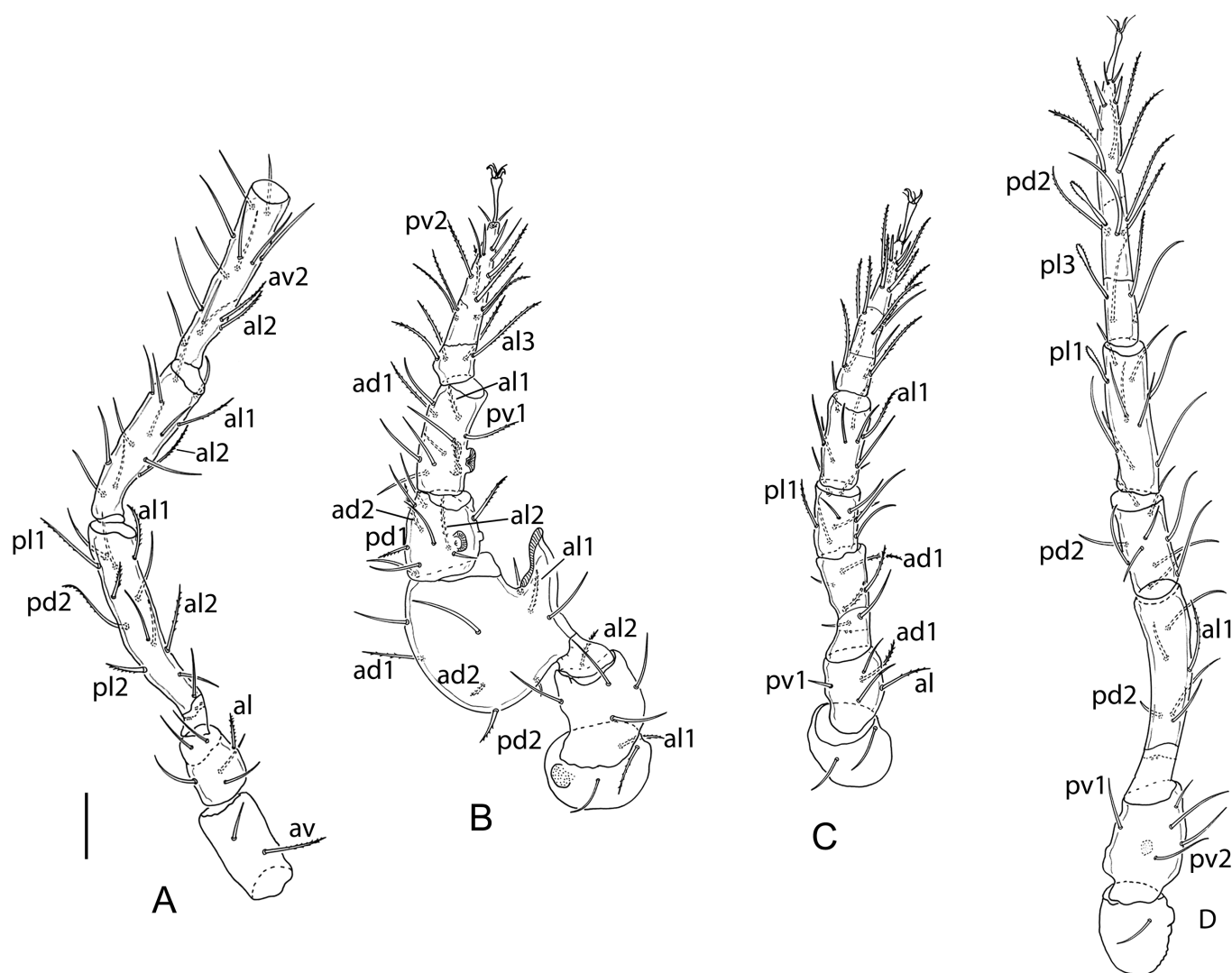


Figure 3 *Pergamasus holecova* n. sp. Male. Legs. A – leg I from ventral view (without tarsus); B – leg II from posterolateral view; C – leg III from ventral view; D – leg IV from ventral view; A–D – holotype. Scale bar 100 μ m.

resembling elbow, dorsally. Setae av on coxa, al1 on trochanter, al1, al2, ad1, ad2, pd2 on femur, al1, al2, ad2, pd2 on genu, al1, ad1, pv1 on tibia, av2, pv2, mv, al2, al3, pl2, pl3, ad2, ad3, pd2, pd3, md on tarsus pilose. Leg III (Fig. 3C) – Setae al, ad1 on trochanter, al1, ad1 on femur, pl1 on genu, al1 on tibia, al1, al2, al3, pd2, av2, pv2, mv, pl1, pl2 and pl3 on tarsus pilose. Leg IV (Fig. 3D) – Setae al1 on femur, al1, pl1, av2, pv2, al2 and al3 on tarsus pilose, setae pl2 and pl3 on tarsus and pl1 on tibia extended apically and pilose; coxa with distinct anterolateral protuberance, trochanter with two protuberances: one quadrangular is situated posterolaterally and one smaller is oval and situated dorsally.

Female (Figures 4–6)

Dorsal idiosoma — (Figure 4) – Length = 1154–1248, width = 722–786 (n = 10). Dorsal shield entire, bearing 21 pairs of podonotal setae, opisthodorsum polytrichous, setae are relatively long, of similar thickness. Setae length (n = 5): j1 = 119–141, j2 = 104–123, j3 = 106–129, j4 = 116–141, j5 = 105–128, j6 = 106–122, z1 = 42–65, r3 = 110–121, J1 = 89–122, Z1 = 114–130. Peritremes without villosity, extending from the level of the posterior margin of coxae III to the level of setae j3. Peritremal shields are fused with dorsal shield along entire

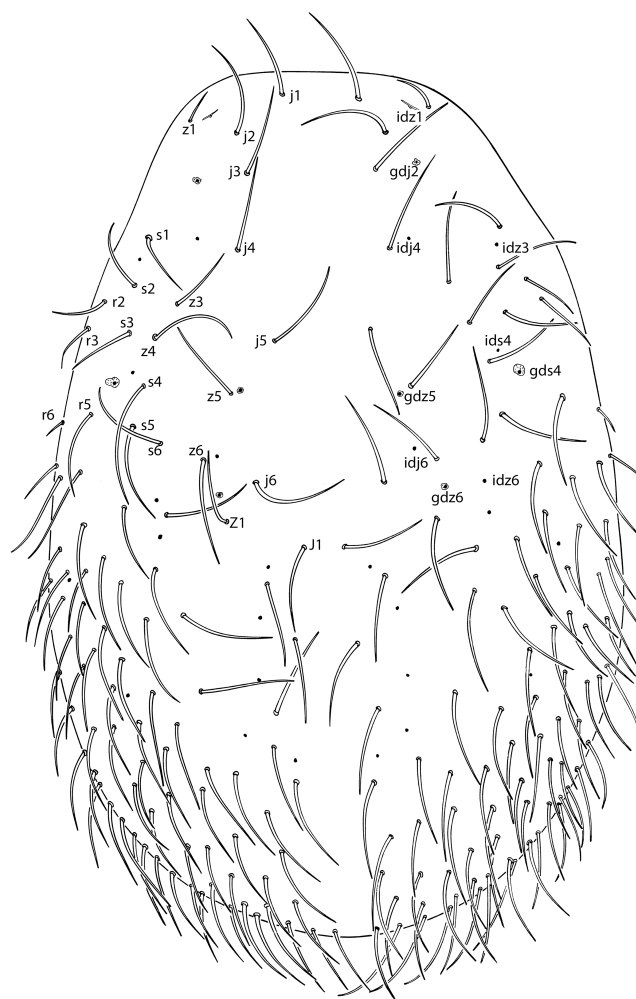


Figure 4 *Pergamasus holecovae* n. sp. Female. Dorsal idiosoma. Scale bar 100 μ m.

length, with ventral shield only anteriorly. Poroidotaxy and adenotaxy as in males.

Ventral idiosoma — (Figures 5, 6A–E) – Distinctive polygonal reticulation and dimples are present. The dimples are most prominent close to anterior and lateral margins of sternal shield, in anterolateral parts of paragnathia and in the posterolateral and posterior part of the epigynum. The presternal plates are trapezoidal, close to each other medially but do not touch or merge. The sternal shield with three pairs of setae (st1 = 99–128, st2 = 98–133, st3 = 91–125), the lyrifissures iv1 are located posterolaterally to setae st1, and lyrifissures iv2 are located between st2 and st3, equidistant or slightly closer than setae st2. Gland openings gv1 are located very close to the posterior margin of the sternal shield and are further apart than setae st3. The paragnathia (Fig. 6A) are relatively wide, with the anterolateral region having many dimples. Lyrifissures iv3 are relatively short, equidistant from st4 and the anterior margin of the paragnathium, setae st4 = 99–116. The epigynum (Fig. 6B) is subtriangular, with a narrow anterior tip, a wavy anterolateral margin, and a small tooth-like incision at the lateral angle. The posterior margin is straight, st5 = 95–112, lyrifissures iv5 are located at the posterior margin of the epigynum. Glands gv2 have a double opening. The endogynum (Fig. 6C–E) has a rounded endogynial sack without denticles, spherules that are kidney-shaped or bean-shaped and have smooth margins. The stipule is as long as the spherules, or slightly longer, apically divided into two or more very short branches. The trabeculae are well developed, narrow, bent

Figure 5 *Pergamasus holecovae* n. sp. Female. Ventral idiosoma. Scale bar 100 μ m.

backward at the anterior end, and have long, narrow adaxial protrusions located in the anterior third. The opisthogaster has 17-23 pairs of setae, ZV1 = 108-134, JV1 = 105-126. Lyrifissures ivo2, ivo3 are present.

Gnathosoma — (Figure 6F, G) – Gnathotectum (Fig. 6F) with 5 prongs, the middle one longest and most extended, wider at basis, significantly narrower from the middle, lateral prongs shorter and narrower. Hypostome with 12-14 rows of denticles, h1 (105–121) very weakly feathered, h2 (91–100), h3 (124–154) and pcx (113–123) feathered. Palptrochanter with smooth seta v1 and feathered seta v2. Chelicerae (Fig. 6G). Digitus mobilis with 4 big teeth, digitus fixus with several small teeth ahead of pilus dentilis and wavy edge with 4 distinct waves behind pilus dentilis.

Legs — (Figure 6H) – Tarsus I = 334–373, tarsus IV = 376–440. Leg II (Fig. 6H) – Setae al, pl on trochanter, al1, al2, pl1 on femur, al1, al2 on genu, al1, al2, v1, v2 on tibia, ad2, ad3, pl1, pl2, av2, pv2 and mv on tarsus pilose. Leg IV – Coxa with distinct triangular protuberance anterolaterally, trochanter IV with quadrangular protuberance posterolaterally and oval protuberance dorsally.

Etymology

The species is dedicated to an excellent entomologist prof. RNDr. Milada Holcová, Csc. who collected the mites and thanks to whom we were able to discover this beautiful species.

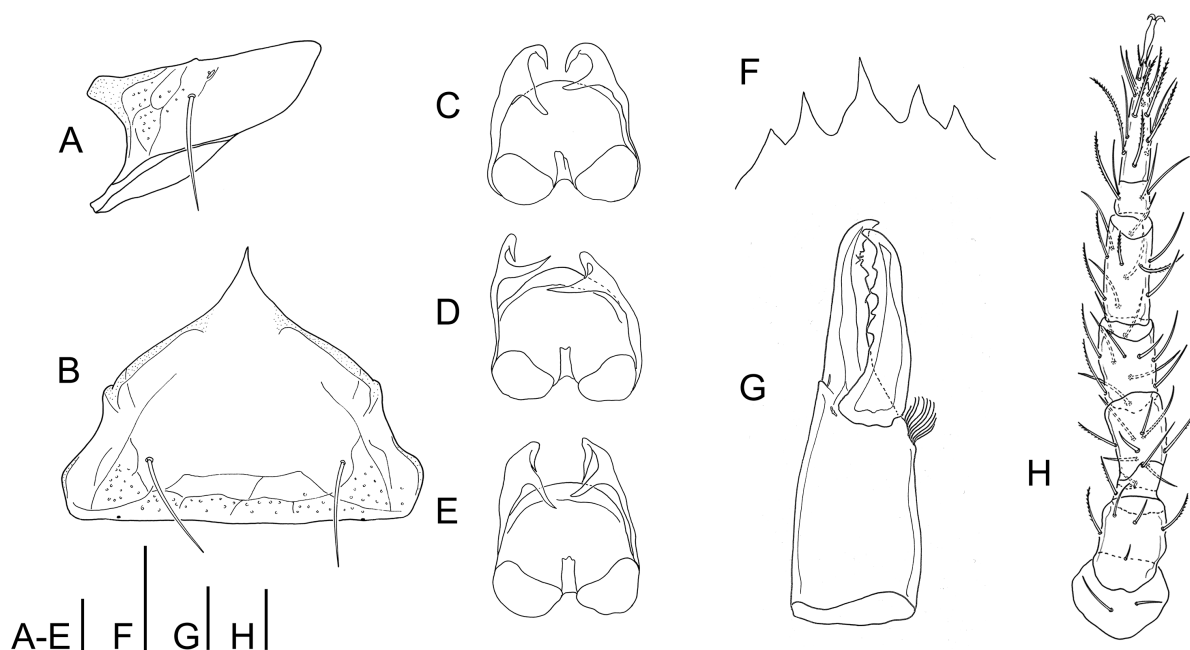


Figure 6 *Pergamasus holecovae* n. sp. Female. A – paragnathum; B – epigynum; C, D, E – endogynium, different specimens; F – gnathotectum; G – chelicera antiaxially; H – leg II. Scale bars A-G 50 µm, scale bar H 100 µm.

Type material

Holotype — 1 ♂ – Little Carpathians, Dúbravská Hlavica, 48°11' N, 17°00' E, 360 m a.s.l., oak-hornbeam forest, leaf litter, 2 Aug. 2006, leg. M. Holecová, slide PH1MA16/10.

Paratypes — 3 ♀♀, 1 ♂ – Little Carpathians, Devínska Kobyla, tourist crossroads Červený kríž, 48°10' N, 17°00' E, 380 m a.s.l., oak-hornbeam forest, leaf litter, 2 Aug. 2006, leg. M. Holecová, slides PH2HO11/08, PH3HO11/08, PH4HO11/08, PH7HO11/08; 4 ♂♂ – Little Carpathians, Dúbravská Hlavica, 48°11' N, 17°00' E, 360 m a.s.l., oak-hornbeam forest, leaf litter, 26 May 2006, leg. M. Holecová, slide PH5MA11/10; 1 ♂ – Little Carpathians, NPR (national nature reserve) Devínska Kobyla, Úzky les, 48°10' N, 16°59' E, 300 m a.s.l., oak-hornbeam forest, mosses, 26 Nov. 2010, leg. J. Kraljik, slide PH6SU25/10.

Type deposition — Holotype and all paratypes are deposited in Zoological Collection of Faculty of Natural Sciences, Comenius University, Bratislava, Slovakia.

Material not included in type series — (180 ♀♀, 180 ♂♂). 31 ♂♂ – Little Carpathians, Devínska Kobyla, tourist crossroads Červený kríž, 48°10' N, 17°00' E, 380 m a.s.l., oak-hornbeam forest, leaf litter, 3 Jun. 2005, leg. M. Holecová; 10 ♀♀, 7 ♂♂ – ibidem, 13 Jul. 2005; 2 ♀♀, 2 ♂♂ – ibidem, 21 Apr. 2006; 12 ♀♀, 10 ♂♂ – ibidem, 30 Jun. 2006; 21 ♀♀, 11 ♂♂ – ibidem, 2 Aug. 2006; 1 ♀, 3 ♂♂ – ibidem, 2 Sept. 2006; 1 ♀, 7 ♂♂ – ibidem, 1 Nov. 2006; 1 ♀, 4 ♂♂ – ibidem, 6 Jan. 2007; 4 ♀♀ – Little Carpathians, NPR Devínska Kobyla, Úzky les, 48°10' N, 16°59' E, 300 m a.s.l., 31 May 2006, oak-hornbeam forest, leaf litter, leg. M. Holecová; 2 ♀♀ – ibidem, 3 May 2005; 8 ♂♂ – ibidem, 13 Jul. 2005; 1 ♀ – ibidem, 2 Sept. 2006; 4 ♀♀, 1 ♂ – ibidem, 2 Oct. 2006; 3 ♀♀, 1 ♂ – ibidem, 9 Dec. 2006; 8 ♂♂ – ibidem, 12 Jun. 2009; 1 ♂ – ibidem, 15 Oct. 2001, soil sample, leg. P. Fend'a; 7 ♀♀, 6 ♂♂ – ibidem, 19 Jun. 2011; 1 ♀ – ibidem, mosses, 26 Nov. 2010, leg. J. Kraljik; 1 ♀, 2 ♂♂ – Little Carpathians, Dúbravská Hlavica, tourist crossroads, 48°11' N, 17°00' E, 360 m a.s.l., oak-hornbeam forest, leaf litter, 29 Apr. 2005, leg. M. Holecová; 3 ♀♀, 9 ♂♂ – ibidem, 3 Jun. 2005; 2 ♀♀ – ibidem, 13 Jul. 2005; 20 ♀♀, 23 ♂♂ – ibidem, 8 Oct. 2005; 11 ♀♀ – ibidem, 19 Apr. 2006; 9 ♀♀, 23 ♂♂ – ibidem, 26 May 2006; 5 ♀♀ – ibidem, 28 Jun. 2006; 15 ♀♀, 9

♂♂ – ibidem, 2 Aug. 2006; 2 ♀♀, 1 ♂ – ibidem, 2 Sept. 2006; 1 ♂ – ibidem, 1 Oct. 2006; 2 ♂♂ – ibidem, 1 Nov. 2006; 3 ♀♀ – ibidem, 5 Dec. 2006; 2 ♀♀, 8 ♂♂ – ibidem, 4. 1. 2007; 14 ♀♀ – Little Carpathians, Lošonec, PR Lošonský háj, 48°28' N, 17°24' E, 260 m a.s.l., oak forest with *Quercus cerris*, leaf litter, 3 Nov. 2000, leg. M. Holecová; 2 ♀♀ – Little Carpathians, PR (nature reserve) Katarínka pod kláštorom, 48°33' N, 17°32' E, 320 m a.s.l., oak forest with *Quercus cerris*, leaf litter, 16 Jul. 2001, leg. M. Holecová; 1 ♀ – ibidem, 13 Mar. 2002; 1 ♀ – ibidem, 3 Jul. 2001; 8 ♀♀ – Little Carpathians, PR Katarínka, 48°33' N, 17°32' E, 350 m a.s.l., oak forest with *Quercus cerris*, leaf litter, 3 Jul. 2001, leg. M. Holecová; 7 ♀♀ – ibidem, 12 Oct. 2001; 1 ♂ – Little Carpathians, Mokrá dolina, 48°29'20.7" N, 17°19'33.4" E, 473 m a.s.l., beech forest, 22 Oct. 2021, leg. A. Šuláková; 1 ♀ – Little Carpathians, Mokrá dolina, 48°29'32.1" N, 17°19'32.6" E, 433 m a.s.l., maple forest, 22 Oct. 2021, leg. A. Šuláková; 1 ♂ – Little Carpathians, Mokrá dolina, 48°29'04.7" N, 17°19'13.1" E, 476 m a.s.l., beech forest, 22 Oct. 2021, leg. A. Šuláková; 1 ♀ – Little Carpathians, Mokrá dolina, 48°30'02.4" N 17°19'30.7" E, 382 m a.s.l., maple and linden forest, 22 Oct. 2021, leg. A. Šuláková; 1 ♀ – Little Carpathians, Plavecké podhradie, Plavecká priepasť, 48°29'43,8" N, 17°15'58,8" E, 347 m a.s.l., maple and linden forest, 27 Oct. 2021, leg. P. Fend'a.

Remarks

A gnathotectum with three prongs is typical for the subgenus *Triadogamasus*. However, males of this subgenus possess divided corniculi and usually processus axillaris on femur II, as well. Females of the subgenus *Triadogamasus* have an endogynium with conical or pear-shaped spherules. The gnathotectum with three prongs can be found also in males of the subgenus *Pergamasus* s. str., in particular in species *Pergamasus tuberopalpus* Juvara-Balş, 1976 and *Pergamasus meledensis* Willmann, 1941. Males of these species possess the gnathotectum with strong, wide middle prong and one pair of low lateral prongs, while females possess the gnathotectum with 5 prongs, similarly to the females of the new species. The species *P. tuberopalpus* can be easily distinguished from the new species according to strong protuberances on palptrochanter present in both sexes of *P. tuberopalpus*. The species *P. meledensis* can be distinguished by a hole ornamentation of cuticle and male leg II, which is in the species *P. meledensis* similar to other species of *alpinus* species group: tibia II with one proximal apophysis, one bigger leaf-shaped apophysis and one distal tubercle with a seta.

New species was numerous in samples from Devínska Kobyla hill, in addition it was found in oak forests near Lošonec and Katarínka. We did not find it in any other sample from Slovakia, thus it is probably an endemic species of Little Carpathians. It is interesting, that in all three cases of the species with reduced male gnathotectum these are presumably endemic species occurring only in a small area and a reduction of male gnathotectum seems to be a derived character evolved in each species independently.

Pergamasus saxicolis n. sp.

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Figures 7–12

Diagnosis

Male — Gnathotectum with five distinctive prongs. All prongs are at the same level, the central prong is the longest. All prongs of the gnathotectum are pointed and without additional denticles. Cheliceral fixed digit is longer than movable digit, slender, in the whole length it is similarly wide, pointed apically. There is a round edge and one round denticle between apex and pilus dentilis. The edge with 8 small denticles is behind pilus dentilis. Femur II bears a bulky spur with a rounded apex, a convex proximal edge, and a straight distal edge, which is distinctly transversely striated. A processus axillaris is absent, and a smooth seta is present in the axilla of the spur. Genu II with one button-like apophysis close to the distal margin of the article. Tibia II with two apophyses, the smaller apophysis is oval, longitudinally striated and

located obliquely, in the middle of the tibia. The bigger apophysis is leaf-shaped, located in the proximal half of the article.

Female — Gnathotectum has five sharp prongs, with the central one being the longest. The lateral prongs are significantly smaller and may be apically divided. Additionally, supplementary denticles may be present. Presternal plates trapezoidal, reaching each other in the middle. Epigynium subpentagonal, anterolateral margin wavy, followed by a distinct lateral bend and concave margin more posteriorly, posterior margin straight. Endogynium with round or oval spherules and long stipule. The stipule is about twice as long as spherules, apically divided into two or three short divergent branches, one or more small denticles can be present between the branches. Trabeculae well developed, straight posteriorly and bent backwards anteriorly, with large and wide adaxial triangular protrusions approximately in the middle. These protrusions can be divided in several branches and can point slightly posterior. Posterior to the endogynium is an area with a number of small denticles.

Description

Male (Figures 7–9)

Dorsal Idiosoma — Length 1306 (n = 1), width (n = 2; in parentheses holotype) 741–825 (824). The dorsal shield is entire, with 19 pairs of podonotal setae, and the opisthodorsum is polytrichous. Setae length: j1 = 117–123 (123), j2 = 104–109 (117), j3 = 122 (119), j4 = 102–130 (124), j5 = 101–108 (NA), j6 = 120–129 (NA), r3 = 92–95 (85), z1 = 66–77 (57), J1 = 112–114 (120), Z1 = 122 (126). The peritremes are well-developed, without villosity, extending from the posterior edge of coxa III to the level of setae j3. In the podonotal region, there are 7 pairs of lyrifissures (idj2, idj4, idz1, idz3, idz6, ids4, ids6) and 4 pairs of glands (gdj2, gdz5, gdz6, gds4); in the opisthonotal region, 8 pairs of lyrifissures are visible.

Ventral Idiosoma — (Figure 7) – Tritosternum has a quadrangular base and two long, feathered laciniae. The genital shield has a mucronate tip and is extending posteriorly beyond the base of setae st2. The presternal plates are in the shape of an isosceles triangle. The sternal shield has an anterior semicircular notch and a prominent polygonal reticulation, uniformly visible across the shield, with no dimples. The endopodal plates are more distinctly sclerotized than the sternal shield. Setae lengths: st1 = 102–104 (120), st2 = 104–121 (107), st3 = 97–104 (100), st4 = 102–105 (102), st5 = 107–121 (114), ZV1 = 94–128 (110), JV1 = 107–114 (NA). Lyrifissures iv1 are located posterolaterally to setae st1, while iv2 are equidistant to each other as st3, slightly closer to st2 than st3. Lyrifissures iv3 are about a quarter of the distance between st3 and st4, closer to st4, and are positioned closer to each other than st4 are. Two pairs of small, round thickenings of the cuticle are located just above and below the iv3 level, paraxially. The openings of glands gv1 are about a third of the distance between st3 and st4, closer to st3, and are as far apart as st4. Glands gv2 have a double opening. Lyrifissures iv5 are positioned between st5 and ZV1, about a quarter of the distance from st5. Two pairs of lyrifissures are visible on the opisthogaster.

Gnathosoma — (Figure 8) – Gnathotectum (Fig. 8A, B) has five prongs, with the middle prong being the longest. All prongs are sharp and lack additional denticles. Hypostomal setae (Fig. 8C) h1 are smooth, h2 and h3 are weakly feathered, while palpcoxal setae are well feathered. Setae lengths: h1 = 97–110 (110), h2 = 109–122 (110), h3 = 117–157 (145), pcx = 116–128 (102). The hypognathal groove has 12–13 rows of denticles. The corniculi are slender, conical, and slightly tapered paraxially in the apical third. The palptrochanter has a small rounded tubercle proximal to seta v1, which is smooth, while seta v2 is feathered. Chelicerae (Fig. 8D). The fixed digit is longer than the movable one, slender, with a nearly uniform thickness along its length, pointed apically. Between the apex and pilus dentilis, there is a rounded edge and one rounded denticle. At the level of pilus dentilis, there is one prominent blunt tooth, and posterior to it, a ridge with eight small denticles. The movable digit is slender, with a slightly curved apex and 5–6 teeth, the proximal one being the largest. The spermatotreme is relatively short and narrow.

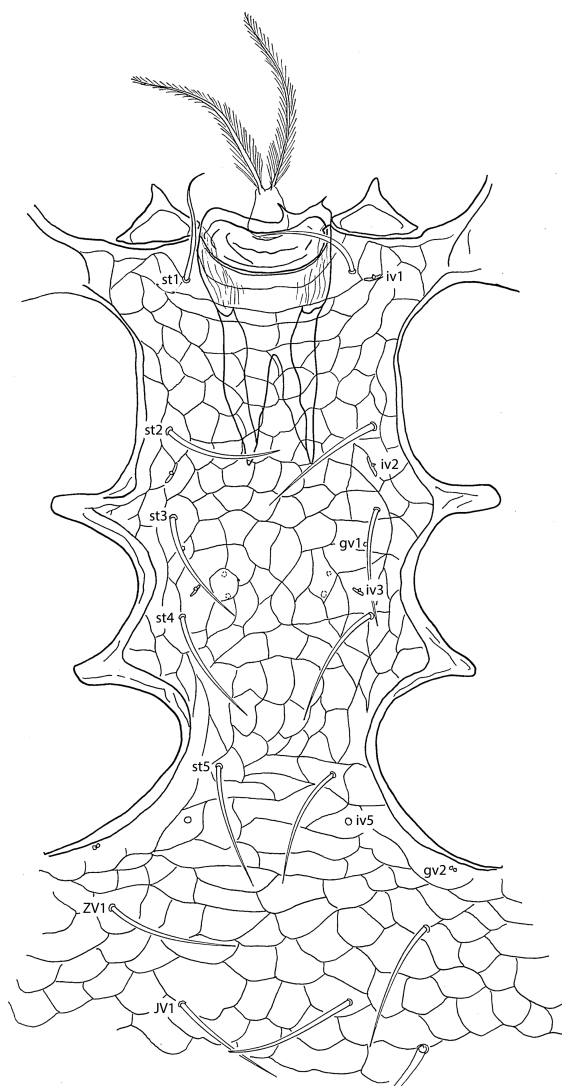


Figure 7 *Pergamasus saxicolis* n. sp. Male. Sternogenital shield, presternal shields, tritosternum and genital lamina. Scale bar 50 μ m.

Legs — (Figure 9) – Tarsus I = 367–379 (359), tarsus IV = 463–485 (437). Leg I (Fig. 9A) – Setae al1, av1 on the trochanter; al1, al2, pl1, ad1, pd1, pd2 on the femur; al1, al2 on the genu; and av2, pv2 on the tibia are feathered. Leg II (Fig. 9B, C) – The femur II has a bulky spur with a rounded apex, a convex proximal edge, and a straight distal edge, which is distinctly transversely striated. There is no processus axillaris, and in the axilla of the spur, there is a smooth seta. On genu II, a button-like spur is located close to the distal margin of the segment. On tibia II, there are two spurs: one smaller, oval, and longitudinally striated, obliquely positioned around the middle of the segment, and the other one is larger, leaf-like, positioned in the proximal half of the segment. Setae al1, ad1, av1 on the trochanter, al1, ad2, pd2 on the femur, al1 on the genu, al1 on the tibia, and av2, pv2, mv, al1, al2, al3, pl1, pl2, pl3, ad2, ad3 on the tarsus are feathered. Leg III (Fig. 9D) – Setae al1, pl1 on the trochanter, ad1, ad2 on the femur, v1, v2 on the tibia, and al1, al2, al3, ad2, pd3, av1, av2, pv1, pv2, mv, pl1, pl2 and pl3 on the tarsus are feathered. Leg IV (Fig. 9E) – Coxa has a weak anterolateral tubercle, and the trochanter has no tubercles. Setae ad1 on the trochanter, v1, v2 on the genu, and v1, v2 on the tibia, as well as al1, al2, al3, pl1, av2, pv2, mv, and md on the tarsus, are feathered,

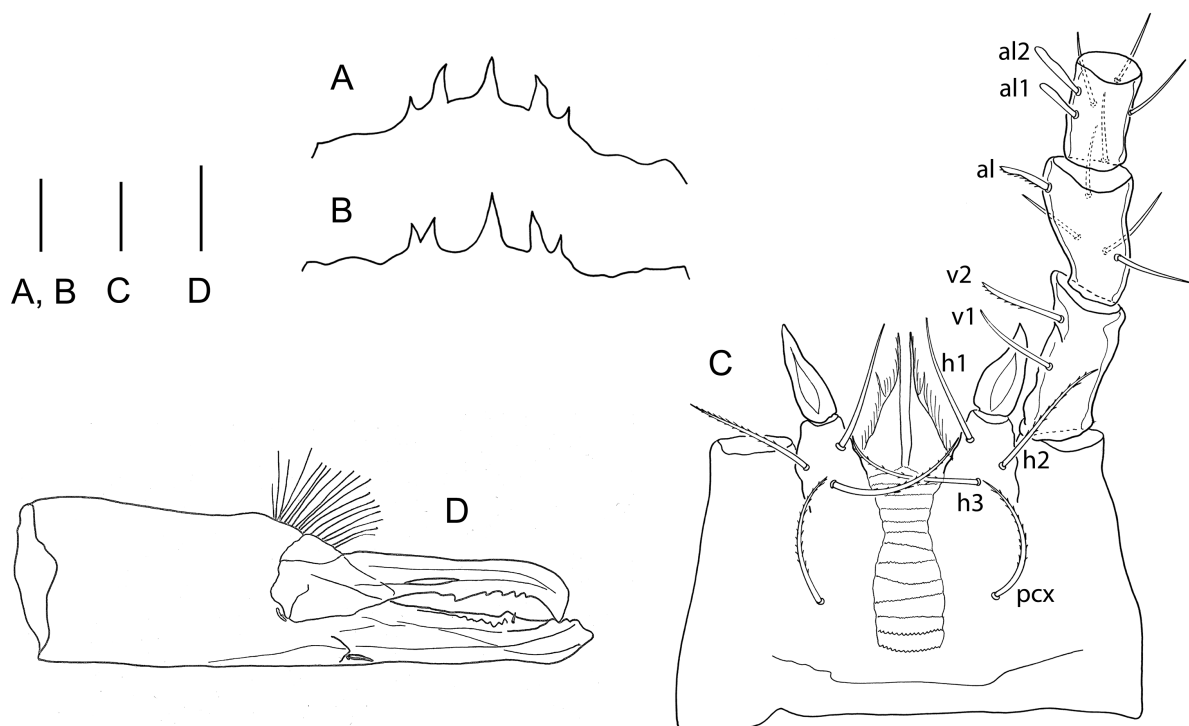


Figure 8 *Pergamasus saxicolis* n. sp. Male. A, B – gnathotectum, different specimens; C – hypostome; D – chelicera, antiaxially; C, D – holotype. Scale bars 50 μ m.

while setae pl2 and pl3 on the tarsus and pl1 on the tibia are widened and feathered.

Female (Figures 10–12)

Dorsal idiosoma — (Figure 10) – Length ($n = 5$) = 1342–1407, width = 797–887. The dorsal shield is entire, bearing 19 pairs of podonotal setae, with a polytrichous opisthodorsum. The setae are relatively long and of similar thickness. Setae length: j1 = 119–129, j2 = 120–129, j3 = 112–126, j4 = 116–130, j5 = 106–122, j6 = 113–127, z1 = 66–76, r3 = 80–97, J1 = 113–137, Z1 = 113–130. Peritremes are well developed, extending from the posterior edge of coxa III to the level of j3 setae, without villosity. The peritremal shields are fused with the dorsal shield along their entire length, and with the ventral shield only in their anterior part. Poroidotaxy and adenotaxy are similar to those in males.

Ventral idiosoma — (Figures 11, 12A–C) – With prominent polygonal reticulation, without dimples. Tritosternum has a well-developed rectangular base and two long, distinctly feathered laciniae. Presternal plates are trapezoidal, merging medially. The sternal shield bears three pairs of setae (st1 = 115–136, st2 = 115–133, st3 = 114–133). Lyrifissures iv1 are relatively long, located posterolaterally to st1 setae. Lyrifissures iv2 are between st2 and st3, equidistant from both, and similarly spaced from each other as st2. The glands gv1 are located near the posterior edge of the sternal shield, further apart than st3 setae. The paragnathial shields (Fig. 12A) are relatively wide, and lyrifissures iv3 are long, located closer to the anterior edge of the paragnathial shields than to st4 setae. Setae st4 = 111–116. The epigynum (Fig. 12B) is subpentagonal, with a wavy anterolateral edge, followed by a pronounced lateral curve. The posterior edge is straight, with st5 = 98–114. Lyrifissures iv5 are located on the posterior margin of the epigynum. Glands gv2 have a double opening. The endogynium (Fig. 12C) contains round to oval spherules and a stipule that is approximately twice as long as the spherules. The stipule is branched into two or three short, diverging branches in its distal third, and may have one or more small teeth in the center. Trabeculae are well developed, straight, curved

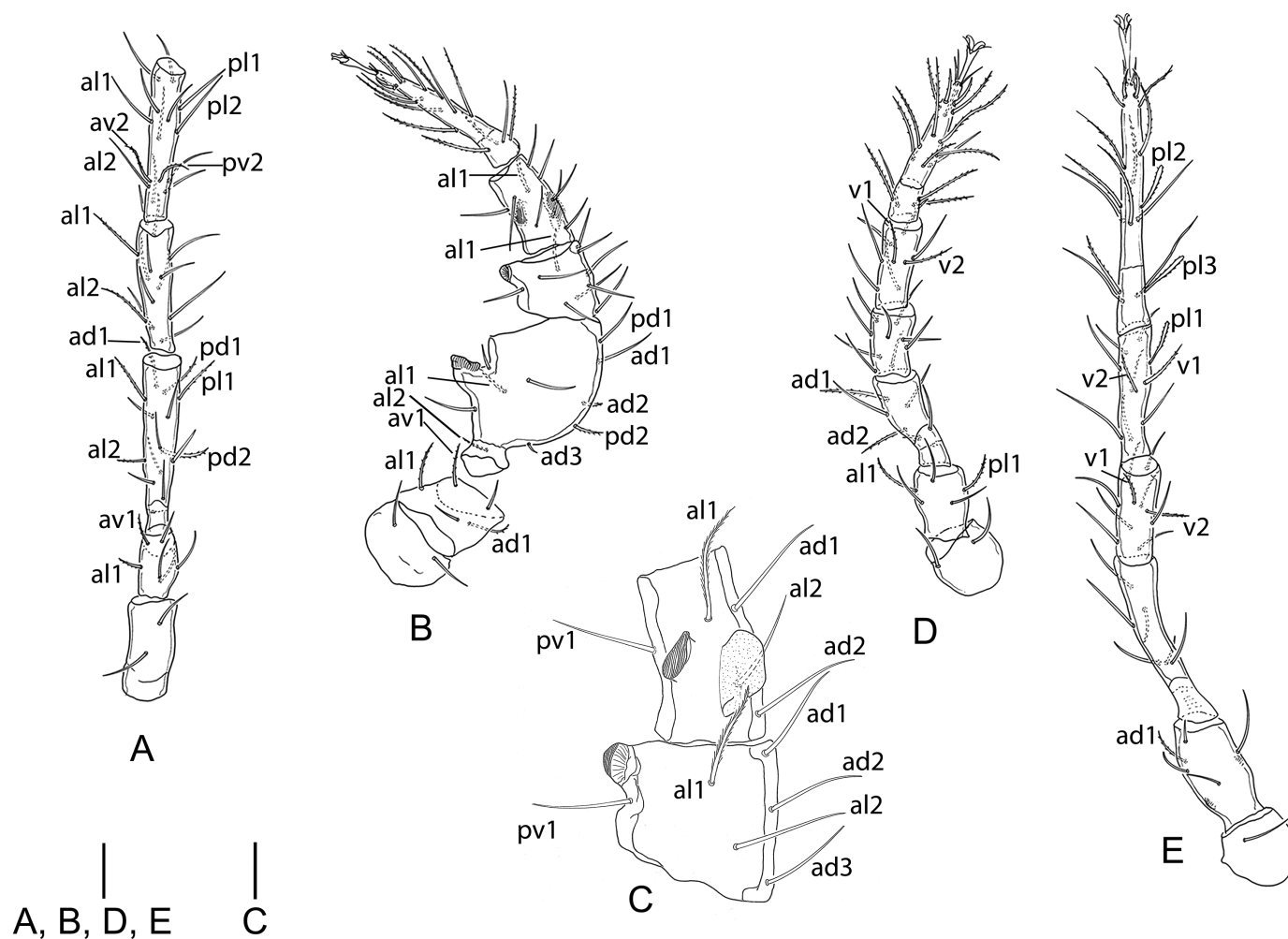


Figure 9 *Pergamasus saxicolis* n. sp. Male. A – leg I from ventral view (without tarsus); B – leg II from posterolateral view; C – genu and tibia II from anterolateral view; D – leg III from ventral view; E – leg IV from ventral view; B, C – holotype. Scale bars A, B, D, E 100 μ m, scale bar C 50 μ m.

posteriorly at the anterior end, and feature large, wide adaxial triangular protrusions at about halfway, which may branch into several extensions and may be slightly posteriorly oriented. Posterior to the endogynium, there is an area with numerous small teeth. The opisthogaster bears 17–21 pairs of setae, ZV1 = 121–128, JV1 = 111–123. Lyrifissures ivo2 and ivo3 are present.

Gnathosoma — (Figure 12D–F) – The gnathotectum (Fig. 12D, E) has 5 sharp prongs, with the middle one being the longest, while the lateral ones are much smaller and may be apically divided, also additional denticles can be present. The hypognathal groove has 13–15 rows of teeth. Setae h1 (113–131), h2 (101–120), and h3 (143–160) are smooth, while pcx (79–137) are feathered. The palptrochanter has a smooth v1 seta and a feathered v2 seta that arises from a small tubercle. Chelicerae (Fig. 12F). The movable digit has 4 large teeth, while the fixed digit has several small teeth before pilus dentilis and several round and sharp teeth behind it.

Legs — Tarsus I = 324–412, tarsus IV = 452–522. Leg II (Fig. 12G) – Setae av on the coxa, al1 on the trochanter; al1, al2, v1 on the femur; al1, al2 on the genu; and al1, al2, v1, v2 on the tibia are feathered. Setae al1, al2, al3, ad2, ad3, pl1, pl2, pl3, av1, av2, pv1, pv2, and mv on the tarsus are feathered. Leg IV – Coxa IV has a prominent triangular tubercle

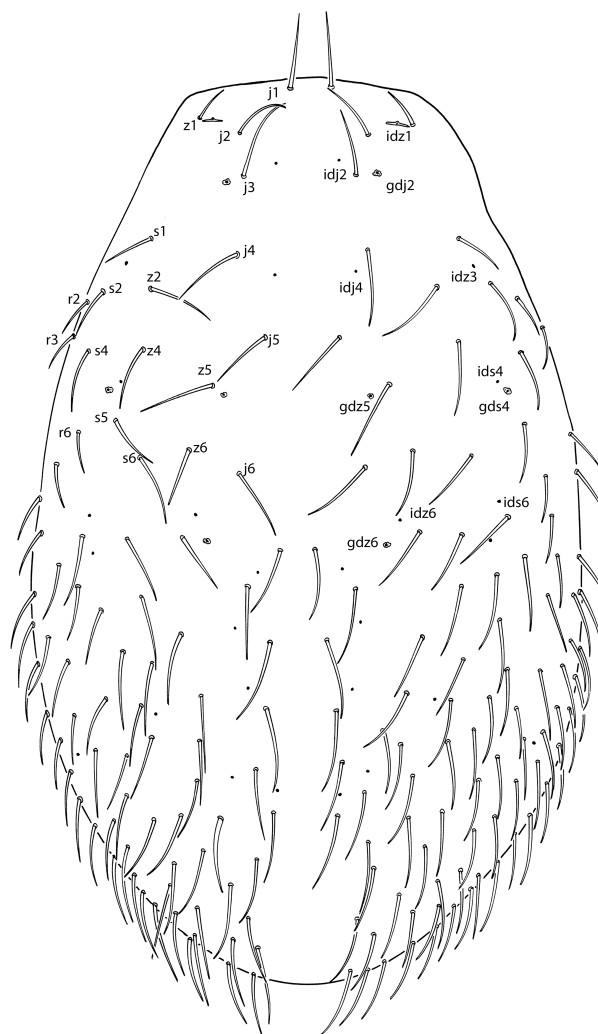


Figure 10 *Pergamasus saxicolis* n. sp. Female. Dorsal idiosoma. Scale bar 100 μ m.

anterolaterally. Trochanter IV has inconspicuous oval tubercles – one anterolaterally and another posterolaterally.

Etymology

The species is named after the habitat where it was found - under and between rocks.

Type material

Holotype — 1 ♂ – High Tatras, Gerlachovský štít Mt., 49°09' N, 20°08' E, 2654 m a.s.l., soil and grass clump from a rock crevice, 13 Sept. 2012, leg. P. Fend'a, slide PB1SU2/10.

Paratypes — 1 ♀, 1 ♂ – Belianske Tatry, cave on Mt. Nový 2, 49°15' N, 20°11' E, 1548 m a.s.l., pitfall trap in the entrance hall of the cave, 28 Jun. 2012, leg. Ľ. Kováč & A. Mock, slides PB2KO330/12, PB3KO329/12; 8 ♀♀, 1 ♂ – High Tatras, Gerlachovský štít Mt., 49°09' N, 20°08' E, 2654 m a.s.l., soil and grass clump from a rock crevice, 13 Sept. 2012, leg. P. Fend'a, slides PB4SU2/10, PB5SU2/10, PB6SU2/10, PB7SU2/10, PB8SU2/10.

Type deposition — Holotype and all paratypes are deposited in Zoological Collection of Faculty of Natural Sciences, Comenius University, Bratislava, Slovakia.

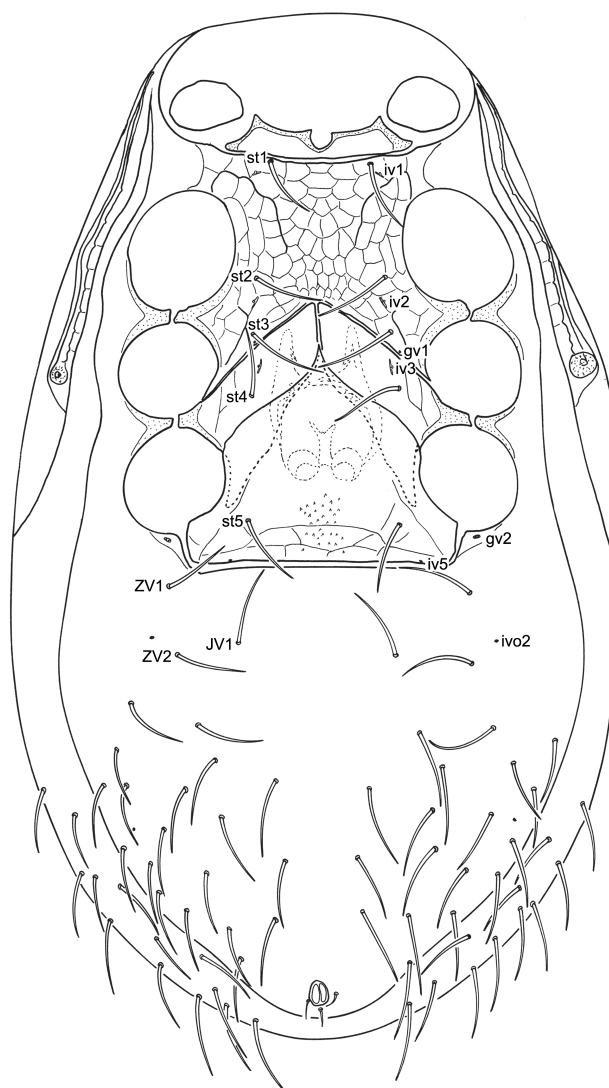


Figure 11 *Pergamasus saxicolis* n. sp. Female. Ventral idiosoma. Scale bar 100 μ m.

Remarks

Based on the presence of two spurs on tibia II of males, this species belongs to the *beklemischevi* species group. The males resemble *P. brevicornis* in having one spur on tibia II significantly larger than the other, oval-shaped. However, they differ in that the spur on genu II is small and button-like, trochanter IV lacks a prominent posterolateral tubercle, and the fixed digit of the chelicera is apically pointed, whereas in *P. brevicornis*, it is slightly hook-shaped with a dorsoapical notch. Females have variable trabeculae, appearing as intermediates between *P. brevicornis* and *P. mediocris*, but differ from both species by having a stipule that is divided only in the apical third, and especially by the presence of a denticulate field posterior to the endogynium. The males resemble *P. mediocris* in the form of chelicerae, but the idiosoma is larger, more slender, and the new species lacks tubercles on the palptrochanters.

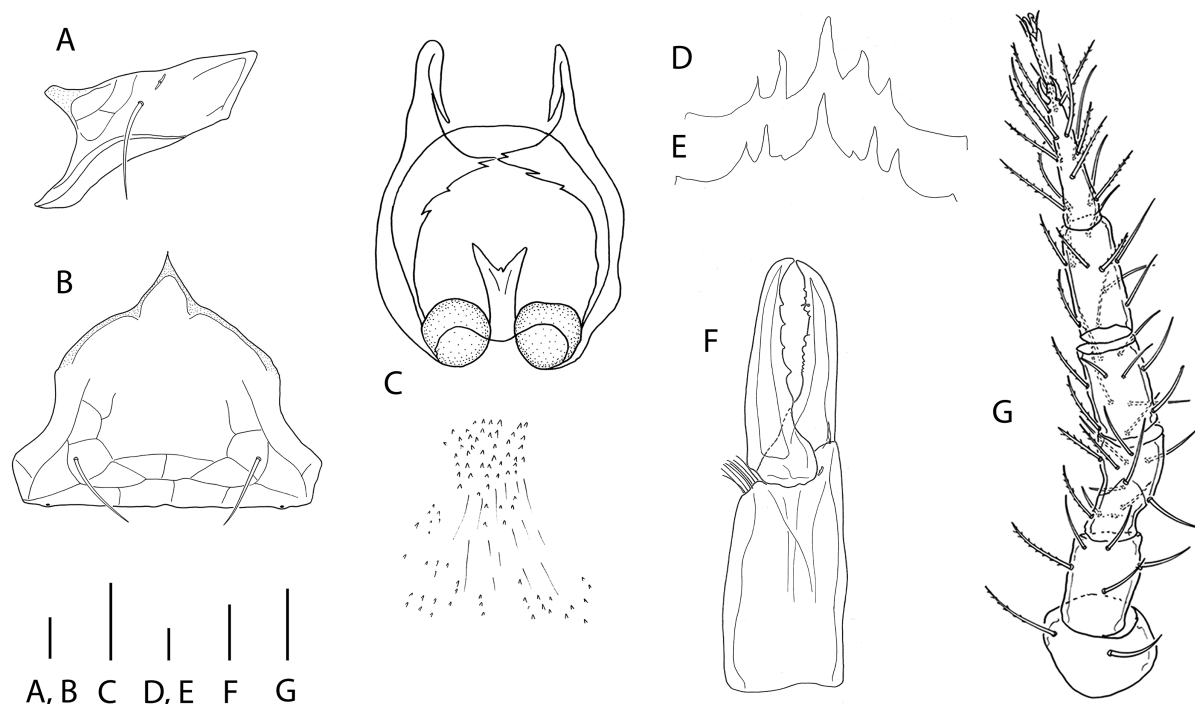


Figure 12 *Pergamasus saxicolis* n. sp. Female. A – paragnathum; B – epigynum; C – endogynum; D, E – gnathotectum, different specimens; F – chelicera antiaxially; G – leg II. Scale bars A-C, F 50 µm, scale bar D, E 20 µm, scale bar G 100 µm.

Identification key to species of *beklemischevi* species group

Males

1. Distal edge of the palptrochanter with 1-2 prominent protuberances 2
 — Palptrochanter without prominent protuberances on distal edge, only the base of the setae may be elevated and thickened 3
2. Palpfemur with 2 prominent protuberances, apophysis on femur II thick, with a tubercle at the base; genu II with a relatively large striped trapezoidal spur, and a swelling extending from the genual spur towards the distal edge of the segment, tibia II with a long, low ridge-like spur covering more than the proximal half of tibia length; in the middle of the segment, a smaller ridge-like spur and two additional protuberances are present, idiosoma 1278–1487 µm
 *Pergamasus tuberopalpus* Juvara-Balş, 1976
 — Palpfemur without protuberances, spur on femur II lacking protuberances or swellings; genu II with a low rounded spur; tibia II with two approximately equal ridge-like spurs, starting at the same level and diverging, idiosoma 975–1085 µm
 *Pergamasus mediocris* (Berlese, 1904)
3. Corniculi truncated at the end, with two protuberances in the proximal third – larger abaxial, smaller adaxial; genu II with a small rounded transverse spur and a small protuberance; tibia II with two similarly sized, divergent spurs – one rectangular, the other tapering to a point at the distal end, idiosoma 949–962 µm *Pergamasus adinae* Juvara-Balş, 1970
 — Corniculi pointed at the end, without protuberances, male leg II formed differently 4
4. Tectum with only 3 large prongs, the middle one the longest, the lateral ones truncated; basitarsus II with a pronounced protuberance forming an “elbow”; coxa II with a small protu-

- berance, idiosoma 1147–1296 μm *Pergamasus holecovae* **n. sp.**
 — Tectum with 5 prongs, basitarsus II and coxa II without protuberances 5
5. Spurs on tibia II are longitudinal and nearly the same size, though the adaxial one is slightly shorter; both are in the proximal third of tibia and are transversely striped; genu II with a button-like spur; fixed digit of chelicerae very thickened, with a lobed dorsal edge and a notch in the distal quarter, idiosoma length unknown
 *Pergamasus kelemeneus* Athias-Henriot, 1967
 — Spurs on tibia II of different sizes: one longitudinal spur long, the other smaller and oval; fixed digit of chelicerae less robust 6
6. Trochanter IV rounded, without a posterolateral protuberance; spur on genu II button-like; tibia II with one large, leaf-shaped spur plus one smaller, oval, obliquely placed spur; fixed digit of chelicerae longer than the movable one, with an anterior point; idiosoma 1306 μm
 *Pergamasus saxicolis* **n. sp.**
 — Trochanter IV with a prominent posterolateral protuberance, spur on genu II differently shaped, fixed digit of chelicerae anteriorly hook-shaped 7
7. Spur on genu II oriented transversely, transversely striped, and convex; anterolateral small protuberance present; longitudinal spur on tibia II transversely striped along its entire length, taller distally; idiosoma 1012–1350 μm *Pergamasus beklemischevi* Sellnick, 1929
 — Spur on genu II longitudinal, concave, or bilobed, longitudinal spur on tibia II not taller distally 8
8. Longitudinal spur on tibia II uniform in height, transversely striped, with sparser stripes distally; fixed digit of chelicerae with an initially rounded apex and a small tooth dorsoapically; dorsal notch behind pilus dentilis present; idiosoma 1130–1400 μm
 *Pergamasus brevicornis* (Berlese, 1903)
 — Longitudinal spur on tibia II raised proximally, lower distally, without striping; fixed digit of chelicerae without dorsal notch or dorsoapical tooth, significantly narrowed ahead pilus dentilis, with a large tooth at the level of pilus dentilis; idiosoma 890–1208 μm
 *Pergamasus laminarius* Witaliński, 1971

Females

1. Inner walls of the endogynium with small teeth 2
 — Inner walls of the endogynium without teeth 4
2. Trabeculae lacking a triangular paraxial protrusions, stipula with short branches, dorsal teeth may be present, idiosoma 1000 μm *Pergamasus laminarius* Witaliński, 1971
 — Trabeculae with a triangular paraxial protrusions, stipula variable in shape 3
3. Palptrochanter with multiple small protuberances, trochanter IV and coxa IV with prominent protuberances, stipula with short branches, spherules oval, cuticle of the sternum and epigynium with dimples, idiosoma 1218–1235 μm *Pergamasus tuberopalpus* Juvara-Balş, 1976
 — Palptrochanter without protuberances, trochanter IV and coxa IV either without or with only small, inconspicuous protuberances, stipula about twice as long as the spherules, variable in branching depth and presence of teeth, spherules round, cuticle of the sternum without dimples; idiosoma 1012–1060 μm *Pergamasus adinae* Juvara-Balş, 1970
4. Stipula T-shaped, with long deeply divergent branches running almost horizontally and reaching or extending beyond the antiaxial edge of the spherules, trabeculae with wide triangular protrusions or without them 5

- Stipula undivided or with short or deeply divided branches, directed anteriorly or anterolaterally, but never T-shaped, trabeculae with long, slender triangular protrusions or with wide triangular protrusions branched into multiple small branches 6
- 5. Trabeculae robust but weakly sclerotized and without triangular protrusions, idiosoma length unknown *Pergamasus kelemeneus* Athias-Henriot, 1967
 — Trabeculae with thick triangular protrusions and transverse stripes, especially prominent near the protrusions, idiosoma 1130–1432 µm *Pergamasus beklemischevi* Sellnick, 1929
- 6. Stipula with only very short branches directed anteriorly or undivided with an anterior depression or notch only, spherules kidney- or bean-shaped, idiosoma 1154–1248 µm *Pergamasus holecovae* **n. sp.**
 — Stipula distinctly divided into two divergent branches, a small teeth can be present between them, spherules regularly round 7
- 7. An area with small teeth present posterior to the endogynium, idiosoma 1342–1407 µm *Pergamasus saxicolis* **n. sp.**
 — An area with small teeth posterior to the endogynium not present 8
- 8. Stipula branches directed straight anteriorly, trabecula protrusions long, slender, unbranched, occasionally one protrusion may be slightly split, directed perpendicular to the body axis, idiosoma 1170–1400 µm *Pergamasus brevicornis* Berlese, 1903
 — Stipula branches slightly diverging, trabecula protrusions thick, splitting into several short branches at the end, directed posteroparaxially, idiosoma 975–1150 µm *Pergamasus mediocris* Berlese, 1904

Notes on the distribution of *beklemischevi* species group

In the *beklemischevi* species group, there are species with Central and Eastern European distribution and several endemic species found in the Carpathians. The widely distributed species are *P. beklemischevi*, *P. brevicornis* and *P. mediocris*. Notably, *P. beklemischevi* has been recorded in Ukraine, Russia, and Romania, with an occurrence near Prague marking the species' westernmost finding (Halašková 1959; Tabacaru *et al.* 2018). Interestingly, *P. beklemischevi* has not yet been recorded in Slovakia. However, the specimens found near Prague appear to differ slightly in appearance from the description of *P. beklemischevi* as well as from the specimens of *P. beklemischevi* that we had available for comparison. It is possible that these specimens represent another species within the *beklemischevi* group, but this material is likely lost (F. Šťáhlavský in litt.). *Pergamasus mediocris* is distributed in Central Europe and is relatively common in both the Czech Republic and Slovakia, yet it has not been recorded in Romania (Tabacaru *et al.* 2018). Defining its eastern distribution boundary based on existing data is challenging, as the species was historically confused with *P. brevicornis*. The other species within this group are distributed across the Carpathians, with some having endemic ranges within specific mountain ranges: *Pergamasus holecovae* **n. sp.** is endemic to the Little Carpathians (Slovakia), *Pergamasus saxicolis* **n. sp.** is found only in the High Tatras (Slovakia), *P. tuberopalpus* is exclusive to the Gutâi Mountains (Romania), *P. kelemeneus* and *P. adinae* are found in the Eastern Carpathians, and *P. laminarius* occurs in the northern Carpathians (Slovakia and southern Poland) (Tabacaru *et al.* 2018; Witaliński 1971).

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ORCID

Kamila Ondřejková  <https://orcid.org/0000-0003-1327-2868>

Peter Fend'a  <https://orcid.org/0000-0002-4791-1990>

Lucia Švecová  <https://orcid.org/0009-0002-4726-8816>

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