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The *Anchigamasus* mite species (Parasitiformes: Parasitidae), synonyms revisited

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Original research

ABSTRACT

Anchigamasus crassicornutus (Willmann, 1954) has sometimes been considered as synonym of *Anchigamasus geileri* (Karg, 1968). In view of a large body of material, it is proposed that both species are valid and these names are not synonyms. This study contains supplementary descriptions for *Anchigamasus crassicornutus* (Willmann, 1954) and *Anchigamasus geileri* (Karg, 1968) in support of that proposal, and a new synonymy for *Pergamasus crassicornutus* Willmann *sensu* Athias-Henriot, 1967.

Keywords mite taxonomy; non-synonym species; new synonymy; Austrian; Czech; German; Polish and Slovak fauna

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Introduction

The genus *Anchigamasus* Athias-Henriot, 1971 (Parasitidae) is one of eight subgenera previously included in the genus *Paragamasus* Hull, 1918 *sensu lato* (Athias-Henriot, 1971: 172), which were subsequently considered as genera (see Hruzová & Fend'a, 2018). *Pergamasus crassicornutus* Willmann, 1954: 219 was designated as the type species of *Anchigamasus* (Athias-Henriot, 1971: 172). *Anchigamasus* is a small genus comprising five species, i.e. *Anchigamasus alportus* (Athias-Henriot, 1968), *Anchigamasus crassicornutus* (Willmann, 1954), *Anchigamasus geileri* (Karg, 1968), *Anchigamasus halaskovellus* (Athias-Henriot, 1967), and *Anchigamasus siculiger* (Athias-Henriot, 1967). Athias-Henriot (1971: 174), and Karg (1971: 411) considered *A. geileri* to be a synonym of *A. crassicornutus*, but this paper shows that these are separate, valid species.


Material and methods

The material under study was collected during faunal research in Austria, Czech Republic, Germany, Poland and Slovakia. Mites were routinely extracted from forest litter into 70% ethanol using Berlese funnels, mounted in Hoyer's medium on glass slides, cured for several days in an oven (60° C), and studied using an Olympus BX51 microscope, fitted with a drawing tube. All measurements are expressed in micrometres, taken as follows: idiosoma measurements were made along the sagittal line (length), and at the widest place (width); setal lengths were measured from the alveolus to the apex of the seta; the peritreme length was measured, including the stigma; Ta IV was measured without the apotele. Drawings were made with the aid of Corel Draw X8 and a Wacom Intuos Graphic Tablet. The system of dorsal, ventral, palp and leg setal notations was based on Evans and Till (1979), and the poroidotaxy

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and adenotaxy on Moraza and Peña (2005), with some necessary adjustments for Parasitidae. In the species under study both females and males were available, but the developmental stages were not present. The points where both species were collected to date are present in Figure 12.

Results

Systematics

Family Parasitidae Oudemans, 1901

Subfamily Pergamasinae Juvara-Balş, 1972

Genus *Anchigamasus* Athias-Henriot, 1971

Paragamasus (*Anchigamasus*) Athias-Henriot, 1971: 172

Type species *Pergamasus crassicornutus* Willmann, 1954: 219

The basic characteristics of *Anchigamasus* are as follows. In both sexes opisthogastral setae relatively short, terminating well short of the next setae row. In the female, presternal plates are subtriangular and far from each other; peritrematal shield free, only anteriorly connected to podonotal shield; gland pores *gv1* present; endogynial sac cup-shaped, with lateral spherules, laciniae or embossing can be present; epigynium is characteristic, with subapical inverted T-shaped thickening. In the male, cheliceral movable digit bears two teeth, followed by a distinct tooth-like indentation located proximally, fixed digit paucidentate; two or three anterior hypostomal rows of denticles transverse, or only weakly arcuate anteriorly; central prong of gnathotectum longer than the lateral ones; seta *v1* on palp trochanter short and on a tubercle; seta *all* on Ti II can be on a tubercle; transverse suture present between podonotal and opisthonotal shields.

Anchigamasus crassicornutus (Willmann, 1954)

Pergamasus crassicornutus Willmann, 1954: 219

not *Pergamasus crassicornutus* Willmann, 1954 *sensu* Athias-Henriot, 1967: 47.

(Figures 1–6)

Diagnosis (based on own research material)

Female and male — Idiosoma well sclerotised; podonotum with 22 pairs of setae, opisthonotum normally with 24 pairs of setae, but one or two supplementary setae (Sx) may also be located marginally. Tr IV with a tubercle.

Female — Gnathotectum prongs similarly narrow and acute, the central one twice as long as lateral prongs; 2–3 fine lines are present in the area between subtriangular presternal plates and sternal margin; gland pores *gv1* located behind *st3* setae at sternal margin; central prong of epigynial shield long, the lateral subapical thickenings straight, running backward somewhat divergently, central subapical inverted T-shaped thickening with the ends of its arms slightly angular, and the posterior edge centrally concave; endogynium cup-shaped with two spherules projecting inward; the endogynium diameter similar to the width of subapical epigynial thickening.

Male — Gnathotectum central prong much larger than the lateral ones; genital lamina anterior margin convex, its corners rounded and extended laterally; palp trochanter with seta *v1* short, located on a tubercle, a little tubercle located proximal to *v1*, seta *v2* barbed; ventrally, cheliceral fixed digit regularly tapered; laterally, cheliceral movable digit with two teeth, followed by tooth-like indentation, fixed digit blunt, with two denticles ahead of pilus dentilis, and one more sclerotised denticle behind it, followed by a denticulate lamellar edge; leg II ventrally: the femoral main spur short and triangular, the axillary process long and triangular, ending at the level of main spur apex; laterally, femoral main spur stout and triangular, axillary

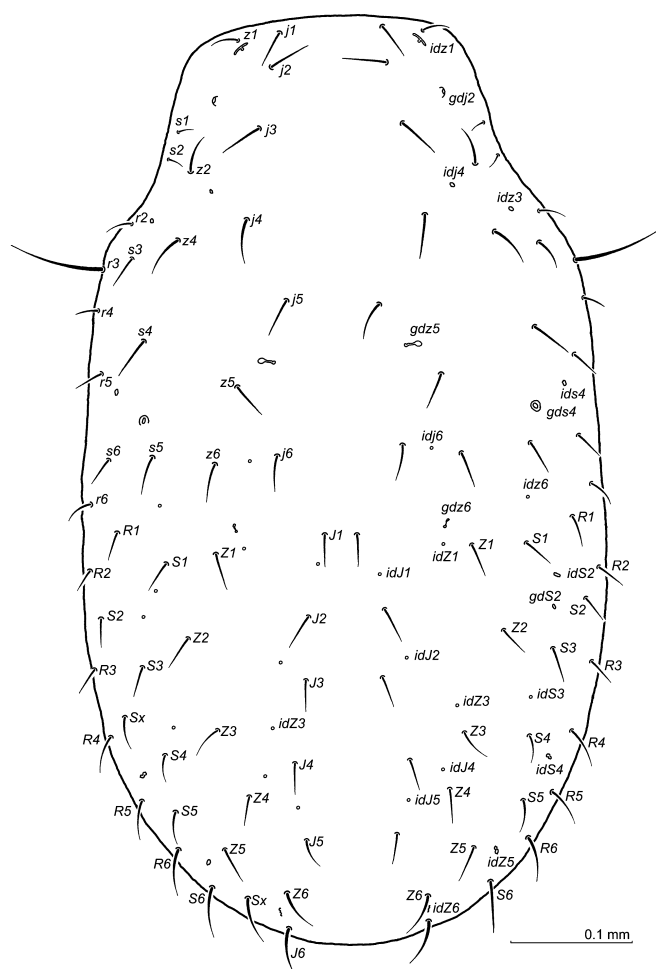


Figure 1 *Anchigamasus crassicornutus*, female: dorsal side. Abbreviations: podonotal setae (*j*, *z*, *s*, *r*), opisthonotal regular setae (*J*, *Z*, *S*, *R*), supplementary setae (*Sx*), pores (*id*) and gland openings (*gd*) are marked.

process triangular but narrow, main spur and axillary process oriented at a right angle; genual spur elongated and rectangular, located on the protrusion at distal article margin, tibial spur triangular; seta *all* on Ti II located on the tubercle.

Description

Female (Figures 1–3)

Idiosoma (Fig. 1) — Oval and well sclerotised, 725–755 x 387–415 (length x width, n=5). **Podonotum** – 22 pairs of setae (*r1* and *z3* lacking), setae length on podonotum *ca.* 31–38, *s1* and *s2 ca.* 25–35 long, *r3 ca.* 80–84, *r4 ca.* 16–20. **Opisthonotum** – with 24 pairs of normal setae, but one or two supplementary setae (*Sx*) may be present in the marginal regions. Setae on opisthonotum are shorter than the podonotal ones, and range from *ca.* 26 to 34; posterior marginal setae may reach 38–42. Dorsal setae simple, podonotum not reticulated, opisthonotum with a scale-like reticulation. **Peritreme** – length 318–324, ending anteriorly at the Co I level.

Ventral idiosoma — Setae length: 30–35 (*st1*), 31–37 (*st2*), 40–45 (*st3*), 26–31 (*st4*), 32–34 (*st5*), opisthogastral setae 33–37 (*JV1–JV3*), 46–50 (*JV4*), 20–22 (*ZV1*), 22–24 (*ZV2*),

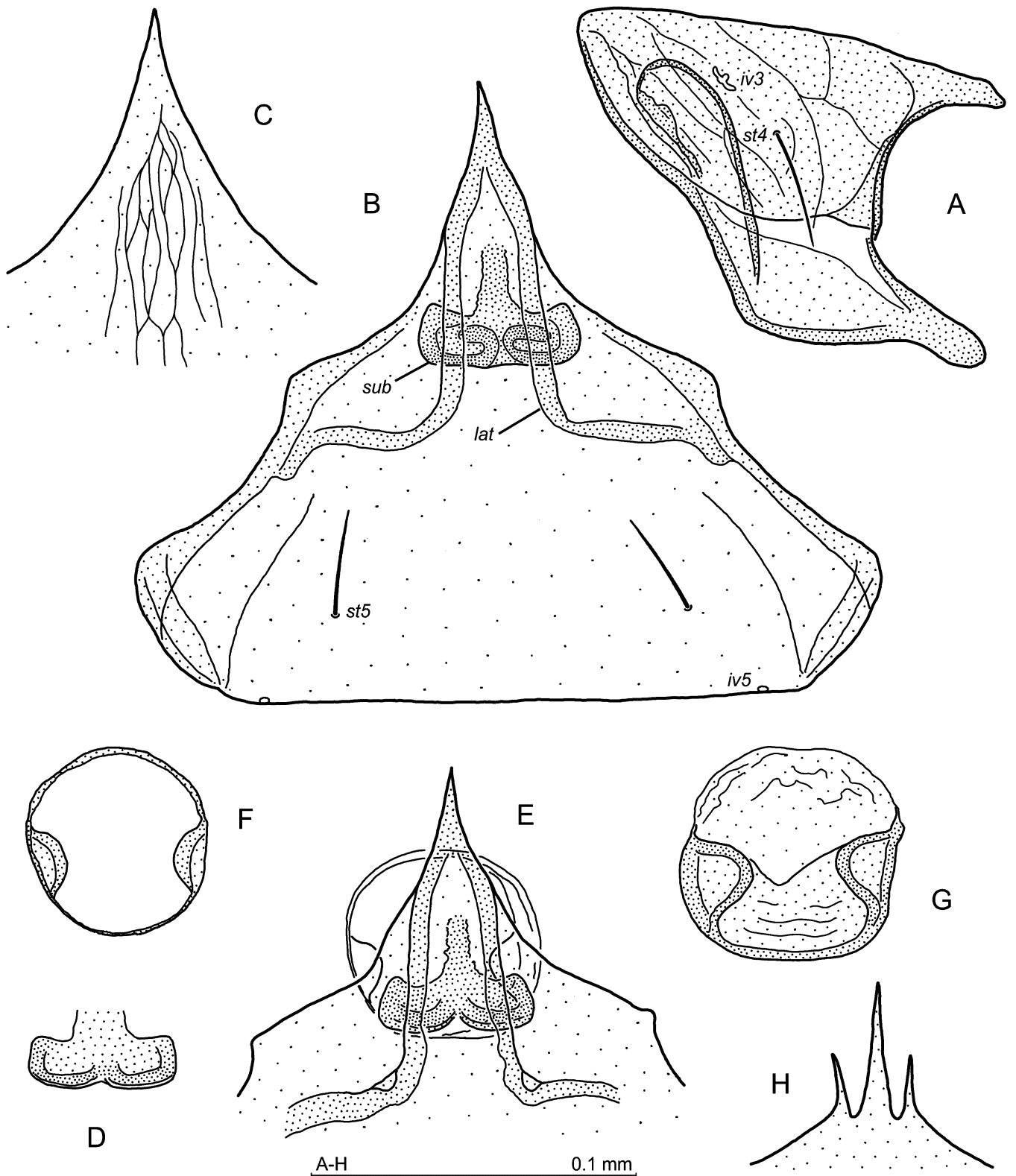


Figure 2 *Anchigamasus crassicornutus*, female: A – paragynium; B – epigynum; C – reticulation on the anterior part of the epigynum; D – subapical thickening of the epigynum; E – anterior prong of the epigynum with an outline of the endogynium; F, G – endogynium, two aspects; H – gnathotectum. Abbreviations: *iv3*, *iv5* paragynial and epigynial pores, respectively; *lat* lateral epigynial thickenings; *st4*, *st5* paragynial and epigynial setae, respectively; *sub* subapical inverted T-shaped thickening.

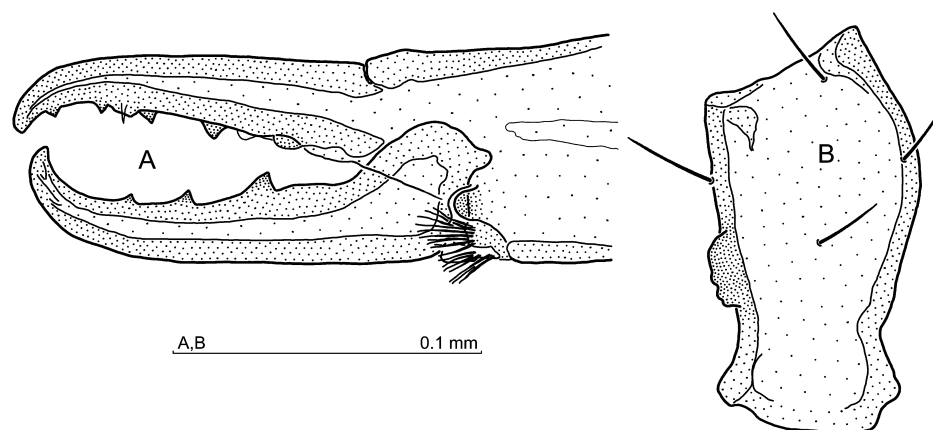


Figure 3 *Anchigamasus crassicornutus*, female: A – chelicera, adaxially; B – Tr IV ventrally.

28–34 (*ZV3*, *ZV4*), 38–43 (*ZV5*), 22–28 (*SV3*). Ventral setae simple, reticulation of the opisthogaster scale-like. The presternal plates subtriangular, the area between the presternal plates and the sternum margin with 2–3 lines. The pores *gv1* located behind setae *st3* at the sternal margin. Paragynial shields (Fig. 2A) with narrow, arcuate metagynial sclerites. Epigynial shield (Fig. 2B,C,E) with the central prong long and the anterior margins wavy. The lateral subapical thickenings straight, running backward somewhat divergently, central subapical inverted T-shaped thickening with the ends of its arms slightly angular, and posterior edge sometimes concaved centrally (Fig. 2B,D,E). Epigynium shows reticulation which on the anterior prong is longitudinal (Fig. 2C). Endogynium cup-shaped with two spherules located laterally and protruded centripetally (Fig. 2F,G). The diameter of endogynium is similar to inverted, T-shaped epigynial thickening (Fig. 2E). Gland pores *gv2* with two openings, *ivo5*, *ivo2*, *ivo3* pores and *gv3* gland pores clearly visible.

Gnathosoma — Gnathotectum (Fig. 2H) trispinate, all prongs similarly narrow and acute, the central prong twice as long as lateral prongs. Corniculi conical, hypostome with 11 rows of denticles, hypostomatic and palpcoxal setae simple, similarly long. Palptrochanter *v1* seta simple, *v2* barbed in distal half. Chelicera (Fig. 3A) movable digit with three teeth, fixed digit with one low tooth adjacent to pilus dentilis, two distal teeth ahead of the pilus dentilis and two behind it.

Legs — Seta *al* on Tr I somewhat shorter, seta *all* on Fe I normal, *al2* minute. Leg II: setae *all*, *al2* on Fe II shortened. Leg IV: posterolateral setae on the femur shorter than others, posteroventral setae on Ge II, Ti II, Ge IV and Ti IV thicker than anteroventral ones. Tarsal tactile seta *pd1* thin and long. Trochanter IV with a posterolateral tubercle (Fig. 3B). Ta IV 191–202 long. Other aspects of legs I–IV unremarkable.

Male (Figures 4–6)

Idiosoma — Well sclerotised, 733–760 x 360–387 (length x width, n=5), body oval with an incision at the level of legs IV. Setae length on podonotum *ca.* 38–52, but *s1* and *s2* 26–28 long, *r3 ca.* 87–90, *r4 ca.* 21–24. **Opisthonotum** – setae length from *ca.* 26 to 30, lateral setae on the posterior part 39–42 long. Dorsal setae simple. Reticulation in the central part of podonotum is fine and longitudinal, reticulation of opisthonotum is scale-like and more distinct. **Peritreme** – length 339–342, ending anteriorly as in the female.

Ventral idiosoma — Setae length: 40–43 (*st1*), 33–36 (*st2*), 34–38 (*st3*), 25–27 (*st4*), 30–33 (*st5*), opisthogastral setae 34–39 (*JV1–JV3*), 47–51 (*JV4*), 16–22 (*ZV1*), 25–28 (*ZV2*), 37–39 (*ZV3*, *ZV4*), 40–46 (*ZV5*), 31–34 (*SV3*). Ventral setae simple. **Sternal region** (Fig.

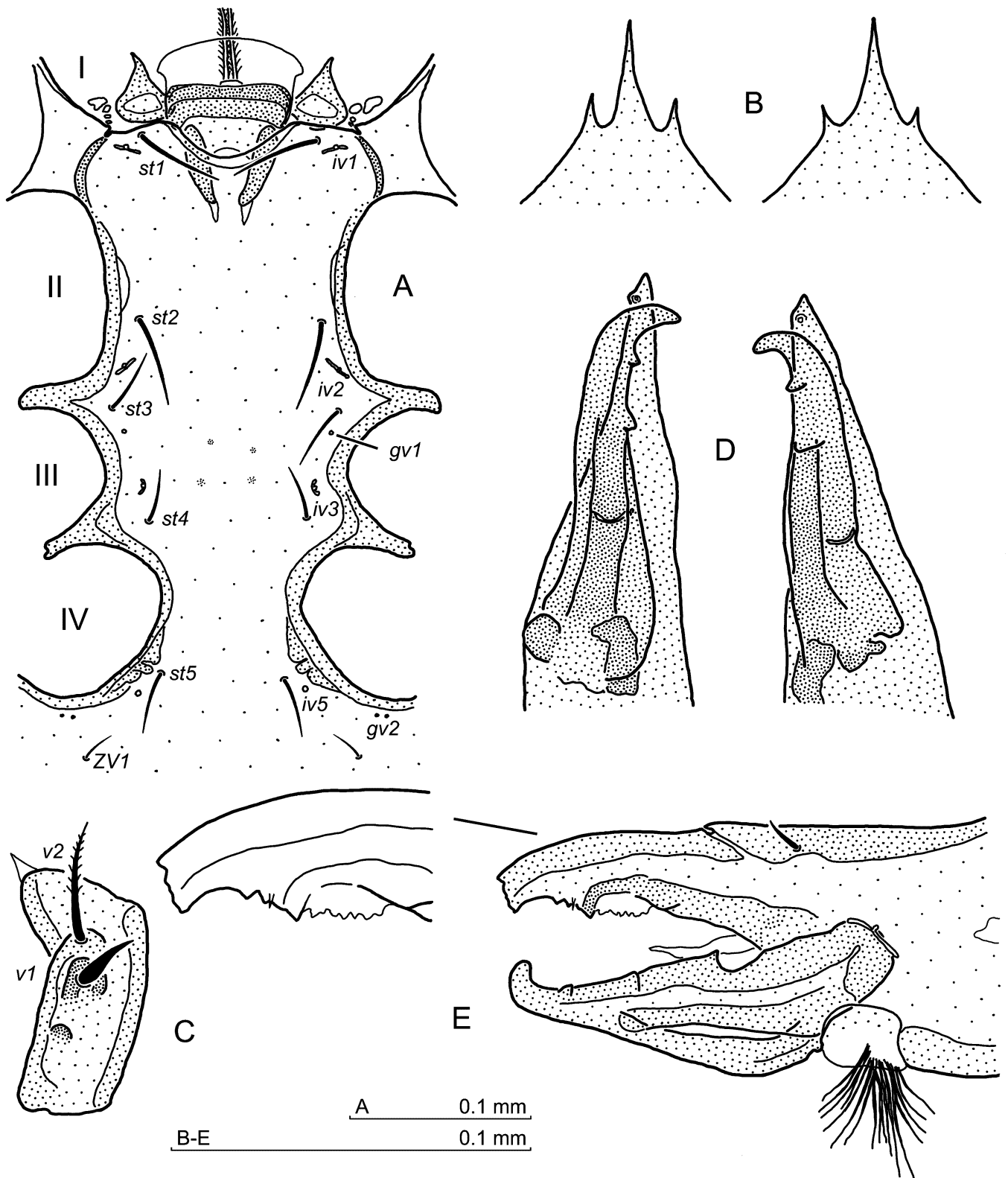


Figure 4 *Anchigamasus crassicornutus*, male: A – genital lamina, presternal plates and sternal shield; B – gnathotectum, two aspects; C – palptrochanter ventrally; D – chelicerae, ventrally; E – chelicera, antiaxially. Abbreviations: I–IV openings for coxae I–IV; *iv1*–*iv5* sternal pores; *gv1*, *gv2* gland openings; *st1*–*st5* sternal setae; *v1*, *v2* palptrochanter setae; *ZV1* opisthogastral seta.

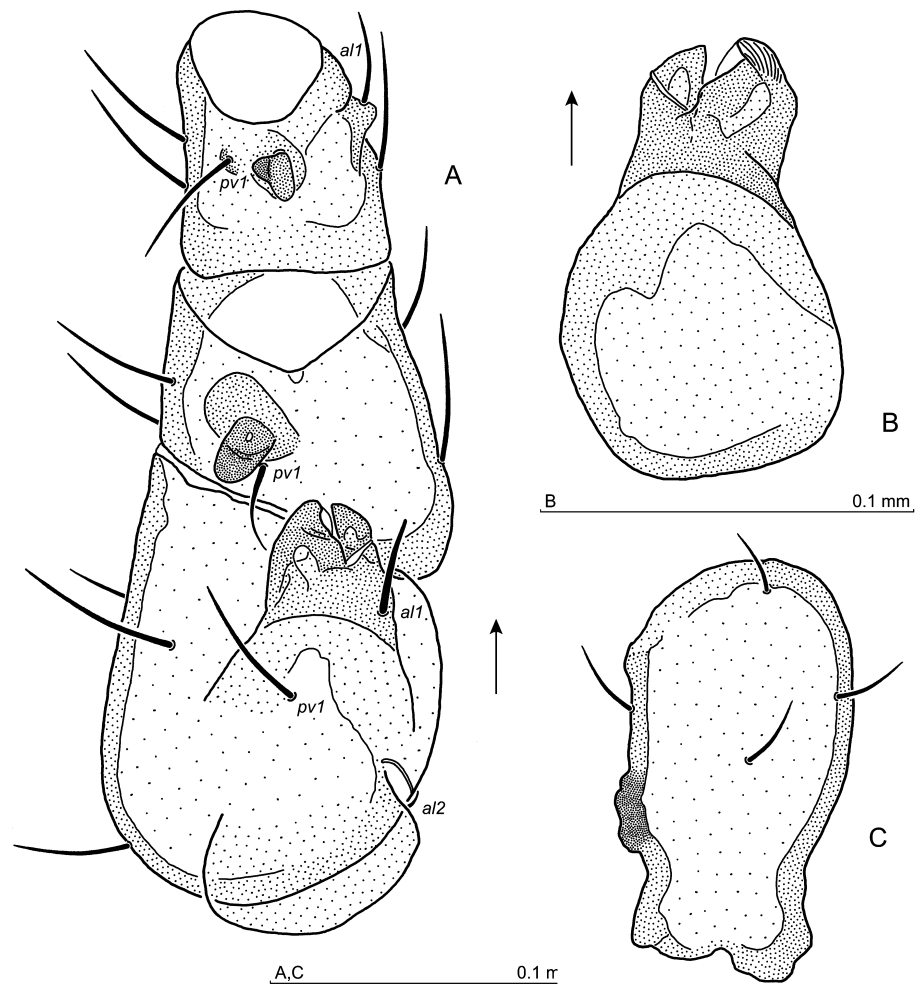


Figure 5 *Anchigamasus crassicornutus*, male: A – Fe, Ge and Ti of leg II, ventrally; B – main spur and axillary process on Fe II, ventrally. Setae not marked; C – Tr IV, ventrally. Abbreviations: arrow – on the anterolateral side; *al1*, *al2* anterolateral setae; *pv1* posteroventral setae.

4A) – anterior margin of the genital lamina convex, its corners rounded and extended laterally. Presternal plates drop-shaped. Sternum with gland pores *gv1* located laterally, behind setae *st3*. Two pairs of slight thickenings of the sternal cuticle are present at the level of pores *gv1* and *iv3*. Gland pore *gv2* with two openings, pores *iv5* at 1/4 behind *st5* seta towards seta *ZV1*. Pores *ivo2*, *ivo3*, and *gv3* clearly visible.

Gnathosoma — Gnathotectum (Fig. 4B) with central prong subtriangular and much longer than the lateral ones. Corniculi slim, inserted on arcuate bases (*genae*). Hypostome with *ca.* 10 rows of denticles, hypostomal and palpcoxal setae simple and similar in length. Palptrochanter *v2* seta barbed on both sides, *v1* simple, very shortened and thick basally, located on a cuticular protrusion (Fig. 4C), another tubercle located behind this protrusion. Chelicera – when observed from the ventral side (Fig. 4D), terminal parts of movable digits moderately curved adaxially, the fixed ones regularly tapered. Laterally (Fig. 4E), movable digit with two teeth, followed by a tooth-like indentation of the digit's edge, fixed digit blunt apically, with two denticles ahead of the pilus dentilis, and one more sclerotised tooth behind the pilus dentilis, followed by a denticulate lamellar edge.

Legs — Leg II (Figs 5A,B, 6) spurred as follows: when viewed from the ventral side (Fig.

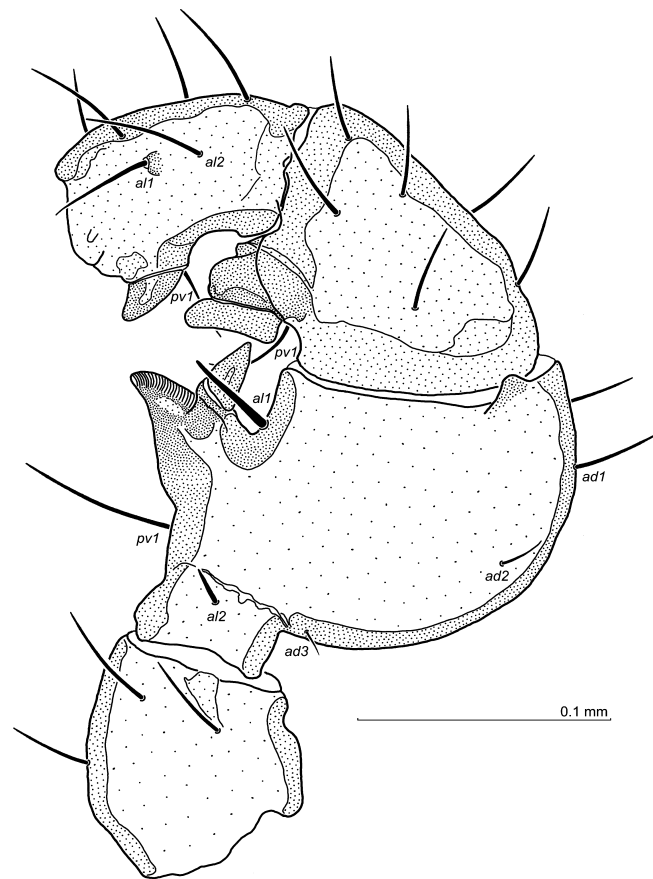


Figure 6 *Anchigamasus crassicornutus*, male: Tr, Fe, Ge and Ti of leg II, anterolaterally. Abbreviations: *ad1–ad3* anterodorsal setae; *al1, al2* anterolateral setae; *pv1* posteroventral setae.

5A, B), the main femoral spur is stout, subtriangular, the axillary process triangular and ending at the main spur apex level. Genual spur oval, directed somewhat proximally, the tibial spur tubercular. From a lateral perspective (Fig. 6), the main femoral spur is stout and triangular, whereas the axillary process is triangular but narrower. Main spur directed ventrally, the axillary process distally, thus both remaining oriented at a right angle. Genual spur an elongate rectangle, located on the protrusion at the distal article margin, tibial spur triangular. Setae on leg II simple, femoral setae *al1* somewhat thickened, *al2* short and thickened, *ad2* short, *ad3* short and needle-like. Seta *al1* on Ti II located on a tubercle. Leg IV: trochanter anterolateral margin gibbous distally, posterolateral with elongated tubercle (Fig. 5C). Posteroventral setae on the genu and tibia, as well as *av2*, *av3* and *pv2* on the tarsus slightly thickened, tarsal *av1* thicker than *pv1*. Tactile dorsal seta on Ta IV as in the female. Ta IV 199–204 long. Other aspects of legs I–IV unremarkable.

Material examined

Reference material — 2 females, 3 males (slides no. 2697 G, H), Tylawa, Low Beskid mountain range, S-E Poland, 46.7549°N, 25.0622°E, alt. ca. 422 m a.s.l., 7 Sept. 2016, rotted hay; 3 females, 8 males (slide no. 2919), Wołosate, Bieszczady Mts; S-E Poland, 49.0573°N; 22.7145°E, alt. ca. 791 m a.s.l., 10 August 2019, litter in old mixed forest (mainly great maple).

Other material — 92 females and 132 males from southern Poland (surroundings of

Kraków), south-eastern Poland (Słonne Mts, Cergowa Mt. and Tylawa in Low Beskid), as well as in Slovakia (Poloniny National Park) were also available for the study.

Material deposition — The reference material is deposited in the Zoological Division of the Nature Education Centre, Jagiellonian University, Kraków, Poland, whereas the other material is held in the author's own collection.

***Anchigamasus geileri* (Karg, 1968)**

Pergamasus geileri Karg, 1968: 335

Pergamasus crassicornutus Willmann, 1954 *sensu* Athias-Henriot, 1967: 47. **syn. nov.** (Athias-Henriot material examined)

(Figures 7–11)

Diagnosis (based on own research material)

Female and male — Idiosoma well sclerotised; podonotum with 22 pairs of setae, opisthonotum with 24 normal pairs of setae, but one or two supplementary setae (Sx) may be located marginally.

Female — Gnathotectum prongs narrow and acute, the central one twice as long as lateral prongs; 2–3 thin lines present in the area between the subtriangular presternal plates and the sternal margin; gland pores *gv1* located behind *st3* setae, close to the sternal margin; epigynial shield central prong long, the lateral subapical thickenings arcuate, running backward somewhat convergently; central subapical inverted T-shaped thickening with rounded arm ends and posterior edge usually straight or somewhat convex; the endogynium cup-shaped, with the spherules located laterally and projecting inward, the endogynial sac posterior wall reticulated; the diameter of endogynium exceeds nearly double the width of the T-shaped subapical epigynial thickening.

Male — Gnathotectum central prong much larger than the lateral prongs; genital lamina anterior margin undulate, its corners rounded and extended laterally; palp trochanter with seta *v1* short, located on a tubercle, seta *v2* barbed, a small tubercle is present proximally to *v1*. Chelicera: ventrally, terminal parts of movable digits curved at a right angle adaxially, the fixed digits narrow in the terminal part; laterally, movable digit with two teeth, followed by a tooth-like indentation of the digit's edge, fixed digit blunt apically, with two denticles ahead of the pilus dentilis, and one more sclerotised tooth behind it, followed by a short lamellar edge; leg II ventrally: trochanter with a distal protrusion, the femoral main spur short and bifurcate, the axillary process elongated, ending at the article distal margin; leg II laterally: the main femoral spur triangular, the axillary process also triangular but narrow, both the main spur and the axillary process oriented at a right angle, genual spur quadrilateral and located on the protrusion at the distal article margin, tibial spur triangular and rounded apically; dorsal surface of leg II basitarsus gibbous. Seta *all* on Ti II located on the tubercle; Tr IV with elongated, low tubercle.

Description

Female (Figures 7, 8)

Idiosoma — Oval and well sclerotised, 740–800 x 410–450 (length x width, n=5).

Podonotum – 22 pairs of setae (*r1* and *z3* lacking), podonotum setae lengths 29–52 (*j1* 44–52), *s1* and *s2* ca. 32–39 long, *r3* ca. 94–97, *r4* ca. 20–24. **Opisthonotum** – with 24 pairs of normal setae, but one or two supplementary setae (Sx) may also be present. Setae on the opisthonotum are similar in length to the podonotal ones, and range from ca. 27 to 39, but posterior marginal setae may reach 39–52. Dorsal setae simple, podonotum not reticulated, opisthonotum with a scale-like reticulation. **Peritreme** – length 305–320, ending anteriorly at the Co I level.

Ventral idiosoma — Setae length: 42–47 (*st1*), 39–44 (*st2*), 42–50 (*st3*), 33–37 (*st4*), 30–33 (*st5*), opisthogastral setae 35–44 (*JV1–JV3*), 52–55 (*JV4*), 22–25 (*ZV1*), 30–34 (*ZV2*),

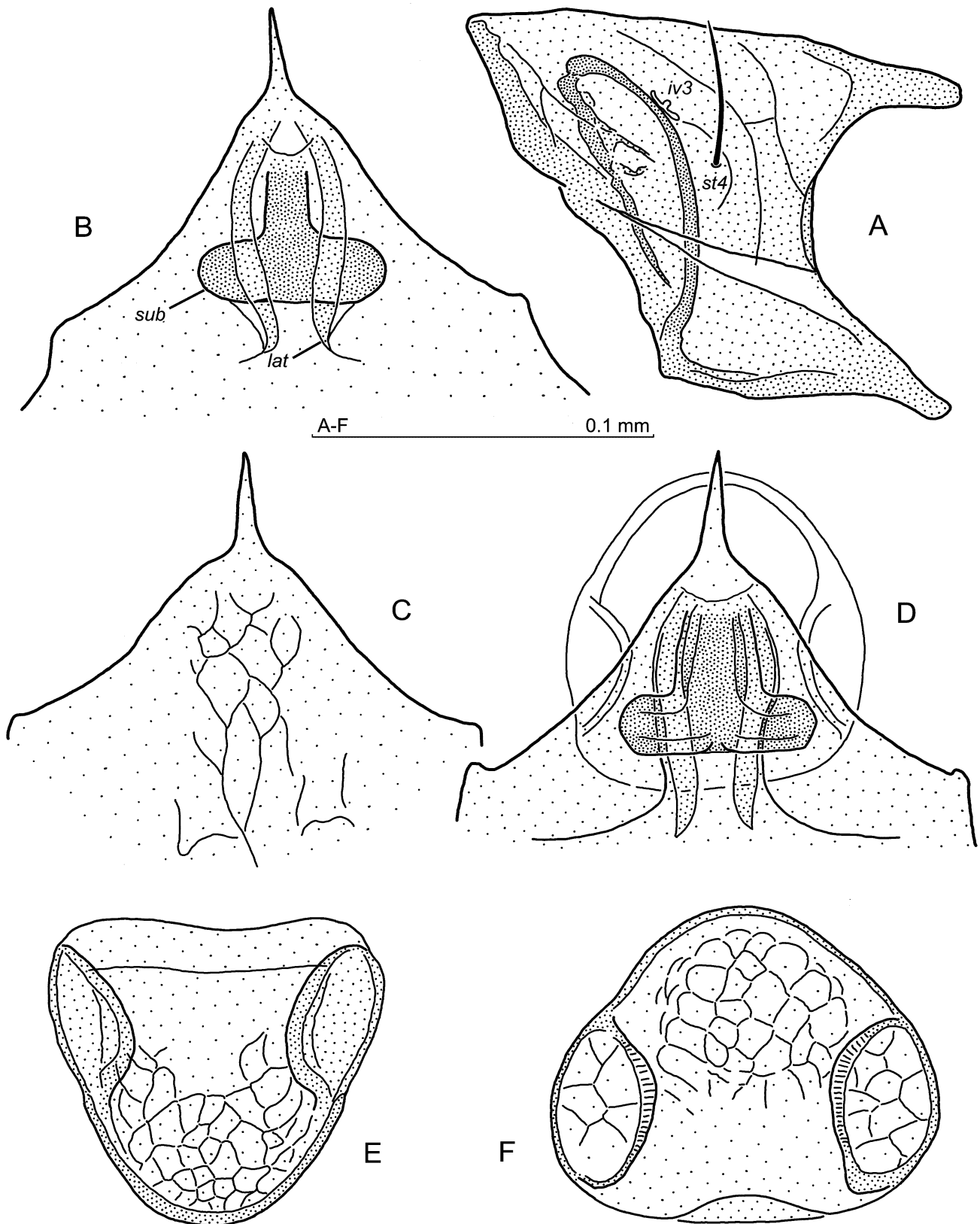


Figure 7 *Anchigamasus geileri*, female: A – paragynium; B – anterior part of the epigynum with lateral and subapical thickenings; C – reticulation on the anterior part of the epigynum; D – anterior part of the epigynum and an outline of the endogynium; E – endogynium showing reticulation on the posterior wall; F – endogynium differently oriented. Abbreviations: *iv3* paragynial pore; *lat* lateral epigynial thickening; *st4* paragynial seta; *sub* subapical inverted T-shaped thickening.

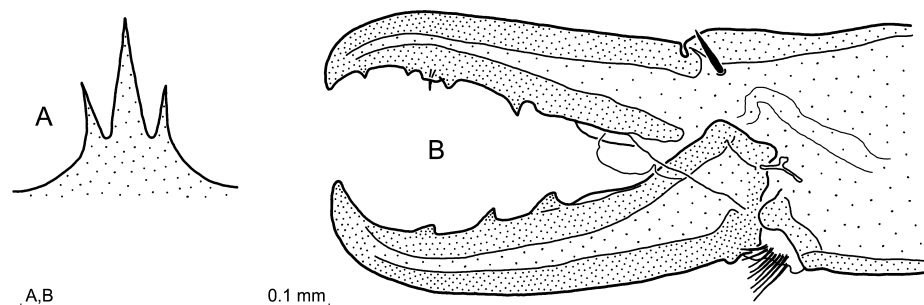


Figure 8 *Anchigamasus geileri*, female: A – gnathotectum; B – chelicera, antiaxially.

38–41 (*ZV3*), 43–46 (*ZV4–ZV5*), 34–37 (*SV3*). Ventral setae simple, reticulation of the opisthogaster scale-like. The presternal plates subtriangular with a line parallel to the posterior edge, the area between the presternal plates and the sternum margin with 2–3 lines. Pores *gv1* located behind setae *st3*, close to the posterior sternal margin. Paragynial shields (Fig. 7A) with narrow, arcuate metagynial sclerites. Epigynial shield with the central prong long and the anterior margins wavy (Fig. 7B–D). The lateral subapical thickenings arcuate, running backward somewhat convergently, central subapical, inverted T-shaped thickening with the rounded arm ends and the posterior edge usually straight or somewhat convex (Fig. 7B,D). Epigynium with scale-like reticulation also on the anterior prong (Fig. 7C). Endogynium (Fig. 7E,F) cup-shaped with two spherules located laterally and projecting inward. The endogynial sack is frequently directed anteriorly, so the posterior wall is directed dorsally, showing more or less distinct reticulation. The diameter of the endogynium exceeds nearly double the width of T-shaped subapical epigynial thickening (Fig. 7B,F). Gland pores *gv2* with two openings, *iv5*, *ivo2*, *ivo3* pores and *gv3* gland pores clearly visible.

Gnathosoma — Gnathotectum (Fig. 8A) with all prongs similarly narrow and acute, the central one more than twice as long as the lateral prongs. Corniculi conical, hypostome with 10 rows of denticles, hypostomatic and palpcoxal setae simple, similar in length. Palptrochanter *v1* seta simple, *v2* barbed in distal half. Chelicera (Fig. 8B) – movable digit with three teeth, fixed digit with one blunt tooth by the side of pilus dentilis, two distant teeth ahead of the pilus dentilis, and two behind it.

Legs — Seta *al* on Tr I somewhat short, seta *all* and *al2* on Fe I short. Leg II: setae *all*, *al2* on Fe II shortened. Leg IV: posteroventral seta on the genu and both ventral setae on the tibia thickened. On Ta IV seta *av1* thickened, *av2* thin, *av2* and *av3*, as well as *pv2* thickened. Tarsal tactile seta *pd1* thin and long. Trochanter without a tubercle. Ta IV 215–230 long. Other aspects of legs I–IV unremarkable.

Male (Figures 9–11)

Idiosoma — Well sclerotised, 790–810 x 385–420 (length x width, n=5), body oval. Setae length on podonotum *ca.* 33–50, but *jl* 55–58, *s1* and *s2* 31–35, *r3 ca.* 92–99, *r4 ca.* 22–26. **Opisthonotum** – setae length from *ca.* 27 to 34, but lateral setae on the posterior part 50–54 long. Dorsal setae simple. Central part of the podonotum with very weakly discernible reticulation, reticulation of the opisthonotum scale-like and more pronounced. **Peritreme** – length 329–332, ending anteriorly as in the female.

Ventral idiosoma — Setae length: 48–52 (*st1*), 46–50 (*st2*), 38–44 (*st3*), 31–34 (*st4*), 26–30 (*st5*), opisthogastral setae 32–39 (*JV1–JV3*), 39–46 (*JV4*), 27–31 (*ZV1*), 29–31 (*ZV2*), 37–42 (*ZV3*, *ZV4*), 43–51 (*ZV5*), 34–39 (*SV3*). Ventral setae simple. **Sternal region** (Fig. 9A) – the genital lamina anterior margin undulate, its corners rounded and extended laterally.

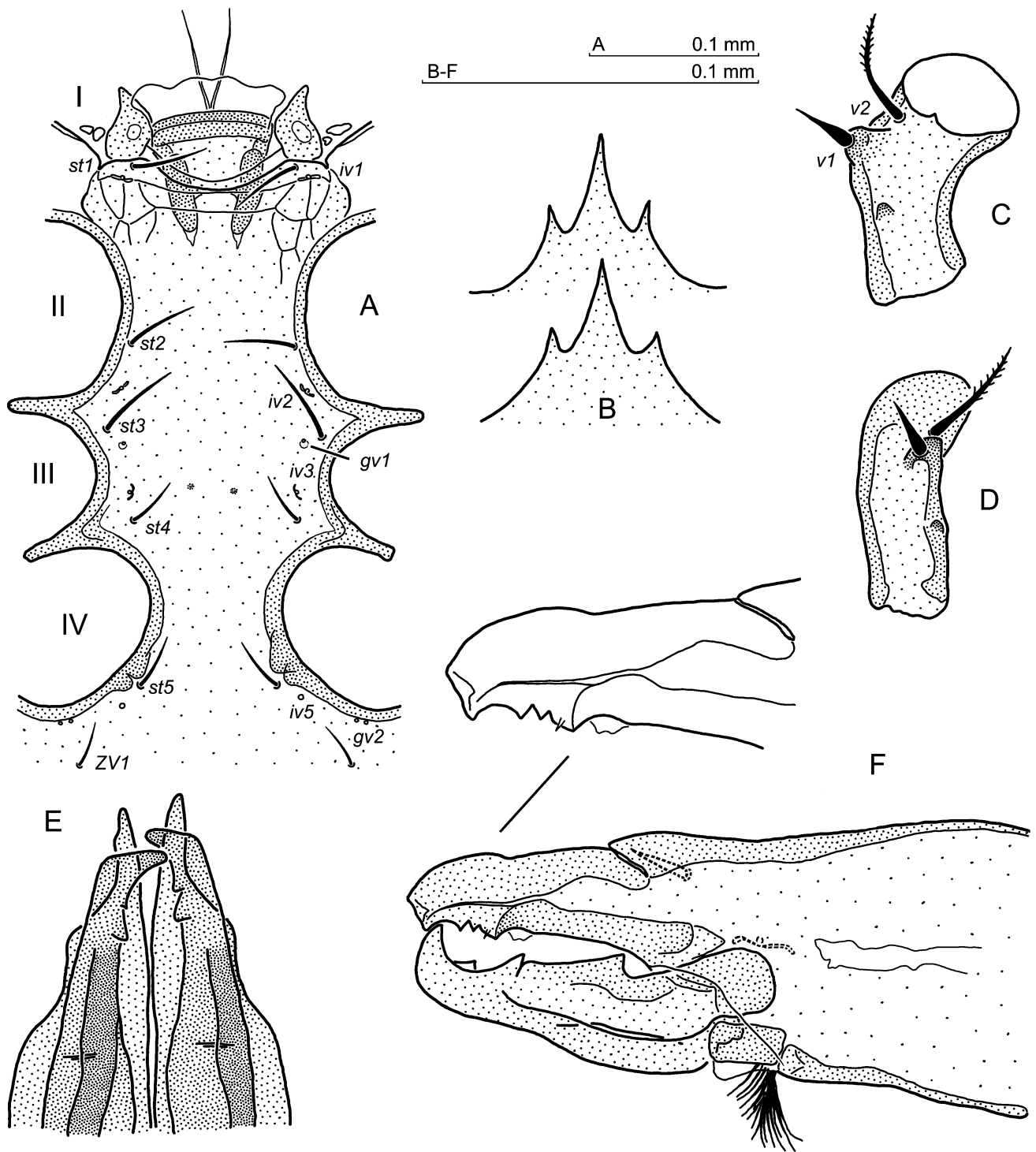


Figure 9 *Anchigamasus geileri*, male: A – genital lamina, presternal plates and sternal shield; B – gnathotectum, two aspects; C – palptrochanter laterally; D – palptrochanter ventrally; E – chelicerae, ventrally; F – chelicera, adaxially. Abbreviations as in Figure 4.

Presternal plates quadrilateral with the anterior protrusion curved antiaxially. Sternum with gland pores *gv1* located laterally behind setae *st3*. Two pairs of sternal cuticle thickenings may

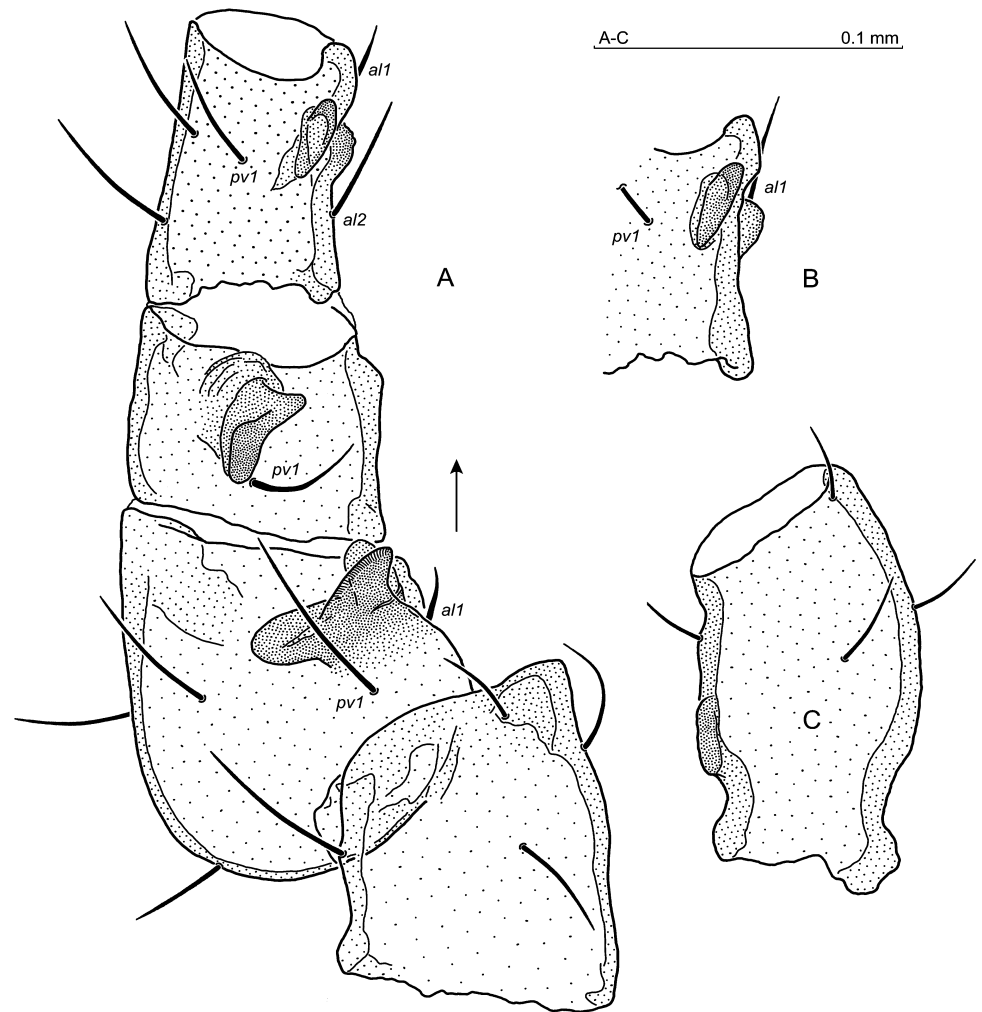


Figure 10 *Anchigamasus geileri*, male: A – Tr, Fe, Ge and Ti of leg II, ventrally; B – spur on Ti II ventrally, another aspect; C – Tr IV, ventrally. Abbreviations as in Figure 5.

be present at the level of pores *gv1* and *iv3*, but frequently only the posterior pair is present (Fig. 9A). Gland pore *gv2* with two openings, pores *iv5* at 1/4 behind *st5* seta towards seta *ZV1*. Pores *ivo2*, *ivo3*, and *gv3* clearly visible.

Gnathosoma — Gnathotectum (Fig. 9B) with the central prong subtriangular and much longer than the lateral ones. Corniculi slim, inserted on arcuate bases (genae). Hypostome with *ca.* 10 rows of denticles, hypostomal and palpcoxal setae simple and similar in length. Palptrochanter *v2* seta barbed on both sides, *v1* simple, very shortened and thick basally, located on a cuticular protrusion (Fig. 9C,D). Behind the protrusion a tubercle is present. Chelicera: when observed from the ventral side (Fig. 9E), the terminal parts of movable digits are curved at the right angle adaxially, the fixed digits suddenly narrow terminally. Laterally (Fig. 9F), the movable digit has two teeth, followed by a tooth-like indentation of the digit's edge, fixed digit blunt apically, with two denticles ahead of the pilus dentilis and one more sclerotised tooth behind pilus, followed by a short lamellar edge.

Legs — Leg II spurred as follows: when viewed from the ventral side (Fig. 10A), the main femoral spur is short and bifurcate, the axillary process elongated, ending at the level



Figure 11 *Anchigamasus geileri*, male: A – Tr, Fe, Ge, Ti and basitarsus of leg II, anterolaterally. B – main spur and axillary process on Fe II posterolaterally. Abbreviations as in Figure 6.

of the article's distal margin. The genual spur arcuate, located on the elevation and oriented obliquely towards article's axis, the tibial spur conical, with a rounded apex (Fig. 10B). From the lateral perspective (Fig. 11), Tr II distal margin forms a large protrusion, the main femoral spur short and triangular, the axillary process also triangular, but narrower and ending at the article's distal margin. Main spur oriented towards the axillary process at a right angle. Genual spur quadrilateral, located on the protrusion at the distal article's margin, tibial spur triangular. Dorsal surface of the basitarsus is gibbous. Setae on leg II simple, femoral seta *al1* somewhat thickened, *al2* short and thickened, *ad2* short, whereas *ad3* short and needle-like. Seta *al1* on Ti II located on the tubercle. Leg IV: Tr IV posterolateral margin of the trochanter with an elongated, low tubercle (Fig. 10C). Posteroventral setae on the genu and tibia, as well as *av2*, *av3* and *pv2* on the tarsus slightly thickened, tarsal *av1* thicker than *pv1*. Tactile dorsal seta on Ta IV as in the female. Ta IV 220–230 long. Other aspects of legs I–IV unremarkable.

Material examined

Reference material — 1 male (slide no. 810 A), surroundings of Graz, Austria, 46.7549°N, 25.0622°E, alt. ca. 422 m a.s.l., 5 July 1975, beech forest litter with pines and hazels; 3 females, 2 males (slide no. 1891), Waidhofen a.d. Thaya, Austria, 48.8196°N, 15.3583°E, alt. ca. 630 m a.s.l., 12 Nov. 2004, moss under larches.

Other material — 13 females, 4 males (slides no. 733–739, 809 B, 810 B, 811),



Figure 12 A map showing distribution of points where both species were collected: solid circle – *A. crassicornutus*, solid triangle – *A. geileri*, empty triangle – materials of Athias-Henriot (1967). The locations where Willmann and Karg collected the type materials are indicated.

surroundings of Graz, Austria, 46.7549°N, 25.0622°E, alt. ca. 422 m a.s.l., 5 July 1975, beech forest litter with pines and hazels; 14 females, 7 males (slides no. 1235, 1239), Pielenhofen near Regensburg, Germany, 7 Sept. 1999, mixed forest litter in a limestone ravine; 1 male (slide no. 1700), Chribska, Czech Republic, 50.8816°N, 14.4107°E, alt. ca. 403 m a.s.l., leg. Dr. M. Liana; 1 female, 1 male, (slides no. 1894, 1896), Waidhofen a.d. Thaya, Austria, 48.8196°N, 15.3583°E, alt. ca. 630 m a.s.l., 12 Nov. 2004, moss under larches; 3 females (slide no. 2864), Szklarska Poręba, South-Western Poland, 50.8371°N, 15.3583°E, alt. ca. 637 m a.s.l., 23 June 2019, mixed forest litter, leg. Dr. D. Podkowa.

Material deposition — The reference material is deposited in the Zoological Division of the Nature Education Centre, Jagiellonian University, Kraków, Poland, whereas the other material is held in the author’s own collection.

Remarks on synonymy and differential taxonomy

The male of *A. crassicornutus* had been described by Willmann (1954: 219) based on material collected in Czechoslovakia (now Czech Republic), near Sloup (cz.: Sloupske udoli). A re-description of the male and the description of the female were provided by Athias-Henriot (1967: 47). Karg (1968: 335) described both female and male of the new species *A. geileri* (as *Pergamasus geileri* Karg, 1968) from Tharandt Forest in Saxony (Germany). This species was synonymised with *A. crassicornutus* by Athias-Henriot, who informed Wiktor Micherdziński by letter, and possibly also Wolfgang Karg. That synonymy was acknowledged (Athias-Henriot, 1971: 174; Karg, 1971: 411, also Karg, 1993: 450), and remained unchallenged for half a century.

If we compare the male of *A. crassicornutus* (Willmann, 1954) (only one specimen was studied by Willmann) and the male of *A. geileri* (Karg, 1968), the striking, key difference

can be observed in the main spur on Fe II. In *A. crassicornutus* the main spur culminates in one summit, whereas in the male of *A. geileri* the main spur is bifid. It is best visible from a ventral perspective, whereas in a lateral view, the main spurs can be superficially similar in both species.

We may ask why Athias-Henriot considered these two species as synonyms. Athias-Henriot (1967) re-described *P. crassicornutus* Willmann, but her description and drawings of males and females evidently indicated that she had erroneously identified her material, which was actually *P. geileri* Karg (Athias-Henriot material examined). Hence, she proposed that both species should be considered as synonyms. In other words, Athias-Henriot synonymised *P. crassicornutus* sensu Athias-Henriot, 1967 and *P. geileri*, but misidentified *P. crassicornutus*.

The female of *A. crassicornutus* differs from *A. geileri*, mainly owing to the shape of the epigynial, subapical T-shaped thickening, which in the former species has “arms” arcuate and with angular corners, whereas in the latter species the arms are straight and rounded terminally. Also, in *A. crassicornutus* the endogynial sac diameter is similar to the span of the T “arms”, whereas in *A. geileri* the endogynial sac is nearly twice as large as the width of the T “arms”.

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