

# New *Leptogamasus* mite species (Parasitiformes: Parasitidae) from Europe. II. Northern Italy

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## Original research

### ABSTRACT

The four new species belonging to Parasitidae family, *Leptogamasus* (*Leptogamasus*) *bicornis* n. sp., *Leptogamasus* (*L.*) *digiticornis* n. sp., *Leptogamasus* (*L.*) *sextus* n. sp. and *Leptogamasus* (*L.*) *trentinis* n. sp. originating from the surroundings of Lake Garda (Lago di Garda), northern Italy, are described.

**Keywords** *Leptogamasus* subgenus; mite taxonomy; new species; northern Italy

**Zoobank** <http://zoobank.org/38DD61F6-6509-435E-A57D-9DC8A17F820F>

## Introduction

The *Leptogamasus* Trägårdh, 1936 s. str. subgenus, one of four subgenera comprising the *Leptogamasus* genus (Parasitidae family) can be distinguished owing to the length of peritreme, which reach the midregion of the openings for the second pair of legs (Witaliński, 2019). Other permanent feature is a podonotal chaeto- and poroidotaxy, as the podonotum features 21 pairs of setae – *r1*, *s3* and *z3* are lacking – and 6 pairs of poroids (*idj1*, *idj4*, *idj6*, *idz3*, *idz6*, *ids4*) plus 4 pairs of gland pores (*gdj2*, *gdz5*, *gdz6*, *gds4*). Poroids and gland pores on the opisthosomal area are permanent – 11 poroid pairs (*idJ1*, *idJ2*, *idJ4*, *idJ5*, *idZ1*, *idZ3*, *idZ5*, *idZ6*, *idS2*, *idS3*, *idS4*) and 2 pairs of gland pores (*gdS2*, *gdZ4*). The arrangement of opisthosomal setae is subject to great variability, however, as some marginal setae may be lost, or an extra setae may occasionally appear (Witaliński 2020).

Species described in this study belong to *Leptogamasus* subgenus and share the above-referenced features. They were encountered practically in two relatively close localities (ca. 32 km apart) east and west from Lake Garda (Lago di Garda). As in most species of *Leptogamasus*, the females of these species are very different, so they are relatively easily identifiable, as well as suitable for making the holotypes. The males are similar, and their exact identification is possible after sectioning, but *L. (L.) digiticornis* n. sp., features a very conspicuous, finger-like, ventral appendage on each corniculus.

The Italian *Leptogamasus* fauna is very little known, mostly from the taxonomic studies describing the new species. There are two Italian species belonging to *Medioperigamasus* subgenus, i.e. *L. (M.) parvus* Witaliński, 2019 and *L. (M.) sarcidanus* Witaliński, 2019 (from Sardinia), as well as five or six species of *Leptogamasus* s. str. subgenus, i.e. *L. (L.) dilatellus* (Berlese, 1906), *L. (L.) distinctellus* (Berlese, 1906), *L. (L.) oxygynellus* (Berlese, 1906), *L. (L.) parvulus* (Berlese, 1903), *L. (L.) parvulus* (Berlese, 1903) sensu Athias-Henriot, 1967, and *L. (L.) varpulus* Athias-Henriot, 1967.

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## Methods

Methods used in this study were described in detail in the previously published paper within this series (Witaliński 2020). Since the podonotum structure in all the species actually described looks the same, the opisthonotum structure has been presented, as the only variable one.

## Systematics

### Family Parasitidae

#### Genus *Leptogamasus* Trägårdh, 1936 sensu Juvara-Balş, 1981

Type species *Leptogamasus suecicus* Trägårdh, 1936: 227.

The original genus *Leptogamasus* Trägårdh, 1936 was modified by Athias-Henriot (1971) who defined two subgenera within it: *Tomeogamasus* Athias-Henriot, 1971 and *Ernogamasus* Athias-Henriot, 1971. Both subgenera, along with the third one, *Leptogamasus* s. str., were subsequently raised to the genus level by Juvara-Balş (1981). In the same paper Juvara-Balş divided genus *Leptogamasus* s. str. into three subgenera, i.e. *Breviperigamasus*, *Holoperigamasus* and *Leptogamasus* s. str. Recently, the fourth subgenus *Medioperigamasus* was defined (Witaliński, 2019).

#### *Leptogamasus* (*Leptogamasus*) Trägårdh, 1936.

Type species *Leptogamasus suecicus* Trägårdh, 1936: 227.

#### *Leptogamasus* (*Leptogamasus*) *bicornis* n. sp.

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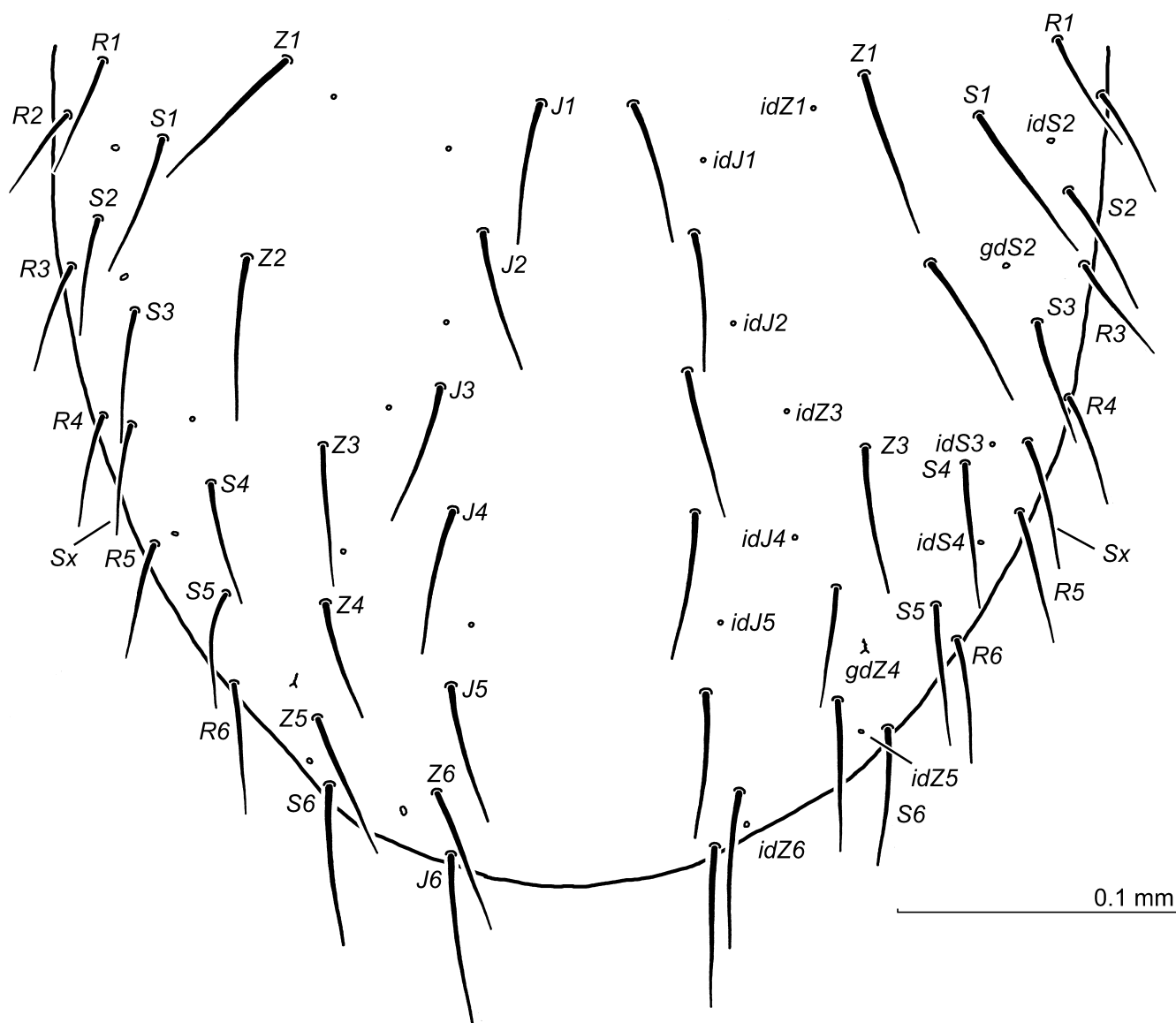
(Figures 1–4)

### Diagnosis

**Female and male** — Gnathotectum trispinate with pointed and moderately long prongs, the central one longer; gland pore *gv1* present; dorsal setae relatively long, podonotum with 21 pairs of setae, opisthonotum with 24 pairs of setae (plus 1–2 supplementary setae located marginally); Tr IV without tubercle.

**Female** — All three prongs of gnathotectum similarly narrow, central one slightly longer; distance of the presternal plates similar or slightly greater to thickness of the tritosternum base; anterior margin of the sternal shield more or less concaved; gland pores *gv1* not far from *st3* setae; epigynial shield with two prominent teeth on the internal (dorsal) surface, anterior margins straight, but with a shallow concavity in midregion, behind the internal teeth level and anteriorly to the minute denticles on each margin, posterolateral margins short and arcuate; spherules of the endogynium oval to foot-shaped, depend on the orientation, with two to four shallow indentations on the anterior margin; lamellar and wide stipule growing from an arcuate base, dentate at the anterior margin, featuring a number of small teeth on the ventral surface; endogynial sac with several teeth, usually in symmetric arrangement, located behind the stipule base, as well as on the dorsal and lateral sac walls; on the lateral sac's walls two prominent, curved hooks are also found.

**Male** — Gnathotectum with central prong triangular and wider than the lateral ones; genital lamina with the rounded anterior corners; presternal plates subrectangular; corniculi with sinuous adaxial margin; cheliceral fixed digit with curved, pointed apex, ventral margin convex in the central part, fitted with many (7–9) similar, small teeth behind pilus dentilis, followed by one much larger proximal tooth; femur II with axillary process half-moon shaped, spurs on the genu and tibia similar, conical, located some distance away from the distal article margin.



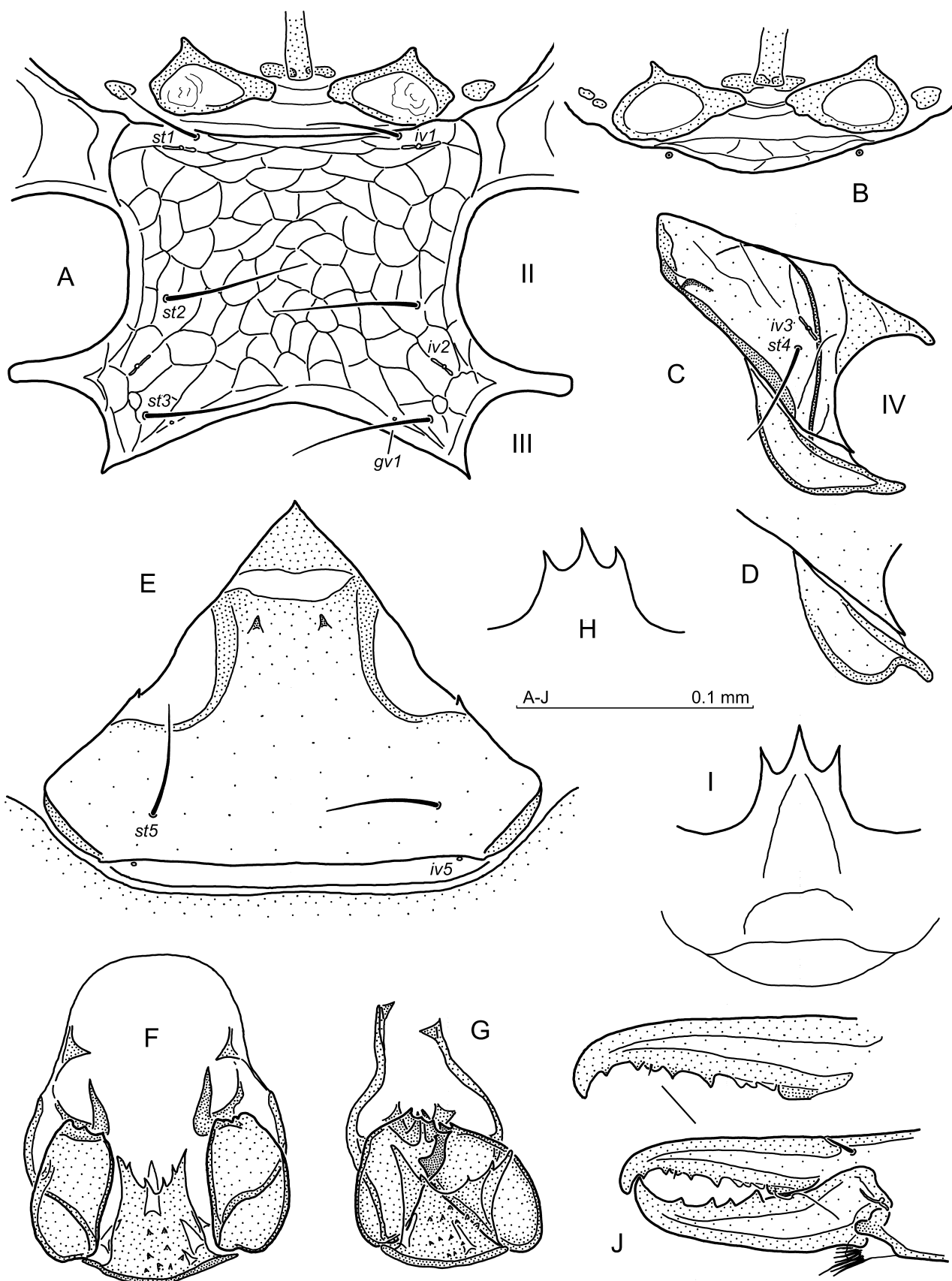
**Figure 1** *Leptogamasus (L.) bicornis* n. sp., opisthonotum of female, setae (*J1–J6*, *Z1–Z6*, *S1–S6* and *R1–R6* and supplementary setae *Sx*), pores (*idJ1*, *idJ2*, *idJ3*, *idJ4*, *idJ5*, *idZ1*, *idZ2*, *idZ3*, *idZ4*, *idZ5*, *idZ6*, *idS2*, *idS3*, *idS4*) and gland openings (*gdS2*, *gdZ4*) are marked.

## Description

### Female (Figures 1, 2)

**Idiosoma** — Well sclerotised, 645–675 x 340–360 (length x width, n=5), holotype 695 x 366. **Podonotum** — setae length: 40–44 (*j1*), 43–47 (*j2*), 47–52 (*j3*), 46–50 (*j4*), 43–47 (*j5*), 37–41 (*j6*), 86–93 (*r3*), in holotype 46 (*j1*), 43 (*j2*), 43 (*j5*), 39 (*j6*), 93 (*r3*), *j3* and *j4* not available. **Opisthonotum** (Fig. 1) — 24 pairs of setae and 1–2 supplementary setae located marginally. Setae long, length from ca. 40 up to 60, holotype 37–55. Dorsal setae simple, reticulation of podonotum not discernible, opisthonotum with a scale-like reticulation. **Peritreme** — length 150–160, including stigma (holotype 157), anterior tip located anteriorly to the midregion of the opening for Co II, at the level between the podonotal setae *r2* and *z2*.

**Ventral idiosoma** — Setae length: 44–48 (*st1*), 52–58 (*st2*), 52–59 (*st3*), 44–47 (*st4*), 46–51 (*st5*), 50–54 (*JVI*), 33–37 (*ZVI*), other opisthogastral setae ca. 35–52, in holotype



**Figure 2** *Leptogamasus (L.) bicornis* n. sp., female: A – presternal plates and the sternal shield; B – presternal plates and reticulation in front of the sternal margin; C – paragynial plate; D – posterior end of paragynial plate, another aspect; E – epigynum; F, G – endogynium, two aspects; H, I – gnathotectum, two aspects; J – chelicera, antiaxially. Abbreviations: II–IV the openings for coxae II to IV; *gv1* gland opening; *st1*–*st5* sternal setae; *iv1*–*iv3*, *iv5* pore openings. A, E, F, H – holotype.

46 (*st1*), 60 (*st2*), 63 (*st3*), 48 (*st4*), 50 (*st5*), 59 (*JVI*), 38 (*ZVI*), other opisthogastral setae ca. 26–49. Ventral setae simple, reticulation of the sternum and opisthogaster scale-like. Anterior margin of the sternal shield variably concaved (Fig. 2A,B), the area between the presternal plates and the sternal margin usually with reticulation (Fig. 2B). Presternal plates of irregular shape, the distance between them similar to the thickness of tritosternum base (Fig. 2B) or slightly greater (Fig. 2A). The pores *gv1* far from each other (Fig. 2A). Paragynial shields (Fig. 2C,D) metagynial sclerites narrow and regularly arcuate, reaching the anterior paragynial margin. Epigynial shield (Fig. 2E) with two prominent teeth on the internal (dorsal) surface. The anterior epigynial margins straight, but with the shallow concavities just behind the teeth level, and in front of the minute denticles on the margins. Posterolateral margins short and convex, and the posterior margin concaved laterally forming a band of soft cuticle between the epigynium and opisthogaster. Epigynium apex with less pigmented transversal band. Endogynium (Fig. 2F,G) large, with spherules generally oval, but sometime foot-shaped dependent on the orientation. Their anterior tips are located closer than posterior ones and possess two to four shallow indentations. Stipule grows from an arcuate solid base, is lamellar and wide, and its anterior margin is richly dentate, many small teeth are also encountered on its ventral surface. Endogynial sac with several teeth, usually in symmetric arrangement: two are located behind the stipule base, one or two teeth are on the dorsal sac wall, and two teeth are on the lateral walls in the anterior portion of the endogynial sac. Most conspicuous are two prominent, curved hooks on the dorsolateral or the dorsal sac wall. Gland pores *gv2* with two openings; *iv5*, *ivo2*, *ivo3* and *gv3* well discernible.

**Gnathosoma** — Gnathotectum (Fig. 2H,I) trispinate, with pointed, similarly narrow and moderately long prongs, the central one somewhat longer. Corniculi conical, hypostome with 11–12 rows of denticles, hypostomatic and palpcoxal setae simple, anterior hypostomatics and palpcoxal setae slightly larger. Palptrochanteral *v1* seta simple, *v2* barbed. Chelicera (Fig. 2J) — movable digit with four teeth, the proximal one larger. Fixed digit with 2 distant teeth in front of pilus dentilis, arcuate one by side of it, and two behind pilus dentilis, followed by 3 lamellar teeth.

**Legs** — Setae *al* on Tr I short and thick. Seta *al2* on Fe II short and thick, whereas anteroventral seta thickened, but longer. Ti II with thickened ventral setae: anteroventral barbed, posteroventral simple. Leg IV: dorso- and posterolateral setae on the femur thick and short, posteroventral seta on Ge IV and both ventral setae on the tibia thickened, out of those the posteroventral ones barbed. Some ventral and posterolateral setae on the tarsus thickened, posteroventral seta on the basitarsus terminally barbed. Tr IV without the dorsal tubercle. Other aspects of legs I–IV unremarkable.

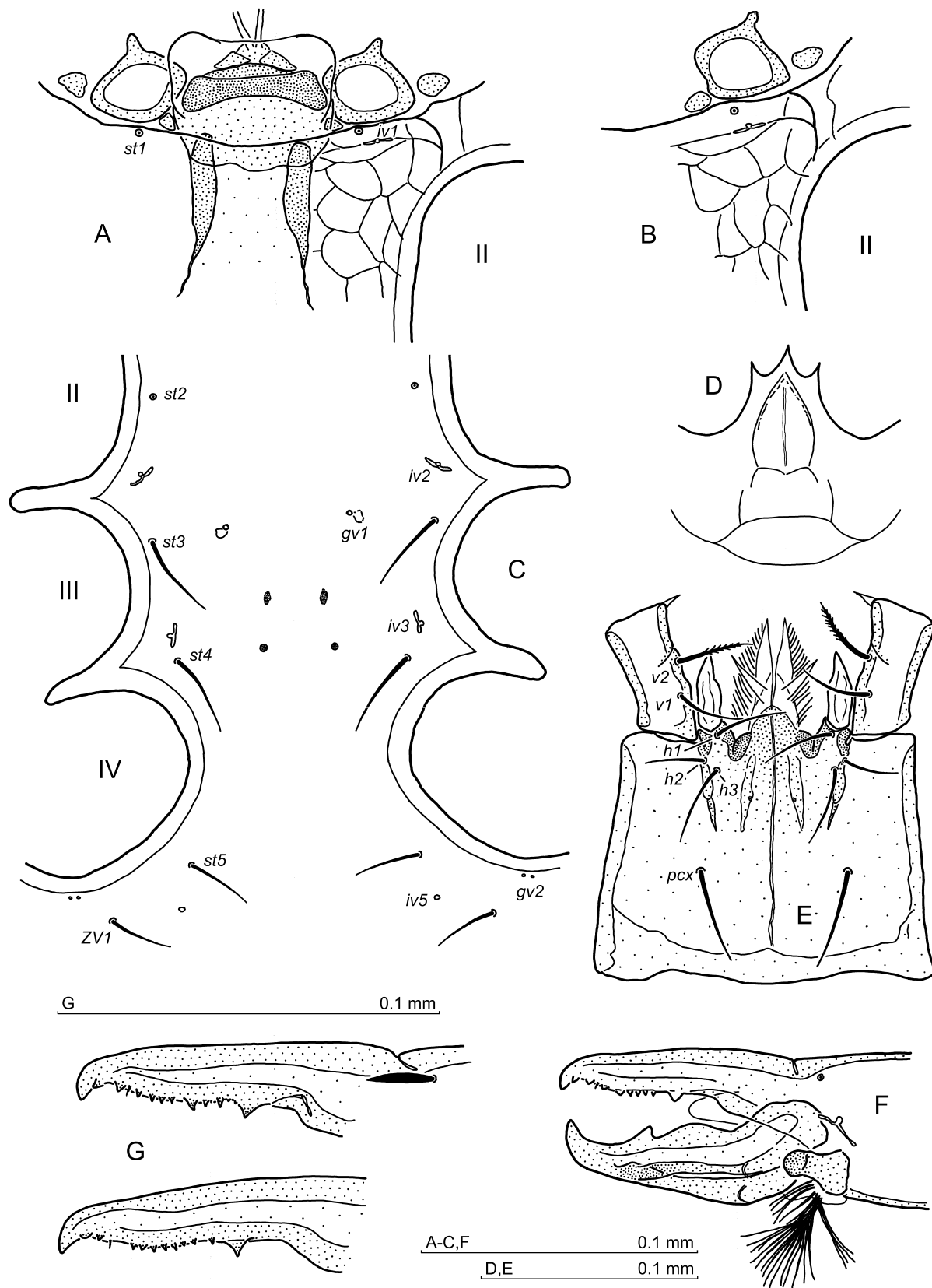
**Male** (Figures 3, 4)

**Idiosoma** — Sclerotized as in the female, 600–640 x 315–340 µm (length x width, n=5).

**Podonotum** — the length of setae: 43–47 (*j1*), 42–46 (*j2*), 50–55 (*j3*), 50–52 (*j4*), 38–42 (*j5*), 35–38 (*j6*), 80–88 (*r3*). **Opisthonotum** — setae length from ca. 41 to 47. **Peritreme** — including stigma 148–153 long, ending anteriorly as in the females. Dorsal setae simple, reticulation pattern as in the female.

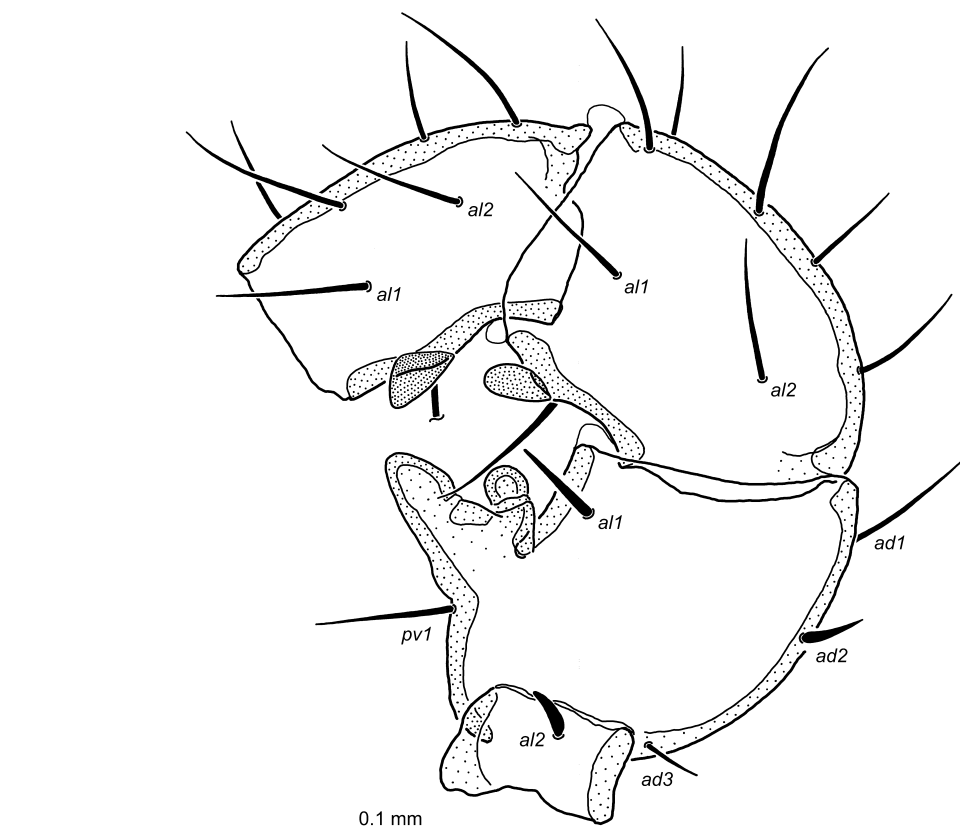
**Ventral idiosoma** — Setae length: 47–51 (*st1*), 46–52 (*st2*), 42–46 (*st3*), 38–42 (*st4*), 33–37 (*st5*), 42–46 (*JVI*), 27–31 (*ZVI*), other opisthogastral setae ca. 27–39. Ventral setae simple. **Sternal region** (Fig. 3A–C) — genital lamina (Fig. 3A) with rounded anterior corners flanked by subrectangular presternal plates (Fig. 3A,B). Sternum (Fig. 3C) with gland pores *gv1* at the *st3* setae level, followed by two elongated weak thickenings and two stronger button-like thickenings of the sternal cuticle, located somewhat laterally at the level between *iv3* sternal pores and setae *st4*. Pores *gv2* with two openings, pores *iv5* equally distant from setae *st5* and *ZVI*, but slightly shifted adaxially. Sternum and opisthogaster reticulation scale-like.

**Gnathosoma** — Gnathotectum (Fig. 3D) with central prong acute and wider than the lateral ones which are like in the female. Corniculi (Fig. 3E) adaxial margin sinuous, hypostome with 11–12 rows of denticles, palpcoxal and hypostomatic setae simple, the former ones largest, whereas hypostomatics *h2* shortest. Palptrochanteral *v1* seta simple, *v2* thicker and barbed.



**Figure 3** *Leptogamasus (L.) bicornis* n. sp., male: A – genital lamina flanked by presternal plates. Reticulation of sternogenital right anterior corner marked; B – sternogenital right anterior corner reticulation, another aspect; C – sternal plate with setae and pores marked; D – gnathotectum; E – gnathosoma, corniculi and palptrochanters ventrally; F – chelicera, antiaxially; G – two aspects of cheliceral fixed digit, antiaxially. Abbreviations: II–IV the openings for coxae II to IV; gv1, gv2 gland openings; h1–h3 hypostomatic setae; iv1–iv3, iv5 pore openings; pcx palpcoxal seta; v1, v2 palptrochanteral setae; st1–st5 sternal setae; ZV1 opisthogastral seta.





**Figure 4** *Leptogamasus (L.) bicornis* n. sp., male: Fe II, Ge II and Ti II anterolaterally. Some setae marked.

Chelicera (Fig. 3F) – movable digit with one tooth followed by an arcuate edge proximally, fixed digit (Fig. 3F,G) with 1–2 small teeth in front of pilus dentilis followed by a slightly convex ventral edge bearing a row of 7–9 minute denticles and distinctly larger proximalmost tooth.

**Legs** — Leg II spurred as follows: when observed from the ventral side, femoral main spur is curved posterolaterally, axillary process hooked and also curved posterolaterally. When viewed from the lateral side, leg II (Fig. 4) shows straight main spur with a small elevation above seta *pv1*, axillary process half-moon shaped. Spurs on the genu and tibia similar, conical, located in some distance from the distal article margin. Sometimes tibial spur much pointed (Fig. 4). Setae on leg II simple, setae *al2* and *ad2* on the femur shorter and thicker, seta *al1* thickened, whereas *ad3* needle-like. Seta *al* on Tr I short and thick, leg IV setation as in the female. Tubercle on Tr IV absent. Other aspects of legs I–IV unremarkable.

#### Material examined

**Holotype** — female (slide no. 1001 A), Tiarno di Sopra, Trentino, northern Italy, 45.8824 °N, 10.6790 °E, alt. ca. 1100 m a.s.l., 24 Sept. 1990, detritus under beech and fir. **Paratypes** — 10 females, 8 males (slides no. 1001 B–D, 1004 F–M), ibid. **Other material** — 1 female (slide no. 1009 A), Tiarno di Sotto, Trentino, northern Italy, 45.8961 °N, 10.6734 °E, alt. ca. 850 m a.s.l., 24 Sept. 1990, detritus under beech and fir.

**Type deposition** — Types are deposited in the Zoological Division of the Nature Education Centre, Jagiellonian University, Kraków, Poland, whereas the remaining material is held in the Author's collection.

## Etymology

The specific name *bicornis* refers to two large horns or hooks (lat. *cornus* = horn) within the female endogynium.

## ***Leptogamasus (Leptogamasus) digiticornis* n. sp.**

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(Figures 5–9)

## Diagnosis

**Female and male** — Gnathotectum trispinate with similar, pointed prongs; gland pores *gv1* present; podonotum with 21 pairs of setae, opisthonotum with 24 pairs of setae (plus 1–2 supplementary setae located marginally); Tr IV without tubercle.

**Female** — Presternal plates distant less than the thickness of tritosternum; sternal shield anterior margin concaved; the anterior margins of epigynial shield slightly wavy, posterolateral one short and convex, on the internal (dorsal) surface of the epigynium two tiny teeth present; endogynium with oval spherules, their anterior poles are close together, with 2–3 small tooth-like protrusions, anterolaterally minute denticles may also be present, stipule is short and just behind the posterior poles of spherules, bears numerous teeth in a fan-like arrangement.

**Male** — Genital lamina anterior margin with a shallow central concavity, anterior corners rounded; presternal plates with circular central area, rounded despite the sharp anterior protrusion; corniculi conical, with a conspicuous finger-like protrusion on the ventral side; hypostomatic seta *h1* growing from a tubercle; cheliceral movable digit relatively wide, with one small tooth followed by a convex edge proximally, spermatodactyl with antiaxially directed triangular protrusion from a ventral perspective, fixed digit narrow and wavy with 1–2 tiny denticles in front of pilus dentilis, and a row of ca. 4 minute denticles behind pilus dentilis; leg II from the ventral perspective: the femoral main spur slim and long, finger-like, and curved posterolaterally, the axillary process pointed posterolaterally, from a lateral perspective the femoral main spur arcuate, narrow and finger-shaped, the axillary process half-moon shaped, spur on the genu finger-shaped and growing from the elevation at distal article margin, spur on the tibia conical, close to the distal tibial margin.

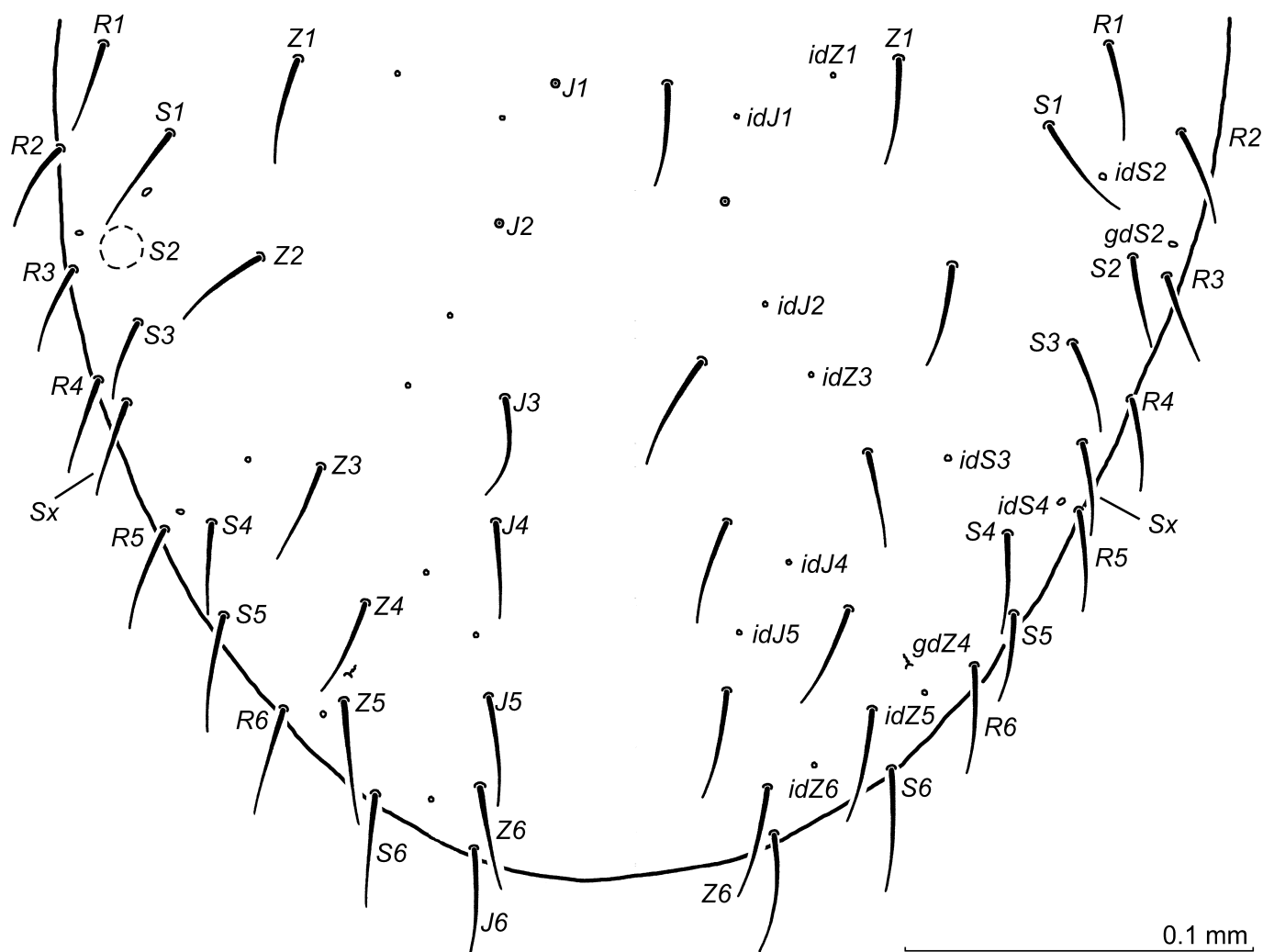
## Description

**Female** (Figures 5–7)

**Idiosoma** — Moderately sclerotised, paratype 535 x 285 (length x width), holotype 550 x 295. **Podonotum** — the length of setae in female paratype: 41 (*j2*), 42 (*j3*), 43 (*j4*), 34 (*j5*), 29 (*j6*), 84 (*r3*), *j1* not available, in holotype 30 (*j1*), 42 (*j3*), 39 (*j4*), 38 (*j5*), 27 (*j6*), 83 (*r3*), *j2* not available. **Opisthonotum** (Fig. 5) — 24 pairs of setae and 1–2 supplementary setae located marginally. Setae length from ca. 29 up to 38. Dorsal setae simple, reticulation of podonotum poorly discernible, better so in the lateral regions, opisthonotum with a scale-like reticulation. **Peritreme** (Fig. 6) — length in paratype 127 including stigma, in holotype 124, ending anteriorly in front of the podonotal setae *r2*.

**Ventral idiosoma** (Fig. 6) — Setae length in female paratype: 41 (*st1*), 44 (*st2*), 47 (*st3*), 35 (*st4*), 34 (*st5*), 37 (*JV1*), 24 (*ZV1*), other opisthogastral setae ca. 29–39. In holotype 39 (*st1*), 46 (*st2*), 48 (*st3*), 35 (*st4*), 35 (*st5*), 39 (*JV1*), 22 (*ZV1*). Ventral setae simple, reticulation of opisthogastral scale-like. Anterior margin of the sternal shield with concavity, presternal plates distant less than the thickness of tritosternum, *gv1* pores not far from the posterior margin of the sternum, and far from each other. Paragynial shields (Figs 6, 7A) with a thin, semicircular metagynial sclerites. Epigynial shield (Figs 6, 7B), the anterior margins slightly wavy, posterolateral ones short and convex, and the posterior margin straight. On the internal (dorsal) surface of epigynium, two tiny teeth are present. Endogynium (Figs 6, 7C,D) with oval spherules anteriorly convergent, their anterior poles form 2–3 small tooth-like protrusions, minute denticles can also be present anterolaterally (Fig. 7C). Stipule is short and located



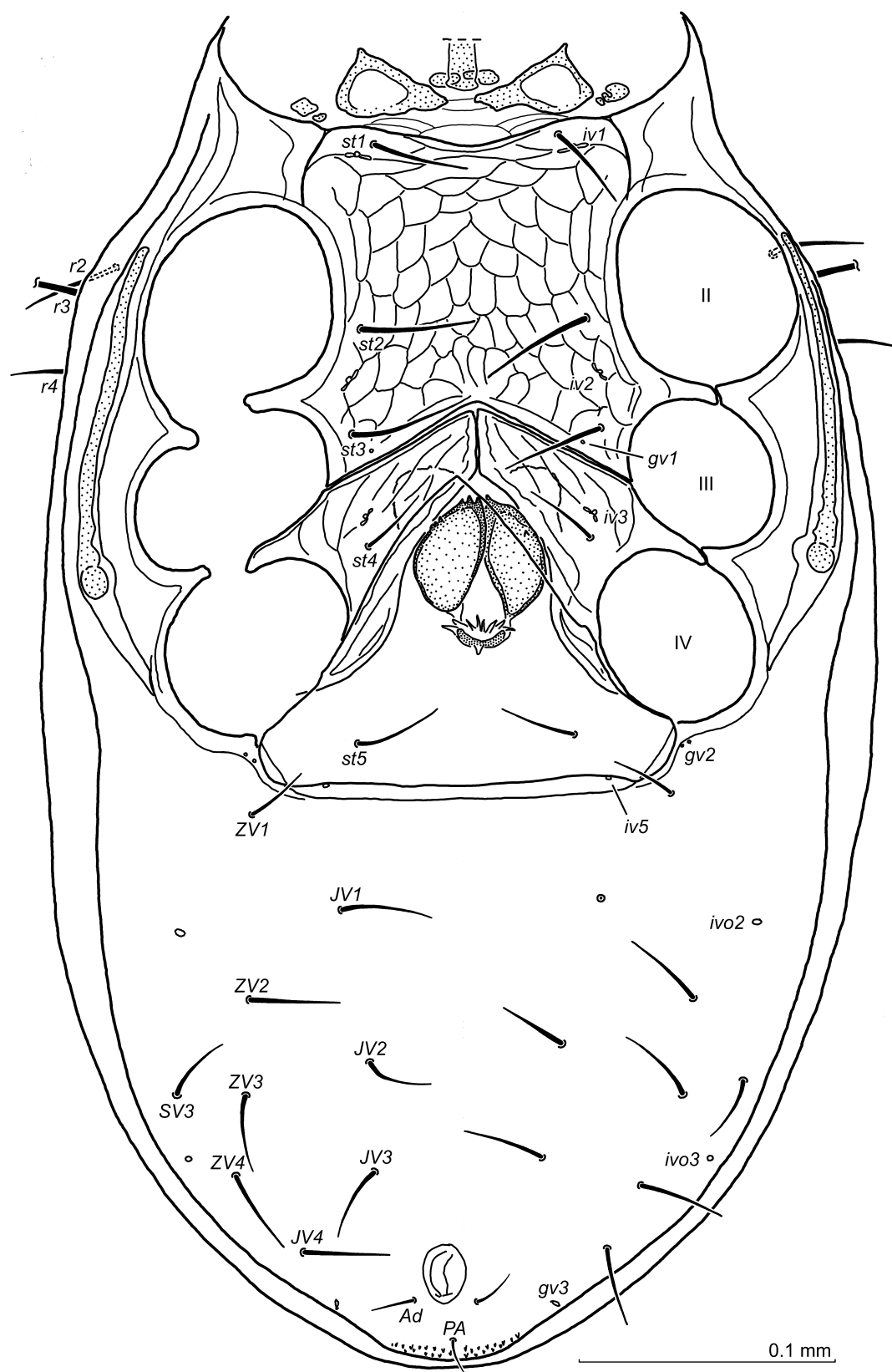


**Figure 5** *Leptogamasus (L.) digiticornis* n. sp., opisthonotum of the female (holotype). Setae, pores and gland openings marked as in Figure 1.

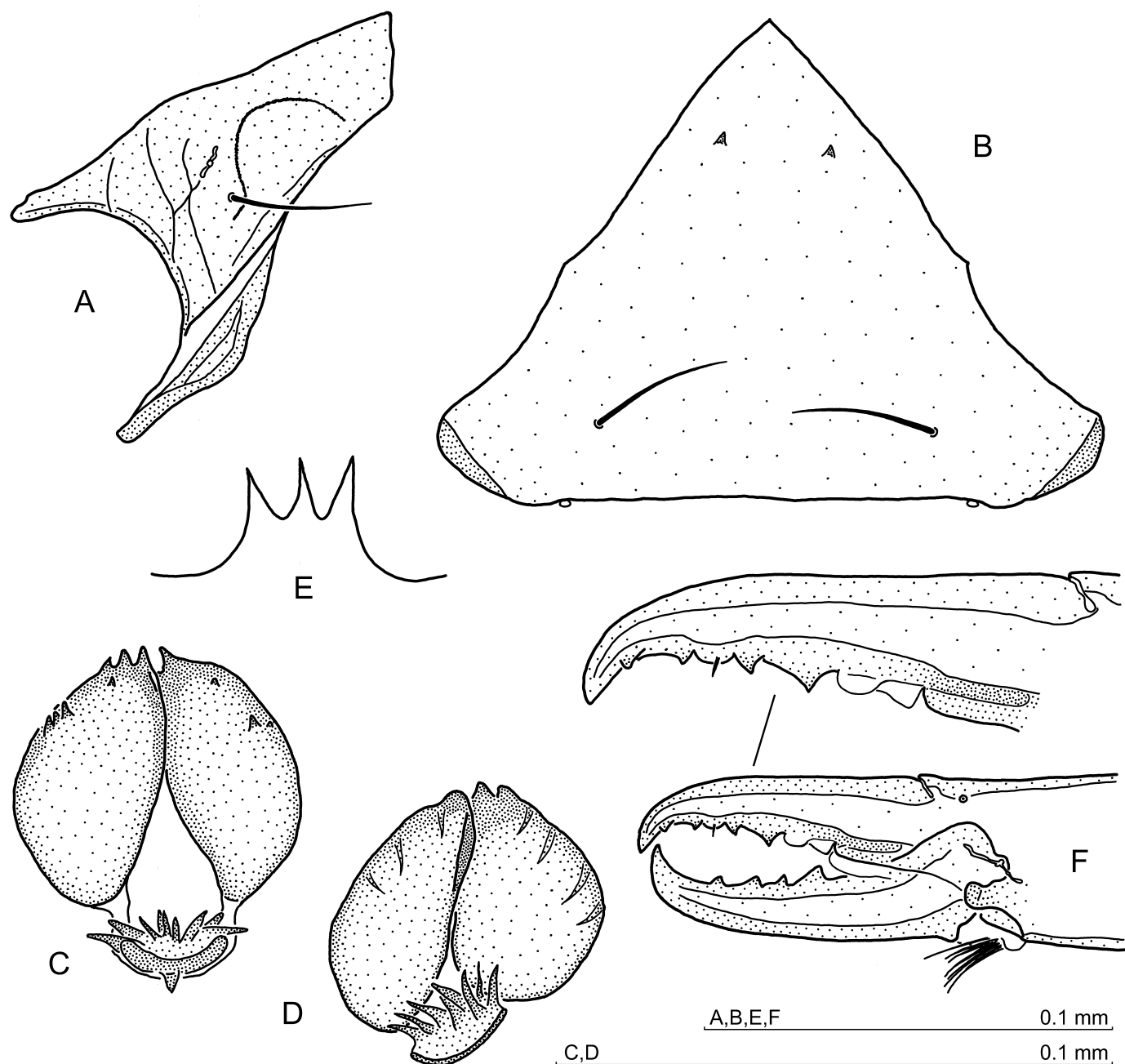
between, or just behind the posterior poles of spherules; it features many teeth in fan-like arrangement. Gland pores *gv2* with two openings; *iv5*, *ivo2*, *ivo3*, and *gv3* well discernible.

**Gnathosoma** — Gnathotectum (Fig. 7E) trispinate, all prongs similar, narrow and acute. Corniculi conical, hypostome with 11 rows of denticles, hypostomatic and palpcoxal setae simple, the last ones larger. Palptrochanteral *v1* seta simple, *v2* larger and barbed. Chelicera (Fig. 7F) – movable digit with four teeth, the proximalmost ones larger. Fixed digit with 2 distant teeth in front of pilus dentilis, arcuate one by the side of it, and two behind pilus dentilis, followed by 2 lamellar protrusions, the last one pointed.

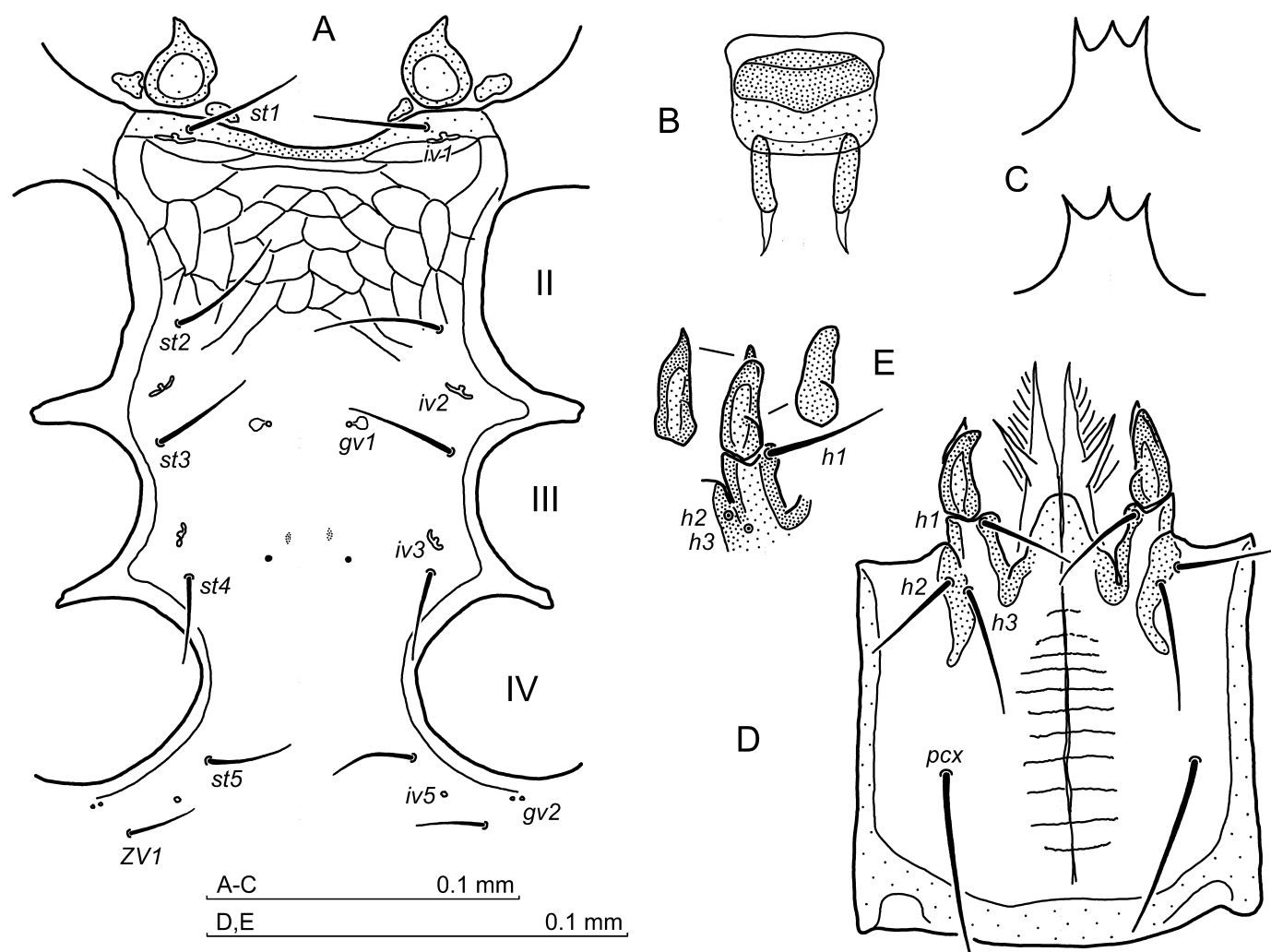
**Legs** — Setae *al* on Tr I short and thick, setae *ad2* on Fe I larger than others. Fe II with anteroventral seta larger and barbed, seta *al2* short and thick, anterolateral setae on Ge II and Ti II barbed. Leg IV: dorso- and posterolateral setae on the femur thick and short, posteroventral seta on the genu and tibia thickened and terminally barbed. Some ventral and posterolateral setae on the tarsus thickened, posteroventral seta on the basitarsus terminally barbed. Tr IV without dorsal tubercle. Other aspects of legs I–IV unremarkable.



**Figure 6** *Leptogamasus (L.) digiticornis* n. sp., ventral side of the female idiosoma (holotype). Reticulation of the sternum and the paragynia is shown. Abbreviations: II–IV the openings for coxae II to IV; *Ad* and *PA* adanal and postanal setae, respectively; *gv1*–*gv3* gland openings; *st1*–*st5* sternal setae; *JV*, *ZV* and *SV* series of opisthogastral setae; *iv1*–*iv3*, *iv5*, *ivo2*, *ivo3* pore openings.



**Figure 7** *Leptogamasus (L.) digiticornis* n. sp., female: A – paragnathum; B – epigynum; C, D – two aspects of endogynium; E – gnathotectum; F – chelicera, antiaxially. C – holotype.

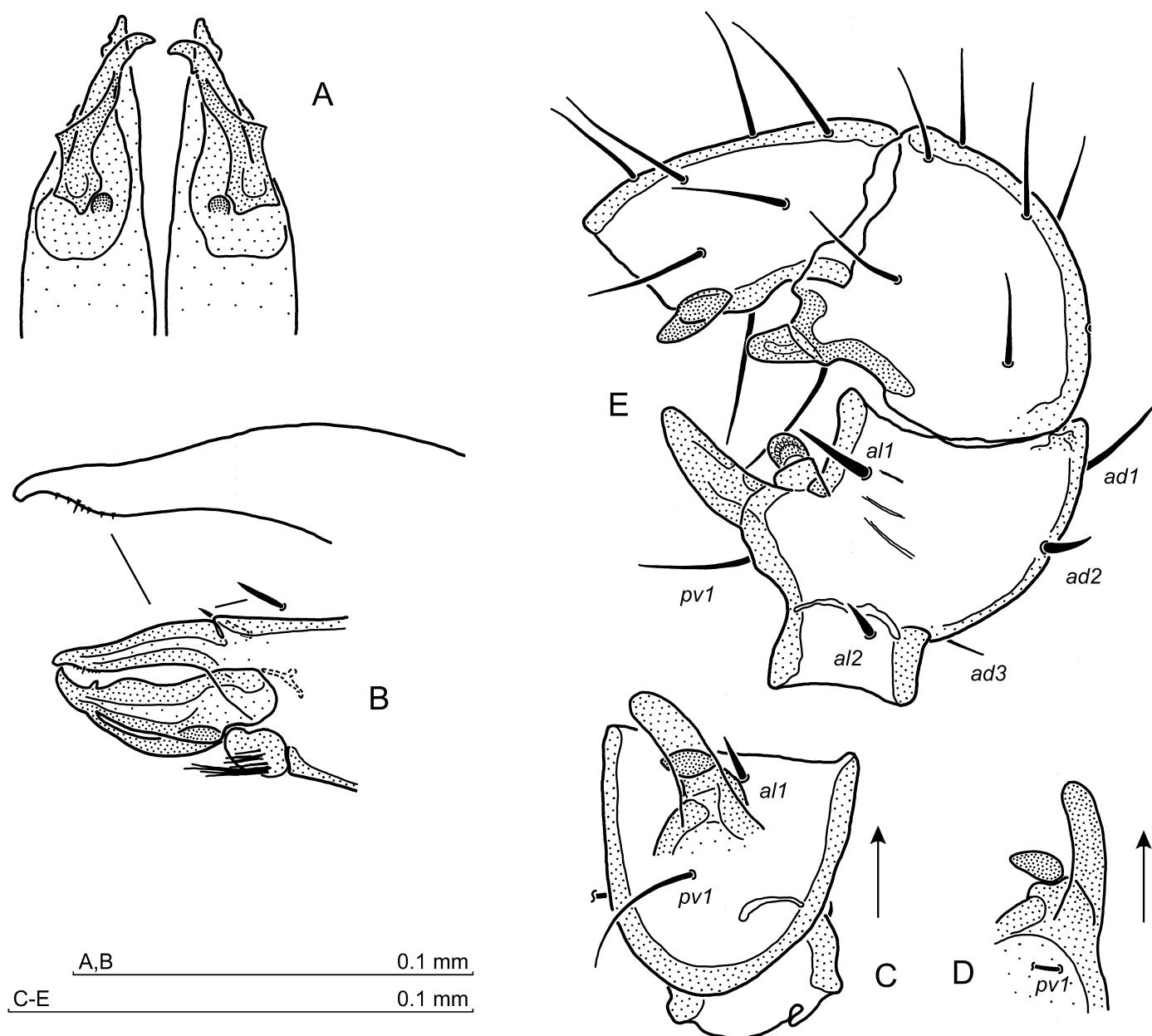


**Figure 8** *Leptogamasus (L.) digiticornis* n. sp., male: A – presternal plates and sternogenital shield. Reticulation of the anterior part of the sternum shown, genital lamina absent; B – genital lamina; C – two forms of gnathotectum; D – gnathosoma, ventrally; E – corniculus ventrally, note two parts of corniculus, dorsal acute and ventral finger-like, as well as the location of *h1* hypostomatic seta on the adaxial elevation. Abbreviations as in Figure 3.

#### Male (Figures 8, 9)

**Idiosoma** — Sclerotized and reticulated as in the female, 490–505 x 250–260 (length x width, n=3), body oval. **Podonotum** — setae length: 30–33 (*j1*), 33–38 (*j2*), 38–39 (*j3*), 35–37 (*j4*), 29–31 (*j5*), 24–26 (*j6*), 71–73 (*r3*). **Opisthonotum** — setae length from ca. 24 up to 32. **Peritreme** — length including stigma 111–116 ending anteriorly just in front of the level of podonotal setae *r3*. Dorsal setae simple.

**Ventral idiosoma** — Setae length: 33–35 (*st1*), 31–38 (*st2*), 33–37 (*st3*), 29–33 (*st4*), 24–29 (*st5*), 29–31 (*JV1*), 18–21 (*ZV1*), other opisthogastral setae ca. 22–31. Ventral setae simple. **Sternal region** (Fig. 8A,B) — the anterior margin of genital lamina slightly concaved centrally (Fig. 8B), anterior corners rounded. Presternal plates with circular central area, rounded despite the anterior sharp protrusions curved antiaxially (Fig. 8A). Gland pores *gv1* anteriorly to the *st3* setae level, followed by two pairs of quite indistinct thickenings of the sternal cuticle: the anterior thickenings are axially elongated, the posterior ones rounded and very small, distributed more laterally. Pores *gv2* with double opening, pore *iv5* halfway between *st5* and *ZV1* setae, *ivo2*, *ivo3*, and *gv3* well pronounced.



**Figure 9** *Leptogamasus (L.) digiticornis* n. sp., male: A – chelicerae in the ventral view; B – chelicera, adaxially; C, D – Fe II in the ventral view, two aspects; Fe II, Ge II and Ti II anterolaterally. Some setae are marked, arrows at the anterolateral side.

**Gnathosoma** — Gnathotectum (Fig. 8C) trispinate, prongs acute and similar in length. Corniculi (Fig. 8D,E) conical, with conspicuous finger-like protrusion on the ventral side. Hypostome (Fig. 8D) with 11 rows of denticles, hypostomatic setae simple, palpcoxal setae simple but larger. Hypostomatic seta *h1* growing from a tubercle located at the adaxial margin of corniculi base. Palptrochanteral *v1* seta simple, *v2* larger and barbed. Chelicera (Fig. 9A,B) – in ventral view (Fig. 9A) the fixed digit straight and longer than the movable one which curved adaxially, spermatodactyl with an antiaxial triangular protrusion. In lateral view (Fig. 9B) the movable digit relatively wide in proximal part, with one small tooth followed by a convex edge proximally; fixed digit narrow and wavy with 1–2 tiny denticles in front of pilus dentilis and a row of ca. 4 minute denticles behind pilus dentilis.

**Legs** — Leg II (Fig. 9C–E) spurred as follows: when viewed from the ventral side, the femoral main spur slim and long, finger-like, and curved posterolaterally, the axillary process pointed posterolaterally (Fig. 9C,D). From a lateral perspective (Fig. 9E), the femoral main spur arcuate, narrow and finger-shaped, whereas the axillary process half-moon shaped, its base located posterolaterally to the main spur base. The spur on the genu finger-shaped and growing from an elevation at the distal article margin. Tibial spur conical, located close to the distal tibial margin. Setae on leg II simple. Leg IV: trochanter without tooth/tubercle, dorso- and posterolateral setae on femur shorter and thicker, posteroventral setae on the tibia and basitarsus terminally barbed. Some ventral and posterolateral setae on the tarsus thickened. Other aspects of legs I–IV unremarkable.

## Type material

**Holotype** — female (slide no. 1001 E), Tiarno di Sopra, Trentino, northern Italy, 45.8824 °N, 10.6790 °E, alt. ca. 1100 m a.s.l., 24 Sept. 1990, detritus under beech and fir. **Paratypes** — 1 female, 3 males (slides no. 1001 F–I), *ibid.*

**Type deposition** — Types are deposited in the Zoological Division of the Nature Education Centre, Jagiellonian University, Kraków, Poland.

## Etymology

The specific name *digiticornis* refers to a peculiar form of corniculi featuring finger-like protrusions.

## *Leptogamasus (Leptogamasus) sextus* n. sp.

Zoobank: [518EDCF7-CB7F-49B2-8D70-997CA2209393](https://doi.org/10.24349/518EDCF7-CB7F-49B2-8D70-997CA2209393)

(Figures 10–14)

## Diagnosis

**Female and male** — Gnathotectum trispinate with similar, triangular and pointed prongs; gland pore *gv1* present; dorsal setae long, most of them reach the next setae row, podonotum with 21 pairs of setae, opisthonotum features 24 pairs of setae (plus several supplementary setae); dorsal tubercle on Tr IV absent.

**Female** — Presternal plates distance similar to the thickness of tritosternum; sternal shield anterior margin slightly concaved; the anterior margins of epigynial shield wavy, posterolateral one short and convex, the apical part separate from the rest by the less pigmented arcuate band; the internal (dorsal) surface of epigynium with two teeth; endogynial spherules close together, roundish posteriorly and with the flattened or wavy anterior margin. Stipule narrow and long, ending in front of the spherules, richly dentated, with numerous teeth also at the base.

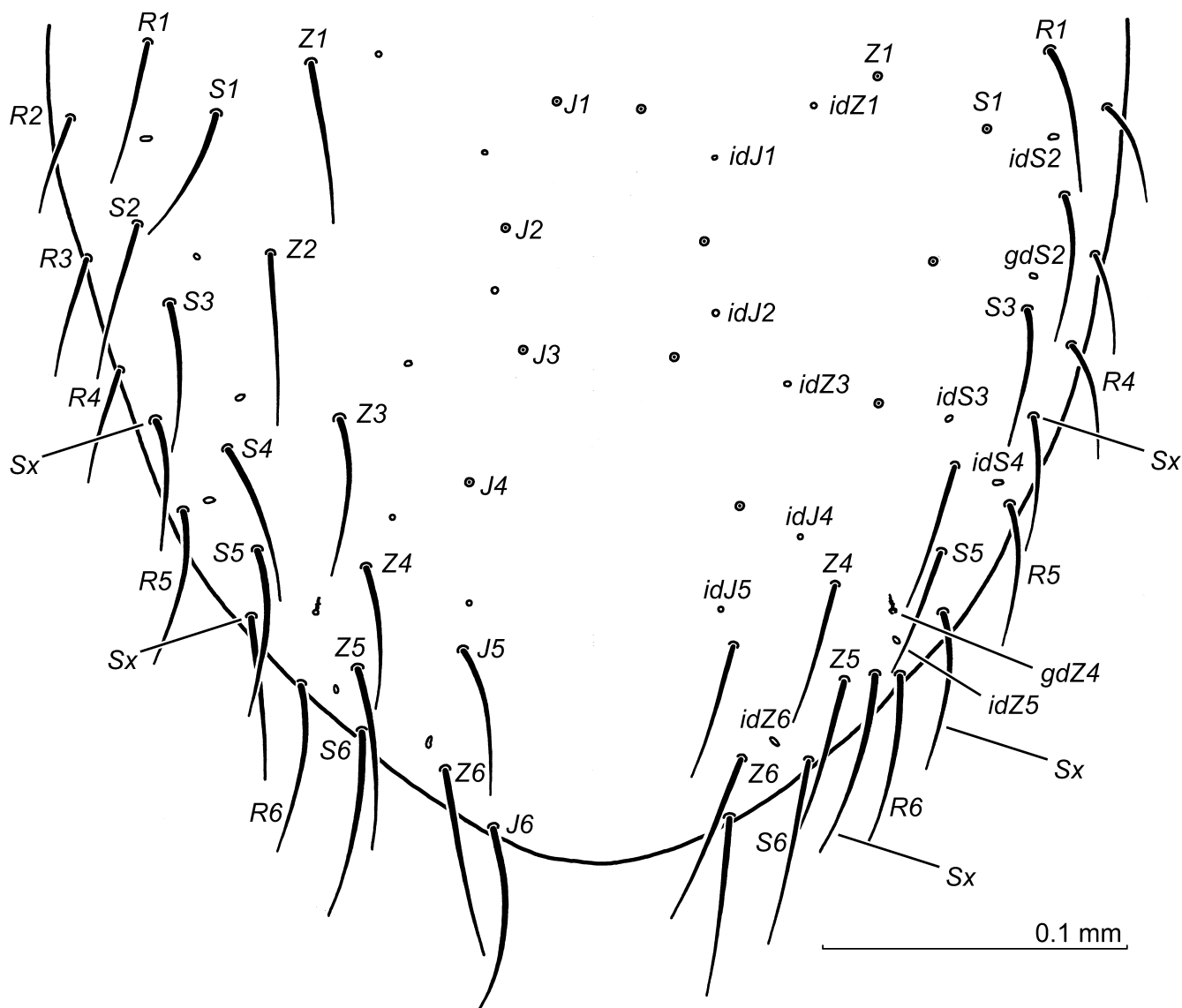
**Male** — Genital lamina of the anterior corners rounded; subrectangular presternal plates with a rounded posterior margin; cheliceral fixed digit with a blunt apex, slightly concaved in front of pilus dentilis and straight behind it, 1–2 minute denticles in front and a row of ca. 7 denticles behind pilus dentilis; leg II femoral main spur straight and finger-shaped, the axillary process finger-shaped; genual and tibial spurs finger-shaped and in some distance from the article distal margin, spur on the genu rounded apically, the one on the tibia more pointed; setae *al1*, *al2* on Ti II finely barbed.

## Description

**Female** (Figures 10–12)

**Idiosoma** — Moderately sclerotised, 575–615 x 320–345 (length x width, *n*=3), holotype 576 x 332. **Podonotum** — setae long, the length: 34–40 (*j1*), 41–45 (*j2*), 47–54 (*j3*), 46–52 (*j4*), 43–50 (*j5*), 39–44 (*j6*), 88–92 (*r3*), in holotype 34 (*j1*), 43 (*j2*), 47 (*j3*), 52 (*j4*), 46 (*j5*), 44 (*j6*), 90 (*r3*). **Opisthonotum** (Fig. 10) — setae long, length from ca. 43 up to 60, the longest ones at the posterior margin. Opisthonotum features 24 pairs of setae and 3–5 supplementary

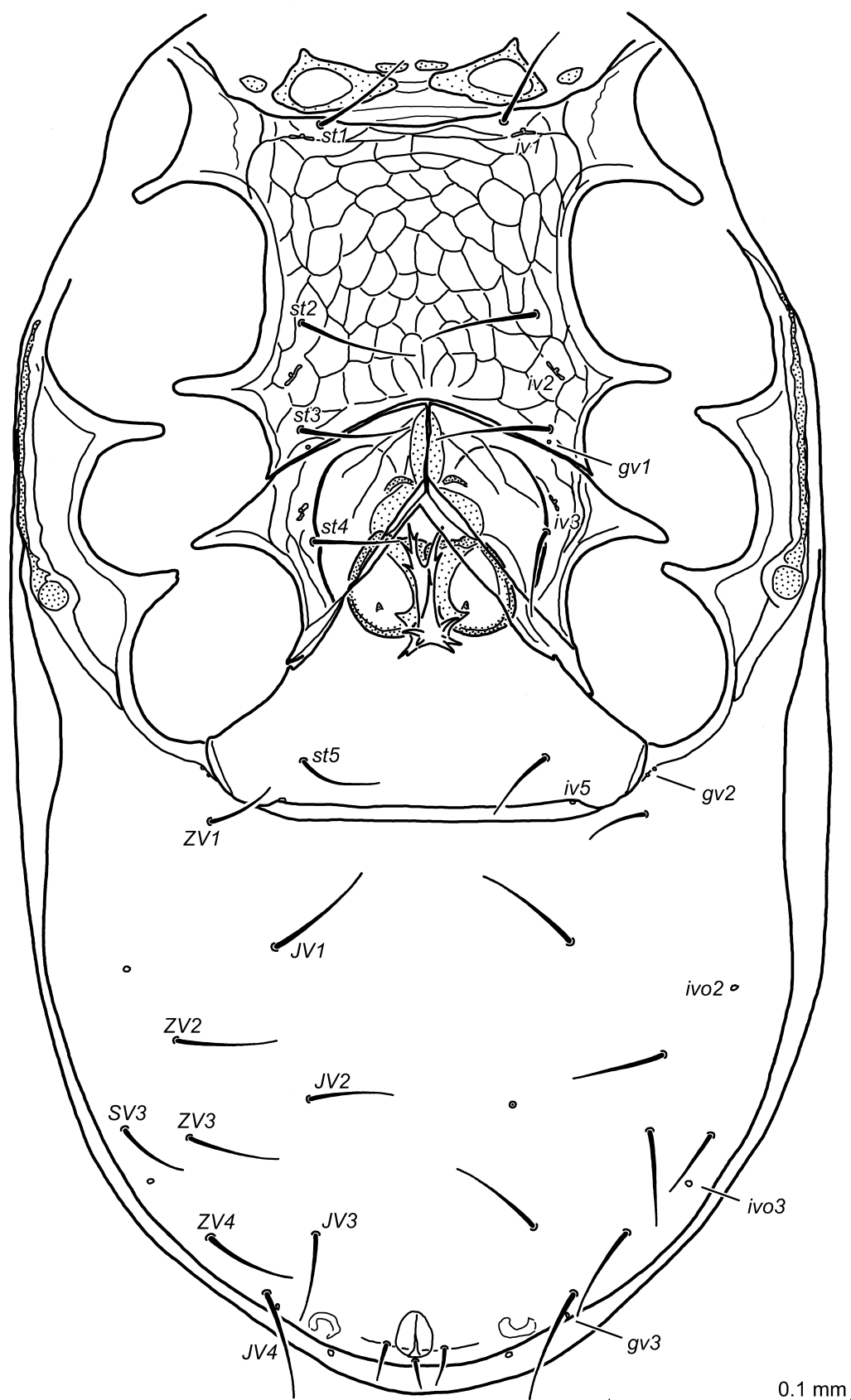




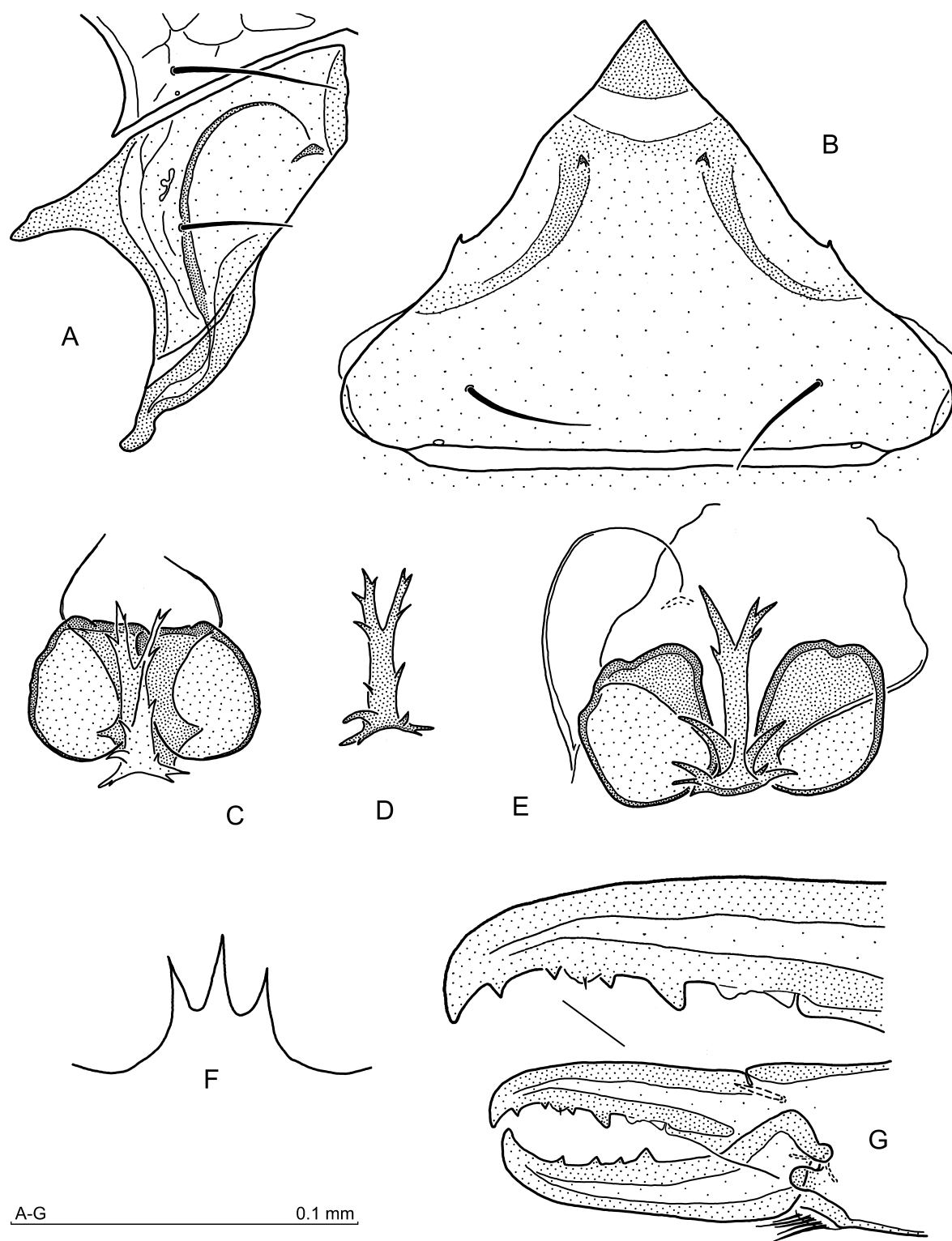
**Figure 10** *Leptogamasus (L.) sextus* n. sp., opisthonotum of female (holotype). Setae, pores and gland openings marked as in Figure 1, but many setae have been lost in preparation.

setae located marginally. Dorsal setae simple, reticulation of the podonotum poorly discernible, opisthonotum with a scale-like reticulation. **Peritreme** — length 140–144, including stigma (holotype 144), ending anteriorly in the midregion of the opening for Co II, at the level of the podonotal setae *r2*.

**Ventral idiosoma** (Fig. 11) — Setae length: 38–46 (*st1*), 42–48 (*st2*), 44–48 (*st3*), 37–42 (*st4*), 33–39 (*st5*), 46–50 (*JVI*), 25–30 (*ZVI*), other opisthogastral setae ca. 33–47, in holotype 46 (*st1*), 48 (*st2*), 48 (*st3*), 38 (*st4*), 35 (*st5*), 46 (*JVI*), 30 (*ZVI*). Ventral setae simple, reticulation of the opisthogastral scale-like. Anterior margin of the sternal shield (Fig. 11) with shallow concavity, the distance between presternal plates similar to the thickness of tritosternum, *gv1* pores close to the posterior margin of the sternum and behind setae *st3*. Paragynial shields (Figs 11, 12A) with arcuate metagynial sclerites. Anterior margins of the epigynial shield (Fig. 12B) wavy, the apical triangular part more pigmented, followed by a less pigmented arcuate band. The internal (dorsal) surface of the epigynium features two teeth.



**Figure 11** *Leptogamasus (L.) sextus* n. sp., ventral side of female idiosoma (holotype). Reticulation of the sternum and the paragynia is shown. Abbreviations as in Figure 6.



**Figure 12** *Leptogamasus (L.) sextus* n. sp., female: A – paragynium; B – epigynum; C, E endogynium, two aspects; D – stipule of endogynium; F – gnathotectum; G – chelicera, adaxially. B, C, D – holotype.

Spherules of endogynium (Figs 11, 12C–E) close together, roundish posteriorly and with a flattened or wavy anterior margin. Stipule narrow and long, ending in front of the spherules, richly dentated, with numerous teeth also at the base. Gland pores *gv2* with double opening, *iv5*, *ivo2*, *ivo3*, and *gv3* well discernible.

**Gnathosoma** — Gnathotectum (Fig. 12F) trispinate, all prongs narrow and acute, similar in shape, the central one slightly longer. Corniculi conical, hypostome with 10–11 rows of denticles, hypostomatic and palpcoxal setae simple. Palptrochanteral *v1* seta simple, *v2* barbed. Chelicera (Fig. 12G) – movable digit with four teeth, the proximal one larger, fixed digit with 2 distant teeth in front of pilus dentilis, arcuate tooth by the side of pilus dentilis, and two teeth behind pilus dentilis, followed by 2 lamellar teeth.

**Legs** — Setae *al* on Tr I short and thick. Fe II anterolateral setae *al1*, *al2* shorter and thicker, anteroventral setae on Fe II, GeII and Ti II larger and barbed. Leg IV: dorso- and posterolateral setae on the femur thick and short, posteroventral setae on the tibia and basitarsus thickened and terminally barbed. Some ventral and posterolateral setae on the tarsus thickened. Tr IV without tubercle. Other aspects of legs I–IV unremarkable.

**Male** (Figures 13, 14)

**Idiosoma** — Sclerotized and reticulated as in the female, 565–607 x 300–340 (length x width, *n*=2), body with a shallow lateral incisions at the Co IV level. **Podonotum** — setae length: 34–38 (*j1*), 38 (*j2*), 37–38 (*j3*), 34 (*j6*), 84–89 (*r3*), *j4* and *j5* not available. **Opisthonotum** — setae length from ca. 33 up to 48, shorter located laterally. **Peritreme** — length including stigma 140–145 (stigma diameter 13–14), ending anteriorly, as in the females. Dorsal setae simple.

**Ventral idiosoma** — Setae length: 38–44 (*st1*), 40–47 (*st2*), 38–41 (*st3*), 33–38 (*st4*), 33–39 (*st5*), 36–42 (*JV1*), 29–32 (*ZV1*), other opisthogastral setae ca. 29–42. Ventral setae simple. **Sternal region** (Fig. 13A) — the anterior margin of the genital lamina convex centrally and the anterior corners rounded. Presternal plates subrectangular, with a rounded posterior margin. Sternum with gland pores *gv1* anteriorly to the *st3* setae level, followed by two pairs of thickenings of the sternal cuticle, oval to spindle-shaped and button-shaped the anterior and posterior ones, respectively. Pores *gv2* with two openings, pore *iv5* halfway between *st5* and *ZV1* setae or closer to *st5*, *ivo2*, *ivo3*, and *gv3* well discernible.

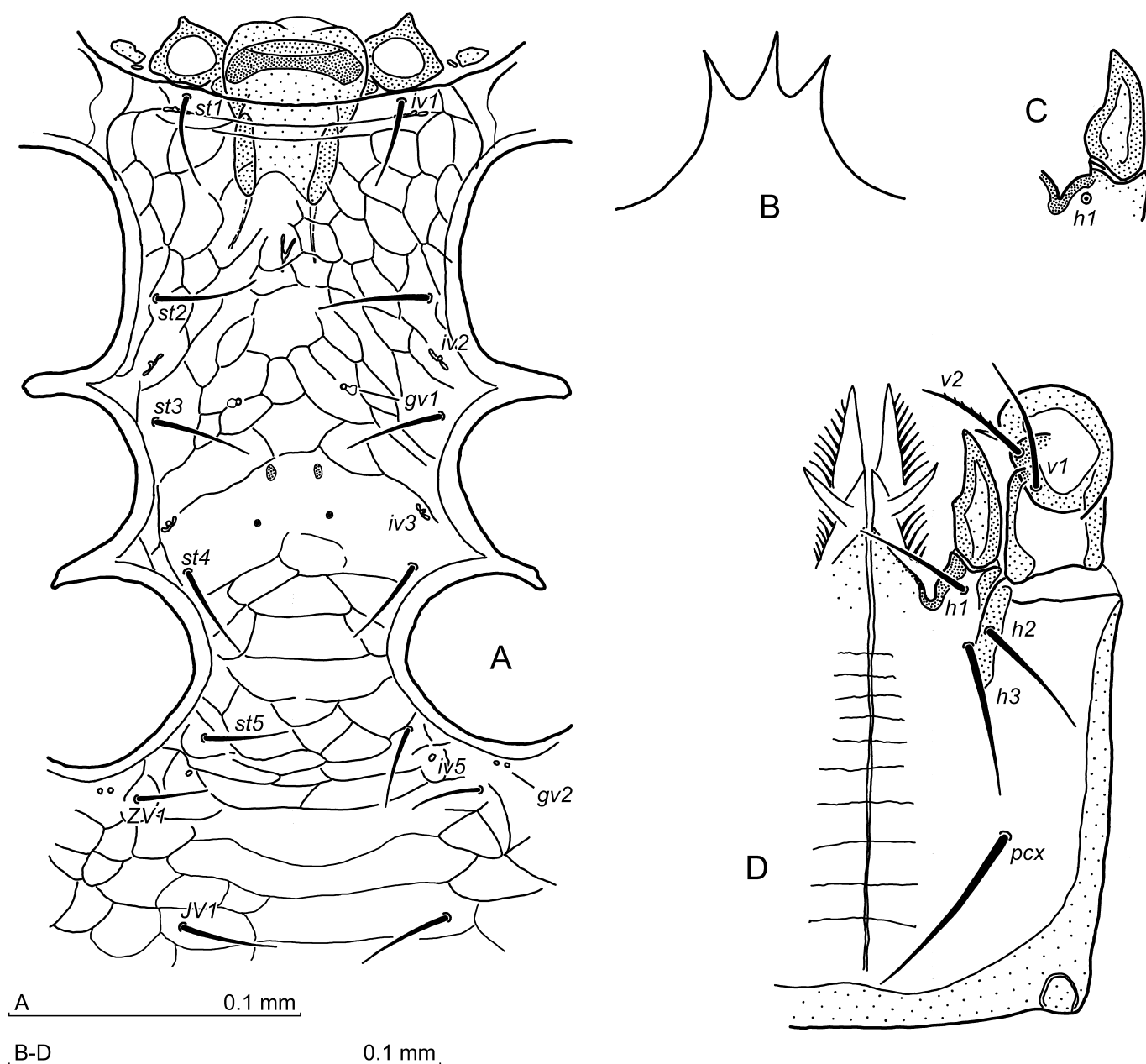
**Gnathosoma** — Gnathotectum (Fig. 13B) trispinate, prongs similar, triangular and acute. Corniculi (Fig. 13C,D) with an elevation on the adaxial surface, hypostome with ca. 10 rows of denticles, hypostomatic and palpcoxal setae simple, the latter somewhat longer. Palptrochanteral *v1* seta simple, *v2* barbed (Fig. 14A). Chelicera (Fig. 14B–D) – when observed from the ventral side, mobile digits curved adaxially and shorter than the straight fixed digits. Laterally (Fig. 14C,D), mobile digit with one tooth followed by an arcuate edge proximally; fixed digit with a blunt apex, slightly concaved in front of the pilus dentilis and straight behind it; 1–2 minute denticles and a row of ca. 7 denticles in front and behind the pilus dentilis are present, respectively.

**Legs** — Leg II (Fig. 14E,F) viewed from a lateral perspective (Fig. 14F): the femoral main spur is straight and, like the axillary process, finger-shaped. Genua and tibial spurs finger-shaped and located at some distance from the article distal margin. Spur on the genu rounded apically, whereas the tibial spur more pointed. Setae on leg II simple, except for the anterolateral setae (*al1*, *al2*) on the tibia which can be finely barbed. Other aspects of setation of leg I, III and IV, as in the female. Tr IV without tubercle. Other aspects of legs I–IV unremarkable.

## Type material

**Holotype** — female (slide no. 1004 A), Tiarno di Sopra, Trentino, northern Italy, 45.8824 °N, 10.6790 °E, alt. ca. 1100 m a.s.l., 24 Sept. 1990, detritus under beech and fir. **Paratypes** — 2 females, 2 males (slides no. 1004 B–E), *ibid*.

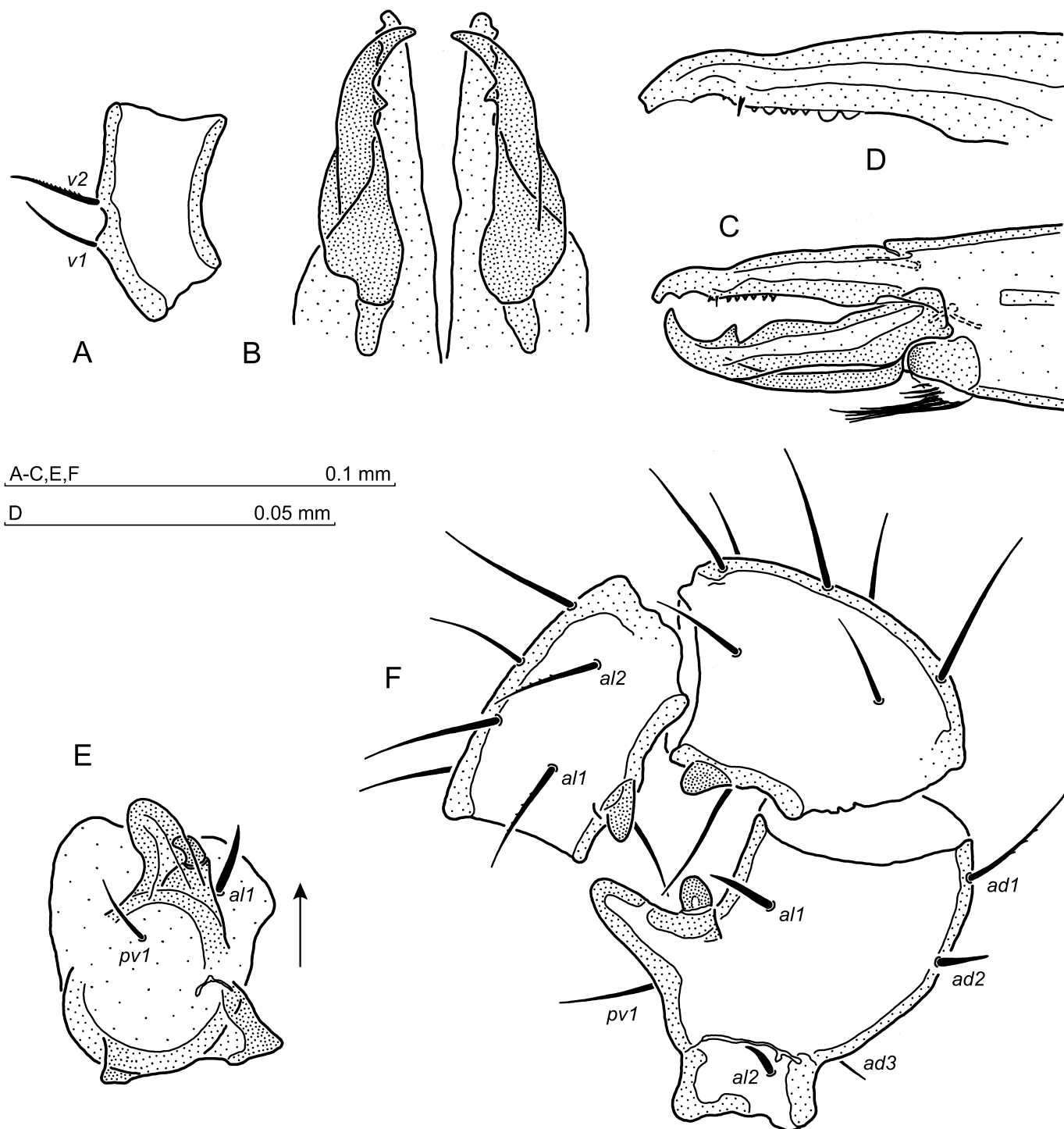
**Type deposition** — Types are deposited in the Zoological Division of the Nature Education Centre, Jagiellonian University, Kraków, Poland.



**Figure 13** *Leptogamasus (L.) sextus* n. sp., male: A – sternogenital shield, genital lamina flanked by the presternal plates; B – gnathotectum; C – corniculus; D – ventral view of gnathosoma and palptrochanter. Abbreviations as in Figure 3, *JV1* opisthogastral seta.

### Etymology

The specific name *sextus* is simply owed to the fact that this species occupied the 6th position in the Author's list of new *Leptogamasus* species.



**Figure 14** *Leptogamasus (L.) sextus* n. sp., male: A – palptrochanter in the lateral view; B – chelicerae, ventrally; C – chelicera, adaxially; D – fixed digit of chelicera, another aspect; E – Fe II, ventrally; Fe II, Ge II and Ti II in the anterolateral perspective. Some setae are marked. Arrow at the anterolateral side.



## ***Leptogamasus (Leptogamasus) trentinis* n. sp.**

Zoobank: 8B8A0488-EEC7-439E-A3C5-AC3F2DB759F7

(Figures 15–19)

### **Diagnosis**

**Female and male** — Gnathotectum trispinate with pointed and moderately long prongs, in the male central prong somewhat longer; gland pore *gv1* present; podonotum with 21 pairs of setae, opisthonotum with 23 or sometimes 22 pairs of setae; Tr IV without tubercle.

**Female** — Presternal plates distance less than the thickness of tritosternum base; sternal shield anterior margin concaved, forming a lenticular space between sternum and presternal plates; location of gland pores *gv1* variable, but usually close to central axis of the sternum, and far from *st3* setae; epigynial shield with the anterior margins sinuous, and posterolateral margins arcuate, the internal (dorsal) surface with two distinct teeth; spherules of the endogynium adhering axially, each one forms anteriorly a large acute protrusion located adaxially and a thorn-like tooth growing from the antiaxial margin; narrow stipule can be terminally dentated and usually directed ventrally.

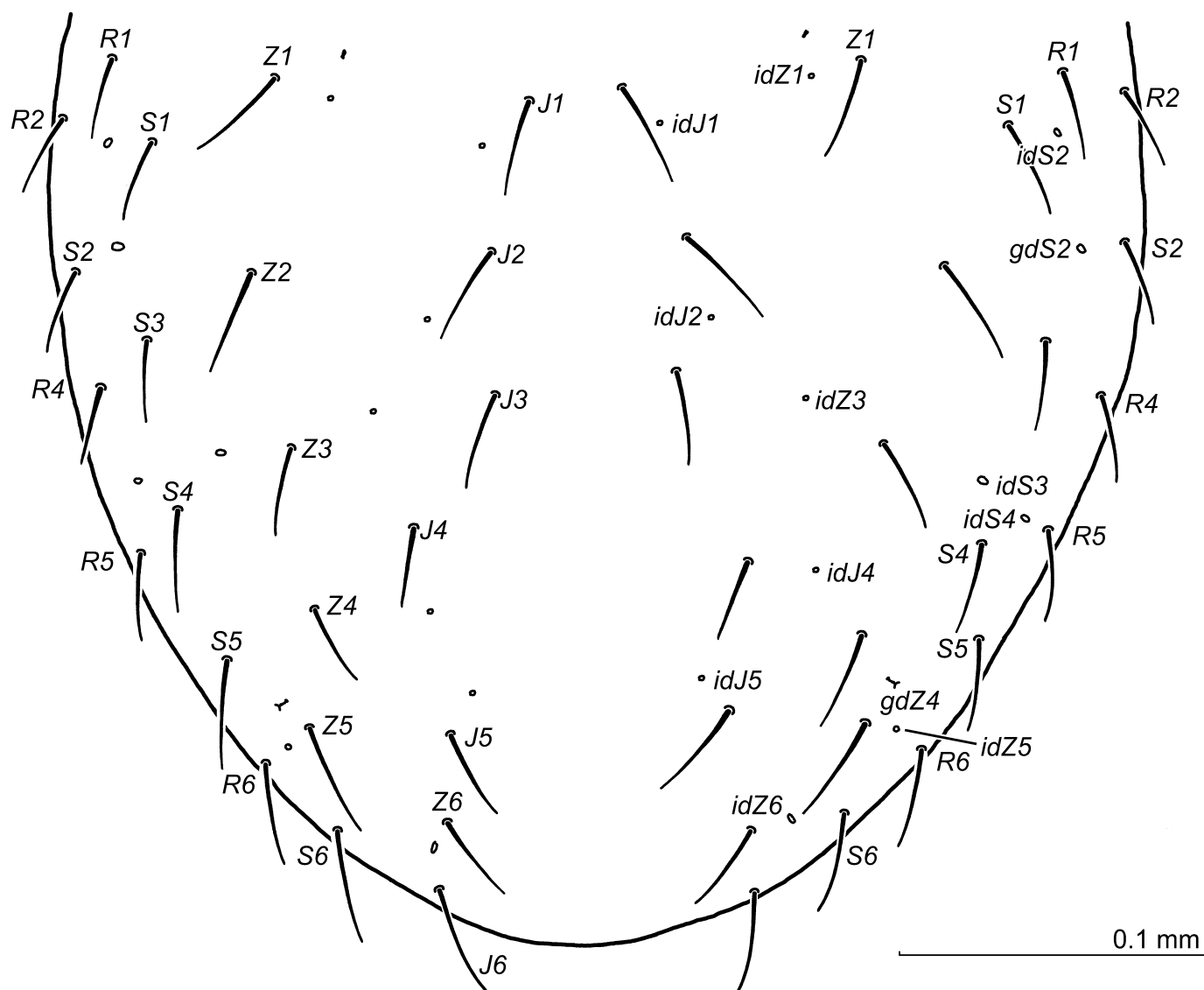
**Male** — Genital lamina with rounded corners, slightly concaved lateral margins and an anterior edge, the latter usually with a tiny denticle; presternal plates subrectangular; corniculi with the elevation on the adaxial margin; cheliceral fixed digit with finely blunt apex, featuring lamellar teeth, one tooth in front of the pilus dentilis, one by the side and ca. 4 teeth behind the pilus dentilis; leg II in ventral view: femoral main spur curved posterolaterally, axillary process located more anterolaterally, genual spur oriented obliquely to article axis, distally to posteroventral setae; leg II in lateral view: femoral main spur straight, axillary process semilunar, spurs on the genu and tibia finger-like, and at some distance from the distal article margin.

### **Description**

**Female** (Figures 15–17)

**Idiosoma** — Moderately sclerotised, 595–650 x 305–355 (length x width, n=5), holotype 586 x 315. **Podonotum** — 21 pairs of setae, setae length: 38–48 (*j1*), 29–33 (*j2*), 36–47 (*j3*), 37–43 (*j4*), 33–38 (*j5*), 30–34 (*j6*), 86–94 (*r3*), in holotype 31 (*j1*), 27 (*j2*), 33 (*j3*), 41 (*j4*), 38 (*j5*), 93 (*r3*), *j6* broken. **Opisthonotum** (Fig. 15) — 23 pairs of setae since setae *R3* are missing, but also *R6* may occasionally be missing. Setae length from ca. 24 up to 37, holotype 29–35. Dorsal setae simple, reticulation of the podonotum poorly discernible, opisthonotum with a scale-like reticulation. **Peritreme** — length 146–153, including stigma (holotype 141), stigma diameter 13–14 (holotype 13), reaching the anterior region of the opening for Co II, ending just anteriorly to the podonotal seta *r2*.

**Ventral idiosoma** (Fig. 16A) — Setae length: 39–48 (*st1*), 51–58 (*st2*), 51–60 (*st3*), 41–47 (*st4*), 39–46 (*st5*), 48–54 (*JV1*), 20–25 (*ZV1*), other opisthogastral setae ca. 23–39, in holotype 34 (*st1*), 48 (*st2*), 47 (*st3*), 42 (*st4*), 35 (*st5*), 46 (*JV1*), 22 (*ZV1*), other opisthogastral setae ca. 21–38. Ventral setae simple, reticulation of the sternum and opisthogaster scale-like. Presternal plates (Fig. 16A) in close proximity, less distant than the thickness of the tritosternum. Anterior margin of the sternal shield concaved, forming a lenticular space between the sternum and the presternal plates. Location of the sternal pores *gv1* variable, even in the same specimen (Fig. 16A,B), but usually located axially in close proximity, and distant from *st3* setae (Fig. 16B). Paragynial shields (Fig. 16A,C) metagynial sclerites narrow and arcuate laterally, whereas anteriorly - wavy and less distinct (Fig. 16C). Epigynial shield (Figs 16A, 17A) with the anterior margins sinuous, posterolateral margins arcuate, the posterior one straight. Two distinct teeth on the epigynial internal (dorsal) surface present. Endogynium (Figs 16A,C, 17B–D) with spherules adhering axially, each one forming anteriorly the adaxial large acute protrusion (Fig. 17B), but in some cases (Fig. 17C) depending on the orientation of the endogynium, the protrusions are non-distinct and roundish anteriorly. On the lateral margin of each spherule, a

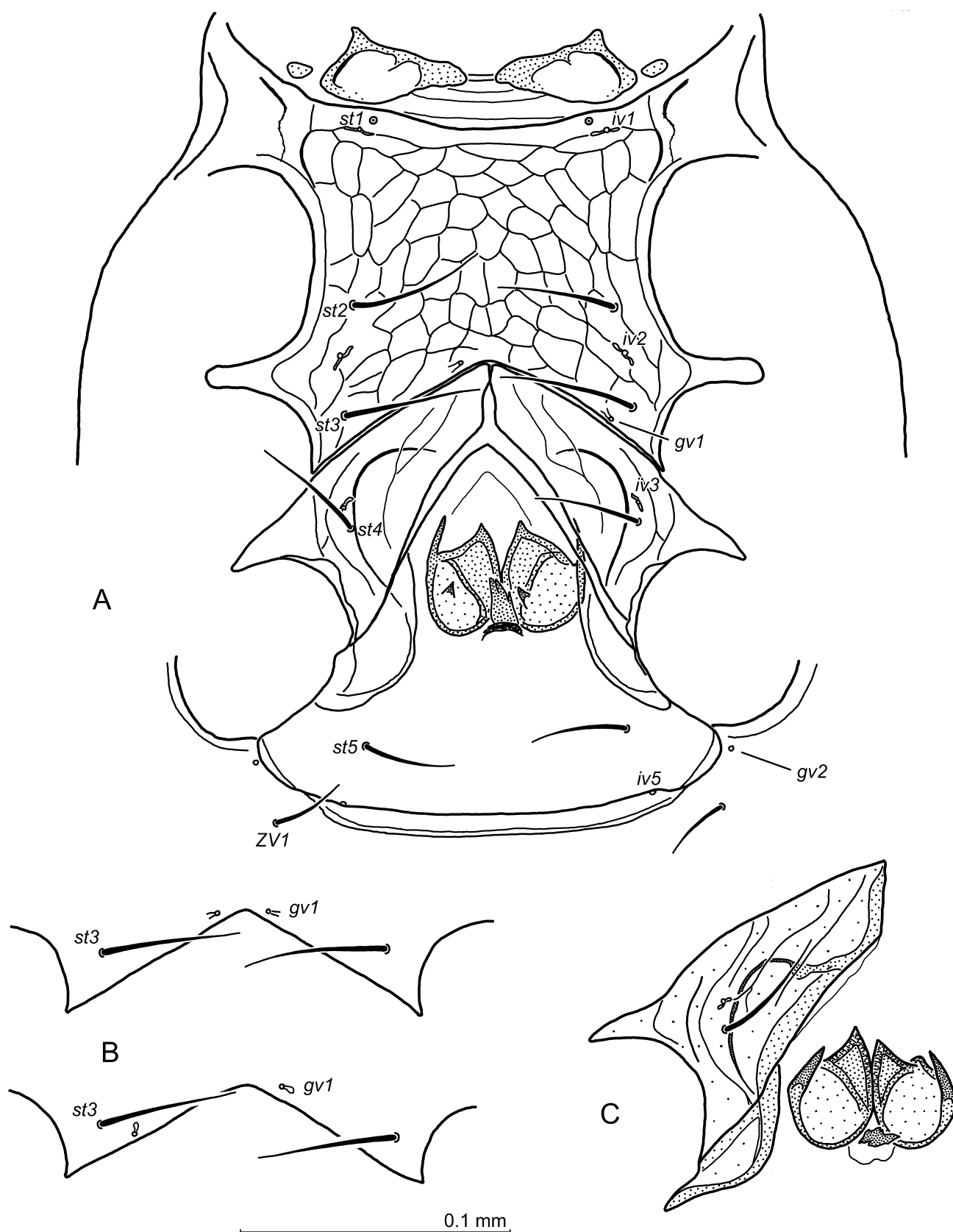


**Figure 15** *Leptogamasus (L.) trentinis* n. sp., opisthonotum of female. Setae, pores and gland openings marked as in Figure 1. Note the absence of setae R3.

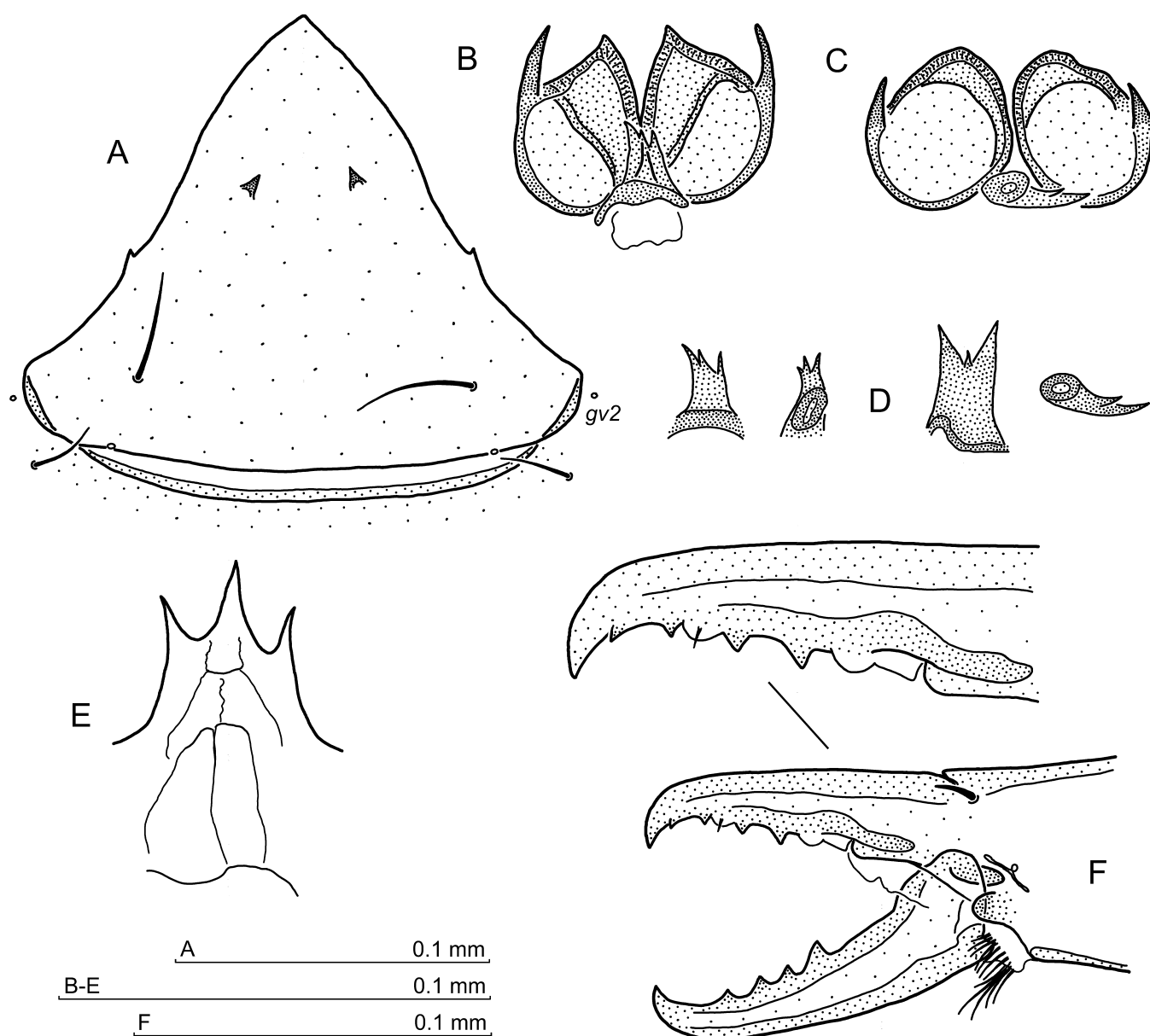
thorn-like tooth is featured. Narrow stipule is variable (Fig. 17D), may be dentate apically, and usually is directed ventrally. Gland pores *gv2* (Figs 16A, 17A) with poorly discernible double channels; *iv5*, *ivo2*, *ivo3* and *gv3* well discernible.

**Gnathosoma** — Gnathotectum (Fig. 17E) trispinate, all prongs acute and moderately long, the central one longer. Corniculi conical, hypostome with 11 rows of denticles, hypostomatic and palpcoxal setae simple. Palptrochanteral *v1* seta simple, *v2* barbed. Chelicera (Fig. 17F) — movable digit with four teeth, the proximal one the largest, fixed digit with 2 distant teeth in front of pilus dentilis, arcuate and lamellar one by the side of it, and 2 teeth followed by the two tooth-like lamellar protrusions behind pilus dentilis.

**Legs** — Anterolateral (*al1*, *al2*) and anterodorsal (*ad2*) setae on Fe II short and thickened, setae *ad3* needle-like. Anteroventral setae on Fe II, Ge II and Ti II thicker and barbed. Leg IV ventral setae on the tibia larger, posteroventral seta on the femur conical, some ventral and posterolateral setae on the tarsus thickened, posteroventral and posterolateral setae on the tibia and the basitarsus, respectively, blunt/barbed apically. Tr IV without a dorsal tubercle. Other



**Figure 16** *Leptogamasus (L.) trentinis* n. sp., female: A – the ventral side of idiosoma: presternal plates, sternum, paragynia, epigynum and endogynium in situ (holotype). Abbreviations as in Figure 6; B – posterior sternal margins showing different distribution of *gv1* gland openings; C – paragynium and endogynium.



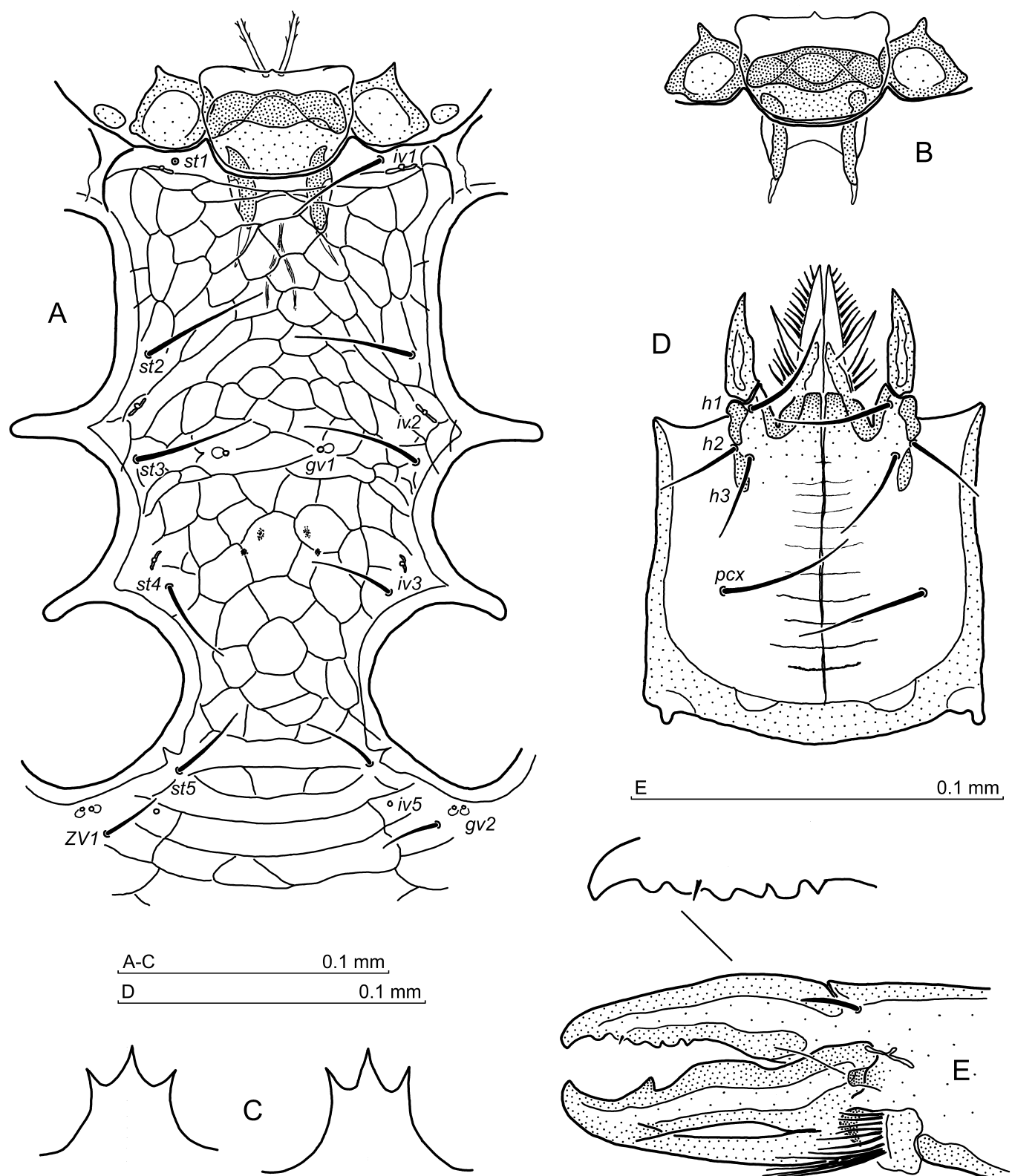
**Figure 17** *Leptogamasus (L.) trentinis* n. sp., female: A – epigynum; B, C – two aspects of endogynium; D – stipule variability; E – gnathotectum; F – chelicera, antiaxially. B – holotype.

aspects of legs I–IV unremarkable.

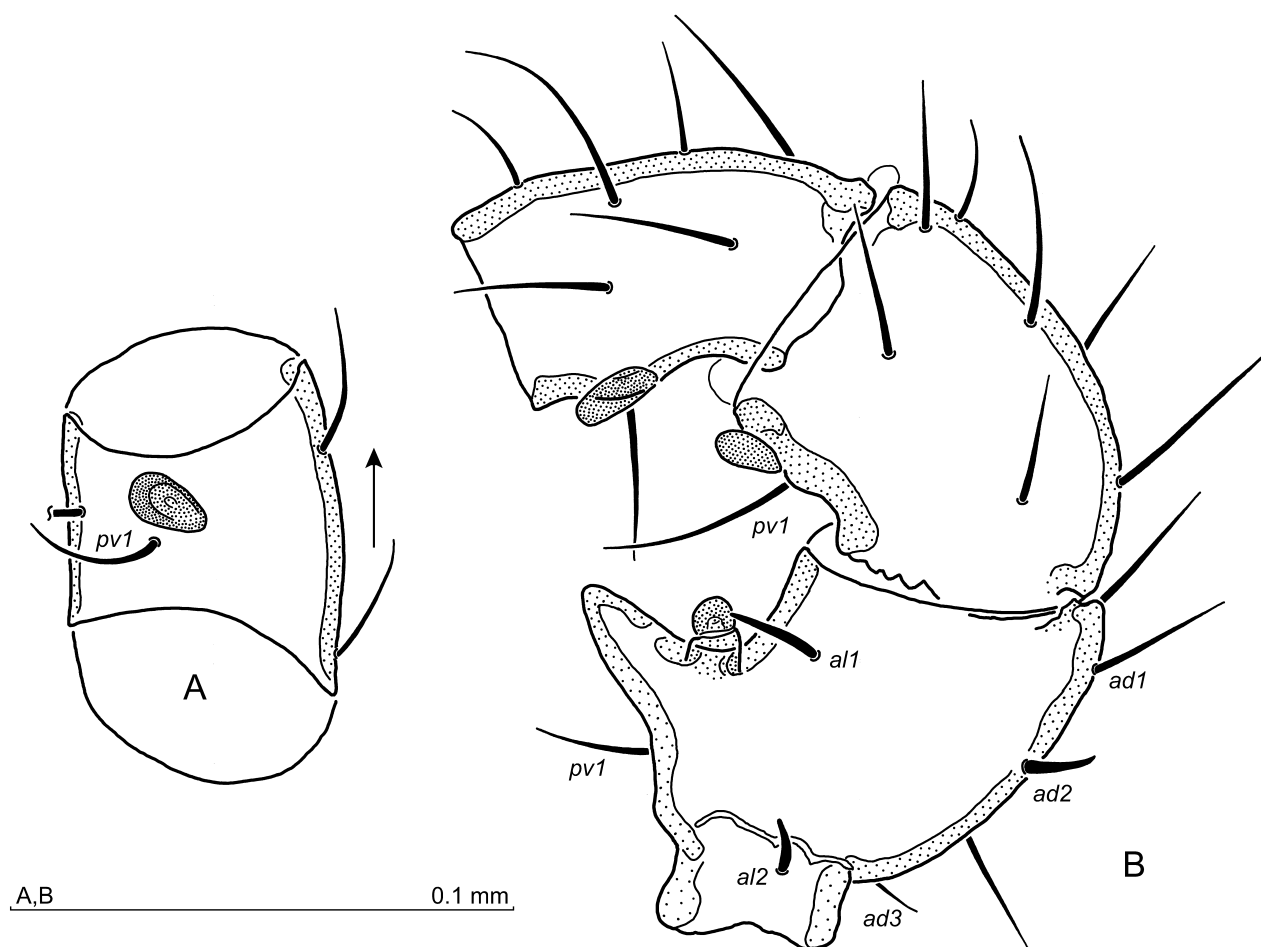
**Male** (Figures 18,19)

**Idiosoma** — Sclerotized as in the female, 570–600 x 270–300 (length x width, n=5), body incised laterally at Co IV level. **Podonotum** — setae length: 33–38 (*j1*), 36–41 (*j2*), 43–51 (*j3*), 34–37 (*j4*), 33–38 (*j5*), 22–29 (*j6*), 78–85 (*r3*). **Opisthonotum** — setae length from ca. 22 up to 34. **Peritreme** — length including stigma 144–148 (stigma diameter 12–13), ending anteriorly, as in the females. Dorsal setae simple.

**Ventral idiosoma** — Setae length: 42–45 (*st1*), 44–47 (*st2*), 39–42 (*st3*), 31–34 (*st4*), 31–34 (*st5*), 39–44 (*JVI*), 18–21 (*ZVI*), other opisthogastral setae ca. 23–39. Ventral setae simple. **Sternal region** (Fig. 18A) — genital lamina (Fig. 18A,B) with rounded corners and a concaved anterior edge, usually with a tiny denticle axially, and lateral margins with shallow



**Figure 18** *Leptogamasus (L.) trentinis* n. sp., male: A – sternogenital shield, genital lamina flanked by the presternal plates and the sternogenital shield; B – genital lamina and presternal plates, other specimen; C – gnathotectum, two aspects; D – gnathosoma, ventrally; E – chelicera, antiaxially. Abbreviations as in Figure 3.



**Figure 19** *Leptogamasus (L.) trentinis* n. sp., male: A – Ge II, ventrally; B – Fe II, Ge II and Ti II in anterolateral perspective. Some setae are marked. Arrow at the anterolateral side.

concavities. Presternal plates subrectangular. Sternum with gland pores *gv1* at the *st3* setae level, followed by two small elongated thickenings and two more distinct elongated or circular thickenings of the sternal cuticle. Pores *gv2* with distinct two channels, pore *iv5* halfway between *st5* and *ZVI* setae. Sternum, opisthogaster and opisthonotum reticulation scale-like.

**Gnathosoma** — Gnathotectum (Fig. 18C) trispinate, prongs triangular, and the central one somewhat longer. Corniculi (Fig. 18D) with elevation on the adaxial margin, hypostome with ca. 10 rows of denticles, posterior ones better pronounced, hypostomatic and palpcoxal setae simple, the last ones larger. Palptrochanter *v1* seta simple, *v2* barbed. Chelicera (Fig. 18E) – when observed from the ventral side, mobile digits nearly straight, fixed digits straight. Laterally, movable digit with one tooth, followed by a sinuous edge proximally, fixed digit with finely blunt apex, featuring lamellar teeth, most of them blunt: one tooth in front of pilus dentilis, one by the side, and ca. 4 teeth behind pilus dentilis.

**Legs** — Leg II (Fig. 19A,B) spurred as follows: when viewed from the ventral side, the main spur slightly curved posterolaterally, the axillary process located more anterolaterally. Spur on the genu (Fig. 19A) oriented obliquely to the article axis, distally to the posteroventral seta. When the leg II is viewed from the lateral perspective (Fig. 19B), the main spur is straight, axillary process half-moon, spurs on the genu and the tibia finger-like, and in some distance from the distal article margin, the tibial one more distant. Setae on leg II simple, setae *al2* and *ad2* on the femur short and thick, *ad1* normal, *ad3* needle-like. Seta *al* on Tr I short and



thick, leg IV setation as in the female. Tubercle on Tr IV absent. Other aspects of legs I–IV unremarkable.

## Material examined

**Holotype** — female (slide no. 2685 A), east of Lago di Garda, near Matassone, Trentino, northern Italy, 45.8182 °N, 11.0722 °E, ca. 820 m a.s.l., 1 Sept. 2015, beech forest litter.

**Paratypes** — 3 females, 7 males (slides no. 2685 B, 2685 C, 2686, 2687 A), *ibid.* **Other material** — 2 females, 7 males and 1 female deutonymph (slide 2684), *ibid.*

The material has been collected by Leszek Dumnicki.

**Type deposition** — Types are deposited in the Zoological Division of the Nature Education Centre, Jagiellonian University, Kraków, Poland, whereas all remaining material is held in the Author's collection.

## Etymology

The specific name *trentinis* refers to Trentino, the province in northern Italy where the types were encountered.

## New species differential taxonomy

All new *Leptogamasus* (*Leptogamasus*) species described in this study share several features, what may be related to a relative close distribution in the areas west and east of Lake Garda (Lago di Garda). In the females, the following features are of permanent character: (1) a pair of denticles on the internal (dorsal) surface of the epigynial shield, (2) paragynial plates moderately distant from one another, (3) a narrow and arcuate metagynial sclerite of the paragynial shield, (4) dentation of the fixed digit of chelicera – two distant teeth in front of pilus dentilis, one arcuate tooth by the side of pilus, and two teeth followed by two-three lamellar teeth behind pilus dentilis, and (5) gnathotectum of a similar form. However, other characteristics, mainly the structure of endogynium, effectively distinguishes the new species from the other. In *Leptogamasus* (*L.*) *bicornis* **n. sp.**, the endogynium possesses a broad lamellar and dentate stipule, and a richly dentated endogynial sac, as well as the paragynium metagynial sclerite reaches the anterior paragynium margin, i.e. characteristics similar to the one encountered in *Leptogamasus* (*L.*) *octavellus* (Athias-Henriot, 1967). In *L.* (*L.*) *bicornis* **n. sp.** endogynial spherules are wavy anteriorly, though, whereas in *L.* (*L.*) *octavellus* they form the chelate protrusions. Furthermore, in *L.* (*L.*) *octavellus* two conspicuous horn-shaped protrusions of the endogynial wall are not present. *Leptogamasus* (*L.*) *digiticornis* **n. sp.** is comparable to *Leptogamasus* (*L.*) *varpulus* (Athias-Henriot, 1967) in which the endogynial spherules are also oval, and form the small protrusions anteriorly. The main differences are: in *L.* (*L.*) *digiticornis* **n. sp.** teeth on internal surface of the epigynium are minute and more distant, whereas in *L.* (*L.*) *varpulus* are larger and closely located. Endogynial stipule in *L.* (*L.*) *digiticornis* **n. sp.** is short and the teeth are in a fan-like arrangement, whereas in *L.* (*L.*) *varpulus* stipule is much longer and dentate on the distal margin only. Endogynium in *Leptogamasus* (*L.*) *sextus* **n. sp.** is characterised by roundish spherules with a wavy or flat anterior margin, and relatively long, narrow and richly dentate (also at the base) stipule. Some similarities may be encountered in *Leptogamasus* (*L.*) *parvulus* (Berlese, 1903) sensu Athias-Henriot, 1967 re-described as *Pergamasus* (?) *parvulus* (Berlese) by Athias-Henriot (1967). There are several substantial differences, however, i.e. solid stipule is dentate, but thick and shorter than the spherules, metagynial sclerite of the paragynium has different shape in the adaxial part, the teeth on the internal surface of the epigynium are located marginally, and finally, Tr IV features a large tooth in the article midregion. *Leptogamasus* (*L.*) *trentinis* **n. sp.** shows some similarities in the endogynium and the paragynium structures to *Leptogamasus* (*L.*) *kaposvariensis* (Athias-Henriot, 1967), but the latter has a distal tubercle on Tr IV, not encountered in *L.* (*L.*) *trentinis* **n. sp.**

The males of the newly described species have to be compared with the males which belong to the most similar species of the females under study. *L. (L.) bicornis* **n. sp.** male differs from the males of *L. (L.) octavellus* in several respects, i.e. corniculi shape, chelicera structure and dentation, as well as the armature of the second leg. Corniculus in *L. (L.) octavellus* is much more projected adaxially than in *L. (L.) bicornis* **n. sp.** The shape of cheliceral fixed digit differs as follows: in *L. (L.) bicornis* **n. sp.** it is straight, whereas in *L. (L.) octavellus* is sinuous. Its dentation is similar, i.e. features numerous fine similar denticles, but in *L. (L.) bicornis* **n. sp.** the last (proximalmost) tooth is evidently larger. The main spur of Co II has slightly convex distal margin in *L. (L.) bicornis* **n. sp.**, whereas in *L. (L.) octavellus* there is a proximal margin showing convexity. Genua and tibial spurs are also different in both species. *L. (L.) digiticornis* **n. sp.** may not be compared with the male of *L. (L.) varpulus*, since the male in this species has not as yet been encountered, but in the former species there is a characteristic ventral protrusion of each corniculus which, to the best of the Author's knowledge, is not found in any other known *Leptogamasus* species. The other two conspicuous features are: the lateral protrusion of cheliceral spermatodactyl, as well as a location of Ge II spur on elevation. *L. (L.) parvulus* (Berlese) sensu Athias-Henriot, 1967 male differs from *L. (L.) sextus* **n. sp.** at least in two regards, i.e. the main spur of Co II in the former species shows convexity of the proximal margin not found in *L. (L.) sextus* **n. sp.**, and features a large tooth on Tr IV, absent in *L. (L.) sextus* **n. sp.** In *L. (L.) trentinis* **n. sp.** the Tr IV does not feature any tubercle, as found in *L. (L.) kaposvariensis*. The other differences pertain to the shape of corniculi, hypostome, and a dentation of the cheliceral fixed digit.

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## References

- Athias-Henriot, C. 1967. Observations sur les *Pergamasus*. I. Sous-genre *Paragamasus* Hull, 1918 (Zoologie Acariens anactinotriches, Parasitidae). Mém. Mus. natl. Hist. nat., Sér. A (Zool.), 49: 1-197.
- Athias-Henriot, C. 1971. *Paragamasus (Tanygamasus) probsti* (Oudemans) (systématique, géographie), avec quelques mises au point synonymiques (Arachnides, Gamasides tocospermiques, Parasitidae). Zool. Meded., 45: 167-179.
- Berlese, A. 1903. Acari nuovi. Manipulus Ius. Redia, 1: 235-252.
- Berlese, A. 1906. Monografia del genere *Gamasus* Latr. Redia, 3: 66-304.
- Juvara-Balş, I. 1981. Nouvelle définition du genre *Leptogamasus* Trägårdh, 1936 (Acarina, Gamasida, Parasitidae) et description de six nouvelles espèces. Revue Suisse Zool., 88: 77-93. doi:10.5962/bhl.part.82355
- Trägårdh, I. 1936. *Leptogamasus*, a new genus of Acari from Sweden. Ent. Tidskr., 57: 227-234.
- Witaliński, W. 2019. Five new species of mites in the genus *Leptogamasus* Trägårdh, 1936, and a new subgenus *Medioperigamasus* (Parasitiformes: Parasitidae). Zootaxa, 4619: 487-517. doi:10.11646/zootaxa.4619.3.4
- Witaliński, W. 2020. New *Leptogamasus* mite species (Parasitiformes: Parasitidae) from Europe. I. Poland. Acarologia, 60: 698-721. doi:10.24349/acarologia/20204397