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Description of the mature larva of *Gonioctena pseudogobanzi* Kippenberg, 2001 (Coleoptera: Chrysomelidae: Chrysomelinae) and key to the larvae of the subgenus *Spartoxena*

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Abstract

Mature larva of *Gonioctena (Spartoxena) pseudogobanzi* Kippenberg, 2001 is described and illustrated for the first time, based on specimens collected on *Genista umbellata* (L'Hér.) Dum. Cours. [Fabaceae] in southeastern Spain. Diagnostic characters for the identification of species within the subgenus *Sparoxena* Motschulsky, 1860 are number of dorsal tubercles of abdominal segments, shape of tarsal claw, shape of labrum and disposition of microtrichia of epipharynx. A key to known larvae of subgenus *Spartoxena* is provided, along with figures illustrating the diagnostic characters. Notes on the distribution and host plant of *G. pseudogobanzi* are included.

Key words: Chrysomelidae, *Gonioctena*, *Spartoxena*, *Gonioctena pseudogobanzi*, larva, key

Introduction

The genus *Gonioctena* Chevrolat, 1837 (Coleoptera: Chrysomelidae: Chrysomelinae) is widely distributed in the Holarctic region and contains more than 70 species classified into nine monophyletic subgenera (Mardulyn *et al.*, 1997). Among them, *Spartoxena* Motschulsky, 1860 is comprised of eight species (Kippenberg, 2001), restricted to southwest Europe and north Africa, with its maximum diversity in the Iberian Peninsula (four species). Adult taxonomy of *Spartoxena* has received much attention due to the intraspecific variability and the external interspecific similarity, which have produced a high number of synonyms and thus the need of several taxonomic works clarifying the true status of several taxa from the Iberian Peninsula (Bechyné, 1957) or North Africa (Bourdonné & Doguet, 1979), and more recently a revision based on male genitalia (Kippenberg, 2001). Finally, a review of the female genitalia within the subgenus provided diagnostic characters for the identification of females (Baselga, 2007).

Contrary to the advanced state of knowledge of adult taxonomy, larval taxonomy of *Spartoxena* is far from completion, as it is for the whole genus, with only 17 Palaearctic species known at the larval stage (Steinhausen, 1994; Baselga & Novoa, 2004). This condition is not particular of *Gonioctena*, but involves all leaf beetles. In the Palaearctic region, we only know the larvae of about 22% of Chrysomelidae and 37% of Chrysomelinae (Steinhausen, 1996). Within *Spartoxena*, the larvae of only three species are currently known: *G. gobanzi* (Reitter, 1902) from the Alps, which is included in the key for the Central European species (Steinhausen, 1994), and *G. aegrota* (Fabricius, 1798) and *G. leprieuri* (Pic, 1911) from the Iberian Peninsula, recently described and illustrated (Baselga & Novoa, 2004). The aims of this paper are (i) to describe for the first time the mature larvae *G. (Spartoxena) pseudogobanzi* Kippenberg, 2001, providing diagnostic characters for its identification, and (ii) to provide an identification key for the larvae of the subgenus *Spartoxena*.

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Materials and methods

Mature larvae were collected along with adults by sweeping their host plants. Specimens were attributed to genus *Gonioctena* following Steinhausen (1994). The specific identity of larvae was assigned after determination of adults collected from the same plants. To ensure this larval identification some specimens were reared until pupation and adult emergence, confirming the assignation of larvae here described to *G. pseudogobanzi*. Larvae were preserved in 70% ethanol. Some specimens were cleared in warm 10% KOH and its tegument was mounted on microscope slides, as well as dissected cephalic and thoracic appendages. Slide mounts were prepared using dimethyl hydantoin formaldehyde resin (DMHF). Drawings were traced using CorelDraw 11 software, from images captured with a Nikon Coolpix 4500 digital camera attached to a Zeiss 475057 stereomicroscope and a Zeiss 473011-9901 compound microscope. The morphological terminology was taken from Kimoto (1962) and Cox (1982).

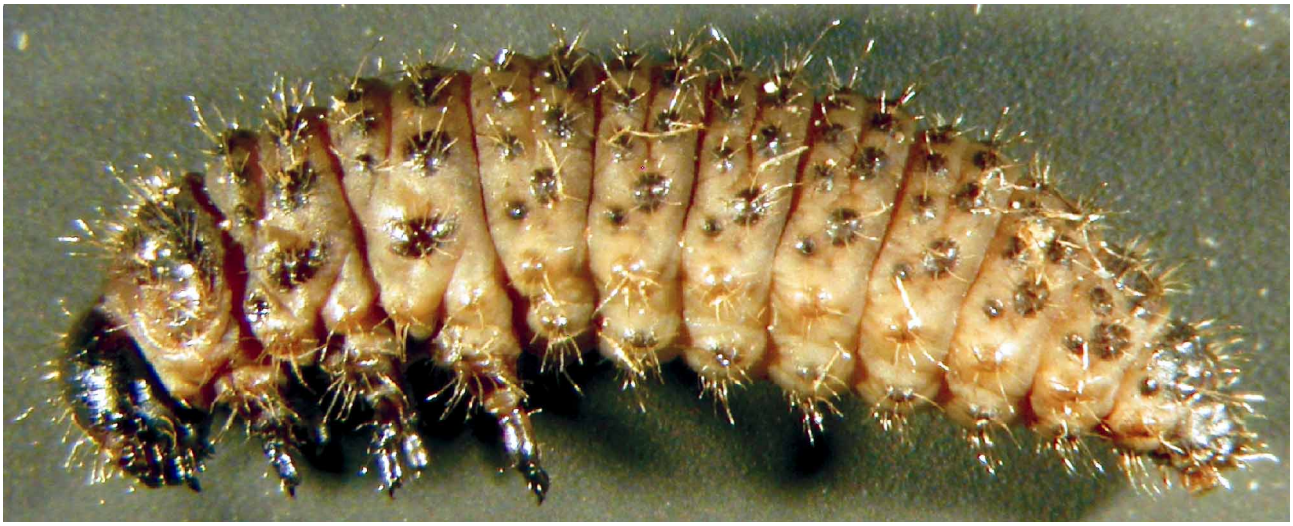


FIGURE 1. Habitus of *Gonioctena pseudogobanzi*, mature larva from Villanueva de Cauche. Length = 11.5 mm.

Gonioctena (Spartoxena) pseudogobanzi Kippenberg, mature larva

(Figs. 1–5, 10)

Material examined. SPAIN. Málaga, Frigiliana (UTM 30SVF1972), 350 m asl, 12 May 2007, 17 mature larvae; Málaga, Villanueva de Cauche (UTM 30SUF7095), 750 m asl, 11 May 2007, 15 mature larvae.

Description. Length: 8.5–12.5 mm. Body eruciform (Fig. 1), convex and slightly arched in preserved specimens. Inter-tubercular plates pale yellow-brown, tubercles pale brown in ventral region, dark brown in dorsal and dorsolateral regions, as well as pronotum. **Head.** Hypognathous, well sclerotized. Great part of vertex and frons dark brown coloured, the anterior part of frons, clypeus and mouth parts, paler. Epicranial suture well developed and long, frontal arms distinct, V-shaped and almost straight (Fig. 2). Endocarina present, extending almost to clypeus. Vertex bearing 5 large primary setae (v1, v3, v4, v5, v6) along with many shorter ones on each side. Frons with 5 primary setae (f1, f2, f3, f4, f6) and 7–10 slightly shorter ones on each side. Antennae very short and well sclerotized, three-segmented: first joint highly transverse; second joint almost as long as wide, bearing a conical membranous sensillum, 3 minute setae and 1 placoid sensillum; distal joint narrow, subconical, with membranous apex bearing 5 highly minute setae and 1 placoid sensillum. Stemmata arranged in two groups, 1 pair located below the base of antenna and 2 pairs behind the antenna. Clypeus with 3 pairs of setae. **Mouthparts.** Labrum (Fig. 3) bearing 2 pairs of setae on upper surface and 1 pair of placoid sensilla, anterior border with a wide U-shaped notch and 5–6 stout setae on each side. Epipharynx with 2

bands of microtrichia situated laterally to anterior notch (Fig. 3), microtrichia mostly isolated (but sometimes paired). Mandibles symmetrical, 5-toothed, bearing 2 setae on external face and 1 placoid sensillum on dorsal side. Maxillae: cardo transverse, with 1 seta in external border; stipes elongate, with 2 large setae near base of maxillary palp; mala bearing 12–15 setae on internal margin and apex, basal setae longer than apical ones, maxillary palpi 4-segmented, first joint slightly wider than long, bearing 2 long setae basally and another minute seta apically on external margin, second joint highly transverse, third joint longer than wide with 2 setae on internal face and 1 on external side, and fourth joint conical with 1 minute seta on internal face and membranous apex bearing 11–12 highly minute setae. Labium with postmentum membranous, bearing 3 pairs of setae, anterolateral one very short; prementum with 4 pairs of minute setae, 1 pair posterior and 3 pairs anterior to labial palpi along with 1 pair of placoid sensilla; palpi two-segmented, first joint transverse, distal joint conical with membranous apex bearing 10 highly minute setae. **Thorax.** All tubercles multisetose (Fig. 10). Prothorax with tubercles D (dorsal), DL (dorsolateral) and EP (epipleural) fused together in a pronotal sclerite, pronotum (D-DL-EP) bearing 10 pairs of primary setae along with many other slightly shorter ones; tubercle P (pleural) with 4–6 setae; ventral region with slightly sclerotized tubercles, tubercle SS (sternellar) reduced to 3–4 sclerotized spots bearing 1 seta, midventral tubercle ES (eusternal) bearing 4 setae. Meso- and metathorax with 6 tubercles on each side of dorsal region: Dai (dorsal anterior interior, with 5–7 setae), Dae (dorsal anterior exterior, 6–7 setae), Dpi-Dpe (dorsal posterior interior and dorsal posterior exterior fused together, 7–13 setae), DLai (dorsolateral anterior interior, 2–5 setae), DLpi (dorsolateral posterior interior, 10–15 setae), DLae-DLpe (dorsolateral anterior exterior and dorsolateral posterior exterior fused together, 12–15 setae); epipleural region with 2 tubercles, EPa (epipleural anterior, 8–11 setae) and EPp (epipleural posterior, 5–6 setae); mesothoracic spiracle isolated from EPa tubercle, located in front of DLae-DLpe one; P tubercle bearing 4–6 setae; SS and ES tubercles reduced to numerous sclerotized dots bearing isolated setae. **Legs.** All pairs similar in size; trochantin located in front of P tubercle (Fig. 10), bearing 2 minute setae in anterior half; prothoracic trochantin also with a larger seta in postero-ventral angle; coxa almost twice longer than wide in lateral view (Fig. 4), with 10–11 large setae on dorsal face and 3–5 shorter ones in each lateral declivity; trochanter triangular in lateral view, with 2 large setae on each side, 1 minute seta and 4 placoid sensilla near coxal articulation on anterior side, and 2 placoid sensilla on posterior side; femur wider apically than basally in lateral view, with 2 large and 1 small setae dorsally, 3 large setae and 1 placoid sensillum on anterior side, and 2 large setae on posterior side; tibio-tarsus twice longer than wide, bearing 3 large and 1 minute setae dorsally and 4 ventrally; unguis wide basally, curved apically, with marked acute tooth and seta on lower side (Fig. 5). **Abdomen.** All tubercles multisetose (Fig. 10). Segments 1–6 with 6 tubercles on each side of dorsal region: Dai (3–6 setae), Dae (6–8 setae), Dpi (6–9 setae), Dpe (6–8 setae), DLai-DLae (4–7 setae) and DLpi-DLpe (6–8 setae); epipleural region with tubercle EP bearing 7–10 setae; spiracle isolated from EP tubercle, located in front of DLpi-DLpe one; P tubercle with 6–11 setae; sternal region presents the following tubercles: PS (parasternal, 2–5 setae, but it is extremely reduced in segment 1, substituted by 1 isolated setae), SS (4–6 setae), ES separated in two halves, each one with 1–3 setae. Segment 7 with tubercle Dai fused to Dae, and Dpi to Dpe; segment 8 and 9 with all dorsal and dorsolateral tubercles fused together, ventral ones also fused in segment 9; segment 10 forming anal pseudopod, without dorsal tubercles, ventral ones fused together.

Distribution and ecology. *G. pseudogobanzi* is distributed in the southeast region of Spain, from the Penibetic mountains to the South and ranging from eastern Malaga to Murcia (Kippenberg, 2001; Baselga, 2007). Its host plant is known after the original description (Kippenberg, 2001): *Genista umbellata* (L'Hér.) Dum. Cours. [Fabaceae]. The larvae described in this paper were collected in the same plant [field identification]. *Genista umbellata* is present in the Iberian Peninsula but also in Morocco and Algeria. The Iberian range is restricted to the Southeast of Spain, but its distribution is wider than that of *G. pseudogobanzi*, reaching the provinces of Badajoz, Sevilla, Albacete and Valencia to the North (Talavera, 1999). Although phytophagous insects usually have narrower distribution ranges than their hosts (Gaston, 2003), further research is needed to clarify to which extent both distributions are different.

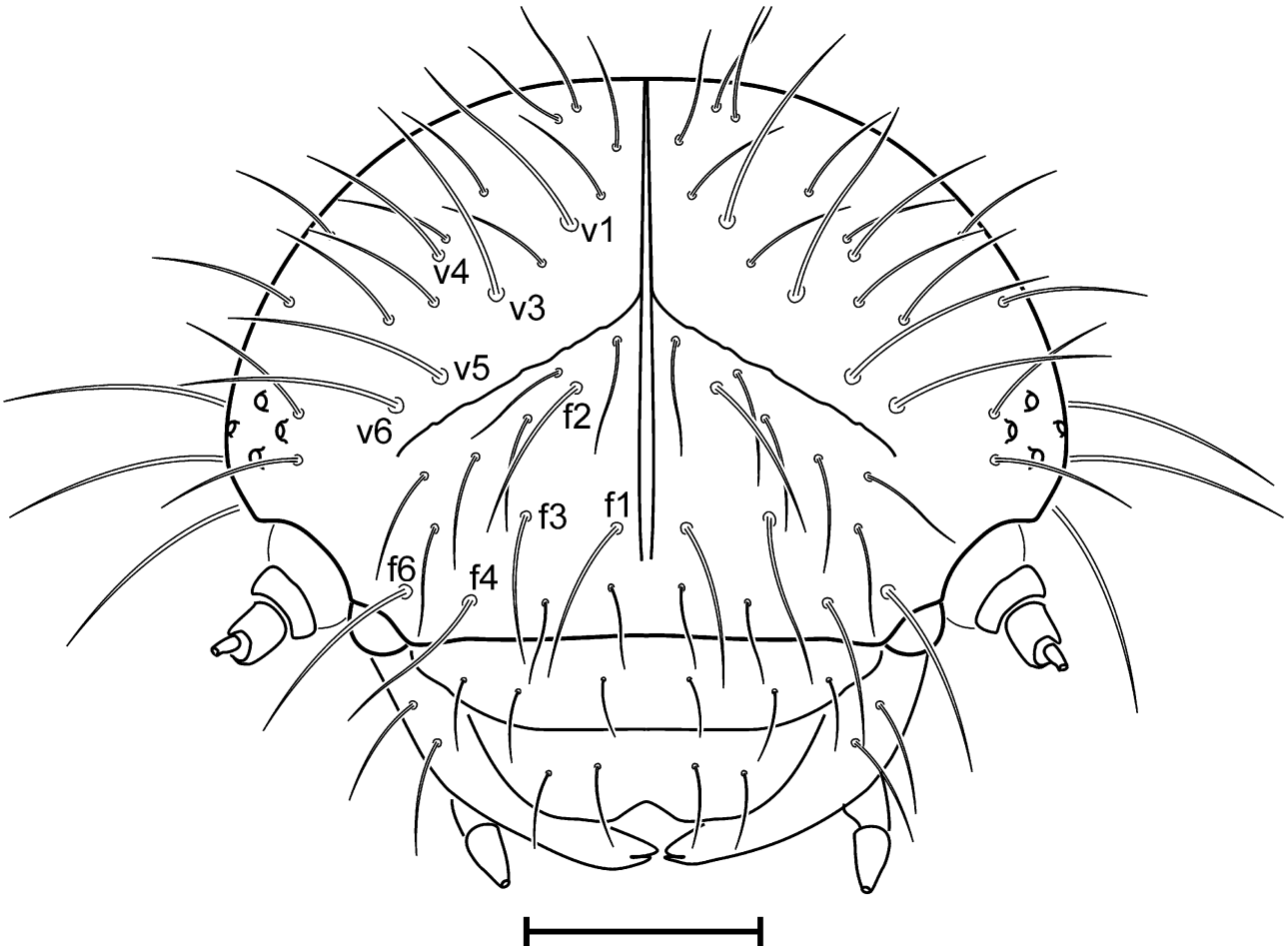
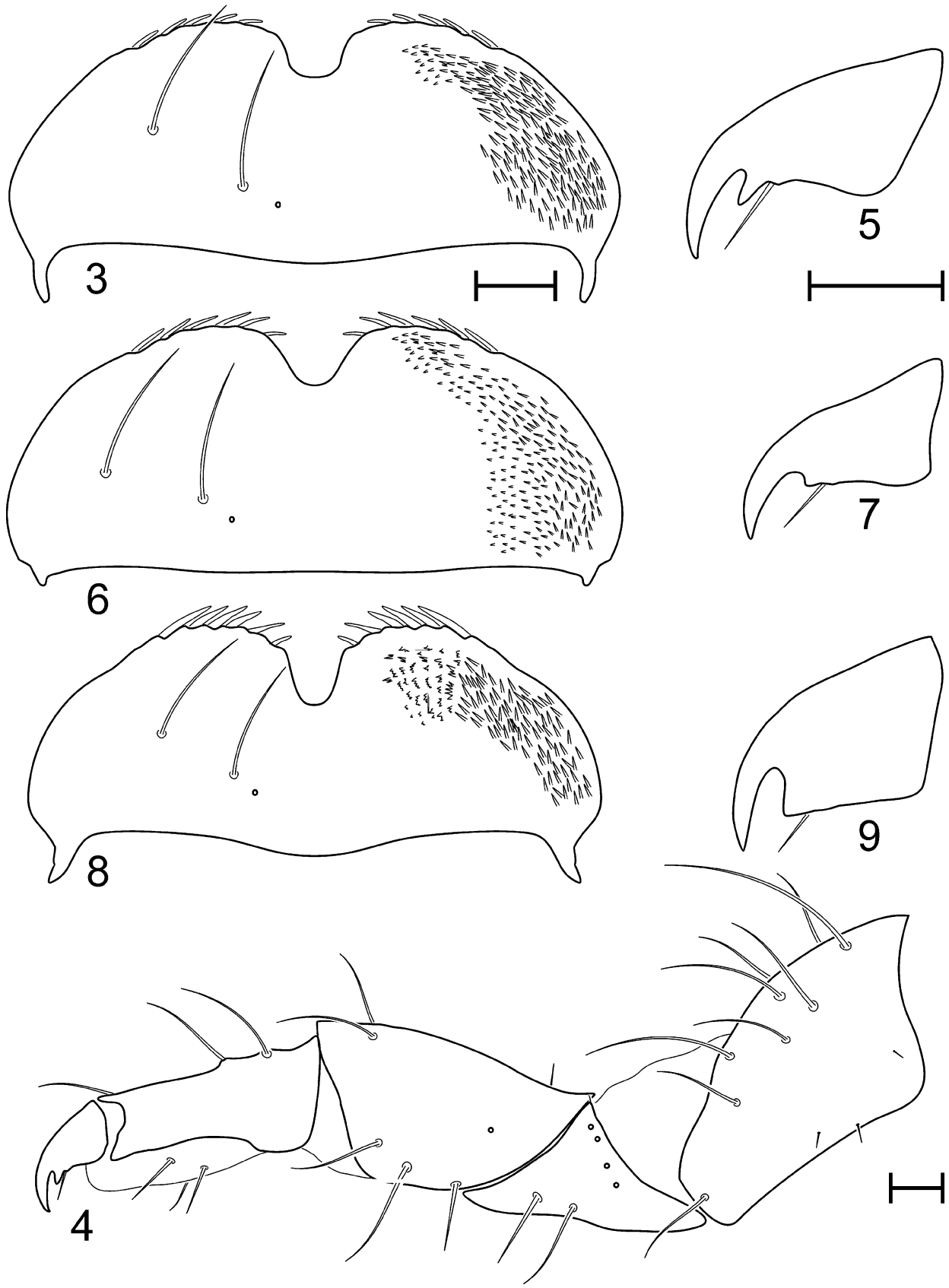


FIGURE 2. Head of *Gonioctena pseudogobanzi*, frontal view. Primary setae of frons and vertex are marked as f and v, respectively. Scale bar = 0.5 mm.

Discussion

The mature larva of *G. pseudogobanzi* presents all the diagnostic characters given by Cox (1982) and Steinhausen (1994) for the identification of the genus *Gonioctena*: body dorsally not strongly convex, labrum with 2 pairs of setae, pronotum bearing a high number of setae on disc, dorsolateral tubercles of meso-, metathorax and abdomen without eversible glands, tarsal claws toothed on lower side. The larvae of 17 species of *Gonioctena* are known in the west Palaearctic region (Steinhausen, 1996; Baselga & Novoa, 2004), but only three 3 of them belong to subgenus *Spartoxena*: *G. aegrota*, *G. gobanzi* and *G. leprieuri*. The three species share the following features, that were considered diagnostic for subgenus *Spartoxena* (Baselga & Novoa, 2004): (i) frons with two dark spots, (ii) frons with 5 primary setae along with more than 8 slightly shorter setae on each side, (iii) abdominal segments 1–6 with dorsal tubercles not fused together, (iv) dorsal interior tubercles not pigmented. The description of the larva of *G. pseudogobanzi* allows the reassessment of this diagnosis, from which the latter character (interior dorsal tubercles not pigmented) must be excluded because it is not present in *G. pseudogobanzi*. Moreover, the second character must be slightly modified, so the diagnostic combination of characters delimiting the subgenus *Spartoxena* remains as follows: (i) frons with two dark spots, (ii) frons with 5 primary setae along with more than 7 slightly shorter setae on each side, (iii) abdomen with dorsal tubercles not fused together.



FIGURES 3–9. *Gonioctena* spp. (3) Labrum of *G. pseudogobanzi*, dorsal view. In the right side the setae were removed and the microtrichia of epipharynx are shown by transparency. (4) Leg of *G. pseudogobanzi*, lateral view. (5) Tarsal claw of *G. pseudogobanzi*, lateral view. (6) Labrum of *G. aegrota*, dorsal view. (7) Tarsal claw of *G. aegrota*, lateral view. (8) Labrum of *G. leprieuri*, dorsal view. (9) Tarsal claw of *G. leprieuri*, lateral view. Scale bars = 0.1 mm.

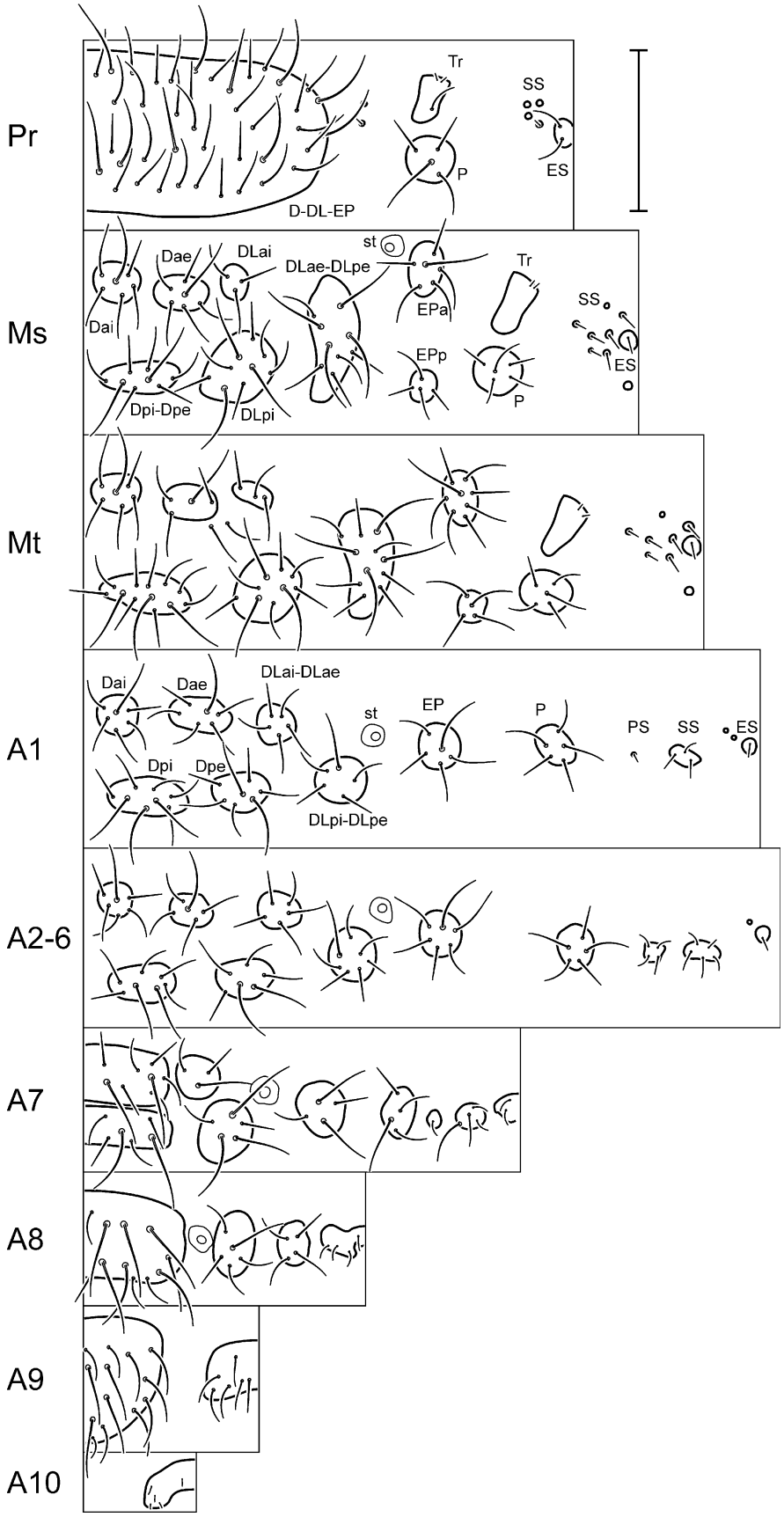


FIGURE 10. *Gonioctena pseudogobanzi*: location of tubercles and body chaetotaxy, right side. Pr, prothorax; Ms, mesothorax; Mt, metathorax; A1-A10, abdominal segments 1–10. See text for definition of tubercles abbreviations. Scale bar = 1.0 mm.

Despite the high interspecific similarity, the four known larvae within the subgenus can be accurately identified, based on the number of dorsolateral tubercles, as well as the shapes of labrum and tarsal claw. No detailed description of *G. gobanzi* has been published, but it has three dorsolateral tubercles (Steinhausen, 1994: Fig. 216), instead of two dorsolateral tubercles as the remaining species (Baselga & Novoa, 2004), including *G. pseudogobanzi* (Fig. 10). Among these species, *G. pseudogobanzi* can be distinguished from *G. aegrota* by the U-shaped median notch of the labrum, which is wide V-shaped in *G. aegrota* (Fig. 6), and especially by the marked acute tooth of the tarsal claw, which is poorly marked in *G. aegrota* (Fig. 7). The larva of *G. pseudogobanzi* can also be separated from *G. leprieuri* by the microtrichia situated laterally to anterior notch of epipharynx, which are mostly isolated in *G. pseudogobanzi* whereas they are arranged in ridges of 3–5 denticles in *G. leprieuri* (Fig. 8), and by the acute tooth of the tarsal claw, which is marked but broad in *G. leprieuri* (Fig. 9).

Key to known larvae of the subgenus *Spartoxena*

1. Abdominal segments 1–6 with four dorsal and three dorsolateral tubercles on each side (Steinhausen 1994: Fig. 216). Southern Alps..... *G. gobanzi* (Reitter)
- Abdominal segments 1–6 with four dorsal and two dorsolateral tubercles on each side (Fig. 10 and Baselga & Novoa 2004: Figs. 10–11). 2
2. Tarsal claws with a weak tooth in ventral side (Fig. 7). Labrum with a wide V-shaped notch (Fig. 6). Microtrichia of epipharynx mostly isolated or sometimes paired (Fig. 6). Iberian peninsula and northern Morocco..... *G. aegrota* (Fabricius)
- Tarsal claws with a marked tooth in ventral side (Figs. 5, 9) 3
3. Tarsal claws with a broad tooth (Fig. 9). Labrum with a deep U-shaped notch (Fig. 8). Microtrichia of epipharynx fused together to form ridges of 3–5 denticles (Fig. 8). Northwest quarter of the Iberian peninsula..... *G. leprieuri* (Pic)
- Tarsal claws with an acute tooth (Fig. 5). Labrum with a shallow U-shaped notch (Fig. 3). Microtrichia of epipharynx mostly isolated or sometimes paired (Fig. 3). South-east Iberian peninsula. .... *G. pseudogobanzi* Kippenberg

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