



Description of the mature larva of *Gastrophysa janthina* (Suffrian, 1851) [= *G. unicolor* auct.] (Coleoptera: Chrysomelidae: Chrysomelinae) and key to the larvae of the European *Gastrophysa*

ANDRÉS BASELGA

Departamento de Biodiversidad y Biología Evolutiva, Museo Nacional de Ciencias Naturales - CSIC, c/ José Gutiérrez Abascal, 2, 28006 Madrid, Spain. E-mail: baselga@mncn.csic.es

Abstract

Mature larva of *Gastrophysa janthina* (Suffrian, 1851) (= *G. unicolor* auct.) is described and illustrated for the first time, based on specimens collected on *Rumex* spp. (Polygonaceae) in Spain. Nomenclature of this species is discussed, justifying the use of *G. janthina* instead of *G. unicolor* auct. Diagnostic characters for the identification of species within *Gastrophysa* Chevrolat, 1837 are coloration of dorsal tegument and shape of labrum. This latter character is the only one separating the larva of *G. janthina* from that of *G. viridula* (De Geer, 1775). A key to European larvae of genus *Gastrophysa* is provided. Notes on distribution and host plants are included.

Key words: Chrysomelidae, *Exiguipecta*, *Gastrophysa janthina*, *Gastrophysa unicolor*, larva, key

Introduction

The genus *Gastrophysa* Chevrolat, 1837 is comprised of 11 species distributed in the Holarctic and Oriental regions (Jolivet, 1951), and four of them are present in Europe. Among the latter, *G. polygona* (Linnaeus, 1758) and *G. viridula* (De Geer, 1775) have wide distribution ranges, whereas *G. janthina* (Suffrian, 1851) (= *G. unicolor* auct.) and *G. analis* (Reitter) are endemic from the Iberian and Balkan peninsulas, respectively. Since larvae of *G. polygona* and *G. viridula* were already described (Hennig, 1938; Steinhausen, 1994), larval stages of European *Gastrophysa* are comparatively quite well known, considering that for the western Palaearctic species only about 22% of the larvae are known within Chrysomelidae, and 37% within Chrysomelinae (Steinhausen, 1996).

Gastrophysa janthina and *G. analis* are brachypterous species, condition related with their restricted distributions. This character motivated the creation of a subgenus, *Exiguipecta* Jolivet, separating both species from the rest of the genus. However, no other adult characters justify this splitting of *Gastrophysa* into two subgenera, and for this reason the first description of the larva of an *Exiguipecta*, could add new diagnostic characters or, on the contrary, confirm the lack of justification for the separation. Therefore, the aims of this paper are (i) to describe the mature larvae of the Iberian endemic *Gastrophysa*, *G. janthina*, and (ii) to evaluate the characters justifying the subgenus *Exiguipecta* and thus the convenience on maintain the subgeneric classification of *Gastrophysa*.

Nomenclatural note

The name *Gastrophysa unicolor* (Marsham, 1802) is currently attributed to the blue species of *Gastrophysa*

endemic of the Iberian peninsula (Jolivet, 1951). However, Marsham's descriptions are based only on British specimens, as the title of his book indicates (Marsham, 1802), and therefore it seemed to contradict the attribution of this name to the Iberian taxon. The original description (Marsham, 1802: 185) could be applied to a broad range of Chrysomelidae and, in fact, Stephens (1839: 312) applied this name to a *Phratora* Chevrolat. Marsham's collection was purchased by Stephens, and the nine specimens standing as "*unicolor*" in Stephens' collection are all *Phratora vulgatissima* (Linnaeus, 1758) (Sharon Shute, personal communication). However, the original Marsham's description states "Totum corpus ejusdem coloris" [body entirely unicoloured], thus seeming not to match with any species of *Phratora*, which have basal antennomeres red-brown coloured. Therefore, it could be argued that Stephens' usage of "*unicolor*" was a misidentification, but there is no reason to suppose that the specimens described by Marsham in the British fauna could belong to an Iberian endemic taxon. The first usage of *Chrysomela unicolor* Marsham for the Iberian endemic taxon is due to Gyllenhal (in Sch nherr, 1808: 258), who states "*Spec. dist. mihi videtur. Magnitudo et statura Chr. Polygoni. Ex Hispania*" [Distinct species, in my opinion. Size and longitude like *Chr. polygoni*. From Spain], applying the name of a species described from England to an Iberian endemic without further justification. This confusion was perpetuated by Weise (1916), who included this name in *Gastroidea* Hope (synonym of *Gastrophysa*, p. 117) although also placed it in *Phyllodecta* Kirby (synonym of *Phratora*) as a synonym of *P. vulgatissima* (p. 188), considering simultaneously the different usages of the Marsham's name made by Gyllenhal and Stephens. Therefore, considering that it is not possible to know the identity of the specimens named *Chrysomela unicolor* by Marsham and that there is no reason to suppose that these specimens were not collected in Great Britain, the synonymization of *Chrysomela janthina* Suffrian, 1851 with *Chrysomela unicolor* Marsham, 1802 is not justified and the former name should be applied to the Iberian endemic *Gastrophysa*.

Materials and methods

Mature larvae were collected along with adults by sweeping their host plants. Specimens were attributed to genus *Gastrophysa* following Steinhausen (1994). After determination of adults collected from the same plants, the specific identity of larvae was assigned because only a single different species of this genus, *G. polygoni*, occurs in the region and its larvae are clearly different. 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).

Gastrophysa janthina (Suffrian, 1851), mature larva (Figs. 1–6, 8)

Material examined. SPAIN. A Coru na, A Capela, Caaveiro, (UTM 29TNJ7407), 50 m asl, 11 April 1999, 5 mature larvae; Ourense, Chandrexa de Queixa (UTM 29TPG3478), 600 m asl, 8 May 1999, 14 mature larvae. Voucher specimens are deposited in the Museo Nacional de Ciencias Naturales, Madrid, Spain.

Description. Habitus as in Fig. 1. Length: 5.5–7.1 mm. Body eruciform, moderately convex and slightly arched in preserved specimens. Inter-tubercular plates and tubercles concolor, brown in dorsal region, light brown in ventral region. **Head.** Hypognathous, well sclerotized. Color brown. Epicranial suture well developed and long, frontal arms distinct, V-shaped and almost straight (Fig. 2). Endocarina present, extending to the middle of the frons and thus not reaching the clypeus. Vertex bearing 4 pairs of setae (v1, v3, v4, v6).

Frons with 4 pairs of setae (f1, f3, f4, f6). Antennae short and well sclerotized, three-segmented (Fig. 3): first joint highly transverse, bearing 2 placoid sensilla (only 1 visible in frontal view); second joint 1.5 times longer than wide, bearing a large conical membranous sensillum and 5 minute setae; distal joint narrow, bottle-shaped, constricted anteapically, with membranous apex bearing 6 highly minute setae similar in size (no central one larger than the others) and 1 placoid sensillum slightly produced and situated before the anteapical constriction. Stemmata arranged in two groups, 1 pair located below the base of antenna and 2 pairs behind the antenna. Clypeus with 2 pairs of setae. **Mouthparts.** Labrum (Fig. 4) bearing 1 pair of placoid sensilla and 2 pairs of setae on dorsal surface, one near middle, the other near lateral sides; anterior border with a median wide V-shaped notch; ventral surface with 2 pairs of short setae not reaching the anterior border. Mandibles symmetrical, 5-toothed, bearing 2 setae on external face and 1 placoid sensillum on dorsal side. Maxillae (Fig. 5): cardo transverse, without setae; stipes elongate, with 2 large setae on external face and 1 short seta on the internal one; mala bearing 10 setae on internal margin and apex, basal setae longer than apical ones; maxillary palpi 4-segmented, first joint almost as long as wide, bearing 2 long setae basally in ventral side, second joint transverse with 1 minute seta on external side, third joint longer than second, but still transverse, with 1 seta on internal face, 1 placoid sensillum on ventral face and two setae on external side, and fourth joint conical with 1 minute seta on internal face and membranous apex bearing 9–11 highly minute setae. Labium (Fig. 5) with postmentum membranous, bearing 3 pairs of setae, anterolateral one shorter than the others; prementum with 4 pairs, 2 posterior and 2 anterior to labial palpi (only one visible in Fig. 5), one of the former much longer than the others; labial palpi 2-segmented, first joint transverse, distal joint conical with membranous apex bearing 9 highly minute setae. **Thorax.** Prothorax with tubercles D (dorsal), DL (dorsolateral) and EPa (epipleural) fused together in a pronotal sclerite (Fig. 8), pronotum (D-DL-EPa) bearing 10 pairs of primary setae along with 1 pair of extremely minute ones; tubercle EPp bearing 1 seta; tubercle P (pleural) with 1 seta; ventral region with midventral tubercle ES (eusternal) fused with tubercle SS (sternellar), tubercle SS-ES bearing 2 pairs of setae. Meso- and metathorax with 5 tubercles on each side of dorsal region: Dai (dorsal anterior interior, bearing 1 seta), Dae (dorsal anterior exterior, 1 seta), Dpi-Dpe (dorsal posterior interior and dorsal posterior exterior fused together, 1 seta), DLai-DLpi (dorsolateral anterior interior and dorsolateral posterior interior fused together, 1 long seta and 2 smaller ones), and DLae-DLpe (dorsolateral anterior exterior and dorsolateral posterior exterior fused together, 2 large setae along with 1–2 minute ones) enclosing the eversible gland; epipleural region with 2 tubercles, EPa (epipleural anterior, 2–3 setae, variable among individuals and even lateral sides of a specimen) and EPp (epipleural posterior, 1 seta); mesothoracic spiracle (st) very close to EPa tubercle; P tubercle bearing 1 seta; SS-ES bearing 2 pairs of setae. **Legs.** All pairs similar in size; trochantin (Tr) located in front of P tubercle (Fig. 8), bearing 2 extremely minute setae in anterior half; prothoracic trochantin also bearing a large seta near posterior angle; coxa 1.5 times longer than wide in lateral view (Fig. 6), with 4 large setae on dorsal half of anterior side and 5 shorter ones in lateral declivities; trochanter triangular in lateral view, with 2 setae on each side, 5 placoid sensilla near coxal articulation on anterior side and 2 on posterior side; femur trapezoidal in lateral view, with 3 setae dorsally (1 pair near apex and 1 single minute one near base, 3 ones on each lateral declivity and 1 placoid sensillum on anterior side); tibio-tarsus twice longer than wide, bearing 4 setae dorsally, 1 on each side and 2 ventrally; unguis wide basally, curved apically, bearing 1 seta on lower side. **Abdomen.** Segments 1–6 with only 3 tubercles on each side of dorsal region (Fig. 8): Dpi-Dpe (2 setae), Dae (1 seta) and DLae-DLpe (2 setae) enclosing the eversible gland; Dai and DLai-DLpi lacking; epipleural region with tubercle EP bearing 2 setae; spiracle (st) located between EP and DLae-DLpe tubercles, closer to EP; P tubercle with 2 setae, one of them shorter (lacking in segment 1); sternal region presents the following tubercles: PS (parasternal, 2 setae, excepting segment 1 with only 1 seta), SS (1 seta), ES (1 pair of setae); secondary tubercle as1 (with 1 minute seta) present. Segment 7 with tubercles Dpi-Dpe fused together in a single unpaired dorsal sclerite, and with tubercles as1, PS, SS and ES fused together in a ventral sclerite; segment 8 and 9 with dorsal and dorsolateral tubercles fused together, as well as pleural and ventral ones; segment 9 with tubercle EP lacking; segment 10 forming anal pseudopod,

without dorsal tubercles, ventral ones fused.

Distribution and ecology. Although *G. janthina* was cited by Oliveira (1893) from “*tout le Portugal*” and after Jolivet (1951) this species is distributed throughout the Iberian peninsula, considering the available data the taxon is restricted to the northwest quadrant of the Iberian peninsula: it is very common in Galicia (Baselga & Novoa, 2000a; 2000b; 2002; 2004a; 2006) and it was also recorded from León (Petitpierre & Gómez-Zurita, 1998), North Portugal (Baselga & Novoa, 2000b), Zamora (Baselga & Novoa, 2003), Asturias and Cantabria (Petitpierre, 2005). In all these citations the species is referred as *G. unicolor*. *Gastrophysa janthina* lives on Polygonaceae of the genera *Polygonum* L. (Petitpierre & Gómez-Zurita, 1998) and *Rumex* L. (Baselga & Novoa, 2000a; 2000b; 2002; 2003), but no host plant was ever identified to the specific level. The larvae described in this paper were collected on *Rumex* spp. (field identification).

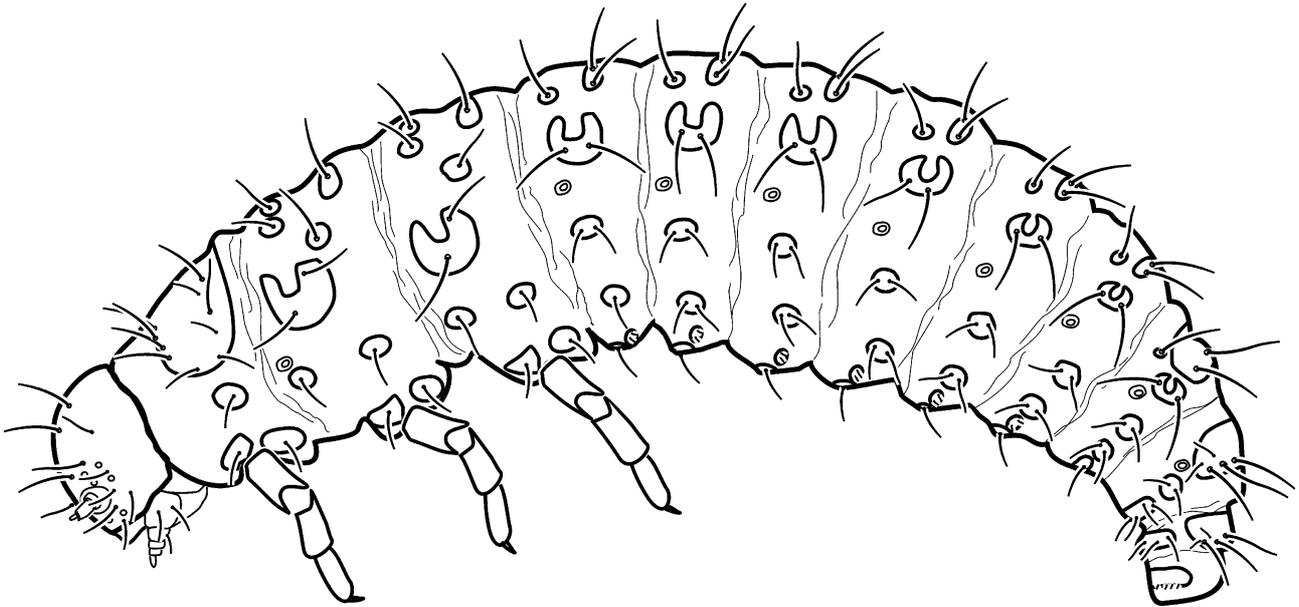


FIGURE 1. Habitus of *Gastrophysa unicolor*, mature larva from Chandrexa de Queixa. Length = 6.4 mm.

Discussion. Four species of *Gastrophysa* are distributed in the western Palaearctic region (Warchalowski, 2003) but the larval stages are known only for *G. polygona* and *G. viridula* (Hennig, 1938; Steinhausen, 1994). The larvae of the genus *Gastrophysa* are well defined by the following combination of characters (Cox, 1982; Steinhausen, 1994): body dorsally not strongly convex, epicraneal suture long, labrum with an anterior median notch and 2 pairs of setae on upper surface, pronotum bearing a low number of setae on disc, dorsolateral tubercles of meso-, metathorax and abdominal segments 1–7 with eversible glands, abdominal segments 1–6 with a dorsal anterior tubercle, tarsal claws not toothed on lower side. The mature larva of *G. janthina* agrees all these diagnostic characters, as described in this paper, and keys out with *Gastrophysa viridula* following both Hennig (1938) and Steinhausen (1994) works, due to its brown dorsum with tubercles clearly delimited from intertubercular tegument. No characters are available in the cited papers to separate *G. janthina* from *G. viridula*, but larvae of the latter species were collected [SPAIN: Lleida, Valle de Arán, Circo de Colomers (3ITCH2922), 23 July 2006, 19 mature larvae and 5 adults], and the comparison of the larvae has showed that they are almost identical in both species. No differences were observed in the number and configuration of tubercles or setae and even the same variation in the number of setae of meso- and metathoracal tubercles DLae-DLpe and EPa is observed in both species. The only diagnostic character that could be detected is the outline of the labrum which has a wide V-shaped median notch in *G. janthina*, whereas it has a narrow U-shaped notch in *G. viridula* (Fig. 7).

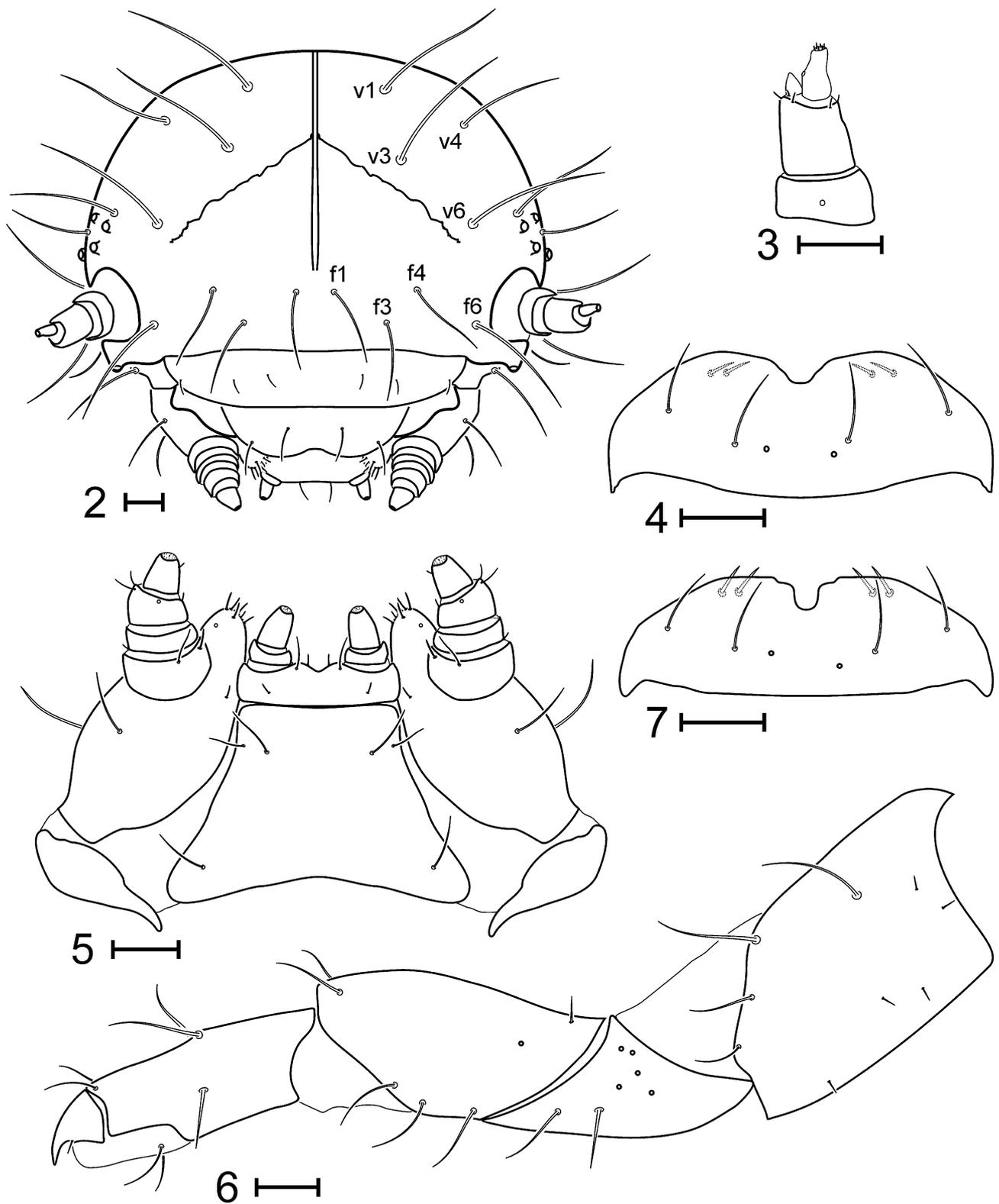


FIGURE 2-7. *Gastrophysa* spp. (2) Head of *G. janthina*, frontal view. (3) Antenna of *G. janthina*, frontal view. (4) Labrum of *G. janthina*, dorsal view. (5) Maxillae and labium of *G. janthina*, ventral view. (6) Leg of *G. janthina*, lateral view. (7) Labrum of *G. viridula*, dorsal view. Scale bars = 0.1 mm.

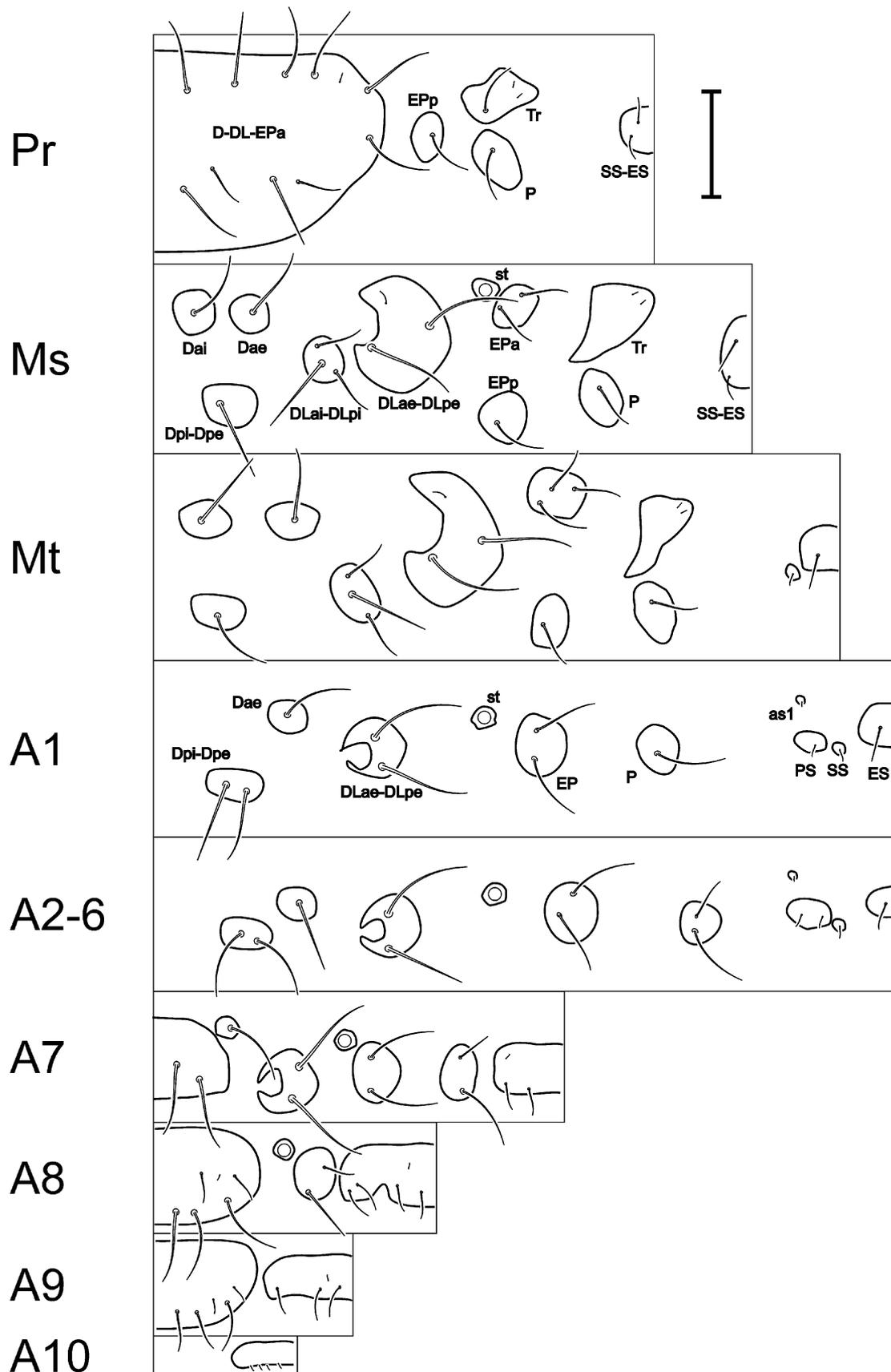


FIGURE 8. *Gastrophysa viridula*: location of tubercles and body chaetotaxy, right side. Pr, prothorax; Ms, mesothorax; Mt, metathorax; A1–A10, abdominal segments 1–10. See text for definition of tubercles abbreviations. Scale bar = 0.5 mm.

The description of the larva of *G. janthina* is the first one within the subgenus *Exiguipenna* Jolivet, which includes only this species and *G. analis* from the Balkan peninsula. The subgenus was established based on the reduction of wings in adults of both species. No other characters support the splitting of the genus, and the larval morphology does not supply any other diagnostic feature, providing that the two species are virtually identical at this stage, except for the shape of the labrum, which is highly variable among close species of Chrysomelinae (Steinhausen, 1994; Baselga & Novoa, 2004b) and thus not appropriate for supporting supraspecific taxa. On the other hand, wing reduction or loss is a common evolutionary event frequently produced in independent lineages due to environmental conditions (see Wagner & Liebherr, 1992 for a review of the causes leading to apterism and its frequent independence of phylogeny; Philips, 2000 for a report of the independent origin of flightlessness in New World Ptininae; and Flowers, 2004 for an example in other Chrysomelidae). In my opinion it is questionable that brachypterism justify the subgenus *Exiguipenna*, in absence of any other evidence, and further phylogenetic research should clarify its validity.

Key to larvae of the European *Gastrophysa*

1. Dorsal tubercles pale yellow, hardly distinguishable from the intertubercular tegument *G. polygona* (Linnaeus)
- Dorsal tubercles brown, distinct from the intertubercular tegument 3
3. Labrum with a narrow U-shaped median notch and with large ventral setae, producing out the anterior margin (Fig. 7) *G. viridula* (De Geer)
- Labrum with a wide V-shaped median notch and with short ventral setae, not reaching the anterior margin (Fig. 4) *G. janthina* (Suffrian)

Acknowledgments

I wish to thank Carola Gúmez-Rodríguez for her help during the sampling for larvae of *G. viridula*, Miguel Ángel Alonso-Zarazaga (Museo Nacional de Ciencias Naturales, Madrid) for his valuable advice on the nomenclatural procedures necessary for this paper, Sharon Shute (Natural History Museum, London) for her indispensable help in consulting Stephens' collection and several comments on the literature, and an anonymous referee for interesting comments on the nomenclatural note. Author position at MNCN is supported by Juan de la Cierva Program (MEC, Spanish Ministerio de Educación y Ciencia).

Literature cited

- Baselga, A. & Novoa, F. (2000a) Los Chrysomelidae (Coleoptera) de la Sierra de Ancares, Noroeste de la España (Coleoptera). *Nouvelle Revue d'Entomologie (N. S.)*, 17, 165–180.
- Baselga, A. & Novoa, F. (2000b) Los Chrysomelidae (Coleoptera) de los sistemas dunares de Galicia (Noroeste de España). *Boletín de la Real Sociedad Española de Historia Natural (Sec. Biol.)*, 96, 113–124.
- Baselga, A. & Novoa, F. (2002) Los Chrysomelidae (Coleoptera) de las sierras orientales de Ourense (Galicia, noroeste de la Península Ibérica). *Boletín de la Asociación española de Entomología*, 26, 57–73.
- Baselga, A. & Novoa, F. (2003) Los Chrysomelidae de los Arribes del Duero, noroeste de la Península Ibérica (Coleoptera). *Nouvelle Revue d'Entomologie (N. S.)*, 20, 117–131.
- Baselga, A. & Novoa, F. (2004a) Coleópteros del Parque Natural de las Fragas del Eume (Galicia, noroeste de la Península Ibérica), II: Scarabaeoidea, Buprestoidea, Byrrhoidea, Elateroidea, Bostrichoidea, Lymexyloidea, Cleroidea, Cucujoidea, Tenebrionoidea, Chrysomeloidea y Curculionioidea. *Boletín de la Asociación española de Entomología*, 28, 121–143.
- Baselga, A. & Novoa, F. (2004b) Larvae of the *Gonioctena* subgenus *Spartoxena*: description of mature larvae of *G. lep-*

- rieuri* and *G. aegrota* (Coleoptera: Chrysomelidae: Chrysomelinae). *Canadian Entomologist*, 136, 313–321.
- Baselga, A. & Novoa, F. (2006) Diversity of Chrysomelidae (Coleoptera) in Galicia, Northwest Spain: estimating the completeness of the regional inventory. *Biodiversity and Conservation*, 15, 205–230.
- Cox, M.L. (1982) Larvae of the British genera of chrysomeline beetles (Coleoptera Chrysomelidae). *Systematic Entomology*, 7, 297–310.
- Flowers, R.W. (2004) New flightless Eumolpinae of the genera *Apterodina* Bechyné and *Brachypterodina* n. gen. (Coleoptera: Chrysomelidae) from the Neotropics. *Zootaxa*, 549, 1–18.
- Hennig, W. (1938) Übersicht über die Larven der wichtigsten deutschen Chrysomelinen (Coleoptera). *Arbeiten über physiologische und angewandte Entomologie aus Berlin-Dahlem*, 5, 85–136.
- Jolivet, P. (1951) Contribution à l'Étude de genre *Gastrophysa* Chevrolat (Coleoptera: Chrysomelidae) (3eme note). *Bulletin de l'Institut royal des sciences naturelles de Belgique*, 27, 1–47.
- Kimoto, S. (1962) A phylogenic consideration of Chrysomelinae based on immature stages of Japanese species (Coleoptera). *Journal of the Faculty of Agriculture, Kyushu University*, 12, 67–89.
- Marsham, T. (1802) *Entomologia Britannica, sistens Insecta Britanniae indigena, secundum methodum Linnaeanam disposita. I. Coleoptera*. J. White, London, 580 pp.
- Oliveira, M.P. (1893) *Catalogue des Insectes du Coléoptères* Universidade de Coimbra, Coimbra, 393 pp.
- Petitpierre, E. (2005) Listado de Chrysomelidae (Coleoptera) de Asturias y Cantabria. *Boletín de la Asociación española de España Entomología*, 29, 51–72.
- Petitpierre, E. & Gómez-Zurita, J. (1998) Los Chrysomelidae de León; NO de España (Coleoptera). *Nouvelle Revue d'Entomologie (N. S.)*, 15, 13–26.
- Philips, T.K. (2000) Phylogenetic analysis of the New World Ptininae (Coleoptera: Bostrichoidea). *Systematic Entomology*, 25, 235–262.
- Schönherr, J.C. (1808) *Synonymia insectorum, oder, Versuch einer Synonymie Aller bisher bekannten Insecten : nach Fabricii Systema Eleutheratorum geordnet. Volume 1(2), Sperchus — Cryptocephalus*. H. A. Nordström, Stockholm, 423 pp.
- Steinhausen, W.R. (1994) Familie Chrysomelidae. In: Klausnitzer, B. (Ed.). Goecke & Evers, Krefeld, Germany, pp. 231–314.
- Steinhausen, W.R. (1996) Status of west Palaearctic leaf beetle larvae research. In: Jolivet, P. & Cox, M.L. (Eds.). SPB Academic Publishing, Amsterdam, The Netherlands, pp. 65–91.
- Stephens, J.F. (1839) *A manual of British Coleoptera, or beetles*. Longman, Orme, Brown, Green, and Longmans, London, 455 pp.
- Wagner, D.L. & Liebherr, J.K. (1992) Flightlessness in insects. *Trends in Ecology & Evolution*, 7, 216–220.
- Warchalowski, A. (2003) *Chrysomelidae. The leaf-beetles of Europe and the Mediterranean area*. Natura optima dux Foundation, Warszawa, 600 pp.
- Weise, J. (1916) *Chrysomelidae: 12. Chrysomelinae. Coleopterum Catalogus. (68)*. W. Junk, Berlin, 255 pp.