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Colaspis caligula, a new species found in association with *Vitis vinifera* (L.) crops in Argentina (Coleoptera: Chrysomelidae)

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Abstract

Some species of *Colaspis* Fabricius are well-known pests of several crops in Argentina. In this contribution, we describe a new species within this genus: *Colaspis caligula* **n. sp.**, found in association with *Vitis vinifera* (Linnaeus) crops. We provide descriptions and illustrations of the mature larva, pupa and adult, as well as notes on its diagnostic characters, life cycle, and the damages produced to the plants.

Key words: Eumolpinae, new species, pest, life cycle, vine crops

Resumen

Algunas especies de *Colaspis* Fabricius son conocidas como plagas de varios cultivos en Argentina. En esta contribución se describe una nueva especie dentro de este género: *Colaspis caligula* **n. sp.**, la cual ha sido encontrada en asociación con cultivos de *Vitis vinifera* (Linnaeus). Se proporcionan aquí las descripciones e ilustraciones de la larva madura, pupa y adulto, así como también se brindan algunas notas sobre sus caracteres diagnósticos, ciclo de vida y los daños producidos a las plantas.

Introduction

The Eumolpini Hope, is the largest tribe within the subfamily Eumolpinae, it has about 170 genera distributed around the globe (Jolivet *et al.* 2014), and it contains most of the genera present in the new world. *Colaspis* Fabricius include over 200 species, being the largest genus within the subfamily (Riley *et al.* 2002). As in several other groups of Neotropical leaf beetles, its taxonomy is somewhat neglected. Furthermore, there has been a general misunderstanding among former taxonomists (Flowers 2004). In this regard, most workers in the Neotropical region have been using *Maecolaspis* (Bechyné) as the generic name, although the latter genus was synonymized with *Colaspis* Fabricius by Brown (1961).

Numerous species of *Colaspis* are known to produce economic losses and have shown potential to affect crops (Blake 1976; Jolivet & Verma 2008, references therein). Generally, when found in commercial crops the species belonging to this genus are considered as secondary pest, yet, its control (when necessary) can lead to economic losses, especially because the damages cannot be easy controlled once noticed (Steffey & Gray 2009).

In this contribution we provide the description and illustrations of the mature larva, pupa, and adult, in order to aid the identification of this new species. The latter will allow for a rapid recognition of the species in the field, and will aid any future taxonomic work since *Colaspis* is a large genus in need of modern taxonomic revision.

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Material and methods

The material used in this study is deposited at IADIZA (Colección Entomológica, Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina; and MLPA (Museo de La Plata, La Plata, Argentina). The material studied consisted of dried, pinned specimens, and alcohol preserved larvae and pupae. For the dissections of adults, the specimens were soaked in NH_3 for ten minutes to relax their anatomical structures. In order to study the male genitalia, the aedeagus was removed through the pygidium and cleared in 10% hot KOH for five minutes (for the female the whole abdomen was removed). Upon completion of the examination, the genitalia and other dissected parts were placed in a plastic microvial with glycerine, and pinned directly beneath each specimen. Terminology follows previous authors (Blake 1976; Jolivet & Verma 2008). Larvae were obtained from eggs laid by adults collected on their host plant in the field, killed with hot water and preserved in 70% ethanol. Techniques for dissection and slide-mounting of the larvae follow Goulet (1977) and May (1979). Terminology for morphological features of the immatures follows LeSage (1986), Cox (1998), and LeSage & Zmudzinska-Krzesinska (2004). All photographs were taken by the authors with a Leica EC3 digital camera, mounted on a Leica S6E stereomicroscope. The source photos were taken at multiple focal planes (at least five) and then combined into a single image (with all features in focus) using the free software CombineZP (http://www.hadleyweb.pwp.blueyonder.co.uk/CZP/News.htm). Drawings of slide-mounted anatomical structures of the larvae were made with a camera lucida attached to a Leitz compound microscope and a Wild dissecting microscope. Scale bars in mm are indicated on each figure.

Results

***Colaspis caligula* n. sp.**
Figs 1–5

Etymology. The specific epithet is treated as a noun in apposition (ICZN 1999, Art. 34.2.1). It refers to the diminutive form of the Latin term “caliga” and it literally means "little boots" due to the appearance of the tarsi of the adults. It also reminds of the nickname given to the infamous Roman emperor Gaius Caesar Germanicus.

Adult (Figs 1–2)

Specimens studied. Holotype: pinned. Original labels: white label (printed): ARGENTINA: Mendoza, Maipú (Barrancas)/ (-33.094652, -68.674391)/ 18/XII/2014. Col F. Vicchi. Red label (printed): HOLOTYPE/ *Colaspis caligula* **n. sp/** Des. Federico A. Agrain 2016. IADIZA. Allotype: female, pinned. Original labels: white label (printed): ARGENTINA: Mendoza, Maipú (Barrancas)/ (-33.094652, -68.674391)/ 18/XII/2014. Col F. Vicchi. Red label (printed): ALLOTYPE/ *Colaspis caligula* **n. sp/** Des. Federico A. Agrain 2016. IADIZA. Paratypes: 6 specimens, pinned. Original labels: white label (printed): ARGENTINA: Mendoza, Maipú (Barrancas)/ (-33.094652, -68.674391)/ 18/XII/2014. Col F. Vicchi. Red label (printed): *Colaspis caligula* **sp. n.**/ PARATYPE / Des. Agrain et al. 2016. IADIZA. Paratype: 1 specimen, female. pinned, with genitalia in a separate microvial and hindwing glued to a card point. Original labels: white label (printed): ARGENTINA: Mendoza, Maipú (Barrancas)/ (-33.094652, -68.674391)/ 18/XII/2014. Col F. Vicchi. Red label (printed): *Colaspis caligula* **sp. n.**/ PARATYPE / Des. Agrain et al. 2016. IADIZA. Paratype: 1 specimen, male. pinned, with genitalia in a separate microvial. Original labels: white label (printed): ARGENTINA: Mendoza, Maipú (Barrancas)/ (-33.094652, -68.674391)/ 18/XII/2014. Col F. Vicchi. Red label (printed): *Colaspis caligula* **sp. n.**/ PARATYPE / Des. Agrain et al. 2016. IADIZA. Paratypes: 4 specimens, pinned. Original labels: white label (printed): ARGENTINA: San Juan, 9 de Julio/ (-31.650381, -68.401328)/ 15/XII/2013.Col F. Vicchi, M. Holgado. Red label (printed): *Colaspis caligula* **sp. n.**/ PARATYPE / Des. Agrain et al. 2016. IADIZA. Paratypes: 7 specimens, pinned. Original labels: white label (printed): ARGENTINA: Mendoza/ Tunuyan Vista Flores/ 25/XII/2009 Coll. S. Lanati. Red label (printed): *Colaspis caligula* **sp. n.**/ PARATYPE / Des. Agrain et al. 2016. Paratypes: 20 males, 24 females, pinned. Original labels: white label (printed): ARGENTINA: Mendoza, Maipú (Barrancas)/ (-33.094652, -68.674391)/ 18/XII/2014. Col F. Vicchi. Red label (printed): *Colaspis caligula* **sp. n.**/ PARATYPE / Des. Agrain et al. 2016. MLPA. Paratypes 12 Larvae, 6 Pupae (alcohol preserved voucher): ARGENTINA: Mendoza, Maipú (Barrancas)/ (-33.094652, -68.674391)/ 26/II/2015. Col F. Vicchi. Red label (printed): *Colaspis caligula* **sp. n.**/ PARATYPE / Des. Agrain et al. 2016. MLPA.

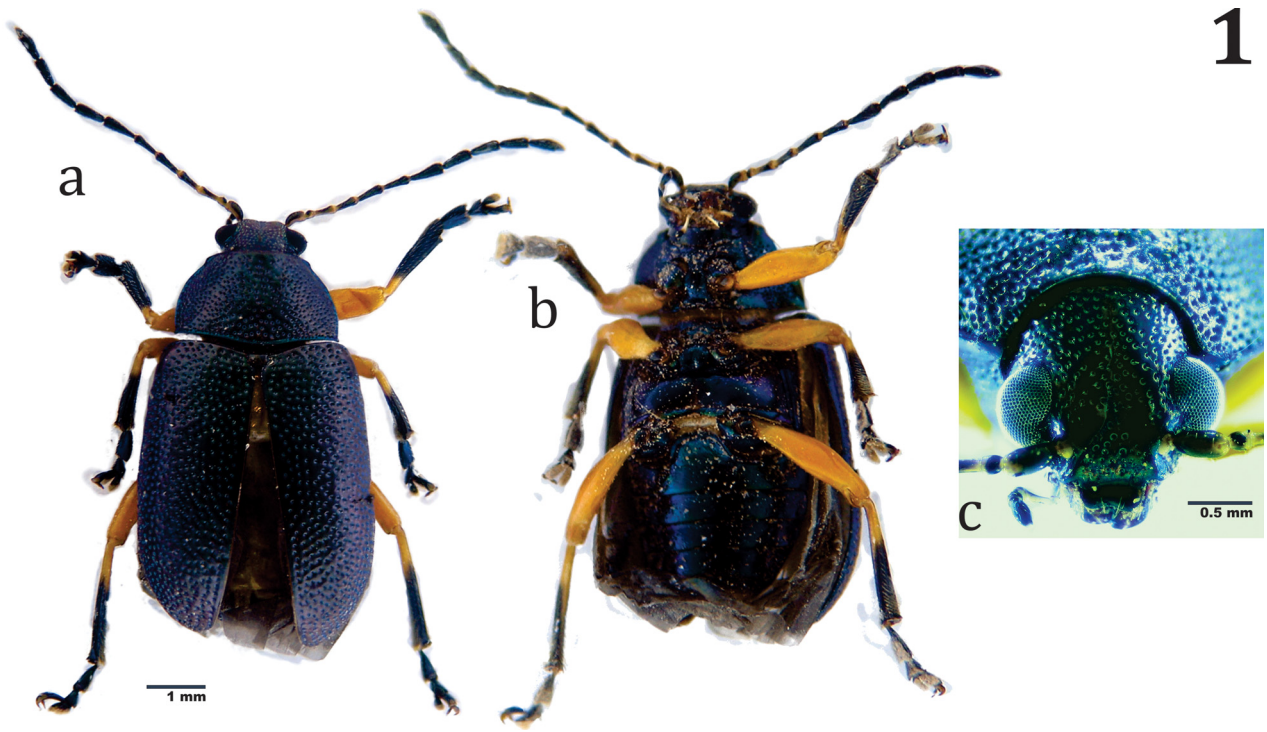

FIGURE 1. *Colaspis caligula* **n. sp.**, adult (female): a. dorsal habitus; b. ventral habitus; c. head.

Type locality. Argentina, Mendoza, Maipú, Barrancas (-33.094652, -68.674391).

General aspect (Fig. 1a–c) Length (average, females slightly larger): 7 mm; width 4 mm, intermediate size; body elongate-oval; green/blue metallic dorsal coloration, color varies with illumination and darkens in dry or alcohol preserved specimens. Dorsum, glabrous; elytral puncturation deeper than pronotal puncturation; scutellum small, subtriangular, black; coxae and labrum brown; mandibles black; antennomeres 1–3 light brown with black apex, other antennomeres black with apical region of antennomeres 9–11 darker. Pygidium black. Coxae, trochanter metallic as venter; femora dark or light brown; tibiae anterior third dark or light brown, rest black; tarsi black. *Head.* (Fig. 1c), surface densely punctured, size smaller than pronotal puncturation; inter-ocular space wider than half width of head; eyes ovoid, with internal side faintly emarginate; clypeus slightly concave with anterior carina; labrum smooth, anterior margin strongly emarginate; mandibles compact, right tooth larger, both teeth with median denticulate area, bearing much longer and sharp tooth on each extreme. Antennae filiform, slender, gradually expanded from base to apex; pedicel curved; antennomeres 1–5 tubular; antennomere 6 conspicuously wider (1.8x than 5th, at apex); antennomere 6–11 slightly larger, wider at apex; last antennomere with thin apical lobe. *Thorax.* (Fig. 1a–b), prothorax trapezoidal, 2x wider than long, each corner with small tooth, widest below middle; all margins regular, curved, with interrupted puncturation; surface densely punctate, smaller at sides. Prosternum sub-rectangular, longer than wide, laterally excavated near coxae. *Elytra.* (Fig. 1a), scutellum small, subtriangular, with apex not pronounced; elytral base wider than prothorax, nearly 3x the length of prothorax; elytral puncturation sub-regular, smaller at apex and external margin, all margins with puncturation interrupted; humeral callus conspicuous, smooth with interrupted puncturation: epipleura smooth. *Hind wing.* (Fig. 2a), venation as typically in Eumolpinae, with two cubital cells, 1Cuc and 2Cuc. *Pygidium.* (Fig. 2b) concealed by elytra, external margin rounded, with conspicuous median longitudinal groove, tegument brighter and markedly punctured, external margins opaque with puncturation less marked; with small setae on its external margin. *Legs.* (Fig. 1a–b), all pro-tarsomeres same length as two following tarsomeres combined; claws appendiculate. *Abdomen.* (Fig. 1b), metallic, without secondary sexual structures on ventrites. *Female genitalia.* Ovipositor (Fig. 2b), long (telescopic), almost 5x longer than wide, with well-developed styli. Coxites with narrow elongate sclerotization at base. Spermathecal capsule (Fig. 2c) U-shaped, with arms very closely joined, distal part wider than proximal part. *Male genitalia.* Aedeagus (Fig. 2d) long and broad; sclerotized portion of median lobe (aedeagus proper) strongly curved (90º) in lateral view, conspicuously wider near base before curvature; apex of median lobe with round tip. Non-sclerotized portion of median lobe (basal hood) longer than aedeagus proper.

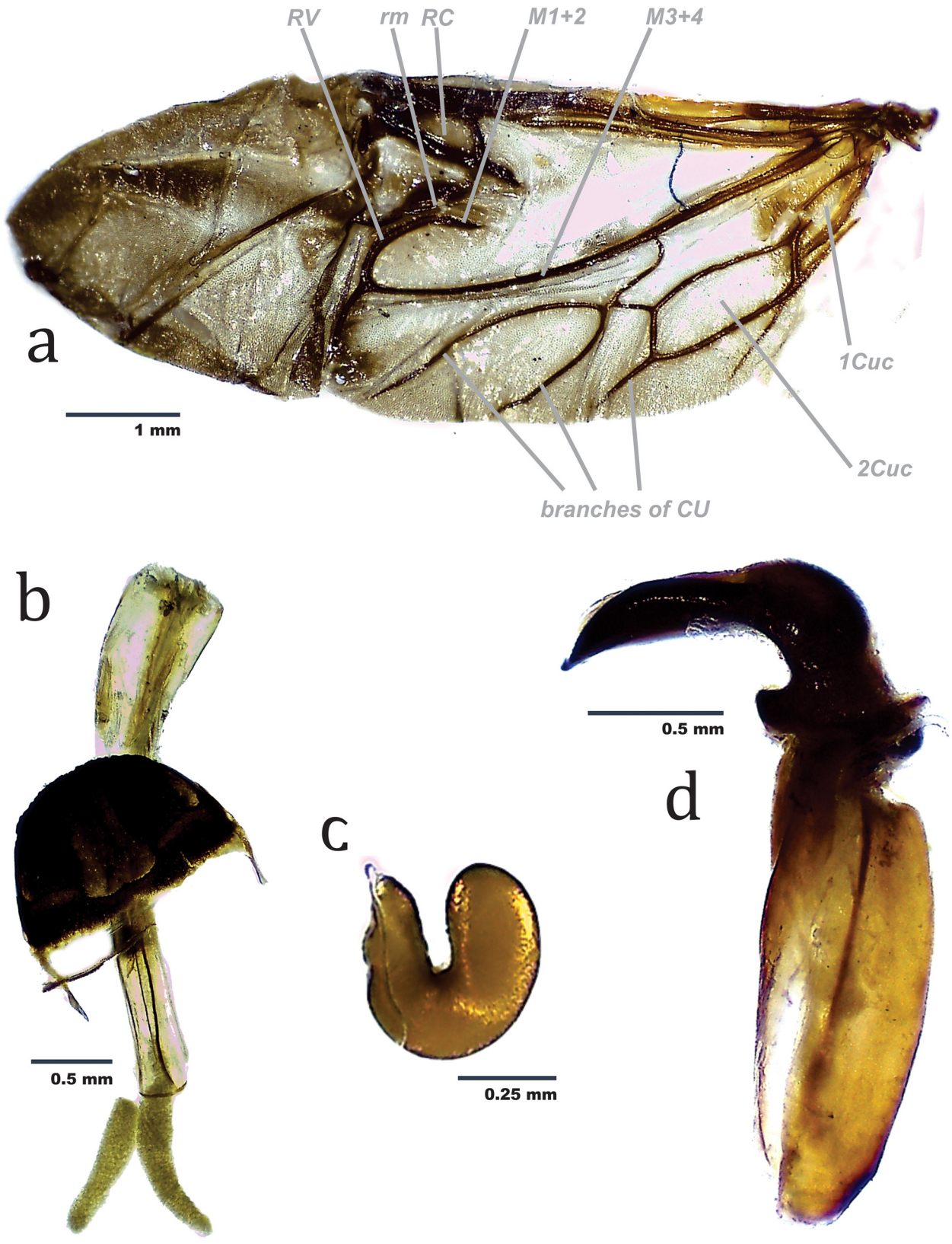

FIGURE 2. *Colaspis caligula* **n. sp.**, adult (diagnostic characters): a. hind wing venation; b. ovipositor and pygidium in dorsal view; c. spermathecal capsule; d. aedeagus.

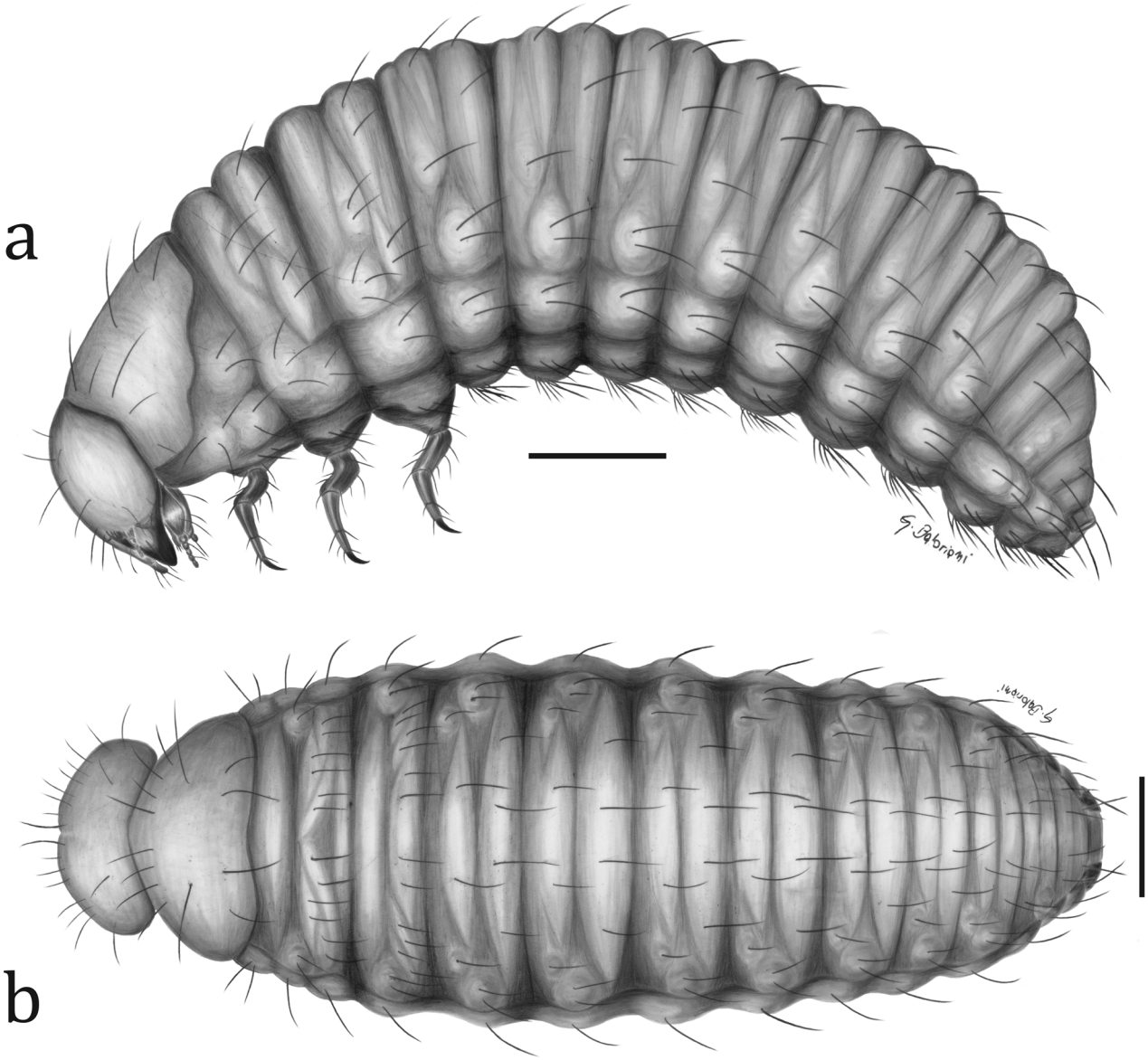

FIGURE 3. *Colaspis caligula* **n. sp.**, mature larva: a. habitus, lateral view; b. habitus, dorsal view.

Taxonomic remarks. *Colaspis caligula* **n. sp.** is similar to those species included by Bechyné (1949) within the "Bridarolli" species group. The latter group is characterized by the metallic coloration of dorsum, and testaceous legs; the prothorax is wide and sharply angled with dense puncturation; additionally, the elytra are not carinate, and without postbasal impressions. Within this group, it resembles *C. achardi* (Bechyné), from which it can be separated because in the species described herein male and female do not differ markedly in size and do not have denticles on the prothorax. Finally, the new species also differs from *C. willinki* Bechyné and *C. scientillifera* Bechyné, which have brighter elytra with more coarse puncturation.

Mature larva (Figs 3–4). Length 3.7–5.6 mm, width 1.0–1.7 mm.

General aspect (Fig. 3a–b). Body weakly convex, bright yellow (turning whitish in alcohol preservation). Head capsule light brown; mandibles dark brown. Microsculpture of body granulate. *Head* (Fig. 4a–b). Hypognathous, rounded, slightly sclerotized; epicranial suture distinct, Y-shaped, well developed, extending less than half length of head, frontal arms pale, distinct throughout, divergent and curved; endocarina slightly marked; epicranial plates bearing three large setae along epicranial suture on each side, and other two pairs next to antennae; frons bearing three pairs of setae on disc, two pairs long and other four short setae arranged in a longitudinal row near clypeus. Antennae short, 3-segmented, segment 1 transverse bearing three setae, segment 3 with conical sensory appendage at base. Clypeus transverse, wide, bearing long seta on each lateral margin. Labrum transverse,

apical margin bearing six large setae on each side. Mandibles short, sclerotized at apex, with blunt tooth at apex, two long mandibular setae inserted dorso-laterally. Maxillae with cardo subtriangular, bearing two setae at outer side, stipes quadrate, with two short outer setae, mola elongated with six thick setae on distal margin and other three at apex; maxillary palpi with palpiger bearing two long setae, segment II with long and short setae, segment III conical and thin, with short seta at base: labium slightly sclerotized, widened at base, with two pairs of long filiform sub-mental setae; pre-mentum broad, with two pairs of short setae; labial palpi 3-segmented, short. *Thorax*. Pronotum transverse, with long setae on minute tubercles, located on disc: two pairs on anterior margin, two near each angle, three pairs of setae next to the posterior margin, the two central pairs longer than the lateral ones; epipleural area bearing two setae, small pre-hypopleural area bearing one seta. Meso-and metathorax wider than prothorax, each bearing two pairs of setae arranged along mid-line and two setae on each exterior scuto-scutellar area. Meso-and metapleura each with alar tubercle bearing three setae and anterior epipleural tubercle bearing two setae. Pro-meso-and metasterna with two medial setae. Spiracle annuliform displaced into mesothoracic region. Legs 5-segmented, third pair slightly larger; coxa trapezoidal bearing three long setae; trochanter triangular, with two setae; femur sub-rectangular bearing six long setae; tibia bearing 5–6 setae. Tarsungulus thin, moderately curved, with single basal seta. *Abdomen*. Abdominal segments I–VIII with two pairs of dorsal setae; posterior parascutal area bearing one seta; epipleural and hypopleural area each bearing two setae; eusternal area of segments I–VII with numerous setae on apical margin; segment VIII with four pairs of long, filiform setae; segment IX forming fleshy pygopod. Spiracles I–VIII annuliform.

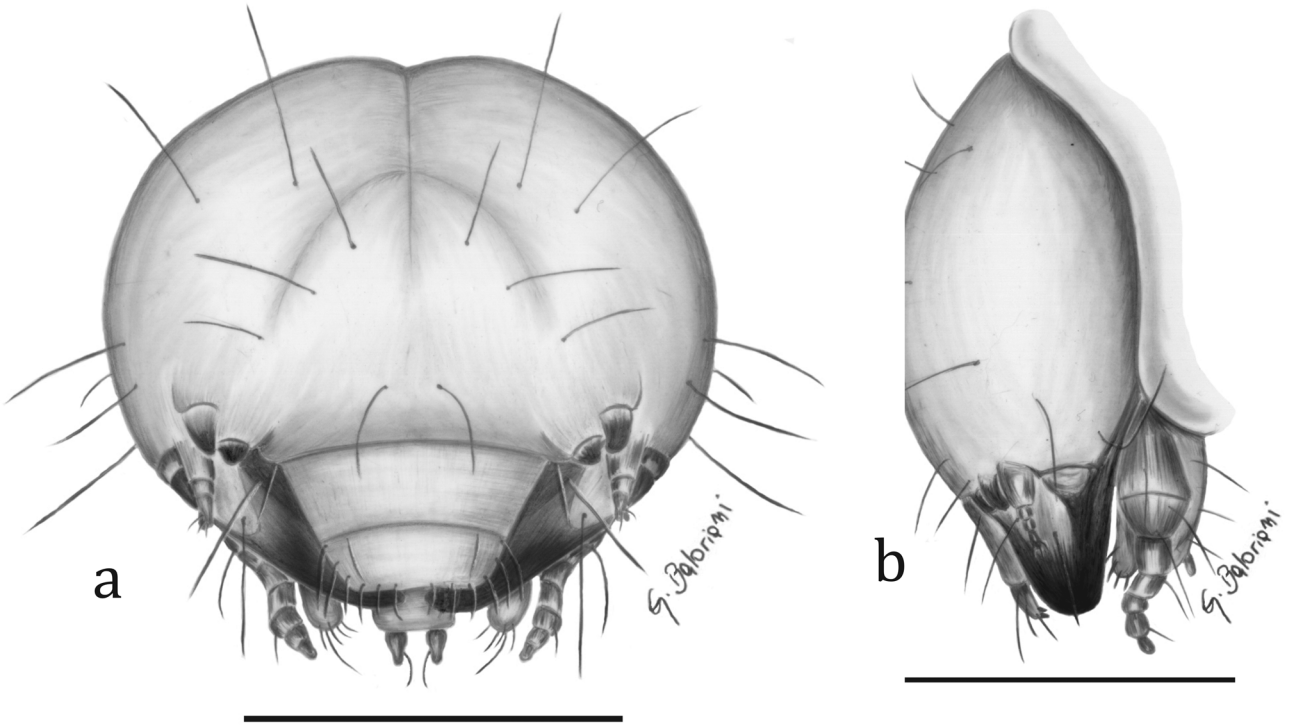

FIGURE 4. *Colaspis caligula* **n. sp.**, mature larva: a. head, frontal view; b. head, lateral view.

Pupa (Fig. 5). Length 3.4–4.1 mm, width 1.8–2.5 mm. *General aspect*. Color of body creamy white, claws, apex of mandibles and antennae dark brown. Head deflexed, not visible from above, rounded, with two pairs of setae on vertex, one seta above inner margin of eye, two setae between antennae, one subantennal, and one pair of frontal setae. Mouthparts well developed. Pronotum with two pairs of setae on anterior margin, two pairs on anterior part of disc, three pairs on posterior part of disc and five setae situated on each lateral margin; one pair of rounded spiracles. Mesothorax with setae arranged in two rows: one pair of anterior setae and two pairs of posterior setae; metathorax with three pairs of setae on disc. Podothecae with two femoral setae on apex and one long, thick seta next to distal margin of tibiae; claws simple. Abdominal segments I–VII transverse, each with two pairs of median setae and one pair of pleural setae. Abdominal segment VIII reduced with two pairs of short lateral setae; abdominal segment IX with urogomphi almost straight, two pairs of setae at base, two pairs of lateral setae ventrally, and two shorter setae medially.

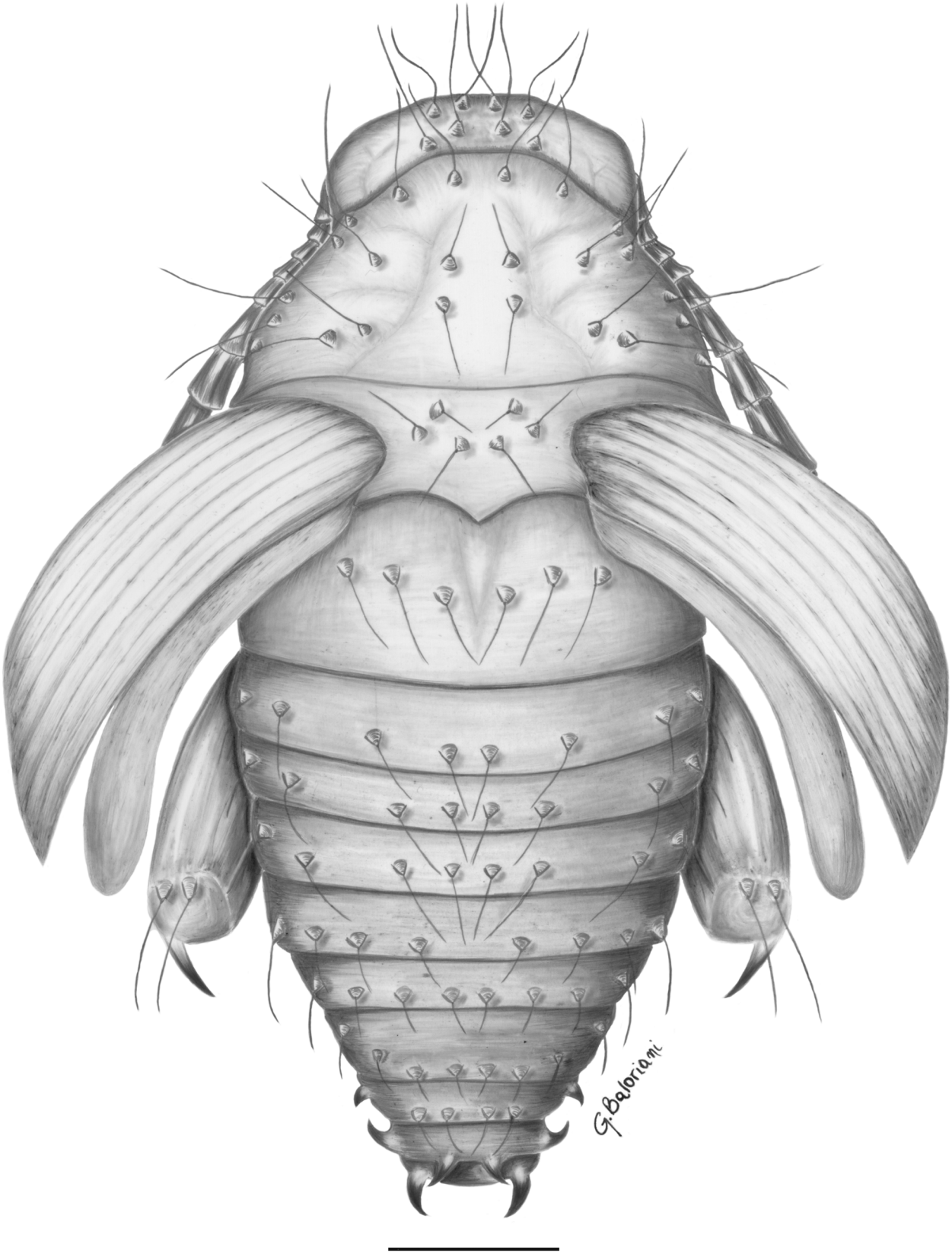

FIGURE 5. *Colaspis caligula* **n. sp.**, pupa: dorsal view.

Remarks on biology. Similar to other species of *Colaspis*, this species seems to complete an univoltine life cycle (Lindsay 1943). The larva feeds primarily on the lateral roots, and overwinters underground, becomes active

early in the spring (September/October), and starts feeding on the roots of the host plant. Later (November/December), the larvae pupate (3–6 cm below the soil surface). Adults emerge 5–10 days later. The adults of the new species herein described were collected from November until March. Adults can live for over a month feeding on young leaves perforating irregular holes into the leaf surface; less often they also consume young shoots and petioles, and although the damage caused by the adults does not seem to be significant, it could become problematic in young vine plantations. The oviposition process last for about 40 minutes, the female introduces the ovipositor into a crack in the sand, the ovipositor movements facilitates its insertion. The eggs are smooth, ovate, yellowish, and about 0.6 x 0.25 mm in length, they are covered with a translucent secretion that clusters them together in masses (about 62 on each mass). The larvae hatch between 3–5 days later; recently hatched larvae are yellowish like the eggs, but rapidly the bodies become whitish while the head and the thoracic sclerites gradually darken during their development. The larvae are the ones causing the greatest damage to the plants, feeding on the roots, therefore, causing the reduction of water and nutrient absorption. Especially the third instar larvae, which are able to produce cavities and longitudinal grooves on the roots making them likely more vulnerable to pathogens.

Discussion

Most genera of Neotropical Eumolpinae lack a modern taxonomic revision, therefore, their diagnosis at generic and specific level can be very difficult. In this regard, our diagnosis of this new species as belonging to the genus *Colaspis* is based on the presence of the following diagnostic characters (plus the study of genitalia): pygidium with median longitudinal groove; posterior margin of prosternum shallowly emarginated; antennae gradually expanded from base to apex, antennomeres 9-11 at least 3x as long as wide; females with first abdominal sternite shorter than the next three combined, usually no longer than the second sternite. It is also useful to remark that *Colaspis* is similar to other genera from which it can be separated as follows: from *Allethaxius* Lefèvre, by the last antennomeres which are at least 3x longer than wide; from *Talurus* Lefèvre and *Rhabdopterus* Lefèvre by the narrower prosternum (less than 0.75x the width of fore coxae); from *Percolaspis* Bechyné by its elytral marginal bead restricted to the humeral area, the lateral margin of abdominal sternite IV smooth only at apex, and lateral margin of sternite V smooth; from *Allocolaspis* Bechyné by its straight mesotibia. Finally, it also differs from *Hermesia* Lefèvre by the narrow lateral margins of pronotum, and yellow legs.

In Argentina, there are ten species within the genus *Colaspis* (=*Maecolaspis*), and some of these are known defoliators of several crops in the country, including artichoke, cayenne, citrus, cotton, cucumber, eggplant, mate, potato, soya, sunflower, tung, and wheat (Cabrera 2004).

To date there is no data on the possible economic losses caused by *Colaspis caligula* **n. sp.**, on the vine crops therefore, by now it should be considered as an emergent pest. In most wine-growing regions of the world different species of Eumolpinae subfamily, specifically within *Colaspis* (=*Maecolaspis*) rarely reach dangerous levels of damage, being in generally considered as secondary pests. All data provided in this contribution is intended to alert for the early detection of this species in the vine crops. No studies have yet been conducted to measure the phytosanitary status of this species. Nevertheless, for other species of *Colaspis*, counteractive measures of control might be necessary, and some countries have adopted the following methods: collecting of adults, soil cultivations for the destruction of pupae, flood to suffocate larvae and pupae, and phytosanitary treatment with insecticide to reduce adult populations (Botton 2005; Kaeb 2006; Taillon *et al.* 2012, and references therein). In addition, cultural practices that stimulate root growth and maintain the vines vigour, can make rootworm damage to go unnoticed. It is also interesting to remark that, for other species of *Colaspis*, the immature stages are very sensitive to desiccation (Lindsay 1943) being the soil moisture one of the most important growth factors. The study of this sensitivity to soil moisture constitutes an interesting factor to be analysed for the species described herein if a future control is necessary because this species was found in crops that use artificial drip irrigation methods, which are being stepwise implemented in vineyards in Mendoza and San Juan provinces.

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