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Description of the last-instar larva of *Zenithoptera lanei* Santos, 1941 (Odonata: Libellulidae)

CAMILA G. RIPPEL[1*], ULISSES G. NEISS[2], ALEJANDRO DEL PALACIO[3], NOELIA M. SCHRÖDER[4], GÜNTHER FLECK[5], NEUSA HAMADA[5], DARDO A. MARTÍ[1] & NICOLÁS J. SCHWEIGMANN[6]

[1]*Laboratorio de Genética Evolutiva. Instituto de Biología Subtropical (IBS) CONICET-UNaM. FCEQyN, Félix de Azara 1552, Piso 6°. Posadas, Misiones, Argentina*
[2]*Instituto de Criminalística, Departamento de Polícia Técnica-Científica, Manaus, Amazonas, Brazil*
[3]*Laboratorio de Biodiversidad y Genética Ambiental (BioGeA), Universidad Nacional de Avellaneda, Argentina*
[4]*Laboratorio de Biotecnología Molecular, Instituto de Biotecnología Misiones, FCEQyN-UNaM. Ruta 12 km 7,5. Posadas, Misiones, Argentina*
[5]*Laboratório de Citotaxonomia e Insetos Aquáticos, Coordenação de Biodiversidade, Instituto Nacional de Pesquisas da Amazônia—INPA, Manaus, Amazonas, Brazil*
[6]*Departamento de Ecología, Genética y Evolución, FCN-UBA. Ciudad Universitaria Pabellón II piso 4 Buenos Aires, Argentina*
[*]*Corresponding author. E-mail: camilag.rippel@gmail.com*

Abstract

The larva of *Zenithoptera lanei* Santos, 1941 is described and illustrated based on three exuviae of reared larvae collected in Misiones, Argentina, Roraima and Amazonas, Brazil. A comparison with the larva of *Z. anceps* Pujol-Luz, 1993 is included.

Key words: Anisoptera, Dragonfly, larvae, taxonomy

Introduction

The Neotropical genus *Zenithoptera* Selys, 1869 includes four valid species: *Z. fasciata* Linnaeus, *Z. anceps* Pujol-Luz, 1993; *Z. lanei* Santos, 1941 and *Z. viola* Ris, 1910 (Garrison *et al.* 2006).

With a wide distribution from Costa Rica to the North of Argentina, *Z. lanei* was recorded numerous times in Brazil (Ferreira *et al.* 1979; Pujol-Luz & da Fonseca 1997; Ferreira-Peruquetti & Fonseca-Gessner 2003; Pinto & Carvalho 2009; Cardoso 2011; Guillermo-Ferreira & Vilela 2013; Bedê *et al.* 2015; Guillermo-Ferreira *et al.* 2015; de Souza Leite 2017) and occasionally in neighboring countries, such as Venezuela, Peru, Paraguay and Colombia (Garrison 1983; Pujol-Luz & da Fonseca 1997; Bota-Sierra 2014). In Argentina there is only one previous record for Iguazu, Misiones province (Jurzitza 1981) (Fig. 1).

Adults occur at grassy marshes or in clearings. When at rest on tips of twigs or on grass, they often hold their wings over the back (unique character for New World libellulines), which they start opening slowly to then rapidly lower to display a brief flash of metallic blue, as seen in some butterflies (Garrison *et al.* 2006).

Despite the wide distribution in the Neotropical region, the larva of *Z. lanei* has not been described, only the larvae of *Z. anceps* has been described (Costa *et al.* 2004).

The objective of this contribution is to describe the larva of *Z. lanei* based on reared material from Posadas (Misiones, Argentina), Cantá (Roraima, Brazil) and Presidente Figueiredo (Amazonas, Brazil). A comparison with the only described larva of the genus is also provided.

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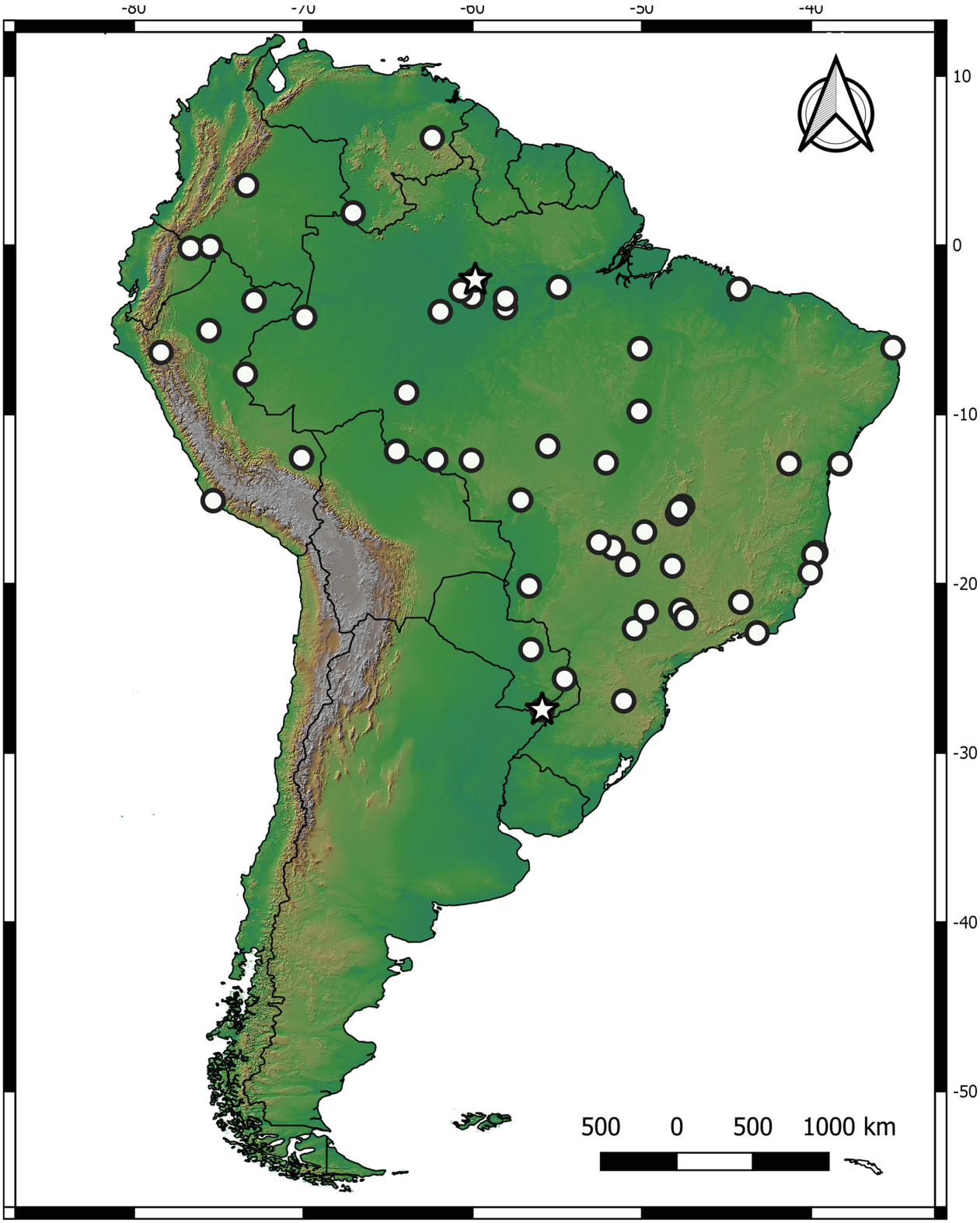


FIGURE 1. *Zenithoptera lanei*, distribution map. ☆: collecting sites (larvae localities); previous known localities ○.

Material and Methods

Localities

Argentina: The larva was collected in a protected area of Posadas city, Misiones province. The larva of *Z. lanei* was found in a permanent pond with submerged vegetation and marginal pastures. Brazil: Amazonas: The larva was collected in Sítio Santo Amaro, highway AM 010-Km 21, municipality of Presidente Figueiredo. The larva of *Z. lanei* was found in a small temporary pond with large marginal vegetation (composed of grasses), formed in the rainy season and located in an open field, near a stream; Roraima: larva was collected at Cantá municipality in sub-permanent pools of a temporary running stream surrounded by grass and vegetation.

The breeding was carried out in telgopor containers with 500cc capacity, with plants of *Elodea* sp. extracted from the collection site. Specimens were preserved in ethanol 70%.

The specimens were deposited in the Centro de Investigaciones Entomológicas collection, Posadas, Argentina and Coleção de Invertebrados do Instituto Nacional de Pesquisas da Amazônia—INPA, Manaus, Amazonas. Photographs were taken using a Leica M165 with Automontage 3.5 software.

Terminology. Larval mandibular formula follows Watson (1956). Abbreviations: S = abdominal segment, L =length, W = width.

Results

Description of the last-instar larva of *Zenithoptera lanei* Santos, 1941

(Figures 2–4)

Specimens examined. Brazil, Amazonas, Sítio Santo Amaro, highway AM 010–Km 21 (02º 02’21.4”S 59º 50’43.9”W, 112 m asl), 2/V/2005, coll. U. Neiss, 1♂ F-0 larva (reared) [emergence 10-V-2005]; Roraima, Cantá municipality, road to Serra Grande (02º 40’ 40”S 60º 42’ 00”W, ca 70 m asl), 30/IV/2007, coll. G. Fleck, 1 ♀ F-0 larva(reared) [emergence 5-V-2007]. Argentina, Misiones, Área de recursos ambientales “El Zaimán” Posadas (27°26’12.0”S 55°53’49.5”W, 86 m asl), 2/XI/2016, coll. C. Rippel, 1 ♂ F-0 larva (reared) [emergence 27-XI-2016].

Habitus. Larvae of a relative glabrous appearance, with head developed transversally, rather long legs, and lateral spines on S8–9 protruding backwards surpassing the posterior ends of the corresponding segments (Fig. 2).

Head. Length at least two times wider than long, broader than thorax. Front with group of thin setae aligned transversely. Compound eyes developed and protruding laterally, post-occular lobes with fringes of short spines (Fig. 3A). Tuft of dark setae in the posterior dorsal portion of the head, each side of the midline (Fig. 3B). Antennae longer than head length (Fig. 3C), with seven antennomers, the last being the longest; antennomers size (mm): 0.15; 0.18, 0.20; 0.30, 0.34; 0.25, 0.27; 0.30, 0.35; 0.35, 0.40; 0.37, 0.41. Prementum-postmentum articulation reaching the second coxa. Prementum gradually extending from the base, with maximum width equal to the total length of the prementum; 8–14 premental setae each side, “U” disposed according Figure 3F. Anterior margin almost straight in dorsal view, except for middle portion protruding as in Figure 3F. Prementum with 2 setae in the base of palp; each side of distal margin of prementum with six minute seta (Fig. 3G). Labial palp triangular with seven palpal setae, not longer than movable hook (Fig. 3H); inner surface between articulation and proximal palpal setae with six to seven small spine-like setae; distal margin of palpus with nine shallow and asymmetric crenulations, each one with a small minute tooth and carrying a strong single spine-like seta (*raptorial seta*) (Fig. 3I); movable hook long, 0.2–0.34 times maximum palp length, curved inward. Mandibular formula: L1234 0 ab; R123 + 4 y (-) a b d; left mandible with incisors developed and well separated from each other (Fig. 3. E.); right mandible with smaller incisors, the 3 and 4 being slightly united, and with a reduced ‘y’ tooth (Fig. 3E). Maxilla according to Figure 3D.

Thorax. Prothorax small and short, with rounded lateral angles, in dorsal view, posterior margin covered by numerous curved spines. Supracoxal process rounded, protruding slightly. Relatively long legs; posterior femora not reaching end of S8 (exuviae). Femora with three dark transversal bands. Antero-dorsal and ventral femoral carinae with rows of short spines and some very long intermedia setae; posterior margin of middle and posterior tibiae with strong spines, surpassing the distal margin. Tarsi with two ventral rows of single and trifid spine-like setae; third tarsomere distinctly longer than other ones; tarsal claws thin and slightly curved.

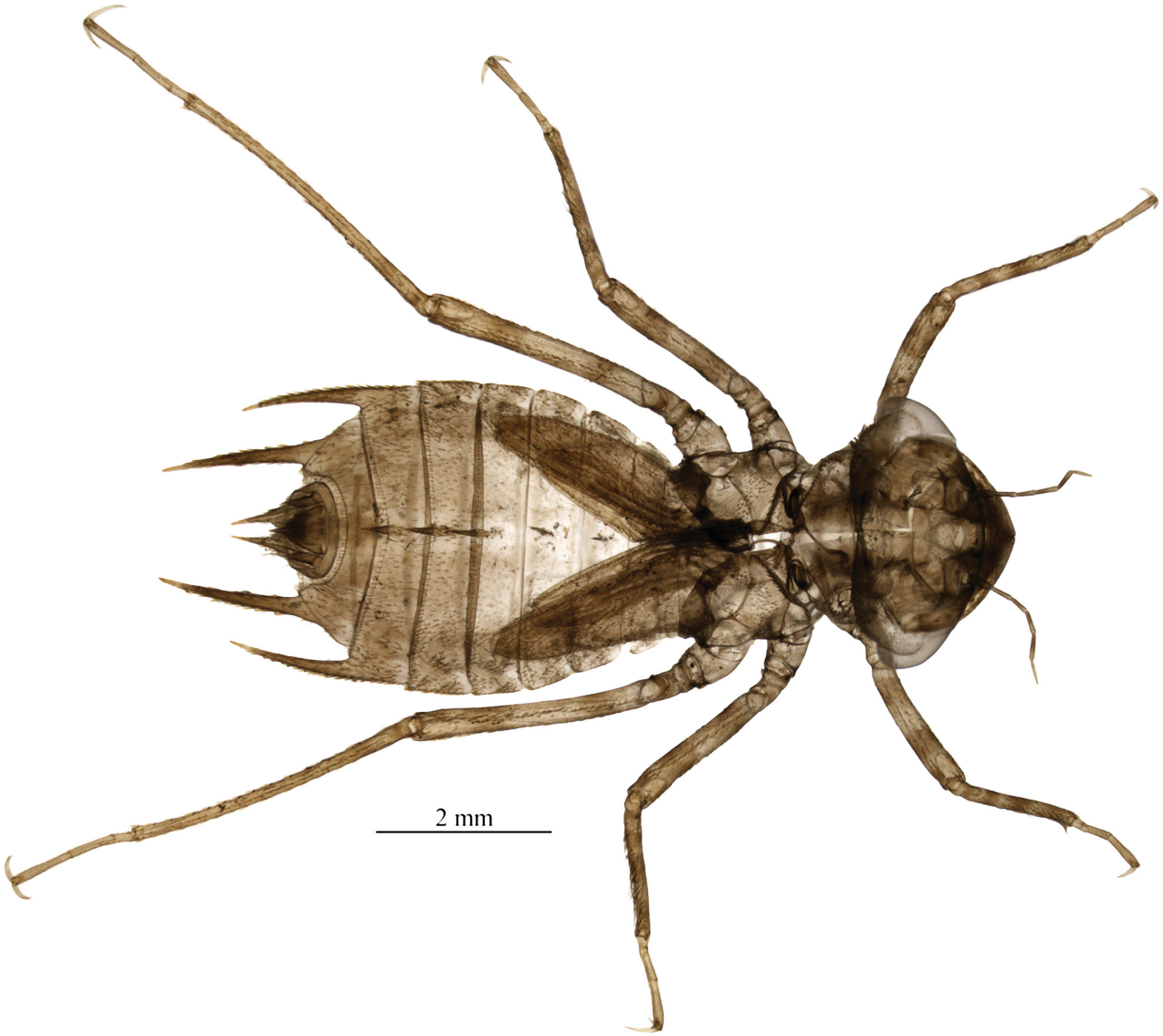
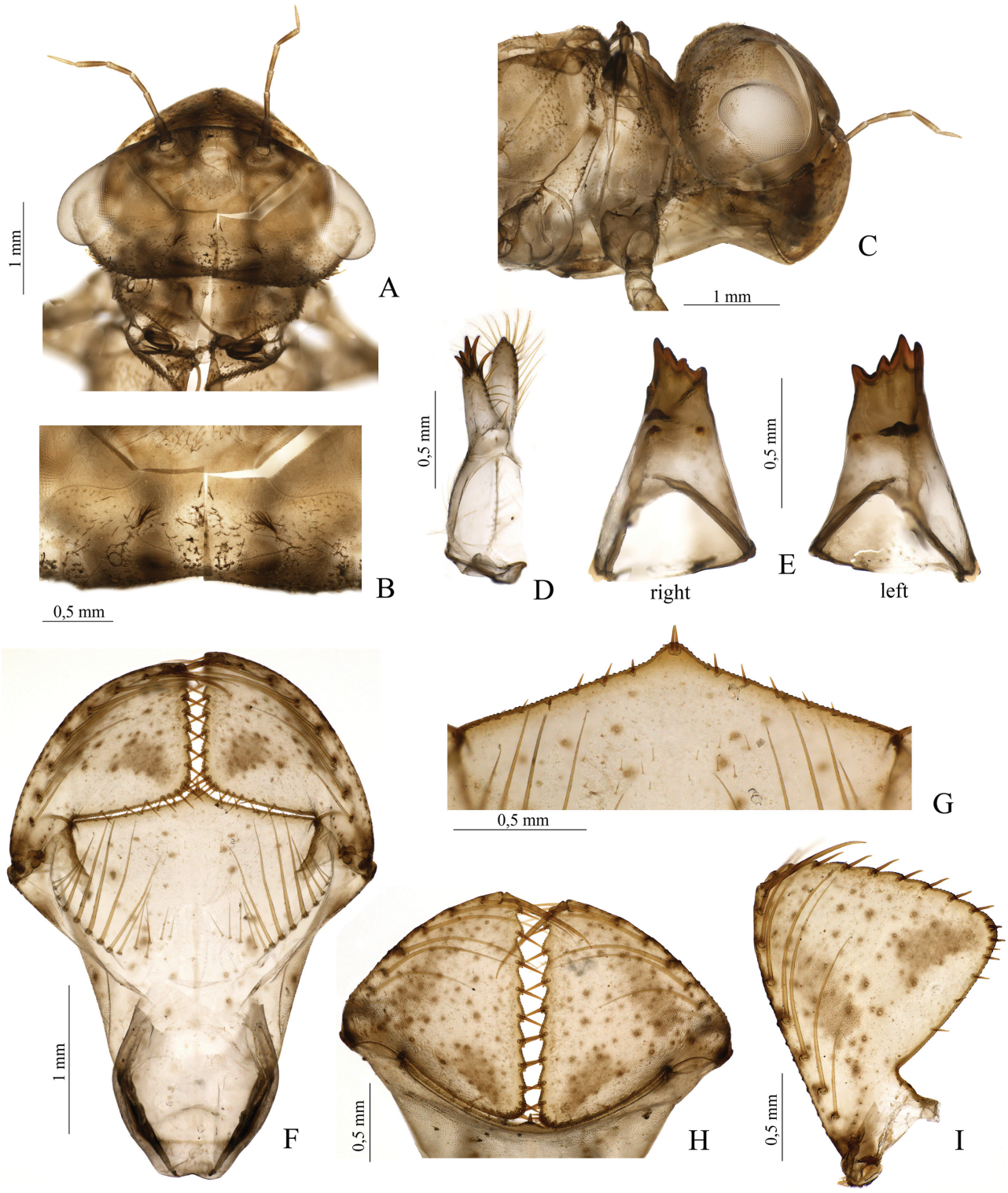


FIGURE 2. Exuvia of *Zenithoptera lanei*, dorsal view.

Abdomen. Posteriorly enlarged, with convex dorsal region and flat ventral surface, widest on S7 (Fig. 4A). Dorsal hooks developed in S4–8 (in the larvae from Brazil there is a presence of a small tubercle with tiny spines on the distal margin of S3 as in Figure 4E), in S4 and S5 thin and slightly bent backwards, those on S6–8 more robust than the previous ones and distinctly posteriorly oriented (Fig. 4C–D). Strong and very long lateral spines present on S8–9 (Fig. 4B). Lateral spines of S8 half the length of the lateral spines of S9; lateral spines on S9 surpassing distal margin of the anal pyramid by almost 1/2 of its length. Epiproct wider at base, practically as long as wide, apex acute. Paraproct longer than 1.5 the length of the epiproct. Cerci conical, ¾ as long as epiproct. Epiproct, cerci and paraprocts darkish brown with a subapical pale stripe (Fig. 4B–C).

Measurements (N=2, in mm [specimen from Roraima not included]). Total length (with caudal appendages) 9.5, 12; head max. W 3.5; head max. L 1.7, 1.8; antennae total L 1.9, 2.14; prementum max. L 2.6, 3; prementum max.W 2.5, 3; palp max. L 1.8, 2; palp max. W 1.35, 1.8; palp movable hook L 0.4, 0.66; femur I L 2, 2; femur II 2.5, 4; femur III 3.25, 5; tibia I L 2.25, 2.5; tibia II 2.7, 3.3; tibia III 4.15, 6; internal wing pads L 2, 3; external wing pads 2.3, 4; max. L of abdominal segment, VI 0.61, 1.1; VII 0.61, 1.1; VIII 0.57, 1.1; IX 0.32-1; X 0.1, 0.4; W of abdominal segment, VI 3.46, 4.6; VII 3.5, 4.8; VIII 3.3, 4.5; IX 2.56, 3; X 1.35, 1.6; lateral spines (inner margin) on segment VIII 1.3, 2.9; IX 1.6, 3 ; cerci 0.55, 0.6; paraprocts 1.1, 1.2; epiproct 0.72, 0.74.



FIGURES 3. A. Head Dorsal view; B. Tuft of bristles on dorsal side of the head; C. Head, lateral view; D. Left maxillae; E. Right and left mandibles; F. Prementum, dorsal view; G. Ligula, dorsal view; H. Labial palp, frontal view; I. Labial palp, internal view.

Differential Diagnosis

The larvae of *Z. anceps* and *Z. lanei* are very similar in appearance, however, they can be differentiated by the following characteristics (characteristics of *Z. anceps* in parentheses): antennomers 6th and 7th longer than the 5th but

not twice as long (antennomers 6th and 7th twice the length of the 5th); left mandible without molar tooth ‘d’ (left mandible with molar tooth ‘d’); prementum gradually widening from base to apex (prementum abruptly widening in the distal half); distinct dorsal hooks present in S4–8, a very small dorsal hook hardly visible can be present on S3 (distinct dorsal hooks present in S3–8); cerci 3/4 the length of the epiproct (1/2 the length of the epiproct).

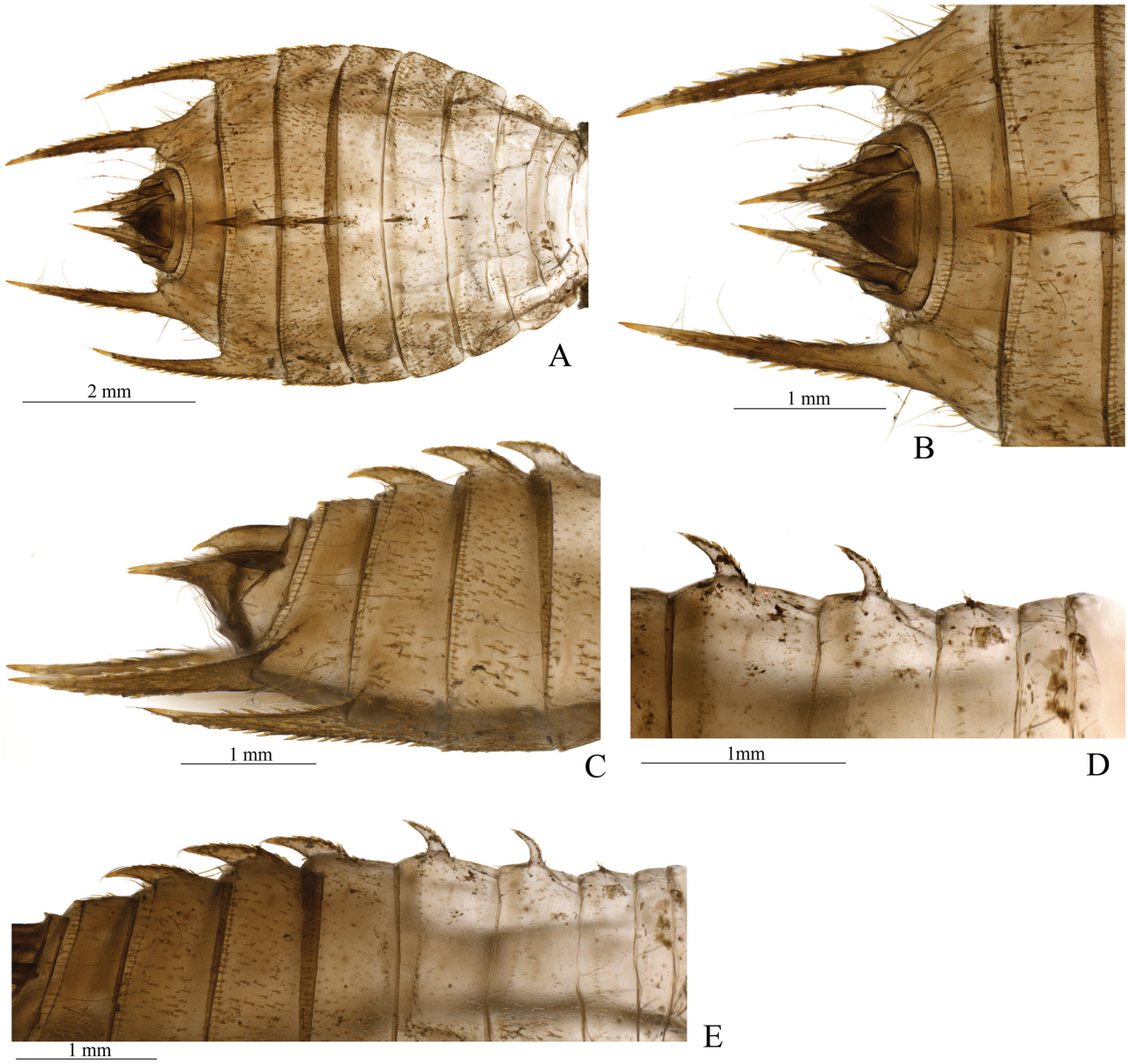


FIGURE 4. A. Abdomen, dorsal view; B. Anal pyramid, dorsal view; C. Abdominal segments S6–10 and anal pyramid, lateral view; D. Abdominal segments S1–5, lateral view; E. Dorsal spines of abdominal segments S4–8, lateral view.

Discussion

This study makes an important contribution towards the taxonomy of the genus *Zenithoptera*. Whit the description of the larva of a second member of the genus, is possible validate the following characters as diagnostic for the genus: 1) lateral spines on S8–9 protruding backwards surpassing the posterior ends of the corresponding, those on S8 longer than middorsal length of S8 and S9 combined, and S9 lateral spine distinctly extending past anal pyramid apex; 2) S9 with distinct middorsal hook and S8 without any middorsal hook; 3) eyes not produced dorsally and rather well produced laterally (Fleck, pers. obs.; Neiss *et al.* 2018).

Even though progress has been made, it is still necessary to invest resources in the description of the larvae at

the species level. Overcoming the difficulties of lack of knowledge positively impacts the identification of larvae, and thus on all disciplines that rely on it, such as ecology, biological assessments, behavior studies, etc.

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