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Re-description of the last instar of *Remartinia luteipennis luteipennis* (Burmeister, 1839) (Odonata: Aeshnidae)

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The final instar of *Remartinia luteipennis luteipennis* (Burmeister, 1839) is described and illustrated based on reared specimens from Salta Province, Argentina. It is compared with *R. secreta* and *R. l. florida*, and with Calvert's original description of *R. l. luteipennis*. *Remartinia l. luteipennis* can be differentiated by the length of the lateral valvae of the female gonapophyses (equal to the central ones in *R. l. luteipennis*, slightly shorter in *R. secreta*, and longer in *R. l. florida*), and length of S6 lateral spines (1.24 mm in *R. l. luteipennis* 0.4–0.5 mm in *R. secreta*, and 0.2 mm in *R. l. florida*).

Keywords: dragonfly; Aeshnidae; South America; Argentina

Introduction

Aeshnidae is a cosmopolitan Odonata family with over 450 species (Dijkstra et al., 2013). Garrison, von Ellenrieder, and Louton (2006) report 152 species for the New World (14 of which are endemic). Adults are very good flyers with confluent compound eyes and a well-developed ovipositor modified for endophytic oviposition. Larvae are voracious predators which can be found in a wide variety of lentic and lotic environments, often top predators in aquatic ecosystems that lack fish; many species show specific habitat or substrate preferences such as phytotelmata or muddy sediment (Carvalho & Nessimian, 1998; De Marmels & Neiss, 2011). Despite aeshnids being common and conspicuous, the knowledge of the larval stages is scarce; in the New World only 78 species have their larva described which represents only 51% of the fauna (Garrison et al., 2006). This lack of knowledge is a big hurdle for studies involving freshwater insects, greatly limiting our ability to understand the role of Odonate larvae in aquatic ecosystems.

The American genus *Remartinia* Navas, 1911 has a wide distributional range from Arizona (USA) to Salta (Argentina). It includes four species: *R. luteipennis* (Burmeister, 1839), *R. restricta* Carvalho, 1992, *R. rufipennis* (Kennedy, 1941), and *R. secreta* (Calvert, 1952); of these the larvae of *R. restricta* and *R. rufipennis* are still unknown. For *R. luteipennis*, three subspecies are recognized: *R. l. luteipennis* known from Colombia south to Brazil and Argentina, *R. l. florida* (Hagen, 1861) found from southern USA and mainland Mexico south to Panama, and *R. l. penninsularis* (Calvert, 1941) restricted to Baja California, Mexico (Figure 1).

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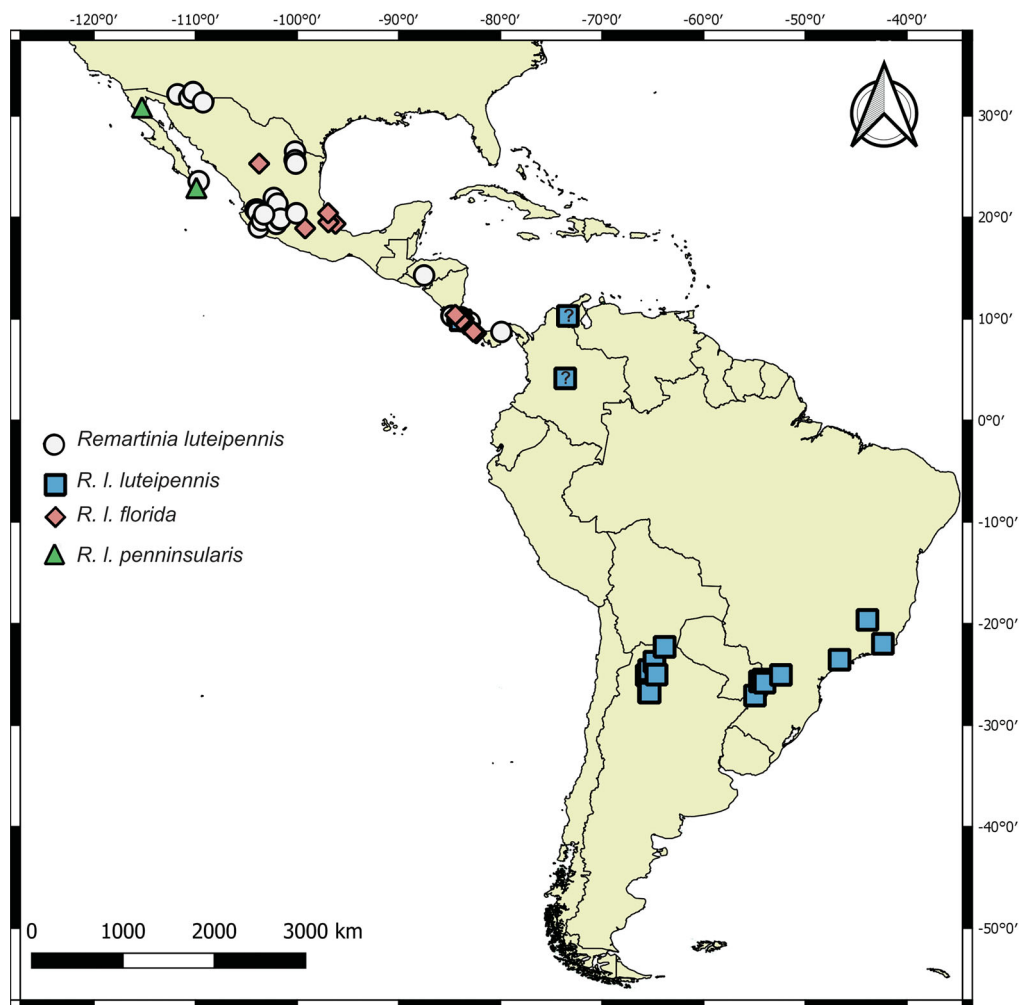


Figure 1. *Remartinia luteipennis* distribution map: ○ *R. luteipennis* (unknown subspecies); ◇ *R. l. florida*; □ *R. l. luteipennis* (“?” doubtful records); △ *R. l. penninsularis*.

Calvert (1956) described the larvae of *R. l. luteipennis* and *R. l. florida* based on larvae and exuviae which were not reared or associated with adults; he reported differences in the tip of the epiproct of two subspecies (“v-shaped” in *R. l. luteipennis*; truncated in *R. l. florida*). Novelo Gutiérrez (1998) described the larva of *R. secreta* and redescribed the larva of *R. l. florida*. When comparing these two with Calvert’s description of *R. luteipennis*, he argued that the differences within the subspecies were greater than the differences between *R. secreta* and *R. l. florida*. Therefore, Novelo Gutiérrez suggested that Calvert’s specimens used for the description of the larva of *R. l. luteipennis* probably belong to a different species.

The aim of this paper is to provide a detailed description and illustrations of the larva of *Remartinia luteipennis luteipennis* based on reared material from Argentina.

Materials and methods

Specimens were collected by Natalia von Ellenrieder in 1998 and reared to adult emergence. The adult and the associated exuvia were preserved in 70% ethanol and deposited in the *Laboratorio*

de Biodiversidad y Genética Ambiental (BioGeA) collection. Specimens were studied with the aid of a Zeiss Stereo Discovery V20 stereomicroscope (Gottingen, Germany) coupled to a digital camera Axio Cam Cc5 (Gottingen, Germany). Illustrations were made with an open-source design program (Inkscape version 0.92.3; www.inkscape.org) and are not to scale. Measurements were taken with the aid of a Leica MS5 (Taiwan) with a special lens with a scale bar and then converted to mm with the table provided by the manufacturer. Larval mandibular formula follows Watson (1956). Abbreviations: S, abdominal segment; L, length; W, width.

Results

Remartinia luteipennis luteipennis (Figures 2, 3)

Specimen examined

Argentina, Salta, Barrio “Los Lapachos”, 1 April 1997, coll. von Ellenrieder, 1 female last instar exuvia.

Description

Head. L:W ratio 0.34, broader than thorax; light brown. Posterolateral lobes broadly rounded (Figure 2a), with dark spines. Antennae 7-segmented, the third antennomere the longest. Mandibular formula as follows: R 1234 y a (m^1) b k / L 1234 0 a (m^0) b k (Figure 2c, d); right mandible molar crest with a forked tooth on anterior margin (near molar a). Prementum (Figure 2b) long, reaching the second coxae, as maximum width 0.75 times length (without hinge); anterior margin of ligula with a fringe of pale setae and one dark conical tooth on each side of the median cleft. Labial palp sub-rectangular, infra-apical tooth acute, as long as 0.35 the width of palpal blade apex; inner and distal margins serrated, slightly undulated, without setae; movable hook long, almost as long as maximum palp length, curved inwards, with 8–10 setae.

Thorax. Prothorax light brown; wing sheaths light brown, hind wing sheath reaching anterior margin of S5. Prothoracic process slender, pointed and bifid, with arms similar in size. Femora and tibiae light brown.

Abdomen. Slender, widest on S6, dorsal color pattern as in Figure 3a. Lateral spines present on S6 to S9, those on S6 poorly developed, those on S8 the longest. Gonapophyses not surpassing anterior margin of S10 (Figure 3b). Sterna uniformly pale. Epiproct tip truncate, shorter than paraprocts. Cercus conical, slightly longer than epiproct (Figure 3c). Epiproct light brown; cerci and paraprocts light brown darkening to the apex.

Measurements (N=1, in mm). Total length (with caudal appendages): 41.1; head max. W: 7.8; head max. L: 2.7; antenna total L: 2.3; third antennomere L: 0.5; prementum max. L: 10.0; prementum max. W: 4.5; palp max. L: 2.2; palp max. W: 0.9; palp movable hook L: 2.2; femur I L: 3.2; femur II L: 4.2; femur III L: 5.6; tibia I L: 4.2; tibia II L: 4.2; tibia III L: 4.6; forewing sheath L: 6.2; hind wing sheath L: 5.8; max. L of S5: 2.7; max. L of S6: 2.9; max. L of S7: 3.0; max. L of S8: 2.6; max. L of S9: 2.4; max. L of S10: 1.4; max. W of S5: 6.5; max. W of S6: 6.6; max. W of S7: 6.4; max. W of S8: 6.3; max. W of S9: 5.1; max. W of S10: 3.7; lateral spines

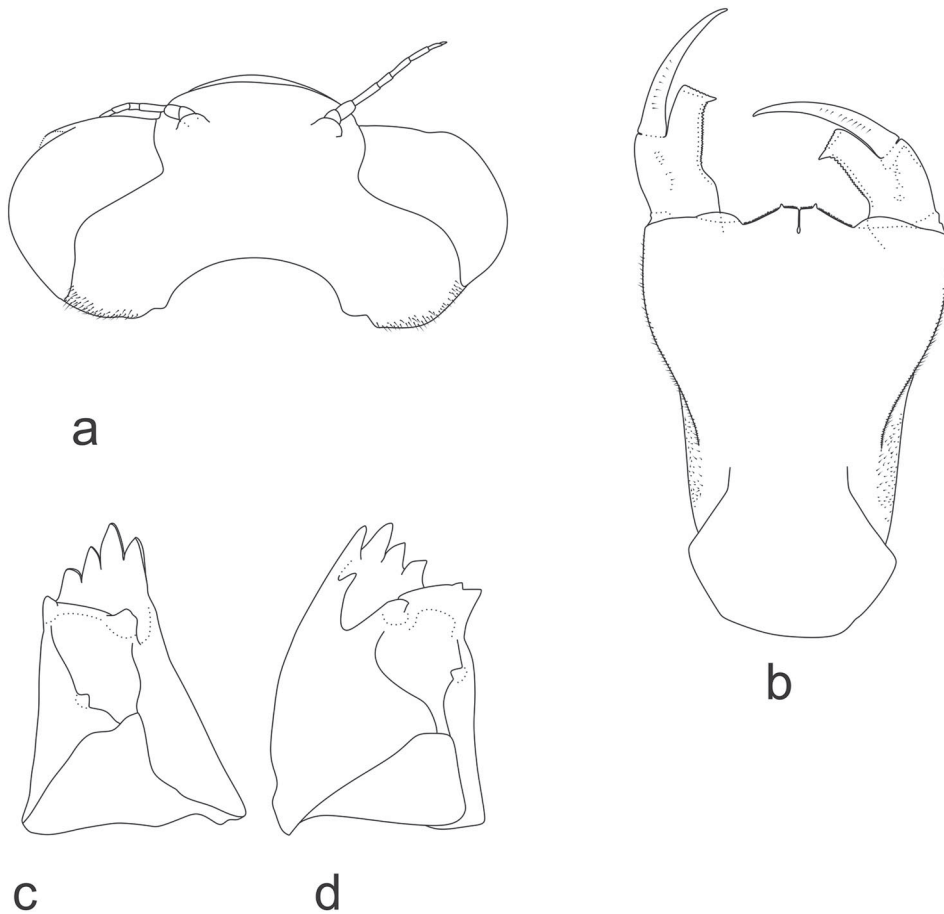


Figure 2. (a) Head, dorsal view; (b) prementum, dorsal view; (c) left mandible; (d) right mandible.

(inner margin) on S6: 1.2; S7: 2.7; S8: 3.4; S9: 3.0; cercus L: 3.2; paraproct L: 3.2; epiproct L: 2.9; internal gonapophyses L: 2.0.

Discussion

The larva of *Remartinia luteipennis luteipennis* is very similar to that of *R. l. florida* and *R. secreta*, sharing a similar mandibular formula (although accessory tooth *k* was not mentioned in previous descriptions, there is an angulation of the ridge that runs from the molar crest down to the base of the right mandible in *R. l. florida*, *R. secreta*, and *R. rufipennis*, Tennesen, pers. obs.), median cleft closed with one tooth on each side, prothoracic process bifid, and presence of spines on S6 to S9. With *R. l. florida* it shares the general body coloration (light brown) and the epiproct almost or as long as cerci.

On the other hand, the subspecies of *Remartinia luteipennis* have an allopatric distribution: *R. l. luteipennis* has been recorded in southern South America (there are two records in Colombia by Calvert 1956, which are much further north from other known localities) whereas *R. l. florida* and *R. l. penninsularis* share a distribution alongside Central America and Southern North America (*R. l. penninsularis* has only been recorded in Baja California, Mexico).

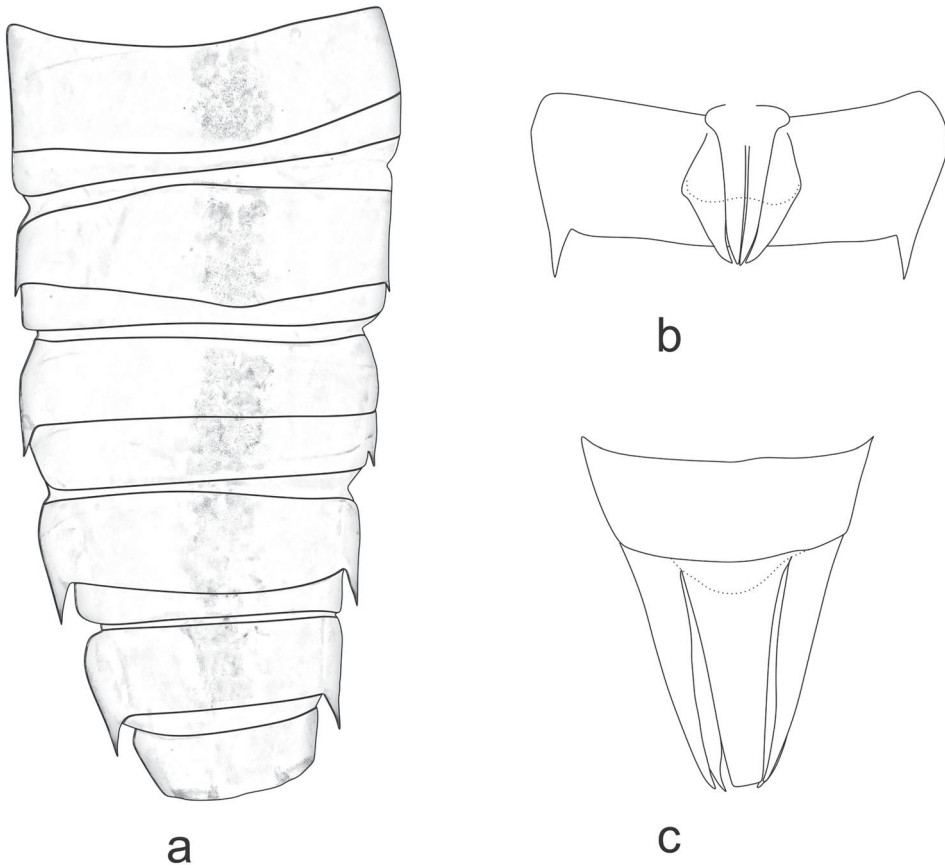


Figure 3. (a) Abdomen color pattern; (b) gonapophyses, ventral view; (c) terminalia, dorsal view.

Table 1. Summarized differences between the larval description of *R. l. luteipennis* from Calvert (1956) and the present work.

	Calvert 1956	del Palacio <i>et al.</i> 2018
Epiproct	V shaped	Truncated
Labium reaching	Caudad to 2nd or base of 3rd coxae	Proximal to 2nd coxae
Ligular cleft	Open	Closed
Spines on S5	Present	Absent
Hind wing sheath	Reach S4 or less	Reach S5

Remartinia l. luteipennis can be differentiated by the length of the lateral valvae of the female gonapophyses (equal to the central ones in *R. l. luteipennis*, slightly shorter in *R. secreta*, and longer *R. l. florida*); length of S6 lateral spines (1.24 mm in *R. l. luteipennis* 0.4–0.5 mm in *R. secreta*, and 0.2 mm in *R. l. florida*).

Conclusion

All the known larvae of *Remartinia* share mandibular formula, a truncated epiproct and the presence of spines on S6–S9. Differences between the present description and that of Calvert (1956),

which was based on supposition, are presented in Table 1, showing support for the conclusion by Novelo Gutiérrez (1998) that the specimens described as *Remartinia luteipennis luteipennis* by Calvert were misidentified. It is likely that the species described by Calvert belongs to *Rhionaeschna* due to the open medial cleft in the ligula and the U-shaped tip of the epiproct in Calvert's fig. 587.

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