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Redefinition of *Leptobasis* Selys with the synonymy of *Chrysobasis* Rácenis and description of *L. mauffrayi* sp. nov. from Peru (Odonata: Coenagrionidae)

ROSSER W. GARRISON[1] & NATALIA VON ELLENRIEDER[2]

[1]*Plant Pest Diagnostic Branch, California Department of Food and Agriculture, Sacramento, United States of America* <*rgarrison@cdfa.ca.gov*>

[2]*Instituto de Bio y Geociencias, Museo de Ciencias Naturales de Salta, Universidad Nacional de Salta, Salta, Argentina* <*natalia.ellenrieder@gmail.com*>

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Abstract

Chrysobasis is synonymized with *Leptobasis*. The latter is diagnosed by the combination of rounded frons, CuP reaching hind margin of wing, CuA relatively short, and supplementary pretarsal claw reduced to vestigial, and by the presence on the distal segment of the genital ligula of a pair of chitinized, flap-like, movable processes directed posteriorly. A new species from Peru, *L. mauffrayi*, is described, and illustrations, maps, and keys for all *Leptobasis* species are provided.

Key words: Odonata, damselfly, Coenagrionidae, key, *Leptobasis*, *Leptobasis mauffrayi* n. sp., *Chrysobasis*, taxonomy, South America

Resumen

Chrysobasis es sinonimizado con *Leptobasis*, el último es diagnosticado por la combinación de frente redondeada, CuP alcanzando el margen posterior del ala, CuA relativamente corta, y uña pretarsal suplementaria reducida a vestigial, y por la presencia de un par de procesos quitinizados, a modo de lengüetas, movibles, dirigidos posteriormente en el segmento distal de la ligula genital. Se describe una nueva especie de Perú, *L. mauffrayi*, y se proveen ilustraciones, mapas y claves para todas las especies de *Leptobasis*.

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Introduction

Recognition of genera of neotropical Odonata is difficult, and it is often easier to identify individuals to species rather than to genus. Part of the problem stems from the imprecise definition of many genera. *Leptobasis* was described by Selys (1877) to include all New World Coenagrionidae with wings petiolated at the level of CuP and proximal to the level of antenodal 2 and quadrangle, vein descending from quadrangle broken, lacking pale postocular spots, with supplementary pretarsal tooth obliterated, cylindrical male cerci about as long as S10, male paraprocts conical and slightly shorter than cerci, and female lacking vulvar spine. Several additional species were assigned to it throughout the years. Selys' original concept of *Leptobasis* was very broad, and several of the species he originally included were later found to belong to other genera; i.e., *L. bicornis* Selys, *L. diceras* Selys, and *L. quadricornis* Selys to *Metaleptobasis* Calvert 1907 (Cumming 1954, von Ellenrieder & Garrison 2008), *L. macrogaster* Selys *in* Sagra to *Diceratobasis* Kennedy 1920 (Kennedy 1920), *L. rosea* Selys to *Inpabasis* Santos 1961 (Garrison & Costa 2002), *L. inversa* (Selys) to *Tuberculobasis* Machado 2009 (Machado 2009). Other species originally described in *Leptobasis* by other authors were later transferred to other genera, such as *L. tenax* St. Quentin to *Telagrion* (De Marmels & Garrison 2005), and *L. mammilaris* Calvert, *L. cardinalis* (Fraser), *L. costalimai* Santos, and *L. yanomami* De Marmels to *Tuberculobasis* (Machado 2009). Thus *Leptobasis* currently includes only five species: *L. candelaria* Alayo 1968, *L. guanacaste* Paulson 2009, *L. melinogaster* González-Soriano 2002, *L. raineyi* (Williamson 1915), and *L. vacillans* Selys 1877.

Rácenis (1959) described the genus *Chrysobasis* to receive his new species *C. buchholzi*. He diagnosed it from *Leptobasis* by its short CuA vein not reaching level of RP_2, the presence of a pair of lobe-like processes at the sides of the medio-dorsal cleft on posterior margin of S10, and (incorrectly) the absence of a ventro-basal branch on male cercus. Donnelly (1967) described a second species he assigned to this genus, *C. lucifer.* When Rácenis (1959) described *C. buchholzi*, the concept for *Leptobasis* was based almost exclusively on *L. vacillans*. Although most of the generic differences he proposed (Rácenis 1959) would work for just these two species, they do not hold when taking into consideration additional species subsequently assigned to both genera. When analyzing generic concepts of New World Coenagrionidae we found that the species included in *Leptobasis* and *Chrysobasis* share a unique combination of characters, and that the characters proposed to separate the two genera intergrade across their species. The purpose of this paper is to synonymize *Chrysobasis*, redefine *Leptobasis*, describe a new species from Peru, and provide updated distribution data and illustrated keys to both sexes for all described species.

Materials and Methods

Nomenclature follows Riek & Kukalovà-Peck (1984) for wing venation, and Westfall & May (2006) for body morphology. All measurements are given in mm; total length and length of abdomen include cerci; means (in parenthesis) are given for more than two specimens. All drawings were made with the aid of a camera lucida coupled to a Nikon SMZ1500 stereoscope and are not to scale. Wings were scanned from specimens. Maps represent distribution records from collections and reliable literature records, and were created electronically from the Digital Chart of the World (1:1,000,000) using ArcView 9.1. Elevation data and longitude/latitude coordinates were culled from the Global Gazetteer website (<http://www.fallingrain.com/world/>) and distribution records for species occurring in the United States were taken from Abbott (2009); all locality data are available from the authors. Abbreviations for structures used throughout the text are as follows: Fw: forewing; Hw: hindwing; pt: pterostigma; Px: postnodal crossveins; S1–10: abdominal segments 1 to 10. Acronyms for collections are as follows:

DRP— Dennis R. Paulson collection, Seattle, WA, USA
FSCA— Florida State Collection of Arthropods, Gainesville, FL, USA
IES— Instituto de Ecología y Sistemática, La Habana, Cuba

MHNP— Muséum National d'Histoiree Historie Naturelle, Paris, France
MIZA— Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez", Maracay, Venezuela
RWG— Rosser W. Garrison collection, Sacramento, CA, USA
TWD— Thomas W. Donnelly collection, Binghamton, NY, USA
USNM— Museum of Natural History, Smithsonian Institution, Washington, D.C., USA

Results

Leptobasis Selys 1877

Leptobasis Hagen *in* Selys 1877: 99 (5 reprint).
= *Hylaeagrion* Förster 1906: 15.

Type species: *Agrion croceum*: Förster 1906 (*nec* Burmeister 1839), subsequently designated by Williamson 1917.

(Note: All catalogs (Davies & Tobin 1984: 78; Bridges 1994: III.22, Steinmann 1997: 290; Tsuda 2000: 208) treat *Hylaeagrion* as a synonym of *Aeolagrion* Williamson 1917 with its type species *H. argenteolineatum* Förster 1906 (= *Agrion dorsale* Burmeister 1839). Förster described *Hylaeagrion* including two species, "*Leptagrion*? *croceum* Selys-Burmeister" and *Hylaeagrion argenteolineatum* (sp. nov.) both from Surinam; he did not designate a type species. Williamson (1917: 241) considered *Leptagrion croceum* (= *Agrion croceum* Burmeister 1839) as type species ("The second new genus proposed by Foerster is *Hylaeagrion*, of which *Leptagrion croceum*, of his determination must be the type, congeneric with which, according to Foerster, is his new *H. argenteolineatum*, known from the male only…"). From Förster's description, Williamson believed *Leptagrion croceum* Förster (*nec* Burmeister) to be a *Leptobasis*—probably *L. vacillans*—based on illustrations of Burmeister's type of *Agrion croceum*.)

= *Chrysobasis* Rácenis 1959: 55 (description, type species *Chrysobasis buchholzi* Rácenis 1959 by original designation) **syn. nov.**

Type species. *Leptobasis vacillans* Hagen *in* Selys 1877, subsequently designated by Kirby (1890).

Other species included. *Leptobasis buchholzi* (Rácenis 1959) **comb. nov.**, *L. candelaria* Alayo 1968, *L. guanacaste* Paulson 2009, *L. lucifer* (Donnelly 1967) **comb. nov.**, *L. mauffrayi* Garrison & von Ellenrieder 2009 **sp. nov.**, *L. melinogaster* González-Soriano 2002, *L. raineyi* (Williamson 1915).

Calvert (1909) described *Leptobasis mammilaris* based on two males (one incomplete) from Chapada, Brazil, and a female (Rio de Janeiro) which he doubtfully assigned to this species. Machado (2009) transferred *L. mammilaris* to his new genus *Tuberculobasis*, and Williamson (1917) and Garrison (in Machado 2009) both expressed doubt as to the identity of Calvert's female. Our examination of the female from Rio de Janeiro shows it to be a female *Telagrion longum* Selys.

Synonymy of *Chrysobasis*. Of the characters proposed for *Chrysobasis* (Rácenis 1959), an equally short CuA is found in *Leptobasis candelaria*, *L. guanacaste*, *L. melinogaster*, *L. raineyi*, and often in *L. vacillans*. A short ventro-basal process is present on the cercus of *C. buchholzi* (Fig. 20a), which we observed similarly developed in *C. lucifer*, *L. candelaria*, *L. guanacaste*, and *L. melinogaster* (Figs. 20b–d, f), reduced to a very low bump in *L. mauffrayi*, *L. raineyi*, and *L. vacillans* (Figs. 20e, g–h). The pair of lobe-like processes on sides of medial cleft of postero-dorsal margin of male S10 described by Rácenis (1959) for *C. buchholzi* (Figs. 20a, 21a) is present also, although less developed, in *C. lucifer* (Figs. 20d, 21d), and even less developed in *L. melinogaster* (Figs. 20f, 21f). Thus, none of these three characters, and no other combination of characters, can be employed to confidently diagnose two genera within this complex of species. Moreover, these eight species share a unique genital ligula morphology within Coenagrionidae, indicating their close relationship: the distal segment has a pair of chitinized, flap-like, movable processes directed posteriorly (shared only with the nearctic genus *Hesperagrion* Calvert, Figs. 9–17), an inner fold proximal to ligula flexure (absent in *Hesperagrion*, which has a transverse fold distal to ligula flexure; see discussion), and no lateral lobes. For all these reasons we consider *Chrysobasis* a junior synonym of *Leptobasis*.

Characterization. Small to medium coenagrionids (26–41 mm), with a relatively long abdomen (ratio of 4–5.25 to length of head plus thorax); dorsum of head, thorax, and S3–8 black, brown, or orange; pterothoracic stripes blue or green, S7–10 to S9–10 blue, yellowish, orange, reddish, or black; pale areas on sides of thorax and abdomen yellow and green (Figs. 23–26). Pale postocular spots and pale occipital bar present (Figs. 1a, b, d), blue or green, or absent (Figs. 1c, 26d). Frons rounded; location of most posterior point of head at level of eyes. Posterior lobe of prothorax smoothly convex, bi- or trilobate, projected medially or not projected in both sexes (Figs. 2, 4). Pterothorax with (Figs. 24a, 26a) or without (Figs. 26b-d) dark mid-dorsal and humeral stripes; dark metapleural stripe absent; pale antehumeral stripe present and mesepimeron and metepisternum mostly pale; pterothorax entirely orange in immature specimens (Fig. 26d). Female lacking well defined mesepisternal carinae between mesostigmal plates and medial carina (Figs. 3b–e). Metatibial spurs shorter than twice intervening spaces (Fig. 5c); pretarsus with supplementary tooth very small, forming a right angle with claw. CuA extending 2–6 cells distal to vein descending from subnodus (Figs. 6–8), occasionally 7–8 in *L. vacillans*; CuP linking CuA to posterior wing margin (Figs. 6–8). Genital ligula distal segment with inner fold proximal to flexure**;** lacking lateral lobes; with apex entire to bifid; with a lateral chitinized flap-like process distal to flexure directed posteriorly on each side (Figs. 9–16). Postero-dorsal margin of male S10 with (Figs. 21a, d, f) or without (Figs. 21b, c, e, g–h) a pair of lobe-like processes on sides of medial cleft. Male cercus shorter than or subequal to S10, with a short ventro-basal branch on medial surface; male paraproct entire and shorter to longer than cercus (Fig. 21). Female usually lacking a vulvar spine on S8 (Figs. 19a–e), although a small spine is present in most females of *L. vacillans* (Fig. 19f); postero-dorsal margin of female S9 with denticles; ovipositor extending distally to tip of cerci (Figs. 19, 23b, 24b, 25a, c, 26c, d).

Diagnosis. *Leptobasis* shares the combination of a rounded frons, CuP reaching hind margin of wing, CuA relatively short, and supplementary pretarsal claw vestigial or reduced and forming a right angle with claw with *Dolonagrion* Garrison & von Ellenrieder 2008, *Mesoleptobasis* Sjöstedt 1918, and *Telagrion* Selys 1876. It differs from all of them by the presence on the distal segment of the genital ligula of a pair of chitinized, flap-like, movable processes directed posteriorly (Figs. 9–16). Branched male cerci lacking a transverse membranous dorsal depression (Figs. 20, 22), and tip of female ovipositor extending distally to postero-dorsal margin of S10 for a distance shorter than length of S10 (Fig. 19), further distinguish it from *Dolonagrion*, which has entire cerci with a membranous dorsal depression and ovipositor surpassing tip of cerci for a distance longer than S10 length (Garrison & von Ellenrieder 2008). It further differs from *Mesoleptobasis* in that the vein descending from the quadrangle does not form a straight line to wing margin (Figs. 6–8), versus forming a straight line in the latter (Garrison & von Ellenrieder 2009). *Leptobasis* differs from *Telagrion* by the absence of paired ental medio-longitudinal ridges and of an outer-lateral patch of thin setae on the distal segment of the genital ligula (Figs. 9–16), which are present in the latter (see von Ellenrieder & Garrison 2008), and inner margin of female cerci straight or convex in dorsal view, versus concave in the latter.

Distribution. *Leptobasis* occurs from southern Texas (USA), the Antilles, and Central America south through Venezuela and into southern Peru (Figs. 27–28).

Biology. Adults perch in shady areas on littoral vegetation, grasses or sedges, along margins of ponds, lakes, swamps, and marshes, banks of rivers, and temporary streams; they are rarely seen flying over open water. Daigle (2009) reported *L. lucifer* flying around fern patches among cypress trees in swamps, with males perching on vines and leaf tips, and females ovipositing in the stem of *Lycopus rubellus*. The only larva described so far is that of *L. vacillans* (Geijskes 1941, Needham 1941) although Paulson (2009b) reared *L. guanacaste* and provided diagnostic differences between the two.

Adults of *Leptobasis* undergo ontogenetic changes in color and pattern; tenerals and immatures are often pale orange (with a dark mid-dorsal stripe in *L. guanacaste*) and, in some species, may develop dark mid-dorsal (*L. guanacaste*) and humeral thoracic stripes against a pale green to orange background (*L. buchholzi*, *L. candelaria*, *L. lucifer*, *L. mauffrayi*, *L. melinogaster*, *L. vacillans*). In *L. raineyi* these stripes are represented as orange against a pale blue background, but a similar pattern can exist in other *Leptobasis* species mentioned above. The dynamics of these color changes are not understood and these differences led Calvert (1902, 1909)

to apply three varietal names to *L. vacillans*. Paulson (2009a) suggests that immature colored adults may span the dry season in the tropics; he found adults and larvae of *L. guanacaste* at temporary pools in Costa Rica during the wet season, and observed mature and immature-colored females in pairs.

Key to males of *Leptobasis*

1. Metafemur with modified inner row of spurs, the most proximal one strongly differentiated and at least twice as long as remainder of spurs (Figs. 5a, b); genital ligula distal segment with paired lateral chitinized flap-like processes as long as segment and appressed against its ental surface (Figs. 10a, 11a, c) 2
1'. Metafemur with unmodified inner row of spurs, the proximal one not differentiated and shorter than remainder of spurs (Fig. 5); genital ligula distal segment with paired lateral chitinized flap-like processes short, half as long as segment, and visible in lateral view (Figs. 9c, 12c, 13c, 14a, 15a, 16a) 3

2(1'). Cercus with a rounded, foliate process distally (Fig. 20b); paraproct longer than cercus in lateral view (Fig. 21b); Cuba, Mexico, Belize, and Guatemala (Fig. 27) ..... *L. candelaria*
2'. Cercus lacking a rounded, foliate process distally (Fig. 20c); paraproct shorter than cercus in lateral view (Fig. 21c); Costa Rica and W Mexico (Fig. 27)..... *L. guanacaste*

3(1'). Cercus as wide as long with posterior half bent ventrally into a broadly based triangular tooth (Figs. 20e, g, h; 21e, g, h); apical margin of genital ligula concave in ectal view (Figs. 13b, 15b), with fleshy papillae on ectal (Fig. 16b) or latero-ectal sides (Figs. 13b, 15b) of apex 4
3'. Cercus longer than wide, posterior half not bent ventrally (Figs. 20a, d, f; 21a, d, f), apical margin of genital ligula transverse or rounded in ectal view (Figs. 9b, 12b, 14b); fleshy papillae lacking on ectal or latero-ectal sides of apex (Figs. 9b, 12b, 14b)..... 5

4(1'). Contour of distal half of genital ligula distal segment rounded in lateral view (Fig. 16a), with a pair of fleshy papillae on raised linear medial margin of apex (Fig. 16b); Texas in USA, Antilles, and Mexico south through Ecuador (Fig. 28) ..... *L. vacillans*
4'. Contour of distal half of genital ligula distal segment acuminate in lateral view (Fig. 15a), with pair of fleshy papillae on latero-ectal sides of apex (Fig. 15b, c); Trinidad (Fig. 28) ..... *L. raineyi*
4". Contour of distal half of genital ligula distal segment rounded followed ventrally by a broadly-based, chitinized tooth in lateral view (Fig. 13a), with pair of fleshy papillae on latero-ectal sides of apex (Fig. 13b, c); Peru (Fig. 28) ..... *L. mauffrayi*

5(4'). Lateral chitinized flap-like process of genital ligula distal segment spatulate, abruptly narrowed apically into a recurved hook, with a U-shaped notch between its base and distal half in lateral view (Fig. 14a); dorsal margin of cercus convex in lateral view (Fig. 21f); paraproct longer than cercus in lateral view (Fig. 21f); Texas in USA south through Mexico (Fig. 27) ..... *L. melinogaster*
5'. Lateral chitinized flap-like process of genital ligula distal segment linear and acuminate, lacking U-shaped notch between its base and distal half in lateral view (Fig. 9a, 12a); dorsal margin of cercus straight or slightly concave in lateral view (Figs. 21a, 21d); paraproct shorter than cercus in lateral view (Figs. 21a, 21d)..... 6

6(5'). Ventro-basal tooth large, occupying basal third to half of cercus in medio-dorsal view (Fig. 20a); paraproct with a basal dorso-medially directed tooth (Fig. 20a); Colombia and Venezuela (Fig. 27) ..... *L. buchholzi*
6'. Ventro-basal tooth small, occupying approximately middle third of cercus in medio-dorsal view (Fig. 20d); paraproct with an apical dorso-medially directed tooth (Fig. 20d); Florida in USA, Mexico south through Guatemala and Costa Rica (Fig. 27)..... *L. lucifer*

Key to females of *Leptobasis*

1. Posterior margin of prothorax continuous, evenly rounded (Figs. 2e, g, h), or with lateralmost margin sharply bent ventrad and lacking a smaller inferior lobe below in dorsal view (Fig. 2c) 2
1'. Posterior margin of prothorax not continuous, with lateral lobes partially overlying median lobe resulting in a partial (Fig. 2b, f) or complete (Figs. 2a, d) supplementary inferior lobe 5

2(1'). Raised posterior lobe of prothorax forming a narrow rim of the same length throughout and with lateralmost margin sharply bent ventrad (Fig. 2c); Costa Rica and W Mexico (Fig. 27) ..... *L. guanacaste*

2'. Raised posterior lobe of prothorax with middle portion much longer than lateral portion and with lateralmost margin not sharply bent ventrad (Figs. 2e, g, h)..... 3

3(2'). Antilles, Mexico south through Ecuador (Fig. 28)..... *L. vacillans*

3'. Trinidad (Fig. 28)..... *L. raineyi*

3''. Peru (Fig. 28) ..... *L. mauffrayi*

5(1'). Posterior lobe of prothorax with lateral margins of median lobe angled and overlying smaller rounded supplementary ventral lobe (Figs. 2a, b, d) 6

5'. Posterior lobe of prothorax with lateral margins of median lobe rounded and overlying smaller rounded supplementary ventral lobe (Fig. 2f); Texas in USA south through Mexico (Fig. 27) ..... *L. melinogaster*

6(5'). Dorsal margin of ovipositor in lateral view concave (Fig. 19a); Cuba, Mexico, Belize, and Guatemala (Fig. 27)... ..... *L. candelaria*

6'. Dorsal margin of ovipositor in lateral view linear (Fig. 19c)..... 7

7(6). Florida in USA, Mexico south through Guatemala and Costa Rica (Fig. 27) ..... *L. lucifer*

7'. Colombia and Venezuela (Fig. 27)..... *L. buchholzi*

Leptobasis buchholzi (Rácenis 1959) comb. nov.

Figs. 2a, 3a, 6a, 9, 20a, 21a, 27

Chrysobasis buchholzi Rácenis 1959: 56 (description: holotype ♂, Pericoco, Guárico, Venezuela, 03 viii 1955, J. Rácenis leg., in MIZA); — Donnelly 1967: 50 (comparison with *C. lucifer*; new record); — Davies 1981: 2 (mention); — Davies & Tobin 1984: 77 (catalog); — De Marmels 1990: 337 (checklist); — De Marmels 1993: 157 (new record); — Bridges 1994: VII.39 (catalog); — Steinmann 1997: 285 (catalog); — Tsuda 2000: 29 (catalog); — Heckman 2008: 324 (key to neotropical genera), 532 (key to species).

Specimens examined. Total: 2 ♂. Colombia, Bolivar Dept., Puerto Colombia, 9°43'N, 74°26'W, 93 m, 11 xii 1916, leg. J.H. & E.B. Williamson, deposited in RWG.

Diagnosis. The linear, decumbent cercus (Figs. 20a, 21a) resembles that of *L. lucifer* (Fig. 20d, 21d) but the tip is more blunt and is not as long as in the latter species. We have been unable to diagnose females of *L. buchholzi* from *L. lucifer*. Jürg De Marmels illustrated the paratype female and its pronotum and mesostigmal plates (Figs. 2a, 3a) mirror those for *L. lucifer* (Figs. 2d, 3d).

Dimensions. Males (n = 2): Hw 15.4–15.7; abdomen 29.5–30.0; total length 36. Females: none available.

Distribution. Venezuela and Colombia (Fig. 27).

Leptobasis candelaria Alayo 1968

Figs. 1a, 2b, 3b, 5a, 6b, 10, 19a, 20b, 21b, 27

Leptobasis candelaria Alayo 1968a: 83 (description: holotype ♂, Candelaria, Pinar del Río, Cuba, in IES [not examined]); 1968b: 45, 51 (illustrations of holotype ♂); — Paulson 1982: 254, 260 (Mexico, West Indies); — Davies & Tobin 1984: 77 (catalog); — González-Soriano 1993: 296; — Bridges 1994: VII.43 (catalog); — González-Soriano & Novelo-Gutiérrez 1996: 164 (Mexico); — Flint 1996: 19 (checklist); — Steinmann 1997: 287 (catalog); — Tsuda 2000: 38 (catalog); — Förster 2001: 62 (key to species);— Trapero Quintana & Naranjo López 2003: 27–28 (Cuba); — Trapero Quintana & Naranjo López 2004: 179 (in key); — González-Soriano & Novelo-Gutiérrez 2007: 129 (Mexico); — Novelo-Gutiérrez & Gómez-Anaya 2009: 686 (record).

Specimens examined. Total 2 ♂, 2 ♀: 1 ♂, 1 ♀, Mexico, Veracruz State, stream 6.9 km E of Córdoba, by Mex. Hwy. 150, 18°53'24"N, 96°55'12"W, 12 xiii 1976, leg. R.W. & J.A. Garrison; 1 ♂, 1 ♀, Belize, Toledo District, Monkey River, 16°21'N, 88°29'W, 27 viii 1995, leg. Tineke Boomsma, All specimens deposited in RWG.

Diagnosis. The combination of metafemoral armature (Fig. 5a) and convoluted, foliate cercus (Figs. 20b, 21b) will distinguish males from all others except for *L. guanacaste*. The proximal large metafemoral spur of *L. candelaria* (Fig. 5a) is not as long as that of *L. guanacaste* (Fig. 5b) and the shape of the cerci differ between the two species. The ventro-basal process in *L. candelaria* is projected ventro-posteriorly and is visible in medio-dorsal view when the cerci are spread (Fig. 20b); this structure is ventrally curved and hidden from view when the cercus is viewed medio-dorsally in *L. guanacaste* (Fig. 20c). Females of *L. candelaria* and *L. guanacaste* are unique in having the dorsal margin of ovipositor concave in lateral view (Figs. 19 a, b); this structure is linear in all other species (Figs. 19c–f). The female of *L. candelaria* differs by the unique morphology of its prothoracic hind lobe; its middle lobe is expanded with lateral margins angulate and overlying a smaller inferior margin (Fig. 2b). In *L. guanacaste*, the hind lobe is upright, of even width, and its lateral arms are deflexed ventrally diverging from the carinate propleural extension (Fig. 2c). Mature individuals of *L. candelaria* have broad mid-dorsal and humeral dark stripes and the pale postocular spots are round (Fig. 1a); in mature *L. guanacaste*, the dark antehumeral stripe is lacking and the postocular spots are represented by narrow pale triangles (Fig. 1b).

Dimensions. Males (*n* = 2): Hw 15.0–15.6; abdomen 28; total length 33–34. Females (*n* 2): Hw 17.2–18.1; abdomen 26–28; total length 32–33.

Distribution. Cuba, Mexico, and Belize (Fig. 27).

***Leptobasis guanacaste* Paulson 2009**

Figs. 1b, 2c, 3c, 4a, 5b, 6c, 11, 19b, 20c, 21c, 22a, 23a, b, 27

Leptobasis n. sp. Paulson 1982: 263 (as n. sp. from Costa Rica)

Leptobasis guanacaste Paulson 2009b: 63 (holotype ♂, 63; allotype ♀, Hacienda Taboga, Guanacaste Prov., Costa Rica, 02 viii 1967 and 14 vii 1967, both in FSCA); — Bailowitz, Danforth, & Deviche 2009: 16 (Sinaloa, Mexico).

Specimens examined. Total: 5 ♂, 10 ♀: 1 ♂, 1 ♀, Costa Rica, Guanacaste Prov., Hacienda. Taboga, 10°19'48"N, 85°12'0"W, 14 vii 1966, leg. D.R. & M.L. Paulson; 1 ♂, 1 ♀, same data but 17 ix 1966; 1 ♂, 1 ♀, same data but 2 viii 1967 (paratypes, all deposited in RWG); 2 ♂♂, 7 ♀♀, same data but 25-26 vii 1967, leg. Oliver S. Flint, Jr. & M.A. Ortiz B., deposited in USNM.

Diagnosis. Similar to *L. candelaria* by male metafemoral armature and female ovipositor morphology; males are diagnosed under that species. Female unique in morphology of its prothoracic hind lobe, which is of even width throughout and with sharply decumbent margins at side diverging from carinate propleural margin (Fig. 2c), versus an expanded middle lobe in all other species (Fig. 2a, d–h), and lacking a sharply decumbent lateral margin in *L. candelaria* (Fig. 2b). The narrowly triangular postocular spots (Fig. 1b) and lack of a dark humeral stripe are also unique for fully mature *L. guanacaste*.

Dimensions. Males (*n* 10, data from Paulson 2009b): Hw 14.7–16.0 (15.5); abdomen 26.7–29.5 (28.2); total length 31.5–35.0 (33.2). Females (*n* 10; mean in parenthesis [data from Paulson 2009b]): Hw 16.3–18.3 (17.0); abdomen 23.8–27.0 (24.9); total length 28.0–32.5 (30.2).

Distribution. Guanacaste Province, Costa Rica, and Sinaloa State, Mexico (Fig. 27).

***Leptobasis lucifer* (Donnelly 1967) comb. nov.**

Figs. 2d, 3d, 7a, 12, 19c, 20d, 21d, 22b, 24, 27

Chrysobasis lucifer Donnelly 1967: 47–50 (holotype ♂, allotype ♀, Tenedores, 25 km E of Morales, along Atlantic highway at km 268, Izabal, Guatemala, 16 viii 1965, T.W. Donnelly leg., both in FSCA); — Paulson 1982: 253 (Guatemala); — Davies & Tobin 1984: 77 (catalog); — González-Soriano 1993: 296 (new record for Mexico); —

Bridges 1994: VII.138 (catalog); — González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico); — Boomsma & Dunkle 1996: 25 (checklist); — González-Soriano & Novelo-Gutiérrez 1996: 163 (Mexico);— Steinmann 1997: 285 (catalog); — Tsuda 2000: 29 (catalog); — Paulson 2000: 12 (record); — Förster 2001: 50 (key to genera), 59 (mention); Westfall & May 2006: 226 (description ♂, ♀); — González-Soriano & Novelo-Gutiérrez 2007: 129 (Mexico); — Paulson 2008: 17 (record); — Daigle 2008: 25 (record); — Daigle 2009: 9–10 (record).

Specimens examined. Total: 7 ♂, 5 ♀: 4 ♂, 3 ♀, USA, Florida, Corkscrew Audubon Sanctuary, Hwy. 849, about 13.0 miles west of Immokalee, 26°22'31"N, 81°36'23"W, 4 m, 27 ii 2009, leg. J.J. Daigle; 1 ♂, Mexico, Campeche State, Laguna en Zoh Laguna, Reserva de la Biósfera de Calakmul, 18°51'23"N, 89°31'08"W, 260 m, 23 ix 1997, leg. E. González-Soriano, Sandra Montiel Barrón; 1 ♂, Belize, Orange Walk District, Gallon Jug, forest swamp, 17°34'N, 89°03'W, 15 x 1992, leg. Tineke Boomsma; 1 ♀, Costa Rica, Heredia Prov., Finca La Selva, 1.5 mi S Puerto Viejo, 10°28'N, 84°01'W, 20 ix 1966, leg. D.R. & M.L. Paulson, and 1 ♂, 1 ♀, same data but 10 iv 1967. All specimens deposited in RWG.

Diagnosis. This species is nearest *L. buchholzi* and is diagnosed under that species.

Dimensions. Males (*n* = 7; mean in parenthesis): Hw 14.1–16.1 (15.4); abdomen 25–29.5 (27.4); total length 30.0–35.5 (35.0). Females (*n* = 5; mean in parenthesis): Hw 16.9–17.4 (17.2); abdomen 26.0–27.5 (27.0); total length 31.0–33.0 (32.3).

Distribution. Southern Florida, USA, Guatemala, Belize, and Costa Rica (Fig. 27).

***Leptobasis mauffrayi* sp. nov.**
Figs. 1c, 2e, 3e, 7b, 13, 19d, 20e, 21e, 22c, 25a, 28

Leptobasis n. sp. A, Paulson, 1985: 12 (Tambopata, Peru).
Leptobasis raineyi Butt, 1995: 96 (misidentified by R. Garrison; Tambopata, Peru).

Etymology. This species is named *mauffrayi* after our good friend and colleague William Mauffray, collection manager of the Odonata collection at FSCA, who has always come to our aid in our work on neotropical Odonata.

Type material. Total 20 ♂, 18 ♀. Holotype ♂, Peru, Madre de Dios Dept., Manu, Aguajal, ca. 5 km S Pakitza, 11°55'48"S, 71°15'18"W, 200 m elev., 19 ix 1988, leg. Oliver S. Flint, Jr., deposited in USNM. Paratypes: ♀ allotype, Parque Nacional Manu, Pakitza, Res. Zone, T2 to R2 to T1 to base camp, JAL89-019, 17 ix 1989, leg. Jerry Louton; 1 ♀, Manu, Pakitza, Trocha Uno to Aguajal (5 km E) JAL88-015, 20 ix 1988, leg. Jerry Louton, deposited in USNM; 1 ♀, Tambopata Nature Reserve, 39 km SW of Puerto Maldonado, Boca Río La Torre, 12°50' 18"S, 69°17' 59"W, 300m, 3 ii 1982, leg. G. Lamas. Paratypes from Explorer's Inn region on Río Tambopata, 39 km SW Puerto Maldonado (all deposited in DRP): 1 ♂, forest trail, 16 vi 1977, leg. D.R. Paulson; 1 ♂, 18 vi 1977; 1 ♂, bamboo thicket, 1 viii 1979, leg. M. Perkins & P. Donahue; 1 ♀, swamp forest—main trail km 1.8, 29 xii 1981, leg. W.M. Bronaugh; 1 ♂, 1 ♀, transition forest, ant trail, 15 i 1982; 1 ♀, forest trail, 15 ii 1982, leg. D.L. Pearson; 1 ♂, 16 ii 1982, R. Aspillaga; 1 ♂, 25 ii 1982; 1 ♀, main trail km 1.7, leg. J.M. Pratt, 26 iv 1982; 1 ♂, 1 ♀, ant trail, 4 v 1982; 1 ♂, Río La Torre trail, 7 vi 1982,; 1 ♂, main trail 0.5 km, bamboo thicket, small exposed stream, transition forest, 7 xii 1982, leg. J.J. Anderson; 1 ♂,1 ♀, inundation, transition forest and swamp forest, small exposed stream, 8 xii 1982; 1 ♀, young upland forest, 14 ii 1983; 1 ♀, ant trail, 6 iii 1983, leg. M. Frisbie; 1 ♂, young terra firma, 7 iii 1983; 1 ♀, little lagoon trail, 12 iii 1983, leg. M. Gunther; 1 ♀, swamp forest, leg. M. Frisbie; 1 ♀, main trail, 3 vii 2002, leg. D.R. Paulson & N. Smith; 1 ♀, Laguna Chica Trail at lodge clearing, 13 vii 2002; 1 ♂, 1 ♀ (in copula), main trail, 21 vii 2002; 2 ♂, main trail, 26 vii 2002; 1 ♂, Laguna Chica trail, 1 ♂, main trail, leg. H. Herter, 27 vii 2002; 1 ♀, 30 vii 2002, leg. D.R. Paulson & N. Smith. Additional paratypes deposited in RWG: 1 ♂, Tambopata-Candamo Reserved Zone, Camp 5, Río Tambopata east bank, dry forest, 12°50'S, 69°18'W, 12 xi 1992, and 1 ♀, same data but 18 xi 1992, leg. Martin Butt; 2 ♂, Huanuco Dept., 10 km N Cucharas, confluence of Huallaga and Pacay rivers, 9°18'S, 75°59'W, 500 m, viii 1954, leg. Woytkowski.

Description. Holotype dimensions: Hw 16.1; abdomen 27.5; total length 29.5. Head of male holotype with labium ivory, remainder of head including epicranium dull orange brown becoming olive green on

postocular regions (Fig. 1c), paler on rear of head, dark brown along postfrontal suture, and spot posterior to postfrontal suture.

Prothorax dull olive brown, paler along pleural areas, hind lobe of prothorax evenly rounded; pterothorax entirely olive blue with diffuse orange brown thoracic stripes along medial portion of mesepisternum and mesopleural suture, remainder of thorax paler laterally. Costal side of Fw pt rhomboid, subequal to basal side, its posterior margin slightly convex. CuA ending five cells distal to vein descending from subnodus (just beyond level of 3rd Px). Wings hyaline, Px Fw 10; Hw 9 (8 right); RP_2 originating at Px 5 in Fw, at Px 4 in Hw; pterostigma 0.4 mm long. Legs ivory with wash of brown at distal margin of femora, spines black.

On abdomen, S1 with brown spot dorsally, pale olive brown laterally and dorso-distally; S2 pale orange dorsally with wash of brown at subapical eighth of segment, sides becoming pale olive green; S3–7 dark brown dorsally, pale orange laterally; S3–5 with brown apical ring; S8–10 dark like S3–7 but with brown extending laterally; S8 with dorsal dark spot on basal 0.70, basal portion and sides dull blue with wash of brown laterally; S9 pale blue; S10 like S9 but with irregular basal half ring of brown. Genital ligula in ectal view (Fig. 13b, paratype) with sides parallel, distal margin shallowly concave and armed latero-dorsally with row of fleshy papillae; in lateral view (Fig. 13a, paratype) with distal portion of segment roughly semicircular and ending ventro-apically in a short, conical sclerotized tubercle followed by a lateral posteriorly directed chitinized flap-like process which tip ends in a spine, inner fold present but small. Cercus longer than wide, posterior half angled ventrally (Fig. 20e) and with a short ventro-basal prominence medially (Fig. 22c); paraproct slender, acuminate, in lateral view, its tip slightly surpassing tip of cercus (Fig. 21e).

Female allotype with head entirely dark olive blue becoming paler along genae and postocular region; anteclypeus dark brown. Thorax as in male but dark olive blue; hind lobe of pronotum (Fig. 5e) evenly rounded. Wing venation as in male but CuA ending five cells beyond vein descending from subnodus (at level of 4th Px) in Fw, at four cells beyond vein descending from subnodus (at level of 3rd Px) in Fw. Wings hyaline, Px Fw 11 (both wings); Px Hw 9 (left)/ 10 (right); RP_2 originating at Px 5 in Fw, at Px 4 in Hw; pterostigma 0.5 mm long. Abdomen as in male but shorter, more robust, and S8–10 dark brown above and blue laterally; ovipositor surpassing tip of cerci for a distance subequal to length of cerci (Fig. 19d). Dimensions: Hw 18.8; abdomen 31.0; total length 37.0.

Variation in paratypes. The male from Tambopata is similar to the holotype but the dorsum of prothorax and the mid-dorsal and humeral stripes are dark and contrasting to remainder of thorax, the dark abdominal markings are more defined than in the holotype, and all of S8–10 is pale blue; two males from Cucharas differ by having all of the head, thorax, and S1–2, and all of S3 except apical tenth orange, remainder of abdomen dark brown except for hint of pale annuli. The female paratype from Pakitza is similar to the allotype but the blue coloration is paler; female from Tambopata is a juvenile with head and thorax orange with similar head markings as for holotype and with faint hint of blue between mid-dorsal and humeral orange of thorax, abdomen dorsally dark brown on S2–6 with apical tenth extending laterally to form incomplete apical ring, S8 with basal half dark, S9 with divided dorsal spot at basal 0.50, remainder of abdomen orange becoming paler laterally.

Dimensions. Males (n = 10, including holotype): Hw 16.1–19.9 (17.1); abdomen 26.0–30.7 (28.7); total length 32.0–36.7 (34.1). Females (n = 10): Hw 17.2–19.7 (18.3); abdomen 26.0–31.0 (28.2); total length 32.0–37.0 (34.0).

Diagnosis. *Leptobasis mauffrayi* is one of three allopatric species of the *Leptobasis vacillans* group which also includes *L. raineyi*; all share a similar pronotal, thoracic, and caudal appendage morphology. Examination of the genital ligula is necessary to confirm identification. The genital ligula of males of *L. mauffrayi* has a short ventro-apical, conical sclerotized tubercle (Figs. 13a, c) that is lacking in *L. raineyi* (Fig. 15a) and *L. vacillans* (Fig. 16a). In the field adults can usually be identified by overall abdominal color pattern, which is largely blue in *L. mauffrayi* and *L. raineyi*, and with some orange or red in *L. vacillans*. However, we have seen pale female *L. vacillans* (Panama) which are ochraceous and similar to *L. mauffrayi*. *Leptobasis mauffrayi* replaces *L. vacillans* in Peru but further collecting may show both species to occur sympatrically.

Remarks. As noted above, individuals vary considerably in color and markings that are likely similar to differences noted for *L. vacillans*.

Distribution. Peru (Fig. 28).

***Leptobasis melinogaster* González-Soriano 2002**
Figs. 2f, 4b, 7c, 14, 20f, 21f, 22d, 25b, c, 27

Leptobasis melinogaster González-Soriano 2002: 181 (holotype ♂, Estación de Biología Chamela, Jalisco State, Mexico, in UNAM); —Abbott 2004: 17 (TX); — Paulson 2005: 38 (common name);— Abbott 2006: 162 (distribution, seasonality); — González-Soriano & Novelo-Gutiérrez 2007: 129 (Mexico); — Abbott 2007: 140 (distribution, seasonality); — Abbott 2008: 144 (distribution, seasonality); — Bailowitz, Danforth, & Deviche 2009: 16 (Sinaloa, Mexico); — Lasley & Abbott 2009: 17 (Texas);— Paulson 2009a: 136 (identification, distribution, photos); — Rose 2009: 3 (Texas).

Specimens examined. Total: 2 ♂, 1 ♀: 1 ♂, USA, Texas, Hidalgo Co., Willow 1, Santa Anna National Wildlife Refuge, 26°04'42"S, 98°08'14"W, 24–26 vi 2005, leg. John Abbott; 1 ♀, Kleberg Co., Santa Gertrudis Creek, King Ranch, 27°35'02"S, 98°02'36"W, 17 x 2006, leg. Jim Sinclair (deposited in RWG); 1 ♂, Mexico, Veracruz state, Cuitlahuac, 18°48'43"S, 96°43'22"W, 24–25 vii 1965, leg. O.S. Flint, Jr. & M.A. Ortiz B., deposited in USNM.

Diagnosis. Elongate decumbent cercus (Figs. 20f, 21f) and spinulose, hook-like posteriorly directed movable process of genital ligula (Fig. 14a) are unique for males. Female diagnosed by rounded corners of medial lobe (Fig. 2f) which are angular in those species with a supplementary inferior lobe (*L. buchholzi*, Fig. 2a; *L. candelaria*, Fig. 2b; *L. lucifer*, Fig. d). Pale femora with darkened apices also separate this species from others which have largely pale femora or only flexor surfaces darkened.

Dimensions. Males (*n* = 2): Hw 17.0–17.3; abdomen 31.0; total length 37.0–38.0. Female (*n* = 1): Hw 20.6; abdomen 32; total length 40.

Distribution. Southern Texas, USA, and Mexico (Fig. 27).

Leptobasis raineyi (Williamson 1915)
Figs. 2g, 8a, 15, 19e, 20g, 21g, 22e, 28

Telagrion raineyi Williamson 1915: 613 (holotype ♂, small swamp near Cumuto, Trinidad, 10 iii 1912, in UMMZ); — Geijskes 1932: 248 (description of female); — Davies & Tobin 1984: 94 (catalog); — Michalski 1988: 48 (Trinidad, additional notes); — Steinmann 1997: 358 (catalog).
Leptobasis raineyi: Garrison 1986: 67 (transferred to *Leptobasis*); — Dunkle 1987: 5 (Trinidad); — Bridges 1994: VII.197 (catalog); — Tsuda 2000: 38 (catalog); —Garrison, von Ellenrieder, & O'Brien 2003: 36 (type data).
Acanthagrion raineyi: Heckman 2008: 527 (key to species of *Leptobasis* as *Acanthagrion*).

Specimens examined. Total: 4 ♂, 4 ♀, all from Trinidad: 1 ♀, St. George Co., forest and small stream along trail called Indian Walk Ride off main road, 1.9 mi N of Cumuto, 10°36'N, 61°12'W, 7 iv 1980, leg. J.A. & R.W. Garrison, deposited in RWG; 1 ♀, St. Andrew Co., Valencia, 10°38'54"N, 61°11'55"W, 59 m, 11 iv 1965, leg. T.W. Donnelly; 1 ♂, 1 ♀, same data but forest just SE of town, 10°38'36"N, 61°11'42"W, 62 m, 13 iv 1965; same data but 15 iv 1965, 1 ♂ (all deposited in DRP); 1 ♂, 1 ♀, forest cut and forest 2 mi SE of Valencia on Eastern Main road, 10°37'26"N, 61°10'55"W, 42m, leg. J.A. & R. W. Garrison; 1 ♂, Plantation Rd., by Tumpuna Rd., 1 mi W of Cumuto, 10°35'N, 61°13'W 11 i 1981, leg. R.W. Garrison (all deposited in RWG).

Diagnosis. Males differentiated from *L. mauffrayi* and *L. vacillans* only by unique morphology of genital ligula; apex of terminal segment in lateral view is bluntly pointed and ventral margin is linear (Fig. 15a); in *L. mauffrayi*, the tip is rounded and the ventral margin has a sclerotized tubercle (Fig. 13a), and in *L. vacillans* the apex is evenly rounded (Fig. 16a). Fleshy papillae on terminal segment of the genital ligula occur only on these three species but they are randomly distributed on the dorso-lateral surface in *L. raineyi* (Fig. 15b), not

arranged in a linear row as in the other two species (Figs. 13b, 16b). Females apparently not morphologically different from *L. mauffrayi* and *L. vacillans* and separable only by locality.

Dimensions. Males (*n* = 4): Hw 16.3–17.2 (16.8); abdomen 29.5–32.0 (30.8); total length 35.0–37.0 (36.3). Females (*n* = 4): Hw 18.0–19.0 (18.7); abdomen 29.0–30.5 (29.9); total length 34.5–36.5 (35.8).

Remarks. Overall light blue body coloration, usually faint orange mid-dorsal and humeral stripes on the thorax as well as paler, postocular spots are present on all material we examined, and the same color scheme is also found in *L. mauffrayi* and some *L. vacillans*. We have seen no individuals of *L. raineyi* with any orange or reddish coloration.

Distribution. Apparently endemic to Trinidad (Fig. 28). A record of *L. raineyi* from Peru by Butt (1995) as identified by Garrison was in error, and in fact is *Leptobasis mauffrayi*.

Leptobasis vacillans **Hagen *in* Selys 1877**

Figs. 1d, 2h, 4c, 5c, 8b, 16, 19f, 20h, 21h, 22f, 26, 28

Leptobasis vacillans — Hagen 1867: 291 (*nomen nudum*).

Leptobasis vacillans Hagen *in* Selys 1877: 101 [reprint 7] (description: types ♂, ♀, Cuba, J. Gundlach leg., in MHNP [not examined]); — Kolbe 1888: 172 (description, notes);— Kirby 1890: 156 (catalog);— Calvert 1902: 120 (redescription); — Baker 1905: 86 (Nicaragua); — Calvert 1907: 385 (further notes); — Calvert 1909: 200 (Guiana); — Muttkowski 1910: 64 (catalog, types erroneously stated to be in BMNH); — Calvert 1919: 355 (Gundlach's description); —; Gowdey 1926: 2 (Jamaica); — Klots 1932: 87 (description Puerto Rico);— Needham 1941: 14 (adult color changes, description of larva from Dominican Republic); — Whitehouse 1943: 53 (Jamaica); — Rácenis 1953: 52 (Venezuela); — Santos 1957: 5 (comparison with *Leptobasis costalimai*); — Rácenis 1958: 193 (Venezuela); — Santos 1961b: 172 (comparison with *Leptobasis tuberculata*); — Alayo 1968a: 82 (description ontogenetic color changes); 1968b: 27, 46, 51 (illustrations); — Davies 1981: 2 (mention as type species); — Paulson 1982: 254, 260 (distribution); — Paulson 1984a: 34 (Yucatan, Mexico); — Paulson 1984b: 51 (El Salvador); — Davies & Tobin 1984: 77 (catalog); — Dunkle 1988 (Honduras); — Novelo-Gutiérrez, Canul-González & J. Camal 1988: 44 (Quintana Roo, Mexico); — De Marmels 1990: 337 (checklist, Venezuela); — Novelo-Gutiérrez 1991: 259 (Quintana Roo, Mexico); — Donnelly 1992 (Panama); — Daigle 1993: 67 (Dominican Republic); — González-Soriano 1993: 296 (Mexico); — Bridges 1994: VII.243. (catalog); — Boomsma & Dunkle 1996: 25 (checklist); — Flint 1996: 18 (Cuba); — González-Soriano & Novelo-Gutiérrez 1996: 164 (Mexico); — Steinmann 1997: 287 (catalog); — González-Soriano 1997: 254 (Veracruz, Mexico); — Askew, Prosser & Corbet 1998: 28 (Grand Cayman Island); — Ramos Hernández 1999: 16 (checklist); — Tsuda 2000: 38 (catalog); — Förster 2001: 62 (key); —Belle 2002: 3 (checklist, Surinam); — Ramos Hernández 2003: 16 (checklist); — Trapero Quintana & Naranjo López 2003: 28 (Cuba); — Rehn 2003: 200 (phylogeny); — Trapero Quintana & Naranjo López 2004: 179 (in key); Machet 2004: 147 (French Guiana); — Esquivel 2005: 167 (Costa Rica, color photo); — Flint, Bastardo & Perez-Gelabert 2006: 71 (Dominican Republic); — González-Soriano & Novelo-Gutiérrez 2007: 129 (Mexico); — Heckman 2008: 528 (key to neotropical genera); — Perez-Gelabert 2008: 285 (Hispaniola); — Bailowitz, Danforth, & Deviche 2009: 16 (Sinaloa, Mexico); — Novelo-Gutiérrez & Gómez-Anaya 2009: 686 (Mexico).

Agrion (*Leptobasis*) *vacillans*: Gundlach 1888: 231 (redescription of color pattern); — Gundlach 1893: 268 (Puerto Rico).

Hylaeagrion croceum Förster 1906:15 (description ♀, ♂ Surinam).

Leptobasis vacillans var. *atrodorsum* Calvert 1902: 121 (description); — Calvert 1908: xxix (holotype ♂ from Santiago Iscuintla, Jalisco, Mexico designated); — Klots 1932: 88 (mention); — Gloyd 1981: 133 (El Salvador); — Steinmann 1997: 287 (catalog).

Leptobasis vacillans ecuadorica Calvert 1909: 201 (description ♂, ♀ Guayaquil and Quevedo, Ecuador, syntypes in ANSP); — Steinmann 1997: 287 (catalog).

Leptobasis vacillans guianae Calvert 1909: 201 (description ♂, ♀ Paramaribo, Guiana, syntypes in ANSP); — Machet 1989: 14 (French Guiana); — Steinmann 1997: 287 (catalog).

Leptobasis vacillans var. *atrovirens* Needham 1941: 15 (misquote of *L. vacillans atrodorsum* Calvert).

Leptobasis atrodorsum — Rácenis 1958: 193 (comparison with *L. vacillans*).

Specimens examined. Total: 31 ♂, 34 ♀. Puerto Rican specimens: 1 ♀, Municipio Carolina, ditch at junction of Hwy 26 & Ave. Campo Rico, 18°24'37"N, 66°0'0"W, 3 m, 4 xi 1981, leg. J.A. Garrison deposited in RWG; 1 ♂, Municipio Juncos, Juncos, 18°13'46"N, 65°55'17"W, 71 m, 4 xi 1981, no collector data, (RWG); 1 ♂, Municipio Mayagüez, Mayagüez, 18°12'11"N, 67°8'24"W, 48 m, 24 x 1981, leg. L. Gomez, 1 ♂ (RWG).

Dominican Republic specimens: 1 ♀, La Altagracia Prov., Nisibon, Finca Papagallo, beach, 18°54'25"N, 68°40'41"W, 16 vi 1999, leg. R.E. Woodruff & R. M. Baranowski (deposited in USNM); 4 ♂, 2 ♀, La Vega Prov., pond 4.5 mi S to La Vega, 19°12'N, 70°30'W, 16 iv 1981, leg. J.A. & R. W. Garrison (RWG); 1 ♂, pasture & small wet areas, 19.5 km NE of Jarabacoa, 19°17'27"N, 70°36'6"W, 200 m, 3 viii 1983, leg. R. W. Garrison (RWG); 7 ♂♂, 7 ♀♀, San Cristobal Prov., pond in sugar cane field, 9.5 km N Villa Altagracia on autopista Duarte, 18°44'2"N, 69°23'1"W, 93 m, 2 vii 1984, leg. J.A. & R. W. Garrison (RWG). Cuban specimens: 1 ♀, Cienfuegos Prov., Jardín Botánico Cienfuegos, 3 km E of Pepito Tey, 22°7'30"N, 80°19'12"W, 13 xii 1994, leg. O.S. Flint, Jr., (USNM); 1 ♀, La Habana Prov., Río Ariguanabo, at Base de Campismo, ca 4 km N of San Antonio de Los Baños, 22°54'54"N, 82°29'18"W, 8 xii 1994, leg. O.S. Flint, Jr. (USNM). Mexican specimens: 1 ♀, Morelos State, La Fuente, Municipio Jiutepec, 10 km W of Cuernavaca, 18°51'21"N, 99°16'56"W, 1300 m, 17 ix 1983, leg. R. W. Garrison (RWG); 1 ♀, Veracruz State, La Palma, NW of Sontecomapan, 18°56'N, 96°54'W, 866 m, 5 xii 1975, leg. C.M.& O.S. Flint, Jr. (USNM). Guatemalan specimens: 1 ♂, 1 ♀, Izabal Prov., Quiriguá, 15°16'N, 89°5'W, 68 m, 14 viii 1965, leg. O.S. Flint, Jr. & M.A. Ortiz B. (USNM); 2 ♂, 1 ♀, Izabal Prov., Séneca, 9 km 239, 15°28'N, 88°52'W, 50 m, 16–18 viii 1965, leg. O.S. Flint, Jr. & M.A. Ortiz B. (USNM); 1 ♂, Zacapa Prov., Los Amates, 15°16'N, 89°6'W, 80 m, 18 i 1905, leg. E.B. Williamson (USNM); 1 ♀, same data but leg. James S. Hine (USNM). Nicaraguan specimens: 1 ♂, Esteli Dept., Rio Pueblo Nuevo, Ducuali, 13°23'N, 86°86'W, 599 m, 13 vi 1967, leg. O.S. Flint, Jr. & M.A. Ortiz B. (USNM); 1 ♂, 1 ♀, Rt. 1, km 183, Condega, 13°21'N, 86°24'W, 562 m, 31 vii 1967, leg. O.S. Flint, Jr. & M.A. Ortiz B. (USNM). El Salvadoran specimens: 2 ♀, San Salvador, near Colima, roadside pool at km 40, 14°3'31"N, 89°8'9"W, 247 m, 30 vi 1966, leg. O.S. Flint, Jr. & M.A. Ortiz B. (USNM). Costa Rican specimens: 1 ♂, 1 ♀, Guanacaste Prov., Hacienda Taboga, wet marsh, 10°20'N, 85°12'W, 4 m, 16–26 vii 1967, leg. O.S. Flint, Jr. & M.A. Ortiz B. (USNM); 1 ♂, 1 ♀, Heredia Prov., Puerto Viejo, La Selva Biological Station, 10°28'N, 84°1'W, 76 m, 20 vii 1989, leg. C. Esquivel H. (RWG). Panamanian specimens: 1 ♂, Panama Prov., Trinidad River, 8°8'N, 81°14'W, 217 m, 2 iv 1911, leg. August Busck; 1 ♂, same data but 5 iv 1911; 1 ♂, same data but 15–30 iii 1912; 1 ♂, La Chorrera, 8°52'34"N, 79°46'36"W, 78 m, iv 1912, leg. August Busck (all USNM); 1 ♂, 1 ♀, San Blas Prov., Navagandi, 9°1'N, 77°48'W, 76 m, 1–6 iii 1985, leg. O.S. Flint, Jr., J. Louton (RWG, USNM); 1 ♂, 1 ♀, Veraguas Prov., Los Algarrobos, 8°29'45"N, 82°32'22"W, 170 m, 5 viii 1967, leg. O.S. Flint, Jr. (USNM). Colombian specimens: 1 ♀, Choco Dept., Quibdó, perímetro urbano W of Puente Río Cabí, 5°41'3"N, 76°38'56"W, 47 m, 10 xii 1997, leg. M. García (deposited in TWD); 1 ♀, Valle del Cauca Dept., Bajo Calima, 3°59'47"N, 76°58'28"W, 75 m, 30 i 1986, leg. M.E. Burbano (RWG). Venezuelan specimens: 1 ♀, Aragua State, Rancho Grande, 10°4'14"N, 67°32'50"W, 1100 m, 17 ii 1969, leg. W.D. Duckworth (USNM); 1 ♀, Est. Exp. Cataurito, ca. 32 km. E. Villa de Cura, 10°3'N, 67°19'W, 1128 m, 28 i 1983, leg. O.S. Flint, Jr. (USNM); 2 ♀, Barinas State, Río Masparro, 25 ii 1969, leg. W.D. Duckworth & R.E. Dietz (USNM). Ecuadoran specimens: 1 ♂, 1 ♀, Guayas Prov., Guayaquil, 2°44'N, 79°45'W, 17 m, no date, leg. F. Campos R. (USNM); 2 ♂, 1 ♀, Pichincha Prov., 29 km W of Santo Domingo de los Colorados, 0°15'18"S, 79°23'51"W, 276 m, 7 v 1975, leg. Andrea Langley (USNM); 1 ♂, 1 ♀, Seepage fen at Hotel Colorados, Hwy 30 about 16 km E Santo Domingo, 0°15'S, 79°9'W, 604 m, 30 i 1997, leg. Jerrell J. Daigle (RWG).

Diagnosis. This common and widespread species is nearest to *L. mauffrayi* and *L. raineyi* and is diagnosed under those species; it appears to be allopatric to both.

Dimensions. Males (*n* 10): Hw 11.7–18.6 (15.9); abdomen 21.7–30.6 (25.8); total length 25.5–35.9 (31.4). Females (*n* 10): Hw 13.8–17.8 (15.9); abdomen 22.6–28.7 (25.8); total length 27.5–33.9 (31.4).

Remarks. The long list of synonyms documents the chromatic variability and widespread distribution of this species. Ontogenetic and chromatic differences have led authors to assign varietal names and some (e. g. Rácenis 1958) considered one of these (*L. atrodorsum*) as a distinct species. Our examination of the genital ligula for this species throughout its range, including that of a syntype of *L. vacillans ecuadorica*, shows them all to be the same. Selys' original description was from a pair from Cuba with immature (all orange to brown) coloring. Calvert (1902) applied the varietal name *atrodorsum* to specimens from Mexico and Panama with a blackish epicranium and pale postocular spots (Fig. 1d), and pale green thorax with black brown mid-dorsal and humeral stripes, and he gave conditional varietal names to South American material from Guyana and Ecuador with darker abdomens (*guianae* and *ecuadorica* respectively).

Distribution. Southern Texas, USA (Lasley & Abbott 2009, Rose 2009), Antilles, and Mexico south through Ecuador (Fig. 28).

Discussion

Contrary to the statement of Rácenis (1959), there is a short ventro-basal process on the cercus of *L. buchholzi* (Fig. 20a), which is shared by all *Leptobasis* species (Figs. 20b–h). This process is usually hidden in lateral view and in posterior view if the cerci are pressed together, and can be seen only when the cerci are outspread. We consider the pair of lobe-like processes on the sides of the medial cleft on S10 postero-dorsal margin not generically diagnostic and we have found both states (pair of lobe-like processes present and absent) in other genera (i.e. *Cyanallagma*, *Enallagma*, *Ischnura*, *Mesoleptobasis*, *Tepuibasis*). Donnelly (1967) considered the genital ligula of *Chrysobasis* and *Leptobasis* similar to that of *Apanisagrion lais* (Brauer *in* Selys) and *Hesperagrion heterodoxum* (Selys). However, in *Apanisagrion* the chitinized structures are small, fixed, broadly triangular plate-like processes arising on the ental surface and latero-posteriorly directed (Fig. 18). In both *Apanisagrion* and *Hesperagrion*, the inner transverse process is not homologous to a true inner fold as defined by Kennedy (1916) since it is distal and not proximal to the flexure (Figs. 17a, c, 18a, c; De Marmels 2002).

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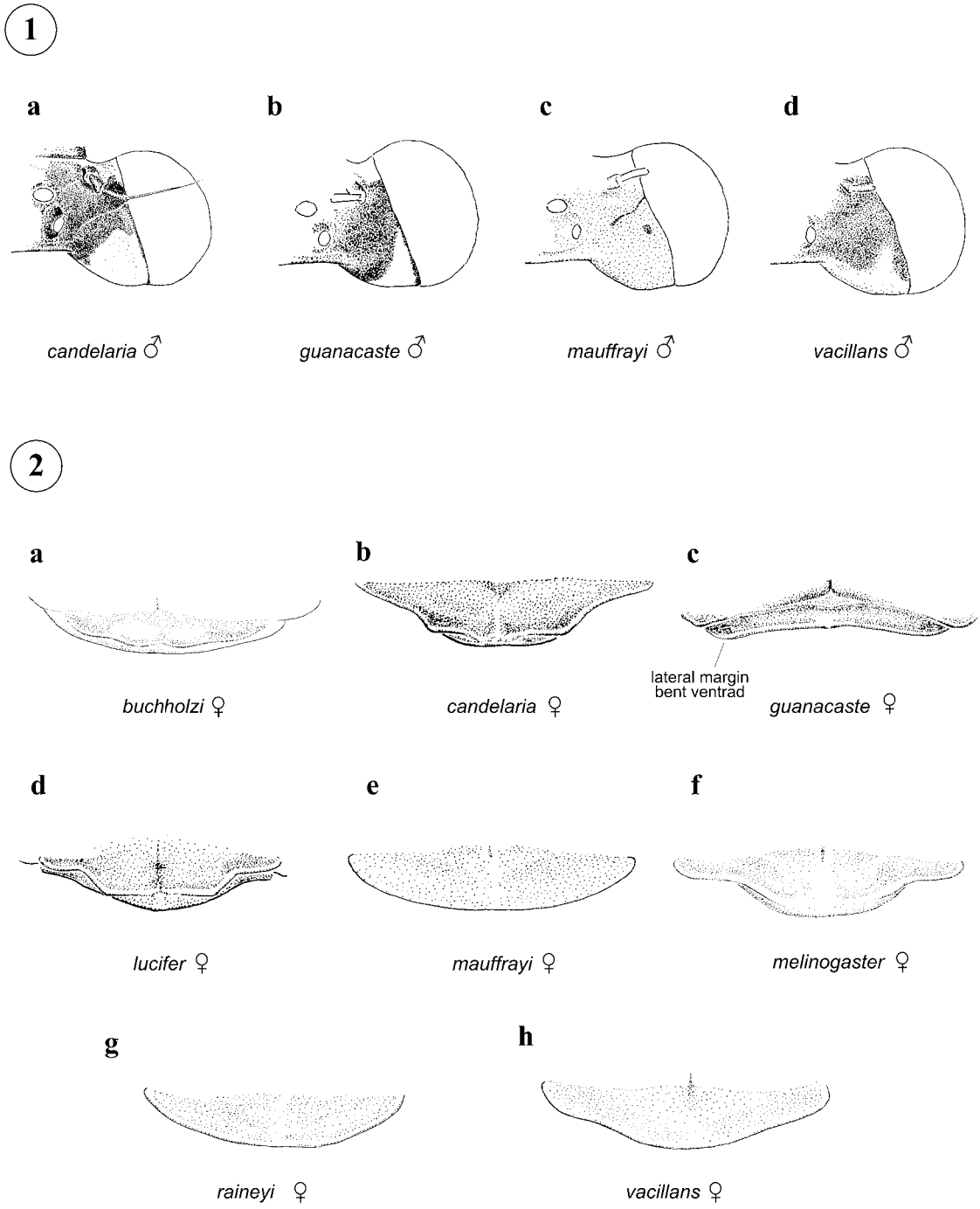


FIGURE 1. Head, dorsal view of right half. (a) *Leptobasis candelaria*, male, Mexico, Veracruz, E of Córdoba; (b) *L. guanacaste*, male paratype, Costa Rica, Guanacaste, Hacienda Taboga; (c) *L. mauffrayi*, male holotype, Peru, Manu, Pakitza; (d) *L. vacillans*, male, Dominican Republic, La Vega, S of La Vega.

FIGURE 2. Female pronotum, dorsal view. (a) *Leptobasis buchholzi*, paratype, Venezuela, Guárico, Pericoco [redrawn from a draft by J. De Marmels]; (b) *L. candelaria*, female, Belize, Toledo, Monkey River; (c) *L. guanacaste*, paratype, Costa Rica, Guanacaste, Hacienda Taboga; (d) *L. lucifer*, Mexico, Campeche, Laguna Zoh; (e) *L. mauffrayi*, allotype, Peru, Manu, Pakitza; (f) *L. melinogaster*, USA, Texas, Kleberg, King Ranch; (g) *L. raineyi*, Trinidad, St. George, Indian Walk Ride; (h) *L. vacillans*, Cuba, Cienfuegos, E of Pepito Rey.

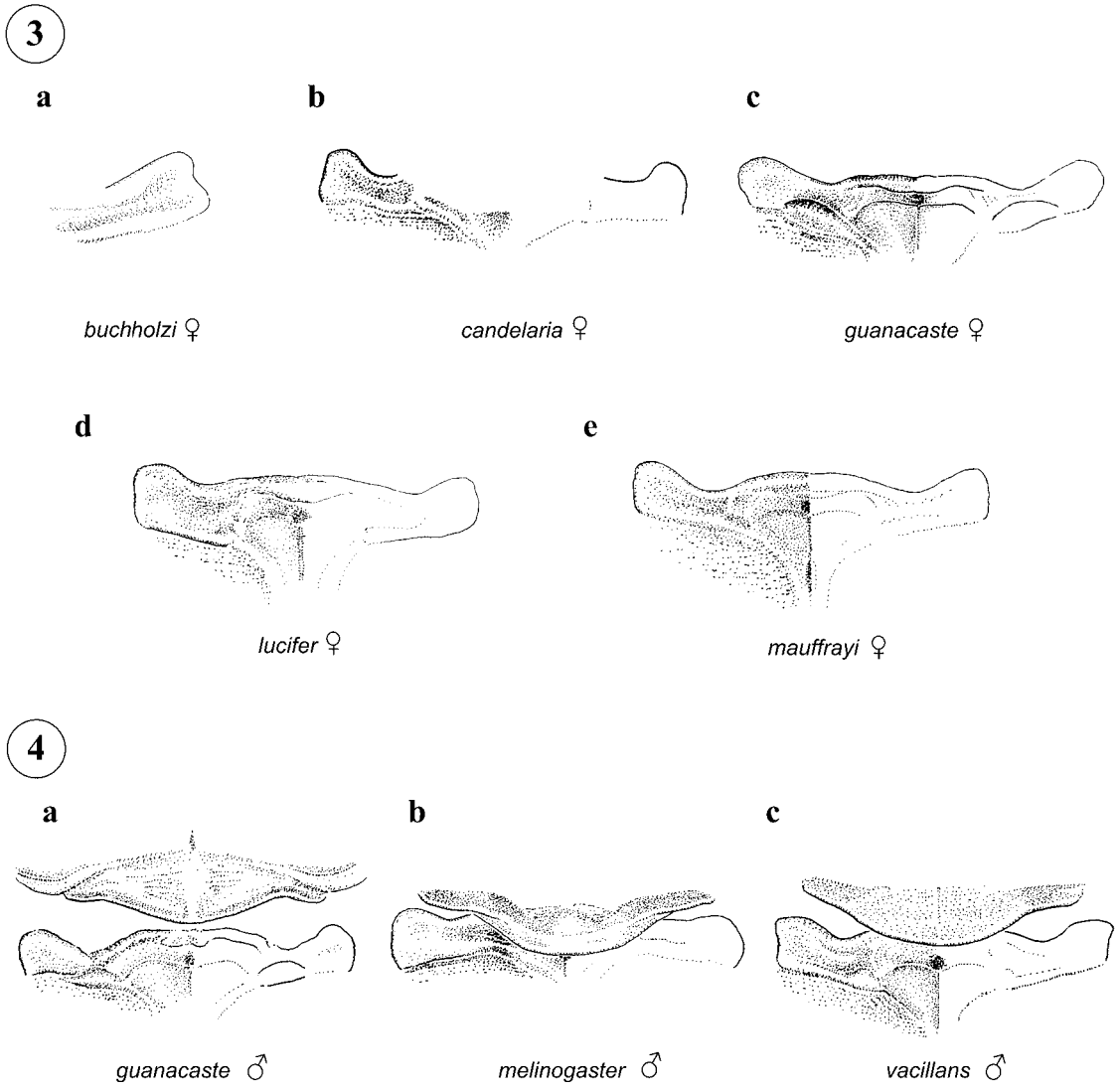


FIGURE 3. Female mesostigmal plates, dorsal view. (a) *Leptobasis buchholzi*, right plate, paratype, Venezuela, Guárico, Pericoco [redrawn from a draft by J. De Marmels]; (b) *L. candelaria*, female, Belize, Toledo, Monkey River; (c) *L. guanacaste*, paratype, Costa Rica, Guanacaste, Hacienda Taboga; (d) *L. lucifer*, Mexico, Campeche, Laguna Zoh; (e) *L. mauffrayi*, allotype, Peru, Manu, Pakitza.

FIGURE 4. Male pronotum and mesostigmal plates, dorsal view. (a) *Leptobasis guanacaste*, paratype, Costa Rica, Guanacaste, Hacienda Taboga; (b) *L. melinogaster*, USA, Texas, Hidalgo, Santa Ana Natural Wildlife Reserve; (c) *L. vacillans*, Dominican Republic, Jarabacoa.

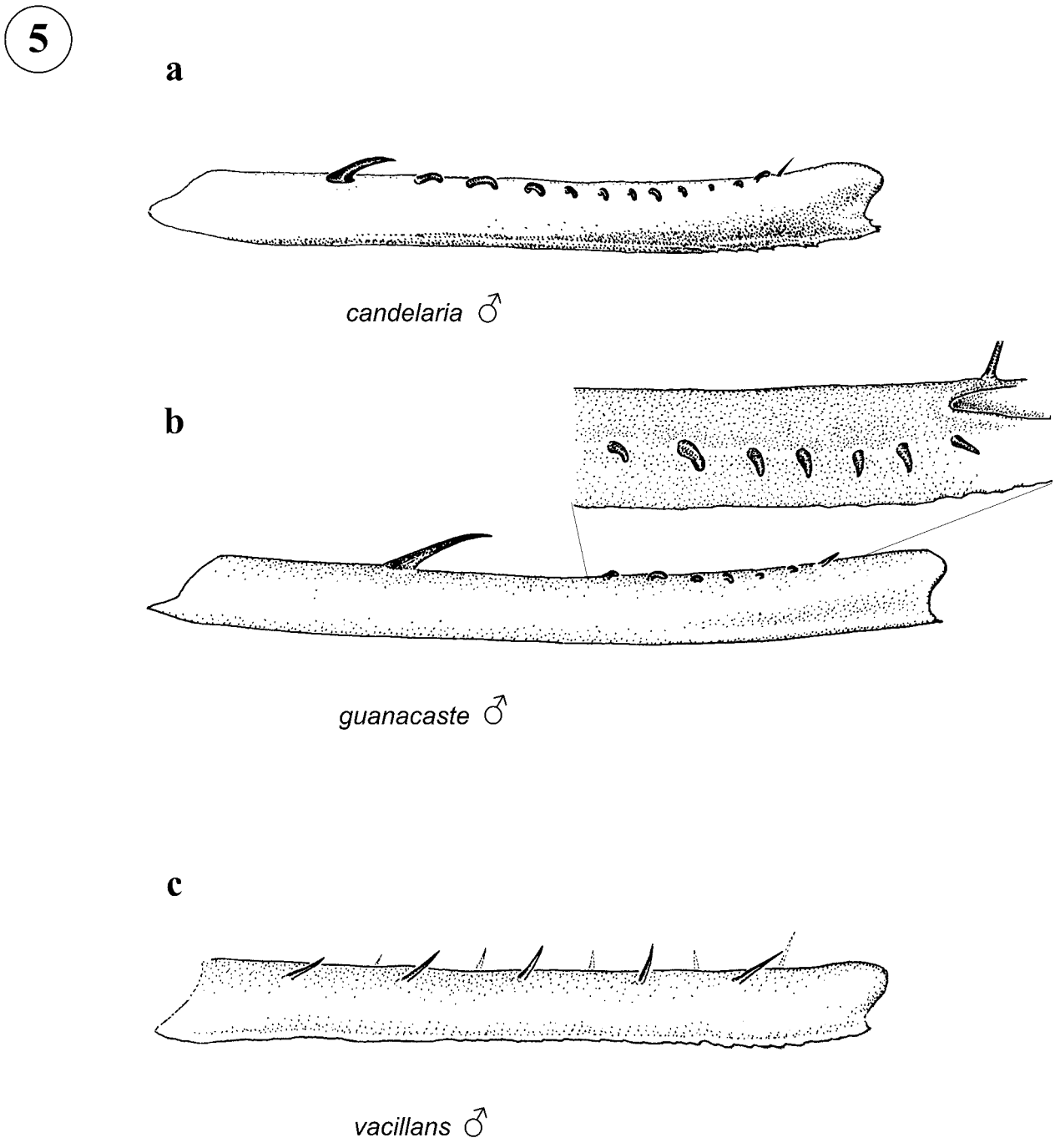


FIGURE 5. Male metafemur. (a) *Leptobasis candelaria*, Belize, Toledo, Monkey River; (b) *L. guanacaste*, paratype, Costa Rica, Guanacaste, Hacienda Taboga; (c) *L. vacillans*, Dominican Republic, Jarabacoa.

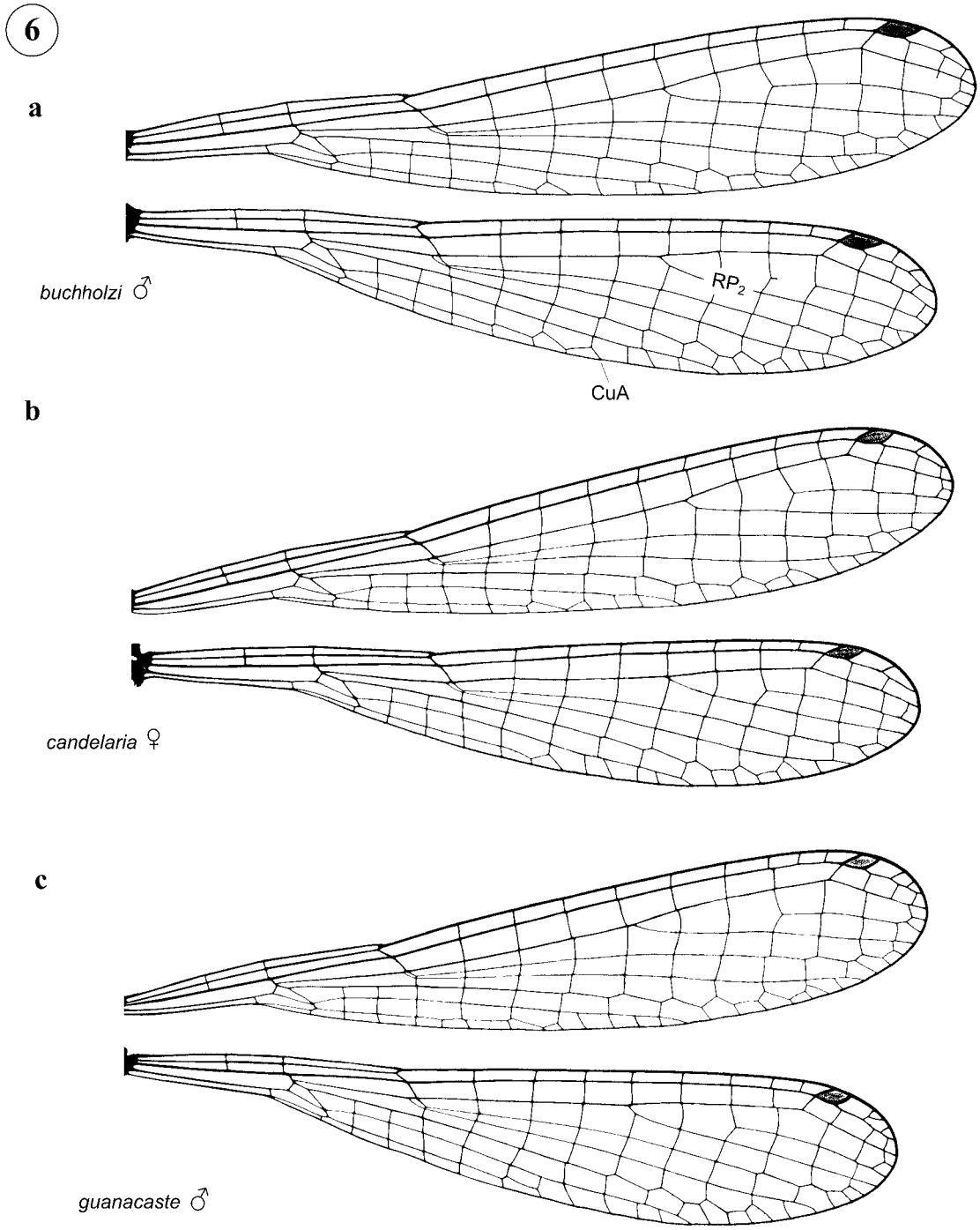


FIGURE 6. Wings. (a) *Leptobasis buchholzi*, male, Colombia, Puerto Colombia; (b) *L. candelaria*, female, Belize, Toledo, Monkey River; (c) *L. guanacaste*, paratype, Costa Rica, Guanacaste, Hacienda Taboga.

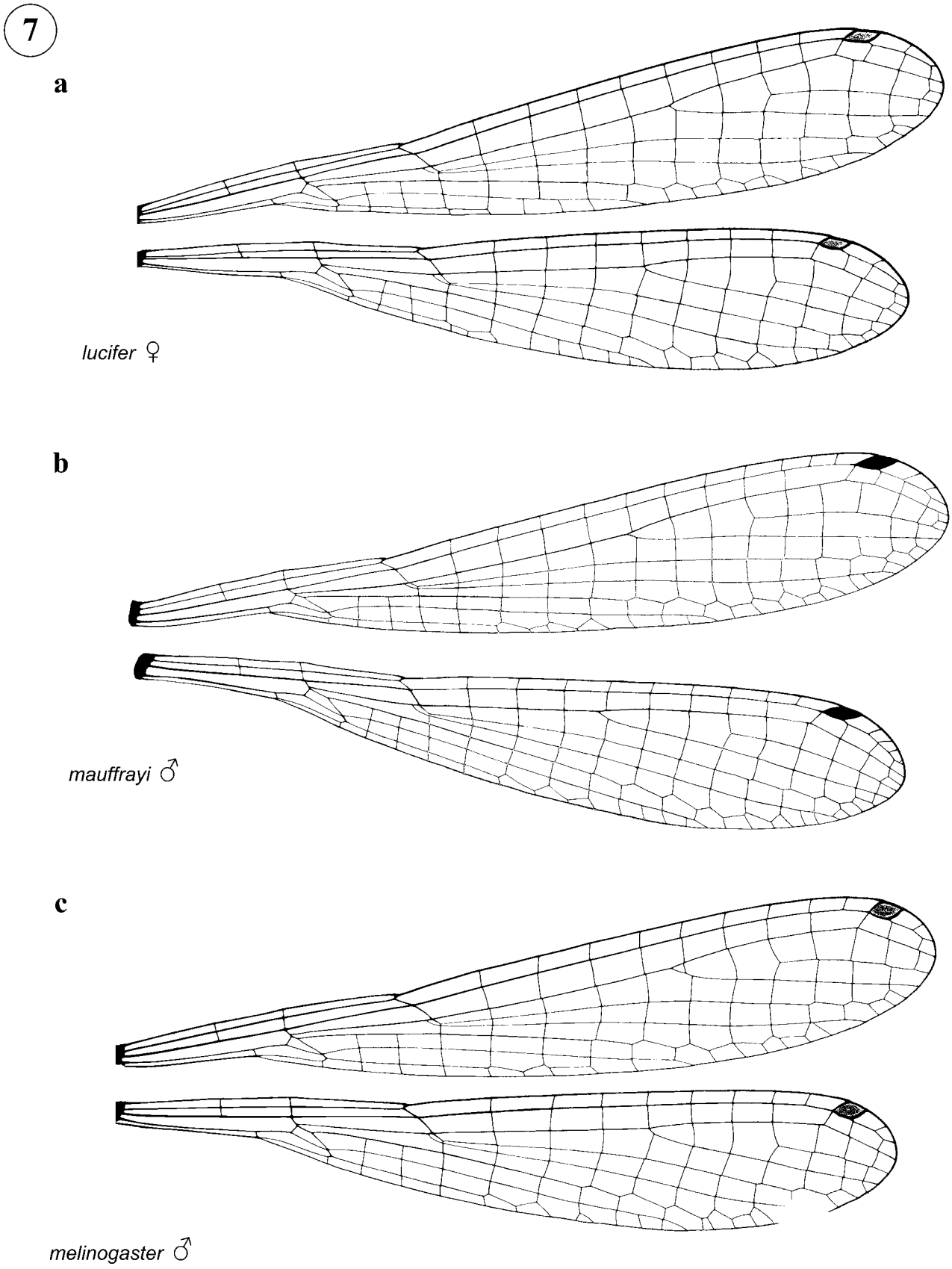


FIGURE 7. Wings. (a) *Leptobasis lucifer*, female, Mexico, Campeche, Laguna Zoh; (b) *L. mauffrayi*, male paratype, Peru, Manu, Pakitza; (c) *L. melinogaster*, male, USA, Texas, Hidalgo, Santa Ana Natural Wildlife Reserve.

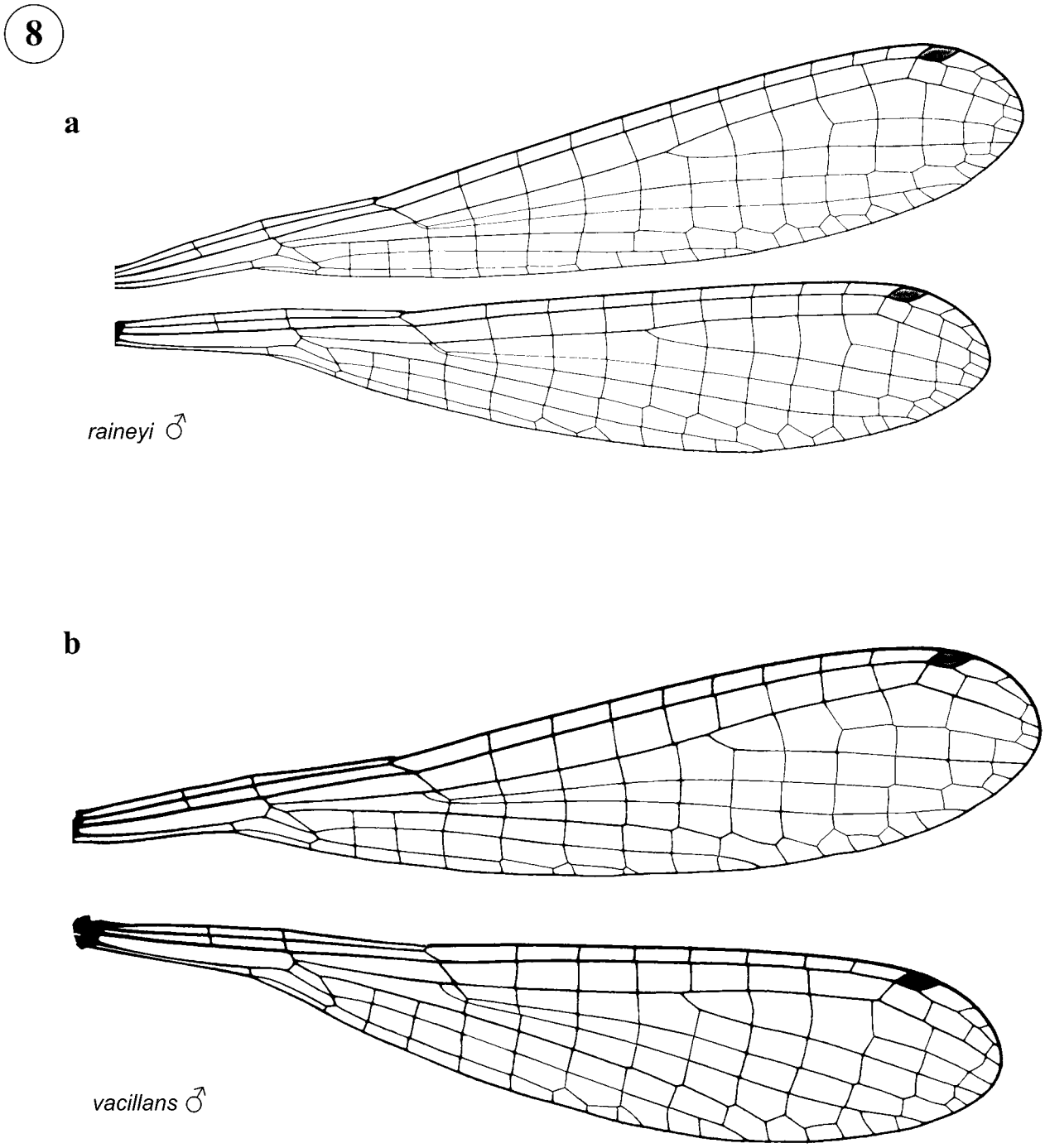
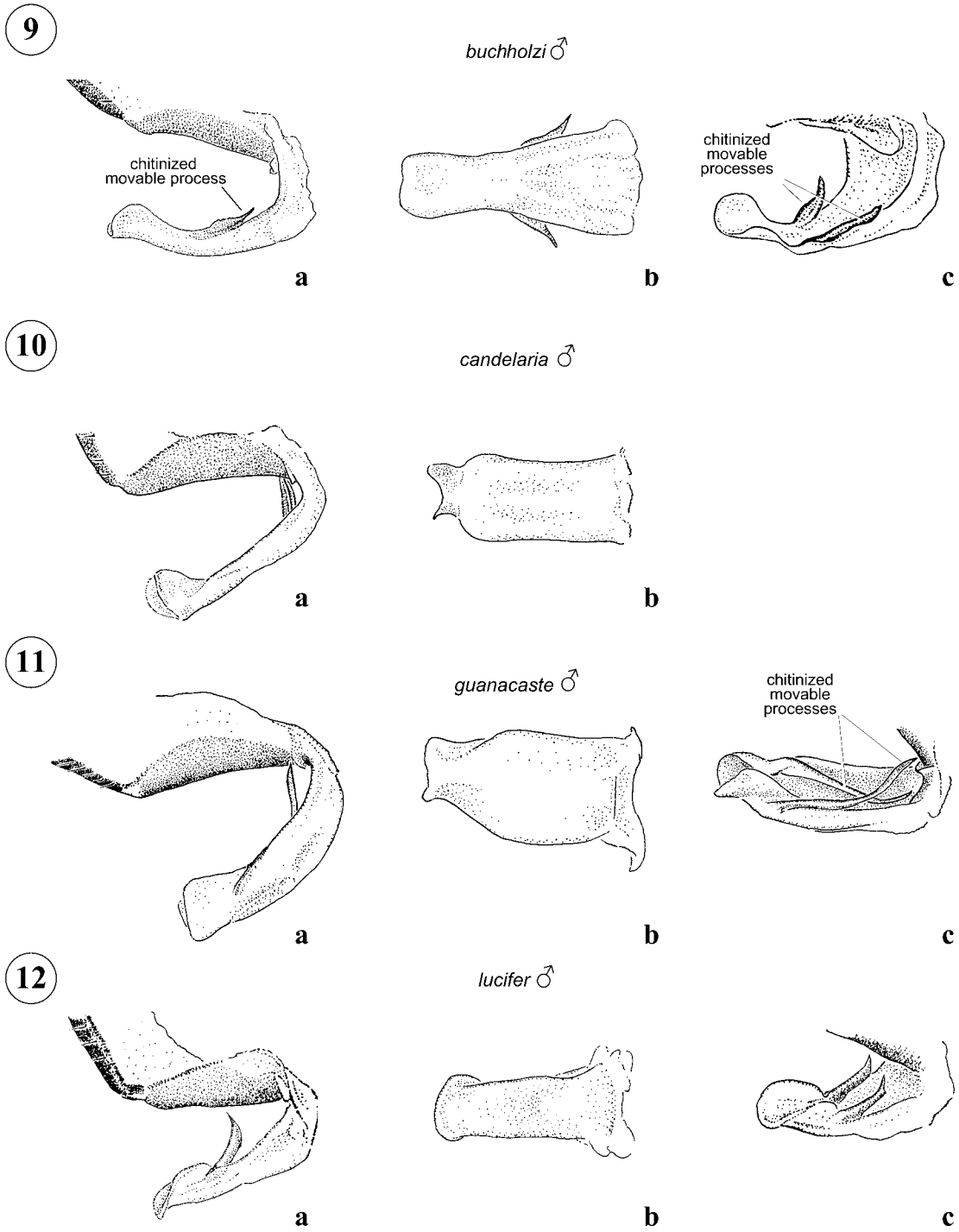
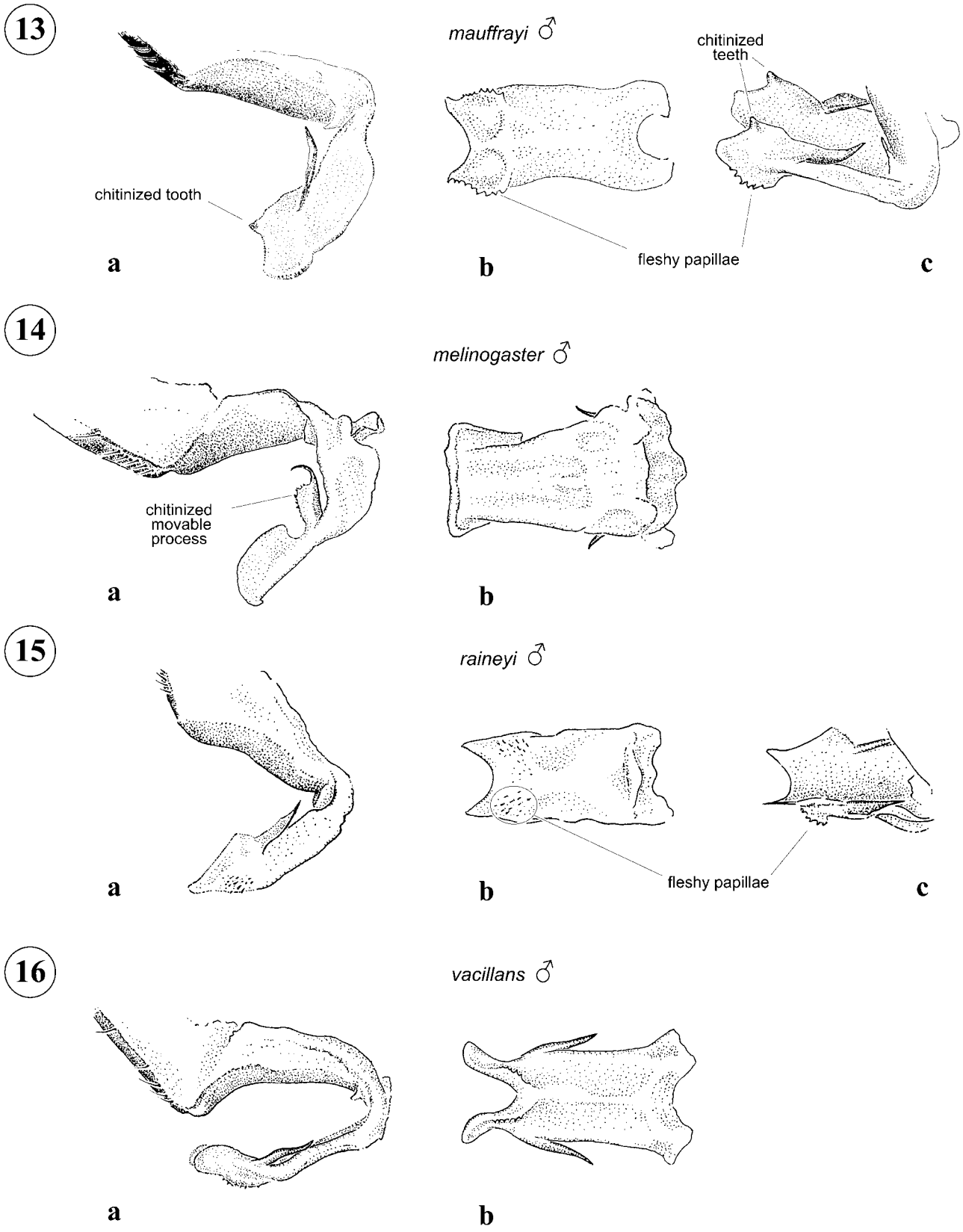


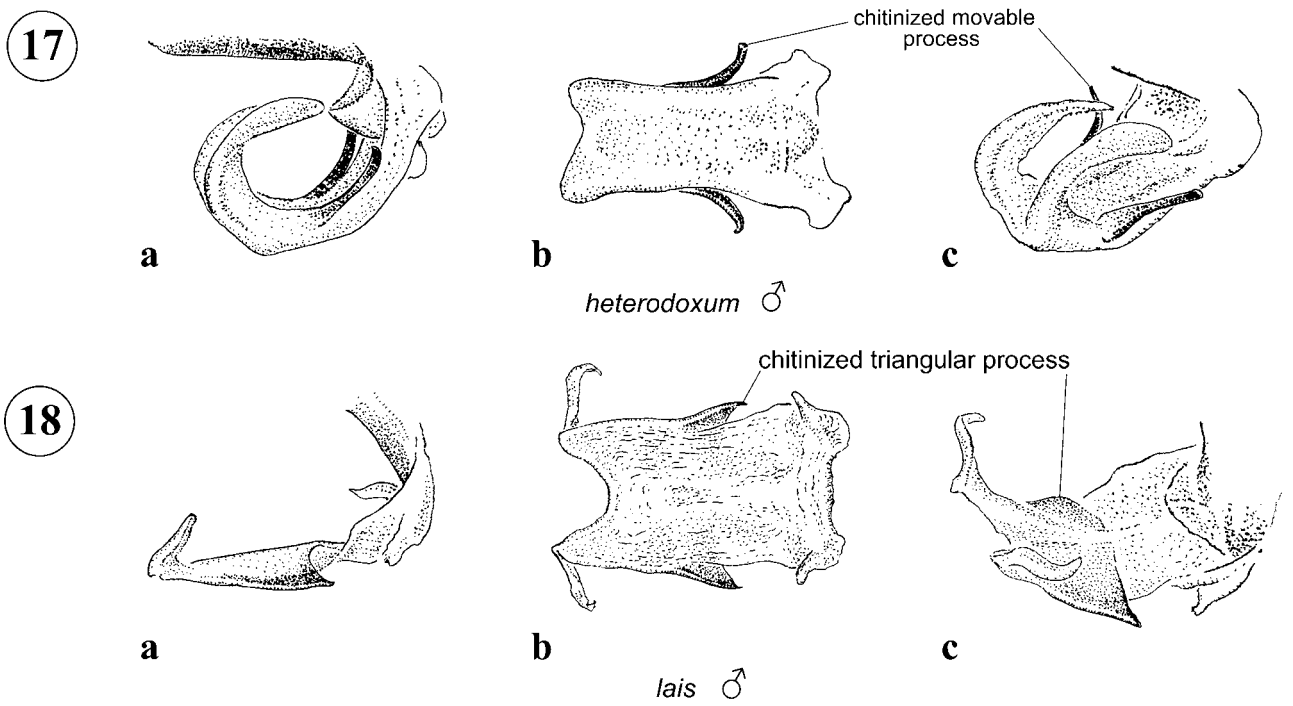
FIGURE 8. Wings. (a) *Leptobasis raineyi*, male, Trinidad, St. Andrew, 1 mi W of Cumuto; (b) *L. vacillans*, male, Dominican Republic, La Altagracia, Nisibon.



FIGURES 9-12. Genital ligula, (a) lateral view; (b) ectal view; (c) latero-ental view. 9: *Leptobasis buchholzi*, Colombia, Puerto Colombia. 10: *L. candelaria*, Belize, Toledo, Monkey River. 11: *L. guanacaste*, holotype, Costa Rica, Guanacaste, Hacienda Taboga; 12: *L. lucifer*, Mexico, Campeche, Laguna Zoh.



FIGURES 13-16. Genital ligula, (a) lateral view; (b) ectal view; (c) latero-ental view. 13: *Leptobasis mauffrayi*, paratype, Peru, Huanuco, N of Cucharas; 14: *L. melinogaster*, USA, Texas, Hidalgo, Santa Ana Natural Wildlife Reserve; 15: *L. raineyi*, Trinidad, St. Andrew, 1 mile W of Cumuto; 16: *L. vacillans*, Dominican Republic, La Altagracia, Nisibon.



FIGURES 17–18. Genital ligula, (a) lateral view; (b) ectal view; (c) latero-ental view. 17: *Hesperagrion heterodoxum*, USA, Arizona, Yarnell; 18: *Apanisagrion lais*, USA, Arizona, Hot Springs Canyon

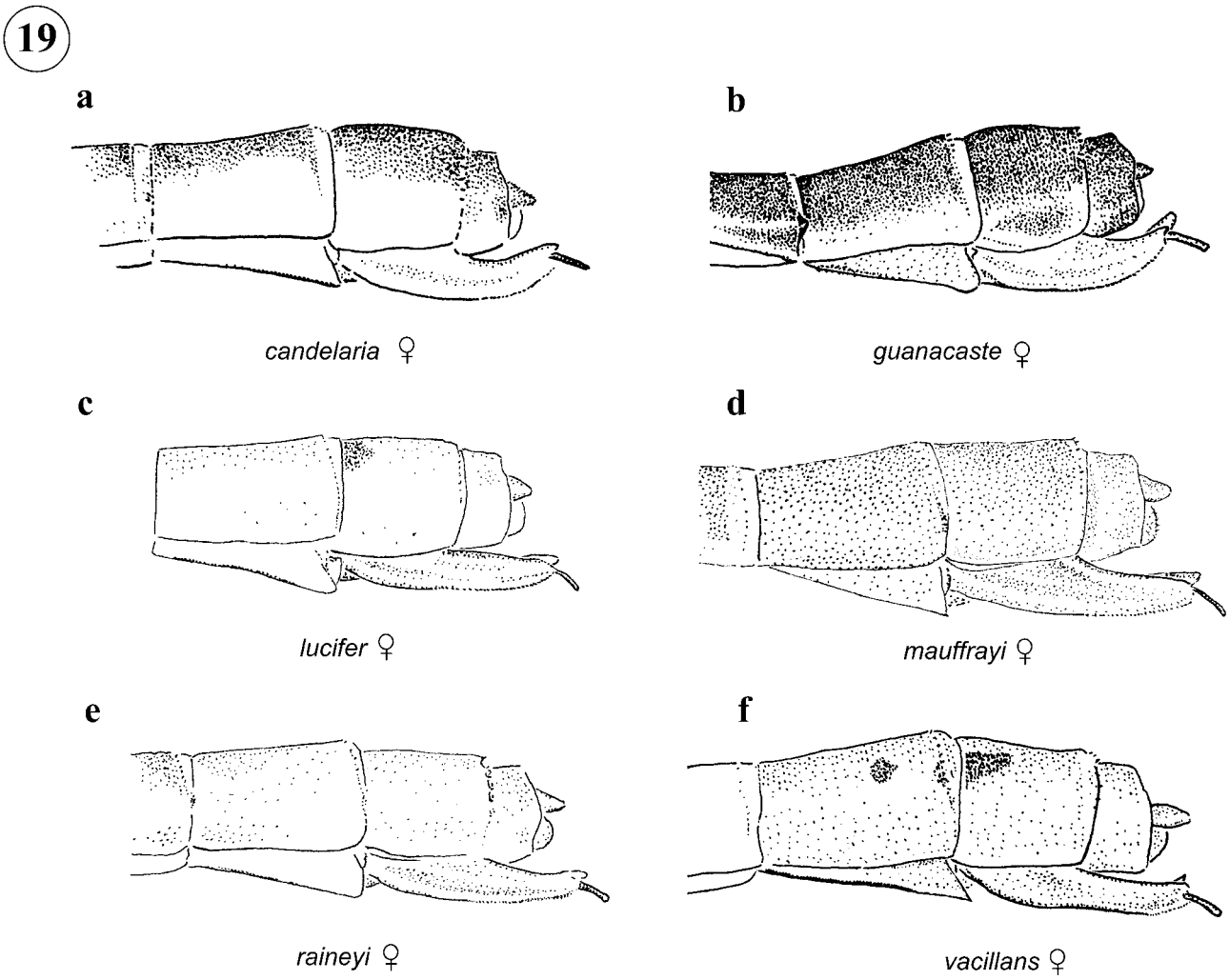


FIGURE 19. Female S7–10, lateral view. (a) *Leptobasis candelaria*, Belize, Toledo, Monkey River; (b) *L. guanacaste*, allotype, Costa Rica, Guanacaste, Hacienda Taboga; (c) *L. lucifer*, Mexico, Campeche, Laguna Zoh; (d) *L. mauffrayi*, allotype, Peru, Madre de Dios, Pakitza; (e) *L. raineyi*, Trinidad, St. George, Indian Walk Ride; (f) *L. vacillans*, Mexico, Morelos, La Fuente.

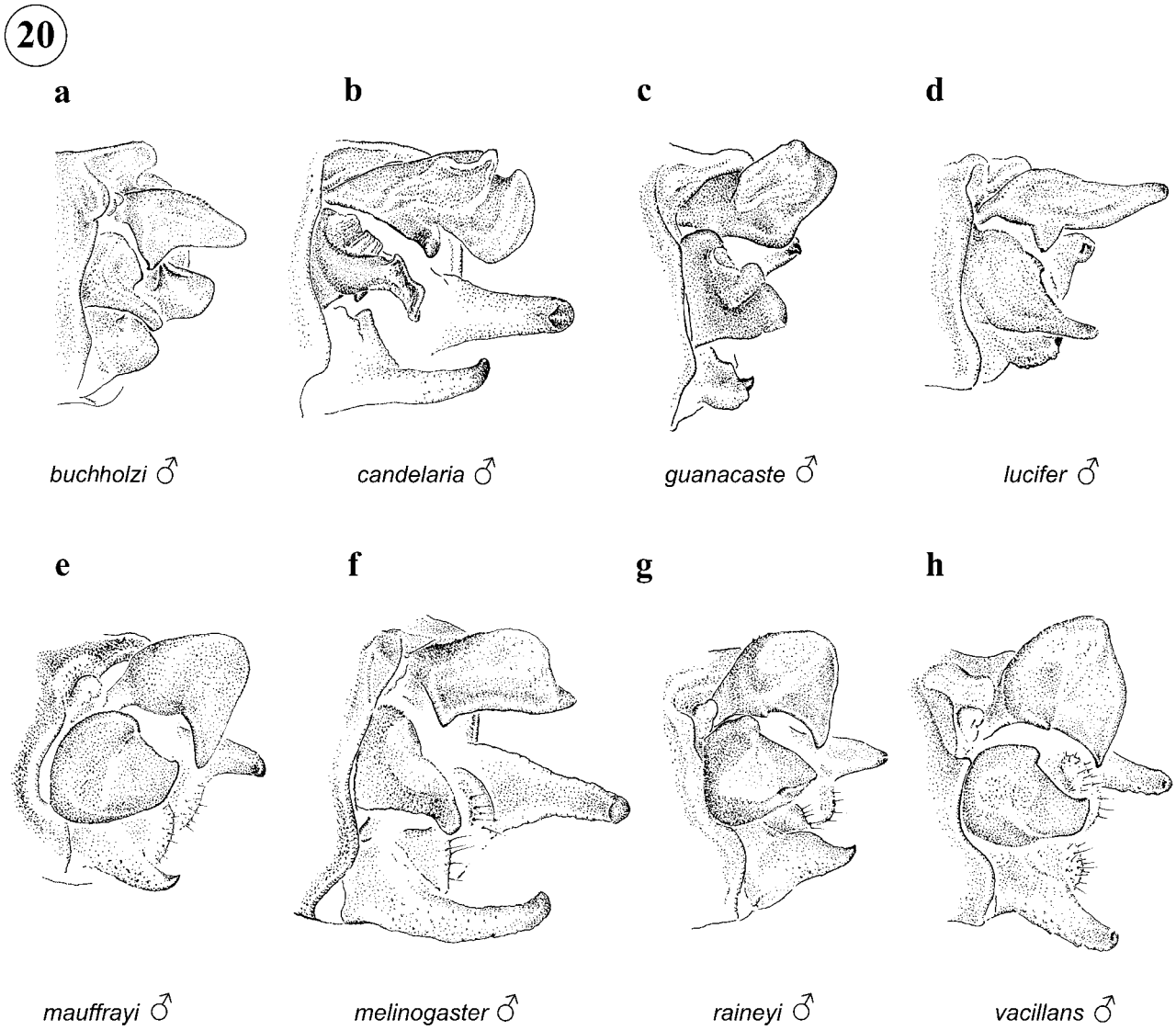


FIGURE 20. Male S10, medio-dorsal view. (a) *Leptobasis buchholzi*, Colombia, Puerto Colombia; (b) *L. candelaria*, Belize, Toledo, Monkey River; (c) *L. guanacaste*, holotype, Costa Rica, Guanacaste, Hacienda Taboga; (d) *L. lucifer*, Costa Rica, Heredia, Finca La Selva; (e) *L. mauffrayi*, holotype, Peru, Madre de Dios, Pakitza; (f) *L. melinogaster*, USA, Texas, Hidalgo, Santa Ana Natural Wildlife Reserve; (g) *L. raineyi*, Trinidad, St. Andrew, 1 mi W of Cumuto; (h) *L. vacillans*, Puerto Rico, Mayagüez, Mayagüez.

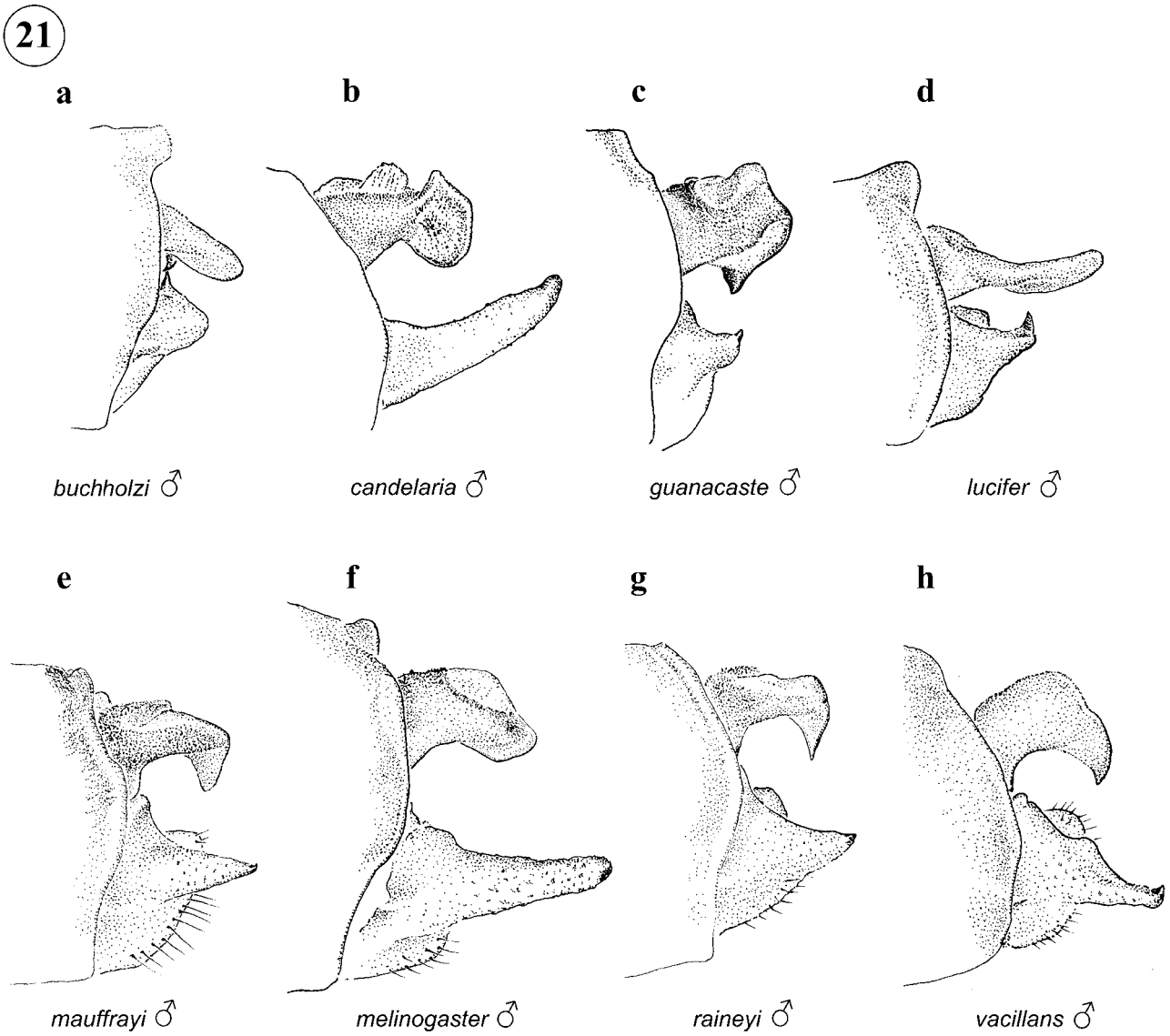


FIGURE 21. Male S10, lateral view. (a) *Leptobasis buchholzi*, Colombia, Puerto Colombia; (b) *L. candelaria*, Belize, Toledo, Monkey River; (c) *L. guanacaste*, holotype, Costa Rica, Guanacaste, Hacienda Taboga; (d) *L. lucifer*, Costa Rica, Heredia, Finca La Selva; (e) *L. mauffrayi*, holotype, Peru, Madre de Dios, Pakitza; (f) *L. melinogaster*, USA, Texas, Hidalgo, Santa Ana Natural Wildlife Reserve; (g) *L. raineyi*, Trinidad, St. Andrew, 1 mile W of Cumuto; (h) *L. vacillans*, Puerto Rico, Mayagüez, Mayagüez.

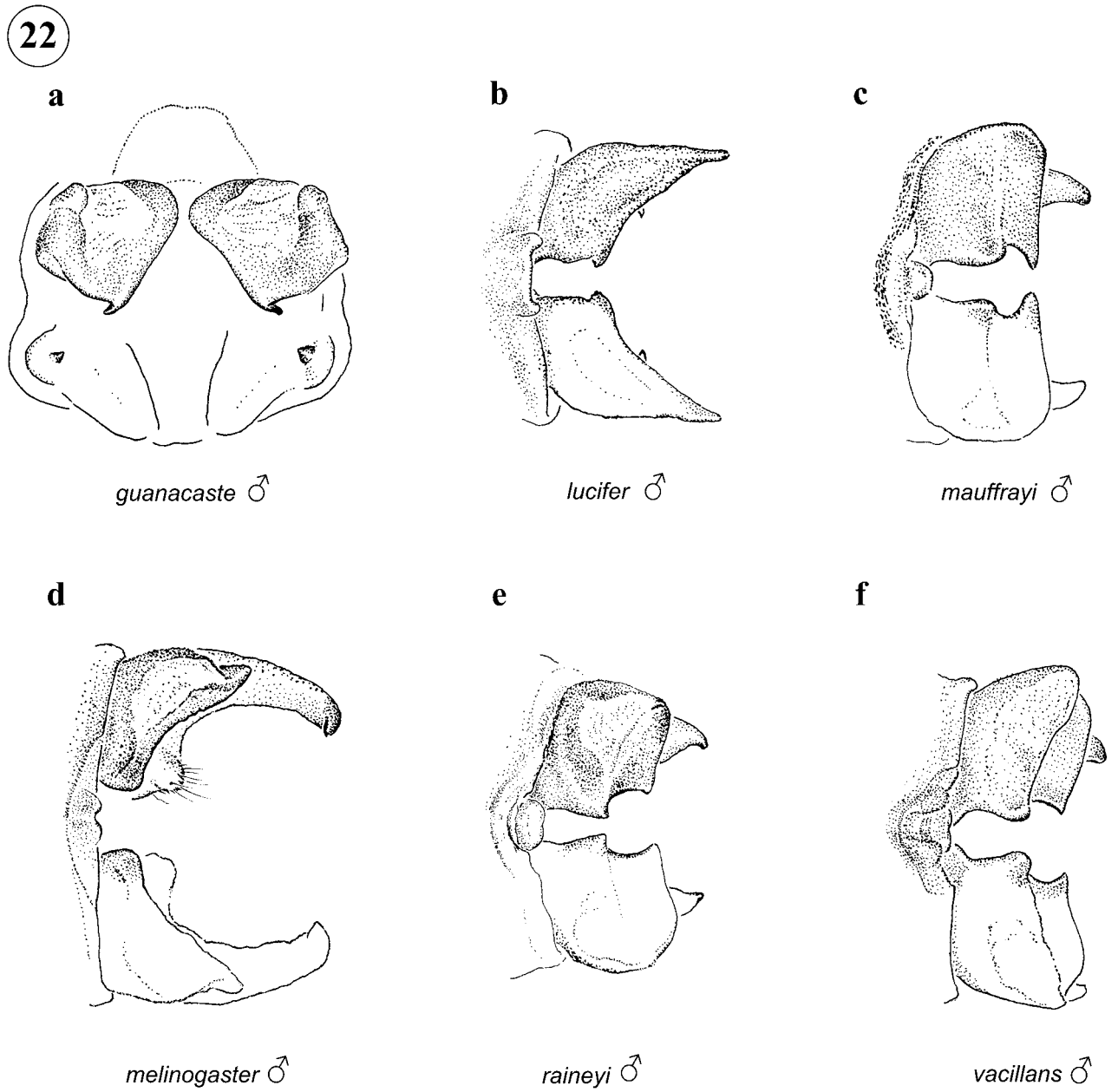


FIGURE 22. Male S10. (a) *Leptobasis guanacaste*, holotype, Costa Rica, Guanacaste, Hacienda Taboga; (b) *L. lucifer*, Costa Rica, Heredia, Finca La Selva; (c) *L. mauffrayi*, holotype, Peru, Madre de Dios, Pakitza; (d) *L. melinogaster*, USA, Texas, Santa Anna; (e) *L. raineyi*, Trinidad, St. Andrew, 1 mile W of Cumuto; (f) *L. vacillans*, Puerto Rico, Mayagüez, Mayagüez. (a) posterior view; (b–f) dorsal view.

FIGURE 23. Adults of *Leptobasis*. (a) *L. guanacaste* immature male, Costa Rica, Guanacaste, Río Cañas, photographed by William A. Haber; (b) *L. guanacaste* female, Costa Rica, Guanacaste, Río Cañas, photographed by William A. Haber.

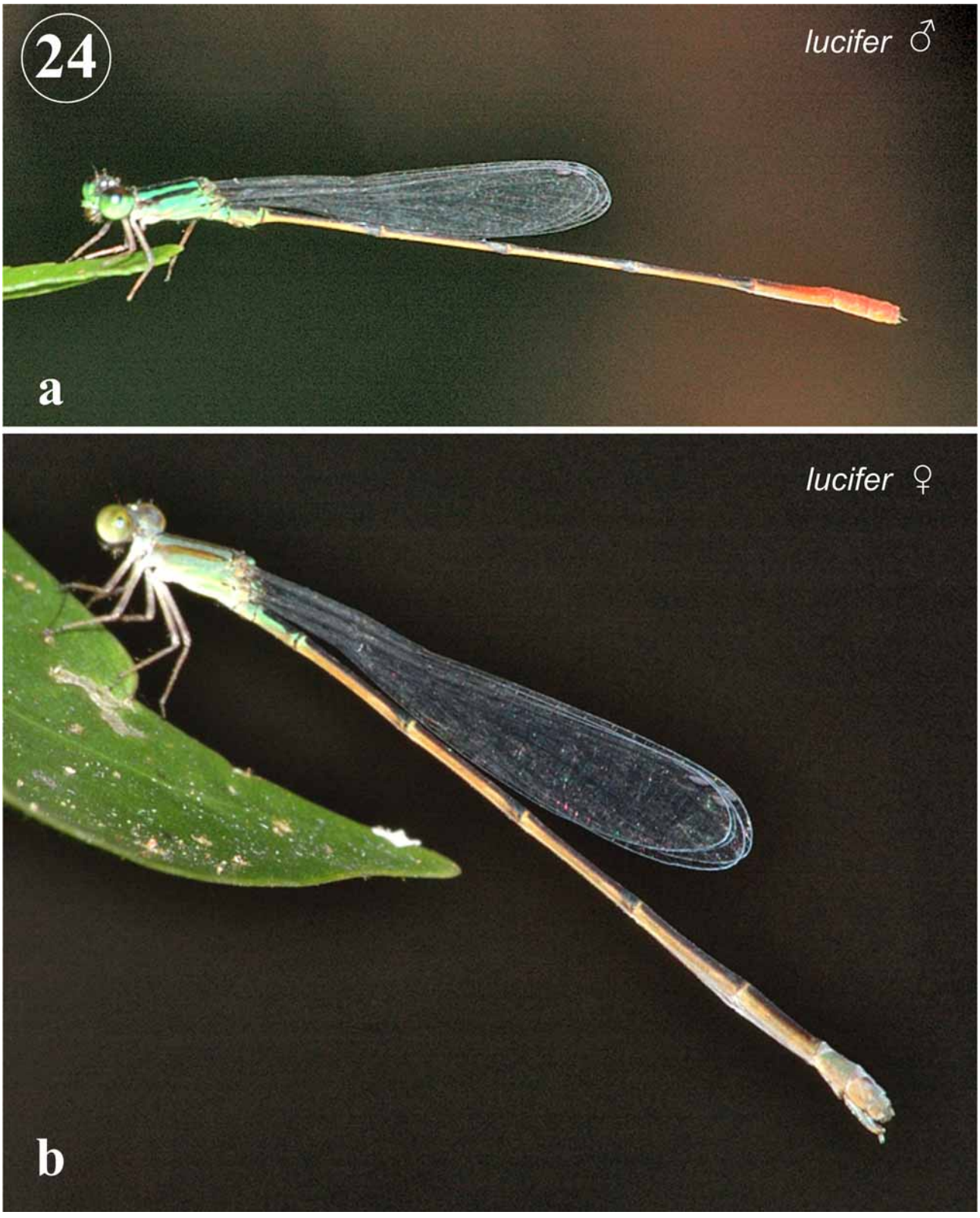
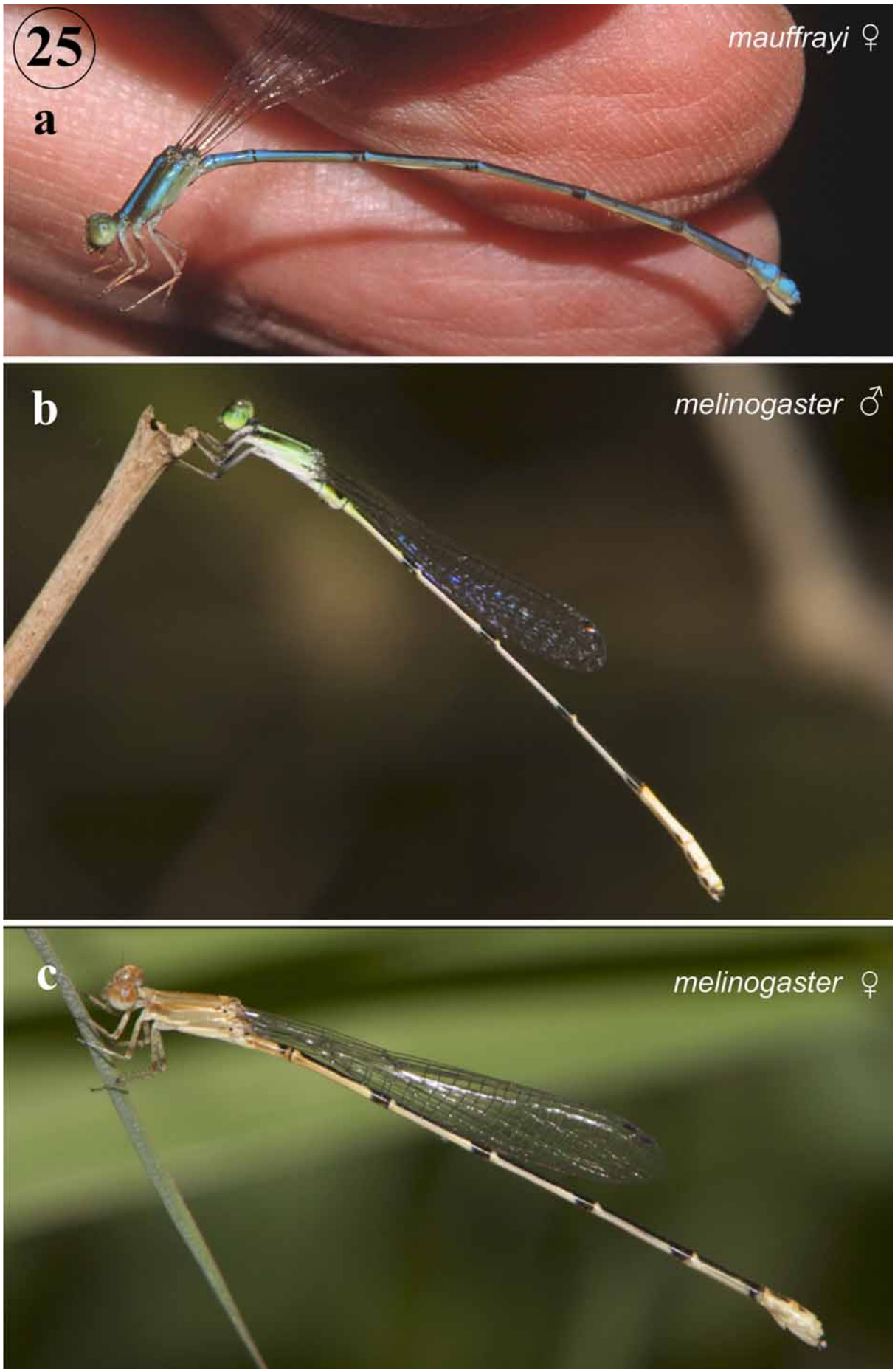


FIGURE 24. Adults of *Leptobasis lucifer*, USA, Florida, Collier, Corkscrew Swamp Sanctuary. (a) male, photographed by Dennis R. Paulson; (b) female, photographed by Netta Smith.

FIGURE 25. Adults of *Leptobasis*. (a) *L. mauffrayi* female, Peru, Madre de Dios, Explorer's Inn, photographed by Dennis R. Paulson; (b) *L. melinogaster* male, USA, Texas, Hidalgo, Santa Ana National Wildlife Refuge, photographed by J.C. Abbott; (c) *L. melinogaster* female, USA, Texas, Hidalgo, Santa Ana National Wildlife Refuge, photographed by J.C. Abbott.


25
a
mauffrayi ♀
b
melinogaster ♂
c
melinogaster ♀

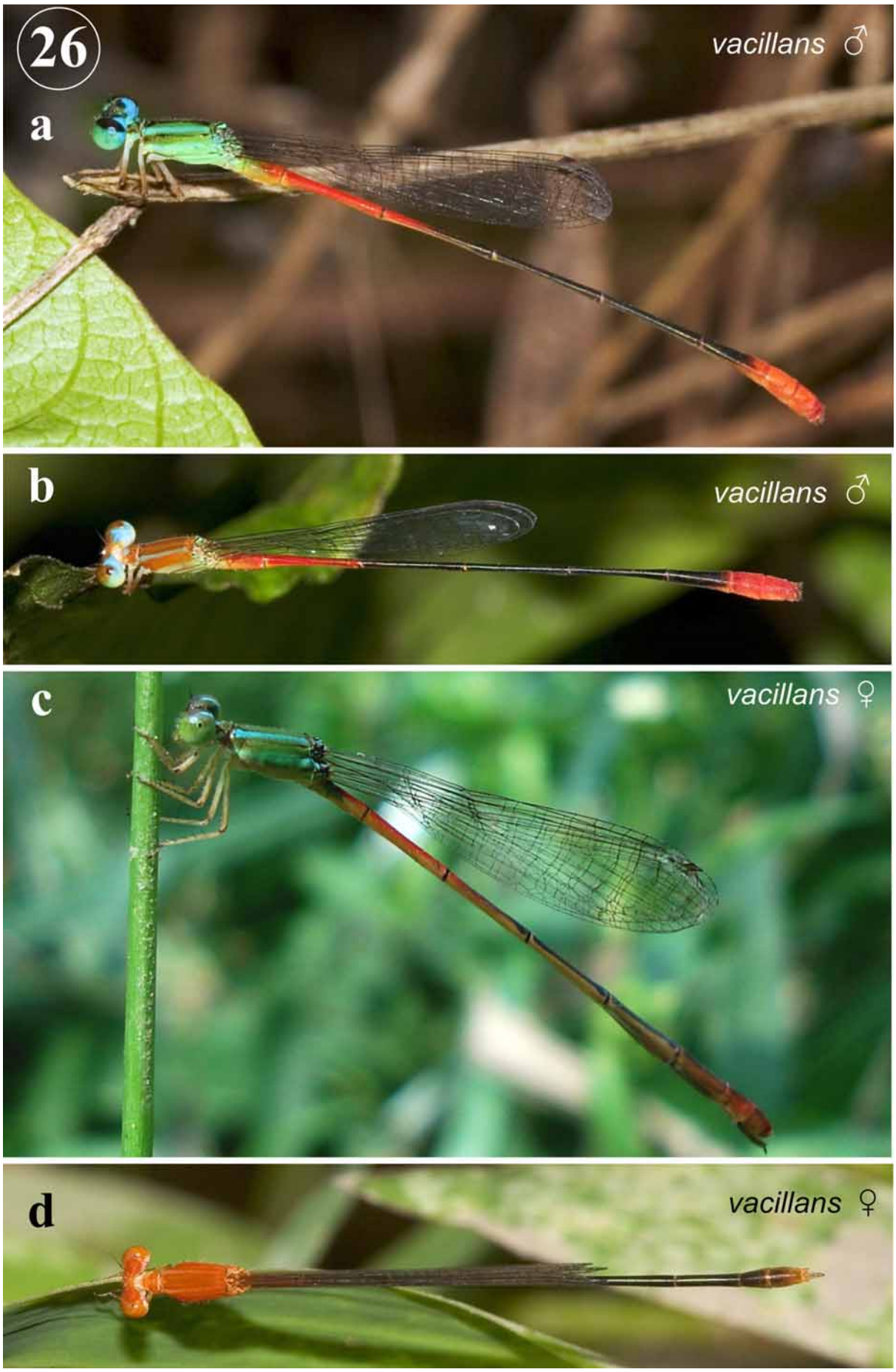

26
a
vacillans ♂
b
vacillans ♂
c
vacillans ♀
d
vacillans ♀

FIGURE 26. Adults of *Leptobasis vacillans*. (a) mature male, Costa Rica, Limón, SW of Beverly, photographed by William A. Haber; (b) immature male, Costa Rica, Limón, SW of Beverly, photographed by William A. Haber; (c) mature female, Colombia, Antioquía, Municipio de la Pintada, Farallón de la Paz, cañón del río Cauca, photographed by Cornelio A. Bota Sierra; (d) teneral female, Costa Rica, Limón, SW of Beverly, photographed by William A. Haber.

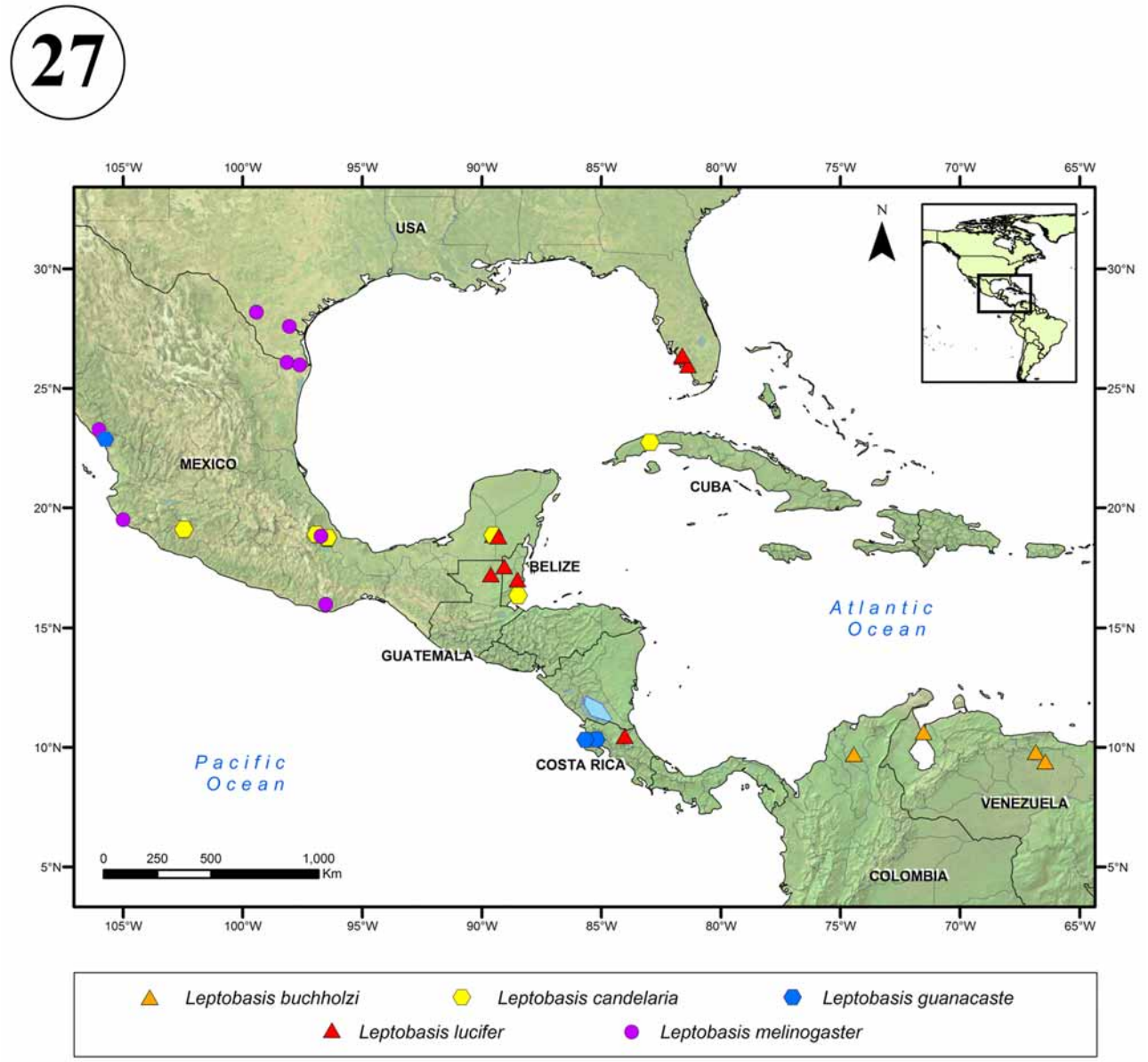


FIGURE 27. Distribution of *Leptobasis buchholzi*, *L. candelaria*, *L. guanacaste*, *L. lucifer*, and *L. melinogaster*.

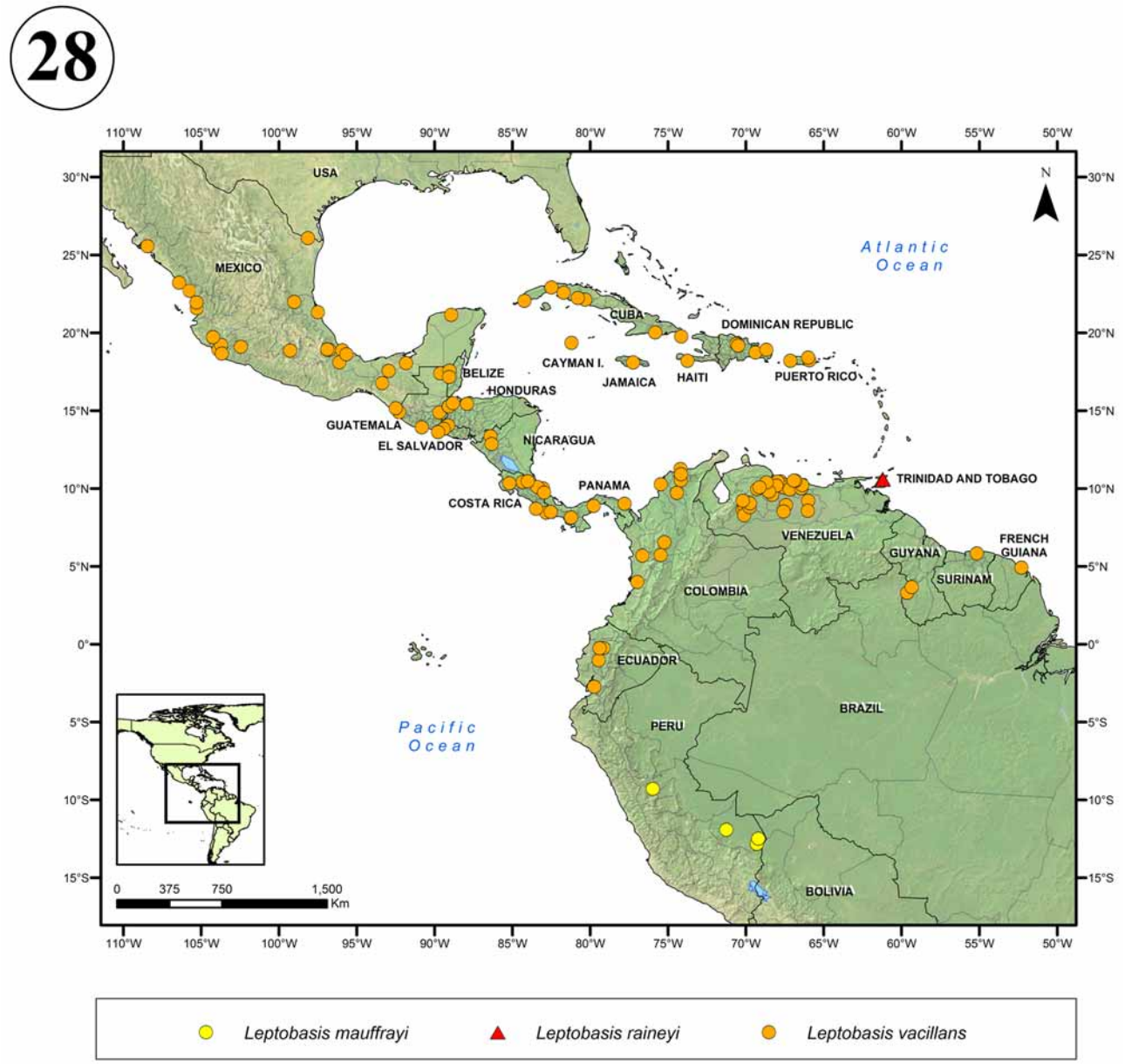


FIGURE 28. Distribution of *Leptobasis mauffrayi*, *L. raineyi*, and *L. vacillans*.