

A new genus and species of Cicadellini (Hemiptera: Cicadellidae) from the Brazilian Atlantic Rainforest

Gabriel Mejdalani^{1,3} & Rodney Ramiro Cavichioli²

¹ Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro. Quinta da Boa Vista, São Cristóvão, 20940-040 Rio de Janeiro, RJ, Brazil. E-mail: mejdalan@acd.ufrj.br

² Departamento de Zoologia, Setor de Ciências Biológicas, Universidade Federal do Paraná. Caixa Postal 19020, 81531-980 Curitiba, PR, Brazil. E-mail: cavich@ufpr.br

³ Corresponding author.

ABSTRACT. The Neotropical sharpshooter *Parasubrasaca felixi*, **gen. nov.**, **sp. nov.**, is described and illustrated from the Atlantic Rainforest of Southeastern Brazil (state of Espírito Santo). The new genus can be distinguished from other members of the Cicadellini by several morphological features, including a unique modification of the basal portion of the aedeagus, which bears a conspicuous, ventrally directed projection that articulates with the connective. The projection bears a pair of strong spines directed posteriorly. In addition to the external morphology, color pattern, and male genitalia, the female genitalia of the new taxon are also described in detail. A discussion comparing the new genus with similar Neotropical taxa (*Subrasaca* Young, 1977, *Soosius* Young, 1977, *Ramosulus* Young, 1977, *Geitogonalia* Young, 1977, *Ladoffa* Young, 1977, and *Scopogonalia* Young, 1977) is provided.

KEY WORDS. Auchenorrhyncha; Cicadellinae; morphology; South America; taxonomy.

The xylem-feeding Cicadellinae includes two tribes, the cosmopolitan Cicadellini and the New World Proconiini (YOUNG 1968). The Cicadellini currently comprises over 170 genera and 1,200 species in the New World. This tribe can be distinguished from the Proconiini and other leafhopper groups by the following combination of features (YOUNG 1968, TAKIYA & CAVICHIOLI 2005): 1) ocelli located on crown, nearly always closer to posterior margin than to apex or anterolateral margin; 2) frontogenal sutures almost always extending onto crown up to or near ocelli; 3) antennal ledges usually not strongly protuberant in dorsal view; 4) face usually swollen and not pubescent; 5) proepisternum exposed; 6) fore wings with inner apical cell parallel to long axis of wing; 7) hind legs at rest position with knees (femur-tibia articulation) almost always attaining the lateral pronotal lobes; 8) hind tibiae usually compressed laterally and with macrosetae in four regular rows; and 9) male pygofer and/or subgenital plates nearly always with macrosetae and/or microsetae not evenly dispersed.

The vast majority of the known genera of the Cicadellini were redefined (64) or erected (91) by YOUNG (1977) in his comprehensive review of the New World Cicadellini (TAKIYA & CAVICHIOLI 2005). The accessibility, thoroughness, and breadth of Young's monograph provided a sound basis that allowed taxonomists to more easily recognize additional new genera and species (TAKIYA & CAVICHIOLI 2005), especially from the Neotropical region, as in the case of the new Brazilian genus (and species) here proposed. After the publication of Young's mono-

graph, new genera of the New World Cicadellini were proposed by CAVICHIOLI (1996, 1998, 2000a,b, 2003, 2008, 2010), HAMILTON (1985), MEJDALANI (1994), NIELSON & GODOY (1995), TAKIYA *et al.* (2001, 2003), FREYTAG (2007), and CAVICHIOLI & TAKIYA (2012).

Herein, we propose a new genus of Cicadellini that is so far known from a single (new) species from the Atlantic Rainforest of Southeastern Brazil (state of Espírito Santo). A discussion comparing the new genus with similar Neotropical taxa (*Subrasaca* Young, 1977, *Soosius* Young, 1977, *Ramosulus* Young, 1977, *Geitogonalia* Young, 1977, *Ladoffa* Young, 1977, and *Scopogonalia* Young, 1977) is provided.

MATERIAL AND METHODS

In YOUNG'S (1977) monograph, the genera are carefully described, including separate paragraphs for the head, thorax, male and female genitalia. We have followed that format for our monotypic new genus, whereas the new species description includes the color and measurements. The descriptive terminology follows mainly YOUNG (1968, 1977), except for the facial areas of the head (HAMILTON 1981, MEJDALANI 1993, 1998) and the female genitalia (NIELSON 1965, HILL 1970). The use of the term gonoplac (= third ovipositor valvula) and the names of the sculptured areas of the first ovipositor valvulae follow MEJDALANI (1998). The techniques for preparation of male and female genital structures follow, respectively, OMAN (1949) and MEJDALANI (1998). The dissected parts are stored in small vials

with glycerin, as suggested by YOUNG & BEIRNE (1958). Label data are given inside quotation marks with a reversed virgule (\) separating lines on the labels. The specimens examined belong to the following institutions: Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro (MNRJ) and Coleção Entomológica Pe. Jesus S. Moure, Departamento de Zoologia, Setor de Ciências Biológicas, Universidade Federal do Paraná, Curitiba (DZUP).

TAXONOMY

Parasubrasaca gen. nov.

Figs 1-20

Type species: *Parasubrasaca felixi* sp. nov., by present designation and monotypy.

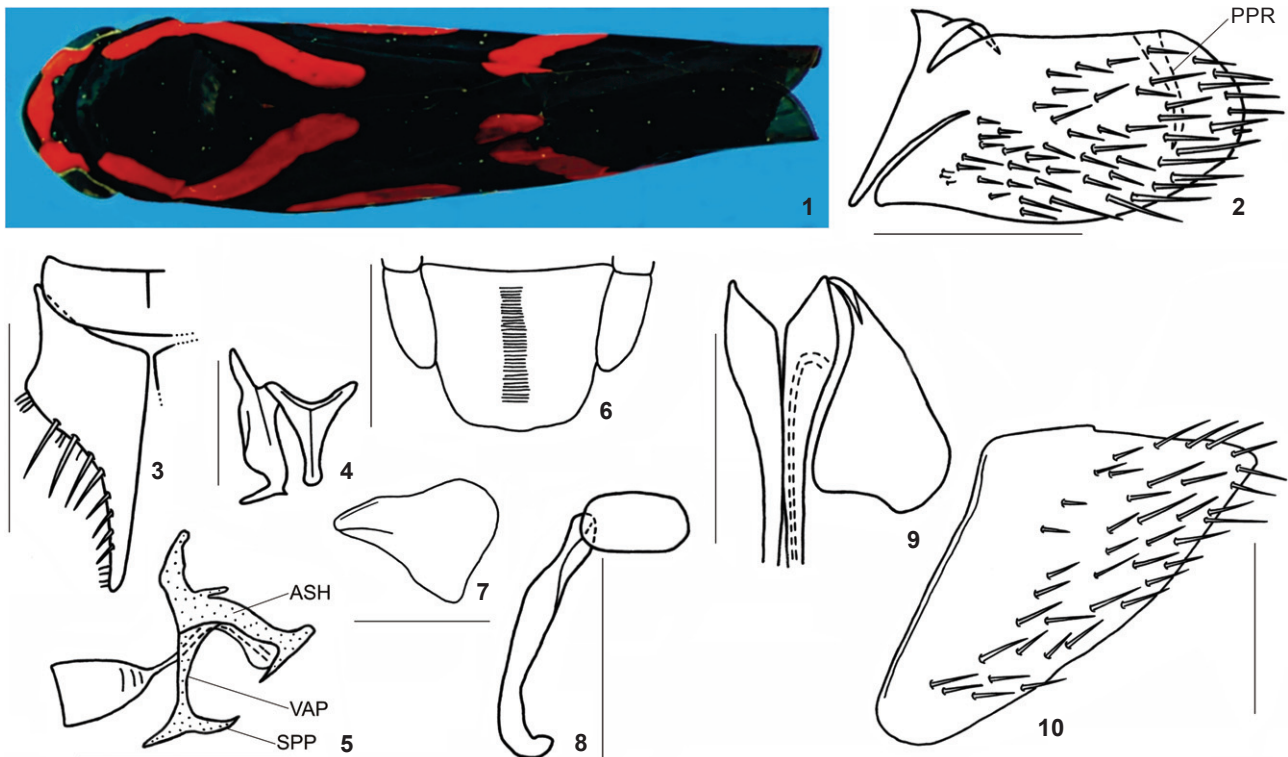
Description. Head (Fig. 1), in dorsal view, moderately produced anteriorly, median length of crown approximately 4/10 interocular width and 3/10 transocular width; anterior margin broadly rounded; without carina at transition from crown to face; ocelli located on imaginary line between anterior eye angles, each ocellus slightly closer to median line of crown than to adjacent anterior eye angle; crown without transverse concavity before ocelli, without median fovea, without sculpturing or setae; frontogenal sutures extending onto crown and attaining ocelli. Antennal ledges, in dorsal view, not protuberant; in lateral view, with anterior margin almost vertical, slightly convex; in anterolateral view, extending ventrally in front of antennal insertions. Frons convex medially; muscle impressions inconspicuous. Epistomal suture complete. Clypeus, in lateral view, not produced, its contour continuing profile of frons, apex convex.

Thorax (Fig. 1) with pronotal width slightly greater than transocular width; lateral pronotal margins convergent anteriorly; posterior margin slightly concave or almost rectilinear; dorsopleural carinae complete; disk slightly striate. Mesonotum with scutellum not transversely rugose. Fore wings of coriaceous texture, without distinct membrane, apical margin convex; veins not very distinct except for those at apical portion; with four apical cells, base of fourth more proximal than base of third; with three anteapical cells, inner one open basally; without anteapical plexus of veins; fore wings of female at rest exceeding apex of ovipositor. Hind wings with vein R_{2+3} incomplete. Hind legs with femoral setal formula 2:1:1; length of first tarsomere greater than combined length of two more distal tarsomeres.

Male genitalia. Pygofer (Fig. 2), in lateral view, well produced posteriorly; posterior margin broadly rounded; dorsoposterior portion with conspicuous, long spiniform process directed ventrally; distal 3/4 of disk with many macrosetae, largest ones located on posterior half. Valve (Fig. 3) transverse, subrectangular. Subgenital plates (Fig. 3), in ventral view, with basal 1/3 broad, median 1/3 strongly narrowed, distal 1/3

narrowing slightly toward apex; outer margins with uniseriate macrosetae; surface with scattered microsetae; in lateral view, plates not extending as far posteriorly as pygofer apex. Styles (Fig. 4), in dorsal view, without distinct preapical lobe; apical portion expanded, foot-shaped; apex truncate. Connective (Fig. 4), in dorsal view, Y-shaped, not extending as far posteriorly as styles; stalk with median keel. Aedeagus (Figs 5, 19 and 20) symmetrical; its basal portion with conspicuous, ventrally directed projection that articulates with connective; pair of strong, posteriorly directed spiniform processes located on inferior half of projection; aedeagal shaft directed ventrally, its basidorsal portion with projection directed posteriorly, ventral portion membranous, bearing the gonoduct, gonopore located apically; shaft apex with pair of ventral spiniform processes and dorsal lobe. Paraphyses absent (see discussion).

Female genitalia. Sternite VII (Fig. 6), in ventral view, simple, with very slight median lobe on posterior margin; surface slightly transversely striate on median portion. Pygofer (Fig. 10), in lateral view, well produced posteriorly, subtriangular, posterior margin narrowly rounded; macrosetae located mostly on posterior half and extending anteriorly along ventral margin. Internal sternite VIII (Fig. 8) with median sclerite located on dorsoanterior portions of first valvifers; in dorsal view, sclerite with subrectangular form; in lateral view, sclerite distinctly visible as a narrow connection between sternite VII and first valvifer; in caudal view, dorsal surface of sclerite distinctly concave. First valvifers (Figs 7-9), in lateral view, subtriangular, distinctly expanded from anterior to posterior portion; posterior margin oblique, only slightly concave, dorsoposterior portion rounded; in dorsal view, posterior portion curved inward. First ovipositor valvulae (Figs 9 and 11-14), in ventral view, moderately expanded basally, anterior portion triangularly produced anteriorly; in lateral view, blade slightly narrowed toward apex, the latter acute; dorsal sculptured area extending from basal portion of blade to apex, formed mostly by scale-like processes arranged in oblique lines (Fig. 13); ventral sculptured area restricted to apical portion of blade, formed mostly by scale-like processes (Fig. 14); ventral interlocking device located on basal third of valvula, its basal half extending along ventral blade margin, distal half directed dorsally (Fig. 11). Second valvulae (Figs 15-18), in lateral view, only moderately expanded beyond basal curvature, narrowing slightly toward apical portion; preapical prominence small but distinct (Fig. 18); apical portion triangular; apex acute; dorsal margin with about 16 continuous teeth, most teeth (Fig. 17) large, triangular, with high anterior portion followed by elongate, slightly declivous low posterior portion (basalmost tooth distinctly smaller, without flat posterior portion; Fig. 16); denticles (Fig. 17) distributed on teeth and on dorsal and ventral apical portions of blade, ventral dentate apical portion distinctly longer than dorsal one; blade with ducts (Figs 17 and 18) extending to apex, others attaining teeth or terminating below them. Gonoplaps, in lateral view, with basal half nar-



Figures 1-10. *Parasubrasaca felix*, gen. nov., sp. nov. (1) female (length 6.9 mm), dorsal view (legs and antennae not depicted). (2-5) male genitalia: (2) pygofer, lateral view; (3) valve and subgenital plate, ventral view; (4) style and connective, dorsal view; (5) ejaculatory reservoir and aedeagus, lateral view (stippling indicates sclerotized areas). (6-10) female genitalia: (6) sternite VII, ventral view; (7) valvifer I, lateral view; (8) internal sternite VIII and valvifer I, dorsal view; (9) bases of first ovipositor valvulae and valvifer I, ventral view; (10) pygofer, lateral view. (ASH) aedeagal shaft; (PPR) pygofer process; (SPP) spiniform process; (VAP) ventral aedeagal projection. Scale bars = 0.5 mm (except Fig. 4 = 0.3 mm).

row and apical half distinctly expanded; apex obtuse; apical portion and ventral margin covered by tiny spiniform tegumentary processes, setae also present.

Etymology. The new genus name, *Parasubrasaca*, has been chosen because the color pattern of *P. felix* sp. nov. is similar to that of the type species of *Subrasaca*, *S. ignicolor* (Signoret, 1854). The gender is feminine.

Parasubrasaca felix sp. nov.

Figs 1-20

Type locality: Santa Teresa, state of Espírito Santo, South-eastern Brazil.

Measurements in mm (male holotype/female paratype). Dorsal length of body, 6.6/6.9; median length of crown, 0.37/0.42; transocular width, 1.45/1.50; interocular width, 0.97/1.07; median length of pronotum, 0.92/1.07; greatest width of pronotum, 1.55/1.68; length of fore wing, 5.45/5.73.

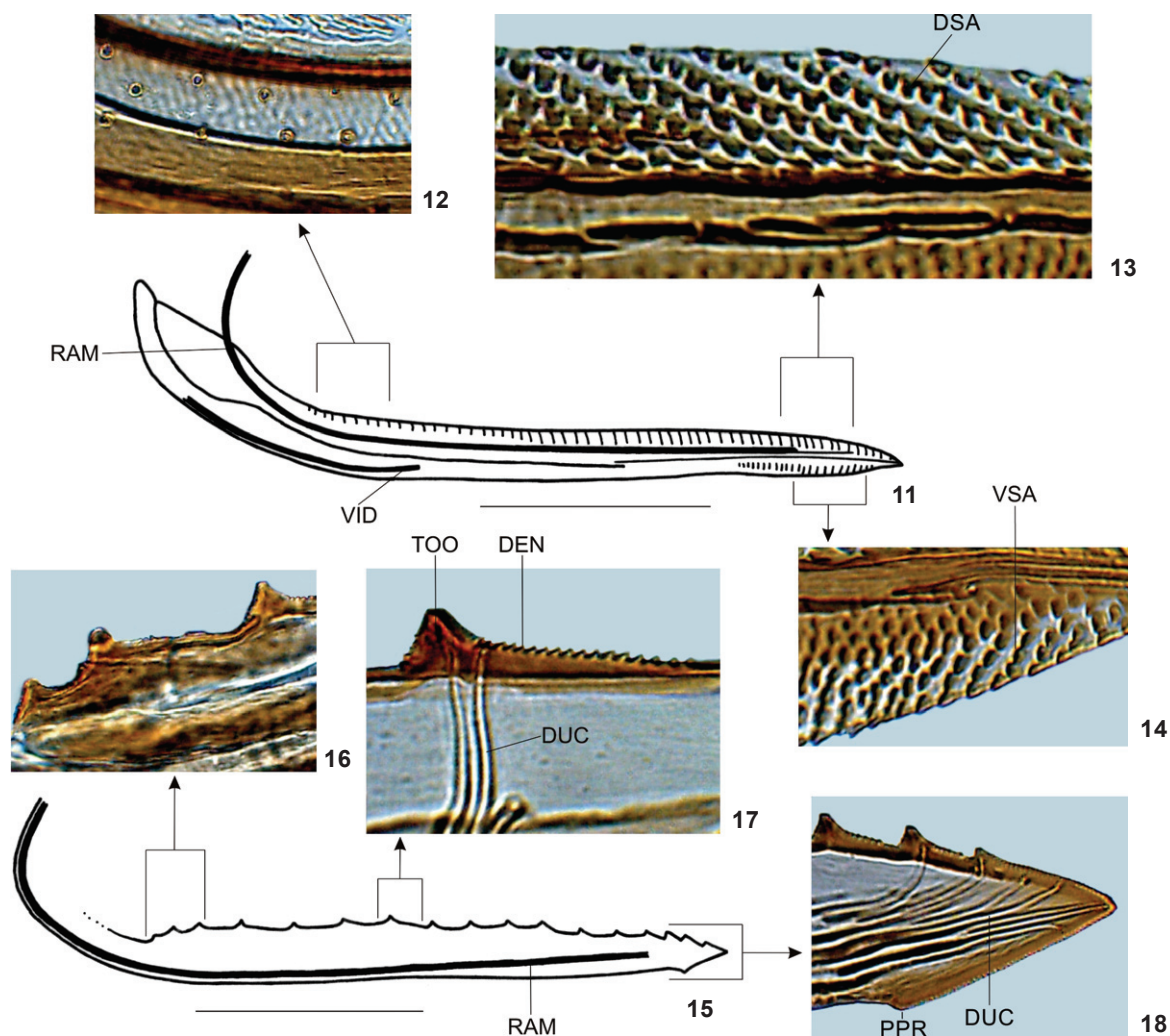
Color (Fig. 1). Dorsum dark brown to black with orange stripes as follows: crown with pair of lateral longitudinal stripes

from anterior to posterior margin, connected to each other by transverse stripe located before ocelli; pronotum with pair of lateral longitudinal oblique stripes; fore wings with three stripes, one on basal half of clavus extending from base (continued from pronotum stripe) to commissural margin, smaller one on basal half of corium located mostly on first discal cell, largest oblique one extending from apical portion of clavus posteriorly to costal margin. Hind wings brown, vein m-cu pale orange, located in a depigmented area. Face and lateral and ventral portions of thorax brownish-yellow; legs brownish-yellow to orange.

Etymology. We are pleased to name the new species for our colleague and friend Dr Márcio E. Felix (Instituto Oswaldo Cruz, Rio de Janeiro), who has contributed to our knowledge of the Neotropical Cicadellinae.

Known distribution. Atlantic Rainforest, Southeastern Brazil, state of Espírito Santo (dense ombrofilous forest; 550-950 m a.s.l.; EBSL 2011).

Material examined. Holotype: male, "BR/ES, Santa Teresa\Parque Municipal\São Lourenço\11/XI/2007\GONÇALVES, NOGUEIRA & CARVALHO Col." (MNRJ).



Figures 11-18. *Parasubrasaca felixi*, gen. nov., sp. nov. (11-14) first ovipositor valvula: (11) general lateral view; (12) detail of basal portion; (13) dorsal sculptured area; (14) ventral sculptured area. (15-18) second ovipositor valvula: (15) general lateral view; (16) basal teeth; (17) tooth at median portion; (18) apical portion. (DEN) denticle; (DSA) dorsal sculptured area; (DUC) duct; (PPR) preapical prominence; (RAM) ramus; (VID) ventral interlocking device; (VSA) ventral sculptured area. Scale bars = 0.5 mm.

Paratypes: 1 male, "BR/ES, Santa Teresa\Res. Bio. Augusto Ruschi\19-23/VI/2009\R. Carvalho & M. Lopes Col." (DZUP); 1 female, same as preceding, except "24-28/VI/2009" and "R. Carvalho, A. Carpi, L.\Nogueira & M. Lopes Col." (DZUP); 1 female, "BR/ES/Stª. Teresa\Est. Biol. Stª. Lúcia\02-06/II/2009\R. A. Carvalho col." (MNRJ).

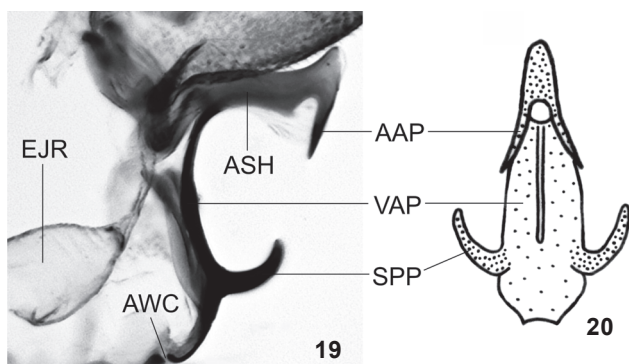
DISCUSSION

Parasubrasaca felixi, gen. nov., sp. nov., keys to *Sisimitalia* Young, 1977 in YOUNG'S (1977) key to the New World genera of Cicadellini (couplet 146). In the case of our new species, it is difficult to use that key because the fore wing venation is quite

obscure at the area of the bases of the anteapical cells. We have interpreted the inner anteapical cell of *P. felixi* as open basally, so that it goes from couplet 145 to 146. The male genitalia of the four known species of *Sisimitalia* bear paraphyses and the aedeagus has no processes (YOUNG 1977, CAVICHIOLI 2011), two features that will readily distinguish *Sisimitalia* from *Parasubrasaca*.

The dark brown to black dorsum with striking orange stripes of *P. felixi* (Fig. 1) is similar to that of species assigned to the genera *Subrasaca*, *Soosius*, *Ramosulus*, and *Geitogonia* (see images of the body in WILSON *et al.* 2009). In none of these genera, which were all proposed by YOUNG (1977), the basal portion of the aedeagus forms a conspicuous, ventrally directed

projection as observed in *Parasubrasaca* (Figs 5, 19 and 20). This projection, which bears a pair of strong spines directed posteriorly, is articulated anteriorly with the connective (see details in Figs 19 and 20). Morphologically, it is possible that the projection is derived from strongly modified paraphyses, but its origin is not clear. Also, considering that the projection is fused with the aedeagal shaft, we believe that the term paraphyses is inadequate in this case. The epistomal suture (= transclypeal suture of YOUNG 1977) is complete in the new genus, whereas it is interrupted or obsolete medially in *Subrasaca*, *Soosilus*, and *Geitogonia* (YOUNG 1977). In *Ramosulus*, the epistomal suture is complete or not medially (YOUNG 1977). The aedeagus in the latter genus has a dorsoapical and a ventroapical process or a single apical process (YOUNG 1977, FREYTAG 2004), whereas a pair of ventroapical processes is present in *Parasubrasaca* (Fig. 20).



Figures 19 and 20. *Parasubrasaca felixi*, gen. nov., sp. nov. (19) ejaculatory reservoir and aedeagus, lateral view, showing the ventral projection, which is one of the diagnostic features of the new genus; (20) aedeagus, caudal view. (AAP) apical aedeagal process; (ASH) aedeagal shaft; (AWC) articulation with connective; (EJR) ejaculatory reservoir; (SPP) spiniform process; (VAP) ventral aedeagal projection.

The m-cu cross vein of the hind wings of *P. felixi* has an orange tonality and is located in a small depigmented area. Curiously, a similar condition is observed in the genus *Ladoffa*, which is otherwise externally quite distinct from *Parasubrasaca*. The crown in *Ladoffa* has a median full-length longitudinal fovea, the epistomal suture is usually incomplete, the apical margin of the fore wings is slightly concave, and paraphyses are usually present (YOUNG 1977, LOZADA 1993, CAVICHIOLI & CHIAMOLERA 2001, LOZADA & FREYTAG 2010). These four features, especially the crown fovea and the concave fore wing apex, will readily distinguish *Ladoffa* from *Parasubrasaca*. *Ladoffa dependens* Young, 1977, which is recorded from Belize, Mexico, Honduras, Guatemala, and Costa Rica (McKAMEY 2007), has a basal aedeagal projection that is somewhat similar to that of *P.*

felixi (see YOUNG 1977: 362, fig. 289). Externally, *L. dependens* looks like a typical *Ladoffa* species (see WILSON *et al.* 2009), so that it can be easily distinguished from *P. felixi*. Finally, a basal aedeagal structure similar to that of *P. felixi* was also observed in the South American genus *Scopogonia* Young, 1977 (e.g., *S. paula* Young, 1977: 533, fig. 438). The latter genus, which has paraphyses according to YOUNG (1977), is quite distinct from *Parasubrasaca*. The fore wings in *Scopogonia* have the inner two anteapical cells open basally and the male pygofer bears a ventral process usually appearing brushlike at the apex (YOUNG 1977, CAVICHIOLI 1986).

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