Descriptions of three new Brazilian Subrasaca species, redescription of S. nigriventris (Signoret, 1855) and a key to males of the genus (Hemiptera: Cicadellidae: Cicadellini)

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Abstract

Three new species of the Neotropical sharpshooter genus Subrasaca Young, 1977 from Southeastern and Southern Brazil are described and illustrated: S. diminuta sp. nov. (State of São Paulo and State of Paraná), S. rubra sp. nov. (State of Minas Gerais and State of São Paulo), and S. rachelae sp. nov. (State of Espírito Santo). Subrasaca nigriventris (Signoret, 1855) is reinterpreted, redescribed and illustrated based on specimens from Southeastern Brazil (State of Rio de Janeiro). In addition to the external morphology, color pattern, and male genitalia, this paper includes detailed descriptions and illustrations of the female genitalia. A key to males of all known Subrasaca species is provided.

Key words: Auchenorrhyncha, Cicadellinae, morphology, leafhopper, taxonomy

Introduction

The South American sharpshooter genus Subrasaca Young, 1977 comprised eleven species until the present paper (Young 1977, McKamey 2007, Silva et al. 2013): S. atronasa Young, 1977, S. austera Young, 1977, S. bimaculata Silva, Cavichioli & Mejdalani, 2013, S. constricta Silva, Cavichioli & Mejdalani, 2013, S. curvovittata (Stål, 1862), S. flavolineata (Signoret, 1855), S. flavornata (Stål, 1862), S. ignicolor (Signoret, 1854) (type species), S. monacha (Melichar, 1951), S. nigriventris (Signoret, 1855), and S. rhienetta (Signoret, 1854). This genus is known from Brazil, Argentina, and Colombia. Two males of S. monacha studied and recorded by Young (1977: 475) from “Paraguay (?)” were labeled “Paraguai”, one from “Rio Aguatal” and the other from “Rio Vitaco”. These rivers, however, are apparently in Colombia, which was cited as the type locality (“West-Columbien”) in the original description of Melichar (1951).

Species of Subrasaca may be recognized by the following combination of male genital features: (1) aedeagus usually short and expanded (lobed) dorsally, (2) style (paramere) with distinct preapical lobe, (3) paraphyses with two or four rami (except for S. monacha, with only one ramus), and (4) subgenital plates connected to each other at base, usually not extending as far posteriorly as pygofer apex. Young (1977: 445) included Subrasaca in his Juliaca group of genera.

Recently, Silva et al. (2013) reviewed the group of Subrasaca species that have longitudinal dark brown to black stripes on the forewings. This group, which comprises four species (S. bimaculata, S. constricta, S. curvovittata, and S. flavolineata), is apparently a monophyletic assemblage within the genus. Three new Southeastern and Southern Brazilian species of Subrasaca are herein described and illustrated (states of São Paulo, Paraná, Minas Gerais, and Espírito Santo). In addition, S. nigriventris is reinterpreted, redescribed, and illustrated based on specimens from Southeastern Brazil (State of Rio de Janeiro). A key to males of all known Subrasaca species is also provided. The present contribution, along with its companion paper (Silva et al. 2013), attempts to
provide a more comprehensive view of our current knowledge of species diversity within Subrasaca. We are currently preparing a phylogenetic analysis of the relationships among the fourteen species now recognized.

Material and methods

Techniques for preparation of male and female genital structures follow Oman (1949) and Mejdalani (1998), respectively. The dissected genital parts are stored in small vials with glycerin and attached below the specimens, as suggested by Young & Beirne (1958). The descriptive terminology adopted herein follows mainly Young (1977), except for the facial areas of the head (Hamilton 1981, Mejdalani 1998) and the female genitalia (Nielson 1965, Hill 1970). Use of the term gonoplac (= third ovipositor valvula) and the names of the sculptured areas of the first ovipositor valvulae follow Mejdalani (1998). We have observed significant intraspecific color variation in Subrasaca rubra sp. nov. Accordingly, we have added a section on intraspecific variation for the latter species. Photographs of the body and of the female sternite VII were prepared with the Automontage software (Synoptics Inc., Frederick, Maryland, USA) using a digital camera attached to a stereomicroscope. Photographs of the first and second valvulae were taken with a digital camera attached to an optical microscope. Label data are given inside quotation marks with a reversed virgule (‘) separating lines on the labels and a semicolon separating the labels of a specimen. The specimens studied belong to the following institutions: Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ, Rio de Janeiro); Coleção Entomológica José Alfredo P. Dutra, Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro (DZRJ, Rio de Janeiro); and Coleção Entomológica Pe. Jesus S. Moure, Departamento de Zoologia, Setor de Ciências Biológicas, Universidade Federal do Paraná (DZUP, Curitiba).

Results

Subrasaca diminuta Silva, Cavichioli et Mejdalani, sp. nov.
(Figs 1–20)

Length. Male holotype, 5.0 mm; male paratypes, 4.8-5.1 mm (n = 2); female paratypes, 5.4-5.6 mm (n = 2).

Holotype description. Head and thorax. Head (Fig. 1) with median length of crown approximately 1/2 interocular width and 3/10 transocular width. Crown (Fig. 1), in dorsal view, broadly rounded anteriorly; ocelli located slightly anterad of line between anterior eye angles; without transverse concavity before ocelli. Antennal ledges, in lateral view, with anterior margin vertical. Frons convex; muscle impressions distinct; epistomal suture obscure medially; clypeus not produced, contour continuing profile of frons dorsally and more nearly horizontal ventrally. Thorax (Fig. 1) with pronotal width approximately equal to transocular width of head; lateral pronotal margins convergent anteriorly; posterior margin slightly concave; pronotal disk with slight rugae; mesonotum with scutellum slightly transversely striate behind transverse sulcus. Forewings with veins mostly indistinct except at apical portion; texture coriaceous. Other features of head and thorax as in the generic description of Young (1977: 472).

Color. Anterior dorsum (crown, pronotum, and mesonotum) and forewings dark brown to black (Fig. 1). Crown with broad, transverse orange arc, median portion of arc located before ocelli; arc delimiting large, posterior dark brown to black trapezoid area; posterior coronal margin with pair of small brown spots. Pronotum with pair of oblique, elongate orange maculae extending to lateroposterior margins. Forewings with orange markings distributed as follows: clavus with elongate stripe on basal half (extended from pronotal macula), posterior claval portion with large macula; distal half of corium with macula extending from apex of clavus over apical portion of brachial cell and basal portion of inner anteapical cell; distal half of corium with narrow unpigmented stripe along costal margin. Face mostly dark brown to black except brownish-yellow inferior portion; antennal ledges orange; rostrum brownish-yellow. Thorax and legs mostly yellow except dark brown proepisternum, lateral pronotal lobe, and lateral area of mesothorax.

Male genitalia. Pygofer (Fig. 2), in lateral view, not strongly produced posteriorly; posterior margin rounded; without processes; macrosetae distributed mostly on distal third of disk and more anteriorly on ventral portion. Subgenital plates (Fig. 3), in ventral view, subtriangular, elongate, basal third expanded laterally, median and distal
thirds gradually narrowed posteriorly; plates connected to each other basally by small, triangular membranous area; in lateral view, not extending as far posteriorly as pygofer apex; with uniseriate macrosetae. Connective (Fig. 4), in dorsal view, Y-shaped; stalk narrow and elongate in comparison to arms. Style (Fig. 4), in dorsal view, elongate, extending posteriorly farther than apex of connective; preapical lobe distinct, with few setae; apical portion digitiform. Aedeagus (Fig. 5) short; in lateral view, with distinct dorsal lobe; latter not constricted, distal portion slightly emarginated; gonoduct distinct, sclerotized. Paraphyses (Fig. 6) symmetrical, with two rami; distal half of each ramus directed dorsoanteriorly, forming distinct angle with basal half, and with spiniform process at base.

FIGURES 1–8. Subrasaca diminuta sp. nov. 1, body, male, dorsal view (length 5.0 mm); 2–6, male genitalia: 2, pygofer, lateral view; 3, valve and subgenital plates, ventral view; 4, styles and connective, dorsal view; 5, ejaculatory reservoir, aedeagus, and anal tube, lateral view; 6, paraphyses, dorsal view; 7 and 8, female sternite VII, ventral view (macerated and unmacerated specimen, respectively). Abbreviations: BHR = basal half of ramus, DHR = distal half of ramus, SPP = spiniform process. Scale bars: 2 = 0.5 mm; 3, 5, 7 = 0.4 mm; 4 = 0.3 mm; 6 = 0.1 mm.
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Figures 9–20. Subrasaca diminuta sp. nov., female genitalia. 9, first valvifers and sclerites of internal sternite VIII, dorsal view; 10, bases of first ovipositor valvulae, ventral view; 11, pygofer, lateral view; 12–15, first valvifer and first ovipositor valvula: 12, general lateral view; 13, basal portion of dorsal sculptured area; 14, apical portion of dorsal sculptured area; 15, ventral sculptured area; 16–20, second ovipositor valvula: 16, general lateral view; 17, basal-most teeth; 18, tooth at median portion; 19, teeth at apical portion; 20, area of preapical prominence. Abbreviations: DEN = denticle, DSA = dorsal sculptured area, DUC = duct, MIN = macrosetal insertion, PPR = preapical prominence, RAM = ramus, SST = sclerite of internal sternite VIII, TOO = tooth, VAL = first valvifer, VID = ventral interlocking device, VSA = ventral sculptured area. Scale bars: 9 = 0.5 mm; 10 = 0.4 mm; 11, 12, 16 = 1 mm.

Female genitalia. Abdominal sternite VII (Figs 7, 8), in ventral view, with strongly convex surface; lateral margins convergent posteriorly; posterior margin slightly concave, with small darkly sclerotized area on median portion. Internal abdominal sternite VIII (Fig. 9), in dorsal view, with pair of small sclerites adjacent to each other.
medially. Pygofer (Fig. 11), in lateral view, moderately produced posteriorly; apical portion narrowed, apex obtuse; macrosetae distributed mostly on posterior portion and extending anteriorly along ventral margin. First valvifers (Fig. 12), in lateral view, ellipsoid. First valvulae, in ventral view, moderately expanded basally (Fig. 10); in lateral view (Fig. 12), with apex acute; ventral interlocking device located on basal half of blade, about 2/3 of its length adjacent to ventral blade margin, apical 1/3 directed dorsally; dorsal sculptured area (Figs 13, 14) extending from basal portion of blade to apex, formed mostly by scale-like processes arranged in oblique lines, except basally with more linear processes; ventral sculptured area (Fig. 15) restricted to apical portion of blade, formed mostly by scale-like processes. Second valvulae (Fig. 16), in lateral view, with dorsal margin convex, ventral margin mostly straight; preapical prominence (Fig. 20) small but distinct; apex obtuse; about 25 teeth (Figs 17–19) distributed continuously on dorsal expanded portion of blade, most teeth triangular with ascending portion short, descending portion long; basal-most two teeth rounded, inconspicuous; denticles (Figs 17–20) distributed on teeth and on apical portion of blade, except at apex; dorsal dentate apical portion distinctly smaller than ventral one; blade with ducts (Fig. 18) extending to apical portion and to teeth or terminating below latter; few basal teeth without ducts. Gonoplates, in lateral view, with basal half narrow and apical half distinctly expanded; apex obtuse; tiny setae and few macrosetae distributed on apical portion and extending anteriorly along ventral margin.

**Etymology.** The new species name, *diminuta*, refers to the small size of the body in comparison to other species of the genus.

**Type material.** Southeastern and Southern Brazil. Holotype: male, “BR [Brazil] SP [São Paulo State] Ubatuba PESM [Parque Estadual da Serra do Mar] \ Núcleo Picinguaba \ 1-4\VI\2000 \ Equipe Lab. Ent. UFRJ \ col.” (MNRJ). Paratypes: one female, same data as holotype (MNRJ); one male, one female, same data as holotype except “25-28/X\2000” (MNRJ); one female, “Picinguaba – Ubatuba / São \ Paulo / 08-12/VI/2005 \ R. Carvalho & A. Leal col.” (MNRJ); two males, “25°48’S 290m \ 48°54’W X/2004 \ Paraná [State] – Brasil \ CAVICHIOLI col.” (DZUP, MNRJ); two males, three females, “S. J. Pinhais / PR [Paraná State] \ Estrada dos \ Castelhanos \ Rio S. João”; “296 m \ 25/IX/2004 \ 25°48’41’’ \ 48°54’54’’”; “Cavichioli col.” (DZUP, MNRJ); two females, same data as preceding except “18/IX/2004” and “Cavichioli & \ Leal col.” (DZUP).

**Subrasaca rubra** Silva, Cavichioli et Mejdalani, sp. nov. (Figs 21–37)

**Length.** Male holotype, 7.5 mm; male paratypes, 7.0-7.3 mm (n = 2); female paratypes, 7.7 mm (n = 2).

**Holotype description.** **Head and thorax.** Structural features of head and thorax much as described above for *S. diminuta* sp. nov., except crown with transverse concavity anterad of ocelli.

**Color.** Crown (Fig. 21) entirely black. Pronotum (Fig. 21) black with two large, transverse orange stripes on median third, touching each other medially. Mesonotum (Fig. 21) black. Forewings (Fig. 21) with two orange-red areas, smaller area at base of clavus and much larger area on corium and clavus, covering most of wing surface and thus delimiting dark brown to black areas as follows: complete transverse stripe basally, elongate, transcommissural subtriangular area on clavus, narrow stripe along basal half of costal margin with small transverse projection approximately at middle, and most of corium behind apex of clavus. Face mostly dark brown to black; with dirty white area extending from inferior surface of antennal ledge to upper limit of lorum; labrum brownish-white; rostrum dark brown. Lateral and ventral portions of thorax mostly dark brown to black; legs brown with extensive whitish portions.

**Male genitalia.** Pygofer (Fig. 22), in lateral view, not strongly produced posteriorly, quadrangular, posterior margin truncate; without processes; macrosetae distributed mostly on distal third of disk and ventrally on median third. Subgenital plates (Fig. 23), in ventral view, subtriangular; outer margin rounded on basal third, plates then tapering gradually toward apex; connected to each other basally by membranous triangular area; in lateral view, extending about as far posteriorly as pygofer apex; with few uniseriate macrosetae. Connective (Fig. 24), in dorsal view, Y-shaped, with short arms and broad stalk narrowing toward apex. Style (Fig. 24), in dorsal view, extending posteriorly slightly farther than apex of connective; preapical lobe distinct, bearing few setae; apical portion directed outward; apex truncate. Aedeagus (Fig. 25) short; shaft with dorsal lobe bearing strong digitiform process directed dorsally; gonoduct distinct, sclerotized. Paraphyses (Fig. 26) symmetrical, with pair of elongate rami; each ramus with apical half slender and curved ventrally; without projections or processes.
FIGURES 21–28. **Subrasaca rubra sp. nov.** 21, body, male, dorsal view (length 7.5 mm); 22–26, male genitalia: 22, pygofer, lateral view; 23, subgenital plates, ventral view; 24, styles and connective, dorsal view; 25, aedeagus and anal tube, lateral view; 26, paraphyses, dorsal view; 27 and 28, female sternite VII, ventral view (macerated and unmacerated specimen, respectively). Scale bars: 22, 23, 27 = 0.5 mm; 24–26 = 0.4 mm.

**Female genitalia.** Abdominal sternite VII (Figs 27, 28), in ventral view, with shallow, broad median emargination on posterior margin; lateroposterior portions rounded. Internal sternite VIII (Fig. 29), in dorsal view, with pair of small digitiform sclerites directed ventrally. Pygofer, in lateral view, well produced posteriorly; apex obtuse; macrosetae distributed mostly on posterior portion and extending anteriorly along ventral margin. First valvifers (Fig. 30), in lateral view, produced dorsally, dorsal margin broadly convex. First valvulae (Fig. 30), in lateral view, with dorsal margin slightly concave, ventral margin distinctly convex; apex acute; ventral interlocking device elongate, extending posteriorly beyond basal half of blade, about 1/3 of its length adjacent to ventral blade margin, apical 2/3 directed dorsally; dorsal sculptured area (Figs 31, 32) extending from basal portion of blade to apex, formed mostly by scale-like processes arranged in oblique lines except for irregular processes basally; ventral
sculptured area (Fig. 33) restricted to apical portion of blade, formed mostly by scale-like processes. Second valvulae (Fig. 34), in lateral view, with dorsal margin slightly concave, ventral margin convex; preapical prominence (Fig. 37) small but distinct; apex subacute; dorsal margin with about 17 low, flat continuous teeth (Figs 35, 36), some of them very elongate; denticles (Figs 35–37) distributed on teeth and on apical portion of blade, except at apex; dorsal dentate apical portion greater than ventral one; blade with ducts (Fig. 35) extending to apical portion and to teeth or terminating below latter. Gonoplas much as described above for *S. diminuta* sp. nov.

**FIGURES 29–37.** *Subrasaca rubra* sp. nov., female genitalia. 29, first valvifers and sclerites of internal sternite VIII, dorsal view; 30–33, first valvifer and first ovipositor valvula: 30, general lateral view; 31, basal portion of dorsal sculptured area; 32, median portion of dorsal sculptured area; 33, ventral sculptured area; 34–37, second ovipositor valvula: 34, general lateral view; 35, tooth at median portion; 36, teeth at apical portion; 37, area of preapical prominence. Abbreviations: SST = sclerite of internal sternite VIII, VAL = first valvifer. Scale bars: 29 = 0.5 mm; 30, 34 = 1 mm.

**Intraspecific variation.** We have observed a great deal of color variation in *S. rubra* sp. nov. The transverse pronotal markings vary from orange to yellow, may be broad or narrow, divided into smaller marks, or even absent. The form of the large orange-red area of the forewings is also quite variable; this area may be interrupted by irregular dark brown areas or it may include irregular yellow portions.
Etymology. The new species name, *rubra*, refers to the large orange-red areas on the forewings.

Type material. Southeastern Brazil. Holotype: male, “Brasil, MG [Minas Gerais State], Itamonte \ 2100–1700m altitude \ 21–23.XI.2008 \ CARVALHO, R.; EVANGELISTA, O. & TAKIYA, D. Cols” (MNRJ). Paratypes: two males, two females, same data as holotype (MNRJ, DZUP); two males, three females, “Brasil-Minas \ Gerias-Itamonte \ 13–15/XI/1998 \ D. TAKIYA leg.” (DZRJ); one male, “BRASIL: MG, Itamonte \ 2400–1700m asl \ 01–03.XI.2007 \ D. M. Takiya leg.” (DZRJ); two males, Brasil, MG, Itamonte \ 1700–2400m altitude \ 24–29.XI.2010 \ CARVALHO, R.A. Col.” (MNRJ); one male, same data as preceding except “2400–1700m altitude” (MNRJ); one male, “SUBIDA P/O P.N. \ ITATIAIA, DIVISA \ RJ-MG [border between Rio de Janeiro and Minas Gerais states] \ 30/X/1993 \ G. MEJDALANI col.” (DZRJ); two females, “BR/SP, S. J. do Barreiro, \ P. N. S. Bocaina 1300–\ 1600m alt 16–21.XII.2010 \ CARVALHO, R.A. Col.” (MNRJ).

**Subrasaca rachelae** Silva, Cavichioli et Mejdalani, sp. nov. (Figs 38–46)

Length. Male holotype, 5.3 mm; male paratypes, 5.1 mm (n = 2); female paratypes, 5.4–5.5 mm (n = 2).

Holotype description. Head and thorax. Structural features of head and thorax much as described above for *S. diminuta* sp. nov., except for muscle impressions of frons not distinct and mesonotum with scutellum not transversely striate behind transverse sulcus.

Color. Anterior dorsum yellowish-brown to brown. Crown (Fig. 38) with large, conspicuous symmetrical orange mark delimiting pair of yellowish-brown to brown anterolateral areas and posterior M-shaped area. Pronotum (Fig. 38) with pair of large orange maculae extending from posterolateral margins and almost reaching median line, area posterad of maculae dark brown. Mesonotum (Fig. 38) with scutum dark brown, delimiting pair of yellowish-brown spots. Forewings (Fig. 38) mostly dark brown with unpigmented areas along costal margin and along inner claval margin; with three conspicuous longitudinal orange stripes (one from base to apex of clavus; one on corium, near costal margin, extending from basal portion to level of clavus apex; and one on corium from apex of clavus to base of second apical cell); posterior portion of forewing with orange spot near costal margin. Face, lateral and ventral portions of thorax, and legs yellow.

Male genitalia. Pygofer (Fig. 39), in lateral view, not strongly produced posteriorly; posterior margin narrowly round; without processes; macrosetae distributed mostly on distal third of disk and more anteriorly on ventral portion. Subgenital plates (Fig. 40), in ventral view, subtriangular, basal third expanded laterally, then tapering gradually toward apex; connected to each other basally by small membranous triangular area; in lateral view, not extending as far posteriorly as pygofer apex; with few uniseriate macrosetae. Connective (Fig. 41), in dorsal view, short, Y-shaped but with arms poorly differentiated; stalk broad. Style (Fig. 41), in dorsal view, extending posteriorly farther than apex of connective; preapical lobe distinct, with few setae; apical portion directed outward, apex narrow, truncate. Aedeagus (Fig. 42) short; in lateral view, with dorsal lobe directed posteriorly, bearing pair of sclerotized spiniform dorsal processes located preapically, ventral margin of shaft distinctly convex; gonoduct distinct, sclerotized. Paraphyses (Fig. 43) symmetrical with two rami; base of each ramus, in dorsal view, with strong dentiform projection directed posteromedially; apex of rami, in lateral view, distinctly expanded.

Female genitalia. Abdominal sternite VII (Figs 44, 45), in ventral view, with posterior margin weakly trilobed. Internal sternite VIII (Fig. 46), in dorsal view, with pair of small, linear transverse sclerites located above bases of first valvulae. Pygofer, first valvifers, ovipositor valvulae, and gonoplacs much as described above for *S. diminuta* sp. nov. Second valvulae with about 20 teeth.

Etymology. The new species is described in honor of Dr. Rachel A. Carvalho (Museu Nacional, Universidade Federal do Rio de Janeiro) in recognition of her contribution to our knowledge of the Neotropical Cicadellinae. She was also one of the collectors of the holotype and other specimens of the type series.

Type material. Southeastern Brazil. Holotype: male, “BR [Brazil]/ ES [Espírito Santo State]/ St\'. [Santa Teresa \ Museu M. Leitão \ 24–28/III/2004 \ T. T. Mauro & R. A. Carvalho col.” (MNRJ). Paratypes: three males, three females, same data as holotype (MNRJ, DZRJ, DZUP); one female, same data as holotype except “16/I/2004” and “T. T. Mauro col.” (MNRJ); one male, “Santa Teresa/ES \ Reserva do Museu \ 15/X/2003 \ T. T. Mauro col.” (MNRJ); one female, same data as preceding except “16/X/2003” (MNRJ); one female, same data as preceding except “18/X/2003” (MNRJ); one male, “BR/ES, Santa Teresa \ Parque Municipal Sã\o \ Lourenç\o 14/IX/2008 \ R. A. CARVALHO Col.” (MNRJ); one male, “BR/ES/ St\'. Teresa \ Parq. Muni. Sã\o \ Lourenç\o 03/II/2009
FIGURES 38–46. Subrasaca rachelae sp. nov. 38, body, male, dorsal view (length 5.3 mm); 39–43, male genitalia: 39, pygofer, lateral view; 40, valve and subgenital plates, ventral view; 41, styles and connective, dorsal view; 42, ejaculatory reservoir, aedeagus, and anal tube, lateral view; 43, paraphyses, dorsal view; 44 and 45, female sternite VII, ventral view (macerated and unmacerated specimen, respectively); 46, first valvifers and sclerites of internal sternite VIII, dorsal view. Abbreviations: SST = sclerite of internal sternite VIII, VAL = first valvifer. Scale bars: 39, 40, 42 = 0.5 mm; 41, 43 = 0.3 mm; 44, 46 = 0.4 mm.
Subrasaca nigriventris (Signoret, 1855) (Figs 47–55)

Tettigonia nigriventris Signoret, 1855: 784, pl. 24, fig. 1. Lectotype from Brazil designated by Young (1964: 12), female (Museum für Naturkunde der Humboldt-Universität, Berlin); photograph examined.

Length. Males, 5.4–5.9 mm (n = 2); females, 6.3–6.5 mm (n = 2).

Head and thorax. Structural features of head and thorax much as described above for S. diminuta sp. nov.

Color. Anterior dorsum and forewings dark brown to black. Crown (Fig. 47) with ellipsoid, transverse orange

FIGURES 47–55. Subrasaca nigriventris (Signoret, 1855). 47, body, male, dorsal view (length 5.6 mm); 48–52, male genitalia: 48, pygofer, lateral view; 49, valve and subgenital plates, ventral view; 50, styles and connective, dorsal view; 51, ejaculatory reservoir, aedeagus, and anal tube, lateral view; 52, parahyses, dorsal view; 53 and 54, female sternite VII, ventral view (macerated and unmacerated specimen, respectively); 55, first valvifers and sclerites of internal sternite VIII, dorsal view. Abbreviations: SST = sclerite of internal sternite VIII, VAL = first valvifer. Scale bars: 48, 49, 53 = 0.5 mm; 50, 52 = 0.3 mm; 51, 55 = 0.4 mm.
macula located anterior to ocelli and connected laterally to pair of large orange maculae delimiting posterior, M-shaped black area; large area on anterior coronal portion and pair of maculae on posterior margin brown; with pair of narrow dark brown to black stripes located anteriorly to orange area. Pronotum (Fig. 47) with pair of large brown areas anteriorly followed by pair of large, oblique orange maculae. Forewings (Fig. 47) with orange maculae and stripes distributed as follows: clavus with three large maculae, basal half of corium with elongate stripe near costal margin, distal half of corium with stripe extending from apex of clavus over inner antecapial cell and with small macula on basal portion of fourth apical cell near costal margin. Face, lateral and ventral portions of thorax and legs mostly pale yellow; abdomen mostly dark brown.

**Male genitalia.** Pygofer (Fig. 48), in lateral view, moderately produced posteriorly; posterior margin rounded inferiorly and more truncate superiorly; without processes; macrosetae distributed mostly on distal third of disk and more anteriorly on ventral portion. Subgenital plates (Fig. 49), in ventral view, subtriangular, basal half expanded laterally, then tapering gradually toward apex; connected to each other basally by membranous triangular area; in lateral view, not extending as far posteriorly as pygofer apex; with uniseriate macrosetae. Styles (Fig. 50), in dorsal view, Y-shaped; stalk long, expanded apically; arms poorly differentiated. Styles (Fig. 50), in dorsal view, extending posteriorly slightly farther than apex of connective; preapical lobe distinct, with few setae; apical portion directed outward; apex clearly truncate. Aedeagus (Fig. 51) elongate; in lateral view, with slight dorsal lobe; with conspicuous pair of ventroapical retrorse spiniform processes; gonoduct distinct. Paraphyses (Fig. 52) symmetrical with two strong rami; distal half of rami directed inward, forming right angle with basal half.

**Female genitalia.** Abdominal sternite VII (Figs 53, 54), in ventral view, with posterior margin simple, truncate or slightly concave medially. Internal sternite VIII (Fig. 55), in dorsal view, with pair of small sclerites located adjacent to each other medially. Pygofer, first valvifers, valvulae, and gonoplacs much as described above for *S. diminuta* sp. nov. Second valvulae, in lateral view, with about 18 teeth.

**Material examined.** Southeastern Brazil. Two males, four females, “BR [Brazil] RJ [Rio de Janeiro State] Nova Friburgo \ Macaé de Cima \ 21–22/VI/2003 \ P. Ceotto col.” (MNRJ, DZUP); one male, one female, “BRASIL – RJ \ Macaé de Cima \ 20–21/1/2001 \ Ceotto e Roquete” (MNRJ); one female, “MACAÉ DE CIMA \ NOVA FRIBURGO-RJ \ 1/II/1992 \ G. MEJDALANI col.” (DZRJ); one male, “BR/RJ, Nova Friburgo \ Vale dos Pinheiros \ 16–18/2/2010 \ Gabriel Mejdalani & \ Ana Alves col.” (MNRJ); one male, “Brasil, RJ \ Teresópolis \ 21-VII-1991 \ G. Mejdalani” (MNRJ); two females, “SERRA DO SUBAIO \ TERESÓPOLIS - RJ \ 22/V/1992 \ G. MEJDALANI col.” (DZRJ); one male, same data as preceding except “21/VII/1991” (DZRJ); one female, “Brasil, RJ, Teresópolis \ Serra do Subaio \ 17/18-VIII-1996 \ Felix e Mejdalani cols.” (MNRJ); one male, “PARQUE NACIONAL \ SERRA DOS ÓRGÃOS \ TERESÓPOLIS - RJ \ 30/VIII/1992 \ G. MEJDALANI col.” (DZRJ); one male, one female, “BR-RJ-Teresópolis \ Vale da Revolta \ 29-V-1998 \ G. Mejdalani col.” (MNRJ).

### Key to species of *Subrasaca* (males)

Note: in addition to the present paper, the reader is referred to Young (1977: figs 389–394), Wilson et al. (2009), and Silva et al. (2013) for illustrations and photographs of the external morphology and genital structures of *Subrasaca* species that will be useful for evaluating the identifications obtained using our key. As discussed below, we believe that Young (1977) did not interpret *S. flavolineata* (his fig. 395) and *S. nigriventris* (his fig. 396) correctly.

| 1a. Crown and/or pronotum dark brown to black with striking orange markings | 2 |
| 1b. Crown and pronotum not as above | 7 |
| 2a. Pygofer truncate apically; aedeagal shaft with dorsal lobe bearing strong digitiform process directed dorsally; paraphyses with pair of elongate rami, each ramus with apical half slender and curved ventrally, without projections or processes | S. rubra sp. nov. |
| 2b. Without above combination of features | 3 |
| 3a. Aedeagus elongate, its dorsal lobe poorly developed, shaft with conspicuous pair of ventroapical spiniform processes directed anteriorly | S. nigriventris (Signoret, 1855) |
| 3b. Without above combination of features | 4 |
| 4a. Aedeagus without dorsal lobe, shaft elongate, directed dorsally, apical portion with ventral membranous lobe and pair of spatulate processes directed posteriorly | S. flavoornata (Stål, 1862) |
| 4b. Aedeagus with distinct dorsal lobe, without apical processes | 5 |
5a. Aedeagus with dorsal lobe directed posteriorly, bearing pair of sclerotized spiniform processes located preapically; paraphyses with base of each ramus with strong dentiform projection directed posteromedially; apex of rami, in lateral view, distinctly expanded .................................................. \textit{S. rachelae} sp. nov.
5b. Without above combination of features ............................................................ 6
6a. Distal half of paraphyses rami directed dorsoanteriorly, forming distinct angle with basal half, and with spiniform process at base .................................................. \textit{S. diminuta} sp. nov.
6b. Distal half of paraphyses rami simple, directed posteriorly, not forming angle with basal half, without process ............................................................ \textit{S. ignicolor} (Signoret, 1854)
7a. Forewings with longitudinal dark brown to black stripes alternating with yellow-green stripes ............................................................ 8
7b. Forewings without such color pattern ............................................................ 11
8a. Forewings with eight longitudinal dark brown stripes, three on clavus and five on corium; distal third of dorsal portion of pygofer with cleft associated with medially-directed inner lobe; dorsal lobe of aedeagus with distinct constriction .................................................. \textit{S. consticta} Silva, Cavichioli & Mejdalani, 2013
8b. Without above combination of features ............................................................ 9
9a. Mesonotum with large, dark brown to black T-shaped area; paraphyses with two rami, each one with two lateral spiniform processes .................................................. \textit{S. flavolineata} (Signoret, 1855)
9b. Without above combination of features ............................................................ 10
10a. Mesonotum with basal, transverse dark brown to black area; paraphyses with four rami, inner pair distinctly smaller than outer one .................................................. \textit{S. curvovittata} (Stål, 1862)
10b. Mesonotum with pair of yellow spots; paraphyses with four rami, inner pair larger and broader than outer one .................................................. \textit{S. bimaculata} Silva, Cavichioli & Mejdalani, 2013
11a. Dorsum dark brown to black with striking yellow markings (transverse stripe on crown, transverse stripe on pronotum, longitudinal stripe on clavus mostly along claval sulcus, and macula or transverse stripe on corium at level of claval apex) .................................................. \textit{S. rachelae} (Signoret, 1854)
11b. Dorsum not as above ............................................................ 12
12a. Crown elongate, deltoid, narrowly rounded anteriorly .................................................. 13
12b. Crown broadly rounded anteriorly; aedeagus elongate, expanded apically, apex with spiniform projection directed ventrally.................................................. \textit{S. monacha} (Melichar, 1951)
13a. Forewings with longitudinal ivory stripe extending from base to apex of clavus .................................................. \textit{S. austera} Young, 1977
13b. Forewings with longitudinal pale yellow to bluish-ivory stripe in basal half of clavus .................................................. \textit{S. atronasa} Young, 1977

Discussion

In our previous paper on \textit{Subrasaca} (Silva et al. 2013), we reported that Young (1977) synonymized \textit{S. curvovittata} (Stål, 1862) with \textit{S. flavolineata} (Signoret, 1855) because he associated a male of the former species with the female lectotype of the latter. In that paper, we revalidated \textit{S. curvovittata} (Stål, 1862) based on consistent differences of the male genitalia and color pattern. In the present study, we believe that a similar situation occurred between \textit{S. nigriventris} (Signoret, 1855) and \textit{S. rachelae} sp. nov. Young (1977) probably associated the female lectotype of the former species to a male of the latter. We carefully studied the original description (Signoret 1855) and a digital image of the lectotype of \textit{S. nigriventris} (from Wilson et al. 2009). The lectotype has a pair of narrow dark brown to black stripes on the crown located anteriorly to the orange marking and the mesonotum is uniformly dark brown to black. We have observed these same features (Fig. 47) in our male and female specimens from Rio de Janeiro State, which we thus interpreted as \textit{S. nigriventris}. In the males, the aedeagus is elongate, its dorsal lobe is poorly developed, and the apex bears a pair of ventral spiniform processes directed anteriorly (Fig. 51). On the other hand, our specimens of \textit{S. rachelae}, from Espírito Santo State, do not have the pair of narrow dark brown to black stripes on the crown, whereas the mesoscutum has a pair of brown spots and the mesoscutellum is almost entirely brown (Fig. 38). Males with such color pattern have the dorsal aedegal lobe directed posteriorly, bearing a pair of sclerotized spiniform processes located preapically (Fig. 42). This aedeagal form was interpreted by Young (1977) as belonging to \textit{S. nigriventris}.

\textit{Subrasaca diminuta} sp. nov. has the color pattern (Fig. 1) most similar to that of \textit{S. ignicolor}, type species of the genus. These species can be easily distinguished by the paraphyses. In \textit{S. diminuta} (Fig. 6), the distal half of the paraphyses rami is directed dorsoanteriorly, forming a distinct angle with the basal half, and bears a spine at base. In \textit{S. ignicolor}, the distal half is directed posteriorly, does not form an angle with the basal half, and has no process.

\textit{Subrasaca rubra} sp. nov. is quite distinct from other species of the genus. In addition to the larger body size (males 7.0–7.5 mm, females 7.7 mm) compared to that of other species (males 4.8–6.1 mm, females 5.4–6.7 mm), both the male and female genitalia of the new species show diagnostic features. In the male genitalia, the posterior pygofer margin (Fig. 22) is distinctly truncate and the dorsal lobe of the aedeagal shaft (Fig. 25) bears a strong...
digitiform process directed dorsally. In the female genitalia, the teeth (Fig. 35) of the second valvulae are low and flat and the dorsal dentate apical portion is greater than the ventral one. Due to these remarkable differences, we consider the assignment of this new species to Subrasaca as provisional. We are currently compiling a detailed morphological data matrix of Subrasaca and various out group taxa that will test the generic assignment of S. rubra. A similar problem of generic assignment occurs with S. monacha (Young 1977).

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