



Additional notes on biting midges from the subtropical forest of northeastern Argentina (Diptera: Ceratopogonidae)

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Abstract

Adult males and pupae of *Culicoides guarani* Ronderos & Spinelli and *Parabzezia brasiliensis* Spinelli & Grogan are fully described and illustrated with a modern criterium from material recently collected in the vicinities of the city of Posadas in Misiones province, Argentina. Both species are compared with their most similar congeners. Besides, *Bezzia blantoni* Spinelli & Wirth and *B. brevicornis* (Kieffer) are firstly recorded from Misiones province.

Key words: *Culicoides guarani*, *Parabzezia brasiliensis*, male, pupa, taxonomy

Resumen

Se describen e ilustran con un criterio moderno los adultos machos y las pupas de *Culicoides guarani* Ronderos & Spinelli y *Parabzezia brasiliensis* Spinelli & Grogan, sobre la base de material colectado recientemente en las cercanías de la ciudad de Posadas en la provincia de Misiones, Argentina. Ambas especies son comparadas con sus congéneres más similares. Además, *Bezzia blantoni* Spinelli & Wirth y *B. brevicornis* (Kieffer) son citadas por primera vez para la provincia de Misiones.

Introduction

The Ceratopogonidae are commonly known as biting midges. Adult females of *Leptoconops* Skuse, *Culicoides* Latreille and *Forcipomyia* Meigen (only in the subgenus *Lasiohelea* Kieffer) are haematophagous on vertebrates and, in some instances, transmit harmful diseases (Borkent & Spinelli, 2007). On the other hand, this group of flies provides important services in a wide array of ecosystems, being some species important pollinators of such plants as cacao and rubber trees, and the larvae of many are important predators of other organisms in semiaquatic and aquatic habitats. The adults of most biting midges actually suck blood from other insects and may even be important vectors of viruses that kill caterpillars (Borkent *et al.*, 2009).

Borkent (2015), in his World catalogue, mentioned 6224 extant and 277 extinct valid species, grouped in 110 extant and 21 extinct genera. Many of these species are known only by the adults (especially females) and the majority of the descriptions of pupae are very old and/or incomplete

During a sampling program focused on the collection and study of biting midges recently carried out in the subtropical forest area of northeastern Argentina, pupae of four species of ceratopogonids were collected and posteriorly reared to adults. We are presenting here the first results of this program, describing for the first time the adult males and pupae of *Culicoides guarani* Ronderos & Spinelli and *Parabzezia brasiliensis* Spinelli & Grogan, and recording *Bezzia blantoni* Spinelli & Wirth and *B. brevicornis* (Kieffer) for the Argentinean Misiones province.

Material and methods

Pupae of *Culicoides guarani* were collected with a pipette in tree holes and those of *Parabezzia brasiliensis* and other ceratopogonids in a drainage channel that originates a permanent pond, both in the vicinities of Posadas, a city located near the Paraná river in the southwest of the Misiones province. Specimens were carried to the laboratory and placed individually in a vial with a drop of water and observed daily until adult emergence. Adults were allowed to harden for 24 hours before being preserved to ensure their pigmentation was complete. For detailed examination, exuviae were slide mounted in Canada balsam following the technique of Borkent & Spinelli (2007) and placed with ventral, dorsal and lateral sides to observe structures. Photomicrographs were taken with a digital camera Micrometrics SE Premiun, through Nikon Eclipse E200 microscope. Ink illustrations were drawn with a camera lucida.

For terminology of pupae see Borkent (2014), with an addition of the following abbreviations of measurements: DAL: dorsal apotome length, and DAW: dorsal apotome width. Studied specimens are deposited in the collection of the Museo de La Plata, Argentina (MLPA).

Taxonomy

Culicoides guarani Ronderos & Spinelli

(Figs. 1–21)

Culicoides guarani Ronderos & Spinelli, 1994: 48 (female; Argentina); Borkent & Wirth, 1997: 69 (in World catalogue); Spinelli, 1998: 325 (in list, Argentina); Borkent & Spinelli, 2000: 39 (in catalogue south of USA); Spinelli *et al.*, 2005: 140, 145 (in key; wing photo); Borkent & Spinelli, 2007: 72 (in Neotropical catalogue); Borkent, 2015: 86 (in online World catalogue).

Male adult (Figs. 1–4, 15–16). Head (Figs. 1–2) dark brown. Eyes bare, forming a V-shaped where they contact. Antennae with flagellomeres pale brown, 2–10 fused (Fig. 2); sensilla coeloconica in flagellomeres 1, 11–13. Third palpal segment stout, with deep, rounded subapical sensory pit (Figs. 1–2). Thorax dark brown, scutum without definite pattern, only slightly paler areas laterally. Legs dark brown, knees blackish, fore and midfemora with subapical, tibiae with subbasal narrow pale rings; hind tibial comb with 4 spines, second from spur longest. Wing length 1.00 (0.98–1.02, $n = 2$) mm, width 0.41 (0.40–0.42, $n = 2$) mm; pattern as in Fig. 3; CR 0.54 ($n = 2$); macrotrichia sparse on distal half of wing, none in mcu_1 and anal cell; halter brown. Genitalia (Fig. 4): tergite 9 long, tapering, with short, pointed apicolateral processes, distal margin truncate, pair of evident, pilose, median cerci; sternite 9 with narrow, V-shaped, posteromedial excavation. Gonocoxite stout, twice longer than greatest breadth, ventral root foot-shaped, posterior heel evident, dorsal root slender; gonostylus as long as gonocoxite, slender, slightly curved to pointed tip. Parameres (Fig. 15) separate, subparallel, each stout, with strongly sclerotized basal knob; stem curved near base, midportion of stem slightly swollen, nearly straight, distal portion slender, bent ventromesad, tapering to fine point with lateral fringe of stout spines, the portion at the base of the fringe slightly expanded. Aedeagus (Fig. 16) Y-shaped; basal arch pointed caudad, extending to 0.75 of total length; basal arms slender, strongly sclerotized, nearly straight; posteromedial projection lightly sclerotized tapered to slender, broad tip, with pair of conspicuous lateral processes.

Male pupa (Figs. 5–6, 8–13). Exuviae general coloration pale brown. Flagellum against lateral margin of face (Fig. 5). Total length 2.20–2.40 (2.31, $n=3$) mm. Length of cephalothorax 1.00–1.15 (1.07, $n=3$) mm, width 0.62–0.70 (0.65, $n=3$) mm. Dorsal apotome (Fig. 6) without ventral line of weakness, dorsomedial tubercle and central dome; slightly wider than long, distal margin truncate, smooth, except for few small wrinkles; disc surface covered by stout rounded spinules; raised areas present; tubercles of dorsal apotome sensilla well-developed, bearing 2 dorsal apotome sensilla as follows: DA-1-H, long, stout seta, DA-2-H campaniform sensillum at tubercle base; DAL 0.13–0.17 (0.12, $n=3$) mm; DAW 0.12–0.17 (0.14, $n=3$) mm; DAW/DAL 0.86–1.26 (0.95, $n=3$). Cephalothorax rectangular (Fig. 5), surface covered with stout rounded spinules, antenna extending posteriorly to various points along anterior margin of wing; mouthparts (Figs. 11, 17) with mandible, lacinia well developed; palpus extending equal to posterolateral margin of labium; labium separated medially by labrum; apex of labrum rounded. Cephalothoracic sensilla (Figs. 8–11, 17, 19) as follows: one anteriomedial AM-1-T (Fig. 9) minute seta on small

tubercle, 2 dorsolateral cephalic sclerite sensilla (Fig.10): DL-1-H long, thin seta, DL-2-H short, stout seta on rounded strong tubercle; 3 anterolaterals (Fig. 8): AL-1-T short, thin seta, AL-2-T long, thin seta, AL-3-T short, stout seta, all sensilla on prominent tubercle; clypeal labrals (Figs. 11, 17): CL-1-H campaniform sensillum, CL-2-H medium-sized, thin seta; oculars (Figs. 11,17): O-1-H, O-3-H long, thin setae, O-2-H campaniform sensillum. Respiratory organ (Figs. 5, 8–9) elongated, slender, uniformly brown, medium-sized, circular in cross-section, wider at base, covered with scale-like spinules; 6–7 apical pores, 2–3 lateral; pedicel (Fig. 9) short, stout, P length 0.02–0.03 (0.025, n=3) mm, RO length 0.195–0.20 (0.197, n=3) mm, RO wide 0.025–0.03 (0.027, n=3) mm; P/RO 0.10–0.15 (0.126, n=3); 5 dorsal setae (Fig. 18): D-1-T, D-2-T, D-4-T long, stout setae, D-2-T longer than D-1-T and D-4-T; D-3-T campaniform sensillum, D-5-T minute seta, all setae on rounded tubercles, SA-2-T present. Metathoracics (Fig. 19): M-2-T long, thin seta, M-3-T campaniform sensillum, M-3-T near anterior margin. Abdominal segments with smooth integument, with scarce, scattered spicules on anterior and posterior portions; each segment without pigmentation pattern. First abdominal segment (Figs. 5, 20) with setae as follows: 3 anteromesal setae, D-2-I short, stout seta, D-3-I long, thin seta, D-7-I campaniform sensillum; 3 posterior setae, D-4-I medium-sized, thin seta, D-8-I short, thin seta, D-9-I minute seta; 3 lateral setae: L-1-I long, thin seta, L-2-I, L-3-I campaniform sensilla. Fourth segment (Figs. 5, 21) with dorsal and ventral tubercles with small base: D-1-IV minute seta, D-2-IV, D-3-IV medium-sized, thin setae, D-3-IV longer and thinner than D-2-IV; D-4-IV, D-7-IV without setae, D-5-IV, D-8-IV minute setae, D-9-IV short, curved seta; V-1-IV, V-2-IV campaniform sensilla, V-5-IV short seta, V-6-IV long, thin seta, V-7-IV minute seta, all on notorious pointed lateral tubercles with wide base: L-1-IV short seta, tubercle smaller than others, L-4-IV short, stout seta, L-2-IV, L-3-IV medium-sized, stout setae. Segment 9 (Figs. 5, 13) approximately 1.14 X longer than greatest width, length 0.20–0.205 (0.202, n= 3) mm, width 0.155–0.185 (0.177, n= 3) mm; posteriorly directed spicules restricted dorsally to mesal area, terminal processes triangular, these moderately elongated, subparallel, pointed; ventral surface of processes spiculate, D-5-IX, D-6-IX campaniform sensilla (Fig. 13), genital lobe moderately long, globose, extending under posterior margin.

Female pupa (Figs. 7, 14). Similar to male with usual sexual differences. Total length 2.33–2.40 (2.37, n=3) mm. Dorsal apotome (Fig. 7) with DAL 0.14–0.16 (0.15, n=2) mm; DAW 0.125–0.135 (0.13, n=2) mm, DAW/DAL 0.82–0.90 (0.85, n=2). Respiratory organ: RO length 0.19–0.21 (0.20, n=3) mm, RO width 0.03–0.04 (0.035, n=3) mm; pedicel length 0.025 (n=2) mm, P/RO 0.119–0.125 (0.122, n=2). Cephalothorax length 1.00–1.04 (1.02, n=3) mm, width 0.62– 0.65 (0.64, n=3) mm. Segment 9 (Fig. 14) length 0.20–0.215 (0.207, n=3) mm, width 0.145–0.150 (0.148, n=3) mm; terminal processes (Fig. 14) length 0.065–0.075 (0.072, n=3) mm, width 0.015–0.040 (0.025, n=3) mm.

Distribution. Argentina (Misiones).

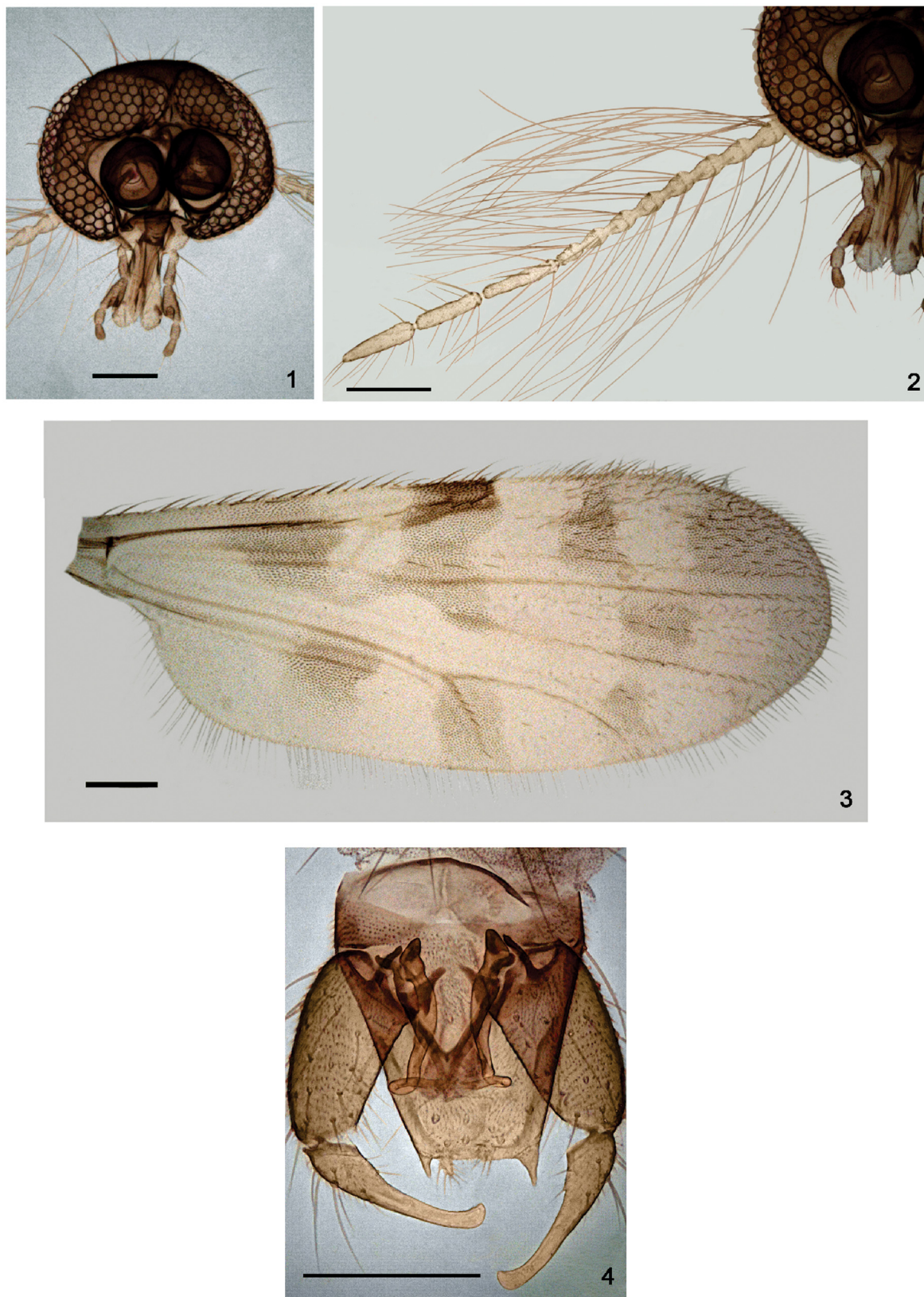
Taxonomic discussion. *Culicoides guarani* is one of the 14 species included in the *Culicoides eublepharus* group. All these are known only through adults and seven of them, including *C. guarani*, just from females.

The pupa of this new species is similar to *C. debilipalpis* Lutz, a species placed in the subgenus *Haematomyidium* that also breeds in tree holes. However, in the latter species the exuviae is pale yellowish brown, the respiratory organ is yellowish except the distal half brown with its pedicel longer, the posteriorly directed spicules of the caudal segment are restricted to a narrow anterior band and not connected to the mesal inverted V-shaped patch of spicules, and the terminal processes are subparallel with pointed and dark tips. Although the general chaetotaxy is similar, the setae of cephalothorax and abdomen are thinner and shorter than in *C. debilipalpis*.

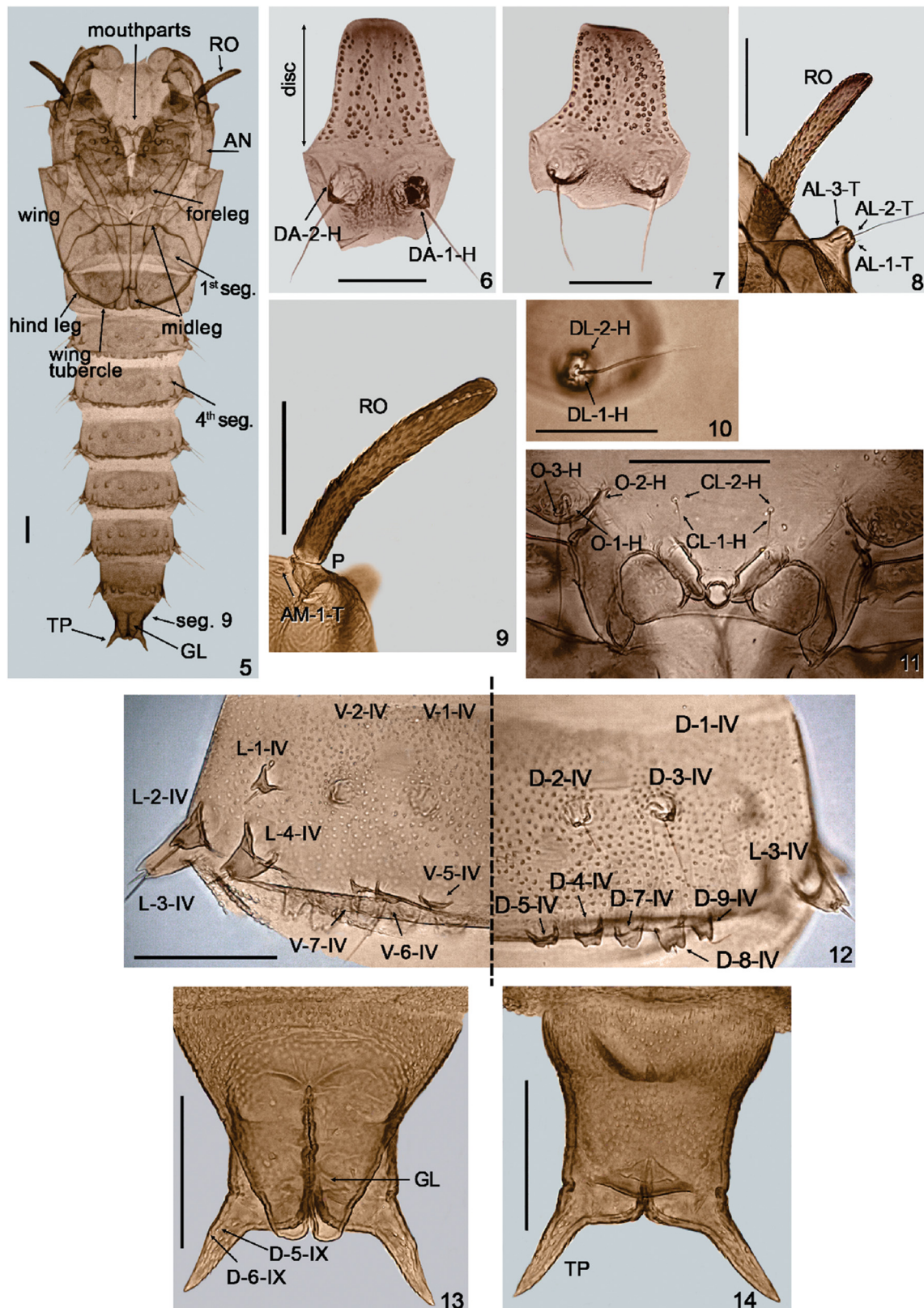
The male genitalia of this species is similar to the one illustrated by Wirth & Lee (1967) for *C. tamboensis* Wirth & Lee, a species inhabiting high altitudes of Colombia except for the sternite 9 with V-shaped and deep caudomedian excavation (very shallow in *C. tamboensis*) and by the posteromedial projection of the aedeagus without lateral processes. Moreover, the latter species is larger (wing length 1.20 mm), the third palpal segment is shorter, the flagellomere 13 lacks sensilla coeloconica and the halter knob is pale at tip.

Culicoides propiipennis Macfie from Mexico to Ecuador, Venezuela and northern Brazil also have very similar genitalia, but the sternite 9 exhibits a very shallow caudomedian excavation, the parameres are convergent and the posteromedial projection of the aedeagus is slender and lacks lateral processes.

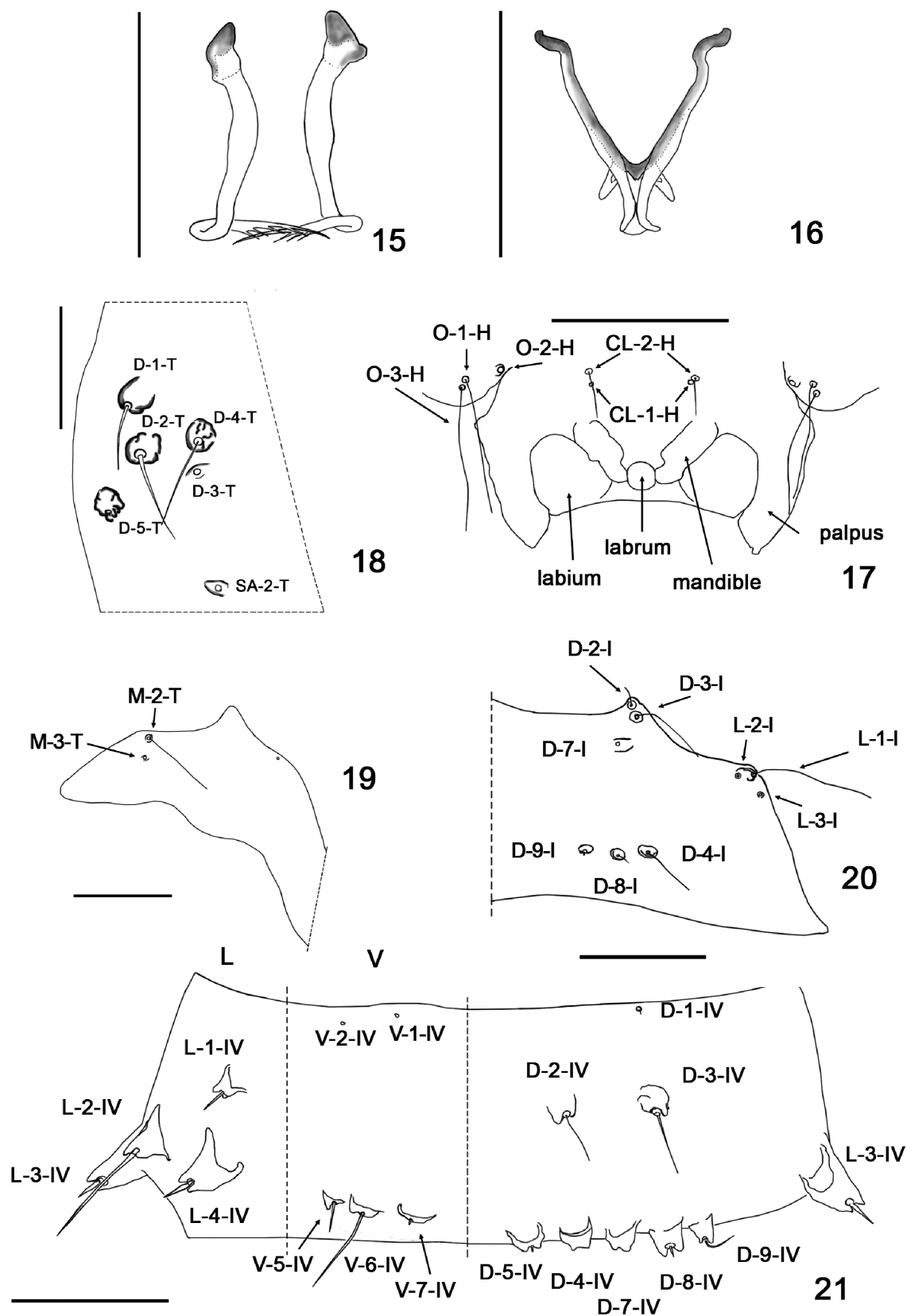
Specimens examined. Argentina, Misiones Prov., Garupá, Barrio Santa Inés, Estancia Santa Inés, 27° 31' 40.9" S, 55° 51' 59.4" W, 9-XI-2013, M. Ayala, 2 males, 3 females (with pupal exuviae).



FIGURES 1–4. *Culicoides guarani* Ronderos & Spinelli, male. 1, head, in anterior view; 2, flagellum; 3, wing; 4, genitalia (ventral view). Scale bars: 0.05 mm.



FIGURES 5–14. *Culicoides guarani*, 5–6, 8–13, male pupa; 7, 14, female pupa; 5, entire pupa; 6–7, dorsal apotome and dorsal apotome sensilla (DA-H); 8, respiratory organ (RO) and anterolateral sensilla (AL-T); 9, respiratory organ (RO), detail of pedicel (P) and anteromedial sensillum (AM-T); 10, dorsolateral cephalic sclerite sensilla (DL-H); 11, clypeal/labral sensilla (CL) and ocular sensilla (O), details of mouthparts; 12, fourth abdominal segment chaetotaxy (dorsal and ventral views); 13, Segment 9, detail of ventral surface, genital lobe (GL), terminal processes (TP); 14, Segment 9. Scale bars: 0.05 mm



FIGURES 15–21. *Culicoides guarani*, 15–16, male adult; 18–21, male pupa. 15, parameres; 16, aedeagus, 17, clypeal/labral sensilla (CL) and ocular sensilla (O), details of mouthparts; 18, dorsal setae (D-T), supraalar (SA); 19, metathorax chaetotaxy (M-T); 20, first abdominal segment chaetotaxy (dorsal view); 21, fourth abdominal segment chaetotaxy (dorsal and ventral views), with detail of setae and tubercles. Scale bars: 0.05 mm.

***Parabezzia brasiliensis* Spinelli & Grogan**

(Figs. 22–42)

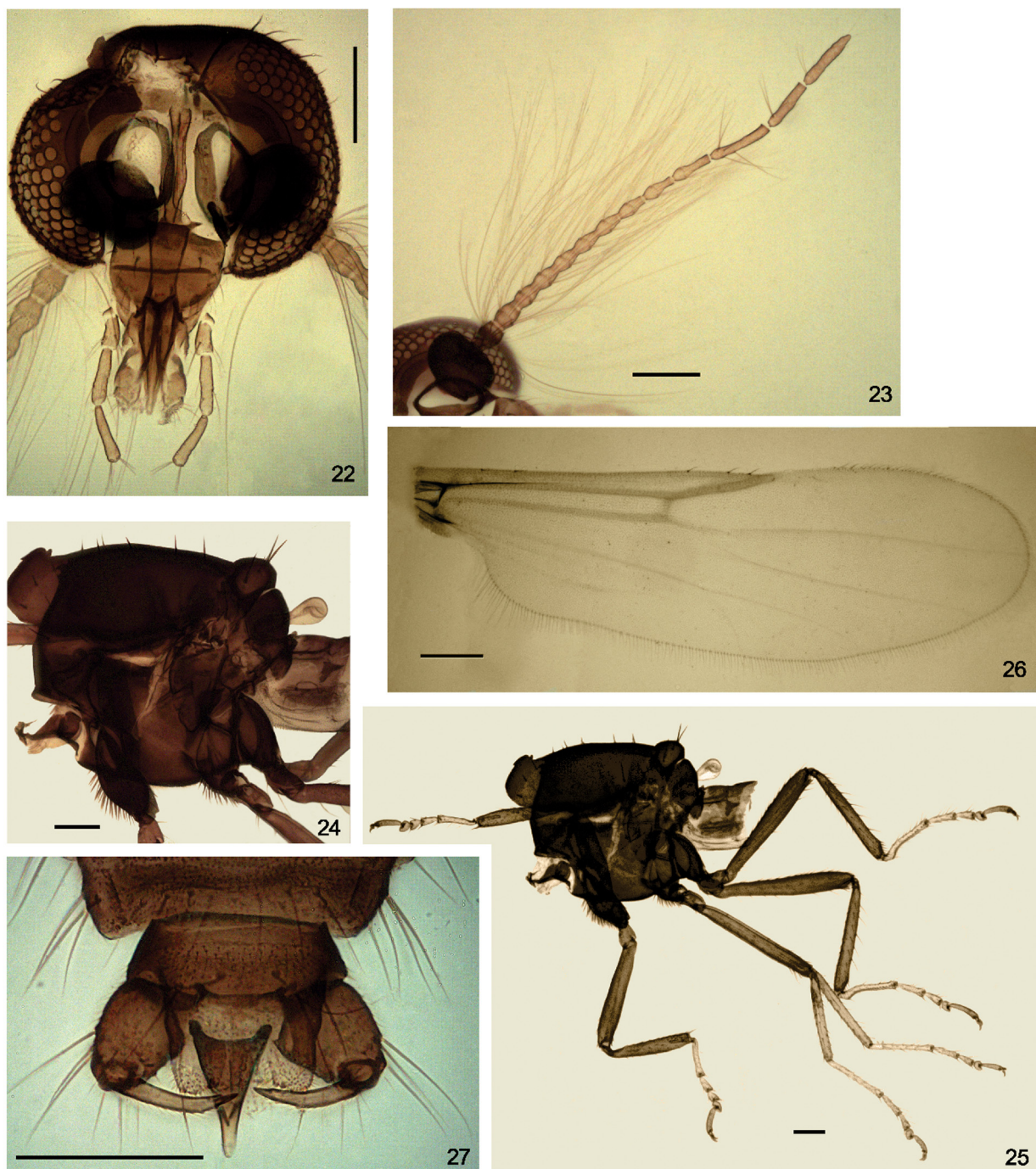
Parabezzia brasiliensis Spinelli & Grogan, 1987: 34 (female; Brazil); Borkent & Wirth, 1997: 104 (in World catalogue); Borkent & Spinelli, 2000: 51 (in catalogue south of USA); Borkent & Spinelli, 2007: 84 (in Neotropical catalogue); Borkent, 2015: 131 (in online World catalogue).

Male adult (Figs. 22–27, 38–39). Head (Fig. 22) dark brown. Eyes separated by diameter of 6 ommatidia, without interommatidial spicules. Antenna (Fig. 23) with flagellomeres 1–10 brown, 11–13 slightly darker, plume well-developed, flagellomeres 2–8 fused, 1–9 short, 11–13 elongate. Palpus (Fig. 22) brown, with 4 segments; third segment slender, elongate, subequal to apical segment. Thorax (Figs. 24, 25) uniformly dark brown. Scutum with numerous, moderately elongate, erect setae; scutellum with 6 setae, the two mesal the longest. Pleura without setae. Legs (Fig. 25) with femora and tibiae uniformly dark brown, tarsi paler except tarsomeres 5 infuscated; fore, midcoxae with abundant spine-like setae; hindtibial spur short; hindtibial comb with 8 spines, third from spur longest; tarsomeres 1 of hindleg with dense palisade setae; prothoracic TR 2.40, mesothoracic TR 2.67, metathoracic TR 2.14; tarsomeres 5 elongate; claws equal, small, nearly straight, bifid at tip. Wing (Fig. 26) length 0.96 mm; width 0.30 mm; CR 0.57; membrane very slightly infuscated; radial cell obliterated, venation as figured; costa with 5 setae, 2 near but distal to basal arculus, other 3 on its distal 1/4. Halter pale brown. Abdomen uniformly brown. Genitalia (Fig. 27): tergite 9 broad, subquadrangular, extending just anterior to level of apex of gonocoxite; posterior margin broad, nearly straight with broad posteromedian notch, circus stout, rounded; sternite 9 with anterior margin straight, 0.42 length of breadth, with broad, shallow posteromedian excavation. Gonocoxite short, as long as greatest (mesal) width, with short, pointed mesal process; gonostylus slender, 1.3 X longer than gonocoxite, slightly curved with pointed tip. Parameres (Fig. 38) fused, heavily sclerotized, base straight base; distal portion lightly sclerotized, slender, nearly straight with blunt tip; gonocoxal apodemes heavily sclerotized, slender, each with short process directed anterolaterally. Aedeagus (Fig. 39) triangular, 1.6 X longer than greatest (basal) width; basal arch extending 0.1 of total length; proximal 3/4 heavily sclerotized; distal portion about 1/4 of total length, lightly sclerotized, with blunt tip.

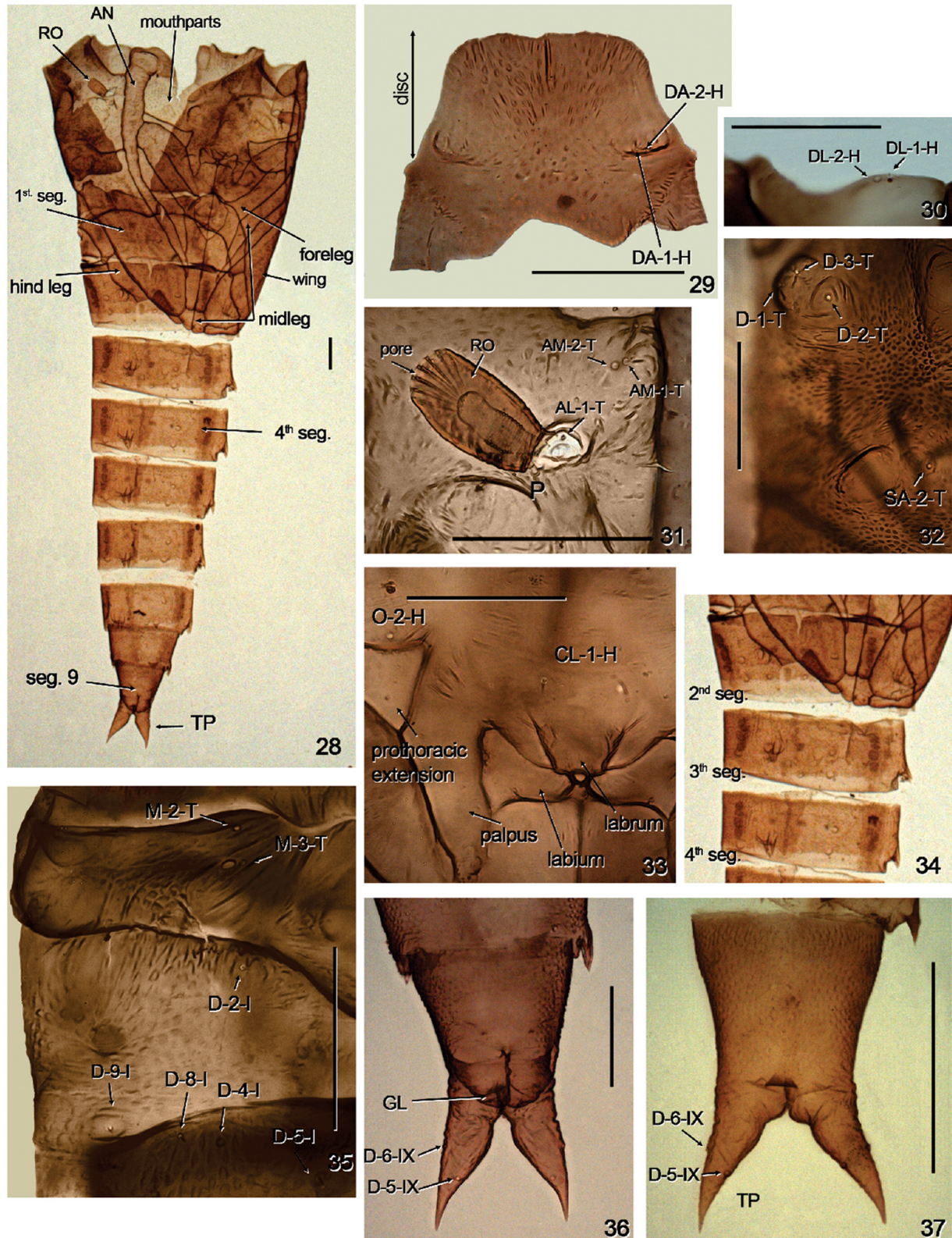
Male pupa (Figs. 28–34, 36, 40–42). Exuviae general coloration pale brown, body surface with small rounded tubercles and spinules. Total length 1.76 mm. Flagellum appressed against lateral margin of face, midleg and wing (Fig. 28). Dorsal apotome (Fig. 29) without ventral line of weakness, dorsomedial tubercle and central dome, with anterior margin quadrangular, posterior margin broken, disc surface covered by few rounded tubercles and longitudinal wrinkles on anterior portion, lateral margins with broad raised areas with flattened tubercle at base, bearing 2 dorsal apotome sensilla (Fig. 29) as follows: DA-1-H short seta, DA-2-H campaniform sensillum at tubercle base; DAL 0.09 mm, DAW 0.19 mm, DAW/DAL 5.56. Cephalothorax rectangular (Fig. 28), narrowed posteriorly, length 0.95 mm, width 0.67 mm; mesonotum covered with few moderately-sized tubercles; prothoracic extension wide (0.16 mm) (Fig. 40), well developed, extending from palpus to antenna; mouthparts (Fig. 40) with mandible well developed, lacinia absent, palpus extending posteriorly to posterolateral margin of labium; labium entire. Cephalothoracic sensilla as follows: anteriomedials (Fig. 31) AM-1-T very short seta, AM-2-T campaniform sensillum on small tubercle, 2 dorsolateral cephalics sclerites (Fig. 30): DL-1-H very short seta, DL-2-H campaniform sensillum; one anterolateral (Fig. 31): AL-1-T minute seta; clypeal labral sensillum (Figs. 33, 40): CL-1-H minute seta; ocular (Figs. 33, 40): O-2-H campaniform sensillum; 3 dorsal setae (Fig. 32): D-1-T, D-2-T peg-like setae, D-3-T campaniform sensillum, D-2-T, D-3-T on closely approximate tubercles, SA-2-T present (Fig. 32). Respiratory organ (Figs. 28, 31) short, squat, 5–6 apical closely abutting pores arranged in single row, outer surface with wrinkles, membranous base of respiratory organ short, tracheal tube straight, with annulations to half length; pedicel (Fig. 31) short, wide, P length: 0.0025 mm, RO length 0.075 mm, RO wide 0.04 mm; P/RO 0.033. Metathoracics (Fig. 41): 2 campaniform sensilla (M-2-T, M-3-T), M-3-T near anterior margin. Abdominal segments with 2 spots laterally on segment 2–7, segment 2 (0.55 mm) wider than segment 3 (0.45 mm). First abdominal segment (Fig. 41) with 7 setae: D-2-I very short, D-3-I absent, D-4-I, D-7-I campaniform sensilla, D-5-I, D-9-I minute setae, D-8-I peg, L-1-I very short seta. Fourth segment (Fig. 42) with sensillar pattern as follows: dorsal tubercles with small base: D-1-IV, D-3-IV absent, D-2-IV very short seta, D-4-IV, D-7-IV campaniform sensilla, D-5-IV, D-8-IV, D-9-IV minute setae, V-5-IV, V-6-IV without visible setae, on notorious tubercles; L-1-IV absent, L-2-IV, L-3-IV short, stout setae, on triangular pointed tubercles. Segment 9 (Fig. 36) approximately 1.83 X longer than greatest width, length 0.275 mm, width 0.15 mm; posteriorly directed spicules restricted dorsally to

mesal area, terminal processes triangular, these moderately elongated, subparallel, pointed; ventral surface of processes spiculated, terminal processes length 0.125 mm, width 0.05 mm, D-5-IX, D-6-IX campaniform sensilla (Fig. 36), genital lobe moderately long and globose, extending under posterior margin.

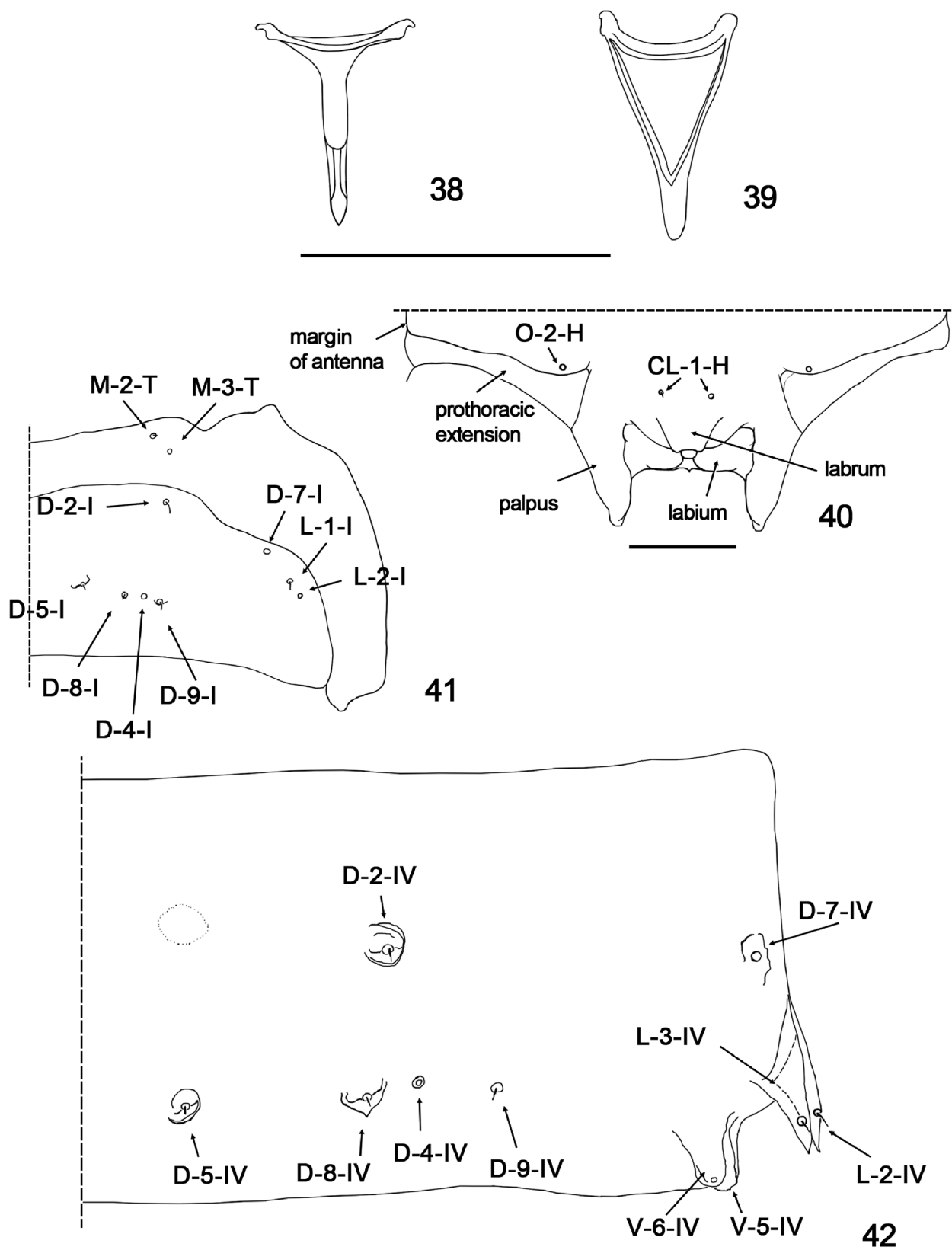
Female pupa (Figs. 35, 37). Similar to male with usual sexual differences: CTL 0.90 mm. First abdominal segment (Fig. 35) with setae: D-2-I minute seta, D-7-I and L-1-I not in position to describe, D-5-I very short seta, D-9-I minute seta on flattened tubercle, D-8-I very short seta. Segment 9 (Fig. 37) length 0.325 mm, width 0.175 mm; terminal processes length 0.125 mm, width 0.05 mm.



FIGURES 22–27. *Parabezzia brasiliensis*, male adult. 22, head, in anterior view; 23, flagellum; 24, thorax; 25, legs; 26, wing; 27, genitalia (ventral view). Scale bars: 0.05 mm.



FIGURES 28–37. *Parabzezia brasiliensis*, 28–36, male pupa, 35, 37, female pupa. 28, entire pupa; 29, dorsal apotome and dorsal apotome sensilla (DA-H); 31, respiratory organ (RO) and anterolateral sensilla (AL-T); 31, anteromedial sensillum (AM-T); 32, dorsolateral cephalic sclerite sensilla (DL-H); 33, clypeal/labral sensillum (CL) and ocular sensillum (O), details of mouthparts; 34, second and third abdominal segments; 35, metathorax and first abdominal segment chaetotaxy (dorsal and ventral views); 36, segment 9 (ventral view), genital lobe (GL), terminal processes (TP), D-5-IX-D-6-IX (campaniform sensilla); 37, segment, 9. Scale bars: 0.05 mm



FIGURES 38–42. *Parabezzia brasiliensis*, 38–39, male adult; 40–42, male pupa. 38, parameres; 39, aedeagus; 40, clypeal/labral sensillum (CL) and ocular sensillum (O), details of mouthparts; 41, metathorax chaetotaxy (M-T) and first abdominal segment chaetotaxy (dorsal view); 42, fourth abdominal segment chaetotaxy (dorsal and ventral views), with detail of setae and tubercles. Scale bars 0.05 mm.

Distribution. Brazil (Mato Grosso), Argentina (Misiones).

Taxonomic discussion. *Parabezzia brasiliensis* is one of the 25 species inhabiting the Neotropical region. Of these, only are known the pupae of *P. alexanderi* Wirth and *P. balseiroi* Spinelli & Grogan. Fourteen species, including *P. brasiliensis*, are known only from female adults.

There are two quite different types of pupae in *Parabezzia*. One has number of rounded tubercles, the other called *alexanderi* group, has sharp tubercles and abdominal sternites with membranous discs (Borkent, 2014). *Parabezzia brasiliensis* perfectly fits in the *alexanderi* group and is very similar to *P. balseiroi*, but in the latter species the DAW/DAL ratio is lower (2.26 for male, 3.60 for female), the DA-1-H is a minute seta on well developed tubercle, and the respiratory organ bears 10–12 apical opening pores.

The adult male of *P. brasiliensis* is easily distinguished from their congeners inhabiting the Americas by the obliterated radial cell and by the costal fringe limited to 5 setae. The aedeagus is very similar to the one illustrated by Grogan & Wirth (1977, page 73) for the Nearctic species *P. inermis* (Coquillett), but in the latter the radial cell is open, the costal fringe is complete and the parameres are apparently absent.

Pupae of this specie was collected associated with pupae of *Bezzia blantoni* Spinelli & Wirth and *Bezzia brevicornis* (Kieffer).

Specimens examined. Argentina, Misiones Prov., Posadas, Miguel Lanús, área de Recursos Ambientales El Zaimán, 27° 26' 11.6" S, 55° 53' 48.7" W, 28-III-2014, M. Ayala, 1 male, 1 female (with pupal exuviae).

New records

Bezzia blantoni Spinelli & Wirth

Bezzia blantoni Spinelli & Wirth, 1989: 771 (male, female, pupa; distribution); Spinelli & Wirth, 1993: 63 (in list, Argentina); Borkent & Wirth, 1997: 125 (in World catalogue); Borkent & Spinelli, 2000: 60 (in catalogue south of USA); Borkent & Spinelli, 2007: 93 (in Neotropical catalogue); Borkent, 2015: 158 (in online World catalogue); Ronderos & Spinelli, 2009: 47 (redescription of pupa).

Distribution. Belize to Costa Rica, Puerto Rico, Argentina (Misiones, Corrientes, Buenos Aires).

New record. Argentina, Misiones Prov., Posadas, Miguel Lanús, área de Recursos Ambientales El Zaimán, 27° 26' 11.6" S, 55° 53' 48.7" W, 28-III-2014, M. Ayala, 4 males, 2 females (with pupal exuviae).

Bezzia brevicornis (Kieffer)

Bezzia brevicornis Kieffer, 1917: 328 (male, female; Paraguay); Wirth, 1974: 52 (in catalogue south of USA); Spinelli, 1983: 18; Spinelli & Wirth, 1993: 63 (in list, Argentina); Borkent & Wirth, 1997: 125 (in World catalogue); Spinelli, 1998: 326 (in list, Argentina); Borkent & Spinelli, 2000: 60 (in catalogue south to USA); Borkent & Spinelli, 2007: 93 (in Neotropical catalogue); Spinelli *et al.*, 2012: 64 (redescription of pupa); Borkent, 2015: 159 (in online World catalogue).

Distribution. Paraguay, Argentina (Misiones, Corrientes, Entre Ríos, Buenos Aires, Río Negro), Uruguay.

New record. Argentina, Misiones Prov., Posadas, Miguel Lanús, área de Recursos Ambientales El Zaimán, 27° 26' 11.6" S, 55° 53' 48.7" W, 28-III-2014, M. Ayala, 1 male (with pupal exuviae).

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References

- Borkent, A. (2014) The pupae of the biting midges of the World (Diptera: Ceratopogonidae), with a generic key and analysis of the phylogenetic relationships between genera. *Zootaxa*, 3879 (1), 1–327.
<http://dx.doi.org/10.11646/zootaxa.3879.1.1>
- Borkent, A. (2015) World species of biting midges (Diptera: Ceratopogonidae). 241 pp. Last update 1 February 2015. Available from: <http://www.inhs.illinois.edu/files/1114/2384/5200/CeratopogonidaeCatalog.pdf> (accessed 4 March 2015)
- Borkent, A. & Spinelli, G.R. (2000) Catalog of the New World biting midges south of the United States of America (Diptera: Ceratopogonidae). *Contributions on Entomology, International*, 4, 1–107.
- Borkent, A. & Spinelli, G.R. (2007) Neotropical Ceratopogonidae (Diptera: Insecta). In: Adis, J., Arias, J.R., Rueda Delgado, G. & Wantzen, K.M. (Eds.), *Aquatic Biodiversity in Latin America (ABLA). Vol. 4*. Pensoft, Sofia-Moscow, 198 pp.
- Borkent, A. & Wirth, W.W. (1997) World species of biting midges (Diptera: Ceratopogonidae). *Bulletin of the American Museum of Natural History*, 233, 1–257.
- Grogan, W.L. & Wirth, W.W. (1977) A revisión of the Nearctic species of *Parabezzia* Malloch (Diptera: Ceratopogonidae). *Journal of the Kansas Entomological Society*, 50, 49–83
- Ronderos, M.M. & Spinelli, G.R. (1994) Dos especies nuevas de *Culicoides* de la Argentina (Diptera: Ceratopogonidae). *Revista de la Sociedad Entomológica Argentina*, 53, 47–50.
- Ronderos, M.M. & Spinelli, G.R. (2009) Description of the immatures of the predaceous midge *Bezzia blantonii* Spinelli & Wirth (Diptera: Ceratopogonidae). *Zootaxa*, 2295, 46–54.
- Spinelli, G.R. (1983) Notas sobre Ceratopogonidae (Diptera: Nematocera) de la República Argentina. III. Nuevos aportes al conocimiento de la tribu Palpomyiini. *Revista de la Sociedad Entomológica Argentina*, 42, 17–24.
- Spinelli, G.R. (1998) Ceratopogonidae. In: Morrone, J.J. & Coscaron, S. (Eds.), *Biodiversidad de Artrópodos argentinos. Una perspectiva biotaxonomica*. Ediciones Sur, La Plata, pp. 314–326.
- Spinelli, G.R. & Grogan, W.L. (1987) A revision of the Neotropical species of *Parabezzia* (Diptera: Ceratopogonidae). *Biología Acuática*, 11, 1–45.
- Spinelli, G.R., Ronderos, M.M. & Cazorla, C.G. (2012) A new species of *Bezzia* Kieffer from Argentina (Diptera: Ceratopogonidae). *Zootaxa*, 3232, 62–68.
- Spinelli, G.R., Ronderos, M.M., Díaz, F. & Marino, P.I. (2005) The bloodsucking biting midges of Argentina (Diptera: Ceratopogonidae). *Memorias do Instituto Oswaldo Cruz*, 100, 137–150.
- Spinelli, G.R. & Wirth, W.W. (1989) The Neotropical predaceous midges of the genus *Bezzia* (Diptera: Ceratopogonidae). Part I. The *glabra* and *brevicornis* groups. *Limnobiós*, 2, 762–778.
- Spinelli, G.R. & Wirth, W.W. (1993) Los Ceratopogonidae de la Argentina (Insecta: Diptera). In: Castellanos, Z.A. de (Ed.), *Fauna de agua dulce de la República Argentina*, 38 (Fasc. 3), pp. 121. [La Plata]
- Wirth, W.W. (1974) Family Ceratopogonidae. In: Papavero, N. (Ed.), *A catalog of the Diptera of the Americas South of the United States. Fasc. 14*. Departamento de Zoologia, Secretaria da Agricultura, São Paulo, pp. 89.
- Wirth, W.W. & Lee, V.H. (1967) New species of *Culicoides* from high altitudes in the Colombian Andes (Diptera: Ceratopogonidae). *Proceedings of the United States National Museum*, 124, 1–22.