Culicoides baniwa sp.nov. from the Brazilian Amazon Region with a synopsis of the *hylas* species group (Diptera: Ceratopogonidae)

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A new species of the Culicoides (Hoffmania) hylas *species group*, Culicoides baniwa *Felippe-Bauer is described and illustrated based on a female specimen from the state of Amazon, Brazil. A systematic key, wing photographs, diagramme of the legs pattern, table with numerical characters of females and a synopsis of the 11 species of the* C. hylas *group are presented. This paper further presents a new record of* Culicoides pseudoheliconiae *Felippe-Bauer out of the previously defined geographic distribution of the* hylas *species group, in the province of Misiones, Argentina.*

Key words: Amazon - Brazil - *Culicoides baniwa* sp.nov. - *Culicoides hylas* group - neotropical bloodsucking midges - new record

Wirth and Blanton (1956) re-described and keyed out the three species of the subgenus *Hoffmania* Fox of *Culicoides* Latreille previously related to *Culicoides hylas* Macfie and first recognized the *hylas* species group. In their 1956 paper, they treated *Culicoides contubernalis* Ortíz & León as a variety of *Culicoides rozeboomi* Barbosa and considered it to be a junior synonym of *Culicoides verecundus* Macfie. Wirth and Blanton (1968) reviewed the species group, describing three more species and establishing that they occur between Veracruz in Mexico through Central and South America to Ecuador and the Amazon Region of Brazil, Colombia and Peru. Recently, Felippe-Bauer et al. (2008) described *Culicoides pseudoheliconiae* Felippe-Bauer from Peruvian Amazon and re-established *C. contubernalis* as an autonomous species. Finally, Spinelli et al. (2009) described *Culicoides antioquiensis* Spinelli from Colombia. Currently, the *hylas* species group is known to contain 10 species, half of which (*Culicoides aitkeni* Wirth & Blanton, *Culicoides heliconiae* Fox & Hoffmann, *C. hylas* Macfie, *Culicoides palpalis* Macfie, *Culicoides polypori* Wirth & Blanton and *C. verecundus* Macfie) inhabit the Brazilian Amazon Region.

In the present paper, we describe and illustrate a new species from the Amazon Basin of Brazil and provide a key, a table of numerical characters, a diagramme of the leg pattern of female specimens and a synopsis of the 11 species actually belonging to the *hylas* species group. We also report the presence of *C. pseudoheliconiae* Felippe-Bauer in the Misiones province in Argentina, a subtropical forest area situated south of the Amazon Region. This report represents an extension of the previously described southern limit of the geographic distribution of the *hylas* species group.

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MATERIAL AND METHODS

The specimen described herein as a new species was collected while it was biting a human during an entomological survey in São Gabriel da Cachoeira, Amazonas (AM), Brazil. The specimen was mounted in phenol-balsam in the manner described by Wirth and Marston (1968) and has been deposited in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), AM, Brazil. Specimens of the other studied species were deposited in the Ceratopogonidae Collection of the Instituto Oswaldo Cruz and in the Collection of the Museo de La Plata (MLP), Argentina. Diagnostic characters were illustrated using a camera lucida attached to an Olympus BH-2 microscope. Microphotographies of the wings were taken with a Nikon Eclipse E-800; brightness and contrast of images were adjusted using Adobe Photoshop CS2.

In this paper, we follow the terminology established in *Culicoides* papers by Spinelli et al. (2005) and Felippe-Bauer et al. (2008). Therms of wing veins follow the system of the Manual of Neartic Diptera (MacAlpine et al. 1981) with modifications proposed by Szadziewski (1996). All measurements are in micrometres, except those of the wings which are in millimetres.

Culicoides hylas group

Diagnosis: medium to large sized species belonging to subgenus *Hoffmania* Fox with dark brown to blackish colour and wings with very distinct pale spots. Wing (Figs 1-10, 17) with second radial cell included in a single or subdivided pale spot; base of cell cua_1 dark where it borders the bases of veins CuA_1 and CuA_2; cell r_3 shows a pale spot usually present anterior to base of vein M_1; apices of veins M_1 and M_2 pale; apices of veins CuA_1 and CuA_2 with or without pale spot, depending on the species. Mesonotum dark brown to black with a prominent

pattern of large pale or pruinose areas. Eyes contiguous, bare. Antenna long and slender, segments with bases conspicuously pale; proximal flagellomeres not greatly shorted, sensilla coeloconica present on flagellomeres 1, 9-13. Palpus slender; third palpal segment slender, cylindrical to spindleshaped, usually with scattered sensilla, palpal ratio varies between 2.7-6.0. Legs dark brown with distinct pale bands characteristic of each species; hind tibial comb shows six spines, the longest of which is the second from the spur. Two spermathecae usually with short, slender necks plus a rudimentary third and sclerotized ring. Male tergite 9 rounded posteriorly, without conspicuous apicolateral processes; posteromedial margin with distinctive lobe or processes; sternite 9 with shallow posteromedial excavation, the ventral membrane not spiculate. Gonocoxite slender, dorsal and ventral root not developed; gonostylus curved and slender with moderately sharp pointed tip. Aedeagus narrow with very short basal arch, the anterior margin with distinct sclerotized band; distal portion with internal sclerotized projection, ending in a rounded papilla. Parameres fused at base usually for about half of total length, separate portion abruptly tapered to slender terminal filaments with very fine distal fringing hairs.

Key to the species of the *Culicoides hylas* group

1. Hind femur dark to tip (Figs 13-16) 2
- Hind femur with subapical pale band (Figs 11, 12) ... 7

2. Mid femur dark to tip (Fig. 16), a double distal pale spot in r_3, pale spot absent in front of base of M1 (Fig. 17) ..... *baniwa* Felippe-Bauer sp.nov.
- Mid femur various, a single distal pale spot in r_3, pale spot present in front of base of vein M1 3

3. Mid femur with subapical pale band (mid knee dark; Fig. 15); 3rd palpal segment with irregular sensory pit ..... *hylas* Macfie
- Mid femur with apical pale band (mid knee pale; Figs 13, 14); 3rd palpal segment without sensory pit, with scattered sensilla on surface of 3rd segment 4

4. Wing markings diffuse, dark and pale spots not brightly contrasting; pale spot that crosses second radial cell subdivided in two separate spots (Fig. 8) .... *pseudoheliconiae* Felippe-Bauer
- Wing with contrasting pattern of dark and pale spots; pale spot that crosses the second radial cell, single 5

5. Distal pale spot in r_3 narrow and transverse; apices of CuA_1 and CuA_2 pale (Fig. 4) .... *heliconiae* Fox & Hoffman
- Distal pale spot in cell r_3 large; apices of CuA_1 and CuA_2 various 6

6. Apices of CuA_1 and CuA_2 dark (Fig. 6) .... *palpalis* Macfie
- Apices of CuA_1 pale and CuA_2 dark (Fig. 2) .... *antioquiensis* Spinelli

7. Pale spot absent in front of base of M1 (Fig. 10); flagellomeres 2-8 with prominent four or five-branched hyaline sensory filaments..... *xanifer* Wirth & Blanton
- Pale spot present in front of base of M1, flagellomeres 2-8 with simple hyaline sensory filament 8

8. Apices of CuA_1 and CuA_2 pale (Figs 1, 3) 9
- Apices of CuA_1 and CuA_2 dark (Figs 7, 9) 10

9. Large species, wing length 1.50 mm, P.R. 6.0, A.R. 1.26, P/H ratio 1.38 ..... *aitkeni* Wirth & Blanton
- Smaller species, wing length 1.30-1.35 mm, P.R. 3.8-4.3, A.R. 1.09-1.14, P/H ratio 1.14-1.18 .... *contubernalis* Ortiz & Leon

10. Mid femur with subapical pale band (Fig. 11) .... *polypori* Wirth & Blanton
- Mid femur with apical pale band (Fig. 12) .... *verecundus* Macfie

C. aitkeni Wirth & Blanton
(Figs 1, 11)

C. aitkeni Wirth & Blanton, 1968: 214 (female, Trinidad and Tobago; Figs; in key), Wirth & Blanton, 1973: 424 (Amazon records, Brazil), Aitken et al., 1975: 115 (Trinidad and Tobago records, wing photo), Wirth et al., 1988: 19 (in Atlas; wing photo; distribution), Borkent & Wirth, 1997: 61 (in catalogue), Borkent & Spinelli, 2000: 33 (in catalogue), Borkent & Spinelli, 2007: 67 (in catalogue), Felippe-Bauer et al., 2008: 260 (in key).

Diagnosis: the female of the species possesses the following combination of characters: third palpal segment with scattered sensilla; wing length 1.50 mm, r_3 with pale spot present anterior to base of M_1 and in apices of CuA_1 and CuA_2, a single pale spot crossing second radial cell; mid and hind femur with subapical pale band; spermathecae with short, slender necks.

Male: unknown.

Distribution - Trinidad and Tobago, Brazil [Pará (PA)].

C. antioquiensis Spinelli
(Figs 2, 13)

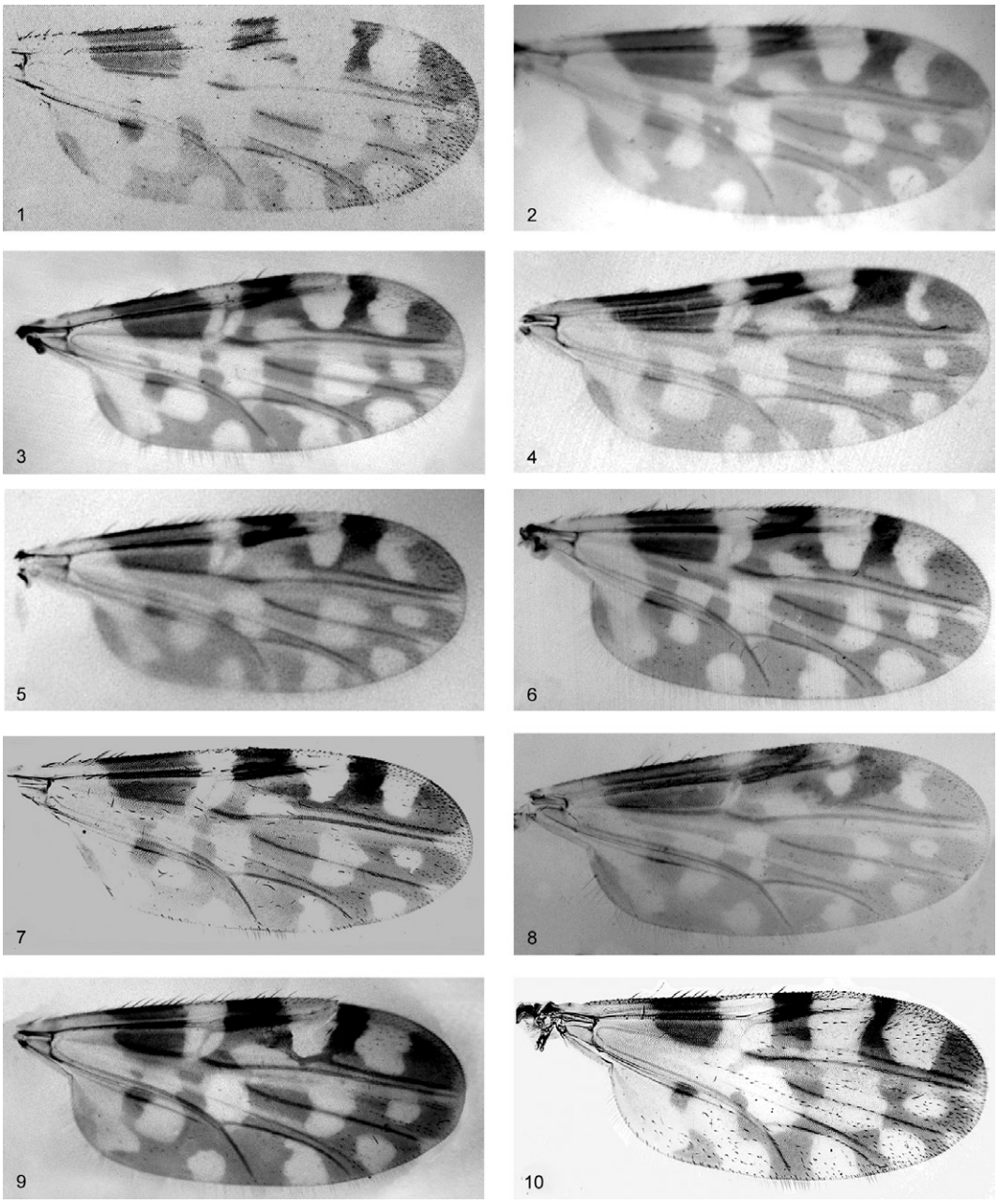
C. antioquiensis Spinelli (in Spinelli et al. 2009): 82 (male, female; Colombia)

Diagnosis: the species possesses the following combination of characters: third palpal segment with scattered sensilla; mid femur with apical pale band, hind femur dark to tip; wing with apices of CuA_1 pale and apex of CuA_2 dark, r_3 with pale spot present anterior to base of M_1, a single pale spot crosses the second radial cell and wing pattern most similar to *C. hylas*; spermathecae without sclerotized necks. Male tergite 9 somewhat truncated; gonostylus with subapical tooth; fused portion of the parameres 1.5 broader than long, separate portion V-shaped at base.

Distribution - Colombia.

C. baniwa Felippe-Bauer, sp.nov.
(Figs 16, 22)

Diagnosis: this species is easily distinguished from the other species of the *hylas* group by the presence of double pale spots in r_3, one crossing second radial cell and the other in distal portion of r_3, by the absence of pale spot in front of base of M1 and by the mid femur dark to tip.



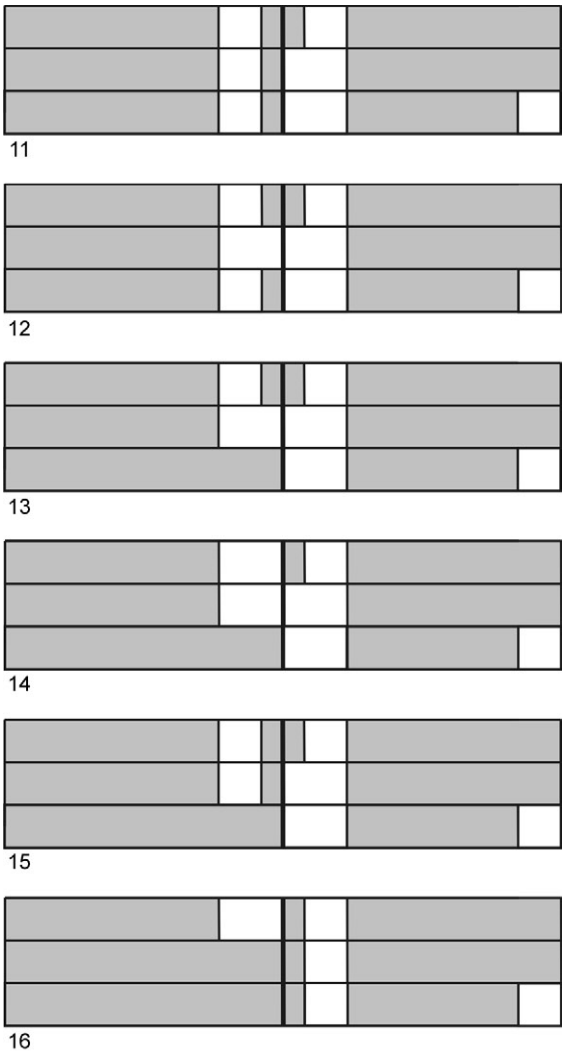
Figs 1-10: wing photograph of *Culicoides hylas* species group. 1: *Culicoides aitkeni*; 2: *Culicoides antioquiensis*; 3: *Culicoides contubernalis*; 4: *Culicoides heliconiae*; 5: *C. hylas*; 6: *Culicoides palpalis*; 7: *Culicoides polypori*; 8: *Culicoides pseudoheliconiae*; 9: *Culicoides verecundus*; 10: *Culicoides xanifer*.

Male: unknown.

Female: wing length 1.32 mm; breadth 0.54 mm.

Head: dark brown. Eyes contiguous, bare. Pedicel dark brown. Flagellum (Fig. 18) brown, with base of flagellomeres conspicuously pale; flagelomeres with mean lengths of 75-107-107-107-107-107-107-107-75-80-85-91-139 µm; antennal ratio 1.05; sensilla coeloconia on flagellomeres 1, 9-13, three on 1, one on 9-13. Palpus (Fig. 21) brown, apices of the segments 1-4 pale, base of the third segment pale, fifth segment entirely pale; lengths of segments 27-128-149-53-53 µm; third segment slender, subcylindrical, without sensory pit, with scattered sensilla on surface; palpal ratio 4.7. Proboscis brown, P/H ratio 1.48; mandible with 27 teeth.

Thorax: dark brown; scutum, scutellum, postscutellum, pleuron dark brown. Legs mostly dark brown; fore femur with apical pale band, mid and hind femur entirely dark; mid knee dark; tibiae with subbasal pale bands; hind tibia pale apically (Figs 16, 22); hind tibial comb with six spines, the second from de spur longest (Fig. 20). Tarsi pale, first



Figs 11-16: leg pattern of *Culicoides hylas* species group (top to bottom: fore, mid and hind; left to right: femur and tibia). 11: *Culicoides aitkeni*, *Culicoides contubernalis* and *Culicoides polypori*; 12: *Culicoides verecundus* and *Culicoides xanifer*; 13: *Culicoides antioquiensis*, *Culicoides heliconiae* and *Culicoides palpalis*; 14: *Culicoides pseudoheliconiae*; 15: *C. hylas*; 16: *Culicoides baniwa* sp.nov.

tarsomeres darkest. Wing (Fig. 17) with pattern typical of *hylas* group: one round pale spot over the second radial cell; two spots on r_3: one just below the pale spot on second radial cell not reaching M1, the other a distal, double pale spot; pale spot over r-m crossvein extending from M to costal margin, narrow, slender; m_1 with two rounded pale spots, distal spot smaller and farther from wing margin; m_2 shows one proximal pale spot, double pale spot lying between medial, mediocubital forks, one subapical, another in distal portion near wing margin; cua_1 with rounded pale spot extending from CuA_1 to wing margin; anal cell with two well separated pale spots on distal portion, one anterior of mediocubital fork, the other near wing margin; base of the wing extensively pale since the costal vein to anal cell; apices of M_1, M_2, CuA_1, CuA_2 pale; costal ratio 0.69. Halter pale, base of the knob infuscate.

Abdomen: brown. Two unequal sized ovoid spermathecae (Fig. 19) without necks, measuring 48 by 37 µm and 37 by 32 µm, respectively. Rudimentary third spermathecae, short sclerotized ring present.

Distribution - Brazil (AM).

Type data and depository - Holotype female, Comunidade de Assunção, Rio Içana, São Gabriel da Cachoeira (01°03'44,5''N 67°35'36,0''W), AM, Brazil, 25.XI.2007, biting human, 6-6:30 h, Damasceno col. Deposited in Invertebrates Collection of INPA (INPA/LETEP 6301), AM, Brazil.

Etymology - This species is named in honour of the Baniwa Indians who live in location where the specimen was found.

Taxonomic discussion - *C. baniwa* sp.nov. is a typical member of the subgenus *Hoffmania* and, as outlined in the key and in the Table, may be distinguished from other species of the *hylas* group by the double distal pale spot in r_3, the absence of the pale spot in front of base of M_1 the long proboscis and by the entirely dark mid femur and pale fifth palpal segment.

C. contubernalis Ortiz & Leon
(Figs 3, 11)

C. contubernalis Ortiz & Leon, 1954: 574 (female; Ecuador; Figs antennae, palpus, spermathecae, wing; as var. of *rozeboomi*), Felippe-Bauer et al., 2008: 261 (revalid., redescript., Figs); *C. verecundus* Wirth & Blanton, 1956: 98 (*C. contubernalis* var. of *rozeboomi* as syn.), Forattini, 1957: 249 (in neotropical catalogue; in part, Ecuador records), Wirth & Blanton, 1959: 278 (in part, Ecuador records), Wirth & Blanton, 1968: 209 (in part, Ecuador records), Wirth et al., 1988: 20 (in Atlas; in part, Ecuador records), Borkent & Wirth, 1997: 85 (in catalogue; *C. contubernalis* var. of *rozeboomi* as syn.), Borkent & Spinelli, 2000: 35 (in catalogue, *C. contubernalis* var. of *rozeboomi* as syn.), Borkent & Spinelli, 2007: 69 (in catalogue, *C. contubernalis* var. of *rozeboomi* as syn.).

Diagnosis: species distinguished from other species of the *hylas* group by its medium size, mid and hind femur with subapical pale band; pale spot present anterior to base of M_1 on r_3, a single pale spot crosses the second radial cell, apices of CuA_1 and CuA_2 pale. The wing pattern is most similar to *verecundus*; P.R. 4.1, P/H ratio 1.15 and A.R.1.11.

Male: unknown.

Distribution - Ecuador (Pichincha), Peru (Madre de Dios).

C. heliconiae Fox & Hoffman
(Figs 4, 13)

C. heliconiae Fox & Hoffman, 1944: 108 (male, female; Venezuela; wing photo; bionomic dates), Fox, 1948: 22 (male, female, Figs; Trinidad and Tobago, Hondura records; bionomic dates), Ortiz, 1950: 450 (discussion), Wirth & Blanton, 1956: 95 (male, female, Figs; distribution, misident. in part, Peru record, syn. *palpalis*; *rozeboomi* as syn.), Wirth & Blanton, 1959: 274 (redescript.; Figs), Williams, 1964: 463 (bionomic dates),

TABLE

Numerical characters of females of the *Culicoides hylas* Group

Species[a]	Wing length (mm)	Costal ratio	Antennal ratio	Palpal ratio	P/H ratio
aitkeni	1.50	0.70	1.26	6.0	1.38
antioquiensis	1.40	0.67	1.00	4.1	1.23
baniwa sp.nov.	1.32	0.69	1.05	4.7	1.48
contubernalis	1.30-1.35	0.66-0.69	1.09-1.14	3.8-4.3	1.14-1.18
heliconiae	1.29-1.69	0.66-0.75	0.99-1.12	3.1-4.6	1.33
hylas	0.99-1.29	0.67-0.72	1.03-1.16	2.7-4.0	1.15
palpalis	1.38-1.59	0.65-0.74	1.07-1.20	4.2-6.0	1.32
polypori	1.25-1.59	0.68-0.72	1.09-1.28	3.4-5.6	1.20
pseudonheliconiae	1.22-1.27	0.67-0.70	1.01-1.03	3.7-4.3	1.08-1.09
verecundus	1.35-1.56	0.65-0.72	1.01-1.09	4.6-5.9	1.40
xanifer	1.29-1.50	0.66-0.72	0.97-1.06	4.0-6.0	1.25

a: arranged alphabetically.

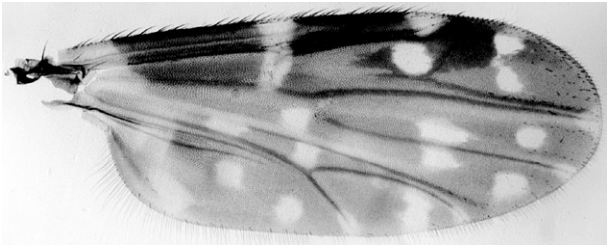


Fig. 17: wing photograph of *Culicoides baniwa* sp.nov., female.

Wirth & Blanton, 1968: 205 (in key; redescript.; Figs), Wirth & Blanton, 1973: 439 (Amazon records, Brazil, Colombia), Aitken et al., 1975: 129 (Trinidad and Tobago records, wing photo, distribution), Wirth et al., 1988: 18 (in Atlas; wing photo; distribution), Borkent & Wirth, 1997: 70 (in catalogue), Borkent & Spinelli, 2000: 34 (in catalogue), Borkent & Spinelli, 2007: 68 (in catalogue), Felippe-Bauer et al., 2008: 260 (in key); *C. rozeboomi* Barbosa, 1947: 26 (male, female; Trinidad and Tobago; Figs); *C. hylas* Forattini, 1957: 244 (in part, *heliconiae* as syn.).

Diagnosis: species shows the following combination of characters: third palpal segment with scattered sensilla; apical pale band on mid femur, hind femur dark to tip; wing with distal pale spot in r_3 narrow and transverse, r_3 with pale spot present anterior to base of M_1, a single pale spot crosses the second radial cell, apices of CuA_1 and CuA_2 pale; spermathecae with short, slender necks. Male tergite 9 with posteromedial margin slightly pronounced, rounded, sometimes, slightly bilobed; fused portion of the parameres slightly broader than long, separate portion long and V-shaped at base.

Distribution - Belize to Ecuador, Venezuela, Brazil (AM, PA), Grenada, Trinidad and Tobago.

C. hylas Macfie
(Figs 5, 15)

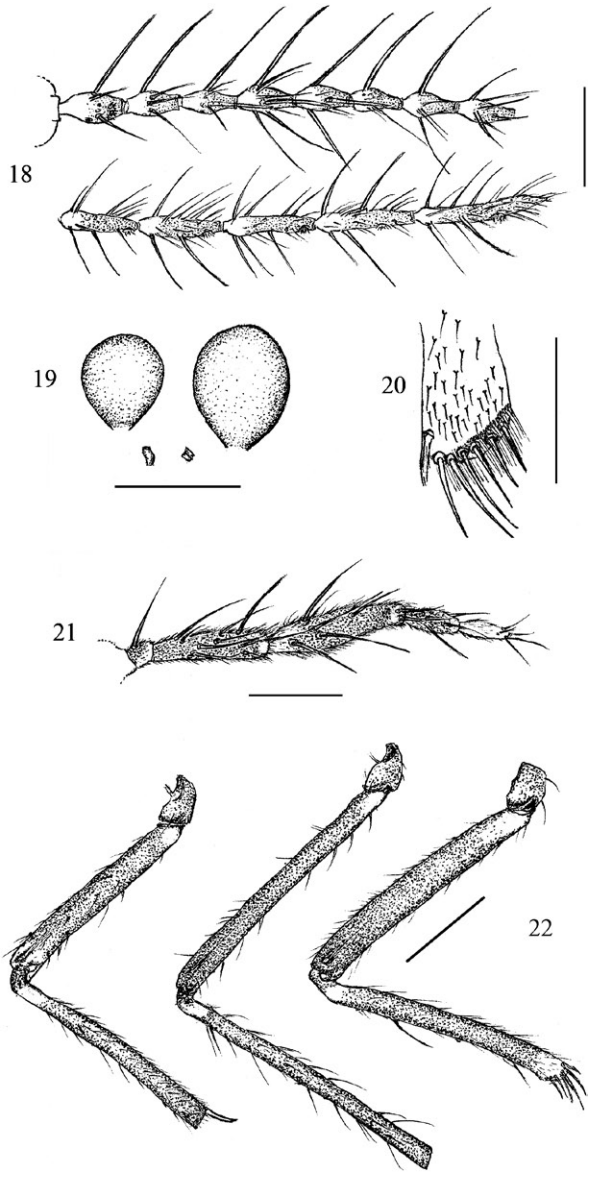
C. hylas Macfie, 1940: 26 (female, Guyana; wing photo), Wirth & Blanton, 1956: 98 (male, female; Figs; distribution), Forattini, 1957: 243 (in part; redescript.; Figs; distribution), Wirth & Blanton, 1959: 276 (redescript.; Figs), Wirth & Blanton, 1968: 203 (in key; redescript.; Figs; distribution), Wirth & Blanton, 1973: 439 (Amazon records, Brazil, Colombia), Wirth et al., 1988: 18 (in Atlas; wing photo; distribution), Borkent & Wirth, 1997: 70 (in catalogue), Borkent & Spinelli, 2000: 34 (in catalogue), Borkent & Spinelli, 2007: 68 (in catalogue), Felippe-Bauer et al., 2008: 260 (in key).

Diagnosis: the only species of the *hylas* group with an irregular sensory pit in the third palpal segment. Species also shows mid femur with subapical pale band, hind femur dark to tip; wing with r_3 with pale spot present anterior to base of vein M_1, a single pale spot crossing the second radial cell, apices of CuA_1 and CuA_2 pale; spermathecae with short, slender necks. Male tergite 9 with small median papilliform process on posterior margin; fused portion of the parameres nearly as broad as long, separate portion slender, U-shaped at base.

Distribution - Mexico to Peru, Brazil (PA).

C. palpalis Macfie
(Figs 6, 13)

C. palpalis Macfie, 1948: 78 (female; Mexico), Wirth & Blanton, 1968: 207 (in key; redescript.; Figs), Wirth & Blanton, 1973: 443 (Amazon records, Colombia), Wirth et al., 1988: 20 (in Atlas; wing photo; distribution), Borkent & Wirth, 1997: 77 (in catalogue), Borkent & Spinelli, 2000: 34 (in catalogue), Borkent & Spinelli, 2007: 69 (in catalogue), Felippe-Bauer et al., 2008: 260 (in key); *C. verecundus* Ortiz & Mirsa, 1952: 259 (male, female; Venezuela; Figs; *palpalis* as syn.), Wirth



Figs 18-22: *Culicoides baniwa* sp.nov., female; 18: flagellum (scale bar: 0.1 mm); 19: spermathecae (scale bar: 0.05 mm); 20: hind tibial comb (scale bar: 0.1 mm); 21: palpus (scale bar: 0.1 mm); 22: legs (left to right) fore, mid and hind (scale bar: 0.2 mm).

& Blanton, 1956: 98 (*palpalis* as syn.), Forattini, 1957: 249 (in neotropical catalogue; *palpalis* as syn.), Wirth & Blanton, 1959: (redescript., Figs; *palpalis* as syn.).

Diagnosis: the species shows the following combination of characters: third palpal segment with scattered sensilla; mid femur with apical pale band, hind femur dark to tip; r_3 shows a pale spot present anterior to base of M_1, a single pale spot crosses the second radial cell, apices of CuA_1 and CuA_2 dark; spermathecae with short, slender necks. Male tergite 9 with very small papilliform process on posterior margin; fused portion of the parameres shows a width to length ratio of 1.75.

Distribution - Mexico to Peru, Brazil (Amazon records).

C. polypori Wirth & Blanton
(Figs 7, 11)

C. polypori Wirth & Blanton, 1968: 212 (male, female; Panama), Wirth et al., 1988: 20 (in Atlas; wing photo; distribution), Borkent & Wirth, 1997: 79 (in catalogue), Borkent & Spinelli, 2000: 34 (in catalogue), Borkent & Spinelli, 2007: 69 (in catalogue), Felippe-Bauer et al., 2008: 260 (in key); *C. verecundus* Wirth & Blanton, 1956: 99 (misident., Panama specimens).

Diagnosis: species shows the following combination of characters: third palpal segment with scattered sensilla; mid and hind femur with subapical pale band; r_3 with pale spot present anterior to base of M_1, a single pale spot crosses the second radial cell, apices of CuA_1 and CuA_2 dark; spermathecae with short, slender necks. Male tergite 9 with a bilobed process on posterior margin; fused portion of the parameres slightly longer than basal width.

Distribution - Honduras to Colombia, Brazil (AM).

C. pseudoheliconiae Felippe-Bauer
(Figs 8, 14)

C. pseudoheliconiae Felippe-Bauer (in Felippe-Bauer et al. 2008): 260 (female; Peru).

Diagnosis: this is the only species of the *hylas* group with pale wing markings that are diffuse, rather than brightly contrasting; r_3 with pale spot present anterior to base of M_1, pale spot that crosses the second radial cell subdivided in two separate spots, apices of CuA_1 and CuA_2 dark; third palpal segment with scattered sensilla; mid femur with apical pale band, hind femur dark to tip; spermathecae with short, slender necks.

Male: unknown.

Distribution - Peru (Madre de Dios, San Martin), Argentina (Misiones province).

New record - Ten females, Arroyo Mbocay, Puero Iguazú, Misiones, Argentina, 24.VIII.2008, CDC light trap, H. Walantus col. Deposited in the MLP, Argentina.

C. verecundus Macfie
(Figs 9, 12)

C. verecundus Macfie, 1948: 76 (male, female; Mexico; wing photo), Wirth & Blanton, 1956: 98 (male, female; *palpalis*, *contubernalis* var. of *rozeboomi* as syn.; Figs), Forattini, 1957: 248 (in neotropical catalogue; male, female; *palpalis*, *contubernalis* var. of *rozeboomi* as syn.; Figs), Wirth & Blanton, 1959: 278 (redescript., male, female; *palpalis*, *contubernalis* var. of *rozeboomi* as syn.; Figs), Wirth & Blanton, 1968: 209 (in key; redescript.; *contubernalis* var. of *rozeboomi* as syn.; Figs), Wirth et al., 1988: 20 (in Atlas; wing photo; *contubernalis* var. of *rozeboomi* as syn.; distribution), Castellón et al., 1990: 80 (AM, PA records), Borkent & Wirth, 1997: 85 (in catalogue; *contubernalis* var. of *rozeboomi* as syn.), Borkent & Spinelli, 2000: 35 (in catalogue; *contubernalis* var. of *rozeboomi* as syn.), Borkent & Spinelli, 2007: 69 (in catalogue; *contubernalis* var. of *rozeboomi* as syn.), Felippe-Bauer et al., 2008: 260 (in key).

Diagnosis: species shows the following combination of characters: third palpal segment contains scattered sensilla; mid femur with apical and hind femur with subapical pale band; r_3 with pale spot present anterior to base of M_1, a single pale spot crossing second radial cell, apices of CuA_1 and CuA_2 dark; spermathecae with short, slender necks. Male tergite 9 with a prominent papilliform process on posterior margin; fused portion of the parameres longer than width; separate portion long and V-shaped at base.

Distribution - Mexico to Panama, Brazil (AM, PA). Specimens from Ecuador previously considered to be *C. verecundus* were restored from synonymy by Felippe-Bauer et al. (2008) and are now known as *C. contubernalis* Ortiz & Leon.

C. xanifer Wirth & Blanton
(Figs 10, 12)

Culicoides xanifer Wirth & Blanton, 1968: 210 (male, female, Panama; Figs; in key), Wirth et al., 1988: 20 (in Atlas; wing photo; distribution), Borkent & Wirth, 1997: 85 (in catalogue), Borkent & Spinelli, 2000: 35 (in catalogue), Borkent & Spinelli, 2007: 69 (in catalogue), Felippe-Bauer et al., 2008: 260 (in key).

Diagnosis: only species of the *hylas* group with four or five-branched hyaline sensory filaments on flagellomeres 2-8; third palpal segment with scattered sensilla; mid femur with apical and hind femur with subapical pale band; r_3 without pale spot anterior to base of $M_{1;}$ a single pale spot crosses the second radial cell, apices of CuA_1 and CuA_2 dark; spermathecae with short, slender necks. Male tergite 9 with a prominent papilliform process on posterior margin; fused portion of the parameres nearly as broad as long, separate portion slender, U-shaped at base.

Distribution - Honduras to Panama.

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