

New *Culicoides* Latreille of the subgenus *Mataemyia* Vargas from Pará, Brazil (Diptera: Ceratopogonidae)

Maria Luiza Felipe-Bauer^{1/+}, Tiago do Nascimento da Silva¹, Rosimeire Lopes da Trindade²

¹Laboratório de Diptera, Instituto Oswaldo Cruz-Fiocruz, Rio de Janeiro, RJ, Brasil

²Coordenação de Zoologia, Entomologia, Museu Paraense Emílio Goeldi, Belém, PA, Brasil

Two new species of Culicoides Latreille of the Neotropical subgenus Mataemyia Vargas are described and illustrated based on female specimens from Juruti, Pará, Brazil and compared with their similar congeners. This paper also presents a diagnosis of the subgenus Mataemyia and a systematic key for the identification of the 19 species of the subgenus.

Key words: *Culicoides (Mataemyia) aldomari* sp. nov. - *Culicoides (Mataemyia) sherlocki* sp. nov. - bloodsucking midges - Neotropical Region

The subgenus *Mataemyia* Vargas is represented by the species included in the *discrepans* species group by Wirth and Blanton (1973). This group was formally characterized by Wirth and Soria (1981) based on eight Neotropical species. Borkent and Spinelli (2000) recognize the subgenus based on *Culicoides mojingaensis* Wirth & Blanton, type species of *Mataemyia*. The subgeneric classification has been followed by several authors including the more recently and comprehensive paper by Borkent (2011).

From the 273 Neotropical species reported in Borkent (2012), 17 belong to *Culicoides* of the subgenus *Mataemyia*. In the revision of the biting midges from the Amazon Basin, Wirth and Blanton (1973) cited three species of this subgenus (*Culicoides albuquerquei* Wirth & Blanton, *Culicoides bricenoi* Ortiz and *Culicoides wallacei* Wirth & Blanton). Trindade and Gorayeb (2005) recorded *Culicoides daviesi* Wirth & Blanton for the first time from Brazilian Amazonia in Outeiro Island, state of Pará (PA), Brazil. Recently, Spinelli et al. (2007) described *Culicoides felippebaueri* from the state of Amazonas, so five species from this subgenus are presently known inhabiting northern Brazil.

In the present paper, we describe and illustrate two new species from the municipality of Juruti, PA, based on females specimens collected by CDC light trap and discuss the similarities and differences with their related species of the subgenus *Mataemyia*. With the addition of the two new species described here, there are now 11 species of *Culicoides (Mataemyia)* known from Brazil (7 from the Brazilian Amazon Region) and 19 from the Neotropical Region. As the available key for subgenus *Mataemyia* was provided by Wirth and So-

ria (1981) for only eight species included in *discrepans* group, we update the key for the identification of the 19 species belonging to the subgenus and made a synopsis of the subgenus *Mataemyia*.

MATERIALS AND METHODS

The specimens are slide-mounted in phenol-balsam in the manner described by Wirth and Marston (1968). The new species is deposited in Emílio Goeldi Museum (MPEG) (Invertebrates Collection) and Oswaldo Cruz Institute (Ceratopogonidae Collection) (CCER), Brazil. Diagnostic characters were illustrated using a *camera lucida* attached to an Olympus BH-2 microscope and the plates were prepared using Photoshop GIMP Portable. Microphotographs of the wings were taken with a Nikon Eclipse E-800. The general terminology used is that employed for *Culicoides* by Felipe-Bauer (2003). Terms for structures follow the Manual of Central America Diptera (Brown et al. 2009). The measurements of the spermathecae are in micrometers and those of the wings are in millimetres. Meristic information is given as range, following by the mean and number of specimens examined.

Culicoides of the subgenus *Mataemyia* Vargas

Diagnosis - Medium to large-sized species (wing with 0.80-1.8 mm). Eyes bare. Palpus moderately swollen; third segment with moderately broad pit located on mid-length or subapical; palpal ratio (PR) 1.8-3.0. Antenna usually with transition in length between proximal and distal series; sensilla coeloconica present on flagellomeres 1, (4), (5), 6-8 (except in *C. albuquerquei* 1, 6-12); antennal ratio (AR) 0.75-1.70 (usually more than 1.00). Scutum dark brown with prominent pattern of yellowish spots. Wing with distinct pale spots; poststigmatic pale spot in r_3 usually as inverted L-shaped, nearly isolating a small dark spot behind second radial cell; sometimes this small dark spot is connected to the oblique dark line in r_3 , separating the poststigmatic pale spots; distal pale spot in r_3 usually reaching the anterodistal portion of wing margin; CuA_1 and CuA_2 usually dark; wing base usually with broad pale spot extending from costal mar-

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+ Corresponding author: mlfbauer@ioc.fiocruz.br

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gin to anal cell; macrotrichia in distal half of wing. Legs dark brown with distinct pale bands characteristics of each species; hind tibial comb with four spines (rarely 5 or 6). Two (rarely 1) spermathecae present. Male tergite 9 with long, subparallel apicolateral processes (rarely slender and well separated). Gonocoxite moderately stout, dorsal and ventral root moderately to well developed; gonostylus curved, slender. Aedeagus triangular with rounded basal arch extending 0.5 of total length, tapering to bifid or slender, single apex. Parameres separate; mid-portion long, slender; apical portion tapered, abruptly bent ventrally, mesally directed, with fringe of fine spicules or as simple, filiform tip.

Key to the species of the *Culicoides* (*Mataemyia*) Vargas (primarily to females)

- 1. Sensilla coeloconica on flagellomeres 1, 6-12.....
..... *C. albuquerquei* Wirth & Blanton
- Sensilla coeloconica on flagellomeres 1, (4), (5), 6-8..... 2
- 2. One spermatheca; hind femur dark to tip; sensilla coeloconica on flagellomeres 1, 5-8..... 3
- Two spermathecae; hind femur various; sensilla coeloconica on flagellomeres 1, (4), (5), 6-8..... 4
- 3. Mid femur dark to tip; hind tibial comb with six spines; second radial cell pale in mid portion with extreme base and tip in dark spots.....
..... *C. daviesi* Wirth & Blanton
- Mid femur with subapical pale band; hind tibial comb with four spines; second radial cell in dark spot.....
..... *C. felippebauerae* Spinelli
- 4. Base of the wing with a pale spot restricted to the area near basal arculus..... 5
- Base of the wing broadly pale, sometimes extending from costal margin to anal cell..... 7
- 5. Large species, wing length 1.45 mm; one distal pale spot in anal cell; distal pale spot in r_3 single, irregular, slightly meeting wing margin in reduced breadth.....
..... *C. volcanensis* Wirth & Blanton
- Smaller species, wing length 1.22-1.38 mm; two distal pale spot in anal cell; distal pale spot in r_3 various, broad meeting wing margin..... 6
- 6. Hind tibia broad pale apically; single distal pale spot in r_3 ; distal pale spot in M_1 reaching wing margin; distal portion of the aedeagus rounded on lateral margin, ending in a pair of posteriorly directed processes.....
..... *C. dalessandroi* Wirth & Barreto
- Hind tibia with apical, narrow pale rings; double distal pale spot in r_3 ; distal pale spot in M_1 far from wing margin; distal portion of the aedeagus slightly expanded on lateral margin, ending in a pair of divergent lateral processes..... *C. huyanacapaci* Felipe-Bauer
- 7. Hind femur dark to tip..... 8
- Hind femur with subapical pale band..... 11
- 8. Second radial cell long, 2x longer than first; AR 1.47-1.70..... 9
- First and second radial cells nearly similar in length; AR 0.75-0.84..... 10

- 9. r_3 with two large pale spots, the distal one located in distal portion of cell reaching anterodistal wing margin; sensilla coeloconica on flagellomeres 1,6-8; AR 1.70.....
..... *C. bricenoi* Wirth
- r_3 with three small, round, pale spots, the distal one located in middle of cell; sensilla coeloconica on flagellomeres 1, 5-8; AR 1.47..... *C. cuiabai* Wirth
- 10. Small species, wing length 0.88-0.90 mm; distal pale spot in r_3 rounded, not reaching wing margin; anal cell with one, large, distal pale spot.....
..... *C. sherlocki* Felipe-Bauer & Trindade
- Large species, wing length 1.47 mm; distal pale spot in r_3 oblique, broadly reaching wing margin; anal cell with two distal small, round, pale spot.....
..... *C. wallacei* Wirth & Blanton
- 11. PR 2.8-3.0..... 12
- PR 1.8-2.5 14
- 12. Distal pale spot in r_3 double; basal pale spot in m_1 small, not connected with the basal pale spot in m_2 ; distal pale spot in m_2 not reaching wing margin.....
..... *C. avilaensis* Ortiz & Mirsa
- Distal pale spot in r_3 single; basal pale spot in m_1 large, slightly connected with the basal pale spot in m_2 ; distal pale spot in m_2 reaching wing margin..... 13
- 13. Large species, wing length 1.80 mm; one distal pale spot in anal cell; pale spot on M_1 restricted to extreme apex, connected with the distal pale spot in r_3 and m_1 *C. discrepans* Ortiz & Mirsa
- Smaller species, wing length 1.20 mm; two distal pale spot in anal cell; pale spot on apical $\frac{1}{2}$ of M_1
..... *C. lenti* Tavares & Luna Dias
- 14. AR 1.31-1.33; third palpal segment with a shallow, broad pit; parameres straight in mid portion, abruptly curved ventrally to simple tip, without lateral fringe of spines; apex of aedeagus slender and rounded..... *C. mojingaensis* Wirth & Blanton
- AR 0.77-1.21; third palpal segment with a moderately deep pit; parameres and aedeagus various 15
- 15. Flagellomeres 8, 9 subequal, AR 0.77-0.89; sensilla coeloconica on flagellomeres 1, 6-8.....
..... *C. aldometri* Felipe-Bauer & Trindade
- Flagellomere 8 clearly shorter than 9, AR 0.98-1.21; sensilla coeloconica on flagellomeres 1, (4), 5-8..... 16
- 16. Poststigmatic pale spot without dark spot behind second radial cell; anal cell with two distal connected pale spots..... *C. barthi* Tavares & Souza
- Poststigmatic pale spot with dark spot just behind second radial cell; anal cell with two distal separated pale spots..... 17
- 17. AR 1.15-1.21; base of the wing with a pale band extending from costal vein to wing margin in anal cell; distal pale spots in anal cell oblique, the proximal one in the midlength of CuA; poststigmatic pale not divided by the dark spot behind second radial cell; distal portion of the parameres slender, without ventral expansion or lobe, tapered to simple tip without lateral fringe of spines; aedeagus ending in a simple tip.....
..... *C. azureus* Wirth & Blanton

- AR 0.98-1.08; base of the wing with a pale band extending from costal vein to proximal portion of anal cell; distal pale spots in anal cell longitudinally aligned, the proximal one near mediocubital fork; poststigmatic pale divided by the dark spot behind second radial cell; distal portion of the parameres with well developed ventral expansion or lobe, tapered to simple tip with lateral fringe of fine spines; aedeagus ending in a bifid tip..... 18

18. Apex of aedeagus, long, slender, with bifid point laterally directed..... *C. dicrourus* Wirth & Blanton
- Apex of aedeagus like a clamp process directly connected to the basal arch..... *C. macieli* Tavares & Ruiz

C. aldomari Felipe-Bauer & Trindade, sp. nov.
(Figs 1-7)

Diagnosis - Only species in the subgenus *Mataemyia* Vargas with the following combination of characters: medium-sized, eyes narrowly separated, flagellomeres 8 and 9 subequal, sensilla coeloconica on flagellomeres 1, 6-8, AR 0.77-0.89, PR 2.0-2.2.

Female - Head - Brown. Eyes (Fig. 2) separated by distance equal to diameter of $\frac{1}{2}$ ommatidia. Flagellum (Fig. 1) pale brown, flagellomeres vasiform, without transition in length between proximal and distal series; antennal ratio 0.77-0.89 (0.82, $n = 10$); sensilla coeloconica on flagellomeres 1, 6-8, one on 1, two on 6-7, three or four on 8. Palpus (Fig. 4) brown; third segment stout with deep sensory pit on mid length; palpal ratio 2.0-2.2 (2.1 $n = 9$). Proboscis short; P/H ratio 0.67-0.75 (0.71, $n = 10$); mandible with 12-14 ($n = 6$) teeth.

Thorax - Dark brown. Scutum with prominent pattern of oval yellowish patches; scutellum yellowish on sides; postscutellum brown. Wing (Fig. 3) with contrasting pattern: second radial cell in dark spot; pale spot over R-M large, extending from M_1 to costal margin (in some specimens extending from CuA_1 to costal margin), poststigmatic pale spot in r_3 extending behind second radial cell, nearly isolating small dark spot that sometimes is connected to the oblique dark line in r_3 , separating the poststigmatic pale spots; distal pale spot in r_3 broadly reaching wing margin or nearly rounded and not reaching wing margin; m_1 with two pale spots, distal one usually meeting wing margin; m_2 with four pale spots, one in front of mediocubital fork, second behind medial fork, third in the middle of cell, fourth reaching wing margin; cu_a with rounded pale spot nearly reaching wing margin; anal cell with two distal rounded pale spots; wing base with broad pale spot extending from costal margin to anal cell; M_1 and M_2 faint pale, CuA_1 and CuA_2 dark; macrotrichia scarce in distal half of wing; wing length 0.80-0.88 (0.83, $n = 10$) mm; breadth 0.40-0.43 (0.42, $n = 10$) mm; costal ratio 0.60-0.62 (0.61, $n = 10$). Halter pale. Legs (Fig. 7) mostly brown; femora with subapical pale bands (in some specimens faint in hind femur), tibiae with subbasal pale bands; hind tibia with a large and faint pale band apically; hind tibial comb (Fig. 6) with four spines, the two nearest the spur longest, subequal.

Abdomen - Dark brown. Two slightly unequal or sometimes subequal, ovoid spermathecae with long necks (10 μ m), measuring 49 by 31 μ m, 45 by 29 μ m

(Fig. 5); long, slender third spermatheca (30 μ m), sclerotized ring present.

Male - Unknown.

Type data and depository - Holotype female, Fazenda Gavião, Forest, Ourém, PA, 1°29'44"S 47°13'7"W 28-29.XI.2008, CDC light trap, Trindade & Guimarães col. (MPEG). Paratypes nine females as follows: two, same data as holotype, except *curral*, 1°29'39"S 47°13'16"W (MPEG; #468 CCER); three, same data as holotype, except 26-27.XI.2008 (MPEG; #469 CCER); two, same data as holotype, except 27-28.XI.2008 (MPEG; #470 CCER); one, same data as holotype, except 29-30.XI.2008 (MPEG) and one paratype, Fazenda Rezende, Comunidade do Café Torrado, Juruti, 02°18'77.3"S 56°05'244.4"W, 17-18.XII.2007, CDC light trap, Trindade col. (MPEG).

Distribution - PA.

Etymology - This species is named in honour to Aldomar Airão Monteiro, resident in the field area in recognition of his continuous support.

Taxonomic discussion - *C. aldomari* has similar wing pattern to that of *C. azureus* Wirth & Blanton, *C. barthi* Tavares & Souza, *C. felippebauerae* Spinelli and *C. mojingaensis* Wirth & Blanton, but it can be distinguished from these species by the smaller wing 0.80-0.88 (1.02-1.09 in *C. azureus*, 1.20 in *C. barthi*, 0.96-1.20 in *C. felippebauerae*, 0.89-1.02 in *C. mojingaensis*), darker lumen of the second radial cell (pale lumen in the others species), by the small dark spot in r_3 located on the distal end of second radial cell (without defined dark spot in *C. barthi*, dark spot behind second radial cell in *C. azureus*, *C. felippebauerae* and *C. mojingaensis*) and by the flagellomeres without transition in length between proximal and distal series (flagellomeres 9-12 more elongated than 2-8 in the others species).

C. sherlocki Felipe-Bauer & Trindade, sp. nov.
(Figs 8-14)

Diagnosis - Only species in the subgenus *Mataemyia* Vargas with the following combination of characters: medium size, eyes contiguous, sensilla coeloconica on flagellomeres 1, 6-8, AR 0.84, distal pale spot in r_3 rounded not reaching wing margin and anal cell with one, large, distal pale spot, hind femur dark to tip.

Female - Head - Brown. Eyes (Fig. 9) nearly contiguous. Flagellum pale brown, with transition in length between proximal and distal series; antennal ratio 0.84 ($n = 1$); sensilla coeloconica (Fig. 8) on flagellomeres 1, 6-8. Palpus (Fig. 11) brown; third segment stout with moderately deep sensory pit on mid length; palpal ratio 2.3 ($n = 1$). Proboscis short; P/H ratio 0.64-0.66 (0.65, $n = 2$); mandible with nine ($n = 1$) teeth.

Thorax - Dark brown. Scutum without definite pattern in slide mounted specimens; scutellum, postscutellum brown. Wing with contrasting pattern as in Fig. 10: second radial cell in dark spot; pale spot over R-M large, extending from M_1 to costal margin, poststigmatic pale spot in r_3 extending behind second radial cell, nearly isolating small dark spot that in one specimen is connected to the

oblique dark line in r_3 , separating the poststigmatic pale spots; distal pale spot in r_3 rounded, located in the middle of cell, not reaching wing margin and M_1 ; m_1 with two pale spots, distal most far from wing margin; m_2 with three pale spots, one between medial, mediocubital forks, connected with subapical pale spot, distal one reaching wing margin; cu_a_1 with rounded, large pale spot reaching wing margin; anal cell with large distal spot, broadly reaching wing margin, connected with pale spot on wing base, which extends from costal margin to anal cell; M_1 and M_2 dark in distal $\frac{1}{2}$, CuA_1 and CuA_2 dark; macrotrichia present on distal margin of wing; wing length 0.88-0.90 (0.89, $n = 2$) mm; breadth 0.43-0.45 (0.44, $n = 2$); costal ratio 0.64 ($n = 2$). Halter knob brown. Legs (Fig. 14) mostly brown; fore-, mid femur with subapical pale bands, tibiae with subbasal pale bands; hind tibial comb (Fig. 13) with four spines, the two nearest the spur longest, subequal.

Abdomen - Dark brown. Two subequal, ovoid spermathecae, measuring 31 by 26 μm , 30 by 26 μm (Fig. 12); long, slender third spermatheca (13 μm), sclerotized ring present.

Male - Unknown.

Type data and depository - Holotype female, Fazenda Rezende Comunidade do Café Torrado, Juruti, PA, "barn", CDC light trap, 06-07.IV.2008, DDR Guimarães, E Mon-

teiro & A Quaresma cols. (MPEG). Paratype female, same data as holotype, except 07.IV.2008, 06:00 pm-09:00 pm, RL Trindade & DDR Guimarães cols. (#471 CCER).

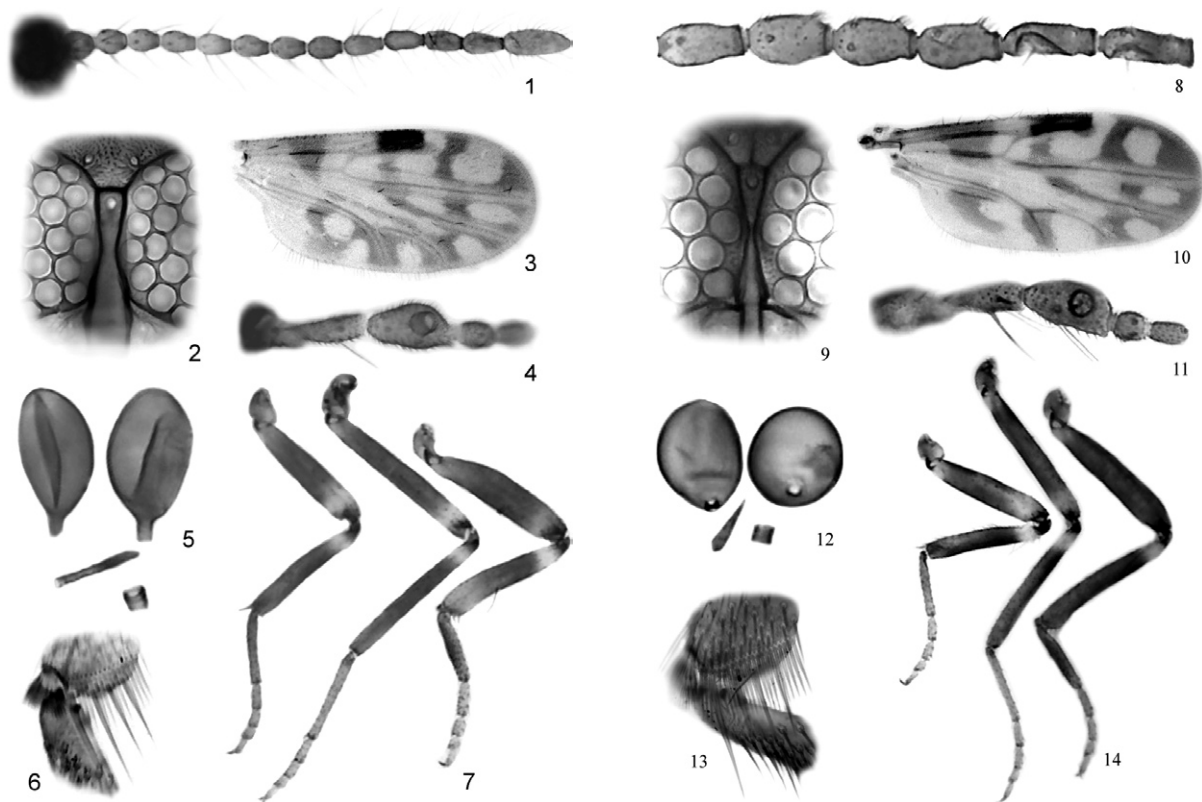
Distribution - PA.

Etymology - This species is named in honour to Dr Italo Sherlock in recognition of his important contributions in the knowledge of the tropical maladies, especially leishmaniasis.

Taxonomic discussion - *C. sherlocki* shows the hind femur dark to tip as in *C. bricenoi* Ortiz, *C. cuiabai* Wirth and *C. wallacei* Wirth & Blanton. However, it can be distinguished from the two first mentioned species by the wing pattern, by the subequal first and second radial cells (2nd radial cell 2x longer than 1st in *C. bricenoi* and *C. cuiabai*) and by the AR 0.84 (1.70 in *C. bricenoi* and 1.47 in *C. cuiabai*). From *C. wallacei* Wirth & Blanton can be distinguished by the smaller length, by the rounded distal pale spot in r_3 not reaching wing margin and by the presence of one, large distal pale spot in anal cell.

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Figs 1-7: *Culicoides aldomari* sp. nov., female; 1: flagellomeres 1-13; 2: eyes separation; 3: wing photograph; 4: palpus; 5: spermathecae, third spermatheca and sclerotized ring present; 6: hind tibial comb; 7: legs (left to right) fore, mid and hind.

Figs 8-14: *Culicoides sherlocki* sp. nov., female; 8: flagellomeres 5-10; 9: eyes separation; 10: wing photograph; 11: palpus; 12: spermathecae, third spermatheca and sclerotized ring present; 13: hind tibial comb; 14: legs (left to right) fore, mid and hind.

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