New records of genus Culicoides Latreille from Oaxaca, Mexico (Diptera: Ceratopogonidae)

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NEW RECORDS OF GENUS *CULICOIDES* LATREILLE FROM OAXACA, MEXICO (DIPTERA: CERATOPOGONIDAE)

NUEVOS REGISTROS DEL GÉNERO *CULICOIDES* LATREILLE DE OAXACA, MÉXICO (DIPTERA: CERATOPOGONIDAE)

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**ABSTRACT.** First records of *Culicoides ginesi* and *Culicoides glabellus* for Mexico. New distribution records for the state of Oaxaca of the following species are also presented: *Culicoides baueri*, *Culicoides debilipalpis*, *Culicoides hylas*, *Culicoides neopulicaris*, *Culicoides pseudodiabolicus* and *Culicoides pusillus*. Also, new localities for *Culicoides foxi*, *Culicoides insignis*, *Culicoides jamaicensis* and *Culicoides ocumarensis* are included. A key and table are presented for the known species in the state of Oaxaca.

**Key words:** *Culicoides*; new record; neotropics; key

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**RESUMEN.** Se incluye el primer registro de *Culicoides ginesi* y *Culicoides glabellus* para México. Se dan a conocer nuevos registros de distribución para el estado de Oaxaca de las siguientes especies: *Culicoides baueri*, *Culicoides debilipalpis*, *Culicoides hylas*, *Culicoides neopulicaris*, *Culicoides pseudodiabolicus* y *Culicoides pusillus*. Asimismo, se incluyen nuevas localidades para *Culicoides foxi*, *Culicoides insignis*, *Culicoides jamaicensis* y *Culicoides ocumarensis*. Se presenta una clave y un cuadro para las especies conocidas en el estado de Oaxaca.
Palabras clave: Culicoides; nuevo registro; neotrópico; clave

INTRODUCTION

The biting midges of the genus Culicoides Latreille include a diverse group widely distributed worldwide, which occur in varied habitats from coastal areas to high altitudes (Mellor et al., 2000; Spinelli & Borkent, 2004). Culicoides genus is the most diverse within the Ceratopogonidae family, with almost 1,347 recognized extant species in the world (Borkent & Dominiak, 2020). Various species have medical and veterinary importance and role as biological vectors of viruses, protozoa, and filarial nematodes (Borkent, 2005; Borkent & Spinelli, 2007), and others are known as notorious pests of humans and other warm-blooded vertebrates (Kettle, 1977; Linley et al., 1983; Borkent, 2005; Borkent & Spinelli, 2007).

In Mexico, biting midges are commonly known as “jejenes” or “chaquistes”. Early descriptions by Dampf (1936), recognized them as a pest, and several specimens were identified with filarial nematodes in the state of Chiapas, south of Mexico. Other studies related them to the transmission of mansonelliasis in the Peninsula of Yucatan (Biagi et al., 1958).

Current knowledge of the genus Culicoides in Mexico includes 84 species (11 endemic) belonging to 14 subgenera, nine species groups and four species without any group or subgenus (Ibáñez-Bernal et al., 1996; Borkent & Spinelli, 2000; 2007; Huerta et al., 2012; Spinelli & Huerta, 2015). However, some regions of Mexico are still scantily studied. This is the case of the states of Aguascalientes, Guanajuato and Tlaxcala that do not have any record for Culicoides species (Ibáñez-Bernal et al., 1996).

Here we report recent collections performed at the state of Oaxaca, with two new records for Mexico, six new records from the state of Oaxaca and new local records for another four previously reported species. Additionally, we include an updated list of known species for the state of Oaxaca (Table 1) and a key to separate the species from this state.

MATERIALS AND METHODS

Adults specimens were collected by CDC light traps, and then preserved in ethanol 70%. Subsequently, specimens were cleared, dissected, and mounted on microscope slides in Canada balsam using the technique described by Borkent and Spinelli (2007). Most of the specimens were mounted on microscope slides in Canada balsam, a set of remaining specimens was preserved directly in ethanol 70%. The specimens were examined and measured with a binocular compound microscope Olympus BX50. The photographs were taken with a Lumenera® Infinity 1, digital camera attached to Olympus BX50 compound microscope and SZX7 stereoscopic. The photos were edited using Adobe Photoshop.

Morphological terminology is based on Borkent (2017) and Borkent et al. (2009). Assignment of species to subgenus and species groups follows the system proposed by Borkent (2016). Regardless of how collection data of specimens is presented on specimen labels, this information is presented here in the following order: state, locality/localities data, date(s) of collection, name(s) of collector(s), method(s) of collection, number of specimens and their sexes.

All specimens examined are deposited in the Colección de Artrópodos con Importancia Médica (CAIM), Mexico City, Mexico.

Abbreviation wing. CuA = anterior branch of cubital veins; m1, m2 and m4 = medial cells; M1, M2 and M4 = branches of medial vein; R1, R3 = radial veins; r-m = radial-medial cross vein; r1, r2 and r3 = radial cells; according to Borkent (2017).
### RESULTS

**Table 1.** List records of *Culicoides* from Oaxaca, Mexico.

| Species                     | Locality                                                        | Record                          |
|-----------------------------|-----------------------------------------------------------------|---------------------------------|
| *Culicoides baueri*         | Santiago Yaveo                                                  | in the present                  |
| *Culicoides copiosus*       | Comatlán, Ixtlán Etla                                            | Vargas, 1945                    |
| *Culicoides diabolicus*     | San Juan Guichicovi, El Zarzal                                   | Huerta *et al.*, 2012           |
| *Culicoides debilipalpis*+  | Santiago Yaveo                                                  | in the present                  |
| *Culicoides elutus*         | Camotlán, Ixtlán                                                 | Wirth & Blanton, 1959           |
| *Culicoides gabaldoni*      | San Juan Guichicovi, El Zacatal                                 | Huerta *et al.*, 2012           |
| *Culicoides ginesi*+        | Santiago Yaveo                                                  | in the present                  |
| *Culicoides glabellus*+     | Santiago Yaveo                                                  | in the present                  |
| *Culicoides foxi*           | Rio Jaltepec, Istmo de Tehuantepec                              | Spinelli *et al.*, 1993         |
| *Culicoides hylas*+         | San Juan Guichicovi, El Zacatal                                 | Huerta *et al.*, 2012           |
| *Culicoides insignis*       | Santiago Yaveo, Putla Villa de Guerrero, Rancho Viejo           | in the present                  |
| *Culicoides jamaicensis*    | San Juan Guichicovi, El Zarzal                                   | Huerta *et al.*, 2012           |
| *Culicoides leopoldoi*      | Santa Cruz Zenzontepec, Soledad Cofradía                         | in the present                  |
| *Culicoides luteovenus*     | Yolox, Ixtlán                                                    | Vargas, 1945                    |
| *Culicoides neopulicaris*+  | Santa María Tonameca, Arroyo La Puerta                          | in the present                  |
| *Culicoides ocumarensis*    | Rio Jaltepec, Istmo de Tehuantepec                              | Spinelli *et al.*, 1993         |
| *Culicoides pampoikilus*    | without locality data                                           | Borkent & Spinelli, 2000        |
| *Culicoides phlebotomus*    | Salina Cruz                                                     | Wirth & Blanton, 1953           |
| *Culicoides pusillus*+      | Santa Cruz Zenzontepec, Soledad Cofradía                         | in the present                  |
| *Culicoides pseudodiabolicus*+ | Santiago Yaveo                                               | Vargas, 1954 (as donajii)       |
| *Culicoides rangeli*        | Comatlán, Ixtlán                                                 | Wirth, 1974                     |
| *Culicoides stigmatli*      | Río Cajones, entre Yaé y Comatlán                                | Vargas, 1953                    |
| *Culicoides variipennis*    | Etla                                                            | Vargas, 1945                    |

*New records for Mexico.
+New records for Oaxaca, Mexico.
Key to the *Culicoides* species from Oaxaca, Mexico
(Primarily for females)

1. Second radial cell entirely or mostly on a pale spot (Figs. 1A-D).......................... 2
   – Second radial cell entirely on a dark spot (Figs. 3A-D)........................................... 10

2(1) Base of cell m₄ pale bordering veins M₄ and CuA, or apices of veins M₁ and M₂ pale...................... 5
   – Base of cell m₄ and adjacent veins on a dark area; apices of veins M₁ and M₂ dark.................. 3

3(2) Cell r₃ with distal pale area continuous to the distal area of cell m₁........................................... 4
   – Cell r₃ with distal pale area discontinuous to the distal area of cell m₁................................. 11

4(3) Cell m₄ with a small dark area in the middle (Fig. 2C)......................................................... 12
   – Cell m₄ without a small dark area in the middle............................................................... 13

5(2) Cell r₃ with a separate pale spot beyond to the base of vein M₁ (*hylas* species group) (Fig. 1B); third palpal segment with a subdivided sensory pit............................................. 6
   – Cell r₃ without a separate pale spot beyond to the base of vein M₁, pale area continuous from r-m cross-vein to the borders of vein M₁ (*guttatus* species group) (Fig. 1A); third palpal segment with or without a subdivided sensory pit......................................................... 14

6(5) Cross-vein r-m pale.................................................................................................................. 7
   – Cross-vein r-m dark............................................................................................................... 8

7(6) Halter knob dark; vein M₂ with discontinuous straddling pale area (Fig. 2A); nineth tergite of the male with mesal cleft, and the apicolateral process is very close.......................................................................................................................... 9
   – Halter knob pale; vein M₂ with continuous straddling pale area; nineth tergite of the male without mesal cleft, and the apicolateral process is widely spaced........................................ 10

8(6) Cell m₁ with a distal pale spot; halter dark; vein R₃ dark up to the point where it turns abruptly forward to meet with costal vein (Fig. 1D)............................................................... 11
   – Cell m₁ with two distal pale spot, halter dark or pale; vein R₃ pale........................................ 12

9(8) Halter knob pale; third palpal segment with subdivided pit; vein R₃ pale (infuscated for a short distance in some specimens) (Fig. 1C)............................................................................. 13
   – Halter knob dark brown; third palpal segment with shallow and rounded pit; vein R₃ pale but with small blackish spot behind apex (Fig. 1A)................................................................. 14

10(1) Wing with contrasting pattern of dark and pale spot (Fig. 3).............................................. 15
   – Wing with very faint pattern (Fig. 2B).................................................................................. 16

11(10) Cell r₂ with similar proportion to the r₁ (Fig. 2B); hind tibial comb with five spines; halter yellowish.............................................................................................................................. 17
   – Cell r₂ longer to the cell r₁; hind tibial comb with four spines; halter dark............................... 18

12(10) Eyes widely separated; spermatheca U or C-shaped (subgenera *Monoculicoides*)............................... 19
   – Eyes slightly separated; spermatheca different shaped......................................................... 20
13(12) Wing with a pale straddling middle of vein M₂ (Fig. 2D), or veins M₁ and M₂ with completely pale margins.................................................................14
   – Wing without a pale straddling middle of vein M₂, or veins M₁ and M₂ without completely pale margins, usually dark to apex..........................................................................................19

14(13) Third palpal segment with a very large and deep sensory pit.................................................................15
   – Third palpal segment with shallow sensory pit or open sensory area..........................................................17

15(14) Base of vein M₁ with straddling pale spot..........................................................................................16
   – Base of vein M₁ without straddling pale spot..............................................................................pampoikilus Macfie

16(15) Apex of the veins M₁ and M₂ with a pale area in the wing margin (Fig. 2D); cell r₃ with distal pale area reaching the wing margin.................................................................jamaicensis Edwards
   – Apex of the veins M₁ and M₂ without a pale area in the wing margin; cell r₃ with distal pale area not reaching the wing margin................................................copiosus Root & Hoffman

17(14) Mesonotum with pattern of punctiform brown dots; cell m₁ with three pale spots, the distal at the wing margin.................................................................furens (Poey)
   – Mesonotum without pattern of punctiform brown dots; cell m₁ with one pale spots, located far from wing margin.................................................................................................................18

18(17) Legs with distinct pale bands; hind tibial comb with four spines; wing with abundant macrotrichia (Fig. 3A)..................................................................baueri Hoffman
   – Legs without distinct pale bands; hind tibial comb six to eight spines; wing without abundant microtrichia................................................phlebotomus (Williston)

19(13) Mesonotum with distinctive pattern of punctiform brown dots; cell r₃ with three small rounded equidistant pale spots in a triangle (Fig. 3C)..................................................................ginesi Ortiz
   – Mesonotum without distinctive pattern of punctiform brown dots; cell r₃ with different arrangement.................................................................................................................20

20(19) Macrotrichia sparse, only a few in apices of cells r₃, m₁ and m₂; small species (wing length 0.80 ≤ mm).................................................................................................................21
   – Macrotrichia more numerous, present at least on distal half of wing; large species (wing length 0.8 ≥ mm).................................................................................................................22

21(20) Two spermathecae; legs paler; cell r₂ closed..............................................................................gabaldoni Ortiz
   – One spermatheca; legs darker; cell r₂ open (Fig. 3D).................................................................glabellus Wirth & Blanton

22(20) Two spermathecae; mesonotum with median anterior triangular marking................debilipalpis Lutz
   – One spermatheca; mesonotum with different pattern.................................................................................23

23(22) Cell r₃ with four pale spots.................................................................................................................leopoldoi Ortiz
   – Cell r₃ with two pale spots.................................................................................................................rangeli Ortiz & Mirsa
New records for Mexico

*Culicoides (Haematomyidium) ginesi* Ortiz
(Figs. 3C, 4)

*Culicoides ginesi* Ortiz, 1951b: 586 (Venezuela; female; figs.). Wirth & Blanton, 1959: 450 (Panama; redescription; *debilipalpis* group distribution; in key; figs.); Aitken *et al*., 1975: 126 (Trinidad record; distribution; in key; fig.).

*Culicoides* (Oecacta) *ginesi* Ortiz: Forattini, 1957: 395 (Brazil; redescription; in key; distribution; figs.).

*Culicoides* (Haematomyidium) *ginesi* Ortiz: Wirth, 1974: 31 (Catalogue of the Americas south of US).

Remarks. This species is widely distributed in the Neotropics and was originally described from Venezuela (Ortiz, 1951b). In Mexico, other similar species belonging to this subgenus, and known are: *Culicoides debilipalpis* Lutz, *Culicoides eadsi* Wirth & Blanton and *Culicoides paraensis* (Goeldi). *Culicoides ginesi* can be distinguished from the previous species by the characteristic pattern of strikingly marked mesonotum and wing with cell R₃ well-separated spots arranged in a triangle (Fig. 3C). We examined two females from Oaxaca, which represent the first record from Mexico.

Specimens examined. The examination of a specimen identified by Willis Wirth, deposited in the collection of Ceratopogonidae (CCER/FIOCRUZ) was measurement and photograph by comparison through the courtesy of Dr. Maria Luiza Felippe-Bauer.

New record for Mexico. Oaxaca, Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 20 Nov. 2019, col. Benitez-Alva, J. I., Reyes-Garcia, F., trap CDC, 2 females (slide mounted).

Distribution. Mexico (Oaxaca). El Salvador to Panama, Colombia, Venezuela, Trinidad, Brazil northeastern Argentina (Borkent & Spinelli, 2007).

Subgenus unplaced, leoni species group

*Culicoides glabellus* Wirth & Blanton
(Figs. 3D, 4)

*Culicoides glabellus* Wirth & Blanton, 1956c: 47 (Panama; Honduras; Nicaragua; Trinidad; male; female; distribution; figs.). Wirth & Blanton, 1959: 429 (Panama; redescription; in key; distribution; figs.); Williams, 1964: 462 (Trinidad; larvae habitat); Wirth *et al*., 1988: 52 (Wing Atlas of Neotropical species; fig.).

*Culicoides* (Oecacta) *glabellus* Wirth & Blanton: Wirth, 1973: 437 (Brazil; diagnosis; distribution; in key; fig.).

*Culicoides glabellus* Wirth & Blanton: Wirth & Blanton, 1973: 437 (Brazil; diagnosis; distribution; in key; fig.).
Figure 1. Wing, dorsal view. Female. A) Culicoides foxi Ortiz; B) Culicoides hylas Macfie; C) Culicoides pseudodiabolicus Fox; D) Culicoides insignis Lutz. Scale = 0.5 mm.
Remarks. According to Borkent (2016), *leoni* species group included six species from the Neotropical region (*Culicoides benarrochi* Ortiz & Mirsa, *Culicoides fieldi* Wirth & Blanton, *Culicoides gabaldoni* Ortiz, *Culicoides glabellus* Wirth & Blanton, *Culicoides leoni* Barbosa and *Culicoides trifidus* Spinelli & Borkent and only *Culicoides reevesi* had distribution in the Nearctic region. The previously known members of the *leoni* species group from Mexico was *C. gabaldoni* reported by Wirth & Blanton (1973), this species is mostly and widely distributed in the Neotropical region (Borkent & Spinelli, 2007). Huerta *et al.* (2012) included the first record of *C. leoni* from Mexico (Veracruz). From the samples collected from Oaxaca, we examined two females conspecific to *C. glabellus*, based on the description and key of Wirth & Blanton (1956c; 1959), which represent the first record from Mexico (Oaxaca).

General appearance, size, and wing markings of *C. glabellus* are very similar to *C. leoni* and *C. gabaldoni* (Wirth & Blanton, 1959). This last species has two spermathecae, while *C. leoni* and *C. glabellus* only present one spermatheca. In *C. leoni* the distal sensilla coeloconicae present on segments I and V-VIII, and the antennal ratio is 0.75, compared with *C. glabellus* has the distal sensilla coeloconicae present on segments I and VI-VIII, and antennal ratio is 0.91 (0.81–0.95).

Specimens examined. PANAMA: Canal Zone, Mojinga Swamp, light trap, 14 Nov. 1951, F. S. Blanton, 1 female (slide) (CAIM Cr/lam-00669).

New record for Mexico. Oaxaca, Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 20 Nov. 2019, col. Benitez-Alba, J. I., Reyes-Garcia, F., trap CDC, 2 males (slide mounted); same data except, 23 Oct. 2019, 6 females, 4 males (slide mounted).

Distribution. Mexico (Oaxaca). Honduras to Colombia, Ecuador, Trinidad and Tobago, Brazil (Borkent & Spinelli, 2007).

New distributional records of species previously recorded from Mexico.

*Culicoides (Avaritia) pusillus* Lutz

(Figs. 2B, 4)

*Culicoides pusillus* Lutz, 1913: 52 (Brazil; male; female; fig.). Macfie, 1938: 165 (Trinidad record; fig.); Adamson, 1939: 81 (Trinidad; habitats); Adamson, 1941: 75 (Trinidad; habitats); Barbosa, 1947: 25 (Panama; Jamaica records; in key; fig.); Macfie, 1948: 79 (Mexico record; in key); Ortiz & Mirsa, 1951: 603 (Venezuela record; figs.); Ortiz & León, 1955: 570 (Ecuador record); Wirth, 1955b: 110 (Guatemala record; fig.); Beck, 1956: 134 (USA, Florida record); Forattini, 1957: 284 (Brazil; redescription; in key; distribution; figs.); Beck, 1958: 11 (USA, Florida record); Williams, 1964: 462 (Trinidad; larvae habitat); Smith & Varnell, 1967: 519 (USA, Florida; tree holes); Gutsevich *et al.*, 1969: 2 (Cuba; notes); Tikasingh, 1972: 447 (Trinidad; habits); Winder & Silva, 1972: 653 (Brazil; larval habits); Winder, 1977: 60 (Brazil; larval habits); Mellor *et al.*, 2000: 313 (epidemiology); Borkent & Wirth, 1997: 80 (World species of Ceratopogonidae); Ronderos & Spinelli, 1998: 82 (Paraguay record; in key); Silva *et al.*, 2001: 353 (Brazil record); Soria *et al.*, 2002: 320 (Brazil record).

*Culicoides (Avaritia) pusillus* Lutz Wirth & Blanton, 1959: 292 (Panama; redescription; distribution; in key; figs.); Wirth & Blanton, 1973: 446 (Brazil; diagnosis; in key; distribution; fig.); Wirth, 1974: 21 (Catalogue of the Americas south of US); Wirth & Blanton, 1974: 77 (West Indian review; distribution; in key; figs.); Aitken *et al.*, 1975: 138 (Trinidad record; distribution; in key; figs.); Blanton & Wirth, 1979: 140 (USA, Florida; diagnosis; distribution; in key; figs); Wirth *et al.*, 1988: 14 (Wing Atlas of Neotropical species; fig.); Wirth & Mullens, 1992: 1007 (in key; pusillus group); Borkent & Spinelli, 2000: 28 (Catalog of New World, South USA); Ronderos *et al.*, 2003: 22 (Paraguay record); Spinelli & Borkent, 2004: 390 (Costa Rica records); Spinelli *et al.*, 2005: 138
Remarks. This species is widely distributed from United States (Florida) and Mexico, south to Brazil and northeastern of Argentina (Borkent & Spinelli, 2000; 2007). In Mexico it was previously reported from states of Chiapas, Tabasco, and Veracruz (Macfie, 1948; Huerta et al., 2012).

New record for Oaxaca. Oaxaca, Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 23 Nov. 2019, col. Benitez-Alva, J. I., Reyes-Garcia, F., trap CDC, 1 male (slide mounted); Santa Cruz Zenzontepec, La Soledad Cofradía, GPS: 16° 32’ 40.4” N, 97° 32’ 44.9” W; 26 Nov. 2019, col. Benitez-Alva, J. I., Perez-Martinez, D., trap CDC, 1 male (slide mounted).

Distribution. United States, Mexico (Chiapas, Tabasco, Veracruz, Oaxaca) to northeastern of Argentina (Borkent & Spinelli, 2007; Huerta et al., 2012).

Culicoides (Culicoides) neopulicaris Wirth
(Figs. 2C, 4)

Culicoides neopulicaris Wirth, 1955a: 355 (United States; Mexico; female; figs.). Borkent & Wirth, 1997: 75 (World species of Ceratopogonidae); Borkent, 2014: 208 (pupae reference).

Culicoides (Culicoides) neopulicaris Wirth: Vargas, 1960: 39 (subgenera of Culicoides of America); Wirth, 1965: 128 (Nearctic catalog); Wirth & Blanton, 1969: 229 (North American review pulicaris group; diagnosis; distribution; in key; figs.); Wirth, 1974: 21 (Catalogue of the Americas south of US); Wirth et al., 1985: 12 (Wing Atlas of Nearctic species; fig.); Borkent & Spinelli, 2007: 64 (Neotropical catalog); Borkent & Grogan, 2009: 13 (Nearctic catalog); Vigil et al., 2014: 6 (United States record; distribution); Borkent, 2016: 12 (online the subgeneric classification of species of Culicoides); Ronderos et al., 2018: 639 (immature list); Borkent & Dominik, 2020: 109 (World catalogue).

Culicoides yukonensis Hoffmann: misidentification, Vargas, 1945: 45 (Mexico record).

Remarks. This species has a widely distribution from United States (Texas, Louisiana, Alabama) to Costa Rica. In Mexico, five species belonging to subgenera Culicoides Latreille are recognized: Culicoides elutus Macfie, Culicoides fortinensis Spinelli & Huerta, Culicoides luteovenus Root & Hoffmann, Culicoides neopulicaris and Culicoides rulfoi Spinelli & Huerta. This species has been previously reported from seven states of Mexico (Vargas, 1945; Wirth, 1965; Wirth & Blanton, 1969; Huerta et al., 2012).

New record for Oaxaca. Oaxaca, Santa María Tonameca, Arroyo La Puerta (Fig. 4), GPS: 15° 45’ 51.4” N, 96° 42’ 44.67” W; 24 Nov. 2019, col. Benitez-Alva, J. I., Zurita-Perez, G., trap CDC, 5 females (2 slide mounted, 3 preserved in ethyl alcohol), 1 male (slide mounted).

Distribution. United States, Mexico (Chiapas, Hidalgo, Estado de Mexico, Morelos, San Luis Potosi, Oaxaca, Veracruz, and Yucatan) to Costa Rica (Borkent & Spinelli, 2007; Vargas, 1945; Wirth, 1965; Wirth & Blanton, 1969; Huerta et al., 2012).
Figure 2. Wing, dorsal view. Female. A) Culicoides ocumarensis Ortiz; B) Culicoides pusillus Lutz; C) Culicoides neopulicaris Wirth; D) Culicoides jamaicensis Edwards. Scale = 0.5 mm.
Figure 3. Wing, dorsal view. Female. A) Culicoides baueri Hoffman; B) Culicoides debilipalpis Lutz; C) Culicoides ginesi Ortiz; D) Culicoides glabellus Wirth & Blanton. Scale = 0.5 mm.
Huerta et al.: Records of Culicoides in Oaxaca, Mexico

Culicoides (Diphaomyia) baueri Hoffman
(Fig. 3A, 4)

Culicoides baueri
Hoffman, 1925: 297 (United States; female; figs.); Root & Hoffman, 1937: 163 (notes; distribution; figs.); Vargas, 1945: 43 (Mexico record); Macfie, 1948: 72 (in key); Vargas, 1949: 195 (list species); Beck, 1952: 104 (USA, Florida record); Foote & Pratt, 1954: 16 (United States record; diagnosis; distribution; in key; figs.); Williams, 1955: 33 (USA, Georgia; distribution; larval habitat); Messersmith, 1966: 93 (seasonal incidence); Khalaf, 1969: 1159 (distribution; seasonal incidence); Battle & Turner, 1970: 426 (diagnosis; distribution; in key; larval habitat); Gazeau & Messersmith, 1970: 315 (distribution; notes); Root & Gerhardt 1991: 127 (seasonal emergence); Reeves et al., 2004: 8 (USA record; notes); Borkent & Wirth 1997: 63 (World species of Ceratopogonidae).

Culicoides (Diphaomyia) baueri
Hoffman: Wirth, 1965: 131 (Nearctic catalog); Atchley, 1967: 985 (New Mexico; diagnosis; distribution; in key; figs.); Battle & Turner, 1971: 24 (redescription; distribution; in key; figs.); Wirth et al., 1985: 39 (Wing Atlas of Nearctic species; fig.); Borkent & Grogan, 2009: 34 (Nearctic catalog); Huerta et al., 2012: 2 (Mexico record); Harrup et al., 2015: 251 (fig.); Mukhopadhyay et al., 2016: 281 (India; species list; distribution); Borkent, 2016: 13 (online the subgeneric classification of species of Culicoides); Borkent & Dominiak, 2020: 110 (World catalogue).

Culicoides (Oecacta) baueri
Hoffman: Jamnback, 1965: 42 (United States; figs.).

Remarks. This primarily Nearctic species is distributed from south of the United States (Borkent & Grogan, 2009). In Mexico, it was previously known from specimens collected by light trap from Mexico City (Root & Hoffman, 1937). Huerta et al. (2012) confirmed such records from Mexico.

New record for Oaxaca. Oaxaca, Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 22 Oct. 2019, col. Benitez-Alva, J. I., Reyes-Garcia, F., trap CDC, 2 females (slide mounted).

Distribution. Southeastern United States, Mexico (Ciudad de México, Oaxaca, Puebla) (Root & Hoffman, 1937; Borkent & Grogan, 2009; Huerta et al., 2012). Mukhopadhyay et al., (2016) indicated this species was recorded from India.

Culicoides (Drymodesmyia) jamaicensis
(Figs. 2D, 4)

Culicoides loughnani var. jamaicensis
Edwards, 1922: 165 (Jamaica; female; fig.). Hoffman, 1925: 283 (Panama record); Vargas, 1945: 43 (Mexico record); Barbosa, 1947: 21 (Panama, Jamaica records; fig.); Macfie, 1948: 80 (Chiapas, Mexico; female; descriptive notes; in key); Vargas, 1949: 200 (list species); Fox, 1949: 32 (Puerto Rico; figs.); Ortiz & Mlsa, 1952: 271 (in part, Venezuela; figs.); Forattini, 1957: 412 (in part, Brazil; diagnosis; distribution; in key; fig.).

Culicoides jamaicensis
Edwards: Wirth, 1955b: 112 (Guatemala record; fig.); Wirth & Blanton, 1959: 339 (Panama; copiosus group; redescription; distribution; in key; figs.); Wirth & Hubert, 1960: 649 (review copiosus group; diagnosis; in key; figs.); Williams, 1964: 463 (Trinidad; larvae habitat); Borkent & Wirth, 1997: 71 (World species of Ceratopogonidae).

Culicoides (Drymodesmyia) jamaicensis
Edwards: Wirth, 1974: 22 (Catalogue of the Americas south of US); Wirth & Blanton, 1974: 61 (West Indian review; diagnosis; distribution; in key; figs.); Aitken et al., 1975: 131 (Trinidad record; distribution; in key; fig.); Wirth et al., 1988: 26 (Wing Atlas of Neotropical species; fig.); Borkent & Spinelli, 2000: 30 (Catalog of New World, South USA); Spinelli & Borkent, 2004: 390 (Costa Rica records); Borkent & Spinelli 2007: 65 (Neotropical catalog); Spinelli & al., 2009: 87 (Colombia records); Huerta et al., 2012: 9 (Mexico records); Borkent, 2016: 14 (online the subgeneric classification of species of Culicoides); Spinelli & Wolff, 2016: 109
(Colombia records); Santarém & Felippe-Bauer, 2020: 22 (Brazilian species); Borkent & Dominiak, 2020: 111 (World catalogue).

Remarks. This species has a wide Neotropical distribution, including part of the Nearctic region of United States (Borkent & Grogan, 2009). Macfie (1948) included the first record of *C. jamaicensis* in Mexico from Chiapas. Huerta et al. (2012) provided records from the states of Guerrero, Jalisco, Estado de Mexico, Oaxaca, Veracruz, and Yucatán.

New record for Oaxaca. Santa Cruz Zenzontepec, La Soledad Cofradía (Fig. 4), GPS: 16° 32’ 40.4” N, 97° 32’ 44.9” W; 26 Nov. 2019, col. Benitez-Alva, J.I., Perez-Martinez, D., trap CDC, 4 females, 3 males (slide mounted). (Fig. 4).

Distribution. United States (Texas, Florida), Mexico (Jalisco, Estado de Mexico, Veracruz, Guerrero, Chiapas, Oaxaca, and Yucatan), Central America and Caribbean to Colombia, Venezuela, and Brazil (Borkent & Spinelli, 2007; Huerta et al., 2012).

Figure 4. Map of Mexico, with the collection records in the state of Oaxaca.
**Culicoides (Haematomyidium) debilipalpis Lutz**

(Figs. 3B, 4)

*Culicoides debilipalpis* Lutz, 1913: 60 (Brazil; female; description; fig.); Macfie, 1937: 7 (Trinidad record; female; redescription); Floch & Abonnenc, 1942: 3 (French Guiana record); Vargas, 1945: 43 (Mexico record); Macfie, 1948: 78 (Caribbean record; in key); Vargas, 1949: 197 (list species); Barbosa, 1952: 12 (Argentina, Brazil records); Forattini, 1957: 383 (in part, Brazil; redescription; distribution; in key; figs.); Wirth & Blanton, 1959: 442 (Panama; redescription; distribution; in key; figs.); Franca-Rodríguez, 1963: 67 (Uruguay record); Williams, 1964: 463 (Trinidad; larvae habitat); Smith & Varnell, 1967: 520 (Florida record; tree holes); Wirth & Blanton, 1971a: 34 (redescription; distribution; in key; fig.); Wirth & Blanton, 1971b: 75 (*khalafi* as synonymy; notes); Wirth & Blanton, 1973: 431 (Brazil; diagnosis; distribution; in key; fig.); Reeves et al 2004: 9 (USA record; notes).

*Culicoides (Oecacta) debilipalpis* Lutz: Wirth, 1974: 29 (Catalogue of the Americas south of US); Aitken et al., 1975: 119 (Brazil; *debilipalpis* group; diagnosis; distribution; fig.); Blanton & Wirth, 1979: 78 (USA, Florida; diagnosis; distribution; in key; figs.); Vitale et al., 1981: 149 (Panama; in key; diagnosis; fig.).

*Culicoides (Haematomyidium) debilipalpis* Lutz: Spinelli & Ronderos, 1997: 304 (revalidation); Borkent & Spinelli, 2000: 32 (Neotropical catalog); Ronderos et al., 2003: 22 (Yacyretá records); Spinelli & Borkent, 2004: 391 (Costa Rica records); Spinelli et al., 2005: 141 (Argentina record; in key; fig.); Trindade & Gorayeb, 2005: 67 (Brazil record); Borkent & Spinelli, 2007: 66 (Neotropical catalog); Borkent & Grogan, 2009: 14 (Nearctic catalog); Ronderos et al., 2010: 42 (description immature); Harrup et al., 2015: 252 (fig.); Borkent, 2016: 15 (online the subgeneric classification of species of *Culicoides*); Spinelli & Wolff, 2016: 110 (Colombia record); Ronderos et al., 2018: 639 (immature list); Santarém & Felippe-Bauer, 2020: 22 (Brazilian species); Borkent & Dominia, 2020: 112 (World catalogue).

*Culicoides ichevi* Ronderos & Spinelli, 1995: 77 (Argentina; Paraguay; Uruguay; female). Ronderos & Spinelli, 1998: 81 (Yacyretá record; in key).

*Culicoides khalafi* Beck, 1957: 104 (Florida; male; female; fig.).

*Culicoides lahillei*: Spinelli & Wirth, 1986: 62 (synonymy); Wirth et al., 1988: 48 (Wing Atlas of Neotropical species; fig.); Spinelli et al., 1989: 735 (Argentina record); Spinelli & Ronderos, 1991: 91 (Uruguay record); Spinelli & Martínez, 1991: 176 (Uruguay; in key); Waller et al., 1990: 352 (French Guiana; redescription; notes); Lamberson et al., 1992: 117 (United States; description; pupa); Borkent & Wirth, 1997: 72 (synonymy; World species of Ceratopogonidae).

**Remarks.** Macfie (1948) included the first record of *Culicoides debilipalpis* from Chiapas, Mexico. Huerta et al. (2012) confirmed Mexico record, based on the revision of specimens from Veracruz and Yucatan deposited in the Florida State Collection of Arthropods, Gainesville, Florida, USA (FSCA).

**New record for Oaxaca.** Santiago Yaveo (Fig. 4), GPS: 17° 20' 8.5" N, 95° 41' 38" W; 23 Oct. 2019, col. Benitez-Alva, J.I., Reyes-García, F., trap CDC, 1 female (slide mounted).

**Distribution.** Widespread from United States (Maryland, Kentucky, Nebraska south to Louisiana and Florida), Mexico (Chiapas, Veracruz, Oaxaca, Yucatan), Guatemala and Belize to Argentina (Macfie, 1948; Borkent & Spinelli, 2007; Huerta et al., 2012).

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**Culicoides (Hoffmania) foxi Ortiz**

(Figs. 1A, 4)

*Culicoides foxi* Ortiz, 1950b: 461 (Puerto Rico). Ortiz, 1951a: 4 (Venezuela record; figs.); Fox, 1953: 888 (Puerto Rico record; notes); Wirth & Blanton, 1956a: 309 (Panama; redescription; distribution; in key; figs.); Forattini, 1957: 205 (Brazil; diagnosis; distribution; in key; figs.); Fox & García-Moll,
1961: 120 (Puerto Rico record; notes); Williams, 1964: 463 (Trinidad; larvae habitat); Aitken et al., 1968: 265 (Trinidad record; habitats); Tikasingh, 1972: 447 (Trinidad record; habits); Wirth & Blanton, 1973: 434 (Brazil; diagnosis; distribution; in key; fig.); Wirth & Blanton, 1974: 41 (West Indian review; diagnosis; distribution; in key; figs.); Aitken et al., 1975: 124 (Trinidad record; diagnosis; distribution; in key; fig.); Ramirez-Perez, 1984: 62 (Venezuela record); Greiner et al., 1984: 398 (Bluetongue in the Caribbean region); Spinelli & Wirth, 1986: 51 (Amazon basin record; in key); Greiner & Rawlins, 1987: 153 (Jamaica record); Lien & Lu, 1987: 93 (Bolivia record; fig.); Greiner et al., 1989: 101 (Bluetongue in Trinidad and Tobago); Waller et al., 1990: 357 (French Guiana record; notes); Spinelli & Wirth, 1993: 34 (Argentina species list; distribution; Borkent & Wirth, 1997: 68 (World species of Ceratopogonidae); Silva et al., 2001: 353 (Brazil records); Soria et al., 2002: 320 (Brazil, Peru record); Ronderos et al., 2003: 22 (Paraguay record); Laender et al., 2004: 145 (Brazil record); Spinelli et al., 2005: 139 (Argentina record; in key; fig.).

**Culicoides (Hoffmania) foxi** Ortiz: Wirth & Blanton, 1959: 283 (Panama; redescription; distribution; in key; figs.); Wirth, 1974: 24 (Catalogue of the Americas south of US); Wirth et al., 1988: 16 (Wing Atlas of Neotropical species; fig.); Spinelli & Ronderos, 1991: 88 (Argentina, Uruguay record; in key; fig.); Spinelli et al., 1993: 41 (review Neotropical of subgenera Hoffmania; diagnosis; distribution; in key; figs.); Borkent & Spinelli, 2000: 34 (Catalog of New World, South USA); Borkent & Spinelli, 2007: 24 (Brazilian species; Borkent & Dominiak, 2020: 114 (World catalogue).

**Culicoides diabolicus** Hoffman, of authors, misidentification; Floch & Abonnenc, 1942: 2 (French Guiana; notes; figs.).

**Culicoides guttatus** (Coquillet), of authors, misidentification; Fox, 1948: 23 (Venezuela record); Fox, 1949: 31 (Puerto Rico record); Fox & Kohler, 1950: 342 (Puerto Rico record; biology).

**Remarks.** This species is common and widely distributed within the Neotropical region. It was previously known in Mexico (Wirth & Blanton, 1974; Aitken et al., 1975), and subsequently, Spinelli et al., (1993) reported distribution records for this Veracruz, Oaxaca, and Guerrero. Huerta et al. (1912) included new local records from Veracruz and Oaxaca.

**New record for Oaxaca.** Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 20 Nov. 2019, col. Benitez-Alva, J. I., Reyes-Garcia, F., trap CDC, 14 females (slide mounted) (CAIM); Putla Villa de Guerrero, Rancho Viejo, Constancia del Rosario, GPS: 17° 04’ 05.8” N, 97° 59’ 48” W; 16 Dec. 2019, col. Benitez-Alva, J. I., Zurita-Perez, G., trap CDC, 1 female (slide mounted).

**Distribution.** Mexico (Guerrero, Chiapas, Oaxaca, Veracruz) through Central and South America to Bolivia and northeastern Argentina; Caribbean area (Jamaica, Trinidad & Tobago, Puerto Rico) (Spinelli et al., 1993; Borkent & Spinelli, 2007; Huerta et al., 2012).

**Culicoides (Hoffmania) hylas** Macfie

(Figs. 1B, 4)

**Culicoides hylas** Macfie, 1940: 26 (British Guiana; female; fig.). Macfie, 1948: 70 (Caribbean record; in key); Wirth & Blanton, 1956b: 98 (Panama; diagnosis; distribution; in key; figs.); Forattini, 1957: 243 (Brazil; diagnosis; distribution; in key; figs.); Borkent & Wirth, 1997: 70 (World species of Ceratopogonidae).

**Culicoides (Hoffmania) hylas:** Wirth & Blanton, 1959: 276 (Panama; diagnosis; distribution; in key; figs.); Wirth & Blanton, 1968: 203 (Neotropical review hylas group; diagnosis; distribution; in key; figs.); Wirth & Blanton, 1973: 439 (Brazil record; diagnosis; distribution; in key; fig.); Wirth, 1974: 25 (Catalogue of the Americas south of US); Wirth et al., 1988: 18 (Wing Atlas of Neotropical species;
Remarks. This is a common species in the Neotropical region (Borkent & Spinelli, 2007). It is known in Mexico, south from the state Veracruz (Wirth & Blanton, 1968; Huerta et al., 2012).

New record for Oaxaca. Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 20 Nov. 2019, col. Benitez-Alva, J. I., Reyes-Garcia, F., trap CDC, 23 females (5 females slide mounted, rest preserved in ethyl alcohol), 5 males (slide mounted); same date except, 23 Oct. 2019, 1 male (slide mounted).

Distribution. Mexico south (Oaxaca, Veracruz) to Colombia, Guyana, Peru, and Brazil (Wirth & Blanton, 1968; Borkent & Spinelli, 2007; Huerta et al., 2012).

Culicoides (Hoffmania) insignis Lutz (Fig. 1D, 4)

Culicoides insignis Lutz, 1913: 51 (Brazil; male; female; pupae; figs.). Costa-Lima, 1937: 415 (notes on Lutz collection; fig.); Floch & Abonnenc, 1942: 1 (French Guiana record; fig.); Vargas, 1945: 43 (Mexico record); Barboa, 1947: 20 (Brazil; in key; fig.); Fox, 1948: 25 (diagnosis); Macfie, 1948: 75 (Mexico record; in key); Vargas, 1949: 200 (list species); Barbosa, 1952: 17 (Brazil record); Forattini et al. 1956: 195 (Brazil; immature stages; figs.); Forattini, 1957: 223 (Brazil; diagnosis; distribution; in key; figs.); Williams, 1964: 463 (Trinidad; larvae habitat); Linley, 1965: 57 (Jamaica; pupa; fig.); Cavalieri & Chiossone, 1966: 148 (Argentina record); Davies, 1967: 39 (Jamaica record; habitat); Gutsevich et al., 1969: 4 (Cuba record); Davies & Giglioli, 1977: 414 (Cayman Island record); Davies & Giglioli, 1979: 593 (Cayman Island record); Wirth & Soria, 1981: 107 (Brazil record); Barreto, 1986: 144 (Colombia catalog); Gibbs et al., 1989: 141 (USA, Florida; virus isolated); Waller et al., 1990: 358 (French Guiana record); Homan et al., 1990: 1089 (potential bluetongue vector); Tanya et al., 1992: 1 (bluetongue virus); Borkent & Wirth 1997: 71 (World species of Ceratopogonidae).

Culicoides (Hoffmania) insignis Lutz: Fox, 1948: 25 (designation type species of Hoffmania); Wirth & Blanton, 1956a: 319 (Panama; designated male syntype as lectotype; USA, Florida record; synonymy: inamollae, painteri); Wirth & Blanton, 1959: 285 (Panama; guttatus group; diagnosis; distribution; in key; figs.); Wirth & Blanton, 1973: 440 (Brazil; diagnosis; distribution; in key; fig.); Wirth, 1974: 25 (Catalogue of the Americas south of US; synonymy); Wirth & Blanton, 1974: 57 (West Indian review; diagnosis; distribution; in key; figs.); Aitken et al., 1975: 130 (Trinidad record; distribution; in key; figs.); Blanton & Wirth, 1979: 106 (USA, Florida; diagnosis; distribution; in key; figs.); Ramírez-Pérez, 1984: 62 (Venezuela record); Greiner et al., 1984: 389 (Bluetongue in the Caribbean region); Wirth et al., 1985: 12 (Wing Atlas of Nearctic species; fig.); Wilkening et al., 1985: 520 (USA, Florida records); Spinelli & Wirth, 1986: 52 (in key; Amazon basin record; fig.); Greiner & Rawlins, 1987: 153 (Jamaica record); Lien & Lu, 1987: 94 (Bolivia record; fig.); Wirth et al., 1988: 16 (Wing Atlas of Neotropical species; fig.); Greiner et al., 1989: 101 (Bluetongue in Trinidad and Tobago); Greiner et al., 1990: 289 (Bluetongue in Caribbean region); Spinelli & Ronderos, 1991: 85 (Argentina, Uruguay records; in key; fig.); Spinelli & Wirth, 1993: 34 (Argentine list; distribution); Spinelli et al., 1993: 53 (review Neotropical of subgenera Hoffmania; diagnosis; distribution; in key; figs.); Spinelli, 1998: 325 (Argentina record); Ronderos & Spinelli, 1998: 79 (Paraguay record; in key); Borkent & Spinelli, 2000: 34 (Catalog of New World, South USA); Spinelli & Borkent, 2004: 391 (Costa Rica record); Spinelli & Ronderos, 2005: 63 (Medical
importance; fig.); Spinelli et al., 2005: 139 (Argentina record; in key; fig.); Borkent & Spinelli, 2007: 68 (Neotropical catalog); Borkent & Grogan, 2009: 14 (Nearctic catalog); Spinelli et al., 2009: 88 (Colombia record); Ronderos et al., 2011: 1188 (Argentina list); Huerta et al., 2012: 12 (Mexico record); Marino et al. 2013: 784 (pupae description); Borkent, 2016: 17 (online the subgeneric classification of species of Culicoides); Vigil et al., 2014: 7 (United States record; distribution); Spinelli & Wolff, 2016: 112 (Colombia record); Santarém & Felippe-Bauer, 2020: 25 (Brazilian species); Borkent & Dominiak, 2020: 114 (World catalogue).

**Culicoides guttatus** (Coquillett): misidentification Lutz, 1913: 58 (Brazil; fig.); Beck, 1952: 102 (Florida records).

**Culicoides inamollae** Fox & Hoffman, 1944: 110 (Puerto Rico record; figs.). Barbosa, 1947: 9 (in key); Fox, 1948: 25 (United States, Florida record; fig.); Fox & Kohler, 1950: 341 (Puerto Rico record; biology); Fox, 1953: 888 (Puerto Rico record; notes); Foote & Pratt, 1954: 25 (United States record; diagnosis; distribution; in key; fig.); Fox, 1955: 242 (synonymy: *painteri, oliveri* [sic]); Beck, 1958: 9 (Florida record); Fox & García-Moll, 1961: 120 (Puerto Rico record; notes).

**Culicoides oliveri** Fox, 1946: 257 (Honduras record; fig.). Fox, 1948: 26 (Florida record; fig.); Barbosa, 1947: 9 (in key); Ortiz, 1950a: 451 (notes).

**Remarks.** This species is known as possible vector of bluetongue virus in the Neotropical Region (Sáenz & Greiner, 1994; Borkent, 2005). This species is known as widely distributed in the Neotropical region, and also throughout southeastern USA (Borkent & Grogan, 2009). It was previously known in Mexico from Chiapas and Yucatan (Macfie, 1948; Blanton & Wirth, 1979; Borkent & Spinelli, 2007). Huerta et al. (2012) provided records from Tabasco and Veracruz.

**New record for Oaxaca.** Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 20 Nov. 2019, col. Benítez-Alva, J. I., Reyes-Garcia, F., trap CDC, 1 female (slide mounted).

**Distribution.** United States (Alabama, Georgia, Florida), Mexico (Chiapas, Oaxaca, Veracruz, Tabasco, Yucatan), Central American and Caribbean to central Argentina (Macfie, 1948; Blanton & Wirth, 1979; Borkent & Spinelli, 2007; Huerta et al., 2012).

**Culicoides (Hoffmania) ocumarensis**

(Figs. 2A, 4)

**Culicoides ocumarensis** Ortiz, 1950a: 455 (Venezuela; male, female; figs.). Ortiz & León, 1954: 571 (Ecuador record; notes; fig.); Lien & Lu, 1987: 93 (Bolivia record; fig.). Borkent & Wirth, 1997: 77 (World species of Ceratopogonidae).

**Culicoides (Hoffmania) ocumarensis** Ortiz: Wirth, 1974: 25 (Catalogue of the Americas south of US); Wirth et al., 1988: 18 (Wing Atlas of Neotropical species; fig.); Spinelli et al., 1993: 63 (review Neotropical of subgenera *Hoffmania*; diagnosis; distribution; in key; figs.); Borkent & Spinelli, 2000: 34 (Catalog of New World, South USA); Borkent & Spinelli, 2007: 69 (Neotropical catalog); Spinelli et al., 2009: 88 (Colombia record); Borkent, 2016: 17 (online the subgeneric classification of species of Culicoides); Spinelli & Wolff, 2016: 112 (Colombia record); Santarém & Felippe-Bauer, 2020: 25 (Brazilian species); Borkent & Dominiak, 2020: 114 (World catalogue).

**Culicoides diabolicus** Hoffman, of authors, misidentification; Macfie, 1932: 488 (Colombia record; notes); Wirth & Blanton, 1956a: 316 (synonymy: *ocumarensis*); Wirth & Blanton, 1959: 280 (synonymy).

**Culicoides lutzi** Costa-Lima, of authors, in part; Forattini, 1957: 238 (synonymy; diagnosis; distribution; in key; figs.).

**Culicoides insignis** Lutz, of authors, misidentification; Floch & Abonnenc, 1942: 2 (male; French Guiana record; figs.); Barbosa, 1944: 259 (Brazil; female; male; figs.).

**Culicoides recifei** Barbosa, 1947: 25 (Brazil; female); Barbosa, 1952: 20 (notes valid species).
**Culicoides filariferus** Hoffman, of authors, in part: Aitken et al., 1975: 121 (synonymy: ocumarensis; Trinidad record; distribution; fig.).

**Remarks.** This species is widely distributed in the Neotropical region. Previously records confirmed in Mexico included Oaxaca (Istmo de Tehuantepec) and Tabasco (Spinelli et al., 1993).

**New record for Oaxaca.** Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 20 Nov. 2019, col. Benitez-Alva, J. I., Reyes-Garcia, F., trap CDC, 1 female, 1 male (slide mounted).

**Distribution.** Mexico (Oaxaca, Tabasco) to Colombia, Venezuela, Peru, and northern Brazil (Spinelli et al., 1993; Borkent & Spinelli, 2007).

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**Culicoides (Hoffmania) pseudodiabolicus Fox**

(Figs. 1C, 4)

**Culicoides pseudodiabolicus** Fox, 1946: 256 (Trinidad; female; figs.); Barbosa, 1947: 8 (in key); Macfie, 1948: 70 (in key); Aitken et al., 1975: 137 (Trinidad record; distribution; fig.); Wirth & Blanton, 1973: 445 (Brazil; distribution); Borkent & Wirth, 1997: 79 (World species of Ceratopogonidae).

**Culicoides (Hoffmania) pseudodiabolicus** Fox: Wirth & Blanton, 1959: 283 (Panama; diagnosis; distribution; key; figs.); Wirth, 1974: 24 (Catalogue of the Americas south of US); Wirth et al., 1988: 18 (Wing Atlas of Neotropical species; fig.); Spinelli et al., 1993: 71 (review Neotropical of subgenera Hoffmania; diagnosis; distribution; key; figs.); Borkent & Spinelli, 2000: 35 (Catalog of New World, South USA); Borkent & Spinelli, 2007: 69 (Neotropical catalog); Borkent, 2016: 17 (online the subgeneric classification of species of Culicoides); Spinelli & Wolff, 2016: 113 (Colombia record); Santarém & Felippe-Bauer, 2020: 25 (Brazilian species); Borkent & Dominiak, 2020: 115 (World catalogue).

**Culicoides diabolicus** Hoffman; of authors, misidentification; Macfie, 1937: 7 (in part, Trinidad record; notes); Macfie, 1938: 164 (Trinidad record); Adamson, 1939: 81 (Trinidad; habitats); Macfie, 1940: 25 (British Guiana; as guttatus; synonymy: diabolicus); Adamson, 1941: 74 (Trinidad record; habitats); Wirth, 1956: 249 (Brazil record; pollination); Wirth & Blanton, 1956b: 316 (in part female; diagnosis; description; in key; figs.); Wirth & Blanton, 1959: 280 (in part, Panama; diagnosis; distribution; in key; fig.); Williams, 1964: 463 (Trinidad; larvae habitat); Aitken et al., 1968: 265 (Trinidad; habitats); Wirth et al., 1968: 132 (Panama record); Greiner et al., 1989: 103 (Bluetongue in Trinidad and Tobago).

**Culicoides trinidadensis** Hoffman; of authors, misidentification; Myers, 1935: 71 (in part; Trinidad record).

**Culicoides guttatus** (Coquillett); of authors, misidentification; Macfie, 1938: 166 (in part; Trinidad record).

**Remarks.** The species is included in a species group complex –Culicoides filariferus, C. pseudodiabolicus, C. diabolicus and C. guttatus– by Aitken et al. (1975) and is the most difficult taxonomic group in the genus (Spinelli et al., 1993). Previously records from Mexico need to be confirmed because most of the records are indicated as C. diabolicus and C. filariferus, in which several species were usually misidentified (Spinelli et al., 1993). At the moment, the confirmed record in Mexico from for locality of Puente Nacional (Veracruz). The specimens of the subgenus Hoffmania of Colección de Artrópodos con Importancia Médica (CAIM) are in review.

**New record for Oaxaca.** Oaxaca, Santiago Yaveo (Fig. 4), GPS: 17° 20’ 8.5” N, 95° 41’ 38” W; 20 Nov. 2019, col. Benitez-Alva, J. I., Reyes-Garcia, F., trap CDC, 4 females (slide mounted), same date except, 23 Oct. 2019, 6 females, 10 males (slide mounted).

**Distribution.** Mexico (Veracruz, Oaxaca) to Peru and north and northeastern of Brazil (Borkent & Spinelli, 2007).
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