

Original paper
(Artículo científico)

**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
<i>Culicoides baueri</i> +	Santiago Yaveo	in the present
<i>Culicoides copiosus</i>	Comatlán, Ixtlán Etlá	Vargas, 1945
<i>Culicoides diabolicus</i>	San Juan Guichicovi, El Zarzal	Huerta <i>et al.</i> , 2012
<i>Culicoides debilipalpis</i> +	Santiago Yaveo	in the present
<i>Culicoides elutus</i>	Camotlán, Ixtlán	Wirth & Blanton, 1959
<i>Culicoides gabaldoni</i>	San Juan Guichicovi, El Zacatal	Huerta <i>et al.</i> , 2012
<i>Culicoides ginesi</i> *	Santiago Yaveo	in the present
<i>Culicoides glabellus</i> *	Santiago Yaveo	in the present
<i>Culicoides foxi</i>	Rio Jaltepec	Spinelli <i>et al.</i> , 1993
	Istmo de Tehuantepec	
	San Juan Guichicovi, El Zacatal	Huerta <i>et al.</i> , 2012
	Santiago Yaveo, Putla Villa de Guerrero, Rancho Viejo	in the present
<i>Culicoides furens</i>	without locality data	Wirth & Blanton, 1974
<i>Culicoides hylas</i> +	Santiago Yaveo	in the present
<i>Culicoides insignis</i>	Arroyo Chopan, Tuxtepec 20 Km S. Bethania	Spinelli <i>et al.</i> , 1993
	Rio Jaltepec, Istmo de Tehuantepec	
	Santiago Yaveo	in the present
<i>Culicoides jamaicensis</i>	San Juan Guichicovi, El Zarzal	Huerta <i>et al.</i> , 2012
	Santa Cruz Zenzontepec, Soledad Cofradía	in the present
<i>Culicoides leopoldoi</i>	San Juan Guichicovi, El Zarzal	Huerta <i>et al.</i> , 2012
<i>Culicoides luteovenus</i>	Yolox, Ixtlán	Vargas, 1945
<i>Culicoides neopulicaris</i> +	Santa María Tonameca, Arroyo La Puerta	in the present
<i>Culicoides ocumarensis</i>	Rio Jaltepec, Istmo de Tehuantepec	Spinelli <i>et al.</i> , 1993
	Santiago Yaveo	in the present
<i>Culicoides pampoikilus</i>	without locality data	Borkent & Spinelli, 2000
<i>Culicoides phlebotomus</i>	Salina Cruz	Wirth & Blanton, 1953
<i>Culicoides pusillus</i> +	Santa Cruz Zenzontepec, Soledad Cofradía	in the present
	Santiago Yaveo	
<i>Culicoides pseudodiabolicus</i> +	Santiago Yaveo	in the present
<i>Culicoides rangeli</i>	Comatlán, Ixtlán	Vargas, 1954 (as <i>donajii</i>)
		Wirth, 1974
<i>Culicoides stigmalis</i>	Río Cajones, entre Yaé y Comatlán	Vargas, 1953 Wirth & Blanton, 1959
<i>Culicoides variipennis</i>	Etlá	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 m ₄ pale bordering veins M ₄ and CuA, or apices of veins M ₁ and M ₂ pale.....	5
–	Base of cell m ₄ and adjacent veins on a dark area; apices of veins M ₁ and M ₂ dark.....	3
3(2)	Cell r ₃ with distal pale area continuous to the distal area of cell m ₁	4
–	Cell r ₃ with distal pale area discontinuous to the distal area of cell m ₁ <i>luteovenus</i> Root & Hoffman	
4(3)	Cell m ₄ with a small dark area in the middle (Fig. 2C).....	<i>neopulicaris</i> Wirth
–	Cell m ₄ without a small dark area in the middle.....	<i>elutus</i> Macfie
5(2)	Cell r ₃ with a separate pale spot beyond to the base of vein M ₁ (<i>hylas</i> species group) (Fig. 1B); third palpal segment with a subdivided sensory pit.....	<i>hylas</i> Macfie
–	Cell r ₃ without a separate pale spot beyond to the base of vein M ₁ , pale area continuous from r-m cross-vein to the borders of vein M ₁ (<i>guttatus</i> species group) (Fig. 1A); third palpal segment with or without a subdivided sensory pit.....	6
6(5)	Cross-vein r-m pale.....	7
–	Cross-vein r-m dark.....	8
7(6)	Halter knob dark; vein M ₂ with discontinuous straddling pale area (Fig. 2A); ninth tergite of the male with mesal cleft, and the apicolateral process is very close.....	<i>ocumarensis</i> Ortiz
–	Halter knob pale; vein M ₂ with continuous straddling pale area; ninth tergite of the male without mesal cleft, and the apicolateral process is widely spaced.....	<i>diabolicus</i> Hoffman
8(6)	Cell m ₁ with a distal pale spot; halter dark; vein R ₃ dark up to the point where it turns abruptly forward to meet with costal vein (Fig. 1D).....	<i>insignis</i> Lutz
–	Cell m ₁ with two distal pale spot, halter dark or pale; vein R ₃ pale.....	9
9(8)	Halter knob pale; third palpal segment with subdivided pit; vein R ₃ pale (infuscated for a short distance in some specimens) (Fig. 1C).....	<i>pseudodiabolicus</i> Fox
–	Halter knob dark brown; third palpal segment with shallow and rounded pit; vein R ₃ pale but with small blackish spot behind apex (Fig. 1A).....	<i>foxi</i> Ortiz
10(1)	Wing with contrasting pattern of dark and pale spot (Fig. 3).....	12
–	Wing with very faint pattern (Fig. 2B).....	11
11(10)	Cell r ₂ with similar proportion to the r ₁ (Fig. 2B); hind tibial comb with five spines; halter yellowish.....	<i>pusillus</i> Lutz
–	Cell r ₂ longer to the cell r ₁ ; hind tibial comb with four spines; halter dark.....	<i>stigmalis</i> Wirth
12(10)	Eyes widely separated; spermatheca U or C-shaped (subgenera <i>Monoculicoides</i>).....	<i>variipennis</i> (Coquillett)
–	Eyes slightly separated; spermatheca different shaped.....	13



- 13(12)** Wing with a pale straddling middle of vein M_2 (Fig. 2D), or veins M_1 and M_2 with completely pale margins.....**14**
 – Wing without a pale straddling middle of vein M_2 , or veins M_1 and M_2 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 M_1 with straddling pale spot.....**16**
 – Base of vein M_1 without straddling pale spot.....*pampoikilus* Macfie
- 16(15)** Apex of the veins M_1 and M_2 with a pale area in the wing margin (Fig. 2D); cell r_3 with distal pale area reaching the wing margin.....*jamaicensis* Edwards
 – Apex of the veins M_1 and M_2 without a pale area in the wing margin; cell r_3 with distal pale area not reaching the wing margin.....*copiosus* Root & Hoffman
- 17(14)** Mesonotum with pattern of punctiform brown dots; cell m_1 with three pale spots, the distal at the wing margin.....*furens* (Poey)
 – Mesonotum without pattern of punctiform brown dots; cell m_1 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 macrotrichia.....*phlebotomus* (Williston)
- 19(13)** Mesonotum with distinctive pattern of punctiform brown dots; cell r_3 with three small rounded equidistant pale spots in a triangle (Fig. 3C).....*ginesi* Ortiz
 – Mesonotum without distinctive pattern of punctiform brown dots; cell r_3 with different arrangement.....**20**
- 20(19)** Macrotrichia sparse, only a few in apices of cells r_3 , m_1 and m_2 ; small species (wing length $0.80 \leq$ mm).....**21**
 – Macrotrichia more numerous, present at least on distal half of wing; large species (wing length $0.8 \geq$ mm).....**22**
- 21(20)** Two spermathecae; legs paler; cell r_2 closed.....*gabaldoni* Ortiz
 – One spermatheca; legs darker; cell r_2 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 r_3 with four pale spots.....*leopoldoi* Ortiz
 – Cell r_3 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.); Borkent & Wirth, 1997: 69 (World species of Ceratopogonidae).
- Culicoides (Oecacta) ginesi* Ortiz: Forattini, 1957: 395 (Brazil; redescription; in key; distribution; figs.); Wirth, 1974: 31 (Catalogue of the Americas south of US).
- Culicoides (Haematomyidium) ginesi* Ortiz: Wirth *et al.*, 1988: 48 (Wing Atlas of Neotropical species; fig.); Borkent & Spinelli, 2000: 32 (Catalog of New World, South USA); Spinelli *et al.*, 2005: 141 (Argentina record; in key; fig.); Borkent & Spinelli, 2007: 66 (Neotropical catalog); Borkent, 2016: 16 (online the subgeneric classification of species of *Culicoides*); Spinelli & Wolff, 2016: 110 (Colombia record); Santarém & Felipe-Bauer, 2020: 23 (Brazilian species); Borkent & Dominiak, 2020: 113 (World catalogue).

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 of 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 Felipe-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.); Borkent & Wirth, 1997: 69 (World species of Ceratopogonidae); Borkent & Spinelli, 2000: 39 (Catalog of New World, South USA); Spinelli & Borkent, 2004: 393 (Costa Rica records); Borkent & Spinelli, 2007: 73 (Neotropical catalog); Borkent, 2016: 34 (online the subgeneric classification of species of *Culicoides*); Spinelli & Wolff, 2016: 117 (Colombia records); Santarém & Felipe-Bauer, 2020: 28 (Brazilian species); Borkent & Dominiak, 2020: 132 (World catalogue).
- Culicoides (Oecacta) glabellus* Wirth & Blanton: Wirth & Blanton, 1973: 437 (Brazil; diagnosis; distribution; in key; fig.); Wirth, 1974: 31 (Catalogue of the Americas south of US); Aitken *et al.*, 1975: 126 (Trinidad record; 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 Crt/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; fig.); 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; fig.); 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; fig.); 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; fig.); Aitken *et al.*, 1975: 138 (Trinidad record; distribution; in key; fig.); Blanton & Wirth, 1979: 140 (USA, Florida; diagnosis; distribution; in key; fig.); 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



(Argentina record; in key; fig.); Borkent & Spinelli, 2007: 63 (Neotropical catalog); Spinelli *et al.*, 2009: 87 (Colombia record); Huerta *et al.*, 2012 (Mexico records); Borkent, 2016: 9 (online the subgeneric classification of species of *Culicoides*); Spinelli & Wolff, 2016: 108 (Colombia record); Santarém & Felipe-Bauer, 2020: 22 (Brazilian species); Borkent & Dominiak, 2020: 105 (World catalogue).

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-García, 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 & Dominiak, 2020: 109 (World catalogue).

Culicoides yukonensis Hoffman: 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 & Hoffman, *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).

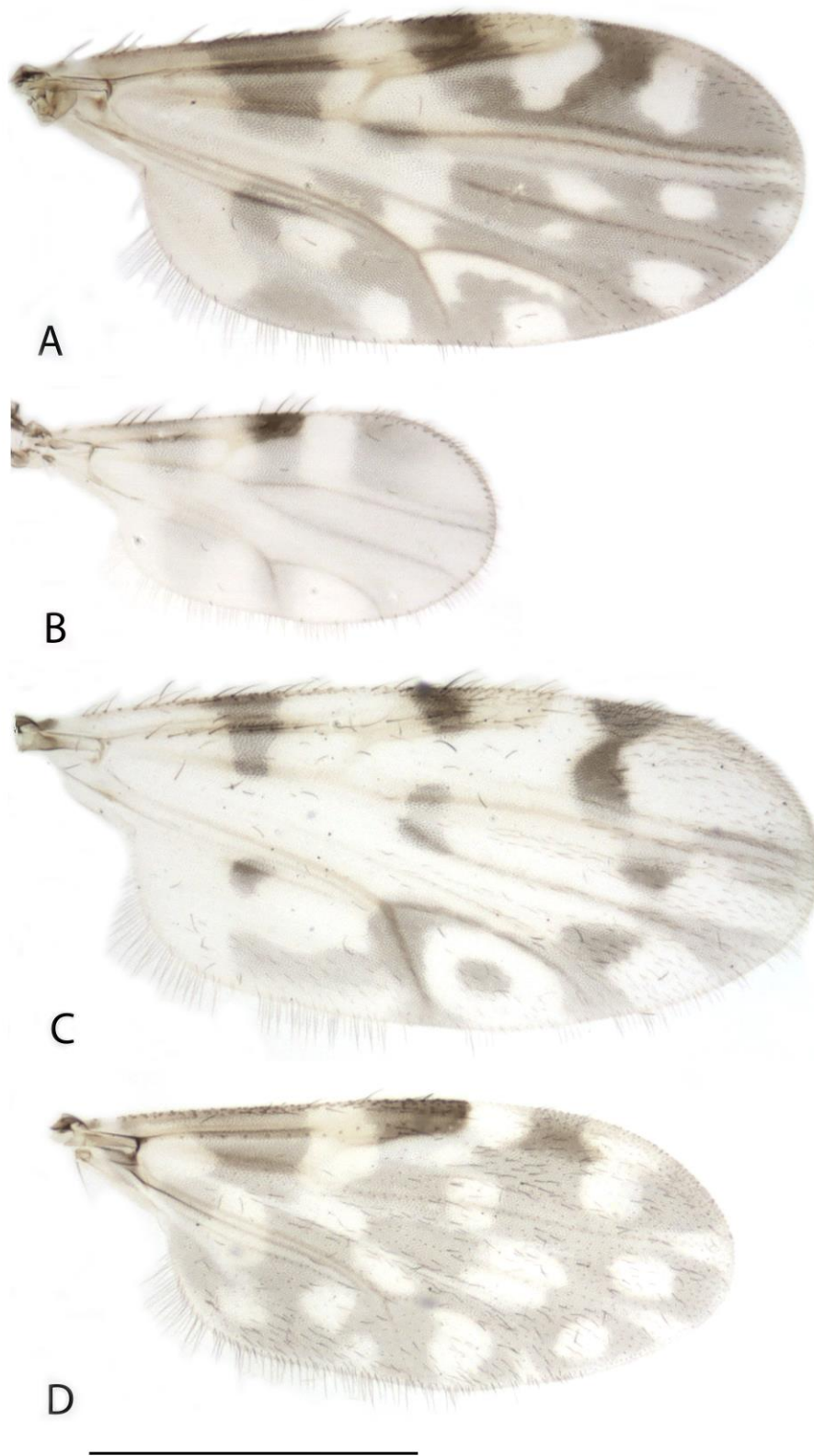


Figure 2. Wing, dorsal view. Female. A) *Culicoides ocumarensis* Ortiz; B) *Culicoides pusillus* Lutz; C) *Culicoides neopulicaris* Wirth; D) *Culicoides jamaicensis* Edwards. Scale = 0.5 mm.



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.

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: 32 (habitat); Cochrane, 1974: 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.); Blanton & Wirth, 1979: 61 (as *Diphaeomyia* (sic); 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 & Mirsa, 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 *et 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 & Felipe-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).

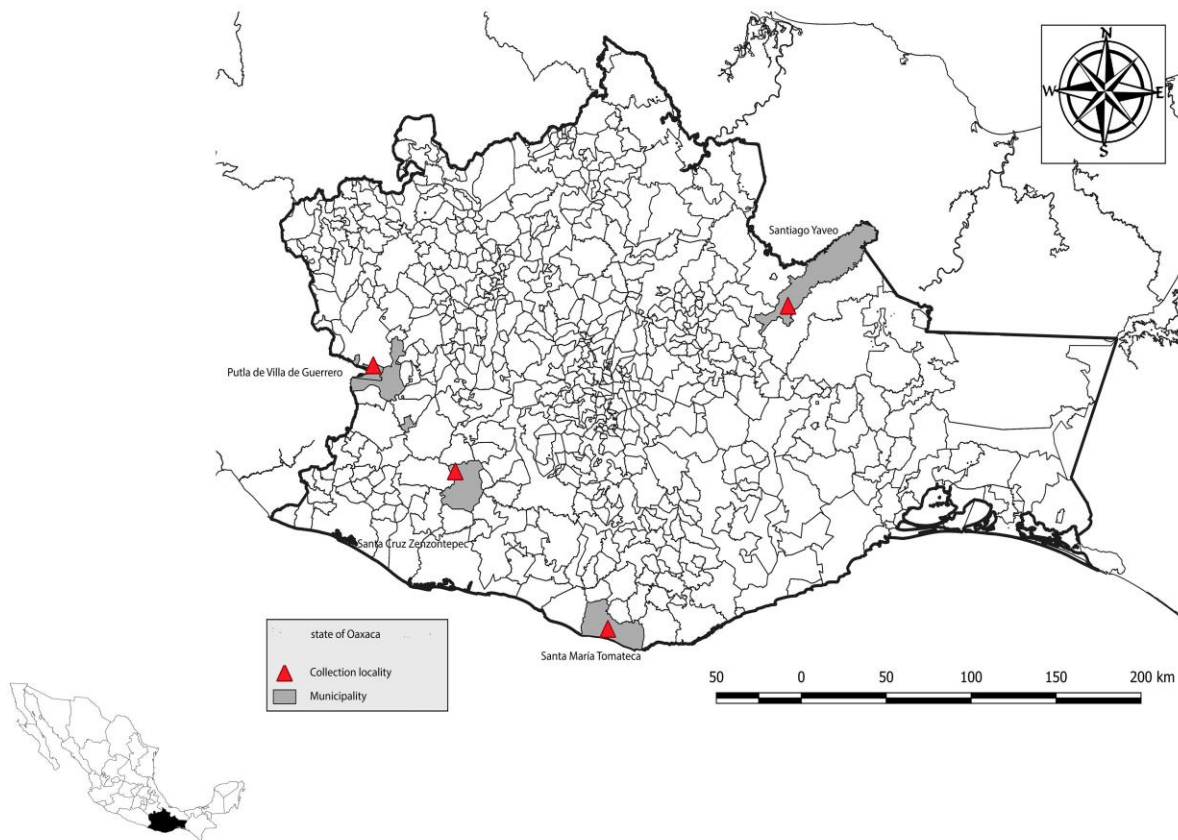


Figure 4. Map of Mexico, with the collection records in the state of Oaxaca.

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); Messersmith, 1964: 339 (Virginia; breeding site); 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 & Felipe-Bauer, 2020: 22 (Brazilian species); Borkent & Dominiak, 2020: 112 (World catalogue).

Culicoides ichesi 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 & Martinez, 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-Garcia, 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).

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; habits); 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; fig.); Aitken *et al.*, 1975: 124 (Trinidad record; diagnosis; distribution; in key; fig.); Ramírez-Pérez, 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; fig.); 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; fig.); Borkent & Spinelli, 2000: 34 (Catalog of New World, South USA); Borkent & Spinelli, 2007: 68 (Neotropical catalog); Felipe-Bauer *et al.*, 2008: 35 (Peru record); Huerta *et al.*, 2012: 11 (Mexico records); Borkent, 2016: 17 (online the subgeneric classification of species of *Culicoides*); Spinelli & Wolff, 2016: 111 (Colombia); Santarém & Felipe-Bauer, 2020: 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 (Coquillett), 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-García, F., trap CDC, 14 females (slide mounted) (CAIM); Putla Villa de Guerrero, Rancho Viejo, Constanza 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; fig.); Forattini, 1957: 243 (Brazil; diagnosis; distribution; in key; fig.); Borkent & Wirth, 1997: 70 (World species of Ceratopogonidae).

Culicoides (Hoffmania) hylas: Wirth & Blanton, 1959: 276 (Panama; diagnosis; distribution; in key; fig.); Wirth & Blanton, 1968: 203 (Neotropical review *hylas* group; diagnosis; distribution; in key; fig.); 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;

fig.); Borkent & Spinelli, 2000: 34 (Catalog of New World, South USA); Borkent & Spinelli, 2007: 68 (Neotropical catalog); Felipe-Bauer *et al.*, 2008: 260 (Peru record; in key); Felipe-Bauer *et al.*, 2009: 855 (Brazil; diagnosis; distribution; in key); Huerta *et al.*, 2012: 11 (Mexico record); Borkent, 2016: 17 (online the subgeneric classification of species of *Culicoides*); Spinelli & Wolff, 2016: 112 (Colombia record); Ronderos *et al.*, 2018: 640 (immature list); Santarém & Felipe-Bauer, 2020: 25 (Brazilian species); Borkent & Dominiak, 2020: 114 (World catalogue).

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); Barbosa, 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; fig.); 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 (Argentina 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 & Felipe-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 & Hoffman, 1944: 108 (in part, diagnosis; Haiti record; figs.).

Culicoides painteri 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. Benitez-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 & Felipe-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).

***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 & Felipe-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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