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***Culicoides* (Diptera: Ceratopogonidae)
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importance from National Institute of
Health**

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Culicoides (Diptera: Ceratopogonidae) of Colombia: records from the collection of insects of medical importance from National Institute of Health

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Abstract

Background

The collection of insects of medical importance from the National Institute of Health (Colombia) INS, was started in 1934 with the aim of being an institutional and national repository of the biodiversity of insects involved in vector-borne diseases of importance in public health. Today, the entomological collection includes more than 7.500 specimens.

The ceratopogonids insects are one of the Groups of Diptera that conform this collection. Within the Ceratopogonidae family, are the insects of the genera *Culicoides* which are relevant in public health because of the nuisance caused by their bites when they are presented in great abundance and because of their role as transmitters of several agents (virus, protozoa and nematodes) that causes diseases to the humans and to the animals (Mullen 2002, Kettle 1995). Brief of the Ceratopogonidae insects (Diptera: Ceratopogonidae) found in the collection, is presented here. A total of 801 individuals of this family rest in the collection, mainly adult of the genus *Culicoides* (90%). The collection is the result of the effort of several researchers through the history of the Group of Entomology (INS). These researchers collected ceratopogonids when they went to different transmission scenarios of the vector-borne diseases in Colombia, with the purpose of making the entomological characterizations. The effort of the researchers also included the processing, assembly, and identification of the specimens in the laboratory.

New information

New information about the geographical distribution of 39 species of the genera *Culicoides* appears for Colombia.

Keywords

Public Health, Ceratopogonidae, Oropouche virus infection, biting midges, entomology, occurrence, specimen, Colombia

Introduction

The family Ceratopogonidae comprises a large group of small diptera insects represented worldwide by at least 6,180 species and 111 living genera (Borkent 2014). It is composed of four subfamilies, with the subfamily Ceratopogoninae being the most diverse in both number of genera and species. After this, the subfamilies Forcipomyiinae, Dasyheleinae and Leptoconopinae remain in species diversity. Regarding the food preferences of adult insects in the family Ceratopogonidae, males are nectarific, while the nutrition of females is diverse (Gonzalez et al. 2014). Females of some genera may be of predatory habits, especially from small flying insects of similar or lower size and may also be ectoparasites of other insects, sucking the hemolymph from lepidoptera, coleoptera, odonates, phasmitids, neuroptera and hemiptera, among others (Borkent 2004). However, the most studied groups are those that feed on blood from vertebrates, as are the genera *Culicoides*, *Leptoconops* and *Forcipomyia*, attacking mainly mammals, including humans and also birds, amphibians and reptiles (Szadziwski et al. 2011, Gonzalez et al. 2014).

Focusing on the importance of the genus *Culicoides*, these insects are relevant in public health for the nuisance caused by their bites when there is a great abundance of them, and for their role as vectors of various agents (viruses, protozoa and nematodes) that cause diseases to humans and animals (Mullen 2002, Kettle 1995). In addition, depending on the degree of sensitivity of people to the saliva components of these insects, bites can cause dermatological reactions ranging from papules and pustules product of overinfection by scratching, to flaken with alteration of skin pigmentation (Kettle 1995, Forattini 1957, Sherlock and Guitton 1965).

The most important disease transmitted by *Culicoides* to humans in the neotropics is the Oropouche virus (Bunyavirus), whose main vector is *Culicoides paraensis* (Goeldi, 1905) (Borkent 2005, Tesh 1994, Linley et al. 1983). In Colombia, sera of febrile patients with antibodies to the Oropouche virus have been found in the departments of Santander and Cundinamarca (Suárez et al. 2008). The *Culicoides* can also transmit to humans the nematodes of the genus *Mansonella*, (Mullen 2002, Undiano 1966). In Colombia *Culicoides insinuatus* Ortiz y León, 1955 is suspected as one of the possible vectors of *Mansonella ozzardi* in the department of the Amazon (Tidwell and Tidwell 1982). In animals

the most notable disease transmitted by *Culicoides* is the bluetongue, caused by an Orbivirus that affects cattle and sheep. In Colombia, the abundance of *Culicoides insignis* has been associated with the transmission of the bluetongue virus found in cattle in the department of Antioquia (Homan et al. 1985).

In addition, the biting nuisance caused by *Culicoides* in some areas of Colombia had been characterized. In the rural area of nine municipalities of the department of Boyacá, it was confirmed that the nuisance was caused by *Culicoides pachymerus*, with biting rates of up to 52 females/person in 5 minutes (Santamaria et al. 2008). Another species that has been recorded by biting humans is *Culicoides puracensis* Wirth and Lee, 1967 in the Puracé moor, in the Cauca department (Rodríguez and Wirth 1986).

In relation with the knowledge of the biodiversity of insects of the genus *Culicoides* in Colombia, three catalogues had been published reporting: the first, at least 88 species (Barreto 1986); the second, a list of 114 species with confirmed presence in Colombia and 66 species suspected may be in the country (Spinelli et al. 2009) and finally a third catalogue with 235 species of ceratopogonids, including 112 species of the genus *Culicoides* and 50 of the genus *Forcipomyia* (Spinelli and Wolff 2016).

General description

Purpose: The resource presented here contains the description and quantification of ceratopogonid insects (Diptera: Ceratopogonidae) from the collection of insects of medical importance from the Group of Entomology at National Institute of Health (Bogotá, Colombia) INS. In total 801 individuals make up this data set, mainly adults of the genus *Culicoides* (90%).

Project description

Title: “Entomological research applied to the surveillance and control of vector-borne diseases”. This is a cross-sectional project from the group of entomology, in the framework of which studies of outbreaks, epidemics and interdisciplinary studies of vector-borne disease transmission areas are continuously developed.

Personnel: A significant contribution in the field collection, insect mounting process and identification of the ceratopogonids in this data set was made by: Between 1963 and 1970 (Suárez MF, Martínez E., Marinkelle CJ, Young DG, de Osorno F., Lee VH); between 1971 and 1980 (Ferro C., Beltrán B., Guerra E., Strum H., Tidwell MA, de Rodríguez MC, Lozano R., Lee VH). More recently, between 2006 and 2010, the study “Ecological aspects and evaluation of methods of control of *Culicoides pachymerus* (Diptera: Ceratopogonidae)” was developed in the foothills of the Magdalena valley of Boyacá, Colombia. In this study, ceratopogonids (adult and immature) were collected, some of which were included in the collection. Some researchers that participated in the study were

Santamaría E., Ferro C., Carrasquilla MC., Zipa Y., Cabrera OL, Ahumada ML. and Pardo R.

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Sampling methods

Study extent: Altogether 801 specimens conform the data set (Santamaría et al. 2020), mainly adult of the genera *Culicoides* (90%). It covers most of the Colombian territory, with records for 68.7% of the departments in the country (Fig. 1). The departments with the highest number of records are Boyacá (217) and Tolima (166).

The department of Boyacá with an area of 23,189 km² is the administrative division mainly represented in the collection with more than 15 sampled locations. The greater diversity of species has the department of Boyacá (25 species), followed by Tolima (13) and Valle del Cauca (13). The departments without records were Atlántico, Córdoba, La Guajira, Nariño, Norte de Santander, Risaralda, Arauca, Casanare, Guainía y Vichada.

Sampling description: The ceratopogonids specimens deposited in the collection of insects of medical importance of the National Institute of Health (Colombia) are the result of donations (e. g. paratypes) and biting midges catches in field research carried out within the framework of vector-borne diseases study. Information about the sampling method of biting midges is available for 72.2% (n=578) of collected specimens. The more common methods of sampling were human landing catches (43.4%) and trap of light (28.7%). Other methodologies of sampling included trap Shannon, bait animal and trap CDC with CO₂. Next, the main methods of sampling identified in the revision of the collection are described.

- Human landing catches: a voluntary person exposed a hand and forearm, whereas another person collected, with the aid of a brush dampened in alcohol, the *Culicoides* as soon as settled on the exposed skin (Santamaría et al. 2008, Fig. 2)
- Light traps: The vision of *Culicoides* and the ceratopogonids in general have not been well studied although its phototactic behavior is of epidemiological importance (Allan et al. 1987). This behavior influences in its answer to the light traps, that are used widely to determine the presence, abundance, and phenology (Kirkeby et al. 2013). Normally the sampling is done by using CDC-type light traps with or without ultraviolet light installed near to the stables or sheds where the animals are located (Fig. 3).

Once the entomological sampling was carried out, the taxonomic identification of *Culicoides* was made having in account the wing pigmentation pattern and the original descriptions of the species (Wirth et al. 1988).

Quality control: In all the *Culicoides* catches, previously designed formats were used to record field collection information. The taxonomic identification was advised by external

technical experts when was necessary. The records of the data set were confirmed and verified one by one.

Before the specimen is deposited in the collection, the curators of the collection from the Group of Entomology review the information associated to the specimen, i.e. the locality, geographical coordinates, sex, stage of development, taxonomy. The minimum of required information to include to a specimen in the collection is related with the standard Darwin Core and is the same as the minimum information to be published in the GBIF.

Geographic coverage

Description: The collection of insects of Ceratopogonidae family includes 22 of the 32 departments of Colombia. The specific collection location is defined for 82.8% of the records. The digitized biting midges specimens are all from Colombia with the Andean natural region at (63,9%), Amazonian region (12,7%), Pacific region (8,5%), Orinoquía region (7,4%), Caribbean region (4,5%), and Insular region (0,6%) as shown in Fig. 4

From the data presented, there is only a record of altitude for adult specimens belonging to the genus *Culicoides* sp. collected in Monserrate, Bogotá (n=19) the altitude recorded in the field was 3,230 m a.s.l. There is a register of height for the collections made in Boyacá and Cundinamarca departments.

The larvae (n=55) collected in the department of Boyacá (San Pablo de Borbur) were distributed in three groups: tribe Culicoidini (92.7%), Sphaeromiini (5.5%) and Ceratopogonini (1.8%) distributed in an altitudinal range that oscillates between 437 and 439 m a.s.l.

New information on the distribution of *Culicoides* species for Colombia

The following six *Culicoides* species were suspected in Colombia, but their specific location was unknown (Spinelli et al. 2009, Spinelli and Wolff 2016). Below are the new distribution reports in Colombia for each of these species:

C. ignacioi Forattini, 1957. Departamento Boyacá: municipio Pto. Boyacá (n=1); Cauca: López de Micay (n=3); Putumayo: Pto. Leguízamo (n=1) and Caquetá: Solano (n=1).

C. iriartei Fox, 1952. Tolima: Coyaima (n=2); Cundinamarca: Fusagasugá (n=3) and Boyacá: San Pablo de Borbur (n=1).

C. jamaicensis Edwards, 1922. Tolima: Coyaima (n=3) and Cundinamarca: Medina (n=1).

C. neoparaensis Tavares & Souza, 1978. Amazonas: Leticia (n=6).

C. rostratus Wirth & Blanton, 1956. Meta: Villavicencio (n=11) and Acacias (n=2).

C. volcanensis Wirth & Blanton, 1959. Guaviare: San José del Guaviare (n=1).

Additionally, this data paper updates the distribution in Colombia of another 33 species of ceratopogonids, most of them in the genus *Culicoides*. For each species, the new location report is presented as well as the number of specimens per locality.

C. alahialinus Barbosa, 1952. Antioquia: Apartadó (n=2).

C. balsapambensis Ortiz & León, 1955. Boyacá: Pauna (n=1).

C. castillae Fox, 1946. Tolima: Falan (n=3).

C. covagarciai Ortiz, 1950. Boyacá: Togüí (n=1); Meta: Acacias (n=4) and Villavicencio (n=4).

C. dasyophrus Macfie, 1940. Putumayo: Puerto Leguízamo (n=2).

C. debilipalpis Lutz, 1913. San Andrés y Providencia: Providencia (n=2); Meta: Villavicencio (n=2); Cundinamarca: Sasaima (n=1); Amazonas: El Encanto (n=1), La Chorrera (n=1); Boyacá: San Pablo de Borbur (n=3) and Pauna (n=2).

C. diabolicus Hoffman, 1925. Chocó: Bajo Baudó (n=1); Meta: Villavicencio (n=2).

C. dicrourus Wirth & Blanton, 1955. Tolima: Falan (n=1).

C. eublepharus Macfie, 1948. Putumayo: Puerto Leguízamo (n=1).

C. filarifer Hoffman, 1939. Boyacá: Pto. Boyacá (n=2); Antioquia: Apartadó (n=3); Putumayo: Pto. Leguízamo (n=1).

C. florenciae Messersmith, 1972. Huila: Tello (n=1), San Agustín (n=1); Meta: Villavicencio (n=1); Tolima: Mariquita (n=1); Cauca: Lopez de Micay (n=1).

C. foxi Ortiz, 1950. Boyacá: Pto. Boyacá (n=2), Togüí (n=19); Guaviare: San José del Guaviare (n=7).

C. furens (Poey), 1853. Chocó: Bahía Solano (n=3); San Andrés y Providencia: Providencia (n=3); Magdalena: Sitionuevo (n=2), Ciénaga (n=3).

C. gabaldoni Ortiz, 1954. Antioquia: Turbo (n=1).

C. hylas Macfie, 1940. Putumayo: Pto. Leguízamo (n=1).

C. insignis Lutz, 1913. Bolívar: El Carmen de Bolívar (n=3); Boyacá: Togüí (n=2), San Pablo de Borbur (n=2); Caquetá: Solano (n=6); Cauca: López de Micay (n=6); Chocó: Bajo Baudó (n=9), Riosucio (n=1); Cundinamarca: Medina (n=16), Fusagasugá (n=1); Tolima: Coyaima (n=17).

C. insinuatatus Ortiz & León, 1955. Tolima: Mariquita (n=2), Armero (n=1); Caquetá: Solano (n=5).

C. leoni Barbosa, 1952. Boyacá: San Pablo de Borbur (n=2); Bolívar: El Carmen de Bolívar (n=1).

C. leopoldoi Ortiz, 1951. Antioquia: Apartadó (n=1); Meta: Acacias (n=1), Villavicencio (n=1), Vista Hermosa (n=1); Sucre: Tolú (n=1); Chocó: Bajo Baudó (n=1).

C. mirsae Ortiz, 1953. Antioquia: Carepa (n=2), Necoclí (n=2); Boyacá: Pto. Boyacá (n=7), San Pablo de Borbur (n=1), Pauna (n=3); Cundinamarca: Caparrapí (n=7), Útica (n=9), La Mesa (n=3); Tolima: Melgar (n=19), Armero (n=1).

C. pachymerus Lutz, 1914. Tolima: Armero (n=11), Coyaima (n=3), Mariquita (57), Prado (9); Antioquia: Turbo (n=3); Boyacá: Muzo (n=1), Pauna (n=23), Pto. Boyacá (n=2), San Pablo de Borbur (n=7); Caldas: town near the river La Miel (n=10); Cundinamarca: Caparrapí (n=6); Vaupés: Mitú (n=1).

C. paraensis (Goeldi), 1905. Boyacá: Pauna (n=4), Pto. Boyacá (n=24), San Pablo de Borbur (n=24), Togüí (n=1); Caldas: localidad cercana al río La Miel (n=2); Cesar: Valledupar (n=5); Guaviare: San José del Guaviare (n=3); Magdalena: Ciénaga (n=11); Quindío: Armenia (n=1); Santander: San Gil (n=6); Tolima: Armero (n=1).

C. paucienfuscatus Barbosa, 1947. Meta: Acacias (n=1); Putumayo: Pto. Leguízamo (n=1); Valle del Cauca: Buenaventura (n=1); Vaupés: Mitú (n=1).

C. phlebotomus (Williston), 1896. Sucre: Tolú (n=3); Bolívar: Cartagena (n=3); Huila: Neiva (n=1).

C. pifanoi Ortiz, 1951. Boyacá: Pto. Boyacá (n=1), Pauna (n=3); Tolima: Mariquita (n=1), Coyaima (n=1); Cundinamarca: Caparrapí (n=1).

C. plaumanni (Spinelli, 1993). Boyacá: Pauna (n=1).

C. pseudodiabolicus Fox, 1946. Antioquia: Apartadó (n=1); Cundinamarca: Caparrapí (n=2), Sasaima (n=1); Guaviare: San José del Guaviare (n=1); Meta: Acacias (n=2).

C. pusillus Lutz, 1913. Meta: Pto. López (n=5), Acacias (n=4); Caquetá: Solano (n=1); Cesar: Valledupar (n=4); Guaviare: San José del Guaviare (n=1).

C. trinidadensis Hoffman, 1925. Huila: Neiva (n=1); Tolima: Mariquita (n=1), Melgar (n=1); Boyacá: Pto. Boyacá (n=1).

C. venezuelensis Ortiz & Mirsa, 1950. Cundinamarca: Bogotá (n=7), La Calera (n=4), Tabio (n=2), Anolaima (n=1); Boyacá: Pto. Boyacá (n=1), Togüí (n=2).

Forcipomyia genualis (Loew), 1866. Cundinamarca: Medina (n=2).

Forcipomyia (Lasiohelea) sp. Meta: Vistahermosa (n=1); Guaviare: San José del Guaviare (n=1).

Dasyhelea sp. Tolima: Coyaima (n=2).

Coordinates: -3.530059 and 13.35325 Latitude; -81.373939 and -70.045137 Longitude.

Taxonomic coverage

Description: From 801 specimens, 701 are identified at the species level, 77 at the genus level, 2 at the subgenus level and 21 at the tribe level (Fig. 5).

Stage of development: 90% of the records correspond to adults and 9.9% to larvae. The collection also includes the assembly of an egg.

Paratypes: As an important aspect to highlight, the data set includes a total of 18 paratypes corresponding to the following species: *C. youngi* (n=1), *C. teretipalpis* (n=1), *C. trapidoi* (n=1), *C. puracensis* (n=1), *C. eldridgei* (n=1), *C. raposoensis* (n=3) and *C. sanmartini* (n=10) (photos of some of these paratypes can be downloaded from the resource). These paratypes were identified by Wirth W and Barreto P.

Taxa included:

| Rank | Scientific Name | Common Name |
|---------|--|-------------|
| species | <i>Culicoides (Oecacta) alahialinus</i> Barbosa, 1952 | Jején |
| species | <i>C. balsapambensis</i> Ortiz & León, 1955 | Jején |
| species | <i>C. caprilesi</i> Fox, 1952 | Jején |
| species | <i>C. castillae</i> Fox, 1946 | Jején |
| species | <i>C. (Anilomyia) covagarciai</i> Ortiz, 1950 | Jején |
| species | <i>C. dasyophrus</i> Macfie, 1940 | Jején |
| species | <i>C. (Haematomyidium) debilipalpis</i> Lutz, 1913 | Jején |
| species | <i>C. (Hoffmania) diabolicus</i> Hoffman, 1925 | Jején |
| species | <i>C. (Mataemyia) dicrourus</i> Wirth & Blanton, 1955 | Jején |
| species | <i>C. (Anilomyia) efferus</i> Fox, 1952 | Jején |
| species | <i>C. (Haematomyidium) eldridgei</i> Wirth & Barreto, 1978 | Jején |
| species | <i>C. eublepharus</i> Macfie, 1948 | Jején |
| species | <i>C. (Hoffmania) filarifer</i> Hoffman, 1939 | Jején |
| species | <i>C. florenciae</i> Messersmith, 1972 | Jején |
| species | <i>C. fluviatilis</i> Lutz, 1914 | Jején |
| species | <i>C. (Hoffmania) foxi</i> Ortiz, 1950 | Jején |
| species | <i>C. (Oecacta) furens</i> (Poey), 1853 | Jején |

| | | |
|---------|--|------------|
| species | <i>C. gabaldoni</i> Ortiz, 1954 | Jején |
| species | <i>C. galindoi</i> Wirth & Blanton, 1953 | Jején |
| species | <i>C. (Hoffmania) heliconiae</i> Fox & Hoffman, 1944 | Jején |
| species | <i>C. (Hoffmania) hylas</i> Macfie, 1940 | Jején |
| species | <i>C. (Hoffmania) ignacioi</i> Forattini, 1957 | Jején |
| species | <i>C. (Hoffmania) insignis</i> Lutz, 1913 | Jején |
| species | <i>C. (Haematomydium) insinuatius</i> Ortíz & León, 1955 | Jején |
| species | <i>C. (Diphaomyia) iriartei</i> Fox, 1952 | Jején |
| species | <i>C. (Drymodesmyia) jamaicensis</i> Edwards, 1922 | Jején |
| species | <i>C. leoni</i> Barbosa, 1952 | Jején |
| species | <i>C. leopoldoi</i> Ortiz, 1951 | Jején |
| species | <i>C. (Diphaomyia) mirsae</i> Ortiz, 1953 | Jején |
| species | <i>C. monticola</i> Wirth & Lee, 1967 | Jején |
| species | <i>C. (Haematomydium) neoparaensis</i> Tavares & Souza, 1978 | Jején |
| species | <i>C. pachymerus</i> Lutz, 1914 | Moscacilla |
| species | <i>C. (Haematomydium) paraensis</i> (Goeldi), 1905 | Jején |
| species | <i>C. paucienfuscatus</i> Barbosa, 1947 | Jején |
| species | <i>C. (Macfiella) phlebotomus</i> (Williston), 1896 | Jején |
| species | <i>C. pifanoi</i> Ortiz, 1951 | Jején |
| species | <i>C. (Hoffmania) plaumanni</i> (Spinelli, 1993) | Jején |
| species | <i>C. (Hoffmania) pseudodiabolicus</i> Fox, 1946 | Jején |
| species | <i>C. (Avaritia) puracensis</i> Wirth & Lee, 1967 | Jején |
| species | <i>C. (Avaritia) pusillus</i> Lutz, 1913 | Jején |
| species | <i>C. (Cotocripus) raposoensis</i> Wirth & Barreto, 1978 | Jején |
| species | <i>C. (Anilomyia) rostratus</i> Wirth & Blanton, 1956 | Jején |
| species | <i>C. (Hoffmania) sanmartini</i> Wirth & Barreto, 1978 | Jején |
| species | <i>C. teretipalpis</i> Wirth & Barreto, 1978 | Jején |
| species | <i>C. (Anilomyia) trapidoi</i> Wirth & Barreto, 1978 | Jején |
| species | <i>C. (Hoffmania) trinidadensis</i> Hoffman, 1925 | Jején |
| species | <i>C. (Psychophaena) venezuelensis</i> Ortiz & Mirsa, 1950 | Jején |
| species | <i>C. (Mataemyia) volcanensis</i> Wirth & Blanton, 1959 | Jején |

| | | |
|----------|--|-------|
| species | <i>C. (Haematomydium) youngi</i> Wirth & Barreto, 1978 | Jején |
| tribe | Ceratopogonini Kieffer, 1906 | Jején |
| genus | <i>Dasyhelea</i> sp. Kieffer, 1911 | Jején |
| species | <i>Forcipomyia (Forcipomyia) genualis</i> (Loew), 1866 | Jején |
| subgenus | <i>Forcipomyia</i> (Lasiohelea) Kieffer, 1921 | Jején |
| tribe | Palpomyiini Enderlein, 1936 | Jején |
| tribe | Sphaeromiini Newman, 1834 | Jején |
| genus | <i>Culicoides</i> Latreille, 1809 | Jején |
| genus | <i>Forcipomyia</i> Meigen, 1818 | Jején |

Temporal coverage

Data range: 1905-5-30 - 2008-3-11.

Notes: The *Culicoides* specimens deposited in the collection of insects of medical importance from National Institute of Health cover a timespan of 103 years between 1905 and 2008 (Fig. 6). This motivated to designate this collection as an unique entity, which in fact is the result of heterogeneous entomological activities carried on by different collectors.

Collection data

Collection name: Collection of insects of medical importance

Collection identifier: INS <http://rnc.humboldt.org.co/admin/index.php/registros/detail/845>

Parent collection identifier: Unique National Registry of Biological Collections 056, Colombia

Specimen preservation method: microscopic preparation

Curatorial unit: Species collecting event

Usage licence

Usage licence: Other

IP rights notes: Open Data Commons Attribution License (CC-BY-NC)

All data in the database can be freely used. Please cite this publication or the resource when using newly presented data in your analyses.

Data resources

Data package title: Collection of insects of medical importance - Ceratopogonidae

Resource link: <https://doi.org/10.15472/5psmbm>

Alternative identifiers: <https://www.gbif.org/es/dataset/40a8aeb8-cf10-40b8-878d-54e6804ae9f9>

Number of data sets: 1

Data set name: Ceratopogonidae

Character set: Occurrence

Data format: Darwin Core

Description: Summary of ecological traits for 801 Biting Midges species.

| Column label | Column description |
|--------------------------|--|
| occurrenceID | An identifier for the Occurrence (as opposed to a particular digital record of the occurrence). In the absence of a persistent global unique ID, one should construct one from a combination of identifiers in the registry so that the biological registry ID approximates a persistent identifier. |
| catalogNumber | An identifier (preferably unique) for the record within the dataset or collection. |
| basisOfRecord | The specific nature of the data record. |
| type | The nature or genre of the resource. |
| institutionCode | The name (or acronym) in use by the institution having custody of the object(s) or information referred to in the record. |
| institutionID | An identifier for the institution having custody of the object(s) or information referred to in the record. |
| collectionCode | The name, acronym, coden, or initialism identifying the collection or data set from which the record was derived |
| collectionID | An identifier for the institution having custody of the object(s) or information referred to in the record |
| language | Language of the resource. |
| scientificName | The full scientific name, with authorship and date information, if known. |
| scientificNameAuthorship | The authorship information for the scientificName. |
| taxonRank | The taxonomic rank of the most specific name in the scientificName. |

| | |
|-------------------------------|---|
| higherClassification | A list (concatenated and separated) of taxa names terminating at the rank immediately superior to the taxon referenced in the taxon record. |
| kingdom | The full scientific name of the kingdom in which the taxon is classified. |
| phylum | The full scientific name of the phylum or division in which the taxon is classified. |
| class | The full scientific name of the class in which the taxon is classified. |
| order | The full scientific name of the order in which the taxon is classified. |
| family | The full scientific name of the family in which the taxon is classified. |
| verbatimTaxonRank | The taxonomic rank of the most specific name in the scientificName as it appears in the original record. |
| coordinateUncertaintyInMeters | The horizontal distance (in meters) from the given decimalLatitude and decimalLongitude describing the smallest circle containing the whole of the Location. Leave the value empty if the uncertainty is unknown, cannot be estimated, or is not applicable (because there are no coordinates). |
| genus | The full scientific name of the genus in which the taxon is classified. |
| subgenus | The full scientific name of the subgenus in which the taxon is classified |
| georeferenceProtocol | A description or reference to the methods used to determine the spatial footprint, coordinates, and uncertainties. |
| specificEpithet | The name of the first or species epithet of the scientificName. |
| lifeStage | The life stage (egg, larvae, adult) of the specimen of the Occurrence. |
| typeStatus | Status of the type. A list (concatenated and separated) of nomenclatural types (type status, typified scientific name, publication) applied to the subject. Controlled vocabulary of terms (HOLOTYPE, LECTOTYPE, ISOTYPE, SINTYPE, PARATYPE, NEOTYPE, EPITYPE, TYPUS). |
| sex | The sex of the specimen represented in the Occurrence. |
| identifiedBy | A list (concatenated and separated) of names of people who assigned the Taxon to the subject. |
| recordedBy | A list (concatenated and separated) of names of people, groups or organizations responsible for recording the original Occurrence. |
| georeferenceSources | A list (concatenated and separated) of maps, gazetteers, or other resources used to georeference the Location, described specifically enough to allow anyone in the future to use the same resources. |
| year | The four-digit year in which the Event occurred, according to the Common Era Calendar. |
| month | The ordinal month in which the Event occurred. |
| day | The integer day of the month on which the Event occurred. |
| eventDate | The date-time or interval during which an Event occurred. |

| | |
|---------------------|---|
| samplingProtocol | The name of, reference to, or description of the method or protocol used during an Event. |
| country | The name of the country or major administrative unit in which the Location occurs. |
| countryCode | The standard code for the country in which the Location occurs. |
| stateProvince | The name of the next smaller administrative region than country in which the Location occurs. |
| county | The full, unabbreviated name of the next smaller administrative region than stateProvince in which the Location occurs. |
| decimalLatitude | The geographic latitude (in decimal degrees, using the spatial reference system given in geodeticDatum) of the geographic centre of a Location. |
| decimalLongitude | The geographic longitude (in decimal degrees, using the spatial reference system given in geodeticDatum) of the geographic centre of a Location. |
| geodeticDatum | The ellipsoid, geodetic datum, or spatial reference system (SRS) upon which the geographic coordinates given in decimalLatitude and decimalLongitude as based. |
| locality | The specific description of the place. Less specific geographic information can be provided in other geographic terms. |
| georeferenceRemarks | Notes or comments about the spatial description determination, explaining assumptions made in addition or opposition to the those formalized in the method referred to in georeferenceProtocol. |

Additional information

We consider important to disclose the complete list of this historical collection of the Group of Entomology (INS) because of the importance in public health of Ceratopogonidae insects. We expect that this resource can serve as a reference for further studies of the biodiversity of these insects in Colombia and the Neotropics.

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Author contributions

Erika Santamaría conceived the study, collected field data and wrote the manuscript; Marco Fidel Suarez collected field data, reviewed and edited the manuscript; Ricardo Ortiz,

systematized data, improved the data quality, provided bioinformatics skills and publication support, Patricia Fuya reviewed and editing the manuscript; Geraldine Paez systematized data, corrected the database, Catalina Marceló, systematized data, provided bioinformatics skills, analysed data and wrote the manuscript. All authors contributed to the manuscript.

References

- Allan S, Day J, Edman J (1987) Visual ecology of biting flies. Annual Review of Entomology 32: 297-314. <https://doi.org/10.1146/annurev.en.32.010187.001501>
- Barreto P (1986) Catálogo de los Culicoides (Diptera: Ceratopogonidae) de Colombia. Colombia Médica 17 (3): 140-150. [In Spanish]. URL: <https://biblat.unam.mx/es/revista/colombia-medica/articulo/catalogo-de-los-culicoides-diptera-ceratopogonidae-de-colombia>
- Borkent A (2004) Insecta: Dptera, Ceratopogonidae. In: Yule CM, Yong HS (Eds) Freshwater invertebrates of the Malaysian region. Academy of Sciences Malaysia, 861 pp.
- Borkent A (2005) The biting midges, the Ceratopogonidae (Diptera). In: Marquardt W (Ed.) Biology of disease vectors. Second. Elsevier Academic Press, 785 pp.
- Borkent A (2014) World species of biting midges (Diptera: Ceratopogonidae). Ceratopogonidae URL: <http://www.inhs.illinois.edu/research/FLYTREE/Borkent.html>
- Forattini OP (1957) Culicoides da Regiao Neotropical (Diptera: Ceratopogonidae). Arquivos Da Faculdade De Higiene E Saúde Pública Da Universidade De São Paulo 11 (2): 161-526. <https://doi.org/10.11606/issn.2358-792X.v11i2p161-526>
- Gonzalez M, Lopez S, Romon SP, Iturrondobeitia JC, Golderazena A (2014) Fenología, ecología y diversidad de la familia Ceratopogonidae (Dptera: Nematocera), excluyendo el genero *Culicoides*, en el Pais Vasco (Peninsula Iberica). Boletin de la Sociedad Entomologica Aragonesa 55: 205-215.
- Homan EJ, Taylor WP, Ruiz HL, Yuill TM (1985) Bluetongue virus and epizootic haemorrhagic disease of deer virus serotypes in northern Colombian cattle. Journal of Hygiene 95 (1): 165-172. <https://doi.org/10.1017/s0022172400062409>
- Kettle DS (1995) Ceratopogonidae (Biting midges). In: Kettle DS (Ed.) Medical and veterinary entomology. Second. Cambridge: CAB Internacional
- Kirkeby C, Græsbøll K, Stockmarr A, Christiansen LE, Bødker R (2013) The range of attraction for light traps catching *Culicoides* biting midges (Diptera: Ceratopogonidae). Parasites Vectors 6 (67). <https://doi.org/10.1186/1756-3305-6-67>
- Linley JR, A.L. H, F.P. P (1983) Biting midges (Diptera: Ceratopogonidae) and human health. Journal of Medical Entomology 20 (4): 347-364. <https://doi.org/10.1093/jmedent/20.4.347>
- Mullen GR (2002) Biting midges (Ceratopogonidae). In: Mullen G, Durden L (Eds) Medical and veterinary entomology . Academic Press, San Diego. <https://doi.org/10.1016/B978-012510451-7/50012-8>
- Rodriguez M, Wirth W (1986) A new species of man- biting *Culicoides* from the high Andes of Colombia (Diptera: Ceratopogonidae). The Florida Entomologist 69 (2): 311-314. <https://doi.org/10.2307/3494934>
- Santamaria E, Cabrera OL, Zipa Y, Ferro C, Ahumada ML, Pardo RH (2008) Diagnostico preliminar de la molestia sanitria causada por *Culicoides* (Diptera: Ceratopogonidae) en

- el departamento de Boyacá, Colombia. *Biomédica* 28: 497-509. <https://doi.org/10.7705/biomedica.v28i4.55>
- Santamaría E, Suárez MF, Fuya P, Páez G, Marceló Díaz C (2020) Colección de insectos de importancia médica del Instituto Nacional de Salud - Ceratopogonidae. Occurrence dataset. Instituto Nacional de Salud via GBIF.org. URL: <https://doi.org/10.15472/5psmbm>
 - Sherlock IA, Guitton N (1965) Dermatozoonosis by *Culicoides* bite (Diptera: Ceratopogonidae) in Salvador, state of Bahia, Brazil. IV. A clinical study. *Memórias do Instituto Oswaldo Cruz* 63: 27-37. <https://doi.org/10.1590/S0074-02761965000100003>
 - Spinelli G, Wolff M (2016) Family Ceratopogonidae. In: Wolff M, Silvio S, Carvalho Cd (Eds) Catalogue of Diptera of Colombia: an introduction. 1. *Zootaxa* 412 <https://doi.org/10.11646/zootaxa.4122.1.3>
 - Spinelli GR, Santamaria E, Cabrera OL, Ronderos MM, Suárez MF (2009) Five new species of *Culicoides* Latreille described from Colombia, yielding a new species list and country records (Diptera: Ceratopogonidae). *Memórias do Instituto Oswaldo Cruz* 104 (1): 81-92. <https://doi.org/10.1590/s0074-02762009000100013>
 - Suárez R, Hidalgo M, Nio N, González C, Vesga J, Orejuela L, et al. (2008) Las rickettsias como agentes etiológicos de entidades febriles no diagnosticadas en Colombia. Ediciones Uniandes. Ediciones Uniandes, Bogotá, Colombia. URL: https://apcciso.uniandes.edu.co/sip/data/pdf/Las_rickettsias_como_agentes_etiologicos.pdf
 - Szadziewski R, Gwizdalska-kentzer M, Gilka W (2011) Order Diptera, family Ceratopogonidae. *Arthropod Fauna of the UAE* 4: 636-653.
 - Tesh RB (1994) The emerging epidemiology of Venezuelan hemorrhagic fever and Oropouche fever in tropical South America. *Annals of the New York Academy of Sciences*, 740: 129-137. <https://doi.org/10.1111/j.1749-6632.1994.tb19863.x>
 - Tidwell MA, Tidwell MA (1982) Development of *Mansonella ozzardi* in *Simulium amazonicum*, *S. argentiscutum* and *Culicoides insinuatus* from Amazonas, Colombia. *The American Society of Tropical Medicine and Hygiene* 31 (6): 1137-1141 . <https://doi.org/10.4269/ajtmh.1982.31.1137>
 - Undiano C (1966) Importance and present-day concepts of pathogenicity of *Mansonella* infections. *Revista de la Facultad de Ciencias Médicas de Córdoba*, 24: 183-189.
 - Wirth WW, Dyce AL, Spinelli GR (1988) An atlas of wing photographs, with a summary of the numerical characters of the neotropical species of *Culicoides* (Diptera:Ceratopogonidae). *Contributions of the American Entomological Institute* 25: 1-72.

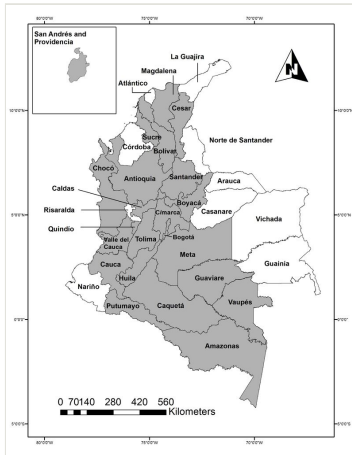


Figure 1.

Colombian departments with specimens deposited in the collection of ceratopogonids insects from National Institute of Health.

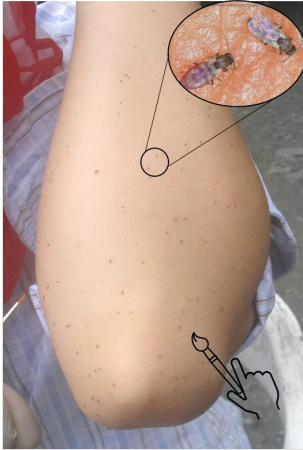


Figure 2.
Human landing catches for the capture of *Culicoides* spp.



Figure 3.
Light traps for the capture of *Culicoides* spp.

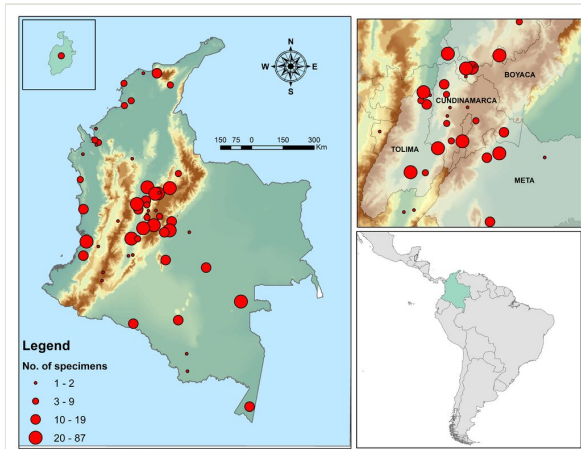


Figure 4.

Geographic distribution and density per locality of specimens deposited in the collection of ceratopogonids.

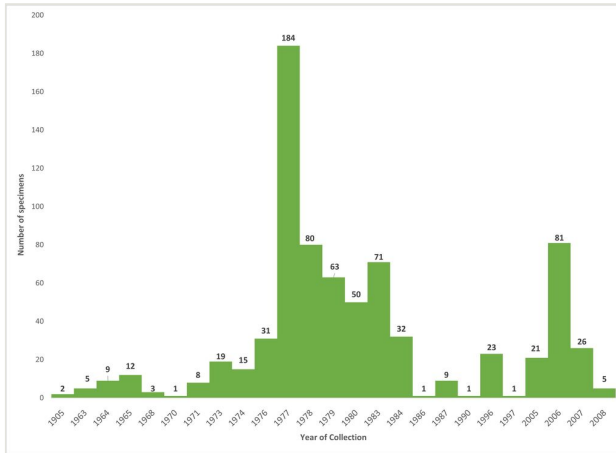


Figure 6. Temporal distribution of *Culicoides* specimens in the collection of insects of medical importance from National Institute of Health (n=753).