

New records of Sabethini (Diptera: Culicidae) from Colombia

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Abstract

Background

In the Neotropical Region, the mosquitoes, grouped in the tribe Sabethini (Arthropoda, Insecta, Diptera: Culicidae) are considered of medical importance by the role that some species may have in arbovirus transmission; also, because they are good bioindicators. More than 400 species are currently recognised and are mainly associated with forest areas. The tribe Sabethini is poorly studied and the information about diversity and distribution for species relating to it is scarce. In Colombia, 54 species of the tribe are known; however, several geographical areas have not been included in the studies for this group and data for recent field collections are not available; therefore, the records are outdated.

New information

This study presents the species list of the Sabethini tribe in Colombia, based on a review of previous publications and recent unpublished data. The list includes 68 species of nine genera and 16 subgenera. The genus *Wyeomyia* has the highest species number (39), followed by *Sabethes* (14). A total of 29 new records are registered and actualized information related to the local distribution in some Departments is presented, including geographic coordinates. In this paper, the distribution records of Sabethini for Colombia are updated, revealing the high diversity of this group in the country and providing some useful information for species that may need surveillance or control.

Keywords

Sabethini, Colombia, Neotropical Region, records data

Introduction

Tribe Sabethini of the subfamily Culicinae is composed of 432 recognised species of 14 genera (Harbach 2014). In the Neotropical Region, there are reported numerous species in different genera including *Isostomyia* (4 species), *Johnbelkinia* (3), *Limatus* (9), *Onirion* (7), *Runchomyia* (8), *Sabethes* (41), *Shannoniana* (3), *Trichoprosopon* (13) and *Wyeomyia* (139) (Harbach 2014). Sabethini mosquitoes prefer forest environments and exhibit predominantly diurnal feeding behaviour (Lane 1953, Suaza-Vasco et al. 2015). Phytotelmata are known as breeding places for some species, but artificial breeding sites are also used for some of them (Lane 1953, Chaverri et al. 2018).

In the Neotropical Region, the tribe Sabethini is related to arbovirus transmission. The genera *Johnbelkinia*, *Limatus*, *Sabethes*, *Trichoprosopon* and *Wyeomyia* include species recognised as potential vectors (De Souza Lopes et al. 1975, Auguste et al. 2010, Bueno-Marí et al. 2015, Navarro et al. 2015, Gravina et al. 2018). Some species, such as *L. durhamii* Theobald, 1901, *L. flavisetosus* de Oliveira Castro, 1935, *Sa. chloropterus* (von Humboldt, 1819) and *T. digitatum* (Rondani, 1848), are recognised vectors of viral encephalitis (Worth et al. 1968, Aitken 1972, Shope et al. 2000, Navarro et al. 2015). Yellow fever is potentially transmitted by *Sa. cyaneus* (Fabricius, 1805), *Sa. chloropterus*, *Sa. albipivus* Theobald, 1903, *Sa. glaucodaemon* (Dyar and Shannon, 1925) and *Sa. soperi*. Lane & Cerqueira, 1942 (Monath 1988, Navarro et al. 2015). Other species, such as *L. asulleptus* (Theobald, 1903) and *Sa. cyaneus* (Fabricius, 1805), are related to Mayaro fever transmission (Muñoz and Navarro 2012, Navarro et al. 2015).

In Colombia, there are no recent studies related to this tribe, except published works by Suaza-Vasco et al. (2015), for coffee growing areas; however, diversity of biomes in the country favours the presence of a high number of species. Here, we present an updated species list of the tribe Sabethini in Colombia, based on historical and our own data.

Materials and methods

The list of species presented in this study was compiled using the following reports: (Lane and Cerqueira 1942, Stone et al. 1959, Vargas and Díaz Nájera 1959, Barreto and Vernon 1969, Knight and Stone 1977, Heinemann and Belkin 1978, Zavortink 1979a, Zavortink 1979b, Kano 1991, Carrejo and Gonzalez 1992, Olano and Tinke 1993, Zuluaga et al. 1993, Marchon-Silva et al. 1996, Molina et al. 2000, Harbach and Peyton 2000, Barrera et al. 2002, Porter and Wolff E. 2004, Ferro et al. 2008, Parra-Henao and Suárez 2012, Barajas et al. 2013, Rozo-Lopez and Mengual 2015, Suaza-Vasco et al. 2015, Rosero-García et al. 2017, Rosero-García et al. 2018). Unpublished data from a Masters thesis (Cochero Bustamante 2017) and database portals (Gaffigan et al. 2014, SIB 2020) were included, as well as new material collected by the authors records for field-collected material with a buccal aspirator, entomological nets or which was taxonomically identified by the authors were also included, the material being collected by direct sample using a

buccal aspirator and entomological net. Additionally, some adults were sampled in Shannon traps located in vegetal covers such as forest, gradual and coffee plantations. The light in the trap was activated during the twilight hours and the attracted adults were collected using a mouth aspirator and entomological net.

Species distribution records were classified into ecoregions (WWF 2015) as follows: Llanos, Apure-Villavicencio Dry Forest, Cordillera Oriental Montane Forest, Magdalena Valley Montane Forest, Magdalena Valley Dry Forest, Cauca Valley Montane Forest, Cauca Valley Dry Forest, North-western Andean Montane Forest, Chocó-Darién Moist Forest, South American Pacific Mangroves, Magdalena-Urabá Moist Forest, Amazon-Orinoco-Southern Caribbean Mangroves, Guajira-Barranquilla Xeric Scrub, Caquetá Moist Forest, Negro-Branco Moist Forest and Catatumbo Moist Forest. The list of species is presented by genus and subgenus; the name of the species includes the authorship and the year of description, followed by notes with references to previous records and finally the review of the historical distribution records, including new records (Department: locality [ecoregion]). The abbreviation "cf." (meaning "confer" or to be compared with) is used for distinguishing some species names to indicate that most of the diagnostic characters correspond to a given species, but some characters are unclear or not available. "cf." is a qualifier frequently used in taxonomic records and closely associated with open nomenclature (ON) practice (Sigovini et al. 2016).

Checklist of the tribe Sabethini from Colombia

Isostomyia espinii (Martini, 1914)

Distribution: Caquetá: Solano [Caquetá Moist Forests].

Notes: Reported by Molina et al. (2000).

Johnbelkinia leucopus (Dyar & Knab, 1906)

Distribution: Antioquia: Hispania [Cauca Valley Montane Forests]. Caquetá: Solano [Caquetá Moist Forests].

Notes: Reported by Molina et al. (2000), new record.

Johnbelkinia longipes (Fabricius, 1805)

Distribution: Meta: Restrepo, Villavicencio [Apure-Villavicencio Dry Forests]. Santander: Barrancabermeja, Cimitarra [Magdalena-Urabá Moist Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Barreto and Vernon (1969), Zavortink (1979a), Barrera et al. (2002), Ferro et al. (2008), SIB (2020).

***Johnbelkinia ulopus* (Dyar & Knab, 1906)**

Distribution: Antioquia: Hispania, Jardín, Valparaíso [Cauca Valley Montane Forests]. Boyacá: Chiquinquirá [Magdalena-Urabá Moist Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests]. Cauca: Isla Gorgona [Chocó-Darién Moist Forests]. Chocó: Acandí [Chocó-Darién Moist Forests]. Meta: Restrepo, Villavicencio [Apure-Villavicencio Dry Forests]. Norte de Santander: Villamizar [Catatumbo Moist Forests]. Valle del Cauca: Buenaventura, Darién [Chocó-Darién Moist Forests].

Notes: Reported by Knight and Stone (1977), Zavortink (1979b), Suaza-Vasco et al. (2015), SIB (2020), new record.

***Limatus asulleptus* (Theobald, 1903)**

Distribution: Caquetá: Solano [Caquetá Moist Forests]. Meta: Villavicencio [Apure-Villavicencio Dry Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Heinemann and Belkin (1978), Molina et al. (2000), SIB (2020).

***Limatus durhamii* Theobald, 1901**

Distribution: Antioquia: Apartadó, Hispania [Cauca Valley Montane Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests]. Caquetá: Solano [Caquetá Moist Forests]. Cundinamarca: Guaduas [Magdalena Valley Dry Forests]. Guanía: Inírida [Negro-Branco Moist Forests]. Meta: La Macarena, Puerto López, Puerto Rico, Villavicencio [Apure-Villavicencio Dry Forests, Caquetá Moist Forests, Llanos]. Santander: El Carmen del Chucurí [Magdalena Valley Montane Forests]. Sucre: Coloso [Guajira-Barranquilla Xeric Scrub]. Tolima: Honda, Chaparral [Magdalena Valley Dry Forests].

Notes: Reported by Barreto-Reyes (1955), Heinemann and Belkin (1978), Olano and Tinke (1993), Molina et al. (2000), Parra-Henao and Suárez (2012), Barajas et al. (2013), Suaza-Vasco et al. (2015), Cochero Bustamante (2017), SIB (2020).

***Onirion personatum* (Lutz, 1904)**

Distribution: Valle del Cauca, Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Knight and Stone (1977), Harbach and Peyton (2000).

***Runchomyia (Ctenogoeldia) magna* Theobald, 1905**

Notes: Reported by Knight and Stone (1977).

***Sabethes (Peytonulus) identicus* Dyar & Knab, 1907**

Distribution: Meta: Puerto López, Villavicencio [Apure-Villavicencio Dry Forests, Cordillera Oriental Montane Forests].

Notes: Reported by Gaffigan et al. (2014), SIB (2020).

***Sabethes (Peytonulus) ignotus* Harbach, 1995**

Distribution: Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests].

Notes: Reported by Harbach (1995), Suaza-Vasco et al. (2015).

***Sabethes (Peytonulus) luxodens* Hall, Howard & Harbach, 1999**

Distribution: Caldas: Anserma [Cauca Valley Montane Forests].

Notes: Reported by Suaza-Vasco et al. (2015).

***Sabethes (Peytonulus) undosus* (Coquillett, 1906)**

Distribution: Antioquia: Belmira, Jardín, Valparaíso [Cauca Valley Montane Forests]. Caldas: Anserma [Cauca Valley Montane Forests]. Meta: Puerto López [Apure-Villavicencio Dry Forests].

Notes: Reported by Heinemann and Belkin (1978), Carrejo and Gonzalez (1992), Barajas et al. (2013), Suaza-Vasco et al. (2015), SIB (2020), new record.

***Sabethes (Peytonulus) xenismus* Harbach, 1995**

Distribution: Meta: Villavicencio [Apure-Villavicencio Dry Forests].

Notes: Reported by Harbach (1995), SIB (2020).

***Sabethes (Sabethes) albiprivus* Theobald, 1903**

Distribution: Córdoba: San Bernardo del Viento [Magdalena-Urabá Moist Forests].

Notes: Reported by Barreto-Reyes (1955), new record.

***Sabethes (Sabethes) belisarioi* Neiva, 1908**

Distribution: Caquetá: Solano [Caquetá Moist Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Vargas and Díaz Nájera (1959), Barreto and Vernon (1969), Molina et al. (2000).

***Sabethes (Sabethes) cyaneus* (Fabricius, 1805)**

Distribution: Caquetá, Solano [Caquetá Moist Forests]. Córdoba: San Bernardo del Viento [Magdalena-Urabá Moist Forests]. Meta: Restrepo [Apure-Villavicencio Dry Forests]. Sucre: Coloso [Guajira-Barranquilla Xeric Scrub]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969), Heinemann and Belkin (1978), Molina et al. (2000), Cocheró Bustamante (2017), SIB (2020).

***Sabethes (Sabethes) quasicyaneus* Peryassú, 1922**

Distribution: Santander: San Vicente de Chucurí [Magdalena Valley Montane Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Knight and Stone (1977).

***Sabethes (Sabethes) tarsopus* Dyar & Knab, 1908**

Notes: Reported by Barreto-Reyes (1955).

***Sabethes (Sabethinus) intermedius* (Lutz, 1904)**

Distribution: Caquetá: Solano [Caquetá Moist Forests]. Chocó: Nuquí [Chocó-Darién Moist Forests]. Risaralda: San Julian [Cauca Valley Montane Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969), Harbach (1994), Molina et al. (2000), Suaza-Vasco et al. (2015), new record.

***Sabethes (Sabethinus) cf. xhyphydes* Harbach, 1994**

Distribution: Caldas: Anserma [Cauca Valley Montane Forests].

Notes: New record

***Sabethes (Sabethoides) chloropterus* (von Humboldt, 1819)**

Distribution: Antioquia: Hispania [Cauca Valley Montane Forests]. Caquetá: Solano [Caquetá Moist Forests]. Caquetá: Solano [Caquetá Moist Forests]. Meta:

Villavicencio [Apure-Villavicencio Dry Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969), Molina et al. (2000), Suaza-Vasco et al. (2015), SIB (2020).

***Sabethes (Sabethoides) glaucodaemon* (Dyar and Shannon, 1925)**

Distribution: Antioquia: Valparaíso [Cauca Valley Montane Forests]. Caquetá: Solano [Caquetá Moist Forests].

Notes: Reported by Molina et al. (2000), new record.

***Shannoniana fluvialis* (Theobald, 1903)**

Distribution: Antioquia: Jardín [Cauca Valley Montane Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Barreto and Vernon (1969), Suaza-Vasco et al. (2015).

***Trichoprosopon andinum* Levi-Castillo, 1953**

Distribution: Antioquia: Jericó [Cauca Valley Montane Forests]. Valle del Cauca: Cali [Cauca Valley Dry Forests].

Notes: Reported by Carrejo and Gonzalez (1992), Rosero-García et al. (2018), SIB (2020).

***Trichoprosopon compressum* Lutz, 1905**

Distribution: Antioquia: Apartadó, La Pintada [Cauca Valley Montane Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests]. Meta: Restrepo. [Apure-Villavicencio Dry Forests].

Notes: Reported by Lane and Cerqueira (1942), Barreto-Reyes (1955), Parra-Henao and Suárez (2012), Suaza-Vasco et al. (2015), new record.

***Trichoprosopon digitatum* (Rondani, 1848)**

Distribution: Antioquia: Apartado, Carepa, Hispania, Maceo, La Pintada, Puerto Berrio [Chocó-Darién Moist Forests, Magdalena Valley Montane Forests, Cauca Valley Dry Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests]. Caquetá: Solano [Caquetá Moist Forests]. Cundinamarca: Soacha [Magdalena Valley Montane Forests]. Meta: Villavicencio [Apure-Villavicencio Dry Forests]. Quindío: Salento [Cauca Valley Montane Forests]. Santander: Carmen del Chucurí [Magdalena Valley Montane

Forests]. Valle del Cauca: Alcalá, Buenaventura [Cauca Valley Montane Forests, Chocó-Darién Moist Forests].

Notes: Reported by Vargas and Díaz Nájera (1959), Barreto-Reyes (1955), Barreto and Vernon (1969), Molina et al. (2000), Parra-Henao and Suárez (2012), Barajas et al. (2013), Suaza-Vasco et al. (2015), SIB (2020), new record.

***Trichoprosopon evansae* Antunes, 1942**

Distribution: Antioquia: Jardín [Cauca Valley Montane Forests]. Caldas: Rio Sucio [Cauca Valley Montane Forests]. Meta: Restrepo, Villavicencio [Apure-Villavicencio Dry Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Lane and Cerqueira (1942), Barreto-Reyes (1955), Barreto and Vernon (1969), Marchon-Silva et al. (1996), Rozo-Lopez and Mengual (2015), Suaza-Vasco et al. (2015).

***Trichoprosopon lanei* (Antunes, 1937)**

Distribution: Meta: Restrepo [Apure-Villavicencio Dry Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Marchon-Silva et al. (1996).

***Trichoprosopon pallidiventer* (Lutz, 1905)**

Distribution: Tolima: Guamo [Magdalena Valley Dry Forests]. Valle del Cauca: Alcalá, Buenaventura [Cauca Valley Montane Forests, Chocó-Darién Moist Forests]. Cauca: Puerto Tejada [Cauca Valley Dry Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969), Heinemann and Belkin (1978), Suaza-Vasco et al. (2015), SIB (2020), new record.

***Wyeomyia* (subgenus uncertain) cf. *argenteorostris* (Bonne-Wepster & Bonne, 1920)**

Distribution: Caldas: Anserma [Cauca Valley Montane Forests]. Chocó: Acandí, Litoral de San Juan, Nuquí [Chocó-Darién Moist Forests, South American Pacific Mangroves, Amazon-Orinoco-Southern Caribbean Mangroves].

Notes: New record.

***Wyeomyia* (subgenus uncertain) *chalcocephala* Dyar & Knab, 1906**

Distribution: Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Knight and Stone (1977), SIB (2020).

***Wyeomyia (subgenus uncertain) clasoleuca* Dyar & Knab, 1908**

Distribution: Antioquia: Hispania [Cauca Valley Montane Forests]. Caldas: Chinchiná [Cauca Valley Montane Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), SIB (2020), new record.

***Wyeomyia (subgenus uncertain) melanocephala* Dyar & Knab, 1906**

Distribution: Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969).

***Wyeomyia (subgenus uncertain) moerbista* (Dyar & Knab, 1919)**

Distribution: Antioquia: Apartadó [Magdalena-Urabá Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Parra-Henao and Suárez (2012).

***Wyeomyia (subgenus uncertain) phroso* Howard, Dyar & Knab, 1915**

Distribution: Antioquia: Jardín [Cauca Valley Montane Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests].

Notes: Reported by Suaza-Vasco et al. (2015), Rosero-García et al. (2017), new record.

***Wyeomyia (subgenus uncertain) serratoria* (Dyar & Nunez Tovar, 1927)**

Notes: Reported by Barreto-Reyes (1955).

***Wyeomyia (subgenus uncertain) undulata* del Ponte & Cerqueira, 1938**

Distribution: Antioquia: Hispania [Cauca Valley Montane Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests]. Quindío: Quimbaya [Cauca Valley Montane Forests].

Notes: Reported by Suaza-Vasco et al. (2015), new record.

***Wyeomyia (Antunesmyia) colombiana* Lane, 1945**

Distribution: Meta: Restrepo [Apure-Villavicencio Dry Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), SIB (2020).

***Wyeomyia (Antunesmyia) flavifacies* Edwards, 1922**

Distribution: Antioquia: Apartadó, Turbo [Magdalena-Urabá Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Parra-Henao and Suárez (2012).

***Wyeomyia (Cruzmyia) kummi* Lane & Cerqueira, 1942**

Notes: Reported by Knight and Stone (1977).

***Wyeomyia (Cruzmyia) mattinglyi* Lane, 1953**

Notes: Reported by Knight and Stone (1977).

***Wyeomyia (Decamyia) cf. felicia* (Dyar & Nunez Tovar, 1927)**

Distribution: Chocó: Nuquí [Chocó-Darién Moist Forests].

Notes: New record.

***Wyeomyia (Decamyia) pseudopecten* Dyar & Knab, 1906**

Distribution: Antioquia: Abejorral [Cauca Valley Montane Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Heinemann and Belkin (1978), Suaza-Vasco et al. (2015), SIB (2020).

***Wyeomyia (Decamyia) ulocoma* (Theobald, 1903)**

Distribution: Antioquia: Fredonia [Cauca Valley Montane Forests]. Caldas: Chinchiná [Cauca Valley Montane Forests]. Quindío: Quimbaya [Cauca Valley Montane Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Carrejo and Gonzalez (1992), Heinemann and Belkin (1978), Suaza-Vasco et al. (2015), SIB (2020).

***Wyeomyia (Dendromyia) complosa* (Dyar, 1928)**

Distribution: Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969).

***Wyeomyia (Dendromyia) jocosa* (Dyar & Knab, 1908)**

Distribution: Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto and Vernon (1969), Knight and Stone (1977).

***Wyeomyia (Dendromyia) luteoventralis* Theobald, 1901**

Distribution: Antioquia: La Pintada [Cauca Valley Montane Forests].

Notes: Reported by Rozo-Lopez and Mengual (2015).

***Wyeomyia (Dendromyia) ypsipola* Dyar, 1922**

Distribution: Meta: Villavicencio [Apure-Villavicencio Dry Forests].

Notes: Reported by Barreto-Reyes (1955), SIB (2020).

***Wyeomyia (Dodecamyia) aphobema* Dyar, 1919**

Distribution: Chocó: Nuquí [Chocó-Darién Moist Forests]. Meta: Restrepo, Villavicencio [Apure-Villavicencio Dry Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Heinemann and Belkin (1978), SIB (2020), new record.

***Wyeomyia (Exallomyia) tarsata* Lane & Cerqueira, 1942**

Distribution: Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto and Vernon (1969), Knight and Stone (1977).

***Wyeomyia (Hystatomyia) chocoensis* Porter & Wolff, 2004**

Distribution: Choco: Bahía Solano, Nuquí [Chocó-Darién Moist Forests].

Notes: Reported by Porter and Wolff E. (2004), new record.

***Wyeomyia (Hystatomyia) cf. circumcincta* Dyar & Knab, 1907**

Distribution: Antioquia: Carepa [Chocó-Darién Moist Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests]. Choco: Acandí, Litoral del San Juan,

Nuquí [Chocó-Darién Moist Forests, South American Pacific Mangroves, Amazon-Orinoco-Southern Caribbean Mangroves].

Notes: New record.

***Wyeomyia (Hystatomyia) intonca* Dyar & Knab, 1910**

Distribution: Choco: Quibdo [Chocó-Darién Moist Forests].

Notes: Reported by Porter and Wolff E. (2004).

***Wyeomyia (Miamyia) codiocampa* Dyar & Knab, 1907**

Distribution: Meta: Puerto López, Villavicencio [Apure-Villavicencio Dry Forests, Llanos].

Notes: Reported by Carrejo and Gonzalez (1992), SIB (2020).

***Wyeomyia (Miamyia) hosautos* Dyar & Knab, 1907**

Distribution: Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969).

***Wyeomyia (Miamyia) cf. limai* Lane & Cerqueira, 1942**

Distribution: Antioquia: Jericó [Cauca Valley Montane Forests]. Choco: Litoral del San Juan [South American Pacific Mangroves].

Notes: New record.

***Wyeomyia (Miamyia) oblita* (Lutz, 1904)**

Distribution: Antioquia: Betania, Hispania [Cauca Valley Montane Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests]. Choco: Acandí [Chocó-Darién Moist Forests]. Magdalena: Santa Marta [Guajira-Barranquilla Xeric Scrub].

Notes: Reported by Barajas et al. (2013), Suaza-Vasco et al. (2015), new record.

***Wyeomyia (Nunezia) bicornis* (Root, 1928)**

Distribution: Antioquia: Carepa, Ciudad Bolívar, Jardín, Jericó, Támesis, Tarso [Cauca Valley Montane Forests, Chocó-Darién Moist Forests]. Caldas: Anserma, Chinchiná [Cauca Valley Montane Forests].

Notes: New record.

***Wyeomyia (Nunezia) cf. paucartamboensis* Porter, 2014**

Distribution: Caldas: Chinchiná [Cauca Valley Montane Forests].

Notes: New record.

***Wyeomyia (Triamyia) aporonoma* Dyar & Knab, 1906**

Distribution: Caldas: Chinchiná [Cauca Valley Montane Forests]. Chocó: Nuquí [Chocó-Darién Moist Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969), SIB (2020), new record.

***Wyeomyia (Wyeomyia) cf. abebela* Dyar & Knab, 1908**

Distribution: Caldas: Chinchiná [Cauca Valley Montane Forests]. Quindío: Quimbaya [Cauca Valley Montane Forests].

Notes: New records.

***Wyeomyia (Wyeomyia) arthrostigma* (Lutz, 1905)**

Distribution: Cundinamarca: Soacha [Magdalena Valley Montane Forests]. Meta: Restrepo, Villavicencio [Apure-Villavicencio Dry Forests]. Valle del Cauca: Alcalá, Buenaventura, Cali [Cauca Valley Montane Forests, Chocó-Darién Moist Forests].

Notes: Reported by Heinemann and Belkin (1978), Carrejo and Gonzalez (1992), Suaza-Vasco et al. (2015), SIB (2020).

***Wyeomyia (Wyeomyia) celaecephala* Dyar & Knab, 1906**

Distribution: Antioquia: Apartadó, Jardín, Jericó [Magdalena Urabá Moist Forests, Cauca Valley Montane Forests]. Chocó: Litoral de San Juan, Nuquí [Chocó-Darién Moist Forests, South American Pacific Mangroves]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969), Parra-Henao and Suárez (2012), SIB (2020), new record.

***Wyeomyia (Wyeomyia) cf. medioalbipes* Lutz, 1904**

Distribution: Antioquia: Jericó [Cauca Valley Montane Forests]. Caldas: Chinchiná [Cauca Valley Montane Forests]. Chocó: Acandí [Chocó-Darién Moist Forests]. Magdalena: Santa Marta [Guajira-Barranquilla Xeric Scrub].

Notes: New record.

***Wyeomyia (Wyeomyia) melanopus* Dyar, 1919**

Distribution: Antioquia: Apartadó, Jericó, Turbo [Cauca Valley Montane Forests, Magdalena-Urabá Moist Forests]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Carrejo and Gonzalez (1992), Parra-Henao and Suárez (2012), SIB (2020), new record.

***Wyeomyia (Wyeomyia) pertinans* (Williston, 1896)**

Distribution: Chocó: Nuquí [Chocó-Darién Moist Forests]. Meta: Restrepo, Villavicencio [Apure-Villavicencio Dry Forests, Cordillera Oriental Montane Forests]. Valle del Cauca: Buenaventura, Dagua [Chocó-Darién Moist Forests, North-western Andean Montane Forests].

Notes: Reported by Heinemann and Belkin (1978), Carrejo and Gonzalez (1992), SIB (2020), new record.

***Wyeomyia (Wyeomyia) scotinomus* (Dyar & Knab, 1907)**

Distribution: Atlántico: Barranquilla [Guajira-Barranquilla Xeric Scrub]. Antioquia: Fredonia, Hispania, Jericó [Cauca Valley Montane Forests]. Caldas: Chinchiná [Cauca Valley Montane Forests]. Chocó: Nuquí [Chocó-Darién Moist Forests]. Valle del Cauca: Candelaria, Buenaventura. [Cauca Valley Dry Forests, Chocó-Darién Moist Forests].

Notes: Reported by Barreto-Reyes (1955), Stone et al. (1959), Barreto and Vernon (1969), new record.

***Wyeomyia (Wyeomyia) simmsi* (Dyar & Knab, 1908)**

Distribution: Chocó: Nuquí [South American Pacific Mangroves]. Valle del Cauca: Buenaventura [Chocó-Darién Moist Forests].

Notes: Reported by Kano (1991), Carrejo and Gonzalez (1992), Zuluaga et al. (1993), SIB (2020).

Analysis

This species checklist with distribution records of sabethine mosquitoes constitutes a first approximation to demonstrate the diversity of this group in Colombia. The results largely reflect the sampling efforts in specific ecoregions of the Colombian territory and the lack of studies in other areas with ecological conditions that may harbour species of Sabethini mosquitoes (Fig. 1).

A total of 68 species and 16 subgenera were recognised. *Wyeomyia* was the genus with the highest number of species (39). This genus exhibits the greatest number of species in the tribe (139) and, according to authorities, is prioritized for a taxonomic revision. Although *Wyeomyia* is divided into 17 subgenera, 29 species are without subgeneric placement (Harbach 2014, Pereira et al. 2019). Sabethini have been recorded in 19 of the 32 Departments of Colombia (Fig. 1) (Suppl. material 1). According to the literature review and the author's fieldwork, the genus *Trichoprosopon* exhibits the highest political distribution.

Colombia is also divided into 34 ecoregions (WWF 2015) and species listed here are present in 16 of them. The distribution records in ecoregions were obtained, based on the geographic coordinates (see Materials and Methods and Suppl. materials 1, 2). Chocó Darien Moist Forests, Cauca Valle Montane Forests and Apure-Villavicencio Dry Forests were the ecoregions with most distribution records of species: 38, 35 and 17 species, respectively. On the contrary, the Catatumbo Moist Forests, Negro-Branco Moist Forests, Amazon-Orinoco-Southern Caribbean Mangroves, North-western Andean Montane Forests and South American Pacific Mangroves were each represented by only a single genus.

Data indicate *Wyeomyia* occurs in 12 ecoregions. Chocó-Darién Moist Forests and Cauca Valley Montane Forests included the greatest number of species of this genus with a total of 26 and 19, respectively. Remarkably, *Wyeomyia* was the unique genus present in mangrove ecoregions. *Limatus* exhibit a wide distribution with presence in 10 ecoregions. This genus is represented by two species in the country, *L. asulleptus* and *L. durhamii*, the last one exhibiting the most cosmopolitan distribution in the tribe with presence in eight ecoregions.

Species of the genus *Sabethes* are involved in the transmission of very important arbovirus, such as yellow fever and Mayaro virus (Barrett and Higgs 2007, Muñoz and Navarro 2012, Navarro et al. 2015); however, species of *Trichoprosopon*, *Limatus* and *Wyeomyia* genera are important in the transmission of lesser-known viruses, such as Pixuna, Kairi, Ilheus, Guama and Caraparu (de Rodaniche and Galindo 1961, Karabatsos 1985, Navarro et al. 2015). Despite the growing importance in Colombia due to ecological and epidemiological changes, studies considering Sabethini distribution (Suaza-Vasco et al. 2015) and arbovirus transmission (Groot Liévano 2017) are limited.

In this study, the ecoregions with high numbers of Sabethini species contain known or suspected vector species. In Chocó Darien Moist Forests, an annual average of 16,000 mm precipitation (WWF 2015) may favour the existence of the phytotelmata used as

breeding places for species, such as *J. ulopus* (Consoli and Oliveira 1994) and *L. assulleptus*, both of which are vectors of Mayaro virus (Navarro et al. 2015), *Sa. cyaneus* the vector of yellow fever, Mayaro virus and Ilhéus virus (Monath 1988, Navarro et al. 2015), *Sa. chloropterus* the vector of yellow fever, Ilhéus virus and St. Louis encephalitis virus (De Rodaniche and Galindo 1957, Monath 1988), *T. digitatum* the vector of St. Louis encephalitis virus, Bussuquara virus and Pixuna (Hastrister et al. 1998, Auguste et al. 2010), as well as *T. pallidiventer*, a potential vector of Guama virus (De Souza Lopes et al. 1975, Navarro et al. 2015).

The Cauca Valley Montane Forests exhibit humid forest of the lower elevations (<1500 m.a.s.l.) (WWF 2015) and have species, such as *J. ulopus* and *L. durhamii* known as the vectors of Venezuelan equine encephalitis and Caraparu virus (Aitken 1972, Navarro et al. 2015); *Sa. chloropterus* and *Sa. glaucodaemon* the vectors of yellow fever (Monath 1988); *T. compressum* the potential vector of Guama virus (Navarro et al. 2015), as well as *T. pallidiventer* and *T. digitatum*.

The Apure-Villavicencio Dry Forest is a transition zone between montane forests and extensive plains, composed of a mosaic of premontane forests, dry forests, savannah and gallery forests with low annual precipitation (WWF 2015). In this area are present potential vectors, such as *J. ulopus*, *L. assulleptus*, *L. durhamii*, *Sa. cyaneus*, *Sa. chloropterus*, *T. compressum* and *T. digitatum*. The Caquetá Moist Forest is part of Colombia Amazon with large expanses of seasonally-flooded forests (WWF 2015), where species of *Sabethes* with sylvatic preferences, such as *Sa. belisarioi* the vector of Ilhéus virus (Gravina et al. 2018), *Sa. cyaneus*, *Sa. chloropterus* and *Sa. glaucodaemon*, are present. *Limatus durhamii* is also registered in this zone. The Magdalena Urabá Moist Forest is a region characterized by dry forests and wetland vegetation on flooded soils (WWF 2015) with data indicating the presence of species, such as *L. durhamii*; *Sa. cyaneus*; *T. compressum* and *T. digitatum*.

Two potential new species of the genus *Trichoprosopon* are mentioned in the distribution records (Suppl. material 1). They are named *Trichoprosopon* sp. n.e. A and *Trichoprosopon* sp. n.e. B. Both "species" are considered to be part of the *T. pallidiventer* complex (Suaza-Vasco et al. 2015). According to Zavortink (1981), some species of this complex can be sympatric. This was evidenced, based on revision of entomological material by the authors (not published data, including detailed morphological study of characters present in male genitalia, larvae and distribution records).

This work does not represent the complete distribution of the Sabethini tribe in Colombia, but it constitutes a first approximation to the more complete knowledge of the group in Colombia, including species and distribution. We consider ongoing studies to be relevant and intend to conduct a review of the material deposited in the entomological collections of museums and entities dedicated to the sampling of the Culicidae family for public health studies.

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Author contributions

Nelson Naranjo-Díaz: Identification of specimens, laboratory work, analysis data, writing, review & editing. Juan Suaza-Vasco: Identification of specimens, laboratory work, review & editing. Jacobo Pineda-Angel: Laboratory work, review. Sandra Uribe: Coordinated the research group, participated in data analyses and performed critical revisions and editing of manuscript drafts.

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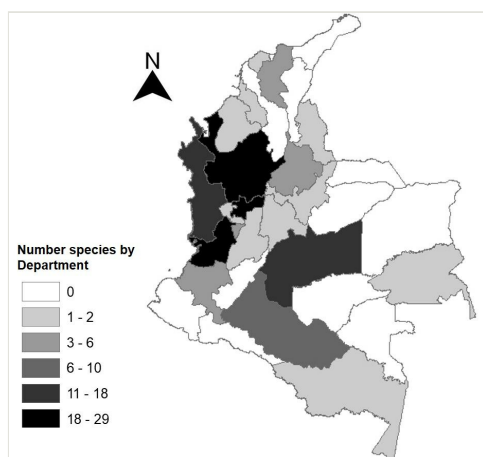


Figure 1.

Political and administrative division of Colombia in Departments and distribution of the recorded species of tribe Sabethini. Darker areas indicate higher number of species (according to historical records available in literature and new records derived from this work).

Supplementary materials

Suppl. material 1: New Colombian Sabethini records

Authors: Nelson Naranjo-Díaz

Data type: Occurrences

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Suppl. material 2: References for records

Authors: Nelson Naranjo-Díaz

Data type: References

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