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New *Sabethes* (Diptera: Culicidae) species records for Ecuador, from Colonso-Chalupas biological reserve, province of Napo (Amazon)

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Abstract

Two new records of *Sabethes* mosquitoes (Culicidae: Nematocera) are reported for Ecuador with the respective extension of their geographical distribution in the Neotropics: *Sabethes intermedius* Lutz and *Sabethes soperi* Lane & Cerqueira, from the provinces of Napo (Amazon) into the Natural Reserve of Colonso-Chalupas at 1,200 m altitude, beside Tena city, Ecuador. Both species are considered as potential vectors of sylvatic Yellow Fever virus and Mayaro virus. Information on collection locality and date, biogeographical region and climate, number of specimens deposited, collectors and the current distribution are included for each species. With these records, the alpha diversity of Culicidae of Ecuador is estimated for 240 species.

Keywords: New records, Biodiversity, Ecuador, mosquitoes, Sabethini, *Sabethes*.

1. Introduction

Studies on mosquito biodiversity and species distribution are essential to determine areas of potential risk of pathogen transmission and an assessment of environmental health. Pioneer contributions regarding Culicidae distribution in Ecuador were made by Levi-Castillo in 40's and 50's^[1]. After that and recently, the mosquito diversity have been updated, with new records and some ecological information in the country^[2-9]. This note updates the mosquito fauna of Ecuador, extending the geographical distribution of two *Sabethes* species in South America and also increasing the number of species from the country which is approximately 240 species recorded^[1, 10-13]. However, this number must be underestimated considering Ecuador as one of the mega diversity countries and in comparison with mosquito fauna diversity from other countries as Colombia, Peru, and Venezuela with Andes and Amazonian bio-geographical regions also.

General taxonomic information

The genus *Sabethes* belongs to Subfamily Culicinae, tribe Sabethini. *Sabethes* currently includes 39 described species classified in five subgenera: *Davismyia* (1 species), *Peytonulus* (12 species), *Sabethinus* (4 species), *Sabethes* (18 species) and *Sabethoides* (4 species)^[12, 14, 15]. The adults of *Sabethes* are brilliantly coloured mosquitoes with a smooth covering of metallic green, blue, violet, gold and silver scales. Prealar setae are absent in all species except for *Sa. petrocchia* belongs to subgenus *Davismyia*.

The phylogenetic affinities of *Sabethes* are uncertain. The genus was recovered as the sister of *Wyeomyia* in the cladistic analysis of Judd^[16] but also as the sister of genus *Limatus* in the analyses of Harbach & Kitching^[17] and Harbach & Peyton^[18]. The phylogeny of the subgenera and species has not been investigated yet.

Sabethes are forest/sylvan mosquitoes. The larvae inhabit phytotelmata, primarily bamboo and tree-holes, but bromeliads have occasionally been reported as development sites for few species. Adults have biting activity during the daylight hours. They are most abundant in the forest canopy and attracted to humans on the ground. *Sabethes* mosquitoes have received little attention from culicidologists mainly because they are largely arboreal and the females oviposit in plant cavities, which are usually inaccessible or overlooked by collectors. Consequently, museum collections contain few adult specimens and even fewer, if any, larval and pupal specimens of most species^[14]. *Sabethes chloropterus* appears to play a role in the transmission of yellow fever virus in Central America.

St. Louis encephalitis and Ilheus viruses have also been isolated from this species in Panama, and the latter virus has been also isolated from *Sa. belisarioi* in Brazil. However, due the canopy behavior in the biting pattern, other species in the genus could be involved in the transmission of arboviruses as sylvatic yellow fever and Mayaro^[19, 20]. The genus have a Neotropical distribution, reported in Central and South America^[21, 11].

2. Material and Methods

The field collection is part of zoonotic pathogens and entomological surveillance in the Amazonian, project carried out during two years in punctual samplings in six Provinces of Ecuador starting on 2015 in Napo Province. The specimens were collected using CDC miniature traps plus CO₂ as attractant^[22] during daylight hours between 08:00 h – 17:00 for one day (and three days nightlight captures for all field collection) between 9-13th February 2015 at 1,200-1,330 m altitude in the expedition to Biological Reserve Colonso-Chalupas one of the most biodiverse natural areas in Ecuador (Fig 1). This area is located in the slopes of the Amazonian of Ecuador, Napo Province, near to the Capital Tena between

Archidona and Cotundo Counties, and surrounded by Misahualli, La Cruz and Monte Verde mountains. This Reserve covers an area of 1,192.90 ha. and its protect area of the basin of rivers Colonso, Tena, Shitie and Inchillaqui. Its climate is moderately cold in the highlands and temperate and subtropical in the valleys, with temperatures ranging from 16-22 °C. Summer goes from June to December and winter from December to June. Annual rainfall ranges from 2,185 to 4,013 mm with a mean of 3,635.39 and a maximum in March and November. This location presents rainy, cloud and evergreen mountain forests, called Mountain evergreen forest from north of Eastern Andeans cordillera^[23]. The species were identified from females collected based on keys by Lane^[24] and Lane & Cerqueira^[25], description of Subgenus *Peytonulus*^[26] and re-description of subgenus *Sabethinus*^[14]. The abbreviations of life stages and other terms used are as follows: female (F), the person who determined the species (det.), and the collector (coll.). Information on collection locality and date, biogeographical region and climate, code number of specimens examined, deposited individuals, stage of the collected specimens, collectors, and the current distribution are included for each species.

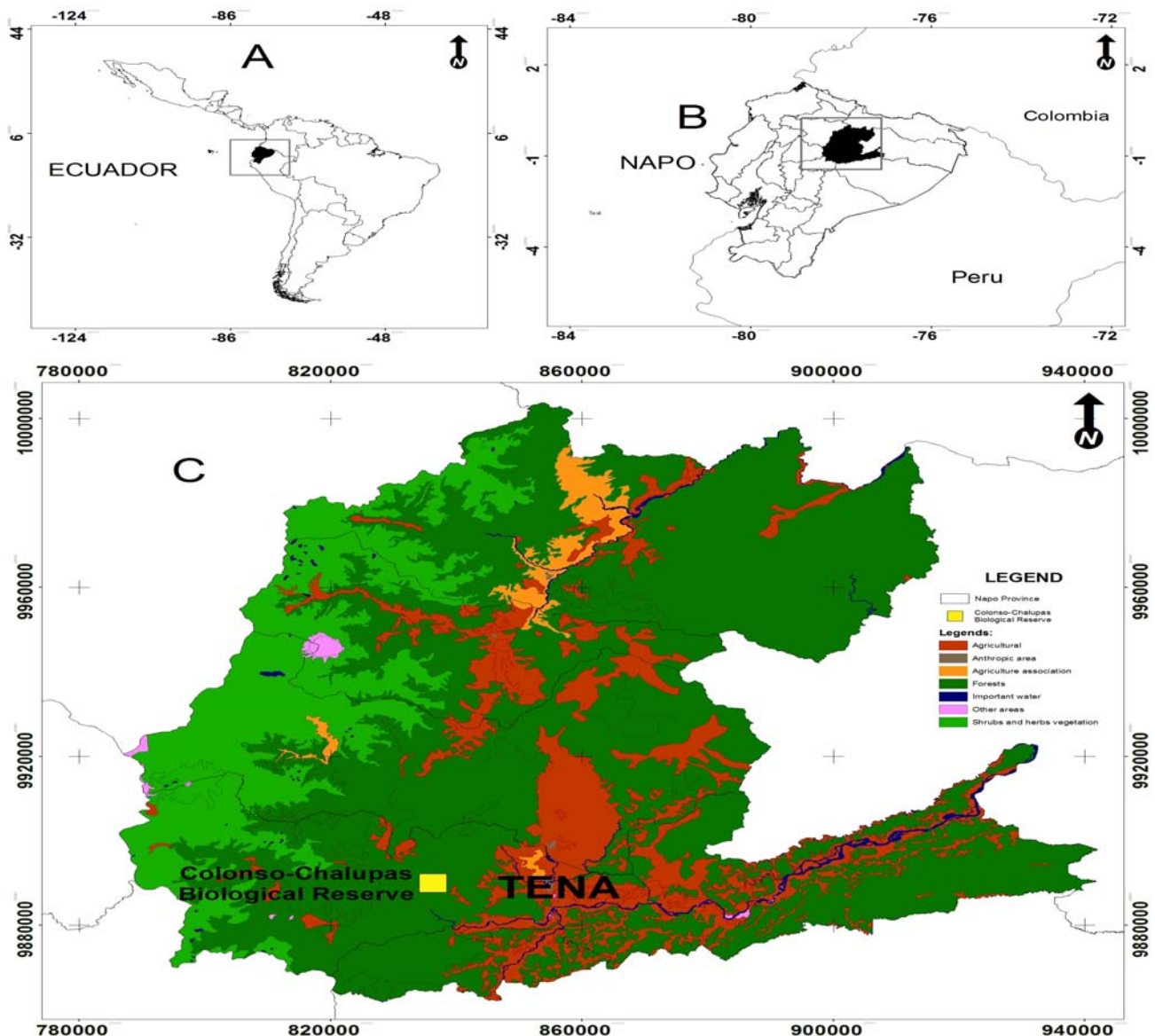


Fig 1: Map of collection site: National Biological Reserve Colonso-Chalupas, Napo Province, Amazon Region of Ecuador. Shows the continental location (A), Province (B), and Locality with land use (C).

3. Results

3.1 New mosquito records and relevant information

Sabethes (Sabethinus) intermedius (Lutz 1904) and *Sabethes (Peytonulus) soperi* Lane & Cerqueira 1942 have been successfully captured as adults using CDC light traps using dry ice during daylight hours. These results show an efficient adult collect method for a mosquito evasive species group as *Sabethes*, which are difficult to capture, being the main collection methods with human attractant or by immature aquatic instars in natural containers. The use of this collection method would avoid the contact mosquito-human and reduce the risk of virus infection.

3.2 The specimens and collection data

Sabethes (Sabethinus) intermedius (Lutz 1904)

Label #: ECU-N-CCh-CDC1-103 (F). Date of Collection: 12/II/2015.

ID Characters: In the female, the “absence of lower mesokatepisternal setae”, Subgenus *Sabethinus sensu* Harbach 1994 [24]; then “scales of vertex and dorsal part of antepnotum with same metallic coloration, vertex and antepnotum with bright violet and gold reflections when viewed dorsally, antepnotum entirely golden-scaled in lateral view” (key [25]).

Geographic distribution: Brazil (Type locality, near São Paulo), Panama, French Guiana, Colombia, Bolivia, Argentina [11].

Locality in ECU, data: Napo Province, Biological Reserve Colonso-Chalupas, Ecuador. Adult collected in CDC light traps with dry ice attractant. Altitude: 1,300 m; Coordinates: 00°56'09.8" S; 077°54'12, 3 W.

Coll.: S. Enríquez, Y. Campaña, P. Duque, C. Pérez, E. Villacrés, J. Vieira; Det.: J.C. Navarro.

Material deposited at: National Collection of Arthropoda of Zoonotic Importance (Ticks, Mosquitoes, Sandflies, and others) in the Centro Internacional de Zoonosis (CIZ) at Universidad Central del Ecuador Museum.

Sabethes (Peytonulus) soperi Lane & Cerqueira, 1942

Label #: ECU-N-CCh-CDC8-122 (F). Date of Collection: 12/II/2015.

ID Characters: “thorax with upper proepisternal and lower mesokatepisternal setae; legs without paddles, midleg entirely dark-scaled; most species with conspicuous white scaling on ventral surface of hindtarsomere 5” as Subgenus *Peytonulus* [16]. Then, “Propleurals present; legs without paddles formed by long scales, mid tarsi dark; proboscis thick, shorter than fore femur, the apical third strongly thickened; mesonotum quite elongate and twice as long as wide, root of wing with yellowish setae, ventral surface of proboscis with a bronzy or white stripe, proboscis with a white spot in the middle or distal third of ventral surface; mesonotum green, golden or blue, fifth hind tarsi white below; mesonotum golden green” [22, 23].

Geographic distribution: Brazil (Type locality: Pirajá, Bahia), Bolivia, Argentina [11].

Locality in ECU, data: Napo Province, National Reserve Colonso-Chalupas, Ecuador.

Adult collected in CDC light traps with dry ice attractant. Altitude: 1,300 m; Coordinates 00°56'09.8" S; 077°54'12,3 W.

Coll.: S. Enríquez, C. Pérez, P. Duque, Y. Campaña, E. Villacrés, J. Vieira; Det.: J.C. Navarro.

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