

Generic diversity of the predaceous fungus gnats (Diptera: Keroplatidae) from Colombia

Diversidad genérica de las mosquitas depredadoras de los hongos (Diptera: Keroplatidae) de Colombia

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ABSTRACT

Keroplatidae is a family of Diptera that is poorly known and with scarce previous studies in Colombia, with only five species in four genera, and another five genera with non-identified species. This paper provides an extensive revision of the Keroplatidae from Colombia, with specimens collected along different altitudinal gradients, from Amazonian areas to Andean mountains. We found 17 genera, nine of these represent new records for Colombia (*Cerotelion*, *Heteropterna*, *Placoceratias*, *Platyroptilon*, *Lapyruta*, *Micrapemon*, *Plautyura*, *Pyrraula* and *Xenoplatyura*). Additionally, the distribution in Colombia is extended for the genera *Isoneuromyia*, *Keroplatus*, *Lyprauta*, *Macrocera*, *Neoceroplatus*, *Neoditomyia*, *Neoplatyura* and *Proceroplatus*. For each genus we present a diagnosis, annotations of their biology based on literature and new field observations, and a distribution map.

Keywords: Amazonian areas, Andean mountains, Sciaroidea, taxonomy.

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RESUMEN

Keroplastidae es una familia de Diptera poco conocida y con escasos estudios en Colombia, con registro de solo cinco especies distribuidas en cuatro géneros y otros cinco géneros con especies no identificadas. Proveemos una extensa revisión de la familia Keroplastidae para Colombia, con especímenes colectados a lo largo de diferentes gradientes altitudinales, desde áreas amazónicas hasta montañas de los Andes. Se encontraron 17 géneros, nueve de estos son nuevos registros para Colombia (*Cerotelion*, *Heteropterna*, *Placoceratias*, *Platyroptilon*, *Lapyruta*, *Micrapemon*, *Plautyura*, *Pyrtaula* y *Xenoplautyura*). Adicionalmente, se amplía la distribución en Colombia para los géneros *Isoneuromyia*, *Keroplatus*, *Lyprauta*, *Macrocera*, *Neoceroplatus*, *Neoditomyia*, *Neoplautyura* y *Proceroplatus*. Para cada género presentamos una diagnosis, anotaciones de su biología, basados en literatura y nuevas observaciones realizadas en campo, y un mapa de distribución.

Palabras clave: Áreas amazónicas, montañas de los Andes, Sciaroidea, taxonomía.

INTRODUCTION

Keroplastidae is a dipterous family with small to medium size (3–15 mm), that can be recognized by their cylindrical or modified antennae (dorsoventrally flattened or lamellated), regularly composed of fourteen flagellomeres, although they can reach of several times the length of their body (Macrocerinae), and by their wing venation, with presence of a short R_4 vein ending in R_1 or C; and with veins R and M in contact or briefly fused, resulting in the absence of the transverse vein r-m (Vockeroth 2009, Falaschi 2016). This group has cosmopolitan distribution comprising seven subfamilies: the classically known Arachnocampinae, Macrocerinae, Keroplastinae, and Sciarokeroplastinae (Matile 1990, Ševčík *et al.* 2015, Mantič *et al.* 2020), and three new subfamilies recently established based on molecular phylogenetic results and fossil records: Platyurinae, Lygistorrhinae, and Adamacrocerinae (Mantič *et al.* 2020, Ševčík *et al.* 2020). There are 92 genera and approximately 1000 described species in the family (Evenhuis 2006, Ševčík 2009, 2012, Mantič *et al.* 2020). The highest species richness is for the Palearctic region with 243 species in 30 genera, having the Neotropics 204 species in 31 genera (Papavero 1978, Evenhuis 2006, Falaschi *et al.* 2019, Mantič *et al.* 2020). In Colombia, studies are very scarce, with records of only five described species in four genera and two subfamilies (Macrocerinae and Keroplastinae), and five more genera with undescribed species (Falaschi 2016).

The biology of most keroplastids remains unknown. The larvae are predatory in some genera of Orfeliini, and mycophagous in Keroplastini and Macrocerinae, most often in wood-decaying mushrooms, e.g. Hapalopilaceae and Polyporaceae (Mansbridge 1933, Matile 1997, Ševčík 2006, Rindal *et al.* 2008), with some records of cannibalism, myrmecophagy and endoparasitism (Hickman 1965, Evenhuis 2006). The adults of some genera have been described as floral visitors (Chandler 1977, Chandler *et al.* 2005, Falk and Chandler 2005, Bechev 2010), with one species, *Xenoplautyura conformis* Skuse, 1888, reported pollinating *Pterostylis* Brown, 1810 orchids by sexual deception (Reiter *et al.* 2019).

According to their ecology, they are mainly reported in humid tropical forests at low altitudes, in places such as caves and slippery holes in banks, under rocks or fallen logs, banks of streams in forests, as well as in understory vegetation and on fungi (Meyer-Rochow 1999, 2007, Evenhuis 2006). The five Keroplastidae species recorded in Colombia by Falaschi (2016) have been found mainly in high altitude ecosystems such as *Macrocera matilei* Papavero, 1978, at 3000 meters above sea level (m.a.s.l.); *Neoditomyia colombiana* Lane and Sturm, 1958, between 1600 - 2000 m.a.s.l.; and *Neoditomyia andina* Lane and Sturm, 1958, found in low altitudes between 400 - 500 m.a.s.l.; finally, *Paramacrocera lanei* Matile, 1990 and *Lyprauta zetekyi* Lane, 1950 which lack specific locality data. Additionally, Falaschi (2016) reported five other genera with undescribed species, between 130 - 1960 m.a.s.l. (*Isoneuromyia* Brunetti, 1912; *Neoceroplatus* Edwards, 1941; *Procerop-*

platus Edwards, 1925; *Keroplatus* Bosc, 1792; and *Neoplatyura* Malloch, 1928) from three localities in Colombia. This study aims to update the generic Keroplatidae records from Colombia by studying specimens from fieldwork and biological collections, providing for each genus a diagnosis, remarks, information about its biology, and an updated distribution in Colombia.

MATERIALS AND METHODS

Sampling

The study was based on specimens collected between 2016 and 2019 in the peri-urban High Andean Forest at 2000 m.a.s.l., and in two paramo complexes from the high Central Andes between 2720 - 3400 m.a.s.l. (Fig. 1) in three vegetation types (paramo, forest, and grassland). The specimens are deposited in the Colección Entomológica Universidad de Antioquia (CEUA), Medellín. In addition, we examined specimens from the Instituto de Investigaciones Biológicas Alexander von Humboldt (IAvH), Villa de Leyva. These specimens were collected in National Natural Parks (PNN), Fauna and Flora Sanctuaries (SFF), and Natural Reserves (RN) distributed in 20 departments of Colombia, which were sampled with Malaise traps, except for a couple done with canopy Malaise and emergence traps.

Taxon treatments

The specimens were identified at the generic level following keys available for subfamilies, tribes, and genera (Edwards 1929, Lane 1950, Freeman, 1951, Vockeroth 1981, Matile 1990, Vockeroth 2009, Ševčík *et al.* 2015). Photographs of the habitus and wings representing the subfamilies, tribes, and genera, were taken with a Moticam 5MP digital camera adapted to an Olympus SZx7 stereomicroscope. The photos were taken at different focal levels, and then combined by stacking into a single image using Helicon Focus 6.7.2 software and were edited with Adobe Photoshop CS6.

Distribution maps of the genera were made with QGIS 3.12.3 software, with the Colombian departments and the terrestrial ecoregions of the world (Olson *et al.*, 2001) to determine the ecological characteristics of the areas inhabited by the specimens.

RESULTS

A total of 452 specimens were identified in two subfamilies, three tribes, and 17 genera, nine of which are new records from Colombia: *Cerotelion* Rondani, 1856, *Heteropterna* Skuse, 1888, *Placoceratias* Enderlein, 1910, *Platyroptilon* Westwood, 1850, *Lapyruta* Edwards, 1929, *Micrapemon* Edwards, 1925, *Plautyura* Edwards, 1941, *Pyrtaula* Edwards, 1929, and *Xenoplatyura* Malloch, 1928 (Table 1).

Macrocerinae Rondani, 1856

Macrocerini Rondani, 1856

Macrocera Meigen, 1803

(Figs. 2a, 3a)

Diagnosis. Distinctive head callus; antenna about the same length of the body or longer; setose anepisternum; three ocelli; membrane of the wing with macrotrichia; CuA and M4 convergent at the base and divergent towards the apex; vein CuP reaching wing margin; apex of the middle and posterior tibia without fine spine combs; tibial setae in regular rows (Vockeroth 1981, Matile 1990, Vockeroth 2009).

Biology. The biology of this genus is predatory (Matile 1990). Specimens were mainly found in forest with closed canopies and paramo vegetation types, rocky soil forming small cavities and next to small streams (Fig. 1). Additionally, in the field, three specimens were associated with *Alpinia* Roxb, 1810 (Zingiberaceae) in one locality of the municipality of Envigado, Antioquia at 1700 m.a.s.l.

Remarks. Before this work, only one female of *M. matilei* Papavero, 1978 was recorded from Colombia without a specific locality (Papavero 1978). In this work we recorded three more unidentified species, being the first records with specific localities in the country for Antioquia and Santander departments (Fig. 4b).

Examined material. COLOMBIA. Antioquia: one female, **Belmira**, El Morro, 6.642983N -75.667603W, 3005-3080m, Bosque, trampa Malaise suelo, 04-14.ii.2017, J. Torres and A. Montoya (CEUA: 97279); two males, same data except: 6.641399N -75.667205W, 2970-3020m, Pastizal, trampa Malaise dosel, 04-14.xii.2016 (CEUA: 106439, 106493); one male, one female, same data

Table 1. Keroplatidae subfamilies, tribes and genera identified from Colombia, with world distribution (based on Papavero 1978, Matile 1982, 1990, Bechev 2000, Evenhuis 2006, Vockeroth 2009, Mederos 2018, Falaschi 2016, Falaschi *et al.* 2019, Huerta 2019).

Subfamily	Tribe	Genus	World distribution (species number)	Neotropical distribution (species number)	
Macrocerinae	Macrocerini	<i>Macrocera</i> Meigen, 1803	AFR (24), AUS (24), NEA (24), NEO (25), OR (25), PAL (72)	Arg (13), Bra (7), Chl (10), Col (4), Cri (1), Dma (1), Ecu (1), Glp (1), Jam (0), Mex (0), Pan (0), Per (1), Vgb (1)	
		<i>Paramacrocera</i> Edwards, 1927	AUS (1), NEO (2)	Arg (1), Col (1)	
Keroplatinae	Keroplatini	* <i>Cerotelion</i> Rondani, 1856	AUS (7), NEA (1), NEO (2), OR (1), PAL (2)	Arg (1), Col* (1), Chl (2)	
		* <i>Heteropterna</i> Skuse, 1888 (Including Ctenoceridion)	AFR (3), AUS (9), NEA (1), NEO (11), OR (4), PAL (2)	Arg (1), Bra (4), Col* (2), Cub (1), Jam (2), Mex (1), Pan (1), Per (1), Tto (2)	
		<i>Keroplatus</i> Bosc, 1792	AFR (2), AUS (1), NEA (4), NEO (10), OR (1), PAL (9)	Arg (3), Bra (2), Col (3), Cub (1), Mex (2), Pan (2), Pry (1), Tto (2)	
		<i>Neoceroplatus</i> Edwards, 1941	NEA (1), NEO (12)	Arg (3), Bra (8), Cri (1), Col (4), Dma (1), Glp (1), Pan (2), Per (2)	
		* <i>Placoceratias</i> Enderlein, 1910	NEO (7)	Arg (1), Blz (0), Bra (5), Col* (2), Dma (1), Glp (1), Pan (3), Mex (0), Per (1), Tto (1), Vct (1), Vgb (1)	
		* <i>Platyroptilon</i> Westwood, 1850	AUS (2), NEO (9), OR (2)	Arg (2), Bra (4), Col* (2), Ecu (2), Per (4)	
	Keroplatinae	Orfelliini	<i>Isoneuromyia</i> Brunetti, 1912	AUS (3), NEA (4), NEO (21), OR (21), PAL (4)	Arg (2), Bol (1), Bra (11), Col (4), Chl (2), Cri (2), Mex (1), Per (3)
			* <i>Lapyruta</i> Edwards, 1929	NEO (2)	Bra (1), Col* (1), Vgb (1)
			<i>Lyprauta</i> Edwards, 1931	AFR (4), NEA (12), NEO (9), PAL (1)	Arg (3), Blz (0), Bra (5), Col (4), Cri (1), Dma (2), Glp (2), Grd (1), Jam (0), Lca (2), Pan (1), Per (2), Tto (2), Vgb (1)
			* <i>Micrapemon</i> Edwards 1925	NEO (3)	Arg (1), Bhs (0), Bra (2), Col* (1), Cri (0), Dma (1), Ecu (1), Glp (1), Jam (1), Mex (1), Per (1), Vct (1), Ven (1), Vgb (1)
			<i>Neoditomyia</i> Lane and Sturm, 1958	NEO (7)	Blz (1), Bra (1), Col (3), Cub (1), Dma (1), Jam (1)
			<i>Neoplatyura</i> Malloch, 1928	AFR (5), AUS (20), NEA (2), NEO (10), OR (2), PAL (11)	Arg (1), Bra (4), Col (4), Cri (1), Cym (1), Dma (2), Glp (3), Jam (1), Lca (2), Mex (7), Pan (1), Per (1), Pri (1), Tto (1), Vgb (2)
			* <i>Plautyura</i> Edwards, 1941	NEO (9)	Arg (2), Bra (7), Col* (2), Pan (2), Per (1), Tto (3)
<i>Proceroplatus</i> Edwards 1925	AFR (3), AUS (5), NEA (3), NEO (24), OR (4), PAL (1)	Arg (2), Bol (1), Bra (7), Col (5), Cri (4), Dma (2), Dom (1 extinct), Ecu (1), Glp (2), Jam (1), Mex (1), Pan (2), Peru (2), Pri (1), Sur (1), Tto (3), Vct (1), Vgb (1)			
* <i>Pyrtaula</i> Edwards, 1929	AUS (15), NEA (5), NEO (9)	Arg (4), Chl (6), Col* (2), Cri (1), Ecu (1), Mex (2)			
		* <i>Xenoplatyura</i> Malloch, 1928	AFR (24), AUS (6), NEO (11), OR (5), PAL (5)	Arg (2), Bra (4), Col* (2), Dma (1), Glp (1), Pan (2), Tto (3)	

(*) New record for Colombia. Species number = (0) indicates records of the genus in that country without identified species reported. Abbreviations of biogeographic regions and countries: AFR: Afrotropical; AUS: Australasian; NEA: Nearctic; NEO: Neotropical; OR: Oriental; PAL: Palearctic; Arg: Argentina; Bhs: Bahamas; Blz: Belize; Bra: Brazil; Bol: Bolivia; Chl: Chile; Col: Colombia; Cri: Costa Rica; Cub: Cuba; Cym: Cayman Islands; Dma: Dominica; Dom: Dominican Republic; Ecu: Ecuador; Glp: Guadeloupe; Grd: Grenada; Jam: Jamaica; Lca: Saint Lucia; Mex: Mexico; Pan: Panama; Per: Peru; Pri: Puerto Rico; Pry: Paraguay; Sur: Suriname; Tto: Trinidad and Tobago; Vct: Saint Vincent and the Granadines; Ven: Venezuela; Vgb: British Virgin Islands.

except: Laguna de Sabanas, 6.640907N - 75.635719W, 3200m, Paramo, trampa Malaise, 28-31.v.2016, C. Henao-Sepúlveda, A. Montoya, M. Wolff (CEUA: 93468, 93522); one male, same data except: 6.634233N - 75.658654W, 2980-3050m, Bosque, trampa de emergencia, 04-14.xii.2016, J. Torres and A. Montoya (CEUA: 97157); one female, same data except: trampa Malaise dosel (CEUA: 106461); one male, same data except: trampa Malaise suelo, 04-14.ii.2017 (CEUA: 97306); one female, same data except: 6.632639N - 75.645267W, 3190-3205m, Paramo, 21-30.vi.2017 (CEUA: 106463); one male, same data except: trampa Malaise dosel, 25.iii.05.iv.2017 (CEUA: 106531). 18 males, **Ciudad Bolívar**, Faralones de Citará, 5.768805N - 76.051194W, 3200m, Paramo, trampa Malaise, 18-22.xi.2013, C. Henao-Sepúlveda (CEUA: 94149, 94151, 94153, 94176, 94234). one female, **El Retiro**, Parcelación Fizebad, Quebrada La Cebolla, 6.099831N - 75.507887W, 2150m, Quebrada, trampa de emergencia, 07-21.iii.1983, M. Wolff (CEUA: 93852); one female, same data except: 05-20.vi.1983 (CEUA: 94156). one male/one female, **Envigado**, La Sebastiana, Clara-

val, 6.1653N - 75.569W, 1700m, trampa de Luz Blanca, 17.vii.2015, C. Henao-Sepúlveda (CEUA: 93701); one female, same data except: Loma del Escobero, Nubarrones, 6.139736N - 75.5538545W, 2000m, Bosque, trampa Malaise, 01-07.x.2016, M. Wolff and C. Henao-Sepúlveda (CEUA: 97080); one male/one female, same data except: 04-18.iii.2018 (CEUA: 97395, 97379); one male/one female, same data except: 01-14.iv.2018 (CEUA: 106459, 106444); one male/two female, same data except: 14-30.iv.2018 (CEUA: 106447, 106448); one female, same data except: 15-30.vii.2017 (CEUA: 106471); one female, same data except: 03-17.vi.2018 (CEUA: 106481); one female, same data except: 26.ii-12.iii.2017 (CEUA: 106489); two males/one female, same data except: 17.vi-08.vii.2018 (CEUA: 106508); one male/three females, same data except: 20.vii-07.viii.2018 (CEUA: 106509); one male/four females, same data except: 30.xii.16-12.i.2017 (CEUA: 106510); one female, same data except: 03-20.x.2018 (CEUA: 118366); one male/four females, same data except: 24.viii-16.ix.2018 (CEUA: 118368); two males/one female, same data except: 15.ix-03.x.2018 (CEUA:

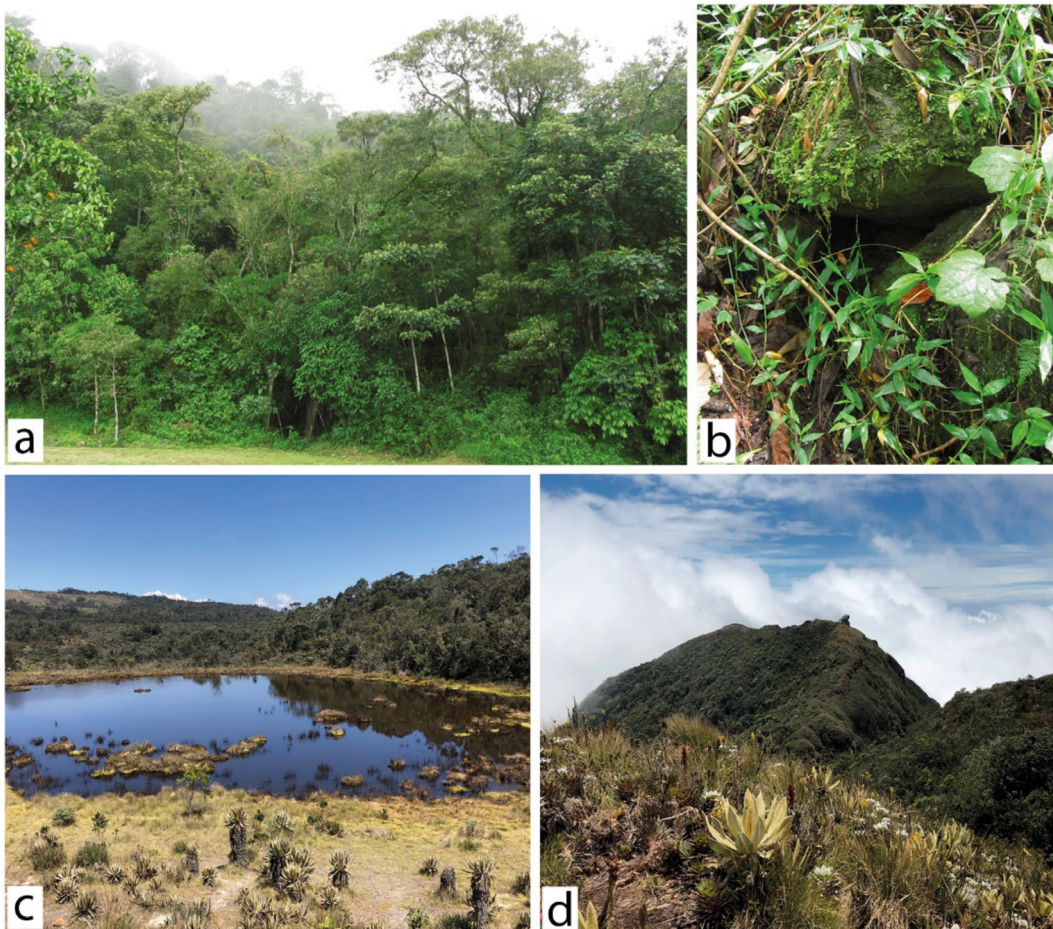


Figure 1. Sampling localities of Keroplastidae specimens in Colombia: A) High Andean Forest, municipality of Envigado (Nubarrones); B) rocky soil cavity in the municipality of Envigado (Nubarrones), C) municipality of Belmira, Santa Inés Paramo; D) municipality of Sonsón, Palomas mountain, paramo of Sonsón.

118371); one male/one female, same data except: Planta de tratamiento de aguas La Ayurá, Quebrada La Ayurá, 6.1650142N - 75.5648694W, 1750m, trampa de emergencia, 08.viii.1983, M. Wolff (CEUA: 93653); two females, same data except: 23.vi.1983 (CEUA: 93668); one female, same data except: 29.ix.1983 (CEUA: 93820); one male, same data except: 03.iii.1984 (CEUA: 93996); two males/one female, same data except: Urbanización Claraval, 6.165126N - 75.572246W, 1700m, manual, 05.vi.2021 (CEUA: 109642, 109643, 109644). One male, **Medellín**, Corregimiento Santa Elena, Parque Ecológico Piedras Blancas, 6.2951345N - 75.5035934W, 2400m, Bosque, red entomológica, 11.vii.2013, J.A. Rafael, J.T.C. Camará and J. Xavier (CEUA: 94069); two males, same data except: 2407m, 03.vii.2013, J.A. Rafael (CEUA: 106527); one female, same data except: 6.28705N - 75.51295W, 2300m, Borde Lago, trampa Malaise, 26.viii-02.ix.2016, D. Cardona and J. Ramirez (CEUA: 97070). One female, **San José de La Montaña**, Vereda El Congo, Paramo El Congo, 6.762229N - 75.723144W, 3165-3190m, Paramo, plato color azul, 04-15.xii.2016, A. Sepúlveda and C. Henao-Sepúlveda (CEUA: 97366); one male/two female, same data except: red entomológica, 02-13.xii.2017 (CEUA: 97369, 118347); two females, same data except: trampa Malaise suelo (CEUA: 106457, 106458); one male, same data except: plato color amarillo (CEUA: 97387); two males/three females, same data except: red entomológica, 04-14.ii.2017 (CEUA: 97372, 97385, 97530, 106514, 118354); two males/one female, same data except: 25.iii-05.iv.2017, C. Henao-Sepúlveda, M. Wolff and A. Sepúlveda (CEUA: 106530, 106511); one male, same data except: trampa Malaise dosel, 20-30.vi.2017, A.L. Montoya and A. Sepúlveda (CEUA: 106529); three males/one female, same data except: 6.764901N - 75.70946W, 2980-3045m, Bosque, red entomológica, 04-14.ii.2017, A. Montoya and C. Henao-Sepúlveda (CEUA: 97227); two females, same data except: C. Henao-Sepúlveda and A. Sepúlveda (CEUA: 97382); one female, same data except: trampa de emergencia, 20-30.vi.2017, A.L. Montoya and A. Sepúlveda (CEUA: 106520); one female, same data except: 6.764743N - 75.719372W, 3080-3120m, Pastizal, red entomológica, 02-13.xii.2017, C. Henao-Sepúlveda and A. Sepúlveda (CEUA: 97369). Three males, **San Vicente Ferrer**, Vereda Chaparral, Finca la Mosca, 6.265814N - 75.360082W, 2200m, Bosque, trampa Malaise, 19-21.iv.2010, I. Ceballos, A. Bustamante and M. Wolff (CEUA: 97380). One male, **Sonsón**, Vereda las Tres Cruces, 5.7024722N - 75.2539167W, 3000m, trampa Malaise, 01-15.viii.2010, L. Ríos (CEUA:

106443); one male, same data except: Vereda Norí, Cerro Norí, 5.809667N-75.269028W, 2860-2940m, Bosque, trampa Malaise suelo, 23.vi-02.vii.2018, J. Saucedo and J. Vallejo-Sosa (CEUA: 106526); one male, same data except: trampa Malaise dosel, 09-19.ii.2019, J. Saucedo, I. Ceballos, A. Mejía (CEUA: 118355); two males, same data except: 5.812861N - 75.268444W, 3010-3055m, Paramo, trampa Malaise dosel, 24.v-04.vi.2019, J. Saucedo and M. Posada (CEUA: 118365); one male, same data except: Vereda San Francisco, Cerro Las Palomas (A), 5.727096N - 75.257001W, 2900-2955m, Bosque, trampa Malaise suelo, 01-12.ix.2018, M.I. Salinas, A.M. Echeverry, J. Saucedo (CEUA: 118359); one male, same data except: Cerro Las Palomas (B), 5.726718N - 75.256032W, 2955-3000m, 23.vi-02.vii.2018, J. Saucedo and J. Vallejo-Sosa (CEUA: 106532); one male, same data except: 01-06.iv.2018, A.L. Montoya (CEUA: 118357); one female, same data except: 5.726238N - 75.250544W, 3170-3260m, Paramo, 01-12.ix.2018 (CEUA: 118360), M.I. Salinas, A.M. Echeverry, J. Saucedo. **Santander**: three females, **Cimitarra**, Puerto Olaya, Central Termocentro Isagen, 6.46771N - 74.390094W, 100-110, Bosque, trampa Malaise, 28.iv-01.v.2015, Y. Carmona (CEUA: 93825).

Paramacrocera Edwards, 1927

Diagnosis. Cerebral sclerite present but incomplete; short antennae with flagellomeres almost moniliform; long anepisternal bristles present; one anterior tibial comb; empodium and pulvili present; wing macrotrichias present or absent (Tonnoir and Edwards 1927, Matile and Vockeroth 1980, Matile 1990).

Remarks. *Paramacrocera lanei* Matile, 1990 was described by Matile (1990) from Colombia, from one specimen collected in 1955 according to the collection data in the original description, but without specific locality. Species representing the genus had not been recorded since from Colombia. Images of this genus have not been provided in the literature.

Keroplastinae Rondani, 1856

Keroplastini Rondani, 1856

Cerotelion Rondani, 1856

(Figs. 2b, 3b)

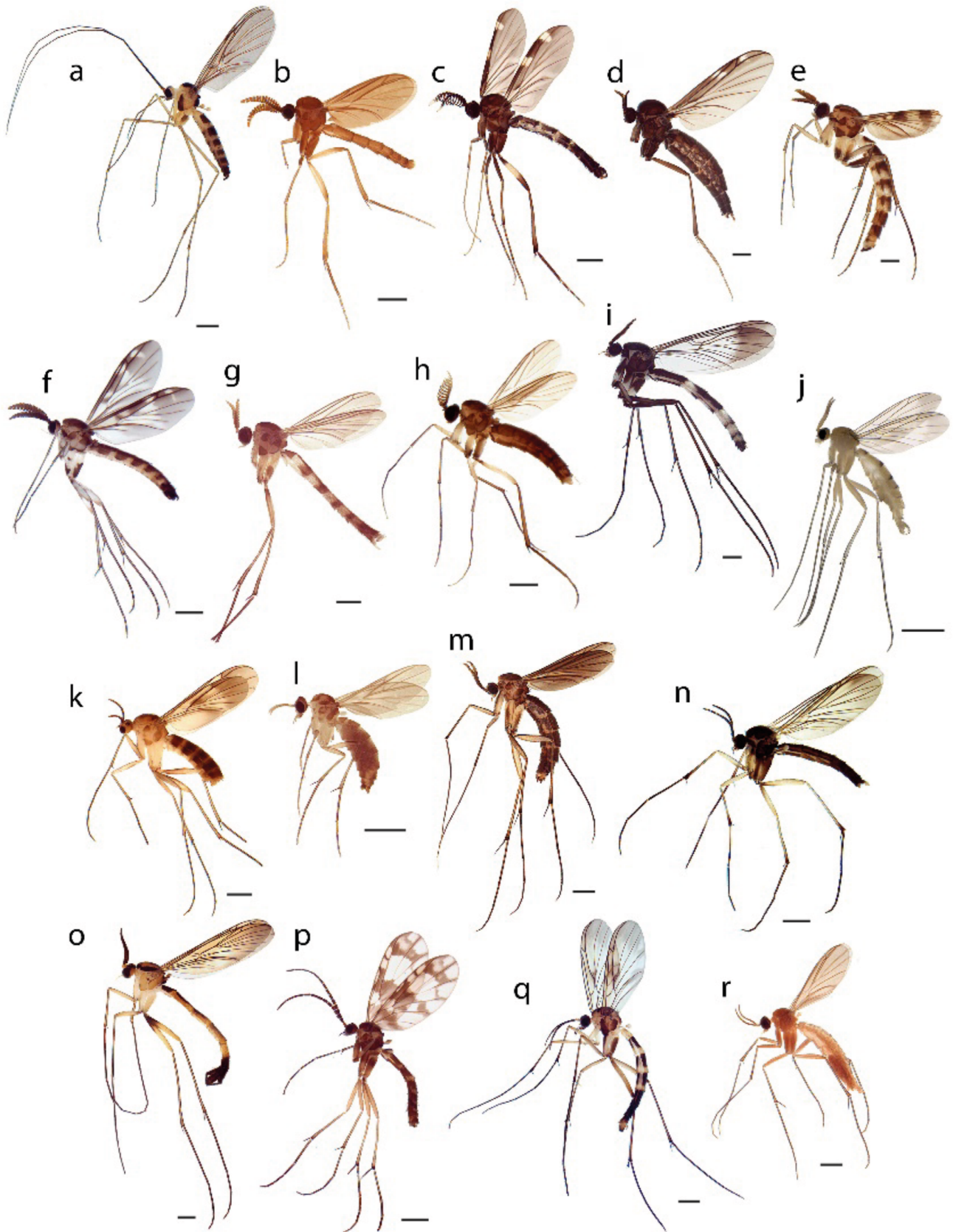


Figure 2. Habitus of Keroplatidae genera from Colombia. a. *Macrocera*, b. *Cerotelion*, c-d. *Heteropterna*, e. *Keroplatus*, f. *Neoceroplatus*, g. *Placoceratias*, h. *Platyroptilon*, i. *Isoneuromyia*, j. *Lapyruta*, k. *Lyprauta*, l. *Micrapemon*, m. *Neoditomyia*, n. *Neoplatyura*, o. *Plautyura*, p. *Proceroplatus*, q. *Pyrtaula*, r. *Xenoplatyura*. Scale bar: 1mm.

Diagnosis. Wide face; non-pectinate antennae, flagellum with flagellomeres compressed and widened; last flagellomere without apiculus; two ocelli; naked pleurites; narrow membranous subscutellar area; strongly sclerotized CuP but weak at the apex, R_{2+3} ending in C; irregular tibial setae, except sometimes at the apex (Matile 1990, Ševčík *et al.* 2015).

Biology. Specimens were collected and associated with well-preserved forested areas, particularly in high mountain cloud forests dominated by *Quercus humboldtii* Bonpl., and with wet transitional habitats between these forests and dry forests of lowlands.

Remarks. This is the first record of this genus from Colombia (Fig. 4a), with one undescribed species.

Examined material. COLOMBIA. Huila: one male, **PNN Cueva de los Guácharos**, Cabaña Cedros, $1^{\circ}37'S - 76^{\circ}6'W$, 1950m, trampa Malaise, 20.iv-05.v.2003, C. Cortés (IAvH-E-191334); one male, same data except: 2100m, 06–20.iii.2002, J. Fonseca (IAvH-E-155601).

Heteropterna Skuse, 1888

(Figs. 2c-d, 3c-d)

Diagnosis. Strongly pectinate antenna or antennal flagellomeres with ventral processes at most twice as long as dorsal processes, not pectinate. If pectinate, apex of antennal processes without one single long and conspicuous bristle; three ocelli; membranous area of mediotergite at base large and triangular; strong vein CuP, strongly sclerotized; tibial setae in irregular rows (Matile 1990, Vockeroth 2009, Ševčík *et al.* 2015).

Biology. The specimens were associated mainly with well-preserved closed forested areas and rocky soil forming small cavities (Fig. 1b), principally in montane forests in the Central and Oriental Andes, and with the piedmont dry forests and the Llanos grasslands of the Orinoco basin, as well as with the forests of the isolated Santa Marta Mountain, which is also a transitional habitat between dry forests and the peaks of the Andes. They were also recorded in areas of anthropogenic activity, such as grasslands.

Remarks: this is the first record of this genus in Colombia (Fig. 4a), with three undetermined species. Until recently, the specimens with pectinate antennae were group-

ped within the genus *Ctenoceridion* Matile, 1972, however, Mantič *et al.* (2020) proposed *Ctenoceridion* as a junior synonym of *Heteropterna* based on phylogenetic analyses and similarities in the structures of the male genitalia. The current taxonomy is followed here.

Examined material. COLOMBIA. Antioquia: one female, **Belmira**, El Morro, $6.642983N - 75.667603W$, 3005-3080m, Bosque, trampa Malaise suelo, 04-14.ii.2017, A.L. Montoya and J. Torres-Toro (CEUA: 106490), one female, same data except: $6.641399N - 75.667205W$, 2970-3020m, Pastizal, 02-12.xii.2017, C. Rodríguez and A. Echeverry (CEUA: 118346). Two females, **Envigado**, Loma del Escobero, Parcelación Nubarrones, $6.139736N - 75.5538545W$, 2000m, Bosque, trampa Malaise, 12-27.xi.2016, M. Wolff and C. Henao-Sepúlveda (CEUA: 97247, 97374); one male, same data except: 04-18.iii.2018 (CEUA: 97396). One male, **Sonsón**, Vereda San Francisco, Cerro Las Palomas (A), $5.726901N - 75.263412W$, 2720-2745m, Pastizal, trampa Malaise dosel, 01-12.ix.2018, M.I. Salinas, A.M. Echeverry, J. Saucedo (CEUA: 106528). **Meta:** one male, **PNN Sierra de la Macarena**, Caño Curía, $3^{\circ}21'N - 72^{\circ}38'W$, 150m, trampa Malaise, 12.x-12.xi.2003, W. Villalba (IAvH-E-191329). **Norte de Santander:** one male, **Toledo**, PNN Tamá, Vda. Quebradagrande, Fca. El Porvenir, $7^{\circ}30'N - 72^{\circ}32'W$, 2628m, trampa Malaise, 28.iv-05.v.2004, C. Leal (IAvH-E-191256), one male, same data except: Vda. Toledito, Acueducto de Toledo, $7^{\circ}20'N - 72^{\circ}29'W$, 2125m, 19–28.viii.2003 (IAvH). **Vaupés:** two males, Estación Biológica, Centro Ambiental, $1^{\circ}4'S - 69^{\circ}31'W$, 60m, trampa Malaise, 20.i-01.ii.2003, M. Sharkey and D. Arias (IAvH-E-155497, 155746); one male, same data except 18–27.iii.2003, L. Benavides (IAvH-E-155607).

Keroplatus Bosc, 1792

(Figs. 2e, 3e)

Diagnosis. Wide face; short terminal palpomere, slender or more or less dilated, swollen; flagellum with flagellomeres compressed and widened; two ocelli; setose anepisternum, laterotergite and metepisternum; anterior spiracle with rows of setae; naked posterior spiracle; triangular and narrow membranous area of the mediotergite (isosceles triangle), but no dividing the mediotergite (V form); R_{2+3} ending in R_1 ; tibial trichia in regular rows (Matile 1990, Vockeroth 2009, Ševčík *et al.* 2015).

Biology. Specimens were found associated only with forested habitats of closed canopies in protected areas, mainly with montane forests of the Cauca Valley and Northern Andes, highly diverse areas that are important centers of endemism, with the last one having the influence of the piedmont dry forests and the Llanos grasslands of the Orinoco basin, and with species associations shared with the Santa Marta mountains. Additionally, one specimen was recorded in moist forests of the Chocó-Darien region.

Remarks. *Keroplatus* is similar to the genus *Neoceroplatus*, but they differ most obviously by the size of the palps, which in *Keroplatus* are shorter than the length of the face and the clypeus together, whereas in *Neoceroplatus* the palps are slender and longer than the length of the face and the clypeus. Before this work, two males of an undescribed species were recorded in the PNN Gorgona (Falaschi 2016), here, we recorded two additional non-identified species, being the first records of the genus for Antioquia, Norte de Santander and Risaralda (Fig. 4a).

Examined material. COLOMBIA. Antioquia: one male, **Carepa**, Estación Biológica Tulenapa, 7.7727083N - 76.6683W, 20m, Bosque, Manual, 14-16.x.2017, Grupo de Entomología Universidad de Antioquia (CEUA: 97393). **Norte de Santander:** one male, **Toledo**, PNN Tamá, vereda Toledito, Acueducto de Toledo, 7°20'N - 72°29'W, 2125m, bosque, trampa Malaise, 19-28.viii.2003, C. Leal (IAvH-E-154014). **Risaralda:** one male, **SFF Otún Quimbaya**, Cuchilla Camino, 4°43'S - 75°35'W, 2050m, bosque, trampa Malaise, 17.xii.2002 - 03.i.2003, R. Walker (IAvH-E-154016).

Neoceroplatus Edwards, 1941

(Figs. 2f, 3f)

Diagnosis. Slender and long terminal palpomere; flagellum with flagellomeres compressed, more wider than long; last flagellomere with an apical process, light in color and usually long; setose anepisternum and laterotergite; triangular and narrow membranous area of mediotergite (isosceles triangle), with the top of the triangle extending and dividing the mediotergite (Y form); R_{2+3} ending in R_1 ; tibial trichia in regular rows, at least in the apical third (Matile 1990, Vockeroth 2009, Ševčík *et al.* 2015).

Biology. Data about the biology of this genus were provided by Falaschi *et al.* (2019), when describing a new

species from Brazil, *Neoceroplatus betaryiensis*, reporting for the first time bioluminescence in the larvae of this genus. The larvae are very active, especially at night, and are usually found on fallen branches or tree trunks. Some larvae were also spotted in association with mycelium of polyporaceous fungi. Pupae are also bioluminescent. In the same study, the authors report a case of parasitoidism by an ichneumonid wasp emerged from a pupa (Falaschi *et al.* 2019). The examined specimens from Colombia were primarily associated with dense canopy forests and rocky soils forming small cavities (Figs. 1a-b), inhabiting mainly montane forests of the Colombian Andes, with just a few records in paramo areas. However, there are also records in moist forests of the Chocó-Darien and Amazon regions.

Remarks. Before this work, two males of an undescribed species were recorded for the Natural Reserve La Planada in Nariño (Falaschi 2016). Here, we record three more unidentified species, extending the distribution of the genus for Antioquia, Boyacá, Meta, Norte de Santander, Putumayo, Valle del Cauca, and Vaupés (Fig. 4c).

Examined material. COLOMBIA. Antioquia: one female, **Envigado**, Loma del Escobero, Parcelación Nubarones, 6.139736N - 75.5538545W, 2000m, Bosque, trampa Malaise, 01-07.x.2016, M. Wolff and C. Henao-Sepúlveda (CEUA: 97091); one male, same data except: 12-27.xi.2016 (CEUA: 97261); two males, same data except: 17-30.xii.2016 (CEUA: 106469, 106470); one male/two females, same data except: 29.i-11.ii.2017 (CEUA: 106477, 106475); one female, same data except: 11-26.ii.2017 (CEUA: 106466); three females, same data except: 12-25.iii.2017 (CEUA: 106486); one male, same data except: 25.iii-10.iv.2017 (CEUA: 106480); one male, same data except: 10-22.iv.2017 (CEUA: 106485); one male, same data except: 27.v-10.vi.2017 (CEUA: 97370); one male/three females, same data except: 15-30.vii.2017 (CEUA: 106472); one female, same data except: 04-18.iii.2018 (CEUA: 97378). one male, **San José de La Montaña**, Vereda El Congo, Paramo El Congo, 6.762229N - 75.723144W, 3165-3190m, Paramo, trampa Malaise suelo, 02-13.xii.2017, C. Henao-Sepúlveda and A. Sepúlveda (CEUA: 106456). one male, **Sonsón**, Vereda San Francisco, Cerro Las Palomas, 2928-2977m, Bosque, trampa Malaise suelo, 06-19.iv.2017, A.L. Montoya (CEUA: 106496); one female, same data except: Cerro Las Palomas (B), 5.726718N - 75.256032W, 2955-3000m, 23.vi-02.vii.2018, J. Saucedo and J. Vallejo-Sosa (CEUA: 106494). **Boyacá:** one male, SFF Iguaque, El

Caimo, Sector Chaina, 5°25'N - 73°27'W, 2730m, trampa Winkler, 06–10.xi.2003, A. Roberto (IAvH-E-154726); one male, same data except: Lagunillas, 3380m, trampa Malaise, 16.iv.2002 (IAvH-E-212317). **Chocó:** one male, **PNN Los Katíos**, Centro Administrativo Sautatá, 7°51'N - 77°8'W, 30m, borde de bosque, trampa pitfall, 19–21.viii.2003, P. López (IAvH-E-155549). **Cundinamarca:** one male, **PNN Chingaza**, Charrascales, 4°31'N - 73°45'W, 2990m, trampa Malaise, 31.x-15.xi.2001, L. Cifuentes (IAvH-E-154732). **Meta:** one male, **PNN Sierra de la Macarena**, Caño Curía, 3°21'N - 72°38'W, 150m, trampa Malaise, 31.viii-12.x.2003, W. Villalba (IAvH-E-191287). **Putumayo:** one male, **PNN La Paya**, Loma Baja, 0°6'S - 4°58'W, 320m, trampa Malaise, 16 vi-01.vii.2003, L. Magno (IAvH-E-155570); one male, same data except 18.vi-01.vii.2003, R. Cobete (IAvH-E-154758). **Valle del Cauca:** one male, **Toledo**, PNN Tamá, vereda La Camacha, Pozo Negro, 7°21'N - 72°28'W, 2203m, trampa Malaise, 09–16.x.2003, C. Leal (IAvH-E-154613); three females, **PNN Farallones de Cali**, Anchicayá, 3°26'N - 76°48'W, 730m, trampa Malaise, 16.i.2002 (IAvH-E-212424, 212429, 212426). **Vaupés:** one female, **Taraira**, Estación Biológica Mosiro-Itajura (Caparú), Igapo, 1°4'S - 69°31'W, 60m, trampa Malaise, 10–17.iv.2003, J. Pinzón (IAvH-E-155797); one undetermined, same data except: 18–27.iii.2003 (IAvH-E-154561); one male, same data except: 10-17.iv.2003 (IAvH-E-153944); one male, same data except: 03–18.iii.2003, L. Benavides (IAvH-E-153992); one male, same data except: Centro Ambiental, 18–27.iii.2003 (IAvH-E-153933); one male, same data except: 20.i-01.ii.2003, M. Sharkey and D. Arias (IAvH-E-154064).

Placoceratias Enderlein, 1910

(Figs. 2g, 3g)

Diagnosis. Very narrow face; flagellum with compressed and widened flagellomeres; last flagellomere with an apical process (apiculus); two ocelli; setose anepisternum, laterotergite and metepisternum; very narrow membranous area of mediotergite, linear and transverse, sometimes difficult to see; strong vein CuP at the base but weak at the apex; R_{2+3} ending on C; tibial trichia in regular rows, at least in the apical third (Matile 1990, Vockeroth 2009, Ševčík *et al.* 2015).

Biology. The examined specimens were associated mainly with dense canopy forests in protected areas, with one re-

cord in an urbanized intervening area surrounded by forest habitats. These forests correspond to moist forests of the Chocó-Darien region and moist evergreen tropical rain forests of the Amazon region.

Remarks. This is the first record of the genus from Colombia (Fig. 4a), with two undetermined species.

Examined material. COLOMBIA. **Antioquia:** one male, **Carepa**, Estación Biológica Tulenapa, Zona E, 7.77333N - 76.66263W, 33-55m, trampa emergencia, 21-24.xi.2019, J. Torres-Toro and A.L. Montoya (CEUA: 117802). **Putumayo:** two males/one undetermined, **PNN La Paya**, Loma Baja, 0°6'S - 4°58'W, 320m, trampa Malaise, 16.vi-01.vii.2003, L. Magno (IAvH-E-153965, 155570, 154710); one male, same data except: Loma Alta, 350m, 18.vi-01.vii.2003, R. Cobete (IAvH-E-154652).

Platyroptilon Westwood, 1850

(Figs. 2h, 3h)

Diagnosis. Narrow face; pectinate antennal flagellum, each with one single long and conspicuous bristle; bare pleurotergites but anepisternum sometimes with a very few hairs in the upper part near margin; narrow membranous area of mediotergite, linear and transverse; bare anepisternum; normal anal lobe, not reduced; irregular tibial setae in the basal half and regular at the apex (Matile 1990; Ševčík *et al.* 2015).

Biology. Specimens were associated mainly with forested areas, some with rocky soils forming small cavities (Fig. 1b), others in paramo habitats and grasslands disturbed by anthropogenic activities. The type of forest where they were mostly found corresponds to montane and cloud forests with a wet climate, some of them surrounding the Magdalena Valley, containing transitional habitats between dry forests and high mountains of the north of the Andes.

Remarks. This is the first record for the genus in Colombia (Fig. 4b), with two undetermined species.

Examined material. COLOMBIA. **Antioquia:** one male, **Belmira**, El Morro, 6.641399N - 75.667205W, 2970-3020m, Pastizal, trampa Malaise suelo, 04-14.xii.2016, A.L. Montoya and J. Torres-Toro (CEUA: 97162). One male, **Envigado**, Loma del Escobero, Parcelación

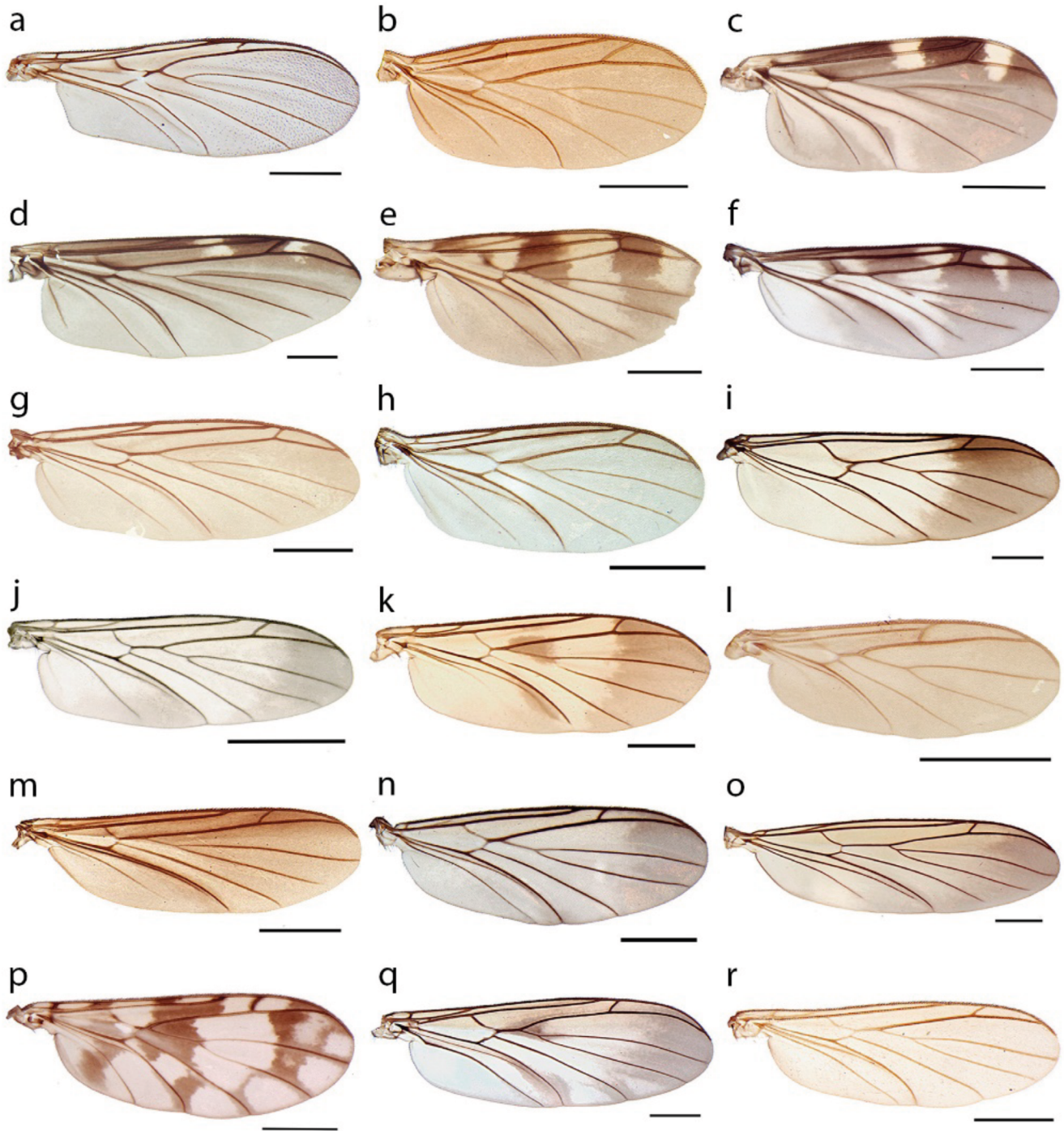


Figure 3. Wings of Keroplatidae genera from Colombia. a. *Macrocera*, b. *Cerotelion*, c-d. *Heteropterna*, e. *Keroplatus*, f. *Neoceroplatus*, g. *Placoceratias*, h. *Platyroptilon*, i. *Isoneuromyia*, j. *Lapyruta*, k. *Lyprauta*, l. *Micrapemon*, m. *Needitomyia*, n. *Neoplatyura*, o. *Plautyura*, p. *Proceroplatus*, q. *Pyrtaula*, r. *Xenoplatyura*. Scale bar: 1mm.

Nubarrones, 6.139736N - 75.5538545W, 2000m, bosque, trampa Malaise, 07-20.v.2017, M. Wolff and C. Henao-Sepúlveda (CEUA: 106482); one male, **Sonsón**, Vereda San Francisco, Cerro Las Palomas, 5.7269139N - 75.2564472W, 2928-2977m, bosque, trampa Malaise suelo, 15.x-28.xii.2017, A.L. Montoya (CEUA: 118356); one male, same data except: Cerro Las Palomas (A), 5.725972N - 75.24925W, 3240-3310m, paramo, trampa Malaise dosel, 25.xi-05.xii.2018 (CEUA: 118358), J. Saucedo and cols. **Santander**: one male, **Gambitá**, Vereda el Palmar, sector el Taladro, 5.98521N - 73.22247W, 2357m, Bosque, trampa Malaise, 14-31.v.2018, T. Zambrano-Estupiñán (CEUA: 106465). **Vaupés**: one male, Estación Biológica Mosiro-Itajura (Caparú), Centro Ambiental, 1°4'S - 69°31'W, 60m, trampa Malaise, 20.i-01.ii.2003, M. Sharkey and D. Arias (IAvH-E-154681); one male, same data except: 17.iv.2003 (IAvH-E-212362); one undetermined, same data except: Estación Biológica Igapo, 22.x-06.xi.2002, L. Benavides (IAvH-E-154633). **Vichada**: one male, **Cumaribo**, Corregimiento Sta. Rica, PNN el Tuparro, 5°21'20"N - 68°1'28"W, 135m, bosque de cerro, trampa Malaise, 18-21.ii.2004, I. Quintero and E. Gonzalez (IAvH-E-154547).

Orfeliini Malloch, 1917

Isoneuromyia Brunetti, 1912

(Figs. 2i, 3i)

Diagnosis. Three ocelli; sub-squared flagellomeres; bare laterotergite, anepisternum, katepisternum and metepisternum; uniformly setose scutum; C projected one-fifth of distance from R_{4+5} to M_1 ; branches of M or Cu with distinctive rows of setae above; tibial setae in regular rows throughout tibial length; meso and metatibia with two apical spurs (Vockeroth 2009, Blagoderov and Ševčík 2017).

Biology. Specimens found were associated exclusively with preserved forest habitats with dense canopies, some with rocky soils forming small cavities (Fig. 1b), mainly in montane forests of the northern and northwestern Andes, having the influence of the piedmont dry forests and Orinoco basin, and with associations with the Santa Marta Mountains, and some records in the moist forest of the Amazon.

Remarks. Before this work, two males of an undescribed species were recorded for one locality in the department of

Valle del Cauca (Falaschi 2016). Here, we recorded three more unidentified species, extending the distribution of the genus to Antioquia, Cundinamarca, Meta, and Putumayo (Fig. 4b).

Examined material. COLOMBIA. Antioquia: one female, **Envigado**, Loma del Escobero, Parcelación Nubarrones, 6.139736N - 75.5538545W, 2000m, bosque, trampa Malaise, 12-29.i.2017, M. Wolff and C. Henao-Sepúlveda (CEUA: 106487); one male, same data except: 29.i-11.ii.2017 (CEUA: 106473); one male, same data except: 26.ii-12.iii.2017 (CEUA: 106479); one female, same data except: 27.v-10.vi.2017 (CEUA: 97368); one female, same data except: 01-14.iv.2018 (CEUA: 106445). One male, **San José de La Montaña**, Vereda El Congo, Paramo El Congo, 6.764901N - 75.70946W, 2980-3045m, bosque, plato color rojo, 04-14.ii.2017, C. Henao-Sepúlveda and A. Sepúlveda (CEUA: 106515). One male, **Yarumal**, Vereda el Respaldo, Finca la Maruja, Sector Santa Isabel, 6.91069N - 75.42792W, 2200-2600m, bosque, trampa Malaise, 26.i-04.iii.2017, C. Henao-Sepúlveda and M. Wolff (CEUA: 106506). **Cundinamarca:** three males, PNN Chingaza, Charrascales, 4°31'N - 73°45'W, 2990m, trampa Malaise, 31.x-15.xi.2001, L. Cifuentes (IAvH-E-154719, 154051, 154558). **Meta:** one male, PNN Tinigua, Vereda Bajo Raudal, 2°16'N - 73°48'W, 460m, trampa Malaise, 20.iii-04.iv.2004, C. Sánchez (IAvH-E-154121); one female, same data except: 290m, 20.vii-05.ix.2004, J. Sánchez (IAvH-E-154712). **Putumayo:** one male/one female, PNN La Paya, Cabaña la Playa, 0°2'S - 75°12'W, 330m, trampa Malaise, 01-15.vii.2002, A. Morales (IAvH-E-154256, 155677). **Valle del Cauca:** one female, **Jamundi**, PNN Farallones de Cali, Corregimiento La Meseta (Cabecera) La Selva, 2200m, trampa Malaise, 13-27.v.2004, S. Sarria and M. Lasso (IAvH-E-153949).

Lapyruta Edwards, 1929

(Figs. 2j, 3j)

Diagnosis. Three ocelli; setose pleurotergites; laterotergite with very fine, short and pale hairs above (pilose); bare spiracles; uniformly setose scutum; C produced at least two-fifths of distance from R_{4+5} to M_1 ; vein CuP not reaching wing margin; tibial setae in regular rows, except sometimes at the base; meso and metatibia with two apical spurs; in males the inner spur of hind tibia become swollen at the apex, just before the acuminate tip, in females both hind tibial spurs are normal (Edwards 1929, Lane 1950).

Biology. The specimens found were associated exclusively with preserved forest habitats with dense canopies, mainly in the Amazon region's moist evergreen tropical rain forests.

Remarks. This is the first record for the genus in Colombia (Fig. 4d), with an undescribed species.

Examined material. COLOMBIA: Meta: one male, **PNN Sierra de la Macarena**, Caño Curía, 3°21'N - 72°38'W, 150m, trampa Malaise, 12.x-12.xi.2003, W. Villalba (IAvH-E-191339). **Putumayo:** one female, **PNN La Paya**, Cabaña la Playa, 0°2'S - 5°12'W, 330m, Winkler, 24-25.iii.2002, R. Cobete (IAvH-E-154118); one female, same data except: Loma Alta, 0°6'S - 4°58'W, 350m, trampa Malaise, 18.vi-01.vii.2003 (IAvH-E-154742).

Lyprauta Edwards, 1931

(Figs. 2k, 3k)

Diagnosis. Three ocelli; bare pleurotergites; uniformly setose scutum; C produced at least two-fifths of distance from R_{4+5} to M_1 ; branches of M and Cu bare above; vein M_2 incomplete, interrupted at base; R+M shorter than the stem of M fork; reduced vein CuP, not exceeding the apex of basal cell (br+bm); tibial setae in regular rows; meso and metatibia with two apical spurs (Lane 1950, Vockeroth 2009).

Biology. The examined specimens were associated mainly with forested environments, with one record in cultivated areas product of anthropogenic activities. The forest types correspond mainly to montane forests in the Magdalena Valley, with few records in moist forests of the Chocó and Amazon regions.

Remarks. One male of *L. zeteki* Lane, 1950 has been recorded without specific locality data from Colombia (Evenhuis 2006). Here, we recorded three more unidentified species, including specific localities for the first time for Antioquia, Chocó, Putumayo, and Vichada (Fig. 4d).

Examined material. COLOMBIA. Antioquia: one female, **Envigado**, la Sebastiana, Unidad Clara-val, 1700m, trampa de luz blanca, 17.xii.2015, C. Henao-Sepúlveda (CEUA: 93762); one male, same data except: Loma del Escobero, Parcelación Nubarrones, 6.139736N-75.5538545W, 2000m, bosque, trampa Malaise, 15-

22.x.2016, M. Wolff and C. Henao-Sepúlveda (CEUA: 106484). Two males, **San Roque**, Vereda Guacas Abajo, 907945 - 12100845, 900-1000m, cultivo, Van someren Raydon, 21-30.vii.2013, Grupo de Entomología Universidad de Antioquia (CEUA: 94183). **Chocó:** one female, **PNN Los Katíos**, Centro administrativo Sautatá, 7°51'N - 77°8'W, 30m, borde de bosque, trampa Malaise, P. López, 15-30.ix.200 (IAvH); one male, same data except: bosque (IAvH-E-154039); one female, same data except: fuera del bosque, 01-15.viii.2003 (IAvH-E-154598). **Putumayo:** one male, **PNN La Paya**, Loma Baja, 320m, 16.vi-01.vii.2003, L. Magno (IAvH-E-155620). **Vichada:** one male, **La Primavera**, Vereda Primavera, 06°19'34"N-71°7'10"W, trampa CDC, 01.iv.2016, E. Garcés (CEUA: 93884).

Micrapemon Edwards, 1925

(Figs. 2l, 3l)

Diagnosis. Antenna with twelve flagellomeres; sub-squared flagellomeres; three ocelli; vein R_{2+3} ending in R_1 ; weak CuP, poorly sclerotized; tibial setae irregular in the basal half and regular at apex; middle and hind tibia with one apical spur (Vockeroth 2009).

Biology. The specimen recorded in this work was found associated with moist evergreen tropical rain forest habitats with dense canopies in the Amazon region.

Remarks. This is the first record of the genus for Colombia (Fig. 4c), with an unidentified species.

Examined material. COLOMBIA. Putumayo: one female, **PNN La Paya**, Loma Baja, 0°6'N - 4°58'W, 320m, trampa Malaise, 16.vi-01.vii.2003, L. Magno (IAvH-E-154672).

Neoditomyia Lane and Sturm, 1958.

(Figs. 2m, 3m)

Diagnosis. Slightly compressed flagellomeres; two ocelli; setose anepisternum, laterotergite and mediotergite; anterior and posterior spiracles with fringes of hairs; Sc evanescent apically, ending free; tibial setae irregular in the basal half and regular at apex; middle and posterior tibiae with one apical spur (Vockeroth 2009).

Biology. Specimens were found associated with well-preserved and continuous forest habitats with dense canopies in protected areas, mainly with montane forests dominated by *Cecropia obtusifolia* Bertol., of the western slope of the Western Andes and moist forests of Western Amazonia.

Remarks. Before this work, *N. andina* Lane & Sturm, 1958 and *N. colombiana* Lane & Sturm, 1958 were recorded for Meta and Huila departments respectively (Lane and Sturm 1958, Evenhuis 2006). We recorded one more unidentified species, extending the distribution of the genus to Leticia, Nariño, and Valle del Cauca (Fig. 4c).

Examined material. COLOMBIA. Amazonas: one male, **Leticia**, RN Tanimboca, 4.09914S - 69.9455W, 97m, bosque, trampa Malaise, 07-14.xi.2017, G. Kvitte (CEUA: 106434). **Nariño:** One female, **RN La Planada**, vía Hondón, 1°15'N - 78°15'W, 1930m, trampa Malaise, 16.xi-02.xii.2001, G. Olivia (IAvH-E-153984). **Valle del Cauca:** one female, **PNN Farallones de Cali**, Anchicayá, 3°26'N - 76°48'W, 730m, trampa Malaise, 13.xi-11.xii.2001, S. Sarria (IAvH-E-155458).

Neoplatyura Malloch, 1928

(Figs. 2n, 3n)

Diagnosis. Sub-rectangular flagellomeres, slightly compressed; three ocelli; bare pleurotergites, but sometimes anepisternum with a few hairs in the upper half; anterior spiracle with a fringe of hairs (sometimes not visible); setose scutum with bare stripes; C projected at least two fifths of distance from R_{4+5} to M_1 ; branches of M and Cu with a row of fine dorsal setae (denser towards the apex); tibial setae irregular in the basal half and regular at apex (Vockeroth 2009).

Biology. Specimens were found associated mainly with closed-canopy forests, with a few records in paramo ecosystems, grasslands with little or no forest cover, and areas near bodies of water, such as streams and lakes. They are distributed throughout the Andean mountain range.

Remarks. Before this work, two males of an undescribed species were recorded for a locality in the department of Nariño (Falaschi 2016). We recorded three more unidentified species, extending the distribution of the genus to An-

tiouquia, Boyacá, Cundinamarca, La Guajira, Meta, Norte de Santander, Risaralda, and Valle del Cauca (Fig. 4d).

Examined material. COLOMBIA. Antioquia: one female, **Belmira**, El Morro, 6.641399N- 75.667205W, 2970-3020m, pastizal, trampa Malaise suelo, 25.iii-05.iv.2017, A.L. Montoya and C. Rodriguez (CEUA: 97371); one female, same data except: Exterior Cabaña, 6.645901N- 75.670441W, 3185-3200m, paramo, 04-14.ii.2017, A.L. Montoya and J. Torres-Toro (CEUA: 106491); one female, same data except: Laguna, 6.632639N - 75.645267W, 3190-3205m, paramo, trampa Malaise suelo, 02-12.xii.2017, J. Torres-Toro (CEUA: 106460); one male, same data except: 21-30.vi.2017, A.L. Montoya and C. Rodriguez (CEUA: 106464). One female, **Envigado**, Loma del Escobero, Parcelación Nubarrones, 6.139736N-75.5538545W, 2000m, bosque, trampa Malaise, 07-15.x.2016, M. Wolff and C. Henao-Sepúlveda (CEUA: 97036); one female, same data except: 11-26.ii.2017 (CEUA: 106467); one male, same data except: Planta de tratamiento de aguas La Ayurá, Quebrada La Ayurá, 6.1650142N -75.5648694W, 1750m, quebrada, trampa de emergencia, 05.v.1983, M. Wolff (CEUA: 93649). One female, **Medellín**, Santa Elena, Parque Ecológico Piedras Blancas, 6.2951345N -75.5035934W, 2400m, bosque, red entomológica, 11.vii.2013, J.A. Rafael, J.T.C. Camará and J. Xavier (CEUA: 94063). Two males, **San José de La Montaña**, Vereda El Congo, Paramo El Congo, 6.762229N - 75.723144W, 3165-3190m, paramo, plato color azul, 04-15.xii.2016, A. Sepúlveda and C. Henao-Sepúlveda (CEUA: 97367); one female, same data except: trampa Malaise suelo (CEUA: 97389); one male, same data except: plato color rojo, 04-14.ii.2017 (CEUA: 106450); one male, same data except: trampa Malaise suelo, 25.iii-05.iv.2017, M. Wolff and A. Sepúlveda (CEUA: 106440); one male, same data except: plato color blanco (CEUA: 106452); one male, same data except: trampa Malaise suelo, 16-27.ix.2017, A. Sepúlveda (CEUA: 97365); one female, same data except: red entomológica (CEUA: 110016); one male/one female, same data except: trampa Malaise suelo, 20-30.vi.2017, A.L. Montoya and A. Sepúlveda (CEUA: 106524, 106523); one female, same data except: 6.764901N - 75.70946W, 2980-3045m, bosque, plato color azul, A. Montoya and C. Henao-Sepúlveda (CEUA: 97192); one male, same data except: plato color rojo (CEUA: 106518); one female, same data except: trampa de emergencia, 20-30.vi.2017, A.L. Montoya and A. Sepúlveda (CEUA: 106519); one male, same data except: 6.764743N - 75.719372W, 3080-3120m,

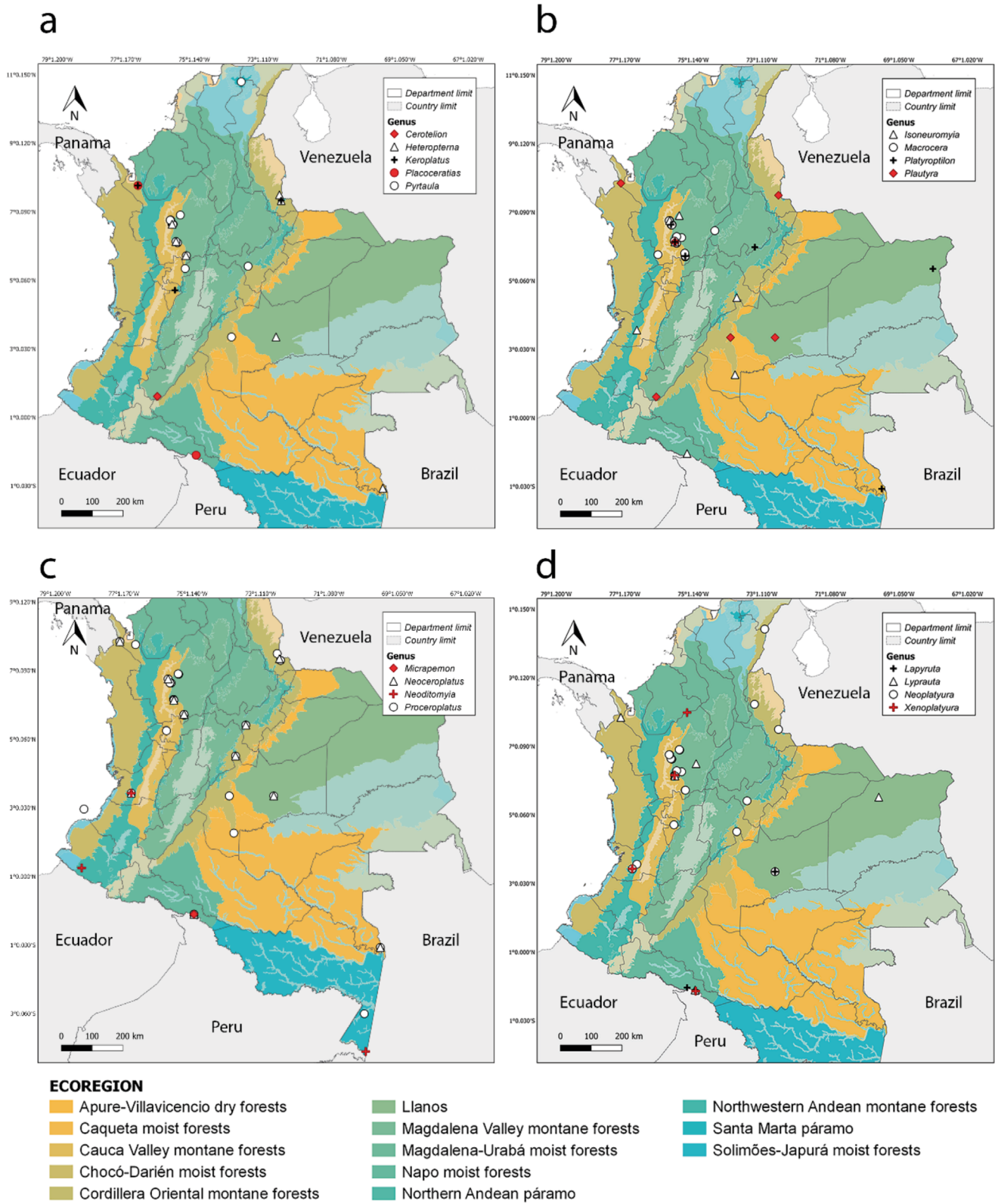


Figure 4. Geographic distribution of Keroplatidae genera found in Colombia.

pastizal, plato color azul (CEUA: 106517); one female, same data except: plato color rojo (CEUA: 106516). Two females, **San Vicente Ferrer**, Vereda Chaparral, Finca La Mosca, 6.265814N - 75.360082W, 2200m, bosque, trampa Malaise, 19-21.iv.2011, I. Ceballos, A. Bustamante and M. Wolff (CEUA: 93886). Four males, **Sonsón**, Vereda San Francisco, Cerro Las Palomas, 5.7269139N - 75.2564472W, 2928-2977m, bosque, trampa Malaise suelo, 15.x-28.xii.2017, A.L. Montoya (CEUA: 106435); one male, same data except: Cerro Las Palomas (A), 5.725972N - 75.24925W, 3240-3310m, paramo, trampa Malaise dosel, 01-12.ix.2018, M.I. Salinas, A.M. Echeverry, J. Saucedo (CEUA: 118363). Two females, **Yarumal**, Vereda el Respaldo, Finca la Maruja, 6.8983333N - 75.41425W, 2300m, bosque, trampa Malaise, 2016.xii.15, J.D. Medina and C. Henao-Sepúlveda (CEUA: 94367, 94392); one female, same data except: Sector Santa Isabel, 6.91069N - 75.42792W, 2200-2600m, 15.xii.16-26.i.2017, C. Henao-Sepúlveda and M. Wolff leg (CEUA: 106499); nine males/four females, same data except: 26.i-04.iii.2017 (CEUA: 106503, 106505, 106507); four males/one female, same data except: 04-19.iii.2017 (CEUA: 106498); one female, same data except: 19.iii-01.iv.2017 (CEUA: 106500). **Boyacá**: one male/three females, **SFF Iguaque**, La Planada, 5°25'N -73°27'W, 2850m, trampa Malaise, 21.i.2002 (IAvH-E-212443, 212439, 212441, 212444); one female, same data except: Lagunillas, 3380m, 16.iv.2002 (IAvH-E-212319). **Cundinamarca**: one male, **PNN Chingaza**, Charrascales, 4°31'N - 73°45'W, 2990m, trampa Malaise, 31.x-15.xi.2001, L. Cifuentes (IAvH-E-154653); one male, same data except: 08.v.2002 (IAvH-E-212431). **La Guajira**: two females, **La Jagua del Pilar**, Cerro Pintado, 10.4266111N-72.9355556W, 2900m, bosque, trampa Malaise, 05-10.viii.2015, C. Valverde (CEUA: 93748, 93821). **Meta**: four females, PNN Sierra de la Macarena, Caño Curía, 3°21'N - 72°38'W, 150m, bosque, trampa Malaise, 12.x-11.xi.2003, W. Villalba (IAvH-E-191341, 191340, 191342, 191321). **Risaralda**: one female, **SFF Otún Quimbaya**, Cuchilla Camino, 4°44'N -75°35'W, 2050m, bosque, trampa Malaise, 15.ix.2004 (IAvH-E-212392); four females, same data except: 4°43'N, 25.xi-03.xii.2002, D. Campos (IAvH-E-155696, 155532, 155561, 155717); one male/one female, same data except: 17.xii.02-03.i.2003, R. Walker (IAvH-E-155568, 155635); one female, same data except: Mollinillo, 4°43'N - 75°34'W, 2220m, 30.ix.2004, D. Campos (IAvH-E-212405). **Norte de Santander**: one male/one female, **Herrán**, PNN Tamá, Vda. Pabellón, Fca. Virgi-

lio Pabón, 7°30'N - 72°32'W, 2384m, trampa Malaise, 22.x-05.xi.2003, D. Castillo (IAvH-E-191295, 191309). One female, ANU Los Estoraques, Platanillo, 8°14'N - 73°14'W, 1516m, trampa Malaise, 28.xi-13.xii.2003, E. Bayona (IAvH-E-154711). **Valle del Cauca**: one undetermined, **PNN Farallones de Cali**, Anchicayá, 3°26'N - 76°48'W, 650m, bosque, trampa Malaise, 13.ii.2001 (IAvH-E-212423); one female, same data except: 730m, 16.i.2002 (IAvH-E-212377). One male, **Jamundi**, PNN Farallones de Cali, Corregimiento La Meseta (Cabecera) La Selva, 2200m, trampa Malaise, 22.vii-05.viii.2004, S. Sarria and M. Lasso (IAvH-E-154663).

Plautyra Edwards, 1941

(Figs. 20, 30)

Diagnosis. Sub-rectangular flagellomeres, slightly compressed; three ocelli; bare katapisternum and laterotergite; setose metepisternum; uniformly setose scutum; fusion of R and M at least five times as long as the stem of M; C projected at most one-fifth of distance between R_{4+5} and M_1 ; branches of M and Cu bare above; well-developed vein CuP, ending near wing margin; tibial setae in regular rows throughout the entire tibia (Vockeroth 2009).

Biology. The specimens were associated with forest environments with dense canopies and rocky soils forming small cavities (Figs. 1a-b), mainly with montane forests dominated by *Quercus humboldtii* Bonl. in central and eastern Andes, with a few records in moist and dry forests of the Chocó and Llanos regions, respectively.

Remarks. This is the first record of the genus for Colombia (Fig. 4b), with two undetermined species.

Examined material. COLOMBIA. Antioquia: one male, **Envigado**, Loma del Escobero, Parcelación Nubarrones, 6.139736N - 75.5538545W, 2000m, bosque, trampa Malaise, 11-26.ii.2017, M. Wolff and C. Henao-Sepúlveda (CEUA: 106468); one male, same data except: 26.ii-12.iii.2017 (CEUA: 106478); one female, same data except: 27.v-10.vi.2017 (CEUA: 106437); two males, same data except: 04-18.iii.2018 (CEUA: 97377, 97398); one male, same data except: 15.ix-03.x.2018 (CEUA: 118370); two males, same data except: 17.vi-08.vii.2018 (CEUA: 106483); two males, same data except: 24.viii-16.ix.2018 (CEUA: 118367). **Chocó:** one male, PNN Los Katíos, Centro Administrativo Sautatá, 7°51'N -77°8'W, 30m, fuera

del bosque, trampa Malaise, 01-15.viii.2003, P. López (IAvH-E-154753). **Huila:** one female, PNN Cueva de los Guácharos, Cabaña Cedros, 1°37'N-76°6'W, 1950m, trampa Malaise, 05-20.v.2003, C. Cortés (IAvH-E-154050). **Meta:** two males/two females, PNN Sierra de la Macarena, Caño Curía, 3°21'N - 72°38'W, 150m, trampa Malaise, 12.x-12.xi.2003, W. Villalba (IAvH-E-191323, 191324, 191320, 191328); one male, same data except: Casino, 73°56'W, 120m (IAvH-E-153932); one male, same data except: 12-13.xi.2003 (IAvH-E-154048). **Norte de Santander:** one male, **Herrán**, PNN Tamá, Vda. Pabellón, Fca. Virgilio Pabón, 7°30'N - 72°32'W, 2384m, trampa Malaise, 22.x-05.xi.2003, D. Castillo (IAvH-E-191313); one male, same data except: Fca. de Gonzalo Mejía, 7°25'N - 72°26'W, 2262m, 02-19.viii.2003, C. Leal (IAvH-E-154079).

***Proceroplatus* Edwards, 1925**

(Figs. 2p, 3p)

Diagnosis. Compressed flagellomeres, sometimes pectinate; three ocelli; setose laterotergite; bare metepisternum; bare anterior and posterior spiracles; wing with irregularly arranged dark spot patterns; two tibial spurs, the outer one-fifth to one-eighth as long as the inner and the latter about four times as long as apical tibial diameter (Vockeroth 2009).

Biology. Specimens found were associated mainly with continuous forest ecosystems dominated by *Quercus humboldtii* Bonpl., *Wienmania* sp., *Schefflera trianae* (Planch. and Linden ex Marchal) Harms, *Drimys granadensis* L.f. and *Cecropia obtusifolia* Bertol.; in paramo ecosystems and habitats near small streams, with some records in grasslands produced by anthropogenic activity.

Remarks. Before this work, two males of an undescribed species were recorded for a locality in the department of Cauca (Falaschi 2016). We recorded four more unidentified species, extending the distribution of the genus to Amazonas, Antioquia, Boyacá, Caldas, Chocó, Cundinamarca, Meta, Norte de Santander, Putumayo, Valle del Cauca, and Vaupés (Fig. 4c).

Examined material. COLOMBIA. Amazonas: one male, PNN Amacayacu, Cabaña Lorena, 3°0'S - 9°59'W, 210m, trampa Malaise, 27.viii.2001, P. López (IAvH-E-212397). **Antioquia:** two males, **Belmira**, El Morro, 6.645901N - 75.670441W, 3185-3200m, para-

mo, trampa Malaise suelo, 16-27.ix.2017, C. Rodríguez and A. Rúa (CEUA: 97364, 106492); one male, same data except: 25.iii-05.iv.2017, A.L. Montoya and C. Rodríguez (CEUA: 118353); one male, same data except: 6.641399N - 75.667205W, 2970-3020m, pastizal, trampa Malaise, 21-30.vi.2017, A.L. Montoya and C. Rodríguez (CEUA: 106446); one male, same data except: Laguna, 6.640907N - 75.635719W, 3200m, paramo, trampa Malaise, 28-30.v.2016, C. Henao-Sepúlveda and cols. (CEUA: 93491); three males, same data except: 28-31.v.2016 (CEUA: 93501, 94146). One male, **Carepa**, Estación Biológica Tulenapa, Zona D, 30m, red entomológica, 21-24.xi.2019, J. Torres-Toro and A.L. Montoya (CEUA: 117366). Two males, **Envigado**, Loma del Escobero, Parcelación Nubarrones, 6.139736N - 75.5538545W, 2000m, bosque, trampa Malaise, 29.i-11.ii.2017, M. Wolff and C. Henao-Sepúlveda (CEUA: 106474, 106476); one female, same data except: 04-18.iii.2018 (CEUA: 97397); one male/one female, same data except: 14-30.iv.2018 (CEUA: 106449); one male/one female, same data except: 15.ix-03.x.2018 (CEUA: 118369); one female, same data except: Planta de tratamiento de aguas La Ayurá, Quebrada La Ayurá, 6.1650142N -75.5648694W, 1750m, Quebrada, trampa de Emergencia, 03.vii.1983, M. Wolff (CEUA: 93819); one female, same data except: 03.iii.1984 (CEUA: 94000). Five males, **San José de La Montaña**, Vereda El Congo, Paramo El Congo, 6.762229N - 75.723144W, 3165-3190m, paramo, trampa Malaise suelo, 16-27.ix.2017, A. Sepúlveda (CEUA: 118349, 118351). One male, **Sonsón**, Vereda las Tres Cruces, 5.7024722N - 75.2539167W, 3000m, trampa Malaise, 01-15.viii.2010, L. Ríos (CEUA: 106442); one male, same data except: vereda San Francisco, Cerro Las Palomas, 5.7269139N - 75.2564472W, 2928-2977m, bosque, trampa Malaise suelo, 15.x-28.xii.2017, A.L. Montoya (CEUA: 106436); one male, same data except: 09.ix-15.x.2017 (CEUA: 106497); one male, same data except: Cerro Las Palomas (A), 5.727096N - 75.257001W, 2900-2955m, bosque, red entomológica, 23.vi-02.vii.2018, J. Saucedo and J. Vallejo-Sosa (CEUA: 106495). One male/one female, **Yarumal**, Vereda el Respaldo, Finca la Maruja, 6.8983333N - 75.41425W, 2300m, bosque, trampa Malaise, 01.xii.2016, J.D. Medina and C. Henao-Sepúlveda (CEUA: 97376, 94387); one female, same data except: Sector Santa Isabel, 6.91069N - 75.42792W, 2200-2600m, bosque, trampa Malaise, 19.iii-01.iv.2017, C. Henao-Sepúlveda and M. Wolff (CEUA: 106501). **Boyacá:** four males/two females, SFF Iguaque, Cerro Pan de Azúcar, 5°25'N - 73°27'W, 3300m, trampa Mal-

aise, 27.iii-16.iv.2001, P. Reina (IAvH-E-154006, 154036, 154073, 155598, 154049, 155682); one male, same data except: quebrada Los Francos, 2860m, 14.ii-13.iii.2003 (IAvH-E-153959). **Caldas:** one male, **Anserma**, Vereda Palo Blanco, 5.251144N -75.770532W, 1822m, Guadual, trampa Malaise, 12.v.2015, A.L. Montoya (CEUA: 94142). **Cauca:** one male, PNN Gorgona, Mancora, 2°58'N - 78°11'W, 60m, trampa Malaise, 24.iv-09.v.2000, H. Torres (IAvH-E-154642). **Chocó:** one male/one undetermined, PNN Los Katíos, Centro administrativo Sautatá, 7°51'N - 77°8'W, 30m, borde de bosque, trampa Malaise, 15-30. ix.2003, A. Cansia (IAvH-E-154586, 155610); one male, same data except: bosque, 15-30.vii.2003, P. López (IAvH-E-154593); one male, same data except: 01-15.viii.2003 (IAvH-E-155586); one female, same data except: 15-30. ix.2003 (IAvH-E-191343); one male/one female/one undetermined, same data except: fuera del bosque, 01-15. viii.2003 (IAvH-E-154724, 154599, 155668); one female, same data except: 15.viii-12.ix.2003 (IAvH-E-155557); one female, same data except: 13-28.i.2004 (IAvH-E-155528); one female, same data except: 20.xi-05.xii.2003 (IAvH-E-154690); one female/one undetermined, same data except: 29.ix-13.x.2003, A. Cansia (IAvH-E-155800, 155758); two males, same data except: 05-20.x.2003 (IAvH-E-155789, 153960). **Cundinamarca:** one male, PNN Chingaza, Charrascales, 4°31'N - 73°45'W, 2990m, trampa Malaise, 31.x-15.xii.2001, L. Cifuentes (IAvH-E-155558). **Meta:** two females, PNN Sierra de la Macarena, Caño Curía, 3°21'N - 72°38'W, 150m, trampa Malaise, 12.x-12. xi.2003, W. Villalba (IAvH-E-191352); three males/one female, same data except: Casino, 73°56'W, 120m (IAvH-E-153977, 154037, 155537, 153991); two males, same data except: 12-13.xi.2003 (IAvH-E-154022, 155799); one male, PNN Tinigua, vereda Bajo Raudal, 2°16'N - 73°48'W, 460m, trampa Malaise, 20.iii-04.iv.2004, C. Sánchez (IAvH-E-155580). **Norte de Santander:** ten males, **Toledo**, PNN Tamá, Vda. Belchite, Fca. El Rey, 7°18'N - 72°26'W, 1821m, trampa Malaise, 12-27.vi.2004, F. Martínez (IAvH-E-191249, 191361, 191363); one female, same data except: Vda. Quebrada grande, Fca. El Porvenir, 7°30'N - 72°32'W, 2628m, 07-14.iv.2004, C. Leal (IAvH-E-191252). **Putumayo:** six males/one female, PNN La Paya, Loma Baja, 0°6'S - 4°58'W, 320m, bosque, trampa Malaise, 16.vi-01.vii.2003, L. Magno (IAvH-E-153964, 154010, 154564, 154746, 155701, 155769, 155681); four males, same data except: Loma Alta, 350m, 18.vi-01. vii.2003, R. Cobete (IAvH-E-153934, 154033, 154602, 155533). **Valle del Cauca:** one male, PNN Farallones de

Cali, Anchicayá, 3°26'N - 76°48'W, 650m, trampa Malaise, 13.ii.2001 (IAvH-E-212414). **Vaupés:** one male, Estación Biológica Mosiro-Itajura (Caparú), Centro Ambiental, 1°4'S - 69°31'W, 60m, trampa Malaise, 10-17.iv.2003, J. Pinzón (IAvH-E-154646); one male, same data except: 17.iv.2003 (IAvH-E-212360); one female, same data except: Estación Biológica Igapo, 18-27.iii.2003, J. Pinzón (IAvH-E-153939).

Pyrtaula Edwards, 1929

(Figs. 2q, 3q)

Diagnosis. Antenna with fourteen flagellomeres; three ocelli; setose anepisternum and metepisternum; bare laterotergite and mediotergite; bare anterior and posterior spiracles; setose scutum with bare stripes; strong CuP, strongly sclerotized; branches of M and Cu with a row of fine setae above (most dense near apex); tibial setae in irregular rows throughout the tibia (Vockeroth 2009).

Biology. The specimens were associated mainly with paramo ecosystems, followed by closed canopy forests dominated by *Quercus humboldtii* Bonpl. and *Cecropia* sp., with a few records from grasslands produced by agricultural and livestock expansion and areas near bodies of water. The type of forest corresponds mainly to montane forests in the Cauca and Magdalena valleys, the transition areas between the dry forests of the lowlands and the high mountain ecosystems of the Andes and with records also in dry forests of the Llanos region.

Remarks. This is the first record of the genus for Colombia (Fig. 4a), with two unidentified species.

Examined material. COLOMBIA. Antioquia: one male, **Belmira**, El Morro, 6.645901N - 75.670441W, 3185-3200m, paramo, plato color amarillo, 02-12.xii.2017, C. Rodríguez and A. Echeverry (CEUA: 97363); one male, same data except: trampa Malaise suelo, 16-27.ix.2017, C. Rodríguez and A. Rúa (CEUA: 106438); one male, same data except: Laguna, 6.640907N - 75.635719W, 3200m, paramo, trampa Malaise, 28-31.v.2016, A. Montoya and cols. (CEUA: 94039); one male, same data except: 6.632639N - 75.645267W, 3190-3205m, trampa Malaise suelo, 16-27.ix.2017, J. Torres-Toro (CEUA: 106462); one male, same data except: trampa emergencia, A.L. Montoya and Y. Cardona (CEUA: 118350); one female, same data except: 6.634233N - 75.658654W,

2980-3050m, bosque, plato color rojo, 04-14.xii.2016, A.L. Montoya and J. Torres-Toro (CEUA: 106454). One female, **El Retiro**, Parcelación Fizebad, Quebrada la Cebolla, Zona A, 6.099831N - 75.507887W, 2150m, trampa de emergencia, 05.vi.1983, M. Wolff (CEUA: 97384). One female, **Envigado**, Loma del Escobero, Parcelación Nubarrones, 6.139736N - 75.5538545W, 2000m, bosque, trampa Malaise, 20.vii-07.viii.2018, M. Wolff and C. Henao-Sepúlveda (CEUA: 106488). One male, **San José de La Montaña**, Vereda El Congo, Paramo El Congo, 6.764743N - 75.719372W, 3080-3120m, pastizal, trampa Malaise suelo, 04-15.xii.2016, C. Henao-Sepúlveda and A. Sepúlveda (CEUA: 97388); one female, same data except: plato color blanco (CEUA: 106453); one female, same data except: 6.762229N-75.723144W, 3165-3190m, paramo, plato color rojo (CEUA: 97390); one male, same data except: trampa Malaise dosel, 04-14.ii.2017 (CEUA: 97381); two males, same data except: trampa Malaise suelo, 25.iii-05.iv.2017 C. Henao-Sepúlveda, M. Wolff and A. Sepúlveda (CEUA: 106441, 106451); two males, same data except: 16-27.ix.2017, A. Sepúlveda (CEUA: 118348, 118352); one female, same data except: red entomológica (CEUA: 106513); one female, same data except: plato color blanco (CEUA: 109984); one female, same data except: trampa Malaise suelo, 20-30.vi.2017, A.L. Montoya and A. Sepúlveda (CEUA: 106522); one female, same data except: red entomológica (CEUA: 106525); one male, same data except: 6.764901N - 75.70946W, 2980-3045m, bosque, trampa Malaise dosel, 20-30.vi.2017, A.L. Montoya and A. Sepúlveda (CEUA: 106521); one female, same data except: red entomológica, 02-13.xii.2017, C. Henao-Sepúlveda and A. Sepúlveda (CEUA: 106512); one male, same data except: 16-27.ix.2017, A. Sepúlveda (CEUA: 116971). One female, **Sonsón**, Vereda San Francisco, Cerro Las Palmas (B), 5.726238N -75.250544W, 3170-3260m, paramo, trampa Malaise suelo, 25.xi-05.xii.2018, J. Saucedo-V. and cols. (CEUA: 118361); one female, same data except: trampa plato color blanco (CEUA: 118364). One female, **Yarumal**, Vereda el Respaldo, Finca la Maruja, Sector Santa Isabel, 6.91069N - 75.42792W, 2200-2600m, bosque, trampa Malaise, 26.i-04.iii.2017, C. Henao-Sepúlveda and M. Wolff (CEUA: 106504). **Boyacá**: one male/one female, SFF Iguaque, Lagunillas, 5°25'N - 73°27'W, 3380m, trampa Malaise, 16.iv.2002 (IAvH-E-212316, 212318). **Caldas**: One female, **Pensilvania**, Vereda la Brigada, Valle Alto, 5.346971N - 75.286728W, 3878m, bosque, pitfall, 11-12.vi.2014, M. Wolff (CEUA: 93818). **Magdalena**: one male, PNN Sierra Nevada de Santa Marta, El Chuscal, 10°48'N

- 73°39'W, 2300m, trampa Malaise, 13-30.vii.2001, J. Cantillo (IAvH-E-153947). **Meta**: one female, PNN Sierra de la Macarena, Casino, 3°21'N - 73°56'W, 120m, trampa Malaise, 12.x-12.xi.2003, W. Villalba (IAvH-E-155692).

Xenoplatyura Malloch, 1928

(Figs. 2r, 3r)

Diagnosis. Frons with little setae between the antennal base; sub-rectangular flagellomeres slightly compressed; three ocelli; bare pleurotergites; uniformly setose scutum; C produced at least two-fifths of distance from R_{4+5} to M_1 ; branches of M and Cu bare above; well-developed vein CuP, ending in wing margin or very near; tibial setae irregularly arranged in the basal half and regular towards the apex (Vockeroth 2009).

Biology. Specimens were associated with forests with dense canopies and humid environments close to bodies of water. The type of forest corresponds to Andean montane forests dominated by *Quercus humboldtii* Bonpl., flanked by paramo habitats, and to transitional forests between these Andean forests and the dry forests of lowlands; and also, to moist forests in the Amazon region and northern Colombia.

Remarks. This is the first record of the genus for Colombia (Fig. 4d), with two unidentified species.

Examined material. COLOMBIA. Antioquia: one male/one female, **Caucasia**, Regiones Universidad de Antioquia, 7.99177N - 75.2014W, 46m, bosque, trampa Malaise, 20-27.iv.2010, Grupo de Entomología Universidad de Antioquia (CEUA: 93798). Two males/four females, **Envigado**, Planta de tratamiento de aguas La Ayurá, Quebrada La Ayurá, 6.1650142N - 75.5648694W, 1750m, trampa de emergencia, 10.xi.1983, M. Wolff (CEUA: 93766). **Putumayo:** two females, PNN La Paya, Viviano Cocha camino Cecilio Cocha, 0°8'S- 4°57'W, 220m, trampa Malaise, 26-29.i.2003, C. Sarmiento and M. Macanilla (IAvH-E-154566, 155639). **Valle del Cauca:** one female, PNN Farallones de Cali, Anchicayá, 3°26'N- 76°48'W, 650m, trampa Malaise, 13.ii.2001 (IAvH-E-212412).

DISCUSSION

The generic review of the Keroplatidae present in Colombia shows that the family is widely distributed covering va-

rious ecosystems at different altitudinal ranges in the country. The greatest diversity of the family is concentrated in the Andean mountains, and this could be explained due to the increased sampling efforts carried out in these ecosystems during the last 10 years to uncover the diversity and ecology of some groups of paramo dipterans (e.g., Montoya and Wolff 2020, Henao-Sepúlveda *et al.* 2019, 2020, 2023). The fewer representatives of the family found in tropical lowland forests might be explained because of the lesser exploration efforts carried out in the country (Pizarro and García 2014, Parrado-Rosselli *et al.* 2015).

Some genera have been shown to be exclusive of high altitudes and temperate zones, such as *Cerotelion* Rondani, 1856, with species recorded from Argentina and Chile (Freeman 1951) and now from Colombia. A similar distribution is exhibited by *Pyrtaula* Edwards, 1929 (Lane 1958, Lane 1963, Freeman 1951), but with one species also present in Ecuador (Edwards 1920). These distributional records suggest that both genera have a restricted distribution throughout the Neotropical Andes from Chile to Colombia, a pattern that is also shared with other close groups of the family Mycetophylidae, such as *Neuratelia* Rondani, 1856 (Henao-Sepúlveda *et al.* 2019), *Eudicrana* Loew 1869 (Henao-Sepúlveda *et al.* 2020) and the genus *Paraleia* Tonnoir, 1929 (Oliveira and Amorin 2012, Henao-Sepúlveda *in press*). Other groups were found to be more associated with low altitudes and warm climates, such as the genus *Neoditomyia*, with two species known for the country before this work, which were found in Huila (Garzón) and Villavicencio between 400 and 500 m.a.s.l. (Lane and Sturm 1958). These altitudinal ranges are shared with other species of the genus recorded for Belize (Jackson 1974), Dominica, Cuba (Matile 1977, 1982), Jamaica, and Brazil (Coher 1996). Nevertheless, in this work, two specimens are reported between 700 and 1900 m.a.s.l., extending the altitudinal range of distribution for this genus.

The specimens studied here were found associated with three different vegetation covers: forest areas, paramos, and areas for livestock and agriculture. All the genera were found in forest areas, exhibiting their greatest diversity in these ecosystems. We highlight the genera *Cerotelion*, *Heteropterna*, *Isoneuromyia*, *Keroplatus*, *Lapyruta*, *Micrapemon*, *Neoditomyia*, *Plautyura*, and *Xenoplatyura* that were collected exclusively in these habitats. This high richness and abundance found in the forests was expected and

corresponds to what is mentioned in the literature since keroplatus prefer environments with low brightness and high humidity (Evenhuis 2006), characteristics present in forest areas. In the case of paramo ecosystems, although the abundance and richness found does not compare with that of forests for most genera, it is clear that paramo habitats present microhabitats with differential conditions compared to forested areas, promoting the emergence of unique taxa in these environments. For most of the genera present in the paramo ecosystem, we found a species diversity that potentially has not yet been described. It is worth highlighting the genus *Pyrtaula*, whose greatest abundance was found in paramo areas, in contrast to the other genera.

We found that some specimens of *Heteropterna*, *Lyprauta*, *Macrocera*, *Neoplatyura*, *Placoceratias*, *Platyroptilon*, *Proceroplatus*, and *Pyrtaula* were associated with disturbed environments, however, abundances in this habitat in general were extremely low, with less than five individuals reported for each of the mentioned genera. Specimens associated with these areas probably correspond to widespread distributed species that exhibit some degree of tolerance to disturbance and that were able to continue to occupy these niches after forest degradation.

In this work, the genera *Macrocera* (three morphospecies) and *Proceroplatus* (four morphospecies) were found in all ecosystems and abundant in the Malaise traps (Matile 1990) and well represented in the Neotropical region (Bechev 2000). To date, only one species has been recorded for *Macrocera* in the country (Papavero, 1978), likewise *Proceroplatus* has a record of an undescribed species (Falaschi 2016), which could suggest that most of the species reviewed in this work may be new records or new species. The genera *Isoneuromyia* (three morphospecies), *Neoceroplatus* (three morphospecies), and *Neoplatyura* (three morphospecies) show high diversity of species described for Brazil (Bechev 2000), but completely unknown for the Colombian regions, especially for the Andean regions of the country. While the genera that have one or two representatives, such as *Cerotelion* (one morphospecies), *Lapyruta* (one morphospecies) and *Micrapemon* (one morphospecies), groups that we consider rare and scarce in traps. The lack of knowledge of the taxonomic determination at the species level of the representatives of the family Keroplatusidae in Colombia, is largely due to the lack of

studies that focus on providing information that embraces its diversity at both generic and species levels.

CONCLUSIONS

This work greatly increases the knowledge of the generic diversity and life histories of Keroplatidae for Colombia, mainly in high mountain ecosystems, with a total of 17 genera identified, nine of which are recorded for the first time for the country. These results demonstrate the enormous potential of finding high hidden diversity in these poorly studied groups, which is relevant, not only for the general knowledge of these groups, but also to propose and implement effective actions for their conservation. We hope that this work will not only serve as a basis for future studies of Keroplatidae in Colombia but will also encourage the study of other unknown groups, in order to continue increasing the knowledge of the Colombian entomofauna and its overwhelming diversity.

AUTHORS' CONTRIBUTIONS

JSV, JVS and CHS revised the entomological material and literature, analyzed the data and prepared the draft and the illustrations. MW and CHS revised the entomological material and literature, designed the investigation, acquired the funding, contributed to the writing of the text and made critical revisions. All authors actively participated in the discussion of the results and approved the final manuscript.

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