



Annotated list of beetles (Insecta, Coleoptera) in an urban area of the Eastern Andes of Colombia

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Abstract

We present the first list of beetle species from an urban area in the northeast Andes of Colombia, based on a review of specimens deposited in the insect collection of the Museo de Historia Natural “Luis Gonzalo Andrade” of the Universidad Pedagógica y Tecnológica de Colombia and from sporadic collections from various points around the city of Tunja, Boyacá. We recorded 34 species, 30 genera, 17 subfamilies, and 12 families of beetles. Of these, 10 new records for the department of Boyacá and two new species records for Colombia are reported. In addition, we recorded the type of urban habitat for the individuals of 24 species collected: 11 species in gray areas (roads, sidewalks, houses, buildings) and eight in green areas (parks, pastures, plantations). Our results form a baseline for further studies on biodiversity in urban ecosystems in the Eastern Andes of Colombia.

Keywords

Distribution, diversity, insects, new records, urbanization

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Introduction

Urban growth has increased worldwide in recent decades to the point that a high percentage of the global human population now lives in cities (United Nations 2019). The growth rate in cities is especially accelerated in developing countries (e.g., Colombia) and this trend has drastic negative consequences on the preservation of biodiversity (Wu et al. 2003). The pattern of urban growth is well-known in the Andean environments of Colombia, where multiple emerging cities will experience high urban development, due to population growth (Parés-Ramos et al. 2013).

Knowledge of urban biodiversity in Colombia is

limited, more so in Andean cities, and even more so for groups whose role in maintaining ecosystem functioning is well known, such as the beetles. In the Andes of Colombia, studies on beetles have focused on natural habitats such as high Andean forests (Camero-R. et al. 2012; López-García et al. 2015; Bohórquez et al. 2016; Villalobos et al. 2016; Villalobos-Moreno 2017) and in páramos (Vargas and Pedraza 2003; Morales-Castaño and Amat-García 2012; Moreno and Molano 2016; Henao et al. 2019). For urban habitats, there are only the studies of Andrade and Amat (2000), Corporación Suna-Hisca (2003) and Vivas (2018).

Tunja is the biggest city of Boyacá, located in the center of the northeast Andes of Colombia (López 2019). The municipal area covers agricultural areas in which revisionary studies were carried out on some beetle families such as Coccinellidae, Chrysomelidae, Curculionidae, Dytiscidae, Nitidulidae, Scarabaeidae, and Silphidae, as for some other groups of insects (Sánchez and Carrillo 1975; Álvarez and Velásquez 1976; Barrera and Mendoza 1976; Concha and Niño 1978). For urban city areas, no reviews have been published, nor there are species lists of beetles, which is important if urban, economic and population growth of the city is taken into account for the present and projected into future years (Quintero-González 2017). Our objective was to provide information on the richness and composition of beetle species (Insecta: Coleoptera) from the urban part of the municipality of Tunja in the Eastern Andes of Colombia.

Methods

Study area. The municipality of Tunja is located in the department of Boyacá (Colombia), in the northern of the Eastern Cordillera of the Andes, with an average elevation of 2775 m a.s.l. (Venegas 2019) and an area of 121 km² (Ruiz et al. 2015) (Fig. 1). The mean annual precipitation is 645 mm, and the mean annual temperature is 12.9 °C (Venegas 2019).

The urban part of the municipality has an area of 17 km², which represents 14% of the total municipality (López 2019). Most of the buildings are located on the high slopes and are predominantly of colonial architecture, mainly in the center of the city (Soto 2016). For green areas, the city has 88 urban parks, mostly with spaces smaller than 1000 m², representing 0.2 km² of the total area of the city (<1%) (Ruiz et al. 2015). Within the urban area, 10 forest areas exist with a high dominance

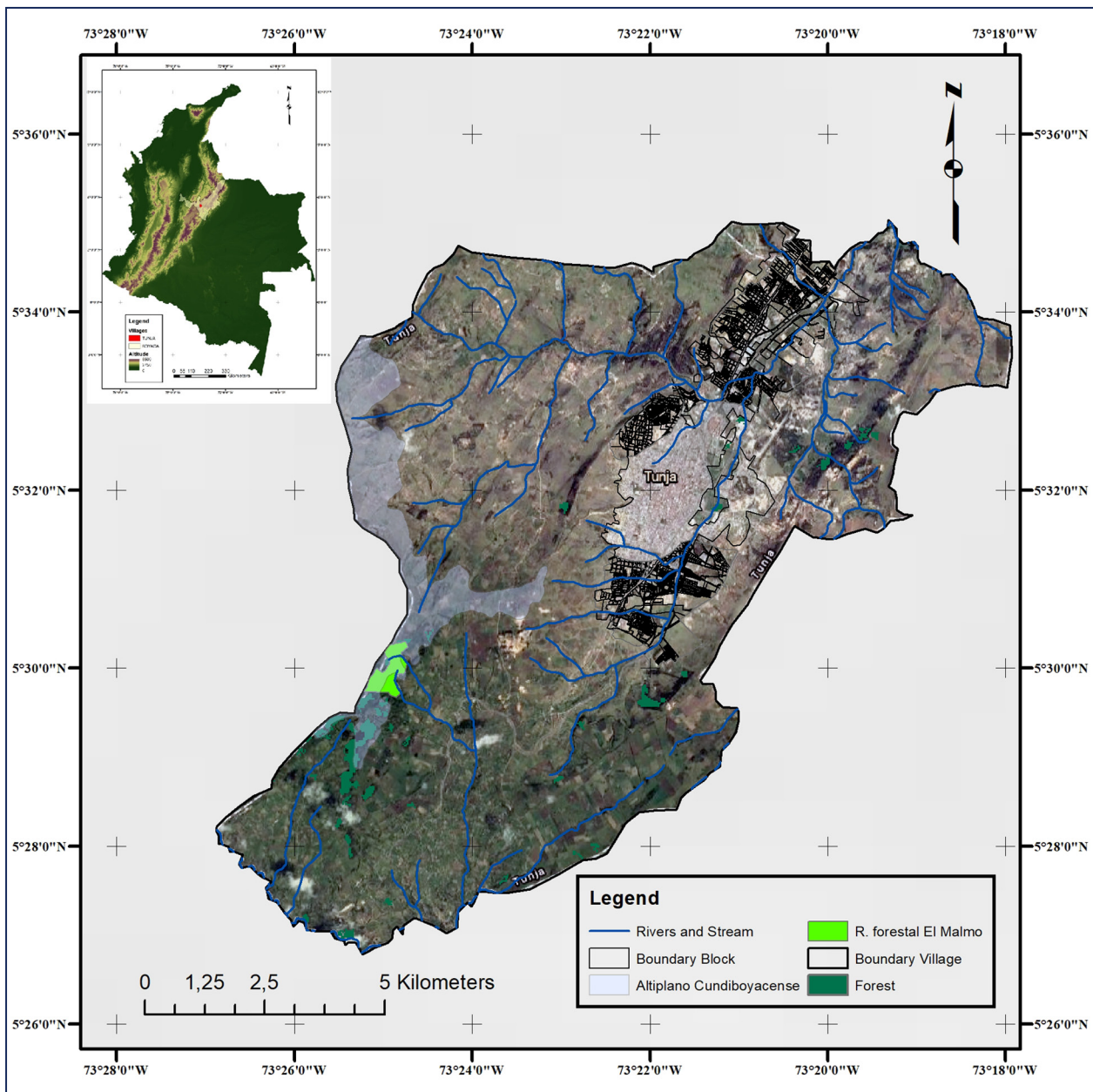


Figure 1. Urban and peri-urban area of the municipality of Tunja, Boyacá, Colombia.

of introduced tree species such as *Eucalyptus globulus* Labill., *Pinus radiata* D. Don, *Pinus patula* Schltdl. & Cham., *Araucaria angustifolia* (Bertol.) Kuntze, *Acacia decurrens* Willd., *Acacia melanoxylon* R. Br., *Cupressus lusitanica* Carrière, and *Araucaria heterophylla* (Salisb.) Franco (Mayor's Office of Tunja 2019).

Data collection. We followed two steps for collecting the information: First, we reviewed the specimens deposited in the Insect Collection of the Museo de Historia Natural "Luis Gonzalo Andrade" of the Universidad Pedagógica y Tecnológica de Colombia. Additionally, in the years 2016–2019, we collected beetles through hand collecting within the urban area of Tunja (Sporadic encounters, for this reason it does not correspond to a systematic sampling), particularly in green areas such as parks, *Eucalyptus* L'Hér. plantations, and grasslands, and on sidewalks, homes, and buildings (gray areas) (Roy et al. 2012; Sánchez-Quiroga 2019). Collections were made under the collection framework permitted by the Universidad Pedagógica y Tecnológica de Colombia (Resolution 724 of 2014) granted by the Autoridad de Licencias Ambientales of Colombia. The collected specimens are deposited in the Insect Collection of the Museo de Historia Natural "Luis Gonzalo Andrade". Habitat information was obtained from collection and specimen labels, and habitats were categorized into either green areas (parks, pastures, plantations) or gray areas (roads, sidewalks, houses, buildings) according to the classification of Roy et al. (2012) and Sánchez-Quiroga (2019).

We determined the species and species recorded from Tunja for the first time with the support of specialists for each family, besides using keys to family and genera (taxonomic revisions) and original descriptions of the species: Cantharidae (Pic 1911), Cerambycidae (Bates 1866; Zajciw 1964; Huedepohl 1985; Martins 1969; Botero and Santos-Silva 2017; Botero et al. 2019a, 2019b), Chrysomelidae (Guérin 1830), Coccinellidae (Vandenberg 2002; Bustamante and Yabar 2006; Zambrano 2019), Curculionidae (del Río 2009; Kirsch 1868), Dryophthoridae (Peng et al. 2002), Elateridae (Candèze 1859), Histeridae (Celli et al. 2015), Hydrophilidae (Young 1953; Hansen 1995), Phengodidae (Guérin 1843; Wittmer 1976), Scarabaeidae (Blanchard and Milne-Edwards 1850; Arrow 1933; Zunino and Halfpter 1997; Sanabria-García et al. 2012; Shaughney and Ratcliffe 2015; Fuhrmann and Vaz-De-Mello 2017; Villalobos et al. 2017; Rossini et al. 2018; Paucar-Cabrera and Ratcliffe 2019), and Silphidae (Bonilla et al. 2016). For comments on species identification, we follow the terminology and characters of the previous papers.

Results

Class Insecta
Order Coleoptera
Family Cantharidae Imhoff, 1856
Subfamily Chauliognathinae LeConte, 1861

Daiphron multicostatum (Pic, 1911)

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja; 05°32'07"N, 073°22'04"W; 2700 m a.s.l.; 13 Dec. 2006; Rodríguez S. leg.; hand collecting; UPTC-In-00204.

Identification. Black head with orange line on the forehead; orange pronotum with black stripe in the middle; orange elytra at the front and metallic blue-black at the back; antennal segments III–XI serrated and flattened; the prothorax narrower than the elytra and with a central black stripe (adapted from Pic 1911).

Geographical distribution. Peru (Pic 1911; Constantin and Chaboo 2016). This is the first record for Colombia.

Family Cerambycidae Latreille, 1802
Subfamily Cerambycinae Latreille, 1802

Amyipunga moritzii (Thomson, 1861)

Materials examined. COLOMBIA • 5♀ 3♂, adults; Boyacá, Tunja, UPTC; 05°31'57"N, 073°21'42"W; 2810 m a.s.l.; 05 Aug. 2018; Martínez D.C. leg.; *Eucalyptus* plantations; hand collecting; UPTC-In-00177 to 00184.

Identification. Body dark brown to black coloration (individuals from Venezuela may be reddish in color); head with yellow band on each side of the forehead; pronotum with longitudinal band of granules in the middle; elytra with yellow banding pattern: pubescent anterior stripes do not touch the scutellum and curved pubescent third stripes (adapted from Zajciw 1964; Santos-Silva and Martínez 2020).

Geographical distribution. Colombia (Boyacá) and Venezuela (Monné 2018; Santos-Silva and Martínez 2020).

Remarks. This species was collected in a *Eucalyptus* plantation near the western periphery of the city.

Deretrachys juvenis (Dupont, 1840)

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°33'18"N, 073°21'23"W; 2741 m a.s.l.; 22 Feb. 2017; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00147 • 1 adult; Boyacá, Tunja; 05°31'57"N, 073°21'42"W; 2800 m a.s.l.; 4 Apr. 2006; Molano F. leg.; hand collecting; UPTC-In-00186.

Identification. Body with yellow transverse band in the middle portion of the elytra, bordered by a black line that can vary in width; rough elytra and with evident punctation, and its general coloration can vary between dark brown and reddish (adapted from Huedepohl 1985).

Geographical distribution. Colombia: Tolima, Cundinamarca (Bogotá DC), Boyacá, Antioquia, and Santander (Monné 2018; Bezark 2019).

Remarks. This species was collected from the sidewalk of a road with low traffic flow.

Eurysthea cribripennis (Bates, 1885)

Figure 2A

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°33'22"N, 073°21'23"W; 2733 m a.s.l.; 28 Apr. 2017; Martínez D.C. leg.; *Eucalyptus* plantations;

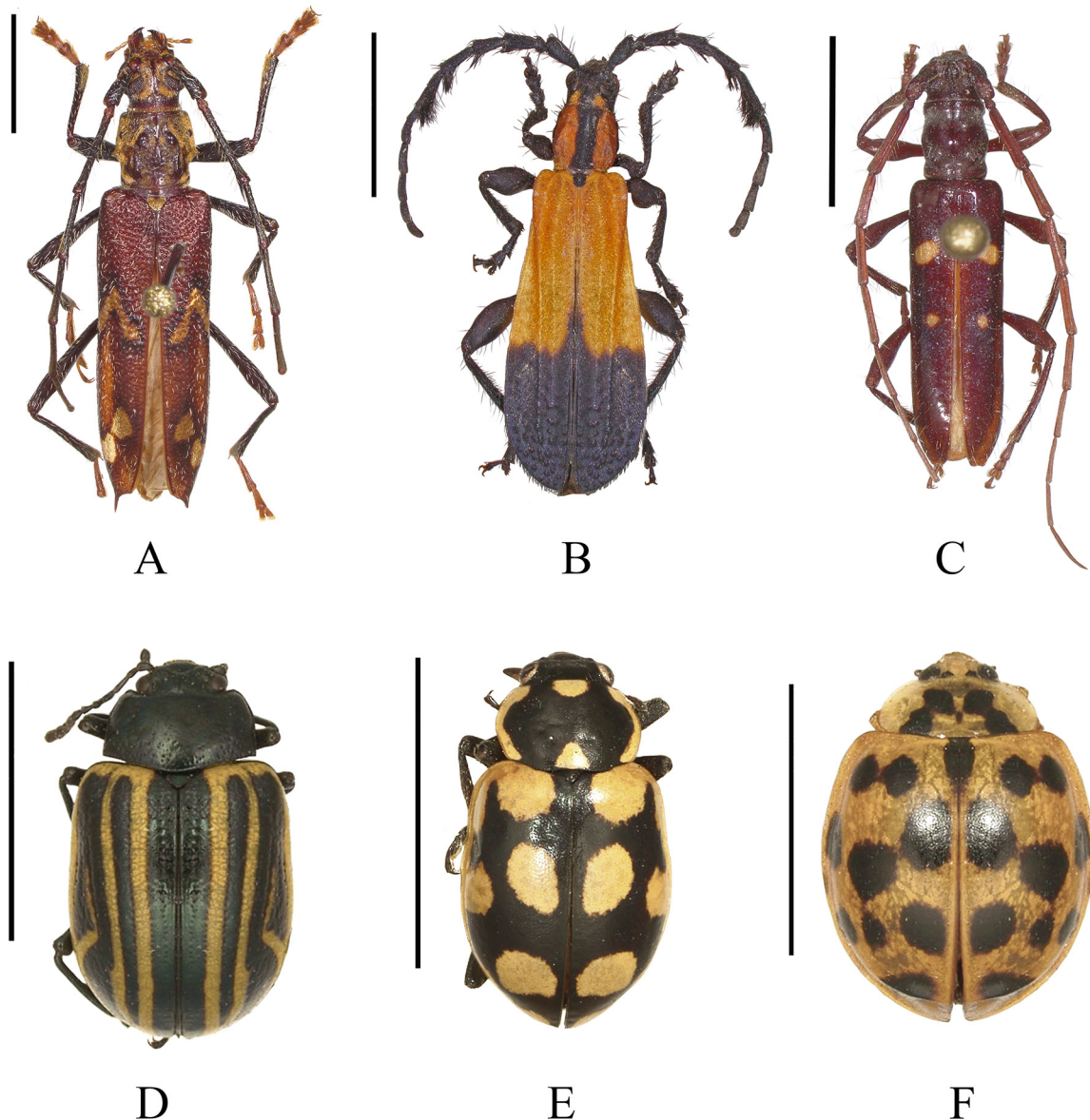


Figure 2. Beetles from the urban area of the municipality of Tunja (Colombia). **A.** *Eurysthea cribripennis*. **B.** *Pteroplatus gracilis*. **C.** *Rhysium guttiferum*. **D.** *Calligrapha percheroni*. **E.** *Eriopis punicola*. **F.** *Harmonia axyridis*. Scale bars = 5 mm.

carpotrap; UPTC-In-00148 • 1 adult; Boyacá, Tunja, UPTC; 05°33'18"N, 073°21'22"W; 2721 m a.s.l.; 17 Apr. 2017; Martínez D.C. leg.; *Eucalyptus* plantations; carpotrap; UPTC-In-00149.

Identification. Body reddish color, each elytron has a yellow spot in the shape of an inverted “V”, a yellow split spot at the apex, and a thorn-shaped ending; antennomers III and IV with spines in the basal part; prothorax with two lateral spines and five tubercles on the dorsal part. (adapted from Botero and Santos-Silva 2017).

Geographical distribution. Peru, Ecuador, Colombia, Panama, Costa Rica, and Nicaragua. Colombia: Cundinamarca, Boyacá, Antioquia, and Magdalena (Monné 2018; Bezark 2019).

Remarks. Species collected in *Eucalyptus* plantations by means of carpotraps.

***Pteroplatus gracilis* (Buquet, 1840)**

Figure 2B

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°32'34"N, 073°22'06"W; 2826 m a.s.l.; 15 Sep. 2017; Martínez D.C. leg.; inside a building; hand collecting; UPTC-In-00150.

Identification. Body rough, orange and black; elytra orange-yellow on the anterior half and black on the posterior half, wide chromatic variation in the color of the elytra where longitudinal black bands can be present; head with two orange spots behind the eyes; pronotum is orange-yellow with a central black band (adapted from Botero et al. 2019a).

Geographical distribution. Peru and Colombia. Colombia: Cundinamarca (Bogotá DC), Quindío, Boyacá, and Santander (Monné 2018; Botero et al. 2019a).

Remarks. This species was collected inside a building in the northwestern part of the city.

***Rhysium guttiferum* (Thomson, 1867)**

Figure 2C

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Villa Universitaria neighborhood; 05°32'57"N, 073°21'20"W; 2689 m a.s.l.; 14 Jun. 2017; Ciendua K. leg.; park; hand collecting; UPTC-In-00146 • 1 adult; Boyacá, Tunja, Santa Inés neighborhood; 05°32'34"N, 073°22'06"W; 2781 m a.s.l.; 23 Feb. 2018; Martínez D.C. leg.; sidewalks; hand collecting; UPTC-In-00151.

Identification. Body with elytra reddish brown and each with two yellow spots, one in the front and the other in the middle, variations of this spot pattern may exist: one spot per elytra or absent; head antennomer III carinate and longer than IV, and in turn the antennomer IV shorter than V; pronotum longer than wide, covered by a dense and short pubescence, except for a central region of triangular shape in the dorsal part that is smooth and shiny (adapted from Martins 1969).

Geographical distribution. Colombia: Huila, Cundinamarca (Bogotá DC), and Boyacá (Martins and Galileo 2002; Monné 2018).

Remarks. Species were collected in park areas and on roadside pavement.

Subfamily Lamiinae Latreille, 1825

***Nealcidion lineatum* (Bates, 1863)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja; 05°31'57"N, 073°21'42"W; 2700 m a.s.l.; 13 Dec. 2006; Rodríguez S. leg.; hand collecting; UPTC-In-00187.

Identification. Body brown with short yellow hairs giving a mottled appearance; elytra with a defined punctuation, with sinuate-truncated apexes, inner apex angle of each elytron pointed, and obtuse external angle; head, with two protrusions from which the antennae emerge. (adapted from Bates 1866).

Geographical distribution. Ecuador, Venezuela, Panama, and Costa Rica. Previously reported in Colombia without locality data (Swift et al. 2010; Monné 2018), the presence of this species is now confirmed. First records for the department of Boyacá.

Family Chrysomelidae Latreille, 1802

Subfamily Chrysomelinae Latreille, 1802

***Calligrapha percheroni* (Guérin-Ménéville, 1830)**

Figure 2D

Materials examined. COLOMBIA • 3 adults; Boyacá, Tunja, UPTC; 05°32'07"N, 073°22'04"W; 2775 m a.s.l.; 21 Nov. 2007; López Y. et al. leg.; hand collecting; UPTC-In-00188 to 00190.

Identification. Body bright, dark-blue, elytra with a pattern of four yellow lines: first line very close to the elytra

suture, reaches the end of the elytra and joins the fourth line that runs along the outer edge; second line joins the first on the back of the elytra; the third line does not join the others in the anterior part; it has an abrupt curvature from the middle part towards the back of the elytra, joining at the end to the fourth line (adapted from Guérin 1830).

Geographical distribution. Bolivia, Peru, Ecuador, and Venezuela (Briceño-Vergara 1975; Chaboo and Flowers 2015; Merckx et al. 2018). First record for Colombia.

Family Coccinellidae Latreille, 1807

Subfamily Coccinellidae Latreille, 1807

***Cycloneda sanguinea* (Linnaeus, 1763)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°31'57"N, 073°21'42"W; 2782 m a.s.l.; 16 Mar. 2007; Martínez & Neira M. leg.; fragmented habitat; hand collecting; UPTC-In-00197 • 1 adult; Boyacá, Tunja; 05°31'57"N, 073°21'42"W; 2760 m a.s.l.; 9 Sep. 2006; Gómez D. leg.; hand collecting; UPTC-In-00198.

Identification. Body circular; elytra with chromatic variations from orange to red but always without spots and with yellow edges. This last character can differentiate it from *E. sanguinea limbifer*, a species that has dark elytra borders; pronotum, black with a yellow border and two light-yellow semicircular spots. This species can be confused with *C. emarginata*; however, they are distinguished by the genitalia of the males and the pronotal spots that in *C. emarginata* are rhomboid in shape (adapted from Zambrano 2019).

Geographical distribution. Chile, Argentina, Uruguay, Brazil, Paraguay, Bolivia, Peru, Ecuador, Colombia, Venezuela, and the Antilles. Colombia: Putumayo, Nariño, Huila, Meta, Valle del Cauca, Chocó, Cundinamarca, Casanare, Risaralda, Boyacá, Antioquia, Santander, Arauca, Norte de Santander, Bolívar, Córdoba, Cesar, and Magdalena (Vandenberg 2002; Zambrano 2019).

***Eriopis punicula* (Hofmann, 1970)**

Figure 2E

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°32'07"N, 073°22'04"W; 2775 m a.s.l.; 21 Nov. 2007; López Y. et al. leg.; hand collecting; UPTC-In-00193 • 1 adult; Boyacá, Tunja, UPTC; 05°33'06"N, 073°21'24"W; 2690 m a.s.l.; 14 Sep. 2008; Bohórquez et al. leg.; grasslands; hand collecting; UPTC-In-00194.

Identification. Body oblong, black with light yellow spots on the pronotum and elytra; each elytron with seven light yellow spots following the pattern: 2: 2: 2: 1, spots 2–4, and 6 attached to the lateral edge of the elytra, which is light yellow; pronotum with thin, light-yellow lateral edges, with small light-yellow spots in the middle anterior and posterior part (adapted from Bustamante and Yabar 2006; Zambrano 2019).

Geographical distribution. Bolivia, Peru, and Colombia. Colombia: Valle del Cauca, Tolima, Cundinamarca,

Casanare, and Boyacá (Bustamante and Yabar 2006; Zambrano 2019).

Remarks. This species was collected in a grassland area.

***Harmonia axyridis* (Pallas 1772)**

Figure 2F

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Pozo de Donato; 05°31'57"N, 073°21'42"W; 2750 m a.s.l.; 30 Mar. 2006; Palacio M. leg.; hand collecting; UPTC-In-00191 • 1 adult; Boyacá, Tunja, UPTC; 05°32'07"N, 073°22'04"W; 2775 m a.s.l.; 21 Nov. 2007; Y. López et al. leg.; hand collecting; UPTC-In-00192.

Identification. Body oval, yellow-orange; elytra with nine black spots each arranged in four horizontal lines (2: 3: 3: 1), this pattern of spots in the elytra can vary between individuals; pronotum with a black M-shaped patch (adapted from Zambrano 2019).

Geographical distribution. Chile, Argentina, Uruguay, Brazil, Paraguay, Peru, Ecuador, Colombia, Venezuela, USA, and Canada. Colombia: Nariño, Cauca, Tolima, Valle del Cauca, Cundinamarca, Caldas, Boyacá, and Antioquia (Roy et al. 2016; Zambrano 2019).

Remarks. This species was recorded in the Pozo de Donato, which has green areas with tall trees.

***Neda amandi* (Mulsant 1850)**

Figure 3A

Materials examined. COLOMBIA • 2 adults; Boyacá, Tunja, Sector San Ricardo; 05°31'57"N, 073°21'42"W; 2750 m a.s.l.; 15 Sep. 2007; Alvarado F. leg.; hand collecting; UPTC-In-00195, 00196.

Identification. Body with elytra yellow, each with seven black spots distinctive for the species; pronotum with two yellow spots on each side of the anterior part (adapted from Mader 1952; González 2016).

Geographical distribution. Colombia and Venezuela (Mérida) (González 2016). The presence of the species is confirmed for the country and it is recorded for the first time for the department of Boyacá.

Family Curculionidae Latreille, 1802

Subfamily Entiminae Schönherr, 1823

***Amphideritus* aff. *setosus* (Schönherr 1847)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Altamira neighborhood; 05°32'34"N, 073°22'06"W; 2826 m a.s.l.; 16 Jul. 2017; Martínez D.C. leg.; inside a building; hand collecting; UPTC-In-00154.

Identification. Body dark brown; elytra with slightly protruding rounded shoulders and covered by long scattered brown scales that reveal the integument, base of the elytra straight or slightly curved backwards; head rostral groove that exceeds the posterior margin of the eye, scrubs that end in front of the eyes; pronotum covered by few iridescent cream-colored oval scales (adapted from del Río 2009).

Geographical distribution. Colombia: Bogotá DC (del

Río 2009).

Remarks. This species was collected inside buildings.

***Amphideritus steinheili* (Kirsch 1889)**

Materials examined. COLOMBIA • 3 adults; Boyacá, Tunja, UPTC; 05°33'18"N, 073°21'22"W; 2721 m a.s.l.; 28 Apr. 2017; Martínez D.C. leg.; *Eucalyptus* plantations; carpotrap; UPTC-In-00144 • 1 adult; Boyacá, Tunja, Altamira neighborhood; 05°32'34"N, 073°22'06"W; 2826 m a.s.l.; 03 Mar. 2017; Martínez D.C. leg.; inside a building; hand collecting; UPTC-In-00152.

Identification. Body covered by ocher colored filiform hairs; elytra covered with oval brown and ocher scales that give a spotty appearance; head, rostral groove narrow and deep that does not exceed the posterior margin of the eyes; scrubs ending below the eye and with a slightly conical face (adapted from del Río 2009).

Geographical distribution. Colombia: Cundinamarca and Boyacá (del Río 2009).

Remarks. This species was collected in *Eucalyptus* plantations and inside buildings.

***Amphideritus vilis* (Boheman 1840)**

Figure 3B

Materials examined. COLOMBIA • 2 adults; Boyacá, Tunja, UPTC; 05°33'22"N, 073°21'23"W; 2733 m a.s.l.; 28 Apr. 2017; Martínez D.C. leg.; *Eucalyptus* plantations; carpotrap; UPTC-In-00143 • 1 adult; Boyacá, Tunja, Altamira neighborhood; 05°32'34"N, 073°22'06"W; 2826 m a.s.l.; 05 Feb. 2017; Martínez D.C. leg.; inside a building; hand collecting; UPTC-In-00153.

Identification. Body covered with ocher scales; elytra with decumbent setae that give an appearance of white spots; head not having scales on the head and with rostral groove that does not extend beyond the rear edge of the eyes; scrubs ending front of the eye at the height of its lower margin; pronotum straight, having long, filiform, decumbent setae (adapted from del Río 2009).

Geographical distribution. Chile, Peru, Colombia, and Venezuela (del Río 2009). The presence of this species in Colombia is confirmed, and it is reported for the first time from Boyacá.

Remarks. This species was collected in *Eucalyptus* plantation using carpotrap and inside buildings.

***Leschenius vulconarum* (Kirsch 1889)**

Figure 3C

Materials examined. COLOMBIA • 6 adults; Boyacá, Tunja, UPTC; 05°33'18"N, 073°21'22"W; 2721 m a.s.l.; 28 Apr. 2017; Martínez D.C. leg.; *Eucalyptus* plantations; carpotrap; UPTC-In-00142 • 7 adults; Boyacá, Tunja, Altamira neighborhood; 05°32'34"N, 073°22'06"W; 2826 m a.s.l.; 18 Jan. 2018; Martínez D.C. leg.; inside a building; hand collecting; UPTC-In-00145.

Identification. Body black; elytra with setae are filiform and abundant; head with rostral furrow that extends beyond the posterior border of the eyes; head with filiform,

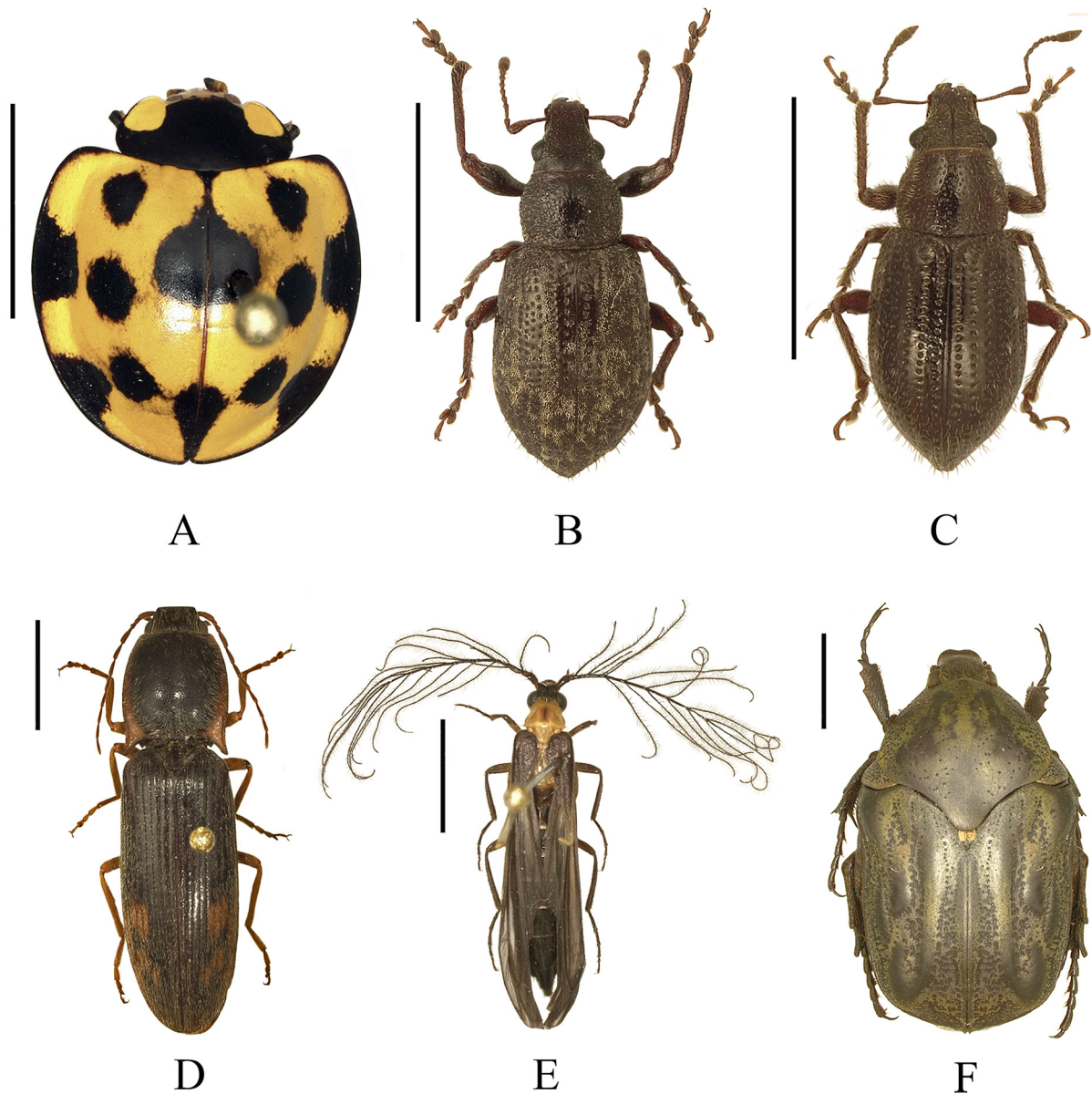


Figure 3. Beetles from the urban area of the municipality of Tunja (Colombia). **A.** *Neda amandi*. **B.** *Amphideritus vilis*. **C.** *Leschenius vulcanorum*. **D.** *Conoderus semimarginatus*. **E.** *Pseudophengodes roulini*. **F.** *Hoplopyga liturata*. Scale bars = 5 mm.

decumbent and thick setae of ocher color; pronotum with light-ocher, filiform setae forming two longitudinal lines on each side of the midline (adapted from del Río 2009).

Geographical distribution. Chile, Argentina, Uruguay, Brazil, Peru, Ecuador, Colombia, Venezuela, and the USA. Colombia: Nariño, Cundinamarca, and Boyacá (Garza-Puentes 2006; del Río 2009).

Remarks. This species was collected in *Eucalyptus* plantations using carpotrans and inside buildings.

***Mimographus amandus* (Kirsch, 1868)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°32'07"N, 073°22'04"W; 2775 m a.s.l.; 21 Nov. 2007; López Y. leg.; hand collecting; UPTC-In-00199.

Identification. Body green with iridescent green scales; pronotum with longitudinal line of white scales on each

side of the central part, and a row of long, upright, white setae on the anterior border; elytra have ovoid, iridescent scales with of various shades of green, punctuated in longitudinal rows with erect iridescent white hairs (adapted from Kirsch 1868).

Geographical distribution. Colombia: Bogotá DC (Kirsch 1868; Blackwelder 1947). It is confirmed for the first time from the department of Boyacá.

Family Dryophthoridae Schönherr, 1825

Subfamily Rhynchophorinae Schönherr, 1833

***Sitophilus oryzae* (Schoenherr, 1838)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Bello Horizonte neighborhood; 05°31'57"N, 073°21'42"W; 2775 m a.s.l.; 13 Mar. 2010; Pineda et al. leg.; hand collecting; UPTC-In-00200.

Identification. General color reddish or dark brown; punctuation of the pronotum and elytra longitudinally oval; each elytron with two yellow or light-orange spots; aedeagus with convex dorsal surface (adapted from Peng et al. 2002).

Geographical distribution. Cosmopolitan species present in Africa, America, Asia, Europe, and Australia (Hong et al. 2018; Pérez et al. 2018). This is the first record of this species from Boyacá.

Family Elateridae Leach, 1815

Subfamily Agrypninae Candèze, 1857

***Conoderus semimarginatus* (Latreille 1833)**

Figure 3D

Materials examined. COLOMBIA • 2 adults; Boyacá, Tunja, Altamira neighborhood; 05°32'34"N, 073°22'06"W; 2826 m a.s.l.; 10 Apr. 2017; Martínez D.C. leg.; inside a building; hand collecting; UPTC-In-00155, 00156.

Identification. Body brown and covered by small yellow hairs; antennomeres II and III smaller than the others and their added length is subequal to antennomere IV; pronotum with elongated, slender, slightly carinate posterior angles; elytra with light brown spots on the posterior half (adapted from Candèze 1859).

Geographical distribution. Colombia but without specific locality (Candèze 1859). This is the first record from Boyacá.

Remarks. This species was collected inside buildings.

Family Histeridae Gyllenhal, 1808

Subfamily Histerinae Gyllenhal, 1808

***Hister cavifrons* (Marseul, 1854)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°31'57"N, 073°21'42"W; 2760 m a.s.l.; 21 Nov. 2006; Arias J. leg.; hand collecting; UPTC-In-00201.

Identification. Body shiny black; forehead concave and frontal stria on the head complete; marginal stria of pronotum is incomplete at back of head; prosternum with thin keel; elytra with incomplete elytral striae I–IV, and stria V only present in the posterior half (adapted from Celli et al. 2015).

Geographical distribution. Brazil, Colombia (without specific locality), and Mexico (Celli et al. 2015; Correa et al. 2019). This is the first report of this species from Boyacá.

Family Hydrophilidae Latreille, 1802

Subfamily Hydrophilinae Latreille, 1802

***Tropisternus lateralis* (Fabricius, 1775)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC; 05°31'57"N, 073°21'42"W; 2782 m a.s.l.; 21 Mar. 2007; Martínez & Neira M. leg.; fragmented habitat; hand collecting; UPTC-In-00202 • 1 adult; Boyacá,

Tunja; 05°31'57"N, 073°21'42"W; 2700 m a.s.l.; 10 Sep. 2007; Alvarado H., Ángel A. leg.; aquatic nets; UPTC-In-00203.

Identification. Body green, with a yellow border on the head, pronotum, and elytra; posterior femur with carina curved that does not extend beyond the end of the trochanter; last abdominal sternum with carina on the posterior border that forms a small spine (adapted from Young 1953; Hansen 1995).

Geographical distribution. Argentina, Uruguay, Paraguay, Bolivia, Brazil, Peru, Galapagos Island, Colombia, Venezuela, Antilles, Jamaica, Puerto Rico, Cuba, Bahamas, Mexico, USA, and Canada. Reported from Colombia but without specific locality (Roskov et al. 2019). This species is reported here for the first time from Boyacá.

Family Phengodidae LeConte, 1861

Subfamily Phengodinae LeConte, 1861

***Pseudophengodes roulini* (Guérin-Méneville, 1843)**

Figure 3E

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC, Museo de Historia Natural “Luis Gonzalo Andrade”; 05°33'19"N, 073°21'19"W; 2737 m a.s.l.; 18 May. 2018; Prieto J. leg.; inside a building; hand collecting; UPTC-In-00175 • 1 adult; Boyacá, Tunja, Mesopotamia neighborhood; 05°32'45"N, 073°21'17"W; 2692 m a.s.l.; 20 Apr. 2018; Martínez P.J. leg.; inside a building; hand collecting; UPTC-In-00176.

Identification. Body black except for the yellow pronotum with a thin longitudinal black line; antennae longer than the body, with ramifications, and these in turn with small hairs; black elytra, reaching the middle of the abdomen with the apical part thin and lighter in color (adapted from Guérin 1843; Wittmer 1976).

Geographical distribution. Peru, Ecuador, and Venezuela. Reported for Colombia, but without a specific location (Zaragoza-Caballero and Pérez 2014). This species is reported here for the first time from Boyacá.

Remarks. This species was collected from inside buildings.

Family Scarabaeidae Latreille, 1802

Subfamily Cetoniinae Leach, 1815

***Hoplopyga liturata* (Olivier, 1789)**

Figure 3F

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC, INCITEMA; 05°33'13"N, 073°21'24"W; 2708 m a.s.l.; 21 May. 2016; Martínez D.C. leg.; sidewalks; hand collecting; UPTC-In-00165 • 1 adult; Boyacá, Tunja, UPTC, Vivero; 05°33'10"N, 073°21'28"W; 2699 m a.s.l.; 12 Jan. 2018; Martínez D.C. leg.; sidewalks; hand collecting; UPTC-In-00171.

Identification. Body green; pronotum with an M-shaped black spot; elytra with dark elevations in the shape of an inverted “J” in the apical part, and with depressions in

the mid-discal area in which there are “n” shaped punctures organized in rows that do not touch the scutellum (adapted from Shaughney and Ratcliffe 2015).

Geographical distribution. Chile, Argentina, Paraguay, Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Suriname, Guyana, French Guiana, Panama, Costa Rica, Trinidad, Nicaragua, Honduras, El Salvador, Guatemala, Belize, and Mexico. Colombia: Guaviare, Cauca, Meta, Valle del Cauca, Vichada, Quindío, Cundinamarca, Chocó, Casanare, Caldas, Boyacá, Antioquia, Norte de Santander, Córdoba, and Sucre (Shaughney and Ratcliffe 2015; Taboada-Verona et al. 2019).

Remarks. This species was collected from sidewalks surrounded by grasslands and *Eucalyptus* plantations.

Subfamily Dynastinae Macleay, 1819

***Ancognatha scarabaeoides* (Erichson, 1847)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Fuente neighborhood; 05°32'55"N, 073°21'49"W; 2766 m a.s.l.; 23 Nov. 2016; Martínez D.C. leg.; grasslands; hand collecting; UPTC-In-00166 • 1 adult; same data as for preceding; 12 Oct. 2016; UPTC-In-00167.

Identification. Body shiny black; clypeus subtriangular with rounded lateral margins and acute apex; frontoclypeal region with two small elevations attached to the margin of each eye; pronotum, elytra and pygidium with smooth and glabrous surface (adapted from Paucar-Cabrera and Ratcliffe 2019).

Geographical distribution. Bolivia, Peru, Ecuador, Colombia, and Panama. Colombia: Nariño, Cauca, Huila, Meta, Valle del Cauca, Tolima, Quindío, Cundinamarca, Risaralda, Caldas, Boyacá, Antioquia, Santander, and Atlántico (Villalobos et al. 2016, 2017; Paucar-Cabrera and Ratcliffe, 2019).

Remarks. This species was collected in areas of grasslands.

***Ancognatha ustulata* (Burmeister, 1847)**

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Fuente neighborhood; 05°32'55"N, 073°21'49"W; 2766 m a.s.l.; 27 Oct. 2017; Martínez D.C. leg.; grassland; hand collecting; UPTC-In-00168 • 1 adult; Boyacá, Tunja, UPTC, Centro de Laboratorios; 05°33'18"N, 073°21'19"W; 2722 m a.s.l.; 12 Apr. 2018; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00169.

Identification. Body with black and brown spots: pronotum with black blotch covering most of it; elytra with elongated, central black spot that fades in the apical part; metasternal and abdominal sternites with brown apical parts (adapted from Paucar-Cabrera and Ratcliffe 2019).

Geographical distribution. Peru, Ecuador, Colombia, and Venezuela. Colombia: Cauca, Valle del Cauca, Tolima, Cundinamarca, Chocó, Caldas, Boyacá, and Antioquia. (Restrepo-Giraldo et al. 2003; Paucar-Cabrera and Ratcliffe 2019).

Remarks. This species was collected in grasslands and built-up areas.

***Golofa eacus* (Burmeister, 1847)**

Figure 4A

Materials examined. COLOMBIA • 1♀, adult; Boyacá, Tunja, Plazoleta San Francisco; 05°32'07"N, 073°21'44"W; 2778 m a.s.l.; 30 Aug. 2016; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00163 • 1♀, adult; Boyacá, Tunja, UPTC, main entrance; 05°32'55"N, 073°21'16"W; 2693 m a.s.l.; 9 Aug. 2018; Castro K. leg.; sidewalk; hand collecting; UPTC-In-00164.

Identification. Body yellow or brown but with have chromatic variations to darker tones; the size can vary between 30 and 40 mm; anterior horn of the head with 3–5 teeth; the genitalia of the male have a long and widened basal part, with long and asymmetric extensions with one of them emarginated and with a rounded and pubescent apex (adapted from Villalobos et al. 2017).

Geographical distribution. Argentina, Brazil, Peru, Colombia, and Venezuela. Colombia: Valle del Cauca, Tolima, Cundinamarca, Antioquia, and Santander (Villalobos et al. 2016, 2017; Roskov et al. 2019). This species is recorded for the first time from Boyacá.

Remarks. This species was collected on sidewalks in areas with a high influx of people.

***Heterogomphus dilaticolis* (Burmeister, 1847)**

Materials examined. COLOMBIA • 1♂, adult; Boyacá, Tunja, UPTC, Centro de Laboratorios; 05°33'18"N, 073°21'19"W; 2722 m a.s.l.; 05 Sep. 2016; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00161 • 1♂, adult; Boyacá, Tunja, UPTC, Rafael Azula Building; 05°33'00"N, 073°21'25"W; 2690 m a.s.l.; 23 Jun. 2016; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00162.

Identification. Body shiny black in males and females. Males with long, recurved frontoclypeal horn; pronotum with bifurcated projection that can vary in size. Females with small tubercle in the frontoclypeal region of the head, an acute and pronotum clypeus without projections (adapted from Sanabria-García et al. 2012).

Geographical distribution. Peru, Ecuador, Colombia, and Venezuela. Colombia: Putumayo, Nariño, Cauca, Huila, Valle del Cauca, Tolima, Quindío, Cundinamarca, Casanare, Risaralda, Caldas, Boyacá, Antioquia, Santander, Norte de Santander, Cesar, and Magdalena (Sanabria-García et al. 2012; Villalobos et al. 2016).

Remarks. This species was collected on sidewalks, in areas with a high influx of people, and in areas with many trees and grasslands.

***Heterogomphus schoenherri* (Burmeister, 1847)**

Materials examined. COLOMBIA • 1♂, adult; Boyacá, Tunja, UPTC; 05°32'07"N, 073°22'04"W; 2775 m a.s.l.; 21 Nov. 2007; López Y. et al. leg.; hand collecting; UPTC-In-00205.

Identification. Body shiny black, and elytra rough; anterior tibia quadridentate, with a small basal tooth and a second and third tooth almost at right angles. Male

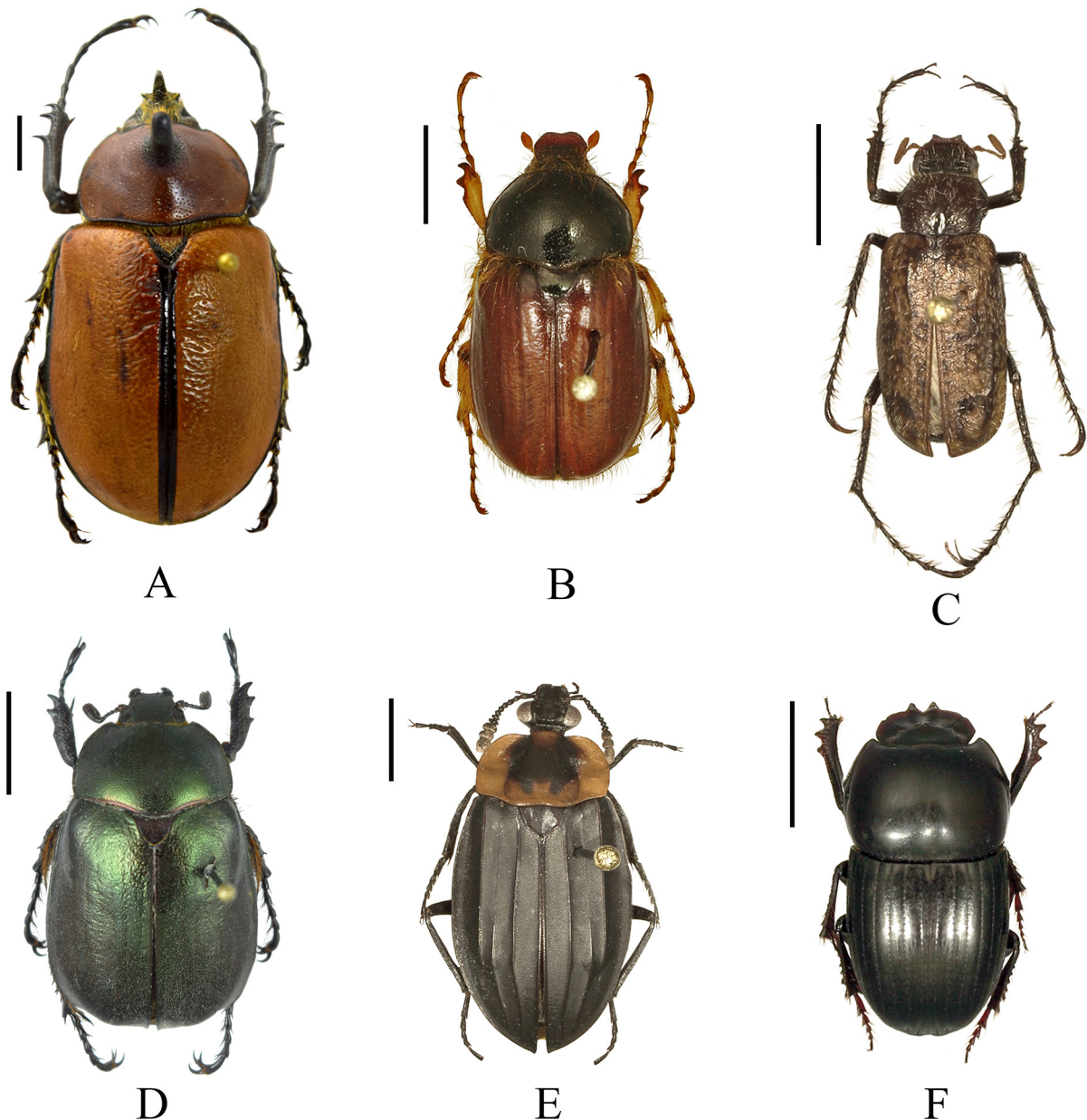


Figure 4. Beetles from the urban area of the municipality of Tunja (Colombia). **A.** *Golofa eacus*. **B.** *Paulosawaya ursina*. **C.** *Manopus biguttatus*. **D.** *Lasiocala lucens*. **E.** *Oxelytrum discicolle*. **F.** *Uroxys coarctatus*. Scale bars = 5 mm.

pronotal horn broad, concave, and densely covered underneath by short brown hairs. Females with a convex pronotum surface with the posterior half with large and small punctures (adapted from Sanabria-García et al. 2012).

Geographical distribution. Ecuador, Colombia, Venezuela, and Panama. Colombia: Caquetá, Nariño, Cauca, Huila, Valle del Cauca, Tolima, Quindío, Cundinamarca, Casanare, Caldas, Boyacá, Antioquia, Santander, Norte de Santander, and Cesar (Villalobos et al. 2016, 2017; Roskov et al. 2019).

Subfamily Melolonthinae Leach, 1819

Manopus biguttatus (Castelnau, 1840)

Figure 4C

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC, Museo de Historia Natural “Luis Gonzalo Andrade”; 05°33'19"N; 073°21'20"W; 2741 m a.s.l.; 09 May. 2018; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00170.

Identification. Body elongate with erect white setae; pronotum trapezoidal and dark brown; elytra longer than wide and with two dark spots on the apical part (adapted from Villalobos et al. 2017).

Geographical distribution. Peru and Colombia. Colombia: Cundinamarca, Boyacá, Antioquia, and Santander (Fuhrmann and Vaz-De-Mello 2017; Villalobos-Moreno 2017).

Remarks. This species was collected on the sidewalk of a building surrounded by *Eucalyptus* plantations.

***Paulosawaya ursina* (Blanchard, 1850)**

Figure 4B

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Fuente neighborhood; 05°32'55"N; 073°21'49"W; 2766 m a.s.l.; 19 Apr. 2017; Martínez D.C. leg.; grassland; hand collecting; UPTC-In-00157 • 1 adult; same data as for preceding; 13 Apr. 2017; UPTC-In-00158.

Identification. Head dark brown; pronotum black; elytra rough and brown; clypeus enlarged and somewhat square; palpomeres IV enlarged and semicircular. Ventral part of the whole body with long, light-brown hairs (adapted from Fuhrmann and Vaz-de-Mello 2017).

Geographical distribution. Colombia: Huila, Valle del Cauca, Tolima, Cundinamarca, Caldas, and Boyacá (Fuhrmann and Vaz-de-Mello 2017).

Remarks. This species was collected in grasslands.

Subfamily Rutelinae MacLeay, 1819

***Lasiocala lucens* (Ohaus, 1908)**

Figure 4D

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Fuente neighborhood; 05°32'55"N; 073°21'49"W; 2766 m a.s.l.; 22 Nov. 2016; Martínez D.C. leg.; grassland; hand collecting; UPTC-In-00159 • 1 adult; same data as for preceding; 13 Feb. 2018; UPTC-In-00160.

Identification. Body iridescent green; metatibia with a straight internal margin and spines on its apical edge; elytra wider at the back, with obvious protrusions, and rough surface (adapted from Blanchard and Milne-Edwards 1850).

Geographical distribution. Colombia and Ecuador. Colombia: Boyacá (López-García et al. 2015).

Remarks. This species was collected in grasslands through direct collection.

Subfamily Scarabaeinae Latreille, 1802

***Onthophagus curvicornis* (Latreille, 1811)**

Materials examined. COLOMBIA • 2♂, adults; Boyacá, Tunja, UPTC; 05°32'07"N, 073°22'04"W; 2775 m a.s.l.; 21 Nov. 2007; López Y. et al. leg.; on cow manure in grassland; hand collecting; UPTC-In-00206, 00207.

Identification. Body iridescent green; clipper trapezoidal, with curved sides; frontal carina with two long, thin, curved horns; pronotum with a square antero-medial projection delimited by two lateral excavations where the horns of the frontal carina fit; pronotal punctuation simple (adapted from Zunino and Halfpeter 1997; Rossini et al. 2018).

Geographical distribution. Brazil, Ecuador, Colombia, Venezuela, Panama, Costa Rica, Guatemala, Belize, and Mexico Colombia: Valle del Cauca, Quindío, Cundinamarca, Risaralda, Caldas, and Boyacá (Cultid et al. 2012; Roskov et al. 2019).

Remarks. This species was collected by hand from cow manure in grasslands.

***Uroxys coarctatus* (Harold, 1867)**

Figure 4F

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, Altamira neighborhood; 05°32'34"N, 073°22'06"W; 2826 m a.s.l.; 15 Jan. 2017; Martínez D.C. leg.; inside a building; hand collecting; UPTC-In-00172 • 1 adult; same data as for preceding; 05 Feb. 2017; UPTC-In-00173.

Identification. Body subelongate, black, and dorsal surface very shiny; head with a simple tubercle and a bidentate anterior clypeal edge; pronotum smooth, strongly convex with punctuation at the posterior base, and with a deep longitudinal groove on each side; elytra convex, with strong punctate striae and smooth interstitial spaces; smooth pygidium; anterior leg with trochantal-femoral fovea (adapted from Arrow 1933).

Geographical distribution. Colombia and Nicaragua. Colombia: Nariño, Cundinamarca, Risaralda, and Boyacá (Medina et al. 2001; Roskov et al. 2019).

Remarks. This species was collected inside buildings through direct collections.

Family Silphidae Latreille, 1806

Subfamily Silphinae Latreille, 1806

***Oxelytrum discicolle* (Brullé, 1840)**

Figure 4E

Materials examined. COLOMBIA • 1 adult; Boyacá, Tunja, UPTC, INCITEMA; 05°33'13"N, 073°21'24"W; 2708 m a.s.l.; 03 Jul. 2017; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00174 • 1 adult; Boyacá, Tunja, UPTC, Administrative building; 05°33'05"N, 073°21'27"W; 2695 m a.s.l.; 06 Nov. 2019; Martínez D.C. leg.; sidewalk; hand collecting; UPTC-In-00185.

Identification. Body flattened; antennae capitated and flattened; eyes white, large, and protruding; pronotum yellow or orange, large, rounded, and with a large black spot in its center; elytra black on three sides (adapted from Bonilla et al. 2016).

Geographical distribution. Argentina, Uruguay, Paraguay, Bolivia, Brazil, Peru, Ecuador, Colombia, Venezuela, Panama, Costa Rica, Nicaragua, El Salvador, Guatemala, Belize, and Mexico. Colombia: Amazonas, Putumayo, Nariño, Cauca, Huila, Meta, Vichada, Valle del Cauca, Tolima, Cundinamarca, Chocó, Quindío, Casanare, Risaralda, Caldas, Boyacá, Antioquia, Santander, Norte de Santander, Bolívar, Cesar, Magdalena, Atlántico, and La Guajira (Bonilla et al. 2016; Roskov et al. 2019).

Remarks. This species was collected from sidewalks that are surrounded by grasslands.

Discussion

In the eastern Andes, knowledge of coleopteran species in urban areas is mainly based on studies carried out in the city of Bogotá DC, and 41 species of beetles have

been recorded to date in the urban and peri-urban areas of this city (Andrade-C. and Amat-G. 2000; Corporación Suna-Hisca 2003; Mora 2017; López-Moreno and Pianda-Rodríguez 2018; Vivas 2018). In our study, we found two species previously reported from Colombia, and we expand the distribution of 31 species to the city of Tunja. Eleven species are recorded from the department of Boyacá for the first time.

Some species found by us, such as *Manopus biguttatus* and *Uroxys coarctatus*, had only been recorded in natural areas of high-Andean forest and in grassland areas (Amat-García et al. 1997; Andrade-C. and Amat-G. 2000). Our results provide information for proposing new hypotheses about the ecological performance of such species and their ability to survive in a wide spectrum of habitats. Other species, such as *Ancognatha scarabaeoides*, *A. ustula*, *Paulosawaya ursina*, *Harmonia axyridis*, *Leschenius vulconarum*, and *Sitophilus oryzae*, that traditionally inhabit crops and are crop pests (Amat-García et al. 2011; Cortázar et al. 2012; Dughetti 2015; López-García et al. 2015; Roy et al. 2016; Pérez et al. 2018), are known in urban areas. This intuitively leads us to think about a change in the diet and a broader range of the dietary spectrum of these species, which is an interesting topic of research.

We found the greatest number of species in gray areas (11 spp.), followed by the green areas (eight spp.). The heterogeneity of food resources and microhabitats in buildings, such as artificial cavities, and the ecological flexibility of many species to survive in these habitats (Melic 1997; Robinson 2005) may account for the greater number of species in gray areas. On the other hand, gray areas have fewer competitors and predators, facilitating the establishment of generalist species (Durán-Barrón et al. 2009). Although we found the fewest species in green areas, we expect that given the habitat conditions, food availability, and nesting sites of green areas, they have capacity to host a greater number of beetle species. Green areas can function as reservoirs of biodiversity (Sattler et al. 2010; Mata et al. 2017; Salomão et al. 2019), mainly for phytophagous (*Amphideritus steinheili*, *A. vilis*, and *Leschenius vulconarum*) and xylophagous species (*Amyipunga moritzii* and *Eurysthea cribripennis*).

The list of beetles that we present here is a baseline inventory for future research in urban areas of the northeastern Andes. Additional research might aim to describe (1) the population dynamics of beetles in urban, peri-urban, and rural areas and the temporal dynamics; (2) the use of microhabitats such as backyards, the interiors of houses or other buildings, parks, and gardens in urban areas; or (3) describe the potential impact that pest species have on other insect species or on vegetation cover within urban areas.

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Authors' Contributions

DCM and IM equally designed the research project, produced, and edited the photographs, and discussed, produced, and approved the final document.

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