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Colombocricus gen. nov., a new genus of millipede from Colombia (Diplopoda: Spirobolida: Rhinocricidae)

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Abstract. *Colombocricus* gen. nov. is established for two species from Colombia, with *C. tegua* gen. et sp. nov. designed as the type species. Based on the type material and fresh specimens, *Rhinocricus fundipudens* (Karsh, 1881) is transferred to the new genus *Colombocricus* gen. nov. and its redescription is presented. In addition, a key to males and a map of distribution of the genus is provided.

Keywords. Diplopods, new taxa, Neotropical, Myriapoda.

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Introduction

The family Rhinocricidae Brölemann, 1913 is one of the most dominant families of the class Diplopoda in the Neotropical region, with more than 575 species and 30 genera known (Pitz & Sierwald 2010; Enghoff *et al.* 2015; Golovatch *et al.* 2021). From Colombia, 22 species and two subspecies are known. These belonging to six genera, among which *Rhinocricus* Karsh, 1881 is the most diverse with 16 species and two subspecies, followed by *Anadenobolus* Silvestri, 1897 with two species, *Neocricus* Chamberlin, 1941, *Lissocricus* Chamberlin, 1953, *Opheocricus* Verhoeff, 1938 and *Oxypyge* Silvestri, 1896 all with only one species each (Carl 1914; Marek *et al.* 2003). *Rhinocricus fundipudens* (Karsch, 1881), from Santa Marta, Colombia, was originally described as *Spirobolus* (*Rhinocricus*) *fundipudens* and had its

gonopods illustrated for the first time by Carl (1914). In this work he described the singular differences of the posterior gonopod but maintained the species within *Rhinocricus*. Based on freshly collected material, the species is reported 100 years after its description, examination of the type material and other specimens revealed that the species is not referable to *Rhinocricus* or any other Rhinocricidae genus. In the present study, we propose *Colombocricus* gen. nov. to accommodate *C. fundipudens* gen. et comb. nov. and a new species from Colombia, *C. tegua* gen. et sp. nov. The redescription and description of both species include images of gonopods and external morphology. In addition, a key to males and a distribution map of the new genus is presented.

Material and methods

The examined material is deposited in the institutions indicated below (curators in parentheses). The specimens are preserved in 70% ethanol. For the examination of taxonomic characters, measurements, and preparation of illustrations of the gonopods, we used a stereo microscope with a measuring eyepiece coupled to a drawing tube. Photographs were taken with a Motic SMZ171 stereo microscope camera together with a “Motic Moticam 5+ digital imaging system” software and a Canon EOS 550D digital camera. Photos were compiled with Helicon Focus ver. 8.2.16. To edit images, we used CorelDRAW Standard. A distribution map was created applying QGIS Desktop ver. 3.40.0 software. For the gonopod terminology and external characters, we followed Enghoff *et al.* (1993), Koch (2015), and Rodrigues *et al.* (2020).

Institutional abbreviations

ICN = Instituto de Ciencias Naturales de la Universidad Nacional de Colombia, Bogotá, Colombia (E. Flórez)

ZMB = Museum für Naturkunde der Humboldt Universität zu Berlin, Berlin, Germany (J. Dunlop)

Morphological abbreviations

c = collum
cx = coxite
eb = external branch of telopodite of the posterior gonopod
ep = epiproct
ex = external process of solenomere of the posterior gonopod
in = inner process of solenomere of the posterior gonopod
lb = lobe of telopodite of the anterior gonopod
ms = mandibular stipes
pr = paraproct
sl = solenomere
st = sternite
tl = telopodite
tp = tarsal pad

Results

Taxonomy

Class Diplopoda de Blainville in Gervais, 1844
Order Spirobolida Bollman, 1893
Suborder Rhinocricidea Brölemann, 1913
Family Rhinocricidae Brölemann, 1913

Colombocricus gen. nov.

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Type species

Colombocricus tegua gen. et sp. nov., by present designation.

Other species included

Colombocricus fundipudens (Karsch, 1881) gen. et comb. nov.

Diagnosis

Large spirobolidan, adults with 39–43 body rings plus telson, length 160–200 (♂) (Figs 1, 4, 5A) or 150–185 mm (♀) (Fig. 5B–C), width 13–17 (♂) or 20 mm (♀), with scobinae and tarsal pads (Fig. 1C). The genus differs from other rhinocricids mainly in the male gonopods features: the coxite (cx) of the anterior gonopods is short and wide with the terminal edge almost transverse, the median corner elongated to a sharp point shorter than the sternite (st); the telopodite of the posterior gonopod is long, with an external branch (eb) spoon-shaped with an excavation on the femoral process and a solenomere (sl) bifurcated in two lanceolate processes (Figs 2–3, 6–7).

Etymology

The generic name is the union of ‘Columbus’, a general word in reference to ‘Colombia’, to which both species of the genus are restricted, and ‘-cricus’, a combining element frequently used in the formation of generic names of this family.

Distribution

Only known from Colombia (Fig. 8).

Colombocricus fundipudens (Karsch, 1881) gen. et comb. nov
Figs 1–3, 8

Spirobolus (*Rhinocricus*) *fundipudens* Karsch, 1881: 78.

Rhinocricus fundipudens – Carl 1914: 879, fig. 106. — Marek *et al.* 2003: 56.

Type material

Holotype

COLOMBIA • ♂; Santa Marta; only gonopods and legs found; ZMB 711; ZMB.

Other material examined

COLOMBIA • 1 ♂; Santa Marta, Hacienda La Victoria; [11°07'12.0" N, 74°04'55.2" W]; 1300 m a.s.l.; 10 Jul. 2015; CarBio Team leg.; ICN 1719; ICN • 2 ♂♂; Bolívar, San Jacinto, Finca El Amanecer Gaitano; [9°51'09.7" N, 75°10'32.3" W]; 314 m a.s.l.; 12 Mar. 2017; L. Martínez leg.; ICN 3134; ICN.

Redescription

Male (ICN 1719)

MEASUREMENTS. With 43 body rings plus telson. Total length 153 mm, maximum width of midbody body ring 13 mm.

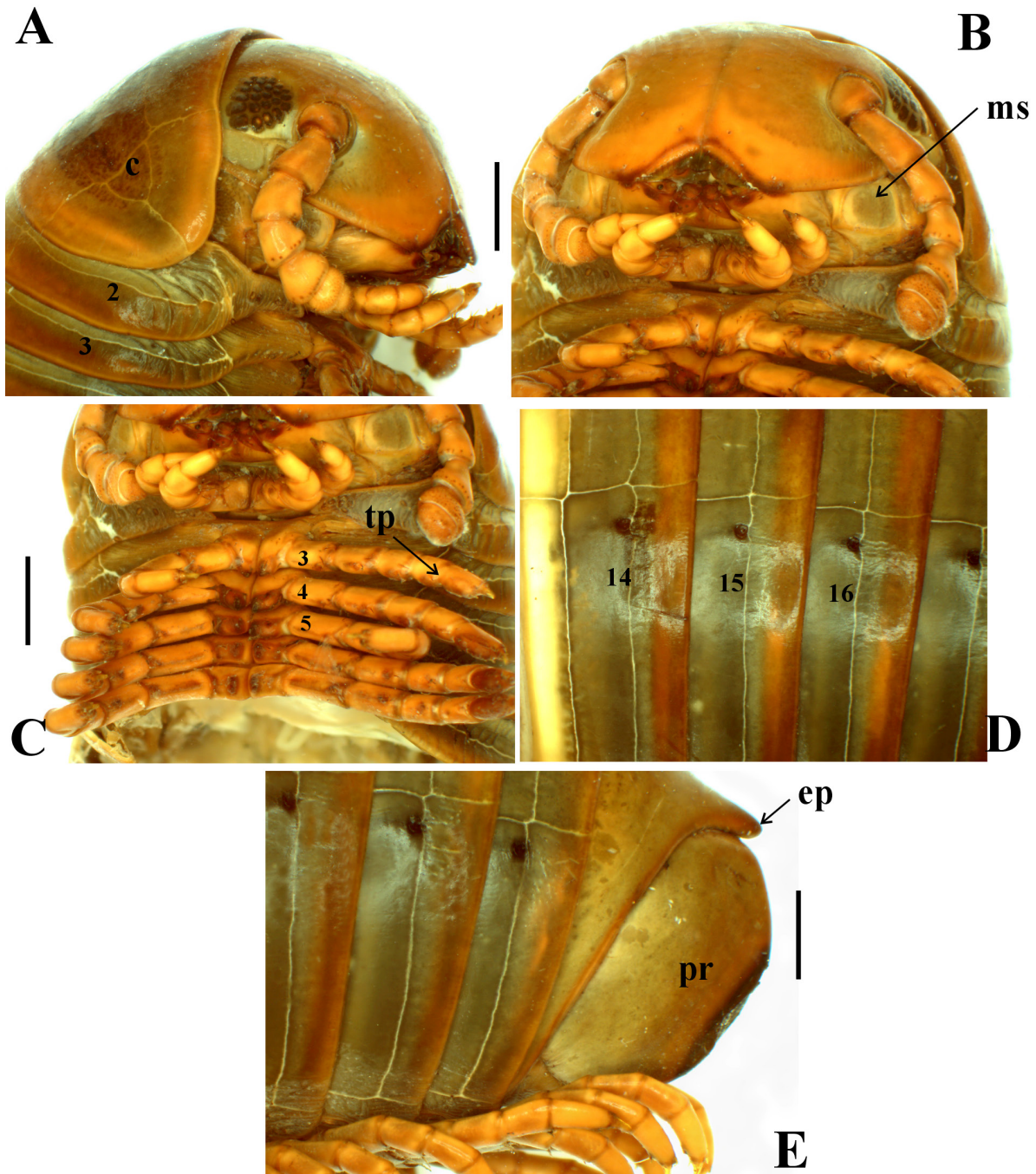


Fig. 1. *Colombocricus fundipudens* (Karsch, 1881) gen. et comb. nov., ♂ (ICN 1719). **A.** Head and anterior body rings, lateral view. **B.** Head and anterior body rings, ventral view. **C.** Anterior body rings, ventral view, showing the first legs with inflated tarsal pads. **D.** Midbody rings, lateral view. **E.** Posterior body rings and telson, lateral view. Abbreviations: see Material and methods. Scale bars = 10 mm.

COLORATION (in 70% alcohol) (Fig. 1). General coloration greenish brown. Head light brown with labrum yellowish. Antennae and legs light brown. Median part of collum greenish brown, margins light brown. Meso- and metazonites greenish, posterior margins brown. Anterior portion of prozonites light. Telson greenish brown.

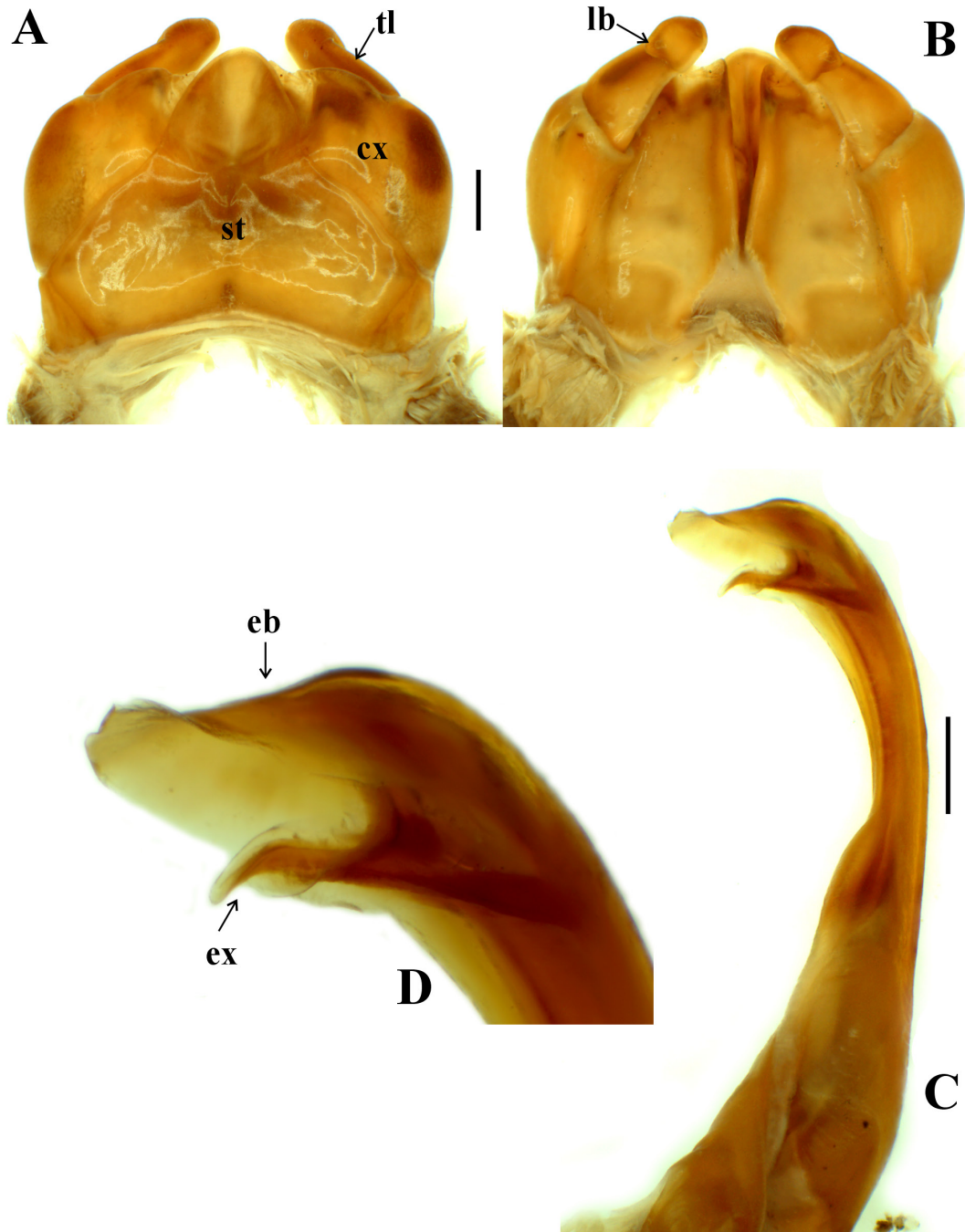


Fig. 2. *Colombocricus fundipudens* (Karsch, 1881) gen. et comb. nov., ♂ (ICN 1719). **A.** Anterior gonopod, anterior view. **B.** Anterior gonopod, posterior view. **C.** Left posterior gonopod, ectal view. **D.** Apical region of the left posterior gonopod, ectal view. Abbreviations: see Material and methods. Scale bars = 1 mm.

HEAD. Clypeus with two setiferous foveolae on each side. Eyes in rounded cluster in five rows of ommatidia, 6-6-5-4-3 (= 24), with excavated below eyes. Antennae short and slender, reaching back to body ring 3. Length of antennomeres: 1<2>3=4=5>6. Terminal antennomere very rounded with numerous sensory cones covered by bristles. Mandibular stipes (ms) excavated. Incisura lateralis open.

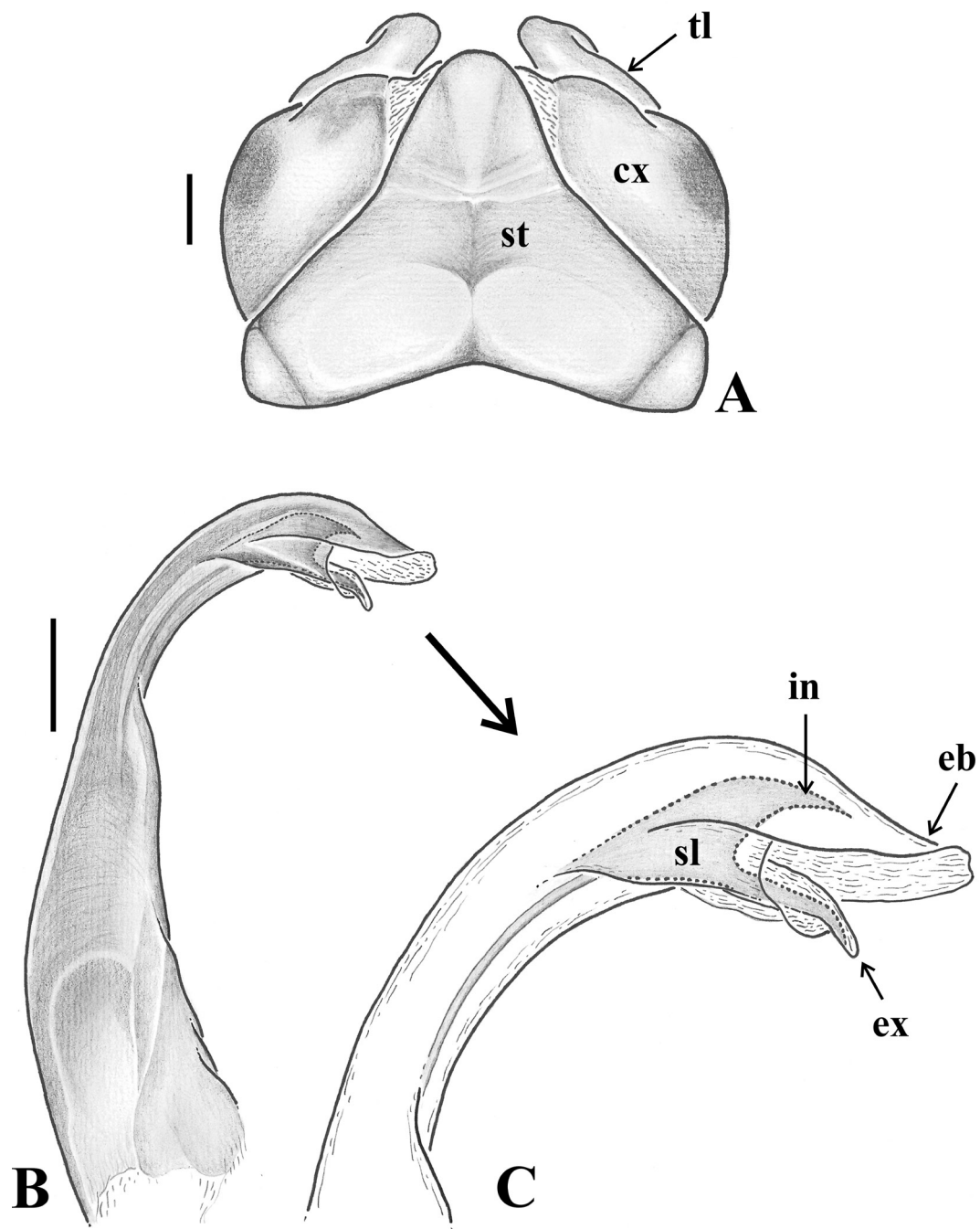


Fig. 3. *Colombocricus fundipudens* (Karsch, 1881) gen et comb. nov., ♂ (ICN 1719). **A.** Anterior gonopod, anterior view. **B.** Right posterior gonopod, mesal view. **C.** Apical region of the right posterior gonopod. Abbreviations: see Material and methods. Scale bars = 1 mm.

BODY RINGS. Collum (c) smooth. Ozopores starting at body ring 6. Scobinae concave, decreasing in size in posterior portion of body, disappearing in last rings.

LEGS. Legs with tarsal pads (tp) from third pair, decreasing in size posteriorly. Coxae of leg pairs 3–5 of male expanded into large process. Coxae of leg pairs 3–5 with pointed conic lobe; in leg pairs 6 and 7 the process similar but decreasing in size (Fig. 1C).

TELSON. Epiproct (ep) very short, not extended over paraprocts (pr). Hypoproct subtriangular (Fig. 1E).

GONOPODS. Anterior gonopod wider than long, with sternite (st) tongue-shaped; coxite (cx) short and wide, with terminal edge almost transverse, the median corner elongated to sharp point shorter than sternite. Telopodite (tl) longer than coxite and sternite, with well-developed pointed lobe (lb) projected laterally (Figs 2A–B, 3A). Posterior gonopod with telopodite broad at base, distally narrowing with excavation on femoral base. External branch (eb) spoon-shaped, dorsally covered the solenomere (sl) as cupula. Solenomere (sl) bifurcated into two short lanceolate processes, but with one (in) shorter almost invisible (Figs 2C–D, 3B–C).

Female

Unknown.

Distribution

Known from Santa Marta and Bolivar, Colombia (Fig. 8).

Colombocricus tegua gen. et sp. nov.

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Figs 4–8

Diagnosis

Colombocricus tegua gen. et sp. nov. resembles *Colombocricus fundipudens* (Karsh, 1881) gen. et comb. nov. in the following characters: the shape of the anterior gonopod is wider than long, and the coxite (cx) is shorter than the sternite (Figs 2A, 6A). The telopodite (tl) is longer than the coxite (cx) and sternite (st), in posterior view with a well-developed subtriangular lobe (lb) (Figs 2A–B, 6A–B) projecting laterally (Figs 2B, 6B). The telopodite of the posterior gonopod is long with the external branch (eb) spoon-shaped, with a long excavation on the femoral process of the telopodite (Figs 2C–D, 6C). The solenomere (sl) is bifurcated into two lanceolate processes (Figs 2C–D, 6C–E). It differs by some parts of the anterior gonopods, the sternite (st) is subtriangular and has paramedian excavations in the basal portion and the coxite with a distal edge is almost transverse, forming a salience (Figs 6A, 7B). The solenomere (sl) of the posterior gonopod with inner (in) process is shorter than the external branch, while the external process (ex) is longer (Figs 6C–E, 7A).

Etymology

The new species is named in honor of the indigenous community ‘Tegua’, who inhabited the species type locality before colonization.

Type material

Holotype

COLOMBIA • ♂; Boyacá, Santa María, Pedra Campana close to the border with San Luis de Gaceno; [4°50'39" N, 73°13'25" W]; 490 m a.s.l.; 14 May 2009; E. Flórez and D. Luna leg.; ICN 800; ICN.

Paratypes

COLOMBIA • 1 ♀; Boyacá, Santa María, Sector Cachipay bajo; [4°52'38.6"N, 73°14'07.8"W]; 719 m a.s.l.; 10–21 Apr. 2023; D. Cabellero and M. Camargo leg.; ICN 2889; ICN • 1 ♂; Cundinamarca, Medina, Vereda Choapal; [4°35'20.5" N, 73°23'13.4" W]; 770 m a.s.l.; 7 May 2019; C. Sarmiento and UNAL Students Team leg.; ICN 2205; ICN.

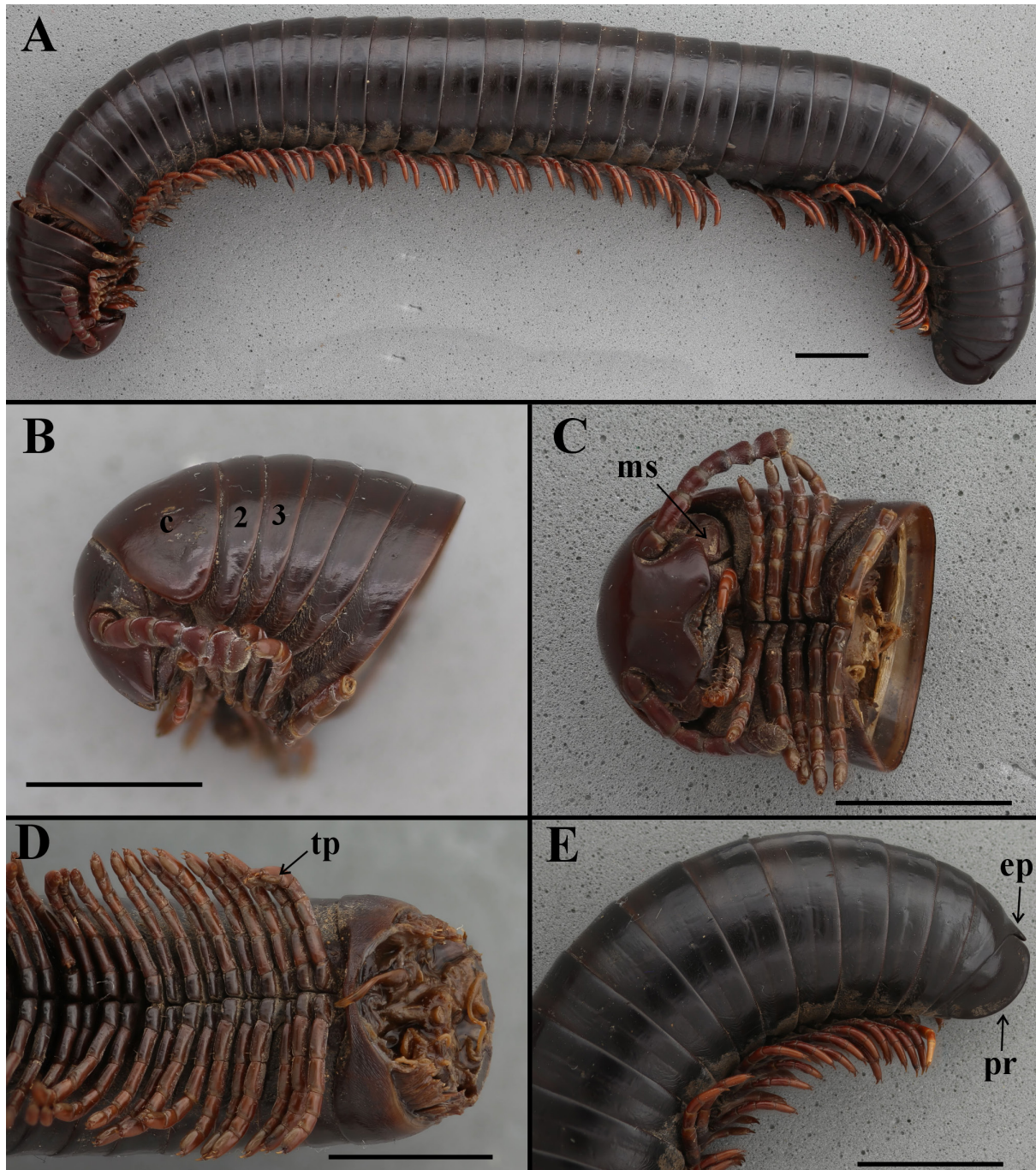


Fig. 4. *Colombocricus tegua* gen. et sp. nov., ♂, holotype (ICN 800). **A.** Habitus, lateral view. **B.** Head and anterior body rings, lateral view. **C.** Head and anterior body rings, ventral view. **D.** Midbody rings, ventral view. **E.** Posterior body rings and telson, lateral view. Abbreviations: see Material and methods. Scale bars = 10 mm.

Other material examined

COLOMBIA • 1 ♂, 1 ♀; Cundinamarca, Medina, Vereda Chaopal; [4°23'37.3" N, 73°17'55.9" W]; 400 m a.s.l.; 9 May 2019; C. Sarmiento and UNAL Students Team leg.; ICN 2165; ICN.

Description

Male

MEASUREMENTS. holotype with 40 body rings plus telson. Total length 190 mm, maximum width of midbody body ring 17 mm.

COLORATION (in 70% alcohol) (Fig. 4). General coloration reddish brown. Head and labrum reddish brown. Antennae and legs reddish. Median part of collum reddish, margins reddish brown. Meso- and metazonites reddish brown. Anterior portion of prozonites light red. Telson reddish brown.

HEAD. Clypeus with two setiferous foveolae on each side. Eyes in a rounded cluster in five rows of ommatidia, 6-6-5-3-2 (= 22). Antennae short and slender, reaching back to body ring 3. Length of antennomeres: 1<2=3>4=5>6. Terminal antennomere very rounded, with numerous sensory cones covered by bristles. Mandibular stipes (ms) (Fig 4C) excavated. Incisura lateralis open.



Fig. 5. *Colombocricus tegua* gen. et sp. nov., living specimens. A. ♂, holotype (ICN 800). B–C. ♀, paratype (ICN 2205).

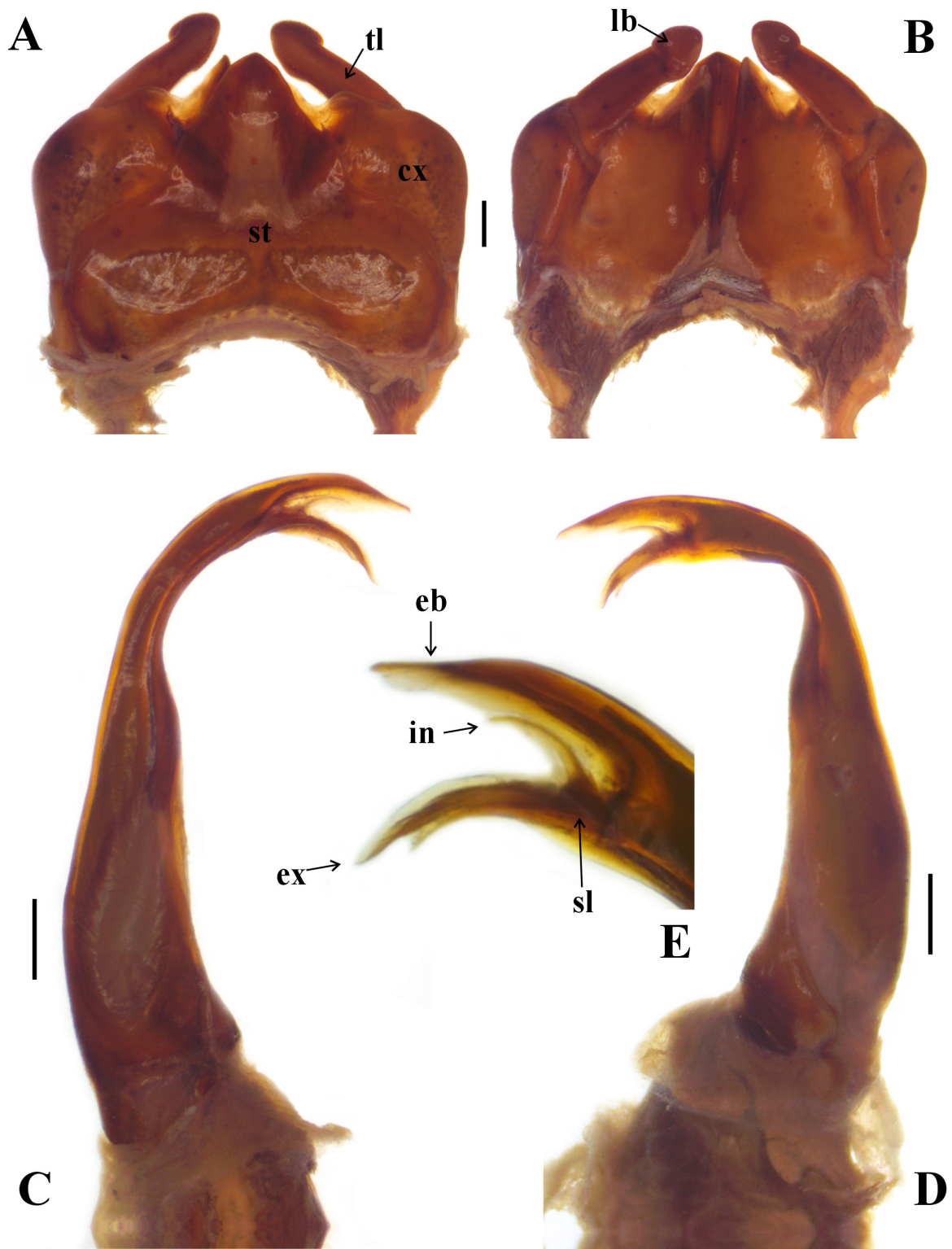


Fig. 6. *Colombocricus tegua* gen. et sp. nov., ♂, holotype (ICN 800). **A.** Anterior gonopod, anterior view. **B.** Anterior gonopod, posterior view. **C.** Right posterior gonopod, mesal view. **D.** Right posterior gonopod, ectal view. **E.** Apical region of right posterior gonopod, ectal view. Abbreviations: see Material and methods. Scale bars = 1 mm.

BODY RINGS. Collum (c) (Fig 4B) smooth. Ozopores starting at body ring 6. Scobinae concave, decreasing in size in the posterior portion of the body, disappearing in the last rings.

LEGS. Legs with tarsal pads (tp) (Fig 4D) from third pair, decreasing in size posteriorly. Coxae of leg pairs 3–5 expanded into a short pointed conical process.

TELSON. Epiproct (ep) very short, not extended over paraprocts (pr) (Fig 4E). Hypoproct subtriangular.

GONOPODS (Figs 6–7). Anterior gonopod wider than long, sternite (st) subtriangular, with paramedian excavations in the basal portion, coxite (cx) short and wide, with distal edge almost transverse, forming salience, medially protruding in triangular projection, shorter than sternite. Telopodite (tl) longer than coxite and sternite, with well-developed subtriangular lobe (lb) projected laterally (Figs 6A–B, 7B). Posterior gonopod with telopodite broad at base, distally narrowing with excavation on femoral base. External branch (eb) spoon-shaped. Solenomere (sl) bifurcated into two lanceolate processes, inner process (in) shorter than external branch (eb), while external process (ex) is longer than external branch (Figs 6C–D, 7A).

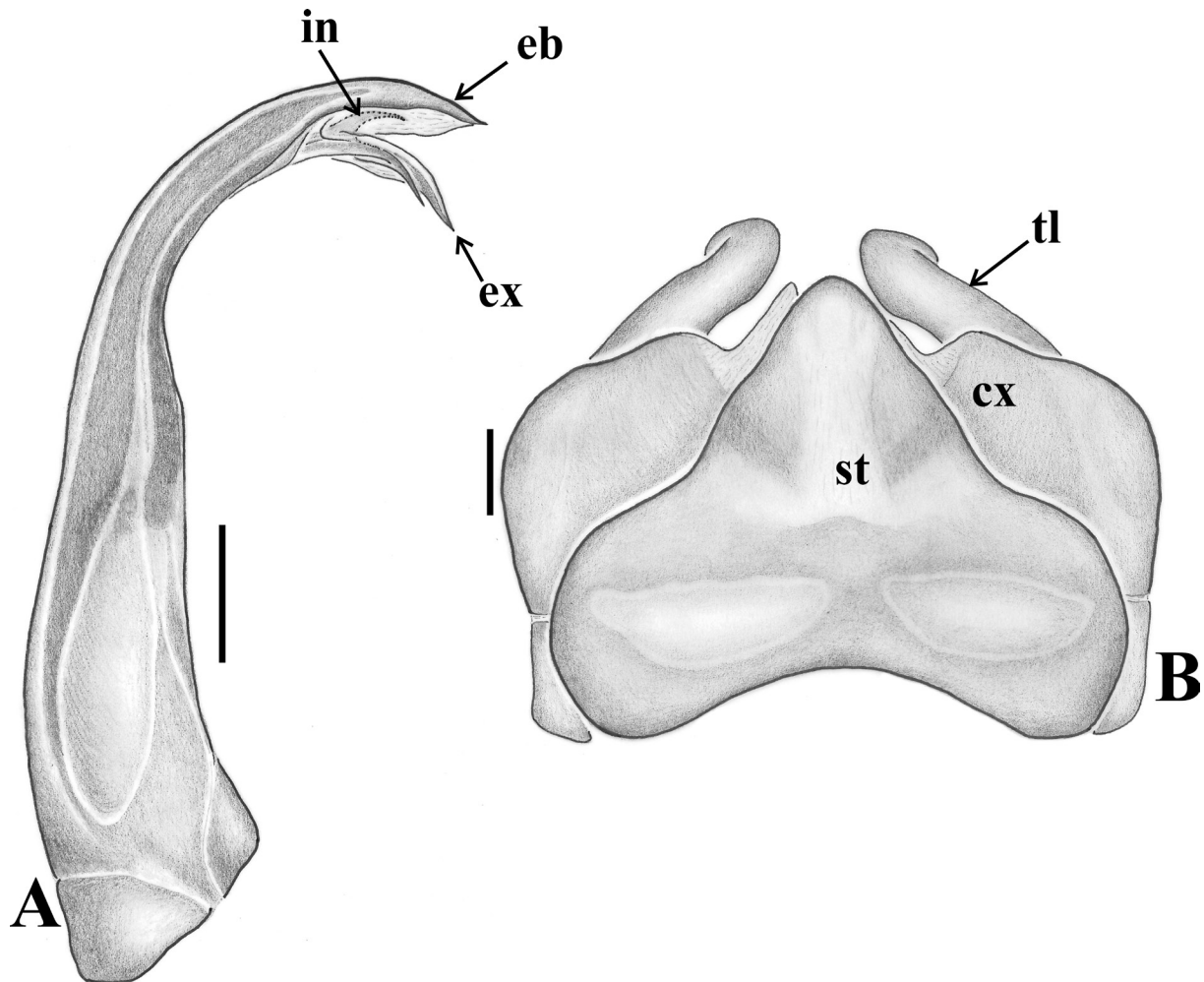


Fig. 7. *Colombocricus tegua* gen. et sp. nov., ♂, holotype (ICN 800). **A.** Right posterior gonopod, mesal view. **B.** Anterior gonopod, anterior view. Abbreviations: see Material and methods. Scale bars = 1 mm.

Female

General coloration reddish brown lighter than that of male (Fig. 5B–C), with 40 body rings plus telson. Total length 150 mm.

Distribution

Known from Boyacá and Cundinamarca, Colombia (Fig. 8).

Key to the species of *Colombocricus* gen. nov. (based on males)

1. General coloration greenish brown (Fig. 1). Sternite (st) of the anterior gonopod tongue-shaped with smooth surface; distal edge of the coxite (cx) without a salience (Figs 2A, 3A). Solenomere (sl) of the posterior gonopod with the external branch (eb) spoon-shaped, dorsally covered the solenomere (sl) as a cupula, the external process (ex) shorter than external branch (eb) and inner process (in) almost invisible (Figs 2C–D, 3B–C) *Colombocricus fundipudens* (Karsch, 1881) gen. et comb. nov.
- General coloration reddish brown (Figs 4, 5A). Sternite (st) of the anterior gonopod subtriangular with paramedian excavations in the basal portion; distal edge of the coxite (cx) with a salience (Fig. 6A). Solenomere (sl) of the posterior gonopod with the external branch (eb) with rounded lamella at the tip, the external process (ex) longer than the external branch (eb) and inner process (in) is visible (Figs 6C–E, 7A) *Colombocricus tegua* gen. et sp. nov.

Discussion

This work expands the number of species and genera of the Rhinocricidae for Colombia. About 20 species of this family have previously been described for Colombia, although most of them have a

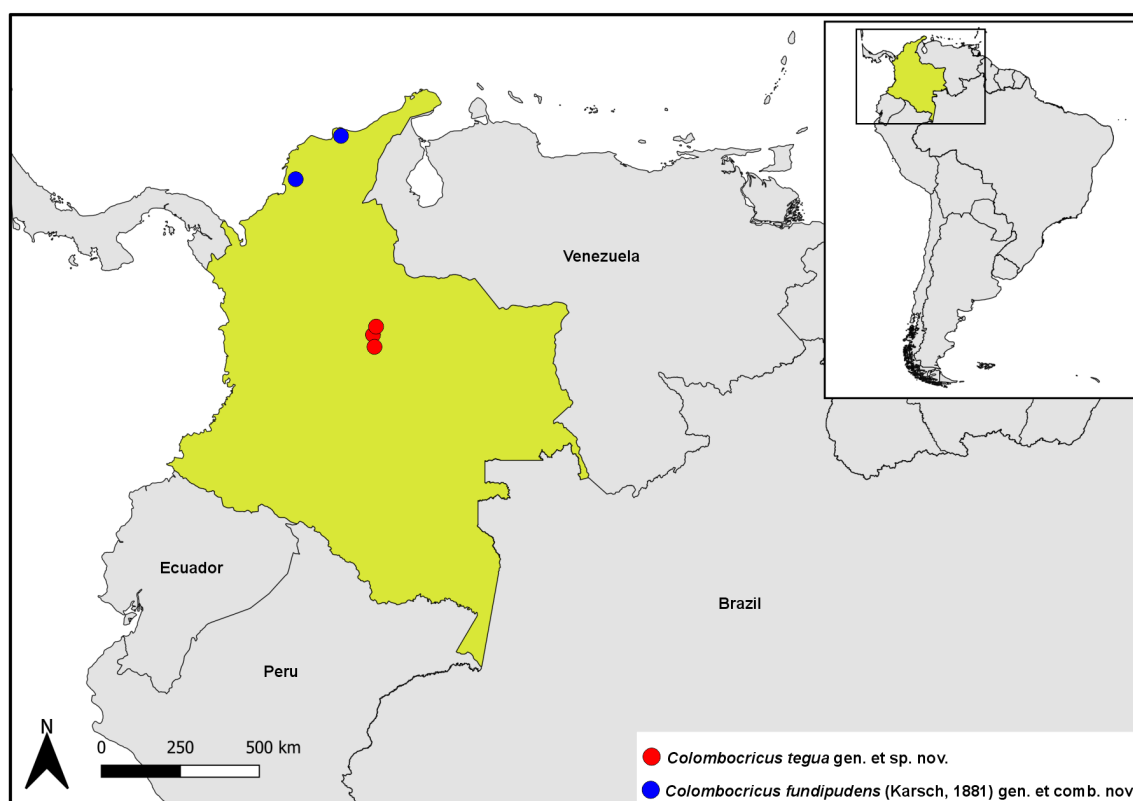


Fig. 8. Map of the distribution of *Colombocricus* gen. nov.

very poor original description and without any drawings of the male genitalia. Most of the species were originally described as belonging to *Rhinocricus* Karsch, 1881. Many errors were also detected, as for example in Carl's list of Diplopoda (1914), where *Rhinocricus crassicornis* (Humbert & DeSaussure, 1870) and *R. acutus* (Humbert & DeSaussure, 1870) were recorded for Colombia. Both these species were in fact described from Brazil and are today placed in the genus *Spirobolus* Brandt, 1833 (Humbert & DeSaussure 1970; DeSaussure & Humbert 1972). In the most recent catalog of Rhinocricidae (Marek *et al.* 2003), four species are recorded for Colombia. However, this number is actually higher, due to a misspelling of type localities. "Columbia" is cited as the type locality for 15 species, and by searching for information in the original descriptions of these species, it was possible to confirm that the correct type locality is in Colombia. The same is the case for the species *Rhinocricus miniatipus* Karsch, 1881 and *R. fundipudens* (in this work transferred to *Colombocricus* gen. nov.) described from Nova Granada, which in the catalog of Rhinocricidae is listed as a locality in Brazil. During the mid-19th century, New Granada covered large territories of Colombia, Panama, and small portions of Costa Rica, Ecuador, Venezuela, and Brazil. After checking Karsch's descriptions of 1881, the material of both species turned out to have been collected by Gondot and Tetens (the latter also referencing Sta. Martha in Colombia). Therefore, it seems plausible to suggest that both species were described from Colombia. The species *R. capucinus* Silvestri, 1898 is recorded for Argentina, but based on Silvestri (1898), the species described by him was collected by Dr Bürger in Colombia. Following Karsch's and Silvestri's works and our results, currently 23 species of Rhinocricidae are recorded for Colombia.

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