

## Research article

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## A revision of *Discodon tricolor* (Guérin-Méneville) and its mimics from the Atlantic forests of Brazil (Coleoptera: Cantharidae)

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**Abstract.** *Discodon tricolor* (Guérin-Méneville, 1832) was thought to be a common species widely distributed in the Atlantic Forests of Brazil, yet showing morphological and chromatic variations. After examination of a large number of specimens from different regions of the Atlantic Forest biome, we found that *Discodon tricolor* actually represents a complex of many similar and sometimes sympatric species. Thirteen species in this complex are recognised as valid: *Discodon tricolor*, *D. neoteutonum* sp. nov., *D. vanini* sp. nov., *D. obscurior* Pic, 1906 stat. nov., *D. lineaticorne* sp. nov., *D. aurimaculatum* sp. nov., *D. marginicollis* sp. nov., *D. tenuicostatum* sp. nov., *D. nigrocephalum* Pic, 1949, *D. tamio* sp. nov., *D. viridimontanum* sp. nov., *D. crassipes* Wittmer, 1952, and *D. testaceipes* Pic, 1930 stat. nov. The species *Discodon albonotatum* Pic, 1906 is confirmed as a synonym of *D. tricolor*, while the subspecies *D. albonotatum obscurior* and *D. albonotatum testaceipes* are elevated to specific status. The subgenus *Acanthodiscodon* Wittmer, 1952 is synonymised with *Discodon* Gorham, 1881. All the species are described and illustrated in detail and an identification key is provided. Despite being chromatically similar, the species show major morphological differences in their aedeagus and antennal structures, suggesting that they do not form a monophyletic clade. A potential mimicry ring involving these species of *Discodon* as well as other members of Cantharidae, Lampyridae, Cerambycidae and Belidae is discussed. Comments are made on the conservation of these species and their habitats within the Atlantic Forest biome.

**Keywords.** Insecta, Elateroidea, Neotropical Region, Mata Atlântica, Mullerian mimicry.

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## Introduction

Within the Neotropical fauna of Cantharidae Imhoff, 1856, there are two particularly diverse and taxonomically difficult genera, *Discodon* Gorham, 1881, with nearly 400 currently valid species, and

*Chauliognathus* Hentz, 1830, with over 450 (Delkeskamp 1977; Constantin 2015, 2016). While the taxonomic problems relating to the latter are gradually being tackled in some recent publications (Biffi 2016; Constantin 2016), *Discodon* still remains poorly studied. Only two regional revisions exist: that of Constantin (2015) dealing with the fauna of French Guiana, and the much older and now heavily outdated one by Champion (1915) dealing with Central America. Aside from those two larger papers, there were a variety of smaller, more fragmentary taxonomic contributions on the genus, usually limited to isolated species descriptions. W. Wittmer occasionally revised and re-described a few of the previously named species, illustrating their male genitalia (Wittmer 1977).

While working through the extensive Cantharidae material at the Museu de Zoologia da Universidade de São Paulo, the Natural History Museum in London and the Naturhistorisches Museum in Basel, while also looking at photographs of live beetles on the online platform iNaturalist (Fig. 1), we came across some difficulties regarding the correct identification of a relatively large, ‘charismatic’ and apparently not uncommon species from the Atlantic Forest biome of Brazil. It soon became clear that what previous authors considered to be *Discodon tricolor* (Guérin-Méneville, 1832) is in fact a whole group of species, distinguishable by a variety of external and male genitalia characters. This led us to re-examine also the taxa described as similar or related to *D. tricolor*.

This recently recognised group of species is characterised by the black colour of the body and legs, a similar orangish pattern on the pronotum and a pair of white to yellowish rounded or semi-circular spots in the middle of elytra, differing from many other species of *Discodon* in which the elytral patches merge in the suture forming transversal bands. Besides *D. tricolor*, in this group are included *D. albonotatum* Pic, 1906, treated as a junior synonym of *D. tricolor* by Delkeskamp (1977), its two subspecific taxa (originally described as “var.”, but available names according to ICZN Art.45.6), and several undescribed species. Amongst the studied species, there are taxa that show some general appearance similarity with *D. tricolor*, but with legs testaceous, like *D. albonotatum testaceipes* Pic, 1930, or hind legs greatly swollen, like *Discodon (Acanthodiscodon) crassipes* Wittmer, 1952, or even elytra entirely black, like *Discodon albonotatum* var. *obscurior* Pic, 1906 and *D. nigrocephalum* Pic, 1949.

While providing a regional revision and key of the entire genus *Discodon* still must remain a project for the future, we hope that by revising this interesting and surprisingly diverse species group of potentially mimetic species, we can still provide an important first step to better understand the diversity of this genus and enable people to identify at least some of the species in this group. Furthermore, the habitat of the *D. tricolor* species group, the Atlantic Forest biome of Brazil, has been considered one of the most seriously threatened biodiversity hotspots on the planet, making the documentation of its biodiversity even more urgent (Myers *et al.* 2000).

## Material and methods

A large number of smaller and larger institutional collections in Brazil and Europe were contacted or consulted for material of the ‘*Discodon tricolor*’ species group, but we only managed to find specimens in some of them. Acronyms for these institutions are given as follows:

CEMT	=	Seção de Entomologia da Coleção Zoológica, Instituto de Biociências, Universidade Federal de Mato Grosso, Cuiabá, Brazil
DZUP	=	Coleção de Entomologia Pe. Jesus Santiago Moure, Departamento de Zoologia da Universidade Federal do Paraná, Curitiba, Brazil
MNHN	=	Muséum national d’histoire naturelle, Paris, France
MZSP	=	Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil
NHMB	=	Naturhistorisches Museum Basel, Basel, Switzerland
NHMUK	=	Natural History Museum, London, United Kingdom
UFMG-ICO	=	Coleção de Entomologia, Centro de Coleções Taxonômicas da Universidade Federal de Minas Gerais, Belo Horizonte, Brazil





**Fig. 1.** Habitus of live specimens of *Discodon*. **A–C.** *Discodon neoteutonium* sp. nov. **A.** Specimen from São Francisco de Paula, RS. **B.** Specimen from Canelas, RS. **C.** Specimen from Concórdia, SC. **D–E.** *Discodon vanini* sp. nov. **D.** Specimen from Guarulhos, SP. **E.** Specimen from Santo André, SP. **F–G.** *Discodon tamio* sp. nov. from Itatiaia, RJ. **H.** *Discodon aurimaculatum* sp. nov. from Monteiro Lobato, SP. **I.** *Discodon tenuecostatum* sp. nov. from Petrópolis, RJ. **J.** *Discodon obscurior* Pic, 1906. All photos retrieved from iNaturalist ([inaturalist.org/observations/](https://www.inaturalist.org/observations/)) followed by the following numbers within parenthesis. Photo credits: A: Ricardo Brugnera, “Insetos do Brasil” project (71994819). B: Daniel Cavallari (21263951). C: Frederico Sonntag (52702210). D: Marcos Melo (38125823). E: ©Rita Souza (42536697). F: ©Paula Romano (93100080). G: ©Paula Romano (93100914). H: ©Luciano Bernardes (106703561). I: Mickaël Villemagne (38335533). J: ©Anderson Rabello Pereira (42019906). All photos adapted. All but E–H and J licenced under CC BY-NC 4.0.

The morphological terminology follows Constantin (2015) and Biffi & Constantin (2018). Colour descriptions are based on museum specimens; live or fresh specimens exhibit stronger contrasting colours, with darker black background and lighter whitish patches. The species are organised in the text and plates by similarity, in order to enable an easier morphological comparison.

Illustrations were produced via camera lucida attached to a stereo microscope. Photographs were taken with a Canon EOS Rebel T3i camera equipped with a Canon MP-E 65 mm macro lens, attached to a StackShot macro-rail. Multi-focus images were combined with Zerene Stacker 1.04. Illustrations and photographs were edited in Adobe Photoshop CC and Adobe Illustrator CC.

Distribution maps were made with Quantum GIS ver. 3.10 (available at [www.qgis.org](http://www.qgis.org)). Locality records were obtained from specimens' labels. Data points on the maps correspond to approximate localities since the available information is often imprecise or inaccurate.

## Results

### *Taxonomic account*

Class Insecta Linnaeus, 1758  
 Order Coleoptera Linnaeus, 1758  
 Superfamily Elateroidea Leach, 1815  
 Family Cantharidae Imhoff, 1856  
 Subfamily Silinae Mulsant, 1862

Genus *Discodon* Gorham, 1881

*Discodon* is a morphologically diverse and heterogeneous genus distributed all across the continental parts of the Neotropical region and into the south-western United States. Gorham (1881) characterised the genus based on males as having the sides of the pronotum with a small notch, the last ventrite deeply divided into two halves, and the anterior claw of the protarsus with a broad basal lobe. The males of other genera of Silinae occurring in the Atlantic forests of Brazil – *Silis* Charpentier, 1825 and *Pachymesia* Westwood, 1849 – differ from *Discodon* for having the pronotum much wider than long and the lateral margins deeply notched, with variously shaped spines and projections, the anterior tarsal claw of the protarsus with a small basal lobe, the other claws simple, and the antennae sometimes distinctly swollen (*Pachymesia*). Other species from the Atlantic Forests currently combined in *Incisosilis* Pic, 1908, *Polemios* LeConte, 1851, *Parasilis* Gorham, 1885 and *Malthinocantharis* Pic, 1914 might need to be transferred to the aforementioned genera. The widespread Neotropical genus *Polemios* LeConte, 1851 is primarily distinguished from *Discodon* by the meso- and metatarsal claws of the males, which have a basal lobe in *Polemios*, but are deeply cleft in *Discodon* (Constantin 2017), but the phylogenetic relevance of this character is yet to be proven for the Neotropical fauna.

The *Discodon tricolor* mimetic complex includes relatively large species (9.7–16.2 mm) characterised by the black body and legs, a similar orangish pattern on the pronotum and a pair of white to yellowish rounded or semi-circular spots in the middle of the elytra. It also includes some species with entirely black elytra that are here described as new species or have been treated as subspecies of *D. tricolor*.

*Discodon tricolor* (Guérin-Méneville, 1832)  
 Figs 2, 6A, L, 7A, 8A, 9A, 10A, 11A–C, 15A

*Silis tricolor* Guérin-Méneville in Griffith, 1832, pl. 36 fig. 10; 1844: 47, pl. 14 fig. 10.  
*Discodon albonotatum* Pic, 1906: 90 (excluding “var. *obscurior*”).



*Silis tricolor* – Pic 1909: 8. — Delkeskamp 1939: 188 (catalogue). — Blackwelder 1945: 368 (checklist).  
*Discodon albonotatum* (partim) – Delkeskamp 1939: 155 (catalogue); 1977: 259 (catalogue) (syn.). —  
Blackwelder 1945: 364 (checklist).

*Discodon tricolor* – Delkeskamp 1977: 259 (catalogue). — Wittmer 1977: 4 (type specimen). — Vanin  
2014: 50 (mimicry).

### Diagnosis

*Discodon tricolor* differs from the other species for having most of the antennomeres yellow. *Discodon tricolor* is similar to *D. vanini* sp. nov. and *D. neoteutonum* sp. nov., differing from these species by the ventral wall of the tegmen (Fig. 11A–C) longer, about as long as wide, and the median lobe with a narrow central sclerite; the last ventrite of the females (Fig. 15A) with a distal margin almost straight, with a slight median projection.

### Type material

#### Holotype of *Discodon tricolor*

BRAZIL • ♂; Minas Gerais, “du midi de la capitale des mines”; “*Silis tricolor* Guér. icon. R.A.”; MNHN, Paris EC14297 (Fig. 2A–C).

#### Lectotype of *Discodon albonotatum* (here designated)

BRAZIL • ♂; Rio de Janeiro, Itatiaia [Itatiaia]; 2400 m a.s.l.; Feb. 1899; E. Gounelle leg.; “Museum Paris, Coll. M. Pic”; MNHN, Paris EC13550 (Fig. 2D–F).

#### Paralectotypes of *Discodon albonotatum* (3 specimens)

BRAZIL • 1 ♀; São Paulo, Vale do Rio Pardo; Dec. 1898; E. Gounelle leg.; “Museum Paris, Coll. M. Pic”; MNHN, Paris EC13549 • 1 ♂; Rio de Janeiro, Itatiaia [Itatiaia]; 2400 m a.s.l.; Feb. 1899; E. Gounelle leg.; “Museum Paris, Coll. M. Pic”; MNHN, Paris EC13551 • 1 ♀; Rio de Janeiro, Itatiaia [Itatiaia]; 850 m a.s.l.; Feb. 1899; E. Gounelle leg.; “Museum Paris, Coll. M. Pic”; MNHN, Paris EC13552.

### Other material examined (29 specimens)

BRAZIL • 2 ♂♂, 1 ♀; Rio de Janeiro, Itatiaia; Feb. 1955; Dirings leg.; MZSP 46319 to 46321 • 5 ♂♂, 2 ♀♀; same collection data as for preceding; Mar. 1959; MZSP 46322 to 46328 • 1 ♂; same collection data as for preceding; Apr. 1959; MZSP 46329 • 1 ♂; same collection data as for preceding; Jan. 1963; MZSP 46330 • 2 ♂♂, 3 ♀♀; same collection data as for preceding; Jan. 1967; MZSP 46331 to 46335 • 1 ♀; same collection data as for preceding; 5 Feb. 1963; J. Halik leg.; MZSP 46336 • 2 ♂♂, 1 ♀; Rio de Janeiro, Parque Nacional do Itatiaia; above 1200 m a.s.l.; 5 Apr. 1964; C.E. and E.S. Ross legs.; NHMB [labelled as “*D. tricolor* (Guér.) mit Typus verglichen”] • 1 ♂; same collection data as for preceding; 4 Feb. 1927; Dr Seitz leg.; NHMB [labelled as “*D. albonotatum* Pic” by Wittmer] • 1 ♂; same collection data as for preceding, Maromba; 7 Apr. 1989; B. Harky leg.; MZSP 46337 • 1 ♂; “Mar” [Rio de Janeiro, Parque Nacional do Itatiaia, Maromba]; 1100 m a.s.l.; 11 Feb. 1926; Zikán leg.; NHMB • 1 ♂, 2 ♀♀; São Paulo, São José dos Barreiros, Parque Nacional Serra da Bocaina; 1400 m a.s.l.; 21–24 Mar. 1997; Pinto-da-Rocha, Campaner and Vanin leg.; MZSP 46338 to 46340 • 1 ♀; Minas Gerais [Passa Quatro]; 18 Mar. 22; [Zikán leg.]; NHMB • 1 ♂; “America, Brasilia, coll. Rich Hicker”; NHMB.

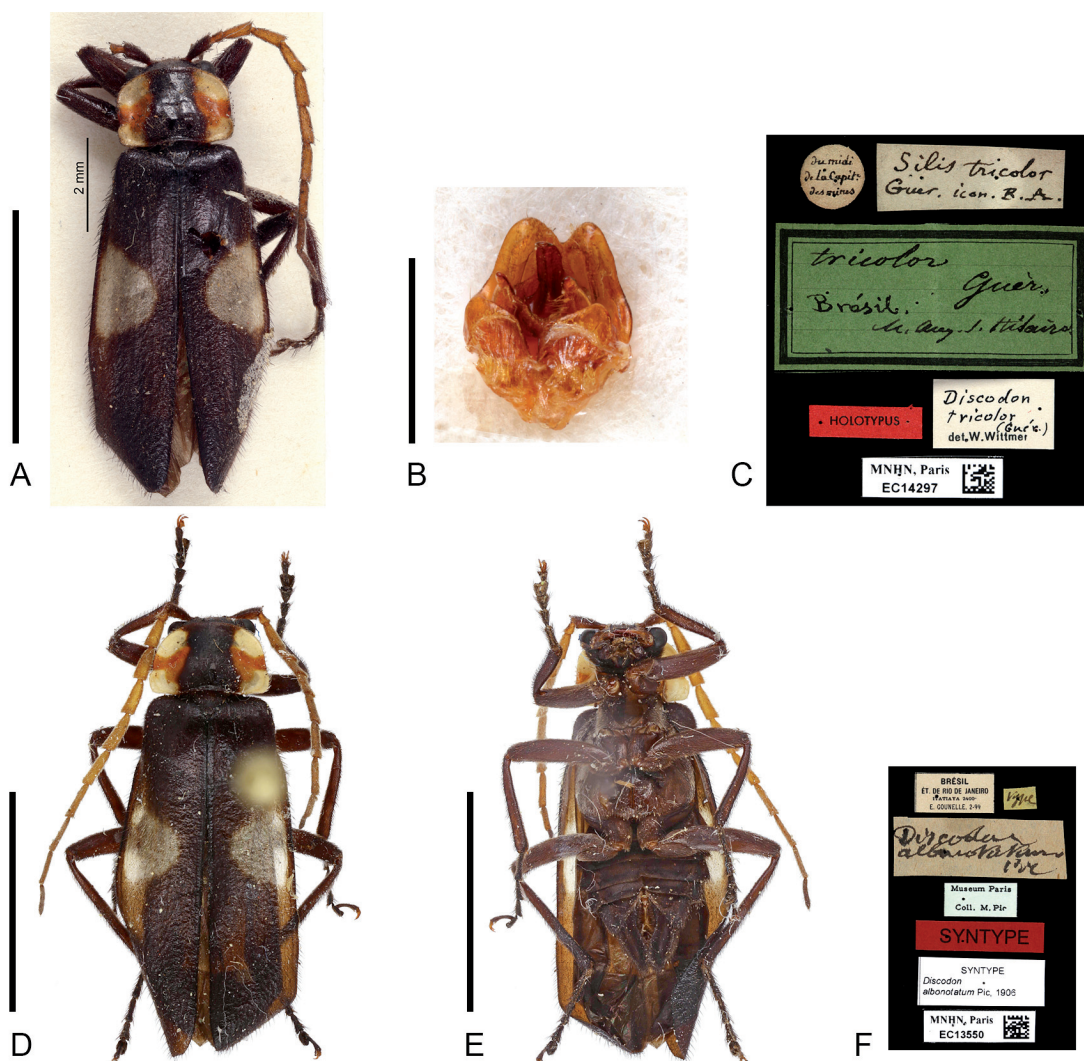
### Re-description

Body length: 10.4–14.0 mm. Coloration (Fig. 2): head pitch black, lustrous, except in front of antennae sockets and anterior margin of clypeus, dark brown; mandibles dark brown, darker at base and the tip; maxillary and labial palpi black, except apex of last palpomeres, dark brown; antennomeres I and sometimes II black, the latter testaceous to light brown. Pronotum (Figs 7A, 8A) lustrous, translucent, with broad irregular black band from anterior to posterior margin, wider posteriorly and narrower near

anterior margin; background bright yellow to light orange with barely defined orange and brown lateral patches. Scutellum and elytra pitch black, slightly lustrous; at mid-length of each elytron, large whitish to pale yellow round spot nearly reaching lateral borders but not meeting at suture. Thorax, legs and abdomen pitch black, tarsal claws brown.

**Male** (Fig. 2)

Head short, slightly wider than long, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short; vertex flat; occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with median incision. Eyes small, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Figs 2A, 6A) slightly flattened dorsoventrally; antennomeres wider distally; antennomeres IX–XI distinctly narrower than preceding ones. Pronotum (Fig. 3A) about 1.5 times as wide as long; anterior margin broadly arched, anterior angles indistinct; lateral margins with a shallow notch at posterior third, pronotum wider behind notch; integument smooth, densely covered with very



**Fig. 2.** Primary types, habitus. A–C. *Silis tricolor* Guérin-Ménéville, 1832 (holotype, ♂, MNHN EC14297), dorsal, ventral and labels. D–F. *Discodon albonotatum* Pic, 1906 (lectotype, ♂, MNHN EC13550), dorsal, ventral and labels. Photographs by Christophe Rivier (MNHN, Paris). Scale bars = 5.0 mm

fine yellow setae. Elytra long, each elytron 3.4 times as long as wide, wider at apical third; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with a transversal slit at base; anterior prothoracic tarsal claws (Fig. 9A) broadly lobed basally, lobe with sinuous margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI deeply notched at posterior margin, V-shaped, lateral apices arched; lobes of ventrite VII (Fig. 10A) elongate, oblong, concave, internal margins directed ventrally, distal margins rounded. Aedeagus (Fig. 11A–C): ventral wall of tegmen short and broad, lateral margins slightly convergent, distal margin forming a pair of broadly rounded lobes; between lobes, small acute tip directed ventrally; fringe of long setae along lateral margins of tegmen dorsally; parameres broadly separated, robust, long and broad, parallel, curved ventrally, apex acute; median lobe short, membranous, partially retracted behind parameres; very long and narrow sclerite curved ventrally, apex acute.

### Female

Similar to male; antennae (Fig. 6L) shorter, antennomeres less broad; pronotum (Fig. 8A) trapezoidal, much broader, 1.7 times as wide as long, lateral margins sinuate, without notches; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII (Fig. 15A) broad, lateral margins arched, distal margin sinuous, with a short and broad medial lobe.

### Note on nomenclature

Delkeskamp (1977) and Wittmer (1977) both indicated Guérin-Méneville's 1844 work as the original reference for *Silis tricolor*, since it contains the first published description of that species. Delkeskamp (1977) also cites "Blanch. in Griffith, Anim. Kingdom 1, 1832, l. 36, fig. 10", a plate published 12 years prior to Guérin-Méneville's description. According to ICZN Art. 8.7, an illustration of a species published before 1930 that is accompanied by a new name does however already count as a valid description "by indication" and makes this name available, even without being accompanied by a description in words or an explicit statement that the name is new. We therefore regard the illustration in Griffith's "Animal Kingdom" as the first available evidence of this species. As the species name *Silis tricolor* is explicitly attributed to "Guérin" on Griffith's plate, F.E. Guérin-Méneville remains the author of the species (not Blanchard), but the year of description must be corrected to 1832.

### Distribution

Brazil (Minas Gerais, Rio de Janeiro and São Paulo states) (Fig. 16).

### *Discodon neoteutonium* sp. nov.

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Figs 3A, 4B, M, 7B, 8B, 9B, 10B, 11D–F, 15B

### Diagnosis

Similar to *D. tricolor* and *D. vanini* sp. nov. It differs from these species by the antennae entirely black, larger whitish elytral spots (Fig. 3A), the aedeagus (Fig. 11D–F) with distal margin of tegmen shorter, apical lobes less pronounced; the median lobe with a very broad central sclerite; females with ventrite VII (Fig. 15B) broader, with a more pronounced median projection.

### Etymology

The epithet *neoteutonium* refers to the type locality of the species, Nova Teutônia, a district in the Seara municipality in Santa Catarina state, Brazil.



## Type material

### Holotype

BRAZIL • ♂; Santa Catarina, Nova Teutônia [Seara]; 27°11' S, 52°23' W; 300–500 m a.s.l.; Apr. 1947; Fritz Plaumann leg.; MZSP 46341 (Fig. 3A).

### Paratypes (43 specimens)

BRAZIL • 1 ♀; same collection data as for holotype; Feb. 1951; MZSP 46342 • 1 ♂, 1 ♀; same collection data as for preceding; Mar. 1951; MZSP 46343, 46344 • 4 ♂♂, 5 ♀♀; same collection data as for preceding; 14 Apr. 1951; NHMB • 1 ♀; same collection data as for preceding; 15 Mar. 1954; NHMB • 4 ♂♂; same collection data as for preceding; 9 Mar. 1957; NHMB • 2 ♂♂; same collection data as for preceding; Feb. 1965; MZSP 46345, 46346 • 3 ♂♂; same collection data as for preceding; Feb. 1966; MZSP 46347 to 46349 • 1 ♀; same collection data as for preceding; DZUP 320980 • 1 ♀; same collection data as for preceding; CEMT CUIABA 00118354 • 1 ♀; same collection data as for preceding; Nov. 1966; MZSP 46352 • 1 ♂; same collection data as for preceding; Dec. 1966; MZSP 46353 • 1 ♀; Santa Catarina, Rio Vermelho [São Bento do Sul]; Feb. 1961; Dirings leg.; MZSP 46354 • 1 ♂; Santa Catarina, Mafra; Rtrr. leg.; NHMB • 1 ♂; Santa Catharina; Hicker leg.; NHMB • 9 ♂♂, 2 ♀♀; Rio Grande do Sul, Vila Oliva [Caxias do Sul]; 18 Feb. 1949; Becker leg.; NHMB • 1 ♂; same collection data as for preceding; 21 Feb. 1948; NHMB • 2 ♂♂; same collection data as for preceding; 24 Feb. 1948; NHMB.

## Description

Body length: 10.4–13.0 mm. Coloration (Fig. 3A): head pitch black, lustrous, except in front of antennae; sockets dark brown; mandibles dark brown, darker at the base and the tip; maxillary and labial palpi black; antennae black, except last three antennomeres, sometimes lighter, and ventral face of antennomere I dark brown. Pronotum (Figs 7B, 8B) lustrous, translucent, with a broad irregular black band from anterior to posterior margin, wider anteriorly and narrower near the middle; background bright yellow to light orange with barely defined orange to brownish lateral patches. Scutellum and elytra pitch black, slightly lustrous; at mid-length of each elytron, a large sulphur to pale yellow hemispheric to triangular spot nearly reaching the lateral borders but not meeting at the suture. Thorax, legs and abdomen pitch black, tarsal claws dark brown.

### Male (Fig. 3A)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short; vertex flat; occipital region convex, broadly rounded behind the eyes. Clypeus flat, anterior margin emarginate, with pair of lobes slightly projected anteriorly. Eyes small, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6B) slightly flattened dorsoventrally; antennomeres wider distally; antennomeres IX–XI slightly narrower than the preceding. Pronotum (Fig. 7B) about 1.5 times as wide as long; anterior margin broadly arched, anterior angles indistinct; lateral margins with a shallow notch at posterior third, pronotum wider behind notch; integument smooth, densely covered with very fine yellow setae. Elytra long, each elytron about 4 times as long as wide, almost parallel, slightly wider in the middle; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with a transversal slit at base; anterior prothoracic tarsal claws (Fig. 9B) with tip pointing externally, broadly lobed basally, lobe with sinuous margin; posterior claws on meso- and metathoracic tarsal claws apparently split at the apex, with fine protruding tooth shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI deeply notched at posterior margin, V-shaped, lateral apices arched; ventrite VII (Fig. 10B) elongate, oblong, strongly concave, internal margins arcuate, directed ventrally, distal margins projecting posteriorly, apices rounded. Aedeagus (Fig. 11D–F): ventral wall of tegmen short and broad, lateral margins slightly convergent, distal margin forming a pair of broadly rounded lobes;

between lobes, small acute tip directed ventrally; fringe of long setae along lateral margins of tegmen dorsally; parameres broadly separated, robust, long and broad, parallel, curved ventrally, apex rounded; median lobe short, membranous, partially retracted behind parameres; very broad central sclerite curved ventrally with broadly rounded apex.

### Female

Similar to male; antennae (Fig. 6M) longer, antennomeres broader; pronotum (Fig. 8B) trapezoidal, broader, 1.6 times as wide as long, lateral margins sinuate, without notches; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII (Fig. 15B) broad, lateral margins arched, distal margin sinuous, with broad medial lobe projecting posteriorly.

### Distribution

Brazil (Santa Catarina and Rio Grande do Sul states) (Fig. 16).

### *Discodon vanini* sp. nov.

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Figs 3B, 6C, N, 7C, 8C, 9C, 10C, 11G–I, 15C

### Diagnosis

Similar to *D. tricolor* and *D. neoteutonium* sp. nov. It differs from these species by the last two or three antennomeres being orange to light brown (Fig. 3B); the ventral wall of the tegmen (Fig. 11G–I) less distinctly narrowed laterally, the central sclerite of the median lobe broader than in *D. tricolor* and narrower than in *D. neoteutonium*; the last ventrite (VII) of females with distal margin sinuate (Fig. 15C).

### Etymology

The specific epithet is patronymic, named in honour of the late Professor Sergio A. Vanin (1948–2020) in appreciation of his enormous and enduring contribution in the study and teaching of zoology, especially Coleoptera systematics.

### Type material

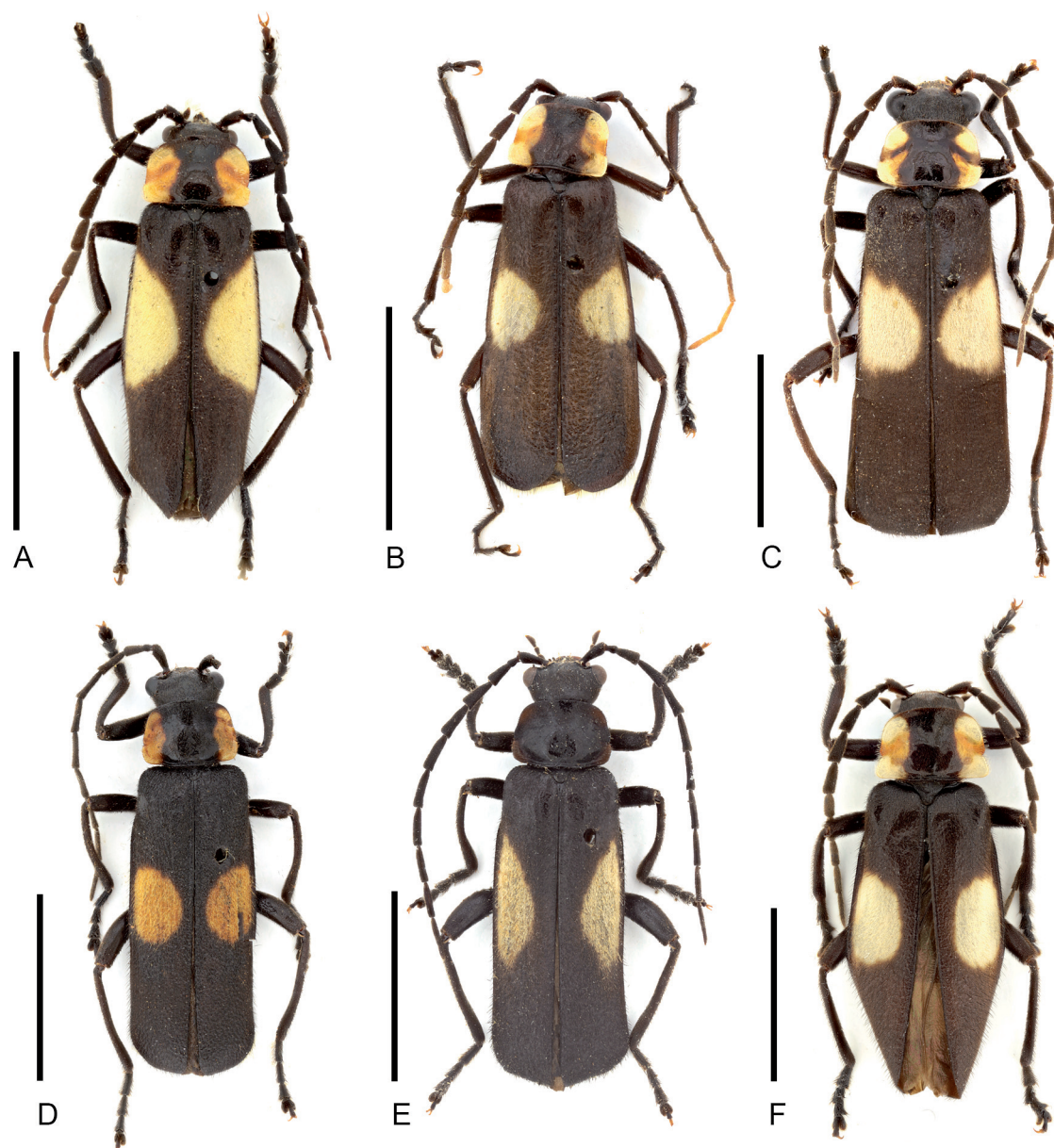
#### Holotype

BRAZIL • ♂; Minas Gerais, Monte Verde; 28 Feb. 1964; J. Halik leg.; MZSP 46355 (Fig. 3B).

#### Paratypes (59 specimens)

BRAZIL • 1 ♂, 1 ♀; same collection data as for holotype; MZSP 46356, 46357 • 1 ♂; same collection data as for preceding; 5 Dec. 1964; MZSP 46358 • 1 ♂; same collection data as for preceding; 10 Feb. 1965; MZSP 46359 • 1 ♀; same collection data as for preceding; DZUP 320981 • 2 ♂♂; same collection data as for preceding; 13–18 Jan. 1969; MZSP 46361, 46362 • 1 ♂; same collection data as for preceding; 16 Jan. 1969; MZSP 46363 • 1 ♀; same collection data as for preceding; UFMG-ICO-2200000 • 1 ♀; same collection data as for preceding; 22 Feb. 1969; MZSP 46365 • 1 ♂; same collection data as for preceding; Nov. 1969; MZSP 46366 • 1 ♂, 1 ♀; same collection data as for preceding; Jan.–Feb. 1970; MZSP 46367, 46368 • 1 ♀; same collection data as for preceding; CEMT CUIABA 00118355 • 1 ♂; same collection data as for preceding; 24 Feb. 1971; MZSP 46370 • 1 ♂; São Paulo, Campos do Jordão; Jan. 1954; J. Lane leg.; MZSP 46371 • 1 ♀; same collection data as for preceding; Mar.–Apr. 2018; S.P. Rosa leg.; MZSP 46397 • 1 ♂; same collection data as for preceding; 1610 m a.s.l.; 12 Feb. 1952; NHMB • 1 ♂, 1 ♀; same collection data as for preceding; 1600 m a.s.l.; Mar. 1945; Wygodzinsky leg.; NHMB • 3 ♀♀; same collection data as for preceding, Capivari; Jan. 1961; Dirings leg.; MZSP 46372 to 46374 • 1 ♀; same collection data as for preceding; 10–22 Feb. 1981; S.A. and A.N. Vanin leg.; MZSP 46375 • 1 ♂; São Paulo, Cantareira [São Paulo]; 23 Mar. 1907; E. Garbe leg. [7772]; MZSP 46376 •

3 ♂♂, 2 ♀♀; same collection data as for preceding; Feb. 1962; J. Halik leg.; MZSP 46377 to 46381 • 1 ♀; same collection data as for preceding; 1 Mar. 1963; MZSP 46382 • 1 ♀; same collection data as for preceding; 6 Mar. 1968; MZSP 46383 • 1 ♂, 1 ♀; São Paulo, Ipiranga; 4 Mar. 1962; L. Stowbunenko leg.; MZSP 46384, 46385 • 1 ♂; São Paulo, Mata do Governo [Parque Estadual das Fontes do Ipiranga]; 3 Apr. 1931; R. Spitz leg.; MZSP 46386 • 1 ♂; Jundiaí, Reserva Biológica Serra do Japi; 23°14'20" S, 46°57'27" W; 23–25 Jan. 2012; E.A. Nascimento, G. Biffi and F.R. Fernandes leg.; MZSP 46387 • 1 ♀; Salesópolis, Estação Biológica de Boracéia; Apr. 1948; E.X. Rabello leg.; MZSP 46388 • 1 ♂; same collection data as for preceding; 21–22 Mar. 1973; S. Vanin and M. Jorge leg.; MZSP 46389 • 4 ♂♂,



**Fig. 3.** Primary types, habitus, males. **A.** *Discodon neoteutonum* sp. nov. (holotype, MZSP 46341). **B.** *Discodon vanini* sp. nov. (holotype, MZSP 46355). **C.** *Discodon lineaticorne* sp. nov. (holotype, MZSP 46436). **D.** *Discodon aurimaculatum* sp. nov. (holotype, MZSP 46447). **E.** *Discodon marginicolle* sp. nov. (holotype, CEMT CUIABA 00118359). **F.** *Discodon tamoio* sp. nov. (holotype, MZSP 46470). Scale bars = 5.0 mm.



1 ♀; São Paulo, Alto da Serra [Paranapiacaba, Santo André]; 28 Feb. 1912; G.E. Bryant and G. Bryant leg. 1919-147; NHMUK • 4 ♂♂, 2 ♀♀; same collection data as for preceding; 5 Mar. 1912; NHMUK • 1 ♂, 1 ♀; same collection data as for preceding; 7 Mar. 1912; NHMUK • 1 ♂, 1 ♀; same collection data as for preceding; 9 Mar. 1912; NHMUK • 1 ♂, 1 ♀; Paranapiacaba; Feb. 1962; L. Stowbunenko leg.; MZSP 46390, 46391 • 2 ♂♂, 2 ♀♀; same collection data as for preceding; 5 Mar. 1962; MZSP 46392 to 46395 • 1 ♂; Paraná, Ponta Grossa, Distrito de Itaicoca; 23°07'03.7" S, 49°56'27.8" W; 24 Mar.–12 Apr. 2017; M.D. Almeida L. Tozetto and M.H. Santos leg.; MZSP 46396.

### **Description**

Body length: 9.7–13.0 mm. Head pitch black, lustrous, except in lateral corners of clypeus, dark brown; mandibles dark brown, darker at base and tip; maxillary and labial palpi black; antennae black, last two or three antennomeres orange to light brown. Pronotum lustrous, translucent, with broad irregular black band from anterior to posterior margin, wider posteriorly and narrower near middle; background bright yellow to light orange with well-defined diagonal orange and brown patches laterally. Scutellum and elytra pitch black, slightly lustrous; at mid-length of each elytron, large whitish to pale yellow round spot nearly reaching lateral borders but not meeting at suture. Thorax, legs and abdomen pitch black, tarsal claws brown.

#### **Male** (Fig. 3B)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short; vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with a median incision. Eyes small, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6C) slightly flattened dorsoventrally; antennomeres III–VIII wider distally; antennomeres IX–XI narrower and less expanded distally than preceding ones. Pronotum (Fig. 7C) about 1.5 times as wide as long; anterior margin almost straight, anterior angles arched; lateral margins with shallow notch at posterior third, pronotum wider behind notch; integument smooth, densely covered with very fine yellow setae. Elytra long, each elytron 4.2 times as long as wide, wider at middle; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with a transversal slit at base; anterior prothoracic tarsal claws (Fig. 9C) broadly lobed basally, lobe with sinuous margin; posterior claws on meso- and metathoracic tarsal claws apparently split at the apex, with fine protruding tooth shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI deeply notched at posterior margin, V-shaped, lateral apices arched; ventrite VII (Fig. 10C) elongate, oblong, strongly concave, internal margins arcuate, directed ventrally, distal margins projecting posteriorly, apices rounded. Aedeagus (Fig. 11G–I): ventral wall of tegmen short and broad, lateral margins slightly convergent, distal margin forming a pair of broadly rounded lobes; between lobes, small acute tip directed ventrally; fringe of long setae along lateral margins of tegmen dorsally; parameres broadly separated, robust, long and broad, parallel, curved ventrally, apex rounded; median lobe short, membranous, partially retracted behind parameres; broad central sclerite curved ventrally, with apex narrowly rounded.

#### **Female**

Similar to male; antennae (Fig. 6N) shorter, antennomeres slightly broader; pronotum (Fig. 8C) trapezoidal, narrower, 1.4 times as wide as long, lateral margins sinuate, without notches; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII (Fig. 15C) broad, lateral margins broadly arched, distal margin sinuous, with broad and shallow medial lobe.

### Distribution

Brazil (Minas Gerais, São Paulo and Paraná states) (Fig. 16).

*Discodon obscurior* Pic, 1906 stat. nov.

Figs 5A–C, 6D, O, 7D, 8D, 9D, 10D, 11J–L, 15D

*Discodon albonotatum* var. *obscurior* Pic, 1906: 90.

*Discodon albonotatum* var. *obscurior* – Delkeskamp 1939: 155 (catalogue); 1977: 259 (catalogue). — Blackwelder 1945: 364 (checklist).

### Diagnosis

Similar to *D. nigrocephalum* by general coloration (Fig. 5A–B). It differs especially by the elytra being smoother (Fig. 5A), the pronotum (Figs 7D, 8D) with anterior and lateral margins broadly arched, the shape of the lobe of the tarsal claws (Fig. 9D), the ventrite VII of males (Fig. 10D) and females (Fig. 15D) and the aedeagus (Fig. 11J–L). The colour of the antennae (Fig. 5A–B) of *D. obscurior* is usually light brown to orangish.

### Type material

**Lectotype** (here designated)

BRAZIL • ♀; Rio de Janeiro, Nova Friburgo; Feb.–Mar. 1903; E. Gounelle leg.; “Muséum Paris, Coll. M. Pic”; MNHN, Paris EC13554 (Fig. 5A–C).

**Paralectotype**

BRAZIL • 1 ♀; same collection data as for lectotype; MNHN, Paris EC13555.

### Other material examined (38 specimens)

BRAZIL • 28 ♂♂, 10 ♀♀; Rio de Janeiro, Petrópolis; 5–7 Mar. 1962; J. Bechyné leg.; MZSP 46398 to 46435.

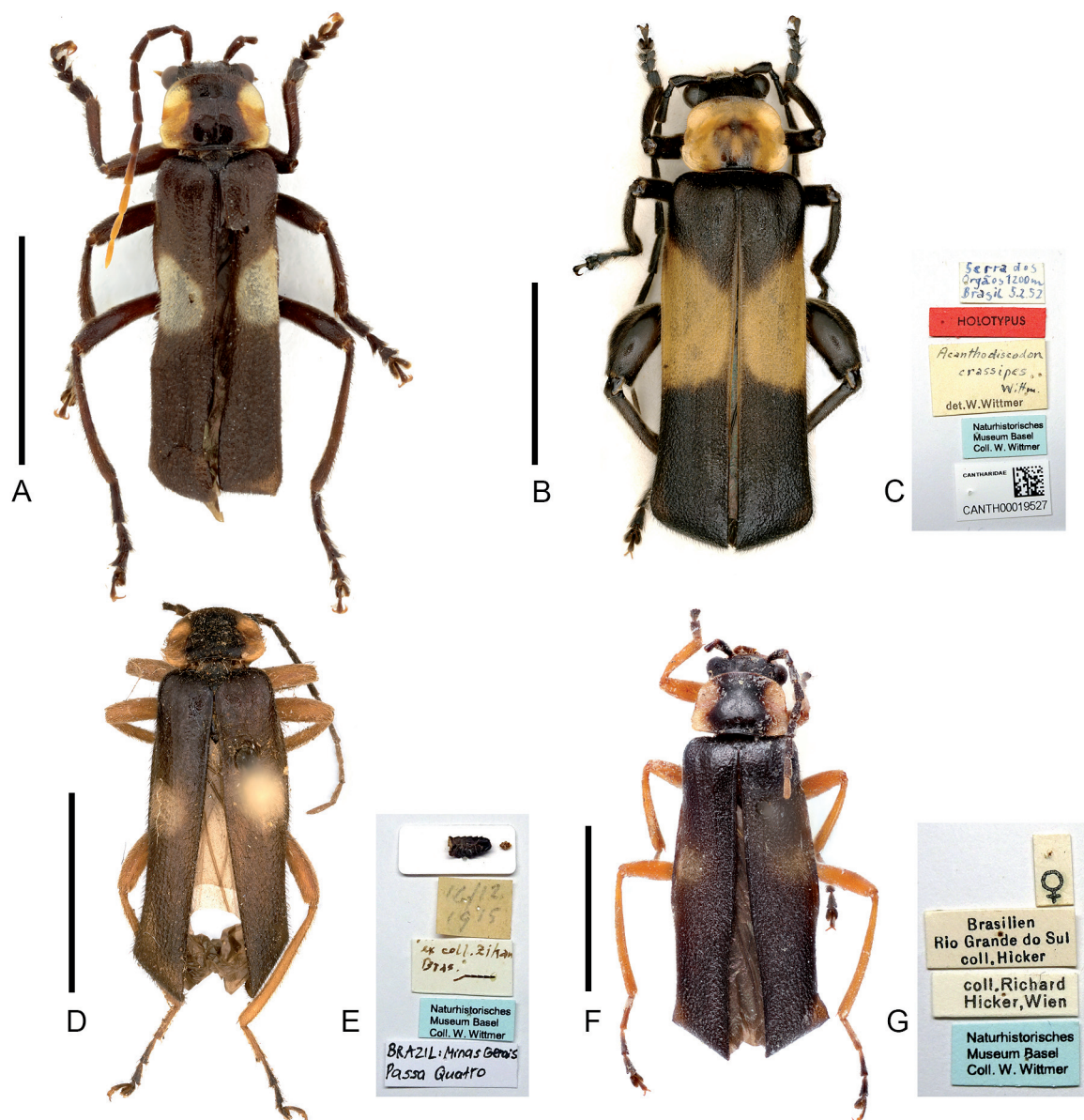
### Re-description

Body length: 11.0–13.0 mm. Coloration (Fig. 5A–B): head pitch black, lustrous, except in lateral corners of clypeus, dark brown; mandibles dark brown, darker at base and tip; maxillary and labial palpi dark brown, light brown in last palpomeres; antennomere I black, the latter light brown, sometimes orangish. Pronotum (Figs 7D, 8D) lustrous, partly translucent, with broad irregular black band from anterior to posterior margin, black band usually with lateral projections in posterior third; background pale yellow with diffuse orange regions. Scutellum and elytra entirely pitch black, slightly lustrous. Thorax, legs and abdomen black, tarsal claws brown.

**Male** (Fig. 5A–B)

Head short, slightly wider than long, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short, vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with median incision. Eyes large, rounded, slightly prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6D) long, slightly flattened dorsoventrally; antennomeres III–X narrowing proximally, sub-serrate; antennomeres without longitudinal lines. Pronotum (Fig. 7D) wide, 1.5 times as wide as long; anterior margin, anterior angles and lateral margins broadly arched; lateral margins with shallow notch at posterior third; integument smooth, densely covered with very fine yellow setae. Elytra long, each elytron 4.2 times as long as wide, wider medially; integument coriaceous,

densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base; anterior prothoracic tarsal claws (Fig. 9D) broadly lobed basally, lobe with sinuous to truncate margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI notched at posterior margin; ventrite VII (Fig. 10D) with concave lobes, inner margins divergent, directed ventrally, with sharp borders; outer margins straight, apical margins truncate, meeting medially. Aedeagus (Fig. 11J–L): ventral wall of tegmen short, lateral



**Fig. 4.** Primary types, habitus and labels. **A.** *Discodon viridimontanum* sp. nov. (holotype, ♂, MZSP46483). **B–C.** *Discodon (Acanthodiscodon) crassipes* Wittmer, 1952 (holotype, ♂, NHMB CANTH00019527), dorsal habitus and labels. **D–E.** *Discodon albonotatum testaceipes* Pic, 1930 (syntype, ♂, NHMB), dorsal habitus and labels. **F–G.** *Discodon albonotatum testaceipes* Pic, 1930 (syntype, ♀, NHMB), dorsal habitus and labels. Photos B–G by Matthias Borer (NHMB). Scale bars = 5.0 mm.



margins convergent from apical half; apex forming a pair of rounded lobes and salient border projecting ventrally; fringe of long setae along lateral margins of tegmen dorsally; parameres very long, robust, falciform, projecting dorsally, apex rounded with small acute tip; median lobe membranous, with very long and broad flattened central sclerite dorsally.

### Female

Similar to male; antenna (Fig. 6O) longer; pronotum (Fig. 8D) more transverse, wider, 1.6 times as wide as long, sub-rectangular, anterior margin nearly straight, lateral margins without notch; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII (Fig. 15D) broad, lateral and distal margins sinuous, apex without strong projections, with shallow lobes not strongly projecting posteriorly.

### Distribution

Brazil (Rio de Janeiro state) (Fig. 16).

### *Discodon lineaticorne* sp. nov.

urn:lsid:zoobank.org:act:66D5B02D-DAD1-47BB-A93E-0981BECD4BB7

Figs 3C, 6E, P, 7E, 8E, 9E, 10E, 12A–C, 15E

### Diagnosis

Differs from other species in the region by the entirely black antennae (Fig. 3C), the males with antennomeres IX–XI with short longitudinal lines dorsally (Fig. 6E), ventrite VII with apices truncate (Fig. 10E), aedeagus (Fig. 12A–C) with three distal projections on distal margin of tegmen, the central projection very long and curved ventrally; females with last ventrite (VII) (Fig. 15E) broadly rounded with a pair of acute projections medially.

### Etymology

The epithet *lineaticorne* refers to the longitudinal antennal lines on antennomeres IX–XI of the males.

### Type material

#### Holotype

BRAZIL • ♂; São Paulo, Pindamonhangaba, Eugênio Lefèvre; 28 Sep. 1962; Exp. Dep. Zool leg.; MZSP 46436 (Fig. 3C).

#### Paratypes (10 specimens)

BRAZIL • 1 ♀; Minas Gerais, Itamonte, Instituto Alto Montana; 22°21'13" S, 44°47'57" W, 5–6 Nov. 2019; UC. Entomologia UNIFESP leg.; Malaise; MZSP 46444 • 1 ♀; São Paulo, Campos do Jordão; 22°40'51.4" S, 45°35'30.5" W; 1461 m a.s.l.; Oct.–Nov. 2019; S.P. Rosa leg.; MZSP 46445 • 1 ♂; same collection data as for preceding; 1–13 Oct. 2018; MZSP 46446 • 1 ♀; same collection data as for holotype; DZUP 320982 • 1 ♂; same collection data as for preceding; 26 Oct. 1962; MZSP 46438 • 1 ♀; same collection data as for preceding; 1200 m a.s.l.; 21 Dec. 1962; MZSP 46439 • 1 ♂, 3 ♀♀; São Paulo, Ipiranga; Oct. 1908; Luederwaldt leg. '20371' [Luederwaldt's collection record]; MZSP 46440 to 46443.

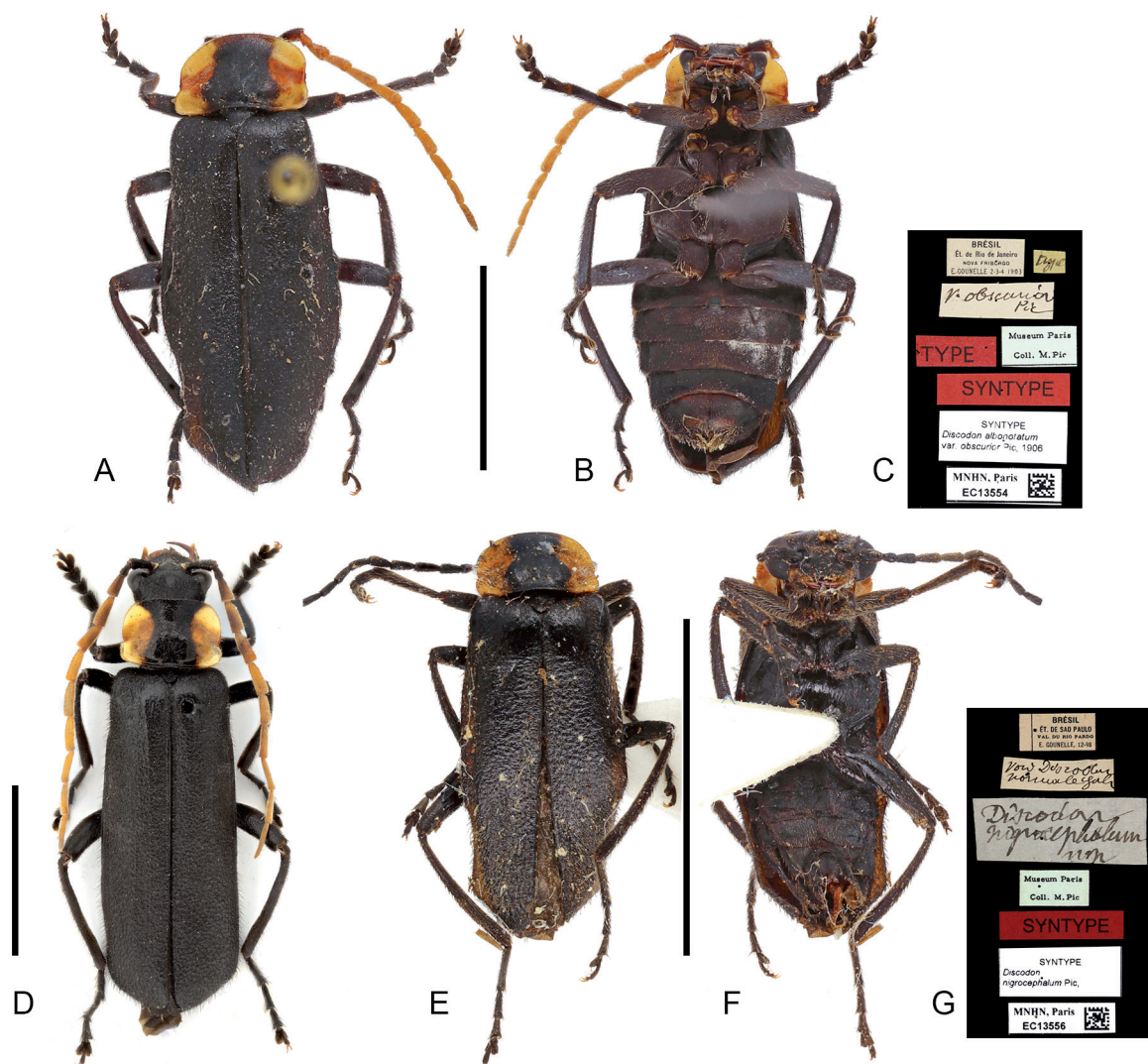
### Description

Body length: 13.0–14.3 mm. Coloration (Fig. 3C): head pitch black, lustrous, except in lateral corners of clypeus, light brown; mandibles light brown, darker at base and tip; maxillary and labial palpi dark brown to black, light brown at apex of last palpomeres; antennae entirely black. Pronotum (Figs 7E, 8E) lustrous, partly translucent, with broad irregular black band from anterior to posterior margin,

wider anteriorly and near posterior margin, and narrower near anterior half; from median band, a pair of diagonal black bands; background pale yellow to light orange with barely defined orange patches. Scutellum and elytra pitch black, slightly lustrous; at mid-length of each elytron, large whitish to pale yellow round spot nearly reaching lateral borders but not meeting at suture. Thorax, legs and abdomen dark brown to black, tarsal claws brown.

**Male (Fig. 3C)**

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short, vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with median incision. Eyes large, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6E) long, slightly flattened dorsoventrally; antennomeres III–



**Fig. 5.** Primary types, habitus and labels. A–C. *Discodon albonotatum obscurior* Pic, 1906 (lectotype, ♀, MNHN EC13554), dorsal habitus, ventral view and labels. D. *Discodon tenuecostatum* sp. nov. (holotype, ♂, MZSP 46459). E–G. *Discodon nigrocephalum* Pic, 1949 (lectotype, ♂, MNHN EC13556), dorsal habitus, ventral view and labels. Photographs A–C and E–G by Christophe Rivier (MNHN, Paris). Scale bars = 5.0 mm.

IX wider distally, sub-serrate; antennomeres IX–XI with short longitudinal lines dorsally. Pronotum (Fig. 7E) wide, about 1.5 times as wide as long; usually, anterior margin slightly arched, almost straight in middle, anterior angles arched; lateral margins slightly sinuate, with shallow notch at posterior third; anterior, posterior and lateral margins elevated; integument smooth, densely covered with very fine yellow setae. Elytra long, each elytron 5 times as long as wide, almost parallel; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base; anterior prothoracic tarsal claws (Fig. 9E) broadly lobed basally, lobe with rounded margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI deeply notched at posterior margin, V-shaped, lateral apices arched; ventrite VII (Fig. 10E) with parallel-sided lobes, distal margins truncate; ventrite lobes concave, internal margins directed ventrally. Aedeagus (Fig. 12A–C): ventral wall of tegmen long and broad, apical margin convergent, forming a pair of lateral projections with truncate apices and very long central projection, strongly curved ventrally and with hook-like apex, usually visible between lobes of ventrite VII; fringe of long setae along lateral margins of tegmen dorsally; parameres robust, long and broad, parallel, apex acute; median lobe short, membranous, partially retracted behind parameres.

### Female

Similar to male; antennae (Fig. 6) shorter, without longitudinal lines; pronotum wider, 1.6 times as wide as long, lateral margins without notches; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII broad, lateral and distal margins broadly arched, distal margin with two long apical lobes projecting posteriorly at middle and U-shaped medial notch.

### Distribution

Brazil (Minas Gerais and São Paulo states) (Fig. 16).

### *Discodon aurimaculatum* sp. nov.

urn:lsid:zoobank.org:act:0D454F22-6E27-402C-ADDB-36D5483D57FB

Figs 3D, 6F, Q, 7F, 8F, 9F, 10F, 12D–F, 15F

### Diagnosis

Differs from all the other species by the elytra with the weakly defined longitudinal roughness and dark yellow spots (Fig. 3D), the shape of the aedeagus (Fig. 12D–F) and the last ventrite (VII) of the females (Fig. 15F).

### Etymology

The specific epithet *aurimaculatum* refers to the dark yellowish to golden rounded elytral spots.

### Type material

#### Holotype

BRAZIL • ♂; Pindamonhangaba, Eugênio Lefèvre; 1200 m a.s.l.; 21 Dec. 1962; Exp. Dep. Zool. leg.; MZSP 46447 (Fig. 3D).

#### Paratypes (12 specimens)

BRAZIL • 2 ♀♀; Rio de Janeiro, Itatiaia; 1100 m a.s.l.; Feb. 1963; MZSP 46448, 46449 • 2 ♀♀; same collection data as for preceding; Jan. 1968; MZSP 46450, 46451 • 1 ♂; same collection data as for preceding; 1300 m a.s.l.; Nov. 1950; NHMB • 1 ♀; same collection data as for preceding, Vêu da Noiva,



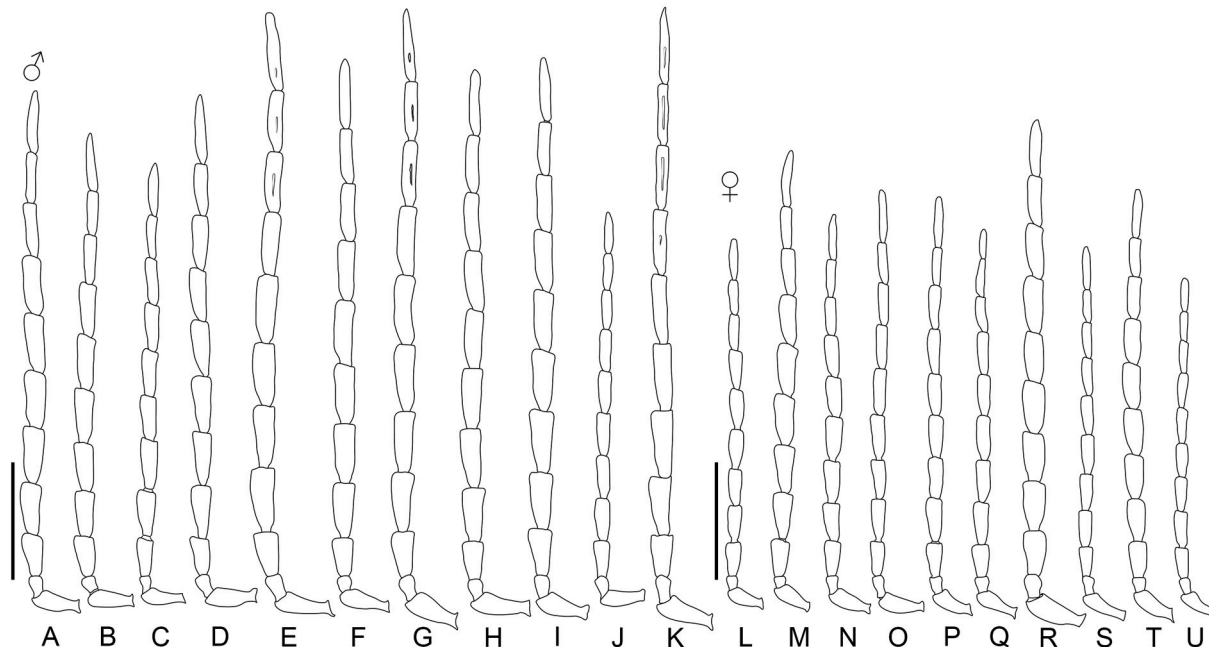
córrego Maromba; 22°26'10" S, 44°37'28" W; 1100 m a.s.l.; 2–3 Feb. 1997; Kury, Rocha and Mestre leg.; MZSP 46452 • 1 ♂, 2 ♀; same collection data as for holotype; MZSP 46453, 46454, 46457 • 1 ♀; same collection data as for holotype; DZUP 320983 • 1 ♀; same collection data as for holotype; CEMT CUIABA 00118356 • 1 ♀; same collection data as for holotype; 24 Jan. 1963; MZSP 45593.

## Description

Body length: 11.7–13.0 mm. Coloration (Fig. 3D): head pitch black, lustrous, except in lateral corners of clypeus, light brown; mandibles light brown, darker at tip; maxillary and labial palpi black, light brown at apex of last palpomeres; antennae entirely black. Pronotum (Figs 7F, 8F) lustrous, partly translucent, with broad irregular black band from anterior to posterior margin, wider anteriorly and near posterior margin, and narrower near anterior half; no lateral dark bands or patches; background pale yellow to light orange with barely defined orange regions. Scutellum and elytra pitch black; at mid-length of each elytron, pale-yellow round spot meeting lateral borders but not meeting at suture. Thorax, legs and abdomen dark brown to black, tarsal claws brown.

### Male (Fig. 3D)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short, vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with shallow median incision. Eyes small, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6F) long, slightly flattened dorsoventrally; antennomeres slightly narrowing anteriorly, sub-serrate; antennomeres without longitudinal lines dorsally. Pronotum (Fig. 7F) wide, about 1.4 times as wide as long; anterior margin slightly arched, anterior angles arched; lateral



**Fig. 6.** Right antennae, dorsal view. A–K. Males. L–U. Females. A, L. *Discodon tricolor* (Guérin-Méneville, 1832). B, M. *Discodon neoteutonum* sp. nov. C, N. *Discodon vanini* sp. nov. D, O. *Discodon obscurior* Pic, 1906 stat. nov. E, P. *Discodon lineaticorne* sp. nov. F, Q. *Discodon aurimaculatum* sp. nov. G, R. *Discodon marginicolle* sp. nov. H, S. *Discodon tenuecostatum* sp. nov. I, T. *Discodon tamoio* sp. nov. J, U. *Discodon viridimontanum* sp. nov. K. *Discodon crassipes* Wittmer, 1952. Scale bars = 1.0 mm.

margins slightly sinuate, with deep notch at posterior third; integument smooth, densely covered with very fine yellow setae. Elytra long, each elytron 4.8 times as long as wide, almost parallel; weakly defined longitudinal roughness, like costae, more visible anteriorly; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base; anterior prothoracic tarsal claws (Fig. 9F) broadly lobed basally, lobe with rounded margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI slightly notched at posterior margin; ventrite VII (Fig. 10F) with broad lobes, internal margins arched externally, apical margin broadly rounded. Aedeagus (Fig. 12D–F): ventral wall of tegmen elongate, apical margins convergent, forming a pair of parallel lateral projections with rounded apices and a short central projection, strongly curved ventrally and with acute hook-like apex; fringe of long setae along lateral margins of tegmen dorsally; parameres very short, hidden between tegmen and median lobe; median lobe long, membranous, with a pair of strong sclerites, each with double acute apices; sides of median lobe with tuft of thick spine-like setae.

### Female

Similar to male; antennae (Fig. 6Q) shorter; pronotum (Fig. 8F) wider, 1.6 times as wide as long, lateral margins without notches; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII (Fig. 15F) broad, lateral and distal margins broadly arched, distal margin with two short acute apical lobes projecting posteriorly at middle and V-shaped medial notch.

### Distribution

Brazil (Rio de Janeiro and São Paulo states) (Fig. 16).

### *Discodon marginicollae* sp. nov.

urn:lsid:zoobank.org:act:CECFCC8E-713B-4A5F-B6B0-9995F9A776B3

Figs 3E, 6G, R, 7G, 8G, 9G, 10G, 12G–I, 15G

### Diagnosis

Similar to *D. neoteutonum* sp. nov. by the shape and coloration of the elytral spots. It differs from this species by the antennae being entirely black (Fig. 3E), with the antennal lines in males (Fig. 3G), the pronotum almost entirely black (Figs 7G, 8G), and the aedeagus with distal margin of the tegmen with three projecting lobes (Fig. 12G–I); females with ventrite VII broad, with a sinuous distal margin and a less pronounced median projection (Fig. 15G). The aedeagus of *D. marginicollae* sp. nov. is similar to that of *D. aurimaculatum* sp. nov., differing in the shape of the distal projections of the ventral wall of the tegmen; besides, the antennae of *D. aurimaculatum* do not have antennal lines and the elytral spots are rounder.

### Etymology

The specific epithet refers to the barely defined dark-orangish spot in the margin of the pronotum.

### Type material

#### Holotype

BRAZIL • ♂; Rio de Janeiro, Nova Friburgo, Macaé de Cima; Jan. 2000; P. Grossi leg.; CEMT CUIABA 00118359 (Fig. 3E).

#### Paratypes (4 specimens)

BRAZIL • 1 ♂; same collection data as for holotype; MZSP 46458 • 2 ♀♀; Nova Friburgo, Mury; 1050 m a.s.l.; Mar. 1941; NHMB • 1 ♀; Terezópolis; Jan. 1980; A. Bello leg.; CEMT CUIABA 00118360.

## Description

Body length: 11.0–13.0 mm. Coloration (Fig. 3E): head pitch black, lustrous, except in corners of clypeus, dark brown; mandibles dark brown, darker at tip; maxillary and labial palpi black and antennae entirely black. Pronotum (Figs 7G, 8G) lustrous, mostly black, except for orangish to dark brown irregular patches near anterior and posterior angles. Scutellum and elytra pitch black; at mid-length of each elytron, large sulphur to greyish hemispheric to triangular spot nearly reaching lateral borders but not meeting at suture. Thorax, legs and abdomen pitch black, tarsal claws dark brown.

### Male (Fig. 3E)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short; vertex flat; occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, with a pair of lobes slightly projected anteriorly. Eyes small, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6G) sub-serrate, slightly flattened dorsoventrally; antennomeres III–VI wider distally, the latter nearly parallel, antennomere XI narrowing apically; antennomeres IX–XI with short longitudinal lines dorsally. Pronotum (Fig. 7G) about 1.1 times as wide as long; anterior margin slightly arched, anterior angles rounded; lateral margins with shallow notch at posterior third, pronotum wider near notch; integument smooth, densely covered with very fine clear setae. Elytra long, each elytron about 5.5 times as long as wide, almost parallel; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base; anterior prothoracic tarsal claws (Fig. 9G) with pointing tip, broadly lobed basally, lobe with rounded margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI broadly concave at posterior margin; ventrite VII (Fig. 10G) elongate, halves triangular, internal margins straight, lateral margins arched, apices rounded. Aedeagus (Fig. 12G–I): ventral wall of tegmen elongate, apical margins convergent, forming a pair of parallel lateral projections with acute apices and central projection, strongly curved ventrally and with acute hook-like apex; fringe of long setae along lateral margins of tegmen dorsally; parameres very short, hidden between tegmen and median lobe; median lobe long, conical, membranous, with a pair of strong sclerites, each with double acute apices; sides of median lobe with a tuft of thick spine-like setae.

### Female

Similar to male; antennae (Fig. 6) shorter, antennomeres broader, without antennal lines; pronotum (Fig. 8) trapezoidal, broader, 1.6 times as wide as long, lateral margins sinuate, without notches; tarsal claws without basal lobe or apical slit; ventrite VI with distal margin slightly arched, concave; ventrite VII (Fig. 15G) broad and short, distal margin sinuous, with a broad medial lobe projecting posteriorly.

## Distribution

Brazil (Rio de Janeiro state) (Fig. 16).

### *Discodon tenuecostatum* sp. nov.

urn:lsid:zoobank.org:act:7DC62ADA-E43F-4874-AB7D-97EED692DB78

Figs 5D, 6H, S, 7H, 8H, 9H, 10H, 12J–M, 15H

## Diagnosis

Similar to *D. obscurior* and *D. nigrocephalum* by the general coloration. It differs especially by the weakly defined elytral costulae (Fig. 5D) visible under unidirectional lighting, the shape of the pronotum



(Figs 7H, 8H), which is less arched anteriorly, the tarsal claws of the males (Fig. 9H), ventrite VII of the males (Fig. 10H) and females (Fig. 15H) and the aedeagus (Fig. 12J–M).

### Etymology

The name *tenuecostatum* refers to the weakly defined longitudinal elytral costulae in both males and females.

### Type material

#### Holotype

BRAZIL • ♂; Rio de Janeiro, Teresópolis, Parque Nacional da Serra dos Órgãos; 4–9 Nov. 2013; V.S. Ferreira and F.F. Barbosa leg.; MZSP 46459 (Fig. 5D).



**Fig. 7.** Pronotum of males, dorsal view. **A.** *Discodon tricolor* (Guérin-Ménéville, 1832). **B.** *Discodon neoteutonum* sp. nov. **C.** *Discodon vanini* sp. nov. **D.** *Discodon obscurior* Pic, 1906 stat. nov. **E.** *Discodon lineaticorne* sp. nov. **F.** *Discodon aurimaculatum* sp. nov. **G.** *Discodon marginicolle* sp. nov. **H.** *Discodon tenuecostatum* sp. nov. **I.** *Discodon tamoio* sp. nov. **J.** *Discodon viridimontanum* sp. nov. **K.** *Discodon crassipes* Wittmer, 1952. Scale bar = 1.0 mm.



**Paratypes** (11 specimens)

BRAZIL • 3 ♂♂, 1 ♀; same collection data as for holotype; MZSP 46460, 46461, 46463, 46466 • 1 ♀; same collection data as for holotype; UFMG-ICO-2200001 • 1 ♀; same collection data as for holotype; DZUP 320984 • 1 ♀; same collection data as for holotype; CEMT CUIABA 00118357 • 1 ♂, 1 ♀; same collection data as for preceding, Casa do Pesquisador; 16 Dec. 2016; Simeão Moraes leg.; MZSP 46467, 46468 • 1 ♀; [Parque Nacional do] Itatiaia; Nov. 1966; Dirings col.; MZSP 46469 • 1 ♀; Rio de Janeiro, Serra do Macaé; Nov. 1909; E. Garbe leg. [15,235]; MZSP 45594.

**Description**

Body length: 11.7–16.2 mm. Coloration (Fig. 5D): head pitch black, lustrous, except in lateral corners and anterior margin of clypeus, dark brown; mandibles dark brown, darker at base and tip; maxillary



**Fig. 8.** Pronotum of females, dorsal view. **A.** *Discodon tricolor* (Guérin-Méneville, 1832). **B.** *Discodon neoteutonum* sp. nov. **C.** *Discodon vanini* sp. nov. **D.** *Discodon obscurior* Pic, 1906 stat. nov. **E.** *Discodon lineaticorne* sp. nov. **F.** *Discodon aurimaculatum* sp. nov. **G.** *Discodon marginicolle* sp. nov. **H.** *Discodon tenuecostatum* sp. nov. **I.** *Discodon tamoio* sp. nov. **J.** *Discodon viridimontanum* sp. nov. **K.** *Discodon testaceipes* Pic, 1930 stat. nov. Scale bar = 1.0 mm.

and labial palpi dark brown, light brown in last palpomeres; antennae black at base, clearing apicad, antennomeres I–II black, III–V dark brown, VI–XI light brown, sometimes III–V light brown and the latter orangish. Pronotum (Figs 7H, 8H) lustrous, partly translucent, with broad irregular black band from anterior to posterior margin, wider anteriorly and near posterior margin, and narrower near anterior half; background pale yellow with diffuse orange regions. Scutellum and elytra entirely pitch black, slightly lustrous. Thorax, legs and abdomen black, tarsal claws brown.

### Male

Head short, as long as wide, excluding eyes; integument smooth, densely covered with short and fine clear setae; frons short, vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with rounded median incision. Eyes small, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6H) long, reaching elytral apical third, slightly flattened dorsoventrally; antennomeres narrowing proximally, sub-serrate, without longitudinal lines. Pronotum (Fig. 7H) wide, about 1.5 times as wide as long; anterior margin slightly arched, anterior angles arched; lateral margins sinuate, almost parallel anteriorly, and widened before lateral deep notch at posterior third; integument smooth, densely covered with very fine yellow setae. Elytra very long, each elytron 5.6 times as long as wide, almost parallel; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base; anterior prothoracic tarsal claws (Fig. 9H) broadly lobed basally, lobe with very broad rounded margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI with posterior margin concave; ventrite VII (Fig. 10H) with triangular concave lobes, inner margins nearly parallel, directed ventrally, outer margins convergent posteriorly, apical margins rounded, with tip directed internally. Aedeagus (Fig. 12J–M) very robust, ventral wall of tegmen elongate, lateral margins constricted apically; apex forming a pair lobes with rounded projections, with strongly sinuous aspect; broad central projection, strongly flattened laterally with flat plaque-like projection ventrally, usually visible between ventrite lobes; fringe of long setae along lateral margins of tegmen dorsally; parameres very short, hidden between tegmen and median lobe; median lobe membranous, with strong falciform sclerites directed dorsally and central tufts of thick pubescence.

### Female

Similar to male; antennae (Fig. 6S) shorter; pronotum (Fig. 8H) wider, 1.7 times as wide as long, sub-rectangular, anterior margin nearly straight, lateral margins without notch; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII (Fig. 15H) long and broad, lateral and distal margins broadly arched, apex with two long and broad apical lobes projecting posteriorly at middle and U-shaped medial notch.

### Distribution

Brazil (Rio de Janeiro state) (Fig. 16).

### *Discodon nigrocephalum* Pic, 1949

Fig. 5E–G

*Discodon nigrocephalum* Pic, 1949: 6.

*Discodon nigrocephalum* – Delkeskamp 1977: 255 (catalogue).



### Diagnosis

Similar to *D. obscurior* and *D. tenuecostatum* sp. nov. by the general coloration. It differs from these species by the wider head (Fig. 5F), apparently nearly as wide as the pronotum, the antennae black, and the elytra coriaceous, rough, without costulae (Fig. 5E).

### Type material

#### Lectotype (here designated)

BRAZIL • ♂; São Paulo, Vale do Rio Pardo; Dec. 1898; E. Gounelle leg.; “Museum Paris Coll. M. Pic”; MNHN, Paris EC13556 (Fig. 5E–G).

### Remarks

We were not able to examine the type specimen of *D. nigrocephalum* nor found similar specimens that could be attributed to this species. However, the photographs of the lectotype, deposited at the MNHN, Paris, enable the distinction between *D. nigrocephalum* on the one hand and *D. obscurior* and *D. tenuecostatum* sp. nov. on the other hand.

### Distribution

Brazil (São Paulo state) (Fig. 16).

#### *Discodon tamoio* sp. nov.

urn:lsid:zoobank.org:act:A319DC64-B2FD-4853-A80E-CE88D46B5BC2

Figs 3F, 6I, T, 7I, 8I, 9I, 10I, 13A–C, 15I

### Diagnosis

Antennae entirely black (Fig. 3F), last ventrite (VII) of males with a strongly prominent acute tip directed ventrally (Fig. 10I); the last ventrite of the females (VII) with a distal margin with two apical rounded lobes projecting posteriorly at middle (Fig. 15I).

### Etymology

The specific epithet refers to the Tamoio indigenous people, that inhabited the same region as *D. tamoio* sp. nov., currently comprising part of the coast of São Paulo and Rio de Janeiro states, Brazil.

### Type material

#### Holotype

BRAZIL • ♂; São Paulo, Salesópolis, Estação Biológica de Boracéia; 23°39'14" S, 45°53'25" W, 24–28 Mar. 2011; Expedição MZUSP/FFCLRP leg.; MZSP 46470 (Fig. 3I).

#### Paratypes (14 specimens)

BRAZIL • 1 ♂; São Paulo, Salesópolis, Estação Biológica de Boracéia; 23°39'15.63" S, 45°53'22.38" W, 8–12 Mar. 2013; F.F. Albertoni leg.; lâmpada mista [mist lamp]; MZSP 46472 • 1 ♂; same collection data as for preceding; DZUP 320985 • 1 ♂; same collection data as for preceding; 23°39'14.5" S, 45°53'21.7" W; 16 Mar. 2008; F.R. Fernandes leg.; MZSP 46474 • 1 ♂; same collection data as for preceding; UFMG-ICO-2200002 • 1 ♀; same collection data as for preceding; 23°39'02.6" S, 45°53'32.1" W; 23–27 Mar. 2012; F.F. Albertoni leg.; MZSP 46476 • 1 ♂; same collection data as for preceding; 23°39'14" S, 45°53'25" W; 24–28 Mar. 2011; Expedição MZUSP/FFCLRP leg.; MZSP 46471 • 1 ♂; same collection data as for preceding; 16–19 Feb. 2018; Expedição MZUSP leg.; MZSP 46477 • 1 ♀; Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba; 3–14 Mar. 2008; F. Esteves and R. Feitosa leg.; MZSP 46478 • 1 ♂; Caraguatatuba, Reserva Florestal; 40 m a.s.l.; 2 Apr. 1962; Exp. Dep. Zool. leg.; MZSP 46479 • 1 ♂; same collection data as for preceding; 2 Apr. 1962; U.R. Martins,

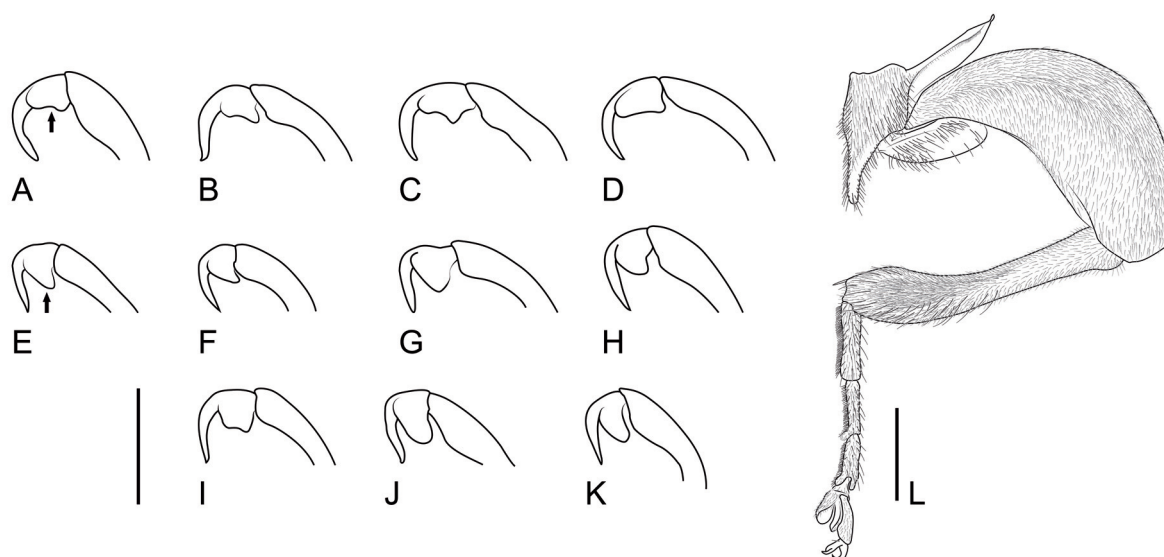
H. Reichardt and Silva leg.; MZSP 46480 • 1 ♀; same collection data as for preceding; CEMT CUIABA 00118358 • 1 ♂; São Sebastião; Dec. 1955; A.P. Silva leg.; Ferracioli leg.; MZSP 46482 • 2 ♂♂; Rio de Janeiro, Parque Nacional do Itatiaia; 700 m a.s.l.; 6 Apr. 1947; W. Zikán leg.; NHMB.

### Description

Body length: 10.4–13.6 mm. Coloration (Fig. 3F): head pitch black, lustrous, except in lateral corners of clypeus, dark brown; mandibles dark brown, darker at base and tip; maxillary and labial palpi black; antennae entirely black. Pronotum (Figs 7I, 8I) lustrous, translucent, with broad irregular black band from anterior to posterior margin, wider anteriorly and near posterior margin, and narrower near anterior half; background pale yellow to light orange with barely defined orange and brown lateral patches. Scutellum and elytra pitch black, slightly lustrous; at mid-length of each elytron, large whitish to pale yellow round spot nearly reaching lateral borders but not meeting at suture. Thorax, legs and abdomen pitch black, tarsal claws brown.

### Male (Fig. 3F)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short, vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with median incision. Eyes small, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6I) slightly flattened dorsoventrally; antennomeres III–IX wider distally, subserrate; antennomeres IX–XI slightly narrower than preceding ones. Pronotum (Fig. 7I) variable, about 1.5 times as wide as long; usually, anterior margin slightly arched, almost straight in middle, anterior angles arched; lateral margins slightly sinuate, with deep notch at posterior third; sometimes lateral margins less sinuate and lateral notches shallow; integument smooth, densely covered with very fine yellow setae.



**Fig. 9.** Tarsal claws and leg of males. **A–K.** Anterior claw of fore tarsus, lateral view. **A.** *Discodon tricolor* (Guérin-Ménéville, 1832). **B.** *Discodon neoteutonium* sp. nov. **C.** *Discodon vanini* sp. nov. **D.** *Discodon obscurior* Pic, 1906 stat. nov. **E.** *Discodon lineaticorne* sp. nov. **F.** *Discodon aurimaculatum* sp. nov. **G.** *Discodon marginicollis* sp. nov. **H.** *Discodon tenuicostatum* sp. nov. **I.** *Discodon tamio* sp. nov. **J.** *Discodon viridimontanum* sp. nov. **K.** *Discodon crassipes* Wittmer, 1952. **L.** Hind leg of male *Discodon crassipes* Wittmer, 1952, ventral view. Black arrows show the lobe of the anterior tarsal claw of the protarsi. Scale bars: A–K = 0.5 mm; L = 1.0 mm.

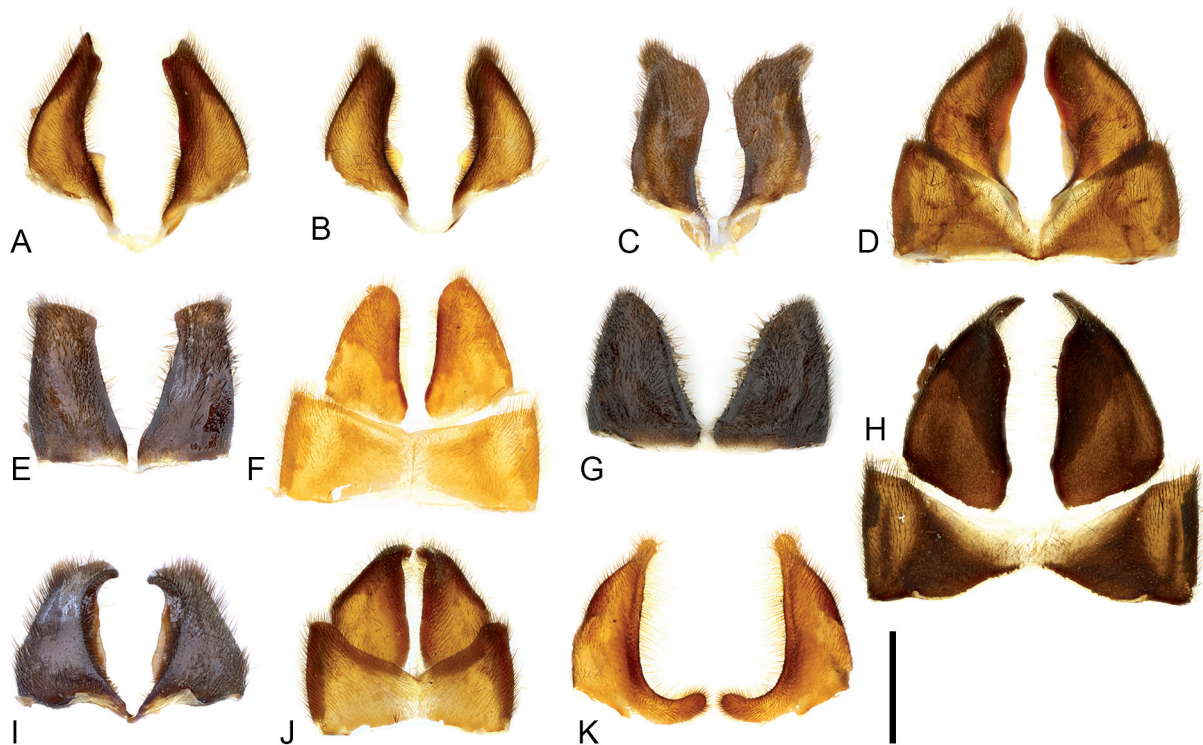
Elytra long, each elytron 4.5 times as long as wide, almost parallel, wider at middle; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base; anterior prothoracic tarsal claws (Fig. 9I) broadly lobed basally, lobe with truncate margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI deeply notched at posterior margin, V-shaped, lateral apices arched; ventrite VII (Fig. 10I) with broad lobes, internal and apical margins forming acute tip strongly projecting ventrally. Aedeagus (Fig. 13A–C) triangular, ventral wall of tegmen parallel at base and strongly narrowing apically, apex acute; fringe of long setae along lateral margins of tegmen dorsally; parameres robust, very long, sinuous, apices acute, convergent; median lobe short, membranous, partially retracted behind parameres; central sclerite very long and slender, curved dorsally.

### Female

Similar to male; antennomeres (Fig. 6T) broader; pronotum (Fig. 8I) trapezoidal, wider, 1.6 times as wide as long, lateral margins sinuate, without notches; tarsal claws without basal lobe or apical slit; ventrite VI not notched, distal margin slightly arched, concave; ventrite VII (Fig. 15I) broad, lateral and distal margins broadly arched, distal margin with two apical rounded lobes projecting posteriorly at middle.

### Distribution

Brazil (São Paulo and Rio de Janeiro states) (Fig. 16).



**Fig. 10.** Ventrite VII of males. **A.** *Discodon tricolor* (Guérin-Méneville, 1832). **B.** *Discodon neoteutonium* sp. nov. **C.** *Discodon vanini* sp. nov. **D.** *Discodon obscurior* Pic, 1906 stat. nov. **E.** *Discodon lineaticorne* sp. nov. **F.** *Discodon aurimaculatum* sp. nov. **G.** *Discodon marginicolle* sp. nov. **H.** *Discodon tenuecostatum* sp. nov. **I.** *Discodon tamoio* sp. nov. **J.** *Discodon viridimontanum* sp. nov. **K.** *Discodon crassipes* Wittmer, 1952. Scale bar = 1 mm.



***Discodon viridimontanum* sp. nov.**

urn:lsid:zoobank.org:act:07CD44CC-D82E-44B0-A547-97C1F392D997

Figs 4A, 6J, U, 7J, 8J, 9J, 10J, 13D–F, 15J

**Diagnosis**

Similar to *D. vanini* sp. nov. by the last antennomeres orangish (Fig. 4A), but differs by the antennae shorter with longitudinal lines on the antennomeres IX–XI (Fig. 6J, U), the pronotum with lateral margins not elevated (Figs 7J, 8J), by the elongate elytra (Fig. 4A), and by the shape of ventrite VII of males (Fig. 10J) and the aedeagus (Fig. 13D–F). The single known male specimen of *D. viridimontanum* sp. nov. was fixed with an everted internal sac, which exacerbates the morphological comparison with other species.

**Etymology**

The specific epithet *viridimontanum* refers to the type locality of the species, Monte Verde (Minas Gerais state, Brazil), which translates to ‘green hill’ from Portuguese.

**Type material**

**Holotype**

BRAZIL • ♂; Minas Gerais, Monte Verde; 22 Feb. 1960; J. Halik leg.; MZSP 46483 (Fig 4A).

**Paratype**

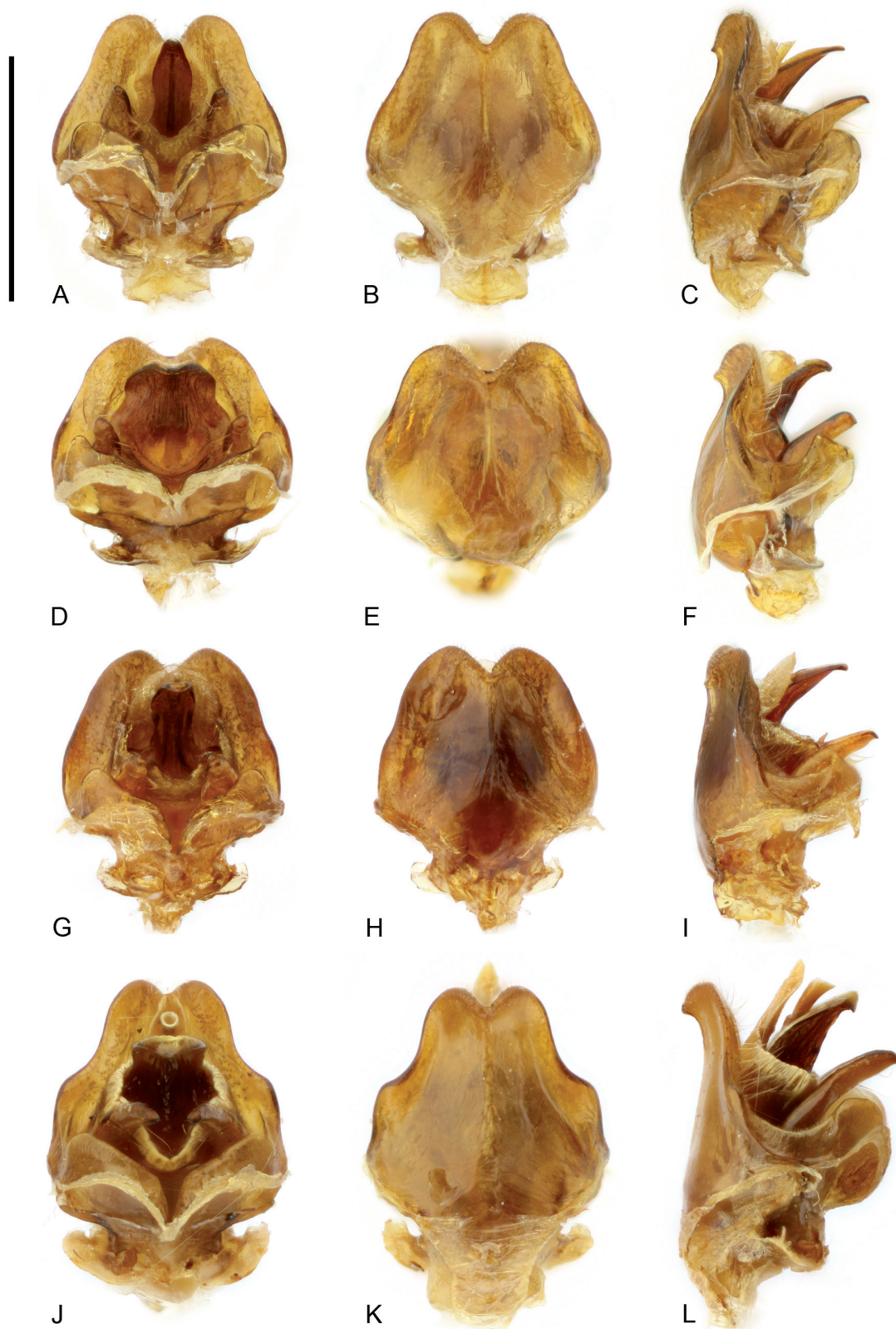
BRAZIL • 1 ♀; same collection data as for holotype; 2 Feb. 1970; MZSP 46484.

**Description**

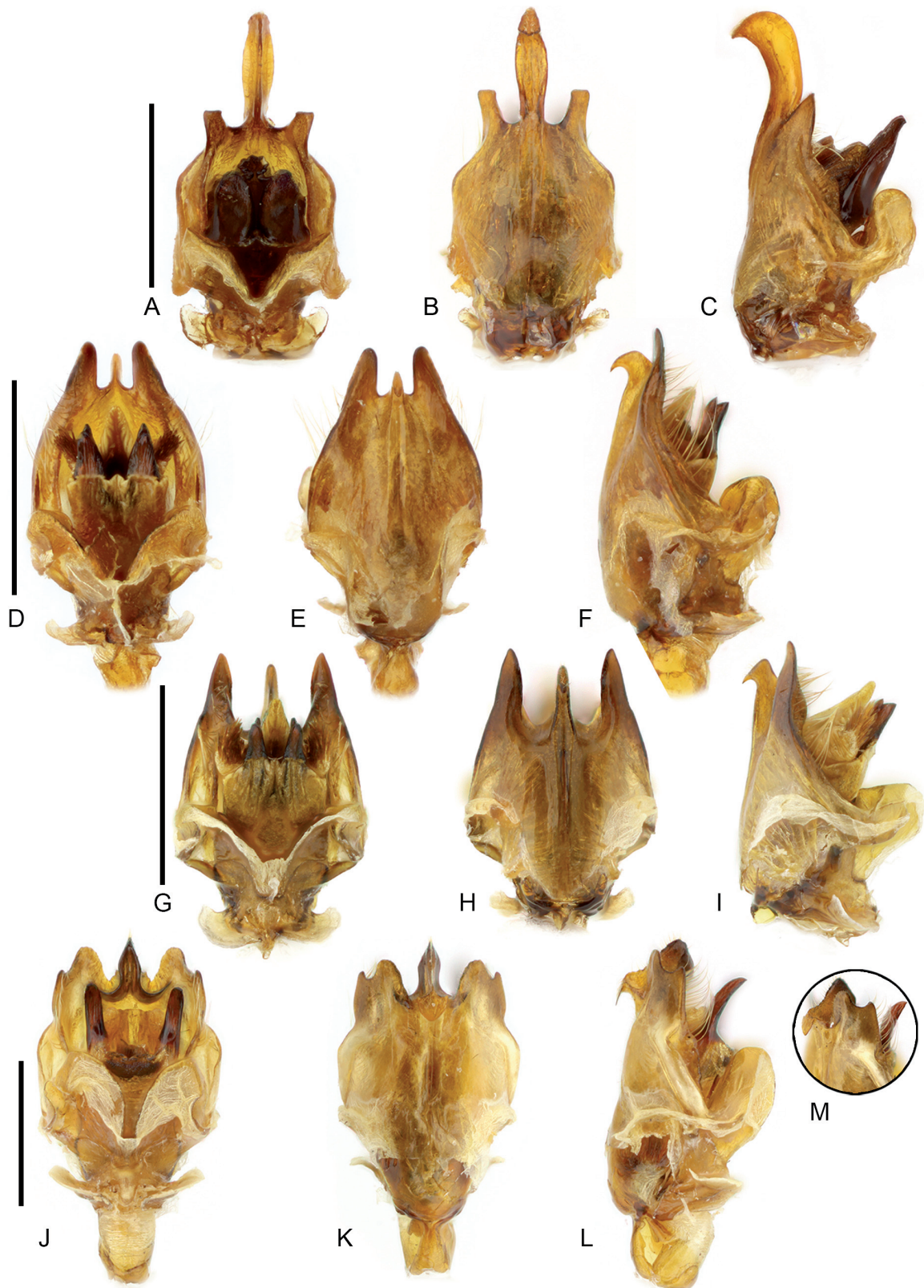
Body length: 10.4 mm. Coloration (Fig. 4A): head pitch black, lustrous, except in lateral corners of clypeus, light brown; mandibles light brown, darker at base and tip; maxillary and labial palpi dark brown to black, light brown at apex of last palpomeres; antennae black, except antennomeres IX–XI and apex of VIII, orangish. Pronotum (Figs 7J, 8J) lustrous, partly translucent, with broad irregular black band from anterior to posterior margin, wider anteriorly and near posterior margin, and narrower near anterior half; background pale yellow with barely diffuse orange patches. Scutellum and elytra pitch black, slightly lustrous; at mid-length of each elytron, rounded whitish spot nearly reaching lateral borders but not meeting at suture. Thorax, legs and abdomen dark brown to black, tarsal claws brown.

**Male** (Fig. 4A)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short, vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with median incision. Eyes large, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres securiform. Antennae (Fig. 6J) short, slightly flattened dorsoventrally; antennomeres III–IX narrowing proximally, sub-serrate; antennomeres IX–XI with longitudinal lines dorsally. Pronotum (Fig. 7J) wide, about 1.4 times as wide as long; anterior margin and anterior angles arched; lateral margins slightly sinuate, with shallow notch at posterior third; anterior, posterior and lateral margins not elevated; integument smooth, densely covered with very fine yellow setae. Elytra very long, each elytron 5.7 times as long as wide, almost parallel; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with a transversal slit at base; anterior prothoracic tarsal claws (Fig. 9J) broadly lobed basally, lobe with very broad rounded margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, coriaceous, densely covered with long setae; ventrite VI notched at posterior margin; ventrite VII (Fig. 10J) with triangular lobes, inner margins



**Fig. 11.** Aedeagus, dorsal, ventral and lateral views. **A–C.** *Discodon tricolor* (Guérin-Méneville, 1832). **D–F.** *Discodon neoteutonium* sp. nov. **G–I.** *Discodon vanini* sp. nov. **J–L.** *Discodon obscurior* Pic, 1906 stat. nov. Scale bar = 1 mm.



**Fig. 12.** Aedeagus, dorsal, ventral and lateral views. **A–C.** *Discodon lineaticorne* sp. nov. **D–F.** *Discodon aurimaculatum* sp. nov. **G–I.** *Discodon marginicolle* sp. nov. **J–M.** *Discodon tenuecostatum* sp. nov. Scale bars = 1 mm.



nearly parallel, outer margins convergent posteriorly, apical margins rounded, with tip directed internally. Aedeagus (Fig. 13D–F): ventral wall of tegmen elongate, lateral margins convergent from apical third; apex forming a pair of short, rounded lobes with central acute tip curved ventrally; fringe of long setae along the lateral margins of tegmen dorsally; parameres very short, hidden between tegmen and median lobe; median lobe membranous, with numerous spine-like sclerites and tufts of thick pubescence.

#### **Female**

Similar to male; antennae (Fig. 6U) shorter; pronotum (Fig. 8J) wider, 1.5 times as wide as long, lateral margins sinuate, without notches; tarsal claws without basal lobe or apical slit; ventrite VII (Fig. 15J) with distal margin broadly arched, without projections or notches.

#### **Distribution**

Brazil (Minas Gerais state) (Fig. 16).

*Discodon crassipes* Wittmer, 1952  
Figs 4B–C, 6K, 7K, 9K–L, 10K, 13G–J

*Discodon (Acanthodiscodon) crassipes* Wittmer, 1952: 200.

*Discodon (Acanthodiscodon) crassipes* – Delkeskamp 1977: 260 (catalogue).

#### **Diagnosis**

Species readily distinguished by the strong modifications on the metathoracic legs (Figs 4B, 9L), the shape of the pronotum (Fig. 7K), ventrite VII of the male (Fig. 10K) and the aedeagus (Fig. 13G–J).

#### **Type material**

##### **Holotype**

BRAZIL • ♂; [Rio de Janeiro, Parque Nacional da] Serra dos Órgãos; 1200 m a.s.l.; 5 Feb. 1952; NHMB CANTH00019527 (Fig. 4B–C).

##### **Paratype**

BRAZIL • ♂; same collection data as for holotype; NHMB.

#### **Other material examined** (1 specimen)

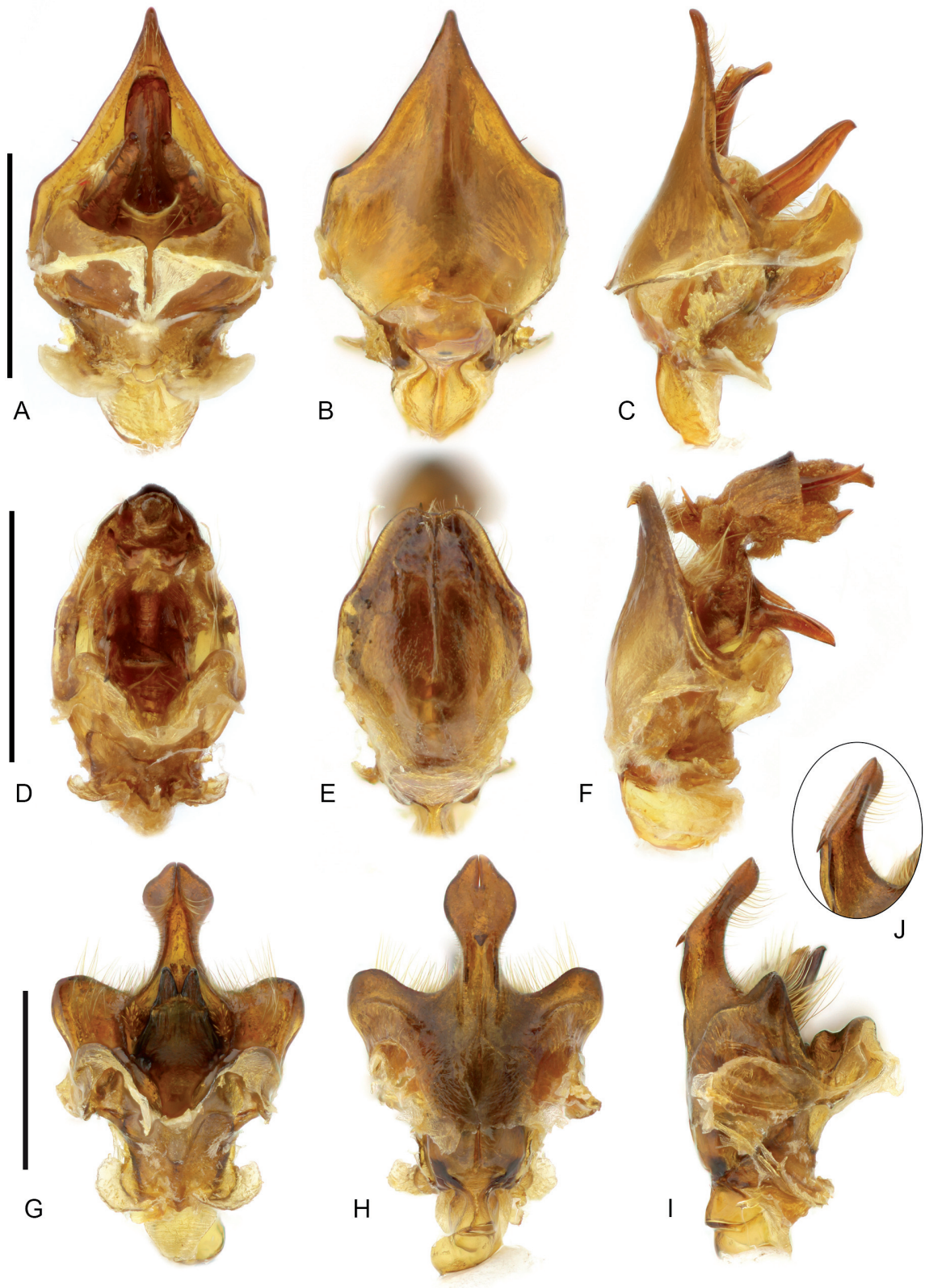
BRAZIL • 1 ♂; Rio de Janeiro, Teresópolis; 13–16 Dec. 1957; Seabra and Alvarenga leg.; DZUP 376213.

#### **Re-description**

Body length: 13.0 mm. Coloration (Fig. 4B): head black, lustrous, except in lateral corners of clypeus, orangish; mandibles testaceous at base, gradually darker apicad; maxillary and labial palpi black, light brown at apex of last palpomeres; antennae entirely black. Pronotum (Fig. 7K) lustrous, partly translucent, with broad irregular dark brown to black band from anterior to posterior margin, wider anteriorly and near posterior margin, and narrower near anterior half; background pale yellow with diffuse orange patches. Scutellum and elytra dark brown to black, slightly lustrous; at mid-length of each elytron, long, irregular yellow to orangish spot extending from lateral borders to suture. Thorax, legs and abdomen dark brown to black, tarsal claws brown.

##### **Male** (Fig. 4B)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine yellow setae; frons short, vertex flat, occipital region convex, broadly rounded behind eyes. Clypeus flat, anterior margin emarginate, slightly projected anteriorly with median incision. Eyes large, rounded, prominent. Mandibles falciform, acute, without accessory teeth. Last maxillary and labial palpomeres



**Fig. 13.** Aedeagus, dorsal, ventral and lateral views. **A–C.** *Discodon tamoio* sp. nov. **D–F.** *Discodon viridimontanum* sp. nov. **G–J.** *Discodon crassipes* Wittmer, 1952. Scale bars = 1 mm.

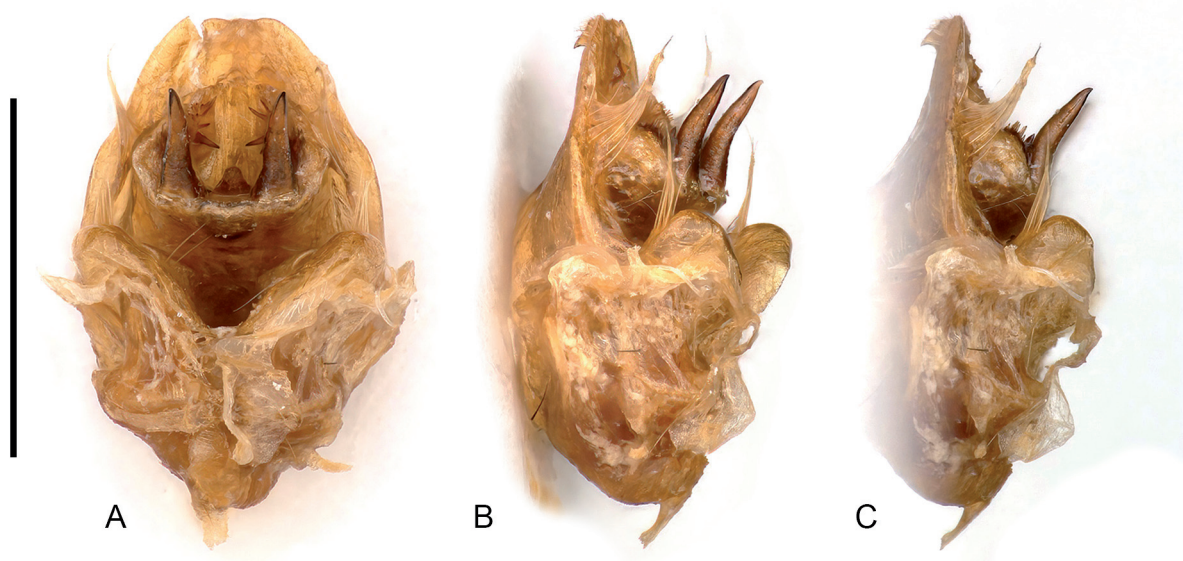
securiform. Antennae (Fig. 6K) long, distinctly flattened dorsoventrally; antennomeres III–IX slightly narrowing proximally, sub-serrate; antennomeres VIII–XI with longitudinal lines dorsally. Pronotum (Fig. 7K) wide, about 1.3 times as wide as long; anterior margin and anterior angles arched; lateral margins nearly parallel anteriorly, with rounded lobe, followed by deep notch at posterior third and broadly rounded lobe posteriorly; anterior, posterior and lateral margins elevated; integument smooth, densely covered with very fine yellow and black setae. Elytra very long, each elytron 5.5 times as long as wide, almost parallel; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs densely pubescent, covered with long and thick setae; fore leg slender; mid femur slightly arcuate at base and swollen at apex, mid tibia curved at apex; hind leg (Fig. 9L) strongly modified, coxa with strong unciform projection, trochanter oblong, femur strongly curved and swollen, narrower proximally, tibia widened and flattened distally; all tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base; anterior prothoracic tarsal claws (Fig. 9K) broadly lobed basally, lobe with very broad rounded margin; posterior claws on meso- and metathoracic tarsal claws apparently split at apex, with fine protruding tooth slightly shorter than claws. Abdomen weakly sclerotised, especially at middle of the ventrites, coriaceous, densely covered with long setae; ventrite VI notched at posterior margin, U-shaped; ventrite VII (Fig. 10K) strongly notched at inner margins, exposing part of aedeagus, inside densely covered with thick and long yellow setae, brush-like, outer margins arched posteriorly, apical margins acute, with tip directed internally. Aedeagus (Fig. 13G–J) partly exposed between halves of ventrite VII; ventral wall of tegmen short and broad, with elongate central projection curved dorsally; lateral margins of ventral wall rounded and divergent, with long and thick setae on distal margin and inside; central projection parallel and with a pair of longitudinal ridges proximally, and widened, flattened, with small triangular spine distally, apex with longitudinal slit; parameres short and stout, apex truncate; median lobe short, membranous, with a pair of strong triangular dorsal sclerites and brush-like projections laterally and ventrally.

#### Female

Unknown.

#### Distribution

Brazil (Rio de Janeiro state) (Fig. 16).



**Fig. 14.** Aedeagus, *Discodon testaceipes* Pic, 1930 stat. nov., syntype (NHMB) **A.** Dorsal. **B.** Latero-dorsal. **C.** Lateral. Photos by Matthias Borer (NHMB). Scale bar = 1 mm.



## Remarks

Wittmer (1952) erected the subgenus *Acanthodiscodon* to include the single species *D. (A.) crassipes*, defined by the strong modifications in the hind legs. Given the vast morphological variation seen in Neotropical species of *Discodon*, especially in the aedeagus structures, it is not justifiable to separate a single species *D. crassipes* in its own subgenus *Acanthodiscodon*, which is herein synonymised with *Discodon* (syn. nov.).

***Discodon testaceipes* Pic, 1930 stat. nov.**  
Figs 4D–G, 7K, 14A–C

*Discodon albonotatum* var. *testaceipes* Pic, 1930: 82.

*Discodon albonotatum* var. *testaceipes* – Delkeskamp 1939: 155 (catalogue); 1977: 259 (catalogue). — Blackwelder 1945: 364 (checklist).

## Diagnosis

Distinguished from the other species by the elytra black with unclearly defined lighter spots and the legs reddish brown with black tarsi (Fig. 4D, F).

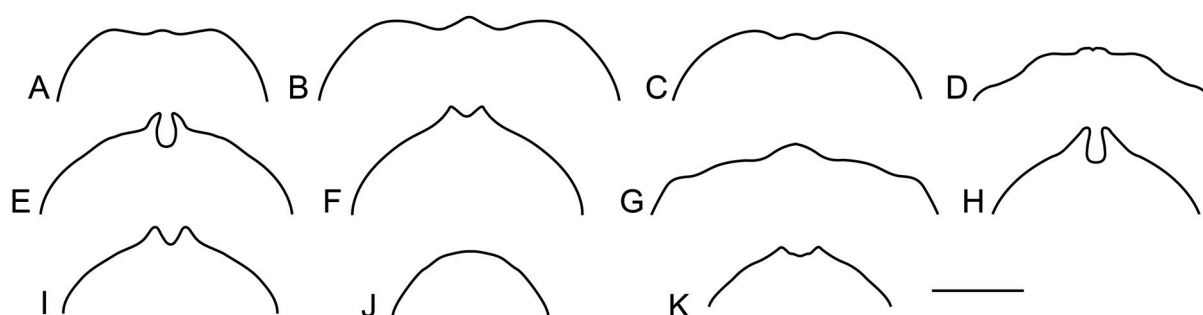
## Type material

**Syntypes** (2 specimens)

BRAZIL • 1 ♂; [Minas Gerais, Passa Quatro]; “16/12. / 1915 // ex coll. Zikan / Bras.”; “Naturhistorisches Museum Basel, Coll. W. Wittmer”; 16 Dec. 1915; NHMB • 1 ♀; Rio Grande do Sul; “coll. Richard Hicker, Wien”; “Naturhistorisches Museum Basel, Coll. W. Wittmer”; NHMB (Fig 4D–G).

## Re-description

Body length: 12.0 mm. Coloration: head black, lustrous, except in lateral corners of clypeus, orangish; maxillary palpi dark brown; antennomeres I–VIII dark brown, IX–XI orangish. Pronotum (Fig. 8K) lustrous, with broad irregular black band from anterior to posterior margin, wider anteriorly and near posterior margin, and narrower near anterior half; background testaceous with diffuse orange patches. Scutellum and elytra black, slightly lustrous; at mid-length of each elytron, small and weakly defined round yellowish spot near lateral margins. Legs reddish brown, tarsomeres II–V black.



**Fig. 15.** Ventrite VII of females. **A.** *Discodon tricolor* (Guérin-Méneville, 1832). **B.** *Discodon neoteutonum* sp. nov. **C.** *Discodon vanini* sp. nov. **D.** *Discodon obscurior* Pic, 1906 stat. nov. **E.** *Discodon lineaticorne* sp. nov. **F.** *Discodon aurimaculatum* sp. nov. **G.** *Discodon marginicolle* sp. nov. **H.** *Discodon tenuecostatum* sp. nov. **I.** *Discodon tamoio* sp. nov. **J.** *Discodon viridimontanum* sp. nov. **K.** *Discodon testaceipes* Pic, 1930 stat. nov. Scale bar = 1 mm.



### Male (Fig. 4D–E)

Head short, nearly as long as wide, excluding eyes; integument smooth, densely covered with short and fine setae; frons short. Eyes large, rounded, prominent. Last maxillary palpomeres securiform. Antennae long, probably reaching the middle of elytra, slightly flattened dorsoventrally; antennomeres III–IX slightly narrowing proximally, sub-serrate. Pronotum wide, about 1.5 times as wide as long; anterior margin and anterior angles broadly arched; lateral margins sinuate broader posteriorly; anterior, posterior and lateral margins elevated; integument smooth, densely covered with very fine setae. Elytra long, each elytron 5 times as long as wide, nearly parallel; integument coriaceous, densely covered with short and fine decumbent setae, and much longer thick erect setae. Legs slender, densely pubescent, covered with long and thick setae; tarsi flattened dorsoventrally, fourth tarsomere with transversal slit at base. Aedeagus (Fig. 14A–C): ventral wall of tegmen elongate, lateral margins convergent from apical third; apex forming a pair of short, rounded lobes with central acute tip curved ventrally; fringe of long setae along lateral margins of tegmen dorsally; parameres very short, hidden between tegmen and median lobe; median lobe membranous, with numerous spine-like sclerites and tufts of thick pubescence.

### Female

Similar to male; pronotum (Fig. 8K) wider, lateral margins without notches; tarsal claws without basal lobe or apical slit; ventrite VII (Fig. 15K) broad, lateral and distal margins broadly arched, distal margin with two apical rounded lobes projecting posteriorly at middle.

### Distribution

Brazil (Minas Gerais and Rio Grande do Sul states) (Fig. 16).

### Remarks

This taxon was described as a variety (“v.”) of *D. albonotatum* by Pic (1930). Pic did not specify the number of specimens examined, but he stated that they were “ex Hicker”, i.e., from the collection of his contemporary Richard Hicker (1872–1965). Hicker’s Cantharidae collection was acquired by Walter

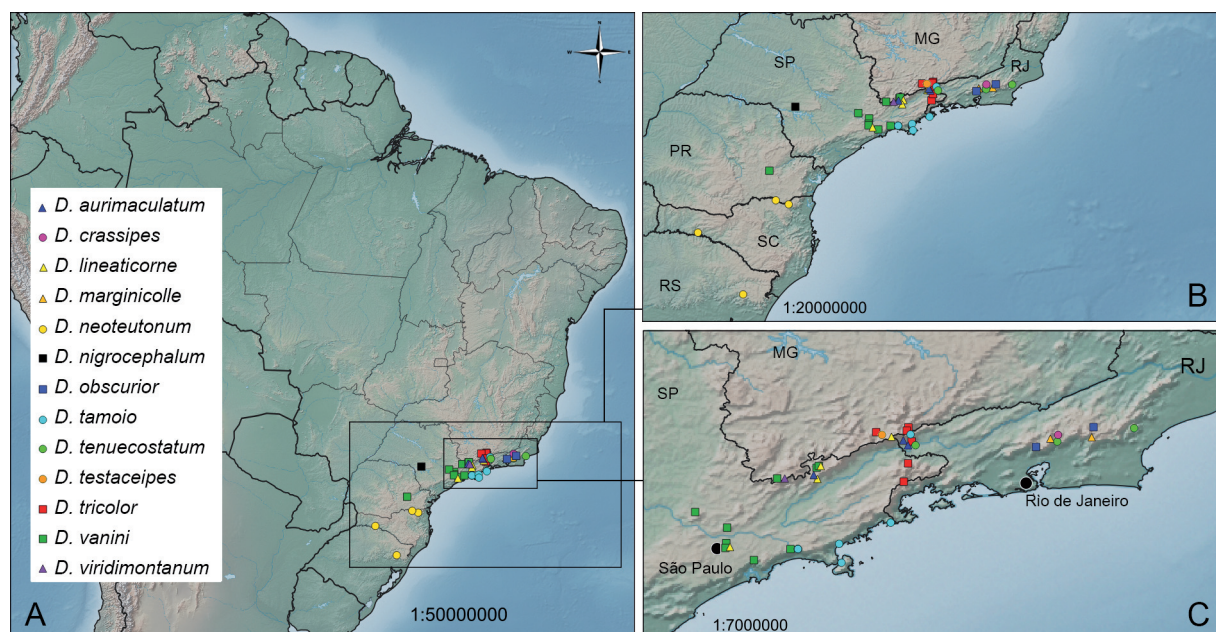


Fig. 16. Distribution map of the *Discodon tricolor* species complex.

*Key to the species of D. tricolor mimetic complex*

- |   |   |
|---|---|
| 1. Fronto-clypeal suture distinct; anterior and lateral margins of pronotum broadly arched; tibial spurs absent; tarsal claws always simple; last ventrite broad and strongly convex in males and flat and with a median parallel-sided notch in females (Chauliognathinae, <i>Chauliognathus</i> ) .....   |   |
| .....   | <i>Chauliognathus fenestratus</i> (Perty, 1830) |
| – Fronto-clypeal suture indistinct; lateral margins of pronotum slightly sinuous, males with a notch at posterior third (Figs 7–8); tibial spurs present (Fig. 9L); anterior prothoracic tarsal claws lobed basally (Fig. 9A–K), posterior claws on meso- and metathoracic tarsal claws apparently split at the apex; last ventrite deeply divided into two halves in males (Fig. 10), and entire, sometimes with median projections in females (Fig. 15) (Silinae, <i>Discodon</i> ) ..... | 2   |
| 2. Elytra with white or yellowish spots .....   | 3   |
| – Elytra entirely black .....   | 12  |
| 3. Elytra with small and weakly defined rounded spots, legs reddish brown (Fig. 4D, F) .....  |   |
| .....   | <i>D. testaceipes</i> Pic, 1930                 |
| – Elytral spots large, legs entirely black .....  | 4   |
| 4. Antennae mostly black with some antennomeres clearer, or antennae mostly testaceous to light brown .....   | 5   |
| – Antennae entirely dark brown or black .....   | 7   |
| 5. Males: lobe of protarsal claws sinuate (Fig. 9A–D); aedeagus: ventral wall of tegmen short and broad, distal margin with two rounded lobes and a median notch (Fig. 11). Females: distal margin of last ventrite sinuate, with short median projection (Fig. 15A–C) .....  | 6   |
| – Males: lobe of protarsal claws broadly rounded (Fig. 9J); aedeagus (Fig. 13D–F): ventral wall of tegmen elongate, distal margin slightly concave medially. Females: distal margin of last ventrite broadly arched, without projections or notches (Fig. 15J) .....  | <i>D. viridimontanum</i> sp. nov.               |
| 6. Antennae mostly pale yellow to testaceous brown, except antennomere I or I and II. Males: lobe of protarsal claws slightly sinuate (Fig. 9A); aedeagus (Fig. 11A): ventral wall of tegmen longer, median lobe with a narrow central sclerite. Females: last ventrite with distal margin almost straight, with a slight median projection (Fig. 15A) .....  | <i>D. tricolor</i> (Guérin-Méneville, 1832)     |

- Antennae with last two or three antennomeres orange to light brown. Males: lobe of protarsal claws with a distinctly projecting lobule (Fig. 9C); aedeagus (Fig. 11G–I): ventral wall of tegmen less distinctly narrowed laterally, central sclerite of median lobe broader. Females: last ventrite with distal margin sinuate (Fig. 15C) ..... *D. vanini* sp. nov.
- 7. Elytra with weakly defined costae, more visible anteriorly (Fig. 3D); elytral spots rounded, dark yellow to orangish; antennae without lines ..... *D. aurimaculatum* sp. nov.
- Elytra smooth, without costae; elytral spots variable; antennae with or without lines ..... 8
- 8. Pronotum black with dark reddish-brown markings at the angles (Fig. 7G) ..... *D. marginicollae* sp. nov.
- Pronotum with a broad longitudinal black band with irregular yellow and orange markings at the sides ..... 9
- 9. Pronotum distinctly narrower than humeri, about 1.3 times as wide as long (Fig. 7K). Males: hind leg strongly modified, coxa with unciform projection, femur swollen and tibia flattened distally (Fig. 9L); antennomeres VIII–XI with antennal lines (Fig. 6K); lobe of protarsal claws with broadly rounded margin (Fig. 9K); last ventrite broad, inner margins of halves notched, divergent, exposing the aedeagus (Fig. 10K); aedeagus with ventral wall of tegmen with a long median projection (Fig. 13G–J) ..... *D. crassipes* Wittmer, 1952
- Pronotum wider, nearly or as wide as humeri. Males: hind leg slender, not modified; antennomeres with or without antennal lines ..... 10
- 10. Elytral spots somewhat triangular, elongate, extending anteriorly and posteriorly (Fig. 3A). Males: antennomeres without antennal lines (Fig. 6B); lobe of protarsal claws with sinuate margin (Fig. 9B); last ventrite elongate, inner margins of halves nearly parallel (Fig. 10B); aedeagus with ventral wall of tegmen short and broad, distal margin with a pair of rounded lobes and a median incision (Fig. 11D–F). Females: distal margin of last ventrite sinuous, with a short projection medially (Fig. 15B) ..... *D. neoteutonum* sp. nov.
- Elytral spots smaller and rounder. Males: antennomeres with or without antennal lines; aedeagus elongate, distal margin of ventral wall of tegmen greatly projected. Females: distal margin of last ventrite with a pair of projections and a median V- or U-shaped incision (Fig. 15E–F, H–I) ..... 11
- 11. Males: antennomeres without antennal lines (Fig. 6I); last ventrite elongate, distal margins of halves truncate, inner margins broadly separated, exposing part of aedeagus and meeting distally (Fig. 10I); aedeagus: distal margin of ventral wall of tegmen triangular, with an acute apex (Fig. 13A–C). Females: distal margin of last ventrite with two short projections and a median V-shaped notch (Fig. 15I) ..... *D. tamoio* sp. nov.
- Males: antennomeres IX–XI with antennal lines (Fig. 6E); last ventrite broad, distal margins of halves rounded, inner margins almost parallel (Fig. 10E); aedeagus: distal margin of ventral wall of tegmen with a pair of short and truncate projections, and a very long and curved median projection (Fig. 12A–C). Females: distal margin of last ventrite with two long projections and a median U-shaped notch (Fig. 15E) ..... *D. lineaticorne* sp. nov.
- 12. Antennae mostly orangish to light brown; head much narrower than pronotum, eyes prominent ..... 13
- Antennae dark brown to black; head broad, nearly as wide as the pronotum (Fig. 5E–F); eyes not prominent ..... *D. nigrocephalum* Pic, 1949

13. Elytra narrower, nearly parallel, with weakly defined costulae (Fig. 5D); pronotum transverse, anterior margin nearly straight (Fig. 7H); antennae black at the base, clearing towards the apex; aedeagus elongate, distal margin of ventral wall of tegmen with a flat median projection and lateral sinuous lobes (Fig. 12J–M). Females: distal margin of last ventrite with two long projections and a median U-shaped notch (Fig. 15H) ..... *D. tenuecostatum* sp. nov.
- Elytra wider, rough, without weakly defined costulae (Fig. 5A); pronotum with anterior and lateral margins broadly arched (Fig. 7D); antennae mostly light brown to orangish; aedeagus short, distal margin of ventral wall of tegmen with a median incision (Fig. 11J–L). Females: last ventrite short, distal margin sinuous, not strongly projected posteriorly (Fig. 15D) ..... *D. obscurior* Pic, 1906 stat. nov.

## Discussion

### Species and morphological diversity in *Discodon*

*Discodon* includes nearly 400 species distributed in the continental Americas, from southern USA to Argentina, except in Chile (Delkeskamp 1977). The genus represents a wide range of morphologically different assemblages of species throughout its distribution range. In its original description, Gorham (1881) diagnosed the genus based on males, especially as having the sides of the pronotum with a small notch (e.g., Fig. 7), the last ventrite deeply divided into two halves (e.g., Fig. 10), and the anterior tarsal claw of the protarsus with a broad basal lobe (e.g., Fig. 9). Although these diagnostic features are rather constant in the genus, the species greatly differ when other characters of both males and females are thoroughly explored.

Despite this broad morphological diversity, only three subgenera were proposed in the attempt to reunite morphologically similar species: *Falsopolemius* Pic, 1928, with nine species, and the monotypic *Mathanosilis* Pic, 1955 and *Acanthodiscodon*. Considering the current broad morphological concept of *Discodon*, it makes no sense to maintain a separate monotypic subgenus for a single species that falls well within the range of the morphological diversity of *Discodon* s. str. Thus, *Acanthodiscodon* is herein synonymised with *Discodon*. We acknowledge, however, that future studies may eventually require the restitution of *Acanthodiscodon* and the erection of new genera and subgenera to accommodate other species currently identified as *Discodon*. However, when compared to the global diversity of *Discodon*, the number of species studied here is still insignificant to justify the erection of new genera, subgenera or species groups.

Some of the species studied here show a rather constant set of characters that may indicate a close phylogenetic relationship. For instance, *D. tricolor*, *D. neutonum* sp. nov., *D. vanini* sp. nov. and *D. obscurior* stat. nov. have similar small aedeagi, with the ventral wall of the tegmen short, slightly narrowing distally, and the apex bilobed with a median incision and a small tip pointing ventrally (Fig. 11A–L); the protarsal claws of the males have an elongate basal lobe with a sinuous margin (Fig. 9A–D); the distal margin of ventrite VII of females has two lateral lobes and a slight central round projection (Fig. 15A–D); and ventrite VII of males has sinuous margins (Fig. 10A–D). In contrast, *D. lineaticorne* sp. nov., *D. aurimaculatum* sp. nov., *D. marginicollis* sp. nov. and *D. tenuecostatum* sp. nov. have the aedeagus large, with the ventral wall of the tegmen elongate, the distal margin with three strong projections and the central projection strongly curved ventrally; the protarsal claws of males have a broad basal lobe with arched margin (Fig. 9E–H); and ventrite VII of females usually broadly arched laterally and the apex with two projecting tips and a central rounded notch (Fig. 15E–F, H). Other species have a combination of these or different features, like the presence of antennal lines in males of *D. lineaticorne*, *D. crassipes* and *D. marginicollis* sp. nov. (Fig. 6E, G, K), a central projection of the ventral wall of the tegmen with a flat ventral plaque in *D. crassipes* and *D. tenuecostatum* sp. nov. (Figs 12M,



13J), and ventrite VII of females broadly arched, without lobes or projections in *D. viridimontanum* sp. nov. (Fig. 15J), among others.

The shape and distribution of the antennal lines are important diagnostic characters in Amazonian species of *Discodon* and *Pygodiscodon* Wittmer, 1966 (Constantin 2015; Biffi & Constantin 2018), but they are absent in most of the species of *Discodon* from the Atlantic Forest biome. Other characters that may be important in morphological comparisons include the shape of the pronotum, the general body pubescence, the presence of elytral costae, the shape and compression of the antennomeres and the shape of the last tergite of males. Our study does show that the morphology of some structures is similar between some species and, at the same time, rather different from others. The recognition of new genera and a subdivision of *Discodon* into subgenera or species groups might eventually be necessary when the species diversity and phylogenetic relationships of *Discodon* are assessed.

### Notes on mimicry

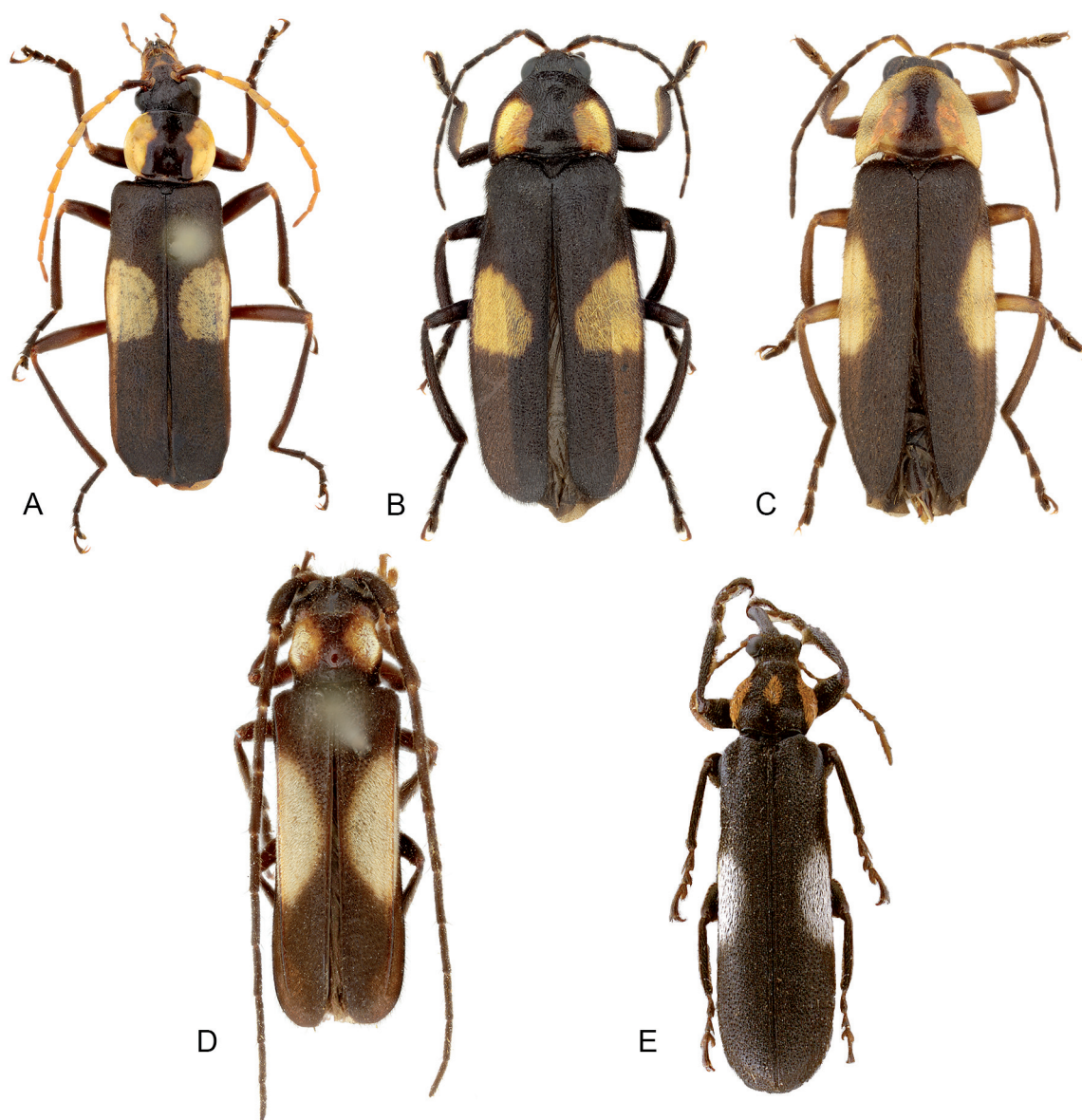
As discussed above, despite their striking similarities in colour pattern, size and habitus, the 13 species discussed herein do not seem to be part of the same monophyletic clade within *Discodon*. This opens up the question as to whether this particular ‘habitus’ has an evolutionary advantage for cantharids living in the Atlantic Forest biome. Outside of the genus *Discodon*, a very similar colour pattern and habitus can also be found in *Chauliognathus fenestratus* (Perty, 1830) (Cantharidae: Chauliognathinae), at least two Lampyridae Latreille, 1817 of the subfamily Photurinae Lacordaire, 1857 (*Bicellonycha* sp. and *Pyrogaster* sp.), and to some extent also in the Cerambycidae *Ibitiruna fenestrata* (Bates, 1881) and the weevil *Homalocerus bimaculatus* Vanin, 2014 (Belidae) (Fig. 17). All these species are roughly the same size as the *Discodon* discussed here and occur sympatrically. All of the *Discodon* discussed here also occur sympatrically with at least one other *Discodon* with a similar appearance, with the possible exception of *D. neoteutonum* sp. nov. A possible mimicry complex involving *Homalocerus bimaculatus*, *Chauliognathus fenestratus* and *Discodon tricolor* (‘sensu lato’) was first proposed by Vanin (2014). Our findings of an unexpectedly high number of similar-looking species of *Discodon* support the existence of a larger mimicry ring.

We do not have any precise information on chemical defences present within *Discodon*, *Chauliognathus fenestratus* or the two lampyrid species here. However, we can infer from related taxa that most, if not all of these species, share some kind of chemical defence and may therefore be Mullerian mimics. Chemical defences and aposematism are well documented in members of *Chauliognathus* (Meinwald *et al.* 1968; Eisner *et al.* 1981). A Mullerian mimicry ring involving another member of Silinae as well as Lycidae Laporte, 1836 was proposed as early as 1902, based on extensive feeding experiments involving birds and baboons (Marshall 1902; Darlington 1938). Potential mimicry between members of Lampyridae and some species of *Discodon* was noted by Champion (1915). Autohaemorrhaging (“reflex bleeding”) behaviour is common among Neotropical Lampyridae and Lycidae (Eisner *et al.* 2008), and may occur in Silinae, albeit poorly documented.

For the time being, we suspect that the *Discodon* discussed here are likely to be Mullerian mimics, along with the *Chauliognathus* and the lampyrids, though this hypothesis needs further evidence. *Ibitiruna fenestrata* and *Homalocerus bimaculatus* are likely to be Batesian mimics, considering that many related members of their respective clades are (e.g., Vanin 1976; Nascimento *et al.* 2010). Furthermore, we have examined specimens of *Ibitiruna fenestrata* from the Atlantic Forest biome ranging from Rio de Janeiro to Santa Catarina states, from the same localities as the above-mentioned species of *Discodon*. In each locality *I. fenestrata* shows variations in the pronotal and elytral patches that perfectly match their sympatric species of *Discodon*. These observations suggest that *Ibitiruna fenestrata* might easily mimic a specific *Discodon* model at each locality, or that *I. fenestrata* actually also comprises a complex of species with restricted distributions.

### Species discovery amidst the rapidly vanishing Atlantic Forest

This work started with the recognition of certain morphological and chromatic variation in specimens of *D. tricolor* from collections and from photographic records on the online platform iNaturalist (Fig. 1). Such species, characterised by the black elytra with rounded whitish spots, the pronotum partly orangish and testaceous antennae, would eventually exhibit larger and angulate whitish elytral spots or entirely black elytra, and the antennae and pronotum partly or entirely black. The closer study of *D. tricolor*, their subspecies and similar sympatric species revealed the existence of a species complex comprising at least 12 different species, seven of which new to science.



**Fig. 17.** Coleoptera species with the same colour pattern as *Discodon tricolor* species complex. **A.** *Chauliognathus fenestratus* (Perty, 1830) from Itatiaia, RJ (MZSP 30588). **B.** *Bicellonycha* sp. from Pindamonhangaba, SP (MZSP 45596). **C.** *Pyrogaster* sp. from Nova Teutônia, SC (MZSP 45597). **D.** *Ibitiruna fenestrata* (Bates, 1881) from Mafra, SC (MZSP 45595). **E.** *Homalocerus bimaculatus* Vanin, 2014 from São Paulo state (holotype, NMPC) (photo modified from Vanin 2014).

Most of the species were discovered mainly in a small portion of the Atlantic Forest in the area between the cities of São Paulo and Rio de Janeiro, and at some of the localities most frequently surveyed within the south-eastern Atlantic Forest, at the borders of São Paulo (SP), Rio de Janeiro (RJ) and Minas Gerais (MG) states, such as the Parque Nacional da Serra dos Órgãos (RJ), Parque Nacional do Itatiaia (RJ), Parque Estadual da Serra do Mar (MG, RJ, SP), Serra da Cantareira (SP) and Estação Biológica de Boracéia (SP) (Fig. 16).

The discovery of such a high number of new species from a single species initially investigated (*D. tricolor*) and from a relatively small portion of the Atlantic Forest implies that the real diversity of *Discodon* might be enormously higher than presently known and is still hidden across the whole biome range. It is not surprising that new species are discovered from species thought to be highly variable. Biffi & Geiser (2020) described six new species of *Peltariosilis* Wittmer, 1952 after revising one single species supposedly variable and broadly distributed in the Amazon Forest. Thus, it is expected that substantially more new cantharid species might be discovered as other species complexes are thoroughly investigated and broader areas of the Atlantic Forest are explored.

The Neotropical Atlantic Forest is an extremely heterogeneous biome composed of numerous vegetation types, such as evergreen to semi-deciduous forests, deciduous forests, mangroves, swamps, coastal forest and scrub on sandy soils, inselbergs, high-altitude grasslands, and mixed *Araucaria* pine forests, which led to outstanding levels of endemism and species richness (Ribeiro *et al.* 2009, 2011). The original coverage of the Atlantic Forest is estimated at ca 150 million km<sup>2</sup>, ranging along the Brazilian Atlantic coast and extended westward into smaller, inland areas of Paraguay and Argentina (Ribeiro *et al.* 2009). The agricultural, urban and industrial expansion have profoundly affected the Atlantic Forest, which is now confined to only small, often disconnected fragments, representing about 11–16% of the original coverage (Ribeiro *et al.* 2009), with the most optimistic estimates revealing a current vegetation cover of 28%, or 32 million hectares of native vegetation (Rezende *et al.* 2018). Despite the large area of original coverage, with a broadly diversified mosaic of habitats, the knowledge on the diversity in this biome is uneven across its range, with studies and sampling usually restricted to few protected, easy-to-access and popular localities, leaving most portions of the remaining Atlantic Forest poorly explored or completely unsampled.

Given the rapid rate of deforestation and destruction of natural habitats, with the consequent loss of biodiversity, and the predictions of future extinctions (Gonçalves-Souza *et al.* 2020), there is an urgent need to step up efforts not only for conservation but also for documentation of the remaining Atlantic Forest biodiversity. Such research must be done as soon as possible, before some areas are completely destroyed and the species there are extinct. *Discodon lineaticorne* sp. nov. is a possible example of local extinction due to urban expansion. Four specimens were collected in the district of Ipiranga in 1908, then located in the outskirts of São Paulo city. Due to the immense urban sprawl, Ipiranga is now located in the middle of the metropolitan area, and no more specimens were collected there ever since.

## Acknowledgements

Most part of this work was conducted in refuge during the pandemic years of 2020 and 2021. This paper is dedicated to those who passed away or still suffer the consequences of the pandemic of Covid-19.

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Antonio Santos Silva and Luiz Felipe Silveira for suggesting examples of cerambycids and lampyrids with similar *tricolor* pattern. Thanks to Max Barclay (NHMUK) for advice on nomenclature. Ricardo Brugnera (“Insetos do Brasil” project), Daniel Cavallari, Frederico Sonntag, Marcos Melo, Rita Souza, Anderson Rabello Pereira, Paula Romano, Luciano Bernardes and Mickaël Villemagne kindly granted permission to use their photos of live specimens. We thank two anonymous reviewers for their critical reading and valuable suggestions on the manuscript. This work was supported by grants from the University of São Paulo Support Foundation (FUSP 3587- ITV/MZ) to GB.

## References

- Blackwelder R.E. 1945. Checklist of the coleopterous insects of Mexico, Central America, the West Indies and South America, pt. 3. *Bulletin of the United States National Museum* 185: 345–550. <https://doi.org/10.5479/si.03629236.185.3>
- Biffi G. 2016. On the identity of *Chauliognathus flavipes* (Coleoptera: Cantharidae): revision of type specimens, new synonyms and new status. *Zoologia (Curitiba)* 33 (6): e20160088. <https://doi.org/10.1590/S1984-4689zool-20160088>
- Biffi G. & Constantin R. 2018. Taxonomic revision of *Pygodiscodon* (Coleoptera: Cantharidae). *Acta Entomologica Musei Nationalis Pragae* 58 (1): 77–90. <https://doi.org/10.2478/aemnp-2018-0008>
- Biffi G. & Geiser M. 2020. A revision of *Peltariosilis* Wittmer (Coleoptera: Cantharidae), a surprisingly diverse Amazonian radiation. *Papéis Avulsos de Zoologia* 60 (Special Issue): e202060(s.i.).16. <https://doi.org/10.11606/1807-0205/2020.60.special-issue.16>
- Champion G. 1915. Revision of the Mexican and Central American Telephorinae (Fam. Telephoridae), with descriptions of new species. *Transactions of the Entomological Society of London* 1915: 16–146. <https://doi.org/10.1111/j.1365-2311.1915.tb02520.x>
- Constantin R. 2015. Les *Discodon* Gorham de Guyane (Coleoptera, Cantharidae). *Le Coléoptériste* Suppl. 9: 4–34.
- Constantin R. 2016. Contribution à l’étude des Chauliognathinae de la Guyane et description de cinq espèces nouvelles (Coleoptera, Cantharidae). *Le Coléoptériste* Suppl. 10: 3–33.
- Constantin R. 2017. Les Silinae de Guyane avec la description de quatorze espèces nouvelles (Coleoptera, Cantharidae). *Le Coléoptériste* Suppl. 11: 41–67.
- Darlington P.J. 1938. Experiments on mimicry in Cuba, with suggestions for future study. *Transactions of the Royal Entomological Society of London* 87 (23): 681–695. <https://doi.org/10.1111/j.1365-2311.1938.tb00729.x>
- Delkeskamp K. 1939. *Col. Cantharidae*. Coleopterorum Catalogus Pars 165. Dr W. Junk, 's-Gravenhage.
- Delkeskamp K. 1977. *Col. Cantharidae*. Coleopterorum Catalogus Supplementa Pars 165, fasc. 1. Dr W. Junk, The Hague.
- Eisner T., Hill D., Goetz M., Jain S., Alsop D., Camazine S. & Meinwald J. 1981. Antifeedant action of Z-dihydromatricaria acid from soldier beetles (*Chauliognathus* spp.). *Journal of Chemical Ecology* 7 (6): 1149–1158. <https://doi.org/10.1007/BF00987634>
- Eisner T., Schroeder F.C., Snyder N., Grant J.B., Aneshansley D.J., Utterback D., Meinwald J. & Eisner M. 2008. Defensive chemistry of lycid beetles and of mimetic cerambycid beetles that feed on them. *Chemoecology* 18: 109–119. <https://doi.org/10.1007/s00049-007-0398-4>
- Gonçalves-Souza D., Verburg P.H. & Dobrovolski R. 2020. Habitat loss, extinction predictability and conservation efforts in the terrestrial ecoregions. *Biological Conservation* 246: 108579. <https://doi.org/10.1016/j.biocon.2020.108579>

- Gorham, H.S. 1881. Fam. Telephoridae. In: Godman F.D. & Salvin O. (eds) *Biologia Centrali-Americana. Insecta, Coleoptera. Vol. III. Part 2. Malacodermata*. Taylor & Francis, London. <https://doi.org/10.5962/bhl.title.730>
- Griffith E. 1832. *The Animal Kingdom, Arranged in Conformity with its Organization by the Baron Cuvier* Vol. 14 [plates of insects]. Whittaker, Treacher and co., London. <https://doi.org/10.5962/bhl.title.45021>
- Guérin-Méneville F.-É. 1844. *Iconographie du règne animal de G. Cuvier, ou représentation d'après nature de l'une des espèces les plus remarquables et souvent non encore figurées, de chaque genre d'animaux. Avec un texte descriptif mis au courant de la science. Ouvrage pouvant servir d'atlas à tous les traités de zoologie. Insectes*. J.B. Baillière, Paris. <https://doi.org/10.5962/bhl.title.10331>
- Marshall G.A.K. 1902. Five years' observations and experiments (1896–1901) on the bionomics of South African insects, chiefly directed to the investigation of mimicry and warning colours. *Transactions of the Entomological Society of London* 1902: 287–584. <https://doi.org/10.1111/j.1365-2311.1902.tb02391.x>
- Meinwald J., Meinwald Y.C., Chalmers A.M. & Eisner T. 1968. Dihydromatricaria acid: acetylenic acid secreted by soldier beetle. *Science* 160 (3830): 890–892. <https://doi.org/10.1126/science.160.3830.890>
- Myers N., Mittermeier R.A., Mittermeier C.G., da Fonseca G.A.B. & Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858. <https://doi.org/10.1038/35002501>
- Nascimento E.A. do, Del-Claro K. & Martins U.R. 2010. Mimetic assemblages of lycidlike Cerambycidae (Insecta: Coleoptera) from Southeastern Brazil. *Revista Brasileira de Zoociências* 12 (2): 77–83. Available from <https://periodicos.ufjf.br/index.php/zoociencias/article/view/24458> [accessed 15 Aug. 2022].
- Pic M. 1906. Noms nouveaux et diagnoses de “Cantharini” (Telephorides) européens et exotiques. *L'Échange, Revue Linnéenne* 22: 89–92. Available from <https://www.biodiversitylibrary.org/item/285236#page/99/mode/1up> [accessed 15 Aug. 2022].
- Pic M. 1909. Contribution à l'étude des *Silis* Latr. de l'Amérique Méridionale. *Annales de la Société entomologique de Belgique* 53: 6–8. Available from <https://www.biodiversitylibrary.org/item/46155#page/14/mode/1up> [accessed 15 Aug. 2022].
- Pic M. 1930. Malacodermes exotiques (suite). *L'Échange, Revue Linnéenne* 46 (440, hors-texte): 81–85.
- Pic M. 1949. Coléoptères du Globe (suite). *L'Échange, Revue Linnéenne* 65 (516): 5–8.
- Rezende C.L., Scarano F.R., Assad E.D., Joly C.A., Metzger J.P., Strassburg B.B.N., Tabarelli M., Fonseca G.A. & Mittermeier R.A. 2018. From hotspot to hopespot: an opportunity for the Brazilian Atlantic Forest. *Perspectives in Ecology and Conservation* 16 (4): 208–214. <https://doi.org/10.1016/j.pecon.2018.10.002>
- Ribeiro M.C., Metzger J.P., Martensen A.C., Ponzoni F.J. & Hirota M.M. 2009. The Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142 (6): 1141–1153. <https://doi.org/10.1016/j.biocon.2009.02.021>
- Ribeiro M.C., Martensen A.C., Metzger J.P., Tabarelli M., Scarano F. & Fortin M.J. 2011. The Brazilian Atlantic Forest: a shrinking biodiversity hotspot. In: Zachos F.E. & Habel J.C. (eds) *Biodiversity Hotspots: Distribution and Protection of Conservation Priority Areas*: 405–434. Springer, Berlin, Heidelberg. [https://doi.org/10.1007/978-3-642-20992-5\\_21](https://doi.org/10.1007/978-3-642-20992-5_21)
- Vanin S.A. 1976. Taxonomic revision of the South American Belidae (Coleoptera). *Arquivos de Zoologia* 28 (1): 1–75. <https://doi.org/10.11606/issn.2176-7793.v28i1p1-75>

Vanin S.A. 2014. A new species of *Homalocerus* Schoenherr from the Atlantic coast of the State of São Paulo, Brazil (Coleoptera, Belidae, Belinae), with notes on color pattern and on the sclerites of the internal sac. *Revista Brasileira de Entomologia* 58 (1): 47–51.  
<https://doi.org/10.1590/S0085-56262014000100008>

Wittmer W. 1952. 13. Beitrag zur Kenntnis der neotropischen Malacodermata (Coleoptera). *Revista Chilena de Entomología* 2: 197–205.

Wittmer W. 1977. Ueber einige Typen von Blanchard und Guérin aus der Fam. Cantharidae (Col.) im Muséum de Paris. *Nouvelle Revue d'Entomologie* 7: 321–328.

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