

Research article

urn.lsid:zoobank.org/pub:E239C584-B41B-4AC7-89E1-E3D8A2EB921A

**Redescription and synonymies of *Diplura macrura* (C.L. Koch, 1841)
and *D. lineata* (Lucas, 1857), with notes on the genus
(Araneae, Dipluridae)**

Denis Rafael PEDROSO^{1,*}, Pedro DE SOUZA CASTANHEIRA² &
Renner Luiz CERQUEIRA BAPTISTA³

¹Museu Nacional, Universidade do Brasil (UFRJ). Quinta da Boa Vista, São Cristóvão, 20.940-040,
Rio de Janeiro, RJ, Brazil.

^{2,3}Instituto de Biologia, Universidade do Brasil (UFRJ). Avenida Brigadeiro Trompowski s/n,
Ilha do Fundão, 21944-970, Rio de Janeiro, RJ, Brazil.

*Corresponding author: drbpedroso@gmail.com

²E-mail: pedrocastanheira.bio@gmail.com

³E-mail: baptistr@gmail.com

¹urn.lsid:zoobank.org/author:E67DAD82-2E69-4E76-B4F0-7BA09E13A68F

²urn.lsid:zoobank.org/author:BFEC9541-C4F5-4FBF-90AB-AE4885A943D5

³urn.lsid:zoobank.org/author:CF514365-072A-4248-AF23-C112FC360305

Abstract. *Diplura* C.L. Koch, 1850 is a mygalomorph genus with putative records from Central and South America. The type-species *Diplura macrura* (C.L. Koch, 1841), originally described from West Indies, is poorly known and represented only by its holotype. Most of the 20 species currently included in the genus lack modern taxonomic descriptions, as *D. lineata* (Lucas, 1857), from Rio de Janeiro state, Brazil. Males and females of *Diplura macrura* and *D. lineata* are herein redescribed. New junior synonyms of *D. macrura* are identified (*Linothele bicolor* (Simon, 1889), *Diplura uniformis* Mello-Leitão, 1923, and the two junior synonyms of the latter species, *Thalerothele minensis* Mello-Leitão, 1926 and *T. aurantiaca* Mello-Leitão, 1943). Also, two junior synonyms are established for *D. lineata*: *Diplura fasciata* (Bertkau, 1880) and *Diplura nigradorsi* (Mello-Leitão, 1924). The type-locality of *D. macrura* is corrected to São João del Rei, Minas Gerais state, Brazil. *D. macrura* is restricted to the state of Minas Gerais and *D. lineata* to the state of Rio de Janeiro. The type-locality of *D. parallela* (Mello-Leitão, 1923) is also corrected from Argentina to Paraná state, Brazil. The distribution of *Diplura* is now restricted from south Panama to north Argentina, excluding previous erroneous records for Cuba and West Indies. The six synonymies herein established help to clarify the genus composition, which includes now 17 valid species.

Keywords. Atlantic Forest, biodiversity, Brazil, Diplurinae, Mygalomorphae.

Pedroso D.R., Castanheira P. de Souza & Baptista R.L.C. 2016. Redescription and synonymies of *Diplura macrura* (C.L. Koch, 1841) and *D. lineata* (Lucas, 1857), with notes on the genus (Araneae, Dipluridae). *European Journal of Taxonomy* 210: 1–21. <http://dx.doi.org/10.5852/ejt.2016.210>

Introduction

Diplura C.L. Koch, 1850 is a Neotropical mygalomorph genus, including twenty species of variable size and color pattern. Nowadays, its accepted distribution goes from Cuba to Argentina (World Spider Catalog 2015). Most species were described from southeastern and southern Brazil, with species recorded also from the following countries: Bolivia, Ecuador, Paraguay and Venezuela.

Raven (1985) included *Diplura* in the subfamily Diplurinae, alongside *Trechona* C.L. Koch, 1850 and *Linothele* Karsch, 1879. The traditional diagnostic character for *Diplura* is the simple lyra, at the internal side of the maxilla (coxa) of the palp, formed by a single row of clavate setae (Raven 1985). In contrast, *Linothele* has no lyra and *Trechona* has a complex lyra, with multiple rows of numerous setae, arranged in a black shield. However, *Harmonicon* F.O. Pickard-Cambridge, 1896, included in Diplurinae by Maréchal & Marty (1998), also has a simple lyra. In the revalidation of *Harmonicon*, Maréchal & Marty (1998) proposed a separation from *Diplura* based on the shape and number of setae on lyra. In *Harmonicon*, the lyra is formed by only 5 setae, with a flattened and curved tip, whereas in *Diplura* it has more setae and a different tip. However, Pedroso & Baptista (2014) pointed out that the number and shape of the setae are variable in *Diplura*, where some species may have just a few setae (down to 2) and setae tip curved and sometimes a bit flattened. The number of setae is not a reliable character for *Harmonicon*, as already suggested by Drolshagen & Bäckstam (2011). Nevertheless, the strongly curved and flattened setal tip is found only in *Harmonicon* (Pedroso & Baptista 2014). Several other characters have previously been used to separate the genera included in Diplurinae, as the tarsal scopulae and segmentation (Raven 1985) and leg formulae and size (Maréchal & Marty 1998). A preliminary discussion on the diagnostic characters used in Diplurinae is found in Pedroso & Baptista (2014), where several traits are dealt with. For example, the short and thickened palp tibia of males in *Diplura* (see Figs 5 and 17 in the plates below) strongly contrasts with the long and thin tibia in other Diplurinae, as *Trechona* (Pedroso *et al.* 2008: fig. 5), *Harmonicon* (Pedroso & Baptista 2014: fig. 7) and *Linothele* (Duperré & Tapia 2015: fig. 28). On the other hand, the rigid setae near lyra found in most *Harmonicon* species (Pedroso & Baptista 2014: fig. 6) is diagnostic at least to a large subset of the genus.

In this paper, the composition and distribution of *Diplura* are discussed. The type-species *Diplura macrura* (C.L. Koch, 1841) is redescribed, based on the holotype and recently collected specimens. Also, the female is newly described and new synonymies are presented. The type-locality of the species is corrected to Minas Gerais state, Brazil, implying in the exclusion of Cuba and West Indies from its geographical range. Additionally, *Diplura lineata* (Lucas, 1857) is redescribed, two synonymies are given and the species distribution is widened. The type-locality of *D. parallela* (Mello-Leitão, 1923) is corrected from Argentina to Brazil.

Material and methods

The description of color pattern is based on specimens preserved in 75% ethanol. The female genitalia was cut off and clarified with clove oil. Habitat information and photos of living animals were added, when available. Observations, photographs and measurements were made with a Leica DFC295 camera, attached to a Leica M205C stereo microscope. Samples for scanning electron were coated with gold-palladium and observed under high vacuum on a JEOL JSM-6510 microscope. All photos were edited in the software Photoshop CS5 and plates were mounted in the software CorelDraw X7. Measurements are given in millimeters, unless otherwise noted. Carapace length was measured from anterior margin of the clypeus to the posterior border. Total length was measured from the anterior margin of the clypeus to the posterior border of the anal tubercle, not including the spinnerets. Each article of the pedipalp and legs was measured in retrolateral view, from the basal condylus to the distal one. Geographical coordinates for localities were obtained from Geonames (2015). The distribution map (Fig. 26) was elaborated using ESRI ARCGIS 10 software.

Abbreviations

Institutions

- IBSP = Instituto Butantan, São Paulo, Brazil
MfN = Museum für Naturkunde, Berlin, Germany (formerly Zoologisch Museum für Naturkunde der Humboldt-Universität)
MLPC = Mello-Leitão's Private Collection, now at Museu Nacional, Universidade do Brasil/Universidade Federal do Rio de Janeiro, Brazil
MNHN = Muséum National d'Histoire Naturelle, Paris, France
MNRJ = Museu Nacional, Universidade do Brasil/Universidade Federal do Rio de Janeiro, Brazil
MZSP = Museu de Zoologia da Universidade de São Paulo, Brazil

Structures

- ALE = anterior lateral eyes
AME = anterior median eyes
ITC = inferior (or unpaired) tarsal claws
PLE = posterior lateral eyes
PLS = posterior lateral spinnerets
PME = posterior median eyes
PMS = posterior median spinnerets
STC = superior (or paired) tarsal claws

Spines (or macroseta)

- ap = apical
p = prolateral
pld = prolaterodorsal
plv = prolateroventral
r = retrolateral
rld = retrolaterodorsal
rlv = retrolateroventral
v = ventral

Results

Class Arachnida Cuvier, 1812
Order Araneae Clerck, 1757
Family Dipluridae Simon, 1889
Genus *Diplura* C.L. Koch, 1850

Diplura macrura (C.L. Koch, 1841)
Figs 1–13, 26

Mygale macrura C.L. Koch, 1841: 38, fig. 715 (♂).

Diplura bicolor Simon, 1889: 215 (♀) **syn. nov.**

Thalerothele uniformis Mello-Leitão, 1923: 105, fig. 4 (♂) **syn. nov.**

Thalerothele minensis Mello-Leitão, 1926: 314, figs 1-3 (♂) **syn. nov.**

Thalerothele aurantiaca Mello-Leitão, 1943: 255 (♀) **syn. nov.**

Diplura bicolor – Mello-Leitão 1937: 3, fig. 3 (♂). — Bücherl 1957: 385, figs 12, 12a.

Diplura macrura – C.L. Koch 1850: 75. — Raven 1985: 74, figs 18–23.

Thalerothele uniformis – Bücherl, Timotheo & Lucas 1971: 128, figs 12–14 (syn. *T. minensis*, *T. aurantiaca*).

Diplura uniformis – Platnick 1993: 89 (transfer). — Silva-Moreira *et al.* 2010: 32.
Linothele bicolor – Platnick 1998: 120 (transfer).

Diagnosis

Both sexes of this species have a strongly contrasting color pattern, with a reddish brown carapace and a dark brown abdomen, shared only with *Diplura paraguayensis* (Gerschman & Schiapelli, 1942). In mature *D. macrura*, the abdomen is uniformly dark brown, without spots or any visible markings. However, according to its original description (Gerschman & Schiapelli 1942), *D. paraguayensis* has a blackish brown reticulate on abdomen dorsum. Moreover, the lyra of *D. paraguayensis* has 13 setae (Gerschman & Schiapelli 1942: pl. ix; Schiapelli & Gerschman 1968, fig. 7), in contrast with the 7–9 setae in *D. macrura*. The bulb of *D. macrura* (Figs 6–7) has an embolic base much larger than in *D. paraguayensis* (Schiapelli & Gerschman 1968: figs 14–15). Also, the embolus is about 2× longer than the bulb in *D. macrura* and 3× longer in *D. paraguayensis*. The spermathecae of *D. macrura* has a longer and thinner stalk (Fig. 13) than the females of *D. paraguayensis* from Argentina (Goloboff 1982: 1). Also, the distal lobes are larger and spread over the distal third of the stalk in *D. macrura*, while they are smaller and concentrated in the apex in *D. paraguayensis*.

Type material

Mygale macrura: BRAZIL: ♂, holotype, Minas Gerais, São João del Rei, [1830], Sellow, Friedrich W. (MfN 2083), examined.

Diplura bicolor: BRAZIL: 2 ♀♀, syntypes, Minas Gerais, Catas Altas, Caraça (coll. E. Simon, MNHN AR 4932 B337), examined (photos).

Thalerothele uniformis: BRAZIL: ♂, holotype, São Paulo, E. of Garbe (MZSP?, MNRJ?), not located.

Thalerothele minensis: BRAZIL: ♂, holotype, Minas Gerais, Ouro Preto, Magalhães Gomes (Mello-Leitão collection 880, MNRJ 1360), not located.

Thalerothele aurantiaca: BRAZIL: ♀, holotype, Minas Gerais, Ouro Preto/Mariana: Itacolomi, O. Leonardos (MNRJ 53945), not located.

Material examined

BRAZIL: 1 ♂, Minas Gerais, Parque Nacional Serra do Cipó, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ); 1 ♀, 2 juvs, Caeté, 11–19 Feb. 1961, P. Vanzolini, H. Britski & N. Menezes

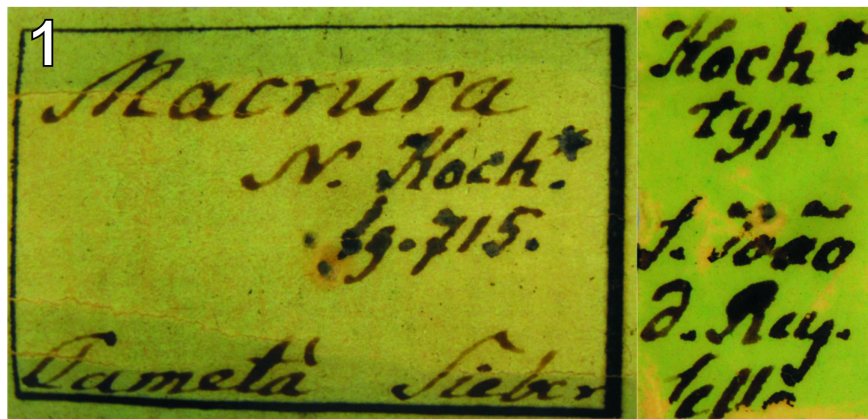
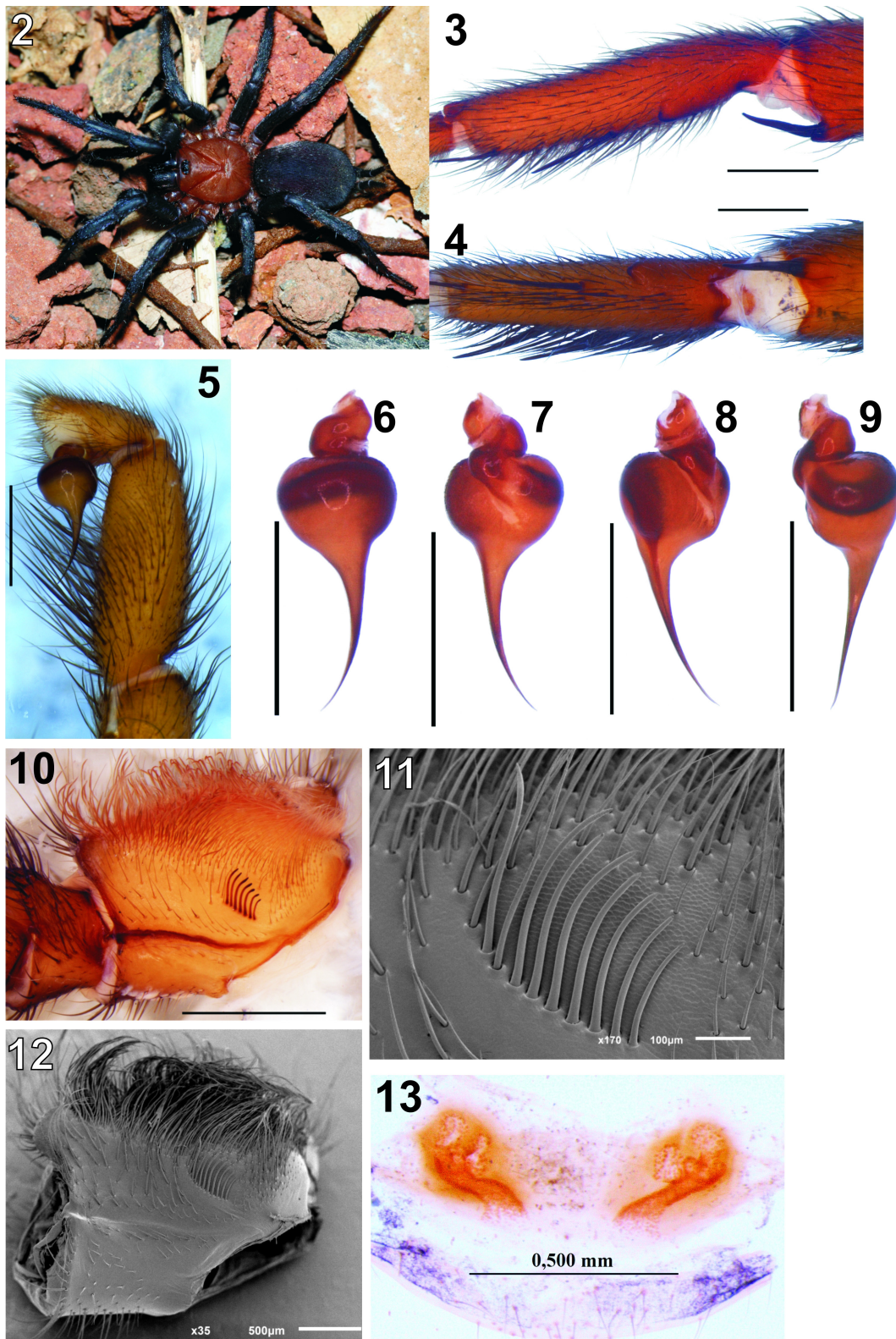


Fig. 1. Original (right) and added (left) labels from the holotype of *Diplura macrura* (C.L. Koch, 1841).



Figs 2–13. *Diplura macrura* (C.L. Koch, 1841). **2.** ♀, habitus dorsal. — **3–9.** ♂, left leg I. **3.** Tibial spur, retrolateral. **4.** Tibial spur and metatarsal clasper, ventral. **5.** Left palp, retrolateral. **6–9.** Left bulb. **6.** Retrolateral. **7.** Prolateral. **8.** Ventral. **9.** Dorsal. — **10–13.** ♀. **10.** Maxilla with lyra. **11.** Lyra detail, SEM. **12.** Maxilla with lyra, SEM. **13.** Vulva, dorsal. Scale = 1 mm, unless otherwise noted.

leg. (MZSP 6576); 1 ♂, Catas Altas, Reserva Particular de Patrimônio Natural Serra do Caraça, 24 Apr.–1 May 2002, Equipe Biota (IBSP 13148); 2 ♂♂, 1 juv., Lima Duarte, Parque Estadual de Ibitipoca, 21 Mar. 1997, A. Oliveira & B. Souza leg. (IBSP 8390); 1 ♂, Parque Estadual de Ibitipoca, Apr. 1997, A. Oliveira & B. Souza leg. (IBSP 8432); 1 ♀, juv., Ouro Preto, Estação Ecológica de Tripuí, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4467 and MNRJ 4490, respectively); 1 ♀, Estação Ecológica de Tripuí, 1220 m, 20°22'92.7" S, 43°33'29.3" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4502); 1 ♂, Estação Ecológica de Tripuí, 1236 m, 20°22'93.2" S, 43°33'28.7" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4496); 1 ♀ (MNRJ 4487), 1 ♂ (MNRJ 4497), 1 ♀ (MNRJ), Estação Ecológica de Tripuí, 1246 m, 20°22'93.2" S, 43°33'28.7" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg.; 1 ♀, Estação Ecológica de Tripuí, 20°22'6.62" S, 43°32'5.74" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4509); 1 juv., Estação Ecológica de Tripuí, 20°22'9.70" S, 43°33'1.04" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4498); 1 ♀, Estação Ecológica de Tripuí, 20°22'915" S, 43°33'227" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4489); 1 ♂, Estação Ecológica de Tripuí, 20°22'93.2" S, 43°33'26.7" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4505); 1 ♂, Estação Ecológica de Tripuí, 20°22'93.2" S, 43°33'28.7" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4479); 1 juv., Estação Ecológica de Tripuí, 20°22'93.2" S, 43°33'28.7" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ); 1 juv., Estação Ecológica de Tripuí, 20°22'970" S, 43°33'104" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4492); 1 ♂, Estação Ecológica de Tripuí, 20°22'92,2" S, 43°33'13" W, 8 Jan. 2006, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ); 1 ♀, Estação Ecológica de Tripuí, 20°22'93.2" S, 43°33'287" W, 7 Jan. 2005, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani M. leg. (MNRJ 4333); Ouro Preto: 1 juv., Parque Estadual do Itacolomi, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ); 1 juv., Parque Estadual do Itacolomi, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4515); 1 ♂, Parque Estadual do Itacolomi, 1,306 m, 20°22'662" S, 43°32'574" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4495); 1 ♀, Parque Estadual do Itacolomi, 20°25'638" S, 43°30'399" W, R. Bertani, R. Martins, C.S. Fukushima & M.P. Pavani leg. (MNRJ 4507).

Description

Male (MNRJ 4496) (Figs 3–9)

Carapace: 6.4 long, 5.0 wide. Abdomen: 6.6 long. Spinnerets: PMS 1.3 long; PLS, total length 6.8, basal article 2.0, middle 2.2, distal 2.6, respectively. Legs: see Table 1. Carapace: length/width 1.3; flat, cephalic area slightly raised, thoracic furrows shallow and wide. Fovea: short, deep, recurved. Carapace covered with short, thin setae, interspersed with some longer and thicker setae; border with abundant long and thick setae pointing outwards, increasing in number towards posterior angles. Clypeus almost totally hidden by the bulging eye tubercle, frontal margin bearing 5 thick, long, erect setae. Eye tubercle: 0.6 long, 1.0 wide, area between posterior eyes covered with thin setae and bearing 4 thicker, longer setae. AME 0.3, almost spherical, but a bit longer than wide, set apart by 0.7× their diameter. ALE elliptical, much longer than wide, its length about 0.6× the AME diameter. PME small, with flattened lens, longer than wide, its length about 0.5× AME diameter. PLE elliptical, much longer than wide, its length a bit less than 0.7× AME diameter. PME and PLE clearly set apart by around 0.4× the PME length. Anterior eye row slightly recurved, posterior eye row recurved. Eye rows with similar width. Chelicerae: promargin with 11 teeth on left and 9 on right chelicera. Plectrum with 5 thick, long setae. Labium: length/width 0.8, no cuspules. Labio-sternal groove deep with elongated sigilla. Sternum: about 45% longer than wide, very similar to the sternum of *D. lineata*. Posterior angle in a blunt point, not separating coxae IV. Sigilla: three pairs, spherical, with a subtle increase in size from anterior to posterior, all near margin. Palp (Fig. 5): relatively short, without retrolateral spines, femur: d1–2–0, pl0–0–1, tibia pl 0–1–0, v1–2–0. Tibia: length 2.3, width 0.9, short, incrassated, thinner at the basis and apex. Maxillae: length/width 1.5. Cuspules: 13 spread over ventral inner heel. Lyra at the ventral side of the maxilla, formed by 8 modified thick, long setae, increasing in size from basis to apex of the lyra,

Table 1. *Diplura macrura* (C.L. Koch, 1841), ♂. Length of left leg articles (dorsal view).

	Leg I	Leg II	Leg III	Leg IV
Fe	5.5	5.1	4.7	5.9
Pa	3.2	2.9	2.4	2.5
Ti	4.2	3.8	3.2	4.4
Mt	4.0	4.1	4.4	6.2
Ta	3.3	3.2	3.1	3.6
Total	20.2	19.1	17.8	22.6

weakly curved at apical portion. Legs: Leg formula 4123. Legs covered with short, thin, horizontal black setae and with some longer, thicker, erect black setae. All tarsi with thin scopula, throughout the length of the article, divided by two series of thicker setae at the middle line of the ventral face. Metatarsus I with undivided thin scopula, covering the distal half of the retrolateral side. Metatarsus II similar to I, but with scopula on both sides. Metatarsi III–IV without scopula. All tarsi provided with numerous small cracks covering almost all the ventral and lateral faces, except by the basis and tip of the article. Leg I (Figs 3–4): tibia I with a relatively short distal retrolateral spur, curved and blunt, placed at its ventral corner. Megaspine pointed, slightly sinuous, especially on the apex, almost 2x longer than the spur. Metatarsus I with a distinct retrolateral tubercle placed ventrally at the beginning of the median third, conical, pointed and facing towards the tip of article. Ventrally, there is one spine near the apex and another one on the median third, placed much ahead of the tubercle. Fringe formed by many thick and long spiniform setae and spines (clasper) covering almost all prolateral side of the metatarsus (Fig. 4). Spines: leg I: femur d1–2–0, pld0–0–1, rld0–0–1, patella p0–0–1 left, p0 right, r0 left, 0–1–0 right, tibia p0–2–0, v0–1–1ap (apophysis), metatarsus p0–2–0, v0–1–1ap; leg II: femur d1–2–0, pld1–0–1 left, pld0–0–1 right, rld0–0–1 left, rld0 right, patella p0–1–1 left, p0–0–1 right, tibia p0–2–0, v1–1–2ap left, v1–0–2ap right, metatarsus p1–1–1 left, p1–1–0 right, v1–2–2ap left, v1–2–1ap; leg III: femur d1–2–0, pld0 left, pld0–1–1 right, rld0–1–1 left, rld0–2–1 right, patella p0–1–1 left, p0–1–1 right, r0–1–0 left, r1–1–0 right, tibia p0–2–0 left, p0–2–1 right, r1–1–1, v1–1–2ap; metatarsus p2–2–1 left, p0–4–1 right, r1–1–1 left, r1–2–1 right, v0–4–3ap left, v0–3–3ap right; leg IV: femur d2–1–0 left, d1–2–0 right, rld0–0–1 left, rld0–0–2 right, patella r0–1–0, tibia p0–1–0 left, p0–2–0 right, r1–2–1 left, r1–1–1 right, v2–1–2ap left, v1–0–2ap right, metatarsus d1–0–0 left, d1–1–0 right, p1–2–1, r1–2–1, v1–5–3ap. Claws: ITC without teeth. Teeth at STC: all claws with a small spur at the basis in both sides leg I: inner 6–7 and outer rows 5–6; leg II: inner row 9, outer row 8–9; leg III: inner row 6–7, outer row 6; leg IV: inner and outer rows 6–7. Bulb (Figs 6–9): piriform and conical in a retrolateral view, with length about $\frac{3}{4}$ of its width. Embolus about 2x longer than the bulb itself, with a wide base in relation to the globose part of the bulb and tapering towards the apex. Embolus clearly curved since its base and tapering from the basal third to the apex, clearly seen both on retrolateral and prolateral views. However, in dorsal view, the embolus is just slanted, almost straight. On ventral view, spermatic duct large at the base, tapering regularly towards the tip, but much thinner from the distal third on.

Female (MNRJ 4487) (Figs 2, 10–13)

Total length 15.3. Carapace: 7.3 long, 5.8 wide. Abdomen: 8.0 long, 5.0 wide. Spinnerets: PMS 1.4 long; PLS, total length 5.9, basal article 2.3, middle 1.6, distal 2.0, respectively. Legs: see Table 2. Females are very similar to males except by its bigger size and the following characteristics: carapace length/

Table 2. *Diplura macrura* (C.L. Koch, 1841), ♀. Length of left leg articles (dorsal view).

	Leg I	Leg II	Leg III	Leg IV
Fe	5.6	4.8	4.4	5.2
Pa	3.4	3.0	2.6	2.9
Ti	3.6	3.3	3.0	4.2
Mt	4.0	3.5	4.2	5.6
Ta	3.0	2.8	2.8	3.0
Total	19.6	17.4	17.0	20.9

width 1.3. Clypeus very narrow, with the frontal margin carrying five thick, long setae, facing forward. Eye tubercle with a thick seta on its anterior margin. Area between eyes with two longer and thicker setae. AME separated by around their diameter. PME and PLE less separated. Chelicera with 10–11 promarginal teeth, on the right and left chelicera, respectively. Plectrum with 6 thick, long setae. Maxilla with 16 (left) or 19 (right) cuspules. Lyra (Figs 10–11) as in male, formed by 7 modified setae. Tarsi I–II with scopula similar to male, but tarsus III with a very thin scopula and tarsus IV without scopula. Metatarsi I–II with undivided thin scopula, covering both sides and the ventral face. All tarsi provided with few small cracks covering only the median area of the ventral and lateral faces. Spines: leg I: femur d1–2–0, pld0–0–1; patella 0; tibia p0–0–1, v0–0–2ap (apophysis); metatarsus v0–3–2ap; leg II: femur d1–1–0, pld0–0–1; patella p0–0–1; tibia p0–0–1, v0–0–2ap; metatarsus v0–3–2ap; leg III: femur d1–0–0, rld0–0–2 left, rld0–0–1 right; patella p0–1–1 left, r0–1–0; tibia p1–1–0 left, p0–2–0 right, r0–2–0, v0–0–1ap left, v0–0–2ap right; metatarsus p1–2–1 left, p1–3–1 right, r1–1–1, v0–4–3ap; leg IV: femur d1–1–0 left, d1–2–0 right, rld0–0–1; patella r0–1–0; tibia p1–1–0, r2–1–0, v0–0–1ap left, v–0–0–2ap right; metatarsus p0–2–1 left, p1–2–1 right, r2–1–2 left, r1–1–2 right, v1–3–2ap. Spermathecae (Fig. 13): separated by about 70% of its length, with a thick stem, keeping a similar width up to the distal lobules. Stem curved forward from the median part on, bearing three large apical lobules of variable sizes.

Color pattern

Both sexes with carapace reddish brown, covered by abundant setae of a weakly coppery hue. Thoracic furrows and cephalic area darker. Eye area black. Legs, palps, chelicera and spinnerets dark brown, with a clear contrast to the color of carapace. Labium, sternum and leg coxae orange, with darker sigilla. Dorsum of the abdomen uniformly dark brown without markings or stripes, venter usually lighter colored than dorsum, but with a dark hue in some males.

Variation

Chelicera with 8–11 promarginal teeth. Lyra at the ventral side of the maxilla, formed by 7 to 9 modified setae (Figs 10–12). The maxillary cuspules may vary from 13 to 17 in males and from 16 to 19 in females.

Synonymy and notes

When describing *Mygale macrura*, C.L. Koch (1841: 39) indicated that the type-locality of the species was “WestIndien, St. Juan”. Nine years later, he transferred the species to his new genus *Diplura*, without mentioning the type-locality (C.L. Koch 1850: 75). The type-locality indicated by Koch 1841 was cited differently by subsequent authors, for example, “Westindien” (Ausserer 1871: 178), “St. Jean,

Antilles” (Simon 1903: 963), “West Indies” (Petrunkevitch 1911: 60), or “Saint John, U.S. Virgin Islands” (Muchmore 1993: 32). All those subsequent authors did not mention any additional specimen of *D. macrura* and were certainly restating the information given by C.L. Koch (1841).

Banks (1909: 155) was the first arachnologist to record *D. macrura* in Cuba, from Pinar Del Rio, as “*Ischnothele macrura* Koch”, but he made no comments on the implicit genus transfer, nor did he include any description of the specimens he examined. Lutz (1915: 77) and Petrunkevitch (1926: 27) also pointed out that *D. macrura* had previously been recorded from Cuba. While Lutz expressly cited Banks (1909), Petrunkevitch did not mention its source. However, he was probably also citing Banks (1909), as he stated that “*Diplura macrura* C. Koch, has been also reported from Cuba”. In his paper on endemic spiders from Cuba, Alayón (2000: 38) also included *D. macrura* without any further comment. Currently, the only record for *D. macrura* included in the World Spider Catalog (2015) is Cuba, without any mention of Koch’s type-locality.

In her paper on Cuban spiders though, Bryant (1940: 260) considered Banks’ record a misidentification of *Ischnothele longicauda* Franganillo, 1936. She based her opinion on the relative abundance of the latter species in Cuba. The family Dipluridae is scarcely represented in Cuba, with only *I. longicauda* and two species of *Masteria* L. Koch, 1873 recorded for the country (World Spider Catalog 2015), not considering the erroneous *D. macrura* citation by Banks. Therefore, the only specimen of *D. macrura* undoubtedly cited for Cuba, West Indies or any other Caribbean locality is the holotype.

Surprisingly, an analysis of the holotype of *D. macrura* indicates that the type-locality was misinterpreted by Koch. The holotype label clearly indicates “Koch *. typ. S. João d. Rey. Sello” (Fig. 1, right). On the other hand, there is an additional label (Fig. 1, left) inside the vial that contains the type indicating “*Macrura* N. Koch. * fg. 715. Cametá Sieber”, referring to Cametá, a locality in the state of Pará, northern Brazil. This additional label was probably wrongly added later in the vial, as there are no records for *D. macrura* from Pará. Up to now, all the specimens of *D. macrura* we examined came only from the state of Minas Gerais. Therefore, it is clear that the type-locality is really São João del Rei, central Minas Gerais state, Brazil. Friedrich Sellow (or Sello, 1789–1831), a famous Prussian naturalist, collected a large number of zoological specimens in Minas Gerais state, such as insects (Papavero 1973) and birds (Rego *et al.* 2013). Furthermore, most of Sellow’s specimens are also deposited at MfN.

Diplura bicolor was described from Caraça, Minas Gerais State, Brazil, based on two female syntypes (Simon 1889: 215). It is, currently, placed in the genus *Linothele*, although it was considered a *Diplura* by former authors (Mello-Leitão 1937; Bücherl 1957). This species was implicitly transferred to its current genus following Raven (1985: 182): “all alyrate Diplurinae [...] are transferred to *Linothele*”. As Simon (1889: 215) had not cited a lyra in his description, *Diplura bicolor* was regarded as a *Linothele* in all later spider catalogs (e.g., World Spider Catalog 2015). Notwithstanding the fact that the first description of a lyra in the maxilla of Dipluridae was made by Blackwall (1867), this structure was not mentioned again until the reevaluation of its form and function by Pocock (1896). So it is clear that Simon and other former authors had not dissected the maxilla of their specimens in search for a lyra. We have only been able to analyze photos of one syntype of *Linothele bicolor* (Dipluridae Contributors, 2016), as it is currently in loan to another researcher, but the photos clearly show a lyra formed by 8 setae. Simon (1889: 216) clearly cited the characteristic contrasting color pattern found in *D. macrura* in the original description of *D. bicolor*. However, he also cited some light brown spots scattered on the posterior half of the abdomen. It is possible that the syntypes cited by Simon are immature or small mature females (15.3 mm long) since isolated light brown spots on the sides of the abdomen are usually found only in immatures of *D. macrura*, disappearing in older males and females. Besides the syntype photos, the examination of other specimens of *D. bicolor* from its type-locality (Caraça, Catas Altas) and nearby areas of Minas Gerais state allow the clear recognition of the species. The examined specimens

agree very well to the original description of *D. bicolor* in color and size, except by the presence of a lyra. Furthermore, despite several collections on Caraça and other nearby localities, including extensive search for Mygalomorphae, we and other researchers had not been able to find any other *Diplura* or *Linothele* species from the same region. The comparison of the above cited specimens with *D. macrura* from central Minas Gerais state allowed us to establish this synonymy, based on the similar color pattern and lyra.

The male of *D. bicolor* was supposedly described by Mello-Leitão (1937: 3, fig. 3) and Bücherl (1957: 385, fig. 12–12a). However, both specimens clearly belong to other species. We were able to examine the “allotypus” of *D. bicolor* described by Mello-Leitão, from Gustavo da Silveira, Minas Gerais state (IBSP 3452). It is a male of an undetermined species of Nemesiidae, with a distinctive copulatory bulb and a very setose pedipalp (Mello-Leitão 1937: fig. 3). Likewise, judging by the figures 12 and 12a by Bücherl 1957, the male he identified as *D. bicolor* is actually a Theraphosidae, with the typical two lobed tibial spur in leg I (Bücherl 1957: fig. 12a) and a copulatory bulb also characteristic of that family (Bücherl 1957: fig. 12).

Diplura uniformis (Mello-Leitão, 1923) was originally described as *Thalerothele uniformis* by Mello-Leitão (1923: 105). He stated that the male holotype was collected in the state of São Paulo: São Paulo, by E. Garbe, and should be deposited in Museu de Zoologia de São Paulo (MZSP, old number 321). However, Bücherl *et al.* (1971: 119, 122) examined a male specimen from MNRJ, collected in Ouro Preto, labeled as type of *T. uniformis* by Mello-Leitão [MNRJ 192, MLPC 1056]. Since they were not able to find any type material of the species in MZSP, they considered the MNRJ specimen as the holotype of *T. uniformis*. They also stated that the type-locality and repository cited in the description were wrong (Silva-Moreira *et al.* 2010: 32). Since a later examination of the MZSP collection by R. Baptista also did not produced any evidence of the holotype, we follow Bücherl *et al.* (1971) and Silva-Moreira *et al.* (2010) in considering the MNRJ specimen as the actual holotype of *T. uniformis*. The transfer of *T. uniformis* to *Diplura* was made by Platnick (1993) in his catalog, following Raven (1985).

Bücherl *et al.* (1971: 123) also considered *T. minensis* Mello-Leitão, 1926 and *T. aurantiaca* Mello-Leitão, 1943, both described from Ouro Preto (Mello-Leitão 1926: 105 and 1943: 255, respectively) as synonyms of *T. uniformis*. Bücherl *et al.* (1971: 119) examined the female holotype of *T. aurantiaca*, collected in Itacolomi, Ouro Preto, by Othon Leonardos (MNRJ 53945), but not the male holotype of *T. minensis*. In the description of *Thalerothele minensis*, it is stated that the holotype received the number MLPC 880. However, this number belongs to a type specimen of Opiliones, as Mello-Leitão wrote down in the catalogue of the part [or whole?] of his private collection purchased by MNRJ in 1929 (Kury & Baptista 2004). Probably the wrong number in the original description was a misprint or a lapse (Silva-Moreira *et al.* 2010: 32).

Unfortunately, we were not able to find any *Diplura* material from Ouro Preto in MNRJ collection, despite several attempts. Thus, the MNRJ specimen Bücherl *et al.* (1971) considered as the holotype of *T. uniformis* and the female holotype of *T. aurantiaca* had also been probably lost later on. We follow Bücherl *et al.* (1971) on the synonymies of *T. minensis* and *T. aurantiaca* with *D. uniformis*, considering that all species were described from Ouro Preto and the original descriptions do not allow the recognition of any diagnostic trait. *T. minensis* was diagnosed in relation to *T. uniformis* (= *D. macrura*) by Mello-Leitão (1926: 11) based on the uniformly dark color of the abdomen, 7 setae on lyra and only 5 teeth on the promargin of chelicera. Nevertheless, the coloration of the venter in *D. macrura* males vary from a light hue to a dark color similar to dorsum, the number of setae on lyra varies between 7 to 9 and the number of cheliceral teeth varies from 8 to 11. The last character is a not reliable one, as it may be variable even in one specimen, as the 9 and 11 teeth on different sides of the male herein redescribed demonstrate. The illustrations of the holotype of *T. minensis* by Mello-Leitão (1926: figs 1–3) are poorly

done and not diagnostic. The similarity in color, size and lyra structure indicates that it really is a synonym of *D. macrura*.

T. aurantiaca is just the female of *T. uniformis* (= *D. macrura*), with the same color pattern and similar size as the males. Among the characters mentioned in the original description, only the 6 setae on lyra fall out of the range for *D. macrura* (7 to 9). However, the first seta in the lyra is smaller and thinner than the others (Fig. 10) and the number of setae increases over age. Therefore, it is probable that the 6 setae may represent a normal variation or indicate that the holotype was a small young female. The holotype vulva poorly illustrated by Bücherl *et al.* (1971: fig. 12) does not seem to be fully developed. Apart from the reasons mentioned above, only one species has been collected in Ouro Preto, in spite of many collecting trips resulting in abundant specimens of *D. macrura*. Notwithstanding the loss of the types of the three species from Ouro Preto, the synonymies also avoid the proliferation of *nomina dubia*. We compared specimens of Ouro Preto with specimens of *D. macrura* and this examination indicated that they all belong to the same species, as they share the same color pattern, structure of lyra and shape of male and female genitalia.

Habitat notes

D. macrura specimens have been found under fallen logs and rocks in relatively dry areas of Atlantic Forest or Cerrado vs Atlantic Forest ecotones. The spiders do not make funnel-webs, but applies silk to the ground or log cavities, sometimes building small entrance silk tubes.

Distribution (Fig. 26)

Known only from localities in central and south Minas Gerais state, Brazil.

Diplura lineata (Lucas, 1857)

Figs 14–26

Mygale lineata Lucas, 1857: 14, fig. 1a–c (♂).

Thalerothele fasciata Bertkau, 1880: 24, pl. 1, f. 6 (♀) **syn. nov.!**

Harmonicon nigradorsi Mello-Leitão, 1924: 186 (♀) **syn. nov.!**

Diplura fasciata – Simon 1889: 183.

Thalerothele fasciata – Simon 1903: 963. — Mello-Leitão 1923: 101, f. 10.

Thalerothele lineata – Mello-Leitão 1926: 309.

Harmonicon nigradorsi – Mello-Leitão 1926: 315, fig. 4. — Bücherl *et al.* 1971: 122, figs 15–16 (♂).

Paraharmonicon nigradorsi – Mello-Leitão 1926: 316 (tentative superfluous name only).

Type material

Mygale lineata: BRAZIL, Rio de Janeiro: Rio de Janeiro, [no date], near Rio [“environs de Rio”, probably Tijuca] (♂ holotype, MNHN, not located).

Thalerothele fasciata: BRAZIL, Rio de Janeiro, Tijuca [no date], van Beneden leg. (♀ holotype, IRSNB, not located).

Harmonicon nigradorsi: BRAZIL, Rio de Janeiro, [no date], W.S. Bristowe leg. (♀ holotype + ♂ probably mixed later, MNRJ 17, MLPC 847, examined).

Material Examined

BRAZIL: 2♂♂, 1♀, 1 juv., Rio de Janeiro, Casimiro de Abreu: Barra de São João, Morro de São João, 21–24 Mar. 2003, Expedition Arachné (MNRJ 4322); 1♀, 24 Mar. 2003, Expedition Arachné (MNRJ

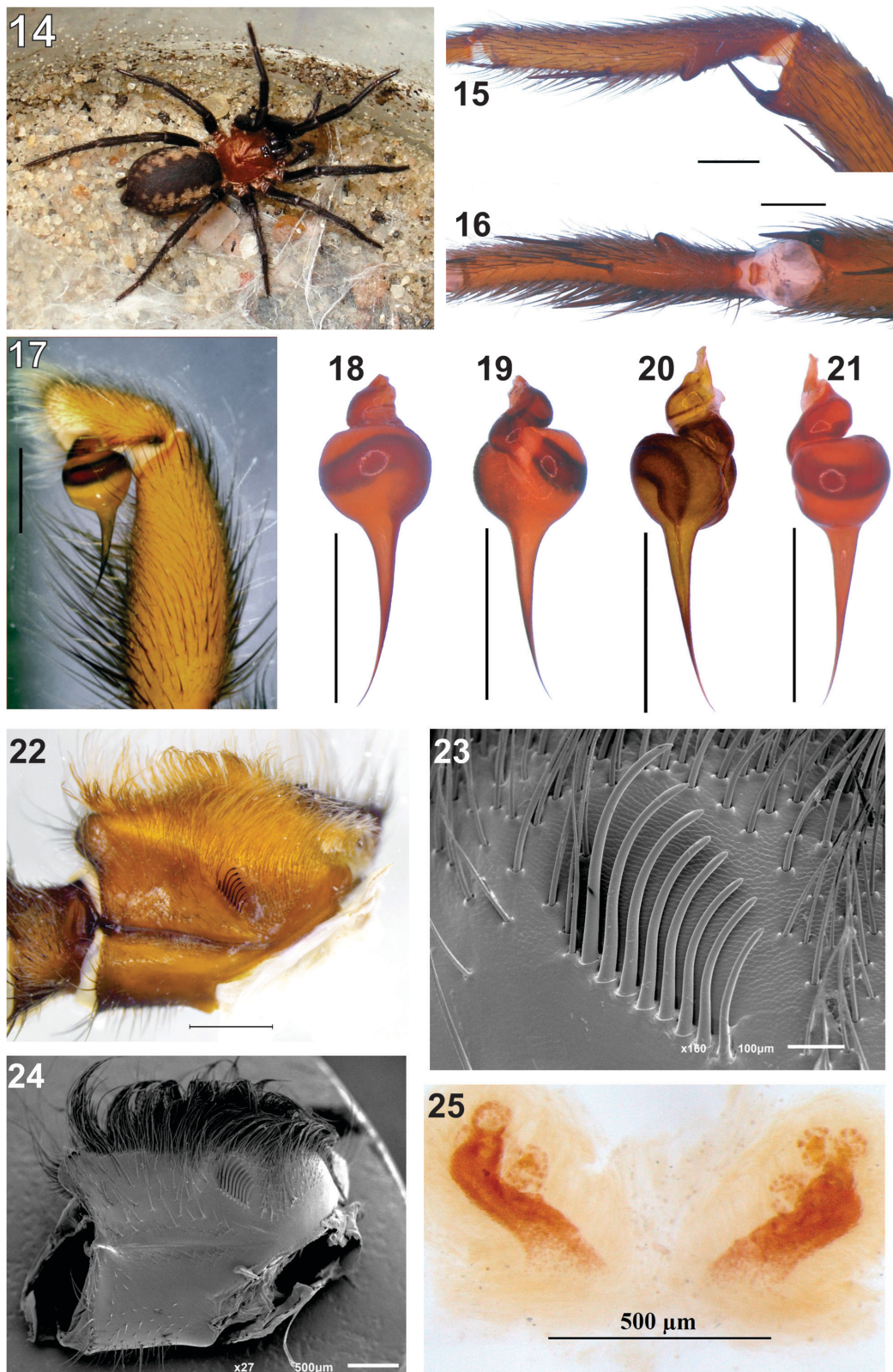
Table 3. *Diplura lineata* (Lucas, 1857), ♂. Length of left leg articles (dorsal view).

	Leg I	Leg II	Leg III	Leg IV
Fe	6.7	6.4	6.0	7.6
Pa	4.0	3.3	2.8	3.2
Ti	5.6	5.3	4.7	6.1
Mt	5.3	5.9	6.6	9.1
Ta	5.0	4.6	4.0	5.0
Total	26.6	25.5	24.1	31.1

4335); Mangaratiba: 1 ♂, 1 ♀, Ilha de Itacuruçá, Águas Lindas, 24–25 Mar. 2007, R.L.C. Baptista, C.S. Costa & A.R. Oliveira leg. (UFRJ 0332); 1 juv., Reserva Ecológica Rio das Pedras, 11–12 Nov. 2004, A.P.L. Giupponi leg. (MNRJ 4312); 1 juv., Nova Iguaçu: Parque Municipal de Nova Iguaçu, 21 Jul. 2004, C. Lima leg. (MNRJ); 1 ♂, PM Nova Iguaçu, (MNRJ 4311); 1 ♀, Rio de Janeiro, Parque Estadual da Pedra Branca, (MNRJ 4310); 1 ♀, Camorim, Açude, 31 Mar. 2014, P. Castanheira leg. (MNRJ 6820); 1 ♂, Serra do Mendanha, 485 m, Pitfall, 12 Dec. 2008, J.A.L. Pontes leg. (MNRJ 18434); 1 ♀, Floresta da Tijuca, 20 Apr. 1986, R.L.C. Baptista leg. (MNRJ 3112 [CRB T005]); 1 ♀, 1 juv., Floresta da Tijuca, 400 m, 27 Nov. 1987, A.P.L. Giupponi leg. (MNRJ 3410); 1 ♀, Floresta da Tijuca, 7 Jan. 1998, A.P.L. Giupponi leg. (MNRJ 1854); 1 ♀, Floresta da Tijuca, 400 m, 3 Mar. 2001, A.P.L. Giupponi, D.R. Pedroso & D.F. Almeida leg. (MNRJ 1856); 1 ♂, Parque Nacional da Tijuca, 25 May 2001, A.P.L. Giupponi, D.R. Pedroso & R.L.C. Baptista leg. (MNRJ 3568); 1 ♀, Parque Nacional da Tijuca, 10 Jan. 2005, D.R. Pedroso & R.L.C. Baptista leg. (MNRJ 4302 [AER]); 1 ♀, Parque Nacional da Tijuca, 25 Aug. 2004, D.R. Pedroso & A.P.L. Giupponi leg. (MNRJ 4308); 1 ♀, Parque Nacional da Tijuca, Archer, 22 Jan. 2005, D.R. Pedroso & A.P.L. Giupponi leg. (MNRJ 4309); 1 juv., Parque Nacional da Tijuca, Gávea, 18 Jan. 2005, D.R. Pedroso leg. (MNRJ 4307 [AER]); 2 ♀♀, Parque Nacional da Tijuca, Gávea, 18 Jan. 2005, D.R. Pedroso leg. (MNRJ 4304); 2 ♀♀, Parque Nacional da Tijuca, Pai Ricardo, 21 Jan. 2005 D.R. Pedroso leg. (MNRJ 4305 [AER]); 1 ♀, Parque Nacional da Tijuca, Pai Ricardo, 21 Jan. 2005, D.R. Pedroso leg. (MNRJ 4306 [AER]); 1 ♀, Parque Nacional da Tijuca, Pai Ricardo, 21 Jan. 2005, D.R. Pedroso leg. (MNRJ [AER]); 1 ♀, Parque Nacional da Tijuca, Sumaré, 22 Jan. 2005, D.R. Pedroso leg. (MNRJ 4303 [AER]).

Diagnosis

Both sexes of this species have a characteristic color pattern, similar to the Amazonian *D. sanguinea* (F.O. Pickard-Cambridge, 1896). The abdomen of both species have a dark brown dorsum bearing beige broad transversal stripes. In *D. lineata*, the stripes are short and broad, with irregular outline, covering only the side margins of the dorsum. At the sides, there are several small beige spots among and under the stripes (sometimes fused with them). On the other hand, *D. sanguinea* have longer and a bit thinner stripes, without connecting beige spots at the sides. The copulatory bulb is very similar in both species, but the spermatheca is very constricted at the basis of the embolus, becoming almost filiform afterwards, in *D. lineata* (Fig. 20), while in *D. sanguinea* the constriction is small, and the basis of embolus harbors a large duct, which tapers regularly towards the apex. The spermathecae in *D. lineata* (Fig. 25) have a thick stem and three distal lobules, while *D. sanguinea* have a thin stem and six to seven distal lobules.



Figs 14–25. *Diplura lineata* (Lucas, 1857). 14. ♀, habitus, dorsal. — 15–21. ♂, left leg I. 15. Tibial spur, retrolateral. 16. Tibial spur and metatarsal clasper, ventral. 17. Left palp, retrolateral. 18–21. Bulb detail. 18. Retrolateral. 19. Prolateral. 20. Ventral. 21. Dorsal. — 22–25. ♀. 22. Maxilla with lyra. 23. Lyra detail, SEM. 24. Maxilla with lyra, SEM. 25. Vulva, dorsal. Scale = 1 mm, unless otherwise noted.

Description

Male (MNRJ 4311)

Total length 18.5. Carapace: 7.4 long, 6.0 wide, chelicerae 2.7. Abdomen: 7.6 long, 3.9 wide. Spinnerets: PMS 0.9 long; PLS, total length 10.0, basal article 3.3, middle 3.3, distal 3.3, respectively. Legs: see Table 3. Carapace: length/width 1.2; flat, cephalic area slightly raised, thoracic furrows shallow and wide. Fovea: short, deep, slightly recurved. Carapace covered with short, thin setae, interspersed with some longer and thicker setae; border with abundant long and thick setae pointing outwards, increasing in number towards posterior angles. Clypeus narrow and small, but clearly visible, not totally hidden by the eye tubercle, frontal margin bearing 6 thick, long, erect setae. Eye tubercle: 0.5 long, 1.1 wide, one thick, long seta on tubercle anterior margin, area between posterior eyes covered with thin setae and bearing 3 thicker, longer setae. AME 0.3, almost spherical, but a bit longer than wide, set apart by half its diameter. ALE elliptical, much longer than wide, just a bit longer than the AME diameter. PME small, with flattened lens, longer than wide, its length around $0.6 \times$ AME diameter. PLE elliptical, much longer than wide, its length a bit less than $0.9 \times$ AME diameter. PME and PLE closely spaced by around $0.2 \times$ the PME length. Anterior eye row slightly recurved, posterior eye row recurved. Eye rows with similar width. Chelicerae: formed by 11 teeth on promargin on both left and right chelicera. Plectrum with 4 thick, long setae. Labium: length/width 0.8, no cuspules. Labio-sternal groove deep, with elongated sigilla. Sternal groove deep, with elongated sigilla. Sternum slightly longer than wide. Posterior angle in a blunt point, not separating coxae IV. Sigilla: three pairs, elliptical, increasing in size from anterior to posterior, all near margin. Palp (Fig. 17): relatively short, femur: d1–3–0, pl0–0–1, r10–0–1, tibia pl 0–2–0, v0. Tibia: 3.1 long, 1.0 wide, short, incrassated, thinner at the basis and apex. Maxillae: length/width 1.5. Cuspules: 15 spread over ventral inner heel. Lyra: located at the ventral side of the maxilla, formed by 6 modified thick setae, the basalmost much thinner and shorter than the others, which slightly increase in size from basis to apex of the lyra, all setae weakly curved at apical portion, with rounded apex. Legs (Figs 15–16): Leg formula 4123. Legs covered with short, thin, horizontal black setae and with some longer, thicker, erect black setae. All tarsi with thin scopula, throughout the length of the article. Tarsi I–III with scopula almost undivided, with only some isolated thicker setae at the middle line of the basal third of the ventral face. Tarsi IV with scopula partially divided, with thicker setae covering the basal half of the ventral face. Metatarsi I–II almost without scopula, with only a few setae near the apex. Metatarsi III–IV without scopula. All tarsi provided with numerous small cracks covering almost all the ventral and lateral faces, except by the basis and tip of the article. Tibia I around $4.3 \times$ longer than wide. Retrolateral distal spur placed at the ventral corner of tibia I, with a wide-base, bearing at its apex a pointed and almost erect megaspine, with similar length of the spur. Metatarsus I relatively long and a little sinuous on ventral view, with a protruding retrolateral tubercle, placed ventrally on its basal third, faced towards the apex of the article. Ventral side with an apical spine and two spines on the median third, the basalmost located in advance to the tubercle. Fringe formed by many spiniform setae and spines (clasper) covering the median portion of the prolateral side of metatarsus I (Fig. 16). Spines: **leg I**: femur d1–2–1, pld0–2–1, rld1–1–1 left, rld0–1–2 right; patella 0 left, 0–0–1 right; tibia p0–1–1, v0–1–1ap (apophysis); metatarsus p0–1–0, v0–2–1ap; **leg II**: femur d1–2–1 left, d1–2–0 right, pld0–2–1, rld0–2–0 left, rld0–2–1 right; patella 0–1–1 left, 0–0–1 right; tibia p0–1–1, v1–1–2ap; metatarsus pl0–2–0, v1–2–2; **leg III**: femur d1–2–0, pld0–2–1, rld0–2–1 left, rld1–1–1 right; patella pld0–1–0 left, pld0–1–1 right, rld0–1–0; tibia d1–1–0 left, d0–1–0 right, p0–1–0 left, p1–1–0 right, r0–1–1 left, r1–2–0 right, v2–2–2ap; metatarsus d3–1–1 left, d2–3–2 right, p0–2–0 left, p1–1–0 right, r0–1–0; v1–3–3ap; **leg IV**: femur d1–2–0, pld0–2–1, rld1–2–1 left, rld0–2–1 right; patella 0–1–0 left, 0–0–1 right, tibia d0–1–0, p0–1–1 left, p0–2–0 right, r2–1–1, v2–2–2; metatarsus d2–2–2, p1–1–1, r1–1–0, v2–3–3ap. Claws: ITC without teeth. Teeth at STC: all claws with a wide and high spur at the basis in both sides **leg I**: inner and outer rows 9–10; **leg II**: inner row 9, outer row 8–9; **leg III**: inner row 6–7, outer row 6; **leg IV**: inner and outer rows 6–7. Bulb (Figs 18–21): globose, slightly wider than long, with embolus moderately long, around $2 \times$ the bulb size. Bulb with an abrupt curve near the base of the embolus and a

Table 4. *Diplura lineata* (Lucas, 1857), ♀. Length of left leg articles (dorsal view).

	Leg I	Leg II	Leg III	Leg IV
Fe	7.5	7.0	6.6	7.4
Pa	4.6	4.4	3.7	4.1
Ti	5.5	5.2	4.6	5.9
Mt	5.5	5.5	5.9	6.9
Ta	4.1	4.0	3.6	3.5
Total	27.2	26.1	24.4	27.8

strong constriction on ventral view. Embolus with a relatively thin base, gradually tapering towards the apex, either on prolateral or retrolateral view. Embolus on ventral view slightly curved at its beginning, straight through most of its length, with the apex bended retrolaterally. Also on ventral view, a strong bulge near the base of the embolus and spermatheca wide, abruptly tapering near the base of the embolus, becoming thinner, almost filiform.

Female (MNRJ 6820) (Fig 14)

Total length 15.3. Carapace: 6.7 long, 5.4 wide, chelicerae 2.6. Abdomen: 8.6 long, 4.9 wide. Spinnerets: PMS 1.1 long; PLS, total length 6.9, basal article 2.5, middle 2.2, distal 2.2; respectively. Legs: see Table 4. Females are very similar to males except by its bigger size and the following characteristics: carapace length/width 1.2. Clypeus narrow, around ½ AME diameter, frontal margin with 7 setae. Eye tubercle with 4 thick setae on anterior margin, area between posterior eyes bearing 5 thick setae. 13 teeth on promargin of chelicera. Maxilla with 19 (left) and 16 (right) cuspules. Lyra (Fig. 22-24) with 8 setae. All tarsi with thin scopula, throughout the length of the article. Tarsi I–II with scopula divided by two series of thicker setae at the middle line of the ventral face, but tarsi III–IV with many setae arranged in several rows covering most of the ventral face throughout the article. Metatarsi I–II with undivided thin scopula, covering both sides and the ventral face. Metatarsi III–IV without scopula. All tarsi provided with few small cracks covering only the median area of the ventral and lateral faces. Spines: leg I: femur d2–1–1 left, d1–2–0 right; patella 0; tibia p0–0–1, r0–0–1 left, r0 right, v0–0–2; metatarsus v0–3–2ap; leg II: femur d1–2–0, pld0–0–1; patella 0; tibia p0–0–1, v0–0–2ap; metatarsus v1–2–2ap; leg III: femur d1–0–0 left, d0 right, pld0–0–1, rld0–0–1 left, rld0–0–2 right; patella r0–0–1 left, r0–1–0 right, pld0–0–1 right; tibia p1–2–0 left, p0–1–0 right, r1–1–1 left, r1–2–0 right, v0–0–2ap; metatarsus p1–3–1 left, p2–3–2 right, r1–2–1, v1–3–3ap left, v1–5–3ap right; leg IV: femur d1–2–0, rld0–0–2, patella p0–0–1, r0–1–0, tibia p0–2–0, r1–1–1, v0–1–2ap; metatarsus p1–1–0, r1–1–0, v1–2–1ap. Spermathecae (Fig. 25) separated by about 50% of its length, with a thick stem and similar width up to the distal lobules. Stem strongly bent forward at the distal third, bearing one large internal lobe just before the curvature and two apical lobules, all with similar size.

Color pattern

Both sexes with carapace reddish brown, thoracic furrows and cephalic area slightly darker, sometimes all the carapace dark reddish brown. Eye area black. Chelicera reddish brown; labium, sternum and leg coxae reddish orange brown with darker sigillae. Legs orange brown. Abdomen dark brown, bearing short and large light brown transversal stripes with irregular outlines, placed only over the flanks, many light brown spots between and underneath the stripes. Venter pale brown.

Variation

Total length may vary from 16.2 to 18.5 in males and from 15.3 to 26 in females. Cheliceral teeth on promargin varying from 8 to 11 in both males and females. The maxillary cuspules may vary between 12 and 15 in males and 14 and 19 in females. In females, the lyra is composed by 6 to 8 setae.

Synonymy and notes

Lucas 1857 described *Mygale lineata* based on a male specimen from the surroundings of the city of Rio de Janeiro. The collecting locality was probably Tijuca Forest, as many foreigners had houses or farms in the area and collecting trips to other localities were not encouraged by Brazilian government. Considering the common practice in that time and the illustration of the habitus (Lucas 1857: fig. 1), the male holotype was probably dried and pinned. The small abdomen seems shrunk and folded at both sides of the dorsum, what gives an impression of a median light longitudinal stripe. The holotype may be lost, as it was not found at the MNHN collection during a visit by the first author and it was not located by the MNHN curator afterward.

Bertkau (1880) described *Thalerothele fasciata* based on a female from Tijuca. The holotype of this species is probably lost, like most Bertkau's type material (e.g., Levi 1969: 71, 1991: 203, 210; Höfer & Brescovit 2000: 332). The description given by Bertkau (1880: 24) for *Thalerothele fasciata*, including an illustration of the female habitus (Bertkau 1880: fig. 6), is extensive. However, it does not give details of the genitalia, as Bertkau considered that it was probably an immature female (Bertkau 1880: 25). On the other hand, the illustration depicts the typical color pattern of *D. lineata*. The 14.5 mm body

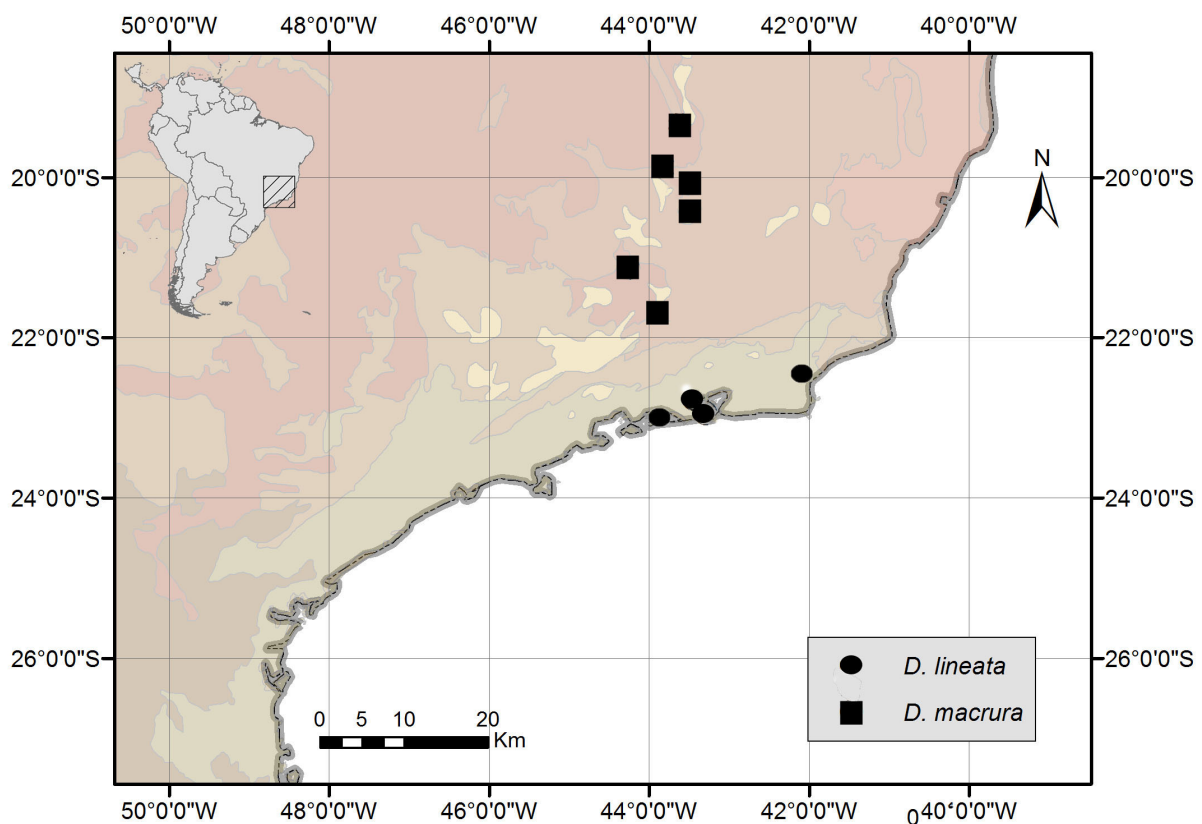


Fig. 26. Map showing the known records of *Diplura macrura* (C.L. Koch, 1841) and *Diplura lineata* (Lucas, 1857).

length of the immature female holotype is just a little less than the 15.3 to 23.5 mm found in *D. lineata* fully grown females. There are 8 teeth on the promargin of the chelicera, what is similar to the 8 to 11 teeth in *D. lineata*. Compared to the range of 14–19 cuspules in *D. lineata*, the smaller number (6–7) of *T. fasciata* holotype is probably due to its small age, as immature *D. lineata* have less cuspules on maxilla and there is a well-known increase in number of cuspules with age and size in many Mygalomorphae.

Mello-Leitão (1924: 186) established *Harmonicon nigradorsi* (now *Diplura nigradorsi*) for one female holotype from the city of Rio de Janeiro. Furthermore, the redundant description of the same species (Mello-Leitão 1926: 10) also mentioned only the female holotype (“typo”). Both descriptions of *Harmonicon nigradorsi* (Mello-Leitão 1924, 1926) are short, without mention to genitalia or any clear diagnostic trait in relation to *D. lineata*. When examining the type vial (MNRJ 17, MLPC 847), we found a male from the same species, besides the female holotype. Bücherl *et al.* (1971: 119) considered the male “tipo” (holotype) and the female as a “sintipo” (paratype), in spite of clear indication by Mello-Leitão that the holotype was a female, without mention to any additional specimen. The female holotype is badly preserved and darkened, with chelicerae, legs and most of the pedipalps separated from the body. Only the coxa (maxilla) and trochanter of the right pedipalp are still connected to the holotype body, and the maxilla of the left pedipalp is missing. Dissection of the genital area revealed an small genitalia, with lobes not completely developed, indicating that the female was not old, but show the pattern found in *D. lineata* (Fig. 25). The color pattern is barely visible, probably due to former events of desiccation. The original description mentioned a large dark median band on the back of abdomen, with sinuous margins, delimited by light stripes at each side. Also, there were light spots scattered over the sides. To date, the shrunk abdomen still displays the light brown transversal stripes with irregular outlines and some light brown spots underneath the stripes also found in typical *D. lineata*. The male (total length 19.5) was clearly erroneously included in the holotype vial and seems to have been collected later, as it is in a better state than the female, although also shrunk and darkened. The chelicerae, coxae and trochanter II–IV and left femur IV are still attached to the body. The severely shrunk abdomen still shows the light brown stripe as in the female. The copulatory bulb, lyra with 6 setae, tibia I retrolateral spur and metatarsus I tubercle are also similar to *D. lineata*. The illustration of the copulatory bulb by Bücherl *et al.* (1971: fig. 15) is misleading, as it depicts a very elongated and wide embolus, compared to smaller and thinner embolus found in the vial, similar to *D. lineata* (Figs 17–21). On the other hand, the tibia and metatarsus I in fig. 16 are accurate and similar to *D. lineata* (Fig. 16).

In relation to the original description, there are two numbers for the total length of the holotype of *D. nigradorsi*: 28 mm (Mello-Leitão 1924) and 23 mm (Mello-Leitão 1926). Probably both numbers are wrong, but 23 mm falls in the range observed for females of *D. lineata* (15.3–26) and is closer to the current shrunk size of the holotype (13.5). Mello-Leitão cited only 8 cheliceral teeth, but there are also 3 small teeth he may have overlooked. He also cited 12–14 cuspules on the maxilla of the holotype. The inner corner of the right maxilla has 14 cuspules, but there is a scar on that area, what may indicates that the original number of cuspules was higher. Anyway, the number of teeth and cuspules both fall within the range of *D. lineata*, but there is a lot of variation in the number of those structures throughout species of *Diplura*. There are 5 setae in the lyra of the holotype of *D. nigradorsi*, just one less than the minimal number found in *D. lineata*. This is obviously just intraspecific variation, as the female is a young mature specimen. Finally, only one species of *Diplura* has been found in the dozens of collection trips to forested areas in Rio de Janeiro city. Following the reasons above, the three described species are considered synonyms, and *D. lineata* prevails as the senior synonym.

Habitat

Specimens of *D. lineata* have been found under fallen logs in humid areas of the Atlantic forest. The spiders do not make funnel-webs, but apply silk to the tunnels or log cavities. Sometimes they build small entrance silk tubes or connect some tubes in a small silk network inside log cavities.

Distribution (Fig. 26)

Known only from the state of Rio de Janeiro, Brazil, restricted to the municipalities of Casimiro de Abreu, Nova Iguaçu, Rio de Janeiro and Mangaratiba. The records for Venezuela and Colombia (Simon 1889: 188) and for the state of Santa Catarina, Brazil (Mello-Leitão 1923: 101–102) are probably erroneous. The specimens cited by Simon may belong to *D. sanguinea* (F.O. Pickard-Cambridge, 1896) or a related species, as we have examined specimens from Colombia belonging to that species-group.

Discussion

Currently, the accepted distribution of *Diplura* includes Cuba, Venezuela, Ecuador, Brazil, Bolivia, Paraguay and Argentina (World Spider Catalog 2015). As discussed above, the records for *D. macrura* from Cuba or any other Caribbean or West Indies localities are erroneous. We have been able to examine a male of *Diplura sanguinea* from Arraiján: Cerro Silvestre, belonging to personal collection of Roberto Miranda. Therefore, the northernmost record known for *Diplura* is from a locality in central Panamá, near Panamá city. As pointed out above, Colombia should also be included in the distribution range for *Diplura*.

One additional remark on the distribution of *Diplura* is the correct type-locality of *Diplura parallela* (Mello-Leitão, 1923). This species is erroneously cited for Argentina in the World Spider Catalog (2015) and older catalogs. However, the holotype and only known specimen of *D. parallela* was collected from an unknown locality in the state of Paraná, Brazil, as Mello-Leitão (1923: 100) stated in the original description. This mistake has probably arisen from the homonymy of Paraná, a locality in the Entre-Ríos province, northern Argentina, and the state of Paraná, in southern Brazil.

Taking into account the synonymies we established in this paper, 17 valid described species remain in *Diplura*. Ten of the described species are recorded from Brazil, two species each from Argentina and Bolivia, and just one for Ecuador, Paraguay and Venezuela. Additionally, there are records of unidentified species from Colombia and Panamá. In summary, the revised distribution range of *Diplura* goes from south Panamá to north Argentina.

Acknowledgments

We thank Osvaldo Villarreal Manzanilla (MNRJ) and Adriano Brillhante Kury for the aid with the map, Marcelo Henrique de Oliveira Sales (UFRJ) by technical support on SEM photos, Ricardo Monteiro and Margarete Macedo, of the Laboratório de Ecologia de Insetos (UFRJ), and Sérgio Potsch de Carvalho-Silva, of the Laboratório de Herpetologia (UFRJ), for allowing the use of equipment for photos and measurements. We also thank Rogério Bertani (Instituto Butantan) for the live specimen photographs and additional samples. This work was supported by a Ph.D. grant from Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ).

References

- Alayón G.G. 2000. Las arañas endémicas de Cuba (Arachnida: Araneae). *Revista Ibérica de Aracnología* 2: 1–48.
- Ausserer A. 1871. Beiträge zur Kenntnis der Arachniden-Familie der Territelariae Thorell. *Verhandlungen der königlich-kaiserlichen zoologisch-botanischen Gesellschaft in Wien* 21: 117–224. Available from <http://biodiversitylibrary.org/page/16425408> [accessed 9 Jun. 2016]
- Banks N. 1909. Arachnida of Cuba. *Estación Central Agronómica de Cuba, Second Report* 2: 150–174.
- Bertkau P. 1880. Verzeichnis der von Prof. Ed. van Beneden auf seiner im Auftrage der Belgischen Regierung unternommen wissenschaftlichen Reise nach Brasilien und La Plata im Jahre 1872–73

gesammelten Arachniden. *Mémoires Couronnés et Mémoires des Savants Étrangers de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique* 43: 1–120.

Blackwall J. 1867. Remarks on the falces and maxillae of spiders. *Annals and Magazine of Natural History* (3) 19: 258–259.

Bryant E.B. 1940. Cuban spiders in the Museum of Comparative Zoology. *Bulletin of the Museum of Comparative Zoology at Harvard College* 86: 247–532. Available from <http://biodiversitylibrary.org/page/2776159> [accessed 9 Jun. 2016]

Bücherl W. 1957. Sobre a importância dos bulbos copuladores e das apófises tibiais dos machos na sistemática das aranhas caranguejeiras (Orthognatha). *Anais da Academia Brasileira de Ciências* 29 (3): 377–416.

Bücherl W., Timotheo da Costa A. & Lucas S. 1971. Revisão de alguns tipos de aranhas caranguejeiras (Orthognatha) estabelecidos por Cândido de Mello-Leitão e depositados no Museu Nacional do Rio. *Memórias do Instituto Butantan* 35: 117–138.

Dipluridae Contributors 2016. “Dipluridae Wiki”. Available from http://dipluridae.de/wiki/index.php?title=Main_Page&oldid=5389 [accessed 2 Feb. 2016].

Drolshagen B. & Bäckstam C.M. 2011. Notes on the genus *Harmonicon* F.O.P.-Cambridge 1896 (Araneae, Dipluridae) with description of a new species from French Guyana. *ZooKeys* 112: 89–96. <http://dx.doi.org/10.3897/ZooKeys.112.1205>

Dupérré N. & Tapia E. 2015. Descriptions of four kleptoparasitic spiders of the genus *Mysmenopsis* (Araneae, Mysmenidae) and their potential host spider species in the genus *Linothele* (Araneae, Dipluridae) from Ecuador. *Zootaxa* 3972 (3): 343–368. <http://dx.doi.org/10.11646/zootaxa.3972.3.3>

Geonames 2015. GeoNames Geographical Database. Available from <http://www.geonames.org/> [accessed 11 Dec. 2015].

Gerschman B.S. & Schiapelli R.D. 1942 [1940]. Una especie paraguaya del género *Parathalerothele* Canals, 1931. *Revista Chilena de Historia Natural* 44: 105–108.

Goloboff P. 1982. Descripción de la hembra de *Achetopus paraguayensis* (Gerschman y Schiapelli, 1940) Araneae Dipluridae. *Physis, Revista de la Sociedad Argentina de Ciencias Naturales (Secc. C)* 41: 103–105.

Höfer H. & Brescovit A.D. 2000. A revision of the Neotropical spider genus *Ancylometes* Bertkau (Araneae: Pisauridae). *Insect Systematics & Evolution* 31: 323–60. <http://dx.doi.org/10.1163/187631200X00075>

Koch C.L. 1841. *Die Arachniden*. Vol. 9. C.H. Zeh'schen Buchhandlung, Nürnberg.

Koch C.L. 1850. *Übersicht des Arachnidensystems*. Vol. 5: 1–77. J.L. Lotzbeck Verlag, Nürnberg. Available from <http://biodiversitylibrary.org/page/27438049> [accessed 10 Jun. 2016]

Kury A.B. & Baptista R.L.C. 2004. Arachnological papers published by Cândido Firmino de Mello-Leitão (Arachnida). *Publicações Avulsas, Museu Nacional do Rio de Janeiro* 105: 1–17.

Levi H.W. 1969. Notes on American theridiid spiders. *Psyche* 76 (1): 68–73. <http://dx.doi.org/10.1155/1969/15815>

Levi H.W. 1991. The Neotropical and Mexican species of the orb-weaver genera *Araneus*, *Dubiepeira* and *Aculepeira* (Araneae: Araneidae) *Bulletin of the Museum of Comparative Zoology at Harvard College* 152 (4): 167–315. Available from <http://biodiversitylibrary.org/page/4782002> [accessed 10 Jun. 2016]

- Lucas H 1857. Arachnides. In: de Castelnau F. (ed.) *Expédition dans les parties centrales de l'Amérique du Sud* 3 (7): 14–23. Bertrand, Paris. Available from <http://biodiversitylibrary.org/page/39510126> [accessed 10 Jun. 2016]
- Lutz F.E. 1915. List of Greater Antillean Spiders, with notes on their Distribution. *Annals of the New York Academy of Sciences* 26: 71–148. Available from <http://biodiversitylibrary.org/page/35615371> [accessed 10 Jun. 2016]
- Maréchal P. & Marty C. 1998. Réhabilitation du genre *Harmonicon* (Pickard Cambridge, 1896) et description d'une nouvelle espèce de Guyane Française (Araneae, Mygalomorphae, Dipluridae). *Zoosystema* 20: 499–504.
- Mello-Leitão C.F. 1923. Theraphosoïdeas do Brasil. *Revista do Museu Paulista* 13: 1–438. Available from <http://biodiversitylibrary.org/page/48495390> [accessed 10 Jun. 2016]
- Mello-Leitão C.F. 1924. Quelques arachnides nouveaux du Brésil. *Annales de la Société Entomologique de France* 93: 179–187.
- Mello-Leitão C.F. 1926. Algumas Theraphosoïdeas novas do Brasil. *Revista do Museu Paulista* 14: 307–324.
- Mello-Leitão C.F. 1937. Aranhas novas ou raras. *Anais da Academia Brasileira de Ciências* 9: 1–12.
- Mello-Leitão C.F. 1943. Araneologica varia brasiliana. *Anais da Academia Brasileira de Ciências* 15: 255–265.
- Muchmore W.R. 1993. List of terrestrial invertebrates of St. John, U.S. Virgin Islands (exclusive of Acarina and Insects), with some records of freshwater species. *Caribbean Journal of Sciences* 29 (1–2): 30–38.
- Papavero N. 1973. *Essays on the History of Neotropical Dipterology, with Special Reference to Collectors (1750–1905)*. Vol. 2. Museu de Zoologia, Universidade de São Paulo, São Paulo.
- Pedroso D.R. & Baptista R.L.C. 2014. A new troglomorphic species of *Harmonicon* (Araneae, Mygalomorphae, Dipluridae) from Pará, Brazil, with notes on the genus. *ZooKeys* 389: 77–88. <http://dx.doi.org/10.3897/zookeys.389.6693>
- Pedroso D.R., Baptista R.L.C. & Ferreira P.S.F. 2008. *Trechona rufa* (Araneae, Dipluridae): new status, redescription and neotype designation with notes on the genus. *Journal of Arachnology* 36: 360–367. <http://dx.doi.org/10.1636/CA07-109.1>
- Petrunkévitch A. 1911. A synonymic index-catalogue of spiders of North, Central and South America with all adjacent islands, Greenland, Bermuda, West Indies, Terra del Fuego, Galapagos, etc. *Bulletin of the American Museum of Natural History* 29: 1–791. Available from <http://biodiversitylibrary.org/page/26894555> [accessed 10 Jun. 2016]
- Petrunkévitch A. 1926. Spiders from the Virgin Islands. *Transactions of the Connecticut Academy, Arts and Sciences* 28: 21–78.
- Platnick N.I. 1993. *Advances in Spider Taxonomy 1988–1991, with Synonymies and Transfers 1940–1980*. New York Entomological Society, New York.
- Platnick N.I. 1998. *Advances in Spider Taxonomy 1992–1995 with Redescriptions 1940–1980*. New York Entomological Society, New York.
- Pocock R.I. 1896. On the presence of Wood Mason's stridulating organ in *Trechona zebrata*. *Annals and Magazine of Natural History* (6) 17: 177–179. <http://dx.doi.org/10.1080/00222939608680344>

- Raven R.J. 1985. The spider infraorder Mygalomorphae (Araneae): Cladistics and systematics. *Bulletin of the American Museum of Natural History* 182: 1–180.
- Rego M.A., Moreira-Lima L., Silveira F. & Frahnert S. 2013. On the ornithological collection of Friedrich Sellow in Brazil (1814–1831), with some considerations about the provenance of his specimens. *Zootaxa* 3616 (5): 478–484. <http://dx.doi.org/10.11646/zootaxa.3616.5.4>
- Schiapelli R.D. & Gerschman de P. B.S. 1968. El género *Achetopus* Tullgren 1905 (Araneae, Dipluridae). *Physis, Revista de la Sociedad Argentina de Ciencias Naturales (C)* 28: 183–192.
- Silva-Moreira T. da, Baptista R.L.C., Kury A.B., Giupponi A.P.L., Buckup E.H. & Brescovit A.D. 2010. Annotated check list of Arachnida type specimens deposited in the Museu Nacional, Rio de Janeiro. II – Araneae. *Zootaxa* 2588: 1–91.
- Simon E. 1889. Arachnides. In: Voyage de M. E. Simon au Venezuela (Décembre 1887 – Avril 1888). 4e Mémoire. *Annales de la Société Entomologique de France* (6) 9: 169–220. Available from <http://biodiversitylibrary.org/page/32438721> [accessed 10 Jun. 2016]
- Simon E. 1903. *Histoire Naturelle des Araignées, vol. 2 (4, Suppl. Gén.)*: 669–1080. Paris. Available from <http://biodiversitylibrary.org/page/36005327> [accessed 22 Jun. 2016]
- World Spider Catalog 2015. *World Spider Catalog*, version 16.5. Natural History Museum Bern. Available from <http://wsc.nmbe.ch> [accessed 11 Dec. 2015].

Manuscript received: 15 December 2015

Manuscript accepted: 16 March 2016

Published on: 7 July 2016

Topic editor: Rudy Jocqué

Desk editor: Kristiaan Hoedemakers

Printed versions of all papers are also deposited in the libraries of the institutes that are members of the *EJT* consortium: Muséum national d'Histoire naturelle, Paris, France; Botanic Garden Meise, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Natural History Museum, London, United Kingdom; Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands.