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Diaphoromyrma, a new myrmicine ant genus (Hymenoptera: Formicidae) from North Eastern Brazil

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Abstract

Diaphoromyrma sofiae, **new genus** and **new species**, is a Myrmicinae ant described from workers from the State of Bahia, Brazil. This taxon is characterized by the following traits: Antenna 9-segmented with 2-segmented club, trapezoidal promesonotum in dorsal view, propodeal spiracles situated on the propodeal edges, and the fourth abdominal sternite with a pair of rounded recurved anterolateral extensions which curve up onto the dorsal surface of the segment. Apparently this ant is close to the genera *Allomerus* and *Diplomorium* in the Solenopsidini, but its tribal attribution remains difficult because of the inadequate resolution of the phylogenetic relationships within the Myrmicinae.

Key words: Brazil, Formicidae, Hymenoptera, *Diaphoromyrma sofiae*, new genus, new species

Introduction

In taxonomic terms ants are currently one of the better known insect groups, with most recent publications dealing with descriptions of new species rather than higher taxa. Discovery of new taxa above the species level seems to be increasingly uncommon. With the widespread use of Winkler sampling (Agosti *et al*. 2000), the exploration of the subterranean realm (Wilkie *et al*. 2007) and the recognition of special microhabitats such as the insides of termites mounds (Rosa da Silva *et al.* 2009), however, new higher taxa continue to be revealed, even at the level of subfamily (e.g. Rabeling *et al.* 2008).

In this paper we describe a new myrmicine ant genus based on specimens collected in the State of Bahia, North-Eastern Brazil. This ant cannot be securely placed in any of the currently accepted myrmicine tribes, as proposed in Bolton (2003).

Methods

All known specimens come from litter samples submitted to Winkler extractors.

Measurements were made using an Optical Instruments stereomicroscope at 80X magnification, studied under a white light lamp. All measurements are in mm: HW—Head width: maximum width in full face view; HL—Head length: maximum length, in full face view, from the clypeus apex to middle of the vertex; SL—Scape length (excluding basal condyle), chord distance; EL—Maximum eye length; PW—Pronotal width;

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WL—Weber´s length: length of mesosoma, diagonally from the most anterior corner of pronotum to the posteroventral corner of mesosoma; PL—Petiole length; PPL- Postpetiole length; GL—Gaster length; TL—Total length; CI—Cephalic index: 100*HW/HL; SI—Scape index: 100*SL/HW.

Automontage pictures were taken by April Nobile in the CASC, San Francisco. SEM pictures were taken on the Carl Zeiss Microscope LEO 1430 VP of the Universidade Estadual de Feira de Santana (UEFS), after the ant material was gold-metallized ("sputtering") in a Balzer SCD 030 apparatus.

Collections

BMNH	The Natural History Museum, London, U.K.
CASC	California Academy of Sciences. San Francisco, USA.
CPDC	Centro de Pesquisas do Cacau, Comissão do Plano de Lavoura, Ilhéus, Bahia, Brazil.
IAvH	Instituto Humboldt, Claustro San Agustín, Villa de Leyva, Boyacá, Colombia.
IBUS	Instituto de Biologia, Universidade Federal Rural do Rio de Janeiro, Seropédica, Rio de Janeiro, Brazil.
ICN	Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia.
IMLA	Instituto Miguel Lillo, Universidad Nacional de Tucumán, Argentina.
INPA	Instituto Nacional de Pesquisa da Amazônia, Manaus –AM, Brazil
LACM	Los Angeles County Museum of Natural History, Los Angeles, USA.
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, USA.
MIZA	Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Venezuela.
MNHN	Museum National d'Histoire Naturelle, Paris, France.
MZSP	Museu de Zoologia, Universidade de São Paulo, Brazil.
PSWC	Phil S. Ward Collection, University of California, Davis, USA
USNM	United States National Museum of Natural History, Washington, D.C. USA.

Taxonomy

Diaphoromyrma gen. n.

Type species: ***Diaphoromyrma sofiae,* sp. n.,** by present designation.

Diagnosis (worker). Monomorphic ants belonging to the subfamily Myrmicinae.

Palp formula 3,2 (*in situ*).

Anterior clypeal border broadly convex.

Clypeus broad, evenly rounded, devoid of carinae and broadly inserted between the widely separated frontal lobes.

Row of hairs on the anterior clypeal margin, including median seta.

Tentorial pits inserted midway in the clypeal margin.

Antennal scrobe absent.

Antenna with 2-segmented club.

In lateral view, promesonotum strongly convex.

In dorsal view the promesonotum triangular, with sides well defined.

Propodeal spiracles conspicuous, situated on the dorsal edge of declivous face of propodeum, breaking the propodeal outline in lateral view.

Propodeum unarmed.

Propodeal lobes small and rounded, not linked by a dorsal carina.

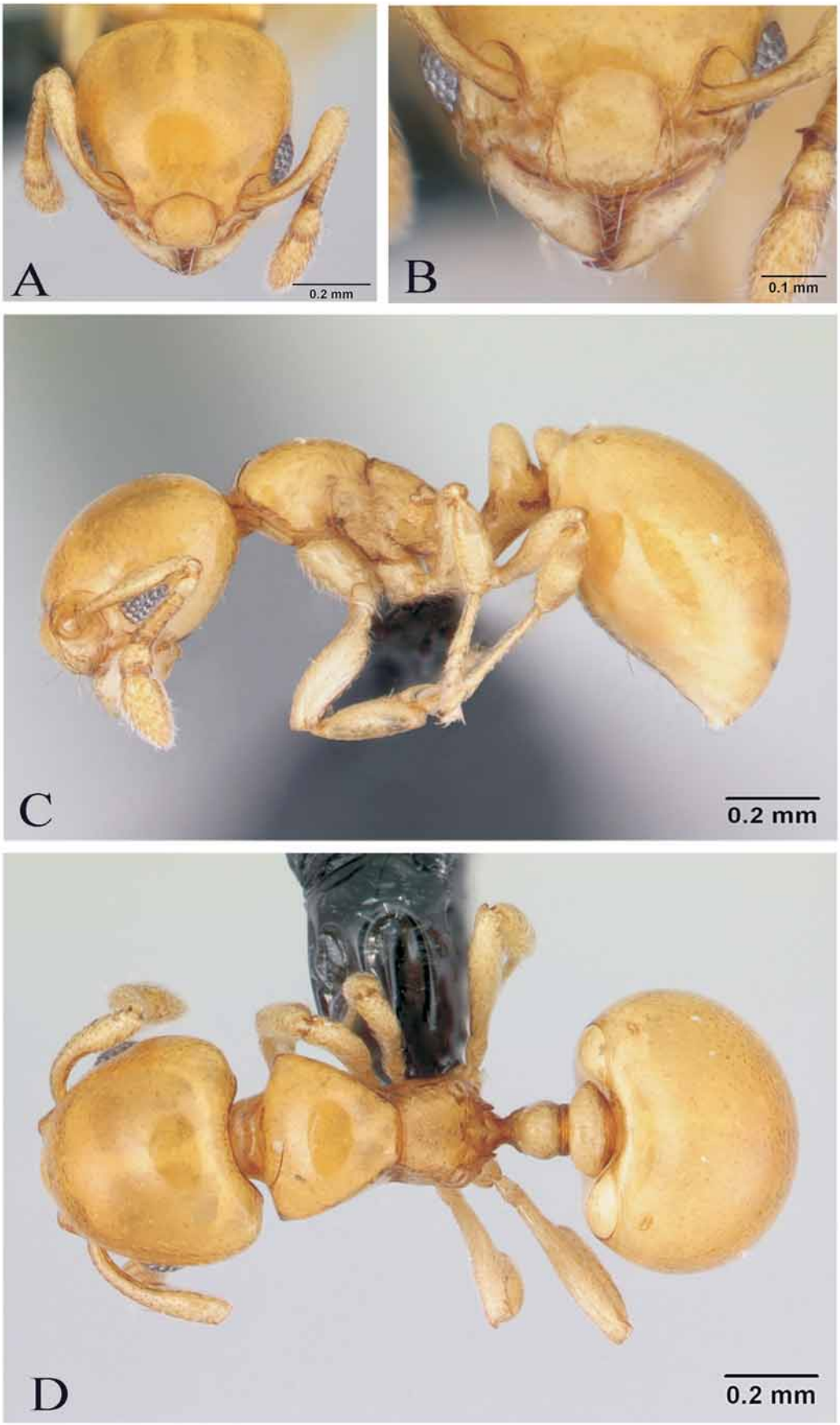

FIGURE 1. *Diaphoromyrma sofiae*, **n. gen. & n. sp.** Automontage pictures, paratype worker. A: Head in full face view; B: Clypeal area of head; C. Body in lateral view; D. Body in dorsal view. Pictures taken by April Nobile (CASC).

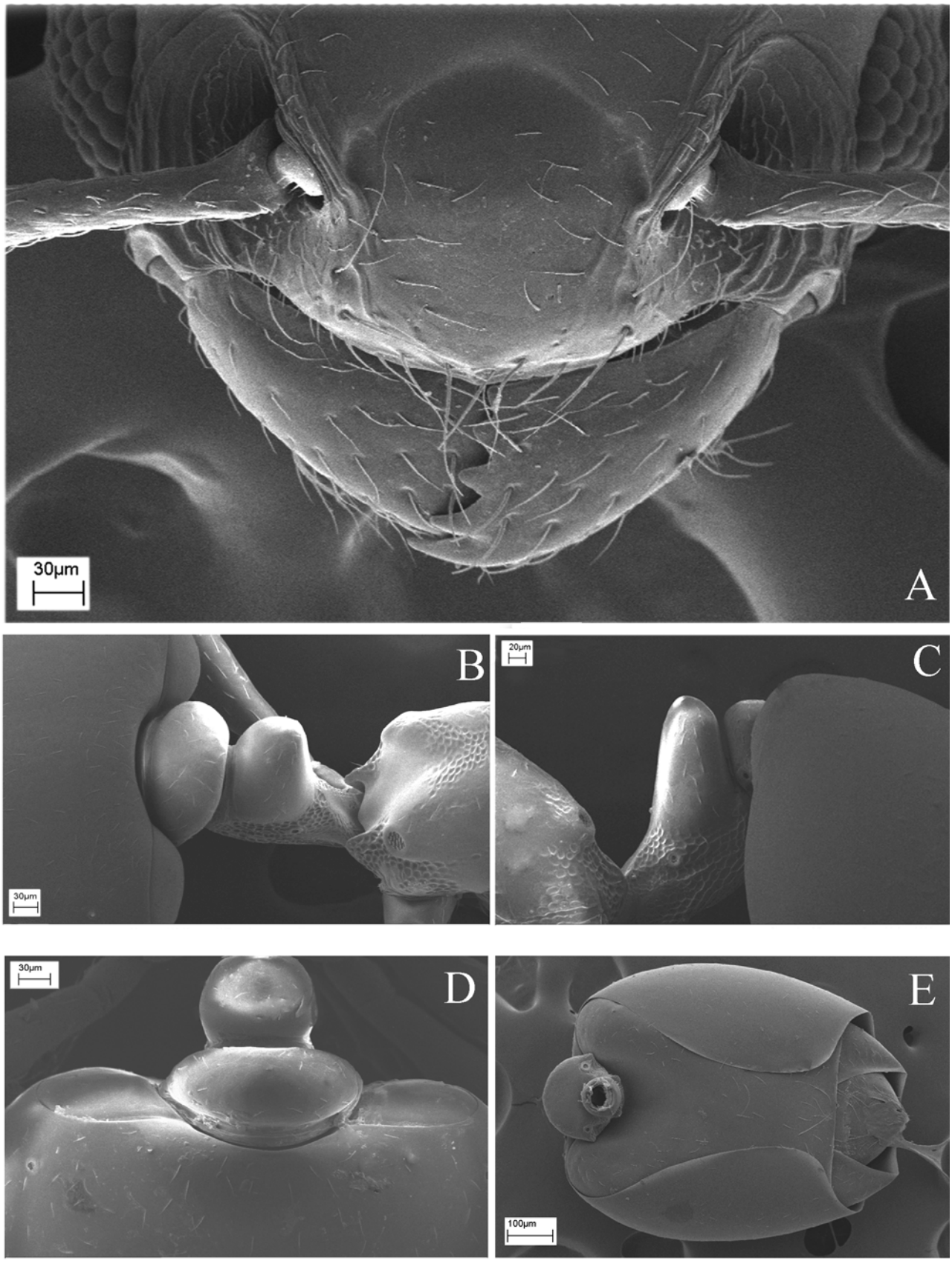

FIGURE 2. *Diaphoromyrma sofiae*, **n. gen. & n. sp.** SEM pictures, paratype worker. A: Clypeus and mandibles in full face view; B: Propodeum, petiole and postpetiole in dorsal oblique view; C. Petiole and postpetiole in lateral view; D. Petiole, postpetiole and first gastral segment in dorsal view. E. Gaster in ventral view.

Petiolar node high in relation to the postpetiolar node, narrow (in dorsal view) in contrast with the broader, postpetiole node.

Postpetiole attached low on the gaster, so the top of the first gastral tergum at about the same level as the postpetiole.

Abdominal sternite 4 (first gastral) with a pair of rounded recurved anterolateral extensions which curve up on to the dorsal surface of the segment, and are visible in dorsal view on either side of the postpetiole.

Comments. The combination of the following traits differentiate this taxon from any other in the subfamily Myrmicinae: antenna 9-segmented with a 2-segmented club, clypeus broad, clypeus with central apical hair, promesonotum trapezoidal, propodeal spiracles situated on lateral propodeal edges. The low position of the postpetiole and the sternal configuration of the first gastric segment are unique in Myrmicinae and apomorphic for the genus.

Etymology. *Diaphoromyrma* is a neologism forged from the Greek words διάφορος (*diaphoros*), meaning different or remarkable, and μύρμηκος (*myrmekos*), ant. This name alludes to the several traits that differentiate this genus from any other Myrmicinae, especially those relative to the gaster.

***Diaphoromyrma sofiae*, sp. n.**
(Figs. 1 & 2)

Type material: Holotype worker, Brazil: Bahia, Santa Cruz Cabrália, Sucupira-b, Veracel Celulose reserve áreas, Winkler trap, 16º16'32"S 39º16'13"W, 5 November 2006, I. C. do Nascimento col., deposited in CPDC.

Paratypes: **18** workers, same data as holotype; **19** workers, Brazil: Bahia, Santa Cruz Cabrália, Sucupira-c, Winkler traps,16º15'08"S 39º16'55"W, 1 December 2006, I. C. do Nascimento col.; **13** Workers, Brazil, Bahia, Santa Cruz Cabrália, Sucupira-c, Winkler traps, 16º15'08"S 39º16'55"W, 19 January 2007, I. C do Nascimento col., deposited in BMNH, CASC, CPDC, IAvH, IBUS, ICN, IMLA, INPA, LACM, MCZC, MIZA, MNHN, MZSP, PSWC, USNM.

Non type material: **2** workers, Brazil: Bahia, Santa Cruz Cabrália, Pequizeiro, Winkler traps, 16º17'28"S 39º25'05"W, 8 August 2006, J. R. M. Santos & J. C. S. Carmo cols.; **9** workers, Brazil, Bahia, Santa Cruz Cabrália, EVC-E – Etapa 2, Winkler traps, 16º18'54"S 39º09'34"W, 12 April 2007, I. C do Nascimento col.; **4** workers, Brazil, Bahia, Santa Cruz Cabrália, Sucupira-b, Winkler traps, 16º16'32"S 39º16'13"W, 19 January 2007, I. C do Nascimento col.; **5** workers, Brazil: Bahia, Santa Cruz Cabrália, Sucupira-c – Etapa 2, Winkler traps, 16º15'08"S 39º16'55"W, 10 January 2007, I. C. do Nascimento col., deposited in CPDC; **2** workers, Brazil, Bahia, Porto Seguro, Estação Pau-Brasil (ESPAB-CEPLAC), Projeto BIOTA/FAPESP, Winkler traps [8, 26], 16º23'33"S 39º10'99"W, 16 June 2000, J. R. M. Santos & J. C. S. Carmo cols., deposited in MZSP.

Worker measurements. Holotype (Paratypes n = 10): HW 0.54 (0.51 – 0.54); HL 0.58 (0.57 – 0.60); SL 0.40 (0.39 – 0.40); EL 0.14 (0.14); PW 0.42 (0.39 – 0.42); WL 0.51 (0.47 – 0.56); PL 0.18 (0.15 – 0.22); PPL 0.13 (0.08 – 0.13); GL 0.90 (0.76 – 0.90); TL 2.39 (2.09 – 2.48); CI 93 (85 – 93); SI 74 (71 – 76).

Description. Head broadly triangular, with rounded sides, narrowed anteriorly, vertex and sides slightly convex (Fig. 1A). Mandibles triangular, with 5 teeth on the masticatory border, the apical and subapical larger than the others. Antenna with 9 segments. Scape clearly fails to reach the vertexal margin. Eyes well developed, situated near anterior margin of the head, with about 8 ommatidia in their maximum diameter. . In dorsal view, promesonotum trapezoidal, sides and dorsum well defined (Fig. 1D). Promesonotum strongly convex in lateral view (Fig. 1C). Promesonotal suture well defined dorsally and laterally. Propodeum unarmed. Propodeal spiracles conspicuous, situated on the edge of declivitous face of propodeum, their aperture obliquely directed backward and upward (Fig. 2C). Metapleural gland bullae conspicuous, bigger than propodeal spiracle. Propodeal lobes small, rounded. Petiole in profile with short anterior peduncle, followed by a high and narrow node, its apex narrowly pointed. Petiolar peduncle attains petiolar mid length.

Petiolar spiracle at base of node. Subpetiolar process present, as a keel-like lamella that ends in rounded apex anteriorly. Postpetiole low, rounded in frontal view (Fig. 2E), noticeably wider than long in dorsal view. Gaster without humeral angles basally. Head, promesonotum, petiole, postpetiole, gaster, scapes and legs smooth and shining. Lower side of mesopleuron and petiolar peduncle finely reticulated; propodeum with fine reticulation on the declivous face, between the propodeal spiracles and on the metasternal lobes. Body devoid of standing pilosity, except for very short, sparse minute hairs on head, legs and scape. Reclined minute hairs on thorax and gaster. Pilosity denser and longer on antennae. Row of hairs on the anterior clypeal margin, including median hair (not visible in the Automontage Picture). Central clypeal hair accompanied by two lateral hairs, although both lateral hairs not in the same plane (in full face view the 3 hairs appearing as the same length). Body yellow, eyes and mandibular teeth dark. Pilosity golden.

Gyne, male, and larva: Unknown.

Etymology. The specific name honors our colleague myrmecologist Sofia Campiolo, from Universidade Estadual de Santa Cruz (Bahia, Brazil) and Driades Institution, who obtained the research funds from Veracel Celulose, allowing an extensive regional ant survey.

Comments. The combination of traits in the diagnosis differentiates this thus far monotypic genus from any other myrmicine. The unique shape of the promesonotum, trapezoidal in dorsal view and with well defined angles at the sides; the comparatively high and narrow petiolar node, contrasting with the broader, low and round postpetiolar node, the low position of the insertion of the postpetiole on the anterior face of first gastral segment, and the dorsal extensions of abdominal sternite 4 are unique and represent potential apomorphies of *Diaphoromyrma*.

Usually in myrmicine ants the dorsal margin of the postpetiole is higher than the top of first gastral tergite, in lateral view. In *Diaphoromyrma* the joining of the postpetiole with the gaster is so ventral that the postpetiole in lateral view is very low relative to the upper margin of the gaster. The rounded and recurved anterolateral extensions of the fourth abdominal sternite, which curve up onto the dorsal surface of the segment and are visible in dorsal view, delimiting two round semicircular areas (Figs. 1D, E), are unique in Myrmicinae. Some cephalotines have differentiated anterolateral extensions on abdominal segment 4, but from the tergite, and not from the sternite (Ward, comm. per.).

There are rows of setae on the anterior clypeal margin, including a central seta. Although not shown on the Automontage view (Fig. 1B), the central seta is visible on the SEM picture (Fig. 2A).

As with some other myrmicine ant genera recently described (*Tyrannomyrmex*, *Dolopomyrmex*, *Tropidomyrmex*), *Diaphoromyrma* is difficult to relate to any of the tribal taxa defined by Bolton (2003). The central clypeal seta is characteristic of the Solenopsidini (*sensu* Bolton 1987), although they may not be homologous, but the clypeal configuration differentiates *Diaphoromyrma* from this group as defined in Bolton (2003:57). As pointed out by Bolton (1987 and 2003:57), *Allomerus* and *Diplomorium* are problematical genera in the Solenopsidini, as the posterior portion of the clypeus is relatively broad. However, *Diaphoromyrma* lacks any of the diagnostic attributes of both genera (antennal club segments constricted basally in *Allomerus* and postpetiole broadly attached to the gaster in *Diplomorium*; and also antennal club 3-segmented in both genera). The 2-segmented antennal club and the specialized first segment of the gaster suggest that *Diaphoromyrma* is not closely related to either of these genera.

The membership of *Diaphoromyrma* in Stenammini or Adelomyrmecini (the other tribes of the solenopsidine tribe group [Bolton 2003]) is unlikely. *Diaphoromyrma* lacks the specialized lamellate hairs on the ventral side of masticatory margin of adelomyrmecine mandibles (Fernández 2004) or the various traits listed in Bolton (2003:58) for stenammines, namely the clypeal configuration. Although *Diaphoromyrma* possess the clypeus broadly inserted between the frontal lobes, it lacks any of the traits defining the tribes Myrmicini, Lenomyrmecini, Pheidolini, Tetramoriini or Paratopulini. *Diaphoromyrma* should also be compared with the formicoxenine tribe group (Bolton 2003:65). The membership of the genus in the tribe Formicoxenini is complicated by several differences: the toruli are slightly exposed in *Diaphoromyrma* (partially visible in only a few taxa of Formicoxenini, Bolton 2003), the propodeal lobes are relatively reduced (present and usually rounded in Formicoxenini), the antenna is 9-segmented with 2-segmented club

(antenna with 8 to 12 segments and with 3 or 4–segmented club in Formicoxenini, but never with this combination, Bolton 2003). This genus is also clearly not a member of the other myrmicine tribes as presented or proposed in Bolton (2003).

According to an ongoing ant phylogenetic study by Phil Ward´s research group in Davis, University of California, *Diaphoromyrma* is not closely related to *Solenopsis* group. These studies offer strong support for a Solenopsidini *sensu stricto* clade, which is quite distinct from *Diaphoromyrma* and other myrmicines (Ward, com. per.).

Further collections and studies on gynes and males may throw some light on the phylogenetic affiliations of this new, enigmatic genus.

Ecological comments. This undescribed taxon was collected in litter samples taken in three rain forest remnants in the extreme southern portion of the State of Bahia, Brazil, using the Winkler technique, according to Agosti *et al*. (2000) methodology. The landscape is dominated by forested valleys inserted in the coastal plateau (Barreiras Formation, Tertiary origin). Most of the vegetation of the remnants was in an initial or medium stage of regeneration, in a region where eucalypt plantations currently predominate. Forty $1m^2$ litter samples were taken in each remnant, and *D. sofiae* was found in 5%, 10%, and 25% of samples in the remnants Pequizeiro, Sucupira B, and Sucupira C at Santa-Cruz Cabrália, respectively, while it was collected in 4% of samples in the ESPAB Mata Atlântica coastal wet forest reserve at Porto Seguro using the same methodology. This finding reinforces the biotic importance of this region and the Atlantic coastal forest of Brazil in general, an abundant source of recent information on ant biodiversity and other important biological features (Lacau & Delabie 2002, Lacau *et al*. 2004, Mariano *et al*. 2004, Delabie *et al*., 2007, Fernández 2007).

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