



RESEARCH ARTICLE - ANTS

A Remarkable New Dimorphic Species of *Solenopsis* from Argentina

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Abstract

Solenopsis Westwood (Myrmicinae: Solenopsidini) is an ant genus that represents a taxonomic challenge, including about 117 species in the New World, most of them Neotropical. *Solenopsis* can be divided into two artificial groups: “fire ants” and “thief ants”. The second group is represented by species often difficult to identify because of their small size and uniformity of color and sculpture. Most of the thief ants are pale yellow, monomorphic, and lestopibiotic, inhabiting small colonies often inside the nests of other ant species. In this paper we describe a new species of thief ant, *Solenopsis longicephala* sp. n., characterized by extreme dimorphism and with a set of characters probably convergent with other genera of Myrmicinae, such as *Carebara* and *Pheidole*.

Introduction

The ant genus *Solenopsis* Westwood (Myrmicinae: Solenopsidini) is a huge taxonomic challenge, not only for the great number of species that it contains, but also from phylogenetic and ecological points of view. At present, nearly 185 species of this genus have been recognized (Bolton, 1987; Pitts et al., 2005; Tschinkel, 2006), with about 117 species in the New World, most of them Neotropical (Pacheco & Mackay, 2013).

Until recently, there were no solid proposals regarding the systematics and phylogeny of solenopsidine ants. In 2003, Bolton proposed the Solenopsidini tribe group, including the tribes Solenopsidini and Stenammini. Within the first tribe (Solenopsidini), the same author distinguished two genus groups: that of *Solenopsis* and that of *Carebara*. Recently, Ward et al. (2015) published the first molecular phylogeny of the subfamily Myrmicinae, reducing the 26 tribes to only six, finding the tribe Solenopsidini (new sense) to be the sister group

of the combined tribes Attini (new sense) + Crematogastrini (new sense). According to Ward et al. (2015), Solenopsidini is expanded to include the tribes Adelomyrmecini, Myrmecariini, and Stegomyrmecini. *Solenopsis* (including *Carebarella*) appears as a strongly monophyletic group, sister to the clade *Kempfidris* + *Tropidomyrmex*, both Neotropical (Ward et al., 2015).

Currently *Solenopsis* comprises two informal groups. The first of these is the so-called “fire ants”, including about 20 species (Trager, 1991; Taber, 2000). This group contains the larger-sized species and is taxonomically better known. The name “fire ants” refers to the painful sting. It is this set of *Solenopsis* species that has received more attention because some of them are invasive, having been introduced from their places of origin to different regions of the world, causing serious economic losses and damages in these zones (Tschinkel, 2006).

Fire ant phylogeny has been explored in recent works (Pitts et al., 2005; Shoemaker et al., 2006). Other studies focus on the genetic and population biological aspects of the



invading species (e.g. Ross & Trager, 1990) or summarize general taxonomic information (Wilson, 1952; Ettershank, 1966; Buren, 1972).

The second group consists of species of thief ants formerly placed in the subgenus “*Diplorhoptrum*”. Most thief ant species are difficult to identify because of their small size and uniformity of color and sculpture. Most species are pale yellow, monomorphic, and lestoproct, inhabiting small colonies often inside the nests of other ant species. The combination of lestoproct and subterranean nests may explain why many thief ant species have been collected at low frequencies and are underrepresented in biotic surveys at local or regional scales. The biology and life cycles of thief ants are poorly known.

The only complete New World revision of the thief ant group is that of Pacheco and Mackay (2013), which proposes several species groups, many synonymies, and several new species. In Argentina, a total of 72 species and subspecies have been documented and the only available regional key is that of Kusnezov (1978), which is now out of date. In the present work a new remarkable species of *Solenopsis* is described. This new species is dimorphic and possesses a set of characters unusual for the genus, probably convergent with traits of other Myrmicinae genera, such as *Carebara* (now member of Crematogastriini, Ward et al., 2015).

Material and Methods

Photographs were taken with a Leica DFC295 camera attached to a Leica stereomicroscope and processed with Automontage software ver. 4.4.0 and Adobe Photoshop ver. CS5. All scale bars are in mm.

Measurements were made using a stereomicroscope at 40x. All measurements are in mm. The following abbreviations are used:

HL (Head Length). The length of the head capsule excluding the mandibles; measured in full-face view, as a straight line from the mid-point of the anterior clypeal margin to the mid-point of the posterior margin.

HW Head Width. The maximum width of the head behind the eyes, measured in full-face view.

EL (Eye Length). Maximum length of compound eye in lateral view.

EW (Eye Width). Maximum diameter of compound eye in lateral view.

SL (Scape Length). The maximum length of the scape, excluding the basal radicle.

SW (Scape Width). Maximum width of the scape in full-face view.

PW (Pronotal Width). The maximum width of the pronotum in dorsal view.

WL (Weber's Length of Mesosoma). The diagonal length of the mesosoma in profile, from the anteriormost point of the pronotum to the posterior basal angle of the metapleuron.

FL (Femur Length) Length of the profemur.

PL (Petiole Length), in dorsal view.

PPL (Postpetiole Length), in dorsal view.

CI (Cephalic Index). $(HW/HL)*100$.

SI (Scape Index). $(SL/HW)*100$.

EI (Eye Index). $(EW/EL)*100$.

Examined material will be deposited in the following Institutions:

MZSP. Museum of Zoology, São Paulo, Brazil.

ICN. Insect Collection, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia.

IFML. Instituto Fundación Miguel Lillo, San Miguel de Tucumán, Tucumán, Argentina.

Results and Discussion

Systematic treatment

Solenopsis longicephala, Cuezco and Fernández **new species** – Figures 1 (a-b); 2 (a-b)

Major Worker measurements: **Holotype** (Measurements of paratypes in parentheses, n=14): **HW** 0.675 (0.670-0.700), **HL** 0.975 (0.950-1.025), **SL** 0.425 (0.375-0.500), **SW** 0.1 (0.1), **EL** 0.050 (0.050-0.075), **EW** 0.050 (0.050), **PW** 0.450 (0.300-0.425), **WL** 0.950 (0.950-1.025), **FL** 0.425 (0.450-0.525), **PL** 0.300 (0.300), **PPL** 0.375 (0.350-0.400), **CI** 69 (68-71), **SI** 63 (56-71), **EI** 100 (67-100).

Body and appendages golden yellow.

Head: Noticeably longer than wide (CI 68-71). Posterior cephalic border sinuous, concave in middle, sides straight. Mandibles conspicuous, smooth and shining with a few short setae scattered on dorsal face; masticatory margin with four stout teeth and denticle behind third tooth. Mandibular teeth darker than rest of mandible. Median part of clypeus bicarinate. Clypeal carinae short, divergent, ending at posterior margin of antennal sockets. Anterior clypeal margin with two teeth and two extralateral denticles (see Fig.1a). One central seta in clypeal anterior margin, besides 6 short setae present on anterior margin of clypeus reaching to halfway point of closed mandibles. Sides of clypeus with four to five extremely short setae. Palpal formula 2-1. Maxillary palp geniculate. Second segment of labial palp distally swollen. Both palps (labial and maxillary) with two long setae, distally attached. Compound eye small (EI 67-100) with four to seven ommatidia, placed anterior to cephalic midline. Median ocellus present (Fig 1a). Antennae 10-segmented with apical club of two articles. Scape exceeding posterior margin of compound eye, but failing to reach vertexal border by more than its maximum width. Scape stout and flattened, ventrally concave. All segments of funiculus wider than long, except last one. Frontal lobes well developed, rounded, completely covering antennal sockets.

Mesosoma (Fig 1b): Straight in lateral view, with shallow notopropodeal suture. Propodeum convex, low, and unarmed. Propodeal spiracle circular, well developed, equidistant from propodeal border. Dorsopropodeum twice as long as

posteropropodeum. From posterior view, posteropropodeum with central concavity, probably used to house anterior face of petiole.

Metasoma (Fig 1b): Petiole wider than long in dorsal view, with short peduncle and well-defined high node. Sternopetiolar process well developed with short anterior tooth. Postpetiole dorsally convex, lower than petiole. Postpetiole, in dorsal view, rounded. Gaster with five visible segments, the anterior segment the longest (Fig 1b). Sting well developed, but generally withdrawn inside gaster.

Body smooth and shiny, except for the gena, which has fine parallel grooves, and for the side of the propodeum, which is covered by fine transverse striation. Cephalic dorsum with scattered punctures. Entire body covered by erect to subdecumbent light yellow hairs, more abundant on all gastral tergal plates. Body and appendages light brown.

Minor worker, measurements (n=15): **HW** 0.300-0.400, **HL** 0.450-0.520, **SL** 0.250-0.300, **SW** 0.038-0.050, **EL** 0.025, **EW** 0.012, **PW** 0.200-0.275, **WL** 0.400-0.525, **PL** 0.125, **PPL** 0.150, **CI** 60-77, **SI** 75-83, **EI** 50.

Body and appendages light yellow.

Head: Longer than wide (CI= 60-77) with sides slightly convex. Cephalic dorsum with scattered punctures. Posterior cephalic margin concave in middle (Fig 2a). Extremely small eyes with only one ommatidium, placed at lateral cephalic margin in full-face view. Compound eyes difficult to see in dorsal view (Fig 2a). Mandibles with four well-developed teeth along masticatory margin, with two diastema, one between

subapical tooth and third tooth and the other between 3rd and 4th teeth. Dorsal face of mandible smooth and shining, covered with yellowish, subdecumbent hairs. Anterior clypeal margin with one central short seta. Central part of clypeus bicarinate, each carina ending in a well differentiated tooth. Two extralateral teeth, visible only at more than 60X magnification, each with an apical long hair (see Fig 2a). Gena without striation observed in major worker. Sides of clypeal margin with 5-6 short hairs. Antennae 10-segmented with 2-segmented apical club with two articles. Antennal sockets close to the posterior clypeal margin. Funicular segments 2x-5x wider than long. Palpal formula: 2-1.

Mesosoma, petiole and postpetiole (Fig 2b): in profile similar to major worker. Both

sternopetiolar and sternopostpetiolar processes present, with antero-ventral denticle or projection.

Body smooth and shining, including gena. Sides of propodeum covered by fine, transverse striation. Mesosoma with more than 10 erect hairs. Gaster with scattered subdecumbent setae, more abundant in last two segments.

Queen and male unknown.

Type data. Holotype major worker: Argentina, Tucumán, Dpto. Burruyacú. Las Lajitas (26° 41.74' S- 64° 94.47' W) 10-i-2011, F. Cuezco coll. (deposited in IFML). Paratypes (same data): 10 major workers and 10 minor workers (deposited in ICN), 5 major workers and 10 minor workers (deposited in MZSP), rest of the series (n= 33 major workers and 439 minor workers) deposited at IFML.

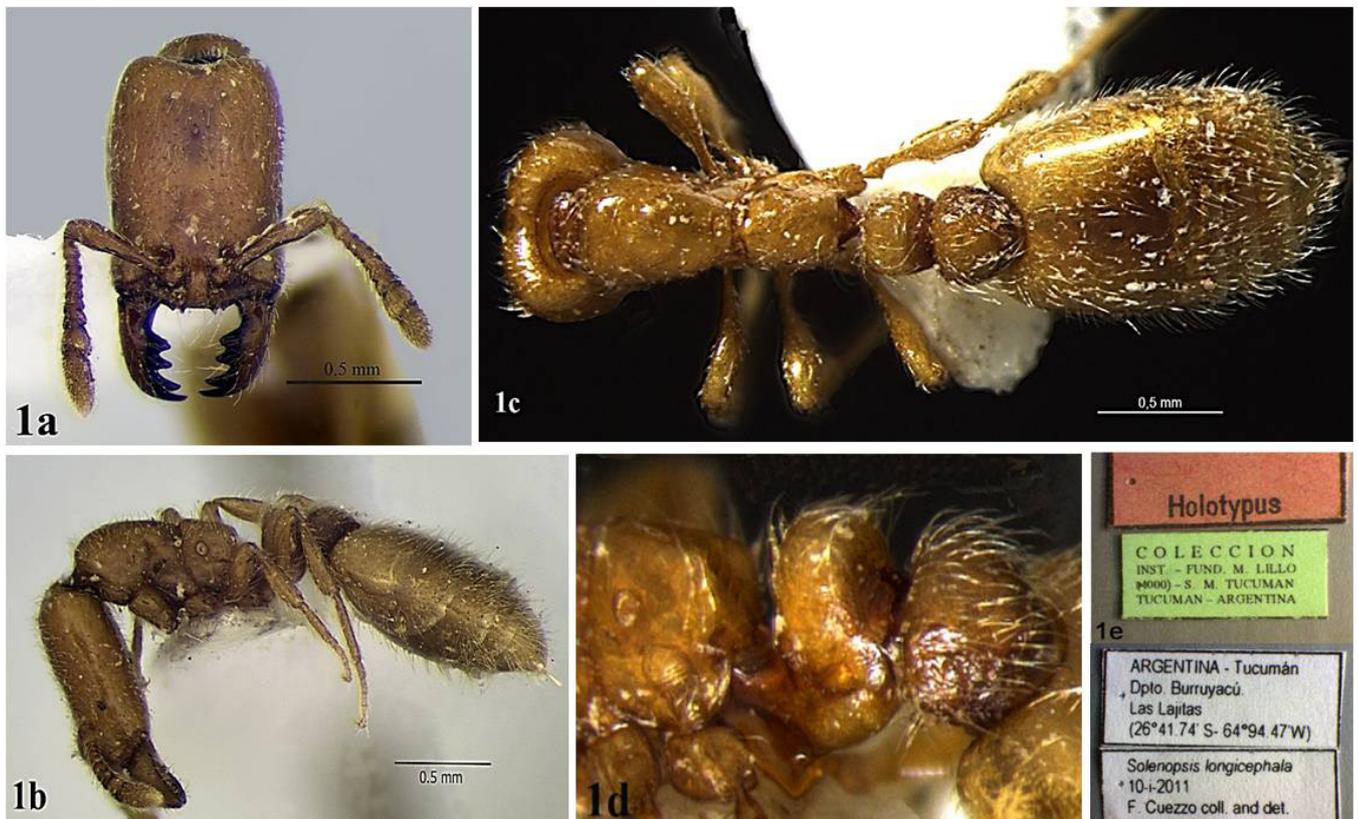


Fig 1a-e. Habitus of *Solenopsis longicephala* sp. n. major worker: a - head in full-face view; b - left side of body, in profile; c - dorsal view of body; d - petiole and postpetiole, lateral view; e - Holotypus labels.



Fig 2a-d. Habitus of *Solenopsis longicephala* sp. n. minor worker: a - head in full-face view; b - left side of body, in profile; c - dorsal view of body; d - Paratype labels.

Distribution. Known only from the type locality.

Biology: One nest was found under a small rock.

Comments. This species can be differentiated from all other *Solenopsis* by the combination of the following traits: dimorphic ants (see Fig 3); major worker with long and abundant hairs on the dorsal face of mesosoma and gaster; *head in major and minor workers extremely elongated*; eye reduced to 1-5 ommatidia; and palpal formula 2-1. According to Pacheco and Mackay (2013) most species of thief ants are monomorphic or weakly polymorphic; only five species are strongly dimorphic (*S. iheringi*; *S. johnsoni*; *S. thoracica*, *S. tetracantha*, and *S. vinsoni*) and none of the polymorphic species have the particular combination of character states mentioned above. All of the species described as dimorphic belong to the *fugax* complex except *S. iheringi*, which belongs to the *wasmanni* complex.

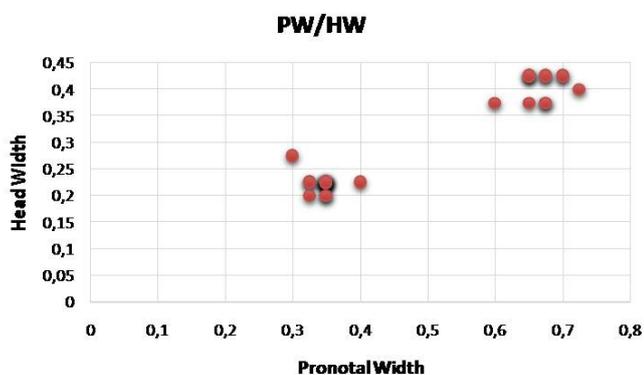


Fig 3. Graph showing two quite separate groups of workers (major and minor) taking in account the relationship between Pronotal Width (PW) and Head Width (HW) in *Solenopsis longicephala* sp. n. (N=30), measurements in mm.

South American species with minor workers similar to those of *S. longicephala* sp. n. include *S. leptanilloides* and *S. tetracantha*, both also found in Argentina. The first species is monomorphic and much smaller than *S. longicephala* sp. n. Other characters of *S. longicephala* sp. n. useful for separating it from these two species include: clypeal carina well developed in major and minor workers (nearly absent in *S. leptanilloides*); anterior clypeal border with 4 teeth, two central and two extralateral (extralateral teeth are absent in *S. leptanilloides*). The elongated anterior clypeal margin of *S. tetracantha* and the lower process of the postpetiole (present in *S. longicephala* sp. n.) are enough to differentiate major workers of both species. Minor workers of *S. tetracantha* and *S. longicephala* sp. n. are extremely similar, but differ in size; *S. longicephala* sp. n. is larger.

The major workers of *S. longicephala* sp. n. are similar to those of *S. wasmannii*, but *Solenopsis longicephala* sp. n. can be recognized by the extremely elongated head, whereas the head of *S. wasmannii* is only slightly longer than broad.

Most myrmecines possess heads not longer or slightly longer than wide. Some species of this subfamily, however, have majors with elongated heads. This trait is known in *Adlerzia*, *Carebara*, and some *Pheidole* (especially in the *aberrans* groups and *P. dispar*, formerly in *Machomyrma*). Because these are distantly related to *Solenopsis* (Ward et al., 2015), the presence of an elongated head in *Solenopsis longicephala* sp. n. is here interpreted as a convergent trait. The biological functions of elongated heads are obscure because little is known of the biology of the mentioned ants. Most *Carebara* appear to be soil-inhabiting ants, perhaps living near or inside the nests of other ants or termites, with supposedly lestoproct habits. However, some *Pheidole* species in the *aberrans* group

appear to be surface foragers and no data are available for *Pheidole dispar* and *Adlerzia*. Other subterranean myrmecines lack elongated heads, e.g., the “majors” of *Tranopelta*. Longer heads and cylindrical bodies could be associated with hard substrates or narrow passages in the soil or in twigs or may be associated with a specialization for defense in the soldier caste.

Solenopsis longicephala sp. n. is a member of the *Solenopsis pygmaea* species complex of Pacheco and Mackay (2013). This complex comprises ants with elongated heads and strongly punctate integuments, often possessing a bicarinate clypeus; 4-5 well-developed clypeal teeth, with different degrees of development but always present, and extremely small minor workers with poorly developed eyes. Also, the notopropodeal suture is only slightly impressed and the postpetiole nearly circular. All the characters above mentioned are present in *S. longicephala*.

Some members of the *Solenopsis wasmannii* complex also have elongated heads, workers that are extremely small (total length up to 1.45 mm), and the head surface with very coarse punctures. However, those species possess a very particular form of the clypeal carinae different from that in *S. longicephala* sp. n. Also, the compound eyes of their major workers have more ommatidia (10 or more) than those of *S. longicephala* sp. n. (4 - 7).

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