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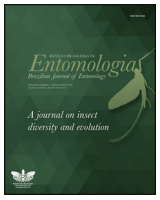

Review of the *Leptogenys unistimulosa* species group (Hymenoptera: Formicidae) with the description of a new Amazonian species

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ABSTRACT

Leptogenys elzasoares **new species**, is described from workers and a male collected near Manaus in the Brazilian Amazon. The worker is recognizable by the presence of 12 chaetae (stout setae) on the clypeal median lobe, the straight mandible, and its bicolored body; the head and mesosoma are black while the gaster is brightly ferruginous. For the first time, the males of *L. bohlsi* Emery, 1896, *L. unistimulosa* Roger, 1863, and *L. parensis* Lattke, 2011 are described. A new key to the males of the *unistimulosa* species group is provided, and the key to workers of Lattke (2011) is updated to include the new species. Finally, we also report new records of *L. parensis* from French Guiana, expanding the known distribution by over 780 km northwest.

Introduction

Leptogenys Roger, 1861 is the most species-rich genus of the ant subfamily Ponerinae, with over 300 valid extant species known to date (Bolton, 2022), which are found throughout the world's tropical and subtropical regions. The genus is notable for its diversity of behaviors, which includes frequent predatory specialization (particularly on isopods), some species that exhibit an army ant-like lifestyle (Schmidt and Shattuck, 2014), and the remarkable "daisy-chaining" species of the southeast Asian *chalybaea* group (Peeters and Greef, 2015; Arimoto and Yamane, 2018). The colonies of many *Leptogenys* species have a single ergatoid queen, therefore the males may play a greater role in gene dispersal and may be subject to elevated levels of sexual selection (*e.g.*, Allard et al., 2002; Dias and Lattke, 2021).

Recent taxonomic treatments are improving our knowledge of the genus across the world, and just in the past decade fourteen new keys to identify *Leptogenys* species were provided: (1) Malaysia Sabah species (Bakhtiar and Chiang, 2011); (2) New World species revision and key (Lattke, 2011); (3) Fiji species key (Sarnat and Economo, 2012); (4) China species key (Zhou et al., 2012); (5) India species key (Bharti and Wachkoo, 2013); (6) Malagasy species revision and key (Rakotonirina and Fisher, 2014); (7) Oriental species key (Xu and He, 2015); (8) southeast Asia *modiglianii* species group revision and key (Arimoto, 2017); (9) Arabian Peninsula species key (Sharaf et al., 2017); (10) Oriental *chinensis* group species key (Wachkoo et al., 2018); (11) *chalybaea* species group key and Oriental species key (Arimoto and Yamane, 2018); (12) additions to the New World species (López-Muñoz et al., 2018); (13) New Caledonia species key (Ramage et al., 2019); and (14) Colombia species key (Fernández and Guerrero, 2019).

While these studies have improved our knowledge of *Leptogenys* taxonomy, many gaps remain to be addressed, including the lack of broad taxonomic revisions for Southeast Asia and Africa, and the aged taxonomic works for Australia. Our knowledge is still preliminary even in regions that have been recently covered, as exemplified by Lattke's (2011) revision of the New World populations: Half of the 49 new species described therein were either from singletons or small series from a single locality. More sampling is needed in South America, particularly in Peru, Brazil, Bolivia, Ecuador, and Colombia.

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Furthermore, the knowledge of male *Leptogenys* is quite limited beyond the generic diagnosis, and studies in which males are treated at the species level are few (*e.g.*, Lattke, 2011; Arimoto, 2017; Sharaf et al., 2017; Arimoto and Yamane, 2018). Indeed, a male-based key to more than one *Leptogenys* species has never been presented, even though winged males are commonly collected using light traps and may even be abundant in collections. The main challenge that is faced after identifying a male specimen as *Leptogenys*—an easy task due to the unique, pectinate to multidentate pretarsal claws—is confirming its association with conspecific workers. In regions of high biodiversity, such as the New and Old World tropics, identifying males collected separately from workers is almost hopeless without the use of COI barcoding or other molecular methods (*e.g.*, Ward and Sumnicht, 2012; Longino and Branstetter, 2020).

Because of the variation of social organization, foraging behavior, and morphological specialization of workers and males across species, *Leptogenys* has been recognized as a model system for the study of natural and sexual selection in ants (Schmidt and Shattuck 2014). In light of this, more male-based alpha-taxonomic studies are necessary to understand the evolutionary dynamics of *Leptogenys*, particularly with respect to their reproductive biology. The present contribution affords the first attempt to classify males of the *Leptogenys unistimulosa* species group (*sensu* Lattke, 2011), which comprises eight valid, previously described species. Within these ants, we specifically deal with a subset of apparently close species: *L. bohlsi* Emery, 1896, *L. parensis* Lattke, 2011, *L. unistimulosa* Roger, 1863, and a new species from the Brazilian Amazon. The workers within the *unistimulosa* group are easily recognizable on account of their arching, sickle-shaped mandibles, relatively large eyes, petiole with an acutely pointed tooth, and generally a bicolored body with a ferruginous gaster and the rest of the body black. A key for identifying the males of these species is included.

Material and methods

Specimen examination, imaging, and mapping

Specimens were studied at 60 x magnification with an Olympus SZ40 or a Leica S8 APO stereomicroscope; reference was also made to AntWeb.org (AntWeb, 2022). Genitalia were dissected and examined in 95% ethanol and genitalic sclerites were preserved in glycerin and pinned with the specimen. High-resolution images were obtained with an Axiocam 305 color camera on a Zeiss SteREO Discovery V20 or with a Canon 1100D mounted on a Leica S8 APO stereomicroscope. Extended depth focus was made with the software Zen Blue v.2.6 or Zerene Stacker and subsequently treated to correct for brightness and contrast in Photoshop CS6 (Adobe). A phoretic mite found on one ant was removed from the paratype's maxilla and boiled in a 50/50 ethanol and water solution. It was then mounted in polyvinyl alcohol-lactic acid-glycerol (PVLG) medium (Omar et al., 1979) and photographed using an Olympus CX41 light microscope with an attached Canon 1100D camera. Images of the mite were examined and identified by Dr. Barry O`Connor, a mite specialist and Professor Emeritus and Curator Emeritus in the Museum of Zoology of the University of Michigan.

Distribution maps were made using QGIS 3.26.1. Occurrence points were based on label information from the examined material, highlighting the new records from the last taxonomic revision (Lattke, 2011) and other literature published after 2011 which were obtained from references compiled in Antmaps.org (Janicki et al., 2016; Guénard et al., 2017). The literature sources are cited in the figure captions. For specimens without geographical coordinates included in the labels, we used the centroid coordinates of the corresponding municipalities.

The material examined is deposited in the following collections:

CELC Coleção Entomológica do Laboratório de Sistemática de Coleoptera. Universidade Federal de Viçosa, Minas Gerais, Brazil.

DZUP Coleção Entomológica Pe. Jesus Santiago Moure, Universidade Federal do Paraná, Curitiba, Paraná, Brazil.

INPA Instituto Nacional de Pesquisas da Amazônia, Coleção de Invertebrados, Manaus, Amazonas, Brazil.

MPEG Museu Paraense Emílio Goeldi, Belém, Pará, Brazil.

MZSP Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.

Measurements and index abbreviations

Measurements and index definitions are adapted from Lattke (2011). Specimens were measured with a dual-axis micrometer stage with output in increments of 0.001. All measurements are presented in millimeters.

EL *Eye length*. Maximum eye length in lateral view.

OL *Ocellar Width*. Maximum width of median ocellus. Only measured in males.

OES *Ocellar Eye Space*. Minimum distance from lateral ocellus to compound eye in full-face view. Only measured in males.

CML *Clypeal median length*. Maximum distance from the midpoint of the posterior clypeal margin to the midpoint of the anterior clypeal margin.

ML *Mandible length*. Maximum distance from the mandible base at the insertion into the head capsule to the apex.

SL *Scape length*. Maximum length of the first antennal segment, excluding the neck and basal condyle.

HL *Head length*. Maximum distance from the midpoint of the anterior clypeal margin to the midpoint of the posterior margin of the head, measured in full-face view.

HW *Head width*. Maximum width of head including eyes in full-face view.

MeL *Mesoscutum length*. Maximum length of mesoscutum in dorsal view. Only measured in males.

MeW *Mesoscutum width*. Maximum width of mesoscutum in dorsal view. Only measured in males.

PW *Pronotal width*. Maximum width of pronotum in dorsal view. Only measured in workers.

WL *Weber's length of the mesosoma*. Diagonal length of mesosoma measured in lateral view from the anterior margin of pronotum (excluding the collar) to the posteroventral metapleural margin.

PetW *Petiole width*. The maximum width of the petiole measured in dorsal view.

PetH *Petiole height*. Height of the petiole measured in lateral view from the apex of the ventral (subpetiolar) process vertically to a line intersecting the dorsal-most point of the node.

PetL *Petiole length*. Maximum length of the petiole measured from the anteroventral junction with propodeum to the posteriormost point of the tergite, where it surrounds the gastral articulation.

OI *Ocular index*. EL/HW×100

MI *Mandibular index*. ML/HW×100

SI *Scape index*. SL/HW×100

CI *Cephalic index*. HW/HL×100

DPI *Dorsal petiole index*. PetW/PetL×100

LPI *Lateral petiole index*. PetH/PetL×100

Species concept

A minority of taxonomic articles explicitly state the concept or operational criteria used for species delimitation (Bond et al., 2021). For this reason, we note that our approach predominantly relies on morphological evidence, *i.e.*, the "gap" criterion for interpopulational comparison, in combination with reproductive isolation as evinced by retention of differences in sympatry. Differing from prior studies of *Leptogenys*, we employ male-specific morphology as an independent line of evidence, given the stark sexual dimorphism of Formicidae (Boudinot et al., 2021). We also recognize that speciation can occur within a clade prior to coalescence of the "stock" populations, resulting in paraphyletic species (Ward and Branstetter 2022). In effect, we espouse the "biological species concept" of Mayr in the present study, with dependence on phenotypic and geographical variation.

Morphological terminology

We briefly outline here the sources that define the terminology which we use to ensure continued interpretability of the phenotypic descriptors. This is particularly important, as the traditional morphological nomenclature applied to Formicidae has been undergoing pronounced modification due to the application of new technologies coupled with the revised understanding of interfamilial and interordinal homologies. The standard references for our worker- and male-based terminology are Bolton (1994) and Boudinot (2015), respectively. Specific term choices that differ from these works are derived from the following studies: Richter et al. (2019, 2020) and Boudinot et al. (2021) for the head of both sexes; Aibekova et al. (2022) for the worker mesosoma, with "upper" and "lower" meso- and metapleural areas also accepted for the male; Lieberman et al. (2022) for the metasoma; Boudinot (2018) for the male genitalia; Harris (1979) for sculpture; and Boudinot et al. (2021) for setation. We indicate traditional term synonymies parenthetically where we consider clarity especially valuable. Male heads are treated as if they were prognathous.

Species descriptions

A diagnosis is first presented, followed by the measurements and full descriptions. The descriptions are organized in major sections: head, mesosoma, metasoma, setation and color. Structures are in italic and separated by a dot. Characters are presented according to the body orientation, from the anterior to posterior region. Due to the similarity of the venation between the different species, we have chosen to provide the complete wing description for *L. bohlsi* male as a general reference and for the other species simply describe the differences. Comments about the taxonomy and distribution are presented followed by the studied material. The label information was transcribed *ipsis literis* and organized as follows: country, state, specific location, collector, date, number of specimens and caste in italic, unique identifier labels, and collection in square brackets.

Results

unistimulosa ***species*** **group**

amazonica Borgmeier, 1930. Brazil, Colombia, Ecuador.
bohlsi Emery, 1896. Argentina, Brazil, Paraguay.
elzasoares **new species.** Brazil.
gatu Lattke, 2011. Costa Rica, Colombia, Panama.
parensis Lattke, 2011. Brazil, French Guiana.
peruana Lattke, 2011. Peru.
pubiceps Emery, 1890. Nicaragua to northern S. America, Caribbean.
punctaticeps Emery, 1890. Costa Rica, Colombia, Panama.
unistimulosa Roger, 1863. Bolivia, Brazil, northern South America.

Worker, descriptive diagnosis

(Modified from Lattke 2011, 212). Compound eye dorsolaterally located on head, subglobulose and prominent. Hypostomal lobe well developed, usually visible in full-face view. Clypeal apex with 2–6, sometimes more (12 in *L. elzasoares* **new species**) chaetae (= stout setae); apex with a narrow lateral lamella. Mandible slender and elongate. Epistomal sulcus well-impressed between antennal torulus and tentorial pit. Scape surpasses posterior cephalic margin by at least one-third its length. Antennomeres of the pedicel and flagellum (= funicular segments) subcylindrical, each slightly widening apicad; first flagellomere (= third antennal segment) elongate. Propleuron mostly striate to rugulose (although mostly shining in *L. amazonica* and *L. peruana*). Metanotal groove well-impressed, not scrobiculate. Metapleuropropodeal suture present, *i.e.*, indicated externally. Mesosomal sculpture mostly striate to costulate, with sparse smooth and shining areas. Propodeal dorsum transversely striate (tending to smooth in *L. amazonica* and *L. peruana*). Propodeum unarmed. Petiolar apex with a posteriorly directed tooth or lobe (except *L. peruana*), which is either sharply pointed or blunt; posterior margin of petiole sinuous in lateral view, with brief dorsal concavity and longer ventral convexity; petiolar sides convex in anterior view. Body with abundant standing hairs. Appressed pubescence only consistently present on cephalic dorsum (except *L. amazonica*), lacking or occasionally occurring on mesosomal dorsum, absent altogether on petiole and gaster. Apex of protibia lacking chaetae; apex of mesotibia with single external chaeta; apex of metatibia with chaeta (chaetae not discernible in *L. amazonica*). Metacoxal dorsum without posterobasal swelling.

Male, descriptive diagnosis (Figure 1)

Recognizable as *Leptogenys* due to the pectinate pretarsal claws. Mandible relatively well sclerotized, stout and spatulate, expanding apicad to form rounded and sometimes pointed apex; mandalus large, partially hidden by clypeus, appearing almost slit-shaped. Scape two to three times longer than pedicel. Mesoscutum longer than wide, mostly smooth and shining anterad of notauli; area posterad of notauli and between parapsidal lines generally striate to rugulose; notauli scrobiculate; mesoscutellar disc striate. Upper mesopleural area (= anepisternum) usually punctate with transverse striae; lower mesopleural area (= katepisternum) mostly smooth with punctures. Propodeum in lateral view with dorsal margin forming more or less evident blunt angle with declivitous margin, these margins rarely forming thoroughly even convexity. Metapleural area (= metapleuron) and propodeum strongly rugulose. Node subtriangular in lateral view; anterior margin in lateral view convex, posterior margin approximately vertical; posterodorsal margin (tip) of node in oblique dorsal view generally with blunt point; lateral face of node weakly to strongly rugulose. Pterostigma broad. Abscissa R-f present, running toward distal wing margin and enclosing cell with Rs-f5. Vein 2r-rs present, differentiated from Rs-f4 by presence of abscissa Rs-f2-3. Jugal lobe of hind wing absent. Genital capsule length more than two times its width in dorsal view; cupula (= basal ring) dorsal and ventral profiles diverging posterad in lateral view; gonopod (= paramere) long, at least four-fifths the total genital capsule

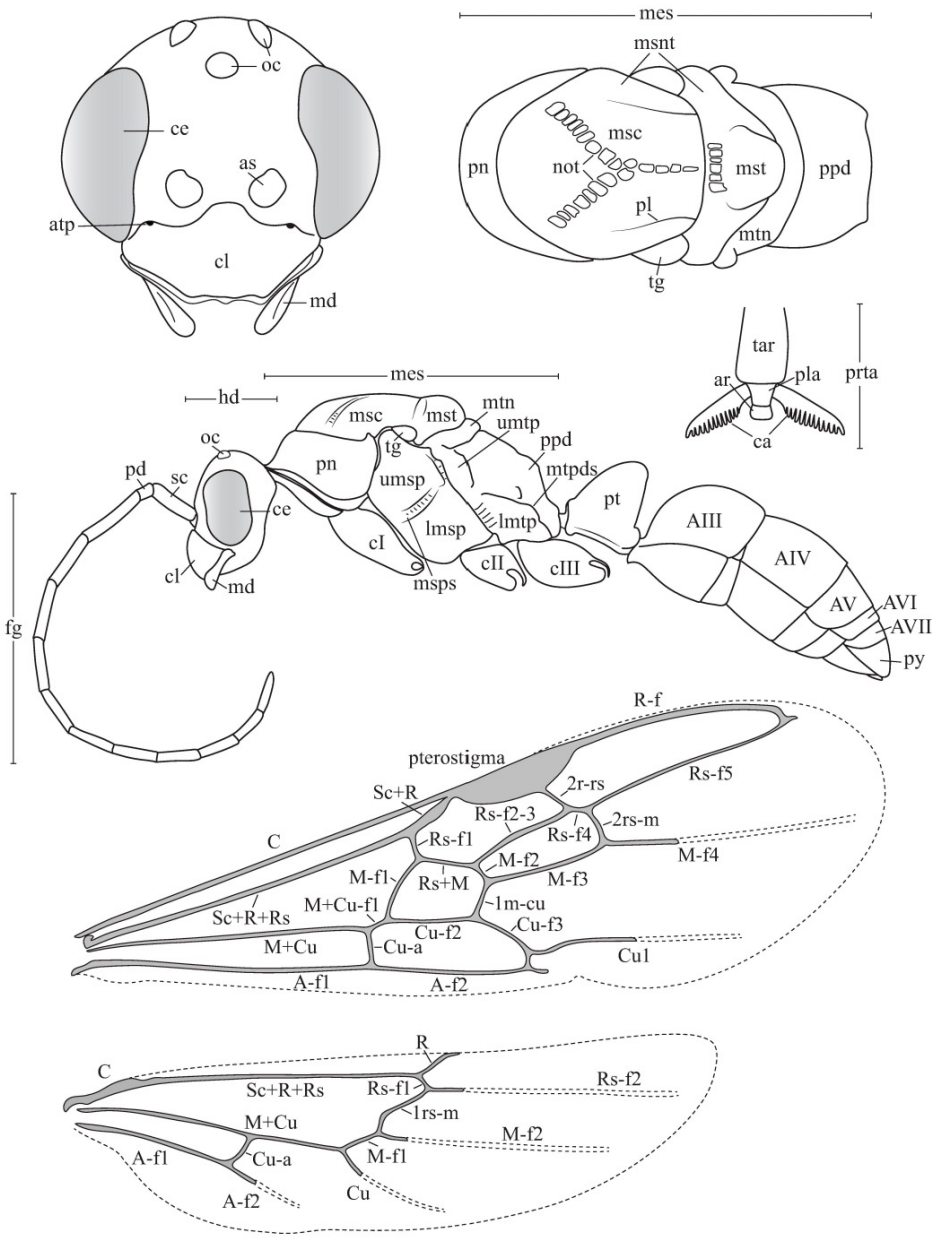

Figure 1. *Leptogenys* male morphology based on *L. unistimulosa*. **A**: abdominal segment number, **as**: antennal socket, **atp**: anterior tentorial pit, **ar**: arolia, **c**: coxa number, **ca**: claws, **ce**: compound eye, **cl**: clypeus, **fg**: flagellum, **hd**: head, **lmsp**: lower mesopleuron, **lmtp**: lower metapleuron, **mes**: mesosoma, **md**: mandible, **msc**: mesoscutum, **msnt**: mesonotum, **msps**: mesopleural sulcus, **mst**: mesoscutellar disc, **mtn**: metanotum, **mtpds**: metapleuropropodeal suture, **not**: notaulli, **oc**: ocelli, **pd**: pedicel, **pl**: parapsidial line, **pla**: planta, **pn**: pronotum, **ppd**: propodeum, **prta**: pretarsal structures, **pt**: petiole, **py**: pydigium, **sc**: scape, **tar**: tarsus, **tg**: tegula, **umsp**: upper mesopleuron, **umtp**: upper metapleuron.

length; gonostylus (= telomere, harpe) apex rounded. Body usually bicolored: head, mesosoma, and node black; gaster usually ferruginous to ferruginous brown, sometimes dark brown.

Diagnostic remarks

With respect to males, the form of the petiole varies significantly across the global fauna of *Leptogenys* and is the most distinctive feature of the *unistimulosa* species complex. More specifically: **(1)** the petiolar node is dorsoventrally taller than anteroposteriorly long, as measured from the anterolateral petiolar carina and posterior collar; **(2)** the node is roughly "shark-tooth-shaped", being in the form of a swept-back wedge, with (2a) a convex anterior margin, (2b) a narrow to broad curve before the posterodorsal angle, which may be pointed (*L. elzasoares* **new species**, *L. pubiceps*) or rounded (*L. bohlsi*, *L. parensis*, *L. unistimulosa*), and (2c) a vertical and straight to more-or-less straight posterior margin. Although some species not belonging to the *unistimulosa* complex approximate this form, they lack the posterodorsal angle and have a broader node anterior to the posterodorsal inflection (*e.g.*, *L. polaszeki* Sharaf & Akbar, 2017 in Sharaf et al., 2017, *L. donisthorpei* Mann, 1922).

Other species with apparently similar petioles have a shorter, more rounded node (*e.g.*, the Neotropical and Nearctic species *L. manni* Wheeler, 1923, and the Paleotropical species *L. comajojo* Rakotonirina and Fisher, 2014, *L. intermedia* Emery, 1902), or the petiole is longer, giving the node a low profile (*e.g.*, *L.* terc08, UFV-LABECOL-010310, Australia), or an acutely triangular profile (*e.g.*, Old World *L. schwabi*, Forel, 1913). Beyond these examples, the petiolar node of male *Leptogenys* may be very small and narrowly triangular or dorsally curved (*e.g.*,

the Neotropical *L. peninsularis* Mann, 1926, or Old World *L. breviceps* Viehmeyer, 1914), it may be bulbous and more-or-less evenly curved dorsally (*e.g.*, the Neotropical *L. montuosa* Lattke, 2011), or the node may be subrectangular to subtrapezoidal as in many New and Old world species (*e.g.*, *L. imperatrix* Mann, 1922 and *L. angusta* (Forel, 1892), respectively).

Relative to other Neotropical species that were directly examined, the males of the *unistimulosa* group appear to be recognizable by the following: **(3)** Mandibles comparatively robust; **(4)** mandalus mostly hidden by the clypeus and appearing as a slit-shaped depression; and **(5)** body generally bicolored, although the ferruginous color of the gaster in some specimens may be attenuated. Even though their mandibles are reduced, as is diagnostic of Ponerini, they are nevertheless relatively robust and more sclerotized. For comparison, we directly examined 36 other males in the DZUP and CELC collections, representing approximately 15 morphospecies. In the aforementioned males that are not of this group, the mandalus is approximately ovoid and totally visible at the base of the closed mandibles, which is not the case for *unistimulosa* group males. Their mandalus is relatively large, but when the mandible is closed, most of the mandalus is covered, thus only a slim, slit-shaped section of the depression is visible (see Figure 2). The ferruginous colored gaster, which contrasts with the darker rest of the body, also reflects the same color pattern of the workers in the *unistimulosa* complex (*L. parensis*, *L. bohlsi*, *L. unistimulosa*, and *L. elzasoares* **new species**). However, this may vary in the workers of some species, with individuals showing diminished contrasting colors, thus the absence of two colors should also be expected in some males.

While we have observed considerable variation in the genitalia of various Neotropical *Leptogenys*, we were unable to document these patterns for the present study. We anticipate that male genitalia will have substantial diagnostic information for species and species complexes. For the two *unistimulosa* complex species that we were able to dissect here, *L. parensis* and *L. elzasoares* **new species**, we observed a high degree of similarity, albeit with several discrete differences. The primary distinctions between the two are described in their respective species accounts. Future studies will certainly benefit from characterizing the male genitalia of these ants.

Leptogenys bohlsi Emery, 1896

(Figures 3 and 11A)

Male diagnosis

Uniquely identified among the *unistimulosa* species complex by the following conditions: **(1)** Body size not very large (WL < 3.00 mm); **(2)** ocelli small, with the distance between compound eye and lateral ocellus in full face view somewhat more than two times longer than median or lateral ocellus width; **(3)** ocelli close to but not surpassing posterior head margin in full face view; **(4)** compound eyes not enlarged, with the distance between them about equal to one eye length in full-face view; **(5)** scape no more than two times pedicel length and about the same length as clypeal length; **(6)** mesoscutum about as long as broad; **(7)** mesoscutum largely smooth; **(8)** vein M+Cu-f1 reduced; **(9)** 2r-rs shorter than Rs-f4; **(10)** petiolar node without bulge anterad of posterodorsal corner; **(11)** abdominal sternites AIII–VIII (gastral I–VI) sparsely pilose, without appearance of dense shaggy pads. The "small" ocelli and compound eyes are the most conspicuous combination diagnosing this species (chars 2–4).

Male measurements

EL 0.61–0.68; **OL** 0.13–0.14; **OES** 0.24–0.25; **CML** 0.37–0.43; **ML** 0.38; **SL** 0.38–0.45; **HL** 1.03–1.18 **HW** 1.12–1.22; **MeL** 1.06–1.16; **MeW** 1.00–1.01; **WL** 2.33–2.62; **PetW** 0.43–0.55; **PetH** 0.81–0.90; **PetL** 0.65–0.75; **OI** 54.5–55.7; **MI** 31.1–33.9; **SI** 34.2–36.9; **CI** 103.4–108.7; **DPI** 66.7–73.3; **LPI** 120.0–123.8; (n = 2).

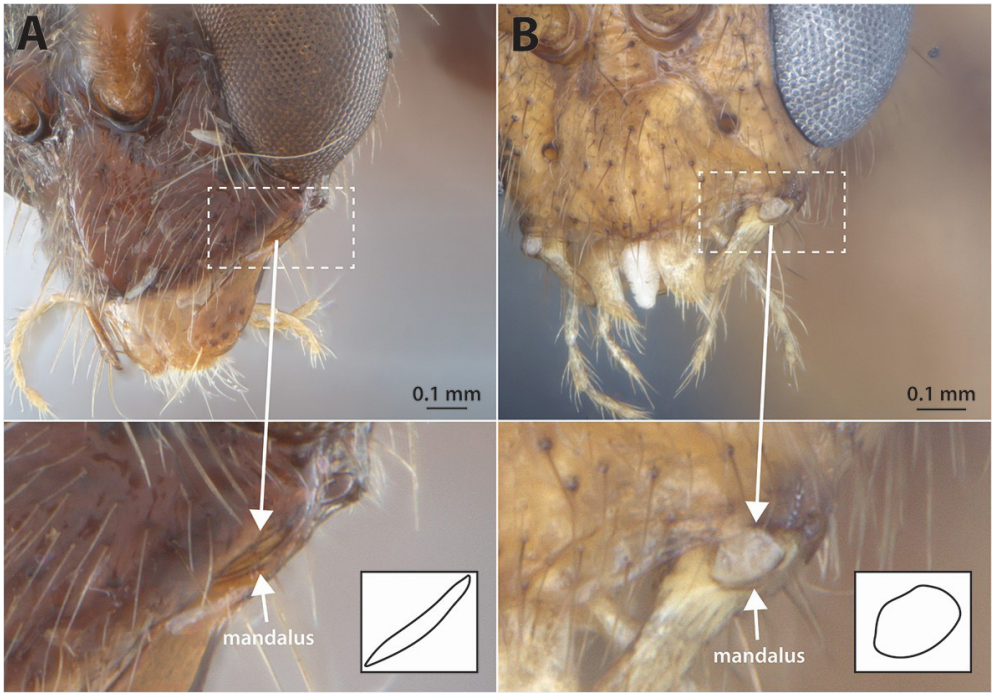

Figure 2. Male mandalus: (A) *Leptogenys unistimulosa*, mandalus partially hidden by clypeus appearing slit-shaped when the mandible is closed; (B) *Leptogenys* sp. mandalus rounded, not hidden by clypeus when the mandible is closed.

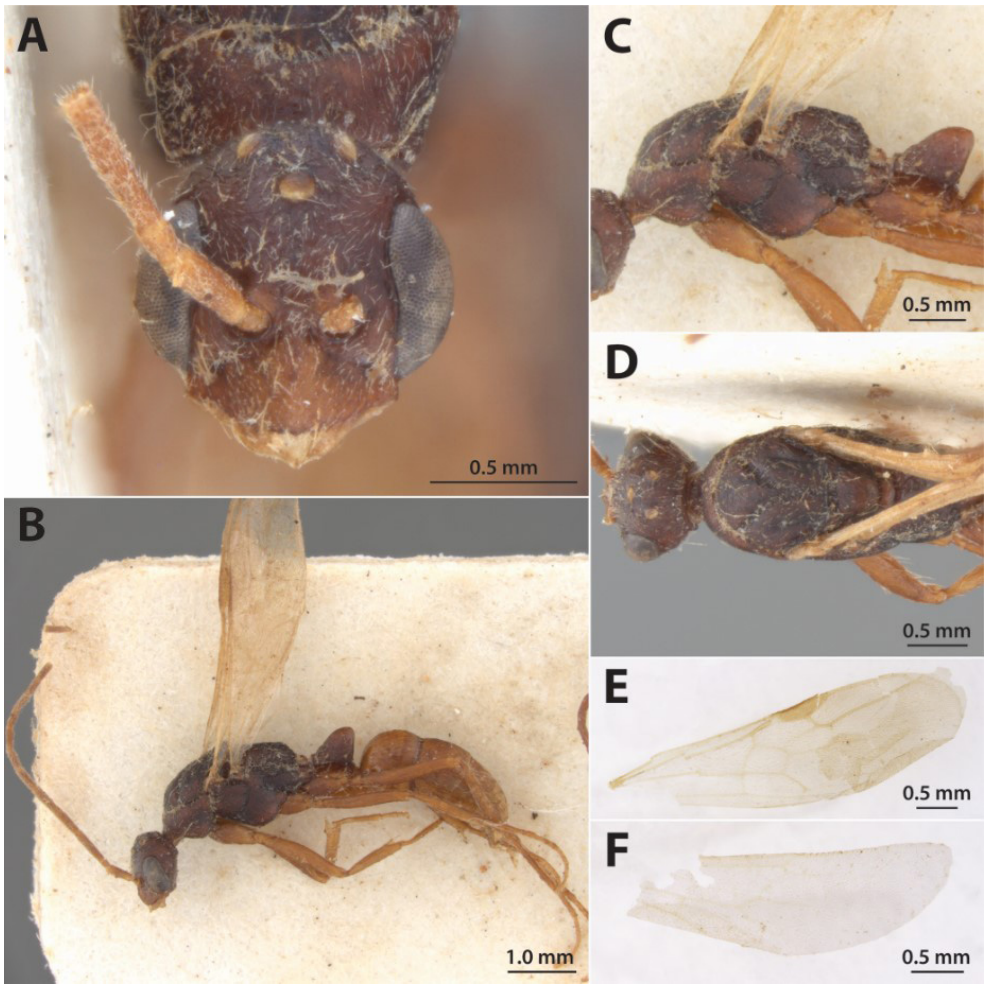

Figure 3. *Leptogenys bohlsi* male, 5512 Coll. Borgmeier: (A) full-face, (B) lateral, mesosoma in (C) profile and (D) dorsal views, (E) fore wing, and (F) hind wing.

Head longer than wide in full face view, with width measured just posterad of compound eyes. *Mandible* slightly shorter than antennal scape, rounded apically, edentate, dorsal surface smooth and shining. *Clypeus* anterolateral margin straight with thin lamella, apex truncate. *Frontal carina* reduced. *Scape* not more than 2x pedicel length and about same length as clypeal length. *Pedicel* longer than wide. *Compound eyes* grossly enlarged; tracing a horizontal line at maximum eye width in full-face view, face (= "frons") width is about 3 x the maximum width of eye. *Ocelli* equal in size, not protruding beyond posterior head border with head in full-face view; distance between compound eye and lateral ocellus greater than two lateral ocellar diameters. *Sculpture*: cuticle of head capsule weakly punctate.

Mesosoma with dorsal profile in lateral view broadly convex; pronotum in dorsal view punctate laterally and smooth medially. *Mesoscutum* in dorsal view slightly longer than wide, sparsely punctate. *Notauli* strongly impressed, scrobiculate, and meeting medially, thus Y-shaped. *Parapsidal lines* impressed about half of mesoscutal length. *Mesoscutellar disc* with longitudinal striae. *Upper mesopleural region* (= anepisternum) punctate with oblique striae. *Longitudinal mesopleural sulcus* scrobiculate. *Lower mesopleural region* (= katepisternum) punctate. *Propodeum* with dorsal profile in lateral view weakly convex, separated from declivity by blunt angle. *Sculpture:* propodeum and metapleural area (= metapleuron) rugulose, declivity shining and with few carinae.

Wings. Vein C in fore wing present. Abscissa R-f3 present, running toward distal wing margin and enclosing radial (= marginal cell) with Rs-f5. Abscissae Rs-f2-3 present, connecting with Rs+M and M-f2 proximally. Crossvein 2r-rs present and about the same length as Rs-f4, and differentiated from Rs-f4 by presence of Rs-f2-3. Abscissae Rs-f4-5 differentiated into Rs-f4 and Rs-f5 by the presence of 2rs-m. Abscissa M-f2 in fore wing present. Abscissa M-f4 almost reaching wing margin. Crossvein 1m-cu present. Vein Cu in fore wing present, M+Cu-f1 reduced. Vein A with abscissae A-f2 and A-f2 present; crossvein 1cu-a slightly prefurcal, *i.e.*, Cu+M splitting just distad the crossvein. Vein C in hind wing absent. Vein Sc+R, M+Cu, Cu in hind wing present. Abscissa Rs-f1 in hind wing present, shorter than 1rs-m. Abscissa Rs-f2 in hind wing present, sometimes almost reaching wing margin. Abscissa M-f1 and M-f2 in hind wing present. Crossvein cu-a in hind wing present. Vein A in hind wing with abscissae A-f1 and A-f2 present.

Metasoma. *Petiole* subtriangular to trapezoid in lateral view, anterior profile straight merging with convex summit, node highest posteriorly, posterior margin abruptly vertical. *Subpetiolar process* rounded; in dorsal view, petiole longer than broad, lateral margins converging anteriorly; lateral surface mostly rugose, posterior face smooth. *Cinctus* well-marked, gaster mostly smooth with sparse punctulae. *Abdominal sternum IX* posteriorly rounded.

Setation. Head with long, erect hairs and fine decumbent hairs; clypeus with fine subdecumbent hairs; antenna with fine decumbent hairs and some stout short, suberect hairs. Mesosoma, petiole, and gaster covered with some long erect hairs.

Color. Body black to brown; clypeus, antenna, legs, and gaster ferruginous brownish; petiole ferruginous ventrally and dark brown dorsally.

Comments

The *Leptogenys bohlsi* male is associated with a worker; both ants were glued on their sides on the same cardstock. The male appears to have lost some or most of its pilosity. According to Borgmeier's catalogue it was collected in 25.ii.33 [1933] Campinas, Goiás (Ulyssea, M. personal communication, July 2022). Although *L. bohlsi* workers can be similar to *L. unistimulosa* (Lattke, 2011), the males can be easily differentiated. Even though *L. bohlsi* males are also smaller in size than *L. unistimulosa* males, the compound eyes are more widely spaced in *L. bohlsi* and not as bulging as in *L. unistimulosa*; the face (= frons) in *L. bohlsi* is at least three times wider than the eye maximum width in full-face view. The ocelli are smaller in *L. bohlsi*, with the distance between the lateral ocellus and eye greater than the maximum diameter of the median ocellus, but this varies among *L. unistimulosa* males. The scape in *L. bohlsi* is shorter than the clypeal length, while it is longer in *L. unistimulosa*.

Material studied

Brazil. Goiás: Campinas, Schwarzmaier, Nr 5512 Coll. Borgm., *1 worker* and *1 male*, [MZSP]. **Maranhão**: Mirador, Geraldina, 05.xii.2009, Mata de Galeria, Ponto de M.10, *1 male* DZUP 550887, [DZUP]. **Mato Grosso**: Poconé, Pantanal, Faz. São Sebastião de Borba, 16°15'24"S 56°37'22" W, X.2016, L. Pavão, col., antes do fogo, AL 10 T4 P40, *1 worker* DZUP 550888, [DZUP].

***Leptogenys elzasoares* new species**

urn:lsid:zoobank.org:act:BAFAC161-1AF8-46A5-83B9-B662086BD376
(Figures 4, 5, 6, and 11B)

Worker diagnosis

Head weakly rugulose in full-face view. Mandible mostly straight in full-face view, weakly widening apicad. Median clypeal lobe with 12 chaetae (= stout setae). Eye large, occupying one-third lateral cephalic margin. Hypostomal tooth not as long as mandibular width. Mesonotum wider than long. Propodeal dorsum transversely striate. Petiolar node with an acutely pointed posterior spine. Head, mesosoma and petiole black, antenna, legs and gaster brightly ferruginous.

Worker measurements

Holotype (Paratypes): **EL** 0.36 (0.34–0.36); **CML** 0.38 (0.34–0.40); **ML** 0.96 (0.92–0.96); **SL** 1.59 (1.58–1.60); **HL** 1.31 (1.26–1.31); **HW** 1.06 (1.06–1.12); **PW** 0.87 (0.86–0.88); **WL** 2.36 (2.35–2.42); **PetW** 0.59 (0.59–0.62); **PetH** 1.07 (1.03–1.07); **PetL** 0.74 (0.70–0.75); **OI** 34.0 (30.6–33.0); **MI** 90.7 (82.1–90.6); **SI** 150.0 (142.3–149.1); **CI** 80.9 (84.1–85.5); **DPI** 79.2 (81.3–87.3); **LPI** 143.7 (137.3–152.8); (Paratypes = 3).

Head longer than wide in full-face view; wider anterad than posterad, posterior profile broadly convex, curving into broadly convex

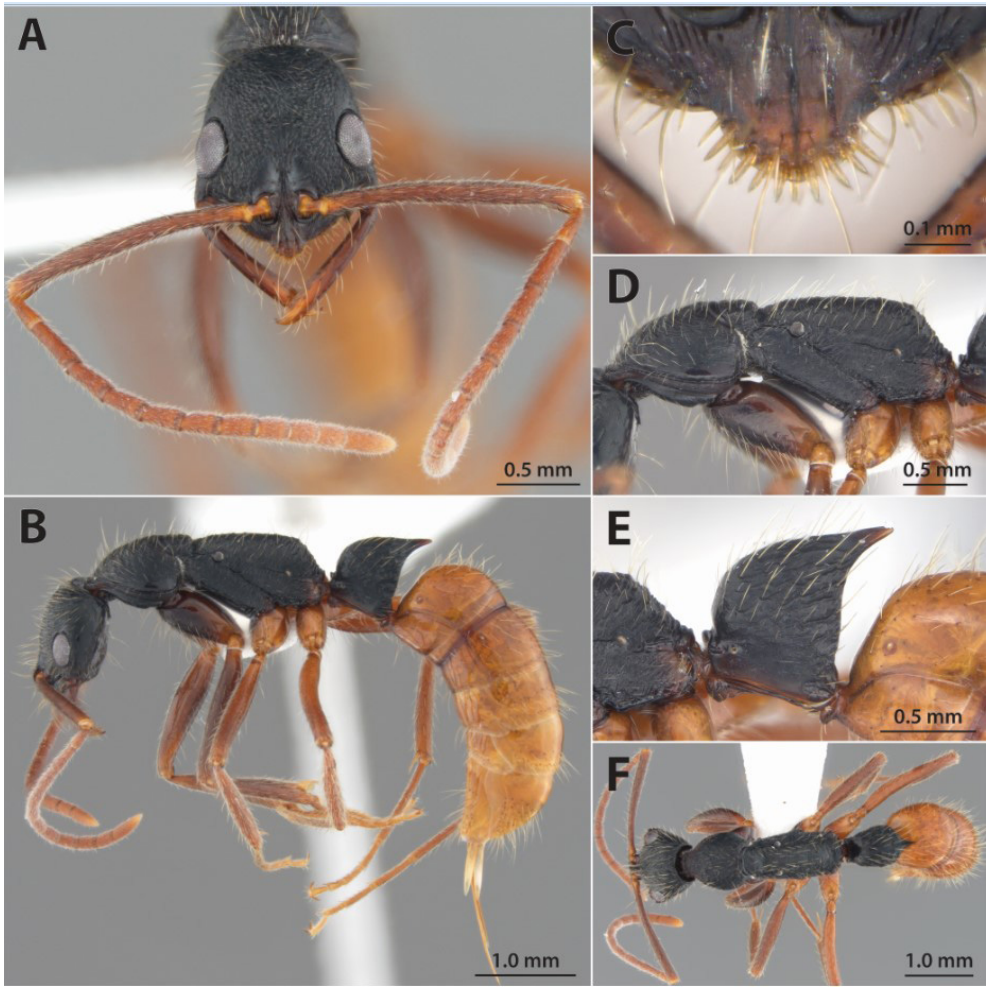

Figure 4. *Leptogenys elzasoares* **new species** worker, INPA - HYM 034449 Holotype: (A) full-face, (B) lateral, (C) clypeus in full-face, (D) mesosoma, (E) petiole and (D) dorsal views.

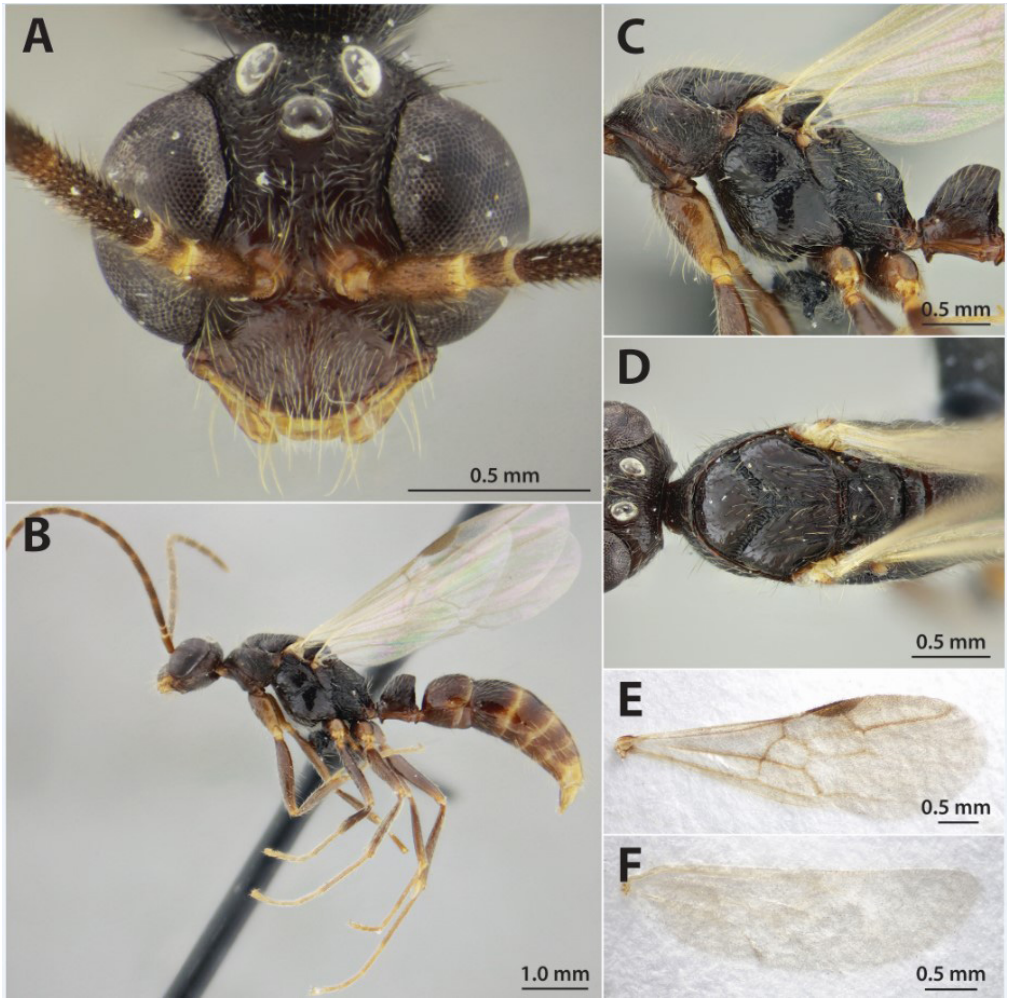

Figure 5. *Leptogenys elzasoares* **new species** male, UFV-LABECOL-011120 paratype: (A) full-face, (B) lateral, mesosoma in (C) profile and (D) dorsal views, (E) fore wing and (F) hind wing.

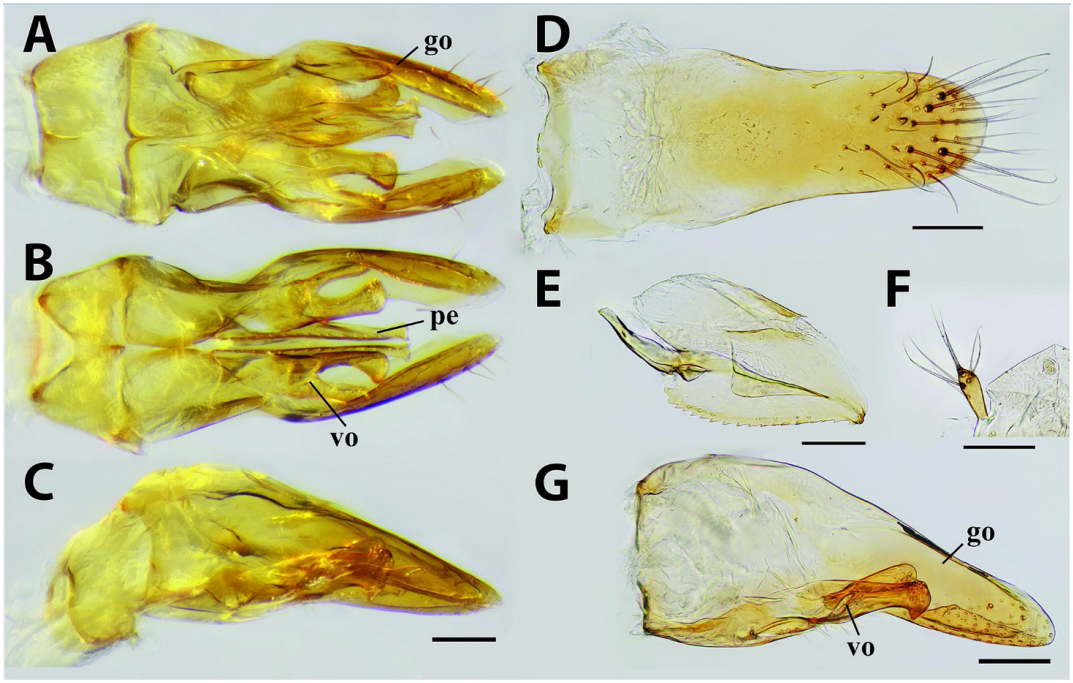

Figure 6. *Leptogenys elzasoares* **new species** male genitalia, UFV-LABECOL-011120 paratype: (A) genital capsule in dorsal, (B) ventral and (C) lateral views, (D) abdominal sternum IX in ventral view, (E) penisvalvae, (F) tergum IX, (G) gonopod and volsella in lateral views. Scale bar = 0.1 mm. **go**: gonopod, **pe**: penisvalvae, **vo**: volsella.

to straight lateral profile; vertexal carina visible. *Mandible* slender, mostly straight, gently bent at base, and widely separated from clypeus; mandibular dorsum smooth and shining, modestly widening apicad. *Median clypeal lobe* protruding, shorter than maximum scape width; apex semicircular; apex bearing 12 chaetae (= stout setae). *Lateral clypeal lobe* low, broadly convex. *Epistomal sulcus* well impressed between torulus and mandibular base. *Hypostomal tooth* visible in full-face view; shaped as curved triangular tooth. *Antenna*: scape surpasses posterior cephalic border by almost one-third its length; pedicel and flagellomeres (= funicular segments) longer than wide; fourth antennomere 75% the length of third antennomere. *Compound eye* large, convex, covering about one-third of lateral cephalic profile. *Sculpture*: Cephalic dorsum rugulose, sculpture softening laterally; ventrally smooth; clypeus with oblique to transverse striae; scape smooth and with punctulae.

Mesosoma. *Promesonotum* with profile broadly convex in lateral view. *Pronotum* lateroventrally smooth, laterally longitudinally rugulose; rugulae form arching, parallel striae extending across dorsum of segment. *Mesonotum* wider than long in dorsal view, transversely striate; posterior margin strongly inflected, metanotal groove appearing deeply impressed. *Mesometapleural suture* well impressed, forming elevated ridge above metapleural area. *Metapleural-propodeal suture* mostly impressed, becoming weak anteriorly. *Propodeum* with dorsal profile in lateral view forms very broad and weak convexity, being almost straight, and separated from declivity by blunt angle; propodeum unarmed. *Sculpture*: Mesopleural and metapleural areas with oblique striae; propodeal dorsum with transverse striae; declivity with transverse carinae; lateral propodeal face strigate-rugose to rugulose.

Metasoma. *Petiole* in lateral view with anterior margin strongly convex, curving to straight ascending dorsal profile that ends with acutely sharp tooth that overhangs posterior margin by almost one-third the length of node; dorsal margin of tooth approximates a 40° angle, and is closely aligned along longitudinal petiolar axis; posterior profile straight and sharply separated from lateral face. *Petiolar node* longer than wide in dorsal view; anterior profile shorter than posterior profile. *Subpetiolar process* subtriangular to rounded. *Abdominal tergite III* in lateral view with vertical anterior profile that becomes convex dorsad. *Cinctus* distinct on both abdominal tergum and sternum IV, but not strongly impressed. *Abdominal tergum VII* (= pygidium) broadly convex in lateral view. *Abdominal sternum VII* (= hypopygium) with stout setae. *Sculpture*: lateral face of petiolar node mostly smooth ventrad, with dorsal half coarsely strigate-rugose, posterior face striate. Gaster smooth and shining.

Setation. Body with erect to suberect hairs; median clypeal lobe with two long parallel hairs; scape with sub-decumbent hairs and decumbent pubescence; mesosoma and gaster lacking pubescence.

Color. Head, mesosoma, and petiole black; clypeus and procoxae black to brownish; antennae, mandibles, and most of legs ferruginous brown; gaster ferruginous.

Male diagnosis

Uniquely identified among the *unistimulosa* species complex by the following conditions: **(1)** Body size not very large (WL < 3.00 mm); **(2)** ocelli grossly enlarged, distance between lateral ocellus and compound eye < 1 lateral ocellus length; **(3)** ocelli surpassing posterior head margin in full face view; **(4)** compound eyes grossly enlarged, with the distance between them slightly more than one eye length in full-face view; **(5)** scape 1.5–2x pedicel length and slightly longer than clypeal length; **(6)** mesoscutum about as long as broad; **(7)** mesoscutum smooth and slightly rugose posteriorly; **(8)** vein M+Cu-f1 short; **(9)** 2r-rs longer than Rs-f4; **(10)** petiolar node bulging anterad at posterodorsal corner; **(11)** abdominal sternites AIII–VIII (gastral I–VI) with sparse hairs, without appearance of dense shaggy pads. The enlarged ocelli and compound eyes and the petiolar node form are the most conspicuous defining features of this species (chars. 2–4, 10).

Male measurements

EL 0.71; **OL** 0.15**; OES** 0.09; **CML** 0.35; **ML** 0.33; **SL** 0.36; **HL** 1.08; **HW** 1.225; **MeL** 1.00; **MeW** 0.94; **WL** 2.38; **PetW** 0.47; **PetH** 0.80; **PetL** 0.65; **OI** 58.0; **MI** 26.9; **CI** 113.4; **SI** 29.4; **DPI** 72.3; **LPI** 123.1; (n = 1).

Head in full-face view longer than wide, excluding eyes. *Mandible* slightly shorter than antennal scape, edged apically, dorsal surface smooth. *Clypeus* anterolateral margin straight with thin lamella, apex truncate. *Frontal carinae* reduced. *Antenna*: Scape 1.5–2x pedicel length and slightly longer than clypeal length; pedicel longer than wide. *Compound eyes* grossly enlarged; minimum distance between eyes slightly more than half eye length in full-face view and slightly more the maximum eye width. *Ocelli* large, equal in size, moderately protruding beyond posterior border of head; distance between compound eye and lateral ocellus less than ocellus width. *Sculpture*: Cuticle of head capsule mostly punctate.

Mesosoma with dorsal profile broadly convex in lateral view. *Pronotum* rugulose laterally. *Mesoscutum* in dorsal view slightly longer than wide; anteriorly and laterally smooth, rugose posterad of notauli. *Notauli* strongly impressed, scrobiculate. *Parapsidal lines* extend about half of mesoscutal length. *Mesoscutellar disc* longitudinally striate. *Upper mesopleural area* (= anepisternum) punctate and medially striate. *Longitudinal mesopleural sulcus* scrobiculate. *Lower mesopleural area* (= katepisternum) smooth. *Mesometapleural suture* well-marked. *Propodeum* in lateral view with angle between dorsal and descending margin; dorsally rugulose, declivity shining and with few carinae. *Sculpture*: propodeum and metapleuron mostly rugulose in lateral view.

Wings. Forewing as in *L. bohlsi*, but vein M+Cu-f1 very short, and 2r-rs longer than Rs-f4; hindwing veins mostly reduced.

Metasoma. *Petiole* with anterior profile broadly convex in lateral view, summit broadly truncate, posterior profile straight. *Subpetiolar process* tapered. *Petiolar sculpture*: lateroventral surface mostly rugulose, posterior face smooth with striae ventrally. *Cinctus* well marked. *Gaster* mostly smooth with sparse punctulae. *Abdominal sternum IX* posteriorly rounded.

Genitalia. *Cupula* (= basal ring) distinctly broadening posterad in dorsal view; dorsal surface longer than ventral surface but not considerably so, being about 2x ventral surface length; ventral surface deeply emarginate medially. *Gonopod* (= paramere) about three times as long as tall; gonocoxa and gonostylus about equal in length, as measured from their ventral inflection point. *Gonocoxa* (= basimere) dorsomedial margins evenly and weakly curving to gonostyli, with dorsal proximomedial margins not parallel; ventromedial margins long, with length of parallel margins about equal to width of gonocoxal base in ventral view. *Gonostylus* (= telomere/harpe) long and narrowly rounded apically. *Volsellae* appearing long. *Penite* (= penisvalva) with lateral process at base of valvura; lateral penital carina (= lateral apodeme) with broad and rounded proximal process; penital apex short, comparatively broad; serrations of ventral margin of variable stature, with serrations not distinctly projecting between the ventral curve and apical concavity.

Setation. Head with some long erect hairs and with fine decumbent hairs; clypeus with fine sub-decumbent hairs, anterad with long suberect hairs; antenna with short sub-decumbent hairs. Mesosoma, petiole, and gaster covered with erect hairs and sometimes with short sub-decumbent hairs.

Color. Body mostly black; clypeus antenna, legs, and gaster brownish to brownish lighter posteriorly.

Comments

In the workers, the clypeal median lobe with 12 chaetae (= stout setae), relatively straightened mandible, and brightly ferruginous gaster are very distinct hallmarks for this species. This species will key without difficulties to couplet 5 in Lattke (2011), whereupon the reader may use the modification to that key provided below. *Leptogenys elzasoares* **new species** is very similar in appearance to *L. bohlsi*, including the long and slender mandible but differs in the more straightened mandibles, slightly longer scape, and longer petiolar tooth. But the most distinctive characteristic is the clypeal median lobe with 12 chaetae in *L. elzasoares* **new species**, but in *L. bohlsi* usually only 3–4 chaetae are present. Although the workers of these two species are similar, the males can be distinguished by the enlarged compound eye in *L. elzasoares* ***new species*** male, with the distance between them slightly more than one eye length in full-face view, while it is relatively small in *L. bohlsi* males.

The male of *L. elzasoares* **new species** resembles *L. unistimulosa* (Lattke, 2011) due to the large and bulging eyes, but can be easily differentiated by the petiole. The *L. elzasoares* **new species** male has the petiolar summit truncate, while in *L. unistimulosa* the petiole summit is rounded to subtriangular. Another aspect to take into account is the shorter scape length in *L. elzasoares* **new species** (0.36 mm) than in *L. unistimulosa* (0.50–0.60mm). Differing colors may also help to separate these males: in *L. elzasoares* **new species** the body is mostly dark and the gaster is black to brownish posteriorly, while in *L. unistimulosa* the body is usually bicolored, the head and mesosoma mostly black to brown and the gaster ferruginous brown.The collection permit covering this collection event is SISBIO no. 53954, issued on 08 May, 2016.

Biology

The workers and male were collected walking on a trail in a small open area surrounded by primary Amazon Forest. Presumably these ants were either migrating at the time, or perhaps fleeing from an army ant raid. A phoretic deutonymph mite of the family Acaridae is adhered on the left maxillae of one worker (UFV-LABECOL-010408) (Figure 7).

Etymology

This species is named, in apposition, after Elza da Conceição Soares (1930–2022), one of the greatest Brazilian singers of all time. Named the voice of the millennium, she was a powerful voice for social and racial justice, and women's rights. Our beloved Elza has gone to rest, but her voice will forever echo in our hearts.

Material studied

Holotype: Brazil. Amazonas: Manaus, Colosso camp, 12-21.VIII.2016, Boudinot, B; Fernandes, I.; Chaul, J. Camp at -2.403723, -59.865735, *1 worker* INPA - HYM 034449, [INPA]. **Paratypes**: same data as holotype, except *1 callow worker* UFV-LABECOL-009566, [CELC]; *1 worker* UFV-LABECOL-010408; and *1 male* UFV-LABECOL-011120, [DZUP]; Manaus, Col. St. Antonio, 11.xi.1971, INPA#1 6564, *1 worker*, [MZSP].

Leptogenys parensis **Lattke, 2011**

(Figures 8, 9, and 11C)
Leptogenys paraense Lattke 2011: 215, fig. 71 (w) Brazil, Pará.
Leptogenys parensis Lattke. Gender agreement established.

Male diagnosis

Uniquely identified among the *unistimulosa* species complex by its comparatively large body size: **(1)** Body size very large (WL > 3.00 mm; HW > 1.40 mm). Further recognized by the following conditions: **(2)** ocelli large but not grossly so, with the distance between compound eye and lateral ocellus in full face view somewhat > 1 lateral ocellus width; **(3)** ocelli close to or slightly surpassing posterior head margin in full face view; **(4)** compound eyes not grossly enlarged, distance between them slightly less than one eye length in full-face view; **(5)** scape robust, about 1.5–2x pedicel length, and slightly longer than clypeal length; **(6)** mesoscutum longer than broad; **(7)** mesoscutum distinctly sculptured posterad of notauli; **(8)** vein M+Cu-f1 one third Cu-f2 length; **(9)** 2r-rs longer than Rs-f4; **(10)** petiolar node without bulge anterad of posterodorsal corner; **(11)** abdominal sternites IV–VIII (gastral II–VI) sparsely hairy, without appearance of dense shaggy pads.

Male measurements

EL 0.80–0.90; **OL** 0.12–0.19; **OES** 0.13–0.26; **CML** 0.47–0.51; **ML** 0.4–0.52; **SL** 0.55–0.61; **HL** 1.25–1.40; **HW** 1.43–1.48; **MeL** 1.35–1.45; **MeW** 1.13–1.21; **WL** 3.25–3.46; **PetW** 0.58–0.62; **PetH** 1.03–1.06; **PetL** 0.86–0.98; **OI** 55.9–61.0; **MI**; 27.6–35.8; **CI** 105.4–115.5; **SI** 38.4–42.1; **DPI** 61.2–72.8; **LPI** 108.2–120.5; (n = 5).

Head in full-face view longer than wide excluding eyes; mostly rugulose to punctate. *Mandible* slightly shorter than antennal scape, rounded apically, edentate, dorsal surface smooth. *Clypeus* convex on antero-midline, anterolateral margin straight with thin lamella, apex

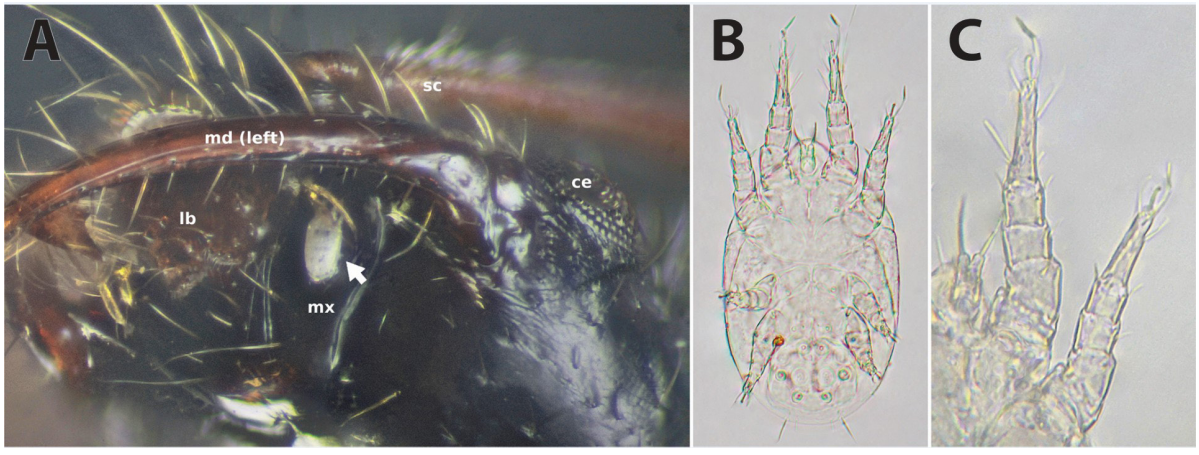

Figure 7. A phoretic deutonymph mite (Acaridae) on a *L. elzasoares* **new species** worker, paratype UFV-LABECOL-010408: (A) mite *in situ* on the left maxilla (white arrow); (B) mite ventral view and (C) zoom of left anterior legs. **ce**: compound eye, **lb**: labrum, **md**: mandible, **mx**: maxilla, **sc**: scape.

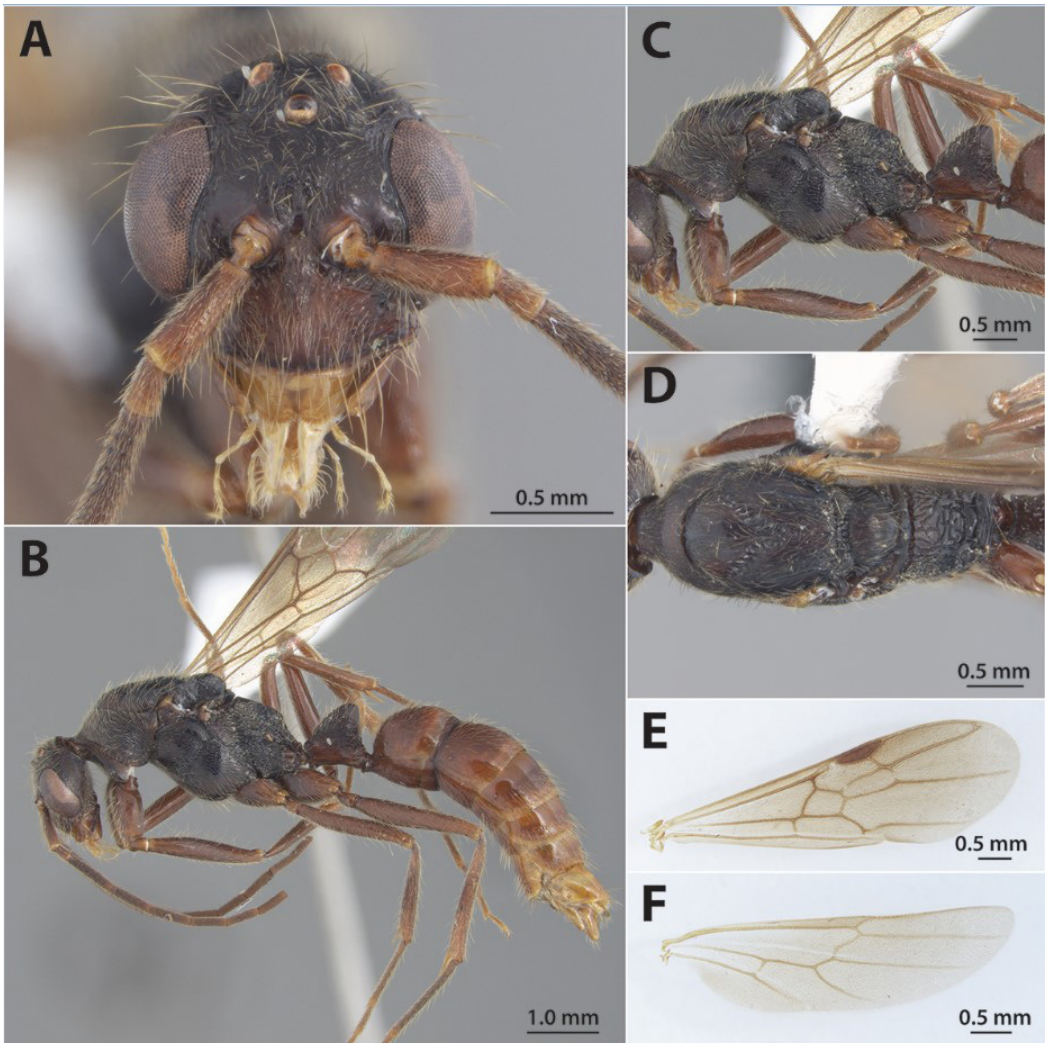

Figure 8. *Leptogenys parensis* male, DZUP 550881: (A) full-face, (B) lateral, mesosoma in (C) profile and (D) dorsal views, (E) fore wing and (F) hind wing.

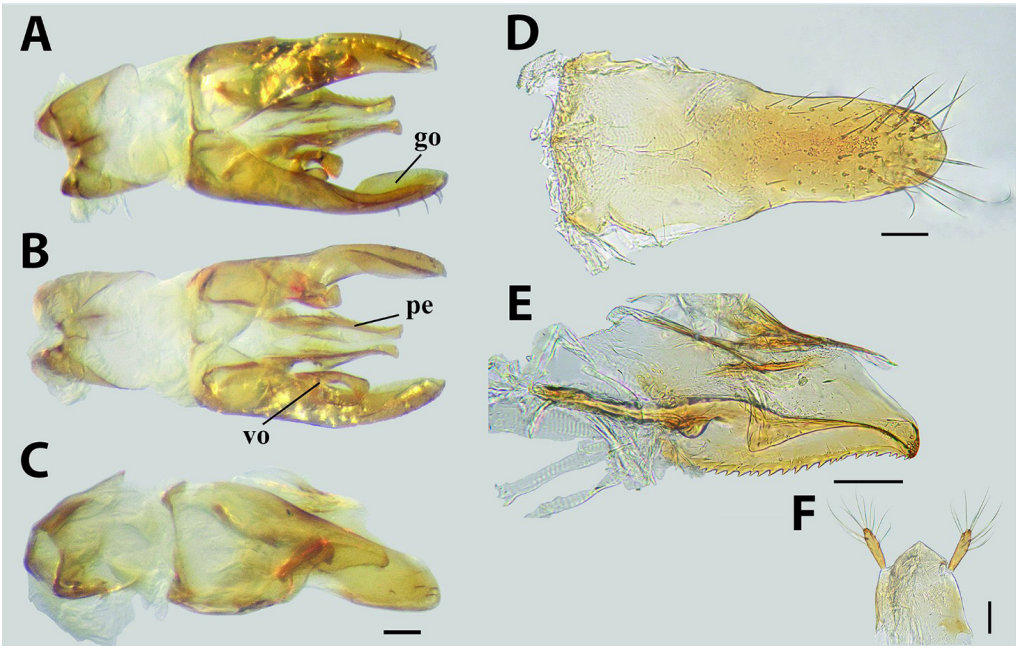

Figure 9. *Leptogenys parensis* male genitalia, DZUP 550881: (A) genital capsule in dorsal, (B) ventral and (C) lateral views, (D) abdominal sternum IX in ventral view, (E) penisvalva and (F) tergum IX in lateral views. Scale bar = 0.1 mm. **go**: gonopod, **pe**: penisvalvae, **vo**: volsella.

truncate, weakly rugose. *Frontal carinae* reduced. *Antenna*: Scape robust, 1.5–2 x pedicel length and slightly longer than clypeal length; pedicel longer than wide. *Compound eyes* large; minimum distance between compound eyes in full-face view slightly more than 1.5 x maximum eye width. *Ocelli* equal in size, sometimes protruding beyond posterior border of head; distance between compound eye and lateral ocellus may vary, but always greater than maximum diameter of medium ocellus.

Mesosoma with dorsal profile broadly convex in lateral view. *Pronotum* punctate to rugulose laterally. *Mesoscutum* in dorsal view longer than wide; anteriorly and laterally smooth, sometimes striate or rugulose between parapsidal lines, striae may be longitudinal or almost transverse. *Notauli* strongly impressed, scrobiculate. *Parapsidal lines* extend about half of mesoscutal length. *Mesoscutellar disc* longitudinally striate. *Upper mesopleural area* (= anepisternum) punctate and medially striate. *Longitudinal mesopleural sulcus* broad and scrobiculate. *Lower mesopleural area* (= katepisternum) punctate. *Mesometapleural suture* well-marked. *Upper metapleuron* rugulose to punctate, sculpturing shallower than on lower metapleuron. *Propodeum* in lateral view with angle between dorsal and descending margin; dorsally rugulose, declivity shining and with few carinae. *Sculpture*: Propodeum and metapleuron mostly rugulose in lateral view.

Wings. As in *L. bohlsi*, but vein M+Cu-f1 is one-third Cu-f2 length, and 2r-rs is longer than Rs-f4.

Metasoma. *Petiole* subtriangular in lateral view, anterior profile broadly convex, summit broadly convex to truncate. *Subpetiolar process* rounded. *Petiolar node* trapezoid in dorsal view, longer than wide; lateral surface rugulose mostly halfway up, posterior face smooth with striae ventrally. *Cinctus* well marked. *Gaster* mostly smooth with sparse punctulae. *Abdominal sternum IX* posteriorly rounded.

Genitalia. *Cupula* (= basal ring) weakly broadening posterad, with sides almost parallel in dorsal view; dorsal surface much longer than ventral surface, being about 3x ventral surface length; ventral surface deeply emarginate medially. *Gonopod* (= paramere) about three times as long as tall; gonocoxa and gonostylus about equal in length, as measured from their ventral inflection point. *Gonocoxa* (= basimere) dorsomedial margins evenly and weakly curving to gonostyli, but with dorsal proximomedial margins distinctly parallel for some distance; ventromedial margins short, with length of parallel margins about distinctly less than width of gonocoxal base in ventral view. *Gonostylus* (= telomere/harpe) long but narrowly rounded apically. *Volsellae* appearing stout and short. *Penite* (= penisvalva) with lateral process at base of valvura; lateral penital carina (= lateral apodeme) with acute and narrowly rounded proximal process; penital apex long, comparatively narrow; serrations of ventral margin of variable stature, but with serrations between ventral curve and apical concavity distinctly projecting.

Setation. Head with some long erect hairs and sometimes with fine decumbent hairs; clypeus with fine sub-decumbent hairs, anterad with long suberect hairs; antenna with some long sub-erect and short sub-decumbent hairs. Mesosoma, petiole, and gaster covered with erect hairs and sometimes with short sub-decumbent hairs.

Color. Body black to brown; clypeus antenna, legs, and gaster ferruginous brownish; petiole ferruginous ventrally and dark brown dorsally.

Comments

Described by Lattke (2011), *L. parensis* was known only from four workers from Pará, Brazil. Recently six workers were collected in the Nouragues Natural Reserve in French Guiana, about 780 km northwest of the type locality and 77 km southwest from Saül, where males were collected. This geographic proximity and the large size of the males support their identification as *L. parensis*. As in the workers, the males of *L. parensis* males are much larger (WL > 3.2 mm) compared with the other males of the group, and the eye is not as bulging as in *L. unistimulosa* and *L. elzasoarez* **new species**. The *L. parensis* males also differ from the other two species by their robust scape and sometimes sculpted mesoscutum. However, they vary in eye size: in the French Guiana specimens the distance between the compound eye and lateral ocellus is more than the width of the medial ocellus, while in the Brazilian specimens the distance is about the same. Another difference is in the mesoscutal sculpture, in specimen DZUP 550880 it is transversely striate, while in other specimens the mesonotum is smooth with punctures. This species has a subtriangular petiole, but the summit in DZUP 550880 is rounded, while it is truncate or pointed in the other specimens studied.

Leptogenys paraensis was named by Lattke (2011) for a geographic place, the Brazilian State of Pará, for which the species epithet should be considered a Latin adjective in the nominative case that must reflect the gender of the genus name. The suffix "-ense" is neuter, but the genus name *Leptogenys* is feminine, therefore the species name is emended to the feminine "*parensis*" to establish gender agreement.

Material studied

Brazil. Pará: Serra Norte, 3-5.xi.1985, J. Dias, *1 male* "N1.Mata" MPEG03034810, *1 male* "Manganês" MPEG03034824, [MPEG]. **French Guiana. Cayenne**: Regina, Nouragues Natural Reserve, Inselberg, lat 4,09569, lon-52.68319, Rainforest, AntCourse 2018, ACF#44, 21.viii-1.ix.2018, *3 workers* DZUP 550883, *2 workers* DZUP 550884, *1 worker* DZUP 550885. Saül, Bélvédère de Saül, 03°37'22"N 53°12'27"W, alt. 326m v05, S.E.A.G. team leg. *1 male* 20.v.2011 DZUP 550882, *1 male* 30.vi.2011 DZUP 550881, *1 male* 14.iii.2011 DZUP 550880 [DZUP].

***Leptogenys unistimulosa* Roger, 1863**

(Figures 10 and 11D)

Male diagnosis

Uniquely identified among the *unistimulosa* species complex by the following conditions: **(1)** Body size not very large (WL < 3.05 mm); **(2)** ocelli medium-sized, the distance between compound eye and lateral ocellus in full face view about no more than 1.5x ocellus width; **(3)** ocelli close to or slightly surpassing posterior head margin in full face view; **(4)** compound eyes large but not grossly enlarged, slightly longer than maximum distance between eyes, facial area may be about twice as wide as eye; **(5)** scape more than two times pedicel length, and longer than clypeal length; **(6)** mesoscutum longer than broad; **(7)** mesoscutum largely smooth, with indistinct sculpture posterad notauli; **(8)** vein Cu-f2 reduced; **(9)** 2r-rs longer than Rs-f4; **(10)** petiolar node without bulge anterad posterodorsal corner; **(11)** abdominal sternites IV–VIII (gastral II–VI) sparsely pilose, without appearance of dense shaggy pads. Most similar to *L. parensis*, having a long mesoscutum (6) and neither small nor particularly large eyes and ocelli (2–4); distinguished from *L. parensis* by its smaller body size (1).

Male measurements

EL 0.69–0.88; **OL** 0.14–0.19; **OES** 0.14–0.19; **CML** 0.39–0.48; **ML** 0.40–0.49; **SL** 0.50–0.60; **HL** 1.18–1.25; **HW** 1.22–1.43; **MeL** 1.09–1.25; **MeW** 1.01–1.17; **WL** 2.62–3.05; **PetW** 0.50–0.62; **PetH** 0.90–1.03; **PetL** 0.70–0.87; **OI** 54.8–63.7; **MI** 31.4–36.3; **CI** 101.7–116.7; **SI** 37.6–44.4; **DPI** 65.2–80.0; **LPI** 108.0–129.5; (n = 10).

Head in full-face view longer than wide, excluding eyes, usually wider than longer including eyes; cuticular surface punctate. *Mandible*

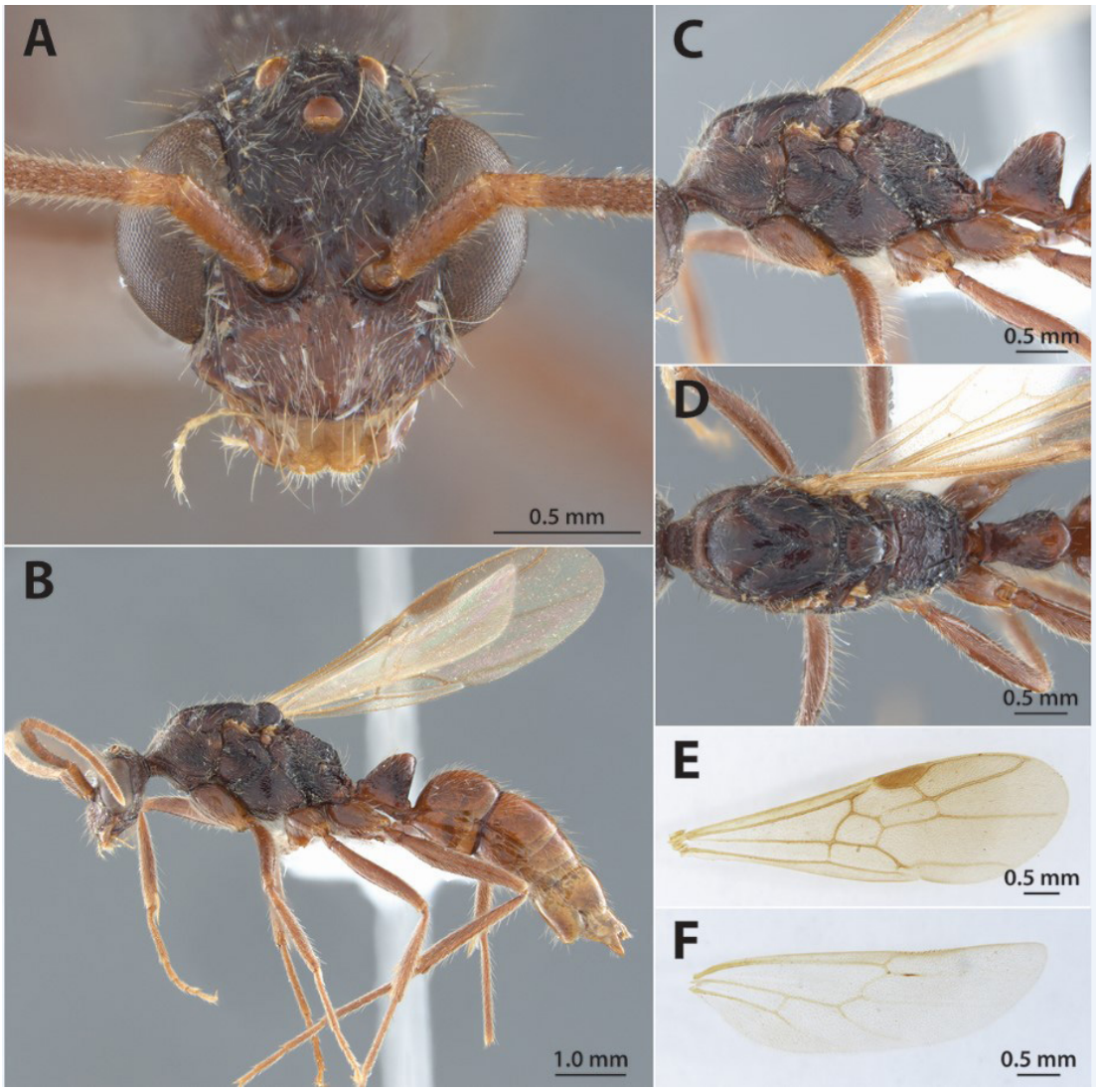

Figure 10. *Leptogenys unistimulosa* male, DZUP 550877. (A) full-face, (B) lateral, (C) mesosoma in profile and (D) dorsal view, (E) fore wing and (F) hind wing.

slightly shorter than antennal scape, rounded apically, edentate, dorsal surface smooth and shining. *Clypeus* with thin lamella present laterally on anterior margin; weakly rugose laterally. *Frontal carinae* reduced. *Antenna*: Scape more than 2x pedicel length and longer than clypeal length; pedicel longer than wide. *Compound eye* large and bulging; minimum distance between eyes in full-face view as wide as eye, sometimes 1.5–2x wider than the eye. *Ocelli* equal in size, not noticeably protruding beyond posterior border of head; distance between compound eye and lateral ocellus may vary, but not more than 1.5 x greater than median ocellus maximum diameter.

Mesosoma with dorsal profile broadly convex in lateral view. *Pronotum* punctate, weakly rugose laterally. *Mesoscutum* in dorsal view longer than wide; usually punctate, occasionally with weakly impressed striae. *Notauli* strongly impressed, scrobiculate. *Parapsidal lines* about half mesoscutal length. *Mesoscutellar disc* with longitudinal striae. *Upper mesopleural area* (= anepisternum) punctate with median band of oblique striae. *Longitudinal mesopleural sulcus* scrobiculate. *Lower mesopleural area* (= katepisternum) punctate to mostly smooth with sparse punctae. *Mesometapleural suture* well impressed. *Upper metapleuron* rugulose to punctate, sculpturing shallower than on lower metapleuron. *Propodeum* in lateral view with an angle between dorsal and descending margins; dorsally rugulose, declivity shining and with few carinae. *Sculpture*: Propodeum and metapleuron rugulose, declivity with some carinae.

Wings. Vein pattern as in *L. bohlsi* but 2r-rs is longer than Rs-f4.

Metasoma. *Petiole* subtriangular in lateral view, anterior profile broadly convex, summit convex to pointed and highest point posteriorly, posterior margin vertical. *Subpetiolar process* rounded. *Petiolar node* trapezoidal in dorsal view, longer than wide; lateral surface mostly rugulose, posterior face with weak striae laterally smooth medially. *Cinctus* well marked. *Gaster* mostly smooth with sparse punctulae. *Abdominal sternum IX posteriorly* rounded.

Setation. Head with erect long hairs and with fined decumbent hairs; clypeus with fine sub-decumbent hairs, anteriad with few long suberect hairs; antenna with stout sub-erect hairs and pubescence, scape with few long hairs. Mesosoma, petiole, and gaster covered with some long erect hairs; pronotum, upper and lower mesopleural areas with short sub-decumbent hairs.

Color. Body black to brown; clypeus, antenna, legs, and gaster ferruginous brownish.

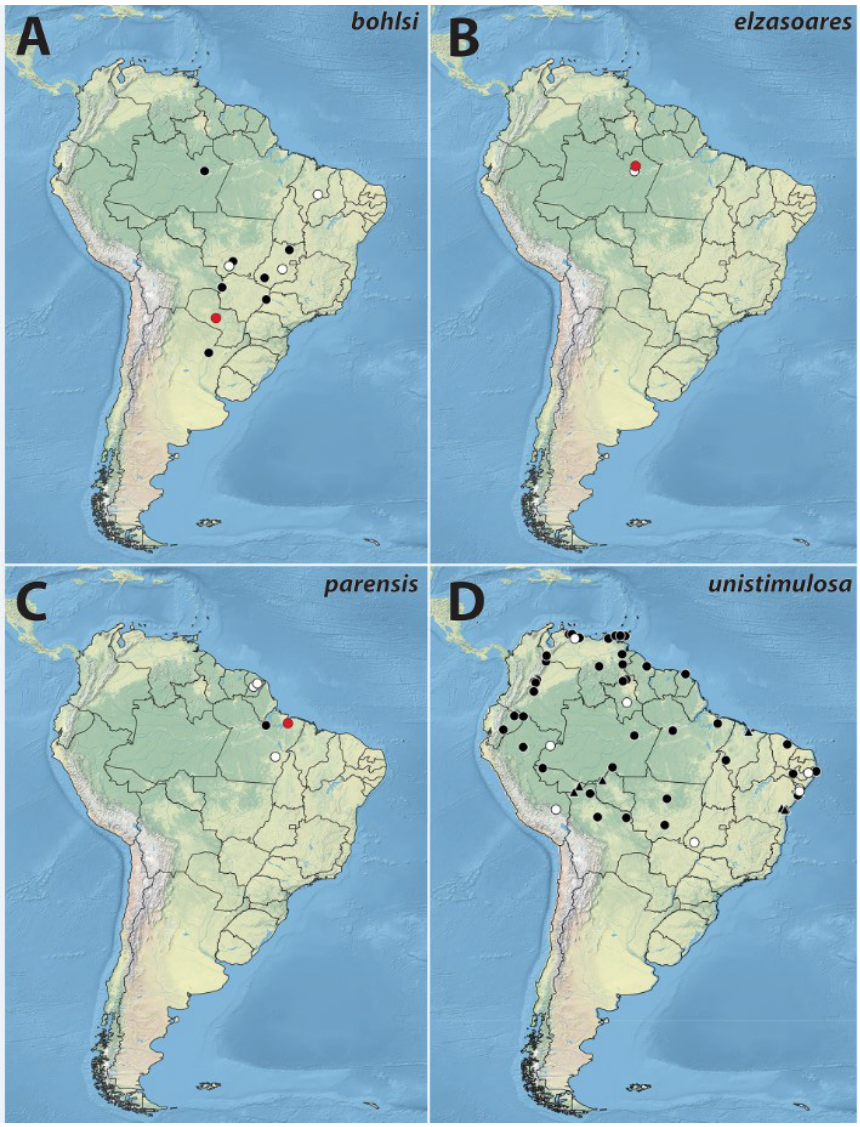

Figure 11. Figure 11. Distribution maps. (A) *L. bohlsi*; (B) *L. elzasoares*; (C) *L. parensis*; (D) *L. unistimulosa*, Miranda et al. (2012), Salazar & Donoso (2013), Gomes et al. (2014), Miranda et al. (2017), Santos et al. (2017), Fernandes & Souza (2018), Prado et al. (2019), Nascimento et al. (2020). Red circles: type locality; White circles: material studied; Black circles: material studied by Lattke (2011), Black triangles: records not examined from literature after 2011.

Comments

We inferred these males belong to *L. unistimulosa* on account of the localities from which they were collected, which match the known distribution of *L. unistimulosa* and are partially beyond the known range of *L. bohlsi*. *Leptogenys unistimulosa* has a distribution that covers most of northern South America with no known records south of 17°S, whilst the distribution of *L. bohlsi* is mostly in southern South America up to Maranhão, Brazil, with a single record from Manaus, Brazil (Lattke, 2011). A single male from the Coastal Cordillera of northern Venezuela is without a doubt *L. unistimulosa*, as many workers have been collected in the same site and in other localities of the Cordillera (Lattke, 2011).

The large and bulging eyes and the subtriangular petiole make this species recognizable. The convexity of the eye is noticeably greater than that of *L. bohlsi* and *L. parensis* with the head in full-face view. *L. unistimulosa* males also resemble *L. elzasoares* **new species,** but the former have the petiole summit rounded to subtriangular, while the latter have a truncate summit (see *L. elzasoares* **new species** comments). *L. unistimulosa* males have a wide morphological variation, even within the same series. The body size may vary, as the specimens from Peru are slightly larger. The ocelli are smaller in the male from Venezuela compared with Brazilian specimens from Pernambuco, Sergipe, and Amazonas. The distance between lateral ocellus and compound eye is less than medium ocellus width in the Venezuela males, while it is equal or greater in specimens from Brazil. The petiolar node shape varies from rounded in the Amazonas specimen to presenting a blunt posterior angle in the Peru specimens, this variation seems to be widespread throughout this species, as a series of three males from Goiás present the node varying from rounded to pointed.

A specimen from La Paz, Bolivia (DZUP 550873) was identified as *L.* aff. *unistimulosa* as it differs from *L. unistimulosa* by having a pointed mandible apex, forming a small tooth, and relatively larger ocelli. A male from Mato Grosso do Sul, Brazil (DZUP 550886) represents another form close to *L. unistimulosa*, as it has a large compound eye, large ocelli, and the mesoscutum in dorsal view only punctate. However, its petiole is mostly rounded, and the specimen is considerably smaller (WL 2.37) than *L. unistimulosa* males (WL 2.62–3.05). These specimens could represent two different species, but a decision should await the availability of additional material given its similarity with *L. unistimulosa.*

Material studied

Bolivia. La Paz: Mapiri-Sarampiuni, 13.ii.2055, Malaise, J. Rodriguez, 1 *male* DZUP 550873 [DZUP]. **Brazil. Amazonas**: Estirão do Equador, R. Javari, ix.1979, Alvarenga, *1 male* [MZSP]. **Pernambuco**: Caruaru, v.1972, J. Lima, *2 males* [MZSP]. **Goiás**: Jataí, 12.xii.1972, 8983, F. M. Oliveira, *3 males* [MZSP]. **Mato Grosso do Sul**: Aquidauana, 20°26'12.53"N 55°39'40.05"W, 05.xii.2012, M. Savaris & S. Lampert, *1 male*, DZUP 550886 [DZUP]. **Pernambuco**: Caruaru, v.1972, J. Lima, *2 males* [MZSP]. **Roraima**: Caracaral, Parque Nacional do Viruá, 01.4412° -61.0437°, 406m, 06-12.xii.2017, J. Lattke #3889, *1 worker* DZUP 550889 [DZUP]. **Sergipe**: N. S. das Dores, 1.ix.2014, Area RL Parcela 24, Almeida, R. P. S. Leg. *1 male* DZUP 550878 [DZUP]; Laranjeiras, 10°49'16.3"S 37°11'15.3"W, 21.vi.2012, E. Gomes, *1 worker* UVF LABECOL 001237 [CELC]. **Peru. Cusco**: Quincemil, 13°20'10"S 70°50'57"W, 23-31.viii.2012, Malaise, 19KmW Rio Araza tributary, 874m, R.R. Cavichioli, J.A. Rafael, A.P.M. Santos & D.M. Takiya, *1 male* DZUP 550875, *1 male* DZUP 550876 [DZUP]. **Venezuela. Carabobo**: Sector Palmichal, 5.3km ENE Canoabo, 10.2932° -68.2342°, 14.vi.1998, J.L. García, F.I.T., *1 male* DZUP 550877 [DZUP].

Identification

Additions to Lattke (2011) worker key

5. Head in full-face view broad (CI > 0.90) with lateral margins distinctly diverging anteriorly… 6

Head narrower (CI < 0.90) with lateral margins sub-parallel or slightly diverging anteriorly… 5a

5a. Clypeal median lobe with 3–4 apical chaetae; mandible arched … ***Leptogenys bohlsi***

Clypeal median lobe with 12 apical chaetae; mandible straight… ***Leptogenys elzasoares* new species**

Key for the known males of the Leptogenys unistimulosa group

1. Compound eyes conspicuously enlarged. Width of frons at full-face view less than 0.45 of HW (Fig. 5A). Distance between lateral ocelli and compound eyes < 1 lateral ocellus length. OL/OES*100 = 166.7. In lateral view, apex of petiolar node bulging above posterodorsal angle (Fig. 5C)… ***Leptogenys elzasoares new species***

- Compound eyes not so enlarged. Width of frons at full-face view more than 0.45 of HW (Fig. 10A). Distance between lateral ocelli and compound eyes ≥ 1 lateral ocellus length. OL/OES*100 < 155, usually < 130. In lateral view, apex of petiolar node not bulging above posterodorsal angle; rather, node unevenly rising to the unevenly rounded apex (Fig. 3C, 8C, 10C) … 3

2. Mesoscutum about as broad as long: Mesoscutal anteroposterior length about equal to its lateromedial width, as measured at its greatest width, just anterad the tegula. Minimum distance between eyes ~ 1 eye length as measured in full-face view… ***Leptogenys bohlsi***

- Mesoscutum longer than broad: Mesoscutal anteroposterior length distinctly longer than its lateromedial width, as measured at its greatest width, just anterad the tegula. Minimum distance between eyes distinctly < 1 eye length as measured in full-face view… 4

3. Large species (HW > 1.43 mm, WL> 3.25 mm). Sculpture relatively more developed: disc of mesoscutellum striate; area between parapsides with dense, irregular, broad longitudinal to transverse grooving or totally rugulose. Restricted to the Brazilian Amazon and French Guiana… ***Leptogenys parensis***

- Smaller species (HW < 1.43 mm, WL < 3.10 mm). Sculpture relatively less developed: disc of mesoscutellum largely smooth, with effaced striations; area between parapsides largely smooth, with sparse longitudinal grooving. More widely distributed, including Brazilian Amazon and non-Amazon regions,, Peru, and Venezuela… ***Leptogenys unistimulosa***

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Conflicts of interest

The authors declare no conflicts of interest.

Author contribution statement

LT contributed with conceptualization, writing, descriptions, and imaging. JC contributed with writing, descriptions, and imaging. BB contributed with writing, review, and editing. JL contributed with writing, descriptions, review and editing.

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