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Lectotype designation and redescription of four commonly collected Neotropical species of *Strumigenys* (Hymenoptera: Formicidae)

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Abstract. In 1887, Mayr described four species of the ant genus *Strumigenys* collected in the Brazilian state of Santa Catarina: *Strumigenys unidentata*, *Strumigenys subedentata*, *Strumigenys denticulata*, and *Strumigenys crassicornis*. All of them were described based on a series of one to several specimens, without designation of a holotype, as usual at that time. The same can be said about *Strumigenys eggersi*, described by Emery in 1890 based on specimens collected in Saint Thomas (U.S. Virgin Islands), without designation of a holotype. In 1961, Brown designated a lectotype for *S. unidentata* and synonymized it under *Strumigenys louisianae*. However, the specimens belonging to the type series of the other four species remain as syntypes. Considering that these are four of the most frequently collected species of *Strumigenys* in the Neotropical region, in this work we provide lectotype designations and complete redescriptions for *S. crassicornis*, *S. denticulata*, *S. eggersi*, and *S. subedentata* to ensure the taxonomic stability of these names.

Keywords. Myrmicine ants, nomenclatural act, taxonomic additions, predatory ants, leaf-litter ants.

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Introduction

The hyperdiverse *Strumigenys* Smith, 1860 is a cosmopolitan genus of ants with more than 850 described species (Bolton 2021), particularly noted for its variation in mandibular morphology (Bolton 2000; Baroni Urbani & De Andrade 2007; Booher & Hoenle 2021; Booher *et al.* 2021). Despite having many

species occurring in temperate ecosystems, the genus is most diverse in the tropical rainforests around the world (Bolton 1998). In those regions, *Strumigenys* is often an abundant component of the litter community (Ward 2000).

In terms of regional diversity, the Neotropical region has more than 200 valid species, with possibly several more to be described (Silva & Feitosa 2019; Bolton 2021). Among them, some species belonging to the *gundlachi* group (Bolton 2000) are considered the most common ant taxa from the Neotropical *Strumigenys* fauna. During the work for a catalogue of the Neotropical fauna belonging to the genus, we found some concerning issues related to type designation in four extremely common Neotropical species from the *gundlachi* group: *Strumigenys crassicornis* Mayr, 1887, *Strumigenys denticulata* Mayr, 1887, *Strumigenys eggersi* Emery, 1890, and *Strumigenys subedentata* Mayr, 1887.

Issues date back from their original description. Three of the four abovementioned species (i.e., *S. crassicornis*, *S. denticulata*, and *S. subedentata*), along with the now synonymized *Strumigenys unidentata* Mayr, 1887, were described by Mayr (1887) based on several specimens collected by Alfred Hetschko at an unknown locality in the southern state of Santa Catarina, Brazil. In his work, Mayr established the syntypes for the new species based on the specimens studied. Later, Brown (1961) designated a lectotype for *S. unidentata* and synonymized it under *Strumigenys louisianae* Roger, 1863. However, no other study has investigated the type status or designated lectotypes for the other three species. In the case of *S. eggersi*, Emery (1890) provided the description of this species, along with several other species and variants of *Strumigenys* collected in continental and insular Mesoamerican territories, especially from Costa Rica and Saint Thomas, and did not designate any type category for the specimens used in the description. This has serious implications for the establishment of accurate species boundaries for *S. crassicornis*, *S. denticulata*, *S. eggersi*, and *S. subedentata*, affecting subsequent revisionary works.

In this work, we provide lectotype designations for *S. crassicornis*, *S. denticulata*, *S. eggersi*, and *S. subedentata* along with redescriptions based on the designated lectotype for each species and commentaries on morphological variation and distribution of recently collected specimens from Brazil.

Material and methods

Material

The material upon which this study is based is located at the following institutions:

CELC = Coleção Entomológica do Laboratório de Sistemática e Biologia de Coleoptera, Universidade Federal de Viçosa, Viçosa, Brazil
DZUP = Coleção Entomológica Padre Jesus Santiago Moure, Universidade Federal do Paraná, Curitiba, Brazil
INPA = Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil
MCSN = Museo Civico di Storia Naturale 'Giacomo Doria', Genoa, Italy
MCZ = Museum of Comparative Zoology, Cambridge, United States of America
MZSP = Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil
NHMUK = The Natural History Museum, London, United Kingdom
NHMW = Naturhistorisches Museum, Wien, Austria
ZMHB = Museum für Naturkunde der Humboldt-Universität, Berlin, Germany

Collection curators were contacted indicating that lectotypes and paralectotypes would be designated in their respective institutions. Unique identification codes were generated for each designated specimen per the curatorial requirements of each depository institution; not all specimens received unique identifiers.

Taxonomic treatment

Species redescriptions are presented in the format of 'Taxonomic treatments' – i.e., sections of a given publication documenting the features and/or distribution of a related group of organisms in ways adhering to highly formalized conventions (Catapano 2019). The taxonomic treatments are comprised of five subsections (based on the types of semantic content by Schulz & Jansen 2013): (i) nomenclature (i.e., species name, species name history, and type designations); (ii) diagnosis (i.e., universal statements describing the defining properties shared by all instances of the kind the statement refers to); (iii) measurements and description (i.e., assertional statements that document empirical observations about particular entities); (iv) comments (i.e., contingent statements of sorts, that ascribe predicates to a class that may or may not be true for all its members); and (v) additional material examined.

Diagnoses and redescriptions of the species are elaborated following Oliveira & Feitosa (2019) and Ladino & Feitosa (2020); declarations are elaborated following an anterior-posterior axis of description, with sculpture and setae being described first, followed by body structures. The redescriptions are additions and amendments to Bolton's (2000) abbreviated descriptions and are based on the designated lectotypes, with known variation (including those observed in paralectotypes) for each species being described in the commentaries. Morphological and qualitative (i.e., sculpture and setae shape) terms follow Bolton (2000). Digital color images were obtained from AntWeb.org and their corresponding credits are given in the legend of each figure in the following format: attribution, specimen code, photographer, and site address. The measurements and indices used in this study are based on those used by Bolton (2000), Lattke *et al.* (2018), Booher *et al.* (2019), Tang *et al.* (2019), and Brassard *et al.* (2020). When needed, measurement definitions were amended as to provide unambiguous procedural criteria for standardized measurement procedures. Whenever possible, when images were made available, paralectotypes were measured and their respective measurement values are presented after the lectotype measurements. Additional non-type specimens were also measured, and maximum-minimum values are given. Image measurements were taken using the measurement application ImageJ (Rasband 2018). Measurements are expressed in millimeters to three decimal places, while indices are expressed merely as non-metric units.

List of measurements

AB4L = Abdominal tergite IV length: the length of the fourth abdominal tergite in lateral view, measured from the posterior margin of the postpetiole (i.e., the rim of the postpetiolar foramen) to the posterior margin of the tergite

DPW = Dorsal petiolar width: the width of the petiolar node measured in dorsal view

EL = Eye length: the maximum diameter of the compound eye in lateral view. In cases where unpigmented ommatidia are present (generally located at the outer rim of the compound eye), the measure should be taken considering these structures. In cases where the eye is reduced to a single ommatidium, the maximum diameter of this structure alone should be taken

HL = Head length: the length of the head capsule excluding the mandibles, measured in dorsal view in a straight line from the mid-point of the anterior clypeal margin to the mid-point of the posterior cephalic margin. In species where one or both of these margins is concave, the measurement is taken from the mid-point of a transverse line that spans the apices of the projecting portions

HT = Head thickness: the thickness of head in lateral view, with maximum distance measured between two parallel lines, one tangent with the dorsal-most point of the head and the other tangent with the ventral-most point of the head. **If** ventral margin concave upward, then measured from the lower line tangent to the uppermost portion of the curve

HW = Head width: the maximum width of the head in full-face view, excluding the eyes

ML = Mandible length: the straight-line length of the mandible at full closure, measured in dorsal view from the mandibular apex to the anterior clypeal margin, or to the transverse line connecting the anteriormost points of the clypeus in taxa where the anterior clypeal margin is concave medially

PH = Petiolar height: maximum distance measured between two parallel lines, one tangent with the node apex and the other tangent with the ventral-most point of the petiole in lateral view. **If** ventral margin concave upward, then measured from the lower line tangent to the uppermost portion of the curve. If present, spongiform processes ignored

PL = Petiolar length: the length of the petiole in lateral view, measured from the propodeal foramen to the posterior margin of the petiole (i.e., the rim of the petiolar foramen). **If** the articulation with the propodeal foramen is obscured by the propodeal lobe, then the measurement is taken from the propodeal lobe to the posterior margin of the petiole

PPL = Postpetiolar length: maximum length of postpetiole in lateral view, measured from the anterior margin to the posterior margin. If present, spongiform processes are ignored

PW = Pronotal width: the maximum width of the pronotum in dorsal view. In cases where the lower pronotum expands laterally, the measurement is taken from each outermost margins of the lower pronotum. Projecting spines, tubercles or other cuticular prominences at the humeral angles are ignored

SL = Scape length: the maximum straight line length of the scape, excluding the basal constriction or neck that occurs distal of the condylar bulb

TL = Total length: the total outstretched length of the ant from the mandibular apex to the gastral apex; the sum of ML + HL + WL + PL + PPL + AB4L

WL = Weber's length: diagonal length of mesosoma in lateral view, measured from the point at which the pronotum meets the cervical shield to the posterior basal angle of the metapleuron

Indices

CI = Cephalic index: HW/HL × 100

DPI = Dorsal petiolar index: DPW/PL × 100

LPI = Lateral petiolar index: PH/PL × 100

MI = Mandibular index: ML/HL × 100

OI = Ocular index: EL/HW × 100

SI = Scape index: SL/HW × 100

Results

Class Insecta Linnaeus, 1758
Order Hymenoptera Linnaeus, 1758
Family Formicidae Latreille, 1809
Subfamily Myrmicinae Lepeletier de Saint-Fargeau, 1835
Genus *Strumigenys* Smith, 1860

Strumigenys crassicornis Mayr, 1887
Figs 1–2

Strumigenys crassicornis Mayr, 1887: 577.

Neostruma crassicornis – Brown 1948: 111.
Pyramica crassicornis – Bolton 1999: 1672.
Strumigenys crassicornis – Baroni Urbani & De Andrade 2007: 117.

Diagnosis

Strumigenys crassicornis is one of the most easily diagnosable Neotropical *Strumigenys* and can be distinguished from other species by the combination of lobate scape near subbasal bend (Fig. 2A), spatulate cephalic ground-setae (Fig. 2A), absence of apicoscrobal setae (Fig. 2A), and swollen postpetiole (Fig. 2B).

Type material

Lectotype (designated herein) (label information) (Fig. 1)
BRAZIL • "St. Cath. Hetschko" [printed]; "Collect. G. Mayr [printed]; "*crassicornis*" [handwritten] "G. Mayr, Type" [printed]; "*Pyramica crassicornis*" [handwritten] "det. B. Bolton 1999" [printed]; "Syntype" [printed]; "ANTWEB CASENT0915943" [printed]; "*Strumigenys crassicornis* Mayr, 1887" LECTOTYPE [printed]; "NHMW-HYM4945" [printed]; NHMW.

Paralectotypes (label information)
BRAZIL • 1 worker; "St. Catharina Coll. G. Mayr" [printed]; "Syntype" [printed]; "*Strumigenys crassicornis* Mayr, 1887 PARALECTOTYPE" [printed]; "NHMW-HYM4946" [printed]; NHMW • 1 worker; same label information as for preceding; "NHMW-HYM4947" [printed]; NHMW • 1 worker; same label information as for preceding; "NHMW-HYM4948" [printed]; NHMW.

Additional material examined

BRAZIL – **Amazonas** • 2 workers; Terra Firme; 02°34′ S, 60°06′ W; 7 Dec. 1990; M.O. de Oliveira leg.; ZF-02, km 10, Capoeira **small caps or capital?**; CELC, UFV-LABECOL009312. – **Bahia** • 2 workers; Itacaré; 14°17′38.0″ S, 38°59′08.6″ W; 23 Oct. 2015; J. Chaul leg.; CELC, UFV-LABECOL-001967. – **Espírito Santo** • 1 worker; Santa Teresa, "Rebio Augusto Ruschi" [Augusto Ruschi Biological Reserve], Preguiça [Preguiça Trail]; 19°54′42.1″ S, 40°32′24.0″ W; 800–870 m a.s.l.; Jan. 2013; S. Simon leg.; CELC, UFV-LABECOL-010752. – **Mato Grosso** • 1 worker; Canarana; 13°04′ S, 52°23′ W; Jun. 2013; M. Bicalho and V. Ribeiro leg.; Winkler; CELC, UFV-LABECOL-000064. – **Minas Gerais** •

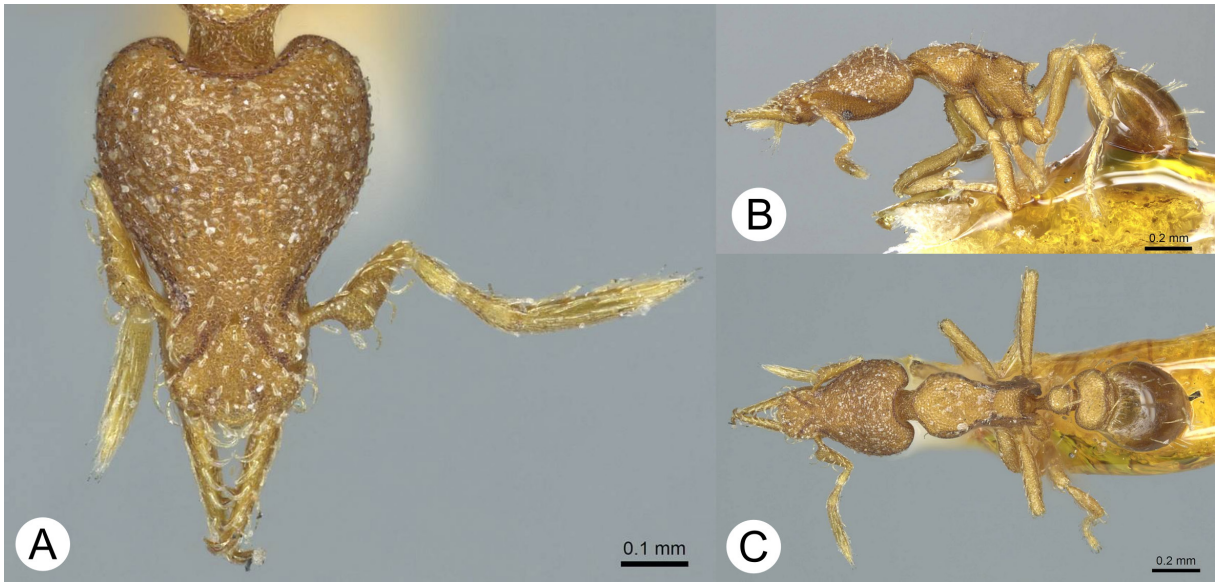

Fig. 1. Lectotype of *Strumigenys crassicornis* Mayr, 1887 (CC-BY, CASENT0915943, Anna Pal, from www.antweb.org). **A**. Head, mandibles and antennae, in dorsal view. **B**. Full body, in lateral view. **C**. Full body, in dorsal view.

1 worker; Viçosa; 13 Jan. 1998; A.M. Soares leg.; CELC, UFV-LABECOL-001842 • 1 worker; Viçosa; Feb. 1994; Sperber, Louzada and Lopes leg.; floresta secundária; CELC, UFV-LABECOL-001824 • 1 worker; Viçosa; 14 Nov. 2008–9 Feb. 2009; E.A. Silva and M. Rodrigues leg.; mata do paraíso; CELC, UFV-LABECOL-001838 • 2 workers, 1 queen; same collection data as for preceding; CELC, UFV-LABECOL-010753 • 1 worker, 1 queen; same collection data as for preceding; CELC-UFV-LABECOL-011011 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-010760 • 1 worker; Viçosa; 20°48′08″ S, 42°51′31″ W, 13–18 Mar. 2011; L. Paolucci leg.; mata do paraíso; Berlese; CELC, UFV-LABECOL-001794 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001764 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001793 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001770 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001767 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001782 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001768 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001762 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001796 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001774 • 1 worker; same collection data as for preceding; CELC-UFV-LABECOL-001776 • 1 worker; Viçosa; 2009–2010; A.S. Pereira leg.; mata do paraíso; CELC, UFV-LABECOL-001833 • 1 worker, 1 queen; Viçosa; 1 Apr. 2013; J. Chaul leg.; horto; hand sampled; CELC, UFV-LABECOL-001843 • 1 worker; Viçosa; 20°45′26.67″ S, 42°51′39.07″ W; J. Chaul leg.; mata da biologia; Winkler; CELC, UFV-LABECOL-001837 • 2 workers; Viçosa, 20°48′21.6″ S, 42°51′10.8″ W; 780 m a.s.l.; 1 May 2013; J. Chaul and R.S. Jesus leg.; mata do paraíso; hypogaeic Winkler; CELC, UFV-LABECOL-1822 • 1 queen; same collection data as for preceding • 1 worker; Viçosa; 20°48′ S, 42°51′ W; 12 Feb. 2015; J. Chaul and A.P. Alves leg.; mata do paraíso; Winkler; CELC, UFV-LABECOL-001841 • 1 queen; Viçosa; 20°48′19″ S, 42°51′13.1″ W; 685 m a.s.l.; 12 Jul. 2016; A.P. Raimundo, L. Ferreira, J. Chaul and L. Paolucci leg.; mata do paraíso; hypogaeic Winkler; CELC, UFV-LABECOL-010759 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010756 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010757 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010758 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010761 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010762 • 1 worker; Araponga; Apr. 2011; D. Muscardi leg.; CELC, UFV-LABECOL-001849 • 1 worker, ; Parque Estadual da Serra do Brigadeiro; 20°39′16″ S, 42°24′58″ W; 1400 m a.s.l.; Jan. 2007; R. Solar leg.; CELC, UFV-LABECOL-009313 • 2 workers, 1 queen; same collection data as for preceding; CELC, UFV-LABECOL-00145 • 4 workers; same collection data as for preceding; CELC, UFV-LABECOL-0018200 • 2 workers; Araponga-Fervedouro, "Serra do Brigadeiro"; 20°44′21.9″ S, 42°27′20.6″ W; 16 Oct. 2016; N. Safar and T. Fernandes leg.; Serra do Brigadeiro; CELC, UFV-LABECOL-009314 • 2 workers; same collection data as for preceding; CELC, UFV-LABECOL-009311 • 1 worker; Alto Caparaó, Vale Verde; 6 Nov. 2016; A. Orsetti and S. Alóquio leg.; Winkler; CELC, UFV-LABECOL-009309 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-009310 • 1 queen; Providência; 21°40′43.7″ S, 42°38′19.0″ W; Dec. 2012; J. Chaul leg.; Fazenda Araribá; Winkler; CELC, UFV-LABECOL-001835 • 1 worker, 1 queen; Parque Estadual do Itacolomi; 20°25′34.8″ S, 43°30′53.7″ W; 25–31 Oct. 2016; G. Soares, J. Falcon, L.F. Climaco and T. Pontes leg.; grotão; CELC, UFV-LABECOL-010729 • 2 workers; Serra do Cipó "Próx. Cachoeira da Capivara" [near Cachoeira da Capivara]; 19°15′10.7″ S, 43°33′06.4″ W; 1351 m a.s.l.; 13 May 2016; J. Chaul and S. Epifânio leg.; CELC, UFV-LABECOL-001909 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001906 • 1 worker; Ipaba, "Faz. Macedônia" [Macedônia Farm]; Nov. 2005; T. Marques leg.; CELC, UFV-LABECOL-001819. – **Pará** • 2 workers; Primavera; 00°58'45″ S, 47°06'43″ W; 5–6 Nov. 2018; L.P. Prado and K.L.S. Sampaio leg.; Winkler; CELC, UFV-LABECOL-010463 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-011010. – **Rondônia** • 1 worker; Jaci Novo; 6 Jul. 2013; km 3; INPA, ANTWEB1032004. – **Santa Catarina** • 2 workers; Indaial, Parque Nacional da Serra do Itajaí, Faxinal do Bepe; Feb. 2015; M.D. Vitorino leg.; regeneração; DZUP •

3 workers; same collection data as for preceding; Apr. 2015; DZUP • 1 worker; same collection data as for preceding; Jun. 2015; DZUP • 2 workers; same collection data as for preceding; Aug. 2015; DZUP • 2 workers; same collection data as for preceding; Feb. 2016; DZUP • 3 workers; same collection data as for preceding; Aug. 2016; DZUP • 1 worker; same collection data as for preceding; Aug. 2015; floresta; DZUP • 1 worker; same collection data as for preceding; Aug. 2015; poleiro; DZUP • 1 worker; same collection data as for preceding; Jun. 2016; DZUP • 2 workers; same collection data as for preceding; Feb. 2016; galharia; DZUP • 1 worker; same collection data as for preceding; Aug. 2016; DZUP • 3 workers; same collection data as for preceding; Aug. 2016; plantio; DZUP • 2 workers; Painel, Base Avançada do IBAMA; 18 May 2013; R.M. Feitosa leg.; solo; DZUP • 1 worker; Três Barras, Floresta Nacional de Três Barras; 26°13′48.444″ S, 50°17′45.21″ W; 723.513 m a.s.l.; 25 Apr. 2015; D.C. Ortiz and J. Niemyer leg.; DZUP • 1 worker; Três Barras, Floresta Nacional de Três Barras; 26°07′35.56″ S, 50°18′51.17″ W; 15 Dec. 2014; D.C. Ortis *et al*. leg.; DZUP • 1 worker; Seara; 1999; R. Silva leg.; MZSP, ANTWEB1032393 • 1 worker; Araranguá, Restinga Morro dos Conventos; 7–23 Jan. 2008; D.C. Cardoso and M.P. Cristiano leg.; CELC, UFV-LABECOL-001893. – **São Paulo** • 1 worker; Salesópolis, Estação Ecológica de Boracéia; 23°39′19.0″ S, 45°53′17.0″ W; 3–11 Nov. 2017; R.P.S. Almeida and J.A. Silva leg.; Winkler; CELC, UFV-LABECOL-010754.

Lectotype measurements

ABD4L 0.396; DPW 0.124; EL 0.052; HL 0.585; HT 0.288; HW 0.412; ML 0.230; PH 0.132; PL 0.277; PPL 0.149; PW 0.279; SL 0.201; WL 0.589; TL 1.954; CI 70.4; DPI 44.7; LPI 47.6; MI 39.3; OI 12.6; SI 48.8.

Non-type measurements

ABD4L 0.330–0.470; DPW 0.105–0.150; EL 0.040–0.060; HL 0.480–0.620; HT 0.250–0.330; HW 0.340–0.450; ML 0.155–0.240; PH 0.130–0.190; PL 0.220–0.340; PPL 0.110–0.200; PW 0.230–0.325; SL 0.210–0.310; WL 0.465–0.630; TL 1.765–2.500; CI 70.1–78.8; DPI 39.7–50.0; LPI 48.3–61.4; MI 32.3–38.7; OI 9.8–14.6; SI 53.8–70.6 (n = 14).

Description

Sculpture. Head entirely reticulate-punctate, including antennal scrobe. Mesosoma mostly reticulate-punctate, katepisternum partly smooth (Fig. 2B). Fourth abdominal tergite entirely smooth, except for basigastral costulae. Basigastral costulae short; in dorsal view, its length about a third of postpetiole length.

Setae. Cephalic and mesosomal ground-setae spatulate (Fig. 2A). Metasomal setae elongate-spatulate to remiform. Apicoscrobal setae absent (Fig. 2A). Pair of erect setae on cephalic dorsum close to occipital margin present. Anterior margin of scape with one or more spatulate setae curved towards antennal insertion. Humeral setae absent and mesonotal setae present (but see Comments below).

Head. Masticatory margin of mandible with three to five denticles between apicodorsal tooth and submedian tooth, with two to four denticles proximal of submedian tooth (Fig. 2A). Apex of mandible with unknown number of intercalary denticles (but see Fig. 2A and Comments section for variation). Anterior clypeal margin, in dorsal view, slightly angular and projecting anteriorly. Eye, in lateral view, with four to five ommatidia in longest row. Eye on anterior half of head. In dorsal view, scape narrows basally; anterior margin expanded and almost lobate near subbasal bend. Third flagellomere smaller than fourth flagellomere; length of former only a third of length of latter.

Mesosoma. Humerus with small angular projection. Dorsum of mesonotum, in lateral view, slightly higher than dorsum of pronotum. Metanotal groove weakly impressed. Propodeal spine relatively long and triangular, linked to propodeal lobe by narrow lamella that extends throughout propodeal declivity. Femoral bulla ovate and located distally on dorsal margin of sclerite.

Metasoma. Petiolar node, in dorsal view, slightly wider than long; in lateral view, anterior margin slightly longer than dorsal margin. Postpetiole, in lateral view, swollen and globular. Anterior margin of postpetiole, in dorsal view, medially concave. Ventral spongiform process of petiole absent. Ventral spongiform lobe of postpetiole minute to absent (Fig. 2B). Lateral spongiform lobe of postpetiole reduced to a narrow lamella (Fig. 2B). Ventral basigastral spongiform pad (= specialized setae on fourth abdominal sternite) small.

Comments

Bolton (2000) considered *S. crassicornis* as a member of the *crassicornis* complex (i.e., a cluster of species in the *gundlachi* species group), along with *Strumigenys aethegenys* (Bolton, 2000), *S. auctidens* (Bolton, 2000), *S. brevicornis* Mann, 1922, *S. crementa* (Bolton, 2000), *S. metopia* (Brown, 1959), *S. myllorhapha* (Brown, 1959), *S. pasisops* (Bolton, 2000), *S. stenotes* (Bolton, 2000), and *S. zeteki* (Brown, 1959). Members of the *crassicornis* complex are defined by the following traits (Bolton 2000): (i) inner margin of mandible with a submedian tooth or denticle near midlength; (ii) inner margin of mandible with smaller teeth between apicodorsal tooth and submedian tooth; (iii) three to five intercalary teeth; (iv) labral lobes long and slender; and (v) setae on apices of labral lobes short (i.e., with the same size or shorter than the labral lobes).

According to Bolton (2000), different series of this species show slight variation in setae and sculpture, although maintaining the diagnostic traits for the species. He mentioned that some specimens possibly have short filiform humeral setae, although this condition was not observed in the type specimen and a few other individuals observed in this study. Additionally, a pair of mesonotal erect simple setae, which was not mentioned by Mayr (1887) nor Bolton (2000) in their descriptions, was also observed in the lectotype and a few other specimens. Humeral and mesonotal setae are apparently lost during the lifetime of the ants, since many specimens, otherwise well preserved, did not have those setae and most of the ones which did have them appear to be young adults by the appearance of their cuticle. Also, some specimens had an extremely reduced lateral spongiform lobe in the postpetiole, appearing vestigial, agreeing with the description made by Bolton (2000).

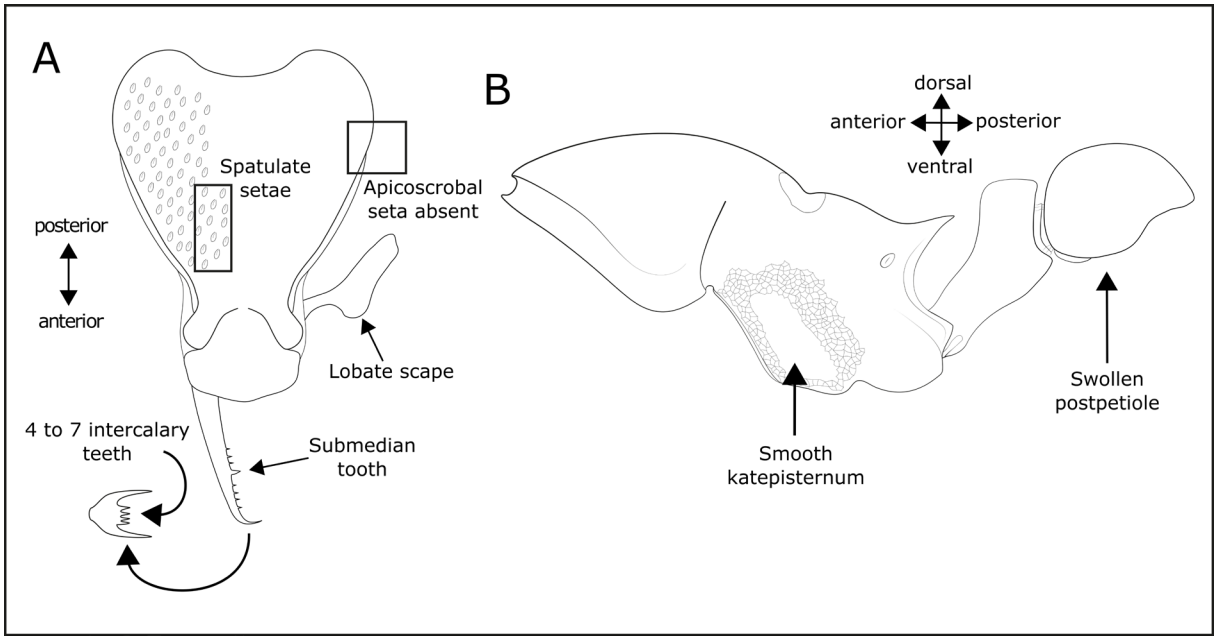

Fig. 2. Generalized schematics of *Strumigenys crassicornis* Mayr, 1887, showing useful identification features. **A**. Head in dorsal view. **B**. Mesosoma, petiole, and postpetiole in lateral view.

In Bolton's (2000) description, the author mentions that *S. crassicornis* have three to four minute intercalary teeth. Since we did not had access to the physical lectotype specimen, we could not confirm this condition. However, while studying other non-type specimens, we observed that the intercalary dentition consists of up to six to seven teeth. Interestingly, these intercalary teeth count does not agree with the diagnosis proposed by Bolton (2000) for the *crassicornis* complex.

In specimens collected in Orleans and Tunas do Paraná (cf. list of examined materials), the katepisternum appears entirely reticulate-punctate, without smooth patches whatsoever. Different specimens collected in the same square meter (from Winkler leaf-litter samples) possess both reticulate-punctate katepisternum and various degrees of smoothness. One specimen from Viçosa (Minas Gerais State) and one specimen from the Reserva Biólogica Augusto Ruschi (Espírito Santo State) also have an entirely reticulate-punctate katepisternum. In Viçosa, all the other specimens examined matched the lectotype in having a smooth katepisternum. The morphological variability in this particular character, summed with the higher intercalary teeth count found in some non-type specimens observed, reinforces the need for a reevaluation of the boundaries of this species.

In the Amazonian region, non-type specimens identified as *S. crassicornis* tend to depart further from the lectotype, differing in one or more traits, and do not entirely match the species' diagnosis. One specimen from Primavera (Pará State) has shallow reticulation on fourth abdominal tergite. A couple of specimens from Amazonas state (vicinities of Manaus; cf. additional material examined ZF-02) have an almost entirely reticulate-punctate katepisternum and shallow reticulation on fourth abdominal tergite. A specimen from Canarana (Mato Grosso State) has shallow reticulation on fourth abdominal tergite and humeral and mesonotal setae which are not simple, but slightly flattened and subflagellate. A couple of specimens, also from Primavera, have shallow reticulation on fourth abdominal tergite, basigastral costulae absent, spongiform process on postpetiole absent, and smaller and less abundant metasomal erect setae. Finally, one specimen from "Jaci Novo" (Rondônia State) is much larger than all examined specimens, has both humeral and mesonotal setae flattened and subflagellate, and a comparatively larger postpetiole, with shallow reticulation on fourth abdominal tergite.

Strumigenys denticulata Mayr, 1887
Figs 3–4

Strumigenys denticulata Mayr, 1887: 576.
Pyramica aschnae Makhan, 2007: 2, figs 3–4 (synonymyzed by Bolton *et al.* 2008).
Pyramica aschnakiranae Makhan, 2007: 3, figs 5–6 (synonymyzed by Bolton *et al.* 2008).

Pyramica denticulata – Bolton 1999: 1672.
Strumigenys denticulata – Baroni Urbani & De Andrade 2007: 117.

Diagnosis

Strumigenys denticulata can be distinguished from other local species by the combination of long mandibles, flagellate humeral setae (Fig. 4B), reduced postpetiolar spongiform projections (Fig. 4B), and fourth abdominal tergite mostly smooth.

Type material

Lectotype (designated herein) (label information) (Fig. 3)
BRAZIL • "St. Cath Hetschko" [printed]; "Collect. G. Mayr" [printed]; "*denticulata*" [handwritten] "G. Mayr, Type" [printed]; "ANTWEB CASENT 0915944" [printed]; "*Strumigenys denticulata* Mayr, 1887 LECTOTYPE" [printed]; "NHMW-HYM4949" [printed]; NMHW.

Paralectotypes (label information)
BRAZIL • 1 worker; same collection data as for lectotype; "*Strumigenys denticulata* Mayr, 1887 PARALECTOTYPE" [printed]; "MCZT_28511" [printed]; MCZ • 2 workers; "Blumenau" [printed]; "Coll. G. Mayr, Type" [printed]; "*Strumigenys denticulata* Mayr, 1887 PARALECTOTYPE" [printed]; "NHMW-HYM4952" [printed]; NHMW • 1 worker; "St. Catharina Coll. G. Mayr [printed]; "Type" [printed]; "*Strumigenys denticulata* Mayr, 1887 PARALECTOTYPE" [printed]; "NHMW-HYM4950" [printed]; NMHW • 1 worker; "St. Catharina Coll. G. Mayr" [printed]; "126 Hetschko 1/984" [handwriten] "Type" [printed]; "*Strumigenys denticulata* Mayr, 1887 PARALECTOTYPE" [printed]; "NHMW-HYM4951" [printed]; NHMW • 1 worker; "St. Catharina Coll. G. Mayr" [printed]; "Brit. Mus. 1922–501." [printed]; "*denticulata*" [handwritten] "G. Mayr, Type" [printed]; "BMNH(E)1013551" [printed]; "ANTWEB CASENT 0900180" [printed]; "Syntype" [printed] "*Strumigenys denticulata* Mayr, 1887 PARALECTOTYPE" [printed]; NHMUK.

Additional material examined

BRAZIL – **Amazonas** • 4 workers, 1 queen; Terra Firme; 02°34′ S, 60°06′ W; 7 Nov. 1990; M.O. de Oliveira leg.; capoeira; km 10; ZF-02; CELC, UFV-LABECOL-009312 • 1 worker; Manaus, Colosso Camp; 2°24′17.6″ S, 59°53′37.6″ W; 12–21 Aug. 2016; B. Boudinot, I. Fernandes and J. Chaul leg.; CELC, ANTWEB1038943 – **Bahia** • 2 workers, 2 queens; Itacaré; 14°17′38.0″ S, 38°59′08.6″ W; 23 Oct. 2015; J. Chaul leg.; CELC, UFV-LABECOL-001970. – **Espírito Santo** • 1 worker; Conceição da Barra, Reserva Biológica Córrego Grande; 18°15′18.3″ S, 39°49′04.0″ W; 33 m a.s.l.; 21 Apr.–10 May 2017; N. Safar, C. Aquila and C. Guimarães leg.; Winkler; CELC, ANTWEB1032525 • 1 worker, 1 queen; Conceição da Barra, Floresta Nacional do Rio Preto; 18°24′31.4″ S, 39°50′00.9″ W; 33 m a.s.l.; 21 Apr.–10 May 2017; N. Safar, C. Aquila and C. Guimarães; Winkler; CELC, UFV-LABECOL-0008497. – **Mato Grosso** • 1 worker; Canarana-Querência; 13°04′ S, 52°23′ W; Jun. 2013; M. Bicalho and V. Ribeiro leg.; Winkler; CELC, UFV-LABECOL-001884. – **Minas Gerais** • 1 worker; São Tiago; 20°57′09.69″ S, 44°26′32.09″ W; Feb. 2012; M. Padilha leg.; CELC, UFV-LABECOL-010975 • 1 queen; same collection data as for preceding; CELC, UFV-LABECOL-001878 • 1 queen; Viçosa; 13 Jan. 1998; S.M. Soares leg.; CELC, UFV-LABECOL-001889 • 1 worker; Viçosa, Mata do Paraíso; 2009–2010; A.S. Pereira leg.; CELC, UFV-LABECOL-001855 • 1 queen; same collection data as for preceding; CELC, UFV-LABECOL-001854 • 1 queen; same collection data as for preceding; CELC, UFV-LABECOL-001888 • 3 queens; same collection data as for preceding; CELC, UFV-LABECOL-001733 • 1 worker; Viçosa; Jan. 2011; L.G. Dornelas leg.; CELC, UFV-LABECOL-001817 • 1 worker; Viçosa, Mata do Paraíso; 20°48′08″ S, 42°51′31″ W; 13–18 Mar. 2011; L. Paolucci leg.; Berlese; CELC, UFV-LABECOL-001786 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001680 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001772 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001760 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001777 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001773 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001763 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001787 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001785 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001784 • 1 worker; Viçosa; 20°47′44.2″ S, 42°50′47.6″ W; 15 Feb. 2006; F.A. Schmidt leg.; CELC, UFV-LABECOL-001694 • 1 worker; Viçosa, Mata do Seu Nico; 20°47′54.5″ S, 42°50′49.9″ W; 745 m a.s.l.; 13 Apr. 2012; F.A. Schmidt, F.M. Rezende and R.S. Jesus leg.; CELC, UFV-LABECOL-001747 • 1 worker, 1 queen; Viçosa, Horto UFV; 8 Feb. 2012; J. Chaul leg.; CELC, UFV-LABECOL-001887 • 1 worker, 1 queen; 20°45′30.44″ S, 42°51′49.65″ W; 731 m a.s.l.; 5 May 2013; J. Chaul and N. Safar leg.; epigaeic Winkler; CELC, UFV-LABECOL-008836 • 1 queen; Viçosa, Mata do Paraíso; 20°48′ S, 42°51′ W; 12 Feb. 2015; J. Chaul and A.P. Alves leg.; Winkler; CELC, UFV-LABECOL-001715 • 1 worker; Viçosa, Mata dos Cristais; 20°46′36.84″ S, 42°50′31.56″ W; Apr. 2013; J. Chaul and R.S. Jesus leg.; CELC, UFV-LABECOL-008220 • 2 workers; Viçosa, Mata do Paraíso; 20°48′18.1″ S, 42°51′05.5″ W; May 2014; R. Jesus leg.; CELC, UFV-LABECOL-000066 •

1 worker; Viçosa, Mata do Paraíso; 20°48′19″ S, 42°51′12″ W; 12 Jul. 2016; A.P. Raimundo, L. Ferreira, J. Chaul and L. Paolucci leg.; hypogaeic Winkler; CELC, UFV-LABECOL-010979 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010978 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010977 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010976 • 1 worker; Viçosa, Mata do Paraíso; 20°48′08.4″ S, 42°51′31.1″ W; 16 Feb. 2018; F. Ferreira leg.; CELC, UFV-LABECOL-009450 • 1 queen; Viçosa, Mata do Paraíso; 20°48′23.3″ S, 42°51′00.5″ W; 6–13 Jan. 2017; R.S. Jesus leg.; Malaise trap; CELC, ANTWEB1032934 • 1 worker; Araponga; Apr. 2011; D. Muscardi; CELC, UFV-LABECOL-001894 • 1 worker, 1 queen; Araponga, Cachoeira do Boné; 20°39′43″ S, 42°26′57.5″ W; 11 Feb. 2016; J. Chaul leg.; CELC, UFV-LABECOL-001536 • 2 workers; Araponga, Parque Estadual da Serra do Brigadeiro, Estrada Araponga-Fervedouro; 20°44′21.9″ S, 42°27′20.6″ W; 16 Oct. 2016; N. Safar and T. Fernandes leg.; CELC, UFV-LABECOL-009314 • 1 worker; Timóteo, Parque Estadual do Rio Doce; 19°46′ S, 42°37′ W; 2009; F.A. Schmidt leg.; CELC, UFV-LABECOL-001857 • 1 worker, 1 queen; Parque Estadual do Itacolomi; 20°25′36.1″ S, 43°30′23.3″ W; 25–31 Oct. 2016; G. Soares, J. Falcon, L.F. Climaco and T. Pontes leg.; CELC, UFV-LABECOL-010729 • 1 worker; Parna do Cipó, Cachoeira da Farofa; 19°22′45.9″ S, 43°34′32.8″ W; 11 May 2016; J. Chaul leg.; CELC, UFV-LABECOL-011008 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-011009 • 1 worker; Conceição do Mato Dentro, Serra da Serpentina; 19.03394° S, 43.33687° W; 1–7 Sep. 2010; R.R. Silva leg.; Winkler; CELC, UFV-LABECOL-010460 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-010462 • 1 worker; Ipaba, Reserva Particular do Patrimônio Natural Fazenda Macedônia, CENIBRA; Nov. 2005; T. Marques leg.; CELC, UFV-LABECOL-001875. – **Pará** • 1 worker; Paragominas; Jan.–Jul. 2011; R. Solar leg.; CELC, UFV-LABECOL-001722 • 1 worker; Primavera; 01°00′36″ S, 47°07′04″ W; 5–6 Nov. 2018; L.P. Prado and K.L.S. Sampaio; Winkler; CELC, UFV-LABECOL-010477 • 2 workers; Portel; 01°50′31.3″ S, 50°37′44.4″ W; 5 Jun. 2016; E.L.S. Siqueira and team leg.; Winkler; CELC, UFV-LABECOL-010449. – **Paraná** • 22 workers; Tunas do Paraná, Parque Estadual das Lauráceas, Trilha da Anta; 24°51′27.53″ S, 48°43.2′58″ W; 2–4 May 2017; T.S.R. Silva, N. Ladino, R.M. Feitosa leg.; DZUP. – **Rondônia** • 1 queen; Rolim Moura; 11°34′11.9″ S, 61°45′37.0″ W; 8 Oct. 2015; E.A. Silva

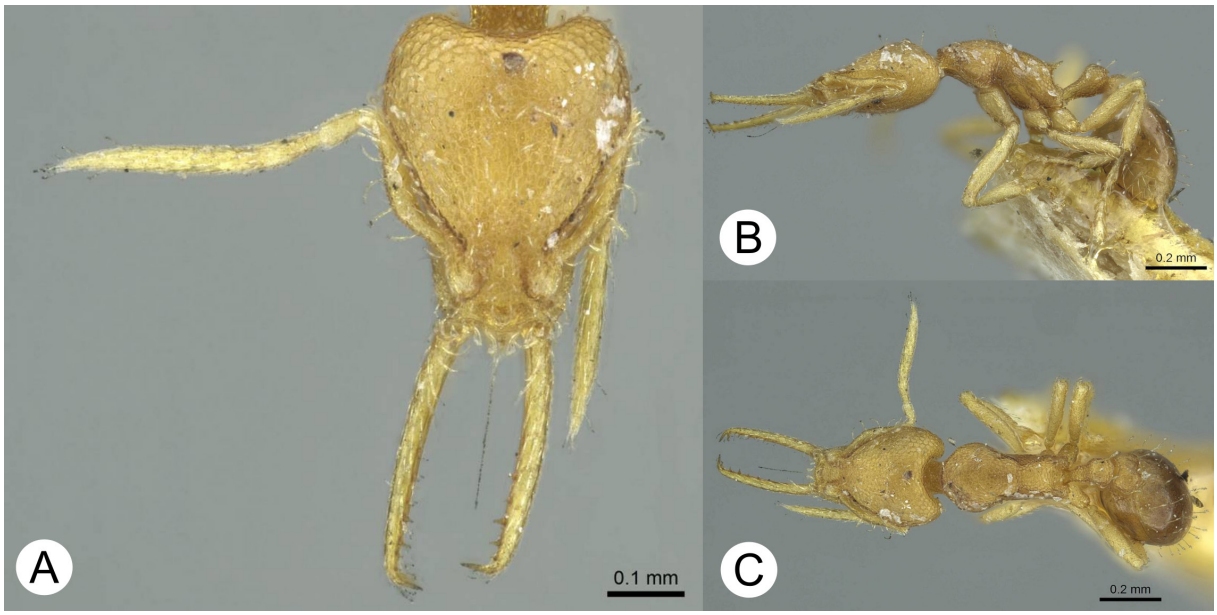

Fig. 3. Lectotype of *Strumigenys denticulata* Mayr, 1887 (CC-BY, CASENT0915944, Anna Pal, from www.antweb.org). **A**. Head, mandibles and antennae, in dorsal view. **B**. Full body, in lateral view. **C**. Full body, in dorsal view.

leg.; CELC, UFV-LABECOL-011006. – **Santa Catarina** • 1 worker; Parque Estadual Serra Dourada; 28°10′38″ S, 49°23′38,94″ W; 31 May 2014; A.S. Pereira leg.; A3W05; DZUP • 1 worker; Orleans, Parque Estadual da Serra Furada; 28°10′38″ S, 49°23′38.94″ W; 31 May 2014; A.S. Pereira leg.; A3W05; DZUP • 1 worker; same collection data as for preceding; 24 Mar. 2014; A3W06; DZUP • 1 worker, 1 queen; Florianópolis, Lagoinha do Leste; 27°46′31.0″ S, 48°29′06.0″ W; 18 Feb. 2016; J. Chaul leg.; CELC, UFV-LABECOL-008223. – **São Paulo** • 1 worker; Parque Estadual da Serra do Mar; 23°21′ S, 44°51′ W; 2009; F.A. Schmidt leg.; CELC, UFV-LABECOL-001853.

PERU – **Madre de Dios** • 1 worker; Puerto Maldonado, Reserva Nacional Tambopata; 12°51′21″ S 69°21′43″ W; 210 m a.s.l.; 19–31 Jul. 2012; R. Feitosa leg.; CELC.

Lectotype measurements

ABD4L 0.321; DPW 0.078; EL 0.033; HL 0.418; HT 0.221; HW 0.321; ML 0.355; PH 0.106; PL 0.172; PPL 0.115; PW 0.226; SL 0.236; WL 0.441; TL 1.816; CI 77.9; DPI 45.3; LPI 61.6; MI 84.9; OI 10.3; SI 73.5.

Paralectotype measurements

ABD4L N/A; DPW 0.094; EL 0.035; HL 0.405; HT 0.218; HW 0.33; ML 0.308; PH 0.104; PL 0.185; PPL N/A; PW 0.228; SL 0.232; WL 0.462; TL N/A; CI 81.5; DPI 50.8; LPI 56.2; MI 76; OI 10.6; SI 70.3 (n = 1; NHMUK BMNH(E)1013551; see Comments for missing measurement values).

Non-type measurements

ABD4L 0.280–0.370; DPW 0.080–0.105; EL 0.040–0.050; HL 0.400–0.450; HT 0.220–0.250; HW 0.320–0.365; ML 0.280–0.370; PH 0.100–0.115; PL 0.170–0.200; PPL 0.080–0.090; PW 0.220–0.250; SL 0.230–0.280; WL 0.420–0.480; TL 1.660–1.895; CI 76.2–81.8; DPI 47.1–55.6; LPI 54.1–61.8; MI 70.0–88.1; OI 11.8–13.7; SI 70.8–84.4 (n = 10).

Description

Sculpture. Head entirely reticulate-punctate, including antennal scrobe. Mesosoma entirely reticulate-punctate, except for katepisternum and part of metapleura, which are smooth (Fig. 4B). Fourth abdominal tergite superficially reticulate-punctate near base. Length of basigastral costulae, in dorsal view, more or less equal to length of postpetiole.

Setae. Cephalic ground-setae remiform (Fig. 4A). Two pairs of remiform erect setae on cephalic dorsum; one pair near medial region of head, other near occipital margin. Apicoscrobal setae flagellate (Fig. 4A). Anterior margin of scape with one or more remiform setae curved towards antennal insertion. Humeral setae flagellate (Fig. 4B). Erect setae on antero-medial region of pronotum absent. Pair of erect setae on mesonotum stiff, simple to slightly remiform. Setae on petiole, postpetiole and fourth abdominal tergite remiform to slightly clavate.

Head. Masticatory margin of mandible with 5–10 preapical denticles (Fig. 4A). Apex of mandible with two minute intercalary denticles (Fig. 4A). Anterior clypeal margin, in dorsal view, convex medially. Eye, in lateral view, with three to four ommatidia along longest row. Eye on anterior half of head. In dorsal view, scape cylindrical. Third flagellomere smaller than fourth flagellomere; length of former only one-third of length of latter.

Mesosoma. Humerus with small angular projection. Dorsum of mesonotum, in lateral view, convex, confluent with dorsum of pronotum. Metanotal groove weakly impressed, almost absent in lateral view. Propodeal spine relatively long and triangular, linked to propodeal lobe by narrow carina that extends

throughout propodeal declivity. Femoral bulla small, ovate and located distally on dorsal margin of sclerite.

Metasoma. Petiolar node, in dorsal view, slightly wider than long, almost as long as wide; in lateral view, anterior margin almost as long as dorsal margin. Anterior margin of postpetiole, in dorsal view, concave. Lateral and ventral spongiform processes of petiole absent. Ventral spongiform lobe of postpetiole minute (Fig. 4B). Lateral spongiform lobe of postpetiole vestigial (Fig. 4B). Ventral basigastral spongiform pad absent.

Comments

Bolton (2000) considered *S. denticulata* as a member of the *gundlachi* complex (i.e., a cluster of species under the *gundlachi* species group), along with *Strumigenys connectens* Kempf, 1958, *S. decipula* (Bolton, 2000), *S. eggersi* Emery, 1890, *S. enopla* (Bolton, 2000), *S. gemella* Kempf, 1975, *S. gundlachi* (Roger, 1862), *S. jamaicensis* Brown, 1959, *S. laevipleura* Kempf, 1958, *S. lalassa* (Bolton, 2000), *S. nubila* Lattke & Goitía, 1997, *S. subedentata* Mayr, 1887, *S. trieces* Brown, 1960, *S. vartana* (Bolton, 2000), and *S. xenognatha* Kempf, 1958. Members of the *gundlachi* complex are defined by the following traits (Bolton 2000): (i) inner margin of mandible without a submedian tooth or denticle near midlength; (ii) inner margin of mandible with several teeth of different sizes posterior to the apicodorsal tooth; (iii) two (rarely three) intercalary teeth; (iv) labral lobes short; and (v) setae on apices of labral lobes long (i.e., longer than the labral lobes).

According to Bolton (2000), specimens belonging to *S. denticulata* have a wide range of mandibular length variation, with individuals collected in a single leaf litter sample presenting MIs ranging from 72 to 85. It is important to notice that the MI of the lectotype falls near the maximum value established by Bolton (i.e., MI 84.9). On the other hand, ML and HL measurements fall well within the range proposed by the same author as diagnosable for the species (i.e., ML 0.355 and HL 0.418).

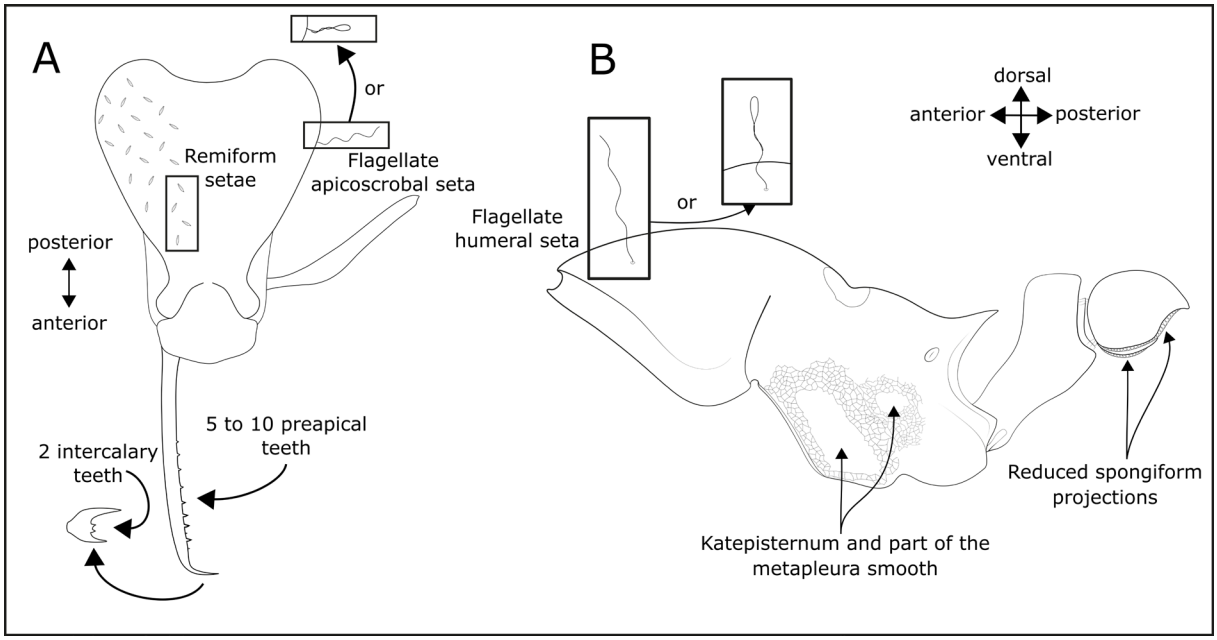

Fig. 4. Generalized schematics of *Strumigenys denticulata* Mayr, 1887, showing useful identification features. **A**. Head in dorsal view. **B**. Mesosoma, petiole, and postpetiole in lateral view.

According to Bolton (2000), some specimens identified as *S. denticulata* have the katepisternum entirely reticulate-punctate, while all specimens observed in this study (cf. examined material) have a smooth patch in the katepisternum, including the lectotype. All specimens observed had the fourth abdominal tergite mostly smooth, only with the base of the sclerite with reticulate-punctate sculpture.

One of the paralectotypes (BMNH(E)1013551) is missing the postpetiole and gaster, rendering it impossible to evaluate morphological variability of those body regions in this particular individual.

Strumigenys eggersi Emery, 1890
Figs 5–6

Strumigenys eggersi Emery, 1890: 69.

Strumigenys (*Pyramica*) *eggersi* – Brown 1948: 110.
Pyramica eggersi – Bolton 1999: 1673.
Strumigenys eggersi – Baroni Urbani & De Andrade 2007: 128.

Diagnosis

Strumigenys eggersi mostly resembles *S. denticulata* and can be distinguished from this species by the combination of shorter mandibles (ML 0.288 and MI 65.6 from the former opposed to the ML 0.355 and MI 84.9 from the latter), humeral setae filiform (Fig. 6B), presence of a pair of erect setae in the antero-medial area of the pronotum (Fig. 6B), and fourth abdominal tergite mostly sculptured.

Type material

Lectotype (designated herein) (label information) (Fig. 5)
BRAZIL • "*Strumigenys eggersi* St. Thomas Eggers" [handwritten]; "Typus" [printed]; "ANTWEB CASENT 0904936" [printed]; "*Strumigenys eggersi* Emery, 1890 LECTOTYPE" [printed]; MCSN.

Paralectotypes (label information)
BRAZIL • 2 workers; same label information as for lectotype; "*Strumigenys eggersi* Emery, 1890 PARALECTOTYPE" [printed]; MCSN • 1 worker; same label information as for lectotype; "*Strumigenys eggersi* Emery, 1890 PARALECTOTYPE" [printed]; "MZSP78535" [printed]; MZSP • 1 worker; "St. Thomas" [handwritten]; "G. Mayr" [printed]; "Type" [printed]; "*Strumigenys eggersi* Emery, 1890 PARALECTOTYPE" [printed]; "NHMW-HYM4953" [printed]; NHMW • 1 worker; same label information as for preceding; "NHMW-HYM4954" [printed]; NHMW • 1 worker; "S. Thomas" [handwritten]; "*Strumigenys eggersi* Em." [handwritten]; "*Strumigenys Eggersi* Emery S. Thomas" [handwritten]; "Type" [printed]; "GBIF-D/FoCol 2160 specimen + label data documented" [printed]; ZMHB.

Additional material examined

BRAZIL – **Bahia** • 5 workers; Ilhéus; 14°47′36.62″ S, 39°2′46.97″ W; [no date]; [no collector]; MZSP. – **Espírito Santo** • 1 worker; Reserva Biológica Córrego Grande; 18°10′55.8″ S, 39°54′19.8″ W; 51 m a.s.l.; 31 Jan. 2018–5 Feb. 2018; N. Safar, H. Cândido, and M. Cóser leg.; Winkler; CELC, UFV-LABECOL-008214. – **Mato Grosso** • 1 worker; Canarana-Querência; 13°04′ S, 52°23′ W; M. Bicalho and V. Ribeiro leg.; UFV-LABECOL-001788. – **Minas Gerais** • 1 worker; Viçosa; 13 Mar. 1998; S.M. Soares leg.; CELC, UFV-LABECOL-001805 • 1 worker; Araponga; Apr. 2011; D. Muscardi; CELC, UFV-LABECOL-001811 • 1 worker; Viçosa, Horto UFV; 20°45′24.11″ S, 42°52′26.43″ W; 660 m a.s.l.; Mar. 2012; J. Chaul leg.; CELC, UFV-LABECOL-001790 • 1 queen; Viçosa; 20°46′12.3″ S, 42°52′02.4″ W; 29 Feb. 2016; S. Epifânio, R. Jesus and J. Chaul leg.; CELC, UFV-LABECOL-007490 • 1 worker; Monte Carmelo; 23–26 May 2016; J.M.M. Aguiar leg.; CELC, UFV-LABECOL-008354 •

1 queen; Buritizeiro, Fazenda Porto; Feb. 2005; R.B.F. Campos leg.; CELC, UFV-LABECOL-001816 • 1 worker; Ipaba, Fazenda Macedônia; Jan. 2005; T. Marques leg.; CELC, UFV-LABECOL-001813. – **Santa Catarina** • 1 queen; Araranguá, Restinga Morro dos Conventos; 7–23 Jan. 2008; D.C. Cardoso and M.P. Cristiano leg.; CELC, UFV-LABECOL-001815. – **Pará** • 1 worker; Paragominas; Jan.–Jul. 2011; R. Solar leg.; CELC, UFV-LABECOL-001778. – **Paraná** • 1 worker; Matinhos; 25°49′26.94″ S, 48°32′58.14″ W; [no date]; [no collector]; MZSP. – **Rio Grande do Sul** • 2 workers; Morro Reuter; 29°32′18″ S, 51°4′53.86″ W; [no date]; [no collector]; MZSP. – **Rio de Janeiro** • 1 worker; Santa Teresa; 22°56′42.11″ S, 43°12′39.70″ W; [no date]; [no collector]; MZSP. – **São Paulo** • 1 worker; Ilha dos Búzios; 23°47′56.89″ S, 45°7’60.00″ W; [no date]; [no collector]; MZSP.

Lectotype measurements

ABD4L 0.321; DPW 0.104; EL 0.043; HL 0.439; HT 0.25; HW 0.366; ML 0.288; PH 0.115; PL 0.197; PPL 0.098; PW 0.245; SL 0.221; WL 0.461; TL 1.872; CI 83.4; DPI 52.8; LPI 58.4; MI 65.6; OI 11.7; SI 60.4.

Paralectotype measurements

ABD4L 0.304; DPW 0.102; EL 0.036; HL 0.415; HT 0.253; HW 0.343; ML 0.278; PH 0.107; PL 0.202; PPL 0.087; PW 0.241; SL 0.230; WL 0.443; TL 1.729; CI 82.7; DPI 50.5; LPI 53.0; MI 67.0; OI 10.5; SI 67.1 (n = 1; ZMHB GBIF-D/FoCol 2160).

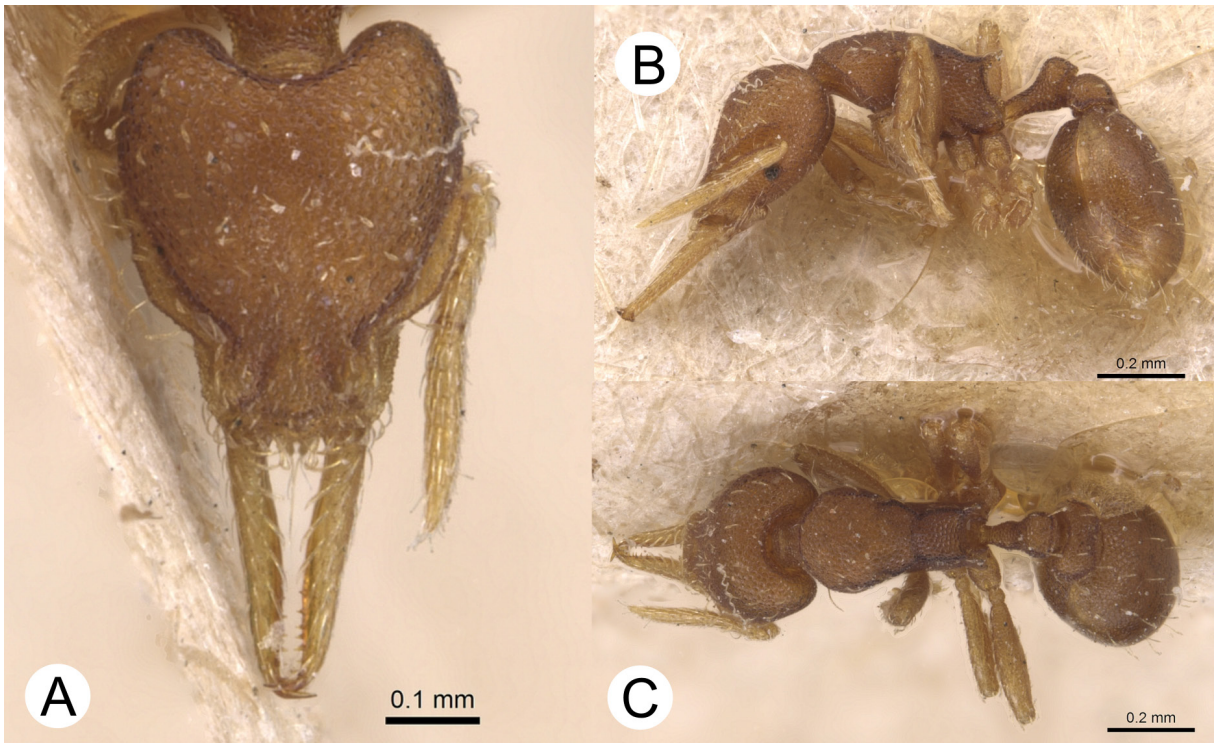

Fig. 5. Lectotype of *Strumigenys eggersi* Emery, 1890 (CC-BY, CASENT0904936, Will Ericson, from www.antweb.org). **A**. Head, mandibles and antennae, in dorsal view. **B**. Full body, in lateral view. **C**. Full body, in dorsal view.

Non-type measurements

ABD4L 0.320–0.410; DPW 0.085–0.115; EL 0.040–0.050; HL 0.420–0.470; HT 0.240–0.270; HW 0.340–0.390; ML 0.250–0.280; PH 0.110–0.130; PL 0.190–0.210; PPL 0.080–0.100; PW 0.220–0.255; SL 0.220–0.250; WL 0.420–0.490; TL 1.690–1.955; CI 81.0–86.0; DPI 44.7–55.3; LPI 55.0–61.9; MI 58.1–65.9; OI 10.8–14.1; SI 62.0–66.7 (n = 6).

Description

Sculpture. Head entirely reticulate-punctate, including antennal scrobe. Mesosoma entirely reticulate-punctate, except for katepisternum which is smooth (Fig. 6B). Fourth abdominal tergite reticulate-punctate almost entirely. Length of basigastral costulae, in dorsal view, less than half the length of postpetiole.

Setae. Cephalic ground-setae remiform (Fig, 6A). Two pairs of remiform erect setae on cephalic dorsum; both pairs located in the posterior third of cephalic dorsum, one pair nearer to occipital margin than the other. Apicoscrobal setae flagellate (Fig. 6A). Anterior margin of scape with one or more remiform setae curved towards antennal insertion. Humeral setae filiform (Fig. 6B). Pair of erect setae located in the antero-medial area of pronotum filiform (Fig. 6B). Setae on petiole, postpetiole and fourth abdominal tergite remiform to slightly clavate.

Head. Masticatory margin of mandible with six preapical denticles (Fig. 6A). Apex of mandible with two minute intercalary denticles (Fig. 6A). Anterior clypeal margin, in dorsal view, convex medially. Eye, in lateral view, with three ommatidia in the longest row. Eye located in the anterior half of head. In dorsal view, scape cylindrical. Third flagellomere smaller than fourth flagellomere; length of former almost a third of length of latter.

Mesosoma. Humerus with a small angular projection. Dorsum of mesonotum, in lateral view, convex, confluent with dorsum of pronotum. Metanotal groove relatively well impressed. Propodeal spine

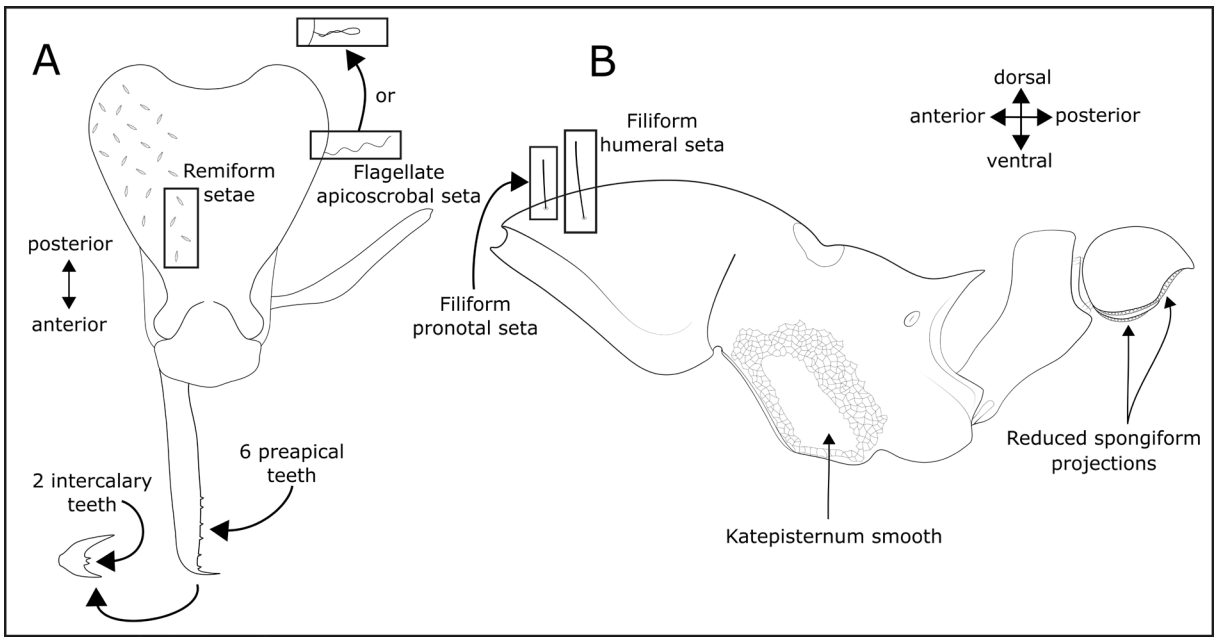

Fig. 6. Generalized schematics of *Strumigenys eggersi* Emery, 1890, showing useful identification features. **A**. Head in dorsal view. **B**. Mesosoma, petiole, and postpetiole in lateral view.

relatively long and triangular, somewhat translucent, and linked to propodeal lobe by a narrow lamella that extends throughout propodeal declivity. Femoral bulla small, ovate and located distally on the dorsal margin of sclerite.

Metasoma. Petiolar node, in dorsal view, wider than long; in lateral view, anterior margin longer than dorsal margin. Anterior margin of postpetiole, in dorsal view, medially concave. Lateral and ventral spongiform processes of petiole absent. Ventral spongiform lobe of postpetiole small (Fig. 6B). Lateral spongiform lobe of postpetiole minute, almost vestigial (Fig. 6B). Ventral basigastral spongiform pad reduced to curved (U-shaped in anterior view) carina.

Comments

Bolton (2000) considered *S. eggersi* as a member of the *gundlachi* complex (i.e., a cluster of species under the *gundlachi* species group), along with *Strumigenys connectens* Kempf, 1958, *S. decipula* (Bolton, 2000), *S. denticulata* Mayr, 1887, *S. enopla* (Bolton, 2000), *S. gemella* Kempf, 1975, *S. gundlachi* (Roger, 1862), *S. jamaicensis* Brown, 1959, *S. laevipleura* Kempf, 1858, *S. lalassa* (Bolton, 2000), *S. nubila* Lattke & Goitía, 1997, *S. subedentata* Mayr, 1887, *S. trieces* Brown, 1960, *S. vartana* (Bolton, 2000), and *S. xenognatha* Kempf, 1958.

This species is widespread in the Neotropics, with its northernmost range in Florida, USA (Wetterer 2018) and southernmost range in Santa Fé, Argentina (Vittar & Cuezzo 2008). According to Wetterer (2018), this species can be commonly found in urban areas when occurring outside its original range, which was, according to Brown (1960), "probably south Brazil and Bolivia, though a lack of collections from central and northern Brazil prevents us from knowing how far north this species extends". Since Brown's (1960) work, the number of records of *S. eggersi* in the Neotropical region has greatly increased, especially due to recent sampling efforts conducted in ecosystems both within and adjacent to the Amazon basin. Nonetheless, there still remains a large record gap for the species in the center of the Amazon biome. Although the revision of the species was not the aim of the present work, it is important to consider that the continuous reduction of this 'distribution gap' is fundamental when addressing the specific boundaries for *S. eggersi*.

Among the specimens examined, dentition patterns varied greatly, both in size and number. In the lectotype, there are total of seven preapical teeth restricted to the distal third of the inner margin of the mandible, while in some other specimens observed there are five or six preapical teeth. Bolton (2000) mentioned that specimens belonging to *S. eggersi* can have four to eight teeth in the inner margin of the mandible, indicating that teeth variation is expected in this species. However, Longino (2006) provided an important account on the usefulness of teeth variation in demarcating different species of *Strumigenys* belonging to the *gundlachi* group, indicating that dental variation (number and relative size of teeth) should be carefully considered when discriminating potential new species in this group.

Strumigenys subedentata Mayr, 1887
Figs 7–8

Strumigenys subedentata Mayr, 1887: 575.
Strumigenys tristani Menozzi 1931: 273, fig. 8 (synonymyzed by Brown 1960).
Strumigenys (Strumigenys) clavata Weber 1934: 32, fig. 8 (synonymyzed by Brown 1960).
Pyramica kiranae Makhan 2007: 4 figs 7–8 (synonymyzed by Bolton *et al*. 2008).

Pyramica subedentata – Bolton 1999: 1673.
Strumigenys subedentata – Baroni Urbani & De Andrade 2007: 128.

Diagnosis

Strumigenys subedentata can be distinguished from other Neotropical species by the combination of five pairs of remiform setae on promesonotum (Fig. 8B), anterior area of fourth abdominal tergite reticulate-punctate (Fig. 8C), and anterior area of fourth abdominal sternite reticulate-punctate.

Type material

Lectotype (designated herein) (label information) (Fig. 7)
BRAZIL • "St. Catharina Coll. G. Mayr" [printed]; "Brit. Mus. 1922–501" [printed]; "*edentata*" [handwritten] "G. Mayr, Type" [printed]; "BMNH(E) 1013552" [printed]; "ANTWEB CASENT 0900181" [printed]. "Syntype" [printed]. "*Strumigenys subedentata* Mayr, 1887 LECTOTYPE" [printed]; NHMUK.

Paralectotypes (label information)
BRAZIL • 1 worker; "St. Catharina Coll. G. Mayr" [printed; Syntype [printed]; "*Strumigenys subedentata* Mayr, 1887" PARALECTOTYPE [printed]; NHMW-HYM4957 • 1 worker; same label information as for preceding; "*Strumigenys subedentata* Mayr, 1887 PARALECTOTYPE" [printed]; NHMW-HYM4958 • 1 worker; same label information as for preceding; NHMW-HYM4961 • 1 worker; same label information as for preceding; NHMW-HYM4962 • 1 worker; same label information as for preceding; NHMW-HYM4963 • 1 worker; same label information as for preceding; NHMW-HYM4964 • 1 worker; same label information as for preceding; NHMW-HYM4965 • 1 worker; "St. Cath. Hetschko" [printed]; "Syntype" [printed]; "*Strumigenys subedentata* Mayr, 1887" PARALECTOTYPE [printed]; NHMW-HYM4959 • 1 worker; same label information as for preceding; NHMW-HYM4960 • 1 worker; "St. Catharina Coll. G. Mayr" [printed]; "126 Hetschko 1/984" [handwritten]; "*edentata*" [handwritten] "G. Mayr, Type" [printed]; "*Pyramica subedentata*" [handwritten] "det. B. Bolton 1999" [printed] "ANTWEB CASENT 0915703" [printed]; "Syntype" [printed]. "*Strumigenys subedentata* Mayr, 1887 PARALECTOTYPE" [printed]. NHMW-HYM4956 • 1 worker; same label information as for lectotype; "*Strumigenys subedentata* Mayr, 1887 PARALECTOTYPE" [printed]; MCZT_28507.

Additional material examined

BRAZIL – **Amazonas** • 1 worker; Manaus, Colosso Camp; 12–21 Aug. 2016; B. Boudinot, L. Fernandes and J. Chaul leg.; CELC, ANTWEB1038944. – **Bahia** • 1 worker; Itacaré; 14°17′38.0″ S, 38°59′08.6″ W; 23 Aug. 2015; J. Chaul leg.; CELC, UFV-LABECOL-001969. – **Espírito Santo** • 1 worker; Santa Teresa, Estação Biológica Santa Lúcia; 19°57′58.4″ S, 40°32′21.2″ W; 30 Jan. 2015; T. Vargas leg.; CELC, UFV-LABECOL • 1 worker, 1 queen; near Reserva Biológica Córrego Grande; 18°14′11.3″ S, 39°49′12.1″ W; 21 Apr.–10 May 2017; N. Safar, C. Aquila and C. Guimarães leg.; Winkler; CELC, UFV-LABECOL-008544. – **Minas Gerais** • 1 worker; Viçosa, Floresta Secundária; Feb. 1994; Sperber, Louzada and Lopes leg.; CELC, UFV-LABECOL-001792 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-001780 • 1 worker; Viçosa; 13 Jan. 1998; S.M. Soares leg.; CELC, UFV-LABECOL-001771 • 1 worker; Viçosa, Mata da Biologia; 20°45′26.67″ S, 42°51′39.07″ W; 706 m a.s.l.; Feb. 2013; J. Chaul leg.; CELC, UFV-LABECOL-001797 • 1 worker; Viçosa, Mata da Biologia; 20°45′30.44″ S, 42°51′49.65″ W; 731 m a.s.l.; 5 May 2013; J. Chaul and N. Safar leg.; epigaeic Winkler; CELC, UFV-LABECOL-001802 • 1 worker, 1 queen; Viçosa, Mata do Paraíso; 20°48′20.5″ S, 42°51′12.4″ W; 781 m a.s.l.; 2013; J. Chaul and R. Jesus leg.; Winkler; CELC, UFV-LABECOL-008225 • 1 worker; Viçosa, Mata do Seu Nico; 20°47′43.8″ S, 42°50′51.8″ W; 750 m a.s.l.; 8 May 2013; J. Chaul and R. Jesus leg.; Winkler; CELC, UFV-LABECOL-008225 • 2 workers; Viçosa, Mata da Biologia; 20°45′30″ S, 42°51′50.3″ W; 17 Aug. 2014; J. Chaul leg.; Winkler; CELC, UFV-LABECOL-001765 • 3 workers; Viçosa; 20°46′07″ S, 42°52′02″ W; 17 Jul. 2015; J. Chaul, R. Jesus, F. Rezende and A. Orsetti leg.; Winkler; CELC, UFV-LABECOL-008593 • 1 worker; Santana de Patos, Fazenda Lagoa Formosa; 18°51′45″ S, 46°34′17″ W; Feb. 2014; L-N- Paolucci leg.; CELC, UFV-LABECOL-001779

• 1 worker; São Tiago; 20°57′09.69″ S, 44°26′32.09″ W; Feb. 2012; M. Padilha leg.; CELC, UFV-LABECOL-010751 • 1 worker; Ipaba, Reserva Particular do Patrimônio Natural Fazenda Macedônia, CENIBRA; Nov. 2005; T. Marques leg.; CELC, UFV-LABECOL-001798 • 1 worker; Conceição do Mato Dentro, Serra da Serpentina; 19.03394°S, 43.33687°W; 1–7 Sep. 2010; R.R. Silva leg.; Winkler; CELC, UFV-LABECOL-010461 – **Pará** • 1 worker; Paragominas; Jan.–Jul. 2011; R. Solar leg.; CELC, UFV-LABECOL-001804 • 1 worker, 1 queen; Primavera; 01°00′36″ S, 47°07′04″ W; 5–6 Nov. 2018; L.P. Prado and K.L.S. Sampaio leg.; Winkler; CELC, UFV-LABECOL-010487. – **Paraná** • 4 workers; Floresta Estadual do Palmito, km 28; 25°59′10.62″ S, 48°55′68.09″ W; 20 m a.s.l.; 28 Apr. 2016; J. Lattke leg.; DZUP. – **Rio de Janeiro** • 1 worker; Santa Maria Madalena, Horto Florestal; 21°57′01.5″ S, 42°00′46.5″ W; 561 m a.s.l.; 30 Oct. 2016; S. Epifânio leg.; Winkler; CELC, UFV-LABECOL-007298. – **Santa Catarina** • 1 worker, 1 queen; Florianópolis, Canto da Lagoa; 27°32′01.2″ S, 48°27′30.3″ W; 15 Feb. 2016; J. Chaul leg.; CELC, UFV-LABECOL-002490 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-008232 • 1 worker; same collection data as for preceding; CELC, UFV-LABECOL-008231 • 1 worker; Florianópolis, Lagoinha do Leste; 27°46′31.0″ S, 48°29′06.0″ W; 18 Feb. 2016; J. Chaul leg.; CELC, UFV-LABECOL-008222 • 1 queen; same collection data as for preceding; CELC, UFV-LABECOL-008221.

PERU – **Madre de Dios** • 1 worker; Puerto Maldonado, Reserva Nacional Tambopata; 12°51′21″ S, 69°21′43″ W; 210 m a.s.l.; 19–31 Jul. 2012; R. Feitosa leg.; CELC, UFV-LABECOL-001789.

Lectotype measurements

ABD4L 0.455; DPW 0.101; EL 0.054; HL 0.534; HT 0.324; HW 0.475; ML 0.306; PH 0.138; PL 0.283; PPL 0.141; PW 0.291; SL 0.267; WL 0.545; TL 2.264; CI 88.9; DPI 35.7; LPI 48.7; MI 57.3; OI 11.3; SI 56.2.

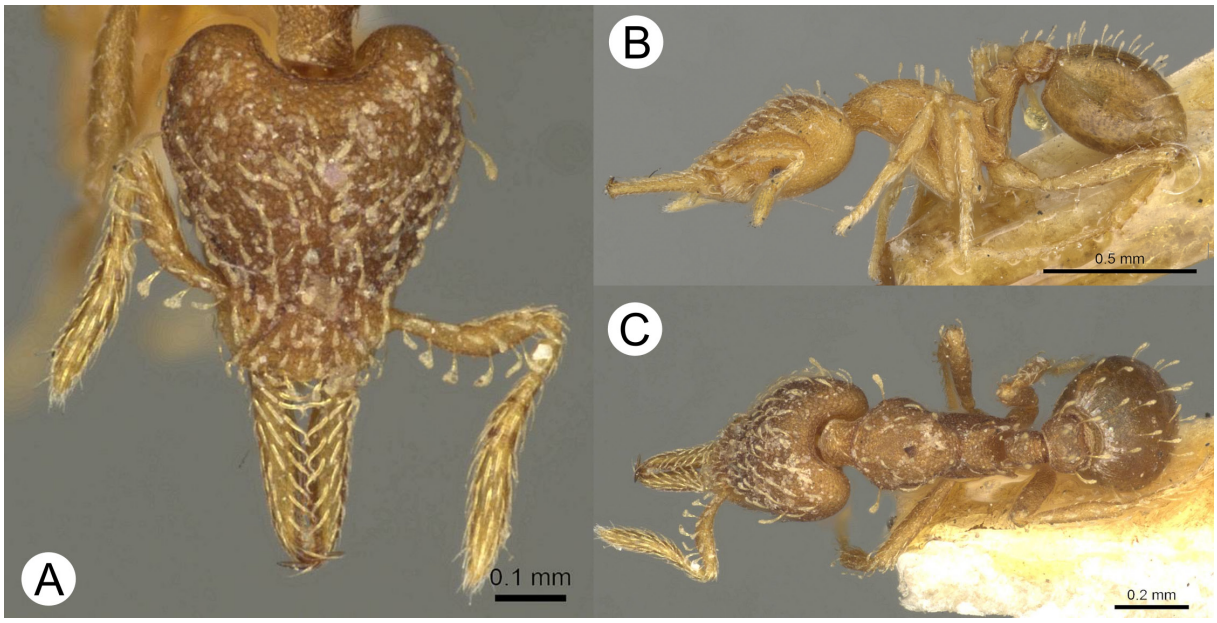

Fig. 7. Lectotype of *Strumigenys subedentata* Mayr, 1887 (CC-BY, CASENT0915703, Harald Bruckner, from www.antweb.org). **A**. Head, mandibles and antennae, in dorsal view. **B**. Full body, in lateral view. **C**. Full body, in dorsal view.

Paralectotype measurements

ABD4L 0.424; DPW 0.104; EL 0.054; HL 0.500; HT 0.300; HW 0.434; ML 0.282; PH 0.119; PL 0.243; PPL 0.146; PW 0.251; SL 0.242; WL 0.481; TL 2.076; CI 86.8; DPI 42.8; LPI 49.0; MI 56.4; OI 12.4; SI 55.8 (n = 1; CASENT 0915703).

Non-type measurements

ABD4L 0.410–0.520; DPW 0.105–0.290; EL 0.055–0.075; HL 0.490–0.575; HT 0.300–0.350; HW 0.430–0.520; ML 0.270–0.310; PH 0.130–0.160; PL 0.240–0.290; PPL 0.100–0.135; PW 0.185–0.310; SL 0.260–0.300; WL 0.510–0.610; TL 2.050–2.440; CI 85.3–90.4; DPI 40.4–103.6; LPI 50.0–58.5; MI 52.9–60.8; OI 12.8–15.1; SI 55.8–63.6 (n = 10).

Description

Sculpture. Head entirely reticulate-punctate, including antennal scrobe. Mesosoma entirely reticulate-punctate (see Comments). Fourth abdominal tergite reticulate-punctate near base (Fig. 8C). Length of basigastral costulae, in dorsal view, almost half length of postpetiole.

Setae. Cephalic ground-setae remiform (Fig. 8A). Two pairs of remiform erect setae on cephalic dorsum; both pairs located on posterior third of cephalic dorsum, one pair nearer to occipital margin. Apicoscrobal setae remiform (Fig. 8A). Anterior margin of scape with one or more remiform setae curved towards antennal insertion. Humeral setae remiform (Fig. 8B). Four pairs of erect remiform setae (excluding humeral pair) on promesonotum (Fig. 8B). Setae on petiole, postpetiole and fourth abdominal tergite remiform.

Head. Masticatory margin of mandible with five preapical denticles (Fig. 8A; see Comments). Apex of mandible with two minute intercalary denticles (Fig. 8A). Anterior clypeal margin, in dorsal view, angular medially. Eye, in lateral view, with five to seven ommatidia along longest row. Eye located on

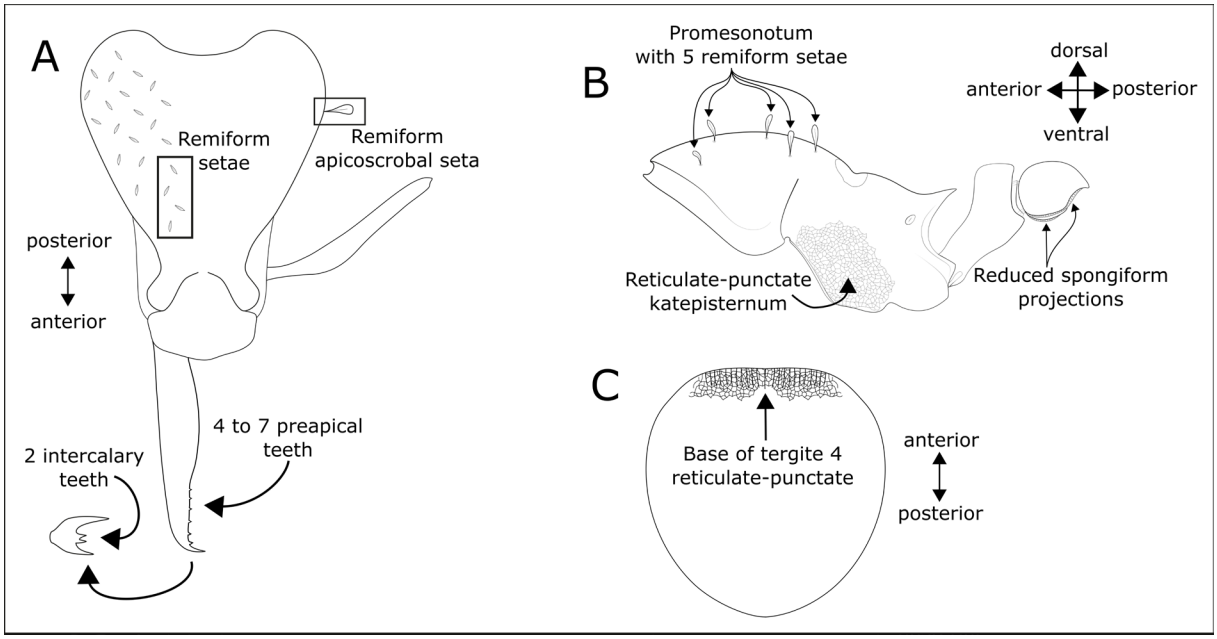

Fig. 8. Generalized schematics of *Strumigenys subedentata* Mayr, 1887, showing useful identification features. **A**. Head in dorsal view. **B**. Mesosoma, petiole, and postpetiole, in lateral view. **C**. Fourth abdominal tergite in dorsal view.

anterior half of head. In dorsal view, scape dorsoventrally flattened, expanded throughout its length. Third flagellomere smaller than fourth flagellomere; length of former almost half length of latter.

Mesosoma. Humerus with small angular projection. Dorsum of mesonotum, in lateral view, convex, confluent with dorsum of pronotum. Metanotal groove relatively well impressed. Propodeal spine long and triangular, translucent, and linked to propodeal lobe by narrow lamella that extends throughout propodeal declivity. Femoral bulla small, ovate and located distally on dorsal margin of sclerite.

Metasoma. Petiolar node, in dorsal view, as long as wide; in lateral view, anterior margin almost as long as dorsal margin. Anterior margin of postpetiole, in dorsal view, slightly concave, almost straight. Lateral and ventral spongiform processes of petiole absent. Ventral spongiform lobe of postpetiole small. Lateral spongiform lobe of postpetiole small. Ventral basigastral spongiform pad reduced to curved (U-shaped in anterior view) carina.

Comments

Bolton (2000) considered *S. subedentata* as a member of the *gundlachi* complex (see Comments in *S. denticulata*). The lectotype and the additional examined specimens did not show major morphological variation. Most specimens have an entirely reticulate-punctate katepisternum; however, some of them have a small but distinct smooth patch on the ventral-most area of the katepisternum. Although it is not possible to clearly determine if the katepisternum of the lectotype has a smooth patch based solely on images, direct observation of the physical specimen showed that this anatomical region is entirely sculptured (G. Broad pers. comm.).

In the lectotype specimen both mandibles possess five preapical teeth each (G. Broad pers. comm.), while in almost every non-type specimen observed in this study this number varied, in a symmetrical manner, from four to seven in each mandible. However, in a few specimens, we observed asymmetric variation in dentition count, which, despite not being a prevalent condition, it is a noteworthy variation.

Despite the wide range of occurrence of the species, the observed morphological traits did not presented a high variability degree, agreeing with Bolton's (2000) own observations. Nonetheless, examination of specimens sampled in other ecosystems within the Neotropical region will provide a clearer understanding of morphological variation along the distribution range of *S. subedentata*, allowing for a better delimitation of the species' boundaries in future revisionary endeavors.

Discussion

With the overall increase in representation of these four *Strumigenys* species in myrmecological collections, the morphological variability described by Bolton (2000) is becoming frequently documented, urging for a reassessment of the limits for these species. Adjusting and normalizing nomenclatural acts, along with their associated criteria, is necessary to provide an objective assessment of the defining features of any given taxon and for providing support for validation of taxonomic identities. Future revisionary efforts should consider expanding the specimen distribution coverage as to better explore morphological variability in a broader geographical perspective, especially considering how several locations that were considered to be knowledge gaps are now better represented in collections. Nonetheless, with the increased deforestation rates occurring in localities that hold an important part of biological diversity, especially in the Brazilian Amazon Forest, it is possible that much of this knowledge is at risk of disappearing.

With the lectotype designations for *S. crassicornis*, *S. denticulata*¸ *S. eggersi*, and *S. subedentata*, we take a step back but two steps forward in establishing clearer boundaries for some of the most common *Strumigenys* species in the Neotropical region.

Acknowledgements

We are deeply grateful to Bonnie Blaimer, who provided vital information on a type specimen of *Strumigenys eggersi* deposited in the ZMHB. Also, Gavin Broad provided us with important information about some morphological traits from *Strumigenys subedentata* lectotype deposited in the NHMUK. We are equally grateful to the support of all managers and curators of the contacted collections: Bonnie Blaimer, Carlos Roberto Ferreira Brandão, Crystal Maier, Dominique Zimmermann, Maria Tavano, Mônica Antunes Ulysséa, Stephanie Krause, and Suzanne Ryder. We also appreciate the help of Itanna Oliveira Fernandes and Lívia Pires do Prado for sending some non-type specimens used in this study. We are also indebted to two anonymous reviewers who suggested changes that greatly improved the manuscript. TSRS did not receive any grant during the elaboration of this work. JCMC was funded by the Coordination for the Improvement of Higher Education Personnel [CAPES grant 88882.437415/2019-01]. RMF was funded by the Brazilian Council of Research and Scientific Development [CNPq grant 301495/2019-0]. This research was carried out during a period of systematic down-sizing of democratic and scientific institutions in Brazil, by the government of Jair Messias Bolsonaro, which occurred simultaneously with a notorious upsurge of environmental disasters and illegal activities during the office of the former Minister of the Environment, Ricardo de Aquino Salles.

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