Zootaxa 3956 (2): 295–300
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3956.2.10
http://zoobank.org/urn:lsid:zoobank.org:pub:06A4E13C-94D3-445B-BB05-9A362352DCC6

A new species of *Simopelta* (Hymenoptera: Formicidae: Ponerinae) from Brazil and Costa Rica

ITANNA O. FERNANDES[1,2], JORGE L. P. SOUZA[1,3], FERNANDO FERNÁNDEZ C.[4], JACQUES H. C. DELABIE[5] & TED R. SCHULTZ[2]

[1]*Instituto Nacional de Pesquisas da Amazônia—INPA. Coordenação em Biodiversidade CBio. Av. André Araújo, 2936. Petrópolis, 69011–970, C. P. 2223. Manaus—AM. Brazil. Fone/Fax: +55 (92) 3643–3305.*
E-mail: itanna.fernandes@gmail.com or FernandesI@si.edu
[2]*Smithsonian Institution, National Museum of Natural History, Department of Entomology. P.O. Box 37012, MRC 188, CE516, Washington DC, 20013–7012*
[3]*Centro de Estudos Integrados da Biodiversidade Amazônica—CENBAM, CP 2223, CEP 69080–971, Manaus, AM, Brazil*
[4]*Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Carrera 30 No. 45 – 03, Bogotá D.C., Colombia*
[5]*Centro de Pesquisas do Cacau—CEPEC, Laboratório de Mirmecologia UESC / CEPLAC, Rod. Ilhéus / Itabuna, 45600–000, C. P. 7, Ilhéus—BA, Brazil*

Abstract

The genus *Simopelta* consists of 21 described species restricted to Central America and South America. The present study describes a new cryptobiotic species, *Simopelta anomma* **sp. nov.**. The new species is blind, possesses a 3-segmented antennal club, and has the midtibia with several stout setae, a combination of characters unique within the genus. Moreover, some traits of this species require broadening the definition of the genus. The discovery of *S. anomma* **sp. nov.** suggests that many undiscovered species, some of which may be important for understanding ant evolution, remain hidden below ground in Neotropical rainforests.

Key words: blind ant, Rio Madeira, hydroelectric plant, cryptobiotic, *Simopelta jeckylli*

Introduction

The higher taxonomic classification of ants (Hymenoptera: Formicidae) has recently undergone significant changes (Schmidt 2013, Schmidt & Shattuck 2014; Brady *et al.* 2014, Ward *et al.* 2015). Driven by careful reconsiderations of morphological variation (Keller 2011, Schmidt & Shattuck 2014) and molecular phylogenetic studies of subfamilies, the higher classification of the Formicidae is now relatively stable and reflective of evolutionary relationships (Schmidt 2013, Brady *et al.* 2014, Ward *et al.* 2015).

The Ponerinae are notable for combining simple social organization with a high diversity of derived morphological, ecological, and behavioral traits (Schmidt & Shattuck 2014). They are broadly categorized based on their foraging microhabitats as either epigaeic, foraging on the surface of the ground or on low vegetation, or cryptobiotic, foraging in soil, leaf litter, rotting wood, or other concealed microhabitats, although many taxa are intermediate between these extremes. Cryptobiotic ant species often converge on several morphological traits that are correlated with life in restricted, dark conditions, including small bodies; eyes typically greatly reduced in size or even entirely absent; clubbed antennae; and legs often short and stocky, sometimes armed with stout setae to increase traction in soil or wood, and with only a single metatibial spur (Schmidt & Shattuck 2014).

Schmidt's (2013) phylogeny places *Simopelta* with strong support as a member of the *Pachycondyla* genus group and as sister to the remainder of that group, though other alternative relationships received some support in Bayesian analyses, including sister relationships with *Thaumatomyrmex* and the *Ponera* genus group.

Simopelta was erected by Mann (1922) as a subgenus of *Belonopelta*, and since then it has been recognized as a subgenus or as a junior synonym of *Belonopelta* (e.g., Donisthorpe 1943, Baroni Urbani 1975) or as a separate

Accepted by J. Longino: 13 Apr. 2015; published: 8 May 2015

genus (e.g., Wheeler 1935, Gotwald & Brown 1966, Bolton 2003). *Simopelta* comprises 21 described species and is restricted to Central America and South America, including Guatemala, Costa Rica, Brazil, Peru, and Ecuador (Mackay & Mackay 2008). *Simopelta* is known from scattered localities throughout the Neotropics, and is especially abundant in mid–montane wet forests (500–2,000 m), spatially restricted habitats infrequently visited by humans. Although colonies are often large, they are present at low densities relative to those of other ants (Brandão *et al.* 2008). *Simopelta* species are notable for their army ant lifestyle (Schmidt & Shattuck 2014). Colony reproduction apparently occurs via budding, as in army ants (Gotwald & Brown 1966).

Simopelta workers can be diagnosed by the following combination of characters: antennae with 12 segments, the segments usually larger toward the apex, but without a defined club; subtriangular mandibles, usually with 3 - 6 teeth; raised clypeal rostrum, medial part of the clypeus usually angulate, sometimes with a short medial spine; eyes small and often consisting of a single enlarged ommatidium; metapleural gland orifice with a posterior U-shaped lip; stout traction setae absent on the middle and hind legs; prominent arolia present (Mackay & Mackay 2008; Schmidt & Shattuck 2014). Some *Simopelta* species (*S. pergandei* and its relatives) superficially resemble *Feroponera* Bolton & Fisher, 2008 and *Cryptopone* Emery, 1893, but differ from those genera in lacking traction setae on the legs, among other differences (Schmidt & Shattuck 2014).

Schmidt & Shattuck (2014) referred to an unidentified Costa Rica specimen that was placed in *Simopelta* but differed in several respects from the above diagnosis. In the present study we provide a description for this new cryptobiotic species and expand the formal diagnosis of *Simopelta* to include the new species. We also report an additional occurrence of the rare species *S. jeckylli* from the state of Pará, Brazil.

Material and methods

The material described in this study was sampled by Winkler extractor (Alonso & Agosti 2000) at the site of the Santo Antônio Hydroelectric Plant in the state of Rondônia, Brazil. Vouchers are deposited in the Instituto Nacional de Pesquisas da Amazônia (INPA) in Manaus and Museu de Zoologia da Universidade de São Paulo, São Paulo (MZSP), Brazil.

Museum collections are referred by the following acronyms:

CPDC	Centro de Pesquisa do Cacau, Laboratório de Mirmecologia, Ilhéus, Bahia, Brazil.
INPA	Instituto Nacional de Pesquisas da Amazonia, Manaus, Brazil.
INBio	Instituto Nacional de Biodiversidad, San José, Costa Rica.
MZSP	Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.

We follow the morphological nomenclature of Bolton (1994) and Hölldobler and Wilson (1990). Specimens were identified and measured using an Olympus stereomicroscope, with magnifications 20x, 40x and 60x. Digital images were made using a Leica Z16 APO stereomicroscope with a JVC KY–F75U digital camera under a white light. All measurements are given in millimeters. Abbreviations used are:

HW: Head width. In full-face view, the maximum width of head.
HL: Head length. In full-face view, from the anterior edge of the clypeus (disregarding the spine, if present) to the medial posterior margin of the head.
SL: Scape length. In frontal view, measured from apex of first antennal segment to base, excluding the basal condyle.
WL: Weber's length. In lateral view, the diagonal length of mesosoma in profile, from the midpoint of the anterior pronotal declivity to posterior margin of metapleuron.
PW: Pronotal width. In dorsal view, the maximum width of pronotum, measured from side to side.
NH: Nodal height. In lateral view, the distance from lower edge of petiolar sternite to apex of petiolar tergite (node), taken as a vertical measurement perpendicular to the longitudinal axis of the petiole.
NL: Nodal length. In lateral view, the maximum distance between anterior and posterior extremes of petiolar node, excluding anterior and posterior condyles.

GL: Gaster length. In lateral view, the maximum length of gaster.
TL: Total length. The summed length of HL, WL, NL, and GL.

***Simopelta anomma* sp. nov.**
(Figures 1–3)

Type material. Holotype worker: BRAZIL, Rondônia, Rio Madeira (módulo da Ilha do Búfalo), 09°08'18"S, 64°29'22"W, km 2, subparcela 200, 19.i.2014, leg. A. H. C. Oliveira, pin labeled USNMENT00923312 (INPA). One paratype: same data as the holotype, but pin labeled USNMENT00923313 (MZSP).

Additional material. COSTA RICA, 1 worker, Cordillera Volcanica Central, La Selva Biological Station (Conservation International's TEAM Project), 10°24'35"N, 84°02'21"W, 160 m elevation, 26.vii.2006, Winkler sample, pin labeled INB0003695155, AMI–2–W–088–08, leg. M. Marcos, H. Gilberth & C. Felix (INBio).

Diagnosis (worker). Eyes absent; antennal club 3–segmented; midtibiae covered by short, golden, stout setae; arolia reduced and translucent; ventral petiolar process rounded; body yellow.

Measurements, workers (n=2): HL: 0.464–0.480; HW: 0.400–0.416; SL: 0.288–0.320; WL: 0.672–0.720; PW: 0.264–0.288; NH: 0.168–0.192; NL: 0.168–0.192; GL: 0.840–0.984; TL: 2.160–2.360.

Description. Head rectangular, sides almost straight and parallel with one another, occipital corners rounded. Mandibles subtriangular with acute basal tooth, two closely spaced apical teeth, and no teeth or denticles between basal and apical teeth; eyes absent; antennae with 12 segments; antennal scapes not extending beyond posterior cephalic margin; antennae with distinct 3-segmented club; last funicular segment as long as the preceding three together; frontal lobes elevated by a narrow and deep furrow; clypeus triangular, elevated in the middle, with a sharp and almost cylindrical median spine. Pronotum as long as the propodeum; laterocervical plate inflated; promesonotal groove well marked. Metanotal groove deep dorsally and well marked laterally; katepisternum and anepisternum not separated by a suture. Propodeum in dorsal view subrectangular with posterior superior corners slightly rounded; in lateral view, propodeal spiracles round, large, almost reaching the dorsal surface. Petiole in lateral view as long as high, subquadrate, with subparallel anterior and posterior sides; ventral petiolar process rounded. Gaster with constriction between abdominal segment III and IV; coxae, femurs, and tibiae robust; arolia reduced and translucent.

Body predominantly yellow. Mandibles and legs smooth and shiny. Head and antennae finely punctulate and shiny. Mesosoma finely punctulate and shining laterally.

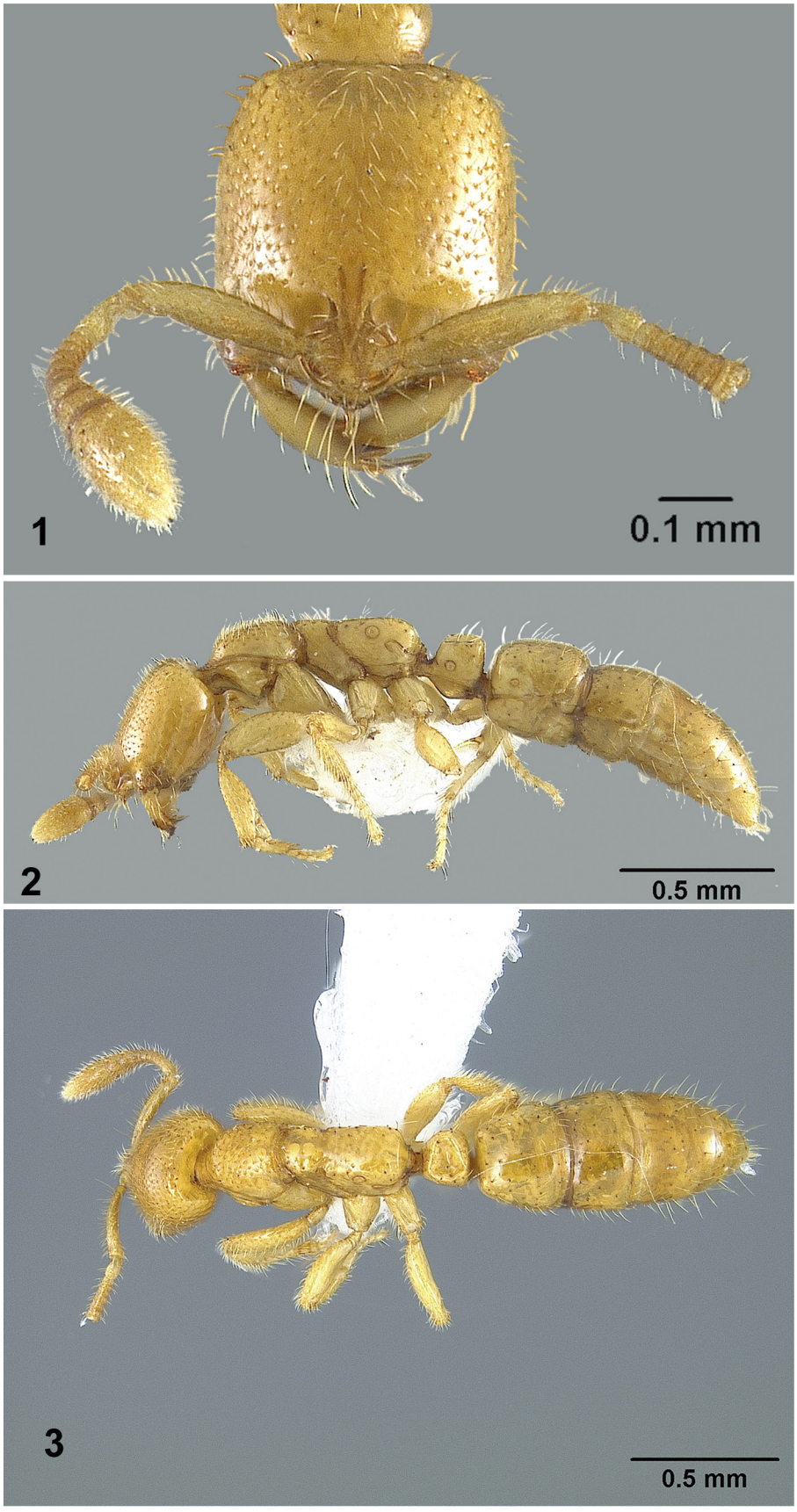
Body covered with fine, short, golden hairs, most abundant on the dorsal surface; middle area of clypeus and mandibles along the masticatory border with long, subdecumbent, golden hairs; sparse golden hairs on the coxae, trochanters, and femurs; pectinate spur present on the legs; tibiae on the forelegs and hindlegs covered by thick, short, golden hairs on the ventral surface; tibiae on the middle legs with abundant, golden, stout setae on all surfaces; tarsus covered by short, golden, stout setae, more abundant on the ventral surface.

Etymology of the species name. Greek origin: *an*=without and *omma*=eyes, due the absence of eyes.

Distribution. **Costa Rica,** La Selva Biological Station (Cordillera Volcanica Central); **Brazil** (Rondônia, Ilha do Búfalo–Rio Madeira).

Discussion. The combination of eyes absent, yellow coloration, a distinct 3-segmented antennal club, and midtibia covered by short, golden, stout setae has so far never been documented in a species of *Simopelta*. As a result, we modify Schmidt and Shattuck's (2014) generic diagnosis as follows: subtriangular mandibles; raised clypeal rostrum; eyes small or absent, when present often consisting of only a single enlarged ommatidium; metapleural gland orifice with a posterior U-shaped lip; usually an absence of stout traction setae on the middle and hind legs (present in *S. anomma*); and usually with prominent arolia (highly reduced in *S. anomma*).

The form of the clypeus, mesosoma, petiole, and the gastral constriction in *S. anomma* are similar to those in *S. pergandei,* but eyes are present in the latter species. *Simopelta minima* (Brandão) is also similar to *S. anomma* in total length (TL: 2.08–2.40) and presence of the clypeal spine, but, again, differs by the presence of eyes, as well as in its 4-segmented antennal club; lack of short, golden, stout setae on the midtibia; triangular anteroventral petiolar process; finer sculpture; and darker color. *Simopelta anomma* is apparently a member of the *curvata* species complex created by Mackay and Mackay (2008) due to the presence of an elongate spine on the median border of the clypeus and the total length less than 4mm.



FIGURES 1–3. Holotype of *Simopelta anomma* **sp. nov.**. in full–face, lateral, and dorsal view.

The robust forecoxa, lack of eyes, and clubbed (3-segmented) antennae of *S. anomma* all suggest that the species is subterranean. Most cryptobiotic ponerines have at least moderately clubbed antennae, which may facilitate movement and prey detection in lightless conditions (Schmidt & Shattuck 2014). The legs are often short and stocky, and are sometimes armed with stout setae to facilitate traction in soil or wood (present in *Centromyrmex, Feroponera, Promyopias,* and most *Cryptopone* species) (Schmidt & Shattuck 2014). According to Schmidt and Shattuck (2014), cryptobiotic ponerines are typically small-bodied, extremely so in many *Cryptopone*, *Dolioponera, Hypoponera,* and *Ponera* species. The eyes are typically greatly reduced in size or even entirely absent (including in *Boloponera*, *Centromyrmex*, *Dolioponera*, *Feroponera*, *Promyopias*, and some *Cryptopone* and *Hypoponera* species). Although these characteristics strongly suggest that *S. anomma* may be mostly or entirely subterranean, the fact that the three known specimens were collected by Winkler leaf-litter sifting suggests that it may occasionally forage above ground in the leaf litter.

The area where the workers were sampled in Rondônia (Ilha do Búfalo, Rio Madeira, km 2–subparcela 200) is part of a conservation monitoring project supported by the Santo Antônio Energia Hydroelectric Plant. At the time when the ants were collected, the water level of the Madeira River had risen 19 m above the maximum limit for the first time in four years of monitoring. Due to the elevation of the river water, the groundwater was also climbing, perhaps forcing normally subterranean species to the surface (Fernandes *et al.* in press). Following the elevation of the river water no additional specimens of *S. anomma* were encountered.

Virtually nothing is known about the life histories, population structures, or reproductive biologies of most rare ant species (Brandão *et al.* 2008). Rare species may have low population densities at the localities in which they are collected for a variety of reasons. They may be rare immigrants from a nearby source locality in which they are more populous, e.g., rare epigaeic foragers of a mostly subterranean species; they may be temporarily rare due to fluctuations in population size; or they may represent remnants of a declining population or the first individuals of an increasing population (Longino & Colwell 1997). The rarity of this species and *S. jeckylli* (reported below) is perhaps explained by inadequate sampling of their microhabitat. Winkler extraction or other common sampling techniques (see Bestelmeyer *et al.* 2000) may be inadequate for sampling some cryptobiotic ant assemblages, including subterranean species. The discovery of the *S. anomma* emphasizes the need for increased exploration of subterranean ant diversity.

New records for *S. jeckylli* (Mann, 1916)

Simopelta jeckylli was first recorded by Mann from Brazil, Rondônia, Madeira-Mamoré, R. R. Co. Camp 39. A second occurrence was reported in Mackay and Mackay (2008), from Ecuador (Orellana). Here we report two additional occurrences of this extremely rare species and extend its known distribution to Tailândia in the state of Pará (Brazil).

Additional material: 13 workers, Rondônia, Porto Velho, Rio Madeira (módulo de Jaci–MD), 09°26'56"S, 64°21'25"W, Km 4, subparcela 50, 22.i.2014, leg. A. H. C. Oliveira, (INPA); 1 worker, Pará, Tailândia, Fazenda Santa Maria, 17–19.vi.2003, leg. A. M. Elizabeth (CPDC).

Acknowledgments

The first author (IOF) kindly acknowledges support from INPA, the Smithsonian Institution (NMNH), FAPEAM, CBio (for logistics), the Pro-equipamentos project CAPES / DCEN – MCT, and the Pronex program FAPESB–CNPq PNX 011/2009. We thank INPA for supporting the visit of the third author to INPA in Manaus. The authors acknowledge their grants from CAPES/CNPq/PDSE (IOF), CNPq (JHCD), CNPq/FAPEAM (JLPS), and NSF and the Smithsonian CGPS (TRS). The authors also thank to Dr. John T. Longino to encourage this publication and the anonymous reviewers. This study was supported by the Wildlife Conservation Program of Santo Antônio Energia, the company responsible for building and operating the SAE Hydroelectric Plant. The authors kindly acknowledge the help of Paulo V. Cruz with Photoshop, of Adriano H.C. Oliveira for help with fieldwork and sampling in Santo Antonio, and of Jeffrey Sosa-Calvo and Roberto F. Guerrero for valuable discussions and suggestions.

Reference

Alonso, L.E. & Agosti, D. (2000) The ALL protocol: a standard protocol for the collection of ground–dwelling ants. *In*: Agosti, D., Majer, J., Alonso, E. & Schultz, T.R. (Eds.), *Ants, Standard Methods for Measuring and Monitoring Biodiversity.* Smithsonian Institution Press, Washington, DC, pp. 204–206.

Baroni Urbani, C. (1975) Contributo alla conoscenza dei generi *Belonopelta* Mayr e *Leiopelta* gen. n. (Hymenoptera: Formicidae). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 48, 295–310.

Bestelmeyer, B.T., Agosti, D., Alonso, L.E., Brandão, C.R.F.R., Brown, W. Jr., Delabie, J.H.C. & Silvestre, R. (2000) Field techniques for the study of ground–living ants: an overview, description, and evaluation. *In*: Agosti, D., Majer, J., Alonso, E. & Schultz, T.R. (Eds.), *Ants, Standard Methods for Measuring and Monitoring Biodiversity.* Smithsonian Institution Press, Washington, DC. pp. 122–144.

Bolton, B. (1994) *Identification guide to the ant genera of the world*. Harvard University Press, Cambridge, Mass., 222 pp.

Bolton, B. (2003) Synopsis and classification of Formicidae. *Memoirs of the American Entomological Institute,* 71, 370 pp.

Brady, S.G., Fisher, B.L., Schultz, T.R. & Ward, P.S. (2014) The rise of army ants and their relative diversification of specialized predatory Dorylinae ants. *BMC Evolutionary Biology*, 93, 1–14. http://dx.doi.org/10.1186/1471-2148-14-93

Brandão, C.R., Feitosa, R.M., Schmidt, F.A. & Solar, R.R.A. (2008) Rediscovery of the putatively extinct ant species *Simopelta minima* (Brandão) (Hymenoptera, Formicidae), with a discussion on rarity and conservation status of ant species. *Revista Brasileira de Entomologia*, 52, 480–483. http://dx.doi.org/10.1590/S0085-56262008000300026

Donisthorpe, H. (1943) A list of the type-species of the genera and subgenera of the Formicidae. *Annals and Magazine of Natural History*, 11 (10), 721–737. http://dx.doi.org/10.1080/03745481.1943.9728055

Fernandes, I.O., Souza, J.L.P., Delabie, J.H.C. & Fernández, F. (2015) New Records of the Dorylinae Ant Genus *Cheliomyrmex* for the Brazilian Amazon Basin. *Sociobiology*, 62. [in press]

Gotwald, W.H. & Brown, W.L. Jr. (1966) The ant genus *Simopelta* (Hymenoptera: Formicidae). *Psyche*, 73, 261–276. http://dx.doi.org/10.1155/1966/69869

Hölldober, B. & Wilson, E.O. (1990) *The Ants*. Harvard University Press, 746 pp.

Keller, R.A. (2011) A phylogenetic analysis of ant morphology (Hymenoptera: Formicidae) with special reference to the poneromorph subfamilies. *Bulletin of the American Museum of Natural History*, 355, 1–90. http://dx.doi.org/10.1206/355.1

Longino, J.T. & Colwell, R.K. (1997) Biodiversity assessment using structured inventory: capturing the ant fauna of a tropical rain forest. *Ecological Applications,* 7, 1263–1277. http://dx.doi.org/10.1890/1051-0761(1997)007[1263:BAUSIC]2.0.CO;2

Mackay, W.P. & Mackay, E.E. (2008) Revision of the ants of the genus *Simopelta* Mann. *In*: Jiménez, E., Fernández, F., Arias, T.M. & Lozano-Zambrano, F.H. (Eds.), *Sistemática, biogeografía y conservación de las hormigas cazadoras de Colombia*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Bogotá, pp. 285–328.

Mann, W.M. (1916) The Stanford Expedition to Brazil, 1911, John C. Branner, Director. The ants of Brazil. *Bulletin of the Museum of Comparative Zoology*, 60, 399–490.

Mann, W.M. (1922) Ants from Honduras and Guatemala. *Proceedings of the United States National Museum*, 61, 1–54. http://dx.doi.org/10.5479/si.00963801.61-2434.1

Schmidt, C.A. (2013) Molecular phylogenetics of ponerine ants (Hymenoptera: Formicidae: Ponerinae). *Zootaxa*, 3647 (2), 201–250. http://dx.doi.org/10.11646/zootaxa.3647.2.1

Schmidt, C.A. & Shattuck, S.O. (2014) The higher classification of the ant subfamily Ponerinae (Hymenoptera: Formicidae), with a review of ponerine ecology and behavior. *Zootaxa*, 3817 (1), 1–242. http://dx.doi.org/10.11646/zootaxa.3817.1.1

Ward, P.S., Brady, S.G., Fisher, B.L. & Schultz, T.R. (2015) The evolution of myrmicine ants: phylogeny and biogeography of a hyperdiverse ant clade (Hymenoptera: Formicidae). *Systematic Entomology*, 40 (1) 61–81. http://dx.doi.org/10.1111/syen.12090

Wheeler, W. (1935) Ants of the genera *Belonopelta* Mayr and *Simopelta* Mann. *Revista de Entomologia*, 5, 8–19.