

Revisionary and natural history notes on some species of the genus *Gnamptogenys* ROGER, 1863 (Hymenoptera: Formicidae)

John E. LATTKE & Thibaut DELSINNE



Abstract

Taxonomic clarifications and natural history data dealing with some species of the genus *Gnamptogenys* are offered: *Gnamptogenys bufonis* (MANN, 1926) is synonymized under *G. simulans* (EMERY, 1896); *G. vriesi* BRANDÃO & LATTKE, 1990 is redescribed and illustrated with SEM and montage images, the peculiar morphology of its compound eye is discussed. Also, an updated key for the *G. minuta* group species is presented and a nest of *G. minuta* (EMERY, 1896) is described. The species known up to now as *G. costata* (EMERY, 1889) is renamed *G. coxalis* (F. SMITH, 1857), and the species misidentified up to now as *G. coxalis* (ROGER, 1860) is renamed *G. sinhala* LATTKE sp.n.

Key words: *Gnamptogenys*, natural history, redescription, *minuta* group key, misidentification, new synonymy, new species.

Myrmecol. News 22: 141-147
ISSN 1994-4136 (print), ISSN 1997-3500 (online)

Received 26 May 2015; revision received 7 July 2015; accepted 10 July 2015
Subject Editor: John S. LaPolla

John E. Latke (contact author), Universidad Nacional de Loja, Dirección de Investigación, Programa Biodiversidad, Bosques y Servicios Ecosistémicos, EC 110101 Loja, Ecuador. E-mail: john.latke@miza-ucv.org

Thibaut Delsinne, Universidad Técnica Particular de Loja (UTPL), Departamento de Ciencias Naturales, Museo de Colecciones Biológicas (MUTPL), EC 110101 Loja, Ecuador. E-mail: delsinnethibaut@yahoo.fr

Introduction

In the course of daily taxonomic work, it is not uncommon to uncover a variety of novel information concerning aspects such as the expansion of distribution ranges, nomenclatural situations, natural history information, and the discovery of unknown infraspecific variation, which may force a reconsideration of how some species are defined. Far from uncommon, such work in species and ecosystem rich regions such as the Neotropics, and particularly diverse countries such as Ecuador, rapidly snowballs into a collection of data that should be shared with the community. Such is the case for the present publication, the result of various tasks by the authors and other workers. Field work has permitted the observation of a nest of *Gnamptogenys minuta* (EMERY, 1896) and the recovery of specimens of *G. vriesi* BRANDÃO & LATTKE, 1990, until now only known from the type specimens. The new material permits us to better define the species, image it, and update an identification key for the workers of the *Gnamptogenys minuta* group. Studies by several workers have gathered growing evidence of the dubious status of *G. bufonis*, and we present the formal case for the synonymy. Barry Bolton recently detected a nomenclatural anomaly affecting two species of the genus, and he has shared this information with us and offered his opinions with a solution in mind.

Materials and methods

This paper is the result of several tasks realised during the course of field work and collections based research on

specimens of the ectatommine genus *Gnamptogenys* using mostly morphology and literature records. The names of the **institutional collections** involved are mentioned within the results and discussion; MHNG = Natural History Museum, Geneva; MCSN = Civic Museum of Natural History, Genoa; MCZC = Museum of Comparative Zoology, Cambridge, MA; NHMW = Natural History Museum, Vienna; OXUM = Oxford University Museum, Oxford; RBINS = Royal Belgian Institute of Natural Sciences, Brussels; USNM = National Museum of Natural History, Washington, DC.

Images: High resolution digital images of *Gnamptogenys vriesi* were taken at RBINS using a Leica DFC290 camera attached to a Leica Z6APO macroscope. A series of images was taken by focusing the sharpness on different levels of the specimen, using the Leica Application Suite v38 (2003 - 2011) and combined with the stacking software Combine ZP (HADLEY 2010). Final editing of the images was done with Adobe Photoshop CS5. SEM photographs of the specimen were taken at the RBINS using a FEI Quanta 200 scanning electron microscope. Images of *G. sinhala* sp.n. were taken in the Natural History Museum of Vienna using a Leica DFC450 camera, model MSV266, attached to a Leica Z16APO macroscope and managed with Leica LAS 3.8.0 software. Stacks were combined with Automontage software and final touches carried out with Photoshop CS5. Labels were photographed with a Canon EOS Rebel T4i camera, using a Canon Macro Lens EF 100 mm. Images were processed

with the EOS Utility and Digital Photo Professional softwares.

Measurements: Measurements of *Gnamptogenys vriesi* worker 1 were made using a Zeiss Stemi 2000C stereomicroscope at 45× magnifications with a Zeiss Axiomat Mrc5 camera and Zeiss Axiovision software. Measurements of *G. vriesi* worker 2 were made using an Olympus SZ61 stereomicroscope at 45× magnifications with a micrometer. The abbreviations are as follows:

CI Cephalic index: $HW / HL \times 100$.

ED Eye diameter: measured along its long axis in lateral view.

HL Head length: midline length of head proper, measured in full-face (dorsal) view, from the anterior clypeal margin to the midpoint of a line drawn across the vertexal margin.

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

OI Ocular index: $ED / HW \times 100$.

PL Petiole length: the maximum length of the petiole measured in lateral view.

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

WL Weber's length of the mesosoma: diagonal length measured in lateral view, from the anterior margin of the pronotum (excluding collar) to the posterior extremity of the metapleural lobe.

Results and discussion

Gnamptogenys minuta (EMERY, 1896)

A nest was uncovered in a cocoa plantation close to the northcentral Venezuelan coastal town of Ocumare by Dr. Robert Johnson during the 2008 edition of Ant Course. The nest was found under a grapefruit-sized stone with a cusp shaped structure, it consisted of a single chamber dug out from the soil from which 24 workers were collected. Two specimens are deposited in the Museo del Instituto de Zoología Agrícola of the Universidad Central de Venezuela in Maracay, Venezuela, and the rest are in the Arizona State University collection. This observation further reinforces the notion that *G. minuta* group species are subterranean nesters, in contrast with most members of the genus which prefer to nest in decomposing wood.

Gnamptogenys simulans (EMERY, 1896)

Alfaria simulans EMERY, 1896a: 177 (footnote) (w.). Costa Rica. EMERY 1896b: 42 (q., m., species also described as new here).

Gnamptogenys simulans (EMERY, 1896). Combination in *Gnamptogenys*: BROWN 1958: 229.

Alfaria bufonis MANN, 1926: 101 (w.) Mexico. **Syn.n.**

Gnamptogenys bufonis was described from a unique specimen from Oaxaca, Mexico by MANN (1926) as a species different from *G. simulans* on account of its smaller size, longer and more elongate antennal scapes, darker color, and presence of a metanotal sulcus. BRANDÃO & LATTKE (1990) studied several specimens of *G. simulans* and the type of *G. bufonis*, concluding they were separate species. In a review of the *minuta* group LATTKE (1992) recognized several specimens as belonging to *G. bufonis*. However, field work by J. Longino in Costa Rica permitted the study of many specimens of *G. simulans*, thus broad-

ening knowledge of the extent of its morphological variation. LONGINO (1998) found that Mann's original parameters for defining *G. bufonis* were insufficient and overlapped amongst the specimens he collected and studied. He found no reason to continue treating it as a distinct entity. The posterior study of even more specimens found during the LLAMA (2015) project in southern Mexico and Central America further support Longino's conclusions. Images of the type of *G. bufonis* (USNM ENT 00533159) are available from USNM (2015). Images of a type of *G. simulans* (CASENT0903848) are available from ANTWEB (2015). We studied images of the type taken in three different perspectives (frontal cephalic, lateral body and dorsal body views) and could find no morphological features supporting the distinctness of *G. bufonis*. This, along with Longino's multiple observations, lead us to synonymise *G. bufonis* under *G. simulans*.

Gnamptogenys vriesi BRANDÃO & LATTKE, 1990

(Figs. 1 - 4)

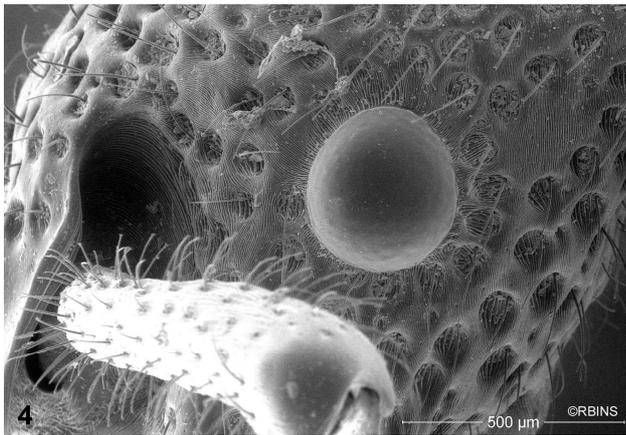
Gnamptogenys vriesi BRANDÃO & LATTKE, 1990: 490, figs. 1-7 (w., q.). Ecuador.

Specimens studied. Worker 1: Ecuador, Zamora Chinchipe, 2.7 km SSE Zamora, Posada Copalinga, 1060 m a.s.l., 4.09106° S 78.96210° W, 24.X.2014, M. Tuza, M. Vélez, C. Gómez, G. Piedra, J. Lattke 3642, ex-leaf litter sample. Deposited in the Ecuadorian Ant Reference Collection (ARCA) of the Museo Biológico, Universidad Técnica Particular de Loja, Loja, Ecuador. Worker 2: Ecuador, Zamora Chinchipe, Parque Nacional Podocarpus, Bombuscaro, 4.11497° S 78.9679° W, 1000 m a.s.l., 1.X.2007, M. Leponce, Pitfall 48h. Deposited in the Royal Belgian Institute of Natural Sciences (RBINS) with these references: Collection-ID 33763, Specimen-ID: 32979 (Leponce's database).

Worker metrics (in mm): Specimen 1: HL 1.95, HW 1.87 (posterad to eye), SL 1.77, ED 0.35, WL 3.03, PL 1.23 (in dorsal view); CI 0.96, SI 0.95, OI 0.19. Specimen 2: HL 1.93, HW 1.82, SL 1.84, ED 0.36, WL 3.00, PL 1.20; CI 0.94, SI 0.95, OI 0.18.

Worker description: Head subquadrate in full face view; posterior cephalic margin straight, lateral margin straight to weakly convex; anterolateral cephalic margin slightly bulging. Frons with a median longitudinal slit that extends from the supraclypeal area to the height of the eye posterior margin. Eye semi-spherical, placed close to cephalic mid-length; frons with abundant foveolae, diameter of each depression usually greater than width of intervening space. Each foveola with an eccentric hair, which turned in different directions, depending on the area of the head. Integument between depressions very finely striate with silky sheen; bottom of foveolae with more impressed and more spaced strigae. Clypeal disc smooth with some foveolae, frontal lobe foveolate and silky mesad but toward lateral margin without depressions, mostly smooth with weak striae. In dorsal view, frontal lobe greatly expanded laterad, covering all of scape base, including condyle and neck. Mandible shining, triangular and elongate, longitudinally striate with an edentate masticatory margin. Palps not visible.

Anteromedian clypeal margin concave, overhanging lateral clypeal margin, which is concave mesad and convex laterad. No anterior clypeal lamella. Antennal scape pro-



Figs. 1 - 4: *Gnampptogenys vriesi* (RBINS Specimen ID 32979). (1) Dorsal view of head. (2) Lateral view of body. (3) Dorsal view of body. (4) SEM lateral view of head.

jects beyond posterior cephalic margin by at most one-fourth its length, shining with fine longitudinal striae and punctures at the base of abundant suberect white to golden hairs. In lateral view occipital lobe well-developed, with bluntly angular ventral margin. Cephalic ventrum also foveolate, with intervening space covered with longitudinal or transverse striae more impressed than on the dorsal area. Anterior part of hypostome forms small blunt projection. Compound eye round, semispherical with smooth and transparent outer surface, physically separated from convex grouping of apparent ommatidia by a space.

Mesosomal dorsal margin in lateral view with promesonotum forming one convexity and propodeum another; promesonotal suture not visible; metanotal groove clearly impressed. Cuticle silky with dense piligerous foveolae, progressively vanishing on metapleuron. Pronotum anterolaterally with depression that mirrors cephalic occipital lobe. Mesometapleural suture well-impressed, anepisternum clearly separated from katepisternum. Metapleural gland opening forming a transverse slit. Bulla distinct as low swelling. Propodeal spiracle slightly bulging, round, surrounded by light brown rim, and separated from posterior margin by one diametre or less. Propodeal declivity opaque, very finely granulose with hints of striolae; surrounded by lamellate, inverted U-shaped crest.

Petiolar node relatively low and evenly convex, without differentiated posterior face, foveolate; anteroventral process of petiole shaped as low rounded lobe. Postpeti-

olar ventral margin sinuate in lateral view, a longitudinal crest extends from prora to posterior margin of abdominal sternite III; dorsal margin mostly weakly convex in lateral view, most convex posterad. Cinctus present between petiole and abdominal segment III, and between abdominal segment III and IV. Abdominal segment IV with dorsal margin extremely convex, bulging such that apex faces anteroventrally; sternite IV convex. Abdominal sternites IV to apex form concavity in lateral view. Gaster mostly foveolate, shallow on abdominal sternite III. Body dark brown with abundant white to golden stiff hairs; well-developed sting. Hindcoxa with low, blunt, and outward projected tubercle. Coxae with transverse striolae, femora dorsally longitudinally striolate, ventrally transverse, tibiae longitudinally striolate. One simple spur each on meso- and metatibiae. Claws with well-developed basal tooth.

Comments: Since its original description, based on a single worker and a single dealate queen collected in 1976 from Ecuador (Prov. Morona-Santiago, Los Tayos), no other specimens belonging to this species have been reported. The original description is rather brief as it mainly emphasized differences with *Gnampptogenys simulans* and *G. falcifera* KEMPF, 1967. Moreover, studying digital photographs of the type series, we detected some errors on the illustrations of type specimens (BRANDÃO & LATTKE 1990: figs. 1-7) (e.g., head lacks occipital lobes, shape of clypeal anterior margin is incorrect, etc.). The finding of two additional specimens gives us the opportunity to com-

plement the description with more details and to provide new illustrations. We also confirm the usefulness of criteria used by BRANDÃO & LATTKE (1990) to separate *G. vriesi* from *G. simulans* and *G. falcifera*, including its larger size (with WL \geq 3 mm; this species is the largest in the *G. minuta* group), the conspicuous anterior median concavity of the clypeus, and its large bulging eyes. The eye structure in *G. vriesi* appears quite different from other *G. minuta* group ants, and from most insects in general, by having the cuticle surrounding the eye forming a smooth, transparent convex structure, appearing as a single fishbowl-shaped lens with what seem to be very faint traces of individual facets formed by corneal lens, visible by SEM with a magnification of 180 \times and more (Fig. 4). Corneal lens molded into individual facets are explicitly visible in both the reduced eyes of *G. minuta* and the large eyes of *G. simulans*. A compound eye with few, or an apparent single facet, is frequent in insects with reduced eyes (e.g., in Dorylinae; WERRINGLOER 1932), but the bulging eyes of *G. vriesi* can hardly qualify as reduced. Separated beneath this fishbowl-like structure the apparent ommatidia are clearly visible (Figs. 1 - 2). This state is shared not only by the present specimens but also by the holotype in the São Paulo Museum. Since the corneal lens is formed by the cuticle itself, this morphology opens questions such as is the crystalline cone separated from the corneal lens or is the corneal lens itself separated into different layers? Perhaps it is simply a postmortem artefact.

The studied specimens have abundant dirt and organic matter covering most of their body except for the cephalic and gastral ventral areas, implying foraging or nesting in the soil. These findings in southern Ecuador extend the range of this species by nearly 135 km to the South-West.

Key for determining workers of the *Gnamptogenys minuta* group species

The following key is meant to replace couplets 75 and onward in the key provided by LATTKE & al. (2007) or the whole key in LATTKE (1992).

- 1 Body integument opaque or shiny; sculpturing granulose to finely striolate with variable degrees of areolae / foveolae; clypeus without an anteromedian denticle. 2
- Body integument shiny, never opaque; sculpturing rugulose to costulate; clypeus with an anteromedian denticle. 7
- 2 Integument mostly opaque, sculpturing predominantly granulose with variable degrees of areolae / foveolae. 3
- Integument mostly shiny or silky, sculpturing can be finely striolate or smooth with variable degrees of areolae / foveolae. 5
- 3 Mandible falcate, masticatory margin edentate and concave (north-central Venezuela). *G. fieldi* LATTKE, 1990
- Mandible triangular, masticatory margin fairly straight and denticulate or crenulate. 4
- 4 Metanotal groove well-impressed; spiracles of abdominal segments I and II shining and conspicuous (northwestern Venezuela). *G. petiscapa* LATTKE, 1990

- Metanotal groove absent; spiracles of abdominal segments I and II opaque and not conspicuous (southern Mexico - Brazil). *G. minuta*
- 5 Mandible falcate (northern South America). .. *G. falcifera*
- Mandible triangular. 6
- 6 Eye not prominent, broadly convex; anterior clypeal margin broadly convex; occipital lobe rounded (southern Mexico - Costa Rica). *G. simulans*
- Eye prominent, semispherical; anterior clypeal margin medially concave; occipital lobe sub-angular (eastern Ecuador). *G. vriesi*
- 7 Postpetiolar tergite mostly with arched punctate-rugulae, longitudinally costulate posteromedially; meso- and metatibial spurs present (southwestern Brazil). *G. striolata* (BORGMEIER, 1957)
- Postpetiolar tergite with rough longitudinal costulae; meso- and metatibial spurs absent (Colombia - southern Brazil). .. *G. caelata* KEMPE, 1967

Gnamptogenys coxalis (F. SMITH, 1857)

Ponera rugosa SMITH, F., 1857: 66. Holotype queen by monotypy. [Malaysia], Borneo, Sarawak (OXUM). Junior primary homonym of *Ponera rugosa* LE GUILLOU, 1842: 318.

Ponera coxalis ROGER, 1860: 308. Replacement name for *Ponera rugosa* SMITH, F. 1857: 66.

Ectatomma (*Stictoponera*) *costatum* EMERY, 1889: 494. Holotype worker by monotypy: Burma [Myanmar], Tenasserim (Fea) (MCSN). **Syn.n.**

Stictoponera costata (EMERY); EMERY 1900: 662. Placed in *Stictoponera*.

Stictoponera costata var. *unicolor* FOREL, 1901: 335. Syntype workers, queen: Borneo (MHNG). Synonym of *costata*: BROWN 1954: 7. **Syn.n.**

Stictoponera rugosa var. *parva* FOREL, 1913: 6. Holotype worker by monotypy: Sumatra (MHNG). Synonym of *costata*: BROWN 1954: 7. **Syn.n.**

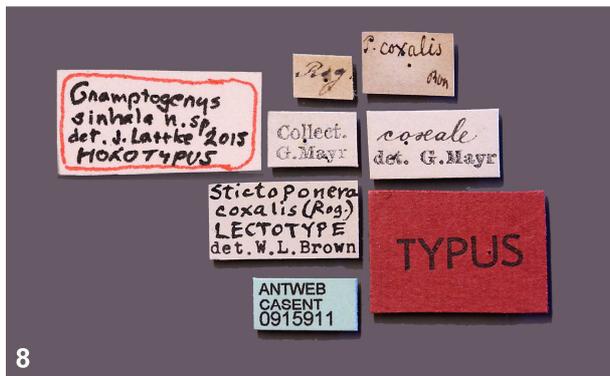
Stictoponera costata var. *simalurensis* FOREL, 1915: 23. Holotype worker by monotypy: Sumatra (MHNG). Synonym of *costata*: BROWN 1954: 7. **Syn.n.**

Stictoponera costata var. *pinealis* WHEELER, W.M. 1929: 31. Holotype queen by monotypy: Malaysia, Penang (Silvestri) (MCZC). Synonym of *costata*: BROWN 1954: 7. **Syn.n.**

Stictoponera wallacei DONISTHORPE, 1932: 447. Replacement name for *Ponera rugosa* SMITH, F. 1857: 66. Synonym of *costata*: BROWN 1954: 7. **Syn.n.**

Gnamptogenys costata (EMERY); BROWN 1958: 227. Placed in *Gnamptogenys*.

Barry Bolton recently detected an anomaly in the nomenclature of *Gnamptogenys costata* and *G. coxalis* and has kindly let us know so it may be corrected. The present situation recognises *G. costata* as a widespread species ranging throughout much of Southeast Asia and *G. coxalis* as an endemic restricted to Sri Lanka (LATTKE 2004). When F. Smith described *Ponera rugosa* in 1857 from ants collected in Borneo, he ignored the fact this same name had already been used by Le Guillou in 1843. Julius ROGER (1860) recognised this situation and expressly introduced the name *coxalis* as a replacement for *rugosa*. ROGER's



Figs. 5 - 8: *Gnamptogenys sinhala*, holotype (CASENT0915911). (5) Dorsal view of head. (6) Dorsal view of body. (7) Lateral view of body. (8) Labels.

(1860: 308) entry is (translated from German by B. Bolton): "43. *Ponera coxalis* (*rugosa* SMITH, Cat. Brit. Mus. 88. 20.) The name has to be changed, because Le Guillou [reference then given, LE GUILLOU 1843: 313] has already described a *Ponera rugosa*, unknown to Mr. Smith in the composition of his catalogue". When ROGER (1860) proposed *coxalis* as a replacement name for *rugosa* he also supplemented Smith's description by studying additional specimens but his material included two species, one represented by a series of workers from Sri Lanka collected by H. Nietner, and the other apparently represented by specimens from Borneo and Aru Island. Thus his description of *rugosa* is a mélange and he misidentified the series from Sri Lanka as Smith's *rugosa*.

Separately, EMERY (1889: 494) described *Gnamptogenys costata* (under the name *Ectatomma* (*Stictoponera*) *costatum*) from a single specimen collected in Myanmar. A few years later, EMERY (1900: 662) upon discussing Malaysian specimens of *costata* made a comment about Roger's *coxalis* from Sri Lanka being compared with Smith's *rugosa*, and then proceeded to make comparisons between *costata* and *coxalis*. The name *coxalis* became associated with these Ceylonese specimens and Roger's intentions were lost. BROWN (1954: 9) was correct in synonymising Roger's *Ponera rugosa* with EMERY'S (1889) *G. costata* (named at that time *Stictoponera costata*) but he was incorrect in retaining *G. coxalis* as a separate taxon, even going so far

as to designate a lectotype for this name from material at NHMW. Since *coxalis* is a replacement name for *rugosa*, the two share the same type material and are objective synonyms.

As a result, even though the Sri Lankan species has been recognised as a different entity from *Gnamptogenys costata*, the names have unfortunately been mistakenly used. Given *coxalis* ROGER (the replacement name) must be the same as *rugosa* SMITH (the junior homonym which it replaces), as it is impossible for *coxalis* to be one species and *rugosa* to be the junior synonym of a different species (*costata*). This confusion was unfortunately propagated by both of the last revisions of the genus (BROWN 1958, LATTKE 2004). So this forces the elimination of the name *G. costata*, and its rightful replacement by the name *G. coxalis*. This leaves the series of specimens collected by Nietner from Sri Lanka, described by ROGER (1860), and included by him in *coxalis*, as a type series representing a distinct species which needs a new name.

The holotype of *coxalis* (= *rugosa*) remains the single specimen originally described as *rugosa* by Smith, from Borneo. This specimen is present in the Oxford University Museum. Barry Bolton's notes on Smith types in OXUM say of this taxon: "*Ponera rugosa* F. SMITH, 1857: 66 (also as new in F. SMITH 1858: 88). Holotype dealate queen in OXUM. Labelled "SAR. 20", and "*rugosa* Sm". There is also a Donisthorpe type-label and one that states "*Sticto-*

ponera wallacei DONISTHORPE", his replacement name for the preoccupied *P. rugosa* F. SMITH".

***Gnamptogenys sinhala* LATTKE sp.n.** (Figs. 5 - 8)

urn:lsid:zoobank.org:act:

5CE46426-162E-45B8-87FA-F010C6916280

Type material: Holotype worker: Ceylon [Sri Lanka] (Nietner) (NHMW). This specimen here was erroneously designated by BROWN (1954: 9) as the lectotype of the misidentified *coxalis*.

Diagnosis. Clypeal lamella projecting anterad as broad triangular lobe; occipital lobes poorly developed. Pronotal dorsum punctate, with rough transverse strigae that arch anterad, becoming longitudinal on posterior pronotum and mesonotum; propodeum unarmed and transversely strigose. The above diagnosis is taken from LATTKE (2004: 103) and is placed here to satisfy the provision that a description should accompany a new species epithet for it to be available (ICZN Article 13.1.1). Detailed characterizations and descriptions of this species have been published by EMERY (1900), BROWN (1954), and LATTKE (2004), all under the name *Gnamptogenys coxalis*. I propose naming the Sri Lankan species as *G. sinhala* in honor of the Sinhalese people, the largest ethnic group native to Sri Lanka. The new name will be applied to the Nietner collected series with the *G. sinhala* holotype being the same specimen designated as the *G. coxalis* lectotype by BROWN (1954: 9). So the name *G. sinhala* now applies to what was previously known as *G. coxalis*, a species endemic to Sri Lanka. High resolution images of this specimen are available from www.antweb.org as specimen CASENT0915911.

Acknowledgments

To Bob Johnson for sharing his field notes about the nest of *Gnamptogenys minuta*. To Livia P. Prado, Carlos R. Brandão, and Rodrigo Feitosa for helping us with images of the *G. vriesi* holotype. To Barry Bolton for signaling the taxonomic confusion enveloping *G. coxalis* and *G. costata*. To John Longino and B. Bolton for reading parts of the manuscript. To Julien Cillis (RBINS) for performing the SEM photographs, Maurice Leponce, Isabelle Bachy, and Yves Laurent (RBINS) for other *G. vriesi* images. To Harald Bruckner (NHMW) for imaging the *G. sinhala* Holotype. To Michele Esposito (AntWeb) and Herbert Zettel (NHMW) for help with the *G. sinhala* images. To Catherine Vits and Boudewijn De Roover, owners of the Nature Reserve Copalinga, Zamora, Ecuador, for allowing us to conduct research in their estate, and the Ministerio del Ambiente of the Republic of Ecuador for access to the Podocarpus National Park and for collection permits. To the Prometeo Programme of the Secretary of Higher Education, Science, Technology and Innovation (SENESCYT) of the Government of Ecuador for financial support that subsidized part of this research. To the referees for their valuable suggestions.

References

ANTWEB 2015: Species: *Gnamptogenys simulans* (EMERY, 1896). – <http://www.antweb.org/browse.do?rank=species&genus=Gnamptogenys&name=simulans&project=worldants>, retrieved on 10 April 2015.

BRANDÃO, C.R.F. & LATTKE, J.E. 1990: Description of a new Ecuadorian *Gnamptogenys* species with a discussion on the

status of the *alfaria* group. – Journal of the New York Entomological Society 1998: 489-494.

BROWN, W.L. Jr. 1954: A review of the *coxalis* group of the ant genus *Stictoponera* MAYR. – Breviora 34: 1-10.

BROWN, W.L. Jr. 1958: Contributions toward a reclassification of the Formicidae. II. Tribe Ectatommini (Hymenoptera). – Bulletin of the Museum of Comparative Zoology 118: 173-362.

DONISTHORPE, H. 1932: On the identity of Smith's types of Formicidae (Hymenoptera) collected by Alfred Russell Wallace in the Malay Archipelago, with descriptions of two new species. – Annals and Magazine of Natural History (10) 10: 441-476.

EMERY, C. 1889: Formiche di Birmania e del Tenasserim raccolte da Leonardo Fea (1885-87). [part]. – Annali del Museo Civico di Storia Naturale 27 [= (2)7]: 485-512.

EMERY, C. 1896a: Clef analytique des genres de la famille des Formicides, pour la détermination des neutres. – Annales de la Société Entomologique de Belgique 40: 172-189.

EMERY, C. 1896b: Studi sulle formiche della fauna neotropica. XVII-XXV. – Bullettino della Società Entomologica Italiana 28: 33-107.

EMERY, C. 1900: Formiche raccolte da Elio Modigliani in Sumatra, Engano e Mentawai. [part]. – Annali del Museo Civico di Storia Naturale 40 [= (2)20]: 661-688.

FOREL, A. 1901: Nouvelles espèces de Ponerinae. (Avec un nouveau sous-genre et une espèce nouvelle d'*Eciton*). – Revue Suisse de Zoologie 9: 325-353.

FOREL, A. 1913: Wissenschaftliche Ergebnisse einer Forschungsreise nach Ostindien ausgeführt im Auftrage der Kgl. Preuss. Akademie der Wissenschaften zu Berlin von H. v. Buttler-Reepen. II. Ameisen aus Sumatra, Java, Malacca und Ceylon. Gesammelt von Herrn Prof. Dr. v. Buttler-Reepen in den Jahren 1911 - 1912. – Zoologische Jahrbücher. Abteilung für Systematik, Geographie und Biologie der Tiere 36: 1-148.

FOREL, A. 1915: Fauna Simalurensis. Hymenoptera Aculeata, Fam. Formicidae. – Tijdschrift voor Entomologie 58: 22-43.

HADLEY, A. 2010: Combine ZP. – <http://www.hadleyweb.pwp.blueyonder.co.uk/>, retrieved on 1 February 2013.

LATTKE, J.E. 1992: Revision of the *minuta* group of the genus *Gnamptogenys*. – Deutsche Entomologische Zeitschrift 39: 123-129.

LATTKE, J.E. 2004: A taxonomic revision and phylogenetic analysis of the ant genus *Gnamptogenys* ROGER in Southeast Asia and Australasia (Hymenoptera: Formicidae: Ponerinae). – University of California Publications in Entomology 122: 1-266.

LATTKE, J.E., FERNÁNDEZ, F. & PALACIO, E. 2007: Identification of the species of *Gnamptogenys* in the Americas. – Memoirs of the American Entomological Institute 80: 253-269.

LE GUILLOU, E.J.F. 1842 [1841]: Catalogue raisonné des insectes hyménoptères recueillis dans le voyage de circumnavigation des corvettes l'Astrolabe et la Zélée. – Annales de la Société Entomologique de France 10: 311-324.

LONGINO, J. 1998: Ants of Costa Rica. *Gnamptogenys simulans*. – <http://academic.evergreen.edu/projects/ants/Genera/Gnamptogenys/SPECIES/simulans/simulans.html>, retrieved on 10 April 2015.

LLAMA 2015: Leaf litter arthropods of Mesoamerica. – <https://sites.google.com/site/longinollama/home>, retrieved on 17 April 2015.

MANN, W.M. 1926: Some new Neotropical ants. – Psyche (Cambridge) 33: 97-107.

ROGER, J. 1860: Die *Ponera*-artigen Ameisen. – Berliner Entomologische Zeitschrift 4: 278-312.

SMITH, F. 1857: Catalogue of the hymenopterous insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singa-

- pore, by A. R. Wallace. [part]. – Journal and Proceedings of the Linnean Society of London. *Zoology* 2: 42-88.
- SMITH, F. 1858: Catalogue of Hymenopterous Insects in the collection of the British Museum. Part VI. Formicidae. – British Museum (Natural History), London, 216 pp.
- USNM 2015: USNM Formicid Type Database. – <<http://ripley.si.edu/ent/nmnhypedb/public/namelisttemplates/longoutput-namelist.cfm?publicconsumption=1&typeid=407>>, retrieved on 10 April 2015.
- WERRINGLOER, A. 1932: Die Sehorgane und Sehzentren der Dorylinen nebst Untersuchungen über die Facettenaugen der Formiciden. – *Zeitschrift für wissenschaftliche Zoologie* 141: 432-524.
- WHEELER, W.M. 1929: Ants collected by Professor F. Silvestri in Formosa, the Malay Peninsula and the Philippines. – *Bollettino del Laboratorio di Zoologia Generale e Agraria della Reale Scuola Superiore d'Agricoltura. Portici* 24: 27-64.