

Rediscovery of *Tricytarus* DONISTHORPE, 1947, a new genus-level synonym of *Meranoplus* F. SMITH, 1853 (Hymenoptera: Formicidae: Myrmicinae)

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Abstract

The male-based genus *Tricytarus* DONISTHORPE, 1947 is rediscovered and synonymized with the genus *Meranoplus* F. SMITH, 1853 syn.n. A neotype is designated for *Meranoplus parviumgulatus* (DONISTHORPE, 1947) comb.n. which is documented to occur sympatrically with the very similar species *M. niger* DONISTHORPE, 1949. Morphometrics and a differential diagnosis are provided for the first time for both species, and the male genitalia of several *Meranoplus* species are contrasted, with notes on the identification of *M. parviumgulatus* and *M. niger*. Micrographs are provided for both *M. parviumgulatus* and *M. niger*, including images of select genitalic sclerites.

Key words: Male, genitalia, Indomalayan region, Australasian region, Meranoplini, taxonomy.

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Introduction

The monotypic genus *Tricytarus* was erected by Donisthorpe in 1947 based on three unassociated male ants from Maffin Bay, Indonesia (DONISTHORPE 1947). Subsequently the types were apparently lost (BOLTON 2003) and the genus was treated as incertae sedis in the Myrmicinae (HÖLDOBLER & WILSON 1990), incertae sedis in the Formicidae (WHEELER & WHEELER 1985), and finally tentatively placed in the Formicoxenini (Myrmicinae) where it was treated as an unrecognizable taxon (BOLTON 1994). Based on material generated from a recent expedition to Papua New Guinea *Tricytarus* has been rediscovered, and it is clear that *Tricytarus* is a junior synonym of the genus *Meranoplus* (Myrmicinae: Meranoplini) syn.n. The sole species belonging to *Tricytarus* is newly characterized and transferred to *Meranoplus*, becoming *M. parviumgulatus* (DONISTHORPE, 1947) comb.n. The specimens collected from this expedition not only fit the original description of *M. parviumgulatus* to virtual perfection, but in retrospect the detailed description provided by DONISTHORPE (1947) conforms closely to the diagnosis of *Meranoplus* males provided for the Malagasy region (BOUDINOT & FISHER 2013). Interestingly, two years after describing the genus *Tricytarus*, DONISTHORPE (1949) described an exceptionally similar species, *Meranoplus niger* DONISTHORPE, 1949, from alate females and males collected at the same location and date as *M. parviumgulatus*. The two descriptions are nearly identical in form and content. It is possible that both *M. niger* and *M. parviumgulatus* may prove to be synonyms of worker-based species described from the Indomalayan and Australian regions (for biogeographic region delimitation see FISHER 2009).

Materials and methods

Specimens were primarily examined with a Wild M5 stereomicroscope with 50× maximum magnification. Prior to dissection, point-mounted specimens were boiled in a cotton-stoppered tube for approximately 2 min. Dissections were carried out in watch-glasses filled with 95% ethanol, and the right half of each genital capsule was partially cleared in 10% KOH and subsequently washed in DI water. For imaging, temporary glycerin slide-mounts were made. To store genitalia after dissection and examination, genitalia were placed in a drop of glycerin in polyethylene microvials affixed to the pin upon which the rest of the specimen was subsequently point-mounted.

Type specimens were given unique specimen identifiers (i.e., CASENT#) affixed to each pin beneath the collection data label, which link the specimens to digitally stored data available on AntWeb.org (ANTWEB 2013), where images of the type specimens are also available. Micrographs were captured with a JVC KY-F57U digital camera mounted on a Leica MZ 16 A microscope using Auto-Montage Pro (Synoptics Ltd., Cambridge, England) and montages were generated using Zerene Stacker 1.02 (Zerene Stacker LLC, Washington, U.S.A.). Montages were then edited in Photoshop CS5 (Adobe Systems Inc., California, U.S.A.) and figures were composed using Illustrator CS6 (Adobe Systems Inc., California, U.S.A.). Sculptural terminology follows HARRIS (1979), non-genitalic, non-sculptural terminology follows BOUDINOT & al. (2013), and genitalic terminology follows BOUDINOT (2013). The use of "ectal" and "mesal" follows YOSHIMURA & FISHER (2011) for dissected sclerites, where ectal refers to the external surface of a sclerite while mesal refers to the internal surface.

Measurements and indices: Measurements were recorded in millimeters to three significant figures from digital photomicrographs using Auto-Montage Pro (Synoptics Ltd., Cambridge, England) and presented to two significant figures due to measurement error and / or variation in specimen orientation. Measurements follow the methods of BOUDINOT & FISHER (2013), with the addition of the measurements PDL, A3L, LOD, MOD, MH, MTL, MTW, MLL, MLW, and the indices SAI, MI, MTI, and MLI. Anterior head length (HLA) is here measured to the anterior clypeal margin, rather than lateral mandibular bases as in (BOUDINOT & FISHER 2013) to incorporate informative variation in clypeus length.

The following measurements and indices are presented in the order provided in the species accounts (Figs. 1 - 5):

- HL Head length, maximum midline length of head in full-face view.
- HW Head width, maximum width of head in full-face view, measured behind compound eyes.
- HLA Head length, anterior, distance between a virtual line drawn from anterior margins of compound eyes to anterior clypeal margin midlength in full-face view.
- SL Scape length, length of scape excluding neck and condyle in medial view from middle of scape base to scape apex.
- PDL Pedicel length, length of pedicel from virtual line drawn from dorsal and ventral basal curves to pedicel apex.
- A3L Antennomere 3 length, maximum length of antennomere 3.
- EL Eye length, maximum diameter of eye.
- EW Eye width, maximum width of eye.
- LOD Lateral ocellus diameter, maximum diameter of lateral ocellus.
- MOD Median ocellus diameter, maximum diameter of medial ocellus.
- ML Mesosoma length, maximum diagonal length of mesosoma from vertex of pronotal inflection to apex of propodeal lobe in profile view.
- MH Mesosoma height, maximum height of mesothorax in profile view.
- MTL Mesoscutum length, maximum length of mesoscutum from anterior apex to scutoscuteellar suture in dorsal view.
- MTW Mesoscutum width, maximum width of mesoscutum in dorsal view.
- MLL Mesoscutellum length, maximum length of mesoscutellum from scutoscuteellar suture, anterior to scutoscuteellar sulcus, to posterior apex of mesoscutellum in dorsal view.
- MLW Mesoscutellum width, maximum width of mesoscutellum posterior to scutoscuteellar sulcus in dorsal view.
- PTL Petiole length, maximum length of petiole from anterolateral margin to posterior margin in profile view.
- PTH Petiole height, height of petiole from apex of node to shallowest point of ventral petiolar margin near midlength perpendicular to maximum longitudinal length of petiole regardless of whether petiolar height is the absolute height of segment in profile view.
- PPL Postpetiole length, length of postpetiole from anterior inflection point of postpetiolar node to poste-

riormost point of posterior postpetiolar margin in profile view.

- PPH Postpetiole height, height of postpetiole from ventral inflection point to dorsal inflection point in profile view, measurement not necessarily perpendicular to PPL nor necessarily maximum height of postpetiole.
- CI Cephalic index, $HW / HL * 100$
- CS Cephalic size, $(HW + HL) / 2$
- SI Scape index, $SL / HW * 100$
- ESI Eye-scape index, $EL / SL * 100$
- SAI Scape-antennomere-3 index, $SL / A3L * 100$
- EYE Eye index, $(EL + EW) / CS$
- EHI Eye-anterior-head index, $EL / HLA * 100$
- MI Mesosoma index, $MH / ML * 100$
- MTI Mesoscutum index, $MTW / MTL * 100$
- MLI Mesoscutellum index, $MLW / MLL * 100$
- PTI Petiole index, $PTL / PTH * 100$
- PPI Postpetiole index, $PPL / PPH * 100$

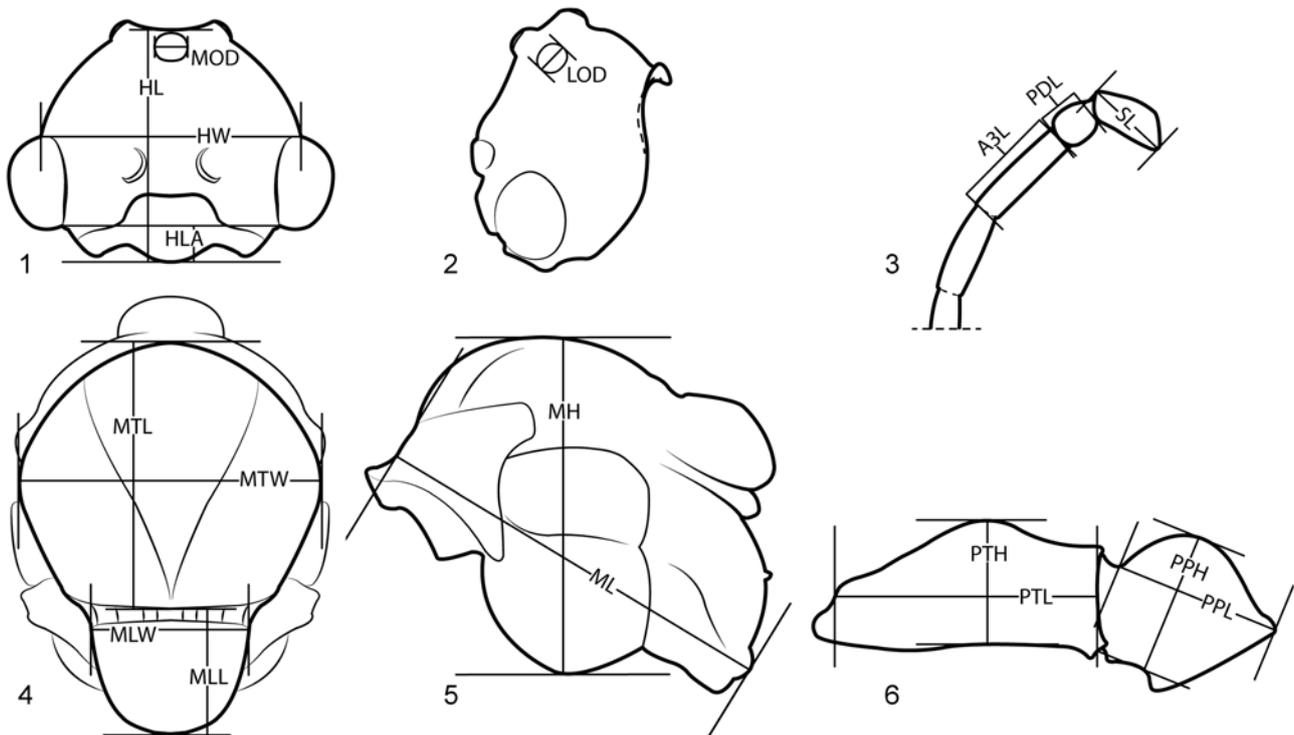
Repositories:

- BMNH The Natural History Museum, London, U.K.
- CASC California Academy of Sciences, San Francisco, California, U.S.A.
- PSWC Philip S. Ward personal collection, Davis, California, U.S.A.
- UCDC Bohart Museum of Entomology, University of California, Davis, California, U.S.A.

Taxonomic synopsis of *Meranoplus* F. SMITH

- Meranoplus* F. SMITH, 1853: 224 Type species: *Cryptocerus bicolor*, by subsequent designation of BINGHAM, 1903: 166.
- Meranoplus* in Myrmicidae, Cryptoceridae: F. SMITH, 1853: 224; EMERY, 1877: 81.
- Meranoplus* in Poneridae, Cryptoceridae: F. SMITH, 1858: 193.
- Meranoplus* in Formicidae, Cryptoceridae: M.R. SMITH, 1957: 81; F. SMITH, 1862: 412.
- Meranoplus* in Cryptoceridae: F. SMITH, 1871: 334; F. SMITH, 1876: 611.
- Meranoplus* in Cryptoceridae, Cataulacinae: ASHMEAD, 1905: 384.
- Meranoplus* in Myrmicinae: MAYR, 1865: 26 [Myrmicidae]; DALLA TORRE, 1893: 136.
- Meranoplus* in Myrmicinae, Tetramoriini: EMERY, 1895: 770; WHEELER, 1910: 141.
- Meranoplus* in Myrmicinae, Meranoplini: EMERY, 1914: 41; FOREL, 1917: 244; ARNOLD, 1917: 363; WHEELER, 1922: 664; EMERY, 1924: 226; WHEELER, 1934: 176; all subsequent authors.
- Tricytarus* DONISTHORPE, 1947: 187 Type-species: *Tricytarus parviumgulatus*, by original designation. **Syn.n.**
- Tricytarus* in Myrmicinae, Myrmicini: DONISTHORPE, 1947: 187.
- Tricytarus incertae sedis* in Formicidae: WHEELER & WHEELER, 1985: 259.
- Tricytarus incertae sedis* in Myrmicinae: HÖLDOBLER & WILSON, 1990: 16.
- Tricytarus* in Myrmicinae, Formicoxenini: BOLTON, 1994: 105; BOLTON, 1995: 422; BOLTON, 2003: 10 (as unrecognizable taxon).

Notes on identification of the males: With our present knowledge of *Meranoplus* males, it is not possible to confirm whether all species conform to the diagnosis of BOUDINOT & FISHER (2013). Although the males of other spe-



Figs. 1 - 6: Male-specific morphometrics; EL and EW not figured. (1) Head in full-face view. (2) Head in oblique posterolateral view. (3) Antenna in medial view. (4) Mesonotum in dorsal view. (5) Mesosoma in profile view. (6) Petiole and postpetiole in profile view.

cies present in Papua New Guinea and elsewhere in the Southeast Asian archipelago have been described, such as *M. bicolor* and *M. mucronatus* (F. SMITH 1875, FOREL 1909, VIEHMEYER 1916), the descriptions are inadequate as they focus primarily upon coloration, characters otherwise uninformative at the species level, or characters stated such that they require specific comparison to other species. Thus, to aid in the identification of the species treated in this paper, the males of *M. niger* and *M. parviumgulatus* were compared to available material, namely the Malagasy *M. mayri* FOREL, 1910 and *M. radamae* FOREL, 1891 and the New Caledonian *M. leveillei* EMERY, 1883. Comparison of these taxa revealed the following characters to separate *M. niger* and *M. parviumgulatus* from the others: 1) petiole height $> 2 \times$ length in profile view (PTI > 200); 2) scape about $2 \times$ pedicel length and shorter than antennomere 3 length (SAI < 90); 3) pronotum neither forming distinct angles nor with dorsolateral triangular processes; 4) mesoscutum and mesopleurae predominantly smooth and shining; 5) propodeal spines small, conical, length not exceeding maximum diameter of base; 6) hindwing with unfused abscissa of Rs basal to juncture of Rs and Irs-m; 7) first gastric tergum smooth and shining with fine raised microareolate sculpturation; 8) mandibles spiniform, not meeting at midline of head; 9) supraclypeal area strongly impressed and separating antennal toruli by somewhat less than one antennal socket diameter from posterior clypeal margin; 10) occipital carina obscured by bulging ocellar area in full-face view; 11) head rugose with weak punctae filling the interspaces, but with frons smooth and shining between antennal toruli and median ocellus. Characters separating *M. parviumgulatus* from *M.*

niger are provided in the diagnosis of the former species below. Notably, male *Pristomyrmex* MAYR, 1866 may be confused for *Meranoplus* due to superficial similarity, but may be separated easily by the open marginal and second submarginal cell.

Species accounts

***Meranoplus niger* DONISTHORPE, 1949** (Figs. 7, 8, 11, 12)

Meranoplus niger DONISTHORPE, 1949: 494 - 496.

Type material examined: Holotype (alate queen): Indonesia ("Dutch New Guinea"): Maffin Bay, 12 June 1944 (CASC, CASTYPE06968-01). Paratypes (male, alate queen): Same data, except male paratype (CASC, CASENT0902040) collected August 1944, female paratype (BMNH, CASENT0902040) collected July 1944.

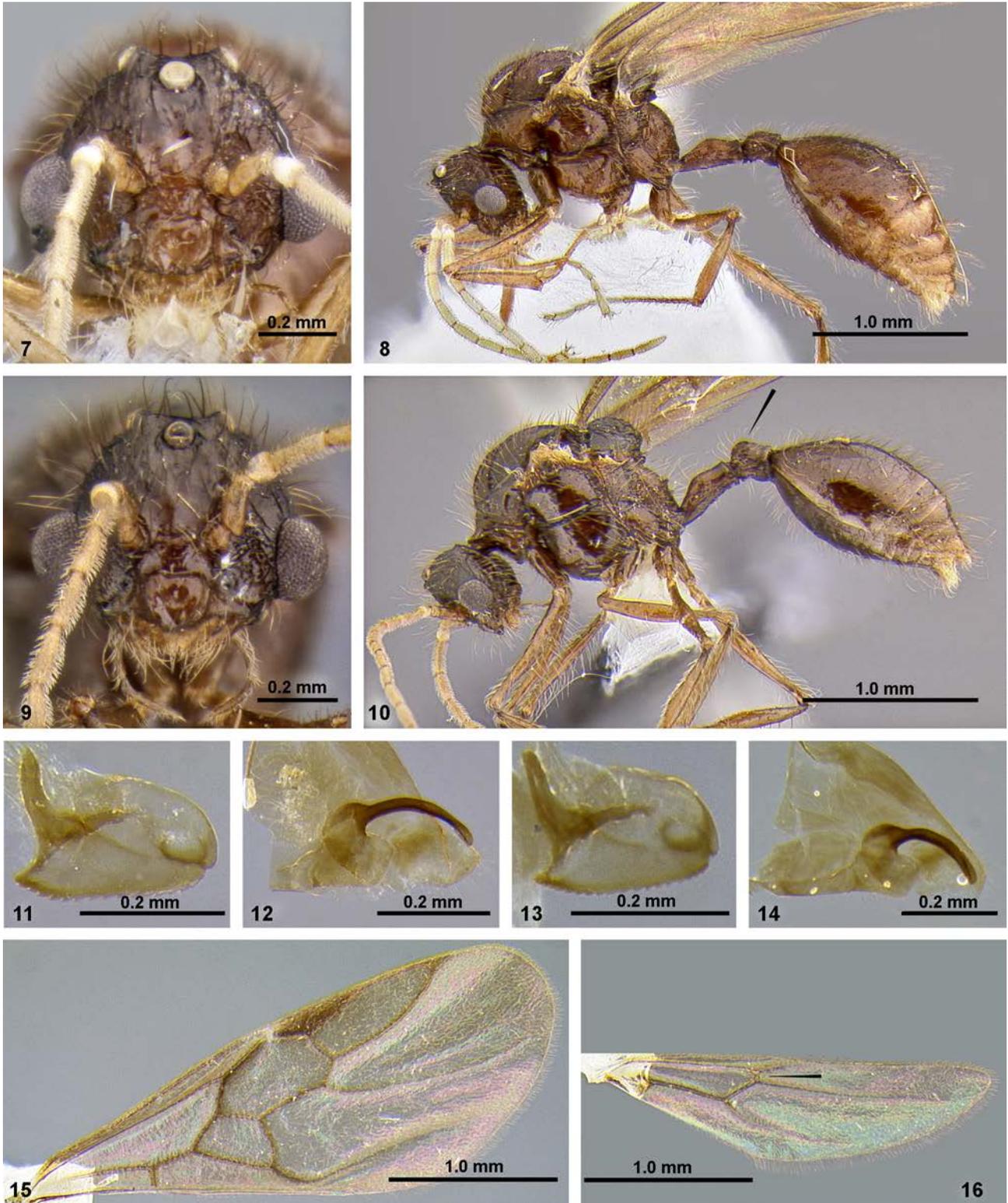
Additional material examined: Papua New Guinea, Morobe: Tikadu, 7° 38' S 146° 34' E, 600 m, January 2000, Malaise trap (T. Sears & Binatung brigade); Tikadu, Lakekamu Basin, 7° 38' S 146° 34' E, 600 m, 17 January 2000, primary rainforest (T. Sears & Binatung brigade).

Diagnosis: For characters separating the male of *Meranoplus niger* from *M. parviumgulatus*, see the diagnosis of the latter species.

Distribution: Eastern Indonesia (Irian Jaya) and Papua New Guinea, sea-level to at least 600 m elevation.

Ecology: Known from tropical rainforest, with mating flights presumably occurring around the dates of collection (January, June).

Description: Measurements ($n = 2$): HL 0.56 - 0.57, HW 0.60 - 0.61, HLA 0.08 - 0.09, SL 0.18 - 0.19, PDL 0.08, A3L 0.21 - 0.23, EL 0.22, EW 0.19, LOD 0.08 - 0.09, MOD 0.09 - 0.08, ML 1.19 - 1.25, MH 0.95 - 1.01,



Figs. 7 - 16: *Meranoplus niger* (7, 8: CASENT0171192; 11, 12: CASENT0171193) and *M. parviumgulatus* (9, 10, 13 - 16: CASENT0171191): (7, 9) Head, full-face view. (8, 10) Body, profile view; diagnostic line indicates swollen postpetiolar node (in 10). (11, 13) Penisvalva, ectal view. (12, 14) Volsella and paramere, mesal view. (15) Forewing. (16) Hindwing; diagnostic line indicates first free abscissa of Rs.

MTL 0.74 - 0.78, MTW 0.85 - 0.87, MLL 0.37 - 0.38, MLW 0.37 - 0.48, PTL 0.41 - 0.42, PTH 0.17 - 0.19, PPL 0.23 - 0.24, PPH 0.18 - 0.19, CI 106 - 108, CS 0.58 - 0.59, SI 29.8 - 31.8, ESI 116 - 123, SAI 80.2 - 90.6, EYE

0.71, EHI 254 - 266, MI 79.6 - 81.2, MTI 111 - 115, MLI 125 - 133, PTI 221 - 239, PPI 123 - 128.

Discussion: All three type specimens of *Meranoplus niger* were examined for this study. DONISTHORPE (1949)

indicated that the alate queen collected on 12 June 1944 (CASTYPE06968-01) was the "type" and the other two specimens were "allotypes", with a red primary type label on the former and yellow secondary type labels on the latter two. This "type" queen is here treated as the holotype, and the other two specimens are here treated as paratypes. It is not certain whether the male paratype is truly associated with the female types.

***Meranoplus parviumgulatus* (DONISTHORPE, 1947)**
(Figures 9, 10, 13 - 16)

Tricytarus parviumgulatus DONISTHORPE, 1947: 188.
Types presumed lost (male): Indonesia ("Dutch New Guinea"): Maffin Bay, August 1944 (E.S. Ross).

***Meranoplus parviumgulatus* comb.n.**

Type material: Neotype (male) by present designation: Papua New Guinea, Morobe: Tekadu, Lakekamu Basin, 7° 38' S 146° 34' E, 600 m, 17 January 2000, primary rainforest (T. Sears & Binatung brigade) [CASC, CASENT-0171191].

Diagnosis: Male: Differentiated from *Meranoplus niger* by the following: 1) Head relatively short (CI 101 vs. 106 - 108); 2) scape long relative to eye length (ESI 129 vs. 116 - 123); 3) compound eyes relatively close to anterior head margin (EHI 237 vs. 254 - 266); 4) petiole relatively short (PTI 208 vs. 221 - 239); 5) postpetiolar node strongly swollen, with anterior face forming a more-or-less even curve in profile view; 6) postpetiole relatively tall (PPI 119 vs. 123 - 128); and 7) head, mesosoma, and metasoma blackish brown.

Description: Measurements (n = 1): HL 0.54, HW 0.55, HLA 0.09, SL 0.16, PDL 0.07, A3L 0.18, EL 0.21, EW 0.18, LOD 0.06, MOD 0.07, ML 1.19, MH 0.96, MTL 0.70, MTW 0.83, MLL 0.34, MLW 0.44, PTL 0.39, PTH 0.19, PPL 0.26, PPH 0.22, CI 101, CS 0.54, SI 29.7, ESI 129, SAI 88.4, EYE 0.72, EHI 237, MI 80.7, MTI 119, MLI 129, PTI 208, PPI 119.

Distribution: Eastern Indonesia (Irian Jaya) and Papua New Guinea, sea-level to at least 600 m elevation.

Ecology: Known from tropical rainforest, with mating flights presumably occurring around the dates of collection (January, June).

Discussion: With two closely similar forms of *Meranoplus* occurring sympatrically in both Maffin Bay (Papua, Indonesia) and the Lakekamu Basin (Papua New Guinea), it is important to correctly identify which form belongs to which of the two available names, or whether the names are synonyms. Based on examination of external and genitalic morphology, it is determined that the two forms are distinct species. The neotype of *M. parviumgulatus* designated here may be attributed to that species specifically given that DONISTHORPE (1947) fortunately indicated that the postpetiole of his new species has a node which is "a little higher than [the] petiole". Thus, although DONISTHORPE (1949) did not indicate the relative height of the postpetiolar node of *M. niger*, the male type and non-type specimens of *M. niger* examined here have relatively short petiolar nodes which do not distinctly surpass the height of the petiolar node. Although the two species are here treated as valid, as both species are alate-based they may turn out to be synonyms of worker-based species described or known from the Indo-Australian region.

In addition to the characters provided in the diagnosis above, comparison of the genitalia of *Meranoplus parviumgulatus* and *M. niger* has revealed subtle genitalic characters separating the two species. Specifically, the genitalia of *M. parviumgulatus* differ from those of *M. niger* by the following characters: 1) digitus apex slightly more swollen; 2) penisvalva proportionally taller, with dorsal margin subequal in length to and more-or-less distinct from apical margin; 3) penisvalvar teeth less well-developed. Among the five species considered here (see "Notes on the identification of males" section above), the genitalia of *M. parviumgulatus* and *M. niger* most strongly resemble those of *M. radamae*, sharing similarly-shaped, ventroapically-notched penisvalvae, and elongate, crescentiform digiti. While the ventroapical penisvalvar notch is also shared with *M. leveillei*, the digitus of the latter species has a dorso-medial flange, similar to *M. mayri*. These patterns suggest that male *Meranoplus* may yield further useful characters in future research.

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References

- ANTWEB 2013: AntWeb v. 5.1.13. – < <http://www.antweb.org/>>, retrieved on 19 September 2013.
- ARNOLD, G. 1917: A monograph of the Formicidae of South Africa. Part III. Myrmicinae. – *Annals of the South African Museum* 14: 271-402.
- ASHMEAD, W.H. 1905: A skeleton of a new arrangement of the families, subfamilies, tribes and genera of the ants, or the superfamily Formicoidea. – *The Canadian Entomologist* 37: 381-384.
- BINGHAM, C.T. 1903: The fauna of British India, including Ceylon and Burma. Hymenoptera, Vol. II. Ants and cuckoo-wasps. – Taylor and Francis, London, UK, 506 pp.
- BOLTON, B. 1994: Identification guide to the ant genera of the world. – Harvard University Press, Cambridge, MA, 222 pp.
- BOLTON, B. 1995: A new general catalogue of the ants of the world. – Harvard University Press, Cambridge, MA, 504 pp.
- BOLTON, B. 2003: Synopsis and Classification of Formicidae. – *Memoirs of the American Entomological Institute* 71: 1-370.
- BOUDINOT, B.E. 2013: The male genitalia of ants: musculature, homology, and functional morphology (Hymenoptera, Aculeata, Formicidae). – *Journal of Hymenoptera Research* 30: 29-49.
- BOUDINOT, B.E. & FISHER, B.L. 2013: A taxonomic revision of the *Meranoplus* F. SMITH of Madagascar (Hymenoptera: Formicidae: Myrmicinae) with keys to species and diagnosis of the males. – *Zootaxa* 3635: 301-339.

- BOUDINOT, B.E., SUMNICHT, T.P. & ADAMS, R.M.M. 2013: Central American ants of the genus *Megalomyrmex* FOREL (Hymenoptera: Formicidae): six new species and keys to workers and males. – *Zootaxa* 3732: 1-82.
- DALLA TORRE, K.W. 1893: *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus*. Vol. 7. Formicidae (Heterogyna). – W. Engelmann, Leipzig, Germany, 289 pp.
- DONISTHORPE, H. 1947: Some new ants from New Guinea. – *Annals and Magazine of Natural History* 14: 183-197.
- DONISTHORPE, H. 1949 [1948]: A fifth installment of the Ross Collection of ants from New Guinea. – *Annals and Magazine of Natural History* 1: 487-506.
- EMERY, C. 1877: Saggio di un ordinamento naturale dei Mirmicidei, e considerazioni sulla filogenesi delle formiche. – *Bullettino della Società Entomologica Italiana* 9: 67-83.
- EMERY, C. 1889: Formiche di Birmania e del Tenasserim raccolte da Leonardo Fea (1885-87). – *Annali del Museo Civico di Storia Naturale* 27: 485-520.
- EMERY, C. 1895: Die Gattung *Dorylus* FAB. und die systematische Eintheilung der Formiciden. *Zoologische Jahrbücher*. – Abteilung für Systematik, Geographie und Biologie der Tiere 8: 685-778.
- EMERY, C. 1914: Intorno alla classificazione dei Myrmicinae. Rendiconti delle Sessioni della Reale Accademia delle Scienze dell'Istituto di Bologna. – *Classe di Scienze Fisiche* 18: 29-42.
- EMERY, C. 1924 [1922]: Hymenoptera. Fam. Formicidae. Subfam. Myrmicinae. [concl.]. – *Genera Insectorum* 174: 207-397.
- FISHER, B.L. 2009 [2010]: Biogeography. In: LACH, L., PARR, C.L. & ABBOTT, K.L. (Eds.): *Ant ecology*. – Oxford University Press, Oxford, UK, 402 pp.
- FOREL, A. 1909: Ameisen aus Java und Krakatau beobachtet und gesammelt von Herrn Edward Jacobson. – *Notes from the Leyden Museum* 31: 221-232.
- FOREL, A. 1910: Glanures myrmécologiques. – *Annales de la Société Entomologique de Belgique* 54: 6-32.
- FOREL, A. 1917: Cadre synoptique actuel de la faune universelle des fourmis. – *Bulletin de la Société Vaudoise des Sciences Naturelles* 51: 229-253.
- HARRIS, R.A. 1979: A glossary of surface sculpturing. – *California Department of Food and Agriculture, Bureau of Entomology* 28: 1-31.
- HÖLLDOBLER, B. & WILSON, E.O. 1990: *The ants*. – Harvard University Press, Cambridge, MA, XII + 732 pp.
- MAYR, G. 1865: Formicidae. In: *Novara Expedition 1865. Reise der Österreichischen Fregatte "Novara" um die Erde in den Jahren 1857, 1858, 1859. Zoologischer Theil. Bd. II. Abt. 1.* – K. Gerold's Sohn, Wien, Austria, 119 pp.
- SMITH, F. 1853 [1854]: Monograph of the genus *Cryptocerus*, belonging to the group Cryptoceridae – family Myrmicidae – division Hymenoptera Heterogyna. – *Transactions of the Entomological Society of London* 2: 213-228.
- SMITH, F. 1857: Catalogue of the hymenopterous insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, 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, London*, 216 pp.
- SMITH, F. 1862: A list of the genera and species belonging to the family Cryptoceridae, with descriptions of new species; also a list of the species of the genus *Echinopla*. – *Transactions of the Entomological Society of London* 1: 407-416.
- SMITH, F. 1871: A catalogue of the aculeate Hymenoptera and Ichneumonidae of India and the Eastern Archipelago. [concl.]. – *Journal of the Linnean Society of London. Zoology* 11: 349-415.
- SMITH, F. 1875: Descriptions of new species of Indian aculeate Hymenoptera, collected by Mr. G. R. James Rothney, member of the Entomological Society. – *Transactions of the Entomological Society of London* 1875: 33-51.
- SMITH, F. 1876: Descriptions of new species of Cryptoceridae, belonging to the genera *Cryptocerus*, *Meranoplus*, and *Cataulacus*. – *Transactions of the Entomological Society of London* 1876: 603-612.
- SMITH, M.R. 1957 [1956]: New synonymy of a New Guinea ant (Hymenoptera: Formicidae). – *Proceedings of the Entomological Society of Washington* 58: 347.
- VIEHMEYER, H. 1916 [1915]: Ameisen von Singapor. Beobachtet und gesammelt von H. Overbeck. – *Archiv für Naturgeschichte* (A) 81: 108-168.
- WHEELER, G.C. & WHEELER, J. 1985: A simplified conspectus of the Formicidae. – *Transactions of the American Entomological Society* 111: 255-264.
- WHEELER, W.M. 1910: *Ants: their structure, development and behavior*. – Columbia University Press, NY, xxv + 663 pp.
- WHEELER, W.M. 1922: *Ants of the American Museum Congo expedition. A contribution to the myrmecology of Africa. VII. Keys to genera and subgenera of ants*. – *Bulletin of the American Museum of Natural History* 45: 361-710.
- WHEELER, W.M. 1934: Formicidae of the Templeton Crocker Expedition, 1933. – *Proceedings of the California Academy of Sciences* 21: 173-181.
- YOSHIMURA, M. & FISHER, B.L. 2011: A revision of the male ants of the Malagasy region (Hymenoptera: Formicidae): Key to genera of the subfamily Dolichoderinae. – *Zootaxa* 2794: 1-34.