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Taxonomic notes on the ant genus *Diacamma* Mayr, 1862 (Hymenoptera: Formicidae), part 1

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Abstract

Taxonomic changes and notes on the ponerine ant genus *Diacamma* Mayr, 1862 are presented. The following species are redescribed: *Diacamma scalpratum* (Smith, 1858) (= *D. compressum* Mayr, 1879?) from Pakistan, India, and Myanmar, *D. violaceum* Forel, 1900 stat.n. from Myanmar and Thailand, *D. palawanicum* Emery, 1900 and *D. concentricum* Wheeler & Chapman, 1925 stat.n. (= *D. sericeiventre* Stitz, 1925 syn.n.) both from Palawan Island, Philippines, *D. geometricum* (Smith, 1857) sp.rev. (= *D. tritschleri* Forel, 1897 syn.n.) from Sumatra (Indonesia), Singapore, and West Malaysia, *D. vagans* (Smith, 1860) from Bacan Island, Indonesia, *D. baguiense* Wheeler & Chapman, 1925 and *D. viridipurpureum* Emery, 1893 stat.n. both from Luzon Island, Philippines. Lectotypes are designated for *D. compressum* and *D. viridipurpureum*. Six species and one subspecies are described as new: *D. magdalenae* sp.n. from Borneo (Sarawak and West Kalimantan), *D. brevistriatum* sp.n. from West Malaysia, *D. holzschuhi* sp.n. from Laos, *D. caeruleum* sp.n. from Mindoro Island, Philippines, *D. generali* sp.n., *D. carbonarium* sp.n., and *D. viridipurpureum quezonicum* ssp.n. from Luzon Island, Philippines.

Key words: Formicidae, Ponerinae, *Diacamma*, ants, taxonomy, new species, new subspecies, new status, new synonymy, lectotype designation, morphometry, Asia, Oriental, Pakistan, India, Myanmar, Thailand, Laos, Malaysia, Singapore, Indonesia, Philippines.

Zusammenfassung

Taxonomische Änderungen und Notizen über die Ameisengattung *Diacamma* Mayr, 1862 aus der Unterfamilie Ponerinae werden präsentiert. Die folgenden Arten werden wiederbeschrieben: *Diacamma scalpratum* (Smith, 1858) (= *D. compressum* Mayr, 1879?) aus Pakistan, Indien und Myanmar, *D. violaceum* Forel, 1900 stat.n. aus Myanmar und Thailand, *D. palawanicum* Emery, 1900 und *D. concentricum* Wheeler & Chapman, 1925 stat.n. (= *D. sericeiventre* Stitz, 1925 syn.n.), beide von der Insel Palawan (Philippinen), *D. geometricum* (Smith, 1857) sp.rev. (= *D. tritschleri* Forel, 1897 syn.n.) von Sumatra (Indonesien), Singapur und West-Malaysien, *D. vagans* (Smith, 1860) von der Insel Bacan (Indonesien), *D. baguiense* Wheeler & Chapman, 1925 und *D. viridipurpureum* Emery, 1893 stat.n., beide von der Insel Luzon (Philippinen). Lectotypen werden für *D. compressum* und *D. viridipurpureum* designiert. Sechs Arten und eine Unterart werden neu beschrieben: *D. magdalenae* sp.n. aus Borneo (Sarawak und West Kalimantan), *D. brevistriatum* sp.n. aus West-Malaysien, *D. holzschuhi* sp.n. aus Laos, *D. caeruleum* sp.n. von der Insel Mindoro (Philippinen), *D. generali* sp.n., *D. carbonarium* sp.n. und *D. viridipurpureum quezonicum* ssp.n., alle drei von der Insel Luzon (Philippinen).

Introduction

The ponerine genus *Diacamma* Mayr, 1862 is distributed from India to Australia and is best known for its unique reproductive biology. Colonies are usually small to intermediate in size, consisting of a few hundred workers, and are entirely queenless. Instead, reproduction is carried out by mated workers, the so-called "gamergates" (Wheeler & Chapman 1922, Peeters & Higashi 1989). While all freshly eclosed workers possess thoracic appendages called "gemmae" (Tulloch 1934, Peeters & Billen 1991), these are only retained by one individual per colony, the acting gamergate. All other workers are mutilated by the gamergate shortly after eclosion, their gemmae are bitten off, thereby rendering them sexually inactive. Though the exact mechanism remains to be discovered, the presence of gemmae seems to determine the fertility of *Diacamma* workers: Only the gamergate with intact gemmae has fully developed reproductive organs, takes part in mating, and lays diploid eggs (Peeters & Higashi 1989, Allard et al. 2005). The fact that alate queens do not exist and all dispersal is therefore carried out by winged males is thought to have contributed to the genus' restricted geographical range and tendency towards species endemism observable today (Doums et al. 2002).

Diacamma is a well-defined genus (e.g., Bolton 2003, Schmidt & Shattuck 2014). A molecular phylogeny of the Ponerinae by Schmidt (2013) distinctly places *Diacamma* as a sister taxon to the remaining *Ponera* genus group. However, the genus itself is in dire need of a taxonomic revision, as there seem to be many undescribed species, especially within the numerous subspecies of *D. rugosum* (Le Guillou, 1842) (Schmidt & Shattuck 2014). Prior to this study, there were 24 species of *Diacamma* and further 23 subspecies recognized (Schmidt & Shattuck, 2014, Bolton 2015). The unusually large number of subspecies and infrasubspecific taxa indicates the uncertainty for the taxonomists of the late 19th and early 20th century (e.g., Emery 1893, 1897, Forel 1900, Wheeler & Chapman 1925, Santschi, 1932, but also Wilson 1958) about the treatment of local "forms". Shattuck & Barnett (2006) opine that the current taxonomic confusion is caused by two main factors: The lack of useable material of all extant castes and the fact that many species were described using a range of morphological characters with high intraspecific variability, thereby making many descriptions unreliable. In fact this "range of characters" was obviously small. Colour and surface structures, especially the metallic shimmer and the striking striation of many species, were the main or even sole characters for separation of taxa. As most of the old descriptions contained no or only a very limited number of illustrations, the service by Antweb (2015) to provide illustrations of type specimens is a great help to understand the meaning of the verbal descriptions. In this study, however, we used several distinguishing characteristics for the first time. Especially the structures of the subpetiolar process, which is often covered by the hind coxae, turned out to be of great importance. The structures of the clypeus and occipital margin, eye size and morphometry in general provide numerous distinguishing features. In this publication and follow-up studies we will show that *Diacamma* will "develop" from a rather small to a moderately sized genus of ants.

Material and methods

This work is chiefly based on female specimens from the Natural History Museum Vienna and from the senior author's collection. Additionally, a smaller number of specimens from other collections (see below) were examined as well. Regarding species of the Philippines, holotypes and some reference specimens will be deposited in the Philippine National

Museum, Manila. Most specimens are either pinned or card-mounted, only some specimens of *D. baguiense* and *D. generali* sp.n. are preserved in ethanol. Due to the scarcity of available male specimens, only female individuals were considered in this study. We refer to all females as "workers" and indicate if they possess gemmae, because we do not know whether they were functional gamergates.

Abbreviations of collections:

BMNH Natural History Museum, London, United Kingdom

CASC California Academy of Sciences, San Francisco, CA, USA

CMS Coll. D.M. Sorger, Vienna, Austria

CZW Coll. H. Zettel, Vienna, Austria

FMNH Field Museum of Natural History, Chicago, IL, USA

MCSN Museo Civico di Storia Naturale Giacomo Doria (main collection and Carlo Emery's collection), Genova, Italy

MCZ Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA

MHNG Muséum d'Histoire Naturelle Genève (Forel Collection), Switzerland

NHMW Natural History Museum Vienna, Austria

OXUM Oxford University Museum, United Kingdom

PNMM Philippine National Museum, Manila, the Philippines

UPLB Museum of Natural History, University of the Philippines Los Baños, Laguna, the Philippines

Measurements of card-mounted or pinned specimens were taken at magnifications of up to 256× with a Nikon SMZ1500 binocular microscope. Measured specimens were labelled with an individual number on green paper. Diagrams (Figs. 56, 57, 62, 63) were created using Microsoft Excel 2010.
The complete data set of measurements is provided as an electronic supplement on the journal's web page: http://www.entomologie.at/zeitschrift/downloads.php

Acronyms of measurements and indices (in part after Shattuck & Barnett 2006):

TL Total length. The added lengths of head (including mandibles), alitrunk, petiole, and gaster (excluding sting).

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

HL Head length. Maximum length of head in full-face view, excluding mandibles, measured from anterior-most point of clypeus to posterior-most point of head vertex, parallel to midline.

SL Scape length. Maximum length of antennal scape in dorsal view excluding basal neck and condyle.

WL Weber's length. Mesosomal length measured laterally from anterior surface of pronotum proper (excluding collar) to posterior extension of propodeal lobes.

MTL Middle tibial length. Maximum length of second tibia, measured at extensor side.

PH Petiole height. Maximum height of petiole, measured laterally, from dorsal-most point of spines to ventral-most point of tergite (sternite not included in measurement).

PL Petiole length. Maximum length of main petiolar body (excluding spines) measured laterally, perpendicular to posterior face.

PW Petiole width. Maximum width of petiolar body, measured fronto-dorsally, perpendicular to midline.

SpD Spine distance. Distance of distal tips of petiolar spines, measured dorsally.

SpL Spine length. Length of petiolar spines, measured fronto-dorsally, from the midpoint of a line between spine-tips to the point of inflexion at base of spines.

EL Eye length. Maximum diameter of compound eye, measured laterally.

CI Cephalic index. HW / HL × 100

SI Scape index. SL / HW × 100

PI Petiolar index. PL / PH × 100

SpDI Spine distance index. SpD / PW × 100

SpLI Spine length index. SpL / PW × 100

EI Eye index. EL / HW × 100

Photographs of specimens were created by the second author with the help of Leica Application Suite v3.8, using a Leica DFC450 camera attached to a Leica Z16APO optics carrier. Images of labels were taken with a Canon EOS REBEL T4i camera mounted on a tripod. Images were processed using Adobe Photoshop 7.0. All illustrations featured in this publication are also available for download on Antweb (http://www.antweb.org/).

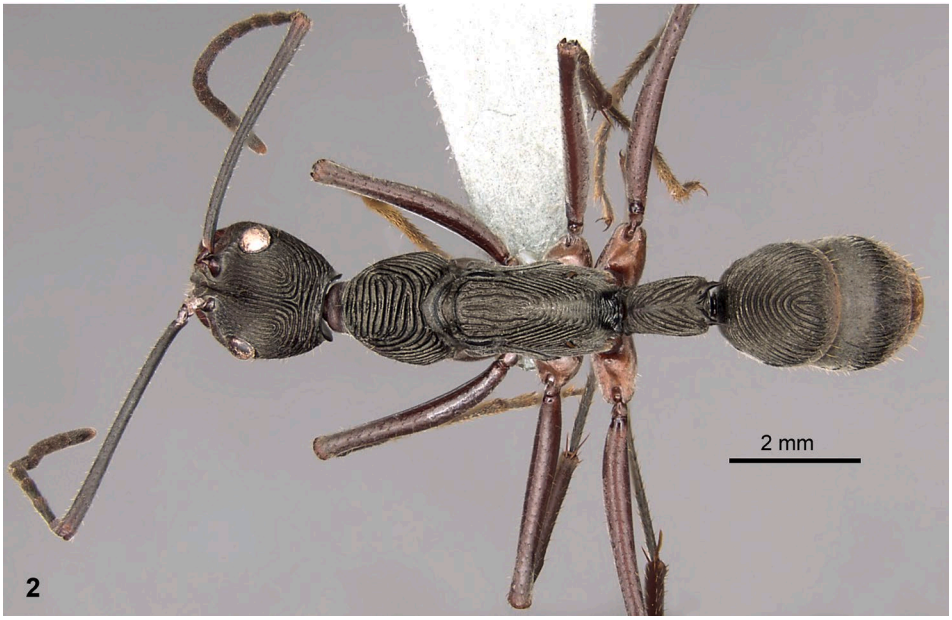
Taxonomy

Diacamma magdalenae **sp.n.** (Figs. 1–6)

Etymology: Kindly dedicated to D. Magdalena Sorger, enthusiastic "antist" who collected this and many other interesting ant species during her adventurous expeditions to Borneo.

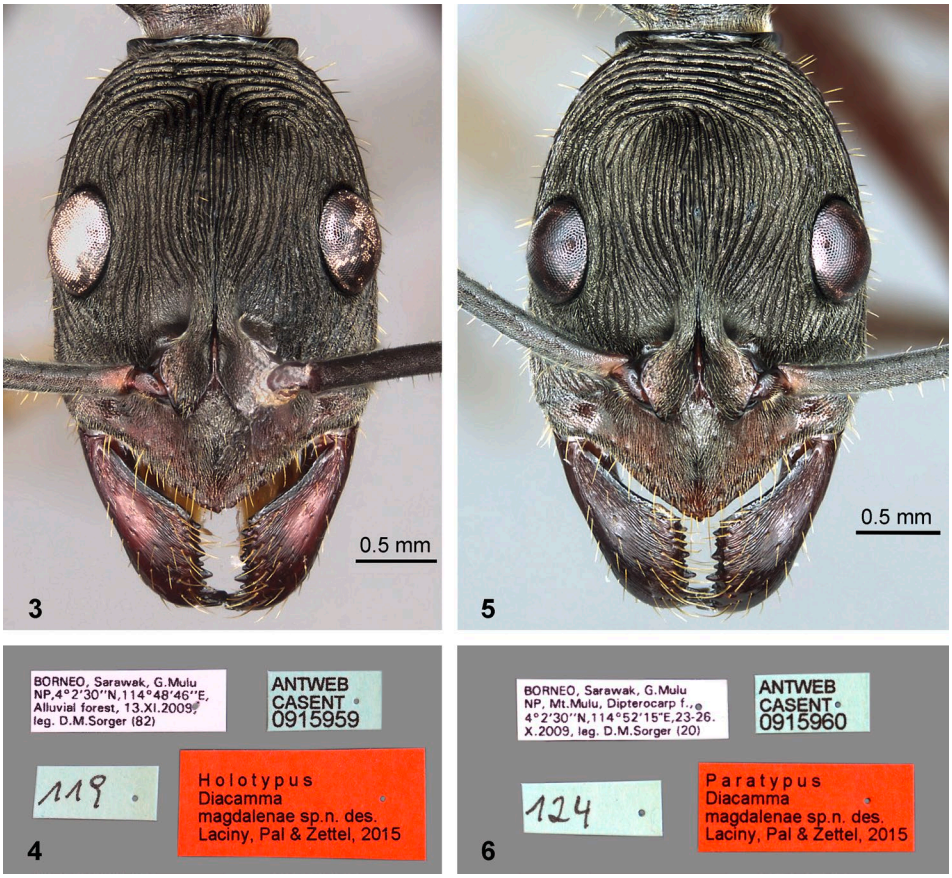
Type material: Holotype (worker, NHMW, CASENT0915959), Borneo, Sarawak, Gunung Mulu National Park, N04°02'30", E114°48'46", alluvial forest, 13.XI.2009, leg. D.M. Sorger (#82) (Fig. 4). Paratypes (all from Gunung Mulu National Park): 3 workers (NHMW), same locality data as holotype; 2 workers (CMS; NHMW, CASENT0915960), N04°02'30", E114°52'15", dipterocarp forest, 23–26.X.2009, leg. D.M. Sorger (#20) (Fig. 6); 1 worker (CMS), N04°02'30", E114°48'46", alluvial / kerangas / limestone forest, along nightwalk trail, 22.X.2009, leg. D.M. Sorger (#12); 1 worker (CMS), N04°02'30", E114°48'46", kerangas / limestone forest, along nightwalk trail, 1 m^2 Winkler sampling, 22.X.2009, leg. D.M. Sorger (#14); 1 worker (CMS), N04°02'30", E114°48'46", alluvial / kerangas / limestone forest, 11.XI.2009, leg. D.M. Sorger (#74); 1 worker (CZW), way to camp 5, 13–15.VII.2010, leg. D.M. Sorger (#GM10-H11); 1 worker (MCSN), Borneo, West Kalimantan, Kapuas, "Ban du Kapouas" [exact locality not found], "1896" [? date of acquisition], leg. M.A. Chaper.

Diagnosis: Moderately large, slender species (TL 12.72–14.80 mm). Trunk black; mandibles and legs dark reddish brown. Standing setae relatively short; fine pilosity



Figs. 1–2: *Diacamma magdalenae* sp.n., holotype worker. (1) Habitus, lateral. (2) Habitus, dorsal.

either absent or inconspicuous on head, mesosoma, and petiole. Trunk strongly striate from genae to gaster tergite 1. Head (Figs. 3, 5) elongated, sides posteriorly of eye strongly convex. Striation posterior of eyes parted, forming a pair of loops, most posterior striae concentrically bowed, by that only the outer one reaching the broad occipital margin which



Figs. 3–6: *Diacamma magdalenae* sp.n., (3, 5) holotype worker, (4, 6) paratype worker. (3, 5) Head, frontal. (4, 6) Labels.

ventrally terminates in short, blunt teeth. Eyes moderately large, protruding. Clypeus strongly convex, with very fine microsculpture, basally with additional fine striation; apex forming a distinct, obtuse angle. Mandible with obliterate fine striation. Striae on pronotum (Fig. 2) transverse at centre, around them forming an almost squared structure. Striation on mesosoma sides slightly oblique (Fig. 1). Petiole (Figs. 1, 2) distinctly compressed, its teeth relatively long and narrow; subpetiolar process prominent, concave, posterior corner strongly developed. Gaster tergite 1 (Figs. 1, 2) with semi-elliptical striation; tergites 2–3 (and 4 if visible) with transverse stripes of longitudinal striae.

Description: Measurements of holotype: TL 13.43; HW 2.15; HL 3.10; EL 0.72; SL 4.11; PH 1.89; PL 1.37; PW 0.96; SpD 0.69; SpL 0.54; WL 4.70; MTL 3.10. Indices: CI 69; SI 191; PI 72; SpDI 74; SpLI 57; EI 33. Measurements of paratypes (n = 10): TL 12.72–14.80; HW 1.97–2.32; HL 2.87–3.26; EL 0.61–0.72; SL 3.72–4.40; PH 1.61–1.96; PL 1.27–1.41; PW 0.89–1.02; SpD 0.55–0.71; SpL 0.45–0.58; WL 4.37–4.92; MTL 2.77–3.29. Indices: CI 69–71; SI 182–197; PI 71–79; SpDI 59–75; SpLI 47–62; EI 26–33.

Structures: Head (Figs. 3, 5) elongated; sides long and parallel in front of eyes, strongly convex behind eyes. Eyes moderately large, slightly protruding. Very coarse rugae present from genae to gaster tergite 1. Posterior of eyes, rugae parted, forming a pair of loops (rarely asymmetrical, comp. Figs. 3 and 5), most posterior striae concentrically bowed, by that only the outer one reaching head margin. Occipital margin broad, slightly wider than one ruga, laminate, ventrally very short, terminating in inconspicuous, blunt teeth in lateral aspect (Fig. 1). Clypeus strongly convex at basal half, in some specimens almost obtusely carinate medially, with very fine microsculpture, base with additional fine striation, moderately shiny; sockets of setae forming small but distinct protuberances; apex forming a distinct obtuse angle medially. Mandible with obliterate fine striation. Striae on pronotum (Fig. 2) transverse at centre, around them forming an almost squared pattern. Striation on mesosoma sides slightly oblique (Fig. 1). Posterior face of propodeum separated from sides by distinct carinae. Petiole distinctly compressed (Fig. 2), sides with coarse striation parted at dorsal face; spines long and narrow. Subpetiolar process (Fig. 1) prominent, in lateral aspect concave, with acute to spine-like posterior tooth that is always slightly stronger than anterior one; in ventral aspect narrow, with more or less distinct margins anteriorly and with complete median carina. Gaster tergite 1 (Fig. 2) with semi-elliptical striation; tergites 2–3 with transverse stripes of longitudinal striae; a similar structure on tergite 4 in three paratypes where this plate is visible at larger extent.

Pilosity: Standing setae on trunk short, only a few on clypeus, underside of head, and abdominal apex longer. Short appressed pilosity of trunk mostly scarce, but dense on clypeus and gaster. Standing setae on scape extremely short, on legs short.

Colour (Fig. 1): Trunk black, without metallic shimmer. Clypeus, mandibles and legs dark reddish brown. On gaster posterior margins of tergites and apex more or less orange brown. Antennae black; legs medium to dark reddish brown, but forecoxa and tarsi strongly infuscated.

Notes: *Diacamma magdalenae* sp.n. belongs to a group of species around *D. intricatum* (Smith, 1857) and *D. holosericeum* (Roger, 1860) that is defined by a distinctly compressed petiole (Fig. 2) and a very peculiar head structure: The coarse rugae form concentric bows posteriorly and only the outer one reaches the strongly developed occipital carina (Figs. 3). Examined specimens of *D. intricatum* and *D. holosericeum* show a strong variability in size and structural details; therefore we assume that both are complexes of several species distributed on Borneo, Sumatra, Java, and some smaller adjacent islands. However, this assumption requires further investigation.

Diacamma magdalenae sp.n. is outstanding by possessing a coarse striation on gaster tergites 1–3(4) (Figs. 1, 2). *Diacamma holosericeum* is without striation on the gaster, and in *D. intricatum* s.l. such striation is usually restricted to gaster tergite 1 where it is variably developed (from faint to coarse). Only in *D. intricatum* ssp. *kershawi* Wheeler, 1919, described from northern Borneo, the gaster tergite 2 bears some faint striae, but in contrast to *D. magdalenae* sp.n. "the striae on the upper surface of the petiole and first gastric segment [are] almost obliterated" (Wheeler 1919). We have studied a specimen from Sarawak (in NHMW) with similar gaster structures.

Within the examined sample of *D. magdalenae* sp.n. we observed considerable variability in eye index and spine distance index.

Distribution: Borneo: Sarawak, West Kalimantan.

***Diacamma scalpratum* (Smith, 1858)** (Figs. 7–10)

Ponera scalprata Smith, 1858: 84, pl. 6: figs. 21, 22.

Diacamma scalpratum: Emery, 1889: 496.

? *Diacamma compressum* Mayr, 1879 (syn. Dalla Torre 1893: 29).

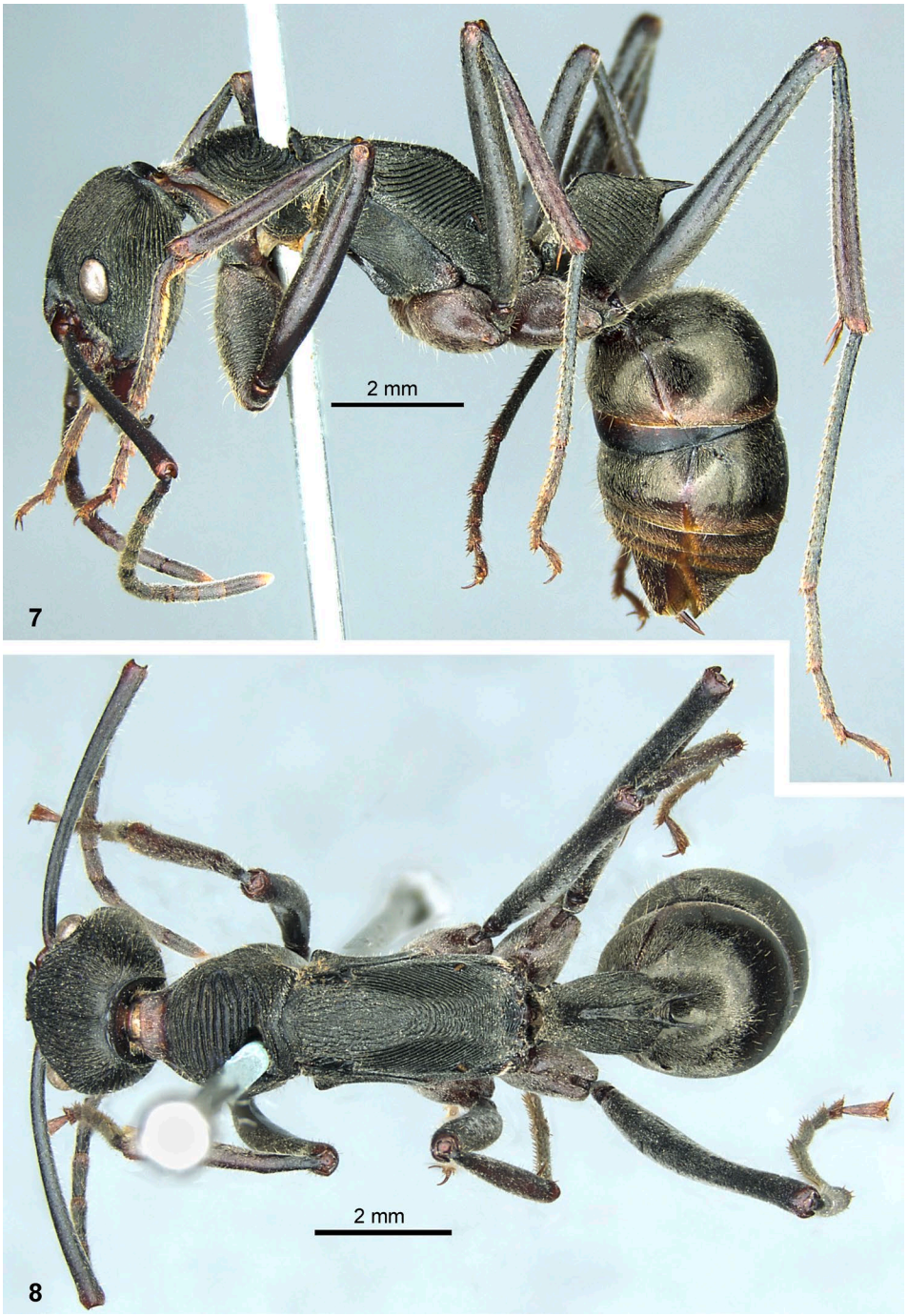
Type material examined: Lectotype (worker, NHMW, present designation, CASENT0915970) of *D. compressum*, labelled "Plason \ 1874 \ Sind", "G.Mayr \ vidit", "Diac. \ compressum \ det. Mayr", "Diacam̃a \ compressum \ Mayr i.l. \ (australe Rog.).", "75", "Lectotypus \ Diacamma \ compressum Mayr, 1879 \ des. Laciny, Pal & Zettel 2015", " Diacamma \ scalpratum (Smith, 1858) \ det. Laciny, Pal & Zettel 2015", ANTWEB \ CASENT \ 0915970" (Fig. 10). Paralectotype (worker, NHMW), labelled "Plason \ 1874 \ Sind", "Collect. \ G. Mayr" and a label "scalpratum det. G. Mayr", "76", "Paralectotypus \ Diacamma \ compressum Mayr, 1879 \ Laciny, Pal & Zettel 2015", " Diacamma \ scalpratum (Smith, 1858) \ det. Laciny, Pal & Zettel 2015".

Non-type material examined: 4 workers (MCSN, NHMW), Myanmar, Yangon ["Rangoon Birmania"], V.1885, leg. Fea, det. C. Emery; 1 worker (MCSN), Myanmar, Taik Kyi ["Tikekee (Pegù)"], VI.1887, leg. L. Fea; 3 workers (MCSN), Myanmar, north of Taik Kyi ["Palon (Pegù)"], VIII–IX.1887, leg. L. Fea; 1 worker (NHMW), India, West Bengal, Darjeeling District, Gorubathan, Mal Forest, ca. 350 m a.s.l. [1150 ft], 18.XII.1973, leg. G.K. Srivastayah Maiti; 1 worker (NHMW), India, West Bengal, Darjeeling District, Sukna, ca. 305 m a.s.l. [1000 ft], IV.1963, leg. Loyd Carmichael; 1 worker (NHMW), without locality information, coll. Felder.

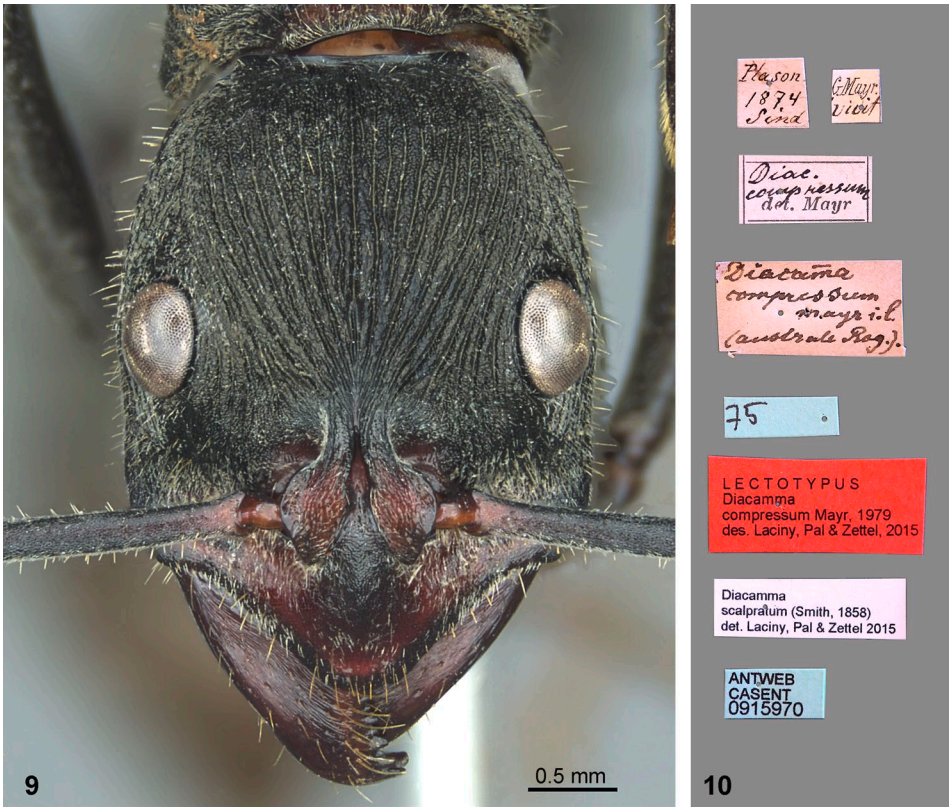
Illustrations examined: Holotype of *Ponera scalprata* (worker, BMNH, CASENT0900667), Antweb (2015).

Diagnosis: Very large, slender species (TL ca. 16.4–18.5 mm). Trunk black; frontal lobes and clypeus often, subpetiolar process and gaster tergites and sternites at posterior margins always reddish brown; mandibles and tibiae dark reddish brown. Standing setae on trunk short. Trunk strongly striate on mesosoma and petiole, weaker on head. Head, mesosoma, and petiole with very dense microreticulation, matt. Head (Fig. 9) elongated, sides posteriorly of eye moderately convex. Striation posterior of eyes meeting narrow, slightly concave occipital margin; ridges slightly narrower than interspaces; occipital margin laterally slightly widened and terminating in very short, blunt projections (Fig. 7). Eyes small, not protruding. Clypeus finely, very densely punctured, except for anterior margin with larger and sparser puncturation; anteromedially with widely rounded apex. Striae on pronotum (Fig. 8) transversely elliptical. Striation on mesosoma sides slightly oblique, upcurved on propodeum (Fig. 7). Petiole (Figs. 7, 8) strongly compressed, dorsally not striate, but with crest posteriorly forked up to the closely spaced, long teeth; dorsolaterally with striation oblique relative to dorsal outline of node, ventrolaterally with reduced striation and almost smooth; subpetiolar process prominent, strongly concave, posterior corner longer than anterior one. Gaster tergite 1 (Figs. 7, 8) without striation, but with fine puncturation, shiny as the following tergites.

Description: Measurements of lectotype of *D. compressum*: TL 18.07; HW 2.82; HL 3.85; EL 0.76; SL 4.76; PH 2.48; PL 1.79; PW 1.28; SpD 0.50; SpL 0.45; WL 6.13; MTL 3.95. Indices: CI 73; SI 169; PI 72; SpDI 40; SpLI 36; EI 27. Measurements of paralectotype of *D. compressum*: TL 17.67; HW 2.74; HL 3.78; EL 0.77; SL 4.70; PH 2.48; PL 1.70; PW 1.29; SpD 0.51; SpL 0.45; WL 5.71; MTL 3.78. Indices: CI 72; SI 171; PI 68; SpDI 40; SpLI 35; EI 28. Measurements of non-type material (n = 6): TL 16.37–18.46; HW 2.64–2.84; HL 3.65–3.91; EL 0.76–0.82; SL 4.50–4.89; PH 2.32–2.51; PL 1.67–1.85; PW 1.11–1.35; SpD 0.42–0.60; SpL 0.47–0.59; WL 5.51–6.13; MTL 3.52–3.85. Indices: CI 72–76; SI 164–174; PI 69–77; SpDI 35–47; SpLI 36–51; EI 26–30.



Figs. 7–8: *Diacamma scalpratum*, lectotype worker of *D. compressum*. (7) Habitus, lateral. (8) Habitus, dorsal.



Figs. 9–10: *Diacamma scalpratum*, lectotype worker of *D. compressum*. (9) Head, frontal. (10) Labels.

Structures: Head (Fig. 9) elongated; sides long and parallel in front of eyes, moderately convex behind eyes. Eyes small, not protruding. Striation posterior of eyes divergent, meeting the narrow, medially slightly concave occipital margin; ridges matt, densely microreticulated, slightly narrower than interspaces. Occipital margin laterally slightly widened and terminating in very short, blunt projections (Fig. 7). Clypeus finely, very densely punctured, except for anterior margin with larger and sparser puncturation; anteromedially with widely rounded apex (Fig. 9). Mandible with obliterate fine striation, setae on masticatory margin very long. Mesosoma with coarse striation, especially on pronotum. Striae on pronotum (Fig. 8) transversely elliptical. Striation on mesosoma sides slightly oblique, upcurved on propodeum, reduced on mesopleura (Fig. 7). Posterior face of propodeum separated from sides by strong carinae.

Petiole (Figs. 7, 8) strongly compressed, with narrow dorsal crest posteriorly forked up to the closely spaced, long teeth; at sides the ridges as wide or slightly narrower than interspaces; subpetiolar process prominent, with strongly concave ventral outline, posterior corner longer than anterior one, anteriorly marginate. Gaster tergite 1 (Figs. 7, 8) lacking striation, but with fine puncturation, shiny as the following tergites and sternites.

Pilosity: Standing setae on trunk short, those on head, pronotum, and abdominal apex slightly longer. Short appressed pilosity of trunk well developed, but on matt surfaces less

obvious than on the shiny gaster where it is longer and velvety (Fig. 8). Standing setae on scape very short, on legs short, slightly longer on flexor sides of femora.

Colour (Fig. 7): Trunk black, without metallic shimmer. Clypeus and frontal lobes often reddish; subpetiolar process and broad stripes at posterior margins of gaster tergites and sternites pale reddish brown. Mandibles, femora and tibiae more or less extended red, other leg parts strongly infuscated. Colour of antennae variable.

Notes: As in the *D. intricatum* species group (see notes for *D. magdalenae* sp.n.), the *D. scalpratum* group possesses a compressed petiole, but the striation of the head is longitudinal like in all species treated in the following. We place in this group three described species, *D. scalpratum*, *D. violaceum* (stat.n.), and *D. longitudinale* Emery, 1889. The latter one is known from Vietnam and Laos (Emery 1889, Santschi 1920, 1924); a type was illustrated by Antweb (2015: CASENT0903863) and can immediately be distinguished by its longitudinal striation of the pronotum (compare also *D. palawanicum* below). Closest to the *D. scalpratum* group are two endemic species of Palawan (Philippines), *D. palawanicum* and *D. concentricum*. They differ by several characters of the petiole.

Mayr (1879) described *D. compressum* from two workers from "Sind in Ostindien im k. k. zoologischen Hofcabinete [old name for NHMW] in Wien"; the type locality is attributed to Sindh in southern Pakistan. Both specimens are still in the collection of NHMW. One of them bears Mayr's original identification labels whereas the second specimen bears a label "Collect. G. Mayr" and a label "scalpratum det. G. Mayr" which were both attached by the former curator, Anton Handlirsch. It is speculative why the specimens were differently labelled. Possibly the second specimen was kept by G. Mayr who changed the identification after Dalla Torre (1893) synonymized *D. compressum* with *D. scalpratum* in his catalogue.

The synonymy of *D. compressum* and *scalpratum* needs to be an issue for further examination if more material becomes available. Morphometry reveals a relatively high variability in several characters (all measurements of petiole and spines, especially spine length, spine distance, and petiole width, as well as their indices). Even the two type specimens of *D. compressum* – although from the same locality – differ in one remarkable character: The lectotype has a peculiar short pilosity that we could not find in any other specimen of *D. scalpratum* s.l. We have chosen the lectotype in a way that *D. compressum* might be conserved as a valid species if this character proves to be species-specific.

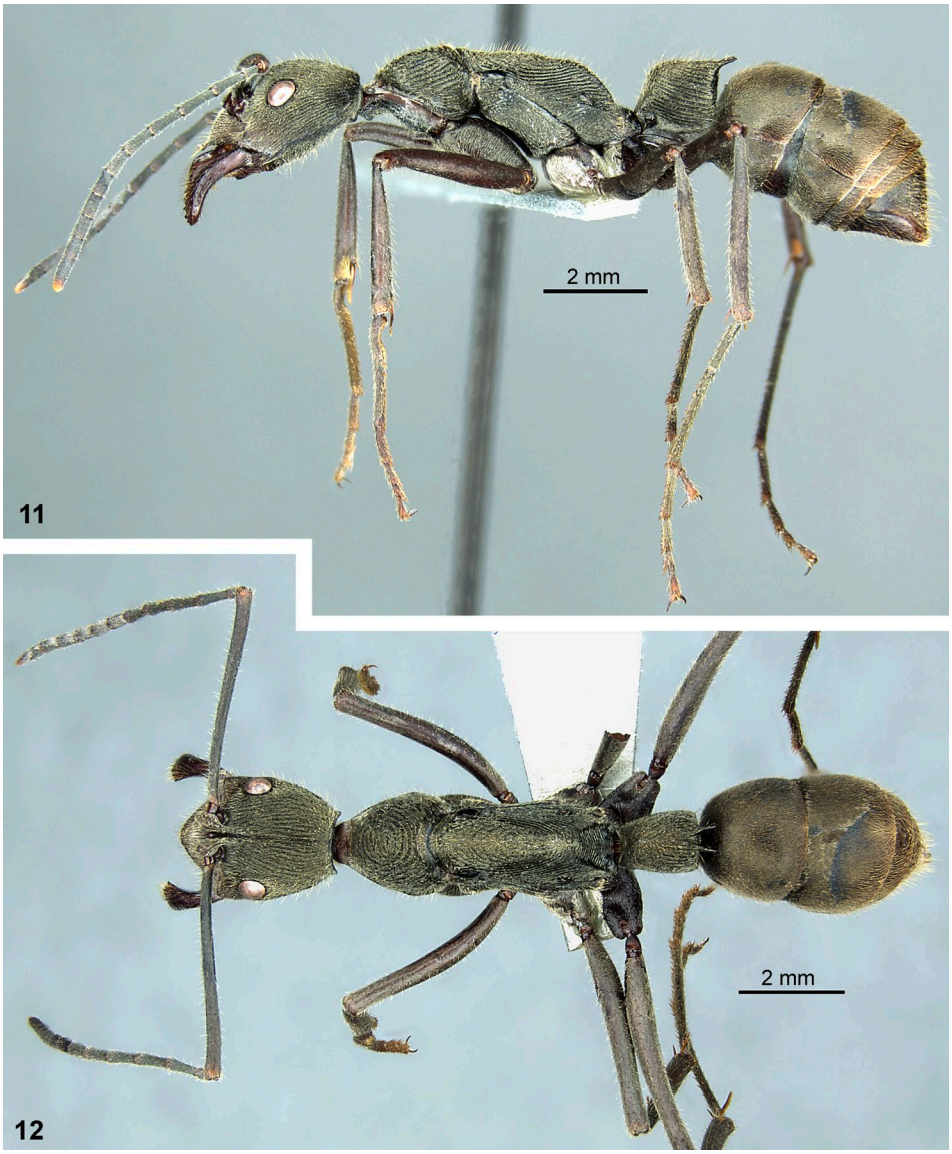
Distribution: Pakistan, India, Myanmar. Records of *D. scalpratum* from Thailand (Antweb 2015: CASENT0173639, CASENT0173640; Peeters et al. 2015) refer to an undescribed species which will be a subject of further investigations.

***Diacamma violaceum* Forel, 1900 stat.n.** (Figs. 11–14)

Diacamma scalpratum var. *violaceum* Forel, 1900: 317 (in key); Bolton 1995: 171.

Diacamma scalpratum violaceum: Schmidt & Shattuck 2014: 191.

Non-type material examined: 3 workers (CZW; NHMW, CASENT0915971), from Thailand, Chiang Mai Province. W Mae Rim, Mae Sa National Park, Mae Sa Falls, 30–31.X.1995, leg. H. Zettel (#2) (Fig. 14); 1 worker (NHMW), from Thailand, Chiang Mai Province, Chiang Mai, Ban Kong Loi, 20 km E Mae Sariang, 400 m a.s.l., 1.I.1995, leg. Schulz & Vock (#066); 3 workers (NHMW), from Thailand, Chiang Mai Province, Doi Inthanon National Park, 1.XI.2005, leg. W. Decha.



Figs. 11–12: *Diacamma violaceum*, non-type worker. (11) Habitus, lateral. (12) Habitus, dorsal.

Illustrations examined: Syntype (worker, MHNG, CASENT0907217), Antweb (2015).

Diagnosis: Large, slender species (TL ca. 16.0–17.9 mm). Trunk black or with weak purple shimmer; parts of frontal lobes and clypeus brown; subpetiolar process and gaster tergites and sternites at posterior margins reddish brown. Standing setae on trunk short. Trunk strongly striate on mesosoma and petiole, slightly finer on head. Head, mesosoma,

Figs. 13–14: *Diacamma violaceum*, non-type worker. (13) Head, frontal. (14) Labels.

and petiole with very dense microreticulation, matt. Head (Fig. 13) elongated, sides posteriorly of eye moderately convex. Striation posterior of eyes meeting narrow, slightly concave occipital margin; occipital margin laterally widened and terminating in short, blunt projections (Fig. 11). Eyes small, not protruding. Clypeus finely, very densely punctured, except for anterior margin with larger and sparser puncturation; apex widely rounded. Striae on pronotum (Fig. 12) transversely elliptical or almost circular. Striation on mesosoma sides slightly oblique, upcurved on propodeum (Fig. 11). Petiole (Figs. 11, 12) strongly compressed, dorsally and dorsolaterally with longitudinal striation, ventrolaterally with reduced striation; petiolar teeth closely spaced, moderately long; subpetiolar process prominent, strongly concave, posterior corner acute, longer than anterior one. Gaster tergite 1 (Figs. 11, 12) without striation, but with fine puncturation, shiny as the following tergites.

Description: Measurements of non-type material (n= 7): TL 16.04–17.93; HW 2.45–2.63; HL 3.52–3.82; EL 0.66–0.74; SL 4.43–4.96; PH 2.04–2.28; PL 1.57–1.74; PW 1.17–1.35; SpD 0.37–0.51; SpL 0.38–0.51; WL 5.35–5.93; MTL 3.46–3.78. Indices: CI 67–71; SI 181–192; PI 73–79; SpDI 32–40; SpLI 30–39; EI 26–28.

Structures: Head (Fig. 13) elongated; sides long and parallel in front of eyes, moderately convex behind eyes. Eyes small, not protruding. Striation posterior of eyes divergent, meeting the narrow, slightly concave occipital margin; ridges densely microreticulated, matt, not or hardly narrower than interspaces; occipital margin laterally slightly widened

and terminating in very short, blunt projections (Fig. 11). Clypeus finely, very densely punctured, except for anterior margin with larger and sparser puncturation; anteromedially with widely rounded apex (Fig. 13). Mandible with obliterate fine striation, setae on masticatory margin very long. Mesosoma with coarse striation, especially on pronotum. Striae on pronotum (Fig. 12) transversely elliptical or almost circular. Striation on mesosoma sides slightly oblique, upcurved on propodeum, reduced on meso- and metapleura (Fig. 11). Posterior face of propodeum separated from sides by strong carinae. Petiole (Figs. 11, 12) strongly compressed, but without dorsal crest, dorsally and dorsolaterally with longitudinal striation approximately parallel to dorsal outline of node, ventrolaterally with reduced striation, almost smooth; at sides the ridges approximately as wide as interspaces; subpetiolar process prominent, with strongly concave ventral outline, anteriorly marginate, posterior corner longer than anterior one. Gaster tergite 1 (Figs. 11, 12) lacking striation, but with fine puncturation, shiny as the following tergites and sternites.

Pilosity: Standing setae on trunk short, those on head, pronotum, and abdominal apex slightly longer. Short appressed pilosity of trunk well developed, but on matt surfaces less obvious than on the shiny gaster where it is longer and velvety (Fig. 12). Standing setae on scape very short, on legs short, slightly longer on flexor sides of femora.

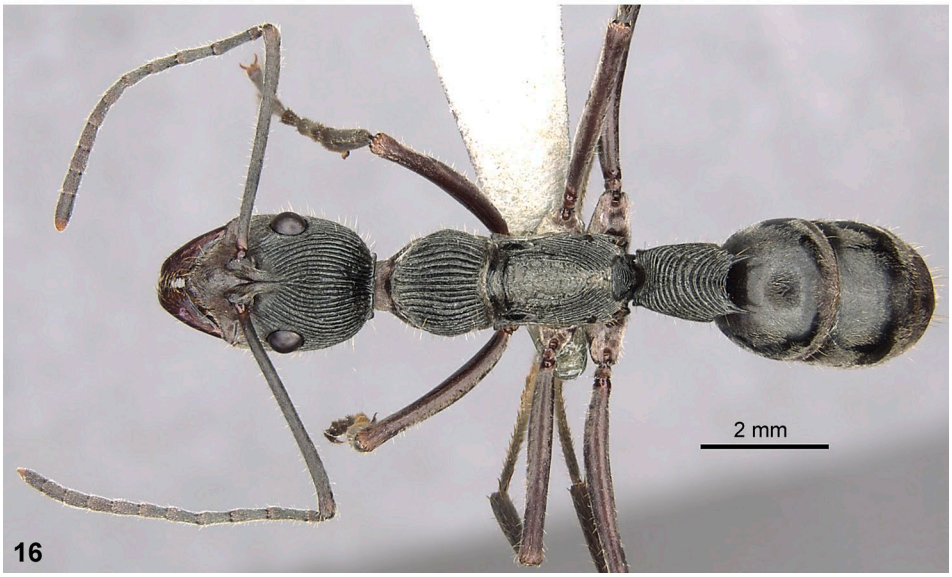
Colour (Fig. 11): Trunk black, sometimes with weak purple shimmer. Clypeus and frontal lobes often brown; subpetiolar process and broad stripes at posterior margins of gaster tergites and sternites reddish brown. Mandibles and tibiae more or less extended red, other leg parts strongly infuscated. Colour of antennae variable.

Notes: We compared seven specimens from three localities in north-western Thailand with the illustrations of a syntype worker from Myanmar published by Antweb (2015). They largely agree with the type, but have a different pronotum sculpture and do not possess the eponymous purple shimmer. The syntype has distinct transverse rugae on the pronotum surrounded by concentric rugae (Antweb 2015), whereas the rugosity in the Thai specimens is circular (Fig. 13). With only these eight specimens available, it is difficult to decide whether the mentioned characters define similar species or show intraspecific variation. In this context it is noteworthy that there are at least two further closely related, undescribed species in Thailand, including the one published under the name *D. scalpratum* by Peeters et al. (2015).

All examined specimens differ clearly from *D. scalpratum* which is distributed from the Indian subcontinent eastwards to Yangon (Rangoon) in Myanmar. In *D. violaceum* the dorsal face of the petiole has a longitudinal striation that is similar to the striation of the dorsolateral parts, whereas in *D. scalpratum* the petiole has a dorsal longitudinal crest with reduced striation. The sculpture of the metapleura is weaker in *D. violaceum* than in *D. scalpratum*, and similar to the sculpture of the mesopleura, whereas in *D. scalpratum* it is coarsely striate, almost as strong as on the propodeum sides. Morphometric analysis showed that the two species also differ in relative length of the antennal scapes (SI 164–174 in *D. scalpratum* vs. 181–192 in *D. violaceum*) as well as in the width of the petiole (in relation to head width), which tends to be wider in *D. violaceum*.

Diacamma violaceum also has strong similarities with *D. concentricum* (see below), but differs distinctly by the structures of the petiole (length, spine length, shape of subpetiolar process).

Distribution: Myanmar, Thailand.



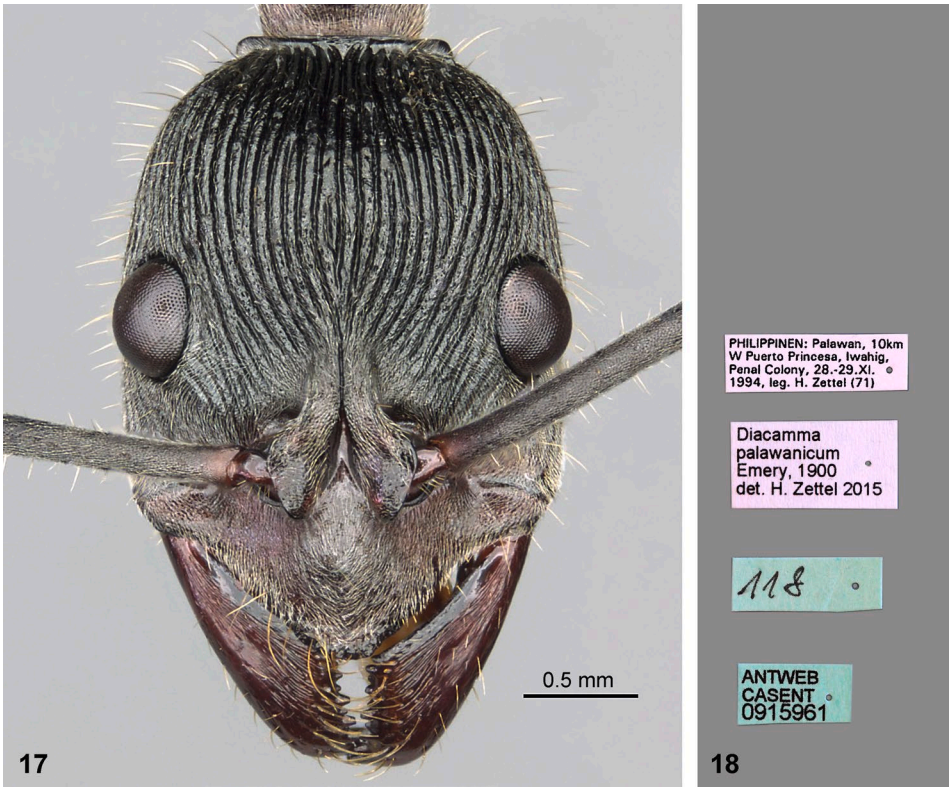
Figs. 15–16: *Diacamma palawanicum*, non-type worker. (15) Habitus, lateral. (16) Habitus, dorsal.

Diacamma palawanicum **Emery, 1900** (Figs. 15–18)

Diacamma palawanicum Emery, 1900: 666 (footnote); Wheeler & Chapman 1925: 64; Bolton 1995: 170; General & Alpert 2012: 101; Schmidt & Shattuck 2014: 190.

Type material examined: 1 syntype (worker, MCSN, CASENT0903865), labelled "Palawan \ 1898. Doherty ex coll. Fruhstorfer", "Typus", "Diacamma \ palawanicum \ Emery", "ANTWEB \ CASENT \ 0903865" (labels see Antweb 2015).

Non-type material examined: 1 worker (CZW, CASENT0915961), Philippines, Palawan Island, ca. 10 km W of Puerto Princesa, Iwahig, Penal Colony, 28–29.XI.1994, leg. H. Zettel (#71) (Fig. 18).



Figs. 17–18: *Diacamma palawanicum*, non-type worker. (17) Head, frontal. (18) Labels.

Diagnosis: Large, slender species (TL ca. 14 mm). Trunk chiefly black, appearing grey by dense whitish pilosity. Trunk strongly striate from genae to petiole. Posterior of head (Fig. 17) longitudinally striate until hind margin; occipital margin moderately wide, laminate, ventrally short, terminating in small, acute teeth (Fig. 15). Clypeus entirely punctured. Pronotum longitudinally striate (Fig. 16). Striation on mesosoma sides slightly oblique (Fig. 15). Petiole stout, its teeth long and far apart; subpetiolar process laterally and medially carinate, very densely and evenly pilose, in lateral aspect with concave outline, anterior corner much longer than posterior one. Gaster tergite 1 (Figs. 15, 16) with extremely fine puncturation.

Description: Measurements of non-type material (n = 1): TL 13.96; HW 2.32; HL 3.20; EL 0.64; SL 3.75; PH 2.00; PL 1.40; PW 1.30; SpD 0.90; SpL 0.58; WL 4.76; MTL 2.90. Indices: CI 72; SI 162; PI 70; SpDI 70; SpLI 45; EI 27.

Structures: Head (Fig. 17) elongated; sides parallel in front of eyes, strongly convex behind eyes. Eyes comparatively small. Very coarse rugae present from genae to petiole. Posterior of eyes, longitudinal rugae perpendicular to occipital margin. Occipital margin about as wide as one ruga, slightly laminate, ventrally short, terminating in small, acute teeth in lateral aspect (Fig. 15). Clypeus (Fig. 17) with very fine puncturation, shiny, a very fine striation at base absent (syntype) or hardly recognizable; apex narrowly rounded. Man-

dibles with some fine striation. Pronotum with longitudinal rugae (Fig. 16). Striation on mesosoma sides slightly oblique (Fig. 15). Posterior face of propodeum separated from sides by distinct carinae. Petiole (Figs. 15, 16) stout, with very coarse striation and with rather long, slender spines. Subpetiolar process very distinctive: in lateral aspect with strongly concave outline, anterior tooth much longer than posterior one; in ventral view appearing arrow-shaped, sides and mid-line sharply carinate in anterior two thirds; pilosity of short standing setae very even (not visible in the type). Gaster tergite 1 (Figs. 15, 16) as the following tergites with very fine puncturation.

Pilosity (Fig. 15): Standing setae on trunk mostly short, but those on vertex, underside of head, and dorsum of petiole longer. Short appressed pilosity abundant, but more scarce on dorsum of head and pronotum, giving the specimen a grey appearance. Standing setae on scape and legs also short.

Colour (Fig. 15): Trunk black, without metallic shimmer; on gaster posterior margins of tergites and apex more or less brown. Antennae black. Mandibles and most parts of legs dark reddish brown; forecoxa black, tarsi strongly infuscated.

Notes: *Diacamma palawanicum* is easily distinguishable from all Philippine congeners by the longitudinal striation of the pronotum (Fig. 16). It shares a finely punctured, non-striate gaster tergite 1 (Figs. 15, 16) with *D. concentricum* (see below) and *D. panayense* Wheeler & Chapman, 1925. *Diacamma palawanicum* and *D. concentricum* possess a moderately broad, laminate occipital carina, similar to the *D. intricatum* species group (see notes for *D. magdalenae* sp.n.), but in those species the posterior of head bears concentrical rugae that do not meet the occipital carina (comp. Fig. 3). Antweb (2015) illustrates a syntype of *D. palawanicum* (in MCSN); as no other type specimen is known, it is probably the holotype.

Distribution: Only known from the island of Palawan. The exact type locality is unknown. Our non-type specimen is from the island's central part.

Diacamma concentricum Wheeler & Chapman, 1925 stat.n. (Figs. 19–22)

Diacamma palawanicum var. *concentricum* Wheeler & Chapman, 1925: 64; Bolton 1995: 169.

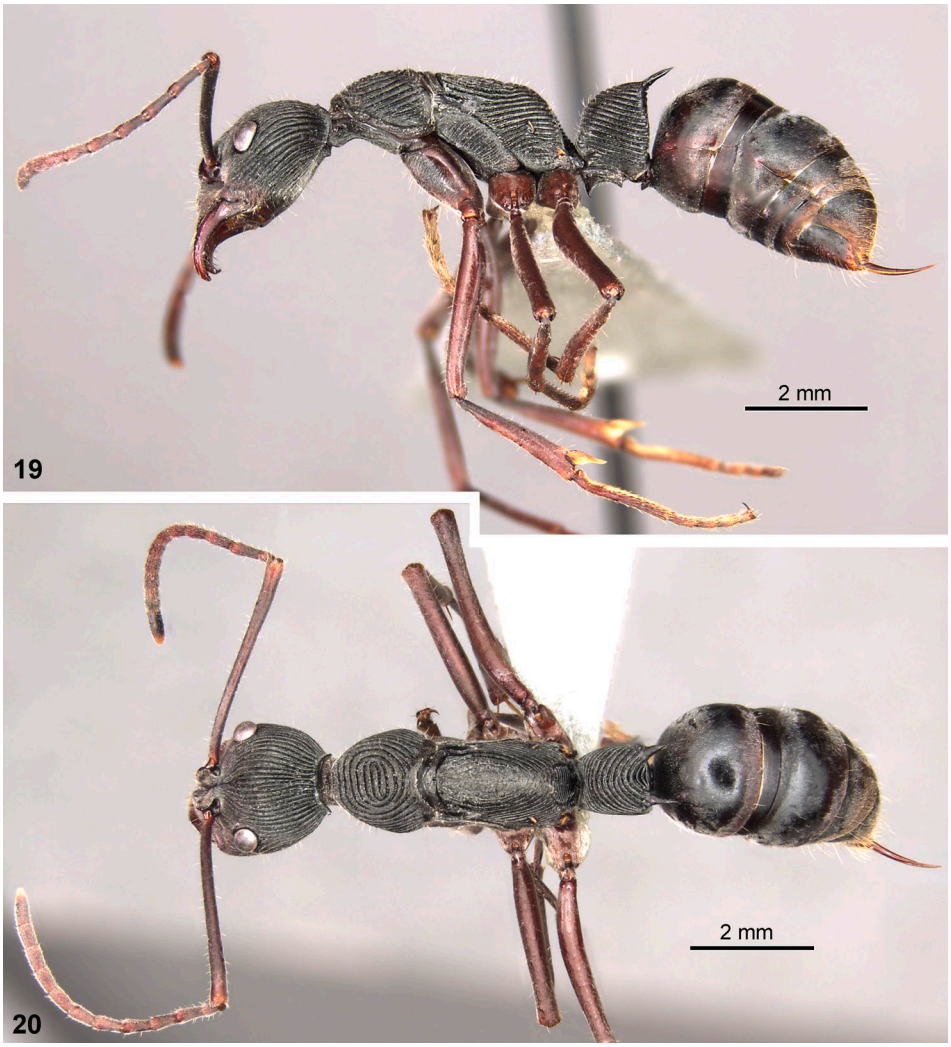
Diacamma sericeiventre Stitz, 1925: 111; Bolton 1995: 170; General & Alpert 2012: 102; Schmidt & Shattuck 2014: 191; **syn.n.**

Diacamma palawanicum concentricum: General & Alpert 2012: 101; Schmidt & Shattuck 2014: 190.

Non-type material examined: 2 workers (NHMW, CZW), Philippines, Palawan, San Vicente, Poblacion, Little Baguio Falls, 30 m a.s.l., 10°30.55'N, 119°18.33'E, 23.XI.1995, leg. H. Freitag (#191bM); 2 workers (NHMW; CZW, CASENT0915962), Philippines, Palawan, Roxas, Bgy. 4, Umalad valley, 5.5 km W of town proper, 25 m a.s.l., 10°19.9'N, 119°19.1'E, 24.XI.2010, leg. H. Freitag (#69dM) (Fig. 22).

Illustrations examined: Cotype (worker, MCZ, MCZ-ENT 20433).

Diagnosis: Large, slender species (TL 14.1–15.3 mm). Trunk black, appearing grey by dense whitish pilosity. Trunk strongly striate from genae to petiole. Posterior of head (Fig. 21) longitudinally striate until hind margin; occipital margin moderately wide, laminate, ventrally short, terminating in small teeth (Fig. 19). Clypeus (Fig. 21) with very dense puncturation and some distinct longitudinal rugae at least basally. Pronotum with concentric rugae (Fig. 20). Striation on mesosoma sides slightly oblique (Fig. 19). Petiole (Figs. 19, 20) stout, its teeth long and far apart; subpetiolar process laterally carinate, a

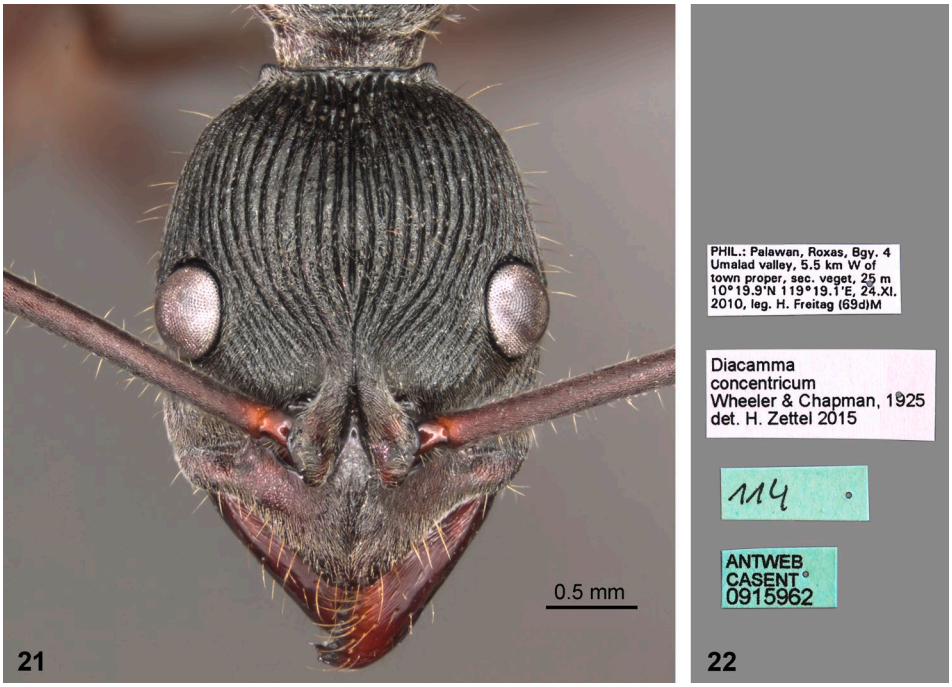


Figs. 19–20: *Diacamma concentricum*, non-type worker. (19) Habitus, lateral. (20) Habitus, dorsal.

median carina absent or weakly developed, in lateral aspect with concave outline, anterior corner much longer than posterior one. Gaster tergite 1 (Figs. 19, 20) with extremely fine puncturation.

Description: Measurements of non-type material (n = 4): TL 14.15–15.33; HW 2.30–2.54; HL 2.97–3.39; EL 0.60–0.68; SL 3.85–4.04; PH 2.07–2.28; PL 1.34–1.60; PW 1.28–1.46; SpD 0.85–1.03; SpL 0.64–0.76; WL 4.60–5.05; MTL 2.87–3.16. Indices: CI 75–79; SI 159–167; PI 65–70; SpDI 59–77; SpLI 45–54; EI 26–27.

Structures: Head (Fig. 21) elongated; sides parallel in front of eyes, strongly convex behind eyes. Eyes comparatively small. Very coarse rugae present from genae to petiole. Posterior



Figs. 21–22: *Diacamma concentricum*, non-type worker. (21) Head, frontal. (22) Labels.

of eyes, longitudinal rugae perpendicular to occipital margin. Occipital margin about as wide as one ruga, slightly laminate, ventrally short, terminating in small, rectangular or blunt teeth in lateral aspect. Clypeus with dense puncturation, matt, with additional striation in basal half; apex narrowly rounded. Mandibles with some fine, more or less reduced striation. Pronotum (Fig. 20) with concentrical, circular rugae. Striation on mesosoma sides slightly oblique (Figs. 19). Posterior face of propodeum separated from sides by distinct carinae. Petiole (Figs. 19, 20) stout, with very coarse striation and with rather long, slender spines. Subpetiolar process similar to that of *D. palawanicum* but distinctive: in lateral aspect with strongly concave outline, anterior tooth much longer than posterior one; in ventral view appearing arrow-shaped, sides sharply marginate anteriorly, a medial carina absent or weakly developed anteriorly, most surface with transverse or irregular rugulae; pilosity uneven. Gaster tergite 1 (Figs. 19, 20) as the following tergites with very fine puncturation.

Pilosity (Fig. 19): Standing setae on trunk mostly short, but those on clypeus, vertex, underside of head, and dorsum of petiole longer. Short appressed pilosity abundant, but more scarce on dorsum of head and pronotum, giving the specimen a grey appearance. Standing setae on scape and legs also short.

Colour (Fig. 19): Trunk black, without metallic shimmer; on gaster posterior margins of tergites and apex more or less brown. Antennae black. Mandibles and most parts of legs dark reddish brown; forecoxa black, tarsi more or less infuscated.

Notes: *Diacamma concentricum* was described as a variety of *D. palawanicum* and given subspecific rank only recently (General & Alpert 2012, Schmidt & Shattuck 2014). Although both taxa are extremely similar in most characters and the number of known specimens is very small, the striking difference in pronotum sculpture justifies in our opinion the species rank of *D. concentricum*: *Diacamma concentricum* possesses concentrical rugae whereas those of *D. palawanicum* are strictly longitudinal (comp. Figs. 16 and 20). In addition, the material examined differs slightly in the sculpture of the clypeus which is densely punctured in *D. concentricum* and with some distinct longitudinal rugae at base, whereas the clypeus of *D. palawanicum* has a reduced rugosity. The structures of the characteristic subpetiolar process are also similar; however, in examined specimens of *D. concentricum* its ventral surface is irregularly rugose and with an irregular pilosity, whereas in the *D. palawanicum* specimens it has a clear median carina and a very even pilosity consisting of short standing setae (this pilosity not visible in the syntype). Additionally, morphometric analysis showed that the specimen of *D. palawanicum* has a slightly more elongated head (CI 72 vs. CI 75–79 in *D. concentricum*) and shorter petiolar spines in comparison to *D. concentricum*. All these differences should be confirmed in more specimens, especially as the hitherto examined sample of *D. concentricum* shows considerable variability of overall size and the proportions of the petiolar spines (especially in SpDI), which may make comparisons difficult.

We tried to locate the type of *D. sericeiventre* but it was not found by the curators in the collections of the Museum für Naturkunde Berlin (Viola Richter, in litt.), Senckenberg German Entomological Institut Müncheberg (Andrew Liston, in litt.), and Royal Saxon Academy of Forestry Tharandt (Ingo Brunk, in litt.). We have compared the original description of *D. sericeiventre* with our specimens of *D. concentricum* and conclude that it is the same species. The two taxa were described in the same year and the respective authors could not know about the other publication. Moreover, the type locality of *D. sericeiventre* is the same as one of the syntype localities of *D. concentricum*. There is some concern about the priority. According to the imprints of the volumes, Wheeler and Chapman's publication was published on 21 September 1925, about three months earlier than Stitz's (19 December 1925). An entry by the librarian of NHMW in Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin, volume 1923 notes that the book arrived in Vienna in February 1926, which serves as more evidence that the name *concentricum* has priority over *sericeiventre*.

Distribution: Only known from the island of Palawan. All four records (Wheeler & Chapman 1925, this study) are from the island's northern part.

***Diacamma geometricum* (Smith, 1857) sp.rev.** (Figs. 23–26)

Ponera geometrica Smith, 1857: 67.

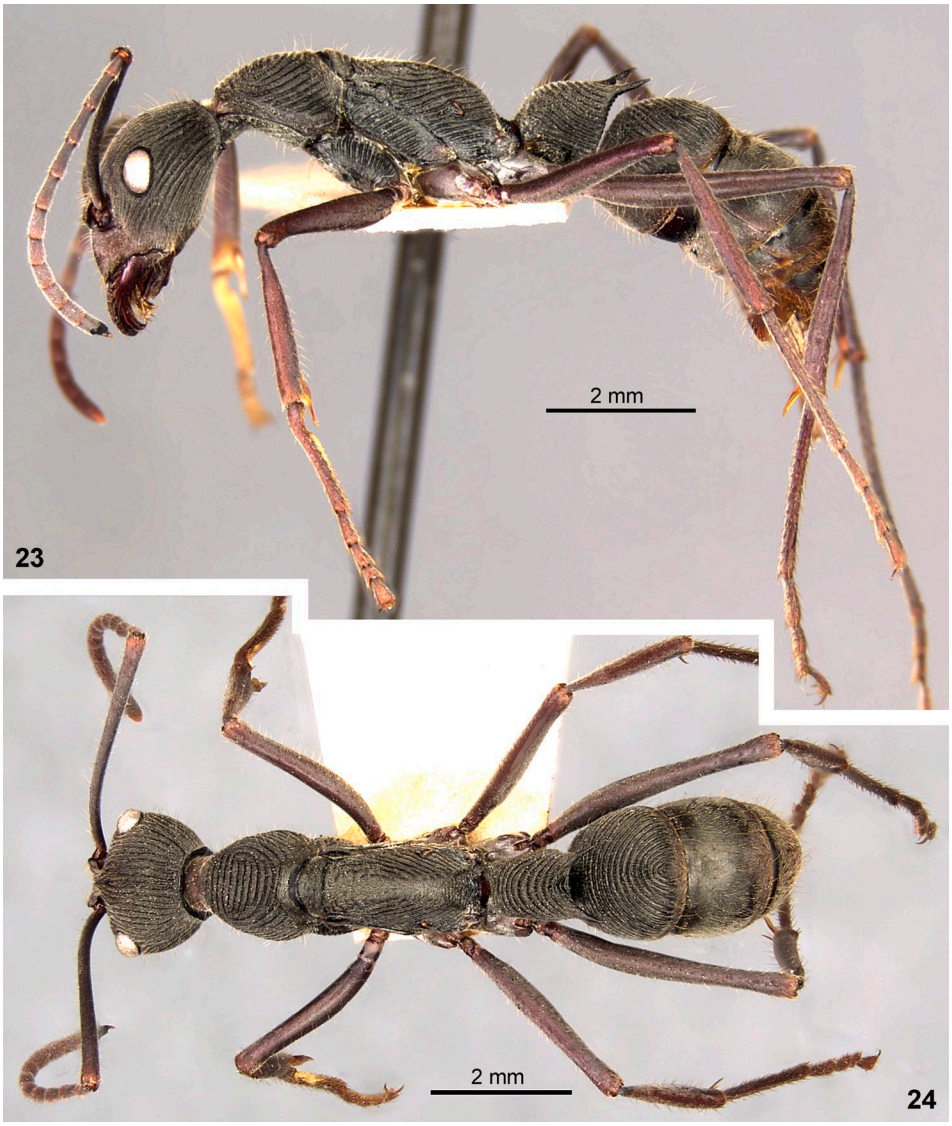
Diacamma rugosum geometricum: Emery 1897.

Diacamma tritschleri Forel, 1897 in Emery 1897: 151 (footnote); **syn.n.**

Diacamma geometricum: Santschi 1932.

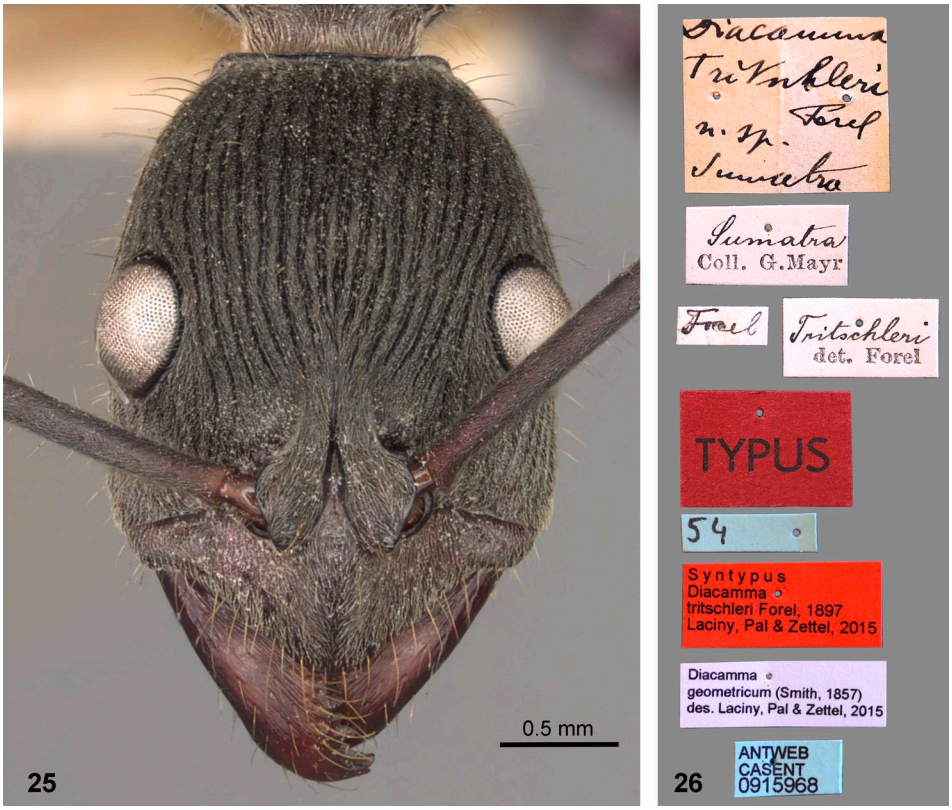
Diacamma rugosum: Wilson 1958 (syn.); Bolton 1995.

Type material examined: 1 worker (syntype of *D. tritschleri*, NHMW, CASENT0915968), "Diacamma \ Tritschleri \ Forel \ n. sp. \ Sumatra", "Forel", "Tritschleri \ det. Forel", "Sumatra \ Coll. G.Mayr", "Typus", "54", "Syntypus \ Diacamma \ tritschleri Forel, 1897 \ Laciny, Pal & Zettel 2015", " Diacamma \ geometricum (Smith, 1857) \ det. Laciny, Pal & Zettel 2015", „ANTWEB \



Figs. 23–24: *Diacamma geometricum*, syntype worker of *D. tritschleri*. (23) Habitus, lateral. (24) Habitus, dorsal.

CASENT \ 0915968“ (Fig. 26); 1 worker (syntype *D. tritschleri*, NHMW, CASENT0915969), „Tritschleri \ det. Forel“, „Sumatra \ Coll. G.Mayr“, „Diacamma\ Tritschleri \ Forel \ Sumatra“, „For.“, „55“, „Syntypus \ Diacamma \ tritschleri Forel, 1897 \ Laciny, Pal & Zettel 2015“, „ Diacamma \ geometricum (Smith, 1857) \ det. Laciny, Pal & Zettel 2015“, ANTWEB \ CASENT \ 0915969“; 1 worker (syntype of *D. tritschleri*, MCSN, CASENT0903864), „Diacamma Tritschleri \ Forel“, „Typus“, „Kali \ Sumatra \ Bedot“, „Syntypus \ Diacamma \ tritschleri Forel, 1897 \ Laciny, Pal & Zettel 2015“, „ Diacamma \ geometricum (Smith, 1857) \ det. Laciny, Pal & Zettel 2015“, „ANTWEB \



Figs. 25–26: *Diacamma geometricum*, syntype worker of *D. tritschleri*. (25) Head, frontal. (26) Labels.

CASENT \ 0903864"; 1 worker (syntype of *D. tritschleri*, MCSN), „Sumatra \ D. Forel \ 1888", „Diacamma \ Tritschleri ☿ Forel \ n.sp \ in litt \ Sumatra", „Syntypus \ Diacamma \ tritschleri Forel, 1897 \ Laciny, Pal & Zettel 2015", „Diacamma \ geometricum (Smith, 1857) \ det. Laciny, Pal & Zettel 2015". 1 worker (syntype of *D. tritschleri*, MCSN), „Sumatra \ Indrapura \ Forel", „Typus", „Syntypus \ Diacamma \ tritschleri Forel, 1897 \ Laciny, Pal & Zettel 2015", „Diacamma \ geometricum (Smith, 1857) \ det. Laciny, Pal & Zettel 2015".

Non-type material examined: 4 workers (CZW), Singapore, McRitchie Reservoir, reserve area, 23.X.2003, leg. H. Zettel (#SG1); 1 worker (CZW), West Malaysia, Kelantan, 60 km NE Tanah Rata, Tanah Kerajaan, 1000 m a.s.l., 12–30.IV.2007, leg. P. Cechovský.

Illustrations examined: Holotype of *Ponera geometrica* (worker, OXUM), CASENT0901342, Antweb (2015); 3 syntypes of *D. tritschleri* (workers), CASENT0900670 (BMNH), CASENT0903864 (MCSN), and CASENT0907218 (MHNG), Antweb (2015).

Diagnosis: Large species (TL 12.8–13.8 mm). Trunk black, without metallic shimmer. Clypeus, mandibles, apex of gaster, and legs dark brown. Trunk strongly striate from genae to gaster tergite 1. Posterior of head (Fig. 25) longitudinally striate until truncated hind margin; margin narrow. Eyes large, protruding. Clypeus very densely punctured. Mandible with fine striation, in some specimens obliterate. Pronotum transversely-elliptically striate (Fig. 24). Propodeum without distinct ridges separating posterior from lateral faces. Petiole (Figs. 23, 24) stout, node anteriorly rounded, its teeth very long and

far apart; subpetiolar process shallowly concave, anterior and posterior corner weakly protruding. Gaster tergite 1 with concentric rugae.

Description: Measurements of syntypes (n = 2): TL 13.30, 13.63; HW 2.35; HL 3.03, 3.07; EL 0.70, 0.71; SL 3.72, 3.68; PH 1.89, 1.87; PL 1.26, 1.24; PW 1.13, 1.15; SpD 1.19, 1.24; SpL 0.64, 0.60; WL 4.70; MTL 2.84, 2.80. Indices: CI 77; SI 158, 157; PI 67, 66; SpDI 107, 109; SpLI 58, 53; EI 29, 30. Measurements of non-type material (n = 5): TL 12.78–13.76; HW 2.12–2.25; HL 2.80–3.03; EL 0.64–0.71; SL 3.55–3.72; PH 1.83–2.04; PL 1.20–1.35; PW 1.28–1.39; SpD 1.09–1.33; SpL 0.59–0.71; WL 4.43–4.73; MTL 2.84–3.00. Indices: CI 73–76; SI 162–169; PI 63–67; SpDI 86–105; SpLI 46–55; EI 28–31.

Structures: Head (Fig. 25) moderately elongate; in front of eyes sides subparallel, behind eyes moderately curved towards relatively wide hind margin. Eyes relatively large and protruding. Very coarse rugae present from genae to gaster tergite 1. Posterior of eyes longitudinal rugae reaching occipital margin that ends in small, blunt teeth (Fig. 23). Clypeus (Fig. 25) entirely covered with very dense puncturation, medially approximately rectangularly protruded; tip often slightly rounded. Mandibles with coarse punctures and more or less strongly developed striation. Pronotum (Fig. 24) with transverse-elliptical rugae. Rugae on mesopleura and propodeum sides more or less oblique (Fig. 23). Posterior face and lateral faces of propodeum not separated by ridges, ventrally with blunt edge. Petiole (Figs. 23, 24) appearing moderately stout in dorsal aspect, its sides anteriorly converging; spines very long and distant; subpetiolar process shallowly concave, laterally carinate, anterior and posterior corners weakly protruding, posterior one varying from obtuse to slightly acute; ventral outline with short, dense pilosity. Gaster tergite 1 (Figs. 23, 24) with coarse, concentric, semi-circular or semi-elliptical rugae; along posterior margin coarsely punctured. Gaster tergite 2 (Figs. 23, 24) with very fine and dense puncturation, slightly shiny.

Pilosity (Fig. 23): Standing setae on trunk long and numerous, on mesosoma shorter than on head and gaster. Short appressed pilosity almost uniformly developed, relatively dense, but thin; only on hind margin of pronotum, on mesonotum and dorsum of propodeum more distinct. Standing setae on legs about as long as those on mesosoma, setae on scape short.

Colour (Fig. 23): Trunk black; clypeus in some specimens brown; on gaster posterior margins of tergites and apex pale brown. Antennae blackish. Mandibles and legs dark brown; forecoxa black; tarsi infuscated.

Notes: *Diacamma geometricum* is the first species of our study that belongs to the *D. rugosum* group in the broader sense, as do all the following species. Members of the *D. rugosum* group are relatively uniform in body structures; most of them have a very coarse striation of mesosoma and gaster, whereas striation on head and gaster tergite 1 is variable among species. Size is usually moderate to large, a metallic shimmer is present in many species. Pilosity and setiferation, the structures of the clypeus and petiole, and last but not least morphometry provide the best differential characteristics.

Diacamma geometricum has a peculiar petiole with long and distant teeth (SpLI 46–58, SpDI 86–107; Figs. 23, 24). It is difficult to place this species correctly in Emery's (1897) key (couplet 1), because the petiole appears longer due to its long teeth, whereas the node is not notably compressed. For this reason *D. geometricum* and *D. tritschleri*, here treated as synonyms, were differently placed in the key.

The holotype of *Ponera geometrica* originates from Singapore, is deposited in OXUM and illustrated in Antweb (2015) with specimen number CASENT0901342 as a synonym of *D.*

rugosum. During its history of changing status it was consecutively treated as a species close to, as a subspecies of, and finally as a synonym of *D. rugosum* (Wilson 1958, Bolton 1995). However, the illustrations in Antweb (2015) reveal its similarity with *D. tritschleri*.

Diacamma tritschleri was so far only known from the original description in a footnote by Forel (in Emery 1897). Terra typica is Sumatra, Indonesia. Antweb (2015) illustrates syntypes deposited in MHNG, MCSN, and BMNH. Three further syntypes are in MCSN and two more in the collection of NHMW, one of them is illustrated (Figs. 23–26).

We compared the type illustrations and syntypes of *D. tritschleri* with newly collected material from Singapore (type locality of *D. geometricum*) and West Malaysia. We came to the conclusion that *D. geometricum* and *D. tritschleri* should be treated as synonyms. There are, however, some noteworthy morphometric differences between the examined *D. tritschleri* syntypes from Sumatra and the remaining material: While they are of larger overall body-size, both measured syntype specimens possess shorter scapes (SI 157, 158 vs. 162–169) and middle tibiae as well as slightly narrower petioles than their conspecifics from Singapore and Malaysia.

All infraspecific taxa of *D. geometricum* are subsequently either valid species or synonyms of other taxa of the *D. rugosum* species group.

Distribution: West Malaysia, Singapore, Sumatra.

***Diacamma vagans* (Smith, 1860) sp.rev.** (Figs. 27–30)

Ponera vagans Smith, 1860: 103.

Diacamma vagans: Mayr 1862: 718.

Diacamma rugosum: Bolton 1995: 170 (and literature cited there; see notes below).

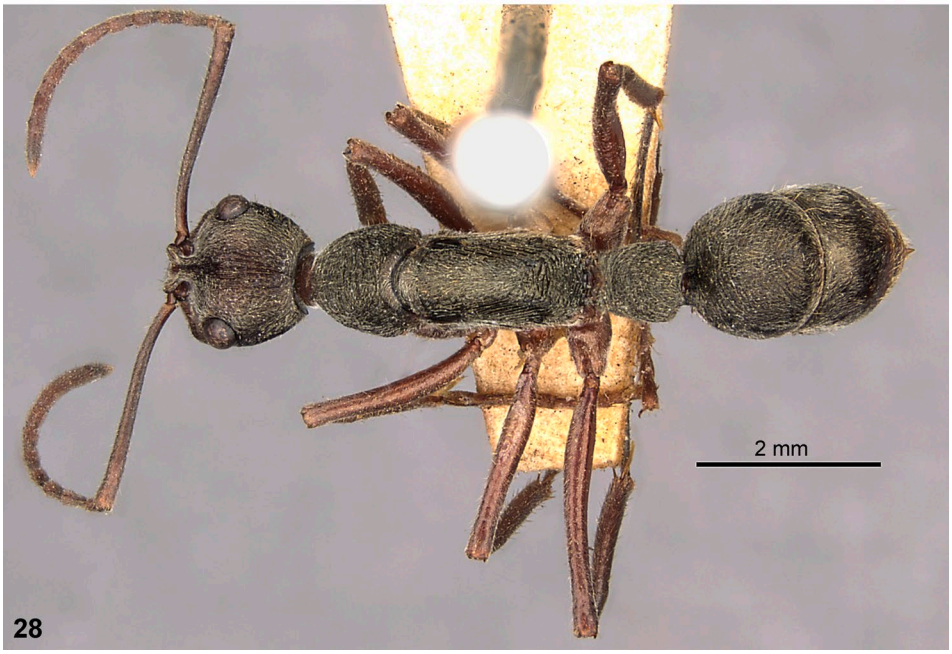
Type material examined: 1 worker (syntype, NHMW, CASENT0915957), "Ponera \ vagans Sm \ Batchian", "Collect. \ G.Mayr", "vagans \ det. G.Mayr", "45", "Syntypus \ Ponera \ vagans Smith, 1860 \ Laciny, Pal & Zettel 2015", "ANTWEB \ CASENT \ 0915957" (Fig. 30).

Illustrations examined: 1 worker (syntype, OXUM), CASENT0901344, Antweb (2015).

Diagnosis: Relatively small species (TL ca. 10 mm). Trunk black, without metallic shimmer. Anterior part of head, larger part of gaster, mandibles, antennae, and legs pale to dark brown. Standing setae of moderate number and short; short pilosity dense, on dorsum partly obscuring surface sculpture. Striation relatively fine on dorsum of head (Fig. 29) and gaster tergite 1 (Fig. 28), coarse on head below eye, pronotum, propodeum, and petiole (Fig. 27). Posterior of head longitudinally striate until narrow hind margin. Eyes large, protruding (Fig. 29). Clypeus densely punctured, apex obtuse. Mandible with some large punctures, and obliterate striation. Pronotum transversely-elliptically striate (Fig. 28). Propodeal striae almost horizontal, with fine ridges separating posterior from lateral faces (Fig. 27). Petiole (Figs. 27, 28) stout, node anteriorly rounded, its teeth short; subpetiolar process concave, anterior and posterior corner acute.

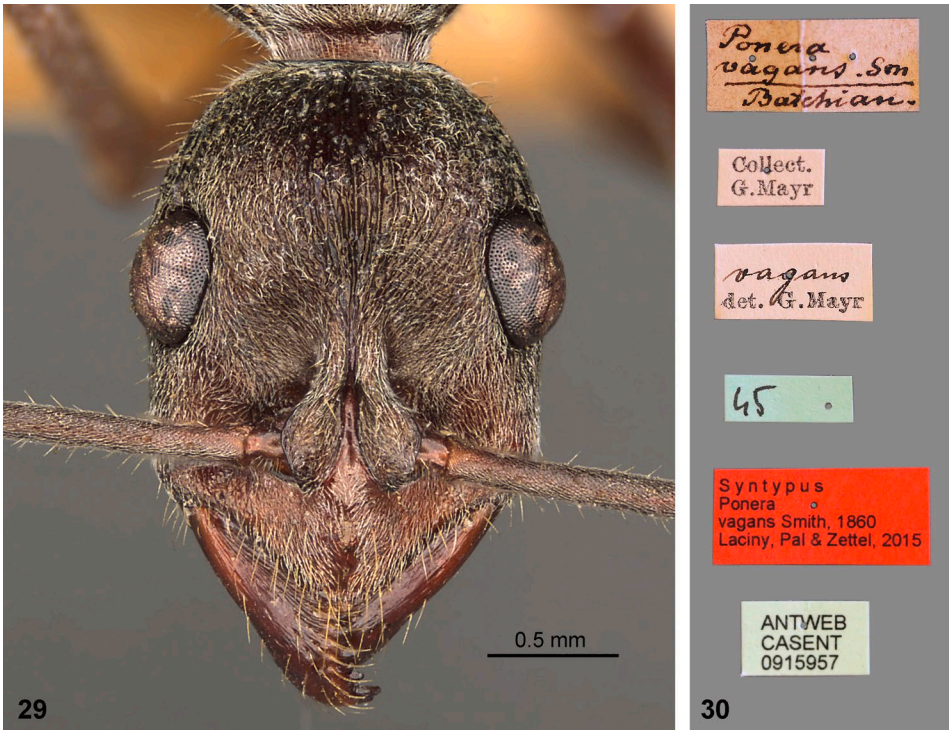
Description: Measurements of syntype (n = 1): TL 10.11; HW 1.78; HL 2.28; EL 0.58; SL 2.48; PH 1.38; PL 0.87; PW 0.93; SpD 0.44; SpL 0.23; WL 3.39; MTL 1.96. Indices: CI 78; SI 139; PI 63; SpDI 47; SpLI 25; EI 32.

Structures: Head (Fig. 29) elongate; sides strongly convex behind moderately large eyes. Rugae present from genae to gaster tergite 1, but very differently developed. Striation on head relatively fine, posterior of eyes longitudinal, reaching narrow occipital margin, on



Figs. 27–28: *Diacamma vagans*, syntype worker. (27) Habitus, lateral. (28) Habitus, dorsal.

genae weakly developed, strongest below eyes. On ventral side of head occipital margin ending in a small rectangular tooth (Fig. 27). Clypeus (Fig. 29) entirely punctured; apex of anterior margin narrowly rounded. Mandibles striate. Rugae on pronotum (Fig. 28) transverse-elliptical and with coarse, but less obvious because of narrow striation and dense pilosity. Rugae on mesosoma sides (Fig. 27) coarse, on pleural parts shallow and obscured by dense pilosity, dorsally on propodeum only slightly oblique. Carinae sepa-



Figs. 29–30: *Diacamma vagans*, syntype worker. (29) Head, frontal. (30) Labels.

rating posterior face of propodeum from sides only ventrally weakly developed. Petiole (Figs. 27, 28) stout, with coarse striae and rather short spines; subpetiolar process strongly concave and with dense, oblique, rather long pilosity in lateral aspect; both anterior and posterior tooth strongly developed and acute. Striation on gaster tergite 1 (Figs. 27, 28) concentric, semi-circular, much finer than on mesosoma; a broad stripe along posterior margin of tergite 1 and the following tergites finely, but densely punctured, matt.

Pilosity (Fig. 27): Standing setae on entire body including scape and legs short, except for a few long setae on clypeus and venter of head; those on petiole and gaster slightly longer than those on mesosoma. Short appressed pilosity dense, scarcer on sides of pronotum and weakly developed on sides of propodeum.

Colour (Fig. 27): Trunk black, without metallic shimmer. Anterior part of head, venter and apex of gaster, posterior margins of gaster tergites 2–4, mandibles, antennae, and legs pale to dark brown.

Notes: Smith (1860) described *Ponera vagans* from Bachian (Bacan Island, Moluccas, Indonesia). Two years later Mayr (1862) based the description of the genus *Diacamma* – among others – on the examined specimen and noted that he had received a specimen from F. Smith. We therefore consider this specimen in NHMW as a syntype of *D. vagans*. Antweb (2015) illustrates the "holotype" of *D. vagans* (specimen number CASENT0901344) which is deposited in the Museum Oxford. The two specimens show great similarity regarding their morphological characters. Morphometric analysis of the

syntype and comparison with the illustrations provided by Antweb (2015) revealed that both specimens are of similar size (ca. 10 mm) and possess the same characteristic large eyes (EI > 30) and short petiolar spines (SpLI ca. 25).

The name *vagans* has a long history as synonym or infraspecific taxon of *D. rugosum*, or as a valid species (see Bolton 1995). It is not our aim at this time to fully clarify all synonymies of *D. rugosum* and *D. vagans*, but we can resolve the Moluccan *D. vagans* from synonymy with the Sunda-Land species *D. rugosum*. *Diacamma vagans* is a species with relatively delicate rugosity on the dorsum of the head, whereas the head of *D. rugosum* bears coarse rugae. There is also a big difference in eye size (EI ca. 27 in syntype specimen of *D. rugosum*, CASENT0913723, collected on Borneo deposited in MNHN Paris, illustrated by Antweb 2015). We have studied specimens from Borneo that are similar to the type, but slightly differ in sculpture. Therefore we presently do not give a morphological interpretation of *D. rugosum* s.str. yet.

Distribution: Moluccas: Bacan Island. Other records from literature probably refer to different species.

Diacamma baguiense Wheeler & Chapman, 1925 (Figs. 31–34)

Diacamma baguiensis Wheeler & Chapman, 1925: 66, pl. 2: figs. 11, 12.

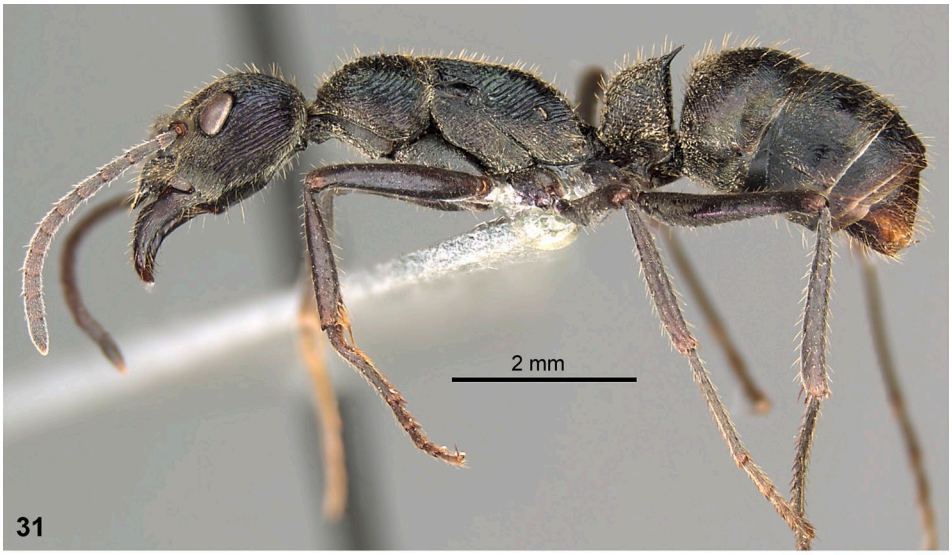
Diacamma baguiense: Bolton 1995: 169; General & Alpert 2012: 101; Schmidt & Shattuck 2014: 190.

Type material examined: 1 worker (syntype, MCSN), "Diacamma \ baguiense \ Wh. + Ch. \ det. W.L. Brown", "Bagui'o, P.I. \ X/24 \ J.W. Chapman", "MUSEO GENOVA \ coll. C. Emery \ dono 1925", "173", "Syntypus \ Diacamma \ baguiense Wheeler \ & Chapman, 1925 \ Laciny, Pal & Zettel 2015".

Non-type material examined: all from Philippines, Luzon Island: 7 workers (NHMW, all in ethanol), Benguet Prov., S of Baguio, Kennon Road-km 31, Bridal Falls, 16.II.1999, leg. S. Schödl (#8); 1 worker (NHMW), Benguet, Baguio, Botanical Garden, 16.II.1999, leg. S. Schödl (#10); 18 workers with gemmae (NHMW, 11 in ethanol), Benguet, Baguio, pine forest, 18.II.1999, leg. S. Schödl (#13); 13 workers with gemmae (CZW, PNMM), Benguet, Baguio, 2 km below Camp John Hay, 18.II.1999, leg. H. Zettel (#181); 7 workers (NHMW, 3 in ethanol), Mountain Province, Sagada, near Bokong Waterfalls, 1400 m a.s.l., 19.II.1999, leg. S. Schödl (#14); 12 workers (NHMW, 5 in ethanol), Mountain Province, between Sagada and Mt. Ampacao, 1500–1900 m a.s.l., 20.II.1999, leg. S. Schödl (#15), 7 workers (1 with gemmae) (CZW), same locality and date, leg. H. Zettel (#183); 1 worker (NHMW), Mountain Province, Gonogon, at Chico River, 1100 m a.s.l., 21.II.1999, leg. S. Schödl (#18); 2 workers (NHMW), Mountain Province, NE Sagada, Banga'an, at Bomod-ok Waterfalls, 22.II.1999, leg. S. Schödl (#19); 4 workers (CZW), same area, barangay Agid, Bomod-ok falls, 19.IV.2015, leg. C. V. Pangantihon (#P526); 2 workers (NHMW), Mountain Province, NE Sagada, Banga'an, 22.II.1999, leg. S. Schödl (#20); 8 workers (NHMW), Mountain Province, Sagada, Echo Valley, Underground River, 23–24.II.1999, 1500 m a.s.l. , leg. S. Schödl (#21); 1 worker (CZW), same locality and date, leg. H. Zettel (#186); 3 workers (NHMW, incl. CASENT0915967, 1 in ethanol), Mountain Province, S Sagada, Bagnen, slopes of Mt. Polis, 1500–1700 m a.s.l., 26.II.1999, leg. S. Schödl (#23); 1 worker (CZW), same locality and date, leg. H. Zettel (#189); 2 workers (CZW), Pampanga, Arayat, Mt. Arayat, 19–20.IV.2014, leg. C. V. Pangantihon (#P506).

Illustrations examined: 1 non-type worker identified by W.M. Wheeler (MCZ, MCZ-ENT 574318).

Diagnosis: Relatively small species (TL 9.8–11.6 mm). Trunk black, without or with weak metallic shimmer. Long setae abundant, on petiole and gaster slightly longer than



Figs. 31–32: *Diacamma baguiense*, non-type worker. (31) Habitus, lateral. (32) Habitus, dorsal.

on mesosoma; fine pilosity abundant. Trunk striate from genae to gaster tergite 1, but striae weakly developed in front of eyes. Head (Fig. 33) elongated; sides posteriorly of eyes strongly convex. Posterior of head longitudinally striate until narrowly truncated hind margin; narrow margin ventrally terminating in short, acute teeth (Fig. 31). Eyes moderately large, hardly surpassing lateral outline of head. Clypeus (Fig. 33) entirely punctured, but punctures more sparse at apex; apex projecting, acute or very narrowly

Figs. 33–34: *Diacamma baguiense*, non-type worker. (33) Head, frontal. (34) Labels.

rounded. Mandible with fine striation, in some specimens obliterate. Pronotum (Fig. 32) with coarse striation, striae transversely concentrical. Coarse striation on propodeum hardly oblique (Fig. 31). Petiole (Figs. 31, 32) stout, its teeth relatively short; subpetiolar process concave between acute anterior and posterior corners. Gaster tergite 1 (Figs. 31, 32) with semi-circular striation; striae finer than those on pronotum and propodeum, semi-elliptically arranged.

Description: Measurements of syntype: TL 9.85; HW 1.79; HL 2.40; EL 0.60; SL 2.58; PH n.a.; PL 0.83; PW 0.91; SpD 0.47; SpL 0.29; WL 3.46; MTL 2.05. Indices: CI 75; SI 144; PI n.a.; SpDI 53; SpLI 33; EI 33. Measurements of non-type material (n = 14): TL 9.85–11.54; HW 1.73–1.89; HL 2.32–2.54; EL 0.54–0.60; SL 2.41–2.70; PH 1.37–1.61; PL 0.78–0.93; PW 0.89–1.07; SpD 0.33–0.55; SpL 0.28–0.38; WL 3.33–3.72; MTL 1.86–2.09. Indices: CI 72–77; SI 135–145; PI 56–63; SpDI 36–55; SpLI 29–40; EI 30–33.

Structures: Head (Fig. 33) elongate; sides strongly convex behind moderately large eyes. Rugae present from genae to gaster tergite 1, but differently developed. Posterior of eyes, coarse longitudinal rugae reaching narrow occipital margin. Striation on genae weakly developed. On ventral side of head occipital margin ending in a small blunt tooth (Fig. 31). Clypeus (Fig. 33) entirely punctured, but shiny, especially anteriorly where the fine punctures are more dispersed; apex of anterior margin sharp or (rarely) narrowly rounded. Mandibles usually with fine striation, rarely more or less reduced. Pronotum (Fig. 32) with coarse transverse-elliptical rugae. Rugae on mesosoma sides (Fig. 31) coarse, moderately shiny and slightly oblique dorsally, evanescent below dense pale pilosity on pleural parts. In lateral aspect dorsal outline of propodeum evenly downcurved; posterior face of propodeum not separated from sides by carinae, or such carinae only ventrally. Petiole (Figs. 31, 32) stout, with coarse striae and rather short spines; subpetiolar process

moderately concave, anterior and posterior tooth acute. Gaster tergite 1 with distinct striation arranged in transverse-concentric, semi-elliptical rugae which are finer than those on mesosoma; along posterior margin densely punctured. Gaster tergite 2 (Figs. 31, 32) with very fine microsculpture, shiny.

Pilosity (Fig. 31): Trunk with numerous, rather short standing setae; those on petiole and gaster slightly longer than those on mesosoma. Short appressed pilosity abundant, scarcer on pronotum and sides of propodeum. Setae on scape clearly, those on legs slightly shorter than those on mesosoma.

Colour (Fig. 31): Trunk black, but a weak bronze or violet-coloured metallic shimmer often recognizable; very rarely the shimmer is dark bluish. Margins of gaster tergites and apex often brownish to reddish. In few specimens clypeus reddish or brown. Mandibles, antennae, and legs variable, from dark reddish brown to black.

Notes: *Diacamma baguiense* can be distinguished from Philippine congeners (described and undescribed) by the combination of moderate body size (TL 9.8–11.5), moderate eye size (EI 30–33), reduction of the longitudinal carinae of the propodeum, and distinct, but delicate striation of gaster tergite 1 (Fig. 32). We observed a strong intraspecific variability in the petiolar spine distance (SpDI 36–55) and length (SpLI 29–40). Trunk colour is black, but a weak bronze or violet-coloured shimmer is frequently present.

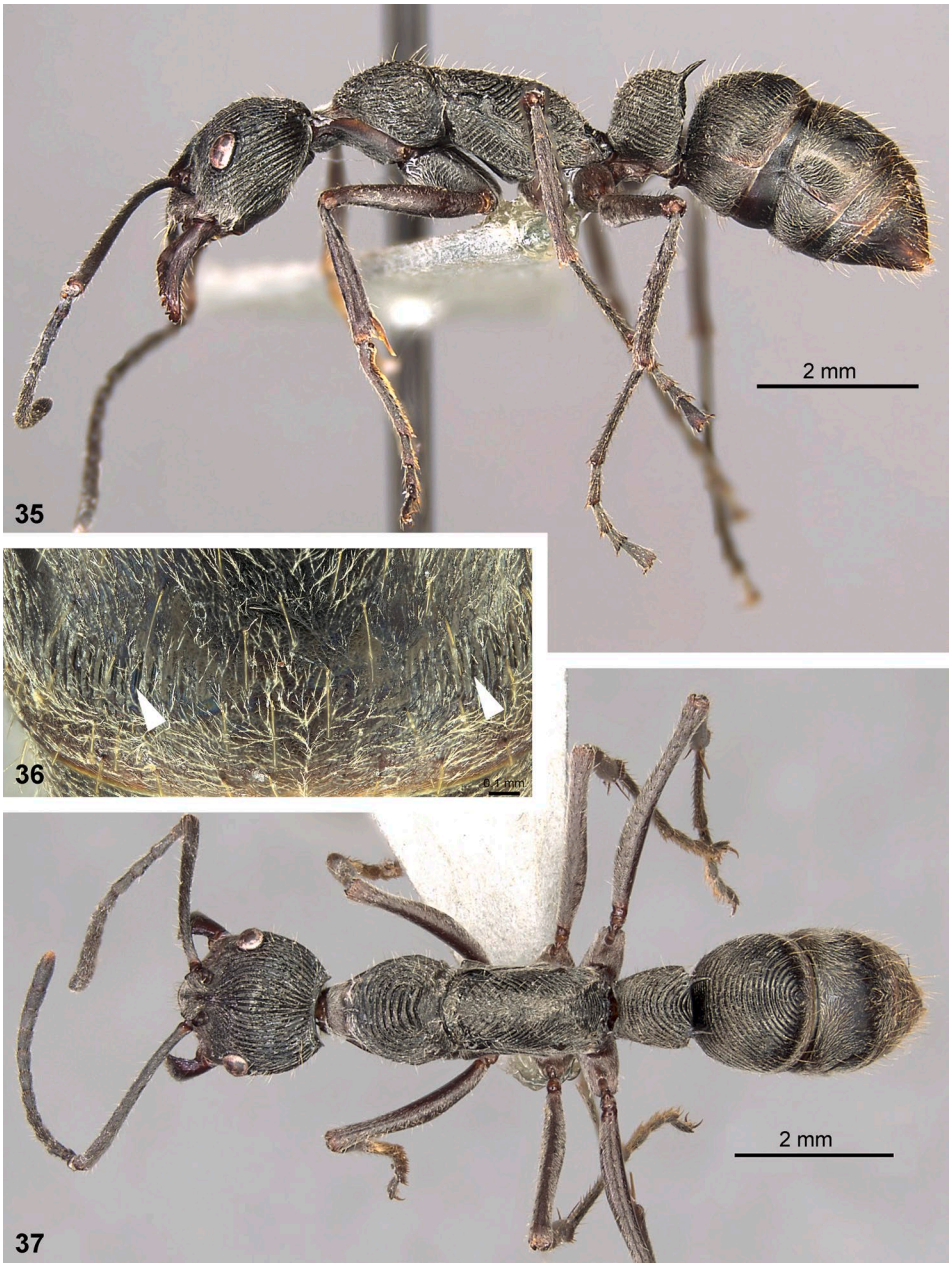
Notably, in contrast to other species many specimens of *D. baguiense* (ca. 36 % of material examined) possess intact gemmae. Cournault & Peeters (2012) observed a similar phenomenon in a hitherto undescribed Indian species of *Diacamma* closely related to *D. ceylonense* Emery, 1897. As a possible explanation a change in gemmal pheromones was postulated which may have led to a switch from mutilation to aggression-mediated monogyny in the respective colonies.

Distribution: This species was described from Baguio City (Benguet, northern Luzon, Philippines) and not recorded since. It was commonly collected by Stefan Schödl and the senior author in the mountains of Benguet and Mountain Province in the Cordillera Central, northern Luzon. In addition there is an isolated record from Mount Arayat, a volcano in Pampanga. These two workers possess slightly shorter petiolar spines (SpL 0.28 vs. 0.31–0.38) but otherwise agree well with the other populations. No records are known from other parts of Luzon.

***Diacamma brevistriatum* sp.n.** (Figs. 35–39)

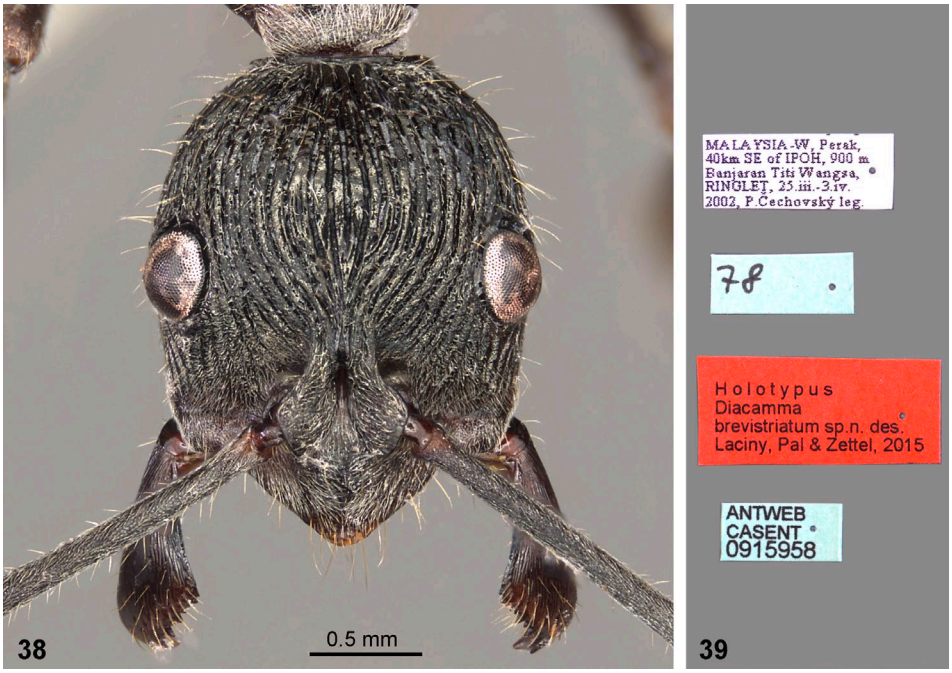
Etymology: This species is named for the characteristic patches of short striae on gaster tergite 2.

Type material: All specimens from West Malaysia: Holotype (worker, NHMW, CASENT 0915958), Perak, Cameron Highland, 40 km SE of Ipoh, Banjaran Titi Wangsa, Ringlet, 900 m a.s.l., 25.III.–3.IV.2002, leg. P. Cechovský. Paratypes: 28 workers (NHMW), same locality data; 18 workers (NHMW), same locality, 25.IV.–5.V.2001, leg. P. Cechovský; 1 worker (NHMW), Perak, Cameron Highland, 25 km NE of Ipoh, Banjaran Titi Wangsa mountains, Korbu mountain, 1200 m a.s.l., 27.I.–2.II.1999, leg. P. Cechovský; 1 worker (CZW), Selangor, N Kuala Lumpur, Ulu Gombak, 16.II.1993, leg. H. Zettel (#1); 5 workers (CZW), Kelantan, 30 km NW of Gua Musang, Ulu Lalat, Kampong Sungai Om, 800–1000 m a.s.l., 21.VI.–14.VII.2010, leg. P. Cechovský; 1 worker (CZW), same locality, 22.V.–14.VI.2012, leg. P. Cechovský; 2 workers (CZW), Pahang, 50 km NE of Kuala Rompin, Endau Rompin N.P., Gunung Kerung, Kampong Tebu Hitam, 400 m a.s.l., 9–30.IV.2008, leg. P. Cechovský; 2 workers (NHMW), Pahang, 30 km SE of Ipoh, Banjaran Titi Wangsa, Tanah Rata, 1500 m a.s.l., 14–15.III.2002, leg. P. Cechovský.



Figs. 35–37: *Diacamma brevistriatum* sp.n., holotype worker. (35) Habitus, lateral. (36) Gaster tergite 2, dorsal; arrows point to short striation. (37) Habitus, dorsal.

D i a g n o s i s : Relatively small species (TL 10.0–11.8 mm). Trunk black, without metallic shimmer. Standing setae relatively short. Trunk coarsely striate from genae to gaster tergite 1. Head (Fig. 38) short; sides posteriorly of eye strongly convex. Posterior of head



Figs. 38–39: *Diacamma brevistriatum* sp.n., holotype worker. (38) Head, frontal. (39) Labels.

longitudinally striate until narrowly truncated hind margin; striae deeply engraved between flat ridges; hind margin narrow, its ends almost flat, forming small, blunt angles (Fig. 35). Eyes relatively small, but slightly surpassing lateral outline of head. Clypeus (Fig. 38) entirely punctured, rectangularly projecting, at apex slightly depressed, its tip rounded. Mandible with fine striation. Entire mesosoma with coarse striation. Striae on pronotum disc arranged concentrically, those in centre transverse (Fig. 37). Striation on mesopleura and propodeum sides strongly oblique (Fig. 35). Petiole (Figs. 35, 37) stout, its teeth moderately long, relatively distant; subpetiolar process shallowly concave, anterior corner acute, posterior corner weakly protruding, obtuse or slightly acute. Gaster tergite 1 (Figs. 35, 37) with coarse semi-circular striation. Gaster tergite 2 with paired groups of longitudinal striae behind middle (Fig. 36).

Description: Measurements of holotype: TL 11.80; HW 2.01; HL 2.51; EL 0.54; SL 2.74; PH 1.63; PL 1.00; PW 1.11; SpD 0.72; SpL 0.44; WL 3.85; MTL 2.15. Indices: CI 80; SI 137; PI 61; SpDI 66; SpLI 40; EI 26. Measurements of paratypes (n = 11): TL 9.98–11.74; HW 1.88–2.09; HL 2.36–2.59; EL 0.49–0.56; SL 2.48–2.77; PH 1.43–1.67; PL 0.87–1.04; PW 1.04–1.15; SpD 0.71–0.81; SpL 0.38–0.47; WL 3.46–3.85; MTL 1.92–2.15. Indices: CI 78–83; SI 130–137; PI 58–63; SpDI 65–73; SpLI 35–43; EI 25–28.

Structures: Head (Fig. 38) relatively short; sides strongly convex behind eyes. Relatively coarse rugae present from genae to gaster tergite 1. Longitudinal striae posteriorly of eyes deeply engraved between flat ridges, reaching the narrowly truncated hind margin. Hind margin narrow, its ventral ends almost flat, forming very small, blunt angles (Fig. 35). Clypeus (Fig. 38) entirely, finely punctured, shiny, strongly protruding into an

approximately rectangular, sharp apex; just behind tip shallowly impressed; tip narrowly rounded. Mandible with some strong punctures and with fine striation. Striation on mesosoma, including sides, very coarse. Pronotum (Fig. 37) concentrically striate, in most specimens with some short, transverse rugae in centre. Rugae on mesosoma sides strongly oblique (Fig. 35). Posterior face of propodeum separated from sides by distinct carinae. Petiole (Figs. 35, 37) very stout, its teeth moderately long and relatively distant; subpetiolar process with shallowly concave ventral outline bearing short pilosity; anterior corner acute, posterior corner weakly protruding, rather variable from obtuse to slightly acute; in ventral aspect with paired lateral carinae (in some specimens reduced posteriorly), without or with indistinct median carina. Gaster tergite 1 (Figs. 35, 37) with very coarse, semi-circular rugae, along posterior margin densely punctured. Gaster tergite 2 shiny, with very fine microsculpture and with distinct paired groups of short longitudinal striae on disc behind middle (Fig. 36). In one specimen a similar, but weaker striation also present on gaster tergite 3.

Pilosity (Figs. 35, 37): Trunk and legs with numerous, relatively short standing setae; those on petiole and gaster longer than those on mesosoma; setae on scape very short. Short appressed pilosity weakly developed, but denser on head in front of eyes, mesonotum, dorsal face of propodeum, posterior margins of pronotum and gaster tergite 1, and on the other gastral tergites.

Colour (Figs. 35, 37): Trunk black, without metallic shimmer, but shiny. Very narrow hind margins of gaster tergites and sternites yellowish brown. Mandibles and legs (except for black fore coxae) dark reddish brown or blackish. Clypeus and antennae varying in colour from black to dark reddish brown.

Notes: In most characters this strongly rugose species is similar to many other species of the *D. rugosum* complex. The most peculiar and diagnostic character of *D. brevistriatum* sp.n. is found on gaster tergite 2 which bears a pair of patches with short striae. In *D.* (*rugosa*) *sculpturatum* Smith, 1857 from Aru Island, there is a continuous striation of tergite 2, similar to *D. ceylonense*, and some reduced striae on tergite 3 (see illustration of the holotype in Antweb 2015). In *D. holzschuhi* sp.n. from Laos a striation on tergite 2 rarely occurs as an individual aberration, but this species differs from *D. brevistriatum* sp.n. by short petiolar spines (SpLI 29–34 vs. 35–43) and a differently shaped and strongly hirsute subpetiolar process. *Diacamma brevistriatum* sp.n. is only recorded from montane areas in West Malaysia.

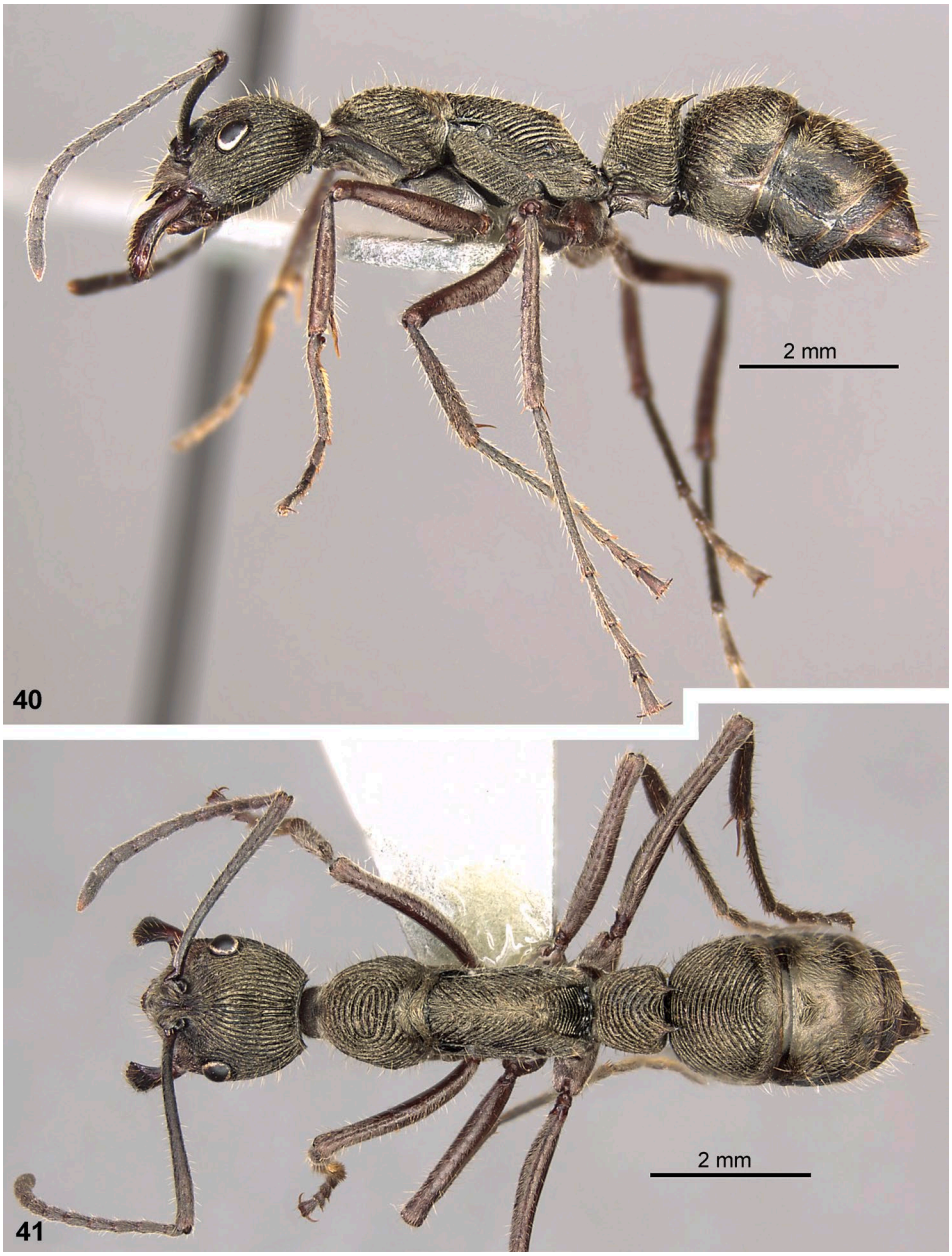
Distribution: West Malaysia: Kelantan, Pahang, Perak, Selangor.

***Diacamma holzschuhi* sp.n.** (Figs. 40–43)

Etymology: Kindly dedicated to Dr. Carolus Holzschuh who provided the specimens.

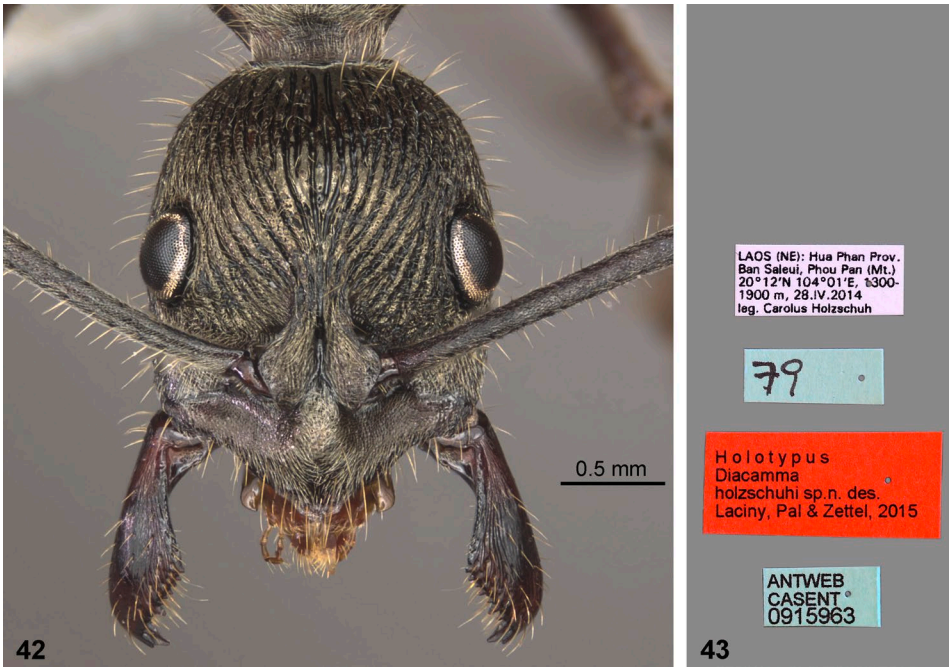
Type material: Holotype (worker, NHMW, CASENT0915963), north-eastern Laos, Hua Phan Province, Ban Saleui, Phou Pan Mountains, 1300–1900 m a.s.l., N 20°12', E 104°01', 28.IV.2014, leg. Carolus Holzschuh. Paratypes: 23 workers (CZW, NHMW), same locality, with different collecting dates, 8–30.IV.2015, leg. Carolus Holzschuh.

Diagnosis: Relatively small species (TL 10.5–11.7 mm). Trunk black, without metallic shimmer. Mandibles and legs dark brown to black. Long setae abundant; fine pilosity sparse. Trunk coarsely striate from genae to gaster tergite 1. Head (Fig. 42) short, sides posteriorly of eye strongly convex. Posterior of head longitudinally striate until narrowly truncated hind margin; narrow margin ventrally terminating in short, acute teeth (Fig. 40).



Figs. 40–41: *Diacamma holzschuhi* sp.n., holotype worker. (40) Habitus, lateral. (41) Habitus, dorsal.

Eyes moderately large. Clypeus (Fig. 42) entirely punctured, apex acute. Mandible with some strong punctures and with fine striation, in some specimens obliterate. Pronotum (Fig. 41) concentrically striate, but with some short transverse rugae in centre. Striation on propodeum oblique (Fig. 40). Petiole (Figs. 40, 41) very stout, its teeth moderately long;



Figs. 42–43: *Diacamma holzschuhi* sp.n., holotype worker. (42) Head, frontal. (43) Labels.

subpetiolar process shallowly concave between acute anterior and posterior corners. Gaster tergite 1 (Figs. 40, 41) with semi-circular striation.

Description: Measurements of holotype: TL 11.61; HW 1.99; HL 2.51; EL 0.52; SL 2.80; PH 1.54; PL 1.02; PW 1.18; SpD 0.49; SpL 0.37; WL 3.88; MTL 2.18. Indices: CI 79; SI 141; PI 66; SpDI 42; SpLI 32; EI 26. Measurements of paratypes (n = 10): TL 10.50–11.74; HW 1.89–2.09; HL 2.41–2.67; EL 0.50–0.57; SL 2.64–2.90; PH 1.46–1.61; PL 0.91–1.04; PW 1.10–1.26; SpD 0.46–0.59; SpL 0.31–0.40; WL 3.59–4.04; MTL 2.04–2.28. Indices: CI 78–84; SI 133–140; PI 61–66; SpDI 42–49; SpLI 29–34; EI 26–27.

Structures: Head (Fig. 42) relatively short; sides strongly convex behind moderately large eyes. Coarse rugae present from genae to gaster tergite 1. Posterior of eyes, longitudinal rugae reaching very narrow occipital margin. On ventral side of head occipital margin ending in a small, but sharp tooth (Fig. 40). Clypeus (Fig. 42) entirely punctured, but shiny, strongly protruded into an approximately rectangular, sharp apex. Mandible with some strong punctures and with fine striation, in some specimens obliterate. Pronotum (Fig. 41) concentrically striate, with some short, transverse rugae in centre. Rugae on mesosoma sides oblique (Fig. 40). Posterior face of propodeum separated from sides by distinct carinae. Petiole (Figs. 40, 41) very stout, its teeth moderately long, with pronounced concavity between them; subpetiolar process with shallowly concave, densely pilose outline, in ventral aspect with paired medial carinae and short lateral carinae anteriorly, anterior and posterior corners acute. Gaster tergite 1 (Figs. 40, 41) with coarse, transverse-concentric, semi-elliptical rugae; along posterior margin densely punctured. Gaster tergite 2 (Figs. 40, 41) shiny, with very fine microsculpture that is reduced on disc in a few specimens; with delicate traces of a short longitudinal striation on sides of disc in two specimens.

Pilosity (Fig. 40): Trunk and legs with numerous, long setae; standing setae on scape slightly shorter. Short appressed pilosity weakly developed, but denser on clypeus, mesonotum, meso- and metapleura, dorsal face of propodeum, posterior margins of pronotum and gaster tergite 1, and the other gastral tergites.

Colour (Fig. 40): Trunk black, without metallic shimmer, but shiny. Very narrow hind-margins of gaster tergites and sternites yellowish brown. Mandibles and legs (except for black fore coxae) dark reddish brown or blackish.

Notes: *Diacamma holzschuhi* sp.n. is a coarsely sculptured species of the *D. rugosum* species group. Within this group it can be recognized by the combination of absence of metallic lustre, short head (CI = 78–84), oblique rugae on the propodeum sides, and coarse, concentric rugae on gaster tergite 1. The eyes are relatively small, the head sides behind eyes shortly convex, and the occipital margin ends in a distinct tooth. The following character information was taken from the original description by Santschi (1932) and from type illustrations in Antweb (2015): Superficially similar taxa from the area like *D.* "*geometricum*" var. *longiceps* Santschi, 1932 from northern Vietnam and *D.* "*rugosum*" var. *anceps* Matsumura & Uchida, 1926 from southern China (Hong Kong) and other areas differ considerably by long heads, large eyes, and horizontal rugae on the propodeum sides. *Diacamma* "*ceylonense*" var. *orbiculatum* Santschi, 1932 from Laos (which is not closely related to *D. ceylonense*!), has a relatively short head and slightly oblique rugae on propodeum sides, but differs in the rugae on pronotum that are strictly concentrical around a point, by semi-elliptical rugae (longitudinally directed) on gaster tergite 1, and by dense pilosity.

Distribution: Northeastern Laos.

Diacamma viridipurpureum Emery, 1893 stat.n.

Diacamma viridipurpureum viridipurpureum Emery, 1893 (Figs. 44–47, 56, 62, 63)

? *Ponera versicolor* Smith, 1857: 65 (in part: Philippine specimens).

Diacamma rugosum (nec Le Guillou, 1842): Mayr 1862: 718 (partim).

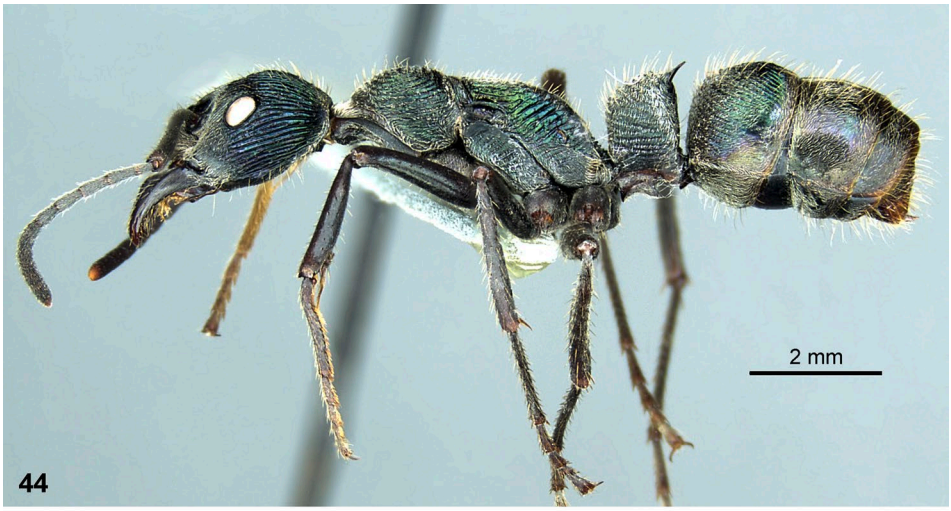
Diacamma geometricum var. *viridipurpureum* Emery, 1893: 261 (partim).

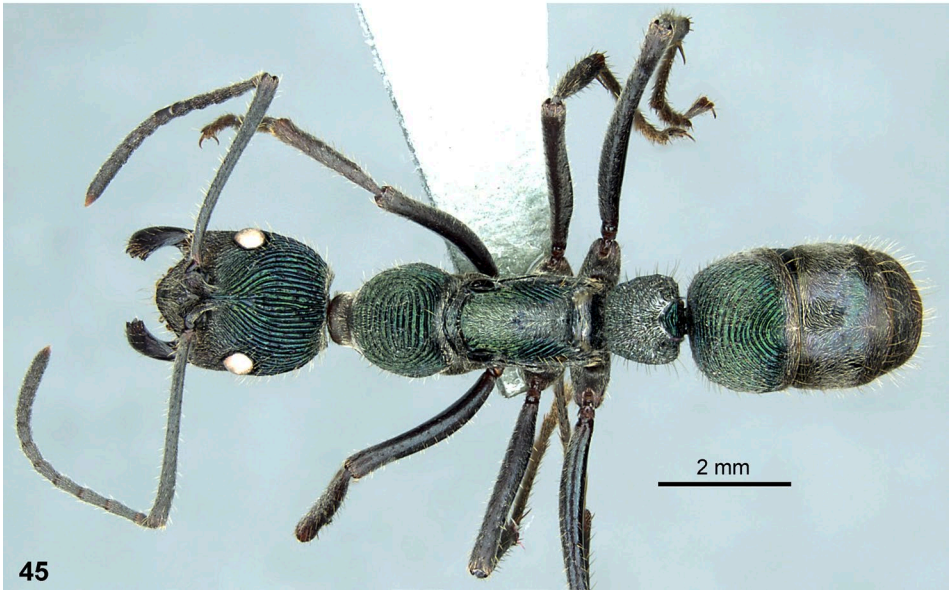
Diacamma rugosum ssp. *geometricum* var. *viridipurpureum*: Emery 1897: 155 (partim); Wheeler & Chapman 1925: 64 (partim?).

Diacamma rugosum viridipurpureum: Bolton 1995: 171; General & Alpert 2012: 102; Schmidt & Shattuck 2014: 191.

Type material examined: Lectotype (worker, present designation, MCSN, CASENT0903875, see Antweb 2015), "Antipolo \ Philippin \ Simon", "Diacamma \ geometricum \ var. \ viridipurpu- \ reum. Em.", "SYNTYPUS \ Diacamma \ geometricum var. \ viridipurpureum \ Emery, 1893", "MUSEO GENOVA \ coll. Emery \ (dono 1925)" "ANTWEB \ CASENT \ 0903875", "136", "Lectotypus \ Diacamma viridipurpu- \ reum Emery, 1893, des. \ Laciny, Pal & Zettel, 2015".

Non-type material examined (all from Philippines, Luzon Island, except one worker of unclear origin): 1 worker (NHMW, CASENT0915972), Laguna Prov., Los Baños, UPLB university campus, 12–14.II.1999, leg. S. Schödl (#1); 1 worker (NHMW), same area, Mount Makiling, Rain Forest Park, 14.II.1999, leg. S. Schödl (#5); 2 workers (CZW), same area, Mt. Makiling, 150–500 m a.s.l., 13–14.XI.1993, leg. H. Zettel (#21); 1 worker (CZW), Laguna Prov., Kalayaan, San Juan, 23.II.2013, leg. C. V. Pangantihon (#P465); 2 workers (CZW), Pampanga Prov., Arayat, Mt. Arayat, 19–20.IV.2014, leg. C. V. Pangantihon (#P506); 1 worker (NHMW), Manila, coll.





Figs. 44–45: *Diacamma viridipurpureum viridipurpureum*, non-type worker. (44) Habitus, lateral. (45) Habitus, dorsal.

G. Mayr; 1 worker (NHMW), Manila, Novara expedition; 1 worker (NHMW), "Schadbg. 1890 / Philippinen", exact locality unknown.

D i a g n o s i s: Large species (TL 12.8–13.8 mm). Trunk with moderate, polychromatic shimmer, dark greenish and purple colours dominating. Mandibles, antennae and legs dark brown to black. Erect setae abundant; fine pilosity well developed. Trunk strongly striate from genae to gaster tergite 1. Head (Fig. 46) moderately long, sides posteriorly of eye strongly convex. Posterior of head longitudinally striate until narrowly truncated hind

margin; occipital margin ventrally terminating in short, blunt teeth (Fig. 44). Eyes rather small. Clypeus (Fig. 46) with very fine puncturation at base, becoming sparse anteriorly and usually lacking anteromedially; apex medially more or less rounded. Mandible with fine striation. Pronotum (Fig. 45) with transverse-elliptical rugae. Striation on propodeum sides strongly upcurved (Fig. 44). Petiole (Figs. 44, 45) very stout, its teeth moderately short; subpetiolar process strongly concave between acute anterior and posterior corners, with rather long, oblique pilosity. Gaster tergite 1 (Figs. 44, 45) with coarse semi-circular striation.

Description: Measurements of lectotype: TL 13.57; HW 2.35; HL 3.00; EL 0.64; SL 3.26; PH 1.83; PL 1.26; PW 1.41; SpD 0.59; SpL 0.23; WL 4.40; MTL 2.58. Indices: CI 78; SI 139; PI 69; SpDI 42; SpLI 17; EI 27. Measurements of non-type material (n = 8): TL 12.85–13.83; HW 2.28–2.48; HL 2.90–3.26; EL 0.58–0.67; SL 3.20–3.52; PH 1.70–2.09; PL 1.20–1.43; PW 1.29–1.43; SpD 0.58–0.64; SpL 0.32–0.46; WL 4.34–4.92; MTL 2.45–2.90. Indices: CI 76–80; SI 136–142; PI 65–71; SpDI 43–49; SpLI 25–33; EI 25–28.

Structures: Head moderately elongate (Fig. 46); sides strongly convex behind small eyes. Very coarse rugae present from genae to gaster tergite 1. Posterior of eyes, longitudinal rugae reaching narrow occipital margin. On ventral side of head occipital margin ending in a small, blunt tooth (Fig. 44). Clypeus (Fig. 46) shiny, basally with very fine puncturation, becoming sparse anteriorly and usually completely absent from apical lobe; anterior margin medially rounded, or a very obtuse angle recognizable. Mandibles usually with well-developed fine striation. Pronotum (Fig. 45) with transverse-elliptical rugae. Rugae on mesopleura almost horizontal, on propodeum sides strongly upcurved (Fig. 44). Posterior face of propodeum separated from sides by distinct carinae. Petiole (Figs. 44, 45) stout, with rather short spines; subpetiolar process strongly concave, both teeth very acute, posterior one usually strongly protruding; in lateral view, outline with long pilosity; in ventral view with distinct median carina and lateral carinae in anterior two thirds. Gaster tergite 1 (Figs. 44, 45) with thick, concentric, semi-circular or semi-elliptical rugae; along posterior margin finely punctured. Gaster tergite 2 (Figs. 44, 45) with very fine puncturation, shiny.

Pilosity (Fig. 44): Standing setae on trunk long and numerous, on mesosoma slightly shorter than on head and gaster. Short appressed pilosity moderately developed, densest on head sides in front of eyes, hind margin of pronotum, mesonotum, dorsal face of propodeum, and petiole. Standing setae on legs about as long as those on mesosoma, setae on scape distinctly shorter.

Colour (Fig. 44): Trunk with distinct metallic shimmer, usually greenish, with some purple reflections mostly on sides and gaster tergite 2, but often also with some bluish areas; apex of gaster brown. Mandibles dark brown. Antennae and legs black, with or without weak bluish-green shimmer; tarsi dark brown.

Notes: We narrowly define *D. viridipurpureum viridipurpureum* based on morphologically similar populations from Central Luzon, but similar distinguishable forms occur on southern areas of Luzon and some central and southern Philippine islands (compare description of *D. v. quezonicum* ssp.n. below; and Wheeler & Chapman 1925 listing var. *viridipurpureum* from nine islands). The lectotype of *D. viridipurpureum* differs by very small (short and thin) petiolar spines, but otherwise agrees well with the other examined specimens. Therefore we consider this as an individual variation. Unfortunately, it seems impossible to collect more material from the type locality, Antipolo, which is now a heavily populated area adjacent to the metropolis Manila. Besides its colour, which always contains

Figs. 46–47: *Diacamma viridipurpureum viridipurpureum*, non-type worker. (46) Head, frontal. (47) Labels.

areas of distinct green and purple shimmer, *D. viridipurpureum viridipurpureum* can be best recognized by the clypeus which is scarcely punctured distally and has a medially rounded apical margin; further by eye size, strongly upcurved rugae at propodeum sides, and structure and pilosity of the subpetiolar process. See also comparative notes of *D. generali* sp.n., *D. caeruleum* sp.n., and *D. viridipurpureum quezonicum* ssp.n.

Diacamma geometricum var. *viridipurpureum* was described based on two workers from Antipolo in Rizal Province, Central Luzon (Emery 1893). One syntype is illustrated by Antweb (2015). Our first assumption was that *D. viridipurpureum* is the species that is now named *D. generali* sp.n., a relatively common species in central Luzon, especially on Mount Makiling, Laguna. However, because we could not see all important characteristics in the photographs, we borrowed both syntypes from MCSN. To our surprise, they belong to two very different species which do not have much more in common than the polychromic metallic shimmer. We select specimen CASENT0903875 as the lectotype of *D. viridipurpureum*. For the second specimen we cannot provide a name at present. It belongs to a species closely related to *D. vagans* and possesses similarly large eyes. So far we have not seen any further specimen of the same species.

One of the *D. viridipurpureum viridipurpureum* specimens in NHMW was used by Mayr (1862) for the description of the genus *Diacamma*, under the name *D. rugosum*.

When describing *Ponera versicolor* from Sarawak, Smith (1857) also included specimens from the Philippines without further locality information. According to current state of

knowledge all species of the *D. rugosum* complex have relatively small ranges of distribution and we do not know of any species that occurs both on Borneo and the Philippines. Therefore the Philippine syntypes are probably not conspecific with those from Sarawak. A lectotype of *Ponera versicolor* should be selected from Sarawak. A Philippine syntype specimen of *D. versicolor* (CASENT0900672) is illustrated by Antweb (2015) and probably belongs to *D. viridipurpureum*.

Distribution: Philippines: Luzon Island: Pampanga, Manila, Rizal (type locality Antipolo), Laguna. Two further specimens illustrated in Antweb (2015) under the name *D. rugosum viridipurpureum* are in need of further examination. Specimen FMNHINS0000050354 from "Massisiat" in Abra Province is from the same locality (with different collector and collection date) as a paratype of *D. generali* and probably belongs to this species. However, neither in the featured images of this specimen nor of the specimen CASENT0217517 from Olongapo in Zambales Province the species-specific characteristics are completely visible. The record of *D. viridipurpureum* from Sulawesi (Emery 1897) is incorrect. We examined the specimen in MCSN on which it was based; it differs from *D. viridipurpureum* by more densely punctured, orange-coloured clypeus, pale mandibles, relatively long setae on scapes, and morphometric characters. At present we cannot relate it to any described taxon.

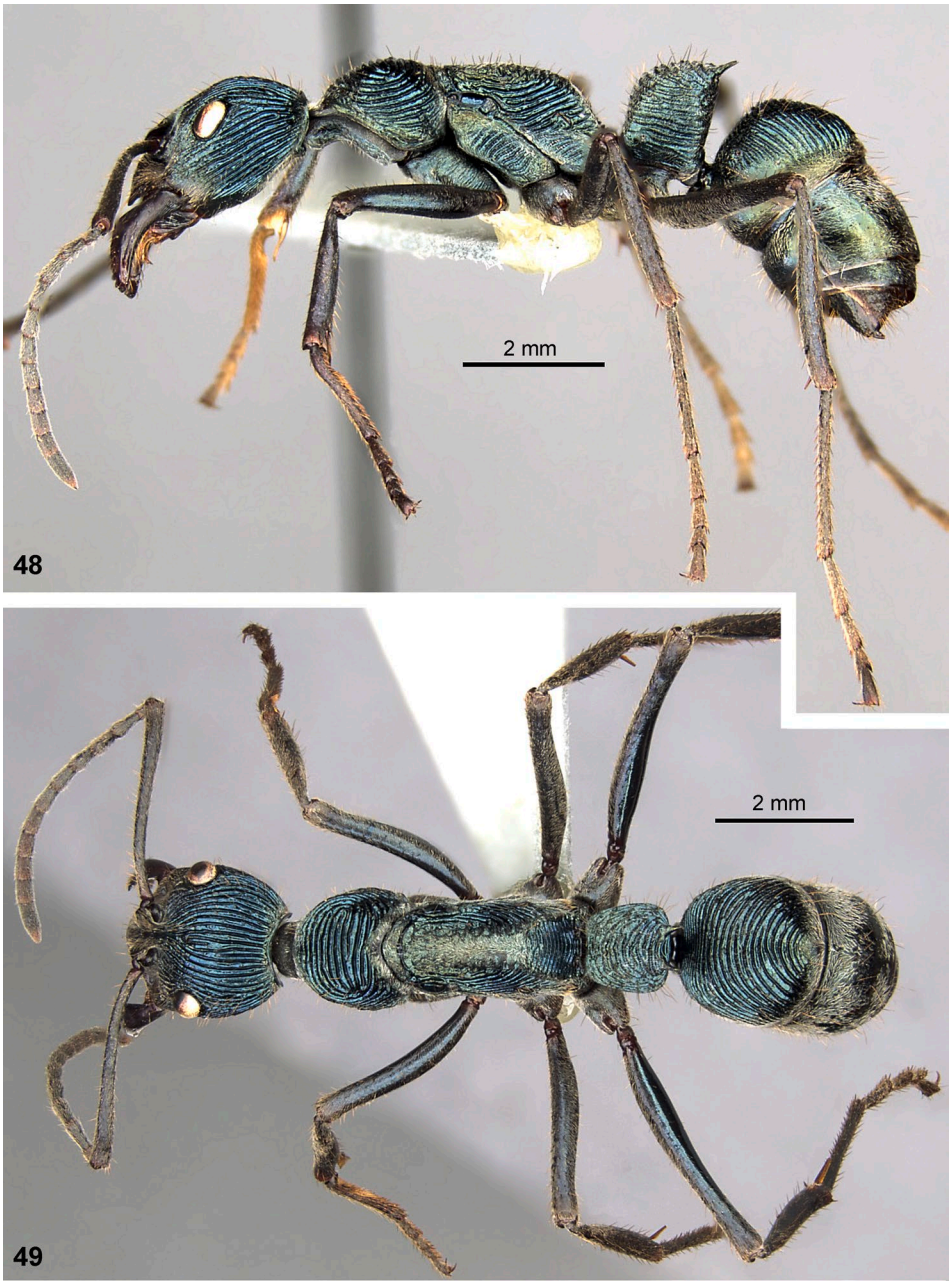
Diacamma viridipurpureum quezonicum **ssp.n.** (Figs. 48–51, 56, 62, 63)

Type material: Holotype (worker, PNMM, CASENT0915973), from Luzon, Quezon Province, Atimonan, Quezon National Park, Old Zigzag Road, 27–28.I.2002, leg. H. Zettel (#300). Paratypes (all from the same area): 12 worker (CZW, NHMW, UPLB), same label data as holotype; 1 worker (CZW), 12–13.II.1996, leg. H. Zettel (#79a); 7 workers (CZW), 24–30.III.1998, leg. H. Zettel (#165); 3 workers (CZW, NHMW), 16.III.1999, leg. H. Zettel (#202); 2 workers (CZW), 6.IV.2000, leg. H. Zettel (#253); 14 worker (CZW, NHMW, UPLB), 30–31.I.2001, leg. H. Zettel (#262); 1 worker (NHMW), 14.III.1999, leg. F. Seyfert (#27); 1 worker (NHMW), 22.XI.1992, leg. M.A. Jäch (#11).

Diagnosis: Large species (TL 12.6–14.2 mm). Trunk with relatively strong bluish shimmer. Mandibles, antennae and legs dark brown to black. Erect setae abundant; fine pilosity well developed. Trunk strongly striate from genae to gaster tergite 1. Head (Fig. 50) moderately long, sides posteriorly of eye strongly convex. Posterior of head longitudinally striate until narrowly truncated hind margin; occipital margin ventrally terminating in short, blunt teeth (Fig. 48). Eyes rather small. Clypeus (Fig. 50) with very fine puncturation at base, becoming sparse anteriorly; apex medially rounded or bluntly angled. Mandible with fine striation. Pronotum with transverse-elliptical rugae (Fig. 49). Striation on propodeum sides upcurved (Fig. 48). Petiole (Figs. 48, 49) very stout, its teeth moderately short; subpetiolar process strongly concave between acute anterior and posterior corners, with rather long, oblique pilosity. Gaster tergite 1 (Figs. 48, 49) with coarse semi-circular striation.

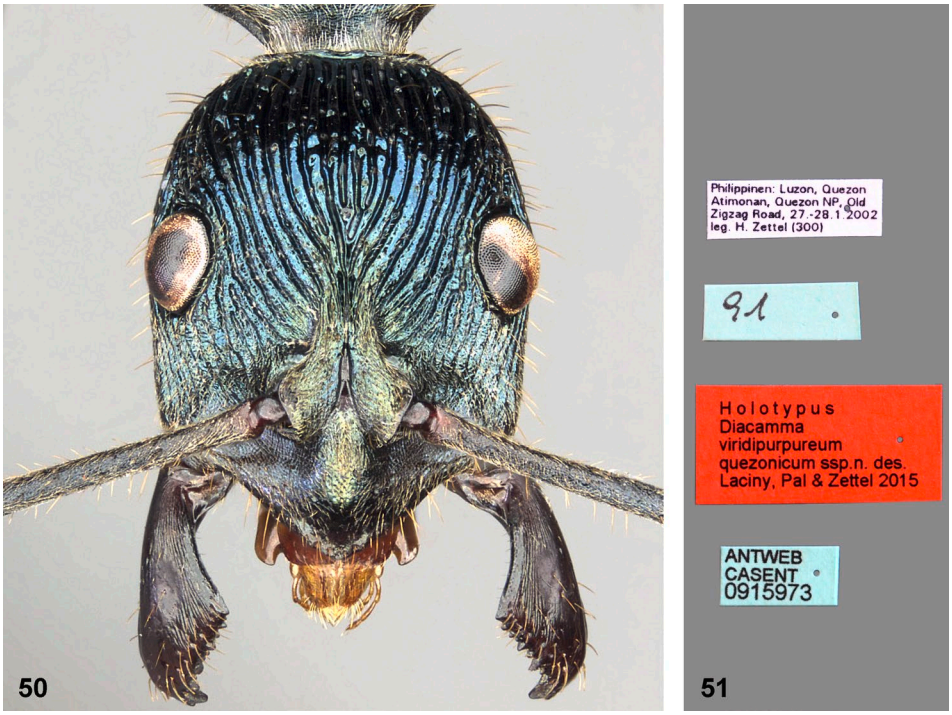
Description: Measurements of holotype: TL 13.70; HW 2.38; HL 3.13; EL 0.65; SL 3.33; PH 2.00; PL 1.33; PW 1.37; SpD 0.64; SpL 0.38; WL 4.73; MTL 2.66. Indices: CI 76; SI 140; PI 66; SpDI 48; SpLI 29; EI 27. Measurements of paratypes (n = 10): TL 12.59–14.15; HW 2.25–2.43; HL 2.93–3.23; EL 0.63–0.70; SL 3.20–3.49; PH 1.87–2.04; PL 1.20–1.35; PW 0.89–1.02; SpD 0.60–0.74; SpL 0.38–0.45; WL 4.43–4.73; MTL 2.51–2.71. Indices: CI 75–79; SI 139–145; PI 62–68; SpDI 46–53; SpLI 30–33; EI 26–28.

Structures: As in *D. v. viridipurpureum* except for the following characters: Ventral side of the head completely striate. Clypeus (Fig. 50) more distinctly punctured at base and



Figs. 48–49: *Diacamma viridipurpureum quezonicum* ssp.n., holotype worker. (48) Habitus, lateral. (49) Habitus, dorsal.

anteriorly less reduced, only in some specimens medially without any punctures, in most specimens just behind apex with shallow depression; apex rather variable from rounded to



Figs. 50–51: *Diacamma viridipurpureum quezonicum* ssp.n., holotype worker. (50) Head, frontal. (51) Labels.

bluntly angled. Striation on propodeum sides upcurved, but curvature often not as strong as in *D. v. viridipurpureum* (compare Figs. 44 and 48). Petiolar spines (Figs. 48, 49) on average longer and more distant than in *D. v. viridipurpureum* (SpDI 42–49 vs. 46–53; SpLI 17–33 vs. 29–33).

Pilosity (Fig. 48): As in *D. v. viridipurpureum*, although the short pubescence tends to be slightly less developed.

Colour (Fig. 48): Trunk with strong bluish shimmer; apex of gaster brown. Mandibles dark brown. Antennae and legs black; femora and tibiae with delicate bluish to purple shimmer; tarsi dark brown.

Notes: Besides the vivid blue colour that immediately distinguishes *D. v. quezonicum* from *D. v. viridipurpureum*, specimens of the two taxa are extremely similar, so that we decided to give them subspecific rank only. In addition to colour there are slight differences in surface structures and morphometry. In most, but not all specimens of *quezonicum* ssp.n. the clypeus has a shallow subapical impression, which we never observed in *viridipurpureum* s.str. or the other related taxa (*D. generali* sp.n., *D. caeruleum* sp.n., *D. carbonarium* sp.n.). The ventral side of the head is completely striate in *quezonicum* ssp.n., but this striation is more or less reduced in the anterior middle part in *viridipurpureum* s.str. There are also slight differences in length and distance of petiolar spines, but these characters are quite variable in both subspecies and in other *Diacamma* species as well.

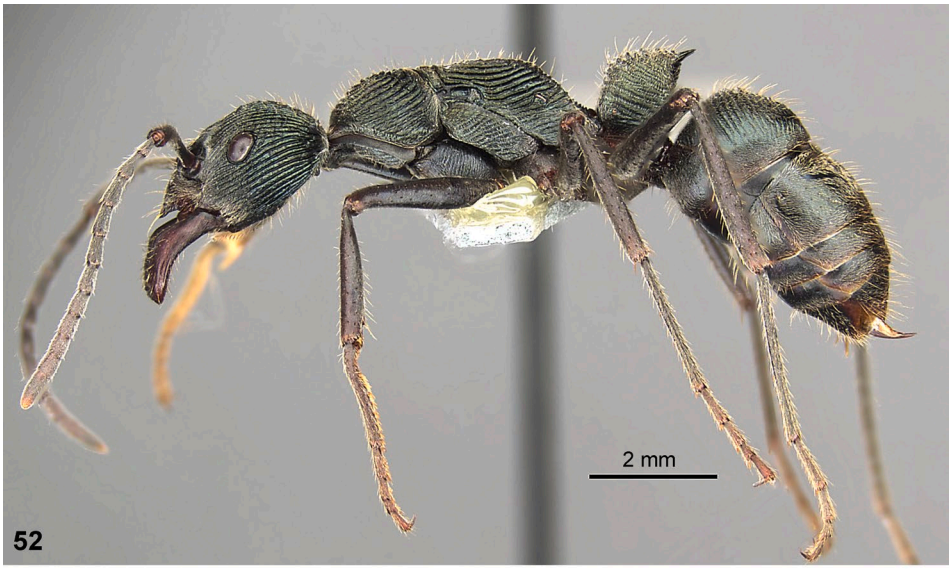
Diacamma generali **sp.n.** (Figs. 52–57)

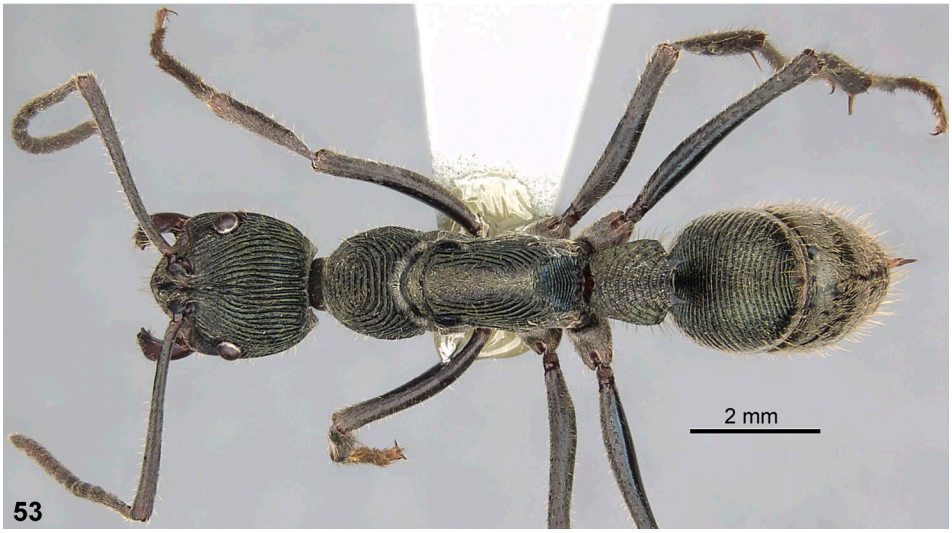
Diacamma rugosum (nec Le Guillou, 1842): Mayr 1862: 718 (partim).

Type material: Holotype (worker, PNMM, CASENT0915964), Philippines, Luzon, Laguna Prov., Los Baños, Mount Makiling, Mud Springs, ca. 650 m a.s.l., 13.II.1999, leg. S. Schödl (#2). Paratypes (all from Philippines, Luzon Island): 4 workers (NHMW, 2 workers in ethanol), same collecting data; 6 workers (CZW), same locality, 23–24.1.1999, leg. H. Zettel (#167); 3 workers (CZW), same, locality, 1.XII.2000, leg. H. Zettel (#259); 1 worker (NHMW), same area, Mount Makiling, 13.XI.1992, leg. H. Schillhammer (#2); 12 workers (CZW, UPLB), same area, Mt. Makling, 13–18.XI.1992, leg. H. Zettel (#1); 2 workers (NHMW), same area, UPLB university campus, 12–14.II.1999, leg. S. Schödl (#1); 7 workers (NHMW, 2 workers in ethanol), same area, Mt. Makiling, Flat Rocks, 14.II.1999, leg. S. Schödl (#4); 1 worker (NHMW), same locality, 10.II.1998, leg. H. Zettel (#132); 2 workers (NHMW), same area, Mt. Makiling Rain Forest Park, 14.II.1999, leg. S. Schödl (#5); 4 workers (CZW, NHMW), same area, Mt. Makiling, 150–500 m a.s.l., 13–14.XI.1993, leg. H. Zettel (#21); 2 workers (CZW, NHMW), same area, Mt. Makiling, 500–1140 m a.s.l., 14.XI.1993, leg. H. Zettel (#21a); 9 workers (CZW, UPLB, NHMW), same area, Mt. Makiling, between UPLB and Mud Springs, 18.XI.1999, leg. H. Zettel (#207); 1 worker (CZW), same area, Mt. Makiling, 400–800 m a.s.l., 27.XI.1999, leg. H. Zettel (#211); 13 workers (CZW, UPLB, NHMW), same area, Mt. Makiling, 300–500 m a.s.l., 8–9.II.1996, leg. H. Zettel (#74); 4 workers (CZW, UPLB, NHMW), same area, Mt. Makiling, 300–600 m a.s.l., 10.II.1996, leg. H. Zettel (#76); 1 worker, same area, Los Baños, leg. Baker (MCSN); 1 worker (NHMW), Laguna Prov., Mt. Banahaw, above Kinabuhayan, 600–700 m a.s.l., trail to Crystallino, 24.XI.1995, leg. J. Kodada & B. Rigová; 8 workers (NHMW), Benguet Prov., S of Baguio, Kennon Road-km 31, Bridal Falls, 16.II.1999, leg. S. Schödl (#8, 9); 1 worker (NHMW), Benguet Prov., W of Baguio, Asin Hot Springs, 17.II.1999, leg. S. Schödl (#12); 3 workers (CZW), Zambales Prov. [erroneously labelled Bataan Prov.], Olongapo City, Subic Bay, near Riding Stable, 2.XII.1993, leg. H. Zettel (#37e); 2 workers (CZW), same area, Subic Botanical Garden, 8.IX.2012, leg. C.V. Pangantihon (#P442), 1 worker (CZW), same area, 1–2.III.2015, leg. C.V. Pangantihon; 1 worker (NHMW), Manila, leg. Sichel, coll. G. Mayr; 1 worker (NHMW), Manila, coll. G. Mayr; 3 workers (CZW), Cavite Prov., Alfonso, Pajo, 7.II.2010, leg. C. V. Pangantihon (#P345); 4 workers (CZW, NHMW), Batangas Prov., Cuenca, Mt. Maculot, 24–25.XI.2012, leg. C. V. Pangantihon (#P461); 1 worker (FMNH), Abra Province, Licuan-Baay, sitio Masissiat, ca. 1070 m a.s.l. [3500 ft], V.1946, leg. M. Celestino, CHNM Philippine Zoological Expedition 1946–1947.

Diagnosis: Large species (TL 12.7–15.7 mm). Trunk with moderate or weak, greenish or bluish-green metallic shimmer. Mandibles brown, antennae and legs blackish. Erect setae abundant; fine pilosity well developed. Trunk strongly striate from genae to gaster tergite 1. Head (Fig. 54) moderately long, sides posteriorly of eye strongly convex. Posterior of head longitudinally striate until narrowly truncated hind margin; occipital margin ventrally terminating in very short, blunt teeth (Fig. 52). Eyes rather small. Clypeus (Fig. 54) entirely and usually very densely punctured, in some specimens with longitudinal rugae; apex forming a distinct, obtuse angle. Mandible with fine striation. Pronotum (Fig. 53) with transverse-elliptical rugae. Striation on propodeum horizontal (Fig. 52). Petiole (Figs. 52, 53) very stout, its teeth relatively short and distant; subpetiolar process moderately concave between acute anterior and posterior corners, with oblique pilosity. Gaster tergite 1 (Figs. 52, 53) with coarse semi-circular striation.

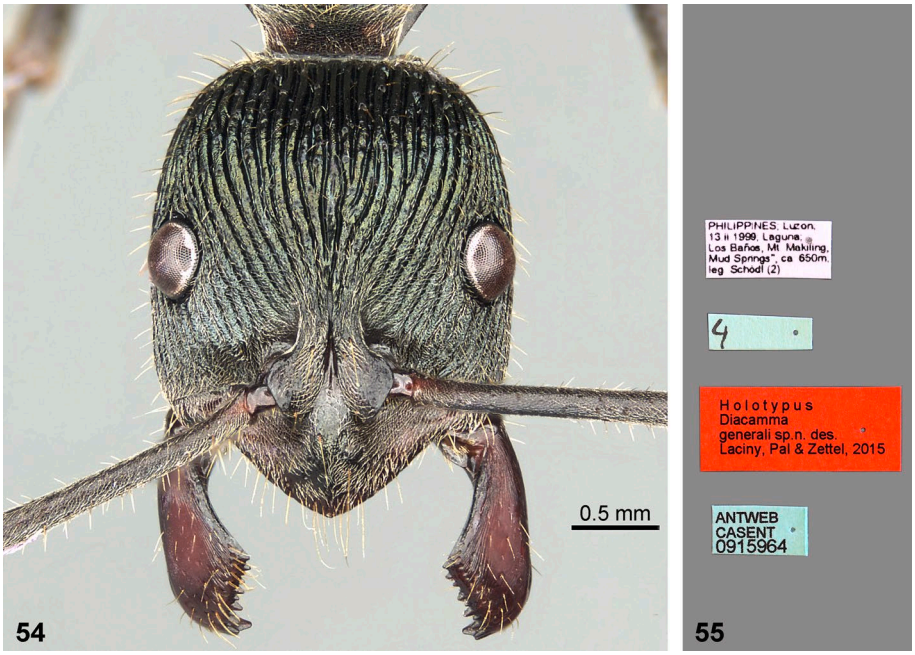
Description: Measurements of holotype: TL 14.67; HW 2.41; HL 3.07; EL 0.56; SL 3.36; PH 1.91; PL 1.30; PW 1.39; SpD 0.68; SpL 0.32; WL 4.50; MTL 2.66. Indices: CI 79; SI 139; PI 68; SpDI 50; SpLI 23; EI 23. Measurements of paratypes (n = 21): TL 12.72–15.65; HW 2.22–2.45; HL 2.84–3.10; EL 0.54–0.61; SL 3.23–3.52; PH 1.70–1.96; PL 1.13–1.30; PW 1.26–1.43; SpD 0.51–0.68; SpL 0.19–0.36; WL 4.17–4.66; MTL 2.46–2.74. Indices: CI 77–81; SI 139–149; PI 62–71; SpDI 40–52; SpLI 15–27; EI 23–25.





Figs. 52–53: *Diacamma generali* sp.n., holotype worker. (52) Habitus, lateral. (53) Habitus, dorsal.

Structures: Head (Fig. 54) moderately elongate; sides strongly convex behind small eyes. Very coarse rugae present from genae to gaster tergite 1. Posterior of eyes, longitudinal rugae reaching narrow occipital margin. On ventral side of head occipital margin ending in a small, blunt tooth (Fig. 52). Clypeus (Fig. 54) densely punctured, almost matt except on apex; anterior margin medially forming a distinct obtuse angle. Mandibles usually with well-developed fine striation. Pronotum (Fig. 53) centrally with transverse rugae that are surrounded by slightly transverse-elliptical rugae. Rugae on mesopleura and propodeum sides almost horizontal (Fig. 52). Posterior face of propodeum separated



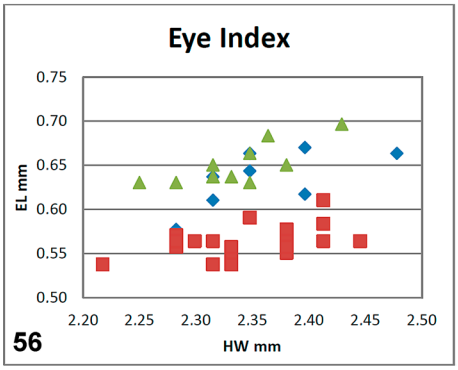
Figs. 54–55: *Diacamma generali* sp.n., holotype worker. (54) Head, frontal. (55) Labels.

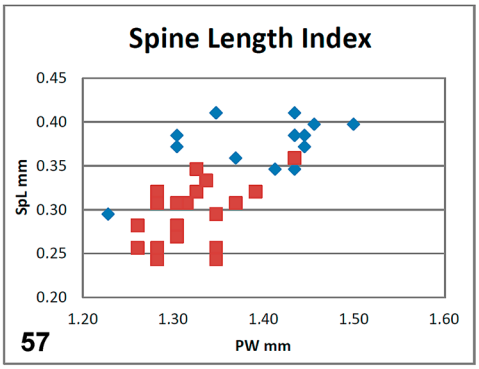
from sides by distinct carinae. Petiole (Figs. 52, 53) stout, with rather short and distant spines; subpetiolar process moderately concave, both teeth acute, not strongly protruding; in lateral view, outline with rather short oblique pilosity; in ventral view narrow, carinae not very distinct. Gaster tergite 1 (Figs. 52, 53) with thick, concentric, semi-circular or semi-elliptical rugae; along posterior margin finely punctured. Gaster tergite 2 (Figs. 52, 53) with fine, dense puncturation, weakly shiny.

Pilosity (Fig. 52): Standing setae on trunk long and numerous, on mesosoma slightly shorter than on head and gaster. Short appressed pilosity abundant, but reduced on head posteriorly, pronotal disc, and sides of propodeum, densest on hind margin of pronotum, mesonotum, dorsal face of propodeum, and petiole. Standing setae on legs about as long as those on mesosoma, setae on scape distinctly shorter.

Colour (Fig. 52): Trunk with moderate or weak, greenish or bluish-green shimmer; gaster at apex and posterior margins of tergites pale brownish. Mandibles medium to dark brown, antennae and legs blackish, without metallic shimmer; tarsi dark brown.

Notes: *Diacamma generali* sp.n. is a relatively common species in central Luzon and was frequently sampled by various collectors on Mount Makiling near the campus of the University of the Philippines, Los Baños, Laguna. Specimens usually have a greenish metallic shimmer that is reduced by a dense, short pilosity, but some specimens – chiefly from the more northern populations – tend to be almost black. A distinct blue or purple shimmer as in *D. viridipurpureum* was never observed. *Diacamma generali* sp.n. can be most easily distingushed from *D. viridipurpureum* and *D. caeruleum* sp.n. by the entirely punctured clypeus that forms an obtuse but distinct anterior angle. An additional character





Figs. 56–57: (56) Compared eye index (EI) of *D. generali* sp.n. (red), *D. viridipurpureum viridipurpureum* (blue) and *D. v. quezonicum* ssp.n. (green). (57) Compared spine length index (SpLI) of *D. carbonarium* sp.n. (blue) and *D. generali* sp.n. (red).

to distinguish it from *D. viridipurpureum* is its smaller eye size (EI 23–25 vs. 25–28, see Fig. 56). *Diacamma baguiense* differs from *D. generali* sp.n. by a finer striation of gaster tergite 1; it is smaller (TL 9.8–11.6 mm vs. 12.7–15.7 mm) and never greenish.

One of the *D. generali* paratypes in NHMW was used by Mayr (1862) for the description of the genus *Diacamma*, under the name *D. rugosum*.

Distribution: Philippines: northern and central Luzon, with records from the following provinces: Abra, Benguet, Zambales, Manila, Cavite, Batangas, Laguna.

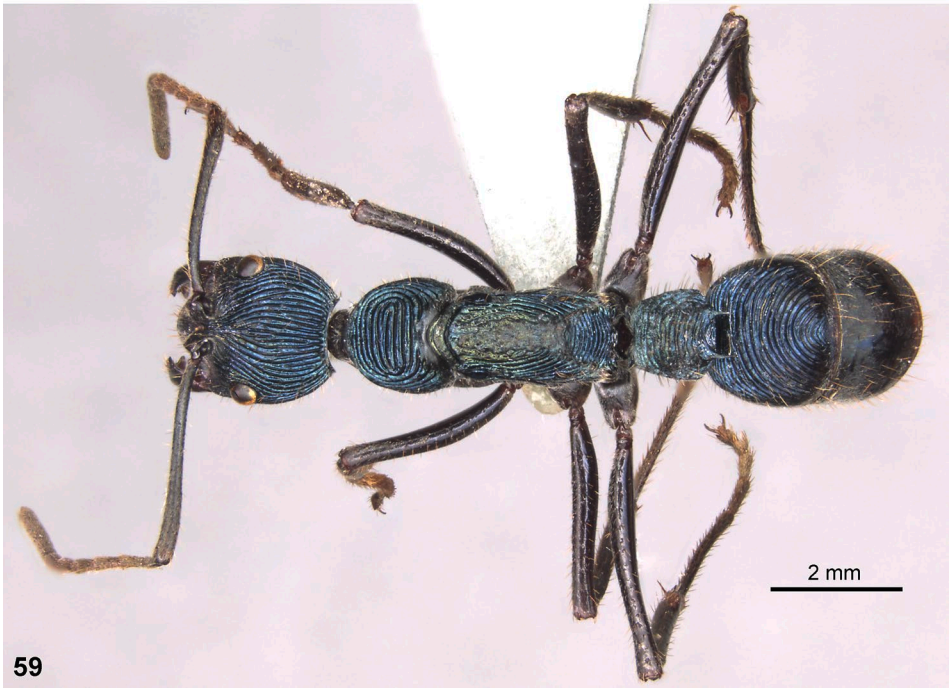
***Diacamma caeruleum* sp.n.** (Figs. 58–63)

Etymology: Named after the conspicuous blue shimmer of the body.

Type material: Holotype (worker, PNMM, CASENT0915965), Philippines, Mindoro Oriental, 28 km S Calapan, environment of Balete, 100–700 m a.s.l., 27–29.XI.1992, leg. H. Zettel (#18). Paratypes: 17 workers (CZW, NHMW), same locality data.

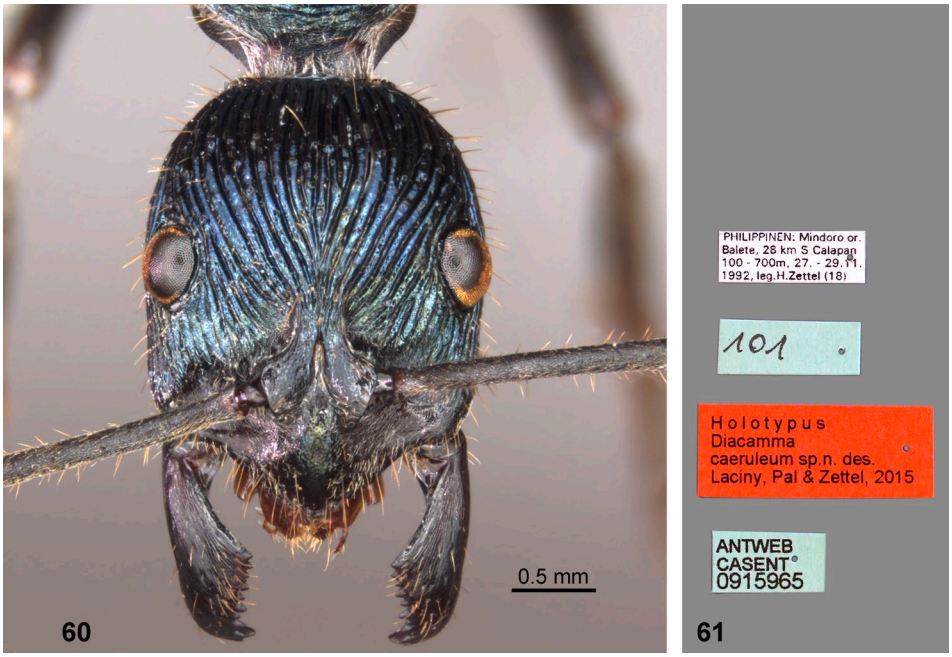
Diagnosis: Large species (TL 12.3–14.0 mm). Trunk with strong blue metallic shimmer. Mandibles and legs blackish. Long setae abundant; fine pilosity reduced. Trunk strongly striate from genae to gaster tergite 1. Head (Fig. 60) short, sides posteriorly of eye strongly convex. Posterior of head longitudinally striate until narrowly truncated hind margin; occipital margin ventrally terminating in short, blunt teeth (Fig. 58). Eyes rather small. Clypeus (Fig. 60) medially smooth and shiny, apex sharp, blunt. Mandible with obliterate striation. Pronotum (Fig. 59) with transverse-elliptical rugae. Striation on propodeum horizontal (Fig. 58). Petiole (Figs. 58, 59) very stout, its teeth relatively short and narrow; subpetiolar process shallowly concave between acute anterior and posterior corners. Gaster tergite 1 (Figs. 58, 59) with coarse semi-circular striation.

Description: Measurements of holotype: TL 13.50; HW 2.38; HL 3.07; EL 0.60; SL 3.39; PH 2.02; PL 1.28; PW 1.47; SpD 0.67; SpL 0.42; WL 4.57; MTL 2.64. Indices: CI 78; SI 142; PI 63; SpDI 46; SpLI 29; EI 25. Measurements of paratypes (n = 10): TL 12.33–13.96; HW 2.20–2.46; HL 2.87–3.20; EL 0.56–0.63; SL 3.07–3.52; PH 1.83–2.07; PL 1.17–1.35; PW 1.33–1.54; SpD 0.58–0.71; SpL 0.36–0.46; WL 4.30–4.96; MTL 2.45–2.77. Indices: CI 74–78; SI 139–148; PI 60–70; SpDI 40–47; SpLI 24–31; EI 24–26.



Figs. 58–59: *Diacamma caeruleum* sp.n., holotype worker. (58) Habitus, lateral. (59) Habitus, dorsal.

Structures: Head (Fig. 60) moderately elongate; sides strongly convex behind small eyes. Very coarse rugae present from genae to gaster tergite 1. Posterior of eyes, longitudinal rugae reaching narrow occipital margin. On ventral side of head occipital margin ending in a small, blunt tooth (Fig. 58). Clypeus (Fig. 60) shiny, anteromedially without punctures; anterior margin forming a sharp obtuse angle at middle. Mandibles with more



Figs. 60–61: *Diacamma caeruleum* sp.n., holotype worker. (60) Head, frontal. (61) Labels.

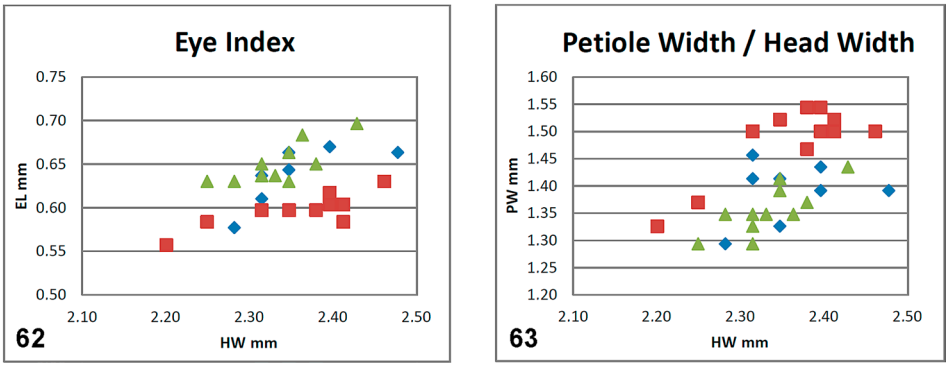
or less reduced striation. Pronotum (Fig. 59) with transverse-elliptical rugae. Rugae on mesosoma sides almost horizontal (Fig. 58). Posterior face of propodeum separated from sides by distinct carinae. Petiole (Figs. 58, 59) stout, with rather short, very slender spines; subpetiolar process moderately concave, posterior tooth protruding, acute. Gaster tergite 1 (Figs. 58, 59) with thick, concentric, semi-circular rugae; along posterior margin finely punctured. Gaster tergite 2 (Figs. 58, 59) with very fine microsculpture, shiny.

Pilosity (Fig. 58): Trunk with numerous and long standing setae. Short appressed pilosity reduced, but more distinct on head in front of eyes, hind margin of pronotum, on mesonotum, dorsal face of propodeum, petiole, hind margin of gaster tergite 1 and on following tergites. Setae on scape and legs much shorter than those on trunk.

Colour (Fig. 58): Trunk with strong blue shimmer, tending towards violet on gaster; apex of gaster brown. Mandibles, antennae, and legs black; tarsi dark brown.

Notes: *Diacamma caeruleum* sp.n. is a large, metallic blue species of the *D. rugosum* group. It is similar to *D. viridipurpureum* and *D. generali* sp.n. From *D. viridipurpureum viridipurpureum* and *D. generali* sp.n., but not from *D. viridipurpureum quezonicum* ssp.n., it can immediately be distinguished by strong blue iridescence. The clypeus of *D. caeruleum* sp.n. has a strongly shiny, unpunctured midline and a blunt, but acute-angled apex, whereas the clypeus of *D. generali* sp.n. is densely punctured and the clypeus of *D. viridipurpureum* is apically rounded. Moreover, in *D. caeruleum* sp.n. the striation of the mandible is reduced.

Morphometric characters distinguishing *D. caeruleum* sp.n. from similar species are its relatively broad petiole and smaller eyes compared to both subspecies of *D. viridipur-*



Figs. 62–63: (62) Compared eye index (EI) of *D. caeruleum* sp.n. (red), *D. viridipurpureum viridipurpureum* (blue) and *D. v. quezonicum* ssp.n. (green). (63) Compared petiole width (PW / HW) of *D. caeruleum* sp.n. (red), *D. viridipurpureum viridipurpureum* (blue) and *D. v. quezonicum* ssp.n. (green).

pureum (EI 24–26 vs. 25–28, see Figs. 62, 63) as well as longer petiolar spines compared to *D. generali* sp.n. (SpLI 24–31vs. 15–27).

Distribution: Only known from the type locality in a hilly area in eastern Mindoro.

***Diacamma carbonarium* sp.n.** (Figs. 57, 64–67)

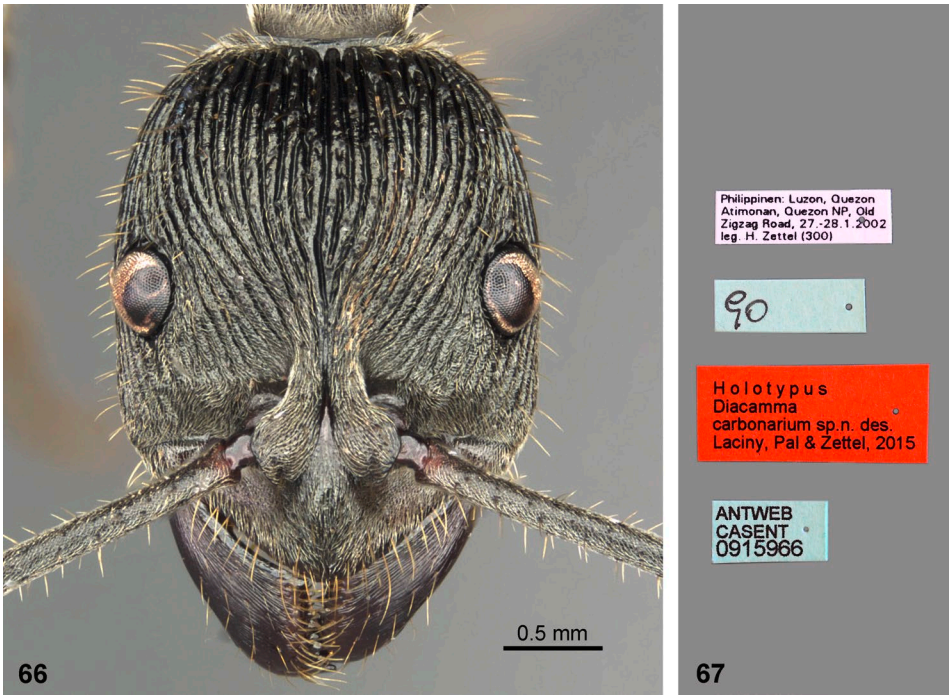
Etymology: Named after the deep black colour of the body.

Type material: Holotype (worker, PNMM, CASENT0915966), Philippines, Luzon, Quezon Province, Quezon N.P., Old Zigzag Road, 27–28.I.2002, leg. H. Zettel (#300). Paratypes: all from Luzon Island: 3 workers (CZW, NHMW), same locality data; 6 workers (CZW), same locality, 12–13.II.1996, leg. H. Zettel (#79a); 5 workers (CZW), same locality, 24–30.III.1998, leg. H. Zettel (#165); 1 worker (CZW), same locality, 16.III.1999, leg. S. S. Vichozo & H. Zettel (#202); 1 worker (CZW), same locality, 9.IV.2000, leg. H. Zettel (#253); 5 workers (NHMW), same locality, 14.III.1999, leg. F. Seyfert (#27); 1 worker (CZW), Laguna, San Pablo, Mt. Banahaw, 15.XI.1992, leg. H. Zettel (#6); 1 worker (CZW), Nueva Viscaya, Santa Fe, Imugan, 1200 m a.s.l., 10.XI.2002, leg. H. Zettel; 1 worker (CZW), Laguna, Cavinti, Tibatib, 26.VI.2010, leg. C. V. Pangantihon (#P358); 1 worker (CZW), Camarines Sur, 20 km E Naga, 5 km E Carolina, Mt. Isarog, nr. Malabsay Falls, 4.III.1999, leg. Zettel (#192); 2 workers (CZW), Camarines Norte, SW Daet, San Vicente, Fabrica, Mananap, 6.II.2001, leg. H. Zettel, E. & L. Vichozo (#264); 3 workers (CZW), Camarines Norte, Labo, Tulay na Lupa, Mt. Labo – Mt. Bayabas area, 17–18.III.2004, leg. H. Zettel & C. V. Pangantihon (#382).

Diagnosis: Rather large species (TL 11.9–14.2 mm). Trunk black, without metallic shimmer. Mandibles dark brown to black. Antennae and legs black. Standing setae abundant, on petiole and gaster distinctly longer than on mesosoma; fine pilosity strongly developed. Trunk strongly striate from genae to gaster tergite 1. Head (Fig. 66) relatively short, sides posteriorly of eye strongly convex. Posterior of head longitudinally striate until narrowly truncated hind margin; occipital margin ventrally terminating in short, blunt teeth (Fig. 64). Eyes small. Clypeus (Fig. 66) entirely punctured, apex rounded. Mandible with fine striation. Pronotum (Fig. 65) with transverse-elliptical rugae. Striation on propodeum horizontal (Fig. 64). Petiole (Figs. 64, 65) very stout, its teeth relatively short; subpetiolar process shallowly concave between short anterior and posterior corners. Gaster tergite 1 (Figs. 64, 65) with coarse semi-circular striation.

Figs. 64–65: *Diacamma carbonarium* sp.n., holotype worker. (64) Habitus, lateral. (65) Habitus, dorsal.

Description: Measurements of holotype: TL 13.83; HW 2.43; HL 3.10; EL 0.54; SL 3.52; PH 2.00; PL 1.30; PW 1.46; SpD 0.68; SpL 0.40; WL 4.76; MTL 2.77. Indices: CI 78; SI 145; PI 65; SpDI 47; SpLI 28; EI 22. Measurements of paratypes (n = 14): TL 11.93–14.22; HW 2.15–2.48; HL 2.74–3.13; EL 0.51–0.63; SL 3.10–3.55; PH 1.63–2.04; PL 1.17–1.37;



Figs. 66–67: *Diacamma carbonarium* sp.n., holotype worker. (66) Head, frontal. (67) Labels.

PW 1.23–1.50; SpD 0.59–0.77; SpL 0.29–0.41; WL 4.11–4.76; MTL 2.48–2.80. Indices: CI 78–81; SI 137–145; PI 64–73; SpDI 44–54; SpLI 24–31; EI 22–25.

Structures: Head (Fig. 66) moderately elongate; sides strongly convex behind small eyes. Very coarse rugae present from genae to gaster tergite 1. Posterior of eyes, longitudinal rugae reaching narrow occipital margin. On ventral side of head occipital margin ending in a small, blunt tooth (Fig. 64). Clypeus (Fig. 66) entirely, often densely punctured, but in some specimens from southern localities the puncturation less dense; especially in large specimens some longitudinal rugae may occur; apex of clypeus rounded, at most with a very obtuse angle. Mandibles always with fine striation. Pronotum (Fig. 65) with transverse-elliptical rugae. Rugae on mesosoma sides almost horizontal (Fig. 64). Posterior face of propodeum separated from sides by carinae. Petiole (Figs. 64, 65) stout, with coarse rugae and short spines; subpetiolar process shallowly concave between short anterior and posterior corners; shape of posterior tooth rather variable, rarely acute; ventral outline of tooth with short, oblique pilosity. Gaster tergite 1 (Figs. 64, 65) with thick, concentric, semi-circular rugae; along posterior margin finely punctured. Gaster tergite 2 (Figs. 64, 65) with very fine, but dense puncturation, almost matt.

Pilosity (Fig. 64): Trunk with numerous and long standing setae; Setae on petiole and gaster distinctly longer than on mesosoma. Short appressed pilosity dense and almost completely covering body, only at sides of propodeum reduced. Standing setae on scape very short, those on legs long.

Colour (Fig. 64): Trunk entirely black, without any metallic shimmer; at most the apex of gaster weakly reddish brown. Mandibles, antennae, and legs black or very dark brown.

Notes: *Diacamma carbonarium* sp.n. is a large, entirely black species of the *D. rugosum* group. Compared to similar congeners from the Philippines it never has any metallic shimmer. Its clypeus is entirely punctured and broadly rounded at middle of foremargin. The subpetiolar process is shallowly concave and has a stout posterior tooth. Rare individuals of sympatric *D. generali* sp.n. with weak metallic shimmer may be confused with *D. carbonarium* sp.n., but differ by a more angular apex of the clypeus. Additionally, morphometric analysis revealed differences in SpLI (24–31 in *carbonarium*, 19–27 in *D. generali* sp.n., see Fig. 57). The species is widespread on Luzon, but restricted to forested areas. One sample from Camarines Norte that strongly resembles *D. carbonarium* differs in EI and SpDI and was excluded; it may represent a further undescribed species.

Distribution: *Diacamma carbonarium* sp.n. was commonly found in a lowland forest in the Quezon National Park in the central part of Luzon, Philippines. We have studied a few individuals from other parts of the island including its northern and southern regions. Records are from the provinces Nueva Viscaya, Laguna, Quezon, Camarines Norte, and Camarines Sur.

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