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**Three new species of the army ant genus *Aenictus* SHUCKARD, 1840
(Hymenoptera: Formicidae: Aenictinae)
from Borneo and the Philippines**

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Abstract

Descriptions of three new species of army ants are provided: *Aenictus pfeifferi* sp.n. from Sarawak, Borneo; *Aenictus pangantihoni* sp.n. from Camiguin, the Philippines; and *Aenictus carolianus* sp.n. from Cebu, the Philippines.

Key words: Hymenoptera, Formicidae, *Aenictus*, army ants, new species, taxonomy, Philippines, Malaysia, Borneo, Cebu, Camiguin.

Zusammenfassung

Diese Arbeit liefert die Beschreibungen von drei Ameisenarten aus der Unterfamilie der Aenictinae (Treiberameisen): *Aenictus pfeifferi* sp.n. wird aus Sarawak, Borneo, beschrieben, *Aenictus pangantihoni* sp.n. von der Insel Camiguin, Philippinen, und *Aenictus carolianus* sp.n. von der Insel Cebu, Philippinen.

Introduction

The islands in the western Pacific region still yield a wealth of undescribed ant species. Despite the interesting biology of army ants – a review was published by KRONAUER (2009) – their taxonomy and zoogeography are poorly studied and need much more attention. To our knowledge, the “true” army ants of the genus *Aenictus* SHUCKARD, 1840 (subfamily Aenictinae) are remarkably specious in the region. The described species are often recorded from a single island; this might be either an effect of reduced dispersal abilities or just a lack of information.

Since WILSON’s (1964) taxonomic revision only a few species have been described from Southeast Asia, including one from Borneo (YAMANE & HASHIMOTO 1999), but none from the Philippines. In our present study we describe three species. One of them was collected by the junior author during an expedition to the Gunung Mulu National Park, northern Sarawak, in 2009. The other two new species were collected by Clister V. Pangantihon and the senior author during their field work on the Philippine Islands in 2008 and 2010; they origin from Camiguin and Cebu. The ant fauna of both islands, and of the Philippines in general, is very incompletely documented.

Material and methods

The type material was dry mounted on card squares or triangles. Depositories of types are noted in the species description part of this paper.

Descriptions and measurements were done with binocular microscopes and with a micrometre. Images (Figs. 1 - 12) were taken with a Leica DFC camera attached to a Leica MZ16 binocular microscope with the help of Leica Application Suite V3, stacked with Zerene Stacker (64-bit), and processed with Adobe Photoshop 7.0.

Measurements:

BL	Length of outstretched ant measured from apex of mandible to apex of abdomen.
HW	Head width. Maximum width of head, in full-face view.
HL	Head length, measured in full-face view along midline from clypeus margin to occipital margin.
CI	Cephalic index. $HW/HL \times 100$.
SL	Scape Length. Length of antennal scape excluding basal constriction.
SI	Scape index. $SL/HW \times 100$.
ML	Mesosoma length. Maximum length of mesosoma, measured in lateral view, diagonal from the point at which the pronotum meets the cervical shield to posterior base of metapleuron.
PHL	Pronotal hair length. Length of longest hair on pronotum measured in a straight line from insertion to tip.

Diagnoses chiefly refer to the key characters used by WILSON (1964). Characters of diagnoses are not repeated in descriptions.

Descriptions of new species

***Aenictus pfeifferi* sp.n.** (Figs. 1 - 4, 13)

Etymology: We dedicate this species to Dr. Martin Pfeiffer, who contributed much effort in ecological and taxonomic investigations on the ants of Borneo and who enabled the junior author's participation in an expedition to Sarawak in 2009.

Type material: Holotype worker (in Natural History Museum Vienna, Austria) and 74 paratype workers (in Natural History Museum Vienna, Austria; AntBaseNet Collection, Ulm, Germany; Sarawak Forest Department Collection, Kuching, Borneo; coll. D.M. Sorger, Vienna, Austria; coll. H. & S. V. Zettel, Vienna, Austria) from Borneo, Sarawak, Gunung Mulu National Park, Moonmilk Trail, 4°2'30" N, 114°48'46" E, 13.XI.2009, leg. D.M. Sorger (81) (locality label see Fig. 4).

Diagnosis of worker: Head with distinct "Typhlatta spots." Occiput on each side with small elevation. Parafrontal ridge present, very short. Clypeal teeth absent, margin nearly straight. Mandible broad, with subapical tooth and ca. 7 minute denticles. Antenna 10-segmented. Pronotal humeri unarmed. Propodeum low, rounded. Subpetiolar process low. Tarsi wide, tarsomere 5 strongly bilobed at dorsoapical margin.

Description of worker:

Measurements of holotype: BL 4.35 mm; HW 0.85 mm; HL 1.00 mm; CI 85; SL 0.81 mm; SI 95; ML 1.52 mm; PHL 0.40 mm.

Measurements of paratypes (n = 10): BL 3.75 - 4.50 mm; HW 0.78 - 0.87 mm; HL 0.91 - 1.02 mm; CI 83 - 88; SL 0.67 - 0.81 mm; SI 86 - 95; ML 1.39 - 1.57 mm; PHL 0.33 - 0.42 mm.

Colour (Figs. 1 - 3): Head blackish brown with large and distinct "Typhlatta spots." Mesosoma, petiole, postpetiole and gaster medium to dark brown (in some specimens much darker than in Figs. 1 - 2); dorsum of mesosoma, node of petiole, and gaster tergites strongly infuscated; venter of abdomen usually pale brown, first sternite often infus-

cated. Antenna medium brown, scape often infuscated. Legs medium brown, in middle part of femora, middle and hind tibia near base, and tarsomeres 1 - 2 on middle and hind legs variably infuscated.

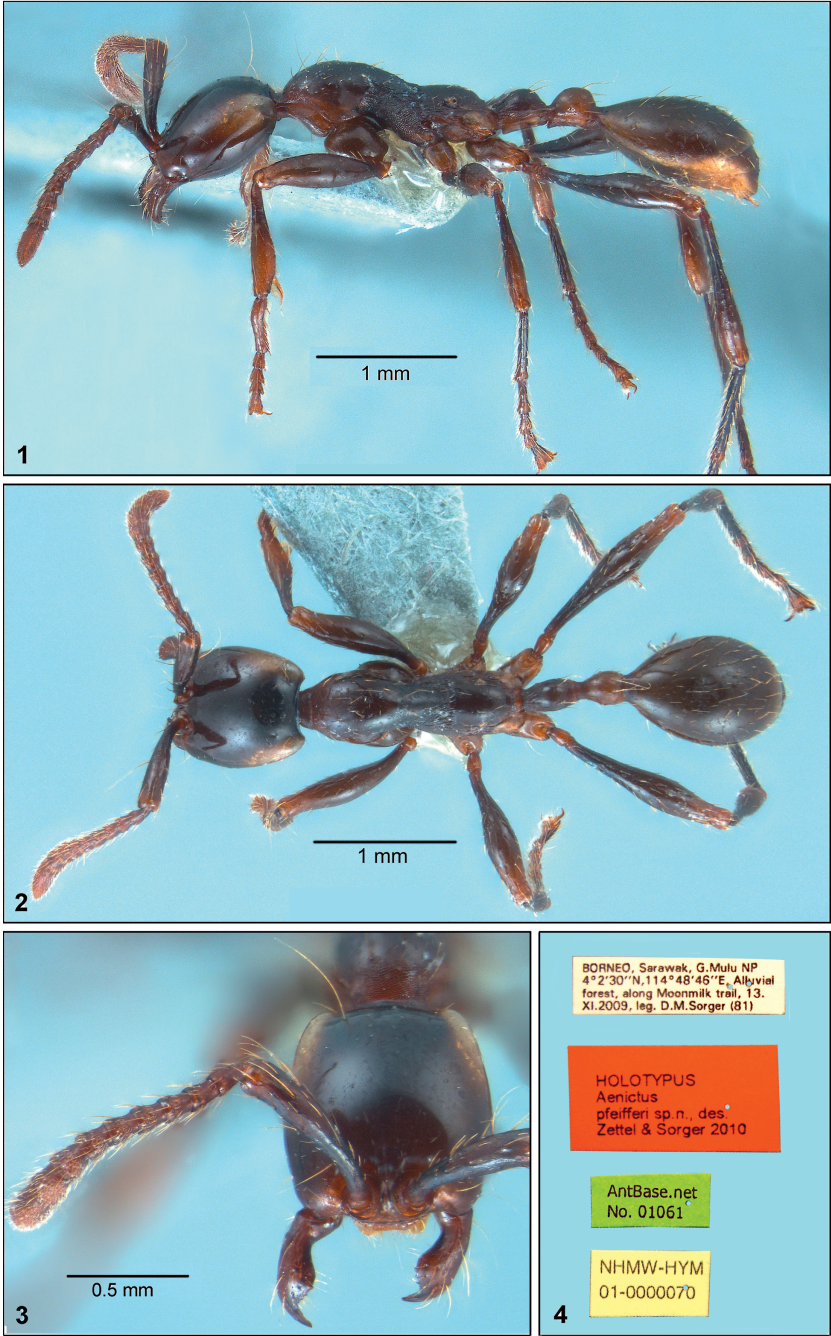
Pilosity (Figs. 1 - 3): Setae scattered and of very different lengths. Longest setae on scape (several), on occiput (one pair) and on pronotum (one pair); setae of medium length on sides (only two pairs) and venter of head, on mesosoma, petiole, postpetiole, and gaster. Dorsum and sides of mesosoma with some short, almost appressed setae intermixed.

Structural characteristics: Head (Fig. 3) completely smooth. In full face view occipital margin slightly biconcave, two small elongate impressions separating weakly developed occipital tubercles. Parafrontal ridge weakly developed as a low, elongate tubercle lateral of antennal insertion. Mandibles punctate (with hair pits). Antennae long, flagellum relatively slender. Mesosoma with dorsal outline (Fig. 1) similar to *A. gracilis*, gently biconvex, at propodeum evenly downcurved. Sculpture on mesosoma strongly reduced; dorsum (Fig. 2) and sides almost smooth. Most anterior part of pronotum delicately reticulate. Mesopleuron (Fig. 1) strongly reticulate and strongly contrasting with other parts of mesosoma; on its dorsal part some indistinct wrinkles. Similar, weakly developed wrinkles below propodeal stigma. Petiole elongate, subpetiolar process very low, forming a sharp angle at its anterior edge. Postpetiole of similar shape as petiole, its anteroventral edge sharp. Both petiole and postpetiole with delicate granulation laterally and ventrally, dorsum smooth. Gaster smooth except for hair pits; most anterior part of tergite 1 reticulate.

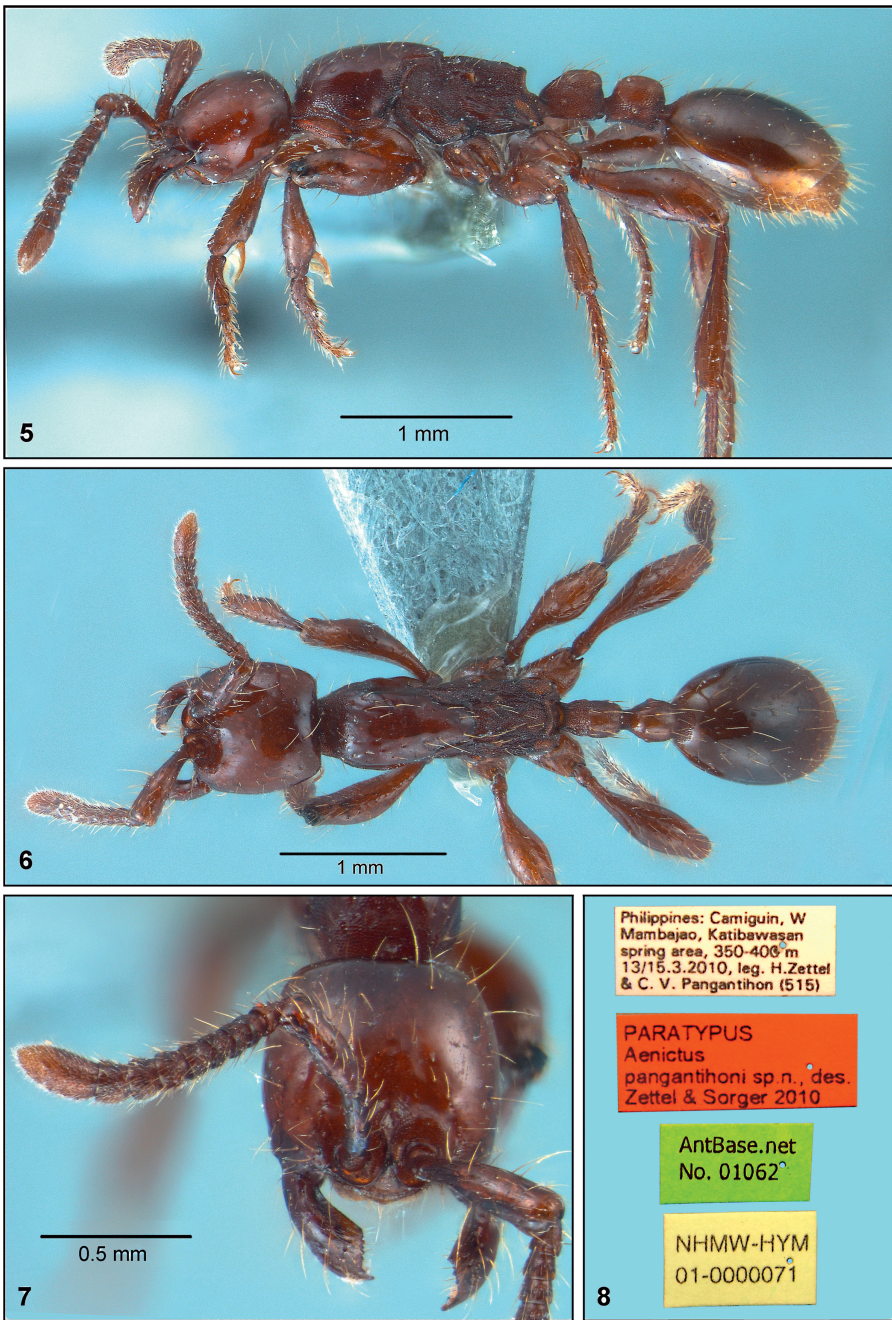
Comparative notes: *Aenictus pfeifferi* sp.n. is closely related to *Aenictus gracilis* EMERY, 1893 and reaches, together with this species, couplet 20 in the key by WILSON (1964). This is a widely distributed species, from Sri Lanka to the Philippines, which – according to WILSON (1964) – expresses some intraspecific variation, especially in HW, SI, and size of occipital protuberances. For comparison, we studied a syntype of *A. gracilis* from Sarawak, a syntype of *A. martini* FOREL, 1900 from Myanmar (both specimens in the Natural History Museum Vienna), and non-type specimens from Sri Lanka, Borneo, and the Philippines. *Aenictus pfeifferi* sp.n. differs clearly from *A. gracilis* by larger head width (HW 0.78 - 0.87 mm in *A. pfeifferi* sp.n. vs. 0.50 - 0.64 mm in *A. gracilis*; fide WILSON 1964), differently sculptured propodeum (smooth in *A. pfeifferi* sp.n., see Fig. 2, vs. totally reticulate or at most medially with narrow stripe of reduced sculpture in *A. gracilis*) and strongly different tarsal structures. All tarsi of *A. pfeifferi* sp.n. are strongly enlarged. On the foretarsus, tarsomeres 3 and 4 are wider than long in *A. pfeifferi* sp.n. but slightly longer than wide in *A. gracilis*; and tarsomere 5 is hardly (about one fourth) longer than wide in *A. pfeifferi* sp.n. but ca. 1.5 times longer than wide in *A. gracilis*. The apical width of tarsomere 5 of the hind tarsus is much wider than in *A. gracilis* (0.14 - 0.15 mm vs. 0.08 - 0.10 mm). The dorso-apical margin of tarsomere 5 is strongly bilobed in both species. Tarsal structures vary strongly among species of *Aenictus* and – although ignored in the past – they may serve as useful characteristics for species distinction.

In the Natural History Museum Vienna we have seen specimens from the Khao Sok National Park in southern Thailand which are extremely similar to types of *A. pfeifferi* sp.n., except for a slightly more developed sculpture on mesopleuron and anterior metapleuron. Although we are inclined to regard this difference as an intraspecific variation, we do not include this series in the type material of *A. pfeifferi* sp.n.

Type locality and habitat: The type locality lies in the Gunung Mulu National Park in Sarawak, Borneo. The new species was collected in an alluvial forest along a concrete



Figs. 1 - 4: *Aenictus pfeifferi* sp.n., holotype worker (NHMW; head width 0.85 mm, mesosoma length 1.52 mm). (1) Habitus, lateral aspect. (2) Habitus, dorsal aspect. (3) Head, full face view. (4) Labels.



Figs. 5 - 8: *Aenictus pangantihoni* sp.n., paratype worker (NHMW; head width 0.78 mm, mesosoma length 1.41 mm). (5) Habitus, lateral aspect. (6) Habitus, dorsal aspect. (7) Head, full face view. (8) Labels.

trail along Melinau river from Park Headquarters to Moonmilk cave at an elevation of ca. 40 - 50 m a.s.l. (4°2'30" N, 114°48'46" E; google maps estimate).

***Aenictus pangantihoni* sp.n.** (Figs. 5 - 8, 13)

Etymology: We dedicate this species to Clister V. Pangantihon, who first discovered some foraging workers.

Type material: Holotype worker (in University of San Carlos, Cebu City, The Philippines) and 56 paratype workers (in University of San Carlos, Cebu City, The Philippines; Natural History Museum Vienna, Austria; coll. D.M. Sorger, Vienna, Austria; coll. H. & S. V. Zettel, Vienna, Austria) from Philippines, Camiguin, West of Mambajao, Katibawasan area, 350 m, 15.III.2010, leg. H. Zettel & C. V. Pangantihon (515) (locality label see Fig. 8).

Diagnosis of worker: Head without "Typhlatta spots." Parafrontal ridge present, up to 0.3 mm long (in some specimens posteriorly reduced and only anterior third, ca. 0.1 mm, distinct). Mandible broad, with a series of minute, indistinct denticles. Antenna 10-segmented. Pronotal humeri unarmed. Mesonotum demarcated from mesopleuron by conspicuous ridge. Metanotum concave, dipping distinctly below mesonotum and slightly below dorsal face of propodeum. Petiole elongate, without subpetiolar process.

Description of worker:

Measurements of holotype: BL 4.00 mm; HW 0.76 mm; HL 0.82 mm; CI 93; SL 0.60 mm; SI 79; ML 1.35 mm; PHL 0.24 mm.

Measurements of paratypes (n = 10): BL 3.90 - 4.20 mm; HW 0.72 - 0.78 mm; HL 0.80 - 0.85 mm; CI 90 - 95; SL 0.76 - 0.80 mm; SI 76 - 80; ML 1.31 - 1.42 mm; PHL 0.22 - 0.25 mm.

Colour (Figs. 5 - 7): Almost uniformly medium brown. Each antennomere except scape and ultimate one distally infuscated; flagellum appearing slightly annulate. Scape, ultimate antennomere, legs, nodes of petiole and postpetiole, and gaster (except tergite 1) somewhat lighter than other body parts.

Pilosity (Figs. 5 - 7): Setae scattered and of relatively uniform lengths, very long setae missing. Long setae distributed almost all over body and appendages, except sides of mesosoma, petiole, and postpetiole. A few short, almost appressed setae present on dorsum of head and sides of mesosoma.

Structural characteristics: Head (Fig. 7) completely smooth, except for hair pits and narrow reticulate stripe just behind antennal sockets. In full face view occipital margin straight or very weakly convex; occipital tubercles lacking. Parafrontal ridge ca. 0.3 mm long, either continuously developed or interrupted, in such cases its anterior third well developed plus a minute tubercle at the position of the usual posterior end. Clypeus angularly produced in middle. Mandibles punctate (with hair pits). Antennae rather short, flagellum thick. Mesosoma with very characteristic dorsal outline (Fig. 5): Pronotum anteriorly sharply down-curved, posteriorly forming a weakly convex bow continuous with almost straight mesonotum; metanotal impression distinct, anteriorly step-like below mesosoma, against dorsal face of propodeum slightly impressed. Propodeum with almost straight dorsal outline sharply separated by a ridge from concave posterior face. Propodeal ridge membranous, ca. 0.25 mm high, horseshoe-shaped in caudal aspect. Dorsum of pronotum and mesonotum (Fig. 6) smooth except for hair pits. Most anterior part of pronotum reticulate, narrow lateral margins (Fig. 5) distinctly canaliculate and

reticulate, reaching back to posterior margin; other lateral areas of pronotum either completely smooth or with faint, superficial reticulation. Mesopleuron separated from mesonotum by very sharp, straight ridge. Mesopleuron, metapleuron and propodeum strongly rugous, mat except anterio-ventral parts of meso- and metapleuron slightly shiny. Petiole moderately elongate (Fig. 5), narrow in dorsal aspect (Fig. 6), subpetiolar process absent. Postpetiole shorter and wider than petiole, its anteroventral edge sharp. Both petiole and postpetiole reticulate except dorsum of nodes smooth. Gaster smooth except for hair pits; most anterior parts of tergite 1 and sternite 1 reticulate.

Comparative notes: The unusual, distinct ridge between mesonotum and mesopleuron closely relates *Aenictus pangantihoni* sp.n. to two other Philippine species, *Aenictus rabori* CHAPMAN, 1963 and *Aenictus philippinensis* CHAPMAN, 1963, both described from Negros. CHAPMAN (1963) separates the two species by the dense head punctation of *A. philippinensis* and by the dorsal outline of the mesosoma. WILSON (1964) distinguishes these species in his key (couplet 27) by the metanotal impression and the length of the parafrontal ridge. For the parafrontal ridges, WILSON (1964) measures a length of 0.28 mm for *A. philippinensis* and only 0.17 mm for *A. rabori*. In *A. pangantihoni* sp.n. this ridge is usually long (ca. 0.3 mm), but we have seen specimens in which it is hardly traceable in posterior two-thirds (see Fig. 7). The metanotal impression is very different in *A. rabori* and *A. philippinensis*, being strongly impressed in the latter (see WILSON 1964: figs. 82, 83). In this character *A. pangantihoni* sp.n. (Fig. 5) resembles *A. rabori*, but in comparison with this species, a low impression is present. Moreover, the femora of *A. pangantihoni* sp.n. are less strongly dilated than in *A. rabori*, the petiole is more slender (in dorsal aspect) and with a smooth area at the node's centre.

Type locality and habitat: The type locality lies on Camiguin Island in the municipality of Mambajao, in the area of the Katibawasan Falls at the lower slopes of Mt. Hibok-Hibok at an elevation of ca. 350 m a.s.l. (09°12' N, 124°43' E; measured in the field by GPS). Workers were collected from a trail lined with some bushes and trees in a pasture area.

***Aenictus carolianus* sp.n. (Figs. 9 - 12, 13)**

Etymology: The species epithet is an adjective and refers to Saint Charles Borromeo (Carolus Borromeus, 2.X.1538 – 3.XI.1584), the great patron of ecclesiastical training in the Renaissance and patron of the University of San Carlos in Cebu City. Since the foundation of the biological collections by the German priest, Father Heinrich Schoenig (2 March 1912 – 18 December 1989), the University of San Carlos has a renowned tradition in classical entomology and takes care of the best insect collection from Cebu Island and from the entire Visayas Region.

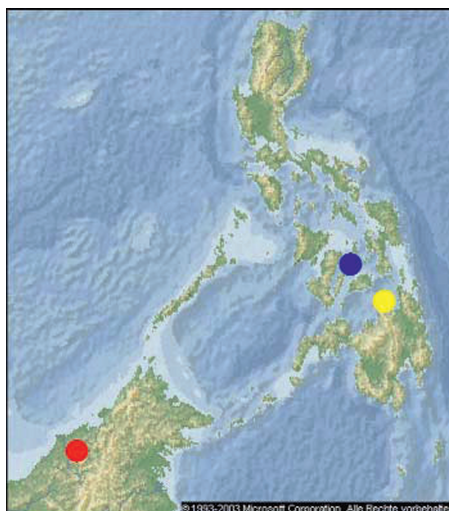
Type material: Holotype worker (in University of San Carlos, Cebu City, The Philippines) and 48 paratype workers (in University of San Carlos, Cebu City, The Philippines; Natural History Museum Vienna, Austria; coll. D.M. Sorger, Vienna, Austria; coll. H. & S. V. Zettel, Vienna, Austria) from Philippines, Cebu City, Cantipla-I Forest Reserve, 1.III.2008, leg. H. Zettel & C. V. Pangantihon (# 512) (locality label see Fig. 12).

Diagnosis of worker: Head without "Typhlatta spots". HW 0.59 - 0.64 mm. Occiput without constriction ("collar"), but with well developed ridge. Parafrontal ridge ca. 0.3 mm long. Anterior clypeal margin convex, without teeth. Mandible broad, with ca. 5 minute denticles. Antenna 10-segmented. Head and pronotum with long setae. Pronotal humeri unarmed. Mesonotum not demarcated from mesopleuron. Dorsal outline of meso-



Figs. 9 - 12: *Aenictus carolianus* sp.n., paratype worker (NHMW; head width 0.59 mm, mesosoma length 0.97 mm). (9) Habitus, lateral aspect. (10) Habitus, dorsal aspect. (11) Head, full face view. (12) Labels.

Fig. 13: Map of the Philippines and northern Borneo with type localities of *Aenictus pfeifferi* sp.n. (red), *Aenictus pangantihoni* sp.n. (yellow), and *Aenictus carolianus* sp.n. (blue).



soma almost straight. Dorsal face of propodeum posteriorly down-curved, separated from posterior face by distinct ridge. Petiole elongate, without subpetiolar process.

Description of worker:

Measurements of holotype: BL 3.10 mm; HW 0.64 mm; HL 0.71 mm; CI 90; SL 0.56 mm; SI 87; ML 1.02 mm; PHL 0.25 mm.

Measurements of paratypes (n = 10): BL 2.95 - 3.15 mm; HW 0.59 - 0.64 mm; HL 0.69 - 0.72 mm; CI 86 - 90; SL 0.52 - 0.56 mm; SI 84 - 90; ML 0.97 - 1.04 mm; PHL 0.22 - 0.27 mm.

Colour (Figs. 9 - 11): Body mainly dark brown, almost blackish. Anterior of head, ventrolateral areas of mesosoma, petiole, postpetiole and sides gaster rather medium brown; apex of abdomen pale brown. Antenna and legs medium brown, scape and femora partly infuscated.

Pilosity (Figs. 9 - 11): Long to very long setae scattered all over body and appendages, except sides of mesosoma, petiole and postpetiole. Longest setae on occiput and pronotum. A few short setae, often almost appressed, present on dorsum of head and sides of mesosoma.

Structural characteristics: Head (Fig. 11) mainly smooth, except for hair pits; area between the two parafrontal carinae densely reticulate; area between parafrontal carina and mandible delicately reticulate, in some specimens intermixed with some elongate rugae. In full face view occipital margin straight; occipital tubercles lacking; distinct ridge visible in dorsocaudal aspect (Fig. 10). Parafrontal ridge (Figs. 9, 11) well developed, ca. 0.3 mm long, with small tooth next to antennal sockets. Clypeus angularly produced in middle. Dorsal face of mandibles densely striate. Scape rather long, flagellum short and thick. Mesosoma with almost straight dorsal outline (Fig. 9): Pronotum anteriorly down-curved, posteriorly forming a continuous straight line with mesonotum; metanotal impression hardly traceable. Propodeum with almost straight dorsal outline, only most posterior part down-curved, separated by a fine ridge from concave posterior face. Propodeal ridge low

(Fig. 10), approximately semicircular in caudal aspect. Dorsum of pronotum and mesonotum smooth except for hair pits. Most anterior part of pronotum reticulate, narrow lateral margins also reticulate, reaching back to posterior margin; other lateral areas of pronotum variable, either smooth or with faint, superficial reticulation. Mesopleuron continuous with mesonotum (without ridge as in *A. pangantihoni* sp.n.). Mesopleuron and metapleuron (Fig. 10) with longitudinal striation, partly shiny, only their most ventral parts reticulate. Propodeum dorsally smooth, posterior face and a very narrow zone anterior of propodeal ridge densely reticulate. Both petiole and postpetiole short, narrow in dorsal aspect (Fig. 10), reticulate except dorsum of nodes smooth; subpetiolar process absent. Postpetiole with sharp anteroventral edge (Fig. 9). Gaster smooth except for hair pits; most anterior parts of tergite 1 and sternite 1 reticulate.

Comparative notes: *Aenictus carolianus* sp.n. keys out at couplet 37 in the key by WILSON (1964), but it is very similar to *Aenictus reyesi* CHAPMAN, 1963 from Negros island. Compared with this species, *A. carolianus* sp.n. is much smaller (HW 0.59 - 0.64 in *A. carolianus* sp.n. vs. 0.73 - 0.74 mm in *A. reyesi*; fide CHAPMAN 1963 and WILSON 1964), has much longer pilosity on head and mesosoma (PHL 0.22 - 0.27 mm in *A. carolianus* sp.n. vs. 0.15 mm in *A. reyesi*; fide WILSON 1964), and a differently structured propodeum (propodeum of *A. reyesi* without transverse ridge separating dorsal and posterior face; fide WILSON 1964).

Type locality and habitat: The type locality lies on Cebu Island within the municipality of Cebu City, at barangay Tabunan, sitio Cantipla-I [= Cantipla-Uno], at an elevation of ca. 800 - 900 m a.s.l. (10°24' N, 123°49' E measured in the field by GPS). The habitat is a degraded forest in a water shed area. Specimens were collected in the vicinity of a streamlet. Recently, several new ant species were discovered in this area (ZETTEL 2007, ZETTEL & SORGER 2010, SORGER & ZETTEL, in prep.), which is one of the last natural forests on Cebu Island.

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