

## TWO NEW SPECIES OF THE *AENICTUS PACHYCERUS* SPECIES GROUP (HYMENOPTERA: FORMICIDAE: AENICTINAE) FROM SOUTHEAST ASIA

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**ABSTRACT.** — The *Aenictus pachycerus* species group is widespread in the eastern Oriental, Indo-Australian, and Australasian regions. The members of the group are characterised by the well-developed frontal carina and parafrenal ridge, a weakly developed subpetiolar process and a smooth and shiny first gastral tergite (rarely superficially shagreened). Eleven worker-based species of the *A. pachycerus* group are recorded from Southeast Asia. Among them, two new species are here described: *Aenictus kutai* from Borneo (E. Kalimantan) and *Aenictus sulawesensis* from Sulawesi. A key to Southeast Asian species of the species group is presented. The distribution and type locality for each species in Southeast Asia are given.

**KEY WORDS.** — *Aenictus pachycerus* species group, army ants, taxonomy, Southeast Asia

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### INTRODUCTION

The *Aenictus pachycerus* species group was established by Wilson (1964) based on external morphology of the worker caste. Later Jaitrong & Yamane (2011) redescribed the species group and listed 14 worker-based species from the Oriental, Indo-Australian and Australasian regions. Recently Jaitrong & Yamane in Jaitrong et al. (2012) described a sibling species of *Aenictus dentatus* Forel, 1911 of the *A. pachycerus* group from continental Southeast Asia. In Southeast Asia, eight species of the group have been recorded.

During our survey on the Asian *Aenictus* we found two new species from Borneo (E. Kalimantan) and Sulawesi, and an unidentified species from Java (Table 1). In this paper we describe the two new species. We anticipate that male-based names will eventually be matched with worker-based names using DNA information, but until then it is important to develop a sound worker-based taxonomy. Where our new worker-based species co-occur with potentially matching named males, we temporarily use morphospecies codes to refer to the workers.

### MATERIAL AND METHODS

The holotype and paratypes for each new species are pin-mounted. Syntypes or paratypes were examined for the six named species (*Aenictus carolianus* Zettel & Sorger, 2010; *A. dentatus* Forel, 1911; *A. nesiotis* Wheeler & Chapman, 1930; *A. paradentatus* Jaitrong & Yamane, 2012; *A. powersi* Wheeler & Chapman, 1930; *A. reyesi* Chapman, 1963) of the *Aenictus pachycerus* species group. The holotype of *A. paradentatus* was also examined. Most morphological observations were made with a Nikon SMZ1000 stereoscope. Multi-focused montage images were produced using Helicon Focus 4.75 Pro from a series of source images taken by a Canon EOS Kiss×4 digital camera attached to a Nikon ECLIPSE E600 microscope. Type material of each species were measured for the following parts using a micrometer (accurate to 0.01 mm).

The abbreviations used for the measurements and indices are as follows:

TL Total length in profile, roughly measured from the anterior margin of head to the tip of gaster in stretched specimens

HL	Maximum head length in full-face view, measured from the anterior clypeal margin to the midpoint of a line drawn across the posterior margin of head
HW	Maximum head width in full-face view
SL	Scape length excluding the basal of constriction and condylar bulb
ML	Mesosomal length measured from the point at which the pronotum meets the cervical shield to the posterior margin of metapleuron in profile
PL	Petiole length measured from the anterior margin of the peduncle to the posteriormost point of tergite in profile
SI	Scape index, $SL/HW \times 100$
CI	Cephalic index, $HW/HL \times 100$

Abbreviations of the type depositories and others are as follows:

AMK	Ant Museum, Faculty of Forestry, Kasetsart University
BMNH	The Natural History Museum, London, U.K
MCZC	Museum of Comparative Zoology, Cambridge, MA, U.S.A
MHNG	Museum d' Histoire Naturelle, Geneva, Switzerland
MZB	Museum Zoologicum Bogoriense, Cibinong, Indonesia
SKYC	SKY Collection at Kagoshima University, Japan
THNHM	Natural History Museum of the National Science Museum, Thailand
WJT	Weeyawat Jaitrong Collection at National Science Museum, Thailand

The general terminology in the worker caste of the ants follows Hölldobler & Wilson (1990), and Bolton (1994). For the important characters in the genus *Aenictus* used in this paper, see Wilson (1964) and Jaitrong & Yamane (2011).

## TAXONOMY

### *Aenictus pachycerus* species group

**Diagnosis.** — Jaitrong & Yamane (2011) defined this species group as follows: antenna long, consisting of 10 segments; scape long reaching or extending beyond posterolateral corner of head; anterior clypeal margin roundly convex in the middle, lacking denticles; mandible triangular, with very dense punctures; its masticatory margin with a large and sharp apical tooth followed by 4–12 small inconspicuous denticles, which gradually reduce in size toward basal angle of mandible; frontal carinae fused at the level of antennal base to form a single carina, and extending less than half length of head, and well developed anteriorly and poorly developed posteriorly; parafrenal ridge present, reaching less than half length of head; seen in profile its anteriormost part well developed and raised as a subtriangular process; occipital margin forming a collar or carina; promesonotum distinctly convex or very weakly convex dorsally and sloping gradually to propodeum; propodeal junction angulated; declivity of

propodeum concave, encircled with a rim; subpetiolar process weakly developed.

Head entirely sculptured or smooth and shiny. Petiole and postpetiole densely punctate, at least in Southeast Asian species. First gastral segment entirely smooth and shiny, or rarely superficially shagreened, except the base of the tergite and sternite that has dense small punctures. Body black, dark or reddish brown to light or yellowish brown; typhlata spot absent.

**Remarks.** — The *Aenictus pachycerus* group consists of relatively large species in terms of body size (TL 3.20–4.65 mm: 1.80–3.00 mm in smaller species). Wilson (1964) and Jaitrong & Yamane (2011) pointed out that this group is closely related to the *A. philippinensis* group, but can be distinguished from the latter by the mesonotum not visibly demarcated from the mesopleuron, and the metanotal groove almost absent or indistinct (mesopleuron clearly demarcated from metapleuron by a deep groove and from promesonotum by a distinct carina and metanotal groove relatively deep and distinct in the *A. philippinensis* group). This species group is also related to the *Aenictus hottai* group in having developed a frontal carina and parafrenal ridge but can be separated from the latter by the first gastral tergite smooth and shiny and by the weakly developed subpetiolar process (the first gastral tergite densely micropunctate and the subpetiolar process well developed in the latter; see Jaitrong & Yamane, 2011).

### Key to species of the Southeast Asian *Aenictus pachycerus* species group based on the worker caste

1. Head entirely smooth and shiny; dorsum of mesosoma entirely smooth and shiny.....2
  - Head entirely sculptured or partly smooth and shiny; dorsum of mesosoma entirely sculptured or partly smooth and shiny 4
2. Promesonotum in profile with clearly convex dorsal outline; propodeum lower than promesonotum; body yellowish brown (Philippines)..... *A. powersi*
  - Mesosoma dorsally flat or feebly convex; body reddish brown.....3
3. Smaller species (HW 0.63–0.65 mm); propodeum in profile with feebly convex dorsal outline; longest pronotal hair 0.25–0.28 mm (Philippines) ..... *A. carolianus*
  - Larger species (HW 0.75–0.78 mm); propodeum in profile with straight dorsal outline; longest pronotal hair ca. 0.15 mm (Philippines)..... *A. reyesi*
4. First gastral tergite superficially shagreened (Vietnam, Laos, and Thailand)..... *A. paradentatus*
  - First gastral tergite smooth and shiny.....5
5. Side of head partly smooth and shiny; dorsal face of pronotum partly shiny .....6
  - Side of head entirely sculpturate (punctate or reticulate); dorsal face of pronotum entirely sculptured and opaque .....7
6. Area just outside parafrenal ridge shagreened; vertex reticulate, with sparse standing hairs (less than 12); postpetiole almost as long as petiole (Sulawesi) ..... *A. sulawesiensis*, new species
  - Area just outside parafrenal ridge with several irregular longitudinal rugulae; vertex finely punctate; vertex with denser standing hairs (more than 15); petiole distinctly longer than petiole (Java) ..... *A. sp. 84* of WJT (see Remarks under Material examined for other species)

7. Propodeal junction in profile with protruding edge that is longer than maximum length of propodeal spiracle, very thin, acute, and far overhanging declivitous face; antennal scape longer (SI 143–152) (Malay Peninsula, Sumatra, Borneo and Java) ..... *A. dentatus*
- Edge of propodeal junction not longer than maximum spiracle width and not overhanging the declivitous face; antennal scape shorter (SI 110 or less than) ..... 8
8. Lateral face of pronotum partly smooth and shiny or superficially shagreened with smooth and shiny interspaces; area just outside parafrontal ridge with 3–5 irregular longitudinal rugulae (Borneo) ..... *A. kutai*, new species
- Lateral face of pronotum entirely sculpturate and opaque; area just outside parafrontal ridge finely punctate ..... 9
9. Apical half of femora superficially reticulate with smooth and shiny bottoms; smaller species (TL 3.5–3.60 mm; HW 0.65–0.68 mm) (Philippines, Sulawesi and Australia) ..... *A. nesiotis*
- Anterior femora finely punctate; larger species (TL 3.65–5.10 mm; HW 0.70–0.98 mm) ..... 10
10. Petiole sessile; subpetiolar process developed, triangular; ventral outline of postpetiole almost straight or weakly convex; larger species (TL 4.85–5.10 mm; HW 0.90–0.98 mm) (S. China and Vietnam) ..... *A. bobaiensis*
- Petiole subsessile; subpetiolar process low, its ventral outline convex; ventral outline of postpetiole feebly concave; smaller species (TL 3.65–4.20 mm; HW 0.70–0.80 mm) (Malay Peninsula, Borneo, and Buru Island) ..... *A. levior*

*Aenictus kutai*, new species

(Fig. 1A, B)

**Material examined.** — Holotype worker from Indonesia, Borneo, E. Kalimantan, Kutai National Park, Teluk Kabah (0°22'N, 117°16'E), 19 Sep.1993, coll. Sk. Yamane, SKY93-09-1 (MZB). Nine paratype workers, same data as holotype (BMNH, MHNG, SKYC, THNHM).

**Measurements.** — **Holotype:** TL 4.40 mm; HL 0.98 mm; HW 0.91 mm; SL 0.85 mm; ML 1.43 mm; PL 0.35 mm, CI 94; SI 93. **Paratypes** (n = 9): TL 4.20–4.40 mm; HL 0.93–0.98 mm; HW 0.85–0.91 mm; SL 0.80–0.85 mm; ML 1.35–1.43 mm; PL 0.34–0.35 mm, CI 92–94; SI 93–94.

**Worker description.** — Head in full-face view oval, slightly longer than broad, with distinctly convex sides; posterior margin convex; occipital margin bearing a collar. Antennal scape relatively short, extending beyond 2/3 of head length but not reaching posterolateral corner of head; all funicular segments each longer than broad; terminal segment slightly shorter than VII+VIII+IX. Frontal carinae well developed, fused at the level of antennal base to form a single carina, extending slightly beyond the level of posterior margin of torulus. Parafrontal ridge well developed, extending 1/3 of head length (ca. 0.45 mm). Masticatory margin of mandible with large apical tooth, followed by 15–16 denticles of two sizes, the larger alternating with 1–3 smaller; basal margin with 1–2 very small denticles just behind basal tooth. Mesosoma stout; promesonotum (seen in profile) strongly convex dorsally, sloping gradually to metanotal groove; propodeum clearly lower than promesonotum, in profile its dorsal outline almost straight; mesopleuron clearly demarcated from metapleuron by a deep groove; upper portion

of mesopleuron impressed; metanotal groove present but indistinct. Propodeal junction angulate, almost right-angled; declivity of propodeum shallowly concave, and encircled with a distinct rim. Petiole sessile, almost as long as high; its dorsal outline convex, posterior face of petiole shallowly concave, and encircled with a thin rim; subpetiolar process weakly produced below; its anteroventral corner bluntly angulate. Postpetiole slightly longer than petiole, its node slightly elevated posteriorly. Femora apically swollen.

Dorsum of head longitudinally but irregularly rugose, superimposed with dense minute punctures in anterior 2/3, densely and minutely punctate in posterior 1/3; sides of head densely and minutely punctate. Mandible densely striate except in apical portion and along masticatory margin. Antennal scape densely micropunctate. Punctuation on dorsum of pronotum similar to that in posterior portion of dorsum of head; lateral face of pronotum with weaker sculpture, partly shiny; remainder parts of mesosoma irregularly and coarsely sculptured, superimposed with small punctures. Petiole and postpetiole densely punctate; dorsa with irregular longitudinal rugae. First gastral tergite and sternite smooth and shiny, except for the basalmost part with dense micropunctures. Basal 2/3 of femora microreticulate, but apically 1/3 superficially reticulate and shiny.

Head and mesosoma dorsally with dense standing hairs; longest pronotal hair 0.38–0.40 mm long. Head and



Fig. 1. *Aenictus kutai*, new species (holotype, SKY93-09-1): A, body in profile; B, head in full-face view; C, body in dorsal view. Colour pictures (A–C) are available in [www.antbase.net](http://www.antbase.net).

mesosoma reddish brown; antenna, legs, petiole, postpetiole, and gaster reddish brown or yellowish brown. Typhlatta spot absent.

**Etymology.** — The specific name is a noun in apposition referring to the traditional name of a historic region in East Kalimantan Province of Indonesia.

**Distribution.** — Borneo (E. Kalimantan) (Fig. 3).

**Notes.** — So far *A. kutai* is known only from the type locality in a lowland fire-damaged forest. This species is closely related to *A. sulawesiensis* and *A. sp.* 84 of WJT in having smooth and shiny lateral face of pronotum. However, it is easily separated from the latter two by its head and dorsal face of pronotum being entirely sculptured (partly smooth and shiny in the latter two).

***Aenictus sulawesiensis*, new species**

(Fig. 2A–C)

**Material examined.** — Holotype worker from Indonesia, S. Sulawesi, Barru, Taneterilau, Lipukasi, Forest Complex Coppo (4°30'S, 119°37'E), 8 Jan.2011, coll. Sk. Yamane, CE11-SKY-21 (MZB). Sixty-seven paratype workers, same data as holotype (AMK, BMNH, MCZC, MHNG, MZB, SKYC, THNHM).

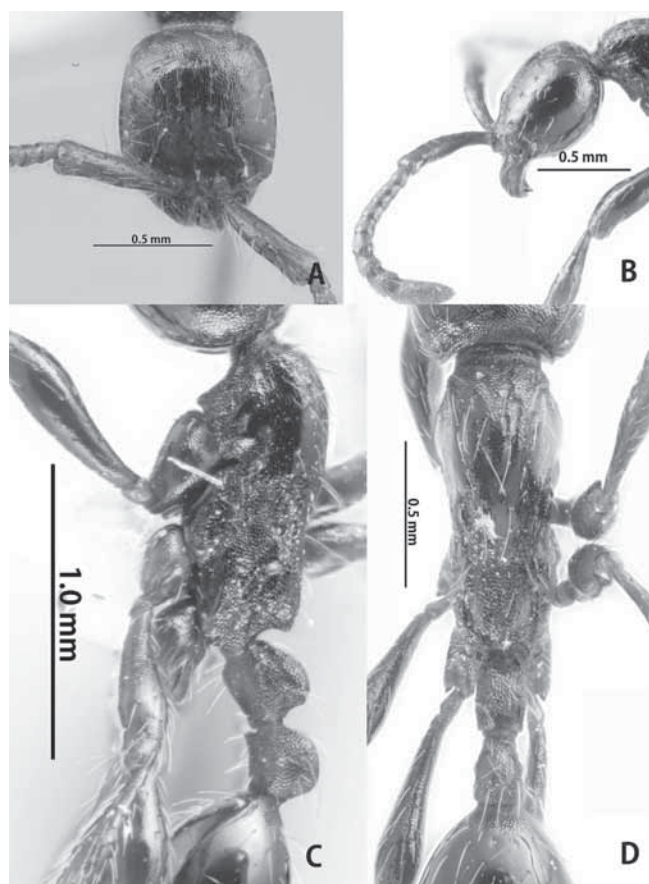


Fig. 2. *Aenictus sulawesiensis*, new species (holotype, CE11-SKY-21): A, head in full-face view; B, head in profile; C, mesosoma and waist in profile; D, body in dorsal view. Colour pictures (A–C) are available in [www.antbase.net](http://www.antbase.net).

**Measurements.** — **Holotype:** TL 3.25 mm; HL 0.76 mm; HW 0.65 mm; SL 0.63 mm; ML 1.05 mm; PL 0.29 mm, CI 85; SI 96. **Paratypes** (n = 9): TL 3.25–3.30 mm; HL 0.75–0.78 mm; HW 0.63–0.65 mm; SL 0.60–0.63 mm; ML 1.04–1.06 mm; PL 0.28–0.30 mm, CI 82–85; SI 96–98.

**Worker description.** — Head in full-face view elliptical, distinctly longer than broad, with feebly convex sides; posterior margin convex; occipital margin bearing a narrow collar. Antennal scape relatively short, extending beyond 2/3 of head length, but not reaching posterolateral corner of head; antennal segment II slightly shorter than broad; III–VII each almost as long as broad; terminal segment almost as long as VII+VIII+IX. Frontal carinae well developed, fused at the level of antennal base to form a single carina, extending less than half length of head; posterior half of frontal carina very poorly developed, with head in profile roundly concave. Parafrontal ridge well developed, reaching 1/3 of head length (0.30 mm); seen in profile, its anteriormost part well developed and subtriangular, and posterior part feebly convex. Masticatory margin of mandible with large apical tooth followed by a medium-sized subapical tooth and 5–6 denticles; basal margin lacking denticles. Mesosoma elongate and stout; promesonotum seen in profile slightly convex dorsally, sloping gradually to metanotal groove; mesopleuron not clearly demarcated from metapleuron; metanotal groove indistinct; propodeum in profile lower than promesonotum, nearly straight dorsally; propodeal junction angulate; declivity of propodeum shallowly concave, encircled with a rim. Petiole subsessile, almost as long as high, its node short and elevated posteriorly; subpetiolar process weakly developed or almost absent, its ventral margin feebly convex. Postpetiole almost as long as petiole, dorsally convex.

Dorsum of head punctate; lateral face with weaker punctation (reticulate with smooth and shiny bottoms) than dorsum and partly smooth and shiny or superficially reticulate with smooth interspaces. Antennal scape microreticulate. Mandible entirely micropunctate except for apical tooth and along masticatory margin. Greater part of pronotum superficially sculptured or smooth and shiny. Petiole entirely punctate and opaque; postpetiole entirely punctate except small area on dorsum shiny. First gastral tergite and sternite smooth and shiny except for the basalmost part with dense punctures. Basal half of femora microreticulate, but apical half superficially macroreticulate, smooth and shiny, partly superficially shagreened with smooth and shiny interspaces. Tibiae microreticulate, somewhat shiny.

Head and mesosoma dorsally with dense standing hairs; longest pronotal hair 0.23–0.25 mm long. Dorsum of head, mandible and mesosoma dark brown; legs, waist, and gaster dark reddish brown to reddish brown; antennal scape dark brown except for apicalmost portion reddish brown; all funicular segments reddish brown. Typhlatta spot absent.

**Etymology.** — The specific name is derived from name of the type locality, Sulawesi Island of Indonesia.

**Distribution.** — Sulawesi (Fig. 3).

Table 1. List of the worker-based names of Southeast Asian *Aenictus pachycerus* group and their distribution. Type localities are marked with \*.

Species	Distribution
1. <i>Aenictus bobaiensis</i> Zhou & Chen, 1999	S. China (Guangxi*, Hainan, and Hong Kong) and Vietnam
2. <i>Aenictus carolianus</i> Zettel & Sorger, 2010	Philippines (Cantipla* and Luzon)
3. <i>Aenictus dentatus</i> Forel, 1911	Malay Peninsula (Southern part of Thailand and Malaysia*), Sumatra, Borneo (Sabah, Sarawak, Brunei, and Kalimantan), and Java
4. <i>Aenictus kutai</i> , new species	Borneo (E. Kalimantan*)
5. <i>Aenictus levior</i> (Karavaivev, 1926)	Borneo (Sabah, Sarawak and Brunei), Malay Peninsula (Malaysia), and Buru Island*)
6. <i>Aenictus nesiotis</i> Wheeler & Chapman, 1930	Philippines (Negros*, Luzon and Palawan), Sulawesi, and Australia
7. <i>Aenictus paradentatus</i> Jaitrong & Yamane, 2012	Vietnam, Laos, and Thailand*
8. <i>Aenictus powersi</i> Wheeler & Chapman, 1930	Philippines (Negros*)
9. <i>Aenictus reyesi</i> Chapman, 1963	Philippines (Negros*)
10. <i>Aenictus sulawesiensis</i> , new species	Sulawesi*
11. <i>Aenictus</i> sp. 84 of WJT	Java

**Notes.** — So far *A. sulawesiensis* has been known only from the type locality. This species is very similar to *A. kutai* (see under *A. kutai*).

#### Material examined for other species of the *A. pachycerus* species group

For the type localities and distributions of all the species belonging to this species group, see Table 1.

*Aenictus bobaiensis* Zhou & Chen, 1999: 1 worker specimen sent by Zhou Shanyi from S. China, Guangxi, 20 Aug.1995, coll. S. Zhou (SKYC); 29 workers from N. Vietnam, Ninh Binh Prov., Nho Quan Dist., Cuc Phuong N.P., 9 Oct.2001, Sk. Yamane, VN01-SKY-40 (SKYC, THNHM).

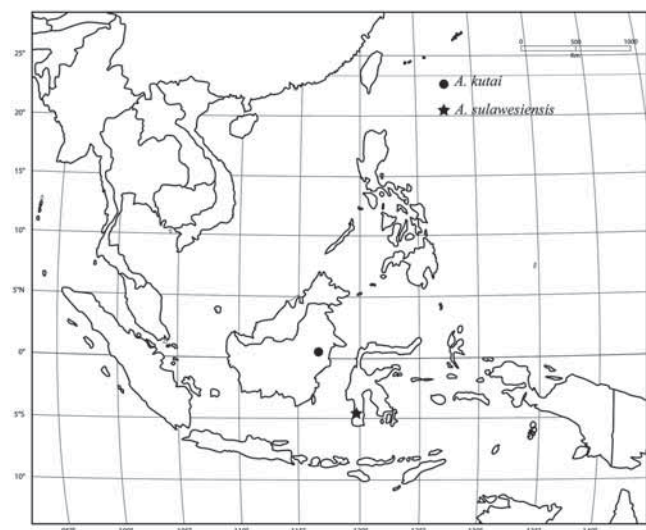


Fig. 3. Distribution of *A. kutai* and *A. sulawesiensis*.

*Aenictus carolianus* Zettel & Sorger, 2010: 4 paratype workers from the Philippines, Cebu City, Cantipla-I Forest Reserve, 1 Mar.2008, coll. H. Zettel & C. V. Pangantihon, #512 (SKYC and THNHM).

*Aenictus dentatus* Forel, 1911: Lectotype and 5 paralectotype workers from Malaya, Malacca, Berhentian Tingi (MHNG).

*Aenictus levior* (Karavaivev, 1926): 6 workers from Peninsular Malaysia, Selangor Prov., Ulu Gombak (ca. 250 m alt.), 7 Nov.1999, coll. V. Witte, VW-05 (SKYC); 32 workers from E. Malaysia, Borneo, Sarawak, Mulu, 12 Dec.1993, Sk. Yamane (SKYC, THNHM); 25 workers from E. Malasia, Borneo, Sabah, Logging area near Ranau, 27 Jun.1998, coll. K. Eguchi, Eg98-BOR-841 (SKYC, THNHM); 13 workers from Brunei, Temburong, Kuala Belalong, 19 Feb.1999, K. Eguchi, Eg99-BOR-201 (SKYC, THNHM).

*Aenictus nesiotis* Wheeler & Chapman in Wheeler, 1930: 21 syntype workers (8 were collected on 4/12/27 and 13 on 11/29/25; collection date was written on the back side of the uppermost label on each pin) from three colonies found at Dumaguete (MCZC).

*Aenictus paradentatus* Jaitrong & Yamane, 2012: Holotype and 17 paratype workers from N. Thailand, Chiang Mai Prov., Muang Dist., Doi Suthep-Pui National Park, 20 Aug.1998, coll. W. Jaitrong, WJT98-PD01 (BMNH, MCZC, MHNG, SKYC, THNHM).

*Aenictus powersi* Wheeler & Chapman in Wheeler, 1930: 11 syntype workers (four pins, two on a pin, three on each of remaining pins) from the Philippines, Negros, Dumaguete, 540 m (MCZC).

*Aenictus reyesi* Chapman, 1963: 20 snytipes from the Philippines, Negros, Horns of Negros, 450 m (MCZC).

*Aenictus* sp. 84 of WJT: Four workers from Indonesia, Central Java, Bandungan (1100 m alt.), grass pasture, 3 Nov.2000, coll. E. Kauffmann, EvaNo.1 (SKYC).

**Remarks.** — Twenty-five male-based species names are reported from Southeast Asia, seven of which were described from Java (Wilson, 1964; Bolton, 1995). Among the Southeast Asian species, only the Javan species, *Aenictus javanus* Emery, 1896 is known both from the worker and the male (Wilson, 1964; Jaitrong & Yamane, 2012). So far we have no information about the correspondence between male-based and worker-based species treated in this paper. Since more male-based species (seven) have been described from Java than worker-based species (four), the specimens from Java above (coded as *Aenictus* sp. 84 of WJT) most probably correspond to one of the Javanese male-based species. We decided not to treat it as a new species until we can identify the association between currently known male-based and worker-based species, and thus provisionally assigned such code to the above specimens to avoid future taxonomic confusion.

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