

ORIGINAL ARTICLE

The army ant *Aenictus silvestrii* and its related species in Southeast Asia, with a description of a new species (Hymenoptera: Formicidae: Aenictinae)

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Abstract

Three species of *Aenictus* with reduced numbers of antennal segments (8–9) occur in Southeast Asia: *A. jarujini* sp. nov., *A. latifemoratus* and *A. silvestrii*. *Aenictus latifemoratus* is new to Java and Borneo, while *A. silvestrii* is recorded for the first time from Borneo.

Key words: *Aenictus jarujini* sp. nov., army ants, southeast Asia, taxonomy.

INTRODUCTION

The genus *Aenictus* Shuckard, 1840 (subfamily Aenictinae) is one of the large ant genera in the world. Currently 149 valid species and subspecies are listed (Bolton *et al.* 2006). They are mainly distributed in the Old World tropics and subtropics, from Africa through the Middle East, India, South China, southernmost part of Japan, various countries in Southeast Asia to New Guinea and Australia (Gotwald 1995). All the known species except two have 10-segmented antennae in the worker caste. The species with less than 10 antennal segments (8 or 9) are *Aenictus silvestrii* Wheeler and *Aenictus latifemoratus* Terayama & Yamane; both are found only in Southeast Asia and are treated in this paper.

Only a few taxonomic papers have been published on the *Aenictus* species from Southeast Asia and adjacent areas. The only revisional paper on this genus is Wilson (1964), in which he omitted the male-based names from the species treatment. The more recent taxonomic papers dealing with species from this region include: Terayama (1984) (Taiwan); Xu (1994), Tang *et al.* (1995), Zhou & Chen (1999), Zhou (2001) (South China); Terayama

& Yamane (1989) (Sumatra, Indonesia); Terayama & Kubota (1993) (Vietnam and Thailand); Yamane & Hashimoto (1999) (Sarawak, Borneo); Shattuck (2008) (Australia). Jaitrong & Nabhitabhata (2005) listed the known species of Thailand.

During our survey on the Asian species of *Aenictus*, we have recognized a well-defined species group of three Southeast Asian species comprising the two species above mentioned and a new species from Thailand. In this paper we revise this group, describe the new species, and discuss the morphological and biological peculiarity of this group.

MATERIALS AND METHODS

This study is mainly based on the materials deposited in SKY collection at Kagoshima University (Kagoshima, Japan), and the Thailand Natural History Museum of the National Science Museum (Technopolis, Khlong Luang, Pathum Thani, Thailand). For the two named species syntypes or paratypes were examined.

The abbreviations used for the measurements and indices are as follows: TL, total length; 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 constriction and condylar bulb; ML, mesosomal length measured from the point at which the pronotum meets the cervical shield to the posterior margin of the

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Received 9 June 2009; accepted 9 January 2010.

metapleuron in profile; MTL, maximum length of mid tibia, excluding the proximal part of the articulation which is received into the distal end of the femur; PL, petiole length; CI (cephalic index), $HW/HL \times 100$; SI (scape index), $SL/HW \times 100$.

Abbreviations of the type depositories are as follows: BMHN, Natural History Museum, London, U.K.; SKYC, SKY collection at Kagoshima University, Kagoshima, Japan; MZB, entomological collection at Museum Zoologicum Bogoriense, Cibinong, Indonesia; MCZC, Museum of Comparative Zoology, Cambridge, MA, U.S.A; THNHM, Thailand Natural History Museum, Technopolis, Khlong Luang, Pathum Thani, Thailand.

SYSTEMATICS

Diagnostic characteristics of the three species with 8–9 antennal segments

All the members of this group share the following characteristics in the worker: head entirely sculptured; antenna thick, consisting of only 8 or 9 segments; scape somewhat flattened, broadened apically and strongly grooved below; anterior clypeal margin roundly convex in the middle; mandible subtriangular, very densely with small punctures; its masticatory margin with small inconspicuous teeth in addition to a sharp apical tooth; frontal carinae fused at the level of antennal base to form a single carina; occipital margin forming a narrow collar; declivity of propodeum concave, encircled with a rim; legs with apical half of tibia weakly and of femur strongly broadened and somewhat flattened; base of gastral tergite I and sternite I with dense small punctures; the punctured area usually dark colored; head and mesosoma yellowish, reddish or dark brown; gaster paler, usually yellow; typhlatta spot absent.

Key to species

- 1 Antenna 8-segmented.....*A. latifemoratus*
– Antenna 9-segmented.2
- 2 Dorsum and sides of head, and pro-mesonotum with longitudinal rugae.*A. silvestrii*
– Dorsum and sides of head with macropunctures; interspaces and bottoms micropunctate. Pro-mesonotum more irregularly sculptured.....*A. jarujini* sp. nov.

Aenictus jarujini Jaitrong et Yamane, sp. nov.

(Figs 1–2)

Holotype. Worker from disturbed area, Haui Nam Dang National Park, Mae Hong Son Province, N. Thailand, 7 iii 2008, W. Jaitrong leg., colony WJT08-HND20.

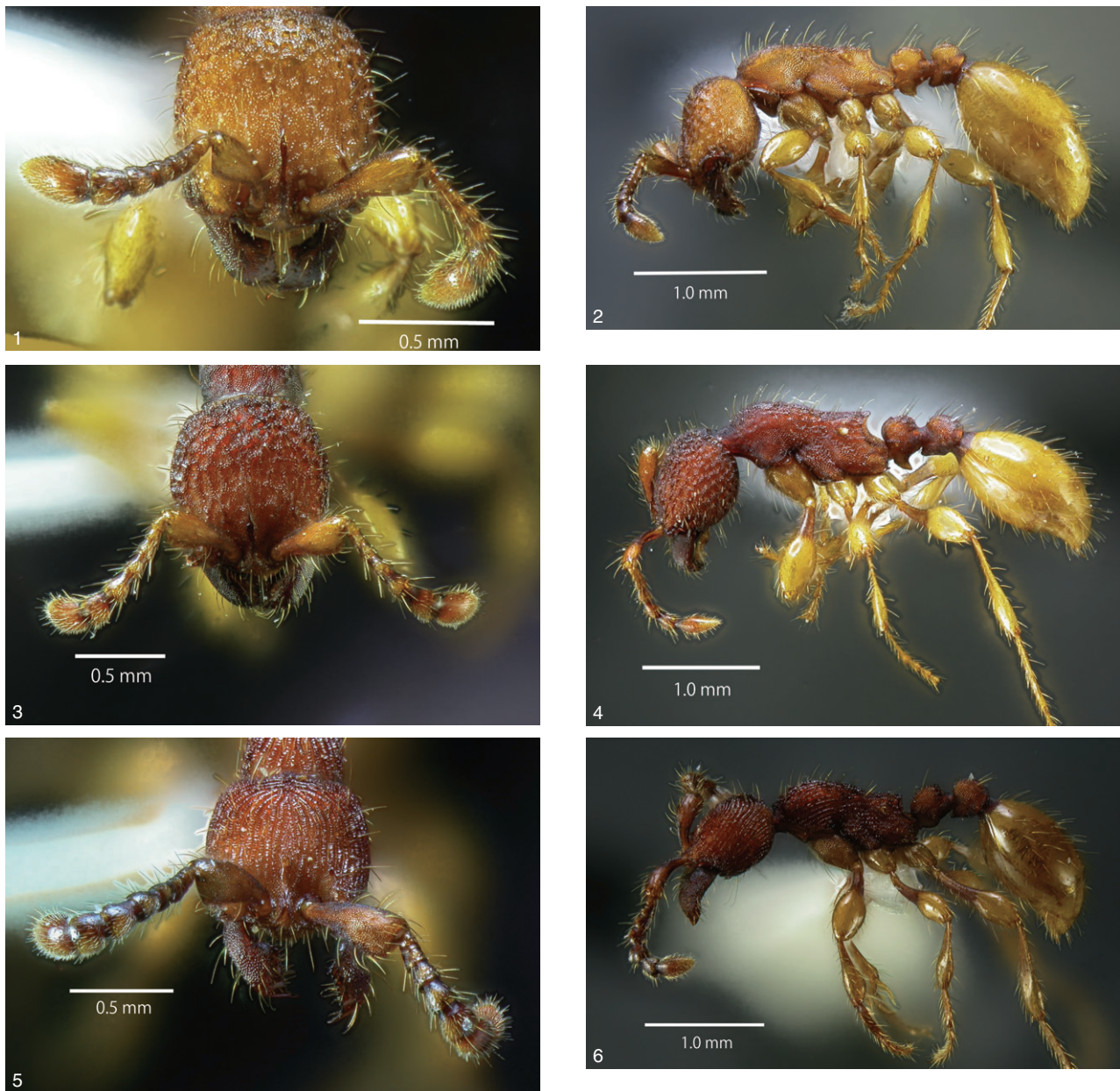
Paratypes. 64 workers, same data as holotype.

Type depository. Holotype and some paratypes are deposited in THNHM, and some paratypes in SKYC, BMHN, MCZC, and MZB.

Measurements. Worker ($n = 20$): TL 3.4–3.8 mm; HL 0.83–0.93 mm; HW 0.70–0.80 mm; SL 0.40–0.47 mm; ML 1.13–1.25 mm; MTL 0.50–0.55 mm; PL 0.25–0.30 mm; CI 82–89; SI 55–62.

Worker Description. Head in full-face view subrectangular, slightly longer than broad, with feebly convex sides and slightly concave posterior border; occipital margin concave bearing a narrow collar; area between frontal carina and parafrontal ridge depressed. Antenna 9-segmented; scape short, extending to the mid-length of head in full-face view; antennal segment II small, nearly as long as broad; III–V broader than long; VI–VIII nearly as long as broad; the terminal segment (IX) very large, almost as long as VII and VIII combined. Frontal carinae well developed, narrow, often with a longitudinal furrow (fused portion of the carinae) and extending half length of head; seen in profile its dorsal outline straight anteriorly and sloping gradually posteriad. Clypeus short and roundly produced anteriorly, lacking anterior teeth. Mandible with apical tooth large and curved, followed by 10–15 denticles of two sizes, the larger alternating with 2 or 3 smaller; basal margin of mandible lacking denticles. Mesosoma rather robust, seen from above wider anteriorly; posterior half almost parallel-sided; mesonotum laterally margined with ridges; in profile pronotum weakly convex dorsally and promesonotum sloping gradually to metanotal groove; propodeum slightly lower and weakly convex dorsally; mesopleuron not clearly demarcated from metapleuron; upper portion of mesometapleura extensively impressed. Propodeal junction acutely angulated; declivity of propodeum shallowly concave, encircled with a narrow rim. Petiole higher than broad, seen from above almost parallel-sided, anteriorly margined by a transverse carina, while posterior face encircled with a rim similar to that of propodeum; subpetiolar process low and subrectangular; postpetiole similar to petiole in shape and length, but without a well-demarcated posterior face, roundly convex above, impressed near posterior margin, anteroventrally produced as a blunt angle directed downward and forward. Gaster elongate-elliptical, narrowed anteriorly and posteriorly.

Dorsum of head in posterior half with dense macropunctures (almost reticulate) and micropunctures, and in anterior half with micropunctures and several longitudinal rugulae; sides of head with micropunctures, and sparse and shallow macropunctures. Mandible largely with dense minute punctures, but smooth apically and along masticatory margin. Upper face of antennal scape



Figures 1–6 Workers of *Aenictus silvestrii* group. 1,2 *A. jarujini* sp. nov.; 3,4 *A. latifemoratus*; 5,6 *A. silvestrii*. 1, 3, 5 Head in full-face view; 2, 4, 6 Habitus in profile.

basally with dense micropunctures and apically much smoother. Dorsal surface of mesosoma weakly and irregularly sculptured, with ill-defined micropunctures, and mat; lateral face of mesosoma densely micropunctate. Petiole dorsally with very superficial reticulum superimposed with dense micropunctures (a condition similar to posterodorsal part of head); postpetiole densely micropunctate. Gaster smooth and shining except for extreme basal portion. Femora and tibiae smooth and shining.

Body with relatively sparse standing hairs mixed with sparse short hairs over the surface; length of the longest pronotal hair approximately 0.20–0.25 mm. Head, mesosoma and waist pale brown; gaster and legs yellow; mandible blackish brown.

Etymology. The specific name is dedicated to the late Dr Jarujin Nabhitabhata of the Thailand Natural History Museum, National Science Museum, who was the most excellent specialist in biodiversity sciences in Thailand and helped and inspired many young biologists.

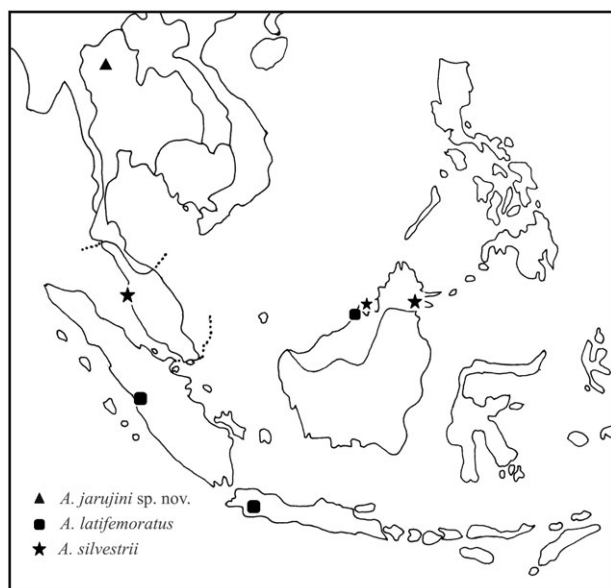


Figure 7 Distribution of *Aenictus jarujini* sp. nov., *A. latifemoratus* and *A. silvestrii*.

Distribution. Northern Thailand (Fig. 7).

Bionomics. This species is very rare and known only from the type locality (around 1000 m alt.). The specimens were collected from a bivouac under a stone in a disturbed area near a hill-evergreen forest during the dry season.

Aenictus latifemoratus Terayama et Yamane (Figs 3–4)

Aenictus latifemoratus Terayama & Yamane, 1989: 600, Figures 3–6; Bolton 1995: 60.

Types. Holotype worker and a paratype worker from Maninjau, W. Sumatra, Indonesia deposited in MZB, and a paratype deposited in SKYC (examined).

Measurements. One paratype: TL 3.9 mm; HL 0.93 mm; HW 0.85 mm; SL 0.60 mm; ML 1.33 mm; MTL 0.63 mm; PL 0.28 mm; CI 92; SI 71. Nontype material ($n = 5$): TL 3.8–4.0 mm; HL 0.92–0.97 mm; HW 0.85–0.85 mm; SL 0.60–0.63 mm; ML 1.25–1.35 mm; MTL 0.63–0.65 mm; PL 0.27–0.33 mm; CI 90–95; SI 69–71.

Worker Description. Head slightly longer than broad, with weakly convex sides; seen in full-face view its posterior margin weakly convex; occiput with a well-demarcated collar bearing many carinae. Antenna 8-segmented; scape extending slightly beyond the midlength of head in full-face view; antennal segments II–III slightly broader than long or as broad as long; IV–VIII distinctly longer than broad, each being broadened apically; VIII $c.$ 2.0 \times as long as broad. Frontal carinae

narrow and extending half length of head, sharply elevated and darkened in anterior half, and low and vestigial in posterior half. Clypeus short and roundly produced anteriorly, lacking anterior teeth. Mandible with apical tooth large and curved, followed by a series of 7–9 denticles; basal margin of mandible lacking denticles. Promesonotum in profile distinctly convex dorsally; propodeum lower than promesonotum, and its dorsal outline straight; propodeal junction acutely angulate; declivity of propodeum shallowly concave, encircled with a rim. Seen from side, petiole subrectangular, anteriorly weakly convex; its anterior face encircled with a sharp rim; subpetiolar process well developed and subtriangular; postpetiole as long as petiole, seen from above distinctly broadened posteriorly, in profile roundly convex above, anteroventrally produced as a blunt angle directed downward and forward. Gaster elongate-elliptical, narrowed anteriorly and posteriorly.

Head almost wholly with macropunctures (somewhat reticulate) except for areas along frontal carinae; interspaces and bottoms with dense small punctures; macropunctures on sides of head sparser than in other regions. Mandible with very dense micropunctures, but smooth apically and along masticatory margin. Upper face of antennal scape basally with dense micropunctures and apically much smoother. Dorsum of mesosoma sculptured as in dorsum of head, but with sparser macropunctures. Petiole with a weak reticulum superimposed with very dense small punctures (a condition similar to that of propodeal dorsum); postpetiole with dense small punctures. Gaster smooth and shining except for extreme base. Femora and tibiae smooth and shining.

Body with relatively sparse standing hairs mixed with sparse short hairs over the surface; length of the longest pronotal hair approximately 0.23 mm. Head, mesosoma and waist reddish brown to dark brown; gaster and legs yellow; mandibles blackish brown.

Nontype material examined. Indonesia: Maninjau, W. Sumatra, 7–9 viii 1985, S. & Sk. Yamane leg., from the same colony as holotype (SKYC); Cibodas, Mt. Gede, West Java, 20 viii 1998, K098082-2, K. Ohkawara leg. (SKYC). Malaysia: Lambir N.P., Miri, Sarawak, Borneo, 20 vi 1998, K. Eguchi leg., Eg98-BOR-800 (SKYC, THNHM).

Distribution. Borneo (Sarawak), West Sumatra, and West Java (new to Borneo and Java) (Fig. 7).

Bionomics. Specimens from West Sumatra and Sarawak were collected in relatively good rainforests from columns on the forest floor.

Aenictus silvestrii Wheeler (Figs 5–6)

Aenictus (*Paraenictus*) *silvestrii* Wheeler 1929: 28.

Aenictus silvestrii: Wilson 1964: 479, Figures 76–78; Bolton 1995: 60.

Types. *Aenictus silvestrii*: Two syntype workers from Penang Island, Malay Peninsula deposited in MCZC (examined).

Measurements. The measurement of a syntype after Wilson (1964): HL 0.92 mm; HW 0.83 mm; SL 0.59 mm. HW of 2nd syntype 0.80 mm. Nontype material ($n = 4$): TL 3.9–4.1 mm; HL 0.87–0.93 mm; HW 0.82–0.85 mm; SL 0.50–0.57 mm; ML 1.25–1.3 mm; MTL 0.6–0.63 mm; PL 0.30–0.35 mm; CI 89–94; SI 61–70.

Worker Description. Head in full-face view subrectangular, slightly longer than broad, with feebly convex sides; posterior margin of head almost straight but weakly sinuate; occiput bearing a narrow collar with irregular carinae. Antenna 9-segmented (in some nontype specimens segment III is clearly demarcated from IV, though in the two syntypes this segmentation is not very clear); antennal segment II small, nearly as long as broad; III very short, broader than long; IV nearly as long as broad; V and VI distinctly longer than broad; VII and VIII as long as broad; the last (IX) longer than broad and much longer than others, almost as long as VII and VIII combined. Frontal carinae short extending less than half length of head, very poorly developed in posterior half. Clypeus short and roundly produced anteriorly, lacking anterior teeth. Mandible with apical tooth large and curved, followed by a series of 10–15 denticles of two sizes, the larger alternating with 2–3 of smaller; basal margin of mandible with 3–4 small denticles. With mesosoma seen in profile promesonotum weakly convex dorsally and sloping gradually to metanotal groove; dorsal outline of propodeum almost straight. Propodeal junction acutely angulate; declivity of propodeum shallowly concave, encircled with a rim. Petiole slightly longer than broad, relatively low, nearly as high as long, anteriorly and posteriorly margined with a rim similar to that of propodeum but poorly developed; subpetiolar process very low; postpetiole as long as petiole in profile roundly convex above, anteroventrally produced as a blunt angle directed downward and forward. Gaster elongate-elliptical, narrowed anteriorly and posteriorly.

Head extensively with regular rugae and dense minute punctures on rugae; rugae on lateral and ventral faces of head longitudinal, but those on vertex transverse and those on frons curved outwardly. Mandible except in apical portion and along masticatory margin, and antennal scape wholly with dense small punctures. Dorsum of mesosoma, pro- and mesopleuron with regular longitudinal rugae. Node of petiole with irregular longitudinal carinae and dense small punctures; postpetiole with similar sculpture but carinae weaker than on petiole.

Gaster smooth and shining except for extreme base. Fore coxa distinctly punctate; narrow basal portions of femora distinctly sculptured and mat; other parts of legs largely smooth.

Body with relatively sparse standing hairs mixed with sparse short hairs over the surface; length of the longest pronotal hair approximately 0.20 mm. Head, mesosoma and waist reddish brown to dark brown; mandible dark brown; antenna reddish brown, with the apical segment paler; gaster and legs largely yellowish brown; narrow basal portions of femora darkened.

Nontype material examined. Malaysia: Danum Valley, Sabah, Borneo, 29 ix 2000, C. Brühl leg, CB-00-03 (SKYC, THNHM). Brunei: Labi Road, Belait distr., Ulu Malayan, Borneo, 13 vi 2005, Tuah leg. (SKYC).

Distribution. Malay Peninsula and Borneo (Sabah and Brunei; new to Borneo) (Fig. 7).

Bionomics. The specimens from Sabah were found marching on the forest floor in a primary rainforest.

DISCUSSION

The *Aenictus silvestrii* species group defined in the present paper is most probably a monophyletic group. The monophyly is supported by the following derived character states: (i) reduced number of antennal segments (8 or 9); (ii) scape somewhat flattened and broadened apically, and strobly grooved below; and (iii) apical half of tibiae weakly and apical half of femora strongly broadened and somewhat flattened (see also the diagnosis for the species group). Among them the reduced number of antennal segments is most distinctive.

Our new species, *A. jarujini*, is very similar and closely related to *A. latifemoratus*, but the two are easily separated by the following characters: number of antennal segments (9 in *A. jarujini*; 8 in *A. latifemoratus*); shape of petiolar node (node subrectangular and relatively low, posteriorly margined with a rim in *A. jarujini*; node without a distinct rim in *A. latifemoratus*), condition of subpetiolar process (very low in *A. jarujini*; well developed and subtriangular in *A. latifemoratus*); sculpturing on head (strongly macropunctate in posterior dorsal half of head, other regions only weakly macropunctate in *A. jarujini*; strongly macropunctate or reticulate extensively on dorsum and sides of head in *A. latifemoratus*). *Aenictus silvestrii* is very unique in having the head and mesosoma with rugae which are absent in the other species, but it has the same number of antennal segments (9) as has *A. jarujini*. With this information, the phylogenetic relationship of these three species is difficult to establish.

According to the literature (Wheeler 1929; Terayama & Yamane 1989; Shattuck 2008) and our own surveys,

the species of this group seem to be confined to Southeast Asia. Little is known about their bionomics. Nothing is mentioned by Wheeler (1929) on the biology of *A. silvestrii*. Recent ecological studies on Southeast Asian *Aenictus* did not include any information on the *A. silvestrii* group (Roscsiszewski & Maschwitz 1994; Hirosawa *et al.* 2000; Ito *et al.* 2001). However, all the series of *A. latifemoratus* were found in the daytime on the forest floor in relatively good rainforests. The single colony of *A. jarujini* was found under a stone in a disturbed area during the hottest and very dry season. No worker activity was seen around the stone and no immatures were found in the bivouac. This means that this group has two different types of species, one adapted to the rainforest and the other to sparse forest with a distinct dry season. Even with this scanty information, we tentatively conclude that this species group is essentially Southeast Asian, and differs in general biology from South Asian and African species, many of which are known to be hypogaecic (Schneirla & Reyes 1966; Gotwald 1976).

ACKNOWLEDGMENTS

We would like to express our heartfelt gratitude to the late Dr Jarujin Nabhitabhata, who supported us for field surveys in Thailand. We are grateful to Dr Katsuyuki Eguchi (Nagasaki University), Dr Carsten Brühl (University of Koblenz-Landau), Prof. Fuminori Ito (Kagawa University) and Mr Tuah Bin Atar (Brunei Museum) for their help in collecting the material. Drs Edward O. Wilson and Stefan Cover (Museum of Comparative Zoology, Harvard University) kindly allowed Sk. Yamane to examine the type material of *Aenictus silvestrii*. We also thank Mr Takuya Maeda (Kagoshima University) for his help in taking the photos. An anonymous reviewer, to whom we are much indebted, kindly gave us valuable comments.

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