

A sibling species of *Aenictus dentatus* FOREL, 1911 (Hymenoptera: Formicidae) from continental Southeast Asia

Weeyawat JAITRONG, Seiki YAMANE & Wattanachai TASEN



Abstract

A new species of army ant, closely related to *Aenictus dentatus* FOREL, 1911, is described and illustrated based on the worker caste under the name *Aenictus paradenatus* JAITRONG & YAMANE sp.n. This species is distributed in the continental Southeast Asia, while *A. dentatus* is restricted to Sundaland.

Key words: Taxonomy, Formicidae, Aenictinae, *Aenictus paradenatus*, army ant, new species.

Myrmecol. News 16: 133-138

ISSN 1994-4136 (print), ISSN 1997-3500 (online)

Received 10 December 2010; revision received 4 February 2011; accepted 20 February 2011

Subject Editor: Herbert Zettel

Weeyawat Jaitrong, Department of Natural Sciences, Graduate School of Science and Engineering, Kagoshima University, Kagoshima, Japan; Natural History Museum, National Science Museum, Technopolis, Khlong 5, Khlong Luang, Pathum Thani, 12120 Thailand. E-mail: polyrhachis@yahoo.com

Seiki Yamane, Dept. Natural Sciences, Graduate School of Science and Engineering, Kagoshima Univ., Kagoshima, Japan.

Wattanachai Tasen (contact author), Department of Forest Biology, Faculty of Forestry, Kasetsart University, Bangkok, 10900 Thailand. E-mail: fforwct@ku.ac.th

Introduction

"*Aenictus dentatus* FOREL, 1911" has been recorded from a wide range of tropical Asia including India, southernmost part of China and various countries of Southeast Asia (WILSON 1964, TERAYAMA & YAMANE 1989, TERAYAMA & KUBOTA 1993, XU 1994, BOLTON 1995, ZHOU & CHEN 1999, ITO & al. 2001, ZHOU 2001, ANNETTE & al. 2003, YAMANE & al. 2003, EGUCHI & al. 2005, JAITRONG & NABHITABHATA 2005, BOLTON & al. 2007). We have examined a rich material of "*A. dentatus*" collected from Southeast Asia and compared them with syntypes of *A. dentatus* from Malacca, Peninsular Malaysia. After a careful study we have reached the conclusion that *A. dentatus* is restricted to Sundaland (southern part of Malay Peninsula, Sumatra, Borneo, and Java) and that the populations of continental Southeast Asia (Vietnam, Laos and Thailand) belong to a closely related but distinct biological species. Both share the distinctive coarse sculpture on the head and mesosoma, and the relatively long antennal scape, extending beyond the posterior margin of the head. However, they differ in some characters (shape of head, scape length, shape of petiole and sculpture on mesosoma and gaster), and distribution pattern.

In the present paper we describe this unidentified species as a new species based on the worker caste. *Aenictus dentatus* is also redescribed based on the lectotype and paralectotypes, which are designated below. The distributions of both species are discussed.

Methods

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

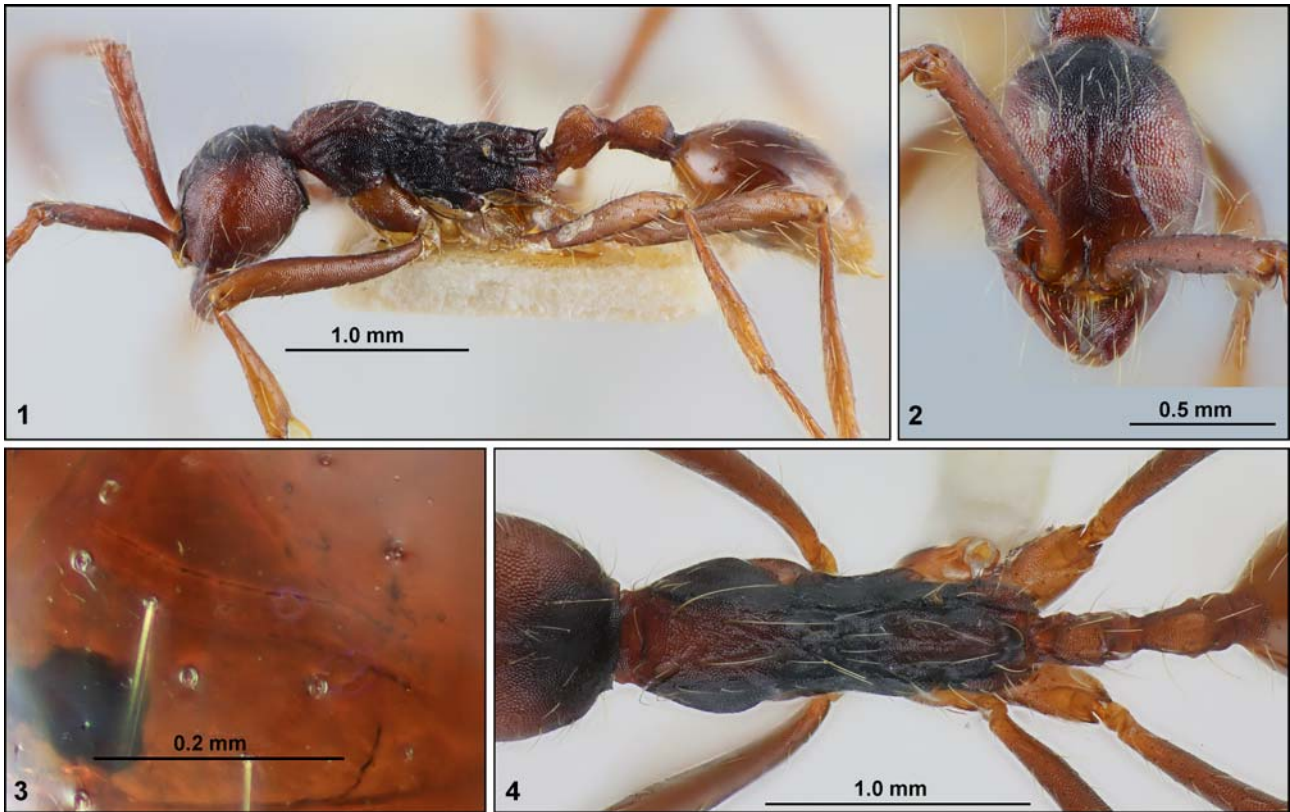
source images taken by a Nikon EOS Kiss X4 digital camera attached to a Nikon ECLIPSE E600 microscope. Workers of each species were measured using a micrometer (accurate to 0.01 mm).

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

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

Abbreviations of the type depositories are as follows:

- BMNH The Natural History Museum, London, UK
- MCZC Museum of Comparative Zoology, Cambridge, MA, USA
- MHNG Muséum d'Histoire Naturelle, Geneva, Switzerland
- SKYC Collection of Sk. Yamane at Kagoshima University, Japan
- THNHM Natural History Museum of the National Science Museum, Thailand



Figs. 1 - 4: *Aenictus dentatus*. (1) Habitus, lateral aspect, lectotype. (2) Head, full-face view, lectotype. (3) Sculpture on first gastral tergite. (4) Habitus, dorsal aspect.

Systematics

Aenictus dentatus FOREL, 1911 (Figs. 1 - 5, 11 - 12)

Aenictus aitkeni var. *dentatus* FOREL, 1911: 383.

Aenictus dentatus: WILSON 1964: 460; BOLTON 1995: 59.

Types. *Aenictus aitkeni* var. *dentatus*: six syntype workers (two pins, three on each pin) from Berhention Tingi, Malacca, Malaya (MHNG, examined). One worker (top on a pin) is designated here as the lectotype, the others as paralectotypes.

Non-type material examined. Thailand: Narathiwat Prov., Bala-Hala W.S., tropical rain forest, 26.IX.2001, leg. C. Bourmas (SKYC, THNHM). Malaysia: Malay Peninsula, Selangor Prov., Ulu Gombak ca. 250 m a.s.l., 19.X.1999, VW-06, leg. V. Witte (SKYC, THNHM); Sabah, Poring, Kinabalu, 800 m a.s.l., 17.III.1995, leg. T. Kikuta (SKYC); Sabah, Sepilok Forest, 25.I.1997, Eg96-BOR-475, leg. K. Eguchi, (SKYC, THNHM); Sabah, Sepilok Forest, 27.VIII.1995, leg. Sk. Yamane (SKYC); Sabah, Tawau Hills N.P., 11.VII.1996, SB96-SKY-27, leg. Sk. Yamane (SKYC, THNHM); Sabah, Gunong Rara, Tawau Hills N.P., 10.XII.1996, Eg96-BOR-333, leg. K. Eguchi, (SKYC); Sabah, Mahua, Tambunan, 2.VI.2005, leg. Bakhtiar (SKYC); Sabah, Sepilok, 29.V.2005, leg. Bakhtiar (SKYC); Sarawak, Miri, Lambir N.P., Bt. Lambir, 12.I.1993, leg. Sk. Yamane (SKYC, THNHM); Sarawak, Miri, Lambir N.P., 13.VIII.1995, leg. Sk. Yamane (SKYC, THNHM); same loc., 30.VI.2004, leg. Sk. Yamane (SKYC, THNHM); same loc., 2.I.1998, leg. Sk. Yamane (SKYC, THNHM); same loc., 19.IV.1993, leg. Sk. Yamane (SKYC, THNHM). Brunei: Tasek Merimbun, 12.II.1999, Eg99-BOR-060,

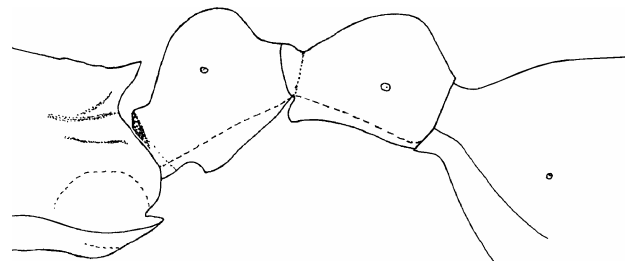


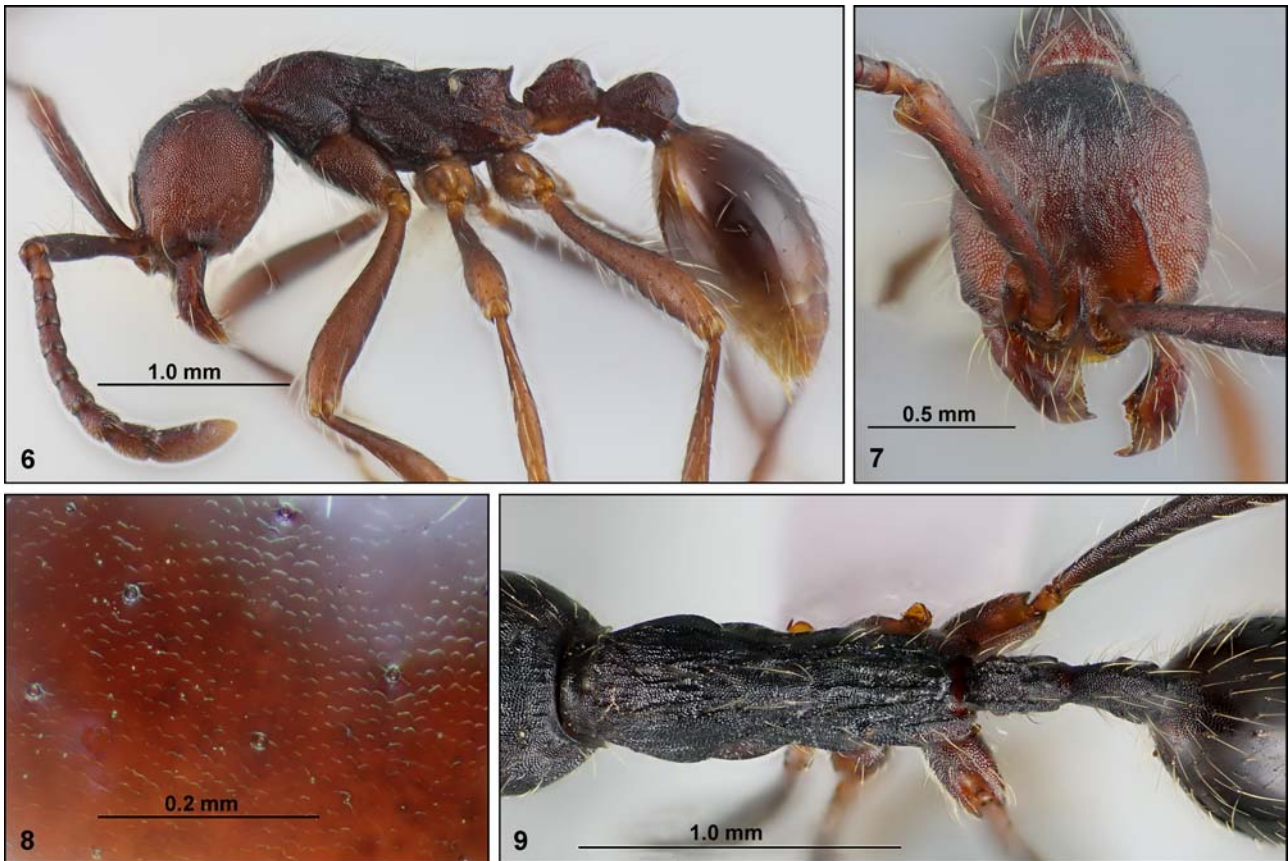
Fig. 5: *Aenictus dentatus*, petiole and postpetiole, lateral aspect, lectotype.

leg. K. Eguchi, (SKYC, THNHM). Indonesia: E. Kalimantan, Kutai N.P., 7.VIII.1992, leg. Sk. Yamane (SKYC); W. Sumatra, Lubuk Gadang, 21 - 23.VIII.1985, leg. Sk. Yamane (SKYC); W. Sumatra, Padang, Ulu Gadut, Bt. Lantik, 450 m a.s.l., 19.I.1988, leg. M. Kato (SKYC); S. Sumatra, Lampung Barat, Bodong Jaya, Sumberjaya, 18.IX.2007, SU07-SKY-197, leg. Sk. Yamane (SKYC, THNHM); W. Java, Pangandaran, 15.XII.1995, FI95-676, leg. F. Ito (SKYC, THNHM).

Redescription of workers. Measurements of lectotype. TL 4.55 mm; HL 1.00 mm; HW 0.78 mm; SL 1.15 mm; ML 1.50 mm; PL 0.35 mm, CI 78; SI 148.

Measurements of paralectotypes (n = 5). TL 4.40 - 4.45 mm; HL 0.95 - 1.00 mm; HW 0.72 - 0.78 mm; SL 1.08 - 1.13 mm; ML 1.45 - 1.50 mm; PL 0.33 - 0.35 mm, CI 76 - 79; SI 143 - 152.

Head in full-face view oval, distinctly longer than broad, with distinctly convex sides; posterior margin strongly convex; occipital margin bearing a distinct collar. Antenna



Figs. 6 - 9: *Aenictus paradentatus* sp.n. (6) Habitus, lateral aspect, holotype. (7) Head, full-face view, holotype. (8) Sculpture of first gastral tergite, holotype. (9) Habitus, dorsal aspect.

10-segmented; scape very long, much extending beyond posterolateral corner of head; all funicular segments longer than broad; apical segment almost as long as three previous ones. Frontal carinae well developed, fused at the level of antennal base to form a single carina, extending less than half length of head, very poorly developed in posterior half. Parafrontal ridge well developed, extending $\frac{1}{3}$ of head length; seen in profile, its anteriormost part well developed and subtriangular. Clypeus short and roundly produced anteriorly, lacking anterior denticles. Mandible triangular, its masticatory margin with large apical tooth, followed by 15 denticles; basal margin of mandible lacking denticles. Mesosoma elongate and stout; promesonotum (seen in profile) with slightly convex dorsum, sloping gradually to metanotal groove; propodeum lower, with feebly convex dorsum; propodeal junction developed into a high, thin transverse ridge, which in profile appears as a large, acute tooth overhanging declivity of propodeum. Petiole with short but distinct peduncle; node short and posteriorly elevated, in profile with anterior and dorsal surfaces continuous, posterior slope steep; subpetiolar process weakly developed and subtriangular, its apex directed downward. Postpetiole almost as long as petiole, its dorsal surface convex. Gaster elliptical, narrowed anteriorly and posteriorly.

Head, mesosoma, petiole and postpetiole entirely micropunctated and opaque. In addition, promesonotum dorsally rugose, and laterally with five to six longitudinal rugae; propodeum dorsally with three to four longitudinal cari-

nae; petiole in dorsal view with longitudinal or irregular rugae. First gastral tergite and sternite smooth and shiny, except for the basalmost part with dense micropunctures.

Head and mesosoma with relatively dense standing hairs; length of the longest pronotal hairs 0.38 - 0.40 mm. Head and mesosoma dark reddish brown; antenna, legs, waist and gaster reddish brown or yellowish brown. Typhlatta spot absent.

Distribution. Southernmost part of Thailand, Peninsular Malaysia, Sumatra, Borneo (Sabah, Brunei, Sarawak, and East Kalimantan), and Java (Fig. 11).

Remarks. In several characters variation is found that may or may not be of geographic nature. The subpetiolar process varies from low (its ventral outline weakly convex as seen in the Sumatran population and some colonies collected from Borneo such as Eg96-BOR-475, SB96-SKY-26 and SR04-SKY-11) to subtriangular (apex directed downward as seen in the type series and some colonies collected from Borneo such as Eg96-BOR-324 and Eg-BOR-545, and the single colony collected by Sk. Yamane from East Kalimantan). Size variation occurs between populations; the specimens from Sumatra are slightly larger than the type series (HW 0.80 - 0.85 mm vs. 0.72 - 0.78 mm). Within the Bornean population the variation in head width is greater: 0.75 mm to 0.88 mm. The specimens collected from Borneo tend to be darker in coloration than the lectotype and the other specimens from Malay Peninsula. However, in most of the characters the specimens from all parts of Sundaland agree with the type series, except for the single colony

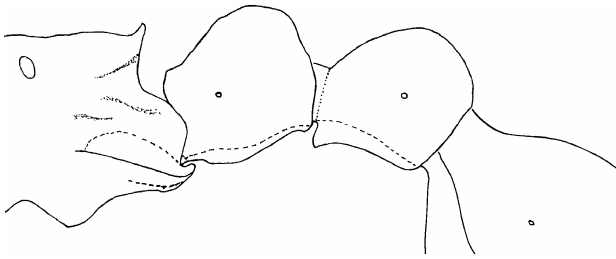


Fig. 10: *Aenictus paradentatus* sp.n., petiole and postpetiole, lateral aspect, holotype.

collected from West Java (FI95-676, SKYC and THNHM), in which the propodeal junction is simply right-angled, in profile not forming a overhanging tooth. We regard this difference as an intraspecific variation.

Bionomics. According to ANNETTE & al. (2003) in Pasoh, Malay Peninsula, *Aenictus dentatus* foraged on the forest floor in the day and night and preyed on ants of the genus *Pheidole* WESTWOOD, 1839. We found this species preying on the ants of the genus *Nylanderia* EMERY, 1906 in Lambir National Park, Sarawak (SR04-SKY-11). This species occurs from the sea level to highlands (up to 1,300 m a.s.l., Bodong Jaya, southern Sumatra) and inhabits primary and disturbed forests.

***Aenictus paradentatus* JAITRONG & YAMANE sp.n.**
(Figs. 6 - 12)

Etymology. The specific epithet *paradentatus* is a compound word meaning "similar to *dentatus*".

Types. Holotype: worker from Doi Suthep-Pui National Park, Muang Dist., Chiang Mai Prov., N. Thailand, 20.VIII.1998, W. Jaitrong leg., WJT98-PD01 (THNHM). Paratypes: 17 workers, same data as holotype (BMNH, MCZC, MHNG, SKYC, THNHM).

Non-type materials examined. Vietnam: Ninh Binh Prov., Nho Quan Dist., Cuc Phuong N.P., 11.VIII.1998, VN98-HO-026, leg. H. Okido (SKYC, THNHM); same loc., 9.XI.2001, VN01-SKY-40, leg. Sk. Yamane (SKYC); Bac Giang, Tay Yen, 150 m a.s.l., 29. - 31.V.2004, Eg04-VN-146, leg. K. Eguchi (SKYC); Quang Ninh, Chua Yen Tu, 520 - 725 m a.s.l., 18.V.2004, Eg04-VN-004, leg. K. Eguchi (SKYC); Vinh Phuc Prov., Tam Dao N.P., 900 m a.s.l., 7.VIII.1998, VN98-SKY-06, leg. Sk. Yamane (SKYC, THNHM); Nghe An Prov., Pu Hoat, VI.1999, VN9902, leg. T. V. Bui (SKYC, THNHM). Laos: Vientiane, Naxaythong Dist., Sivilay Village, 10.VI.2010, WJT10-LAO12 = LA10-SKY-065, leg. W. Jaitrong (SKYC, THNHM); Pak Ngum Dist., Phang Dang Village, 12.VI.2010, WJT10-LAO16 = LA10-SKY-126, leg. W. Jaitrong (SKYC, THNHM); same loc., 14.VI.2010, WJT10-LAO16, leg. W. Jaitrong (THNHM). Thailand: Chiang Mai Prov., Doi Phahom Pok, 28.V.2008, WJT08-N33, leg. W. Jaitrong (SKYC, THNHM); Chiang Mai Prov., Doi Ang Khang, 13.VII.2000, WJT00-TH061, leg. W. Jaitrong (SKYC, THNHM); Chiang Mai Prov., Doi Chiang Dao, 500 - 600 m a.s.l., 19.VIII.1998, TH98-SKY-09, leg. Sk. Yamane (SKYC); Mae Hong Son Prov., Pang Mapha Dist., Tham Lod, 6 III 2008, WJT08-TL01, leg. W. Jaitrong (SKYC, THNHM); Uthai Thani Prov., Ban Rai Dist., Kan Ma Kud Village, 18.VI.2010, HKK10-06-06, leg. W. Jaitrong (THNHM); Chaiyaphum Prov., Phu Kheao, 13.I.1999, WJT99-TH64, leg. W. Jaitrong (SKYC, THNHM); Loei

Prov., Phu Luang, 11.IV.2008, TH08-SKY-103, leg. Sk. Yamane (SKYC, THNHM); Nakhon Ratchasima Prov., Sakhaerat ERS., 22.XI.1999, WJT99-TH46, leg. W. Jaitrong (SKYC, THNHM); Chachoengsao Prov., Khao Ang Reu Nai, 21.VIII.2003, TH03-SKY-43, leg. Sk. Yamane (SKYC, THNHM); Chanthaburi Prov., Pheao, 22.XI.2003, TH03-HS12, leg. S. Hasin (SKYC, THNHM); Prachuap Kirikhan Prov., Tabsakae Dist., 5.VIII.2009, WJT09-TH2002, leg. W. Jaitrong (SKYC, THNHM).

Worker description (holotype and paratypes). Measurements of holotype: TL 4.65 mm; HL 1.03 mm; HW 0.90 mm; SL 1.08 mm; ML 1.53 mm; PL 0.33 mm; CI 88; SI 119.

Measurements of paratypes (n = 9): TL 4.55 - 4.65 mm; HL 0.95 - 1.05 mm; HW 0.80 - 0.93 mm; SL 0.93 - 1.08 mm; ML 1.50 - 1.55 mm; PL 0.33 - 0.35 mm; CI 83 - 88; SI 117 - 124.

Head in full-face view round, slightly longer than broad, with convex sides and posterior margin; occipital carina bearing distinct collar. Antenna 10-segmented; scape long, extending beyond posterolateral corner of head; funicular segment I almost as long as II, but slightly shorter than III - VI; apical segment almost as long as three previous ones. Frontal carinae well developed, fused at level of antennal base to form a single carina, extending less than half length of head, very poorly developed in posterior half. Parafrontal ridge well developed, extending $\frac{1}{3}$ of head length; seen in profile, its anteriormost part well developed and subtriangular. Clypeus short and roundly produced anteriorly, lacking anterior denticles. Mandible triangular, its masticatory margin with large apical tooth, followed by 11 - 12 denticles; basal margin of mandible lacking denticles. Mesosoma rather elongate and stout; promesonotum in profile with strongly convex dorsum, sloping gradually to metanotal groove; propodeum lower and with almost straight dorsum; mesopleuron not demarcated from metapleuron; propodeal junction acutely angulated, protruding as ridge that is often slightly upward directed; declivity of propodeum shallowly concave, encircled with very narrow rim. Petiole almost as long as high without peduncle, its dorsal outline elevated posteriorly; subpetiolar process generally very low, its ventral outline weakly convex. Postpetiole seen in profile slightly larger than petiole, its dorsal outline elevated posteriorly. Gaster elliptical, narrowed anteriorly and posteriorly.

Head, mesosoma, petiole and postpetiole entirely and densely micropunctate and opaque. In addition, promesonotum dorsally rugose, laterally with approximately ten longitudinal rugae; dorsal petiolar surface with longitudinal or irregular rugae. First gastral segment very weakly shagreened with smooth and shiny interspaces, except in basalmost part with dense micropunctures.

Head and mesosoma with relatively dense standing hairs; length of longest pronotal hairs 0.43 - 0.45 mm. Entire body dark reddish brown or dark brown. Typhlata spot absent.

Distribution. Vietnam, Laos, and Thailand (Fig. 11).

Remarks. The specimens from the distribution range (Vietnam, Laos, and Thailand) agree in most characters well with the type series from Doi Suthep-Pui National Park, northern Thailand. Size variation occurs in the worker (HW: 0.75 - 0.95 mm). For example, in the single colony collected from Laos (WJT10-LAO16) the head width

is much smaller than in the type series and the others (HW: 0.75 - 0.78 mm in the former, and 0.80 - 0.93 mm in the type series). In most specimens the subpetiolar process is very low with its ventral outline weakly convex as seen in the type series, but in two specimens collected from Doi Ang Khang (ca. 1,300 m a.s.l.), northern Thailand it is more developed, protruded anteroventrally.

Bionomics. *Aenictus paradentatus* occurs from lowlands to highlands (up to 1,300 m a.s.l., Doi Ang Khang, N. Thailand) and inhabits primary and disturbed forests (rarely marching even in grasslands in the mountain range of N. Vietnam). We observed this species preying on other ants such as species of *Leptogenys* ROGER, 1861 (Vietnam, VN98-SKY-15), *Oecophylla* SMITH, 1860 (Thailand, HKK10-06-06), *Pachycondyla* SMITH, 1858 (Laos, WJT10-LAO16) and *Pheidole* (Vietnam, VN98-SKY-15), and also on termites, *Macrotermes* sp. (Laos, WJT10-LAO12).

Discussion

Aenictus paradentatus sp.n. and *A. dentatus* are very similar in general appearance as they share the distinctive coarse sculpture on head and mesosoma, and the relatively long antennal scape, extending beyond the posterior margin of the head. However, they differ in several significant characters. The antennal scape is relatively shorter in *A. paradentatus* (SI 117 - 124) than in *A. dentatus* (SI 143-152). Figure 12 shows the ratio of HW / SL in the workers of *A. dentatus* (34 specimens) and *A. paradentatus* (47) from throughout their distribution ranges; no overlapping is observed in HW / SL between the species. The posterior portion of the head in full-face view is relatively broader in *A. paradentatus* (Fig. 7) than in *A. dentatus* (Fig. 2). The first gastral tergite is weakly shagreened with smooth interspaces in the former (Fig. 8), while it is wholly smooth and shiny in the latter (Fig. 3). The petiole has no peduncle in the former, but has a short but distinct peduncle in the latter.

The new species *Aenictus paradentatus* is distinctly allopatric with *A. dentatus* in distribution. It occurs in continental Southeast Asia from the southern part of China to the lowest latitude in Peninsular Thailand, ca. 200 km north of the Isthmus of Kra. The distribution pattern of this species, and also of *A. artipus* WILSON, 1964 (JAITRONG & al. 2010), is rather similar to those of many bird and snake species inhabiting this region (e.g., WOODRUFF 2003). On the other hand, *A. dentatus* is confined to Sundaland (Malay Peninsula, Borneo, Sumatra, and Java); so far the northernmost latitude of the range of this species is known at the southernmost part of Thailand, Narathiwat Province (Malay Peninsula, ca. 600 km south of the Isthmus of Kra). This species is almost sympatric with the *A. silvestrii* WHEELER, 1929 group (except for *A. jarujini* JAITRONG & YAMANE, 2010 found in northern Thailand) (JAITRONG & NUR-ZATI 2010, JAITRONG & YAMANE 2010), and the genus *Cladomyrma* WHEELER, 1920 (AGOSTI & al. 1999, but see below).

There are known two phylogeographical transitions on the Malay Peninsula: One is the southern transition between perhumid evergreen rainforest and wet seasonal evergreen rainforest, 400 - 500 km south of Isthmus of Kra near the Thai-Malay border (VAN STEENIS 1950), and the other is the northern transition between wet seasonal evergreen rainforest and mixed moist deciduous forest just

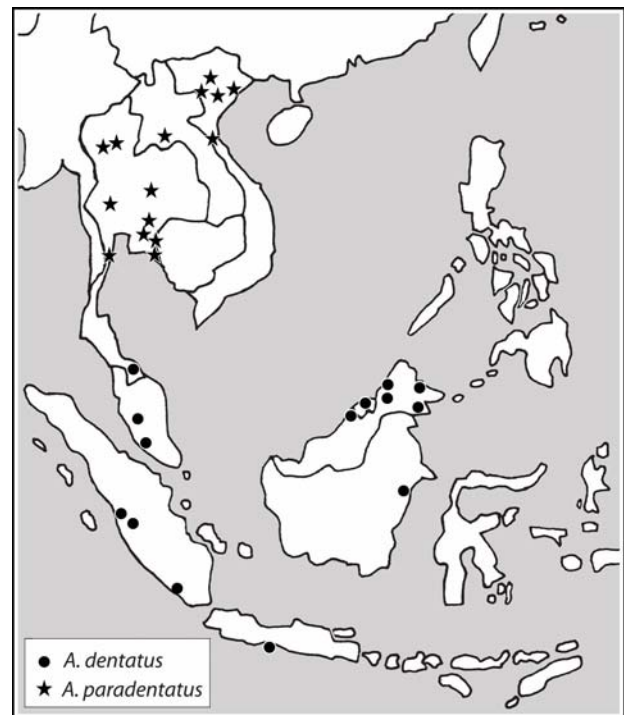


Fig. 11: Distribution of *Aenictus dentatus* and *A. paradentatus* sp.n.

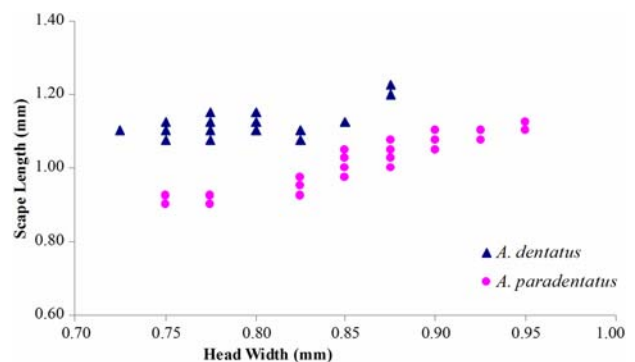


Fig. 12: Scape length against head width in the worker.

north of the isthmus (RICHARDS 1996). According to the collecting sites, *Aenictus paradentatus* is very probably restricted to the seasonal forest (hill evergreen forest, dry evergreen forest, mixed deciduous forest, grassland) located northward from the Isthmus of Kra, in both primary and disturbed conditions, while *A. dentatus* is a distinctly Sundaic species inhabiting the perhumid evergreen rainforest (for vegetation types in this area, see GÖLTENBOTH & ERDELEN 2006). So far no overlapping in the distribution of the two species has been recorded beyond northern and southern phylogeographical transitions.

The pattern found in the ant genus *Cladomyrma* is slightly different since at least two species are found in patchy wet forests in Thailand and Vietnam (FUJIWARA & al. 2004, EGUCHI & BUI 2006). The species of this genus are associated with obligate host plants, some species being restricted to a single plant species or genus and some others with several host plants (AGOSTI & al. 1999). Thus the distributions of *Cladomyrma* species are dependent on the distributions of their host plants. On the other hand, the *Aenictus* species do not have any association with particu-

lar plant species, but probably with vegetation types. The case of *A. paradenatus* and *A. dentatus* seems roughly to coincide with that of bird species and bird communities (cf. MACARTHUR & MACARTHUR 1961; HUGHES & al. 2003).

XU (1994), ZHOU & CHEN (1999), ZHOU (2001) reported *Aenictus dentatus* from southern China, and TERAYAMA & KUBOTA (1993) from Khanh Hoa Province, Vietnam. However, as mentioned above, specimens of this group collected from those areas most probably belong to *A. paradenatus*. All Thai and Vietnamese *Aenictus* specimens cited as *A. dentatus* in YAMANE & al. (2003), EGUCHI & al. (2005), JAITRONG & NABHITABHATA (2005) were reidentified as *A. paradenatus* in the present study, except for the single colony collected from the peninsula (Narathiwat Province) being the true *A. dentatus*. WILSON (1964) cited Bombay [Mumbai], India, as a locality of *A. dentatus*, but the identification should be reconfirmed.

Acknowledgments

We would like to express our deep gratitude to Dr. Bernhard Merz (Muséum d'Histoire Naturelle Geneva, Switzerland), who loaned us the type material of *A. aitkeni* var. *dentatus*. We are grateful to Dr. Kastuyuki Eguchi (Nagasaki University), Prof. Fuminori Ito (Kagawa University), Dr. Tuan Viet Bui (Institute of Ecological Resources), Mr. Tuah Bin Atar (Brunei Museum), Dr. Bakhtiar Effendi Yahya (Universiti Malaysia Sabah), Ms. Sasitorn Hasin (Kasetsart University) and other friends for their help in collecting specimens. Last but not least, we would like to thank two anonymous reviewers and Editor Dr. H. Zettel for their valuable and constructive comments on the manuscript.

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