

***Aenictus dirangensis* sp. nov. (Hymenoptera: Formicidae), a New Species of *Aenictus ceylonicus* Group from India**

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ABSTRACT

A new species of the *Aenictus ceylonicus* group, *Aenictus dirangensis* sp. nov., is described and illustrated based on the worker caste. The new species occurs in North-Eastern Himalayas and shows morphological similarities with *A. yangi* Liu, Hita Garcia, Peng, & Economo (2015) and *A. wilaiiae* Jaitrong & Yamane (2013). *Aenictus dirangensis* sp. nov. can be separated from both by shape of the subpetiolar process and body sculpture. The new species also resembles *A. khaoyaiensis* Jaitrong & Yamane (2013) but clearly differentiated in having 2-6 toothed mandible/denticles between subapical and basal teeth. An identification key to the Asian *Aenictus ceylonicus* group is also updated.

Keywords: Dorylinae, key, taxonomy and army ants.

INTRODUCTION

The army ant genus *Aenictus* is the largest genus belonging to the subfamily Dorylinae. It is represented by 199 species and 25 subspecies from the World (Bolton, 2022). The genus is widely distributed in the Old World tropics and sub tropics. Southeast Asia is the home to majority of species, while Afrotropics also served as a significant centre of diversity for the genus. Additionally, a small number of species can be found in southern Palearctic zone and there are several species known to exist in Australia (Boroweic, 2016).

Shuckard (1840) named *Aenictus* after a male from India because of its “enigmatical structure.” The status of the genus was disputed as many taxonomists considered it as a genus in the subfamily Dorylinae (Mayr, 1865; Dalla Torre, 1893; Emery, 1895; Borgmeier, 1954) whereas, it was mostly considered the only genus of the subfamily Aenictinae by others (Bolton, 1990, 1995; Baroni Urbani, Bolton, & Ward, 1992; Wu & Wang, 1995; Bolton, 2003; Jaitrong & Yamane, 2011, 2013). Brady, Fisher, Schultz, & Ward, (2014) revised the status of the genus and placed it in the subfamily Dorylinae based on molecular data.

The entire contemporary taxonomy of the genus is based on the worker caste even though the type species is only known from the male. A taxonomic revision of the species of the ant genus *Aenictus* present in the Indo-Australian region was published by Wilson (1964), including the description of new taxa and identification keys to the species. It was followed by the subsequent studies on the genus from different parts of the World: Terayama & Yamane (1989) from Japan; Terayama & Kubota (1993), Jaitrong & Nabhitabhata (2005), Jaitrong (2015), Khachonpisitsak, Yamane, Sriwichai, & Jaitrong, (2020) from Thailand; Zhou & Chen (1999), Zhou (2001) from Guangxi; Jaitrong & Nur-Zati (2010) from Malay Peninsula; Jaitrong, Yamane, & Chanthalangsy, (2011) from Laos; Jaitrong, Yamane, & Wiwatwitaya (2010), Jaitrong, Yamane, & Tasen (2012), Jaitrong & Yamane (2011, 2012), Wiwatwitaya & Jaitrong (2011), Jaitrong & Hashimoto (2012), Jaitrong & Wiwatwitaya (2013) from Oriental region and Southeast Asia; Zettel & Sorger (2010) from Borneo and the Philippines; Gomez (2022) from Afrotropical region.

Jaitrong & Yamane (2011) identified 12 species groups of the ant genus *Aenictus* found throughout the eastern portion of the Oriental area, as well as the Indo-Australian and Australasian regions. Out of these species groups, the *A. ceylonicus* species group is the most diverse and is represented by 29 species from Asia (Jaitrong & Yamane, 2011, 2013; Staab, 2015; Liu, Garcia, Peng, & Economo, 2015, Antony & Prasad, 2022). The *A. ceylonicus* group is distinguished from the other species groupings by the following characteristics: linear mandibles, a gap between the mandibles and anterior border of the clypeus when mandibles are closed, and the anterior clypeal margin is almost straight or feebly concave, with no denticles (Jaitrong & Yamane, 2011, 2013).

The characteristics that distinguish army ants are the result of a set of evolutionarily linked physiological, behavioral, and anatomical traits, collectively referred to as the army ant adaptive syndrome. This syndrome includes the construction of temporary

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bivouac nests and a nomadic lifestyle (Kronauer, 2009). They are prominent for their large-scale predation activities, known as “raids,” in which a large number of ants forage concurrently over a large region, collecting a variety of prey, primarily attacking other ants, social wasps and termites, including nearly all kinds of arthropods (Santschi, 1933; Schneirla, 1971; Rościszewski & Maschwitz, 1994; Gotwald, 1976, 1995; Hirose et al, 1998). Therefore, army ants have been labelled as keystone species that have a significant impact on the diversity and composition of terrestrial ecosystems (Franks & Bossert, 1983; Perez-Espona, 2021).

In India the genus is represented by 33 species and 2 subspecies (Bingham, 1903; Bharti et al, 2012, 2016; Antony & Prasad, 2022). In this present study, we document a new species of ant genus *Aenictus* belonging to the *A. ceylonicus* species group from India based on the worker caste. An identification key to the Asian *A. ceylonicus* group based on workers has been updated from Jaitrong & Yamane (2013), Liu et al, (2015) and Staab (2015) and complemented with digital images.

MATERIALS AND METHODS

Specimens were studied using a Nikon SMZ 1500 stereo zoom microscope with a maximum magnification of 112.5X. Digital images of the specimens were prepared using a MP (Micro Publisher) digital camera and Auto Montage (syncroscopy, a division of Synoptics Ltd.) software. All the images were cleaned with Adobe Photoshop CS5 and Helicon Filter 5. Morphological measurements were recorded in millimeters with an ocular micrometer fitted on a Nikon SMZ 1500 stereomicroscope.

Images of the species from Jaitrong & Yamane (2013); Liu et al, (2015) and Staab (2015) or provided by <http://www.antweb.org/> were compared for determining new species identity. Morphological terminology and standard measurements follow Gomez (2022).

HL: In full face view, head Length measured from the clypeal distal border to the occipital line, measured in the vertical symmetry axis; clypeal teeth and other structures are left out of the measurements.

HW: maximum Head Width. Usually the head mid-length, but in some cases it can be lined up with the mandibular insertions.

SL: Scape Length, excluding the basal constriction and the condylar bulb.

WL: Weber's Length, in lateral view from the pronotal declivity to the inferopropodeal lobe.

PH: Petiole Height, in lateral view, from the base of the petiolar sclerite to maximum dome height.

PL: Petiole Length, in lateral view, from the rearmost point of the sclerite, to the anteriormost point of the anterolateral petiolar ridge.

PPH: Postpetiole Height, in lateral view, from the base of the postpetiolar sclerite to maximum dome height.

PPL: Postpetiole Length, in lateral view, from the rearmost point of the sclerite, to the anteriormost postpetiolar point.

CS = $(HL+HW)/2$. Represents the cephalic size independently from cephalic shape.

CI = $HW/HL*100$. Measures head elongation. Indexes greater than 100 indicate oblong heads.

CSR = $Csmax/Csmin*100$. Cephalic Size Range. Measures the relative difference in size from maxima to minima workers, thus, the size variability for a given species.

PI = $PL/PH*100$. Petiolar Index, with higher index corresponding to more elongate petiole.

PPI = PPL/PPH . PostPetiolar Index, with higher index corresponding to more elongate postpetiole.

SIW = $SL/HW*100$. Relative length of the scape in its classical definition.

SIL = $SL/HL*100$. Length of scape relative to head length. The almost complete absence of clypeus in this genus makes this index preferable to SIW as it translates immediately into the percentage of head reached by the scape when laid back.

Depositories

PUAC "Punjabi University Patiala Ant Collection" at Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India.

RESULTS

Aenictus dirangensis sp. nov. (Figs: 1-4)

Types: Holotype worker (PUAC—T 07), from India, Arunachal Pradesh, Dirang, 27.3566° N, 92.23720° E, 1560m, handpicking, 03.ix.2019, Tarun Dhadwal leg. Paratypes: Fourteen workers (PUAC—T 08-17), same data as holotype.

Worker Measurements

Holotype: HL 0.54; HW 0.46; WL 0.78; SL 0.36; PL 0.24; PH 0.19; PPI 0.20; PPH 0.18; GL 0.80; SI 78.26; CI 85.18; CSR; SIW 16.56; SIL 66.66; PPI 90.00; PI 79.16.
Paratypes (n=10): HL 0.52-0.56; HW 0.42-0.48; WL 0.76-0.82; SL 0.36-0.40; PL 0.22-0.26; PH 0.19-0.21; PPI 0.18-0.20; PPH 0.18-0.19; GL 0.78-0.82; SI 85.71-83.33; CI 80.76-85.71; CSR 109.58; SIW 85.71-83.33; SIL 69.23-71.42; PPI 95.00-100.00; PI 80.76-86.36.

Description: Head in full-face view longer than broad, with convex lateral sides and weakly concave posterior margin. Antennal scape short, reaching mid-length of the head. Frontal carina comparatively long, extending beyond posterior margin of torulus. Parafrontal ridge absent. Anterior clypeal margin feebly concave medially; median portion of the margin meets the lateral portion forming blunt angle on each side. Masticatory margin, with a broad apical tooth, followed by medium-sized subapical tooth, 4 denticles, and smaller basal tooth; basal margin nearly straight. Maximum width of gap between anterior clypeal margin and mandibles 0.8 and 1.0 times broader than

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maximum width of mandible. Promesonotum in lateral view, convex and eventually slopes into distinct metanotal groove. Mesopleuron in lateral view moderately long, smooth median strip separates it from metapleuron. The metapleural gland bulla large, its maximum diameter is twice the distance between propodeal spiracle and metapleural gland bulla.

Propodeum in lateral view, with convex dorsal outline, converging more sharply posterad; propodeal corner angular, with distinct tooth. Propodeal declivity sinuous in lateral view. Petiole node as long as high with dorsal margin convex, subpetiolar process well developed and subrectangular with acute anterior corners and blunt posterior corners. Postpetiole shorter than petiole with convex dorsal outline.

Head, mandible and scape completely smooth and polished; mesopleuron, metapleuron, and lateral face of propodeum reticulate; promesonotum smooth and shiny; dorsal face of propodeum reticulate; with some transverse striations. Petiole and postpetiole dorsum smooth with lateral faces moderately reticulated.

Head, mesosoma dorsally with relatively sparse standing hairs mixed with sparse shorter hairs and legs with long sparse hairs. Head including antennal scape reddish-brown; mandible, mesosoma dark reddish-brown; petiole, postpetiole, gaster and legs yellowish-brown.

Remarks: *Aenictus dirangensis* sp. nov. shows similarities with *Aenictus yangi* Liu, Hita Garcia, Peng, & Economo (2015) and *A. wilaiae* Jaitrong & Yamane (2013) and *A. khaoyaiensis* Jaitrong & Yamane (2013).

It can be differentiated from *A. yangi* on the basis of following characteristics: 1) the subpetiolar process in *Aenictus yangi* is elongate, subrectangular, and slightly projecting anteroventrally (well developed and subrectangular with anterior and posterior corners acutely or bluntly angular in *A. dirangensis* sp. nov.); 2) in *Aenictus yangi* the dorsal face of the propodeum is mostly smooth and shiny and the lateral face is partly smooth and shiny whereas (dorsal face of the propodeum has transverse striation and the lateral face is reticulated in *A. dirangensis* sp. nov.); 3) in *A. yangi* lateral propodeal margins gently sloping posteriorly (lateral propodeal margins converge more sharply posteriorly in *A. dirangensis* sp. nov.); 4) the relative width of the propodeal face seems narrower in *A. yangi* (the relative width of the propodeal face wider in *A. dirangensis* sp. nov.); 5) postpetiole angular in lateral view in *A. yangi* (postpetiole convex in profile view in *A. dirangensis* sp. nov.); 6) the metanotal groove is weakly impressed in *A. yangi* (distinct in *A. dirangensis* sp. nov.).

From *A. wilaiae* it can be differentiated based on following characteristics: 1) in *A. wilaiae* promesonotal dorsum smooth and shiny except for anteriormost portion punctate (promesonotal dorsum entirely smooth and shiny in *A. dirangensis* sp. nov.); 2) in *A. wilaiae* subpetiolar process generally very low, with its anteroventral corner angulate and ventral margin convex (well developed and subrectangular with acute anterior corners and blunt posterior corners in *A. dirangensis* sp. nov.); 3) in *A. wilaiae* mesopleuron with longitudinal rugae, lateral face of propodeum with 2-3 short longitudinal rugae, petiole and postpetiole densely punctate (mesopleuron,

lateral face of propodeum reticulate, petiole and postpetiole dorsum smooth with lateral faces moderately reticulated).

However from *A. khaoyaiensis* it can be differentiated based on the following characteristics: 1) in *A. khaoyaiensis* Mandible with 0-1 tooth/denticle between subapical and basal teeth (mandible with 3-4 teeth/denticles) (Mandible with 2-6 teeth/denticles between subapical and basal teeth (mandible with more than 4 teeth/denticles) in *A. dirangensis* sp. nov.); 2) subpetiolar process in *A. khaoyaiensis* is low, with its anteroventral corner angulate and ventral margin weakly convex (well developed and subrectangular with acute anterior corners and blunt posterior corners in *A. dirangensis* sp. nov.); 3) in *A. khaoyaiensis* promesonotum smooth except for anteriormost portion punctate and mesopleuron with several irregular longitudinal rugae (promesonotum smooth and mesopleuron reticulated in *A. dirangensis* sp. nov.); 4) mandibles striate in *A. khaoyaiensis* (in *A. dirangensis* sp. nov. mandibles smooth).



Figure 1-2. *Aenictus dirangensis* sp. nov. 1) head in full face view, 2) mandibles.



Figure 3-4. *Aenictus dirangensis* sp. nov. 3) body in profile view, 4) body in dorsal view.

Habitat: The workers were manually collected from beneath a stone in Dirang village falling in West Kameng district of Arunachal Pradesh. The village is situated at an elevation of 1560 meters, with an average daily temperature of 20°C. The ground is covered with grass and surrounded by Kiwi plantation.

Etymology: The species has been named after the type locality.

Identification key to the *A. ceylonicus* group

Key to Asian *A. ceylonicus* group species based on worker caste, modified after Jaitrong & Yamane's key (2013) with inputs of Liu et al, (2015) and Staab (2015).

1. Mandible with 2-6 teeth/denticles between subapical and basal teeth (mandible with more than 4 teeth/denticles) (Fig. 5a)..... 2

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- Mandible with 0-1 tooth/denticle between subapical and basal teeth (mandible with 3-4 teeth/denticles) (Fig. 5b)..... 22

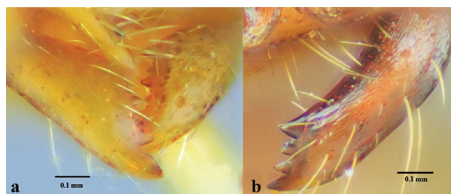


Figure 5. Mandibles of *A. ceylonicus* group species in full face view. a) *A. lifuiae*, b) *A. maneerati* (Images are from Jaitrong & Yamane, 2013).

2. Promesonotum entirely sculptured (punctate or reticulate)..... 3

- Promesonotum largely smooth and shiny..... 4

3. Promesonotum sparsely reticulate or superficially micropunctate; antennal scape superficially shagreened; petiole cylindrical, clearly longer than high (Fig. 6a).....
.....*A. cylindripetiolus* Jaitrong & Yamane

- Promesonotum densely punctate; antennal scape micropunctate; petiole round or subangular, almost as long as high (Fig. 6b)..... *A. thailandianus* Terayama & Kubota

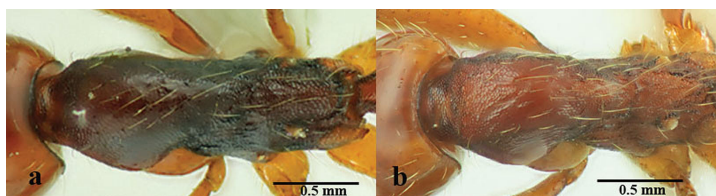


Figure 6. Promesonotum. a) *A. cylindripetiolus*, b) *A. thailandianus*. (Images are from Jaitrong & Yamane, 2013).

4. Subpetiolar process prominent5

- Subpetiolar process not prominent, weakly developed8

5. Dorsum of mesonotum and petiole finely reticulate.....6

- Dorsum of mesonotum and petiole smooth and shiny.....7

6. Subpetiolar process rectangular-trapezoidal, its ventral outline with a thin almost transparent lamellae (Fig. 7a); masticatory margin of mandible with 4 (rarely 3) denticles (total number of mandibular teeth 6-7, including apical, subapical, and basal tooth)*A. hoelldobleri* Staab

- Subpetiolar process rectangular, its apex very acute and directed downwards medially (Fig. 7b); masticatory margin of mandible with 6 denticles (total number of mandibular teeth 9 including apical, subapical, and basal tooth).....*A. wudangshanensis* Wang

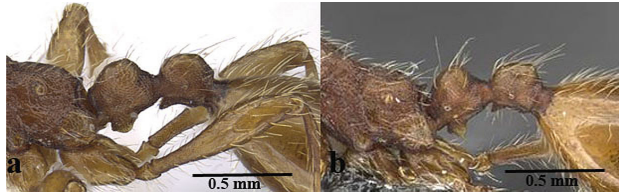


Figure 7. Subpetiolar process. a) *A. hoelldobleri* (CASENT0914932), b) *A. Wudangshanensis* (CASENT0914927).

7. Metanotal groove distinct; lateral propodeal margins converge more sharply posterad; postpetiole convex in profile; subpetiolar process subrectangular with acute anterior corners and blunt posterior corners (Fig. 8a, b) *A. dirangensis* sp. nov.
- Metanotal groove weakly impressed; lateral propodeal margins gently sloping posteriorly; postpetiole angular in profile; subpetiolar process relatively elongated, and slightly projecting anteroventrally (Fig. 8c, d).....
..... *A. yangi* Liu, Hita Garcia, Peng & Economo

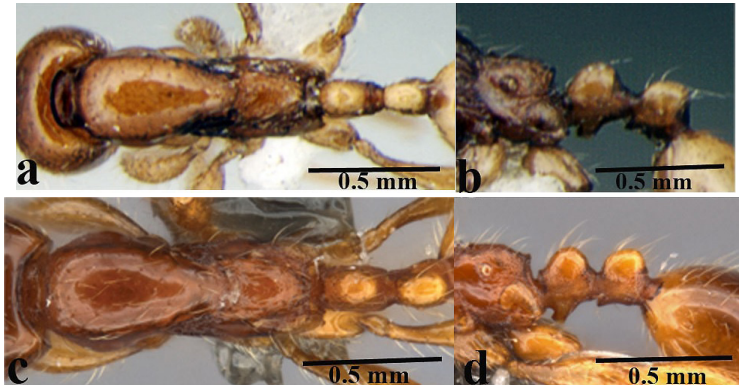


Figure 8. Dorsal view and subpetiolar process. a-b) *A. dirangensis* sp. nov., c-d) *A. yangi* (Liu et al, 2015).

8. Dorsal face of propodeum mostly smooth and shiny, the lateral face of propodeum partly smooth and shiny; postpetiole entirely smooth and shiny (Fig. 9a).....9
- Propodeum entirely sculptured; postpetiole entirely sculptured or with a smooth and shiny small area on the dorsal face (Fig. 9b).....12

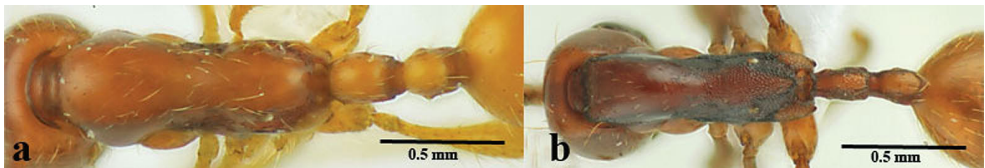


Figure 9. a) Dorsal view of *A. longicephalus*, b) Dorsal view of *A. appressipilosus*. (Images are from Jaitrong and Yamane, 2013)

9. The declivity of propodeum with lateral carinae, but not demarcated basally by a transverse carina (Fig. 10a).....*A. longicephalus* Jaitrong & Yamane
- The declivity of propodeum is shallowly concave, encircled with a rim (Fig. 10b).....10

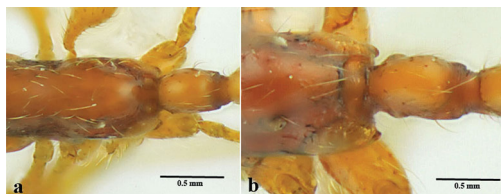


Figure 10. Showing propodeal declivity. a) *A. longicephalus*, b) *A. baliensis*. (Images are from Jaitrong and Yamane, 2013),

10. Distal 2/3 of basal margin of mandible straight, proximal 1/3 narrowed toward the base of mandible; anterior clypeal margin straight; petiole smaller than postpetiole (Fig. 11a, b) *A. minipetiolus* Jaitrong & Yamane
 - Basal margin of mandible feebly concave; anterior clypeal margin concave; petiole larger than or as large as postpetiole (Fig. 11c, d) 11



Figure 11. Showing head, petiole and postpetiole. a-b) *A. minipetiolus*, c-d) *A. baliensis* (Images are from Jaitrong and Yamane, 2013).

11. Promesonotum is strongly convex and sloping gradually to the metanotal groove; subpetiolar process with angular posteroventral corner (Fig. 12a).....
*A. baliensis* Jaitrong & Yamane
 - Mesosoma almost flat dorsally or feebly convex; subpetiolar process lower, with its posteroventral corner rounded (Fig. 12b).....*A. wiwatwitayai* Jaitrong and Yamane

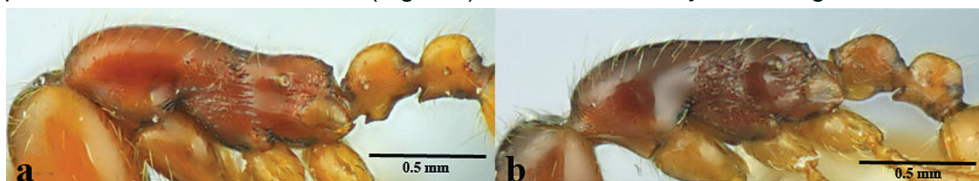


Figure 12. Profile view. a) *A. baliensis*, b) *A. wiwatwitayai*. (Images are from Jaitrong and Yamane, 2013).

12. Vertex with sparse standing hairs and with a few short appressed hairs; promesonotum with few appressed hairs and a few decumbent hairs (Fig. 13a)..... 13
 - Vertex and promesonotum with dense standing or decumbent hairs (Fig. 13b)..... 14

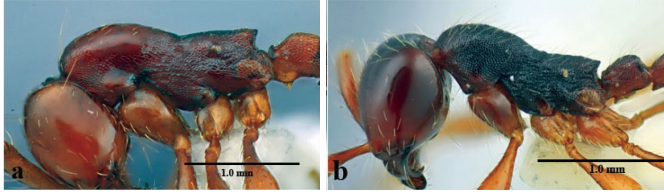


Figure 13. Profile view. a) *A. appressipilosus*, b) *A. pinkaewi*. (Images are from Jaitrong and Yamane, 2013).

13. Vertex with two long-standing hairs mixed with a few short appressed hairs.....
*A. appressipilosus* Jaitrong & Yamane
 - Vertex with only few short appressed hairs.....*A. malakkaparensis* Antony & Prasad
 14. Occipital corner modified into a small lobe in profile and dorsal view (Fig. 14a).....*A. goniocippus* Jaitrong & Yamane
 - Occipital corner without modifications in profile and dorsal view (Fig. 14b).....15

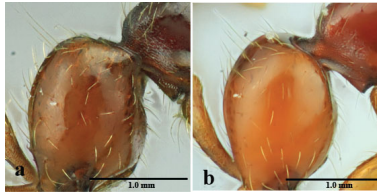


Figure 14. Head profile view. a) *A. goniocippus*, b) *A. lifuiae* (Images are from Jaitrong and Yamane, 2013).

15. Mesonotum straight in dorsally slope down backward; posterodorsal corners of propodeum protruding and dentate, declivity concave..... *A. henanensis* Li & Wang
 - Mesonotum weakly or strongly convex in dorsal outline; posterodorsal corners of propodeum angular nearly right-angled, declivity shallowly concave.....16
 16. Masticatory margin of mandible with large acute apical tooth followed by a series of 6-7 denticles of two sizes, the larger alternating with 1-2 smaller; the gap between anterior clypeal margin and mandibles relatively small or indistinct, with maximum width shorter than the maximum width of the mandible (Fig. 15a).....
*A. lifuiae* Terayama
 - Masticatory margin of mandible with large acute apical tooth followed by a medium-sized subapical tooth, 2-5 denticles, and a medium-sized basal tooth; the gap between anterior clypeal margin and mandibles relatively large and distinct, with maximum width longer than the maximum width of the mandible (Fig. 15b).....17

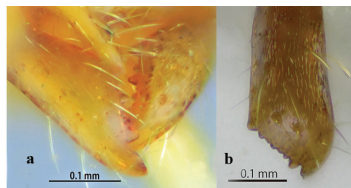


Figure 15. Mandibles. a) *A. lifuiae*, b) *A. thailandicus*. (Images are from Jaitrong and Yamane, 2013).

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17. Subpetiolar process subtriangular, its apex directed backward, anteroventrally not angular; postpetiole elevated posteriorly; its posterior face much steeper than anterior face (Sumatra) (Fig. 16a).....*A. itoi* Jaitrong & Yamane

- Subpetiolar process subrectangular, its apex directed forward, anteroventrally angular; postpetiole with roundly convex dorsal outline (Fig. 16b, c)..... 18

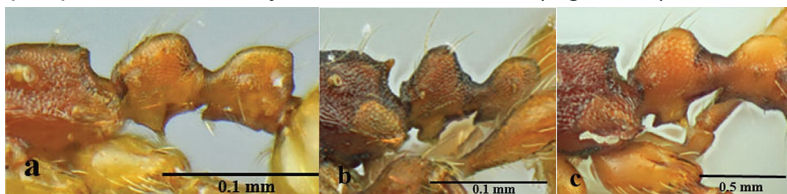


Figure 16. Subpetiolar process. a) *A. itoi*, b-c) *A. goniocippus* and *A. jawadwipa*. (Images are from Jaitrong and Yamane, 2013).

18. Subpetiolar process rectangular, ventrally with anterior and posterior corners..... 19

- Subpetiolar process low, its ventral outline convex, almost straight or feebly concave, and anteroventral corner acutely angular..... 21

19. Dorsal outline of propodeum weakly convex; metapleural gland bulla weakly sculptured (Vietnam)*A. eguchii* Jaitrong & Yamane

- Dorsal outline of propodeum straight; metapleural gland bulla strongly sculptured (puncto-reticulate) 20

20. Posteroventral corner of subpetiolar process angular (not spiniform).....
.....*A. kodungallurensis* Antony & Prasad

- Posteroventral corner of subpetiolar process acutely produced ventrally (spiniform)
.....*A. jawadwipa* Jaitrong & Yamane

21. Promesonotum in profile weakly convex; propodeal dorsum feebly convex; petiole sessile, its posterior face encircled with a thin carina; postpetiole almost as long as petiole (Fig. 17a).....*A. wilaiiae* Jaitrong & Yamane

- Promesonotum in profile strongly convex and forming a dome; propodeal dorsum clearly straight; petiole subsessile, its posterior face not encircled with a carina; postpetiole slightly shorter than petiole (Philippines) (Fig. 17b).....
.....*A. pilosus* Jaitrong & Yamane



Figure 17. Profile view. a) *A. wilaiiae*, b) *A. pilosus*. (Images are from Jaitrong and Yamane, 2013).

22. Mandible with 3 teeth including apical and basal teeth (Fig. 18a). 23

Mandible with 4 teeth including apical and basal teeth (Fig. 18b). 24

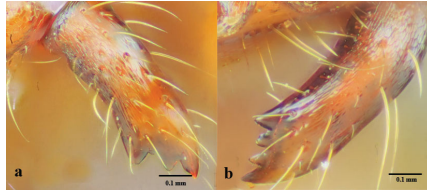


Figure 18. Mandible. a) *A. watanasiti*, b) *A. maneerati*. (Images are from Jaitrong and Yamane, 2013).

23. Occipital corner rounded in lateral view; promesonotum in profile strongly convex and forming a dome; petiole almost as long as high, with high node, and almost as long as postpetiole (Fig. 19a).....*A. watanasiti* Jaitrong & Yamane

- Occipital corner shallowly rounded in lateral view; promesonotum in profile with weakly convex or almost flat dorsal outline; petiole clearly longer than high, with low node, and slightly longer than postpetiole Fig. 19b).....*A. concavus* Jaitrong & Yamane

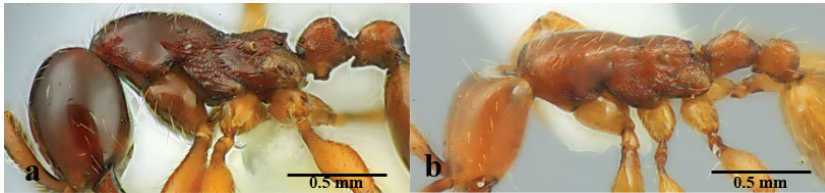


Figure 19. Profile view. a) *A. watanasiti*, b) *A. concavus*. (Images are from Jaitrong and Yamane, 2013).

24. Dorsal and lateral faces of pronotum largely smooth and shiny; petiole almost as long as high; head slightly longer than or almost as long as broad (CI 90- 100) (Fig. 20a).....25

- Dorsal and lateral faces of pronotum entirely sculptured (superficially puncto-reticulate, punctate to reticulate); petiole cylindrical, distinctly longer than high; head slightly shorter than broad (CI 102-112) (Fig. 20b).....27

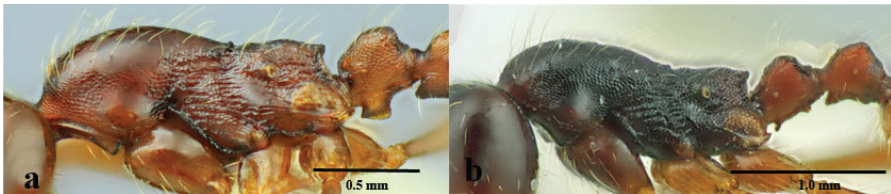


Figure 20. Profile view. a) *A. formosensis*, b) *A. maneerati*. (Images are from Jaitrong and Yamane, 2013).

25. Anterior clypeal margin distinctly concave; metanotal groove distinct, deep; foretibia relatively short, its length less than 0.5 times of head width; mesopleuron finely punctate without longitudinal rugulae (Fig. 21a).....*A. brevipodus* Jaitrong & Yamane

- Anterior clypeal margin almost straight or feebly concave; metanotal groove indistinct; foretibia relatively long, its length about 0.9-1.0 times as long as head width; mesopleuron with longitudinal rugulae (Fig. 21b).....26

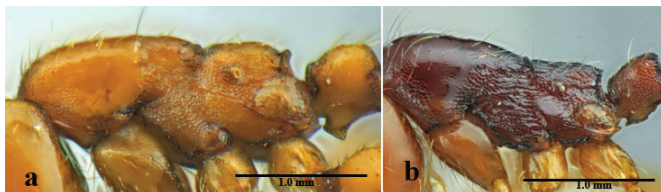


Figure 21. Mesosoma. a) *A. brevipodus*, b) *A. khaoyaiensis*. (Images are from Jaitrong and Yamane, 2013).

26. Subpetiolar process low, ventral outline weakly convex, its anteroventral corner angular (Thailand) (Fig. 22a).....*A. khaoyaiensis* Jaitrong & Yamane
 - Subpetiolar process well-developed, subrectangular with a convex ventral lamella, with anterior corners acute and posterior corners bluntly angular (Fig. 22b).....*A. formosensis* Forel

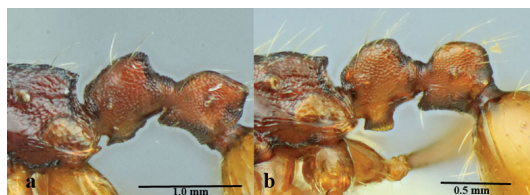


Figure 22. Subpetiolar process. a) *A. khaoyaiensis*, b) *A. formosensis*. (Images are from Jaitrong and Yamane, 2013).

27. Subpetiolar process very low, with anterior and posterior denticles that protrude anteroventrally; head in full-face view rectangular, its posterior margin feebly concave (Thailand) (Fig. 23a, b).....*A. maneerati* Jaitrong & Yamane
 - Subpetiolar process subrectangular or low, with its anteroventral corner acutely angular and ventral outline straight or convex; head in full-face view subrectangular or rounded, its posterior margin weakly concave, almost straight or weakly convex (Fig. 23c, d).....28

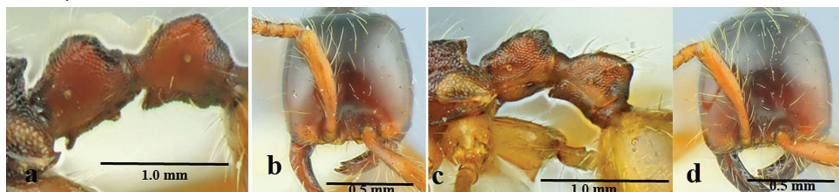


Figure 23. Subpetiolar process and head in full face view. a-b) *A. maneerati* and c-d) *A. fuchuanensis*. (Images are from Jaitrong and Yamane, 2013)

28. Pronotum with central area superficially shagreened or rather smooth and shining, and with lateral face reticulate and shiny; subpetiolar process low, with its anteroventral corner acutely angular and ventral outline concave (Fig. 24a).....*A. sundalandensis* Jaitrong & Yamane
 - Pronotum micropunctate or reticulate and opaque (at most weakly shining);

subpetiolar process always low, with its anteroventral corner acutely angular and ventral outline almost straight or convex (Fig. 24b).....29

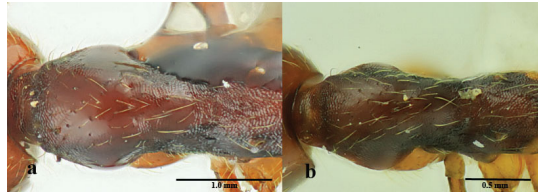


Figure 24. Dorsal view. a) *A. sundalandensis*, b) *A. fuchuanensis*. (Images are from Jaitrong and Yamane, 2013).

29. Pronotum entirely strongly punctate (N. Thailand) (Fig. 25a)
*A. pinkaewi* Jaitrong & Yamane
 - Anterior portion of the pronotum densely punctate, the lateral face of the pronotum finely reticulate (China, Hong Kong, Laos and Thailand) (Fig. 25b)..... *A. fuchuanensis* Zhou

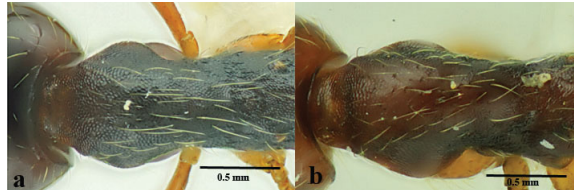


Figure 25. Dorsal view. a) *A. pinkaewi*, b) *A. fuchuanensis*. (Images are from Jaitrong and Yamane, 2013).

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