

A New Species of the Ant Genus *Cladomyrma* Wheeler (Hymenoptera: Formicidae: Formicinae) from Thailand

Weeyawat Jaitrong¹, Kumron Laedprathom² and Seiki Yamane^{3,4}

¹ Thailand Natural History Museum, National Science Museum, Technopolis, Khlong 5, Khlong Luang, Pathum Thani 12120, Thailand
E-mail: polyrhachis@yahoo.com

² The Royal Forest Department of Thailand, Forest Management Bureau No.9, 201 Moo1 Sukhumvit Road, Chonburi 20000, Thailand

³ Graduate School of Science and Engineering, Kagoshima University, 1-21-35 Korimoto, Kagoshima 890-0065, Japan

E-mail: sky@sci.kagoshima-u.ac.jp

⁴ Corresponding author

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Cladomyrma sirindhornae sp. nov. is described from eastern Thailand, based on the minor and major workers, queen and male. The colonies examined here nested inside branches of the climbing plant *Sphenodesme involucrata* (Presl) Robins. (Verbenaceae).

Key Words: Formicidae, *Cladomyrma*, new species, *Sphenodesme involucrata*, Thailand.

Introduction

The ant genus *Cladomyrma* was described by Wheeler (1920), with *Aphomomyrmex hewitti* Wheeler, 1910 as the type species. Agosti (1991) placed this genus in the tribe Lasiini of the subfamily Formicinae. Agosti *et al.* (1999) revised the Oriental species to include 11 species in two species groups, all of which were distributed in Sundaland (Malay Peninsula, Borneo and Sumatra). Eguchi and Bui (2006) described the first continental Southeast Asian species, *Cladomyrma scopulosa* Eguchi and Bui, 2006 from northern Vietnam. Currently 12 nominal species of the genus are listed (Bolton, 2012), but Fujiwara *et al.* (2004) recorded an unidentified species from eastern Thailand, while comparing the surface chemicals of this ant and its host plant. An ecological feature of this genus is the myrmecophytic association with various taxa of plants, *i.e.*, the utilization of living pithy stems of trees and vines as nest sites (Agosti *et al.* 1999; Eguchi and Bui 2006).

Recently, we obtained a rich material of the species reported by Fujiwara *et al.* (2004) from eastern Thailand. After careful study we conclude that this species is new to science. In the present paper we describe it as a new species based on the queen, workers (major and minor), and male.

Materials and Methods

The study material was collected in eastern Thailand. Colonies of this new species were collected from branches of the climbing plant *Sphenodesme involucrata* (Presl) Robins. (Verbenaceae) (Fig. 5). The holotype, paratypes, and non-

types were pin-mounted. 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. Worker measurements, recorded to the nearest 0.01 mm, were made using an ocular micrometer.

The abbreviations used for the measurements and indices are as follows: CI – Cephalic index, $HW \times 100 / HL$; EI – Eye index, $EL \times 100 / HW$; EL – Eye length, maximum diameter of eye; HL – Maximum head length in full-face view, excluding mandibles, measured from midpoint of anterior clypeal margin to midpoint of occipital margin; HW – Maximum head width in full-face view, measured above eyes; ML – Mesosoma length measured from anteriormost point of pronotum to posteriormost point of metapleuron in profile; SI – Scape index, $SL \times 100 / HW$; and SL – Scape length excluding basal constriction and condylar bulb.

Abbreviations of the type depositories are as follows: AMK – Ant Museum, Faculty of Forestry, Kasetsart University, Bangkok, Thailand; BMNH – The Natural History Museum, London, U.K.; KKIC – Kasetsart Kampaengsaen Insect Collection, Kasetsart University, Bangkok, Thailand; SKYC – SKY Collection at Kagoshima University, Kagoshima, Japan; and THNHM – Natural History Museum of the National Science Museum, Pathum Thani, Thailand.

Cladomyrma sirindhornae sp. nov.

(Figs 1–4)

Type material. Holotype: queen from eastern Thailand, Chanthaburi Prov., Khlung Dist., Ban Ang-Ed Community Forest Development Project (Chaipattana Foundation),

20 November 2012, K. Laedprathom leg., TH12-KL-01 (THNHM).

Paratypes: One queen, 33 major workers and 40 minor workers from the same nest as the holotype (AMK, BNMH, KKIC, SKYC, THNHM).

Non-type material. THAILAND: Same locality as holotype, 28 March 2012, K. Laedprathom leg., KL-104-1 (5 major workers and 27 minor workers; AMK, SKYC, THNHM); same loc., 28 March 2012, K. Laedprathom leg., KL-104-2 (10 major workers and 51 minor workers; AMK, SKYC, THNHM); same loc., 28 March 2012, K. Laedprathom, KL-104-3 (5 major workers, 47 minor workers, and 1 male; SKYC, THNHM); Chanthaburi Prov., Nam Tok Phlio, 300–500 m alt., 23 November 2003, Sk. Yamane leg., TH03-SKY-110 (25 major workers, 32 minor workers, and 1 queen; SKYC, THNHM); same loc., 24 November 2003, W. Jaitrong leg., TH03-WJT-570 (5 major workers, 2 minor workers, and 1 queen; THNHM); same loc., 24 November 2003, W. Jaitrong leg., TH03-WJT-570 (6 major workers and 3 minor workers; THNHM); Chanthaburi Prov., Khao Soi Dao, 17 January 2008, W. Jaitrong leg., WJT08-TH-14 (4 major workers and 12 minor workers; THNHM); Chachoengsao Prov., Khao Ang Reu Nai Wildlife Sanctuary, August 2003, S. Hasin leg., SH03-TH-OA (5 major workers, 12 minor workers, and 1 queen; SKYC, THNHM); Rayong Prov., Khao Ang Reu Nai Wildlife Sanctuary, 6 April 2004, W. Jaitrong leg., WJT04-E-026 (6 major workers, 2 minor workers, and 1 queen; THNHM).

Diagnosis. Metapleural gland orifice narrowly opening (all female castes). Petiole longer than high, slightly longer than broad, and flattened in anterior half (queen). Head in full-face view only slightly longer than broad (queen). Mandible with 5 teeth including apical and basal ones; 4th tooth smallest (queen). Upper portion of katepisternum punctate, shiny, with sparse short fine hairs (queen). Petiolar node as seen in profile thick, with nearly parallel anterior and posterior slopes and rounded apex (minor and major workers).

Description. Queen (Figs 1A–C, 4D). Holotype: EL 0.42 mm; HL 1.25 mm; HW 1.05 mm; ML 1.68 mm; SL 0.46 mm; CI 91; EI 40; SI 44. Paratype: EL 0.43 mm; HL 1.11 mm; HW 1.02 mm; ML 1.78 mm; SL 0.50 mm; CI 92; EI 42; SI 49. Non-types ($n=2$): EL 0.43–0.45 mm; HL 1.15–1.25 mm; HW 1.03–1.10 mm; ML 1.75–1.88 mm; SL 0.53–0.55 mm; CI 88–89; EI 41; SI 50–51. Head in full-face view subrectangular, slightly longer than broad, with round posterior margin. Antenna 8-segmented, without distinctly differentiated club; antennal scape incrassate, in full-face view scape extending slightly beyond level of posterior margin of eye; antennal segment II distinct, almost as long as (slightly shorter than) III+IV. Gena (as measured from anterior margin of eye to mandibular insertion; malar space) 0.8 times as long as maximal diameter of eye. Eye relatively large, located at about midlength of head. Frontal lobe obsolete or almost absent. Clypeus large, broadly convex anteriorly; median area raised and gradually declining anteriorly. Mandible with 5 teeth (including apical and basal teeth); in full-face view outer margin convex, but not clearly forming an angle. Mesosoma robust; in profile pronotum steeply

sloping and concave in anterior (lower) half; mesoscutum large, almost flat, with parapsidal furrow and short median furrow; mesoscutellum weakly convex dorsally; metanotum short; propodeum in profile relatively long, with almost straight dorsal outline, and gradually sloping posteriorly; mesopleuron with weak and narrow transverse groove separating anepisternum and katepisternum; metapleural gland orifice narrowly opening. Petiole in profile low, clearly longer than high and flattened dorsally in anterior half. Gaster relatively large and long. Legs relatively short; femora longer than tibiae.

Frons, vertex, and temple of head smooth and shiny, sparsely bearing short standing hairs arising from pits and very short appressed/decumbent hairs; gena with anterior half longitudinally rugose and posterior portion just in front of eye superficially microreticulate, bearing standing hairs; ventral face of head smooth and shiny, covered by short decumbent hairs and bearing long standing hairs; clypeus with median part weakly reticulate and lateral parts weakly rugose-reticulate, with relatively long standing hairs; mandible generally punctate but smooth and shiny along masticatory margin. Pronotum covered with dense decumbent pubescence and sparse long standing hairs; mesoscutum and mesoscutellum superficially microreticulate, smooth and shiny, with sparse short and long standing hairs; anepisternum smooth and shiny, sparsely covered with decumbent pubescence (but with pits of hairs); katepisternum densely covered with appressed/decumbent pubescence, its anterior and lower portions with sparse long standing hairs; propodeum largely smooth and shiny, with dense decumbent pubescence mixed with sparse, very long standing hairs; longest propodeal hair 0.23–0.25 mm. Dorsum of petiole smooth and shiny, with sparse short decumbent hairs mixed with sparse long standing hairs arising from pits. Gaster with relatively dense appressed pubescence mixed with sparse standing hairs. Legs smooth and shiny.

Body entirely dark brown except anterior part of head (including clypeus), antennae, and tarsi yellowish to reddish brown. Body color darker than in the major and minor workers.

Major worker (Figs 2A–C, 4C). Paratypes ($n=10$): EL 0.14–0.20 mm; HL 0.85–1.03 mm; HW 0.79–0.93 mm; ML 0.89–1.08 mm; SL 0.39–0.45 mm; CI 87–95; EI 18–22; SI 45–49. Head in full-face view subrectangular, slightly longer than broad, with almost parallel sides and sinuate posterior margin; in full-face view posterolateral corner rounded; cranium with very shallow and narrow furrow running from midlength of head toward posterior margin of head. Antenna 8-segmented, without distinctly differentiated club; antennal scape incrassate, in full-face view extending beyond level of posterior margin of eye and almost reaching 2/3 of head length; antennal segment II distinct, clearly longer than broad and longer than each of III–V; III–V each broader than long. Gena (malar space) 1.5–1.6 times as long as maximal diameter of eye. Eye composed of *ca.* 50 ommatidia. Frontal lobe obsolete or almost absent. Clypeus large, with basal 1/3 demarcated from apical 2/3, latter much steeper than former; anterior clypeal margin roundly convex

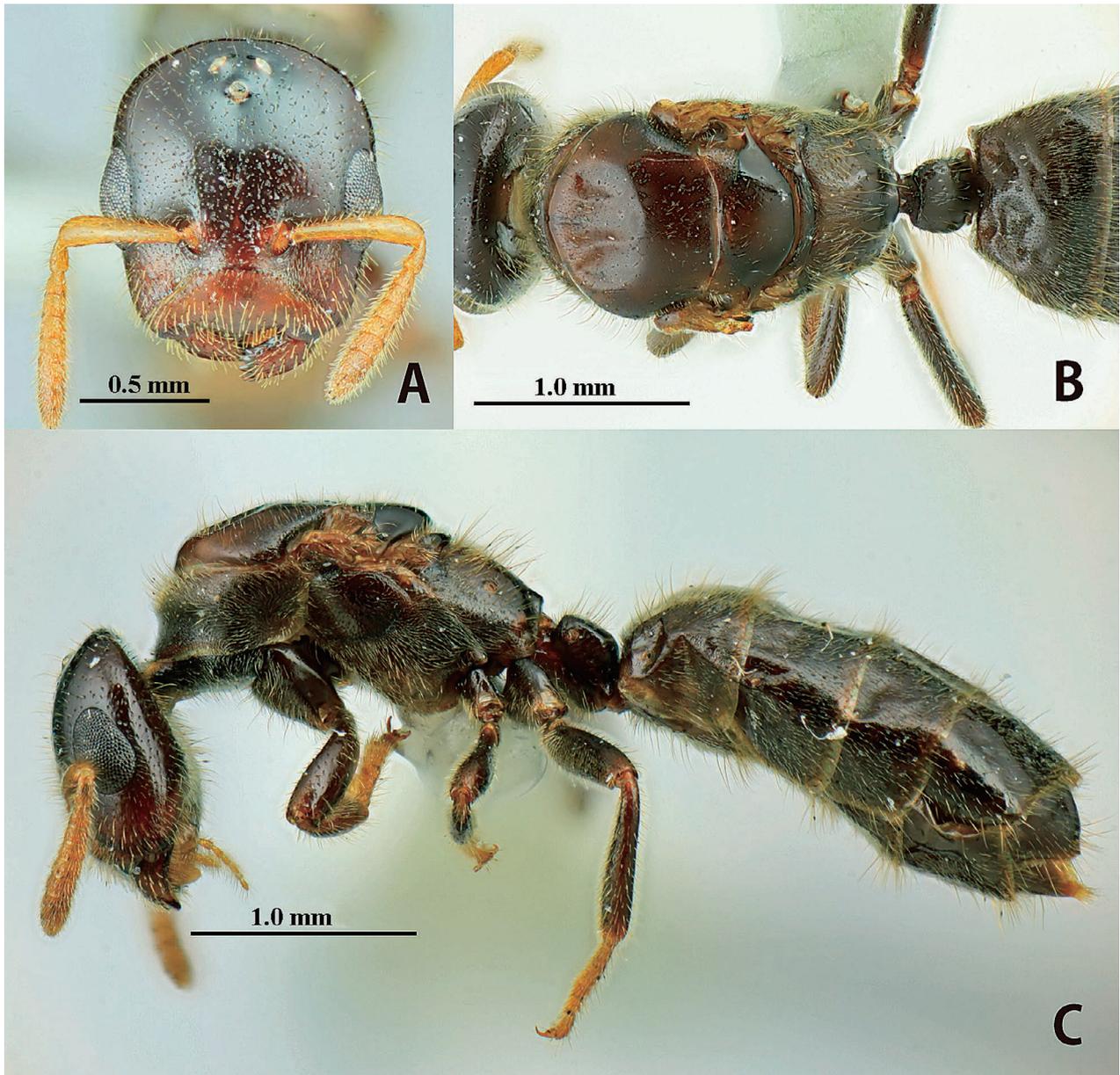


Fig. 1. *Cladomyrma sirindhornae* (queen, SH03-TH-OA). A, head in full-face view; B, dorsal view of body; C, body in profile.

medially. Mandible with 4 teeth (including apical and basal teeth); in full-face view outer margin convex but not clearly forming an angle; basal margin weakly concave. Mesosoma robust, its dorsal outline almost flat; pronotum clearly demarcated from mesonotum by distinct promesonotal suture; pronotum broader than mesonotum and propodeum, its anterior face steeply sloping; metanotal groove obsolete dorsally and laterally or invisible; mesopleuron relatively long, anepisternum not demarcated from katepisternum; border between mesopleuron and metapleuron indistinct; metapleural gland orifice narrowly opening; propodeal declivity continuous from propodeal dorsum, almost flat; propodeal spiracle located around posterolateral corner of propodeal dorsum. Petiolar node slightly higher than long, in profile dorsally rounded; its anterior face shorter than posterior face. Gaster relatively large, in dorsal view tergite II almost as long as III. Legs relatively short; femora longer than

tibiae.

Posterior half of head smooth and shiny, bearing sparse standing hairs arising from pits mixed with very short hairs; area between eye and antennal socket superficially reticulate and shiny; clypeus in basal and median area finely macroreticulate, but rugoso-reticulate in laterally produced parts close to mandibular bases; entire clypeus with relatively long, strong hairs; anterior half of gena (malar space) finely rugoso-reticulate, posterior half microreticulate; antennal scape smooth and shiny; mandible generally punctate but smooth and shiny along masticatory and outer margins. Mesosoma smooth, covered by dense pubescence mixed with dense standing hairs; longest propodeal hair 0.15–0.18 mm; propodeal declivity smooth and shiny, lacking hairs (at most with a few fine hairs). Petiole smooth and shiny with only sparse standing hairs. Gaster with relatively dense pubescence mixed with sparse standing hairs. Legs



Fig. 2. *Cladomyrma sirindhornae* (major worker, KL104-3, specimens from type locality). A, head in full-face view; B, dorsal view of body; C, body in profile.

smooth and shiny.

Body dark brown to yellowish brown, usually with paler anterior part of head and darker gaster; antenna yellowish.

Minor worker (Figs 3A–C, 4E). Paratypes ($n=10$): EL 0.15–0.16 mm; HL 0.68–0.73 mm; HW 0.63–0.69 mm; ML 0.75–0.80 mm; SL 0.35–0.38 mm; CI 91–95; EI 22–25; SI 53–59. Head in full-face view subrectangular, but narrower anteriorly than posteriorly, longer than broad, with sides weakly convex and posterior margin almost straight or feebly concave medially; posterolateral corner rounded. Antenna 8-segmented, without distinctly differentiated club; in full-face view antennal scape extending beyond level of posterior margin of eye and beyond 2/3 of head length but not reaching posterolateral corner of head; antennal segment II distinct, clearly longer than broad and only slightly shorter than III+IV; V almost as long as each of VI and VII.

Gena (malar space) 1.7–1.8 times as long as maximal diameter of eye. Eye composed of *ca.* 40–45 ommatidia. Frontal lobe almost absent. Clypeus large and convex dorsally; anterior margin strongly convex. Mandible with 7–8 teeth, basal margin almost straight. Mesosoma in profile with weakly convex dorsal outline; promesonotal suture distinct; pronotum distinctly broader than mesonotum and propodeum, its anterior face steeply sloping; metanotal groove obsolete dorsally and laterally or invisible; mesopleuron relatively long, anepisternum not demarcated from katepisternum; metapleuron not demarcated from mesopleuron; metapleural gland orifice narrowly opening, larger than propodeal spiracle; propodeal declivity feebly convex; in profile view spiracle located near posterolateral corner of propodeal dorsum. Petiolar node higher than long, its anterior face shorter than posterior face. Gaster and legs as in major workers.

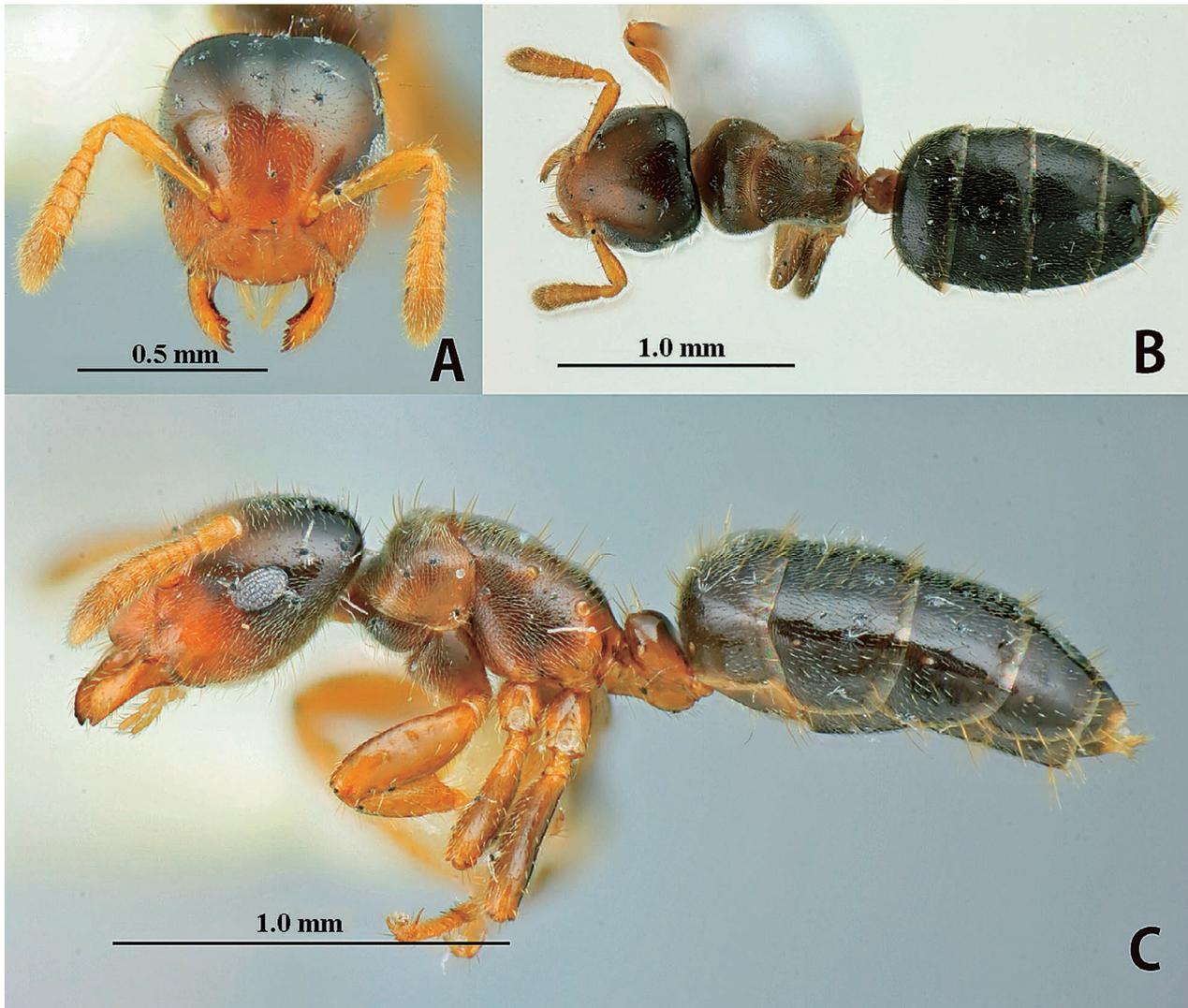


Fig. 3. *Cladomyrma sirindhornae* (minor worker, KL104-3, specimens from type locality). A, head in full-face view; B, dorsal view of body; C, body in profile.

Head including mandible and antennal scape entirely smooth and shiny, bearing sparse standing hairs mixed sparsely with very short appressed pubescence on frons and vertex; lateral face of head below eye with dense appressed pubescence; clypeus entirely smooth and shiny, covered by subdecumbent/suberect pubescent hairs and relatively long standing hairs. Entire mesosoma weakly and densely punctate (or dorsally smooth and shiny), densely covered by pubescence and sparse long standing hairs; longest propodeal hair 0.10–0.13 mm; propodeal declivity smooth and shiny, lacking hairs. Petiole smooth and shiny with several standing hairs on dorsal margin. Gaster with relatively dense pubescence mixed with sparse standing hairs. Legs smooth and shiny.

Coloration of body same as that of major workers.

Male (Fig. 4A–B). Single non-type specimen from type locality: EL 0.35 mm; HL 0.68 mm; HW 0.60 mm; ML 1.23 mm; SL 0.25 mm; CI 89; EI 58; SI 42. Head in full-face view clearly longer than broad, entirely superficially reticulate and shiny, with dense short decumbent hairs mixed with sparse long standing hairs. Antenna 13-segmented,

without distinctly differentiated club; antennal scape relatively short, in full-face view reaching level of posterior margin of eye; antennal segment II clearly shorter than each of III–XIII; scape and segment II smooth and shiny, and whitish. Gena (malar space) relatively short, 0.4 times as long as maximal diameter of eye. Eye relatively large. Frontal lobe obsolete or almost absent. Clypeus as in minor workers, but apically weakly emarginated and slightly darker in color. Mandible narrow, with 7 teeth, smooth and shiny, pale-colored. Mesosoma similar to that of queen in structure and pilosity, with following notable features: episternum superficially reticulate with sparse short decumbent hairs; katepisternum smooth and shiny with sparse short appressed hairs mixed with decumbent hairs; longest propodeal hair 0.10–0.13 mm. Petiole and gaster similar to those of queen. Subgenital plate caudally broad, subparallel, distinctly emarginate with the two ends acute. Legs relatively long.

Body color darker than in major and minor workers.

Etymology. The specific name is dedicated to Her Royal Highness Princess Maha Chakri Sirindhorn of the Kingdom of Thailand.

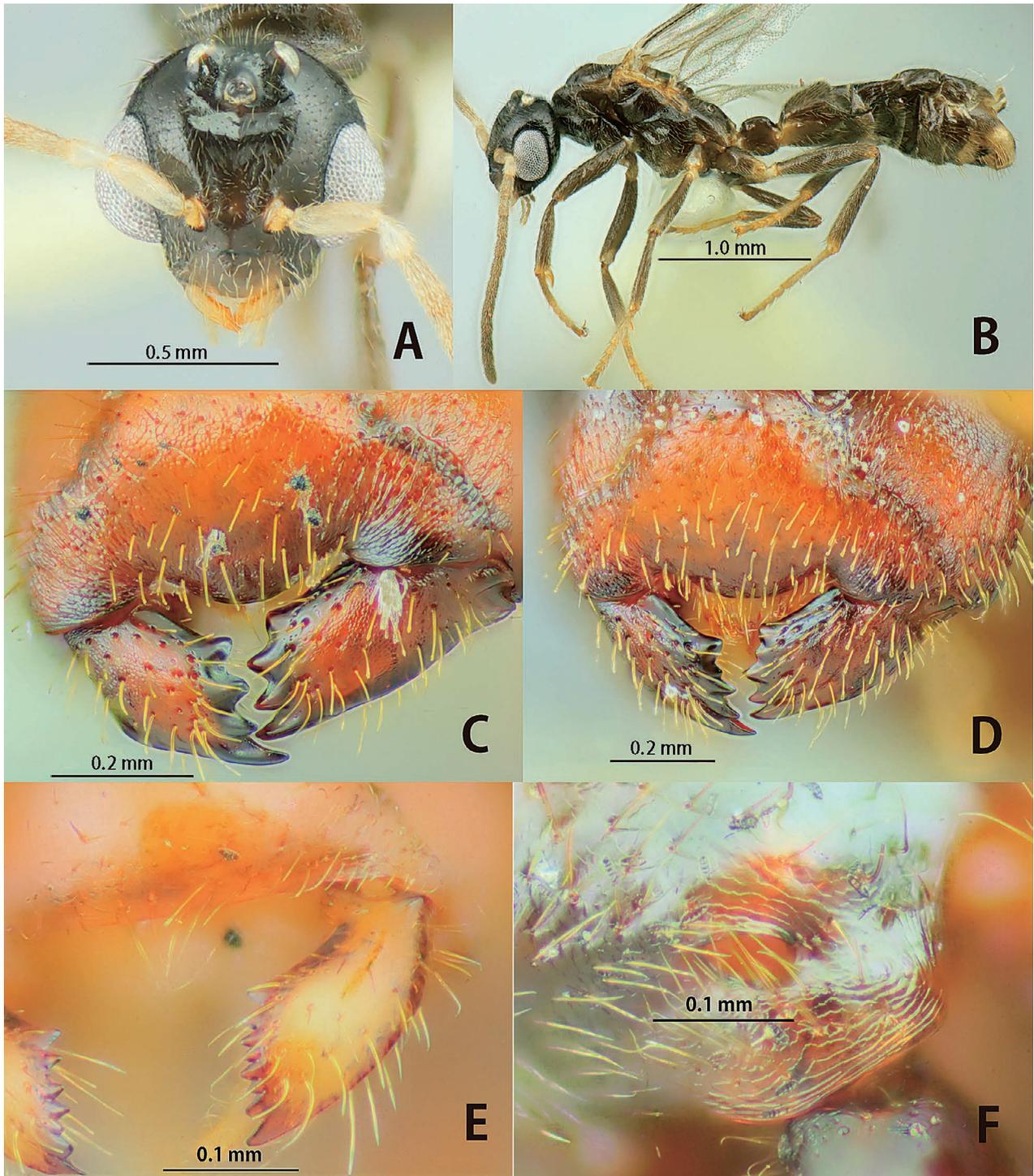


Fig. 4. *Cladomyrma sirindhornae* (A, B, male, KL104-3, specimen from type locality; C, major worker, KL104-3, specimen from type locality; D, F, queen, TH03-SKY-108; E, minor worker, KL104-3, specimen from type locality). A, head in full-face view; B, body in profile; C-E, mandible and clypeus; F, metapleural gland orifice.

Distribution. Eastern Thailand (Chachoengsao, Rayong and Chanthaburi Provinces).

Remarks. *Cladomyrma sirindhornae* belongs to the depressed-petiole group within this genus based on the queen caste (*sensu* Agosti *et al.* 1999). Among the eight species of this group (including the present new species), *C. andrei* (Emery, 1984), *C. hobbyi* Donisthorpe, 1937, *C. maschwitzi* Agosti, 1991, and *C. yongyi* Agosti, Moog and Maschwitz, 1999 have a large metapleural gland orifice in all female

castes; the other four species have a small orifice. Among the latter, only *C. nudidorsalis* Agosti, Moog and Maschwitz, 1999 has the queen caste lacking standing hairs on the dorsum of the mesosoma. The Major and minor workers of the present new species differ from those of *C. petalae* Agosti, 1991 and *C. scopulosa* Eguchi and Bui, 2006 in having a petiole as seen in profile, with a thick node with its anterior and posterior slopes nearly parallel and a reversed U-shaped apex; the petiolar node is thinner and more or less



Fig. 5. Nest of *Cladomyrma sirindhornae*. A, host plant, *Sphenodesme involuocrata*; B, entrance of nest; C, minor worker and cale insect inside nest.

tapers apicad these castes in the other two species. As for the queen, the petiole seen from above is longer than broad in *C. sirindhornae*, versus broader than long in *C. petalae*. In the major worker, *C. scopulosa* has a remarkably developed subbasal ridge on the lateral part of the clypeus (Eguchi and Bui 2006: fig. 4); *C. sirindhornae* has a normal subbasal ridge.

Bionomics. *Cladomyrma sirindhornae* lives in live plants of the verbenacean climber *Sphenodesme involuocrata*, inhabiting plantations and secondary forests. One colony (KL-104-1) was collected from branches co-inhabited by *Crematogaster (Colobocrema)* sp. (KL-104-4, SKYC,

THNHM). A similar situation was reported for *Crematogaster (Colobocrema)* cf. *cylindriceps* Wheeler, 1927 found together with *Cladomyrma hobbyi* in the same host plant *Spatholobus* sp. in Borneo (Yamane *et al.* 2011). Scale insects were observed in the nests of *C. sirindhornae* (Fig. 5C). The ecology of *C. sirindhornae* is currently under investigation by K. Laedprathom (second author herein).

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References

- Agosti, D. 1991. Revision of the oriental ant genus *Cladomyrma*, with an outline of the higher classification of the Formicinae (Hymenoptera: Formicidae). *Systematic Entomology* 16: 293–310.
- Agosti, D., Moog, J. and Maschwitz, U. 1999. Revision of the Oriental plant-ant genus *Cladomyrma*. *American Museum Novitates* 3283: 1–24.
- Bolton, B. 2012. Barry Bolton's Synopsis of the Formicidae and Catalogue of Ants of the World: 1 January 2012. Available at <http://www.gap.entoclub.org/> (17 January 2012).
- Eguchi, K. and Bui, T. V. 2006. *Cladomyrma scopulosa* new species (Hymenoptera: Formicidae: Formicinae) from Vietnam. *Sociobiology* 47: 305–314.
- Fujiwara, N., Murase, K., Yamaoka, R., Wiwatwitaya, D., Jaitrong, W. and Yamane, Sk. 2004. A comparison of composition and profile of surface chemicals between *Cladomyrma* ants and related host plant *Sphenodesme* sp. *ANeT Newsletter* 7: 9–13.
- Wheeler, W. M. 1920. The subfamilies of Formicidae, and other taxonomic notes. *Psyche* 27: 46–55.
- Yamane, Sk., Tanaka, O. H. and Itioka, T. 2011. Rediscovery of *Creमतogaster* subgenus *Colobocrema* (Hymenoptera, Formicidae) in Southeast Asia. *Zootaxa* 2999: 63–68.