

A new species of the ant genus *Calyptomyrmex* Emery, 1887 (Hymenoptera: Formicidae: Myrmicinae) from a cave in Thailand, with the first descriptions of queen and male of *Calyptomyrmex rectopilosus* Dlussky and Radchenko, 1990

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ABSTRACT

Currently, three species of the ant genus *Calyptomyrmex* Emery, 1887 are known from Thailand, including *Calyptomyrmex troglodytes* Chayakul and Jaitrong **sp. nov.**, which is described herein based on the worker caste. The new species was discovered in the completely dark zone of a cave located in northern Thailand. The new species is easily distinguished from the other species known in Asia by its largest body and narrowly spatulate hairs. This paper also provides the first descriptions of the queen and male castes of *Calyptomyrmex rectopilosus* Dlussky and Radchenko, 1990. Additionally, an updated key to Asian species of *Calyptomyrmex* is provided.

Keywords: *Calyptomyrmex*, cave-dwelling ants, distribution, new species, Thailand

INTRODUCTION

Species of the ant genus *Calyptomyrmex* Emery, 1887 are generally considered rare (Shattuck, 2011). They are typically found in rainforests (Bolton, 1981; Taylor, 1991) and various other forest habitats (Shattuck, 2011; Jaitrong and Yamane, 2018), often foraging on the ground surface or in leaf litter (Shattuck, 2011; Jaitrong and Yamane, 2018). To date, 39 valid species of *Calyptomyrmex* have been recorded from Afrotropical, Australasian, Indomalayan, Oriental, Oceania, and Palearctic regions (Shattuck, 2011; Akbar and Bharti, 2015; Jaitrong

and Yamane, 2018; Ito *et al.*, 2023; AntWeb, 2026; Bolton, 2026). Among them, 15 species are known in a wide range of Asian countries, i.e., India, Sri Lanka, Bhutan, China including Hong Kong, Vietnam, Cambodia, Laos, Thailand, Malaysia, Indonesia, the Philippines, and Timor-Leste (Shattuck, 2011; Akbar and Bharti, 2015; Jaitrong and Yamane, 2018; Ito *et al.*, 2023; AntWeb, 2026). However, only two species, *C. rectopilosus* Dlussky and Radchenko, 1990, and *C. beccarii* Emery, 1887, had been known in the mainland of Southeast Asia (Shattuck, 2011). Until *C. laotius* Jaitrong and Yamane, 2018 was described from Laos by Jaitrong and Yamane (2018).

Thailand possesses vast karst areas spanning the entire country, which harbor over 6,000 natural caves (Jantarit and Ellis, 2023). Recently, four ant species were described from Thai caves: *Carebara panhai* Jaitrong, Pitaktunsakul and Jantarit, 2021; *Camponotus (Tanaemyrmex) sirindhornae* Jaitrong, Jantarit and Pitaktunsakul, 2025; *Brachyponera kumtongi* Duanchay and Jaitrong, 2024; and *B. troglomorpha* Duanchay and Jaitrong, 2024. (Jaitrong *et al.*, 2021; Duanchay *et al.*, 2024; Wimolshuthikul *et al.*, 2024; Jaitrong *et al.*, 2025). However, Jaitrong *et al.* (2025) stated that, to date, observations of cave-dwelling ants in Thailand remain quite insufficient.

During a survey at Nam Lod Cave in Phayao Province, Northern Thailand, we found a worker of an unidentified *Calyptomyrmex* species foraging on the bat guano at the completely dark zone in the cave. Following a detailed examination and comparison with type specimens of allied species, this taxon was considered new to science. In this paper, we describe *Calyptomyrmex troglodytes* Chayakul and Jaitrong **sp. nov.** based on worker caste and provide the first descriptions of the queen and male of *C. rectopilosus*. An updated identification key to known Asian species is also provided.

MATERIALS AND METHODS

The single specimen (holotype) of the new species was hand-collected from the floor of Nam Lod Cave in Phayao Province, Northern Thailand. It was pin-mounted and compared with high-resolution images of type specimens of closely related species from Asia and Australia. These included *C. asper* Shattuck, 2011 (holotype worker, ANIC32-051667) and *C. sparsus* Shattuck, 2011 (paratype worker, ANIC32-047434) (images provided by Shattuck, 2011), as well as *C. danum* Shattuck, 2011 (holotype worker, CASENT0900995) and *C. loweryi* Shattuck, 2011 (paratype worker, CASENT0900996) (images available on AntWeb, 2026).

Most morphological observations were made with ZEISS stemi 305 and Olympus SZ30 stereomicroscopes. Multi-montage images were produced using NIS element 3.7 from a series of source images taken by a Nikon MNB42100 digital camera attached to a Nikon ECLIPSE E600 microscope. All measurements were made with an ocular micrometer attached to a Carton MS4582 DSZ-44F stereomicroscope and were given in millimeters to hundredths place.

The abbreviations used for the measurements and indices are as follows (see Shattuck, 2011 and Jaitrong and Yamane, 2018):

CFW	Clypeal fork ^{F W} width, measured between the anterior most points of the teeth in full-face view.
HL	Head Length, measured from the anterior clypeal margin to the midpoint of the margin of the head in full-face view.
HW	Head Width, maximum width of the head capsule measured in full-face view.
ML	Mesosomal Length, measured from the point at which pronotum meets the cervical shield to the posterior most of the propodeal lobe in profile.
MTL	Maximum Length of Mid Tibia, excluding the proximal part of the articulation which inserted into the distal end of the femur.
PetL	Petiolar Length, maximum length of the petiolar node in dorsal view.
PetW	Petiolar Width, maximum length of the petiolar node in dorsal view.
PronW	Pronotal Width, maximum width of the pronotum in dorsal view.
SL	Scape Length, the length of the first antennal segment excluding the basal constriction and condylar bulb.
CI	Cephalic Index, $HW \times 100 / HL$.
PetI	Petiolar Index, $PetW \times 100 / PetL$.
SI	Scape index, $SL \times 100 / HW$.

Abbreviations of type depositories

ANIC Australian National Insect Collection, Canberra, A.C.T.

THNHM the Natural History Museum of National Science Museum Thailand

RESULTS

TAXONOMY

Calyptomyrmex Emery, 1887

Calyptomyrmex Emery, 1887: 471. Type species: *Calyptomyrmex beccarii* Emery, 1887: 472, by monotypy.

Diagnosis of worker. Bolton (1981) enumerated the characteristic of the genus as follows: 1) with deep antennal scrobes containing entire antennae when they rest; 2) strongly expanded frontal lobes covering anterior clypeal margin; 3) with pair of appendages produced from anterolateral corners of clypeus (clypeal fork) projecting out over the mandibles; 4) strongly incrassate scapes; and 5) petiole with anterior peduncle.

***Calyptomyrmex rectopilosus* Dlussky and Radchenko, 1990**

(Figures 1, 2)

Calyptomyrmex rectopilosus Dlussky and Radchenko, 1990: 124, Figures 7, 8 (worker). Type locality: Vietnam.

Calyptomyrmex rectopilosus: Shattuck, 2011: 17 (redescription); Akbar and Bharti, 2015: 8 (in key); Jaitrong and Yamane, 2018: 134; Khachonpisitsak *et al.*, 2020: 79.

Type. Holotype worker from “Archipelago Baitylong, Isl. Dongho”, Quang Ninh Prov., Vietnam (Institute of Zoology, Ukrainian Academy of Science), collected by A. Radchenko. This island is also known as Do Đông Khoa, Ba Mùn Island and Cao Lô Island (and probably more other names) and is located ca. 100 km ENE Hì Phòng at ca. 21.0000° N, 107.5833° E. The image of the holotype provided by Shattuck (2011) was examined.

Non-type material examined. One worker (THNHM-I-00028734, THNHM), N Thailand, Chiang Mai Province, Muang district, Doi Suthep-Pui National Park, Evergreen Forest, 8.VI.2000, S. Hasin leg.; Two workers (THNHM-I-00000298 to THNHM-I-00000299, THNHM), NE Thailand, Nakhon Ratchasima Province, Kao Yai National Park, Evergreen Forest, 17.VI.2000, W. Jaitong leg.; One worker (THNHM-I-00000232, THNHM), NE Thailand, Nakhon Ratchasima Province, Wang Nam Keao district, Forestry Camp, Dry Evergreen Forest, 17.VIII.2009, W. Jaitrong leg., WJT09-TH22/13; 15 workers (THNHM-I-00028735, THNHM), NE Thailand, Srisaket Province, Khun Harn District, Bang Dong Subdistrict, Panom Dong Rak, 13.IX.2018, WJT130918-5, W. Jaitrong leg.; One worker (THNHM-I-00028736, THNHM), E Thailand, Chanthaburi Province, Khao Soi Dao Wildlife Sanctuary, 3.VI.2001, Sk. Yamane leg.; One worker (THNHM-I-00028737, THNHM), E Thailand, Chanthaburi Province, Khao Soi Dao Wildlife Sanctuary, Dry Evergreen Forest, 3.VI.2001, C. Bourmas leg.; One worker (THNHM-I-00028738, THNHM), E Thailand, Chanthaburi Province, Khao Soi Dao Wildlife Sanctuary, Dry Evergreen Forest, 4.VI.2001, C. Bourmas leg.; One worker (THNHM-I-00028739, THNHM), E Thailand, Chanthaburi Province, Khao Soi Dao Wildlife Sanctuary, Tropical Rain Forest, 4.VI.2001, C. Bourmas leg.; One worker (THNHM-I-00028740, THNHM), E Thailand, Chachoengsao Province, Tha Takiab District, Khao Ang Reu Nai Wildlife Sanctuary, collected from leaf litter, 250 m a.s.l., 22.VIII.2003, W. Jaitrong leg., WJT03-TH-258; One worker (THNHM-I-00028741, THNHM), E Thailand, Chanthaburi Province, Khao Soi Dao, Teak Plantation, Q.3, 26.XI.2006, W. Sakchoowong leg.; One worker (THNHM-I-00028742, THNHM), E Thailand, Chanthaburi Province, Khao Soi Dao Wildlife Sanctuary, Mix Deciduous Forest, 15.VII.2006, no collector’s name; 24 workers, one male and two queens (THNHM-I-00028743, THNHM), C Thailand, Nakhon Nayok Province, Muang District, Nang Rong Temple, collected from soil, 10.VIII.2018, W. Jaitrong leg., WJT100818-1; One worker (THNHM-I-00000234, THNHM), C Thailand Saraburi Province, Korkod Waterfall, Khao Yai National Park, 16.VIII.2002, D.

Wiwatwittaya leg.; One worker (THNHM-I-00000282, THNHM), W Thailand, Kanchanaburi Province, Thong Pha Phum District, Dry Evergreen Forest, 15.VI.2004, C. Bourmas leg.; Two workers (THNHM-I-00000280 to THNHM-I-00000281, THNHM), W Thailand, Kanchanaburi Province, Sinakarin Dam National Park, 265 m a.s.l., 18 and 19.I.2014, P. Pitaktunskul leg.; One worker (THNHM-I-00028745, THNHM), W Thailand, Tak Province, Umphang District, Umpang Wildlife Sanctuary, Namtok Thilosu, 560 m a.s.l., rotten wood, 29.V.2015, Sk. Yamane leg., TH15-SKY-211; Two workers (THNHM-I-00000224, THNHM), S Thailand, Ranong Province, Khong Naca Wildlife Sanctuary, Evergreen Forest, 30.XII.2000, S. Hasin leg.; Eight workers (THNHM-I-00000227 to THNHM-I-00000231, THNHM), S Thailand, Nakhon Si Thammarat Province, Tapi Watershed Research Station, collected from rotten wood, 13.X.2011, W. Jaitrong leg., TH11-WJT-79; One worker (THNHM-I-00028746, THNHM), same locality and date, Sk. Yamane leg., TH11-SKY-080 (=TH11-WJT-79); 11 workers (THNHM-I-00000213 to THNHM-I-00000223, THNHM), S Thailand, Nakhon Si Thammarat Province, Noppitam District, Khao Luang, Krung Ching Waterfall, 20.V.2003, W. Jaitrong leg., TH03-WJT-339.; One worker (THNHM-I-00028747, THNHM), S Thailand, Ranong Province, Suksamran District, Ban Khlong Naka, Oil Palm Plantation, collected from soil under rotten wood, 23.IV.2018, W. Jaitrong leg. 14 Workers (THNHM-I-00028748, THNHM), S Thailand, Phatthalung Province, Sri Banpod District, Rhang Thong Waterfall, Collected from soil, 23.XII.2018, WJT221218-6, W. Jaitrong leg.

Measurements and indices. Non-type workers ($n = 10$): CFW 0.11–0.14; HL 0.60–0.67; HW 0.60–0.63; ML 0.60–0.63; PronW 0.42–0.49; MTL 0.21–0.28; PetL 0.11–0.14; PetW 0.21–0.28; SL 0.21–0.25; CI 95–106; SI 33–39; PetI 175–233. Non-type queens ($n = 2$): CFW 0.11–0.14; HL 0.63–0.67; HW 0.70; ML 0.84; PronW 0.53–0.56; MTL 0.25; PetL 0.14; PetW 0.28; SL 0.21–0.25; CI 105–111; SI 35; PetI 200. Non-type male ($n = 1$): HL 0.42; HW 0.35; ML 0.91; PronW 0.42; MTL 0.25; PetL 0.18; PetW 0.18; SL 0.18; CI 83; SI 51; PetI 100.

Diagnosis of worker (Figure 1A–C). Hairs on head and body erected and thin (parallel-sided or slightly widening distally), with blunt or sharp apices; promesonotal hairs almost as long as those on dorsum of head or slightly longer. Distinct fenestra-like dark spots present on frontal lobes. Eyes small, with 2–5 ommatidia along maximum diameters. Propodeum armed with moderately long sharp and narrow teeth pointing upward. Petiole slightly leaning posteriorly, while its anterior face rounding toward its dorsal face; postpetiole slightly narrower than petiole in dorsal view. Mandibles striated basally, but noticeably smooth apically. Dorsum of head covered with widely spaced coarse rugae anteriorly, fading to essentially absent posteriorly, superimposed over punctate background. Upper portion of mesosoma covered with sinuous rugae, superimposed over punctate background, while ventral portion of mesosoma, propodeum, petiole and postpetiole punctate. Gaster finely reticulate, with matte appearance. Body yellowish-red, with slightly darker gaster.

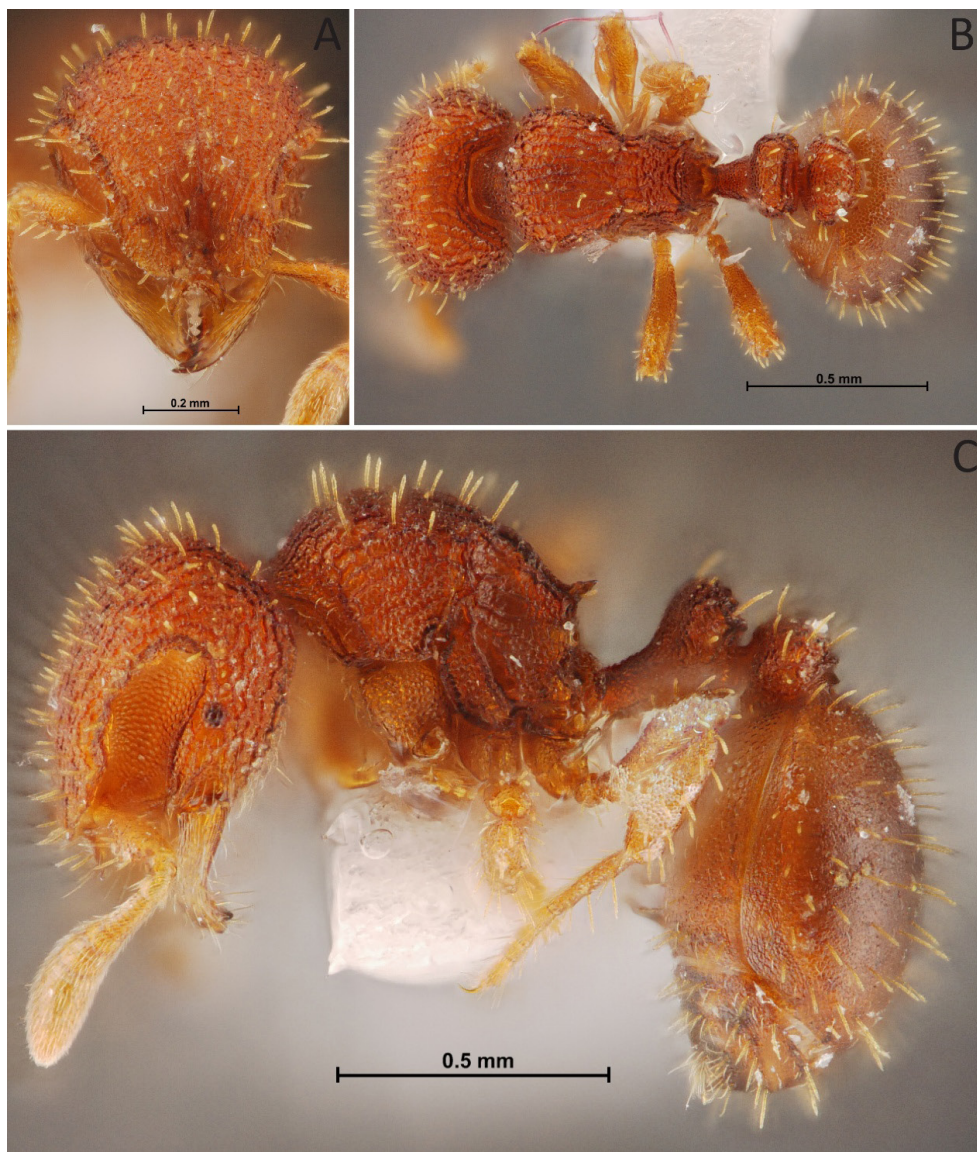


Figure 1. *Calyptomyrmex rectopilosus* (non-type worker, THNHM-I-00028743). A, Head in full-face view; B, Body in dorsal view; C, Body in profile.

Description of queen (Figure 2A–C). Very similar to worker, but head wider and mesosoma slightly longer than worker. Head in full-face view subtriangular, almost as long as broad; posterior margin straight, with convex posterolateral corners; posterodorsalmost part of frontal carinae angulate (Figure 2A). Frontal lobes in full-face view well developed, with pair of fenestra-like dark spots (Figure 2A). Antennal scrobes in profile deep and broad. Clypeus in full-face view forked, anterolateral corners produced into sharp teeth, forming “U” shape. Mandibles in full-face view triangular, moderately long and strongly curved downward in profile; masticatory margin with sharp apical tooth, followed with preapical tooth, five denticles and sharp basal tooth. Eyes moderately large, with 10–11 ommatidia along maximum diameter in profile, strongly convex laterally in full-face view. Three ocelli present, median ocellus located 4/5 of head near posterior margin of head, distance between lateral ocelli longer than distance between median and lateral ocelli. Antennae 12-segmented, with 3-segmented club; scapes short, not reaching posterolateral corners when rest, with convex ventral outline at distal portions (Figure 2A).

Mesosoma in profile moderately long, approximately 1.25–1.34 times as long as head width, its dorsal outline almost flat; anterior margin of pronotum slightly convex; promesonotal suture distinct. Mesoscutum in dorsal view large, distinctly broader than long, anterior margin roundly convex, while its posterior margin straight. Mesoscutellum in profile located lower than mesoscutum, with anterior margin sloped; mesoscutellum in dorsal view much narrower than mesoscutum (Figure 2C), demarcated from mesoscutum by broad and deep scutoscutellar sulcus, its anterior margin almost straight, but its posterior margin slightly convex posteriorly. Mesopleuron in profile almost as broad as lateral face of pronotum; anepisternum distinctly demarcated from katepisternum by mesopleural sulcus. Metanotum short (‘narrow’), located lower than mesoscutum and mesoscutellum, demarcated from propodeum by distinct suture. Propodeum in profile slightly broader than lateral faces of pronotum and mesopleuron, armed with stout and sharp teeth pointing posteriorly; lateral surfaces of propodeum strongly concave; dorsal outline sloping downward toward propodeal teeth (Figure 2B); propodeal declivity flat, gently sloping downward; propodeal spiracles located near proximal end of propodeal declivity, but not touching propodeal declivity. Petiole in profile leaning posteriorly, rounded anteriorly and dorsally, with long anterior peduncle; sternopetiole process ill-defined; petiole in dorsal view distinctly broader than long. Postpetiole in profile with convex dorsal outline, its ventral outline projected into thick sternopostpetiole process, with anterior corner angulate; postpetiole in dorsal view almost as broad as petiole. Gaster oval, its first tergite strongly convex.

Dorsum of head covered with widely spaced coarse rugae, which fade posteriorly and are superimposed over reticulated background (Figure 2A). Clypeus indistinctly punctate. Mandibles striate, less so apically. Scapes punctate. Pronotum, mesoscutum, mesoscutellum covered with wavy rugae, which are superimposed over punctate background; pronotum with

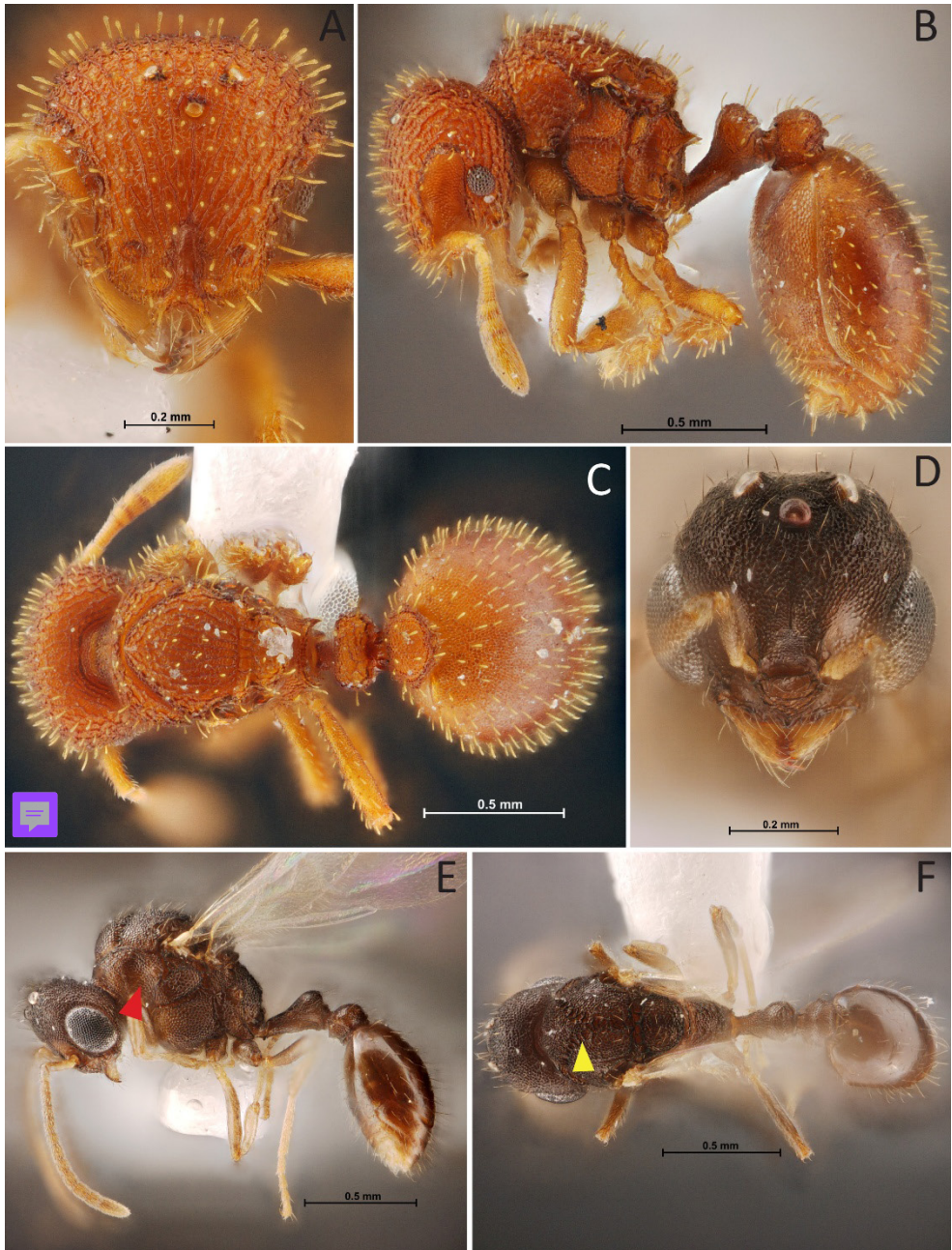


Figure 2. *Calyptomyrmex rectopilosus* (non-type queen, THNHM-I-00028743). A, Head in full-face view; B, Body in dorsal view; C, Body in profile. *Calyptomyrmex rectopilosus* (non-type male, THNHM-I-00030565). D, Head in full-face view; E, Body in profile; F, Body in dorsal view. White arrow indicates the deeply concave vertical furrow on pronotum in Figure E. Yellow arrow indicates the “Y” shape notauli on mesosomal dorsum in Figure F.

areolate-rugose sculpture that is superimposed over reticulated background; mesopleuron, propodeum, petiole, postpetiole in profile and metanotum superficially reticulate. Legs indistinctly finely reticulate. Gaster entirely superficially reticulate.

Dorsum of head and most part of body with thin hairs with parallel-sides, and blunt apices, sparsely present and shortest on metanotum and propodeum. Ventral portion of head, mandibles, antennal segments II–XII and tarsi of all legs with thinner suberect hairs.

Body yellowish-red, with slightly darker gaster; areas around tegulae black; all hairs yellow.

Description of male (Figure 2D–F). Head in full-face view distinctly longer than broad, but broader than long when including eyes (0.53 mm wide when including eyes); posterior margin almost straight with round posterolateral corners; median portion of head with straight concave line (Figure 2D). Frontal lobes in full-face view short, laterally convex, triangular in shape (Figure 2D), partly covering antennal bases and mandibles. Frontal carinae indistinct, obscured by sculptured surfaces. Antennal scrobes deep and broad, present anteriorly and laterally, almost reaching anterior margin of eyes in profile. Clypeus in full-face view subrectangular, broader than long, its anterior margin convex, forming two blunt denticles laterally, while its posterior margin almost straight. Mandibles subtriangular, short, strongly curved downward in profile; masticatory margin with sharp apical tooth, followed by three sharp teeth. Eyes large, oval, located near mandibles; concave areas present around eyes in profile; eyes strongly convex in full-face view. Three ocelli present, moderately large, with median ocellus located at approximately 4/5 length of head near posterior margin; distance between lateral ocelli longer than distance between median and lateral ocelli. Antennae 12-segmented, each segment with equal size; scapes short, not reaching posterolateral corners of head when rest, almost equal to segments II–V combined, with parallel-sided.

Mesosoma in profile approximately two times longer than head width (excluding eyes), with strongly convex dorsal outline anteriorly, but sloping downward posteriorly. Pronotum in dorsal view short, broader than long, feebly concave, with angulate anterolateral corners; its lateral surfaces deeply concave posteriorly as broad vertical furrow (Figure 2E). Mesoscutum broad, demarcated from pronotum by distinct suture; its anterior margin curved, but its posterior margin almost straight; median portion of lateral margins of mesoscutum forming sharp denticles in front of tegulae (Figure 2F); parapsidal furrows narrow starting near lateral denticles of mesoscutum; notauli broad and deep, forming distinct “Y” shape, converging posteriorly, its intersection located at median portion of mesoscutum (Figure 2F). Mesoscutellum round, broader than long, demarcated from mesoscutum by broad scutoscuteellar sulcus; shorter and narrower than mesoscutum; mesoscutellum located lower than inflated mesoscutum in profile. Metanotum short (‘narrow’), located lower than mesoscutum and mesoscutellum, demarcated from propodeum in dorsal view by distinct suture. Mesopleuron higher than long, almost as long as lateral face of pronotum; anepisternum

demarcated from katepisternum by broad oblique mesopleural sulcus, smaller than the latter. Metapleuron distinctly demarcated from mesopleuron, extremely smaller than mesopleuron, divided into upper and lower sections. Propodeum in profile short ('narrow'); its dorsal outline sloping downward to round convexity; propodeal declivity flat, plummeting (Figure 2E); propodeal spiracles located at sutures between metanotum and propodeum; propodeal lobe low, with entirely convex posterior margin. Petiole in profile view much longer than high, with thick and long anterior peduncle; node with anterior slope much gentler than posterior slope; dorsum of node nearly flat; venter of petiole almost straight, with small subpetiolar process anteriorly; longer than broad; node broader than long, laterally rounded; lateral margins of petiole including anterior peduncle carinate. Postpetiole in profile globular, as high as petiole, with carinated posterior margin; sternopostpetiolar process thick, trapezoidal with median indentation; postpetiole in dorsal view distinctly broader than petiole. Gaster in dorsal view elongate, distinctly longer than broad, first gastral tergite partly concealing the other segments of gaster.

Dorsum of head and body entirely reticulate, interspaces formed by reticulae smallest and deepest on propodeum; dorsum of mesoscutellum areolate-rugose at mid-length. Dorsum of propodeum areolate-rugose superimposed over reticulate background. Clypeus areolate-rugose. Mandibles indistinctly striate basally, but apically smooth and shiny. Furrow of notaulices areolate-rugose. Scutoscuteellar sulcus and oblique mesopleural sulcus with widely spaced striae. Gaster smooth and shiny, anterior margin of gaster with striation. Legs indistinctly finely reticulate. Dorsum of head including clypeus and mandibles, mesosoma (except for propodeum), petiole, postpetiole, and gaster sparsely with thin suberect/erect hairs. Legs and antennae covered with short appressed pubescence.

Head and body including coxae brown. Mandibles, antennae, tibiae, tarsi and tip of gaster yellowish; femur dull yellowish. All hairs grey.

Remarks. *Calptomymex rectopilosus* is easily distinguished from the other known Asian species by the combination of the characteristics mentioned by Shattuck (2011) and Jaitrong and Yamane (2018): 1) the hairs on the body are thin with blunt or sharp apices, while those on promesonotum are almost as long as or slightly longer than those on dorsum of head; 2) the propodeum is armed with moderately long and slender propodeal teeth; 3) the dorsum of head is covered with coarse rugae anteriorly fading to essentially absent posteriorly and superimposed over the punctate background.

Distribution. **Cambodia (Eastern:** Kampung Cham Province, Hosoishi *et al.*, 2013), **Hong Kong (New Territories:** Tai Po Kau Nature Reserve, Jaitrong and Yamane, 2018). **Thailand (Northern:** Chiang Mai Province; **Northeastern:** Nakhon Ratchasima Province, Srisaket Province; **Eastern:** Chachoengsao Province, Chanthaburi Province; **Central:** Nakhon Nayok Province, Saraburi Province; **Western:** Kanchanaburi Province, Tak Province; **Southern:** Nakhon Si Thammarat Province, Phatthalung Province, Ranong Province, updated

from Kachonpisitsak *et al.*, 2020). **Vietnam (Northeastern:** Quang Ninh Province, Shattuck, 2011; Eguchi *et al.*, 2011) (Figure 5).

Habitats. In Cambodia, *C. rectopilosus* (cited as *C. sp. 6* of SKY) was reported in the leaf litter of a rubber plantation (Hosoishi *et al.*, 2013). Additionally, Jaitrong and Yamane (2018) recorded the species in the Tai Po Kau Nature Reserve, a subtropical secondary forest in Hong Kong. In Thailand, *C. rectopilosus* has been recorded from decaying twigs, leaf litter, and soil (e.g., colonies WJT100818-1 and WJT221218-6), as well as in soil beneath rotten wood (a single worker from Ranong Province), based on Jaitrong and Yamane (2018) and our updated data. Its habitats span primary forests (evergreen, dry evergreen, mixed deciduous, and tropical rainforests), secondary forests (oil palm and rubber plantations), and disturbed areas, such as temple grounds where colony WJT100818-1 was collected. In Vietnam, Eguchi *et al.* (2011) reported that this species nests in decaying twigs and wood fragments on the forest floor and typically has small colonies consisting of only a few dozen workers.

***Calyptomyrmex troglodytes* Chayakul and Jaitrong, sp. nov.**

(Figure 3)

Holotype. Worker (THNHM-I-00028733, THNHM), Northern Thailand, Phayao Province, 100.449944° N, 19.500842° E, Chiang Kham District, Rom Yen Subdistrict, Nam Lod Cave (25 m from the entrance), station 5, 20.I.2026, W. Jaitrong leg.

Measurements and indices. Holotype: CFW 0.25; HL 1.26; HW 1.40; ML 1.33; PronW 0.91; MTL 0.67; PetL 0.28; PetW 0.46; SL 0.53; CI 111; SI 35; PetI 164.

Diagnosis of worker. Hairs on head and body narrowly spatulate, gradually widening toward their rounded apices, those on clypeus and scapes parallel-sided, with slightly more acute tips. Fenestra-like dark spots absent from the frontal lobes. Eyes small, contain 6–7 ommatidia along maximum diameter in profile. Propodeum armed with robust angular spines, with posterodorsal angle of approximately $\sim$. Propodeal lobe noticeably thicker dorsally than ventrally. Head covered with wavy rugae anteriorly, becoming areolate-rugose posteriorly. Scares gradually thicken toward apex, superficially covered with reticulated sculptures. Mandibles and clypeus entirely striate. Posterior half of first gastral tergite superficially covered with reticulated sculpture. Large species (HW = 1.40 mm).

Description of worker (Figure 3A–E). Head in full-face view subtriangular, slightly broader than long, broader posteriorly; posterior margin straight with roundly convex posterolateral corners; posterodorsalmost part of frontal carinae forming sharp denticles (Figure 3A). Frontal lobes in full-face view well developed, without pair of fenestra-like dark spots. Clypeus in full-face view forked, anterolateral corners produced into long appendages, with sharp apices, forming “V” shape. Antennal scrobes in profile deep and broad. Mandibles in full-face view subtriangular, broad and slightly curved downward in profile; masticatory

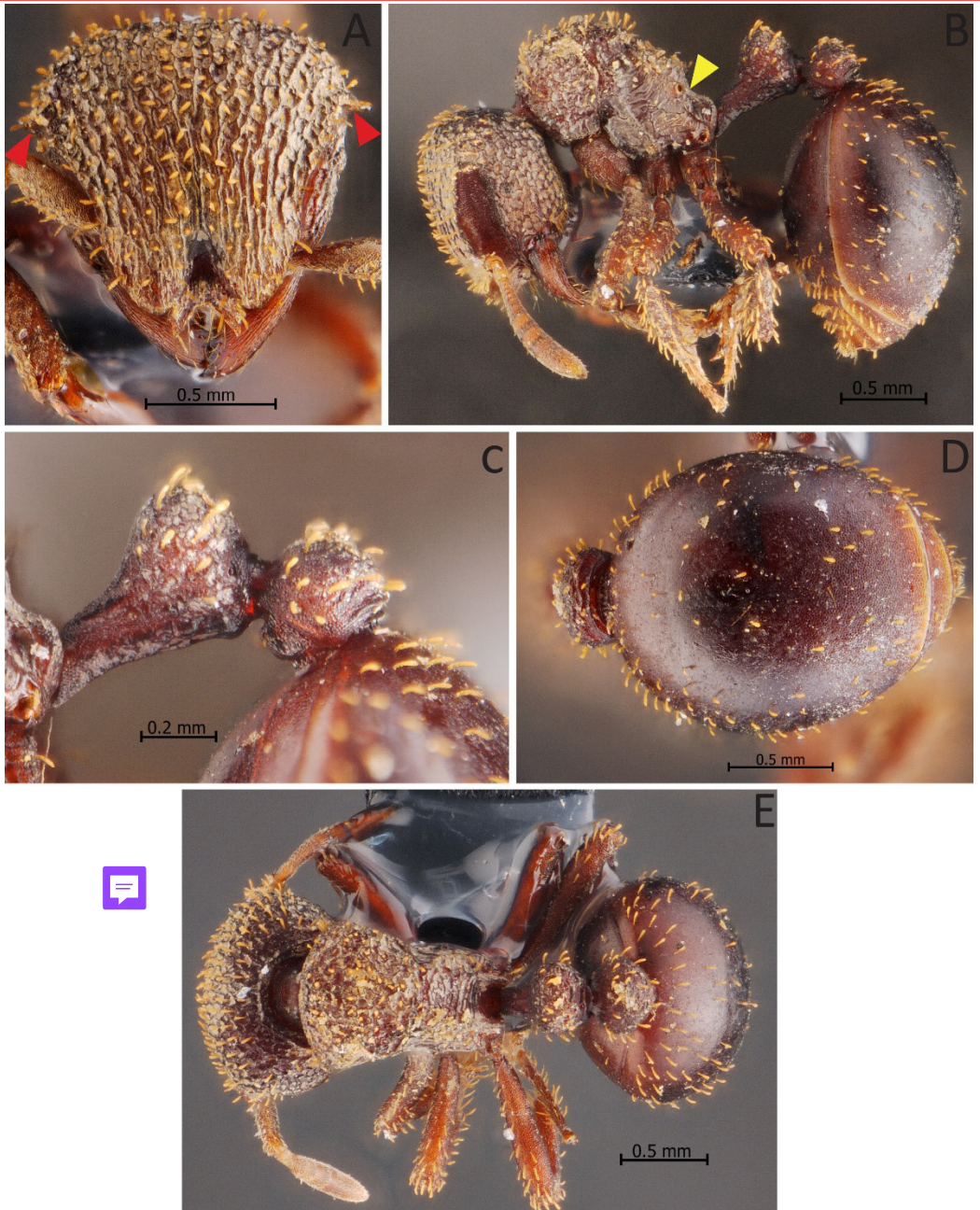


Figure 3. *Calyptomyrmex troglodytes* **sp. nov.** (Holotype worker, THNHM-I-00028733). A, Head in full-face view; B, Body in profile; C, Petiole and postpetiole in profile; D, First gastral tergite in dorsal view; E, Body in dorsal view. Red arrows indicate the sharp denticles forming at posterodorsalmost part of frontal carinae in Figure A. Yellow ~~white~~ indicate the posterodorsal angles of the propodeal declivity (approximately 120°) in Figure B. The left antennae, right legs and right antennal club were accidentally detached from the specimen after the photographing, but the last two were mounted on another triangular card in the same pin.

margin with sharp apical tooth fused with indistinct preapical tooth, followed by three denticles and stout basal tooth with flat apex. Eyes small-sized, with 6–7 ommatidia along maximum diameter in profile, located almost at mid-length of head. Antennae 12-segmented, with 3-segmented clubs; scapes short, gradually increase in width, broadest at mid-length, with convex ventral outline.

Mesosoma in profile, short, with strongly convex dorsal outline and strongly concave lateral faces; anterior margin of pronotum in dorsal view convex, with round anterolateral corners (Figure 3E); promesonotum prominent, raised above propodeum in profile (Figure 3B). Propodeum in profile armed with broad and sharp angular spines, not forming distinct teeth; propodeal declivity flat, with posterodorsal angle approximately 120° (Figure 3B); propodeal spiracles located at upper portions of propodeum, not touching propodeal declivity; propodeal lobe low, with curved posterior margin, upper portion slightly thicker than lower portion (Figure 3B). Petiole in profile subtriangular, with long anterior peduncle; petiole broader than long in dorsal view; its sternopetiole process thin. Postpetiole globular, with convex lateral margin in dorsal view, slightly broader than petiole in dorsal view, but relatively smaller and shorter than petiole in profile; its ventral outline roundly convex ventrally. Gaster oval, with first tergite strongly convex.

Head and body semi-matt (moderately shiny) with various kinds of sculpture. Head rugose; its anterior 3/5 with wavy longitudinal rugae, while posterior 2/5 and ventrolateral portion areolate-rugose (Figure 3A). Clypeus and mandibles entirely striate. Antennal scrobes and scapes superficially reticulate. Mesosoma in profile areolate-rugose, with interspaces increasing in size toward propodeum; dorsum of propodeum areolate-rugose, with smaller interspaces compared to those on promesonotum. Entire petiole and dorsum of postpetiole areolate-rugose superimposed over indistinctly punctate background; anteriormost area of anterior peduncle superficially reticulate, posteriormost area ventrally areolate-rugose; lateral faces of postpetiole entirely superficially reticulate (Figure 3C). Anterior half of first gastral tergite with only semi-matte appearance, while posterior half superficially reticulate as in other tergites (Figure 3D); anteriormost zone with striae; gastral sternites with matte appearance. Legs superficially reticulate, punctate in their interspaces.

Dorsum of head, promesonotum, femur, tibia, and posterior portion of gastral sternite with dense narrowly spatulate erected hairs; approximately 40 hairs present on dorsum of promesonotum; ventrolateral portion of head without such spatulate hairs. Propodeum, petiole, postpetiole, dorsum of gastral tergites, and coxae with the same type of narrowly spatulate hairs, but hairs sparse and shortest on metanotum and propodeum. Clypeus and scapes with inconspicuous narrowly spatulate hairs, which have the same width along entire length and slightly sharper apices. Mandibles, antennal segments II–XII and tarsi with thin suberect hairs.

Head and mesosoma entirely dark reddish-brown; antennae and legs slightly lighter. Gaster darker than head and mesosoma; each gastral tergite posteriorly with light yellow

stripe. All hairs yellow.

Remarks. This new species is easily distinguished from the other known Asian *Calypptomymex* species by its larger body size (HW 1.40 mm, ML 1.33, and MTL 0.67 mm) and narrowly spatulate hairs covering dorsum of head, mesosoma, and first gastral tergite. However, it is morphologically similar to *C. danum* (Malaysia), *C. loweryi* (Malaysia), and *C. sparsus* (Queensland), all of which are relatively large species (HW > 1.02–1.15 mm). However, combining the reticulate sculpture on the scapes, lack of fenestra-like dark spots on the frontal lobes, lack of longitudinal striation on the first gastral tergite, dark reddish-brown coloration, and postpetiole that is broader than the petiole, this new species can be separated from other congeners.

Calypptomymex troglodytes **sp. nov.** is morphologically most similar to *C. danum* in having a head that is distinctly broader than long (CI 111 in *C. troglodytes*; CI > 104 in *C. danum*). Both species share the head with wavy rugae anteriorly and areolate-rugose sculpture posteriorly, lateral faces of the postpetiole with reticulated sculpture, and lack of longitudinal rugae on the first gastral tergite. However, *C. troglodytes* can be distinguished from *C. danum* by the following characteristics: 1) dorsa of frontal lobes without fenestra-like dark spots (distinctly present in *C. danum*; see Figures 3A and 6C for comparison); 2) petiole in profile triangular (subquadrate in *C. danum*; see Figures 3C and 7A for comparison); 3) lateral surfaces of propodeum covered with areolate-rugose sculpture (reticulate with a few transverse rugae in *C. danum*; see Figures 3B and 7A for comparison); 4) dorsum of propodeum covered with areolate-rugose (reticulate in *C. danum*); 5) mandibles are completely covered with striation (striation inconspicuous in *C. danum*).

Calypptomymex troglodytes can be easily distinguished from *C. loweryi* by the following



Figure 4. Type locality (100.449944° N, 19.500842° E), Nam Lod Cave, Chiang Kham District, Rom Yen Subdistrict, Phayao Province, Northern Thailand. A, The cave entrance; B, Dark zone of the cave where the holotype worker was collected (25 meters from the entrance).

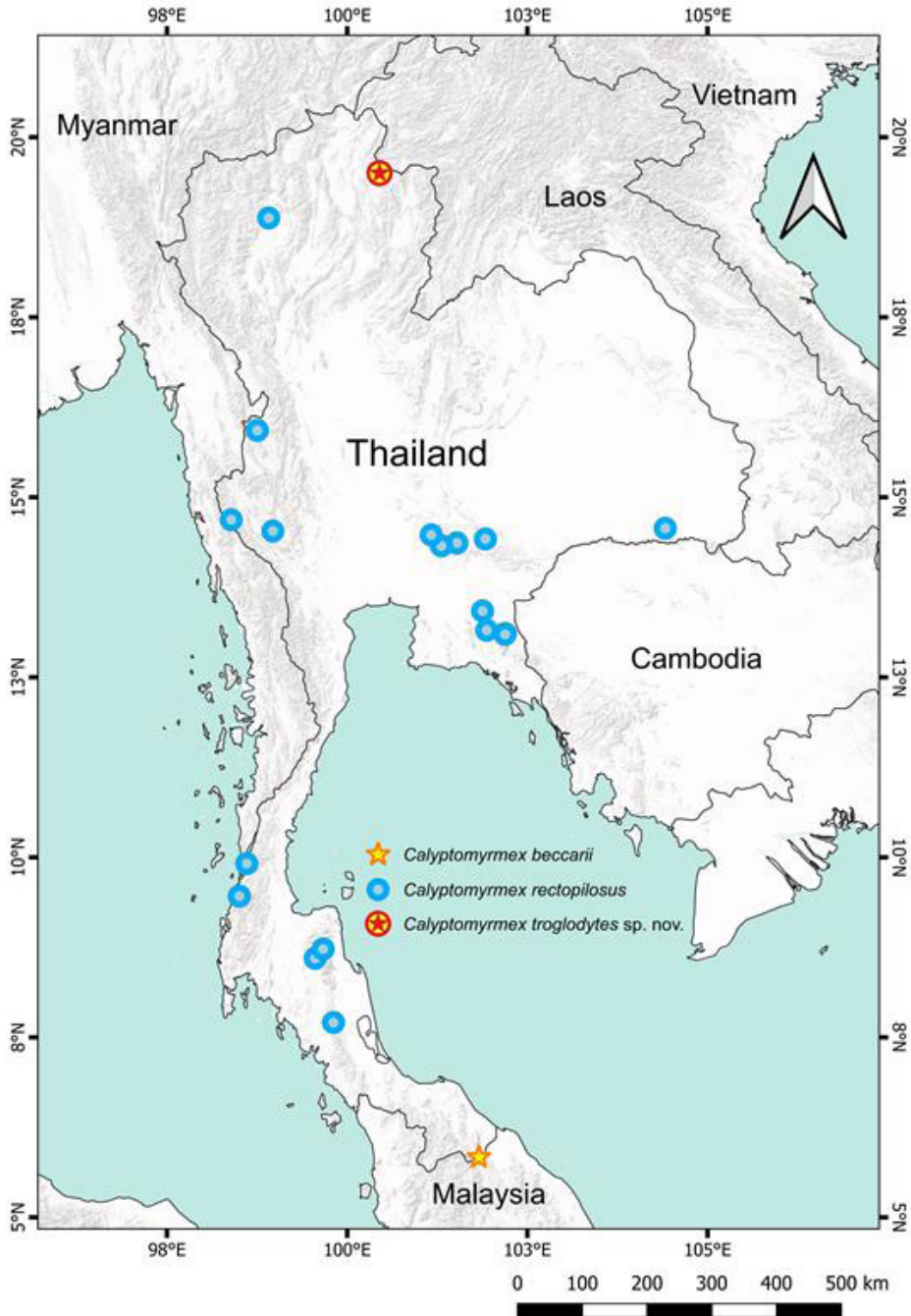


Figure 5. Distribution map of the ant genus *Calyptomyrmex* in Thailand based on literatures cited and materials examined.

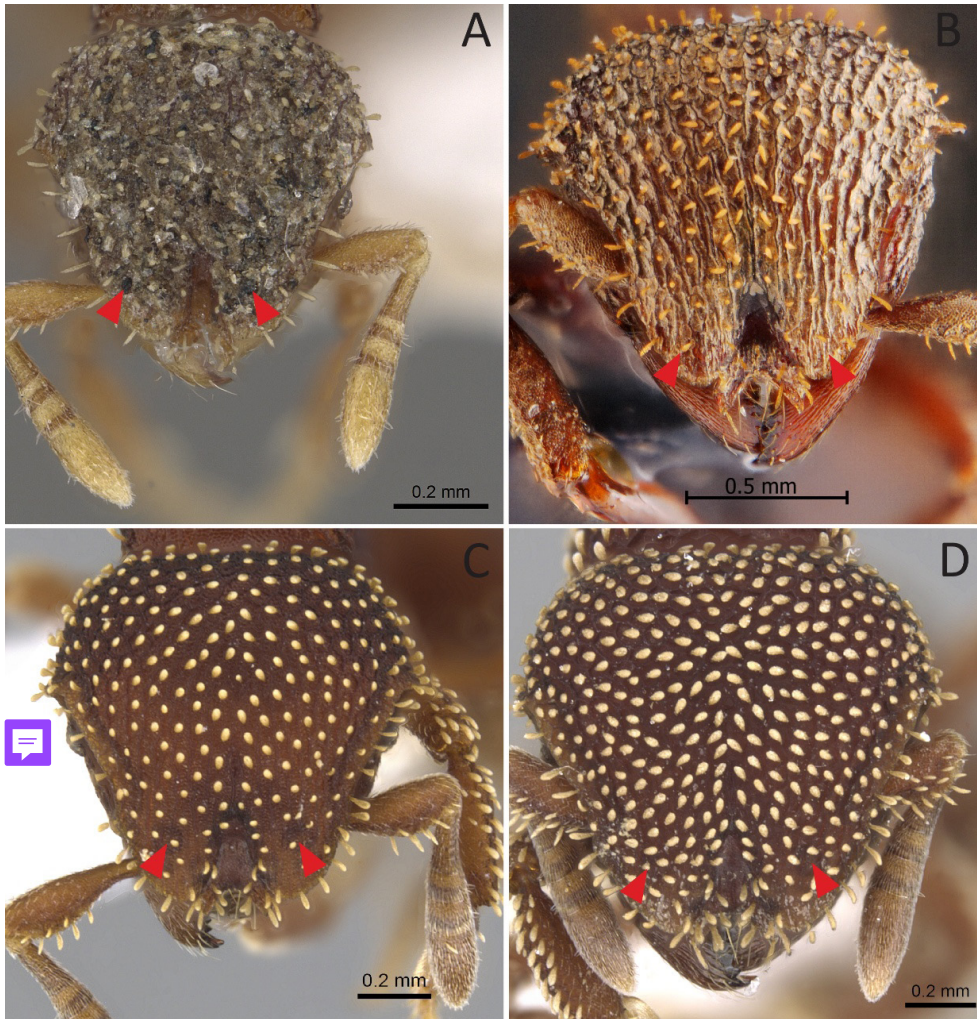


Figure 6. Pictures used in keys and remarks of the new species illustrated head in full-face view of *Calyptomyrmex* spp. A, *Calyptomyrmex vedda* (Holotype worker, CASENT0911134); B, *Calyptomyrmex troglodytes*, **sp.nov.** (Holotype worker, THNHM-I-00028733); C, *Calyptomyrmex danum* (Holotype worker, CASENT0900995); D, *Calyptomyrmex loweryi* (Paratype worker, CASENT0900996). ~~White~~ ^{Yellow} arrows indicate the frontal lobes bearing a pair of fenestra-like dark spots in the species shown in Figures A, C, and D.

characteristics: 1) dorsum of frontal lobes lacking fenestra-like dark spots (fenestra-like dark spots distinct in *C. loweryi*; see Figures 6B and 6D for comparison); 2) anteriormost portion of promesonotum convex with round corners (straight and marginate in *C. loweryi*); 3) mandibular dorsum entirely striated (striation weak and confined to apical portion in *C. loweryi*); 4) clypeal dorsum covered with striated sculpture (weakly striated with only

1–2 striae in *C. loweryi*); 5) propodeal dorsum is covered with areolate-rugose sculptures (appearing matte and unsculptured in *C. loweryi*); 6) propodeal spines stout and angular (spines not angular in *C. loweryi*; see Figures 3B and 7B for comparison); 7) lateral face of postpetiole covered with reticulate sculpture (areolate-rugose in *C. loweryi*; see Figures 3C and 7B for comparison).

Calyptomyrmex troglodytes can be easily distinguished from *C. sparsus* by the following characteristics: 1) larger body size: HW 1.40 mm, ML 1.33 mm, and MTL 0.67 mm (HW < 1.14 mm, ML < 1.25 mm, and MTL < 0.51 mm in *C. sparsus*); 2) head distinctly broader than long in full-face view, with CI = 111 (distinctly longer than broad with CI = 95–96 in *C. sparsus*); 3) body mostly covered with narrowly spatulate yellow hairs (in *C. sparsus*, hairs broadly spatulate and strongly expanded distally); 4) almost entire body concolorous dark reddish-brown (in *C. sparsus*, petiole, postpetiole, and gaster with lighter shade of dark reddish-brown than the head and mesosoma); 5) propodeal spines stout, angular, directing dorsally at an approximately 120° posterodorsal angle (directing rearward at approximately 90° in *C. sparsus*); 6) propodeal lobe with upper portion thicker than lower portion (of uniform thickness in *C. sparsus*).

Etymology. The specific epithet is a noun referring to the cave-dwelling habit of the new species.

Distribution. Thailand (Northern: Phayao Province) (Figure 5).

Habitats. The holotype was collected from a mountain cave with a ground-level entrance (Figure 4A). The specimen was discovered on the cave floor blanketed with bat guano in the dark zone approximately 25 meters from the entrance (Figure 4B). At the collection site, the ground surface consisted of dry and powdery soil with the ground temperature of 20.5 °C and 13.5% relative humidity; the air temperature was 21.5 °C with 94% relative humidity.

Key to the Asian species based on the worker caste

(Modified from Shattuck, 2011; Akbar and Bhatrti, 2015; Jaitrong and Yamane, 2018)

1. Dorsum of head mostly covered with spatulate hairs (Figures 3A, 6A–D). 2
 - Dorsum of head mostly covered with thin hairs (essentially with parallel-sided, or only slightly expanded distally, with blunt tips) (Figure 1A). 9
2. Propodeum armed with pair of angular spines or sharp teeth (Figures 3B, 7A). 3
 - Propodeum unarmed (Figure 7B). 8
3. Propodeal spines well-developed as sharp teeth. 4
 - Propodeal spines angulate without pointed apices (Figures 3B, 7A). 6
4. Hairs on head all distinctly spatulate (Figures 3A, 6B–D); frontal lobes without fenestra-like dark spots (Figures 6B); first gastral tergite covered with spatulate hairs; masticatory margins of mandible with variable number of teeth. 5
 - Head posteriorly with narrowly spatulate hairs, but anteriorly with thin hairs that are sharply

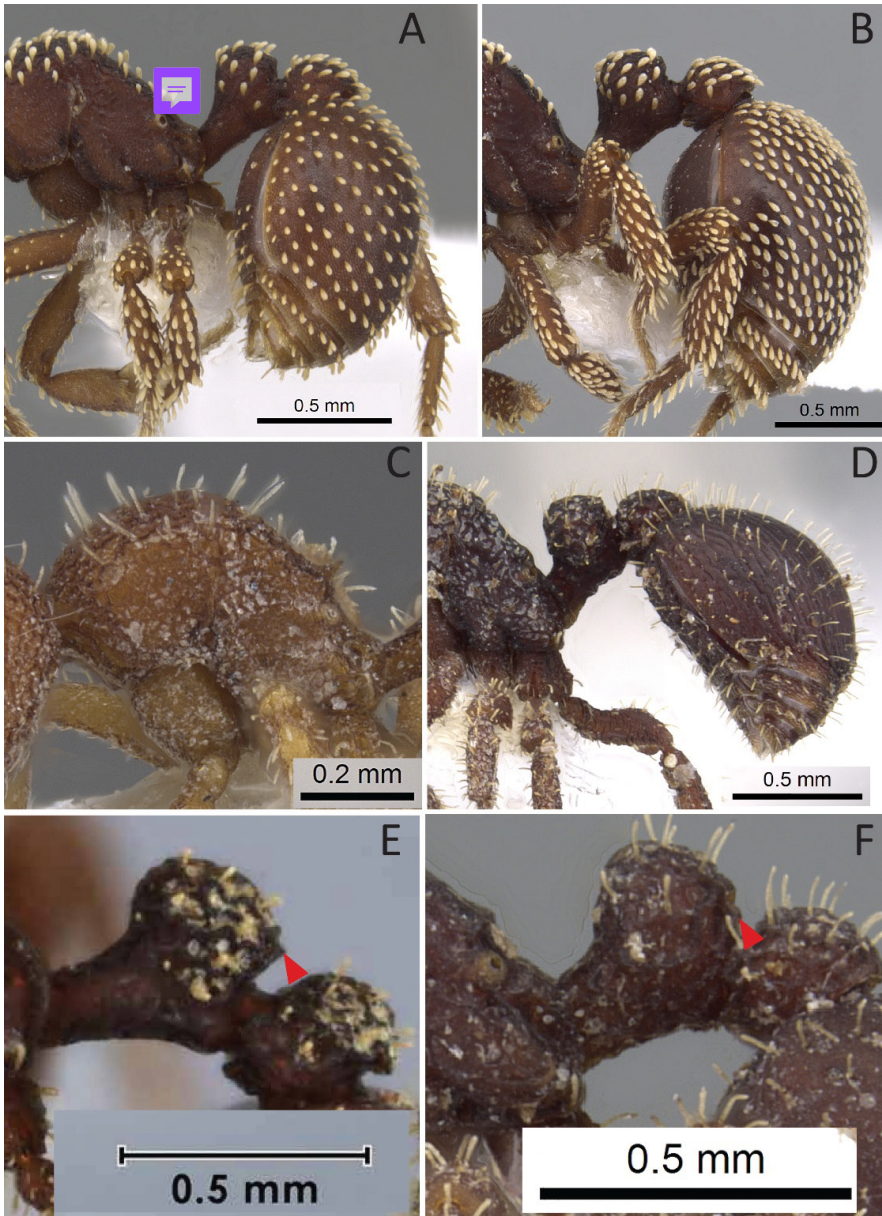


Figure 7. Pictures used in keys and remarks of the new species. A–D propodeum, petiole, postpetiole and gaster in profile, A, *Calyptomyrmex danum* (Holotype worker, CASENT0900995); B, *Calyptomyrmex loweryi* (Paratype worker, CASENT0900996); C, *Calyptomyrmex wittmeri* (Holotype worker, CASENT0913957); D, *Calyptomyrmex retrostriatus* (Holotype worker, CASENT0900997). E–F petiole and postpetiole in profile, E, *Calyptomyrmex asper* (holotype worker, ANIC32-051667, modified from Shattuck, 2011); F, *Calyptomyrmex ryderae* (Holotype worker, CASENT0900998). Red arrows indicate the posterodorsal corners of petiole in Figures E and F.

Yellow

- pointed apically (Figure 6A); frontal lobe with fenestra-like dark spots (Figures 6A, C, D); first gastral tergite covered with thin hairs; masticatory margins of mandibles with six teeth; color light yellowish brown (Sri Lanka). ***C. vedda* Baroni Urbani, 1975**
5. First gastral tergite, dorsa of petiole and postpetiole finely punctate (Bhutan). ***C. friederikae* Kutter, 1976**
 – First gastral tergite superficially reticulate; dorsa of petiole and postpetiole areolate-rugose (Sri Lanka). ***C. tamil* Baroni Urbani, 1975**
6. Large species (HW > 1.02 mm); petiole relatively narrower than postpetiole; spatulate hairs sparsely present on dorsum of propodeum or arranged as rows along lateral margins; color dark reddish-brown. 7
 – Small species (HW < 0.91 mm, after Baron Urbani, 1975); petiole broader than postpetiole in dorsal view; hairs absent from most of propodeum in dorsal view; color light brown (Sri Lanka). ***C. singalensis* Baron Urbani, 1975**
7. Larger species (HW = 1.40 mm); head, mesosoma and first gastral tergite covered by narrowly spatulate hairs that gradually widen toward their rounded apices (Figures 3A, B); frontal lobes without fenestra-like dark spots (Figure 3A, 3B); petiole in profile subtriangular (Figure 3C); spatulate hairs sparsely present on propodeal dorsum (Figure 3E) (Thailand). ***C. troglodytes* sp. nov.**
 – Smaller species (HW > 1.02 mm, after Shattuck, 2011; but < 1.40 mm); body covered by spatulate hairs that strongly and distinctly widen toward their rounded apices (Figures 6C, 7A); frontal lobes with fenestra-like spots (Figure 6C); petiole in profile subquadrate; row of spatulate hairs laterally present on propodeal dorsum (Borneo). ***C. danum* Shattuck, 2011**
8. Posterior portion of head above level of antennal scrobe narrower, posterolateral corners of head rounder; mesosoma shorter (ML < 1.02 mm, after Shattuck, 2011); spatulate hairs narrower and more linear. Color reddish brown to light reddish brown (New Guinea, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Timor-Leste). ***C. beccarii* Emery, 1887**
 – Posterior portion of head above level of antennal scrobe broader, posterolateral corners of head more angular; mesosoma longer (ML > 1.05 mm, after Shattuck, 2011); spatulate hairs broader and rounder (Figure 6D). Color reddish brown (Indonesia, Malaysia, the Philippines and Singapore). ***C. loweryi* Shattuck, 2011**
9. In profile, dorsal outline of mesosoma continuous (Figures 1C, 7A). 10
 – In profile, dorsal outline of mesosoma discontinuous; promesonotum prominent, raised above level of propodeum (Figure 7D). 14
10. Promesonotal hairs often two times as long as those on head or longer; Head and promesonotum punctate with only macropunctures; color dark reddish brown to dark brown (Laos). ***C. laotius* Jaitrong and Yamane, 2018**

- Promesonotal hairs almost as long as those on head; head and promesonotum with longitudinal or areolate-rugose rugae in addition to macropunctures. 11
11. Propodeum essentially lacks propodeal teeth; petiole almost as long as broad in dorsal view; first gastral tergite anteriorly smooth and shiny (Indonesia)..... ***C. nitidiusculus* Yamane and Ito, 2023**
- Propodeum with distinct propodeal teeth or just convexities; petiole distinctly longer than broad in dorsal view; first gastral tergite entirely superficially reticulate..... 12
12. Postpetiole with spine-like anteroventral projection; compound eyes small (2–5 ommatidia in maximum diameter); propodeum armed with moderately long, narrow teeth (Figure 1C); color light-brown (Cambodia, Hong Kong, Thailand and Vietnam)..... ***C. rectopilosus* Dlussky and Radchenko, 1990**
- Postpetiole without anteroventral projection; compound eyes larger (more than 5 ommatidia in maximum diameter); propodeum armed with short teeth or just convexity (Figure 7C, D); color variable. 13
13. Propodeal spines distinct, short and sharp (Figure 7C); first gastral segment finely reticulate; anterior peduncle of petiole longer and thinner; petiole round in profile; color light-brown (Bhutan, China and India). ***C. wittmeri* Baroni Urbani, 1972**
- Propodeal spines ill-developed, being mere convexity. First gastral segment heavily striate longitudinally; anterior peduncle of petiole shorter and thicker; petiole subquadrate in profile; color reddish brown (Figure 7D) (Indonesia and Malaysia). ***C. retrostriatus* Shattuck, 2011**
14. Propodeal spines well-developed, triangular; Color reddish brown (Borneo). ***C. sabahensis* Shattuck, 2011**
- Propodeal spines ill-developed, being mere convexity; color reddish brown 15
15. Lateral faces of mesosoma and dorsum of head with few, well-defined, coarse rugae; petiole in profile with strongly carinate posterodorsal corners (Figure 7E); with mesosoma in profile view, its highest part exists at posterior half of promesonotum (Indonesia and Malaysia). ***C. asper* Shattuck, 2011**
- Lateral faces of mesosoma and dorsum of head with numerous, ill-defined, finer rugae; petiole in profile with angulate (but never strongly carinate) posterodorsal corner (Figure 7F); with mesosoma in profile view, entire dorsal outline of promesonotum lying at same level (Indonesia and Malaysia). ***C. ryderae* Shattuck, 2011**

DISCUSSION

With the inclusion of the new species, the ant genus *Calyptomyrmex* now comprises 40 valid species globally and 16 within the Asian continent and insular regions (Shattuck, 2011; Akbar and Bharti, 2015; Jaitrong and Yamane, 2018; Ito *et al.*, 2023; present study). In Thailand, the genus is represented by three species: *C. beccarii*, *C. rectopilosus*, and *C. troglodytes* **sp. nov.** (Jaitrong and Yamane, 2018; Kachonpisitsak *et al.*, 2020; present

study). Although we were unable to examine the Thai specimens of *C. beccarii*, Jaitrong and Nabhitabhata (2005) reported a single record in Narathiwat Province (the southernmost Province of Thailand) (Figure 5). It was initially cited as *C. emeryi* Forel, 1901, which was later designated as a junior synonym of *C. beccarii* by Shattuck (2011; also see Kachonpisitsak *et al.*, 2020). Shattuck (2011) stated that hair shape and length, surface sculpturing, and the configuration of propodeal teeth can be used to distinguish Southeast Asian species. In addition to these characters, Akbar and Bharti (2015) used some other features including the presence of fenestra-like dark spots on the frontal lobes and the mesosomal outline (continuous vs. discontinuous) in identifying species including those from South Asia. Among the three known species in Thailand, *C. rectopilosus* is widely distributed throughout the country and is typically found in primary forests or occasionally in disturbed areas.

The new species, *C. troglodytes* **sp. nov.**, is the first member of the genus recorded from a cave habitat. Despite being found in the dark zone of a guano cave (over 30 m from the entrance), it does not exhibit distinct troglobiomorphic traits, such as the reduction or loss of eyes, pale cuticular pigmentation, thinner cuticle, or the elongation of appendages, especially the antennae (Christiansen, 1962; Pape, 2016). Instead, it closely resembles non-caverniculous *Calyptomyrmex* species of large sizes. Although we described this *Calyptomyrmex* as new species from the single specimen, we consider its recognition as a distinct species to be well supported for several reasons. First, it possesses distinct morphological differences with the other large species. Second, this genus exhibits monomorphism with relatively less occurrences of intraspecific morphological variation. Third, *C. troglodytes* **sp. nov.** inhabited dark zone of the cave (25 m from the cave entrance) representing the habitat that was ecologically distinct from its congeners. Furthermore, from a biogeographic perspective, most large species (HW > 1.02–1.15 mm) were found in Sundaland (Shattuck 2011), whereas *C. troglodytes* **sp. nov.** was the first large species with a body covered with spatulate hairs discovered in Indochina, where it was geographically disjunct from its Sundaic relatives.

Up to now, as only one worker specimen has been found in a cave it is not clear that this species is an exclusively cave-dependent species or not. Wider range of habitats similar in nature to cave interior should be explored to find additional samples.

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