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Updating the taxonomy of the ant genus *Myrmecina* (Hymenoptera, Formicidae) in China with descriptions of three new species

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Abstract

In this study, we present a taxonomic update for the ant genus *Myrmecina* in China that includes 14 species in total. A recent survey of the leaf litter ant fauna in China's Hengduan Mountains collected three unknown *Myrmecina* species, which we describe here as *Myrmecina eowilsoni* **sp. nov.**, *M. gaoligongensis* **sp. nov.**, and *Myrmecina pierceae* **sp. nov.** These new species are clearly distinguishable from all the other species in the genus. We provide an update to the identification key of Chinese *Myrmecina*, as well as a diagnostic discussion and high-quality specimen images. In addition, *Myrmecina raviwonghei* Jaitrong, Samung, Waengsothorn & Okido 2019 is reported for the first time from China.

Key words: Ant diversity, taxonomic identification key, species inventory, Hengduan Mountains, Gaoligong Mountains, Xishuangbanna, Yunnan

Introduction

Ant species of the genus *Myrmecina* Curtis, 1829 are broadly distributed across the Nearctic, Palearctic, Indomalayan, Oceanian and Australasian realms (based on the WWF biogeographic realms system). The distribution within those realms presents several gaps and disjunctions worth noticing. For instance, in the Nearctic realm, *Myrmecina* is distributed from the Mexican state of Oaxaca north to Quebec, but is apparently absent from the northwest of the USA and Canada. Similarly, in the Palearctic realm, the genus is unknown from a large region extending from the northwest of Iran to Madhya Pradesh in India and appears to be absent from most of Central Asia. *Myrmecina* has its peak of diversity within the Sundaic region of the Oriental realm and is also diverse in New Guinea and northeast Australia. However, it is completely absent from the fauna of the Afrotropics, Madagascar, and the Neotropics (Shattuck 2009; Bharti *et al.* 2016; Janicki *et al.* 2016; Guénard *et al.* 2017). Currently, 99 valid species of *Myrmecina* (excluding the current descriptions) and 1 subspecies are recognized (Bolton 2022), thus making it the 13th most diverse genus among the 144 Myrmicinae genera. Members of this genus are easily distinguished from other Myrmicine ants by a sharp longitudinal ridge running along each ventrolateral side of the head, and by a rounded and barrel-shaped petiole that lacks a distinct node. Despite its wide distribution, individuals of *Myrmecina* are relatively rarely encountered, likely as a result of their cryptic ecology. Generally nesting in soil, leaf litter, rotten wood, under Bryophyte moss, or under deep-set stones, they tend to have very small colony sizes with an average

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of 30 to 50 individuals (e.g., 24 in *M. americana*, Talbot 1957; 46 in *M. graminicola*, Buschinger & Schreiber 2002; 28 in *M. nipponica*, Ohkawara *et al.* 1993), with a recorded maximum of about 230 individuals for an undescribed species from Java (Ito 1996). Specimens are most commonly found within leaf litter samples (Terayama *et al.* 2014; Wong and Guénard 2016; Satria and Yamane 2019; Okido *et al.* 2020). Overall, the biology of most species remains poorly known, but work from Masuko (1994) showed specialized predatory behavior in the Japanese species *M. flava* and *M. nipponica* feeding on the hard-bodied mite family Oribatidae.

Most of the species in the genus *Myrmecina* live in Southeast Asia (www.antmaps.org) and the Australasian region (Shattuck 2009). The taxonomy of the genus is in moderately good condition, with a recent taxonomic revision by Okido and collaborators (2020) for Southeast Asian species providing a foundation for taxonomic updates and future revisions. In mainland China, 10 *Myrmecina* species have been recorded (Zhou 2001, Huang *et al.* 2008, Zhou *et al.* 2008): *Myrmecina asiatica* Okido, 2020; *M. asthena* Okido, 2020; *M. curvispina* Zhou, 2008; *M. guangxiensis* Zhou, 2001; *M. hamula* Zhou, 2008; *M. pauca* Huang, 2008; *M. sauteri* Forel, 1912; *M. sinensis* Wheeler, 1921; *M. striata* Emery, 1889; *M. taiwana* Terayama, 1985, with the highest diversity found within the southern provinces Yunnan (7 species) (Liu *et al.* 2020) and Guangxi (6 species). Records for *Myrmecina graminicola* in China, Eastern Russia, and East Asia are considered to be dubious since their records fall outside of their distribution range from Europe and Northern Africa towards central Russia (www.antmaps.org). With the increasing use of leaf litter and subterranean sampling methods, new records and species of *Myrmecina* are thus expected to be found in the region.

In this study, we describe three new *Myrmecina* species. All the new species were collected in the Gaoligong Shan Mountains, Southern Hengduan Mountains, Yunnan, China, during a recent survey of the local myrmecofauna (Liu *et al.* 2020). The main focus of that study was to assess the ground and leaf litter ant fauna, and three new *Myrmecina* species treated here are from the Gaoligong mountain range. The specimens do not match with any of the known species and, consequently, did not key out with the current identification key of Chinese *Myrmecina* provided by Zhou (2008) as well as the recent key of *Myrmecina* in Southeast Asia (Okido *et al.* 2020). Thus, we consider the materials as new and describe them herein as *Myrmecina eowilsoni* **sp. nov.**, *M. gaoligongensis* **sp. nov.**, and *Myrmecina pierceae* **sp. nov.** based on characteristics of the worker caste. Moreover, *Myrmecina raviwonghei,* which was collected in Xishuangbanna, Yunnan Province (Liu *et al.* 2015), represents a new record for China. We also update Zhou's key for the *Myrmecina* species from China and provide a diagnostic discussion and high-quality illustrations of important morphological characters.

Abbreviations of depositories. The collection abbreviations follow Evenhuis (2022). The material, upon which this study is based, is located and/or was examined at the following institutions:

CAS California Academy of Sciences, San Francisco, U.S.A.
ISAS Kunming, Kunming Institute of Zoology, Yunnan, China
MCZ Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A.

Material and methods

Most of the specimens presented in this study were collected during an inventory of the ant fauna of China's Hengduan Mountains in 2019, which yielded approximately 136 species/morphospecies (Liu *et al.* 2020). All available workers were mounted, examined, and measured. Morphology and terminology in this study follow Okido *et al.* 2020. Morphological observations and measurements were done with a Leica M165 C stereomicroscope equipped with an orthogonal pair of micrometers at a magnification of 100. Measurements were recorded in mm to three decimal places and rounded to two decimal places for presentation. The measurements and indices used in this study follow Wong and Guénard (2016).

HL Head Length. Maximum measured distance from the anterior-most point of the clypeal margin to the midpoint of a line drawn across the posterior margin of the head. Measured in full-face view.
HW Head Width. Maximum width of head in full-face view excluding the eyes.
MaL Mandible Length. Maximum length of mandible from the anterolateral margin of clypeus at outer side of mandibular insertion to mandibular apex.

SL Scape Length. Scape length, excluding the basal radicle.
EL Eye Length. Maximum diameter of eye measured in lateral view.
TL Total Length. Maximum length of specimen measured from the tip of the mandibles to the tip of the abdominal segment VII, not including sting. Due to the position of the specimen, total length was measured as the sum of head length + thorax, petiole and postpetiole length + gaster length.
WL Weber's length measured from the anterior-most point of the pronotal collar to the posterior-most point of the propodeal process.
PNH Pronotum Height. Maximum height of pronotum, measured in profile from the posterior base of the lateral sides of pronotum, where procoxa is attached, to the highest point of the pronotum.
PNW Pronotal Width. Maximum width of pronotum measured in dorsal view.
MW Mesonotal Width. Maximum width of the mesonotum measured in dorsal view.
PSL Propodeal Spine Length. Maximum length of propodeal spines measured in profile view from the tip of the propodeal spine to the closer outward margin of the propodeal spiracle.
PTL Petiole Length. Maximum diagonal length of petiole, measured in lateral view, from most anteroventral point of the peduncle, at or below the propodeal lobe, to most posterodorsal point at the junction with helcial tergite.
PTH Petiole Height. Maximum height of petiole, measured in lateral view from the highest (median) point of the node, orthogonally to the ventral outline of the node.
PTW Petiole Width. Maximum width of the petiole in dorsal view.
PPL Postpetiole Length. Maximum length of postpetiole, measured in lateral view.
PPH Postpetiole Height. Maximum height of postpetiole, measured in lateral view from the highest point of the node.
PPW Postpetiole Width. Maximum width of the postpetiole in dorsal view.
CI Cephalic Index. Calculated as: HW / HL 100.
SI Scape Index. Calculated as: SL / HW 100.
MaI Mandibular Index. Calculated as: MaL / HW 100.
PI Petiolar Index. Calculated as: PTW / PTL 100.
PPI Postpetiolar Index. Calculated as: PPW / PPL 100.

Results

Species synopsis of Chinese *Myrmecina* Curtis

Myrmecina asiatica Okido, Ogata & Hosoishsi, 2020
Myrmecina asthena Okido, Ogata & Hosoishsi, 2020
Myrmecina curvispina Zhou, Huang & Ma, 2008
Myrmecina eowilsoni Liu **sp. nov.**
Myrmecina gaoligongensis Liu **sp. nov.**
Myrmecina guangxiensis Zhou, 2001
Myrmecina hamula Zhou, Huang & Ma, 2008
Myrmecina pauca Huang, Huang & Zhou, 2008
Myrmecina pierceae Liu **sp. nov.**
Myrmecina raviwonghei Jaitrong, Samung, Waengsothorn & Okido, 2019
Myrmecina sauteri Forel, 1912
Myrmecina sinensis Wheeler, W.M., 1921
Myrmecina striata Emery, 1889
Myrmecina taiwana Terayama, 1985

Updated key to *Myrmecina* species from China based on worker caste

The updated identification key to the Chinese species is collated and modified from the original Chinese key (Zhou *et al.* 2008) and the recent key to Southeast Asian species (Okido *et al.* 2020).

1. Antennae with 11 segments . . . . . ***Myrmecina pauca***
- Antennae with 12 segments **2**
2. Lateral portions of clypeus raised into a sharp ridge or shield wall in front of the antennal insertions (Figure 1A, B) **3**
- Lateral portions of clypeus not raised into a sharp ridge or shield wall in front of the antennal insertions (Figure 1C, D) **4**

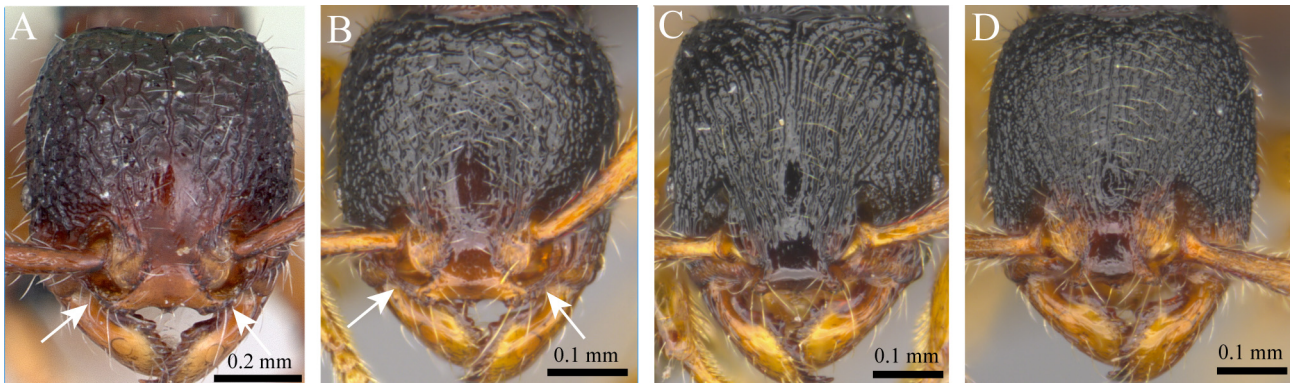

FIGURE 1. Head in full-face view. (A) *Myrmecina guangxiensis* (CASENT0070290), (B) *M. wilsoni* **sp. nov.** (MCZ-ENT00763515), (C) *M. pierceae* **sp. nov.** (MCZ-ENT00759962), (D) *M. gaoligongensis* **sp. nov.** (MCZ-ENT00759990)

3. Postpetiole expanded laterally, more than 2 times broader than petiole . . . . . ***Myrmecina eowilsoni* sp. nov.**
- Postpetiole not expanded laterally, slightly broader than petiole . . . . . ***Myrmecina guangxiensis***
4. Propodeal spines not straight in dorsal view (Figure 2B, C) **5**
- Propodeal spines straight, not curved outwards at the apex in dorsal view (Figure 2A) **6**
5. Propodeal spines distinctly curved outwards at the apex in dorsal view (Figure 2B) . . . . . ***Myrmecina curvispina***
- Propodeal spines with small hooks at their apex (Figure 2C) . . . . . ***Myrmecina hamula***

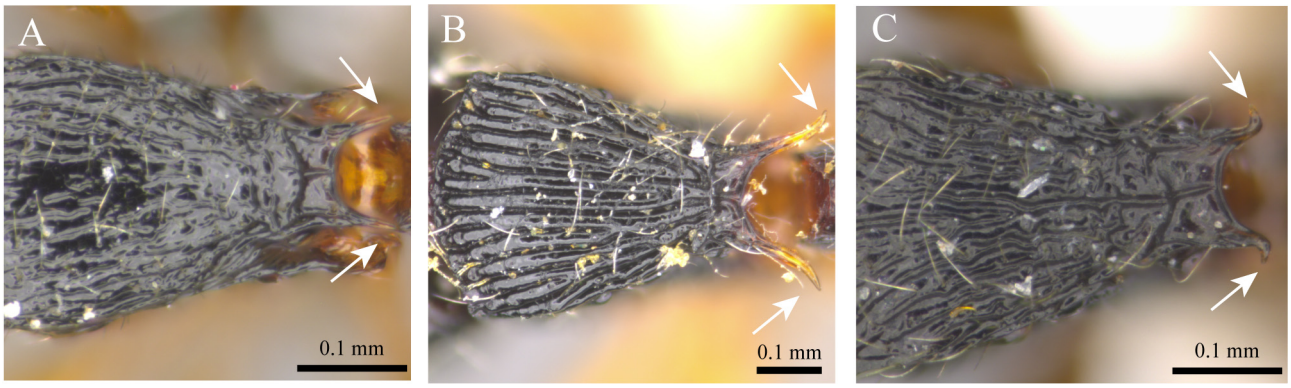

FIGURE 2. Propodeal spines in dorsal view. (A) *M. pierceae* **sp. nov.** (MCZ-ENT00759962), (B) *M. curvispina* (MCZ-ENT00863515), (C) *M. hamula* (MCZ-ENT00863516).

6. First gastral tergum with dense punctation . . . . . ***Myrmecina raviwonghei***
- First gastral tergum smooth and shiny **7**
7. Ventrolateral portion of head with punctures, without longitudinal rugae **8**
- Ventrolateral portion of head with only longitudinal rugae, or smooth and shiny **9**
8. Head in full-face view with dense punctation, and clearly visible longitudinal rugae medially. Anterior margin of clypeus weakly concave to almost straight . . . . . ***Myrmecina gaoligongensis* sp. nov.**
- Head in full-face view with dense punctation, without longitudinal rugae medially, but with weak irregular rugae laterally. Anterior margin of clypeus strongly concave with three distinct processes . . . . . ***Myrmecina asthena***
9. Anterior clypeal margin without median process **10**
- Anterior clypeal margin with median process **12**
10. Eye small, comprising less than 10 ommatidia (7-8); body yellowish orange or yellow . . . . . ***Myrmecina taiwana***
- Eye moderately large, with more than 10 ommatidia, body dark brown or black **11**
11. Ventrolateral portion of head sculptured with longitudinally rugose . . . . . ***Myrmecina sinensis***
- Ventrolateral portion of head smooth and shiny . . . . . ***Myrmecina sauteri***

12. Eye large and oval, comprising more than 20 ommatidia . . . . . ***Myrmecina striata***
- Eye small and circle, comprising 10 ommatidia or less **13**
13. Head in full-face view sculptured with longitudinal rugae posteriorly curving towards occipital corners, ventrolateral portion of head smooth and shiny . . . . . ***Myrmecina pierceae* sp. nov.**
- Head in full-face view with straight to weakly oblique longitudinal rugae not curving towards the occipital corners, ventrolateral portion of head with longitudinal rugae . . . . . ***Myrmecina asiatica***

Description of new species

Myrmecina eowilsoni Liu, sp. nov.
Figure 3.

Type material. Holotype, pinned worker, China, Yunnan, Gaoligong Shan Mountains, Baihua Lin, 25.30865N, 098.79369E, 1505 m, secondary forest, leaf litter, 05.VII.2019 (*C. Liu & G. Fischer*) (ISAS: MCZ-ENT00763515).

Diagnosis. The identification of *M. eowilsoni* in China can be easily performed with the updated identification key provided above. The new species is morphologically most similar to *M. guangxiensis* Zhou, 2001. However, *M. eowilsoni* can be immediately separated from it by the extremely broad postpetiole (PPI = 300), the shape of the anterior portion of the first gastral tergite, and the dense punctation on head and gaster.

Worker measurements. (N=1). TL 2.02 ; HL 0.56 ; HW 0.5 ; MaL 0.23 ; SL 0.43 ; EL 0.05 ; WL 0.65 ; PNW 0.38 ; PNH 0.25 ; MW 0.23 ; PSL 0.10 ; PTL 0.18 ; PTW 0.13 ; PTH 0.18 ; PPL 0.10 ; PPW 0.30 ; PPH 0.15 ; CI 105, SI 81, MaI 43, PI 125, PPI 300.

Worker description. Head. In full-face view, head subrectangular, as long as broad (CI 105); median portion of occipital margin concave; occipital corners rounded, not projected posteriorly. Mandible triangular; masticatory margin with large apical tooth and strong third tooth, followed by 6 denticles; anterior margin of clypeus almost straight, with a small median tooth; lateral portion raised into a sharp ridge of shield wall on each side, in front of antennal insertions. Anterior dorsal surface of the labrum with very small paired denticles. Frontal carinae virtually absent, indistinguishable from rugae on the dorsum of the head. Eyes relatively small with 6 ommatidia and maximum diameter 0.05 mm; antennae 12-segementd, with 3-segmented club; antennal scape reaching the posterolateral corner of head.

Mesosoma. Mesosoma convex in profile view; pronotum without denticles; propleuron angular and forming a small tooth; eumetanotal spine (the spines in front of the propodeal ones, see Okido *et al.* 2020) reduced or vestigial, visible only as a small denticle; propodeal spines triangular, shorter than broad at their bases and pointing posteriorly; propodeal declivity strongly concave; propodeal lobes with distinct lateral projection. Propodeal spiracle large, situated near the base of propodeal spine, separated from margin of the propodeal declivity by a distance of its diameter. Metapleural bulla well developed and covering most of the propodeal lobe.

Metasoma. Petiole in dorsal view rectangular, broader than long; anterodorsal slope of petiole in profile view almost straight with posterodorsal face weakly concave, both faces separated by a sharp little peak and ridge; sternopetiolar process with a convex lobe medially and small point anteriorly; postpetiole in dorsal view much broader than long, broader than petiole; sternopostpetiolar process weakly present. Anterior margin of first gastral tergite strongly concave, with anterolateral corner angled.

Sculpture. Head densely punctured with weak and irregular rugae, Occipital corners reticulate; clypeus and lateroventral area posterior of eyes smooth and shiny; mesosoma with deep longitudinal rugae; forecoxae smooth and shiny; petiole and postpetiole smooth with weak punctation; first gastral tergite and sternum shiny with weak punctation in the middle.

Pilosity and pubescence. Body covered with abundant erect hairs. Antenna with abundant suberect and erect hairs. Mandible with numerous thin and long hairs, basal masticatory margin with few spatulate hairs. Head and Mesosoma with dense and short erect pilosity on dorsum. Petiole and Postpetiole without hairs on ventral surface. All legs with numerous suberect to erect hairs. Gaster with dense and short erect pilosity on both dorsum and ventral.

Coloration. Body black with reddish brown mandibles, antennae, and legs.

Etymology. The species is named in honor of Prof. Edward O. Wilson and his invaluable contributions to biodiversity science and conservation. We thank him for setting up the E. O. Wilson Biodiversity Postdoctoral Fellowship which enabled the discovery of this and many other new species from China's Hengduan Mountains.

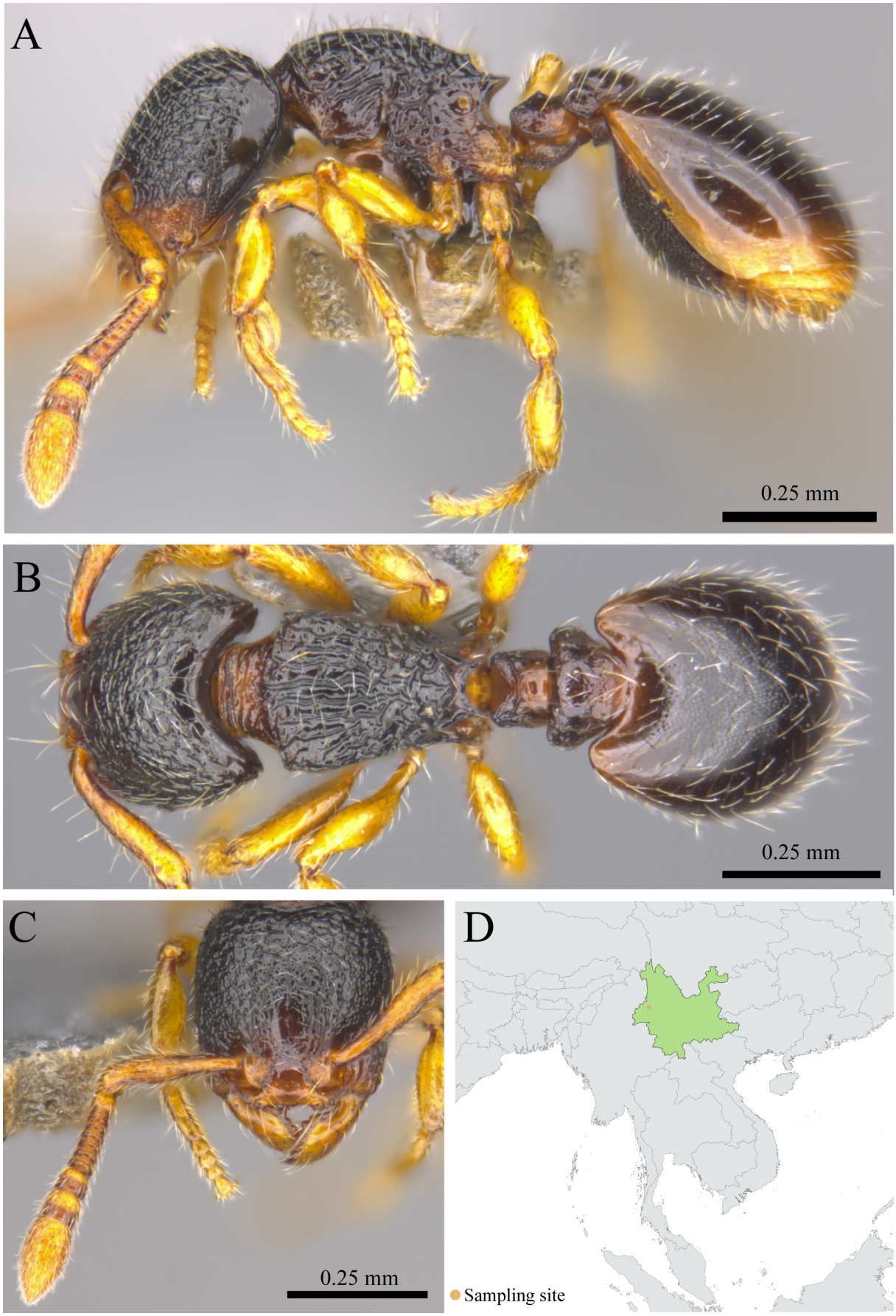

FIGURE 3. *M. eowilsoni* **sp. nov.** (MCZ-ENT00763515). (A) Body in profile view. (B) Body in dorsal view. (C) Head in full-face view. (D) Distribution map in SE Asia.

Distribution and ecology. At present, this species is only known from the Gaoligong Shan Mountains in Yunnan, China. The type locality is a montane secondary forest on Baihua Lin, situated at an elevation of 1500 m. Only one single worker of the new species was collected through leaf litter extraction. There is no additional information about its ecology due to the limited available material.

***Myrmecina gaoligongensis* Liu, sp. nov.**
Figure 4.

Type material. Holotype, pinned worker, China, Yunnan, Gaoligong Shan Mountains, Tiantan Shan, 25.30460N, 098.79349E, 1815 m, mountain forest, leaf litter, 03.VII .2019 (*C. Liu & G. Fischer*) (ISAS: MCZ-ENT00759990).

Paratypes. 6 pinned workers, China, Yunnan, Gaoligong Shan Mountains, Tiantan Shan, 25.30460N, 098.79349E, 1815 m, mountain forest, leaf litter, 03.VII .2019 (*C. Liu & G. Fischer*) (ISAS: MCZ-ENT00759803; CAS: MCZ-ENT00759804; MCZ: MCZ-ENT00759805); China, Yunnan, Shan Gaoligong Mountains, Tiantan Shan, 25.31004N, 098.79469E, 1472 m, temperate mountain forest, leaf litter, 05.VII .2019 (*C. Liu & G. Fischer*) (ISAS: MCZ-ENT00759824; CAS: MCZ-ENT00759889; MCZ: MCZ-ENT00759890).

Diagnosis. *Myrmecina gaoligongensis* differs from other Chinese members of *Myrmecina* by the following combination of characters: propodeal spine triangular, shorter than broad at the base and pointing posteriorly; petiole node in dorsal face-view subrectangular, 1.5 times longer than wide; postpetiole as long as broad; head with dense punctation and weak longitudinal rugae; ventrolateral area of head strongly punctate; gaster smooth and shiny.

Worker measurements. (N=7). TL 2.25–2.27; HL 0.53–0.55 HW 0.53–0.55; MaL 0.30–0.32; SL 0.40–0.43; EL 0.05–0.07; WL 0.65–0.68; PNW 0.40–0.43; PNH; 0.28–0.31; MW 0.20–0.25; PSL 0.10–0.12; PTL 0.23–0.25; PTW 0.15–0.17; PTH 0.13–0.15; PPL 0.18–0.2; PPW 0.18–0.2; PPH 0.18–0.2; CI 100–103; SI 76–81; MaI 57–61; PI 67–70; PPI 100–103.

Worker description. Head. Head subrectangular, as long as broad in full-face view (CI 100 - 103); median portion of occipital margin concave; occipital corners rounded, not projected posteriorly. Mandible triangular; masticatory margin with large apical tooth and robust third tooth, followed by 7 denticles; anterior margin of clypeus concave, with three distinct processes; lateral portion of clypeus lacking a sharp ridge in front of antennal insertions. Anterior dorsal surface of labrum with two small denticles. Frontal carinae virtually absent, indistinguishable from rugae on dorsum of head. Eyes relatively small with 6 ommatidia and maximum diameter 0.05 mm; antennae 12-segementd, with 3-segmented club; antennal scape short, reaching the posterolateral corner of the head.

Mesosoma. Dorsum of mesosoma slightly convex in profile view; pronotum without denticles; propleuron angular without forming a distinct small tooth; eumetanotal spine reduced or vestigial, visible only as a small denticle; propodeal spines triangular, shorter than broad at their bases and pointing posteriorly; propodeal declivity strongly concave; propodeal lobes with high lateral walls. Propodeal spiracle large, situated near the base of propodeal spine. Metapleural bulla well developed and covering most of the propodeal lobe.

Metasoma. Petiole in dorsal view rectangular, 1.5 times longer than broad; anterodorsal slope of petiole in profile view almost straight with posterodorsal face concave, both faces separated by a sharp little peak and ridge; Sternopetiolar process with a convex lobe medially and small point anteriorly; postpetiole in dorsal view as broad as long, shorter than petiolar node. Sternopostpetiolar process weakly present with a small denticle pointing anteriorly. Anterior margin of first gastral tergite weakly concave in dorsal view.

Sculpture. Head in full-face view densely punctate, with weak, longitudinal rugae; lateroventral area of head densely punctate; mandible and clypeus smooth and shiny; in profile view, mesosoma with irregular, longitudinal, and posteriorly converging rugae; forecoxae smooth and shiny; petiole, and postpetiole with longitudinal rugae; mesosoma, petiole, and postpetiole in dorsal view with longitudinal rugae; gaster smooth and shiny.

Pilosity and pubescence. Body covered with abundant erect hairs. Antenna with abundant suberect and erect hairs. Mandible with numerous thin and long hairs, basal masticatory margin with few spatulate hairs. Head and Mesosoma with dense and short erect pilosity on dorsum. Petiole and Postpetiole without hairs on ventral surface. All legs with numerous suberect to erect hairs. Gaster with dense and short erect pilosity on both dorsum and ventral.

Coloration. Body mostly black with yellow-brown mandibles, antennae, and legs.

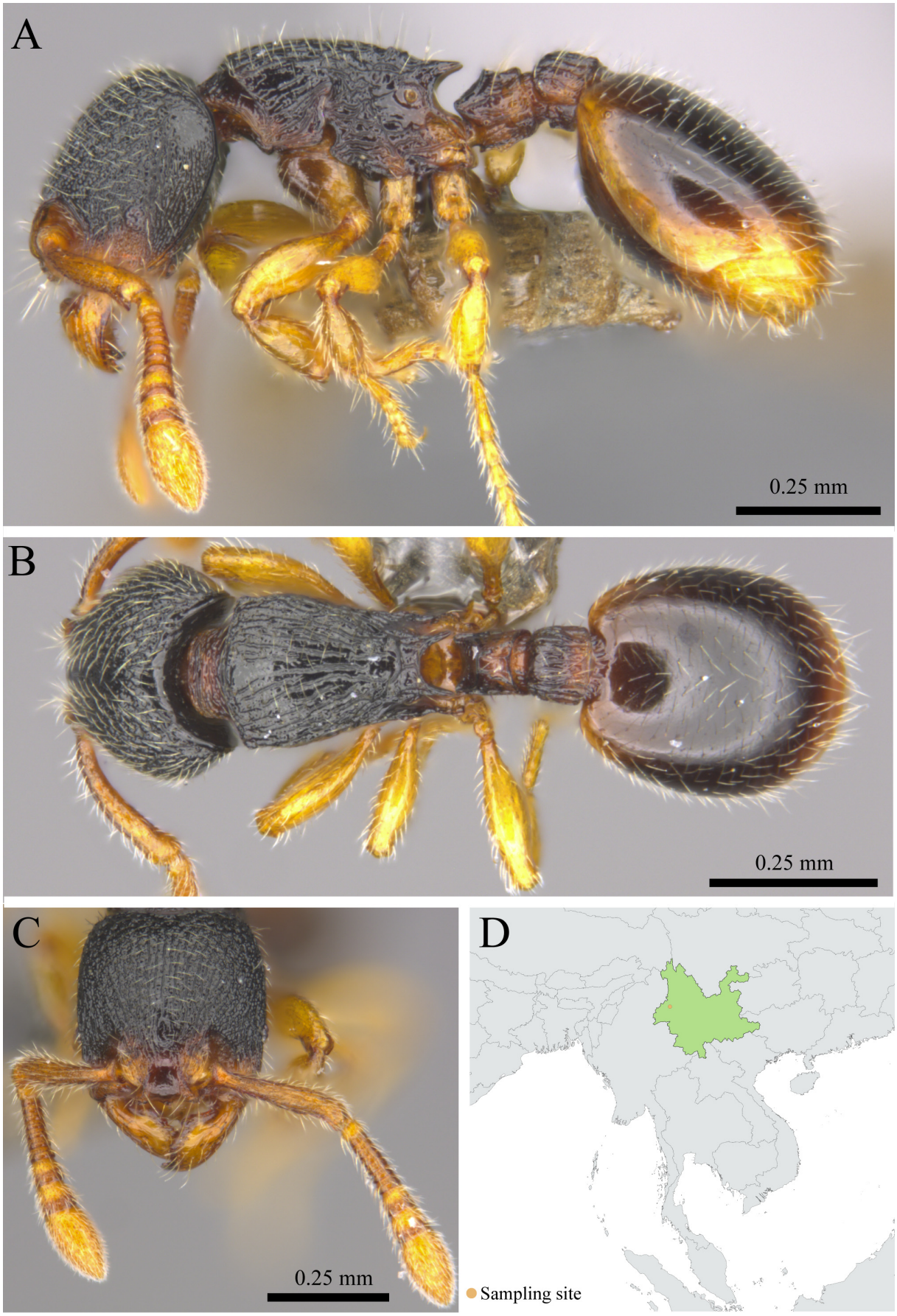

FIGURE 4. *M. gaoligongensis* **sp. nov.** (MCZ-ENT00759990). (A) Body in profile view. (B) Body in dorsal view. (C) Head in full-face view. (D) Distribution map in SE Asia.

Etymology. The species is named after the mountain range where it was collected.

Distribution and ecology. At present, the new species is known only from the Gaoligong Shan Mountains in Yunnan, China. The type locality is a montane forest on Tiantan Shan Mountain, situated at an elevation range from 1400 to 1800 m. Four workers of the new species were collected from a leaf litter extraction at 1800 m altitude, and the other three from a leaf litter sample at 1400 m. Nothing specific is known about its ecology.

***Myrmecina pierceae* Liu, sp. nov.**
Figure 5.

Type material. Holotype, pinned worker, China, Yunnan, Gaoligong Shan Mountains, Tiantan Shan, 25.40230N, 98.71899E, 2180 m, mountain forest, leaf litter, 05.VII .2019 (*C. Liu & G. Fischer*) (ISAS: MCZ-ENT00759962).

Paratypes. 3 pinned workers (same data as holotype) (ISAS: MCZ-ENT00759959; CAS: MCZ-ENT00759960; MCZ: MCZ-ENT00759961).

Diagnosis. The new species is morphologically distinct from all the other species in China. *Myrmecina pierceae* differs from other members of *Myrmecina* by the following combination of characters: propodeal spines triangular, in lateral view shorter than broad at their bases and pointing posteriorly; petiole node in dorsal view subrectangular, 1.5 times longer than wide; face with thin longitudinal rugae curving towards occipital corners; posterior ventrolateral area of head smooth and shiny, with 1 or 2 longitudinal rugae visible in lateral view; gaster smooth and shiny.

Worker measurements. (N=4). TL 2.49–2.56; HL 0.58–0.6; HW 0.58–0.6; MaL 0.28–0.30; SL 0.50–0.55; EL 0.08–0.08; WL 0.78–0.83; PNW 0.45–0.46; PNH 0.33–0.34; MW 0.30–0.40; PSL 0.15–0.18; PTL 0.25–0.27; PTW 0.18–0.18; PTH 0.20–0.25; PPL 0.15–0.20; PPW 0.23–0.25; PPH 0.20–0.23; CI 100; SI 87–92; MaI 48–49; PI 72–88; PPI 123–150.

Worker description. Head. In full-face view, head subrectangular, as long as broad (CI 100); median portion of occipital margin weakly concave; occipital corners rounded, not projecting posteriorly; mandible triangular; masticatory margin with large apical tooth and robust third tooth, followed by 5 denticles; anterior margin of clypeus concave, with a median process; lateral portion of clypeus lacking a sharp ridge in front of antennal insertions. Anterior dorsal surface of labrum with two small denticles. Frontal carinae virtually absent, indistinguishable from rugae on dorsum of head. Eyes relatively small with 10 ommatidia and maximum diameter 0.08 mm; antennae 12-segmented, with 3-segmented club; antennal scape short, not reaching the posterolateral corner of head.

Mesosoma. In profile view, mesosomal dorsum convex; pronotum without denticles; propleuron angular without forming a distinct small tooth; eumetanotal spine reduced or vestigial, visible only as a small denticle; propodeal spines triangular, shorter than broad at their bases and pointing posteriorly; propodeal declivity strongly concave; propodeal lobes with high lateral walls. Propodeal spiracle large, situated near the base of propodeal spine. Metapleural bulla well developed and covering most of the propodeal lobe.

Metasoma. In profile view, petiole in dorsal view rectangular, longer than broad; anterior slope of the petiole almost straight with posterodorsal face concave; dorsal outline of postpetiole flat to weakly convex; petiole longer than postpetiole; in dorsal view, postpetiole 1.5 times broader than long; sternopostpetiolar process weakly present with a small denticle pointing anteriorly. Anterior margin of first gastral tergite weakly concave.

Sculpture. Head in full-face view with distinct longitudinal rugae posteriorly curving towards occipital corners; ventrolateral area of head smooth and shiny, with 1 or 2 longitudinal rugae; clypeus smooth and shiny; mesosoma, petiole, and postpetiole with coarse longitudinal rugae dorsally and some oblique or irregular rugae laterally; forecoxae smooth and shiny; first gastral tergite and sternum smooth and shiny.

Pilosity and pubescence. Body covered with abundant erect hairs. Antenna with abundant suberect and erect hairs. Mandible with numerous thin and long hairs, basal masticatory margin with few spatulate hairs. Head and Mesosoma with dense and short erect pilosity on dorsum. Petiole and Postpetiole without hairs on ventral surface. All legs with numerous suberect to erect hairs. Gaster with dense and short erect pilosity on both dorsum and ventral.

Coloration. Body black with yellowish-brown mandibles, antennae, and legs.

Etymology. The new species is dedicated to Prof. Naomi Pierce and her contributions to entomology and myrmecology. We appreciate her great support of the first author's studies on the ant biodiversity in China's Hengduan Mountains.

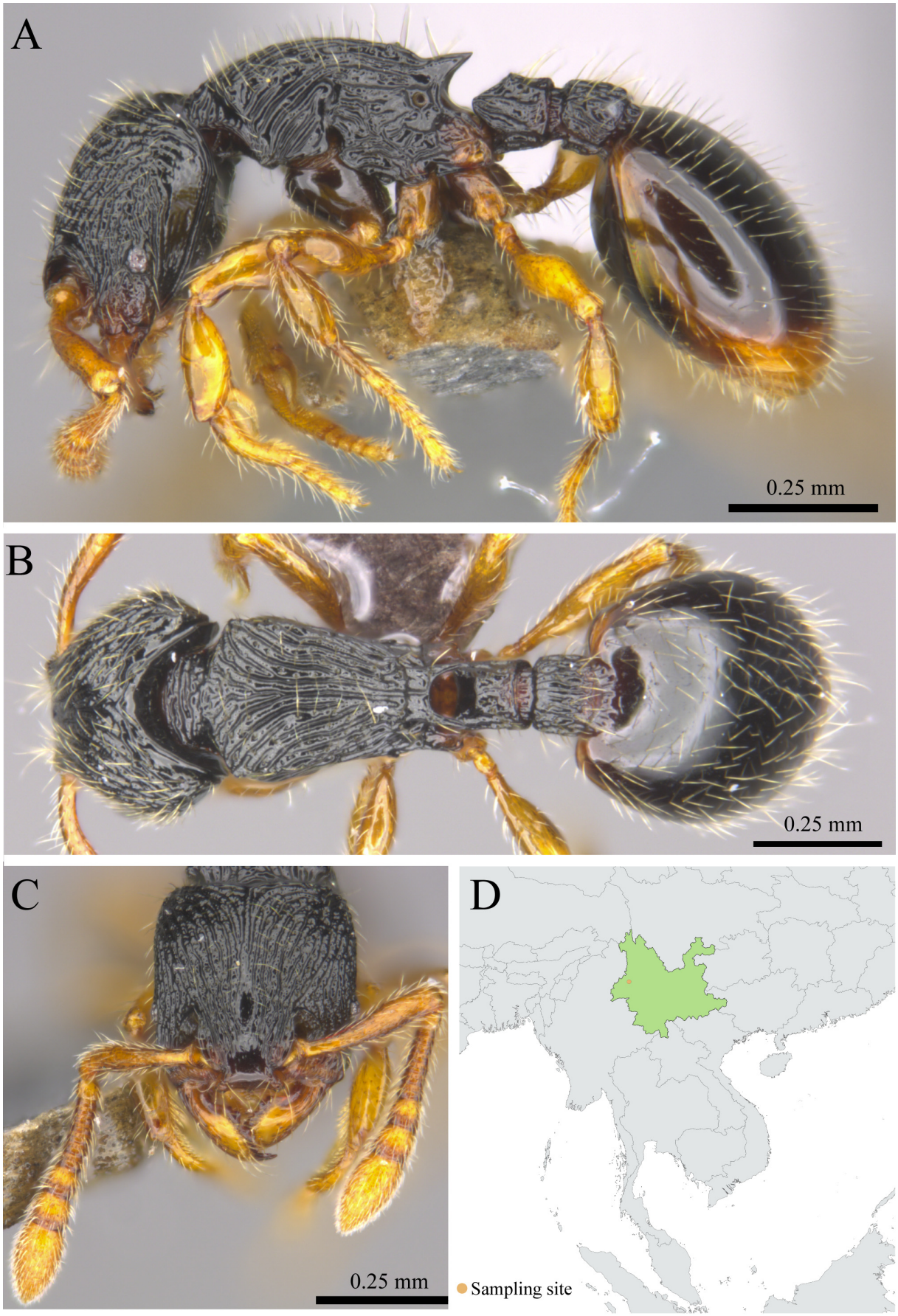

FIGURE 5. *M. pierceae* **sp. nov.** (MCZ-ENT00759962). (A) Body in profile view. (B) Body in dorsal view. (C) Head in full-face view. (D) Distribution map in SE Asia.

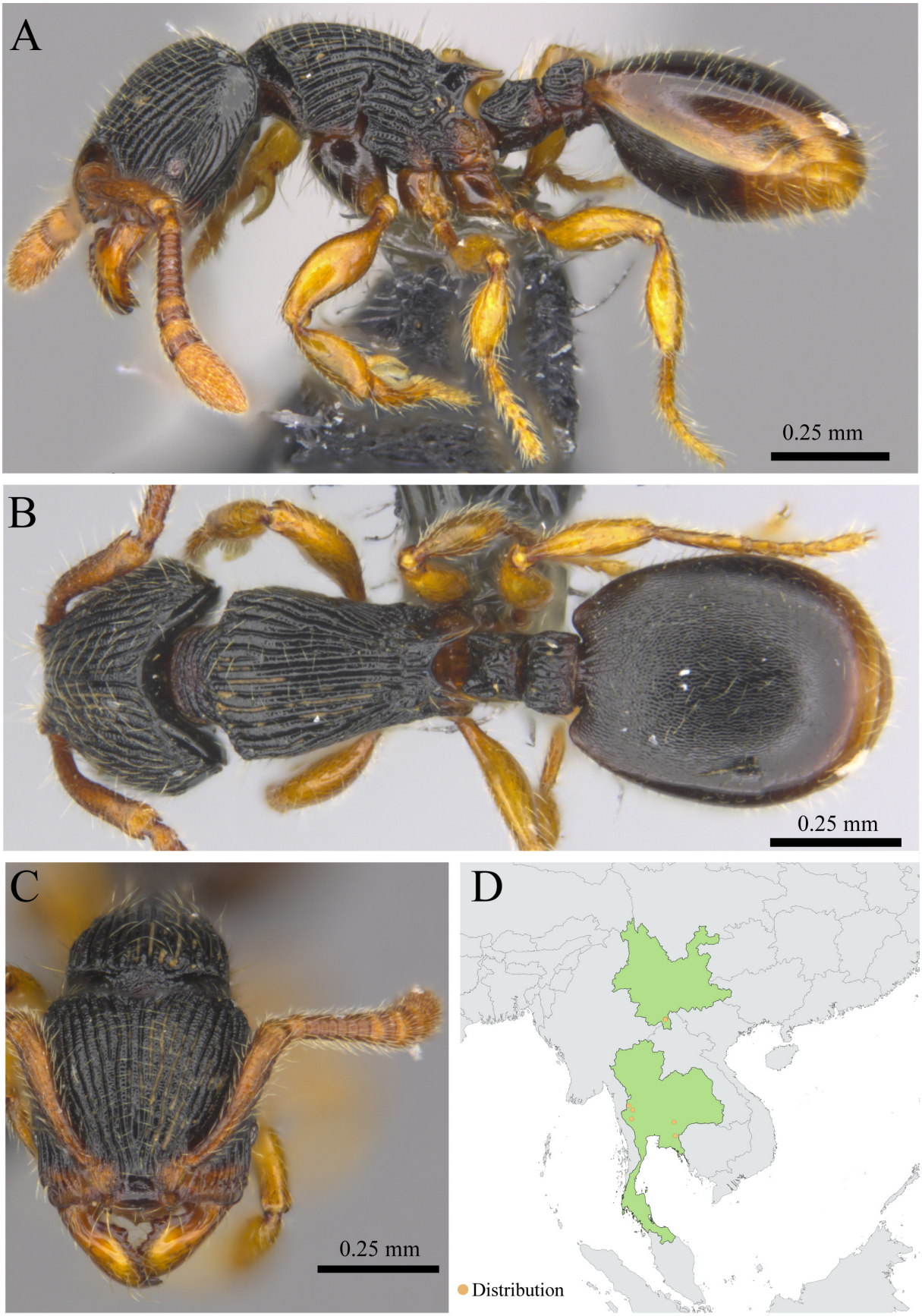

FIGURE 6. *M. raviwonghei* (CASENT0713298). (A) Body in profile view. (B) Body in dorsal view. (C) Head in full-face view. (D) Distribution map.

Distribution and ecology. At present, the new species is only known from one collection site in the Gaoligong Shan Mountains in Yunnan, China. The type locality is a montane forest on Tiantan Shan Mountain, situated at an elevation of about 2200 m. Five workers of the new species were collected from one leaf litter sample. Unfortunately, there is no additional information about its ecology.

Myrmecina raviwonghei Jaitrong, Samung, Waengsothorn & Okido, 2019
Figure 6.

Material examined. China, Yunnan, Xishuangbanna, 1 pinned worker in the botanical garden, 21.912N, 101.282E, 640 m, limestone rainforest, 06.VI.2013 (*B. Blanchard, B. Guénard, & C. Liu*) (MCZ: CASENT0713298); 1 pinned worker near Menglun town, 21.888N, 101.266E, 620 m, rubber plantation, 14.VI.2013 (*B. Blanchard, B. Guénard, & C. Liu*) (MCZ: CASENT0713537, MCZ: CASENT0713540); 1 pinned worker near Man Sai Village, 21.858N, 101.276E, 675 m, rainforest, 12.VI.2013 (*B. Blanchard, B. Guénard, & C. Liu*) (MCZ: CASENT0713303)

Diagnosis. See Jaitrong *et al.* 2019.

Worker measurements. (N=4). TL 2.19–2.31; HL 0.58–0.60; HW 0.53–0.58; MaL 0.23–0.25; SL 0.43–0.45; EL 0.07–0.08; WL 0.65–0.68; PNW 0.43; PNH; 0.30–0.32; MW 0.25–0.28; PSL 0.15–0.17; PTL 0.20–0.22; PTW 0.13; PTH 0.15–0.17; PPL 0.15–0.17; PPW 0.18; PPH 0.18; CI 91–96; SI 78–81; MaI 43; PI 59–62.5; PPI 106 –117.

Distribution and ecology. In China, this species is only known from Xishuangbanna in Yunnan Province. One worker was collected within limestone rainforest in the Xishuangbanna Tropical Botanical Garden, situated at an elevation of 640 m. Another worker was collected from a leaf litter extraction in a rainforest near Man Sai village at 675 m. Two additional workers were collected from leaf litter in a rubber plantation at 620 m. There is no additional information about its ecology.

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