

Taxonomic review of the *Crematogaster ransonneti*-group in Asia, with description of a new species from Malaysia (Hymenoptera: Formicidae: Myrmicinae)

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Abstract. The *Crematogaster ransonneti*-group is revised and three species are recognised, including one new to science. The *C. ransonneti*-group contains *C. cornuta* Crawley, 1924; *C. keris*, new species; and *C. ransonneti* Mayr, 1868. The species group is distinguished among Asian *Crematogaster* species by developed propodeal spines and a diamond-shaped petiole. A key to the species of the group based on the worker caste is given. The mouthparts of *C. keris*, new species, are also described in detail. Morphological characters suggest a close relationship with the *C. fraxatrix*-group.

Key words. *Crematogaster cornuta*, ants, new species, canopy fogging, mouthparts

INTRODUCTION

The ant genus *Crematogaster* is a hyperdiverse group containing more than 500 species (Bolton, 2020) and has been classified into the two subgenera *Crematogaster* and *Orthocrema* (Blaimer, 2012a). The subgenus *Crematogaster* is a large group and contains more than 350 species. Taxonomic work on small species groups (Hosoishi & Ogata, 2014, 2015) is useful as the subgenus contains such a large number of species.

Crematogaster ransonneti Mayr, 1868, was described based on worker specimens from Sri Lanka (Mayr, 1868). Bingham (1903) reported the species from India (Karnataka, Sikkim). Emery (1922) classified this species under the subgenus *Acrocoelia*, but this species is currently assigned to the subgenus *Crematogaster* (Bolton, 1995; Blaimer, 2012a). In the original description, Mayr (1868) mentioned the uniqueness of the diamond-shaped petiole and suggested an affinity with *C. cephalotes* Smith, 1857. However, *C. cephalotes* was later transferred to the subgenus *Decacrema* based on the 10-segmented antenna (Donisthorpe, 1932) and is presently assigned to the *C. borneensis*-group (Blaimer, 2012a; Feldhaar et al., 2016). *Crematogaster ransonneti* can be easily distinguished from other Asian *Crematogaster* species by its divergent propodeal spines and a diamond-shaped petiole. These morphological features have, however, also been found among Asian species such

as *C. cornuta* Crawley, 1924. *Crematogaster cornuta* was described based on worker, queen, and male specimens from Sumatra (Crawley, 1924). This species is endemic to Sumatra and unique among the Asian members of the subgenus *Crematogaster* in having elongated propodeal spines. Crawley (1924) mentioned in the original description that *C. cornuta* resembled *C. coriaria* Mayr, 1872 (as *C. spengeli* Forel, 1912) due to both species having elongated propodeal spines. *Crematogaster coriaria* was subsequently transferred to the subgenus *Paracrema* (Emery, 1922) and is presently placed under the subgenus *Crematogaster* (Blaimer, 2012a). *Crematogaster coriaria* can be differentiated from *C. cornuta* by its four-segmented antennal club and petiole that is broader anteriorly. These two species—*C. ransonneti* and *C. cornuta*—share several morphological features, therefore they can be treated as one species group. The *C. ransonneti*-group is distinguished by well-developed propodeal spines and a diamond-shaped petiole. In the course of a recent examination of *Crematogaster* specimens collected by canopy fogging in the lowland forests of the Malay Peninsula, I found one distinct species which is closely related to *C. ransonneti* and *C. cornuta*, and herein describe it as a new species.

Gotwald (1969) compared the mouthparts among several myrmicine genera, including *Crematogaster* cf. *brasiliensis*, but he did not illustrate either mention about morphological features of the species in his paper. Excluding Gotwald (1969), the mouthparts of the genus *Crematogaster* have not yet been described in detail. In the present study, detailed descriptions of the mouthparts of a new species are provided based on plentiful material. This information will contribute to future comparative studies on the genus *Crematogaster*.

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MATERIAL AND METHODS

Specimens were examined and/or deposited in the collections listed below. Codes for public institutions mainly follow those in Brandão (2000).

BMNH—The Natural History Museum, London, UK

CASC—California Academy of Sciences, San Francisco, CA, USA

FRIM—Forest Research Institute Malaysia, Kuala Lumpur, Malaysia

HNHM—Hungarian Natural History Museum, Budapest, Hungary

IEBR—Institute of Ecology and Biological Resources, Hanoi, Vietnam

ITBC—Institute for Tropical Biology and Conservation, University Malaysia Sabah, Kota Kinabalu, Malaysia

KUEC—Institute of Tropical Agriculture, Kyushu University, Fukuoka, Japan

MBBJ—Museum Zoologicum Bogoriense, Cibinong, Java, Indonesia

MCZC—Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA

MHNG—Musée d'Histoire Naturelle, Geneva, Switzerland

NHMB—Naturhistorisches Museum, Basel, Switzerland

NHMW—Naturhistorisches Museum, Wien, Vienna, Austria

THNHM—Thailand Natural History Museum, Technopolis, Khlong Luang, Pathum Thani, Thailand

ZRC—Zoological Reference Collection, Lee Kong Chian Natural History Museum, National University of Singapore, Singapore

Most observations were made on a Leica M205C stereomicroscope. Images were taken using a Canon EOS 50D with a Canon MP-E 65 mm 1–5 × Macro lens, then processed using Combine ZM (Hadley, 2010).

Measurements were made under a Leica M205C stereomicroscope using micrometres. All measurements are expressed in millimetres, recorded to the second decimal place. The measurements for petiole and postpetiole follow Longino (2003). Anatomical terminology of mouthparts follows Gotwald (1969).

Head Width (HW): Maximum width of head in full-face view, excluding the eyes.

Head Length (HL): Perpendicular distance from vertex margin to line tangent anteriormost projections of clypeus in full-face view.

Cephalic Index (CI): $HW/HL \times 100$.

Scape Length (SL): Length of the first antennal segment, excluding the neck and basal condyle.

Scape Index (SI): $SL/HW \times 100$.

Eye Length (EL): Maximum length of the compound eye.

Pronotal Width (PW): Maximum width of the pronotum in dorsal view.

Weber's Length of the mesosoma (WL): Diagonal length, measured in lateral view from the anterior margin of the pronotum (excluding the collar) to the posterior extremity of the propodeal lobe.

Propodeal Spine Length (PSL): Measured from tip of propodeal spine to closest point on outer rim of propodeal spiracle.

Petiole Length (PtL): Length of the petiole in lateral view.

Petiole Width (PtW): Maximum width of petiole in dorsal view.

Petiole Height (PtH): Height of the petiole in lateral view.

Postpetiole Length (PpL): Length of the postpetiole in lateral view (see Longino, 2003: fig. 2).

Postpetiole Width (PpW): Maximum width of postpetiole in dorsal view, excluding the helcium.

Petiole Height Index (PtHI): $PtH/PtL \times 100$.

Petiole Width Index (PtWI): $PtW/PtL \times 100$.

Postpetiole Width Index (PpWI): $PpW/PpL \times 100$.

Waist Index (WI): $PpW/PtW \times 100$.

TAXONOMY

Crematogaster ransonneti-group

The *Crematogaster ransonneti*-group can be distinguished from other Asian *Crematogaster* species by the following characters: (1) mandible with four teeth; (2) three-segmented antennal club; (3) deep metanotal groove; (4) propodeal spine well-developed and long (PSL 0.21–0.63); (5) propodeal spine directed posterolaterally in dorsal view; (6) petiole diamond-shaped and broadest at mid-length; (7) petiole distinctly wider than postpetiole (WI 73–92); and (8) postpetiole weakly globule but without distinct longitudinal median sulcus. This species group is similar to the *C. fraxatrix*-group in having a diamond-shaped petiole (Hosoishi & Ogata, 2014), but can be distinguished from the latter by the aforementioned characters (3), (4), and (5). Using a comprehensive molecular phylogeny, Blaimer (2012b) revealed a sister relationship between *C. fraxatrix* and *C. ferrarii* (as *C. cf. ferrarii*). The phylogenetic position of the *C. ransonneti*-group is currently unknown because fresh material of the group was unavailable for me. In the future, molecular phylogenetic analysis using fresh material will help verify the relatedness of the *C. ransonneti*-group with other species, which is currently inferred mostly from morphology.

This species group is distributed throughout parts of South and Southeast Asia (Fig. 1), but has not been recorded from the Indochinese Peninsula.

List of species included in the *Crematogaster ransonneti*-group.

C. cornuta Crawley, 1924

C. keris, new species

C. ransonneti Mayr, 1868

Key to species based on the worker caste.

1. Dorsal surface of head smooth and shiny. Promesonotum smooth and shiny *ransonneti*
- Gena sculptured or striated with longitudinal rugulae. Promesonotum striated with rugulae 2

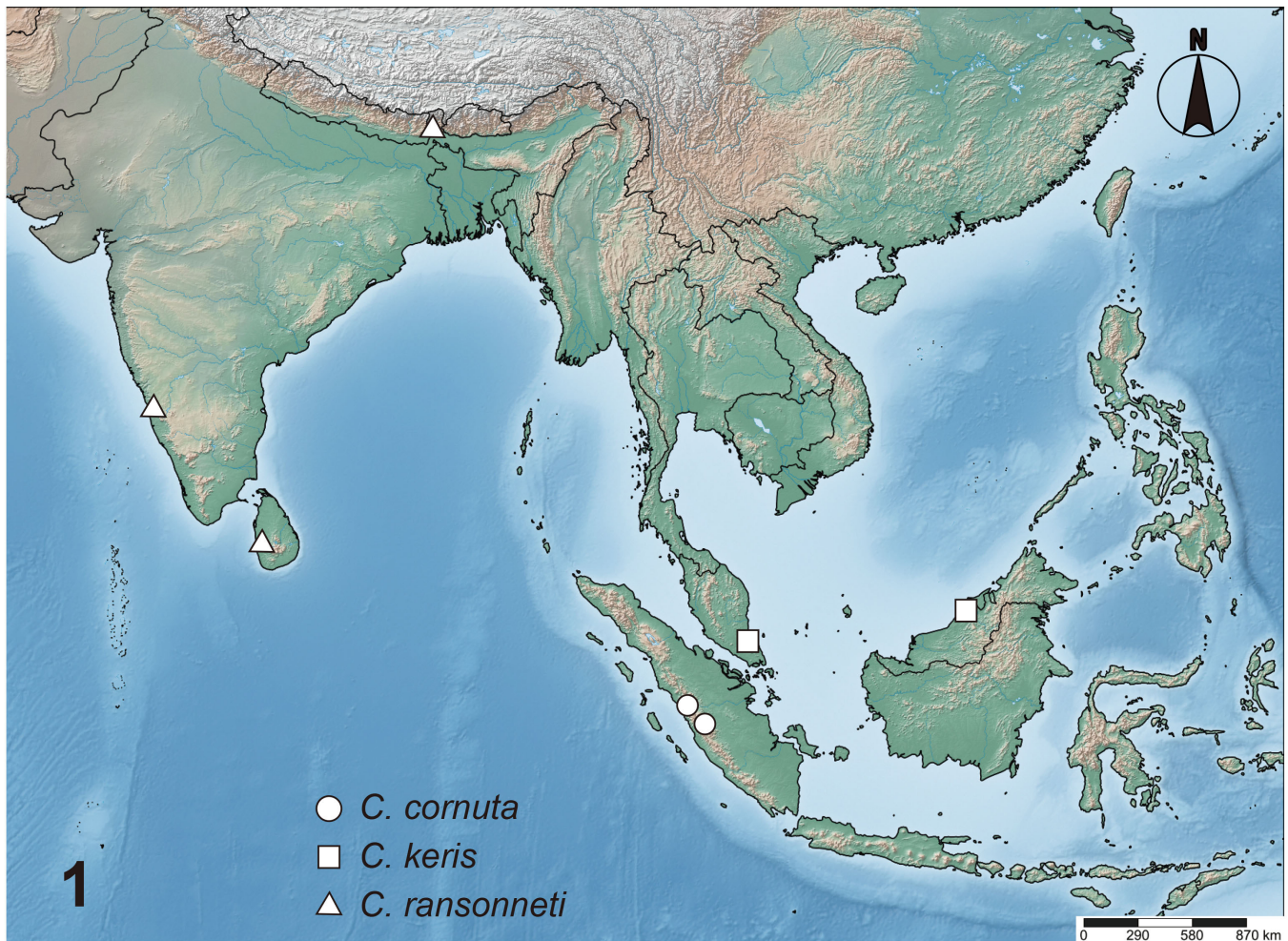


Fig. 1. Distribution map of *Crematogaster cornuta*, *C. keris*, and *C. ransonneti*. Open circle = *C. cornuta*; open square = *C. keris*; open triangle = *C. ransonneti*.

2. Posterior half of head with longitudinal rugulae. Mesopleuron and lateral surface of propodeum with longitudinal rugulae. Propodeal dorsum with longitudinal rugulae *cornuta*
- Posterior half of head smooth. Mesopleuron and lateral surface of propodeum generally smooth. Propodeal dorsum smooth and shiny *keris*

Crematogaster cornuta Crawley, 1924

(Fig. 2)

Crematogaster (Acrocoelia) cornuta Crawley, 1924: 395, worker, queen, male. Combination in *Crematogaster (Crematogaster)*: Bolton, 1995: 166; Blaimer, 2012a: 55.

Type material examined. 1 syntype worker (BMNH), Indonesia, Sumatra, Pantjuran Gading, Kurintji (BMNH[E] 1015160), coll. Donisthorpe, April 1934.

Non-type material examined. 10 workers (KUEC), Indonesia, Sumatra, Solok district, Mt. Talang, coll. R. Satria, 25 February 2011.

Diagnosis of worker. Dorsal surface of head with longitudinal rugulae. Mesonotum with lateral ridge in lateral view. Propodeal spine very long. In dorsal view petiole diamond-shaped, broadest at mid-length. Postpetiole weakly bilobed posteriorly, but without longitudinal median sulcus.

Measurements and indices: Non-type workers (n = 10).

HW 0.97–1.13; HL 0.94–1.08; CI 102–109; SL 0.84–0.97; SI 82–90; EL 0.18–0.21; PW 0.60–0.72; WL 1.09–1.31; PSL 0.30–0.63; PtL 0.34–0.41; PtW 0.31–0.39; PtH 0.19–0.25; PpL 0.18–0.23; PpW 0.28–0.33; PtHI 55–62; PtWI 89–99; PpWI 135–170; WI 84–91.

General description of worker. Workers with weak intracolony size variation.

Head broader than long in full-face view, posterior margin almost straight, posterior corner rounded. Frontal carina extending to mid-length of head. Occipital carina developed. Mandible with four teeth, apical and subapical teeth large. Anterior clypeal margin slightly concave in median portion. Compound eyes slightly projecting beyond lateral margins of head in full-face view. Scape reaching posterior corner of head. Antennal club 3-segmented.

Pronotum with indistinct ridges on dorsolateral margin. In lateral view, mesonotum posteriorly with longitudinal ridges. Mesonotum slightly higher than pronotum in lateral view. Metanotal groove straight in dorsal view, forming a deep concavity between mesonotum and propodeum. Metapleural gland opening slit-shaped. Propodeal spiracles dorsoventrally oval, its horizontal diameter larger than vertical diameter,

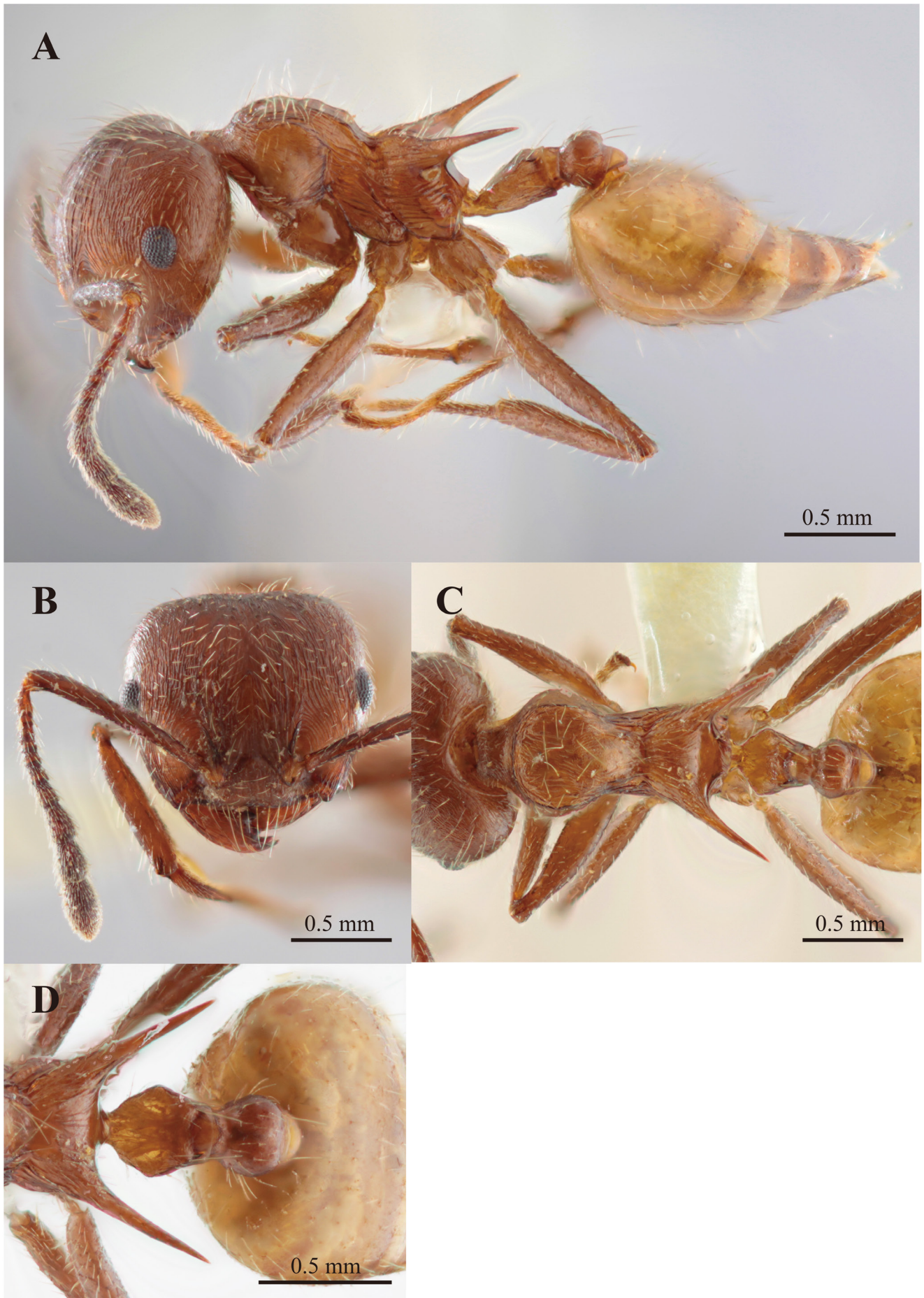


Fig. 2. *Crematogaster cornuta*, non-type worker from Sumatra (HW, 1.08; WL, 1.24). A, body in lateral view; B, full-face view of head; C, dorsal view of mesosoma; D, dorsal view of petiole and postpetiole.

located on posterolateral corner of propodeum in lateral view. Propodeal spines long, directed posterolaterally.

Petiole diamond-shaped, broadest at mid-length in dorsal view; spiracle situated at midportion between dorsal and ventral margin of petiole in lateral view, directed laterally. Subpetiolar process undeveloped. Postpetiole weakly bilobed, but without longitudinal median sulcus in dorsal view. Petiole wider than postpetiole in dorsal view.

Abundantly hirsute, with suberect setae. Scape with abundant suberect to decumbent setae. Dorsal face of head with erect to suberect setae. Clypeus with suberect setae; one pair of longer setae directed medially on anteriormost portion. Anterior clypeal margin with two to three pairs of longer setae, mixed with some shorter setae on the sides. Dorsum of pronotum and propodeum with long erect setae and short suberect setae. Fourth abdominal tergite with sparse erect to suberect setae.

Dorsal surface of head longitudinally rugose; gena with longitudinal rugulae. Clypeus with weak longitudinal rugulae. Pronotum striated with feeble rugulae. Lateral surface of pronotum superficially smooth. Mesonotum weakly striated with feeble rugulae. Mesopleuron and lateral surface of propodeum striated with distinct rugulae. Propodeal dorsum with longitudinal rugulae; propodeal declivity smooth and shiny.

Body colour reddish-brown.

Distribution. This species is known only from Indonesia (Sumatra) (Fig. 1).

Notes. The Sumatran specimens are morphologically most similar to the BMNH syntype worker of *C. cornuta*. Based on worker morphology, the Sumatran specimens are herein determined as *C. cornuta*.

This species is similar to *C. keris*, but can be distinguished by the dorsal surface of head and propodeum with longitudinal rugulae.

***Crematogaster keris*, new species**
(Figs. 3, 4)

Material examined. Holotype (worker) (FRIM) from Malaysia, Endau Rompin National Park, Station 1, coll. H. Kojima, 6 July 2003 (fogging).

Paratypes: 14 workers (BMNH, CASC, FRIM, HNHN, IEBR, ITBC, KUEC, MBBJ, MCZC, MHNG, NHMB, NHMW, THNHM, ZRC), same data as holotype.

Non-type material examined. 20 workers (KUEC), same data as holotype; 1 worker (KUEC), Malaysia, Sarawak, Miri, Lambir National Park, Tower Region, coll. T. Yumoto, 20 August 1995 (from *Myrmecodia*).

Diagnosis of worker. Anterior portion of head with longitudinal rugulae. Mesonotum with lateral ridge in lateral view. Propodeal spine very long. In dorsal view petiole diamond-shaped, broadest at mid-length. Postpetiole weakly bilobed posteriorly, but without longitudinal median sulcus.

Measurements and indices: Holotype and paratype workers (n=15). HW 0.77–1.13; HL 0.71–1.07; CI 102–109; SL 0.66–0.88; SI 69–91; EL 0.17–0.24; PW 0.45–0.66; WL 0.77–1.21; PSL 0.24–0.48; PtL 0.21–0.35; PtW 0.22–0.39; PtH 0.14–0.22; PpL 0.13–0.25; PpW 0.20–0.32; PtHI 61–71; PtWI 99–115; PpWI 124–167; WI 80–92.

General description of worker. Workers with polymorphism in size.

Head broader than long in full-face view, posterior margin almost straight, posterior corner rounded in smaller worker, but angulate in larger workers. Frontal carina extending to mid-length of head. Occipital carina developed. Mandible with four teeth, apical and subapical teeth large. Anterior clypeal margin weakly concave in median portion. Compound eyes slightly projecting beyond lateral margins of head in full-face view. Scape exceeding posterior corner of head in smaller worker, but reaching posterior corner of head in larger worker. Antennal club 3-segmented.

Labrum broader than long; median cleft weakly developed; labral tubercle absent; distal area of the outer face with three to four stout setae. Maxilla with maxillary comb; transverse stipital groove absent; stipe subrectangular; maxillary palp 5-segmented; four apical segments longer than broad. Labium with sclerotised prementum on ventral surface; subglossal brush present; paraglossa with sensory peg at distal end; labial palp 3-segmented; apical segment longer than broad. Palp formula (5, 3).

Pronotum with weak ridges on dorsolateral margin. In lateral view, mesonotum posteriorly with indistinct longitudinal ridges. Mesonotum slightly higher than pronotum in lateral view. Metanotal groove straight in dorsal view, forming a deep concavity between mesonotum and propodeum. Metapleural gland opening slit-shaped. Propodeal spiracles dorsoventrally oval, its horizontal diameter slightly larger than vertical diameter, located on posterolateral corner of propodeum in lateral view. Propodeal spines long, directed posterolaterally in dorsal view.

Petiole diamond-shaped, broadest at mid-length in dorsal view; spiracle situated at midportion between dorsal and ventral margin of petiole in lateral view, directed laterally. Subpetiolar process undeveloped. Postpetiole weakly bilobed, but without longitudinal median sulcus in dorsal view. Petiole wider than postpetiole in dorsal view.

Sparsely hirsute with erect setae. Scape with abundant suberect to decumbent setae. Dorsal face of head with erect to suberect setae. Clypeus with suberect setae; one pair of longer setae directed medially on anteriormost portion. Anterior clypeal margin with two pairs of longer setae, mixed with

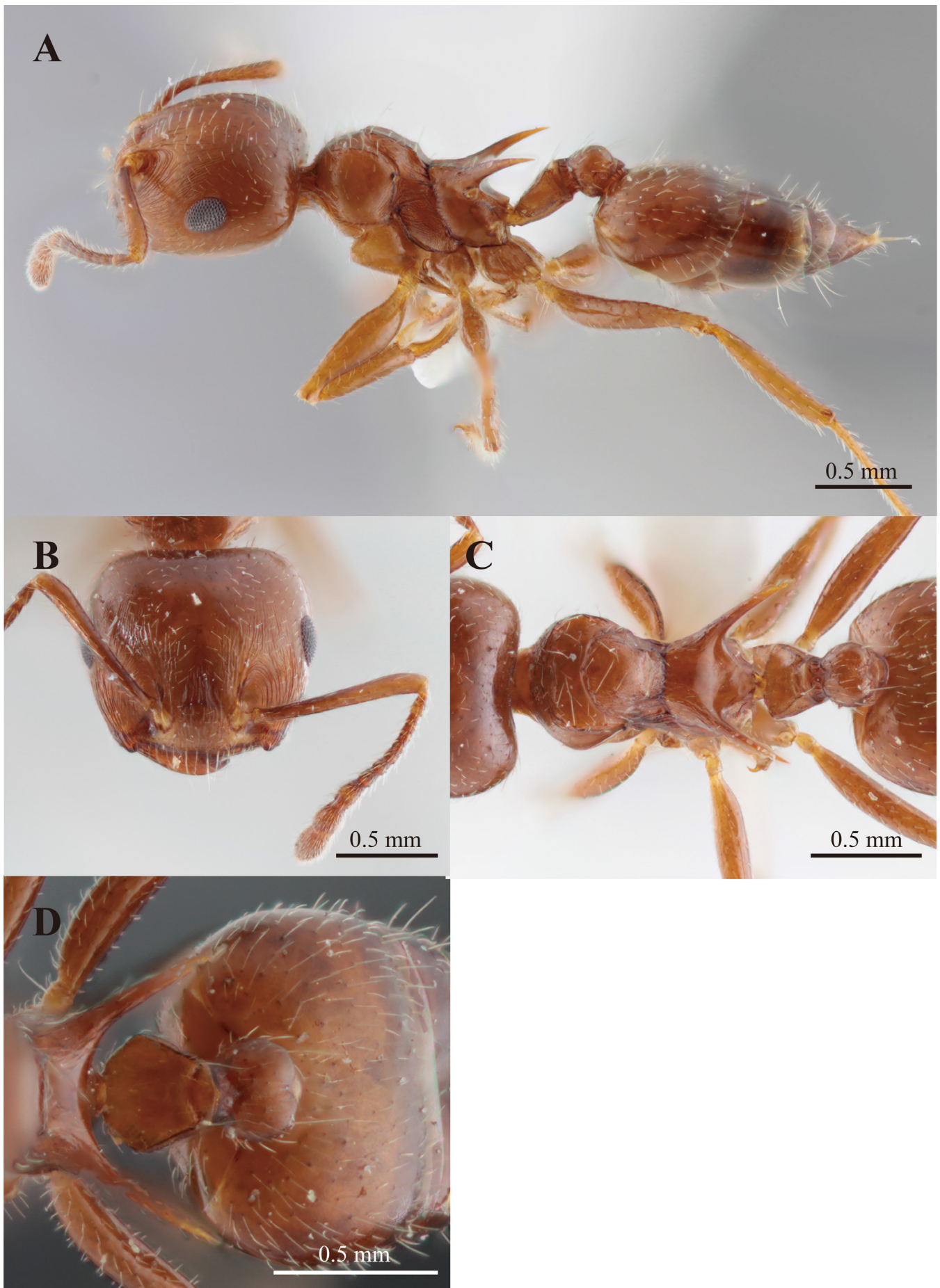


Fig. 3. *Crematogaster keris*, KUEC paratype worker from Malaysia (HW, 1.02; WL, 1.09). A, body in lateral view; B, full-face view of head; C, dorsal view of mesosoma; D, dorsal view of petiole and postpetiole.

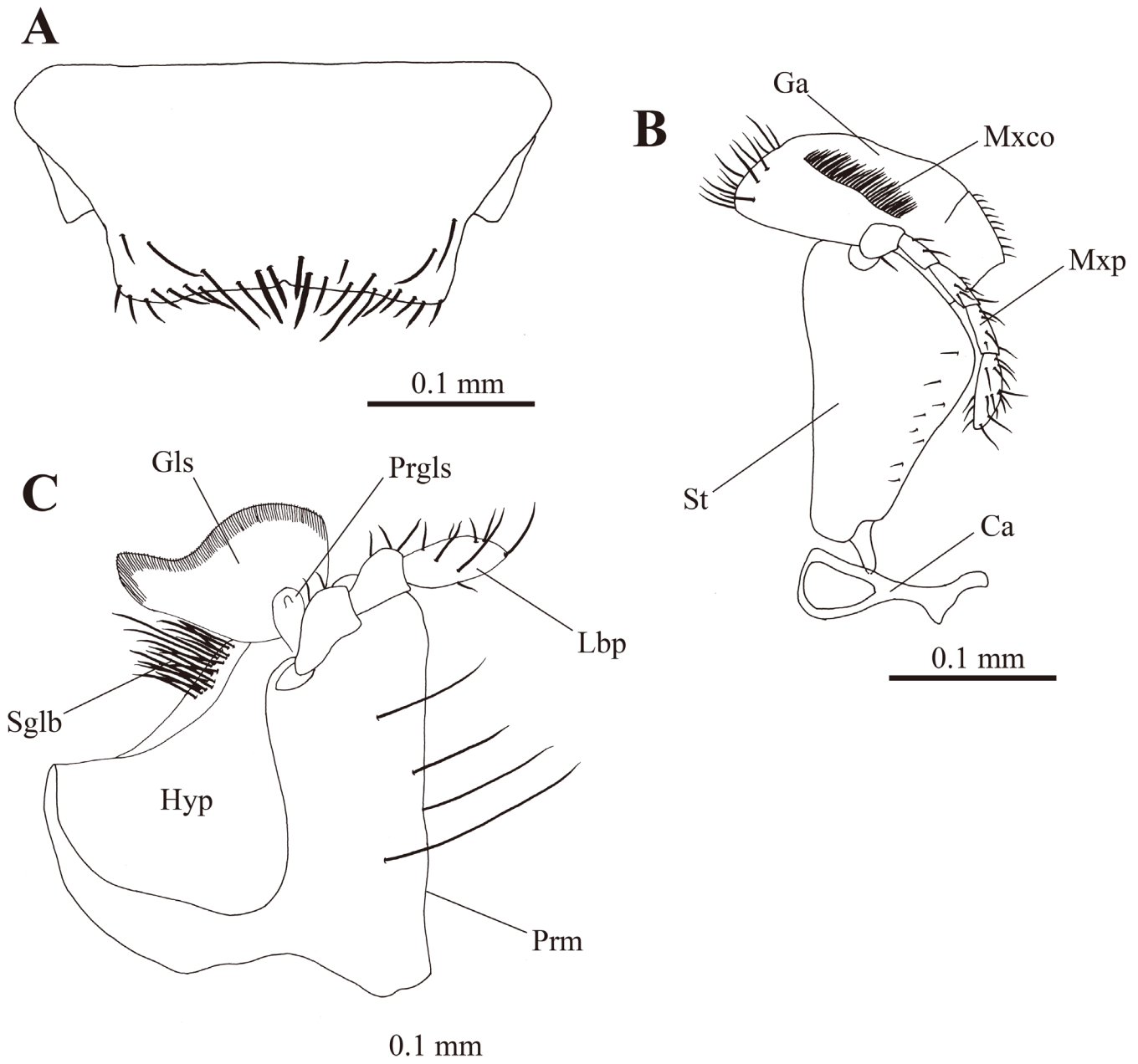


Fig. 4. Mouthparts of *C. keris* worker. A, labrum in outer view; B, left maxilla in outer view; C, labium in lateral view. Abbreviations: Ca = cardo; Ga = galea; Gls = glossa; Hyp = hypopharynx; Lbp = labial palp; Mxco = maxillary comb; Mxp = maxillary palp; St = stipes; Prgls = paraglossa; Prm = prementum; Sglb = subglossal brush.

shorter setae on the sides. Dorsum of promesonotum with long erect setae and short suberect setae. Fourth abdominal tergite with sparse erect to suberect setae.

Dorsal surface of head longitudinally rugose on anterior half, but relatively smooth on frons and posterior half; longitudinal rugulae surrounding antennal sockets and on gena. Clypeus with weak longitudinal rugulae. Pronotum striated with feeble rugulae anteriorly. Mesonotum weakly striated with feeble rugulae near lateral ridge. Lateral surface of pronotum smooth and shiny. Mesopleuron smooth in small worker, but weakly sculptured with feeble rugulae in large worker. Lateral surface of propodeum smooth and shiny. Propodeal dorsum and declivity smooth and shiny.

Body colour reddish-brown.

Distribution and biology. This species is known from Malaysia (Peninsula, Borneo) (Fig. 1). The type specimens were collected by canopy fogging and the Bornean specimen was collected from the ant-plant *Myrmecodia*.

Etymology. The species name 'keris' is directly adopted from the Malayan asymmetrical dagger of the same name, a traditional weapon of indigenous Malays, referring to the elongated propodeal spines of the species. The name is treated as a noun in apposition.

Notes. This species is similar to *C. cornuta*, but can be distinguished by the smooth surface of posterior half of head and propodeum.

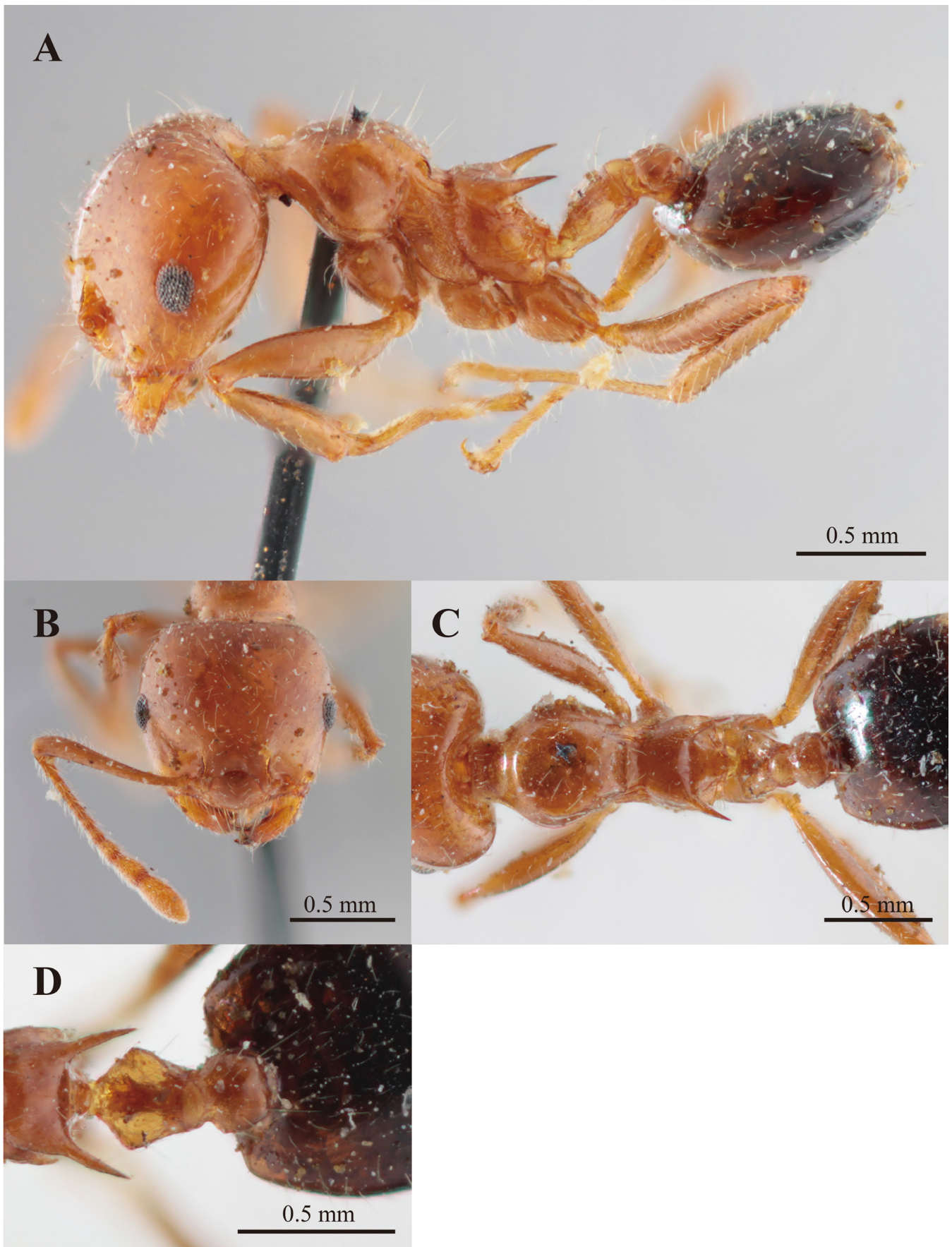


Fig. 5. *Crematogaster ransonneti*, NHMW syntype worker from Sri Lanka (HW, 0.95; WL, 1.07). A, body in lateral view; B, full-face view of head; C, dorsal view of mesosoma; D, dorsal view of petiole and postpetiole.

Crematogaster ransonneti Mayr, 1868

(Fig. 5)

Crematogaster ransonneti Mayr, 1868: 287, worker. Combination in *Crematogaster* (*Acrocoelia*): Emery, 1922: 151. Combination in *Crematogaster* (*Crematogaster*): Bolton, 1995: 166; Blaimer, 2012a: 55.

Type material examined. 2 syntype workers (NHMW), Sri Lanka, Yerbury, coll. G. Mayr, no collection date.

Diagnosis of worker. Dorsal surface of head smooth and shiny. Pronotum smooth. Propodeal spine long. In dorsal view petiole diamond-shaped, broader in the middle portion. Postpetiole weakly bilobed posteriorly, but without longitudinal median sulcus.

Measurements and indices: NHMW syntype workers (n = 2). HW 0.95–0.97; HL 0.95–0.97; CI 99–100; SL 0.82–0.87; SI 87–90; EL 0.19; PW 0.55–0.56; WL 1.1–1.2; PSL 0.21–0.23; PtL 0.33–0.34; PtW 0.31–0.35; PtH 0.18–0.20; PpL 0.17–0.18; PpW 0.24–0.26; PtHI 55–61; PtWI 94–106; PpWI 142–144; WI 73–78.

General description of worker. Head as broad as long in full-face view, posterior margin almost straight, posterior corner rounded. Frontal carina extending to $\frac{1}{3}$ length of head. Occipital carina developed. Mandible with four teeth, apical and subapical teeth large. Anterior clypeal margin convex in median portion. Compound eyes slightly projecting beyond lateral margins of head in full-face view. Scape reaching posterior corner of head. Antennal club 3-segmented.

Pronotum without distinct ridges on dorsolateral margin. In lateral view, mesonotum posteriorly with weak longitudinal ridges. Mesonotum slightly higher than pronotum in lateral view. Metanotal groove straight in dorsal view, forming a deep concavity between mesonotum and propodeum. Metapleural gland opening slit-shaped. Propodeal spiracles dorsoventrally oval, its horizontal diameter larger than vertical diameter, located on posterolateral corner of propodeum in lateral view. Propodeal spines long, directed posterolaterally in dorsal view.

Petiole diamond-shaped and broadest at mid-length in dorsal view; spiracle situated at midportion between dorsal and ventral margin of petiole in lateral view, directed laterally. Subpetiolar process undeveloped. Postpetiole weakly bilobed, but without longitudinal median sulcus in dorsal view. Petiole wider than postpetiole in dorsal view.

Sparsely hirsute with erect setae. Scape with abundant suberect setae. Dorsal face of head with suberect setae. Clypeus with suberect setae; one pair of longer setae directed medially on anteriormost portion. Anterior clypeal margin with two pairs of longer setae, mixed with some shorter setae on the sides. Mesosoma with sparse longer erect setae, mixed with shorter decumbent setae. Fourth abdominal tergite with sparse suberect to decumbent setae.

Dorsal surface of head smooth and shiny. Clypeus generally smooth, but indistinct rugulae anteriorly. Promesonotum smooth and shiny, but posterior mesonotal ridge with feeble rugulae. Lateral surface of pronotum smooth and shiny. Mesopleuron weakly sculptured. Lateral surface of propodeum smooth and shiny. Propodeal dorsum and declivity smooth and shiny.

Body colour reddish-brown.

Distribution. This species is known from India (Karnataka [Kanara], Sikkim) (Bingham, 1903) and Sri Lanka (Fig. 1).

Notes. This species is similar to *C. keris*, but can be distinguished by the smooth and shiny surface of gena and promesonotum.

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