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The trap-jaw ant genus *Odontomachus* Latreille (Hymenoptera: Formicidae) from Sumatra, with a new species description

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Abstract

The ant genus *Odontomachus* Latreille is reviewed for Sumatra, the sixth largest island in the world and located in western Indonesia. Previously three species were recorded from the island: *O. simillimus* F. Smith, *O. rixosus* F. Smith, and *O. latidens* Mayr. We add two species to the fauna, *O. procerus* Emery **stat. nov** and *Odontomachus minangkabau* **sp. nov.** The new species belongs to *O. rixosus* species group, and it is morphologically most similar to *O. rixosus* and *O. para-rixosus* Terayama & Ito. However, it can be separated from the latter two by its large body (HL 3.13–3.55 mm, WL 4.15–4.65 mm), the masticatory margin with 11–14 denticles, and dark-colored body. *Odontomachus latidens* subsp. *sumatranus* Emery is newly synonymized with *O. procerus*. The castes and sexes of the known species are also described, including the first descriptions of the male for *O. latidens*, *O. procerus*, and *O. rixosus*. A key to the Sumatran species based on the worker caste is provided, and the bionomics of each species is summarized.

Key words: *Odontomachus,* Indonesia, Sumatra, taxonomy, male genitalia, DNA barcoding

Introduction

The ponerine ant genus *Odontomachus* Latreille, 1804, is assigned to the *Odontomachus* genus group of the tribe Ponerini (Schmidt & Shattuck, 2014). This genus has so far been known from pantropical, pansubtropical and temperate zones, and contains 67 valid extant and three valid fossil species (Schmidt & Shattuck, 2014; MacGown *et al.* 2014; Bolton, 2015).

The world revision of the genus by Brown (1976) has been widely used as a basis for the taxonomy of the genus. Brown (1976) recognized 51 valid species and classified them into 12 well-defined species groups. Recently, Sorger & Zettel (2011) established two more species groups in their revision of the Philippine *Odontomachus*: the *O. malignus* and *O. silvestrii* species groups, although the latter was only discussed in a note because it is only known from Vietnam and China.

Regional faunas of the genus *Odontomachus* include the Nearctic region (MacGown *et al.* 2014), Malagasy region (Fisher & Smith, 2008), China (Wang, 1993), southern Japan (Yoshimura *et al.* 2007), and various countries of South and Southeast Asia (Emery, 1887, 1901; Forel, 1913; Crawley, 1924; Chapman & Capco, 1951; Wilson, 1959; Ito *et al.* 1996; Yamane, 2008, 2013; Sorger & Zettel, 2011; Terayama & Ito, 2014). The classification of Southeast Asian *Odontomachus* is, however, still far from completion. The present paper is the first outcome of our long-term project for revising Southeast Asian *Odontomachus* and *Anochetus*, and aims to provide new taxonomic and bionomic knowledge of the species known from Sumatra. The island is one of the main components of the Malay Archipelago and the sixth largest island in the world.

Three species of *Odontomachus* had been reported from Sumatra by previous authors: *O. simillimus* F. Smith, 1858; *O. latidens* Mayr, 1867; and *O. rixosus* F. Smith, 1857 (Emery, 1887; Forel, 1913; Crawley, 1924; Karavaiev, 1925; Chapman & Capco, 1951; Brown, 1976). However, our recent intensive study revealed two additional species: *O. minangkabau* **sp. nov.** and *O. procerus* Emery, 1901 **stat. nov.** Thus, the present study contains (1) a

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description of the new species; (2) a change of taxonomic status of *O. procerus*; (3) reexaminations of the castes and sexes of the five Sumatran species (including the first male description for *O. latidens*, *O. procerus* and *O. rixosus*); (4) a key to species based on the worker caste; and (5) bionomics of the species.

Material and methods

Materials. The present study was conducted based on the type and non-type materials from Sumatra and adjacent areas (for details of the materials see the species accounts). Most of those specimens were collected by us under international collaborations with researchers working at universities and research institutions in Asian countries. Abbreviations of specimen depositories are as follows (contact addresses of RSC and SKYC are given under the title of this article).

AUMNS	Department of Biology, Faculty of Mathematics and Natural Sciences, Andalas University, West Sumatra, Indonesia.
BMNH	The Natural History Museum, London, U.K.
MZB	Bogor Zoological Museum, Bogor, Indonesia.
MSNG	Museo Civico di Storia Naturele "Giacomo Doria", Genova, Italy.
MCZC	Museum of Comparative Zoology, Cambridge, MA, U.S.A.
NHMW	Naturhistorisches Museum, Vienna, Austria.
RSC	Collection managed by Rijal Satria, Tokyo Metropolitan University, Tokyo, Japan.
SKYC	Collection managed by Seiki Yamane, Kagoshima, Japan.
TMUZ	Department of Biological Sciences, Tokyo Metropolitan University, Tokyo, Japan.

Images of the type specimens provided in AntWeb v5.17.5 (http://www.antweb.org) were examined to reconfirm our species recognition when the need arose (for details of the images see Type materials and Images examined for each species).

Specimen Preparation. Point-mounted specimens of the worker, queen, and male were examined and measured with a Nikon SMZ1000 stereomicroscope under suitable magnifications.

Male genitalia were cleaned by Chelex-TE method (see under "DNA barcoding based on the CO1 gene"), and at the same time DNA was extracted. Male genitalia were then dehydrated and dissected in 99% ethanol and mounted on slide glasses with Euparal. These slide-mounted specimens were examined with a Nikon Eclipse E600 microscope.

Measurement and terminology. The abbreviations used for the measurements and indices are as follows:

CI	Cephalic Index: HW/HL × 100.
EL	Eye Length. Diameter of major axis of eye measured in lateral view.
EW	Eye Width. Diameter of minor axis of eye in lateral view (male only).
IFLW	Inter-Frontal Lobe Width. Maximum distance between outermost margins of frontal lobe (worker and queen). The frontal lobe is equivalent to the median arch of the torulus in Keller (2011).
FWL	Forewing Length. Maximum length of forewing (alate queen and male).
HL	Head Length. Maximum length of head in full-face view, measured from anteriormost point of clypeus to midpoint of a line drawn across posterior margin of head (including ocelli in male).
HW	Head width. Maximum width of head in full-face view at eye level.
MDI	Mandible Index: MDL/HL × 100.
MDL	Mandible Length. Maximum length of mandible measured from mandibular insertion to apicalmost point of mandible (worker and queen).
OL	Ocellus Length. Diameter of major axis of median ocellus (queen and male).
OED	Ocellus-Eye Distance. Maximum distance between lateral ocellus and compound eye (male only).
PTH	Petiole Height. Maximum height of petiole from ventralmost point of subpetiolar process to an imaginary line tangential to apex as measured in lateral view.
PTHI	Petiole Height Index: PTH/PTL × 100.

PTL Petiole Length. Maximum length of petiole measured in lateral view.
SI Scape Index: SL/HW × 100.
SL Scape Length. Maximum length of antennal scape excluding basal constriction.
WL Weber Length. Maximum diagonal distance of mesosoma in lateral view, measured from base of anterior slope of pronotum to posteriormost point of propodeal lobe.

Morphological terminology follows Brown (1976), Yoshimura *et al.* (2007), Yoshimura & Fisher (2007), and Boudinot (2013). Further explanations are given below.

Abbreviations. In the taxonomic history of each species, the following abbreviations are given in parentheses: worker (w), queen (q), male (m), larva (l), karyotype (k).

Antenna. The antennae of Hexapoda are composed of three segments, the first being the scape, second being the pedicel, and the third being the flagellum (Goulet & Huber, 1993). The flagellum is divided into repeated non-segmental ring sclerites termed flagellomeres. In general, the ring sclerites of the antenna are referred to as the antennomeres.

Frontal lobe. The frontal lobe is equivalent to the medial arch of the torulus in Keller (2011).

Male genitalia. The 8th abdominal tergum is commonly referred to as the pygidium. The 9th abdominal sternum is referred to as the subgenital plate or the hypopygium. Anatomical terms of the external genitalia follow Boudinot (2013).

Mandible. The mandible of *Odontomachus* is long and straight. The teeth of the mandible are classified into the apical group and preapical group (Brown, 1976). The apical group consists of a large and elongate apical tooth, a subapical tooth that is variable in shape, and an intercalary tooth that is smaller than apical and subapical teeth. The preapical group is composed of denticles present along the medial margin of mandibular shaft. Here the medial margin is referred to as the masticatory margin; the number of the denticles along this margin varies among the species.

Palp formula. The palp formula indicates the segmentation of palps: the number of maxillary palp segments (X) is followed by the number of labial palp segments (Y), such as "palp formula X, Y".

Imaging. Multi-focused montage images were produced using Helicon Focus Pro (Helicon Soft Ltd., http://www.heliconsoft.com/) from a series of source images taken by a Canon EOS KissX5 digital camera attached to a Nikon ECLIPSE E600 microscope or Nikon SMZ1270 stereo microscope. Artifacts/ghosts and unnecessary parts (unfocused appendages, insect pin, *etc*.) surrounding or covering target objects were erased and cleaned up using the retouching function of Helicon Focus Pro, and the color balance, contrast and sharpness were adjusted using Adobe Photoshop Elements 7.

DNA barcoding based on the CO1 gene. Wet specimens (preserved in 80% or 100% ethanol) were used for DNA barcoding. A hind leg for each worker, or apex of gaster including genitalia for each male was washed with about 500 µL TE (pH 8.0) in a sterilized disposable dish and was broken into several fragments by sterilized forceps. These were then transferred into 105 µL of extraction buffer (100 µL of 10% Chelex-TE solution and 5 µL Qiagen Proteinase K) and incubated at 56˚C for 24–27h, and then heated at 99˚C for 10 minutes for inactivating Qiagen Proteinase K in the extraction buffer. In addition, the QIAGEN DNeasy Blood & Tissue Kit (QIAGEN, www.qiagen.com) was used for extracting DNA from some wet specimens; incubation at the extraction step was performed at 56˚C for 24h.

The standard DNA barcoding region near the 5' terminus of the CO1 gene (Folmer region) was amplified using the primer set LCO-EG (TTTCAACAAATCACAAAGAYATYGG) and HCO-EG (TAAACTTCAGGRTGACCRAAAAATCA). Each PCR contained 5 µL of 2xPCR buffer, 2 µL of dNTPs (final 0.4 mM), 0.3 µL of 10 pmol/µL forward and reverse primers (final 0.3 µM), 0.2 µL of 1.0 U/µL DNA polymerase KOD FX Neo (TOYOBO KFX-2015), and 0.5 µL of DNA template. The PCR thermal regime consisted of one cycle of 2 min at 94 °C; five cycles of 10 sec at 98 °C, 30 sec at 45 °C and 45 sec at 68 °C; 40 cycles of 10 sec at 98 °C, 30 sec at 48.5 °C and 45 sec at 68 °C; and a final cycle of 7 min at 68 °C. After confirming the PCR amplification on a 2.0% agarose gel, the amplified products were incubated at 37°C for 30 min and 80°C for 20 min with Illustra™ ExoStar (GE Healthcare, Buckinghamshire, UK) to remove any excess primers and nucleotides. The cycle sequencing reactions were run with ABI PRISM BigDye Terminator Cycle Sequencing Kit v.3.1 (Applied Biosystems). The sequencing reaction products were purified, concentrated by ethanol precipitation with sodium acetate, and their nucleotide sequences were determined using an automated sequencer (ABI PRISM 3100,

Applied Biosystems). Sequences assembly was conducted using ChromasPro 1.7.6 (Technelysium Pty Ltd., Australia). The sequences obtained were submitted to the DDBJ database (Accession No. LC056035– LC056053).

The sequences of Sumatran species and *O. pararixosus* Terayama & Ito, 2014 (which is morphologically most close to *O. rixosus* and *O. minangkabau*) were then aligned using MUSCLE (Edgar, 2004) built in MEGA 6.06 (Tamura *et al.* 2013). The p-distance (obtained by dividing the number of nucleotide differences by the total number of nucleotides compared) and K2P distance model (Kimura, 1980) were calculated by the pairwise comparison method of MEGA.

Taxonomy

Odontomachus Latreille, 1804

Diagnosis. For the diagnosis and synoptic description of the worker, queen and male of the genus, see Brown (1976), Yoshimura & Fisher (2007), and Schmidt & Shattuck (2014).

Key to Sumatran species based on the worker caste

1. Palp formula 4, 3; pronotal disc with long erect setae; mesopleuron with anteroventral ridge (arrow in Fig. 2C) . . . . . ***O. simillimus***
- Palp formula 4, 4; pronotal disc without long erect setae; mesopleuron without anteroventral ridge (arrow in Fig. 5C) 2
2. Subapical tooth of mandible 2.5 times as long as broad (arrow in Fig. 11A) 3
- Subapical tooth of mandible as long as broad or shorter than broad (arrow in Fig. 5A) 4
3. Size large (HL 3.13–3.55 mm; WL 4.15–4.65 mm); median part of vertex immediately along median furrow transversely striate; masticatory margin of mandible with more than 10 denticles; pronotal disc densely and transversely striate . . . . . ***O. minangkabau***
- Size small (HL 2.56–3.03 mm; WL 3.35–4.00 mm); median part of vertex immediately along median furrow smooth and shiny or sometimes with rough texture, but not transversely striate; masticatory margin of mandible with 10 or fewer denticles; pronotal disc usually concentrically striate (but rarely transversely striate) . . . . . ***O. rixosus***
4. Masticatory margin of mandible with very small denticles or sometimes without denticles (only preapical angle is recognizable); propodeal dorsum anteriorly with a very weak median longitudinal depression; 1st gastral tergum with short erect setae; subpetiolar process in lateral view lobate and directed ventrally (Fig. 1A) . . . . . ***O. latidens***
- Masticatory margin of mandible with 6–9 distinct denticles which are reduced in size toward base of mandible; propodeal dorsum anteriorly without a median longitudinal depression; 1st gastral tergum without erect setae; subpetiolar process in lateral view triangular and directed posteriorly (Fig. 1B) . . . . . ***O. procerus***

Key to Sumatran species based on the male caste

1. Palp formula 6, 3; propodeum in lateral view with dorsal outline angulate (arrow in Fig. 4D); body almost entirely blackish brown, and frons, clypeus, antenna and mandible yellowish brown to yellow (Fig. 4) . . . . . ***O. simillimus***
- Palp formula 6, 4; propodeum in lateral view with dorsal outline roundly convex (arrow in Fig. 7D); body yellow, blackish yellow, or yellowish brown (Figs. 7, 10, 13, 16) 2
2. Subpetiolar process in lateral view triangular (Fig. 10E); gaster much darker than head and mesosoma (Fig. 10) . ***O. procerus***
- Subpetiolar process in lateral view lobate (Fig. 7E); whole body more-or-less unicolor (Figs. 7, 13, 16) 3
3. Apex of petiolar node in lateral view evently rounded (Fig. 7E); posterior spine of 8th abdominal tergum short and thick, very weakly curved (Figs. 7G, 18B) . . . . . ***O. latidens***
- Apex of petiolar node in lateral view bluntly pointed (Figs. 13E, 16E); posterior spine of 8th abdominal tergum in lateral view long and slender, weakly or very weakly curved (Figs. 13G, 16G, 18D, 18E) 4
4. Body small (HL 1.04–1.14 mm; WL 2.63–2.93 mm); first gastral tergum in lateral view as long as high; whole body yellowish brown to brown, unicolor (Fig. 13) . . . . . ***O. rixosus***
- Body large (HL 1.21–1.24 mm; WL 3.28–3.40 mm); first gastral tergum in lateral view longer than high; body basically pale yellow, but with blackish area in head and mesosoma as seen in Fig. 16. . . . . ***O. minangkabau***

***Odontomachus simillimus* F. Smith, 1858**
(Figs. 2, 3, 4, 17, 18)

Odontomachus simillimus F. Smith, 1858: 80, pl. 5, figs 8, 9, queen, type locality: Fiji Islands; Wilson, 1959: 499; Brown, 1976: 165–166; Fisher & Smith, 2008: 15; Sorger & Zettel, 2011: 157–161, figs. 43–45.

Odontomachus haematodus Linnaeus, 1758: Wheeler, 1924: 243 (misidentification); Dammermann, 1948: 369 (misidentification) (see Wilson, 1959; Brown, 1976; Yamane, 2013).

Odontomahus haematoda var. *breviceps* Crawley, 1915: 239, worker, type locality: Christmas Island. Synonymy by Brown, 1976: 106.

Odontomachus haematodus var. *fuscipennis* Forel, 1913: 19, worker, queen, male, type locality: Sri Lanka (Peradenyia). Synonymy by Wilson, 1959: 499.

Ponera pallidicornis F. Smith, 1860: 73, male, type locality: Indonesia (Makassar). In *Euponera* (*Brachyponera*) by Donisthorpe, 1932: 458. In *Odontomachus* by Brown, 1976: 106. Synonymy by Brown, 1976: 106.

Type materials and images examined. Images of the type material of the following species provided in AntWeb v5.17.5 (http://www.antweb.org) were examined to confirm our species recognition: *O. simillimus*, queen, Ceylon (CASENT0900650); "*O. haematoda braeviceps*", worker (CASENT0901486); "*O. haematoda fuscipennis*", worker (CASENT0907433); "*Ponera pallidicornis*", male (CASENT0901350).

Non-type materials examined. Indonesia: Sumatra: Aceh: Simeulue Island, Babul Makmur, 15.IX.2012, S. Rijal leg., 4 workers (SKYC); same loc., 16.IX.2012, S. Rijal leg., 1 worker (SKYC); West Sumatra: Padang, 24.III.1989, K. Nakamura leg., 89-PD-15 (KN), 1 worker (SKYC, RSC); same loc., Teluk kabung near Padang, 14.III.1985, Sk. Yamane leg., 1 worker (SKYC, RSC); Maninjau, 16–18.VIII.1985, Sk. Yamane leg., Sumatra Nature Study (SNS col.), 1 worker (SKYC); Solok, Mt. Talang, 23–28.X.2010, S. Rijal leg., 3 workers, 1 queen (SKYC, RSC). Lampung: Krakatau Islands, P. Rakata Besar, 19.VII.1982, Sk. Yamane leg., 8 workers (SKYC, RSC); same loc., P. Sertung, 08.VII.1982, Sk. Yamane leg., 8 workers (SKYC, RSC); same loc., P. Rakata kecil, Sk. Yamane leg., 17.VII.1982, 4 workers (SKYC, RSC); same loc., P. Sertung, Sk. Yamane leg., 08.VII.1982, 2 workers, 1 queens (SKYC, RSC); same loc., P. Pencang, Sk. Yamane leg., 05.VII.1982, 1 worker (SKYC). Java: West Java: Jasinga near Bogor, 05.XI.1985, Sk. Yamane leg., 11 workers (SKYC, RSC); ITB campus (ca. 700 m alt.), 28.XII.2002, Sk. Yamane leg., 4 workers (SKYC); Bogor, 09.XI.1985, 5 workers (SKYC); Bogor (botanical garden), 03.VIII.1992, Sk. Yamane leg., 1 worker (SKYC, RSC); Carita, 03.VIII.1982, Sk. Yamane leg., 1 worker (SKYC); Yogyakarta: Campus of Gajah Mada Univ. (100 m alt.), 29.XII.2002, Syaukani leg., 3 workers (SKYC, RSC); same loc., F. Yamane leg., 1 worker (SKYC); same loc., Sk. Yamane leg., JV02/03-SKY-26, 4 workers (SKYC); Borobudur near Yogyakarta, 07.I.2003, Sk. Yamane leg., 4 workers (SKYC, RSC); same loc., F. Yamane leg., 1 worker (SKYC, RSC); East Java: Surabaya, Taman Binatang, 04.I.2003, F. Yamane leg., 1 queen (SKYC, RSC); same loc., Syaukani leg., 1 worker (SKYC, RSC); same loc., Sk. Yamane leg., 2 workers (SKYC, RSC); Batu, Bumiaji, Air Panas Cargar (1600 m alt.), 03.I.2003, Sk. Yamane leg., 9 workers (SKYC, RSC). Bali: Denpasar, 09.III.1987, K. Nakamura leg., 1 worker (SKYC, RSC); W. Bali, Mendaya, Dusun PK Jelati, 05-06.V.1998, I.K.T. Ginarsa leg., 3 workers (SKYC, RSC); same loc., Sk. Yamane leg., 3 workers (SKYC); same loc., 22.X.2012, PKJ-22-12, 6 workers, 1 queen (SKYC, RSC); same loc., S. Rijal leg., PKJ-12-12, 4 workers (SKYC, RSC); same loc., S. Rijal leg., PKJ-24-12, 11 workers, 8 queens (SKYC, RSC); same loc., S. Rijal leg., PKJ-33-12, 4 workers, 1 queen (SKYC, RSC); Denpasar, 24.IV.1998, I.K.T. Ginarsa leg., 5 workers (SKYC). Sulawesi: South Sulawesi: Ujung Pandang, Bantimurung, 18.VIII.1992, Sk. Yamane leg., 9 workers (SKYC). West Nusa Tenggara: W. Lombok, Kopi house near Semaya, 26.X.1998, K. Eguchi leg., EG98-LMB-1042, 4 workers (SKYC, RSC); Same loc., I.K.T. Ginarsa leg., 1 worker (SKYC). Irian Jaya (or Papua): Genyem near Jayapura, 02.v.1998, K. Eguchi leg., 1 queen (SKYC). **Malaysia:** Borneo: Sabah: Kota Kinabalu, 20.III.1995, Sk. Yamane leg., 4 workers (SKYC); Near Keningau (210 m alt.), 24.II.1997, Sk. Yamane leg., 1 worker (SKYC); Sepilok Forest, 29.I.1997, K. Eguchi leg., Eg97-BOR-514, 7 workers (SKYC); Lahad Datu, Lower Segama, 26.V.2005, Alveron leg., 9 workers (SKYC); Manggatal, Taman Fajar, 15.X.1996, K. Eguchi leg., 1 queen (SKYC). Sarawak, Niah N.P., 28.I.1993, Sk. Yamane leg., 1 worker (SKYC); Bako, Nat. Park, 21–22.IV.1993, Sk. Yamane leg., 3 workers (SKYC). Malay Peninsula: Selangor: Ulu Gombak, 12.XII.1992. K. Tomiyama leg., 1 worker (SKYC); same loc., (ca. 250 m alt.), 4.VII.1999, Sk. Yamane leg., 4 workers (SKYC); Pahang: Endu Rompin N.P., 10.VI.2005, Bakhtiar, Ruslan, Fauzi leg., SEM10 (nesting in soil), 2 workers (SKYC); Negeri Sembilan: Pasoh, 14.XII.1992. K. Tomiyama leg., 4 workers (SKYC). **Philippines:** Luzon, Olongapo, Subic Bay (FZ), 09-20.XI.2005, S. Onoda leg., 7 workers (SKYC). **Singapore:** 4.II.1995, Sk. Yamane leg., 9 workers (SKYC). **Sri**

Lanka: Central Province: Kandy, Campus of University Peradeniya, 12.IV.2001, Sk. Yamane, 4 workers, 2 queens (SKYC). Sabaragamuwa: Ratnapura, 11.IV.2001, Sk. Yamane leg., 3 workers, 2 queens (SKYC). Western Province: Gampaha Dist., Pilikuttuwa, 10.IV.2001, Sk. Yamane leg., 7 workers (SKYC).

Material used for DNA barcoding. Colony PKJ-24-12 (individual no. RJ20141114-7, accession no. LC056048); colony PKJ-33-12 (RJ20141114-4, LC056049); colony LMR-01-12 (RJ20141201-5, LC056043); colony LW-09-12 (RJ20141201-4, LC056044).

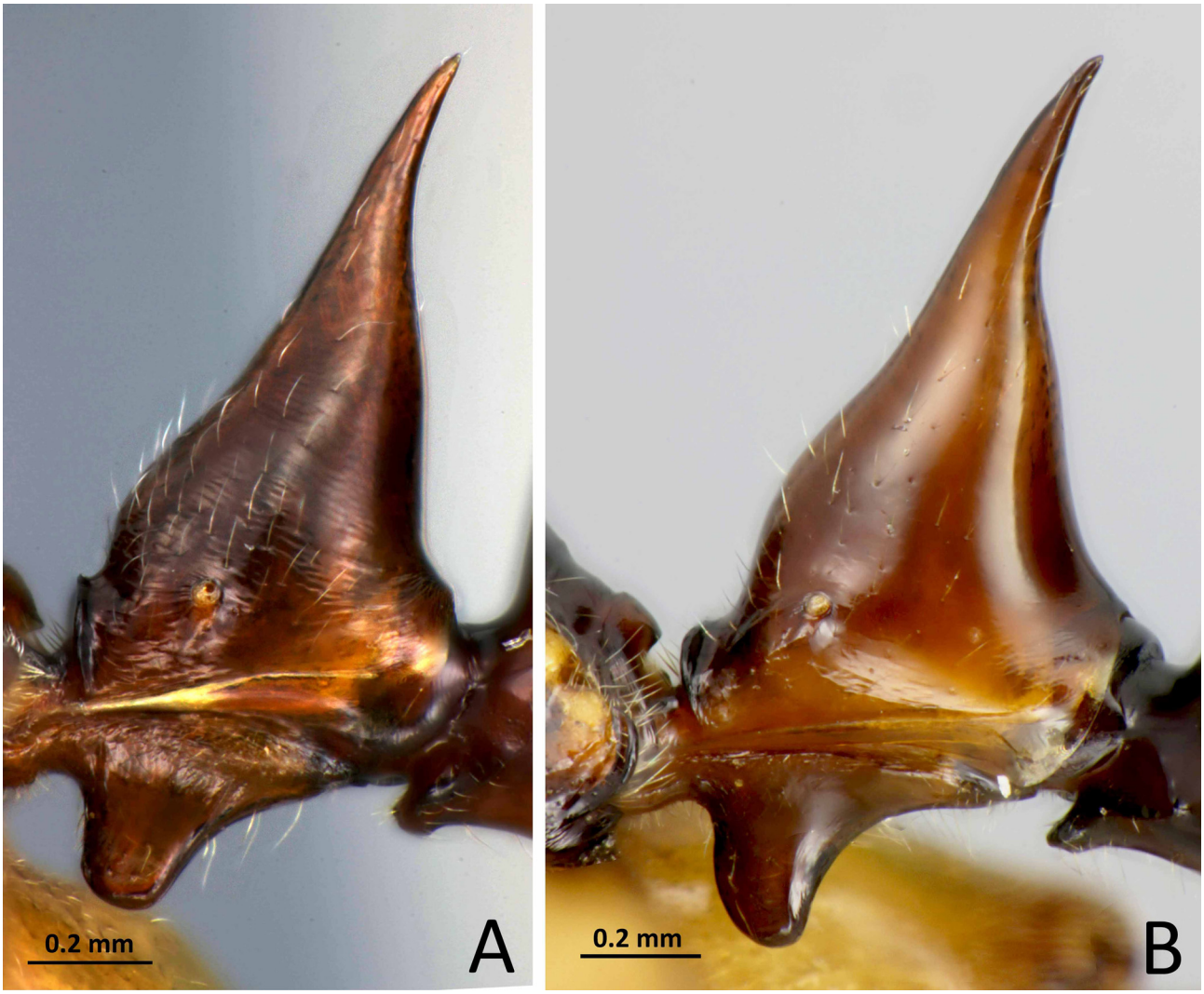

FIGURE 1. Petiole in lateral view, worker: A, *Odontomachus latidens* (colony: GK-38-12; individual: SEMUT150101B); B, *O. procerus* (SAGO-01-12; SEMUT141217B).

Worker measurements and indices. Non-type (n=10): HW 1.72–2.26 mm, HL 2.12–2.73 mm, SL 1.97–2.43 mm, IFLW 0.50–0.65 mm, EL 0.34–0.42 mm, MDL 1.15–1.50 mm, WL 2.66–3.29 mm, PTL 0.46–0.57 mm, PTH 1.02–1.28 mm, CI 76–83, SI 106–116, MDI 52–56, PTHI 212–236.

Worker description. Relatively small (HL 2.12–2.73 mm; WL 2.66–3.29 mm). Head in full-face view slightly longer than broad, with posterior margin strongly concave; median furrow on vertex present as dark line; each side of line weakly humped; frontal lobes followed by weak frontal carinae which are divergent posteriad; minimum distance between margin of ocular ridge and margin of compound eye less than half of major axis of compound eye; mandible relatively stout; masticatory margin with small denticles or edentate; subapical tooth shorter than broad, blunt at apex; palp formula 4, 3. Mesosoma in lateral view stout; pronotum including its anteromedian lobe short, in lateral view with anterodorsal slope steep; mesopleuron with conspicuous anteroventral ridge, with anterodorsal margin distinctly carinate, clearly separated by distinct dorsal carina from mesonotum and metapleuron; propodeum in lateral view with dorsum slightly convex and gradually sloping posteriad, with posterior face steeply sloping; propodeal dorsum without median longitudinal depression. Petiolar node conical,

with sharply pointed apical spine; node in lateral view, excluding apical spine almost straight anteriorly and very weakly convex posteriorly; apical spine short and slender, 1/4 as long as petiolar height, sometimes weakly curved posteriad; subpetiolar process anteroposteriorly longer than dorsoventrally high, triangular, directed posteriorly. First gastral tergum in lateral view short, with anterior face long and vertical.

Head in full-face view extensively striate, with area between eye and frontal lobe and area around eye smooth and shiny; frontal lobe finely and faintly striate; extraocular furrow striate; median part of vertex along median furrow striate; lateral face weakly striate; venter of head completely or largely smooth and shiny; median disc of clypeus with rough texture. Pronotal disc in dorsal view densely with concentric striation; mesonotum densely striate transversely; mesopleuron largely smooth and shiny, but with anterior third finely striate; metapleuron moderately striate; lateral face of propodeum with transverse striation which is a little sparser and stronger than mesonotum; dorsum and posterior face of propodeum coarsely and transversely striate. Petiolar node weakly striate anteriorly and laterally; posterior face of node weakly striate or sometimes smooth and shiny.

Vertex with a pair of long erect setae; frontal lobe without seta; pronotal disc and first gastral tergum with long erect setae, as long as setae on vertex. Head (except its venter), mesosoma, petiole and gaster with dense subdecumbent to decumbent pubescence; venter of head with sparse appressed pubescence.

For color pattern see Fig. 2; body reddish brown (Fig. 2) to dark brown (nearly black).

Queen measurements and indices. Non-types (n=10): HW 2.07–2.17 mm, HL 2.49–2.69 mm, SL 2.22–2.39 mm, IFLW 0.60–0.68 mm, EL 0.45–0.52 mm, OL 0.08–0.11 mm, MDL 1.31–1.45 mm, WL 3.19–3.29 mm, FWL 6.56–6.86 mm, PTL 0.56–0.60 mm, PTH 1.40–1.48 mm, CI 80–85, SI 102–114, MDI 50–55, PTHI 232–256.

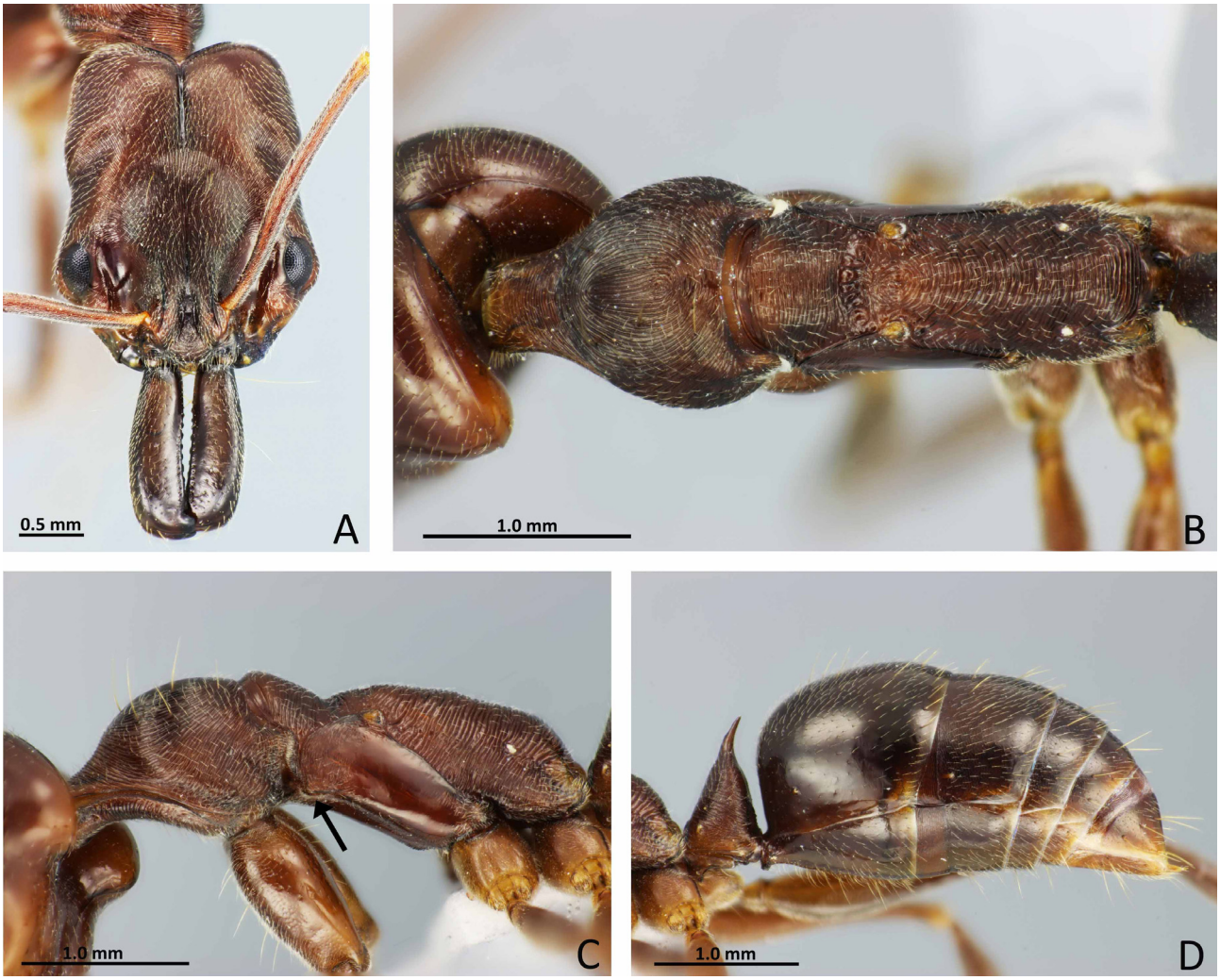

FIGURE 2. *Odontomachus simillimus*, worker (colony: PKJ-22-12; individual: SEMUT150102D): A, head in full-face view; B, mesosoma in dorsal view; C, mesosoma in lateral view, with an arrow indicating mesosoma with its anteroventral ridge; D, petiole and gaster in lateral view.

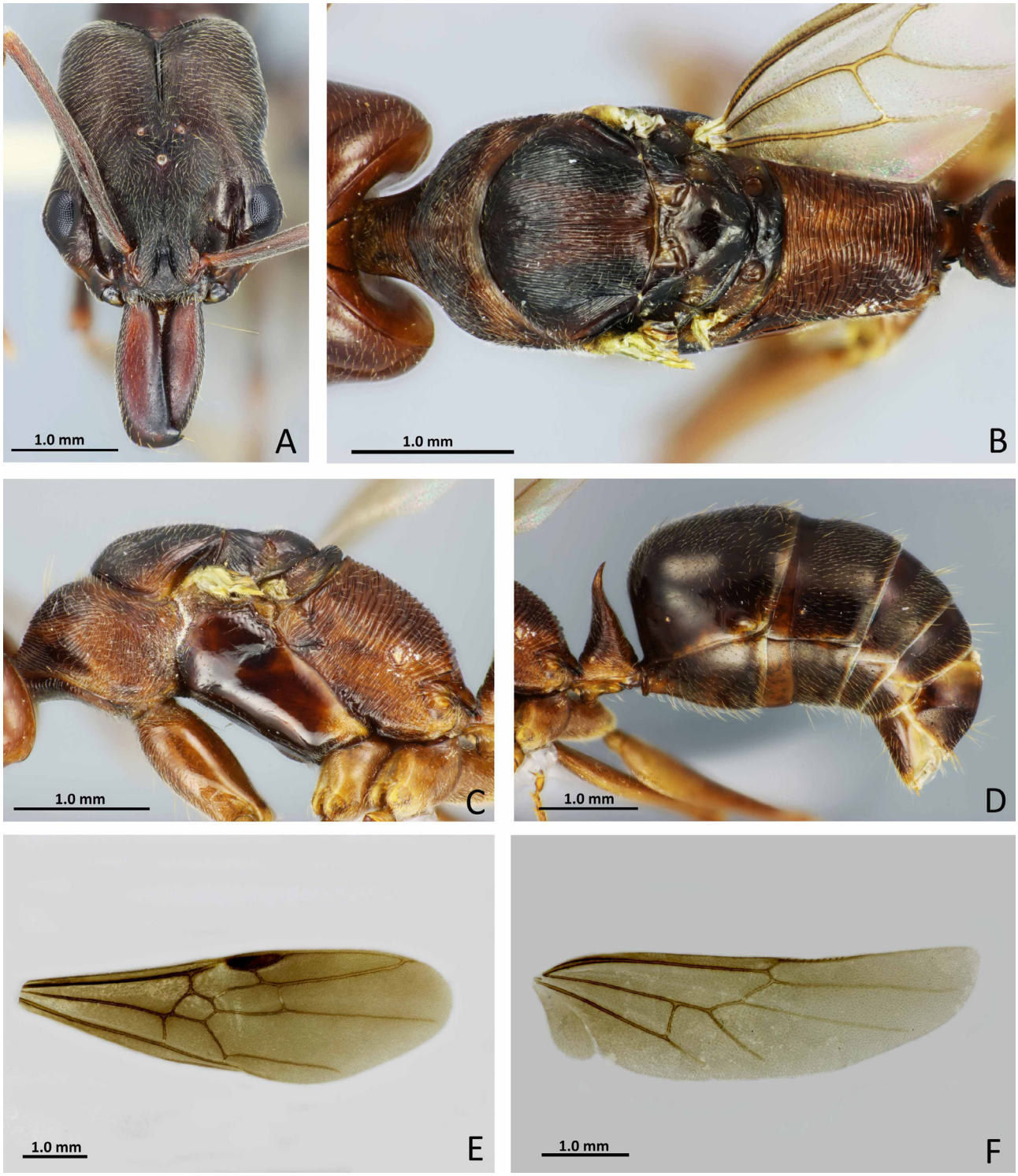

FIGURE 3. *Odontomachus simillimus*, queen (colony: PKJ-27-12; individual: SEMUT150102C): A, head in full-face view; B, mesosoma in dorsal view; C, mesosoma in lateral view; D, petiole and gaster in lateral view; E, forewing; F, hindwing.

Queen description. In general appearance queen is similar to worker. Vertex near ocelli swollen; ocular ridge faintly developed; distance between lateral ocelli as long as distance between lateral and median ocelli, and 3.5 times as long as major axis of median ocellus; ocelli in lateral view with not protruded dorsad. Mesosoma with main sclerites associated with wing function (Figs. 3B, 3C), in dorsal view short and stout; anterodorsal slope of pronotum in lateral view relatively steep; anterodorsal outline of mesoscutum in lateral view relatively gentle; mesoscutum without posteromedian depression; parapsidal furrow very weak and slightly curved; mesopleuron without oblique furrow; propodeum relatively long, in lateral view with dorsum almost straight and sloping

gradually posteriad. Wing venation as in Figs. 3E and 3F. Petiolar node in lateral view, excluding apical spine with anterior face faintly to weakly concave and posterior face faintly convex; apical spine very short and slender, and curved posteriad; subpetiolar process anteroposteriorly longer than dorsoventrally high. First gastral tergum in lateral view relatively short, with anterior face long and vertical.

Head in full-face view extensively striate, with area between eye and frontal lobe, and area around eye smooth and shiny; frontal lobe finely and faintly striate; extraocular furrow striate; median part of vertex along median furrow striate; lateral face weakly striate; venter of head completely or largely smooth and shiny; median disc of clypeus with rough texture. Pronotum weakly striate transversely; mesoscutum with dense longitudinal striation; striation finer on mesoscutum than on pronotum and propodeum; mesopleuron largely smooth and shiny, but with posteriormost part faintly striate; mesoscutellum smooth and shiny; propodeum strongly striate transversely. Petiolar node excluding apical spine entirely striate, but striation on anterior and posterior faces weaker than that on lateral face.

Pair of long erect setae present on vertex near lateral ocelli; frontal lobe without erect seta; pronotal disc and first gastral tergum with long erect setae, as long as setae on vertex near lateral ocelli. Head, mesosoma, petiole and gaster with dense subdecumbent to decumbent pubescence, except mesopleuron very sparsely pubescent.

For color pattern see Fig. 3; body reddish brown (Fig. 3) to dark brown (nearly black).

Male measurements and indices. Non types (n=10): HW 1.16–1.28 mm, HL 0.95–1.14 mm, SL 0.17–0.21 mm, EL 0.59–0.68 mm, EW 0.34–0.40 mm, OL 0.15–0.18 mm, OES 0.21–0.26 mm, WL 2.66–2.99 mm, FWL 4.60–5.48 mm, PTL 0.46–0.64 mm, PTH 0.81–0.95 mm, CI 104–129, SI 14–17, PTHI 147–176.

Male description. Size small (HL 0.95–1.14 mm; WL 2.66–2.99 mm). Major axis of median ocellus smaller than minimum distance between lateral ocelli; antenna 13-merous; scape very short, 1/3 as long as 3rd antennomere; 2nd antennomere 1/2 as long as scape; 3rd to 13th antennomeres each extremely long; palp formula 6, 3; dorsal outline of clypeus in lateral view strongly convex. Mesosoma in lateral view relatively stout and short; dorsal outline of pronotum in lateral view strongly convex; anterodorsal outline of mesoscutum in lateral view steeply slooping; mesoscutum without median depression; parapsidal furrow weak and almost straight; oblique mesopleural furrow relatively deep and wide; ventrolateral part of katepisternum with weak longitudinal furrow; propodeum in lateral view with its dorsal outline angulate (arrow in Fig. 4D); metapleuron distinctly separated from propodeum by a suture; wing venation similar to queen (see Figs. 3E and 3F for queen wings). Petiolar node in lateral view tapering to blunt apex; its anterior slope in lateral view very weakly sinuate, and its posterior slope straight and steeper; subpetiolar process in lateral view anteroposteriorly as long as dorsoventrally high, triangular and thick; petiolar sternum with conspicuously angulate process posteroventraly. First gastral tergum in lateral view short; posterior spine of 8th abdominal tergum long and slender, very weakly curved (but variable in shape within species) (Fig. 18A); pygostyle digitiform, with long setae in apical half; disc of 9th abdominal sternite broader than long, almost as long as apical lobe, with straight basal margin; apical lobe slightly narrower in basal half, with apical margin weakly convex; telomeral apex in lateral view as long as high; distiventral apex of valviceps strongly produced; basiventral corner of valviceps distinctly produced; ventral margin of valviceps with 34–36 denticles.

Head including area between lateral ocelli largely smooth and shiny, with clypeus faintly striate; venter of head faintly striate and shiny. Pronotum largely smooth and shiny, with lateral part faintly striate; mesoscutum faintly rugoso-reticulate and opaque; scuto-scutellar suture with very sparse, weak, longitudinal rugae; mesopleuron with anepisternum smooth and shiny, and katepisternum largely smooth and shiny, but with faint and rough texture in posteriormost part; propodeum including its posterior slope with rough texture. Petiole faintly striate to rugose.

Head, mesosoma, legs, petiole, and gaster with fine dense subdecumbent to decumbent pubescence; apex of mandible, vertex near ocelli, pronotum and gaster with several long erect setae.

For color pattern see in Fig. 4; head, mesosoma, legs, petiole, gaster blackish brown; antenna yellowish brown; frons and clypeus largely yellowish brown, with lateral part of clypeus and the areas in front of antennal insertions rather yellow; mandible yellow.

Species recognition. *Odontomachus simillimus* is easily separated from the other Sumatran species of the genus by the following characteristics of the worker: subapical teeth blunt and short; palp formula 4, 3; pronotal disc and first gastral tergum with several long erect setae. This species is also distinguishable from the other Sumatran species by the following characters of the male: palp formula 6, 3; dorsal outline of clypeus in lateral view much convex; propodeum in lateral view with its dorsal outline angulate; disc of 9th abdominal sternite

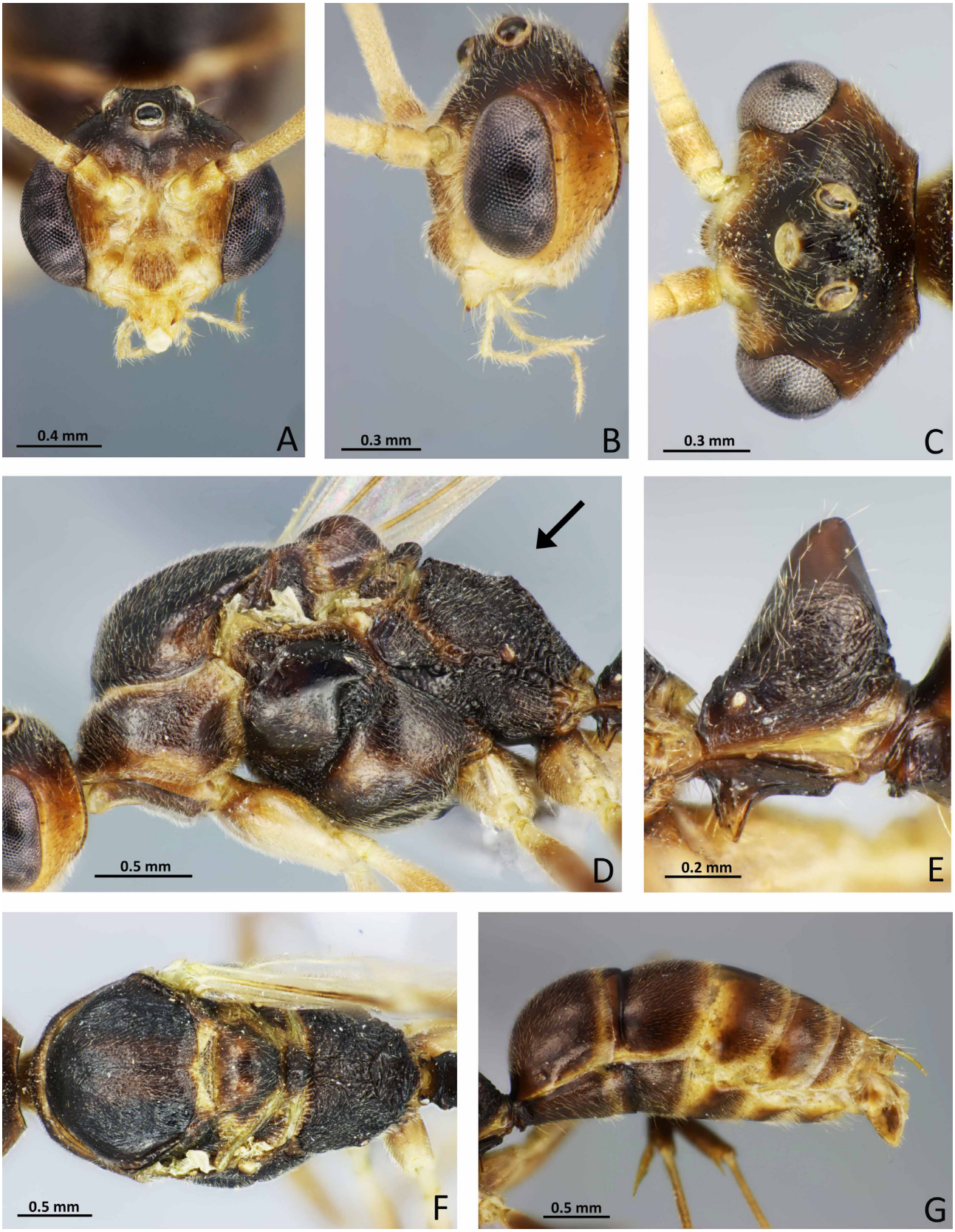

FIGURE 4. *Odontomachus simillimus*, male (colony: PKJ-27-12; individual: SEMUT141217C): A, head in full-face view; B, head in lateral view; C, head in dorsal view; D, mesosoma in lateral view, with an arrow indicating an angulate dorsal outline; E, petiole in lateral view; F, mesosoma in dorsal view; G, gaster in lateral view.

broader than long, almost as long as apical lobe, with straight basal margin; apical lobe slightly narrower in basal half, with apical margin weakly convex; telomeral apex in lateral view as long as high; ventral margin of valviceps with 34–36 denticles; body largely blackish brown, with mandible and small area of clypeus and anterior of head yellowish, and antenna yellowish brown.

Distribution. The majority of the members of the *O. haematodus* species group are distributed in the New World and one species in Africa, but only *O. simillimus* is distributed widely in tropical Southeast and South Asia, Melanesia and Madagascar.

Bionomics. *Odontomachus simillimus* is a common species in gardens and green patches in residential zones, plantations, and secondary forests. Nests are usually found in the soil near the base of living trees, and under shelters (such as stumps, rotten logs and rocks), but sometimes under paved floors around houses.

In Bali, we found two colonies of *O. simillimus* near the base of living trees in a cacao plantation which coexisted with colonies of the myrmicine *Pheidole gighii* Emery, 1900 ("compound colony" PKJ-22-12/PKJ-23-12, PKJ-24-12/PKJ-25-12). However, the coexistence between the two species seems to be occasional because we have not yet found such cases in Krakatau and Sumatra. Any other ant partner of *O. simillimus* has not yet been found.

Odontomachus latidens Mayr, 1867

(Figs. 1, 5, 6, 7, 17, 18)

Odontomachus latidens Mayr, 1867: 48, queen, type locality: Indonesia (Java). Emery, 1887: 428; Emery, 1892: 560 (w); Crawley, 1924: 388; Karavaiev, 1925: 292 (w); Chapman & Capco, 1951: 45; Brown, 1976: 157; Imai, Brown, *et al.* 1984: 67 (k).

Non-type materials examined. Indonesia: Sumatra: Aceh: Leuser Ecosystem (ca. 1100 m alt.), 20.IX.2012, S. Rijal leg., GK-38-12, 29 workers, 5 queens (SKYC, RSC); North Sumatra: Danau Toba, Parapat (900 m alt.), 20.VIII.2002, Sk. Yamane leg., 2 workers (SKYC, RSC). Java: Banten: Cibodas, 29.11.2009, M. Ohashi leg., 1 queen (SKYC, RSC); same loc., Mt. Gede, Dec-1999, F. Ito leg., 1 worker (SKYC, RSC); Yogyakarta: G. Merapi, Kaliadem (800–1000 m alt.), 31.XII.2002, F. Yamane leg., JV02/03-SKY-39, 2 workers, 1 queen (SKYC, RSC). **Malaysia**: Malay Peninsula: Pahang: near Genting H.L., Bunga Buah (ca. 1000 m alt.), 6.VII.1999, Sk. Yamane leg., 1 worker (SKYC, RSC).

Material used for DNA barcoding. Colony GK-38-12 (individual no. RJ20150126-4, accession no. LC056037).

Worker measurements and indices. Non-types (n=10): HW 2.43–3.13 mm, HL 3.23–4.05 mm, SL 2.83–3.65 mm, IFLW 0.60–0.76 mm, EL 0.31–0.40 mm, MDL 1.67–2.09 mm, WL 3.50–4.30 mm, PTL 0.50–0.69 mm, PTH 1.26–1.58 mm, CI 73–77, SI 109–123, MDI 51–55, PTHI 226–280.

Worker description. Relatively large (HL 3.23–4.05 mm, WL 3.50–4.30 mm). Head in full-face view slightly longer than broad, with posterior margin weakly concave (sometimes almost straight); median furrow on vertex present as dark line; each side of line hardly humped; frontal lobes followed by strong frontal carinae which are slightly divergent posteriad and then become nearly parallel; minimum distance between margin of ocular ridge and margin of compound eye half as long as major axis of compound eye; mandible relatively slender; masticatory margin with very small denticles along its length, or only with preapical angle (without denticles); subapical tooth shorter than broad, with truncate apex; palp formula 4, 4. Mesosoma in lateral view stout; pronotum including its anteromedian lobe short, in lateral view with anterodorsal slope relatively steep; mesopleuron without anteroventral ridge, with anterodorsal margin weakly carinate, clearly separated by distinct dorsal carina from mesonotum and metapleuron; propodeum in lateral view with dorsum slightly convex, and gradually sloping posteriad, with posterior face steeply sloping; propodeal dorsum anteriorly with very weak median longitudinal depression. Petiolar node conical, with sharply pointed apical spine; node in lateral view, excluding apical spine with anterior face weakly convex or weakly and bluntly angulate, and posterior face weakly convex; apical spine short and relatively slender, less than 1/4 as long as petiolar height, sometimes weakly curved posteriad (but shape variable within species); subpetiolar process anteroposteriorly shorter than dorsoventrally high, lobate, directed ventrally. First gastral tergum in lateral view relatively short, with anterior face moderately long and vertical.

FIGURE 5. *Odontomachus latidens,* worker (colony: GK-38-12; individual: SEMUT150101B): A, head in full-face view, with an arrow indicating subapical tooth of mandible; B, mesosoma in dorsal view; C, mesosoma in lateral view, with an arrow indicating mesopleuron without its anteroventral ridge; D, petiole and gaster in lateral view.

Head in full-face view largely smooth and shiny, but with striate area bordered by frontal carinae and ocular ridges; frontal lobe smooth and shiny; extraocular furrow smooth and shiny; median part of vertex along median furrow smooth and shiny; lateral face and venter of head smooth and shiny; median disc of clypeus almost smooth and shiny. Pronotal disc and mesonotum in dorsal view densely and transversely striate; posterolateral face of pronotum partly smooth and shiny; mesopleuron largely smooth and shiny, with anterior 1/4 finely striate; metapleuron moderately striate in its anterior 2/3, and smooth and shiny or faintly striate in its posterior 1/3; propodeum with transverse striation which is a little sparser and stronger than pronotum and mesonotum. Petiolar node largely smooth and shiny, but sometimes with its basal area faintly striate.

Vertex with a pair of long erect setae; frontal lobe without seta; pronotal disc without long erect setae; 1st gastral tergum with erect setae (but often missing artificially) which are 2/3 as long as setae on vertex. Head, mesosoma, petiole and gaster with fine appressed pubescence which is sparse and very short on head and gaster.

For color pattern see in Fig. 5; body reddish brown (Fig. 5) to brown; gaster a little darker than head and mesosoma; all legs yellowish brown.

Queen measurements and indices. Non-type material (n=7): HW 2.89–2.99 mm, HL 3.60–3.95 mm, SL 3.35–3.55 mm, IFLW 0.70–0.76 mm, EL 0.50–0.52 mm, OL 0.13–0.20 mm, MDL 1.97–2.05 mm, WL 4.55–4.75 mm, FWL 10.48–11.17 mm, PTL 0.69–0.71 mm, PTH 0.94–1.85 mm, CI 76–80, SI 116–118, MDI 50–58, PTHI 131–277.

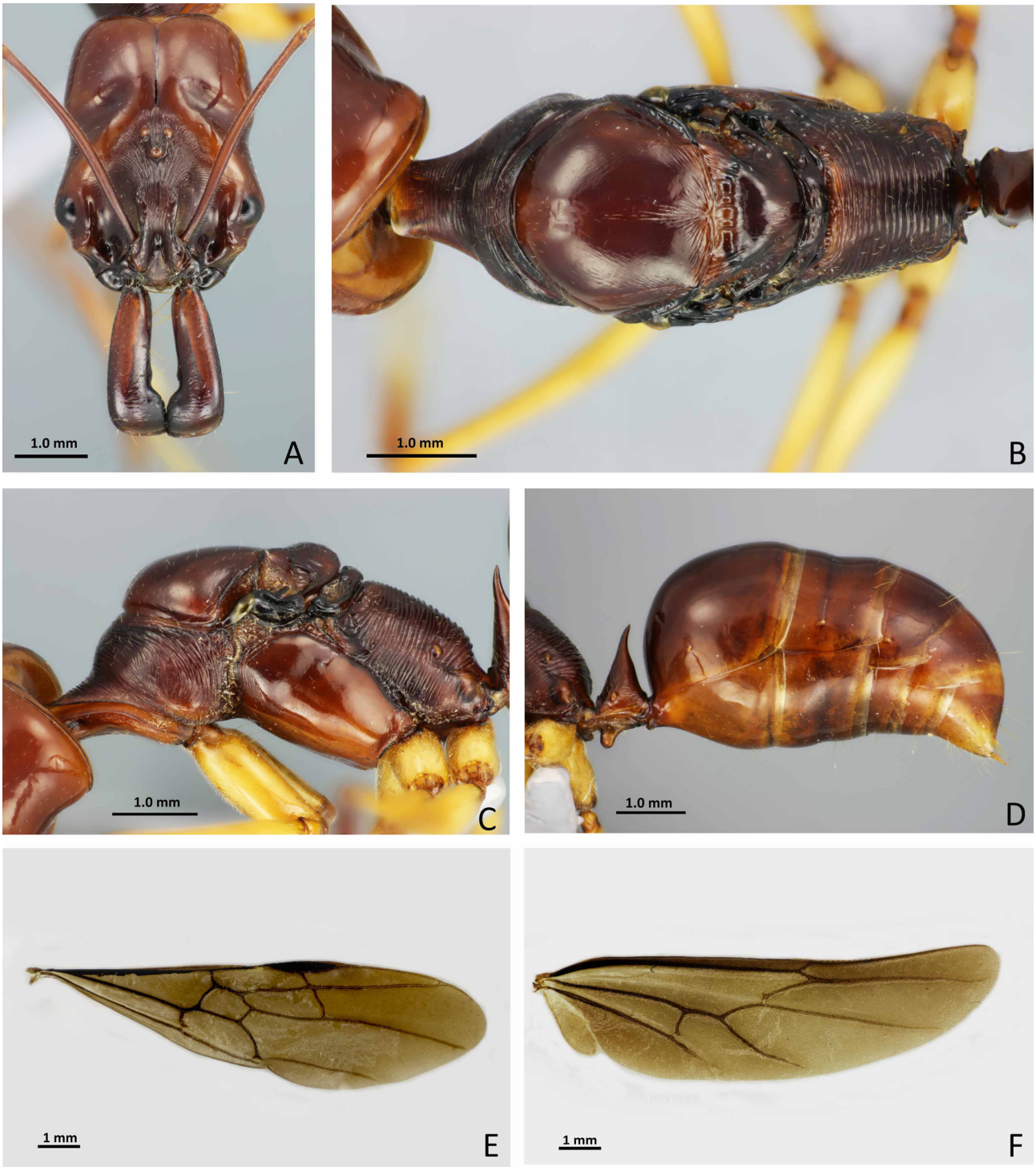

FIGURE 6. *Odontomachus latidens,* queen (colony: GK-38-12; individual: SEMUT150101C): A, head in full-face view; B, mesosoma in dorsal view; C, mesosoma in lateral view; D, petiole and gaster in lateral view; E, forewing; F, hindwing.

Queen description. In general appearance queen is similar to worker. Vertex near ocelli not swollen; ocular ridge clearly developed; distance between lateral ocelli as long as distance between lateral and median ocelli, and as long as major axis of median ocellus; ocelli in lateral view protruded dorsad. Mesosoma with main sclerites associated with wing function (Figs. 6B, 6C), in dorsal view short and stout; anterodorsal slope of pronotum in lateral view steep; anterodorsal outline of mesoscutum in lateral view relatively steep; mesoscutum with very weak posteromedian depression; parapsidal furrow very weak and slightly curved; mesopleuron without oblique furrow; propodeum in lateral view relatively short, with dorsum very weakly convex and gradually sloping posteriad. Wing venation as in Figs. 6E and 6F. Petiolar node in lateral view, excluding apical spine with anterior face almost

straight to weakly convex, and its posterior face weakly convex; apical spine short and relatively slender, and sometimes weakly curved posteriad (but variable in shape within species); subpetiolar process anteroposteriorly longer than dorsoventrally high. First gastral tergum in lateral view relatively short, with anterior face moderately long and vertical.

Head in full-face view largely smooth and shiny, but with striate area bordered by frontal carinae and ocular ridges; frontal lobe smooth and shiny; extraocular furrow faintly striate; median part of vertex along median furrow smooth and shiny; lateral face and venter of head smooth and shiny; median disc of clypeus almost smooth and shiny. Pronotum densely and weakly striate transversely; mesoscutum largely smooth and shiny, with faint striae on posteromedian depression and along posterior margin; mesopleuron largely smooth and shiny, with anteriormost part faintly striate; mesoscutellum smooth and shiny; propodeum strongly and sparsely striate transversely. Petiolar node excluding spine largely striate faintly.

Pair of long erect setae present on vertex near lateral ocelli; frontal lobe and pronotal disc without erect setae; 1st gastral tergum with erect setae (but often missing artificially) which are shorter than setae on vertex near ocelli. Head, mesosoma, petiole and gaster with sparse subdecumbent to decumbent pubescence which is extremely short on gaster; mesopleuron very sparsely pubescent.

For color pattern see in Fig 6. Body reddish brown (Fig. 6) to brown; gaster a little darker than head and mesosoma; all legs yellowish brown.

Male measurements and indices. Non-types (n=7): HW 1.60–1.65 mm, HL 1.26–1.31 mm, SL 0.26–0.28 mm, EL 0.88–0.91 mm, EW 0.50–0.51 mm, OL 0.20–0.22 mm, OES 0.26–0.28 mm, WL 3.55–3.70 mm, FWL 7.05–7.25 mm, PTL 0.63–0.64 mm, PTH 0.97–1.03 mm, CI 123–128, SI 16–18, PTHI 151–164.

Male description. Size large (HL 1.26–1.31 mm, WL 3.55–3.70 mm). Major axis of median ocellus smaller than minimum distance between lateral ocelli; antenna 13-merous; scape very short, 1/3 as long as 3rd antennomere; 2nd antennomere 1/2 as long as scape; 3nd to 13th antennomeres each extremely long; palp formula 6, 4; dorsal outline of clypeus in lateral view weakly convex. Mesosoma in lateral view relatively slender and long; dorsal outline of pronotum in lateral view weakly convex; anterodorsal outline of mesoscutum in lateral view relatively steeply sloping; mesoscutum with short weak median longitudinal depression; parapsidal furrow weak and slightly curved; oblique mesopleural furrow relatively shallow and narrow; ventrolateral part of katepisternum with a very weak longitudinal furrow; propodeum in lateral view with its dorsal outline roundly convex; metapleuron separated from propodeum indistinctly by a suture; wing venation similar to queen (see Figs. 6E and 6F for queen wings). Petiolar node in lateral view tapering gently to rounded apex with its anterior slope straight, and its posterior slope much steeper and shallowly concave; subpetiolar process in lateral view anteroposteriorly shorter than dorsoventrally high, lobate and slender; petiolar sternum without posteroventral process. First gastral tergum in lateral view long; posterior spine of 8th abdominal tergum short and thick, very weakly curved (Fig. 18C); pygostyle digitiform, with long setae in apical 2/3; disc of 9th abdominal sternite not clearly differentiated from apical lobe, gradually merging into apical lobe, with basal margin almost straight; apical lobe gently tapering apicad, with apical margin truncated; telomeral apex in lateral view longer than high; distiventral apex of valviceps weakly produced; basiventral corner of valviceps not produced; ventral margin of valviceps with 27−30 denticles.

Head largely smooth and shiny, with area between lateral ocelli faintly striate. Pronotum in dorsal view smooth and shiny; mesoscutum faintly and longitudinally striate or sometimes smooth and shiny; scuto-scutellar suture with sparse, strong, longitudinal rugae; mesopleural–anepisternum and katepisternum smooth and shiny; propodeum with sparse, strong, longitudinal striate. Petiole smooth and shiny.

Head, mesosoma, legs, petiole, and gaster with fine dense subdecumbent to decumbent pubescence; mandible, vertex near ocelli and gaster except 1st gastral tergum with several long erect setae.

For color pattern see in Fig. 7; head including scape, mesosoma, legs yellowish brown; funiculus dark brown; petiole and gaster darker than head and mesosoma.

Species recognition. The identities of *O. latidens* and *O. procerus* are discussed under *O. procerus*.

Distribution. Known from Indonesia (Sumatra and Java) and Peninsular Malaysia.

Bionomics. *Odontomachus latidens* inhabits secondary and primary forests in the highlands (ca. 800–1300 m alt.), and nests in the soil near the base of living trees. The colony GK-38-12, from Leuser Ecosystem, Aceh Province, was collected nesting together with *Pheidole tandjongensis* Forel, 1913 (colony GK-39-12). Details concerning the nature of their relationship are unknown.

CO1. See remarks under *O. procerus*.

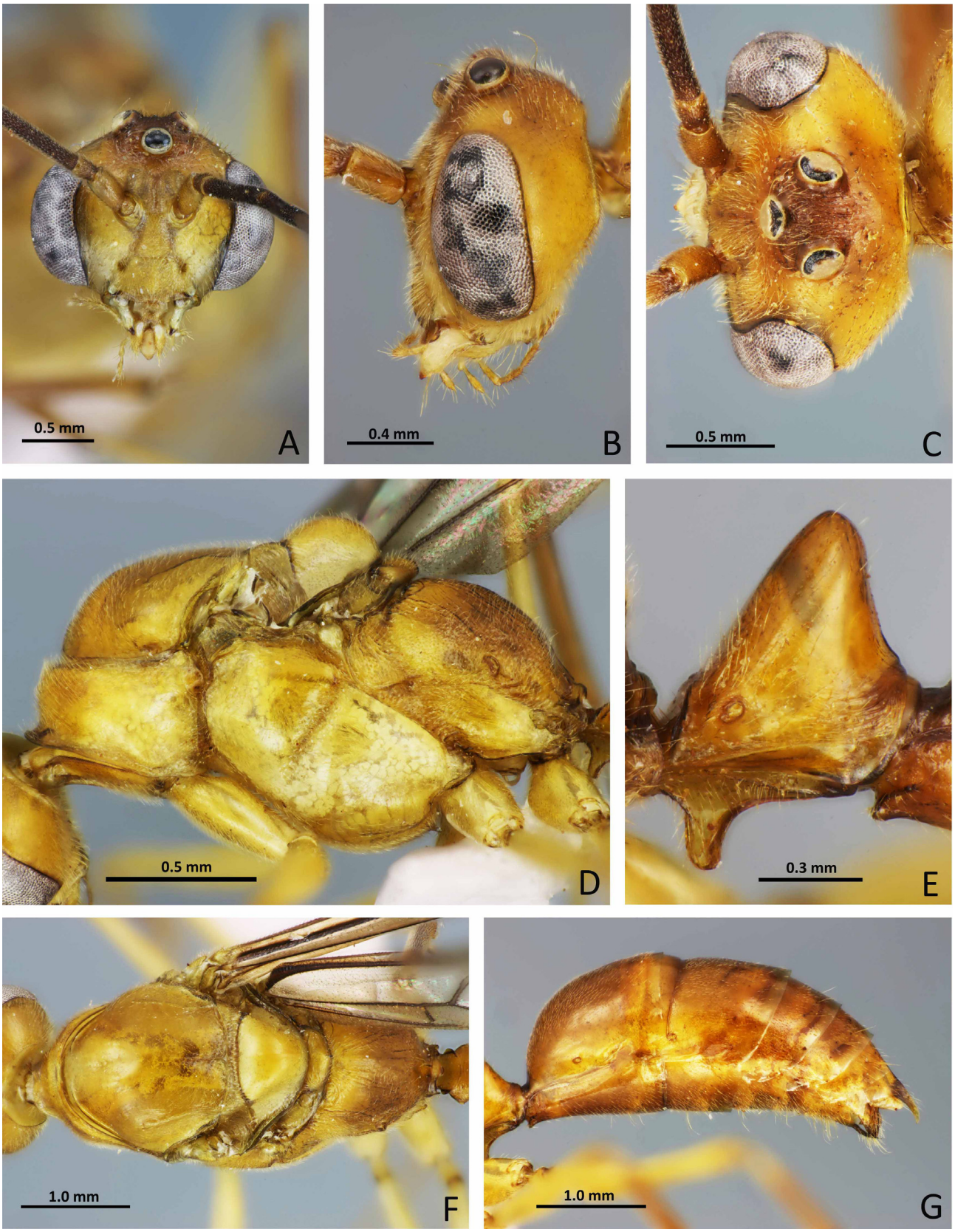

FIGURE 7. *Odontomachus latidens*, male (colony: GK-38-12; individual: SEMUT141225E): A, head in full-face view; B, head in lateral view; C, head in dorsal view; D, mesosoma in lateral view, with an arrow indicating an roundly convex dorsal outline; E, petiole in lateral view; F, mesosoma in dorsal view; G, gaster in lateral view.

***Odontomachus procerus* Emery, 1893 stat. nov.**
(Figs. 1, 8, 9, 10, 17, 18)

Odontomachus latidens subsp. *procerus* Emery, 1893: 203, queen, type locality: West Malaysia. Chapman & Capco, 1951: 45. Synonymy under *Odontomachus latidens* by Brown, 1976: 104. **Stat. nov.**

Odontomachus latidens subsp. *sumatranus* Emery, 1900: 671, fig. 4, worker, queen, type locality: Indonesia (Sumatra). Synonymy under *Odontomachus latidens* by Brown, 1976: 104. **Syn. nov.**

Type materials and images examined. "*Odontomachus latidens* subsp. *procerus*": holotype (queen in MCSN), Peninsular Malaysia: Perak [mesosoma of the holotype heavily deformed by pinning]; "*O. latidens* subsp. *sumatranus*": syntypes (9 workers, 2 queens in MCSN; 2 workers in NHMW), Indonesia: North Sumatra: Si-Rambe (XII.9D-III.91, E. Modigliani leg.) [mesosoma of the syntype queens partly deformed by pinning].

Images of the type material of the following species provided in AntWeb v5.17.5 (http://www.antweb.org) were also examined: "*O. latidens* subsp. *procerus*", queen (CASENT0903998); "*O. latidens* subsp. *sumatranus*", worker (CASENT0903999).

Non-type materials examined. Indonesia: West Sumatra: Mt. Sago, 50 Kota District (ca. 1000 m alt.), 06.IX.2012, S. Rijal leg., SAGO-01-02, 31 workers (SKYC, RSC); Alahan Panjang, 4.I.1992, F. Ito leg., FI92-252, 2 workers (SKYC, RSC). **Malaysia:** Sabah: Sayap Kinabalu, ca. 1000 m alt, 13.VII.1996, Sk. Yamane leg., 2 workers (SKYC, RSC); same loc., 13.VII.1996, K. Eguchi leg., 1 worker (SKYC, RSC); Poring, Kinabalu (550–600 m alt), 17.III.1995, Sk. Yamane leg., 1 worker (SKYC, RSC); Muaya, 27–28.VIII.2012, K. Matsunaga leg., 12 workers (SKYC, RSC); same loc., 19.X.2012, K. Matsunaga leg., 1 worker (SKYC, RSC). Sarawak: Bt. Entimau (610 m alt), 23.IV.1994, Mahmud leg, 1 worker (SKYC, RSC).

Materials used for DNA barcoding. Colony SAGO-01-12 (individual no. RJ20150126-3, accession no. LC056052).

Worker measurements and indices. Syntypes (n=9): HW 2.69–2.93 mm, HL 3.55–4.00 mm, SL 3.65–4.00 mm, IFLW 0.68–0.75 mm, EL 0.36–0.40 mm, MDL 2.12–2.33 mm, WL 4.40–4.70 mm, PTL 0.59–0.73 mm, PTH 1.35–1.60 mm, CI 72–81, SI 133–148, MDI 56–62, PTHI 206–228.

Non-types (n=10): HW 2.66–3.13 mm, HL 3.65–4.40 mm, SL 3.80–4.10 mm, FLW 0.69–0.81 mm, EL 0.41–0.47 mm, MDL 1.97–2.49 mm, WL 4.15–4.90 mm, PTL 0.63–0.76 mm, PTH 1.45–1.82 mm, CI 71–77, SI 126–144, MDI 52–63, PTHI 203–252.

Worker description. Relatively large (HL 3.55–4.40 mm, WL 4.15–4.90 mm). Head in full-face view slightly longer than broad, with posterior margin almost straight; median furrow on vertex present as a dark line; each side of line hardly swollen; frontal lobes followed by strong frontal carinae which are slightly divergent posteriad and then become nearly parallel; minimum distance between margin of ocular ridge and margin of compound eye less than half of major axis of compound eye; mandible relatively slender; masticatory margin with 6–9 distinct denticles; subapical tooth shorter than broad, with truncate apex; palp formula 4, 4. Mesosoma in lateral view relatively stout; pronotum including its anteromedian lobe short, in lateral view with anterodorsal slope relatively steep; mesopleuron without anteroventral ridge, with anterodorsal margin weakly carinate, clearly separated by distinct dorsal carina from mesonotum and metapleuron; propodeum in lateral view with dorsum slightly convex and gradually sloping posteriad, with posterior face steeply sloping; propodeal dorsum without median longitudinal depression. Petiole node conical, with sharply pointed apical spine; node in lateral view, excluding apical spine with anterior face weakly convex or weakly and bluntly angulate, and posterior face weakly convex; apical spine short and relatively slender, less than 1/4 as long as petiolar height, sometimes weakly curved posteriad (but shape variable within species); subpetiolar process anteroposteriorly shorter than dorsoventrally high, triangular, directed posteriorly. First gastral tergum in lateral view relatively long, with anterior face relatively short and vertical.

Head in full-face view largely smooth and shiny, but with striate area bordered by frontal carinae and ocular ridges; frontal lobe smooth and shiny; extraocular furrow smooth and shiny; median part of vertex along median furrow smooth and shiny; lateral face and venter of head smooth and shiny; median disc of clypeus smooth and shiny. Pronotal disc and mesonotum in dorsal view densely and transversely striate; posterolateral face of pronotum partly smooth and shiny; mesopleuron largely smooth and shiny, with anterior 1/4 and posteriormost part finely striate; metapleuron moderately striate in its anterior 2/3, and smooth and shiny or faintly striate in its posterior 1/3; propodeum with transverse striation which is a little sparser and stronger than on pronotum and mesonotum. Petiolar node largely smooth and shiny, but sometimes with its basal area faintly striate.

FIGURE 8. *Odontomachus procerus*, worker (colony: SAGO-01-12; individual: SEMUT141230L): A, head in full-face view; B, mesosoma in dorsal view; C, mesosoma in lateral view; D, petiole and gaster in lateral view.

Vertex with a pair of long erect setae; frontal lobe without seta; pronotal disc without long erect setae; 1st gastral tergum without erect setae. Head, mesosoma, petiole and gaster with fine appressed pubescence which is sparse and very short on head and gaster.

For color pattern see in Fig. 8; head, mesosoma and gaster dark brown; all legs yellowish brown.

Characteristics seen in syntypes of "*O. latidens* subsp. *sumatranus*". The morphological characteristics, excluding coloration, are almost completely the same between the syntypes of "*O. latidens* subsp. *sumatranus*" examined and the non-type workers listed above. In the syntypes the head, mesosoma and gaster are reddish brown and all legs are yellowish brown.

Queen measurements and indices. Holotype of *O. procerus*: HW 3.30 mm, HL 4.40 mm, SL 4.30 mm, IFLW 0.85 mm, EL 0.56 mm, OL 0.18 mm, MDL 2.46 mm, WL 5.68 mm, FWL 10.78 mm, PTL (unmeasurable), PTH (unmeasurable), CI 75, SI 130, MDI 55, PTHI (incalculable).

Syntypes of "*O. latidens* subsp. *sumatranus*" (n=2)**:** HW 2.93 mm, HL 3.90 mm, SL 4.00 mm, IFLW 0.78 mm, EL 0.46–0.50 mm, OL 0.16–0.17 mm, MDL 2.29 mm, WL 4.90 mm, FWL unmeasurable (due to the dealation), PTL 0.79–0.81 mm, PTH 1.87–1.92 mm, CI 75, SI 136, MDI 59, PTHI 229–243.

Queen description. In general appearance queen is similar to worker. Vertex near ocelli not swollen; ocular ridge clearly developed; distance between lateral ocelli as long as distance between lateral and median ocelli, and as long as major axis of median ocellus; ocelli in lateral view protruded dorsad. Mesosoma with main sclerites associated with wing function (Fig. 9B), in dorsal view short and stout; anterodorsal slope of pronotum in lateral view steep; anterodorsal outline of mesoscutum in lateral view relatively steep; mesoscutum with very weak

anteromedian depression (but posteromedian part of mesoscutum is deformed by pinning in holotype and syntypes); parapsidal furrow very weak and slightly curved; mesopleuron with fine, oblique furrow; propodeum in lateral view long with its dorsum almost straight and gradually sloping posteriad. Wing venation as in Fig. 9D. Petiolar node in lateral view, excluding apical spines with anterior face weakly convex, and posterior face weakly convex; apical spine short and relatively slender, and weakly curved posteriad; subpetiolar process anteroposteriorly as long as dorsoventrally high. First gastral tergum in lateral view relatively short, with anterior face moderately long and vertical.

Head in full-face view largely smooth and shiny, but with striate area bordered by frontal carinae and ocular ridges; frontal lobe smooth and shiny; extraocular furrow faintly striate; median part of vertex along median furrow smooth and shiny; lateral face and venter of head largely smooth and shiny, but posterolateral and posteroventral faces faintly striate; median disc of clypeus smooth and shiny. Pronotum densely and weakly striate transversely; mesoscutum largely smooth and shiny, with faintly striate in anterior face and anteromedian depression; area along posterior margin of mesoscutum weakly striate; mesopleuron largely smooth and shiny, with anteriormost part faintly striate; mesoscutellum smooth and shiny; propodeum strongly and sparsely striate transversely. Petiolar node excluding apical spine largely smooth and shiny.

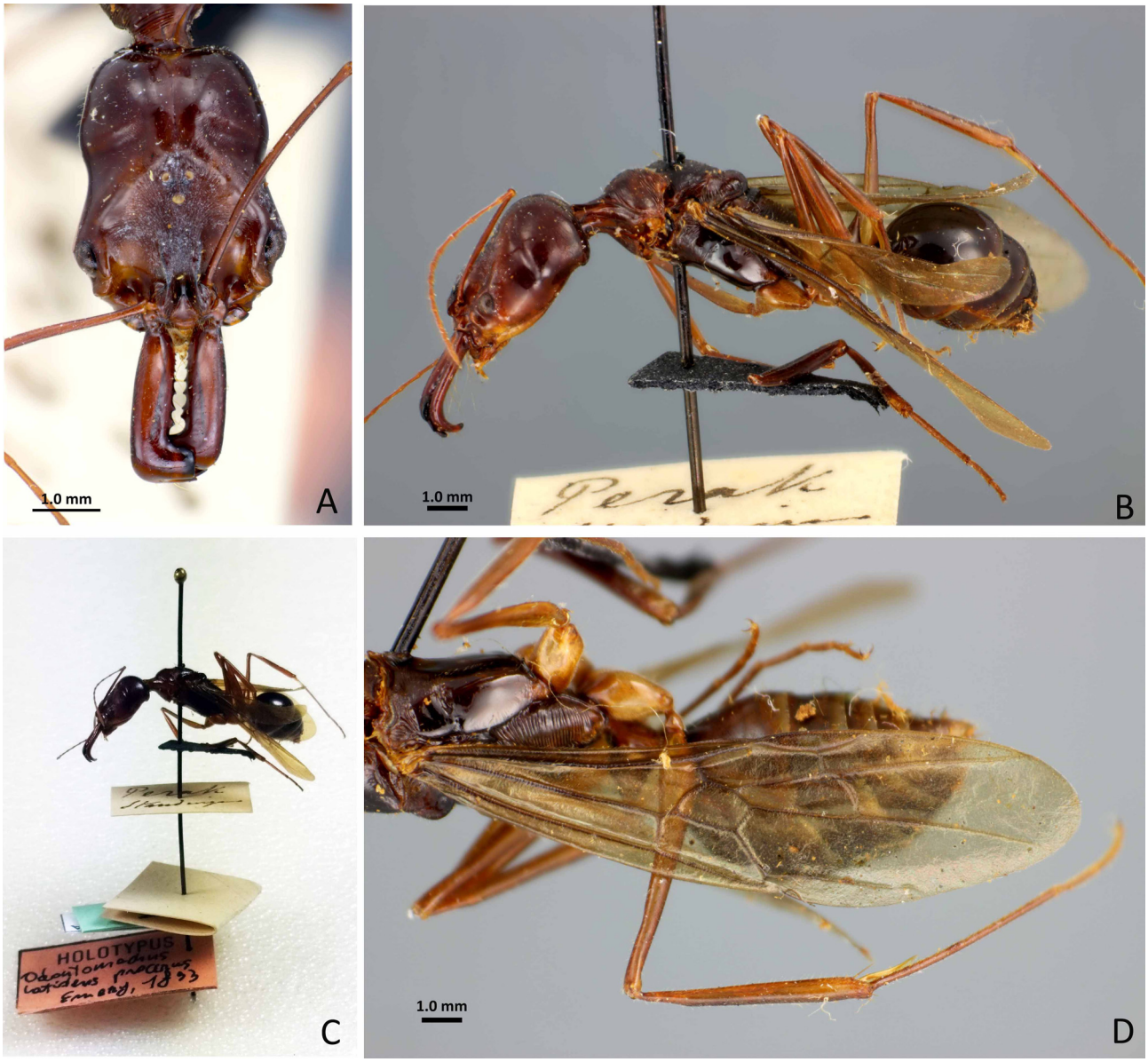

FIGURE 9. *Odontomachus procerus*, queen (holotype; ANTWEB CASENT0903998): A, head in full-face view; B, profile in lateral view; C, label; D, forewing.

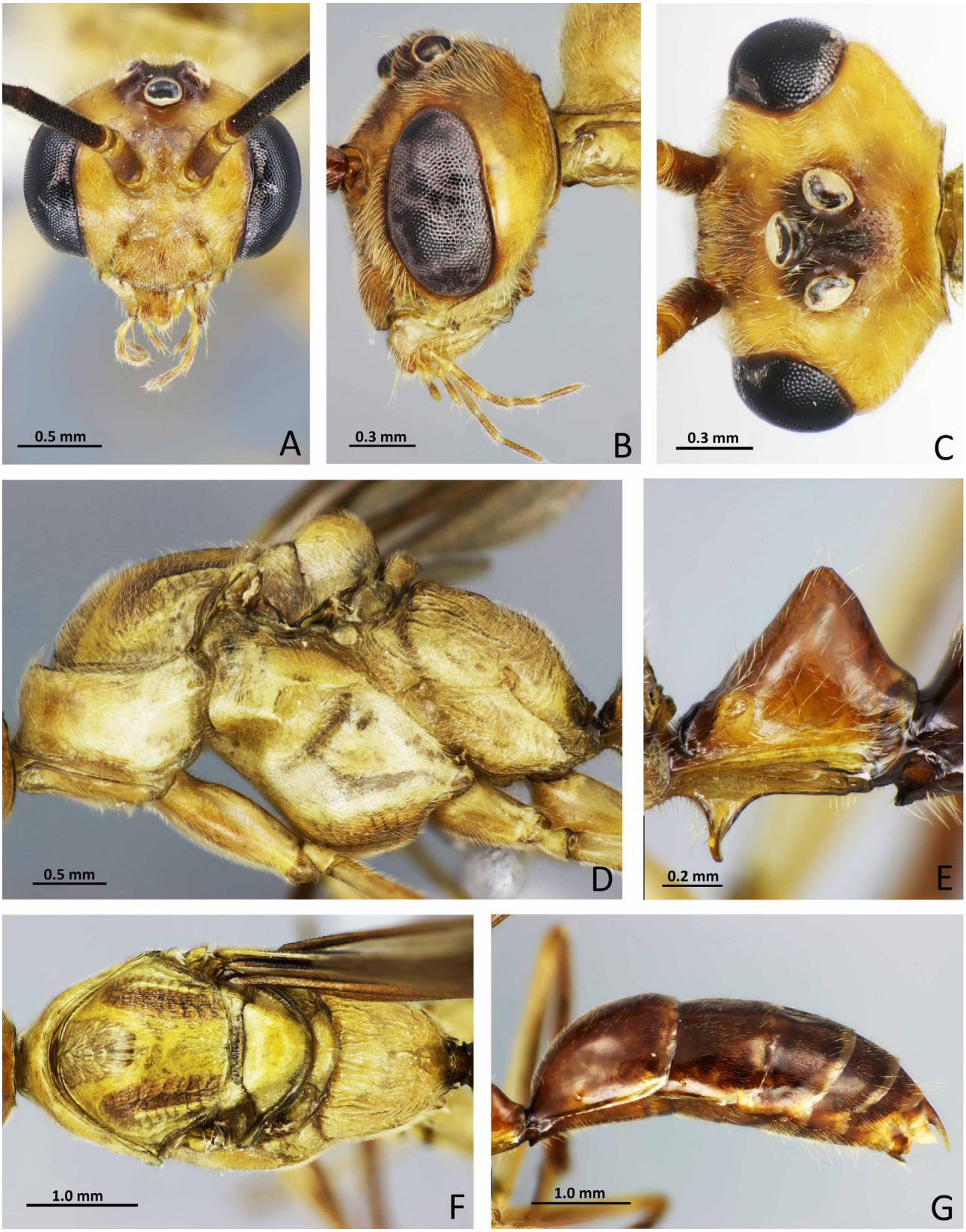

FIGURE 10. *Odontomachus procerus*, male (colony: SAGO-01-12; individual: SEMUT141215B): A, head in full-face view; B, head in lateral view; C, head in dorsal view; D, mesosoma in lateral view; E, petiole in lateral view; F, mesosoma in dorsal view; G, gaster in lateral view.

Pair of long erect setae present on vertex near lateral ocelli; frontal lobe and pronotal disc without erect setae; 1st gastral tergum without long erect setae. Head, mesosoma, petiole and gaster with sparse subdecumbent to decumbent pubescence which is extremely short on gaster; mesopleuron with very sparse pubescent.

For color pattern see in Fig. 9; head, mesosoma, petiole and gaster dark reddish brown; all legs light reddish brown.

Male measurements and indices. Non-types (n=8): HW 1.55–1.70 mm, HL 1.35–1.43 mm, SL 0.26–0.30 mm, EL 0.80–0.97 mm, EW 0.45–0.51 mm, OL 0.20–0.22 mm, OES 0.23–0.31 mm, WL 3.90–4.15 mm, FWL 6.86–7.64 mm, PTL 0.79–0.81 mm, PTH 0.93–1.08 mm, CI 114–121, SI 13–18, PTHI 117–128.

Male description. Size large (HL 1.35–1.43 mm, WL 3.90–4.15 mm). Major axis of median ocellus as long as minimum distance between lateral ocelli; antenna 13-merous; scape very short, 1/4 as long as 3rd antennomere; 2nd antennomere 1/2 as long as scape; 3rd to 13th antennomeres each extremely long; palp formula 6, 4; dorsal outline of clypeus in lateral view weakly convex. Mesosoma in lateral view relatively stout and long; dorsal outline of pronotum in lateral view almost straight; anterodorsal outline of mesoscutum in lateral view gently sloping; mesoscutum without median depression; parapsidal furrow weak and almost straight; oblique mesopleural furrow relatively shallow and narrow; ventrolateral part of katepisternum with a very weak longitudinal furrow; propodeum in lateral view with its dorsal outline roundly convex; metapleuron separated from propodeum indistinctly by suture; wing venation similar to queen (see Fig. 9D for queen wings). Petiolar node broadly conical, with blunt apex; anterior slope of petiolar node in lateral view almost straight, and its posterior slope weakly convex; subpetiolar process in lateral view anteroposteriorly shorter than dorsoventrally high, triangular and much slender; petiolar sternum without posteroventral process. First gastral tergum in lateral view long; posterior spine of 8th abdominal tergum long and slender, very weakly curved (Fig. 18D); pygostyle with long setae in its apical 2/3; disc of 9th abdominal sternum almost circular, much longer than apical lobe, of which almost parallel lateral margins and weakly convex apex; telomeral apex in lateral view longer than high; distiventral apex of valviceps weakly produced; basiventral corner of valviceps not produced; ventral margin of valviceps with 27–31 denticles.

Head including area between lateral ocelli entirely smooth and shiny. Pronotum in dorsal view with rough texture and shiny; mesoscutum with rough texture and shiny; scuto-scutellar suture with sparse, strong, longitudinal rugae; mesopleural anepisternum and katepisternum smooth and shiny; propodeum with sparse, strong, longitudinal striate. Petiole smooth and shiny.

Head, mesosoma, legs, petiole and gaster with fine dense subdecumbent to decumbent pubescence; mandible, vertex near ocelli and gaster except 1st gastral tergum with several long setae.

For color pattern see in Fig. 10; petiole and gaster darker than head and mesosoma; scape yellowish brown and 3rd to 13th antennomeres darker than scape.

Species recognition. In 1893, Emery described *O. latidens* r. *procerus* from the Malay Peninsula based on the queen, and then, in 1900, he described *O. latidens* subsp. *sumatranus* from Sumatra based on the worker and queen. Both of the two forms were regarded as varieties of *O. latidens*, and were synonymized by Brown (1976) with the nominotypical subspecies of *O. latidens* (type locality: Java).

During our survey on Sumatran species of *Odontomachus*, we discovered colonies (containing workers, queens and males) which seemed to be relevant to *O. latidens* sensu lato. We compared these non-type queens with the holotype (queen) of *"O. latidens* subsp. *procerus*"; syntype queens of *O. latidens* subsp. *sumatranus*; and non-type queens from Java (colony JV02/03-SKY-39) which were identified by us as *O. latidens* based on Brown (1976). As a result of these comparisons we were able to separate two forms. The form "A" is characterized by the masticatory margin of the mandible with 6–9 distinct denticles that are reduced in size toward the base of the mandible, and the 1st gastral tergum without erect setae, and it is morphologically equivalent to the type material of "*O. latidens* subsp. *procerus*" and "*O. latidens* subsp. *sumatranus*". On the other hand, the form "B" is characterized by the masticatory margin of mandible with very small denticles or sometimes without denticles (only preapical angle recognized), and the 1st gastral tergum with short erect setae that are shorter than those on vertex near ocelli. The form B is clearly different from the type material of "*O. latidens* subsp. *procerus*" and "*O. latidens* subsp. *sumatranus*" but agrees well with the non-type queens of *"O. latidens*" from Java. The forms A and B are also distinguishable from each other by the male morphology. The male of the form A is characterized by the following characters: body relatively dark; subpetiolar process in lateral view anteroposteriorly shorter than dorsoventrally high, triangular; posterior spine of 8th abdominal tergum long and slender, very weakly curved; disc

of 9th abdominal sternum almost circular, much longer than apical lobe, of which almost parallel lateral margins and weakly convex apex; telomeral apex in lateral view longer than high. On the other hand, the male of the form B is characterized by the body relatively light in color; subpetiolar process in lateral view anteroposteriorly as long as dorsoventrally high, lobate; posterior spine of 8th abdominal tergum short and thick, very weakly curved; disc of 9th abdominal sternite not clearly differentiated from apical lobe, gradually merging into apical lobe, with basal margin almost straight; apical lobe gently tapering apicad, with apical margin truncated; telomeral apex in lateral view longer than high.

These differences between the two forms indicate a species-level delimitation between the two. Because we have not yet found the type material of *O. latidens* in any possible type depositories in Western countries, we are unable to confirm with certainty the identity of *O. latidens.* Thus, we provide here a tentative solution of this taxonomic problem: (1) the form A is identified as *O. latidens* subsp. *procerus* Emery, 1893, and the taxon is revived and raised to species; (2) *O. latidens* subsp. *sumatranus* is synonymized with *O. procerus*; and (3) the form B is, at present, treated as *O. latidens*.

Distribution. Indonesia (Sumatra) and Malaysia (Malay Peninsula, Sabah and Sarawak).

Bionomics. *Odontomachus procerus* inhabits secondary and primary forests in the highlands (between 800 and 1300 m alt., but one specimen in SKYC was collected from Sabah at an elevation of 550-610 m alt.), and it nests in the soil near the base of living trees. The colony SAGO-01-12 collected in Sago Mountain, West Sumatra, was collected nesting together with *Pheidole inornata* (colony SAGO-02-12). Details concerning the nature of their relationship are unknown.

DNA barcoding. The average K2P distance between *O. procerus* and *O. latidens* was 11.89% (SE=1.78%). This value falls within upper part of the full range of pairwise average interspecific distance: between 5.48% (*O. rixosus* vs. *O. pararixosus*, SE=1.04%) and 14.38% (*O. simillimus* vs. *O. procerus*, SE=1.84%) (Table 1). The results support the species-level delimitation between *O. procerus* and *O. latidens*.

TABLE 1. Pair-wise distances of the Folmer region of the CO1 gene among the five Sumatran species and *Odontomachus pararixosus*: *O. simillimus* (n=4), *O, latidens* (n=1), *O. procerus* (n=1), *O. rixosus* (n=10), *O. pararixosus* (n=1), *O. minangkabau* (n=2). K2P distances are beneath the diagonal, and p-distances (%) are above the diagonal. Range of the distance is shown in parenthesis.

No.	Species	*O. simillimus*	*O. latidens*	*O. procerus*	*O. rixosus*	*O. pararixosus*	*O. minangkabau*
1	*O. simillimus*		12.73 (12.62−12.85)	13.08	9.94 (8.88−11.21)	9.70 (9.58−9.81)	10.40 (10.05−10.75)
2	*O. latidens*	0.140 (0.138−0.141)		10.98	10.12 (9.58−11.45)	9.58	9.81
3	*O. procerus*	0.144	0.119		9.11 (8.88−9.58)	9.11	8.18
4	*O. rixosus*	0.107 (0.095−0.122)	0.109 (0.103−0.124)	0.097 (0.095−0.103)		5.28 (5.14−5.84)	8.01 (7.71−9.11)
5	*O. pararixosus*	0.104 (0.103−0.105)	0.102	0.097	0.055 (0.053−0.061)		6.31
6	*O. minangkabau*	0.112 (0.108−0.116)	0.105	0.087	0.085 (0.081−0.097)	0.066	

***Odontomachus rixosus* F. Smith, 1857**

(Figs. 11, 12, 13, 17, 18)

Odontomacus rixosus F. Smith, 1857: 64, worker, type locality: Singapore. Forel, 1900: 58; Viehmeyer, 1916: 116; Crawley, 1924: 388 (q); Karavaiev, 1925: 293; Chapman & Capco, 1951: 45; Wheeler & Wheeler, 1952: 651 (l); Brown, 1976: 163; Imai, Brown *et al*, 1984: 67 (k). Bolton, 1995: 297; Sorger & Zettel, 2011: 157.

Odontomachus rixosus var. *conifera* Forel, 1913: 19, worker, queen, type locality: Indonesia (Java). Chapman & Capco, 1951: 45. Synonymy by Brown, 1976: 105.

Odontomachus rixosus var. *obscurior* Forel, 1900: 58, worker, type locality: Myanmar. Viehmeyer, 1916: 116 (q); Chapman & Capco, 1951: 45. Synonymy by Brown, 1976: 105.

Type materials and images examined. Syntype worker of *Odontomachus rixosus*: syntype (1 worker in BMNH), Singapore [head detached and missing gaster].

Images of the type material of the following species provided in AntWeb v5.17.5 (http://www.antweb.org) were also examined for reconfirming our species recognition: *O. rixosus*, worker (CASENT0900656); "*O. rixosus conifera*", worker (CASENT0907432); "*O. rixosus obscurior*", worker (CASENT0907431).

Non-type materials examined. Indonesia: Sumatra: Aceh: Leuser Ecosystem (ca. 980 m alt.), S. Rijal leg., GK-01-12, 12 workers (SKYC, RSC); same loc., (ca. 980 m alt.), 19.IX.2012, S. Rijal leg., GK-15-12, 16 workers (SKYC, RSC); same loc., (ca. 1000 m alt.), 21.IX.2012, S. Rijal leg., GK-42-12, 14 workers (SKYC, RSC); same loc., (ca. 980 m alt), 19.IX.2012, S. Rijal leg., GK-01-12, 2 workers (SKYC, RSC); same loc., (ca. 980 m alt.), 20.IX.2012, GK-20-12, 4 workers (SKYC, RSC); same loc., (ca. 1000 m alt.), 21.IX.2012, S. Rijal leg., GK-40-12, 12 workers, 2 queen (SKYC, RSC); West Sumatra: Ulu Gadut nr Padang, 27–30.VIII.1985, Sk. Yamane leg., SNS coll., 8 workers (SKYC); Lubuk Gadang, 21–23.VIII.1985, Sk. Yamane leg., SNS coll., 2 workers (SKYC); Padang: Ulu Gadut: Pinang-pinang, 22.III.1997, F. Ito leg., F197-385, 3 workers (SKYC); same loc., 18.II.2007, Sk. Yamane leg., 1 worker (SKYC); Andalas University's forest (ca. 200–600 m alt.), 02.IX.2012, S. Rijal leg., PDG-01-12, 6 workers (SKYC, RSC); same loc., 14.IX.2011, 9 workers (SKYC, RSC); same loc., 02.VIII.2012, S. Rijal leg., PDG-01-12, 5 workers (SKYC, RSC); 50 Kota District: Mt. Sago, 06.IX.2012, S. Rijal leg., SAGO-06-12, 3 workers (SKYC, RSC); Harau, Gantiang, 10.IX.2012, S. Rijal leg., GTH-01-12, 8 workers, 3 queen (SKYC, RSC); Tanah Datar District: Barulak, 05.IX.2012, S. Rijal leg., LBT-03-12, 4 wokrkers (SKYC, RSC); same loc., 07.IX.2012, S. Rijal leg., LBT-11-12, 8 workers (SKYC, RSC); Solok District: Mt. Talang (general collection), 23–28.VIII.2012, S. Rijal leg., 4 workers (SKYC, RSC); Jambi: Merangin: Sungai Manau: Kerinci Seblat N.P., 7.XI.2006, Syaukani leg., SYAU06-75, 7 workers, 1 queen (SKYC); Lampung: Sumber Jaya: Bodong Jaya, 16.IX.2007, Sk. Yamane leg., SU07-SKY-149, 4 workers (SKYC); same loc., 18.IX.2007, Sk. Yamane leg., SU07-SKY-204, 9 workers (SKYC); W. Lampung: Sumber Jaya (800–900 m alt), 16.IX.2007, Sk. Yamane leg., SU07-SKY-158, 8 workers (SKYC). Simeulue Island: Luan Boya, 16.IX.2012, S. Rijal leg., LLB-01-12, 29 workers, 2 queens (SKYC. RSC); Lewak: Alafan, 13.IX.2012, S. Rijal leg., LW-08-12, 17 workers, 4 queens (SKYC, RSC); same loc., 13.IX.2012, S. Rijal leg., LW-10-12, 11 workers, 1 queen (SKYC, RSC); E. Simeulue Island: Sinabang, 15.IX.2012, S. Rijal leg., SNB-03-12, 24 workers (SKYC, RSC); W. Simeulue Island: Babul Makmur, 15.IX.2012, S. Rijal leg., 13 workers, 1 queen (SKYC, RSC); same loc., same date, BMS-21-12, 10 workers (SKYC, RSC). Bali: Mendaya: Dusun PK Jelati, 6.V.1998, K. Eguchi leg., EG98-BALI-739, 3 workers (SKYC); Jembrana District: Pekutatan: Pulukan, 23.X.2012, S. Rijal leg., PKN-01-12, 38 workers, 7 queens (SKYC, RSC). Mentawai Islands: Siberut Island: Simabuggei, 22.II.2007, Sk. Yamane leg., SU07-SKY-078, 5 workers (SKYC). **Malaysia.** Sabah: Poring: Kinabalu (550–600 m alt), 19.III.1995, Sk. Yamane leg., 1 worker (SKYC); same loc., (450–500 m alt.), 21.XI.1996, K. Eguchi leg., EG96-BOR-269, 1 worker (SKYC); same loc., (600–700 m alt.), 16.III.1995, Sk. Yamane leg., 2 workers (SKYC); same loc., (700–800 m alt), Sk. Yamane leg., 5 workers (SKYC); Poring Hot spring (600 m alt), 20.IX.1993, T. Kikuta leg., 2 workers (SKYC); Poring (600 m alt), 26.X.1996, T. Kikuta leg., 6.X2606-(2)Aa, 5 workers (SKYC), 6X2606-(8)Ba, 4 workers (SKYC); Sayap Kinabalu, ca. 1000 m alt., 15.VII.1996, K. Eguchi leg., Eg96-BOR-057, 3 workers, 1 male (SKYC); same loc., same date, HN-140, 1 workers (SKYC); same loc., same date, HD-112, 1 worker (SKYC); same loc., same date, HN-153, 1 worker (SKYC), same loc., same date, Eg96-BOR-056, 3 workers (SKYC); same loc., same date, HD-95, 1 worker (SKYC); same loc., same date, HD-97, 1 worker (SKYC); same loc., same date, S-17, 1 worker (SKYC); same loc., same date, HD-116, 1 worker (SKYC); same loc., 14.VII.1996, Sk. Yamane leg., 3 workers (SKYC); same loc., 15.VIII.1996, Sk. Yamane leg., SB96-SKY-5, 1 worker (SKYC); same loc., 14.VII.1996, Sk. Yamane leg., HC-4, 1 worker (SKYC); Sg. Kalang, Tenom, 800–1000 m alt., 23.III.1997, Sk. Yamane leg., 1 worker (SKYC); Danum valley, 2.XI.1996, K. Eguchi leg., Eg96-BOR-125, 6 workers (SKYC); same loc., 6.XI.1996, K. Eguchi leg., EG96-BOR-203, 3 workers (SKYC); Tawau hills N. P. HQ., 7-12.VII.1996, Sk. Yamane leg. , 1 worker (SKYC); Tambunan village resort centre, 05.XI.2000, Sk. Yamane leg., SB00-SKY-04, 1 queen (SKYC); Crocker range N.P., Mahua Waterfall area (ca. 1000 m alt.), 05.XI.2000, B.T. Viet leg., 1 worker (SKYC); same loc., 04.XI.2000, K. Eguchi leg., Eg00-BOR-110, 1 worker (SKYC). Sarawak: Bako Nat. Park., 21-22.IV.1993, Sk. Yamane leg., 3 workers (SKYC); Niah N. P., 9.I.1993, Sk. Yamane leg., 5 workers (SKYC); Mulu (lowland), 11.XI.1993, Sk. Yamane leg., 2 workers (SKYC); Miri, Tower region, Lambir N. P., 16.II.1995, Abd. Rahman leg., 1 worker (SKYC). Malay Peninsula: Selangor: Ulu Gombak, 12.III.1999, F. Ito leg., F199-139, 3 workers (SKYC); same loc., VII-X.1992, F. Ito leg., 1 worker (SKYC); same loc., (ca. 250 m alt.), 05.VII.1999, Sk. Yamane leg., 2 workers (SKYC); Selangor (ca. 250 m

alt.), 5.VII.1999, Sk. Yamane leg., 2 workers (SKYC). **Thailand:** Chacheongsao: Khao Ang Reu Nai W.S. near Headquarters (secondary forest), 22.VIII.2003, Sk. Yamane leg., TH03-SKY-97, 18 workers, 1 queen (SKYC). Chanthaburi: Khao Soi Dao W.S. (rainforest), 3.VI.2001, Sk. Yamane leg., TH01-SKY-07, 8 workers, 2 queens (SKYC); same loc., 20.VII.1997, Sk. Yamane leg., 11 workers (SKYC); same loc., 19–20.VII.1997, H. Okido leg., 8 workers (SKYC); Nam Thok Phlio N.P. (300–500 m alt.), 21.IX.2003, Sk Yamane leg., 3 workers (SKYC). Nakom Ratchasima: Sakaerat lowland forest (DEF), 09.VII.1999, Sk. Yamane leg., 4 workers (SKYC); Khao Nan N.P., Klong Klai stn., 13.III.2007, Sk. Yamane leg., 2 workers (SKYC); Khao Nan N.P., Papra stn., 14.III.2007, Sk. Yamane leg., 2 workers (SKYC). Songkhla: Hatyai, Prince of Songkhla University forest, 17.III.2007, Sk. Yamane leg., TH07-SKY-72, 3 workers (SKYC); same loc., 17.III.2007, Sk. Yamane leg., TH07-SKY-72, 3 workers (SKYC); Khao Nam Kang N.P., 25.VII.1997, Sk. Yamane leg., 1 worker (SKYC); Pattani: Sa i Kho, 25.VIII.1998, Sk. Yamane leg., 1 worker, 1 queen (SKYC). Trang: Khao Chong (river side), 25.VIII.1998, Sk. Yamane leg., 3 workers (SKYC). Suratthani: Khlongsane W.S. (evergreen forest), 14.X.2011, W. Jaitrong leg., 1 worker (SKYC).

Material used for DNA barcoding. Colony BMS-22-12 (RJ20141201-3, accession no. LC056035), colony GK-15-12 (RJ20141201-13, LC056036), colony GTH-01-12 (RJ20141201-2, LC056038), colony LBT-06-12 (RJ20141201-8, LC056039), colony LBT-07-12 (RJ20141201-9, LC056040), colony LBT-09-12 (RJ20141201-7, LC056041), colony LBT-10-12 (RJ20141201-10, LC056042), colony SAGO-06-12 (RJ20141201-14, LC056053), colony PDG-13-12 (RJ20141114-1, LC056046), colony PKN-01-12 (RJ20141114-2, LC056050).

FIGURE 11. *Odontomachus rixosus*, worker (colony: PDG-13-12; individual: SEMUT141230K): A, head in full-face view, with an arrow indicating subapical tooth of mandible; B, mesosoma in dorsal view; C mesosoma in lateral view; D petiole and gaster in lateral view.

FIGURE 12. *Odontomachus rixosus*, queen (colony: GTH-01-12; individual: SEMUT150102A): A, head in full-face view; B, mesosoma in dorsal view; C, mesosoma in lateral view; D, petiole and gaster in lateral view; E, forewing; F, hindwing.

Worker measurements and indices. Syntype (n=1, gaster missing): HW 2.10 mm, HL 2.98 mm, SL 2.93 mm, IFLW 0.64 mm, EL 0.36 mm, MDL 1.64 mm, WL 4.00 mm, PTL 0.72 mm, PTH 1.21 mm, CI 70, SI 139, MDI 55, PTHI 168.

Non-types (n=10): HW 1.77–2.19 mm, HL 2.56–3.03 mm, SL 2.56–3.03 mm, IFLW 0.45–0.56 mm, EL 0.31–0.42 mm, MDL 1.45–1.67 mm, WL 3.35–4.00 mm, PTL 0.57–0.69 mm, PTH 1.09–1.26 mm, CI 64–73, SI 131–150, MDI 55–57, PTHI 171–196.

Worker description. Relatively small (HL 2.56–3.03 mm, WL 3.35–4.00 mm). Head in full-face view much longer than broad, with posterior margin weakly concave; median furrow on vertex present as dark line; each side

of line not swollen; frontal lobes followed by strong frontal carinae which are nearly parallel; minimum distance between margin of ocular ridge and margin of compound eye less than half major axis of compound eye; mandible relatively slender; masticatory margin with 6–10 denticles (7 in a syntype of *O. rixosus* examined; 7 in a syntype of *O. rixosus conifer* [ANTWEB CASENT 0907432]; 6 in a syntype of *O. rixosus obscurior* [ANTWEB CASENT 0907431]); subapical tooth ca. 2.5 times as long as broad, with truncate apex; palp formula 4, 4. Mesosoma in lateral view relatively slender; pronotum including its anteromedian lobe long, in lateral view with anterodorsal slope gentle; mesopleuron without anteroventral ridge, with anterodorsal margin weakly carinate, clearly separated by distinct dorsal carina from mesonotum and metapleuron; propodeum in lateral view with dorsum almost straight and gradually sloping posteriad, and with posterior face steeply sloping; propodeal dorsum without median longitudinal depression. Petiolar node conical, with sharply pointed apical spine; node in lateral view, excluding apical spine with anterior and posterior faces weakly convex; apical spine needle-shaped, less than 1/4 as long as petiolar height, sometimes weakly curved posteriad (but shape variable within species); subpetiolar process anteroposteriorly as long as dorsoventrally high, lobate, directed ventrally. First gastral tergum in lateral view long, with anterior face relatively short and vertical.

Head in full-face view largely smooth and shiny, but with striate area bordered by frontal carinae and ocular ridges; frontal lobe with almost smooth and shiny; extraocular furrow faintly striate; median part of vertex along median furrow smooth and shiny or sometimes with rough texture; lateral face and venter of head smooth and shiny; median disc of clypeus smooth and shiny. Pronotum in dorsal view finely concentrically striate (but sculpture variable within species); mesonotum finely striate transversely; mesopleuron largely smooth and shiny, with anterior 1/3 and posteriormost parts finely striate; metapleuron and propodeum with transverse striation which is a little sparser and stronger than on pronotum and mesonotum. Petiolar node largely smooth and shiny, but with its basal area faintly striate.

Vertex with a pair of long erect setae; frontal lobe with erect seta; pronotal disc without long erect setae; 1st gastral tergum without erect setae. Head, mesosoma, petiole and gaster with fine appressed pubescence which is sparse and very short on head and petiole and is sparse and extremely short on gaster.

For color see in Fig. 11; body orange-brown, with darker mesosoma and gaster; leg yellowish brown (Fig. 11) to orange-brown, with coxae and femora paler.

Queen measurements and indices. Non-types (n=10): HW 1.87–2.17 mm, HL 2.53–2.96 mm, SL 2.49–2.76 mm, IFLW 0.42–0.57 mm, EL 0.39–0.50 mm, OL 0.12–0.18 mm, MDL 1.45–1.63 mm, WL 3.50–4.05 mm, FWL 6.46–8.33 mm, PTL 0.65–0.70 mm, PTH 1.40–1.56 mm, CI 72–76, SI 124–136, MDI 52–58, PTHI 214–229.

Queen description. In general appearance queen is similar to worker. Vertex near ocelli not swollen; ocular ridge clearly developed; distance between lateral ocelli shorter than or as long as distance between lateral and median ocelli, and as long as major axis of median ocellus; ocelli in lateral view protruded dorsad. Mesosoma with main sclerites associated with wing function (Figs. 12B, 12C), in dorsal view long and slender; anterodorsal slope of pronotum in lateral view gentle; anterodorsal outline of mesoscutum in lateral view relatively gentle; mesoscutum without posteromedian depression; parapsidal furrow very weak, and slightly curved; anterior third of mesopleuron with fine, oblique furrow (sometimes without any furrow); propodeum in lateral view long, with dorsum almost straight and gradually sloping posteriad. Wing venation as in Figs. 12E and 12F. Petiolar node in lateral view, excluding apical spine with anterior and posterior faces weakly convex; apical spine short and stout, and sometimes weakly curved posteriad; subpetiolar process anteroposteriorly as long as dorsoventrally high. First gastral tergum in lateral view long, with anterior face relatively short and vertical.

Head in full-face view largely smooth and shiny, but with a striate area bordered by frontal carinae and ocular ridges; frontal lobe almost smooth and shiny; extraocular furrow faintly striate; median part of vertex along median furrow smooth and shiny or sometimes with rough texture; lateral face and venter of head smooth and shiny; median disc of clypeus smooth and shiny. Pronotum densely and weakly striate transversely (often dorsolateral part smooth and shiny); mesoscutum faintly longitudinally striate (but sometime largely smooth and shiny, and faintly striate along posterior margin of mesoscutum); mesopleuron largely smooth and shiny, with anterior third and posteriormost part faintly striate; mesoscutellum smooth and shiny; propodeum strongly and sparsely striate transversely. Petiolar node largely smooth and shiny, with its basal area faintly striate.

Pair of long erect setae present on vertex near lateral ocelli; frontal lobe with a erect seta; pronotum and 1st gastral tergum without erect setae. Head, mesosoma, and petiole with sparse subdecumbent to decumbent pubescence which is extremely short in head and gaster; mesopleuron very sparsely pubescent.

For color see in Fig. 12; head, mesosoma, petiole and gaster reddish brown; all coxae and femora yellowish brown; tibiae reddish brown.

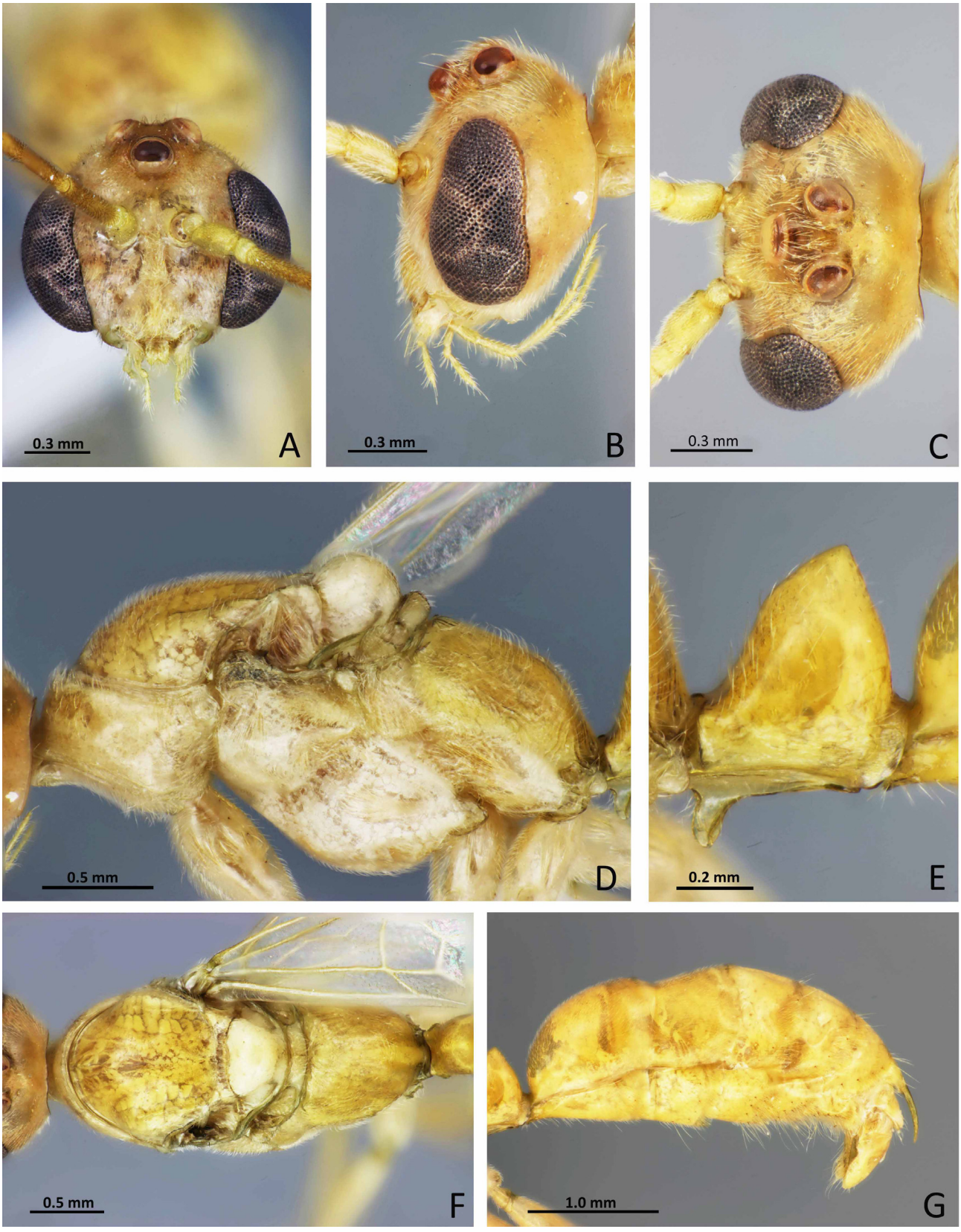

FIGURE 13. *Odontomachus rixosus*, male (colony: PKN-01-12; individual: SEMUT150103A): A, head in full-face view; B, head in lateral view; C, head in dorsal view; D, mesosoma in lateral view; E, petiole in lateral view; F, mesosoma in dorsal view; G, gaster in lateral view.

Male measurements and indices. Non-types (n=10): HW 1.19–1.35 mm, HL 1.04–1.14 mm, SL 0.20–0.26 mm, EL 0.70–0.84 mm, EW 0.37–0.46 mm, OL 0.16–0.22 mm, OES 0.16–0.18 mm, WL 2.63–2.93 mm, FWL 4.52–5.58 mm, PTL 0.56–0.64 mm, PTH 0.78–0.90 mm, CI 107–120, SI 15–20, PTHI 135–152.

Male description. Size small (HL 1.04–1.14 mm, WL 2.63–2.93 mm). Major axis of median ocellus as long as minimum distance between lateral ocelli; antenna 13-merous; scape very short; 1/3 as long as 3rd antennomere; 2nd antennomere 1/2 as long as scape; 3rd to 13th antennomeres each extremely long; palp formula 6, 4; dorsal outline of clypeus in lateral view weakly convex. Mesosoma in lateral view relatively slender and long; dorsal outline of pronotum in lateral view almost straight; anterodorsal outline of mesoscutum in lateral view gently sloping; mesoscutum without median depression; parapsidal furrow very weak and almost straight; oblique mesopleural furrow relatively shallow and wide; ventrolateral part of katepisternum with very weak longitudinal furrow; propodeum in lateral view with its dorsal outline roundly convex; metapleuron separated from propodeum indistinctly by suture; wing venation similar to queen (see Figs. 12E and 12F for queen wings). Petiolar node in lateral view tapering gently to bluntly pointed apex; its anterior slopes weakly convex, and posterior slope almost straight; subpetiolar process in lateral view anteroposteriorly shorter than dorsoventrally high, lobate and slender; petiolar sternum without posteroventral process. First gastral tergum in lateral view short; posterior spine of 8th abdominal tergum long and slender, very weakly curved (Fig. 18B); pygostyle with long setae in its apical third; disc of 9th abdominal sternum much broader than long, with posterolateral corner expanding laterad; apical lobe much longer than disc and gently tapering to almost truncate apex; telomeral apex in lateral view longer than high; distiventral apex of valviceps strongly produced; basiventral corner of valviceps distinctly produced; ventral margin of valviceps with 21−22 denticles.

Head including area between lateral ocelli entirely smooth and shiny. Pronotum in dorsal view smooth and shiny; mesoscutum smooth and shiny; scuto-scutellar suture with sparse, strong, longitudinal rugae; mesopleural anepisternum and katepisternum smooth and shiny; metapleuron smooth and shiny; propodeum in dorsal view with rough texture and shiny. Petiole smooth and shiny.

Head, mesosoma, legs, petiole and gaster with fine sparse subdecumbent to decumbent pubescence; mandible, vertex near ocelli, and gaster except 1st gastral tergum with long erect setae.

For color pattern see Fig. 13; males from Thailand always darker than those from the other localities.

Species recognition. The syntype workers of *Odontomachus rixosus*, *O. rixosus conifer* (ANTWEB CASENT 0907432) and *O. rixosus obscurior* (ANTWEB CASENT 0907431) are similar to the non-type material listed above. In the syntypes of *O. rixosus* and *O. rixosus conifer* the pronotal disc is finely striate transversely, but finely concentric in *O. rixosus obscurior*. *Odontomachus rixosus* is very similar in general appearance to *O. pararixosus*, but is distinguishable from the latter by the weakly notched posterior head margin (almost straight in the latter); the apical spine of the petiolar node is needle-shaped (acutely triangular in the latter); and the first gastral tergite lacks long suberect setae (present in the latter). The delimitation between *O. rixosus* and *O. minangkabau* is discussed under *O. minangkabau*.

Distribution. *Odontomachus rixosus* is distributed throughout tropical Asia: Indo-Malayan subregion (Western part of Indonesia, Malaysia, Brunei and Phillipines), India, Myanmar, Thailand, Vietnam, Cambodia and Laos.

Bionomics. *Odontomachus rixosus* inhabits plantations, secondary and primary forests in lowlands, and nests under leaf litter, in the soil near the base of living trees, and under rotten logs and stumps. This species has been collected nesting together with *Pheidole tandjongensis* ("compound colonies" GK-01-12/ GK-02-12, GK-20-12/ GK-55-12, LBT-11-12/ LBT-12-12, SAGO-06-12/ SAGO-05-12, PDG-01-12/ PDG-02-12, SU07-SKYC-204, TH03-SKY-91, TH03-SKY-152, TH91-RX-01, MP05-SKY-56, SU07-SKY-158, TH00-SKY-59, and SU07-SKY-078) and with *P. inornata* Eguchi, 2001 ("compound colonies" GTH-01-12/GTH-02-12, SOO-SKY-04, TH01-SKY-07, and SB06-SKY-78). Details concerning the nature of the relationship between *O. rixosus* and *Pheidole* spp. are unknown.

DNA Barcoding. See under *O. minangkabau*

***Odontomachus minangkabau* sp. nov.**
(Figs. 14, 15, 16, 17, 18)

Type material. Holotype, worker, secondary forest within the campus of Andalas University, Padang, West Sumatra, Indonesia [RS01-PDG-14, Robby J. leg., 22.ix.2014] (MZB); paratypes: 17 workers, 1 queen, 5 males, same data as holotype (MZB, MHNG, MCZC & RSC).

Non-type material examined. Indonesia: Jambi, Kerinci Seblat N. P., 8.XI.2006, Syaukani leg., 2 workers (SKYC); same loc., 10.XI.2006, Syaukani leg., SYAU06-39, 7 workers (SKYC). Lampung: Sumber Jaya, Bodong Jaya, 16.IX.2007, Sk. Yamane leg., Su07-SKY-159, 19 workers (SKYC). West Sumatra: Maninjau, 7–9.VIII.1985, S. & Sk. Yamane leg., 3 workers (SKYC); same loc., 7.VIII.1985, S. & Sk. Yamane leg., 2 workers (SKYC); same loc., 16-18.VIII.1985, S. & Sk. Yamane leg., 1 worker (SKYC); Padang, 30.XI.1983, K. Nakamura leg., 83-PD-2, 1 worker (SKYC); Padang, HPPB UNAND, 14.IX.2011, S. Rijal leg., 15 worker (SKYC); same loc., 10.X.2012, S. Rijal leg., PDG-22-12, 30 workers, 2 queens (SKYC, RSC); same loc., 11.IX.2012, S. Rijal leg., PDG-12-12, 11 workers (SKYC, RSC); Lubuk Gadang, 21-23.VIII.1985, Sk. Yamane leg., SNS col., 4 workers (SKYC); Sako nr Tapan, 4–5.IX.1985, Sk. Yamane leg., 2 workers (SKYC); Ulu Gadut nr Padang, 27–30.VIII.1985, Sk. Yamane leg., 2 workers (SKYC); Ulu Gadut, Satar house, E. Suzuki leg., 1 worker (SKYC); Ulu Gadut, Pinang-pinang, 29.IV.1997, F. Ito leg., 1 worker (SKYC); same loc., 13.VIII.1989, E. Suzuki leg., 1 worker (SKYC).

Materials used for DNA barcoding. Colony PDG-22-12 (RJ20141201-1, LC056047), colony RS01-PDG-14 (RJ20150126-2, LC056051).

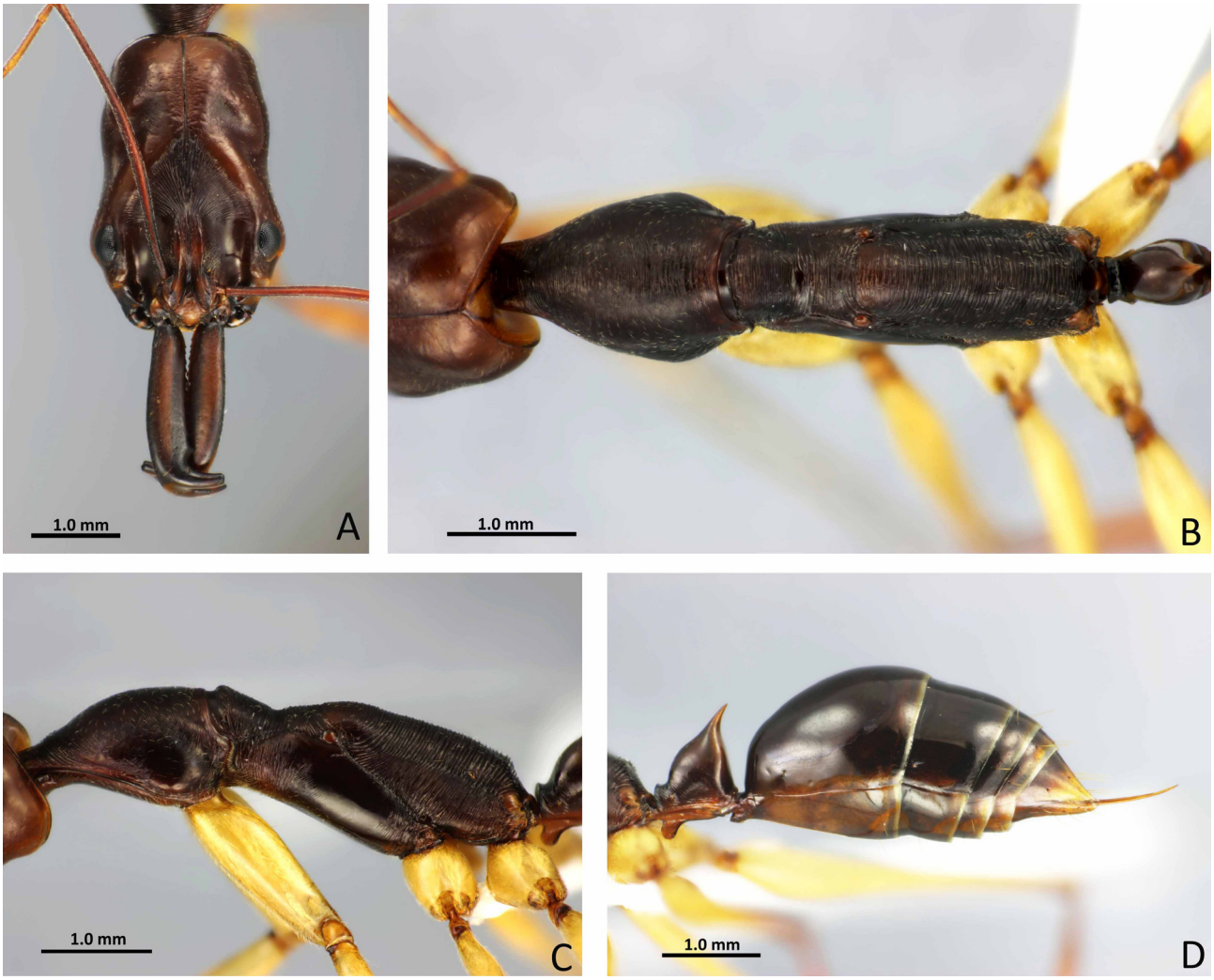

FIGURE 14. *Odontomachus minangkabau*, worker (holotype; colony: RS01-PDG-14; individual: SEMUT141224B): A, head in full-face view; B, mesosoma in dorsal view; C, mesosoma in lateral view; D, petiole and gaster in lateral view.

FIGURE 15. *Odontomachus minangkabau*, queen (paratype; colony: RS01-PDG-14; individual: SEMUT141224H): A, head in full-face view; B, mesosoma in dorsal view; C, mesosoma in lateral view; D, petiole and gaster in lateral view; E, forewing; F, hindwing.

Worker measurements and indices. Holotype and paratypes (n=10): HW 2.05–2.34 mm, HL 3.13–3.55 mm, SL 3.30–3.65 mm, IFLW 0.56–0.64 mm, EL 0.42–0.50 mm, MDL 1.85–2.00 mm, WL 4.15–4.65 mm, PTL 0.78–0.86 mm, PTH 1.25–1.40 mm, CI 65–69, SI 153–161, MDI 53–61, PTHI 158–173.

Worker description. Relatively large (HL 3.13–3.55 mm, WL 4.15–4.65 mm). Head in full-face view much longer than broad, with posterior margin weakly concave; median furrow on vertex present as dark line; neither side of line swollen; frontal lobes followed by strong frontal carinae which are nearly parallel; minimum distance between margin of ocular ridge and margin of compound eye less than half of major axis of compound eye;

mandible relatively slender; masticatory margin with 11–14 denticles; subapical tooth 2.5 times as long as broad, with truncate apex; palp formula 4, 4. Mesosoma in lateral view relatively slender; pronotum including its anteromedian lobe long, in lateral view with anterodorsal slope gentle; mesopleuron without anteroventral ridge, with anterodorsal margin weakly carinate, clearly separated by distinct dorsal carina from mesonotum and metapleuron; propodeum in lateral view with dorsum almost straight, and gradually sloping posteriad, with posterior face relatively gently sloping; propodeal dorsum anteriorly without median longitudinal depression. Petiolar node conical; node in lateral view, excluding apical spine with anterior face weakly convex or weakly and bluntly angulate and posterior face weakly convex; apical spine short and stout, less than 1/4 as long as petiolar height, sometimes weakly curved posteriad (but shape variable within species); subpetiolar process anteroposteriorly as long as dorsoventrally high, lobate, directed ventrally. First gastral tergum in lateral view long, with anterior face relatively short and vertical.

Head in full-face view largely smooth and shiny, but with a striate area bordered by frontal carinae and ocular ridges; frontal lobe with rough texture and shiny; faint striation extended from extraocular furrow through part of temporal ridges till part of posterolateral face of vertex; median part of vertex along median furrow faintly striate transversely; lateral face of head largely smooth and shiny, with its posterior third faintly striate; venter of head smooth and shiny; median disc of clypeus smooth and shiny. Pronotal disc and mesonotum densely and weakly striate transversely; posterolateral face of pronotum partly smooth and shiny; mesopleuron largely smooth and shiny, with its anterior 1/3 and posteriormost part finely striate; metapleuron and propodeum with transversal striation which is a little sparser and stronger than that of pronotum and mesonotum. Petiolar node largely smooth and shiny, but with its basal area faintly striate.

Vertex with a pair of long erect setae; frontal lobe sometimes with a seta; pronotal disc without long erect setae; first gastral tergum without erect setae. Head, mesosoma, petiole and gaster with fine appressed pubescence which is sparse and very short on head and sparse and extremely short on gaster.

For color pattern see in Fig. 14; body dark reddish brown, with head paler; coxae and femora yellowish brown; tibiae and tarsi reddish brown.

Queen measurements and indices. Paratype (n=1): HW 2.36 mm, HL 3.29 mm, SL 3.35 mm, IFLW 0.65 mm, EL 0.54 mm, OL 0.15 mm, MDL 1.80 mm, WL 4.80 mm, FWL unmeasurable (due to the paratype dealated) PTL 0.88 mm, PTH 1.61 mm, CI 72, SI 142, MDI 55, PTHI 183.

Non-type (n=1): HW 2.37 mm, HL 3.30 mm, SL 3.50 mm, FLW 0.66 mm, EL 0.52 mm, OL 0.15 mm, MDL 1.72 mm, WL 4.70 mm, FWL 9.50 mm, PTL 0.88 mm, PTH 1.60 mm, CI 72, SI 147, MDI 52, PTHI 182.

Queen description. In general appearance queen is similar to worker. Vertex near ocelli not swollen; ocular ridge clearly developed; distance between lateral ocelli shorter than distance between lateral and median ocelli, and as long as major axis of median ocellus; ocelli in lateral view protruded dorsad. Mesosoma with main sclerites associated with wing function (Figs. 15B, 15C), in dorsal view long and slender; anterodorsal slope of pronotum in lateral view gentle; anterodorsal outline of mesoscutum in lateral view relatively steep; mesoscutum with very weak median longitudinal depression; parapsidal furrow very weak and slightly curved; mesopleuron with fine, oblique furrow; propodeum in lateral view relatively long, with its dorsum almost straight and sloping gradually posteriad. Wing venation as in Figs. 15E and 15F. Petiolar node in lateral view, excluding apical spine with anterior and posterior faces weakly convex; apical spine relatively stout and slightly curved posteriad; subpetiolar process anteroposteriorly as long as dorsoventrally high. First gastral tergum in lateral view long, with anterior face relatively short and vertical.

Head in full-face view largely smooth and shiny, but with striate area bordered by frontal carinae and ocular ridges; frontal lobe with rough texture and shiny; faint striation extending from extraocular furrow through part of temporal ridges to posterolateral face of vertex; median part of vertex along median furrow faintly striate transversely; lateral face of head largely smooth and shiny, with its posterior third faintly striate; venter of head smooth and shiny; median disc of clypeus smooth and shiny. Pronotum densely and finely striate transversely; mesoscutum weakly and longitudinally striate; mesopleuron largely smooth and shiny, with anterior third and posteriormost part faintly striate; mesoscutellum smooth and shiny; propodeum strongly and sparsely striate transversely. Petiolar node largely smooth and shiny, with its basal area faintly striate.

Pair of long erect setae present on vertex near ocelli; frontal lobe, pronotal disc, and 1st gastral tergum without erect setae. Head, mesosoma, petiole and gaster with sparse, subdecumbent to decumbent pubescence which is extremely short in gaster; mesopleuron with very sparse subdecumbent to decumbent pubescence.

FIGURE 16. *Odontomachus minangkabau*, male (paratype; colony: RS01-PDG-14; individual: SEMUT150101A): A, head in full-face view; B, head in lateral view; C, head in dorsal view; D, mesosoma in lateral view; E, petiole in lateral view; F, mesosoma in dorsal view; G, gaster in lateral view.

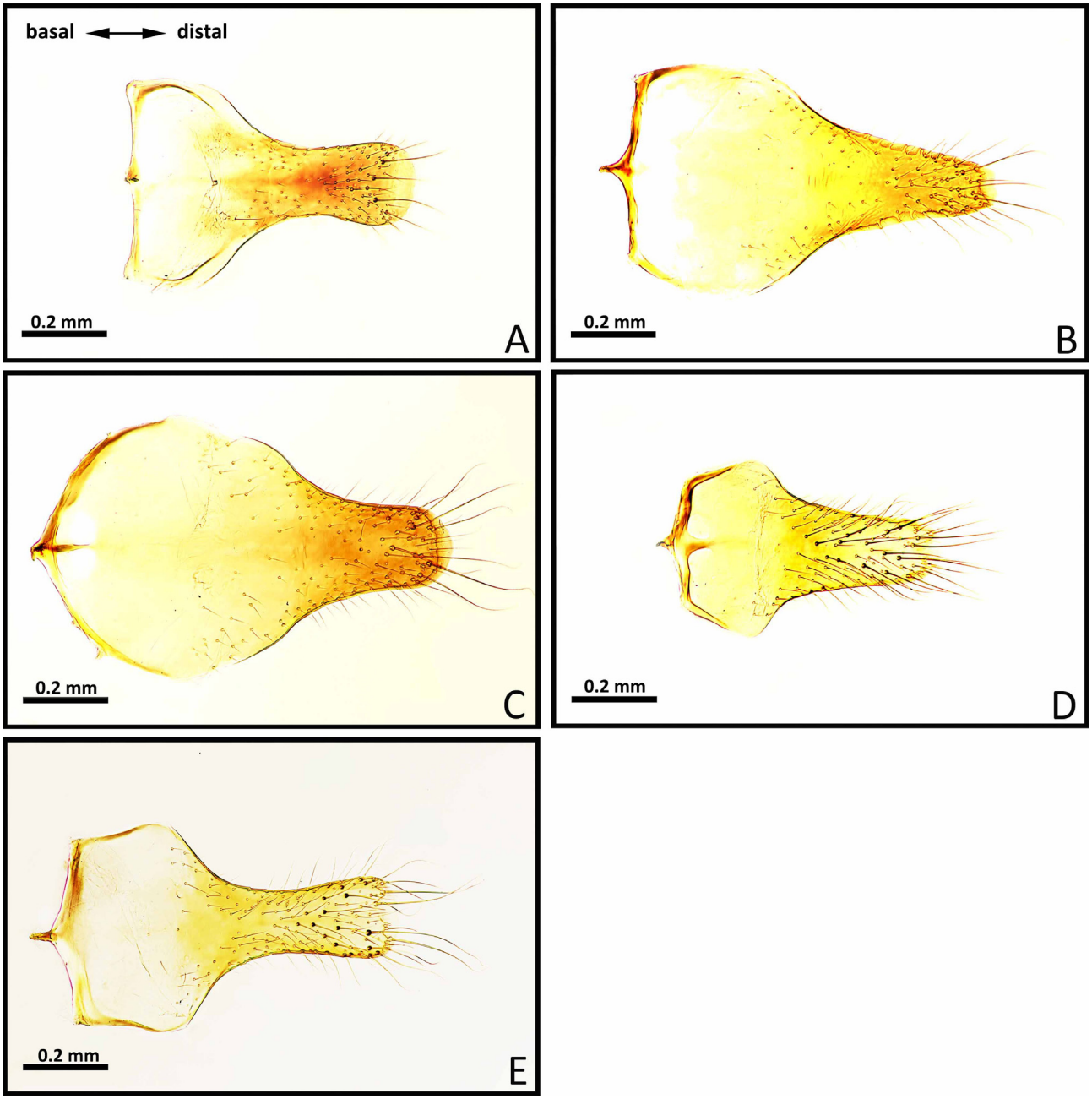

FIGURE 17. Male *Odontomachus*, 9th abdominal sternum, ventral view: A, *O. simillimus*, arrows indicating direction (colony: PKJ-33-12; individual: SEMUT150224C); B, *O. latidens* (GK-38-12; SEMUT150224E); C, *O. procerus* (SAGO-01-12; SEMUT150224B); D, *O. rixosus* (PKN-01-12; SEMUT150224D); E, *O. minangkabau* (paratype; RS01-PDG-14; SEMUT150224A).

For color pattern see in Fig. 15; head, mesosoma, petiole and gaster reddish brown (Fig. 15) to dark brown; femora yellowish brown; tibiae reddish brown.

Male measeurements and indices. Paratypes (n=5): HW 1.41–1.44 mm, HL 1.21–1.24 mm, SL 0.28–0.29 mm, EL 0.85–0.89 mm, EW 0.45–0.49 mm, OL 0.21–0.23 mm, OES 0.18–0.21 mm, WL 3.28–3.40 mm, FWL 6.17–6.46 mm, PTL 0.68–0.71 mm, PTH 0.95–1.07 mm, CI 115–119; SI 15–17, PTHI 139–157.

Male description. Size large (HL 1.21–1.24 mm, WL 3.28–3.40 mm). Major axis of median ocellus as long as minimum distance between lateral ocellli; antenna 13-merous; scape very short, 1/3 as long as 3rd antennomere; 2nd antennomere 1/2 as long as scape; 3rd to 13th antennomeres each extremely long; palp formula 6, 4; dorsal outline of clypeus in lateral view straight. Mesosoma in lateral view relatively slender and long; dorsal outline of pronotum in lateral view almost straight; anterodorsal outline of mesoscutum in lateral view gentle; mesoscutum without

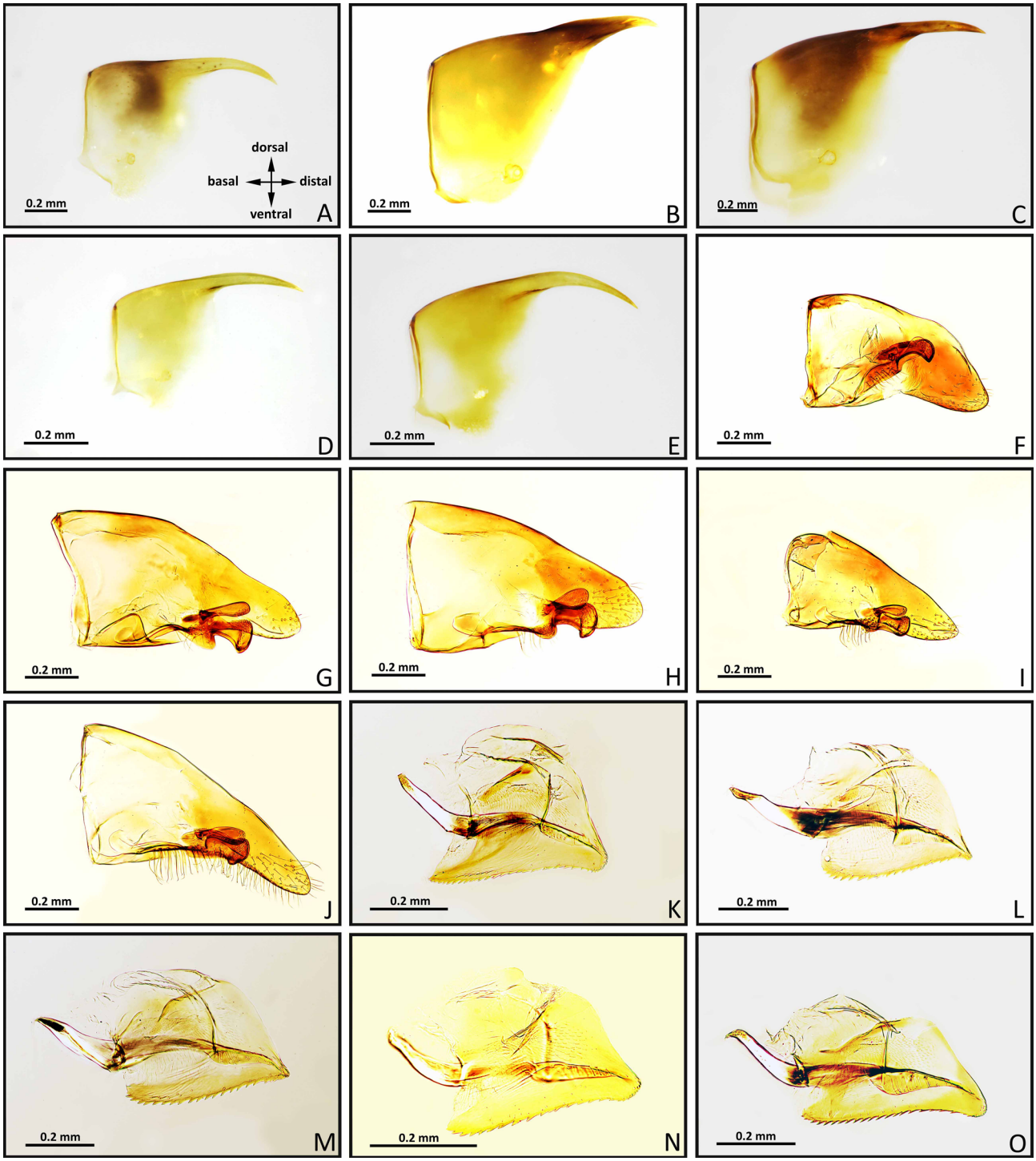

FIGURE 18. Male *Odontomachus*, with arrows in A indicating direction: A–E, 8th abdominal tergum, lateral view; F–J, paramere and volsella, right-hand side, inner view; K–O, penisvalva, right-hand side, inner view. A, F, K, *O. simillimus* (colony: PKJ-33-12; individual: SEMUT150224C); B, G, L, *O. latidens* (GK-38-12; SEMUT150224E); C, H, M, *O. procerus* (SAGO-01-12; SEMUT150224B); D, I, N, *O. rixosus* (PKN-01-12; SEMUT150224D); E, J, O, *O. minangkabau* (paratype; RS01-PDG-14; SEMUT150224A).

median depression; parapsidal furrow weak and almost straight; oblique mesopleural furrow relatively shallow and narrow; ventrolateral part of katepisternum without furrow; propodeum in lateral view with its dorsal outline roundly convex; metapleuron separated from propodeum indistinctly by suture; wing venation similar to queen (see Figs. 15E and 15F for queen wings). Petiolar node in lateral view tapering gently to bluntly pointed apex; its anterior slope weakly convex, and posterior slope straight; subpetiolar process in lateral view anteroposteriorly as

long as dorsoventrally high, lobate and slender; petiolar sternum without posteroventral process. First gastral tergum in lateral view long; posterior spine of 8th abdominal tergum long and slender, weakly curved (Fig. 18A); pygostyle with long setae in its apical third; disc of 9th abdominal sternum much broader than long, with posterolateral corner expanding laterad and posterolateral corner distinctly angled; apical lobe much longer than disc and slightly narrowed in basal half, with apical margin weakly convex; telomeral apex in lateral view much longer than high; distiventral apex of valviceps strongly produced; basiventral corner of valviceps distinctly produced; ventral margin of valviceps with 28–29 denticles.

Head including area between lateral ocelli entirely smooth and shiny. Pronotum in lateral view smooth and shiny; mesoscutum in dorsal view smooth and shiny; scuto-scutellar suture with sparse, strong, longitudinal striation; mesopleural anepisternum and katepisternum smooth and shiny; metapleuron smooth and shiny; propodeum in dorsal view with rough texture and shiny. Petiole smooth and shiny.

Head, mesosoma, legs, petiole and gaster with fine dense subdecumbent to decumbent pubescence; mandible, vertex near ocelli and gaster except 1st gastral tergum with several long erect setae.

For color pattern see in Fig. 16; body basically pale yellow; antennae, area around ocelli, anteromedian and lateral parts of mesoscutum, metanotum and dorsum of propodeum blackish; tibiae, petiole and gaster yellowish brown.

Species recognition. *Odontomachus minangkabau* is morphologically most similar to *O. rixosus* and *O. pararixosus*. However, it is distinguishable from the latter two by the following characteristics of the worker: large size: HL 3.13–3.55 mm, WL 4.15–4.65 mm (vs. small size: HL 2.40–3.03 mm, WL 3.35–4.00 mm in latter two); masticatory margin of mandible with 11–14 denticles (vs. less than 10 denticles in latter two); SI 153–161 (vs. SI 131–150 in latter two); median part of vertex along median furrow faintly striate transversely (vs. smooth and shiny or with rough texture in latter two); colors of head, mesosoma, petiole and gaster darker than in the latter two. Furthermore, *Odontomachus minangkabau* is easily distinguished from *O. rixosus* by the following characteristics of the male: first gastral tergum in lateral view long (vs. short in the latter); apical lobe of 9th abdominal sternum slightly narrowed in basal half, with apical margin weakly convex (vs. gently tapering to almost truncate apex in the latter); telomeral apex in lateral view much longer than high (vs. longer than high in the latter); ventral margin of valviceps with 28−29 denticles (vs. 21−22 denticles in the latter); head, pronotum, mesoscutum and mesopleuron pale yellowish (vs. yellowish to yellowish brown in the latter).

Etymology. The specific epithet is named after the Minangkabau ethnic group indigenous to West Sumatra, Indonesia (type locality of this species).

Distribution. Sumatra Island, Indonesia.

Bionomics. *Odontomachus minangkabau* inhabits secondary and primary lowland forests, and nests in the soil near the base of living trees.

DNA barcoding. The average K2P distance between *O. minangkabau* and two closely related species, *O. rixosus* and *O. pararixosus*, are 8.48% (SE=0.013) and 6.59% (SE=0.012), respectively. These values are a little higher than the average K2P distance between *O. rixosus* and *O. pararixosus* (5.48%, SE=0.010). The results support the species-level delimitation among *O. minangkabau*, *O. rixosus* and *O. pararixosus*.

Materials of *O. pararixosus* used for DNA barcoding are as follows: colony MS14-18 (individual no. RJ20150126-5, accession no. LC056045).

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