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Description of a new species of the ant genus *Ooceraea* Roger, 1862 (Hymenoptera: Formicidae; Dorylinae) from the Vietnam's Central Highlands

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Abstract

Ooceraea quadridentata sp. nov. is described based on a colony series collected from a disturbed and bamboo-mixed evergreen forest in Vietnam's Central Highlands (Nam Kar Nature Reserve, Dak Lak Province). This new species is distinguished from other described congeners by its propodeum with two pairs of conspicuous denticles. This represents the second species of the genus *Ooceraea* from the Indo-Chinese Peninsula. A preliminary key to Oriental species of *Ooceraea* based on the worker caste is also provided.

Key words: ant, Oriental realm, Indo-Chinese Peninsula, new species, key

Introduction

The ant genus *Ooceraea* Roger, 1862 (Formicidae: Dorylinae) was established with the species *O. fragosa* Roger, 1862, later synonymized under the genus *Cerapachys* F. Smith, 1857 by Brown (1975). Until recently, the Brown's treatment had been widely accepted. However, Borowiec (2016) comprehensively revised the generic-level classification of the subfamily Dorylinae, and revived the genus *Ooceraea* (for the details of its taxonomic history, see the Borowiec's revision). According to Borowiec, the genus *Ooceraea* can be distinguished from other doryline genera by the following combination of characteristics of the worker: (1) propodeal spiracle positioned low on the sclerite, (2) pygidium armed with modified setae, (3) antennae with 11 or fewer segments, (4) pronotomesopleural suture developed, (5) abdominal segment III strongly tubulated, i.e., forming "postpetiole", and (6) no constrictions between abdominal segments IV, V and VI.

The genus *Ooceraea* currently consists of eleven extant valid species (Bolton 2018). Six of them are restricted to the Australian and Oceanian realms, and the remaining five are restricted to the Oriental realm (Holt *et al.* 2013; Janicki *et al.* 2016; Antmaps). However, four of the five Oriental species have so far been recorded in the Southern India and Sri Lanka, whereas only a widespread species, *O. biroi* (Forel, 1907), has been recorded from the other areas of the Oriental realm (Tsuji & Yamauchi 1995; Wetterer *et al.* 2012; Antmaps). This regional bias on the number of known species suggests more unknown species likely be awaiting description in the Oriental realm. Indeed, images of three undescribed species (with manuscript names given by Borowiec) from Borneo, Sumatra, and Sulawesi are provided in AntWeb (<http://www.antweb.org>).

In the course of our recent field survey in a disturbed and bamboo-mixed evergreen forest in Vietnam's Central Highland (Nam Kar Nature Reserve, Dak Lak Province), a colony fragment of an unknown species of the genus *Ooceraea* was collected. In the present paper, it is described as a new species and reported as the second species of the genus in the Indo-Chinese Peninsula. A preliminary key to the Oriental species based on the worker caste is also provided.

Material and methods

The bodies of two workers (paratypes) were processed with Proteinase K for accurate observation of antennal and palpal segmentation (for the detailed protocol see Yamada & Eguchi 2016). The processed body then dehydrated in 99% ethanol, the antenna and mouthparts were removed from the head and slide-mounted with Euparal.

Source images for focus stacking and measurements were taken by an Lumix DMC GX8 digital camera attached to a Nikon AZ100 stereomicroscope or Nikon Eclipse E600 microscope (for slide-mounted antenna and mouthparts). Multi-focused images were produced by Helicon Focus Pro 6.8.0 (Helicon Soft Ltd., Ukraine), and then improved using the retouching function of Helicon Focus. Finally, the color balance and contrast were adjusted using GIMP 2.8 (The GIMP Team, available from <http://www.gimp.org>).

The morphological terminology follows Borowiec (2016). Following parts of bodies were measured using ImageJ 1.50i (National Institute of Mental Health, USA, available from <http://imagej.nih.gov/ij>), and then indices were calculated.

- HL Head length: maximum length of cranium in full-face view, measured from transverse line spanning the anteriormost points of clypeus to that of posteriormost points of cranium.
- HW Head width: maximum width of cranium in full-face view (excluding eyes).
- SL Scape length: maximum length of antennal scape excluding basal condylar bulb.
- MW Mesosomal width: maximum width of promesonotum in dorsal view.
- ML Mesosomal length: maximum diagonal length of mesosoma in lateral view, measured from posterodorsal border of pronotal flange to posterior basal angle of metapleuron.
- PL Petiolar length: maximum length of petiole in lateral view (excluding helcium).
- PH Petiolar height: maximum height of petiole in lateral view (including subpetiolar process).
- PW Petiolar width: maximum width of petiole in dorsal view.
- PPL Postpetiolar length: maximum length of postpetiole in lateral view (excluding helcium).
- PPH Postpetiolar height: maximum height of postpetiole in lateral view.
- PPW Postpetiolar width: maximum width of postpetiole in dorsal view.
- CI Cephalic index: $HW/HL \times 100$.
- SI Scape index: $SL/HW \times 100$.
- PI1 Petiolar index 1: $PL/PH \times 100$.
- PI2 Petiolar index 2: $PW/PL \times 100$.
- PPI1 Postpetiolar index 1: $PPL/PPH \times 100$.
- PPI2 Postpetiolar index 2: $PPW/PPL \times 100$.
- WI Waist index: $PPW/PW \times 100$.

Type specimens are deposited in the following collections: AKYC, Ant collection of A. Yamada (see the contact address of the corresponding author); ACEG, Ant Collection of K. Eguchi; IEBR, Institute of Ecology and Biological Resources, Hanoi, Vietnam; MCZC, Museum of Comparative Zoology, Cambridge, Massachusetts, USA; MHNG, Muséum d'Histoire Naturelle, Geneva, Switzerland.

The images of the type materials of the following species provided by AntWeb (<http://www.antweb.org>) were examined for comparison: *O. australis* (Forel, 1900); *O. besucheti* (Brown, 1975); *O. biroi* (Forel, 1907); *O. coeca* Mayr, 1897, *O. fragosa* Roger, 1862; *O. papuana* Emery, 1897; *O. pusilla* Emery, 1897.

Results

Ooceraea quadridentata sp. nov. (Figs 1–11)

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Type Material: **Holotype**, worker, colony no. AKY11x17-114, Vietnam, Dak Lak Province, Nam Kar Nature Reserve, N 12.277°, E 108.094°, ca. 545 m alt., 11.x.2017, A. Yamada leg. (deposited in IEBR). **Paratypes**, 11 workers from the same colony as the holotype (AKYC, ACEG, IEBR, MCZC, MHNG).

Diagnosis. *Ooceraea quadridentata* sp. nov. is easily and precisely distinguished from the other described congeners by its propodeum armed with two pairs of denticles. Furthermore, the number of antennal segments is also one of the useful species-level diagnostic characters in the genus. Nine-segmented antenna is seen in eight species, i.e.,

O. alii (Bharti & Akbar, 2013), *O. australis* (Forel, 1900), *O. biroi* (Forel, 1907), *O. crypta* (Mann, 1921), *O. fuscior* (Mann, 1921), *O. papuana* Emery, 1897, *O. pawa* (Mann, 1919), and *O. pusilla* Emery, 1897 (the three undescribed species in AntWeb also seem to have 9-segmented antenna). On the other hand, 11-segmented antenna is seen in the remaining four species only, i.e., *O. besucheti* (Brown, 1975), *O. coeca* Mayr, 1897, and *O. fragosa* Roger, 1862, and *O. quadridentata* sp. nov. (Brown (1975) pointed out that the number of antennal segments of *Ooceraea coeca* and *O. fragosa* was erroneously reported to be “10” by Roger (1862) and Emery (1902, 1911)).



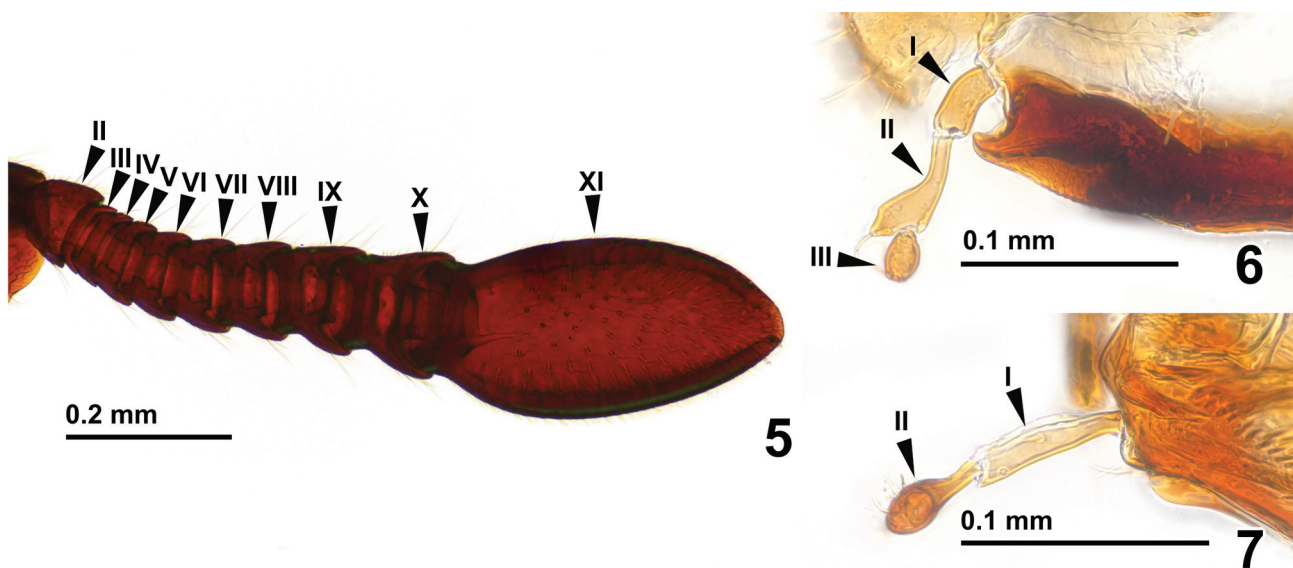
Figures 1–4. *Ooceraea quadridentata* sp. nov. (worker, holotype). **1**, head in full-face view; **2**, head in dorsal view; **3**, anterior part of cranium and mandible in frontal view; **4**, body in lateral view.

Description

Worker. *Size and color.* Relatively large (HW, 0.82–0.89 mm; ML, 1.03–1.13 mm). Body dark reddish brown; antennae and legs paler.

Structure. Cranium in full-face view subrectangular, a little longer than wide (Fig. 1; CI, 83–88); lateral margin weakly convex; posterior margin concave medially. Parafrontal ridge prominently produced anteriorly in dorsal view (Fig. 2). Torulo-posttorular complex relatively broad, with maximum width between outer edges of the lobes in full-face view approximately as long as major axis of antennal socket (Fig. 3). Ventrolateral margin of cranium in lateral

view weakly concave (Fig. 4). Compound eye and ocelli completely absent. Antenna 11-segmented with enlarged apical segment XI which is almost as long as segments V–X combined (Fig. 5); antennal segments III very short; III–X gradually become longer apically. Antennal scape when folded back just reaching the midlength of cranium in full-face view. Area encircling antennal socket which is delimited by torulo-posttorular complex and parafrontal ridge strongly depressed. Masticatory margin of mandible with a series of inconspicuous small teeth. Maxillary palps 3-segmented, with lateroapical part of segment II strongly produced (Fig. 6). Labial palps 2-segmented (Fig. 7). Pronotal flange separated from collar by distinct ridge. Posterior face of propodeum margined by conspicuous lateral ridges each of which is armed with two conspicuous denticles (Figs. 8, 9); in lateral view, the anterior pair of the denticles large subtriangular but blunt apically (black arrow in Fig. 9), and the posterior pair small digitiform (red arrow in Fig. 9). Petiole in lateral view much higher than long when including subpetiolar process (PI1, 82–86); dorsal margin weakly convex. Petiole in dorsal view subrectangular, a little longer than wide (PI2, 88–95); lateral margins slightly convex. Subpetiolar process in lateral view rounded-lobate with conspicuous posteroventral projection (white arrow in Fig. 9). Postpetiole in lateral view subrectangular, around as long as high (PPI1, 99–107); dorsal margin weakly convex. Postpetiole in dorsal view subtrapezoidal, wider posteriorly, almost as long as wide (PPI2, 93–103), a little wider than petiole (WI, 106–118); lateral margins weakly convex. Postpetiolar sternite in lateral view low, not raised ventrad; ventral margin almost straight; anteroventral corner strongly angulate.

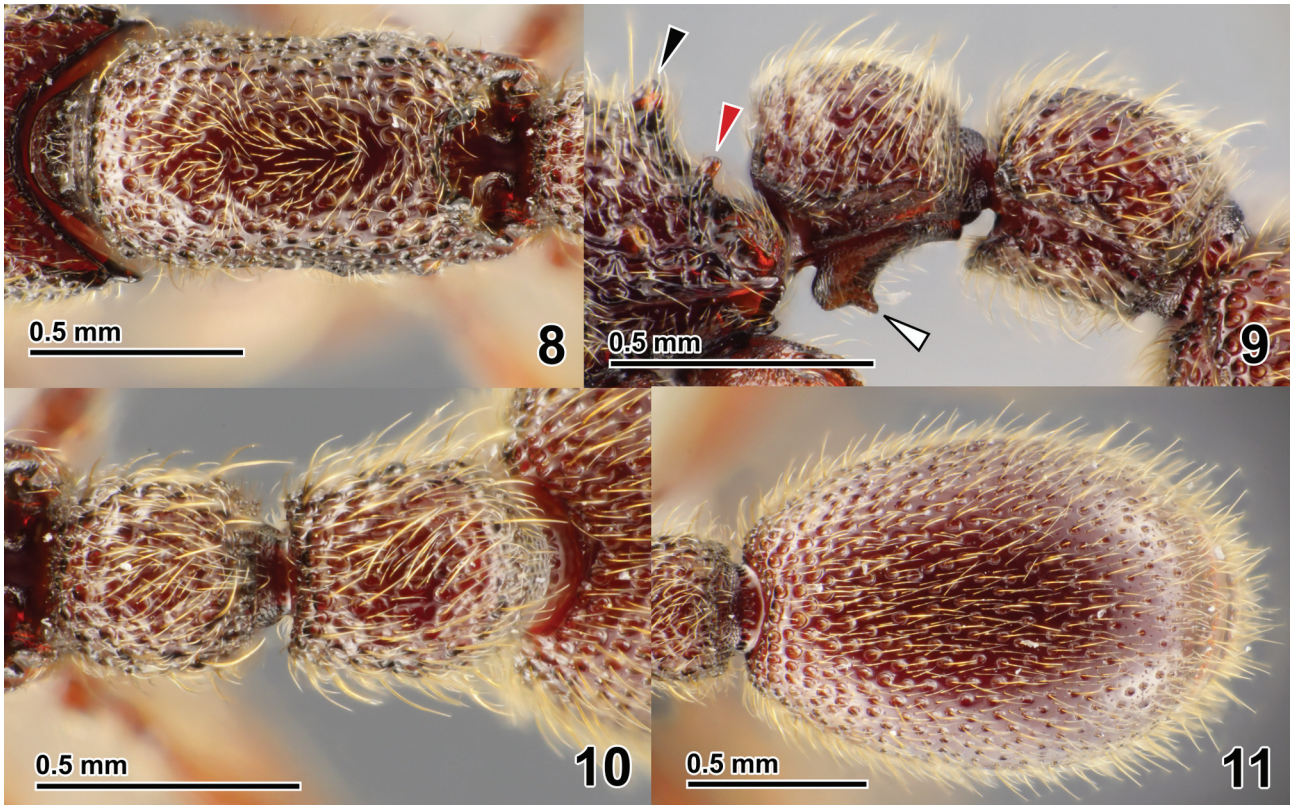


Figures 5–7. *Ooceraea quadridentata* sp. nov. (worker, paratype). **5**, funiculus of antenna (right), in ventral view; **6**, maxillary palpus (right), in ventral view; **7**, labial palpus (left), in dorsolateral view.

Sculpture. Dorsal and lateral faces of cranium deeply foveolate-reticulate; foveae relatively large (ca. 0.03–0.06 mm). Area encircling antennal socket, which is delimited by torulo-posttorular complex and parafrontal ridge shagreened without foveae. Outer face of mandible coarsely rugose in basal part, and smooth in apical part. Pronotal flange partially shagreened with several foveae. Dorsal and lateral faces of mesosoma foveolate; foveae shallower and more sparsely distributed than those of cranium (Figs. 4, 8). Posterior face of propodeum smooth. Legs roughly shagreened. Dorsal and lateral faces of petiolar tergite and postpetiole coarsely and shallowly foveolate-reticulate (Figs. 9, 10). Abdominal tergite and sternite IV densely foveolate; foveae somewhat smaller than those of cranium and mesosoma (Figs. 4, 11).

Pilosity. Body entirely densely covered with flagelliform decumbent or standing hairs.

Measurement and indices. **Holotype:** HL, 0.89 mm; HW, 0.74 mm; SL, 0.49 mm; ML, 1.13 mm; MW, 0.54 mm; PL, 0.41 mm; PH, 0.48 mm; PW, 0.38 mm; PPL, 0.42 mm; PPH, 0.40 mm; PPW, 0.40 mm; CI, 83; SI, 66; PI1, 85; PI2, 93; PPI1, 105; PPI2, 95; WI, 106. **Paratypes** (n = 7): HL, 0.82–0.89 mm; HW, 0.70–0.75 mm; SL, 0.45–0.50 mm; ML, 1.03–1.13 mm; MW, 0.52–0.58 mm; PL, 0.38–0.41 mm; PH, 0.44–0.50 mm; PW, 0.33–0.39 mm; PPL, 0.38–0.45 mm; PPH, 0.37–0.43 mm; PPW, 0.38–0.45 mm; CI, 84–88; SI, 62–65; PI1, 82–86; PI2, 88–95; PPI1, 99–107; PPI2, 93–103; WI, 106–118.



Figures 8–11. *Ooceraea quadridentata* sp. nov. (worker, holotype). **8**, mesosoma in dorsal view; **9**, propodeum, petiole, and postpetiole in lateral view; **10**, petiole and postpetiole in dorsal view; **11**, abdominal tergite IV, in dorsal view.

Queen. Unknown.

Male. Unknown.

Bionomics. The colony fragment AKY11x17-114 was collected in Nam Kar Nature Reserve (Dak Lak Province, Vietnam) by destroying a partly rotten, hard tree stump in a highly disturbed and bamboo-mixed evergreen forest patch near the forest edge (Fig. 12). The colony fragment contained 16 workers but lacked queens, males and immatures.

Distribution. Only known from the type locality: Nam Kar Nature Reserve (Dak Lak Province, Vietnam).

Etymology. The specific epithet, *quadridentata*, describes the two pairs of (*i.e.*, four) conspicuous denticles on the propodeum that is unique to this species.

Notes. A key to the described species of *Ooceraea* from the Oriental realm based on the worker caste are provided below, although multiple undescribed species are present in the realm, as mentioned above.

1	Antenna 9-segmented	2
–	Antenna 11-segmented	3
2	Body conspicuously foveolate; postpetiolar sternite in lateral view weakly raised ventrad	<i>O. alii</i> (Southern India)
–	Body rather punctate; postpetiolar sternite in lateral view strongly raised ventrad	<i>O. biroi</i> (widespread)
3	Lateral ridge of posterior face of propodeum armed with two pairs of denticles	<i>O. quadridentata</i> sp. nov. (Vietnam)
–	Lateral ridge of posterior face of propodeum without denticles	4
4	Body shallowly and coarsely foveolate; eye present with multiple ommatidia	<i>O. besucheti</i> (Southern India)
–	Body conspicuously foveolate; eye absent or vestigial	5
5	Postpetiole distinctly longer than wide	<i>O. fragosa</i> (Sri Lanka)
–	Postpetiole almost as long as wide	<i>O. coeca</i> (Sri Lanka)



Figure 12. Appearance of the forest in the type locality of *Ooceraea quadridentata* sp. nov., Nam Kar Nature Reserve (Dak Lak Province, Vietnam).

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