



RESEARCH ARTICLE - ANTS

Discovery of novel *Ooceraea* (Hymenoptera: Formicidae: Dorylinae) species with 8-segmented antennae from China

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Abstract

Here we describe an *Ooceraea* species with 8-segmented antennae for the first time. A revised key for all the known species of this genus based on the worker caste is provided.

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Introduction

The genus *Ooceraea* was established based on the type species *O. fragosa* Roger, 1862 and was not assigned to a particular group. Since then, the classification of this ant genus has undergone several more complex changes, that is, it has been classified in Myrmicinae (Mayr, 1865; Emery, 1877), in Ponerinae (Dalla Torre, 1893; Forel, 1893), in Dorylinae (Emery, 1895), as a subgenus of *Cerapachys* (Emery, 1902; Wheeler, W.M. 1902; Emery, 1911), and as a junior synonym of *Cerapachys* in Ecitoninae (Brown, 1973). *Ooceraea* was most recently confirmed to be an independent genus within Dorylinae by Borowiec (2016). *Ooceraea* worker ants can be identified by a combination of the following characteristics: pygidium armed with modified setae; propodeal spiracle positioned low on the sclerite; antennae with ≤ 11 segments; developed pronoto mesopleural suture; two-segmented waist with abdominal segment III strongly tabulated; and no constrictions between the abdominal segments IV, V, and VI Borowiec (2016). Only 12 species of the genus *Ooceraea*

have been named and described so far, and half of these are restricted to the Australian and Oceanian regions and five to the Oriental region (Holt et al., 2013; Janicki et al., 2016; Yamada et al., 2018; Antmaps, 2018), whereas *O. biroi* (Forel, 1907) is widespread across the tropical regions of the world (Borowiec, 2016).

The antenna of workers comprises nine segments in *O. alii* (Bharti & Akbar, 2013), *O. australis* (Forel, 1900), *O. biroi* (Forel, 1907), *O. besucheti* (Brown, 1975), *O. crypta* (Mann, 1921), *O. fuscior* (Mann, 1921), *O. papuana* Emery, 1897, *O. pawa* (Emery, 1897) and *O. pusilla* Emery, 1897, and 11 segments in *O. coeca* Mayr, 1897, *O. fragosa* Roger, 1862 and *O. quadridentata* Yamada, Luong & Eguchi, 2018. However, in our recent field surveys in the Guangxi Chongzuo White-headed Langur National Nature Reserve in China, one colony — containing ten workers and one dealate queen — of an *Ooceraea* species with 8-segmented antennae was collected. This species is herein described as a novel discovery and provides new insights into antenna diversity of the genus *Ooceraea*.



Materials and methods

Specimen examination was conducted using the Leica M205A stereomicroscope. High-quality multifocused montage images were produced using the Leica DFC 450 digital imaging system and Leica Application Suite V4.3 software. SEM images were taken by a scanning electron microscope (ZEISS, EVO18). The morphological terminology and standard measurements were as described by Borowiec (2016) and Yamada et al. (2018). All measurements are in millimeters.

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: $PPW/PW \times 100$.

Results

Ooceraea octoantenna Zhou & Chen sp. nov. (Figs 1-7)

Type material: Holotype: worker ant; China, Guangxi, Chongzuo City, Zuozhou Town, Pairu Village, 22°34.594' N, 107°25.311' E, 222 m, nesting in the subterranean zone, 10.VI.2016, Zhilin Chen leg., No. G160045. Paratypes: nine workers and one dealate queen from the same colony as the holotype. These type specimens are deposited in the Insect Collection of Guangxi Normal University (GXNU), Guilin, Guangxi, China, with two of the paratype workers deposited in the Insect Collection of Southwest Forestry University (SWFU), Kunming, Yunnan, China.

Diagnosis: *O. octoantenna* Zhou & Chen sp. nov. is readily distinguishable from other described *Ooceraea* species by following comprehensive characteristics: 8-segmented antenna, eyes absent, posterior margin of head broadly V-shaped concave, the mesosoma dorsum almost straight, the promesonotal suture weak dorsally, the metanotal groove present but somewhat ambiguous.

Description of the holotype worker (Figs 1-4): Head in a full-face view is nearly rectangular, longer than broad, with sides slightly convexed, the posterior margin is broadly V-shaped and concave, and angular posterolateral corners are present. Mandibles subtriangular, and the masticatory margin lacks distinct dentate, except for the apical and basal tooth. Clypeus with anterior margin concave in the middle, with the lateral portion projecting forward as a rounded lobe or apron. The frontal lobe elevated, frontal carinae absent, and antennal scrobe in full-face view fully exposed. Antennae are 8-segmented, and the scape short and apically (Fig 4) broad. Eyes and ocelli absent.

In the dorsolateral view, the mesosoma dorsum almost straight and slightly constricted to be the narrowest across the mesonotum. Promesonotal suture weak dorsally and very weak laterally. Pronotum with sharp anterior carina, with bluntly rounded humeral corners, with sides slightly convexed.

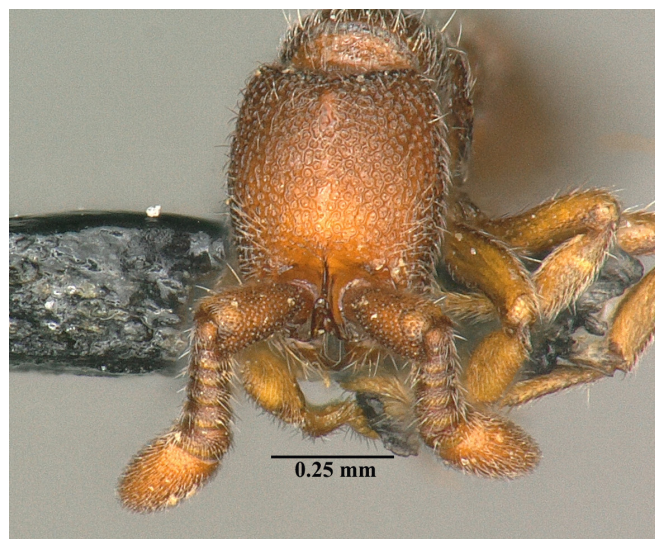


Fig 1. *Ooceraea octoantenna* Zhou & Chen sp. nov., worker, head in full-face view.

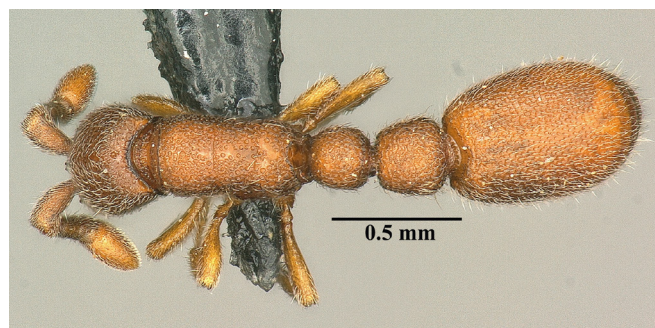


Fig 2. *Ooceraea octoantenna* Zhou & Chen sp. nov., worker holotype, body in dorsal view.

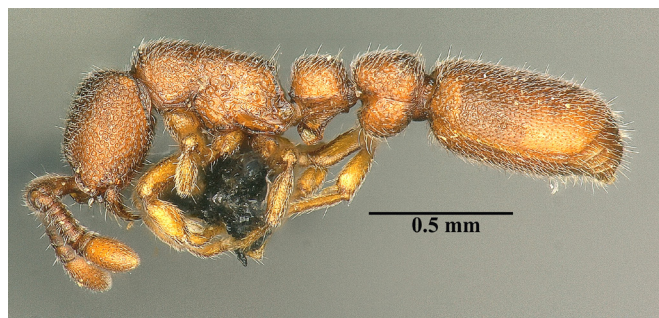


Fig 3. *Ooceraea octoantenna* Zhou & Chen sp. nov., worker holotype, body in profile view.

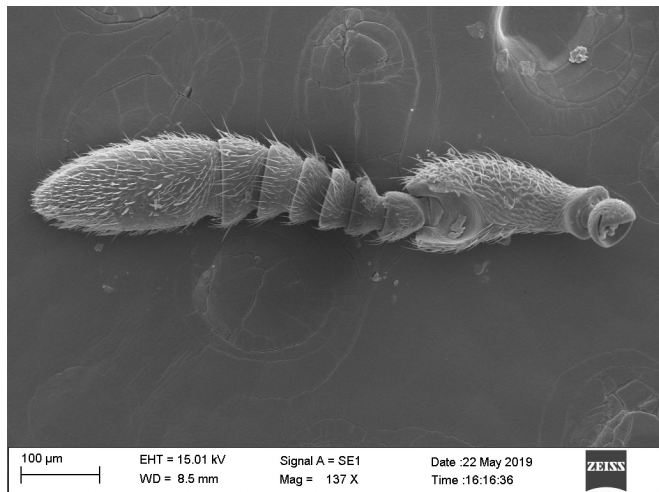


Fig 4. *Ooceraea octoantenna* Zhou & Chen sp. nov., funiculus of antenna, in ventral view.

The metanotal groove present but somewhat ambiguous. The posterodorsal corner of the propodeum in lateral view bluntly angulate, and the posterior face of the propodeum distinctly carinate both dorsally and laterally.

Petiole (AII) in the dorsal view suborbicular; slightly broader than long, with sides weakly divergent posteriad; weakly convex dorsally in the lateral view; and higher in the anterior versus posterior portion. The subpetiolar process prominent and anteroventrally directed with the fenestra. Postpetiole (AIII) in the dorsal view almost trapezoidal, broader than long, with sides slightly convex, divergent posteriad, concave in the lateral view at the helcium. Postpetiolar tergite in the lateral view consists of a convex dorsum larger than the sternite, which is pronounced and roundly produced anteroventrad. The gaster (AIV–AVII combined) elongated, with AIV much longer relative to the remainder.

The head, petiole and postpetiole dense foveolae; the median portion of the mesonotum and propodeum as well as the mesopleuron and metapleuron harbor sparse rugose foveolae. The reddish-brown body comprises many standing hair among the dense, short and subdecumbent background hair. The apical segments of the antennae and legs lighter shade than the body.

Measurement and indices. Holotype worker: HL 0.55, HW 0.43, SL 0.26, MW 0.30, ML 0.61, PL 0.22, PH 0.35, PW 0.25, PPL 0.25, PPH 0.35, PPW 0.30, CI 78, SI

60, PI1 63, PI2 114, PPI1 71, PPI2 120, WI 120. Paratype workers: HL 0.54–0.45, HW 0.41–0.44, SL 0.26–0.27, MW 0.28–0.30, ML 0.60–0.61, PL 0.22–0.23, PH 0.35–0.36, PW 0.25–0.27, PPL 0.24–0.25, PPH 0.34–0.35, PPW 0.29–0.30, CI 74–78, SI 57–62, PI1 63–64, PI2 112–114, PPI1 71–75, PPI2 119–122, WI 115–121.

Description of the paratype dealate queen

Differs from the worker by the following modifications: The eyes large and exist approximately at midlength of the head side. Ocelli present and closely approximated.

In the lateral view, the mesosoma dorsum almost straight. The transverse mesopleural groove distinct. The promesonotal suture present dorsally and laterally, and the metanotal groove absent. The posterodorsal corner of the propodeum bluntly angulate in the lateral view, and the propodeum posterior face distinctly carinate both dorsally and laterally. The mesoscutum in the dorsal view triangular with lateral sides wrapped by V-shaped posterior margin of pronotum; notauli absent. The mesoscutum small and rounded, and metanotum narrow and rod-like. The propodeum posterior face concave.

Petiole (AII) in the dorsal view suborbicular, slightly broader than long, and weakly dorsally convex and higher in the anterior versus posterior portion in the lateral view; subpetiolar process prominent and anteroventrally directed with fenestra.

Measurement and indices of paratype dealate queen (Figs 5-7): HL 0.54, HW 0.44, SL 0.28, MW 0.42, ML 0.82, PL 0.22, PH 0.35, PW 0.25, PPL 0.28, PPH 0.35, PPW 0.30, CI 81, SI 63, PI1 63, PI2 113, PPI1 80, PPI2 107, WI 120.

Etymology: This novel species is named after its 8-segmented antennae.



Fig 5. *Ooceraea octoantenna* Zhou & Chen sp. nov., paratype queen, head in full-face view.

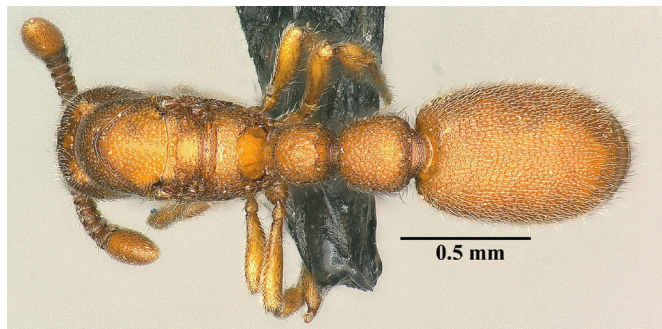


Fig 6. *Ooceraea octoantenna* Zhou & Chen sp. nov., paratype queen, body in dorsal view.

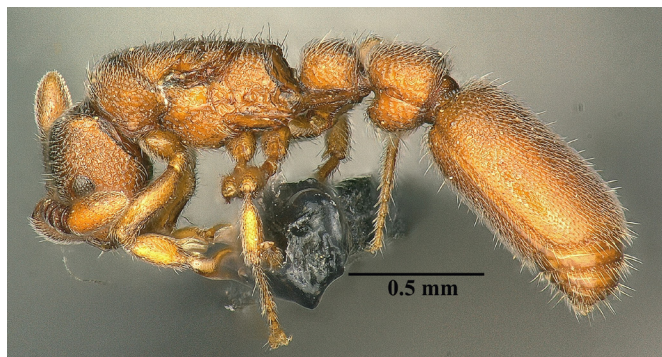


Fig 7. *Ooceraea octoantenna* Zhou & Chen sp. nov., paratype queen, body in profile view.

Discussion

Previously, *O. biroi* is the only species of *Ooceraea* recorded from China and restricted in Hunan (Huang et al., 2005), Shanghai (Wu & Huang, 1995), Zhejiang (Tang et al., 1995) and Taiwan (Tang et al., 1995). However, the species diversity of *Ooceraea* in China seems to be far from well-known if considering the complexity and heterogeneity of geography and climate throughout the country. The limited collection records and distributional information of *Ooceraea* from China could be because of their own subterranean lifestyle and lacking specific field investigation. Further collections will focus on soil or leaf litter to clarify species diversity of *Ooceraea* in China. In addition, *O. octoantenna* sp. nov., is the first recorded species of *Ooceraea* with 8-segmented antennae, the other existing described species are 9- or 11-segmented, so there is no doubt that species with 10-segmented antenna also exist.

Key to the species of *Ooceraea* based on worker caste (modified from Bharti & Akbar, 2013 and Yamada et al., 2018)

1. Antenna 8-segmented (China: Guangxi).....*O. octoantenna* sp. nov.
- Antenna 9- or 11-segmented.....2
2. Antenna 11-segmented.....3
- Antenna 9-segmented.....5
3. Propodeum armed with two pairs of denticles (Vietnam).....*O. quadridentata*
- Propodeum armed without denticles.....4

4. Anterior of pronotum with distinct ridge; pronotum in lateral view slightly convex dorsally; postpetiole in dorsal view slightly broader than long (Sri Lanka).....*O. coeca*
- Anterior of pronotum without ridge; pronotum in lateral view distinctly convex dorsally; postpetiole in dorsal view slightly longer than broad (Sri Lanka).....*O. fragosa*
5. Compound eye present, comprising more than 10 ommatidia (India).....*O. besucheti*
- Compound eye absent or extremely vestigial.....6
6. Postpetiole in dorsal view slightly longer than broad.....7
- Postpetiole in dorsal view slightly broader than long.....8
7. Head coarsely and irregularly rugose and punctate (Solomon Islands).....*O. pawa*
- Head only bearing regular punctures (New Guinea).....*O. pusilla*
8. Dorsum of mesosoma smooth and shiny (australis).....*O. australis*
- Dorsum of mesosoma with abundant punctures.....9
9. Diameter of punctures on dorsum of head as equal to or larger than the average distance separating them.....10
- Diameter of punctures on dorsum of head distinctly smaller than the average distance separating them.....12
10. Posterior margin of head distinctly concave in the middle (India).....*O. alii*
- Posterior margin of head almost straight, at most shallowly concave.....11
11. Antennal scrobe surface smooth and shiny (Fiji).....*O. fuscior*
- Antennal scrobe surface with annular fine striation (New Guinea).....*O. papuana*
12. For full-face view the head is broader posteriorly (The tropical regions).....*O. biroi*
- For full-face view the head is as broad in front as behind (Fiji).....*O. crypta*

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