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Taxonomic notes on the rare genus *Megaodynerus* Gusenleitner, 2012 (Hymenoptera, Vespidae, Eumeninae): a new species from China, with an updated key to all known species

Si-Zhu Long[1], Bin Chen[1], Ting-Jing Li[1]

1 *Chongqing Key Laboratory of Vector Control and Utilization, Institute of Entomology and Molecular Biology, Chongqing Normal University, Chongqing 401331, China*

Corresponding author: Ting-Jing Li (ltjing1979@cqnu.edu.cn)

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Abstract

In this paper, one new species, namely *Megaodynerus flavogaster* Long, Chen & Li, **sp. nov.** from Anhui (China) is described and illustrated, in detail. The male of this genus is firstly described, with its high-resolution morphological images. In addition, an updated key to all known species and a distribution map of these species are given.

Keywords

Eumeninae, China, *Megaodynerus*, new species, key

Introduction

To date, the genus *Megaodynerus* Gusenleitner, 2012 is a rare genus within the subfamily Eumeninae, limited to China and Laos, comprising only two species: *Megaodynerus maximus* Gusenleitner, 2012 and *Megaodynerus bimaculus* Bai, Chen & Li, 2021. Gusenleitner (2012) first proposed the genus *Megaodynerus*, noting its large size resembling that of the two genera *Archancistrocerus* Giordani Soika 1986 (synonym of *Allorhynchium* van der Vecht, 1963) and *Orancistrocerus* van der Vecht, 1963. He pointed out that *M. maximus* shared a broad clypeus with the genus *Orancistrocerus*. The type specimen was collected in Laos. During long-term collections of the eumenine wasps in China, the second species *M. bimaculus* was discovered in Hunan (China) (Bai et al. 2021). And no males of the genus have yet been known. During examining the specimens of the family Vespidae deposited in Institute of Zoology, Chinese Academy of Sciences, three special specimens of the genus *Megaodynerus* from Anhui (China), including one female and two males, were found. Compared with the two known species of the genus, these specimens are verified as new to science. In present paper, the new species is described and illustrated in detail. Based on the references and the specimens, a key to all the known species of *Megaodynerus* and a global geographic distribution map of this genus are provided.

Materials and methods

The examined specimens are deposited in the National Animal Collection Resource Center, the Institute of Zoology, Chinese Academy of Sciences (IOZCAS). Specimens were studied under an Olympus SZ61 stereomicroscope. The distribution map (Fig. 1) was created using Photoshop 2020, integrating all examined specimen data and reliable literature records. And the photographs of the specimens were taken and measured with a KEYENCE-VHX-5000 stereomicroscope, and plates were arranged with Photoshop 2020. Body length, head width and head length were measured as follows: body length from the anterior margin of the head to the posterior margin of metasomal tergum 2, head width as the distance between the outermost edge of the compound eyes, and head length from the anterior ocellus to the clypeal apex. For the density of punctures, "sparsely" means the interspaces longer than one puncture diameter, "moderately" means equal to the diameter, and "densely" means less than one diameter. The abbreviations used in the text are as follows: A (1, 2, …) for antennal segments, T (1, 2, …) for metasomal terga, and S (1, 2, …) for metasomal sterna. Terminology principally follows Yamane (1990).

Taxonomy

Genus *Megaodynerus* Gusenleitner, 2012

Megaodynerus Gusenleitner, 2012: 1048; Bai et al. 2021: 388.

Type species. *Megaodynerus maximus* Gusenleitner, 2012, by subsequent designation of Gusenleitner 2013: 127.

Diagnosis. This genus is notable for its large size, such as female 16.2–18.0 mm and male 10.5–11.4 mm (Figs 2, 3) (fig. 7 in Gusenleitner 2012; fig. 77 in Bai et al. 2021). It is related to the genus *Symmorphus* (Bai et al. 2021), sharing with the latter by elongate body (Figs 2, 3), mesoscutum posteriorly with two deep longitudinal furrows (Fig. 8), and dorsal surface of T1 with a longitudinal furrow medially (Fig. 11).

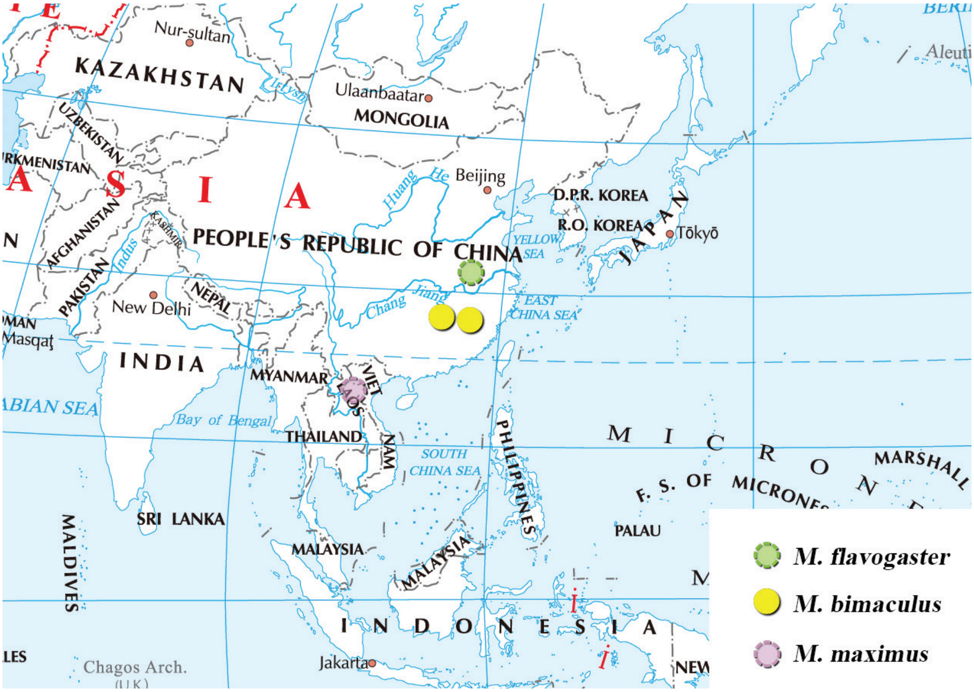


Figure 1. A global geographic distribution map of *Megaodynerus*.

The clypeus of both female and male resembles that of genus *Orancistrocerus* with a broad clypeus, apex wider than the distance between the inner margins of two antennal sockets (Figs 4, 7). The genus can be separated from the related genus by the following character combination: large body, T1 (Fig. 11) elongate, slightly wider than long (about 1.3 times) and obviously narrower than T2, anteriorly without transverse raised carina, the transition between anterior and dorsal surfaces round, S1 with fine striae at narrow part, and A13 of male recurved, forming a hook-like structure (Fig. 9).

Distribution. China (Fujian, Hunan and Anhui) and Laos (Fig. 1).

Megaodynerus flavogaster Long, Chen & Li, sp. nov.

https://zoobank.org/9A45B37E-F3F7-4BDD-8372-0C9D60B0FB45

Figs 2–12

Material examined. ***Holotype*** • ♀, China, Anhui, Lu' an City, Jinzhai County, Tiantangzhai Town, 31°10'23"N, 115°49'29"E, alt. 703 m, 15 May 2023, Yin-Qiao Zhang leg. (IOZCAS). ***Paratypes*** • 2♂, China, Anhui, Anqing City, Yuexi County, 31°2'28"N, 116°6'22"E, alt. 716 m, 2 June 2023, Huan-Xi Cao leg. (IOZCAS).

Diagnosis. This species is distinguished from the two known species *M. maximus* Gusenleitner, 2012 and *M. bimaculus* Bai, Chen & Li by the following character combination: metanotum without a median longitudinal groove (Figs 6, 8), transition between dorsal and posterior surfaces of propodeum with a raised round carina (Fig. 6), both T1 and T2 almost wholly brownish yellow except anterior margin and median black spot, T3 and T4 with apical brownish yellow bands (Fig. 11).

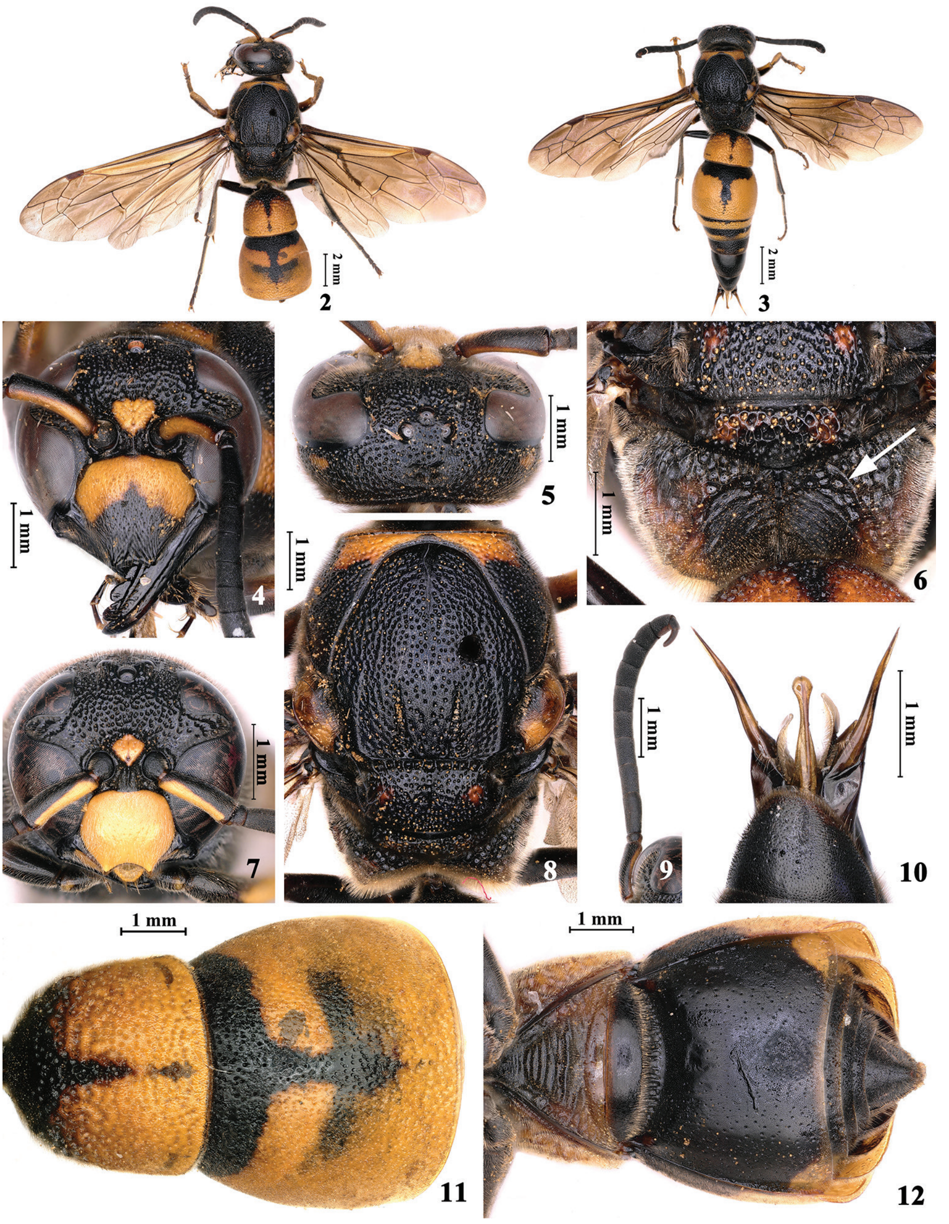
Description. Female: Body (Fig. 2) length 16.7 mm, forewing length 15.0 mm; frons with thick setae exceeding the diameter of an ocelli; mesosoma covered with strongly short and brown setae except mesopleuron and propodeum with longer and light setae, metasoma with microscopic pubescence; body black, with the following parts brownish yellow: basal half of clypeus, interantennal spot, ventral surface of antennal scape, small spot on gena, anterior quarter of pronotum, tegula except the inner margin, a pair of tiny dark spots on scutellum, small dark spot on metanotum, outside of dorsal surface of propodeum, both T1 and T2 almost whole excluding their anterior margins and narrow median gaps, apical bands of T3 and T4, lateral spots on apexes of both S2 and S3; wings brown, with purple luster.

Head. Head slightly wider (about 1.1 times) than long in frontal view (Fig. 4); clypeus about 1.1 times as wide as long, with small and sparse shallow punctures, interspaces microscopically longitudinal carinate at apex, apical emargination shallow and laterally blunt (Fig. 4); mandible with four prominent teeth; frons distinctly reticulo-punctate; vertex with moderate punctures and two connecting cephalic foveae (Fig. 5), foveae bearing dense pubescence, its lateral margin not exceeding posterior ocellus, and their posterior margin close to occipital carina; gena with denser punctures than vertex, occipital carina broaden slightly at the side.

Mesosoma. Mesosoma much longer than wide in dorsal view (Fig. 8); pronotum with deep punctures, these punctures slightly sparser than those on the anterior of mesoscutum; pronotal carina produced completely and lateral corner round; mesoscutum about 1.1 times as long as wide, weakly convex in lateral view, posterior area with two deep longitudinal furrows, anteriorly with dense punctures and posteriorly with slightly sparser punctures (Fig. 8); mesopleuron with flat-bottomed punctures, with weak epicnemial carina; scutellum with dense punctures and a medial longitudinal furrow (Fig. 8); metanotum reticulo-punctate, with much coarser and punctures much densely than both mesoscutum and scutellum, without a median longitudinal furrow (Figs 6, 8); metapleuron smooth; propodeum dorsally with irregular punctures and coarser than mesoscutum, posterior and lateral surfaces of propodeum with transverse striations, transition between dorsal and posterior surfaces with a raised round carina (Fig. 6).

Metasoma. T1 slightly wider than long in dorsal view (1.3 times), punctures larger and denser than mesoscutum with anterior area much coarser, medial longitudinal furrow on the horizontal surface gradually shallower from anterior to posterior (Fig. 11); punctures on T2 smaller and sparser than those on T1, with thin apical transparent lamella; S2 (Fig. 12) concave at base, almost impunctate with scattered and fine punctures; T3 with narrower apical transparent lamella; observable part of T3–T6 with deep punctures; S3–S6 with sparse punctures.

Male. Body length 10.5–11.4 mm (Fig. 3); sculpture, setae and coloration similar to female except as follows: clypeus wholly yellow, its apical emargination broader and deeper forming lateral acute tooth (Fig. 7); apex of A13 bent back reaching the base of A11, A11–A13 ventrally brownish yellow (Fig. 9); vertex without cephalic foveae;



Figures 2–12. *Megaodynerus flavogaster* sp. nov., holotype (♀) (**2, 4, 5, 6, 8, 11, 12**) paratype (♂) (**3, 7, 9, 10**). **2, 3.** Habitus (dorsal view); **4, 7.** Head (frontal view); **5.** Head (dorsal view) **6** propodeum (dorsal view); **8.** Mesosoma (dorsal view); **9.** Antenna; **10.** Genitalia (dorsal view); **11.** Metasoma (dorsal view); **12.** Metasoma (ventral view).

epicnemial carina strongly developed; scutellum and metanotum occasionally with larger yellow spots; epicnemial carina much developed then the female; penis valve suddenly widened at the apex (Fig. 10).

Distribution. China: Anhui.

Etymology. The specific name is derived from two Latin words: flavus (= yellow) and gaster (= metasoma), referring to the species with a lot of yellow marks on metasoma.

Key to the world species of the genus *Megaodynerus*

1 In female, clypeus slightly wider than long (about 1.1 times) with basal half yellow; T2 laterally with large lateral yellow marks connecting apical band... **2**

– In female, clypeus much wider than long (1.4 times), wholly black (fig. 8 in Gusenleitner 2012); T2 laterally without yellow spots.................................. ....***M. maximus* Gusenleitner, 2012**

2 Metanotum without a median longitudinal furrow (Figs 6, 8); transition between dorsal and posterior surfaces of propodeum with a round raised carina (Fig. 6); T1 and T2 almost brownish yellow, and T3 and T4 with apical yellow bands (Figs 11, 12)...............***M. flavogaster* Long, Chen & Li, sp. nov.**

– Metanotum medially with a wide longitudinal furrow (fig. 81 in Bai et al. 2021); dorsal surface of propodeum without a carina; T1 and T2 largely black, and T3 and T4 without apical yellow bands .... ***M. bimaculus* Bai, Chen & Li, 2021**

Discussion

Although these species of the genus *Megaodynerus* are large in size, their current distribution is quite restricted, making them difficult to encounter in the wild. Moreover, there remain significant knowledge gaps regarding their specific habitat conditions, biological life, and their phylogenetic position within the subfamily Eumeninae. To date, their northernmost limit of distributions is the Dabie Mountains region in Anhui Province which is considered part of the Palearctic Region. It represents a typical transitional zone along the southern margin of the Palearctic region. Therefore, *Megaodynerus* cannot be considered as an Oriental genus, which maybe raise awareness and stimulate further research on this group through relevant documentation, thereby promoting the accumulation and in-depth exploration for its evolution.

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