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Taxonomy of the ant genus *Cerapachys* Smith, 1857 (Hymenoptera: Formicidae) in China with description of a new species

Cong Liu[1*], Francisco Hita Garcia[2], Yan-Qiong Peng[3] and Naomi E. Pierce[1]

[1]Museum of Comparative Zoology, Harvard University, 26 Oxford Street, Cambridge, MA 02138, USA.
[2]Center for Integrative Biodiversity Discovery, Museum für Naturkunde, Leibniz-Institute for Evolution and Biodiversity Science, Berlin, Germany.
[3]CAS Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Mengla, China.

[*]Corresponding author: cong.liu0514@gmail.com

ABSTRACT. In this study, we update the taxonomy of the ant genus *Cerapachys* in China. A recent survey of the leaf litter ant fauna in the Hengduan Mountains yielded a hitherto unknown species of *Cerapachys*, which we describe here as *Cerapachys zhengyangwangi* **sp. nov.** This new species is clearly distinguishable from all the other species in the genus. We provide an updated identification key of the genus *Cerapachys* based on the worker caste, as well as a diagnostic discussion and high-quality specimen images.

Keywords *Cerapachys*, Formicidae, China, Hengduan Mountains, Gaoligong Mountains, taxonomy, Yunnan

Zoobank http://zoobank.org/907E60F5-3782-48D7-AE0F-478C2B737C1E

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INTRODUCTION

The ant genus *Cerapachys* Smith, 1857 is narrowly distributed in forest habitats of the tropics and subtropics of Southeast Asia. *Cerapachys* species can be found in northwestern India and Tibet, and from Middle China to Java and Borneo (Borowiec 2016, Antmaps 2024). Currently, there are only five valid species of *Cerapachys* (Bolton 2024), rendering it one of the smallest genera of ants. Historically, *Cerapachys* had once been considered one of the most species-rich genera and was placed in its own subfamily, Cerapachyinae, with a total number of 156 species (Brown 1975). Based on recent advances in DNA sequencing techniques together with morphological analyses, Borowiec (2016) revised the generic classification of the ant subfamily Dorylinae and split the polyphyletic *Cerapachys* into nine well-supported monophyletic genera (Borowiec 2016). All species of *Cerapachys* belong to "non-army ants" dorylines, which means that they do not possess a combination of behavioral and reproductive traits such as obligate group foraging, nomadism, highly modified queens (also called 'army ant syndrome', see Schneirla 1971; Gotwald 1995; Brady 2003). Compared to many other doryline genera, relatively little is known about the natural history of this group.

Most of the species in the genus *Cerapachys* live in Oriental or western parts of the Indo-Malayan region (Antmaps 2024). Following the work of Boroweic (2016), the taxonomy of the

genus is well resolved. In China, two species have been recorded: *C.sulcinodis* Emery, 1889, and *C. xizangensis* Tang et Li, 1982 with the latter only being found in Tibet (Chen et al. 2016). According to Chen et al. 2016, *C. xizangensis* is most likely a synonym of *C. sulcinodis* based on the original description. However, we were unable to confirm this as we were not able to access the type specimens of *C. xizangensis*.

In this study, we describe *Cerapachys zhengyangwangi* **sp. nov.**, the third species of this genus in China. It was collected in the Gaoligong Mountains, a mountainous sub-range of the southern Hengduan Mountains, Yunnan, China, during a recent survey of the local myrmecofauna (Liu et al. 2020). The main focus of that study was to assess the ground and leaf litter ant fauna. Specimens of *Cerapachys* species described here do not match any of the known species, and thus we consider the material to be new, and describe it as a novel species based on characters from the worker caste. In addition, we provide an updated identification key for *Cerapachys* species as well as a diagnostic discussion and high-quality illustrations of important morphological characters.

Abbreviations of depositories

The collection abbreviations follow Evenhuis (2024). The material upon which this study is based is located and/or was examined at the following institutions:

ISAS Kunming Institute of Zoology, Kunming, Yunnan, China

MCZ Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A.

ZMHB Museum für Naturkunde, Berlin, Germany

MATERIAL AND METHODS

The specimens presented in this study were collected during an inventory of the ant fauna of China's Hengduan Mountains in 2019, which yielded 136 species/morphospecies (Liu et al. 2020). All available workers were mounted, examined, and measured. Morphological observations and measurements were performed with a Leica M165 C stereomicroscope equipped with an orthogonal pair of micrometres at a magnification of 100x. Measurements were recorded in mm to three decimal places and rounded to two decimal places for presentation. The measurements and indices used in this study follow guidelines provided by Hita Garcia et al. 2017.

HL Head Length. Maximum distance from the midpoint of the anterior clypeal margin or from a line spanning the anteriormost points of the frontal lobes (depending on which projects farthest forward) to the midpoint of the posterior margin of head, measured in full-face view.

HW Head Width. The maximum width of the head capsule, measured in full-face view

MaL Mandible Length. Maximum length of mandible from the anterolateral margin of clypeus at outer side of mandibular insertion to mandibular apex.

SL Scape Length. The maximum straight-line length of the scape, excluding the basal constriction or the neck.

EL Eye Length. Maximum diameter of eye measured in lateral view.

TL Total Length. Maximum length of specimen measured from the tip of the mandibles to the tip of the abdominal segment VII, not including sting. Due to the position of the specimen, total length was measured as the sum of head length + thorax, petiole and mesosoma.

PH Pronotal Height: the maximum height of the pronotum in profile.

PW Pronotal Width: the maximum width of the pronotum in dorsal view.

DML Dorsal Mesosoma Length: maximum length of mesosomal dorsum from anterodorsal margin of pronotum to dorsal margin of propodeal declivity.

WL Weber's Length of Mesosoma: the maximum diagonal length of the mesosoma in profile, from the angle at which the pronotum meets the cervix to the posterior basal angle of the metapleuron.

MFL Metafemur Length: the maximum straight-line length of the metafemur, measured in dorsal view

PTL Abdominal Segment II (petiole) Length: the maximum length of abdominal segment II (petiole), measured in dorsal view.

PTH Abdominal Segment II (petiole) Height: the maximum height of the petiolar tergum in profile view, including laterotergite, excluding petiolar sternum.

PTW Abdominal Segment II (petiole) Width: the maximum width of abdominal segment II (petiole), measured in dorsal view.

A3L Abdominal Segment III Length: the maximum length of abdominal segment III, measured in dorsal view.

A3W Abdominal Segment III Width: the maximum width of abdominal segment III, measured in dorsal view.

A4L Abdominal Segment IV Length: the maximum length of abdominal segment IV, measured in dorsal view.

A4W Abdominal Segment IV Width: the maximum width of abdominal segment IV, measured in dorsal view.

CI Cephalic Index. Calculated as: HW / HL ×100.

SI Scape Index. Calculated as: SL / HW ×100.

MaI Mandibular Index. Calculated as: MaL / HW ×100.

DMI Dorsal Mesosoma Index: PW / WL × 100

DMI2 Dorsal Mesosoma Index 2: DML / WL × 100

LMI Lateral Mesosoma Index: PH / WL × 100

MF Metafemur Index: MFL / HW × 100

LPI Lateral Petiole Index: PTL / PTH × 100

DPI Dorsal Petiole Index: PTW / PTL × 10

DA3I Dorsal Abdominal Segment III Index: A3W / A3L × 100

DA4I Dorsal Abdominal Segment IV Index: A4W / A4L × 100

RESULTS

Species synopsis of *Cerapachys* Smith, 1857

Cerapachys antennatus Smith, F., 1857
= *Cerapachys wheeleri* Crawley, 1926

Cerapachys jacobsoni Forel, 1912
= *Cerapachys jacobsoni* subsp. *sumatrensis* Crawley, 1926
= *Cerapachys vandermeermohri* Menozzi, 1932

Cerapachys manni Crawley, 1926

Cerapachys sulcinodis Emery, 1889
= *Cerapachys butteli* Forel, 1913
= *Cerapachys risii* Forel, 1892

Cerapachys xizangensis Tang & Li, 1982

Cerapachys zhengyangwangi **sp. nov.**

Updated key to *Cerapachys* species based on worker caste.

The updated identification key to species is collated and modified from the original Chinese key (Chen et al. 2016).

Petiole in dorsal view smooth without rugae (Fig. 1A)..... ***Cerapachys antennatus***

Petiole in dorsal view with coarse longitudinal and/or irregular rugae (Fig. 1B, C) **2**

The anterior margin of the torulo-posttorular complex forming a small projector/tooth in full-face view (Fig. 2A, B, C)..... **3**

The anterior margin of the torulo-posttorular complex without a small projector/tooth in the full-face view (Fig. 2D)..... ***C. zhengyangwangi* sp. nov.**

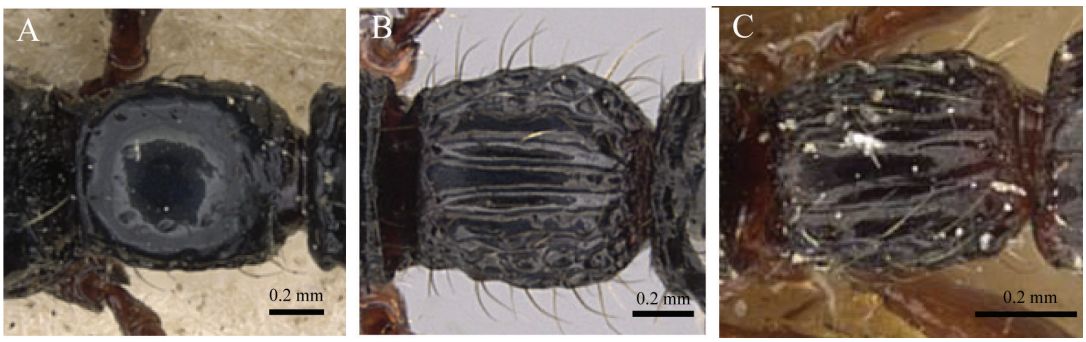

Fig. 1. Petiole in dorsal view. (A) *Cerapachys anternnatus* (CASENT0901347), (B) *Cerapachys jacobsoni* (CASENT0746007), (C) *Cerapachys sulcinodis* (CASENT0907050).

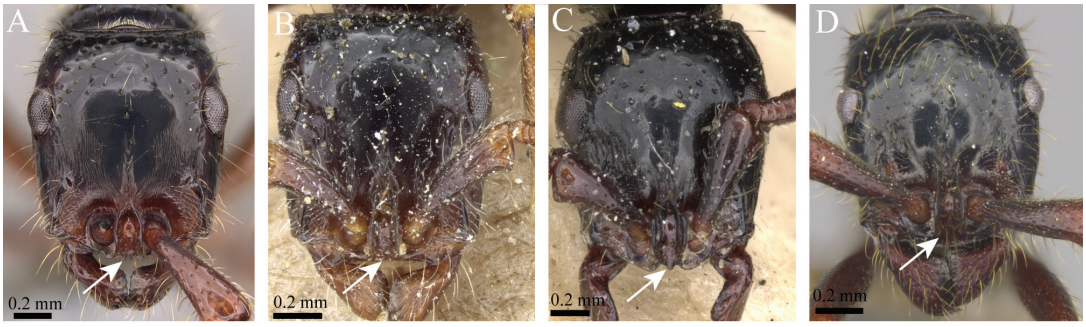

Fig. 2. Head in full-face view. (A) *Cerapachys jacobsoni* (CASENT0746007), (B) *Cerapachys sulcinodis* (CASENT0903772), (C) *Cerapachys anternnatus* (CASENT0901347), (D) *Cerapachys zhengyangwangi* **sp. nov.** (MCZ-ENT00763371).

Large species (TL =11mm).....***C. manni***
Small species (TL < 8mm).....**4**

Petiole in dorsal view with two strong unbroken longitudinal rugae in the centre surrounded by irregular pits (Fig. 1B)..... ***C. jacobsoni***
Petiole in dorsal view with several longitudinal and irregular rugae (Fig. 1C) **5**

Anterior face of petiole shallowly concave .... ***C. xizangensis***
Anterior face of petiole straight .....***C. sulcinodis***

[As noted above and pointed out by Chen et al. (2016), C. *xizangensis* could be a synonym for C. *sulcinodis*. The separation in the key is rather weak and this relationship requires further study, which is currently not possible due to lack of type access]

Description of new species
***Cerapachys zhengyangwangi* sp. nov.**
http://zoobank.org/E1612A06-963D-4ABA-A278-17D5A9C2BF77
(Fig 3.)

Type material. HOLOTYPE, pinned worker, CHINA, Yunnan, Gaoligong Mountains, Baihualing, 25.30059N, 098.80075E, 1635m, secondary forest, leaf litter, 03.VII .2019 (*C. Liu & G. Fischer*) (ISAS: MCZ-ENT00763371). **PARATYPES**, two pinned workers, CHINA, Yunnan, Gaoligong Mountains, Baihualing, 25.30059N, 098.80075E, 1635m, secondary forest, leaf litter, 03.VII .2019 (*C. Liu & G. Fischer*) (MCZ: MCZ-ENT00763372, ZMHB: MCZ-ENT00763373).

Diagnosis
Cerapachys zhengyangwangi differs from other congeners by the following combination of characters: total length of 8.31–8.5 mm; head slightly longer than wide (CI 91); whole body with abundant yellowish hair; head, mesosoma, and gaster shiny with a faint bluish tint; mandible with regular rogues towards the tip; torulo-posttorular complex vertical, lack of a small projector/tooth between them; petiole in dorsal view with several irregular ridges with a smooth and shinning space in the middle.

Worker measurements (N=3)
TL 8.31–8.50; HL 1.35–1.39; HW 1.23–1.26; MaL 0.55–0.59; SL 0.92–0.96; EL 0.22–0.24; PH 0.89–0.92; PW0.89–0.92; DWL 2.03–2.06; WL 2.12–2.15; MFL 1.38–1.45; PTL 0.77–0.83; PTH 0.68–0.71; PTW 0.74–0.77; A3L 0.95–0.98; A3W 1.08–1.11; A4L 1.57–1.60; A4W 1.54–1.57; CI 91–92; SI 76–81; MaI 45–46; DMI 42–43; DMI2 96–97; LMI 42–43; MF 112–115; LPI 113–117; DPI 92–96; DA3I 113; DA4I 98.

Worker description
Head. In full-face view, head subrectangular, slightly longer than wide (CI 91), posterior head margin straight to weakly concave; occipital corner in lateral view forming conspicuous angle. Occipital margin bearing distinct carina. Antennal scapes relatively long (SI 76–81), extending beyond 2/3 of head length but not reaching posterior head margin. Torulo-posttorular complex in full-face view vertical with broader median part, in full-face view anterior (frontoclypeal) margin not forming small projection/tooth. Anterior clypeal margin straight,

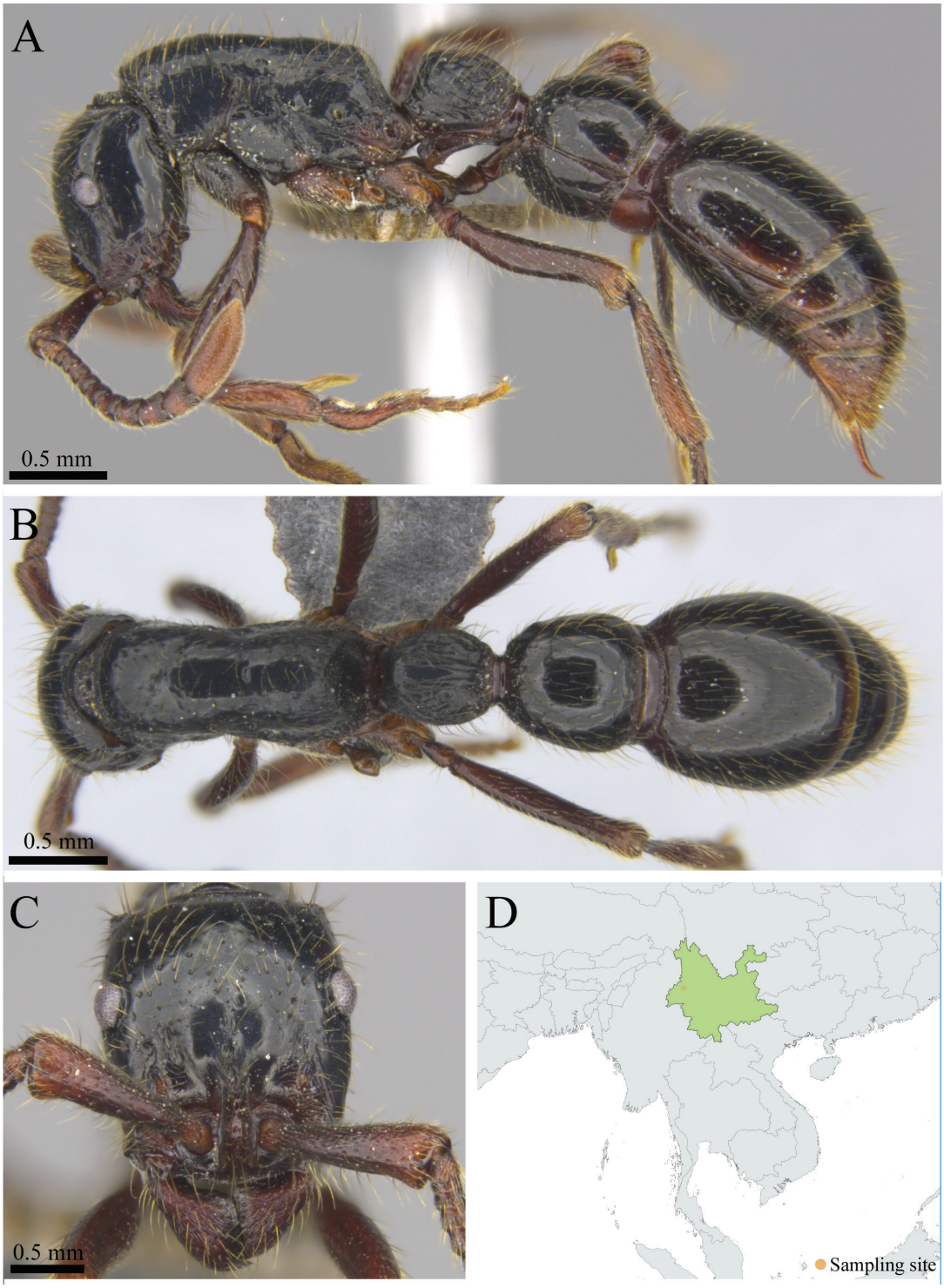

Fig. 3. *Cerapachys zhengyangangi* **sp. nov.** (MCZ-ENT00763371). **A** Body in profile; **B** Body in dorsal view; **C** head in full-face view; **D** Collection locality.

not concealed by curved anterior extension of frontal carina. Parafrontal ridges strongly elevated, incompletely surrounding antennal sockets, forming well-marginated triangular lobes. Mandible elongated triangular, masticatory margin without noticeable teeth except at apices. Eyes large.

Mesosoma. Promesonotum in profile view weakly convex dorsally; in dorsal view lateral margins of promesonotum slightly compressed laterally around mesopleura. Pronotal flange strongly marginated from collar by distinct ridge. Promesopleural suture completely fused, suture visible, but only faintly recognizable as shallow groove. Mesometapleural groove weakly impressed, inconspicuous. Concavity surrounding pleural endophragmal pit weak and inconspicuous. Propodeal declivity with strong margin or edge dorsally and rectangular in posterior view. Propodeal lobes well developed.

Metasoma. Petiole (abdominal segment II) in dorsal view rectangular, slightly longer than wide (DPI 92–96), with weakly convex lateral margins; in profile view longer than high, anterior face almost straight with posterodorsal face weakly concave; dorsal outline of petiole convex. Subpetiolar process relatively elongate, rectangular, and projecting down. Abdominal segment III in dorsal view strongly wider posteriorly, 1.13 wider than long (DA3I, 113); anteriorly narrower than petiole. Abdominal segment IV in dorsal view slightly wider than long, with convex lateral margins.

Sculpture. Head smooth and shiny with sparse seta-bearing foveae except having few irregular rugae around the parafrontal ridges. Mesosoma smooth and shiny with sparse seta-bearing foveae dorsally and laterally. Dorsal surface of petiole with coarse longitudinal and irregular rugae with smooth and shinning space in the middle; lateral surfaces of petiole with some oblique or irregular rugae. Gaster smooth and shiny.

Pilosity and pubescence. Whole body covered with abundant erect hairs. Antennae with abundant suberect and erect hairs. Mandibles with numerous thin and long hairs. Head, mesosoma, and petiole with erect pilosity dorsally and laterally. All legs with dense suberect to erect hairs. Gaster with dense erect pilosity on both dorsum and ventral.

Coloration. Body black with dark red mandibles, antennae, and legs. Head, mesosoma, and gaster with a faint bluish tint.

Etymology.
This new species is dedicated to Dr. Zhengyang Wang, a conservation biologist whose research has significantly contributed to our understanding of insect diversity and conservation in China's Hengduan Mountains.

Distribution and ecology
At present, the new species is known only from the Gaoligong Mountains in Yunnan, China. The type locality is a montane forest on Mount Tiantan, situated at an elevation of 1635m. Three workers of the new species were collected through leaf litter extraction. No additional information is available about the ecology of this species due to the limited number of collected specimens.

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