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A new ant species of the ant genus *Polyrhachis* Smith from the *aequalis*-group in China

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ABSTRACT. In this article, a new species, *Polyrhachis zhoui* **sp. nov.**, of the subgenus *Myrmothrinax*, is described based on worker, gyne and male specimens collected in Guangdong and Hainan Provinces, China. This new species belongs to the *P. aequalis*-group, for which an updated key is provided. The present record significantly increases the known distribution range of this species group to the north, especially within the Indochinese subregion, supporting recent research trends demonstrating that many species await discovery in the southern regions of China. This finding contributes to an increase in the total number of *Polyrhachis* ant species recorded in China to 56.

Keywords Hymenoptera, Formicidae, new species, China
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INTRODUCTION

Polyrhachis Smith ants, commonly known as spiny ants, are a hyper-diverse genus of ants including 790 valid species and subspecies (Bolton 2024) distributed throughout the Paleotropics and the temperate zones of Australia and East Asia (Mezger & Moreau 2016; Guénard *et al*. 2017). Spiny ants exhibit rich taxonomic and ecological diversity (Robson & Kohout 2007; Wong & Guénard 2020). For instance, the nesting habits of spiny ants encompass four main microhabitat types: arboreal, lignicolous, terrestrial, and subterranean (Hung 1967; Robson & Kohout 2007). Among these, China harbors 55 species (Guénard & Dunn 2012, Wong & Guénard 2020), about 7% of the total global diversity of *Polyrhachis* species.

Ants within this genus have been classified into multiple species groups. From the late 1980's to early 2010's, Kohout (2000, 2006, 2007, 2008) conducted extensive revisions of this genus leading to the formation of several subgenera and species groups. He proposed to divide the *Myrmothrinax* subgenus into two species-groups (*P. aequalis*-group and *P. thrinax*-group) based on the most distinctive feature in the workers: the relative lengths of the petiolar spines (Kohout 2008). During the revision of the *P. aequalis*-group, three new species were described from Sulawesi, Indonesia (Kohout 2008). To our knowledge, members of this species group are mainly encountered in the Philippines, Sundaic and Wallacean regions (Guénard *et al.* 2017), with a single record in the Indochinese region

recorded from Eastern Thailand (Chanthaburi Province, ~13.20N 101.73E) (Khachonpisitsak *et al.* 2020). Here we report the second record of this species group for the Indochinese region, collected during recent surveys in Guangdong and Hainan Provinces, China. This new species, *P. zhoui* **sp. nov.**, represents a new member of the *aequalis*-group and extends the known distribution range of this group further north in Asia.

MATERIAL AND METHODS

113 specimens (106 workers, 6 winged gynes, 1 winged male) were collected by hand sampling from an agarwood (*Aquilaria sinensis*) forest in Guangdong Province, and one specimen was collected from a pitfall trap in a forested habitat in Hainan Province.

Images were taken and samples were measured using a Keyence VHX-6000 digital imaging system (made in Japan). All measurements are expressed in millimeters (mm). Standard measurements and indices follow Bolton (1975) and Wong & Guénard (2020) with some additions.

List of measurements and indices.

TL In the stretched state, total length from the mandibular apex to the gastral apex.

HL The maximum length of the head capsule in full-face view, measured from the anterior clypeal margin to the posterior cephalic margin.

HW In full-face view, maximum width of the head excluding eyes.

EL The maximum diameter of the eye measured in profile.

ML The length of the straight line from tip of mandible to the joint at the base .

SL Length of scape of antenna.

PW In dorsal view, maximum width of pronotum without thorn.

MTL Metathoracic tibial length (maximum measurable length of the tibia of the hind leg).

PL The length of petiole measured in lateral view from anterior process to posterior most point of tergite, where it surrounds gastral articulation.

DPW In dorsal view, maximum width of petiole.

PH In lateral view, the vertical height between top of petiole and bottom of subpetiolar process.

CI Cephalic index (HW x 100/HL).

SI Scape index (SL x 100/HW).

LPI Lateral Petiole Index: PH x 100/PL.

DPI Dorsal Petiole Index: DPW x 100/PL.

RESULTS

Polyrhachis. zhoui sp. nov. Chen & Guénard

Type material. Holotype: worker, collected by hand sampling from Pingding Town, Maoming City, Guangdong Province (22.0613 °N, 110.4472 °E, 45 m, 2025-IV-25, ANTWEB1012847, Mengfei Mao collected).

Paratypes: 10 workers, collected by hand sampling from Pingding Town, Maoming City, Guangdong Province (22.0613 °N, 110.4472 °E, 45 m, 2025-IV-25, ANTWEB1012850, ANTWEB1012851, ANTWEB1012852, ANTWEB1012853, ANTWEB1012854, ANTWEB1012855, ANTWEB1012856, ANTWEB1012857, ANTWEB1012859, ANTWEB1012860, Mengfei Mao collected)

Other material examined: 1 worker, CHINA, Hainan Province, Ganshenling Natural Reserve located in Sanya City (18.3932 °N, 109.6504 °E, 266.1 m, 2023-XII-24, ANTWEB1012861, Defu Chen collected).

All the specimens are housed in the Hong Kong Biodiversity Museum (HKBM), School of Biological Sciences, The University of Hong Kong, China.

Worker description:

Holotype worker (n= 1): TL 5.90, HL 1.56, HW 1.31, SL 1.98, PW 0.87, EL 0.43, ML 0.53, PL 0.37, DPW 0.43, PH 0.53, LPI 143.24, DPI 116.22, CI 83.97, SI 115.15, MTL 1.84.

Paratype workers (n= 10): TL 5.29-6.09, HL 1.41-1.56, HW 1.15-1.34, SL 1.86-1.97, PW 0.76-0.87, EL 0.40-0.48, ML 0.51-0.64, PL 0.32-0.44, DPW 0.38-0.45, PH 0.48-0.54, LPI 122.73-165.63, DPI 93.18-140.63, CI 77.70-95.04, SI 140.91-168.70, MTL 1.72-1.97.

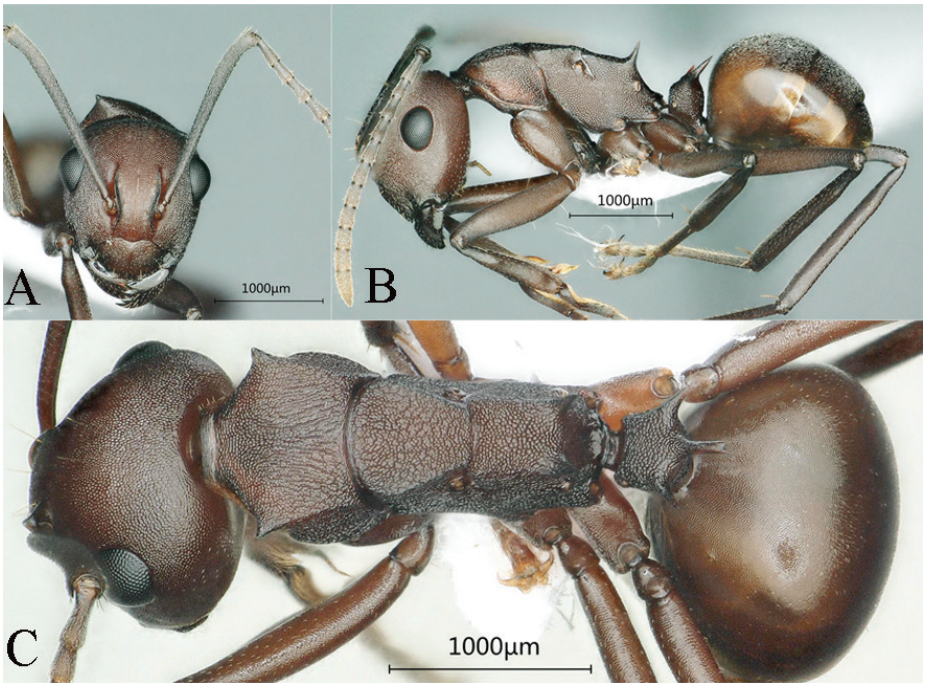

Fig. 1. *Polyrhachis zhoui* worker (ANTWEB1012847). **A.** Head in full-face view; **B.** Body in lateral view; **C.** Body in dorsal view.

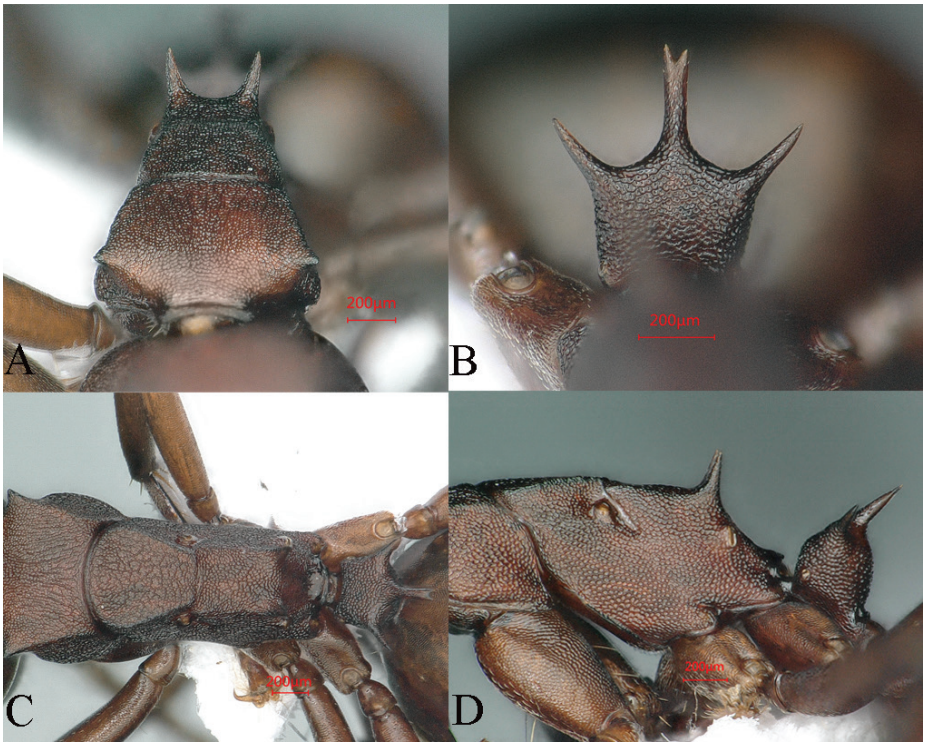

Fig. 2. Diagnostic characteristics of *Polyrhachis zhoui* worker, holotype (ANTWEB1012847). **A.** Propodeal spines in front view; **B.** Petiolar spines in front view; **C.** Propodeal spines and petiole spines in dorsal view; **D.** Propodeal and petiolar spines in lateral view.

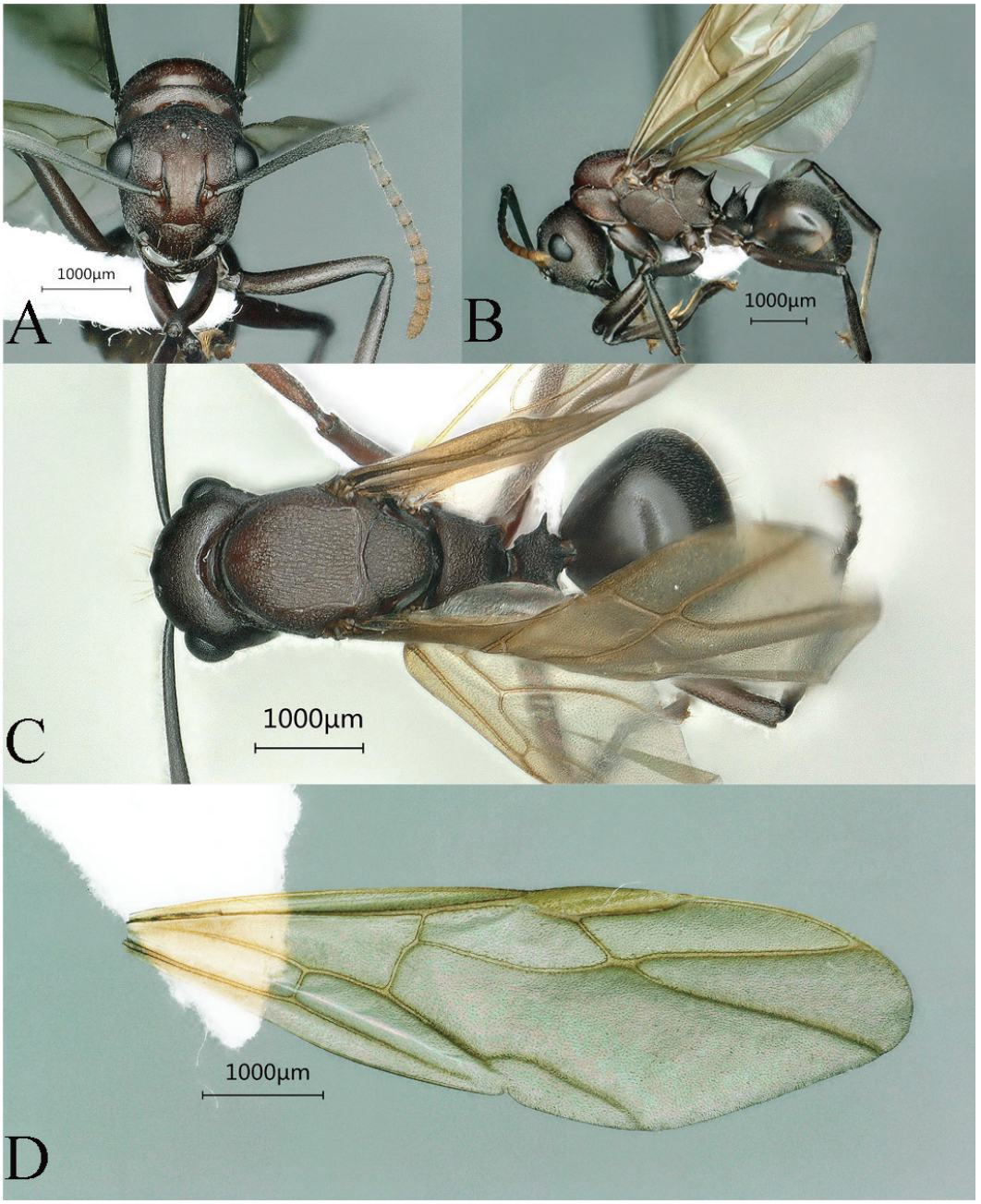

Fig. 3. *Polyrhachis zhoui* winged gyne (ANTWEB1012848). **A.** Head in full-face view; **B.** Body in lateral view; **C.** Body in dorsal view; **D**. Forewing.

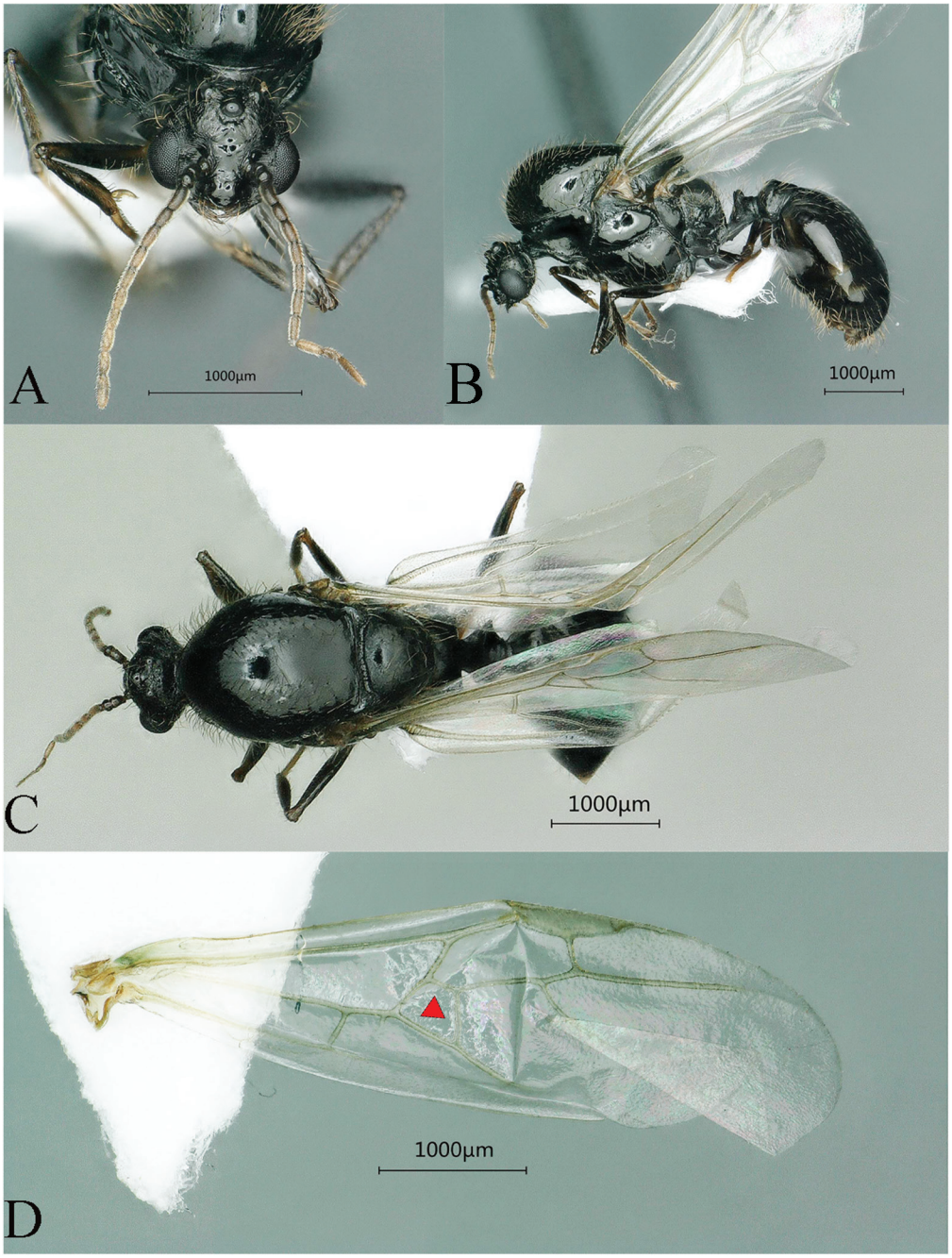

Fig. 4. *Polyrhachis zhoui* male (ANTWEB1012849). **A.** Head in full-face view; **B.** Body in lateral view; **C.** Body in dorsal view; **D**. Forewing (red triangle indicates an additional cell compared to the winged gyne).

Fig. 5. Collection sites. **A.** The agarwood forest land located in Pingding Town, Maoming City, Guangdong Province; **B.** Ganshenling Natural Reserve located in Sanya City, Hainan Province.

Fig. 6. Workers of the *Polyrhachis aequalis* group species. **A.** Body in lateral view of *P. trispinosa* (CASENT0103196); **B.** Body in lateral view of *P. incognita* (CASENT0103188); **C.** Body in lateral view of *P. aequalis* (HUMCZ001H); **D.** Head in full-face view of *P. incognita* (CASENT0103188); **E.** Head in full-face view of *P. aequalis* (HUMCZ001H); **F.** Body in lateral view of *P. imitator* (CASENT0217432); **G.** Body in lateral view of *P. abnormis* (CASTYPE06960); **H.** Body in lateral view of *P. deceptor* (CASENT0103186); **I.** Body in lateral view of *P. zhoui.* sp. nov.

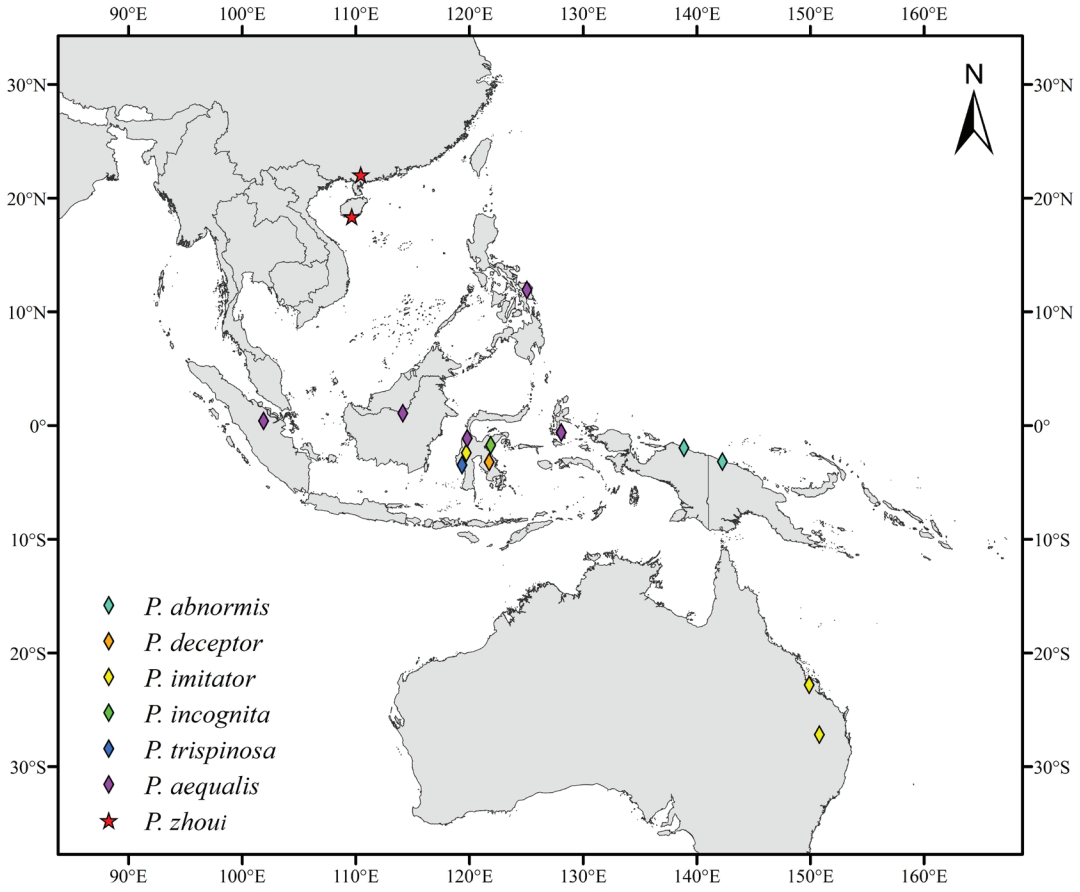

Fig. 7. Collection localities of members of the *Polyrhachis aequalis*-group. Note: *P. javanica* has not been placed on the map due to its division into *P. incognita* and *P. deceptor* by Kohout (2008), and *P. abnormis* was added. All images made using ArcMap.

Other material examined, worker (n= 1, from Hainan Province): TL 5.75, HL 1.34, HW 1.15, SL 1.75, PW 0.78, EL 0.41, ML 0.56, PL 0.33, DPW 0.37, PH 0.50, LPI 151.52, DPI 112.12, CI 85.82, SI 152.17, MTL 1.80.

Head. In full-face view, head oval-shaped, clearly longer than wide (CI 77.70-95.04, Fig. 1A). Lateral margins of head in front of eyes slightly convex, converging towards bases of mandibles. Posterior margin continuously and distinctly convex. Eyes located on the posterior part of head, just behind an imaginary line crossing the head from the posterior part of antennal insertions. Eyes strongly convex, nearly oval, and protruding beyond the lateral outline of cephalic region in full-face view. Ocelli absent. Frontal carinae extending from clypeus to about the level of two thirds of eye length, sinuate and with a shallow groove on its first half. Posterior margin of clypeus slightly concave on its middle portion, middle part of anterior clypeal margin slightly convex, and clypeus with a distinct median carina. Mandibles triangular, with four distinct teeth. Toruli exposed, and antennae with 12 segments, antennal segments II to XII each longer than broad, and segments II and XII a little longer. Antennal scape long, exceeding the posterior margin of head by more than 1/2 of its length (SI 140.91-168.70).

Mesosoma. In lateral view, dorsum of the mesosoma slightly raised towards the posterior part of mesonotum (Fig. 1B, 2D). Promesonotal suture distinct; metanotal groove present, but length less than half of metapleura. Propodeal dorsum straight and slightly downsloping, with a pair of gently curved, weakly divergent propodeal spines pointing upwards; propodeal declivity

slightly concave. In dorsal view (Fig. 1C, 2C), a pair of reduced but distinct pronotal spines present on antero-lateral margins; mesosoma widest at pronotum and distinctly narrowed at mesonotum, with propodeal dorsum being of equal width anteriorly and posteriorly. With mesosoma in profile view, metathoracic spiracle round-shaped, located relatively high, close to metanotal groove, and propodeal spiracle oval, located at mid-height on lateral face of propodeum close to its posterior margin (Fig. 2C, 2D).

Metasoma. Petiole with a flat anterior face and a convex posterior face, anterior and dorsal faces connected in a subconvex smooth curve; petiole higher (PH 0.48-0.54) than large (DPW 0.38-0.45) and long (PL 0.32-0.44); dorsum bears three sharp, rearward-pointing, nearly equally sized spines (Fig. 2B, 2D); anterior face of first gastral tergite straight in lateral view, rounding onto dorsum of segment; in lateral view first tergite shorter than the second (Fig. 1B).

Sculpture. In full-face view, mandibles finely micro-reticulate; head covered with dense reticulate-punctate texture. In dorsal view, pronotum with dense sub-parallel and regular longitudinal rugae, crossed by thinner and irregular transverse rugae; mesonotum, propodeum and petiole with irregular sculpture. In lateral view, mesosoma and petiole with micro-reticulae; gaster finely shagreened, and with micro-reticulae.

Pilosity. Mandibular apex and anterior clypeal region bearing several golden erected hairs, while first gaster tergite covered with fine and short appressed pubescence, other gastral segments with few golden suberect hairs.

Colouration. Body color ranges from reddish-brown to brown, with the gaster being darker towards brown.

Gyne description:

Gyne (n= 1): TL 6.85, HL 1.71, HW 1.38, SL 2.12, PW 1.33, EL 0.57, ML 0.69, PL 0.47, DPW 0.51, PH 0.58, LPI 123.40, DPI 108.51, CI 80.70, SI 109.75, MTL 1.70.

Head. Basic characteristics similar to worker caste. Additionally, head possesses three ocelli of similar sizes, with distance from the median ocellus to the line connecting the two lateral ocelli being approximately one-third of distance between the two lateral ocelli.

Mesosoma. In lateral view, dorsum of mesosoma distinctly raised (Fig. 3B). Promesonotal suture and metanotal groove distinct. In lateral view, propodeal dorsum sloping downward, bearing a pair of gently curved, weakly divergent propodeal spines directed posterolaterally; propodeal declivity slightly concave; pronotum slightly longer than high, ventrally margined with sharp carina; mesopleuron divided into three sections by distinct transverse groove; mesopleuron clearly demarcated from metapleuron by distinct suture. In dorsal view (Fig. 3C), mesoscutum longer than broad, anteriorly rounded and convex, with flat median portion; mesoscutellum broader than long; metanotum shorter than broad.

Forewing. Length: 6.29 mm, with costa, subcosta, radius, radial sector, media, cubitus, cross veins; with 5 closed cells; surface with dense punctures, yellowish-brown (Fig. 3D).

Metasoma. Similar to worker caste.

Sculpture. Sculpture on mandibles, head, mesosoma, petiole and gaster similar to worker caste. In dorsal view, mesonotum and metanotum with reticulate sculpture.

Pilosity. Mesonotum and metanotum bear a few short, golden suberect hairs, other pilosity same as in worker.

Colouration. Similar to worker caste, but wings pale yellow.

Male description:

Male (n= 1): TL 6.48, HL 0.82, HW 0.80, SL 0.87, PW 1.38, EL 0.43, ML 0.29, PL 0.64, DPW 0.59, PH 0.47, LPI 73.44, DPI 92.19, CI 97.56, SI 108.75, MTL 0.61.

Head. In full-face view, head nearly circular, with length and width subequal. Anterior clypeal margin weakly convex medially. Eyes large and convex, their outer margins slightly surpassing lateral margins of head in full-face view. Distance from median ocellus to line connecting lateral ocelli approximately one-third of distance between lateral ocelli; median ocellus larger than lateral ocelli. Antennae 11-segmented; antennal segments II–XX each longer than broad. Frontal lobes indistinct; frontal carinae reaching level of midlength of eyes (Fig. 4A). Mandibles subtriangular and slender, with two teeth: long apical denticle and short basal denticle.

Mesosoma. In lateral view, dorsum of mesosoma distinctly raised (Fig. 4B). Propodeal dorsum sloping downward, lacking spines; propodeal declivity straight. In lateral view, pronotum lateral face subtriangular; mesopleuron divided into two sections by distinct transverse grooves; mesopleuron clearly demarcated from the metapleuron by distinct suture. In dorsal view, mesoscutum longer than broad, anteriorly rounded and convex, with a flat median portion; mesoscutellum broader than long; metanotum shorter than mesoscutum and mesoscutellum (Fig. 4C).

Forewing. Length: 4.86 mm, with costa, subcosta, radius, radial sector, media, cubitus, cross veins; with 6 closed cells (red triangle on Fig. 4D denotes the additional cell); with smoother texture and more transparent than in gyne (Fig. 4D).

Metasoma. In lateral view, petiole subtriangular; ventral surface of petiole possesses a small dentate process, anterior slope forms an acute angle with the ventral face, posterior slope nearly perpendicular to ventral plane; petiole length (PL 0.64) exceeds width (PW 0.59) and height (PH 0.47); dorsum lacks spines. Anterior face of first gastral tergite slightly convex in lateral view, transitioning smoothly onto the dorsum of the segment; first gastral tergite significantly shorter and smaller than the second.

Sculpture. In full-face view, nearly rectangular area between clypeus and median ocellus smooth and shiny, other regions with fine and irregular striae visible. In lateral view, all grooves with irregular striae; first gastral segment with two longitudinal rugae, remaining gastral segments smooth and shiny. In dorsal view, mesonotum and metanotum without sculpture.

Pilosity. In full-face view, mandibles, anterior clypeal region, and area from eyes to posterior cephalic margin with several long golden hairs. In lateral view, body covered with golden hairs of varying lengths. In dorsal view, mesonotum lateral portions with dense and long golden hairs, with small rectangular glabrous area near metanotum; mesoscutellum with sparse, long golden hairs.

Colouration. Body black, gaster dark brown, wings nearly transparent.

Comparative notes: According to Kohout's (2008) classification criteria, the new species belongs to the *P. aequalis*-group due to the presence of subequal petiolar spines.

In the worker caste, the new species, *P. zhoui.* sp. nov., is distinctive for its upward-directed propodeal spines, mesosoma dorsum with complex rugae and its puncto-reticulate lateral portion of mesosoma. It is most similar to *P. abnormis* Donisthorpe*,* 1948, a species endemic to New Guinea, with the differences between both species being the shape and length of propodeal spines. The propodeal spines of *P. abnormis* are slender and straight, non-divergent, and their length approximately equal to the propodeal dorsal face, but the new species possesses shorter and slightly curved propodeal spines.

Polyrhachis zhoui. sp. nov. is also quite similar to *P. deceptor* Kohout, 2008, a species endemic to Sulawesi. We note slight difference in the directions of propodeal and petiolar spines. Compared with *P. deceptor*, the propodeal spines of the new species are up-pointing, with the petiolar spines longer than the height of the petiole and slightly bending backward. In contrast, the propodeal spines of *P. deceptor* are backward-pointing, with their length approximately equal to the height of the petiole. The posterior margin of the head in full-face view in *P. zhoui* is clearly convex while it is flatter in *P. deceptor*. *Polyrhachis zhoui* is among the smaller species of the *P. aequalis* group (Tab 1).

Kohout (2008) discussed the subtle differences between *P. deceptor* and *P. abnormis*, considering them to be nearly morphologically identical and treating them as conspecific. Therefore, *P. abnormis* was subsequently removed from the *aequalis* species-group by Kohout (2008). However, this view is subject to further discussion, as further careful analyses are still needed using detailed morphometrics and/or molecular evidence. Hence, we tentatively regard *P. abnormis* as a valid member of the *aequalis* species-group here.

Etymology. This species is named in honor of Professor Shanyi Zhou, in recognition of his outstanding contributions to the field of ant taxonomy in China, in particular within Southeast China where this species was collected.

Ecological notes: 105 workers, 6 winged gynes and 1 winged male were collected from a nest in an agarwood forest by hand collection from Pingding Town, Maoming City, Guangdong Province. The nest was built from a leaf of agarwood. The leaf was curled into a cylindrical shape 11 larvae were found inside the nest, but no foundress queen was found, so it is possible that this species adopts a polydomous system with the main nest and other satellite nests around. It should be noted, however, that despite our best efforts to collect all the ants, their agility still allowed some workers to escape. The forest floor was covered with a large amount of *A. sinensis* leaf litter. The average temperature and humidity on the day of collection were 23.4°C and 87%, respectively. An additional worker specimen was collected by pitfall trap from Ganshenling Natural Reserve, located in the northeast of Sanya City, Hainan Province, China. The average temperature of the day was about 20 ℃ and the humidity was 67 %. The landform of the Natural Reserve is low mountain and hilly land, 50 ~ 681 meters above sea level, with rich shrubs.

Identification key to *Polyrhachis aequalis* group species based on worker caste (refer to Kohout, 2008, with the addition of *P. zhoui* sp. nov. and *P. abnormis*).

1. In lateral view, pronotal humeri with distinct teeth or short spines 2
- In lateral view, pronotal humeri widely rounded, without teeth or spines (Fig. 6A)…..*P. trispinosa*

2. Propodeum with distinct and relatively short teeth, somewhat triangular 3
- Propodeum with long spines..... 4

3. Propodeum spines rear-pointing, head in full-face view dull (Fig. 6B, D)…….... *P. incognita*
- Propodeum spines upward-pointing, head in full-face view a little shiny (Fig. 6C, E)…*P. aequalis*

4. With mesosoma in dorsal view, propodeum spines not divergent 5
- With mesosoma in dorsal view, propodeum spines divergent or weakly divergent..... 6

Table 1. *Polyrhachis aequalis*-group measurement. *Polyrhachis aequalis* is excluded because of the lack of measurements in the original literature. It should be noted that *Polyrhachis javanica* is not presented here. This is because Kohout (2008) re-examined all of the type specimens for this species and reclassified them as *P. incognita* and *P. deceptor*.

Measurements (mm)	*P. deceptor*	*P. zhoui*	*P. imitator*	*P. incognita*	*P. trispinosa*
TL	6.15 (6.1-6.75)	5.29-6.09	6.55 (6.50-7.21)	6.80 (6.65-7.61)	6.45-7.66
HL	1.65 (1.59-1.75)	1.34-1.56	1.68 (1.65-1.72)	1.75 (1.68-1.75)	1.56-1.81
HW	1.40 (1.34-1.50)	1.15-1.34	1.47 (1.43-1.53)	1.53 (1.47-1.53)	1.22-1.43
SL	2.03 (1.93-2.18)	1.75-1.97	1.96 (1.93-1.98)	2.12 (2.03-2.21)	1.96-2.18
PW	0.90 (0.84-1.00)	0.76-0.87	0.94 (0.90-1.00)	1.06 (1.00-1.06)	0.84-0.90
EL	-	0.40-0.48	-	-	-
ML	-	0.51-0.64	-	-	-
PL	-	0.32-0.44	-	-	-
DPW	-	0.37-0.45	-	-	-
PH	-	0.48-0.54	-	-	-
LPI	-	122.73-165.63	-	-	-
DPI	-	93.18-140.63	-	-	-
CI	85 (84-86)	77.70-95.04	87 (87-91)	87 (87)	78-80
SI	145 (141-150)	140.91-168.70	133 (128-137)	138 (138-147)	149-163
MTL	2.21 (2.15-2.40)	1.72-1.97	2.18 (2.12-2.25)	2.34 (2.18-2.53)	2.15-2.59
N workers measured	7	12	11	4	8

5. Propodeum dorsal face slanting; propodeum spines rear-pointing, shorter than propodeum dorsum (Fig. 6F) ..... *P. imitator*
- Propodeum straight in dorsal outline; propodeum spines up-pointing, perpendicular and parallel, approximately equal to dorsum of propodeum (Fig. 6G) ..... *P. abnormis*

6. Propodeum spines rear-pointing; petiole spines approximately equal to height of petiole, HL relatively long (1.65), distinctly bending backward (Fig. 6H)..... *P. deceptor*
- Propodeum spines up-pointing, tapering from base to apex, slightly curved; petiole spines longer than height of petiole, HL relatively short (1.41-1.56), slightly bending backward (Fig. 3I) .... *P. zhoui.* sp. nov.

DISCUSSION

The ant genus *Polyrhachis* is one of the most species-rich genera in the world, being both common and widely distributed (Janicki et al. 2016; Guénard et al. 2017). The number of recorded species of this genus in China (56 valid species, 1 valid subspecies) represents about 7 % of the total species count worldwide (708 valid species, 82 valid subspecies) (Guénard & Dunn 2012). In recent years, several new members of this genus have been reported in south China (Brassard *et al*. 2021) including the description of several new species (Wong & Guénard 2020), indicating the potential for uncovering more species of *Polyrhachis* within the country. At the same time, through limited collection efforts, we have been fortunate to gather members of the *aequalis*-group from Guangdong and Hainan Province. These serve as a promising indication that many more species of this genus and other arboreal genera may await discovery in China, highlighting the current limitations of our collection efforts (e.g. Luo & Guénard 2016).

Currently, members of the *P. aequalis*-group are predominantly distributed in Southeast Asia, in particular within the Wallacean region, where all species occur (Kohout 2008; Janicki *et al*. 2016; Guénard *et al*. 2017). However, the presence of this group is not confined to this region, as seen with *P. abnormis* and *P. imitator*, which have also been found in New Guinea and Australia respectively (Fig. 7). The discovery of a new species within this group in Guangdong and Hainan Provinces, China, is notable as it represents the northernmost record of this species-group but also the first species known exclusively outside of the Wallacean region – although further sampling across Asia may change this in the future. Through comparison with the morphological characteristics of other species within the same species group, we have found that it is indeed a new species (Table 1). The presence of this species within the Indochinese region is also remarkable, as up to now only *P. javanica* had been recorded in the southern part of this subregion, from Eastern Thailand (Khachonpisitsak *et al*. 2020). It should be noted, however, that the identification of *P. javanica* could be erroneous as the status of this species has been debated previously (Kohout 2008).

Ant surveys and taxonomic studies in China are still strongly needed to catalog the diversity of the country, as shown in the past decade by the plethora of new species and records found in various regions and within various strata (Liu *et al*. 2015, 2020, 2022; Luo & Guénard 2016; Hamer *et al*. 2023a, b; Silva *et al.* 2023; Qian & Xu 2024; Qian *et al*. 2024). This is particularly true on Hainan Island where the known ant diversity of about 180 species is largely underestimated (Hamer *et al*. 2025). For instance, no *Strumigenys* species had been recorded until the work by Tang and Guénard (2023), which presented results for 23 species including five new species to science. Similarly, 13 *Polyrhachis* species have been recorded in Hainan Island to date, likely an underestimation considering that 17 species have been recorded from the much smaller and cooler region of Hong Kong (Wong & Guénard 2020), while 19, 23 and 32 species have been previously recorded in Guangdong, Guangxi and Yunnan provinces respectively (Guénard *et al.* 2017). One could thus expect for additional species to be recorded within Hainan, especially at the light of the diverse ecological niches occupied by the genus, with nesting habits, including arboreal, lignicolous, terrestrial, and subterranean nests (Bolton 1973).

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