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New record of *Camponotus husseini* Dietrich, 2004 and confirmation of *Polyrhachis lacteipennis* Smith, 1858 in Oman, with additional morphometric data on *Polyrhachis palaearctica* Dietrich, 2004 (Hymenoptera: Formicidae)

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Abstract
Camponotus husseini Dietrich, 2004 is recorded from Oman for the first time based on material collected in the Dhofar Governorate. Identification was confirmed using morphometric characters and the discriminant formula proposed by Dietrich (2004), together with the presence of multiple subcephalic bristles. In addition, the presence of *Polyrhachis lacteipennis* F. Smith, 1858 in Oman is confirmed. Comparative morphometric analyses were conducted between Omani specimens of *P. lacteipennis* and material of *Polyrhachis palaearctica* Dietrich, 2004 collected near its type locality at the Dead Sea. Measurements of the dorsal spine index (DSI) demonstrate clear differences between the two species, supporting their separation despite partial overlaps in some other characters. The results further indicate that DSI represents a reliable diagnostic character, whereas other traits such as spine curvature and gastral pilosity appear less consistent. These findings contribute new distributional data for the ant fauna of the Arabian Peninsula and provide additional morphometric information relevant to the taxonomy of the *Camponotus sericeus* (Fabricius, 1798) and *Polyrhachis dives* species groups.

Key words: Arabian Peninsula, biodiversity, Formicidae, Dhofar Governorate.

Introduction

Recent studies by Monks et al. (2019) and Sharaf et al. (2018, 2022) have provided valuable insights into the myrmecological composition of Oman, particularly through field surveys focusing on the Dhofar Governorate. These studies have contributed to the knowledge of Omani ant fauna by reporting previously unrecorded species and describing several new ones.

However, there was an omission of the study by Dietrich (2004), which analyzed ants from the Arabian Peninsula. In that study, Dietrich separated African populations of *Camponotus sericeus* (Fabricius, 1798) from their Arabian counterparts, designating the latter as *Camponotus husseini* Dietrich, 2004. The diagnostic differences observed in Arabian populations include petiole morphology, propodeal shape, and the presence of subcephalic bristles. *Camponotus husseini* possesses multiple long subcephalic bristles, a narrower petiole, and a more convex propodeum, whereas *C. sericeus* usually lacks subcephalic bristles, has a broader petiole, and a less convex propodeum (Dietrich, 2004).

In the same study, Dietrich examined Indian, Afghani and Pakistani populations of *Polyrhachis lacteipennis* F. Smith, 1858 (previously referred to as *Polyrhachis simplex* Mayr, 1862) and compared them to *Polyrhachis* populations from the Dead Sea region in Jordan and Israel, ultimately describing a new species – *Polyrhachis palaearctica* Dietrich, 2004. Both *Polyrhachis* species belong to *dives* species group (Dorow 1995).

Nowadays, both *Camponotus husseini* and *Polyrhachis palaearctica* are valid species (Bolton, 2025) and the absence of any reference to Dietrich's work in Sharaf et al.'s studies is unclear. A re-examination of the specimens analyzed by Sharaf et al. (2018; 2022), as well as those from other studies (Pashaei Rad et al. 2018; Monks et al. 2019), is therefore necessary.

Materials and Methods

During the field trip to Dhofar Governorate (Oman), *Camponotus husseini* and *Polyrhachis lacteipennis* were detected (Fig. 2). All specimens were collected during daytime in a coastal habitat represented by a dune and dominated by *Ipomoea pes-caprae* (L.) R.Br., 1818 (Figs 1, 2). Additionally, some specimens of *Polyrhachis palaearctica* were collected close to its type locality (Dead Sea) to allow comparison with *Polyrhachis* specimens from Oman.

Most of the material is stored in the first author's private collection.

Photographs were taken using a Sony A6000 camera equipped with Laowa 25mm ultra macro, PLAN 10X and Nikon MPLAN 20X ELWD microscope objectives. For focus stacking, an electronic macro rail with a resolution of <1 µm per photo was used. Lighting was provided by two adjustable-intensity LED panels. The scale bar was calibrated by photographing a graduated slide with 0.01 mm divisions at the same magnification as the specimen images.

Measurements were obtained using ImageJ software, following morphometric analysis guidelines after Dietrich (2004):

Camponotus
KB (Maximum Head Width): Measured including the eyes (in µm).
PI (Petiolar Index): Calculated as PW/PL, where:
PW = Maximum width of the petiolar node in dorsal view.
PL = Maximum length of the petiolar node in dorsal view (lateral view provides the same results).

$$KB\text{-}(PI\text{-}0.7137)/0.000246$$

Positive result means that it is *C. sericeus*; negative, *C. husseini* (Dietrich 2004).

Polyrhachis
PDW (Propodeal Spine Angle): The angle between the propodeal spines.
DSI (Dorsal Spine Index): The specimens must be positioned so that the projections of the propodeal spines in lateral view coincide (Fig. 6). Next, the tips of the pronotal and propodeal spines are connected, and the intersection angle (< 90°) is extended downward to the stigma. DSI is calculated as X/Y, where:
X = Length from the top of the propodeal spine to the intersection with the stigma.
Y = Length from the stigma intersection to the top of the pronotal spines.

$$PDW\text{-}(DSI{*}218{+}89.22)$$

Positive result means that it is *P. lacteipennis*; negative, *P. palaearctica* (Dietrich 2004).

Results

Subfamily Formicinae Latreille, 1809
Tribe Camponotini Forel, 1878
Genus *Camponotus* Mayr, 1861
***Camponotus husseini* Dietrich, 2004**
(Figs 1c, 2, 3, 7; Table 1)

Material examined. 3☿, Fazayah Beach (16.8386N, 53.7194E); 20 Apr 2024; leg./det. Matvey Logachev.

Table 1. Comparison of diagnostic characters of *Camponotus husseini* and *Camponotus "sericeus"* based on Dietrich (2004) and the present study.

Character	*Camponotus "sericeus"* (Dietrich, 2004; Afrotropical range[1]) KB, PI: n=36, m=11 SB: n=47, m=8	*Camponotus husseini* (Dietrich, 2004; Middle East and northeastern Africa[2]) KB, PI: n=57, m=9 SB: n=55, m=8	*Camponotus husseini* (Present study; Oman) n=3, m=1
KB (Maximum Head Width) (µm)	2021 ± 448 [1510–3057]	1991 ± 485 [1491–3321]	1797 ± 145 [1680–1960]
PI (Petiolar Index)	1.110 ± 0.131 [0.962–1.480]	1.307 ± 0.136 [1.105–1.667]	1.183 ± 0.025 [1.157–1.208]
SB (Subcephalic bristles)*	0.296 [0–2]	4.39 [0–10]	2.33 ± 2.52 [0–5]
Formula result	Positive	Negative	-108.45 ± 99.13 [-222.91– -50.7]

*Global means from Dietrich, 2004 (table 2) were calculated as means weighted by sample size. For each population, the mean value was multiplied by its sample size (n), and the sum of these products was divided by the total number of examined specimens.
[1]Material of *Camponotus "sericeus"* comes from Gambia, Mali, Chad, Egypt, Burundi, Uganda, and Tanzania.
[2]Material of *Camponotus husseini* originates from Jordan, Yemen, Saudi Arabia, and Egypt.

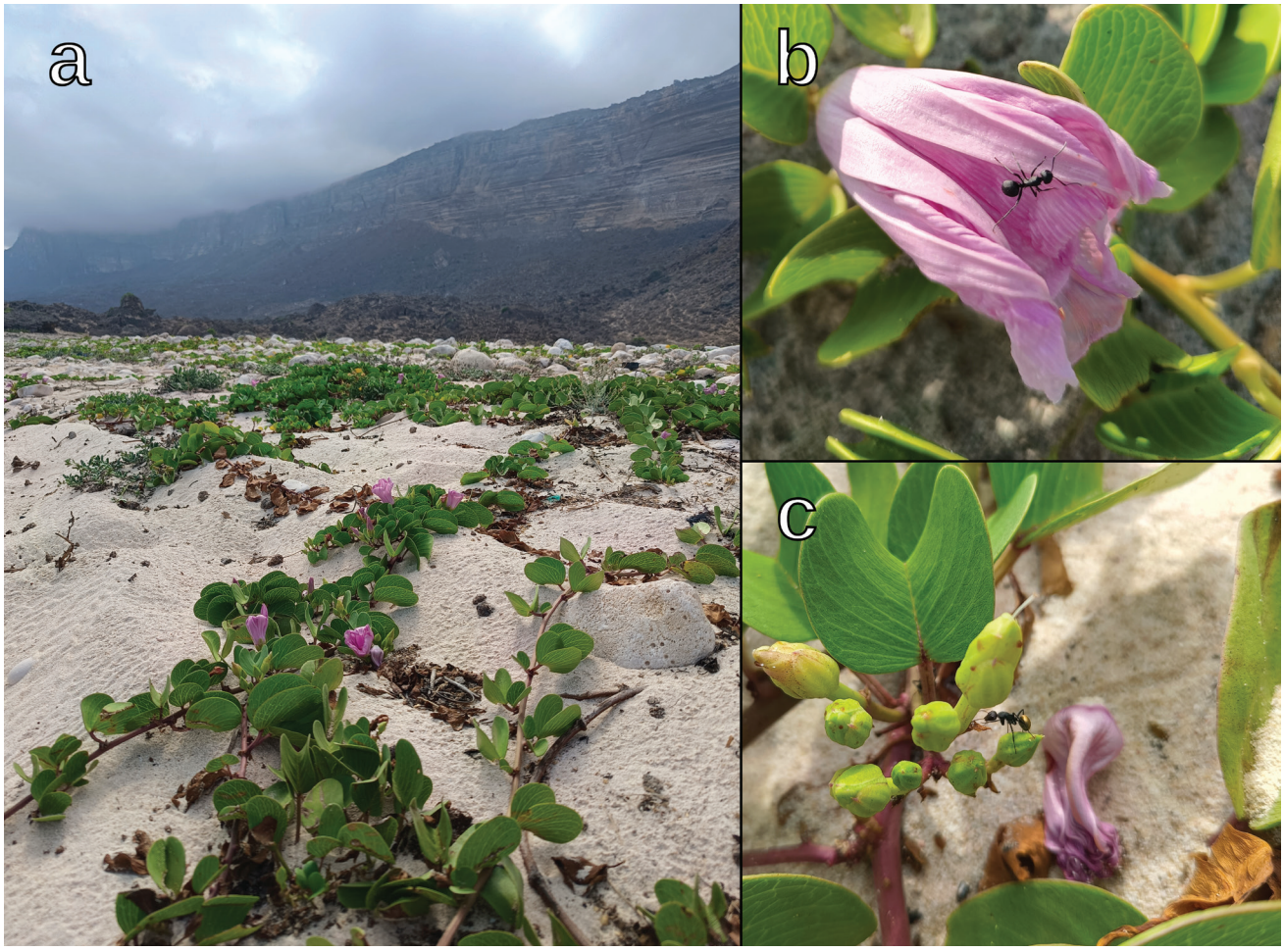

Fig. 1. **a**, habitat of *Camponotus husseini* and *Polyrhachis lacteipennis* domitated by *Ipomoea pes-caprae*, Oman; **b**, *Polyrhachis lacteipennis*; **c,** *Camponotus husseini.*

Remarks. The ants examined in this study belong to *Camponotus husseini* based on the identification formula given above and the presence of multiple subcephalic bristles, though other morphological characters appear less distinctive (Table 1).

Genus *Polyrhachis* F. Smith, 1857
Subgenus *Myrmhopla* Forel, 1915
***Polyrhachis lacteipennis* F. Smith, 1858**
syn. *Polyrhachis simplex* Mayr, 1862
(Figs 1b, 2, 4, 6, 9b; Table 2)

Material examined. 2☿, Mirbat (16.9756N, 54.6946E); 22 Apr 2024; leg./det. Matvey Logachev.

***Polyrhachis palaearctica* Dietrich, 2004**
(Figs 5, 6, 8, 9a; Table 2)

Material examined. 37☿, Dead sea, Israel (10☿ 31.4557N, 35.3781E, 9☿ 31.4559N, 35.3773E, 9☿ 31.4556N, 35.3740E, 9☿ 31.4567N, 35.3693E); 11 Apr 2025; leg. Fábián Péter Imre; det. Matvey Logachev.

Remarks. Our measurements of the Dorsal Spine Index (DSI) and Propodeal Spine Angle (PDW) reveal clear differences between *Polyrhachis lacteipennis* from Oman and *P. palaearctica* from Israel (Table 2). In *P. palaearctica*, the mean DSI was 0.1469 ± 0.02, whereas *P. lacteipennis* two specimens showed DSI values below 0.1. The PDW of *P. palaearctica* was 109.46 ± 6.72, overlapping with *P. lacteipennis* (111.11 and 123), although the latter range is based on only two specimens. The formula result values for *P. palaearctica* were negative, in contrast to the positive values observed in *P. lacteipennis.* These morphometric differences support the separation of the two species, despite limited sample size for *P. lacteipennis* from Oman.

Discussion

The ants were observed on *Ipomoea pes-caprae* (Fig. 1). Their presence represents a mutualistic interaction, in which ants defend the plant against herbivores while benefiting from extrafloral nectar (Martins et al. 2020; Mondal et al. 2013). This behavior appears to be typ-

Table 2. Comparison of diagnostic characters of *Polyrhachis palaearctica* and *P. lacteipennis* based on Dietrich (2004) and the present study.

Character	*P. palaearctica* (Dietrich 2004; Israel) n = 9, m = 4	*P. lacteipennis* (Dietrich 2004; Afghanistan, Pakistan, India) n = 8, m = 4	*P. palaearctica* (Present study; Israel) n = 24, m = 4	*P. lacteipennis* (Present study; Oman) n = 2, m = 1
Pronotal spine angle (°)	102 ± 4.1 [97–107] Holotype: 100.6	121 ± 4.8 [115–128]	109.46 ± 6.72 [95.5–123]	111.11, 123
Dorsal Spine Index (DSI)	0.119 ± 0.023 [0.089–0.155] Holotype: 0.19	0.024 ± 0.0428 [−0.02–0.085]	0.1469 ± 0.02 [0.1096–0.1787]	0.09431, 0.09402
1st and 2d; 3d gastral tergite hairs	1st and 2d: 0–1; 3d: 0–3	More than in *P. palaearctica*. 3d: >5	1st: 0 2d: 0.583 ± 0.653 [0–2] 3d: 4.583 ± 1.558 [2–8]	1st: 0 2d: 1, 2 3d: 11, 7
Formula result	Negative Holotype: -29.93	Positive	−11.79 ± 6.98 [−32.22– -3.29]	1.329; 13.283

*Holotype measurements are obtained through measuring the photographed specimen in Dietrich (2004) study.

ical for *Camponotus* and *Polyrhachis* species (Hughes et. al. 1994). Dietrich (2004) also documented a similar interaction in the Sudanian region of Wadi Araba and the southern Dead Sea, where *C. husseini* was found in sympatry with *P. palaearctica* in an area characterized by scattered shrubs.

Camponotus husseini

Camponotus sericeus is a ground-dwelling, diurnal, openly foraging ant that was originally described from western Africa, where it is common (Sharaf et al. 2022). Based on the current knowledge, its distribution extends to the Arabian Peninsula and parts of Asia. In the Arabian Peninsula, it has been recorded in all countries except Qatar and Bahrain (Borowiec 2014; Collingwood et al. 2011; Collingwood 1985; Collingwood & Agosti 1995; Monks et al. 2019; Sharaf et al. 2018; Walker & Pittaway 1987). However, Dietrich (2004) raises the question of whether all these "golden ants" belong to the same species, suggesting that *C. sericeus* is a group of various species. His study differentiates between Indian, Arabian, and African populations, noting that African populations from Mali, Egypt, Chad, and Burundi originate from regions situated between the type locality of *C. sericeus* and the known distribution of *C. husseini*, and exhibit characters considered intermediate. Consequently, their attribution to *C. sericeus* should be regarded as provisional. All Arabian *Camponotus* specimens he analyzed belonged to *C. husseini*. *Camponotus husseini* is distinguished from *C. sericeus* by petiole morphometry and a generally higher number of bristles under the head. However, some *C. husseini* individuals may lack these bristles (excluding the intermediate African populations), making identification more reliable when examining multiple specimens.

Camponotus husseini has been recorded in Jordan, Egypt, Yemen and Saudi Arabia (Dietrich 2004) (Fig. 7). This study records its presence in Oman. As noted earlier, recent surveys of the region (Monks et al. 2019; Sharaf et al. 2018, 2022) have not compared *C. sericeus* with *C. husseini* and do not reference the work in which *C. husseini* was described. Since both species are very similar, they can easily be confused. Given that, *C. sericeus* specimens from the Arabian Peninsula may actually be *C. husseini* (Dietrich 2004).

Polyrhachis lacteipennis

syn. *Polyrhachis simplex*

The Arabian Peninsula currently harbors four species of *Polyrhachis*: *Polyrhachis omissa* Rigato, 2016, *Polyrhachis viscosa* F. Smith, 1858, *Polyrhachis palaearctica*, and *Polyrhachis lacteipennis*. Their dis-

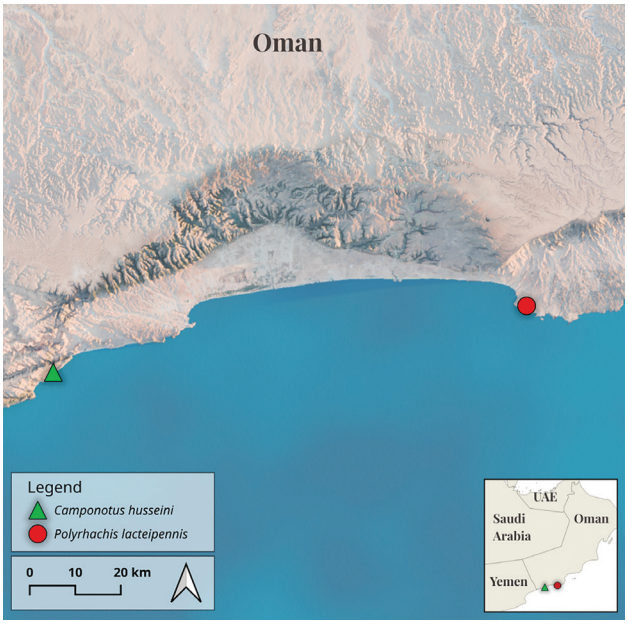

Fig. 2. Collection sites in Oman.

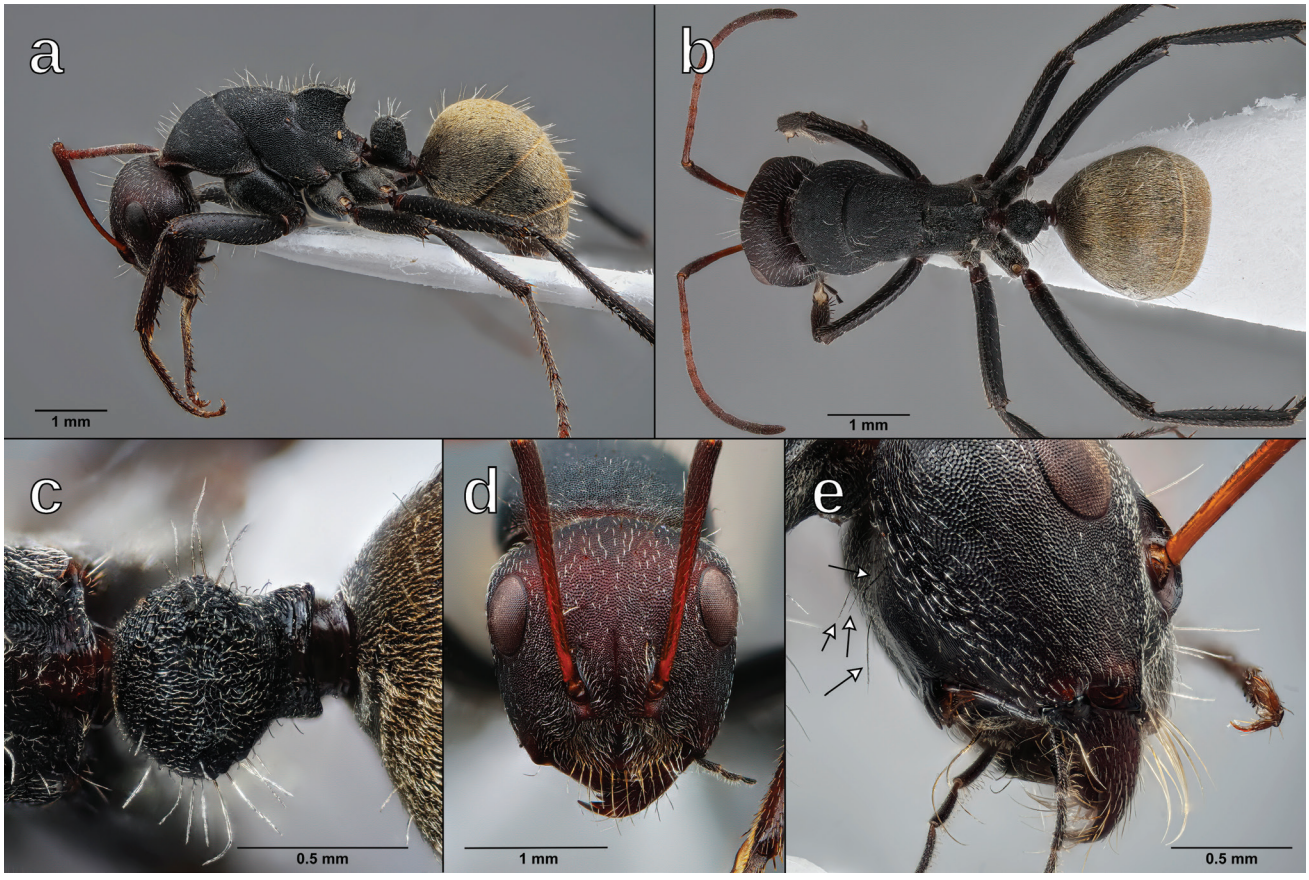

Fig. 3. *Camponotus husseini* from Oman. **a**, lateral view; **b**, dorsal view; **c**, petiole; **d**, frontal view; **e**, subcephalic bristles. Photos of Paco Alarcón.

tribution ranges partially overlap, which has historically complicated species identification (Borowiec & Salata 2020; C. Collingwood et al. 2011; C. Collingwood & Agosti 1995; Lush 2008; Rigato 2016; Sharaf et al. 2020, 2024). As a result, some records previously identified as *P. viscosa* may now require reassignment to *P. omissa* following the latter's formal description (Rigato 2016). Similarly, the distributions of *P. lacteipennis* and *P. palaearctica* remain unresolved and require comparative analyses across regional populations (Dietrich 2004) (Fig. 9a). At present, *P. palaearctica* is reported by Dietrich (2004) from Jordan and Israel (Dead Sea region) (Fig. 8) and marginally from Yemen (Aden), but there are no confirmed records from Oman or southeastern Arabia. In contrast, *P. lacteipennis* appears to have a broader range extending across the Arabian Peninsula and into southern and central Asia (Fig. 9b). However, its precise distribution remains uncertain due to the largely unresolved taxonomy of the species.

Dietrich (2004) provided a diagnostic key separating *Polyrhachis palaearctica* from *P. lacteipennis*, which was used by the present study not only for species identification but also to refine the species concept of *P. palaearctica*, originally described from a limited number of specimens (n = 9). In Dietrich (2004), *P. lacteipennis* is mentioned as *P. simplex*. The latter was synonymized with *P. lacteipennis* (Bolton 1973). Both *P. simplex* and *P. lacteipennis* were originally described based only on queens (Mayr 1862; Smith 1858), which complicated their accurate identification. However, Bolton (1973) stated that *"Comparison of the type of* lacteipennis *with several queen-containing series of the common Middle Eastern and Indian* simplex *shows that this well-known name must fall as a synonym of* lacteipennis*."*

Bingham (1903) illustrated and described a worker specimen that shares the same characteristics as another worker from India, photographed on AntWeb (CASENT0227531) (California Academy of Science 2026). Perhaps the most notable distinguishing feature is the shape of the propodeal spines, which he described as: "*Propodeal (or metanotal) spines are erect and divergent, with the tip slightly bent outward*".

In contrast, *Polyrhachis palaearctica*, according to Dietrich (2004), has: "*Propodeal spines that are fine, straight, and semi-erect, directed backward, with only the tips slightly curved outward. These spines distinctly extend beyond the vertically slit-shaped propodeal spiracle*".

According to Dietrich, the shape and orientation of the spines represent key diagnostic characters for species identification. Pronotal spines are short and evenly pointed,

forming an angle of 97–107° in *Polyrhachis palaearctica*, compared with wider angles of 115–128° in *P. lacteipennis*. Propodeal spines are erect in *P. lacteipennis* and semi-erect in *P. palaearctica*. In addition, Dietrich noted that *P. palaearctica* bears only a few erect hairs on the third tergite (none to three), whereas *P. lacteipennis* typically possesses a greater number of erect hairs (more than five).

Our analysis shows that the pronotal spine angle in *Polyrhachis palaearctica* is more variable than reported in Dietrich (2004) and overlaps with that of *Polyrhachis lacteipennis*. In contrast, the dorsal spine index (DSI) proves to be a reliable diagnostic character, as no overlap is observed between the two species and the mean DSI differs significantly (Fig. 6). Additionally, it is worth noting that the DSI appears to have been measured incorrectly by Dietrich. Although the measurement protocol is clearly defined at the beginning of his work, the reported values are considerably lower than expected. We, therefore, re-measured the holotype specimen from the published photo (Table 2). Some additional characters also appear questionable, as spine curvature was observed in both species, although only in some specimens. The differences in gastral pilosity have yet to be studied; however, they already differ from those described in Dietrich (2004). Nevertheless, the results of the discriminant formula remain consistent.

Although the taxonomy of *Polyrhachis* is not yet fully resolved and a comprehensive revision is required, the Omani specimens should, for the time being, be retained under *Polyrhachis lacteipennis*.

Conclusion

Camponotus husseini is recorded from Oman for the first time, while the presence of *Polyrhachis lacteipennis* is confirmed through comparison of Omani and Israeli specimens

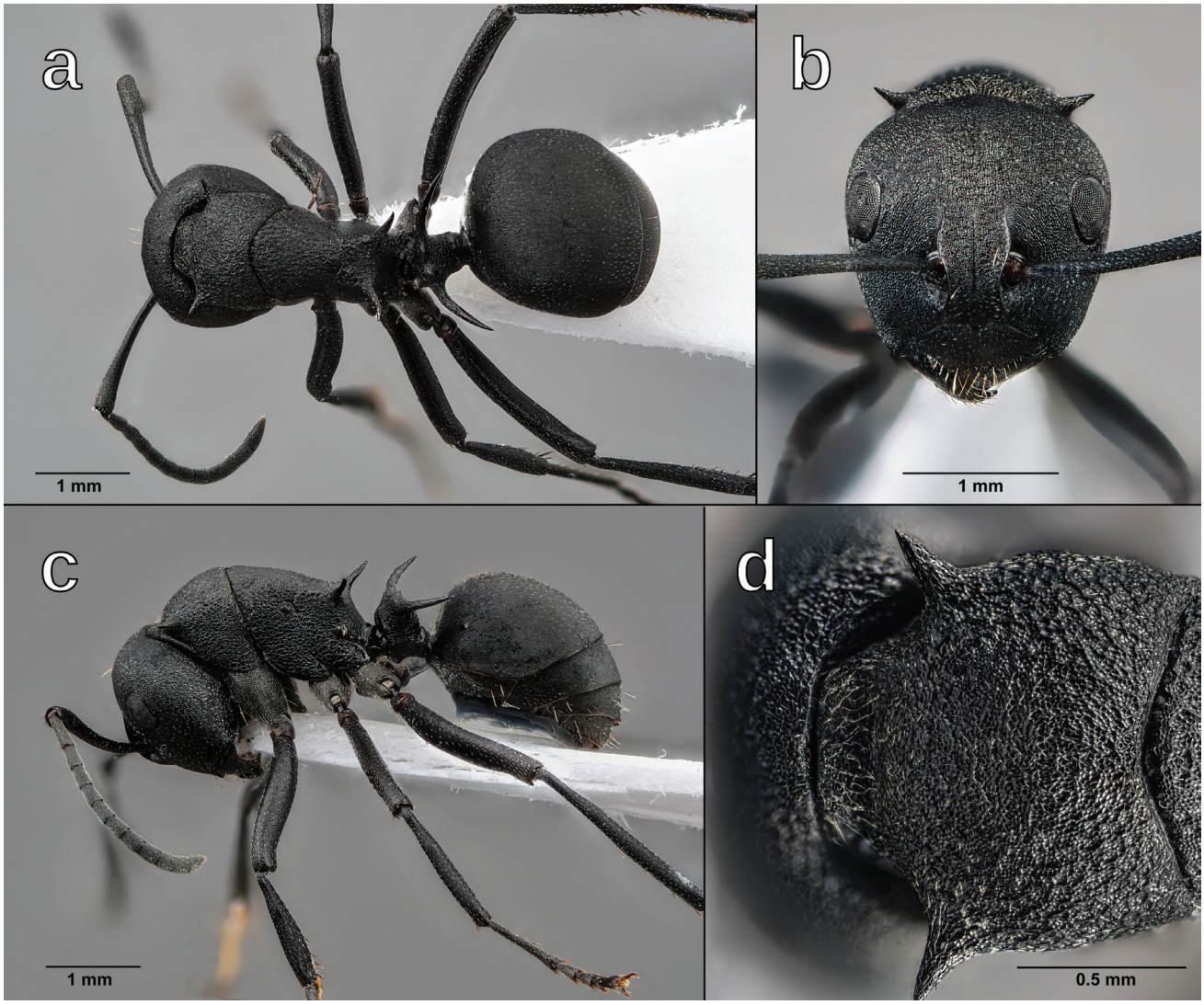

Fig. 4. *Polyrhachis lacteipennis* from Oman. **a,** dorsal view; **b**, frontal view; **c**, lateral view; **d**, propodeal spines. Photos of Paco Alarcón.

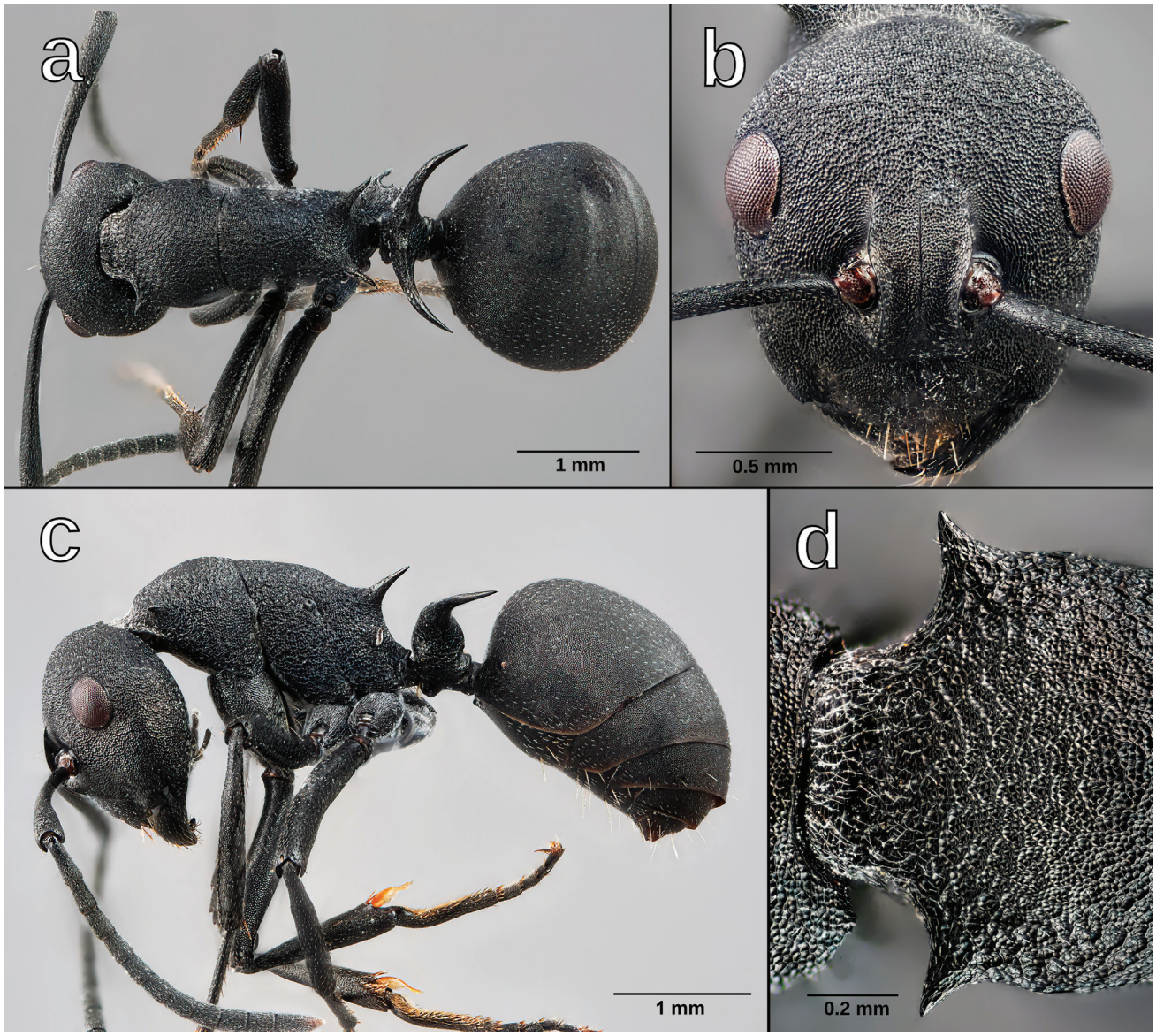

Fig. 5. *Polyrhachis palaearctica* from Dead Sea, Israel. **a**, dorsal view; **b**, frontal view; **c**, lateral view; **d**, propodeal spines. Photos of Paco Alarcón.

as well as type material from Jordan, representing a different but morphologically very similar species. The status of *Camponotus sericeus* in the Arabian Peninsula should remain uncertain until comparative material is examined alongside *C. husseini*. Although *Polyrhachis palaearctica* and *C. husseini* are currently regarded as valid species, future molecular analyses will be necessary to clarify their taxonomic status.

Acknoledgments

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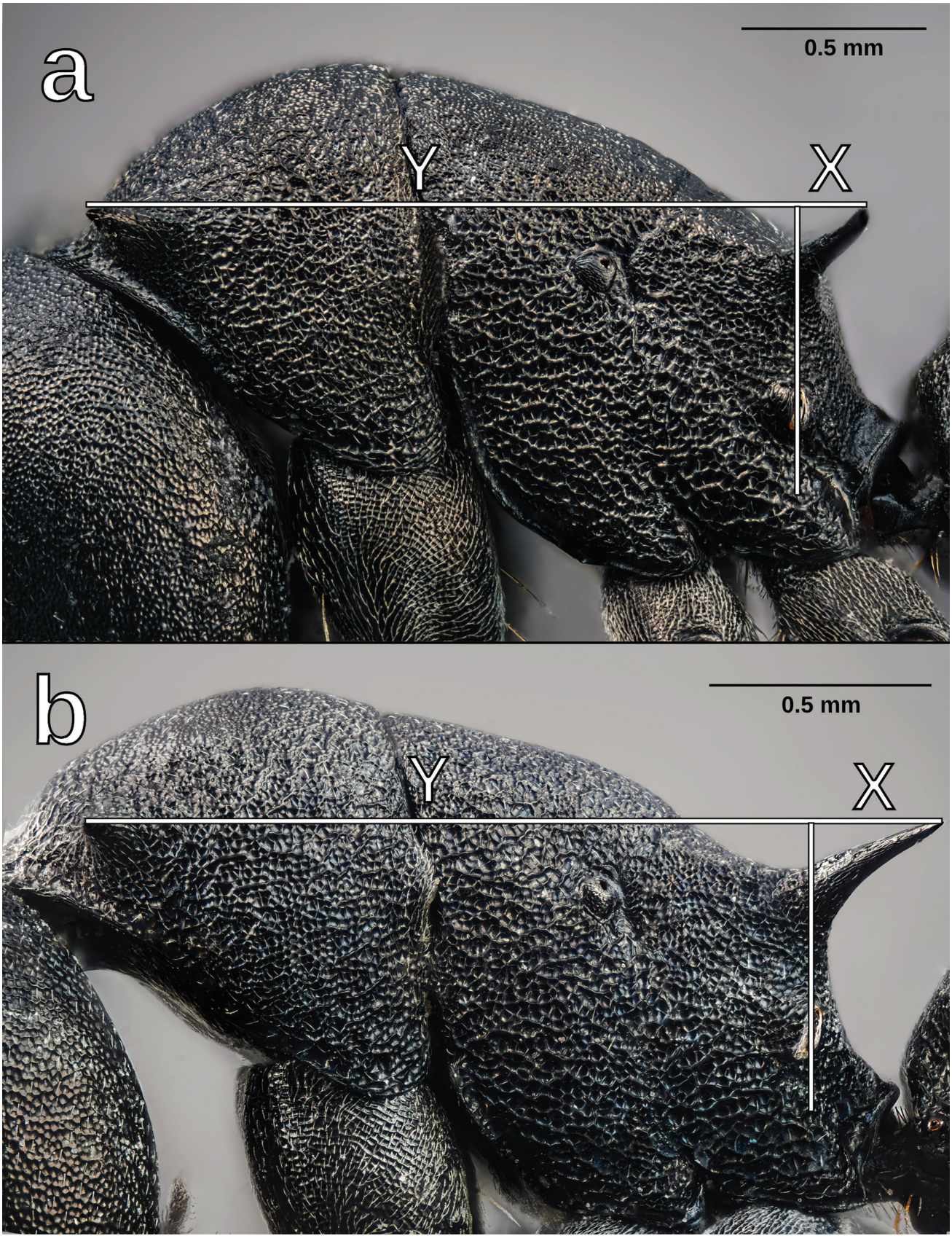

Fig. 6. a, dorsal spine index (DSI) of *Polyrhachis lacteipennis* from Oman; **b**, DSI of *P. palaearctica* from Israel. Photos of Paco Alarcón

Fig. 7. Map showing the countries where *Camponotus husseini* occurs.

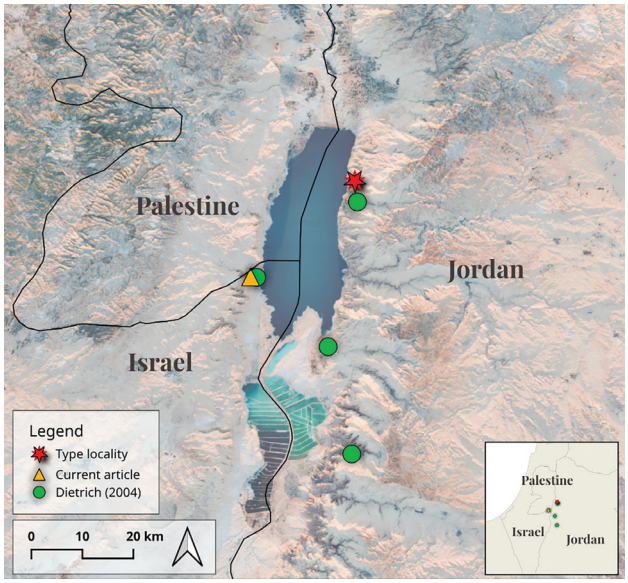

Fig. 8. Collection sites of *Polyrhachis palaearctica* in Jordan and Israel.

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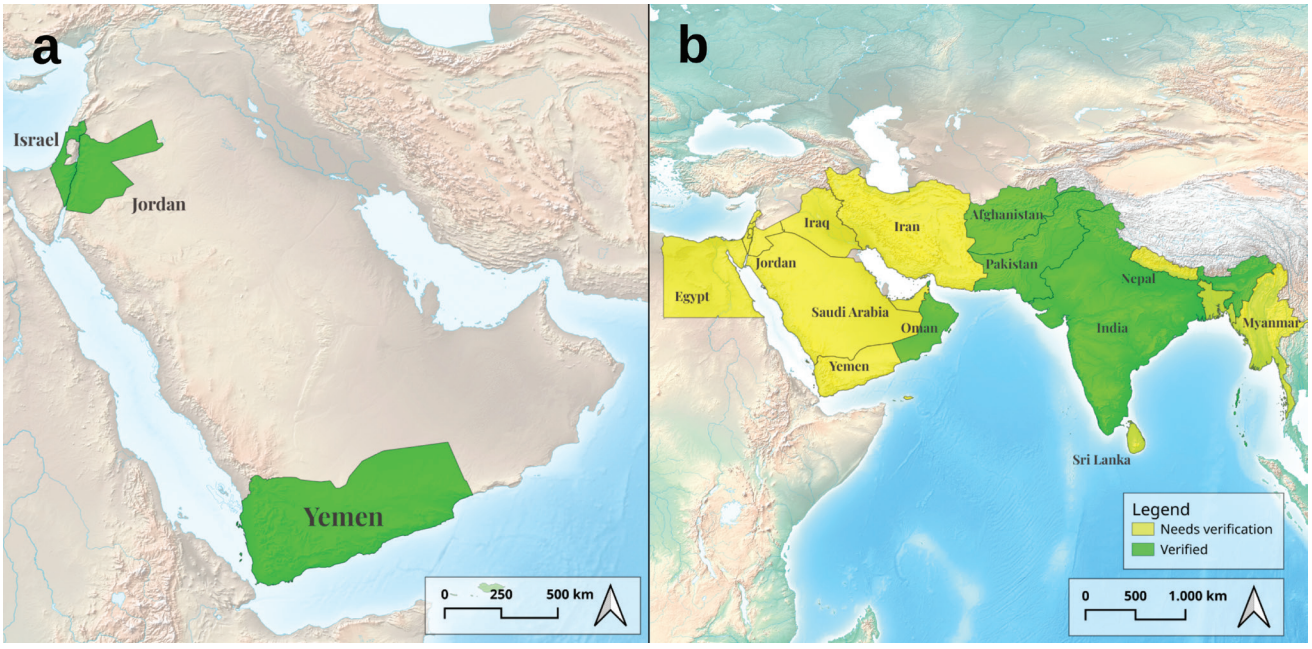

Fig. 9. Maps showing the countries where *Polyrhachis palaearctica* (**a**) and *Polyrhachis lacteipennis* (**b**) occur.

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