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A remarkable new species of the genus *Lepisiota* Santschi (Hymenoptera: Formicidae) from Oman and the United Arab Emirates with a key to the Arabian species

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ABSTRACT

Lepisiota omanensis sp. nov. is described and illustrated based on the worker caste collected in Jebel Qahwan Oman, and Ain Al Waal, United Arab Emirates. The new species belongs to the *L. gracilicornis* group and is separated easily from all Arabian *Lepisiota* species, and other species in the *gracilicornis* group, by the exceptionally long, acute and strongly curved propodeal spines. *Lepisiota elegantissima* Collingwood & van Harten is recorded for the first time from Oman. *Lepisiota simplex* (Forel) stat rev. is recognised at species rank. Ecological and biological observations are provided. A revised key to the Arabian species of *Lepisiota* is given. A checklist of the Arabian *Lepisiota* species is presented.

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Introduction

The ant genus *Lepisiota* Santschi, 1926 belongs to the Formicinae, and currently includes 81 described species with 52 recognised subspecies (Bolton 2014, accessed 18 November 2015), distributed in the southern Palaearctic, Afrotropical and Indomalayan regions (Brown 2000). Species are considered generalist foragers (Brown 2000; Hita Garcia et al. 2013) with diverse nesting habitats, including in decayed wood or soil, or in living trees (Bolton 1973; Brown 2000), and attending sap-sucking sternorrhynchan insects such as scale insects, mealybugs and aphids (Collingwood 1985).

Among the formicine genera, species of *Lepisiota* can be recognised easily by the combination of the following characters in the worker caste (Bolton 1994): antennae 11-segmented; eyes well developed; mesosoma constricted medially at mesonotum region; propodeum armed with a pair of spines, teeth or tubercles; dorsal margin of petiole armed with a pair of spines or teeth, or emarginate.

The genus *Lepisiota* is the first available replacement name for *Acantholepis* Mayr, 1861 (a junior homonym of *Acantholepis* Kroyer, 1846), as noted by Bolton (1994). Identification of *Lepisiota* species is difficult because recent taxonomic

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revisions and regional treatments are lacking, except for the Afrotropical region (Taylor 2015). Identification of species is based primarily on comparison with museum type material, or comparison with images of type specimens available at www.AntWeb.org.

The first species of *Lepisiota* collected from Oman were *L. arenaria* (Arnold 1920) and *L. spinisquama* (Kuznetsov-Ugamsky 1929) (Collingwood 1985). This study was focused mainly on the ant fauna of the Kingdom of Saudi Arabia (KSA) but also included a few records from adjacent countries. Collingwood and Agosti (1996, in their treatment of the Formicidae of the entire Arabian Peninsula) recorded 20 species, 10 of which were from Oman, including a newly described species, *L. dhofara* from Jebel Qara.

The species newly described in this study was collected by the second author (JM) during a joint project between the National Field Research Centre for Environmental Conservation (NFRCEC, Muscat) and the Oman Earthwatch Programme (OEP) entitled the Mobile Environmental Research Unit. The objective of this project is to create baseline data on the biodiversity of the Hajar Mountains of Northeastern Oman, which also extend into the United Arab Emirates (UAE). These mountains are the highest mountain range of the eastern Arabian Peninsula, reaching almost to 3000 m above sea level. We present a key to the known Arabian species of *Lepisiota*.

Materials and methods

The following abbreviations are used for particular morphological features and measurements, and follow Agosti (1990) (Figure 1A–C):

Measurements

EL Eye length; maximum eye length in lateral view.

HL Head length; maximum length of the head, excluding mandibles.

HW Head width; maximum width of the head behind eyes in full-face view.

ML Mesonotum length; maximum length of mesonotum in dorsal view.

PH Petiole height; measured from petiole sternum to apex in lateral view.

PRW Pronotal width; maximum pronotal width in dorsal view.

PSL Propodeal spine length; in dorsocaudal view, tip of the measured spine, its base, and centre of propodeal concavity between spines must all be in focus. Using a dual-axis micrometer, spine length is measured from tip of spine to a virtual point at its base where spine axis meets orthogonally with a line leading to median point of the concavity.

SL Scape length; excluding condylar bulb.

TL Total length; the outstretched body length from mandibular apex to gastral apex in lateral view.

WL Weber's length; diagonal length of mesosoma in lateral view from the postero-ventral margin of propodeal lobe to the anteriormost point of pronotal slope, excluding the neck.

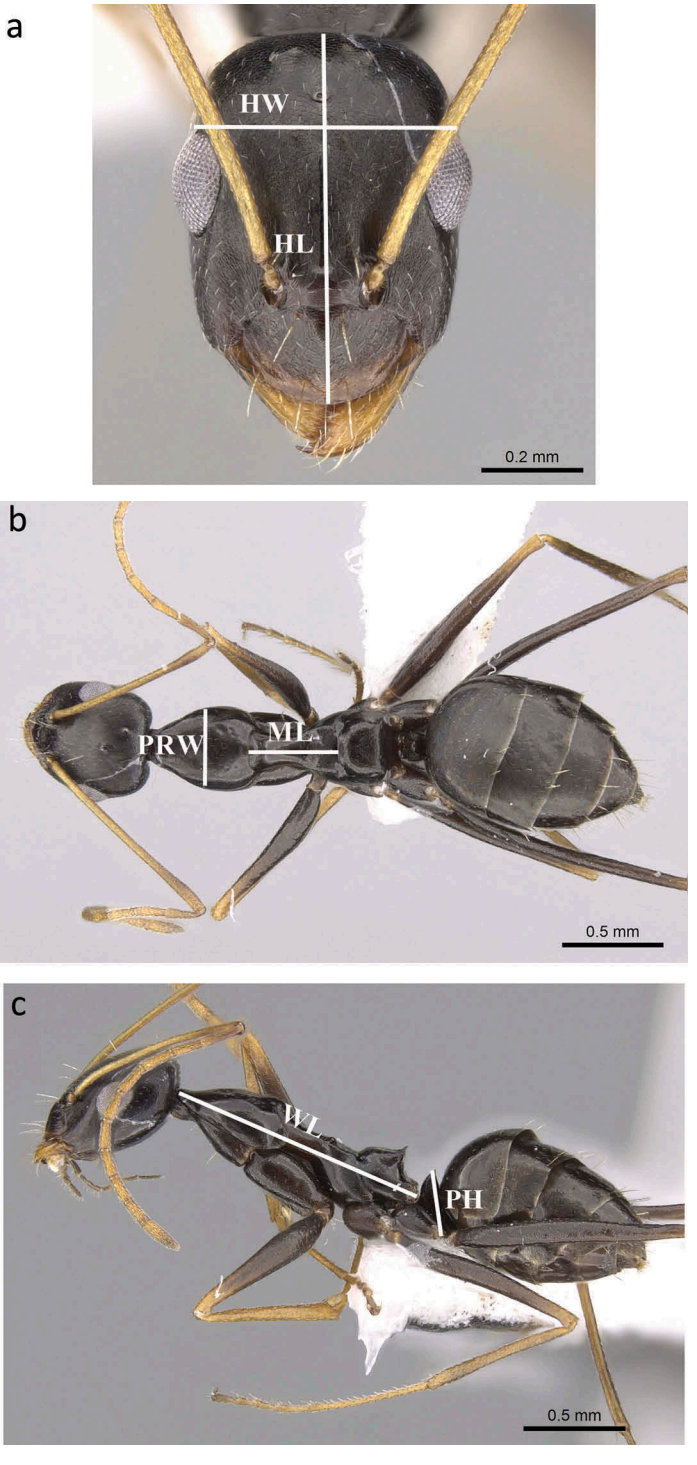

Figure 1. Images of *Lepisiota* illustrating the measurements used. (A) head in full-face view, (B) body in dorsal view, and (C) body in profile.

Indices

CI Cephalic index; HW/HL × 100.
OI Ocular index; EL/HW × 100.
PSLI Propodeal spine index; PSL/HL × 100.
SI Scape index; SL/HW × 100.

All measurements are in millimetres.

Depositories of type material

BMNH Natural History Museum, London, United Kingdom.
KSMA King Saud University Museum of Arthropods, Riyadh, Kingdom of Saudi Arabia.
ONHM Oman Natural History Museum, Muscat, Sultanate of Oman.

Images of type specimens of many *Lepisiota* species are available on www.AntWeb.org, and were compared to confirm validity of the new species. In addition, these images were used for construction of the key to the Arabian *Lepisiota* presented here. Information on species distribution was compiled from the ant websites www.antwiki.org (accessed 20 November 2015) and www.antsofafrica.org (accessed 20 November 2015). Figure 2A and B were taken with a MicroPublisher 5.0 RTV camera on a Leitz Stemi 5 microscope using Syncroscopy AutoMontage stacking software. Figure 2C–E were taken with a Canon EOS 750D camera using HeliconFocus stacking software.

Results

Lepisiota omanensis Sharaf & Monks sp. nov.
(Figure 2A–E)

Holotype worker

Oman, Hajar Mountains, Jebel Qahwan, (Figure 3A), 19 April 2012, 22°9′9.36″N, 59° 22′19.8″E, 305 m, (J. Monks); the holotype is temporarily deposited in BMNH pending the completion of the new Oman Natural History Museum (ONHM).

Paratype workers

Two workers, Oman, base of Jebel Akhdar, near to Birkat Al-Mouz, 25 March 2016, 22° 57′17.58″N, 57°39′40.92″E, 619 m, (J. Monks) one in ONHM and one in KSMA; two workers, United Arab Emirates, Ain Al Waal at the foot of Jebel Hafeet, 11 March 2014, 24°4′2.57″N, 55°44′56.05″E, (Huw Roberts); deposited in KSMA.

Measurements

Holotype. EL 0.17, HL 0.75, HW 0.65, PH 0.31, PRW 0.48, PSL 0.25, SL 1.00, TL 3.31, WL 1.25. Indices: CI 87, OI 26, PSLI 33, SI 154.

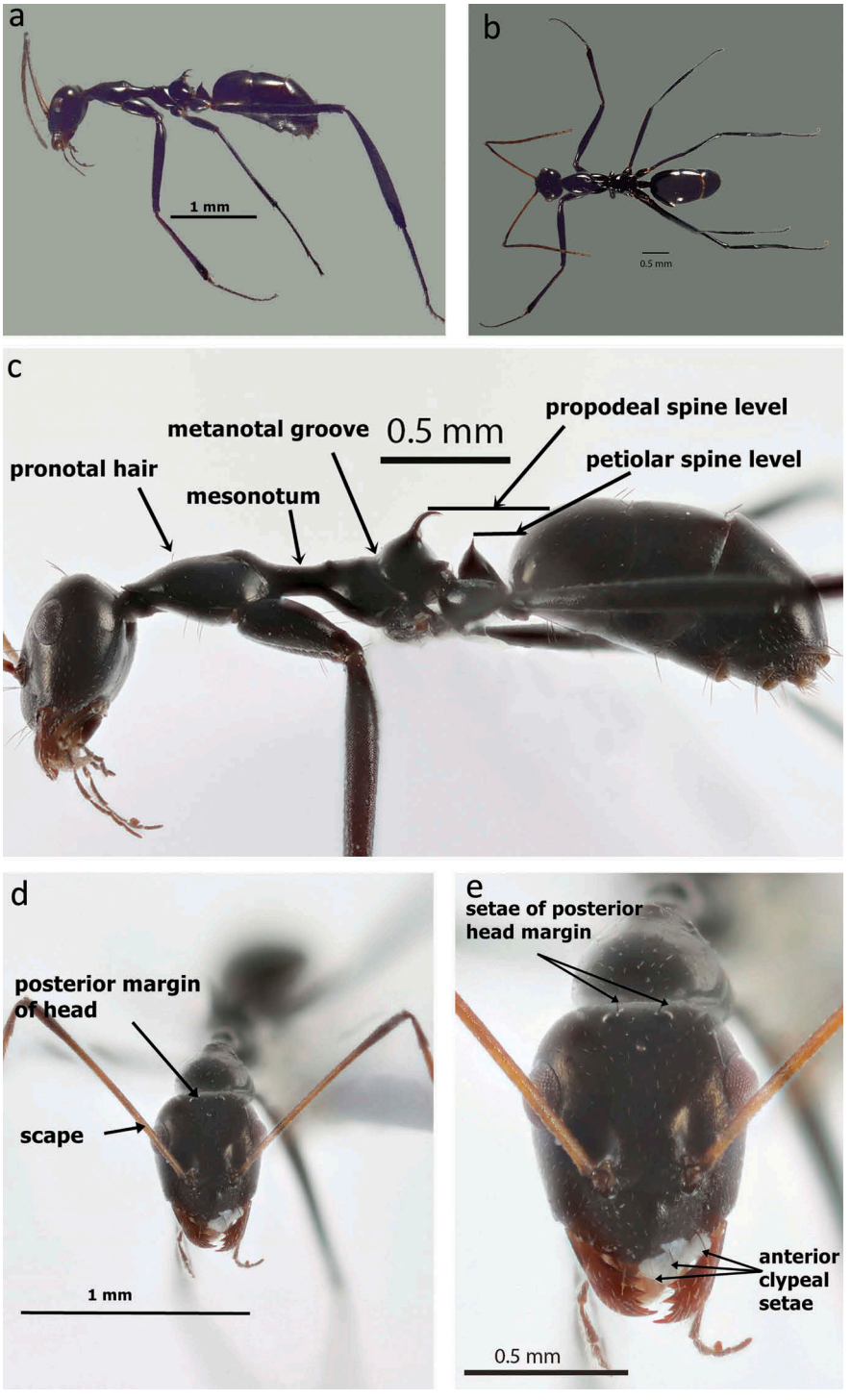

Figure 2. *Lepisiota omanensis*, sp. nov. (A) body in profile, (B) body in dorsal view, (C) body profile characters, (D) head in full-face view showing scape, and (E) head in full-face view showing clypeal and cephalic pilosity.

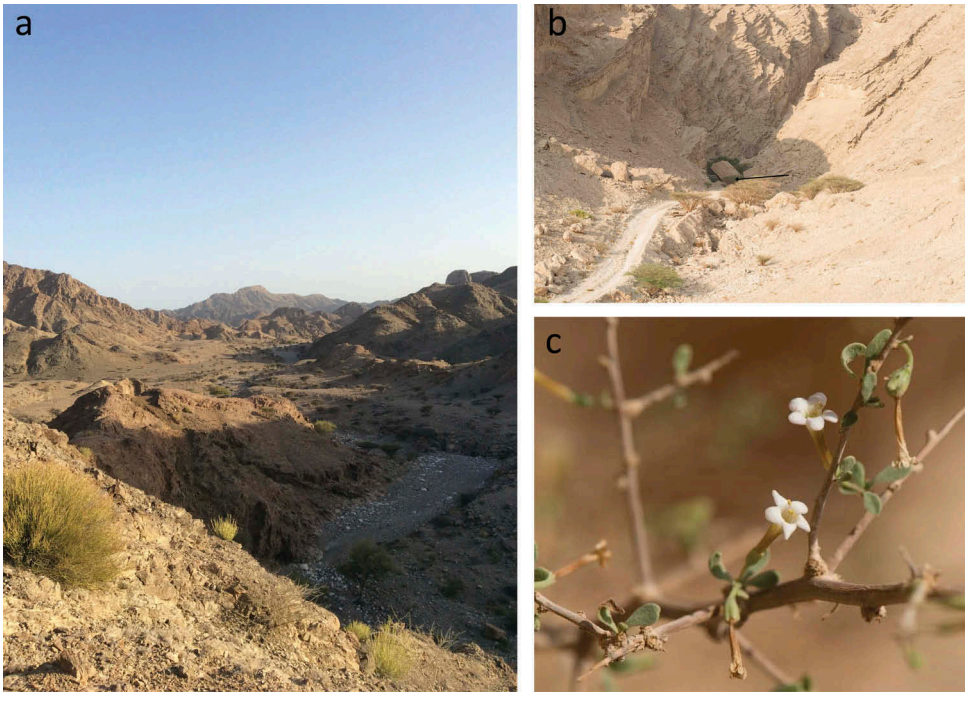

Figure 3. (A) Jebel Qahwan, Oman: type locality of *Lepisiota omanensis* sp. nov. (B) Ain Al Waal, United Arab Emirates, paratype locality. (C) *Lycium shawii* Roem. & Schult.

Paratypes. EL 0.20, HL 0.57–0.70, HW 0.50–0.60, ML 0.20, PH 0.25–0.37, PRW 0.35–0.42, PSL 0.11–0.22, SL 1.15–1.40, TL 2.25–3.50, WL 1.05–1.35. Indices: CI 86–88, OI 33–40, PSLI 19–31, SI 230–233 (n = 2).

Diagnosis

This new species can be distinguished immediately from all known Arabian and Afrotropical species by the long, acute and strongly curved propodeal spines (Figure 2).

Description of worker

Head. Distinctly longer than broad, with straight posterior margin and shallowly convex lateral margins; antennal scape when laid back from its insertion surpassing the posterior margin of head by more than half of its length; eyes of moderate size (EL 0.26–0.40 × HW).

Mesosoma. Elongate with a narrow mesonotum; propodeal spines exceptionally long, acute and strongly curved (PSLI 19–33).

Petiole. Bispinose dorsally.

Pilosity. Posterior margin of head with a single pair of stiff, short setae; anterior clypeal margin with three pairs of long setae; mesosoma bare except for a single pair of setae on pronotum, gastral pilosity restricted to few setae on posterior margins of tergites and sternites, all body surface with pale scattered appressed pubescence.

Sculpture. Overall smooth and shining.

Colour. Uniform black with purple reflections on the face and gaster, antennae and mandibles yellow-brown.

Etymology

Named after the country of the type locality.

Habitat and biology

The type locality, Jebel Qahwan (Figure 3A), is located in the Eastern Hajar Mountains, an area with substantial floral and faunal biodiversity. The two paratypes from UAE were collected at Ain Al Waal (Figure 3B) (Huw Hoberts, pers. comm.). This site is characterised by areas with rocks and boulders surrounding semi-permanent pools near a dam. The water in the pools is used by the endangered Arabian tahr, *Arabitragus jayakari* (Thomas). *Lepisiota omanensis* seems to have an association with the plants *Ochradenus arabicus* Chaudhary, Hillc. & A.G.Mill. (Resedaceae), but two other plants are also present in the area, *Aerva javanica* (Amaranthaceae) and *Tephrosia apollinea* (Fabaceae). A nest was observed about a metre away from the base of a *Lycium shawii* (Solanaceae) plant (Figure 3C). The two paratype workers were observed carrying leaf material.

List of Arabian *Lepisiota* species

arabica (collingwood)
arenaria (arnold)
bipartita (smith)
canescens (emery)
carbonaria (Emery)
dammama collingwood & Agosti
depilis (emery)
dhofara collingwood & Agosti
dolabellae (forel)
elegantissima Collingwood & van Harten
erythraea (Forel)
frauenfeldi (mayr)
gracilicornis (forel)
harteni collingwood & agosti
incisa (forel)
karawaiewi (kuznetsov-Ugamsky)
nigra (Dalla torre)
nigrescens (karavaiev)

obtusa (Emery)
omanensis sp. nov.
opaciventris (Finzi)
riyadha collingwood & Agosti
sericea (Forel)
simplex (Forel) stat. nov.
spinisquama (Kuznetsov-Ugamsky)
validiuscula (Emery)

Key to Arabian species of *Lepisiota*

Modified from Collingwood and Agosti (1996).

1. Antennal scape long, surpassing the posterior margin of head by half its length or more 2
– Antennal scape shorter, surpassing the posterior margin of head by a third of its length or less 18

2. Dorsum of mesosoma and gaster without standing setae; antennal scape exceptionally long; SI > 200 3
– Dorsum of mesosoma with at least one or two pairs of long setae on pronotum; gaster always with some projecting setae; antennal scape shorter; SI < 200 4

3. Unicolourous dark brown or black-brown; body parts of moderate lengths (SI 200–205; WL 1.00) (KSA)..... ***riyadha***
– Bicoloured species, head and gaster brown; body exceptionally long (SI > 375; WL 1.91) (Oman, UAE)..... ***elegantissima***

4. Bicoloured, mesosoma paler than gaster, mainly or entirely reddish 5
– Whole body dark except a small area of the mesonotum more or less red in a few species..... 10

5. Mesosoma with whole dorsum covered with blunt black setae (KSA) ..... ***arabica***
– Mesosoma with one, two or three pairs of fine setae on the pronotum 6

6. Body sculpture coarse, general appearance opaque 7
– All parts of the body shining with superficial reticulate sculpture at most..... 8

7. Colour entirely black; several pairs of long, pale setae on cephalic dorsum, pronotum and gaster; petiole wide, at least 0.33 × HW (Afghanistan, India)..... ***sericea***
– Bicoloured species, head, mesosoma, petiole and appendages orange, gaster dark brown; body pilosity rare except for long few setae on anterior clypeal margin and sparse appressed pubescence on cephalic dorsum; petiole narrower, less than 0.30 × HW (Greece, India, Iran, Israel, Lebanon)..... ***bipartita***

8. Head and mesosoma uniformly red; propodeum armed with long curved spines (Oman, Zimbabwe) ..... ***arenaria***

– Head darker than mesosoma; propodeum simply dentate, or armed with short, straight spines 9

9. Head, petiole and gaster light brown, mesosoma and appendages yellow; mesonotum distinctly narrower anteriorly than posteriorly in dorsal view; propodeal and petiolar spines acute (KSA) ..... ***dammama***
– Head, petiole and gaster dark brown contrasting with the red mesosoma; mesonotum characteristically rectangular in dorsal view; propodeal and petiolar spines blunt (Greece, Iran, Israel, KSA, Turkey) ..... ***dolabellae***

10. Mesosoma densely sculptured; not shining 11
– Mesosoma superficially sculptured; at least partially shining, in some species completely shining 12

11. Head and mesosoma densely sculptured and completely opaque; propodeal spines long and curved; first and second gastral tergites with a few pairs of long setae located at posterior margins of tergites (Oman) ..... ***dhofara***
– Head and mesosoma superficially sculptured and slightly shining; propodeal armature short and blunt; first and second gastral tergites completely bare (Balkan Peninsula, Central Asia, Iran, Kazakhstan, Kuwait, UAE) ***karawaiewi***

12. Body entirely black, with slight reticulate sculpture at most and shining 13
– Mesosoma usually with small area of mesonotum red; head and mesosoma distinctly sculptured and not shining 17

13. Propodeal spines short and straight, petiole dorsum narrow and rounded, with reduced armature; antennal scapes shorter, SI 150–155 (Croatia, Egypt, Greece, Iberian Peninsula, Italy, Kyrgyzstan, Macedonia, Montenegro, Oman, UAE) ... ***nigra***
– Propodeal and petiolar armature both well developed with long curved spines; antennal scape long, SI 165–200 14

14. Propodeum and first gastral tergite with some fine surface sculpture; first gastral tergite with characteristic violet reflection; S1 195–200 (Egypt, Israel, KSA, UAE) ..... ***opaciventris***
– Whole body smooth; first gastral tergite without reflection of any type; SI 165–195 15

15. Propodeal short, less than 0.10 mm, moderately curved; antennal scape long, SI 175–195 (Yemen, Eritrea, Israel, UAE)..... ***gracilicornis***
– Propodeal spines long, more than 0.12 mm, and distinctly curved; antennal scape shorter, SI 165–170..... 16

16. Body dark brown; propodeal spines shorter and slightly curved, in profile appearing at level of the petiolar spines; body slightly shining; scape shorter (SI 170), cephalic index smaller (CI 79), petiolar height lower in profile (0.41); appressed pubescence abundant on body (Kazakhstan, Oman, KSA, Socotra) ..... ***spinisquama***

– Body black, propodeal spines longer and more strongly curved, in profile appearing much higher than level of petiolar spines; body more strongly shining; scape longer (SI 230–233), cephalic index greater (CI 86–88), petiolar height larger in profile (0.25–0.37); pubescence on body scattered (Oman, UAE) ..... ***omanensis* sp. nov.**

17. Pronotum with one pair of setae; petiole dorsum distinctly dentate (widespread in Palaearctic region)..... ***frauenfeldi***
– Pronotum without setae; petiole dorsum feebly incavate or narrowly rounded without teeth (Tunisia, UAE) ..... ***nigrescens***

18. Head and gaster smooth and shining with only faint sculpture 19
– Head and gaster distinctly sculptured 21

19. Whole body dorsum covered with blunt black setae (Namibia, Somalia, Yemen, Zimbabwe) ..... ***validiuscula***
– Mesosoma with pale, thin setae 20

20. Body pilosity short, restricted to a few pairs, sparse on propodeum and gastral tergites; pronotum without setae; whole body smooth and shining (Bangladesh, India, Kenya, KSA, Lesotho, Somalia, Zimbabwe) ..... ***simplex* stat. nov.**
– Body pilosity long and abundant, especially on gaster; pronotum with five pairs of hairs; whole body smooth except mesopleura transversely striate, general appearance moderately shining (Guinea, Israel, Kenya, KSA, Somalia, Oman, Yemen..... ***canescens***

21. Whole mesosomal dorsum covered with long pale setae (Eritrea, Israel, KSA, Oman, Yemen) ..... ***obtusa***
– Pilosity on mesosomal dorsum either restricted to pronotum or absent 22

22. Petiolar angles produced into long spines 23
– Petiole dorsum flat, emarginate or dentate at most 24

23. Larger species, TL 3.30; head superficially sculptured, slightly shining; in full-face view posterior margin of head strongly convex and with three pairs of long, stiff setae; mesosoma with several pairs of setae, smooth and shining, except for transverse striations on mesopleura (Democratic Republic of Congo, Kenya, Yemen) ..... ***incisa***
– Smaller species, TL 2.12; head strongly sculptured, completely opaque; in full-face view posterior margin of head straight, without setae; mesosoma without setae, entirely, and densely sculptured (Djibouti, KSA, Oman, Somalia, Yemen) ..... ***carbonaria***

24. Petiolar armature well developed; gaster finely and densely granulate, completely opaque (Eritrea, Ethiopia, KSA, Yemen) ..... ***erythraea***
– Petiolar dorsum shallowly emarginate; gaster superficially sculptured, slightly but distinctly shining 25

25. Mesosoma red; first gastral tergite with six pairs of long, pale setae located dorsally, posterior margin with several pairs; smaller species (TL 2.80), scape longer (SI 123) and head slightly narrower (HW 0.57) (Yemen) ..... ***harteni***
– Mesosoma brown; pilosity of first gastral restricted to posterior margin; larger species (TL 3.20), scape shorter (SI 111), head wider (HW 0.63) (KSA, Oman, Somalia) ..... ***depilis***

Discussion

Lepisiota omanensis is a member of the *L. gracilicornis* group. The new species is separated readily from all Arabian species, and other species in the group, by the exceptionally long, acute and strongly curved propodeal spines. *Lepisiota omanensis* is superficially similar to *L. spinisquama* (Kuznetsov-Ugamsky, 1929) but can be easily distinguished by the following: *L. omanensis* is black, shining and has longer and more strongly curved propodeal spines, which appear in profile much higher than the petiolar spines. Also, this species has a greater cephalic index (CI 86–88), lower petiolar height (0.25–0.37) and very little pubescence on the body surface. *Lepisiota spinisquama* is brown, slightly shining and has the propodeal spines shorter, lower and nearly at the same level as the petiolar spines in profile. In addition, it has a smaller cephalic index (CI 79) and a slightly higher petiole (0.41), and appressed pubescence is abundant on the body surface.

Lepisiota simplex Forel (1892) stat. rev. (Figure 4A–C) was described by Forel (1892) originally as a subspecies of *L. capensis* (Mayr, 1862) and elevated to species rank by Bingham (1903) but recognised again as a subspecies by Forel (1907). However, despite this taxon being treated as a valid species by Collingwood (1985) and Collingwood and Agosti (1996), these authors did not formalise this new status. *Lepisiota simplex* was treated in the recent ant catalogue (Bolton 2014) as a subspecies of *L. capensis*. *Lepisiota simplex* differs from *L. capensis* by the following characters: pilosity less abundant on body surface, represented by a few pairs scattered over propodeal dorsum and gastral tergites; eyes larger, with approximately 16 ommatidia in the longest row (EL 0.36 × HW, OI 36) and smaller head (HL 0.55, HW 0.50) versus smaller eyes, with about 10 ommatidia in the longest row (EL 0.19 × HW, OI 20) and relatively larger head (HL 0.77, HW 0.66) in *L. capensis*. In addition, *L. simplex* has a smooth and shining mesosoma, whereas in *L. capensis* the mesosoma is irregularly sculptured and dull.

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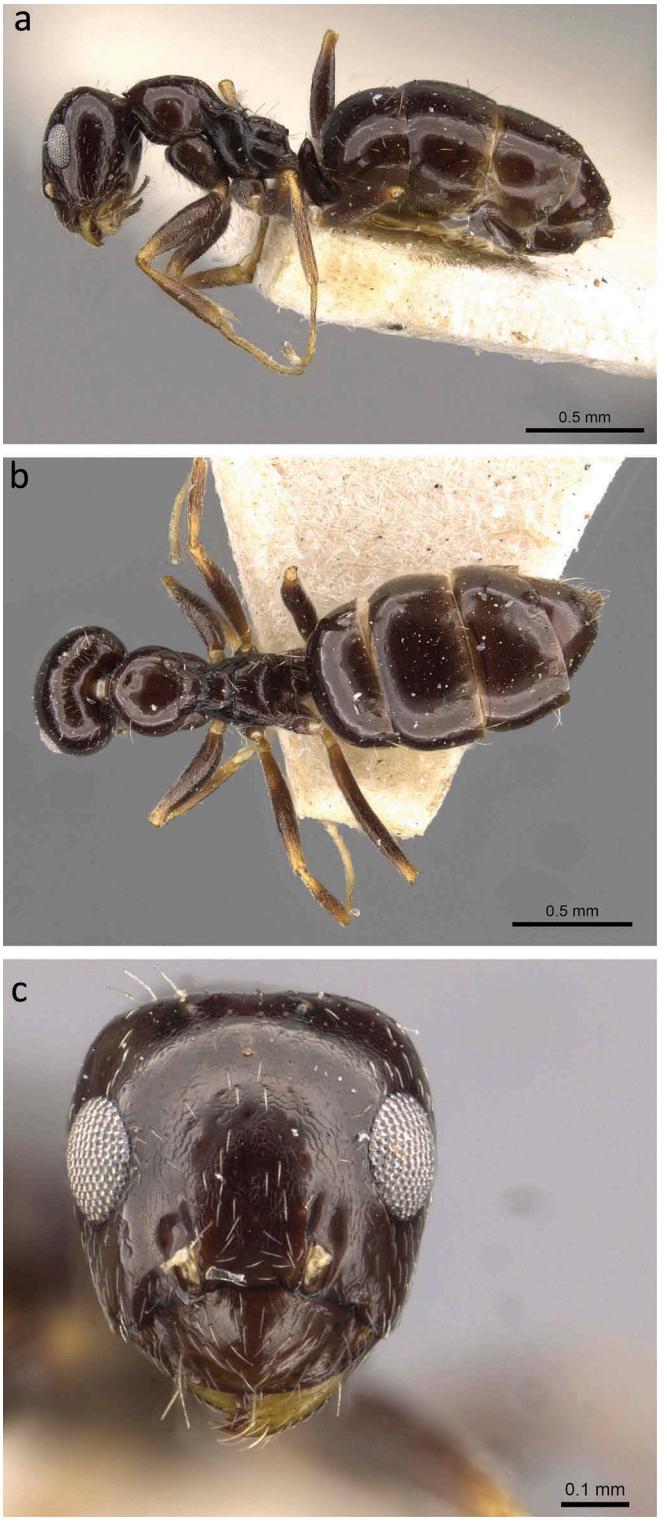

Figure 4. *Lepisiota simplex*. (A) body in profile, (B) body in dorsal view, and (C) head in full-face view, Photo: Zach Lieberman, CASENT0909878 Permission to publish images from AntWeb.org is provided by Brian Fisher.

Disclosure statement

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