

First occurrence of *Solenopsis* Westwood 1840 (Hymenoptera: Formicidae), in the kingdom of Saudi Arabia, with description of a new species *S. saudiensis* n. sp.

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Abstract. The ant genus *Solenopsis* Westwood 1840, is recorded for the first time in Saudi Arabia. The worker caste of *S. saudiensis* n. sp., collected in Riyadh is described and illustrated. This resembles *S. cooperi* Donisthorpe 1947, and *S. kochi* Finzi 1936. A revised key to the Arabian species is given together with ecological and biological notes. *S. saudiensis* n. sp. is identified by the following characters: Anterior clypeal margin with a central pair of stout projecting teeth and a lateral pair of short, broad basal blunt teeth; eyes with two minute facets; funicular segments 2-7 about twice as wide as long; propodeum short and low with the basal face making a continuous arc with the declivity; and petiole as long as broad in dorsal view.

Résumé. Première occurrence de *Solenopsis* Westwood 1840 (Hymenoptera : Formicidae) au royaume d'Arabie Séoudite, avec la description d'une nouvelle espèce, *S. saudiensis* n. sp. Le genre de fourmi *Solenopsis* Westwood 1840 est enregistré pour la première fois en Arabie Séoudite. La caste ouvrière de *S. saudiensis* n. sp., collectée à Riyadh, est décrite et illustrée. Elle ressemble à *S. cooperi* Donisthorpe 1947 et à *S. kochi* Finzi 1936. Une clé révisée des espèces des espèces d'Arabie est proposée en même temps que des notes écologiques et biologiques. *S. saudiensis* n. sp. est identifié par les caractères suivants : marge antérieure du clypéus avec une paire centrale de fortes dents et avec une paire basale latérale de dents larges, courtes et émoussées ; yeux avec deux facettes minuscules ; segments 2-7 du funicule environ 2-7 fois plus larges que longs ; propodéum court et bas, avec la face basale formant un arc continu avec la portion déclive ; pétiole aussi long que large en vue dorsale.

Keywords: Myrmicinae, ants.

The ant genus *Solenopsis* Westwood 1840, is one of the largest ant genera of the subfamily Myrmicinae and contains 285 species and subspecies distributed worldwide in tropical and warm temperate regions (Bolton *et. al.* 2007, Brown 2000). In his genus-level, global study of the ants related to *Solenopsis* and *Pheidologeton* Mayr 1862, Ettershank (1966:134) listed 257 *Solenopsis* species and subspecies. Ecology of most Palaearctic *Solenopsis* species is very poorly known, but members of the genus seem to build nests in ground, sand mounds and litter (Brown 2000), some nesting in loose sandy soil at the base of old trees, *S. cooperi* Donisthorpe 1947, (Sharaf *et. al.* 2009), some nesting under stones, *S. sumara* (Collingwood & Agosti 1996), while others inhabiting the base of palm trees, where rich organic materials exist, *S. saudiensis* n. sp. Others unlike the Arabian species have different ways of life like *S. invicta* which are found in United states near areas of human habitat modification and build conspicuous earthen mounds, which are aggressively defended huge numbers of stinging workers (Trager 1991).

Knowledge of the Arabian *Solenopsis* has progressed little since the first contribution on local species by Collingwood & Agosti (1996). Genus members are tiny with cryptic habits. Thus, they probably have been overlooked by most of the collectors who have ventured into that extensive region, which is among the least documented of any comparable part of the world.

Only four species have been recorded from the Arabian Peninsula. These are *S. omana* Collingwood & Agosti 1996, and *S. geminata* (Fabricius 1804) from the United Arab Emirates (Collingwood *et. al.* 1997); *S. omana* from Oman (Collingwood & Agosti 1996); also, *S. sumara* Collingwood & Agosti 1996; and *S. zingibara* Collingwood & Agosti 1996, from Yemen. In other Arab states the only study of this difficult genus was done by Sharaf *et. al.* (2009) who revised the Egyptian *Solenopsis* with four species, *S. cooperi* Donisthorpe 1947; *S. lou* Forel 1902; *S. occipitalis* Santschi 1911; and *S. kochi* Finzi 1936. Here, the myrmicine ant genus *Solenopsis* Westwood 1840, is recorded for the first time in Saudi Arabia based on specimens collected in Riyadh and a new species *S. saudiensis* n. sp. is described.

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Material and methods

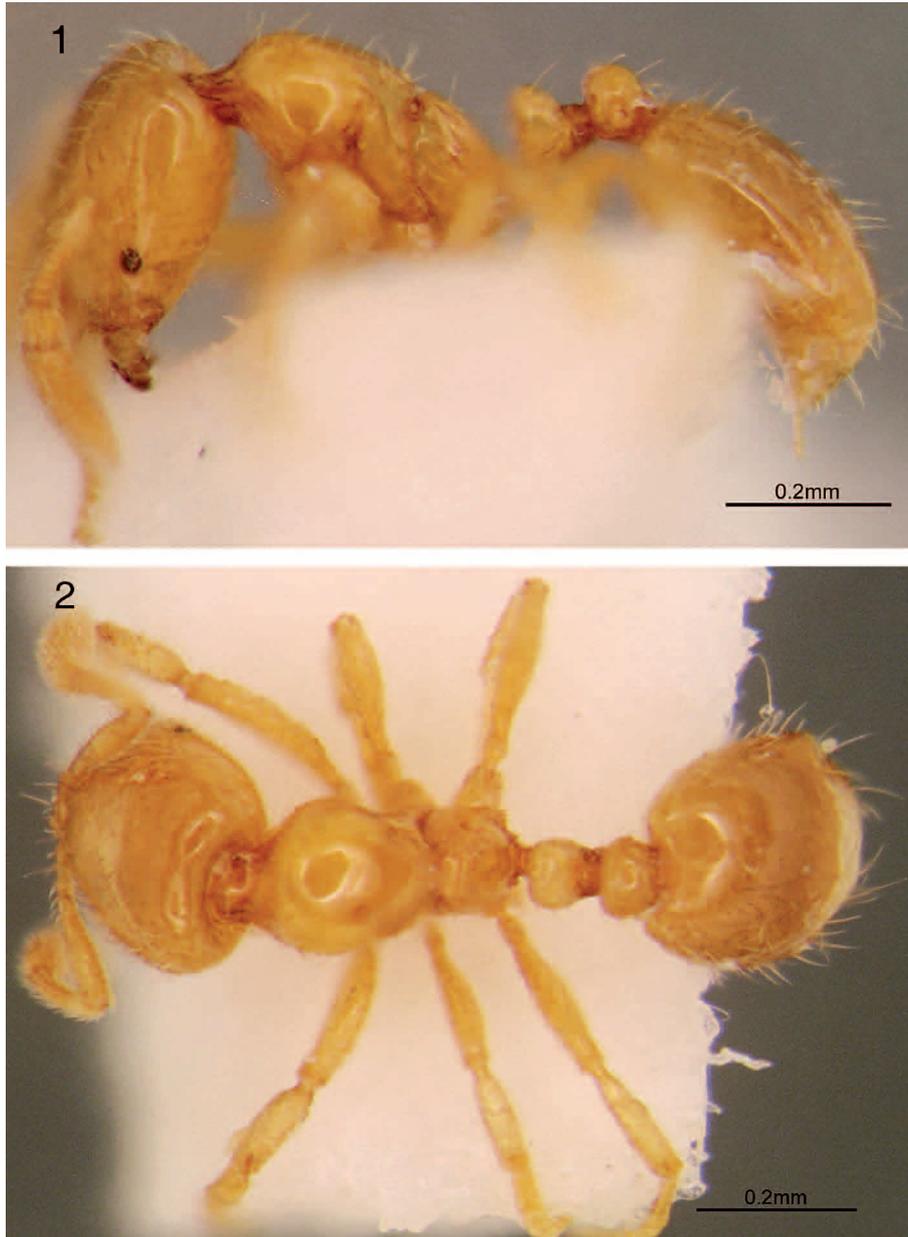
Material

Type series. 5 workers (♀♀). (Leg. Mostafa R. Sharaf & Abdulrahman S. Aldawood). **Type locality:** Saudi Arabia, Riyadh, King Saud University campus, 9.VII.2009, , 24° 43' N, 46° 37' E, altitude 612 m; nesting under date palm tree, hand collecting by aspirator.

Holotype is deposited at the King Saud Museum of Arthropods (KSMA), the Department of Plant Protection, College of Food and Agricultural Sciences, King Saud University, Riyadh, Kingdom of Saudi Arabia.

One paratype is deposited at the entomological collection, the World Museum Liverpool (WML), Liverpool, U.K. deposited by Mr. Guy T. Knight). One paratype is deposited at Kiko Gómez collection. Two paratypes are deposited at (KSMA). All the paratypes with same data as the holotype.

Second paratype series. 117 ♀♀ (Leg. Mostafa R. Sharaf & Abdulrahman S. Aldawood). Locality: Saudi Arabia, Riyadh, Wadi Hanifa, 24°39' N, 46°36' E, altitude 633 m; nesting under a rock on a rotten carpet, hand collecting by aspirator. Paratypes deposited at (KSMA).



Figures 1–2
Solenopsis saudiensis n. sp. (Holotype, KSMA); 1, Profile; 2, Dorsal view.

Measurements and indices

Measurements in mm and indices are as follows:

TL = Total Length; the outstretched length of the ant from the mandibular apex to the gastral apex; HW = Head Width; the maximum width of the head behind eyes in full face view; HL = Head Length; the maximum length of the head, excluding the mandibles; CI = Cephalic Index ($HW \times 100/HL$); SL = Scape Length, excluding basal neck; SI = Scape Index ($SL \times 100/HW$); EL = Eye Length; the maximum diameter of the eye; ML = Mesosoma Length; the length of the mesosoma in lateral view, from the point at which the pronotum meets the cervical shield to the posterior base of the propodeal lobes or teeth; PL = Petiole Length; the maximum length measured in dorsal view, from the anterior margin to the posterior margin; PW = Petiole Width; maximum width measured in dorsal view; PPL = Postpetiole Length; maximum length measured in dorsal view; PPW = Postpetiole Width; maximum width measured in dorsal view.

All measurements are in millimeters and follow the standard measurements (Bolton 1987).

The photographic images were taken with a digital camera attached to a stereomicroscope. The microscope was equipped with a Z-Stepper to enable the generating of usually 30 images in different focus layers, from which a montage image was computed using AutoMontage Pro (Figs. 1–3). Images taken under the scanning electron microscope (SEM) JSM-6380 LA were used to record morphological details of the new species (Figs. 4–7).

Results

Solenopsis saudiensis Sharaf & Aldawood, n. sp. (Figs. 1–5)

Diagnosis. *Solenopsis saudiensis* is characterized by the combination of the following characters: Head in lateral view with convex dorsal and ventral surfaces; anterior clypeal margin with central pair of stout projecting teeth and a lateral pair of short, broad basal blunt teeth; eyes with two minute facets; funicular segments 2–7 about twice as wide as long; propodeum short and low, with the basal face making a continuous arc with the declivity; and petiole as long as broad with the anterior peduncle having a distinct small ventral concave surface.

Holotype worker. TL 1.3, HL 0.41, HW 0.31, SL 0.27, EL 0.02, ML 0.38, PL 0.10, PW 0.10, PPL 0.10, PPW 0.13, SI 87, CI 75.

Paratype workers. TL 1.2–1.3, HL 0.31–0.40, HW 0.30, SL 0.21–0.27, EL 0.02, ML 0.31–0.35, PL 0.10, PW 0.10, PPL 0.10, PPW 0.10–0.11, SI 70–90, CI 75–97 (4 measured).

Head clearly longer than broad with lateral margins slightly convex; in profile with convex dorsal and ventral surfaces; occiput weakly concave with rounded corners; and head dorsum smooth and shining with abundantly scattered minute hair pits. Mandibles armed with four reddish brown teeth, the apical tooth is the largest, the basal one is the smallest, the second and third teeth are subequal; and mandible surface glossy and brilliant with long scattered yellow hair pits. Clypeus with a strongly impressed anterior margin and sharp carinae; anterior clypeal margin with central pair of stout projecting teeth (0.02

mm); and a lateral pair of short, broad basal blunt teeth. Eyes composed of two minute dark facets (Fig. 6). Antennae of 10 segments with a well defined 2-segmented club. Scapes in full-face view falling well short of the occipital margin. Funicular segments 2–7 about twice broader than long, with abundant, decumbent long yellow hairs. Promesonotum with a smooth and uninterrupted profile. Metanotal groove weakly but distinctly impressed; and impression between mesopleuron and metapleuron faintly cross-ribbed. Propodeum with a shallow dorsal longitudinal impression. Propodeal spiracle relatively large (0.02 mm diameter) and circular (Fig. 7). Propodeum short, low with the basal face making a continuous arc with the declivity. Petiole as long as its broad in dorsal view; whereas in lateral view with a high more or less pointed node, anterior peduncle with distinct small ventral concave surface. Postpetiole about 1.3× broader than long; in profile nearly hexagonal with a distinctly convex dorsal surface. All body parts with abundant, scattered, and moderately long yellow hairs, whereas pilosity of the head dorsum is the shortest. Body uniform yellow, and gaster in some individuals slightly darker at the end.

Etymology. A patronymic name (*S. saudiensis*) has been selected after Kingdom of Saudi Arabia.

Biological notes. One of the type series (holotype one) was found nesting at the base of a date palm tree, where many decayed falling dates were present and coexisting with several other ant species including *Tetramorium caldarium* (Roger 1857); *Paratrechina jaegerskioeldi* (Mayr 1904); *Monomorium exiguum* Forel 1894; *Monomorium mayri* Forel 1902; *Pheidole minuscula* Bernard 1951 (or the species denoted as *P. minuscula* by Collingwood (1985)); *Hypoponera abeillei* (André 1881); *Tapinoma simrothi* Krausse 1911, *Cardiocondyla*

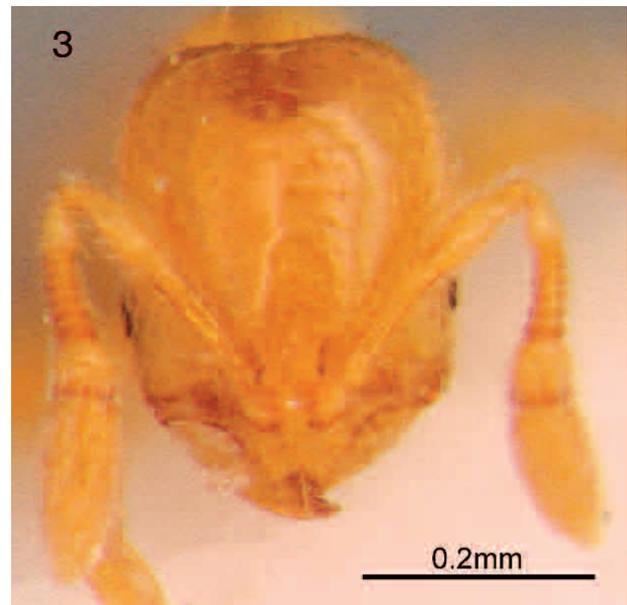


Figure 3
Full-face view of *Solenopsis saudiensis* n. sp. (Holotype, KSMA).

mauritanica Forel 1890; and *Cardiocondyla emeryi* Forel 1881. Our impression is that *S. saudiensis* seems likely to be rare in that area, where it is relatively disturbed with pesticides and other agricultural chemicals. This area is part of a small market. Only five individuals were collected there.

A large colony containing hundreds of individuals was found nesting under a rock, on a rotten used carpet and among roots of gramineae plant, in a wild isolated area in Wadi Hanifa, Riyadh. Many workers of *Tapinoma simrothi* Krausse 1911, were also collected in the same niche attending mealybugs. Several individuals of mites were also collected belonging to the following groups: Order Cryptostigmata (beetle mites), Order Mesostigmata, and family Uropodidae. This locality is a less disturbed one and this may reflect the abundance of *S. saudiensis* in that area.

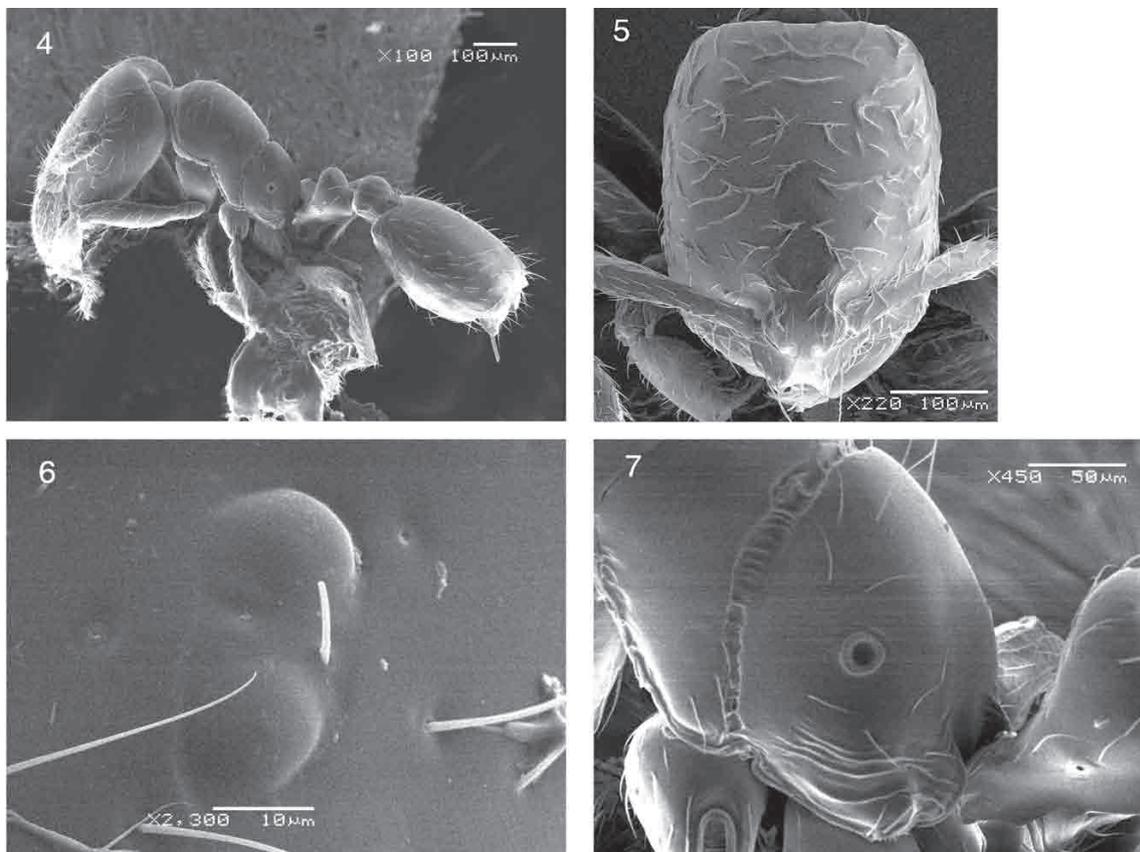
Discussion

This new species appears taxonomically closest to *S. kochi* Finzi 1936, and *S. cooperi* Donisthorpe

1947, both described from Egypt. All three species share the following characters: color uniformly yellow, head smooth and shiny with very minute hair pits; mesosoma with a distinct metanotal groove; and body with abundant yellow hairs.

Solenopsis saudiensis seems taxonomically closest to *S. kochi*, both with the propodeum short and low, and with the basal face making a continuous arc with the declivity. Eyes consist of two minute dark facets in *S. saudiensis*, whereas in *S. kochi*, they consist of a single facet. *S. saudiensis* is consistently smaller; TL 1.2–1.3 versus TL 2.0; the occipital margin in *S. saudiensis* is shallowly concave, whereas in *S. kochi* it is weakly convex; the head is clearly longer than broad in *S. saudiensis* (CI 75), whereas it is not much longer than broad in *S. kochi* (CI 85). *S. saudiensis* has a higher scape index, SI 70–90 versus SI 73. The mesosoma length is distinctly smaller in *S. saudiensis* ML 0.31–0.38 versus ML 0.54 in *S. kochi*.

Comparing *S. saudiensis* with *S. cooperi* Donisthorpe, both species have the posterior of the gaster darkened,



Figures 4–7 *Solenopsis saudiensis* n. sp. (Paratype specimen), SEM picture. 4, Profile; 5, Full-face view; 6, The two-facets eye of the species; 7, Propodeal spiracle.

the head in full-face view with nearly parallel sides; propodeum with a longitudinal impression. However, they differ in the following: *S. saudiensis* has eyes with two minute dark facets, while in *S. cooperi* they consist of a single facet. *S. saudiensis* has the basal face of the propodeum forming a continuous arc with the declivity, whereas in *S. cooperi* the faces are separated by a distinct angle. *S. saudiensis* has a circular propodeal spiracle, while in *S. cooperi* it is ovoid. *S. saudiensis* is consistently smaller, TL 1.2–1.3 versus TL 1.53–1.76. *S. saudiensis* has a smaller head with HL 0.31–0.41 and HW 0.30 versus HL 0.41–0.56, HW 0.34–0.45 in *S. cooperi*. *S. saudiensis* has a shorter scape, SL 0.21–0.27 versus SL 0.25–0.35, and SI 70–90 versus 73–77 in *S. cooperi*.

Superficially, *S. saudiensis* may be closest to *S. sumara* but the former always has eyes with only two minute facets whereas the later has eyes with 2–3 facets. In addition, *S. saudiensis* has much shorter and narrower head HW 0.30–0.31, HL 0.31–0.41 versus HW 0.46–0.51 in *S. sumara*.

The list of the *Solenopsis* species now known to occur in the Arabian Peninsula certainly is far from being complete due to vast unexplored areas. Therefore, we intend to carry out a comprehensive field survey to collect more specimens to complete the species list of this genus in Saudi Arabia and to make out a detailed taxonomic revision.

The *Solenopsis* species are monomorphic, dimorphic, or polymorphic Ettershank (1966) and the workers can be distinguished from all other ant genera by the combination of the following characters: Mandibles with three or four teeth. Palp formula 2,2 or 1,2; and Clypeus strongly longitudinally bicarinate, with the median area sharply elevated and deeply inserted between the closely approximated frontal lobes. Anterior margin of clypeus with a single unpaired long median seta. Antennae 10-segmented (very rarely 9-segmented) with a 2-segmented club. Frontal carinae and antennal scrobes absent. Propodeum unarmed (Bolton 1994 & Sharaf *et. al.* 2009).

Key to the Arabian species of the genus *Solenopsis* including the Egyptian species

Since very little analytical studies were carried out on the Arabian and North African *Solenopsis* fauna, therefore, we prefer to include the Egyptian species revised by Sharaf *et. al.* (2009) in the key of the Arabian species presented here. This will be useful for the future revisionary studies which will be done on the Middle East or even the Palaearctic *Solenopsis* fauna.

1. Eyes with a single facet 2
- Eyes with more than one facet 4

2. Head in lateral view with flat dorsal and ventral surfaces; head in full-face view with nearly parallel sides; propodeum profile distinctly angled at junction of dorsum and declivity (Egypt) *S. cooperi*
- Head in lateral view with convex dorsal and ventral surfaces; head in full-face view with sides nearly parallel or shallowly convex; propodeum profile with a smoothly rounded transition from dorsum to declivity 3
3. Eyes large, eye length 0.1 times head width or more, EL 0.04–0.05 (Egypt) *S. occipitalis*
- Eyes smaller, eye length 0.04 times head width, EL 0.02 *S. kochi*
4. Postpetiole with a distinct anteroventral flange seen in profile as a tooth like projection (Oman and United Arab Emirates) *S. omana*
- Postpetiole without a distinct anteroventral projection ... 5
5. Eyes with 9 facets, the outer circle of facets enclosing a single relatively large facet (Egypt) *S. lou*
- Eyes with 2–4 facets 6
6. Head rather square, only slightly longer than wide; larger species, TL 1.6–2.8. (Yemen) *S. zingibara*
- Head subrectangular; smaller species, TL 1.20–1.75 7
7. Relatively larger species TL 1.50–1.75; eyes very small with 2–3 facets; head much broader HW 0.46–0.51 and much longer HL 0.55–0.68 (Yemen) *S. sumara*
- Smaller species TL 1.2–1.3; eyes minute with only two facets; head less broader HW 0.30–0.31 and shorter HL 0.31–0.41 (Saudi Arabia) *S. saudiensis*

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