

The formicine ant genus *Plagiolepis* Mayr (Hymenoptera: Formicidae) in the Arabian Peninsula, with description of two new species

MOSTAFA R. SHARAF, ABDULRAHMAN S. ALDAWOOD, & BRIAN TAYLOR

[MRS] [ASA] Plant Protection Department, College of Food and Agriculture Sciences, King Saud University, Riyadh 11451, PO Box 2460, Kingdom of Saudi Arabia.

Corresponding author, e-mail: antsharaf@yahoo.com

[BT] 11 Grazingfield, Wilford, Nottingham, NG11 7FN, United Kingdom

ABSTRACT

The formicine ant genus *Plagiolepis* in Arabia is reviewed and an identification key to the worker caste is given. Eight species are recognized, two of which, *P. boltoni* and *P. juddi* are described as new. Two species, *Plagiolepis abyssinica* Forel and *Plagiolepis schmitzii* Forel are redescribed.

KEYWORDS Formicinae, *Plagiolepis*, new species Palaearctic, Arabia, keys.

This paper is one step towards a revision of the ant genera of the Arabian Peninsula (Arabia), many of which are in need of comprehensive taxonomic study at species rank. The formicine ant genus *Plagiolepis* was created by Mayr (1861), with *Formica pygmaea* Latreille, 1798 later designated as the type species by Wheeler (1911). Member species can be recognized easily by the combination of the following characters in the worker caste: Mandibles armed with five teeth; clypeus large and projecting over the basal borders of the mandibles; palp formula 6,4; antennae 11-segmented, and eyes well developed. In dorsal view, the mesonotum is separated from the metanotum by a conspicuous transverse groove or impression, therefore the metanotum forms a distinctly isolated sclerite. The propodeum is unarmed, and the petiole is a reduced scale, inclined forward and sometimes overhung by the first gastral segment.

Plagiolepis is one of the largest and taxonomically most difficult genera in the subfamily Formicinae, with 80 species distributed in the Old World tropics and temperate areas (Bolton, 1995; Brown, 2000). The species nest in a number of different sites; under tree bark, in rotten wood or twigs (*P. abyssinica*), in soil litter (*P. maura*, *P. pallescens*), under stones (*P. schmitzii*), or in hard-packed soil (*P. exigua*) (Collingwood, 1985, Collingwood & Agosti, 1996, Sharaf, 2006). Very few studies have been done on the Palaearctic *Plagiolepis* fauna which include

Palaearctic Russia (Radchenko, 1989), and Central and Southern Palaearctic region (Radchenko, 1996); and, *Plagiolepis* of the Arabia have received little attention. The first record from Arabia was of *P. pygmaea* (Latreille) collected in the 1930's from Jebel Musmah by Scott and E. B. Sutton (Collingwood, 1985). Fifty-five years later, Collingwood (1985) reported four species, *P. abyssinica* (elevated to species rank), *P. pygmaea*, *P. schmitzii*, and *P. maura* Santschi. Collingwood and Agosti (1996) added *P. exigua* from Yemen. Recently, a new species, *P. breviscapa*, from Yemen was described by Collingwood and van Harten (2005). None have been reported from the United Arab Emirates, Qatar, Bahrain, and Kuwait. Here, two new species, *P. boltoni* and *P. juddi*, are described and two species, *P. abyssinica* and *P. schmitzii* are redescribed.

MATERIALS AND METHODS

Standard measurements in mm, and indices follow Bolton (1987):

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 x 100/HL).

SI = Scape Index (SL x 100/HW).

SL = Scape Length, excluding basal neck.

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.

PRW = Pronotum width; the maximum width of pronotum in dorsal view.

Petiole Length; the maximum length measured in dorsal view, from the anterior margin to the posterior margin.

Petiole Width; maximum width measured in dorsal view.

Postpetiole Length; maximum length measured in dorsal view.

Postpetiole Width; maximum width measured in dorsal view.

Material was examined from the following collections: California Academy of Science Collection, San Francisco, California, USA (CASC); King Saud Museum of Arthropods, King Saud University, Riyadh, Kingdom of Saudi Arabia (KSMA); Muséum d'Histoire Naturelle, Geneva, Switzerland (MHNG); Naturhistorisches Museum, Basel, Switzerland (NHMB); World Museum Liverpool, Liverpool, United Kingdom (WML); Oxford Museum of Natural History, United Kingdom (OXUM), and the B. Taylor Collection.

RESULTS AND DISCUSSION

SPECIES DESCRIPTIONS

Plagiolepis abyssinica Forel, 1894

Figs. 1 a-c

Plagiolepis exigua ssp. *abyssinica* Forel, 1894a:73.

Syntype worker. ETHIOPIA, (*Ilg*) (MHNG) [examined].

Plagiolepis abyssinica Forel, Collingwood, 1985:297; elevated to species.

Redescription of worker.— TL 1.20, HL 0.30, HW 0.30, SL 0.29, EL 0.07, PRW 0.18, ML 0.30, CI 97, SI 100.

Collingwood (1985) gave a typical worker from Fayfa, Saudi Arabia, as: TL 1.25, HL 0.35, HW 0.28, CI 80, SI 100, EL 0.05 (0.18 X HW)

Body blackish brown, femora yellowish brown, antennae, clypeus and mandibles yellowish, smooth and shining. Head nearly as long as broad with clearly convex sides. Occiput distinctly concave with rounded corners. Head dorsum with scattered short yellow pubescence. Eyes relatively large, 0.24 X HW, with 9 ommatidia in the longest row and occupying less than one quarter of head sides. Antennal scape just surpassing the posterior margin of head. Clypeus and mandibles with relatively abundant long yellow hairs. Area in front of eyes with several pairs of long hairs. Mesosoma and gaster with relatively abundant pubescence. Erect pilosity of gastral tergites long and situated on the posterior margins.

Remarks.— Collingwood's (1985) decision to elevate this taxon to species rank is confirmed here. *P. abyssinica* was originally described as a subspecies of *P. exigua* but differs on a number of points. For *P. abyssinica*, the body color is brownish and the antennal scapes surpass the posterior margin of the head, whereas in *P. exigua* the color is yellowish and the antennal scapes do not reach posterior margin. Moreover, the eyes in *P. abyssinica* are consistently larger (EL 0.24 X HW) with 9 ommatidia in the longest row and *exigua* is smaller (EL 0.19 X HW), with only 6 ommatidia in the longest row. *P. exigua* as described by Forel (1894) had a smooth, shiny appearance but with sparse punctations on the head and gaster, *P. abyssinica* has no obvious punctuation.

Distribution in Arabia.— Fayfa (Saudi Arabia) (Collingwood, 1985).

Plagiolepis boltoni Sharaf & Aldawood sp. n.

Figs. 2 a-c

Holotype worker.— Saudi Arabia, Riyadh, Al Diri'yah, 23.xii.2009, 24°44'N, 46°35' E, altitude 688 m.a.s.l. (*Mostafa R. Sharaf & Abdulrahman S. Aldawood*); deposited in KSMA.

Paratypes.— 7 workers with same data as holotype deposited at WML, in Kiko Gómez collection, NHMB, MHNG, BMNH, CASC and KSUC. 17 workers; Saudi Arabia: Al Hilwa village

(Hawtat Bani Tamim) ca 180 km south of Riyadh city, 8.xi.2010, 23°25' N, 46°46' E, altitude 631 m.a.s.l. (*Mostafa R. Sharaf*) deposited in KSMA.

Holotype worker: TL 1.40, HL 0.43, HW 0.40, SL 0.41, EL 0.14, ML 0.43, SI 103, CI 93.

Paratype workers: TL 1.35-1.60, HL 0.41-0.44, HW 0.36-0.40, SL 0.36-0.41, ML 0.40-0.44, EL 0.11-0.14, SI 100-103, CI 88-93 (N=5).

Unicolorous yellow, eyes and apex of gaster black, mandible teeth brown. Head distinctly longer than broad, second funicular segment distinctly shorter than the third, fourth funicular segment distinctly longer than broad, nearly subequal to the third; antennae with abundant decumbent yellow pubescence. Head in full face view with distinctly convex sides and the eyes just breaking the outline; the occiput straight or weakly concave with clearly rounded corners. Scapes surpass the occiput by about a quarter of their length. Head dorsum smooth and brilliant but with abundant scattered hair pits. Eyes large (EL 0.30-0.35x HW) with 12 ommatidia in the longest row. Anterior clypeal margin with two lateral pairs of long yellow hairs, posterior margin with one pair of long hairs situated between antennal insertions. Profile of mesosoma elongated, with a flattish dorsal surface and a weak metanotal suture. The propodeal spiracle is minute and circular. The whole mesosoma is bare except for short pubescence on the pronotum and mesonotum. The gaster has a few long sub-erect yellow hairs on each tergite.

Remarks.— *P. boltoni* is morphologically similar to *P. exigua*, sharing the following characters: color yellow, integument smooth and shining, head longer than broad with convex sides, occiput feebly concave, and second funicular segment distinctly shorter than third. *P. boltoni* can be separated from *P. exigua* by the scapes surpassing the posterior margin of head, whereas in the latter the scapes do not reach the posterior margin of head. *P. boltoni* has larger eyes containing eleven ommatidia in the longest row (EL 0.30-0.35X HW), whereas in *P. exigua*, eyes are smaller with only six ommatidia (EL 0.19X HW). *P. boltoni* also is consistently larger, TL 1.35-1.60 versus TL 1.23, and has a slightly higher mesosomal length, ML 0.40-0.44 versus ML 0.35. The anterior clypeal margin of *P. exigua* has two lateral pairs of

long yellow hairs, posterior margin with one pair of long hairs situated between antennal insertions. The anterior clypeal margin of *P. exigua* has several pairs of long yellow hairs and posterior margin bare. The mesosoma profile is elongated in *P. boltoni* with a relatively flat dorsal surface and weak metanotal suture. The mesosoma of *P. exigua* is more compact, short with a convex pronotum and mesonotum and a distinct metanotal groove.

Habitat and biology.— *Plagiolepis boltoni* was collected from an arid area planted with small neglected date palm trees. Some of the ants were observed foraging close to the bases of the trees. Nothing more is known about the biology of the colony except that it was small and in soil close to the road surrounding Riyadh. The second paratype series also was found nesting near a palm tree; in this case the soil was moist because of irrigation. The ants were coexisting with other ant species including *Pachycondyla sennaarensis* Mayr; *Camponotus sericeus* (Fabricius); *Cataglyphis abyssinica* (Forel) and *Cardiocondyla emeryi* Forel. The area was abundantly inhabited also by springtails, lygaeid bugs, web spinners, staphylinid and tenebrionid beetles. It appears that *P. boltoni* prefers areas around palm trees.

Etymology.— This species is named in gratitude and honor of Barry Bolton.

Plagiolepis breviscapa Collingwood & van Harten 2005

Plagiolepis breviscapa Collingwood & van Harten, 2005: 77. Holotype worker, YEMEN, Lahj, 1.x.-17.xii.2001, (*A. v. Harten & A. Sallam*) (not in WML, presumably lost).

Holotype worker.— TL 1.40, HL 0.47, HW 0.41, SL 0.26, EL 0.09, SI 63, CI 87 (Collingwood & van Harten, 2005).

The head, body and legs are completely pale. The head is nearly as long as broad, the antennal scapes are distinctly short, about half of head length. The funicular segments are quadrate.

Plagiolepis exigua Forel, 1894

Figs. 3 a-c

Plagiolepis exigua Forel, 1894b: 417. Syntype worker, INDIA, Poona (*Wroughton*), (MHNG) [examined].

Syntype worker.— TL 1.23, HL 0.36, HW 0.31, SL 0.26, EL 0.06, PRW 0.20, ML 0.35, SI 84, CI 86.

Mesosoma, legs, antennae, clypeus and mandibles yellow, head and gaster pale yellowish brown, the latter with a more or less longitudinal median yellowish band that interrupt the brownish tergites. Smooth and shining. Head oval, longer than broad with convex sides, nearly as broad anteriorly as posteriorly. Eyes situated in the anterior third of head sides and with 6 ommatidia in the longest row (EL 0.19 X HW). Anterior clypeal margin convex and without carinae. Scapes fail to reach the posterior margin of head. Second funicular segment distinctly shorter than third. Funicular segments 2-4 broader than long, the fifth funicular segment as long as or little longer than broad. Occiput feebly concave. Mesosoma compact, short with convex pronotum and mesonotum and distinct mesonotal and metanotal grooves. Basal face of propodeum short, while its descending face long. Pubescence yellow, fine and regularly distributed over whole body. Very few erect hairs except on anterior of clypeus.

Remark.— Forel mentioned that the scapes of this species reach posterior margin of head, but the scapes fail to reach the margin in the syntype. In addition, he gave the funiculus segments 2-5 x broader than long. On the syntype the fifth segment is as long as or little longer than broad.

Material examined.— Saudi Arabia, Fayfa, 30.iii.1983 (*leg. C.A. Collingwood*) (2 specimens (WML)); Yemen, Taiz, ii.1991 (*leg. A. van Harten*) (1 specimen) (WML); Yemen, Seyun, 12-14.viii.02, light trap (*leg. A. van Harten*) (8 specimens) (WML).

Distribution in Arabia.— Taiz, Aden, Al-Mahwit, Al-Turabah (Yemen) (Collingwood & Agosti, 1996).

Plagiolepis juddi Sharaf & Aldawood sp. n.

Fig. 4 a

Holotype worker.— YEMEN, Lahj, v.2002 (*A. van Harten*). The Entomological Collection, World Museum Liverpool (WML), Liverpool, U.K.

TL 1.02, HL 0.29, HW 0.28, SL 0.31, EL 0.07, PRW 0.18, ML 0.40, CI 97, SI 111.

Unicolorous bright yellow, mandibular teeth, posterior margins of first and fourth gastral tergites yellowish brown. Head nearly as long as broad with convex sides and nearly straight or shallowly concave occiput. Head dorsum smooth and shining. Scapes distinctly short not reaching posterior margin of head. Second funicular segment broader than long, third and fourth funicular segments distinctly longer than broad. Eyes oval with about 9 ommatidia in the longest row, EL 0.25 X HW. Whole mesosoma smooth and brilliant. Metanotal groove shallow but distinct. Basal face of propodeum sloping evenly to the descending face making a continuous curve. Pubescence sparse on head and gaster and absent on mesosoma. Antennae with dense appressed pubescence.

Remarks. *Plagiolepis juddi* appears similar to *P. exigua* but is consistently smaller, TL 1.02 versus 1.23; has a higher scape index, SI 111 versus 84; larger eyes, EL 0.25X HW versus 0.19X HW; higher mesosomal length, ML 0.40 versus 0.35. In addition, CI 97 in *P. juddi*, whereas CI 86 in *P. exigua*. The fourth funicular segment of *P. juddi* is distinctly longer than broad, while it is broader than long in *P. exigua*. Furthermore, *P. juddi* has much sparser pubescence than *P. exigua*.

Etymology. Named in honor of Dr. Stephen Judd (Director of World Museum Liverpool).

Plagiolepis pallescens maura Santschi, 1920

Plagiolepis maura Santschi, 1920: 169. Syntype worker and two syntype males and one syntype queen, MOROCCO: Magador, iv.1905 (*Vaucher*) (NHMB) [examined].

Plagiolepis pallescens: Emery, 1924:8.

Syntype worker.— TL 1.49, HL 0.45, HW 0.39, SL 0.39, EL 0.12, CI 87, SI 100, PRW 0.25, ML 0.46

Syntype queen (gaster is broken).— HL 0.63, HW 0.56, SL 0.53, EL 0.19, CI 89, SI 95, PRW 0.25, ML 0.92.

Syntype male.— TL 1.42-1.49, HL 0.38, HW 0.35-0.36, SL 0.34-0.38, EL 0.17, CI 92-95, SI 97-106, PRW 0.35-0.36, ML 0.61-0.63.

Worker.— Yellowish brown, gaster yellowish paler than rest of body, legs and antennae yellow, propodeum dorsum characteristically reddish brown. Body smooth and shining. Head distinctly longer than broad with clearly convex sides. Eyes, in full-face view, fail to break head sides. Antennae with appressed pubescence. Second funicular segment as long as or little broader than long. Third funicular segment little longer than broad. Second and third funicular segments nearly sub equal. Fourth funicular segment distinctly longer than broad, and little longer than third. The remaining funicular segments longer than broad. Scape surpassing posterior margin of head by 2-3 X its thickness. Eyes large (EL 0.12), 0.3X HW, with eleven ommatidia in the longest row. Anterior clypeal margin with several pairs of long hairs. Occiput nearly straight or feebly concave with strongly rounded posterior corners. Promesonotal suture indistinct. Metanotal groove feebly impressed. Erect hairs limited to anterior margin of clypeus and a small number on the gaster. Dorsum of head with abundant but widely spaced pubescence; other pubescence sparse.

Queen.— Body brown, legs and antennae yellowish brown. Eyes very large (EL 0.19) occupying about half of head sides. Anterior clypeal margin with two pairs of long hairs. Palp formula 6,4. Second funicular segment about twice broader than long. Third funicular segment twice longer than broad, and twice longer than second. Fourth funicular segment clearly longer than broad and nearly as long as, or little shorter than, second and third segments combined. Occiput nearly straight or feebly concave with rounded posterior corners. Mesosoma robust, distinctly dorsoventrally compressed. Propodeal spiracle circular. Pronotal humeri with one pair of long hairs. Body with abundant appressed pubescence.

Male.— Body pale brown, legs yellow, all covered with relatively few sparse pubescence. Head distinctly broader than long. Occiput straight.

Third funicular segment about twice longer than second segment. Fourth funicular segment as long as or little longer than second and third segments combined. Anterior clypeal margin with one pair of long hairs. Eyes prominent occupying more than half of head sides.

Material examined.— Saudi Arabia, Wadi Shugub, IV.1983 (*C. A. Collingwood*) (4 specimen, WML); Yemen, II.1999, locality not given (*A. van Harten*) (1 specimen, WML). Egypt (slightly smaller workers), Kaseh Tourism Village, Marsa Matrouh, 31°21' N 27°14' E; 17.viii.2007 (*M. R. Sharaf*) (1 specimen, OUM); St Katherine protectorate around the town of St Katherine, in mountains above 1500m, early 2002 (*M. James*) (1 specimen, OUM).

Distribution in Arabia.— Abu-Arish (Jizan), Al Kola, Riyadh (Saudi Arabia) (*Collingwood*, 1985); Ain Hamran, Dhofar (Oman); Sa'a, Al-Mahwit, Al-Tawilan-Al-Kowd (Yemen) (*Collingwood & Agosti*, 1996).

Plagiolepis pygmaea (Latreille, 1798)

Plate 4, Figs. b-d

Formica pygmaea Latreille, 1798:45. FRANCE, Brive (MNHN) [not examined].

Plagiolepis dufourii: Menozzi, 1925: 19.

Plagiolepis obscuriscapus Santschi, 1923: 137.

Worker.— TL 1.49-1.92, HL 0.38-0.46, HW 0.35-0.42, SL 0.32-0.46, EL 0.08- 0.12, SI 91-110, CI 87-91, PRW 0.24-0.28, ML 0.41-0.44 (N=3)

Body uniformly brown or blackish brown, legs yellow, mandibles, antennae and coxae yellowish brown. Smooth and shining. Head distinctly longer than broad with convex sides. Occiput distinctly concave with rounded corners. Eyes relatively large with 9-10 ommatidia in the longest row (EL 0.12) and (0.28X HW). Clypeus with several relatively long hairs, that are not restricted to the anterior margin. Scape surpassing posterior margin of head by at least one and half times its thickness. Funicular segments 2-4 distinctly broader than long. Fifth funicular segment longer than broad. Pubescence whitish, appressed and abundant on antennae, head and gaster but less abundant on mesosoma and legs. Posterior margins of all gastral

tergites with many relatively long and stiff hairs.

Material examined.— Yemen, Aden Park, viii.1991 (*A. Van Harten*) (4 specimens examined, WML). The Antweb specimen shown in Plate 4 is from Slovenia.

***Plagiolepis schmitzii* Forel, 1895**

Plate 5, Figs. a-c

Plagiolepis pygmaea var. *schmitzii* Forel, 1895:231.

Syntype worker: MADEIRA, Serra d'Agua (*P. E. Schmitz*) (MHNG) [examined].

Plagiolepis pygmaea var. *barbara* Santschi, 1911: 286.

Plagiolepis schmitzi st. *croisi* Santschi, 1920: 168.

Plagiolepis barbara var. *madeirensis* Emery, 1921: 315

Syntype worker.— TL 2.1, HL 0.50, HW 0.46, SL 0.46, EL 0.13, SI 100, CI 92, PRW 0.30, ML 0.60

Redescription of Worker.— Body dirty yellow, gaster yellowish brown, antennae and legs clear yellow. Head longer than broad and with clearly convex sides. Posterior margin of head distinctly concave with rounded corners. Eyes conspicuously large (EL 0.13) with 12 ommatidia in the longest row and occupying about quarter of head sides. All funicular segments clearly longer than broad. Second funicular segment distinctly shorter than the third. Fourth funicular segment 1.5 times longer than the third. Scapes in full-face view surpassing occiput by ca 0.25 of own length. Mesosoma in dorsal view elongated. Whole body and antennae with relatively dense appressed yellow pubescence. Gaster with well spaced and quite thick long hairs situated on posterior margins of all tergites.

Comment.— As Forel (1895) stated in his original description that the sides of the head are less convex than the other species. Other specimens from Spain and Madeira are illustrated by Taylor & Sharaf (2007). Those are a darker red-brown than the, probably faded, syntype.

Distribution in Arabia.— Anamas, Tanuma, Asir Province, Saudi Arabia (Collingwood, 1985)

The following key will allow the separation of the genus *Plagiolepis* known from Arabia.

Key to *Plagiolepis* from Arabia

- 1 Scape short (SL 0.26), not reaching posterior margin of head in full-face view 2
- Scape longer (SL 0.29-0.46) and surpassing posterior margin of head in full-face view 4
- 2 SI 63; antennal scape exceptionally short, only reaching half of head length; relatively large species, TL 1.40, HL 0.47, HW 0.41; (Yemen) ***breviscapa***
- SI 84 or more; antennal scape longer surpassing half of head length; smaller species, TL 1.23 or less, HL 0.29-0.36, HW 0.28-0.31; 3
- 3 EL 0.19 X HW, with 6 ommatidia in the longest row; funiculus segments 3-4 broader than long; pubescence quite dense over whole body; TL 1.23, SL 0.31, SI 84; (India, west to Yemen) (Figs. 3a, b, c) ***exigua***
- EL 0.25 X HW; with 9 ommatidia in the longest row, funiculus segments 3-4 longer than broad; pubescence sparser; TL 1.02, SL 0.26, SI 111; (Yemen) (Plate 3, Fig. a) ***juddi***
- 4 Head as long as broad; clypeus yellow contrasting the dark brown head dorsum; eyes small (EL 0.07); TL 1.20 or less, SL 0.29, SI 100; (Ethiopia, North East Africa, Saudi Arabia) (Figs. 1 a, b, c) ***abyssinica***
- Head distinctly longer than broad; clypeus unicolorous with head dorsum; eyes larger (EL > 0.11) TL 1.3 or more; 5
- 5 Funiculus segments 2-4 longer than broad; yellowish brown to red-brown; TL 2.1, SL 0.46, SI 100; (Madeira, Spain, North Africa and Saudi Arabia) (Figs. 5a, b, c) ***schmitzii***
- At least one of funiculus segments 2-4 broader than long 6

- 6 Funiculus segment 4 broader than long; eyes with 9 ommatidia in the longest row, EL 0.28X HW; occiput distinctly concave; red-brown, gaster often darker; TL 1.9 plus, SL 0.46, SI 110; (Mediterranean, Egypt, Saudi Arabia) (Figs. 4 b, c, d) *pygmaea*
- Funiculus segment 4 longer than broad; eyes with eleven ommatidia in the longest row, EL 0.30X HW or more; occiput nearly straight or feebly concave; unicolorous yellow or yellowish brown; TL max. 1.60 7
- 7 Clear yellow species; funiculus segment 2 distinctly shorter than 3; anterior margin of clypeus with two lateral pairs of long yellow hairs, posterior margin with one pair of long hairs situated between antennal insertions; TL 1.35-1.60, SL 0.36-0.41, SI 100-103; (Saudi Arabia) (Figs. 2 a, b, c) *boltoni*
- yellowish brown, at least base of gaster paler than rest of body; funiculus segments 2-3 nearly subequal; anterior margin of clypeus with several pairs of long hairs; TL 1.4-1.5, SL 0.39, SI 100; (North Africa, Egypt, Oman, Saudi Arabia, Turkey and Yemen) *pallescens:maura*

CONCLUSIONS

Eight species of *Plagiolepis* species are recognized from Arabiab. The number of species, however, is the total number of species is probably higher because vast areas of suitable habitats in Arabia for these ants remain poorly surveyed. Hopefully future collections will occur in these areas.

ACKNOWLEDGMENTS

We thank King Saud University (KSU) represented by the Economic Entomology Research Unit (EERU) for supporting this work. We are also most indebted to Barry Bolton and Boris Kondratieff, Colorado State University for valuable suggestions which improved the manuscript. We are grateful to the following for making types available for examination, without which help this work could not have been completed: Daniel Burckhardt and Isabelle Zürcher-Pfander (NHMB); Bernhard Merz (MHNG); Guy Knight (WML); Cedric Collingwood

and A. van Harten for help with materials collected from Arabia; Brian Fisher (AntWeb Project Leader) for taking automontage images of the new species *P. boltoni* and for permission to use images of *P. exigua*, *P. pygmaea* and *P. schmitzii*; and Darren Mann, Hope Entomological Collection (OXUM), University Museum, Oxford, U.K. for taking photos of *P. juddi*. Special thanks go to Prof. Hassan H. Fadl (King Saud University) for help with original description translations, Hassan Badri for technical assistance, Magdi El Hawagry, Habib El Oteibi, Mohammed Metwally and Ismail Fareed for help in field trips. The senior author greatly acknowledges Stephen Judd, his wife Shirley Judd and their daughter and sons Lucy, Williams, and Sam for the wonderful hospitality they provided during his stay in Liverpool. Mostafa Sharaf expresses his deep thanks to his mother Eglal El Saadany for encouragement and his wife Mrs. Amal El Saadany for her assistance with mounting of specimens.

REFERENCES

- Bolton, B. 1987. A review of the *Solenopsis* genus-group and revision of Afrotropical *Monomorium* Mayr. Bulletin of the British Museum (Natural History) (Entomology) 54: 263–452.
- Bolton, B. 1995. A new general catalogue of the ants of the World. Harvard University Press, Cambridge, Massachusetts, 504 pp.
- Brown, W. L. Jr. 2000. Diversity of ants. Pp. 45-79. In: Agosti, D., Majer, J. D., Alonso, L. E. & Schultz, T. R. (eds), Ants. Standard methods for measuring and monitoring biodiversity. Biological diversity Hand Book Series. Smithsonian Institution Press, Washington, D. C., 280 pp.
- Collingwood, C. A. 1985. Hymenoptera: Fam. Formicidae of Saudi Arabia. Fauna of Saudi Arabia 7: 230-302.
- Collingwood, C.A. and Agosti, D. 1996. Formicidae (Insecta: Hymenoptera) of Saudi Arabia (Part 2). Fauna of Saudi Arabia 15: 300-385.
- Collingwood, C.A. and Harten A. van. 2005. Further additions to the ant fauna (Hymenoptera: Formicidae) of Yemen. Zoology in the Middle East 35: 73-78.
- Emery, C. 1921. Notes critiques de myrmécologie. 9. Etude sur le genre *Plagiolepis*. Annales de la Société Entomologique de Belgique 61:

- 313–319.
- Emery, C. 1924. Formiche della Cirenaica raccolte dal Dott. Enrico Festa e dal Prof. Filippo Silvestri. *Bollettino della Società Entomologica Italiana* **56**: 6–11.
- Forel, A. 1894a. Abessinische und andere afrikanische Ameisen, gesammelt von Herrn Ingenieur Alfred Ilg, von Herrn Dr. Liengme, von Herrn Pfarrer Missionar P. Berthoud, Herrn Dr. Arth. Müller, etc. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* **9**: 64–100.
- Forel, A. 1894b. Les formicides de l'Empire des Indes et de Ceylan. Part 4. Adjonction aux genres *Camponotus* Mayr, et *Polyrhachis* Shuck. *Journal of the Bombay Natural History Society* **8**: 396–420.
- Forel, A. 1895. Südpalaearktische Ameisen. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* **9**: 227–234.
- Latreille, P.A. 1798. *Essai sur l'Histoire des Fourmis de la France*: 50 pp.
- Mayr, G. 1861. *Die Europäischen Formiciden. (Ameisen.)*: 80 pp. Wien.
- Menozzi, C. 1925. Note staccate di mirmecologia. *Bollettino della Società Entomologica Italiana* **57**: 17–22.
- Radchenko. 1989. Ants of the *Plagiolepis* genus of the European part of the USSR. *Zoologicheskii Zhurnal*, **68**: 153-156.
- Radchenko. 1996. [Ants of the genus *Plagiolepis* Mayr (Hymenoptera, Formicidae) of Central and Southern Palaearctic.] *Entomologicheskoye Obozreniye*, **75**(1): 178-187.
- Santschi, F. 1911. Formicides de diverses provenances. *Annales de la Société Entomologique de Belgique* **55**: 278–287.
- Santschi, F. 1920. Cinq nouvelles notes sur les fourmis, *Bulletin de la Société Vaudoise des Sciences Naturelles* **53**: 163–186.
- Santschi, F. 1923. Notes sur les fourmis paléarctiques. 4ème note. *Boletin de la Real Sociedad Española de Historia Natural* **23**: 133–137.
- Sharaf, M. R. 2006. Taxonomic and ecological studies on family Formicidae (Order: Hymenoptera) in Egypt including some protectorates with a study of some insect fauna associated with ant species. Ain Shams University, Faculty of Science, Entomology Department, Cairo, Egypt (unpublished Ph.D dissertation), 340 pp.
- Wheeler, W.M. 1911. A list of the type species of the genera and subgenera of Formicidae. *Annals of the New York Academy of Sciences* **21**: 157-175.

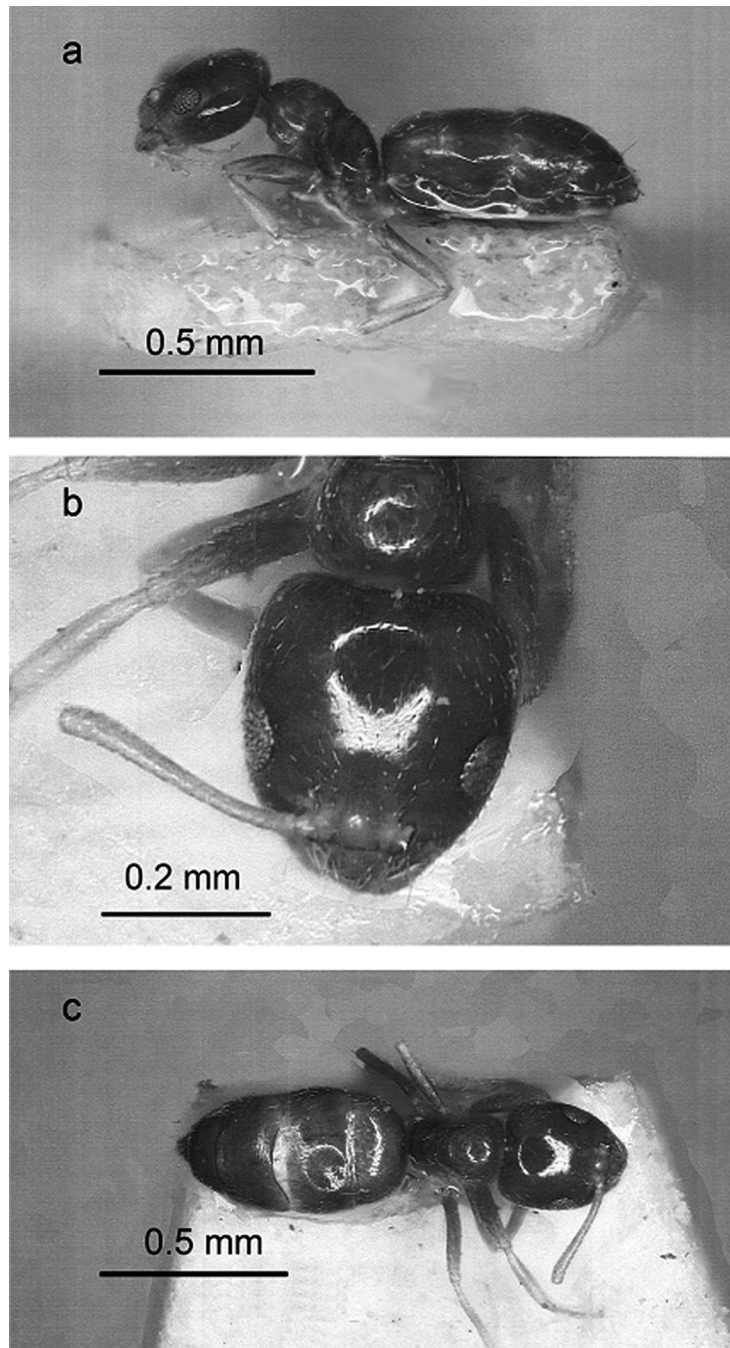


Figure 1. *Plagiolepis abyssinica* syntype worker (a-c), a, body in profile; b, head in full-face view; c, dorsal view.

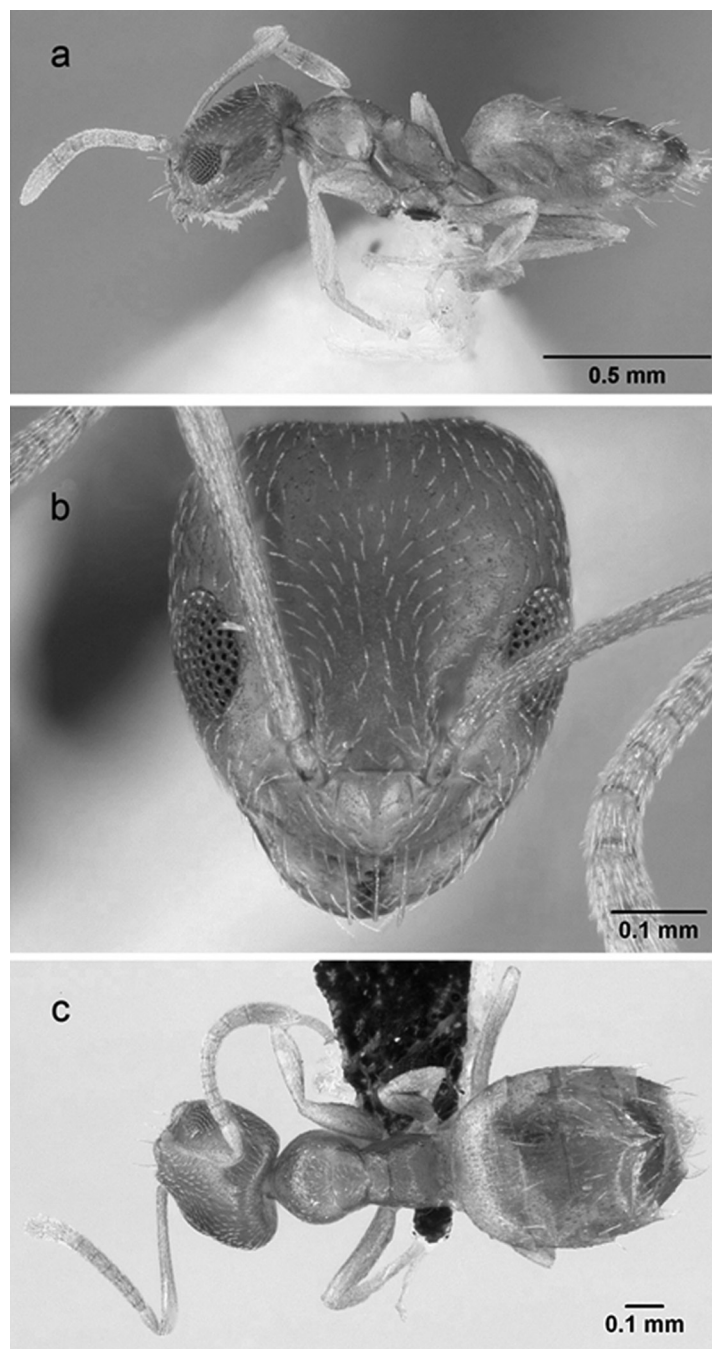


Figure 2. *Plagiolepis boltoni* sp. n. paratype worker (a-c). a, body in profile; b, head in full-face view; c, dorsal view.

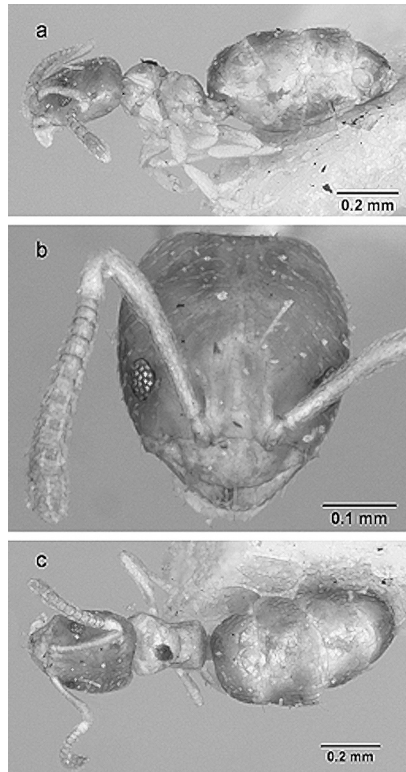


Figure 3. *Plagiolepis exigua* syntype worker (a-c). a, body in profile; b, head in full-face view; c, dorsal view. From <http://www.antweb.org/>

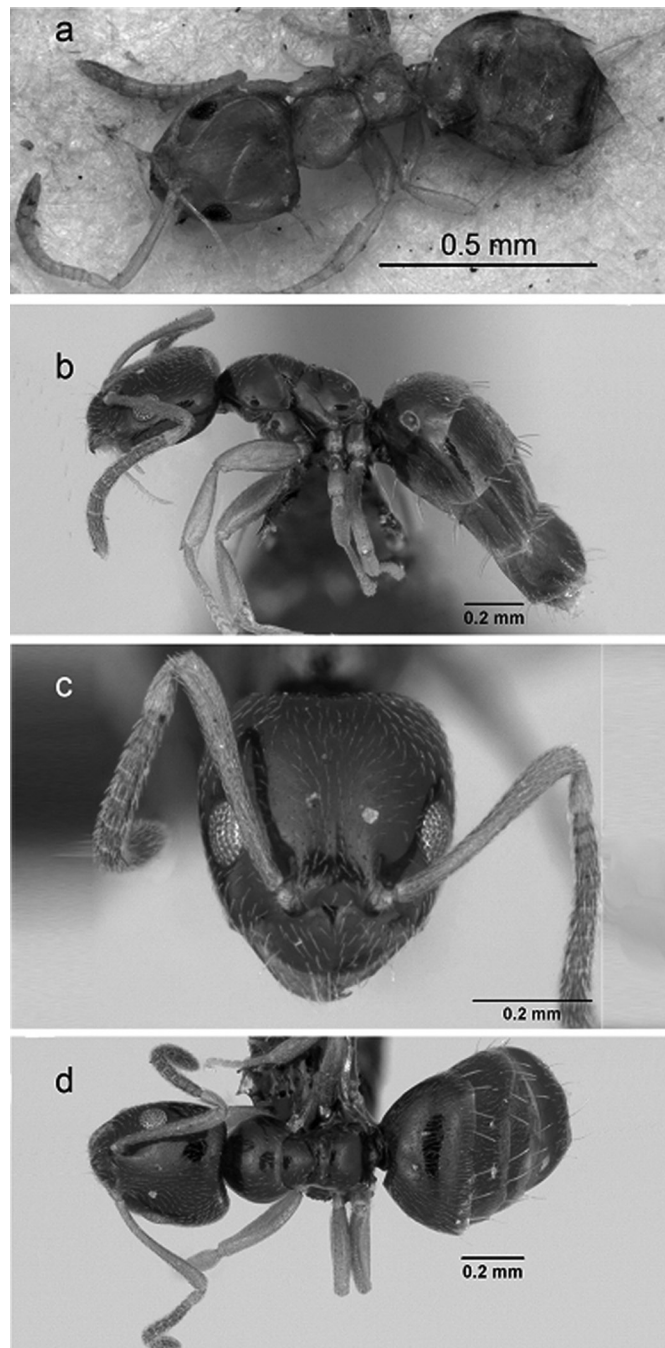
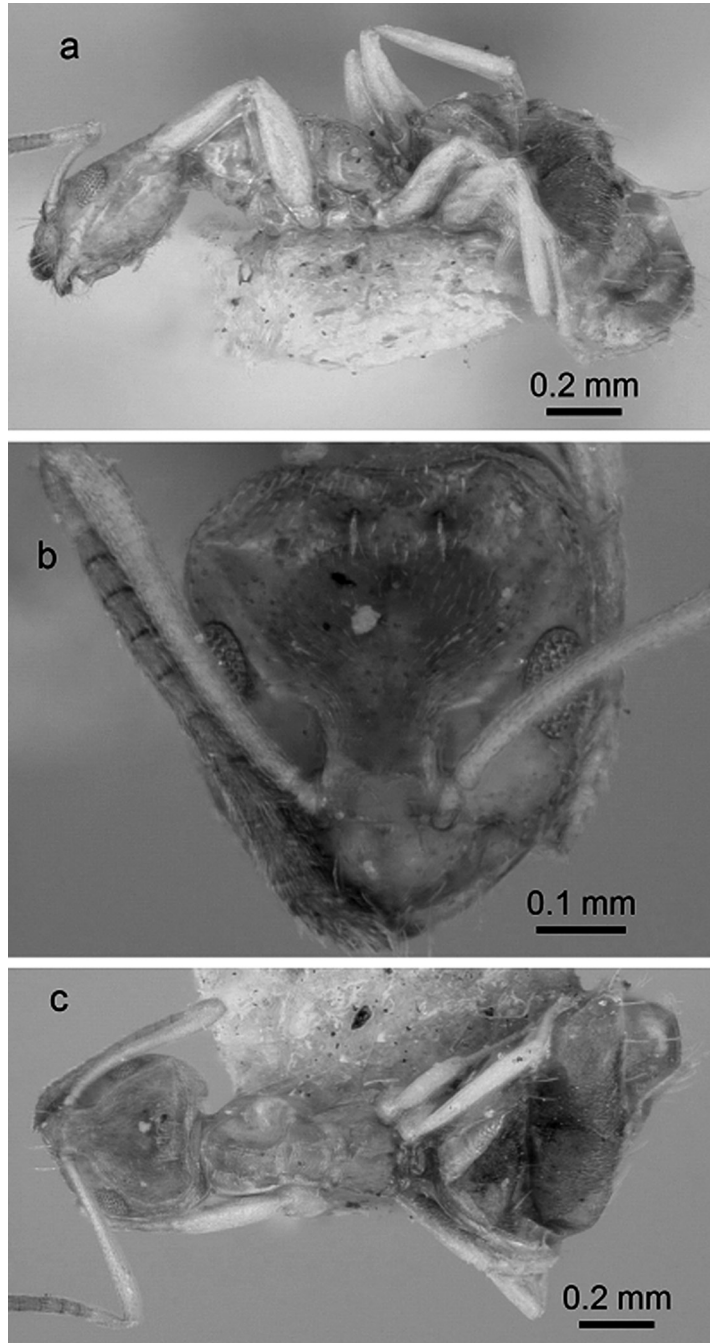


Figure 4. (a) *Plagiolepis juddi* sp. n. dorsal view of holotype worker. (b-d) *Plagiolepis pygmaea*. b, body in profile; c, head in full-face view; d, dorsal view. From <http://www.antweb.org/>



Figures 5. *Plagiolepis schmitzii* syntype worker (a-c). a, body in profile; b, head in full-face view; c, dorsal view. From <http://www.antweb.org/>