

Hymenoptera: Fam. Formicidae of Saudi Arabia

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Abstract: This paper lists and keys 164 species of Formicidae of which 156 are first records for the actual territory of Saudi Arabia and 146 are new records for the Arabian peninsula as a whole. Ten species are described as new.

Keywords: Hymenoptera, Formicidae, Arabian peninsula, taxonomy.

نمليات المملكة العربية السعودية

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خلاصة : تضم هذه الدراسة قوائم ومفاتيح تصنيفية لـ ١٦٤ نوعا من النمليات والتي يشكل ١٥٦ نوعا منها تسجيلات جديدة للمملكة العربية السعودية ، بينما يشكل ١٤٦ نوعا تسجيلات جديدة لشبه الجزيرة العربية بشكل عام . كذلك ، تم وصف عشرة أنواع جديدة .

INTRODUCTION

There are very few references to Arabian ants in existing literature. In all about 16 species have been recorded for the whole peninsula and none from Saudi Arabia itself. Recent collections within Saudi Arabia mainly by Prof. W. Büttiker and amplified by material from other Arabian territories – Yemen Arab Republic, Prof. B. Lanza; Oman, Dr. R.P. Whitcombe, Mr. M. Gallagher; Kuwait, Prof. R.W. Harkness; Dubai, Dr. K. Dumpert, C.A.C. – and material seen in various museums include about 60 species.

A collecting trip sponsored by Mr. Abdul Aziz el Mudbil, Deputy Minister for Agriculture, and arranged through Dr. W. Wittmer of Basel was carried out from 22.III.–18.IV.1983. The journeys included only part of the Central Region, the Asir mountains, the far South West and a small part of the Eastern Region. Much territory in the vast hinterland of Saudi Arabia remains unexplored. The present collections are probably representative of genera such as *Camponotus* and *Cataglyphis* which include a number of large and conspicuous species but probably much remains to be discovered of the more cryptic species. For example no dacetine ants have been collected in Arabia but at least a few species should be present in the remnants of old woodland and in shaded parks.

In this paper I have used existing names as far as possible although many of the previous designations were of infraspecific rank. Many of the older authors made little discrimination between subspecies, stirpes, races and varieties and this has made some difficulties with respect to formal nomenclature procedures where such infraspecific names are clearly not synonyms but would now be regarded as good species. The geographical distribution is given in broad general terms and not by individual countries except with some of the more local species. The main reference collections studied include the Santschi collection at the Natural History Museum Basel (NHMB), the general collection at the British Museum (Natural History) (BMNH) and the Forel collection at the Museum d'Histoire Naturelle, Geneva.

The morphological features used in the text are illustrated in figs 1–2. The keys to genera and species refer to the worker caste only. There are a few records from Oman that refer to un-named species. These will be dealt with separately and the Omani fauna detailed more fully in a separate paper.

MATERIALS AND METHODS

Measurements and Indices

I have followed in general the methods of Bolton in his revisionary studies, e.g. BOLTON (1980, 1982) but with certain species I have included additional measurements where appropriate. All measurements are expressed in mm.

- Total Length (TL): The total outstretched length of the individual.
- Head Length (HL): The length from the mid point of the front clypeal border to the mid point of the occipital border.
- Maximum Head Length: The length measured in profile from the clypeal front border to the furthest extent of the occipital margin.
- Head Width (HW): The maximum width of the head at its widest point but excluding the eyes. For most species this measurement is taken immediately above the eyes.
- Scape Length (SL): The straight line length of the antennal scape not including the condylar bulb.
- Eye Length (EL): The maximum diameter of the eye.
- Cephalic Index (CI): $HW \times 100$ divided by HL.
- Scape Index (SI): $SL \times 100$ divided by HW.

Collecting sites

Eastern Region (east of 48°E), 13.IV.–16.IV.1983.

Al Qatif – coastal marsh; date palm cultivated and semi-derelict plantations; adjacent sand dune desert with low shrubs. Hofuf – Agricultural Centre grounds; sand mountain and surrounding desert; parkland with planted tamarisk; cultivated date palm farmland.

Desert and soil litter species with some Middle East faunal elements.

Other collections: – Hofuf, Dammam (A.S. Talhouk, W. Büttiker).

Central Region (north of 23°30'N, 42°–48°E), 22.III.–24.III.1983; 17.IV.–19.IV.1983.

Riyadh – Agricultural Centre grounds and City surrounds. Al Kharj – parkland and desert. Al Kharfah – desert. Al Hair – river valley and neighbouring deserts. Sulaiel – desert (fringes of Al Badi complex).

Desert and oasis species.

Other collections: – Riyadh (A.S. Talhouk). Wadi Jureisi, Al Khubra, Wadi Khumra, Afif, Wadi Dawasir, Wadi Hanifa, Quwayiyah, Hieth, Wadi Batayn, Khashm Khafs, Tumeir, Sanam (W. Büttiker).

Western Region (Red Sea coast, west of 40°E, south of 24°N), 5.IV.–6.IV.1983.

Al Kudeis; Karm Rauish, Shawag – sandy desert with *Spalodora* bush islands. Al Modlif, Mahaiel.

Other collections: – Jeddah City surrounds, Medina, Al Alam, Wadi Ghomra, Wadi Bani Hunayn, Ras Hatibah, Sahl Rakhbar, Tarfa, Wadi Daykah, Makka, Al Farrah, Usfan, Horash, Bahara, Shoiba, Bani Malek (W. Büttiker).

South Western Region (South of 21°N), 24.III.–3.IV.1983.

Fayfa – terraced cultivation with sorghum; river valleys with trees including ancient tamarisks. Abu Arish (Jizan) – resthouse grounds and stony desert scrub surrounds. Sug al Ahad – river valley and



Plate 1: Characteristic habitat for *Cataglyphis* species in the sand dunes of Khureis of the Dahna desert, 120 km NE of Riyadh, November 1981. (Photo W. Büttiker)



Plate 2: Habitat of North African and endemic ant species. Al Mindak district, Baha Province. March 1984. (Photo W. Büttiker)



Plate 3: Habitat of Ethiopian and tropical African ant species. Asir mountains from Jebel Suda near Abha. September 1983. (Photo W. Büttiker)

lakeside. Al Qahman – mangrove swamp and sandy coast. Rich fauna with arboricolous and soil litter species including Afrotropical elements.

Other collections: – Fayfa, Jizan, Anjara, Hakimah (W. Büttiker).

Asir mountains – areas between Al Taif and Abha, mostly land between 1200 and 3000 m asl. Wadi Shugub; Bishah; Anamas; Shaiq Shumran, Tanuma, Sawdah mountain juniperus forest reserve. High-land fauna with interesting endemics.

Area between Abha and Najran – Al Kola; Zahran (Dharan). Alluvial upland valleys with acacia scrub and old pasture. Savannah species including North African elements.

Other collections: – Wadi Turabah, Wadi Qust; Hesua; Wadi Al Amar; Wadi Turabah/Shuqub, Al Mindak, Jabal Ibrahim, Hama: Wadi Majorish, Wadi Shuwas, Jabal Bushayrah, Bani Musayquirah, Wadi Azizah (W. Büttiker).

Najran – lowland semi-cultivated and derelict pasture with trees including palms.

Other collections: – Wadi Qatan (W. Büttiker) (BÜTTIKER 1981).

Northern Region (north of 24°N, west of 42°E), not visited.

Other collections: – North Hedjaz including Wadi Tabuk/Tobuk, Al Ula, Khaybar, Alam al Asmar, Jal Khartam, Al Farrah, Wadi Tinan (W. Büttiker, King Abdulaziz University – Natural History Museum Basel expedition) (ABO-KHATWA et al. 1980).

A comprehensive list of Saudi Arabian collecting localities is given by LEWIS & BÜTTIKER 1982.

Key to subfamilies (worker caste)

- 1. Pedicel with a single node or scale 2
- Pedicel with two distinct segments, the petiole and the postpetiole 5
- 2. Gaster with a projecting sting. First and second gaster tergite with a distinct constriction in between **Ponerinae**
- Gaster without a projecting sting. First and second gaster tergite not separated by a distinct constriction 3
- 3.(2) No eyes. Antennal insertions very close to anterior margin of head **Dorylinae**
- Eyes always present. Antennal insertions separated by a more or less broad frontal shield (clypeus) from anterior margin of head 4
- 4.(3) Apex of gaster with a circular orifice, in some genera a protruding tube fringed with setae. Petiole a scale or node **Formicinae**
- Apex of gaster ending in a transverse slit. Petiole a small node partially concealed and overhung by the first gaster segment **Dolichoderinae**
- 5.(1) Clypeus projects backward between the frontal ridges. Eyes small to medium, at most occupying about ¼ total head length. Ocelli absent **Myrmicinae**
- Clypeus does not project back between the frontal ridges but bends vertically downward in front of the head. Eyes large; ocelli present **Pseudomyrmecinae**

Subfam. **Dorylinae**

Genus **Dorylus** Fabricius

Dorylus fulvus (Westwood, 1840) (figs 2, 3, 4)

Typhlopone fulvus Westwood, 1840; *Introd. Classif. Insects* 2: 49.

Dorylus fulvus (Westwood) Emery, 1895; *Zool. Jb. Abt. Syst.* 8: 707.

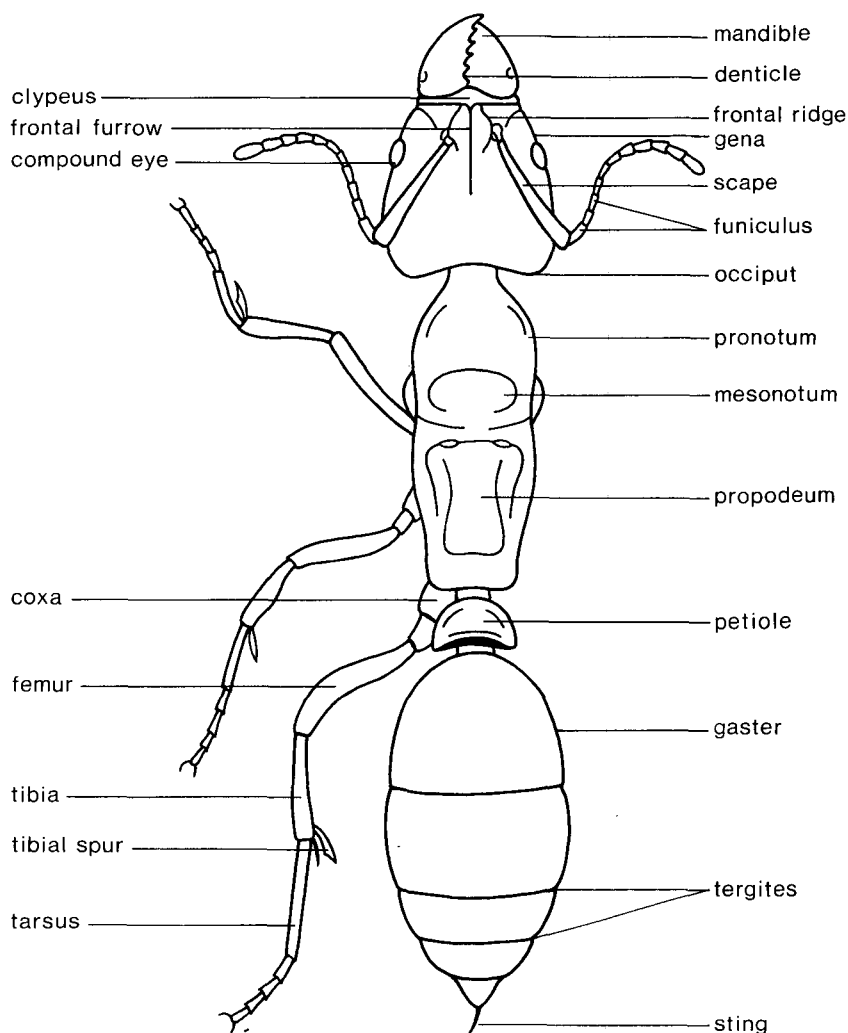
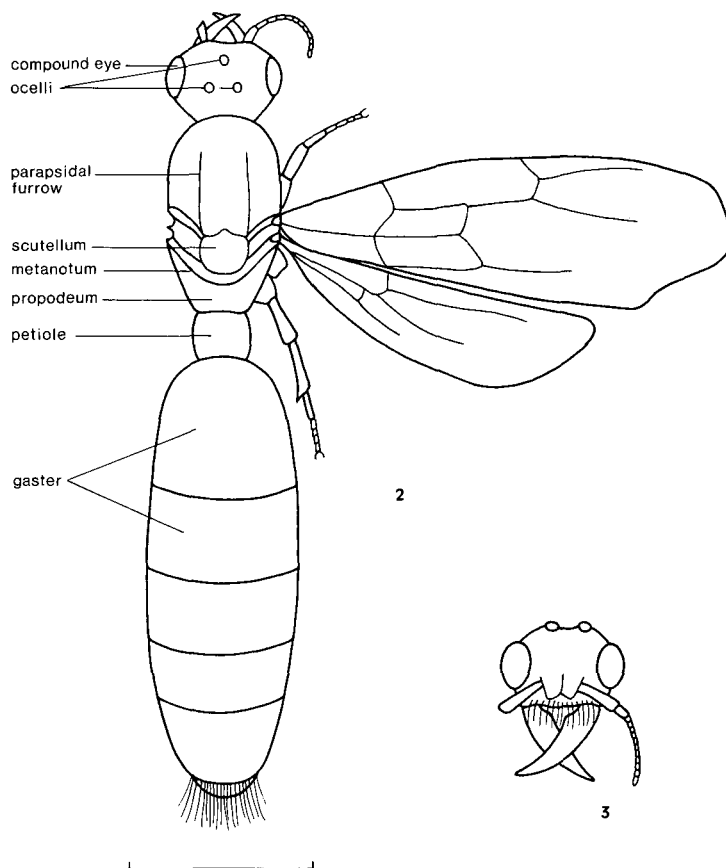


Fig. 1: *Pachycondyla senaarensis* ♀, dorsal view to show morphological features.

Hofuf, King Faisal University collection; ♂♂ Shaker M. Hammad. Riyadh, Department of Agriculture collection; ♂♂. Fayfa 29.III.83; Abu Arish 3.IV.83; ♂♂. Fayfa tamarisk grove 29.III.83; Najran 10.IV.83; ♀♀ CAC. Jebel Ibrahim 10.VII.83; ♂ W. Büttiker.

The first Arabian record for this ant is from Makalla, leg. O. Simony (WHEELER 1922). It is the only species of this subfamily so far represented in Arabia. It has a very wide distribution through the Northern half of Africa and occurs also in the Middle East. The large wasp-like males, up to 25 mm long, fly in numbers to light mainly in the early months of the year. The pale yellowish brown workers are small and blind and are seldom seen above ground. A small group was found under a stone in a wooded valley at Fayfa while at Najran, a mutilated worker was seen still attached to the mid tibia of a worker of *Camponotus aegyptiacus*, a nocturnal species.



Figs 2, 3: *Dorylus fulvus* ♂. 2, dorsal view to show morphological features; 3, head in frontal view. (Scale bar 1 mm).

Subfam. Ponerinae

List of species:

Anochetus sedilloti Emery, 1884
Anochetus traegaordbi Mayr, 1903
Belonopelta loebli Baroni Urbani, 1975
Cerapachys longitarsus (Mayr, 1878)
Cerapachys wittmeri n.sp.
Cryptopone ochracea (Mayr, 1885)
Hypoponera abeillei (André, 1881)
Hypoponera eduardi (Forel, 1894)
Hypoponera punctatissima (Roger, 1859)
Hypoponera ragusai (Emery, 1895)
Leptogenys maxillosa (Smith, 1858)
Pachycondyla ambigua André, 1890
Pachycondyla senaarensis (Mayr, 1862)
Platythyrea modesta Emery, 1899

Geographical distribution:

North Africa, India
 Northeast and tropical Africa
 Middle East
 Northeast Africa, West India
 Saudi Arabia
 South Europe
 South Europe, North Africa
 South Europe, Middle East, North Africa
 Cosmopolitan
 Sicily, Middle East, North Africa
 Tropicopolitan tramp
 Tropical Africa
 Africa
 Tropical Africa

Most of the above species are small, hypogaeic and seldom seen above ground. Only the ubiquitous *Pachycondyla senaarensis* is a daylight and crepuscular surface forager commonly seen in some numbers.

Key to species

1. Mandibles inserted in middle of anterior margin of head, occiput widely emarginate
Anochetus Mayr 2
- Mandibles inserted at sides of anterior margin of head; occiput not emarginate 3
- 2.(1) Eye about 0.16 × maximum head length; mesonotum not striate; petiole tapering to dorsal crest
Anochetus traegaordhi Mayr
- Eye about 0.22 × maximum head length; mesonotum laterally striate; petiole with evenly convex dorsal crest in side view
Anochetus sedilloti Emery
- 3.(1) Mandibles falcate; median portion of clypeus projects as a lobe; tarsal claws pectinate
Leptogenys Roger
- Mandibles denticulate; clypeus either not projecting or as a sharp cone; tarsal claws simple. 4
- 4.(3) Pygidium armed dorsally with a row of denticles on each side; antennal insertions close to centre line but condylar bulbs not concealed by frontal lobes; alitrunk dorsally without visible sutures
Cerapachys Smith 5
- Pygidium not denticulate; antennal insertions concealed by frontal lobes; dorsum of alitrunk with at least one visible suture 6
- 5.(4) Apical funiculus segment swollen to form a large single segmented club; eyes very small but distinct
Cerapachys wittmeri n.sp.
- Apical three segments together forming a club; eyes very large
Cerapachys longitarsus (Mayr)
- 6.(4) Propodeum and petiole node each bituberculate posterodorsally; petiole with two lateral teeth and a low median lobe posterodorsally
Platythyrea modesta Emery
- Propodeum and petiole both unarmed posterodorsally 7
- 7.(6) Basal portion of mandible with a distinct dorsolateral pit 8
- Basal portion of mandible without a dorsolateral pit 9
- 8.(7) Middle tibia with a single pectinate spur; metanotal suture weak; small yellowish species; eyes minute
Cryptopone ochracea (Mayr)
- Middle tibia with two spurs, one small simple and one large pectinate; metanotal suture a deep furrow; robust dark coloured species; eyes moderately large
Pachycondyla senaarensis (Mayr)
- 9.(7) Middle tibia with two spurs, one small simple and one large pectinate; eyes small but clearly visible
Pachycondyla ambigua André
- Middle tibia with a single spur; eyes very small or absent 10
- 10.(9) Middle tibial spur short and simple. Mandibles elongate with five large teeth. Clypeus produced anteriorly into a sharp cone
Belonopelta loebli Baroni Urbani
- Middle tibial spur distinctly pectinate. Mandibles triangular not elongate, with 6 or more small denticles
Hypoponera Santschi 11
- 11.(10) Frontal furrow continued as a thin line almost to occiput
Hypoponera punctatissima (Roger)
- Frontal furrow continued to three quarters of the way towards occiput or less 12
- 12.(11) Antennal scape reaching occiput; body colour dark
Hypoponera eduardi (Forel)
- Antennal scape not extending as far as occiput; body colour light testaceous brown . . 13
- 13.(12) Dorsal surface of alitrunk plane with only metanotal suture faintly indicated
Hypoponera abeillei (André)

Dorsal surface of alitrunk interrupted by shallow but distinct metanotal suture

Hypoponera ragusai (Emery)

Genus *Anochetus* Mayr

Anochetus sedilloti Emery, 1884

Anochetus sedilloti Emery, 1884; Annali Mus. civ. Stor. nat. Giacomo Doria 21: 377.

Fayfa 28.III.83; 1 ♀CAC.

A single worker was taken foraging on the soil surface at a roadside bank in early morning.

Anochetus traegaordhi Mayr, 1903 (fig. 5)

Anochetus traegaordhi Mayr, 1903; in Jaegerskjoeld, 1903 Exp. 9 Formicid.: 2.

Fayfa 30.III.83; ♀♀ CAC.

Two workers were collected on the surface foraging under bushy scrub.

Genus *Belonopelta* Mayr

Belonopelta loebli Baroni Urbani, 1975 (figs 6, 7)

Belonopelta loebli Baroni Urbani, 1975; Mitt. schweiz. ent. Ges. 48: 307.

Al Qatif 14.IV.83; 1 ♀ CAC.

A single worker of this uncommon species was found in soil litter under a date palm. The type was collected from the neighbourhood of Lake Tiberias, Galilee by Dr. I. Loebli. The Arabian record is only the second known locality for this species. The specimen from Al Qatif is slightly larger and darker than the described type but in all other respects accords with the description and keys of BARONI URBANI (1975).

Genus *Cerapachys* Smith

Cerapachys longitarsus (Mayr, 1878)

Lioponera longitarsus Mayr, 1878; Verh. zool.-bot. Ges. Wien 28: 669.

Cerapachys longitarsus (Mayr) Brown, 1975: 23.

Abu Arish resthouse at light 2.IV.83; ♀♀ CAC.

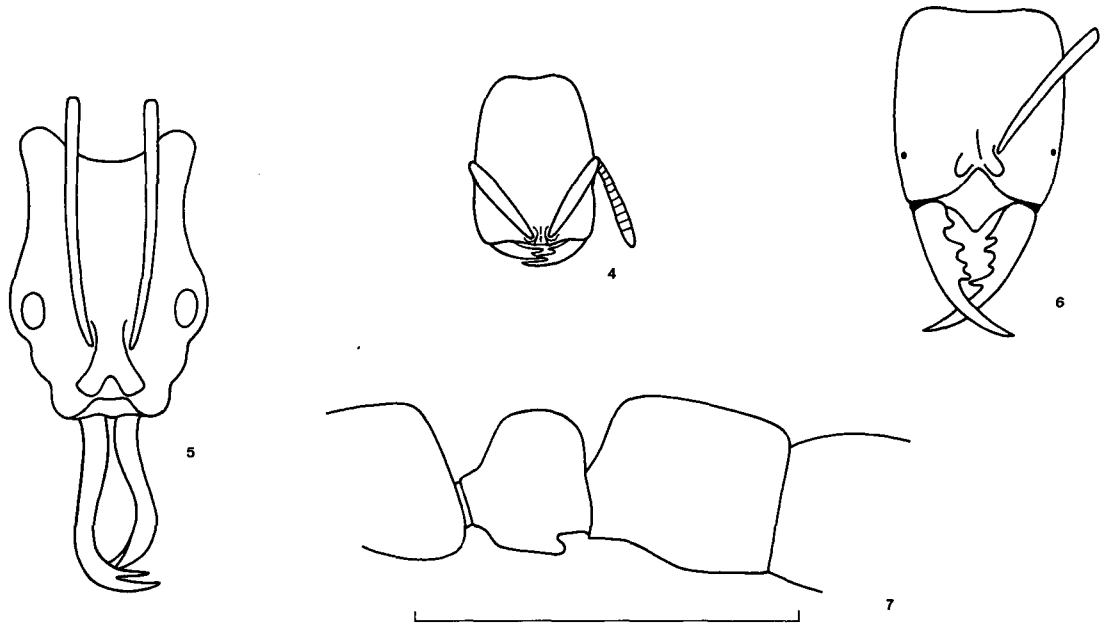
Three dealate queens were taken on the ground beneath a light trap at night. This species is recorded as nesting in hollow twigs and the three queens at Abu Arish may have fallen to the ground after a post nuptial dispersal flight.

Until the revision of the Cerapachyini by BROWN (1975), this species was variously assigned to *Lioponera* or *Phyracaces* which genera are now sunk as synonyms of *Cerapachys*. *C. longitarsus* is a very wide ranging species and is recorded from North Australia, the Philippines, several localities in western India and also from North Africa. The very similar and probably synonymous *C. braytoni* (WEBER 1949) was described from Kenya, East Africa.

Cerapachys wittmeri n.sp. (fig. 8)

Al Kola semi cultivated area 10.IV.83; 12 ♀♀ CAC.

These were found loosely assembled in soil under a stone in grazed scrubby pasture near a village.



Figs 4–6: Head in dorsal view. 4, *Dorylus fulvus* ♀; 5, *Anochetus traegaardhi* ♀; 6, *Belonopelta loebli* ♀. Fig. 7: *Belonopelta loebli* ♀, petiole and first gaster segment in profile view. (Scale bar 1 mm).

The species clearly belongs to the *C. cribrinodis* Emery group in its general morphology but differs in the relatively small eyes which are nevertheless larger than in the minute eyed *C. piochardi* from the Middle East.

Holotype worker: TL 4.1; HL 0.81; HW 0.70; SL 0.45; EL 0.09; petiole length 0.450, width 0.451; apical funiculus segment 0.40; CI 86.4; SI 64.3.

Colour uniformly reddish brown with articulations and base of mandibles darker. Sculpture diffusely punctulate over whole body, denser on the petiole. Long scattered pubescence over whole body and appendages, longer hairs restricted to clypeus and apex of gaster. General appearance moderately shining.

Head longer than broad with a distinct chitinous flange dorsolaterally with angular produced occipital corners widely emarginate between. Sides of head moderately curved. Clypeus with straight front border extended backward between narrow raised frontal ridges. Antennae 12 segmented, insertions not concealed; scapes short broadening distally to enclose partially the first funiculus segment. Funiculus terminates in very large apical segment as long as 7 preceding segments together. Eyes small, about one eighth head width, 12 faceted.

Alitrunk without dorsal sutures; pronotum with obliquely angled shoulders; propodeum broadly emarginate posteriorly with concave descending face; node large and simple about as broad as long with a broad anteroventral lobe. First gaster segment separated by a deep girdle from the larger and longer second segment. Gaster apex armed with short spines partially obscured by setae.

Holotype and paratypes in NHMB; paratype in BMNH.

This species appears to belong to the *C. cribrinodis* group but has smaller eyes and a comparatively narrower petiole than any of the species mentioned by BROWN (1975), in his review of the Cerapachyini except *C. peringueyi* Arnold of South Africa.

Genus *Cryptopone* Emery*Cryptopone ochracea* (Mayr, 1855)

Ponera ochracea Mayr, 1855; Verh. zool.-bot. Ges. Wien 5: 118.

Cryptopone ochracea (Mayr) Emery, 1916; Boll. Soc. ent. ital. 47: 206.

Fayfa 30.III.83; 1 ♀ CAC.

A single worker was taken in leaf litter under bushy trees.

Genus *Hypoponera* Santschi*Hypoponera abeillei* (André, 1881)

Ponera abeillei André, 1881; Bull. Soc. ent. Fr. : 48.

Hypoponera abeillei (André) Taylor, 1967: 12.

Abu Arish resthouse grounds 2.IV.83; ♀♀ CAC.

These were taken in leaf litter beneath a hedge. This small yellowish brown species is characterised by the flat outline of the alitrunk dorsum which has only a very slight metanotal impression. It has a more shining appearance and a thicker petiole node than *H. punctatissima* and, seen from above, the node narrows anteriorly more abruptly than in *H. ragusai*.

Hypoponera eduardi (Forel, 1894)

Ponera eduardi Forel, 1894; Bull. Soc. vaud. Sci. nat. 30: 15.

Hypoponera eduardi (Forel) Baroni Urbani, 1968; Annali Mus. civ. Stor. nat. Giacomo Doria 77: 416.

Al Qatif 14.IV.83; ♀♀ CAC. Oman: Khabura 31.XII.79; 1 ♀ R.P. Whitcombe.

The Al Qatif workers were taken from under a stone in a shaded palm grove. The Oman example was taken from the stomach of a swift (*Apus pallidus*).

Hypoponera punctatissima (Roger, 1859) (fig. 9)

Ponera punctatissima Roger, 1859; Berl. ent. Z. 3: 266.

Hypoponera punctatissima (Roger) Taylor, 1967: 13.

Abu Arish 2.IV.83; Fayfa 31.III.83; ♀♀ CAC.

These queens were caught flying in the neighbourhood of light traps. This cosmopolitan species has a very wide distribution through Europe, Africa and Asia.

Hypoponera ragusai (Emery, 1895)

Ponera ragusai Emery, 1895; Naturalista sicil. 14: 28.

Hypoponera ragusai (Emery) Baroni Urbani, 1971: 18.

Riyadh Agricultural Centre 19.IV.83; ♀♀ CAC.

This species has been recorded from Sicily, Egypt and East Africa. Its identification is tentative pending a revision of this difficult genus of small hypogaecic ants.

Genus *Leptogenys* Roger*Leptogenys maxillosa* (Smith, 1858)

Ponera maxillosa Smith, 1858; Catalogue of Hymenopterous Insects in the collection of the British Museum, Formicidae: 93.

Leptogenys maxillosa (Smith) Roger, 1861; Berl. ent. Z. 5: 43.

Fayfa 30.III.83; 1 ♀ CAC. Oman: Dhofar 9.XII.84; ♀♀ M. Gallagher.

This was collected in leaf litter by the side of a track under shrubs. The species is a wide ranging tropical tramp. The projecting clypeus has a narrow translucent fringe and the mandibles are long moderately curved and falcate. The African species of this genus have been revised by BOLTON (1975).

Genus *Pachycondyla* Smith

Pachycondyla ambigua André, 1890

Pachycondyla ambigua André, 1890; Anns. Soc. ent. Belg. 45: 47.

Fayfa cultivated valley with trees 31.III.83; 1 ♀ CAC.

This single example was seen foraging on the soil surface in tree shade. According to Bolton (pers. commun.), this species is widely distributed through Africa although only the type locality Sierra Leone is listed by WHEELER (1922).

Pachycondyla senaarensis (Mayr, 1862) (figs 1, 10)

Ponera senaarensis Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 72

Pachycondyla senaarensis (Mayr) André, 1890; Revue Ent. 9: 316.

Dammam 18.IV.78; ♂ ♀♀ ♀ W. Büttiker. North west of Tobuk 24.IV.79; ♀ KAU-NHMB expedition. Riyadh Agricultural Centre 22.III.83; Fayfa resthouse and village environs 27.III.83; 30.III.83; Abu Arish resthouse 25.III.83; Mahaiel 4.IV.83; ♀♀ ♀♀ CAC. Dubai 2.VIII.72; ♀♀ CAC. Socotra IV.67; ♂♂ ♀♀ K.M. Guichard. Oman: Dhofar 1978, 1979; ♀♀ R.P. Whitcombe.

This aggressive species is distributed throughout the African tropics and evidently reaches its northern limit in Arabia since it is not known to occur in any of the countries of the Middle East. It is common around village settlements and because of its vicious sting is regarded as a pest in some areas. This species feeds mainly on dead insects but is also attracted to sugary substances and food waste. It flourishes around night time illuminated petrol stations where many night flying insects tend to congregate and fall to the ground.

Hitherto it was the only Ponerine species known in Arabia and was recorded from Muscat, Aden, Tes and other places in South Arabia by EMERY (1881).

Genus *Platythyrea* Roger

Platythyrea modesta Emery, 1899 (fig. 11)

Platythyrea modesta Emery, 1899; Anns. Soc. ent. Belg. 43: 467.

Fayfa cultivated valley 30.III.83; ♂ ♀♀ CAC.

Specimens were taken during bright sunshine on exposed rock. It is an active predator with a relatively sharp sting. It is recorded from the Sudan, west and central Africa.

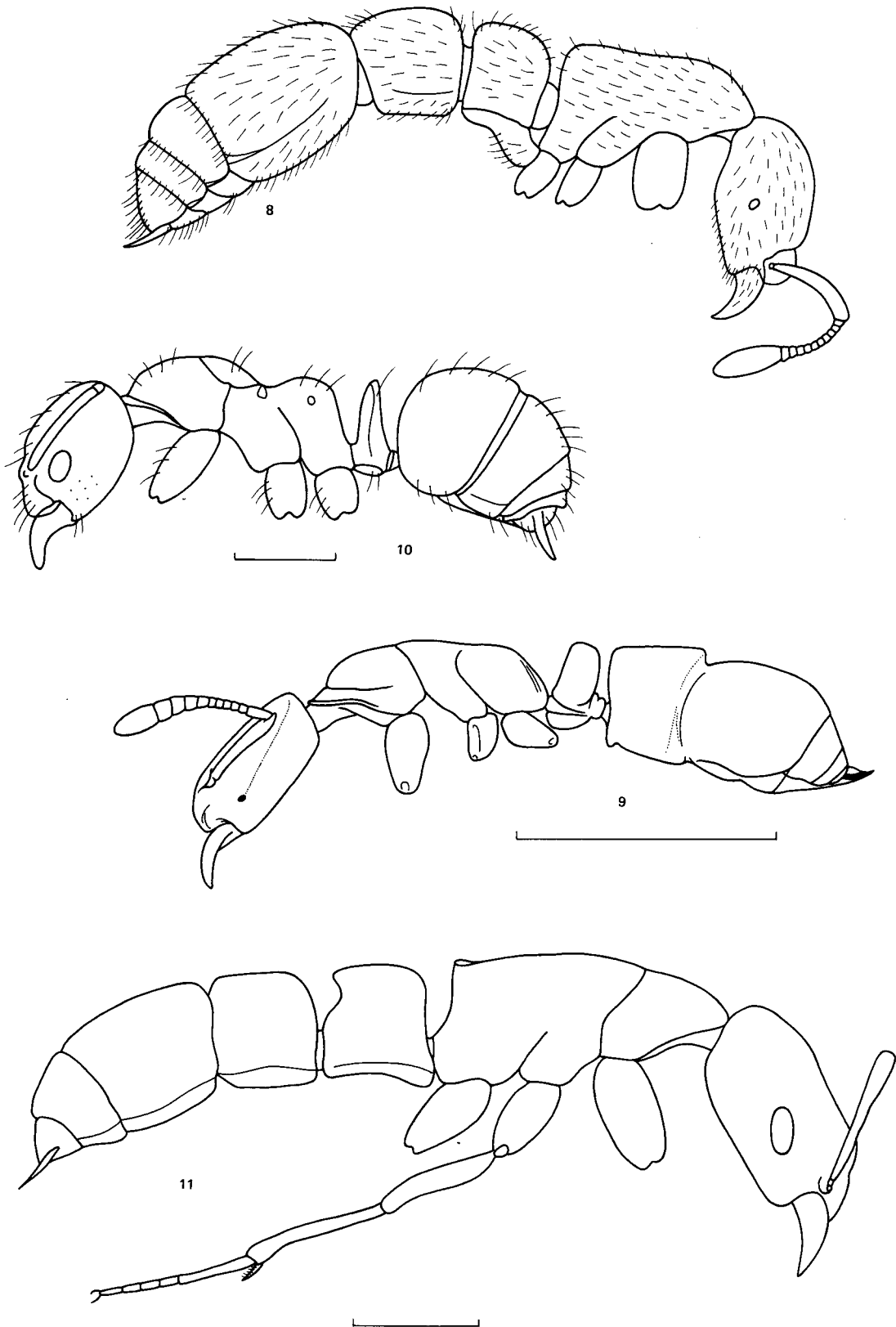
Subfam. *Pseudomyrmecinae*

Genus *Tetraponera* Smith

Tetraponera bifoveolata Mayr, 1895 (fig. 15)

Tetraponera bifoveolata Mayr, 1895; Annln. naturh. Mus. Wien 10: 146.

Al Fresh 20.IV.79; Turabah 20.III.80; Wadi Sanakah 25.IX.80; Wadi Ibrahim 27.III.82; ♀♀ W.



Figs 8-11: Profile view. 8, *Cerapachys wittmeri* ♀; 9, *Hypoponera punctatissima* ♀; 10, *Pachycondyla senaarensis* ♀; 11, *Platythyrea modesta* ♀. (Scale bar 1 mm).

Büttiker. Fayfa 29.III.83; Riyadh Agricultural Centre 19.IV.83; Al Qahman mangrove swamp 1.IV.83; river valley near Abha 25.III.83; Hofuf date palms 13.IV.83; ♀♀ CAC.

Species of this genus are arboreal living in small colonies in hollow twigs and foraging singly on branches. The samples collected closely resemble series from Palestine sent by J. Oefer and probably are referable to the form *T. bifoveolata* ssp. *syriaca* Wheeler, 1916. A single worker taken at Fayfa 30.III.83 has a distinct black blotch on the frons as in named samples of *T. bifoveolata* ssp. *maculifrons* Santschi, 1912 but are not otherwise distinguishable from the above. *T. bifoveolata* in NHMB has a flatter dorsal outline of the alitrunk and more numerous body hairs but the extent of variability in these various forms has not been studied sufficiently to justify species separation for the present.

***Tetraponera erythraea* Emery, 1895**

This was described by EMERY (1895) from Aden in South Arabia. Examples in NHMB have the propodeum obtusely angled and not smoothly rounded as in *T. bifoveolata*.

Subfam. **Dolichoderinae**

List of species:

Tapinoma melanocephalum (Fabricius)

Tapinoma simrothi Krausse

Technomyrmex albipes (Smith)

Technomyrmex setosus n. sp.

Technomyrmex sp. A

Technomyrmex sp. B

Geographical distribution:

Cosmopolitan

North Africa, Middle East, South Europe

Middle East, Palaeotropics

Arabia

These are small pale brown to black species nesting in soil or rotten wood. *T. melanocephalum* is a frequent household pest in the tropics.

Key to species (*Tapinoma* and *Technomyrmex*)

- | | | |
|-------|--|---|
| 1. | Body colour uniformly dark brown to black | 2 |
| - | Bicoloured or yellowish brown species | 3 |
| 2.(1) | Front border of clypeus with a slit-like cleft; legs including tarsi uniformly brownish
<i>simrothi</i> Krausse | |
| - | Front border of clypeus with a shallow, rounded incision; tarsi very pale contrasting with darker tibiae
<i>albipes</i> (Smith) | |
| 3.(1) | Head in part or gaster dark, contrasting with rest of body | 4 |
| - | Entire body and legs unicolorous pale brown | 5 |
| 4.(3) | Gaster dark contrasting with yellowish mid body; alitrunk with scattered dorsal hairs
<i>setosus</i> n. sp. | |
| - | Gaster and most of alitrunk unicolorous pale; alitrunk without dorsal hairs; head sides with dark patches
<i>melanocephalum</i> (Fabricius) | |
| 5.(3) | Front femora enlarged; funiculus segments 2-5 quadrate; scape not reaching occipital border; eyes x 0.15 HL
<i>Technomyrmex</i> sp. A | |
| - | Front femora not enlarged; funiculus segments elongate; scape surpassing occipital border; eyes x 0.34 HL
<i>Technomyrmex</i> sp. B | |

Genus *Tapinoma* Foerster***Tapinoma melanocephalum*** (Fabricius, 1793)

Formica melanocephala Fabricius, 1793; Ent. Syst. 2: 353.

Tapinoma melanocephalum (Fabricius) Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 651.

Hofuf 11.IV.78; 1 ♂ W. Büttiker. Al Qatif 1980; ♀♀ Shaker M. Hammad. Al Qatif 14.IV.83; ♀♀ CAC. Oman: Wahiba sands XII.84; ♀ M. Gallagher.

This common cosmopolitan species was found nesting in the rotting leaf bases of date palms at Al Qatif. It is a common household pest in Africa.

Tapinoma simrothi Krausse, 1909

Tapinoma simrothi Krausse, 1909; Bull. Soc. ent. ital. 41: 18.

Al Qatif 15. IV.83; 1 ♀ CAC. Kuwait III.84; ♀♀ R.W. Service. Oman: Wahiba sands 17.XI.84; ♀♀ M. Gallagher.

A single queen was seen flying on to a leafy shrub. Shortly after, probably the same individual but now wingless, was recovered from the ground nearby. This species is abundant in the Middle East and locally common also in North Africa and parts of South Europe. It is an active daytime scavenger and also tends Homoptera on shrubs.

Genus *Technomyrmex* Mayr***Technomyrmex albipes*** (Smith, 1862)

Formica (Tapinoma) albipes Smith, 1862; J. Proc. Linn. Soc. Zool. 6: 38.

Technomyrmex albipes (Smith) Emery, 1888; Z. wiss. Zool. 66: 392.

Al Qatif 14.IV.84; 1 ♂ CAC.

This is a distinctive dark species with pale tarsi and funiculus segments. It occurs widely through the Indian subcontinent and Africa but occurs more locally in the Middle East.

Technomyrmex setosus n. sp. (fig. 12)

Wadi Shugub 7.IV.83; Bishah 8.IV.83; ♀♀ CAC.

This is a bicoloured species having the head in part and the entire gaster dark, contrasting with the paler testaceous alitrunk. The propodeum is relatively low with a shallow metanotal furrow. The head, alitrunk and gaster bear scattered dorsal hairs. Workers were found under stones in the Asir mountains.

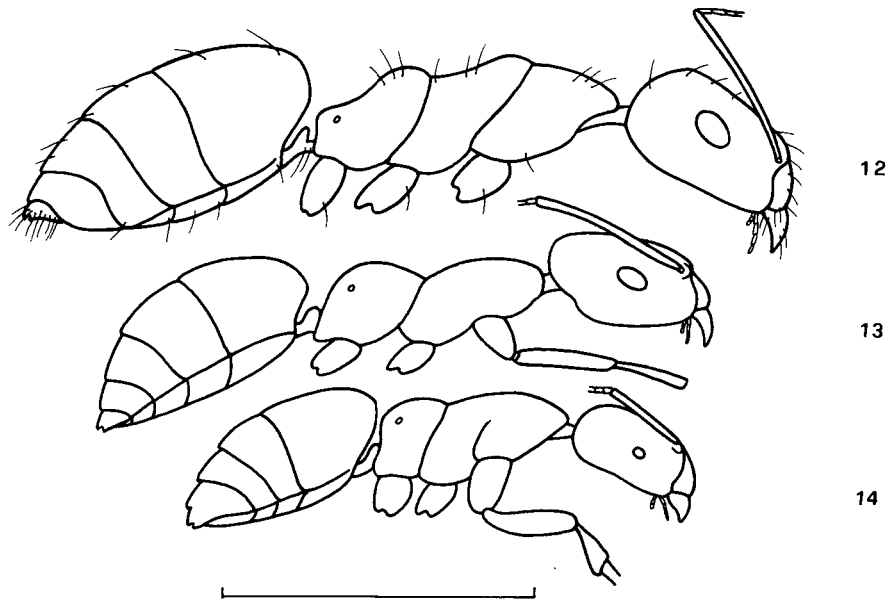
Holotype worker: TL 2.9; HL 0.73; HW 0.66; SL 0.73; EL 0.17; PW 0.43; CI 84.5; SI 109; EI 28.

The head is longer than wide, much wider than the alitrunk. The clypeus is widely emarginate. The mandibles are strongly toothed with the third and sixth teeth shorter than the fourth and seventh respectively. The antennal scape overreaches the occipital margin by the length of the first funiculus segment. All funiculus segments are elongate. The maximum eye length is about a quarter the head length.

The propodeum is widely excavated at its posterior basal face. The propodeal dorsum is rather flat, curving smoothly to the rather shallow metanotal furrow. The head is in part brown and the gaster entirely dark contrasting with the paler testaceous alitrunk and appendages.

The gaster has very fine granulose sculpture while the head and alitrunk are finely striate and rugose giving the whole body a somewhat dull appearance. Scattered dorsal hairs are present on the head, pronotum, propodeum and gaster.

Holotype and paratypes from Wadi Shugub 7.IV.83 are in the NHMB. Paratype workers similar to the holotype were also found at Bishah.



Figs 12–14: Profile view. 12, *Technomyrmex setosus* ♀; 13, *Technomyrmex* sp. A ♀; 14, *Technomyrmex* sp. B ♀. (Scale bar 1 mm).

***Technomyrmex* sp. A (fig. 13)**

Fayfa 28.III.83; ♀♀ CAC.

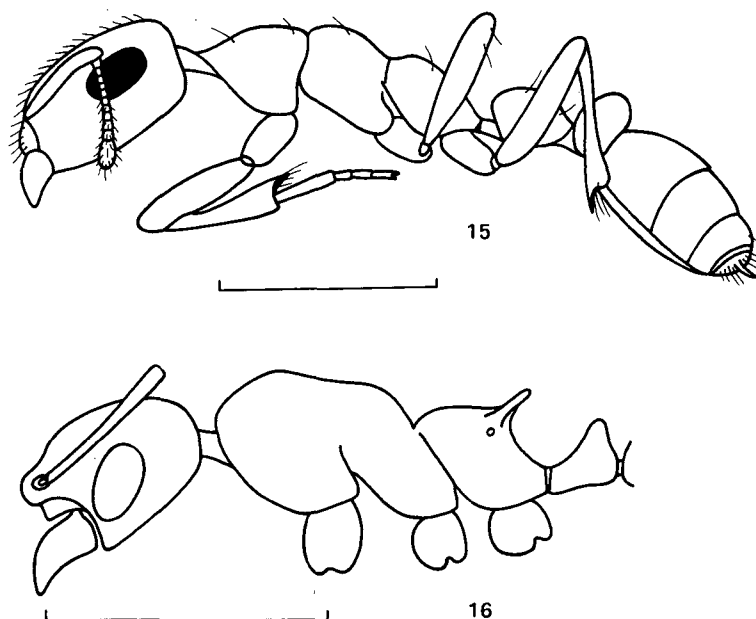
This ant was found inhabiting the trunk of a partly rotten roadside tree. This is a small species, TL 1.75; the body sculpture is finely granulose giving an opaque appearance; the head, alitrunk and gaster are pale yellowish brown. No dorsal hairs are visible on the head and alitrunk. The scape is short just reaching the occipital margin. The mandibles are broadly rounded. The anterior clypeal border has a shallow rounded median incision. The front femora and tibiae are markedly enlarged possibly as an adaptation to an arboreal habitat.

***Technomyrmex* sp. B (fig. 14)**

Al Farrash 15.X.82; ♀♀ W. Büttiker.

This is similar in colour to the previous species being pale yellowish brown with superficial punctulate sculpture. There are no dorsal hairs on the head or alitrunk. It differs in the relatively long antennae and larger eyes. It differs from the widely distributed *T. gibbosus* Wheeler and other similar species in the longer antennae. TL 2.2; HL 0.52; HW 0.52; SL 0.62; EL 0.16; SI 119.

Both the above species may well prove to be new but this cannot be confirmed without an up to date revision of the genus.



Figs 15, 16: 15, *Tetraponera bifoveolata* ♀, profile view; 16, *Oxyopomyrmex sabulonis* ♀, head in profile view. (Scale bar 1 mm).

Oxyopomyrmex sabulonis Santschi, 1926 (fig. 16)

Oxyopomyrmex sabulonis Santschi, 1926; Bull. Soc. Hist. nat. Afr. N. 17: 233.

AI Kola 10.IV.83; ♀♀ CAC.

Only two workers were seen foraging separately over dry pasture. The head and alitrunk are coarsely sculptured and the body colour uniformly blackish brown. The species is recorded from North Africa.

Genus ***Aphaenogaster*** Mayr

This genus includes a number of species groups of diverse form but mainly characterised by relatively long heads, large triangular strongly dentate mandibles and antennae which have the ultimate four or five segments elongate and slightly swollen to form a more or less distinct club. Many species are in part active predators on other insects.

Aphaenogaster muschtaidica Ruzsky, 1905 n. stat. (fig. 17)

Aphaenogaster gibbosa ssp. *muschtaidica* Ruzsky, 1905; Formic. Imp. Rossici 1: 719.

Aphaenogaster gibbosa ssp. *muschtaidica*. – Arnoldi, 1976; Zool. Zh. 15: 1020, 1024.

This has the general shape, sculptured head and smooth shining gaster of *A. gibbosa* (Latreille) of West Europe but the body colour is brown rather than black, the legs are yellowish brown, the scape and funiculus segments are slightly shorter and thicker and the propodeal spines are shorter. Comparative indices for the two species comparing an example of *A. gibbosa* from France of equivalent size are as follows.

A. muschtaidica CI 83.3; SI 76.4; Spine length/HW 0.109.

A. gibbosa CI 85.2; SI 82.7; Spine length/HW 0.134.

These differences are in accord with recent descriptions and keys by ARNOLDI 1976, and justify a species rather than subspecies distinction. *A. muschtaidica* was described from the Caucasus mountains of South Russia and is an interesting addition to the Arabian fauna. Named specimens but not types have been examined.

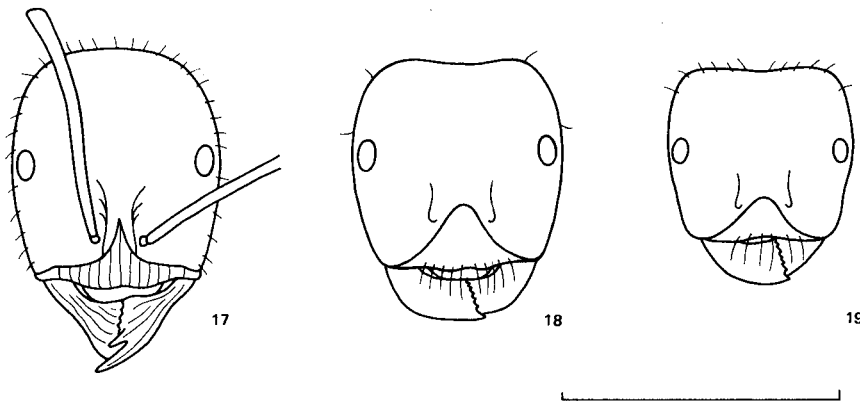
Genus *Messor* Forel

List of species:

Messor aralocaspius (Ruzsky, 1902)
Messor arenarius (Fabricius, 1787)
Messor buettikeri n. sp.
Messor decipiens Santschi, 1917
Messor ebeninus Santschi, 1927
Messor galla (Mayr, 1904)
Messor mediorubra Cagniant, 1969
Messor meridionalis (André, 1882)
Messor minor (André, 1882)
Messor orientalis (Emery, 1896)
Messor picturatus Santschi, 1923
Messor rufotestaceus (Foerster, 1850)
Messor semirufus (André, 1882)
Messor striaticeps (André, 1882)
Messor syriacus Santschi, 1927

Geographical distribution:

South east Europe
 Middle East, North Africa
 Saudi Arabia
 South and East Africa
 Middle East
 North east to West Africa
 North Africa
 Central Asia, Middle East
 North Africa, South Italy
 Middle East, South east Europe
 North Africa
 North Africa, Middle East
 Middle East
 North Africa
 Middle East



Figs 17–19: Head in dorsal view. 17, *Aphaenogaster muschtaidica* ♀; 18, *Messor picturatus* ♀; 19, *M. mediorubra* ♀. (Scale bar 1 mm).

Messor includes a number of mainly granivorous species. Nearly all the species in arid regions bear an arrangement of well developed curved gula hairs or psammophore. The large headed major workers have broad strong mandibles adapted for crushing seeds. Most species forage in files to and from a seed source. In Arabia sorghum is often utilised as a source of food and sorghum fields may suffer some localised seed loss around the field perimeter.

Key to species (large workers)

1. Gula with short moderately curved or straight hairs 2
 - Gula with long anteriorly curved hairs forming a distinct psammophore 3
- 2.(1) Strongly sculptured robust brown or blackish brown species. Propodeum angulate to broadly dentate *orientalis* (Emery)
 - Smooth shining slender bicoloured species with reddish yellow head and alitrunk contrasting with dark gaster. Propodeum with small teeth *rufotestaceus* (Foerster)
- 3.(1) First funiculus segment not longer than second; all tibial spurs pectinate. Propodeum with distinct spines or teeth *arenarius* (Fabricius)
 - First funiculus segment distinctly broader and much longer than second; mid and hind tibial spurs simple. Propodeum rounded, angulate or broadly dentate 4
- 4.(3) First gaster tergite conspicuously hairy with long pale hairs 5
 - First gaster tergite with few short hairs or none 7
- 5.(4) Head red or dark red contrasting with dark brown alitrunk and gaster *decipiens* Santschi
 - Unicolorous black or brownish black species 6
- 6.(5) Maximum head width less than 2 mm; eyes large, $0.25 \times HW$ *buettikeri* n. sp.
 - Maximum head width 2.5 mm; eyes $0.2 \times HW$ *aralocaspius* (Ruzsky)
- 7.(4) Unicolorous black 8
 - Bicoloured species with head or alitrunk or both reddish, contrasting with darker gaster 9
- 8.(7) Propodeum dentate; head closely sculptured with fine striae *striaticiceps* (André)
 - Propodeum angled but never dentate; head smooth and shining *ebeninus* Santschi
- 9.(7) Head and gaster darker than alitrunk 10
 - Head and alitrunk red or brownish red contrasting with dark gaster 12
- 10.(9) Eyes large $0.26 \times HW$; propodeum rounded; head width < 1.5 mm *syriacus* Santschi
 - Eyes smaller $0.21-0.22 \times HW$; propodeum angulate; head width > 1.5 mm 11
- 11.(10) First gaster tergite with some short erect hairs; occiput with at least 6 projecting hairs on each side of occipital impression. Maximum head width less than 2 mm
mediorubra Cagniant
 - First gaster tergite hairless; occiput with 3 hairs or fewer on each side of median impression. Maximum head width 2.5 mm or more *meridionalis* (André)
- 12.(9) Maximum head width 2.5 mm or more 13
 - Maximum head width 2.0 mm or less 14
- 13.(12) Head and alitrunk bright yellowish red *semirufus* (André)
 - Head wine red or brownish red, alitrunk often darker *galla* (Mayr)
- 14.(12) Head bright red, occiput smooth; scape hairs subdecumbent *minor* (André)
 - Head and alitrunk brownish red; dorsum of head completely sculptured to occiput; scape hairs suberect *picturatus* Santschi

Messor aralocaspius (Ruzsky, 1902) (fig. 20)

Aphaenogaster barbara var. *aralocaspius* Ruzsky, 1902; Ants of Lake Aral; 20.

Messor aralocaspius (Ruzsky) Pisarski, 1967; Annls. zool. Warsz. 24: 384.

Al Ula 21.IV.79; ♀ KAU NHMB expedition. Wadi Khumra 10.II.78; Thanomah 2150 m 10.IV.80; Anamas 8.IV.80; Shafah III.82; An Naamah 2000 m 12.IX.83; ♀♀ ♀♀ W. Büttiker. Zahran 25.III.83; Anamas 8.IV.83; Tanuma 8.IV.83; Al Kola 10.IV.83; ♀♀ CAC. Kuwait 17.III.81; ♀ R.W. Harkness.

This species was found mainly on the Asir highlands. The Arabian samples closely resemble named examples from South Russia. They have long, pale body hairs distributed evenly but not thickly over all dorsal surfaces and long curved gula hairs forming a distinct psammophore.

Messor arenarius (Fabricius, 1787)

Formica arenaria Fabricius, 1787; Mant. Insect. 1: 310.

Messor arenarius (Fabricius) Forel, 1890; C.R. Soc. ent. Belg. 34: 70.

Al Qatif 14.IV.83; 1 ♀ CAC. Kuwait: Sulei Bihat III.81; 1 ♀ R.W. Harkness.

This large North African/Middle East species is an inhabitant of sandy desert margins. It is characterised by its strong sculpture and well developed propodeal spines. Unlike the majority of *Messor* species, workers tend to forage singly or in small groups and do not form distinct trails.

Messor buettikeri n. sp. (fig. 22)

Wadi Khumra 10.II.78; Khashm Khafs 25.I.81; ♀♀ ♂♂ ♀♀ W. Büttiker.

This small black species is linked to *M. syriacus* by the large eye size and rounded propodeum but from the pilosity and colour, not the sculpture, it resembles *M. bodenheimeri* Menozzi. It differs from small individuals of *M. aralocaspius* by the propodeum which in that species is distinctly angulate and which also differs by the transversely rugulose promesonotum, more sculptured head and smaller eyes, 0.2 or less x HW.

Holotype worker, paratype workers, males and queens from Wadi Khumra. Paratype queens from Khashm Khafs.

Holotype worker: TL 6.1; HL 1.35; HW 1.30; EL 0.33; SL 1.15; SI 88.4.

In full face, the head is nearly square, straight sided with the occipital margin feebly emarginate. The propodeum is smoothly rounded in profile, the petiole broadly angulate. The mandibles are longitudinally striate. Striae on the head are restricted to the anterolateral area, clypeus, lower frons and around the antennal insertions. The promesonotum is confusedly longitudinally rugulose, the propodeum laterally striate with wide interspaces. The gaster is smooth and the whole body brilliant black with paler appendages. All dorsal surfaces have long pale hairs, the gula hairs forming a distinct psammophore. In full face hairs project all round the occiput and genae to the mandible insertions.

Paratype queen: TL 9.75; HL 1.75; HW 1.9; EL 0.5; SL 1.6. Pilosity and colour as worker; mesonotum and scutellum smooth.

Paratype male: TL 8.05; HL 1.4; HW 1.15.

Mesonotum diagonally striate each side of the mid line; scutellum smooth. Very long hairs are present on all surfaces including the antennae.

Holotype and paratypes in NHMB.

Messor decipiens Santschi, 1917

Messor capensis st. *decipiens* Santschi, 1917; Bull. Soc. Hist. nat. Afr. N. 8: 94.

Messor decipiens. – Bolton, 1982: 348.

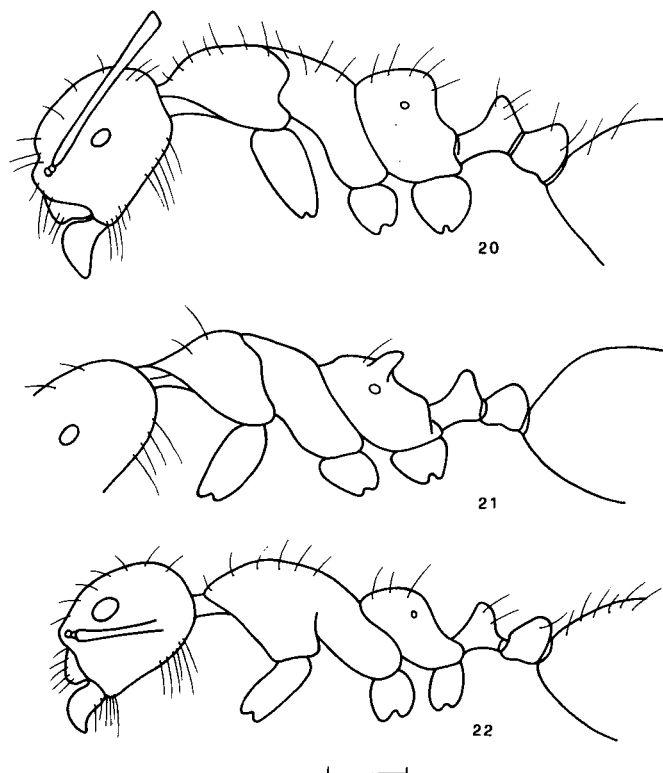
Anamas 2000 m 8.IV.83; ♀♀ CAC.

These red headed workers have very similar pilosity to samples identified as *M. aralocaspius* above. However the ants are somewhat larger and correspond well with the description of BOLTON (1982). *M. decipiens* is recorded from South and East Africa.

Messor ebeninus Santschi, 1927

Messor barbarus ssp. *semirufa* var. *ebenina* Forel, 1910; Annl. Soc. ent. Belg. 54: 10.

Messor semirufus var. *ebeninus* Santschi, 1927; Boln. Soc. esp. Hist. nat. 27: 229.



Figs 20–22: Profile view. 20, *Messor aralocaspius* ♀; 21, *M. striaticeps* ♀; 22, *M. buettikeri* ♀. (Scale bar 1 mm).

Messor ebeninus. – Tohmé, 1970; Bull. Soc. ent. Egypte 54: 569–570.

Riyadh 2.I.76; Quwayiyah 3.III.78; Bakhara 16.II.80; Wadi Daykah 4.IV.80; Khashm Khafs 23.I.81; ♀♀ ♀ W. Büttiker. Riyadh 16.I.80; ♀♀ A.S. Talhouk. River valley near Abha 25.III.83; Wadi Kust 7.IV.83; Fayfa 27.III.83; 30.III.83; Shaqiq Shamron Juniperus bank 8.IV.83; desert outside Riyadh 12.IV.83; Al Qatif cultivated ground 14.IV.83; ♀♀ ♀♀ CAC.

This is a common black Middle East species known to occur in Lebanon, Iran, Iraq, Palestine and Syria and was the most abundant species seen in Saudi Arabia living in large colonies in open ground usually but not always adjacent to cultivated ground. This species has the head and gaster smooth and shining with only an occasional hair on the first gaster tergite and up to six hairs on each side of the occipital margin. The alitrunk has rugulose sculpture and the propodeum is smoothly angulate without teeth.

Messor galla (Mayr, 1904)

Stanamma (Messor) barbarum var. *galla* Mayr, 1904; in Jaegerskjöld, Swed. Zool. Exp. Egypt & White Nile 1 (6): 5.

Messor galla (Mayr) Santschi, 1928.

Fayfa village cultivated ground 1.IV.83; ♀♀ CAC.

This large red headed species has a wide distribution across the Sahelian zone of tropical Africa and has been recorded from several Northeastern and East African countries south of Egypt. It has some resemblance to *M. semirufus* of the Middle East but is of a darker colour with a very different geographical distribution.

Messor mediorubra Cagniant, 1969 (fig. 19)

Stenamma barbarum r. *capitatus* var. *mediorubra* Forel, 1905; Annls. Soc. ent. Belg. 49: 176.

Messor mediorubra Cagniant, 1969; Bull. Soc. Hist. nat. Toulouse 105: 415.

Wadi Khumra 10.II.78; ♀♀ W. Büttiker.

This is a bicoloured North African species similar to *M. meridionalis* in general appearance and size but differing by the presence of more numerous hairs on the occiput and a variable number of hairs on the first gaster tergite.

Messor meridionalis (André, 1882)

Aphaenogaster barbara var. *meridionalis* André, 1882; Spec. Hym. Europe 2: 353.

Messor meridionalis (André) Bondroit, 1918; Annls. Soc. ent. Fr. 87: 155.

Kuwait III.78; ♀ K. Dumpert. Kuwait 17.III.81; ♀ R.W. Harkness.

This is a Central Asian species extending westward into the Middle East (Iran, Iraq, Lebanon, Syria).

Messor minor (André, 1882)

Aphaenogaster barbara var. *minor* André, 1882; Spec. Hym. Europe 2: 355.

Messor minor (André) Kutter, 1927; Folia Myrm. et Term. 1: 99.

Wadi Qust 7.IV.83; Al Tawlah 7.IV.83; ♀♀ CAC.

This small bright red headed species occurs in North Africa and Italy. Two small colonies were seen on the Asir highlands.

Messor orientalis (Emery, 1896)

Stenamma (Messor) structor var. *orientalis* Emery, 1896; Öfvers. finska Vetensk Soc. Förh. 29: 20.

Messor orientalis (Emery) Collingwood, 1960; Vidensk. Meddr. dansk naturh. Foren 123: 62.

Yemen: Sana El Errein XI.37; ♀ C. Rathjens BMNH.

This was not seen during the 1983 expedition. It is the largest species of the *M. structor* (L.) species group from which it is distinguished by the major workers which have a clearly angulate or dentate propodeum. It is recorded from Central Asia, South east Europe and the Middle East.

Messor picturatus Santschi, 1923 n. stat. (provisional) (fig. 18)

Messor barbarus st. *minor* var. *picturata* Santschi, 1921; Bull. Soc. Hist. nat. Afr. N. 12: 69.

Messor instabilis ssp. *picturata* Santschi, 1923; Revue suisse Zool. 30:

Wadi Khumra 10.II.78; ♀♀ W. Büttiker. Riyadh Agricultural Centre 18.IV.83; ♀♀ CAC.

This is similar in colour, head shape and sculpture to *M. instabilis* (Smith) of the Indian subcontinent but differs in having no dorsal hairs on the first gaster tergite and few very short hairs or none on the occiput. The Arabian examples closely match named specimens in the NHMB collection from North Africa and this form is probably a good species, clearly separable on pilosity characters from *M. instabilis*.

Messor rufotestaceus (Foerster, 1850)

Myrmica rufotestacea Foerster, 1850; Verh. naturh. Ver. preuss. Rheinl. 7: 489.

Messor rufotestaceus (Foerster) Emery, 1908; Dt. ent. Z. (1908): 437.

Wadi Qust 7.IV.83; 1 ♀ CAC.

A single worker of this pale shining slender species was found foraging in the early morning on stony ground but no colony was traced. This species is distinguished by the slender antennae, alitrunk and nodes and has short erect hairs evenly distributed all over the body.

Messor semirufus (André, 1882)

Aphaenogaster barbara var. *semirufa* André, 1882; Spec. Hym. Europe 2: 355.

Messor semirufus (André) Santschi, 1927; Boln. Soc. esp. Hist. nat. 27: 232.

Summer Plateau, 1930; ♀ H. Scott & E.B. Sutton.

A specimen so named was seen in the BMNH collection some years ago. It is one of the commoner Middle East species but is not known to occur in North Africa. The species may be distinguished from the similar *M. galla* by the generally lighter colour, the finely reticulate sculpture of the gaster dorsum and the occasional dorsal hairs on the first tergite.

Messor syriacus Santschi, 1927

Messor laboriosa var. *syriacus* Santschi, 1927; Boln. Soc. esp. Hist. nat. 27: 240.

Messor syriacus. - Tohmé & Tohmé, 1981: 145.

Al Khubra 29.V.78; ♀♀ W. Büttiker. Desert near Hofuf 12.IV.83: ♀♀ CAC.

This is one of the smaller *Messor* species. The reddish alitrunk contrasts with the dark head and gaster; the propodeum is smoothly rounded; the eyes are comparatively large, $\times 0.26$ HW; the head bears long dorsal and gula hairs. These features ally the species with *M. rugosus* (André) but the sculpture is much smoother. According to TOHMÉ & TOHMÉ 1981, *M. syriacus* is the commonest *Messor* species in Syria.

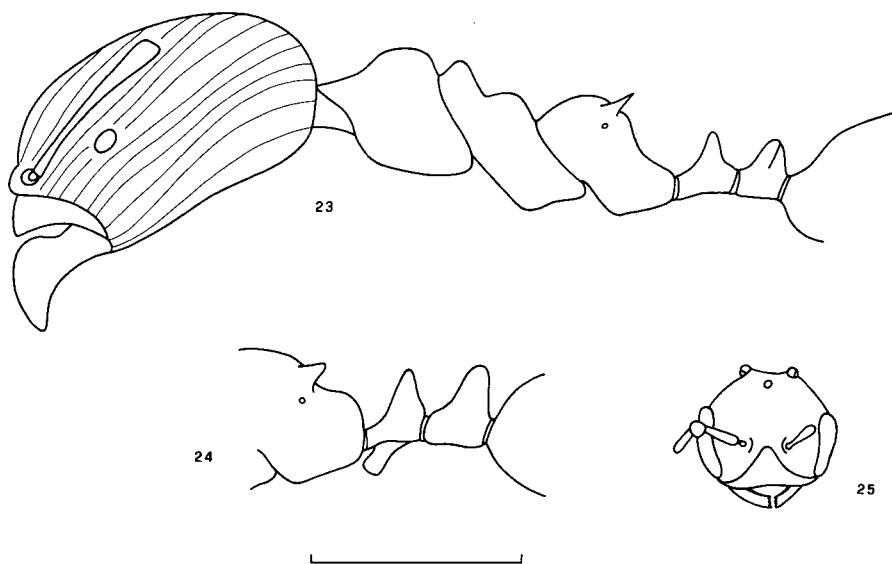
Messor striaticeps (André, 1882) (fig. 21)

Aphaenogaster barbara var. *striaticeps* André, 1882; Spec. Hym. Europe 2: 356.

Messor striaticeps (André) Cagniant, 1969; Bull. Soc. Hist. nat. Toulouse 105: 415.

Al Qatif 15.IV.83; ♀♀ CAC.

This closely sculptured black species with dentate propodeum was found foraging in sandy terrain adjacent to date palm and vegetable cultivation. It is a North African species not known to occur in the Middle East.



Figs 23–25: 23, *Pheidole teneriffana* ♀, profile view; 24, *Pb. lamellinoda* ♀, part profile; 25, *Pb. megacephala* ♀, head in dorsal view. (Scale bar 1 mm).

Genus *Pheidole* Westwood

List of species:

Pheidole jordanica Saulcy, 1874*Pheidole lamellinoda* Forel, 1802*Pheidole megacephala* (Fabricius, 1793)*Pheidole minuscula* Bernard, 1951*Pheidole rugaticeps* Emery, 1877*Pheidole sculpturata* Mayr, 1862*Pheidole sinaitica* Mayr, 1862*Pheidole teneriffana* Forel, 1893

Geographical distribution:

Middle East

West India

Africa, tropicopolitan

North west Africa

North east Africa, Arabia

Tropical Africa

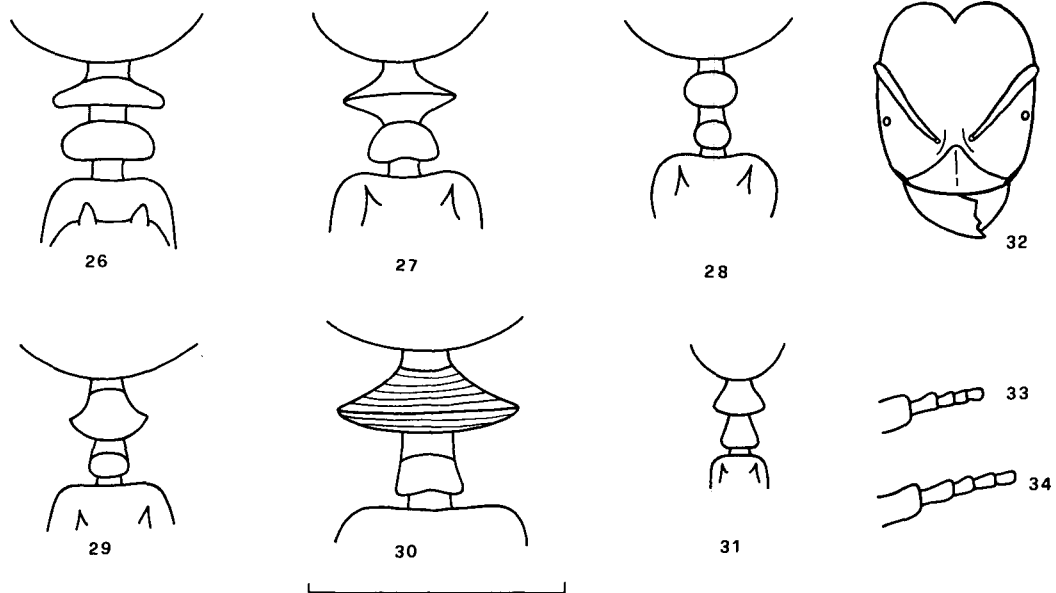
North Africa, Egypt

North Africa, Middle East, Teneriffe

The workers are of two sizes in this genus. The major workers have very large heads with expanded occipital lobes and are much bigger over all than the narrow headed minor workers. Since the major workers with their exaggerated structures show much clearer discriminatory characters in form and sculpture compared with minor workers, all workable keys are based on the former. There are a large number of described forms on the African continent but considerably fewer in the Middle East. Most species are scavengers and predators and will assemble readily to any form of edible bait. The tropicopolitan *Pheidole megacephala* is often a household pest. Males of this genus, recognisable by their short antennal scapes and strongly protuberant ocelli, are often caught at light traps.

Key to species (large workers)

1. HW less than 1 mm; head rectangular clearly longer than wide *minuscula* Bernard
- HW greater than 1.35 mm; head sides curved not or scarcely longer than broad 2
- 2.(1) Petiole with ventral projection, in profile a translucent lobe *lamellinoda* Forel
- Petiole without a ventral projection 3
- 3.(2) Postpetiole wider than long, distinctly dentate at widest point 4
- Postpetiole scarcely or not wider than long, at most slightly angled at sides 6
- 4.(3) Promesonotal outline broken by distinct mesonotal ridge; funiculus segments 2, 3 and 4 longer than broad 5
- Promesonotal outline evenly curved without a distinct mesonotal prominence; funiculus segments 2, 3 and 4 not longer than broad *megacephala* (Fabricius)
- 5.(4) Head completely striate to occiput; postpetiole about $\times 2$ as wide as long *teneriffana* Forel
- Head with median occipital area smooth; postpetiole about $\times 3$ as wide as long *sculpturata* Mayr
- 6.(3) Larger species, HW greater than 2 mm; sides of head finely striate to occiput; first gaster tergite partially or totally striate *rugaticeps* Emery
- Smaller species, HW 1.6 mm or less; occipital lobes without striae; first gaster tergite smooth 7
- 7.(6) Postpetiole longer than broad about $0.2 \times$ HW; funiculus segment 2 scarcely longer than broad *jordanica* Saulcy
- Postpetiole about as wide as long, $0.23 \times$ HW; funiculus segment 2 slightly longer than wide *sinaitica* Mayr



Figs 26–31: Petiole nodes in dorsal view. 26, *Pheidole lamellinoda* ♀; 27 *P. teneriffana* ♀; 28, *P. sinaitica* ♀; 29, *P. megacephala* ♀; 30, *P. sculpturata* ♀; 31, *P. minuscula* ♀. Fig. 32: *P. minuscula* ♀, head in dorsal view. Figs 33–34: First three funiculus segments. 33, *P. megacephala* ♀, 34, *P. sinaitica* ♀. (Scale bar 1 mm).

Pheidole jordanica Saulcy, 1874 (figs 28, 34)

Pheidole jordanica Saulcy, 1874; Bull. Soc. Hist. nat. Moselle 13: 17.

Al Qahman 1.IV.83; Al Tawlah 7.IV.83; Al Kola 10.IV.83; Al Kharfah 24.III.83; ♀♀ CAC.

This is a fairly common Middle East species that also occurs in North east Africa.

Pheidole lamellinoda Forel, 1902 (figs 24, 26)

Pheidole lamellinoda Forel, 1902; Revue suisse Zool. 10: 166.

Socotra: Adho Dimellus IV.67; ♀♀ K.M. Guichard.

This distinctive yellow species with a subpetiolar process in the form of a translucent projecting lamina is recorded from Central and Western India (BINGHAM 1903) but so far has not been reported from the African continent.

Pheidole megacephala (Fabricius, 1793) (figs 25, 29, 33)

Formica megacephala Fabricius, 1793; Ent. Syst. 2: 361.

Pheidole megacephala (Fabricius) Roger, 1863; Verz. Formicid.: 30.

Riyadh Agricultural Centre 7.VII.75; Hofuf 20.V.78; Wadi Qatan 26.IX.80; Turabah 7.X.80; Uqdah 26.VIII.83; ♂♂ ♀♀ ♀ W. Büttiker. Abha 4.IX.83; ♀♀ A.S. Talhouk. Al Kharfah 24.III.83; valley near Abha 25.III.83; Fayfa 27.III.83; Abu Arish 2.IV.83; Wadi Shugub 7.IV.83; Najran 10.IV.83; ♂♂ ♀♀ ♀♀ CAC.

This common cosmopolitan species occurred in a variety of habitats mainly in the south west.

Pheidole minuscula Bernard, 1951 (figs 31, 32)

Pheidole minuscula Bernard, 1951; Mém. Inst. fr. Afr. noire 11: 226.

Fayfa 31.III.83; Abu Arish resthouse grounds 2.IV.83; Al Qatif date palms 14.IV.83; ♂ ♀♀ ♀ CAC.

This was the smallest *Pheidole* species seen. The major workers have long rectilinear heads with only slight genal curvature. Head length to occipital corner 1 mm, width 0.84 mm. The clypeus is shining

with a raised central keel. The species is linked by its narrow head to the larger, darker *P. termitophila* Forel and to the more sculptured and still larger *P. liberiensis* Forel. BERNARD (1951) compared the three and described *P. minuscula* from Mt. Nimba in North west Africa, geographically remote from Arabia. All specimens were taken in leaf litter.

***Pheidole rugaticeps* Emery, 1877**

Pheidole rugaticeps Emery, 1877; Annali Mus. civ. Stor. nat. Giacomo Doria 9: 375.

This was described from the Yemen by Emery but not yet found in Saudi Arabia. *P. rugaticeps* has the occiput with fine transverse striae and the first gaster tergite has fine punctulate sculpture and fine longitudinal striae.

Specimens of a *Pheidole* sp. from Oman kindly sent by Mr M. Gallacher correspond with the less sculptured form *P. rugaticeps* var. *arabs* Emery, 1881 described from Tes in Southern Arabia.

***Pheidole sculpturata* Mayr, 1866 (fig. 30)**

Pheidole sculpturata Mayr, 1866; Verh. zool.-bot. Ges. Wien 16: 897.

Abu Arish resthouse grounds 25.III.83; Fayfa 27.III.83; Najran 10.IV.83; ♀♀ CAC.

This was the largest species of *Pheidole* found with the major worker head widths ranging from 2.2 mm up to 3 mm. The postpetiole is very wide and sharply angulate or dentate at the sides. The large heads are slightly longer than wide, clear red with longitudinal striae fading out on the occiput. A nest was found under a stone at Fayfa but at the other sites individual foragers were seen.

***Pheidole sinaitica* Mayr, 1862**

Pheidole sinaitica Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 745.

Fayfa 30.III.83; Najran 10.IV.83; ♀♀ CAC.

This species is similar to *P. jordanica* from which it differs only in slight details of body shape and sculpture. Forel recorded it as *P. sinaitica* var. *santschii* from Arabia (FOREL 1907: 204). It is otherwise recorded from North East Africa, Egypt and the Middle East.

***Pheidole teneriffana* Forel, 1893 (figs 23, 27)**

Pheidole teneriffana Forel, 1893; Annl. Soc. ent. Belg. 37: 465.

Riyadh 2.I.76; Jeddah 25.III.75; Al Khardj 10.IV.78; Araida 9.X.75; Al Kharj 25.V.50; ♂♂ ♀♀ ♀ W. Büttiker. Riyadh 23.III.83; Al Kharj public park 23.III.83; ♂♂ ♀♀ ♀♀ CAC.

This is a well characterised species with a strongly striate head and a wide sculptured petiole. It is widely distributed and tending to become cosmopolitan, spreading around places of human settlement. Strong populous colonies were seen at Al Kharj and it is evidently a vigorous and successful species.

Genus ***Melissotarsus*** Emery

This genus contains only three known species all of which are restricted to tropical Africa. The ants are small, 2.3–3.4 mm long, arboreal, living under the bark of live trees. Members of this genus have a short, thick box-like unsutured alitrunk; the middle and hind coxae as well as the basal tarsal segment of each leg are enlarged. DELAGE-DARCHEN (1972) showed that worker ants propel themselves forward by the front and hind legs with the mid legs held upward against the bark ceiling of the nest. BOLTON (1982), gives an updated revision of the genus.

Melissotarsus emeryi Forel, 1908 (fig. 35)

Melissotarsus emeryi Forel, 1908; Revue Ent. (1908): 133.

Fayfa tamarisk grove 29.III.83; ♂♂ ♀♀ CAC.

A number of small colonies were found by scraping the bark of ancient tamarisk trees. In West Africa this species occurs high up on large forest trees and can only normally be discovered on felled trees. At Fayfa most of the few old tamarisk trees were in a state of partial collapse with part of their trunks lying horizontally.

This is an interesting record of what may be regarded as a relict species in a small remnant of old woodland. The nearest known records for this species are from Ethiopia and Sudan.

Genus ***Leptothorax*** Mayr

This is a very large genus of small to medium sized ants, some of which are arboreal, living under bark, in twigs or in dead wood.

Leptothorax angulatus Mayr, 1862 (fig. 36)

Leptothorax angulatus Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 739.

Thanomah 11.IV.80; Wadi Drady 1.V.80; Al Fresh 20.IV.79; Wadi Aridah 10.IX.83; ♀♀ W. Büttiker. Fayfa 21.III.83; 30.III.83; Al Tawlah 7.IV.83; Wadi Shugub 7.IV.83; 40 km east of Khamis Muschaid 10.IV.83; ♂ ♀♀ ♀♀ CAC.

This is a widely distributed African species found throughout the continent and extending northward to the Middle East. Workers are yellowish brown with dark antennal clubs and have a superficial resemblance to some members of the genus *Tetramorium* having angled pronotal shoulders and thick petiole and postpetiole nodes. *L. angulatus* is the only species so far found in Arabia and was found mostly in old dead wood of Acacia.

Genus ***Cardiocondyla*** Emery

List of species:

Cardiocondyla emeryi Forel, 1881

Cardiocondyla nuda (Mayr, 1866)

Cardiocondyla schuckardi Forel, 1891

Cardiocondyla wroughtonii (Forel, 1890)

Cardiocondyla sp.

Geographical distribution:

Pantropical

Malaysia, India, North Africa

Tropical & subtropical Africa

Pantropical

Oman

These are minute to small species 1.7–3.4 mm. Most live in the soil but some are also found nesting in the bark of old trees. Many of the species become distributed as tramp species over the warmer parts of the world through soil and plant material but do not reach the status of being glasshouse or household pests.

Key to species (workers)

- | | | |
|----|---|---|
| 1. | Propodeal spines very short and blunt | 2 |
| – | Propodeal spines distinct and acute | 3 |

2. Colour brownish to black; petiole as broad or broader than long *schuckardi* Forel
 – Bicoloured with alitrunk paler than gaster; petiole longer than broad *nuda* (Mayr)
- 3.(1) Mesonotum steeply and abruptly descending to the metanotal groove; petiole node subglobular slightly broader than long *wroughtonii* (Forel)
 – Mesonotum curving evenly to the metanotal groove; petiole oval, longer than broad . 4
- 4.(3) Propodeal dorsum distinctly convex in profile; propodeal spines short, very slightly longer than their basal width; Petiole in profile with flattened dorsum *emeryi* Forel
 – Propodeal dorsum mildly convex, metanotal groove shallow, propodeal spines distinctly longer than their basal width; petiole in profile with rounded dome like dorsum *Cardiocondyla* sp.

***Cardiocondyla emeryi* Forel, 1881**

Cardiocondyla emeryi Forel, 1881; Mitt. münch. ent. Ges. 5: 5.

Fayfa 28.III.83; 30.III.83; Hofuf 13.IV.83; 14.IV.83; ♀♀ ♀ CAC. Oman: Khabura III.79; 1 ♀ R.P. Whitcombe.

The Saudi Arabian samples were all taken in leaf litter in tree shade. The Oman specimen was extracted from the gut contents of a swift (*Apus pallidus*). This is a widely distributed tramp species.

***Cardiocondyla nuda* (Mayr, 1866)**

Leptothorax nudus Mayr, 1866; Sber. Akad. Wiss. Wien, math.-naturw. Kl. 53: 508.

Cardiocondyla nuda (Mayr) Forel, 1881; Mitt. münch. ent. Ges. 5: 5.

Abu Arish resthouse grounds 3.IV.83; ♀♀ CAC.

Specimens were taken from grass litter beneath a hedge. This widespread oriental species has spread westward to the Middle East and North Africa.

***Cardiocondyla schuckardi* Forel, 1891 (fig. 37)**

Cardiocondyla schuckardi Forel, 1891; Grandidier Hist. Madagascar 20 (2): 161.

Al Kharj public park 23.III.83; Hair valley 17.IV.83; ♀♀ CAC Wadi Azizah 18.IX.83; ♀ W. Büttiker.

At Al Kharj, workers were excavating soil from a ground nest in a shady border. Foraging workers were taken singly along a river valley at Hair. The species is characterised by its relatively long antennal scapes, very reduced propodeal spines, globular petiole and generally dark colour. Previous records for this species are from sub-Saharan Africa (BOLTON 1982).

***Cardiocondyla* sp.**

Oman: Wahiba sands 27.XI.84; ♀♀ M. Gallagher.

This has coarser punctulate head sculpture, longer spines, darker colour, flatter propodeal outline and a more domed petiole than *C. emeryi* and does not correspond with any of the species listed and described from the Afrotropics by BOLTON 1982 and is probably an undescribed species.

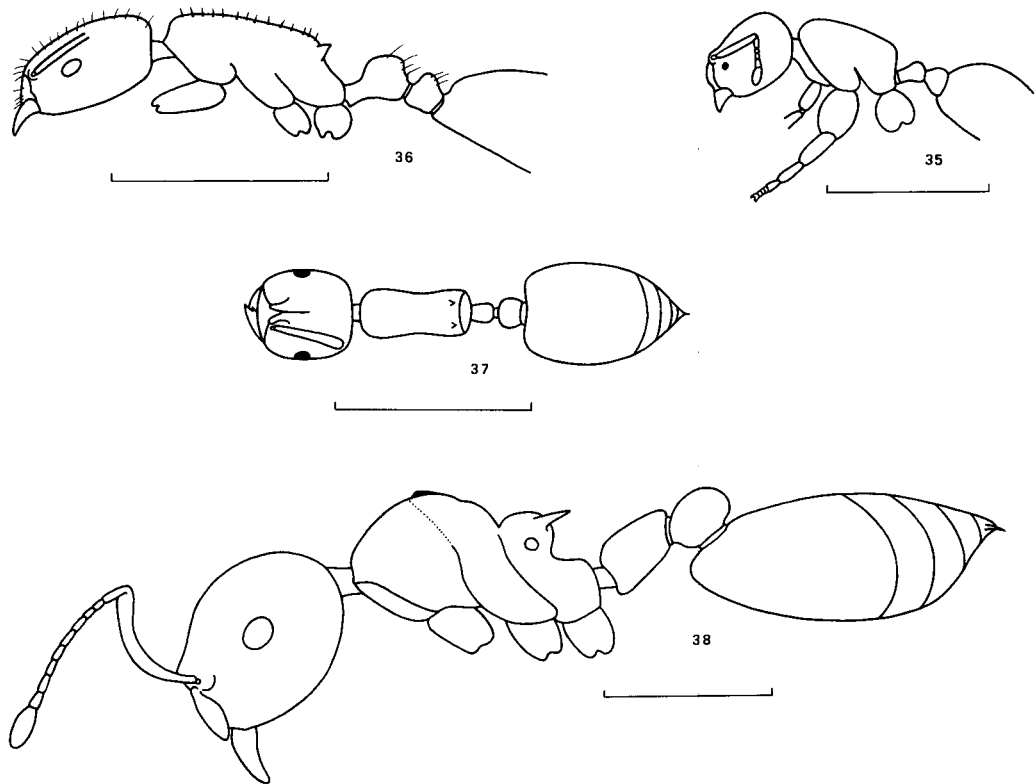
***Cardiocondyla wroughtonii* (Forel, 1890)**

Emeryia wroughtonii Forel, 1890; Anns. Soc. ent. Belg. 34: 101.

Cardiocondyla wroughtonii (Forel) Forel, 1892; Verh. zool.-bot. Ges. Wien 42: 313.

Fayfa tamarisk grove 29.III.83; Fayfa 30.III.83; ♀♀ CAC.

This species was taken in bark crevices or foraging on old trees. It is known from the Middle East and East Africa but has a wide range as a tramp species from the Far East to the Americas. It is the smallest and palest of the species found in Arabia measuring less than two mm in length.



Figs 35–38: 35, *Melissotarsus emeryi* ♀, profile view; 36, *Leptothorax angulatus* ♀, profile view; 37, *Cardiocondyla schuckardi* ♀, dorsal view; 38, *Crematogaster auberti* ♀, profile view. (Scale bar 1 mm).

Genus *Triglyphothrix* Forel

This is a genus of shade loving leaf litter ants. In most species the body hairs are long and abundant and usually branched, giving the insect a furry appearance.

Triglyphothrix lanuginosa (Mayr, 1870) (fig. 50)

Tetramorium lanuginosum Mayr, 1870; Verh. zool.-bot. Ges. Wien 20: 972.

Triglyphothrix lanuginosa (Mayr) Emery, 1891; Exploration Scientifique Tunisie, Formicid.: 4.

Al Qatif 14.IV.83; ♀♀ CAC.

Two workers were collected in a date palm grove in deep leaf litter. This is a tramp species widely distributed over the tropics but probably originating in tropical Asia. This species has been commonly known as *Triglyphothrix striatidens* but BOLTON (1979) has shown that the original and correct name for this species is *T. lanuginosa*.

Genus *Crematogaster* Lund

List of species:

Crematogaster acaciae Forel, 1892

Crematogaster aegyptiacus Mayr, 1862

Geographical distribution:

North east Africa

North east Africa, North Africa

<i>Crematogaster affabilis</i> Forel, 1908	North east Africa
<i>Crematogaster antaris</i> Forel, 1894	North Africa
<i>Crematogaster auberti</i> Emery, 1869	North Africa, South Europe
<i>Crematogaster chiarinii</i> Emery, 1881	North east Africa
<i>Crematogaster laestrygon</i> Emery, 1869	North Africa
<i>Crematogaster luctans</i> Forel, 1907	Tropical Africa
<i>Crematogaster mimosae</i> Santschi, 1914	East Africa
<i>Crematogaster oasisium</i> Santschi, 1911	North Africa
<i>Crematogaster senegalensis</i> Roger, 1862	Tropical Africa
<i>Crematogaster striaticeps</i> Forel, 1902	North Africa
<i>Crematogaster</i> sp.	Oman

Crematogaster includes species that are both arboreal and ground nesting but colonies are never far from trees or shrubs since members of this genus rely on the exudates of Homoptera as the main source of nourishment. Characteristically, those species with large populous colonies are to be seen moving in slow orderly files to and from sources of food. Many are aromatic and most species in alarm raise the gaster with the apex pointing forward over the body. Males and queens of some species frequently come to light and as in the worker may be easily recognised by the attachment of the pedicel to the dorsum of the first gaster tergite.

Keys to species

1. Postpetiole globular, entire not bilobed (colour yellow, spines long) *luctans* Forel
- Postpetiole divided dorsally by a median longitudinal furrow into two lobes 2
- 2.(1) Head distinctly wider than long, CI more than 115 3
- Head only slightly or not wider than long, CI less than 110 8
- 3.(2) Petiole distinctly wider than long 4
- Petiole only slightly or not wider than long 5
- 4.(3) Propodeal spines sharp, at least 0.2 mm; gaster brilliant with fine sparse pubescence, head and alitrunk red *senegalensis* Roger
- Propodeal spines broadly dentate, less than 0.13 mm; gaster with superficial sculpture and coarse pubescence; body colour reddish brown *aegyptiacus* Mayr
- 5.(3) Alitrunk paler than head or gaster; spine length 0.2 mm or more *chiarinii* Emery
- Head and alitrunk unicolorous red; spine length 0.15 mm or less 6
- 6.(5) Head and alitrunk strongly sculptured, spines short and broadly dentate *mimosae* Santschi
- Body sculpture weak; spines reduced to two tubercles 7
- 7.(6) Occiput shining; second funiculus segment about as long as third *antaris* Forel
- Occiput dull; second funiculus segment shorter than third *acaciae* Forel
- 8.(2) Propodeal spines long and thin at least 0.25 mm 9
- Propodeal spines less than 0.20 mm 10
- 9.(8) Head and alitrunk clear red, spines exceptionally long, 0.35 mm or more, spine length/
HW × 100 37 *Crematogaster* sp.
- Body unicolorous dark brown to black; spines 0.25 mm. index 25 *affabilis* Forel
- 10.(8) Alitrunk sculpture strong; mesonotal keel well developed 11
- Alitrunk sculpture weak; mesonotal keel hardly apparent 12

- | | | |
|---------|--|--------------------------|
| 11.(10) | Head smooth with scattered small punctures | <i>laestrygon</i> Emery |
| - | Dorsum of head completely striate | <i>striaticeps</i> Forel |
| 12.(10) | Colour brown to dark brown; spines relatively long, about 0.175 mm | <i>auberti</i> Emery |
| - | Colour pale red; spines very reduced, 0.1 mm | <i>oasium</i> Santschi |

***Crematogaster acaciae* Forel, 1892**

Crematogaster acaciae Forel, 1892; Zool. Anz. 15: 142.

Oman: Mugshin, Dhofar 20.IX.79; ♀♀ R.P. Whitcombe.

This is a pale weakly sculptured species with very reduced spines, broad head, CI 108, and a narrow petiole, 03 × 03. The species was described from Ethiopia.

***Crematogaster affabilis* Forel, 1908 n. stat. (figs 40, 43)**

Crematogaster chiarinii var. *affabilis* Forel, 1908; Revue Ent. (1908): 142.

Abha flood valley 25.III.83; Najran 25.III.83; Abu Arish 25.III.83; Fayfa 27.III.83; 31.III.83; Al Qahman mangrove swamp 1.IV.83; Karm Rausch near Al Kudeis 5.IV.83; ♂♂ ♀♀ ♀♀ CAC. Wadi Dhiyan 14.IX.83; ♀♀ W. Büttiker. Yemen: Wadi Magsala XI.79; ♀♀ Borri & Poggesi (B. Lanza). Oman: Sadh Dhofar 17.III.84; Wadi Satima 15.II.84; Salala mangroves 16.II.84; ♀♀ M. Gallagher.

This is a very distinctive species unicolorous black to brownish black, with smooth sculpture and very long propodeal spines, 0.26–0.31 mm. The Arabian specimens matched named examples of *C. affabilis* in both the Forel collection and in NHMB. No other dark coloured African species was seen with such long thin spines. The head is comparatively narrow, CI 104, the petiole scarcely wider than long and there is no mesonotal keel. *C. chiarinii* by contrast has shorter spines, 0.20–0.23, a broader head, CI 115–118, a mesonotal keel, has the head more sculptured and the alitrunk paler than the head and gaster.

Populous colonies were seen within or at the foot of the larger trees and there were long files of ants along the trunks and branches in the manner of *C. scutellaris* 01. of Europe. Myrmecophilous myrmedoniine beetles were seen among workers around the tree bases in a few places.

***Crematogaster aegyptiacus* Mayr, 1862 (figs 39, 42)**

Crematogaster aegyptiacus Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 765.

Musimah Dahn 2.IX.81; ♀ W. Büttiker. Fayfa 29.III.83; Al Qahman mangrove swamp 1.IV.83; Karm Rausch 5.IV.83; Al Qatif 15.IV.83; ♀♀ CAC.

This is a mainly arboreal species but does not form such dense or conspicuous colonies as *C. affabilis*. There is an old record for *C. aegyptiacus* from Aden (EMERY 1881).

***Crematogaster antaris* Forel, 1894**

Crematogaster antaris Forel, 1894; Bull. Soc. vaud. Sci. nat. 30: 26.

Al Kharfa desert 24.III.83; ♀♀ CAC.

This is a species with a large head differing from *C. aegyptiacus* by the smooth and shining occiput and narrower petiole. It was taken among scrubby bushes fringing sandy desert and was the only species to be found so far in the Central Region of Saudi Arabia.

***Crematogaster auberti* Emery, 1869 (fig. 38)**

Crematogaster auberti Emery, 1869; Annali Accad. Aspir. nat. Napoli 2: 23.

Al Kola 10.IV.83; ♀♀ CAC.

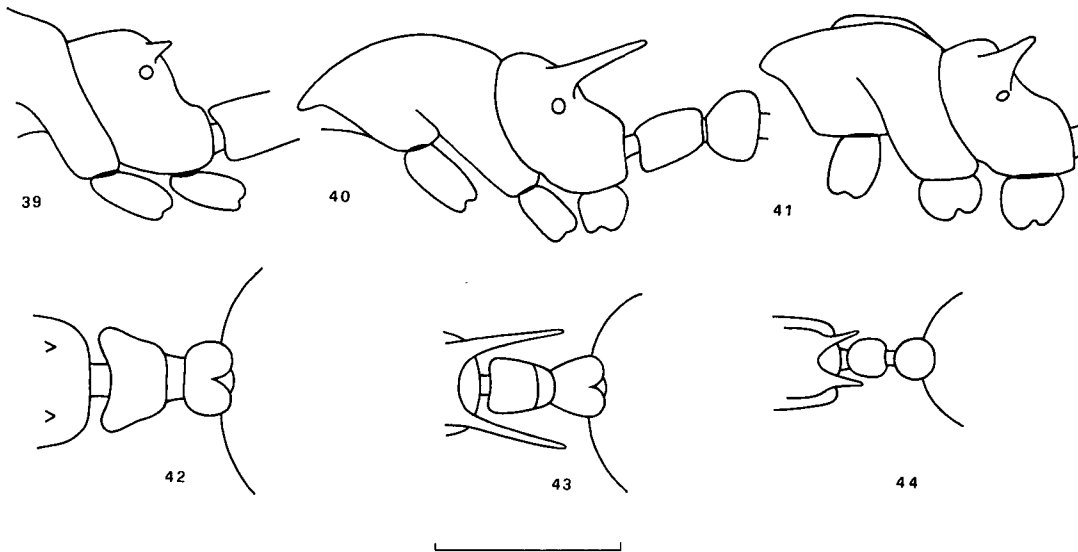
This common South European and North African species was only found at this site in the neighbourhood of a village in semi-cultivated farmland.

***Crematogaster chiarinii* Emery, 1881**

Crematogaster chiarinii Emery, 1881; Annali Mus. civ. Stor. nat. Giacomo Doria 16: 271.

Bishah 7.IV.83; Al Tawlah 7.IV.83; ♀♀ CAC.

This species has the alitrunk somewhat paler than the head and gaster. It was linked by FOREL (1908) with *C. affabilis* but apart from the colour difference, the propodeal spines are shorter, the head wider and the sculpture stronger. An East African species, it was recorded from Tes by EMERY (1881).



Figs 39–41: Part profile of *Crematogaster*. 39, *C. aegyptiacus* ♀; 40, *C. affabilis* ♀; 41, *C. senegalensis* ♀. Figs 42–44: Petiole nodes in dorsal view. 42, *C. aegyptiacus* ♀; 43, *C. affabilis* ♀; 44, *C. luctans* ♀. (Scale bar 1 mm).

***Crematogaster luctans* Forel, 1907 (fig. 44)**

Crematogaster luctans Forel, 1907; Anns. hist.-nat. Mus. natn. hung. 5: 22.

Abu Arish 26.III.83; Fayfa tamarisk grove 29.III.83; Sug al Ahad 26.III.83; ♀♀ ♀ CAC.

This species lives within the hollow twigs of dead acacia branches and was so found by my colleague C. Holzschuh when searching for longhorn beetles. It is the only species with a rounded unindented postpetiole so far found in Arabia. It is characterised by the yellow colour and well developed propodeal spines.

***Crematogaster mimosae* Santschi, 1914**

Crematogaster mimosae Santschi, 1914; Voy. Allaud & Jeannel Afr. Or. Hym.: 14.

Oman: Jabal Akhdar 9.VIII.78; ♀♀ R.P. Whitcombe.

This is a strongly sculptured red species recorded from East Africa.

***Crematogaster oasisium* Santschi, 1911 n. stat.**

Crematogaster auberti ssp. *oasisium* Santschi, 1911; Bull. Soc. Hist. nat. Afr. N. 3: 81.

Oman: Khabura 1.XII.79; ♀ R.P. Whitcombe.

This pale rather shining species with very short spines occurs on the fringes of the North African deserts. It differs from *C. auberti* Emery by the much shorter propodeal spines and paler colour.

***Crematogaster laestrygon* Emery, 1869**

Crematogaster laestrygon Emery, 1869; Bull. Soc. ent. ital. 1: 135.

Zahran 25.III.83; Wadi Shugub 7.IV.83; Anamas 8.IV.83; Tanuma 8.IV.83; Al Qatif 14.IV.83; ♀♀ CAC. Abha 4.XII.83; ♀♀ A.S. Talhouk. Wadi Azizah 2400 m 10.IX.83; ♀♀ W. Büttiker.

This is a common ground nesting North African species. A few workers taken at Al Qahman, 1.IV.83, have the head completely striated but are otherwise similar to the smooth headed *C. laestrygon*. This probably corresponds to *C. laestrygon* var. *striaticeps* Forel, 1902, described from North Africa but whether this is a minor variation or a good species is not yet resolved.

***Crematogaster senegalensis* Roger, 1862 (fig. 41)**

Crematogaster senegalensis Roger, 1862; Berl. ent. Z. 7: 206.

Sug al Ahad 26.III.83; ♀♀ CAC. Sahl Rakbar 3.VI.82; ♀ W. Büttiker.

Workers at Sug al Ahad were taken among tree roots in the immediate vicinity of a clump of trees. This is a brightly coloured species with comparatively long funiculus segments and broad strong spines. It is recorded from several localities in East Africa.

Genus ***Tetramorium*** Mayr

List of species:

<i>Tetramorium biskrense</i> Forel, 1904	Geographical distribution: North Africa, Sicily
<i>Tetramorium caldarium</i> (Roger, 1857)	Cosmopolitan
<i>Tetramorium calidum</i> Forel, 1907	South Arabia
<i>Tetramorium depressiceps</i> Menozzi, 1933	North east Africa, Middle East
<i>Tetramorium doriae</i> Emery, 1881	North east Africa, South Arabia
<i>Tetramorium ferox</i> Ruzsky, 1903	North Africa, South east Europe
<i>Tetramorium jizani</i> n. sp.	Arabia
<i>Tetramorium juba</i> n. sp.	North & North east Africa
<i>Tetramorium khyarum</i> Bolton, 1980	Tropical Africa
<i>Tetramorium sericeiventre</i> Emery, 1877	Throughout Africa
<i>Tetramorium simillimum</i> (Smith, 1851)	Cosmopolitan
<i>Tetramorium syriacum</i> Emery, 1909	Middle East
<i>Tetramorium zabrae</i> Santschi, 1923	North Africa, South Arabia

Key to species

1.	Tibiae without suberect hairs on extensor surface	2
-	Tibiae with stout suberect hairs	7
2.(1)	Larger species, HW 0.70 mm or more; petiole nodes longer than broad	3
-	Smaller species, HW 0.56 mm or less; petiole nodes broader than long	5
3.(2)	Propodeal spines minute or absent	<i>doriae</i> Emery
-	Propodeal spines strongly developed	4
4.(3)	Propodeal dorsum with one or two pairs of stout hairs	<i>khyarum</i> Bolton
-	Propodeal dorsum bare	<i>sericeiventre</i> Emery
5.(2)	Longitudinal rugae on head weakly developed	<i>caldarium</i> Roger
-	Longitudinal rugae on head strongly developed	6

- 6.(5) Frontal carinae long and strongly developed to near occipital border, genae between occiput and eye without projecting setae *simillimum* (Smith)
- Frontal carinae obscured by close head sculpture, genae between occiput and eye with one or more projecting hairs *jizani* n. sp.
- 7.(1) Petiole nodes with distinct dorsal sculpture 8
- Petiole nodes without dorsal sculpture, smooth and shining 9
- 8.(7) Nodes coarsely sulcate; petiole width more than 0.8 × postpetiole width; colour dark blackish brown *ferox* Ruzsky
- Nodes weakly or irregularly sculptured ; petiole width × 0.75 postpetiole width; colour reddish to pale brown *syriacum* Emery
- 9.(7) Head and alitrunk sculpture strongly developed 10
- Head and alitrunk sculpture weak and smooth in part 11
- 10.(9) Colour black; spines very short upturned; striae distinctly divergent on occiput *biskrense* Forel
- Colour pale reddish yellow; spines acute and well developed; head striae remain longitudinal to occipital border *calidum* Forel
- 11.(9) Dorsum of head with distinct depressed area medially; alitrunk sculpture weak but always present; spines short but acute *depressiceps* Menozzi
- Dorsum of head without a median depression; alitrunk smooth and shining; propodeal armature bluntly tuberculate *juba* n. sp.

***Tetramorium biskrense* Forel, 1904**

Tetramorium caespitum var. *biskrensis* Forel, 1904; Revue suisse Zool. 12: 13.

Tetramorium biskrensis. - Bernard, 1958; Riv. Biol. colon. 16: 75.

Tetramorium biskrense. - Baroni Urbani, 1971: 134.

Hair valley 17.IV.83; ♀♀ CAC.

This is a small dark sculptured species of the *T. caespitum* group with relatively small sexuals. The postpetiole has some sculpture at the sides but both petiole and postpetiole are brilliant and smooth on the centre dorsum.

***Tetramorium caldarium* (Roger, 1857)**

Tetrogmus caldarium Roger, 1857; Berl. ent. Z. 1: 12.

Tetramorium caldarium. - Roger, 1862; Berl. ent. Z. 6: 297.

Abu Arish 26.III.83; Fayfa 29.III.83; 30.III.83; Al Qatif 15.IV.83; Riyadh Agricultural Centre 18.IV.83; ♀♀ CAC.

This is a common widely distributed tramp species. Specimens were taken in soil and leaf litter.

***Tetramorium calidum* Forel, 1907 n. stat.**

Tetramorium caespitum var. *calida* Forel, 1907; Annlis hist.-nat. Mus. natn. hung. 5: 15.

No examples referable to this form were collected. A paratype in NHMB was examined. This worker has rounded unsculptured nodes and rather widely spaced rugae on the head and alitrunk. The occiput is slightly concave. The scape almost reaches the occipital border. The propodeal spines are short sharp and suberect. The colour is pale yellowish red. The type locality is Muscat in Oman. It is given specific rank here because of its location so far south, its colour and small details of sculpture.

***Tetramorium depressiceps* Menozzi, 1933**

Tetramorium semilaeve ssp. *depressiceps* Menozzi, 1933; Memorie Soc. ent. ital. 12: 71.

Tetramorium depressiceps. – Tohmé, 1969: 12.

Wadi Shugub 7.IV.83; Shaqiq-Shamran 8.IV.83; Anamas 8.IV.83; ♀♀ CAC.

This species was common in the upland pastures of the Asir mountains. The colour is somewhat paler than in the type specimens but the head depression is very clear. It has been recorded from several Middle East countries including Lebanon, Palestine and the type locality, Sinai.

***Tetramorium doriae* Emery, 1881**

Tetramorium doriae Emery, 1881; Annali Mus. civ. Stor. nat. Giacomo Doria 16: 530.

This species was not collected but the type was described from Tes in Southern Arabia and it has also been recorded from localities in North-east Africa (BOLTON 1980).

***Tetramorium ferox* Ruzsky, 1903**

Tetramorium caespitum var. *ferox* Ruzsky, 1903; Trudy russk. ent. Obshch. 36: 309.

Tetramorium ferox. – Cori & Finzi, 1931; Sber. Akad. Wiss. Wien, math.-naturw. Kl. 23: 3.

Kashm al Buwaybiyat V. 78; ♀♀ W. Büttiker. Riyadh Agricultural Centre 23.III.83; ♀♀ CAC.

These have the dark colour, coarse sculpture and large petiole of *T. ferox* but the propodeal spines are distinctly shorter than in examples from both South Russia and Morocco and resemble in this respect series collected in Greece.

***Tetramorium jizani* n. sp. (fig. 48)**

Fayfa 30.III.83; Al Qahman mangrove swamp 1.IV.83; Abu Arish 3.IV.83; ♀♀ ♀♀ CAC.

A few specimens collected from soil litter could not be identified to species from the keys by BOLTON 1980, to the subsaharan African *Tetramorium*. In general appearance and size they resemble *T. simillimum* (Smith) but the head of the worker is more closely sculptured, the frontal grooves narrower and there are genal hairs between the occiput and eye and the eye and the mandible.

Holotype worker: Abu Arish 9.IV.83: TL 2.3; HL 0.65; HW 0.55 SL 0.46; EL 0.14; Petiole Width 0.18; Postpetiole Width 0.23; CI 84.6; SI 83.

The mandibles are striated; the head and alitrunk dorsally are closely and finely longitudinally striated. The frontal ridges extend to posterior eye level and are then obscured by the general sculpture. The colour is reddish brown. The tibiae and scapes have close decumbent pubescent hairs. Suberect hairs on the head and alitrunk are numerous with one or more projecting at the sides of the head between the occipital corner and eye and two hairs projecting between eye and the mandible insertions.

Paratype queens have similar sculpture to the workers but projecting hairs on the head are longer and more numerous. HL 0.85; HW 0.83; SL 0.69; CI 98; SI 83.3.

Holotype and paratypes in NHMB

***Tetramorium juba* n. sp. (fig. 47)**

Tetramorium caespitum st. *juda* (sic) var. *juba* Santschi, 1921; Mems R. Soc. esp. Hist. nat. Tome 50 Aniv.: 433.

Al Kharj 16.IV.78; ♀♀ W. Büttiker. Al Kharj sandy desert 23.III.83; Al Kola 10.IV.83; ♀♀ ♀♀ CAC.

SANTSCHI (1921) described *T. juba* as a variety of *T. judas* Wheeler (*Tetramorium caespitum* ssp. *judas* Wheeler, 1906, Bull. Mus. comp. Zool. Harv. 60: 172). However *T. judas* Wheeler from Palestine is somewhat smaller, darker and more sculptured. According to MENOZZI 1933, in *T. judas* (*Tetramorium semilaeve* ssp. *judas* Wheeler), the queens have the petiole nodes striate and opaque and the head and alitrunk are more sculptured than those of *T. semilaeve* André. In worker associated *T. juba* queens, only

the head has some striate sculpture and the dorsum of the mesonotum, scutellum, centre of the propodeum and petiole are smooth without sculpture.

The descriptions of a typical worker and a queen of *T. juba* from Al Kharj are as follows:

Worker: TL 3.38; HL 0.83; HW 0.69; SL 0.68; CI 83.3; SI 98; Head has mildly concave occiput, sides almost straight, distinctly striate on the dorsum anterior to the eyes, more finely posteriorly to occiput where the striae diverge. Promesonotum with fine scattered punctures but smooth and shining, propodeum finely cross striate; nodes dorsally smooth and shining. Sides of alitrunk striate. Postpetiole wide, $\times 1.36$ petiole width. Propodeal armature reduced to short blunt tubercles. Colour evenly yellowish brown.

Queen: TL 7.0; HL 1.23; HW 1.15; SL 0.98; CI 96; SI 83; Postpetiole $\times 1.5$ width of petiole. Head striate distinctly divergent at occiput. Dorsum of mesonotum and scutellum smooth and shining without trace of striae. Middle of propodeum and petiole smooth; postpetiole finely striate. Colour as worker.

Tetramorium khyarum Bolton, 1980 (fig. 46)

Tetramorium khyarum Bolton, 1980; Bull. Br. Mus. nat. Hist. 40 (3): 327.

Abu Arish resthouse grounds 25.III.83; Bishah 8.IV.83; ♀♀, CAC.

These are identical with the common and widespread African savannah species *T. sericeiventre* Emery but all workers have one and occasionally two pairs of hairs on the propodeal dorsum which is always bare in *T. sericeiventre*.

Tetramorium sericeiventre Emery, 1877 (fig. 49)

Tetramorium sericeiventre Emery, 1877; Annali Mus. civ. Stor. nat. Giacomo Doria 9: 370.

Al Khubra 29.V.78; Al Kharj 25.V.80; Wadi Azizah 18.IX.83; ♂♂ ♀♀ W. Büttiker. Riyadh 22.III.83; Al Kharj 23.III.83; Al Tawlah 8.IV.83; Anamas 8.IV.83; Al Qatif 14.IV.83; ♂♂ ♀♀ ♀♀ CAC.

This was the most abundant *Tetramorium* species seen. It has not been recorded from the Middle East but occurs sporadically in North Africa becoming increasingly common to the south throughout the savannah areas of tropical Africa. Males of this species often come to light and may be recognised by the ten segmented antenna, the long second segment being a characteristic shared by all members of the genus, the long petiole nodes, distinct propodeal teeth and the very deep metanotal furrow.

Tetramorium simillimum (Smith, 1851)

Myrmica simillima Smith, 1851; List Brit. Anim. Brit. Mus. 6, Aculeata: 118.

Tetramorium simillimum (Smith) Mayr, 1861: 15.

Riyadh 22.III.83; Abu Arish 26.III.83; Fayfa 30.III.83; 31.III.83; Al Kudeis 5.IV.83; Al Qatif 14.IV.83; ♀♀ CAC.

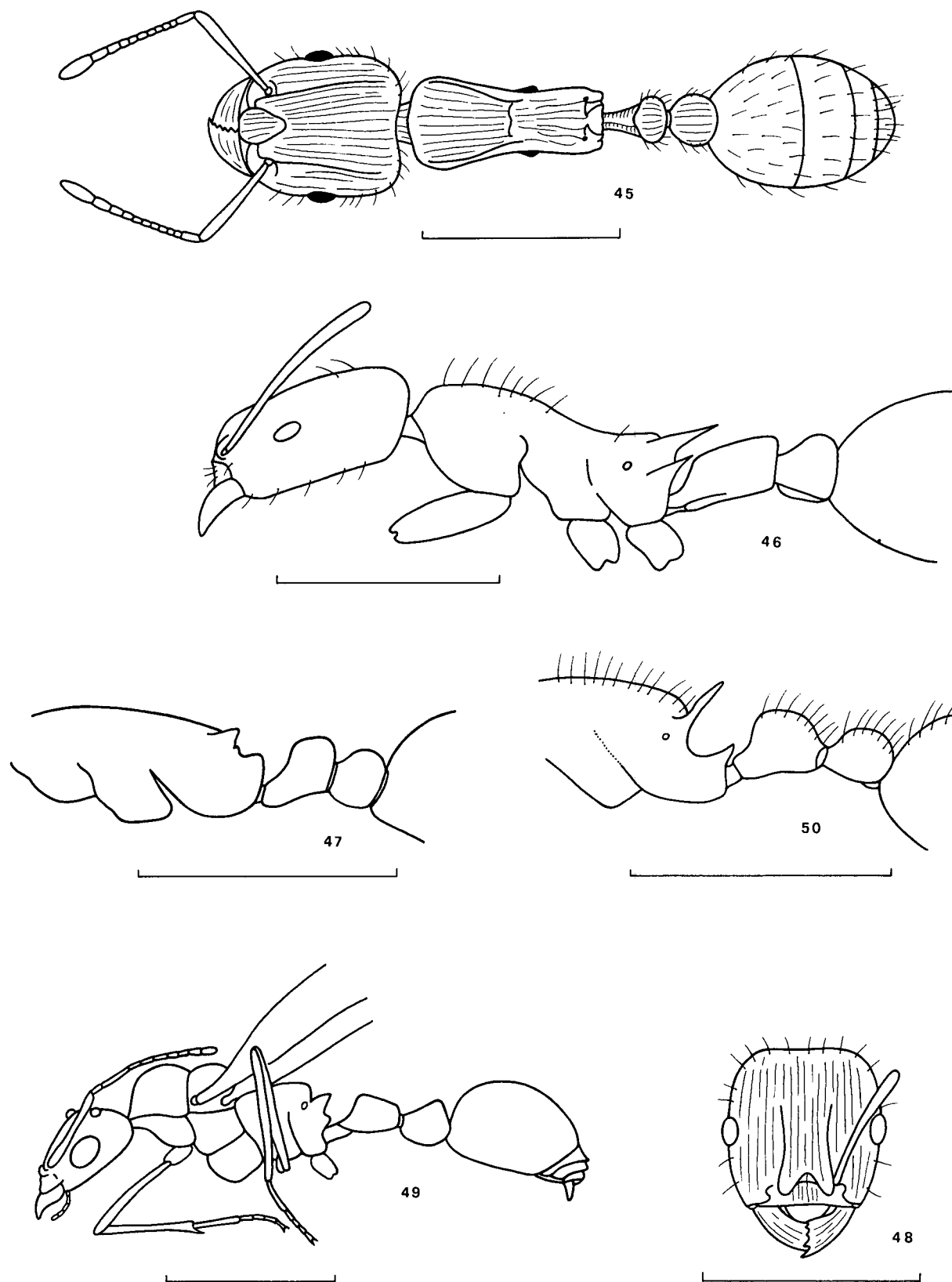
This is a common small species widely distributed through commerce over the whole subtropical and tropical world and found also in heated glasshouses in cooler climates.

Tetramorium syriacum Emery, 1909 n. stat. (fig. 45)

Tetramorium caespitum var. *syriaca* Emery, 1909; Dt. ent. Z. (1909): 699.

Wadi Hanifa 7.V.76; Wadi Darmah 22.XII.76; Kushm al Buwaybiyat 25.V.78; Al Khubra 29.V.78; ♂♂ ♀♀ ♀♀ W. Büttiker. Riyadh Agricultural Centre 23.III.83; 19.IV.83 ♂♂ ♀♀ ♀♀ CAC. Riyadh 19.IV.83; ♂♂ ♀♀ R.A. Abozuhairah.

This reddish species with sculptured nodes is evidently locally common in the Central Region but not seen elsewhere. The queens have short longitudinal striae at the anterior of the first gaster tergite



Figs 45–50: 45, *Tetramorium syriacum* ♀, dorsal view; 46, *T. khyarum* ♀, profile view; 47, *T. juba* ♀, part profile; 48, *T. jizani* ♀, head in dorsal view; 49, *T. sericeiventre* ♂, profile view; 50, *Triglyphostrix lanuginosa* ♀, part profile.. (Scale bar 1 mm).

while the scutellum has the median area smooth. These characters are in accord with samples from the Middle East but all workers from Arabia have the propodeal spines shorter than in the typical form and in this respect resemble specimens labelled var. *punctaticeps* Santschi in the NHMB from Tunisia.

***Tetramorium zahrae* Santschi, 1923**

Tetramorium zahrae Santschi, 1923; Boln. R. Soc. esp. Hist. nat. 23: 135.

There is a small pale male and a dark queen without workers in the NHMB labelled *T. zahrae* Santschi from Yemen: Sokra leg. G. Scortelli. They appear to resemble *T. biskrense* in size and sculpture. In the absence of workers, this species is not included in the key to species.

Genus ***Monomorium*** Mayr

List of species:

- Monomorium abeillei* André, 1881
- Monomorium afrum* André, 1884
- Monomorium areniphilum* Santschi, 1911
- Monomorium barbatulum* Mayr, 1877
- Monomorium bicolor* Emery, 1877
- Monomorium carbonarium* (Smith, 1858)
- Monomorium clavicorne* André, 1881
- Monomorium destructor* (Jerdon, 1851)
- Monomorium gracillimum* (Smith, 1861)
- Monomorium karawajewi* Forel 1913
- Monomorium luteum* Emery, 1881
- Monomorium nitidiventre* Emery, 1883
- Monomorium niloticum* Emery, 1881
- Monomorium pharaonis* (Linnaeus, 1758)
- Monomorium pboenicium* Santschi, 1927
- Monomorium salomonis* (Linnaeus, 1758)
- Monomorium schultzei* Forel, 1910
- Monomorium subopacum* (Smith, 1858)
- Monomorium venustum* (Smith, 1858)
- Monomorium zulu* Santschi, 1914

Geographical distribution:

- Middle East
- East and South Africa
- North Africa
- Turkestan
- North Africa, Middle East
- Madeira, Azores; Arabia ?
- Africa, Middle East
- Cosmopolitan
- Cosmopolitan
- Middle East
- South Arabia
- Africa, Middle East, South Arabia
- North east Africa
- Cosmopolitan
- North Africa, Middle East
- North Africa
- South Africa
- South Europe, North Africa
- Middle East, Arabia
- South Africa

This is a large genus of small to minute species, some of which are cosmopolitan in their distribution and are often household pests. All sites visited in 1983 had one or more species of *Monomorium* present and members of the genus were often abundant in coastal areas, cultivated farm land and in the neighbourhood of dwellings.

Key to species

- 1. Ultimate funiculus segment as long as the two preceding together, the first of the three segments forming the club being shorter than the second 2
- Ultimate funiculus segment shorter than the length of the preceding two together which are subequal 6

2.(1)	Antennae eleven segmented	<i>clavicorne</i> André	
-	Antennae twelve segmented		3
3.(2)	Head and alitrunk with close punctulate microsculpture, dull not shining	<i>pharaonis</i> (L.)	
-	Head and alitrunk at least moderately shining		4
4.(3)	Colour uniformly blackish brown	<i>carbonarium</i> (Smith)	
-	Colour yellowish grey or yellow		5
5.(4)	Head and alitrunk smooth and shining, yellow	<i>zulu</i> Santschi	
-	Head and alitrunk with diffuse punctulate sculpture; colour greyish yellow, rather dull	<i>schultzei</i> Forel	
6.(1)	Antennal scape short, clearly not reaching occiput		7
-	Antennal scape reaching or surpassing occiput		10
7.(6)	Eyes large EL: HL 0.3; gula hairs long and curved forming a psammophore		
		<i>barbatulum</i> Mayr	
-	Eyes small EL; HL 0.15; gula with short hairs only		8
8.(7)	Body colour evenly brownish to brownish black	<i>karawajewi</i> Forel	
-	At least apex of gaster darker than rest of body		9
9.(8)	Head and alitrunk pale reddish brown or testaceous	<i>gracillimum</i> (Smith)	
-	Head and alitrunk clear yellow	<i>destructor</i> (Jerdon)	
10.(6)	Metanotal furrow a deep broad trench, in profile forming a right angle between mesonotum and propodeum		11
-	Metanotal furrow shallow, in profile forming an oblique angle		13
11.(10)	Head coarsely sculptured, darker than reddish mid body; propodeal dorsum convex without a median concave area	<i>areniphilum</i> Santschi	
-	Head finely sculptured, unicolorous clear red with alitrunk; propodeum with median longitudinal flattened or incavate area		12
12.(11)	Penultimate funiculus segment more than twice as long as broad; head relatively long widening anteriorly, CI 75-81	<i>niloticum</i> Emery	
-	Penultimate funiculus segment less than twice as long as broad; head shorter more rectangular, CI 83-86	<i>venustum</i> (Smith)	
13.(10)	Propodeum with a distinct longitudinal median furrow		14
-	Propodeum without a distinct median furrow, at most slightly incavate posteriorly		15
14.(13)	Head and alitrunk dull red, contrasting with dark gaster	<i>phoenicium</i> Santschi	
-	Head and alitrunk shining brownish black, uniform with dark gaster	<i>abeillei</i> André	
15.(13)	Head, alitrunk and most of gaster yellowish, head, alitrunk and antennae exceptionally long	<i>luteum</i> Emery	
-	Colour otherwise; body and appendages not exceptionally long		16
16.(15)	Head and alitrunk clear red contrasting with dense black gaster		17
-	Head and alitrunk reddish brown or dark not well contrasted with gaster		18
17.(16)	Head and antennal scapes relatively short, whole dorsum with scattered long hairs	<i>nitidiventre</i> Emery	
-	Head rectangular, scapes clearly surpass occipital margin; alitrunk dorsum without hairs	<i>bicolor</i> Emery	
18.(16)	Head densely sculptured and dull		19
-	Head moderately shining with only superficial sculpture	<i>salomonis</i> (L.)	
19.(18)	Whole body uniformly dark; metanotal furrow deep and distinct	<i>afrum</i> André	
-	Alitrunk and often head lighter than gaster; metanotal furrow shallow scarcely breaking dorsal outline of alitrunk in profile	<i>subopacum</i> (Smith)	

Monomorium abeillei André, 1881 (figs 52, 60)

Monomorium abeillei André, 1881; Anns. Soc. ent. Fr.(6) 1: 67.

Riyadh Agricultural Centre 7.III.75; 7.VII.75; ♀♀ W. Büttiker. Zahran 25.III.83; Abu Arish 25.III.83; Karm Rausch 5.IV.83; Al Tawlah 7.IV.83; Anamas 8.IV.83; Sawdah Mt. 9.IV.83; desert between Abha and Najran 10.IV.83; Sulaiel desert 11.IV.83; Hofuf sand mountain 13.IV.83; Al Qatif coastal beach 15.IV.83; ♀♀ ♀♀ CAC. Oman: Khabura III.79; ♀ R.P. Whitcombe.

This proved to be one of the commoner *Monomorium* species found equally in sandy desert, coastal areas and on high ground in the Asir mountains. It is a common Middle East species and is easily recognisable from its small size, dark colour and rather shining appearance and by the distinctive longitudinal furrow on the dorsum of the propodeum.

Monomorium afrum André, 1884 (fig. 51)

Monomorium afrum André, 1884; in Magretti, Annali Mus. civ. Stor. nat. Giacomo Doria 21: 540.

Al Kola 10.IV.83; desert between Abha and Najran 10.IV.83; Sulaiel desert 11.IV.83; ♀♀ ♀♀ CAC.

This is rather similar to *M. abeillei* but larger, more sculptured and with a more square head. The posterior dorsum of the propodeum is hollowed but unlike *M. abeillei*, the furrow does not extend as far as the metanotal break. In the queen, the alitrunk is higher and more rounded, the petiole thinner and higher and the head at least as wide as long, CI 100 (*M. abeillei* CI 92). The eyes are distinctly larger, occupying more than 0.35 x HL compared with *M. abeillei* (x 0.27).

According to the Forel collection, the Arabian samples resemble specimens labelled *asmarensis* Forel (*M. afrum* var. *asmarensis* Forel, 1910, Zool. Jb. Abt. Syst. 29: 250) being brownish black rather than dull black but this is assumed to be a minor colour variation.

Monomorium areniphilum Santschi, 1911 n. stat.

Monomorium salomonis var. *areniphila* Santschi, 1911; Bull. Soc. Hist. nat. Afr. N. 3: 84.

Monomorium (Xeromyrmex) salomonis st. *areniphilum*. – Santschi, 1936; Bull. Soc. Sci. nat. Maroc 16: 57.

Nuwayriyah 20.IV.80; ♀♀ W. Büttiker.

This is like a large *M. salomonis* (L.) but is more shining with a much deeper metanotal furrow and more rounded propodeum which clearly differentiate it as a separate species and not a subspecies of *M. salomonis*.

Monomorium barbatulum Mayr, 1877

Monomorium barbatulum Mayr, 1877; in Fedschenko, Voy. Turkestan, Formicid.: 17.

Oman: Wahiba sands 7.XII.84; ♀♀ W. Gallagher.

This is a central Asian species which has also been recorded from Afghanistan (COLLINGWOOD 1960) but not so far, from the Middle East or Arabia. It is a small, dark, large headed species superficially resembling a large worker of *M. karawajewi* but immediately distinct by its large eyes and long curved gula hairs.

Monomorium bicolor Emery, 1877 (fig. 54)

Monomorium bicolor Emery, 1877; Annali Mus. civ. Stor. nat. Giacomo Doria 9: 368.

Abu Arish 26.III.83; Karm Rausch 5.IV.83; Al Qatif coast 14.IV.83; Riyadh Agricultural Centre 19.IV.83; ♀♀ ♀♀ CAC.

This small sculptured but brightly coloured species is well known from various localities in North Africa and the Middle East.

Monomorium clavicorne André, 1881

Monomorium clavicorne André, 1881; Anns. Soc. ent. Fr. (6) 1: 68.

Riyadh Agricultural Centre 22.III.83; 19.IV.83; Fayfa 27.III.83; Al Qatif 15.IV.83; Hair valley 17.IV.83; ♀♀ CAC.

Workers of this minute yellow species were found only as single foragers in soil and litter. *M. clavicorne* is recorded from tropical Africa as well as the Middle East.

Monomorium carbonarium (Smith, 1858)

Myrmica carbonaria Smith, 1858; Cat. Hym. Brit. Mus. 6: 127.

Monomorium carbonarium (Smith) Roger, 1863; Berl. ent. Z. 7: 31.

This was recorded by FOREL (1907) from Muscat leg. Biro but no recent examples have been seen. This species was described from Madeira and occurs abundantly on the islands of the Azores but is not so far known from Africa. Two small dark workers from Oman in collections sent by Mr. M. Gallagher are about the same size as *M. carbonarium* but resemble in their antennal conformation small workers of *M. hesperium* Emery.

Monomorium destructor (Jerdon, 1851)

Atta destructor Jerdon, 1851; Madras J. Lit. & Sci. 17: 105.

Monomorium destructor (Jerdon) Emery, 1893; in Dalla Torre, Cat. Hym. 7: 66.

Makkah 8.XII.79; ♀♀ W. Büttiker. Sug al Ahad riverside 26.III.83; Al Qahman mangrove swamp 1.IV.83; ♀♀ CAC.

This is a wide ranging cosmopolitan species and a well known pest in the Americas. It is a light yellow species with only the apical segments of the gaster dark but is otherwise similar to the slightly darker *M. gracillimum*. The Sug al Ahad specimens were taken from a colony in a partly rotten tree.

Monomorium gracillimum (Smith, 1861) (fig. 57)

Myrmica gracillima Smith, 1861; J. Proc. Linn. Soc. London 6: 34.

Monomorium gracillimum (Smith) Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 753.

Riyadh 26.IV.75; 10.III.80; Jeddah 26.V.75; 26.V.79; Makkah 35 km south 8.XII.79; Hofuf 20.VI.78; 23.V.79; Sanam 28.VIII.80; Shoiba 6.XII.83; Wadi Hanaq 20.I.84; ♀♀ ♀♀ W. Büttiker. Riyadh 19.III.83; Abu Arish 25.III.83; Fayfa 30.III.83; Karm Rausch 5.IV.83; scrub desert west of Najran 10.IV.83; Sulaiel desert 11.IV.83; ♀♀ ♀♀ CAC. Socotra III.76 ♀♀ ♀♀ K.M. Guichard. Oman: Dhofar XI.79; ♀ R.P. Whitcombe.

This is a very common tropicopolitan species, abundant on the Indian subcontinent but found throughout the old world tropics. It is one of the few species previously recorded from Arabia (Muscat, FOREL 1907).

Monomorium karawajewi Forel, 1913 n. stat. (provisional)

Monomorium gracillimum var. *karawajewi* Forel, 1913; Revue suisse Zool. 21: 437.

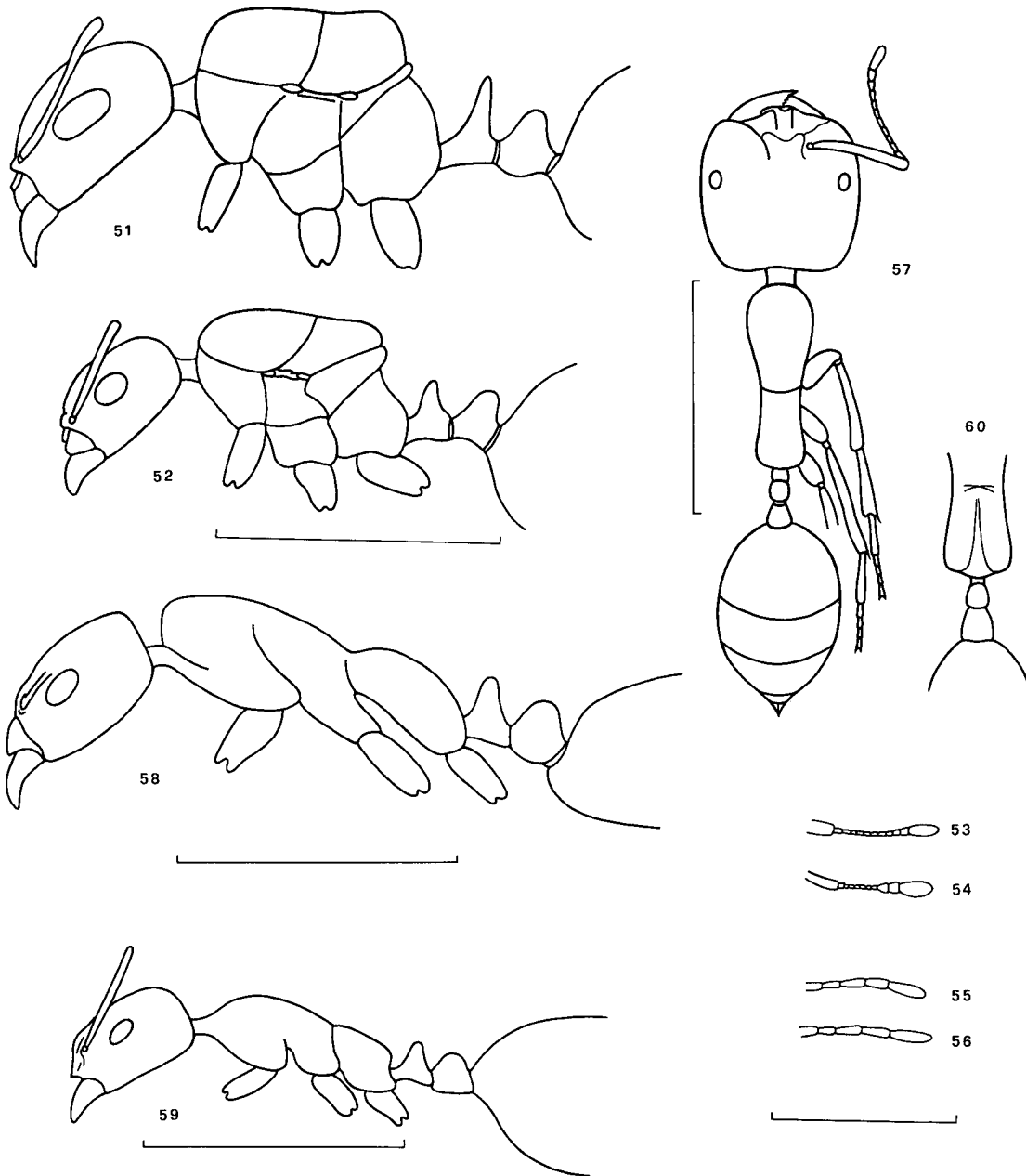
Wadi Khumra 10.II.78; Al Mindak 8.IV.80; An Naahmah 12.X.83; ♀♀ W. Büttiker. Al Tawlah 7.IV.83; Wadi Shugub 7.IV.83; Bishah 7.IV.83; Sulaiel 11.IV.83; Riyadh Agricultural Centre 12.IV.83; Al Qatif 14.IV.83; ♂♂ ♀♀ ♀♀ CAC.

This varietal name has been applied to a form of *M. gracillimum* that is evenly brownish to black, occurring in the Middle East. It is given provisional species status here because of the apparent consistency of the colour difference but there is no other discernible difference in form, sculpture or pilosity to make a specific distinction beyond doubt.

***Monomorium luteum* Emery, 1881**

Monomorium luteum Emery, 1881; Annali Mus. civ. Stor. nat. Giacomo Doria 16: 532.

This was described from Tes in Southern Arabia. Examples in NHMB and others sent by M. Gallagher from Oman have the body colour yellow except for the brown apex of the gaster. Workers resemble those of *M. niloticum* in the length of the head and appendages but the alitrunk is relatively longer and structurally different in the much more shallow metanotal impression.



Figs 51–60: Genus *Monomorium*. 51, *M. afrum* ♀, profile view; 52, *M. abeillei* ♀, profile view; 53, *M. zulu* ♂, funiculus; 54, *M. clavicorne* ♀, funiculus; 55, *M. venustum* ♀, funiculus club; 56, *M. niloticum* ♀, funiculus club; 57, *M. gracillimum* ♀, dorsal view; 58, *M. venustum* ♀, profile view; 59, *M. phoenicium* ♀, profile view; 60, *M. abeillei* ♀, propodeum in dorsal view. (Scale bar 1 mm).

Monomorium nitidiventre Emery, 1893 n. stat.

Monomorium bicolor ssp. *nitidiventris* Emery, 1893; Anns. Soc. ent. Fr. 62: 256.

Fayfa 29.III.83; Abu Arish 2.IV.83; ♀♀ ♀ CAC.

This small bicoloured species was first described from Aden in South Arabia. It differs from *M. bicolor* in the shorter head and appendages – the scape does not reach the occipital border – and by the presence of more numerous long dorsal hairs distributed over the alitrunk.

Monomorium niloticum Emery, 1881 (fig. 56)

Monomorium niloticum Emery, 1881; Annali Mus. civ. Stor. nat. Giacomo Doria 16: 531.

Araida 9.V.75; Wadi Hismah 29.IX.80; Wadi Hanaq 8.V.83; Ras Hatibah 11.X.83; ♀♀ W. Büttiker. Abu Arish resthouse grounds 3.V.83; Al Qatif date palms 13.IV.83; Riyadh town 19.IV.83; ♀♀ CAC. Oman: Sifar Al Shayk 2.III.83; Marbat Dhofar 18.II.84; ♀♀ M. Gallagher.

This is one of the larger *Monomorium* species similar to *M. venustum* (Smith) but generally of a brighter colour and with both the head and the antennal segments more elongate. It was described from Egypt but also recorded from Arabia as *M. niloticum* var. *grandis* FOREL (1910).

Monomorium pharaonis (Linnaeus, 1758)

Formica pharaonis Linnaeus, 1758; Syst. Nat. Ed. 10, 1: 580.

Monomorium pharaonis (L.) Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 752.

This common cosmopolitan small yellow species was not actually seen but according to Mr. Nimah Majid Awami, Public Health Entomologist to ARAMCO, it is a common household pest in the Eastern Region.

Monomorium phoenicium Santschi, 1927 (fig. 59)

Monomorium salomonis ssp. *subopacum* var. *phoenicia* Emery, 1908; Dt. ent. Z.: 677.

Monomorium (Xeromyrmex) subopacum var. *phoenicium* Santschi, 1927; Bull. et Anns. Soc. ent. Belg. 67: 242.

Monomorium phoenicium. – Tohmé, 1969: 11

Tobuk 24.IV.77; ♀♀ KAU – NHMB Expedition. Addar 7.I.83; ♀♀ W. Büttiker. Sug al Ahad river-side 26.III.83; Fayfa 27.III.83; 28.III.83; Abu Arish 2.IV.83; Anamas 8.IV.83; ♀♀ CAC.

This bicoloured species is like *M. abeillei* immediately recognisable by the distinctive longitudinal furrow on the propodeum. It is common in the Middle East and occurs also in North Africa.

Monomorium salomonis (Linnaeus, 1758)

Formica salomonis Linnaeus, 1758; Syst. Nat. Ed. 10, 1: 580.

Monomorium salomonis (L.) Roger, 1862; Berl. ent. Z. 6: 294.

Hofuf tamarisk park 13.IV.83; ♀♀ CAC. Kuwait 1979; ♀ K. Dumpert.

This is a common North African species.

Monomorium schultzei Forel, 1910

Monomorium schultzei Forel, 1910; in Schultze, Zool. Arthrop. Reise Afr. Formicid. 1910: 18.

Wadi Majorish 7.I.83; ♀♀ W. Büttiker.

This is a rather dull yellow sculptured species in the *M. minutum* species group. The first node is distinctly higher than the second, both being about the same width.

Monomorium subopacum (Smith, 1858)

Myrmica subopaca Smith, 1858; Cat. Hym. Brit. Mus. 6: 127.

Monomorium subopacum (Smith) Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 753.

Najran 24.III.83; Hofuf Agricultural Centre 13.IV.83; ♀♀.

Typical samples of this dull coloured South European/North African species were collected in grassy litter.

Monomorium venustum (Smith, 1858) (figs 58, 55)

Myrmica venusta Smith, 1858; Cat. Hym. Brit. Mus. 6: 127.

Monomorium venustum (Smith) Roger, 1863; Berl. ent. Z. 7: 32.

Jeddah 26.V.75; Afif 8.IX.75; Araida 9.IX.75; Al Fresh 20.IV.77; Al Khubra 29.VII.78; Wadi Tinan 16.V.79; Jebel an Nir 2.X.79; Wadi Shugub 11.IV.80; Ar Rayn 25.VIII.80; Wadi Ellah 8.IV.83; Wadi Hismah 24.IX.80; Khartan 12.IV.81; Bani Musayqirah 16.IX.81; Wadi Hilah 8.IX.83; Wadi Majarish 9.I.83; Ras Hatibah 11.X.83; Shoiba 24.XI.83; ♀♀ W. Büttiker. Riyadh Agricultural Centre 22.III.83; Wadi Kust 7.IV.83; Al Tawlah 7.IV.83; Al Kola 10.IV.83; Najran 10.IV.83; Al Qatif 14.IV.83; 15.IV.83; Hair 17.IV.83; ♀♀ ♀♀ CAC. Oman: Dhofar XI.79; ♀♀ R.P. Whitcombe. Khabura XI.83; ♀♀ M. Gallacher.

This abundant and conspicuous species is recorded from the Middle East and North East Africa. It appears to be dominant in many types of terrain in Arabia.

Monomorium zulu Santschi, 1914 (fig. 53)

Monomorium zulu Santschi, 1914; Göteborgs K. Vetensk. - o. Vitterh Samh. Handl. 15: 18.

Sanam 1030 m 28.VIII.80; Wadi Azizah 18.IX.83; ♀♀ W. Büttiker. Bishah 7.IV.83; Anamas 8.IV.83; Sawdah mountain 9.IV.83; ♀♀ CAC.

This ant had the size, appearance and habits of an European *Diplorhoptum* species. It was found nesting in dense clusters under stones in the Asir mountains. There are many such minute yellow *Monomorium* species and it is not certain that this is correctly named. However specimens resemble well enough *M. zulu* from Central South Africa in NHMB and differ in detail from *M. crawleyi* Santschi from Egypt according to a paratype kindly loaned by Mr. Barry Bolton of BMNH which has the head more punctulate, the nodes duller and the tibiae with fewer hairs than *M. zulu*.

Subfam. Formicinae

Key to genera

- | | | |
|-------|---|--|
| 1. | Antennae 12 segmented | 2 |
| - | Antennae 11 segmented | 5 |
| 2.(1) | Antennal insertions distant from clypeal margin | 3 |
| - | Antennal insertions close to or contiguous with clypeal margin | 4 |
| 3.(2) | Petiole with spines or teeth; pronotum anteriorly bidentate | <i>Polyrhachis</i> Smith |
| - | Petiole entire or emarginate never dentate; pronotum rounded or angled anteriorly without projecting teeth. | <i>Camponotus</i> Mayr |
| 4.(2) | Ocelli present and distinct. Anterior of gula with long curved hairs | <i>Cataglyphis</i> Foerster |
| - | Ocelli vestigial or absent. Anterior of gula with short hairs only | <i>Paratrechina</i> Motschulsky |
| 5.(1) | Propodeum bituberculate or bidentate; petiole incised and usually bidentate | <i>Acantholepis</i> Mayr |
| - | Propodeum unarmed; petiole never emarginate | 6 |

- 6.(5) In dorsal view metanotum visibly separated from mesonotum by a deeply impressed suture *Plagiolepis* Mayr
 – Metanotum not distinguished by sutures; metanotal furrow rounded and shallow *Anoplolepis* Santschi

Genus *Polyrhachis* Smith

This is a genus of tropical arboreal ants with pronounced spiny ornamentation.

Key to species

1. Petiole with developed lateral spines only. Propodeal spines long and curved *simplex* Mayr
 – Petiole with two distinct median spines as well as lateral. Propodeal spines very short *viscosa* Smith

Polyrhachis simplex Mayr, 1863 (fig. 62)

Polyrhachis simplex Mayr, 1863; Verh. zool.-bot. Ges. Wien 28: 682.

Al Qatif 14.IV.83; ♀♀ CAC. Oman: Khabura 27.VI.80; ♀ R.B. Whitcombe.

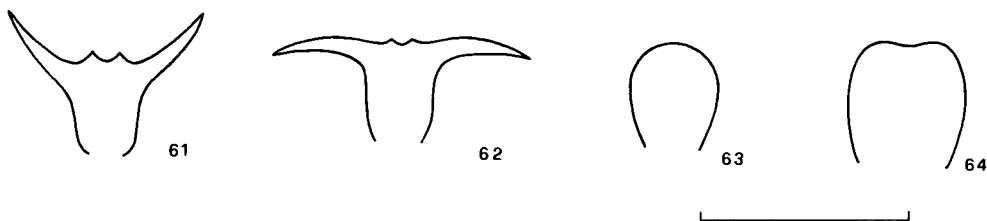
This is one of the commonest species of the genus in the Indian subcontinent and occurs also north of the tropics in Afghanistan, the Middle East and Morocco.

Polyrhachis viscosa Smith, 1858 (fig. 61)

Polyrhachis viscosa Smith, 1858; Cat. Hym. Brit. Mus. 6: 71.

Fayfa semi-cultivated valley 31.III.83; 1 ♀ CAC.

This dense black species is recorded from both East and West tropical Africa. According to BOLTON 1973, it is a savannah species nesting in sandy soil. The single worker at Fayfa was foraging on the soil surface under bushy scrub.



Figs 61–64: Petiole in posterior view. 61, *Polyrhachis viscosa* ♀; 62, *P. simplex* ♀; 63, *Camponotus oasium* ♀; 64, *C. thoracicus* ♀. (Scale bar 1 mm).

Genus *Camponotus* Mayr

List of species:

- Camponotus acvapimensis* Mayr, 1862
- Camponotus adenensis* Emery, 1925
- Camponotus aegyptiacus* Emery, 1915
- Camponotus alii* Forel, 1890
- Camponotus arabicus* n. sp.
- Camponotus atlantis* Forel, 1890
- Camponotus baldaccii* Emery, 1894
- Camponotus empedocles* Arnold, 1922
- Camponotus fayfaensis* n. sp.
- Camponotus fellab* Tohmé, 1969
- Camponotus flavomarginatus* Mayr, 1862
- Camponotus hova* Forel, 1866
- Camponotus ilgii* Forel, 1895
- Camponotus jizani* n. sp.
- Camponotus kersteni* Gerstaecker, 1870
- Camponotus maculatus* (Fabricius, 1781)
- Camponotus oasisium* Forel, 1890
- Camponotus schweinfurtti* Forel, 1910
- Camponotus sericeus* (Fabricius, 1798)
- Camponotus thales* Forel, 1910
- Camponotus thoracicus* (Fabricius, 1804)
- Camponotus xerxes* Forel, 1904

Geographical distribution:

- Tropical Africa
- South Arabia
- North east Africa
- North Africa
- Arabia
- North Africa
- South east Europe
- Central & South Africa
- Saudi Arabia
- Egypt, Middle East
- East Africa
- Madagascar, Aldabra, Socotra
- North east Africa
- Saudi Arabia
- East Africa
- Tropical Africa
- North Africa
- South Arabia
- Africa, India, Middle East
- North & South east Africa
- North Africa
- Central Asia, Middle East

Camponotus species are very diverse in size and form. The majority of species depend on Homoptera exudates as a main source of food. Major workers of the larger species appear very formidable and their mandibles can cut through the skin easily.

Key to species (large workers only)

- 1. In profile, dorsal outline of alitrunk interrupted by a deep metanotal furrow 2
- In profile, dorsal outline of alitrunk seen as a more or less continuous curve 4
- 2.(1) Whole body densely sculptured, hairy and opaque; propodeum broadly dentate posteriorly *sericeus* (Fabricius)
- Body weakly sculptured, moderately shining with sparse hairs; propodeum obtusely rounded posteriorly. (head with shallow round punctures) 3
- 3.(2) Gaster testaceous, contrasting with brown alitrunk and head *fayfaensis* n. sp.
- Gaster dark, unicolorous with rest of body; head sometimes reddish brown *ilgii* Forel
- 4.(1) Gaster dull with close pubescence 5
- Gaster more or less shining with dilute pubescence 6
- 5.(4) Gaster with long thick silvery pubescence with a distinct longitudinal pattern on each side of the median line, head and body uniformly dark *flavomarginatus* Mayr

- Gaster with short pubescence, pattern if present appears as a single median furrow; genae yellowish red immediately above mandible insertions *jizani* n. sp.
- 6.(4) Gaster with distinct pattern of 2 or 3 yellow blotches 7
- Gaster with first gaster tergites either uniformly dark or yellowish or pale yellowish brown in part 8
- 7.(6) Yellow blotches on gaster appear as a row of 2 or 3 discrete spots on either side; gula hairs numerous. Larger species, HW 3.6–3.75 mm, ♀ 3.1 mm *maculatus* (Fabricius)
- Three yellow blotches on each side of gaster dorsum merge into each other laterally giving an irregular banded effect; gula hairs present but not numerous. Smaller species HW 3.5 mm or less, ♀ HW 2.7 mm *aegyptiacus* Emery
- 8.(6) Colour uniformly brown to brownish black, legs paler 9
- At least lower part of posterior mesosoma and scale testaceous 14
- 9.(8) Occiput viewed in full face with at least one seta at each corner *acvapimensis* Mayr
- Occipital hairs if present restricted to median area 10
- 10.(9) Gula hairs very sparse or absent; legs yellow *adenensis* Emery
- Gula hairs always present; legs pale brown or testaceous 11
- 11.(10) Gaster dorsum without pubescence, whole body very shining *thales* Forel
- Gaster with sparse pubescence, body duller with some sculpture 12
- 12.(11) Hind tibiae channeled with a few spiny hairs on flexor surface and short decumbent pubescence evenly distributed round whole appendage *empedocles* Arnold
- Hind tibiae not channeled with a few subdecumbent hairs only and sparsely distributed pubescence 13
- 13.(12) Larger species HW 2.4–3.2 mm; gaster tergite margins with narrow pale bands; legs pale brown *kersteni* Gerstaecker
- Smaller species, maximum HW less than 2.4 mm; gaster uniformly dark; legs testaceous *schweinfurtti* Forel
- 14.(8) Hind tibiae with a row of 8 or more spiny hairs on flexor surface 15
- Hind tibiae with hairs either fine and subdecumbent or restricted to distal end 20
- 15.(14) Gula hairs present 16
- Gula without hairs 18
- 16.(15) Gula hairs abundant; alitrunk pale or with slight promesonotal infuscation; smaller species HW 3.3 mm or less *baldaccii* Emery
- Gula hairs sparse, up to 6 at most; alitrunk mainly brown or brownish black: HW 4.0 mm or more 17
- 17.(16) Large workers have whole dorsum of alitrunk and whole gaster brownish black. Maximum HW 4.5 mm *fellah* Tohmé
- Large workers have most of alitrunk and base and sides of first gaster tergite irregularly pale yellowish brown; Maximum HW less than 4 mm *hova* Forel
- 18.(15) Large workers almost entirely black except for legs and lower part of petiole. ♀ propodeum unicolorous dark with rest of alitrunk *xerxes* Forel
- Large workers with at least lower part of alitrunk and scale pale brown or testaceous; ♀ propodeum testaceous 19
- 19.(18) First gaster tergite with basal two thirds testaceous; dorsum of petiole steeply rounded *oasium* Forel
- First gaster tergite with small patch at base testaceous; dorsum of petiole widely rounded to flat *thoracicus* (Fabricius)

- 20.(14) First gaster tergite and petiole pale yellow *atlantis* Forel
 – Body colour variable without distinctive pattern 21
 21.(20) Gula hairs abundant; gaster with scattered dorsal pubescence and somewhat dull
arabicus n. sp.
 – Gula hairs sparse; gaster with very sparse pubescence, intensely shining *alii* Forel

***Camponotus acvapimensis* Mayr, 1862**

Camponotus acvapimensis Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 664.

Socotra: Adho Dimellus IV.69; ♂ ♀♀ ♀♀ K.M. Guichard. Jebel Al Alam 21.X.81; ♀ W. Büttiker.

This species is widely distributed throughout the savannahs and cleared forest areas of tropical Africa where it is a common daytime forager. It is a dark opaque species with dark appendages and further characterised by the fringe of occipital hairs and the presence of abundant dorsal and gula hairs.

***Camponotus adenensis* Emery, 1925 n. stat.**

Camponotus maculatus ssp. *thraso* var. *adenensis* Emery, 1893; Anns. Soc. ent. Fr. 62: 257.

Camponotus thraso var. *adenensis* Emery, 1925: 92.

Fayfa tamarisk grove 27.III.83; Fayfa hillside 28.III.83; Al Qahman mangrove swamp 1.IV.83; ♀♀ CAC. Hakimah 22.IX.81; ♀♀ W. Büttiker.

This is a small dark brown species with yellow to reddish yellow legs. Gula hairs are either absent or reduced to three or four at most towards the posterior part of the head. Both head and alitrunk are finely sculptured and opaque with the gaster more shining. HW of largest worker 2.4 mm. The hind tibiae lack spiny bristles but a fringe of very short suberect pubescent hairs runs the length of the tibial underside. *C. thraso* Forel is a bicoloured Indian species according to named examples in the Forel collection where there is an example of *C. adenensis* labelled type which matches the Saudi Arabian material. *C. adenensis* was described and recorded from the one locality, Aden.

***Camponotus aegyptiacus* Emery, 1915**

Camponotus maculatus ssp. *aegyptiaca* Emery, 1915; Bull. Soc. ent. Fr. (1915): 79.

Camponotus aegyptiacus. – Baroni Urbani, 1972; Verhandl. naturf. Ges. Basel 82 (1): 130.

Jeddah 20.V.75; Khaybar 26.V.79; Wadi Shugub 21.IV.80; Talaa 23.IX.80; Wadi Talham 27.IX.80; Wadi Majorish 2.I.82; Wadi Horash 29.IX.80; Wadi Nimar 20.V.83; Uqdah 26.VIII.83; Wadi Ellah 9.IX.83; Wadi Dhyan 14.IX.83; Wadi Aridah 20.IX.83; Harithi 27.I.84; ♂♂ ♀♀ ♀♀ W. Büttiker. Al Kharj desert 23.III.83; Al Kharfa desert 24.III.83; Abu Arish 25.III.83; Sug al Ahad 26.III.83; Fayfa 27.III.83; 30.III.83; Sulaiel desert 11.IV.83; Al Qatif coast 14.IV.83; ♂♂ ♀♀ ♀♀ CAC.

This is a common North east African species. This species is mainly active at night when individuals may be seen flitting rapidly over the ground in search of food. The minor workers are very pale.

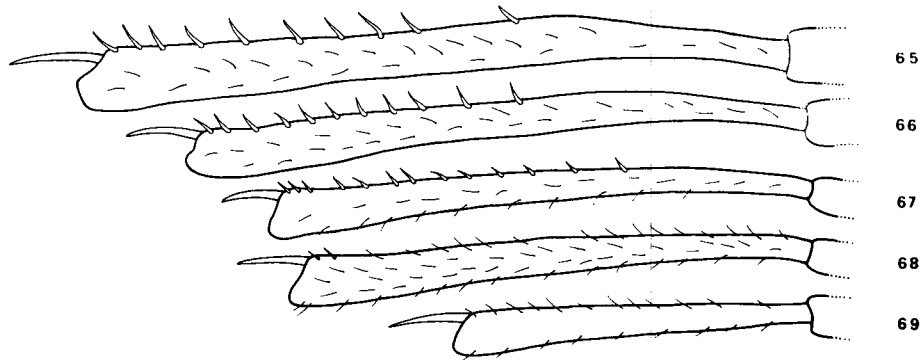
***Camponotus alii* Forel, 1890**

Camponotus rubripes st. *alii* Forel, 1890; Anns. Soc. ent. Belg. 34: 61.

Camponotus alii. – Emery, 1920; Bull. Soc. ent. ital. 52: 7.

Anamas 8.IV.83; Al Tawlah 7.IV.83; ♀♀ ♀♀ CAC.

The colour of this North African species varies with the alitrunk ranging from red to black in the larger workers. It is common in the Atlas mountains of North Africa.



Figs 65–69: Hind tibia of *Camponotus*. 65, *C. xerxes* ♀; 66, *C. hova* ♀; 67, *C. arabicus* ♀; 68, *C. empedocles* ♀; 69, *C. kersteni* ♀. (Scale bar 1 mm).

Camponotus atlantis Forel, 1890

Camponotus rubripes st. *atlantis* Forel, 1890; Anns. Soc. ent. Belg. 34: 83.

Camponotus atlantis. – Emery, 1925: 91.

Al Farrash 15.X.82; ♀♀ W. Büttiker. Fayfa hillside 29.III.83; Wadi Shugub 7.IV.83; ♀♀ ♀ CAC. Yemen: Colline Khazain, Wadi Magsala XI.79; ♀♀ Borri & Poggesi (B. Lanza).

These ants are characterised by the yellow blotch on the gaster which extends over the first and second tergites. It is similar in size, structure and pilosity to *C. alii* but differs in the denser sculpture of the head and promesonotum and generally much paler colour, the minor workers being almost completely yellow. Colonies were under stones on hillside terraces. Like *C. alii* this species is general in the mountains of North Africa.

Camponotus arabicus n. sp. (figs 67, 72, 74)

Riyadh Agricultural Centre 30.I.80; ♀♀ ♀♀ A.S. Talhouk. Riyadh Agricultural Centre 19.IV.83; ♀♀ ♀ CAC. Oman: Qaboos 4.XI.83; ♀♀ M. Gallagher.

This is similar to *Camponotus alii* Forel but has more profuse gula hairs and a more sculptured gaster with closer pubescence. It differs also in colour. The smaller workers have the alitrunk pale yellowish brown while only the largest workers have the alitrunk dorsum dark.

Holotype major worker: TL 11.2; HL 2.95; HW 3.13; SL 2.25; EL 0.40; CI 106; SI 72.

Head, alitrunk and gaster are dark brownish black; the funiculus, legs, petiole, base of the propodeum and an indefinite patch on the basal face of the gaster are testaceous. The head and alitrunk are opaque with close reticulate microsculpture. The gaster is finely cross striate with pubescence evenly scattered over the whole surface giving a much duller appearance than that of *C. alii*. In profile 10 hairs may be seen evenly distributed over the gula surface. The moderately flattened hind tibiae bear two spinules and 14 subdecumbent short hairs on the flexor surface. Long hairs are scattered over the whole dorsum.

The antennal scapes are short, barely reaching the occipital margin. The dorsal outline of the alitrunk is evenly curved. The petiole scale is thin in profile with a convex anterior face. The clypeus is keeled and projects forward as a rectangular plate.

The minor workers are wholly yellowish with only the head dorsum and the gaster apex darker.

The queens are dark like the major worker with the head similarly sculptured. The mesoscutum and scutellum are smooth and shining. The gaster dorsum is less sculptured than in the large workers.

The head is slightly longer than broad with a mildly concave occipital margin. HL 2.75; HW 2.6; SL 3.0; CI 94.8; SI 115.4; Gula and appendage pilosity as in the worker.

This is a nocturnal species, somewhat fugitive, living in small colonies at the base of date palms. Alate queens were in the nests in November and January according to captures by M. Gallacher and A.S. Talhouk respectively.

Holotype worker, paratype workers and paratype queens from Riyadh in NHMB.

Camponotus sp.

Abu Arish resthouse grounds 26.III.83; ♀♀ CAC.

This series of small dark brown workers were taken tending Homoptera on shrubs. This species is similar to *C. adenensis* in size and colour but differs in having a number of gula hairs always present, a more decumbent and shorter tibial pubescence and a relatively longer alitrunk. Workers closely match specimens in the Forel collection, Geneva, named *C. schweinfurti* (*Camponotus maculatus* ssp. *negus* var. *schweinfurti* Forel, 1910: 453) from the type locality, Menakka 1.XII.87 in Arabia. This varietal name is at present unavailable until further study establishes the status of *Camponotus maculatus* ssp. *negus* Forel although it should be stated that *C. schweinfurti*, a name I have used in the keys, is in no way at all similar to or related to *C. maculatus*.

Camponotus baldaccii Emery, 1894 n. stat.

Camponotus dichrous var. *baldaccii* Emery, 1894; Bull. Soc. ent. ital. 26: 9.

Camponotus sylvaticus ssp. *baldaccii*. – Emery, 1920, Bull. Soc. ent. ital. 52: 6.

Hadda XI. 38; ♀♀ H.S.J.A. Philby. Hesua 29.VIII.82; ♀♀ W. Büttiker.

This is linked to *C. sylvaticus* Ol. of South west Europe by its pilosity characters but is distinguished by its yellow alitrunk from the reddish to black *C. sylvaticus*, its less robust appearance and smaller size. Its main area of distribution is in the Greek Islands and Turkey. True *C. sylvaticus* is not found east of Italy. *C. baldaccii* males are pale testaceous in contrast to the black much more robust males of *C. sylvaticus*.

Camponotus empedocles Arnold, 1922 n. stat. (fig. 68)

Camponotus maculatus r. *thales* var. *empedocles* Forel, 1913; Dt. ent. Z. (1913): 224.

Camponotus maculatus ssp. *empedocles* Arnold, 1922; Ann. S. Afr. Mus. 14: 645.

Anamas 2280 m IV. 80; Wadi Azizah 18.IX.83; Wadi al Amar 2000 m 18.IX.83; Wadi Majarish 22.III.82; ♀♀ ♀♀ W. Büttiker. Anamas 8.IV.83; Tanuma 8.IV.83; ♂♂ ♀♀ ♀♀ CAC.

This is the largest of the black *Camponotus* species found, HW 3.3–3.4 mm. The queen caste has the scapes and tibiae clothed with raised pubescence. This is less evident in the worker and male but is thicker and more abundant than in the other black species. Since *C. empedocles* neither resembles *C. maculatus* nor *C. thales*, it is clearly a distinct species. It was described from the mountains of Central South Africa. The Arabian locations are all from the higher areas of the Asir mountains.

Camponotus fayfaensis n. sp. (fig. 70)

Fayfa wooded valley 27.III.83; ♀♀ CAC.

A column of workers was seen ascending a tree from its base in scattered single file at a rapid pace in early evening. The distinctive colour contrast between the testaceous gaster and the brown head and alitrunk coupled with the deep metanotal groove as in *C. ilgii* was not matched by any species seen in BMNH, NHMB or the Geneva collections.

Holotype worker: TL 3.7; HL 1.2; HW 1.1; SL 1.14; EL 0.38; CI 91.7; SI 103.6.

Head and alitrunk brown, whole gaster and legs testaceous forming a distinct colour contrast. A fringe of hairs is present on the dorsum of the petiole scale and on the posterodorsum of the propodeum; two hairs are present on the mesonotum and two on the pronotum. The occiput has very short subdecumbent hairs. There are no gula or appendage hairs. The whole body is moderately shining with sparse pubescence. The ventral and front part of the head including the clypeus has widely spaced shallow punctures. The promesonotum has the dorsal outline an even curve, separated from the rounded propodeum by a wide metanotal groove. The scale is thin in profile with a convex anterior face and a rounded dorsum.

This species belongs to the same group as *C. ilgii* Forel in the *C. foraminosus* Forel species complex and would be easily recognised by the distinctive colour and the wide metanotal groove.

Holotype and paratypes in NHMB.

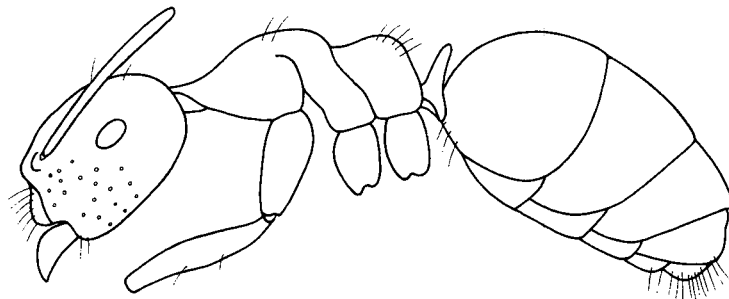


Fig. 70: *Camponotus fayfaensis* ♀, profile view.

Camponotus fellah Tohmé, 1969

Camponotus maculatus r. *oasium* var. *fellah* Emery, 1891; Explor. Sc. Tunisie Formic.: 18.

Camponotus fellah Tohmé, 1969; Doctorate thesis University of Toulouse: 13.

Camponotus fellah. – Pisarski, 1971; Bull. Acad. pol. Sci. CLVI 19 (11): 728.

Wadi Karrar 4.VIII.81; ♀♀ W. Büttiker. Al Qatif 16.IV.83; ♂ ♀♀ CAC. Oman: Khabura 17.III.78; 4.II.80; 31.VII.80; ♀♀ R.P. Whitcombe.

The major workers of this species are large, HW up to 4.5 mm and almost entirely black apart from the appendages, lower part of propodeum and petiole. They are only distinguishable from the similar *C. xerxes* by the presence of a few gula hairs in all castes. The minor workers are much paler than the large workers and in this differ from the common and even larger *C. compressus* (Fabricius) of India where workers of all sizes are dark and in addition have more abundant gula hairs. *C. fellah* is recorded from Egypt, Palestine and Syria but has also occurred in Afghanistan according to PISARSKI (1971).

Camponotus hova Forel, 1866 (fig. 66)

Camponotus hova Forel, 1866; Anns. Soc. ent. Belg. 30: 150.

Socotra; Adho Dimellus IV.69; ♀♀ K.M.Guichard. Oman: Afrad Batina, Khabura 3.II.80. ♀♀ R.P. Whitcombe.

This species links the *C. thoracicus* species group with *C. maculatus*. Gula hairs are always present as in *C. maculatus* but the first gaster tergite is mainly testaceous and does not have clearly demarcated pale spots. This species is recorded from Aldabra, Mozambique and Madagascar.

Camponotus flavomarginatus Mayr, 1862

Camponotus flavomarginatus Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 664.

Anamias 8.IV.83; Sawdah mountain 9.IV.83; ♀♀ CAC.

This is a distinctively patterned pubescent species in the *C. rufoglaucus* (Jerdon) complex. The gaster pubescence is close and thick and so arranged as to give the appearance of two shallow longitudinal furrows at each side of the middle dorsum. The tibiae are more flattened than in the North African *C. micans* which this species resembles in size and dark colour but not in the patterned pubescence. A small troop of workers was seen moving over stony ground in full daylight on Sawdah mountain at 3000 m. The species was described and recorded from East Africa.

Camponotus ilgii Forel, 1895

Camponotus ilgii Forel, 1895; Mitt. schweiz. ent. Ges. 9: 64.

Fayfa 28.III.83; 29.III.83; 30.III.83; Al Qahman 1.IV.83; ♀♀ CAC.

This species has the front part of the head more or less closely set with large shallow punctures as in *C. foraminosus* Forel but differs from that species and its allies by the deep impression between mesonotum and propodeum. It is exclusively arboreal nesting in sections of rotten wood on old trees. Single workers were often seen among files of *Crematogaster affabilis* workers in the same way as the European *Camponotus lateralis* Ol. is often associated with *Crematogaster scutellaris* Ol. presumably as a form of protection from predators.

Camponotus jizani n. sp. (fig. 71, 73)

Abu Arish (near Jizan) 25.III.83; Fayfa 27.III.83; Fayfa hillside 28.III.83; Fayfa resthouse environs 30.III.83; Abu Arish resthouse environs 3.IV.83; Khamis al Bhar 4.IV.83; ♀♀ CAC.

This is a small dark species with a dull pubescent gaster and reddish yellow genae that was found to be locally abundant in the far south west of the country. It is a ground nester that forages actively in daylight hours and was frequently seen tending Homoptera on shrubs.

Holotype worker major: TL 7.0; HL 2.02; HW 2.00; EL 0.43; CI 99; SI 103.

Colour dark brownish black with the genae below the eyes and immediately above the mandibles reddish yellow. A few long hairs are present on the dorsum of the head, alitrunk and gaster. Two to four gula hairs are generally present but the tibiae and scapes are hairless apart from short decumbent pubescence. Decumbent pubescence covers the whole body and is thicker on the gaster where in unworn specimens it is so arranged as to give an appearance of a shallow median furrow along the first two tergites. The mandibles and front part of the projecting keeled clypeus have wide spaced punctures. The head is almost as broad as long but narrows anteriorly. The occipital margin is feebly emarginate. The mandibles bear five strong teeth. The antennal scapes over-reach the occiput by about the length of the first funiculus segment. The alitrunk is evenly and obliquely curved with the dorsal outline broken by a small promesonotal suture. The petiole is simple with a mildly convex anterior face. The tibiae nearly cylindrical, not flattened or channelled.

The smaller workers have the head progressively elongate and narrowing in front of the eyes with the occiput progressively convex as size diminishes.

Holotype and paratypes in NHMB.

Camponotus kersteni Gerstaecker, 1870 (fig. 69)

Camponotus kersteni Gerstaecker, 1870; Arch. Naturgesch. 37: 355.

Al Qatif date palms 14.IV.83; ♂ ♀♀ CAC.

This East African species is similar to *C. empedocles* but not so large, HW 2.4–3.1 mm. The append-

ages are less thickly pubescent but the gaster dorsum is more opaque with denser microsculpture and closer pubescence. A colony was found nesting under date palm litter.

Camponotus maculatus (Fabricius, 1781)

Formica maculata Fabricius, 1781; Spec. Insect. 1: 491.

Camponotus maculatus (Fabricius) Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 654.

This afrotropical species was recorded from Aden by EMERY (1881) but no examples from Arabia have been seen during the present study.

Camponotus oasium Forel, 1890 (fig. 63)

Camponotus rubripes st. *oasium* Forel, 1890; Annl. Soc. ent. Belg. 34: 65.

Camponotus oasium. – Collingwood, 1960: 75.

Wadi Khamra near Khaybar V. 78; ♀♀ KAU-NHMB expedition. Oman: Montasar 15.XII.81; ♀ M. Gallagher.

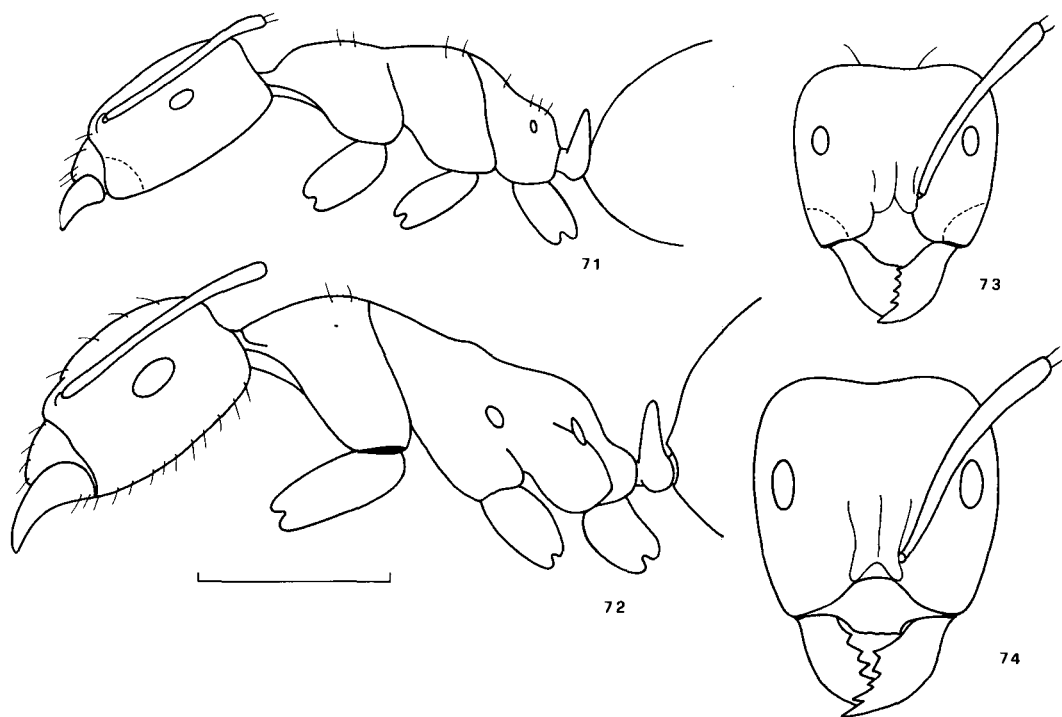
This North African species differs from the similar *C. thoracicus* (Fabricius) in the narrower more convex petiole and the occasional presence of one or two gula hairs.

Camponotus sericeus (Fabricius, 1798)

Formica sericea Fabricius, 1798; Suppl. Ent. Syst.: 279.

Camponotus sericeus (Fabricius) Mayr, 1862; Verh. zool.-bot. Ges. Wien 12: 675.

Wadi Araida 5.IX.75; Wadi Hanifa 30.I.76; Bir Hammi IV.80; Wadi Drady 1.V.80; Dammam 12.X.82; Wadi Majarish 7.I.83; Wadi Bani Malek 8.II.83; Wadi Dhyhan 13.IX.83; Bani Musayqirah



Figs 71, 72: Profile view of *Camponotus*. 71, *C. jizani* ♀; 72, *C. arabicus* ♀. Figs 73, 74: Head in dorsal view. 73, *Camponotus jizani* ♀; 74, *C. arabicus* ♀. (Scale bar 1 mm).

20.IX.83; Usfan 29.XII.83; ♂ ♀♀ W. Büttiker. Riyadh 25.VIII.81; ♀ M. Ghani. Near Makkah 6.IX.80; ♀♀ P. Gasparetti. Riyadh 10.I.80; ♀♀ ♀♀ A.S. Talhouk. Riyadh 22.III.83; Najran 24.III.83; Abu Arish 26.III.83; Sug al Ahad 26.III.83; Fayfa 29.III.83; 30.III.83; Karm Rauisch 5.IV.83; Wadi Qust 7.IV.83; Al Kola 10.IV.83; ♀♀ ♀♀ CAC. Oman: Dhofar 2.XI.83; ♀ M. Gallagher. Khabura Batina 27.I.80; ♀♀ R.P. Whitcombe.

This is the most widespread of the Arabian *Camponotus* species, occurring throughout the Indian subcontinent, savannah Africa and the Middle East. It is a hardy daytime forager and as with most *Camponotus* species tends coccids on trees and shrubs.

Camponotus thales Forel, 1910

Camponotus maculatus ssp. *thales* Forel, 1910; Annl. Soc. ent. Belg. 54: 453.

Camponotus thales. – Emery, 1920; Bull. Soc. ent. ital. 52: 6.

Wadi Azizah 18.IX.83; ♀ W. Büttiker. Anamas 8.IV.83; Sawdah mountain 9.IV.83; ♀♀ ♀♀ CAC.

This is the most brilliantly shining of the black species. The gaster almost entirely lacks pubescence or surface sculpture. Its known distribution is somewhat scattered from Morocco in North Africa to Basutoland far to the south.

Camponotus thoracicus (Fabricius, 1804) (fig. 64)

Formica thoracica Fabricius, 1804; Syst. Piez.: 397.

Camponotus thoracicus (Fabricius) Roger, 1862; Berl. ent. Z. 6: 285.

Dafina 20.IX.31; Hofuf 5.I.32; ♂ ♀♀ H.S.J.B. Philby. Riyadh 14.III.75; 14.VIII.75; 9.I.76; Wadi Shugub 7.IV.80; Al Dahlan 20.I.80; Bokhara 14.IX.80; Jebel al Alam 21.X.81; ♂♂ ♀♀ W. Büttiker.

Camponotus xerxes Forel, 1904 (fig. 65)

Camponotus maculatus st. *xerxes* Forel, 1904; Annl. Soc. ent. Belg. 48: 424.

Camponotus xerxes. – Pisarski, 1967; Annl. Zool. Warsz. 24: 414.

Al Ula 20.V.78; ♀♀ KAU-NHMB expedition. Araidia 9.X.75; Wadi Hanifa 7.V.76; Dammam 18.V.78; Kushm Dibi 20.V.78; Al Khubra 29.V.78; Hofuf 28.IX.78; Quwayiyah 1.III.79; Al Kharj 2.IV.80; Al Khardj 21.VI.80; Wadi Jureisi 30.V.80; Wadi Shugub 6.IV.80; Wadi Batayn 22.IV.80; Khashm Khafs 6.VI.80; Ashayrah 15.VIII.80; Um ad Dabal 13.V.80; Wadi Qatan 20.IX.80; Al Khardj 21.VI.80; Sanam 28.VIII.80; Shanib 20.IX.80; Jebel Bukysal 12.IX.80; Sal al Binat 24.IV.80; Hama 18.IX.81; ♂♂ ♀♀ ♀♀ W. Büttiker. Riyadh 14.I.80; 16.I.80; 18.I.80; 21.I.80; ♂♂ ♀♀ ♀♀ A.S. Talhouk. Riyadh 22.III.83; Sug al Ahad 26.III.83; Al Tawlah 7.IV.83; Wadi Shugub 7.IV.83; Hofuf 13.IV.83; Hair 17.IV.83; ♂♂ ♀♀ ♀♀ CAC.

The first Arabian record for this large conspicuous ant was from Muscat (FOREL 1904). The major workers are large like *C. fellab*, maximum HW up to 4.5 mm and can bite fiercely. Most foraging is during the early evening. Arabia is probably the western limit for this wide ranging Central Asian species. In North Africa various other species of the *C. thoracicus* complex take over including *C. thoracicus* itself, *C. oasisium* and *C. martensi* Forel all of which have the largest workers paler than *C. xerxes* with more or less extended areas of testaceous yellow or pale brown on the lower mesosoma, propodeum and first gaster tergite. Some authors e.g. EMERY (1925) link this species to *C. compressus* (Fabricius) of India but that species is larger, HW up to 5 mm, always has gula hairs while the smaller workers unlike all members of the *C. thoracicus* complex, are as dark as the larger. The smaller workers of *C. xerxes* have the alitrunk dull testaceous and are hard to distinguish from *C. thoracicus*, but males, queens and major workers are all considerably darker than the corresponding castes of *C. thoracicus*.

Genus *Cataglyphis* Foerster

List of species:	Geographical distribution:
<i>Cataglyphis abyssinica</i> (Forel, 1904)	North east Africa
<i>Cataglyphis adenensis</i> (Forel, 1904)	South Arabia
<i>Cataglyphis albicans</i> (Roger, 1859)	North Africa, Middle East
<i>Cataglyphis asiriensis</i> n. sp.	Saudi Arabia
<i>Cataglyphis desertorum</i> (Forel, 1894)	North Africa, Sahara
<i>Cataglyphis diehli</i> (Emery, 1906)	North Africa
<i>Cataglyphis emmae</i> (Forel, 1909)	North Africa
<i>Cataglyphis isis</i> Pisarski, 1967	Suez
<i>Cataglyphis laevior</i> Stitz, 1916	North Africa
<i>Cataglyphis livida</i> (André, 1881)	Middle East, Arabia
<i>Cataglyphis minima</i> n. sp.	Saudi Arabia
<i>Cataglyphis niger</i> (André, 1882)	Middle East
<i>Cataglyphis nodus</i> (Brullé, 1832)	Middle East, South east Europe
<i>Cataglyphis rubra</i> (Forel, 1903)	North Africa
<i>Cataglyphis sabulosa</i> Kugler, 1981	Sinai, Palestine
<i>Cataglyphis sabarae</i> Santschi, 1929	North Africa
<i>Cataglyphis semitonsa</i> Santschi, 1926	North Africa
<i>Cataglyphis urens</i> n. sp.	Arabia

This genus includes species that are highly adapted to desert conditions. All the species bear long ammochoete hairs on the anterior gula surface and long palps with which they are able to dig out channels in loose sand. Nests of the larger species are usually sited at the foot of a bush or at the bottom slope of a sand hill. Individuals forage singly, darting rapidly across hot stones and sand during the heat of the day. DÉLYE (1968) has shown that *Cataglyphis* may survive temperatures of 50 °C for at least one hour whereas species of most other genera would succumb rapidly.

Behaviour and orientation studies have been carried out by HARKNESS & WEHNER (1977) who have shown that with their large eyes and wide angled vision, these ants direct their course by polarised celestial light as well as by remembered landmarks.

Taxonomically this is one of the more difficult groups since differences between geographically separate populations of like forms within a species group may be apparent but often slight. Santschi in his review of the genus enumerated 28 forms within the *Cataglyphis bicolor* (Fabricius) group (SANTSCHI 1929). All of these were keyed but treated as races (stirpes) or varieties. In this paper all recognisably different forms so far found in Arabia within this group are treated as good species.

Key to species

- | | | |
|-------|---|---|
| 1. | Petiole a truncated node with a flat dorsal surface sloping forward (<i>C. albicans</i> group) . | 2 |
| - | Petiole a rounded node or an upright thick scale | 6 |
| 2.(1) | Colour uniformly shining black | 3 |
| - | Head and alitrunk yellow or reddish at least in part | 4 |
| 3.(2) | Head width of large workers 2 mm or more; queen HW 1.85 mm <i>albicans</i> (Roger) | |
| - | Head width of large worker less than 1.2 mm; queen HW 1.62 mm <i>minima</i> n. sp. | |

- 4.(2) Head and alitrunk reddish brown, sculptured and somewhat dull *semitonsa* Santschi
 - Head and alitrunk bright yellow or yellowish red 5
- 5.(4) Bicoloured with gaster tergites 2 to apex infuscate; dorsum of alitrunk with an occasional erect hair or none; whole body brilliant with only sparse pubescence restricted to lower mesosoma
rubra (Forel)
 - Body uniformly yellow, dorsum of pronotum, propodeum and node always with some erect hairs; whole body shining but finely sculptured and not brilliant; sides of mesonotum and propodeum with distinct pubescence
livida (André)
- 6.(1) Petiole in profile an upright scale 7
 - Petiole in profile a more or less thick rounded node 8
- 7.(6) Colour yellowish brown; gaster frequently paler; third maxillary palp fringed with long curved hairs
sabulosa Kugler
 - Colour uniformly brownish black; third maxillary palp without conspicuously long hairs
emmae (Forel)
- 8.(6) Maxillary palps short, segment 4 shorter than 5 + 6; whole dorsum with short thick hairs. (*C. viaticus* group) Colour except for tarsi entirely black
asiriensis n. sp.
 - Maxillary palps long, segment 4 longer than 5 + 6; dorsal hairs scattered, long and fine. (*C. bicolor* group) 9
- 9.(8) Colour mainly black 10
 - Bicoloured species with head and alitrunk red or dull brownish red 12
- 10.(9) Node thick, about as high as long; first funiculus segment nearly x 2 as long as second. Larger species TL up to 12 mm
niger (André)
 - Node higher than long in profile; first funiculus segment less than x 1.4 as long as second. Smaller species maximum length about 9.5 mm 11
- 11.(10) Gaster brilliant; antennal scape without erect hairs; alitrunk pubescence sparse; colour entirely black
diehli (Emery)
 - Gaster with first tergite sculptured; antennal scape often with a few fine erect hairs; alitrunk pubescence dense; mid body occasionally brown in smaller specimens
isis Pisarski
- 12.(9) Head wider than long
adenensis (Forel)
 - Head longer than wide 13
- 13.(12) Gaster dorsum shining. Antennal scapes with some erect hairs 14
 - Gaster sculptured, somewhat dull. Scapes without erect hairs 15
- 14.(13) Occiput shining, gaster brilliant; node higher than long, often infuscated contrasting with red alitrunk. First funiculus segment x 1.3 as long as second
laevior Stitz
 - Occiput dull, gaster shining but not brilliant; node unicolorous red with alitrunk. First funiculus segment about x 1.7 as long as second
saharae Santschi
- 15.(13) Node low, longer than high in profile 16
 - Node as high as long in profile 17
- 16.(15) Propodeum high, the dorsal and descending faces forming a rounded right angle. Head and alitrunk bright red; appendages brownish red
urens n. sp.
 - Propodeum low obliquely rounded. Head and alitrunk dark red; legs with coxae and femora dark brown
abyssinica (Forel)
- 17.(15) Head and alitrunk brownish red. Petiole with anterodorsal slope somewhat flattened
desertorum (Forel)
 - Head and alitrunk generally clear red. Petiole a large rounded dome
nodus (Brullé)

Cataglyphis abyssinica (Forel, 1904) n. stat.

Myrmecocystus viaticus st. *abyssinica* Forel, 1904; Annl. Mus. zool., St. Petersburg 8: 282.

Cataglyphis bicolor st. *abyssinica* (Forel) Santschi, 1929: 52.

Abu Arish stony ground outside resthouse compound 3.IV.83; ♀♀ CAC.

These are characterised by the long low petiole and obliquely rounded propodeum. The petiole is longer in profile than it is high and clearly differentiates this as a distinct species from *C. bicolor* which has a more massive dome-like node. This species was described and recorded from North east Africa.

Cataglyphis adenensis (Forel, 1904)

Myrmecocystus viaticus st. *adenensis* Forel, 1904; Annl. Mus. zool., St. Petersburg 8: 282.

Cataglyphis adenensis (Forel) Santschi, 1929: 41.

The type was described from Aden. It is said to have the head wider than long unlike other members of the *C. bicolor* species group and a high narrow petiole. No sample ascribable to this form was collected. Two specimens in the Santschi collection at NHMB standing under the name of *C. adenensis* appear to belong to the *C. albicans* species group.

Cataglyphis albicans (Roger, 1859)

Formica albicans Roger, 1859; Berl. ent. Z. 3: 235.

Cataglyphis albicans (Roger) Roger, 1863; Verz. Formicid.: 12.

Zahran 25.III.83; Mahaiel 4.IV.83; Anamas 8.IV.83; Al Kola 10.IV.83; ♂ ♀♀ ♀♀ CAC.

The workers appear to be typical of this species which is widespread in North Africa and the Middle East. However there are differences in the male genitalia from different geographical populations that are yet to be resolved.

Cataglyphis asiriensis n. sp. (fig. 76)

Anamas 8.IV.83; Sawdah mountain 3000 m 9.IV.83; ♀♀ CAC.

This is a very distinctive ant, akin in general structure to *C. viaticus* (Fabricius) and allied species but at once recognisable from the remarkable development of stout black hairs all over the body and appendages.

Holotype worker: TL 8.3; HL 1.90; HW 1.65; EL 0.48; SL 2.00; CI 81; SI 121; ratio of first funiculus segment to the second 1.63; length of hind femur 1.63; length of hind tibia 3.50.

Colour entirely black except for pale tarsi. Head and alitrunk coarsely reticulate and matt; gaster very finely sculptured and somewhat shining. Whole dorsum of head, alitrunk and petiole clothed with stout black hairs. Hairs on gaster restricted to basal face of first gaster tergite and to third and remaining apical segments. Femora with similar stout hairs, shorter, subdecumbent and more crowded on tibiae. The fourth maxillary palp is slightly shorter than the third or the fifth plus sixth combined. The eyes are large and bulbous. The antennae are relatively long. The petiole is a high blunt triangular node, rounded at the top and higher than long in profile.

Foraging workers were taken singly on the open hillside at Anamas. Colonies were found under stones on Sawdah mountain. In one, *Thorictus* beetles were seen clinging to the worker scapes.

Holotype and paratypes from Sawdah mountain in NHMB.

Cataglyphis desertorum (Forel, 1894) n. stat. (fig. 83)

Myrmecocystus viaticus var. *desertorum* Forel, 1894; J. Bombay nat. Hist. Soc. 8: 402.

Myrmecocystus viaticus ssp. *desertorum*. – Emery, 1898; Öfvers. finska Vetensk Soc. Förh. 20: 23.

Wadi Jureisi 30.V.80; Dabah 12.V.80; Araida 21.II.75; Riyadh 15.I.80; Wadi Nimar V.83; ♀♀ W.

Büttiker. Karm Rausch 5.IV.83; Al Qatif 14.IV.83; Hair desert 18.IV.83; ♀♀ CAC. Oman: Wattayah XI.83; ♀ M. Gallagher.

This is the duller coloured of the reddish species allied to *C. bicolor* (Fabricius). The head and alitrunk are often brownish rather than red. The node is less massive than in *C. niger* (André) and has the anterodorsal face forming a flattened curve rather than an evenly rounded dome.

Cataglyphis diehli (Emery, 1906) n. stat. (fig. 77)

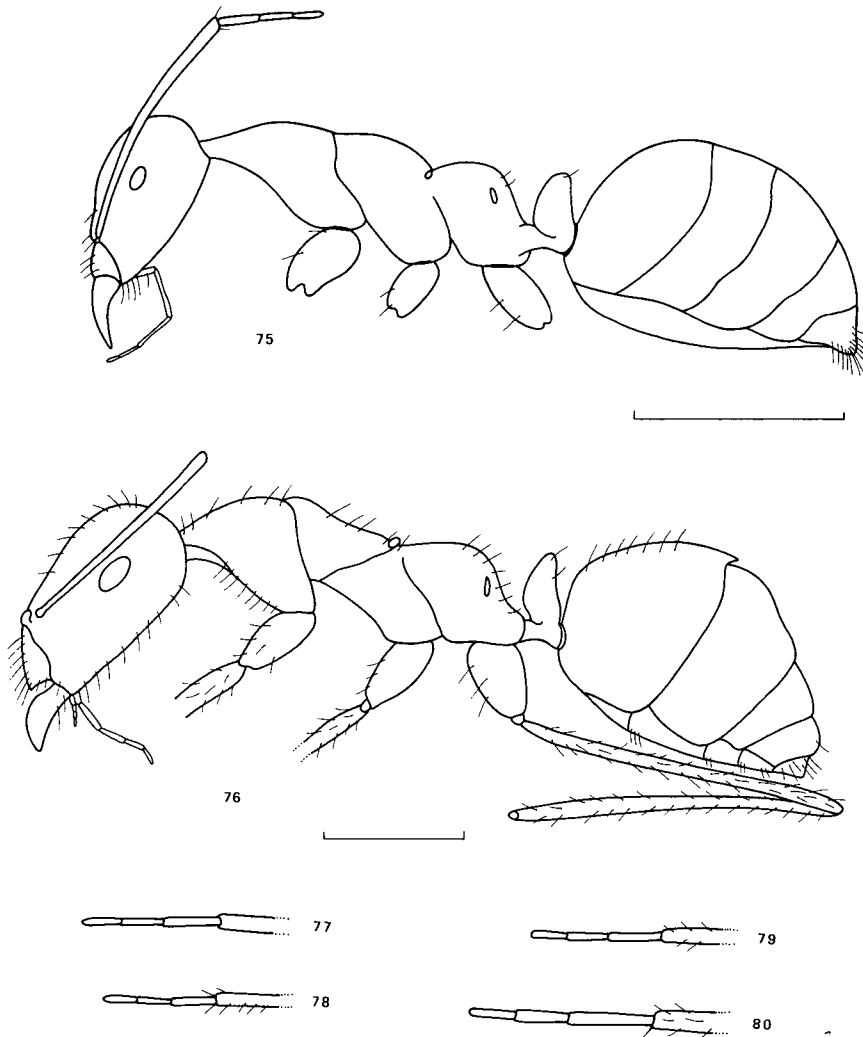
Myrmecocystus viaticus ssp. *desertorum* var. *diehli* Forel, 1902; Anns. Soc. ent. Belg. 46: 462.

Myrmecocystus bicolor ssp. *diehli* Emery, 1906; Memorie R. Accad. Sci. Ist. Bologna 3: 184.

Cataglyphis bicolor st. *diehli* (Emery) Santschi, 1929: 56.

Wadi Khumra 10.II.83; ♀ W. Büttiker. Al Tawlah 7.IV.83; Hofuf sand mountain 13.IV.83; Al Qatif sandy desert 16.IV.83; ♀♀ CAC.

This shining black ant is also distinctive in having the funiculus segments shorter than in *C. bicolor* or *C. niger* and allied species. The first funiculus segment is about x 1.3 as long as the second compared



Figs 75, 76: Profile view of *Cataglyphis*. 75, *C. minima* ♀; 76, *C. asiriensis* ♀. Figs 77-80: Funiculus segments 1-3. 77, *Cataglyphis diehli* ♀; 78, *C. isis* ♀; 79, *C. sabarae* ♀; 80, *C. niger* ♀. (Scale bar 1 mm).

with about $\times 1.8$ as long in the *C. bicolor* group and on this character alone apart from the colour difference, cannot be regarded as a subspecies of *C. bicolor*.

Cataglyphis emmae (Forel, 1909) (fig. 87)

Formica (Proformica) emmae Forel, 1909; Bull. Soc. vaud. Sci. nat. 45: 381.

Cataglyphis emmae (Forel) Santschi, 1929: 30.

Zahran semi-cultivated area 25.III.83; ♀♀. Al Qatif 14.IV.83; 1 ♀ CAC.

These are interesting locality records for a species that has been linked previously with North African desert habitats. The colony at Zahran was located under a stone and the workers from their slow movements were at first thought to belong to the genus *Proformica*. It is somewhat aberrant species within *Cataglyphis*, having short funiculus segments, short palps and an upright scale. It is also one of the few *Cataglyphis* species that does not tilt the gaster upward when foraging. The partially alate queen from Al Qatif appears similar to the workers in all structural essentials but is differently coloured, not being evenly dark brownish black.

Al Qatif queen: TL 7.5; HL 1.63; HW 1.45; SL 1.35; hind femur 1.80; maxillary palp segment no. 3 0.38; no. 4 0.25; nos. 5 + 6 0.29; funiculus segment no. 1 0.3; no. 2 0.15.

Dorsum of gaster, a patch on the propodeum, the whole mesonotal dorsum, the petiole and irregular areas of the head shining brown, the rest including the appendages, reddish. All surfaces including the scapes and tibiae with scattered long hairs. The whole body is shining but the mesonotum is quite heavily sculptured at the sides; the gaster is brilliant as in the worker.

Cataglyphis isis Pisarski, 1967 n. stat. (fig. 78)

Cataglyphis bicolor ssp. *diebli* var. *isis* Forel, 1909; Bull. Soc. vaud. Sci. nat. 45: 385.

Cataglyphis diebli (ssp.) *isis* Pisarski, 1967: 421.

W. Tobuk IV.79; ♀♀ KAU-NHMB expedition. Hair valley 17.IV.83; Hair desert 18.IV.83; ♀♀ ♀ CAC.

This is a distinct species not related structurally to *C. bicolor* but to *C. diebli* having, like the latter, proportionately shorter funiculus segments and a shorter thinner petiole node. It differs from *C. diebli* in having a strongly pubescent alitrunk and occasional erect hairs on the antennal scapes and is clearly a distinct species. It is one of the smallest of the nodal *Cataglyphis* group. The largest workers do not exceed 9.5 mm in length. The queen is likewise small and slender, HW 1.88 mm, compared with that of *C. niger*, HW 2.62 mm.

The known distribution of *C. isis* is centred on the Suez region – Egypt, Sinai but PISARSKI 1967, has recorded it from Afghanistan and the records from the Central Region of Saudi Arabia also represent a considerable extension of its range.

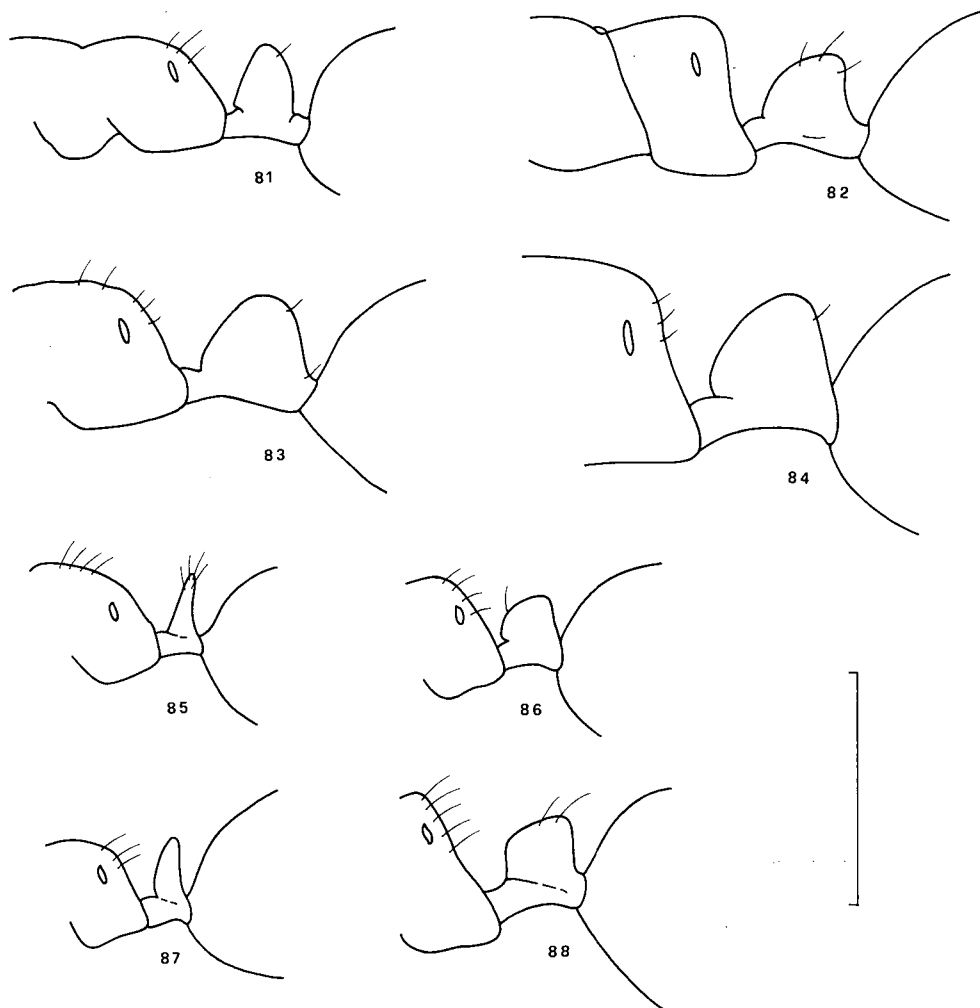
Cataglyphis laevior Stitz, 1916 n. stat. (fig. 81)

Cataglyphis bicolor var. *laevior* Stitz, 1916; Mitt. zool. Mus. Berl. 8: 348.

Cataglyphis bicolor st. *laevior*. – Santschi, 1929: 47.

Jeddah 6.V.78; Riyadh 28.VIII.75; ♀♀ W. Büttiker. Abu Arish resthouse environs 3.IV.83; Al Tawlah 7.IV.83; ♀♀ CAC.

This is a brightly coloured species with the clear red head and alitrunk contrasting with the brilliant unsculptured dark gaster. The workers have short funiculus segments and a high short node as in *C. diebli* and *C. laevior* is clearly a distinct species unrelated to *C. bicolor*.



Figs 81–88: Petiole profile of *Cataglyphis*. 81, *C. laevior* ♀; 82, *C. urens* ♀; 83, *C. desertorum* ♀; 84, *C. niger* ♀; 85, *C. sabulosa* ♀; 86, *C. livida* ♀; 87, *C. emmae* ♀; 88, *C. semitonsa* ♀. (Scale bar 1 mm).

***Cataglyphis minima* n. sp. (fig. 75)**

Bishah 7.IV.83; desert west of Najran 10.IV.83; ♂♂ ♀ CAC.

This is a very small black species closely similar to *C. albicans*.

Holotype large worker: TL 4.4; HL 0.93; HW 1.08; SL 1.15; length of hind femur 1.45; hind tibia 1.35; CI 105.4; SI 106.5.

Paratype small worker: TL 3.62; HL 0.78; HW 0.80; SL 1.02; length of hind femur 1.32; hind tibia 0.90.

Body colour entirely shining black, appendages yellow. Pubescence very sparse; surface of dorsum smooth and shining almost without sculpture except superficially on mesonotum and propodeum. Maxillary palp segment 4 not longer than 5 + 6. The petiole dorsum is more rounded than in *C. albicans*. Dorsal hairs on the alitrunk are few or none. The workers are very like those of *C. albicans* but are less sculptured with minimal pubescence and have fewer body and appendage hairs. Worker size is within the lower limits of the *C. albicans* range: *C. albicans* TL 3.75–8.0; mean 5.87. *C. minima* TL 3.63–4.50, mean 4.06. The mean relative length of hind femur to head is 1.46; in Arabian *C. albicans* it is 1.34.

Paratype queen: TL 7.5; HL 1.56; HW 1.62; CI 104.

Colour dark reddish black; appendages paler. Whole dorsum and antennal scapes with some long hairs. Petiole is thin in profile. The queen is about 2 mm shorter than that of an average *C. albicans*.

Holotype and paratypes in NHMB.

Cataglyphis livida (André, 1881) (fig. 86)

Myrmecocystus albicans var. *livida* André, 1881; Anns. Soc. ent. Fr. 6, 1: 58.

Cataglyphis albicans ssp. *livida* (André) Emery, 1925: 262.

Cataglyphis livida. – Pisarski, 1967: 467.

Khaybar 26.IV.79; Wadi Jureisi 30.IV.80; Sah al Rimah 24.IV.80; Al Fresh 28.IV.80; Hofuf 30.I.80; Riyadh 31.IX.80; Bani Musayqirah 16.IX.81; Shoiba 2.IX.83; Addar 28.I.83; ♂♀ ♀♀ W. Büttiker. Riyadh 22.III.83; desert west of Najran 10.IV.83; Al Qatif 15.IV.83; Hair valley 17.IV.83; Hair desert 18.IV.83; ♂♀ ♀♀ CAC.

Most of these samples have the head with only the most superficial sculpture near the occipital corners and correspond to the Arabian form of this species *C. albicans* subsp. *livida* var. *arabica* Emery, 1906. This was described from Aden. The Middle East and Afghanistan form of this species was given subspecies rank by PISARSKI (1967) (*Cataglyphis livida lutea* Emery). This has a slightly more sculptured head than the Arabian samples but there is insufficient information at present to show whether these forms are minor variants of a species complex or worth distinguishing as subspecies or even species.

Cataglyphis niger (André, 1882) n. stat. (figs 80, 84)

Myrmecocystus viaticus var. *niger* André, 1882; Spec. Hym. Europe 2: 167.

Cataglyphis bicolor st. *nigra* (André) Santschi, 1929: 50.

Riyadh 15.I.80; ♀ W. Büttiker. Riyadh 22.III.83; Al Kharj public park 23.III.83; Al Kharj desert 23.III.83; Zahran 25.III.83; Shaiq 8.IV.83; Hofuf sand mountain 13.IV.83; Al Qatif sandy desert 16.IV.83; ♂ ♀♀ ♀♀ CAC.

This was the most conspicuous and probably largest of the *Cataglyphis* species, the big workers having heads up to 3 mm wide and reaching 12.5 mm in total length. It is abundant in the Middle East and is also recorded from Tunisia. A form of this species with a slightly smaller node and more finely sculptured moderately shining gaster was taken at Abu Arish 2.IV.83; Al Tawlah 7.IV.83; Wadi Shugub 7.IV.83 and Hair desert 18.IV.83. This may be the same as *C. caerulescens* Santschi (TOHMÉ 1969: 14) but the original description is too imprecise to establish its status with respect to *C. niger*.

Cataglyphis nodus (Brullé, 1832)

Formica nodus Brullé, 1832; Exped. Sc. Moree Zool. 2: 32.

There is an old record for this bicoloured South East European species from Riyadh but no specimens that could properly be assigned to *C. nodus* were seen during the present study.

Cataglyphis urens n. sp. (fig. 82)

Cataglyphis bicolor st. *abyssinica* v. *urens* Santschi, 1929: 52.

Wadi Shugub Turabah 6.IV.80; ♂♀ W. Büttiker. Wadi Dawasir desert 24.III.83; Al Kharfah desert 24.III.83; Hofuf tamarisk park 13.IV.83; Sulaiel desert 11.IV.83; Hair desert 18.IV.83; ♂♀ CAC. Oman: Mugsin Dhofar 20.IX.79; ♀ R.P. Whitcombe.

This species has large bright coloured workers which were seen actively foraging in open sandy desert. According to the only previous record and type locality, Muscat, this is a truly endemic species. SANTSCHI 1929, linked *C. urens* to *C. abyssinica* through the relatively low node but the remarkably high raised propodeum clearly distinguishes it as a distinct species.

Typical large worker: TL 12.5; HL 2.80; HW 2.65; SL 3.20; CI 94.5; SI 121; Propodeum height to length 1.48 : 1.13, ratio 131; Petiole height to length 0.80 : 1.13, ratio 141. Hind tibial length 4.63. (Petiole and propodeal ratios for an equivalent sized *C. nodus* are 105 and 100 respectively.)

Head, alitrunk and petiole clear red, gaster brown; all appendages pale reddish brown. Hind tibia with mainly decumbent to subdecumbent fine hairs on extensor surface but with some erect hairs at the uppermost fifth. (*C. nodus* has only very sparse short completely decumbent hairs on the extensor surface.)

In a brief and inadequate description SANTSCHI (1929) gives the following characters (my translation): legs not darker than alitrunk, sides of gaster shining, dorsum of head and propodeum with some erect hairs, anterodorsal edge of mesonotum projecting. All these fit *C. urens* but they are rather variable characters.

However the cotype from Muscat is clearly the same as the numerous samples from Saudi Arabia and Oman all having the characteristic high propodeum contrasting with the low node. A taxon named *Myrmecocystus bicolor* var. *congolensis* Stitz, 1916: 337, said to be widespread in Sudan and Senegal, may well prove to be the same as *C. urens* but according to SANTSCHI (1929) erect body hairs are absent from the dorsum of the alitrunk whereas these are present in all *C. urens* samples.

Cataglyphis rubra (Forel, 1903)

Myrmecocystus albicans ssp. *rubra* Forel, 1903; Annl. Soc. ent. Belg. 47: 268.

Cataglyphis albicans ssp. *ruber* (Forel) Emery, 1912; Zool. Jb. Suppl. 15 (1): 99.

Oman: Montasar 15.IX.84; ♀ M. Gallagher. Mugshin Dhofar 25.IX.79; ♂♂ R.P. Whitcombe.

This ant has the whole of the alitrunk and node shining yellowish red, the basal gaster tergite testaceous and the rest of the gaster shining brown; the legs and antennae are entirely yellowish red. Erect hairs are absent from the dorsum of the alitrunk except for an occasional hair on the propodeum or node. Colour, pilosity and the very sparse pubescence separate this species from the black *C. albicans* and from the somewhat similar but entirely yellow *C. livida*. *C. rubra* is recorded from deserts to the south of the Atlas mountains. This species also occurs in Tunisia in semi desert country.

Cataglyphis sabulosa Kugler, 1981 (fig. 85)

Cataglyphis sabulosa Kugler, 1981; Israel J. Ent. 15: 84.

Al Kharfa desert 24.III.83; Al Qatif sandy desert 16.IV.83; ♂♂ ♀♀ CAC. Oman: Mugshin Dhofar 20.VII.79; ♀ R.P. Whitcombe.

This is an interesting species allied to *C. bombycina* (Roger) but without a differentiated "soldier" caste. It was described from Southern Palestine and Sinai. The pale yellow workers do not raise the gaster when foraging but flit rapidly over the sand like pale ghosts and are very hard to catch.

Cataglyphis saharae Santschi, 1929 n. stat. (fig. 79)

Cataglyphis bicolor st. *saharae* Santschi, 1929; Revue suisse Zool. 56: 48.

Wadi Khumra 10.II.78; ♂♂ W. Büttiker. Al Kharfa 24.III.83; Al Tawlah 7.IV.83; Hair valley 17.IV.83; ♂♂ CAC.

Workers assigned to this species have the gaster shining as in *C. laevior* but differ by the longer funiculus segments, the wider node and more sculptured head.

Cataglyphis semitonsa Santschi, 1926 (fig. 88)

Cataglyphis albicans var. *semitonsa* Santschi, 1926; Bull. Soc. Hist. nat. Afr. N. 17: 236.

Cataglyphis semitonsa. – Tohmé, 1969: 14.

Zahran 25.III.83; Al Kola 10.IV.83; ♂♂ CAC.

Workers of this species were taken singly and no nest was seen. They not only differ in colour from *C. albicans* but also in sculpture having both head and alitrunk distinctly sculptured and duller. The mean ratio hind femur length to head width based on five workers is 1.63 compared with *C. albicans* from Arabia, 1.34. Hitherto this species has been recorded from North Africa and the Lebanon.

Genus *Acantholepis* Mayr

List of species:

Acantholepis arabica n. sp.

Acantholepis canescens Emery, 1897

Acantholepis carbonaria Forel, 1892

Acantholepis depilis Emery, 1897

Acantholepis dolabellae Forel, 1911

Acantholepis erythraea Forel, 1910

Acantholepis frauenfeldi (Mayr, 1855)

Acantholepis gracilicornis Forel, 1892

Acantholepis incisa Forel, 1913

Acantholepis longinoda Arnold, 1920

Acantholepis nigrescens Karawajew, 1912

Acantholepis obtusa Emery, 1901

Acantholepis opaciventris Finzi, 1930

Acantholepis simplex Forel, 1892

Acantholepis spinnisquama Kuznetsov-Ugamskij, 1929

Geographical distribution:

Endemic

North east Africa

North east Africa

North east Africa

Middle East

North east Africa

North Africa, South east Europe

Middle East, Arabia

East and Central Africa

South Africa

North Africa

North Africa

Middle East

East Africa, North India

Turkestan, Afghanistan

These are small black or bicoloured ants, active in full daylight and usually found in the neighbourhood of trees or shrubs over which they forage for scale or aphid honeydew and for insect prey. They are numerous around waterways and in river valleys subject to flooding and are often dominant in such places. Most species are polygynous. The queens are much larger than the workers and are usually much more pubescent, generally lack their propodeal armature but have incised or emarginate petioles corresponding with those of their particular workers. Males are small and black; their 12 segmented antennae have elongate scapes and funiculus segments.

Key to species

1. Antennal scape twice as long as head width, overreaching occiput by two thirds its length; SI 190–200 2
- Antennal scape less than twice as long as head width, overreaching occiput by half its length or less; SI 110–175 4
- 2.(1) Head and alitrunk clear red *longinoda* Arnold
- Whole body uniformly black 3
- 3.(2) Gaster and propodeum with superficial sculpture *opaciventris* Finzi
- Gaster and propodeum brilliant *gracilicornis* Forel
- 4.(1) Antennal scape 1.5 or more x HW, SI 150–175, overreaching occiput by about half its length 5

- Antennal scape only slightly longer than HW, SI 110–128, overreaching occiput by a third or less of its length 9
- 5.(4) Alitrunk entirely pale red; whole dorsum clothed with blunt black setae
arabica n.sp.
- Alitrunk partly red or entirely black; dorsum with scattered fine pale hairs mainly on pronotum 6
- 6.(5) Petiole scale narrowly rounded with shallow incision *nigrescens* Karawajew
- Petiole acutely dentate 7
- 7.(6) Propodeal processes produced into long thin curved spines more than x 0.75 their intervening width
spinnisquama Kuznetsov-Ugamskij
- Propodeal processes dentate with teeth about x 0.5 or less their intervening width . . . 8
- 8.(7) Bicoloured species with head and gaster dark contrasting with red alitrunk
dolabellae Forel
- Alitrunk black or with mesonotum only partly red *frauenfeldi* (Mayr)
- 9.(4) Head and gaster smooth and brilliant 10
- Head and gaster sculptured 11
- 10.(9) Whole dorsum thickly clothed with pale hairs *canescens* Emery
- Alitrunk without dorsal hairs *simplex* Forel
- 11.(9) Whole dorsum with scattered erect pale hairs *obtusa* Emery
- Dorsal hairs on alitrunk sparse, mainly restricted to pronotum or nil 12
- 12.(11) Petiole angles produced into long spines 13
- Petiole emarginate or dentate at most 14
- 13.(12) Petiole spines longer than their intervening width *incisa* Forel
- Petiole spines about as long as half their intervening width *carbonaria* Forel
- 14.(12) Petiole dentate; coarse dorsal sculpture especially on propodeum not obscuring cuticular shine; one or two occasional pronotal hairs *depilis* Emery
- Petiole rounded with very shallow emargination; whole body finely sculptured and dull; alitrunk entirely without dorsal hairs *erythraea* Forel

Acantholepis arabica n. sp. (fig. 89)

Al Tawlah 7.IV.83; 5 ♂♂ CAC.

This is a handsome red species characterised by numerous short black body hairs. Unfortunately its presence in the field was not recognised among the abundant *Monomorium venustum* and *Tetramorium sericeiventre* of similar size and colouring so that only five workers were collected.

Holotype worker: TL 3.5; HL 0.83; HW 0.70; SL 1.05; alitrunk length 1.00; SI 150; CI 84.3.

Head and alitrunk clear pale red; gaster dark with basal face of first tergite testaceous. Tarsi, distal half of scape and antennal club brown; rest of appendages pale red. Head shining, mesopropodeum sculptured, gaster brilliant. Short black hairs are scattered all over the body; in dorsal view occipital hairs extend round genae to eye level. Scapes and tibiae have short oblique pubescent hairs. The head is oval with rounded sides and a straight occipital border. The pronotum is flattened medially. The propodeal spines are long and curved; the petiole spines are very long.

This elegant species resembles *Acantholepis longinoda* Arnold of South Africa in colour and body shape including long propodeal and petiole spines but differs in pilosity, the body hairs of *A. longinoda* being few, fine and pale.

Holotype and paratype ♂♂ in NHMB; paratype ♀ in BMNH.

Acantholepis canescens Emery, 1897

Acantholepis capensis ssp. *canescens* Emery, 1897; Annali Mus. civ. Stor. nat. Giacomo Doria 38: 601.

Acantholepis canescens. – Bernard & Cagniant, 1962; Bull. Soc. ent. Fr. 67: 163.

Najran 24.III.83; Zahran 25.III.83; Sug al Ahad 26.III.83; Fayfa hillside 28.III.83; Fayfa 29.III.83; Al Tawlah 7.IV.83; Wadi Shugub 7.IV.83; Shaqiq 8.IV.83; Tanuma 8.IV.83; Riyadh 19.IV.83; ♂♂ ♀ CAC.

This was one of the most abundant species of the genus seen. It is small, black and shining with widely spaced broad propodeal teeth and a moderately indented petiole. The whole body is clothed with stiff pale hairs. It differs from *A. capensis* Mayr by its smaller size, finer pilosity and absence of propodeal sculpture.

Acantholepis carbonaria Forel, 1892

Acantholepis carbonaria Forel, 1892; Anns. Soc. ent. Belg. 36: 41.

Al Qahman mangrove swamp 1.IV.83; Sug al Ahad riverside 26.III.83; ♂♂ CAC.

This small species is distinguished by its dull black appearance and long petiole spines.

Acantholepis depilis Emery, 1897 n. stat.

Acantholepis capensis ssp. *depilis* Emery, 1897; Annali Mus. civ. Stor. nat. Giacomo Doria 38: 602.

Badr Hanayn 18.IV.79; KAU-NHMB ♂; Wadi Hamaniyah 31.III.80; Shoiba 18.IX.83; ♂♂ W. Büttiker. Bishah 7.IV.83; Al Tawlah 7.IV.83; ♂♂ ♀ CAC.

Erect hairs on the alitrunk of this black sculptured species are restricted to a very few on the pronotum and are often absent. Despite the coarse sculpture especially on the propodeum, the underlying cuticular shine is not obscured. The sparse pilosity differentiates this species from *A. capensis*.

Acantholepis dolabellae Forel, 1911 n. stat. (fig. 93)

Acantholepis frauenfeldi ssp. *dolabellae* Forel, 1911; Bull. Soc. vaud. Sci. nat. 47: 351.

Araida, Selouly's Farm 5.IX.75; 1 ♂ W. Büttiker.

This single worker is the sole representative of this common Middle East species. The alitrunk is red and the head slightly darker, both contrasting with the dark gaster. Apart from colour, this species differs from *A. frauenfeldi* by the finely sculptured alitrunk.

Acantholepis erythraea Forel, 1910 n. stat. (figs 90, 91)

Acantholepis carbonaria var. *erythraea* Forel, 1910; Zool. Jb. Abt. Syst. 29: 265.

Desert west of Najran 10.IV.83; ♂♂ CAC.

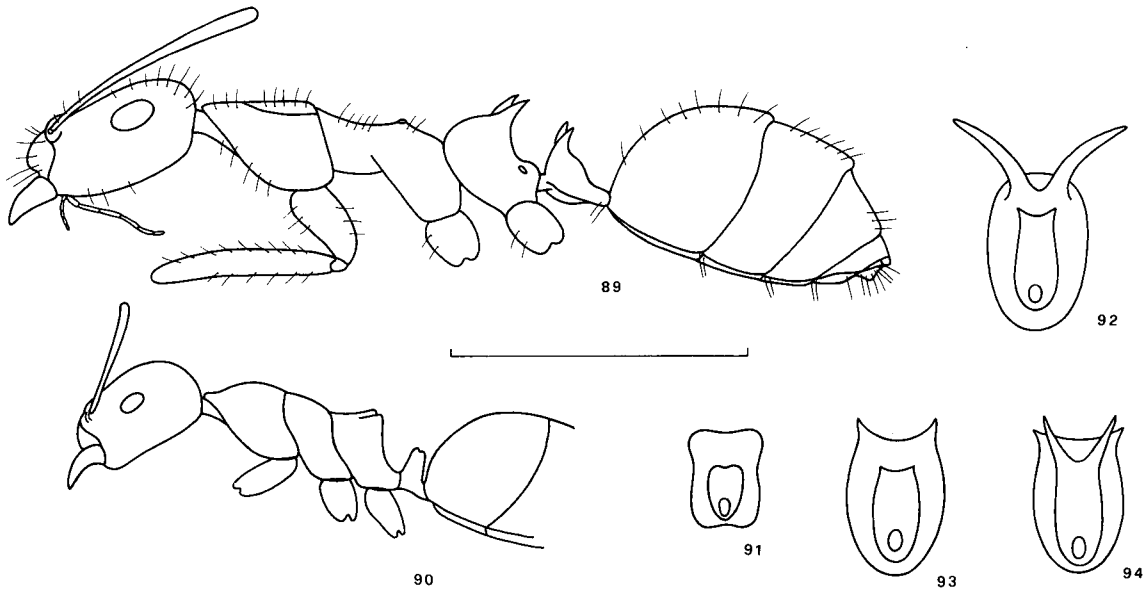
These small opaque dark workers have no hairs on the dorsum of the alitrunk, very reduced propodeal prominences and a petiole scale that is only very slightly indented with rounded corners. *A. erythraea* in the Geneva collection is similar in size, pilosity and colour but the propodeal armature is slightly more prominent. *A. carbonaria* of which this was described as a variety, cannot be the same species since it has the propodeum distinctly dentate and the petiole bispinose.

Acantholepis longinoda Arnold, 1920

Acantholepis longinoda Arnold, 1920; Ann. S. Afr. Mus. 14: 555.

Oman: Wahiba sands 7.XII.84; ♂♂ M. Gallagher.

This species was described from South central Africa and Oman representing a considerable extension of its known range. It is an elegant clear red species with exceptionally long appendages, SI 200.



Figs 89, 90: Profile view of *Acantholepis*. 89, *A. arabica* ♀; 90, *A. erythraea* ♀. Figs 91–94: Petiole and propodeum in posterior view. 91, *Acantholepis erythraea* ♀; 92, *A. spinnisquama* ♀; 93, *A. dolabellae* ♀; 94, *A. incisa* ♀. (Scale bar 1 mm).

Acantholepis frauenfeldi (Mayr, 1855)

Hypoclinea frauenfeldi Mayr, 1855; Verh. zool.-bot. Ges. Wien 5: 378.

Acantholepis frauenfeldi (Mayr) Mayr, 1861; Europ. Formic.: 42.

Hair valley 17.IV.83; ♀♀ CAC.

This was the only place where this common South east European and North African species was found.

Acantholepis gracilicornis Forel, 1892

Acantholepis gracilicornis Forel, 1892; Anns. Soc. ent. Belg. 36: 42.

Fayfa hillside 29.III.83; Fayfa cultivated valley 30.III.83; Al Qahman mangrove swamp 1.IV.83; ♀♀ CAC.

This species was described from Aden in South Arabia. It is characterised by its very long appendages, long thin alitrunk and brilliantly shining integument.

Acantholepis incisa Forel, 1913 n. stat. (fig. 94)

Acantholepis capensis ssp. *incisa* Forel, 1913; Revue zool. afr. 2: 338.

Anamas 8.IV.83; ♀♀ ♀ CAC. The petiole spines in this species are very long and the workers with these exaggerated structures are clearly specifically distinct from the much more shining, simply dentate *A. capensis*.

Acantholepis nigrescens Karawajew, 1912 n. stat.

Acantholepis frauenfeldi var. *nigrescens* Karawajew, 1912; Russk. ent. Obozr. 12: 15.

Wadi Khumra 10.II.78; Taif 11.IV.79; Quawayiyah 7.IV.78; Al Hunayy 20.X.78; Thanomah 11.IV.80; ♀♀ W. Büttiker. Sulaiel desert 14.IV.83; Hair desert 17.IV.83; ♀♀ CAC. Yemen: Amlah XI.79; ♀ Barri & Poggesi (B. Lanza).

This shining black species is similar to *A. frauenfeldi* but has the petiole with reduced teeth, the antennal scapes longer and the pronotum more convex. It was described from North Africa.

Acantholepis obtusa Emery, 1901 n. stat.

Acantholepis carbonaria var. *obtusa* Emery, 1901; Bull. Soc. ent. ital. 33: 63.

Abu Arish 25.III.83; Al Qatif coastal beach 15.IV.83; ♀♀ CAC.

This is a small dull opaque species, clearly differing from *A. carbonaria* in the relatively abundant dorsal pilosity and simply dentate petiole.

Acantholepis opaciventris Finzi, 1930

Acantholepis opaciventris Finzi, 1930; Sber. Akad. Wiss. Wien, math.-naturw. Kl. 139: 23.

Wadi Shuwas 9.IV.80; Wadi Fayidah 10.X.83; Shoiba 15.X.83; ♀♀ W. Büttiker. Sug al Ahad 26.III.83; Fayfa 27.III.83; Karm Rauish 5.IV.83; Al Tawlah 7.IV.83; Wadi Shugub 7.IV.83; Al Kola 10.IV.83; Hair desert 17.IV.83; ♀♀ ♀♀ CAC.

This is similar to *A. gracilicornis* in the long appendages but differs in sculpture. The propodeum and gaster are faintly sculptured with a dull shine instead of being completely brilliant. It appears to be one of the commoner Saudi Arabian species, forming large polygynous colonies.

Acantholepis simplex Forel, 1892

Acantholepis simplex Forel, 1892; Anns. Soc. ent. Belg. 36: 43.

Jeddah 7.IV.78; ♀♀ W. Büttiker. Fayfa cultivated valley 30.III.83; Wadi Shugub 7.IV.83; Riyadh Agricultural Centre 19.IV.83; ♀♀ CAC.

This is a small species similar to *A. canescens* but entirely without hairs on the alitrunk. This species was described from North east Africa but has a wide range through Africa and is recorded also from West and North India according to BINGHAM (1903).

Acantholepis spinnisquama Kuznetsov-Ugamskij, 1929 (fig. 92)

Acantholepis frauenfeldi ssp. *spinnisquama* Kuznetsov-Ugamskij, 1929; Zool. Anz. 82: 480.

Acantholepis spinnisquama. - Pisarski, 1967: 410.

Socotra: Adho Dimellus IV.76; ♀ K.M. Guichard. Oman: Batina 16.II.78; ♀ R.P. Whitcombe. Dhofar 13.II.84; ♀♀ M. Gallagher.

This species has workers whose propodeal processes are extended into long curved spines. It is brilliantly shining as in *A. gracilicornis* but has proportionately shorter appendages and more extended armature both of the propodeum and of the petiole. The only specimens in NHMB that compared with the Arabian material were found under the name of *A. spinnisquama*. This species was described from Turkestan but has also been recorded from Afghanistan (PISARSKI 1967).

Genus ***Plagiolepis*** Mayr

List of species:

Plagiolepis abyssinica Forel, 1894
Plagiolepis maura Santschi, 1920
Plagiolepis pygmaea (Latreille, 1798)
Plagiolepis schmitzji Forel, 1895
Plagiolepis tumidula Emery, 1915

Geographical distribution:

North East Africa
 North Africa
 South Europe
 North Africa, South West Europa
 North West Africa

These are minute to small species, 1.15–2.5 mm long, although the genus does include some larger forms. They are mostly soil dwellers but some also live in rotten wood. The Arabian species were not found in the open desert but in mountain areas, decaying trees or in leaf litter.

Key to species

1. Dorsal outline of alitrunk not interrupted by raised metanotum. Eyes prominent set forward. Scale upright. First funiculus segment shorter than combined second to fourth
tumidula Emery
- Dorsal outline of alitrunk visibly interrupted by raised metanotum. Eyes set about middle of head. Scale an inclined node overhung by gaster. First funiculus segment as long as combined second to fourth. 2
- 2.(1) Size very small < 1.3 mm body and appendages completely pale yellowish brown; eye length one sixth of head length
abyssinica Forel
- Size larger > 1.5 mm. Colour pale brown to dark brown; eye length two fifths or more of head length. 3
- 3.(2) Second and third funiculus segments subequal, broader than long and each much shorter than fourth
pygmaea (Latreille)
- Third funiculus segment about twice or more length of second. 4
- 4.(3) Third and fourth funiculus segments subequal longer than broad. Pubescence on appendages prominent; on gaster mean interface is shorter than length of hair. Total length 2.0 mm or more. Colour brown
schmitzji Forel
- Third funiculus segment quadrate shorter than fourth. Pubescence sparse; on gaster mean interspace about same as length of hair. Total length less than 2.0 mm. Colour pale brown
maura Santschi

Plagiolepis abyssinica Forel, 1894 n. stat. (fig. 95)

Plagiolepis exigua ssp. *abyssinica* Forel, 1894; Mitt. schweiz. ent. Ges. 9: 73.

Fayfa 30.III.83; ♀♀ CAC.

These were taken from a roadside tree nesting in partially rotten wood. *P. abyssinica* is slightly larger, TL 1.25, and darker than the oriental *P. exigua* Forel, TL 1.12. Other measurements from a typical worker are HL 0.35; HW 0.28; SL 0.28; CI 80; SI 100; EL 0.05. (x 0.18 HW).

Plagiolepis maura Santschi, 1920 (fig. 98)

Plagiolepis maura Santschi, 1920; Bull. Soc. vaud. Sci. nat. 53: 169.

Abu Arish 25.III.83; Al Kola 10.IV.83; Riyadh Agricultural Centre 19.IV.83; ♀♀ CAC.

This is a small yellowish brown species differing from *P. schmitzji* by the shorter funiculus segment 3, smaller size, sparser pubescence and generally pale colour. Measurements from a typical worker are HL 0.45; HW 0.40; SL 0.40; EL 0.14; CI 89; SI 100; TL 1.62. This species was taken variously in soil litter.

Plagiolepis schmitzji Forel, 1895 (fig. 97)

Plagiolepis pygmaea var. *schmitzji* Forel, 1895; Mitt. schweiz. ent. Ges. 10: 5.

Plagiolepis schmitzji. - Santschi, 1920; Bull. Soc. vaud. Sci. nat. 53: 168.

Anamas 8.IV.83; Tanuma 8.IV.83; ♀♀ ♀♀ CAC.

This species is common in South west Europe and occurs widely in North Africa. It was found in the Asir mountains nesting under stones in a different kind of habitat to *P. maura*. The antennal scapes and funiculus segments are relatively longer than in that species. Measurements from a typical worker are HL 0.50; HW 0.45; SL 0.49; CI 90; SI 108; TL 2.0. Gaster pubescence is closer than in *P. maura* and the queens have prominent pubescence on the appendages.

Plagiolepis pygmaea (Latreille, 1798)

Formica pygmaea Latreille, 1798; Essai Fourmis Fr.: 45.

Plagiolepis pygmaea (Latreille) Mayr, 1861; Europ. Formicid.: 43.

There is an old determination for this species for Jebel Musmah at an altitude of 2700 m leg. H. Scott & E.B. Sutton, 1930. This South European species is not known to occur in North Africa or the Middle East but has been found as far south as the Maltese Islands.

Plagiolepis tumidula Emery, 1915 (fig. 96)

Plagiolepis (Tapinolepis) tumidula Emery, 1915; Boll. Soc. Labor. Zool. Scu. Agric. Portici 10: 19.

Najran 10.IV.83; ♀♀ CAC.

Individual workers were seen but were very fugitive and disappeared rapidly into the sandy ground at the slightest disturbance. No colony was found and two workers only of this minute, large eyed species could be secured from leaf litter on sandy soil under a shrub. Measurements from one of the workers are HL 0.38; HW 0.35; SL 0.38; EL 0.12; CI 93.3; SI 107; eye length almost one third head length; TL 1.4. The species was described from North east Africa. The two examples meet Emery's description only partially, being smaller and this identification must be regarded as tentative.

Genus ***Anoplolepis*** Santschi***Anoplolepis*** sp. indet. (fig. 99)

Sug al Ahad bare soil in sandy track 26.III.83; 2 ♀♀; Riyadh Agricultural Centre 18.IV.83; 1 ♀ CAC.

These three workers could not be determined to species. The antennae are eleven segmented with the first funiculus segment nearly equal to the second plus third. All funiculus segments are elongate and the scape over-reaches the occiput by about the length of the first funiculus segment. The hind tarsi are long, the tarsal segments together longer than either the tibia or the femur. The propodeal spiracle is large and prominent. The petiole is an upright scale. The alitrunk is flat in profile but the outline is broken by the shallow metanotal furrow. The maxillary palps are longer than the head. The body colour is uniformly brown with the legs somewhat paler. Both the body and the appendages are clothed with short adpressed pubescence.

TL 2.35; HL 0.65; HW 0.55; SL 0.60; EL 0.23; PW 0.39; Hind femur 0.85; Hind tibia 0.86; Hind tarsus 1.00.

Genus ***Paratrechina*** Motschulsky

Only two widely distributed cosmopolitan species were found.

Key to species

- 1 Body dark brownish black. Antennal scapes long reaching as far back as the metanotal suture. Body hairs long but sparse on the alitrunk ***longicornis*** (Latreille)
- Body yellowish with apex of gaster dark. Antennal scapes not extending far beyond occipital border. Body hairs profuse on alitrunk and crowded on the gaster ***jaegerskejoeldi*** Mayr

Paratrechina jaegerskjoeldi (Mayr, 1901)

Prenolepis jaegerskjoeldi Mayr, 1901; Res. Swed. Exp. White Nile 9: 8.

Paratrechina jaegerskjoeldi (Mayr) Emery, 1925: 218.

Hofuf 7.V.78; 9.V.78; 13.V.78; 19.V.78; Riyadh 28.I.78; Khaybar 26.IV.79; Wadi Shuwas 9.IV.80; Jeddah XII.83; ♂♂ ♀♀ ♀♀ W. Büttiker. Riyadh 22.III.83; Al Qatif 14.IV.83; ♂♂ ♀♀ ♀♀ CAC. Oman ♀♀ R.P. Whitcombe, M. Gallagher.

This species is locally very abundant and has become a household pest in many places. Nests are in rotten wood, in the irrigated pathways of parks and gardens or in the footings of buildings. It occurs in Egypt and throughout the Middle East.

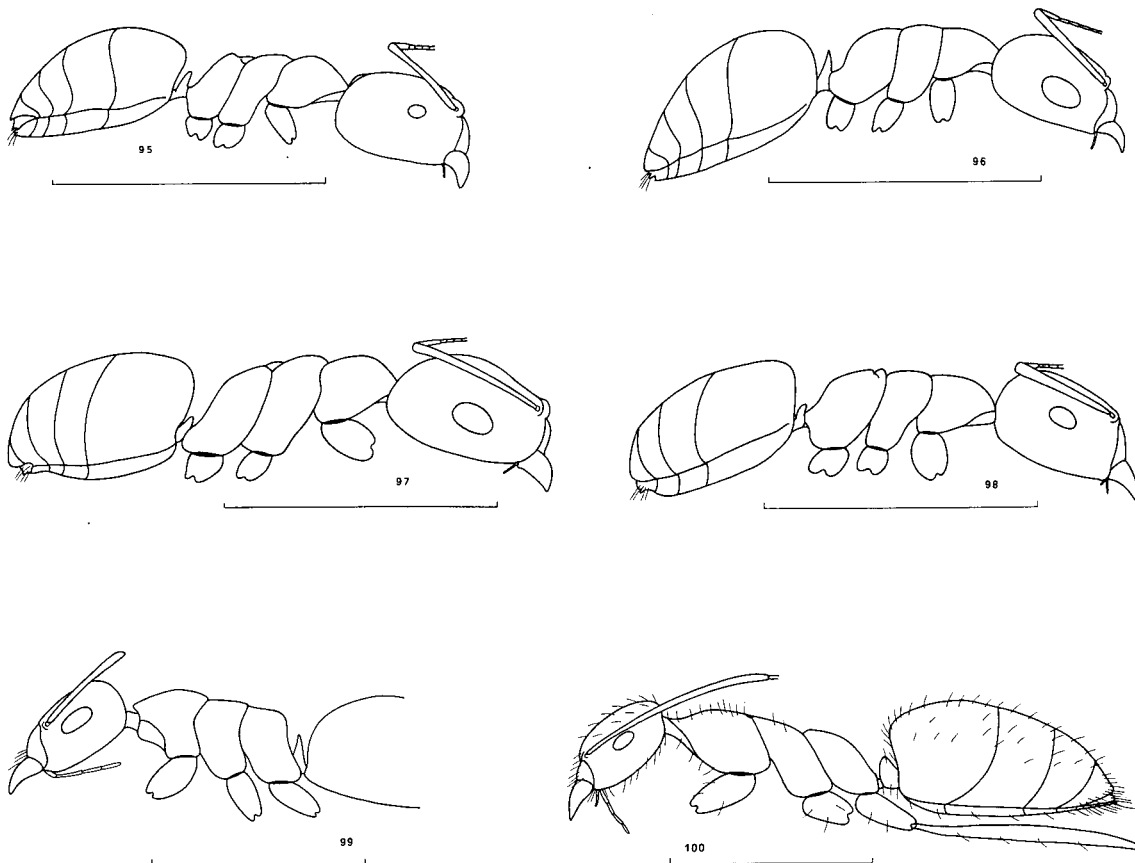
Paratrechina longicornis (Latreille, 1802) (fig. 100)

Formica longicornis Latreille, 1802; Fourmis: 113.

Paratrechina longicornis (Latreille) Emery, 1925: 217.

Jeddah 1.V.80; Harithi 22.I.84; NW of Tobuk 24.IV.79; ♀♀ W. Büttiker. Fayfa 27.III.83; Al Kola 10.IV.83; desert west of Najran 10.IV.83; ♀♀ ♀♀ CAC. Oman ♀♀ R.P. Whitcombe, M. Gallagher.

This has a worldwide distribution and is as abundant in Asia as in Africa. It moves very rapidly over the ground and can easily be mistaken for an *Acantholepis* species. Nests are under stones and colonies are less populous than with *P. jaegerskjoeldi*.



Figs 95–100: Profile view. 95, *Plagiolepis abyssinica* ♀; 96, *P. tumidula* ♀; 97, *P. schmitzii* ♀; 98, *P. maura* ♀; 99, *Anoplolepis* sp. ♀; 100, *Paratrechina longicornis* ♀. (Scale bar 1 mm).

DISCUSSION

The breakdown of the geographical distribution of the present known Arabian fauna gives the following in approximate percentages: Endemic 11; Cosmopolitan 6; Indian 4; South European 7; Tropical African 12; North east and North African 39; Middle East and Oriental 21.

The larger part of the ant fauna therefore is more of an extension of that of Africa than of the Middle East. Most of the afrotropical species were found, as might be expected, in the sheltered valleys on the Yemen border in the far southwest around Fayfa and Abu Arish. These include *Anochoetus tragaordhi*, *Pachycondyla ambigua*, *Platythyrea modesta*, *Messor galla*, *Pheidole sculpturata*, *Crematogaster luctans*, *C. senegalensis*, *Melissotarsus emeryi*, *Tetramorium khyarum* and *Polyrbachis viscosa*.

Species with their main distribution in the Middle East are comparatively few. They include *Belonopelta loebli*, *Messor ebeninus*, *M. meridionalis*, *M. orientalis*, *M. semirufus*, *Tetramorium syriacum*, *Monomorium abeillei*, *M. karawajewi*, *Cataglyphis niger*, *C. livida*, *C. sabulosa*, *Acantholepis dolabellae*, *A. opaciventris*.

The main habitat groups may be categorised as follows: Arboreal – species that are only found on or in trees or branches – *Tetraoponera* spp., *Melissotarsus emeryi*, *Leptothorax angulatus*, *Cardiocondyla wroughtonii*, *Crematogaster aegyptiaca*, *C. affabilis*, *C. acaciae*, *C. chiarinii*, *C. luctans*, *Technomyrmex* sp., *Plagiolepis abyssinica*, *Camponotus ilgii*, *C. fayfaensis*. Deserticolous – species that are only or mainly found in open sandy desert with sparse vegetation – *Messor striaticeps*, *M. syriacus*, *Crematogaster antaris*, *Monomorium afrum*, *Tetramorium juba*, *Cataglyphis abyssinica*, *C. livida*, *C. rubra*, *C. desertorum*, *C. minima*, *C. diebli*, *C. sabarae*, *C. urens*, *Acantholepis erythraea*. Here environmental conditions are at their most extreme with surface soil temperatures around midday in the hotter months of the year around 50 °C or more (CLOUDESLEY-THOMPSON 1962) and the preponderance of the long legged, desert adapted *Cataglyphis* ants is marked.

Litter – species that are only or mainly found in leafy debris – *Belonopelta loebli*, *Hypoconera* spp. *Pachycondyla ambigua*, *Cardiocondyla emeryi*, *Pheidole minuscula*, *Tetramorium caldarium*, *T. jizani*, *T. simillimum*, *Plagiolepis tumidula*. This is perhaps the most profitable habitat type to search for the more uncommon cryptic species. These should include Dacetini species which are still unrecorded from the Arabian fauna.

Mountain and highland pasture – *Messor aralocaspicus*, *M. minor*, *M. rufotestaceus*, *Tetramorium depressiceps*, *Monomorium zulu*, *Camponotus alii*, *C. atlantis*, *C. flavomarginatus*, *C. empedocles*, *Cataglyphis asiriensis*, *C. semitonsa*, *Acantholepis arabica*, *Plagiolepis schmitzji*, *Technomyrmex setosus*.

Most species however occur over a wide range of habitat including savannah type landscape, river valleys, rough pasture and semi-cultivated areas. These include the majority of species in the genera *Messor*, *Pheidole*, *Monomorium*, *Tetramorium*, *Camponotus* and *Acantholepis*, constituting over 60% of all species recorded.

Cosmopolitan or tramp species include a number of small species spread by trade from one country to another. Some of these have the status of minor pests in domestic or public buildings. Such species include *Hypoconera punctatissima*, *Pheidole megacephala*, *Monomorium destructor*, *M. gracillimum*, *M. pharaonis*, *Cardiocondyla emeryi*, *C. nuda*, *Tetramorium caldarium*, *T. simillimum*, *Triglyphothrix lanuginosa*, *Tapinoma melanocephalum*.

Endemic species include the following first records: *Cerapachys wittmeri*, *Messor buettikeri*, *Tetramorium jizani*, *Camponotus arabicus*, *C. fayfaensis*, *C. jizani*, *Cataglyphis asiriensis*, *C. minima*, *Acantholepis arabica* and *Technomyrmex setosus*. Others described by Emery, Forel or Santschi include *Monomorium luteum*, *Tetramorium calidum*, *Cataglyphis adenensis*, *C. urens* and *Camponotus adenensis*. However many of these supposed endemics may well occur in similar habitats in other territories especially in the still under-recorded North east Africa. Previous records for the whole of Arabian territory include only seventeen species compared with the present total of 164 so there is evidently scope for much further collecting in adjacent territories as well as Arabia.

Ants must play an important part in the regulation of other arthropod populations since in Arabia as in other Middle East and subtropical countries, they occur often in considerable numbers in every type of habitat visited and at every site. However many carnivorous species including *Cataglyphis* are scavengers rather than direct predators with exceptions among the Ponerinae, Dorylinae and a few Myrmicine species. They are also probably an important source of food for insectivorous birds especially during mating flights when large numbers will be eaten by such birds as swifts and swallows.

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