JOURNAL OF NATURAL HISTORY, 1989, 23, 1267–1308

The Afrotropical thermophilic ant genus *Ocymyrmex* (Hymenoptera: Formicidae)

BARRY BOLTON and ALAN C. MARSH†

Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD, UK † Department of Zoology, University of Namibia, 13 Storch Street, Windhoek 9000, Namibia

(*Accepted 11 April 1989*)

The taxonomy and biology of the Afrotropical thermophilic ant genus *Ocymyrmex* is reviewed and updated. A new key to workers for the 37 recognized species is presented and species-groups within the genus are delimited. Revised genus-level diagnoses for all castes are given and a check-list with known distributions of all species is included. Nine new species are described. The previously known biology of the genus is reviewed in the introduction and fresh biological and ecological information on a number of species is given in the introduction and under the individual species headings.

KEYWORDS: Formicidae, *Ocymyrmex*, taxonomy, biology.

Introduction

The thermophilic ant genus *Ocymyrmex* is restricted in distribution to parts of the Afrotropical zoogeographical region. Members of the genus are all sun-loving, extremely fast-moving ants characteristic of arid or well-drained ground. They range through dry savannah to extreme desert conditions in the southern and eastern parts of the region, but are absent from the rain forest zones of West and Central Africa. The genus is also absent from the Sahelian zone of the southern Sahara except in the extreme east, and it does not penetrate the Arabian Peninsula (Collingwood, 1985) nor Madagascar (Wheeler, 1922).

In terms of numbers of species and their distribution, most *Ocymyrmex* species are found in Namibia (17) and South Africa (17), followed by Angola (7), Botswana (7), Zimbabwe (4), Kenya (3), Tanzania (2), Somalia (2), and one each known from the territories of Lesotho, Zambia, Uganda, Sudan, and Ethiopia. Undoubtedly these figures represent a distorted approximation of the real distributional densities of the species, for collecting and study has been much more intense in South Africa and Namibia than elsewhere in the range of the genus. Even so, these crude figures appear to indicate a couple of valid points. First, speciation and endemicity are greater in Namibia and South Africa than elsewhere. Of the total number of species recorded 11 out of 17 Namibian, and 7 out of 17 South African species are only known from those countries. Members of all eight species-groups recognized in this paper occur in this area. Second, the absolute number of species in the eastern section of the continent (roughly Malawi and Zambia north to Sudan) is very much lower than in the southern

0022–2933/89 $5·00

section (southern Angola, Namibia, Botswana, Zimbabwe, South Africa). This, and the occurrence of greatest diversity, indicates that the southern states, and particularly South Africa and Namibia, most probably constitute the area of origin and zone of major radiation of *Ocymyrex*. In support of this concept it may be pointed out that all species represented on the eastern side of the continent belong in a single species-group, the *weitzeckeri*-group, which has also radiated widely in southern Africa. We suggest that this implies a northerly spread by taxa of this group from a southern place of origin.

Until relatively recently remarkably little was known of the biology of these ants. Arnold (1916) observed that *Ocymyrmex* species with which he was acquainted nested in the ground in hot arid areas. The nests themselves went very deep into the ground, usually in loose sandy soil, and had a crater-like entrance. The ants used their well-developed psammophores to carry soil particles excavated from the nests. Recently both Marsh and Robertson (pers. comm.) have observed that workers of *fortior* close the nest entrance with small stones during periods of nest inactivity. Also, in Zimbabwe, *fortior* workers have been seen adding small stones to the crater-like nest entrance that were picked up from the ground some distance away from the nest. This suggests that the crater is not just a by-product of the nest excavation but an important feature of the nest entrance. Its function is not fully understood, but its presence may facilitate the deliberate blocking of the entrance noted above.

Species are now known which nest in very rocky soil and the nests may extend through the bedrock itself, necessitating the use of a large crowbar to expose the nest-chambers (H. Robertson, pers. comm.). Careful excavations of nests in well-structured sandy soil by one of us (Marsh) have revealed a simple nest structure. For example, nests of *foreli* typically have one entrance that opens into a vertical tunnel which terminates in a broad chamber at a depth of about 30 cm. Other brood and food chambers branch off from the tunnel at various intermediate levels. A similar structure exists for nests of *picardi* and *sphinx* except in these cases the terminal brood chambers are typically 2 m and 1·5 m from the surface respectively. In most nest excavations the ergatoid queen was discovered near the bottom of the nest. In very unstructured loose sand, such as in the dry river beds of the Namib Desert, the tunnels and chambers of *Ocymyrmex* nests followed the root systems of shrubs and trees, and the major tunnel was therefore not necessarily vertical. Colonies of *Ocymyrmex* range in size from 200 to 1000 individuals (Marsh, 1987).

Arnold (1916), and other observers since, noted that ants of this genus move very swiftly and erratically, faster than any other ants which they had seen, and that the ants were active in the hottest part of the day.

Prins (1963, 1965) recorded that *Ocymyrmex* species were granivorous but would also attack other insects. This is contradicted in part by Marsh (1986 b) who observed that the main food supply of the Namibian species *robustior*, *turneri* and *velox*, was obtained by scavenging dead or heat-stressed insects, although *velox* also preys on termites when these are available. Observations by Marsh indicate that *picardi* has a diet intermediate between these extremes; 70 per cent of their food is other arthropods, much of it live termites, and the remainder consists of plant material. More recently Forder and Marsh (1989) have kept captive colonies of *O. foreli* alive on a diet of water, sugar-water, cockroaches, termites and meal-worms. As Marsh (1985 b) points out, much more data on the feeding habits of the various *Ocymyrmex* species is required.

A series of papers, either specifically dealing with *Ocymyrmex* biology (Marsh, 1985 a, 1985 b), or on *Ocymyrmex* species as a component of the Namib Desert ant

community (Marsh, 1985 c, 1986 a, 1986 b), has added much new information on the species of harsh desert environments. We should point out here that in all but the last of these papers the ant referred to as *O. barbiger* should properly be called *O. robustior*. At the times of publication of Marsh's first four papers *robustior* was incorrectly being treated as a junior synonym of *barbiger*. The former is now considered to be a valid species, separate from *barbiger* but belonging to the same species-group. The name *robustior* was elevated to species-level in Marsh (1986 b).

Marsh (1985 a) has shown that *O. robustior* is an individually foraging ant, diurnal and active on insolated ground at temperatures of 27–67°C. In the upper part of this range (>51°C) the ants, which are very efficient heat-exchangers, lower their body temperatures when necessary. They do this either by pausing in shaded spots or by climbing any object that will take them temporarily off the desert floor. Efficiency in controlling their body temperatures makes these thermophilic scavengers very successful in capturing other, heat- or dessication-stressed, insects as prey (Marsh, 1985 b). However, being primarily scavengers, at least in harsh desert conditions where most ant species tend to be granivores or nectar-honeydew gatherers, *Ocymyrmex* species make up a relatively low proportion of the total ant population in terms of numbers of individuals and biomass (Marsh, 1985 c).

Reproductive females of *Ocymyrmex*, inseminated or virgin, were unknown until relatively recently. Arnold (1916) supposed that the females were ergatoid, or that maybe the worker caste took part in egg production, as he had never found an obvious (reproductive) female, or queen. At the same time, however, he was aware that in some nest-series of *Ocymyrmex* strange individual variants occurred which had cephalic sculpture radically different from the usual cadre of workers. These variants had sometimes been described as infraspecific taxa or even as separate species. It was apparent from material examined that these variant forms left the nest to forage, and in general behaved as the workers did.

Bolton (1981) determined that these oddly sculptured forms were in fact the extremely ergatoid, potentially reproductive, females of the nests. They constitute the most worker-like females yet encountered in the Myrmicinae. They are much more specialized than any ergatoid females known in *Monomorium* (DuBois, 1986; Bolton, 1987) and *Ocymyrmex* apparently lacks the strange combination of ergatoid females and reproductive workers found in at least one *Pristomyrmex* species (Itow, Kobayashi, Kubota, Ogata, Imai and Crozier, 1984). There are no series of intercastes between true workers and true reproductive females, such as are found in several leptothoracine ants (e.g. Francoeur, Loiselle and Buschinger, 1985). Where known, ergatoid females of *Ocymyrmex* species consistently differ from conspecific workers in the structure of the frontal lobes and the antennal scapes, as illustrated in Figs 6 and 7, and as discussed in Bolton (1981). In most species cephalic sculpture is usually radically different in workers and females, as shown in the Figures, but this might not be so obvious in lightly sculptured species.

Recent dissections by Forder and Marsh (1989) of *O. foreli*, *picardi*, *flaviventris*, and *sphinx*, have shown that the ergatoid females always have larger ovaries and many more ovarioles than the workers. One of us (Bolton) has independently observed this also to be the case in *nitidulus*, *ignotus* and *alacer*. Forder and Marsh have also shown that in *O. foreli*, although numerous ergatoid females are present in the colony, and are produced throughout the year, only one is inseminated, so that the colony is functionally monogynous. The ovaries of the single inseminated female are much larger than in unmated females, so much so that the nest's fecund female is markedly

physogastric. Uninseminated ergatoid females behave to a large extent like the workers, and Forder and Marsh suggest that if an ergatoid female remains a virgin beyond a certain undetermined age she switches roles and begins to behave as a worker. They found that 4–20 per cent of the total adult colony membership (excluding males) consisted of unmated ergatoid females with a worker-like, or mostly worker-like, behavioural repertoire. These virgin ergatoid females, however, always have much better developed reproductive organs than the true workers. Work on eight species in southern Africa by Marsh (1987) has revealed that the proportion of reproductively inactive ergatoid individuals in the extra-nidal workforce of a colony ranges from zero to 58·5 per cent.

The question arises: can one or more of these unmated ergatoids revert from a worker-like condition upon the death of the nest's single fecund female, mate, and take over the role of the dead female? This aspect of ergatoid behaviour in *Ocymyrmex* remains to be investigated in detail, but preliminary experiments involving the removal of the fecund female from laboratory colonies suggest that role reversal does not occur in *O. foreli* (Forder and Marsh, unpublished).

Recent observations at Tosca in the northern Cape, South Africa, by one of us (Marsh) indicate that multiplication of colonies is by fission (hesmosis) of an existing nest. In December 1986 a considerable amount of recruitment in one direction was observed from one nest of *picardi*. Investigation revealed that the ants were relocating to another nest 150 m away. The nest from which the ants were being recruited had a large nest disk and midden of arthropod remains and was clearly an old, well established nest. In contrast, the nest to which the ants were moving had a smaller disk and no midden, and appeared to be more recently excavated. Traffic between the two nests continued for a day and thereafter ceased, and normal foraging activitity was seen at both nests. A similar emigration was observed from a nest of *robustior* in the Namib Desert. In this case the new nest was located 40 m from the old. Both persisted for several weeks as independent colonies but thereafter the new colony appeared to die or perhaps to relocate once again without having been seen to do so. The original colony remained vigorous several months later. In the case of the *picardi* example, careful excavation of the two nests revealed that the original (mother) colony contained 360 individuals, one of which was a physogastric ergatoid female, whereas the new (daughter) colony contained 108 individuals, 20 of which were ergatoids but none of which were physogastric. Dissection of all ergatoids from the daughter colony revealed that one had a distended spermotheca that was engorged with sperm. None of the others had been inseminated. This is the first fully excavated *Ocymyrmex* colony that had an inseminated but non-physogastric ergatoid. The evidence strongly suggests that she was a recently mated young queen at the start of her reproductive life.

Two other questions arise from this: where and when does mating occur, and does the mated ergatoid dig the new nest alone or with recruited nest-mates? Chance observation by Marsh on *robustior* in the Namib Desert indicates that mating almost definitely occurs at night, probably at almost any time of the year, and takes place at the nest entrance of the mother colony. As mentioned elsewhere in this paper, males are regularly trapped at night. On several occasions ergatoid females have been seen opening their nest at night, well after the last forager had returned and closed the nest. Having re-opened the nest entrance, the ergatoids remain in the vicinity of the nest for several hours before retreating below ground. No males emerged or arrived at the nest during these times but the most likely explanation for this behaviour is that the females were trying to attract males, probably by 'calling' with pheromones. We hypothesize

that upon insemination the ergatoid returns into the mother colony and later, in conjunction with some recruited help, commences excavating a new nest some distance from the mother colony, an example of autoparasitism in the sense of Bolton (1986).

Observations by one of us (Marsh) indicate that nest digging is a regular part of the diurnal behaviour repertoire of *Ocymyrmex* species and that nest relocation is common. Typically such relocations involve the entire colony and entail a move to a new nest very close to the original nest. For example, a mass emigration in 1986 of an *O. foreli* colony was carefully documented by Alves and Marsh (unpublished). For three weeks prior to the emigration most activity involving individual and group forays from the nest occurred towards a specific site 4 m away, where the ants were excavating a new nest. Finally, during the course of a single day, the entire colony relocated to the new nest. Brood, callows and intra-nidal individuals were carried to the nest by the extra-nidal individuals. Similar but less well documented behaviour has been observed for several other species of *Ocymyrmex*. The reason for mass emigration and nest relocation is not known. It would appear that the ants consider the original nest to be unsuitable but that the foraging area itself remains suitable. Colony fission, in contrast, involves movements over considerably greater distances away from the centre of the foraging area of the mother colony. Thus it seems likely that a recently inseminated ergatoid excavates a new nest with the help of some recruited nest-mates before colony fission occurs.

Several intriguing questions concerning social organization in *Ocymyrmex* remain unanswered at present. For example, if the original physogastric reproductive female dies and a number of ergatoids which are acting as workers then become mated, which takes over the parent nest, and how is the process regulated? Or do all such newly-mated forms disperse, abandoning the original nest-site?

Some years ago Hölldobler, Stanton and Engel (1976) reported the presence of a previously undetected gastral exocrine system in workers of *O. picardi* and in a couple of specialized North American deserticolous ants belonging to the genus *Aphaenogaster* (= *Novomessor*, see Brown, 1974; Bolton, 1982). This exocrine system was later termed the pygidial gland by Kugler (1978), the name now generally accepted for the system. The gland consists of a number of cells located under the intersegmental membrane between gastral tergites 3 and 4 (= abdominal tergites 6 and 7), with ducts through the membrane. In *O. picardi* and some other myrmicines the gland is associated with a special cuticular area on the base of the pygidium (gastral tergite 4), on the section of the sclerite which in life is overlapped by the apex of the third gastral tergite. Kugler (1978) detected this specialized cuticular area in a second species, referred to as *Ocymyrmex* cf. *arnoldi*, which was most probably *O. fortior*.

In their review of tergal and sternal glands in ants Hölldobler and Engel (1978) pointed out that pygidial glands may occur in myrmicines without the development of the specialized cuticular area at the base of the pygidium, and thus only be detectable by histological sectioning. However, by examination of alcohol-preserved material of *Ocymyrmex* we can confirm the presence of the specialized area of pygidial cuticle in workers of all species so examined, namely *alacer*, *flaviventris*, *fortior*, *hirsutus*, *nitidulus*, *picardi*, *resekhes*, *robustior*, and *ignotus*. It appears as a narrow shallowly concave transverse strip, filled with fine reticular patterning, on each side of the midline close to the pygidial base.

Males of *Ocymyrmex* (habitus as Figs 23, 24, 26 and 27) are often collected at lights (H. Robertson, pers. comm.) but males associated with conspecific workers and females are extremely hard to acquire in certain species as the nests are often so deep in

the earth and so difficult of access. Even when a nest is fully excavated there is of course no guarantee that males will be present. For this reason very little is known of this sex, but enough data has been gathered to present a reasonable genus-level diagnosis, given later in this paper. Recently Hamish Robertson (University of the Witwatersrand) has discovered a number of male/female mosaics of *O. robustior*, that is, males with irregular patches of female tissue. These oddities are discussed in the notes following the diagnosis of the male. The cause of such mosaic development is not known, but a reasonable mechanism for the production of patches of female (diploid) tissue in an otherwise haploid male can be adduced.

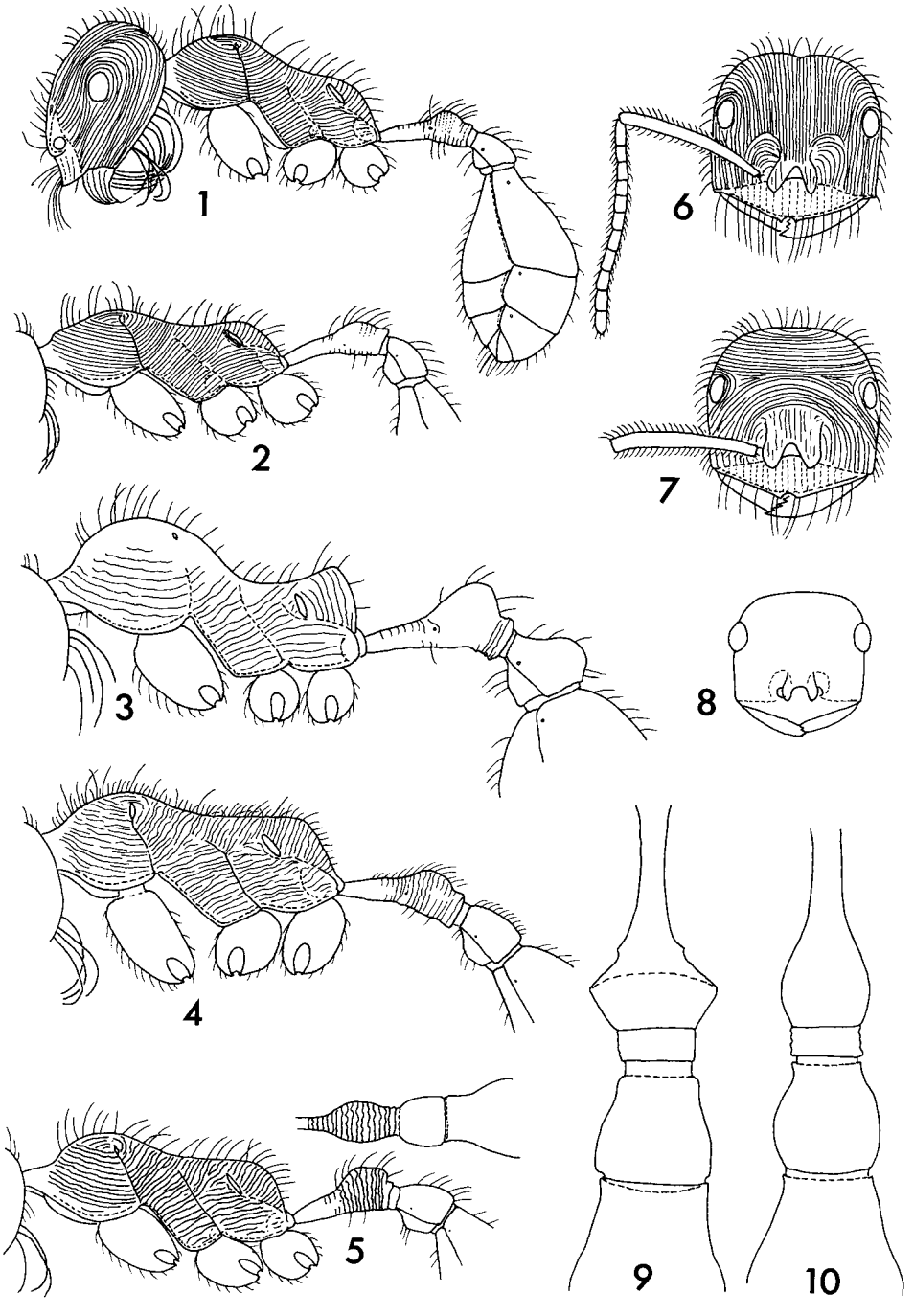
If a haploid cell undergoing mitosis in a male embryo should fail to divide after the number of chromosomes has doubled then that cell, and all its later replicates, will be functionally female (diploid), and the tissues developed from that cell and its replicates will express the female form. Should the failure to complete mitosis occur as early as the 2-cell stage, so that the later replicates of one cell are all diploid and of the other cell all haploid, then the result will be an equal gynandromorph, with half its tissues appearing in the male form and half in the female form. But if the fault is merely local and occurs at a later stage of embryonic development when many cells are present, the result will be expressed as a patch of female tissue upon a male ant.

The present paper has arisen from a preliminary taxonomic revision of *Ocymyrmex* which one of us carried out a few years ago (Bolton, 1981). This, the first such survey of the genus ever undertaken, recognized 23 valid species-level taxa. Since then so much new material and biological data has been accumulated that our knowledge of *Ocymyrmex* has vastly increased and has rendered an update of the earlier survey imperative.

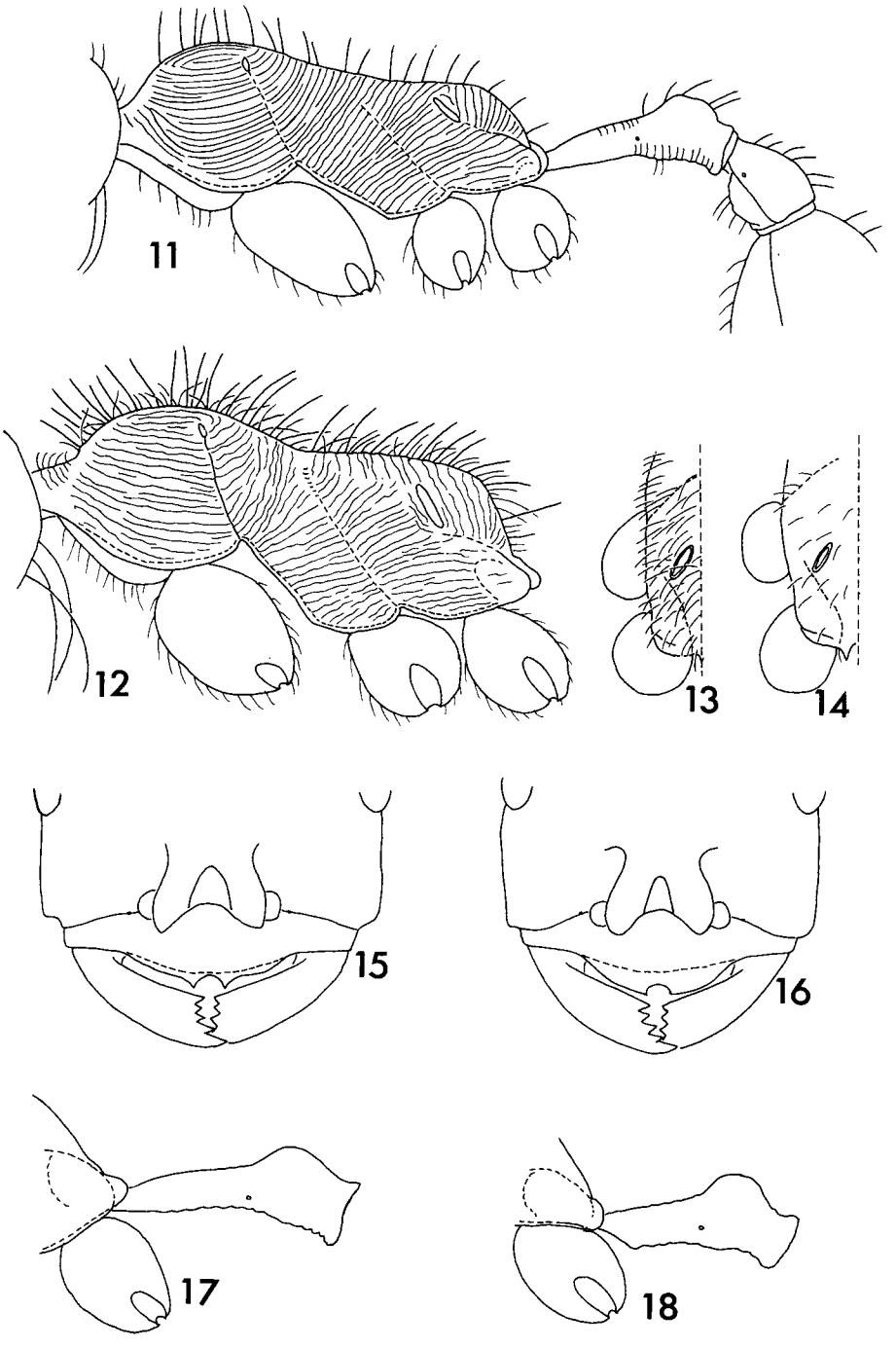
The number of species included in the genus now stands at 37. This increase of 14 species over the number recognized as recently as 1981 has come about through the descriptive work of Prins and Roux (1989), and the detailed collections carried out mainly by Alan Marsh in Namibia and South Africa. The former authors added three species to the list, and the latter (Marsh, 1986 b) has indicated that a varietal form earlier treated as a junior synonym is in fact a valid species. The present paper describes nine more new species and elevates another varietal form to species-level. Undoubtedly, more species await discovery and one or two taxonomic problems in already known taxa, which are discussed elsewhere in the text, still cannot be rectified with any high degree of certainty.

In the following sections the genus *Ocymyrmex* is diagnosed and a check-list and revised key to workers presented. The species-groups of the genus are discussed, following which is a section where individual species are treated in alphabetical order. This section contains descriptions of new taxa, taxonomic notes on some previously known species, and notes on the biology, distribution, etc., of a number of species. All measurements and indices encountered in this paper, and all abbreviations of the names of museums and other depositories, are as defined in Bolton (1981).

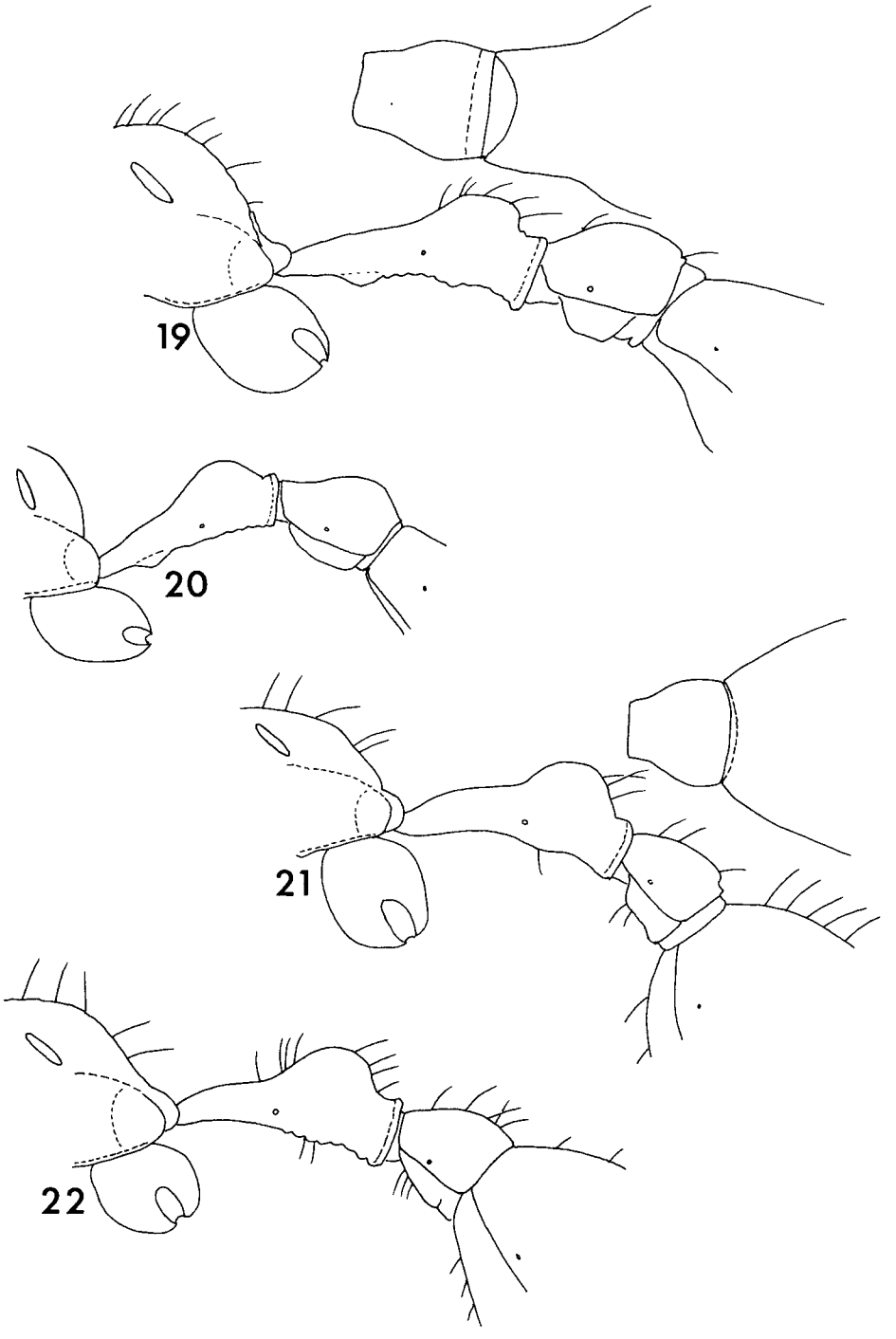
We hope that this survey of the genus will stimulate further ecological and ethological work on this fascinating and highly specialized group of thermophilic ants.



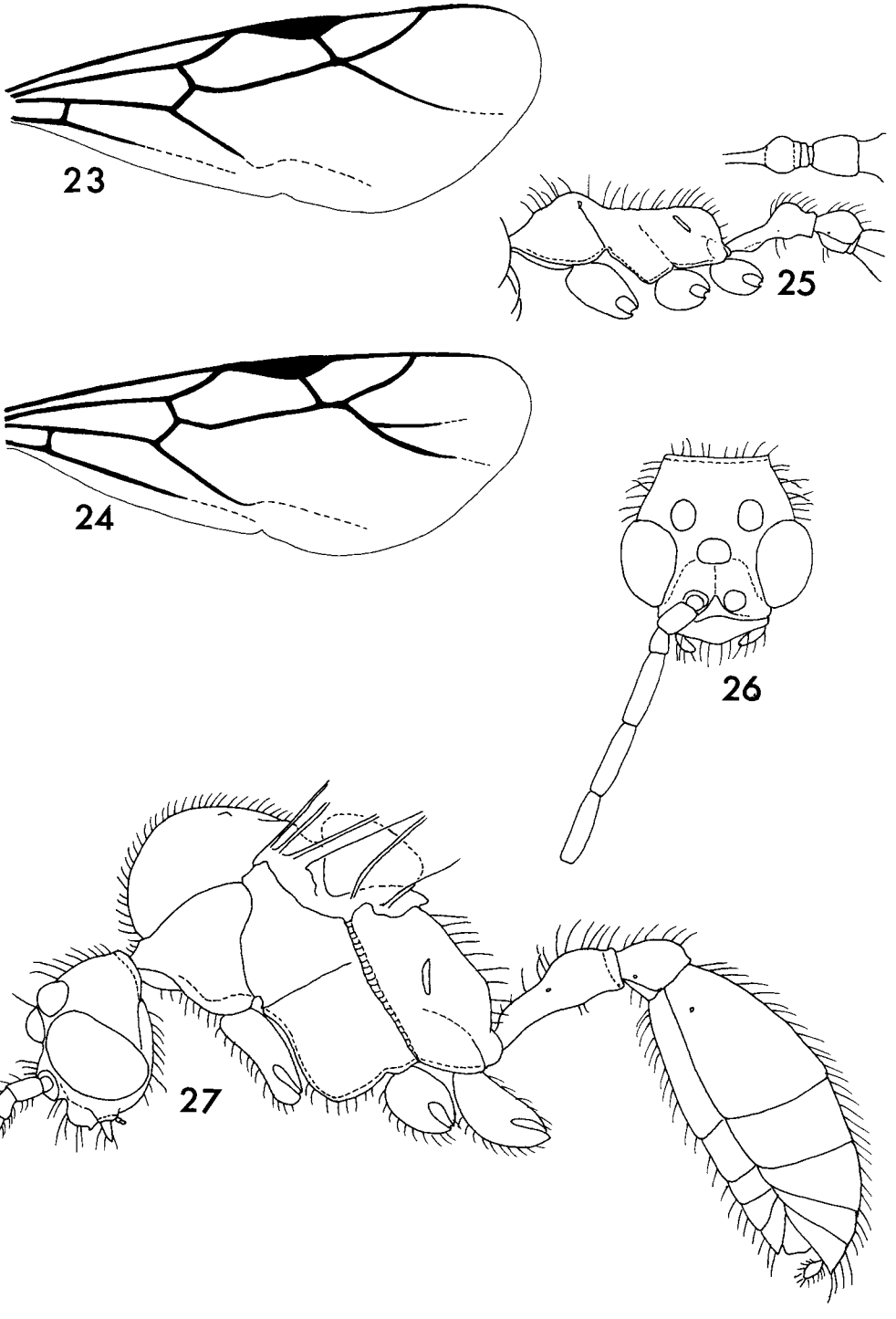
FIGS 1–10. *Ocymyrmex* spp. 1. Profile of body of *nitidulus* worker. 2–5. Profile of alitrunk and waist in workers. 2. *celer*. 3. *cavatodorsatus*. 4. *sphinx*. 5. *sobek*; offset shows waist and base of gaster in dorsal view. 6–8. Head in full-face view. 6. *nitidulus* worker. 7. *nitidulus* ergatoid female. 8. *turneri* worker. 9–10. Waist and base of gaster in dorsal view. 9. *alacer* worker. 10. *sphinx* worker. Sculpure and pilosity omitted in 8–10.



FIGS 11–18. *Ocymyrmex* workers. 11. *kahas* alitrunk and waist in profile. 12. *hirsutus* alitrunk in profile. 13–14. Left sides of posterior alitrunk in dorsal view to show pilosity. 13. *hirsutus* (*hirsutus*-group). 14. *nitidulus* (*weitzeckeri*-group). 15–16. Anterior portion of head in full-face view. 15. *robustior*. 16. *kahas*. 17–18. Outline of petiole in profile. 17. *resekhes*. 18. *flaviventris*. Sculpture omitted in 13–18; pilosity omitted in 15–18.



FIGS 19–22. *Ocymyrmex* workers. Profile of propodeum, waist segments and base of gaster. 19. *cursor*. 20. *laticeps*. 21. *zekhem*. 22. *velox*. Offsets from 19 and 21 show postpetiole and base of gaster in dorsal view. Sculpture omitted.



FIGS 23–27. *Ocymyrmex* spp. 23–24. Forewing of males. 23. *robustior*. 24. *foreli*. 25. Profile of alitrunk and waist in *shushan* worker. 26. Full-face view of head of *robustior* male. 27. Profile of body of *robustior* male. Sculpture omitted.

Genus ***Ocymyrmex*** Emery

Ocymyrmex Emery, 1886: 364. Type-species: *Ocymyrmex barbiger* Emery, 1886: 364, by monotypy.

Diagnosis of worker

Terrestrial fast-moving ants with monomorphic worker caste, belonging to subfamily Myrmicinae. Habitus as in Figs 1 and 6 and with the following combination of characters.

1. Mandible short and powerful, armed with 5 (usually) or 4 (rarely) sharp teeth which decrease in size from apex to base. Counting from the apical the third and fourth teeth (when 5 present in total), or only the third tooth (when 4 present in total) paired, having flanking teeth internally on the masticatory margin; flanking teeth only visible when mandibles open.
2. Trulleum shallow, closed and weakly defined, almost obliterated in some species.
3. Palp formula 5, 3; 4, 3; 3, 3; 2, 3; see notes below.
4. Ventral surface of head with a strongly developed psammophore, the ammochaete hairs arising on the ventre itself, on base of ventral borders of mandibles, and on bases of mouthparts (Fig. 1).
5. Clypeus large, posteriorly broadly inserted between the frontal lobes, lacking a long unpaired anteromedian seta (Figs 6, 8, 15 and 16).
6. Frontal lobes well defined but short, mostly or wholly covering the antennal insertions, ending at same level as do the antennal fossae.
7. Frontal carinae and antennal scrobes absent.
8. Antennae 12-segmented, filiform, without an apical club (Fig. 6).
9. Eyes well developed, situated slightly behind midlength of sides of head.
10. Mesothoracic spiracles opening dorsally or high on the sides, clearly visible in dorsal view, with slit-like or crescent-shaped orifices.
11. Metanotal groove absent; propodeum unarmed, without trace of spines or teeth.
12. Propodeal spiracle extremely elongate, slit-shaped and very conspicuous (Figs 1–5, 11 and 12).
13. Metapleural lobes linked by an arched carina across the propodeal declivity.
14. Metapleural glands small to moderate, widely separated from the elongate propodeal spiracle.
15. Metasternal process (and associated carinae) absent, but metasternal pit conspicuous. The pit is in a depression at the posterior end of the mid-sternal longitudinal suture, very close to the apex of the alitrunk-petiole articulatory excision.
16. Posterior excision of ventral alitrunk where petiole articulates broadly U-shaped and running forward as far as or just beyond a line connecting the anteriormost points of the hind coxal cavities [see notes below].
17. Legs extremely long and slender, coxae large and powerful; middle and hind tibiae with simple to weakly roughened spurs present.
18. Petiole with a long narrow anterior peduncle, the petiolar spiracle situated at the node or just in front of it. A short posterior peduncle present behind the node (Figs 1–5 and 19–22).
19. Sting very reduced in size, apparently not functional.

Notes

The palp formula (PF). As previously stated (Bolton, 1981) PF 3, 3 is predominant in the genus, but it is now known that some species show variation in maxillary palp segmentation. PF remains unknown in *robecchii* and *flavescens*.

PF 5, 3 occurs in *cavatodorsatus*, *gordoni* and *gariepensis*.

PF 4, 3 occurs in *barbiger*, *cilliei*, *afradu*, *dekerus*, *kahas*, and *robustior*. In some, or perhaps all of these species with PF 4, 3, rare individuals may appear which have PF 3, 3. In some cases it is possible that these oddities may be represented by single workers in series where all others have PF 4, 3, but this has not yet been observed. On occasion individual workers may be found in which one maxillary palp has 4 segments and the other 3 segments due to fusion of the small apical palpomeres (*afradu*, *dekerus*).

PF 2, 3 is known only in the small species *tachys* and *engytachys*.

PF 3, 3 occurs in all other known species. A very small minority of workers in many of these species show an apparent or real PF of 4, 3. This is because the apical maxillary palpomere is sometimes deeply constricted near its midlength or its apex; the section beyond the constriction may be separated off as a small fourth segment.

Ventral alitrunk. Characters 15 and 16 above have been investigated in *afradu*, *alacer*, *barbiger*, *cavatodorsatus*, *celer*, *cilliei*, *flaviventris*, *foreli*, *fortior*, *gariepensis*, *hirsutus*, *ignotus*, *nitidulus*, *phraxus*, *picardi*, *resekhes*, *robustior*, *sobek*, *velox*, and *zekhem*.

Diagnosis of female (queen)

Extremely ergatoid, physogastric when reproductive, and approximately the same size as the worker, answering to all characters of the worker (1–19) given above. Characters normally associated with reproductive female ants, such as large eyes, presence of ocelli, enlarged alitrunk with flight sclerites and wings, etc., are never developed. Female is different from worker, in all species where the former is known, by the following.

1. Outer margins of frontal lobes more widely separated in their posterior halves in females than in workers; margins of frontal lobes behind level of antennal insertions parallel or nearly so in females, convergent posteriorly or pinched in in workers (compare Figs 6 and 7).
2. Antennal scapes broader and usually slightly shorter in females than in workers; see table of dimensions for 9 species in Bolton (1981).
3. Dorsum of head behind level of eyes usually with strong regular transverse sculpture in females (Fig. 7), whereas sculpture is generally longitudinal in this area in workers (Fig. 6). [A few species have transverse cephalic sculpture in workers, for instance *ankhu*, *robecchii*, *hirsutus*, but here the form of the sculpture usually varies between the two castes, being more strongly defined in ergatoid females than in workers. In a very few species both castes may have sculpture extremely reduced and difficult to discern on the cephalic dorsum.]

Notes

Ergatoid females are produced in relatively large numbers. In *foreli* they make up 4–20 per cent of the nest population (Forder and Marsh, 1989). Only one is fecund, and is physogastric, the remainder take on a worker-like function and are often found foraging outside the nest. Ergatoid females are now known for *alacer*, *barbiger*, *cavatodorsatus*, *celer*, *cilliei*, *flaviventris*, *foreli*, *fortior*, *hirsutus*, *ignotus*, *nitidulus*, *okys*, *phraxus*, *picardi*, *resekhes*, *robustior*, *sobek*, *sphinx*, *turneri*, *velox* and *zekhem*.

Diagnosis of male

(Based on males of *barbiger*, *cilliei*, *foreli*, *fortior*, *robustior*, *weitzeckeri*, plus one species unassociated with workers but probably *turneri*.)

Male habitus as in Figs 23, 24, 26 and 27.

1. Mandibles extremely reduced and non-functional, elongate-lobiform and edentate. Mandibular apices not meeting at full closure, with a marked gap between them.
2. Labrum large and deeply cleft anteromedially.
3. PF 3, 2 (*foreli* by dissection, *robustior* and *fortior* by *in situ* count).
4. Psammophore absent.
5. Anterior clypeal margin approximately transverse, without a median notch and lacking a strongly differentiated median seta.
6. Clypeus an unspecialized weakly convex transverse strip.
7. Anterior tentorial pits closer to base of mandibles than to antennal sockets.
8. Antennal insertions close together; width of one antennal socket greater than minimum distance between them.
9. Frontal lobes absent.
10. Antennal scape short, shorter than any funicular segment except the first (Fig. 26).
11. Antennae 13-segmented, filiform, without an apical club; first funicular segment much shorter than the remainder.
12. Eyes large and prominent, anteriorly situated; in profile eyes seen to lap around lower margin of sides of head, just on to the ventral surface (Fig. 27).
13. Ocelli present, small to large, borne on a low turret so that the median ocellus is directed forward.
14. Head capsule in full-face view much broader behind eyes than in front; head apparently attached low on anterior face of alitrunk because of specialized mesoscutum.
15. Pronotal posterior lobe raised over orifice of mesothoracic spiracle.
16. Mesoscutum swollen, bulging dorsally and anteriorly; much broader than long in dorsal view and much broader than maximum width of head.
17. Notauli absent but mesoscutum anteromedially with a narrow weakly impressed longitudinal line.
18. Parapsidal grooves vestigial.
19. Venation as shown in Figs 23 and 24; see also notes, below.
20. Alitrunk with a deep median transverse impression between mesoscutum and scutellum, both of which are swollen; the impression bounded laterally by the axillae.
21. Axillae subtriangular on dorsum, widely separated, linked across the dorsal impression by a narrow strip of thinner cuticle.
22. Propodeal spiracle an elongate near-vertical slit.
23. Metapleural lobes small, rounded to angular.
24. Metapleural glands apparently absent.
25. Middle and hind tibiae with simple spurs.
26. Petiole with an elongate anterior peduncle.
27. Petiolar spiracle close to or at the reduced node, always well behind the midlength of the peduncle.
28. Pygostyles (= cerci) present. Basal ring of genitalia large and parameres strongly sclerotized.

Notes

In the forewing venation the radial (= marginal) cell is closed on the margin; *m–cu* is absent; *cu–a* is close to the base of the wing; *Rs* and *M* separate at or distal of the junction of *2r* with *Rs* + *M*. Frequently an adventitious vein or vein-stub arises from *M* and runs towards the apex (Fig. 24). When present this adventitious vein is very variable in length, direction, degree of development, and position at which it leaves *M*. In one male of *fortior* examined the adventitious vein arises from *Rs* on the left forewing, and from close to the base of *M* on the right forewing. Fig. 23 shows the standard venation, Fig. 24 a forewing with a strongly developed adventitious vein arising from *M*. The typically pheidoline system of forewing vein reduction has been outlined by Bolton (1982: 362, Figs. 35–43).

A number of males of *robustior* collected at Gobabeb, Namibia by Hamish Robertson (University of the Witwatersrand), show mosaic patches of female (diploid) tissue on their heads. A mechanism to account for such tissue mosaics is outlined in the introduction to this paper. The main mosaics noted on males now deposited in BM(NH) were as follows.

The first mosaic male (series C1056) has a female left mandible and a hypertrophied but male-like right mandible. The left antennal funiculus is of female form but the scape is short and bizarre, with a number of cuticular excrescences. Anterolateral portions of the head, in front of eyes and on each side of antennal sockets, and the genal areas, are female. As a result the eyes, which are of male form, are deformed and displaced posteriorly. The right antennal socket is female and is supertended by a reduced and deformed female-form frontal lobe; the left is a normal male antennal socket. Long ammochaete hairs are present on the mandibles and under the head of this male.

Three mosaic males occur in series C1057. The first of these has enlarged and grossly deformed mandibles which are basically of the male form but which have patches of female tissue. Ammochaete hairs occur on the mandibles and under the head. The second has deformities very like those of C1056, above, but the right scape is longer and has a massive club-like dorsal excrescence of female tissue. The genal patches of female tissue are not as large as in C1056 so that the eyes are not as strongly displaced posteriorly. The third male has the left mandible mostly of female form, but with incomplete dentition. The right mandible is an undifferentiated mass but shows coarse female-like sculpture. The head in front of the eyes has much female tissue on each side of the clypeus, with the result that the latter is much deformed. The eyes are irregular in shape and are displaced posteriorly. The antennae have only 12 segments. They are of male form except for the apical four antennomeres of the left funiculus, which are female-like. Ammochaete hairs are numerous.

Each of the mosaic forms occurs in series with other, perfectly normal, males. Such mosaic males have not been noted in *fortior*, the only other species of which we have numerous samples of males. So whether the tendency to produce such mosaics is restricted to *robustior* as a species, to the *robustior* population in the Gobabeb area, or to a single *robustior* nest which happened to be in the vicinity of the light-trap, remains a matter for conjecture. However, Robertson (pers. comm.) informs us that as the *robustior* males were collected over a long period it seems safe to assume that more than one nest was involved.

Comments

The genus *Ocymyrmex* is easily isolated from all other Myrmicinae by the following

autapomorphic characters in the worker and ergatoid female castes.

1. Propodeal spiracles elongate, narrow and slit-like.
2. Mesothoracic spiracles dorsal, open and visible in dorsal view.
3. Third mandibular tooth, or usually teeth 3 and 4, double-ranked internally on masticatory margin.
4. Reproductive female (queen) extremely ergatoid and physogastric; uninseminated ergatoids function like workers and occur outside the nest.

The worker/female habitus is also distinctive: a long-legged attenuated terrestrial myrmicine ant with a stockily constructed head, short powerful 4–5 toothed mandibles, a strongly developed psammophore, unarmed propodeum, and an elongate petiole segment.

Males have an advanced pheidoline form of wing venation (Bolton, 1982: 362) but with cross-vein *m–cu* absent and the radial (= marginal) cell closed, extremely reduced and non-functional lobe-like edentate mandibles, and an elongate slit-like propodeal spiracle as in the worker and female castes (Fig. 27).

We now strongly suspect that *Ocymyrmex* is related to *Messor* and *Aphaenogaster*, within the *Pheidole*-group of genera. The structure of the head and alitrunk, and the venation, provide the main clues for our association of *Ocymyrmex* with the pheidolines, although Wheeler and Wheeler (1973) have already pointed out that the larva in this genus is aphaenogastriform.

We suggest that the tribe Ocymyrmecini, containing only the genus *Ocymyrmex*, be abandoned and its constituent genus be regarded as a pheidoline from now on. An analysis giving details supporting this suggestion will be presented in a later paper.

Check-list and known distributions

(For earlier synonymic list and full references see Bolton, 1981).

afradu sp. nov. Namibia.
alacer sp. nov. Botswana, South Africa.
ankhu Bolton, 1981. Angola.
barbiger Emery, 1886. South Africa.
= *barbatus* Emery, 1892.
cavatodorsatus Prins, 1965. South Africa.
celer Weber, 1943. Sudan, Kenya.
cilliei Prins and Roux, 1989. South Africa.
cursor Bolton, 1981. Angola.
dekerus sp. nov. South Africa, Namibia.
engytachys sp. nov. Namibia.
flavescens Stitz, 1923. stat. nov. Namibia.
flaviventris Santschi, 1913. Botswana, South Africa, Namibia.
foreli Arnold, 1916. Zimbabwe, South Africa.
fortior Santschi, 1911. Zambia, Zimbabwe, Botswana, South Africa, Namibia, Angola.
= *weitzeckeri* st. *transversus* Santschi, 1911.
= *arnoldi* Forel, 1913.
= *weitzekeri* [sic] st. *abdominalis* Santschi, 1914.
= *weitzaeckeri* [sic] var. *usakosensis* Stitz, 1923.

gariepensis Prins and Roux, 1989. South Africa.
gordoni Prins and Roux, 1989. South Africa.
hirsutus Forel, 1910. Botswana, South Africa.
ignotus sp. nov. South Africa.
kahas sp. nov. Namibia.
laticeps Forel, 1901. Angola.
micans Forel, 1910. Namibia.
monardi Santschi, 1930. Namibia, Angola.
nitidulus Emery, 1892. Ethiopia, Somalia, Kenya, Uganda, Tanzania.
okys sp. nov. Namibia.
phraxus Bolton, 1981. Kenya, Tanzania.
picardi Forel, 1901. Zimbabwe, Botswana, South Africa, Namibia, Angola.
= *carpenteri* Donisthorpe, 1933.
resekhes sp. nov. South Africa.
robecchii Emery, 1892. Somalia.
robustior Stitz, 1923. Namibia.
shushan Bolton, 1981. Namibia.
sobek Bolton, 1981. Zimbabwe, Botswana, South Africa.
sphinx Bolton, 1981. Botswana, South Africa.
tachys sp. nov. Namibia.
turneri Donisthorpe, 1931. Namibia.
velox Santschi, 1932. Namibia, Angola.
weitzeckeri Emery, 1892. South Africa, Lesotho.
= *weitzeckeri* ssp. *wroughtoni* Forel, 1910.
zekhem Bolton, 1981. Namibia.

Key to workers

Note. The number of maxillary palp segments is very important in some key couplets. One or more specimens from any given series should be mounted with the mouthparts extended. In old specimens where the mouthparts are concealed the ant should be floated off its mount and relaxed, when the mouthparts can be extended and the palpi seen.

1 Mandible usually with only 4 teeth, rarely the third tooth with a minute denticle at its base. Only the third tooth (counting from the apical) paired internally on the masticatory margin. (South Africa) . . . . . *gariepensis* Prins and Roux
– Mandible with 5 stout teeth. The third and fourth teeth (counting from the apical) paired internally on the masticatory margin 2

2 Maxillary palp with 5 segments 3
– Maxillary palp with 2–4 segments 4

3 With alitrunk in profile the propodeal outline rising steeply posteriorly, forming an elevated bluntly subconical peak at its junction with the declivity; entire dorsal outline of alitrunk strongly saddle-shaped (Fig. 3). HW 1·06–1·18, SL 0·94–1·06, CI 105–108, SI 88–91. (South Africa) . . . . . *cavatodorsatus* Prins
– With alitrunk in profile the propodeal outline not rising posteriorly, not forming an elevated subconical peak at its junction with the declivity; entire dorsal outline of alitrunk not saddle-shaped. HW < 0·95, SL < 0·90, CI ca 100, SI ca 93. (South Africa) *gordoni* Prins and Roux

4 Anterior clypeal margin without a conspicuous semicircular to V-shaped median

impression or notch, the margin entire and evenly convex, or at most somewhat flattened in the middle 5

– Anterior clypeal margin with a semicircular to V-shaped median impression or notch, which is usually very conspicuous; the impression often flanked by a pair of dentiform prominences or distinct teeth 10

5 Smaller species, HW 1·25–1·28, SL 1·37–1·40. PW 0·75–0·80. With the head in full-face view the large eyes (0·26 × HW or more) very obviously breaking the outline of the sides. Middle of anterior clypeal margin rarely flattened, usually with a low broad bluntly triangular prominence (Fig. 8). (Namibia) . . . . *turneri* Donisthorpe

– Much larger species, HW > 1·70, SL > 1·50, PW > 1·00. With the head in full-face view the smaller eyes (< 0·25 × HW) usually just failing to break the outline of the sides (as in Fig. 6). Middle of anterior clypeal margin always lacking a triangular prominence 6

6 First gastral tergite in dorsal view strongly constricted basally and forming a narrow neck, the sclerite in this region roughly parallel-sided and no broader than the postpetiole (Fig. 19). Petiole node low and broadly rounded in profile, with a blunt angular ventral process about half way along the peduncle (Figs 19 and 20) . . 7

– First gastral tergite in dorsal view not constricted basally, without a narrow neck, the sclerite broadening evenly from its articulation with the postpetiole (Fig. 21). Petiole node high and domed in profile, without trace of a ventral process at the midlength of the peduncle (Figs 21 and 22). 8

7 Metapleural lobes large and very strongly prominent, plainly visible in absolute profile, not concealed by the bulge of the metapleural gland bulla (Fig. 19). HW 2·04, PW 1·30, CI 98. (Angola) . . . . . *cursor* Bolton

– Metapleural lobes very small, not prominent, scarcely or not visible in absolute profile, mostly or entirely concealed by the bulge of the metapleural gland bulla (Fig. 20). HW 1·70–1·74, PW 1·08–1·14, CI 102–103. (Angola) . . . . *laticeps* Forel

8 Basal half of first gastral tergite with numerous conspicuous hairs which are as long as those on the mesonotal and propodeal dorsa (Fig. 21). Antennal scapes relatively long, SI > 110. Entire ant black to the naked eye, the gaster the same colour as the alitrunk. (Namibia) . . . . . *zekhem* Bolton

– Basal half of first gastral tergite without hairs or at most with a few inconspicuous hairs which are much shorter than those on the mesonotal or propodeal dorsa (Fig. 22). Antennal scapes relatively short, SI < 110. Entire ant not black to the naked eye . 9

9 Head red, alitrunk duller red to black, gaster yellowish to black. Hairs on dorsal alitrunk usually white to silvery, only rarely coloured. SI 101–105, CI 95–97. (Angola, Namibia) . . . . . *velox* Santschi

– Colour everywhere a uniform rich orange-brown, or sometimes with the gaster slightly lighter. Hairs on dorsal alitrunk uniformly reddish brown. SI 94–102, CI 97–101. (Angola) . . . . . *ankhu* Bolton

10 Large or very large species, HW > 2·00, SL > 1·90 11

– Smaller species, HW < 2·00, SL < 1·90 14

11 Hairs on dorsal alitrunk dark reddish brown to blackish. Extremely large species, HW 2·30 or more. (Zimbabwe, Botswana, South Africa, Namibia, Angola) *picardi* Forel

– Hairs on dorsal alitrunk white to silvery. Large species but not approaching the above in size, HW in range 2·02–2·15 12

12 Dorsum of head behind level of eyes with dense tranverse costulate sculpture; ground-sculpture between costulae vestigial. SI > 100. Mesothoracic spiracles with orifices protected by a pair of low tumuli or welts which project from the surface. Metapleural lobes slightly upcurved. (Somalia) . . . . *robecchii* Emery

– Dorsum of head behind level of eyes with dense, usually irregular, longitudinal rugular sculpture; ground-sculpture between rugulae conspicuous. SI usually < 100. Orifices of mesothoracic spiracles lacking protective low tumuli or welts projecting from the surface. Metapleural lobes not upcurved 13

13 Petiole node in dorsal view flattened and its central portion strongly expanded laterally,

the median section of the node projecting as a blunt triangular prominence on each side (Fig. 9). (Botswana, South Africa) . . . . . *alacer* Bolton & Marsh

– Petiole node in dorsal view rounded, its central portion not strongly expanded laterally; sides of node evenly shallowly convex and lacking blunt triangular prominences on each side (Fig. 10). (Botswana, South Africa) . . . . . *sphinx* Bolton

14 Maxillary palps with only 2 segments 15

– Maxillary palps with 3–4 segments 16

15 Alitrunk black. Head mostly dark reddish brown, but mandibles and head to level of frontal lobes lighter. Gaster blackish brown, intermediate in shade between head and alitrunk. Median clypeal impression a deep notch. HW 1·22–1·31, SL 1·30–1·40. (Namibia) . . . . . *tachys* Bolton and Marsh

– Alitrunk red. Head unicolourous dull orange-red. Gaster blackish brown, much darker than both head and alitrunk. Median clypeal impression very shallow. HW 1·16–1·19, SL 1·23–1·26. (Namibia) . . . . *engytachys* Bolton and Marsh

16 In profile the basal outline of the first gastral tergite and first sternite both convex from their articulation with the postpetiole, never with a neck-line or truncated-subconical outline basally (as in Figs 3, 11, 21 and 22). In dorsal view the first gastral tergite not constricted basally to form a narrow parallel-sided neck behind the postpetiole, the gaster broadening more or less evenly from immediately behind the postpetiole (as in Fig. 21). 17

– In profile the basal outline of the first gastral tergite straight to very weakly convex, the first sternite straight to concave, from their articulation with the postpetiole; with a neck-like section or truncated narrowly subconical outline basally (as in Figs 1, 2, 4, 5, 19 and 20). In dorsal view the first gastral tergite constricted basally and forming a narrow, frequently parallel-sided, elongate neck immediately behind the postpetiole (as in Figs 5, 9, 10 and 19) 22

17 Ventral surface of postpetiolar sternite transverse, or at most with a broad even and very shallow median longitudinal concavity. Cuticular flange of anterior clypeal margin very broad (Fig. 16). Petiole node in profile never a high strongly sculptured dome (Fig. 11) 18

– Ventral surface of postpetiolar sternite with a deep median longitudinal groove or impression which divides the sclerite into a pair of roughly triangular projecting halves. Either cuticular flange of anterior clypeal margin a narrow strip (Fig. 15), or petiole node in profile a high strongly sculptured dome, or both 20

18 Larger species with relatively narrow head, dimensions in range HW 1·44–1·56, CI 87–91, SL 1·48–1·56, SI 100–104, PW 0·88–0·96. (Namibia) *kahas* Bolton and Marsh

– Smaller species with relatively broad head, dimensions in the range HW 1·24–1·36, CI ca 94, SL 1·20–1·34, SI 97–99, PW 0·78–0·84 19

19 Head a glossy dull red, remainder of body black. Petiole in profile with the peduncle grading into the node, the two not distinctly separable. (Namibia) *afradu* Bolton and Marsh

– Entirety of head and body yellow. Petiole in profile with the peduncle distinctly separated from the node. (Namibia) . . . . . *flavescens* Stitz

20 Dorsum of head with strongly developed rugular sculpture, usually dense and frequently irregular to vermiculate in places; head never with a slick glossy appearance, the sculpture always strong. Sides of petiole node with strong dense sharply defined vertical rugulose sculpture; in most individuals the rugulae also running across the dorsum of the node. (South Africa) . . . *barbiger* Emery*

– Dorsum of head with fine weak costulate to rugulose sculpture, often superficial; the head usually with a slick and glossy appearance, the sculpture always weak. Sides of petiole node granular or at most with extremely feeble vertical rugulae . . . 21

21 Costulae on sides of pronotum strongly developed but relatively sparse and widely separated, only about 12 (sometimes fewer) such costulae present at the pronotal

* Workers of *cilliei* will also run out here; see notes under *barbiger*.

midlength from its basal margin to the level of the base of the mesothoracic spiracle. Uniformly medium to light brown species. (South Africa, Namibia) *dekerus* Bolton and Marsh

– Costulae on sides of pronotum delicately developed but relatively dense and close-packed, with distinctly more than 12 such costulae (usually 18–20) present at the pronotal midlength from its basal margin to the level of the base of the mesothoracic spiracle. Not uniformly brown species. (Namibia) . . . . . *robustior* Stitz

22 With alitrunk in dorsal view the metapleura and sides of the propodeum only sparsely clothed with hairs, or nearly hairless; at most with scattered short hairs which are mostly decumbent or subdecumbent (Fig. 14); whole side of alitrunk lacking a densely hairy or furry aspect. Dorsum of alitrunk in profile weakly to moderately hairy but without a dense coat of short hairs between the longer main pilosity (Figs 1, 2 and 5) 23

– With alitrunk in dorsal view the metapleura and sides of the propodeum abundantly clothed with dense conspicuous outstanding pilosity (Fig. 13); whole side of alitrunk with a densely hairy or even furry appearance. Dorsum of alitrunk in profile very densely hairy, usually with a dense coat of short hairs between the longer main pilosity (Fig. 12) 31

23 Sides of petiole node completely covered with dense strong, sometimes irregular, vertical rugulae or rugae. In dorsal view the rugulae seen to be continuous around the entire node, which thus appears encircled by coarse rugulae everywhere (Fig. 5) . 24

– Sides of petiole node at most with a few weak to vestigial rugulae or rugular remnants; sometimes without rugulae. In dorsal view these feeble rugulae may persist, may fade out, or may be replaced entirely or in part by fine shagreening or granulation, but in no case does the entire node appear encircled with coarse dense rugulae everywhere . 26

24 Petiole node in dorsal view broad, the length from the level of the spiracles to the apex posterior margin of the petiole less than 1·30 times the maximum width of the node. Petiole node in profile with its posterior face abruptly descending, usually vertically (Fig. 5). Alitrunk dark dull reddish brown to reddish black; gaster yellow to yellowish red; head dull red, intermediate in colour between that of alitrunk and gaster. (Zimbabwe, Botswana, South Africa) . . . . . *sobek* Bolton

– Petiole node in dorsal view narrow, the length from the level of the spiracles to the posterior margin of the petiole greater than 1·40 times the maximum width of the node. Petiole node in profile with its posterior face usually conspicuously sloping. Colour not as above, either uniformly orange-red to dull red throughout, or with the gaster much darker than the head 25

25 Petiole node in profile large and massively developed. Entire ant orange-red to dull red throughout, sometimes the gaster slightly lighter in shade than the head. (Zimbabwe, South Africa) . . . . . *foreli* Arnold

– Petiole node in profile small and not massively developed. Head dull red, alitrunk the same colour or darker, gaster black. (Kenya, Tanzania) . . . .*phraxus* Bolton

26 Dorsum of head behind a line connecting anterior margins of eyes to posteriormost point of frontal lobes either finely regularly costulate or almost smooth. When costulae distinct the sculpture is fine, very regular and parallel everywhere, without trace of irregular, vermiculate areas, blanketing coarse punctation or granular sculpture, or areas of chaotic sculpture. When almost smooth the surface showing only faint to vestigial costulae on a very glossy surface 27

– Dorsum of head behind a line connecting anterior margins of eyes to posteriormost point of frontal lobes never finely regularly costulate, never almost smooth. Instead the sculpture always strong and including either distinctly irregular rugulae, vermiculate areas, blanketing coarse punctate or granular sculpture, or areas of chaotic sculpture 29

27 Costulae on dorsum of head strongly and evenly developed everywhere, usually strikingly parallel from front to back across the entire surface, the cephalic dorsum without a slick, polished or wet-looking appearance. (Zambia, Zimbabwe, Botswana, South Africa, Namibia, Angola). . . . . *fortior* Santschi

– Costulae on dorsum of head weakly or sometimes unevenly developed, often superficial to vestigial and may even be absent in places; the cephalic dorsum always with a slick, polished or wet-looking appearance 28

28 Pronotum in profile with dorsal outline more or less flat or even slightly concave (Fig. 2). Head somewhat longer and narrower, CI 92–93. (Sudan, Kenya) . . *celer* Weber
– Pronotum in profile with dorsal outline evenly convex (Fig. 1). Head somewhat broader, CI 96–100. (Ethiopia, Somalia, Kenya, Uganda, Tanzania) . . *nitidulus* Emery

29 Petiole node elongate, narrow and longitudinal in dorsal view, the node as long as or longer than broad and the posterior peduncle only very slightly narrower than the node itself. Postpetiole in dorsal view as long as broad to longer than broad. (Angola, Namibia) . . . . . *monardi* Santschi
– Petiole node short, broad and transverse in dorsal view, the node distinctly broader than long and the posterior peduncle conspicuously much narrower than the node. Postpietole in dorsal view usually obviously broader than long but sometimes only slightly so 30

30 Gaster much lighter in colour than alitrunk. Sculpture of cephalic dorsum near inner margin of eye minutely vermiculate and chaotic, without a distinct longitudinal direction. Rugulae on sides of pronotum fine, dense and closely packed. (Namibia) *okys* Bolton and Marsh
– Gaster darker in colour than alitrunk. Sculpture of cephalic dorsum near inner margin of eye strongly rugulose and with a marked longitudinal direction. Rugulae on sides of pronotum strongly developed but widely spaced. (South Africa, Lesotho) *weitzeckeri* Emery

31 With alitrunk in profile the pronotum and anterior mesonotum forming a high and narrow dome-like convexity (Fig. 25). (Namibia) . . . . . *shushan* Bolton
– With alitrunk in profile the pronotum and anterior mesonotum forming an even shallow low broad convexity, or the pronotum more or less flat and sloping upwards posteriorly 32

32 In dorsal view the first gastral tergite at least as broad as long, the maximum mid-dorsal length equal to or less than the maximum width of the sclerite. Basally the first gastral tergite with a short parallel-sided narrow neck, behind which the sides are strongly convex-divergent. Body colour orange to orange-red. (Namibia) . . *micans* Forel
– In dorsal view the first gastral tergite much longer than broad, the maximum mid-dorsal length distinctly greater than the maximum width of the sclerite. Basally the first gastral tergite with a narrow neck whose sides diverge posteriorly, the sides contiguous with the sides of the remainder of the sclerite. Body colour usually much darker than the above, but not always so 33

33 In full-face view most or all workers in any given series with a posteriorly arched to transverse band of very irregular to vermiculate fine dense but strongly developed rugulae on the vertex, between or behind the eyes. Less commonly this area with a chaotic mass of vermiculate rugulae without a discernible direction, or extremely rarely the vermiculate rugulae with a longitudinal trend. (Botswana, South Africa) *hirsutus* Forel
– In full-face view all workers with longitudinal and usually irregular fine dense rugulae on the vertex between and behind the eyes. If a small patch of transverse sculpture appears it is U-shaped and situated medially at the extreme occipital margin . . 34

34 Gaster dark, darker than the head, usually black or nearly so. Head and alitrunk dark red to blackish red. (South Africa) . . . . . *ignotus* Bolton and Marsh
– Gaster yellow to dirty orange-yellow, lighter than the head. Head and alitrunk yellowish orange to dull red 35

35 Petiolar peduncle relatively short and stout in profile, suddenly narrowing anteriorly to its articulation with the alitrunk (Fig. 18), its ventral margin sharply deflected upwards. In dorsal view petiole node short and broad, usually very much broader than long. (Botswana, South Africa, Namibia) . . . . *flaviventris* Santschi
– Petiolar peduncle relatively long and narrow in profile, gradually narrowing anteriorly

to its articulation with the alitrunk (Fig. 17), its ventral margin not sharply deflected upwards. In dorsal view petiole node relatively elongate and narrow, usually about as long as broad, more rarely somewhat broader than long. (South Africa)
resekhes Bolton and Marsh

Species-groups of *Ocymyrmex* (based on workers)

In the earlier taxonomic study of *Ocymyrmex* it was pointed out (Bolton, 1981) that the members of this genus mostly show a very uniform habitus, making a division of the mass into species-groups rather difficult. Since then the acquisition of new material has to some extent clarified a number of characters and states which could prove of value in the definition of species-groups. Prins and Roux (1989) have made a start by grouping the South African fauna, but the following is a first attempt at outlining potential species-groups for the entire genus.

In the short diagnoses of the groups the term 'gaster not constricted basally' means that in dorsal view the base of the gaster lacks a narrow neck-like section immediately behind the postpetiole. In profile the outline of the gastral base in such forms shows the first gastral tergite and sternite both convex from their articulation with the postpetiole, without a neck-like or narrowly subconical basal outline (Figs 3, 11, 21 and 22). Conversely the term 'gaster constricted basally' means that in dorsal view the base of the gaster has a narrow neck-like section immediately behind the postpetiole. In profile in these forms the outline of the first gastral tergite is feebly convex to straight basally, and the first sternite is straight to concave from the articulation with the postpetiole, so that a neck-like or narrowly subconical basal outline is shown (Figs 1, 2, 4, 5, 9, 10, 19 and 20).

Palp formula counts are noted as 'predominantly 3, 3' etc., in some cases. This is because of the intraspecific variation of this character discussed in the notes on the worker caste appended to the diagnosis of the worker, above.

1. *O. velox*-group.

Gaster not constricted basally. Palp formula 3, 3. Clypeal margin lacking a median notch or impression. Median portion of clypeus with anterior section projecting forward, not abruptly truncated.

Includes: *ankhu, turneri, velox, zekhem.*

Distribution: Angola, Namibia.

2. *O. cavatodorsatus*-group.

Gaster not constricted basally. Palp formula 5, 3. Median portion of clypeus with its anterior section abruptly truncated, vertical or nearly so, lacking a median notch or impression.

Includes: *cavatodorsatus, gariepensis, gordoni.*

Distribution: South Africa.

3. *O. barbiger*-group.

Gaster not constricted basally. Palp formula predominantly 4, 3. Clypeal margin with a median notch or impression. Anterior cuticular flange of clypeus narrow (Fig. 15). Postpetiolar sternite with a median longitudinal groove or impression.

Includes: *barbiger, cilliei, dekerus, robustior.*

Distribution: South Africa, Namibia.

4. *O. tachys*-group.
Characters as *barbiger*-group but palp formula only 2, 3.
Includes: *engytachys*, *tachys*.
Distribution: Namibia.

5. *O. kahas*-group.
Gaster not constricted basally. Palp formula predominantly 4, 3. Clypeal margin with a median notch or impression. Anterior cuticular flange of clypeus broad (Fig. 16). Postpetiolar sternite lacking a median longitudinal groove or impression.
Includes: *afradu*, *flavescens*, *kahas*.
Distribution: Namibia.

6. *O. laticeps*-group.
Gaster constricted basally. Palp formula 3, 3. Clypeus lacking a median notch or impression.
Includes: *cursor*, *laticeps*.
Distribution: Angola.

7. *O. hirsutus*-group.
Gaster constricted basally. Palp formula predominantly 3, 3. Clypeus with a median notch or impression. Alitrunk very densely hairy (Figs 4 and 12); sides of pleura and propodeum, seen from above, with very conspicuous long dense projecting white to silvery pilosity (Fig. 13).
Includes: *alacer*, *flaviventris*, *hirsutus*, *ignotus*, *micans*, *resekhes*, *shushan*, *sphinx*.
Distribution: Botswana, Namibia, South Africa, Lesotho.

8. *O. weitzeckeri*-group.
Gaster constricted basally. Palp formula predominantly 3, 3. Clypeus with a median notch or impression. Alitrunk sparsely hairy (Figs 1, 2 and 5); sides of pleura and propodeum, seen from above, with sparse scattered short pilosity to virtually hairless (Fig. 14).
Includes: *celer*, *foreli*, *fortior*, *monardi*, *nitidulus*, *okys*, *phraxus*, *picardi*, *robecchii*, *sobek*, *weitzeckeri*.
Distribution: throughout southern and eastern Africa.

Notes on the species

Ocymyrmex afradu sp. nov.

HOLOTYPE WORKER. TL 5·8, HL 1·44, HW 1·36, CI 94, SL 1·34, SI 99, PW 0·84, AL 1·70.

Anterior clypeal margin with a broad and conspicuous cuticular flange, similar to that seen in *kahas*, Fig. 16. Clypeus with a small and shallow anteromedian impression. Palp formula variable, not clearly visible in holotype but the single paratype has the left maxillary palp with 4 segments, the right with 3; labial palpi both 3-segmented. Maximum diameter of eye 0·34, about 0·24 × HW. In full-face view the eyes distinctly breaking the outline of the sides of the head. Sides of head in front of eyes almost parallel, scarcely diverging anteriorly. Behind the eyes the sides convex and converging posteriorly, rounding broadly into the occipital margin which is itself indented medially. Promesonotum evenly convex in profile, the outline of the posterior portion

of the mesonotum sloping and very shallowly concave. Propodeal dorsum weakly convex and rounding broadly and very evenly into the shallowly convex declivity. Bulla of metapleural gland projecting posteriorly and in profile almost obscuring the narrow and evenly rounded metapleural lobes. Petiole in profile with a relatively short peduncle and an elongate low subclaviform node; the length of the node slightly greater than that of the peduncle. In dorsal view the petiole node longer than broad, the postpetiole broader than long and broadest posteriorly. Sternite of postpetiole ventrally almost transverse, with only the shallowest concavity; lacking a strongly defined median longitudinal groove or impression. Gaster in profile with both the first tergite and the first sternite having shallowly convex outlines from their articulation with the postpetiole, lacking a basal constriction. In dorsal view the gaster without a narrow neck-like basal constriction. Dorsum of head glossy, very finely and weakly longitudinally costulate, and with ground-sculpture between the costulae very faint to absent. Cephalic costulae become weaker posteriorly and are almost effaced close to the occipital margin. Dorsal alitrunk evenly transversely sculptured except on pronotum where a patch of longitudinal sculpture runs forward from between the mesothoracic spiracles; the remaining dorsal pronotal sculpture arches around this patch and is relatively faint. Sides of alitrunk regularly sharply costulate everywhere, the individual costulae narrower and more widely spaced on sides of pronotum than elsewhere. Ground-sculpture faint to absent. Petiole with a few weak transverse rugae beneath the node but dorsally with extremely fine and very crowded faint ripple-like transverse rugulae; these are fainter still and tend to peter out on the sides of the node. Postpetiole feebly reticulate. First gastral tergite with superficial reticular patterning basally, which fades out apically on the sclerite. All dorsal surfaces of body with fine white to silvery hairs present. Head glossy dull red, remainder of body black but in places with a reddish or brownish tint.

PARATYPE WORKER. Dissected and mounted ventral side uppermost to show mouthparts and ventral surfaces of body.

Holotype worker, Namibia (= South West Africa): Namib Desert, Hunkab River, Skeleton Coast, 19 deg. 43 min. S., 13 deg. 11 min. E., 16. viii.1982, sample SC5 (*A. C. Marsh*) (BMNH). Paratype. One worker (dissected) with same data as holotype (BMNH).

As reflected in the key, *afradu* is closest related to *kahas* and *flavescens*, two other Namibian species. The three together constitute the *kahas*-group as defined above. Absolute and relative measurements may be used to separate workers of the three, as follows.

	HW	CI	SL	SI	PW
kahas	1·44–1·56	87–91	1·48–1·56	100–104	0·88–0·96
afradu	1·36	94	1·34	99	0·84
flavescens	1·24	94	1·20	97	0·78

Apart from this, *kahas* and *flavescens* have the gaster yellowish, *afradu* has the gaster black; *kahas* and *flavescens* have the petiolar peduncle longer than the node whilst *afradu* has the node slightly longer than the peduncle. In full-face view the occipital margin is more strongly indented medially in *afradu* and *flavescens* than in *kahas*, and in *afradu* the petiole node is long, low and subclavate in profile.

Ocymyrmex alacer sp. nov.
(Fig. 9)

HOLOTYPE WORKER. TL 9·8, HL 2·24, HW 2·12, CI 95, SL 2·10, SI 99, PW 1·38, AL 3·04.

Large species. Anterior clypeal margin with a conspicuous median impression which is flanked by a pair of short triangular teeth. On each side of the teeth, and confluent with them, a narrow smooth lamella extends along the anterior clypeal margin almost to the level of the anterior tentorial pit. With the head in full-face view the eyes conspicuously fail to break the outline of the sides of the head. Maximum diameter of eye 0·44, about 0·21 × HW. Sides of head weakly divergent from level of eyes to clypeus. Behind the level of the eyes the sides convex and converging posteriorly, rounding very broadly and evenly into the occipital margin; the latter shallowly convex and weakly indented medially. Promesonotum rounded and convex in profile. Propodeal dorsum weakly sloping posteriorly, rounding very broadly into the declivity, which is shallowly convex above the level of the metapleural lobes. In profile the bulla of the metapleural gland not concealing the metapleural lobes, the latter short and not strongly prominent. Peduncle of petiole weakly sinuate ventrally, lacking a conspicuous ventral process. Node short and low, its dorsal outline broadly triangular in profile. In dorsal view the node much broader than long, flattened behind its highest point and its central portion strongly expanded laterally on each side so that the median section of the node projects as a blunted triangular prominence on each side (Fig. 9). Maximum width of petiole node about 0·60, approximately three times wider than the length of the posterior petiolar peduncle, and more than four times wider than the anterior peduncle at its narrowest point. Postpetiole in dorsal view fractionally longer than broad, broadening from front to back. Sternite of postpetiole with a marked median longitudinal impression running its length. Base of first gastral tergite narrowed in dorsal view, no broader than the postpetiole. In profile the first gastral tergite outline more or less flat basally, the first sternite very shallowly concave. Dorsum of head finely, densely and irregularly longitudinally rugulose, the rugulae most regular near the cephalic midline. The rugulae arch outwards behind the eyes and are less strongly developed on the occiput than elsewhere. Dorsal alitrunk transversely rugose, the rugae arched on the pronotum; patch between mesothoracic spiracles longitudinally rugose. Sides of alitrunk and propodeal declivity rugose, the sculpture arched-longitudinal on the lateral pronotum, oblique and less regular on the mesopleuron, longitudinal and irregular on the propodeum, transverse on the declivity. Petiole in dorsal view with transverse weak rugulae from midlength of peduncle to node, rugulae stronger on anterior face of node, stronger still and more obviously transverse on posterior face of node. Sides and ventral surface of peduncle predominantly finely reticulate, with some faint transverse rugulae under the node. Postpetiole superficially reticulate everywhere. Pilosity white to silvery, abundant and very dense on all dorsal and lateral surfaces of head and alitrunk; also many conspicuous long hairs present on petiole node and postpetiole. Hairs on gaster much shorter and sparser than on propodeum, the gastral hairs less than half the length of the longest propodeal hairs, the latter at least as long as the propodeal spiracle. Head dull red; alitrunk darker red, almost maroon; gaster lighter, with an orange or yellowish tint.

PARATYPE WORKERS. TL 9·4–9·8, HL 2·20–2·30, HW 2·08–2·20, CI 93–97, SL 2·02–2·12, SI 95–100, PW 1·34–1·40, AL 2·85–3·10 (8 measured).

As holotype but in some the rugular sculpture of the petiole more pronounced. The sides of the head in a few are more strongly divergent anteriorly than in the holotype. Range of eye size is 0·44–0·46, about 0·20–0·21 × HW.

PARATYPE FEMALES. Answering to description of worker; extremely ergatoid as in all females of this genus. Differing from worker in standard features of antennal scape, frontal lobes and cephalic sculpture as mentioned under the diagnosis of this caste, above, and as described in Bolton (1981). Ergatoid females of this species also tend to have the eyes relatively fractionally smaller, and the petiole node broader, than in the workers.

Holotype worker. South Africa: north Cape Prov., Tosca, no. 13. i.1986, (*A.C. Marsh*) (BMNH).

Paratypes. 4 workers with same data as holotype but no. 1; 5 workers and 4 ergatoid females with same data as holotype but no. 2 (BMNH; SAM; MCZ).

O. alacer is closely related to *sphinx* (*hirsutus*-group), but workers and ergatoid females of these two large species can be separated by characters of the petiole and the pilosity. The form of the petiole in *alacer* workers is quite different from that of *sphinx*, compare Figs 9 and 10. In *sphinx* the node in profile is low and rounded dorsally, and is encircled by rugular sculpture. In dorsal view the sides of the node are rounded and evenly convex, not projecting as triangular prominences as they do in *alacer*. The posterior face of the node is not flattened in *sphinx*. Pilosity is conspicuously shorter and much less abundant in *sphinx*. On the propodeal dorsum the longest hairs are distinctly shorter than the length of the spiracle, and those on the pleurae are very short and less conspicuous.

Non-paratypic material of *alacer* examined includes the following. South Africa: north Cape Prov., Severn (*A. C. Marsh*); Vorstershoop (*A. C. Marsh*); Van Zylsrus (*A. C. Marsh*); Bophuthatswana, nr. Ganyesa (*A. C. Marsh*); Botswana: Matops Pan (*H. Lang*).

Ocymyrmex barbiger Emery

Recent collections of this and related species, and a critical re-examination of available type-material, have indicated that two forms originally described as varieties of *barbiger*, *robustior* and *flavescens* (which were both treated as synonyms of *barbiger* in Bolton, 1981), are properly to be understood as valid species-level taxa. *O. robustior* was so treated by Marsh (1986 b), *flavescens* is elevated to species level in this paper.

Recently Prins and Roux (1989) have split *barbiger* into a pair of sibling species, *barbiger* plus *cilliei*, the second described as new in their publication. Unfortunately the two can only be distinguished by their males, their workers and ergatoid females apparently being morphologically inseparable. It is perhaps unfortunate that species based solely on characters shown by males are being described at this stage, when one considers that the males of the vast majority of *Ocymyrmex* species remain utterly unknown.

However, accepting that Prins and Roux have correctly identified a pair of good sibling species based on the males, the following characters may be used to separate them.

O. barbiger male: Mesoscutum without a pair of dorsolaterally situated small peaks or tubercles at its mid-dorsal length. Mesoscutum without a pair of pits posterolaterally, close to the inner margins of the axillae. Head in profile depressed behind level of posterior ocelli.

O. cilliei male: Mesoscutum with a pair of dorsolaterally situated small peaks or tubercles near its mid-dorsal length. Mesoscutum with a pair of conspicuous pits posterolaterally, close to the inner margins of the axillae. Head in profile not depressed behind level of posterior ocelli.

We have examined the syntypic male included in the type-series of *barbiger*, but have not been able to examine any type-material of *cilliei*. The characters given for the latter are therefore based solely on material held in the BMNH collection.

Ocymyrmex cavatodorsatus Prins
(Fig. 3)

Marsh has collected this small species at Andriesvale and Upington, north Cape Province of South Africa. Prins (1965) gave a few measurements of the holotype which more or less conform to modern standard measurements; TL 4·5, HL 1·02, AL 1·41. The series from Andriesvale give the following range of dimensions. TL 4·5–5·0, HL 0·98–1·12, HW 1·06–1·18, CI 105–108, SL 0·94–1·06, SI 88–91, PW 0·66–0·74, AL 1·28–1·44 (10 measured).

Note the relatively broad head and short scapes. These dimensions, combined with the unique dorsal outline shape of the alitrunk (Fig. 3), render *cavatodorsatus* easily identifiable both within the *cavatodorsatus*-group and in the genus as a whole.

The ergatoid females of this species lack transverse sculpture on the cephalic dorsum between and behind the eyes. This form of sculpture is characteristic of ergatoids in almost all species, but in *cavatodorsatus* the area is smooth, as in the worker. Antennal scapes in the ergatoid females of this species are somewhat shorter and obviously stouter than in the worker, as is usual in the genus.

Ocymyrmex celer Weber
(Fig. 2)

Originally known only from the type-locality of Torit, north of the Imatong Mountains, Sudan, as recorded in Bolton (1981). This species has now been discovered in Kenya, at Lake Baringo, by J. Darlington (BMNH). The Kenya sample includes an ergatoid female, not previously known for this species.

Ocymyrmex dekerus sp. nov.

HOLOTYPE WORKER. TL5·8, HL 1·40, HW 1·36, CI 97, SL 1·35, SI 99, PW 0·84, AL 1·80.

Anterior clypeal margin with a median impression. Prominent cuticular flange on anterior clypeal margin narrow and inconspicuous (as in Fig. 15), not a broad lamina. Palp formula 4, 3 (see paratypes). Maximum diameter of eye 0·32, about 0·24 × HW. With the head in full-face view the eyes just intercepting the outline of the sides rather than conspicuously breaking the outline or distinctly failing to reach the outline of the sides. Sides of head in front of eyes parallel, the outline exceptionally weakly concave. Behind the eyes the sides forming an evenly convergent convex broad curve which is confluent with the occipital margin; the latter flattened to very feebly concave medially but not indented. Promesonotum convex, the posterior portion of the mesonotum sloping posteriorly and very shallowly concave to its junction with the propodeum, the latter feebly convex and rounding into the sloping declivity. Metapleural lobe low and rounded in profile, not concealed by the metapleural gland bulla. Node of petiole

longer than broad in dorsal view, the postpetiole slightly broader than long and much broader behind than in front. In profile the postpetiolar sternite acutely pointed (see paratypes). Ventrally the postpetiolar sternite with a conspicuous median longitudinal groove or impression which splits the sclerite into a pair of roughly triangular ventrolateral prominences or tumuli. Gaster in profile with the outline of both the first tergite and first sternite convex behind the articulation with the postpetiole. In dorsal view the base of the gaster not constricted, lacking a neck-like basal area. Dorsum of head very feebly shallowly costulate-rugulose, the sculpture almost effaced in places, and the ground-sculpture weak to vestigial. Dorsal alitrunk transversely costulate to rugose except for a longitudinal patch centrally on the pronotum and anterior mesonotum. Sides of pronotum with strongly developed but widely spaced longitudinal costulae, about 12 such costulae present at the pronotal midlength between its basal margin and the level of the base of the mesothoracic spiracle. Remainder of sides of alitrunk obliquely costulate, the components somewhat closer together than on the pronotal sides. Petiole with transverse rugulae ventrally but the sides and dorsum predominantly reticulate to shagreenate. Standing hairs present on all dorsal surfaces of head and body. Colour brown, the head and gaster with a dull yellowish to dull orange tint, the alitrunk with a dull reddish tint.

PARATYPE WORKERS. TL 5·8–6·0, HL 1·40–1·54, HW 1·36–1·48, CI 96–99, SL 1·35–1·42, SI 95–99, PW 0·84–0·90, AL 1·80–1·88 (5 measured).

As holotype but maximum diameter of eye 0·32–0·34 (about 0·22–0·24 × HW). Sides of head in front of eyes vary from very feebly concave to more or less straight in full-face view. One worker has the left maxillary palp 3-segmented, the right 4-segmented; the reduction of the left palp is due to the fusion of the two small apical palpomeres. Shape of the postpetiolar sternite in profile is variable. In the holotype it is acutely pointed on each side, but the paratypes show variation from this shape to bluntly rounded. Cephalic sculpture is somewhat stronger in some paratypes than in the holotype, the costulate-rugulose component being more obviously developed. Colour varies from that described above to a more or less uniform light to medium brown, often with a yellowish tint to the gaster.

Holotype worker, Namibia (= South West Africa): 9 mi. NW of Grunau, 1150 m 4.v. 1958 (*E. S. Ross and R. E. Leech*) (CAS).

Paratypes, 5 workers with same data as holotype (CAS, BMNH).

O. dekerus is closely related to *robustior, barbiger*, and *cilliei* (*barbiger*-group). In *barbiger* and *cilliei* the eyes are smaller than in *robustior* and *dekerus*, and generally fail to break the outline of the sides of the head. Also, the petiole node in the former pair is uniformly strongly sculptured and the cephalic sculpture is strongly developed. *O. robustior* and *dekerus* separate on the strength and density of sculpture on the lateral pronotum, as indicated in the key, and on the mesopleuron the oblique costulae are finer and more densely crowded in *robustior* than in *dekerus*. Apart from this the clypeal teeth in *robustior* tend to be longer and more acute than in *dekerus*, and the occipital margin of *robustior* is impressed or indented medially, whereas *dekerus* has this zone transverse or at most extremely feebly concave.

This species has also been found at Andriesvale, north Cape Province of South Africa, by Alan Marsh. The few specimens in this series match the *dekerus* holotype extremely well but have the petiole somewhat more strongly sculptured. Like the holotype the postpetiolar sternite is acutely pointed on each side in these South African specimens.

Ocymyrmex engytachys sp. nov.

HOLOTYPE WORKER. TL 5·5, HL 1·34, HW 1·19, CI 89, SL 1·26, SI 106, PW 0·76, AL 1·62.

Very closely related to *tachys* and sharing all the main characters of that species, including the extremely reduced PF 2, 3 and those characters mentioned in the notes on the species-groups. Otherwise answering to the description of *tachys* given below except for the following.

Anterior clypeal margin of *engytachys* with a shallow and inconspicuous median impression.

Sculpture of sides of alitrunk the same density as in *tachys* but more strongly developed, the sides of the ant appearing coarsely rugose. Dorsum of petiole node with rugulae stronger and more extensive than in *tachys*.

Maximum diameter of eye 0·29, about 0·24 × HW.

Colour very different from *tachys*. The head unicolourous dull orange-red, without lighter mandibles or anteriormost portion of head. Alitrunk red. Gaster blackish brown, much darker than both head and alitrunk.

PARATYPE WORKER. TL 5·4, HL 1·30, HW 1·16, CI 89, SL 1·23, SI 106, PW 0·74, AL 1·54. Maximum diameter of eye 0·25 × HW. Very similar to holotype but cephalic sculpture different. In the holotype the cephalic dorsum is finely irregularly longitudinally rugulose, with distinctive punctulate ground-sculpture. In the paratype the rugular component is almost completely suppressed and the punctulate ground-sculpture more intense and obvious.

Holotype worker, Namibia: Namib Desert, 35 km E. of Gamsberg Pass, x.1987, ND3B (*A. C. Marsh*) (BMNH).

Paratype, one worker with same data as holotype (BMNH).

O. engytachys forms a close species-pair with *tachys*, the two together forming their own species-group. Further notes are given under the latter name.

Ocymyrmex flavescens Stitz stat. nov.

Ocymyrmex barbiger var. *flavescens* Stitz, 1923: 147. Syntype worker, NAMIBIA: Okaputa, 5.v.1911 (*W. Michaelsen*) (MNHU) [examined]. [Previously treated as synonym of *barbiger* by Bolton, 1981: 265.]

WORKER. TL 5·2, HL 1·32, HW 1·24, CI 94, SL 1·20, SI 97, PW 0·78, AL 1·50.

Clypeus with a small median impression which is flanked by a rounded prominence of the lamellate anterior clypeal margin on each side, rather than being flanked by a pair of teeth. Lamellate anterior margin of clypeus very broad and conspicuous. In full-face view the eyes just intersect the outline of the sides of the head. Propodeal dorsum in profile rounds broadly and evenly into the declivity, the latter a long sloping surface which is by no means vertical. Petiole node in profile low and shallowly convex, the node itself distinctly separated from the anterior peduncle; entire petiole not elongate-claviform. Postpetiolar sternite ventrally broad and very shallowly evenly transversely concave, almost flat across its width, without a median longitudinal groove. In profile both the first gastral tergite and sternite convex from their articulation with the postpetiole. In dorsal view the postpetiole-gastral articulation broad and the first tergite without a basal constriction or neck. Head to level of eyes densely and regularly, but only faintly to superficially, longitudinally costulate. The spaces between the costulae have weak superficial ground-sculpture. Behind the level of the eyes the

costulae become fainter than in front of them and tend to fade out entirely close to the occipital margin. Dorsolaterally on the head the ground-sculpture becomes more obvious, and mesad of the inner margins of the eyes it appears as lines of weak reticulation or punctation separated by narrow costular walls. Sculpture of pronotal dorsum very faint, vestigial in places. Mesonotum and propodeal dorsum transversely weakly rugulose. Ventral surface of petiole node with transverse short rugae, but sides and dorsum of petiole, and entirety of postpetiole, faintly superficially reticulate only. All dorsal surfaces of head and body with standing hairs, but these are not strikingly dense and may be abraded in the syntype. First gastral tergite with several elevated hairs, which are about equal in length to those on the propodeum. Colour entirely yellow.

Still known only from the type-collection, this species was included as an infraspecific form or synonym of *barbiger* to the present. Accretion of material of *barbiger* and its allies indicates that *flavescens* deserves the rank of a separate species, as indicated by the key characters and the above description. Its closest relatives include *afradu* and *kahas*. Differentiation of the three is indicated in the key and under *afradu*. Diagnosis of the species which constitute the *kahas*-group is noted in the species-group discussion above.

Ocymyrmex flaviventris Santschi
(Fig. 18)

As well as occurring in Namibia and Botswana (Bolton, 1981), this species is now also known to be present in South Africa's northern Cape Province. Alan Marsh has found it at Tosca, Olifantshoek and Vorstershoop, as well as at Ganyesa in Bophuthatswana.

The concept of the species *flaviventris* has changed slightly since the earlier survey of the genus, by the splitting off of the sibling species *O. resekhes*, currently only known from north Cape Province. The two are very similar in overall appearance, but in *flaviventris* the petiolar peduncle is short and stout in profile and suddenly narrows basally, the ventral margin sloping quite steeply upwards to the articulation with the alitrunk. In dorsal view the petiole node is always much broader than long. In *resekhes*, on the other hand, the petiolar peduncle is long and narrow, and tapers gradually and evenly to the articulation (compare Figs 17 and 18). The petiole node in dorsal view is usually much narrower, although a few individuals with broader nodes are known. Variation in the petiolar outline profiles of both species are known to occur. Figs 17 and 18 indicate the most commonly encountered configurations.

Among the populations currently referred to *flaviventris*, specimens from Botswana are generally lighter in colour of head and alitrunk than specimens from either South Africa or Namibia. This is not considered significant at species-level as material from Nkate, Botswana, is intermediate in intensity of colour.

Ocymyrmex foreli Arnold
(Fig. 24)

Previously recorded only from Zimbabwe, this species is now also known from Transvaal, South Africa, having been collected by Marsh at Johannesburg, Makapansgat, and Sterkfontein.

Forder and Marsh (1989) have investigated a number of aspects of the social organization and reproduction of this species. Some of their broader findings are

mentioned in the introduction to the present paper. In summary they found that *O. foreli* colonies contained 160 to 1586 adults, of which 4 to 20 per cent were ergatoid females. Only one inseminated female occurred per colony, and that female was distinguished by her physogastry. Ergatoid females, even when unmated, had significantly more ovarioles than workers, and mated females had more than virgins. The behavioural repertoire of virgin ergatoids was approximately the same as that of the workers but varied with respect to the frequencies with which the various behaviours were performed. They also noted that ergatoid females were produced throughout the year, but that colony production was positively correlated with mean monthly rainfall.

Ocymyrmex fortior Santschi

One of the most widespread species in southern Africa. Prins (1963) notes that in prevailingly grassy areas of the Kruger National Park, South Africa, this species (recorded as *O. weitzeckeri* var. *arnoldi*, which is a junior synonym of *fortior*) is quite common. He states that the ants are mainly granivorous but have also been observed capturing workers of *Odontomachus troglodytes* (given as *O. haematodes* in Prins, 1963; see Brown, 1976) and preying on termites. He also records that the species was found in nests of *Hodotermes mossambicus*, though whether as a predator or merely using the termite nest as a nest-site is not stated.

In workers of *fortior* the cephalic sculpture is almost always of fine sharply defined dense costulae which are parallel and run straight front-to-back across the width of the dorsum. Occasionally however workers are found in which the costulae converge posteriorly, approximately towards the mid-point of the occipital margin. A series which Hamish Robertson (University of the Witwatersrand) collected in the Mkuze Game Reserve of Natal (C554) contains workers with the usual cephalic sculpture and some with arched-transverse costulae posteriorly on the cephalic dorsum. The sculpture in these workers approaches that usually associated with the ergatoid females of this species, but is not so intense. Also, such workers lack the antennal and frontal lobe structure characteristic of the ergatoid females. It is just possible that workers with this rather strange form of cephalic sculpture may represent some form of intercaste, but the possibility remains to be investigated.

Some samples of *fortior* from southern Zimbabwe and northern Transvaal have more broadly rounded occipital corners (full-face view) than is usual, and have the median shallow depression of the occipital margin slightly more impressed. Sculpture on the sides of the alitrunk in these samples is usually somewhat finer, more closely packed and more regular than is usually observed in *fortior*. For the present these variations are not regarded as significant at species-level, but these variant forms may repay future investigation when more material has been amassed.

O. fortior is closely related to the much rarer *O. weitzeckeri*; for notes on separation see under the latter name.

Sites from which *fortior* has been recorded since the list given in Bolton (1981) include the following. Botswana: Serowe (*P. Forchhammer*). Zimbabwe: Chishawasha (*A. Watsham*); Mazoe Estates, 37 deg. 28. min. S., 31 deg. 03 min. E. (*H. Robertson*). South Africa: Transvaal, Nelspruit (*H. Samways*); Naboomspruit (*A. C. Marsh*); Kruger National Park, Skukuza (*A. C. Marsh*); Dunstable Farm 24 deg. 28 min. S., 30 deg. 47 min. E. (*H. Robertson*); Venda, Mpzema (*H. Robertson*); Marite Resort (*H. Robertson*); Natal, Ndumu Game Reserve (*H. Robertson*); Mkuze Game Reserve (*H. Robertson*).

Ocymyrmex gariepensis Prins & Roux

To the present this small member of the *cavatodorsatus*-group is the only species of *Ocymyrmex* with 4-dentate mandibles. All other known species have 5 strong teeth. Very rarely in *gariepensis* a minute denticle occurs on the mandibular masticatory margin immediately following the base of the third tooth, counting from the apex. Cephalic sculpture is also unusual in gariepensis, consisting entirely of dense reticulate-punctuation, without trace of the costulae, rugulae or extensive smooth areas seen so commonly elsewhere in the genus.

This species occurs extensively in the northern parts of Cape Province, South Africa, having been collected by Alan Marsh at Andriesvale, Upington, Olifantshoek, Pomfret, and Van Zylsrus.

Ocymyrmex hirsutus Forel
(Figs 12 and 13)

The type-locality of this species, Severelela (= Sevrelela) was given earlier (Bolton, 1981) as being in Namibia (= South West Africa). Sevrelela is of course in Botswana.

Recently Alan Marsh has found *hirsutus* in western Transvaal, at 26 deg. 50 min. E., 24 deg. 30 min. S., and in several localities in northern Cape Province, including Vryburg, Van Zylsrus, Mafeking, and Vorstershoop.

Variation in form and direction of the predominant cephalic sculpture, as noted in key couplet 33, may indicate that more than one sibling species is currently concealed under the name *hirsutus*. For the purposes of this publication, because relatively few samples of the variant forms are known, and also because some of these variants apparently occur with normally sculptured workers, all are retained here as a single species.

Ocymyrmex ignotus sp. nov.

HOLOTYPE WORKER. TL 8·3, HL 1·90, HW 1·90, CI 100, SL 1·76, SI 93, PW 1·22, AL 2·56.

Notch in anterior clypeal margin deep and conspicuous, flanked by a pair of sharp teeth. Palp formula 3, 3. Maximum diameter of eye 0·38, about 0·20 × HW, the eyes distinctly failing to break the outline of the sides of the head in full-face view. Sides of head weakly divergent in front of the eyes, behind the eyes rounding broadly into the occipital margin; the latter feebly indented medially. With alitrunk in profile the metapleural lobes conspicuous, projecting posteriorly and not concealed by the metapleural gland bulla. Petiole in profile with an elongate anterior peduncle and a narrowly rounded node. In dorsal view the node stocky and broad, distinctly much broader than long and its maximum width strikingly greater than that of the posterior peduncle (ca 0·44 and 0·32 respectively). Postpetiole in profile swollen, broadly convex both dorsally and ventrally and very much more voluminous than the petiole. Base of gaster strongly constricted. Dorsum of head finely densely and strongly sculptured everywhere. Centrally the head with a longitudinal strip of irregular close-packed rugulae behind the frontal lobes. On each side of this, to the inner margins of the eyes, the surface is blanketed by fine and very dense vermiculate to chaotic rugulae. Dorsal alitrunk transversely rugulose to rugose except for a longitudinally sculptured patch between the mesothoracic spiracles. Sides of alitrunk strongly rugulose to rugose, the sculpture finer on the pronotum than elsewhere. Petiole with transverse rugulae

ventrally, but these fading out on the sides of the node, leaving these areas and the dorsum finely shagreenate to superficially reticulate. Postpetiole and first gastral tergite superficially reticulate to shagreenate. Pilosity dense everywhere, the entire body abundantly hairy. Pleurae and sides of propodeum with dense long projecting pilosity. Gaster black, in places with a very faint dull reddish tint. Remainder of body very dull red, the whole ant appearing blackish to the naked eye.

PARATYPE WORKERS. TL 7·9–8·3, HL 1·84–1·90, HW 1·82–1·92, CI 97–102, SL 1·70–1·76, SI 91–95, PW 1·18–1·22, AL 2·46–2·57 (10 measured).

As holotype but maximum diameter of eye 0·20–0·21 × HW. Most paratypes the same colour as the holotype but some darker, the alitrunk in these blackish and almost the same shade as the gaster.

Holotype worker, South Africa: north Cape Province, Pomfret, xii.1986, NC12A, (*A.C. Marsh*) (BMNH).

Paratypes, 17 workers and 2 ergatoid females, with same data as holotype (BMNH; SAM; MCZ).

Non-paratypic material examined includes two more short series from Pomfret (NC1D and NC1E), and a single worker from Vorstershoop (NC2D), all collected by Alan Marsh.

A member of the *hirsutus*-group, *ignotus* displays the abundant dense pilosity and other characteristics of the group, as noted in the species-group discussion above.

Species most closely related to *ignotus* include *flaviventris* and *resekhes*. *O. ignotus* separates from both of these by having the gaster very dark in colour, blackish and darker than the head and alitrunk as opposed to yellowish or orange and lighter than the head and alitrunk in *flaviventris* and *resekhes*. Also, the postpetiole in *ignotus* is voluminous and has a swollen appearance, with a markedly convex ventral outline. *O. ignotus* averages larger than *flaviventris* and has a broader head, as indicated below. It also has a long narrow petiolar peduncle, similar to Fig. 17, rather than the short stout peduncle exhibited by *flaviventris*, Fig. 18.

	HW	SL	PW	CI
flaviventris	1·54–1·70	1·44–1·58	0·98–1·04	93–97
ignotus	1·82–1·92	1·70–1·76	1·18–1·22	97–102

The petiole node of *ignotus* is much broader in dorsal view than that of *resekhes*, and the vermiculate to chaotic areas of cephalic sculpture characteristic of *ignotus* do not occur in *resekhes*.

Ocymyrmex kahas sp. nov.
(Figs 11 and 16)

HOLOTYPE WORKER. TL 6·7, HL 1·72, HW 1·54, CI 90, SL 1·56, SI 101, PW 0·95, AL 2·00.

Anterior clypeal margin with a small notch medially. Margin of clypeus with a broad projecting cuticular flange (Fig. 16). Palp formula 4, 3. With the head in full-face view the outer curve of the eyes just breaking the outline of the sides of the head. Maximum diameter of eye 0·36, about 0·23 × HW. Sides of head in front of eyes more or less straight and very feebly divergent anteriorly. Behind the eyes the sides converging posteriorly and rounding into the relatively broad occipital margin; the

latter very feebly indented medially. With alitrunk in profile the pronotum rising steeply from the cervical shield and only very shallowly convex dorsally (Fig. 11). Propodeal dorsum feebly convex and rounding posteriorly into the weakly convex declivity. Bulla of metapleural gland not strongly projecting posteriorly, the narrow metapleural lobe and the carina linking the lobes across the declivity, clearly visible in profile. Petiole node in dorsal view about as broad as long, postpetiole slightly broader than long. Sternite of postpetiole ventrally shallowly and inconspicuously concave medially, lacking a deep median longitudinal impression or groove. In profile the outlines of the first gastral tergite and sternite are each shallowly convex from their articulation with the postpetiole. In dorsal view the base of the gaster is not constricted. Dorsum of head finely and densely longitudinally rugulose, the rugulae faint and feebly wavy to very weakly sinuate. Ground-sculpture between the rugulae faint and feeble, but the surface not glassy smooth. Dorsal alitrunk mostly densely and finely transversely rugose but with a patch of longitudinal sculpture between the mesothoracic spiracles. Sides of alitrunk with regularly spaced strong dense rugae, the spaces between which are wider than the rugae themselves. On the sides of the pronotum about 16 rugae are present between the base of the mesothoracic spiracle and the ventral margin of the sclerite. Ground-sculpture on sides of alitrunk superficial and minimal, so that the rugae stand out in sharp relief. Petiole and postpetiole mostly feebly reticulate, the petiole node with some extremely faint vestiges of transverse sculpture dorsally and with some stronger transverse rugulae ventrally. All dorsal surfaces of head and body with spaced out standing hairs present. Head a dull orange-red, the gaster more yellowish so that the gaster is somewhat lighter in shade than the head. Alitrunk darker, dull reddish to reddish brown.

PARATYPE WORKERS. TL 6·3–7·0, HL 1·64–1·74, HW 1·44–1·56, CI 87–91, SL 1·48–1·56, SI 100–104, PW 0·88–0·96, AL 1·88–2·00 (8 measured). Maximum diameter of eye 0·33–0·36, about 0·23–0·25 × HW. Sides of pronotum with 13–16 rugae between base of mesothoracic spiracle and ventral margin. In some paratypes the cephalic rugular sculpture diverges more strongly posteriorly than in the holotype, and in these a small area of U-shaped rugular sculpture may occur centrally close to the occipital margin.

Holotype worker, Namibia (= South West Africa): Khorixas, 20 deg. 19 min. S., 14 deg. 57 min. E., 20.iii.1982, sample KH1 (*A.C. Marsh*) (BMNH).

Paratypes, 8 workers with same data as holotype (BMNH; SAM; MCZ).

This distinctive species is characterized by its strong clypeal flange (Fig. 16), eyes which break the outline of the sides of the head, PF 4, 3, and unconstricted gastral base with both tergite and sternite convex basally in profile (Fig. 11). At first glance it is reminiscent of *barbarus, cilliei, robustior* and *dekerus*, but all of these lack the very broad clypeal flange and have a strong median longitudinal impression or groove along the postpetiolar sternite. The closest relatives of *kahas* are *afradu* and *flavescens*, which share the characteristic clypeal and postpetiolar structure of *kahas*, and which together constitute the *kahas*-group. Separation of these three species is noted under *afradu*.

Ocymyrmex okys sp. nov.

HOLOTYPE WORKER. TL 7·5, HL 1·84, HW 1·72, CI 93, SL 1·52, SI 88, PW 1·10, AL 2·26.

Palp formula 3, 3, the left apical maxillary palpomere constricted near its midlength. Anterior clypeal margin with a conspicuous median notch or impression. With the head in full-face view the eyes distinctly failing to break the outline of the sides; the maximum diameter of the eye 0·22 × HW. Sides of head in front of eyes straight to extremely feebly concave; behind the eyes rounding into the occipital corners. Occipital margin with a shallow median indentation. Pronotum and anterior mesonotum evenly shallowly convex in profile, posterior portion of mesonotum sloping to the propodeum, the latter itself gently sloped posteriorly and rounding broadly and evenly into the steeply sloping declivity. Metapleural lobes rounded but prominent, in profile projecting beyond the bulge of the metapleural gland bulla and plainly visible. Petiole node relatively large and rounded in profile, in dorsal view slightly broader than long and distinctly broader than the posterior petiolar peduncle. Postpetiole broader than long, narrow anteriorly and rapidly broadening behind, the widest point just behind the midlength. First gastral segment constricted basally, the first tergite much longer than broad. Sculpture of cephalic dorsum coarse and dense. Behind the frontal lobes, and spanning the midline, is a longitudinal strip of irregular rugulae. The outer rugulae of the strip diverge posteriorly and arch outwards behind the eyes, becoming fainter laterally and tending to become confused with strong punctulate-granular ground-sculpture in this area. Between the eye and the antennal fossa on each side the sculpture is of fine dense irregular to chaotic rugulae, whose trend tends to be along an oblique line running towards the mandibular insertion. Sides of alitrunk densely and quite regularly costate to costate-rugose. Side of pronotum with more than 15 oblique longitudinal costae between the ventral margin and the level of the base of the mesothoracic spiracle. Petiole and postpetiole mostly very finely and faintly reticulate to reticulate-granular, in dorsal view the petiole anteriorly with faint and extremely fine transverse rugulae; the ventral surface with some stronger transverse rugulae. Pilosity moderately dense everywhere but sides of meso- and metapleuron without abundant outstanding pilosity. Head dull reddish, the petiole, postpetiole and gaster approximately the same colour or slightly lighter. Alitrunk blackish, in places with a very weak dull, reddish tint.

PARATYPE WORKERS. TL 6·3–7·3, HL 1·70–1·78, HW 1·60–1·65, CI 93–94, SL 1·48–1·56, SI 93–94, PW 1·04–1·07, AL 2·14–2·20 (2 measured). As holotype but somewhat smaller and the eyes marginally larger, maximum diameter 0·23 × HW.

Holotype worker, Namibia: Windhoek, 1987, sample WH1 (*A.C. Marsh*) (BMNH).

Paratypes, 2 workers and 1 ergatoid female with same data as holotype (BMNH).

Non-paratypic material of *okys* includes two workers from Namibia: Naukluft (= Noukloof) Mts, 1987, sample ND2B (*A.C. Marsh*). These are somewhat larger than the type-series, TL 8·0–8·1, HL 2·00, HW 1·88–1·90, CI 94–95, SL 1·68–1·70, SI 88–90, PW 1·20, AL 2·40–2·42, and have the maximum diameter of the eye 0·21–0·22 × HW. These two workers match the holotype of *okys* very closely but have rather finer and more closely packed sculpture on the sides of the alitrunk. At present these relatively minor differences are not regarded as being significant at species-level.

The species closest related to *okys* is *monardi*, a taxon known from Namibia and Angola; both species belong in the *weitzekeri*-group. *O. monardi* is however a more slender species than *okys*, having the petiole and postpetiole longer than broad in dorsal view, and the petiole node lower and more shallowly convex in profile. Apart from this *monardi* is more uniformly coloured, not having the head and gaster strongly contrasting with the alitrunk as in *okys*.

Ocymyrmex phraxus Bolton

The holotype and other previously known material of *phraxus* all came from Tanzania (Bolton, 1981). More recent collections by J. Darlington in the Masai Mara region of Kenya, near Aitong, have shown the presence of *phraxus*, and form an important northward extension to our knowledge of the range of this species.

In the original description the petiole node shape of *phraxus* was given as 'a small node which is not sharply differentiated from the peduncle; the dorsum of the peduncle runs into the anterior face of the node without a marked change in slope.' This character is now known to be variable. The more recently acquired material shows some workers with the node almost as noted above, some with the anterior slope of the node obviously differentiated from the peduncle, and some of an intermediate shape.

Ocymyrmex picardi Forel

This species, the largest and one of the most widely distributed southern African forms, was previously recorded from Angola, Namibia, Botswana, and Zimbabwe (Bolton, 1981). Collections by Alan Marsh at Tosca and Vorstershoop, northern Cape Province of South Africa, have added this last state to the known range of *picardi*.

Pygidial glands in *Ocymyrmex* species were first recorded from *picardi* (Hölldobler *et al.*, 1976), as discussed in the introduction. A number of collections of ergatoid females in association with workers have confirmed the earlier synonymy (Bolton, 1981) of *picardi*, based on a worker, with *carpenteri* Donisthorpe, based on an isolated ergatoid female.

Colour in *picardi* varies from uniformly dull red to uniformly blackish, via intermediate shades and forms in which the head is lighter than the body. However, apart from being the largest known species in *Ocymyrmex* (HW 2.30 or more), *picardi* is the only species known in which the body pilosity is strongly coloured, being dark reddish brown to blackish.

Ocymyrmex resekhes sp. nov.
(Fig. 17)

HOLOTYPE WORKER. TL 8·6, HL 1·98, HW 1·88, CI 95, SL 1·82, SI 97, PW 1·22, AL 2·50.

Palp formula 3, 3 (dissection of paratypes). Median clypeal notch conspicuous, flanked by a triangular tooth-like prominence at each side. Eyes just failing to break the outline of the sides of the head in full-face view; maximum diameter of eye 0·22 × HW. Sides of head convergent posteriorly, especially behind the eyes where they round broadly and evenly into the occipital margin. Median impression of the occipital margin vestigial. In front of level of eye the sides less convex than posteriorly, only feebly divergent anteriorly. With alitrunk in profile the pronotal dorsal outline somewhat flattened, not evenly convex, ascending posteriorly to the convex mesonotum which slopes posteriorly down to the propodeum. Metapleural lobes small and rounded, but visible in profile, projecting beyond the bulge of the metapleural gland bulla. Peduncle of petiole long and narrow, tapering anteriorly, its anteroventral surface not suddenly deflected upwards close to the articulation with the alitrunk. Petiole node in profile low and rounded, in dorsal view narrow and somewhat longer than broad. Postpetiole in dorsal view longer than broad. Base of gaster in dorsal and lateral view distinctly constricted; the base of the first tergite slightly narrower than the

postpetiole in dorsal view. Cephalic dorsum finely and very densely longitudinally costulate. The costulae centrally on the head running straight back towards the occiput, but those in front of the eyes oblique. The costulae themselves are somewhat irregular, not straight, but without large vermiculate areas and the head lacking areas of chaotic sculpture. Sides of pronotum weakly longitudinally costulate, remainder of side of alitrunk obliquely rugulose. Transversely arched costulae on pronotal dorsum very weak, almost obliterated in places. A small patch of longitudinal sculpture is present between the mesothoracic spiracles but behind this the dorsal alitrunk is uniformly transversely rugulose, as is the propodeal declivity. Petiole ventrally with short transverse rugulae, which also occur dorsally on the peduncle, but elsewhere on petiole sculpture is reduced to a fine granulation or superficial reticulation. Postpetiole everywhere with fine superficial sculpture everywhere. Pilosity on head and alitrunk dorsum conspicuous and dense, the dorsal alitrunk with numerous short elevated hairs between the longer main components of the pilosity. Mesopleura and metapleura densely clothed with outstanding hairs, almost with a furry appearance. Colour of head and alitrunk a very dull dark red, the gaster lighter, orange-red to yellowish.

PARATYPE WORKERS. TL 7·9–8·6, HL 1·74–2·00, HW 1·66–1·96, CI 95–99, SL 1·66–1·90, SI 95–101, PW 1·06–1·23, AL 2·28–2·60 (20 measured).

As holotype but some with pronotal dorsal outline more flattened, and some with the outline somewhat more evenly convex. Cephalic sculpture variable. Many as holotype but some with the fine longitudinal costulae more disorganized, wavy or even broken in places. A distinct punctulate ground-sculpture may occur, especially close to the inner margins of the eyes, and in a few workers this may become the dominant sculpture of the immediate area. In some the longitudinal costulae become disorganized posteriorly, in others they tend to weaken or even fade out as they approach the occipital margin. Sides of pronotum frequently with more strongly developed costulae than those exhibited by the holotype, and the sculpture of the pronotal dorsum is often also better defined. Maximum diameter of eye 0·21–0·23 × HW.

Holotype worker, South Africa: north Cape Prov., Andriesvale, sample NC7F, 1986 (*A.C. Marsh*) (BMNH).

Paratypes, 2 workers with same data as holotype; 18 workers and one ergatoid female with same data as holotype but samples NC7C, NC7E, NC7K, NC7M (BMNH; SAM; MCZ).

Non-paratypic material of this species orginates from Olifantshoek, Upington, Severn, and Pomfret, all collected by Alan Marsh, and from Kalahari Park, collected by Christian Peeters. All of these localities are in northern Cape Province of South Africa, so it is most likely that *resekhes* also occurs in southern Botswana and eastern Namibia. Material from all these localities tends to have the pronotum more evenly convex in profile than in the holotype, though some of the paratypic Andriesvale specimens show an intermediate outline shape. The specimens from Pomfret have somewhat less dense pilosity on the sides of the alitrunk than any other series, but at present we are not counting this as being of species-level significance.

O. resekhes is separated here as a sibling species of the more widely distributed *O. flaviventris*; both show the dense abundant pilosity of the *hirsutus*-group (similar to Figs 12 and 13). The two are basically very similar indeed, but differ in the relative length of the petiolar peduncle, shape of the peduncle anteriorly, and width of the petiole node. In *resekhes* the petiolar peduncle is long and narrow in profile, tapering more or less evenly anteriorly to the junction with the alitrunk. The anteroventral

portion of the peduncle is not suddenly deflected upwards near to the articulation with the alitrunk (Fig. 17). In dorsal view the petiole node tends to be elongate and narrow, usually as long as broad or even slightly longer than broad. A few specimens have the node broader than long, but this widening is not nearly so pronounced as in *flaviventris*. The petiole peduncle is *flaviventris* is short and stout in profile and the anteroventral margin of the peduncle is suddenly deflected upwards near the articulation with the alitrunk (Fig. 18). Sometimes the ventral margin of the peduncle immediately behind this is convex, enhancing the effect. The petiole node in dorsal view is always very conspicuously much broader than long. Some variations in shape occur in the outline profiles of the petiole in both species, but Figs 17 and 18 indicate the most commonly seen configurations.

Finally, workers of *flaviventris* average smaller than those of *resekhes*, and apparently always have shorter scapes, as follows.

	HW	SL	PW	AL
flaviventris	1·54–1·70	1·44–1·58	0·93–1·04	2·04–2·28
resekhes	1·66–1·96	1·66–1·90	1·06–1·23	2·28–2·60

Ocymyrmex robustior Stitz
(Figs 15, 23, 26 and 27)

Ocymyrmex barbiger var. *robustior* Stitz, 1923: 146. Syntype workers, NAMIBIA: Luderitzbucht, 5–13.vii.1911; and Swakopmund, 12–19.iv.1911 (*W. Michaelsen*) (MNHU) [examined]. [Previously treated as a synonym of *barbiger* by Bolton, 1981: 265.]
Ocymyrmex robustior Stitz; Marsh, 1986b: 339 [raised to species].

Good fresh samples of this ant from Ganab, Kuiseb River and at 23 deg. 43 min. S., 15 deg. 19 min. E., all collected by Marsh in Namibia, have made it clear that *robustior* is a valid species. It is a member of the *barbiger*-group but is distinguished from *barbiger* by the characters indicated in the key.

As mentioned in the introduction several aspects of the biology and behaviour of this species have been investigated by Marsh (1985 a, 1985 b, 1985 c, 1986 a) under the name of *barbiger*, the work being completed and published before this more detailed taxonomic study was possible. Marsh (1986 b) has used *robustior* in its current sense as a valid species, and this name should be applied to his earlier studies.

Of the *robustior* material now available the Kuiseb River sample and a sample from Gobabeb, Namib Naukluft Park, collected by Hamish Robertson, match the syntypes extremely well, but Ganab specimens and a sample from Mirabib collected by Robertson, show some variation in intensity of sculpture and colour when compared with the syntypes and the Kuiseb River specimens. A suspicion that two sibling species may currently exist under the name *robustior* must be entertained. At present too little material is available to judge accurately the ranges of variation of these features, which are known to vary to some extent in other *Ocymyrmex* species, so for now all this material is referred to *robustior*.

A number of males collected at light by H. Robertson at Gobabeb, Namibia, are referable to this species. A proportion of these males, in samples C1056 and C1057 (in BMNH), show mosaic development of male and female tissue. These have been discussed above, following the diagnosis of the males of this genus.

Ocymyrmex sphinx Bolton
(Figs 4 and 10)

Previously recorded only from Botswana, *sphinx* has now been discovered by Alan Marsh in northern Cape Province of South Africa, at Tosca and Vryburg. Members of this relatively large species are uniformly coloured, varying from dark dull red to blackish throughout. Whatever the colour the dense but very short pilosity of the propodeal dorsum remains consistent, as do other characters diagnostic of the species (Bolton, 1981)

Ocymyrmex tachys sp. nov.

HOLOTYPE WORKER. TL 5·2, HL 1·36, HW 1·22, CI 90, SL 1·30, SI 107, PW 0·76, AL 1·60.

Palp formula 2, 3; one of only two *Ocymyrmex* species so far known to have just 2 maxillary palp segments, the other being *engytachys*. Anterior clypeal margin with a conspicuous median impression. With the head in full-face view the eyes very obviously breaking the outline of the sides. Eyes relatively large, the maximum diameter 0·32, about 0·26 × HW. Sides of head in front of eyes straight and weakly divergent anteriorly. Behind the eyes the sides convergent posteriorly and rounding into the transverse occipital margin; the latter not indented nor concave medially. Alitrunk in profile with promesonotum evenly convex, the mesonotum sloping posteriorly and confluent with the propodeum, which slopes slightly less steeply backwards. Propodeal dorsum and declivity confluent through a long shallow curve which is only weakly convex and appears almost like a continuation of the dorsum. Bulla of metapleural gland strongly prominent posteriorly, almost masking the metapleural lobe, the apex of which can just be seen posteriorly. Petiole node in profile evenly rounded, in dorsal view slightly longer than broad. Postpetiole about as long as broad in dorsal view, broadest posteriorly. Postpetiolar sternite ventrally evenly shallowly transversely concave, lacking a strong median longitudinal groove. In profile outline of first gastral tergite shallowly convex basally from its articulation with the postpetiole; first sternite with a more or less flat outline in its basal third. In dorsal view the gaster not strongly constricted nor neck-like basally. Gaster no wider than postpetiole at their point of junction but behind this the sides of the tergite are evenly and distinctively divergent. Dorsum of head finely irregularly longitudinally rugulose, the rugulae faint and feebly divergent posteriorly. Spaces between rugulae with conspicuous granular to punctulate ground-sculpture, which tends to become very weak or to fade out occipitally. Dorsal alitrunk densely and finely regularly transversely rugose except on the pronotum where the sculpture is strongly arched and finer than elsewhere. Sides of alitrunk regularly rugose; longitudinal on pronotum, oblique elsewhere. Petiole mostly finely reticulate but the ventral surface with some transverse rugulae below the node, and the dorsum with some faint to vestigial transverse rugulae on the node. Postpetiole superficially reticulate. First gastral tergite mostly glassy smooth but basally with the faintest traces of fine superficial reticular patterning. All dorsal surfaces of head and body with conspicuous silvery standing hairs, those on the basal half of the first gastral tergite about equal in length to those on the propodeal dorsum. Head dark reddish brown, mandibles and head to level of frontal lobes lighter brown. Alitrunk black, gaster intermediate in shade between head and alitrunk.

PARATYPE WORKERS. TL 5·2–5·7, HL 1·36–1·42, HW 1·22–1·31, CI 88–92, SL 1·30–1·40, SI 107–108, PW 0·76–0·84, AL 1·60–1·70 (4 measured).

As holotype but maximum diameter of eye 0·24–0·26 × HW. One paratype is a teneral and light brown in colour. In the remainder the colour of the alitrunk varies from dark brown to black.

Holotype worker, Nambia (= South West Africa): Namib Desert, Skeleton Coast, sample SC6, 11.viii.1982, 19 deg. 45 min. S., 13 deg. 23 min. E., gravel outcrop (*A.C. Marsh*) (BMNH).

Paratypes, 4 workers with same data as holotype (BMNH; SAM).

The character combination of small size (see measurements), very reduced palp formula (PF 2, 3), medially impressed clypeus, eyes which strongly break the outline of the sides of the head, and unconstricted gaster, renders the *tachys*-group immediately recognizable. The affinities of the group certainly lie with the *barbiger*-group as constituted in this paper, but the extremely reduced palp formula easily differentiates the *tachys*-group.

Only two species currently occup the *tachys*-group, *tachys* itself and *engytachys*, a closely related form also from Namibia. Characters useful in separating the two are noted in the key and under *engytachys*.

Ocymyrmex turneri Donisthorpe
(Fig. 8)

Alan Marsh collected a series of this species at Mirabeb, Namibia (sample M11). The specimens match the holotype, which was previously the only known representative of the species, very well indeed, and confirm the description given in Bolton's (1981) study. The range of dimensions shown by workers of this relatively small species is as follows. TL 5·5–5·8, HL 1·38–1·40, HW 1·24–1·28, CI 89–91, SL 1·37–1·40, SI 109–111, PW 0·75–0·80, AL 1·70–1·80. Maximum diameter of eye is 0·26–0·28 × HW (10 measured).

In the new series the sides of the pronotum are somewhat more extensively sculptured than in the holotype, and their dense dorsal pilosity indicates that earlier conjecture regarding abrasion of the holotype was correct. Similarly, the dorsal alitrunk of the new series is feebly sculptured, this area being mostly smooth in the holotype. Hamish Robertson (University of the Witwatersrand) collected a single specimen at the same locality. This matches the preceding but has the median clypeal prominence somewhat flattened and inconspicuous, truncated rather than bluntly triangular at its apex.

Marsh (1986 b) says that *turneri* is a diurnally foraging scavenger, primarily seeking out dead insects. Its nests are inconspicuous and have a single entrance hole. *O. turneri* is widespread on the Namib gravel plains and occurs across the entire width of the desert (Marsh, 1986 a).

Ocymyrmex velox Santschi
(Fig. 22)

The type-material and few samples of *velox* earlier available for examination (Bolton, 1981) all showed the same colour pattern. The alitrunk was dull red to blackish red, the head a lighter red, and the gaster lighter still, orange or even yellow in some individuals. Collections made by Alan Marsh in the Namib Desert at Etosha, in the Naukluft Mountains, and at 23 deg. 23 min. S., 15 deg. 32 min. E., show some *velox*

with this colour pattern but others darker. In the latter the head is red but the remainder of the body is uniformly reddish black to black. Specimens collected by Hamish Robertson in the Namib Naukluft Park are the same as this dark material of Marsh's, but an even darker specimen, collected by H. Schlagbauer in the Brandburg Mountains, also has the head reddish black. These variations in colour are regarded as intraspecific and not significant at species-level. Cephalic sculpture is also variable in intensity. It is usually quite faint but in some individuals it may be more strongly developed and conspicuous.

Marsh (1986b) notes that *velox* is restricted to the eastern gravel plains in the Namib Desert. Nests of the species are inconspicuous and normally have only one entrance hole. A semilunar crater of excavated material may occur near the nest entrance. He adds that *velox* is a diurnal insectivore which scavenges dead arthropods, but it will also prey on termites of the genus *Hodotermes* when eruptions of the latter occur.

Ocymyrmex weitzeckeri Emery

This apparently rare species appears to be closely related to the much more common and widespread *fortior*. In available material workers of the two may be distinguished as follows.

In general *weitzeckeri* workers are very dark in colour and relatively dull, being very dull reddish black to blackish with a dull red tint. Cephalic sculpture is distinctly disorganized rather than regular. Usually on the dorsum of the head there is a broad area of wavy or markedly irregular rugulae on each side of, and converging medially on, a longitudinal strip of more obviously parallel rugulae at the centre of the dorsum. The petiole node is short and wide in dorsal view, distinctly much broader than long and the node very obviously much broader than the posterior petiolar peduncle.

In contrast *fortior* workers are much lighter in colour and more glossy, being orange-red to shiny dark red. On the head the sculpture everywhere consists of regular fine dense and strikingly parallel longitudinal costulae which run in a fore-and-aft direction across the entire width of the dorsum. (There are some rare exceptions, noted under *fortior*.) The petiole node is narrower and more gracile in dorsal view, usually scarcely broader than the posterior petiolar peduncle.

Ocymyrmex zekhem Bolton
(Fig. 21)

Namibian series collected by Alan Marsh at Samanab River (Skeleton Coast), Swakopmund, and two workers from Hunkab Springs, belong to this species, which was previously known only from the holotype. *O. zekhem* is closely related to *velox* but differs in being generally darker in colour, having long standing hairs on the first gastral tergite which equal the length of the erect hairs on the propodeum, and by having longer scapes (SI > 110) than are seen in *velox* (SI < 110). The samples of *zekhem* now available indicate that the intensity of cephalic sculpture is slightly variable, as specimens with more conspicuous dorsal cephalic costulae than others are fairly frequent. The occipital region varies from very feebly striolate to virtually smooth. Colour in *zekhem* varies from having the head very dark dull red to reddish or brownish black. The alitrunk is always glossy jet black. The gaster is blackish brown but the petiole and postpetiole may have a reddish tint. Currently the known range of

dimensions in *zekhem* is TL 8·0–9·5, HL 2·06–2·20, HW 1·90–2·04, CI 91–93, SL 2·20–2·28, SI 111–116, PW 1·22–1·40, AL 2·50–2·70 (10 measured).

Acknowledgements

We are grateful to Dr. Hamish Robertson (South African Museum) for reading over this manuscript and adding many useful notes and comments.

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