

# A revision of the ant genera *Meranoplus* F. Smith, *Dicroaspis* Emery and *Calyptomyrmex* Emery (Hymenoptera: Formicidae) in the Ethiopian zoogeographical region

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## Synopsis

The genera *Meranoplus* F. Smith, *Dicroaspis* Emery and *Calyptomyrmex* Emery are revised for the Ethiopian zoogeographical region. Keys to workers of each genus are presented. Eight species of *Meranoplus* are recognized, one of which is described as new; 12 new synonyms are established in this genus, mostly of infraspecific forms, and new status as a valid species is given to one form. *Calyptomyrmex* has 16 species in the fauna. Of these 7 are described as new and 6 synonyms are established. *Dicroaspis* is returned to generic status, with *Geognomicus* included as a new junior synonym; two species are recognized and one new synonym is established.

## Introduction

The three genera treated in this paper have not previously been revised for the Ethiopian zoogeographical region. The species of southern Africa were reviewed by Arnold (1917; 1926) but all other information is included in the scattered literature of original descriptions.

Of the three genera *Dicroaspis* is restricted to central Africa, but *Calyptomyrmex* and *Meranoplus* are both widely distributed in the Old World tropics, ranging through the Oriental and Indo-Australian regions to Australia. The *Calyptomyrmex* species of the Oriental and western Indo-Australian regions have recently been revised by Urbani (1975), but no work has been done on *Meranoplus* to the present.

The maximum number of species of *Calyptomyrmex* occur in Africa, the numbers falling off in an easterly direction, whilst the reverse is true of *Meranoplus* which has its strongest representation in Australia. In terms of numbers of described species, and ignoring infraspecific forms and synonyms, the distributions break down as follows.

	<i>Dicroaspis</i>	<i>Calyptomyrmex</i>	<i>Meranoplus</i>
Ethiopian region	2	16	8
Malagasy region	—	—	2
Oriental region	—	4	7
Indo-Australian region	—	4	9
Australian region	—	1	21
Totals	2	25	47

The taxonomic histories of *Calyptomyrmex* and *Meranoplus* have been fairly straightforward since their inception, but *Dicroaspis* has had a rather more chequered career. When first described by Emery (1908) it was treated as a valid genus, but later he changed his opinion (Emery, 1915) and from then on he regarded *Dicroaspis* as a subgenus of *Calyptomyrmex*; it was also treated as such by later authors and cataloguers (Wheeler, 1922). The present study reverses the 1915 decision as I am now convinced that *Dicroaspis* deserves generic status, separate from *Calyptomyrmex*, for the reasons given in the discussion of the genus.

The obscure monotypic genus *Geognomicus*, stated at its inception (Menozzi, 1924) to be 'closely related to *Calyptomyrmex* Em., and especially to the subgenus *Dicroaspis* Em.', and illustrated by three misleading sketches, sinks into the synonymy of *Dicroaspis*. On examination the type-species of *Geognomicus*, *G. wheeleri*, proved to be a straight synonym of the type-species of *Dicroaspis*.

In the Ethiopian zoogeographical region all the species of these genera nest in the ground, either directly into the soil or in rotten wood embedded in the topsoil, or under stones. The majority of species also forage and spend their entire lives in the leaf-litter but one or two species of *Meranoplus* may ascend trees or low shrubs, though none of the African species are as strongly arboreal as some of their congeners in the Indo-Australian region.

Historically the three genera *Dicroaspis*, *Calyptomyrmex* and *Meranoplus* were included in a single tribe, the Meranoplini, recently dissolved by Kugler (1978). This tribe was erected by Emery (1914) to include these genera along with *Mayriella* Forel, *Promeranoplus* Emery and *Prodicroaspis* Emery. The same genera constituted the tribe at the formulation of the classifications of Wheeler (1922) and Emery (1922), and by the time of the latest synopsis of the tribe by Wheeler (1935) the genera *Willowsiella* Wheeler, *Romblonella* Wheeler and *Geognomicus* (now a synonym of *Dicroaspis*) had also been added to the list. The final addition to the Meranoplini was *Ankylomyrma* Bolton, made by myself (Bolton, 1973) for reasons which I now consider to be insufficient and wrong. *Ankylomyrma* should be excluded from consideration with any of the above genera, its affinities do not lie in the direction of any of them.

Despite the removal of the anomalous *Ankylomyrma* the Meranoplini still represents an artificial assemblage of genera which in reality should not all be grouped together. The question

of why they were grouped together in the first place is perhaps answered by a consideration of *Meranoplus* itself and the aberrant characters that it shows, such as deep scrobes, short alitrunk with large promesonotum, and short to absent propodeal dorsum. It happens that these characters are also present to some extent in *Calyptomyrmex* although, except for the deep scrobes, by no means as spectacularly. These superficial likenesses were considered sufficient to link the two genera. After this association was made the concept of a tribe Meranoplini was so weighted that other genera merely fell in when they showed either vaguely *Calyptomyrmex*-like or *Meranoplus*-like characters. My opinion now is that the classical Meranoplini contained two groups of genera from basically different stocks, which show fundamental differences in their clypeal structure and the construction of the petiole, as well as the differences in sting structure pointed out by Kugler (1978).

In *Meranoplus*, *Romblonella* and *Willowsiella* the petiole is sessile. There is no elongate anterior peduncle separating the anterior face of the node from its articulation with the alitrunk, merely a very short connecting section which is just long enough to allow the petiole to articulate in vertical plane. On the other hand, in *Calyptomyrmex* and all the other genera mentioned above the petiole has a long peduncle in front of the node so that the anterior face of the node is separated from the portion which articulates with the alitrunk by a conspicuous, more or less horizontal, bar.

The posterior portion of the clypeus in *Meranoplus*, *Romblonella* and *Willowsiella* is broad and broadly arched between the widely separated frontal lobes. The antennal insertions are widely separated and the frontal lobes above them are narrow. In *Calyptomyrmex* and the other genera (*Mayriella*, *Promeranoplus*, *Prodicroaspis*, *Dicroaspis*), the posterior portion of the clypeus is narrow and deeply inserted between the closely approximated frontal lobes. The antennal insertions are relatively close together and the frontal lobes tend to be broad. This implies that the method of formation of the upper scrobe margin may be basically different in *Meranoplus* and *Calyptomyrmex*. Members of the former needed only to fuse the laterally expanded frontal carinae to the narrow frontal lobes to create a uniform flange above the scrobe; no marked expansion of the frontal lobes was necessary to protect the base of the scape. However, in *Calyptomyrmex*, because the clypeus is so narrow posteriorly and the antennal insertions so close together, a strong expansion of the frontal lobes was necessary so that their outer margins would be roughly aligned with those of the frontal carinae and thus form a uniform flange above the scrobe without leaving much of the base of the scape unprotected when it was folded into the scrobe.

In summary then, the modifications discussed above indicate that genera from two fundamentally different stocks were originally included under the name Meranoplini, and I am in agreement with Kugler (1978; 1979) that the tribe is best dissolved. Of the former members the genera *Meranoplus*, *Romblonella* and *Willowsiella* are characterized by having a sessile petiole node and a clypeus which is broad and broadly arched posteriorly, but despite these similarities I am not convinced that the three genera are truly closely related. On the strength of the sting structure Kugler (1978) places *Meranoplus* in the peripheral genera of the *Pheidole*-group, but this list of peripherals also includes such disparate forms as *Crematogaster* Lund, *Myrmicaria* Saunders and *Lachnomyrmex* Wheeler, so I am suspicious of the grouping.

As regards *Romblonella* and *Willowsiella*, both show a triangular prominence on each side of the petiole near the base of the node, such as is commonly seen in leptothoracines, but whether there is any sort of relationship remains to be seen, although there are similarities between *Romblonella* and some tropical species of *Leptothorax*.

The second group of genera, including *Calyptomyrmex*, *Mayriella*, *Dicroaspis*, *Prodicroaspis* and *Promeranoplus*, have the petiole pedunculate and the posterior portion of the clypeus narrow and deeply inserted between the frontal lobes. My present opinion is that members of this group are genuinely related as, besides the characters just mentioned, they have a characteristically shaped alitrunk where the promesonotum is fused (and commonly somewhat swollen), followed by a low propodeum which often has a strongly sloping dorsal surface. On present evidence I consider that *Calyptomyrmex* and its allies are related to the *Lordomyrma*-group of genera.

Kugler's (1978; 1979) studies of the myrmicine sting show partial agreement since he groups *Lordomyrma* Emery, *Promeranoplus* and *Prodicroaspis* together (as the *Promeranoplus*-group), but he puts *Calyptomyrmex* in the peripheral genera of the *Solenopsis*-group. It is possible that *Solenopsis* Westwood and allies, *Calyptomyrmex* and allies, and *Lordomyrma* may be more closely related than was previously thought, but more work will be necessary on many of the genera involved before any real conclusions can be reached. It is, however, interesting to note that Kugler (1979: 122) has placed *Calyptomyrmex* and 'the primitive species of the *Solenopsis*- and *Promeranoplus*-groups' together in the second section of genera with a grade 2 sting apparatus.

### Measurements and indices

**Total Length (TL).** The total outstretched length of the individual, from mandibular apex to gastral apex.

**Head Length (HL).** The length of the head proper, excluding the mandibles; measured in *Meranoplus* in a straight line from the mid-point of the anterior clypeal margin to the mid-point of the occipital margin, in full-face view. In *Calyptomyrmex* and *Dicroaspis* the head length is measured from the base of the clypeal fork to the mid-point of the occipital margin, in a straight line in full-face (after Urbani, 1975).

**Head Width (HW).** The maximum width of the head behind the eyes, measured in full-face view.

**Cephalic Index (CI).**

$$\frac{HW \times 100}{HL}$$

**Scape Length (SL).** The straight-line length of the antennal scape, excluding the basal constriction or neck close to the articulating condylar bulb.

**Scape Index (SI).**

$$\frac{SL \times 100}{HW}$$

**Pronotal Width (PW).** In *Calyptomyrmex* and *Dicroaspis* the maximum width of the pronotum in dorsal view. In *Meranoplus* the width of the pronotum behind the pronotal teeth, in dorsal view.

**Alitrunk Length (AL).** In *Calyptomyrmex* and *Dicroaspis* the diagonal length of the alitrunk in lateral view from the point at which the pronotum meets the cervical shield to the posterior base of the metapleural lobes. In *Meranoplus* the same measurement but commencing at the pronotal tooth.

All measurements are expressed in millimetres.

### Abbreviations of museums

AMNH, New York

BMNH

IE, Bologna

MCSN, Genoa

MCZ, Cambridge

MHN, Geneva

MNHN, Paris

MRAC, Tervuren

NM, Basle

NM, Bulawayo

NM, Vienna

American Museum of Natural History, New York, U.S.A.

British Museum (Natural History), London, U.K.

Istituto di Entomologia dell'Università, Bologna, Italy.

Museo Civico di Storia Naturale 'Giacomo Doria', Genoa, Italy

Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A.

Muséum d'Histoire Naturelle, Geneva, Switzerland

Muséum National d'Histoire Naturelle, Paris, France

Musée Royal de l'Afrique Centrale, Tervuren, Belgium

Naturhistorisches Museum, Basle, Switzerland

National Museum, Bulawayo, Zimbabwe

Naturhistorisches Museum, Vienna, Austria

### *MERANOPLUS* F. Smith

(Figs 1–25)

*Meranoplus* F. Smith, 1853: 224. Type-species: *Cryptocerus bicolor* Guérin-Méneville, 1844: 425, by subsequent designation of Bingham, 1903: 166.

[*Cryptocephalus* Lowne, 1865: 336. Incorrect subsequent spelling of *Cryptocerus* Latreille in the combination *Cryptocephalus pubescens* Smith (= *Meranoplus pubescens* (Smith)).]

**DIAGNOSIS OF WORKER.** Myrmicine ants in which the mandibles have a short masticatory margin, with 4–5 teeth (either 5 teeth, 4 teeth plus offset basal denticle, or 4 teeth only). Palp formula 5, 3 (all African species plus 14 extralimital species dissected; in very small species the basal maxillary palpomere may be short so that the PF appears to be 4, 3). Clypeus large, the median portion shield-like, usually carinate at each side or with the dorsum and sides separated by an angle. Posterior section of median portion of clypeus broad and broadly arched posteriorly, not narrowly inserted between the frontal lobes. Antennal scrobes present, deep and usually long, bounded above by the widely separated frontal carinae and below by a sharp ridge which runs to the eye. Scapes thicker in apical than in basal halves. Antennae with 9 segments, the apical 3 flagellar segments forming a club. Eyes large, situated behind midlength of head, sometimes close to the occipital corners; eyes located below the antennal scrobes and usually close to their apices. (The eyes more or less central on the head in a few Australian species, in which the scrobes are also reduced.) Ventral surface of head with a longitudinal ridge or carina on each side. Pronotum and mesonotum fused into a plate or shield which is usually extended posteriorly and laterally so that the sides of the alitrunk and generally also the propodeum are invisible in dorsal view (not in *spininodis*-group). Lateral and/or posterior margins of promesonotal shield commonly armed with spines, lobes, foliaceous processes or other outgrowths, the body of the promesonotal shield sometimes with cuticular thin-spots or fenestrae. Petiole sessile, without an anterior peduncle, the node usually cuneate in profile, broadest basally and narrowing above; high-nodiform in some extralimital species.

*Meranoplus* is a relatively small compact genus of ants found throughout the Old World tropics and subtropics but with the greatest number of species in Australia. Discounting synonyms and infraspecific forms some 47 species have been described to the present. Of these, only eight occur in sub-Saharan Africa with varying degrees of success. The species *glaber*, *spininodis*, *sthenus* and *peringueyi* are known only from the countries of the southern portion of Africa, namely Zimbabwe, Botswana, South Africa and Lesotho. Two other species, *nanus* and *clypeatus*, are rather more widely distributed but are not known from the afore-mentioned territories, being of more northerly distribution in the continent. The last two species, *inermis* and *magrettii*, are extremely widely distributed in Africa, both being known from Sudan to South Africa and from West to East Africa. The difference in their distribution is that *inermis* is primarily a species of forests whilst *magrettii* is found mainly in savannah.

All the African species nest directly into the ground, either in the open where the nest entrance may form a small crater, or at the base of plants where the nest may be built amongst the roots.

Most of the species of Africa show marked variation in size between different nests of the same species, and commonly between individuals from a single nest there are noticeable size-differences. In many cases the differences in size are linked to changes in other characters such as intensity and density of sculpture, presence or absence of sutures, length of mesonotal spines etc. Intrinsically variable characters such as this were responsible for the creation of most of the infraspecific taxa which are now synonymized. The status of the various African forms is now as shown in the following list.

### Synonymic list of species

#### *spininodis*-group

*glaber* Arnold **stat. n.**

*spininodis* Arnold

*sthenus* sp. n.

#### *nanus*-group

*clypeatus* Bernard

*inermis* Emery

*nanus* subsp. *nanior* Forel **syn. n.**

*nanus* var. *kiboshana* Forel **syn. n.**

*nanus* subsp. *soriculus* Wheeler **syn. n.**

*nanus* subsp. *similis* Karavaiev (homonym)

*nanus* subsp. *affinis* Urbani **syn. n.**

*nanus* André

#### *magrettii*-group

*magrettii* André

*simoni* Emery **syn. n.**

*simoni* subsp. *nitidiventris* Mayr **syn. n.**

*simoni* subsp. *suturalis* Forel **syn. n.**

*bondroiti* Santschi **syn. n.**

*simoni* var. *springvalensis* Arnold **syn. n.**

*simoni* var. *diversipilosus* Santschi **syn. n.**

*peringueyi* Emery

*excisus* Arnold **syn. n.**

**Key to species (workers)**

- 1 Dorsum of petiole armed with a pair of spines or teeth (Figs 1–3). Promesonotal shield posteriorly not overhanging the propodeum, the latter visible in dorsal view and forming a part of the dorsal alitrunk (Figs 1–3, 9–11) . . . . . 2
- Dorsum of petiole unarmed, without spines or teeth. Promesonotal shield posteriorly overhanging the propodeum, the latter not visible in dorsal view and not forming a part of the dorsal alitrunk (Figs 4–7, 12–25) . . . . . 4
- 2 Erect to suberect stout hairs absent from dorsal (outer) surface of hind tibiae, only fine decumbent to appressed pubescence present. Dorsal surfaces of head, alitrunk and gaster with short appressed hairs, without elongate erect or suberect pilosity (Fig. 2). (Zimbabwe, Botswana) . . . . . *glaber* (p. 49)
- Erect to suberect stout hairs present on dorsal (outer) surface of hind tibiae. Dorsal surfaces of head, alitrunk and gaster with conspicuous elongate pilosity which may be very dense and which is erect or suberect at least in part (Figs 1, 3) . . . . . 3
- 3 Postpetiole in profile low and broad, nodiform, the posterodorsal angle prominent and overhanging the shallowly concave posterior face (Fig. 3). Dorsum of postpetiole densely clothed in fine soft curved hairs. Spines on petiole dorsum short. (Zimbabwe, Botswana) . . . . . *spininodis* (p. 50)
- Postpetiole in profile high and narrow, columnar, the posterodorsal angle not prominent, not overhanging the posterior face (Fig. 1). Dorsum of postpetiole with a few long stout hairs and some short, fine pubescence. Spines on petiole dorsum long. (Zimbabwe) . . . . . *sthenus* (p. 50)
- 4 Postpetiole in profile squamiform or very strongly anteroposteriorly compressed, without a long dorsal surface (Figs 4, 5). Propodeal spines absent or short, not projecting posteriorly beyond the mesonotal margin in dorsal view . . . . . 5
- Postpetiole in profile broad and nodiform, with a long dorsal surface which is flat to convex (Figs 6, 7). Propodeal spines projecting posteriorly beyond the mesonotal margin in dorsal view . . . . . 7
- 5 Propodeum armed with a pair of short spines (Fig. 4) . . . . . 6
- Propodeum without spines (Fig. 5). (Sudan, Kenya, Tanzania, Zimbabwe, South Africa, South West Africa, Angola, Zaire, Nigeria, Ghana) . . . . . *inermis* (p. 52)
- 6 Posterior margin of mesonotum with 4–6 opaque cuticular projections, the spaces between the projections with translucent thin cuticular lamellae (Fig. 12). Postpetiole dorsum a transverse crest without rugose sculpture. (Gabon, Zaire, Tanzania) . . . . . *nanus* (p. 53)
- Posterior margin of mesonotum with a broad transverse shelf-like lamella which may project into 2–4 flat triangular teeth, the lamella usually concave and thinner medially (Figs 13–15). Postpetiole dorsum narrow but flattened, with rugose sculpture. (Guinea, Zaire) . . . . . *clypeatus* (p. 52)
- 7 Mandibles armed with 5 teeth. Anterior clypeal apron rounded and generally shallowly convex, without a prominence or denticle on each side of the median portion. (South Africa, Lesotho) . . . . . *peringueyi* (p. 56)
- Mandibles armed with 4 teeth. Anterior clypeal apron more or less flat to concave between a prominence or denticle on each side of the median portion (Fig. 8). (Ghana, Sudan, Uganda, Kenya, Tanzania, Zimbabwe, Botswana, South Africa) . . . . . *magrettii* (p. 55)

**The species-groups**

The eight species of *Meranophus* present in the Ethiopian zoogeographical region divide easily into three approximately equal-sized groups of related forms. The members of the first group, which includes *glaber*, *spininodis* and *sthenus* (Figs 1–3, 9–11), are characterized by possessing a pair of spines or teeth upon the petiolar dorsum. Besides this the promesonotal shield is not as well developed as in the remaining groups and does not completely overhang the propodeum, so that the latter constitutes a part of the dorsal alitrunk and is visible in dorsal view.

In the two remaining groups the petiole is unarmed and the promesonotal shield much more strongly developed, completely overhanging the near-vertical propodeum so that the latter is not visible in dorsal view and does not constitute a part of the dorsal alitrunk.

Of these two groups the species related to *nanus* (*clypeatus* and *inermis*, Figs 4, 5, 12–19) have the postpetiole squamiform whilst the species of the *magrettii*-group (*magrettii* and *peringueyi*, Figs 6–8, 20–25) have the postpetiole strongly nodiform. As well as this difference in postpetiolar

structure *nanus* and its allies either lack propodeal spines (*inermis*) or have them quite short, in dorsal view not projecting beyond the mesonotal margin, whereas in *magrettii*-group the propodeal spines are long and conspicuous.

### The *spininodis*-group

(Figs 1–3, 9–11)

Mandibles with five teeth, consisting of four large distinct teeth and a small offset basal denticle. With the alitrunk in dorsal view the propodeum constituting a part of the dorsum, visible as a narrow transverse strip behind the promesonotal shield and bearing a pair of massive spines. Anterior pronotal corners dentate, posterior mesonotal corners each with a short triangular spine which is much less massive than the spines borne on the propodeum. Dorsal surface of petiole narrow and armed with a pair of teeth or spines. Postpetiole in profile columnar or nodiform, not squamiform.

These diagnostic characters link three small species known from Zimbabwe and Botswana and easily separate them from all other species of the genus in this region. In fact, the bispinose petiole does not seem to occur in any other *Meranoplus* species, making the *spininodis*-group unique to southern Africa.

Of the three *glaber* is separated by its lack of erect/suberect stout hairs on the body and the lack of such hairs on the tibiae. In both *sthenus* and *spininodis* such hairs are numerous and conspicuous. These last two species are differentiated chiefly on the shape of the postpetiole and the length of the petiolar spines. In *spininodis* the petiolar spines are short and the postpetiole has a projecting posterodorsal angle which overhangs the concave posterior face of the postpetiole (Fig. 3). In *sthenus* on the other hand the petiolar spines are long and the postpetiole columnar, lacking a projecting posterodorsal angle and with a vertical posterior face (Fig. 1).

### *Meranoplus glaber* Arnold stat. n.

(Figs 2, 10)

*Meranoplus spininodis* var. *glaber* Arnold, 1926: 285, fig. 82. Syntype workers, ZIMBABWE: Bulawayo, Hillside, 13.v.1917; Sawmills, 30.i.1918 and 1.ii.1918 (*G. Arnold*) (BMNH; NM, Bulawayo) [examined].

WORKER. TL 2.3–3.1, HL 0.60–0.72, HW 0.58–0.72, CI 97–103, SL 0.36–0.44, SI 60–64, PW 0.54–0.72, AL 0.50–0.80 (14 measured).

Mandibles striate, the masticatory margin armed with four teeth plus a small, offset basal denticle. Median portion of clypeus with a narrow translucent apron anteriorly which projects over the bases of the mandibles and conceals the basal tooth and denticle when the mandibles are closed. A longitudinal carina present on each side of the median portion of the clypeus, running forward to the anterior apron and separating the more or less flat dorsum from the sides. Eyes large and conspicuous, maximum diameter 0.61–0.21 (about 0.28–0.30 × HW) and with 10–12 ommatidia in the longest row. Promesonotal shield strongly marginate laterally, the pronotal portion slightly broader than the mesonotal in dorsal view. Anterior pronotal angles projecting as short, broad triangular teeth, posterior mesonotal angles projecting as stout teeth or short triangular spines, which are usually longer than the pronotal teeth. Margins of promesonotal shield without fenestrae or thin-spots, without cuticular outgrowths other than the teeth described above. Propodeum visible in dorsal view as a thin transverse strip behind the promesonotal shield and bearing a pair of long, stout, usually slightly incurved spines. Petiole narrow cuneate, thicker at the base and tapering above in profile, the dorsal surface armed with a pair of teeth which are usually distinctly shorter than the distance separating their bases, rarely otherwise. Ventral process of petiole a very thin translucent lamella which runs forward from the posteroventral bulge almost to the articulation. Postpetiole thick in dorsal view, broader than long, not squamate. In profile postpetiole roughly columnar, the anterior face slightly convex, the posterior face slightly concave and with rounded angles. Subpostpetiolar process elongate-triangular in profile. Dorsum of head faintly longitudinally rugulose, the occipital region and the promesonotal shield delicately reticulate-rugulose. First gastral tergite finely superficially reticulate-punctulate or shagreened basally, this sculpture fading out or diminishing apically on the sclerite. Erect or suberect hairs absent from dorsal surfaces of head and body, all hairs short and decumbent to appressed. Stout standing hairs absent from dorsal (outer) surfaces of middle and hind tibiae. Colour either uniform pale yellow or with the gaster darker in shade than the head and alitrunk.

This small species, originally described as a variety of *spininodis*, is characterized within this group by its lack of standing hairs on the head and body and lack of projecting tibial hairs on the legs. Such hairs are present and conspicuous in both *sthenus* and *spininodis*. Besides the pilosity *glaber* differs from *spininodis* in the construction of the postpetiole, which in the latter is strongly nodiform in profile with a projecting posterodorsal angle.

#### MATERIAL EXAMINED

**Zimbabwe:** Sawmills (*G. Arnold*). **Botswana:** Maxwee (*A. Russell-Smith*).

### *Meranoplus spininodis* Arnold

(Figs 3, 11)

*Meranoplus spininodis* Arnold, 1917: 366. Holotype and paratype workers, ZIMBABWE: Bulawayo, Hillside, 9.vi.1916 (*G. Arnold*) (BMNH) [examined].

WORKER. TL 2.8–3.6, HL 0.66–0.76, HW 0.66–0.76, CI 97–103, SL 0.40–0.50, SI 60–65, PW 0.66–0.74, AL 0.68–0.80 (16 measured).

Mandibles striate, equipped with four teeth plus a small offset basal denticle, the latter concealed by the clypeus when the mandibles are closed. Anterior clypeal margin with a narrow translucent apron, the median portion bounded on each side by a longitudinal carina which runs forward to the apron. Maximum diameter of eye 0.18–0.21 (0.26–0.29 × HW), with 11–13 ommatidia in the longest row. Promesonotal shield strongly marginate laterally, the pronotal portion slightly wider than the mesonotal. Anterior pronotal angles with a pair of teeth, the posterior mesonotal angles armed with a pair of short stout triangular spines. Margins of promesonotal shield without fenestrae or thin-spots, without cuticular outgrowths other than those described above. Propodeum visible in dorsal view as a thin transverse strip behind the promesonotal shield, and bearing a pair of long, stout, very conspicuous spines. Petiole cuneate in profile, tapering from base to apex and armed dorsally with a pair of teeth or short spines which are usually distinctly shorter than the distance separating their bases. Subpetiolar process an anteriorly situated translucent lamella which is commonly produced into a downcurved lobe anteroventrally. Postpetiole nodiform, its ventral process triangular. In profile the posterodorsal angle of the postpetiole produced so that it overhangs the shallowly concave posterior face of the node. Sculpture on head and promesonotal shield of fine rugulae, usually with reticulation on the occiput and at least on the pronotal portion of the shield. Dorsum of postpetiole finely rugulose. First gastral tergite densely reticulate-punctate, at least at base; sometimes this sculpture extending over the entire sclerite but more usually with it fading out posteriorly. All dorsal surfaces of head and body thickly clothed with fine, dense, elongate simple hairs, most of which are curved and some or all of which are erect or suberect. Dorsal (outer) surface of middle and hind tibiae with outstanding hairs. Colour varying from mid-brown with darker gaster through to uniform dark brown.

Easily recognized within the group by its abundance of long curved hairs and thick postpetiole with overhanging posterior angle. It is distinguished from *glaber* by the lack of standing pilosity and projecting tibial hairs in that species, and from *sthenus* by the sparse erect hairs of that species and its differently constructed postpetiole, as described under the description of that species.

#### MATERIAL EXAMINED

**Zimbabwe:** Bulawayo (*G. Arnold*); Sawmills (*G. Arnold*). **Botswana:** between Kastwe and Damana Pan (*H. Lang*).

### *Meranoplus sthenus* sp. n.

(Figs 1, 9)

HOLOTYPE WORKER. TL 3.1, HL 0.76, HW 0.74, CI 97, SL 0.48, SI 65, PW 0.74, AL 0.78.

Mandibles striate, armed with four teeth and a small offset basal denticle, the latter concealed by the clypeus when the mandibles are closed. Median portion of clypeus with a narrow translucent apron anteriorly and bounded on each side by a low longitudinal carina which runs forward to the apron. Maximum diameter of eye 0.20 (0.27 × HW), with 11–12 ommatidia in the longest row. Promesonotal shield sharply marginate laterally, the pronotal portion slightly broader than the mesonotal. Anterior pronotal angles with a pair of triangular teeth, the posterior mesonotal angles with broad triangular teeth



or short spines. Apart from these teeth the promesonotal shield unadorned, without fenestrae or thin-spots and without cuticular outgrowths. Propodeum visible in dorsal view as a transverse strip behind the promesonotal shield, bearing a pair of long, stout spines. Petiole in profile cuneate, tapering from base to apex and with a translucent lamellate ventral process. Dorsum of petiole armed with a pair of spines which are longer than the distance separating their bases. Postpetiole in profile columnar, with roughly parallel anterior and posterior faces and rounded angles. Subpostpetiolar process triangular in profile. Sculpture on head and promesonotal shield of fine rugulae, with a reticulum on the occipital surface and the pronotum. Base of first gastral tergite finely and superficially punctulate, this sculpture weakening posteriorly. All dorsal surfaces of head and body with sparse erect to suberect long strong hairs but lacking dense fine soft long pilosity. Middle and hind tibiae with outstanding hairs. Colour yellowish brown with the gaster slightly darker.

PARATYPE WORKERS. TL 2.8–3.2, HL 0.70–0.78, HW 0.68–0.74, CI 94–97, SL 0.46–0.52, SI 65–68, PW 0.68–0.74, AL 0.66–0.82 (10 measured).

Maximum diameter of eye 0.20–0.22 (0.27–0.29 × HW), with 11–13 ommatidia in the longest row. Paratypes as holotype but in some the gaster distinctly darker than the remainder and the petiolar spines slightly shorter. The base of the first gastral tergite is usually as holotype but in a few the sculpture is almost effaced.

Holotype worker, **Zimbabwe**: Sawmills, 1.ii.1918 (*G. Arnold*) (BMNH).

Paratypes. **Zimbabwe**: 13 workers and 1 female with same data as holotype; 2 workers, Sawmills 30.i.1918 (*G. Arnold*); 8 workers, Victoria Falls, 22.ii.1953 (*G. Arnold*) (BMNH; NM, Bulawayo; MCZ, Cambridge; MRAC, Tervuren).

The final species of the *spininodis*-group, *sthenus* was first collected by Arnold together with a few workers of *glaber*, but he considered them to be expressions of a single species as he thought that they were all from a single nest. However, as extra collections of both forms were made later and as queens of both are now known which show the same separational characters as the workers, it is apparent that the original series was mixed or that some specimens were inadvertently mislabelled.

*M. sthenus* separates easily from *glaber* as the latter lacks long erect to suberect hairs on the body and lacks outstanding tibial hairs. It is separable from *spininodis* on the following characters.

<i>spininodis</i>	<i>sthenus</i>
Postpetiole nodiform, the posterodorsal angle prominent and overhanging the posterior face.	Postpetiole columnar, the posterodorsal angle not prominent, not overhanging the posterior face.
Petiolar spines short, usually distinctly shorter than the distance separating their bases.	Petiolar spines long, usually distinctly longer than the distance separating their bases.
Alitrunk and gaster with a dense pelt of long soft curved hairs.	Alitrunk and gaster without a dense pelt of long soft curved hairs.

### The *nanus*-group

(Figs 4, 5, 12–19)

Mandibles with four teeth. With the alitrunk in dorsal view the propodeum concealed, not constituting a part of the dorsum. Petiole cuneate in profile, its dorsal surface unarmed, without spines or teeth. Postpetiole squamate or at least very strongly antero-posteriorly compressed. Promesonotal shield short and broad. Propodeal spines short or absent.

Of the three African species constituting this group two (*clypeatus* and *nanus*) are much less common than the third (*inermis*) which is very widely distributed in woodland and forest throughout the continent. Lacking propodeal spines, *inermis* is quickly separated from the other members of this group and from all other African species, as propodeal spines are otherwise universally present, even if small. *M. clypeatus*, known from Guinea and Zaire, has the postpetiole somewhat thicker than in the similarly distributed *nanus* (Gabon, Zaire, Tanzania) and the form of the mesonotal posterior margin differs between the two, as discussed below.

*Meranoplus clypeatus* Bernard

(Figs 13–15)

*Meranoplus clypeatus* Bernard, 1952: 244, fig. 13C. Syntype workers, female, GUINEA: Mt Nimba, station F, prairie, 1400 m (*Lamotte*); and prairie, 1550 m (*Lamotte*) (MNHN, Paris) [examined].

WORKER. TL 2.8–3.8, HL 0.76–0.88, HW 0.74–0.84, CI 95–100, SL 0.58–0.66, SI 74–79, PW 0.78–0.90, AL 0.74–0.90 (6 measured).

Mandibles striate, armed with four teeth. Anterior margin of median portion of clypeus shallowly concave and with a narrow translucent apron. Sides of median portion of clypeus with a weak longitudinal carina, the surface between the carinae weakly concave in the anterior half. Maximum diameter of eye 0.19–0.20 (0.24–0.26 × HW), with 10–12 ommatidia in the longest row. Promesonotal shield in dorsal view conspicuously broader than long, strongly marginate and expanded laterally and posteriorly and overhanging the propodeum and sides of the alitrunk which are not visible. Anterior pronotal corners dentate. Shield at junction of pronotum and mesonotum with a thin-spot on each side which may be a roughly circular fenestra set in from the margin or which may be extended to the lateral margin. Promesonotal suture usually absent but sometimes a faint line visible traversing the dorsum between the thin-spots. Outline shape of posterior mesonotal margin variable (Figs 13–15) but without strong cuticular prominences separated by conspicuous thin-spots. A posteromedian thin-spot occurs in some specimens but usually the posterior mesonotal margin is a broad shelf-like lamella which projects into 2–4 flat, roughly triangular teeth. Propodeum in profile nearly vertical, armed at about its mid-depth with a pair of short spines. Petiole in profile cuneate, broadest basally and narrowing above; in anterior view the dorsal face rounded. Postpetiole in profile strongly anteroposteriorly compressed but not as obviously squamiform as in other members of this group. Dorsum of postpetiole narrow and sculptured, not a transverse crest. Head predominantly finely longitudinally rugose, commonly with scattered cross-meshes and usually with a weak reticulum occipitally. Promesonotal shield finely and irregularly reticulate-rugulose, the intensity of sculpture variable, usually stronger in larger specimens. Narrow postpetiole dorsum rugulose or reticulate-rugulose. First gastral tergite finely shagreened to virtually smooth. All dorsal surfaces of head and body, legs and scapes densely clothed with a pelt of long soft fine hairs. Colour uniform medium to dark brown.

Within the *nanus*-group *clypeatus* is distinguished by its somewhat thicker, dorsally sculptured postpetiole. In *nanus* and *inermis* the postpetiole is squamate with the dorsal surface an unsculptured transverse crest. Apart from this *inermis* lacks propodeal spines (present in *clypeatus*) and the posterior mesonotal margin of *nanus* consists of 4–6 thick cuticular projections separated by extensive translucent thin-spots.

## MATERIAL EXAMINED

**Zaire:** Kurukwata, nr Aba (*Myers*).

*Meranoplus inermis* Emery

(Figs 5, 16–19)

*Meranoplus inermis* Emery, 1895: 41, pl. 2, fig. 24. Syntype workers, SOUTH AFRICA: Makapan (*E. Simon*) (MCSN, Genoa) [examined].

*Meranoplus nanus* subsp. *nanior* Forel, 1907: 12. Syntype workers, KENYA: Mto-ya-Kifaru (*Katona*) (MHN, Geneva) [examined]. **Syn. n.**

*Meranoplus nanus* var. *kiboshana* Forel, 1907: 12. Syntype workers, KENYA: Kibosho (*Katona*) (MHN, Geneva) [examined]. **Syn. n.**

*Meranoplus nanus* subsp. *soriculus* Wheeler, 1922: 184, fig. 45. Syntype workers, females, males, ZAIRE: Avakubi (*H. O. Lang*) (MCZ, Cambridge; BMNH; MRAC, Tervuren) [examined]. **Syn. n.**

*Meranoplus nanus* subsp. *similis* Karavaiev, 1931: 44, fig. 3. Holotype worker, KENYA: Mabira (*Dogiel & Sokolow*) (location of type not known). [Junior primary homonym of *Meranoplus similis* Viehmeyer, 1922: 208.]

*Meranoplus nanus* subsp. *affinis* Urbani, 1971: 361. [Replacement name for *Meranoplus nanus* subsp. *similis* Karavaiev.] **Syn. n.**

WORKER. TL 2.7–4.0, HL 0.68–0.90, HW 0.64–0.84, CI 93–98, SL 0.42–0.64, SI 65–75, PW 0.66–0.90, AL 0.58–0.88 (20 measured).

Mandibles striate, armed with four teeth. Anterior clypeal margin with a narrow translucent apron and with a longitudinal carina on each side of the median portion which runs forwards to the apron. Anterior half of clypeus usually shallowly concave between the carinae. Maximum diameter of eye 0.16–0.20. (0.23–0.25 × HW), with 9–12 ommatidia in the longest row. Promesonotal shield in dorsal view conspicuously broader than long, marginate and strongly expanded laterally and posteriorly, concealing the sides and propodeum which are not visible. Anterior pronotal corners dentate. A thin-spot or fenestra is present at each side at the junction of pronotum and mesonotum; commonly this thin-spot is approximately circular and set in from the lateral margin, but often it is elongate and reaches out to the margin. Sometimes the spot is small but it is usually conspicuous, even in the smallest specimens. Promesonotal suture vestigial or absent, at most represented only by a very weak line traversing the shield between the thin-spots. Posterior mesonotal border of variable shape, most commonly with a posterolateral broad angle followed by 2–4 flat projections on the posterior border. The inner pair of projections usually less strongly developed than the outer and with an area of thinner cuticle between them. Sometimes the projections all strong but sometimes all reduced, especially in smaller individuals, so that the margin appears broadly crenulate. Propodeum in profile nearly vertical, unarmed, without trace of teeth or spines but sometimes with a small step or convexity at about the level of the spiracle. Petiole in profile cuneate, broadest basally and tapering above; in anterior view the dorsal surface rounded. Postpetiole squamate, sometimes almost as narrow as the petiole, the dorsal surface a transverse blunt crest which is thicker than that of the petiole. Dorsum of head finely and sometimes quite densely rugulose, the rugulae predominantly longitudinal with a few cross-meshes, and finely reticulate on the occiput. In some samples, usually of smaller individuals, the cephalic sculpture very reduced with just a few faint rugulae; in others the sculpture strong and quite dense, often with numerous cross-meshes. Promesonotal shield varying from finely and densely reticulate-rugulose everywhere to almost smooth with just a few faint irregular rugulae scattered over the surface. Postpetiole dorsum unsculptured or at most with faint shagreening. First gastral tergite generally unsculptured except for hair-pits but sometimes shagreened basally. All dorsal surfaces of head and body, along with legs and scapes, with a dense pelt of long, soft fine hairs. Colour varying from mid to dark brown but often with the gaster darker in shade than the rest.

*M. inermis* is the only species in this group, and the only known African species, to lack propodeal spines. Apart from this difference the two other species in the group are separated from *inermis* by the thicker, dorsally sculptured postpetiole in *clypeatus*, and the differently shaped posterior mesonotal margin in *nanus* which has 4–6 opaque projections separated by very thin translucent cuticle.

The synonyms noted above, although all originally attached to *nanus*, belong in fact to *inermis*. This was due to confusion between the two species as discussed under *nanus*.

*M. inermis* is one of the two commonest species of *Meranoplus* in Africa (the other is *magretti*). It is found nesting in the ground in wooded or forested areas almost throughout the continent.

#### MATERIAL EXAMINED

**Sudan:** Kadugli (C. Sweeney); Imatong Mts (N. A. Weber). **Kenya:** Magombo-Kisii (P. v. d. Werff); Mtito Andei (N. A. Weber). **Tanzania:** Bunduki, Uluguru Mts (P. Basilewsky & N. Leleup). **Ghana:** Kibi (D. Leston); Asamankese (D. Leston); Tafo (H. E. Box); Mampong (P. Room). **Nigeria:** Gambari (B. Taylor); Gambari (B. Bolton); Mokwa (C. Longhurst); Ile-Ife (J. T. Medler). **Zaire:** Medje (H. O. Lang); Haut Uele, Moto (L. Burgeon); Katanga, Kanzenze (N. Leleup); Yangambi (Raignier & van Boven). **Angola:** Bruco (P. Hammond); Salazar (P. Hammond); Gabela (P. Hammond). **South West Africa:** Okahanja (R. E. Turner). **Zimbabwe:** Bulawayo (G. Arnold); Victoria Falls (G. Arnold).

#### *Meranoplus nanus* André

(Figs 4, 12)

*Meranoplus nanus* André, 1892: 55. Syntype workers, GABON (*Mocquerys*) (MNHN, Paris) [examined].

WORKER. TL 2.8–3.8, HL 0.78–0.92, HW 0.74–0.86, CI 93–95, SL 0.56–0.70, SI 75–81, PW 0.80–0.90, AL 0.70–0.86 (10 measured).

Mandibles striate, armed with four teeth. Anterior clypeal margin with a narrow translucent apron and with a longitudinal carina on each side of the median portion which runs forwards to the apron. Anterior half of clypeus usually shallowly concave between these carinae. Maximum diameter of eye 0.20–0.22

(0.24–0.27 × HW), with 10–12 ommatidia in the longest row. Promesonotal shield in dorsal view conspicuously broader than long, marginate and strongly expanded laterally and posteriorly, concealing the sides and propodeum which are not visible. Anterior pronotal corners dentate. A thin-spot or fenestra present at the junction of pronotum and mesonotum; usually this thin-spot is roughly circular and set in from the margin but sometimes it is elongate and reaches out to the margin. Promesonotal suture absent or vestigial, at most represented by a fine line or break in the sculpture which traverses the shield between the thin-spots. Posterior mesonotal border adorned with 4–6 flattened opaque cuticular prominences separated by very thin translucent lamellae; shape and size of the projections variable but generally as in Fig. 12. Propodeum in profile nearly vertical, armed at about the mid-depth with a pair of short, stout spines. Petiole in profile cuneate, broadest basally and tapering above; in anterior view the dorsal surface rounded. Postpetiole squamate, the dorsal surface a transverse blunt crest which is, however, thicker than that of the petiole. Dorsum of head finely rugulose and usually quite densely so. Sometimes entire dorsum reticulate-rugulose but usually only occiput thus, the remainder being predominantly longitudinally sculptured with scattered cross-meshes. Intensity of sculpture on both head and alitrunk variable, generally sharply defined but fainter in some. Promesonotal shield finely, and usually densely, irregularly reticulate-rugulose. Dorsum of postpetiole unsculptured or at most with fine punctulae, never rugulose. First gastral tergite usually finely shagreened, at least basally, but this sculpture sometimes reduced so that the sclerite is almost smooth. All dorsal surfaces of head and body, along with legs and scapes, with a dense pelt of long soft fine hairs. Colour varying from mid to dark brown, but usually the gaster darker in shade than the head and alitrunk.

Of the two species closely related to *nanus*, *inermis* is identified by its lack of propodeal spines, and *clypeatus* by its strongly sculptured postpetiole dorsum and differently constructed posterior mesonotal margin, as noted in the description of that species.

For some reason there seems to have been a great deal of confusion over the identities of *nanus* and *inermis*, although the important differences between the two were stated quite plainly in the original description of the latter. André (1892) noted that the propodeum of *nanus* was armed with spines and Emery (1895), in his description of *inermis*, pointed out that the main difference between *nanus* and *inermis* was that propodeal spines were absent in the latter. Despite this a number of infraspecific forms without spines were attached to *nanus* and the original descriptions apparently ignored. The culmination of this came with Arnold (1917: 364) who, in his key to *Meranoplus*, runs out both *nanus* and *inermis* under 'epinotum (=propodeum) unarmed', whilst on the opposite page he reproduces the original descriptions of the two which flatly contradict the statement in the key.

Examination of the types and original descriptions of the infraspecific forms attached to *nanus* has shown them all to be synonyms of the much more common *inermis*.

#### MATERIAL EXAMINED

**Zaire:** Haut Uele, Abimva (*L. Burgeon*); Katanga, Kanzenze (*N. Leleup*). **Tanzania:** Zanzibar (*M. J. Way*).

### The *magrettii*-group

(Figs 6–8, 20–25)

Mandibles with 4 or 5 teeth. With the alitrunk in dorsal view the propodeum concealed, not constituting a part of the dorsum. Petiole cuneate in profile, its dorsal surface unarmed, without spines or teeth. Postpetiole broad and nodiform. Promesonotal shield not particularly short and broad. Propodeal spines present.

Of the two species in this group *magrettii* is one of the most common and widely distributed species in the region, being found almost everywhere in savannah, grassland and dry woodland. The second species, *peringueyi*, is apparently restricted to South Africa.

The two species are easily distinguished as *peringueyi* has 5 teeth on each mandible and lacks clypeal armament, whilst *magrettii* has only 4 teeth and has the anterior clypeal margin with a denticle or prominence on each side of the median portion.

*Meranoplus magrettii* André

(Figs 7, 8, 23–25)

*Meranoplus magrettii* André, 1884: 543. Syntype worker, SUDAN: Sauakin [= Suakin] (*Magretti*) (MNHN, Paris) [examined]. [Second syntype worker reported by Emery (1886: 366) to be in MCSN, Genoa; not seen.]

*Meranoplus simoni* Emery, 1895: 41, pl. 2, fig. 23. Holotype worker, SOUTH AFRICA: Vrijburg (*E. Simon*) (MCSN, Genoa) [examined]. **Syn. n.**

*Meranoplus simoni* subsp. *nitidiventris* Mayr, 1901: 26. Syntype workers, SOUTH AFRICA: Orange Free State, Bothaville (*H. Brauns*) (NM, Vienna). **Syn. n.**

*Meranoplus simoni* subsp. *suturalis* Forel, 1910a: 424. Syntype workers, SOUTH AFRICA: Natal (*Haviland*) (MHN, Geneva) [examined]. **Syn. n.**

*Meranoplus bondroiti* Santschi, 1915: 254, fig. 4. Holotype worker, EAST AFRICA: 'région des grands lacs, Uzaga' (*Gérard*) (NM, Basle) [examined]. **Syn. n.**

*Meranoplus simoni* var. *springvalensis* Arnold, 1917: 372. Holotype and paratype workers, ZIMBABWE: Springvale, 12.xi.1911 (*G. Arnold*) (BMNH; NM, Bulawayo) [examined]. **Syn. n.**

*Meranoplus simoni* var. *diversipilosus* Santschi, 1932: 388. Syntype workers, ZIMBABWE: Sawmills, 12.vii.1920 (*G. Arnold*) (NM, Basle; NM, Bulawayo) [examined]. **Syn. n.**

WORKER. TL 2.8–4.3, HL 0.72–1.00, HW 0.64–0.94, CI 90–98, SL 0.48–0.72, SI 72–78, PW 0.58–0.98, AL 0.66–1.04 (30 measured).

Mandibles striate, armed with 4 teeth. Anterior clypeal margin usually shallowly concave, sometimes more or less straight, with a narrow apron and bounded on each side by a denticle or prominence where the anterior apron meets the longitudinal edges or carinae which bound the side of the median portion of the clypeus (Fig. 8). In most samples a definite denticle or sharp angular projection is visible on each side of the median clypeal margin but in a few, usually larger individuals, only a pair of low and bluntly rounded prominences occur. Maximum diameter of eye 0.18–0.26 (0.27–0.30 × HW). Anterior pronotal corners armed with a pair of flattened triangular teeth. Promesonotal shield basically as shown in Figs 23–25, narrowing behind the pronotum and without thin-spots or fenestrae. Promesonotal suture usually absent but sometimes visible as a narrow transverse line. Posterior corners of mesonotum armed with a pair of spines which are very variable in length and thickness, the posterior mesonotal margin between the spines concave and without secondary armament in the form of prominences or teeth. A lamina usually present on the posterior mesonotal margin between the spines, which is very variable in development; in most it is a narrow strip or is crescent-shaped but in others, particularly those samples with longer mesonotal spines, it may be extensive. Only rarely is this lamina so narrow as to be unapparent. Propodeum armed with a pair of long spines at about the level of the spiracle. Petiole in profile cuneate, broadest basally and narrowing above. Postpetiole nodiform. Dorsum of head usually densely longitudinally rugulose with numerous cross-meshes and with a reticulum occipitally. In some the entire head appearing reticulate-rugulose. Promesonotal shield and dorsum of postpetiole reticulate-rugulose, usually densely so. First gastral tergite with sculpture varying from a fine dense shagreening to a conspicuously reticulate-punctate surface. Most commonly the sculpture is stronger and more conspicuous on the basal part of the tergite, and tends to be reduced or to fade out more apically on the segment. All dorsal surfaces of the head and body with a dense pelt of soft curved hairs. Colour medium to dark brown, usually with the gaster darker in shade than the head and alitrunk; sometimes with a reddish or foxy tint.

*M. magrettii* is primarily a savannah and open-woodland species of eastern and southern Africa. The Ghanaian records from Legon are from the coastal plain of that country which is also inhabited by numerous other typically savannah or grassland forms. This species is extremely variable in size, intensity of sculpture and in details of the shape of the promesonotal shield. It is true to say that no two series are exactly alike and the differences between the largest and smallest workers seem, at first glance, to indicate that more than one species is present. However, the existence of intermediates between almost all the variants has convinced me that only one species is in fact represented.

Diagnostic characters of *magrettii* include its 4-dentate mandibles, armed clypeal margin, form of the promesonotal shield and nodiform postpetiole.

## MATERIAL EXAMINED

**Ghana:** Legon (*D. Leston*); Legon (*G. Beson*); Legon (*Mkhise*). **Sudan:** Torit (*N. A. Weber*); Equatoria (*N. A. Weber*). **Uganda:** Jinja (*N. A. Weber*). **Kenya:** Mombasa (*N. A. Weber*); Bissell (*J. Darlington*);

Shimba Hills (*B. Hölldobler*); Olkiloriti (*M. G. Lepage*); Kajiado (*G. Nyamasyo*). **Tanzania**: no loc. (*G. Loveridge*). **Botswana**: Maxwee (*A. Russell-Smith*); Xani Pan (*A. Russell-Smith*). **Zimbabwe**: Bulawayo (*G. Arnold*); Victoria Falls (*G. Arnold*); Hillside (*G. Arnold*); Broken Hill (*G. Arnold*); Sawmills (*G. Arnold*); Chishawasha (*A. Watsham*). **South Africa**: Transvaal, Pretoria (*J. C. Faure*); T., Pretoria, Magalieskraal (*Lingnau*).

### *Meranoplus peringueyi* Emery

(Figs 6, 20–22)

*Meranoplus peringueyi* Emery, 1886: 365, pl. 17, fig. 12. Syntype workers, SOUTH AFRICA: Cape of Good Hope (*L. Peringuey*) (MRAC, Tervuren; MCSN, Genoa; MHN, Geneva; NM, Basle [examined]).

*Meranoplus excisus* Arnold, 1914: 29, fig. 9. Syntype workers, SOUTH AFRICA: Natal, Estcourt (*R. C. Wroughton*) (BMNH; NM Bulawayo) [examined]. **Syn. n.**

**WORKER.** TL 3.2–4.9, HL 0.80–1.12, HW 0.74–1.10, CI 93–100, SL 0.52–0.74, SI 67–72, PW 0.70–1.10, AL 0.74–1.20 (20 measured).

Mandibles striate, armed with five teeth. Median portion of clypeus narrowing anteriorly, the margin with a narrow apron or without a distinct apron. Lateral carinae of median portion of clypeus continuous with the anterior margin, without a prominence or denticle where they meet. Maximum diameter of eye 0.17–0.26 (0.21–0.24 × HW). Promesonotal shield strongly marginate and overhanging the sides and propodeum, but the long propodeal spines always visible projecting below the posterior mesonotal margin. Anterior pronotal corners armed with teeth or short triangular spines. Posterior mesonotal corners with a pair of spines and the posterior mesonotal border between these spines with a pair of broad triangular teeth which are variable in shape and size. Promesonotal suture usually absent but sometimes visible as a faint line traversing the shield. Promesonotal shield on each side, at the site of the junction of pro- and mesonotum, with a thin spot which usually extends outwards to the lateral margin. This is usually quite obvious but may be inconspicuous in some workers, especially larger individuals. Commonly the lamella of the thin-spot eroded, to a greater or lesser degree, from the margin inwards, and in general the greater the erosion of the thin-spot the more the mesonotal margin behind the spot projects outwards (Figs 20–22). Propodeum armed with a pair of long stout spines. Petiole in profile cuneate, tapering from a broad base to a crest-like apex. Postpetiole strongly nodiform. Dorsum of head rugose, usually strongly so; most commonly the longitudinal component of the rugosity predominates and in some samples the head is almost entirely longitudinally sculptured. In general, however, there are several to many cross-meshes present and some individuals have the entire head reticulate-rugose. Promesonotal shield and dorsum of postpetiole reticulate-rugose. First gastral tergite densely finely punctulate or shagreened, at least basally, often the sculpture extending over the whole sclerite. All dorsal surfaces of head and body, and the scapes and tibiae, with a dense pelt of fine soft hairs. Colour uniform medium brown to blackish brown.

A very distinctive species known only from Lesotho and South Africa, *peringueyi* is separated from all its African congeners by its combination of 5 mandibular teeth, unarmed clypeal margin and petiole, nodiform postpetiole and long propodeal spines.

#### MATERIAL EXAMINED

**Lesotho**: Qathas Nek (*G. Arnold*). **South Africa**: Cape Province, Katberg (*R. E. Turner*); C. P., Worcester (*R. E. Turner*); C. P., Willowmore (*G. Arnold*); C. P., Willowmore (*W. L. Brown*); C. P., Bethlehem (*Merve*); C. P., Cape of Good Hope (*G. B. King*); C. P., Van Rhyns Pass (*A. Mackie*); C. P., Doorn River (*A. Mackie*); C. P., Port Elizabeth (ex coll. Mayr); C. P., Grahamstown (*W. L. Brown*); Natal (*Wroughton*); Natal, Drakensberg, Mts, Little Berg (*G. Arnold*).

### *Dicroaspis* Emery stat. rev.

(Figs 26, 27)

*Dicroaspis* Emery, 1908: 184. Type-species: *Dicroaspis cryptocera* Emery, op. cit.: 185, by monotypy.

*Dicroaspis* Emery; Emery 1915: 15, and all subsequent authors. [As subgenus of *Calyptomyrmex*.]

*Geognomicus* Menozzi, 1924: 220. Type-species: *Geognomicus wheeleri* Menozzi, loc. cit. [= *Dicroaspis cryptocera* Emery], by original designation. **Syn. n.**

**DIAGNOSIS OF WORKER.** Myrmicine ants with triangular mandibles whose apical (masticatory) margins are armed with 7–8 small, spaced-out teeth. Palp formula 2,2 based on an *in situ* count. (Maxillary palp

apparently has a large basal and much smaller apical palpomere; the labial palp has two conspicuous large segments.) Clypeus with a narrow anterior apron which overhangs the basal margins of the mandibles. Median portion of clypeus behind the anterior margin vertical or nearly so, terminating above in a projecting biramous appendage or fork; this clypeal fork almost on a level with the frontal lobes and projecting out over the basal portions of the mandibles. Frontal lobes strongly expanded and overhanging the anterior clypeal apron. Posterior-most part of the clypeus, behind the clypeal fork, very narrow and deeply inserted between the frontal lobes. Antennae with 11 segments, the 3 apical flagellomeres forming a strong club. Scapes not strongly incrassate in their distal halves. Antennal scrobes present, extensive and deep, running back well beyond the level of the eye, bounded above by the posteriorly-divergent frontal carinae and below by a ridge running above the eye. Frontal carinae not strongly expanded laterally over the scrobes so that most of the scrobal concavity is clearly visible in dorsal view. Promesonotum forming a single convexity in profile. Propodeum sloping steeply, armed with a pair of short, stout spines. Metapleural lobes rounded. Petiole with a short, very thick and dorsally very broad anterior peduncle, with a ventral process present anteriorly. Petiole node low and rounded, tapering dorsally from a broad base. Postpetiole with an anterior process ventrally which appears as a broad tooth in profile but which is seen to be a broad transverse flange or lip in anterior view, running the width of the segment. First gastral tergite large, projecting much further than the first sternite and weakly vaulted apically so that the remaining tergites are reflexed and the sting orifice is ventrally situated. Pilosity dense, the hairs simple and fine; without bizarre pilosity.

When Emery (1908) first described *Dicroaspis* he treated it as a good genus, closely related to *Calyptomyrmex* but separated from it by a reduced antennomere count, the shape of the head and the presence of simple, as opposed to bizarre, pilosity.

Between 1908 and 1915 a few *Calyptomyrmex* species were described as having 11 antennal segments rather than 12 and this apparently convinced Emery that his *Dicroaspis* was best treated as a subgenus of *Calyptomyrmex*, as the two seemed to be separable only by a one-segment difference in antennomere count. Thus in 1915 he reduced *Dicroaspis* to subgeneric status under *Calyptomyrmex*.

The present study has shown that those *Calyptomyrmex* species for which an 11-merous count was claimed, and which were consequently placed in subgenus *Dicroaspis* (*arnoldi*, *clavisetus*, *foreli*, *pusillus*) were all based on miscounts of the narrow annular segments of the antennae; in fact all of these species, and all known *Calyptomyrmex* species to date, have 12-segmented antennae.

Having removed these species back to *Calyptomyrmex* proper only *cryptocera* and *laevidens* remained in *Dicroaspis*, which then seemed best treated as a separate genus on the diagnostic characters given above and the differences from *Calyptomyrmex* tabulated below. There remained only the anomalous monotypic genus *Geognomicus* to deal with, as from its description it seemed related to both *Dicroaspis* and *Calyptomyrmex*. Examination of the type of *Geognomicus wheeleri*, (type- and only species of the genus) showed that it was a direct synonym of *Dicroaspis cryptocera*, and thus *Geognomicus* sank automatically into the synonymy of *Dicroaspis*.

Characters separating *Calyptomyrmex* and *Dicroaspis* are as follows; the first three characters and the final one are the most important.

#### *Calyptomyrmex*

Antennae with 12 segments (Fig. 28).

Scapes strongly expanded and incrassate in apical half, with a narrow projecting flange on the leading edge.

Petiole in profile with a long narrow anterior peduncle, without a large anteroventral process (Figs 33-40).

Node of petiole high, not narrowing above.

#### *Dicroaspis*

Antennae with 11 segments (Fig. 27)

Scapes thicker distally but not strongly expanded nor incrassate in apical half, without a projecting flange on the leading edge.

Petiole in profile with a short and very stout anterior peduncle, with a large anteroventral process (Fig. 26).

Node of petiole low, narrower above than below.

<i>Calptomyrmex</i>	<i>Dicroaspis</i>
Anterior subpostpetiolar process a tooth on each side (in all African species).	Anterior subpostpetiolar process a transverse ridge or flange.
Gastral tergites 2 to apex not reflexed ventrally.	Gastral tergites 2 to apex reflexed ventrally.
Head in dorsal view with frontal carinae strongly expanded, concealing most or all of the scrobal area.	Head in dorsal view with frontal carinae not strongly expanded, most of the scrobal area clearly visible.
Body partially or entirely with bizarre pilosity.	All body hairs fine and simple.

The two known species of *Dicroaspis* are restricted to Central Africa, having been recorded from Gabon, Zaire and Principe I. to the present. They are obviously related to the members of *Calptomyrmex* but the construction of the petiole resembles strongly that seen in the minute species of *Mayriella* from Nepal, the Indo-Australian region and Australia.

The two presently recognized species of *Dicroaspis* are both based on relatively little material and may prove to be variants of a single form. However, for now I propose to treat *laevidens* as a good species, separating it from *cryptocera* by the characters given in the key below.

### Synonymic list of species

*cryptocera* Emery  
*wheeleri* Menozzi **syn. n.**  
*laevidens* (Santschi) **stat. n.**

### Key to species (workers)

- 1 Piligerous punctures on basal portion of first gastral tergite effaced, barely visible. Propodeal dorsum in profile without a peak in the outline before sloping to the spines. Slightly larger species, HL 0.80–0.86, AL 0.86–0.92. (Zaire, Principe I.)..... *cryptocera* (p. 58)
- Piligerous punctures on basal portion of first gastral tergite coarse, broad and conspicuous. Propodeal dorsum in profile with a peak in the outline before sloping to the spines (Fig. 26). Slightly smaller species, HL 0.72, AL 0.74. (Gabon, Zaire)..... *laevidens* (p. 59)

### Treatment by species

#### *Dicroaspis cryptocera* Emery

*Dicroaspis cryptocera* Emery, 1908: 185, fig. 1. Syntype worker, female, ZAIRE: Stanleyville (=Kisangani) (*H. Kohl*) (MCSN, Genoa) [worker examined].

*Calptomyrmex* (*Dicroaspis*) *cryptocerus* (Emery); Emery, 1915: 15, and all subsequent authors.

*Geognomicus wheeleri* Menozzi, 1924: 220, figs 1–3. Syntype workers, PRINCIPE I.: Roca Infante Don Enrique, 1.iii.1901, 100–300 m (*L. Fea*) (IE, Bologna) [examined]. **Syn. n.**

WORKER. TL 3.0–3.1, HL 0.80–0.86, HW 0.68–0.74, CI 85–86, SL 0.50–0.56, SI 74–77, PW 0.50–0.54, AL 0.86–0.92 (3 measured).

Mandibles smooth with a few scattered small pits. Anterior clypeal margin transverse, concealing the basal mandibular teeth when the latter are closed. Narrow vertical median portion of clypeus below the fork transverse and unsculptured. In dorsal view the clypeal fork short, the distance across the apices of its teeth exceeding the length of the side of the fork from apex to frontal lobe. Narrow median portion of clypeus (running back between the frontal lobes) smooth and very shiny. Frontal lobes strongly expanded, convergent posteriorly to the bases of the frontal carinae; the latter divergent and running back almost to the occipital margin, each with a narrow laterally projecting flange along most of the length. Antennal scapes with the distal two-thirds thicker than the proximal third but not incrassate and lacking any lamelliform extension of the leading edge. Eyes small, maximum diameter 0.07–0.08 (0.10–0.11 × HW), with 3–4 ommatidia in the longest row; the eyes situated below the scrobe and separated from its strong ventral margin by a distance about equal to their maximum diameter. Promesonotum forming a single convexity in profile, the metanotal groove very shallowly marked. Propodeal dorsum with a short, more or less flat portion behind the metanotal groove and then sloping steeply to a pair of short, stout triangular spines. Metapleural lobes narrow but deep, evenly rounded and running from the base of the spine almost to the metapleural angle. Short thick peduncle of petiole equipped anteroventrally with a broad, keel-like process which projects forwards and is concealed by the metapleuron and its lobes unless the pedicel



segments are raised. Node of petiole with the anterior and posterior faces converging dorsally so that the dorsal surface is short. Structure of postpetiole, gaster and other major characters as described under the generic diagnosis. Dorsum of head and promesonotum rugose, the rugae low and rounded, not sharply defined. On the head the rugae predominantly or entirely longitudinal but with a tendency to meander. On the promesonotum in places the rugae enclose foveolate spaces. Scrobal areas unsculptured, smooth and shining. Propodeum with a transverse line or ridge between the spines which marks the true junction of dorsum and deliverty; both the sloping dorsum above the line and the declivity below it smooth and highly polished. First gastral tergite with piligerous punctures faint to effaced, difficult to discern. All dorsal surfaces of head and body with numerous short, fine curved simple hairs. Colour glossy light reddish brown.

Known only from the type-series of *cryptocera* and its synonym *wheeleri*, this species seems to be restricted to Central Africa.

***Dicroaspis laevidens* (Santschi) stat. n.**

(Figs 26, 27)

*Calyptomyrmex* (*Dicroaspis*) *cryptocerus* var. *laevidens* Santschi, 1919: 88. Syntype workers, ZAIRE: Yambuya, 26.xi.1913, no. 83 (*Bequaert*) (MRAC, Tervuren; NM, Basle) [examined].

WORKER. TL 2.5–2.6, HL 0.72, HW 0.62–0.64, CI 86–88, SL 0.44–0.46, SI 72–73, PW 0.46–0.48, AL 0.74 (2 measured).

Gross characters as given under the generic diagnosis and answering to the description of *cryptocera*, but with the differences noted in the key.

Apart from this *laevidens* is a somewhat smaller (compare measurements), more heavily sculptured version of *cryptocera*. Sculptural differences are in intensity rather than form; on the promesonotum the low rugae tend to enclose numerous reticular spaces or foveolate spaces, and on the first gastral tergite the piligerous punctures form broad but shallow conspicuous pits. Eye-size is about the same as in *cryptocera*, with maximum diameter 0.06 (0.09–0.10 × HW), with 3 ommatidia in the longest row.

These differences are apparently minor but, because so few specimens of either species are known, I have decided to treat them as being significant at species-level until more material becomes available. Nevertheless, a strong suspicion remains that only a single species may be represented here.

**MATERIAL EXAMINED**

**Gabon:** Plateau d'Ipassa (*J. A. Barra*). **Zaire:** Yangambi (*M. Maldague*).

**CALYPTOMYRMEX** Emery

(Figs 28–44)

*Calyptomyrmex* Emery, 1887: 471. Type-species: *Calyptomyrmex beccarii* Emery, op. cit.: 472, by monotypy.

*Weberidris* Donisthorpe, 1948: 281. Type-species: *Weberidris rufobrunnea* Donisthorpe, loc. cit., by original designation. [Synonymy by Brown, 1949: 84.]

**DIAGNOSIS OF WORKER.** Myrmicine ants. Mandibles triangular with 6–8 teeth arrayed on a fairly long masticatory margin; usually with 6 teeth but counts of 7 or 8 have been noted in a few species (*nummuliticus*, *rennefer*, *piripilis*). Behind the apical teeth are usually widely spaced and commonly the gaps between teeth are greater than the lengths of the teeth themselves. Palp formula 2,2 (dissections of *barak*, *brevis*, *kaurus*, *nummuliticus*, *piripilis*, *rennefer*, *shasu*, plus two extralimital species), always with the basal maxillary palpmere very short and inconspicuous. Clypeus with a narrow anterior apron which overhangs the basal margins of the mandibles. Median portion of clypeus behind the anterior margin vertical or nearly so, terminating above in a projecting biramous appendage (the clypeal fork) which projects out over the mandibles and partially conceals them in dorsal view (Fig. 28). Frontal lobes strongly expanded and overhanging the anterior clypeal margin. Posteriormost part of the clypeus, behind the clypeal fork, narrow and deeply inserted between the frontal lobes. Antennae with 12 segments, the three apical flagellomeres forming a stout club; flagellomeres 2–8 usually reduced to narrow annuli. Scapes strongly incrassate in their distal halves, with a narrow projecting lamina on the leading edge of the incrassate portion. Antennal scrobes extensive and deep, bounded above by the strong frontal carinae and

below by a ridge running above the eye, the scrobes capable of accommodating the whole antenna. Promesonotum forming a single convexity in profile which is elevated above the level of the sloping propodeum (Figs 33–40), the latter usually armed with denticles or teeth but unarmed in several species. Metapleural lobes prominent and rounded, usually with a more or less central thin-spot. Petiole in profile with an elongate fairly narrow peduncle which lacks a ventral process, and with a conspicuous large node. Postpetiole in profile with a broad and usually blunt tooth-like ventral process. First gastral tergite large but not vaulted apically. Some or all dorsal surfaces of the body with bizarre pilosity.

With the removal of the true members of *Dicroaspis* from *Calyptomyrmex* (see above), and the discovery that others formerly placed in *Dicroaspis* (*arnoldi*, *clavisetus*, *foreli*, and the now-synonymized *pusillus*) have 12 antennal segments rather than 11 as was originally stated for each of them, what remains under *Calyptomyrmex* now forms a compact genus. At present 25 species have been described, 16 of which occur in the Ethiopian zoogeographical region. The six species of the Oriental region/western Indo-Australian region have recently been revised by Urbani (1975), and of the final three species two occur in New Guinea and one in Australia.

All members of the genus are typically found in leaf-litter, humus and topsoil and nest either directly into the earth or into rotten wood embedded in the topsoil. Foraging is carried out by individuals or by two to three workers together. Many of the species 'play dead' when disturbed or freeze and remain motionless for several moments, usually blending in very well with the background.

The female (queen) caste is known for six African species and at least one extralimital form. Most of these are normal alates but two of the African species appear to have highly ergatoid females; these are discussed under *piripilis*, one of the species in which such ergatoids occur. In general the females fit the description of the worker given above, differing only in the usual characters of possessing ocelli, having expanded alitrunk with a full complement of flight sclerites, and being larger. Males are very rarely collected and in consequence virtually unknown. Associated males are known only of the African species *nummuliticus* and *foreli*, and for the Australian species *schraderi* Forel where they form part of the type-series. For the record, males of *nummuliticus* are housed in BMNH and MCZ, Cambridge and originate in Ivory Coast and Nigeria; males of *foreli* from South Africa are preserved in NM, Bulawayo.

One striking character shown by the members of *Calyptomyrmex* is the universal presence of bizarre pilosity. This occurs on all dorsal surfaces of the head and body but is always absent from the propodeal dorsum (one or two hairs may occur marginally but never on the dorsum proper). These bizarre hairs may be scale-like, tear-drop shaped, spatulate, clavate, or truly weird such as the hairs described for *stellatus*. Even in forms such as *barak*, where the hairs are described as simple, they are not the usual simple hairs seen so widely in the ants but rather are short, very stout, and taper to an abrupt point. I am baffled by the diversity of these bizarre hairs and can offer no explanation as to their function.

### Synonymic list of species

#### *barak*-group

*barak* sp. n.

#### *piripilis*-group

*brevis* Weber

*kaurus* sp. n.

*piripilis* Santschi

*cataractae* Arnold **syn. n.**

*cataractae* subsp. *litoralis* Arnold **syn. n.**

*punctatus* Weber **syn. n.**

#### *arnoldi*-group

*arnoldi* (Forel)

*foreli* Emery

*emeryi* Forel (homonym)

*pusillus* Santschi **syn. n.**

*arnoldi* subsp. *hartwigi* Arnold **syn. n.**

*nedjem* sp. n.

*nummuliticus* Santschi

*reticulatus* Weber **syn. n.**

*stellatus* Santschi

#### *brunneus*-group

*brunneus* Arnold

*clavatus* Weber

*clavisetus* (Santschi)

*duhun* sp. n.

*rennefer* sp. n.

*shasu* sp. n.

*tensus* sp. n.

**Key to species (workers)**

- 1 Hairs on first gastral tergite scale-like and with the outer edge of each hair having 15–20 freely projecting short filaments so that the margin of the hair has a fringed or ray-like appearance. (Gabon) *stellatus* (p. 69)
- Hairs on first gastral tergite variously shaped, sometimes scale-like but never with the outer edge of each hair with freely projecting filaments giving a fringed or ray-like appearance. 2
- 2 Hair closest to apex on outer margin of clypeal fork short, stout and conspicuously thickened, usually blunt, contrasting strongly with the fine hairs which project forward from the vertical face of the clypeus below the fork (Fig. 44). Hairs on outer margin of fork behind the apicalmost always stout and like the apicalmost hair. 3
- Hair closest to apex on outer margin of clypeal fork elongate, simple and fine, similar in structure to the fine hairs which project forward from the vertical face of the clypeus below the fork, but shorter (Fig. 43). Hairs on outer margin of fork behind the apicalmost either similar to the apicalmost or distinctly thickened as in Fig. 43. 6
- 3 Maximum diameter of eye much greater (2–4 times greater) than the maximum width of the hairs in the first transverse pronotal row (Fig. 39). 4
- Maximum diameter of eye at most equal to the maximum width of the hairs in the first transverse pronotal row, usually distinctly less (Fig. 36). 5
- 4 Flattened hairs on first gastral tergite scale-like, short and squat, widely scattered (Fig. 30). (Zimbabwe) *arnoldi* (p. 66)
- Flattened hairs on first gastral tergite elongate and narrow, spatulate and with a tapering long basal stem, dense (Fig. 31). (Uganda) *tensus* (p. 74)
- 5 Eyes with 5–6 facets, maximum diameter c. 0.04, about 0.05–0.06 × HW. Smaller species, HW 0.62–0.68, AL 0.60–0.64. (Sudan, Ghana, Zaire) *brevis* (p. 63)
- Eyes with > 6 facets, maximum diameter c. 0.06–0.08, about 0.08–0.10 × HW. Larger species, HW 0.68–0.80, AL 0.66–0.84. (Sudan, Kenya, Zaire, Zimbabwe, Angola, South Africa) *piripilis* (p. 65)
- 6 First gastral tergite without scale-like, spatulate or clavate hairs; all hairs erect, simple, stout and acute apically (Fig. 33). (Ivory Coast, Ghana, Nigeria, Gabon). *barak* (p. 62)
- First gastral tergite with scale-like, spatulate or clavate hairs present. 7
- 7 Maximum diameter of eye usually less than the maximum width of the hairs in the first transverse pronotal row, at most the widths about equal. (Ivory Coast, Ghana, Angola) *kaurus* (p. 64)
- Maximum diameter of eye distinctly greater than the maximum width of the hairs in the first transverse pronotal row. 8
- 8 Bizarre hairs similar to those on first gastral tergite present everywhere on the first gastral sternite (Fig. 38) (Uganda, Tanzania, Burundi, Zaire) *shasu* (p. 73)
- Bizarre hairs similar to those on first gastral tergite restricted to the posterior one-third of the first gastral sternite or entirely absent from the first sternite. 9
- 9 With first gastral tergite in dorsal view the hairs squamate, scale-like or tear-drop shaped, without a long tapering basal stem (Figs 29, 32, 34). 10
- With first gastral tergite in dorsal view the hairs not squamate, either elongate-clavate, long-spatulate or Indian club-shaped, with a long tapering basal stem (Figs 35, 37, 41, 42). 12
- 10 Large species, HW 0.78–0.98, PW 0.54–0.68 with abundant large squamate hairs (Fig. 34). On the first gastral tergite the width of each hair about equal to or greater than the distance to the hairs on each side of it (Fig. 29). Mandibles longitudinally striate, usually sharply and conspicuously so. (Ivory Coast, Ghana, Nigeria, Cameroun, Zaire). *nummuliticus* (p. 68)
- Smaller species, HW 0.56–0.70, PW 0.40–0.50 with small squamate hairs. On the first gastral tergite the width of each hair distinctly less than the distance to the hairs on each side of it (Fig. 32). Mandibles smooth or with vestigial marking, not longitudinally striate. 11
- 11 Dorsum of head predominantly longitudinally rugulose, with a reticulum occipitally but without a triangular area on the vertex which is transversely rugulose. (Zimbabwe) *nedjem* (p. 68)
- Dorsum of head with longitudinal rugulae on each side which diverge towards the occipital corners and enclose a roughly triangular area of the vertex which is predominantly or entirely transversely rugulose. (Ethiopia, Gabon, South Africa). *foreli* (p. 67)
- 12 Hairs on outer margin of clypeal fork behind the apicalmost hair as fine as the apicalmost, similar in appearance. Clavate hairs on first gastral tergite very long and slender, longer than the maximum diameter of the eye (Fig. 35). (Zaire). *rennefer* (p. 72)

- Hairs on outer margin of clypeal fork behind the apicalmost hair much stouter than the apicalmost, very different in appearance. Clavate hairs on first gastral tergite stout, at most only slightly longer than the maximum diameter of the eye, usually shorter (Figs 37, 41, 42) 13
- 13 Propodeal dorsum strongly transversely rugose, without reticulate-punctate sculpture. Larger species, HW 0.76–0.82, PW 0.52–0.60. (Kenya, Uganda, Zaire) . . . . . *duhun* (p. 72)
- Propodeal dorsum reticulate-punctate, without strong transverse rugae but sometimes with one or two very feeble irregular rugulae. Smaller species, HW 0.52–0.66, PW 0.34–0.50 . . . . . 14
- 14 Postpetiole in dorsal view distinctly broader and more massively developed than the petiole (Fig. 42). Eyes with 15 or fewer ommatidia . . . . . 15
- Postpetiole and petiole in dorsal view of approximately equal widths, the former not obviously broader than the latter (Fig. 41). Eyes with 18 to > 20 ommatidia. (Ethiopia, Kenya, Zaire) . . . . . *clavatus* (p. 70)
- 15 Larger species, HW 0.64 or more, PW 0.48 or more. Prongs of clypeal fork long, their outer edges not strongly bowed outwards. (Zimbabwe, South Africa) . . . . . *brunneus* (p. 70)
- Smaller species, HW 0.52–0.60, PW 0.34–0.42. Prongs of clypeal fork short and stout, their outer edges strongly bowed outwards. (South Africa) . . . . . *clavisetus* (p. 71)

### The species-groups

The 16 African species of *Calyptomyrmex* fall into four informal groups based on the form of the pilosity and the size of the eyes. The *barak*-group, containing only a single species, is characterized by its simple stout pilosity, all the hairs being short, thick and acutely pointed apically. All the other groups have much more bizarre pilosity, with squamate, spatulate or clavate hairs predominating. Members of the *piripilis*- and *arnoldi*-groups have gastral hairs which are scale-like or tear-drop-shaped, always strongly flattened and broad in dorsal view. In *piripilis* and its allies the eyes are very reduced, whilst in the *arnoldi*-group they are larger. A useful measure of the relative sizes of the eyes is to compare the maximum ocular diameter with the width of the hairs in the first transverse pronotal row, as usually both can be seen at the same time in a direct lateral view of the specimen. Thus in the *piripilis*-group the eyes at most only fractionally exceed the widths of these hairs and are usually smaller, whilst in the *arnoldi*-group the eyes are commonly 2–4 times wider than the hairs in the first pronotal row.

The final group, containing *brunneus* and its allies, has relatively large eyes as in the *arnoldi*-group but has the hairs on the first gastral tergite longer and narrower. These hairs are elongate-clavate, long-spatulate or Indian club-shaped, always with a long tapering basal stem.

### The *barak*-group

(Figs 28, 33)

Hairs on all dorsal surfaces of the body erect, stout, straight and simple, tapering to a point apically; without squamate, spatulate, clavate or otherwise bizarre pilosity.

The single species referable to this group (*barak*) is a relatively large form (HW 1.00–1.08) apparently widely but sparsely distributed in West and Central Africa. To the present it is known from Ivory Coast, Ghana, Nigeria and Gabon. The samples from Ghana and Nigeria were found in rotten wood.

The simple form of the pilosity is diagnostic of *barak* and separates it from all other known African species. Outside the Ethiopian region a similar form of pilosity occurs in *C. wittmeri* Urbani from Bhutan, and in an as yet unidentified species from Sarawak.

### *Calyptomyrmex barak* sp. n.

(Figs 28, 33)

HOLOTYPE WORKER. TL 4.3, HL 1.04, HW 1.06, CI 102, SL 0.62, SI 58, PW 0.76, AL 1.14.

Mandibles finely but strongly longitudinally striate. Hair closest to apex on outer margin of clypeal fork, and all other hairs on clypeal fork, simple; similar in structure to the hairs projecting forwards from the vertical portion of the clypeus below the fork but shorter. Maximum diameter of eye 0.10 (0.09 × HW), much greater than the width of the hairs in the first pronotal row; with 5 ommatidia in the longest row and

each eye with  $> 15$  ommatidia in all. Propodeal declivity armed with a pair of triangular teeth. Metapleural lobes broadly rounded. Petiole node in profile massive, larger than the postpetiole node; in dorsal view both nodes distinctly broader than long, of approximately equal width. Dorsum of head finely and quite densely longitudinally rugulose, with a few weaker cross-meshes towards the occipital corners. The entire surface, including the top surfaces of the rugulae, covered by a dense blanketing fine reticulate-punctulation. Promesonotal dorsum finely but very irregularly rugulose, loosely reticulate in places and with the punctulate ground-sculpture distinctly weaker than on the head. Propodeum irregularly rugose anteriorly but transversely so between the propodeal teeth. Punctulate ground-sculpture virtually effaced on the dorsal propodeum. Nodes both rugulose and finely densely punctulate dorsally. First gastral tergite with a feeble superficial shagreening extending over the whole of the sclerite. Hairs on all surfaces of the head and body stout and simple, of approximately equal thickness throughout their length but tapering to a point apically. Squamate or clavate hairs entirely absent. Colour dark reddish-tinged brown, the appendages lighter.

PARATYPE WORKERS. TL 3.9–4.3, HL 0.98–1.06, HW 1.00–1.08, CI 102–104, SL 0.60–0.62, SI 56–60, PW 0.70–0.76, AL 1.06–1.14 (5 measured).

As holotype but some with the promesonotum more distinctly reticulate-rugulose, and the ground sculpture almost as strong as on the head. Number of cross-meshes on the occipital area of the head variable. The intensity of gastral sculpture varies noticeably. In general it is as in the holotype but it may be reduced to a weak superficial patterning or strengthened to a blanketing shallow reticulate-punctulation. Eyes with 5–6 ommatidia in the longest row, the maximum diameter 0.10–0.11 (0.09–0.11  $\times$  HW).

Holotype worker, **Ghana**: Baudua, 27.viii.1969, rotten stump (*D. Leston*) (BMNH).

Paratypes. **Ghana**: 3 workers with same data as holotype. **Nigeria**: 1 worker, Gambari, 20.vi.1969, rotten log (*B. Bolton*). **Gabon**: 1 worker, Plateau d'Ipassa, IPA 7 Cl (*J. A. Barra*). **Ivory Coast**: 1 female (queen), Divo, 18.iii.1963, rain for. litter (*L. Brader*). (BMNH; MCZ, Cambridge; NM, Basle.)

A very distinctive species which apparently nests in rotten wood, *barak* is unique in the African fauna of this genus as it is the only known species without clavate, squamate, spatulate or otherwise flattened hairs. All body hairs in *barak* are thick and very distinctive but are roughly cylindrical in section and taper to an acute point apically.

### The *piripilis*-group

(Figs 36, 44)

First gastral tergite with broad scale-like hairs. Eyes small, their maximum diameter at most only equal to the width of the hairs in the first transverse pronotal row, usually smaller.

The three species of this group are all widespread and apparently quite successful in the Ethiopian region. *C. brevis* is known from forests in Sudan, Ghana and Zaire; *kaurus* from Ivory Coast, Ghana and Angola; and *piripilis* from Sudan, Kenya, Zimbabwe, Angola and Zaire. All three species appear to nest in the soil.

*C. kaurus* is separated from the other two species by having the apicalmost hair on the clypeal fork fine and simple. In *brevis* and *piripilis* this hair is short and stout. The two last-named species form a close pair, differentiated on small differences in the eyes and in their respective sizes.

### *Calyptomyrmex brevis* Weber

*Calyptomyrmex (Calyptomyrmex) brevis* Weber, 1943: 366, pl. 15, fig. 1. Syntype workers, SUDAN: Imatong Mts, Lotti Forest, 5.viii.1939, no. 1441 (*N. A. Weber*) (MCZ, Cambridge; BMNH) [examined].

WORKER. TL 2.5–2.6, HL 0.62–0.66, HW 0.62–0.68, CI 98–103, SL 0.34–0.38, SI 53–58, PW 0.42–0.48, AL 0.60–0.64 (8 measured).

Mandibles finely and densely longitudinally striate. Hair closest to apex on outer margins of clypeal fork short and stout, contrasting with the long fine hairs which project forwards from the vertical face of the clypeus below the fork. Other hairs on the clypeal fork behind the apicalmost also short and stout, similar to the apicalmost. Eye very small, at most with 6 facets, its maximum diameter c. 0.04 (0.05–0.06  $\times$  HW), less than the width of the flattened hairs in the first transverse pronotal row. Propodeum in profile with merely an obtuse angle between the sloping dorsum and the declivity proper, or with a very low obtuse prominence, without denticles or teeth developed. Postpetiole slightly larger than petiole in dorsal view but

not remarkably so. Dorsum of head finely and irregularly longitudinally rugulose, commonly with a reticulum occipitally; spaces between rugulae with a dense but shallow reticulate-punctulate ground-sculpture. Dorsal alitrunk irregularly rugulose, the constituents forming a loose broad-meshed reticulum in places. Propodeal dorsum shagreened to finely punctulate, often with a few feeble rugulae. Dorsal surfaces of nodes shagreened to finely punctulate, in general with a few weak rugulae but these may be absent. First gastral tergite feebly sculptured basally with superficial punctulation or shagreening which tends to be reduced or to fade out more posteriorly on the sclerite. All dorsal surfaces of body except propodeum liberally covered with large squamate hairs which are very conspicuous; those on the promesonotum arranged in 4-5 transverse rows, commonly the rows more even anteriorly than posteriorly where extra hairs are often seen between rows. Colour uniform light to medium brown.

Of the three species in this group *kaurus* is separated by having the apicalmost hair on the clypeal fork long and fine; it is short and thick in *brevis* and *piripilis*. These last two are closely related and it is possible that they may represent variants of a single species. However, in the material presently available they separate on the size of the eyes and bodily dimensions, as noted in the key.

Besides *brevis* and *piripilis*, three other African species are known in which the apicalmost hair on the clypeal fork is stout and thick. These are *stellatus* which is immediately characterized by its remarkable pilosity, and *tensus* and *arnoldi*, in both of which the eyes have a maximum diameter much greater than the width of the hairs in the first pronotal row (compare Figs 36, 39).

#### MATERIAL EXAMINED

**Ghana:** Tafo (*B. Bolton*), Tafo (*D. Leston*). **Zaire:** Ituri Forest, Beni-Irumbu (*N. A. Weber*).

#### *Calptomyrmex kaurus* sp. n.

**HOLOTYPE WORKER.** TL 2.4, HL 0.64, HW 0.66, CI 103, SL 0.36, SI 55, PW 0.44, AL 0.60.

Mandibles finely longitudinally striate. Hair closest to apex on outer margin of clypeal fork long and fine, similar in construction to the long hairs which project from the vertical face of the clypeus below the fork, but shorter. Hairs on outer margin of fork behind the apicalmost hair shorter and much stouter, contrasting strongly with the apicalmost. Eyes small, maximum 0.05 (0.08 × HW), equal to or slightly less than the width of the flattened hairs in the first transverse pronotal row. Propodeum in profile with an obtuse angle separating the sloping dorsum from the declivity proper, without teeth. Postpetiole slightly longer and broader than petiole in dorsal view, but not markedly so. Dorsum of head finely, irregularly, predominantly longitudinally rugulose; occipitally with a fine ruguloreticulum. Spaces between the rugulae granular or finely superficially punctulate, dull. Dorsal promesonotum finely and quite densely rugulose, the sculpture predominantly longitudinal, meandering and forming reticular meshes in places. Propodeal dorsum finely and densely punctulate, with granular or shagreened appearance, with a couple of very faint longitudinal weak rugulae. Petiole and postpetiole rugulose and finely punctulate dorsally, the first gastral tergite superficially shagreened everywhere. All dorsal surfaces of head and body except propodeum with abundant large, conspicuous, scale-like hairs which are, however, longer than broad. Colour uniform medium brown.

**PARATYPE WORKERS.** TL 2.4-2.8, HL 0.64-0.72, HW 0.66-0.72, CI 100-103, SL 0.36-0.42, SI 53-59, PW 0.44-0.52, AL 0.60-0.74 (12 measured).

Maximum diameter of eye 0.05-0.06 (0.07-0.09 × HW), generally smaller than the width of the hairs in the first pronotal row but sometimes about equal in width; the eye with 6-8 ommatidia. Hairs on promesonotal dorsum arranged in 5-6 transverse rows; behind the first two there are often hairs outside the rows and the pattern is disrupted. In some the promesonotum is more obviously reticulate-rugulose than in the holotype, and the propodeal dorsum may have several faint rugulae present. The propodeum in profile may develop minute low denticles instead of being merely angular, but teeth are never present.

Holotype worker, **Ghana:** Tafo, 29.x.1970, in leaf mould (*B. Bolton*) (BMNH).

Paratype workers. **Ghana:** 1 worker with same data as holotype; 1 worker, Kibi 24.iii.1970, litter sample (*D. Leston*). **Ivory Coast:** 5 workers, Nzi Noua, N. of Ndouci, 13.i.1977, degraded for., rot. log (*W. L. & D. E. Brown*); 1 worker, 3.5 km S. of Sangrobo, S-P de Tiassalé, 14.i.1977, rain for. (*W. L. & D. E. Brown*). **Angola:** 9 workers, Duque de Bragança falls, 12.iii.1972 (*P. M. Hammond*). (BMNH; MCZ, Cambridge; NM, Basle; NM, Bulawayo).

The combination of striate mandibles, small eyes, large squamate hairs and fine apicalmost hair on the clypeal fork will separate *kaurus* from all other species in the region.

*Calyptomyrmex piripilis* Santschi

(Figs 36, 44)

*Calyptomyrmex piripilis* Santschi, 1923: 282. Holotype worker, ZAIRE: Manyema, Niemba-Tengo (Gérard) (MRAC, Tervuren) [examined].

*Calyptomyrmex cataractae* Arnold, 1926: 283. Holotype worker, ZIMBABWE: Victoria Falls, rainforest, 30.viii.1917 (G. Arnold) (NM, Bulawayo) [examined]. **Syn. n.**

*Calyptomyrmex cataractae* subsp. *litoralis* Arnold, 1948: 221. Syntype workers, SOUTH AFRICA: Natal, Zululand, Richards Bay, ii.1946 (J. C. Faure) (NM, Bulawayo) [examined]. **Syn. n.**

*Calyptomyrmex (Calyptomyrmex) punctatus* Weber, 1952: 24, figs 19, 21, 23. Holotype worker, KENYA: 1°25'S 35°10'W [sic] to 1°38'S, 35°17'E, 4.ii.1948, no. 2039 (N. A. Weber) (AMNH, New York) [examined]. **Syn. n.**

WORKER. TL 2.8–3.1, HL 0.68–0.80, HW 0.68–0.79, CI 97–103, SL 0.38–0.48, SI 54–60, PW 0.46–0.54, AL 0.66–0.84 (15 measured).

Mandibles finely longitudinally striate. Hair closest to apex on outer margin of clypeal fork short and stout, contrasting strongly with the elongate fine hairs which arise from the vertical face of the clypeus below the fork. Hairs on clypeal fork behind the apicalmost all short and stout, similar in structure to the apicalmost. Eyes small, maximum diameter 0.06–0.08 (0.08–0.10 × HW), at most as large as the width of the hairs in the first transverse pronotal row, usually smaller than those hairs; the eyes with more than 6 facets. Propodeum in profile at most with a pair of minute obtuse prominences where the sloping dorsum meets the declivity, more commonly merely bluntly angled; without teeth. Petiole and postpetiole in dorsal view of approximately equal size, the two usually being about equal in length and width, but sometimes the latter fractionally broader than the former. In profile the petiole node usually appears larger than that of the postpetiole. Dorsum of head finely and usually quite densely irregularly longitudinally rugulose, the rugulae varying in density and intensity between series. Occipital region commonly with some cross-meshes, often with a loose reticulum. Spaces between the rugulae filled with fine dense punctulation or granulation, matt. Promesonotal dorsum finely irregularly rugulose, the sculpture often forming large reticular meshes, especially anteriorly. Propodeal dorsum reticulate-punctulate, sometimes with only this sculpture present but commonly with a few feeble rugulae superimposed upon the punctures. Petiole and postpetiole finely rugulose and punctulate dorsally. First gastral tergite finely densely punctulate or shagreened, at least basally, usually the entire sclerite similarly sculptured. All dorsal surfaces of head and body except the propodeum with numerous scale-like hairs which are very conspicuous; those on the promesonotum arranged in 4–5 transverse rows. Colour uniform light to medium brown.

One of three species in the region characterized by having relatively small eyes and large flattened scale-like hairs, *piripilis* is closely related to *kaurus* and *brevis*. It separates easily from *kaurus* as the anteriormost hair on the clypeal fork is simple in that species but short and greatly thickened in *piripilis*. Separation of *brevis* from *piripilis* rests on relative sizes of the eyes and dimensions of the body, as given in the key.

*C. piripilis* is a widespread species, ranging from Sudan to South Africa and also occurring in Angola and Zaire, but seeming to be absent from West Africa.

The female (queen) of this species appears to be ergatoid as a series in MCZ, Cambridge collected by W. L. Brown in Zimbabwe (Victoria Falls, spray forest, 7.iii.1969, no. R-14) contains 17 workers plus one odd larger specimen in which the mesonotum is strongly swollen, the promesonotal suture is present, and the eyes are very large; ocelli and flight sclerites are absent, however. Very little is known about the females of this genus but normal alate queens (with fully developed flight sclerites and ocelli) have been found in *nummuliticus*, *barak*, *clavatus* and *shasu*. The possibility that the ergatoid female noted above may in fact be a pathologically deformed worker cannot be absolutely ruled out, but the presence of a similar form in *rennefer*, with the additional character of having ocelli present, seems to indicate that ergatoid females may be usual in at least some species of *Calyptomyrmex*.

## MATERIAL EXAMINED

**Sudan:** Imatong Mts (N. A. Weber). **Kenya:** 1°25'S 35°10'W [sic], to 1°38'S 35°17'E (N. A. Weber). **Zaire:** P.N.A., Mont. Ngulingo, Nyamgaleke (P. Vanschuytbroeck); Mt Hoyo, grotte Saga-Saga and grotte Tala-Tala (P. Vanschuytbroeck); Secteur Nord, Kavudula, Kilia (P. Vanschuytbroeck); riv. Sumalebu, Djuma (P. Vanschuytbroeck); Tungula, Semliki (P. Vanschuytbroeck); Kilebu, Abyalose (P. Vanschuytbroeck).

**Angola:** Gabela (*D. Hollis*). **Zimbabwe:** Victoria Falls (*W. L. Brown*). **South Africa:** Natal, Mtunzini (*J. C. Faure*).

### The *arnoldi*-group

(Figs 29, 30, 32, 34, 39)

First gastral tergite with hairs scale-like or short, broadly tear-drop-shaped; without a long tapering basal stem. Maximum diameter of eye greater than width of hairs in first transverse pronotal row.

This group includes five species, namely *arnoldi*, *foreli*, *nedjem*, *nummuliticus* and *stellatus*. The known distribution of most of these is very limited, with *stellatus* known only from Gabon, and *arnoldi* and *nedjem* only from Zimbabwe. *C. foreli* is more widespread but equally rare, being known from the three very widely separated countries of Ethiopia, South Africa and Gabon. Finally, *nummuliticus* is fairly common in West Africa and also occurs in Cameroun and Zaire, where it is a wet-forest species.

*C. stellatus* is instantly recognizable by its unique pilosity. All the scale-like hairs on the dorsum are flattened and fringed with radiating filaments. Of the remaining species *arnoldi* is the only one which has the apicalmost hairs on the clypeal fork stout and thick; and *foreli* is characterized by having an area of the vertex transversely sculptured. *C. nedjem* and *nummuliticus* lack the characters diagnostic of the above; the latter is a large, darkly coloured species with striate mandibles and large scale-like hairs all over the body, whilst *nedjem* is a smaller, lightly coloured species with smooth mandibles and much smaller scale-like hairs.

### *Calyptomyrmex arnoldi* (Forel)

(Figs 30, 39)

*Dicroaspis arnoldi* Forel, 1913: 115. Syntype workers, ZIMBABWE: Bulawayo, 20.iv.1912, 'under a stone with *P. krugeri* For.' (*G. Arnold*) (MHN, Geneva; BMNH) [examined].

*Calyptomyrmex arnoldi* (Forel) Arnold, 1917: 360.

WORKER. TL 2.5–2.7, HL 0.64–0.70, HW 0.64–0.68, CI 97–100, SL 0.38–0.42, SI 59–62, PW 0.46–0.52, AL 0.66–0.74 (6 measured).

Mandibles usually delicately and faintly striate, rarely more or less smooth. Clypeal fork relatively broad, distance between points of fork greater than outer length from apex to frontal lobe. Erect hair closest to apex on outer margin of clypeal fork stout and thick, contrasting with the long fine hairs which project forward from the vertical part of the clypeus below the fork. Outer margin of clypeal fork with at least one other erect thick hair behind the apicalmost. Eyes relatively large, maximum diameter c. 0.08 (0.12–0.13 × HW), much greater than the width of the flattened hairs on the first pronotal row and usually >10 ommatidia. Propodeum in profile armed with a pair of short conspicuous triangular teeth. Metapleural lobes with a conspicuous thin-spot. Node of petiole in profile usually slightly higher than that of postpetiole and commonly somewhat more voluminous. In dorsal view the two nodes are approximately equal in width or the postpetiole is slightly broader than the petiole. Dorsum of head with fine irregular scattered rugulae which usually tend to diverge towards the occipital corners. Scattered irregular cross-meshes may occur on the head, and are usually present occipitally where they sometimes form a loose reticulum. Spaces between rugulae densely shagreened or densely finely reticulate-punctulate, matt and dull. Promesonotum sculptured as head, with scattered irregular rugulae which may form a reticulum in places and with dense punctulation or shagreening between the rugulae. Propodeal dorsum predominantly or entirely reticulate-punctate, sometimes with one or two meandering fine rugulae. Petiole and postpetiole dorsa densely shagreened or finely and densely reticulate-punctate, usually without regular sculpture. First gastral tergite densely punctate or shagreened, at least basally, the sculpture tending to fade out or be diminished posteriorly. Hairs on dorsum of head and alitrunk short and squat, fairly numerous but small and inconspicuous, none as large as the maximum diameter of the eye. First gastral tergite with widely scattered small squat hairs which are flattened and increase in width from base to apex. Colour medium brown, often with the gaster darker.

To the present this species is known only from Zimbabwe. Like the other members of the *arnoldi*-group it has relatively large eyes, narrow hairs in the first pronotal row (narrower than maximum



eye diameter) and flattened gastral hairs which lack a long tapering basal stem. It is separated from the rest of the group by the presence of thick hairs closest to the apex of the clypeal fork; in the remaining members the apicalmost hair is elongate and fine on each tine of the fork.

#### MATERIAL EXAMINED

**Rhodesia:** Bulwayo, Hillside (*G. Arnold*); Sawmills (*G. Arnold*).

### *Calyptomyrmex foreli* Emery

(Fig. 32)

*Dicroaspis emeryi* Forel, 1910b: 262. Syntype workers, ETHIOPIA: Eritrea, Ghinda (*K. Escherich*) (MHN, Geneva) [examined]. [Junior secondary homonym of *Calyptomyrmex emeryi* Forel, 1901: 51.]

*Calyptomyrmex (Dicroaspis) foreli* Emery, 1915: 15. [Replacement name for *Calyptomyrmex emeryi* (Forel). 1910.]

*Calyptomyrmex (Dicroaspis) pusillus* Santschi, 1915: 256. Holotype worker, GABON (*F. Faure*) (NM, Basle) [examined]. **Syn. n.**

*Calyptomyrmex arnoldi* subsp. *hartwigi* Arnold, 1948: 220. Syntype worker and male, SOUTH AFRICA: Pretoria, 23.i.1946 (*E. K. Hartwig*) (NM, Bulawayo) [examined]. **Syn. n.**

**WORKER.** TL 2.3–3.0, HL 0.58–0.68, HW 0.56–0.66, CI 95–100, SL 0.34–0.40, SI 58–61, PW 0.40–0.50, AL 0.58–0.76 (8 measured).

Mandibles usually unsculptured, smooth with scattered pits, rarely with vestigial striation which is very faint and only visible under correct lighting and at certain angles, and then is generally only visible near the base. Erect hair closest to apex on outer margins of clypeal fork elongate and fine, similar in structure to the long hairs which project forward from the vertical face of the clypeus below the fork, but shorter. Outer margin of clypeal fork behind the apicalmost hair with a second erect hair which is shorter and much stouter, contrasting strongly with the apicalmost. Eyes relatively large, maximum diameter 0.08–0.10 (0.14–0.16 × HW), much greater than the width of the hairs in the first transverse pronotal row and with > 10 ommatidia. Propodeum in profile armed with a pair of angular prominences or minute denticles, without strong teeth. Metapleural lobes deep but low, with an inconspicuous thin-spot. Petiole and postpetiole both broader than long in dorsal view, the latter slightly broader than the former. Dorsum of head finely longitudinally rugulose, the rugulae diverging towards the occipital corners and the roughly triangular space between them and the occipital margin predominantly or entirely transversely rugulose. Promesonotal dorsum irregularly reticulate-rugulose, the spaces between rugulae both here and on the head finely punctulate. Dorsum of propodeum reticulate-punctate. Pedicel segments reticulate-punctate, sometimes with one or two overlying feeble rugulae. Base of first gastral tergite reticulate-punctate or densely shagreened, the sculpture usually becoming weaker posteriorly on the sclerite. Flattened hairs on promesonotal dorsum broader than those on head and more distinctly squamate. Hairs on first gastral tergite squamate, roughly tear-drop-shaped in dorsal view and without a narrow elongate stem, but visibly longer than broad. A few very fine appressed pubescent hairs present, scattered between the bizarre pilosity. Colour uniform medium to dark brown.

The main diagnostic feature of *foreli* within the group (and in the genus as a whole) is the presence of the roughly triangular area of the vertex which has transverse sculpture. Other than this *foreli* is distinguished from *stellatus* by the unique fringed pilosity of the latter, from *arnoldi* by the presence of a thick hair apicalmost on the clypeal fork and the smaller gastral hairs of that species (compare Figs 30, 32). *C. nedjem* is close to *foreli* but lacks the characteristic sculpture on the vertex and has smaller eyes. Finally, in *nummuliticus* the mandibles are sharply longitudinally striate and it has large appressed scale-like hairs on the first gastral tergite, the width of each of these hairs being equal to or greater than the distance between adjacent hairs. In *foreli* and other members of the group the width of each gastral hair is decidedly less than the distance between the hair and the ones on each side of it.

The known distribution of this obviously uncommon species is disturbing. To the present the only localities of *foreli* are those given above, namely localities in Gabon, Ethiopia and South Africa. It is most likely that the species is widely distributed in Africa but rare, but the possibility that it has been transported by man cannot be ruled out.

*Calyptomyrmex nedjem* sp. n.

HOLOTYPE WORKER. TL 2.7, HL 0.72, HW 0.70, CI 97, SL 0.44, SI 61, PW 0.48, AL 0.74.

Mandibles smooth with scattered pits, not evenly longitudinally striate but with feeble vestiges of striate sculpture basally. Hair closest to apex on outer margin of clypeal fork simple and fine, similar in appearance to the long hairs which project from the vertical face of the clypeus below the fork, but shorter. Behind the apicalmost hair others on the dorsum of the clypeal fork are shorter and much stouter, contrasting strongly with the apicalmost hair. Maximum diameter of eye 0.08 ( $0.11 \times \text{HW}$ ), much broader than the flattened hairs in the first pronotal row and with  $> 10$  ommatidia. Propodeum in profile with a denticle at the point where the sloping dorsum meets the declivity. Nodes of petiole and postpetiole of approximately equal length, the node of the latter slightly broader than that of the former. Dorsum of head finely longitudinally rugulose, with a loose reticulum occipitally. Spaces between the rugulae filled with a fine dense punctulate ground-sculpture. Dorsal promesonotum densely and finely, predominantly longitudinally, rugulose but with a few irregular transverse rugulae present. Propodeal dorsum reticulate-punctate, without rugular sculpture. Dorsal surfaces of petiole and postpetiole reticulate-punctate. Base of first gastral tergite finely and superficially punctulate but this sculpture fading out posteriorly and leaving the surface weakly superficially shagreened. Small squamate scale-like hairs present on all dorsal surfaces of the head and body except the propodeum, those on the promesonotum arranged in 5 transverse rows. On the first gastral tergite the scale-like hairs are distinctly longer than broad and the spaces between adjacent hairs is greater than the widths of the individual hairs. Colour uniform medium brown.

PARATYPE WORKERS. TL 2.6–2.7, HL 0.68–0.70, HW 0.68–0.70, CI 99–100, SL 0.42–0.44, SI 60–62, PW 0.44–0.48, AL 0.68–0.74 (4 measured).

As holotype but maximum diameter of eye 0.08–0.09 ( $0.11$ – $0.12 \times \text{HW}$ ). Hairs on promesonotal dorsum in 5 or 6 transverse rows. Propodeum sometimes with a couple of very feeble rugulae superimposed upon the reticulate-punctate sculpture.

Holotype worker, **Zimbabwe**: Bulawayo, 5.ii.1913 (G. Arnold) (BMNH).

Paratypes. **Zimbabwe**: 3 workers with same data as holotype; and 1 worker, Bulawayo, 14.ii.1914 (G. Arnold). (BMNH; NM, Bulawayo; MCZ, Cambridge.)

After *stellatus* with its unmistakable pilosity and *arnoldi* with its thick apicalmost hair on the clypeal fork have been removed from the group, three species remain, namely *foreli*, *nedjem* and *nummuliticus*. The first two of these are more closely related to each other than either is to *nummuliticus*. This last-named species is large (see measurements), darkly coloured, with abundant large squamate hairs and densely striate mandibles. *C. foreli* and *nedjem* are smaller, lighter in colour, have more scattered smaller hairs and smooth (or nearly smooth) mandibles. In *foreli* the vertex of the head has a triangular area of transverse sculpture which is absent in *nedjem* and this serves to separate the two.

*Calyptomyrmex nummuliticus* Santschi

(Figs 29, 34)

*Calyptomyrmex nummulitica* Santschi, 1914b: 352. Syntype workers, CAMEROUN: Victoria (F. Silvestri) (NM, Basle) [examined].

*Calyptomyrmex* (*Calyptomyrmex*) *reticulatus* Weber, 1952: 25, fig. 17. Holotype worker, ZAIRE: Ituri Forest, Beni-Irumu, 17 miles [= 27km] N. of Beni, 24.ii.1948, no. 2124-1 (N. A. Weber) (AMNH, New York) [examined]. **Syn. n.**

WORKER. TL 3.0–3.7, HL 0.76–0.92, HW 0.78–0.98, CI 102–107, SL 0.40–0.52, SI 51–56, PW 0.54–0.68, AL 0.74–0.94 (20 measured).

Mandibles usually sharply finely longitudinally densely striate, rarely the striation less conspicuous. Hair closest to apex on outer margin of clypeal fork fine and simple, situated almost at the apex, similar in appearance to the fine hairs projecting from the vertical face of the clypeus below the fork, but shorter. Hairs on the clypeal fork behind the apicalmost much thicker and contrasting strongly with it. Maximum diameter of eye 0.07–0.11 ( $0.09$ – $0.12 \times \text{HW}$ ), greater than the width of the hairs in the first pronotal row. Propodeum usually armed with a pair of broad teeth where the sloping dorsum meets the declivity. These teeth are variable in size and in small specimens may be reduced to a pair of rounded prominences. Nodes of

petiole and postpetiole in dorsal view of approximately equal size, or the postpetiole marginally larger. Anterior portion of dorsum of head finely and quite densely irregularly longitudinally rugulose. On the vertex this sculpture becomes a rugoreticulum which occupies at least the posterior half of the vertex and all the occipital area, but which is variable in extent, extending further forwards in some specimens than in others. Promesonotal dorsum with a strong rugoreticulum; here as on the head each reticular mesh encloses a squamate hair. Ground-sculpture on head and alitrunk a fine granulation, the surfaces matt and dull. Propodeal dorsum finely granular and dull, with weak irregular rugulae over some or all of the surface. Petiole and postpetiole nodes finely rugulose, again with dense granular ground-sculpture. First gastral tergite usually shagreened everywhere but in some this is superficial. All dorsal surfaces of head and body except the propodeum with abundant large, squamate, scale-like hairs which are much lighter (off-white to yellowish) than the underlying cuticle and hence are very conspicuous indeed. On the first gastral tergite the scale-like hairs are large and numerous, often almost as broad as long, the width of each hair usually as great as or greater than the distance separating it from adjacent hairs. Colour dark brown to blackish brown, the gaster usually lighter in shade and with a dull reddish tint.

One of the larger and more conspicuous species of African *Calyptomyrmex*, *nummuliticus* is easily recognized by its size, dark colour and abundant conspicuous large scale-like hairs, each of which is set in its own reticular mesh on the promesonotum and occiput.

The species is widely distributed in the forests of west and central Africa, nesting in rotten wood or in soil beneath fallen timber. Workers forage singly in the leaf litter.

#### MATERIAL EXAMINED

**Ivory Coast:** Sangrobo, S-P. de Tiassalé (*W. L. Brown & D. E. Brown*); Divo (*L. Brader*). **Ghana:** Tafo (*D. Leston*); Tafo (*B. Bolton*); Mt Atewa (*D. Leston*); Mt Atewa (*B. Bolton*); Mampong (*P. Room*). **Nigeria:** Gambari (*B. Bolton*).

#### *Calyptomyrmex stellatus* Santschi

*Calyptomyrmex stellatus* Santschi, 1915: 255, fig. 5. Holotype worker, GABON (*F. Faure*) (NM, Basle) [examined].

**WORKER.** TL 2.8, HL 0.72, HW 0.71, CI 99, SL 0.44, SI 62, PW 0.48, AL 0.72.

Mandibles finely superficially longitudinally striate. Anteriormost hair on outer margin of clypeal fork short, stout, similar to the bizarre hairs which cover the dorsum of the head and contrasting strongly with the elongate fine hairs which arise from the vertical face of the clypeus below the fork. Hairs on clypeal fork behind the apicalmost bizarre, as described below. Maximum diameter of eye 0.06 (0.08 × HW). Propodeum in profile apparently with a low rounded angle where the sloping dorsum meets the declivity. (The alitrunk is badly crushed and the shape of the propodeum difficult to discern, but it is possible to tell that propodeal teeth are absent.) Postpetiole in dorsal view larger than the petiole node, being both broader and longer. Dorsum of head with very fine, scattered irregular rugulae, the spaces between them finely punctulate or granular. Dorsal surfaces of alitrunk, petiole and postpetiole finely and densely reticulate-punctulate, the promesonotum also with a few vestigial rugulae. Base of first gastral tergite with some fine, scattered and very superficial punctulation. Bizarre hairs on head, promesonotum, pedicel segments and gaster dense, unique in form and highly characteristic. Each hair is scale-like, with a short basal stem, and the outer margins of the flattened hairs have 15–20 short, freely projecting filaments so that the margins have a fringed or ray-like appearance. Santschi described these hairs as stellate but in dorsal view they really have more the appearance of a short-tentacled sea-anemone seen from above.

Known only from the holotype worker this species is immediately diagnosed by its unique pilosity, which separates it from all other members of the genus.

#### The *brunneus*-group

(Figs 31, 35, 37, 38, 40–43)

First gastral tergite with the hairs elongate-clavate, elongate-spatulate or Indian club-shaped, always with a long narrow or tapering basal stem. Maximum diameter of eye always greater than the width of the hairs in the first transverse pronotal row.

The seven species of this group (*brunneus*, *clavatus*, *clavisetus*, *duhun*, *rennefer*, *shasu*, *tensus*) are widely distributed in the Ethiopian region although most are only known from one or two

localities. To the present all the species in this group are known to have a distribution in eastern, central and southern Africa; none have yet been found in West Africa although those occurring in Zaire or Uganda may well be present there. In summary *clavisetus* and *brunneus* occur in South Africa (the latter also being known from Zimbabwe), whilst the rest are more northerly, with *clavatus* from Ethiopia, Zaire and Kenya, *rennefer* from Zaire, *tensus* from Uganda, *duhun* from Uganda, Kenya and Zaire, and *shasu* from Uganda, Tanzania, Burundi and Zaire.

Of the seven species *tensus* is the only one in which the apicalmost hair on the clypeal fork is stout and thick, and *shasu* is the sole species where bizarre hairs similar to those on the first gastral tergite occur all over the first sternite also. In all other species such hairs are restricted to the apical portion of the sternite or are lacking on the sclerite. Of the remainder *rennefer* has very long body hairs which are only feebly clavate apically, and also has all hairs on the clypeal fork simple. In *duhun* the propodeum is strongly transversely sculptured, a feature lacking in *brunneus*, *clavisetus*, *clavatus* and the previously mentioned members of this group.

The last three species mentioned form a closely related complex, with *brunneus* being darkly coloured and the other two light brown. Finally, in *clavatus* the petiole and postpetiole nodes are of approximately equal size, while in *clavisetus* the postpetiole is much larger.

### *Calyptomyrmex brunneus* Arnold

*Calyptomyrmex brunneus* Arnold, 1948: 221. Holotype worker, SOUTH AFRICA: Transvaal, Ngomi Forest, 21.ii.1946 (J. C. Faure) (NM, Bulawayo) [examined].

WORKER. TL 2.6–2.7, HL 0.68–0.70, HW 0.64–0.66, CI 94–97, SL 0.42–0.44, SI 65–67, PW 0.48–0.50, AL 0.72–0.74 (5 measured).

Mandibles varying from superficially finely marked without definite sculpture to finely and very delicately striate. Clypeal fork in dorsal view with fairly long prongs, the outer margins of which are shallowly convex, not strongly bowed outwards and caliper-like. Hair closest to apex of clypeal fork on outer margin fine, similar in structure to those which arise from the vertical face of the clypeus below the fork, but shorter. Hairs on the clypeal fork behind the apicalmost much thicker and contrasting with it. Maximum diameter of eye 0.07–0.08 (0.11–0.13 × HW), much greater than the maximum widths of the hairs in the first pronotal row and at most with about 15 ommatidia. Propodeum in profile armed with a pair of denticles or short teeth where the sloping dorsum meets the declivity. With the pedicel segments in dorsal view the postpetiole distinctly larger than the petiole, markedly broader and also longer. Dorsum of head finely, sharply and quite densely irregularly longitudinally rugulose, with conspicuous dense punctulate ground-sculpture between the rugulae. Promesonotum finely rugulose and with ground-sculpture as on the head. The rugulae on the promesonotum are usually irregular but in some are predominantly longitudinal. Dorsal surfaces of propodeum, petiole and postpetiole densely reticulate-punctate. Base of first gastral tergite superficially punctulate or shagreened, this usually fading out more posteriorly on the sclerite or at least becoming weaker. All dorsal surfaces of head and body except the propodeum with numerous conspicuous clavate or Indian club-shaped hairs. Colour uniform dark brown to blackish brown, the pale hairs rendered more obvious by the dark colour of the cuticle.

*C. brunneus* is most closely related to *clavatus* and *clavisetus*. Differences between these species, and between them and other members of the group, are discussed under the last two names mentioned.

#### MATERIAL EXAMINED

**Zimbabwe:** Vumba Mts (G. Arnold).

### *Calyptomyrmex clavatus* Weber

(Fig. 41)

*Calyptomyrmex (Calyptomyrmex) clavatus* Weber, 1952: 23, figs 20, 22, 24. Holotype worker, KENYA: 1°25'S 35°10'W [sic], to 1°38'S, 35°17'E, 27.i.1948, no. 2000 (N. A. Weber) (AMNH, New York) [examined].

WORKER. TL 2.7–2.9, HL 0.64–0.68, HW 0.62–0.66, CI 96–97, SL 0.38–0.40, SI 60–61, PW 0.46–0.48, AL 0.68–0.74 (3 measured).

Mandibles unsculptured or at most with faint superficial markings, not longitudinally striate. Hair closest

to apex on outer margin of clypeal fork fine, similar in appearance to the fine hairs which project from the face of the clypeus below the fork, but shorter. Others hairs on clypeal fork behind the apicalmost thick, contrasting with it. Maximum diameter of eye 0.07–0.08 (0.11–0.12  $\times$  HW), much greater than the widths of the hairs in the first pronotal row, with 18 to  $>20$  ommatidia. Propodeum armed with a pair of denticles. Petiole and postpetiole in dorsal view of approximately equal size, the postpetiole marginally broader than the petiole. Dorsum of head finely and densely longitudinally rugulose, the rugulae diverging away from the mid-line towards the occipital corners. Ground-sculpture of head a fine and quite dense punctulation. Promesonotal dorsum finely and irregularly rugulose, reticulate in places, and with dense punctulate ground-sculpture. Propodeal dorsum, petiole and postpetiole densely reticulate-punctate. First gastral tergite finely punctulate basally, this sculpture becoming reduced more posteriorly on the sclerite. All dorsal surfaces of head and body except for propodeum with numerous clavate or Indian club-shaped hairs which are relatively short; those on the first gastral tergite shorter than the maximum diameter of the eye. Colour uniform medium brown.

Within the *brunneus*-group *clavatus* is most closely related to *clavisetus* but the two are separated by the fact that the postpetiole in *clavisetus* in dorsal view is much larger than the petiole, whereas in *clavatus* they are approximately the same size. Another closely related species is *brunneus*, but here again the postpetiole is obviously broader than the petiole and the body is much darker brown or blackish brown in colour.

Other species with elongate-clavate or Indian club-shaped hairs are easily separated from *clavatus*, as in *tensus* the apicalmost hair on the clypeal fork is thick (fine in *clavatus*), in *shasu* the first gastral sternite has bizarre pilosity like that on the tergite (not so in *clavatus*), in *duhun* the propodeum is coarsely transversely rugose (punctate in *clavatus*), and in *rennefer* the clavate hairs are very long and narrow, those on the gaster exceeding the maximum diameter of the eye.

#### MATERIAL EXAMINED

**Ethiopia:** Harrar (no collector's name but probably *Escherich*). **Zaire:** Yangambi (*M. Malague*).

#### *Calyptomyrmex clavisetus* (Santschi)

(Fig. 42)

*Dicroaspis claviseta* Santschi, 1914a: 27. Syntype workers, SOUTH AFRICA: Natal, Pietermaritzburg, 21.iii. 1905 (*J. Trägårdh*) (NM, Basle) [examined].

*Calyptomyrmex* (*Dicroaspis*) *clavisetus* (Santschi) Emery, 1915: 15 [implied in text].

WORKER. TL 2.1–2.6, HL 0.56–0.64, HW 0.52–0.60, CI 93–94, SL 0.34–0.36, SI 60–65, PW 0.34–0.42, AL 0.58–0.66 (4 measured).

Mandibles smooth with the faintest traces of superficial markings, not longitudinally striate. Clypeal fork short and caliper-like, the outer edges of the prongs of the fork strongly bowed outwards. Hair closest to apex on outer margin of clypeal fork fine, similar in appearance to the long hairs which project from the vertical face of the clypeus below the fork. Hairs on the fork behind the apicalmost much stouter and contrasting with the apicalmost. Maximum diameter of eye 0.06–0.07 (0.12  $\times$  HW), much greater than the maximum width of the hairs in the first transverse pronotal row and with 15 or fewer ommatidia. Propodeum armed with a pair of denticles or short teeth where the sloping dorsum of the propodeum meets the declivity. Postpetiole in dorsal view distinctly more massive than petiole node, both broader and longer than it. Dorsum of head finely and quite densely irregularly longitudinally rugulose, the individual rugulae narrow but quite sharp and well-defined. Spaces between rugulae with a fine, dense and very conspicuous reticulate-punctate ground-sculpture. Promesonotal dorsum irregularly rugulose and with dense reticulate-punctate ground-sculpture. Dorsal surfaces of propodeum, petiole and postpetiole densely reticulate-punctate, without regular sculpture or at most with very faint vestiges on the propodeum. Base of first gastral tergite superficially faintly shagreened, this sculpture fading out posteriorly on the sclerite. All dorsal surfaces of head and body except the propodeum with numerous clavate or Indian club-shaped hairs. Colour uniform light brown to medium brown.

Three small species of this group, *brunneus*, *clavatus* and *clavisetus*, are closely related and taken together they can be separated from all other members by the following differentiating characters being present together in a single specimen. Firstly, the apicalmost clypeal fork hair is fine but others on the fork are stout. Secondly, the propodeum lacks transverse rugae. Thirdly, the first gastral sternite does not have hairs like those on the tergite all over the surface; any

which are present are restricted to the posterior one-third of the sternite. Finally, the clavate or Indian club-shaped hairs are not exceptionally long and fine on the first gastral tergite.

Within these limits *clavatus* is distinguished from the other two by having larger eyes and pedicel segments which in dorsal view are of approximately equal size, the postpetiole not being noticeably larger than the petiole. In both *brunneus* and *clavisetus* the eyes are smaller and the postpetiole is markedly larger than the petiole in dorsal view. These last two are separated on size (*brunneus* being larger) and by the shape of the clypeal fork, which in *brunneus* is longer and has straighter sides, whilst in *clavisetus* it is very short and has strongly bowed outer margins.

#### MATERIAL EXAMINED

**South Africa:** Natal, Umhlanga (*G. Arnold*).

### *Calyptomyrmex duhun* sp. n.

(Fig. 37, 43)

**HOLOTYPE WORKER.** TL 3.3, HL 0.78, HW 0.76, CI 97, SL 0.48, SI 63, PW 0.54, AL 0.88

Mandibles finely superficially striate. Hair closest to apex on outer margin of clypeal fork elongate and fine, similar in appearance to those projecting from the vertical face of the clypeus below the fork, but shorter. Hairs on clypeal fork behind the apicalmost short and very much stouter, contrasting strongly with it. Maximum diameter of eye 0.08 ( $0.11 \times \text{HW}$ ), much greater than the width of the hairs in the first transverse pronotal row and with  $> 10$  ommatidia. Propodeum in profile with a pair of triangular teeth. Dorsum of head finely and densely irregularly longitudinally rugulose, grading into a loose irregular and broken ruguloreticulum occipitally. Spaces between rugulae with a densely punctulate ground-sculpture. Promesonotal dorsum densely, closely and coarsely irregularly rugulose. Propodeal dorsum transversely concave and conspicuously transversely strongly rugulose, without punctate ground-sculpture. Petiole and postpetiole feebly rugulose dorsally and with weak punctulate to granular ground-sculpture. First gastral tergite with fine superficial shagreening. All dorsal surfaces of head and body except for propodeum with numerous flattened clavate or Indian club-shaped hairs, very conspicuous on the first gastral tergite. Colour dark brown, the gaster with a reddish tint and somewhat lighter.

**PARATYPE WORKERS.** TL 3.2–3.6, HL 0.78–0.84, HW 0.76–0.82, CI 97–98, SL 0.47–0.51, SI 62–63, PW 0.52–0.60, AL 0.88–0.96 (2 measured).

As holotype but propodeal teeth of variable size. Maximum diameter of eye 0.08–0.10 ( $0.10\text{--}0.12 \times \text{HW}$ ).

Holotype worker, **Uganda:** Ft Portal, ii.1948, no. 2095 (*N. A. Weber*) (MCZ, Cambridge).

Paratypes. **Zaire** (= 'B. Congo' on data label): 1 worker, W. side Ruwenzori, ii.1948, no. 2112 (*N. A. Weber*). **Kenya:** 1 worker, Kaimosi Mission, 27 miles (= 43.4 km) NE. of Kisumu, 1650 m, 29.xi.1957 (*E. S. Ross & R. E. Leech*) (MCZ, Cambridge; BMNH).

This is the only member of the *brunneus*-group which has transverse rugose sculpture on the propodeal dorsum. All other species show a fairly conspicuous reticulate-punctate sculpture and, although a few may have some feeble rugulae, these are usually not transverse and are always inconspicuous. Apart from this, *tensus* has a thick apicalmost hair on the clypeal fork, *shasu* has bizarre hairs all over the first gastral sternite, *rennefer* has all clypeal fork hairs simple and also has long narrow body pilosity. The species related to *brunneus* (*clavatus*, *clavisetus*) are smaller and for the most part have the mandibles unsculptured.

### *Calyptomyrmex rennefer* sp. n.

(Fig. 35)

**HOLOTYPE WORKER.** TL 2.9, HL 0.72, HW 0.74, CI 103, SL 0.44, SI 59, PW 0.52, AL 0.80.

Mandibles with fine sculpture basally but this fades out towards the apical (masticatory) margin, leaving a smooth strip. Hair closest to apex on outer margin of clypeal fork, and all other hairs on the clypeal fork, simple, similar in appearance to the elongate hairs which project from the vertical face of the clypeus below the fork, but shorter. Maximum diameter of eye 0.06 ( $0.08 \times \text{HW}$ ), distinctly much greater than the width of the hairs in the first transverse pronotal row and with 10–11 ommatidia. Propodeum in profile armed with a pair of triangular denticles. Petiole node in profile larger than that of postpetiole, in dorsal view the latter slightly broader than the former. Head in dorsal view finely irregularly and quite densely longitudinally

rugulose, the rugulae arising on or just behind the frontal lobes, roughly paralleling the line of the scrobe margin and directed towards the occipital corner. Occipital region of head with some scattered cross-meshes but without a developed reticulum. Spaces between rugulae packed with a fine and very dense reticulate-punctate ground-sculpture, the dorsal surfaces of many of the rugulae with a beaded appearance due to the presence of aligned punctulae upon them. Promesonotal dorsum densely and quite coarsely rugulose, predominantly longitudinally so, but with numerous scattered short cross-meshes. Ground-sculpture as on head but less conspicuous because the rugulae on the promesonotal dorsum are more tightly packed than on the head. Propodeal dorsum densely and strongly reticulate-punctate, without rugulose sculpture. Petiole and postpetiole dorsally predominantly reticulate-punctate and with sparse fine rugulae also present. First gastral tergite very lightly superficially reticulate or reticulate-punctate everywhere. Hairs present and numerous on all dorsal surfaces of the head and body except the propodeum, characteristically shaped, elongate and fine but narrowly clavate apically; those on the first gastral tergite distinctly much longer than the maximum diameter of the eye. Colour uniform dark brown.

PARATYPE WORKERS. TL 2.8–3.0, HL 0.70–0.74, HW 0.72–0.76, CI 100–104, SL 0.40–0.44, SI 54–59, PW 0.50–0.54, AL 0.78–0.86 (8 measured).

Maximum diameter of eye  $0.06 (0.08 \times HW)$ , with 10–14 ommatidia. Mandibles usually as in holotype but in some the sculpture almost completely effaced, the blade virtually smooth. A few weak rugulae, formed by the alignment of the margins of adjacent punctures, may occur on the propodeal dorsum. On the promesonotum the cross-meshes on the dorsum are sometimes almost as strongly developed as the longitudinal rugulae.

Holotype worker, **Zaire**: Kivu, Terr. Lubero, riv. Lubero, 1780 m, 10.vi.1954, coll. Mus. Congo, tamisage de terreau (*R. P. M. J. Celis*) (MRAC, Tervuren).

Paratypes, **Zaire**: 6 workers with same data as holotype; 2 workers, Kivu, Kabare Nyakasiba 2350, xii.1950, forêt de montagne, I.R.S.A.C. -Mus. Congo, récolté dans terreau, au Berlese (*N. Leleup*) (MRAC, Tervuren; BMNH; MCZ, Cambridge; NM, Basle).

An ergatoid female, housed in MRAC, Tervuren, is certainly to be associated with this species. It is extremely ergatoid, with all the characters given above, but is larger, HL 0.82, HW 0.84, AL 0.90, has much larger eyes, maximum diameter 0.14 ( $0.17 \times HW$ ), and has ocelli present. The data on this specimen are: **Zaire**, Kivu, Terr. Lubero, route Kimbulu, 1830 m (ravin), iv.1954, coll. Mus. Congo, tamisage de terreau sous fougères arbor (*R. P. M. J. Celis*).

The form of the pilosity immediately distinguishes *rennefer* from all other known African species. The long narrow hairs with feebly clavate apices are not duplicated in any other species. Coupled with this, *rennefer* is one of the very few species in which all the hairs on the clypeal fork are simple.

This species is one of two African forms in which an ergatoid female is known, the other being *piripilis*. Notes on the known females are given under the discussion of that species.

### *Calyptomyrmex shasu* sp. n.

(Fig. 38)

HOLOTYPE WORKER. TL 3.4, HL 0.84, HW 0.78, CI 93, SL 0.52, SI 67, PW 0.52, AL 0.88.

Mandibles finely and densely longitudinally striate. Hair closest to apex on outer margin of clypeal fork simple, similar in appearance to the long hairs which project from the vertical face of the clypeus below the fork, but shorter. Other hairs on dorsum of clypeal fork stout and clavate, contrasting strongly with the apicalmost. Maximum diameter of eye 0.08 ( $0.10 \times HW$ ), greater than the maximum width of the hairs in the first transverse pronotal row and with about 14 ommatidia. Propodeum in profile armed with a pair of short triangular teeth. Nodes of petiole and postpetiole of approximately equal width in dorsal view, the latter only fractionally broader than the former. Dorsum of head finely and densely longitudinally rugulose, the individual rugulae narrow and somewhat divergent posteriorly. Spaces between the rugulae filled with a very conspicuous, dense reticulate-punctate ground-sculpture. Promesonotal dorsum weakly irregularly rugulose, with irregular open reticular meshes in places. Reticulate-punctate ground-sculpture superficial and much less conspicuous than on the head. Propodeal dorsum reticulate-punctate. Petiole and postpetiole reticulate-punctate dorsally, with vestiges of regular sculpture in places. First gastral tergite only weakly sculptured, with a faint superficial reticular patterning. All dorsal surfaces of head and body except for the propodeum with a dense array of flattened, thickly clavate hairs which are very conspicuous. First gastral

sternite everywhere with hairs similar to those on the tergite. Colour medium brown, varying in shade over the body.

PARATYPE WORKERS. TL 3.3–3.5, HL 0.76–0.86, HW 0.72–0.82, CI 93–95, SL 0.46–0.52, SI 63–68, PW 0.48–0.54, AL 0.80–0.90 (15 measured).

Maximum diameter of eye 0.07–0.08 (0.09–0.11 × HW), with 13–16 ommatidia. Colour varying from fairly light to dark brown. Intensity of sculpture variable, in some the promesonotal rugulae are strong and the weak ground-sculpture virtually effaced. Propodeal teeth usually short and triangular but may be very low and blunt or somewhat elongated to a short triangular point. Variation is common and the two teeth may vary in shape and size on a single specimen.

Holotype worker, **Burundi**: Bujumbura, 1977, no. 1 (*A. Dejean*) (BMNH).

Paratypes. **Burundi**: 8 workers with same data as holotype. **Tanzania**: 3 workers, Kilimanjaro, Marangu, I.R.S.A.C.-Mus. Congo, 2400 m, 20.ii.1956, Mission Zoolog. IRSAC en Afrique orientale P. Basilewsky et N. Leleup, forêt mont., humus (*J. & N. Leleup*). **Uganda**: 4 workers and 1 dealate female, E. Ruwenzori, Kalengire, 2000 m, 14.i.1954, coll. Mus. Congo, dans bois mort (*R. P. M. J. Celis*); 15 workers and 2 females (one alate), E. Ruwenzori, ruiss. Murusege, 2275 m, 25.i.1954, coll. Mus. Congo, dans terreau de bambous (*R. P. M. J. Celis*). **Zaire**: 2 workers, Kivu, Terr. Lubero, route Kimbulu, 1830 m (ravin), iv.1954, coll. Mus. Congo, tamisage de terreau sous fougères arbor. (*R. P. M. J. Celis*); 2 workers, Kivu, t. lubero, rés. forest Biena, 1800 m, 24.vii.1954, coll. Mus. Congo, dans terreau, au Berlese (*R. P. M. J. Celis*); 1 worker, P.N.A., 30.i.-21.ii.1953, Massif Ruwenzori, Kalonge, 2060 m, Ruiss. Karambura affl. Kataulenko, 2225–59 (*P. Vanschuytbroeck & J. Kekenbosch*). (BMNH; MRAC, Tervuren; MCZ, Cambridge; NM, Basle; NM, Bulawayo.)

*C. shasu* is a very distinctive species, immediately characterized by its possession of bizarre hairs all over the first gastral sternite which are similar to those on the first tergite. This is the only known species to show this development; in all others the sternite either lacks hairs similar to those on the tergite or has them restricted to the posterior one-third of the sclerite.

### *Calyptomyrmex tensus* sp. n.

(Figs 31, 40)

HOLOTYPE WORKER. TL 2.5, HL 0.62, HW 0.59, CI 95, SL 0.35, SI 59, PW 0.41, AL 0.64.

Mandibles mostly smooth and shining, with only the faintest vestiges of sculpture in places. Hair closest to apex on outer margin of clypeal fork stout, contrasting with the long fine hairs which project from the face of the clypeus below the fork. Other hairs on clypeal fork behind the apicalmost also stout, similar to the apicalmost hair in construction. Maximum diameter of eye 0.06 (0.10 × HW), greater than the width of the hairs in the first transverse pronotal row and with 9–10 ommatidia. Propodeum in profile armed with a pair of very low but quite broadly triangular denticles. Metapleural lobes strongly prominent, with a conspicuous almost circular thin-spot. Petiole node in profile higher than that of postpetiole. In dorsal view the postpetiole node marginally broader than that of the petiole. Dorsum of head extremely finely longitudinally rugulose, the rugulae for the most part scarcely stronger than the underlying dense reticulate-punctulate ground-sculpture. Promesonotal dorsum finely irregularly rugulose, the rugulae stronger than on the head and forming a loose, open-meshed reticulum on the pronotum. Ground-sculpture finely reticulate-punctulate. Propodeal dorsum densely reticulate-punctate, with a few weak rugulae formed by alignment of the walls of the punctures. Petiole and postpetiole densely reticulate-punctulate with a few very feeble regular vestiges. Base of first gastral tergite superficially punctulate to shagreened, fading out posteriorly. All dorsal surfaces of head and body except for propodeum densely clothed with elongate-spatulate hairs. In dorsal view those on the first gastral tergite much longer than broad and gradually increasing in width from the narrow base to the blunt apex. Colour uniform mid-brown.

Holotype worker, **Uganda**: Ruwenzori Expd., nr Mubuku Rr, c. 1 mile [1.61 km] SE. Ibanda, 30.vii.1952, no. 128, soil and litter under elephant grass (*G. O. Evans*) (BMNH).

This small species, known only from the holotype, is one of five African forms in which the apicalmost hair on the clypeal fork is stout. The other four are *stellatus*, *brevis*, *piripilis* and *arnoldi*. The first of these is isolated from *tensus* by its truly unique pilosity (see description), the next two by their possession of very small eyes which are smaller in diameter than the widths of the hairs in the first pronotal row, and the last named separates from *tensus* on the shape of the bizarre hairs on the first gastral tergite. In *arnoldi* these hairs are short, squat and widely



scattered whilst in *tensus* they are longer, narrower and denser (compare Figs 30, 31). *C. tensus* is quickly separated from other members of the *brunneus*-group as it is the only species within the group bearing a stout apicalmost hair on the clypeal fork.

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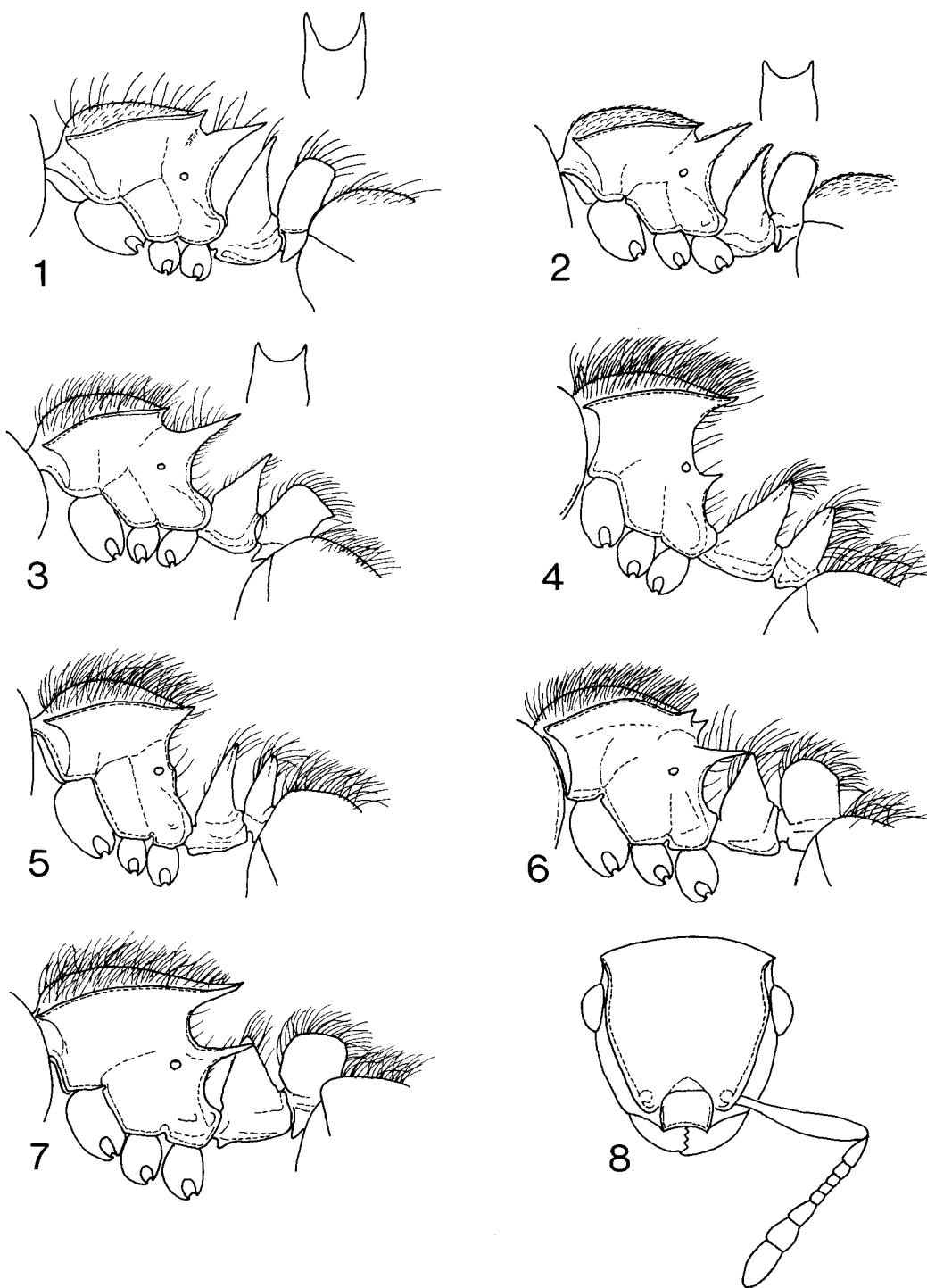
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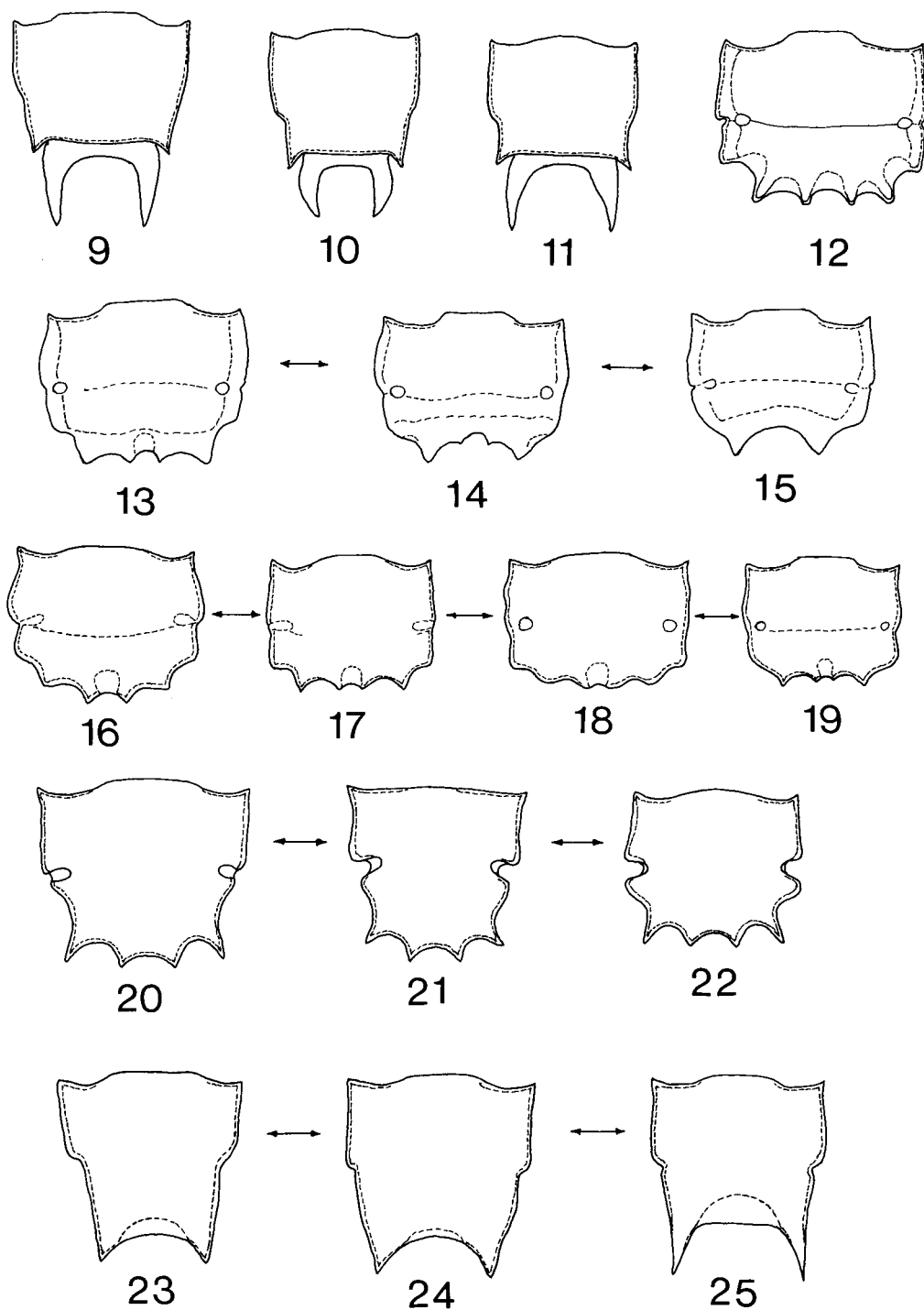
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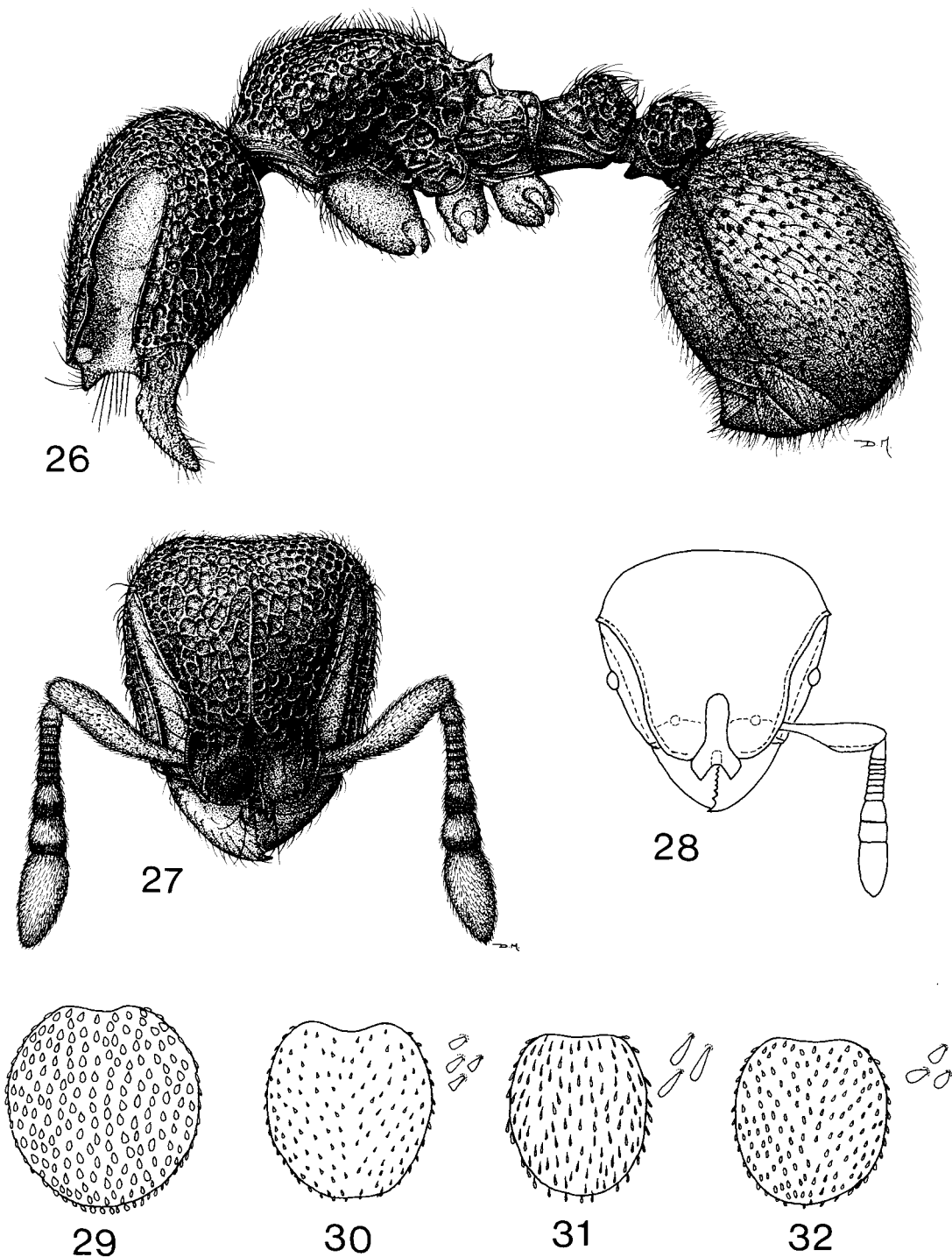
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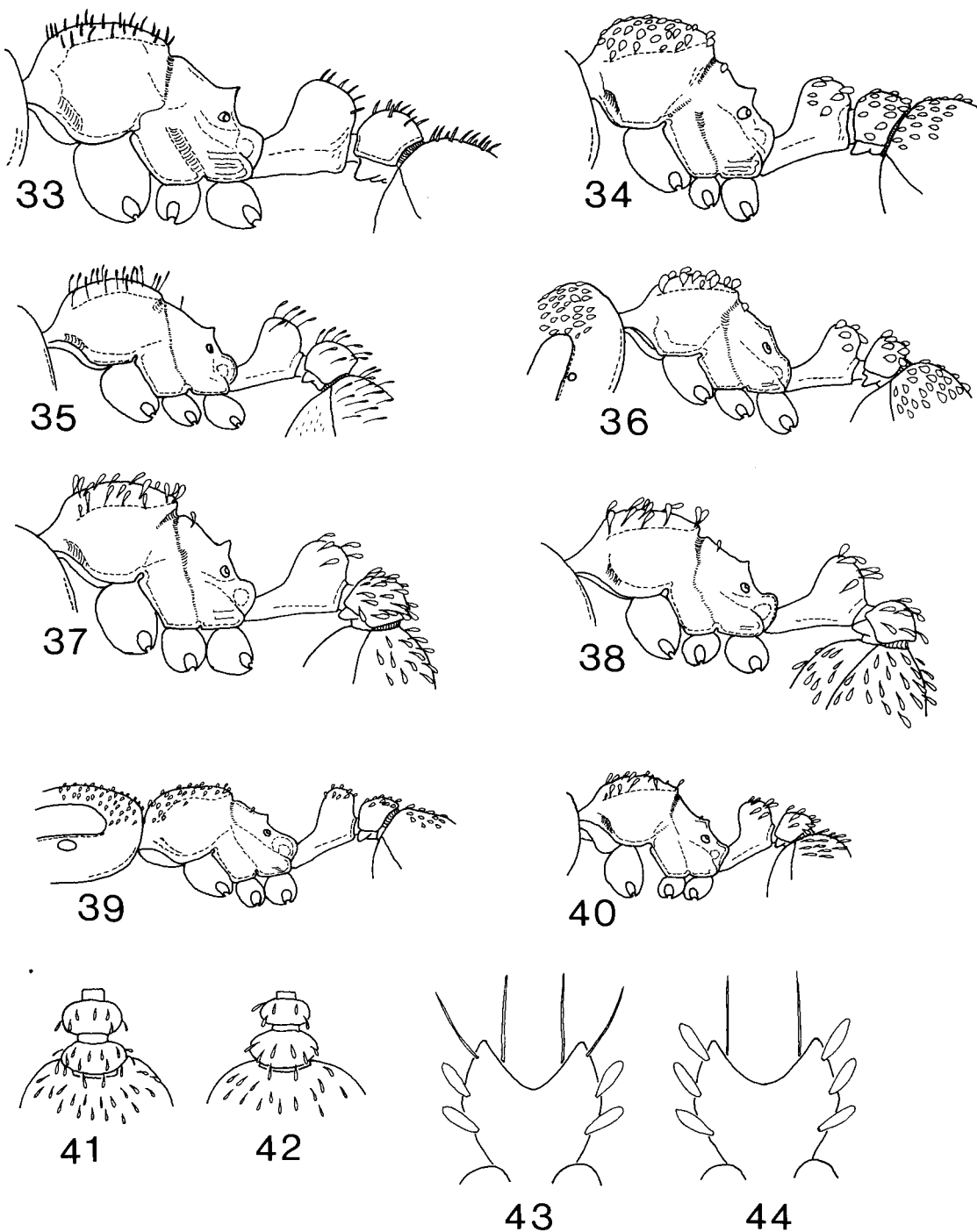
**Figs 1–8** *Meranoplus* workers. 1–7. Alitrunk and pedicel segments of (1) *sthenus*, (2) *glaber*, (3) *spininodis*, offsets show petiole in anterior view, (4) *nanus*, (5) *inermis*, (6) *peringueyi*, (7) *magrettii*. 8, Head of *magrettii*, pilosity omitted.



**Figs 9–15** *Meranoplus* workers. Promesonotal shield of (9) *sthenus*, (10) *glaber*, (11) *spininodis*, (12) *nanus*, (13–15) *clypeatus*, (16–19) *inermis*, (20–22) *peringueyi*, (23–25) *magrettii*; pilosity omitted.



**Figs 26–32** *Dicroaspis* and *Calyptomyrmex* workers. 26, Lateral view of *D. laevidens*. 27, Head of *D. laevidens*. 28, Head of *C. barak*, pilosity omitted. 29–32, First gastral tergite to show pilosity of (29) *C. nummuliticus*, (30) *C. arnoldi*, (31) *C. tensus*, (32) *C. foreli*; offsets of 30–32 show approximate shapes of hairs.



**Figs 33-44** *Calyptomyrmex* workers. 33-40. Alitrunk and pedicel segments of (33) *barak*, (34) *nummuliticus*, (35) *rennefer*, (36) *piripilis*, (37) *duhun*, (38) *shasu*, (39) *arnoldi*, (40) *tensus*. 41, 42. Dorsal view of pedicel segments in (41) *clavatus*, (42) *clavisetus*. 43, 44. Pilosity of clypeal fork (diagrammatic) in (43) *duhun*, (44) *piripilis*.

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