

Ants of the genus *Myrmecia* Fabricius: a preliminary review and key to the named species (Hymenoptera: Formicidae: Myrmeciinae)

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Taxonomic notes, a checklist, and a key to most of the 89 recognized, currently named species of *Myrmecia* are presented. Twenty-seven species or species complexes are discussed in detail, and eight species described as new—*M. acuta* (Western Australia), *M. borealis* (N. Queensland), *M. browningi* (South Australia), *M. erecta* (WA, SA), *M. eungellensis* (N. Qld), *M. fabricii* (N. Qld), *M. loweryi* (New South Wales, Australian Capital Territory), and *M. tridentata* (NSW). Fourteen new synonyms are proposed (senior names listed first): *M. brevinoda* Forel = *M. decipians* Clark = *M. longinodis* Clark; *M. froggatti* Forel = *M. eupoeila* (Clark) = *M. excavata* (Clark) = *M. greavesi* (Clark); *M. fulgida* Clark = *M. suttoni* Clark; *M. harderi* Forel = *M. celaena* (Clark); *M. nigriceps* Mayr = *M. fasciata* Clark; *M. occidentalis* (Clark) = *M. opaca* (Clark); *M. pavidata* Clark = *M. atrata* Clark; *M. rowlandi* Forel = *M. cordata* Clark = *M. cardigaster* Brown; *M. testaceipes* (Clark) = *M. dixonii* (Clark); *M. vindex* F. Smith = *M. vindex basirufa* Forel. *M. athertonensis* Forel and *M. fuscipes* Clark are reinstated from junior synonymy, and 4 previous subspecies, *M. chasei ludlowi* Crawley, *M. flavicomma minuscula* Forel, *M. maura formosa* Wheeler and *M. michaelsoni queenslandica* Forel, are raised to species.

KEYWORDS: *Myrmecia*, Myrmeciinae, Formicidae, ants, taxonomy, Australia.

Introduction

Ants of the genus *Myrmecia* are the sole living examples of the formicid subfamily Myrmeciinae. They are among the most characteristic, representative and popularly familiar of all Australian insects (often painfully so, because of their propensity to sting).

Apart from one apparently endemic New Caledonian species, *M. apicalis* Emery, the genus is found naturally only in Australia. In addition, an introduced population of the eastern Australian *M. brevinoda* Forel has been reported from Auckland, New Zealand (Brown, 1958; Keall, 1981).

The first named species, *Myrmecia gulosa* (Fabricius, 1775), was one of the earliest Australian animals to be taxonomically described. Its holotype was collected at Botany Bay by Joseph Banks or Daniel Solander while ashore from James Cook's *Endeavour* during the first ever week of recorded eastern Australian terrestrial scientific exploration (28 April to 5 May 1770).

Two centuries later *M. gulosa* furnished the symbol of the 14th International Congress of Entomology, which assembled at Canberra in 1976. *Myrmecia* has also provided the logo of the Australian Entomological Society, and the title of its newsletter.

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Myrmecia species are distinctive in appearance, and are easily recognized by their usually strongly toothed, forwardly directed, long mandibles; their very large, strongly convex, anteriorly positioned eyes; articulated pronotum; paired spiracular lobes situated dorsolaterally on the metanotal area of the mesosoma; tubulate abdominal segment IV, with posteriorly constricted abdominal segment III forming a postpetiole; and powerfully functional sting.

The Australian check-lists of Taylor and D. R. Brown (1985) and Taylor (1987) listed 91 species names under *Myrmecia* (excluding junior synonyms, and including 5 subspecies), each placed according to its most recently published taxonomic assignment. Despite monographic studies by Clark in 1943 and 1951, and critical reviews of his work by W. L. Brown (1953a, b), the current species-level classification of the genus is not satisfactory. Clark's keys are largely unworkable, and his species concepts and descriptions undependable. The collections with which he worked were poorly representative compared to those available today, and this contributed importantly to the problems evident in his papers. Only two new species, the workerless parasite *M. inquilina* Douglas and Brown (1959), and the karyologically exceptional *M. croslandi* Taylor (1991) have been described since 1953. There have been no other recent formal taxonomic changes in the genus apart from some revised nomenclatural combinations stemming from Brown's (1953a) junior synonymy of *Promyrmecia* Emery with *Myrmecia* (*Promyrmecia* was recognized as a separate genus by Clark) (Brown, 1953a, b; Taylor and D. R. Brown, 1985).

Thus, because of the difficulties encountered when attempting to identify subject specimens, myrmecologists and other biologists seeking to work with these prominent ants face a substantial taxonomic impediment to their studies.

In the meantime, several clearly undescribed species have accumulated in the considerable holdings of the Australian National Insect Collection (ANIC) and other museums, and it has been realized that a number of named species require taxonomic attention.

The resolute collecting activities and field observations of Rev. B. B. Lowery, SJ have been especially important in these regards. His donations of *Myrmecia* material to the ANIC cover various regions of Australia, and include many long series, as well as other important acquisitions—especially nest series, often including queens and males, and samples of related species taken in sympatric association.

Graeme P. Browning (1987) provided much information on the taxonomy, karyology and male genitalic characters of *Myrmecia*, in an unpublished Ph.D. thesis. He outlined a revision of the genus, recommended several possible synonymies, and indicated the existence of undescribed species. At the conclusion of Browning's studies his large collection, including many voucher specimens related to his observations, was donated to the ANIC (under the Australian Government's *Tax Incentives for the Arts Scheme*). The Browning collection has proved valuable in illuminating his work, and as a major general addition to available public holdings of *Myrmecia* material. We acknowledge Browning's important contribution, and are especially grateful for his advice, and the generous provision of access to his unpublished findings.

It is with special pleasure that we dedicate the new species *M. loweryi* and *M. browningi* to Fr Lowery and Dr Browning.

Recent collaborative studies by Japanese and Australian myrmecologists on the karyology of *Myrmecia* have yielded much valuable information on species limits, taxonomically relevant characters, etc., and have themselves challenged a major taxonomic impediment (Imai *et al.*, 1977, 1988, 1990; Imai and Taylor, 1989; Taylor,

1991). The present paper was conceived partly to serve the taxonomic needs of this continuing genetic research, which has demonstrated to date that, in light of the known chromosome numbers of component species, *Myrmecia* is the most karyologically diverse of all relevantly studied animal genera. *M. croslandi* (previously called *M. pilosula*) $n = 1$) is the only known animal in a phylum higher than the Nematoda which has a single pair of chromosomes, and the range of known chromosome numbers in *Myrmecia* ($2n = 2$ to $2n = 84$) is almost that of the whole order Hymenoptera (with the sole exception of the related Australian ant *Nothomyrmecia macrops* Clark, which has $2n = 94$), and significantly close to the total range known for the Phylum Arthropoda (Imai *et al.*, 1990).

We have also responded to a perceived need for improved taxonomic coverage of *Myrmecia* due to its notorious capacity to induce severe allergic reactions, occasionally even death, in stung humans (Taylor, 1989).

This paper considers the species-level classification of *Myrmecia*, and includes nomenclatural changes, descriptions of 8 new species, and comments on others. Eighty-nine taxa of the nomenclatural species group are recognized and listed, and keys to their identification, either individually or as components of particular species complexes, are presented. The last remaining subspecies in the genus are eliminated, either by synonymy or elevation to species rank.

An antecedent historical review of past generic and species-group-level classifications of the presently constituted genus *Myrmecia* was published by Ogata (1991), with a revised species-group classification, and analyses of the possible phylogenetic relationships among the 9 recognized species groups.

Most of the nomenclatural arrangements reviewed here, the illustrations, and the key to species presented below, result directly from work by K.O. His original manuscript has been edited and prepared for publication by R.W.T., with some revision and additions, especially in the sections dealing with the *auriventris* subgroup of the *gulosa* species group and the *urens* group, which have been substantially taxonomically reinterpreted. The work is preliminary, since we are aware of further undescribed species; that some of the taxa recognized here require more detailed analysis than has now been achievable, with further possible changes in synonymy; that some of the variable 'species' recognized might be composite; and that some standing junior synonymys could represent 'good species'. Also, a considerable number of relevant spirit-stored holdings in the ANIC and Lowery collections remain to be mobilized. The project was designed to provide a foundation for further projected postdoctoral studies by K.O., which unfortunately could not be continued because of other, overseas, professional obligations.

Taxonomic work is consecutive, rarely final, and we have elected to make these results, however preliminary, available, despite our expectations for further direct work on, and changes to, *Myrmecia* taxonomy.

The taxonomic changes proposed here are summarized above in the abstract.

Procedural matters

Aggregate nomenclature

On several occasions we utilize or recommend the provisions of Article 6 of *The International Code of Zoological Nomenclature* (3rd edn, 1985). These regulate the formation of aggregate names for complexes of related species, by citation of the senior relevant epithet in parenthesis. *Myrmecia (urens)*, for example, comprises the 7

currently intractable named taxa of the *M. urens* species group, apart from *M. loweryi* sp. nov. We are unable confidently to determine the number of biological species in this complex, which could include more than the available names, or any number down to one, as far as revealed by working specimens (including most relevant types) and data. It is not possible therefore to use any of these names for species identification, and the aggregate form *M. (urens)* is thus recommended.

Use of the provisions of *Article 6* has been firmly established for the *Myrmecia (pilosula)* complex in the karyological work of Imai, Taylor and co-authors, referred to above.

Abbreviations

Abbreviations used for institutions are:

AMSA	Australian Museum, Sydney
ANIC	Australian National Insect Collection, Canberra
BMNH	Natural History Museum, London, UK
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, Mass., USA
MHNG	Museum d'Histoire Naturelle, Geneva, Switzerland
MVMA	Museum of Victoria, Melbourne
NHMW	Naturhistorisches Museum, Vienna, Austria
OXUM	University Museum, Oxford, UK
QMBA	Queensland Museum, Brisbane
SAMA	South Australian Museum, Adelaide
SMNS	Städtliches Museum für Naturkunde, Stuttgart, Germany
WAMP	Western Australian Museum, Perth
ZMHB	Museum für Naturkunde, Humboldt Universität, Berlin, Germany

The following initials are used for the collectors indicated: *BBL*=B. B. Lowery, *EFR*=E. F. Riek, *GBM*=G. B. Monteith, *GPB*=G. P. Browning, *JC*=J. Clark, *PJMG*=P. J. M. Greenslade, *RWT*=R. W. Taylor, *TG*=T. Greaves, *WWF*=W. W. Froggatt.

States and territories of Australia are abbreviated ACT, NSW, NT, Qld, SA, Tas, Vic.

Distribution records are given using 'short' 1-degree geographical mapping coordinates, following Taylor (1987). The citation (22/149), for example, indicates the 1-degree mapping grid cell 22°S × 149°E.

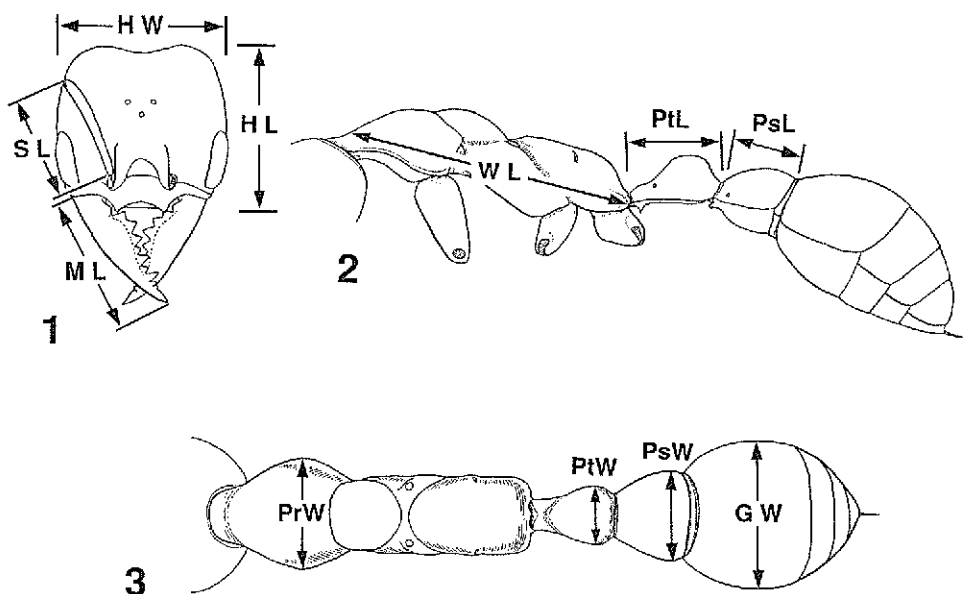
Other abbreviations, usually taken from collection labels, are: CP=Conservation Park; HS=Head Station; NP=National Park; SF=State Forest.

Measurements and indices

All measurements are given in mm, with the following conventions:

Head width (HW): Maximum width of head in full-face view, measured behind the eyes and excluding them (Fig. 1).

Head length (HL): Maximum length of head, measured in full-face view, from the midpoint of the anterior clypeal border (or, when the clypeus has anterior projections, from the midpoint of a transverse line connecting their anteriormost points) to the midpoint of the occipital margin of the head, excluding the occipital carina (or, when the occipital margin is concave, to a transverse line connecting its posteriormost extensions) (Fig. 1).



FIGS 1-3. Parameters of measurements used in this study: Fig. 1 *M. aberrans*, head, frontal view: HL = head length; HW = head width; ML = mandible length; SL = scape length. Fig. 2. *M. nigrocincta*, lateral view. PsL = postpetiole length; PtL = petiole length; WL = Weber's length of mesosoma. Fig. 3. *M. nigrocincta*, dorsal view. GW = gastral width; PrW = pronotal width; PsW = postpetiole width; PtW = petiole width.

Cephalic index (CI): $HW/HL \times 100$.

Scape length (SL): Maximum chord length of the scape, excluding its basal articulation condyle (Fig. 1).

Scape index (SI): $SL/HW \times 100$.

Mandible length (ML): Maximum chord length of the mandible, measured in full-face view from the outer end of its basalmost portion to the tip of its apical tooth (Fig. 1).

Mandibulo-cephalic index (MI): $ML/HL \times 100$.

Pronotal width (PrW): Maximum width of the pronotum in dorsal view (Fig. 3).

Weber's length of the mesosoma (WL): Diagonal length of the mesosoma in lateral view, measured from the base of the anterior collar of the pronotum to the posterior ventral corner of the mesosoma (Fig. 2).

Petiole width (PtW): Maximum width of the petiole in dorsal view (Fig. 3).

Petiole length (PtL): Length of the petiole in lateral view, measured from the anteroventral base of the peduncle to the dorsal posterior margin of the petiole (Fig. 2).

Postpetiole width (PsW): Maximum width of the postpetiole in dorsal view (Fig. 3).

Postpetiole length (PsL): Maximum length of the postpetiole in lateral view, from the midpoint of the anterior margin (excluding the articular constriction) to the midpoint of the posterior margin (Fig. 2).

Gastral width (GW): Maximum width of the first gastral segment (abdominal segment IV), measured in dorsal view.

Postpetiolar index (PsI): $PsW/GW \times 100$.

Synonymic list of *Myrmecia* species

Asterisks indicate taxa which are discussed in further detail below. For publication details etc. concerning other species see Taylor and D. R. Brown (1985) or Taylor (1987).

The *M. aberrans* species group

- aberrans* Forel, 1900
- formosa* Wheeler, 1933 stat. nov.
- hematosticta* Wheeler, 1933
- **froggatti* Forel, 1910
- taylori* Wheeler, 1933
- sericata* Wheeler, 1933
- eupoecila* (Clark, 1943) syn. nov.
- greavesi* (Clark, 1943) syn. nov.
- excavata* (Clark, 1951) syn. nov.
- maura* Wheeler, 1933
- nobilis* (Clark, 1943)

The *M. cephalotes* species group

- callima* (Clark, 1943)
- **cephalotes* (Clark, 1943)
- hilli* (Clark, 1943)

The *M. gulosa* species group

- analis* Mayr, 1862
- atriscapa* Crawley, 1925
- arnoldi* Clark, 1951
- * *athertonensis* Forel, 1915 stat. nov.
- * *auriventris* Mayr, 1870
- * *borealis* sp. nov.
- * *brevinoda* Forel, 1910
- gigas* Forel, 1913
- eudoxia* Forel, 1915
- decipians* Clark, 1951 syn. nov.
- longinodis* Clark, 1951 syn. nov.
- * *browningi* sp. nov.
- comata* Clark, 1951
- desertorum* Wheeler, 1915
- lutea* Crawley, 1922
- princeps* Clark, 1951
- dimidiata* Clark, 1951
- * *erecta* sp. nov.
- esuriens* Fabricius, 1804
- tasmaniensis* F. Smith, 1858
- walkeri* Forel, 1893
- * *eungellensis* sp. nov.
- * *fabricii* sp. nov.

- ferruginea* Mayr, 1876
- flavicoma* Roger, 1861
- forceps* Roger, 1861
 - obscuriceps* Viehmeyer, 1924
 - singularis* Clark, 1951
- forficata* (Fabricius, 1787)
 - lucida* Forel, 1893
 - rubra* Forel, 1910
- * *fulgida* Clark, 1951
 - suttoni* Clark, 1951 syn. nov.
- * *fuscipes* Clark, 1951 stat. nov.
- gratiosa* Clark, 1951
- gulosa* (Fabricius, 1775)
 - obscurior* Forel, 1922
- hirsuta* Clark, 1951
- inquilina* Douglas & Brown, 1959
- midas* Clark, 1951
- * *minuscule* Forel, 1915 stat. nov.
- mjobergi* Forel, 1915
- * *nigriceps* Mayr, 1862
 - fasciata* Clark, 1951 syn. nov.
- nigriscapa* Roger, 1861
- * *pavida* Clark, 1951
 - atrata* Clark, 1951 syn. nov.
- picticeps* Clark, 1951
- pulchra* Clark, 1929
 - crassinoda* Clark, 1934
 - fallax* Clark, 1951
 - murina* Clark, 1951
- pyriformis* F. Smith, 1858
- sanguinea* F. Smith, 1858
- regularis* Crawley, 1925
- * *rowlandi* Forel, 1910
 - malandensis* Forel, 1915
 - cardigaster* Brown, 1953 syn. nov.
 - cordata* Clark, 1951
- rubripes* Clark, 1951
- rufinodis* F. Smith, 1858
- gracilis* Emery, 1898
- simillima* F. Smith, 1858
 - crudelis* F. Smith, 1858
 - nigriventris* Mayr, 1862
 - spadicea* Mayr, 1862
 - affinis* Mayr, 1862
 - tricolor* Mayr, 1862
 - paucidens* Forel, 1910
 - rogeri* Emery, 1914
- subfasciata* Viehmeyer, 1924
- tarsata* F. Smith, 1858

* *tridentata* sp. nov.

* *vindex* F. Smith, 1858

vindex basirufa Forel, 1907 syn. nov.

The *M. mandibularis* species group

fulviculis Forel, 1913

fulvipes Roger, 1861

femorata Santschi, 1928

barbata Wheeler, 1933

gilberti Forel, 1910

regina Santschi, 1928

luteiforceps Wheeler, 1933

mandibularis F. Smith, 1858

aerorufa Forel, 1910

postpetiolaris Wheeler, 1933

coelatinoda Wheeler, 1933

laevinodis (Clark, 1943)

piliventris F. Smith, 1858

rectidens Forel, 1910

potteri (Clark, 1951)

The *M. nigrocincta* species group

flammicollis Brown, 1953

nigrocincta F. Smith, 1858

petiolata Emery, 1895

The *M. picta* species group

fucosa Clark, 1934

picta F. Smith, 1858

The *M. pilosula* species group

apicalis Emery, 1883

chasei Forel, 1894

mediorubra Forel, 1910

chrysogaster (Clark, 1943)

croslandi Taylor, 1991

cydista (Clark, 1943)

dispar (Clark, 1951)

elegans (Clark, 1943)

* *harderi* Forel, 1910

scabra (Clark, 1943)

maloni (Clark, 1943)

celaena (Clark, 1943) syn. nov.

* *ludlowi* Crawley, 1922 stat. nov.

michaelseni Forel, 1907

perthensis Crawley, 1922

- * *occidentalis* (Clark, 1943)
 - opaca* (Clark, 1943) syn. nov.
 - pilosula* F. Smith, 1858
 - ruginoda* (F. Smith, 1858)
- * *queenslandica* Forel, 1915 stat. nov.
 - overbecki* Viehmeyer, 1924
 - rugosa* Wheeler, 1933
 - ruginodis* (Clark, 1943)
- varians* Mayr, 1876
 - rufonigra* (Crawley, 1921)
 - wilsoni* (Clark, 1943)
 - shepherdi* (Clark, 1943)
 - goudiei* (Clark, 1943)
 - marmorata* (Clark, 1951)

The *M. tepperi* species group

- * *acuta* sp. nov.
 - clarki* Crawley, 1922
- * *swalei* Crawley, 1922
 - tepperi* Emery, 1898
- * *testaceipes* (Clark, 1943)
 - dixonii* (Clark, 1943) syn. nov.

The *M. urens* species group

- * *loweryi* sp. nov.
- * *urens* Lowne, 1865
 - pumilio* Mayr, 1866
 - dichospila* Clark, 1938
 - exigua* (Clark, 1943)
 - infima* Forel, 1900
 - nigra* Forel, 1907
 - rubicunda* (Clark, 1943)

Preliminary key to the species of *Myrmecia* (workers)

Terminology for geographical divisions is based on that used by Taylor and D. R. Brown (1985—see their map 1, page iv). New distributional records are indicated with an asterisk. Characters used in the initial key to species groups are illustrated in Ogata (1991). Aggregate nomenclature is indicated by species names in parenthesis (see explanation above).

The species groups
(after Ogata, 1991)

1	Occipital carina present	2
—	Occipital carina lacking	4
2(1)	Subapical portion of mandible with a small to minute supplementary ventral tooth below the main series	<i>M. gulosa</i> group
—	Subapical portion of a mandible with a single, unsupplemented row of teeth	3

- 3(2) Genal furrow present *M. nigrocincta* group
 - Genal furrow absent *M. urens* group
- 4(1) Anterior margin of clypeus extended forwards as a pair of strong, bilateral,
 obtusely triangular projections, which conceal the basal margin of the labrum
 in facial view *M. aberrans* group
 - Anterior margin of clypeus not strongly extended; basal margin of labrum usually
 clearly visible in facial view 5
- 5(4) Posterior tibial spur of hind leg a simple spine-like process *M. cephalotes* group
 - Posterior tibial spur of hind leg distinctly pectinate 6
- 6(5) Subapical portion of mandible with a single row of teeth; head bicoloured (anterior
 section yellow, remainder brown) *M. picta* group
 - Subapical portion of mandible with a supplementary ventral tooth below the
 normal series; head essentially uniformly coloured 7
- 7(6) Dentition strongly developed along entire inner margin of mandible
 *M. pilosula* group
 - Sub-basal portion of mandible with the teeth reduced, very small, usually somewhat
 spaced, and often reclinate; apical teeth longer, more erect, and sometimes
 clustered 8
- 8(7) Clypeus with distinctly long, forwardly directed hairs, reaching to about half the
 length of the mandibles, or further *M. mandibularis* group
 - Clypeus lacking hairs of such length *M. tepperi* group

Species of the *M. aberrans* group

- 1 Head capsule essentially uniformly blackish-brown to black 2
 - Head capsule more or less uniformly red, or bicoloured blackish-brown and red 4
- 2(1) Dorsum of mesosoma sectionally bicoloured, the mesonotum blackish-brown to
 black, the pronotum and propodeum red (S. Gulfs; SA) *M. aberrans* Forel
 - Dorsum of mesosoma wholly red, yellowish-red or blackish-brown to black 3
- 3(2) Mesosoma wholly blackish-brown to black; standing hairs on postpetiole short and
 sparse, those on its anterior margin shorter than the spaces separating them
 (Murray-Darling basin; NSW, ACT*) *M. maura* Wheeler
 - Mesosomal dorsum red or yellowish-red; standing hairs on postpetiole short but
 less sparse, those on its anterior margin longer than their interspaces (SE coastal,
 Murray-Darling basin; Vic) *M. nobilis* (Clark)
- 4(1) Gaster densely pubescent, the surface opaque; standing hairs on anterior margin of
 postpetiole longer than their interspaces (NE coastal, Murray-Darling basin;
 Qld, NSW) *M. froggatti* Forel
 - Gaster sparsely pubescent, the surface shining; standing hairs on anterior margin of
 postpetiole shorter than their interspaces (Murray-Darling basin; NSW)
 *M. formosa* Wheeler

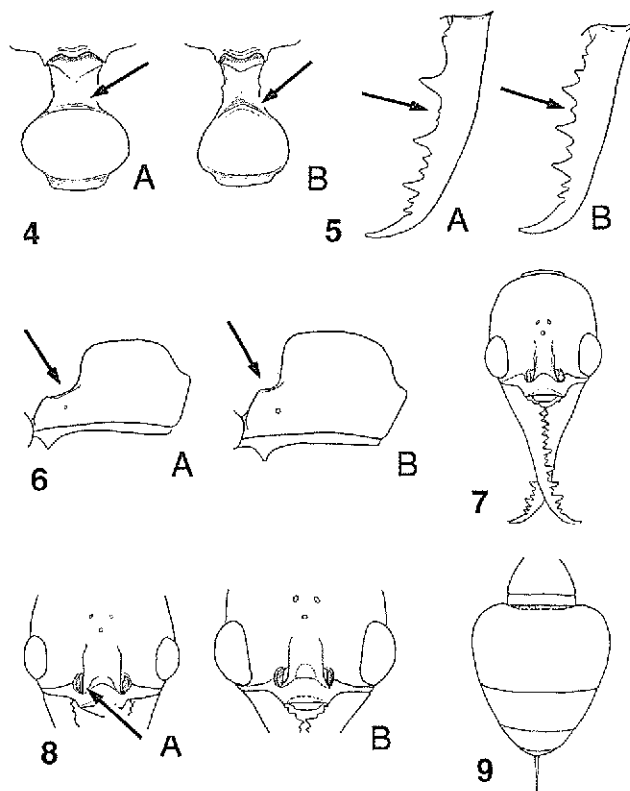
Species of the *M. cephalotes* group

- 1 First gastral segment distinctly dark brown, contrasting with the orange-coloured
 postpetiole (Murray-Darling Basin*, Lake Eyre basin; NSW*, SA)
 *M. cephalotes* (Clark)
 - First gastral segment orange-brown, coloured like the postpetiole 2
- 2(1) Entire gaster reddish-brown; mandibles broader, their outer borders convex
 (Murray-Darling basin, Western Plateau*, SW coastal*; Vic, SA*, WA*, NT*)
 *M. callima* (Clark)
 - Apical 2 segments of gaster blackish, the rest light reddish brown; mandibles slender,
 their outer borders essentially straight (Lake Eyre basin; NT) *M. hilli* (Clark)

Species of the *M. gulosa* group

Note: *M. inquilina* Douglas and Brown is excluded because it is a workerless parasite known only from the female. *M. ferruginea* Mayr and *M. subfasciata* Viehmeyer are not included because we have been unable to confirm their true identities using type material.

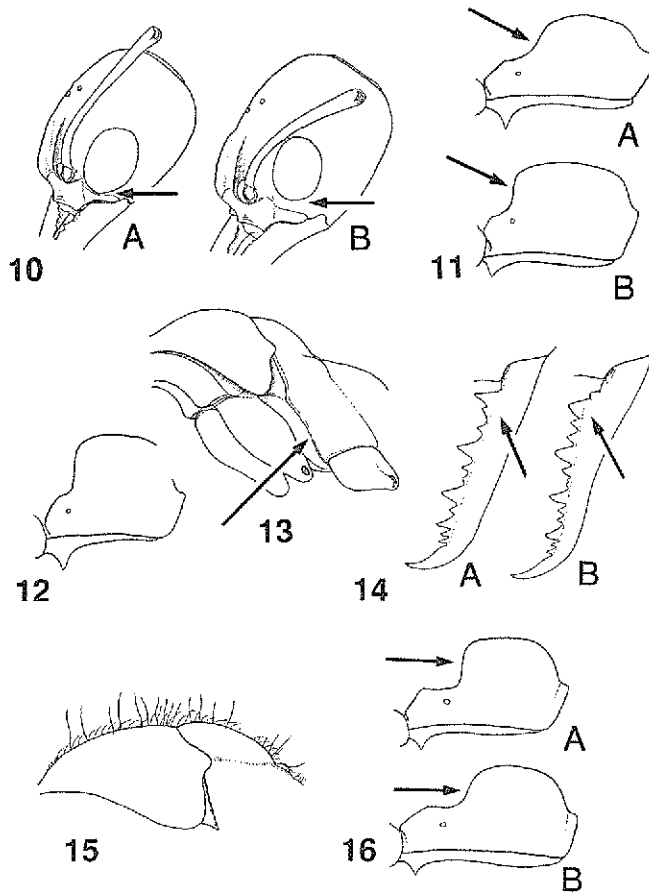
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|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---|
| 1 | Petiolar node subrectangular in dorsal view, with the anterior margin broadly rounded, its mid section more or less transverse, body generally dark blackish-brown, the postpetiole contrasting bright reddish-brown (Fig. 4 A; Tas, probably endemic) | <i>M. esuriens</i> Fabricius | |
| - | Petiolar node subtriangular in dorsal view, its sides more or less strongly anteriorly convergent, anterior margin at least narrowly rounded, often more or less pointed, colouration usually very different (Fig. 4 B; mainland Australia, etc.) | | 2 |
| 2(1) | Mandibles each with 3 enlarged teeth apart from the apical one (Fig. 5) | | 3 |
| - | Mandibles each with 4 or more enlarged teeth apart from that at the apex. | | 9 |
| 3(2) | Space between basalmost and next large mandibular teeth dentate or nearly so (Fig. 5 A); outer borders of mandibles strongly and continuously convex; frontal carinae somewhat divergent anteriorly in facial view (SE coastal, S Gulfs, W Plateau* and SW coastal*; NSW, Vic. SA, WA) | <i>M. forceps</i> Roger | |
| - | Space between basalmost and next large mandibular teeth with one or more smaller teeth, like that or those between the 2nd and 3rd large teeth (Fig. 5 B); outer borders of mandibles not strongly and continuously convex, straight to feebly concave or sinuous in outline; frontal carinae less divergent anteriorly in facial view (<i>M. auriventris</i> subgroup). | | 4 |
| 4(3) | Mesosoma basically uniform in colour, at most only vaguely flushed with slightly darker or lighter patches—not distinctly bicoloured, with sections defined more or less by its sclerites; pronotal and propodeal dorsa thus almost identical in coloration | | 5 |
| - | Mesosoma distinctly bicoloured, with clearly contrasting sections more or less defined by its sclerites; the pronotum in dorsal view dark mahogany to blackish-brown, the propodeal dorsum bright reddish-brown | | 7 |
| 5(4) | Sculpturing of pronotum only about as intense as that of mesonotum, petiolar node very lightly sculptured, its dorsum essentially smooth and shining—a species known only from the Mt Warning (28/153) area, NSW (Figs 36–38; SE coastal; NSW) | <i>M. tridentata</i> sp. nov. | |
| - | Sculpturation relatively strong, that of pronotum distinctly more intense than on mesonotum; petiolar node distinctly rugose—taxa known only from the Eungella (21/148) area, NE Qld | | 6 |
| 6(5) | Occipital carina vestigial at the midline, though more or less distinct laterally—as a result the median frontal and occipital sections of the cranium are separated by a narrowly rounded, acarinate border; petiolar peduncle relatively very short, its free dorsum (excluding the frontal depressed section) in profile only about half as long as the height of the anterior face of the node (Fig. 6 B; NE coastal; Qld) | <i>M. fabricii</i> sp. nov. | |
| - | Occipital carina entire, sharply defined at the midline; petiolar peduncle relatively long, its free dorsum in profile approximately as long as the height of the anterior face of the node (Fig. 6 A; NE coastal; Qld) | <i>M. eungellensis</i> sp. nov. | |
| 7(4) | Anterior coxae (and legs in general) light reddish-brown, contrasting sharply with the dark mahogany to blackish-brown pronotum; propodeal dorsum rugose to striate-rugose, the sculpturing at most with only a weak transverse trend (NE coastal; Qld) | <i>M. auriventris</i> Mayr | |
| - | Anterior coxae (and most other sections of legs) dark mahogany to blackish-brown, coloured similarly to pronotum; propodeal dorsum transversally striate-rugose, the transversity distinct | | 8 |



FIGS 4-9. Characters of *Myrmecia gulosa*-group species (relevant key couplets indicated thus (2)): Fig. 4 (1): petiolar node, dorsal view: A, *M. esuriens*; B, *M. forficata*. Fig. 5 (3): left mandible, dorsal view: A, *M. forceps*; B, *M. auriventris*. Fig. 6 (6): petiole, lateral view: A, *M. eungellensis*; B, *M. fabricii*. Fig. 7 (9): head, frontal view. *M. mjobergi*. Fig. 8 (10): frontal carinae: A, *M. comata*; B, *M. desertorum*. Fig. 9: gaster, dorsal view, *M. cardigaster* holotype (a junior synonym of *M. rowlandi*).

- 8(7) Antennae dark mahogany-brown, somewhat like the cranium in colour, distinctly darker than the golden-brown mandibles; mes- and metepisterna and much of anterior part of lateral wall of propodeum dark brown, like the pronotum (NE coastal; Qld) *M. athertonensis* Forel
- Antennae golden-brown, similar in colour to mandibles and contrasting with the much darker cranium; mesepisternum usually reddish-brown, like propodeal dorsum—occasionally partly or even entirely dark brown, like pronotum; propodeum entirely reddish-brown (NE coastal; Qld) *M. borealis* sp. nov.
- 9(2) Larger teeth on mandible, apart from the apical denticle, numbering 6 or more; head distinctly longer than broad (CI < 90); mandibles extremely long (MI > 110, often > 120) (Fig. 7; NE coastal; Qld) *M. mjobergi* Forel
- Larger teeth on mandible, apart from the apical denticle, numbering 4 or 5; head as long as broad or almost so (CI > 90); mandibles at most slightly longer than head (MI never > 120) 10
- 10(9) Dorsal edges of frontal carinae barely anteriorly divergent (except the portion from the middle to the front of the antennal lobes) (Fig. 8 A) 11
- Dorsal edges of frontal carinae distinctly to strongly anteriorly divergent (Fig. 8 B) 16

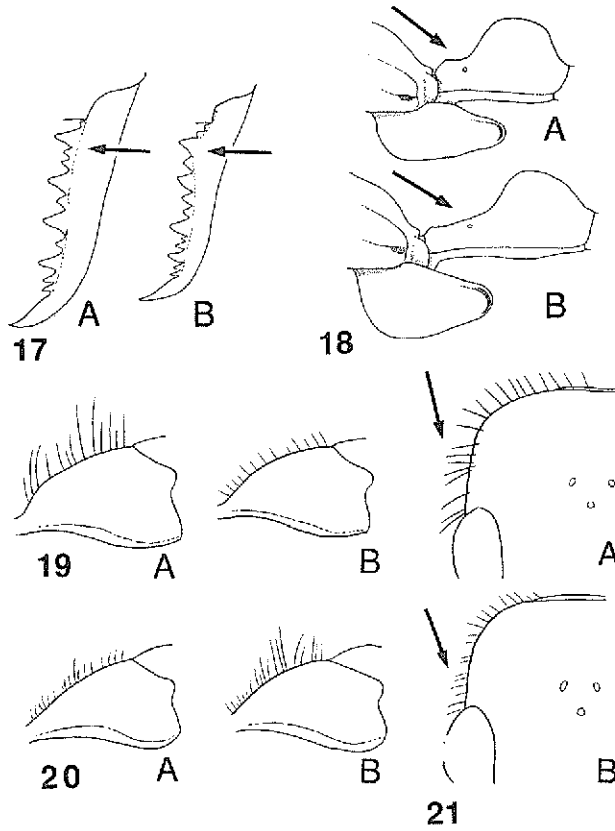
- 11(10) Pronotum reddish brown 12
 - Pronotum dark chocolate brown to black 15
- 12(11) Mandibles relatively darkly coloured, concolorous with cranium 13
 - Mandibles yellowish, distinctly lighter than cranium 14
- 13(12) Eyes close to posterior margin of clypeus, space between anterior margin of eye and posterior margin of clypeus shorter than lateral length of clypeus (Fig. 10 A; SE coastal; NSW) *M. midas* Clark
 - Eyes more distant from posterior margin of clypeus, space between anterior margin of eye and posterior margin of clypeus as long as lateral length of clypeus (Fig. 10 B; NE coastal, SE coastal*; Qld, NSW*) *M. comata* Clark
- 14(12) Dorsal median portion of 2nd and 3rd gastral segments with dense, distinct, short, yellowish, velvety pubescence (NE coastal; Qld) *M. minuscula* Forel
 - Dorsal median portion of 2nd and 3rd gastral segments without such pubescence (NE coastal; Qld) *M. flavicoma* Roger
- 15(11) Anterior face of petiolar node inclined posteriorly (Fig. 11 A); dorsal surface of gaster pubescent; gaster entirely blackish (NE coastal; Qld) *M. rowlandi* Forel
 - Anterior face of petiolar node vertical (Fig. 11 B); dorsal surface of gaster not pubescent; apical portion of gaster yellowish red (NE coastal, SE coastal, Murray-Darling basin; Qld, NSW, ACT, Vic) *M. tarsata* F. Smith
- 16(10) Anterior peduncle of petiole shorter than length of anterior face of petiolar node in profile (Fig. 12); anteroventral ridge of mesepisternum usually complete (Fig. 13) (SE coastal, Murray-Darling basin; NSW*, Vic) *M. pulchra* Clark
 - Anterior peduncle of petiole usually longer (occasionally a little shorter) than height of anterior face of petiolar node in profile; anteroventral ridge of mesepisternum incomplete 17
- 17(16) Mandibles medium reddish-brown to dark brown, approximately concolorous with cranium 18
 - Mandibles light yellowish- to reddish-brown, distinctly lightly coloured compared to cranium 25
- 18(17) Mandibular shaft straight, even in width, without a narrowed base and broadened sub-basal area (Fig. 14 A) (SE coastal, S Gulfs; NSW, Vic, SA) *M. simillima* F. Smith (part)
 - Mandibular shaft broadened at basal 1/4, and with a narrowed base (Fig. 14 B) 19
- 19(18) Body hairs abundant, sinuous and long (Fig. 15); those on pronotum longer than 1st funicular segment (Murray-Darling basin; NSW*, Vic) *M. hirsuta* Clark
 - Body hairs sparse, straight and short; those on pronotum generally shorter than 1st funicular segment 20
- 20(19) Apex of gaster reddish to yellowish 21
 - Apex of gaster dark brown to blackish-brown 22
- 21(20) Lateral surfaces of mesepisternum and propodeum at most obscurely sculptured, largely smooth and shining (SW coastal; WA) *M. regularis* Crawley
 - Lateral surfaces of mesepisternum and propodeum distinctly and entirely sculptured (Figs 39, 40; S Gulfs; SA) *M. browningi* sp. nov.
- 22(20) Dorsal surfaces of postpetiole and gaster without pubescence (SE coastal Murray-Darling basin; NSW*, ACT*, Vic, Tas) *M. forficata* (Fabricius)
 - Dorsal surfaces of postpetiole and gaster distinctly pubescent 23
- 23(22) Broad, basal end of mandible with a gently convex inner margin; body bicoloured, light brown from head to postpetiole, gaster dark brown; eyes hairless, or with very few, very indistinct small hairs (NE coastal, southeastern coast, Murray-Darling basin; Qld, NSW; introduced into Auckland area, New Zealand) *M. brevinoda* Forel



FIGS 10-16. Characters of *Myrmecia gulosa*-group species (relevant key couplets indicated thus (12)): Fig. 10 (13): left gena, dorsolateral view: A, *M. midas*; B, *M. comata*. Fig. 11 (15): petiole, lateral view: A, *M. rowlandi*; B, *M. tarsata*. Fig. 12 (16): petiole, lateral view: *M. pulchra*. Fig. 13 (16): anterior ventral edge of mesepisternum: *M. pulchra*. Fig. 14 (18): mandible, dorsal view; A, *M. simillima*; B, *M. pyriformis*. Fig. 15 (19): pronotal hairs: *M. hirsuta*. Fig. 16 (25): petiole, lateral view: A, *M. analis*; B, *M. gulosa*.

- Broad, basal end of mandible forming a rather angularly convex inner margin; body usually essentially uniformly dark brown (sometimes bicoloured); eyes with distinct standing hairs, each longer than diameter of a single facet 24
- 24(23) Scape with numerous short erect hairs (Figs 41-43; S Gulfs, W Plateau; SA, WA) *M. erecta* sp. nov.
- Scape without erect or suberect hairs (SE coastal, Murray-Darling basin*, S Gulfs*; NSW, ACT*, Vic, Tas, SA*) *M. pyriformis* F. Smith
- 25(17) Apical segment of gaster yellowish; anterior face of petiolar node vertical (Fig. 16 A); scapes darker than head 26
- Apical segment of gaster blackish; anterior face of petiolar node more or less inclined posteriorly (Fig. 16 B); scapes concolorous with, or lighter than, head 27

- 26(25) Basal portion of gaster very dark blackish-brown (SW coastal; WA—we have not confirmed the records from eastern states given by Clark (1951), they might involve other species) *M. analis* Mayr
- Basal portion of gaster reddish-brown, concolorous with postpetiole (NE coastal, SE coastal, S Gulfs, W Plateau, SW coastal; Qld, NSW, Vic, SA, WA) *M. nigricapa* Roger
- 27(25) Mandibular shaft generally even in width, not narrowed basally (Fig. 17 A) 28
- Mandibular shaft narrow at the extreme base, broadened over the basal 1/4 to 1/5 of its length (Fig. 17 B) 33
- 28(27) Gaster sharply bicoloured, with yellowish- to light reddish-brown basal portion (more or less matching the fore-body) and dark brown to blackish apical portion (NE coastal, SE coastal, Murray-Darling basin*; Qld, NSW, ACT*) *M. gulosa* (Fabricius)
- Gaster entirely blackish 29
- 29(28) Petiolar peduncle short, at most as long as node, and not reaching the apices of the hind coxae when they are extended posteriorly (Fig. 18 A) 30
- Petiolar peduncle longer than petiolar node; reaching or exceeding the apices of the hind coxae when they are extended posteriorly (Fig. 18 B) 31
- 30(29) Hairs on pronotum longer than 1st funicular segment (Fig. 19 A; SE coastal, S Gulfs; NSW, Vic, SA) *M. simillima* F. Smith (part)
- Hairs on pronotum shorter than 1st funicular segment (Fig. 19 B; SW coastal; WA) *M. picticeps* Clark
- 31(29) Pronotum with standing hairs shorter than those of 1st funicular segment (Fig. 20 A; SW coastal; WA) *M. rubripes* Clark
- Pronotum with standing hairs longer than those of 1st funicular segment (Fig. 20 B) 32
- 32(31) Petiole and postpetiole light yellowish- to reddish-brown, contrasting with the more darkly coloured mesosoma and gaster (sometimes median portions of pronotum and propodeum are partially lightly coloured) (S Gulfs; SA) *M. rufinodis* F. Smith
- Petiole and postpetiole dark brown to black, concolorous with mesosoma and gaster (SW coastal, W Plateau; WA) *M. arnoldi* Clark
- 33(27) Clypeus dark brown, concolorous with cranium. (SW coastal; WA) *M. pavidata* Clark
- Clypeus yellowish, concolorous with mandibles 34
- 34(33) Hairs on head and mesosoma long and thick, those on sides near posterior corners of head extending beyond outer margins of eyes (Fig. 21 A) *M. fulgida* Clark
- Hairs on head and mesosoma thin and sparse, those on sides near posterior corners of head not extending beyond outer margins of eyes (Fig. 21 B) 35
- 35(34) Head blackish, concolorous with gaster; mesosoma and waist nodes pale yellow, concolorous with mandibles 36
- Head dark reddish-brown to yellowish-brown, lighter than gaster; mesosoma and waist nodes light reddish-brown to dark brown, more darkly brown than mandibles 37
- 36(35) Legs blackish-brown, markedly darker than mesosoma (S Gulfs, W Plateau; SA) *M. fuscipes* Clark
- Legs yellowish, concolorous with mesosoma (Lake Eyre basin, W Plateau, SW coastal; SA, WA) *M. desertorum* Wheeler
- 37(35) Scape almost lacking erect or suberect hairs 38
- Scape with numerous erect or suberect hairs 39
- 38(37) Mesosoma light reddish-brown, head concolorous with mesosoma; petiolar spiracle usually situated somewhat dorsally on peduncle (SW coastal; WA) *M. gratiosa* Clark



FIGS 17–21. Characters of *Myrmecia gulosa*-group species (relevant key couplets indicated thus (26)): Fig. 17 (27): left mandible, dorsal view: A, *M. pavidus*; B, *M. gulosa*. Fig. 18 (29): petiole and left hind coxa, lateral view; A, *M. simillima*; B, *M. rufinodis*. Fig. 19 (30): pronotal hairs: A, *M. simillima*; B, *M. picticeps*. Fig. 20 (31): pronotal hairs: A, *M. rubripes*; B, *M. arnoldi*. Fig. 21 (34): standing hairs on right posterior side of head: A, *M. fulgida*; B, *M. desertorum*.

- Mesosoma yellowish-brown to dark brown; petiolar spiracle usually situated laterally on the peduncle (SW coastal; WA) *M. vindex* F. Smith
- 39(37) Head entirely reddish-brown, concolorous with mesosoma; basal portion of gaster reddish-brown, concolorous with postpetiole (Murray-Darling basin; Qld) *M. dimidiata* Clark
- Head entirely dark brown or somewhat indistinctly bicoloured (blackish between eyes, the rest reddish-brown); gaster entirely blackish (SE coastal, Murray-Darling basin, S Gulf, W Plateau, SW coastal; NSW, ACT, Vic, SA, WA) *M. nigriceps* Mayr

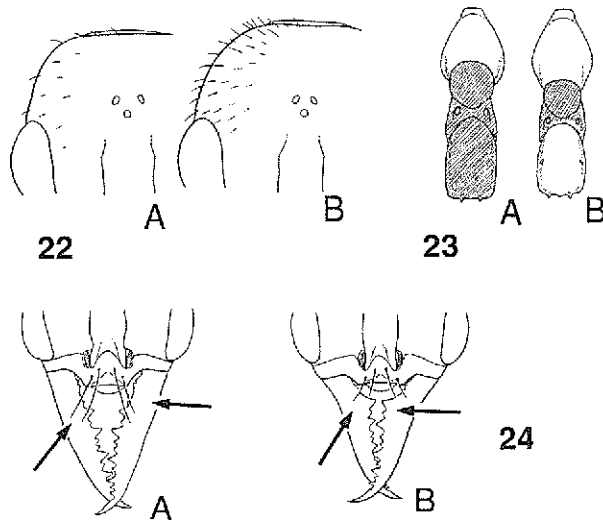
Species of the *M. mandibularis* group

- 1 Legs yellowish- to reddish-brown, clearly lighter in colour than mesosoma 2
- Legs black or dark brown, concolorous with mesosoma 3
- 2(1) Apical portion of gaster yellow (NE coastal, SE coastal, Murray-Darling basin; Qld, NSW (previous record from Tas. is apparently an error—see Clark 1943: 144) *M. fulviculis* Forel
- Apical portion of gaster blackish (SE coastal; NSW, Vic) *M. fulvipes* Roger

- 3(1) Mandibles yellowish, contrastingly more lightly coloured than cranium. (NE coastal; Qld) *M. luteiforceps* Wheeler
- Mandibles blackish, concolorous with cranium 4
- 4(3) Pubescence on 1st gastral tergite reddish, postpetiole sometimes sculptured (southeastern coast, S Gulfs, SW coastal; Vic, SA, WA) *M. mandibularis* F. Smith
- Pubescence on 1st gastral tergite yellowish- to greyish-white, postpetiole never sculptured 5
- 5(4) Pubescence of postpetiole dense, yellowish (SE coastal; NSW, Vic)
- Pubescence on postpetiole sparse, whitish *M. piliventris* F. Smith 6
- 6(5) Apical portion of gaster reddish-brown; pubescence on gaster short, whitish (Murray-Darling basin; Vic) *M. potteri* (Clark)
- Apical portion of gaster black; pubescence on gaster longer, yellowish (NE coastal; Qld) *M. gilberti* Forel

Species of the *M. nigrocincta* group

- 1 Mesosoma more or less uniformly black; standing hairs on lateral and posterior areas of head sparse, shorter than their interspaces (Fig. 22 A; NE coastal; Qld) *M. petiolata* Emery
- Mesosoma bicoloured, with contrasting red to yellowish-brown and blackish-brown sections delimited by sclerites; standing hairs on lateral and posterior areas of head relatively abundant, longer than their interspaces (Fig. 22 B) 2
- 2(1) Mandibles blackish, concolorous with cranium; pronotum light orange-brown, remaining mesosoma blackish brown (Fig. 23 A); genal furrow deep, distinct (NE coastal; Qld) *M. flammicollis* Brown
- Mandibles light yellow, contrasting strongly with the blackish-brown cranium; mesonotum blackish-brown, remaining mesosoma bright yellowish- to reddish-brown (Fig. 23 B); genal furrow shallow, obscure (NE coastal, SE coastal, Murray-Darling basin; Qld, NSW, Vic) *M. nigrocincta* F. Smith



FIGS 22-24. Characters of *Myrmecia nigrocincta*- and *picta*-group species (relevant key couplets indicated thus (2)): Fig. 22 (1): right posterior portion of head: A, *M. petiolata*; B, *M. nigrocincta*. Fig. 23 (2): mesosoma, dorsal view: A, *M. flammicollis*; B, *M. nigrocincta*. Fig. 24. *Myrmecia picta*-group species: mandibles and standing hairs on clypeus: A, *M. foveola*; B, *M. picta*.

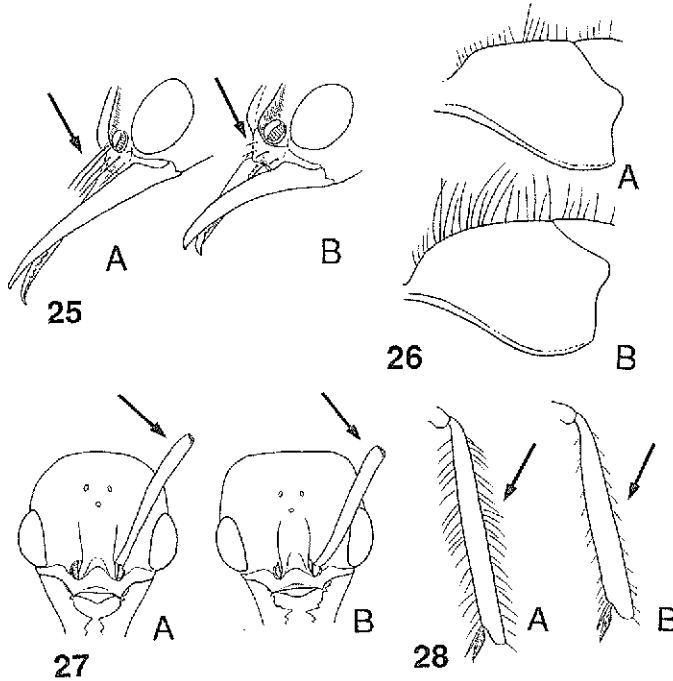
Species of the *M. picta* group

- 1 Sub-basal portion of mandible only slightly broadened; standing hairs on clypeus reaching basal 1/4 of mandible (Fig. 24 A); pronotum light reddish-brown (Murray-Darling basin; Vic, SA) *M. fucosa* Clark
- Sub-basal portion of mandible distinctly broadened; standing hairs on clypeus not reaching basal 1/4 of mandible (Fig. 24 B); pronotum black (S Gulfs; SA) *M. picta* F. Smith

Species of the *M. pilosula* group

Note: *M. croslandi* Taylor is not specifically discriminated here; it is a member of the karyologically diverse *M. (pilosula)* species complex.

- 1 Standing hairs on clypeus long, reaching at least to the basal 1/4 of mandibles (Fig. 25 A) 2
- Standing hairs on clypeus short, at most only slightly exceeding its anterior margin (Fig. 25 B) 6
- 2(1) Almost all standing hairs on pronotum shorter than 1st funicular segment; clypeus sometimes with yellowish pubescence; mandible slender, tapering toward apex; propodeum not depressed (Fig. 26 A; NE coastal, Murray-Darling basin, Lake Eyre basin; Qld, NSW, Vic, NT) *M. varians* Mayr
- Standing hairs on pronotum at least as long as 1st funicular segment; clypeus without yellowish pubescence; mandibles subapically less tapered; propodeum depressed (Fig. 26 B) 3
- 3(2) Postpetiole distinctly sculptured (SW coastal; WA) *M. rugosa* Wheeler
- Postpetiole at most only obscurely sculptured 4
- 4(3) Legs light yellowish- to reddish-brown (NE coastal, SE coastal; Qld, NSW) *M. chrysogaster* (Clark)
- Legs black 5
- 5(4) Pubescence on postpetiole white to grey, that on gaster reddish (SW coastal; WA) *M. michaelsoni* Forel
- Pubescence on postpetiole and gaster greenish to grey (NE coastal, SW coastal, Murray-Darling basin, S Gulfs; Qld, NSW*, Vic, SA*) *M. queenslandica* Forel
- 6(1) Apical segment of gaster yellowish; antennal scape long, exceeding posterior margin of head in full-face view by length of 1st funicular segment, certainly by more than the width of the scape (Fig. 27 A; New Caledonia, apparently endemic) *M. apicalis* Emery
- Apical segment of gaster black to dark brown; antennal scape shorter, failing to exceed posterior margin of head by more than length of 1st funicular segment, at most by about the width of the scape (Fig. 27 B; Australia) 7
- 7(6) Standing hairs on hind tibia abundant and long, some as long or longer than maximum width of the tibia (Fig. 28 A) 8
- Standing hairs on hind tibia sparse, shorter than maximum width of the tibia (Fig. 28 B) 9
- 8(7) Mandibles yellowish, lighter than head (SW coastal; WA) *M. chasei* Forel
- Mandibles blackish, concolorous with head (SW coastal; WA) *M. ludlowi* Crawley
- 9(7) Mandibles dark brown, concolorous with head (Murray-Darling basin; NSW, Vic) *M. dispar* (Clark)
- Mandibles light reddish to yellowish, lighter than head 10
- 10(9) Femora, tibiae and tarsi lightly coloured, yellowish- or reddish-brown 11
- Femora, tibiae and tarsi darkly coloured, dark brown or black 13



FIGS 25–28. Characters of *Myrmecia pilosula*-group species (relevant key couplets indicated thus (1)): Fig. 25 (1): standing hairs on clypeus: A, *M. varians*; B, *M. chasei*. Fig. 26 (2): pronotal hairs: A, *M. varians*; B, *M. chrysogaster*. Fig. 27 (6): head, frontal view: A, *M. apicalis*; B, *M. pilosula*. Fig. 28 (7): left hind tibia: A, *M. chasei*; B, *M. elegans*.

- 11(10) Mesosoma essentially uniformly black; petiole black (NE coastal, SE coastal, Murray-Darling basin, S Gulfs, SW coastal; Qld, NSW, Vic, Tas, SA, WA)
 - Mesosoma more or less uniformly light reddish to yellowish, or bicoloured black and red; petiole yellowish- to reddish-brown 12
 - species complex of M. (pilosula) Smith*
- 12(11) Pubescence of clypeus yellowish; scape not exceeding posterior border of head; mesosoma essentially uniformly reddish-brown (SW coastal; WA)
 - Pubescence on clypeus whitish; scape exceeding posterior border of head by about half the length of 1st funicular segment; mesosoma sectionally bicoloured, with black pronotum and reddish propodeum (W Plateau, SW coastal; WA)
 - M. elegans* (Clark)
 - M. occidentalis* (Clark)
- 13(10) Dorsal surface of gaster with dense greenish pubescence; postpetiole seldom sculptured (SE coastal; NSW) *M. cydista* (Clark)
 - Dorsal surface of gaster with sparse whitish pubescence; postpetiole always sculptured (Murray-Darling basin, S Gulfs; NSW, Vic, SA) *M. harderi* Forel

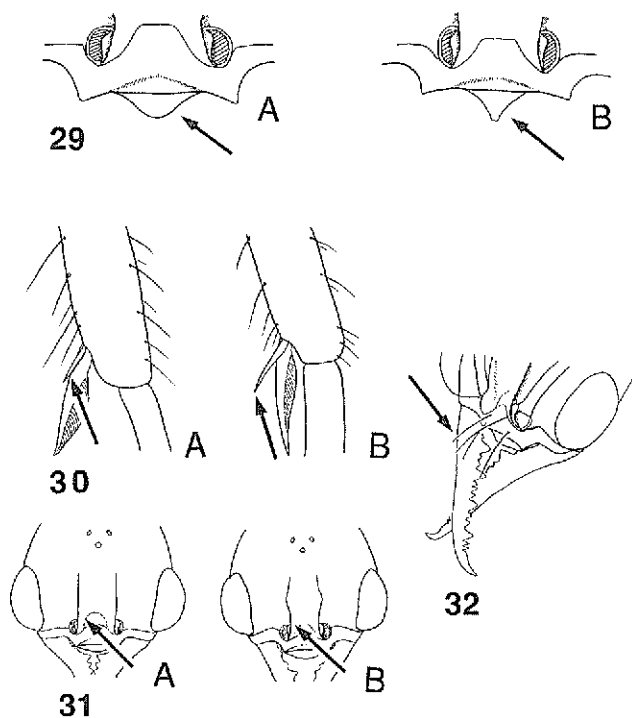
Species of the *M. tepperi* group

- 1 Main body tagmata more or less uniformly blackish-brown 2
- Body bicoloured—head and gaster blackish-brown, mesosoma and petiole reddish (postpetiole varying with species) 3

- 2(1) Mandibles dark brown; dorsal surfaces of 2nd gastral and following segments with dense golden-yellow pubescence (SE coastal*, Murray-Darling basin*, S Gulfs, W Plateau, SW coastal; NSW*, ACT*, Vic*, SA, WA) *M. tepperi* Emery
 – Mandibles yellowish; dorsal surfaces of 2nd gastral and following segments with sparse whitish pubescence (SW coastal; WA) *M. clarki* Crawley
- 3(1) Legs reddish-brown, approximately concolorous with mesosoma (usually a little lighter); postpetiole usually lighter in colour than gaster (SE coastal*, Murray-Darling basin*, S Gulfs*, SW coastal, NSW*, SA*, WA) *M. testaceipes* (Clark)
 – Legs distinctly darker brown than mesosoma; postpetiole dark in colour, concolorous with gaster 4
- 4(3) Dorsal projection of labrum obtuse, broadly rounded (Fig. 29 A) (SW coastal; WA) *M. swalei* Crawley
 – Dorsal projection of labrum narrow and acute (Fig. 29 B) (Figs 44, 45; (SW coastal; WA) *M. acuta* sp. nov.

Species of the *M. urens* group

- 1 Petiolar node lacking major sculpture; minutely punctate like mesonotum, and only a little more densely sculptured than postpetiolar dorsum; pronotum relatively lightly sculptured, but clearly more strongly so than petiolar node; frontal carinae straight and parallel in frontal view; all body tagmata uniformly glossy blackish-brown to black (Figs 31 A, 46, 47; Murray-Darling basin; NSW, ACT) *M. loweryi* sp. nov.



Figs 29–32. Characters of *Myrmecia tepperi*- and *urens*-group species (relevant couplets indicated thus (1)): Fig. 29 (4): labral projection: A, *M. swalei*; B, *M. acuta*. Fig. 30: hind tibial spurs: A, B, *M. (urens)* complex variants. Fig. 31 (1): frontal carinae: A, *M. loweryi*; B, *M. (urens)*. Fig. 32: standing hairs on clypeus, dorsolateral view: *M. (urens)*.

Petiolar node distinctly moderately to coarsely rugose; the sculpture as strong or stronger than that of pronotal disc, and markedly stronger than on the superficially sculptured mesonotum; frontal carinae sinuate, diverging anteriorly (Fig. 31 B); sclerites of mesosoma, and the petiole, frequently sectionally bicoloured blackish-brown and red. . . . species complex of *M. (urens)* Lowne

Discussion of individual taxa

The *Myrmecia aberrans* species group

The *aberrans* group is the most distinctive in *Myrmecia*. Its component taxa, which share the 11 available names listed above, are morphologically very similar. They differ mainly in coloration. Most are not particularly well represented in collections, little is known of their biology, and there are no available chromosomal data. They are diurnal foragers, and their mature colonies contain very few workers, usually fewer than 20. The queens are flightless and ergatoid.

Various nomenclatural arrangements of these taxa have been published.

Wheeler (1933) considered all 7 taxa then current (including 5 which he then established) to be subspecies of *M. aberrans*.

Clark added 4 further taxa (3 in 1943, 1 in 1951), and recognized 9 species in 1951. One, *M. nobilis*, included the nominotypical and 2 other subspecies, *nobilis taylori* and *nobilis sericata*.

Our classification is based largely on Brown's (1953b) modification of Clark's system, except that the only two subspecies (*maura maura* and *maura nobilis*) recognized by him are raised to species (their rank in the Clark classification). Otherwise, Brown's synonymies, whether formal or suggested, have been accepted—apart from this implication that *aberrans* and *nobilis* could be conspecific. Relevant characters distinguishing these taxa are given in the key above.

Myrmecia froggatti Forel

Myrmecia froggatti Forel, 1910: 9. Holotype worker (MHNG). Type locality: Manilla, NSW. (Examined.)

Promyrmecia froggatti: Clark, 1943: 96.

Myrmecia aberrans froggatti: Wheeler, 1933: 52.

Myrmecia aberrans sericata Wheeler, 1933: 53. Holotype worker (MCZC). Type locality: Wagga Wagga, NSW. (Synonymy by Brown, 1953b.)

Myrmecia aberrans taylori Wheeler, 1933: 53. Holotype worker (MCZC). Type locality: Roma district, Qld. (Synonymy by Brown, 1953b.)

Promyrmecia eupocila Clark, 1943: 98. Holotype female (MVMA). Type locality: Adelaide, SA. (Examined) syn. nov.

Promyrmecia excavata Clark, 1951: 137. Holotype worker (ANIC). Type locality: Bundarra, NSW. (Examined) syn. nov.

Promyrmecia greavesi Clark, 1943: 99. Holotype female (MVMA). Type locality: Mareeba, Qld. (Examined) syn. nov.

Although Brown (1953b) did not formally synonymize Clark's 3 species *eupocila*, *excavata* and *greavesi* under *M. froggatti*, he did consider them 'barely distinguishable' and thus doubtfully valid. Examination of the relevant types and other specimens confirms this position, and we here formalize the appropriate synonymies. Clark (1951) used petiolar sculpturing and cephalic coloration as characters distinguishing these putative species, but both character sets can be intraspecifically variable—they are, for example, in the type series of *M. excavata*. The colour of the mesosoma and characteristics of gastral pubescence were also used in Clark's analysis, but we do not consider them taxonomically useful, at least not in the material we have seen.

The holotypes of *eupoecila* and *greavesi* are both ergatoid females, and have long, distinctive, slender hairs on their hind tibiae. Such hairs occur also in the ergatoid female of *M. maura*, indicating that they are probably not a valid specific character, but a feature related to the ergatogyny of queens in this group.

M. froggatti is distinguished from other *aberrans*-group species by its bright reddish head, which sometimes has a blackish-brown spot surrounding the ocelli, or a transverse black band between the eyes, but is never black ventrally. In addition *froggatti* has dense white pubescence on the propodeum, postpetiole and gaster, and relatively long standing hairs on the postpetiole, which are longer than their interspaces. We have some hesitation about the above synonymy of *M. greavesi* under *froggatti*, since we have seen only the holotype (a queen) of the former, which is from a population very distantly disjunct from all others known in the *aberrans* group. The possibility of formal distinction remains, but will depend on the study of additional material, including workers.

Collection localities of specimens examined. Queensland: Mareeba (17/145) (TG). New South Wales: Mungindi (28/149) (BBL); Moree (29/149) (WWF); Manilla (30/150) (WWF); Bundarra (30/151) (TG); Nyngan (31/147); Gilgandra (31/148) (BBL); Trundle (32/147) (BBL); 3 mi N of Condobolin (33/147) (BBL); Grenfell, Weddin State Forest (33/148) (BBL). South Australia: Adelaide (34/138) (R. Blackwood); Adelaide, Bank of Torrens River at Findon Road (34/138) (BBL); Brown Hill Creek (34/138) (C. Miller); Maslins Beach (35/138) (PJM); Waitpinga (35/138) (P. Christy).

The *Myrmecia cephalotes* species group

The above key to the *cephalotes*-group species is essentially that of Clark (1951). Following review of all relevant types (MVMA) and the few other appropriate available specimens, we believe that the three nominal taxa could be conspecific—at best they are sibling species. The differences in gastral coloration used by Clark to separate them seem unlikely to be taxonomically significant, and while generally operational, are not particularly effective for sorting some of the specimens we have seen. The differences in mandibular dentition inferred by Clark seem partly to result from differing patterns of wear among his types, and in any case appear to be taxonomically insignificant in the light of other specimens available to us. We decline to formalize the synonymies implied, because so few representative specimens are yet to hand, and the geographical distribution of the 3 morphotypes, which might be allopatrically arrayed in nature, is certainly not well represented. For the general purposes the aggregate name *M. (cephalotes)* is recommended where appropriate for the identification of '*cephalotes* group' specimens, especially if the state of their gastral coloration is not clear.

The *Myrmecia gulosa* species group

The *M. gulosa* group, as constituted here, is the largest in *Myrmecia*. It is almost coextensive with the '*Myrmecia*' of Clark's (1951) classification of subfamily Myrmeciinae, excluding only the species of his '*nigrocincta* group'. The *gulosa* group contains, in effect, all of the large *Myrmecia* species which Australians recognize colloquially as 'bull dog ants' (or under several other frequently used, often geographically varying, common names—bulldogs, bull ants, bull Joes, inch ants, inch men, sergeant ants, soldier ants, etc.).

Seven of the 41 *gulosa*-group taxa listed by Ogata (1991) (comprising 39 species and 2 subspecies), including a previous subspecies, are synonymized here; two species (*M. athertonensis* and *M. fuscipes*) are reinstated from former synonymy (note that previously designated junior synonyms were not listed by Ogata in 1991); one previous subspecies is raised to species rank; and 6 new species are described.

Thus, 42 species are current in the *gulosa* group.

At least 5 subgroups are recognizable— those of *M. analis* (*analis* and *nigriscapa*); *M. auriventris* (*auriventris*, *athertonensis*, *borealis*, *eungellensis*, *fabricii* and *tridentata*); *M. forficata* (*brevinoda*, *browningi*, *erecta*, *forficata*, *hirsuta*, *pyriformis* and *regularis*); *M. rufinodis* (*arnoldi*, *pavida*, *rubripes* and *rufinodis*); and *M. vindex* (*desertorum*, *dimidiata*, *fulgida*, *fuscipes*, *nigriceps* and *vindex*).

We have considered separate species-group status for *M. forceps*, following Clark, and for the 6 species which constitute the *auriventris* subgroup, but eschew further division of the present *gulosa* group prior to a thorough phylogenetic analysis.

The *M. auriventris* subgroup

Six species are assigned here to the *M. auriventris* subgroup. One (*M. athertonensis*) is reinstated from previous junior synonymy under *M. auriventris*, and 4 (*M. borealis*, *M. eungellensis*, *M. fabricii* and *M. tridentata*) are described as new. They are associated on the basis of their common possession of the following features:

1. Frontal carinae less divergent anteriorly than in other subgroups.
2. Petiolar node long, with anterior margin vertical in profile, and with a short anterior peduncle relative to most other *Myrmecia* species.
3. Mandibles straight, relatively less broadened sub-basally than in most other *Myrmecia* species.
4. Three large teeth (in addition to small ones) on each mandible, exclusive of the apical tooth.
5. Fine whitish to greyish or golden pubescence on gastral dorsum.

The component species range across scattered sites along the Great Dividing Range and its flanks, from Iron Range, N. Qld, south to northeastern NSW.

Myrmecia athertonensis Forel stat. nov.

Myrmecia auriventris var. *athertonensis* Forel, 1915: 8. Syntype workers and male (MHNG, ANIC) (Examined). Type locality: Atherton, Qld.

This taxon was classified as a subspecies of *M. auriventris* by Clark (1951), following Forel (1915), and synonymized under *auriventris* by Brown (1953b).

Following examination of its type and more recently collected *auriventris*-group material we consider *M. athertonensis* to be a 'good' species separate from *auriventris*. Brown (1953b) had not seen the *athertonensis* type and was probably misled by Forel's inadequate original description when he considered it to represent a 'slight colour variant' found in many nest series of the 'typical form' (i.e. *M. auriventris*). Brown also discussed specimens from McIlwraith Range, probably representatives of the species described here as *M. borealis*. His assumption that these were conspecific with more southern *auriventris* and *athertonensis* material would have further confused his analysis, because of variation in coloration of the *borealis* mesosoma (see type description below).

The following features distinguish *M. athertonensis* from *M. auriventris*:

- | <i>M. auriventris</i> | <i>M. athertonensis</i> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Antennae and legs bright to medium golden brown, contrasting with the darker cranium; the legs rather uniformly coloured. | 1. Antennae and legs dull, dark chocolate brown, coloured similarly to the cranium; apical sections of legs usually lighter than coxae and femora. |
| 2. Mandibles golden brown, matching the antennae and legs; the apices of the teeth darkly infuscated. | 2. Mandibles golden brown, as in <i>auriventris</i> —thus contrasting strongly with the darker, differently coloured, antennae and legs. |
| 3. Anterior coxae (like the others) light in colour, contrasting sharply with the dark pronotum. | 3. Anterior coxae (like the others) dark in colour, essentially matching the pronotum. |
| 4. Darkly coloured sections of the body (cranium, anterior parts of mesosoma, postpetiole and gaster) dark mahogany brown, the postpetiole and gaster usually a shade lighter. | 4. Relevant body sections more darkly coloured—very dark chocolate to blackish-brown, the postpetiole and gaster almost as dark as the rest. |
| 5. Pronotum, mesonotum, and a small portion of the upper mesepisternum darkly coloured, the remaining mesosoma entirely reddish-brown, occasionally with slight, indefinitely delimited small darkly infuscated patches; metanotal dorsum, including its spiracular structures, reddish-brown, like propodeum. | 5. Mesosoma somewhat similarly bicoloured, but the dark brown section here includes the entire mesepisternum, the metepisternum, and, bilaterally, either the anteroventral half of the side of the propodeum, or a distinctive narrow dark stripe extending from the propodeal spiracle to the upper metepisternum; metanotal dorsum and its spiracular structures dark brown, like pronotum and mesonotum. |
| 6. Front of head with coarse granular rugosity, which shows little trace of a longitudinal trend. | 6. Front of head coarsely striate-rugose; the sculpture with a distinct more or less longitudinal trend. |
| 7. Pronotal dorsum roughly rugose, the longitudinal trend of the sculpturation somewhat vague. | 7. Pronotal dorsum coarsely striate-rugose, the sculpturing with a distinct longitudinal trend. |
| 8. Propodeal dorsum sculptured similarly to pronotum, but with the somewhat vague sculptural trend transverse. | 8. Propodeal dorsum coarsely and distinctly transversally striate-rugose. |

Collection localities of specimens examined. Queensland: Kuranda (16/145) (C. P. Haskins); Atherton (17/145) (syntype); Ravenshoe (17/145); Mt Spec Plateau (19/145) (Darlingtons); 12 km W of Paluma (19/145) (BBL); 6 mi W of Paluma (19/145) (E. B. Britton).

Myrmecia auriventris Mayr

Myrmecia auriventris Mayr, 1870: 968. Syntype workers (NHMW). Original localities: Port Mackay, Qld; Cape York, Qld (RWT Type compared material in ANIC examined).

M. auriventris is characterized by the features itemized above in comparison with those of *M. athertonensis*.

Collection localities of specimens examined. Queensland: Davies Creek (16/145) (*Darlingtons*); Kuranda (16/145) (*Wheeler*); Mareeba (17/145) (H. E. Hill); St Ronas (18/144) (*BBL*); Forty Mile Scrub NP (18/144) (*RWT*); 8 km S of Sarina (21/149) (*BBL*); nr. Marlborough (22/149) (D. Rakemann); Great Keppel I. (23/150) (*Balderson and Vickery*); Maryborough (25/152) (*E. W. Fischer*).

Myrmecia borealis sp. nov.

Worker. A bicoloured species close to *M. auriventris* and *M. athertonensis*; similar to both in size and general morphology, and sharing taxonomically distinctive features with both or either.

Ground colour of legs very dark brown, much like the pronotum and much as in *M. athertonensis*, but the humeral knees, fore tibiae and all tarsi are here more generally lightly infuscated dull golden brown. Antennae light in colour; golden yellowish-brown, like the mandibles and labrum; contrasting markedly with the dark brown cranium and legs—in the latter feature unlike either *auriventris* or *athertonensis*, where the legs and antennae are similarly coloured (though light in *auriventris*, dark in *athertonensis*). Mesosoma bicoloured, usually much as in *M. auriventris*—the pronotum, mesonotum and a small dorsal section of the mesepisternum dark chocolate brown, the remainder generally contrasting reddish-brown. Metanotal dorsum, sometimes including the associated spiracular structures, usually darkly infuscated, unlike *auriventris*, but less distinctly so that is usual in *athertonensis*. In some specimens the mesepisterna are more generally, but vaguely, darkly infuscated, and occasionally entirely dark brown; the pattern is, however, never as extensive as in *M. athertonensis*, since it does not extend distinctly on to the sides of the propodeum.

Sculpturation generally as in *M. athertonensis*. Head more or less longitudinally coarsely striate-rugose; pronotum similarly, but more distinctly, longitudinally sculptured; propodeal dorsum even more distinctly transversally so. The general sculptural intensity exceeds that usual in *M. athertonensis*. Mesonotum with more distinct fine transverse striae than in either *auriventris* or *athertonensis*.

Holotype, worker. Queensland: McIlwraith Range (13/143), Leo Creek Rd, ca. 550 m, 22 July 1973 (*R. W. Taylor*).

Paratypes. Queensland: 3 workers, Iron Range, Mt Tozer summit (12/143), 8 December 1985 (*GBM and D. Cook*); 3 workers, Mt Tozer above 1500 ft, 16 October 1968 (*GBM*); 2 workers, Mt Tozer area, 30–31 May 1971 (*B. Cantrell*); 17 workers, McIlwraith Range, Leo Creek Rd. (13/143) (type nest series); 12 workers, McIlwraith Range, Leo Creek Road, 500 m, 29 June to 4 July 1976 (*G.B. and S. R. Monteith*); 11 workers, McIlwraith Range, 10–20 July 1976 (*P. Filewood*); worker, McIlwraith Range, Summit C., 700–800 m, 5 June 1979 (*P. A. Matthew*); 2 workers, Lankelly Creek, June 1932 (*Harvard Australia Expedition*); 14 workers, Upper Lankelly Creek (13/143), 10–11 June 1971 (*GBM*).

Holotype and most paratypes in ANIC (type No. 7925); paratypes in BMNH, MCZC, MHNG, QMBA.

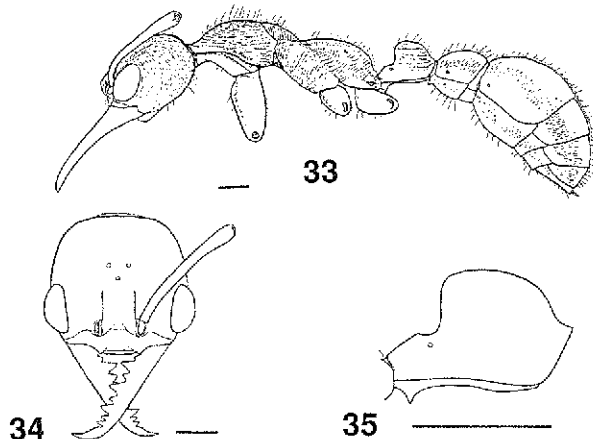
Remarks. *M. borealis* is consistently distinct from both *M. auriventris* and *M. athertonensis*, and occurs substantially further north than either. It is known only from the mid-Cape-York-Peninsular uplands of Mt Tozer near Iron Range (12/143), and the McIlwraith Ranges (13/143), in the Coen district. Mt Tozer rises to 545 m and the McIlwraiths a little higher. *M. borealis* is commonly encountered in open grassy *Eucalyptus* woodland tracts enclosed within rainforest at high elevations in the McIlwraiths, as at the type locality. The *nigrocincta*-group species *M. flammicollis* apparently has general distribution similar to *M. borealis*. Judging from available specimen labels the two species are probably closely sympatric at Iron Range, though *flammicollis* has been taken only one in the McIlwraiths, by R.W.T., at lower elevations than *M. borealis*, and a few km east of its type locality. Neither species appears to be present in true rainforest, or in the surrounding relatively open *Eucalyptus* savanna; both seem rather to favour moist marginal habitats like the woodland indicated above, or, in the case of *M. flammicollis*, the peculiar deciduous rainforest referred to as 'bastard scrub' in north Queensland.

Myrmecia eungellensis sp. nov.

(Figs 33-35)

Worker. General features as illustrated. Dimensions (mm, 5 specimens measured): HW 3.0-3.4; HL 3.1-3.4; CI 97-101; SL 3.6-3.7; SI 103-113; ML 3.1-3.6; MI 98-106; PrW 2.0-2.3; WL ca. 5.5-7.0; PtW 1.0-1.2; PtL 1.8-1.9; PsW 1.6-1.9; PsL 1.4-1.6; GW 2.9-3.4; PsI 55-57.

Head as long as broad, or nearly so, with slightly concave occipital margin, rounded occipital corners, and subparallel, slightly posteriorly convergent sides. Occipital carina present as a thin, sharply distinct, relatively high flange, unreduced and entire at the median occipital border. Clypeus with its exposed depressed anterior section relatively shallow and obscure, failing posteriorly to reach the level of the mandibular insertions; standing clypeal hairs longer than those of scape. Mandibles approximately as long or slightly longer than head; their outer margins straight to feebly concave in full-face view; the shafts slender, not broadened sub-basally. All mandibular teeth



FIGS 33-35. *Myrmecia eungellensis* sp. nov. and *M. fabricii* sp. nov., worker (scale line = 1 mm).
Fig. 33: *M. eungellensis*, body, lateral view. Fig. 34: same, head, frontal view. Fig. 35: *M. fabricii*, petiole, lateral view.

behind the apical denticle erect or directed slightly towards the mandibular apices. Supplementary ventral mandibular tooth relatively small but distinct. Eyes lacking distinct standing hairs; each separated from posterolateral margin of clypeus by a space subequal to the lateral length of the clypeus. Frontal carinae not diverging anteriorly ahead of the antennal insertions, rather erect, as in other *auriventris*-group species. Antennal scapes with erect and suberect hairs, the standing hairs moderately abundant; scapes exceeding occipital margin of head by almost the length of the 1st funicular segment; 3rd funicular segment as long or slightly shorter than 1st. Pronotum rather steeply raised anteriorly; anterior margin rounded in dorsal view, sides convex. Mesepisternal ridge incomplete. Metanotal area long, its middle section slightly longer than the diameter of the spiracular lobes. Propodeum depressed; its anterodorsolateral borders strongly convergent anteriorly in dorsal view. Tibial spurs of each middle and hind leg subequal in length; posterior spurs of hind legs distinctly pectinate. Petiolar peduncle distinctly set-off from node; its anterior dorsal margination incomplete at midline, not particularly invasive of the dorsal surface of the peduncle, which is less than half as long as node, but as long or slightly longer than the height of its anterior face. Petiolar node longer than high, as long as or longer than broad; anterior face abruptly vertically raised; posterior face inclined, with a rounded, obtuse posterodorsal angle in profile; anterior margin of node convex, somewhat pointed in dorsal view.

M. eungellensis is not distinctly sectionally bicoloured like the more northern species of the *M. auriventris* group. Body, excluding appendages, generally somewhat reddish, dull, medium brown, with the posterior part of the frons vaguely lighter, and a little brighter in hue. Mesosomal dorsum often lightly flushed with pale colour like that of posterior frons, and sometimes obscurely darkly flushed on the sides and dorsum. Mandibles lighter in colour than clypeus, yellowish- to light reddish-brown; antennal scapes and legs matching mandibles in colour; the legs contrasting somewhat with the darker body colour; apical portions of femora, tibiae and tarsi sometimes darkly infuscated.

Erect to suberect pilosity moderately abundant on all dorsal body surfaces; the longest dorsal pronotal hairs as long or longer than the first funicular segment; the hairs fine, tapered, and straight to slightly curved. Dorsal surfaces of postpetiole and gaster with dense richly golden pubescence.

Holotype, worker. Queensland: Eungella National Park (21/148), 50 mi W of Mackay, 2500 ft, 17 December 1972, (*B. B. Lowery*).

Paratypes. Queensland: 30 workers, Eungella National Park (type nest series); 2 workers, Eungella National Park, 8 January 1985 (*R. M. Delaney* and *K. R. McDonald*); worker, Eungella National Park, Mt William (21/148), 1000 m, 14 November 1976, (*RWT* and *T. A. Weir*); 5 workers, 13 km NE of Eungella (21/148), 980 m (*P. S. Ward*, No. 9933).

Holotype and most paratypes in ANIC (type No. 7926); paratypes in BMNH, MCZC, MHNG, QMBA.

Remarks. *M. eungellensis* is known only from high elevations in or near Eungella National Park, near Dalrymple Heights (often called Eungella, as on some of the labels seen here), inland from Mackay, North Queensland. According to Lowery's notes this species is not aggressive, and the type-nest entrance was a 'tiny hole in the ground' in rainforest. Workers were collected foraging on rocks and in leaf litter around mid-day, and 'catching bees at pond of water on fallen palm leaf'. The type-colony series included cocoon-enclosed pupae. The very similar general appearance of this species to that of the following, and probably sympatric, *M. fabricii* could imply mimicry between them.

This would presumably be of the so-called 'Müllerian type', involving convergence in the recognition signal presented to would-be predators by two species, each of which is well defended.

Myrmecia fabricii sp. nov.

(Fig. 35)

Worker. Very similar to workers of the sympatric *M. eungellensis*, but on average slightly larger, less gracile, and slightly more darkly coloured, with the postpetiole and gaster more distinctly blackish than the head, mesosoma or petiole, and the mandibles, antennae and legs less contrastingly light in colour. As in *eungellensis* there is a tendency for the head and mesosoma to be vaguely flushed with smudges of darker or lighter hue than the ground colour. In *M. fabricii* dark smudges are more frequent than light ones, and the tendency for the posterior section of the frons to be lightly infuscated is weaker than in *eungellensis*. The dense gastral pubescence is less brightly golden than in *eungellensis*.

The major salient features distinguishing these two species are compared below. The quite striking differences in pilosity are usually well displayed on the propodeum and petiole, and the states of the occipital carina and petiolar peduncle are immediately diagnostic.

M. eungellensis

1. Occipital carina a relatively high, thin, sharply raised crest, as distinct and acute at the midline as elsewhere, and abruptly separating the median frontal and occipital sections of the cranium.
2. Free dorsum of petiolar peduncle (excluding the depressed anterior section) relatively long, in profile approximately as long as the height of the anterior face of the node.
3. Body hairs relatively erect, generally straight or only slightly curved.

M. fabricii

1. Occipital carina much less sharply raised than in *M. eungellensis* but distinct on each side of the occiput; plainly vestigial to absent at the midline, where the frontal and occipital sections of the cranium meet across a narrowly rounded curve.
2. Free dorsum of petiolar peduncle relatively very short, in profile approximately only half or less as long as the height of the anterior face of the node.
3. Body hairs slightly more abundant, less straight, distinctly flexuous or even somewhat curly on the dorsa of the frons, pronotum, propodeum, petiole and postpetiole.

Holotype, worker. Queensland: Eungella National Park (21/149), 51 mi W of Mackay, 2000 ft, 17 December 1972 (*B. B. Lowery*).

Paratypes. Queensland: 20 workers, Eungella National Park (type nest series); 3 workers, 6 km SSE of Eungella, 14 November 1976 (*RWT* and *T. A. Weir*); worker, Homevale (21/148) (*R. J. Kohout* and *V. E. Davies*).

Holotype and most *paratypes* in ANIC (type No. 7927); *paratypes* in BMNH, MCZC, MHNG, QMBA.

Nomenclature. Named for Johann Christian Fabricius (1745–1808), who in 1775 described the first scientifically named Australian ants (among the first such animals), which were collected in 1770 by Banks and Solander. This is, perhaps surprisingly, the only Australian ant species to be so dedicated. *Myrmecia* is the sole Australian 'Fabrician' ant genus. Fabricius described its first 3 species: *M. gulosa* (in 1775), the type species *M. forficata* (in 1787) and the Tasmanian endemic *M. esuriens* (in 1804).

Remarks. The type-colony series was collected from a mound at the edge of relict rainforest and cleared land. Lowery notes that the workers rushed aggressively from the nest at first disturbance. The colony contained large, almost fully developed larvae. The very similar general appearance of this species to that of *M. eungellensis* could imply mimicry between them (see above).

***Myrmecia tridentata* sp. nov.**

(Figs 36–38)

Worker. A non-bicoloured *gulosa*-group species with the characters of the *M. auriventris* subgroup, as listed above. Most resembling *M. eungellensis*, described above, from which it is distinguished by the following salient features:

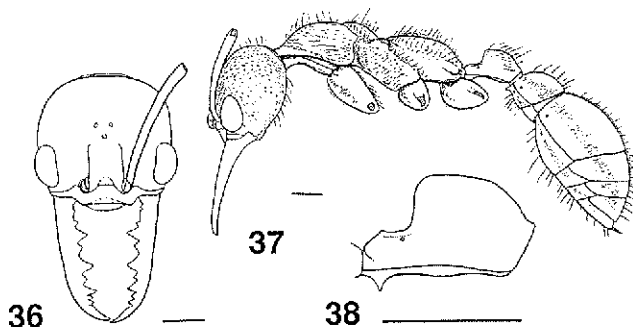
M. eungellensis

1. Sculpturing relatively coarse; e.g. pronotum distinctly more heavily sculptured than mesonotum; petiolar node distinctly rugose.
2. Legs, mandibles and antennae concolorous, distinctly lighter in hue than the head and mesosoma.

M. tridentata

1. Sculpturing relatively superficial and effaced; e.g. sculpturing of pronotum only about as intense as that of mesonotum, petiolar node essentially smooth and shining.
2. Legs and antennal scapes coloured similarly to head and mesosoma; mandibles and scapes somewhat lighter in colour.

General features as illustrated. Dimensions (mm, 6 specimens measured): HW 3.0–3.8; HL 3.0–3.7; CI 100–104; SL 3.1–3.7; SI 94–103; ML 3.2–4.0; MI 104–110; PrW 1.9–2.3; WL 5.8–6.8; PtW 1.0–1.2; PtL 1.6–2.0; PsW 1.5–1.9; PsL 1.3–1.7; GW 2.9–3.5; PsI 50–53. Head as long as broad, or slightly broader than long, with slightly



FIGS 36–38. *Myrmecia tridentata* sp. nov., worker (scale line = 1 mm). Fig. 36: head, frontal view. Fig. 37: body, lateral view. Fig. 38: petiole, lateral view.

concave occipital margin, rounded occipital corners, and subparallel sides. Clypeus with the exposed depressed area short and shallow, and with standing hairs shorter than 1st funicular segment. Mandibles longer than head; outer margins straight in full-face view; shafts slender, not broadened sub-basally; the 3 large mandibular teeth interpolated by 1 or 2 small teeth; all teeth directed inwards or slightly anteriorly. Eyes lacking standing hairs, separated from posterior margin of clypeus by a distance equal to the lateral length of the clypeus. Frontal carinae not diverging anteriorly at the antennal insertions. Antennal scapes with erect and suberect hairs; exceeding occipital margin by the length of the 1st funicular segment or slightly less; 3rd funicular segment as long as 1st, 2nd longer.

Standing hairs of pronotum abundant and slightly wavy, some usually longer than 1st funicular segment. Mesepisternal ridge vestigial to incomplete. Metanotal area well defined, middle section longer than diameter of a spiracular lobe. Propodeum depressed; anteriolateral margins converging forwards in dorsal view. Anterior and posterior hind tibial spurs almost equal in length.

Petiolar peduncle shorter than node; anterodorsal emargination incompletely edged mesally. Petiolar node longer than high, as long as or longer than broad; anterior face vertically raised; anterior margin convex, more or less pointed in dorsal view. Postpetiole small, subconical.

Mandibles shining, very obscurely and incompletely longitudinally sculptured. Head rather weakly, and somewhat vaguely, longitudinally rugose. Sculpturing of pronotum similarly intense; more distinctly longitudinal; mesonotum distinctly more finely and obscurely transversally striate-rugose; propodeal dorsum distinctly more coarsely so. Petiole only vaguely sculptured, almost matching the very superficially sculptured postpetiolar and gastral dorsa.

Body excluding appendages generally light, dull brown from head to petiole (the head sometimes a shade darker); postpetiole and gaster darker, more blackish-brown. Mandibles light yellowish-brown, lighter than cranium, the teeth dark brown; antennal scapes light brown, concolorous with head, funiculi yellowish-brown, matching mandibles; legs light brown, matching scapes.

Pilosity well developed; the longest hairs as long as the first funicular segment or a little longer; the average nearly as long as that segment; the longest hairs somewhat flexuous. Body covered with white pubescence, which is relatively thick and distinct on the postpetiole and gaster, especially dorsally, where its elements are distinctly brassy, though not as richly golden as in *M. eungellensis*, or the slightly paler *M. fabricii*.

Holotype, worker. New South Wales: Mt Warning (28/153), Breakfast Creek, rain forest, 1000 ft, 30 August 1966 (*B. B. Lowery*).

Paratypes. New South Wales: 33 workers, Mt Warning (type nest series); 9 workers, slopes to W of Mt Warning (28/153), 800 ft, 31 August 1964 (*BBL*).

Holotype and most *paratypes* in ANIC (type No. 7928); *paratypes* in AMSA, BMNH, MCZC, MHNG.

Remarks. *M. tridentata* is known only from the rainforests of Mt Warning. The type-colony was taken 'under a volcanic rock' and there was 'no external sign of the nest'. This species is said on Lowery's labels to be 'non-aggressive' and 'rare'.

The ground colour of the body and that of the gastral pubescence resemble those of the sympatrically associated *M. flavicoma*, but *tridentata* is readily distinguished by its possession of only 3 large subapical mandibular teeth, and by its less anteriorly-divergent frontal carinae.

Other species of the *Myrmecia gulosa* group*Myrmecia brevinoda* Forel

- Myrmecia forficata* var. *brevinoda* Forel, 1910: 2. Syntype workers and female (MHNG, ANIC). Original localities: Gisborne, Vic., NSW. (Examined.)
- Myrmecia pyriformis gigas* Forel, 1913: 310. Syntypes worker (MHNG, RMB). Type locality: Qld. (Synonymy by Brown 1953b: 22.)
- Myrmecia forficata eudoxia* Forel, 1915: 8. Syntypes worker (MHNG). Type locality: Atherton, Qld. (Synonymy by Brown 1953b: 104.)
- Myrmecia decipians* Clark, 1951: 86. Holotype worker. Type locality: Quirindi, NSW. (Examined) syn. nov.
- Myrmecia longinodis* Clark, 1951: 87. Holotype worker. Type locality: Kiama, NSW. (Examined) syn. nov.

M. brevinoda varies widely in size, even in a single colony (Clark, 1951; Higashi and Peeters, 1990). Larger workers can have HW (across eyes) exceeding 5 mm, with WL more than 8 mm, and small workers can have HW less than 3 mm and WL less than 6 mm. Because of this, size-correlated characters such as the postocular lateral and posterior outline of the cranium, proportions of the petiolar node and its peduncle, intensity of pronotal sculpture, and other allometric characters, also vary substantially. The colour of head plus mesosoma, petiole and postpetiole ranges from yellowish- to dark reddish-brown, but the gaster is consistently, and contrastingly, dark chocolate brown. In his 1951 key Clark separated *M. longinodis* and *M. decipians* from *brevinoda* and other allied species using purported differences in pronotal sculpturation. We find the relevant character set apparently not to be taxonomically applicable. Specimens from the type series of *longinodis* have elongate petiolar nodes, but this character falls within the range of variation of other *brevinoda* specimens. We thus propose the new synonymy of *decipians* and *longinodis* under *brevinoda*.

Within the *gulosa* group *brevinoda* is a member of the *forficata* subgroup, which comprises *M. brevinoda*, *M. forficata*, *M. hirsuta*, *M. pyriformis*, *M. regularis* and 2 species described here as new (*M. browningi* and *M. erecta*). The subgroup is distinguished by its possession of mandibles concolorous with the clypeus and cranium, a broadened sub-basal section to each jaw, and generally a short petiolar node. Among these species *M. pyriformis* most resembles *M. brevinoda*, notably in the possession of gastral pubescence. It can be distinguished by the less-broadened sub-basal portions of its mandibles, the lighter body colour, and longer mesosomal pilosity.

M. brevinoda is found in more northerly districts of eastern Australia than *M. pyriformis*, and has been reported as an introduction to the Devonport area of the north shore of Auckland, New Zealand (Keall, 1981). It is the only *Myrmecia* species known to have been introduced beyond the natural range of the genus.

Collection localities of specimens examined. Queensland: Stony Creek nr Shiptons Flat (15/145) (*J. E. Feehan*); Ravenshoe, (17/145) (*TG*); Landsborough (26/152) (*BBL*); Toowoomba (27/151) (*W. B. Barnard*); Stanthorpe (28/151) (*E. Sutton*); E slope of Cunninghams Gap (28/152) (*BBL*); Binna Burra (*R. J. Kohout*) (28/153). New South Wales: Walcher (*WWF*); Coraki (29/153) (*I. F. B. Common* and *M. S. Upton*); Armidale (30/151) (*BBL*); 12 S Coffs Harbour (30/153) (*EFR*); Quirindi (31/150) (*C. V. Morissett*); 12 km S of Cessnock (32/151) (*BBL*); Bulahdelah Mt (32/152) (*BBL*); Maroota (33/151) (*BBL*); Kiama (34/150) (*F. A. Cudmore*); Kosciusko NP (37/151) (*BBL*). Victoria: Gisborne (37/144). New Zealand: Auckland, Devonport (*Keall, Farr*).

Myrmecia browningi sp. nov.

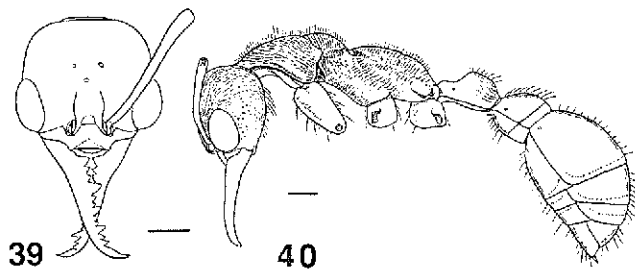
(Figs 39, 40)

Worker. General features as illustrated. Dimensions (mm, 6 specimens measured): HW 1.9–3.6; HL 1.9–3.6; CI 92–100; SL 1.8–3.8; SI 97–110; ML 1.8–3.9; MI 95–111; PrW 1.3–2.4; WL 3.4–7.0; PtW 0.7–1.3; PtL 1.1–2.2; PsW 1.1–1.9; PsL 0.9–1.6; GW 2.1–3.7; PeI 49–55.

A large species. Head as long as broad, or nearly so; occipital border slightly convex, with rounded corners and parallel or slightly posteriorly converging sides. Clypeus with standing hairs shorter than 1st funicular segment; anterior depression exposed, not clearly margined; its posteriormost portion reaching the level of the mandibular insertions. Mandibles longer than head; outer margins slightly concave. Mandibular shaft slender with inner margin sub-basally convex. Mandibular dentition with 4 large teeth, the pairs separated by 1 to 3 smaller, interpolated denticles; apices of basal teeth directed somewhat posteriorly. Eyes strongly convex, with minute, somewhat scattered standing hairs; anterior borders virtually contiguous with posterior margin of clypeus. Frontal carinae divergent anteriorly. Antennal scape exceeding occipital border by length of 1st funicular segment or more; with short suberect hairs, at least on apical 1/3; 3rd funicular segment as long as, or slightly shorter than, 1st. Pronotum sloping gently upwards, with anteriorly converging sides. Standing hairs on pronotum shorter than 1st funicular segment. Mesonotum slightly raised; posterior margin more or less rounded in dorsal view; anterior metepisternal ridge vestigial to absent. Metanotal area relatively long, length at midline varying, short to long compared to diameter of spiracular lobes. Propodeum depressed; dorsoanterolateral margins converging. Anterior hind tibial spur more than 2/3 as long as the distinctly pectinate posterior spur. Petiolar peduncle well set-off from node; anterior margination complete in dorsal view; peduncle about half as long as node, its free dorsal surface a little shorter than height of anterior face of node. Node nearly as long as high measured from ventral end of petiolar tergum; as broad as or broader than long; anterior face almost vertical; anterior and posterior faces nearly parallel, so node is subrectangular in profile, with rounded corners; anterior margin convex, broadly pointed medially in dorsal view. Postpetiole small, subconical, with converging sides.

Postpetiole and gaster smooth and shining, with short standing hairs, lacking pubescence.

Body, excluding appendages and apical portion of gaster, reddish brown, sometimes lighter; mandibles reddish-brown, concolorous with clypeus and cranium; antennae and legs yellowish- to reddish-brown, approximately to fully concolorous with head and mesosoma; gaster dark brown to black, apical margin of each segment flushed yellow to yellowish brown.



FIGS 39, 40. *Myrmecia browningi* sp. nov., worker (scale line = 1 mm). Fig. 39: head, frontal view. Fig. 40: body, lateral view.

Holotype, worker. South Australia: Kangaroo Island, Flinders Chase National Park, Rocky River Head Station (35°57'S; 136°44'E), 22 March 1979 (*G. P. Browning*, acc. M25).

Paratypes. South Australia: Kangaroo Island: worker, dealate queen, mouth of Rocky River, 4 April 1983 (*GPB*, M334); 18 workers, male, Finders Chase NP, Rocky River HS, 22 March 1979 (*GPB*, M25) (holotype nest series); 4 workers, same data (*GPB*, M28); 4 workers, same data (*GPB*, M29) 2 workers, alate queen, male, same locality, 20 March 1979, (*GPB*, M17); 2 workers, same locality, 18 March 1979 (*GPB*, M52); 2 workers, Finders Chase NP, 6 km N of Rocky River HS (35/136), 22 March 1979, (*GPB*, M21); 12 workers, Hanson Bay (36/136), 5 November 1980 (*GPB*, and *P. Christy*, M99); 17 workers, Parndana CP (35/137), 23 March 1979 (*GPB*, M34); worker, Kangaroo Island, (*G. O. Tepper*) (labelled '*Myrmecia sanguinea* Smith, Id. by W. M. Wheeler'); worker, Kangaroo Isl. (labelled '*Myrmecia lucida* Forel, Det. J. Clark').

Holotype and most paratypes in ANIC (type No. 7929); paratypes in BMNH, MCZC, MHNG, SAMA.

Nomenclature. Named for Dr Graeme P. Browning, who first recognized this taxon as a distinct species.

Remarks. *M. browningi* is known only from Kangaroo Island. The related *M. regularis* is found in southwestern WA.

This species is a member of the *M. forficata* subgroup, most closely similar to *M. regularis*, which it resembles particularly in having the apical gastral segment lightly coloured. *M. browningi* is distinguished by the clearly sculptured lateral portions of its mesepisterna and metepisternal areas, and the vertically raised petiolar node.

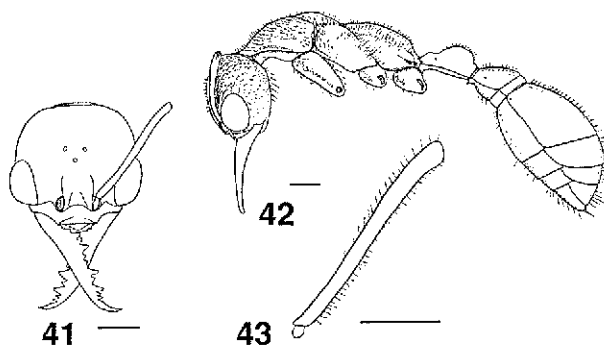
We have seen 4 specimens of *M. regularis* labelled 'Portland, Vic', collected by H. W. Davey (ANIC). The occurrence of *regularis* in eastern Australia is not otherwise confirmed, so this material might be mislabelled.

Myrmecia erecta sp. nov.

(Figs 41–43)

Worker. General features as illustrated. Dimensions (mm, 8 specimens measured): HW 2.6–3.9; HL 2.5–3.7; CI 100–107; SL 2.6–3.8; SI 96–107; ML 2.9–4.5; MI 109–122; PrW 1.6–2.4; WL 5.0–6.8; PtW 0.9–1.1; PtL 1.6–2.4; PsW 1.3–2.0; PsL 1.1–1.8; GW 2.6–3.9; PsI 48–53.

Head as long as broad or nearly so; occipital margin straight or slightly convex, with rounded corners; occipital carina distinct. Standing hairs of clypeus as long as, or a little shorter than, 1st funicular segment; anterior clypeal depression exposed, not clearly margined; its posterior portion not reaching the anterior extensions of the frontal carinae. Mandibles longer than head; outer margin distinctly concave. Mandibular shaft slender, with convex inner margin at sub-basal portion. Mandibular dentition with 5 larger teeth, the pairs separated by 1 or 2 smaller interpolated denticles; apices of basal teeth directed somewhat posteriorly; subapical ventral tooth relatively small, but distinct. Eyes with short but distinct standing hairs, anterior borders contiguous with posterior margin of clypeus. Frontal carinae relatively quite strongly divergent anteriorly. Antennal scape exceeding occipital border by length of 1st funicular segment or more, and with short erect hairs along its whole length; 3rd funicular segment as long as 1st. Pronotum sloping gently towards the dorsum, with anteriorly converging sides; standing hairs of dorsum dense, shorter than 1st funicular



FIGS 41–43. *Myrmecia erecta* sp. nov., worker (scale line = 1 mm). Fig. 41: head, frontal view. Fig. 42: body, lateral view. Fig. 43: left antennal scape.

segment. Mesonotum slightly raised; posterior margin rounded in dorsal view; anterior mesepisternal ridge incomplete, but distinct above. Metanotal area long, its middle portion as long as or longer than diameter of spiracular lobes. Propodeum depressed; dorsal anterior margins strongly convergent, the anterior border somewhat pointed. Anterior hind tibial spur 2/3 or more as long as the distinctly pectinate posterior one. Petiole with anterior peduncle and node well set-off; anterior margination of peduncle complete in dorsal view; peduncle shorter than node, its free face more or less as long as height of anterior face of node. Petiolar node trapezoidal in profile, with inclined anterior face; the node longer than high measured from ventral end of tergum; as long as broad in dorsal view; anterior margin convex, rather pointed at the midline. Postpetiole small, subconical, with converging sides.

Postpetiole and gaster finely pubescent, and with numerous short standing hairs. Body, excluding appendages, yellowish-brown to light reddish-brown from head to postpetiole, the latter sometimes a shade darker; gaster, including apical segment, darker mahogany brown. Mandibles reddish-brown, concolorous with clypeus; antennae and legs yellowish- to reddish-brown, more or less concolorous with mesosoma, and quite close in colour to the mandibles and antennae.

Holotype, worker. South Australia: Stenhouse Bay (35°17'S; 136°57'E), 14 October 1972, (B. B. Lowery).

Paratypes. South Australia: 8 workers, 41 km W by S of Nullarbor (31/131), 24 October 1977, (RWT, 77.651 and 652); 4 workers, Lake Gilles CP (33/136), 15 December 1981, (GPB, M177); 2 workers, Marble Hill (34/138), 26 February 1979 (GPB, M1); alate queen, Lake Bonney, Pelican Point (34/140), 2 April 1981 (GPB, M265); worker, Cambrai (34/139), 16 October 1972 (PJMG); 2 workers, same locality, 17 March 1972 (PJMG); 14 workers, Stenhouse Bay (holotype nest series). Western Australia: 5 workers, 10–25 km N of Junana Rock on Balladonia Rd. (33/123), 26 October 1977, (RWT) (77.672; 77.673).

Holotype and most paratypes in ANIC (type No. 7930); paratypes in BMNH, MCZC, MHNG, SAMA, WAMP.

Remarks. The type nest series was taken in mallee and dense scrub vegetation over sandy limestone soil; the specimens collected 41 km W by S of Nullarbor and on the Balladonia Road were nocturnal strays on the ground or tree trunks in tall mallee woodland.

M. erecta is a member of the *forcicata* subgroup. It is most similar to *M. pyriformis* in possessing hairy eyes, pubescent postpetiole and gaster, and short standing hairs on the pronotum. This species can be distinguished by the short standing hairs on the scapes, which are present throughout their length. Though there is variation, the bicoloured body coloration distinguishes *M. erecta* to some extent, since *M. pyriformis* is nearly always more or less uniformly dark brown. *M. erecta* ranges from the Southern Gulfs of SA, through southern areas of that state to southeastern WA.

Myrmecia fulgida Clark

Myrmecia fulgida Clark, 1951: 73. Holotype worker (ANIC). Type locality: Parkers Range, WA.
Myrmecia suttoni Clark, 1951: 72. Holotype worker (ANIC). Type locality: Fletcher, Qld. syn. nov.

We have examined and compared the holotype and 5 paratype workers (so labelled) of *M. fulgida* with the holotype, 3 paratype workers (so labelled) and a dealate queen of *M. suttoni* (all ANIC). The *suttoni* queen has data labels identical to the worker types, and appears to have been mounted and labelled simultaneously with them. It is not labelled a type, but Clark originally described the dealate female, and this specimen is probably the relevant paratype.

M. fulgida was described from Parkers Range (31/119), WA; *M. suttoni* a continent away, from Fletcher (28/151), Qld. The ANIC has other worker specimens from WA (localities listed below), which we confidently consider to be conspecific with the *fulgida* types. It appears that further specimens matching the *suttoni* types have never been recognized from Queensland, so that the latter are evidently the only specimens ever identified as *M. suttoni*.

These two nominal taxa share the same detailed physiognomy and colour pattern, and both have dense, thick, standing hairs on the head and mesosoma. Workers of the two cannot be separated morphologically to our satisfaction. We confidently believe them to be conspecific, and thus declare the above synonymy.

We suggest that the Queensland types are probably mislabelled Western Australian specimens, and select the WA name as the senior synonym because the presence of this species in WA has been confirmed by modern collections.

Collection localities of specimens examined. Specimens identified as *M. fulgida* and discussed above are from Western Australia: Parkers Range, (TG) (?type series—labels etc. identical to the types, but the pins lack type-indicative labels); South Ironcap (32/121) (GPB and G. J. Mutze); Middle Ironcap (32/119) (J. Gardner); Lake Cronin (32/119) (W. F. Humphreys).

Myrmecia fuscipes Clark stat. nov.

Myrmecia fuscipes Clark, 1951: 62. Holotype worker (ANIC). Type locality: Port Lincoln, SA. (Examined.) (Synonymized with *Myrmecia desertorum* Wheeler by Brown 1953b.)

M. fuscipes is closely related to *M. desertorum*, but, unlike Brown (1953b), we consider it to be a distinct species, morphologically distinguished primarily by its darker-coloured legs. The nesting habits and behavioural characteristics of *fuscipes* are different from those of *desertorum*, briefly as follows. Nests of *fuscipes* open directly on flat ground, usually without mounds, and mostly near a tree base or stone, in open woodland or shrubby situations. Its workers are not particularly aggressive when nests are disturbed, and quickly cease emerging from the nests if repeatedly disturbed. *M. desertorum*, on the other hand, constructs very large low mounds (more than 1 m, or

even 2 m, in diameter) with large, open entrances in the centre. These are usually situated in open sandy situations. The workers are relatively very aggressive.

Karyological studies by H. T. Imai (personal communication) show these two morphologically similar species to be karyologically very distinct: *M. fuscipes* has the diploid chromosome number $2n=78$; *M. desertorum* has $2n=38$ (*M. fuscipes*: colony HI89-012, 13 December 1989, Poochera, SA; *M. desertorum*: colony HI89-011, 13 December 1986, ca. 18 km SSE of Poochera, SA; collectors Imai, Taylor, Kubota, Ogata and Wada). *M. fuscipes* inhabits southern semi-arid areas of SA and WA. It is a member of the *vindex* subgroup. The latter is characterized by yellowish mandibles and clypeus, with the head and gaster often dark brown, contrasting with the dull yellowish-brown or light brown mesosoma and nodes, the sub-basal portion of the mandible is more or less broadened, the petiolar peduncle long, and the node rounded. The *vindex* subgroup comprises *M. desertorum*, *M. dimidiata*, *M. fulgida*, *M. fuscipes*, *M. nigriceps* and *M. vindex*. Species-level classification of the subgroup is difficult, and several known 'good' species (some of them evidently undescribed), like *fuscipes*, have workers morphologically distinguished apparently only by characters of coloration. This being the case it is sometimes very difficult to determine the relationships of slightly divergent worker specimens. Studies on karyology and male genitalia will likely resolve this complex (see Browning, 1987).

Collection localities of specimens examined. South Australia: 46 km N of Renmark (33/140) (*GPB et al.*); Ridley Cons. Pk. (34/139) (*P. Christy*); Port Parham (34/138) (*GPB*); Port Augusta (32/137) (*TG*); 6 km NW of Kadina (33/137) (*GPB et al.*); Honeymoon Paddock (32/137) (*GPB et al.*); Reevesby Island (34/136); 13 km W of Nonning HS (32/136); Lake Hart (31/136) (*GPB et al.*); 15 mi E of Kimba (33/136) (*EFR*); Laura Bay CP (32/133) (*GPB*); 35 mi E of Ceduna (32/133) (*EFR*); 100 mi W of Penong (31/131) (*EFR*); 4 km W of Nullarbor (31/130); (*GPB et al.*); 120 mi W of Penong (31/130) (*EFR*). Western Australia: Madura (31/127) (*TG*); Balladonia (32/123) (*TG*); Mardarbillia (32/123) (*TG*); Pt Malcolm (33/123) (*TG*); Mt Ragged (33/123) (*RWT*); Breeborinia Rocks (33/123) (*GPB et al.*); 14 mi WS of Fraser Range HS (32/122) (*RWT*); 26 km E of Norseman (32/122) (*GPB et al.*); 4 km SW of Kalgoorlie (30/121) (*GPB*); 2 km S of Peak Charles (32/121) (*GPB et al.*).

Myrmecia minuscula Forel stat. nov.

Myrmecia flavicoma var. *minuscula* Forel, 1915: 8. Syntype worker (MHNG, ANIC). Original localities: Malanda and Cedar Creek, Qld. (Examined.)

M. minuscula is closely similar to *M. flavicoma*, to which it is probably related, and of which it has formerly been considered a subspecies. We consider it to be a separate species, recognized by its less divergent frontal carinae, shorter and straight standing hairs on the pronotum, and dense pubescence of velvety yellow to golden colour on the apicodorsal surface of the gaster, distributed in a section extending from the posterior margin of the large first segment to the gastral apex. The distribution of these species is allopatric: *minuscula* is restricted to the eastern base of Cape York Peninsula, while *flavicoma* is found in more southern areas of eastern Queensland.

Collection localities of specimens examined. Queensland: Mossman Bluff Track (16/145) (*GBM et al.*); Lamb Range, (1100–1200 m) (17/145) (*GBM and Thompson*); Bel Peak North (900–1000 m) (17/145) (*GBM and D. Cook*); Mt Bartle Frere (1620 m) (17/145) (*Earthwatch*); Upper Boulders Ck (850 m) (17/145) (*D. Cook, GMB, Thompson*); Cedar Creek (*Mjöberg*).

Myrmecia nigriceps Mayr

Myrmecia nigriceps Mayr, 1862: 725. Syntype worker (NHMW). Type locality: Australia (New Holland). (Type compared material examined.)

Myrmecia fasciata Clark, 1951: 63. Holotype worker (ANIC). Type locality: Pilliga, NSW. (Examined) syn. nov.

M. nigriceps is widely distributed in southern Australia, and is one of the most common *Myrmecia* species of the southeast. It is distinguished from other members of the *M. vindex* subgroup by its dull reddish-brown mesosoma and the short suberect hairs on the antennal scapes.

The head of *nigriceps* is usually darker in colour than the mesosoma, but varies gradually from mostly dull reddish-brown to entirely blackish-brown. The holotype and paratypes of *M. fasciata* have heads almost concolorous with their mesosomas, with an obscure transverse black band between the eyes, the extent of which is variable. ANIC specimens of *nigriceps* compared in 1972 by R.W.T. with the Mayr types in Vienna are in our opinion conspecific with the holotype of *M. fasciata*, justifying the above synonymy.

Collection localities of specimens examined. New South Wales: Pilliga (30/148) (WWF); Warrumbungle NP (31/148) (BBL); 12 km S of Narrabri (32/149) (BBL); 6 km S of Cessnock (32/151) (BBL); Como (33/151) (RWT); Heathcote (34/151) (*W. M. Wheeler*); Wilton (34/151) (JC). Australian Capital Territory: Canberra (35/149) (*G. A. Currie*). Victoria: Stawell (37/142) (*J. A. Hill*); Lake Hattah (34/142) (*J. E. Dixon*); Wedderburn (36/143) (EFR). South Australia: Lake Bonney (34/140) (GPB); 2 km S of Seal Bay (36/137), Kangaroo I (GPB). Western Australia: Ravensthorpe (33/120); Perth (31/115) (JC).

*Myrmecia pavid*a Clark

*Myrmecia pavid*a Clark, 1951: 76. Holotype worker (ANIC). Type locality: Mt Barker, WA. (Examined.)

Myrmecia atrata Clark, 1951: 77. Holotype worker (ANIC). Type locality: Ravensthorpe, WA. (Examined) syn. nov.

*M. pavid*a is a member of the *rufinodis* subgroup. The latter is defined by the following combination of characters: (1) yellowish mandibles, distinctly lighter in colour than the cranium; (2) a dark-coloured clypeus, almost concolorous with the cranium; (3) a slender, elongate petiolar peduncle, which extends beyond the level of the apices of the hind coxae when they are turned posteriorly beside it; (4) a virtually hemispherical petiolar node, clearly rounded when viewed in profile.

This subgroup comprises *M. arnoldi*, *M. pavid*a, *M. rubripes* and *M. rufinodis*. Its species are distributed across the southern part of SA and the southwestern part of WA. Species of the *rufinodis* subgroup somewhat resemble those of the *vindex* subgroup, but can be distinguished by the relatively dark-coloured clypeus and slender petiolar peduncle.

Within the *rufinodis* subgroup *M. pavid*a is distinguished by the broadened sub-basal portions of its mandibles, and the relatively very short standing hairs on the pronotum. The latter are as long or slightly shorter than the width of the antennal scape. Coloration, except for the appendages, varies from essentially uniformly dark brown or black to bicoloured, with tagmata from head to postpetiole light brown, and gaster black or very dark brown. The latter coloration resembles that of *M. vindex*. Some colour variants have the head and gaster dark brown and other tagmata light brown. They thus resemble *M. nigriceps*. Others have the petiole and postpetiole

relatively lightly coloured, like that of *M. rufinodis*. Coloration of the legs is also variable, generally paralleling that of the mesosoma, but the antennae and mandibles are consistently yellow to reddish yellow.

Collection localities of specimens examined. South Australia: Coultia (34/135) (TG). Western Australia: Israelite Bay (33/123) (TG); Thomas River (33/123) (RWT); 10 mi ENE of Esperance (33/121) (RWT); Ravensthorpe (33/120); Jacup (33/119) (TG); Jerramungup (33/118) (GPB); Mt Barker (34/117) (TG).

Myrmecia rowlandi Forel

Myrmecia tarsata rowlandi Forel, 1910: 4. Original localities: Kuranda and Cairns, Qld. (Syntypes examined.)

Myrmecia tarsata malandensis Forel, 1915: 9. Syntype worker (from Malanda) (ANIC). Original localities: Malanda, Cedar Creek (=Ravenshoe) and Atherton, Qld. (Synonymy by Brown 1953b.)

Myrmecia cordata Clark, 1951: 116. Holotype worker (ANIC). Type locality: Malanda, Qld (Preoccupied by Fabricius 1805 = *Daceton armigerum* Latreille, 1802). (Examined) syn. nov.

Myrmecia cardigaster Brown, 1953b: 28. (nom. nov. for *Myrmecia cordata* Clark 1951) (Preoccupied) syn. nov.

The junior synonym *M. cardigaster* is known only from its holotype. Its cordate gaster (Fig. 9) is unusual, but the type otherwise runs to *M. rowlandi* in our keys. Compared to available *rowlandi* specimens the colours of the body and appendages are relatively light, but arrangement of the variously toned sections is the same. A semi-callow *rowlandi* would likely be similarly coloured. The sculpturation is similar to that of average *rowlandi* workers, but a little less pronounced. Viewed from above the mesonotum in *rowlandi* is relatively narrow compared to those of other north Queensland *gulosa*-group species. The mesosoma thus has a more pronounced than usual constricted appearance in dorsal view. This feature is even more extreme in the *cardigaster* type, but that might result from pupal damage, since the mesonotum is exceptionally narrow, and the propodeum has a median dorsal longitudinal crease, possibly indicating past compression, or perhaps shrinkage following drying of a callow specimen. Either way, the features reviewed need not be considered taxonomically significant. We believe that they are not. The unusual gaster of the *cardigaster* type appears to be a deformity, or the result of pupal damage, and thus not taxonomically significant. We therefore assign *M. cardigaster* to the junior synonymy of *M. rowlandi*.

Crosland (1988) demonstrated that certain peculiarly light yellowish-brown worker individuals found in the nests of *M. pilosula* (a species normally very dark blackish-brown to black) are affected by gregarine protozoan endoparasites. He concluded that parasitic infection prevents tanning and hardening of the host cuticle, explaining this condition. The light colour and gastral configuration of *cardigaster* might similarly have resulted from gregarine or other parasitism of a *rowlandi* worker.

M. rowlandi is represented in the ANIC from at or near the following localities: Queensland: Mt Finnigan and Shiptons Flat (15/145); Kuranda and Mossman Gorge (16/145); Bellenden Ker Range, Crawford's Lookout, Josephine Falls, Lake Eacham NP, Malanda (*tarsata malandensis* syntype), and North Bell Peak 20 km S of Cairns (17/145).

The *cardigaster* holotype is from Malanda (17/145—one of the original localities of the *rowlandi* junior synonym *M. tarsata malandensis*), well within the known *rowlandi* range, in an area where *M. rowlandi*, *M. minuscula* and *M. mjobergi* are the only *gulosa*-group species found in rainforest, and few other large *Myrmecia* species, apart from *aurentiventris*, *athertonensis* and *brevinoda*, are known from other habitats.

Myrmecia vindex F. Smith

Myrmecia vindex F. Smith, 1858: 144. Syntype worker (BMNH). Type locality: WA. (Type compared material examined.)

Myrmecia vindex basirufa Forel, 1907: 264. Syntype worker (MHNG, ANIC). Type locality: Subiaco, WA. (Examined) syn. nov.

M. vindex is apparently very closely related to *M. nigriceps* and *M. gratiosa*, and is distinguished from them only by the absence of standing hairs on the antennal scapes (except for a few at the extreme apex), and the darker colour of the mesosoma. This species shows wide-ranging colour variation. The head varies from light brown (almost concolorous with the mesosoma) to dark brown, and the gaster ranges from entirely dark brown or black to light brown basally, with the apex dark brown. The type of *M. basirufa* is in our opinion simply a light-coloured individual of *M. vindex*, hence the above synonymy.

Collection localities of specimens examined. Western Australia: Northampton (28/114) (*J. C. Cardale*); Subiaco (31/115) (*Hamb. S.W. Austr. Exp.*); Perth (31/115) (*JC*); Kings Park (31/115) (*W. M. Wheeler*); Mundaring (31/116) (*JC*); Toodayay (31/116) (*M. S. Upton*); Ludlow (33/115) (*JC*); 10 S Margaret River (33/115) (*EFR*); Lort River valley (33/121) (*BBL*); Cranbrook (34/117) (*TG*); Albany (35/117) (*JC*); Nornalup (35/116) (*EFR*).

The *Myrmecia pilosula* species group

The *pilosula* group, as recognized here, comprises 15 species (including the New Caledonian *M. apicalis*). Two new synonyms and 2 elevations from subspecies rank are proposed.

Specimens previously identified in collections as *M. pilosula* are now known from karyological evidence to include several sibling species. All of these, apart from *M. pilosula* itself and the recently described *M. croslandi* (Taylor, 1991), appear to lack scientific names. They have been discussed extensively using the formal aggregate name *M. (pilosula)*, with associated codes on chromosome numbers distinguishing the component units, e.g. *M. (pilosula) n = 1* (Imai and Taylor 1986; Imai *et al.*, 1990). The code cited above was used, for example, to discriminate *M. croslandi* prior to its description. Taxonomic descriptions of other (*pilosula*) siblings, including chromosomal data, distributional details etc., are in preparation.

Other close-knit subgroups or complexes of species recognized here within the *pilosula* group are those of *M. chasei* (*chasei* and *ludlowi*), *M. harderi* (*harderi* and *cydista*), and *M. michaelseni* (*chrysogaster*, *michaelseni*, *queenslandica* and *rugosa*).

Myrmecia harderi Forel

Myrmecia harderi Forel, 1910: 8. Syntype worker (MHNG, ANIC). Type locality: Gunnedah, NSW. (Examined.)

Promyrmecia harderi: Clark, 1943: 118.

Promyrmecia scabra Clark, 1943: 118. Syntype worker and female (MVMA). Type locality: Leigh Creek, SA. (Examined.) (Synonymy by Brown, 1953b: 16.)

Promyrmecia maloni Clark, 1943: 121. Syntype worker (MVMA). Type locality: Inglewood, Vic. (Examined.) (Synonymy by Brown 1953b: 16.)

Promyrmecia celaena Clark, 1943: 120. Syntype worker (MVMA). Original localities: Pilliga and Narrabri, NSW; Millmerran, Qld. (Examined) syn. nov.

M. harderi is distinguished from other members of the *pilosula* group by the following combination of characters: (1) mandibles yellow; (2) mandibular shafts slender, without distinct broadened sub-basal areas; (3) standing hairs on clypeus shorter than 1st funicular segment; (4) legs dark brown to black; (5) standing hairs on postpetiole rather abundant and long; (6) postpetiole distinctly sculptured (the sculptural intensity less than that of node, approximately as on the mesonotum); (7) pubescence on postpetiole and gaster white. Except for the mandibles and legs, the colour pattern of *M. harderi* varies considerably. The body may be bicoloured, with the mesosoma and petiole reddish-brown and the remainder black, to entirely black. The postpetiole is usually black, but sometimes has pair of bilateral reddish dorsal spots. The type specimens of *celaena* are representatives of the black form of *M. harderi*. Assuming it to be a separate species, the closest relative of *harderi* is *M. cydista*, which shares characters (1) to (6) listed above, though distinct postpetiolar sculpturing is less frequent in *cydista* than in *harderi*. *M. harderi* can be separated from *cydista* by character (7), since *cydista* has distinctly greenish postpetiolar and gastral pubescence. The distribution of *M. harderi* runs from the Murray-Darling basin (including parts of Qld, NSW and Vic), to the S Gulfs of SA.

Collection localities of specimens examined. Queensland: St George South, (BBL). New South Wales: Palmer SF (35/146) (BBL); 25 km N of Barooga (34/145) (BBL); 10 km N of Dubbo (32/148) (BBL); Buckingbong SF, 30 km S of Narrandera, (BBL); Berrigan SF (35/145) (BBL); 10 km E of Morundah (34/146) (BBL); Bookong SF (35/145) (BBL); Pilliga Scrub (WWF); Gunnedah, (WWF); Victoria: Inglewood, (JC). South Australia: Leigh Creek; Sevenhill (BBL).

Myrmecia ludlowi Crawley stat. nov.

Myrmecia chasei var. *ludlowi* Crawley, 1922: 431. Syntype workers (OXUM, MVMA). Type locality: Ludlow, WA. (Examined.)

Promyrmecia chasei var. *ludlowi*: Clark, 1943: 117.

Promyrmecia chasei ludlowi: Clark, 1943: 215

M. ludlowi is closely related to *M. chasei* and, since its first description, has been considered by authors to be a subspecies of the latter. These taxa are distinguished in the *pilosula* group by the possession of abundant long hairs on the body and legs, a subrectangular petiolar node in dorsal view, and relatively large size. Except for the mandibles, the general colour pattern of both is similar, and relatively invariable: head, legs, postpetiole and gaster blackish-brown to black, the remaining body parts generally yellowish-red, though the mesonotum sometimes carries an obscure blackish median spot. *M. ludlowi* is distinguished from *M. chasei* by its dark brown mandibles and coarser sculpturation on the head, which is irregularly reticulate posteriorly. *M. chasei* has light yellowish mandibles and the head is finely striate behind. The distribution of *ludlowi* appears to be more restricted in southwestern WA than that of *M. chasei*.

Collection localities of specimens examined. Western Australia: Morley (31/115) (K. T. Richards and L. M. O'Hallarn); Ludlow (33/115) (JC); Dansborough (33/115) (WAMP); Bunbury (33/115) (EFR); Yallingup (33/115) (EFR); Stewart Highway, 18 km from Nannup-Pemberton Rd (34/115) (E. B. Britton); Calgardup (34/115) (WAMP).

Myrmecia occidentalis Clark

Promyrmecia occidentalis Clark, 1943: 119. Syntype worker and female (MVMA). Original localities: Tammin (type locality), Eradu, Merredin and Beverley, WA. (Examined.)

Myrmecia occidentalis: Taylor and D. R. Brown, 1985: 13.

Promyrmecia opaca Clark, 1943: 123. Syntype worker and female (MVMA). Type localities: Tammin (type locality), Eradu and Dowerin, WA. (Examined) syn. nov.

The colour pattern of *M. occidentalis* is relatively invariable: mandibles, propodeum, legs and petiole yellowish- to reddish-brown, remainder generally blackish, though the antennae, mesepisternum, metanotal groove, spiracular lobes, and postpetiole may vary from reddish-brown to black. Similar coloration occurs in *M. picta*, *M. infima*, *M. harderi* and *M. varians*. *M. occidentalis* has short standing hairs on the clypeus; antennae relatively long for a member of the *pilosula* group—they exceed the posterior margin of the head by half the length of the 1st funicular segment; and a broad anterior ventral flange on the postpetiole. The latter is subrectangular, with rounded corners and a slightly incised anteroventral margin. Clark (1951) separated *occidentalis* from *opaca* using the colour of the 'epinotum' (i.e. propodeum), antennae and legs. *M. occidentalis* in his scheme had 'light red' propodeum and 'reddish-yellow' antennae and legs, while *M. opaca* had 'blood red' propodeum and 'reddish-brown' appendages. These differences we consider to be minor, and insufficient to indicate possible separate specific status. Direct comparison of the types, and consideration of putatively conspecific specimens, demonstrates no other apparently significant differences between them. Note the similar suites of original localities for the two putative species, which are cited in the heading above.

Collection localities of specimens examined. South Australia: Yudnamutana (30/139) (BBL). Western Australia: Esperance (33/121) (BBL); Thomas River (33/121) (E. B. Britton); Mogumber (WAMP); Lake Grace (WAMP); Tammin (31/117) (JC); Beverley (32/116) (JC); Eradu (28/115) (JC).

Myrmecia queenslandica Forel stat. nov.

Myrmecia michaelsoni r. *queenslandica* Forel, 1915: 4. Holotype worker (SMNS). Type locality: Lamington Plateau, Qld.

Promyrmecia michaelsoni queenslandica: Clark, 1943: 112.

Myrmecia michaelsoni overbecki Viehmeyer, 1924: 222. Syntype worker and female (ZMHB). Type locality: Trial Bay, NSW. (Synonymy by Clark 1943: 112).

M. queenslandica is closely related to *M. michaelsoni*—indeed it seems not impossible that the two might eventually prove to be geographical variants of a single species. These putative taxa share the following characters: (1) clypeus with hairs long enough virtually to span the basal third to half of the mandibles; (2) standing hairs on mesosoma and petiole abundant and wavy, longer than the 1st funicular segment; (3) mandibular shaft weakly broadened sub-basally; (4) mandibular dentition consisting of 4 large teeth, the basal 2 of which are closely adjacent, and usually without interpolated small teeth; (5) body more or less uniformly black, with dark brown mandibles, antennae and legs.

Although we have not examined its type(s), we provisionally recognize *M. queenslandica* as a species separate from *michaelsoni* because (a) the distributional range of *queenslandica* is not overlapped by that of *michaelsoni* (*queenslandica* ranges from the southeastern coastal region of Qld through NSW and Vic to the S Gulfs of SA, while *michaelsoni* is restricted to the southwestern coastal region of WA); (b) the two putative taxa are distinguished by differences in the pubescence of the postpetiole and

gaster—*queenslandica* has greenish pubescence on the dorsal surfaces of both, while *michaelseni* has whitish pubescence on the postpetiole, and that of the gaster is reddish.

Apart from the coloration and surface sculpturing, *queenslandica* and *michaelseni* are similar to *M. chrysogaster* and *M. rugosa*. These 4 species constitutes the *M. michaelseni* species subgroup, which is defined by its possession of characters 1 to 4 of the preceding paragraph.

Collection localities of specimens examined. Queensland: Noosa River, Cooloola (26/153) (PJM); Blackall Range (26/152); Ravensbourne NP (27/152) (BBL); Archerfield (27/153) (GBM); Glenugie SF (31/151) (BBL); Grenfell (33/148) (BBL); Wyngala Dam (33/148) (BBL); Leumeah (34/150) (BBL); 4 mi W of Berry (34/150); Long Beach, nr Batemans Bay (35/150) (BBL); Rosedale Beach, nr. Batemans Bay (35/150) (BBL). South Australia: Sandy Creek CP (34/138) (GPB); 20 mi S of Tailern Bend (35/139) (BBL).

The *Myrmecia tepperi* species group

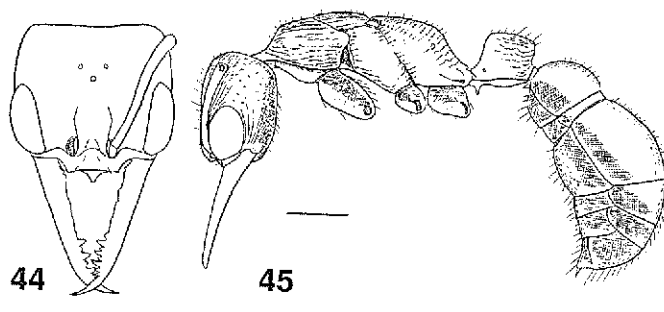
Although the total number of *tepperi*-group species recognized here is the same as in Clark (1951), one of his names is synonymized, and a new species is added.

Myrmecia acuta sp. nov.

(Figs 44, 45)

Worker. General features as illustrated. Dimensions (mm, 2 specimens measured): HW 1.7–1.8; HL 1.6–1.8; CI 103, 103; SL 1.3–1.4; SI 76–77; ML 1.7–1.8; MI 100–109; PrW 1.2–1.3; WL 2.9–3.0; PtW 0.7; PtL 0.8–0.9; PsW 1.1–1.3; PsL 0.9; GW 1.5–1.7; PeI 75.

A relatively small species. Head slightly broader than long; occipital margin slightly concave, with rounded corners. Clypeus with standing hairs shorter than 1st funicular segment; anterior depression exposed, short, triangular, posteriormost portion reaching the level of the mandibular insertions. Mandibles longer than head; outer margins almost straight to slightly concave; shafts slender, not broadened sub-basally. Dentition behind the narrow apical tooth including 3 clustered, erect, larger teeth (the middle one usually smallest), separated from the apex by 1 or 2 minute denticles (the basal one paired with the small but distinct ventral supplementary tooth); the pairs of large teeth with or without an interpolated small denticle; basal half of shaft with poorly developed, low teeth, which are directed basally. Dorsal process of labrum a distinctive, narrow, acute, tooth-like process. Eyes strongly convex, with or without (? the latter due to wear) very minute, almost imperceptible hairs; anterior portion contiguous with posterior margin of clypeus. Frontal carinae divergent anterior to antennal insertions. Antennal scape failing to reach occipital margin by about half the length of the 1st funicular segment, or nearly so; lacking erect or suberect hairs; 3rd funicular segment slightly shorter than 1st; 2nd longer. Pronotum rather steeply raised anteriorly; sides weakly convex, but not greatly constricted posteriorly in dorsal view; standing hairs mostly shorter than length of 1st funicular segment, a few sometimes as long or slightly longer. Mesonotum flattened, not raised in profile; posterior margin at the midline transversally straight in dorsal view. Mesepisternum with anterior ridges complete, separating ventral from lateral areas. Metanotal area reduced to form a shallow furrow. The sides of the mesothoracic section of the mesosoma inflated in dorsal view, so that the mesosoma here is as broad or slightly broader than across the pronotum or propodeum. Propodeum not depressed; anterior dorsal margin transverse, straight, thick enough to appear sub-truncate in dorsal view. Anterior hind tibial spur 2/3 or



FIGS 44, 45. *Myrmecia acuta* sp. nov., worker (scale line = 1 mm). Fig. 44: head, frontal view. Fig. 45: body, lateral view.

more as long as the distinctly pectinate posterior spur. Anterior emargination of petiolar peduncle incomplete in dorsal view; the peduncle not very clearly set-off from node. Petiolar node as long as high (measured from ventral margin of tergum), subrectangular in profile, with parallel anterior and posterior faces and rounded corners; in dorsal view as broad or broader than long, with convex sides; anterior face vertically raised; anterior margin straight. Postpetiole relatively large, hemispherical, with rounded anterior margin; dorsal surface covered with white pubescence. Dorsal surface of gaster with white pubescence from base to apical segments. Standing hairs on body short, sparse.

Body, excluding appendages, bicoloured; mesosoma and petiole reddish-brown, the remainder dark brown to black; mandibles yellow.

Holotype, worker. Western Australia: Esperance, Telegraph Hill (33/141), 300 ft, 5 January 1970 (*B. B. Lowery*).

Paratypes, 12 workers. Western Australia: Telegraph Hill (type nest series).

Holotype and most paratypes in ANIC (type No. 7931); paratypes in BMNH, MCZC, MHNG, WAMP.

Remarks. The type series includes specimens from a single colony, some of which were collected in the evening, at around 6 p.m., foraging on low flowering scrubs.

M. acuta is closely similar to *M. swalei*, which it resembles in colour pattern (the mandibles yellowish and the body bicoloured red and black). It is distinguished by its pointed labral process, the more abundant mid-tibial pilosity, the somewhat less-coarse striation on the head, which is not reticulate behind (as is usual in *swalei*), and, in dorsal view, the generally more distinctly inflated mesosoma, the condition of which is similar to *acuta* only in the largest available specimens of *swalei*.

Myrmecia swalei Crawley

Myrmecia harderi r. *swalei* Crawley, 1922: 429. Holotype worker (OXUM). Type locality: Albany, WA.

Promyrmecia swalei: Clark, 1943: 133.

M. swalei was described by Crawley from a single worker. Although we have not examined the type, the species is confidently distinguished by the following combination of characters:

1. Distinct and constant colour pattern, with the mandibles yellowish-brown, the mesosoma and petiole light reddish-brown and the remainder (including antennae and legs) blackish-brown.

2. Mesosoma less constricted across the mesothoracic section than is usual, so that its sides are more or less sub-parallel in dorsal view.
3. Mesonotum flattened and propodeum swollen, so that the dorsal mesosomal profile forms a single, gently curved arc.
4. Rather long standing hairs (longer than width of scape) on the pronotum.
5. Dorsal projection of labrum trapezoidal, sometimes reduced or vestigial.

In size and colour pattern *M. swalei* is similar to *M. elegans* (*pilosula* group).

Known distribution is restricted to southwestern Australia. The ANIC and MVMA have specimens labelled '*Promyrmecia swalei* Craw., Type', presumably by Clark. These are not types, but were probably used by Clark as the reference material for his revisions (Clark, 1943, 1951). The specimens in MVMA are a male and a dealated female, respectively, with the following data: Albany, WA, January 1935, M. Solomon; Albany, W Australia, J. Clark. The ANIC specimen is a worker with the data: Albany, W Australia, J. Clark. It is in fact an incorrectly identified specimen of *M. testaceipes*.

Collection localities of specimens examined. Western Australia: Kings Park, Perth (31/115) (*BBL*); Nedlands (31/115) (*WAMP*); Swanbourne (31/115) (*WAMP*); Wembley (31/115) (*WAMP*); Midland (31/116) (*WAMP*); Cannington (32/115) (*R. P. McMillan*) (*WAMP*); Dwellingup (32/116) (*JC*); Dansborough (33/115) (*WAMP*); Ludlow (33/115) (*JC*); Margaret River (33/115) (*EFR*); Yallingup (33/115) (*WAMP*); Augusta (34/115) (*E. B. Britton*).

Myrmecia testaceipes (Clark)

Promyrmecia testaceipes Clark, 1943: 134. Syntype worker (MVMA). Type locality: Albany, WA. (Examined.)

Myrmecia testaceipes: Taylor and D. R. Brown, 1985: 17.

Promyrmecia dixonii Clark, 1943: 135. Syntype worker and female (MVMA). Original localities: Eltham, Vic.; Albury, NSW; Canberra, ACT. (Examined) syn. nov.

Myrmecia dixonii: Taylor and D. R. Brown, 1985: 8.

The syntype workers of *M. testaceipes* are slightly lighter in colour than those of *M. dixonii*, but the basic colour pattern is almost the same: mandibles yellow to brown, more lightly coloured than head, and contrasting with it; head and gaster dark brown to black; the remainder, including antennae and legs, lighter brown. *M. testaceipes* can be distinguished from other members of the *tepperi* group by the combination of the following characters: (1) bicoloured body; (2) antennal scape never exceeding occipital border of head; (3) pronotum broadest anteriorly, posterior portion narrowed in dorsal view; (4) mesonotum slightly raised. *M. testaceipes* is not common, but it is rather wide-ranging across southern Australia, from NSW to southwestern WA.

Collection localities of specimens examined. New South Wales: Wallerawang (33/150) (*BBL*); Albury (36/146) (*F. E. Wilson*). Victoria: Heathcote (36/144) (*BBL*); Eltham (37/149) (*J. F. Dixon*). South Australia: Calca (33/134) (*BBL*); 5 km N Fishery Bay (34/135) (*BBL*); Lincoln NP (34/136) (*BBL*); Stenhouse Bay (35/136) (*BBL*). Western Australia: Albany (35/117) (*JC*).

The *Myrmecia urens* species group

In this section the distinctive new species *M. loweryi* is described, and all other names available in the *urens* group are assigned to the aggregate complex of *M. (urens)*, following procedures discussed in the introduction.

The *Myrmecia (urens)* aggregate species complex

Ogata (1991) listed 6 species in the *M. urens* group, preserving Clark's (1951) arrangement, which included only one synonymy, *M. urens* = *M. pumilio*; first proposed by Mayr in 1876, and since universally accepted.

Early in this project we believed that these taxa could be arranged as 3 putative species, with the following synonymy:

1. *M. dichospila* Clark, 1938
= *M. exigua* (Clark, 1943)
= *M. rubicunda* (Clark, 1943)
2. *M. infima* Forel, 1900
= *M. nigra* Forel, 1907
3. *M. urens* Lowne, 1865
= *M. pumilio* Mayr, 1866.

Variation in size and sculpturation (the latter apparently largely allometric) among the many available specimens appeared to disqualify the relatively small types of *exigua* and *rubicunda* as possible representatives of 'good' species.

The fact that colour variation within single demes or even colonies of *urens*-group species can sometimes be extreme (including uniformly dark brown to blackish individuals, and others with sections of the body reddish-brown in various combinations) was invoked to support synonymy of the Western Australian taxa *infima* and *nigra*, as first suggested (though not formalized) by Wheeler (1933).

The key character provisionally separating *urens* from *dichospila* and *infima* was 'anterior hind tibial spur shorter than standing hairs on inner surface of hind tibia' (Fig. 30 A) versus 'anterior hind tibial spur longer than standing hairs on inner surface of hind tibia' (Fig. 30 B). This separates most eastern NSW, ACT and Victorian specimens from those taken in SA and southwestern WA. However, a few of the latter have short anterior hind-tibial spurs, and some of the putative *urens* have the spurs bilaterally short and long. Specimens thus identified as *M. urens* are nearly always uniformly dark blackish-brown in body colour, but occasional individuals have the propodeum, petiole, or both, reddish. Some colonies contain a diversity of bicoloured dark brown and red individuals, often including some which are fully brown; other colonies are entirely uniformly dark brown. All these '*urens*' specimens have (or apparently had before abrasion) abundant, short, erect ocular hairs.

M. dichospila was initially distinguished from *M. infima* by the characters 'eyes distinctly hairy (the hairs usually longer than the average diameter of the eye facets); standing hairs on clypeus long; sub-basal areas of mandibles more or less broad' versus 'eyes without hairs, or with the hairs very scattered and minute (usually shorter than the average diameter of the eye-facets); standing hairs on clypeus short; mandible slender, not expanded sub-basally'.

Western Australian material thus referable to *M. infima* almost universally has naked eyes and long anterior hind-tibial spurs, but exceptions exist to both character states. Ocular hairs, when present, are very tiny and dispersed. Bicoloured morphs are much more frequent here than in eastern '*urens*', perhaps supporting Wheeler's (1933) suggestion that the uniformly dark southwestern WA morph (*M. nigra*) should not be considered a species separate from the more common bicoloured morphs. The latter exist in substantial array. In the extreme situation much of the mesosoma, and the petiole, are bright reddish-brown, but this condition intergrades to uniform dark

brown. Thus, when comparison with the eastern '*urens*' of this discussion is considered, use of the name *Myrmecia infima* for southwestern Western Australian specimens (as by Wheeler, 1933) seems reasonable.

The apparent distinction between eastern (*urens*) and western (*infima*) species is completely clouded when material from SA, southeastern WA, western Vic and southwestern NSW is considered. The various features discussed are represented in all possible combinations, and there seems no chance that separate taxa can be distinguished using them alone. This led us to reject the hypothesis that the name *dichospila* could apply to most *urens*-group specimens from these areas.

We are thus unable, using available specimens, satisfactorily to distinguish separate biological species within the *urens* complex, or to confidently assert the number of likely species. There are probably several, but for the time being they are intractable. Use of the aggregate name *Myrmecia (urens)* is therefore recommended for identification purposes until more satisfactory resolution of the group is possible.

This situation is partly occasioned by the available collections. Most series comprise single or very few specimens, revealing little or nothing about variation or possible sympatric associations in source populations. It is usually not clear whether series were collected from single colonies or not, or, if they were taken foraging, whether the various colour morphs sometimes identically labelled were collected together or not. It is important with these ants that such details should be indicated on collection labels or in associated notes (preferably the former). Collectors should particularly seek to elucidate in the field possible sympatric associations between putative (*urens*)-complex species. Material collected by Rev B. B. Lowery is, incidentally, exemplary in these regards.

Also, preserved nest-series are scarce, so we have been unable satisfactorily to assess the importance of intranidal *versus* intrademe variability in colour polymorphism, mandibular dentition or sculptural expression. The latter featured in Clark's character system. There is variation in mandibular dentition, which seems partly to be allometric.

Separate colonies excavated at the same place and date should be differentiated by collectors on their labels, otherwise specimens will become disordered when mounted and identically labelled.

Variability in these ants is complicated, apparently involving intranidal, allometric, intrademe, geographical, and probably interspecific components. Understanding of intranidal and intrademe variation in several areas, or of the differences distinguishing confirmed separate species in sympatric associations, would be of great value here.

Taxonomic resolution of the (*urens*) complex is clearly largely a matter for field investigation and specifically directed collecting.

For the reasons given above we formally retain the Clark nomenclature, but recommend use of the aggregate *M. (urens)* to identifiers, and hope that future collectors will grasp opportunities for further understanding of these little ants (which include the smallest known in *Myrmecia*), and ensure that properly documented voucher specimens and series are deposited in accessible public collections.

We suspect that the remarkable colour variability of *M. (urens)* might be due to mimicry involving 'Müllerian' communication mutualism with other sympatric species of *Myrmecia*, such as *M. varians*, *M. picta*, and other small, brightly coloured forms. A similar hypothesis was used by Brown (1953b) successfully to explain colour variability in *M. forceps* (*gulosa* group), which appears always to mimic in colour the most common similarly large *Myrmecia* species with which it is associated. It would be of great interest to know the associates of *M. (urens)* at various localities, and to relate this

to its variability. The possibility that colour polymorphism in some populations could have resulted from selection for simultaneous resemblance to several local model species is worthy of examination, and if demonstrated would be of great scientific interest. We suggest below that the related new species, *M. loweryi*, could be a mimic of its locally very common associate *M. pilosula*.

Myrmecia loweryi sp. nov.

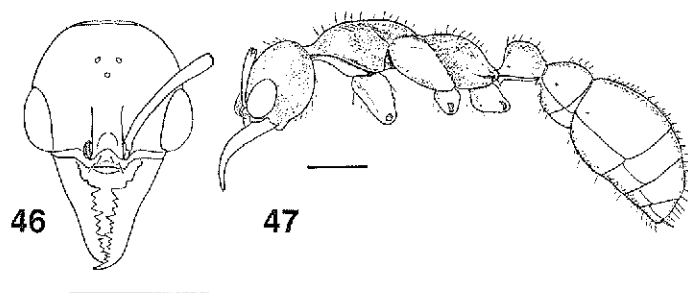
(Figs 46, 47)

Worker. A species with the characters of the *M. urens* group; distinguished from *M. (urens)* by the following features. (In this comparison the *M. (urens)* details are collectively applicable to all specimens of that aggregate species complex known to us.)

- | <i>M. (urens)</i> | <i>M. loweryi</i> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Frontal carinae sinuate, diverging anteriorly in frontal view. | 1. Frontal carinae straight, parallel in frontal view. |
| 2. Eyes variously hairy or lacking hairs—those present often minute. | 2. Eyes consistently with abundant standing hairs, each as long or longer than the diameter of an average facet. |
| 3. Body colour varying from uniformly very dark brown to bicoloured, with the mesosoma and petiole contrasting reddish-brown; intermediate individuals have the mesonotum, mesepisternum, propodeum or petiole variously reddish-brown. | 3. Body colour uniformly very dark glossy blackish-brown or black. |
| 4. Sculpturing relatively coarse; e.g. petiolar node distinctly, roughly, and moderately to coarsely rugose; the sculpture as strong or stronger than that of the pronotal disc, and markedly stronger than on the superficially sculptured mesonotum. | 4. Sculpturing at most very superficial and effaced; e.g. petiolar node dull shining, minutely punctate like mesonotum, and only a little more densely so than postpetiolar dorsum; pronotum relatively lightly sculptured, but clearly more strongly so than petiolar node. |
| 5. Anterior tibial spurs of hind legs long, short, or so small as to be considered vestigial. | 5. Anterior tibial spurs of hind legs consistently long, almost 2/3 as long as the pectinate posterior spurs. |

General features as illustrated. Dimensions (mm 6 specimens measured): HW 1.3–1.4; HL 1.3–1.5; CI 98–103; SL 1.1–1.2; SI 73–83; ML 1.2–1.3; MI 87–97; PrW 1.0; WL 2.6–2.8; PtW 0.5–0.9; PtL 0.8–0.9; PsW 0.9–1.0; PsL 0.7–0.8; GW 1.4–1.5; PsI 62–66. A smaller species (WL less than 4 mm).

Head as long as broad, with slightly convex occipital margin, blunt-angled occipital corners and posteriorly converging sides. Clypeus with standing hairs sparse, shorter than 1st funicular segment. Outer margin of mandibles straight; shafts slender, outer



FIGS 46, 47. *Myrmecia loweryi* sp. nov., worker (scale line = 1 mm). Fig. 46: head, frontal view. Fig. 47: body, lateral view.

margins convex; sub-basal portions weakly broadened. Mandibular dentition including 5 large teeth, the pairs interpolated by 1 or 2 small denticles, all teeth directed slightly forwards or mesally. Eyes contiguous with posterior margin of clypeus. Frontal carinae straight, parallel, not divergent anteriorly ahead of antennal insertions. Scapes when laid back not attaining occipital margin of head; lacking erect or suberect hairs; 3rd funicular segment shorter than 1st. Standing hairs of pronotum a little shorter than 1st funicular segment. Mesonotum barely raised in profile; mesepisternal ridge incomplete. Metanotal area shorter at the midline than the diameter of a spiracular lobe. Propodeum only slightly lower than mesonotum; anterior margin broadly rounded in dorsal view.

Petiolar peduncle with anterodorsal margination mesally incomplete in dorsal view; anterior peduncle short and obscure, not especially clearly set-off from node; shape of node variable, from slightly broader than long to a little longer than broad in dorsal view; anterior face slightly posteriorly inclined, transverse and almost straight in dorsal view. Postpetiole large, hemispherical, with rounded anterior margin.

Mandibles shining, with very superficial vague sculpturation. Head finely striate-rugose; the raised elements very broken along their length, more spaced between the frontal carinae than elsewhere, and somewhat posteriorly divergent laterally. Pronotal dorsum with transversally arched sculpturing, the elements similar to but finer than those of head; mesonotum superficially densely punctate, the sculpture often with a very vague transverse bias; propodeal dorsum transversally striate-rugose, the raised elements stronger, but less well defined than on head. Petiolar sculpturing matching mesonotum, the dorsum only slightly less shining than those of postpetiole and gaster; gaster a little less coarsely and densely punctate than postpetiole.

Body colour consistently and uniformly very dark glossy brown to black. Mandibles, antennae, labrum, visible maxillary and labial mouthparts and sting pale yellow to minutely brownish-yellow; antennae very slightly darker than mandibles, essentially matching their colour. Coxae, trochanters and femora matching body colour, with light infuscation at the joints. Apices of anterior femora and all tibiae and tarsi light yellowish-brown, matching antennae.

Body hairs moderately numerous, erect, about as long on average as the first funicular segment. Pilosity white, dense, ubiquitous on body.

Holotype, worker. Australian Capital Territory: 4 km W of Smoker's Gap, near Corrin Dam (35/148), ca. 3500 ft, 5 February 1959 (*B. B. Lowery*).

Paratypes. Australian Capital Territory: 7 workers, 2 dealate females, male, 4 km W of Smokers Gap (type-nest series); 5 workers, Honeysuckle Creek (35/148), 23 May

1988 (BBL); 6 workers, Mt Aggie (35/148), ca. 5000 ft, 1 January 1976 (BBL). New South Wales: worker, Mt Kosciuszko, Sawpit Creek (36/148), 10 November 1960 (EFR).

Holotype and most paratypes in ANIC (type No. 7932); paratypes in AMSA, BMNH, MCZC, HMNG.

Nomenclature. Named for Rev B. B. Lowery, SJ, who first recognized this taxon as a distinct species.

Remarks. Specimens of *M. loweryi* are readily distinguishable from all those available of *M. (urens)*. In the ACT *M. (urens)* coloration ranges from uniformly dark brown to variously bicoloured. Available specimens have hairy eyes; their sculpturing is coarse, as specified above for (*urens*); and their anterior hind-tibial spurs are relatively very small, usually clearly less than 1/3 as long as the pectinate posterior spurs, or sometimes minute vestigial nubbins.

Lowery's notes indicate that this species inhabits dry sclerophyll shrubland, nests in the soil, and is evidently a late diurnal/crepuscular forager (strays were taken on low shrubs at 4 p.m. and 7 p.m. on 1 January 1976). *M. loweryi* is common above about 4000 ft in the alps of southern NSW and the ACT. The original Smoker's Gap label describes the nest entrance as 'a tiny neat hole in the soil', and the nest as '9 inches deep'. We have not seen the entire type-nest series, which originally contained a dealate queen, 2 males, and 8 alate females (*testé* BBL label), with an unspecified number of workers.

The labels indicate that *M. loweryi* has been taken sympatrically with '*M. femorata*, *M. forficata*, *M. fulvipes*, *M. murina*, *M. piliventris*, *M. pilosula* and *M. pulchra*' (the locally abundant species of the (*pilosula*) complex is identified provisionally by RWT as 'true' *M. pilosula*). *M. loweryi* is somewhat smaller on average than local *pilosula*, but is strikingly similar in coloration. These two species have been collected foraging on the same individual shrubs (*testé* BBL). Mimicry between them might be evidenced (presumably communication mutualism of the 'Müllerian' type, since both species are otherwise likely to be unattractive to experienced predators).

Judging from the known distributions of associated other ants, including *M. pilosula*, *M. loweryi* might be expected also in the Victorian Alps and Tas, possibly in southeastern SA.

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