

## Two new Australian *Monomorium* Mayr (Hymenoptera: Formicidae), including a highly distinctive species

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**Abstract** Two new Australian ants of the genus *Monomorium* Mayr (Hymenoptera: Formicidae) are described. The most distinctive of the two species, *Monomorium sublamellatum* sp. n., pushes back the diagnostic boundaries of the genus *Monomorium*, and can not be placed at present in existing Australian species-groups of *Monomorium*. *Monomorium punctulatum* sp. n. belongs to the *Monomorium rubriceps* species-group.

**Key words** ants, *Monomorium sublamellatum* sp. n., *Monomorium punctulatum* sp. n., Solenopsidini, *rubriceps* species-group.

### INTRODUCTION

In terms of its diversity, morphological and biological variability, and its extensive range throughout the world, the myrmicine genus *Monomorium* Mayr represents one of the more important groups of ants. Several taxa, i.e., the pharaoh ant [*Monomorium pharaonis* (L)], the Singapore ant [*Monomorium destructor* (Jerdon)], and *Monomorium floricola* (Jerdon) are also notable tramp species and domestic pests (Williams 1994). On a world scale, Bolton (1995) listed 296 species in the genus *Monomorium*, but its true diversity could be well in excess of this. Recent major revisions of the genus at a regional level include those by DuBois (1986) (native New World species), Bolton (1987) (Afrotropical species) and Heterick (2001) (Australian fauna).

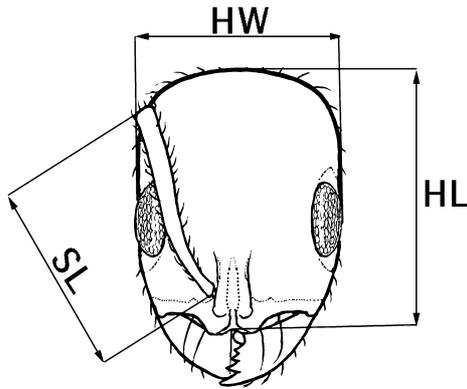
The current tribal classification of the subfamily Myrmicinae (to which the genus *Monomorium* belongs) is far from satisfactory (Bolton 1994). Although the tribe Solenopsidini has been characterised by Bolton (1987), his analysis is equally unsatisfactory; it requires examination of up to 13 characters, and some of these (e.g., the maximum number of mandibular teeth on the masticatory border) have had to be redefined in the light of recent discoveries (e.g., Heterick 2001). The most helpful diagnostic character, in most instances, is the presence of a median clypeal seta (occasionally slightly offset to one side). Only *Cardiocondyla* Emery (Tribe Formicoxenini) also possesses this feature (Bolton 1995), and gynes and workers of this genus can be separated from members of the Solenopsidini by a combination of 12 antennal segments, a non-bicarinat clypeus that projects forward over the mandibles, and 5-segmented maxillary palps. While one or more of these characters may be found in several genera among the Solenopsidini, they do not all occur together.

The genus *Monomorium* is equally hard to differentiate, and on a worldwide basis includes a bewildering variety of forms, which, on a superficial analysis, do not necessarily even remotely resemble one another. There is a lengthy diagnosis of the genus considered at the global level in Bolton (1987). Most *Monomorium* workers, however, can be recognised by the raised median portion of their clypeus that bears a pair of carinae (the latter may be blunt, indistinct or secondarily ridged in a few species), and an antennal segment count of 10–12, with the antennal club (if present) never consisting of just two segments. In Australia, however, the task of recognising *Monomorium* is rendered much easier, since only two other genera belonging to the Solenopsidini are present. *Anillomyrma* Emery includes one or more minute, fossorial species, the workers of which are usually blind, with at most a single-faceted eye (only members of the *Monomorium fossulatum* species-group have compound eyes reduced to a single ommatidium, and in these ants the profile of the dorsum of the alitrunk is sinuate, while that of *Anillomyrma* is flattened). Workers and gynes of *Solenopsis* Westwood have a 2-segmented antennal club.

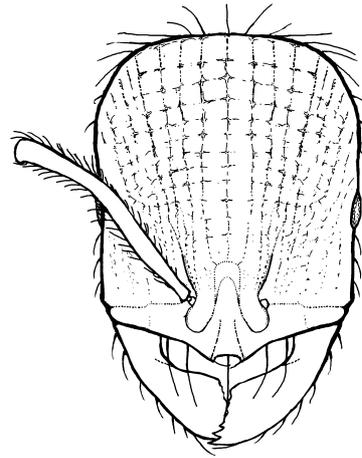
This work describes two new Australian *Monomorium*, one of which has a distinctive worker that has led to a re-examination of the diagnosis for the genus.

### MATERIALS AND METHODS

Measurements were made using an ocular graticule. Lengths (in millimetres) and indices are reported as (see Fig. 1): HML, combined length of head-alitrunk-petiole-postpetiole (note, the alitrunk length is the Weber's Length, in which measurement is taken from the anterior base of the promesonotum, i.e., where the occiput of the head would rest if it was tilted upwards to its fullest extent, to the apex of the metapleural lobe).



**Fig. 1.** Measurements used in this study (*Monomorium punctulatum* worker). HW, head width; HL, head length; SL, scape length. (note, the antennal flagella are omitted in this and the following figures). Scale bar 1 mm.



**Fig. 2.** *Monomorium sublamellatum*, full-face view. Right-hand scape omitted here. Scale bar 1 mm.

HL, maximum head length in full-face view, measured as a straight line from the midpoint of the anterior clypeal margin to the midpoint of the occiput;

HW, maximum head width in full-face view, excluding the eyes;

CeI, Cephalic index, calculated by the formula  $CeI = HW/HL \times 100$ ;

SL, maximum length of the antennal scape, excluding the condylar bulb and the basal neck;

SI, scape index, calculated by the formula  $SI = SL/HW \times 100$ ;

PW, maximum width of the pronotum viewed from the front.

The single known specimen of *Monomorium sublamellatum* sp. n. has been deposited with the Western Australian Museum (WAM), while the four specimens of *Monomorium punctulatum* sp. n. were donated by Department of Conservation and Land Management (CALM). The holotype and one paratype of *M. punctulatum* were deposited with the Australian National Insect Collection (ANIC). Two specimens of the latter were retained by the JDM Collection, Curtin University of Technology, Bentley, Western Australia, Australia (JDM).

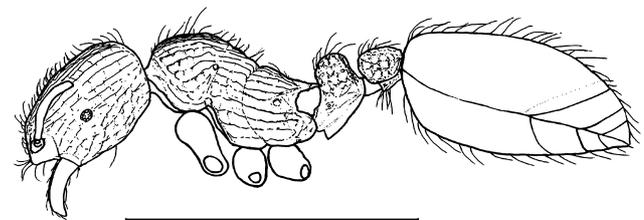
## SYSTEMATICS

### *Monomorium sublamellatum* sp. n. (Figs 2,3)

**Holotype.** *Western Australia.* Worker, North Twin Peaks Island, Recherche Archipelago, 9.v. 1976, C. Bryce, NE side at face of granite (WAM 94/1679).

**Diagnosis.** Unique dentition distinguishes it from all other *Monomorium* species, as does the enlarged subpetiolar process from other Australian *Monomorium*.

**Description of worker. Head** (Fig. 2). Head rectangular, vertex planar; frons longitudinally striate-reticulate with



**Fig. 3.** *Monomorium sublamellatum*, profile. Scale bar 1 mm.

inwardly curved, fine, decumbent setae. Compound eyes circular; (viewed from front) eyes set in anterior half of head capsule; (viewed from side) eyes set slightly posterior of midline of head capsule; eye size moderate, about same width as antennal scape. Antennal segments 12; antenna gradually tapering without a clearly differentiated club. Anteromedian portion of clypeus bicarinate, median clypeal carinae protruding narrowly, produced apically as a pair of tiny denticles; median seta present on anterior margin of clypeus; longest lateral anterior clypeal setae long, extending beyond dorsal margin of closed mandibles; posteromedian clypeal margin level with posterior surface of antennal fossae; anterior tentorial pits about equidistant between mandibular insertions and antennal fossae. Frontal lobes parallel, sinuate; venter of head capsule without long, strongly curved setae. Palp formula unclear, but palps visibly short (one or two segments). Mandibles triangular, smooth and shining with scattered piliferous punctures; mandibles each with large apical tooth, two large subapical teeth and four tiny denticles; basal tooth a tiny denticle; basal angle of mandible distinct, apical and basal mandibular margins ending in a denticle. **Alitrunk** (Fig. 3). Promesonotal sculpture in form of

longitudinal striae, some reticulate sculpture also present on anterior and posterolateral sectors, cuticle between striae shining; in profile, promesonotum abruptly declivous before its juncture with head capsule, gently convex thereafter throughout most of its length; many (i.e., >20) erect and suberect setae present on promesonotum, all of approximately the same length. Mesonotal suture visible as fine line, terminating at mesothoracic spiracle. Metanotal groove present as feebly impressed furrow between promesonotum and propodeum. Propodeal sculpture present laterally and on anterodorsal sector as longitudinal striae, posterodorsal sector of propodeum more-or-less smooth, enclosed within an arch-shaped carina directed anteriorly; dorsal propodeal face flattened; propodeal angle present; propodeal angles produced as short, sharp spines; metapleural lobes blunt, acute-angled flanges; length ratio of dorsal propodeal face to its declivous face near 1:1; declivous face of propodeum smooth except for two faint transverse striae between propodeal spines; erect and suberect propodeal setae sparse; decumbent or appressed propodeal setae apparently lacking; propodeal spiracle lateral and about midway between metanotal groove and declivous face of propodeum; propodeal spiracular vestibule indistinct. **Petiole and postpetiole** (Fig. 3). Petiolar spiracle small, lateral and positioned slightly ahead of petiolar node; in profile, peduncle short, its length about half width of node. In profile, shape of petiolar node sub-cuboidal; sculpture of node reticulate; ratio of greatest node breadth (i.e., viewed from front) to greatest node width (i.e., viewed in profile) near 1:1; subpetiolar process a large, thick flange, projected anteriorly as a spur, underside of process possessing two distinct carinae which converge anteriorly, about two thirds of the way along their length. Height ratio of petiolar node to postpetiole between 2:1 and 1:1. In profile, height-length ratio of postpetiole near 1:2; sculpture of postpetiole reticulate; ventral process on postpetiole present and distinct. **Gaster**. Pilosity of first gastral tergite consisting of abundant, semi-erect yellowish setae of approximately the same length; surface of sclerites smooth and shining.

**General characters.** Colour a uniform, rich yellow. Worker caste differentiation not able to be assessed (only one specimen known). **Holotype worker measurements.** HML 1.57; HL 0.58; HW 0.48; CeI 82; SL 0.41; SI 86; PW 0.32.

**Etymology.** Latin adjective *sub* 'under' + *lamellatum* 'thin plate'.

**Remarks.** In view of the presence of the median clypeal seta combined with the strongly bicarinate clypeus, the single known worker can clearly be assigned to the tribe Solenopsidini, but fitting it into a recognised genus is not so easy. I take the view that the worker is a *Monomorium*. However, *M. sublamellatum* occupies a place at the boundary of the genus *Monomorium* as it is currently defined; the specimen has more mandibular teeth and denticles than any of those species recognised by Ettershank (1966), DuBois (1986), Bolton (1987) or Heterick (2001). Consideration of Bolton's (1987) diagnosis of the genus *Monomorium* on a worldwide basis, and that by Heterick (2001) for the worker of Australian *Monomorium* species, shows that both now need a

re-appraisal in terms of the mandibular structure to be found in the worker. The relevant statement in the diagnosis by Heterick is: 'Mandible with two to six teeth and denticles that normally decrease in size from apex to base; basal tooth enlarged and broader than preceding nonapical teeth in a few species; sometimes reduced to minute offset denticle in other species.' This definition should be expanded to incorporate a mandible with up to seven teeth and denticles. In *M. sublamellatum*, the four tiny denticles may be a derived feature, representing a modification of the two basal-most teeth, the primitive number of teeth being five.

The large subpetiolar process is also unique among Australian *Monomorium* workers, but is paralleled in the South African species *M. lubricum* Arnold. Other features that occur less frequently in Australian *Monomorium* include the propodeal spines, the relatively small eye, and the strongly striate sculpture of the alitrunk. However, this ant shares several of the characters found in most of those *Monomorium* formerly placed in *Chelaner* Emery, namely a 12-segmented, gradually tapering antenna without a discernible club, a protrusive anteromedian clypeal border, a small, laterally placed propodeal spiracle, and a thick petiolar node that is higher than the postpetiole. Nonetheless, this species is sufficiently distinctive that I am unable to assign it to any of the species-groups discussed in Heterick (2001), and its affinities are unclear.

The known location for the ant is an offshore island approximately 100 km east of the small south coastal town of Esperance. Apart from the results of a few attempts at farming and sheep grazing by former settlers, most of the Recherche Archipelago remains in a natural state (Burbidge *et al.* 1993). Faunistically, the Recherche Archipelago appears to be comparable to the adjacent southern coast of Australia. For instance, the islands support a moderately rich (i.e., 20 spp.) herpetofauna, though one that includes mainly common species found on the nearby mainland and which is unremarkable in terms of conservation values (Smith & Johnstone 1996). However, the flora of these islands includes at least 384 species of vascular plants (Keighery 1995), with many niches available for small invertebrates such as ants. Moreover, the ant fauna of the Esperance region and further to the east is not particularly well-known, and may well yield additional surprises.

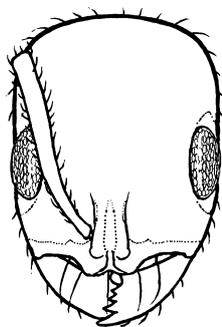
### ***Monomorium punctulatum* sp. n. (Figs 1,4,5)**

**Holotype.** *Western Australia.* Worker (bottom point), 102.5 km SSE Newman 24°06'16'S, 120°19'36'E, viii. 1997, S. van Leeuwin & R. N. Bromilow, Perm. invert. pitfall trap, C4, Sand dune (ANIC). Paratype: 1 worker (top point) with same data as holotype (ANIC).

**Other material examined (not types).** *Western Australia.* 2 workers with same data as holotype (JDM).

**Diagnosis.** Distinguished from other *Monomorium* in the *rubriceps* species-group by a combination of its shagreenate and finely microreticulate sculpture, and its large eyes.

**Description of worker. Head** (Figs 1,4). Head rectangular, vertex planar; frons densely microreticulate with minute, inwardly curved, decumbent setae directed towards the midline of the head capsule, and almost invisible in some lights. Compound eyes elliptical; (viewed from front) eyes set slightly below midpoint of head capsule; (viewed from side) eyes set slightly posterior of midline of head capsule; eye size large, about 2 times width antennal scape. Antennal segments 12; antenna with 3-segmented club. Anteromedian portion of clypeus bicarinate, protruding narrowly, median clypeal carinae not produced apically as teeth or denticles; median seta present on anterior margin of clypeus; longest lateral anterior setae long, extending beyond dorsal margin of closed mandible; posterior clypeal margin extending slightly posteriad of posterior surface of antennal fossae; anterior tentorial pits straight; venter of head capsule without long, strongly curved setae. Palp formula unknown (palps not visible in specimens seen). Mandibles subtriangular, smooth and shining with scattered piliferous punctures; mandibles each with five teeth and denticles; basal tooth a tiny denticle; basal angle of mandible distinct, apical and basal mandibular margins ending in a denticle. **Alitrunk** (Fig. 5). Promesonotal sculpture in form of dense microreticulation, heavier sculpture lacking, matt in appearance; in profile, dorsal promesonotal face very gently concave anteriorly, otherwise flattened; short, erect setae sometimes present on humeral angles, otherwise promesonotal setae very short and decumbent or appressed. Mesonotal suture absent. Metanotal groove virtually absent. Propodeal sculpture in form of dense microreticulation, with a few faint striae on lower lateral surface; dorsal propodeal face flattened anteriorly, sloping gradually toward propodeal declivity posteriad, propodeal processes absent (propodeum bluntly angulate in profile); metapleural lobes present as blunt flanges; length ratio of dorsal propodeal face to its declivous face near 2:1; declivous face of propodeum flat; propodeal setae minute, appressed, almost invisible; propodeal spiracle lateral and about midway between metanotal groove and declivous face of propodeum; propodeal spiracular vestibule indistinct. **Petiole and postpetiole** (Fig. 5). Petiolar spiracle minute, lateral and positioned slightly ahead



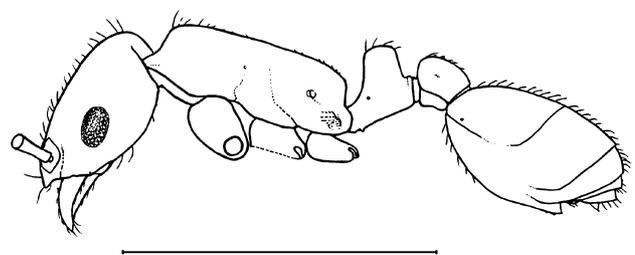
**Fig. 4.** *Monomorium punctulatum*, full-face view. Right-hand scape omitted here. Scale bar 1 mm.

of petiolar node; in profile, peduncle of moderate length, its length slightly less than width of node (in profile). In profile, shape of petiolar node cuboidal to subcuboidal; sculpture of node densely microreticulate; ratio of greatest node breadth (i.e., viewed from front) to greatest node width (i.e., viewed in profile) between 1:1 and 1:2; subpetiolar process absent or vestigial, an anteroventral process present in some individuals as a small spur. Height-length ratio of postpetiole between 1:1 and 1:2; sculpture of postpetiole present in form of dense microreticulation; ventral process on postpetiole present and distinct. **Gaster.** Pilosity of first gastral tergite consisting of combination of erect and decumbent yellowish setae of approximately the same length; surface of sclerites smooth and shining. **General characters.** Colour of head, alitrunk and nodes orange-yellow, gaster and legs yellow. Worker caste apparently monomorphic. **Holotype worker measurements.** HML 1.69; HL 0.58; HW 0.48; CeI 82; SL 0.39; SI 81; PW 0.34. **Other worker measurements.** HML 175–1.90; HL 0.59–0.61; HW 0.47–0.50; CeI 78–81; SL 0.41–0.43; SI 88–90; PW 0.32–0.37 (3 measured).

**Etymology.** Latin adjective ‘minutely dotted’.

**Remarks.** *Monomorium punctulatum* belongs to the *M. rubriceps* species-group, as evidenced by certain of its features, namely the shape of the node, the number of mandibular teeth (five), and the compact postpetiole. Within the *M. rubriceps* group, *M. punctulatum* closely resembles *Monomorium leae* Forel (especially specimens originally placed under ‘*Monomorium flavipes*’ Clark and ‘*Monomorium insulare*’ Clark), and also *Monomorium centrale* Forel, but may be separated from these close relatives through its larger eye and shagreenate sculpture. The exotic *M. pharaonis* has a similar body sculpture, but the shape of the node is quite different and the metanotal groove is a distinct furrow in this species. Moreover, *M. pharaonis* is a tramp species, rarely found far from built-up areas.

The four known specimens of *punctulatum* were collected in a pitfall trap in a sand-dune 102 km SE of Newman in the Mid West Region of Western Australia, as part of a CALM survey. Interestingly, the ant fauna collected in this general area during the survey appears to have a greater affinity with



**Fig. 5.** *Monomorium punctulatum*, profile. Divisions between the gastral sternites and the gastral tergites were indistinct in all lights, and have not been shown. Scale bar 1 mm.

that of far northern and north-eastern Australia than with the ant fauna of the adjacent Pilbara Region.

### Key to Australian species of *Monomorium*

To incorporate the two new species described in this paper, the key to Australian *Monomorium* workers provided by Heterick (2001) can be modified as follows.

23. Number of mandibular teeth and denticles three ..... 24  
 – Number of mandibular teeth and denticles four to seven ..... 25a  
 Couplets 24–25 in the original key remain unaltered.
- 25a. Mandible with three large teeth (one apical, two sub-apical) and four minute denticles; petiole with a large, ventrally carinate subpetiolar process, which projects as a spur anteriad .....  
 ..... *M. sublamellatum* sp. n.
- Maximum number of mandibular teeth and denticles six; petiole with, at most, a vestigial carinae on its ventral surface, or small anteroventral process which projects as a spur ..... 26  
 Couplets 26–56 in the original key remain unaltered.
57. Dorsum of head and entire alitrunk finely reticulate-punctate ..... 57a  
 – Sculpture not as above, species generally smooth ..... 58
- 57a. Number of mandibular teeth and denticles five; mandibles subtriangular, smooth and shining; metanotal groove virtually absent; petiolar node subcuboidal .....  
 ..... *M. punctulatum* sp. n.
- Number of mandibular teeth and denticles four; mandibles striate; metanotal groove distinctly impressed; petiolar node conical (introduced species, only found in highly disturbed, predominantly urban environments in Australia) ..... *M. pharaonis* (L)  
 The remaining couplets in the original key from 58 to 70 are unaltered.

### ACKNOWLEDGEMENTS

I thank the WAM for its loan of the sole known specimen of *Monomorium sublamellatum*; and CALM, which donated the four known specimens of *M. punctulatum* to the JDM Curtin Ant Collection.

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