



## A revision the Australian species of the ant genus *Myrmecina* (Hymenoptera: Formicidae)

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### Abstract

The Australian species belonging to the ant genus *Myrmecina* are revised. The genus was found to contain thirteen species, eleven of which are described here for the first time. The species include *M. alpina* sp. n., *M. australis* Wheeler and Wheeler, *M. difficulta* sp. n., *M. eruga* sp. n., *M. inaequala* sp. n., *M. pumila* sp. n., *M. rugosa* Forel, *M. silvalaeva* sp. n., *M. silvampla* sp. n., *M. silvangula* sp. n., *M. silvarugosa* sp. n., *M. silvatransversa* sp. n. and *M. wesselensis* sp. n. The majority of species are found in coastal Queensland with two also occurring in eastern New South Wales and one restricted to the Northern Territory. Several species are known from very limited regions and one is only known to occur above approximately 1000m, making these some of the most restricted and high-elevation specialist ants known from Australia.

**Key words:** Hymenoptera, Formicidae, Myrmicinae, *Myrmecina*, taxonomy, new species, Australia

### Introduction

The myrmecine ant genus *Myrmecina* contains 46 valid species (including those described here) which are found from southern Canada south to southern Mexico, in Europe and northern Africa, and from India east to Korea and Japan and south into Fiji, the Solomon Islands and Australia. It is apparently absent from Central and South America, sub-Saharan Africa and the Middle East (Guenard, 2009). While relatively common and well represented in Papua New Guinea, this fauna is distinct from that of Australia and none of the species examined here are shared between these two regions.

These are uncommon ants that are most often encountered in leaf litter samples, generally in forested areas. Colonies are small and occur in soil with or without coverings, between rocks, in twigs on the ground or in rotten wood. While little is known about their biology, some are thought to be predacious on oribatid mites, and it has been suggested that the exceptionally small heads of larval *Myrmecina* are an adaptation to feeding on the partially opened bodies of these mites (Masuko, 2008). A rare, social parasitic species occurs in nests of *M. americana* in North America (S. Cover, pers. comm.).

Within Australia, *Myrmecina* has been represented by a single species, *M. rugosa*, with a second species, *M. australis*, “accidentally” described from several larvae. Taylor (1991) provided an overview of the Australian fauna, giving general distribution information and speculating that at least eight species occurred here. However, during this study the genus was found to be more diverse, containing 13 species. These species range from widespread and relatively common to extremely restricted and rare. In fact, some are the most narrowly endemic ants known from Australia, being restricted to high-elevation mountain tops within an area of only a few hundred square kilometres. And surprisingly, seven species show nearly identical patterns within a small area of Queensland’s wet tropics, some sympatric, some allopatric on neighbouring mountains, but all with restricted ranges and limited to rainforest. These species are morphologically distinct but do share unique characters not found in other, more wide-ranging species. While similar distribution patterns are

known for other groups of insects (Wilson *et al.*, 2007; Yeates *et al.*, 2002), this is one of the few examples involving a large number of closely related Australian ants.

#### Abbreviations of morphological terms

Size and shape characters were quantified and are reported as lengths or indices. Measurements were made with a stereomicroscope using a dual-axis stage micrometer wired to digital readouts. All measurements were recorded in thousandths of a millimetre, but expressed here to the nearest hundredth. The following measurements and indices are reported: CI (cephalic index), HW/HL x 100; HL, maximum head length in full-face view, measured from the anterior-most point of the clypeal margin to the midpoint of a line drawn across the posterior margin of the head; HW, maximum head width measured in full-face view; MTL, maximum length of the tibia of the middle leg, excluding the proximal part of the articulation which is received into the distal end of the femur; SI (scape index), SL/HW x 100; SL, scape length, excluding the basal radicle; WL, Weber's length measured from the anterior-most point of the pronotal collar to the posterior-most point of the propodeal process.

#### Acronyms for museums

ANIC, Australian National Insect Collection, Canberra, A.C.T.; BMNH, The Natural History Museum, London, U. K.; MCZC, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U. S. A.; QMBA, Queensland Museum, Brisbane, Queensland; TERC, Tropical Ecosystems Research Centre, CSIRO Sustainable Ecosystems, Darwin, N.T.

### ***Myrmecina* Curtis**

*Myrmecina* Curtis 1829: 265. Type species: *Formica graminicola* Latreille 1802, by monotypy.

**Diagnosis.** The sides of the head behind the eyes with an elongate ridge or groove on each side which starts at the mandibles, runs the length of the head and ends near the upper corners. In side view, the petiole is low, rounded and barrel-shaped and lacks a distinct node. The propodeum is armed with long spines near the angle as well as short spines or angles near the metanotal groove. The distinctive ridge on the sides of the head behind the eyes combined with the low, rounded petiole will separate these ants from all others in Australia.

#### List of Australian species

*alpina* **sp. n.**

*australis* Wheeler and Wheeler

*difficulta* **sp. n.**

*eruga* **sp. n.**

*inaequala* **sp. n.**

*pumila* **sp. n.**

*rugosa* Forel

*silvalaeva* **sp. n.**

*silvampla* **sp. n.**

*silvangula* **sp. n.**

*silvarugosa* **sp. n.**

*silvatransversa* **sp. n.**

*wesselensis* **sp. n.**

## Key to Australian *Myrmecina* based on workers

1. First segment of funiculus expanded laterally, with strongly convex sides and appearing essentially spherical..... *australis*
- First segment of funiculus narrower, with nearly straight sides and essentially cone-shaped ..... 2
2. Sculpturing on pronotum forming continuous transverse carinae which form shallow arches to deep “V”s ..... 3
- Sculpturing on pronotum running longitudinally and generally with the central carina (or carinae) running nearly the length of the mesosoma, or occasionally sculpturing ill-defined and irregular ..... 7
3. Sides of head behind compound eyes with 2–3 longitudinal carinae running the length of the head..... *silvarugosa*
- Sides of head behind compound eyes smooth ..... 4
4. Dorsal surface of pronotum immediately behind the collar with at most very weak sculpturing (sometimes nearly smooth) ..... *silvalaeva*
- Dorsal surface of pronotum continuously sculptured, the area immediately behind the collar not differing significantly from more posterior regions ..... 5
5. Antennal scapes smooth; body larger (HW > 0.8mm) ..... *silv ampla*
- Antennal scapes with low longitudinal ridges; body smaller (HW < 0.7mm) ..... 6
6. Majority of carinae on pronotum and mesonotum gently curved across width of mesosoma ..... *silvatransversa*
- Majority of carinae on pronotum and mesonotum “V”-shaped..... *silvangula*
7. Sides of head behind compound eyes with 2–3 longitudinal carinae running the length of the head ..... *alpina*
- Sides of head behind compound eyes smooth ..... 8
8. Dorsal surface of pronotum immediately behind the collar with at most very weak sculpturing (sometimes nearly smooth) ..... 9
- Dorsal surface of pronotum continuously sculptured, the area immediately behind the collar not differing significantly from more posterior regions ..... 10
9. Body larger (HW > 0.65mm, MTL > 0.35mm); head squarer (CI > 95) ..... *eruga*
- Body smaller (HW < 0.60mm, MTL < 0.30mm); head more elongate (CI < 95)..... *pumila*
10. Dorsal surface of pronotum with irregular, ill-defined sculpturing ..... *rugosa*
- Dorsal surface of pronotum with continuous longitudinal carinae..... 11
11. Erect hairs on gaster (and most on mesonotum) strongly curved so their tips are nearly parallel with the surface of the body (known only from the Wessell Islands, Northern Territory) ..... *wesselensis*
- Erect hairs on gaster (and longer ones on mesonotum) only weakly curved with their tips at a strong angle with body (coastal Queensland and north-eastern New South Wales) ..... 12
12. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma and not interrupted as they cross the angle separating the dorsal and lateral surfaces ..... *difficulta*
- Dorsal and lateral surfaces of mesosoma separated by an indistinct angle or ridge which interrupts or breaks the mesosomal sculpturing..... *inaequala*

### *Myrmecina alpina* sp. n.

(Figs 1–4, 47)

**Types.** Holotype worker from Mt. Demi, 7km SW Mossman, 16°30'S 145°19'E, 1100m, Queensland, 29 Oct. 1983, D. K. Yeates & G. I. Thompson, rainforest, sieved litter berlesate (ANIC, ANIC32-047350); 13 paratype workers, same data as holotype (ANIC, BMNH, MCZC, ANIC32-047232).

**Diagnosis.** Sides of head behind compound eyes with 2–3 well defined longitudinal carinae running nearly the length of the head. The presence of these carinae will separate this species from all others in Australia with the exception of some higher-elevation populations of *M. silvangula*. The longitudinal rather than transverse sculpturing on the pronotum will separate this taxon from these workers.

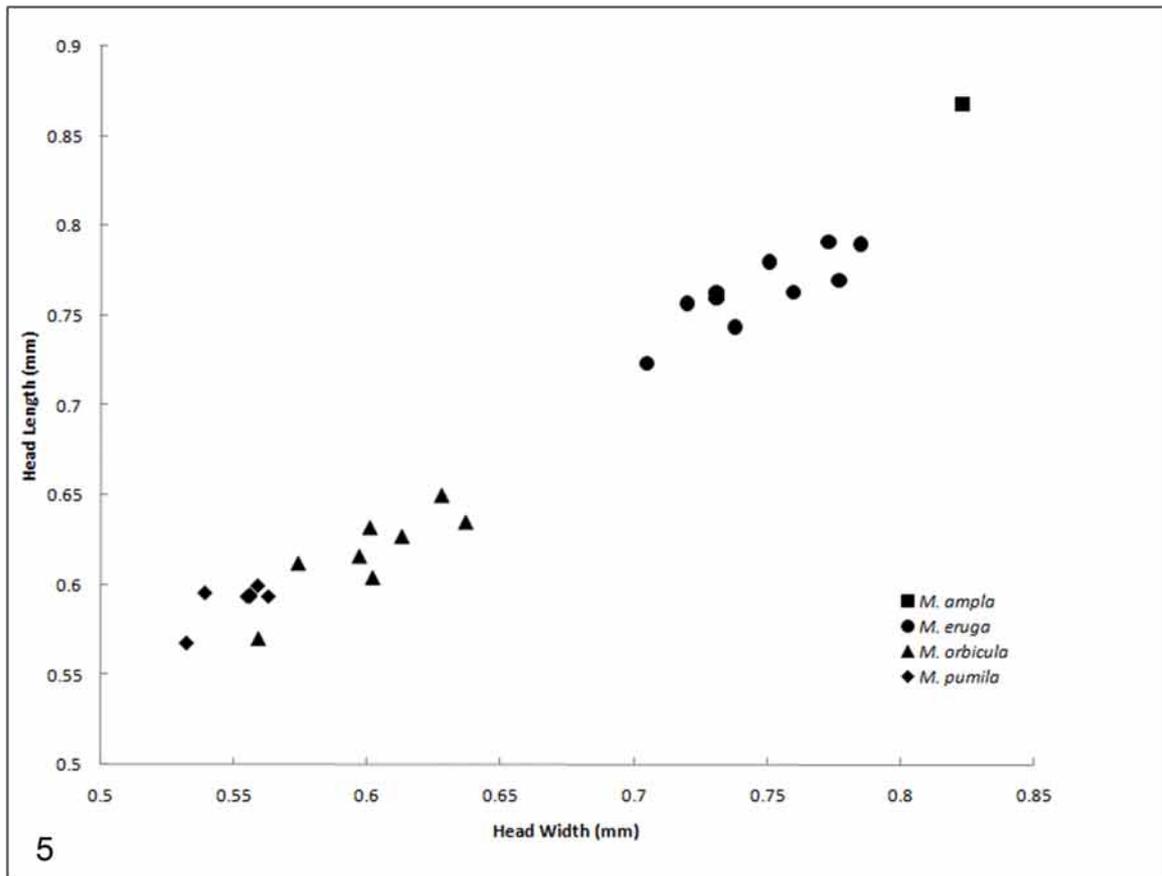
**Worker description.** Antennal scapes smooth to weakly ridged. First segment of funiculus cone-shaped. Sides of head behind compound eyes with 2–3 longitudinal carinae running the length of the head. Sculpturing on dorsal surface of mesosoma running longitudinally and generally with the central carina (or carinae) running nearly the length (the pronotum not differentiated from the mesonotum). Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines short. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles and legs yellow-red.



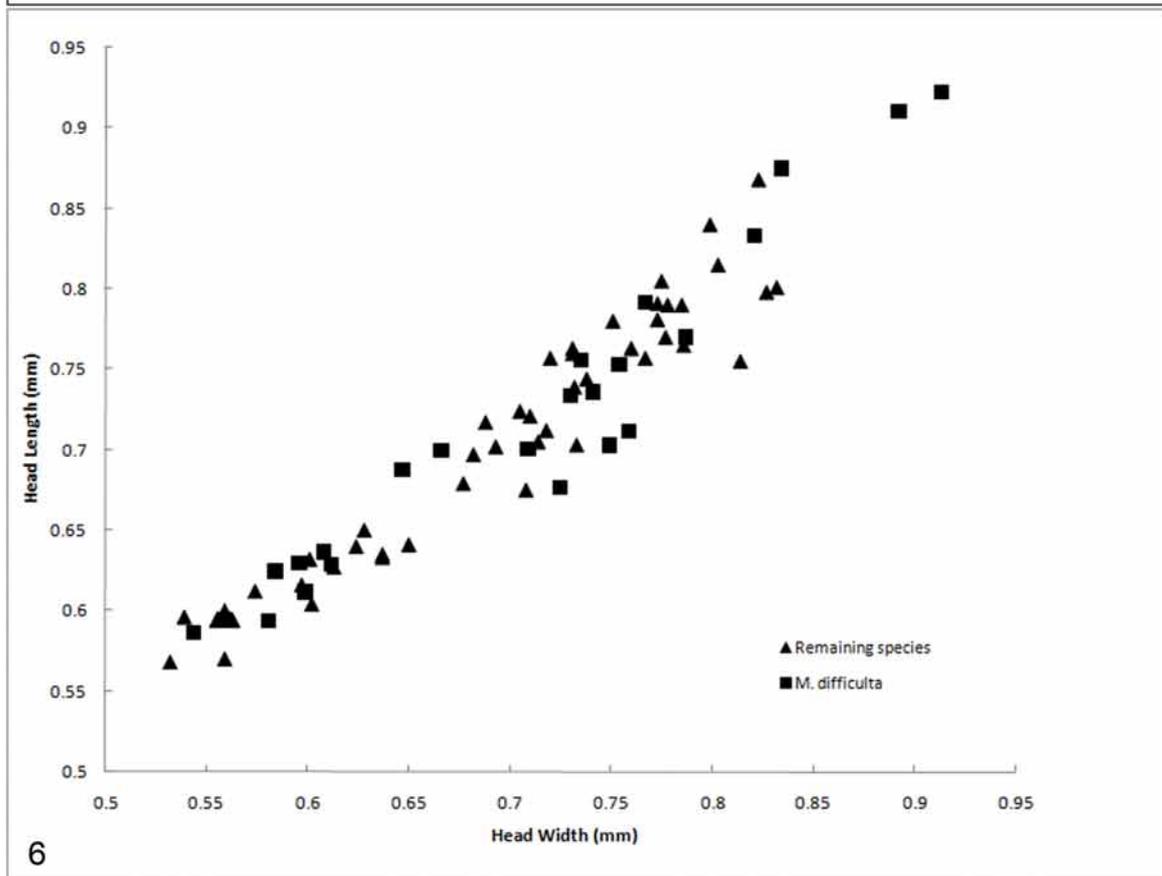
**FIGURES 1–4.** *Myrmecina alpina* sp. n. worker. Fig. 1, front of head; Fig. 2, side of head; Fig. 3, lateral view of body; Fig. 4, dorsal view of body.

**Measurements.** *Worker* ( $n = 5$ ) - CI 95–99; HL 0.72–0.84; HW 0.69–0.80; MTL 0.38–0.45; SI 85–94; SL 0.65–0.72; WL 0.87–1.06.

**Additional material examined (ANIC except where noted).** **Queensland:** 1km S Mt. Lewis (Calder, A. & Weir, T.); 2.5km N Mt. Lewis via Julatten (Yeates, D.K. & Thompson, G.I.); 4km WNW Round Mt. site 3 (Burwell, C.) (QMBA); 4km WNW Round Mt. site 5 (Yek, S) (QMBA); Mary Creek site 4 (Burwell, C.) (QMBA); Mary Creek site 5 (Burwell, C.) (QMBA); Mt. Demi, 7km SW Mossman (Yeates, D.K. & Thompson, G.I.); Mt. Lewis (Taylor & Feehan); Mt. Lewis (Van Ingen, L.) (TERC); Mt. Lewis summit, via Julatten (Monteith, G. & Cook, D.); The Bluff, 11km W Mossman (Monteith, G.B. & Yeates, D.K.).

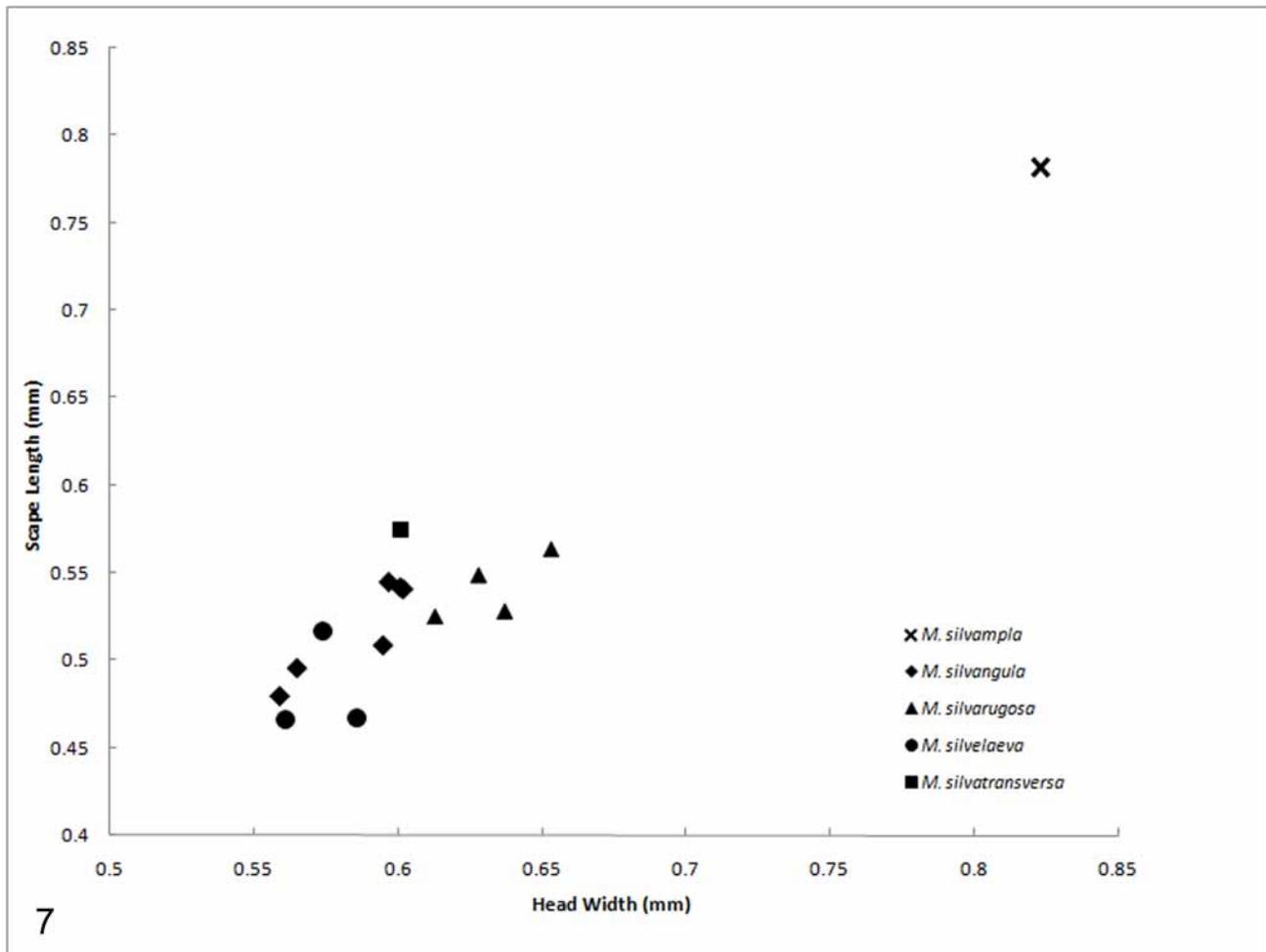


5



6

**FIGURES 5–6.** Fig. 5, graph of head length versus head width for *M. ampla*, *eruga*, *orbicula* and *pumila*; Fig. 6, graph of head length versus head width for *M. difficulta* and the remaining Australian species.



**FIGURE 7.** Fig. 7, graph of scape length versus head width for *M. silvampila*, *silvangula*, *silvarugosa*, *livelaeava* and *silvatransversa*.

**Comments.** This is a high-elevation specialist known from a limited number of mountain-tops, the lowest collection site being just less than 1000m, and is confined to an area less than 20 square kilometres within Queensland's wet tropics. It is found in rainforest where it has been collected in leaf litter samples. It is sympatric with *silvarugosa*, another high-elevation species, and these two species are the only Australian species with carinae on the sides of the head behind the eyes.

***Myrmecina australis* Wheeler & Wheeler**  
(Figs 8–11, 48)

*Myrmecina australis* Wheeler & Wheeler, 1973: 34.

**Types.** Four syntype larvae from New South Wales, B. B. Lowery (MCZC).

**Diagnosis.** Basal segment of funiculus shortened and expanded laterally, with strongly convex sides and appearing essentially spherical. The shape of this antennal segment is highly distinctive and will separate this species from all others known from Australia.

**Worker description.** Antennal scapes smooth or with low ridges. First segment of funiculus expanded laterally and nearly spherical in shape. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma running longitudinally and generally with the central carina (or carinae) running nearly

the length (the pronotum not differentiated from the mesonotum). Dorsal and lateral surfaces of mesosoma separated by an indistinct angle or ridge which interrupts or breaks the mesosomal sculpturing. Metanotal spines short. Propodeal spines long. Erect hairs abundant, straight to gently curved. Colour dark brown-black, antennae, mandibles and legs yellow-brown.

**Measurements.** *Worker* ( $n = 8$ )—CI 98–108; HL 0.70–0.80; HW 0.69–0.83; MTL 0.36–0.43; SI 78–85; SL 0.58–0.69; WL 0.85–1.05.

**Additional material examined (ANIC except where noted).** **Australian Capital Territory:** Mt. Ainslie (Brooks, C.G.); Wombat Creek, 6km NE Piccadilly Circus (Weir, T.A., Lawrence, J. & Johnson). **New South Wales:** 10.5km W of Gibraltar Range N.P. (HQ) (Monteith, G.B.); 15km E Legume (Greenslade, P.J.M.); 15.5km N Mulwala, Wahgunyah State Forest (Freudenberger, D.) (TERC); 2 km SSE of Bundanoon (Hill, L.); 20km E Legume (Greenslade, P.J.M.); 2km N Monga (Harvey, M.S.); 2km NW Bomaderry (Moran, R.J.); 5km SW Pigeon House (Hill, L.); Allyn R., 44km NW Dungog (Hill, L.); Barrington Tops Nat. Pk (Ward, P.S.); Barwick Ck. Bog on New England N.P. Road (Hill, L.); Cambewarra Mountain (Taylor, R.W.); Gibraltar Range Nat. Pk (Hill, L.; Monteith, G.B.); Jerrabomberra Hill nr. Queanbeyan (Taylor, R.W. & Weir, T.A.); Kanangra Brook and Rocky Spur, Kanangra-Boyd Nat. Pk (Hill, L.); Killarney Gap, Narrabri (Room, P.M.); Lower Stringybark Creek Reserve (Gush, T.); Moonpar Nat. Forest (Gush, T.); Myall Lakes (Greenslade, P.J.M. & Moulton); Myall Lakes (York, A.); Myall Lakes Nat. Pk (York, A.); Nothofagus Mtn, 12km N Woodenbong (Monteith, Yeates & Cook); Orara East State Forest (Gush, T.); Pt. Lookout, New England N.P. (Taylor, R.W.); Tomalla Tops, Mt. Royal Range (Darlingtons); Upper Hunter Valley (Schnell, M.) (TERC); Whiporie, 55km S Casino (York, A.). **Queensland:** Bunya Mountains (Monteith, G.B.); Joalah Nat. Pk, Mt. Tambourine (Woodward, T.E.); Lamington Nat. Pk (Woodward, T.E.) (ANIC); Lamington Nat. Pk, various sites (Burwell, C.; Burwell, C. & Wright, S.; Monteith, G. & Menendez, R.; Nakamura, A.; Staunton, K.; Thompson, G.; Thompson, G. & Burwell, C.; Wright, S.; Wright, S. & Burwell, C.; Wright, S. & Nakamura, A.) (QMBA); Mt. Chinghee, 12km SE Rathdowney (Monteith, Yeates & Thompson); Mt. Hobwee area, Lamington Plat. (Woodward, T.E.); slopes below Wilsons Peak (Woodward, T.E.); Tamborine Mt. (Woodward, T.E.).

**Comments.** This is the southern-most species of *Myrmecina* found in Australia. It occurs in a range of habitats from dry sclerophyll woodlands through wet sclerophyll, *Nothofagus* and *Dicksonia* forests and into rainforest. Most specimens have been found in leaf litter samples or under rocks.

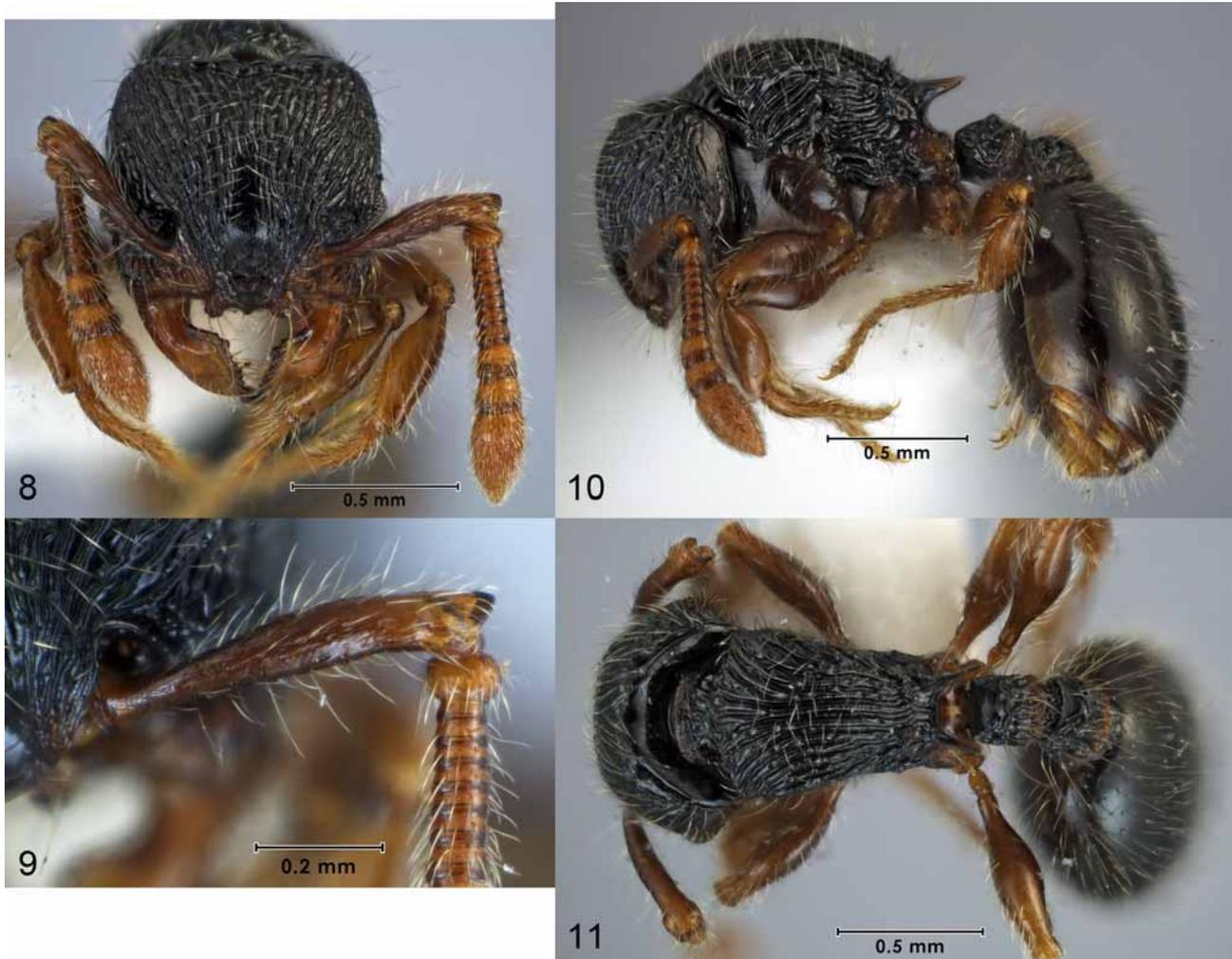
The name *australis* was first published by Wheeler and Wheeler (1973) when describing larvae received from B. B. Lowery from an unspecified locality in New South Wales. The name was attributed to Forel, indicating that the Wheeler's did not intend to establish a new species. It was treated as a *nomen nudum* until it was correctly recognised by Bolton (1995) that the larval description met the requirements of the ICZN to be treated as an available name. Unfortunately it is difficult to determine the identity of this taxon as species-level differences among ant larvae are minimal and few species are represented by the larval stage.

The origin of the name seems to lie with Lowery. Lowery labelled a number of his collections as being "Myrmecina australis Forel," this material ranging from northern Queensland to southern New South Wales. It appears that he sent specimens from New South Wales to the Wheeler's which were labelled as being "Myrmecina australis Forel." They accepted this name without checking its validity, the result being that they inadvertently created a new available name. While we don't know the exact collection locality for these larvae, the vast majority of Lowery's collections were from central and southern New South Wales and lie within the range of this taxon and no other. It is therefore highly likely that these larvae belong to this species.

This name could be treated as *species inquirenda*, arguing that there is no direct evidence to associate it with workers and therefore no positive way to relate it to the worker-based taxonomy developed in this study. And while its identity could be determined with DNA barcoding methods, it seems unlikely that currently available technologies will recover significant intact DNA from 40-year old larvae stored at room temperature. Unfortunately, this course of action would leave this name unplaced within the taxonomy developed here, a less than desirable situation.

To avoid having *M. australia* unplaced, and based on the high likelihood that it belongs to this taxon, this name is here accepted for this taxon rather than proposing a new name. As long as the taxon concept proposed

here is accepted then this nomenclature will remain stable. If, however, this species is found to represent more than one taxon then the status of this name can be re-examined and resolved or it can be treated as *species inquirenda* and new names proposed for this and any additional taxa discovered.



**FIGURES 8–11.** *Myrmecina australis* Wheeler and Wheeler worker. Fig. 8, front of head; Fig. 9, antenna showing spherical first funicular segment; Fig. 10, lateral view of body; Fig. 11, dorsal view of body.

***Myrmecina difficulta* sp. n.**

(Figs 6, 12–16, 49)

**Types.** Holotype worker from Summit, Mt. Bellenden-Ker, 1700m, Queensland, 7 July 1971, R. W. Taylor & J. Feehan, moss forest (ANIC, ANIC32-047353); 8 paratype workers, same data as holotype (ANIC, BMNH, MCZC, ANIC32-047507).

**Diagnosis.** Dorsal surface of mesosoma with continuous longitudinal carinae running from pronotum to propodeum; carinae extending continuously from the posterodorsal surface onto the lateral surfaces of the anterior mesosoma (the carinae extend from the mesonotum to the sides of the pronotum), the sculpturing well developed on sides of pronotum. The form of the mesosomal sculpturing combined with the smooth region behind the compound eyes will separate this species from others known from Australia.

**Worker description.** Antennal scapes smooth or with low ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma varying from running longitudinally and generally with the central carina (or carinae) running nearly the length (the

pronotum not differentiated from the mesonotum) to weakly “V”-shaped anteriorly. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines very short and broadly angular. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, gaster slightly lighter, antennae, mandibles, legs and tip of gaster yellow.



**FIGURES 12–16.** *Myrmecina difficulta* sp. n. worker. Fig. 12, front of head; Fig. 13, lateral view of body; Fig. 14, dorsal view of body; Fig. 15, dorsal view of body; Fig. 16, dorsal view of body.

**Measurements.** Worker ( $n = 24$ )— CI 93–107; HL 0.59–0.92; HW 0.54–0.91; MTL 0.28–0.49; SI 79–97; SL 0.45–0.82; WL 0.67–1.15.

**Additional material examined (ANIC except where noted).** Queensland: 2.0km WNW Cape Tribulation (Site 2) (Monteith, Yeates & Thompson); 4km E Lake Barrine (Taylor, R.W. & Feehan, J.E.); 4.3km NE Mt. Perseverance (Burwell, C.) (QMBA); 6.5km SSE Eungella (Gillison, A.); Alexandra Bay (Taylor, R.W. & Feehan, J.); Bellenden Ker Range, 1km S Cable Tower 6 (Earthwatch, Qld Museum); Bellenden Ker Range, Summit TV Stn (Earthwatch, Qld Museum; Monteith, Yeates & Thompson; Monteith, G.B. & Yeates, D.K.); Bellenden Ker Summit (Monteith, G.B.); Bellenden Ker, Centre Peak Summit (Monteith, G.B.); Brandy Ck. Rd., Conway S.F. (Monteith, G.B.); Crystal Cascades, via Redlynch (Monteith, G.B.); Hinchinbrook Is., Gayundah Ck. (Monteith, Davies, Thompson & Gallon); Kuranda, Black

Mt. Road (Taylor,R.W. & Feehan,J.); Mt. Bartle Frere, below NW Peak Summit (Monteith,G.); Mt. Bartle Frere, Summit NW Peak (Monteith,G. & Monteith,S.); Mt. Dryander (Monteith,G.); Mt. Elliot (Taylor,R.W.); Mt. Fisher, 7km SW Millaa Millaa (Monteith, Yeates & Cook); Mt. Tyson, 2km W Tully (Yeates,D.K.); Mt. Windsor Tableland (Taylor,R.W.); Mulgrave River Road, 7km WbyS Bellenden Ker (Calder,A. & Weir,T.); Noah Creek (Taylor & Feehan); Noah Creek, 7km ENE Thornton Peak (Calder,A. & Weir,T.); Nob Creek, Byfield (Monteith,G.B.); Summit, Mt. Bellenden-Ker (Taylor,R.W. & Feehan,J.); Thornton Range (Taylor,R.W. & Feehan,J.); Tully Falls Nat. Pk (Taylor,R.W. & Feehan,J.E.).

**Comments.** This rainforest and palm forest species has been collected from leaf litter and under stones.

*Myrmecina difficulta* shows considerable morphological variation in a number of character systems, including the size, number and shape/configuration of carinae on the head and mesosoma, the development of sculpturing in the area behind the compound eye, the length of the metanotal spines and the overall body size. In some cases these characters show as much variation as that seen between other species in the genus, strongly suggesting that multiple closely related species are involved. For example the density of carinae on the mesonotum shows considerable variation, ranging from large and widely spaced to smaller and more dense. Similarly, body size is extreme in this species, showing more variation than that found in all other species combined – a highly unexpected and surprising condition.

However, this variation was found to be largely continuous and lacking obvious subdivisions. Additionally, there are numerous examples where significant variation is seen among specimens collected from the same litter sample, suggesting that this variation is intra- rather than inter-specific.

Additionally, the variation across characters showed little correlation. For example, many of the smaller specimens show a tendency to have the carinae on the dorsum of the pronotum in the form of a “V”, a pattern also seen in some of the largest workers but absent from the majority of intermediately sized specimens (where the carinae are more or less linear).

Combined, the lack of congruence among characters and the considerable variation found within individual characters make it difficult or impossible to subdivide the specimens treated here into diagnosable subsets. As a result these specimens are treated as belonging to a single heterogeneous species. It would be worth revisiting this conclusion as additional material becomes available.

### ***Myrmecina eruga* sp. n.**

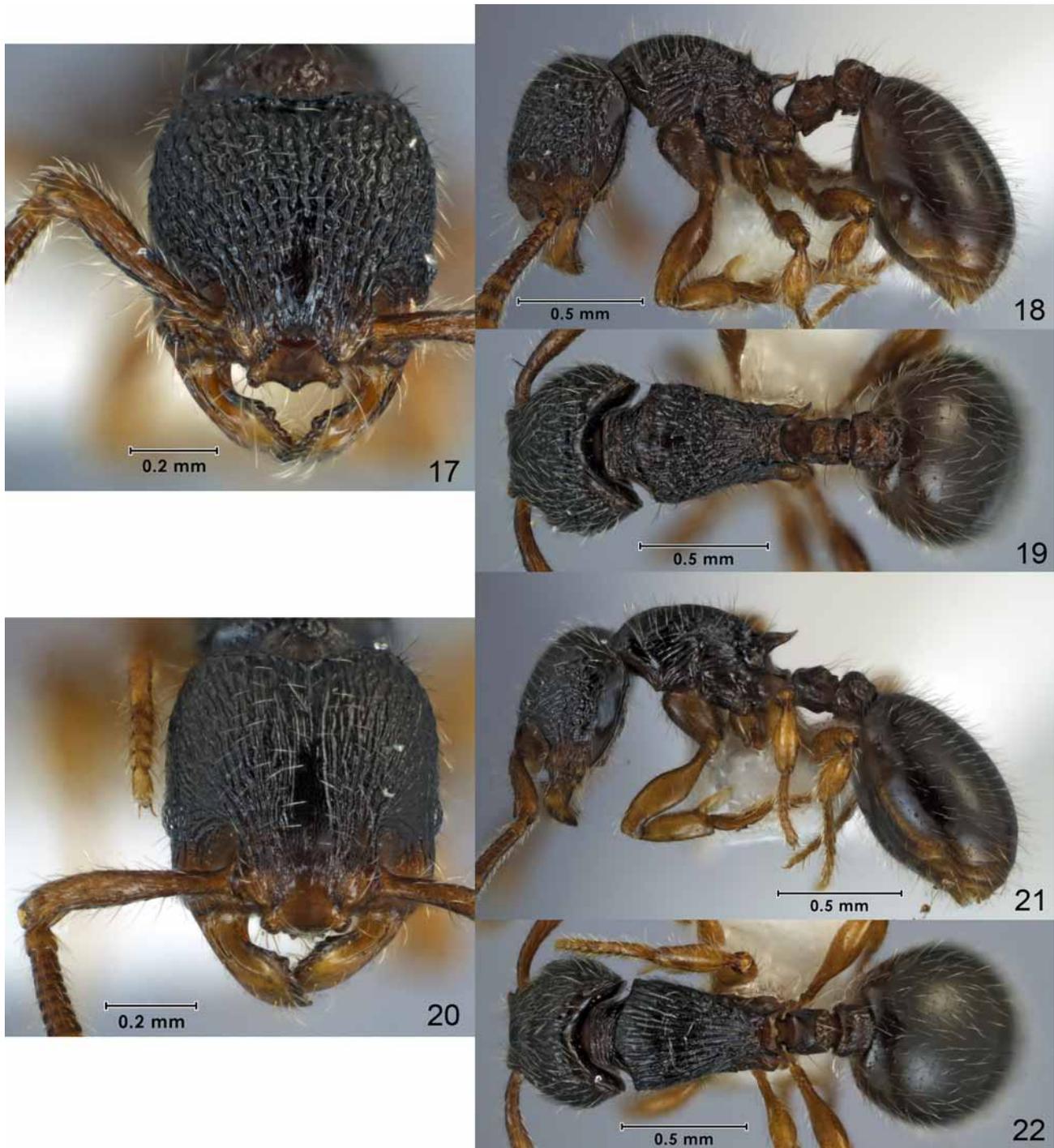
(Figs 5, 17–19, 50)

**Types.** Holotype worker from Mt. Webb Nat. Pk, 15°04'S 145°07'E, Queensland, 27–30.iv.1981, A. Calder & J. Feehan, rainforest, litter (ANIC, ANIC32-047352); 11 paratype workers, same data as holotype (ANIC, BMNH, MCZC, ANIC32-047249); 3 paratype workers, same data as holotype (ANIC, ANIC 32-047246); 6 paratype workers, same data as holotype (ANIC, ANIC32-047250); 3 paratype workers, same data as holotype (ANIC, ANIC32-047251); 9 paratype workers, same data as holotype (ANIC, ANIC32-047252).

**Diagnosis.** Antero-medial surface of pronotum immediately behind the collar with at most very weak sculpturing and sometimes nearly smooth, this region differing significantly from the more heavily sculptured posterior regions of the pronotum and mesonotum; sculpturing on pronotum running longitudinally and generally with the central carina (or carinae) running nearly the length of the mesosoma; body larger (HW > 0.65mm, MTL > 0.35mm); head squarer (CI > 95). This species is most similar to *pumila* and *silvalaeva* in the pattern of sculpturing on the pronotum but differs from *pumila* in being larger and with a squarer head and from *silvalaeva* in the longitudinal (rather than transverse) carinae on the dorsum of the mesosoma. It shares the pattern of sculpturing on the head with *rugosa*, but differs in the pronotal sculpturing.

**Worker description.** Antennal scapes with low longitudinal ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth with weak irregular sculpturing centrally. Sculpturing on dorsal surface of mesosoma ill-defined and running longitudinally, the dorsal surface of pronotum immediately behind the collar very weakly sculpturing (sometimes nearly smooth). Dorsal and lateral surfaces

of mesosoma separated by an indistinct angle or ridge which interrupts or breaks the mesosomal sculpturing. Metanotal spines moderately short. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles and legs yellow-brown.



**FIGURES 17–22.** *Myrmecina eruga* sp. n. worker. Fig. 17, front of head; Fig. 18, lateral view of body; Fig. 19, dorsal view of body. *Myrmecina inaequala* sp. n. worker. Fig. 20, front of head; Fig. 21, lateral view of body; Fig. 22, dorsal view of body.

**Measurements.** Worker ( $n = 10$ )—CI 95–101; HL 0.72–0.79; HW 0.71–0.79; MTL 0.37–0.42; SI 83–90; SL 0.61–0.69; WL 0.83–0.96.

**Additional material examined (ANIC except where noted).** Queensland: 20km N of Cairns (Lowery, B.B.); 3km NE Mt. Webb (Calder, A. & Feehan, J.); 4.5km NNW Cape Tribulation (Ward, P.S.)

(ANIC, QMBA); Alexandra Bay (Feehan & Taylor); Bellenden Ker Range, Cableway Base Stn (Earthwatch, Qld Museum); Cape Richards, Hinchinbrook I. (Taylor,R.W.); Cape Tribulation area (Calder,A. & Weir,T.); Hinchinbrook Is., Gayundah Ck. (Monteith, Davies, Thompson & Gallon) (ANIC, QMBA); Mt. Webb Nat. Pk (Calder,A. & Feehan,J.); nr. Cape Tribulation (Taylor,R.W. & Feehan,J.); Spear Creek (Davies & Raven); W Seymour Range, nr. Innisfail (Taylor,R.W.).

**Comments.** This species is restricted to rainforest and *Melaleuca* forests of northern Queensland coastal areas where it has been found in leaf litter samples and nesting in rotten logs and under rocks.

***Myrmecina inaequala* sp. n.**

(Figs 20–22, 51)

**Types.** Holotype worker from 11km ENE Mt. Tozer, 12°43'S 143°18'E, Queensland, 11–16 July 1986, T. A. Weir, rainforest, litter (ANIC32-047354); 2 paratype workers, same data as holotype (ANIC, ANIC32-047469); 6 paratype workers, same data as holotype (ANIC, BMNH, ANIC32-047470); 6 paratype workers, same data as holotype (ANIC, MCZC, ANIC32-047471); 2 paratype workers, same data as holotype (ANIC, ANIC32-047472).

**Diagnosis.** Dorsal surface of mesosoma with continuous longitudinal carinae running from pronotum to propodeum; dorsal and lateral surfaces of mesosoma separated by an indistinct angle or ridge which interrupts or breaks the mesosomal sculpturing; carinae weak and relatively indistinct on sides of pronotum. This species can be separated from the similar *rugosa* by the more distinct and linear carinae on the mesosoma and from *difficulta* by the angle or ridge separating the dorsal and lateral surfaces of the mesosoma which interrupts the sculpturing (in *difficulta* the sculpturing is continuous across these surfaces).

**Worker description.** Antennal scapes with low longitudinal ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma running longitudinally and generally with the central carina (or carinae) running nearly the length (the pronotum not differentiated from the mesonotum). Dorsal and lateral surfaces of mesosoma separated by an indistinct angle or ridge which interrupts or breaks the mesosomal sculpturing. Metanotal spines very short, broadly angular. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles and legs yellow-red.

**Measurements.** *Worker* ( $n = 8$ ) — CI 97–105; HL 0.63–0.79; HW 0.62–0.78; MTL 0.33–0.43; SI 81–96; SL 0.55–0.67; WL 0.79–0.93.

**Additional material examined (ANIC except where noted).** **New South Wales:** nr. Armidale, Eastwood State Forest (Sakurai,Y.). **Queensland:** 11km ENE Mt. Tozer (Weir,T.A.); 14km SW Yarraman (Hill,L.); 1km N Nounded Hill (Calder,A. & Feehan,J.); 1km W Kuranda (Doyen,J.); 2.5km ESE of Eungella (Gillison,A.); 3km ENE Mt. Tozer (Weir,T.A.); 3km N of Upper Yarraman (Gallon,J. & Thompson,G.); 3km SWbyW Mount Ossa (Gillison,A.); 5km E Yarraman (Hill,L.); 6km S Eungella (Shattuck,S.O.); 7km ENE Mt. Tozer (Weir,T.A.); Bakers Blue Mt., 17km W Mount Molloy (Monteith,G.B. & Cook,D.); Bellenden Ker Range, Summit TV Stn (Monteith,G.B. & Yeates,D.K.); Boombana Nat. Pk (QM party) (QMBA); Brandy Ck. Rd., Conway S.F. (Monteith,G.B.); Broken R. Eungella N.P. (Gillison,A.); Bunya Mountains (Monteith,G.B.); Fraser Island (Collier,P.) (TERC); Iron Range (Taylor,R.W. & Feehan,J.); Iron Range (Monteith,G.B.); Iron Range, Claudie River (Taylor,R.W. & Lawrence,J.F.); Iron Range, S slope Mt. Lamond (Taylor,R.W. & Feehan,J.); Kirrama Range via Kennedy (Monteith,G.B.); Kroombit Tops, 45km SSW Calliope, Sites 2, 4, 5, 6 and 15 (Monteith, Davies, Gallon & Thompson); Kroombit Tops, SSW Calliope, Beauty Spot 98 (Monteith,G.B.); Kuranda (Brown,W.L.); Massey Range, 12km S Gordonvale (Monteith,G.B. & Cook,D.); Mount Blackwood, 14km SE by E Mount Ossa (Gillison,A.); Mt. Windsor Tableland (Taylor,R.W.); near Kenilworth (Taylor,R.); Rocky River, Cape York (Darlington,P.F.); Townsville (Hill,G.F.); W McNamee Creek (Taylor,R.W. & Feehan,J.); Mount Windsor Tableland, 28km NNW Mt Carbine (Monteith, Yeates & Cook); Mount Windsor Tableland, 35km NNW Mt. Carbine (Monteith, Yeates & Cook).

**Comments.** This is the most widespread species of *Myrmecina* in Australia and occurs in a range of habitats including *Eucalyptus* forests, meso-notophyll vine forests, Picabeen palm forests, wet sclerophyll and rainforest. It is most commonly encountered in litter samples or occasionally in rotten logs.

***Myrmecina pumila* sp. n.**

(Figs 5, 23–25, 47)

**Types.** Holotype worker from Bellenden Ker Range, Cableway Base Stn, 17°16'S 145°54'E, 100m, Queensland, 17–24 Oct. 1981, Earthwatch, Qld Museum, rainforest, sieved litter (ANIC, ANIC32-047349); 1 worker paratype from Crater National Park, 17°26'S 145°31'E, ca. 1000m, Queensland, 2 July 1971, R. W. Taylor & J. E. Feehan, rainforest, berlesate (ANIC, ANIC32-001269); 1 paratype worker from Danbulla Forestry Reserve, Queensland, J. Holt, May 1976 (ANIC, ANIC32-047262); 1 paratype worker from Danbulla Forestry Reserve, Queensland, P. J. M. Greenslade, 9 April 1976, litter (ANIC, ANIC32-047263); 1 paratype worker from Malanda Falls Environmental Park, 17°21'S 145°35'E, Queensland, Jan. 1998, A. D. Cutter, leaf litter (ANIC, ANIC32-011657).

**Diagnosis.** Antero-medial surface of pronotum immediately behind the collar with at most very weak sculpturing and sometimes nearly smooth, this region differing significantly from the more heavily sculptured posterior regions of the pronotum and mesonotum; sculpturing on pronotum running longitudinally and generally with the central carina (or carinae) running nearly the length of the mesosoma; body smaller (HW < 0.60mm, MTL < 0.30mm); head elongate (CI < 95). This species is most similar to *eruga* and *silvalaeva* in the pattern of sculpturing on the pronotum but differs from *eruga* in being smaller and with a more elongate head and from *silvalaeva* in the longitudinal (rather than transverse) carinae on the dorsum of the mesosoma.

**Worker description.** Antennal scapes smooth or with very low ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma shallow “V”s, the dorsal surface of pronotum immediately behind the collar and central mesonotum essentially smooth. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines weakly developed and essentially absent. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles, legs and tip of gaster yellow.

**Measurements.** Worker ( $n = 8$ ) — CI 90–95; HL 0.53–0.60; HW 0.50–0.56; MTL 0.25–0.29; SI 81–92; SL 0.44–0.50; WL 0.62–0.72.

**Additional material examined (ANIC).** Queensland: Bellenden Ker Range, Cableway Base Stn (Earthwatch, Qld Museum); Crater Nat. Pk (Taylor,R.W. & Feehan,J.E.); Danbulla Forestry Reserve (Greenslade,P.J.M.; Holt,J.); Gadgarra Greenslade,P.J.M.); Josephine Falls, Mt.Bartle Frere (Halliday,R.B.); Lake Barrine Nat. Forest, Yungaburra (Cutter,A.D.); Malanda Falls Environmental Park (Cutter,A.D.); McNamee Creek (Taylor,R.W. & Feehan,J.).

**Comments.** . This species is known from a restricted area of northern Queensland measuring less than 50km by 70km. It occurs in rainforest where it has been collected from leaf litter samples.

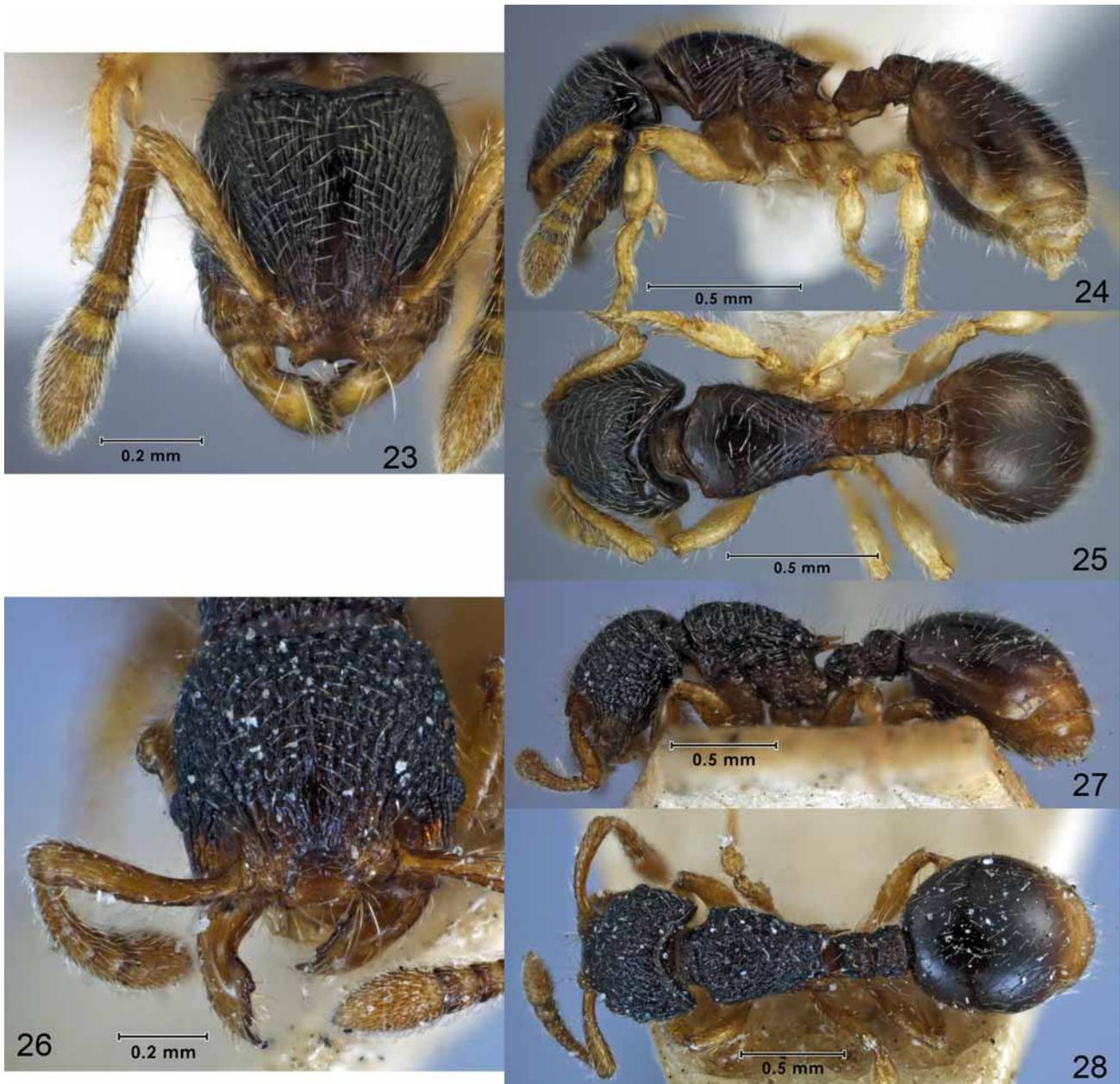
***Myrmecina rugosa* Forel**

(Figs 26–28, 50)

*Myrmecina rugosa* Forel, 1902: 438.

**Types.** Syntype workers from Mackay, Queensland, Turner (1 worker in ANIC, examined, ANIC32-047224).

**Diagnosis.** Rugae on head and dorsum of mesosoma irregular and ill-defined, not forming a regular pattern. The presence of irregular rugae on the body of this species will separate it from all other Australian species.



**FIGURES 23–28.** *Myrmecina pumila* sp. n. worker. Fig. 23, front of head; Fig. 24, lateral view of body; Fig. 25, dorsal view of body. *Myrmecina rugosa* Forel worker. Fig. 26, front of head; Fig. 27, lateral view of body; Fig. 28, dorsal view of body.

**Worker description.** Antennal scapes smooth or with low ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma ill-defined and irregular rugae. Dorsal and lateral surfaces of mesosoma separated by an indistinct angle or ridge which interrupts or breaks the mesosomal sculpturing. Metanotal spines very short. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles, legs and tip of gaster yellow-red.

**Measurements.** *Worker* ( $n = 1$ ) — CI 101; HL 0.64; HW 0.65; MTL 0.35; SI 81; SL 0.53; WL 0.78.

**Comments.** This species, the first species in the genus described from Australia, is so far known only from type material. It can be recognised by the irregular rugose body sculpturing which is in contrast to the remaining Australian species where distinct carinae are present on the head and mesosoma. It is curious that this species was the first described given that it is one of the rarest in the genus.

***Myrmecina silvalaeva* sp. n.**

(Figs 5, 7, 29–31, 47)

**Types.** Holotype worker from Gadgarra, 17°16'S 145°40'E, Queensland, Feb. 1976, P. J. M. Greenslade & J. Holt, litter (ANIC, ANIC32-047265).

**Diagnosis.** Sculpturing on anterior mesonotum consisting of continuous transverse “U”-shaped carinae, the area immediately behind the pronotal collar weakly sculptured or essentially smooth. This species is most similar to *eruga* and *pumila* in having weakly developed sculpturing on the pronotum immediately behind the collar but differs in having transversely arched (rather than longitudinal) carinae on the dorsum of the mesosoma.

**Worker description.** Antennal scapes smooth with one or two low ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma “U”-shaped anteriorly and “V”-shaped posteriorly, dorsal surface of pronotum immediately behind the collar with very weak sculpturing and nearly smooth. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines short. Propodeal spines long. Erect hairs abundant, straight, relatively short. Colour dark brown-black, antennae, mandibles, legs and tip of gaster yellow-red.

**Measurements.** Worker ( $n = 3$ ) — CI 93–96; HL 0.60–0.61; HW 0.56–0.59; MTL 0.29–0.29; SI 79–90; SL 0.47–0.52; WL 0.70–0.73.

**Additional material examined (ANIC). Queensland:** 6km E Butchers Creek School (Monteith,G.).

**Comments.** This rainforest species is known from a limited number of collections from a small area of the wet tropics, northern Queensland. It has been collected from leaf litter samples.

***Myrmecina silvampla* sp. n.**

(Figs 5, 7, 32–34, 47)

**Types.** Holotype worker from 2.0km WNW Cape Tribulation (Site 2), 16°05'S 145°28'E, 50m, Queensland, 3 Oct. 1982, Monteith, Yeates & Thompson, QM Berlesate No. 447, rainforest, sieved litter (ANIC, ANIC32-047355); 1 paratype ergatoid, same data as holotype (ANIC, ANIC32-047243).

**Diagnosis.** Sculpturing “V”-shaped on pronotum grading into “U”-shaped on mesonotum; body larger (HW > 0.8mm). This species can be separated from all other known Australian species by the combination of “V”-shaped sculpturing on the mesonotum and the large body size.

**Worker description.** Antennal scapes smooth. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma narrowly “V”-shaped anteriorly and broadly “V”-shaped posteriorly. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines long. Propodeal spines long. Erect hairs abundant, straight, relatively long. Colour dark brown-black, antennae, mandibles, anterior section of head, lower sections of mesosoma, legs and tip of gaster yellow.

**Measurements.** Worker ( $n = 1$ ) — CI 95; HL 0.87; HW 0.82; MTL 0.50; SI 95; SL 0.78; WL 1.02.

**Comments.** This rare Far North Queensland rainforest species is known from a single collection consisting of two specimens, one a worker and the other an ergatoid (with an enlarged mesosoma).

***Myrmecina silvangula* sp. n.**

(Figs 5, 7, 35–37, 47)

**Types.** Holotype worker from Thornton Range, 16°14'S 145°26'E, 100m, Queensland, 24 June 1971, R. W. Taylor & J. Feehan, rainforest, berlesate (ANIC, ANIC32-047351); 2 paratype workers, same data as holotype (MCZC, ANIC32-047239; ANIC, ANIC32-047240); 1 paratype worker from Thornton Range, 16°15'S

145°26'E, 150m, Queensland, 23 June 1971, R. W. Taylor & J. Feehan, rainforest, berlesate (ANIC, ANIC32-047238).

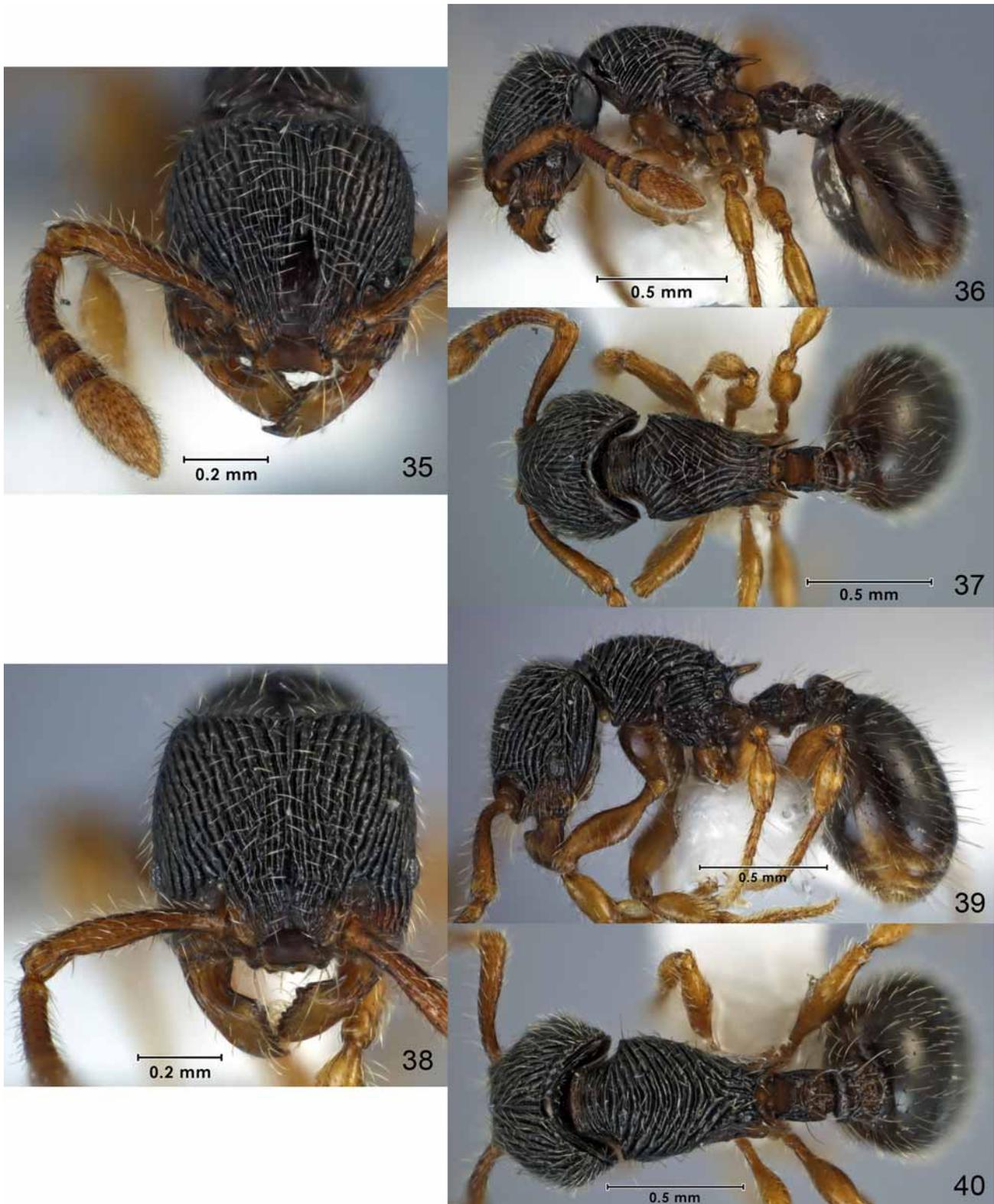


**FIGURES 29–34.** *Myrmecina silvalaeva* sp. n. worker. Fig. 29, front of head; Fig. 30, lateral view of body; Fig. 31, dorsal view of body. *Myrmecina silvampila* sp. n worker. Fig. 32, front of head; Fig. 33, lateral view of body; Fig. 34, dorsal view of body.

**Diagnosis.** Carinae on pronotum and anterior mesonotum “V”-shaped; sides of head behind compound eyes smooth; antennal scapes with low longitudinal ridges; body smaller (HW < 0.70). This species can be separated from all other known Australian species by the combination of “V”-shaped sculpturing on the dorsum of the mesosoma and the small body size.

**Worker description.** Antennal scapes with low ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma broadly “V”-shaped

anteriorly, narrowly “V”-shaped medially and parallel posteriorly. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines short. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles and legs yellow-brown.



**FIGURES 35–40.** *Myrmecina silvangula* sp. n. worker. Fig. 35, front of head; Fig. 36, lateral view of body; Fig. 37, dorsal view of body. *Myrmecina silvarugosa* sp. n. worker. Fig. 38, front of head; Fig. 39, lateral view of body; Fig. 40, dorsal view of body.

**Measurements.** *Worker* ( $n = 6$ ) — CI 93–100; HL 0.57–0.64; HW 0.56–0.60; MTL 0.28–0.32; SI 85–92; SL 0.48–0.55; WL 0.65–0.80.

**Additional material examined (ANIC).** **Queensland:** Alexandra Bay (Feehan & Taylor); Cooper Ck., nr. Daintree (Taylor, R.W. & Feehan, J.); Mt. Sorrow slopes, Cape Tribulation (Monteith, G.B.); Thornton Range (Taylor, R.W. & Feehan, J.).

**Comments.** This species has been collected from leaf litter in rainforests from a restricted area of northern Queensland.

***Myrmecina silvarugosa* sp. n.**

(Figs 5, 7, 38–40, 47)

**Types.** Holotype worker from Mt. Lewis, 16°34'S 145°17'E, Queensland, 20 June 1971, Taylor & Feehan, rainforest (ANIC, ANIC32-047234).

**Diagnosis.** Majority of carinae on pronotum and mesonotum gently curved across width of mesosoma; sides of head behind compound eyes with 2–3 longitudinal carinae running the length of the head. The combination of arched mesonotal sculpturing and elongate carinae on the sides of the head behind the eyes will separate this species from all others in Australia.

**Worker description.** Antennal scapes smooth or with weak ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes with 2–3 longitudinal carinae running the length of the head. Carinae on pronotum and mesonotum transverse, gently curved, extending across width of mesosoma. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines short. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles and legs yellow-brown.

**Measurements.** *Worker* ( $n = 4$ ) — CI 96–100; HL 0.63–0.66; HW 0.61–0.65; MTL 0.32–0.33; SI 82–87; SL 0.53–0.56; WL 0.71–0.78.

**Additional material examined.** **Queensland:** 2.5km N Mt. Lewis via Julatten (Yeates, D.K. & Thompson, G.I.) (ANIC); Mary Creek site 4 (Burwell, C.) (QMBA); Mt. Lewis Barracks, via Julatten (Monteith, G. & Cook, D.) (ANIC).

**Comments.** This high-elevation species is restricted to mountain-tops above 1000m in a small area within Queensland's wet tropics where it occurs in rainforests. This species is sympatric with *alpina*, another high-elevation species, and these are the only Australian species with carinae on the sides of the head behind the eyes.

***Myrmecina silvatransversa* sp. n.**

(Figs 5, 7, 41–43, 47)

**Types.** Holotype worker from 4km W of Cape Tribulation (site 8), 16°5'S 145°26'E, Queensland, 24 Sept. 1982, Monteith, Yeates & Thompson, rainforest, sieved litter (ANIC, ANIC32-047244).

**Diagnosis.** Majority of carinae on pronotum and mesonotum gently curved across width of mesosoma; sides of head behind compound eyes smooth. The combination of arched mesonotal sculpturing and smooth sides of the head behind the eyes will separate this species from all others in Australia.

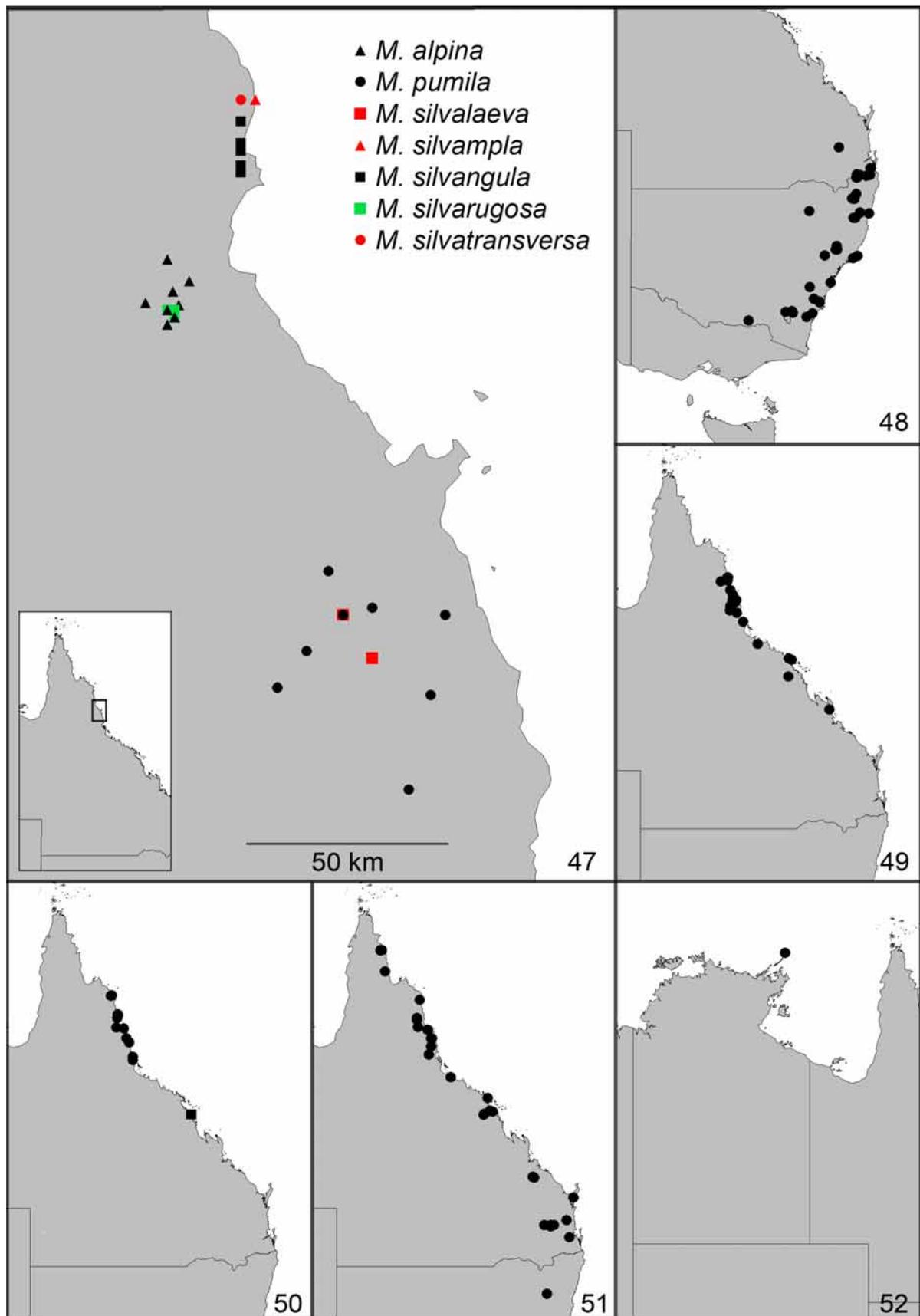
**Worker description.** Antennal scapes with low ridges. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Carinae on pronotum and mesonotum transverse, gently curved, extending across width of mesosoma. Carinae extending continuously from the dorsal surface onto the lateral surfaces of the mesosoma. Metanotal spines reduced to low angles. Propodeal spines long. Erect hairs abundant, straight. Colour dark brown-black, antennae, mandibles and legs yellow-red.

**Measurements.** *Worker* ( $n = 1$ ) — CI 95; HL 0.63; HW 0.60; MTL 0.32; SI 96; SL 0.58; WL 0.74.

**Comments.** This rare species is known from a single high-elevation rainforest leaf litter sample from northern Queensland.



**FIGURES 41–46.** *Myrmecina silvatransversa* sp. n. worker. Fig. 41, front of head; Fig. 42, lateral view of body; Fig. 43, dorsal view of body. *Myrmecina wesselensis* sp. n. worker. Fig. 44, front of head; Fig. 45, lateral view of body; Fig. 46, dorsal view of body.



**FIGURES 47–52.** Distribution of material examined during this study. Fig. 47, *M. alpina*, *M. pumila*, *M. silvalaeva*, *M. silvampla*, *M. silvangula*, *M. silvarugosa* and *M. silvatransversa*; Fig. 48, *M. australis*; Fig. 49, *M. difficulta*; Fig. 50, *M. eruga* (circles) and *M. rugosa* (square); Fig. 51, *M. inaequala*; Fig. 52, *M. wesselensis*.

***Myrmecina wesselensis* sp. n.**

(Figs 44–46, 52)

**Types.** Holotype worker from Rimbija Island, Wessel Islands, 11°01'S 136°45'E, Northern Territory, 3–14 Feb. 1977, T. A. Weir, ground strays collected at night (ANIC, ANIC32-047233).

**Diagnosis.** Erect hairs on gaster (and most on mesonotum) strongly curved so their tips are nearly parallel with the surface of the body. These short, curved hairs are unique among the Australian fauna and will separate this species from all others.

**Worker description.** Antennal scapes smooth. First segment of funiculus cone-shaped. Sides of head behind compound eyes smooth. Sculpturing on dorsal surface of mesosoma running longitudinally and generally with the central carina (or carinae) running nearly the length (the pronotum not differentiated from the mesonotum). Dorsal and lateral surfaces of mesosoma separated by an indistinct angle or ridge which interrupts or breaks the mesosomal sculpturing. Metanotal spines reduced, small. Propodeal spines long. Erect hairs on gaster (and most on mesonotum) strongly curved so their tips are nearly parallel with the surface of the body. Colour dark brown-black, antennae, mandibles, legs and tip of gaster yellow-red.

**Measurements.** *Worker* ( $n = 1$ ) — CI 100; HL 0.68; HW 0.68; MTL 0.34; SI 81; SL 0.55; WL 0.77.

**Comments.** This species is known from a single worker collected foraging on the ground at night from the Wessel Islands, Northern Territory.

## Acknowledgments

I would like to thank Stefan Cover, Ted Schultz and Phil Ward for notes on G. C. and J. Wheeler's larval collection, and to Barry Bolton for recognising the Wheeler's larval description as making the name *australis* available. Comments on the manuscript from Gary Alpert, Jack Longino and an anonymous review were most helpful and appreciated.

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