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Australian ants of the genus *Aphaenogaster* (Hymenoptera: Formicidae)

STEVEN O SHATTUCK
CSIRO Entomology, GPO Box 1700, Canberra, ACT 2601, Australia. E-mail: Steve.Shattuck@csiro.au

Abstract

The Australian species of the myrmicine ant genus *Aphaenogaster* Mayr are revised. Eight species are recognised, four of which are described as new. The species include *barbara* sp. n., *barbigula* Wheeler (for which a lectotype is designated), *kimberleyensis* sp. n., *longiceps* (Smith) (with its newly recognised synonym, *flava* Emery), *mediterrae* sp. n., *poultoni* Crawley, *pythia* Forel (for which a neotype is designated) and *reichelae* sp. n. *Aphaenogaster* is widely distributed across eastern and southern Australia (except Tasmania), with isolated populations in northern Northern Territory and northern Western Australia. Species occur in a range of habitats from rainforests through open woodlands and can be of significant economic importance because of damage caused by their nests.

Key words: Australia, Formicidae, Hymenoptera, new species, lectotype, neotype, *Aphaenogaster*

Introduction

The distinctive nests of Australian *Aphaenogaster* ants are often the first indication of their presence. These nests can be very dense and when in sandy soils, individual entrances can be large, deep cones or bores (up to 4 cm in diameter and 30 cm deep) with large mounds of loose dirt. This style of nest has resulted in these ants being known as "funnel ants." In some cases nests can be so dense and extensive that they severely affect soil structure, resulting in a loose and fragile surface which easily collapses under foot. When this occurs in situations such as golf courses, pastures and unsealed airstrips damage can be severe and these ants can become a serious problem. Although not aggressive, workers will defend their nests when disturbed, emerging from entrances in small numbers to attack intruders.

While nests can contain large numbers of workers, few workers are usually seen on the surface, and then most are found near the entrance; they are rarely seen foraging any distance from nests. It is known that these ants tend aphids on the roots of plants (Saunders 1967) and that arthropod fragments are often found in the upper portions of their nests. It is possible that the tended aphids provide much of the food needed by the nest, and that the funnel-shaped entrances act as traps for surface foraging arthropods. These factors may combine to reduce or eliminate the need to forage on the surface of the ground.

The nomenclatural history of the Australian species of *Aphaenogaster* is complex, especially given the small number of names involved. Much of the early confusion resulted from the poor quality of Smith's (1858) original description of *A. longiceps* and the lack of direct examination of this material by subsequent authors. Early workers (Mayr, Emery and Forel) did their best to assign material to Smith's name, but often missed badly. Forel (1915) was so uncertain that he proposed a provisional new name (*pythia*) in case some of the earlier identifications proved incorrect. Unfortunately the material Forel's name was based on (that of Mayr 1862) had been destroyed a few years earlier, leaving only Mayr's (1862) description. To confuse things even further, Mayr's material was from four widely distributed locations and likely represented more than one

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taxon (Wheeler 1916). This trend continued when Emery (1914) discussed two forms that he identified as *longiceps* and *longiceps ruginota*. Wheeler (1916) considered Emery's specimens to represent a single taxon. However Emery (1921) used one of these specimens as the type of a new taxon (*flava*), this new taxon being established by indication to his earlier figure and without comment or justification. This name was not discussed further until Bolton (1995) listed it in his world catalogue. Thus of the six names available at the beginning of this study for the Australian fauna (*barbigula, flava*, *longiceps*, *poultoni*, *pythia* and *ruginota*), two (*flava, pythia*) were established by indication, one of these (*pythia*) being based on non-existent type material and the other (*flava*) having only been mentioned once since it was established. None of these complications were insurmountable and all are addressed below, but it is surprising that such a common group of ants with a relatively straight-forward taxonomy is based on such shaky nomenclature.

The literature on Australian *Aphaenogaster* is moderately extensive, with some of the more important papers including Wheeler (1916) (taxonomy), Crawley (1922b) (taxonomy), Hitchcook (1958) (pest status), Saunders (1961) (biology, control), Hitchcook (1962) (biology), Wilson (1962) (control), Saunders (1967) (biology, control), Saunders (1969) (control), Saunders (1970) (biology, control), Murray (1982) (control), Andersen (1988a) (relation to fire), Andersen (1988b) (relation to plants), Nicholls and McKenzie (1994) (distribution pattern) and York (1994) (relation to fire).

The Australian fauna of *Aphaenogaster* is now known to contain eight species. Species range from very common and widespread (*longiceps*, *pythia*) to narrowly endemic and rare (*reichelae*). Four species are described as new, a lectotype is designated for *barbigula* and a neotype is established for *pythia*. Colour images are provided for all species and a key is provided for their identification.

Methods and abbreviations

Size and shape characters were quantified and are reported as lengths or indices. Measurements were made with a Zeiss Stemi SV8 stereo microscope at various magnifications using a dual-axis stage micrometer wired to digital readouts. All measurements were recorded in thousandths of millimetres, but are expressed here to the nearest hundredth as a range from minimum to maximum across all measured specimens.

The following measurements and indices are reported.

CI	Cephalic index: HW/HL x 100.
EI	Eye index: EL/HW x 100.
EL	Maximum eye length with eye in full face view.
HL	Maximum head length in full face (dorsal) view, measured from the anterior-most point of the clypeal margin to the posterior-most point of the head proper (excluding the occipital collar).
HW	Maximum head width in full face (dorsal) view excluding the eyes.
ML	Mesosomal length measured from the anterior surface of the pronotum proper (excluding the collar) to the posterior extension of the propodeal lobes.
MTL	Maximum length of mid tibia, 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	Length of the scape (first antennal segment) excluding the basal neck and condyle.

Collections: ANAC, A. N. Andersen Collection, CSIRO Sustainable Ecosystems, Darwin, N.T.; ANIC, Australian National Insect Collection, Canberra, A.C.T.; JDMC, Jonathan D. Majer Collection, Curtin University of Technology, Perth, W.A.; MCZC, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A.; MHNG, Muséum d'Histoire Naturelle, Geneva, Switzerland; MVMA,

Museum Victoria, Melbourne, Vic.; PSWC, P. S. Ward Collection, University of California, Davis, California, U.S.A.; QMBA, Queensland Museum, Brisbane, Qld; WAMP, Western Australian Museum, Perth, W.A.

Aphaenogaster Mayr

Diagnosis. Antennae 12 segmented (including the scape) with a 4 segmented club (Fig. 9). In side view the propodeum depressed below the level of the pronotum and anterior region of the mesonotum, these two regions being connected by the steeply sloping posterior section of the mesonotum (Fig. 2). Monomorphic.

Aphaenogaster is most likely to be confused with *Pheidole* or possibly *Pheidologeton*. Workers of *Aphaenogaster* can be separated from those of *Pheidole* by the 4 segmented rather than 3 segmented club and the larger body size (over 3.4mm long), and from *Pheidologeton* by the 12 segmented antennae (11 segmented in *Pheidologeton*). Additionally, both *Pheidole* and *Pheidologeton* have polymorphic workers while *Aphaenogaster* is monomorphic.

The Australian species of *Aphaenogaster* show differences which are little more than "variation on a theme." This is in contrast to the nearby Papua New Guinea fauna where morphological variation is considerable (Smith 1961). This difference suggests that the Australian fauna is composed of closely related species while that of PNG consists of several more distantly related lineages.

List of Australian species

barbara sp. n. (Queensland)
barbigula Wheeler (New South Wales, Queensland, South Australia, Victoria)
kimberleyensis sp. n. (northern Northern Territory, northern Western Australia)
longiceps (Smith) (ACT, New South Wales, southern Queensland, south-east South Australia, Victoria)
    flava Emery (new synonymy)
    ruginota Forel
mediterrae sp. n. (western South Australia, southern Western Australia)
poultoni Crawley (south-western Western Australia)
pythia Forel (Queensland, PNG)
reichelae sp. n. (northern Northern Territory)

Key to species of Australian *Aphaenogaster* based on workers

1. Majority of hairs on venter of head located laterally and forming a distinct psammophore, only scattered hairs on central portion (Fig. 4) 2
- Hairs on venter of head randomly distributed and not forming a distinct psammophore (Fig. 2) 4
2 Eye relatively large (EI greater than 21, Fig. 19); scape relatively long (SI greater than 106, Fig. 20)..... ..... *mediterrae*
- Eye relatively small (EI less than 21, Fig. 19); scape relatively short (SI less than 106, Fig. 20) 3
3. Petiolar node (in dorsal view) wider than long; mandibular sculpture composed of irregularly sized striations (Fig. 6) (occurring in Western Australia)..... *poultoni*
- Petiolar node (in dorsal view) approximately square; mandibular sculpture composed of regularly sized striations (Fig. 5) (occurring in South Australia and eastward)..... *barbigula*
4. Posterior margin of head nearly flat in full face view, extending laterally of the occipital collar before

passing through a distinct posterolateral corner into the lateral margin of the head (Fig. 15) 5
- Posterior margin of head broadly arched in full face view, the arch beginning at the occipital collar and with at most a weak angle separating the posterior and lateral margins of the head (often posterior and lateral margins forming a continuous surface) (Fig. 9) 6

5. Scape relatively short (SI less than 125, Fig. 23) (occurring in e. Queensland and ne. New South Wales) ..... *pythia*
- Scape relatively long (SI greater than 135, Fig. 23) (occurring in Northern Territory) .....*reichelae*

6. Shorter erect hairs on mesosomal dorsum (especially those on mesonotum) with blunt tips; dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity (so that the base of each spine is at approximately the same level as the dorsal surface of the propodeum) (Fig. 10) ..... *longiceps*
- Erect hairs on mesosomal dorsum tapering to sharp points; dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity followed by a gentle convexity (so that the base of each spine is raised slightly above the dorsal surface of the propodeum) (Fig. 8)..... 7

7. Head relatively narrow (Fig. 21), scape relatively long (Fig. 22) (occurring in n. Northern Territory and n. Western Australia) .....*kimberleyensis*
- Head relatively broad (Fig. 21), scape relatively short (Fig. 22) (occurring in Queensland)..... *barbara*

***Aphaenogaster barbara* sp. n.**
(Figs 1, 2, 21, 22, 24)

Types. Holotype worker, Australia, Queensland, 3km NE Mt. Webb, 15°03S 145°09E, 30 April–3 May, 1981, J. E. Feehan (ANIC) (ANIC32-031017); paratype workers, 33 (same data as holotype) (ANIC32-001260) (ANIC, MCZC, QMBA).

Diagnosis. Hairs on venter of head randomly distributed and not forming a distinct psammophore (Fig. 2); head relatively broad (Fig. 21), its posterior margin broadly arched in full face view (Fig. 1); scape relatively short (Fig. 22); erect hairs on mesosomal dorsum tapering to sharp points; propodeal spines long, the dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity followed by a gentle convexity (so that the base of each spine is raised slightly above the dorsal surface of the propodeum) (Fig. 2). This species can be separated from the similar *A. kimberleyensis* by the broader head and shorter scapes (see that species for additional notes on separating these taxa).

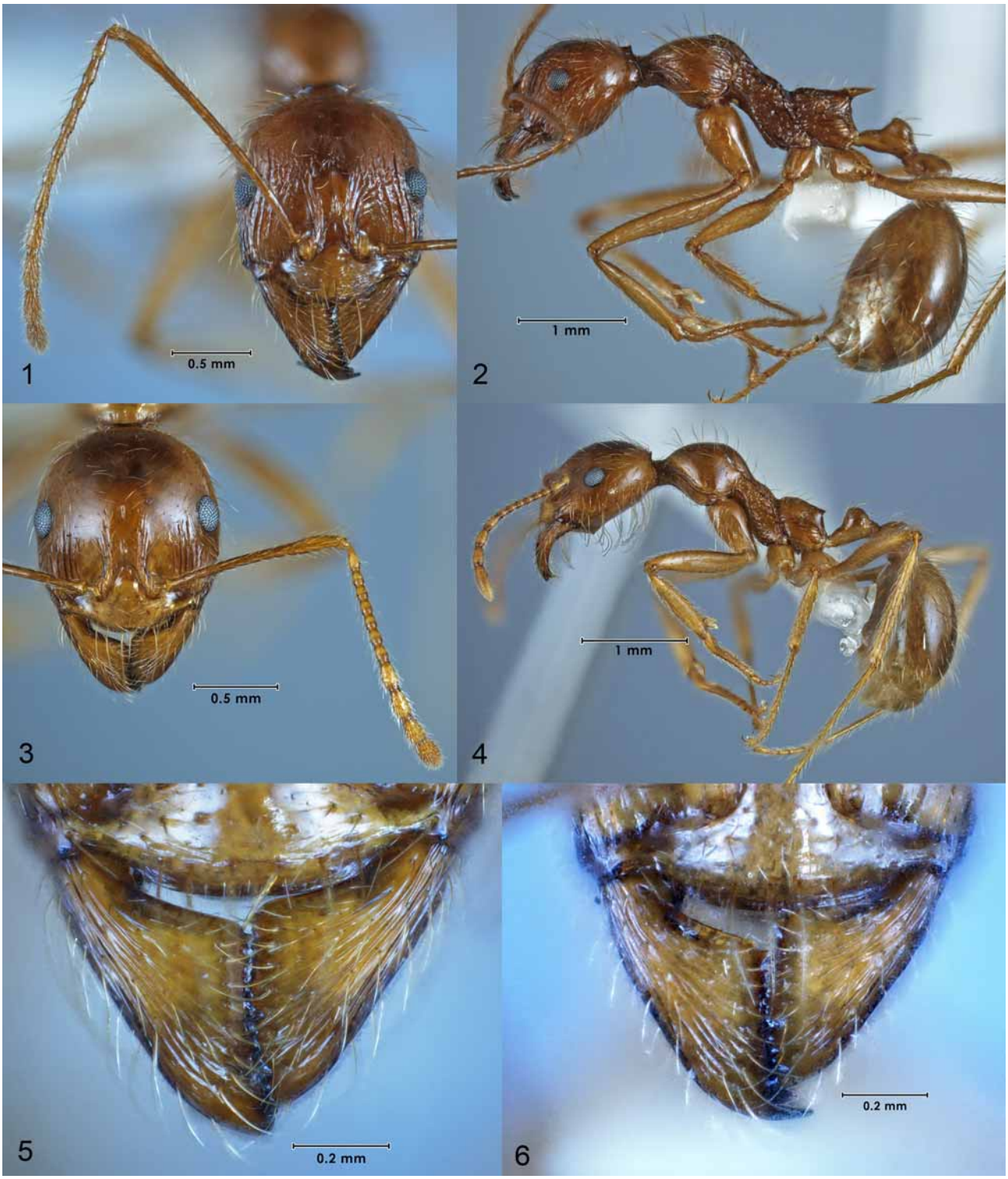
Description. Posterior margin of head broadly arched in full face view, the arch beginning at the occipital collar and with at most a weak angle separating the posterior and lateral margins of the head (often posterior and lateral margins forming a continuous surface). Hairs on venter of head randomly distributed and not forming a distinct psammophore. Mandibular sculpture composed of regularly sized striations. Erect hairs on mesosomal dorsum tapering to sharp points. Propodeal spines long. Dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity followed by a gentle convexity (so that the base of each spine is raised slightly above the dorsal surface of the propodeum). Petiolar node (in dorsal view) longer than broad.

Measurements. Worker (n = 12). CI 84–91; EI 17–20; EL 0.20–0.24; HL 1.22–1.51; HW 1.04–1.29; ML 1.82–2.17; MTL 1.23–1.62; SI 133–156; SL 1.55–1.82.

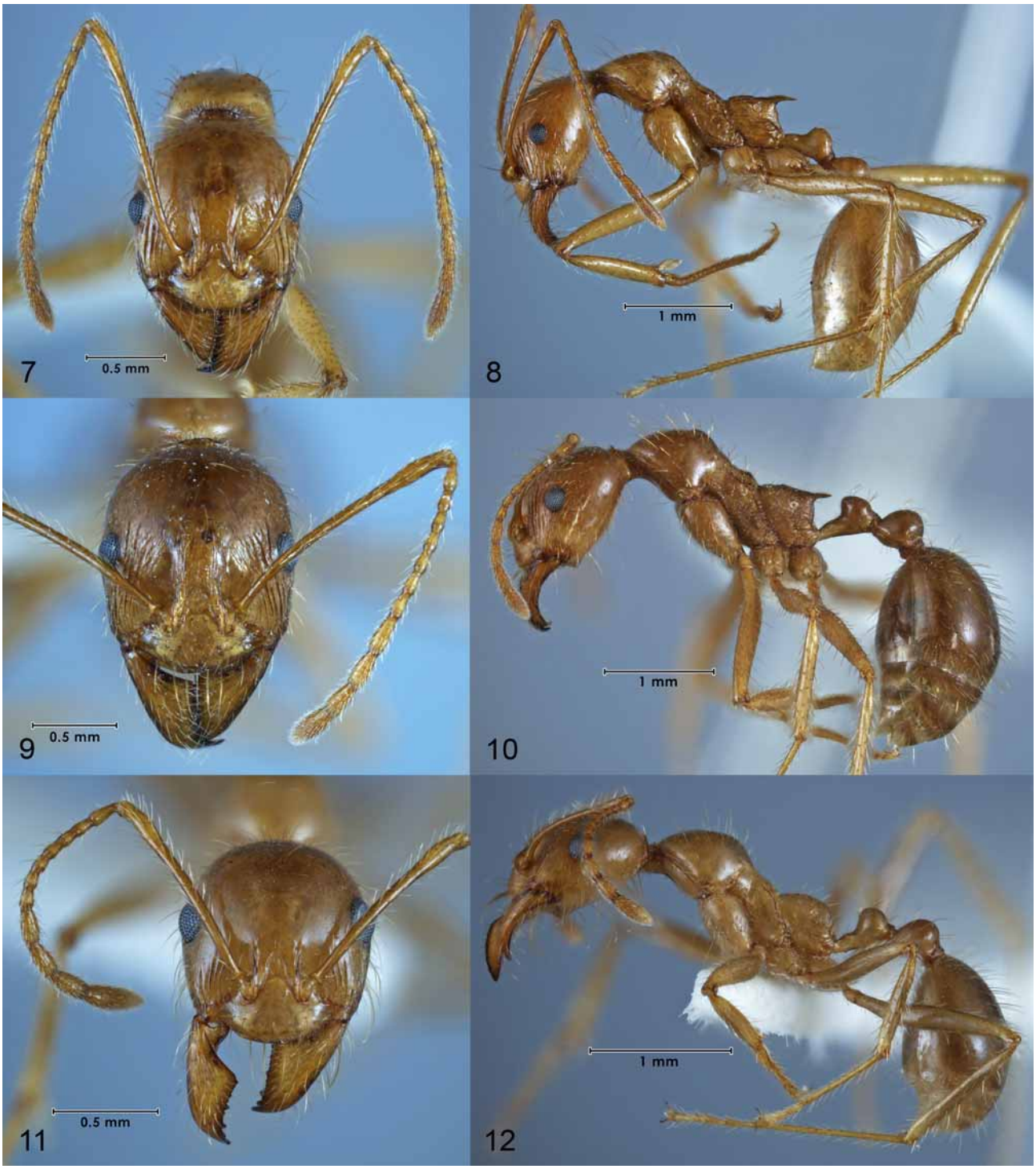
Material examined (in ANIC unless otherwise noted). **Queensland**: 10km E Mareeba (Lowery,B.B.); 12km N Collinsville (Lowery,B.B.); 14km W by N Hope Vale Mission (Feehan,J.E.); 15km S Eton (Lowery,B.B.); 15mi. W Mt. Garnet (Lowery,B.B.); 20km N Monto (Lowery,B.B.); 24mi. NE Clermont (Dowse,J.E.; Lowery,B.B.); 25km W Mt. Garnet (Lowery,B.B.); 30mi. N Tambo (Lowery,B.B.); 39mi. NNW Taroom; 50km S Mackay (Lowery,B.B.); 5km E Pentland (Lowery,B.B.); 8km E Woodstock (Greenslade,P.J.M.); Camel Ck. Stn (Harrington,S.A.); Emu Creek, Mareeba (Lowery,B.B.); Expedition Ra., 50km E

Rolleston (Lowery,B.B.); Koah (Wheeler,W.M.); Mareeba, 3km along Davies Ck. Road (Lowery,B.B.); Mundubbera (Lowery,B.B.); vic. Mt. Garnet (Taylor,R.W.).

Comments. This is a fairly common and widely distributed Queensland species (Fig. 24) which had previously been confused with *A. pythia*. However, it differs significantly from *A. pythia* and there is little chance of confusing these two species. *Aphaenogaster barbara* occurs in drier forested habitats such as dry sclerophyll and savannah woodlands. Nests are typical for the genus with large funnel-shaped entrances.



FIGURES 1–6. *A. barbara* sp. n., holotype worker: Fig. 1, front of head; Fig. 2, lateral view of body. *A. barbigula* Wheeler, worker: Fig. 3, front of head; Fig. 4, lateral view of body. Mandibles: Fig. 5, *A. barbigula* Wheeler; Fig. 6, *A. poultoni* Crawley.



FIGURES 7–12. *A. kimberleyensis* sp. n., holotype worker: Fig. 7, front of head; Fig. 8, lateral view of body. *A. longiceps* (Smith), worker: Fig. 9, front of head; Fig. 10, lateral view of body. *A. mediterrae* sp. n., holotype worker: Fig. 11, front of head; Fig. 12, lateral view of body.

***Aphaenogaster barbigula* Wheeler**
(Figs 3–5, 19, 20, 25)

Aphaenogaster (*Nystalomyrma*) *barbigula* Wheeler, 1916: 221.

Types. Lectotype worker (here designated) from Sea Lake, Victoria, G. C. Goudie (MCZC); paralectotypes as follows: Yanco (6 workers, MCZC, examined), New South Wales; Adelaide (3 workers, MCZC, examined), Meningie (5 workers, MCZC, examined); Gawler and Karoonda to Peebinga, South Australia; Dongara (as Dongarra), Gooseberry Hill, Wallaby Island and Beverley, Western Australia; Sea Lake (16 workers, MCZC, examined; 1 worker, MVMA, examined), Victoria.

Diagnosis. Majority of hairs on venter of head located laterally and forming a distinct psammophore (Fig. 4); eye relatively small (EI less than 21, Fig. 19); scape relatively short (SI less than 106, Fig. 20); mandibular sculpture composed of regularly sized striations (Fig. 5); petiolar node (in dorsal view) approximately square. The presence of a psammophore will separate this species from all others except *A. mediterrae* and *A. poultoni*. It can be separated from these species as outlined in the key above.

Description. Posterior margin of head nearly flat in full face view, extending laterally of the occipital collar before passing through a distinct posterolateral corner into the lateral margin of the head. Majority of hairs on venter of head located laterally and forming a distinct psammophore, only scattered hairs on central portion. Mandibular sculpture composed of regularly sized striations. Erect hairs on mesosomal dorsum tapering to sharp points. Propodeal spines reduced to small denticles, or sometimes essentially absent. Petiolar node (in dorsal view) approximately square.

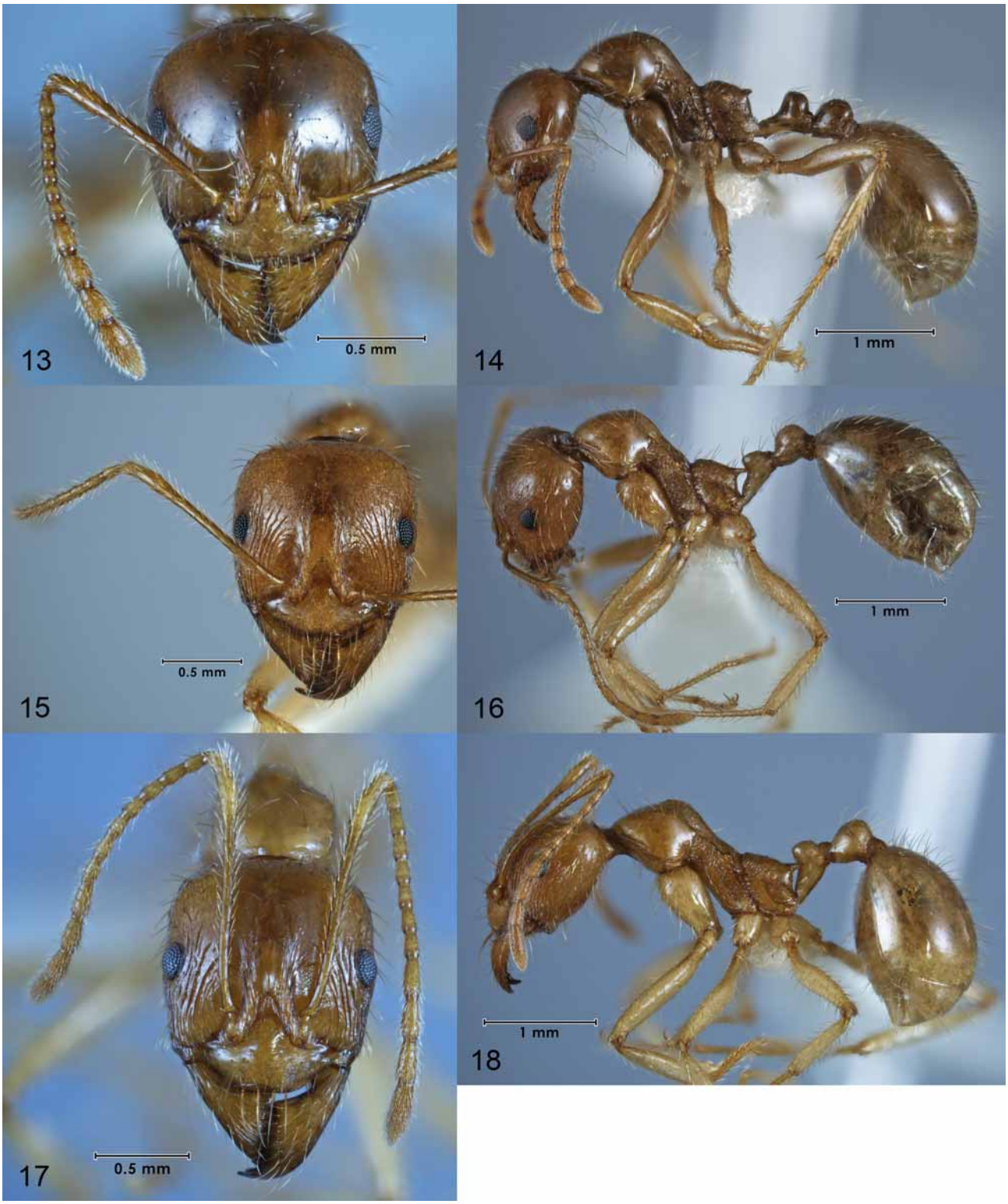
Measurements. Worker (n = 8). CI 84–92; EI 22–27; EL 0.23–0.27; HL 1.12–1.26; HW 0.97–1.16; ML 1.58–1.84; MTL 0.96–1.08; SI 104–115; SL 1.11–1.25.

Material examined (in ANIC unless otherwise noted). **New South Wales**: 12km S Coombah (Ward,P.S.) (ANIC, PSWC); 4mi. N Condobolin (Lowery,B.B.); 60mi. S Broken Hill (Lowery,B.B.); 7mi. S Hillston (Lowery,B.B.); Berrigan SF (Lowery,B.B.); Cocoparra NP, nr Griffith (Lowery,B.B.); Emu Vale, nr. Deniliquin (Greenslade,P.J.M. & Valentine,I.); Griffith, bank of Lake Wyangan (Lowery,B.B.); nr. Darling R., Wentworth (Lowery,B.B.); Lake Popilta [Popiltah Lake] (Lowery,B.B.). **Queensland**: 15 km S by W of Charleville (Upton,M.S.); 30km W St. George (Lowery,B.B.); Beralga c.50mi. NW St. George (Lowery,B.B.); St. George (Lowery,B.B.); St. George nr. Balonne R. (Lowery,B.B.). **South Australia**: 15km NW Renmark (Shattuck,S.O.); 18km NNE Meninjie (Greenslade,P.J.M.); 30mi. S Whyalla, Moonabie Ra. (Haycraft,J., MCZC); 32km N Renmark (Shattuck,S.O.); 40km S Oodnadatta (Lowery,B.B.); 5mi. W Tintinara (Greaves,T.); Blythe, 80mi. N Adelaide (Lowery,B.B.); Ferries McDonald Natl. Pk. (Shattuck,S.O.); Gawler Ra., Saline to SE (Greenslade,P.J.M.); Hambridge NP [Hambidge NP] (Britton,E.B.); Kokatha, Gawler Ranges (Greenslade,P.J.M.); Lochiel (Lowery,B.B.); Perponda (Greenslade,P.J.M.); Tailem Bend (Lowery,B.B.); Two Wells (Lowery,B.B.); Victoria Desert, 53km E Vokes Hill (Greenslade,P.J.M.); Warooka, Yorke Peninsula (Lowery,B.B.); Yorke Pen., Hardwicke Bay (Greenslade,P.J.M.). **Victoria**: 20mi. NW Swan Hill (Greaves,T.); Bannerton Mallee (Nilson,A.C.); Bendigo (Greenslade,P.J.M.; Lee,K.E.); Ouyen.

Comments. This species occurs in semi-arid areas of eastern South Australia, south-central Queensland, western New South Wales and north-western Victoria (Fig. 25). It is generally found in forested habitats including *Callitris* and mulga (*Acacia* sp.) woodlands (including on red soils), mallee (with and without *Triodia* (spinifex grass)) and in savannah woodlands, but is occasionally found in grasslands, especially with scattered trees. It is most often found on sandy soils. Nests are always in soil and almost always have large, deep craters around the entrance. The biology of this species was discussed by Crawley (1922a: 122).

***Aphaenogaster kimberleyensis* sp. n.**
(Figs 7, 8, 21, 22, 26)

Types. Holotype worker, Australia, Western Australia, 6km E Surveyors Pool Camp, Mitchell Plateau, 14°37’48”S 125°37’48”E, 4 May 1992, S. O. Shattuck, *Eucalyptus* woodland (ANIC) (ANIC32-017982); paratype workers, 9 (same data as holotype) (ANIC32-017983) (ANIC, MCZC).



FIGURES 13–18. *A. poultoni* Crawley, worker: Fig. 13, front of head; Fig. 14, lateral view of body. *A. pythia* Forel, neotype worker: Fig. 15, front of head; Fig. 16, lateral view of body. *A. reichelae* sp. n., holotype worker: Fig. 17, front of head; Fig. 18, lateral view of body.

Diagnosis. Hairs on venter of head randomly distributed and not forming a distinct psammophore (Fig. 8); head relatively narrow (Fig. 21), its posterior margin broadly arched in full face view (Fig. 7); scape relatively long (Fig. 22); erect hairs on mesosomal dorsum tapering to sharp points; propodeal spines long, the dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity followed by a gentle

convexity (Fig. 8). This species is most similar to *A. barbara* and can be separated from it by the narrower head and longer scapes.

Description. Posterior margin of head broadly arched in full face view, the arch beginning at the occipital collar and with at most a weak angle separating the posterior and lateral margins of the head (often posterior and lateral margins forming a continuous surface). Hairs on venter of head randomly distributed and not forming a distinct psammophore. Mandibular sculpture composed of irregularly sized striations. Erect hairs on mesosomal dorsum tapering to sharp points. Propodeal spines long. Dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity followed by a gentle convexity (so that the base of each spine is raised slightly above the dorsal surface of the propodeum). Petiolar node (in dorsal view) slightly longer than broad.

Measurements. Worker (n = 7). CI 83–86; EI 17–20; EL 0.19–0.22; HL 1.25–1.38; HW 0.04–1.17; ML 1.83–2.02; MTL 1.25–1.43; SI 149–157; SL 1.63–1.80.

Material examined (in ANIC unless otherwise noted). **Northern Territory**: Kakadu NP, Round Jungle. **Western Australia**: 6km E Surveyors Pool Camp, Mitchell Plateau (Shattuck,S.O.); Glenelg River (Andersen,A.N.); Mt. Trafalgar, Kimberley region (Majer,J.D.) (ANAC, JDMC).

Comments. *Aphaenogaster kimberleyensis* occurs in forested areas ranging from *Eucalyptus* and *Allosyncarpia* woodlands to rainforests. Nests are in sandy soil.

This species is very similar to *A. barbara* but the limited material currently available suggests that two species are involved. Specimens here considered to belong to *A. kimberleyensis* have narrower heads (Fig. 21) and longer scapes (Fig. 22) compared to specimens placed in *A. barbara*. It should be noted that these differences are slight and that some smaller specimens of both species do overlap, but the majority of specimens (especially larger ones) show little overlap. No other characters could be found which differ between these two sets of specimens. Given that these two species are currently allopatric (compare Figs 24 and 26) it is possible that only a single variable species is involved. However, the characters used here to separate these species (head shape and scape length) have proven to be reliable in diagnosing other species in the genus (species with numerous additional supporting characters). Given this, these differences are taken as being significant and suggest that two separate species are present.

***Aphaenogaster longiceps* (F. Smith)**
(Figs 9, 10, 27)

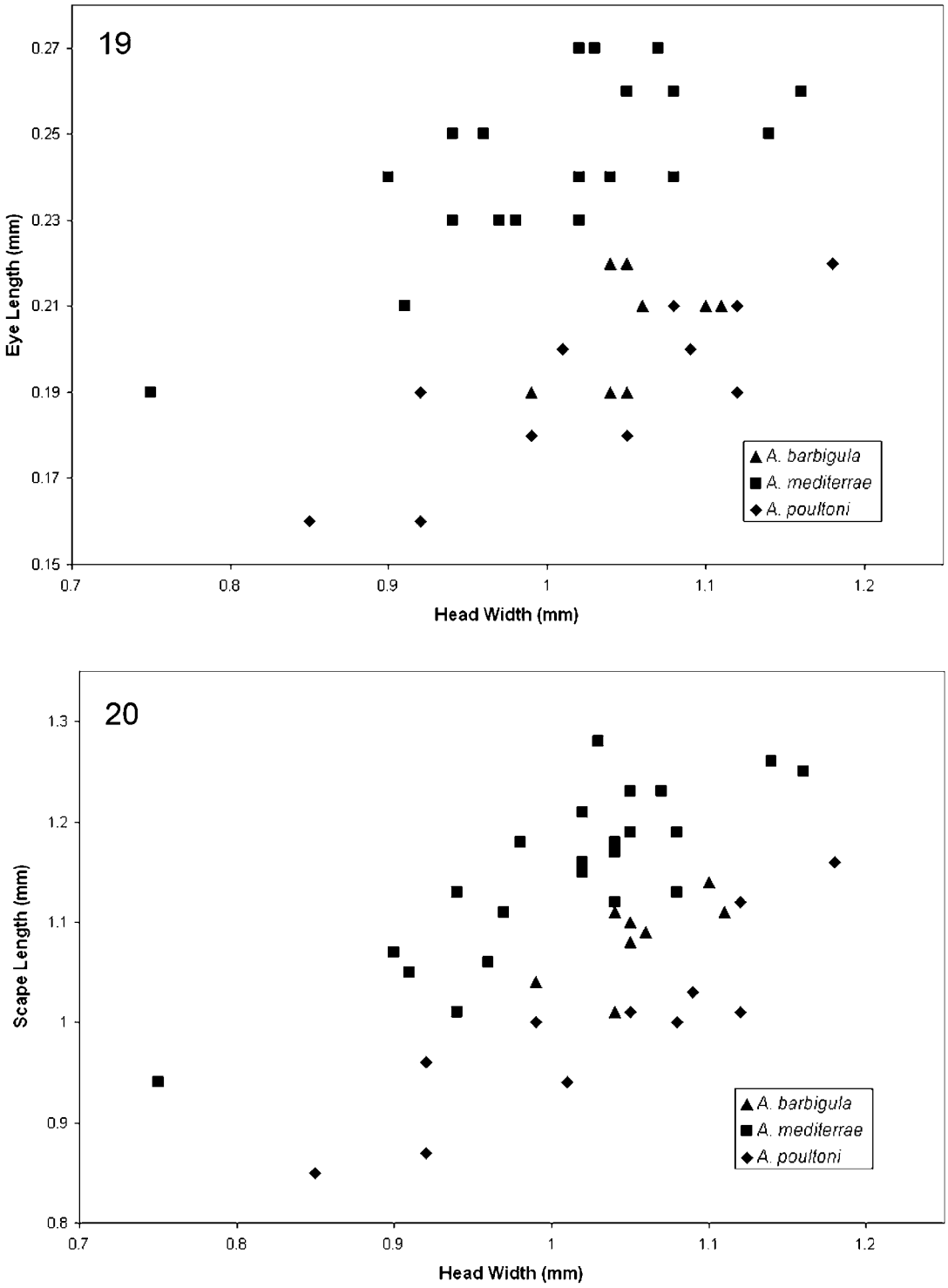
Myrmica longiceps F. Smith, 1858: 128.
Aphaenogaster longiceps: Mayr, 1876: 98.
Stenamma (*Ischomyrmex*) *longiceps ruginota* Forel, 1902: 440 (synonymy by Wheeler, 1916: 217).
Aphaenogaster (*Nystalomyrma*) *longiceps* var. *flava* Emery, 1921: 61 (m.) **syn. n.**

Types. *A. longiceps* (Smith): Worker from Melbourne, Victoria (BMNH). *A. longiceps ruginota* Forel: Worker and queen syntypes from New South Wales and Yarra District, Victoria (MHNG). *A. flava* Emery: Male from Queensland (not examined).

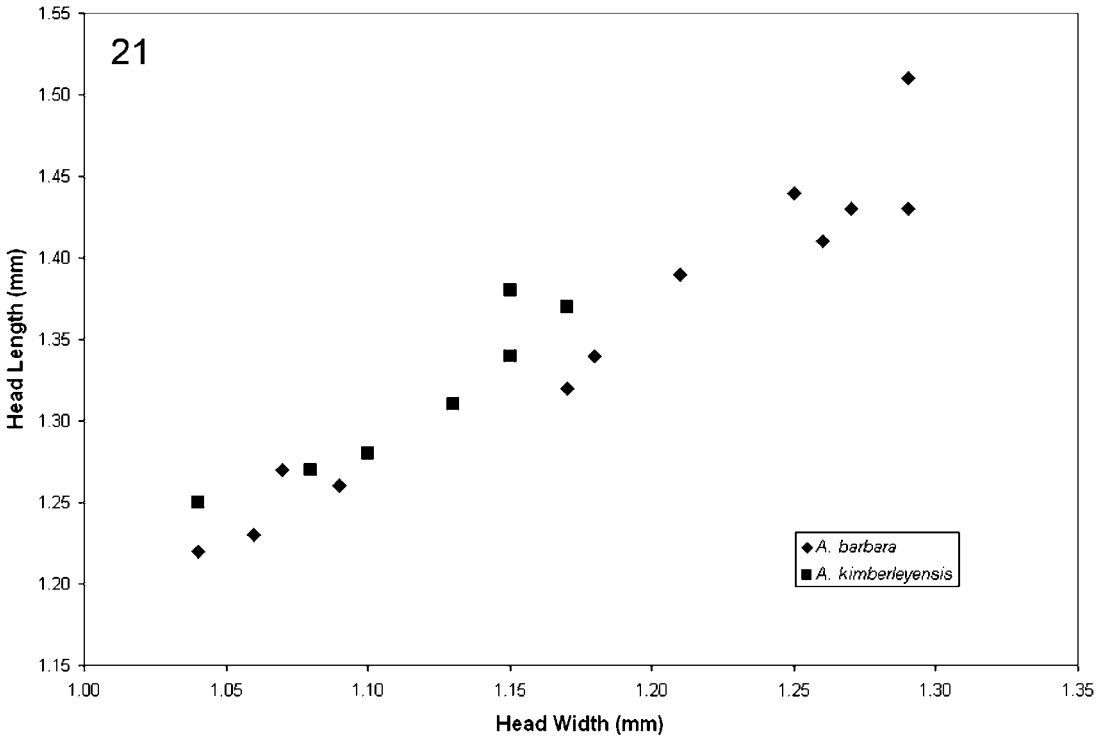
Diagnosis. Hairs on venter of head randomly distributed and not forming a distinct psammophore (Fig. 10); posterior margin of head broadly arched in full face view (Fig. 9); shorter erect hairs on mesosomal dorsum (especially those on mesonotum) with blunt tips; propodeal spines long, the dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity (so that the base of each spine is at approximately the same level as the dorsal surface of the propodeum) (Fig. 10). The long scapes and blunt mesonotal hairs will separate this species from near relatives.

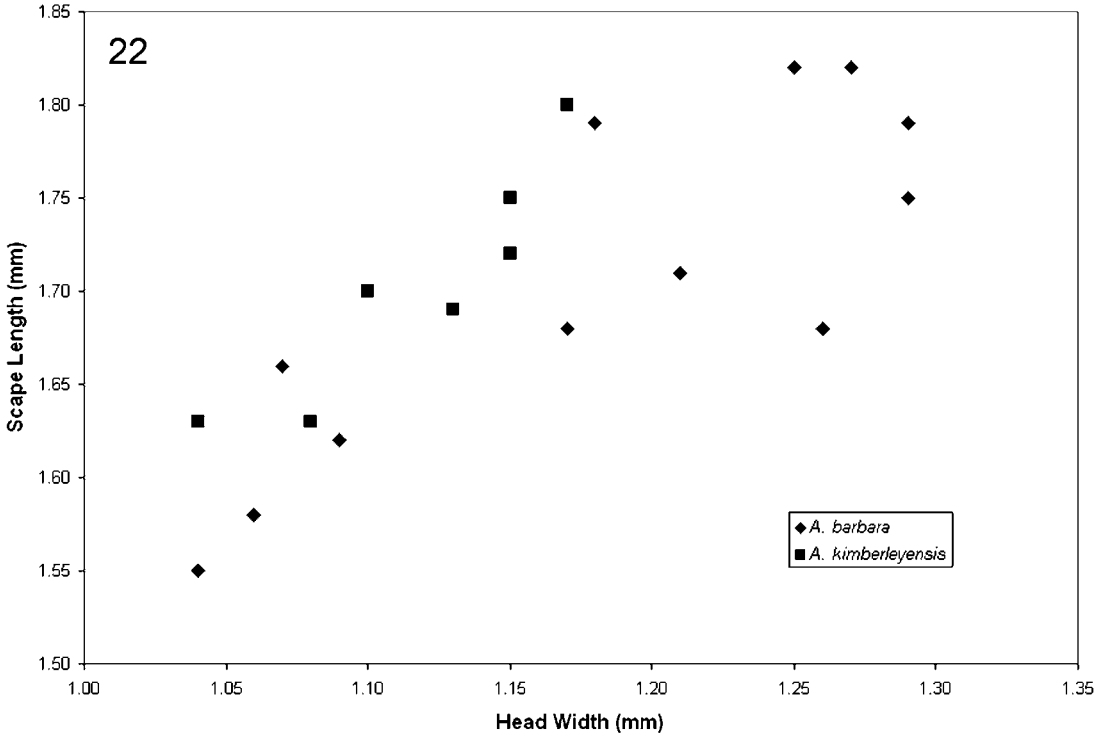
Description. Posterior margin of head broadly arched in full face view, the arch beginning at the occipital collar and with at most a weak angle separating the posterior and lateral margins of the head (often posterior

and lateral margins forming a continuous surface). Hairs on venter of head randomly distributed and not forming a distinct psammophore. Mandibular sculpture composed of regularly sized striations. Shorter erect hairs on mesosomal dorsum (especially those on mesonotum) with blunt tips. Propodeal spines intermediate in length. Dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity (so that the base of each spine is at approximately the same level as the dorsal surface of the propodeum). Petiolar node (in dorsal view) approximately square.



FIGURES 19–20. Fig. 19, eye length versus head width measurements for *A. barbigula*, *A. mediterrae* and *A. poultoni*; Fig. 20, scape length versus head width measurements for *A. barbigula*, *A. mediterrae* and *A. poultoni*.





FIGURES 21–22. Fig. 21, head length versus head width measurements for *A. barbara* and *A. kimberleyensis*; Fig. 22, scape length versus head width measurements for *A. barbara* and *A. kimberleyensis*.

Measurements. Worker (n = 10). CI 78–89; EI 19–24; EL 0.18–0.25; HL 0.99–1.43; HW 0.82–1.25; ML 1.50–2.07; MTL 1.04–1.41; SI 130–161; SL 1.31–1.71.

Material examined (in ANIC unless otherwise noted). **Australian Capital Territory**: Black Mountain (Taylor,R.W.; Taylor,R.W. & Bartell,R.J.; Greaves,T.); Black Mountain, near Haydon Drive (Berg,R.Y.); Bulls Head Rd., Brindabellas (Berg,R.Y.); Canberra (Hill,G.F.); Lake McKenzie (Barnett,N.J.); Naas

(Greaves,T.); Paddys River (Greaves,T.). **New South Wales**: 12km S Cessnock (Lowery,B.B.); 16mi. ENE Coonabarabran (Greaves,T.); 16mi. S Tenterfield (Greaves,T.); 1km S Bateau Bay Faunal Res. (Lowery,B.B.); 3 mi. E Berry (Lowery,B.B.); 4km N The Entrance (Lowery,B.B.); 4km NE Mt. Wog Wog, 17km SE Bombala (Greenslade,P.J.M.; Margules,C.R.); 5km S St. Albans (Lowery,B.B.); 6mi. NE Bendemeer (Greaves,T.); 75km E Armidale (Greenslade,P.J.M.); Adams Lookout, near Bungonia (Berg,R.Y.); Appin (Greaves,T.); Armidale (Lowery,B.B.); Avon River State Forest (Gush,T.); Bald Knob SF., nr. Woodenbong (Lowery,B.B.); Beecroft Res., Jervis Bay (Naumann,I.D.); Belanglo State Forest (Gush,T.); Blackheath, Blue Mts. (Lowery,B.B.); Bodalla State Forest (Gush,T.); Brindabella HS (Shattuck,S.O.); Broadwater NP (Lowery,B.B.); Bugaldie (Lowery,B.B.); Burril Lakes (nr. Cockwhyte Ck) (Moran,R.J.); Burrinjuck Dam Sanctuary (Lowery,B.B.); ca. 2km S Byron Bay (Reichel,H.); Central Mangrove (Lowery,B.B.); Clyde Mountain (Berg,R.Y.); Colo Vale, nr. Mittagong (T.G.); Cowra (Lowery,B.B.); Dalrymple Forest, Pymble, Sydney; Dr. George Mt., 4km E of Bega (Lowery,B.B.); Durras (Shattuck,S.O.); Durras Lake (Greaves,T.); E foot of Brown Mt., Bega (Lowery,B.B.); East Boyd State Forest (Gush,T.); Faulconbridge (Gush,T.); Fitzroy Falls (McAreavey,J.); Galston (Willings); Gerroa, 8mi. S Kiama (Lowery,B.B.); Gilgai, 4mi. E Inverell (Lowery,B.B.); Goulburn (Lowery,B.B.); Gravel Pit Creek, Kaputar, Narrabri (Room,P.M.); Hawks Nest, Myall Lakes (Greenslade,P.J.M.); Hazelbrook (Wetherly,A.H.); Heathcote Nat. Pk (Gush,T.); Hume Hwy nr. Harden (Lowery,B.B.); Huskisson (Barnett,N.J.); Iluka (Lowery,B.B.); Jerrabomberra Hill nr. Queanbeyan (Taylor,R.W. & Weir,T.A.); Jervis Bay, between Huskisson and Vincentia (Berg,R.Y.); Kings Tableland, 5 km S Wentworth Falls (Lowery,B.B.); Kioloa, ANU Field Station (Shattuck,S.O.); Kiwarrak State Forest (Gush,T.); Lane Cove (Lowery,B.B.); Lansdowne (Gush,T.); Lawson (Lowery,B.B.); Legume (Armstrong,J.); Macquarie Pass (Greaves,T.); Mangrove Central (Lowery,B.B.); Mongarlowe (Gush,T.); Mooney Mooney Creek (Bridge) (Gush,T.); Mount Keira (Gush,T.); Mt. Flora nr. Mittagong (Taylor,R.W., Sadler,R. & Bartell,R.); Mt. Warning (Lowery,B.B.); Myall Lakes (Greenslade,P.J.M. & Fox,M.); Myall Lakes (Greenslade,P.J.M.); Myall Lakes, ML 1 (Greenslade,P.J.M.); Myall Lakes, ML 5 (Greenslade,P.J.M.); Myall Lakes, Mungo Brush (Greenslade,P.J.M.); New England Nat. Pk, Bullock Ck. (Taylor,R.W.); Newlands Ck., 10km W Merrimbula [Merimbula] (Lowery,B.B.); nr. Armidale, Newholme Road (Sakurai,Y.); nr. Hornsby, Galston Gorge (Greaves,T.); nr. Otford Stn, Royal NP (Ward,P.S.) (ANIC, PSWC); Nullica State Forest (Gush,T.); Ophir, nr. Orange (Taylor,R.W.); Pymble (McAreavey,J.); Queanbeyan, Mt. Jerrabomberra (Taplin,I.C.); Royal National Park (Berg,R.Y.); Smiths Lake, Myall Lakes (Greenslade,P.J.M.); South Head, Moruya (Watson,J.A.L.); Sutherland (Wheeler); Sydney (Ward,P.S.) (ANIC, PSWC); Sydney, Gordon (Ward,P.S.) (ANIC, PSWC); Tambourine Bay Res., Sydney (Lowery,B.B.); Tantawangalo Mts. (Hill,G.F.); Tobbimoble SF [Tabbimoble State Forest] (Greaves,T.); Uralla (Lowery,B.B.); Wahroonga; Wallingat State Forest (Gush,T.); Wang Wauk State Forest (Gush,T.); Washpool National Park (Lowery,B.B.); Weddin Mountains Nat. Pk. (Ward,P.S.); Wentworth Falls (Wheeler,W.M.); Whiporie (Lowery,B.B.); Wollongbar (Lawrence,J.F.); Woodstock Cemetery approx. 1km S of Woodstock nr. Cowra (Prober,S.); Yarabal, 13km S Braidwood (Taylor,R.W.). **Queensland**: 22mi. ENE Condamine (Dowse,J.E.); 2mi. NNE Ballandean (Greaves,T.); 41km NE Inglewood (Gush,T.); Bauple, State Forest 958 (House,A.); Beaconsfield (T.G.); Boombana NP (Taylor,R.W. & Kohout,R.); Cedar Creek Falls Pk., Mt. Tamborine (Taylor,R.W.); Cooloola (Greenslade,P.J.M.); Cooloola Natl. Pk., Burwilla (Greenslade,P.J.M.); Cooloola Natl. Pk., Carlands Ck. (Greenslade,P.J.M.); Cooloola Natl. Pk., Como (Greenslade,P.J.M.); Cooloola Natl. Pk., Kabali W (Greenslade,P.J.M.); Cooloola Natl. Pk., Mutyi (Greenslade,P.J.M.); Cooloola Natl. Pk., Noosa Plain (Greenslade,P.J.M.); Cooloola Natl. Pk., Noosa R. (Greenslade,P.J.M.); Cooloola Natl. Pk., Plowman (Greenslade,P.J.M.); Cooloola Natl. Pk., Rainforest (Greenslade,P.J.M.; Room,P.M.); Cooloola Natl. Pk., Warrawonga (Greenslade,P.J.M.); Cooloola, Chalamban [Chalambar] (Greenslade,P.J.M.); Cooloola, Kabali E (Greenslade,P.J.M.); Cooloola, Wide Bay (Greenslade,P.J.M.); Dawson Range, Blackdown Tableland (Kohout,R.J.); Duaringa; Fletcher (Barrett,J.H.); Frazer Island [Fraser Island] (Dick,M. & Hunt,P.); Landsborough (Taylor,R.W.); Monto (Gush,T.); Mt. D'Aguilar (Taylor,R.W.); Mt. Glorious (Lowery,B.B.; Taylor,R.W.); Mt. Moffat NP, Mahogany Forest (Monteith,

Thompson & Yeates); Mt. Mort, Grandchester (Parlett,H.); Mt. Tamborine, Cedar Ck NP (Taylor,R.W.); Mt. Tamborine, Cedar Ck. Falls (Taylor,R.W.); summit Mt. Coot-tha, Brisbane (Lowery,B.B.); Tamborine Mt. nr. Witches Falls (Kohout,R.J.); Wallum, Cooloola (Room,P.M.). **South Australia**: 3mi. E Kongorong (Lowery,B.B.). **Victoria**: 10mi. N Nelson (Lowery,B.B.); 12km E Warburton (Newton,A. & Thayer,M.); Ferntree Gully (T.G.); Gellibrand (Clark,J.); Glenaladale Natl. Pk.; Grampians [The Grampians]; Melbourne; Mt. Buffalo NP, Eurobin Ck. (Newton,A. & Thayer,M.); nr. Baxter (Boulton,A.); Seville (Greaves,T.); Spring Vale [Springvale] (Greaves,T.).

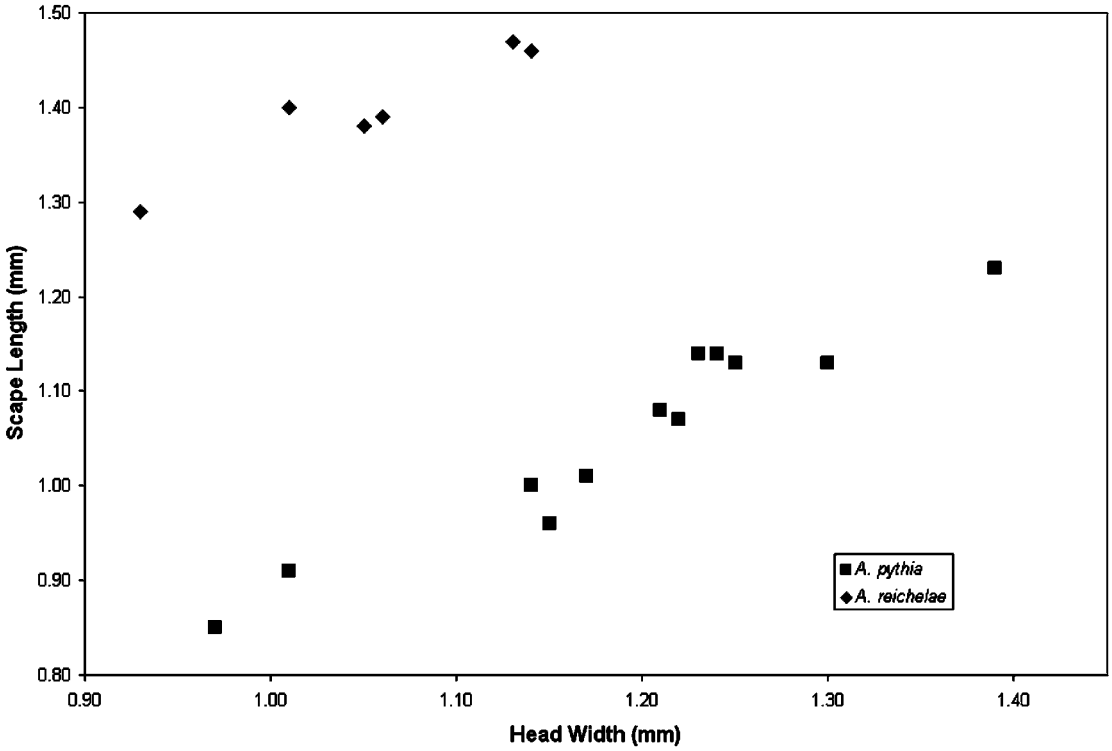
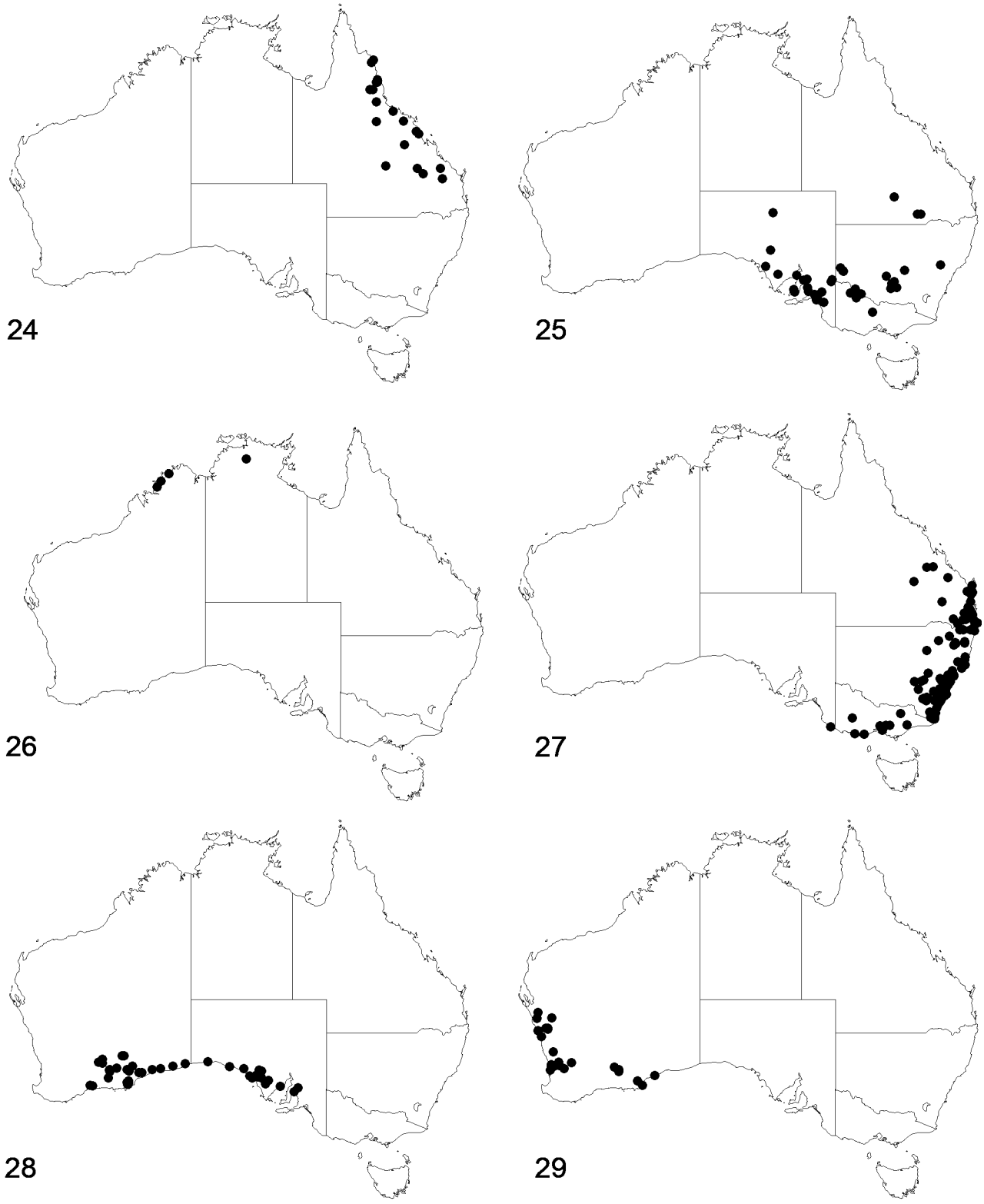


FIGURE 23. Scape length versus head width measurements for *A. pythia* and *A. reichelae*.

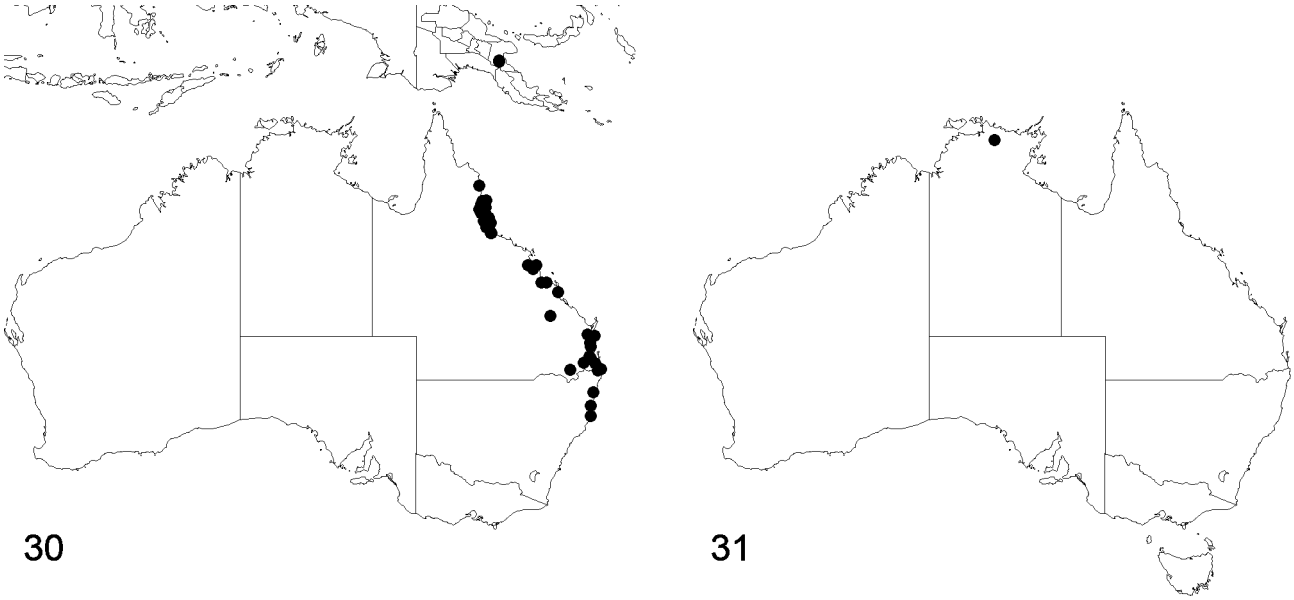
Comments. This is one of the most commonly encountered species of *Aphaenogaster* in Australia. It occurs in a wide range of habitats from swampy coastal scrub, wet sclerophyll and rainforests through to dry sclerophyll and *Callitris* woodlands. Nests in sandy soil are often highly visible with large, funnel-shaped entrances while nests in firmer soils are less obvious with low, scattered soil around entrances. Nests are also found under rocks or other objects on the ground. Activity around nests is generally restricted to a few workers excavating soil or defending the nest entrance. Foraging activity seems to be limited with workers foraging singly and primarily near the nest. This species has an extensive literature, including the following: Banks (1916) (association with mites), Crawley (1922a: 122) (biology), Barrett (1927) (habits, as *A. longipes* [sic]), Clark (1929: 121) (distribution), Clark (1934: 58) (distribution), Smith and Atherton (1944: 4) (biology, economic importance), Sloane and Sloane (1964) (nesting biology), Berg (1975) (seed dispersal), Imai, Crozier and Taylor (1977) (karyotype), Greenslade and Thompson (1981) (biology), Humphreys (1981) (relation to soils), Humphreys and Mitchell (1983) (relation to soils), Cowan *et al.* (1985) (relation to soils), Andersen (1988a) (relation to fire), Anderson (1988b) (relation to plants), Hughes and Westoby (1992a) (seed dispersal), Hughes and Westoby (1992b) (seed dispersal), Nicholls and McKenzie (1994) (distribution pattern) and York (1994) (relation to fire).

Emery's (1921) *A. flava* is here treated as a junior synonym of *A. longiceps*. *A. flava* was established by indication based on a male from Queensland and figured in Emery (1914). Emery (1914) presented two figures, one identified as *longiceps* from Queensland and the other as *longiceps ruginota* from Sydney. Emery

(1921) based *flava* on the figure of *longiceps*. Wheeler (1916) (before Emery established *flava*) stated that the differences between these males were "insignificant" and considered them to belong to the same taxon, *longiceps* (he considered *ruginota* to be a synonym of *longiceps*, a treatment supported during this study); he also mentions that the male of *pythia* is quite different. Unfortunately Emery (1921) gave no information on why he considered *flava* to be a distinct taxon.



FIGURES 24–29. Distribution of material examined during this study: Fig. 24, *A. barbara*; Fig. 25, *A. barbigula*; Fig. 26, *A. kimberleyensis*; Fig. 27, *A. longiceps*; Fig. 28, *A. mediterrae*; Fig. 29, *A. poultoni*.



FIGURES 30–31. Distribution of material examined during this study: Fig. 30, *A. pythia*; Fig. 31, *A. reichelae*.

In fact the males of *longiceps* and *pythia* are very similar, differing mainly in colour and size (being larger and darker in *longiceps*). The male of *barbara*, the only other species of *Aphaenogaster* known from Queensland, differs from both *longiceps* and *pythia* in lacking a metanotal groove and in having the occipital collar rounded. The males of both *longiceps* and *pythia* have distinct, angular metanotal grooves and the occipital collars are angular. What Wheeler (1916) considered to be the male of *pythia* may well have actually been the male *barbara*.

Emery's (1914) illustration of *longiceps* gives little hint as to whether this male belongs to *longiceps* or *pythia*, although *barbara* can be safely eliminated. The shape of the head does differ slightly between *longiceps* and *pythia*, and Emery's figure resembles *longiceps* more closely than *pythia*. Based on this *flava* is here treated as a synonym of *longiceps* rather than *pythia*.

It should be noted that the name *flava* was overlooked for 74 years, until Bolton (1995) drew attention to it in his world catalogue. The name's obscurity was due to the cryptic way in which it was established. The name was based on a scant two lines of text, one consisting of "*flava*, Emery" and a second with a reference to Emery (1914). It is easy to see why the name was overlooked for such an extended period of time.

***Aphaenogaster mediterrae* sp. n.**
(Figs 11, 12, 19, 20, 28)

Types. Holotype worker, Australia, Western Australia, 21mi. NWbyW Balladonia Motel, 32°12'S 123°19'E, 4 Nov. 1969, Key and Upton (ANIC) (ANIC32-031016); paratypes, 30 workers and one male (same data as holotype) (ANIC32-001084) (ANIC, MCZC, WAMP).

Diagnosis. Majority of hairs on venter of head located laterally and forming a distinct psammophore (Fig. 21); eye relatively large (EI greater than 21, Fig. 19); scape relatively long (SI greater than 106, Fig. 20). This species has a psammophore similar to that found in *A. barbigula* and *A. poultoni*. It can be separated from these species by the presence of a larger eye and longer scape.

Description. Posterior margin of head broadly arched in full face view, the arch beginning at the occipital collar and with at most a weak angle separating the posterior and lateral margins of the head (often posterior and lateral margins forming a continuous surface). Majority of hairs on venter of head located laterally and

forming a distinct psammophore, only scattered hairs on central portion. Mandibular sculpture composed of regularly sized striations. Erect hairs on mesosomal dorsum tapering to sharp points. Propodeal spines reduced to small denticles. Petiolar node (in dorsal view) approximately square.

Measurements. Worker (n = 22). CI 84–92; EI 21–27; EL 0.19–0.27; HL 0.88–1.29; HW 0.75–1.16; ML 1.23–1.84; MTL 0.77–1.08; SI 104–126; SL 0.94–1.28.

Material examined (in ANIC unless otherwise noted). **South Australia**: 15mi. SE Streaky Bay (Greaves,T.); 31mi. SE Colona (Greaves,T.); 3km ENE Mt. Centre (Greenslade,P.J.M.); 40km ENE Yantanabie (Taylor,R.W., Bartell,R.J. & Lowery,B.B.); 41km WbyS Nullabor (Taylor,R.W.); 8km N McLachlan Siding, Eyre Peninsula (Greenslade,P.J.M.); Blyth (Lowery,B.B.); c.18km SSE Poochera (Taylor,R.W. & Bartell,R.J.); Ceduna (Riek,E.F.; Casparson,K.); Cowell (Lowery,B.B.); Inkster, SW Poochera (Casparson,K.); Koongawa (Moddev,M.); NW Yaninee, Eyre Penin. (Casparson,K.); Poochera (Taylor,R.W. & Bartell,R.J.); Port Wakefield (Bogisch,G.P., ANIC, MCZC); Streaky Bay (Greenslade,P.; Lowery,B.B.; McAreavey,J.); Victoria Desert, 1km W Emu Camp (Greenslade,P.J.M.). **Western Australia**: 10km SW Mt. Ragged (Taylor,R.W.); 11km W Balladonia motel (Brown,W.L., MCZC); 12mi. NW Mt. Ragged (Greaves,T.); 13mi. ESE Ravensthorpe (Greaves,T.); 16mi. N Mt. Ragged (Taylor,R.W.); 16mi. W Coonana (Taylor,R.W.); 20km S Norseman (Lowery,B.B.); 21mi. NWbyW Balladonia Motel (Key,K.H.L. & Upton,M.S.); 22km N Norseman (Browning,G.P.); 23km ESE of Cocklebiddy (Taylor,R.W.); 23mi. W Eucla (Greaves,T.); 23mi. W Fraser Rge. HS (Taylor,R.W.); 25mi. S Coolgardie (Riek,E.F.); 26 m. E of Madura Stn. (Greaves,T. & Calaby,J.H.); 30mi. E Balladonia Stn (Greaves,T.); 38mi. N Balladonia HS (Taylor,R.W.); 46mi. SSW Coolgardie (Taylor,R.W.); 4mi. S Ravensthorpe (Lowery,B.B.); 50mi. S Coolgardie (Riek,E.F.); 6km S Norseman (Feehan,J.E.); 6mi. W Coonana (Taylor,R.W.); 71km E Balladonia (Browning,G.P. & Mutze,G.J.); 8km E Caiguna (Heterick,B.E.) (JDMC); 90mi. E Balladonia (Greaves,T.); Ethel Creek (Varris,P.A.) (JDMC); Goora Hill [Gora Hill] (Greaves,T.); Junana Rock, on Balladonia Rd. (Taylor,R.W.); Mt. Ragged (Lowery,B.B.); Norseman (Lowery,B.B., ANIC; Wilson,E.O., MCZC); Salmon Gums (Lowery,B.B.); Salmon Gums, 70mi. N Esperance (Lowery,B.B.).

Comments. *Aphaenogaster mediterrae* is found in mallee and open woodlands from the Adelaide region west across the Nullabor Plain to south-central Western Australia (Fig. 28). Nests are generally in sand with cone or funnel-shaped entrances. This species was previously confused with *A. barbigula*.

Aphaenogaster poultoni Crawley

(Figs 6, 13, 14, 19, 20, 29)

Aphaenogaster poultoni Crawley, 1922b: 17.

Types. Worker syntypes (10 in WAMP, examined) from Beenup [?=Beenyup Brook or Beenyup Swamp], Western Australia; 1 worker syntype without locality data in MVMA.

Diagnosis. Majority of hairs on venter of head located laterally and forming a distinct psammophore (Fig. 14); eye relatively small (EI less than 21, Fig. 19); scape relatively short (SI less than 106, Fig. 20); mandibular sculpture composed of irregularly sized striations (Fig. 6); petiolar node (in dorsal view) wider than long. This species is most similar to *A. barbigula*. These two species can be separated by the pattern of sculpturing on the mandibles and the shape of the petiolar node.

There is a tendency for the head of *A. poultoni* to be more square (when viewed in full face view, the lateral and posterior margins are separated by an angle) compared to both *A. barbigula* and *A. mediterrae* (in which the head is essentially uniformly arched behind the eyes in full face view). However, all species show moderate variation in the shape of the head with essentially identical morphologies being found in some individuals of all three species. Thus while this character is indicative of *A. poultoni* it is not diagnostic.

Description. Posterior margin of head nearly flat in full face view, extending laterally of the occipital collar before passing through a distinct posterolateral corner into the lateral margin of the head. Majority of hairs on venter of head located laterally and forming a distinct psammophore, only scattered hairs on central portion. Mandibular sculpture composed of irregularly sized striations. Erect hairs on mesosomal dorsum tapering to sharp points. Propodeal spines reduced to small denticles or sharp angles. Petiolar node (in dorsal view) wider than long;

Measurements. Worker (n = 11). CI 86–98; EI 16–21; EL 0.16–0.22; HL 0.93–1.28; HW 0.85–1.18; ML 1.30–1.86; MTL 0.68–1.00; SI 90–105; SL 0.85–1.16.

Material examined (in ANIC unless otherwise noted). **Western Australia**: 100km E Norseman (Lowery,B.B.); 10km S Mullewa (Lowery,B.B.); 10mi. W Mullewa (Riek,E.F.); 160km ENE Esperance (Ward,P.S.) (ANIC, PSWC); 180km N Geraldton, nr. Billabong Roadhouse (Lowery,B.B.); 20km S Norseman (Lowery,B.B.); 20km W York (Lowery,B.B.); 26mi. NWbyW Norseman (Taylor,R.W.); 3.2km SSW Dongara (Feehan,J.E.); Beenup [Beenyup] (Clark,J.); Beyerley (du Boulay,F.H., MCZC); Brookton Hwy, 20km E Boulders (Lowery,B.B.); Bungulla (Greaves,T.); Caron (Darlington,P.J., MCZC); Darlington (Glauert,G., MCZC); Geraldton (Lowery,B.B.; Mercovich,C.T.; Weatherill; Wheeler,W.M. (ANIC, MCZC); Gayamin Pool, Lower Chittering (Wilson,E.O. and Douglas,A., MCZC); Israelite Bay (T.G.); Kalbarri Nat. Park (Lowery,B.B.); Kings Park, Perth (Clark,J., Lowery,B.B.) (ANIC, MCZC); Moora (Lowery,B.B.); Mullewa (Wheeler,W.M., MCZC); National Park, Darling Range (Wheeler,W.M., MCZC); Perth (Clark,J.; Greaves,T.; Keirath,A.R.) (ANIC, MCZC); Perth, Kings Park (Lowery,B.B.); Rockingham (Glauert,L., MCZC); Toodyay (Lowery,B.B.); Toolinna (Brooker,M.G.); Woongondy, 300mi. N Perth (Mercovich,C.T.).

Comments. This species is restricted to a narrow semi-arid band across south-western Western Australia (Fig. 29) and is sympatric with *A. mediterrae* in south-central Western Australia (see Fig. 28). It is found in coastal scrub, Jarrah forests, dry sandy sclerophyll, mulga woodlands and mallee. Nests are in soil generally with a large crater at the entrance. An exceptionally large mating swarm was noted by McMillan (1977) (as *A. barbigula*).

***Aphaenogaster pythia* Forel**

(Figs 15, 16, 23, 30)

Aphaenogaster (*Deromyrma*) *pythia* Forel, 1915: 76.
Aphaenogaster longiceps: Mayr, 1876: 96 (misidentification recognised by M. R. Smith, 1961: 229).
Aphaenogaster (*Deromyrma*) *longiceps*: Forel, 1915: 75 (as *A. ruginota*, misidentification recognised by M. R. Smith, 1961: 229).
Aphaenogaster (*Nystalomyrma*) *pythia* Forel: Wheeler, 1916: 219.

Types. Neotype worker, Australia, Queensland, Millstream National Park, near Ravenshoe, 6 August, 1975, B. B. Lowery, dry sclerophyll (ANIC) (ANIC32-031018) (additional non-type material from this nest series includes 40 workers, two queens (one dealate) and one male) (ANIC32-000767) (ANIC, MCZC, QMBA).

Diagnosis. Hairs on venter of head randomly distributed and not forming a distinct psammophore (Fig. 16); posterior margin of head nearly flat in full face view, extending laterally of the occipital collar before passing through a distinct posterolateral corner into the lateral margin of the head (Fig. 15); propodeal spines short (Fig. 16); scape relatively short (SI less than 125, Fig. 23). This species is most similar to *A. reichelae*, and can be separated from it by the relatively shorter scapes and in having distinct dorsal and posterior petiolar node faces.

Description. Posterior margin of head nearly flat in full face view, extending laterally of the occipital collar before passing through a distinct posterolateral corner into the lateral margin of the head. Hairs on venter of head randomly distributed and not forming a distinct psammophore. Mandibular sculpture composed of

irregularly sized striations. Erect hairs on mesosomal dorsum tapering to sharp points. Propodeal spines short. Dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity (so that the base of each spine is at approximately the same level as the dorsal surface of the propodeum). Petiolar node (in dorsal view) wider than long.

Measurements. Worker (n = 12). CI 83–93; EI 15–22; EL 0.16–0.22; HL 0.97–1.39; HW 0.85–1.23; ML 1.34–1.94; MTL 0.75–1.13; SI 107–122; SL 1.02–1.40.

Material examined (in ANIC unless otherwise noted). **New South Wales**: Glenugie SF., 15mi.S Grafton (Lowery,B.B.); Macksville (Lowery,B.B.); Macksville, Warrell Ck. area (Lowery,B.B.); Murwillumbah (Lowery,B.B.); Port Macquarie (Pullen,R.); Round Mountain, Kingscliff (Lowery,B.B.); Terranora Lakes Golf course (Seymour,G.J.). **Queensland**: 10km W Herberton (Lowery,B.B.); 10mi. S Atherton; 12km W Paluma (Lowery,B.B.); 15km SbyE Byfield (Taylor,R.W. & Weir,T.A.); 18km S Banana (Lowery,B.B.); 20km N Cairns (Lowery,B.B.); 20km S Eton (Lowery,B.B.); 6km SSE Eungella (Taylor,R.W. & Weir,T.A.); 6mi. SW Karara (Greaves,T.); 8km W Tully, nr. Rocky Ck. Bridge (Lowery,B.B.); Atherton (A.H.W.); Bauple, State Forest 958 (Vanderwoude,C.); Brookfield (Greenslade,P.J.M.); Bruce Hwy, 5km N Aphis Ck., 54km N Marlborough (Lowery,B.B.); c. 8km W Paluma (Taylor,R.W. & Feehan,J.E.); Cedar Creek, Tamborine Mt. (Brown,W.L.); Clohesy River (Greaves,T.); Como Scarp (Greenslade,P.J.M.); Cooloola, Chalamban [Chalambar] (Greenslade,P.J.M.); Cooloola, Como Scarp (Greenslade,P.J.M.); Cooloola, Noosa R. (Greenslade,P.J.M.); Egger Farm Paddock, Yungaburra (Cutter,A.D.); Gore (Lowery,B.B.); Herberton (Lowery,B.B.); Highvale (Marks) (Barrett,J.H.); Kirrama Forest (Greenslade,P.J.M.); Koah (Wheeler,W.M.); L. Eacham NP (Taylor,R.W.); Mackay (Turner,G.); Mareeba (Lowery,B.B.); Millstream NP nr. Ravenshoe (Lowery,B.B.); Mt. Mort, Grandchester (Greaves,T.); Noosa River, Cooloola Natl Pk (Greenslade,P.J.M.); Obi Obi Ck., Blackall Ra. (Taylor,R.W.); Scraggy Pt., Hinchinbrook Is. (Ward,P.S.) (ANIC, PSWC); St. Lawrence (Cudmore,F.A.); Thurling Farm, Malanda (Cutter,A.D.); Tully (Lowery,B.B.); Wallaman Falls (Lowery,B.B.); West Coorey [Cooroy West]. **Papua New Guinea**: Bulolo (Lowery,B.B.); Wau, goldfields (Lowery,B.B.).

Comments. This is a fairly wide ranging species and the only species to occur outside Australia (in Papua New Guinea). Its main range is coastal northern New South Wales north through Queensland, with a smaller disjunct population in southern PNG (Fig. 30). Given this wide distribution and the broad range of habitats in which it is found (see below), it is curious that in Australia this species occurs in three fairly narrow regions separated by areas where it is apparently absent. There is no morphological evidence to indicate that more than one species is involved, yet this distribution pattern might suggest otherwise. Additional investigation into this pattern may be well rewarded.

Aphaenogaster pythia occurs in a wide range of habitats including coastal scrub, dry sclerophyll, suburban parks and pastures, wet sclerophyll and rainforests. Nests are either in the open with large funnel-shaped entrances or under rocks or logs on the ground. The biology of this species was discussed by Hitchcock (1958) and its control by Hitchcock (1962).

The nomenclatural history of this species is rather complex. Forel (1915) stated that there were two species of Australian *Aphaenogaster*, *longiceps* and *ruginota*, and listed differences between them. He then said "Sollte der Typus von Smith irgendwo zum Vorschein kommen und sich gegen meine Annahme als mit ruginota und nicht mit Mayr's Typen identisch erweisen, schlage ich für letztere den Namen pythia n. sp. vor." ["Should the type of Smith appear somewhere and turn out identical, against my assumption, with *ruginota* and not with Mayr's [1862] types, I suggest for the latter the name *pythia* n. sp."] (Mayr (1862) had described queens and males under the name *longiceps* from four localities, Gayndah, Peak Downs, Rockhampton and Sydney.) To resolve the identity of *longiceps* Wheeler (1916) sent samples to H. Donisthorpe (British Museum (Natural History), London) for direct comparison with the Smith type of *longiceps*. Wheeler (1916) reports that "[Donisthorpe] writes me that [Smith's] type is undoubtedly what Forel calls *ruginota*, and not what he calls *longiceps*. Hence *ruginota* becomes a synonym of *longiceps*, Smith, and the rarer Queensland

form, Forel's *longiceps*, which was unknown to Smith, must take the name *pythia*, Forel." A few lines later Wheeler states that "Mayr probably confused both species" and that "… as [Mayr] introduced no new names his interpretation is now a matter of little moment." Finally, Wheeler lists the type locality for *pythia* as Herberton, one of the localities mentioned by Forel (1915) for specimens he examined under the name *longiceps*. It seems clear that Wheeler (1916) interpreted Forel's name *pythia* as applying to material examined by Forel (1915) under the name *longiceps*, and not to material examined by Mayr (1862) (although the comment "… and the rarer Queensland form" is puzzling as it seems to apply to *pythia* rather than *longiceps*).

Smith (1961) next examined *pythia* during a study of Papua New Guinean species of *Aphaenogaster*. He states that "Forel 1915 assigned the provisional name *pythia* to the specimens studied by Mayr [1862] should they prove to be not *longiceps* or any previous described species" and "Wheeler errored however in designating Herberton, Queensland, as the type locality of *pythia* as none of the specimens studied by Mayr came from there." Thus Smith (1961) interpreted Forel (1915) as establishing a new available name by indication for material referred to by Mayr (1862) and not for material identified as *longiceps* by Forel (1915), as Wheeler (1916) had.

Of these two interpretations, Smith's (1961) is here accepted as the correct one. Given this, the type material for the name *pythia* becomes that examined by Mayr (1862). Unfortunately this material was destroyed during World War I (Smith 1961), leaving the name without extant type material. Thus it is currently impossible to know to what species the name *pythia* should be applied. Even without type material, essentially all authors since Wheeler (1916) have followed the concept developed by Wheeler (1916) for the species to which this name has been applied. This situation is certainly less than ideal and has the potential to cause considerable disruption to the nomenclature of this group. To resolve this confusion a neotype is here designated for Forel's *A. pythia*.

***Aphaenogaster reichelae* sp. n.**
(Figs 17, 18, 23, 31)

Types. Holotype worker, Australia, Northern Territory, Podocarpus Canyon, 12°38.73'S 133°26.73'E, Dec. 1993, H. Reichel, Nest A3 (ANIC) (ANIC32-031019); paratype workers, 6 (same data as holotype) (ANIC32-031020), 4 (same data as holotype but Nest B2) (ANIC32-031021) and 6 (same data as holotype but Nest E9) (ANIC32-000327) (ANIC, MCZC).

Diagnosis. Hairs on venter of head randomly distributed (Fig. 18); scape relatively long (SI greater than 135, Fig. 23); posterior margin of head nearly flat in full face view (Fig. 17); propodeal spines short (Fig. 18). This species is morphologically similar to *A. pythia* but differing from it in the relatively longer scapes and in having the dorsal and posterior faces of the petiolar node only weakly defined.

Description. Posterior margin of head nearly flat in full face view, extending laterally of the occipital collar before passing through a distinct posterolateral corner into the lateral margin of the head. Hairs on venter of head randomly distributed and not forming a distinct psammophore. Mandibular sculpture composed of regularly sized striations. Shorter erect hairs on mesosomal dorsum generally tapering to sharp points but often those on propodeum thickened and more or less blunt. Propodeal spines short. Dorsal surfaces of propodeum and propodeal spines connected through a gentle concavity (so that the base of each spine is at approximately the same level as the dorsal surface of the propodeum). Petiolar node (in dorsal view) approximately square.

Measurements. Worker (n = 6). CI 83–87; EI 15–19; EL 0.17–0.19; HL 1.12–1.32; HW 0.93–1.14; ML 1.52–1.82; MTL 0.95–1.12; SI 128–139; SL 1.29–1.47.

Comments. This species is currently known from a single location, Podocarpus Canyon, in the East Alligator River catchment, Arnhemland, Northern Territory (Fig. 31). This canyon is approximately 15km long

and contains rainforest vegetation. When the type series was collected these ants were fairly common in the upper few kilometres of the canyon, where they were found nesting on the flat sand sheet along the creek which runs through the gorge. The curious thing is that this sand sheet floods during the wet season, completely covering the nesting sites. Even while these collections were being made there were heavy rains overnight which destroyed the conical nest entrances, the ants being forced to repair the damage each morning. It would be interesting to learn how these ants have adapted to life in such a harsh and variable location. (These notes were made by H. Reichel while making the only known collection of this interesting species.)

Conclusion

All Australian species of *Aphaenogaster* are endemic except *pythia*, which is shared with Papua New Guinea. Nests are always in soil, often in the open with large funnel-shaped entrances but also under rocks or logs on the ground. Individual species range from common and widespread to rare and with restricted distributions.

The nomenclature of these species was found to be unexpectedly complex given the small number of species involved. This was primarily caused by the large number of studies dealing with these ants and the lack of examination of type material. Provisional names were proposed and several species were established by indication, in one case using specimens which were not directly examined by the author and, in fact, had been destroyed at the time the name was established. While all of these events are common among the ants, it was surprising to find so many among such a small group.

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