

## A REVIEW OF THE ANTS OF NEW ZEALAND (HYMENOPTERA)

By William L. Brown, Jr.<sup>1</sup>

Since 1892, when Forel's brief "Die Ameisen Neu-Seelands" was published, there has been offered no comprehensive study of New Zealand ants. The present paper is intended to serve as a preliminary to such a study. The New Zealand ant fauna is most interesting zoogeographically, and since the number of species is small, studies of ecology and speciation biology on this fauna should in some ways be simpler than they would be if made on some rich continental fauna, such as that of neighboring Australia. Before such studies can be started in earnest, it seems necessary to provide a firmer background in "alpha taxonomy" than the available literature provides.

That I, as one who has never visited New Zealand, cannot go beyond a crude cabinet-type revision of the ant species there goes without saying. The details, and even the species boundaries in such difficult groups as the *Monomorium antarcticum* complex, will have to be worked out by observation of living populations on the spot in New Zealand. But I can do much in the way of establishing synonymies, outlining relationships and origins of New Zealand species and groups, and in setting some of the problems that are taxonomically hardest to understand. I hope, therefore, that this paper will serve as a useful preliminary guide to New Zealand ants for taxonomists, ecologists and economic entomologists until someone can complete the work needed for a really exhaustive treatment of the subject. I have tried to avoid excessive use of technical terminology, and most of the anatomical terms employed are illustrated in Figure 1. Because New Zealand is of such very great interest to zoogeographers, I have emphasized throughout material that will likely be of use to them.

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The most recent comprehensive list of New Zealand ants is included in Wheeler's "Check List of the Ants of Oceania" (1935), but among New Zealand species this list includes several *nomina nuda* and synonyms, so that the 34 species and varieties mean very little as a reliable total. In an earlier list, Wheeler (1927 b) gave a list of 23 species (including two infraspecies) of ants known to occur in New Zealand, and stated as his opinion that 21, or 91 %, of these forms were endemic. It is only a coincidence that the present paper also recognizes a total of 23 species of ants occurring in New Zealand as present evidence goes, for many of the details of the new list differ from that of Wheeler. After synonymy and additions, the two lists have in common only fifteen species (including nomenclatorial equivalents). A more striking difference is that I consider only 10 of the 23 species, or 43.5 %, to be certain endemics, even when the enigmatic *Camponotus (Colobopsis) newzealandicus* is considered to be an endemic. Of the remaining 56.5 %, eight, or more than half, are undoubted introductions through human commerce, most of them from known, far distant source areas. Finally, there are five species occurring in New Zealand and probably introduced there by man, but which are widely distributed in Australian and/or Melanesian areas bordering the Tasman Sea and the Coral Sea, and which conceivably could have reached New Zealand over sea without help from man; these are labeled as "probably introduced" in the list that follows.

#### List of Ants Known to Occur in New Zealand at Present

- Myrmecia brevinoda* Forel. Introduced from e. Australia.  
*Amblyopone australis* Erichson. Probably introduced from e. Australia.  
*Amblyopone saundersi* Forel. Endemic.  
*Heteroponera brouni* Forel. Endemic.  
*Discothyrea antarctica* Emery. Endemic.  
*Mesoponera castanea* (Mayr). Endemic.  
*Brachyponera chinensis* (Emery). Introduced from e. Asia.  
*Ponera eduardi* Forel. Introduced, apparently from North Africa.  
*Huberia striata* (Fr. Smith). Endemic.  
*Huberia brouni* Forel. Endemic.  
*Tetramorium grassii* Emery. Introduced from South Africa.  
*Monomorium antarcticum* (White). Endemic.  
*Monomorium smithi* Forel. Endemic.  
*Monomorium antipodum* Forel. Probably a synonym of *M. orientale*.  
*Monomorium orientale* Mayr. Introduced from Asia or Africa.  
*Monomorium pharaonis* (L.). Introduced from Asia or Africa.  
*Orectognathus antennatus* Fr. Smith. Probably introduced from Australia.  
*Strumigenys perplexa* (Fr. Smith). Probably introduced from e. Australia.  
*Iridomyrmex glaber* (Mayr). Probably introduced from e. Australia.  
*Technomyrmex albipes* (Fr. Smith). Introduced from Asia or Africa.  
*Prolasius advena* (Fr. Smith). Endemic.  
*Camponotus (Colobopsis) newzealandicus* Donisthorpe. Endemic?  
*Paratrechina vaga* Forel. Probably introduced from Queensland.

Wheeler included also in his list *Paratrechina longicornis* (Latreille), a very slender, long-legged and long-antennate species that is a widespread tramp through

human commerce, but I have been able to find no evidence that this species now is established in New Zealand.

The New Zealand ant complement is a "text-book" example of an unbalanced fauna. The endemic species are all restricted to New Zealand (with its Subantarctic islands), but all, with the sole exception of *Huberia*, belong to genera well represented in eastern Australia, or Australia and Melanesia. *Huberia* is problematical, but its closest relatives may be the *Aphaenogaster* species of eastern Australia; no other stocks from this quarter of the world seem very close at all. The endemics all belong to genera suspected on other grounds of being old, and most of these genera have "extralimital" distributions. The picture is one of occasional colonization through chance introduction of one stock at a time over sea, probably chiefly or entirely from Australia. The Tasman Sea is a formidable barrier, but the prevailing

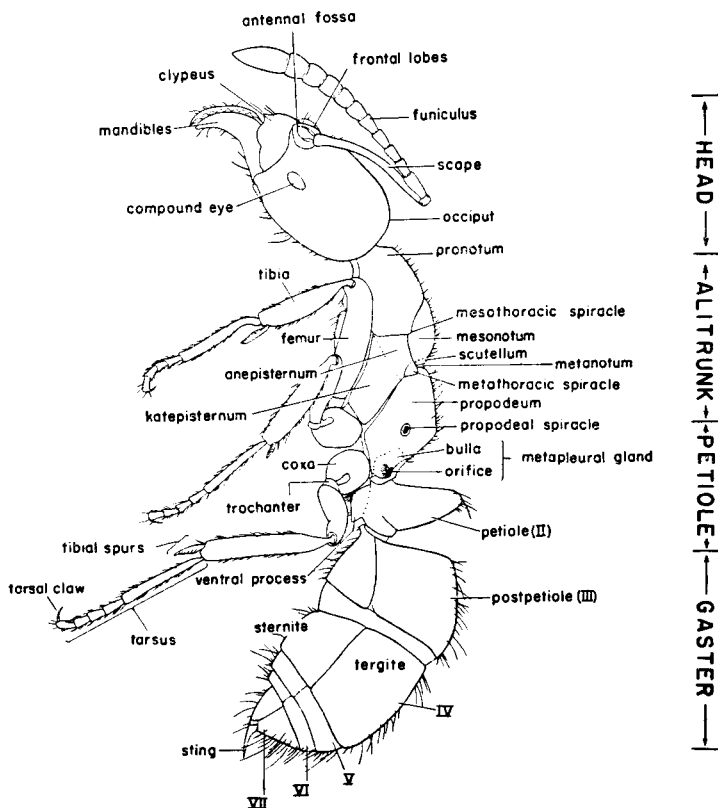


Fig. 1. *Mesoponera castanea* (Mayr), side view of worker, with the major external features of the body labelled. The propodeum is the first true abdominal segment; the remaining visible abdominal segments are numbered with Roman numerals II-VII. Drawing by Nancy Buffler.

winds do blow from west to east; New Caledonia also seems to have received the great majority of its ant stocks directly from Australia over sea, as will be shown by E. O. Wilson (in press).

New Zealand lacks entirely many genera that are widely distributed, abundant, and rich in species in Australia and/or Melanesia, e.g. *Myrmecia*, *Rhytidoponera*, *Onychomyrmex*, *Proceratium*, *Platythyrea*, *Sphinctomyrmex*, *Cerapachys*, *Phyracaces*, *Bothroponera*, *Leptogenys*, *Trachymesopus*, (endemic) *Ponera*, *Anochetus*, *Odontomachus*, *Epopostruma*, *Colobostruma*, *Lordomyrma*, *Podomyrma*, *Dacryon*, *Aphaenogaster*, *Pheidole*, *Crematogaster*, *Meranoplus*, *Mayriella*, *Oligomyrmex*, (endemic) *Iridomyrmex*, *Cardiocondyla*, *Pristomyrmex*, *Metapone*, *Turneria*, *Notoncus*, *Melophorus*, *Stigmacros*, *Myrmecorhynchus*, *Opisthopsis*, *Oecophylla*, *Calomyrmex*, *Polyrhachis*, *Aenictus* and *Tetraponera*. At least some of these have radiated very extensively in Australia, and must be old residents there.

New Zealand genera or species groups ("subgenera") are sometimes represented also in the southern half of South America, suggesting an "Antarctic" link. For instance, the "Notomyrmex" stock of *Monomorium*, *Discothyrea*, *Heteroponera*, the "Fulakora" stock of *Amblyopone*— all have both New Zealand and Chilean-Argentinian representatives. But all of these stocks also are known to have species existing well within the tropics in one or both hemispheres. *Prolasius*, which is very similar to the Chilean-Argentinian *Lasiophanes*, is widely distributed and diverse on the Australian continent, and also extends into the tropics in Queensland. Everything considered, the common elements of the two "Antarctic" faunas look more like peripheral elements of a single worldwide fauna in each separate stock, although in some cases the intervening links in the Old World tropics have become extinct. Thus, the similarities are probably due to distant common ancestry of the respective groups involved, and not to Antarctic exchange of faunas.

To me, the most interesting problem raised by the New Zealand fauna is the question of the extreme impoverishment of the stocks that have reached there, in terms of species. Most of the endemics show considerable intraspecific variation, but no stock seems to have produced more than two species. Ten endemic species is an almost ridiculously small number of ant species for such large islands with apparently relatively favorable and varied climate and vegetation, especially when compared with such smaller islands as New Caledonia and the Fijis, which have five to ten or more times as many species, and which show extensive radiation and speciation in particular stocks. The role of the cooler climate and other factors that may have kept the ant fauna in this depauperate state are well worth investigation.

#### Key to Genera and Species of New Zealand Ants, Native and Introduced

Wingless (workers and dealate or ergatoid females) or winged (females), with 12 or less segments in the antennae, but never with 10 segments

..... Workers and Females

Normally winged (with small head and very large, convex eyes), with 13-segmented antennae (10 segments in *Tetramorium*) ..... Males

#### Workers and Females

1. Very large species, the smallest workers more than 10 mm. in outstretched

- length, with mandibles; worker eyes very large and convex, placed on the anterior half of the sides of the head (Auckland vic., introduced)  
 ..... *Myrmecia brevinodis* Forel
- Smaller forms, less than 10 mm. in outstretched length; worker eyes modest in size, or placed near or behind the middle of the sides of the head ..... 2.
2. Waist consisting of a single reduced segment, the petiole (abdominal II; Figs. 1, 3, 8) ..... 3.
- Waist consisting of two reduced nodiform segments, the petiole and postpetiole (abdominal II, III; Fig. 4) ..... 14.
3. Exsertile sting present and usually visible at gastric apex; gaster slightly but distinctly constricted at juncture of its first and second segments (Fig. 1).....subfamily Ponerinae..... 4.
- Sting absent or reduced to a completely internal vestige; gaster not normally constricted at all between its first two segments ..... 10.
4. Antennae short, indistinctly 9-segmented, thick and claviform, with greatly enlarged apical segment; small, compact species with greatly modified clypeus forming a small shelf over the mandibles; frontal carinae fused to form a raised narrow platform between the antennal insertions (North I., south I.)..... *Discothyrea antarctica* Emery
- Antennae more slender, 12-segmented..... 5.
5. Petiolar node without a descending posterior face, so that the petiole is broadly attached to the succeeding segment (Fig. 3); mandibles linear, clypeus with a row of tubercles or denticles along its anterior margin (Fig. 2) .....*Amblyopone*..... 6.
- Petiole with an extensive, steep descending face (Fig. 1); mandibles triangular, anterior clypeal border arcuate, simple or with a single indistinct median process or tubercle..... 7.
6. Larger species, head width 1.5 mm. or more; head coarsely costate-foveolate in front, smooth and shining behind (Auckland vic., introduced)  
 ..... *Amblyopone australis* Erichson
- Smaller species, head width 1.3 mm. or less; dorsum of head finely reticulate-punctulate and opaque (both Islands, widespread)  
 ..... *Amblyopone saundersi* Forel
7. Dorsal surface of head with a median carina extending continuously from clypeus to occiput; compound eyes situated behind midlength of sides of head (North I.)..... *Heteroponera brouni* (Forel)
- Dorsal surface of head without a median carina, although a median "frontal" sulcus is more or less developed; compound eyes (in worker often small to minute) situated on the anterior half of the sides of the head.....tribe Ponerini..... 8.
8. Sides of propodeum concave above and separated from the declivity by very distinct, blunt, raised margins; body color black in fully adult workers and females (North I., introduced, doubtfully established)  
 ..... *Brachyponera chinensis* (Emery)
- Sides of propodeum flat or gently convex, without raised margins where

- they round into the declivity; body color usually brownish under good magnification ..... 9.
9. Larger species, head width of smallest workers near 1.0 mm., usually more than 1.0 mm.; profile of alitrunk divided into two convexities by the deeply impressed metanotal groove (Fig. 1) (North I., n. part of South I.)..... *Mesoponera castanea* (Mayr)
- Smaller species, head width of largest workers and females less than 0.70 mm.; profile of alitrunk nearly straight, scarcely interrupted by the suture-like metanotal groove (North I., n. part of South I., introduced) ..... *Ponera eduardi* Forel
10. Gastric apex beneath with a short, projecting conule which has a round apical orifice (and sometimes an apical tuft or circlet of guard hairs); this is the formic acid spray nozzle, not to be confused with the cloacal orifice (See Fig. 8).....subfamily Formicinae..... 11.
- Gastric apex without a projecting spray nozzle as described above; cloacal orifice slit-like (without formic acid system; workers often have odor of rotting coconuts when disturbed)---subfamily Dolichoderinae..... 13.
11. Anterior margins of compound eyes situated well behind the middle of the sides of head; workers varying markedly in size in a single mature nest, larger workers and females with head truncate in front, plug-shaped for use in blocking nest entrance (North I., needs confirmation) ..... *Camponotus* (*Colobopsis*) [*newzealandicus* Donisthorpe]
- Anterior margins of compound eyes situated near or in front of middle of sides of head; workers in a single nest all of one kind, varying only slightly in size..... 12.
12. Alitrunk with numerous and conspicuous erect setae (North I., introduced)..... *Paratrechina vaga* (Forel)
- Alitrunk bare of standing hairs, or with only a very few inconspicuous ones (both Islands, widespread)..... *Prolasius advena* (Fr. Smith)
13. Petiole in the form of a flattened, nearly horizontal plate or scale, normally covered by the overhanging anterior face of the gaster (around cities, both Islands; introduced, often in houses) ..... *Technomyrmex albipes* (Fr. Smith)
- Petiole in the form of a thin erect scale, not normally covered by front of gaster (around cities, both Islands; introduced) ..... *Iridomyrmex glaber* (Mayr)
14. Antennae 5-segmented (head bilobate behind, depressed; mandibles long, straight and narrow, each with three spiniform teeth at apex; humeri (shoulders) of alitrunk dentiform; Auckland area, introduced) ..... *Orectognathus antennatus* Fr. Smith
- Antennae 6-segmented, the third and fourth segments very short (head bilobate behind, depressed; sides of head with deep antennal scrobes, below which are the reduced eyes; head and mandibles as in Fig. 6; petiole and postpetiole with spongiform appendages; size very small; North I., probably introduced).....*Strumigenys perplexa* (Fr. Smith)
- Antennae 11-segmented..... 15.
- Antennae 12-segmented..... 17

15. Propodeum unarmed; worker very small, total outstretched length usually under 2.0 mm., yellowish to brownish; female much larger and more robust, brown (Auckland area, introduced)  
 .....*Monomorium antipodum* Forel and *M. orientale* Mayr
- Propodeum bidentate; workers 3.0 mm. or more total outstretched length  
 .....*Huberia* Forel..... 16.
16. Size large, most workers 4–5 mm., females 7.5–9 mm. total outstretched length; striation of workers delicate and obliterated over wide areas, so that much of the head, alitrunk and nodes is smooth and shining in this caste (both Islands, widespread).....*Huberia striata* (Fr. Smith)
- Size small, most workers 3.2–3.5 mm., females about 4 mm. total outstretched length; workers with head, alitrunk and both nodes striate throughout (both Islands, widespread)..... *Huberia brouni* Forel
17. Head and alitrunk predominantly sculptured and opaque or subopaque... 18.
- Head and alitrunk predominantly smooth and shining..... 19.
18. Propodeum with well developed and acute paired teeth; sculpture fairly coarse, with longitudinal costulae preponderating (small reddish-brown species; Auckland vic., introduced).....*Tetramorium grassii* Emery
- Propodeum unarmed; head and alitrunk finely and densely punctulate (a very small yellowish species, found indoors in cities, introduced)  
 .....*Monomorium pharaonis* (L.)
19. Size larger in general, though very variable, total outstretched length of worker from 3.0 mm. or slightly less to more than 5 mm.; color yellow to black; punctulation of posterior pleural area of alitrunk fine, inconspicuous, and usually limited in extent (both Islands, widespread)  
 .....*Monomorium antarcticum* (White)
- Size smaller, total outstretched length of worker under 3 mm.; worker dull yellow, often with brownish gaster; punctulo-reticulation of posterior pleural areas of alitrunk coarse, extensive and conspicuous. In practice, it may prove to be impossible to separate this form in the worker caste from minor workers of *M. antarcticum*; see male key and discussion in text (North I., distribution local and poorly known)  
 ..... *Monomorium smithi* Forel

### Males

Several species, the names of which are placed in brackets below, remain unknown to me in the male sex. These are included in the key on the assumption that they will correspond to the characters cited— characters exhibited in each case by related species of the same genus.

1. Very large species, the forewing over 12 mm. long (based on Australian samples)..... *Myrmecia brevinoda*
- Smaller species, forewing much shorter..... 2.
2. Waist consisting of a single reduced segment, or node, the petiole (abdominal II) ..... 3.
- Waist consisting of two small segments, the petiole and postpetiole (abdominal II, III) .....subfamily Myrmicinae..... 14.

3. Gaster slightly but distinctly constricted at juncture of its first and second segments (abdominal II and III).....subfamily Ponerinae..... 4.
- Gaster not normally constricted at all between its first and second segments..... 10.
4. Petiolar node low and thick from front to rear, without a distinct posterior descending face (more or less as in Fig. 3), or, if the postero-dorsal face does slope downward, it does so only slightly for a brief distance, so that the node is attached over most of its posterior aspect to the succeeding segment..... 5.
- Petiolar node higher, more compressed from front to rear, and with steep posterior face; attached to the succeeding segment by a relatively narrow, low-placed connection, more or less as in Fig. 1.  
.....tribe Ponerini..... 8.
5. Mandibles when closed forming a rounded border that hugs closely the anterior clypeal border; petiolar node without any posterior descending face..... *Amblyopone*..... 6.
- Mandibles triangular, when closed forming a strongly projecting and more or less pointed shelf in front of the clypeus; petiolar node with a fairly distinct, though small and sloping, posterior descending face  
.....tribe Ectatommini..... 7.
6. Size larger; length of forewing more than 4 mm..... *Amblyopone australis*
- Size smaller; length of forewing less than 4 mm.....*Amblyopone [saundersi]*
7. Clypeus impressed behind, forming a raised transverse ridge in front; antennal insertions very close together, but separated by a vertical plate or high carina representing the fused lobes of the frontal carinae (size very small).....*Discothyrea [antarctica]*
- Clypeus of normal form, broad and gently convex; antennal insertions separated by a fairly broad space which lacks a prominent vertical plate or carina.....*Heteroponera [brouni]*
8. Pygidium, or last external dorsal gastric plate, with a bluntly rounded posterior border, that is, without a spine or tooth  
..... *Ponera eduardi* (normal winged form)
- Pygidium produced as a large, acute, more or less downcurved tooth or spine, to be seen on the dorsal side of the gastric apex, just above the genitalia ..... 9.
9. Mandibles very slender and sinuate in their apical 2/3, each about as long as the III antennal segment (counting from the base)  
.....*Brachyponera chinensis*
- Mandibles wedge-shaped, nearly straight and less slender, not more than half as long as the III antennal segment..... *Mesoponera castanea*
10. Scape (basal segment of antenna) shorter than greatest diameter of compound eye.....subfamily Dolichoderinae..... 11.
- Scape longer than greatest diameter of compound eye, and often as long or longer than head proper..... subfamily Formicinae..... 12.
11. Second antennal segment broader than the scape and subequal to it in length.....*Iridomyrmex glaber*



- Second antennal segment about as broad as the scape, and less than half as long ..... *Technomyrmex albipes*
- 12. Parameres (outermost pair of genital valves) broad and short, their apical margins broadly excised or emarginate ..... *Paratrechina vaga*
- Parameres elongate, laterally situated, tapering to narrow apices, not emarginate ..... 13.
- 13. Parameres subtriangular (wedge-shaped), tapering gradually from broad base to narrow apex; mandibles each with a well-developed, acute apex and a dentiform angle separating the masticatory and basal borders ..... *Prolasius advena*
- Parameres each with a broad base, tapering suddenly to a long, digitiform distal process; mandibles very degenerate, the apex more or less blunt, and the masticatory and basal borders meeting through a curve ..... *Camponotus* (Col.) [*newzealandicus*]
- 14. Antennal segments (probably) 10 ..... *Tetramorium* [*grassii*]
- Antennal segments 12 ..... *Huberia* ..... 15.
- Antennal segments 13 ..... 16.
- 15. Size large, forewing length more than 6 mm. .... *Huberia striata*
- Size smaller, forewing length less than 6 mm. .... *Huberia* [*brouni*]
- 16. Mandibles reduced and degenerate (often not opposable), no teeth in addition to the more or less acute apex ..... tribe Dacetini ..... 17.
- Mandibles only moderately reduced, opposable or overlapping when closed, with a well-defined masticatory border having two or more teeth in addition to the acute apex ..... *Monomorium* ..... 18.
- 17. Larger species, forewing more than 2.7 mm. long ... *Orectognathus antennatus*
- Smaller species, forewing less than 2.7 mm. long ..... *Strumigenys* [*perplexa*]
- 18. Larger species, alitrunk length normally over 1.3 mm. .... *Monomorium antarcticum*
- Smaller species, alitrunk length normally under 1.3 mm. .... 19.
- 19. Head, alitrunk and both nodes of waist densely and finely punctulate and opaque; color black, with yellowish legs, mandibles and antennae ..... *Monomorium pharaonis*
- Head and alitrunk finely sculptured, opaque, except alitrunk dorsum, which is coriaceous and subopaque; both nodes of waist smooth and shining; color brown (varying to black?) with sordid yellowish legs ..... *Monomorium smithi*
- Alitrunk, nodes and perhaps even the head chiefly smooth and shining ..... *Monomorium* [*antipodum* and *orientale*]

#### Subfamily Myrmeciinae

Medium-sized to large ants, the workers and females with long, porrect, serially dentate mandibles, large eyes, and 12-segmented antennae; palpi segmented 6, 4. Alitrunk of worker of the complete type, with distinctly separated pronotum, mesonotum, metanotum and propodeum; metanotal spiracles distinct. Propodeum rounded, unarmed; petiole pedunculate, with a distinct and usually rounded node behind. Postpetiolar segment in the form of a second, separate node, separated from

the gaster by a constriction in *Myrmecia*, but incorporated in the gaster without constriction in *Nothomyrmecia*. Sting well developed and functional; legs long, with strong, unidentate (bifid) tarsal claws.

Males wasplike insects, with small head, short, triangular mandibles and large, bulging eyes. Wing venation of the "complete" type, sometimes even with a trace of the first radial crossvein present. Petiole and postpetiole (in *Myrmecia*) like those of the corresponding workers, but sometimes a bit more slender. Genitalia complex and differing widely with the species.

At present, *Myrmecia* and *Nothomyrmecia* are the only living genera; *Nothomyrmecia* is known only from two specimens, supposed to have come from southwestern Australia, while *Myrmecia* is Australian, with one endemic species in New Caledonia.

### Genus *Myrmecia* Fabricius

*Myrmecia* Fabricius, 1804, Syst. Piez., p. 423. Type: *Myrmecia gulosa* Fabricius, designated by Wheeler, 1911.

This large and spectacular Australian genus was revised by Clark last in 1952, but unfortunately, Clark's frame of taxonomic reference differed so much from what modern systematists normally accept that his monograph is confusing rather than helpful. A modest beginning has been made at the extensive task of straightening out this taxonomic tangle, but much remains to be done with the aid of more extensive collections and field studies. For preliminary revisionary notes, see Brown, 1953.

The workers of *Myrmecia* are epigaeic, and often arboreal, foragers, spending much time at blossoms searching for nectar and ambushing small bees and other insects. They are very aggressive, especially in defending the nest, and their sting is exceedingly painful. The nests of most species are built in the ground, and are often surmounted by a mound of earth up to a foot or more high. The females of some species, perhaps most, hunt actively for food during the period of nest-founding, unlike founding queens of most higher ants. These are among the most primitive groups of ants.

### *Myrmecia brevinoda* Forel

*Myrmecia forficata* var. *brevinoda* Forel, 1910, Rev. Suisse Zool., 18:2, worker, female. Type locality: Walcha, New South Wales, and Gisborne, Victoria, both in Australia. Syntypes in Forel Coll., Geneva; MCZ; one worker syntype seen.

*Myrmecia forficata* var. *eudoxia* Forel, *M. pyriformis* race *gigas* Forel, and perhaps *M. ferruginea* Mayr, are the same as *M. brevinoda*. *M. brevinoda* may itself be a synonym of *M. pyriformis* Fr. Smith, which appears to be a darker color form restricted to southeastern Australia. For synonymy, etc., cf. Clark, 1952; Brown, 1953:22.

Mr. Thomas loaned a dealate female of this species taken at North Shore, Auckland (Jockin leg.), where at least one other sample has been taken (now in the Auckland Museum). Apparently the species has managed to maintain itself in the district for some time, but its present status is not known. There is little doubt

that it was introduced from Australia within historic times.

This is a large species, although the worker size varies considerably, even within single nests (Clark, 1952: fig. 83). The workers and females are dull deep red with blackish gaster; the clypeus and gastric dorsum usually bear dull tan or gray pubescence, though this is easily rubbed off. The species is easily recognized by its large size, by the long, narrow, serrate mandibles, which are crossed over one another at the tips when closed, and by the large, convex, anteriorly placed eyes. It is a ground-nesting form, and forages principally at night, at least during warm weather; it should be sought on the trunks of trees with a light.

### Subfamily Ponerinae

Small to large ants of very diverse form. Petiole nodiform (Fig. 3) or more nearly in the form of a thick scale (Fig. 1). Postpetiole incorporated in the gastric tagma, though usually constricted slightly at its juncture with the succeeding segment. Sting well developed and thought to be functional in most cases, exsertile; posterior and middle legs with one or two spurs at the tibial apices. Males usually smaller than females and much more slender, with small, round heads and large convex eyes. Wing venation and genitalia varying widely with genera. Many genera, widespread, particularly in the tropics; chiefly carnivorous feeders, many narrowly specialized predators of particular arthropod groups.

### Genus *Amblyopone* Erichson

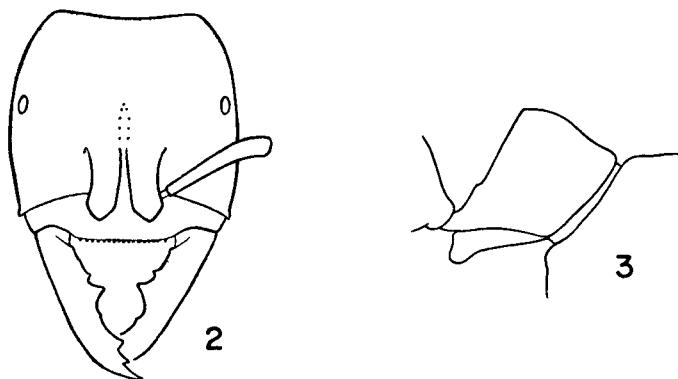
*Amblyopone* Erichson, 1842, Arch. Naturg., 8; 260. Type: *Amblyopone australis* Erichson, monobasic.

*Stigmatomma* + *Fulakora* of authors; for synonymy see Brown, 1949, Psyche, 56: 86-88.

The head form (Fig. 2) and petiole (Fig. 3) of the worker and female are rather characteristic, though both, and especially the mandibles, vary considerably with the species. Features diagnostic of the genus are the row of teeth or denticles across the anterior clypeal border, the general head shape, the posteriorly placed (and usually poorly developed) eyes, and the petiole, with its distinct anterior and dorsal faces, but no descending posterior face. *Amblyopone* is a very widespread genus, conservative in body form, but differing by species in size, mandibular and clypeal dentition, and in general shape and sculpture of the head. The antennae are usually 12-segmented, but lesser counts are known in a South American species. The palpal segmentation varies widely with the species; in the Australian and New Zealand species so far checked, the counts are low, with two segments the rule for both maxillary and labial palps in *A. australis* and most of the small species; however, counts up to 6 and 4 can be expected in this genus. In *A. saundersi* a worker dissected had a 2, 2 count, while a female examined in 1954 appeared to have only 1-segmented maxillary palps, with 2-segmented labial palps. Since *A. saundersi* is an extremely variable species, this is perhaps not surprising, but the counts need more extensive checking. There may conceivably be more than one species making up what I call *saundersi* here.

The *Amblyopone* of New Zealand belong to two distinct stocks. *A. australis* is widespread in Australia and Melanesia, and belongs to a group at present restricted

to the Indo-Australian region. *A. australis* and its group are large for *Amblyopone*, but are apparently specialized types within the genus; most of the characters are those of reduction, as seen in the sculpture, the anterior clypeal dentition, the palpal segmentation and the wing venation. *A. australis* is a very common ant in the moister parts of eastern and southwestern Australia, and it appears to be a general predator (and scavenger?) of arthropods. Perhaps the *australis* group arose in isolation in the Australia-New Guinea area from a diverse *Amblyopone* stock that arrived there as long ago as the Cretaceous, and developed widened prey preferences in the absence of effective competition from other ant groups in the cryptobiotic niche occupied by most amblyoponines wherever they are found. Whatever its origin, *A. australis* appears to have been a recent, if not an historic, arrival in New Zealand.



Figs. 2 and 3. *Amblyopone australis* Erichson, worker from vic. Auckland, N. Z. Fig. 2, head and mandibles in dorsal view, antennal funiculus omitted. Fig. 3, petiolar node and adjoining structures in side view. Drawing by Nancy Buffler.

*A. saundersi* belongs to the "*Fulakora*" group of species, formerly considered by many specialists to represent a distinct subgenus or genus. I have dealt with the question of division of *Amblyopone* in the 1949 reference cited above, and I concluded for the time being that broad intergradation between *Fulakora* Mann and *Stigmatomma* Roger prevented the separation of these groups in any but the most arbitrary manner. The tentative recognition of *Stigmatomma* I allowed myself at that time must, it now appears, be withdrawn, for even in the single Australasian fauna it is rather clear that the two groups are broadly connected by intermediate forms that must be assigned arbitrarily to one or the other. This whole question does require closer study from the world point of view, but until this study is completed in proper style, I am forced to put forms like *australis* and *saundersi* in one genus without further subgeneric divisions.

*A. saundersi* is much smaller and more slender proportionately than *australis*, with the densely punctulate cephalic sculpture and the clypeal-mandibular dentition of the "ordinary" form for the genus. It is specialized chiefly in its small size and in the reduction of the palpi, both features apparently connected with extreme

adaptation to a cryptobiotic mode of life. It will be interesting to see whether *saundersi* is specialized in its feeding habits, as it is suspected it may be. It seems likely that *saundersi* is native to New Zealand—that is, it probably reached New Zealand a fairly long time ago from Australia, and seems to have become specifically distinct from the Australian members of its group. Its wide distribution in New Zealand tends to confirm this interpretation, but the record from the Chathams, mentioned below, is somewhat disconcerting in that it proves, perhaps, that the species is readily transported by man.

It seems clear that both New Zealand *Amblyopone* came from Australia, and it seems equally clear that they came across a water barrier. Australia has a very diverse *Amblyopone* fauna (perhaps as many as twenty distinct species, described and undescribed), and the genus has radiated to produce derivative genera there. Since New Zealand appears to be a favorable kind of place for amblyoponines in general, the imbalance of the New Zealand representation of the genus speaks against a land connection with Australia.

*Amblyopone* is a curious mixture of generalized and specialized characters, and there is little doubt that the genus represents a very archaic group. The world distribution is both wide and discontinuous in the warm and temperate regions of the earth, and the representation of species is good in both Northern and Southern Hemispheres, but the genus is unknown in the Ethiopian Region except at its north-western fringe. Probably it has occurred throughout Africa, but is now nearly extinct there. Perhaps one-fifth to one-quarter of all *Amblyopone* species are now confined to Australia. As mentioned already, most *Amblyopone* are cryptobiotic in their habits, usually living in and foraging through the soil or soil cover, or in rotten logs, in forested regions. Recently, however, some records of *Amblyopone* species have been obtained from rather arid grasslands areas in North America and elsewhere, though in these cases from deep soil layers.

The colonies are usually small in population, though *A. australis* may form large colonies in exception to this rule. The ants are sluggish, and often feign death, though possessing a well-developed sting which, in the case of *australis*, can penetrate the skin and cause severe pain. The food consists of arthropods, but details are lacking for the New Zealand forms.

Males of *Amblyopone* are smaller than the corresponding workers and much different in appearance, usually being blackish, with small, round head and very large eyes and slender, elbowless antennae. The relationship is noted only when the petiole is checked in most cases.

#### *Amblyopone australis* Erichson

*Amblyopone australis* Erichson, 1842, Arch. Naturg., 8:260, pl. 5, fig. 7, worker.

Type loc.: Woolnorth, Tasmania. Type (not seen) in Zoologisches Museum, Humboldt Universität, Berlin.

*Amblyopone australis*, Wheeler, 1927 a: 4-16, figs. 1, 2, worker, female, male, including varieties or subspecies *fortis* Forel, *minor* Forel, *foveolata* Wheeler, *obscura* Fr. Smith, *pallens* Wheeler, *laevidens* Emery, *queenslandica* Wheeler, *cephalotes* Fr. Smith, *norfolkensis* Wheeler, *howensis* Wheeler, *nana* Emery. Provisional new synonymy.

*Amblyopone cephalotes* Fr. Smith, 1876b: 490, worker. Type loc.: Auckland, Type in British Museum (Natural History), not seen. *New synonymy*.

Worker: Head as shown in Figure 2; petiole, Figure 3. Total outstretched length of body varying from about 4.5 to 8 mm. The figures are drawn from specimens taken near Auckland. The body is predominantly smooth and shining, with scattered punctures; the anterior half or more of the head is coarsely longitudinally striate-foveolate. Color ranging from light yellowish-red to deep piceous, nearly black; the New Zealand samples are in the dark end of the range. Eyes small, with some 25-35 facets each.

Female: Similar to worker, with bulkier alitrunk and well developed flight sclerites, bearing wings in virgin individuals; eyes much larger than in worker. Total size larger than worker.

Male: See under genus, above.

After reviewing more than 100 samples of this complex from nearly as many different localities in Australia, New Guinea, the New Hebrides and neighboring islands, I cannot separate the New Zealand population as an entity worth a formal name. There is considerable variation over the areas mentioned in such characters as total size, depth of pigmentation, strength and extent of cephalic sculpture, details of mandibular dentition and striation of mandibular shafts, proportions of funicular segments, etc. These characters vary discordantly and very markedly with geography, even within the narrow band of the range that runs parallel to the Australian coast from South Australia through Victoria and New South Wales northward into northern Queensland. Following given characters one at a time, patterns of local and clinal variation are readily traced, and it is clear that these patterns are discordant one with the next through the continuous or near-continuous part of the range in eastern Australia. Specimens from northern Queensland come very close to the New Guinea *laevidens*, while Tasmanian and south Victoria samples fit the definitions of "typical" *australis* in most instances; in between we find all gradations and combinations of the character differences.

It is not my purpose here to detail the geographical variation of *A. australis* (this will be done in a separate publication), but I do want to establish the fact that the New Zealand population (*cephalotes*) is not really different from those inhabiting localities in southeastern or east-central Queensland, and that the latter are connected to typical *australis*-like populations through intergradient populations in eastern New South Wales. As Wilson will show elsewhere in dealing with the Melanesian samples, these cannot be separated on a purely morphological basis from the Australian continuum.

In view of the uncertainty principle introduced when one considers allopatric populations, it is not possible to state with confidence that the various isolated island populations (e. g., *nana*, *cephalotes*, *howensis*, *norfolkensis*) all belong to the same species, but for lack of evidence to the contrary, we provisionally include them in *australis*. Only on Lord Howe is there some indication of speciation within the complex: there appears to have occurred a "double invasion" of that island by successive *australis*-complex stocks, one of which is represented by *A. leae* Wheeler, and the other by "*cephalotes howensis*." These two forms, while appearing quite different on this island, can both be matched more or less successfully by examples from other parts of the Australian mainland *australis* cline. Further collections are

needed from Lord Howe to make sure that no intergrades exist here, also, since the present samples are too limited to preclude such intergradation.

The New Zealand population appears to be restricted to the North Island and centered on the Auckland area. As I have already stated, the ants appear to agree quite well with samples from Queensland. Under the circumstances, I believe that a good case can be made for considering the New Zealand population to have originated from a stock introduced by man. Whether or not such introduction through human agency occurred, I think we can be sure that the New Zealand population was derived from eastern Australia within rather recent geological times.

I have found *A. australis* in southeastern Australian upland country mostly under stones; in more tropical situations in Queensland, the ants are more commonly found in rotten logs. They prey on a wide variety of insects, including beetles and termites; the chitinous remains seen in the nests indicate that other arthropods are taken as well. The feeding habits need study.

In Australia, and presumably also in New Zealand, the males and females are produced during the summer, and engage in nuptial activities during mid- or late summer. The nuptial flight and nest-founding efforts of the females are very imperfectly known, and would make an excellent subject for an intensive study. This study has been begun in Australia, but there is no reason why it could not be continued in New Zealand.

During the years 1952-1955, I still considered that the New Zealand populations could be separated taxonomically, so that all material determined and labeled at that time may bear my determination as *A. cephalotes*. I mention this in order to avoid confusion over certain material that I have already returned to New Zealand so labeled.

#### **Amblyopone saundersi** Forel

*Amblyopone Saundersi* Forel, 1892: 336, dealate female. Type loc.: "Neu-Seeland, Capt. Brown" (*recte* Broun). Type presumably in Forel Coll., Mus. Hist. Nat., Geneva, not seen.

*Stigmatomma saundersi* or *Stigmatomma (Fulakora) saundersi* of authors.

*Amblyopone saundersi*, Clark, 1928, J. R. Soc. W. Australia, 14: 36, pl. 1, figs. 24-29, worker, female.

Worker: This is a small, slender, cylindrical species, varying in outstretched length (including mandibles) from about 3 to nearly 5 mm., the variation often extending nearly this far even in single nest series. The color varies from light yellow to rather dark brown, with the gaster usually not so dark as head and alitrunk. The general form of the head and body is much like that of its much larger relative, *A. australis*, although the form is relatively more slender in *saundersi*, and the head is densely punctulate and opaque. The mandibles are like those of *australis* in having a spiniform apical tooth, in being long, slender and in crossing when closed to enclose a triangular space, but their inner margins are convex and are crowded with teeth, the middle three or four of which are double and have recurved, acute apices. The clypeus has a rounded, projecting anterior apron, in place of the nearly straight border of *australis*, and in place of the minute denticles of *australis*, *saundersi* has 6-10 short, coarse, irregular teeth socketted on low

tubercles; of these, the two median units are usually closely paired and project farthest. This clypeal armament, together with the mandibular teeth, frames a triangular space with teeth that undoubtedly serve well in holding struggling prey. On each anterior corner of the head a more or less prominent and acute tooth projects diagonally, anterolaterally. The antennal scapes are short, and the eyes are represented by minute vestiges situated on the sides of the head behind the midlength. Unlike the head, the alitrunk and the rest of the body are rather smooth and shining, with only scattered punctures. The pilosity is rather short and fine, but abundant over most of the body.

Female: Similar to the worker, but usually larger than the largest worker from the same nest (ca. 4.5-5.8 mm.). Eyes large and flat, ocelli present, alitrunk bulky and with well developed flight sclerites and wing stumps in the dealates. Male as yet unknown, but undoubtedly similar to those of other small *Amblyopone* from other parts of the world.

*A. saundersi* has been placed in a group of small-sized species often known as "subgenus *Fulakora*." I have given my reasons for rejecting this grouping for the present under the generic heading, above. The closest species to *saundersi* are about a half dozen from southeastern Australia, none of which is very well known. It is even possible that *saundersi* may yet turn up in Tasmania or the mountains of the mainland, but none of the forms so far found there is exactly similar. Nevertheless, the origin of *saundersi* seems most likely to have been Australia. One other fairly similar species, *A. celata* Mann, is known from the Solomons.

The distribution of *A. saundersi* is very wide in New Zealand, and may include all of the more temperate forest country of both main islands. About 25 records from the North Island and adjacent archipelagoes, and from the northern and western sectors of the South Island, demonstrate the breadth of this range at least partially. A sample from Mangare Island in the Chatham Group may represent a human introduction from New Zealand; the natural transport and establishment of an ant like *A. saundersi*, with its rigid ecological requirements and very feeble powers of flight, on so small and remote an island would be very unlikely, although it must be remembered that a *saundersi* precursor had to reach New Zealand itself by a similarly difficult route.

So far as this study has gone, I have not detected any very startling or significant trends of variation of this species in New Zealand that seem to be correlated with geography, but it is not impossible that such apparently random variation as does exist might actually hide differences between two or more close but different species. This is a subject for study in years to come by New Zealanders on the ground.

Like most of the small Australian species, *A. saundersi* is apparently hypogaecic in its habits. It is found chiefly in forests, in the soil and soil cover, in rotten logs, under rocks, and so on. The colonies are usually quite small, consisting of 10-30 workers and females. However, we have reason to believe that many, if not all *Amblyopone* species are partly nomadic, with very diffuse colonies, so that a single colony may, at a given time, be more populous than the usual collecting tactics will show. Related small-to-medium *Amblyopone* in the United States of America feed chiefly on chilopods, which they appear to sting and kill, and to which they then carry their brood to feed, instead of trying to return with them to the subterranean galleries. At least, this seems to be the way in which they handle the larger



centipedes I have seen them with at various times in the U. S. A. I have also induced one of the *saundersi*-like forms of *Amblyopone* from southeastern Australia to attack and sting a geophilid centipede in the artificial nest. The centipede was disabled by the sting, which was administered while the ant clung by means of its jaws to the thrashing animal, and the latter finally died, was dragged into the brood chamber by the ants for a brief period, and then ejected. The geophilid was quite large compared to the ants, and it is possible that they normally feed on smaller forms, perhaps even on symphylans or other arthropods, in the natural state. In my artificial nest, the ants did not behave normally, so it is not possible to say how their behavior should be interpreted, except that it probably shows how the prey is killed. Since *Amblyopone* is a very ancient and primitive genus of ants, it would be very interesting to know more precisely and fully the habits of a variety of species. The species are kept only with some difficulty in the artificial nest, but trials at keeping them are well worth making.

So far as my experience of collecting the smaller *Amblyopone* goes, I have had the best luck during periods of very rainy, cool weather. Although many of the species live in very wet environments, excessive saturation of the soil will force them toward the soil surface, and even out onto the surface itself, or into rotten wood above the surface. Perhaps this holds for New Zealand as well as Australia and eastern North America.

### Genus *Heteroponera* Mayr

*Heteroponera* Mayr, 1887, Verh. Zool.-bot. Ges. Wien, 37:532. Type: *Heteroponera carinifrons* Mayr, from Chile.

*Acanthoponera* or *Anacanthoponera* of authors, at least in part.

*Heteroponera*, Brown, 1952, Psyche, 59:70.

In my paper of 1952, cited above, I showed that the old genus *Acanthoponera* really contained two related genera. Of these, *Heteroponera* is distributed widely in South and Central America, and has four known species in the Australasian area—three in Australia and one in New Zealand. I have reviewed the generic characters and revised and keyed the species in my revision of the ectatommine genera, now in press in the Bulletin of the Museum of Comparative Zoology.

*Heteroponera* includes a small number of rather nondescript small Ponerinae with rather coarse, opaque sculpture over head and alitrunk; one outstanding feature is the presence of a continuous raised carina running from the clypeal disc up to the vicinity of the occiput. The promesonotal and metanotal sutural lines are present and distinct. In some species found elsewhere, the petiole is apically dentate, but in the sole New Zealand form the petiolar node is in the form of a thick erect scale, truncate at the summit, and with a slightly overhanging posterodorsal border. The general build of the majority of species is rather compact, and they tend to follow the custom of feigning death. The New Zealand species appears to be distinct and precinctive, although related to the Australian species *H. imbellis* Emery. Many of the species have wingless, ergatoid females, including *H. brouni*.

### *Heteroponera brouni* (Forel)

*Ectatomma* (*Acanthoponera*) *Brownii* (f) Forel, 1892:335, worker. Type loc.:

Drury, Auckland, New Zealand. Types in Forel Coll., Mus. Hist. Nat., Geneva; possible syntypes in Canterbury Mus., Christchurch, New Zealand; some of the Canterbury specimens have been examined.

*Acanthoponera browni*, Emery, 1911: 36.

*Acanthoponera* (*Anacanthoponera*) *brouni*, Wheeler, 1923, *Psyche*, 30: 183.

*Acanthoponera* (*Anacanthoponera*) *brouni* subsp. *kirki* Wheeler, 1923, *Psyche*, 30: 184, fig. 4, worker, ergatoid female. Type loc.: Waitakari Forest, near Auckland, New Zealand. Types in Mus. Comp. Zool., Harvard Univ., and elsewhere, several pins examined.

Worker: Compact, averaging about 3.5 mm. outstretched length, the body surface largely opaque, except for gaster, which is largely shining. Color brownish-red in varying shades, the teneral specimens brownish-yellow, or mottled. Dorsum of head with a fine *raised* median carina. Body with abundant recumbent pubescence and fine erect pilosity of moderate length. Eyes rather large, situated slightly behind the middle of the head. Frontal carinae widely separated by the posterior extension of the clypeus. Other characters given under the notes on the genus, above.

Female: Differs from the worker in slightly larger size, in the presence of small ocelli, and in minor differences in form of alitrunk. The male is unknown, but is probably winged. The nests are small and contain few adults; the ants move sluggishly and feign death when disturbed. Nests are in rotten wood, forest litter, etc.

Wheeler's syntypes of the subspecies *kirki* have been compared directly with the presumed syntypes from the Canterbury Museum. These specimens were sent to the Canterbury Museum by Forel long ago, and they are supposed to be "cotypes," though without locality label. They match the *kirki* types in every way. Actually, the Forel types are scarcely needed for this synonymy, because Wheeler's types are fitted better to Forel's description than to Wheeler's description, the latter being in error in a number of respects, including the size measurement. Since Wheeler's specimens, like Forel's, came from the vicinity of Auckland, there seems to be no excuse for his having raised *kirki* except that he misinterpreted Forel's description or the nature of his own types, or both. The necessary new synonymy has been proposed in the appropriate part of my ectatommine revision, now in press.

I have seen eight separate collections of *H. brouni*, all from Auckland County or contiguous counties in the northern part of the North Island, and all from forest. The limited distribution might suggest that the species has been introduced, but I have been able to find no evidence at all that the species occurs elsewhere, even though I have recently revised the world species of the genus. So far as I know, *H. brouni* has been taken only in rather wild, or at least natural situations, and not in city gardens. There is no reason to believe that it is not an aboriginal inhabitant of its present range, perhaps derived from an Australian ancestor by an oversea immigrant that preceded man.

The emendation of the original spelling, "*brownii*" seems permissible in view of the fact that the original collector and obvious object of the patronym was Capt. Thomas Broun.

#### Genus *Discothyrea* Roger

*Discothyrea* Roger, 1863, Berlin. ent. Zeitschr., 7: 176. Type: *Discothyrea testacea*

Roger, 1863, monobasic. Brown, 1958, Bull. Mus. Comp. Zool., 118:248, review of the genus and checklist of species.

The workers and females of *Discothyrea* are small, more or less depigmented ants fitted for cryptobiotic living. The antennae are inserted very close together and are crowded toward the front of the head, so that the lobes of the frontal carinae are raised and fused together with the remnant of the posterior extension of the clypeus caught between them to form a vertical plate or narrow platform. The antennae themselves are reduced in number of segments: from 11 to 6 in all species but one, but the apical segment and scape are enormously enlarged, particularly the former. The alitrunk is more or less truncate posteriorly, showing signs of reduced paired teeth in the form of more or less well-marked angles. The node is small, in the form of a short, compact scale, attached over most of its posterior face to the gaster. The gaster is downcurved, and the small apical segments curl forward underneath.

The eyes are more or less reduced in the workers, and worker-female mandibles are edentate, with a curved, cultrate, emarginate masticatory border, usually bearing a comb-like row of short, stiff bristles; the clypeofrontal fusion process extends well forward to cover part of the mandibles. Sculpture fine, usually opaque, the gaster more shining. Coarser pilosity reduced or absent; fine short pubescence abundant and dense.

The male where known is similar in length to the female and worker, but more slender and black in color, with large eyes, slender, 13-segmented antennae, and more or less reduced mandibles.

In this genus there are twenty-odd known species distributed chiefly in the tropics and Southern Hemisphere in Africa, the Indo-Australian area, and the New World. Australia has three or four species representing at least two stocks, and it appears that the New Zealand species, *D. antarctica*, is most closely related to one of these. New Caledonia has one very distinct species, and at least one or two others remaining undescribed; these form one stock that is similar to both Australian and Papuan species, but not particularly to *D. antarctica*. It seems likely that the New Zealand species is derived from Australian ancestors.

The *Discothyrea* species are cryptobionts, forming small colonies in the soil, in leaf litter, or in rotting wood. More than likely they are specialized feeders on some kind of small arthropods or their eggs. The related genus *Proceratium* appears, at least in part, to be a specialist feeder on eggs of spiders and perhaps other arthropods. There are no conclusive observations on the feeding habits of any species of *Discothyrea*.

#### *Discothyrea antarctica* Emery

*Discothyrea antarctica* Emery, 1895, Zool. Jahrb. Syst., 8:266, nota, worker. Type loc.: Hunua Mts., N. Z. Type in Emery Coll., Museo Civico di Storia Naturale, Genoa. Emery, 1895, Trans. N. Z. Inst., 27:636, fig., worker. Type not seen.

Worker and female: Very small ants, varying around an average length of about 2 mm., ferruginous in color. The body is very compact and the traverse of the head on the alitrunk restricted, so that the head is usually bent downward from the long axis of the alitrunk. The gaster is flexed downward also, and the apical gastric

segments actually point as much to the front as downward, as in some other ectatommines. These features impart a "curled-up" aspect to the body, and one which is enhanced when these insects feign death.

The vertical clypeofrontal plate is more thickened in some series, particularly those of largest-sized individuals, than in others. The alitrunk is compact and dorsally sutureless in the workers. Eyes moderate in size in the workers, but quite distinct and pigmented. Antennae 9-segmented, the apical segment subequal in length to the remainder of the funiculus.

Without conspicuous erect hairs; entire body covered with a fine pruinose pubescence; sculpture extremely fine, chiefly densely and finely punctulate, opaque or nearly so, becoming more shining on gaster.

This species forms minute colonies in leaf litter, rotten wood, etc., mainly in wooded areas. Moore (1940b) thought that the workers might feed on mites, particularly those obtained in the nests of other species of ants.

#### Genus *Mesoponera* Emery

*Euponera* subgenus *Mesoponera* Emery, 1901, Ann. Soc. Ent. Belg., 45:43. Type: *Ponera cafferaria* Fr. Smith, of Africa. Emery, 1911:80, characterization and catalog of species.

*Mesoponera* is here arbitrarily considered to be a separate genus in the absence of a satisfactory classification of the large and cosmopolitan tribe Ponerini. When the Ponerini are finally arranged more rationally than at present, *Mesoponera* may well be considered as a synonym of some other genus. For the present, this usage as a genus at least conforms to Wilson's in his review of the Melanesian Ponerini (Bull. Mus. Comp. Zool. Harvard, in press).

The characters at present employed to distinguish *Mesoponera* are its moderately large size, its 4-segmented maxillary palpi, its rather long but more or less triangular mandibles with serially dentate masticatory margins, the teeth normally rather numerous, its slender, completely sutured alitrunk, and its legs, which lack spinelike bristles on the outer tibial surfaces and which have two distinct (large and small) spurs at the apex of each of the middle and posterior tibiae. The females are normally of the definitive winged type, becoming dealate after nuptial flight. The male does not differ widely from other ponerine males of related genera, and like most of these, it has the pygidium, or last external tergite of the gastric apex, drawn out into a long, slender spine, downcurved over the retracted genitalia.

The genus is tropicopolitan and contains 30-40 very heterogeneous species, but those of Australia and the Oriental-Melanesian area (group of *M. melanaria*) appear to be closely related. The New Zealand species is distinct and precinctive, though close to group *melanaria*.

#### *Mesoponera castanea* (Mayr)

*Ponera castanea* Mayr, 1865:69, worker. Type loc.: Auckland. Types in Naturh. Mus., Vienna (not seen).

*Euponera* (*Mesoponera*) *castanea*, Emery, 1911:81.

*Euponera* (*Mesoponera*) *castanea* var. *striata* Stitz, 1911:356, worker. Type loc.: Auckland. Types in Zoologisches Museum, Berlin. *New synonymy*.

Worker: Total outstretched length about 5.5 to 7 mm., with occasional specimens exceeding these limits. Color varying from yellowish (teneral) to dark red or dark brown. The form of the body as seen from the side is shown in Figure 1. The form of the alitrunk varies slightly, and also the shape of the node. The clypeus has a median carina, usually projecting slightly beyond the anterior clypeal border, but this point difficult to see when mandibles are closed. Mandibles with the blades relatively more elongate and with more teeth than in *Ponera* or *Brachyponera*. The maxillary palpi in the few workers examined all had 4 segments, the labial palpi, 3. In the females seen, the maxillary palpi always had 4 segments, while the labials had either 3 or 2. The numbers in the male are 6 and 4, respectively.

Female a little larger than the worker, with ocelli and flight sclerites of the alitrunk developed, and the compound eyes much larger. The worker and female are distinguished from the related species of the Indo-Australian *melanaria* group in having the head shorter, in having fairly abundant and generally distributed erect pilosity, and in the thicker, apically rounded petiolar node.

Male: About as long as the smallest workers, but very slender, with small, rounded head, blackish in color. Antennae with short scape, so that they are very slender and evenly curved, at least in death, without elbowing.

The variety *striata* is synonymized on circumstantial evidence. Apparently Stitz missed the variable and often inconspicuous median clypeal point, and he appears to have interpreted Mayr's original description of the sculpture too loosely. *M. castanea* is a widespread and common species in the North Island and also is found around Nelson, at the northern tip of the South Island, and, while it shows considerable variation over this range, there seems to be no reason to recognize more than one species, or to give names to any of the variants.

Members of the *melanaria* group in Australia and Melanesia tend to inhabit mostly the moist, shady forests, but *M. castanea* shows much wider ecological tolerance in New Zealand, where nests are made not only in the shady forest in rotten wood and leaf litter, but also under stones in open pastures, and even in the soil of vegetable gardens in the cities. Judging from the structure of the workers and females, and from the habits of the *melanaria* group forms that Wilson and I have seen in the field, I should think that *M. castanea* is a fast-moving and rather timid ant, though with a respectable sting. The colonies are small to medium in size. Males have been taken abroad in the Auckland district in January and March.

### Genus *Brachyponera* Emery

*Euponera* (*Brachyponera*) Emery, 1901, Ann. Soc. Ent. Belg., 45:43. Type: *Ponera sennaarensis* Mayr, 1862, by designation of Emery, 1901.

The ants included here are medium-small, rather plain ponerines belonging to tribe Ponerini. They are black, brown or yellow in color (usually black), and have the fine, superficial punctulation also shown by other Ponerini of several genera. The mandibles are triangular, with a multidentate or -denticulate masticatory border. The eyes are small to medium in size, and placed well forward on the sides of the head, near the mandibular insertions. The alitrunk has a well developed metanotal groove, deeply impressed between mesonotum and propodeum. The petiole is high, in the form of a thick scale, with steep anterior and posterior faces. Antennae

segmented 12 in worker and female, 13 in male; maxillary palpi 3-segmented. Female slightly to much larger than the worker; male with degenerate mandibles and with the pygidium produced as a short spine over the gastric apex.

Since preliminary studies in the tribe Ponerini have convinced me that the classification of the tribe, particularly the portion generally considered to belong to genus *Euponera*, is artificial and seriously outmoded, I am treating *Brachyponera* provisionally as a genus, though I realize that the species included here by Emery and subsequent authors may well be differently assigned when the Ponerini are adequately revised. As at present constituted, *Brachyponera* includes a relatively small number of species in three groups: one in Australia, one in the Indo-Australian area, and one in Africa and Arabia. These are for the most part abundant and dominant ants with wide ecological tolerance.

#### ***Brachyponera chinensis* (Emery) new status**

*Ponera solitaria* Fr. Smith, 1874, Trans. Ent. Soc. London, p. 404, worker, *nec* Fr. Smith, 1860. Type loc.: Hyogo, Japan. *New synonymy*.

*Ponera nigrita* subsp. *chinensis* Emery, 1894, Ann. Mus. Stor. Nat. Genova, 34: 460, worker. Type loc.: Shanghai, China.

A single worker taken by E. M. Ehrhorn at Waikino, Auckland, agrees well with extensive samples of this species from many localities in Japan and China. The *Brachyponera* of the Asian mainland are taxonomically confused; certainly no more than two of the several names available fit distinct species, and it is entirely possible that all of them are variants of a single species. After careful comparison, it seems to me that the Japanese populations are conspecific with the form occurring at Shanghai, as well as over the greater part of temperate and subtropical China; Smith's preoccupied name *solitaria* can now safely be synonymized with *chinensis*. When a revision of the Asian *Brachyponera* is forthcoming, the name *chinensis* may well fall as a synonym of *luteipes* (Mayr).

For a ponerine, *B. chinensis* is an unusually common and successful ant. In China, it is seen everywhere on the rice paddy dikes and in the farm compounds, foraging in the open on tree trunks and on the ground in broad daylight. Probably most of its food consists of live or dead insects, but there is no direct information on this. Indications are that this species might well establish itself in New Zealand if given a good chance, but establishment is certainly not confirmed by this single record. The species is probably to be regarded as economically neutral or mildly beneficial wherever it now occurs.

#### **Genus *Ponera* Latreille**

*Ponera* Latreille, 1804, Nouv. Dict. Hist. Nat., 24: 179. Type: *Formica contracta* Latreille, 1802 = *Formica coarctata* Latreille, 1801, by selection of Latreille, 1805.

Mostly small, slender ants of plain appearance and drab coloration. Alitrunk usually weakly or not at all impressed at the metanotal groove, with the latter effaced or merely suture-like. Mandibles triangular in worker and female, with serially dentate or denticulate masticatory border. Eyes in worker small to absent. Antennae in worker and female 12-segmented, often clavate; palpal segmentation much reduced, with reported maxillary numbers ranging from 0 to 2, labial numbers 1 to 2.

The males of many species are smaller editions of *Brachyponera* or *Mesoponera* males, and have the same pygidial spine at the gastric apex, but a few species, including the New Zealand species *P. eduardi*, lack this spine. In addition, several species (again including *P. eduardi*) have developed wingless ergatoid males more or less like true workers; in some species, these supplement normal winged males, but in other species the workerlike males are the only ones known. The details and the significance of these aberrant males in certain *Ponera* species are not known fully yet. In New Zealand, *Ponera eduardi* has been found only with normal winged males so far, but the collections are few.

The tibial spurs, whether one or two, and their relative size, have been used as a generic character to separate *Ponera* from some other genera in the *Ponerini*, but intergradient conditions in some species make this character doubtful.

*Ponera* contains many species in most warm or temperate countries, and several species act as tramps through human commerce.

#### *Ponera eduardi* Forel

*Ponera Eduardi* Forel, 1894, Bull. Soc. Vaud. Sci. Nat., 30:15, worker major and minor. Type loc.: Msila Forest, Oran Prov., Algeria. Types in Forel Coll., Mus. Hist. Nat., Geneva (not seen).

*Ponera antipodum* Forel, 1895, Ann. Soc. Ent. Belg., 39:43, worker (*recte* a dealate female). Type loc.: Rotorua, New Zealand. Type in Forel Coll., (not seen). *New synonymy*.

*Ponera eduardi*, Le Masne, 1956, Insectes Sociaux, Paris, 3:239-259; summary of information concerning polymorphism of both male and female sexes and its relationship to reproductive biology; also a summary of distributional records for s.e. Palearctic area; further references.

Worker: 2.6 to about 3.0 mm. fully outstretched; dark redbrown to blackish when fully pigmented, yellowish during teneral period, which may last several days. Mandibles triangular, with straight, serially dentate-denticulate masticatory margins that are approximately opposable for their full length, so that no significant space is left between the closed mandibles, or between the mandibles and the clypeal border. Eyes minute, composed of one to about six or seven ommatidia, situated anteriorly on the sides of the head near the mandibular insertions. The body is elongate, slender-cylindrical in form, superficially like that of *Amblyopone saundersi*, but the petiolar node is in the form of a thick erect scale, seen from the side slightly tapered toward the subtruncate apex. The integument is subopaque, the sculpture consisting predominantly of very fine, dense, shallow punctulation giving rise to a fine, short, inconspicuous pubescence.

Ergatoid female: This is the *worker major* of Forel and Le Masne. It is like the worker in general form, but a little larger and more robust. The eyes are distinctly (3-4 times) larger than those of the typical worker, and contain, as nearly as I can make out, some 20-30 ommatidia each. The petiolar node as seen from the side is thinner and higher than in the worker. The characters of eye size, petiolar compression and general robustness are all intermediate between those of worker and female of alate, definitive type, though in general, the ergatoid is closer in these respects to the worker. Le Masne, in the paper cited, demonstrates that the

ergatoids are much more like the true females in respect to their ovarian development and ability to lay eggs. Indications are that, as in other ants with worker-female intermediates, the development of the characters obeys an allometric gradient. One sees also a few workers among the New Zealand material that tend to be intermediate between the worker and ergatoid female; these apparently correspond to Le Masne's *media* workers. The possibilities that Le Masne has opened up with regard to division of reproductive function among these various kinds of workerlike individuals should be followed up by a careful study of abundant material of all the classes, including a full allometric analysis. It should be pointed out, meanwhile, that in New Zealand the ergatoid female is found in undoubted association with winged males and dealate females in the same nests.

**Female:** The full female is initially alate and loses its wings after a nuptial flight. It is only slightly larger than the ergatoid form, but has much larger eyes, a bulky "wing sclerite" alitrunk, three ocelli on the vertex, and a very thin, high petiolar node. Isolated, presumably nest-founding females have been collected in New Zealand on a number of occasions.

**Male:** Among the *P. eduardi* populations of the southwestern Palearctic area, two types of males are known, one the normal large-eyed, pigmented winged form, while the other is a depigmented, wingless, workerlike form with minute eyes. In New Zealand, only the normal type of male has so far been found. This is about as long as the worker, but more slender and with a small subglobular head bearing very large convex compound eyes. The mandibles are reduced to small, tongue-shaped flaps, one on each side of the mouth region. As in the male of *Mesoponera castanea*, the antennal scapes are short, so that the antennae are filiform, without a distinct elbow, and are generally seen to be evenly curved in the dead, dried insect. The pygidium, or terminal external dorsal plate of the gastric apex, does not form a downcurved spine, as it does in many other species of *Ponera* and in *Mesoponera castanea*. The general color is blackish, the appendages lighter. Males were taken away from the nest at Owairaka by R. W. Denne at the end of January, indicating that this is the approximate time of the nuptial flight.

The only species of *Ponera* known to be firmly established in New Zealand is the present one, which agrees well enough with Forel's brief description of *antipodum*, and which agrees equally well in all of the castes mentioned above with specimens of *P. eduardi* from the Mediterranean area determined by Emery, Wheeler, Finzi and myself independently (the wingless male, of course, has not been seen from New Zealand). In spite of the fact that I have seen the types of neither species, I believe that there is no doubt about their identity. The fact that Forel described both forms only one year apart signifies little; Forel worked largely according to a method of faunal compartmentalization, and seldom thought of comparing specimens from localities so far apart as New Zealand and Oran.

It may, in fact, be shown eventually that the synonymy of *eduardi* should be extended to include still other forms of *Ponera* described by Forel and others. For instance, *P. trigona opacior* Forel, a Pan-Caribbean form, is difficult if not impossible to separate from *eduardi* in the worker and female castes, and Emery was unable to separate the males; and specimens from Willowmore, in the Cape Province of South Africa, which were determined by Wheeler as *P. coarctata boerorum* Forel, are indistinguishable from the workers and ergatoids of *eduardi*. Of course, synonymies



in these and other cases depend upon verification of the identifications and careful comparison of adequate material, but the present information does suggest that *eduardi* may be a very widespread tramp form, currently masquerading under several other names in various parts of the world.

There seems to be no doubt that *P. eduardi* is an introduced species in New Zealand, and most of the records there are from the vicinity of ports and other large population centers, especially Auckland, with the Coromandel Peninsula; Wellington and Nelson. There are other scattered records from the North Island to show that the species is successful in expanding its range within the country.

*P. eduardi*, like most other species of its genus, seems to make out best nesting in rotting logs, in forest leaf mold, or under stones in moist soil, but some nests apparently are found deep in the soil in open situations such as pastures. The feeding habits are largely unknown for the very many species of *Ponera*, but the few observations I have made on other species than *eduardi*, plus a few references in the literature, suggest that small soil-inhabiting arthropods, particularly Collembola, form the main part of a totally or nearly totally carnivorous diet.

For further notes on the biology of this species, see Le Masne's paper, cited above in the synonymy. This ant should be fairly easy to keep in the plaster nest, though it is slow-breeding and forms only small colonies. Its movements are of medium rapidity for its size, and like other *Ponera* species, the adults feign death when disturbed strongly enough. The larvae have mushroom-like tubercles in pairs on certain abdominal segments; these tubercles are glutinous over their free surface, and by means of them, the larvae are stuck to the walls or ceiling of the nest cell, where they are handy, but out of the way. The colonies are often very diffusely distributed through the substrate, and this may be the reason why auxiliary reproductives in the form of the ergatoid females are useful to the species.

Finally, it should be noted that the name *Ponera eduardi* ought to be regarded as provisional in view of the revision that is needed in the genus *Ponera*. In fact, the name *antipodum*, or *antipoda*, might conceivably be used again if the wingless and winged males are ever proven to represent two sibling species.

#### Subfamily Myrmicinae

Ants of very diverse size and form. Waist formed of two reduced segments constricted off sharply from the rest (abdominal II and III) and called the petiole and postpetiole respectively. First segment of gaster (abdominal IV) large, and often forming the largest part of the exoskeleton of the whole gaster; apical gastric segments correspondingly reduced and directed more or less posteroventrally in many species. Sting present, sclerotized and normally exsertile, modified in various ways, in worker and female. Worker caste monomorphic or polymorphic. Male more slender than female, with small, round head and large eyes.

This is the largest of the subfamilies, with more genera and species than any other. The classification at and above generic level is artificial and confused, and needs revision.

#### Genus *Huberia* Forel

*Huberia* Forel, 1890, Ann. Soc. Ent. Belg., 34: (c. r.) cv. Type: *Huberia striata*

= *Tetramorium striatum* Fr. Smith, 1876; monobasic.

The two known species of *Huberia* are typically myrmicine in habitus, and are generally considered to be related to *Monomorium*, which genus they do resemble in many points. *Huberia*, however, has 11 antennal segments in the worker and female, and 12 segments in the male, or one less for each of the castes than *Monomorium* usually has; even the 11-segmented *Monomorium* species have 13-segmented antennae in the male caste. With palpal segment counts, the situation is reversed; *Huberia* workers and females have 5 maxillary and 3 labial segments, and the male of *H. striata*, at least, has this count also; *Monomorium antarcticum* has 3 maxillary segments and 2 labial, while workers of a number of other species of *Monomorium* all have 2, 2 counts (males commonly 3, 2). The clypeus in *Huberia* has a median longitudinal sulcus usually distinct, but distinct carinae are not present on either side of it as is normal for *Monomorium*.

*Huberia* has a slender alitrunk in the worker, with deeply impressed metanotal groove and paired stout, acute teeth on the propodeum. The petiole is pedunculate and unarmed, the postpetiole rounded above and also unarmed; gaster not truncate anteriorly. The worker and female have more or less extensive areas of striation on head and alitrunk, though in *H. striata*, the body may often be predominantly smooth and shining. Gaster smooth and shining. Hairs fine and tapered, not unusually abundant.

The genus is confined to New Zealand and neighboring islands. Its relationships are problematical; probably it represents a peripheral relict of an old and generalized myrmicine stock, perhaps near *Aphaenogaster*.

#### ***Huberia striata* (Fr. Smith)**

*Tetramorium striatum* Fr. Smith, 1876 a: 481, female, worker, male. Type locs.: "west coast of South Island, at Peel Forest, and at Kelly's Creek." Types in British Museum, not seen.

*Huberia striata*, Forel, 1890, Ann. Soc. Ent. Belg., 34: (c. r.) cv, worker, female.

*Huberia striata* var. *rufescens* Forel, 1902, Rev. Suisse Zool., 10:447, worker, female. Type locs.: New Zealand: "M. Somers; Tironea Mount.; Auckland; Gov. Bay" and Lyttleton. Types in Forel Coll., Geneva, not seen. *New synonymy*.

The worker of *Huberia striata* is larger than that of *Monomorium antarcticum* on the average; most specimens are over 4.5 mm. long (outstretched, including mandibles), and occasional ones reach over 5 mm. Minim workers from incipient nests may, however, range slightly below 4 mm. Females are much larger, running from about 7.5 up to 9 mm. The males approach the females in length, but have smaller heads and much larger petiolar and postpetiolar nodes.

Males are always blackish in color, but the worker and female coloration varies widely. The workers range from bright reddish-yellow to nearly jet black, the intermediates darkening either relatively concolorously, or through variously mottled combinations of reddish and fuscous. Strangely enough, the coloration parallels at least roughly that of the *Monomorium* I have provisionally assigned to *antarcticum*, so that, in general, nests of the two species found at the same place tend to be of the same or similar color. This may account for some of the mixed series that have

reached me; it is not unusual for two different species of ants to be found in the same log or under the same stone, even though their nests may not really be mixed. The extent and precision of this color correspondence I cannot safely judge without seeing the species involved at a number of localities in the field, so I must leave this problem to some future investigator. Nevertheless, the possibility of mimicry, of social-parasitic relations between the two species, or even simply the adaptive correlations of color with factors like temperature, humidity and insolation, present tempting subjects for speculation.

The female color pattern follows that of the worker, although even at its lightest, the female still is darker than the worker, retaining particularly broad areas of infuscation over the alitrunk and gaster.

*H. striata* is very widely distributed in New Zealand, but is not as abundant as *M. antarcticum*. According to Moore (1940b), the nests are very populous and without definite colony limits; he found it very easy to combine groups from different localities into a single nest. The ants nest in the soil, often under stones in cooler parts of the range, although they frequently nest in rotting wood in the north. *H. striata* is a general feeder, and keeps homopterans in its nests.

#### Huberia brouni Forel

*Huberia Brounii* Forel, 1895, Ann. Soc. Ent. Belg., 39:41, worker. Type loc.:

Rotorua, New Zealand. Type presumably in Forel Coll., Geneva (not seen).

Worker 3.2-3.5 in outstretched length; size and appearance rather constant in the series I have seen. Color rusty brown to deep brown, with lighter, more yellowish legs, antennae and mandibles. The head is sharply and closely longitudinally, the alitrunk transversely, rugulose-striate; gaster largely smooth and shining, but striolate at extreme base. Mandibles closely striate. Mandibles short, triangular, with serially dentate masticatory margin. The female is larger than the worker, with more bulky alitrunk (wing-bearing in virgin females) and gaster. I have seen no males certainly referable to this species.

This interesting little species resembles in its general habitus (though not in its large, convex eyes) the species of *Stenamma* found in the woodlands of the Northern Hemisphere. Like *Stenamma*, *H. brouni* forms small colonies, usually in the leaf litter of woodland areas. It is apparently rather widely distributed in both North and South Islands; I have records from Nelson and from Westland, as well as several for various parts of the North Island. It would be interesting to know whether *H. brouni* feeds, like its northern analogues in the genus *Stenamma*, on small arthropods in the soil cover.

#### Genus Tetramorium Mayr

*Tetramorium* Mayr, 1855, Verh. Zool.-bot. Ges. Wien, 5:423. Type: *Formica caespitum* Linnaeus, 1758, by restriction of Girard, 1879.

Rather small-sized ants of typical myrmicine habitus, usually sculptured over head and alitrunk (sculpture occasionally effaced). Antennal insertions forming pits bounded in front by narrow ridges formed by lateral extensions of the clypeus. Antennae 12-segmented in worker and female, 10-segmented in most males, due to fusion of the second through the fifth segments of an ordinary 13-segmented male

antenna to form one long segment, the second funicular, of a 10-segmented antenna. There are a few African species that are supposed to have 12- or 13-segmented antennae in the male, but the male of the sole species introduced into New Zealand, *T. grassii*, remains undescribed.

*Tetramorium* is primarily a genus of the Old World tropics, particularly of Africa; the New World records apparently represent historical introductions.

### *Tetramorium grassii* Emery

*Tetramorium grassii* Emery, 1895, Ann. Soc. Ent. France, 63:37, worker, *nec* female. Type loc.: Table Mt., near Capetown, South Africa (type is Mus. Stor. Nat. Genova, not seen).

A series taken at Panmure, Auckland, "under a store (stone?)" (D. Spiller) and another from Remuera, Auckland, in a garden (K. P. Lamb), agree well with a topotypic specimen of this ant sent me by Dr. George Arnold, the authority on Hymenoptera of southern Africa. The species is widespread in South Africa, and shows considerable geographical variation there.

*T. grassii* can be distinguished readily from *T. guineense* on the basis of its uniform brown coloration and its higher, more slender petiolar node with rounded apex.

### *Tetramorium guineense* (Fabricius)

*Formica guineensis* Fabricius, 1793, Ent. Syst., 2: 397.

This tropicopolitan species, of African origin, is ferruginous in color, with blackish gaster, and has a low, blocky petiolar node, partly rounded above. Specimens exist in several New Zealand collections, including winged females, but of these, the ones with proper data are from shipments intercepted at Auckland, specifically on banana plants. I have no definite evidence that *T. guineense* is established in New Zealand, and it may be that the country has too cool a climate for it. In other countries, *T. guineense* often becomes very common in agricultural land and around cities, and it can be regarded in some instances as a minor pest.

### Genus *Monomorium* Mayr

*Monomorium* Mayr, 1855, Ver. zool.-bot. Ges. Wien, 5:452. Type: *Monomorium minutum* Mayr, 1855, monobasic.

This is a large genus containing, at a rough estimate, more than 150 species, predominantly in the warmer parts of the Old World. The workers of most species are slender, usually glabrous forms, and in all but a few relatively primitive species, the propodeum lacks spines or teeth. The antennae are most commonly 12-segmented, although one group of species has 11 segments, and rarely there are 10. The funiculus is often formed into a distinct club apically, the club normally including the last three segments, which are enlarged. In the 12-segmented species of Australia, New Zealand and elsewhere, the club is often indistinct or is composed of an indefinite number of segments, due to the gradual enlargement of the segments from the middle of the funiculus toward the apex. This more generalized type of antenna characterizes the group often called "subgenus *Notomyrmex*," distributed chiefly in the Southern Hemisphere, and including the common New Zealand species. An

11-segmented species, *M. antipodum*, occurs in New Zealand, but may be an introduction. The 11-segmented species are generally put into "subgenus *Lampromyrmex*," a species-group found chiefly in Australia and known fossil from the Oligocene Baltic Amber, but, aside from their antennae, they look and act very much like many of the "typical" *Monomorium* of Asia and Africa. For the purposes of this paper, the very questionable usefulness of the subgeneric category need not be a problem, and subgenera are ignored in listing the species.

#### ***Monomorium antarcticum* (White)**

*Formica antarctica* White, 1848, Voy. Erebus and Terror, Zool.: Insects, Pl. 7, fig. 13, alate female. Type loc.: "New Zealand." Type in British Museum, not seen. For date, cf. Hutton, 1881: 14.

*Atta antarctica*, Fr. Smith, 1858: 167, female.

*Tetramorium nitidum* Fr. Smith, 1876 a: 480, female, worker, male. Type loc.: New Zealand, "at Peel Forest, at Oxford, and at Lake Coleridge," probably in Canterbury. Types in British Museum, not seen. *New synonymy*, provisional.

*Monomorium Suteri* Forel, 1892: 340, worker, female, male. Type loc.: Ashburton, New Zealand. Types and eutopotypes in Forel Coll., Geneva; Canterbury Museum; MCZ; several seen. *New synonymy*, provisional.

*Monomorium integrum* Forel, 1894: 228, worker, female, male. Type loc.: Ashburton, New Zealand. Types presumably in Forel Coll., Geneva, not seen. *New synonymy*, provisional.

*Monomorium succineum* Stitz, 1911: 367, female. Type loc.: Auckland. Types in Zoologisches Museum, Berlin, not seen. *New synonymy*.

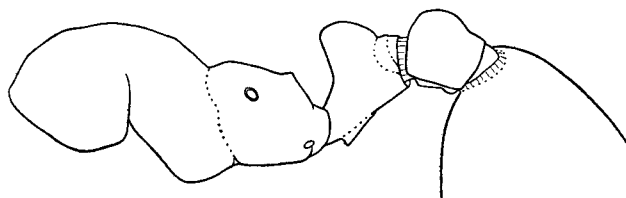


Fig. 4. *Monomorium antarcticum* (White), worker, side view of alitrunk and nodes. Drawn from a large, blackish specimen from South Island, the head of which is shown in Fig. 5, p. 31 Drawing by Nancy Buffler.

The *Monomorium antarcticum* complex includes what are probably the commonest and most ubiquitous of New Zealand ants. They are also the most variable, a fact that has caused considerable confusion in the taxonomy of the complex and still continues to be troublesome for this taxonomist. In previous literature and in most collections, the complex has been divided into five or more species (with or without additional subdivision into subspecies and varieties), corresponding to as many trends in color, size, structure of clypeus, structure of propodeum, etc. It is possible to recognize extremes of development for these characters, or for combinations of them, but it also seems to be true that intergrades exist for each of them. Some of the characters (color, for instance) tend to vary broadly with geography, while others

appear to be very locally distributed, or even characteristic of individual colonies. The variation in some structural characters appears to be at least partly size-linked or allometric; similar variation is seen in the related Australian species *M. leae* Forel (= *M. hemiphaeum* Clark). Of the several named forms, it is possible to eliminate from the beginning *M. succineum*, which was described without any real attempt to distinguish it from the "typical" *antarcticum*, and which from the description is clearly a straight synonym. The other described forms can now be discussed briefly, one by one.

The "typical" *antarcticum* is the bright orange form with dark-fasciate gastric segments, common especially in the North Island. The workers fall mostly in the range of 3.0–4.0 mm. outstretched length, but some fall below 3 mm., and an occasional one reaches slightly above 4 mm. The female is similar in color, and often also has the alitrunk marked with two or three longitudinal dark bands; she is much larger than the corresponding workers, and has the bulky alitrunk and gaster characteristic of those ant queens that found their own nests independently in the "claustral" manner. The male is slender, about the length of workers from the same nest or smaller, and is predominantly blackish or piceous in color.

The clypeus is bicarinate, the bicarinae sometimes forming a pair of blunt teeth in front, sometimes not so pronounced and not markedly changing the general rounded or subtruncate outline of the more or less protruding median clypeal lobe. Propodeum usually rounded as seen from the side, but individuals from some nests, particularly among the larger specimens, show a tendency toward angulation. The mandibles are usually 5-toothed, but in rare specimens, a sixth small intercalary tooth may be present.

Some samples, particularly from the Wellington area, and from near Christchurch and Nelson on the South Island, are considerably darker in overall coloration than are most of the samples from the North Island, and the color really seems to grade into the brown, piceous or black of the forms described as *nitidum* and *suteri*. In the Auckland area, "typical" *antarcticum* is the predominant form, and in some colonies from the north of the North Island, particularly those with the smallest sizes of workers (incipient nests?), the coloration is so light that the gastric fasciae tend to disappear, leaving the bodies of the workers nearly concolorous reddish-yellow.

*M. nitidum* is the name usually applied to the form in general resembling *antarcticum*, just discussed above, but differing from that form markedly in its darker, usually uniformly piceous or black color, of course in the worker and female castes. The male is similar to that of *antarcticum*. This dark form is more characteristic of the South Island, and from the available records seems to occur in colder and often damper places, such as mountain forests and bogs. Forel (1892) made much of the strongly bicarinate clypeus, with the carinae forming two projecting sharp teeth in front, but this character is subject to such wide variation that it is scarcely acceptable as a species character. Unfortunately, this feature apparently weighed heavily in separating *M. integrum* and *M. suteri* as new species apart from *nitidum*. I have examined many specimens determined as *nitidum* by Forel himself, and now in the Canterbury Museum and the MCZ. As already mentioned, some of the samples available appear to intergrade toward *antarcticum* in color. However, in spite of the appearance of continuity these two color forms show, the possibility

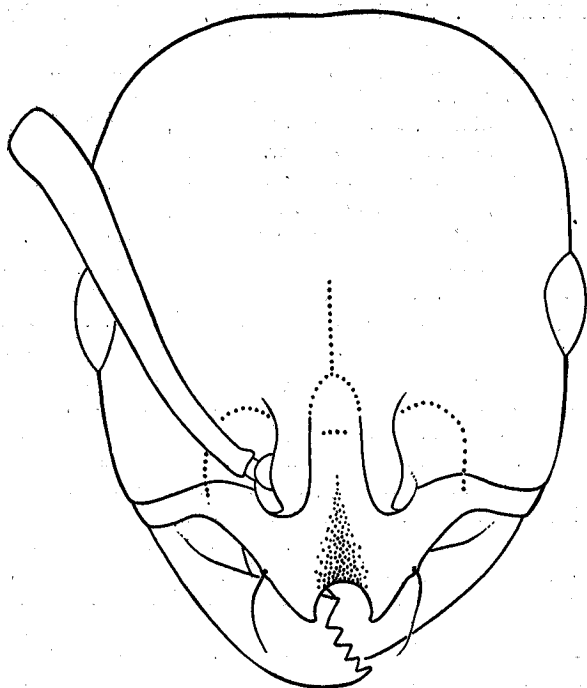


Fig. 5. *Monomorium antarcticum* (White), worker, dorsal or full-face view of head; alitrunk and nodes of this specimen shown in Fig. 4, p. 29. Drawing by Nancy Buffler.

does exist in this type of cabinet investigation that fading of dark specimens may produce specimens approaching in color the lighter form. Bearing this in mind, I still cannot separate the two color forms, either as species or as "subspecies," from the evidence at hand.

*M. suteri* was used by Forel to designate a form with the color of *nitidum*, but averaging larger, up to 5.2 mm. in total outstretched length. This species was said to have a less strongly projecting median clypeal lobe, only feebly emarginate anteriorly, so that the two carinae do not project markedly as teeth. Also emphasized (in both worker and female) was the development of the metanotal teeth. Other minor characters of the female and male cited by Forel do not sound convincing as differences.

In the MCZ there is a specimen labelled as a cotype of *suteri*, received from Forel, and I have seen several specimens, probably types, labelled by Forel and now in the Canterbury Museum. These specimens are, in my opinion, only large examples of the *nitidum* form with unusually well marked propodeal angles, a character at least to some extent allometrically varying in this and related *Monomorium*.

The types of *M. integrum* Forel are not available to me at present, but from Forel's characterization, I can see little hope of separating any such form as he

describes from *M. nitidum*. As already mentioned, the untrustworthy clypeal lobe character is emphasized by Forel in his brief description. I have seen samples that agree well enough with the description, but I would place these with *nitidum*.

The species called "*M. Smithii*" by Forel is a problem less easily dealt with than the others. As described, this form is very small, only "2.3 to 2.6 mm." long in the worker, which is dull brownish-yellow. Workers supposed to be "cotypes" in the MCZ, and others from the Canterbury Museum bearing Forel's determination labels in his own hand, and probably part of the original series, do not agree with his statement, "6-toothed," for all of these workers are 5-toothed. In fact, the workers from among the material in these two museums all look to me like small specimens of *M. antarcticum*. However, the male in the Canterbury Museum series, though reduced (by damage in transit) to the alitrunk alone, differs markedly from the *antarcticum-nitidum* kind of male, but agrees well with males accompanying another series of workers and females with peculiar characters, these agreeing well with every statement of Forel except that they have 5, not 6, mandibular teeth. Two possibilities occur to me: either the type series Forel had was mixed, containing two different species, or the variation of worker, female and male of the possible single species, *antarcticum*, is wide enough to include even the distinct dwarf male form associated with *smithii*, and the rather distinct worker and female linked with it otherwise, as in the Gourlay Collection. Because of the possibility that there exists a distinct species corresponding at least in part to Forel's *smithii*, I have listed that species separately below and continue to consider it apart from the *antarcticum* complex for the time being.

Thus, for the purposes of the present work, the taxonomic problem of the *antarcticum* complex is brought down primarily to the question of the relationship of the more northerly orange form *antarcticum* to the more southerly form *nitidum-integrum-suteri*, blackish in color. Here one realizes the value of studying separate characters separately—color apart from size, size apart from clypeus, clypeus apart from propodeum—for obviously, if there is only a single species involved here, these characters are to a large extent separate variates.

This study cannot decide the status of the various named forms; it can only narrow down the problems that need to be solved in order to decide this status for each form. The nomenclatorial scheme followed here should not be taken as a standard, but rather as a provisional guide to be tested thoroughly by much more field work and collecting. It may help to set the problems in general terms.

One source of possible error in the present scheme lies with the unknown proportion of collections that are mixed. In the New Zealand material I have studied, I have found a few obviously mixed series of superficially similar species—for instance, of the dark or "*nitidum*" form of *antarcticum* with *Huberia striata* of the same color. If such forms can be mixed in the same vial, it is obvious that more closely related species within the single genus *Monomorium* might be even more readily jumbled together during the course of a single day's collecting trip. Occasionally, vials will be labelled as from "two nests close together" or something of the sort. The chances of mixing are therefore relatively great, and it should be impressed upon future collectors that single nest series should be kept apart in their own vials, especially if the samples are apparently the same species or very similar. Even when this precaution is taken, the possibility exists that natural mixed nests may occur



through parasitism (temporary or permanent) of one form upon another, or through mutual adoption of foreign-species queens such as occurs in at least a few closely related Northern Hemisphere species of other genera. Collectors in New Zealand should be alert to the possibilities of mixed nests, and should learn how to recognize them in the field by studying the literature of Northern Hemisphere and Argentinian mixed colonies (various works by Wheeler, Kusnezov, and others in references too scattered to bring together here). *Monomorium* is one of the genera that has given rise to numerous parasitic forms in different parts of the world, and it may well have done so in New Zealand.

As seen from the present data, the light-colored series are mostly from the North Island, and the dark-colored ones mostly from the South Island. Several exceptions occur in both directions. We need to know more exactly the distribution of the color forms, and especially their frequency and ecological distribution in areas where they appear to occur together. With this is linked a more basic question: do the two extreme forms occur together anywhere without producing intergrades? Brief papers such as those of W. W. Smith (1896) suggest that indeed two or more distinct forms may occur together in areas such as parts of the Canterbury Plain without intergrading, but in these papers the facts are never stated explicitly enough or in convincingly quantitative form, so that a cabinet worker, as I am forced to be in the present instance, has no concrete signs to go on. Of course, it is possible, under the character displacement concept (Brown and Wilson, 1956) to have two good species occur together and be distinctly different at that place, while either (or both) converges at some places where one occurs alone. The data we have at present are totally inadequate to evaluate possible character displacement systems, if they should exist.

It is, as I hope I have made clear, too early to tell how many species—whether one, two, or several—the *M. antarcticum* group represents. If it should turn out that only one or two good species do exist in this complex, as seems to me nearest the truth at present, one is left with the question of why, in the dominant species-group of ants in New Zealand, adaptive radiation has not gone further at and above the species level, especially when compared with situations like that of the much smaller island of New Caledonia, which is rich in species of *Monomorium*.

The biology of the *M. antarcticum* complex as known is highly diversified. The nest is built in the soil or in rotten logs, and if in the ground, is often under a stone or log, but may be separately placed, with a crater entrance. These ants tolerate a wide variety of ecological situations, ranging from warmer forest in the north to cold bogs at higher altitudes in the south, and open pastures of all kinds throughout New Zealand at lower altitudes. Of course, it must be kept in mind that all records may not represent one species. The ants are general feeders, preying on small insects, scavenging, and tending homopterans; since related Australian and other species feed on plant tissues, especially seeds, similar habits must be suspected for this New Zealand group as well.

Of all the New Zealand ants, this appears to be the most important and the most interesting, taxonomically as well as biologically. It is hoped that it will be studied more widely and more intensively in the future.

I have summarized the biology of the ants from the papers of Moore (1938, 1940a), which will be useful works to future investigators. It is worthy of note that Moore

found that what he called *antarcticum* in mixed nests with "*nitidum*" on two occasions. Populations of this species occur in the Chatham and Kermadec Islands, apparently carried there by man.

#### ***Monomorium smithi* Forel**

*Monomorium Smithii* Forel, 1892 : 342, worker, female, male. Type loc. : Ashburton, New Zealand. Specimens presumed to be the syntypes are in the Forel Collection at Geneva, in the Canterbury Museum, and in MCZ. Only the MCZ specimens are labelled as types, so far as I am aware, but some MCZ examples labelled as types are from Palliser Bay (W. W. Smith) and may not have been in Forel's original series.

This small form has been discussed already under *M. antarcticum*, above. The worker is dull yellowish or yellowish-red, with the gaster often more or less infuscated; outstretched length varying from about 2 to about 3 mm. The appearance is pretty much that of the smallest *antarcticum*, although the reticulation on the sides of the posterior alitrunk is usually somewhat more distinct and widespread than in *antarcticum*. As already mentioned, the mandibles in all the specimens I have seen are 5-toothed, not 6-toothed. The specimens received from Canterbury Museum were badly damaged in the mail, but it is possible to get a good composite view because the specimens are broken in different ways.

The female varies from 4 to 5 mm. in length, according to Forel. Females in association with *smithi*-like workers that I have examined are between 5.0 and 5.5 mm. in outstretched length. The color to the naked eye is uniform dark brown, but under the microscope, the alitrunk appears somewhat lighter and more reddish than the gaster. A series from Nelson (E. S. Gourlay leg.) has female, males and workers definitely associated and agreeing well (except for the slight discrepancy in female size) with Forel's description of size, color and sculpture, so there seems to be no question of the yellowish worker belonging to the deep brown female. This color difference between castes runs against the usual tendency in the *antarcticum* complex, in which workers and females usually have the same ground color, at least, if they come from the same nest.

The male associated with workers in the Canterbury Museum Collection, and bearing Forel's identification label, is badly damaged, and now consists only of the alitrunk. However, this tagma is much smaller than in the usual males of *antarcticum*, measuring about 0.85 mm. (WL); the alitrunk of an "average" *antarcticum* is about 1.5 mm. long (WL). The alitrunk is also higher and wider relative to its length than is that of *antarcticum*. The Nelson series in the Gourlay Collection, mentioned above, also contains males, very small in size and compact in build, the alitrunks of which agree with the Canterbury Museum fragment. The Gourlay series thus contains all castes in good condition, and since it agrees well enough with Forel's description (allowing for the probable error in counting mandibular teeth) and with the presumed syntypes available, it may be taken as a digm set or starting point in further study of *M. smithi*. We need more collections in order to determine the degree to which the separatory characters remain constantly so.

Nothing much is known about the biology of this form. Dr. Woodward sent me a worker from under *Mesembryanthemum* growing on rocks by the sea at Fletcher's Bay, Cape Colville on the Coromandel Peninsula. Some of the specimens in the

MCZ bearing type labels are from Palliser Bay (W. W. Smith leg.). This is all we have at present. The possibility must be considered that *M. smithi* is an introduced species; although I do not know of any *Monomorium* from outside New Zealand that is exactly like it, the genus is so large, and the literature and collections so scattered, that some obscure Old World continental species might be synonymous without anyone's discovering the synonymy for years.

### ***Monomorium antipodum* Forel**

*Monomorium antipodum* Forel, 1901, Ann. Soc. Ent. Belg., 45:377, worker. Type loc.: Auckland. Types in Forel Coll., Geneva, not seen.

*Monomorium (Monomorium) antipodum*, Emery, 1922:171.

This very small (length usually under 2 mm.) *Monomorium* is distinguished by means of its 11-segmented antennae, each ending in a stout 3-segmented club. The mandibles are 4-toothed, and the entire insect is smooth and shining. The clypeus is bicarinate, but not bidentate. Color reddish-brown, with yellowish appendages. Female considerably larger than worker, with long and fairly robust alitrunk and gaster; wing stumps in the specimens I have seen indicate that the virgin females are often winged. The male of this species, although I have seen no specimens of this sex referable with certainty to *M. antipodum*, would undoubtedly have 13-segmented antennae, as in close relatives.

This species has been found several times in reasonably wild circumstances around Auckland since its original capture, but there is every reason to suspect that it is an historic introduction into New Zealand. *M. antipodum* does not belong to the *minutum* group, where Emery placed it in 1922; evidently, he overlooked the fact that it has only eleven antennal segments, a character that puts it in the group of *M. orientale* and *M. laeve*. The *orientale* group (=subgenus *Lampromyrmex*) is best developed in Australia, with a few forms in Asia and one or two extending into Africa. *M. laeve* and one or two other species occupy in Australia much the same ecological position as does the *minutum* group elsewhere in the Old World. *M. laeve* differs from *antipodum* and *orientale* in its more abundant and longer gular pilosity, in its less regularly rounded propodeal profile as seen in side view, and in its much larger propodeal spiracle. Only one sample from Australia—a small series of workers with a dealate female collected by myself at Kuranda, northern Queensland, from a polypore fungus in heavy rain forest—has workers resembling those of New Zealand *antipodum*, although here the queen of the colony is larger and darker in color than the queens of *antipodum* I have seen. Probably the Australian sample represents a different but closely related species.

*M. antipodum* is even more closely related to *M. orientale* itself, and I suspect that these two forms may really be synonymous. As will be seen below, *M. orientale* also occurs in New Zealand, and specifically in the Auckland area. All of the records are from houses, where the ants are generally taken from stored foodstuffs, such as sugary or greasy items. *M. orientale* is very like *antipodum*, and the only real difference I have been able to credit (without sufficient good material for mass comparisons of all castes) is the darker color of the *antipodum* workers. The *orientale* workers are sordid yellow in color, and the step to the reddish-brown of *antipodum* is only a slight one. It may even be that color depth is only a phenotypic difference

controlled by the humidity or temperature of the nest habitat. It may be that *antipodum* workers average slightly larger than those of *orientale*, and there may be a very slight difference in the shape of the petiolar node, but both of these characters are difficult to judge from such a small amount of material as I now have. While I feel that *antipodum* is introduced, and that it may well be a synonym of *orientale* or some other member of the *orientale* group, I have retained the name because the taxonomy of the group is so poorly worked out.

#### **Monomorium orientale** Mayr

*Monomorium orientale* Mayr, 1878, Verh. Zool.-bot. Ges. Wien, 28:670, worker.

Type loc.: Calcutta, India. Type in Naturhistorisches Museum, Vienna.

This is the tiny yellow household pest of the Auckland area, discussed above under *M. antipodum*. As will be seen there, the distinction between these forms is very unsatisfactory, and probably will remain so until a thorough-going revision of the *orientale* group is forthcoming. At present, I have only a very few representatives of the *orientale* complex except for the Australian species, which appear to be sufficiently distinct. The *orientale*-like forms I have seen from East Africa, India and the Philippines are so much alike that they could belong to one species. Without sufficient material, including at least the females, it is impossible to do anything to straighten out this group, so for the time being, even the determination of the New Zealand indoor form as *M. orientale* proper must remain tentative.

#### **Monomorium pharaonis** (Linnaeus)

The well known Pharaoh's ant is small and yellowish, but still a little larger than *M. orientale*. It has the worker alitrunk finely reticulate and opaque, and the antennae are 12-segmented. The two New Zealand records, from Auckland and Wellington, are both from indoors. This species lives outdoors usually only in tropical conditions, but it is worldwide as a house ant. It is a minor pest in kitchens and pantries, where it steals sugary and fatty foods.

#### **Genus Orectognathus** Fr. Smith

*Orectognathus* Fr. Smith, 1853, Trans. Ent. Soc. London, (2) 2:228. Type:

*Orectognathus antennatus* Fr. Smith, 1853, monobasic.

The characterization of *O. antennatus* below covers most of the generic characters. The revision of Brown, 1953, *loc. cit. infra.*, and the supplement of Brown, 1958, *Psyche*, 64:17-29, cover the general information and list the species of the genus with descriptions and figures. The genus includes eleven species, chiefly from eastern Australia, but also from outlying areas in New Guinea, New Caledonia and Lord Howe Island in addition to New Zealand.

#### **Orectognathus antennatus** Fr. Smith

*Orectognathus antennatus* Fr. Smith, 1853, Trans. Ent. Soc. London, (2) 2:228, pl. 21, fig. 9, worker. Type loc.: Auckland, New Zealand.

*Orectognathus antennatus*, Brown, 1953, Mem. Queensland Mus., 13: 99-100, worker, female, male; synonymy of var. *septentrionalis* Forel, records from vic. Auckland, N. Z., and from New South Wales and Victoria in Australia.

Worker: Total outstretched length ranging from about 5 to 6.7 mm.; New Zealand workers are usually among the largest. In general head shape, this species resembles somewhat *Strumigenys perplexa* (Figure 6), but is much larger, has large, dorsolaterally placed eyes, and relatively longer, straighter mandibles that are situated close together and have three strong apical teeth and a low, rounded preapical flange on the inner margin. The alitrunk is slender, but is armed with a pair of humeral teeth, two pairs of mesonotal tubercles, and a pair of slender propodeal teeth or spines. The pronotum is somewhat depressed and is laterally marginate. The petiole is subclavate, with a very slender peduncle and a low, rounded node, bearing at its summit a pair of more or less distinct vestiges of teeth or denticles. The postpetiole is short and bun-shaped, rounded above, and the gaster is relatively small and broadly oval. The antennae are remarkable in that they consist of only 5 segments each; the second funicular segment is very long and slender. There are no spongiform appendages, as in *Strumigenys*. The integument is more or less shining, with remnants of coarse foveolation occurring on parts of the head and alitrunk. Pilosity virtually obsolete; color yellowish-ferruginous, with the gaster sometimes lightly infuscated in the middle.

The female is slightly larger than the worker, has larger eyes and the normal female development of the thoracic flight sclerites; wings are borne by the virgin females, and are lost in the usual fashion after nuptial flight.

The male is very different from the worker-female castes; it is in fact a rather ordinary-appearing myrmicine male of slender build, with 13-segmented antennae, black in general color.

As I stated in my 1953 revision of *Orectognathus*, it seems very likely that *Orectognathus antennatus* was originally introduced by man into New Zealand from New South Wales. Even now, the species is very restricted in distribution, having been found only in and around Auckland. In Australia, *antennatus* is found only in wet forest in Victoria and New South Wales, where nests have been found in and under rotten logs. Apparently, judging from the relative numbers of collections available, it is much more common around Auckland than it is at any of the known Australian sites; this is a common sort of pattern for introduced ant species to show. The nests are small in size, and the colonies not populous; probably two dozen workers and one queen would be the average. The habits of *antennatus* are not directly known, but judging from the related species *O. clarki* of Australia, this ant may be supposed to hunt living Collembola (and other small arthropods?) mostly aboveground, and possibly mostly at night. The obsolescence of smaller elements of the armament of the alitrunk, head and petiole, when compared with that of some other, better-armed and known subarborally-foraging species of the genus in Australia, suggests that *antennatus* may not forage so much on trees and shrubs; however, the very closely related *O. sarasini* Emery of New Caledonia (which may not even really be specifically distinct) has been found foraging on tree trunks at night.

This species should not be difficult to keep alive in a small, glass-topped plaster nest, and its slow-motion pace would make it easy to observe. We need much more information about the feeding and other habits of *Orectognathus*, and residents of the Auckland area are in a good position to furnish this.

A related species, *O. howensis* Wheeler, has been described from Lord Howe

Island. Unfortunately, the unique worker upon which the description was based, now in the South Australian Museum, has lost its head. The only really diagnostic character of this island form is its somewhat angulate or low toothlike preapical flange of the inner mandibular border (as figured and described by Wheeler); otherwise, the characters seem to be those of *antennatus*. The difference is difficult to assess in the absence of further material.

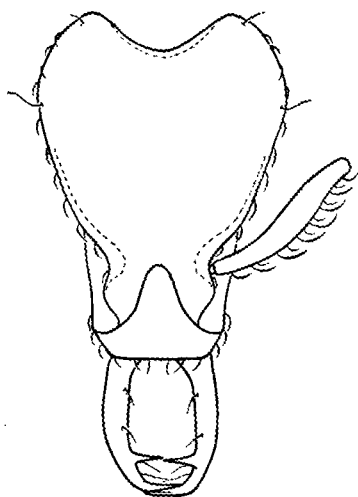


Fig. 6. *Strumigenys perplexa* (Fr. Smith), worker, dorsal view of head and mandibles, with one antennal scape only. Specimen from Lake St. Clair, Tasmania. Drawn by Nancy Buffler.

near Mercury Bay, New Zealand.

*Strumigenys antarctica* Forel, 1892:338, worker. Type loc.: Drury, Auckland, New Zealand. Synonymy by Emery, 1922:321.

*Strumigenys perplexa*, Emery, 1897, Term. Füzetek, 20:575, pl. 14, fig. 14, worker.

*Strumigenys Leae* Forel, 1913:182, worker, female. Type loc.: "Tasmanie." New synonymy.

*Strumigenys leae*, Wheeler, 1927:146, fig. 8, worker. Records from Lord Howe I. and Norfolk I.

Worker: Full outstretched length with closed mandibles 2.2-2.7 mm. Head and mandibles shown in Figure 6. This species belongs to the *S. godeffroyi* group, the dominant branch of the genus in the Indo-Australian and Pacific areas. *S. perplexa* is distinguished from the other members of the group by means of its few pairs of stiffly erect, slender, truncate hairs, ranked along the dorsolateral borders of the alitrunk, and by the toothed propodeal lamellae without appreciable development of spongiform tissue on their lateral faces. Spongiform appendages are present on

### Genus *Strumigenys* Fr. Smith

*Strumigenys* Fr. Smith, 1860, Jour. Ent., 1:72. Type: *Strumigenys mandibularis* Fr. Smith, 1860, monobasic.

The essential features of this genus are given in the key, in the characterization of *S. perplexa* below, and in Fig. 6. The ants are small to minute in size and have peculiar adaptations of mandibles, antennae and head form, among other things, fitting the ants as trap-jaw predators of small arthropods, among which certain collembolan families appear to be the preferred prey.

The genus probably has 200 species, many of which remain undescribed; the Indo-Australian-Pacific fauna of *Strumigenys* has more than 70 species that I have seen, described and undescribed. Another strong fauna exists in the New World tropics, and a more modest one in Africa.

### *Strumigenys perplexa* (Fr. Smith)

*Orectognathus perplexus* Fr. Smith, 1876a:491, worker, female. Type loc.: Tairua,

petiole and postpetiole, including the posterior parts of the sides of the former, despite Wheeler's statement that lateral petiolar masses are absent in the *perplexa* of New Zealand. These masses are diagnostic of the genus *Strumigenys*, and with the head shape and small size, they will serve as recognition characters for this species in New Zealand.

*S. perplexa* has been taken at a number of places widely scattered over the North Island, and I have numerous series from southeastern and southwestern Australia, where the species is fairly common in a variety of woodland types, ranging from wet fern gullies in Victoria and Tasmania to rather dry gum forest in South Australian uplands. Its presence on Lord Howe and Norfolk Islands indicates that the species was probably introduced into New Zealand from Australia within historical times. The nests are very small in size, often occupying no more than a cubic centimeter in space, and containing 40 to about 200 workers in "mature" colonies, with 1 to 5 or even more dealate females in each. Winged forms in Australia are produced and fly during the height of the summer season.

Observations on feeding habits of this species made in Australia showed that it fed chiefly, perhaps exclusively, on entomobryoid, isotomoid and sminthurid Collembola. In the artificial nest, *S. perplexa* was very efficient at catching the springtails in its spring-trap mandibles; most springtails were quickly stung by the ants into immobility. *S. perplexa* is very easy to keep alive in a small artificial nest of plaster with a glass top, and is a fascinating subject for observation. In the field, workers alone or in the nest are very difficult to detect because of their dull brownish-red integument, slow-motion gait, and their habit of feigning death. Nests are situated in rotten wood, in small rotting seeds or twigs, or directly in the superficial soil layers, with or without a rock for cover—at least, this is the case in Australia. On one occasion, foraging workers were taken in a garden of the inner suburbs of Melbourne, a site that suggests strongly the probable mode of transport to New Zealand.

#### Subfamily Dolichoderinae

Ants of diverse size and shape, but mostly small to medium and rather simple in form. Compound eyes always well developed, ocelli present usually only in female and male; antennae 12-segmented in worker and female, 13-segmented in male. Alitrunk usually clearly separated into pronotum, mesonotum and propodeum. Node a simple erect or reclinate scale, often much reduced and partly or wholly covered by the anteriorly-expanded gaster. Apex of gaster without a conical poison-spray nozzle having a circular orifice; cloacal orifice slit-shaped, this in workers and females, of course. In many of the genera, the workers have a strong odor called the *Tapinoma*-odor, resembling to various degrees rotting coconuts, which they emit when disturbed or handled in strong amounts. Proventriculus very diverse, almost every genus having a different structural type (Eisner, 1957).

This subfamily is now best represented and most dominant in the Indo-Australian and Neotropical Regions, and is poorly developed in the Ethiopian Region and the Holarctic, although it was dominant in North America and Europe, at least, during mid-Tertiary times. Indications are that the dolichoderines are retreating toward the zoogeographically peripheral areas under competitive pressure from myrmicine genera, particularly *Crematogaster*.

### Genus *Iridomyrmex* Mayr

*Iridomyrmex* Mayr, 1862, Verh. Zool.-bot. Ges. Wien, 12:702. Type: *Formica detecta* Fr. Smith, 1858 = *Formica purpurea* Fr. Smith, by designation of Bingham, 1903.

This genus consists of twenty or more valid species distributed in the Indo-Australian area, most of them occurring in Australia. The New World species formerly placed in the genus apparently do not belong there. The workers vary according to species in size, color and proportions, but there are no startling departures from the unadorned basic form of the body. The color is often overlain with more or less distinct metallescence.

In Australia, *Iridomyrmex* may be said to be the dominant genus of ants, at least in the southern half of the country, but it apparently did not occur in New Zealand before man brought it.

The species mostly form very populous nests, and the workers are aggressive and often forage in files or along definite trails. All or most species tend homopterans, and some of them are so fond of the flesh of vertebrates that the Australians call them "meat ants."

Ants of the genus *Iridomyrmex* were among the dominants in the Baltic Amber of Oligocene Europe, but the genus does not now occur west of India.

### *Iridomyrmex glaber* (Mayr)

*Hypoclinea glabra* Mayr, 1862, Verh. Zool.-bot. Ges. Wien, 12:705, worker, male.

Type loc.: Sydney, New South Wales, Australia. Types in Naturhistorisches Museum, Vienna; not seen.

Worker: This ant is small (2 to 2.5 mm. long) and black or brown in color, the gaster often with a purple or blue metallescence. The legs, mandibles and antennae vary from brown to sordid yellow. The species is easily recognized in this caste by means of the angulate propodeum and the thin, erect, scale-like node of the petiole.

Female: Much larger and more bulky than the worker, with a more or less parallel-sided, elongate gaster; the color is black or nearly so.

Male: Nearer the size of the worker, slender, dark in color.

*I. glaber* is the commonest and most widespread species of a small group, all distinguished from other *Iridomyrmex* by their angulate propodeum and by their general size and habitus. A number of these forms appear to be only a part of the geographical variation of *I. glaber*; for instance, *I. punctatissimus* Emery (temperate Australia), *I. itoi* Forel (Japan), and *I. sororis* Mann (Fiji), all seem to grade into the "typical" *glaber*, to say nothing of the various infraspecific forms that have been assigned to *I. glaber* itself. The more peripheral populations tend to have more opaque sculpture. The New Zealand samples, which appear to represent one or more established introductions from eastern Australia, are approximately "typical" of *I. glaber*.

In Australia, *I. glaber* usually lives in open or savannah woodland areas, where it nests under stones, in old, dry logs, in hollow trees, and so on. It is often found in gardens and similar domestic situations, where it may be conspicuous because of



the files it forms on tree trunks, the workers ascending and descending in their search for honeydew and small insects.

In New Zealand, *I. glaber* does not seem to be very common at present. Two or three lots have been seen from Auckland and suburbs, and the species may well occur in other cities. No samples have been received from wild areas of the country. Since this ant attends homopterans and is at home in domestic environments, it should be regarded as a potential pest.

The Plant Diseases Division of the DSIR has intercepted samples of *Iridomyrmex rufoniger* (Lowne) on hardwood poles from Australia (determined by J. Clark), and there is hardly any doubt that other species of the dominant Australian *Iridomyrmex* fauna reach New Zealand by way of commerce from time to time, although there is no evidence that any of these have been established. All *Iridomyrmex* species, however, must be regarded as potentially dangerous. The famous Argentine ant, called *Iridomyrmex humilis* Mayr, differs from the true (Indo-Australian) *Iridomyrmex* by important internal characters, and probably belongs to another, exclusively American genus. It has not yet invaded New Zealand, but since it is essentially a warm temperate ant, it should be guarded against, particularly in the Auckland area.

### Genus *Technomyrmex* Mayr

*Technomyrmex* Mayr, 1872, Ann. Mus. Civ. Stor. Nat. Genova, 2:147. Type:

*Technomyrmex strenuus* Mayr, 1872, by designation of Bingham, 1903.

Although the characteristics of this genus are given below in the description of *T. albipes*, as well as in the key for the same species, the best generic character is to be found in the shape of the proventriculus and the reticulate pattern of its cupolar face (Eisner, 1957).

The prior name *T. detorquens* (Walker) has been used for *T. albipes* (below) by Donisthorpe and occasionally of late by a few other authors, although *albipes* is by far the more familiar name, and the only one used over many years for this species, excepting the color varieties. In 1950, the late Mr. John Clark told me that he had learned that the type of Walker's *detorquens* was a badly damaged female specimen, the identity of which could not certainly be made out. In view of the doubts, I feel that it is best to retain the name *albipes* until a thorough study can be made of the whole situation involving these two species.

*Technomyrmex* includes perhaps 15 or 20 good species, restricted to the warmer parts of the Old World, except for *T. albipes*, a wide-ranging tramp spreading through human commerce. The genus was definitely present in the Miocene Amber of Sicily, but not in the Oligocene Baltic Amber. It is presently most successful in the Indomalayan area, and less so in Africa and eastern Australia.

There is supposed to occur a wingless male ergatoid form, but this requires confirmation through further study.

### *Technomyrmex albipes* (Fr. Smith)

*Formica* (*Tapinoma*) *albipes* Fr. Smith, 1861, Jour. Proc. Linn. Soc. London, Zool., 6; 38, worker. Type loc.: Tondano, Celebes. Type in Hope Department of Entomology, Oxford University Museum; not seen, but checked by Donisthorpe, 1932, Ann. Mag. Nat. Hist. (10) 10:465.

Worker 3.0-3.4 mm. in total outstretched length; female averaging about 3.8 mm. Color black or dark fuscous, with pale ivory tarsi and light brownish appendages otherwise. Mandibles triangular, with long masticatory border set with numerous fine, regular denticulae (all castes, including males). Metanotal groove deeply impressed; propodeum short, obliquely truncate behind. Petiolar node flattened and forming a horizontal scale, overhung by the anterior extension of the gaster in such a way as to make it appear that the alitrunk and gaster are articulated directly, without an intervening petiole.

There are a few fine, erect hairs scattered over the body and there is a fine appressed ashy pubescence over the body, especially dense on the gaster. Integument densely, finely and superficially punctulate, opaque over head and alitrunk, but weakly shining through the pubescence over the gastric dorsum.

Male black; characterized in key.

This species is widely distributed in southeastern Asia and through the Pacific, especially around works of man. It undoubtedly has been introduced into New Zealand in historical times, and is still largely confined to urban areas in the North Island and around Nelson in the South Island. It forms long foraging files and can become a serious pest both indoors and in gardens and orchards.

#### Subfamily Formicinae

Ants of a wide range of shapes and sizes and adaptive types. Compound eyes present in workers, poorly to well developed. In workers and females, antennal segmentation varies widely with genus and species, but most genera have 12-segmented antennae, with 13 segments in the male. The waist has a single segment, often reduced to an erect scale, and the first gastric segment (abdominal III) is not constricted off from the succeeding segment. The gastric apex bears a small poison-ejecting nozzle, in many genera tipped with a small brush or funnel of guard hairs, that has been confused with the cloacal orifice in most classifications of ants and subfamily keys. The orifice of this nozzle is terminal and round. In many genera of formicines, the workers have persistent ocelli present on the vertex. Internally, the formicines differ widely from the externally similar dolichoderines in structure of the proventriculus (Eisner, 1957) and in structure and function of the poison apparatus, which produces, stores, and ejects a spray of formic acid utilized in defense.

The males differ from their opposite sex in much the same way that the males of the other subfamilies differ from their workers and females. The Formicinae include a large number of genera and species and are virtually worldwide in distribution.

#### *Prolasius* Forel

*Melophorus* subgenus *Prolasius* Forel, 1892: 332. Type: *Melophorus* (*Prolasius*) *advena* = *Formica advena* Fr. Smith, 1862, monobasic.

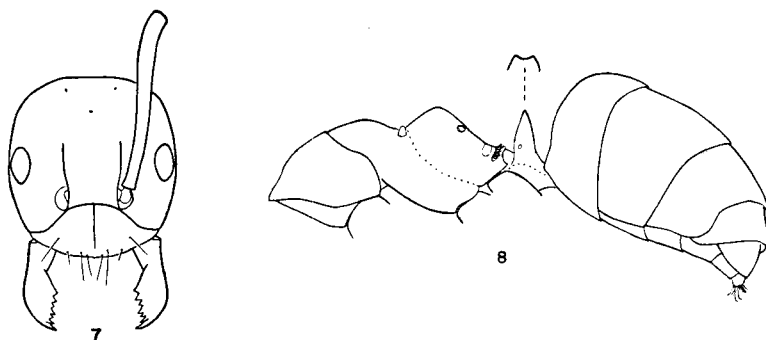
*Prolasius*, McAreavey, 1947, Mem. Nat. Mus. Vict., Melbourne, 15: 7-27; review of known species.

*Prolasius* Brown, 1955, Bull. Mus. Comp. Zool., 113: 473; diagnosis.

The species of this genus are entirely confined to Australia and New Zealand, where they inhabit chiefly the moist timbered areas. In life form and habits they

resemble the species of *Lasius* and *Prenolepis* of the Northern Hemisphere in a general way. The workers are small and plain, with short alitrunk divided into two portions at a deeply impressed metanotal groove. The head is ovoid to subquadrate, and workers as well as females normally have ocelli developed in some form. The antennae are 12-segmented, with slender scapes, and the eyes are medium to large in size.

For purposes of distinguishing the New Zealand species from other native or established introduced ants, the key characters will serve well. However, there are still some difficulties to be encountered in characterizing the genus in distinction from the world fauna of subfamily Formicinae. *Prolasius* has the "short" or asepalous type of proventriculus.



Figs. 7 and 8. *Prolasius advena* (Fr. Smith), worker from Nelson, N. Z. Fig. 7, dorsal view of head, funiculus lacking. Fig. 8, side view of alitrunk, petiole and gaster, with front view profile of petiolar node summit shown in inset. Drawings by Nancy Buffler.

### ***Prolasius advena* (Fr. Smith)**

*Formica advena* Fr. Smith, 1862, Trans. Ent. Soc. London, p. 53, worker, female.

Type loc.: "New Zealand." Types in British Museum (Natural History), not seen.

*Formica Zealandica* Fr. Smith, 1878, Trans. Ent. Soc. London, p. 6, female. Type loc.: (by inference from subtitle, *op. cit.*, p. 1) Otago, New Zealand. Type in British Museum (Natural History), not seen. *New synonymy*.

*Prolasius advena* + *Prolasius zealandica*, McAreavey, 1947, Mem. Nat. Mus. Vict., Melbourne, 15: 12, 14, Pl. 1, figs. 1-3, worker, female, male. See for further references and synonymy.

*Prolasius advena* var. *zealandica*, Wheeler, 1935: 37.

Worker: 2.9-3.5 mm. approximate outstretched length, including mandibles. Color very variable; yellowish ferruginous to dark brown, the gaster, and sometimes the head, darker than the alitrunk. Many of the specimens available are, however, obviously faded after death. The female is larger, 4.5 to nearly 6 mm. in total length, and is usually darker in color than the corresponding workers; the darkest specimens

are piceous, sometimes nearly black. The female is winged as a virgin, and has the bulky alitrunk and gaster of a normally claustral nest-founding formicine. The "cinereous" pubescence mentioned in Smith's description of *F. zealandica* is usually quite distinct. The clypeus of the worker and female normally has a weak longitudinal carina, but this varies a good deal; apparently McAreavey merely missed the carina in some of the specimens in which it was unusually feeble, and thus came to believe that two species could be separated among his New Zealand material. The abundant series (about 40 nest series represented) I now have from New Zealand appear to me to belong to one species, but of course this judgement might easily be turned aside by new evidence gained through field studies.

The male is a little shorter than workers from the same nest, and more slender, with the usual small head and large eyes, and is yellowish-brown in color.

*Prolasius advena* is widespread in both Islands of New Zealand, where it nests primarily in bush country, judging from the few notes I have. Nests are built in the soil or in rotten wood. Judging from the close morphological resemblance of this species to its relatives of eastern Australia and Tasmania, the habits are probably similar in both countries. I should expect that the workers tend plant lice, including subterranean types, and that they are general predators and scavengers of small arthropods on the ground and in foliage above the ground. The winged forms fly out in the midsummer months. The colonies are often populous.

It is difficult to compare this species with any of the Australian species, because the latter badly need revision. However, I have compared *advena* with samples of what I believe are all the valid Australian forms (except one aberrant Queensland species), and it does not agree exactly enough with any of them to be the same species.

### Genus *Camponotus* Mayr

*Camponotus* Mayr, 1861, Europ. Formic., p. 35. Type: *Formica ligniperda* Latreille, 1802, by designation of Bingham, 1903.

This enormous genus probably contains at least 2,000 species, well over half of which are already described. The genus is practically worldwide in distribution. The species live in the soil, in wood, or in various plant cavities for the most part. The characters are given in the keys.

Aside from the species listed below as having been intercepted from foreign shipments of timber, nursery stock, and the like, there is one form that may be native to New Zealand. This species is *Camponotus (Colobopsis) newzealandicus* Donisthorpe (see below), about which so little is known that it must be regarded as a doubtful member of the New Zealand fauna. The subgenus *Colobopsis* includes many of the species of *Camponotus* in which the largest soldier forms have plug-shaped heads, used to block the nest entrance as a kind of door. *Colobopsis* extends to some species that do not seem to fit comfortably in this group, so that it is hard to tell at present just how natural a group the subgenus is. It is not impossible that *Colobopsis*, once its limits are properly determined, will prove to constitute a separate genus. For this reason, I have continued to use the formal generic-subgeneric designation, even though I do not approve of the use of formal subgenera in a general way.

**Camponotus (Colobopsis) newzealandicus** Donisthorpe

*Camponotus (Colobopsis) newzealandicus* Donisthorpe, 1940, Ann. Mag. Nat. Hist. (11) 5:47, female. Type loc.: "New Zealand (ex Coll. Cameron)." Type in British Museum (Natural History), not seen.

Donisthorpe's description of the unique dealate female type gives the length as 5.8 mm., and the color as brown, with the anterior part of the head reddish-yellow, scapes and legs dirty yellow; margins of scutellum, insertions of wings, posterior borders of gastric segments very narrowly, apex of second segment broadly, yellow. The head is abruptly truncate and "almost completely margined," characters that should permit easy identification of a *Colobopsis* on New Zealand. No ant following this exact description has ever been taken again in New Zealand, and in view of the vague locality data, I think the locality should be considered questionable. The specimen could, of course, have been taken from timber introduced into New Zealand from abroad.

I should be inclined to dismiss the *newzealandicus* record more quickly were it not that there exists a second collection said to be from New Zealand. This collection consisted of at least two workers or soldiers bearing a printed label as having come from a definite locality in or near Wellington, New Zealand. I myself recall having seen the specimens in the Museum of Comparative Zoology, but they have become misplaced during subsequent rearrangement of the ant collections. As I remember them, they were small, black or blackish ants, similar to but probably distinct from the common Australian species *C. (Colobopsis) gasseri* Forel. I can say no more than this without seeing the specimens once again. Since Wheeler himself was the stated collector on the printed label, this sample must be taken seriously, although it could still represent an error in labeling (of which the MCZ ant collections certainly contain their share). Wheeler evidently intended to describe this find, for he gave a name ("*tane*" Wheeler, 1935:43) that is repeated on the ms. label with the specimens. This name is, and should continue to be regarded as, a *nomen nudum*, at least until someone finds and describes specimens under circumstances in which no doubts can be entertained about the taxonomic status or type locality.

Meanwhile, we do not know whether Wheeler's species is the worker of *newzealandicus*, or whether one or both of the forms, if there are two species, actually exist in New Zealand. Active search should be made for them.

The species of *Colobopsis* mostly live in hollow twigs, small dead branches on the tree or on the ground, hollow galls, nuts, and sedges, etc. The common and widespread black Australian species *gasseri* is partial to forest areas, wet or dry, and it commonly nests in fence posts, wooden trellises, and similar places in gardens in large cities such as Melbourne. In such circumstances, one would expect that *C. gasseri* might easily have been transported to New Zealand; there appear to be no climatic barriers against its establishment, at least in parts of the North Island.

*Colobopsis* species, if they occur in New Zealand, may be expected to be found arboreal or semiarboreal foragers and tenders of plant lice. Some species of other countries forage mostly at night.

**Genus Paratrechina** Motschoulsky

*Paratrechina* Motschoulsky, 1863, Bull. Soc. Nat. Moscou, 36:13. Type: *Paratre-*

*china currens* Motschoulsky = *Formica longicornis* Latreille, 1802; designated by Wheeler, 1911.

*Paratrechina*, Emery (with subgenus *Nylanderia* Emery), 1925, Gen. Insect., 183: 216-223.

The worker and female resemble in general those of *Prolasius*, but the internal structures are different. The proventriculus is of the sepalous type. The body is well provided with long, heavy, more or less erect pointed bristles, the largest of which are usually paired in definite positions on the alitrunk. The colors are usually brownish, but some species are yellow or blackish.

The males are smaller than the females; the mandible is toothless, with acute apex. Pygostyles absent. Genitalia complex and varying widely with the species, especially the parameres and volsellae.

The taxonomy of this widespread and common genus of rather small, drab ants is currently rather chaotic. The male genitalia furnish good species characters, and males are known for many of the species, but in other cases they have not been correlated with the workers. Many of the species appear to have been widely carried about by commerce, so that the same species has often been described over and over again as found at different localities. The identification of the oceanic species, including *P. vaga*, is and will continue to be uncertain until the genus is revised from the world point of view. Most species are soil nesters, though a few reside in epiphytes or plant cavities, rotten wood, or the like. The nests generally have small to medium populations, and the workers tend plant lice. In some parts of the world, *Paratrechina* species are agricultural pests. The three or four subgenera into which *Paratrechina* is customarily divided are doubtful, and their status will only be decided after a world revision of the genus.

#### ***Paratrechina vaga* Forel**

*Prenolepis obscura* st. *vaga* Forel, 1901, Mitt. Zool. Mus. Berlin, 2:26, worker.

Type loc.: Ralum, Bismarck Archipelago. Types in Zoologisches Museum, Berlin; Forel Coll., Geneva.

*Paratrechina* (*Nylanderia*) *vaga*, Emery, 1925, Gen. Insect., 183:221.

This little brown species appears to be introduced. It is known from the suburbs of Auckland, where it has been found attending aphids on shrubbery. It has been recorded from widely scattered parts of Melanesia and remote Pacific islands (to Juan Fernandez). There are specimens in the Museum of Comparative Zoology at Harvard collected by Wheeler and myself at Kuranda and Cairns in northern Queensland.

I do not know how Emery and Wheeler established the identity of the specimens in their collections with *vaga*, especially since the only male taken with the *vaga* type workers was stated by Forel to be a callow unfit for description. The *obscura* "races" described by Forel on the same page with *vaga* (*bismarckensis* and *papuana*) seem from the descriptions to be very close, and this entire complex obviously needs revision. The name *vaga* must be regarded as applicable only tentatively, following general custom for the present.

*P. obscura* Mayr has also been recorded from shipments entering New Zealand; this southern Australian species does not appear to have become established in New

Zealand, but may do so at any time. The males of *obscura* have the exposed apices of the volsellae yellow and bluntly rounded; the parameres are deeply emarginate between the two acute external angles.

### Additional Species Intercepted at New Zealand Ports

A number of species, not known to have been established in New Zealand, has been taken aboard ships, or on imported materials such as hardwood poles or other timber. Most interceptions have been those of New Zealand Department of Agriculture inspectors. For the convenience of the port inspectors, those species that have been intercepted, but not mentioned under their respective generic headings in the text above, are listed below with appropriate comments. Species listed as "not seen" are included only on the strength of reports (in litt.) of determinations of port-collected samples determined by Mr. John Clark of Melbourne, Australia, or other specialists.

#### Subfamily Ponerinae

**Rhytidoponera victoriae** Andre. A small, blackish or brownish stinging ant, common in the moist forests of eastern Australia, where it nests in the soil or in rotten wood. It is also successful in gardens in cities such as Melbourne, so should be watched for in imported nursery stocks. Not seen.

**Rhytidoponera aspera** (Roger). A beautiful, medium-sized purplish-green species with red appendages, from wooded areas in southeastern Australia, where it is uncommon. Its habit of foraging on the trunks of trees is consistent with its interception on hardwood poles originating in Australia.

**Platythyrea australis** Forel. This species from eastern Australia is known under two or three synonymous names. It is closely related to the Indo-Melanesian *P. parallela* (Fr. Smith), of which it possibly is a mere geographical variant. From imported hardwood poles; not seen.

**Ponera ergatandria** Forel. A small, slender, usually yellowish species with a tropicopolitan distribution. It resembles closely, and may be synonymous with, other *Ponera* species— particularly *P. gleadowi* Forel. Not seen.

#### Subfamily Myrmicinae

**Lordomyrma stigmatica** Emery, new combination *pro* *Rogeria stigmatica* Emery. All of the *Rogeria* described from the Oriental-Pacific area appear to fit well in *Lordomyrma*, and not in the strictly New World assemblage that constitutes the true *Rogeria*. The New Zealand sample was determined by Clark as var. *sublevinodis*, a slight variant that is probably not worth nomenclatorial recognition. Somewhat similar to *Huberia*, but with 12 segments in the antennae. *L. stigmatica* is Melanesian in origin.

**Pheidole megacephala** (Fabricius). This and the other three species of *Pheidole* listed are small forms with a dimorphic worker caste, consisting of large-headed soldiers and smaller, more normal workers. The genus is widespread in warm and temperate countries, and the various species tend homopterans, harvest seeds, and prey on various arthropods. Some species, among them *P. megacephala*, are important pests in some parts of the world. *P. megacephala* is tropicopolitan, but African in origin.

**Pheidole javana** Mayr. This species, which has the head more extensively costulate behind than does *P. megacephala*, has been introduced secondarily from Fiji and perhaps other Pacific islands. Its original home is the Indo-Malayan area.

**Pheidole variabilis** Mayr. An Australian species which, as its name implies, is extremely variable in characters of sculpture, color and certain proportions. The systematics of this form must be regarded as unsettled, and the determination tentative.

**Pheidole umbonata** Mayr. A small, yellowish species widespread in littoral Melanesia. Not seen.

**Crematogaster laeviceps** (Fr. Smith). From Australia. The species of *Crematogaster* are many, and the genus widespread over the earth. In the worker, the gaster is triangular or cordate, and is attached anterodorsally to the postpetiole, so as to be capable of being raised aloft in wielding the weak, often spatulate sting. The sting is designed to hold and apply to the bodies of assailants an accumulation of secreted toxic fluid. The ants are fond of honeydew, and tend to form files leading to source trees or shrubs. Nests are often built in plant cavities or rotting logs. Not seen.

**Dacryon** sp. A specimen intercepted at Auckland on poles from Australia was determined as *D. ferruginea* Clark by Clark himself, but does not compare well with types and other material of *D. ferruginea* in the Museum of Comparative Zoology. For the moment, I cannot place this specimen to any species of *Dacryon* among those already described.

**Monomorium latinode** Mayr. This species was listed by the Department of Agriculture with a query, probably referring to a doubtful determination. It is a rather ordinary smallish brown species, widespread and common in the Indomalayan area, where it is frequently found in plantations and gardens. Not seen.

**Monomorium rubrum** Forel. Originally described as a variety of the similar species *M. rubriceps* Mayr, this species is widespread and locally common in southeastern Australia. Nests are often made under the loose bark of eucalypts in the moister woodlands. *M. cinctum* Wheeler, also from southeastern Australia, appears to be just about identical to *rubrum*; specimens comparing well with *M. cinctum* types were found nesting in the soil under volcanic rocks in the Lake Purrumbete area, near Camperdown, Victoria, Australia, in this case living as seed harvesters. New Zealand samples not seen; probably intercepted on imported poles.

#### Subfamily Dolichoderinae

**Leptomyrmex cnemidatus** Wheeler. This rather large, exceedingly slender and long-legged ant runs rapidly, with its gaster cocked up over the alitrunk, so that it looks like a small, orange-and-black spider when foraging. This particular species of the Australo-Papuan genus *Leptomyrmex* is fairly common in parts of eastern New South Wales and southeastern Queensland, usually in or near moist subtropical forest. Not seen.

#### Subfamily Formicinae

**Camponotus aeneopilosus** Mayr. A small-to-medium-sized species from eastern Australia, where it nests in hollow trunks of standing trees, and sometimes also in the ground. Its color is black, with pale golden gastric pubescence.



**Camponotus irritans** (Fr. Smith). This species is medium in size, brown in color, with the alitrunk usually a lighter tan, although color, as well as sculpture and pilosity, are highly variable. *C. irritans* has been divided into a number of infraspecific forms (varieties and subspecies), all of which are dubious and require investigation. Some of these have been confused with other related species. *C. irritans* is Idomalayan in distribution. It lives in wood, at least partly, and it has been taken from lumber and crates at New Zealand ports.

**Camponotus pennsylvanicus** (De Geer). This is the common black carpenter ant of temperate eastern North America. It is large, and has coarse but sparse yellowish pubescence on the gaster. This species nests in standing living or dead timber, and in the beams and walls of wooden houses and other structures. It is in some areas of the United States considered a pest.

**Polyrhachis (Hedomyrma) erato** Forel. This and the following species belong to a section of *Polyrhachis* distinguished by its convex alitrunk and paired spines on the humeri, propodeum and petiole. *P. erato* comes from tropical Australia. Not seen.

**Polyrhachis (Hedomyrma) rufifemur** Forel. This New South Wales form was originally described as a variety, but it should be reckoned as a distinct species until the Australian *Hedomyrma* can be properly revised.

**Plagiolepis alluaudi** Emery. This minute yellow or yellow-and-brown species may have originated in East Africa or tropical Asia. It is now widespread in the tropics as a tramp, particularly on the shores and islands of the tropical Pacific and Indian Oceans. Several color variants have received names, and at least two species names—*P. augusti* Emery (*nom. pro foreli* Mann, *nec* Santschi) and *P. mactavishi* Wheeler—are straight synonyms, judging from their types in the Museum of Comparative Zoology (references in Emery, 1925, Gen. Insect., 183: 19–20). Although I have seen specimens of this ant from East Africa and Indo-Pacific localities, I have not seen any of the specimens intercepted at New Zealand ports.

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