

Argentine ant (*Linepithema humile*) and other adventive ants in New Zealand

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R.J. Harris

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Argentine ant (*Linepithema humile*) and other adventive ants in New Zealand

R.J. Harris

Landcare Research Limited, Private Bag 6, Nelson

ABSTRACT

Argentine ant (*Linepithema humile*) is a recent arrival to New Zealand and has been shown to impact native systems overseas. This report provides a key allowing identification of ant genera confirmed to be established in New Zealand; information on the identification of Argentine ant in the field and under the microscope, and its current distribution in Northland; and information on other adventive species that are probably present or may impact on native systems in Northland. The key is a guide to identification of about 30 species, from 21 genera and four subfamilies, of which 20 species are considered adventive. Argentine ants were first recorded in Auckland in 1990. Since then the species has spread widely across Auckland, and populations have been found from Kaitia to Christchurch. The records from Northland are listed, but it is likely that further investigation will find it in many other sites there. Argentine ant workers, which are described and illustrated, are about 2.7 mm long and a uniform honey-brown colour. Foragers collect honeydew from scales and aphids and collect nectar from flowers. Nests can be found under wood, stones, piles of leaves, in potted plants, etc. Colonies have many queens (polygynous), which can be evident if a nest is found. Several other adventive species probably occur in native forest. One of these, *Pheidole megacephala*, which poses a significant threat to native habitats should it establish in Northland, is described and illustrated, and two other species, *Orectognathus antennatus* and *Strumigenys perplexa*, with unknown impact, are also illustrated.

Keywords: Argentine ant, *Linepithema humile*, adventive ants, *Pheidole megacephala*, *Orectognathus antennatus*, *Strumigenys perplexa*, environmental impact, identification key, Northland, New Zealand.

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1. Background

Argentine ant (*Linepithema humile*) is a recent arrival to New Zealand and has been shown to impact native systems overseas. It has recently been found in Northland, and also has established on an offshore island of conservation significance (Tiritiri Matangi). The risk of Argentine ant spreading to other areas of conservation significance is high. This report follows a meeting with Ray Pierce (DOC Northland Conservancy) in Whangarei on 22 September 2000 to discuss the threat posed by Argentine ant.

2. Objectives

To provide for DOC Conservancy use:

- a key allowing identification of ant genera confirmed to be established in New Zealand;
- information on the identification of Argentine ant in the field and under the microscope, and its current distribution in Northland;
- information on other adventive species that are probably present or may impact on native systems in Northland.

3. Ants present in New Zealand

There are currently around 40 species of ants from 25 genera listed from New Zealand. Of these 40 species, seven are doubtful records (either due to taxonomic uncertainties or because they probably have not established). A further three species are only recorded from the Kermadec Islands and are not included in this key.

The remaining species (about 30—the exact number of species in some genera is unclear) come from 21 genera and four subfamilies (Table 1). Twenty species are considered adventive. All species are likely to be found in the North Island.

4. Key to subfamilies and genera

The following key (**based on workers**) identifies the four subfamilies and 21 genera listed in Table 1.

The line drawings and key are modified from:

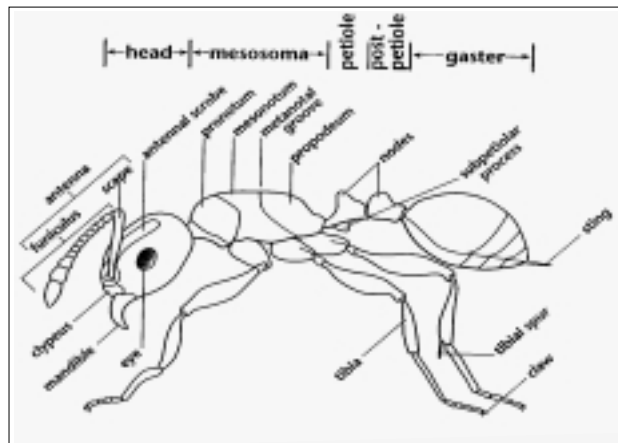
Shattuck, S.O. 1999: *Australian ants: Their biology and identification*. Canberra, CSIRO Publishing.

TABLE 1. LIST OF ANT GENERA CONSIDERED ESTABLISHED IN NEW ZEALAND (EXCLUDING THE KERMADEC ISLANDS). THE NUMBER AFTER EACH GENUS IS THE NUMBER OF SPECIES.

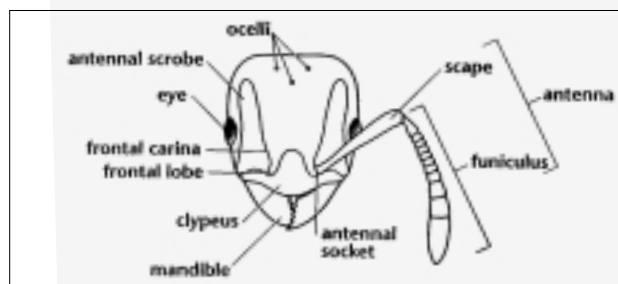
DOLICHODERINAE	SUBFAMILIES		
	FORMICINAE	PONERINAE	MYRMICINAE
<i>Doleromyrma</i> (1)	<i>Paratrechina</i> (1)	<i>Amblyopone</i> (2)	<i>Cardiocondyla</i> (1)
<i>Iridomyrmex</i> (1)	<i>Prolasius</i> (1)	<i>Discothyrea</i> (1)	<i>Huberia</i> (2)
<i>Linepithema</i> (1)		<i>Heteroponera</i> (1)	<i>Mayriella</i> (1)
<i>Ocnetellus</i> (1)		<i>Hypoconera</i> (1)	<i>Monomorium</i> (4?)
<i>Technomyrmex</i> (1)		<i>Pachycondyla</i> (2?)	<i>Orectognathus</i> (1)
		<i>Ponera</i> (1)	<i>Pheidole</i> (3)
		<i>Rhytiponera</i> (2)	<i>Strumigenys</i> (2)
			<i>Tetramorium</i> (2)

4.1 ANT MORPHOLOGY

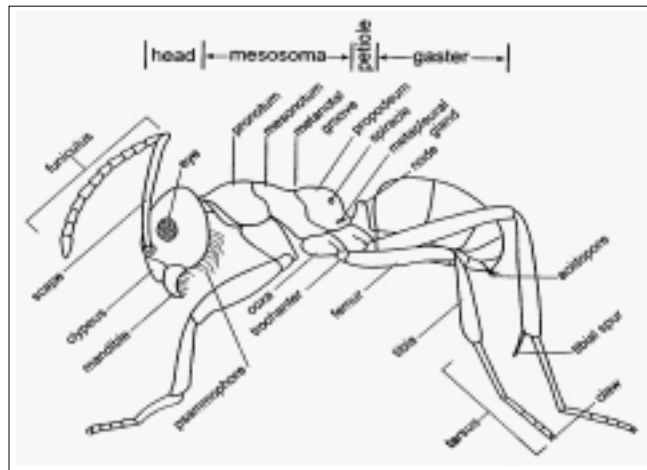
Below are three diagrams that highlight the terminology used in the key.



A typical Myrmicine.



The head parts of ants.



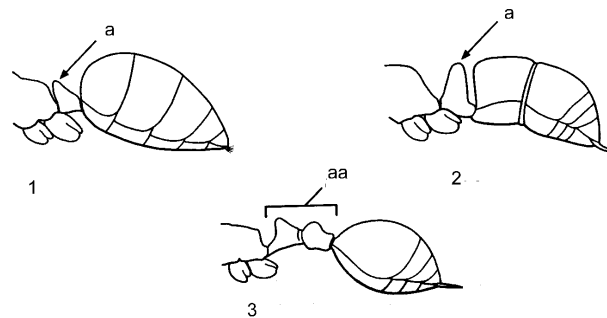
A typical Formicine.

4.2 KEY TO THE FOUR SUB-FAMILIES OF ANTS CONFIRMED FROM NEW ZEALAND

1

Mesosoma attached to gaster by one segment (the petiole) (Fig. 1a, 2a) 2

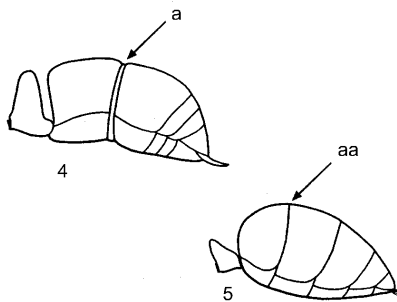
Mesosoma attached to gaster by two segments (the petiole and post petiole) (Fig. 3aa) Myrmicinae (incl. *Pheidole* spp.)



2

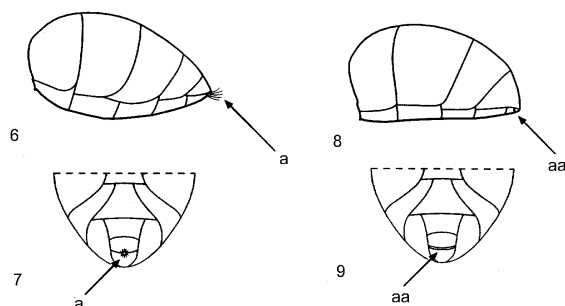
Gaster with a slight but distinct impression between the first and second segments (Fig. 4a); sting may be obvious Ponerinae

Gaster uniform in outline (Fig. 5a), and sting absent 3



3

- Tip of gaster with a circular or semicircular opening (acidopore) fringed with short hairs (Fig. 6a, 7a) Formicinae
- Tip of gaster slit-like without fringe of short hairs (Fig. 8aa, 9aa) Dolichoderinae (incl. *Linepithema*)



[No Figs 10, 11 provided in the current report]

4.3 KEY TO GENERA OF DOLICHODERINAE

1

- Node of the petiole greatly reduced (Fig. 12a). Black ... *Technomyrmex albipes*
- Node of petiole present with distinct forward and rearward faces (Fig. 13a). Black or brown 2



2

- Rear face of propodeum concave (Fig. 14a), petiole narrowed longitudinally and expanded laterally. Black. ~ 2 mm in length *Ochetellus glaber*
- Rear face of propodeum convex or nearly flat (Fig. 15aa). Black or brown, if black > 2.5 mm in length 3



3

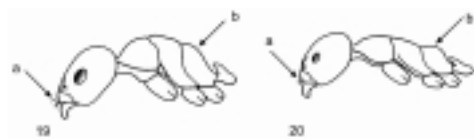
- Front margin of the clypeus with rounded protuberances on each side of a central projection, the projection either pointed or rounded (Fig. 16a - best seen if mandibles open). Black *Iridomyrmex anceps*
- Front margin of the clypeus uniformly arched across its width and with central area broadly concave (Fig. 17aa) to convex (Fig. 18aa) without a central projection. Brown 4



4

Hairs on front margin of clypeus moderately curved downwards (Fig. 19a). Upper (dorsal) face of the propodeum shorter than rear face (Fig. 19b). < 2 mm in length *Doleromyrma darwiniana*

Hairs on front margin of clypeus straight (Fig. 20a). Upper (dorsal) face of propodeum generally same length or longer than rear face (Fig. 20b). > 2 mm in length *Linepithema humile*

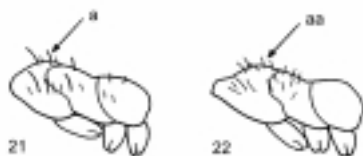


4.4 KEY TO GENERA OF FORMICINAE

1

Upper surface of head and body with pairs of large, stout, dark hairs (Fig. 21a), as well as smaller fine pale hairs *Paratrechina vaga*

Upper surface with fine pale hairs only (Fig. 22aa) *Prolasius adverna*



4.5 KEY TO GENERA OF MYRMICINAE

1

Antennae 5-segmented *Orectognathus antennatus*

Antennae 6-segmented *Strumigenys* spp.

Antennae 10-segmented with 2-segmented club *Mayriella abstinens*

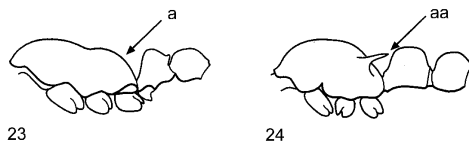
Antennae 11-segmented 2

Antennae 12-segmented 3

2

Propodeum unarmed (Fig. 23a), worker ~ 2 mm .. *Monomorium* spp. (in part)

Propodeum armed (Fig. 24aa), worker > 3 mm *Huberia* spp.



3

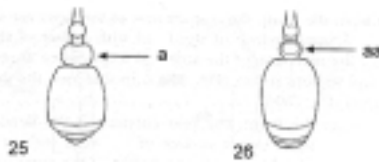
Propodeum unarmed (Fig. 23 above) *Monomorium* spp. (in part)

Propodeum armed (Fig. 24 above) 4

4

Post petiol is swollen, wider than long and much broader than petiole when viewed from above (Fig. 25a) *Cardiocondyla minutior*

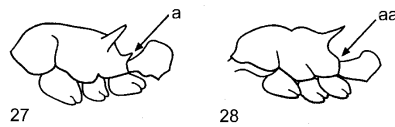
Post petiol not swollen and broad when viewed from above (Fig. 26aa) 5



5

A pair of spine-like flanges on the propodeum near the insertion of the petiole (Fig. 27a) *Tetramorium* spp.

Without a pair of spine-like flanges on the propodeum near the insertion of the petiole (Fig. 28aa) *Pheidole* spp.

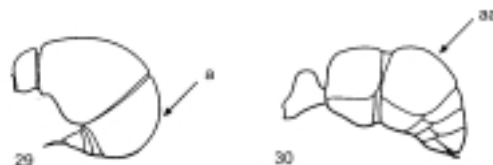


4.6 KEY TO GENERA OF PONERINAE

1

Upper plate of second segment of gaster strongly arched so that it forms the rear-most part of the gaster when viewed from the side (Fig. 29a), and short 9-segmented antennae *Discothyrea antarctica*

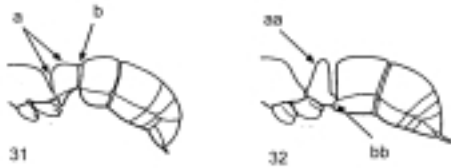
Upper plate of second segment of gaster only weakly arched (Fig. 30aa), 12 segmented antennae 2



2

Petiole with distinct front and top faces (Fig. 31a) but without a separate rear face (Fig. 31b) *Amblyopone* spp.

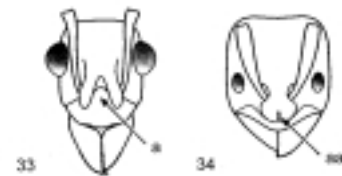
Petiole with distinct front, top (Fig. 32aa) and rear faces (Fig. 32bb) 3



3

Forward sections of the frontal lobes and the antennal sockets widely separated by the broadly rounded or triangular rear section of the clypeus which extends between them (Fig. 33a) 4

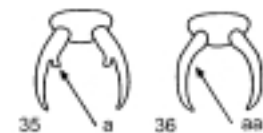
Forward sections of the frontal lobes and the antennal sockets very close together and at most separated by a very narrow triangle of the clypeus which extends rearwards between them (Fig. 34aa) 5



4

Claws on hind legs with a tooth at about the middle of their inner surface (Fig. 35a) *Rhytiponera* spp.

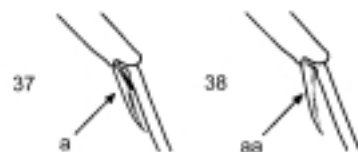
Claws on hind legs without teeth (Fig. 36aa) *Heteroponera browni*



5

Tibia of hind leg with two spurs: a large comb-like spur behind a much smaller, simple one (Fig. 37a) *Pachycondyla* spp.

Tibia of hind leg with a single large, comb-like spur (Fig. 38aa) 6



Lower surface of the petiole (sub-petiole process) with a sharp angle to the rear and a translucent thin spot towards the front, when viewed from the side (Fig. 39a) *Ponera leae*

Lower surface of the petiole a simple rounded lobe when viewed from the side (Fig. 40aa) *Hypoponera eduardi*



5. Argentine ant *Linepithema humile* (Mayr)

5.1 IMAGES

The Argentine ant is illustrated in Figs 41 and 42.

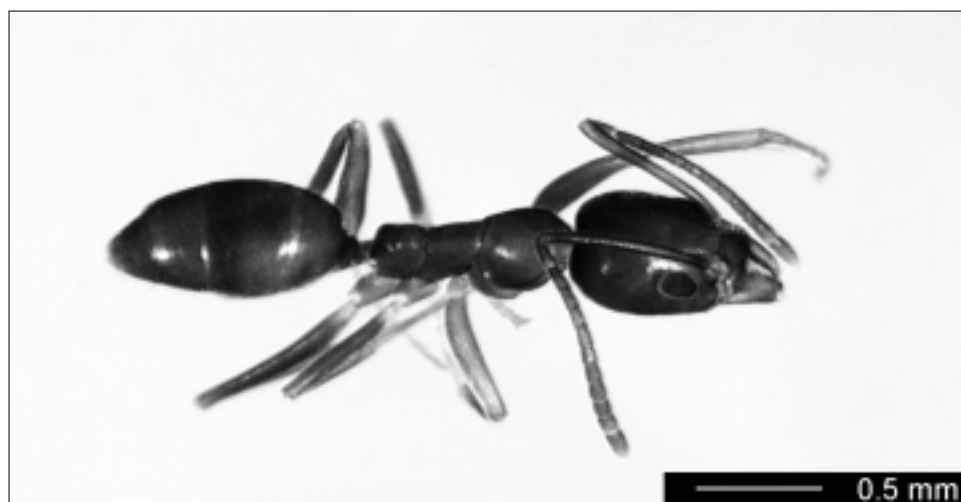


Figure 41. Argentine ant worker.

5.2 TAXONOMIC IDENTIFICATION

- Workers all same size (monomorphic)
- Petiole only (one segment between mesosoma and gaster)
- Antennae 12-segmented and without club
- Eyes placed low on head
- Weakly concave front margin of clypeus
- 5-8 large teeth on the mandibles



Figure 42. Argentine ant queen (top) and worker.

5.3 FIELD IDENTIFICATION

Workers are about 2.7 mm long and a uniform honey-brown colour. They appear dark brown/grey when seen foraging in the field and are dull and relatively streamlined compared with the common black species found foraging in urban areas. Foragers move steadily in defined continuous trails and tend to walk over objects placed on trails. They have only a slight greasy odour when crushed, as opposed to the strong formic acid smell of some ant species when crushed. Trails can often be found along smooth surfaces, and in an urban environment they are commonly found by pulling back the grass at the edge of the footpath. Foragers collect honeydew from scales and aphids and collect nectar from flowers. Trails can often be found ascending flowering trees and shrubs. Nests are highly mobile and, if disturbed, workers run off carrying the brood. Nests can be found under wood, stones, piles of leaves, in potted plants, etc. Colonies have many queens (polygynous), which can be evident if a nest is found.

5.4 DISTRIBUTION

Argentine ants were first recorded in Auckland in 1990. Since then the species has spread widely across Auckland, and populations have been found from Kerikeri to Christchurch. The records from Northland are listed in Table 2. As I recently (Sep 2000) found Argentine ant well established in several sites in Whangarei within just half a day of searching, it is likely that further investigation will find it in many other sites in Northland.

While looking for Argentine ant in Whangarei, I visited several other sites and collected other specimens (see Appendix 1 for details).

TABLE 2. SITES IN NORTHLAND WHERE ARGENTINE ANT HAS BEEN COLLECTED. RECORDS FROM MY OWN COLLECTING AND THE NEW ZEALAND ARTHROPOD COLLECTION.

LOCALITY	YEAR COLLECTED
Whangarei, Port, Hewlett St, grass verge	2000
Whangarei, Fraser St, Port, outside Ready Mix	2000
Whangarei, Port Rd, outside Astral Marine	2000
Whangarei, Reyburn House, nests under stones along estuary edge	2000
Kerikeri, beaten from banana passionfruit	2000
Mongonui, beaten from boneseed	2000
Baylys Beach, beaten from boneseed	2000

5.5 ARGENTINE ANTS ON OFFSHORE ISLANDS

Argentine ants disperse through a group of queens and workers budding off from an existing colony in spring and summer and moving to a new site nearby. Smaller colonies may join to form a large colony over the winter. Spread of an infestation is slow (typically <<200 m) unless a colony is transported by humans. The latter is the likely mode of transport to offshore islands and to new sites in Northland, and is a relatively common occurrence as Argentine ants are very successful in disturbed habitats and will nest in a wide range of localities (e.g. boats, potted plants, compost, photocopiers).

Specific protocols need to be in place to stop ants being transported to remote localities, and if this should happen, to detect them early. These include:

- Check boats and freight before departure from the mainland for signs of ants.
- No potted plants to be taken to offshore islands.
- Collect ants at landing points during island expeditions to build up a list of ant species present on each offshore island, so that any incursion of Argentine ant, or other adventive species, can be detected early and decisions made whether or not to eradicate before the infestation becomes widespread.

6. Ant collecting

A hand search is the easiest way to survey most ants at a locality. Look for trails along smooth surfaces, and nests under rotting logs, stones, etc. This method is suitable for sampling *L. bumile* and *P. megacephala*. Another collection method suitable for *L. bumile* and *P. megacephala* is to place out sweet and protein baits and revisit at intervals to collect ants feeding on the bait. Several of the more cryptic species which live and forage in the litter layer (e.g. *S. perplexa* and *O. antennatus*) may be harder to find without using pitfall traps or Tullgren extraction of litter.

To collect specimens, use a small artist's brush dipped in 75% alcohol to grab a worker and transfer to a vial containing 75% alcohol. Label with location, date, collector, and habitat details.

Sort the material collected to recognisable taxonomic units (RTUs) with the help of the keys provided. Maintain a reference collection of each RTU. I am happy to confirm the identity of the RTUs and help with any problem specimens in exchange for details of collection sites (to enter on a database I am putting together of the distribution of the adventive species).

7. Other adventive ants in native habitats

Pheidole megacephala poses a significant threat to native habitats should it establish in Northland. Several other adventive species probably occur in native forest, but little is known of their densities and impacts.

7.1 *Pheidole megacephala* (F.A.B.)

Taxonomic identification of *Pheidole* spp.

- Workers have distinct majors and minors (Figs 43, 44) without intermediates (dimorphic)
- Petiole and post-petiole present
- Antennae 12-segmented with 3-segmented club at the end
- Spines on propodeum but without a pair of spine-like flanges on the propodeum near the insertion of the petiole

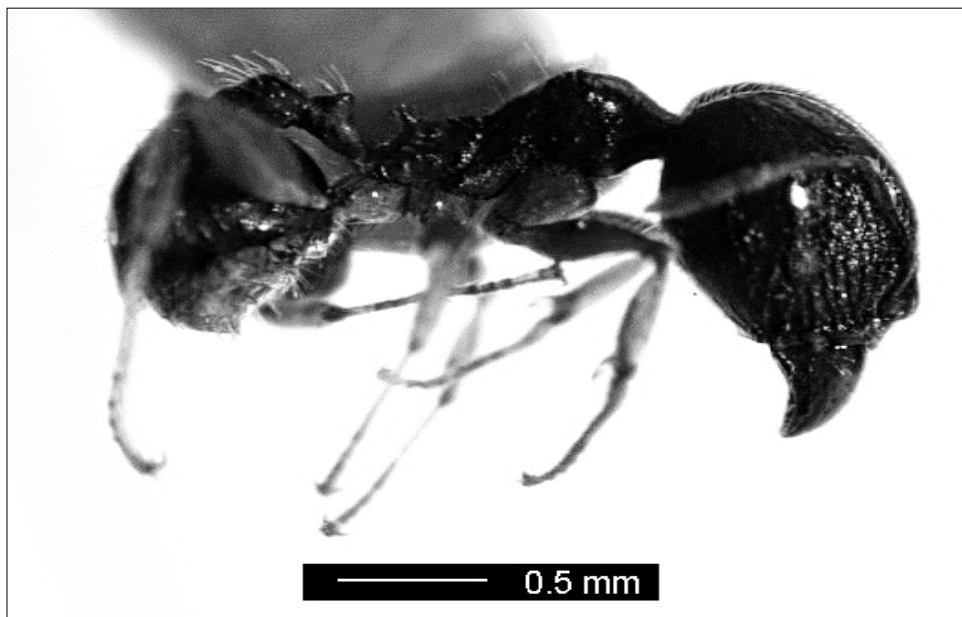
For a key to separate the three species of *Pheidole* in New Zealand see:

Berry, J.A.; Green, O.R.; Shattuck, S.O. 1997: Species of *Pheidole* Westwood (Hymenoptera, Formicidae) established in New Zealand. *New Zealand Journal of Zoology* 24: 25-33..



Figure 43. *Pheidole megacephala*, minor worker.

Figure 44. *Pheidole megacephala*, major worker.



Distribution

P. megacephala was first recorded in Auckland in 1945. To date this species has only been collected from Auckland and the Kermadec Islands. As it is a tropical species, climate may restrict its spread in New Zealand. There are two other species established in New Zealand. *P. vigilans* (Smith) has been collected from Kerikeri, Kaikohe, and Auckland. *P. rugosula* has been collected from Auckland and the Waikato (and a doubtful record from Fiordland). See Berry et al. (1997) for more detail.

Field identification

If *P. megacephala* establishes in Northland, it is likely to be in warm open habitat near the coast. Nests will generally be underground and often there will be a small mound of soil around the nest entrance. Workers are brown in appearance, and the minor workers (~ 2 mm) do most of the foraging. Major workers (~3.5 mm) may be seen at the nest entrance and are rather shy and difficult to sample.

7.2 *Orectognathus antennatus* SMITH

A predator of soft-bodied invertebrates such as Collembola and very distinctive in appearance (see Figs 45 and 46),

Figure 45. *Orectognathus antennatus*, head.



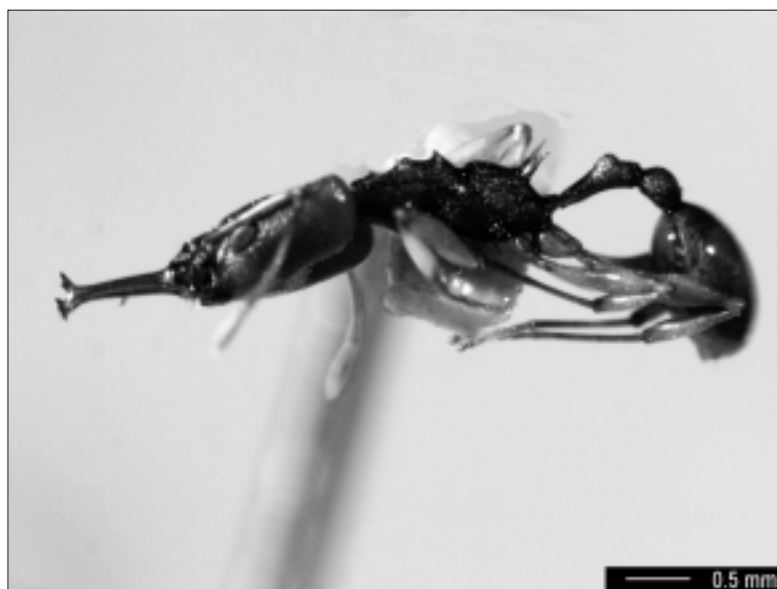


Figure 46. *Orectognathus antennatus*, body profile.

TABLE 3. RECORDS OF *Strumigenys perplexa* AND *Orectognathus antennatus* FROM NEW ZEALAND ARTHROPOD COLLECTION AT MT ALBERT.

REGION	YEAR COLLECTED	LOCALITY	HABITAT
<i>O. antennatus</i>			
AK	1927	Titirangi	
AK	1960	Cascades Park, Waitakere Ranges, Swanson	
AK	1983	Fairy Falls track Waitakere Ranges	Nest in rimu log
AK	1987	Piha Valley Track	Litter
CL	1982	Cuvier I.	
ND	1976	Omahuta State Forest, Kauri Sanctuary	Light trap
ND	1976	Paihia	Trunk of <i>Leptospermum</i>
ND	1980	Waipoua State forest, 1 km east of Forest HQ	Litter
<i>S. perplexa</i>			
AK	1892	Drury, Broun Collection	
AK	1941	Point Chevalier	
AK	1942	Papakura	Leaf mould
AK	1974	Lynfield, Tropicana Drive	
AK	1976	Woodhill	Pitfall in pasture
AK	1980	Birkenhead	
BP		Lake Rotoiti, Otaramarae	Log in bush
CH	1970	Chatham Is, South East I.	Litter
CL		Mercury Is, Middle I.	Litter
CL	1978	Little Barrier I., Pohutukawa Flat	Litter
FD		Secretary I.	Litter
ND	1953	Paihia	Litter
ND	1972	Paihia	Litter
ND	1977	Tehuka	
ND	1978	Mokohinau Is, Fanal I.	
ND	1978	Mokohinau Is, Maori Bay	Litter
ND	1978	Waipoua State Forest, Headquarters Rd	Forest
ND	1980	Poor Knights, Tawhiti Rahi	
ND	1981	Poor Knights, Aorangi Puweto Valley	
TH	1970	Three Kings, Castaway Camp	
TH	1970	Three Kings, Great I., summit	
TH	1982	Three Kings, Great I.	Litter
WO		Raglan, Mt Karioi	

Orectognathus antennatus was sampled in New Zealand as early as 1927 and has only been collected in forest in northern New Zealand (Table 3). It is rarely collected, as workers forage within the litter layer.

7.3 *Strumigenys perplexa* (SMITH)

Strumigenys perplexa is a very early introduction to New Zealand, having been sampled by Broun in the late 19th Century in Drury. It is very widespread on the mainland and offshore islands. It has been collected infrequently (Table 3). It too is a predator of soft-bodied invertebrates such as Collembola, is very distinctive in appearance (Figs 47 and 48), and workers forage within the litter layer.



Figure 47. *Strumigenys perplexa*, head.



Figure 48. *Strumigenys perplexa*, body profile.

Appendix 1. Ants collected from Whangarei

Sites visited in and around Whangarei on 22 September 2000 and ants collected.
n = native, i = introduced.

SPECIES	LOCALITY
<i>Iridomyrmex anceps</i> (i)	Kaiwaka Point, grass by sea Whangarei, Park cnr Bank and Dent Sts Whangarei, Port, by Tenix boatbuilders Whangarei, Port, log storage area Whangarei, cnr Memorial Drive and Old Parua Bay Rd Whangarei, Okara Park
<i>Linepithema humile</i> (i)	Whangarei, Port, Hewlett St, grass verge Whangarei, Fraser St, Port, outside Ready Mix Whangarei, Port Rd, outside Astral Marine Whangarei, Reyburn House, nests under stones along estuary edge
<i>Monomorium antarcticum</i> (n)	Kaiwaka Point, grass by sea Whangarei, Port, log storage area Whangarei, Okara Park
<i>Ocbetellus glaber</i> (i)	Whangarei, Port, by Tenix boatbuilders Whangarei, cnr Memorial Drive and Old Parua Bay Rd
<i>Pachycondyla castanea</i> (n)	Whangarei, cnr Memorial Drive and Old Parua Bay Rd
<i>Paratrechina vaga</i> (i)	Whangarei, Park cnr Bank and Dent Sts Whangarei, Port, by Tenix boatbuilders Whangarei, Port, log storage area Whangarei, Riverside Drive, Pile moorings Whangarei, cnr Bank St and Kamo Rd Whangarei, cnr Memorial Drive and Old Parua Bay Rd Whangarei, Parahaki memorial carpark
<i>Technomyrmex albipes</i> (i)	Whangarei, Parahaki memorial carpark
<i>Tetramorium grassii</i> (i)	Whangarei, Park cnr Bank and Dent Sts Whangarei, cnr Memorial Drive and Old Parua Bay Rd