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Mason wasps (*Pison* species, Hymenoptera: Apoidea: Crabronidae) in Aotearoa New Zealand

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Abstract

Four species of *Pison* are recorded from Aotearoa New Zealand and include the relatively recently detected *P. peletieri* (2001) and *P. marginatum* (2020). All species are illustrated and a key to enable identification is provided. Information on the nest structure and prey of *P. peletieri* is given.

Keywords

Pison marginatum; *Pison morosum*; *Pison peletieri*; *Pison spinolae*; *Pison westwoodii*; *Melittobia*, new record.

INTRODUCTION

The wasp family Crabronidae is represented in Aotearoa New Zealand by 14 species in 4 genera. They are solitary wasps that hunt and paralyse various insects and spiders with which they provision their nest cells as food for their larvae. *Pison* species specialize in preying on various spiders. Many species make nest cells from mud earning them the common name of mason wasps. Within the New Zealand Crabronidae, the genus *Pison* is easily

recognised by the conspicuous notch in the inner margin of the compound eye (Fig. 1). Notched eyes are also found in the introduced *Vespula*, *Polistes*, *Ancistrocerus gazella* and *Paralastor* sp. but these belong to the Vespidae.

The genus *Pison* has a wide distribution with species native to all continents except North America and Antarctica; most species are found in the Southern Hemisphere (Bohart and Menke 1976). A recent revision (Pulawski, 2018) recorded 163 species from Australia. By contrast Aotearoa New Zealand has but one endemic



Figure 1. *P. peletieri* head in frontal view. Scale line = 0.5mm.

species, *P. morosum* Smith, 1856 although the long-established adventive Australian *P. spinolae* Shuckard, 1838 is more commonly encountered (Callan, 1979; Harris, 1994). This paper records two additional species which have established more recently – *Pison peletieri* Le Guillou, 1841 and *P. marginatum* F. Smith, 1856.

THE SPECIES

Pison spinolae

Recognition. This is the largest of the four species (female body length 11.0 – 16.0 mm, male 9.0 – 12.0 mm (Harris 1994)) and the only species to have long, erect, wispy, white hairs on the head, mesosoma, ventral surface of coxae, tibiae, femora and the sloping anterior face of the first metasomal tergite (Figs 2, 3). In all other species setae on the body are short and/or appressed. The depressed posterior margins of the first three metasomal tergites are covered with dense appressed silvery-white setae giving the metasoma a banded appearance.

Distribution. This Australian species was accidentally introduced around 1880 (Callan 1979) and is now common throughout Aotearoa New Zealand. In Australia it is found in all states including Norfolk I., but not yet from the Northern Territories. It is also recorded from Indonesia (one record from West Papua) (Pulawski, 2018).

Nesting habits and prey. The mud nest cells of this species are commonly encountered in exterior crevices and corners of houses, but also indoors in folds of curtains and blinds near open windows. The presence of a female is indicated by a buzzing sound as she constructs nest cells and provisions them with paralysed orbweb spiders (Araneidae). Details of biology and prey species can be found in Callan (1979), Cowley (1961, 1962) and Harris (1994). Despite its Australian origin it is sometimes referred to as the New Zealand mason wasp.

Pison morosum

Recognition. This species is similar in appearance to *P. spinolae* being entirely black, but lacks long erect hairs, is smaller (female length 7.5 – 11.5 mm, male 5.5 – 8.0 mm (Harris 1994)) although there is some size overlap, and the metasoma does not have a banded appearance (Figs 4, 5).

Distribution. This is the only endemic *Pison* species in Aotearoa New Zealand and is found throughout the country including the Chatham Is (specimens in the New Zealand Arthropod Collection, Macfarlane 1979).

Nesting habits and prey. Nest cells are made in old galleries made by various wood-boring insects (Siricidae, Curculionidae, Cerambycidae). Its biology and nesting behaviour are well documented by Harris (1994) and Laing (1988).

Pison peletieri

Recognition. This adventive Australian species is easily recognised in Aotearoa New Zealand by its colour. The head and mesosoma are black but the metasoma, tibiae

and tarsi of the legs are a rusty reddish brown (Figs 6,7). It is the smallest of the four species with female length 6.2 – 7.7 mm, male 5.3 – 5.6 mm (Pulawski 2018). It was first detected in Auckland in March 2001 (MAF Biosecurity Authority 2004) and provisionally identified as *P. ruficornis* F. Smith, 1856 which was subsequently synonymised under *P. peletieri* Le Guillou, 1841 by Pulawski (2018).

Distribution. This species has a wide geographical distribution in Australia being found in all states except Tasmania (Pulawski 2018). From its original detection in the Auckland CBD in 2001, observations on iNaturalist (www.inaturalist.nz) show that it is now widespread across greater Auckland with records also from Northland (Whangārei) to Waikato (Pokeno, Te Aroha). Although aware of its presence in central Auckland I did not observe it in my garden some 15 km distant until the summer of 2015/16.

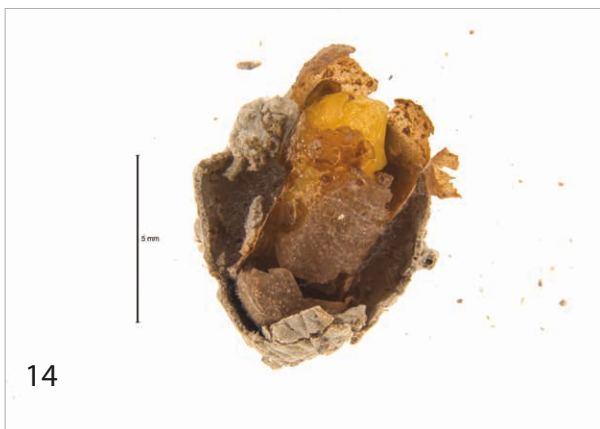
Nesting habits and prey. Like many other *Pison* species, *P. peletieri* constructs a nest of several mud cells and, from the few available observations, is versatile in their configuration which is determined by the shape of the chosen space. In early January 2019 I first observed a cluster of six mud cells in a seldom-used outside power socket in the carport. The flask-shaped cells were located in a groove around its perimeter and underneath the spring-loaded cover (Fig. 10). The only point of entry for a female wasp is a small gap behind the cover and at the bottom of the electrical socket. At first glance there appears to be only five cells but cells 2 and 3 were joined side by side; cells 1 and 4–6 were discrete (Fig. 11). The cells were made from a pale brownish-grey mud that has been built up piece by piece and not plastered over so that they have a wrinkled appearance. Each cell had its entrance/exit plugged by a yellowish mud of a different and coarser texture, containing small sand grains (Figs 12, 13). In March 2019 I removed the cells. Cells 4–6 were successfully extracted intact but cells 1–3 fell and shattered on the concrete below. Cell 4 was opened to reveal a yellow prepupa within its cocoon (Fig. 14). No spider remains were found apart from a pair of chelicerae and part of one leg. Cells 5 and 6 were kept in the lab at a constant 21°C to await emergence of adult wasps to confirm their identity. In both cases an exit hole was chewed through the yellow plug (Fig. 13). A male wasp emerged from one cell sometime over the period 13 Oct – 6 Nov 2019, and a female at 09:00 on 18 Nov 2019.

A single dead female *Melittobia* sp (Eulophidae) was found in the broken remains of cells 1–3. *Melittobia* species are recorded as pupal parasitoids of *P. spinolae* (Cowley 1961, Cumber 1953, Donovan 1976) and *P. morosum* (Macfarlane and Palma 1988).

A different manner of nest cell construction was observed on two occasions at Warkworth by David Wilson who posted several photos online (<https://iNaturalist.nz/observations/37940721>, [72975801](https://iNaturalist.nz/observations/72975801), [72975802](https://iNaturalist.nz/observations/72975802)). Cells were constructed in a linear manner in the mortar groove between adjacent bricks in a wall. The observation made



Figures 2–9. *Pison* species in lateral and dorsal views. 2, 3 *P. spinolae*; 4, 5 *P. morosum*; 6, 7 *P. peletieri*; 8, 9 *P. marginatum*. Scale line 2–5, 8 = 2.0 mm; 6, 7, 9 = 1.0 mm.



Figures 10-14. Nest cells of *P. peletieri*. 10, 11, cells *in situ*; 12, 13, cells 5 and 6 before (12) and after (13) emergence of adults; 14, cell 4 showing fragmented cocoon and yellow prepupa. Scale line 12-14 = 5.0mm

in January 2020 shows a constriction between adjacent cells. In the April 2021 observation of three nest cells the centre cell was the last to be constructed. This cell was provisioned with eight *Maratus griseus* (Salticidae) and a single specimen of *Clubiona* sp (Clubionidae). Olwyn Green (pers. com. 2021) reported that all nest cells made on the outside walls of her house in West Auckland contained Salticidae. Other small spiders (Theridiidae and possibly Tetragnathidae) in addition to Salticidae were recorded by David Wilson (December 2021, <https://inaturalist.nz/observations/103450309>). I have frequently observed this species actively hunting on shrubs and bare cultivated garden soil. There is no published information on nesting behaviour or prey selection in Australia.

Pison marginatum

Recognition. This species has a black head and body although parts of some legs may be a dark reddish brown in some specimens (Figs 8, 9). It has a banded metasoma like *P. spinolae* but the bands of appressed hairs on the posterior margins of tergites 1–5 appear pale brown to the naked eye or pale brownish gold depending on the intensity of incident illumination. The setae are in fact silvery white under direct bright light, but the pale brown appearance comes from the brown colour of the integument showing through. *Pison marginatum* is smaller than *P. spinolae*, female length 9.5 – 11.7 mm, males 7.5 – 12.6 mm (Pulawski 2018) although there is some overlap. The colour of the banding and absence of long wispy white setae on the head and body readily distinguishes *P. marginatum* in Aotearoa New Zealand.

Voucher specimens are in the Auckland Museum collection with accession numbers AMNZ96495-96498, 96507, 96508, 96514, 96517, 152019-152023, 173682. Additional images can be found by searching at <https://www.aucklandmuseum.com/discover/collections/search>.

Distribution. This species was first recognised from yellow pan trap samples collected in my garden in Kelston, West Auckland (36.892106°S, 174.664168°E) from December 2020 to February 2021, a sampling programme initiated in May 2020 during COVID-19 lockdown and continued monthly. It was absent from March to September but reappeared in October 2021. A specimen was also recorded from Auckland's Stanmore Bay (36.624043°S, 174.735575°E) in early January 2021 (<https://inaturalist.nz/observations/67634694>). An earlier record from February 2020 in Hawkes Bay (Waipatiki Beach, 39.300327°S, 176.973481°E, <https://inaturalist.nz/observations/39511111>) may also be this species. The wide separation of Auckland and Hawkes Bay locations suggests that either it may have been present in Aotearoa New Zealand but unrecognised for quite some time and has expanded its distribution, or that there may have been more than one incursion.

Pulawski (2018) showed that the distribution of *P. marginatum* extends across all states of Australia, Indonesia, Malaysia, the Philippines, Micronesia, Melanesia and Polynesia to Hawai'i making it one of the most widespread species of the genus.

Nesting habits. Nest cells have not yet been observed in Aotearoa New Zealand. Williams (1927) reported that it (as *P. hospes*) adapted old mud nests of *Sceliphron* (Sphecidae) on rocky banks in Hawai'i but did not record prey species. In Canberra, Australia A.C.T., Evans, Matthews and Hook (1980) observed nest cells made in trap nests, with araneids and an oxyopid spider as prey, and that there were two generations per year.

KEY TO SPECIES

The following key should enable accurate identification of the four species now found in Aotearoa/New Zealand.

- 1 Head and mesosoma black, metasoma rusty reddish brown by contrast (Figs 6, 7) *P. peletieri*
- 1' Head, mesosoma and metasoma entirely black (shades of brown if present restricted to posterior marginal bands of metasomal terga)2
- 2 Head and body with long, erect, wispy white setae (Fig. 2).....*P. spinolae*
- 2' Head and body without long, erect, wispy white setae, at most with appressed short white setae in places3
- 3 Posterior margins of all metasomal tergites brown and with pale brownish bands of appressed setae (Fig. 9)..... *P. marginatum*
- 3' Metasomal tergites entirely black and without banded appearance (Figs 4, 5) *P. morosum*

DISCUSSION

The recent establishment of *P. peletieri* and *P. marginatum* has doubled the number of *Pison* species present in Aotearoa New Zealand. More observations and data are needed for *P. marginatum* and *P. peletieri* to determine the number of generations per year, nesting behaviour, nest structure, and prey preferences. The latter is essential to determine their likely impact on Aotearoa New Zealand's spider populations. Limited observations indicate that *P. peletieri* prefers jumping spiders (Salticidae). Given the wide geographic distribution of *P. marginatum* it probably won't be very specific. Prey choice will most likely be determined by whatever spiders are found in the habitats where they prefer to hunt, and which are of a size they are able to handle and carry back to nests.

Both will surely become more widely distributed in Aotearoa New Zealand. As well as natural range expansion, mason wasps are good hitch hikers because of their adaptability to make nest cells in all kinds of cavities and grooves in both natural and human-made objects which are easily transported by shipping (Bohart and Menke 1976). This is probably the way that *P. spinolae* arrived here from Australia. Dispersal by shipped cargo seems the most likely way *P. marginatum* spread so far and wide from Australia across the Western Pacific islands to Hawai'i and most recently here to Aotearoa New Zealand. The source of the wasps could either be Australia or one of the Pacific island nations where it is established. Given its wide geographical distribution it is perhaps a wonder that it didn't find its way here much sooner. Another species with a similarly wide geographic range is *P. westwoodii* Shuckard (Pulawski 2018) and is also a likely candidate for future establishment.

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