The movement of native pollinators within urban areas

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It is a pleasure to present to you today not only my own research, but an acknowledgement of Leonard Cockayne's first publication on the humble bee, these days known as the bumblebee. This short communication contained a list of eight plant families and 17 species on which the newly introduced bee had been seen. He mentions the bees' colour preference for either white or red flowers, and makes comments about the bees appearing to be intoxicated on certain plant nectars, requiring time to recover (Cockayne 1891).

In preparing for today, I found several similarities between Cockayne's observations and my own. Not only do both of us have an interest in bees, but I also plan to publish my findings in what will also be my first publication. Like Cockayne, I have also observed a colour preference and plants toxic to bees, which I will explain shortly. My research was part of the University of Canterbury Summer Research Scholarship Programme and was supervised and co-funded by the University of Canterbury and the Canterbury Branch of the Royal Society of New Zealand.

Now, as humans, you know where to find excellent food and drink, or if in doubt, you can always observe and follow one of your peers. But how would you fair if you were one of New Zealand's smallest, endemic, solitary bees? The bee in question is *Lasioglossum sordidum*. This bee nests within tunnels in the ground, usually in bare soil, under foliage or amongst rocks. Although using a solitary nest, there might be many nests grouped together in one area where the soil type is suitable. This *Lasioglossum* bee is smaller than your little fingernail, or less than half the size of a honey worker bee (Figure 1).

So why is this bee interesting, and how effective is it in gaining its food supply? Bees play an essential part in the global production of important human foods (Garibaldi et al. 2011). Bee pollinators, especially honey bees, are in decline worldwide, so native bees might become more important than we originally thought (Howlett and Donovan 2010). However, we do not know a lot about our native pollinators. It would be useful to know more about how they live, and which plants they visit and pollinate. Quite often they are either misidentified as flies or are small enough to be simply ignored.

Figure 1. A native *Lasioglossum sordidum* bee, approximately 5 mm long. (Photo: Della Bennet)

The staff of the Christchurch Botanic Gardens were aware of small native bees foraging within the grounds, but they were unaware of their identity, their nesting locations and their preferred food sources. After walking the sites of potential interest, searching for these tiny individuals and nests (Figure 2), I found that they were *Lasioglossum sordidum* and they were more abundant than previously expected.

Figure 2. Tunnel entrances at bee nest sites among scoria pebbles, and in a lawn with a pen for scale. (Photos: Della Bennet)

Two nest sites were chosen within the Pinetum near the western boundary of the Botanic Gardens. This area is bordered by sports fields, roads and buildings, requiring the bees to fly over mown grass and the Avon River before reaching suitable foraging sites. I needed to capture 40 bees from each site, collect the pollen grains they carried, and identify the plant species on which they were foraging.

Assisted by my co-worker children (Figure 3), I laid a sweep net on ground beside the nest sites to think about the best technique to capture these small bees. To my surprise, the bees just landed on the white net fabric and could be scooped up into plastic vials. The bees either dropped their pollen into the plastic tube or required chilling whereupon they groomed the pollen into the tube for me. Bees were returned to their nesting site unharmed.

Figure 3. Family bee research in progress. (Photo: Peter Bennet)

The bees yielded 24,000 pollen grains! These were identified by comparing them to a reference slide collection of pollen grains collected from the flowers of native and exotic plant species flowering at the time.

Seventy-four percent of the bees were behaving like specialised foragers and collected >90% of their pollen from solely one of five plant types, e.g. daisy family members, *Hebe*, or the horse chestnut.

Some of the bees (21%) collected 100% of their pollen from a single source. We know that honeybees will select a plant species, form a search image and specialise for the whole day on that plant, whereas another honeybee from the same nest site might select a different species. We assume this is also the case with *L. sordidum*. However, there were some bees that had mixed loads of 23 different plant species.

I was also able to establish the minimum distance the bees travelled between their nest site and the nearest identified plant species. These mighty little machines flew 75–250 m to reach the different target plants. They would have overflown various plant species that were in flower without stopping to forage.

It has also been thought that native bees preferred native plants, but this does not appear to be the case. Native (Figure 4) and exotic plants (Figures 5, 6, page 12) were targets for foraging, suggesting *L. sordidum* may assist in pollinating various exotic plant species. The details of my work appeared as a poster at the 2013 Botanic Gardens Conservation International Congress in Dunedin (Bennet et al. 2013) and in a refereed science paper (Bennet et al. 2018).

So next time you are out walking or sitting outside during the summer months, you might meet one of these bees foraging among any number of plants in your garden.

Figure 4. A *Lasioglossum sordidum* bee foraging on a *Pachystegia insignis* flower head. (Photo: Della Bennet)

Figure 5. A *Lasioglossum sordidum* bee foraging on a daisy (*Bellis perennis*) flower head (Photo: Della Bennet)

Figure 6. Two *Lasioglossum sordidum* bees foraging on a dandelion flower head. (Photo: Della Bennet)

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