

BLUE BANDED BEES

POTENTIAL POLLINATORS OF GLASSHOUSE TOMATOES

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MELISSA BELL of the University of Western Sydney – Hawkesbury is conducting Australia's first-ever glasshouse experiments with blue banded bees. These trials, in collaboration with the Australian Native Bee Research Centre, are testing the potential of Australian native blue banded bees (*Amegilla*) as pollinators of glasshouse tomatoes.

Tomato crops grown inside glasshouses need a special kind of pollination to maximise their production. The flowers must be vibrated to release the pollen which is held inside tiny capsules in the flower. In Australia this process is currently done manually with mechanical vibrators. However, in overseas countries European bumble bees (*Bombus*) are often used to do this job.

Australia has no native species of bumble bees, and horticulturalists are applying to introduce European

bumble bees to mainland Australia for crop pollination. Conservationists, however, are most concerned about the impact such an introduction would have on our Australian environment (see [Aussie Bee Bulletin Issue 13](#)). Could an Australian native bee be used instead to pollinate glasshouse tomatoes? Melissa Bell's experiments are showing that this may indeed be possible.

Early Success in the Glasshouse

The earliest stages of this pioneering experiment were described in [Issue 17 of Aussie Bee Bulletin](#). Blue banded bees were successfully introduced into a University glasshouse room (5.25 m long x 3 m wide x 4.3 m high) in late March, 2001. The bees rapidly accepted the confined space and began feeding on flowers and honey feeders that we had provided.

Les Dollin of the Australian Native Bee Research Centre made 55 nest blocks for the bees. These were Besser bricks, each filled with a soft clay mixture. Soon the bees began visiting these blocks too, digging nesting holes and bringing in supplies of pollen.

Left, a blue banded bee buzzing a tomato flower during the glasshouse experiment. Right, Melissa Bell, University of Western Sydney – Hawkesbury. Photographs by the Australian Native Bee Research Centre.



Blue Banded Bees Don't Fly During Winter

In April and May, at the natural nest sites (outside of the glasshouse) all the adult bees die as the cold weather starts. In the nest burrows, though, immature bees (called *prepupae*) are curled up inside their sealed cells. These prepupae become dormant during winter and stay inside their cells until the weather warms up in spring. Then they complete their development into adults and emerge



into the sunshine to begin the new flying season. So from about May to October no adult blue banded bees can be found flying in the garden.

So How Can We Pollinate Crops in Winter?

The biggest challenge with pollinating glasshouse tomato crops is that they flower all year round. If we want to use blue banded bees to pollinate these crops we will need to be able to supply flying adult bees during the cold months when the bees are normally dormant. Melissa wondered if she could make some of the blue banded bee prepupae develop into adults much earlier than usual by keeping them at warmer temperatures.

Thus Started a Huge Experiment

Melissa made up many little plastic dishes holding small batches of blue banded bee prepupae. She stored these dishes in incubators set at various temperatures from 8°C up to 29°C. Patiently Melissa watched her little charges, day by day, carefully adjusting the temperature and humidity to keep them healthy. Melissa divided the development process from prepupa to adult into nine different stages (see photographs) and diligently recorded the number of days it took each bee to develop from stage to stage.

Sure enough by mid September many of Melissa's prepupae developed into adults which she then released into the glasshouse room. We were excited to note that at our main natural nest site (outside of the glasshouse), the bees had not even started to fly by late November. So Melissa's experiments had been very successful in making the prepupae develop into adults much earlier than they would have done in the wild!

Other Discoveries

At one of the natural nest sites, Melissa also discovered some other insects

that had been sharing the nest burrows with the blue banded bees. There were some flies (*Miltogramma*), some grain moths (*Sitotroga*) and a black and white spotted Domino Cuckoo Bee (*Thyreus lugubris* – see [Aussie Bee Issue 10](#)). Some insects that are found in nests simply share the burrow with the bees whilst other insects may be harmful parasites. The cuckoo bees, for example, can be harmful because they eat the food stored for the blue banded bee's young. Melissa also found that many blue banded bee nests in the wild were riddled with fungus. We need to learn much more about these things that endanger the nests of blue banded bees.

The Studies Continue...

Melissa recorded detailed information during her experiment about the development rates of bees at many different temperatures. However, further studies still must be done before we can select the best possible conditions for producing blue banded bees, all year round, for crop

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pollination. More work also needs to be done to improve the designs of the feeders and nest blocks, and to find ways to protect the bees from parasites. Experiments will also be needed to find out how effectively blue banded bees pollinate tomato flowers, in comparison with the manual pollination methods that tomato growers currently use.

Over the next three years Melissa hopes to pursue her research on blue banded bees as she studies for her PhD at the University of Western Sydney – Hawkesbury. The Australian Native Bee Research Centre looks forward to continuing to collaborate with Melissa and her supervisor, Associate Professor Robert Spooner-Hart in these exciting studies. We hope that this research will enable us to produce a commercially viable stock of native bees for the pollination of glasshouse tomato crops in Australia.



Left, Melissa Bell studied the development stages of immature blue banded bees. Some of the major stages that occur before the bee becomes an adult are shown here. The immature blue banded bee spends the winter as a prepupa (see the first two photographs on the top row). Then in spring it changes into a pupa that gradually becomes darker and darker in colour. This development can be seen in the other photographs. Finally the pupa hatches into an adult that is able to fly, nest and feed in the garden. Photographs by Melissa Bell.

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