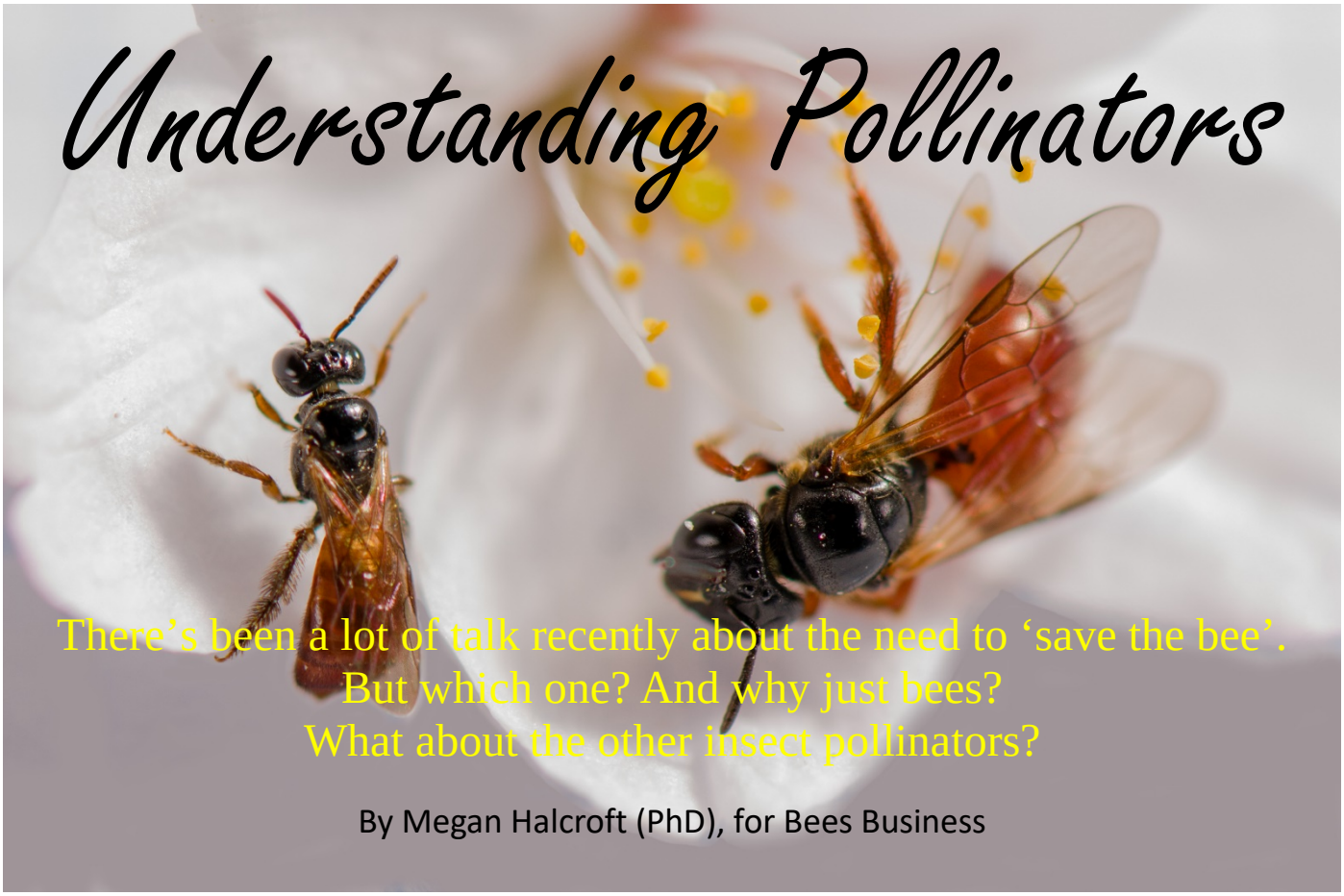
Understanding Pollinators



There's been a lot of talk recently about the need to 'save the bee'.
But which one? And why just bees?
What about the other insect pollinators?

By Megan Halcroft (PhD), for Bees Business

While the honey bee is an invaluable pollinator, especially in broad acre horticultural and some agricultural crop production, it is just one of over 20,000 species of bee worldwide. Australia is home to over 1,660 described species of native bee, and there are several hundred more yet to be identified and described.

What is pollination?

Because plants can't move around to find a mate, they must enlist the help of a pollination vector.

Top: Reed bees (*Exoneura* sp.) on a cherry blossom. **Above:** Fun activities during #OzPollinatorWeek 2016 at Eskbank House, Lithgow.

Pollination is the transfer of pollen (containing the male sex cells) to the female flower part, which facilitates fertilisation and seed development. In fruiting plants, seed development initiates the production of a plant hormone which stimulates fruit tissue growth. This results in high quality fruit development and increased fruit yield. Good cross pollination also increases genetic diversity and vigour which increases seed quality and germination, in crops and in nature.

What is a pollinator?

Anything that aids in the transfer of pollen to the flower's female reproductive organs is a pollination vector; including water, wind and animals. Many plants are wind pollinated, including cereal crops (wheat, oats, barley, rice and corn). But almost 90% of plant species benefit from pollination services provided by insect pollinators. The main reason insects visit flowers is to feed on their energy-giving nectar. As the insect pushes its way into the

Above: Bugs (Lithgow Living History) with their hotels. Sponsored by Lithgow Council and local businesses and men's shed.

flower to collect the sugary fluid, it touches the reproductive parts of the flower, depositing pollen on its body. This pollen is then transferred to the female part of the flower, thus enabling fertilisation.

I'm sure you've heard the expression that every third mouthful of food we eat is due to honey bees… Well, in reality, it is more likely due to insect pollinators, of all shapes and sizes. This includes bees, beetles, wasps, ants, butterflies, flies and more. These insects help us produce 75% of the crops we grow worldwide, including food and fibre.

Why are bees some of the best pollinators?

While other insects visit flowers to collect nectar, bees also collect pollen. Over 120 million years ago, some species of meat-eating wasps began to evolve into vegetarian bees. Rather than hunting other insects, bees started to collect pollen from flowers, as a protein source to feed their offspring. Because bees visit flowers to actively collect pollen, they come in contact with the reproductive parts of the flower far more often than other flower visitors. The co-evolution between bees and flowers is a natural wonder which has seen bees develop branched, electrostatic hairs to enhance their ability to collect and transport pollen to their nest. They also have specialised tongues to collect nectar from deep within the flower and a crop (honey stomach) to store the nectar, without it being digested.

Only 11 species of Australian bee are social and, like the honey bee, they live in communities consisting of a single queen, thousands of sterile, female workers and a few hundred males (at certain time of the year). The rest of the 1,600 or so species are mostly solitary.

Social bees have a complex community, and each worker bee has a specific job to do, at certain times of her life. These jobs include, nursery work, cleaning, building structures, dehydrating honey, feeding the queen and guarding the nest. This is called task partitioning, and it provides the worker with a productive, safe existence within the nest, for the first few weeks of life. The final and most hazardous task is foraging for food resources. On average, during spring and summer, a forager only lives for an additional 1 - 3 weeks. If she's lucky, she will die from wear and tear, but it's a risky business and the chances of getting eaten are high.

Being a forager is hard work and she needs to 'shop' for the entire community; feeding the masses of in-nest workers, the queen and developing brood. Therefore, she must ensure her shopping baskets (in fact, her pollen baskets and crop) are fully laden. To do this, she grooms the pollen from her branched body hairs, and moistens it with a drop of nectar. This allows her to pack layers of pollen into larger and larger loads on her hind legs. However, this moistened pollen is no longer available for transfer from flower to flower, for pollination. It is only the small amounts of pollen which remain on her body, between grooming sessions, that can be transferred.

Above: Building bee hotels in Sydney Park for Australian Pollinator Week 2016. Sponsored by City of Sydney Council.

Solitary bees, as the name indicates, live on their own. The female bee mates and then spends the rest of her life collecting pollen and nectar to provision individual brood cells, where she lays an egg. She seals the cell and never returns to her offspring. About a third of solitary bees nest in pre-existing cavities such as burrows in wood, created by moth or beetle larvae (borers), hollow stems, under mulch or in nooks and crannies of trees and rocks. The majority of solitary bees dig ground burrows for nests. A 10mm bee is capable of digging a 1 metre deep burrow.

Unlike social bees, solitary bees only collect enough pollen and nectar for one individual offspring at a time. Instead of pollen baskets, she packs dry pollen grains into modified hairs called 'scopa', on her hind legs or under her abdomen. These dry pollen grains are easily transferred as she moves from flower to flower. This makes solitary bees, as individuals, more effective pollinators than social honey bees or stingless bees. Although solitary bees don't make honey, they are very effective and important pollinators of our crops and native plants.

How can we help support our insect pollinators?

The world is becoming more and more aware of the threats facing honey bees, but what about the other bees and insect pollinators? The greatest threat to our food security and to the health of our ecosystems is the loss of beneficial insects, such as pollinators. These are the drivers of biodiversity.

As we carry out our human activities, we modify the environment to suit ourselves. One of the best things we can do to support our bees and other pollinators is to plant lots and lots of flowering plants. These provide much needed food resources, which enable bees to feed their offspring and fuel the adult insects in their daily tasks. By planting a range of plant species, we can provide food resources all year round. A list of bee-attracting native and exotic plants is available here (http://beesbusiness.com.au/articles/Choosing_plants_to_attract_native_bees.pdf)

We can also provide nesting havens for native bees by leaving some areas of the garden un-mulched. It is very difficult for a 5mm bee to dig through a thick layer of mulch, so by leaving just a small, bare area (about a metre squared) you may encourage bees to nest in the ground. You might want to include a 'bee hotel', which is actually a nursery, for cavity-nesting bees. It is best to make several small hotels, rather than one large one, as this mimics nature more closely. A basic guide on how to provide nesting substrate for cavity-nesting bees can be found here http://beesbusiness.com.au/articles/Creating_nesting_substrate_for_cavity_nesting_bees.pdf

Pesticides are not only used by farmers, orchardists, the nursery industry and market gardeners. Many gardeners use pesticides, whether they be synthetic or homemade, to kill insects they haven't even identified. These may kill beneficial predators or parasitoids that can help control insect pests. So many people 'shoot first and ask questions later'… or don't ask questions at all. We need to understand the complex balance that nature presents to us. Rather than killing anything that moves.

Community engagement

By combining community and education we can spread the word

about the importance of bees and other pollinators. And have fun while we're at it!

Australian Pollinator Week was first launched in 2015, as part of the "Bee Aware of Your Native Bees" project, funded by the NSW Environmental Trust and managed by Western Sydney University's Office of Sustainability and Bees Business https://www.westernsydney.edu.au/rcegws/rcegws/biodiversity_and_river_health/bee_aware The aim of Australian Pollinator Week is to engage communities in pollinator-friendly activities. We hope the event will be self-perpetuating in years to come. Some of the activities include conducting a 'wild pollinator count'. Participants can be part of a national citizen science project and help us better understand the distribution and diversity of our insect pollinators. Partake in hands-on, activities that enhance the community environment, such as creating a pollinator habitat, building bee hotels, creating beautiful pollinator-inspired art, learning how to photograph tiny, beautiful insects up close or conducting educational presentations on pollinators.

Last year Australian Pollinator Week reached communities in the inner Sydney parks, gardens in Western Sydney, regional NSW and even Perth, Queensland community gardens and national parks in Victoria. Kurrajong even a street fair. Facebook was abuzz with activities and the most beautiful images of communities enjoying our wonderful pollinators.

It's hoped that every year will see the growth of Australian Pollinator Week, but it's only with the support of communities, like yours, that this can be accomplished. Now is the time to start planning your

Top *Lasioglossum* **(***Parasphecodes***)** on buckwheat flower. **Bottom:** Carpenter bee on Salvia.

#OzPollinatorWeek event. If you need some inspiration, go to the Australian Pollinator Week page at http://beesbusiness.com.au/pollweekmain.html

There are Facebook groups that are extremely useful in identifying and better understanding native bees https://www.facebook.com/groups/beeawareofyournativebees/ and insects https://www.facebook.com/groups/AmateurEntomologyAustralia/