

Urban development is the nemesis of native bees. Wendy Pyper learns the tricks of their sweet saviours.

Men in hats: Rob Raabe, Ces Heather and Alan Waters of the Bee Rescue Service.

Princes of bees

Five years ago, retired farmer and cable-jointer Rob Raabe had a little more time on his hands and a desire to contribute towards the conservation of native flora and fauna. A long-held interest in native stingless bees spawned the idea of rescuing the insects from land earmarked for clearing and development. So Raabe contacted the manager of a site destined to become a race track.

'The manager gave me permission to look around the site and I found two hives after just a few minutes,' he says.

Raabe also noticed a variety of native orchids and asked his friend and fellow West Moreton Orchid Society member, Ces Heather, to help him collect the hives and orchids.

'We took ten hives from the site that day,' Raabe says. 'Then Ces got a taste for it and we've been rescuing bees together ever since.'

The Bee Rescue Service has grown to include a core of about five men. Each has an interest in stingless bees that stems from a desire to conserve the tiny, harmless creatures, whose native habitat is rapidly disappearing. Some of the members sell rescued hives to help cover rescue costs. Others keep the bees to enhance pollination of crops or bushland. Mostly, however, members of the rescue service just like to watch the bees go about their business from the comfort of their backyard.

Today, Raabe, Heather and three other enthusiasts, Alan Waters, Kevin White and Col Webb, are at a property near Ipswich west of Brisbane that's being cleared for fencing. Piles of fallen timber litter the paddock in readiness for burning, but at least one dead tree stands. Inside are two stingless bee hives. As I look skywards, I can just make out a black dot flying around the knot of a broken branch. Spotting such hives, I see, requires a degree of knowledge and a good pair of binoculars!

Left: The brood comb, the most important part of the nest, contains the bee larvae and the queen.

Below: The honey pots are of cerumen, a mixture of wax and propolis (a resin of plant origin).







Raabe says these bee-spotting skills, and the techniques used to rescue stricken bees, have been acquired during years of observing the insects, coupled with a liberal dash of trial and error.

'We made a lot of mistakes in the early years, but our knowledge and skills are improving all the time,' he says.

The group has also benefited from stingless bee-keeping workshops run by CSIRO entomologist, Dr Tim Heard, and information provided by the Australian Native Bee Research Centre in New South Wales. Rescue service member, Alan Waters, has just started his own beekeeping

As Waters starts up the chainsaw, the rest of us stand back to admire his handiwork. The aim is to fell the tree without too much damage, then isolate the two hives.

The chainsaw does the job quickly and efficiently and it's not long before the hives are cut from the main trunk. The entrance to each hive tells the men that two bee species are present. The first hive entrance is surrounded by the sticky red seeds of the Cadagi tree (*Eucalyptus torelliana*). These seeds usually litter the entrance of *Trigona carbonaria* hives, as the bees acquire the seeds while foraging for resin in the gumnuts (see story on page 20). The second hive entrance is less obvious and consists of a long thin tube, which extends quite a way outside the hollow log. This hive belongs to *Austroplebeia australis*, a smaller and less active bee than *T. carbonaria*.

As Raabe and Waters open the *T. carbonaria* hive, expertly slicing the section of log in two, a puff of bees escapes what looks like a waxy, brown lump filling the hollow. The hive is loosened from the sides of the log and the most important part – the brood comb – is carefully extracted.

Work, jelly, and sex

Inside the brood comb are the queen bee and thousands of larvae, which will ensure the continued survival of the hive. The *T. carbonaria* comb that Raabe holds up for inspection is made up of thousands of cells arranged in a spiral pattern. Each cell is stocked with honey, pollen and a glandular secretion called 'royal jelly', which feeds the developing larvae for about 50 days.

As Raabe and Waters work, they tell me that the sex of the bees depends on the number of chromosomes they receive. Female bees have two sets of chromosomes (diploid), one set from the queen and another from one of the male bees or 'drones'. Drones have only one set of chromosomes (haploid) and are the result





Top: Rob Raabe, Ces Heather and Alan Waters open up the log. Above centre: A *T. carbonaria* nest in the knot of a broken branch. Above: Wax and resin from the original nest is smeared on the new hive so that bees out foraging can find their way home. of unfertilised eggs.

Female bees may become workers or queens depending on the nutrition they receive as larvae. Queen bee cells can be distinguished from other cells by their larger size, as they are stocked with more food than the worker and drone cells. When the new queens emerge, they are killed or evicted. But if the ruling queen is weak or dying, the hive will select a virgin queen to replace her.

When the young worker bees emerge

from their cells, they tend to remain inside the hive pursuing different jobs. Some will be involved in the ongoing construction of the hive while others will remove rubbish or become nurse bees, producing royal jelly to feed the larvae. As they get older they become guards or foragers. Most die at this stage (about 80 days), although some may live to become scouts, responsible for finding food and alerting other bees in the hive to its source. At any one time, hives can contain about 10 000

The bees' trees

THE first instance of 'mellitochory' – seed dispersal by bees – has been observed between the stingless bee, Trigona carbonaria, and the Cadagi tree, Eucalyptus torelliana. The discovery came after biologists Dr Helen Wallace and Dr Stephen Trueman, from the University of the Sunshine Coast, noticed Cadagi seeds in resin deposits at the entrance of T. carbonaria hives, and on the ground below.

Further research showed that when the bees entered Cadagi gumnuts to collect resin droplets for nest building, they often emerged carrying resin in their 'corbiculae' (pollen baskets), with one or two seeds attached.

Wallace says that before returning to the hive, workers would attempt to dislodge the seeds by grooming with the hind leg and scraping the seeds onto nearby leaves or gumnuts. At other times they would attempt to remove the seeds at the hive entrance or carry the seeds directly into the hive.

'We know most of the seeds taken into the hive were eventually removed, as we saw workers fly away from the hive entrance carrying seeds in their mandibles and forelegs,' Wallace says.

'They were often discarded within 10 metres of the hive, and we suspect they can disperse the seed up to two kilometres away from the parent tree.'

Wallace and Trueman also looked at the viability and germinability of seeds collected from the resin around hive entrances and underneath the hives.

'We found that about 94% of the seeds were viable and intact when



Seeds from the cadagi tree at entrance to a *T. carbonaria* hive. The bees appear to function as a dispersal agent for the tree.

removed from the resin,' Wallace says. 'This was a similar percentage to seeds collected directly from the gumnuts. And at least 89% of seeds deposited under the bee nest were able to germinate.'

These results suggest that T. carbonaria is an effective dispersal agent for Cadagi seeds. The dispersal of plant seeds by vertebrates such as birds, mammals and reptiles, is a well-known phenomenon, but ants had been thought the only significant invertebrate seed dispersal agents.

Wallace says future work will delve further into the relationship between the bees and the Cadagi tree, which is rapidly becoming an invasive species in south-east Queensland. Wallace will also examine the distinctive anatomy of Cadagi gumnuts, which she believes may represent an adaptation for seed dispersal by bees.

More about mellitochory

Wallace HM and Trueman SJ (1995) Dispersal of Eucalyptus torelliana seeds by the resin-collecting stingless bee, Trigona carbonaria. Oecologia 104:12–16. workers, 10000 larvae and several hundred drones.

When Raabe and Waters finish transferring the brood comb, and as many pollen and honey pots they can salvage, to a new box, they smear some of the cerumen around the entrance of the box. The cerumen is thought to release a pheromone that enables bees to identify their hive. Importantly, the new hive will remain on site until night falls, ensuring that any workers out foraging for pollen and nectar have time to find their way home.

With *T. carbonaria* relocated, Raabe and Waters turn their attention to the *A. australis* hive. The section of log containing the hive is well preserved, so the men decide to leave the hive in place. The ends of the log are sealed with pieces of wood to prevent predator access, and the log is transported back to Raabe's place. Here the bees will happily visit the trees and flowers in his and surrounding gardens.

While two more hives have been saved, Raabe says thousands more across the country are in danger or have already been destroyed. He hopes a network of rescue services will be able to cover a much wider area as more people become aware of the plight of stingless bees and learn the skills of bee rescue and beekeeping.

A b s t r a c t : Stingless bees play a small but important role in the pollination of native plants and some crops in tropical and sub-tropical Australia. They also fill a small niche market for bush honey. Land clearing has decimated many stingless bee nests, but recent initiatives have increased awareness of the need to conserve these harmless, social insects. These initiatives include the establishment of a native bee rescue service and the design of suitable hives. Efforts to protect our major pollinator and honey producer - the European honeybee - from a parasitic mite, are also underway. The mite, whose natural host is the Asian hive bee, has decimated European honeybee populations around the world. Australian scientists are close to identifying a chemical signal released by the honeybee that stimulates mite reproduction. Isolation of this signal could lead to the development of European honeybees resistant to the mite.

K e y w o r d s : native bees, stingless bees, bee, honey, bee hives, wildlife conservation, reproduction, European honeybee, mites, parasites, varroa mite, Varroa jacobsoni insect pests, pest control.