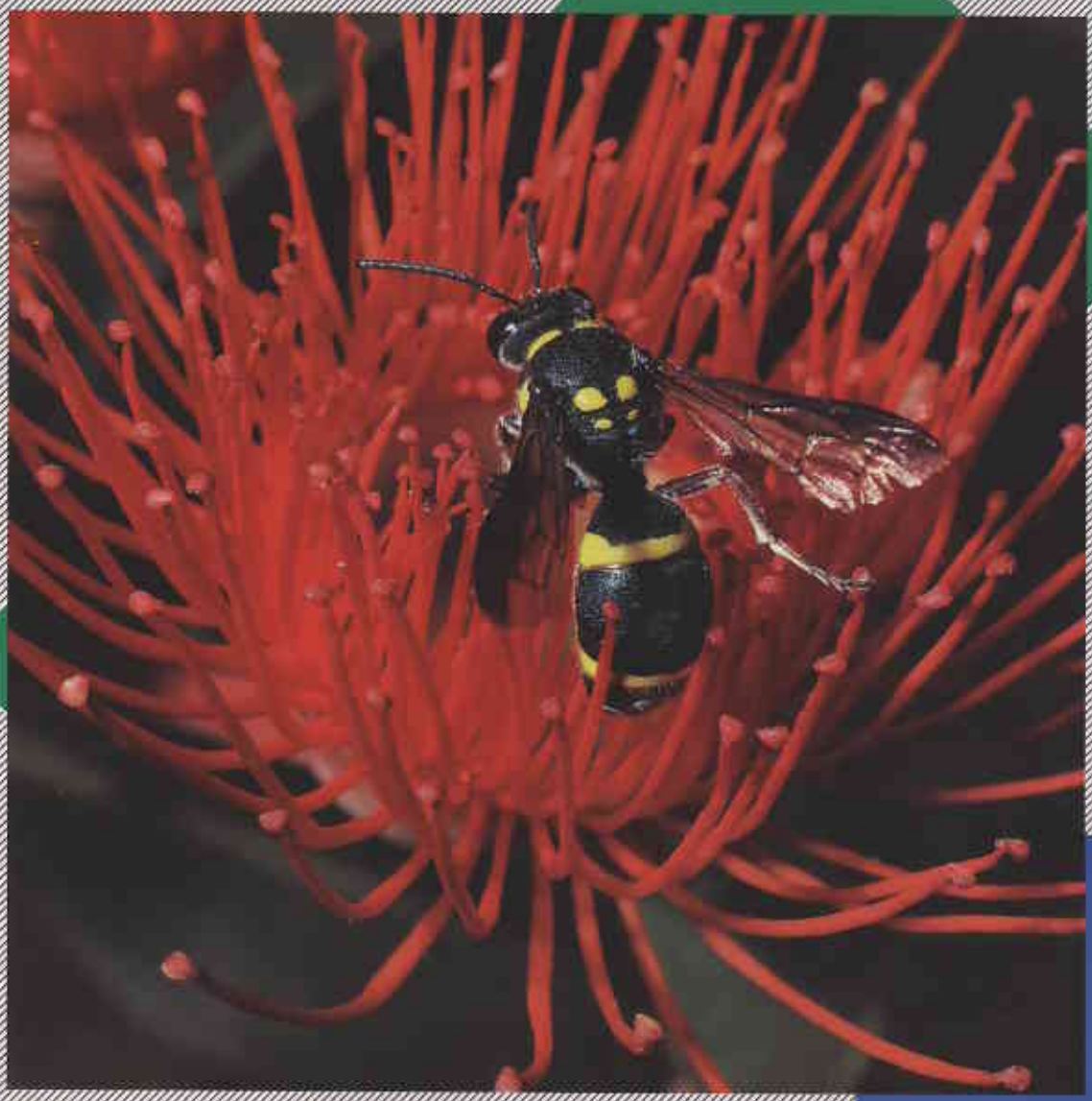
THE 'REAL' BEES OF WESTERN AUSTRALIA



BY JOHN ALCOCK

Mention the word 'bee' to an Australian, in fact to almost anyone the world around, and that person will probably think about an unhappy encounter that he or she has had with a honey bee. Yet this introduced species is only one of some 3 000 named species of bee that call Australia home.

Domesticated honey bees (*Apis mellifera*) were introduced to Australia by Europeans. They quickly produced colonies that escaped into the wild, where they multiplied with a vengeance and spread across the continent. Although they produce that delightfully tasty and sticky substance, honey, there is concern that feral honey bees do considerable ecological damage, by occupying tree cavities that parrots would otherwise use as nest sites, and by consuming vast quantities of nectar that would otherwise sustain many Australian birds, mammals and insects.

In contrast, native bees are well integrated into their ecological communities as a result of a long evolutionary history here. Furthermore, the native bees are delightfully diverse in both appearance and behaviour, each species having its own way of making a living.

Consider the banksia bee *(Hyaleus alcyoneus)*, a glossy blue-black insect about as long as your thumbnail. Unlike the social honey bee, which forms colonies where a single queen rules over sterile workers, the banksia bee is a solitary species. Females nest by themselves without the benefit of worker assistants. Each nesting female collects pollen, which she uses to form brood balls in her nest in a hollow twig. Each completed packet of pollen receives an egg laid by the nesting female. The egg becomes a larva that consumes the food its mother provided; the larva in due course becomes a pupa, which in turn metamorphoses into an adult, long after its mother's demise.

Most bees around the world lead a solitary lifestyle when it comes to provisioning nests, although there are a few native Australian bees that form social groups with a sterile worker caste. Among the solitary bees, species differ behaviourally in a host of ways. For example, some nest in hollow twigs, others use termite tunnels or similar pre-existing burrows, a few gnaw homes into solid wood and many excavate tunnels into the ground. In addition, solitary bees vary with respect to the flowers visited by mothers building brood balls.

BEE SMORGASBORD

The huge variety of Western Australia's flowering plants provides a breathtaking smorgasbord for the many native bees of the State, most of which specialise to some extent on a small part of the available nectar and pollen sources. For example, female banksia bees prefer to nibble pollen from the inflorescences of the bull banksia (*Banksia grandis*) or the showy banksia (*B. speciosa*), which is often found in national parks along the south coast, such as Fitzgerald River and Cape Le Grand. The banksia bee swallows the pollen and stores it for regurgitation back at the nest. Other native bees carry pollen on their hairy hind legs, whereas some pack pollen on the underside of their abdomen. Other species forego pollen-collecting and nest-building altogether. Instead, they parasitise the hard-working females of certain other species, slipping into an established nest and laying their eggs on brood provisions intended for the nest builder's offspring.

No matter what their occupation, the native bees are completely inoffensive in dealing with people. Most are smaller than the honey bee and could not do much damage even if they wanted to.

Previous page
A female of the solitary bee *Hyleoides zonalis* gathering nectar from the flower of the red-flowering gum (*Eucalyptus ficifolia*).
Photo - John Alcock

Left: A common honey bee (*Apis mellifera*) feeding from the flower of a pigface plant.
Photo - Jiri Lochman

Below: A territorial male banksia bee (*Hyaleus alcyoneus*) guarding his showy banksia (*Banksia speciosa*) inflorescence.
Photo - John Alcock

Above: The bull banksia (*Banksia grandis*) is a favourite nectar source for banksia bees.
Photo - Jiri Lochman

Right: Male Dawson's burrowing bees (*Amegilla dawsoni*) fighting over a female.
Photo - Babs & Bert Wells

Any person who has been stung by a banksia bee or any other native species probably deserved it, as they probably tried to capture a female for some reason and she resented it.

Only female bees can sting, because only they possess a stinger, which is a modified ovipositor (the egg-laying device). In contrast, male bees lack a stinger, as well as lacking any drive to collect food for their offspring. Even so, their behaviour is every bit as intriguing and diverse as that of the females. The focus of male behaviour is the location of mates, a task to which the typical male Australian native bee devotes much of each day of his adult life.

TO DEFEND OR PATROL?

Because female bees are attracted to certain flowers, male bees are often found at the appropriate pollen or nectar source. If you visit Walpole-Nornalup National Park in January, you may see females of *Hyleoides zonalis*, a small black and yellow bee, sipping nectar from the beautiful red-flowering gum (*Eucalyptus ficifolia*). If you are alert, you will also see males of this species cruising steadily from one red flower to another, following a patrol route that keeps them going around in circles. The males are not there to drink nectar or admire the flowers, but to inspect any female that happens to show up. If she is receptive, the male pounces and mating occurs.

Hyleoides zonalis males make no attempt to defend the flowers they inspect, but the males of some species are ferociously aggressive (but not towards humans). A spectacular example is provided by Dawson's burrowing bee (*Amegilla dawsoni*). Some males of this species search for females that have just become adults and have gnawed their way up to the surface of the ground (their mothers having tunnelled out underground nests in which they placed their brood balls). Having discovered an emerging female, a male may have to fight violently to gain access to her, while other males attempt to displace him from his partner-to-be. Mobs of males may form a ball around a female, wrestling and tumbling over the ground in an effort to take her away to copulate.

There are other Australian species whose mate-searching males may employ more than one tactic to encounter females, exhibiting behavioural flexibility and complexity that give the lie to the reputation that insects have for being automatons. The banksia bee provides an instructive example. During summer, some males of this species engage in small but violent dramas played out on the stage of banksia inflorescences.

Any visitor to Cape Le Grand National Park in February or March can verify this point by locating a showy banksia with a considerable number of flowering spikes. Inspection of the spikes will reveal that some are being used as perches by yellow-faced, blue-black bees about a centimetre long. People can easily approach the bees, so intently do they cling to their flower spikes. The perched males are not harvesting nectar or pollen but are guarding their flower spikes against other males while they wait for receptive females to fly to them. When a resident male spots an approaching intruder, he wheels around to confront the other bee, whirring his wings as the other individual darts in, then leaping off his perch as the incoming bee becomes an outgoing one. Should the intruder have the temerity to land on the perch, a battle royal is likely to result, with the two males tumbling about on the flower spike in a wrestling match without Marquess of Queensbury rules. The bees bite at each other's wings, and thump their opponent with their abdomen, which has two spines on its underside, just to add emphasis to the thumping. Soon one male is on his way, and the other adopts the alert, head-down,

territory-defending pose, ready to respond at once to a new challenge.

MARKING MALES

In my studies of banksia bees, done in collaboration with Terry Houston of the Western Australian Museum, I have found that making sense of their lives is helped immeasurably by marking some males, so that they can be recognised as individuals. To this end, I have captured several dozen male banksia bees and marked them with dots of liquid paper applied to the thorax or abdomen.

Once this was done, and remember that handling male bees does not require courage, as male bees cannot sting, I released the marked males, which invariably made a beeline back to their perch. If they found the spike occupied by a newcomer who had taken advantage of their temporary absence, a wrestling match usually ensued, with the original resident usually regaining his territory. Thereafter, by surveying a population of marked individuals on some banksias, I learned that some males returned to the same territory for five or six hours a day over a period of as much as a couple of weeks. Moreover, once I got to know 'yellow three dots', 'white two dots' and 'blue X', I quickly realised they had 'personalities', in the sense that they did not all behave in an identical manner. Besides the determinedly territorial individuals, some did not defend their perches, but instead patrolled a whole battery of inflorescences, using one flower spike or another as an occasional resting site only.

I have also learned that territorial males are larger than patrollers. In this bee species, and for many other creatures, body size determines fighting potential, with smaller males being disadvantaged when it comes to physical combat. As a result, in the banksia bee, small males have evolved the capacity to avoid their bigger, tougher rivals, which they do by patrolling a set of flower spikes rather than by attempting (unsuccessfully) to defend a territory. But if one removes the large territory defenders from a banksia shrub, some of the smaller males will quickly claim the vacant perches, defending them against still smaller rivals. Amazingly, the bee is able to judge the nature of the competition in reaching a 'decision' about whether to defend a mating perch or to peacefully patrol a set of less attractive flower spikes in the attempt to encounter willing females that happen to be there.

Thus, the lives of banksia bees are anything but simple or dreary. And remember that this is just one of hundreds of bee species native to Western Australia, no two of which behave in precisely the same manner. The native bees may not have the economic or physical impact of the introduced honey bee, but they remind us that there are worlds within worlds in nature. Knowing even a little about them enriches a walk in native bushland as the bees invite us to focus down, to consider the smaller living things, and to be surprised and delighted by the stories they have to tell.

Top: A Dawson's burrowing bee at the entrance to its burrow.
Photo - Jiri Lochman

Above: Lasiglossum sp., one of a group of bee species whose females may nest together in the same burrow, is seen here feeding on a coastal plant.
Photo - Jiri Lochman

John Alcock is Professor of Zoology at Arizona State University and a regular visitor to Australia on his study leaves.

The galah is just one of the many bird species that visit our urban and suburban gardens. 'Birds in the Garden' shows us how we can attract more.

In spring, the Wongan Hills are ablaze with wildflowers, but this 'island' sanctuary is also a home to a wide variety of animals. See page 21.

LANDSCOPE

VOLUME TEN NO. 2 SUMMER ISSUE 1993-94

Yanchep National Park is having a facelift. Our story on page 28 examines the history and rebirth of one of Perth's closest and most visited national parks.

Banksia gardneri *var.* brevidentata *is one of a number of plants named in honour of Charles Gardner. See 'Gardner's World' on page 41.*

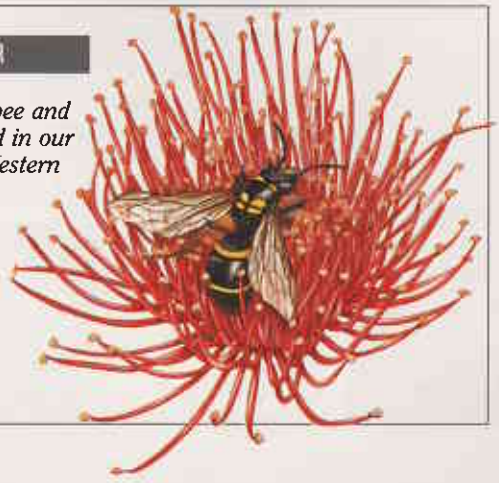
The Pinnacles is one of several destinations for licensed tours operating in WA's national parks. See 'Travel Companions'.

FEATURES

REGULARS

COVER

Hyleoides zonalis *is a solitary bee and one of the native bees described in our story about the 'real' bees of Western Australia on page 17.*
The illustration is by Philippa Nikulinsky.



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Colour Separation by Prepress Services
Printed in Western Australia by Lamb Print

Published by Dr S Shea, Executive Director
Department of Conservation and Land Management,
50 Hayman Road, Como, Western Australia 6152.