





big

The wrestling,
mating,
nesting,
buzzing,
bees

of Kennedy Range National Park

Tucked away in claypans in the less visited eastern plains of the far flung Kennedy Range National Park is a natural phenomenon that leaves US professor John Alcock abuzz with excitement!

by John Alcock

The vast arid plain on the eastern side of Kennedy Range National Park lacks the obvious drama of the deeply-cut canyons and massive sandstone cliffs to the west. Not surprisingly, therefore, visitors to the park, which lies some 60 kilometres north of Gascoyne Junction, are drawn primarily to the attractive canyons near the camping area. A few bushwalkers even manage to scramble cautiously to the top of the cliffs, where they find themselves on a strange and wonderful plateau covered in pale green spinifex accented by brilliant red sand dunes.

Given the appeal of the ranges themselves, only a handful of visitors choose to explore the eastern plain. This tiny minority wanders through a shrubby woodland of acacias, hakeas and eremophilas. There is no trail here but the walking is easy, offering none of the obstacles provided by the jumbled rocks in the canyons nearby. Thornbills, redthroats and spiny-cheeked honeyeaters slip from bowgada to mulga and back again.

Claypans

In the course of a stroll across the eastern plain, you will come sooner or



later to one or another of the claypans scattered through this part of the park and beyond. These depressions sometimes fill to overflowing, but only on those rare occasions when remnants of cyclones surge into the arid interior of Western Australia. Most of the time the park's claypans are bone dry and hard as concrete. A line of emu or kangaroo footprints, all but fossilised in brick-hard clay, may reveal that once upon a time the pan's surface was wet and muddy—but not now.

Anyone who finds one claypan is likely to want to see others. Some pans are beautifully symmetrical, a circle of red clay rimmed by pale red sand dunes; others have an irregular outline, all curves and indentations, with an isolated white-barked eucalypt or two growing on a bend in the shoreline. Some cover several hectares; others are much

smaller. Some have smooth, flat surfaces that would be the envy of a tennis club; in others the clay is deeply cracked and flaked, or blotched with patches of black pebbles. On the borders of some pans, stone flakes lie in the sand where they were left by Aboriginal people long ago.

The pans are largely barren and apparently devoid of life, although some have a little island of scrub where a red kangaroo or two may lay up during the heat of midday. Most pans, however, are empty, and suffused in a profound silence broken only when a breeze rustles the acacias on the nearby dunes. Nevertheless, in a small number of pans, the rule of silent lifelessness is overruled for a small part of each year. As you walk out onto the edge of one of these special sites in August or September, you will be greeted by a swirling mass of very large and noisy bees, an intimidating encounter that sends most people into retreat. These are Dawson's burrowing bees, one of the largest and most handsome of Australia's native bees, and they have gathered here in great numbers to build their nests in the clay soil of the pan. Once you have backed away from the bees (which are all buzz and no bite), you will notice that the surface of the pan is dotted with hundreds or thousands of miniature pyramids, little mounds consisting of dirt excavated during the construction of the burrows of the bees.

Gnawing problem

Each mound of dirt surrounds the entrance to a nest built and maintained by an elegant black and pale grey female bee. To make her nest, the

Previous page

Main Dawson's burrowing bees compete fiercely for mates. Here, a group of males has assembled around an emerging female. A free-for-all will ensue when the virgin female does venture out of the exit tunnel. As the males all seek to hold the female, a ball of bees forms from which the winning male will emerge with his mate to race for cover away from the losing males.

Left A claypan in the Kennedy Range National Park.

Photos – John Alcock





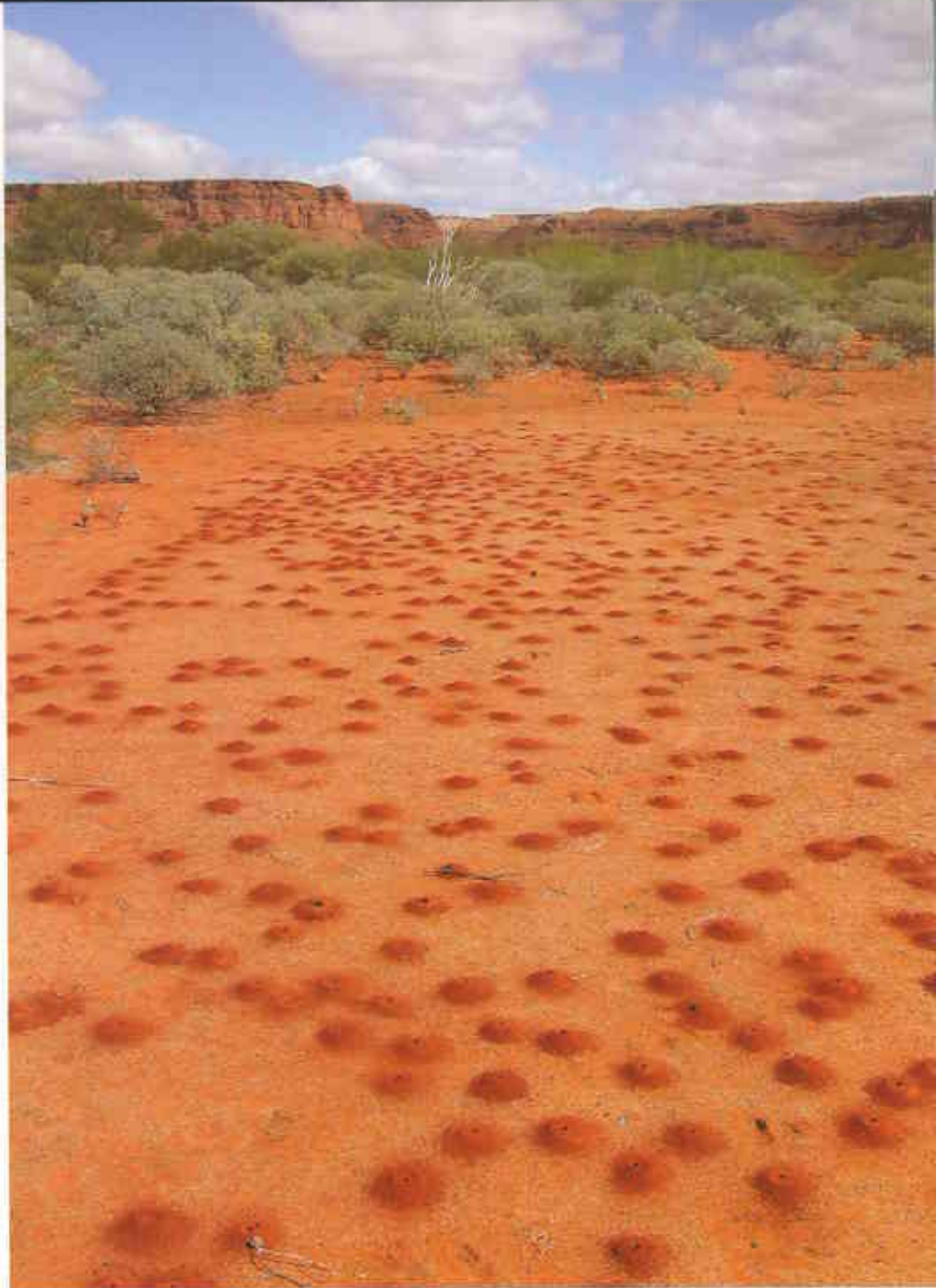
Above Although female Dawson's burrowing bees build their nest entrances very close together, they easily relocate their nest when returning from their pollen and nectar-collecting trips.

Right A nesting aggregation photographed late in the nesting season after many hundreds of females had chosen to dig their nests in this area. The eastern cliffs of the Kennedy Range are visible in the background.
Photos – John Alcock

Below right A female Dawson's burrowing bee builds her nest in the hard clay favoured by this species. Note that the female has built a circular turret that retains the loose soil pushed out of the nest burrow during the construction phase.
Photo – Jiri Lochman

female had to dig down into the rock hard clay of the pan. For Dawson's burrowing bees, 'digging' might be more accurately described as chewing, because the females do most nest construction with their jaws. Although the bees have powerful mandibles, they would be stymied by the location they have chosen, were it not for the fact that they regurgitate fluid onto the clay, which softens it. The identity of the liquid is not known for sure, but is suspected to be flower nectar, which the bees collect and store in a honey crop linked to their digestive tract. Whether nectar or ordinary water, the fluid makes it possible for the bee to gnaw a vertical shaft into the ground in stages, each step requiring a trip out to collect more liquid to moisten the bottom of the lengthening nest tunnel.

Females spend the better part of a day digging straight down, some 20 centimetres or so, before tunnelling in





Above A female emerges from her exit tunnel after having recently become an adult. The male will grasp her as soon as possible.



Left A male mounts a female Dawson's burrowing bee immediately upon her emergence.
Photos - John Alcock

a path roughly parallel to the surface for a short distance. The bee then heads down again, as she excavates a terminal upright cavity perhaps five centimetres long. This chamber is lined with wax produced by special glands in the female's head. The female subsequently fills the now-waterproofed container with a soupy mix of nectar and pollen gathered over a long series of trips to and from flowering plants in her neighbourhood. In the Kennedy Range, the bees harvest these materials from cremophilas and northern bluebells.

At the height of the nesting season, battalions of females come and go all day long from the aggregated nests. Given the number of nest entrances and their close proximity to one another, you might think that the bees would sometimes get confused about

which nest was whose, but Dawson's burrowing bees are professionals. They never make mistakes. Instead, each pollen-carrying female rockets directly back to her nest entrance where she hovers for a fraction of a second before plunging head-first into her burrow. Females almost certainly manage this trick by learning the visual landmarks en route to and from their burrows, including those cues available right around the burrow entrance, such as the position of some local pebbles or the pattern made by a set of neighbouring nest mounds.

Because of their navigational skills, females efficiently deposit pollen and nectar in their own brood cells (and never help other females at their nests). Once a pot is about two-thirds full, the bee lays an egg on this moist mass of

food. She then closes off the cell with a mud cap. When this dries, it seals off the brood pot, preventing desiccation of its contents and keeping parasites away from her offspring. Inside the safely sealed brood pot, the egg hatches into a grub that feasts on the supplies left for it by its mother. Meanwhile, the female extends her nest burrow, adds another brood cell, and goes to work all over again for her next offspring, a cycle that she usually repeats for her entire adult life, which only lasts a month or so. During this period, the nest burrow is steadily extended until such time as the female dies or moves to a new location.

As a larva polishes off the provisions left by its mother, it grows rapidly until it metamorphoses into the so-called prepupal stage. At this time, the baby bee becomes a dormant grub bloated with fat, which helps to keep it alive for the better part of a year. Then, after a new winter has come around, the prepupa becomes a pupa, which changes into an adult and gnaws its way

out of the brood pot and up through the soil until it reaches the surface. In a place where dozens, hundreds or thousands of Dawson's burrowing bees nested shoulder-to-shoulder in the previous winter, many dozens, hundreds or thousands of bees make this transition over a couple of months.

Greeting committee

Once out of the ground, the bees embark on the busy program of activities that they must accomplish in order to reproduce. Adult females spend the bulk of their lives building a nest or two and, in the process, will fill a dozen or so brood pots with food for their progeny. But, before they can start nesting, female bees must mate to secure sperm with which to fertilise their eggs. This is where the adult males come into their own. After a male emerges, he fuels up with nectar from some local flowering plants before returning (probably) to the place where he emerged. Odds are that many females will also be coming to the surface here in the days and weeks ahead. These are the females that males attempt to find, and they are so good at this task that when a female pops out of the ground, she almost always finds a male (or males) waiting right there.

The female's greeting committee has assembled because males can detect the odour of the female, which wafts out of the exit tunnel soon after her jaws break the surface of the ground. As the female continues to nibble away at this little opening, making it larger, her scents attract the attention of one or more males sailing low over the area.

Above right On the left, a male that had been guarding an emerging female wrestles a rival male while a third male waits at the emergence hole, which he discovered while the other two males were fighting. Neither of the two wrestlers mated with the female when she emerged because their fight lasted too long. Instead, the third male won the honours.

Right One of the pollen and nectar sources for Dawson's burrowing bee, a species of *Eremophila*.
Photos – John Alcock

A patroller that smells an emerging female is quick to drop to the ground by the incipient exit hole, because when the virgin female comes out, she is sexually receptive. A male that is able to scramble onto her back will accompany his partner as she races to the edge of the pan, where the pair can hide under a little shrub or by some debris. There they can copulate without interference from other male bees or from predators like butcherbirds, which can kill Dawson's burrowing bees with a snap of the beak.

Bee-to-bee combat

The way for a male to leave many descendants is to find and mate with many freshly emerged females. In their eagerness to do so, males

regularly get in each other's way. So, when several males independently smell a female before she has fully come to the surface, they may encircle the exit hole shoulder to shoulder. When the female does come out, a free-for-all ensues in which Marquis of Queensbury rules are forgotten. The males violently attempt to interpose themselves between the female and their rivals. Occasionally, the battle for control of a potential mate becomes so fierce that the virgin female is literally pulled to pieces by her out-of-control suitors. Usually, however, the battle is resolved in a minute or two, when one male somehow forces his way out of the tumbling melee with the





female safely beneath him. The pair then moves as quickly as possible away from their harassers.

To avoid having to struggle with large numbers of competitors after a female's emergence, males that have managed to find a potential mate generally try to repel newcomers as quickly as they can. When a waiting male senses a male approaching from behind, he flies up and back into the other male, bumping him away as forcefully as possible. If this manoeuvre is successful, the Johnny-come-lately will not be able to land by the emergence hole, and so cannot position himself to scramble onto the female's back when the bee decides to leave her exit burrow. Instead, the guarding male will secure the prize.

If, however, a rival somehow manages to land near the emergence hole, the guarding male may attack, leading to an all-out wrestling match on the ground. In these bouts, the two males tumble about trying to bite one another or tear at each other's wings with their powerful mandibles. If an opponent can be convinced to leave, the winner hurries back to be there when the female emerges. Two evenly matched contestants, however, may spend several minutes grappling with one another, during which time a third male sometimes slips down to wait for the female to emerge. Not infrequently, this latecomer wins the

chance to copulate, when the female comes out before a winner of the wrestling match has been determined.

August attraction

During my occasional visits to the Kennedy Range over the years, I have come to spend more time in Dawson's burrowing bee habitat than in the park's canyons and plateau, at least during the month of August. I imagine that if more park visitors knew of the mate guarding, bee-to-bee combat and sexual intrigue that occur in the eastern plain, some would set out to find claypans rather than spend all their time exploring the imposing canyons and cliffs of the range.

Even if a trip to the range is not in the offing, I encourage winter travellers to the arid central parts of Western Australia to keep their eyes open for Dawson's burrowing bees, which often nest and emerge in roadside verges scraped clean by graders working the back roads of the Murchison and Gascoyne districts. These bees, although big and noisy, are essentially harmless (the females can sting but will do so only if picked up, not something most people are likely to attempt); they readily tolerate human observers and will reveal much of their lives to anyone willing to spend even an hour or two in their company. Although the marvellous geological features, birds, mammals and flowering plants

rightfully attract the attention of most visitors to parks and reserves managed by the Department of Conservation and Land Management, the insects of Western Australia also warrant a look. Some, like Dawson's burrowing bees, positively demand our attention. Those of us willing to invest some time getting acquainted with these creatures know that a good return on our investment awaits us.

Above Looking east over Kennedy Range National Park. Several claypans can be seen on the left hand side of the photograph.

Photo – David Bettini

Below A nesting female.

Photo – John Alcock



John Alcock is a professor at Arizona State University and a frequent visitor to Western Australia. He studies the behaviour of the native bees in both Arizona and Australia and has great enthusiasm for the natural environments of both places. He can be reached at j.alcock@asu.edu.

- 50 The Geraldton to Shark Bay sandplain—a strikingly beautiful biodiversity hotspot
Initiatives are underway to restore the Geraldton to Shark Bay sandplain area to its former state and protect it from threats.
- 56 Julimar—turning full circle
After a chequered past, Julimar Conservation Park is once again home to an abundance of animals, including threatened chuditch.

Regulars

- 3 Contributors and Editor's letter
- 9 Bookmarks
An enthusiasm for orchids
The Turquoise Coast
Ernest Hodgkin's Swanland
- 18 Endangered
Cape Range remipede community
- 30 Feature park
Cape Arid National Park
- 62 Urban antics
Moving poles

Publishing credits

Executive editor Caris Bailey.
Editors Carolyn Thomson-Dans, Rhianna King.
Scientific/technical advice Tony Start, Paul Jones, Chris Simpson, Keith Morris.
Design and production Tiffany Taylor, Maria Duthie, Natalie Jolakoski, Gooitzen van der Meer.
Illustration Gooitzen van der Meer.
Cartography Promaco Geodraft.
Marketing Estelle de San Miguel
Phone (08) 9334 0296 Fax (08) 9334 0432.
Subscription enquiries
Phone (08) 9334 0481 or (08) 9334 0437.
Prepress and Printing Advance Press, Western Australia.

© ISSN 0815-4465

All material copyright. No part of the contents of the publication may be reproduced without the consent of the publishers

Please do not send unsolicited material, but feel free to contact the editors.

Visit NatureBase at www.naturebase.net

Published by the Department of Conservation and Land Management, 17 Dick Perry Avenue, Kensington, Western Australia.

