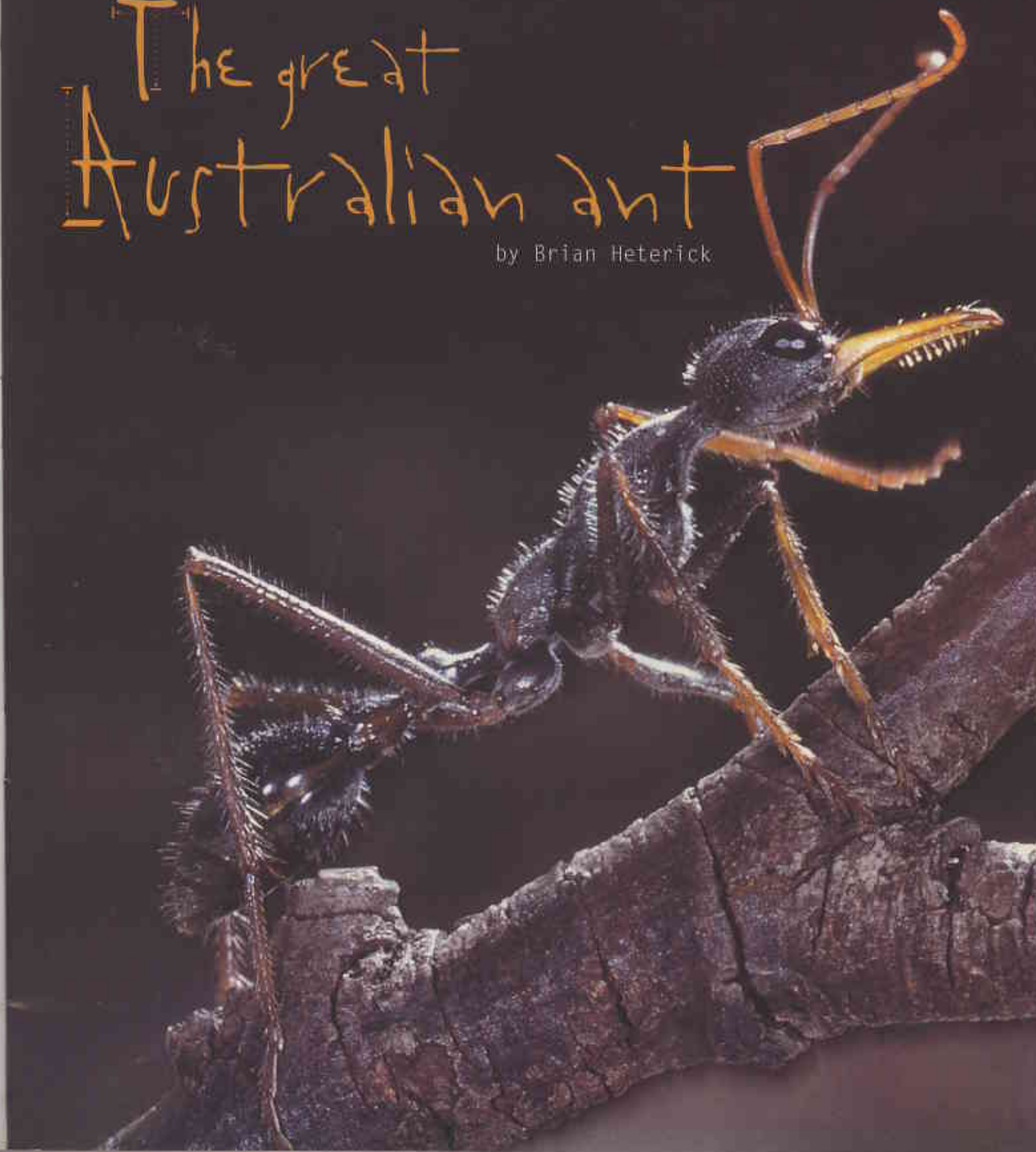
Which group of animals is found in every national park and nature reserve in the State and plays a fundamental role in ecosystems, by helping many seeds to germinate and altering the soil profile? The answer is ants. However, ants are more than just helpful agents in land management. This group deserves attention in its own right because of the fascinating array of forms, behaviour and adaptations found among its members.

The great Australian ant

by Brian Heterick



Ants, like bees and wasps, belong to the insect Order Hymenoptera, with all ants being placed in the Family Formicidae. Also, as with bees and wasps, the Australian ant fauna is huge, and contains many endemic forms found nowhere else. Western Australia boasts an enviable portion of this diverse ant fauna. The western third of our continent may be home to between 700 and 800 ant species, out of an Australian total of perhaps 4,000. All 10 of the Australian ant subfamilies have Western Australian representatives, though several of these, like the Nothomyrmeciinae, are known from only one or a handful of specimens.

Indeed, *Nothomyrmecia macrops*, the only surviving member of the ancient ant superfamily Nothomyrmeciinae, has been termed 'the fossil ant'. Two specimens of this rare ant were collected in 1931 'somewhere' east of Esperance, but it was not rediscovered until 1975 in South Australia's Eyre Peninsula, near the small settlement of Poochera.

THE IMPORTANCE OF ANTS

Ants are necessary to the health of many native Australian ecosystems. For instance, ants perform a vital function in dispersing seeds. Forty per cent of the seeds dispersed by ants are from *Acacia* and *Eucalyptus* species, and the Proteaceae (the banksia family), Fabaceae (pea plants) and Casuarinaceae (sheoaks) are dominant families in banksia woodland whose seeds are also spread by ants. The ants take the seeds back to the nest, eat the oily appendages and leave the embryos intact, enabling them to germinate.

Ants also cycle litter in the soil. Decomposition of litter is aided by the dispersal of fungi and bacteria by ants. In this way, ants help to modify the physical and chemical properties of soil.

AMAZING ANTS

Ants display an amazing variety of forms and lifestyles. Some ants, like the tropical green tree ants (*Oecophylla smaragdina*), which use their larvae as living shuttles to weave together the leaves of their nest, or the desert-dwelling 'honeypot' ants (in the genera *Camponotus* and *Melophorus*) are well known. Less well known is the little spinifex ant (*Ochetellus flavipes*) of the Pilbara and Kimberley regions, which tends plant-sucking bugs (Order Hemiptera) under coverings of plant resin and soil.

In the south-western forests, tiny nocturnal hunters (members of the Myrmicine tribe Dacetini) stalk their springtail prey. These ants have jaws like spring-traps, which snap shut when sensitive hairs on or around them are touched. The traumatised prey is then stung and immobilised. *Odontomachus* has superficially similar dentition to some of the dacetine ants, but belongs to the Subfamily Ponerinae and is much larger, with a powerful sting. Its

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A bulldog ant.
Photo – Babs & Bert Wells/CALM

Above: Green tree ants build a nest from leaves, using silk produced from the silk gland of the larva.
Photo – Hans & Judy Beste/Lochman Transparencies

Left: A bulldog ant returns to its nest with a spider that it has captured. These ants are skilful predators.
Photo – Jiri Lochman

jaws snap shut in as little as a third of a millisecond, one of the fastest response times in the animal kingdom!

The ubiquitous meat ants (*Iridomyrmex purpureus* species group) are well known to, and sometimes detested by, country residents of Western Australia, while the unique bulldog ants (Subfamily Myrmeciinae) have stings that can be life threatening to people who are sensitive to ant, bee and wasp venoms. Rather more comical are the enormous-eyed 'robot' ants (*Opisthopsis* spp.), which move in grotesque little jerks.

ANT DIVERSITY

These and many other ant species are dominant life forms in most terrestrial ecosystems of Western Australia. Our ant biodiversity can be astonishing. On mining tenements in heathland at Eneabba, 300 kilometres north of Perth, just over 100 ant species have been found in a few hectares of heathland. A similar number has been recorded from the trunks of four species of eucalypt in the Darling Range. Nearly 60 species have been identified on the Mt Eliza escarpment in Kings Park, almost in the heart of Perth.

Ant diversity is reduced in developed areas, although as many as 20 species of ant may still reside in reasonably large backyards of the newer Perth suburbs. In such areas, however, exotic ant species or those that can adapt to disturbance are more plentiful than 'bush' ants. In fact, because our ant fauna as a whole is sensitive to disturbance, as well as to climatic variability, ants are very useful bioindicators in terrestrial ecosystems. They are also abundant as a group, easy to capture (especially in pitfall traps) and reasonably easy to identify to at least 'morpho-species' level without a great deal of technical training.

A number of Australian researchers are now using a classification of ant communities pioneered by John Greenslade (ex CSIRO, Division of Soils) and Alan Andersen (CSIRO, Darwin) to examine the effects of overgrazing, rehabilitation of mine sites, burning regimes and similar environmental activities. Ants are placed in functional groups according to their competitive interactions, postulated habitat requirements and evolutionary history. Nine ant groups are currently recognised. They are

Above: Channels excavated by ants.
Photo – Dennis Sarson/Lochman Transparencies

Above right: Ants (*Iridomyrmex* sp.) drinking.
Photo – Jiri Lochman

Right: Meat ants may carry small pebbles to their nest. They can build huge mounds which are very large in relation to the ant's body.
Photo – Babs & Bert Wells/CALM

dominant Dolichoderinae (the huge genus *Iridomyrmex* that dominates native ant communities, and several smaller closely related genera); subordinate Camponotini (containing the sugar ants, *Camponotus* spp., as well as *Calomyrmex*, *Polyrhachis* and *Opisthopsis*); hot climate specialists (*Melophorus*, *Meranoplus*, some *Monomorium* and the spinifex ant); cold climate specialists (*Dolichoderus*, some *Monomorium*, *Stigmacros* and several smaller genera); tropical climate specialists (such as the green tree ant and red fire ant, *Solenopsis geminata*); cryptic species (a number of small, litter-loving ant genera); opportunists (the little black house ant, *Ochetellus glaber*, *Paratrechina*, *Rhytidoponera* and some other genera); generalised Myrmicinae (*Crematogaster*, various small *Monomorium* species and the large genus *Pheidole*); and specialist predators (the bulldog ants, the Dacetini, and about half-a-dozen small genera).

Researchers have noted some important patterns when they place their ant data into functional groups. For example, urban areas have few, if any, specialist predators. This is mainly due to the absence of specific prey species or prey in sufficient abundance to support colonies of large insects such as bulldog ants. Householders also target the latter species for extermination! Litter-dwelling cryptic species are also usually absent, or present only in small numbers, since lawns and other plant monocultures provide few suitable habitats for them. In large disturbed areas, such as new mine sites or overgrazed paddocks, pioneering dominant dolichoderines (especially meat ants) and opportunist species are favoured, and their numbers are often far higher than those of ants in other categories. Over time, with the return of most of the original vegetation of the area, their numbers can be expected to diminish, while those of ants in the other categories rise. On the other hand, unsuccessful rehabilitation results in disproportionate numbers of dominant dolichoderines and opportunist species.

LODGERS IN ANTS' NESTS

Ants' nests also provide homes for an astounding variety of invertebrates, including spiders, mites, millipedes, springtails, representatives of 10 or more insect orders, and some vertebrates. The most important invertebrates from the ants' point of view are plant-sucking bugs, which may be 'farmed' for their honeydew (actually sugary faeces). Queens of the genus *Acropyga* even carry honeydew-producing mealybugs with them on their nuptial flights! Many of the other invertebrates are harmless scavengers, but some prey on the ants or their brood.

Vertebrates found in ants' nests in Western Australia include certain lizards, snakes (particularly blind snakes in the Family Typhlopidae) and native rodents. Around Perth, the small Gould's hooded snake (*Rhinoplocephalus gouldii*) can be found in the nests of stick-nest ants (*Iridomyrmex conifer*). In the Pilbara,

Above left: Ants obtaining honeydew from a plant-hopping bug. Ants will protect these creatures from predators and parasites.
Photo – Ann Storrie

Left: A legless lizard (*Delma australis*) emerges from an ants' nest in Fitzgerald River National Park.
Photo – Babs & Bert Wells/CALM

native mice often shelter from predators in the nests of large ants, such as those of the mulga ant (*Polyrhachis macropus*).

URBAN 'TRAMPS'

Despite the presence of such a diverse suite of ant species in relatively undisturbed areas, ants seen by the public in large cities like Perth are, unfortunately, mostly exotics. Most of these so-called 'tramp ant' species were introduced to Western Australia around World War II or just afterwards. Since then, they have made steady progress in dominating ant communities in and around the larger towns and cities. These ants have large colonies with many queens, and can live in very temporary habitats. Moreover, the typical urban ground cover of bitumen, brick, cardboard, concrete, lawn, sheet metal and wood shavings is sufficiently commodious for Singapore ants (*Monomorium destructor*), Argentine ants (*Linepithema humile*), coastal brown ants (*Pheidole megacephala*) and similar exotic pests to make their homes. At the same time, it does not provide pleasant living quarters for native ant species.

Recent research by staff and students of the Department of Environmental Biology at Curtin University suggests that the picture, at least in Perth, is becoming quite grim. Using studies done in the mid-1980s as a comparison, researchers are finding that the Argentine and coastal brown ants, in particular, appear to be eliminating other ants from the metropolitan area at a rapid rate. Undoubtedly, their success is being furthered by urban development and urban infill that results in increasingly sterile conditions for native invertebrate species.

Just as we have accepted that changes in outlook and practice have been necessary to ensure the preservation of our indigenous vertebrate fauna, so changes in outlook and practice will be needed if we want to retain our delightful, diverse and ecologically important native ant fauna in cities and towns. Otherwise we will be hosting only the annoying and damaging ant pests introduced in a less enlightened age.

Top: Mulga ant (*Polyrhachis macropus*) nests are raised above the desert floor as a defense against flooding.
Photo – Jiri Lochman
Inset: A closely-related ant in the same genus as the nest builder.
Photo – Bill Bachman

Above: Bulldog ants investigate an intruder to their nest.
Photo – Ann Storrie

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LANDSCOPE

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Armed with sketch pad, pencils, pens and paints, an intrepid group of artists set off on a brand new LANDSCOPE *expedition. See 'Awash with Colour' on page 28.*

Most of us only know of the exotic pest ants that invade our kitchens. But what of the great Australian ants? See page 23.

Ningaloo Marine Park and Cape Range National Park lie side by side in our north-west corner. Read about how they are managed on page 17.

Four more conservation reserves now offer greater protection to areas in and around the Mitchell Plateau. See 'Parks of the Plateau' on page 48.

Scientists continue to develop ways to locate, track and trap animals for research. See 'Tools of the Trade' on page 41.

FEATURES

REGULARS

COVER

For many years, the decline of frogs in various parts of the world has puzzled conservationists. A breakthrough came in 1996 when scientists isolated a new kind of fungus that infects and may kill frogs. Western Australian research now under way is beginning to answer some initial questions about the fungus and its impact on our unique frogs. See 'In Pursuit of the Frog Fungus' on page 10.

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