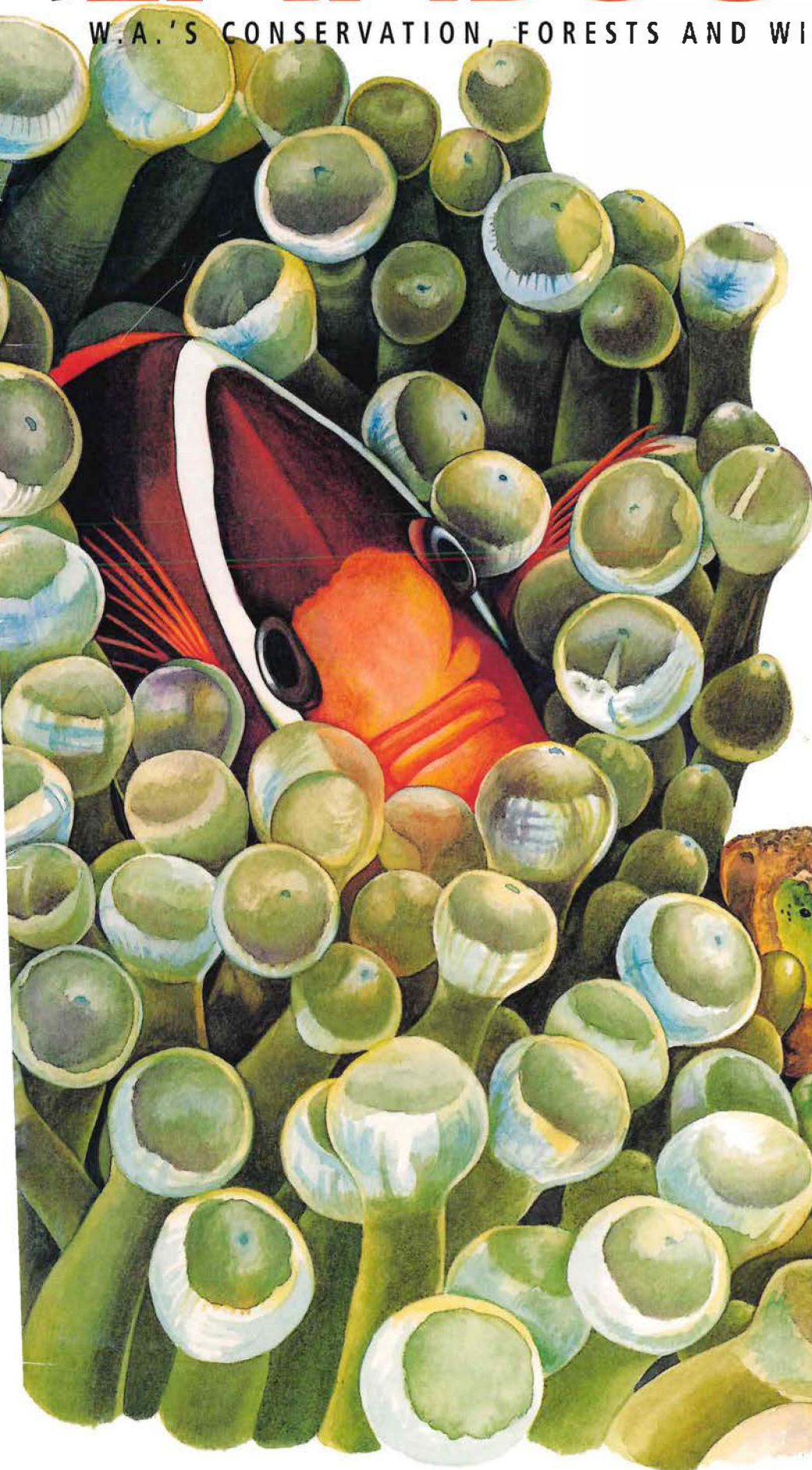


WINTER 2001

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# LANDSCOPE

W.A.'S CONSERVATION, FORESTS AND WILDLIFE MAGAZINE



## Return to Dryandra

Marsupials come home

## Our Frozen Future

Stocking the global seed store

## Linking the Landscape

Providing highways for threatened species





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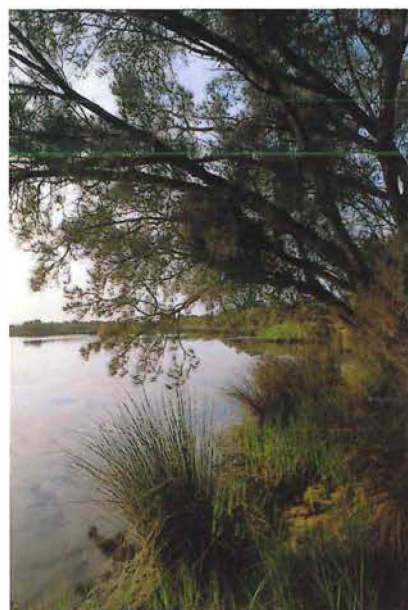
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Western Australian botanists are taking part in a global plan to store seed from 10 per cent of the world's flora by 2010. See page 23.



Discover the rich bird life and tranquillity of the Canning River Regional Park on page 17.

Winner of the 1998 Alex Harris Medal for excellence in science and environment reporting.

# LANDSCOPE

VOLUME SIXTEEN, NUMBER 4, WINTER 2001



Mushrooms the size of a dinner plate can appear within 48 hours of a fire in the karri forest. Read about forest fungi on page 48.



The Pilbara's numerous islands are rich in history, wildflowers and wildlife, with prolific marine life in the surrounding waters. See page 34.



Many of WA's threatened marsupials can be seen in the south-west for the first time in decades. Read about their return to Dryandra Forest on page 10.

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## COVER

Paradoxically, the stinging tentacles of sea anemones—a group of carnivorous invertebrates that sometimes resemble colourful flowers—can also provide a safe haven for many underwater creatures. Anemonefish gain immunity to the stinging cells and live primarily in sea anemone tentacles. Other animals, such as crabs, carry a protective anemone on their backs. Turn to page 28.

Cover illustration by Ellen Hickman



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DEPARTMENT OF  
**Conservation**  
 AND LAND MANAGEMENT  
*Conserving the nature of WA*



## GOOD NEWS ... BUT MORE TO BE DONE

Stories about the return of animals that haven't been seen locally for at least half a century, an ambitious global science project that is helping to ensure the survival of Western Australia's rare and threatened native plant species, new marine conservation reserves to protect the unique marine ecosystems of the Pilbara and wildlife-safe 'highways' along the South Coast. Has LANDSCOPE got a case of the 'positives'? You bet! There is good news in the marathon to conserve the State's biodiversity and its unique landscapes, but as you'll discover, we still have a lot of work ahead of us.

Dryandra Woodland, near Narrogin, is one of the most important remnant woodlands in the Wheatbelt. Home to a group of marsupials that had become extinct across most of the State's agricultural area, it was in Dryandra that the early experiments in fox control, that were the genesis of CALM's Western Shield predator control and native-animal reintroduction program, were conducted. In 'Return to Dryandra', Tony Friend, Clare Anthony and Neil Thomas document a field breeding and reintroduction program that will not only have Dryandra hopping with marsupials, but will raise public awareness of WA's fascinating marsupials through nature-based tourism.

In 'Our Frozen Future', Anne Cochrane, manager of CALM's Threatened Flora Seed Centre and a research scientist at the Western Australian Herbarium, writes of how WA seed biologists will work with the Royal Botanic Gardens in Kew to conserve one of the world's unique and most diverse flora. The Millennium Seed Bank Project—based at a purpose-built centre south of London—will help to prevent natural and human-induced catastrophes driving plant species to extinction.

One tried and important strategy for protecting and conserving natural biodiversity is establishing and properly managing conservation reserves. In 'Pearls of the Pilbara', Dorian Moro and Fran Stanley describe the conservation values in two proposed marine conservation reserves along the Pilbara coast and the process that is being followed to establish the reserves. The proposed reserves will protect the marine environment and ensure the various important uses of these areas are managed in a sustainable, integrated and equitable manner.

'Linking the Landscape' takes us through a project in the South Coast region of WA that is making it easier for native animals to move between habitats, increasing their chance for survival in a land that's now mostly cleared. Peter Wilkins, Ranger-in-Charge at Fitzgerald River National Park, describes a long-term conservation project involving government agencies and the wider community working together to help animals that are in real danger of local extinction.

We hope you'll find some inspiration and encouragement in this issue of LANDSCOPE.

Enjoy the winter and we'll see you in spring.

*RA Kenneth*

Executive Editor

## WILDCARE RESCUE SERVICE



A new project—Wildcare—has volunteers supporting a State-wide telephone service for people wishing to report sick, injured and/or orphaned native wildlife. It is available around the clock, with the telephone switching through to a private number after hours.

Before Wildcare was established, telephone calls were received daily from people all over Western Australia, and while most of the calls (11,000 calls in 1999 alone) were made to the Department of Conservation and Land Management (CALM), they were also made to the police, local authorities, vets and the RSPCA.

"Animals such as parrots, kangaroos, bandicoots, seabirds, marine mammals, woylies, possums and others are found on the sides of roads, in parks, suburbs, paddocks, forests, river banks and ocean shores," said CALM Coordinator of Volunteers Margaret Buckland.

"Often the life of a sick or injured animal depends on how quickly it can receive attention from an

appropriate carer, and when they can't find help quickly, people can become extremely distressed. Fortunately, hundreds of dedicated volunteers care enough about our wildlife to offer their time to help these worried rescuers and the animals they find."

Wildcare has its own office at CALM's operational headquarters in Kensington, and the phone number—(08) 9474 9055—is a one-stop, emergency number for callers to be promptly referred to one of CALM's 560 registered wildlife carers, who collect and rehabilitate animals before releasing them back into their native habitat. Wildcare volunteers taking the initial emergency calls do not handle or care for the wildlife themselves.

Readers who would like more information about the Wildcare initiative, or who would like to become part of the Wildcare project, should phone CALM's Coordinator of Volunteers on (08) 9334 0251.

Western grey kangaroo  
(*Macropus fuliginos*).  
Photo—Babs & Bert Wells/CALM



## SOUTH AFRICAN DEVOURS SOUTH AFRICAN

Bridal creeper is a highly invasive weed with the potential to become rampant throughout the south of Western Australia, and make a disastrous impact on WA's natural ecosystems. Already classed by the National Weed Strategy as a Weed of National Significance, it has been rated as a high priority for action in CALM's Environmental Weed Strategy for WA since 1999.

Bridal creeper (*Asparagus asparagoides*), a relative of the familiar asparagus vegetable, is one of southern Australia's worst

environmental weeds and is prevalent in many WA bushlands and waterways. It is a perennial climber from South Africa that smothers existing vegetation. Its extensive and impenetrable tuber matt competes with native plants for nutrients, and prevents the germination of native seedlings. Bridal creeper is difficult to control with herbicides, as the tuber matt has many growing points requiring repeated applications of herbicide to kill it. Also, the herbicide may contact surrounding vegetation.

So what is the answer? Perhaps biological control, using natural enemies from the weed's country of origin would be a more sustainable method of controlling bridal creeper.

In 1999, the CSIRO and the Cooperative Research Centre (CRC) Weed Management Systems, with support from CALM, released the bridal creeper leafhopper, an insect from South Africa that attacks the plant. Several releases of the leafhopper have been made, and it has demonstrated its ability to rapidly defoliate bridal creeper, with early results showing great promise. While demand for the insect Australia-wide is greater than available stocks, there is a way a local school or community group may be able to help. The leafhopper is easy to rear in a classroom or home environment, and can then be released at local infestations.

To help people get involved in rearing their own leafhoppers, the CSIRO and the CRC Weed Management Systems have developed a website that contains all the information needed to start a rearing project. Already, several WA schools have taken part in the project, and the website

can help schools in other States to become involved. The reader can find the website at: [http://www.ento.csiro.au/research/weedmgmt/bridal\\_creeper/](http://www.ento.csiro.au/research/weedmgmt/bridal_creeper/)

The breeding of bridal creeper leafhopper in schools is educational, fun and an excellent way of involving young Western Australians in the protection of our natural environment from this potentially disastrous weed.

Readers interested in learning about and/or helping to eradicate the bridal creeper weed can also contact their local CALM district office for advice on where to find bridal creeper plants, and where best to release the leafhopper offspring.



*Left: CSIRO Research Officer Kathryn Batchelor examines a leafhopper, one of many raised by Swanbourne Primary School students.*

*Photo - Peter Maloney*

*Below: Adult bridal creeper leafhopper.*

*Photo - Mike Keller*





## FOUR YEARS ON AND MALLEEFOWL ARE STILL THRIVING



discovered, there were several sightings of immature malleefowl that did not have leg-bands, indicating that released birds were successfully building mounds and raising chicks. Mounds contain up to five cubic metres of soil as well as vegetation to incubate the eggs. The discovery of active mounds confirms released malleefowl are breeding and malleefowl are being reproduced to expand further the population on Peron Peninsula.

Malleefowl were once widespread across much of southern Australia, but declined throughout their former range and are no longer found in some areas. Young malleefowl, emerging from the mound after hatching, are extremely vulnerable to predation by feral cats and foxes during the first few months of life. However, control of feral animals on Peron Peninsula has virtually eliminated foxes from the peninsula, and numbers of feral cats have been reduced to a low enough level to allow several species of threatened animals to be released into the national park.

The Peron Endangered Species Breeding Centre also breeds other native animals such as mala, banded hare-wallaby, western barred-bandicoot and bilby for reintroduction to Peron Peninsula and other WA sites.

It is part-funded by the Commonwealth Government through Environment Australia.

*Two views of a malleefowl on its mound.*

*Photos - Babs & Bert Wells/CALM*



The success of conservation initiative Project Eden in the Shark Bay World Heritage Area has been further affirmed with the discovery of the first active malleefowl mounds on Peron Peninsula. Since November 2000, three active mounds have been discovered by staff from the Department of Conservation and Land Management (CALM) based at Denham. All three mounds were discovered while staff were radio-tracking bilbies, another threatened species released into Francois Peron National Park as part of Project Eden. The project, part of CALM's State-wide fauna recovery program Western Shield, focuses on restoring the range of native animals once found in the Shark Bay area before the onslaught of introduced foxes and feral cats.

Malleefowl were among the first species reintroduced into Francois Peron National Park. Groups of malleefowl, hatched from eggs at the Peron Endangered Species Breeding Centre, were released in 1997 and 1998. CALM officers and members of the North Central Malleefowl Preservation Group collected eggs for incubation at the breeding centre in 1996 and 1997. The mounds from which eggs were collected were on conservation reserves

and private property in the Wubin-Dalwallinu, Canna, Morawa and Mingenew districts. Eggs were also collected from mounds at Kalbarri National Park and Nanga Station, south of Denham, and provided a more local contribution to the founder stock. At least half of the eggs were left in each mound so there would be little or no impact on the reproductive success of resident malleefowl populations.

In the 12 months before the mounds were



## SCAVENGING SHRIMP EXPANDS ITS TERRITORY

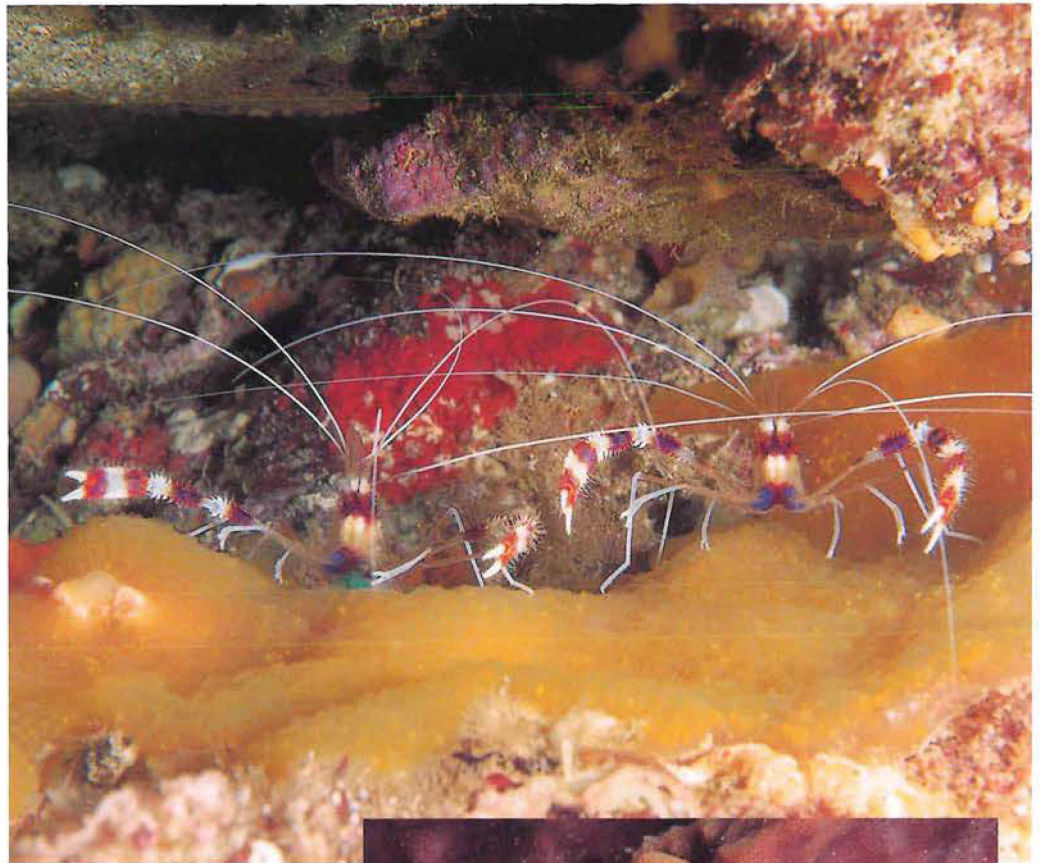
Banded cleaner shrimps (*Stenopus hispidus*) are attractive red and white striped shrimps usually found in tropical waters. Also known as banded coral shrimps, their normal distribution in Australia is often given as 'from the North West Cape in WA, across northern Australia to southern NSW'.

The banded cleaner shrimp is named for its habit of cleaning parasites and dead tissue from fish (especially large moray eels). Red and white bands extend along the slender body and down its third pair of clawed legs. The carapace, abdomen and third pair of legs are spiny. Claws for cutting and picking up food occur on the first two pairs of legs, while large pincers on the third pair are mainly used for display or to threaten.

Banded cleaner shrimps are usually found in pairs in an established territory, such as under a coral ledge, or in the folds of huge barrel sponges. Females can grow up to nine centimetres long, while the males are slightly shorter.

The distribution of these exquisite little shrimps has been increasing southwards along the WA coast, and for a number of years they have been recorded around Rottnest Island and in the Marmion Marine Park.

More recently, banded cleaner shrimps have been found in Geographe Bay and in the proposed marine park between Cape Naturaliste and Cape Leeuwin. There are now so many regular sightings of cleaner shrimps that they are included in CALM's book, *Wonders of Western Waters: the Marine*



*Life of South-Western Australia* by Sue Morrison and Ann Storrie. There has even been a report that banded cleaner shrimps have taken up residence in areas east of Albany.

Their appearance in temperate waters is believed to be largely due to the Leeuwin Current, a band of warm water that originates in the tropics and meanders down the west coast and around Cape Leeuwin. In places, the current is about 50 kilometres wide and up to 200 metres deep off the coast. From Cape Leeuwin, it pivots eastward into the Southern Ocean and flows towards the Great Australian Bight, where it eventually peters out. On the way, it deposits many marine larvae and nutrients that it brings



down from the tropics and mangrove systems found in northern Australia.

*Banded coral shrimp*  
Photos – Ann Storrie



## WOYLIES REINTRODUCED ON FARMING PROPERTIES



A total of 38 woylies has been released on to two Harvey farms as part of a program to restore nature's balance in the region. The 124-hectare farm Wildwater and the 300-hectare farm Sunnyvale—neighbouring properties on the banks of the Harvey River—are listed with CALM's Land for Wildlife scheme, where part of the land is registered as wildlife habitat. Land for Wildlife is a voluntary scheme where landowners manage part of the property for nature conservation. It is an integral part of the State Salinity Strategy and part-funded by the Natural Heritage Trust.

This is the first time woylies have been released on private property without predator-proof fencing, and reflects the continuing success of CALM's Western Shield native wildlife recovery program. This is



the first step towards reintroducing native animals to private rural properties where the farm owners bait for foxes.

The farmers use 1080, a toxin that occurs naturally in a group of plants known as the 'poison peas' (*Gastrolobium* species). At Wildwater, foxes have been baited with eggs injected with 1080 every two or three months since 1994. Brushtail possum and quenda are now regularly

found on the farm and in surrounding areas. At Sunnyvale, the owner baits nearly every month and no foxes or feral cats are now seen on the property.

Bordering the farms is the Hadfield Forest Block, where a further 31 woylies were also released. Woylies have now been translocated to more than 20 sites in WA, and these latest releases will help consolidate the species.

Woylies eat mostly underground fungi and

supplement this diet with bulbs, tubers, seeds, insect larvae and resin. As they move about, digging for the fruiting bodies of fungi, woylies bring many benefits to their environment, including improved rainfall infiltration of the soil and dispersal of fungi that aid plant growth. Because woylies are prolific breeders and thrive in a wide range of habitats, they are usually the first candidate for reintroduction for many areas in the south-west of WA. CALM will monitor the progress of the animals released in Hadfield Forest Block for the next three years.

*Top: A woylie.*

*Photo – Babs & Bert Wells/CALM*

*Above left: Farmer Don Watts releases a woylie on to his property, Wildwater, as CALM Western Shield Zoologist Peter Orell looks on.*

*Photo – Nigel Higgs/CALM*



## ORIGINS OF FOREST BLOCK NAMES REVEALED

*Lost Your Block?*, an informative book by John Sclater on the origins of WA's forest block names, would be appreciated by anyone with even a passing interest in Western Australia's history.

The author arrived in WA from Scotland in 1958 as an assisted migrant nominated by the Forests Department and spent 11 years on district work that took him over most of the south-west, including Dwellingup, Shannon River and Harvey. He decided to write the book after becoming intrigued by the unfamiliar place names of a new country.

Forest blocks got their names largely through links

with the colonial past, from Aboriginal names, from explorers, politicians and other notable people, from pioneers and settlers, from the local flora and fauna, from geographic features and the timber and mining industries. The descriptions of the origins of the various names and stories are arranged in chapters around these themes.

Names range from the historical to the whimsical. The curious name Lol Gray, for instance, took its name from Lol Gray Soak, which was named after a shepherd who worked in the area. Boyanup Block was named after the town of Boyanup, gazetted in 1894, after an

Aboriginal name meaning 'place of quartz'.

Two blocks in the Pemberton area—Lane and Poole—honour the first Conservator of Forests, Charles Edward Lane-Poole. Lane-Poole reorganised the functions of the Forests Department and made recommendations for the Forests Act, 1918, which gave WA the basis for a sound forest policy and provided for the dedication of State forests in perpetuity.

The explanations are interspersed with anecdotes. For instance, Nanga Block includes the following quote from forester Jim Williamson on the fire of 1961: 'During the week

following the Dwellingup fire, I worked on the mop-up of the fire edges. The aftermath produced some sad and eerie sights; the stark blackened forest of still, tortured trees; the corpses of dead kangaroos; and particularly plaintive, the line of brick chimneys at Nanga Brook. Looking like a row of tombstones, the chimneys were all that remained of the once quaint little mill town.'

*Lost Your Block?* can be purchased from the author for \$35 plus \$7 postage (if applicable).

John Sclater can be contacted on (08) 9592 2090 or by writing to 20 Hubbard Place, Safety Bay, WA, 6169.

## Heading north?

Don't forget to pack a guide or two.

Titles in the pocket guide series include:

Discovering Shark Bay Marine Park and Monkey Mia

Wildflowers of Shark Bay

Geology and Landforms of the Kimberley

Plants of the Pilbara

Animals of Shark Bay

Wildflowers of the Mid-West

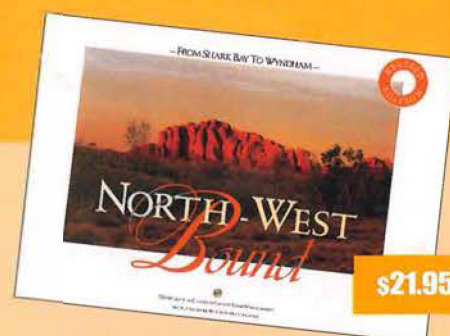
Plants of the Kimberley

Mammals of North-Western Australia

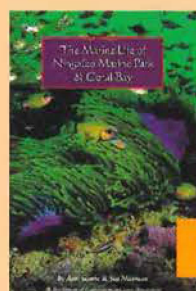
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# RETURN TO DRYANDRA

MARSUPIALS HOP AWAY FROM EXTINCTION

The  
Department of  
Conservation and Land

Management's Return to Dryandra program  
is bringing native species—many of which haven't  
been seen in the south-west for at least half a  
century—back to the Wheatbelt for the first time.

Soon, visitors may be able to see marsupials known to the  
Nyongars as merrnine, marl, boodies, wurrups and dalgytes  
living wild in the scenic woodland at Dryandra.

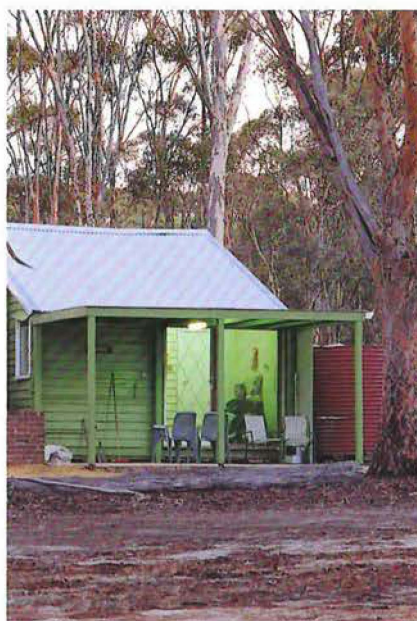
by Tony Friend, Clare Anthony and Neil Thomas



In the 1800s, explorers and the first settlers travelling inland from the Swan River Colony found a spectacular array of small to medium-sized mammals they'd never seen before. Historical diaries and letters described the creatures as the most wonderful assortment they'd seen. Some were given English names, but many settlers used Nyoongar names.

Sadly, since European settlement, 11 species of native mammals have become extinct in Western Australia. Bruce Leake's *Eastern Wheatbelt Wildlife*, published in 1962, recalls 20 mammal species found in the early days on his family's Kellerberrin farm. As well as the woylie, quenda and tammar, he wrote about the bertie (pig-footed bandicoot), dalgyte (bilby), wurrung (crescent nailtail wallaby), merrnine (banded hare-wallaby) and wurrup (rufous hare-wallaby or mala).

In an environmental disaster, most of those animals had disappeared from agricultural areas by the 1950s. The clearing of native vegetation, coupled with the arrival of cats, rabbits and finally foxes, drove many medium-sized native mammals to local extinction. Although grey kangaroos, brush wallabies, brushtail possums and echidnas remained reasonably common, other species larger than a mardo (35 to 50 grams) disappeared or survived only in isolated colonies. Forever gone are



the bertie, the wurrung, the broad-faced potoroo, the djooyalpi (lesser stick-nest rat) and others.

Fortunately, many of the mammals lost from the south-west agricultural areas survived in tiny parts of their former haunts. The merrnine and marl (western barred bandicoot) survived only on Bernier and Dorre Islands in Shark Bay, together with the boodie (also on two islands of the Barrow Island group) and the wurrup, which survived in the wild in the Tanami Desert until 1991. Dalgytes are still thinly but widely distributed in the Pilbara, southern Kimberley, Great Sandy Desert and Gibson Desert, where foxes and rabbits are scarce.

*Previous page*

*Main:* Dryandra Woodland.

*Inserts (from left):* A boodie forages in one of the breeding enclosures at Dryandra. Photos – Michael James/CALM

Marl (western barred bandicoot).

Photo – Jiri Lochman

Dalgyte reintroduced into the woodland.

Photo – Michael James/CALM

*Left:* Accommodation at Dryandra Village is available in refurbished timber workers' cottages.

*Below:* Dryandra Woodland, as viewed from the firetower.

Photos – Michael James/CALM

*Facing page, left:* Early settlers in the south-west encountered marsupials such as the bertie (pig-footed bandicoot), which is now extinct.

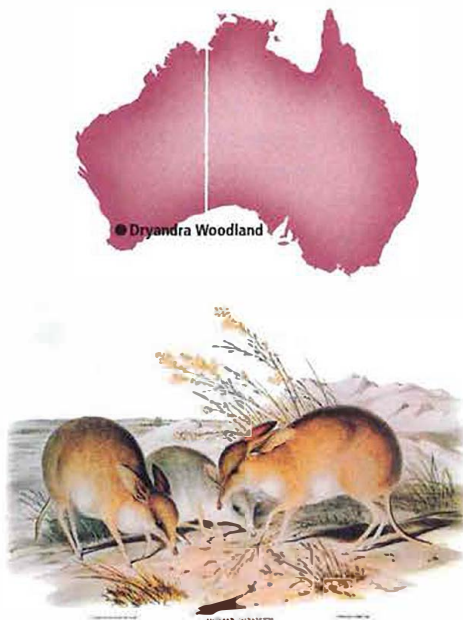
Illustration – John Gould

## DRYANDRA

Dryandra Woodland, near Narrogin, was not cleared because the land was used to grow brown mallet (*Eucalyptus astringens*) for tannin extraction, and because it was the catchment of a dam that collected fresh water for steam locomotives. Fortunately, the mallet plantation affected only a third of the area, leaving nearly 20,000 hectares of natural bush. By a lucky quirk, perhaps due to the presence of extensive thickets of *Gastrolobium* (poison plants deadly to introduced animals, but harmless to most native species), Dryandra continued to harbour a group of marsupials that had become extinct across most of the agricultural area.

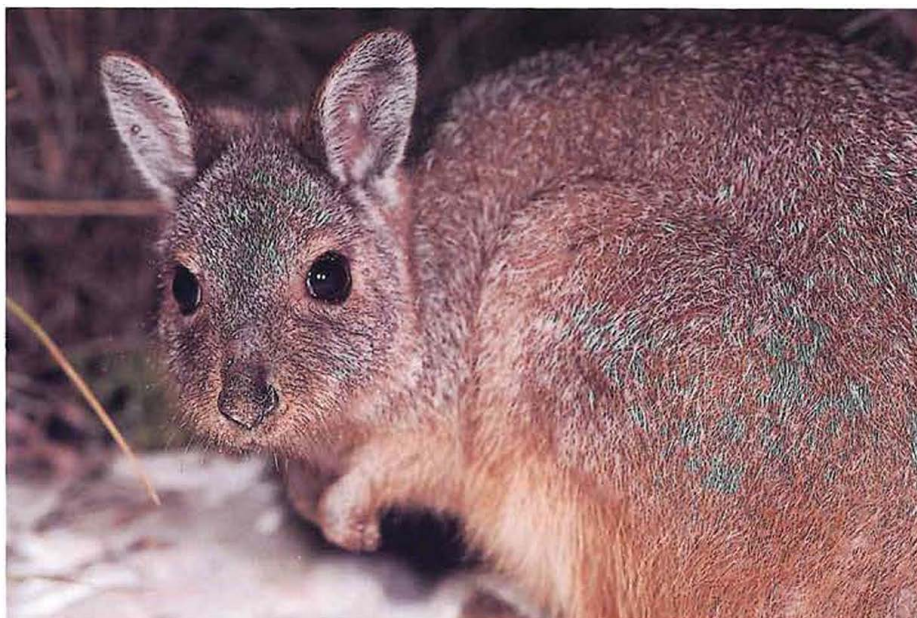






In the 1980s, Dryandra was a haven for one of the last two populations of numbats and one of three colonies of woylies, as well as populations of the threatened tamar wallaby and kenggoor, or red-tailed phascogale. Even these species had fallen to very low levels by the late 1970s, after a rise in fox numbers across the south-west. The introduction of the rabbit flea to spread the fatal rabbit disease myxomatosis led to reduced use of 1080 to control rabbits. Foxes, which had been controlled because they ate poisoned rabbit carcasses, then increased in number.

In the early 1980s, Western Australian scientists began experiments to measure the effect of poisoning foxes with 1080 on native animal populations. Numbat numbers at Dryandra were monitored during one of these experiments. Sightings of numbats increased dramatically, as did the numbers of woylies, possums and tammars. Along with CALM Principal Research Scientist Jack Kinnear's ground-breaking study of rock-wallabies and fox control, the Dryandra experiment was the genesis of CALM's Western Shield predator control and reintroduction program. Because of the dramatic increase in Dryandra's marsupial populations, the woodland became the source of animals for several important translocation programs. These programs led to the removal of the woylie from the threatened species list and to the creation of seven new numbat populations in Western Australia and one each in South Australia and New South Wales.



Today, Dryandra is the focus of a burgeoning nature-based tourism industry in the Great Southern region, raising public awareness of Western Australia's fascinating marsupial fauna.

## WESTERN SHIELD

The Western Shield program aims to reverse the extinction crisis facing many Western Australian mammals and birds. The concept is simple: first remove foxes by regular poisoning, then return a range of native animals to their former haunts, especially in the south-west. Since Western Shield began in 1996, 16 species have been reintroduced in 44 translocations to national parks, nature reserves, State forests and even private property, and three species have been removed from the State's threatened fauna list.

Many reintroductions involved direct transfer of animals from recovering wild populations to the destination site. Numbats, woylies, tammars and quendas have been reintroduced in this way. This method is best used when the source population is large and accessible and the destination site is close by. When source populations are remote, as in the case of the Shark Bay island mammals, it is very expensive to make repeated visits to remove translocation groups. If only small source populations are available, the removal of a group large enough for a translocation, say 20 to 40 animals, may be damaging. In the case of the dalgite, which is sparsely distributed through remote parts of the State, both the cost and risk of damage are great. Large



**Top:** Twenty wurrups (rufous hare-wallabies) from the Tanami Desert were transferred to the Return to Dryandra breeding enclosure.

Photo – Jiri Lochman

**Above:** Merrimere (banded hare-wallabies) are vulnerable to predation by wedge-tailed eagles.

Photo – Marie Lochman

captive breeding colonies can solve these problems, but full-time staff and expensive facilities are needed to care for the animals. On release, the captive-bred animals still face a giant transition from caged life to life in the wild.

## RETURN TO DRYANDRA

Return to Dryandra, run jointly by CALM's Narrogin District and CALMScience, aims to provide a cost-





effective solution to these difficulties and enable the reintroduction of marl, boodies, merrnine, wurrups and dalgites to the south-west. These species have disappeared from the upper Great Southern region since European settlement. Dryandra Woodland, where many threatened species had successfully recovered, was a natural choice as an experimental reintroduction site.

The heart of the program is the Dryandra Field Breeding Centre—20

hectares of woodland surrounded by a 2.4-metre electrified fence. Heathland, tall shrubland, wandoo-marri and wandoo-sheoak woodlands provide a range of habitats, and predominantly sandy soils allow for burrow digging. Separated by a conventional fence, two 10-hectare compounds are set up so that mini-populations of these five endangered mammal species can be established and increase in number, eventually providing stock for release into Dryandra and elsewhere in the

south-west. While the animals can find part of their natural diet in the enclosure, this is supplemented by specially formulated pellets and drinking water. This allows populations to grow to much higher numbers than resources within the 20 hectares would normally support.

Most animals released into the enclosure are fitted with radio-collars so that their movements and survival can be recorded. Any deaths can then be investigated promptly and, if possible, management changes made to reduce further deaths. Regular trapping is undertaken to monitor the condition, breeding status and numbers of each species.

### HOW TO RELEASE?

One problem with reintroduction releases is the rapid dispersal of new animals away from the release site. Sometimes it causes loss of contact between members of the colony and movement away from suitable habitat.

Return to Dryandra aims to compare the release methods used for different animals, to ensure the best option is used during subsequent releases. It is an experiment that requires intensive monitoring, making Dryandra an ideal site because CALM staff are based at nearby Narrogin. The first experiment will be to compare animals released into the wild after a short period in an enclosure and animals released directly into the wild, to find out which release method results in less dispersal.

### THE ANIMALS ARRIVE

Twenty wurrups were released into the Return to Dryandra enclosure on 26 March 1998. They were brought from the 'Mala Paddock', a 100-hectare enclosure near Willowra in the Tanami Desert, rather than from the Shark Bay island populations. Island animals tend to be predator-naïve and the Tanami animals were thought to be more suitable for mainland release because of their past exposure to mammalian



**Above left:** Tony Friend and a Kanyana volunteer release a captive-bred dalgite inside the breeding enclosure.

**Left:** CALM's Clare Anthony and Tony Friend record details of one of the released dalgites.

Photos – Michael James/CALM



predators. Subsequent genetic work has shown that the Tanami colony also has much more genetic variability than the island populations.

The Parks and Wildlife Commission of the Northern Territory (PWCNT) runs the Tanami facility with the assistance of traditional owners living in the Willowra community. Don Langford of the PWCNT carried out the transfer of the animals, which were captured over two nights. The wurrups were driven to Willowra, flown via Alice Springs to Perth, then taken by road to Dryandra. Don and CALM staff released the animals into the northern compound soon after dark on the same day. Two years later, Sandy Japangardi, the Willowra community's custodian of the mala story, and two other community members visited Dryandra to check on the animals. They left satisfied that CALM's program was in the interest of the species.

The wurrups preferred the enclosure's densely vegetated heath areas. In the desert and on the islands, they nest in a small scrape under spinifex (*Triodia* spp.) hummocks. In the enclosure they use low shrubs, the foliage of fallen branches, or vegetation resting on the ground surface.

Next to be released were three species from Shark Bay. Twenty boodies, seven marl and four merrnine were trapped over two nights in April 1998 near White Beach on Dorre Island. Each morning a helicopter took a consignment of animals to Denham where they were transferred to a light aircraft and flown to Narrogin. They were driven to Dryandra and released in the evening, less than 24 hours after capture. The boodies and merrnine were settled in the southern enclosure, which contains more woodland than heathland, while the marl were placed in the northern enclosure with the wurrups. CALM's Narrogin staff constructed eight artificial warrens for the boodies, which live communally underground in the wild.

On the first release night, 10 captive-bred marl were driven from Perth to Dryandra and released with the first of the island marl. These animals were the result of June Butcher's breeding program at Kanyana Wildlife Rehabilitation Centre—supported by



CALM—that had been running in Gooseberry Hill since 1996. Since the first release, seven more Kanyana-bred animals have been released into the enclosure. The releases were carried out by CALM staff, Kanyana volunteers and local community members in an atmosphere of quiet joy and anticipation.

The marl preferred the dense heath habitat and quickly built their nests under the shrubs. The neatly-crafted nests, a mass of leaf litter in a bowl-shaped pit, were almost indistinguishable from the surrounding litter. Unfortunately, a few radio-collared marl fell victim to local owls, which quickly learned where extra food was to be found.

The boodies used their artificial homes and, while many other burrows have appeared, some original warrens,

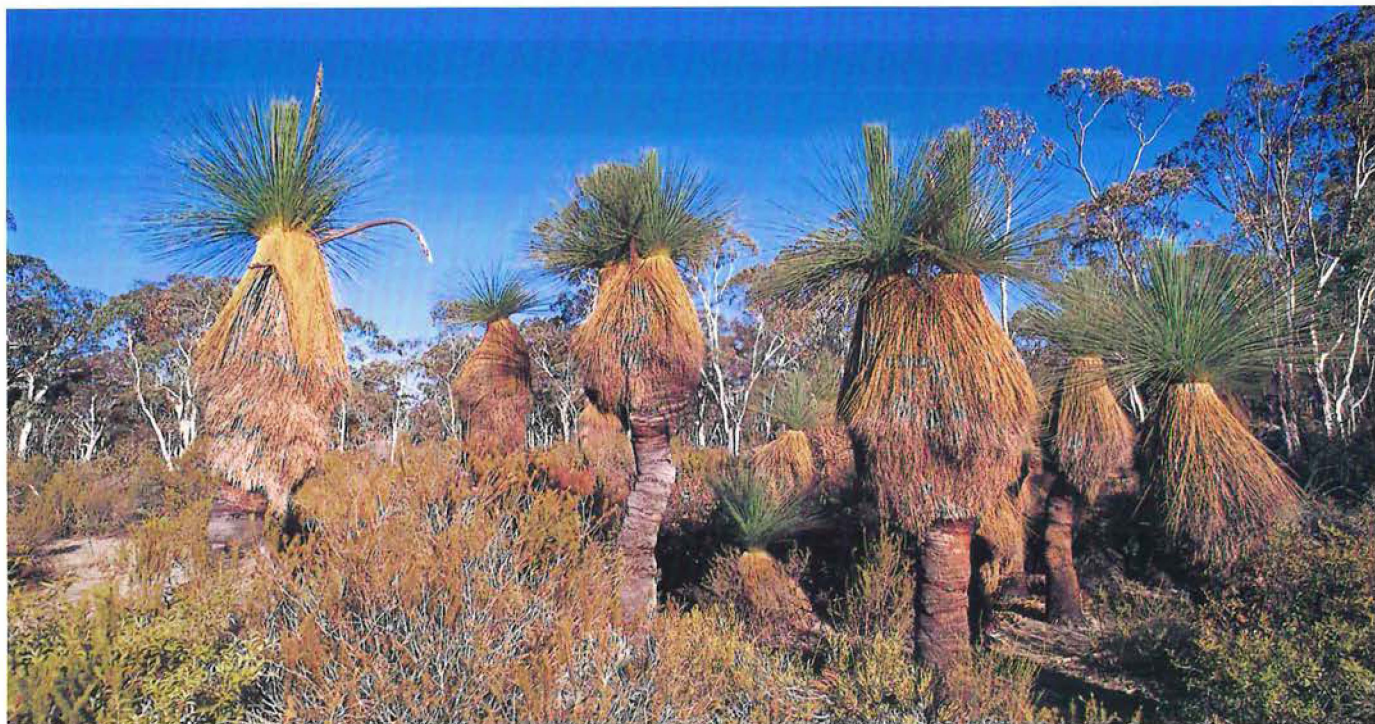
**Top:** A predator-proof fence surrounds the Return to Dryandra breeding enclosure in which breeding populations of five threatened species have been established.

**Above:** One of Dryandra's resident woylies is captured to check on its condition.  
Photos — Michael James/CALM

now greatly modified, are still used today. The merrnine chose two particular tall thickets in the southern enclosure under which they rest during the day. They were joined in September 2000 by another 13 merrnine from Dorre Island. Their greatest bane has been Dryandra's population of wedge-tailed eagles: at least three have been taken by these large raptors.

The dalgites (bilbies) had a more tortuous path to Dryandra. Because





these fascinating animals live in small colonies scattered through the Great Sandy Desert, Pilbara and southern Kimberley, only small numbers could be captured at a time. Captive breeding—which avoids the inbreeding that occurs in a small colony—was needed to build up sufficient numbers to establish a colony in the enclosure. The dalgite breeding program to supply the Dryandra enclosure is carried out at Kanyana. Frequent exchanges with CALM's Peron Captive Breeding Centre and interstate breeding programs avoid close breeding. Sixteen dalgites were taken from the wild in Western Australia to found the Peron and Kanyana colonies, including three youngsters rescued after their mothers ended up in the cooking pot in a desert community. The others were caught by CALM staff at Shay Gap in the Pilbara, in the northern Great Sandy Desert and on Yakkamunga and Udiella stations in the Kimberley. The capture of dalgites, captive breeding and monitoring wild populations have been supported by Coles Supermarkets' 'Save the Bilby' fund and BHP.

On 20 November 1998, five dalgites were released into artificial burrows in the northern enclosure at Dryandra. Altogether, 31 Kanyana dalgites have entered the Dryandra enclosure in a total of eight releases.

### HOW HAVE THEY FARED?

The program to breed animals for release has had varied success. Boodies

have bred up to about 40, and when eight of these were removed for an exchange with Earth Sanctuaries Limited, numbers quickly returned to that level. Most of the original animals are still present. It appears that the boodies' breeding and the survival of their young may be limited by the population size.

Marl and wurrups remain at similar numbers as were released. Wurrup numbers increased initially, but then dropped below the founder number. A change in diet formulation may have been the trigger that ended this decline and numbers are now back around their initial levels. Similarly, the number of marl fell at first, raising fears that Dryandra's resident masked owls, which were seen hunting in the enclosure on several occasions, had zeroed in on them. However, numbers have now risen again and at last trapping 20 were caught.

Merrine have not fared very well. Despite the presence of wedge-tailed eagles on their native Dorre Island, the attractive little banded wallabies appear to be most vulnerable to their predation. Artificial shelters are being trialed to reduce their exposure to raptors.

Grass trees within the proposed Return to Dryandra viewing enclosure.

Photo – Michael James/CALM

Dalgites have shown the most spectacular success, with more than 50 new animals captured during monitoring sessions. This success has seen dalgites take the honours as the first species to be released from the enclosure into the Dryandra Woodland, in May 2001.

### THE FUTURE

As numbers of animals in the enclosures rise, releases of further species will continue. The next exciting development in the Return to Dryandra program is the construction of an interpretive facility incorporating a viewing enclosure. Visitors will be able to walk among these rare mammals at night, recreating scenes that met the first white settlers. This project is being run by CALM Narrogin with support from a State Government Tourism Development Fund grant. Not only will Dryandra be hopping with marsupials, these engaging animals can once more become familiar to people of all ages, backgrounds and abilities.

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A scenic view of the Canning River. In the background, a bridge with a white metal railing spans the river. The river is surrounded by dense green trees and vegetation. In the foreground, there are tall, thin reeds or grasses. The sky is clear and blue.

# Captivating Canning

Regional Park on the River

Canning River Regional Park, located nine kilometres south-east of central Perth, extends for some six kilometres along both sides of the Canning River, from Shelley Bridge in Shelley to Nicholson Road Bridge in Ferndale. Covering 266 hectares, it is one of few places left in the heart of the metropolitan area that provides a haven for native plant and animal species.

by Christine Silbert



**D**rive along the glaring bitumen of Leach Highway, Albany Highway and Nicholson Road and you would scarcely imagine the wealth of bird life and tranquillity found in the nearby Canning River Regional Park.

The park had its beginnings in 1989, when the State Government approved the establishment of the Canning River Regional Park and the preparation of a management plan. The Western Australian Planning Commission has continued to acquire land to realise the goal of a riverine regional park.

## HISTORY

There is a strong Aboriginal history associated with Canning River. The wetlands were important to indigenous people as a source of food and materials for shelter and artefacts.

Few people realise that the Canning River once played an important role in the early development of the State's timber industry. In the 1850s, Perth businessman Benjamin Mason began to

**Below:** The Canning River still has some wild, inaccessible sites between Riverton Bridge and Kent Street Weir.  
Photo – Michael James/CALM



fell jarrah trees along the Canning River. The timber was then transported via the river to Perth and Fremantle, where building materials were in great demand. In 1861, a boat landing was built along River Road and dubbed Masons Landing, and the entire Cannington district was soon cleared of trees, with the logs being carted on bullock-drawn wagons down to the boat loading area. Here they were cut up in several nearby sawpits.



## Previous page

The Kent Street Weir, built to regulate the flow of salt water from the estuary into the Canning River, is a popular picnic area.

Photo – Michael James/CALM

**Left:** Family groups of the engaging purple swamphen are reasonably common in some parts of the park.

Photo – Bill Belson/Lochman 'Transparencies'

By 1864, there was little suitable nearby timber left, and Mason obtained a lease to cut timber in the Darling Range, about nine miles (15 kilometres) away. A steam-driven saw was installed at Masons Landing and the little community based around the site included a blacksmith, baker, wheelwright, a school and a number of workers' cottages. Bullock teams were still carting the timber to the boat landing, but Mason began to search for





a less expensive alternative. He joined forces with an architect, Francis Bird, who designed and built a timber railway from the hills east of Bickley to Masons Landing. The railway spanned several brooks and was completed in 1872.

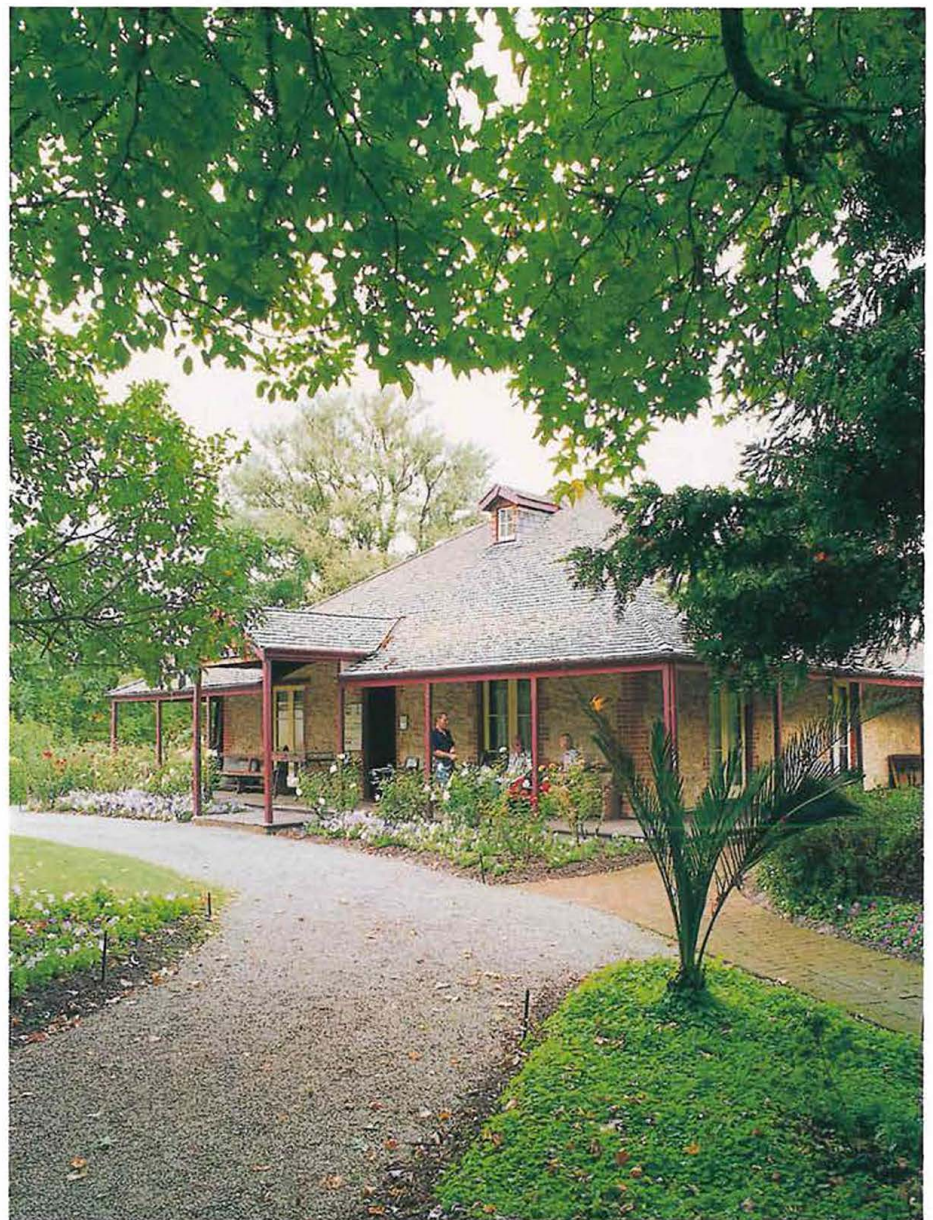
## SNAGS AND MUDFLATS

Mason and Bird experienced several problems with transport along the river, including accidents and constant snags due to debris being washed downriver every winter. The mudflats at Riverton and Shelley were another obstacle to boat traffic. To deepen the channel through these shallows, convict gangs drove stakes into the riverbed to build a dam of branches, twigs and reeds and scooped mud from the channel by shovel or bucket and deposited it beyond the dam. The State's best known bushranger, Moondyne Joe (see 'Bushranger Country: Avon Valley National Park' *LANDSCOPE*, Summer 1998-99), helped to build the 'convict fence', remnants of which can still be seen in the Canning River today.

When the new Government railway to Midland was completed during the late 1870s, it reduced the cost of transporting timber to such an extent that Mason and Bird could no longer compete with other timber millers and the operation eventually folded. However, relics of this fascinating history can still be seen at the Woodloes Museum, the former homestead of Francis Bird, and at Masons Landing, where a plaque and memorial commemorates Mason and his mill. Today, they form two important recreation sites within the Canning River Regional Park. Woodloes Homestead, built in 1874, is run by volunteers from the local Historical Society and is open on Sundays from 2 pm – 5 pm. The homestead is built of stone and brick with a shingled roof. It was fully restored between 1973 and 1978, and furnished with genuine period furniture donated by the area's pioneering families.

## CONSERVATION VALUES

Today, the Canning River Regional Park contains some of the best estuarine vegetation in the entire Swan-Canning River system, with a wide diversity of habitats that includes



saltwater estuary and deltine islands; salt marshes and riverine environment; freshwater environment; billabong; modified forest; and woodlands on the floodplain. The park is listed on the Register of the National Estate for its conservation values. Within the park, there are five important wetlands: Wilsons, Adenia Reserve, Nicholson Road, Masons Landing Lagoons and Greenfield Street Footbridge.

The park is an important refuge for birds and other wildlife. A total of 97 bird species has been observed in the park, including 44 waterbirds. Some of the most common waterbirds to be seen on the river or its nearby wetlands include Australasian grebes, black swans, Pacific black ducks, Australian shelducks, Eurasian coots, wood ducks, great cormorants, pied cormorants, little black cormorants, darters and

**Above:** Woodloes Homestead is a reminder of the links of the Canning River Regional Park to the early days of timber cutting.

Photo – Michael James/CALM

Australian pelicans. The occasional great egret may be seen stalking prey. Flocks of ibis graze on nearby grassy areas. Family groups of the engaging purple swamphen are reasonably common. Dusky moorhen are abundant in the park, which is one of the most important sites in the State for this species.

The remaining natural vegetation includes flooded gums, paperbarks and sheoaks, woollybush, wattles, zamia, dodder, grevilleas, sedges and rushes. Weeds pose the greatest threat to the natural environment and are the primary focus of the Department of Conservation and Land Management's





(CALM's) work plans. Part of the strategy is to limit vehicle and pedestrian access to reduce rubbish dumping, fires, and soil disturbance—all of which encourage weeds to establish.

## MANAGING FOR THE FUTURE

In conjunction with the City of Canning and the local community, CALM developed and released a Regional Park Management Plan in 1997. The overall vision for the park is that it is recognised as an important natural resource of lands and waters, where sustainable habitats and ecosystems are protected, where a wide range of appropriate recreational activities can take place and where degraded areas are restored and protected.

Sections of the park are managed by the City of Canning, and CALM works closely with them to support the efficient and effective implementation of the management plan. The Canning River Regional Park also falls within the area managed by the Swan River Trust (SRT), whose role is to coordinate and implement activity associated with the Swan and Canning rivers. Any developments affecting the river must therefore be approved by the Trust. CALM's Regional Parks Unit helps to coordinate everyone's efforts in managing the park, and to prepare and implement plans for recreational use, specific site development and rehabilitation.

## VOLUNTEERS

Unfortunately, if you walk for any distance along the banks of the Canning River Regional Park, you will see evidence of alteration and disturbance. Dense and thorny blackberry thickets threaten to strangle the native vegetation, while other weeds choke it out. Such extensive weed problems can only be tackled by intensive work put

**Top left:** The Canning River Regional Park, between the Riverton Bridge and Kent Street Weir.

Photo – Michael James/CALM

**Centre left:** Black swans are often seen in the Canning River Regional Park.

**Left:** Flocks of ibis perch on low branches and feed on grassy areas along the river bank.

Photos – Jiri Lochman

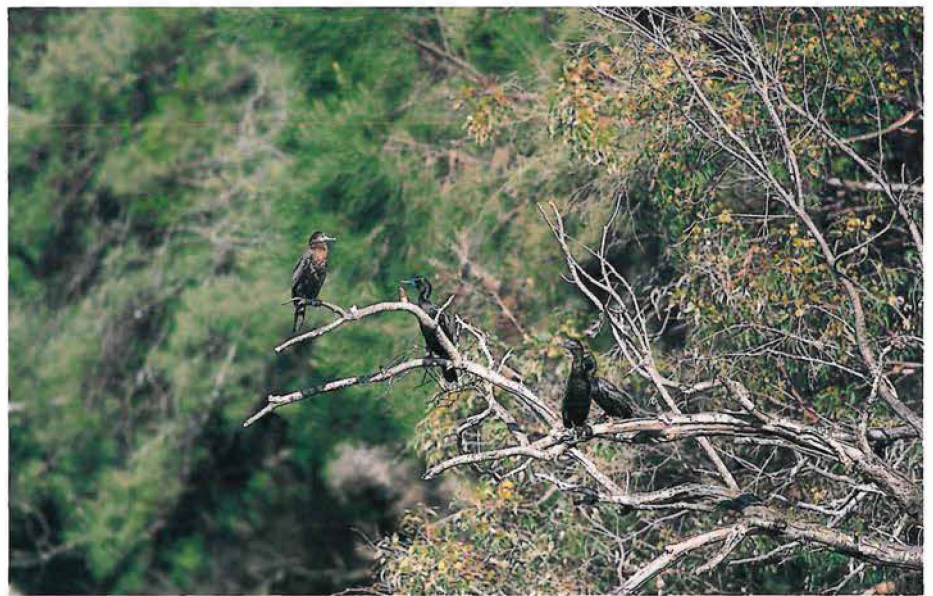




in by large numbers of people. Fortunately, the park is also blessed with a band of hardworking, organised volunteers who provide the lifeblood of the regional park.

One group, Canning River Regional Park Volunteers, started back in 1986. Founding member, Jo Stone, still spends four to six hours a day, six days a week on five designated rehabilitation projects. She and others have created a green corridor at Eastfield Court, where a corps of four volunteers has weeded the wet area, and revegetated and planted a grove of eucalypts that is bringing back the birds. They have transformed a drain into a 'living' stream and revegetated an adjacent fenced-off area, and rehabilitated both sides of Banksia Hill. Jo also organises wonderful nature walks for the public, such as the Orchid Walk and Nesting Bird Walk coming up in September, the Bikes, Birds and Bridges walk, and walks for school groups.

Russell Gorton, of the Wilson Wetland Action Group, lived next to a wetland in another suburb and saw it disappear—but not his memories of playing there. The pleasure his five-year-old son Matthew gets from working beside his dad, and Russell's joy from seeing him experience nature, is his catalyst to try to 'do something that is good and does good'. At the Miller Street Main Drain, the Group has undertaken extensive bank restoration over the past 12 months, covering 250 metres of stream. They have been 'block sedging', that is, planting blocks of



various types of vegetation with rhizomes that dominate weeds and push them out.

The Canning River Regional Park Community Advisory Committee has been providing advice to the land managers from the beginning. Appointed by the Minister for the Environment and Heritage, the community representatives come with varying backgrounds, and all have a passion to advance and protect the park.

#### BAFFLING WEEDS WITH TECHNOLOGY

A combination of technical expertise, strategic planning and old-fashioned manual labour is being used by CALM in a new approach to solving the serious weed problem.

Ecoscape, a consultancy involved

**Top:** Canoeing is popular in the regional park, where launch sites are provided.

**Above:** Cormorants fish along the Canning River and then find nearby vantage points to dry their plumage.  
Photos – Michael James/CALM

in environmental science, landscaping and mapping, was enlisted to provide an accurate and systematic plan of attack to return what is considered to be one of the best examples of riverine vegetation on the Swan and Canning rivers, to pristine condition. By using the GPS (geographical positioning system) and then translating this through the software of their GIS (geographical information system), Ecoscape has created a series of overlay maps with a two-metre accuracy level.





**Above left:** Japanese pepper trees are removed from less accessible areas of the Canning River wetlands by boat to minimise the impact on the environment. Photo – Michael James/CALM

**Above:** Dianne Frylinck shows Cameron Valentine 'the smallest tree leaf in the world', during the Canning River Regional Park Wetlands Welly Walk. Photo courtesy of Jo Stone



**Above:** Canning River foreshore, in the vicinity of Riverton Bridge. Photo – Michael James/CALM

Technology, however, cannot change the fact that the only access to some of the wetland areas is water transport and that work has to be done by hand. Workers have to be ferried in by boat and huge piles of harvested weed are loaded and taken out to be mulched for use in domestic gardens.

## ATTRACTIONS

The beautiful riverine system found in the Canning River Regional Park incorporates passive and active recreation. CALM has prepared a Recreation Master Plan in consultation with the local Community Advisory Committee that indicates the access and recreation areas within the park, such as trails (including shared paths), walk paths, picnic sites and car parks.

Fishers may spend a few peaceful hours along the densely vegetated river banks in pursuit of the wily black bream. They mostly pass their time with few signs of other people apart from canoeists

negotiating the waters of the Canning. Others prefer to cycle or walk along the long lengths of shared paths provided. Some of these walks are described in CALM's book *More Family Walks in Perth Outdoors*. Picnic areas are a great drawcard, with Kent Street Weir being the most popular spot, together with Masons Landing and Riverton Bridge.

The Castledare Miniature Railway is open on the first Sunday of every month, attracting 200 to 300 people. They flock to enjoy, not just one but multiple rides, where they can observe the birds nesting, spring wildflowers, and smell the genuine aroma of a coal-fired steam engine. The Castledare Miniature Railway Club's voluntary members spend much of their spare time maintaining five or more kilometres of track, which traverse five bridges that

straddle lagoons and inlets, and they are currently building a new bridge. They offer activities for the whole family, and volunteers are always welcome. With a retirement village about 50 metres away, a growing number of residents, grandchildren and 'big kids' wander over for a ride. A nearby picnic area is provided with barbecues that are always ready-stacked with wood.

With so much to do and a wide variety of things to see, the Canning River Regional Park is a place to appreciate fine company in beautiful settings surrounded by the natural beauty of Australian bush in the suburbs.

Christine Silbert is a freelance writer on contract to CALM's Regional Parks Unit. She can be contacted on (08) 9388 2002.

If you would like to become a volunteer, you can phone Jo Stone from the Canning Regional Park Volunteers on (08) 9458 3669, Julie Roberts of the Bannister Creek Catchment Group on (08) 9458 6746, Russell Gorton from the Wilson Wetland Action Group on (08) 9451 1354, John Parker of Woodloes Homestead on (08) 9451 8538 or Ken Belcher of the Castledare Miniature Railway Club on (08) 9375 1223.





# Our Frozen Future

During the next 10 years, Western Australian seed biologists from the Department of Conservation and Land Management (CALM) will work with the Royal Botanic Gardens, Kew, UK in a global insurance policy to conserve one of the world's unique and diverse floras.

by Anne Cochrane





**T**he south-west of Western Australia is recognised as one of the world's top 20 biodiversity hotspots, and the only one in Australia. It is but a small part of the nation, yet some 75 per cent of its plant species are found nowhere else in Australia—in fact, nowhere else in the entire world. Without a doubt, Western Australia's flora is unique. It includes the spectacular scarlet banksia (*Banksia coccinea*), the kangaroo paws such as *Anigozanthos manglesii* in their red and green coats, the majestic karri trees (*Eucalyptus diversicolor*) and the triggerplants (*Stylidium* species) with their minute hammers. These plants are common, often occurring over wide expanses and in large numbers, easily seen and widely admired for their beauty and intricacy.

But the south-west of the State also has a high concentration of threatened species, such as those restricted to small areas or few plants, that are often cryptic or poorly known. These plants are recognised as important conservation species. They include the large-flowered regelia (*Regelia megacephala*), restricted to the Noondine Chert hills around Moora and Watheroo (see 'Endangered', *LANDSCOPE*, Spring 2000), the beautiful mountain bells (*Darwinia* species) of the peaks of the Stirling Range National Park, and some of the plants that border WA's naturally saline lake systems, such as the small



paperbarks (*Melaleuca dempta*, *M. fissurata* and *M. viminea* subsp. *appressa*) that are threatened with waterlogging and rising salt levels.

### PLANTS ON THE BRINK

War is being waged on many of these species. A war fueled by land clearing leading to habitat fragmentation, rising groundwater levels and salinisation (see 'Wheatbelt wonders under threat', *LANDSCOPE*, Summer 2000-2001), and by dieback (the root rot disease caused by *Phytophthora cinnamomi*), weed invasion and grazing by introduced herbivores such as rabbits. These issues are threatening the very survival of many of WA's threatened, rare, and poorly known plant species. Experts are predicting that many of our threatened species will become extinct in the wild within the next 50 years, even if we do our utmost to ameliorate the threats. And we haven't even considered the



possible adverse effects of long-term climate change on these plants, which are already restricted by their narrow environmental tolerances.

In short, we face an urgent and enormous task of conserving our plant biodiversity—if not for ourselves, then for our children and grandchildren. Any loss of WA's biodiversity will be a major tragedy. Once a species becomes extinct, it is lost forever. The extinction of any species represents an irreplaceable lost opportunity for plant utilisation, study and appreciation, not only for Western Australia, but also for the world. As a signatory to the Convention on Biological Diversity we have made a global commitment to biodiversity conservation.

In terms of flora conservation, conserving plants on the ground is the Department of Conservation and Land Management's (CALM) most important objective. But when there is no quick solution to threats such as dieback and

#### Previous page

The amazing diversity of plant species found in Western Australia parallels few places in the world, yet these plants bear seed that can be frozen and stored for many generations without loss of viability. Photos – (clockwise from left) Jiri Lochman, Andrew Brown/CALM, Ellen Hickman/CALM, courtesy of the Royal Botanic Gardens, Kew, Bill Benson/Lochman Transparencies, (centre) Dennis Sarson/Lochman Transparencies

**Above left:** Flowers of *Eucalyptus petila*, a small tree that is restricted to the Ravensthorpe area of Western Australia. Photo – Anne Cochrane/CALM

**Above:** The sun star orchid (*Thelymitra stellata*) is an endangered species. Photo – Andrew Burbidge/CALM

**Left:** Collecting seeds from *Eucalyptus halophila*, a species from the Esperance area threatened by rising salt and waterlogging. Photo – Anne Cochrane/CALM





**Right:** The exhibition in the Orange Room of the Wellcome Trust Millennium Building that provides information on seed conservation to visitors.

**Below right:** The Wellcome Trust Millennium Building that will hold seed from 24,000 wild plant species in its vaults.

Photos – courtesy of the Royal Botanic Gardens, Kew

salinity, off-site conservation strategies, such as the storage of seed, may be the last hope for conservation and future restoration of many of these threatened species.

## PLANT INSURANCE

Storing seed is like taking out an insurance policy. When a disaster happens, we can draw on the insurer to help us rebuild what we have lost. Stored seed can be used to rebuild our damaged or lost plant communities.

Almost 10 years ago, CALM established such a plant insurance policy: a seed storage facility for material from rare and threatened native plant species (see 'Banking for the Future', *LANDSCOPE*, Winter 1996). The Threatened Flora Seed Centre is part of CALMScience Division's Flora Recovery and Conservation Program, forming an integral part of the Western Everlasting Project that underpins plant recovery programs in Western Australia (see 'Restoring Diversity, Restoring Hope', *LANDSCOPE*, Spring 1999). Until recently, this insurance policy was supported from within Australia, from both State and Commonwealth sources. But in 2001, CALM's Threatened Flora Seed Centre became an international partner in what can be considered a major global conservation insurance policy: the Millennium Seed Bank Project of the Royal Botanic Gardens, Kew, United Kingdom.

The Royal Botanic Gardens, Kew, began its life in 1750 as the private estate of the Prince and Princess of Wales. Over the next 250 years, it built its reputation as a world-class Botanic Gardens, as adventurers, botanists and travellers moved around the world collecting plant specimens. Many of Australia's early explorers provided plant material to Kew: not only herbarium specimens, but also material



in the form of seed and living plants for the gardens.

In 1974, the Royal Botanic Gardens, Kew established a modest seed bank for the long-term conservation of world flora at Wakehurst Place, a National Trust property 40 miles south of London, leased by the Royal Botanic Gardens as their 'Kew in the country'.

For more than 20 years, this seedbank actively conserved seed from many of the world's common and threatened species, and allowed important research into the seed germination and storage capacity of a range of floras to be carried out. The Millennium Seed Bank Project, funded in its early stages through a generous grant from the UK National Lottery's Millennium Commission, marks the expansion of this seed conservation facility and, with further support from the Wellcome Trust, allowed the creation of a much larger seed bank and

research facility. In November 2000, the Wellcome Trust Millennium Building, home to the Millennium Seed Bank itself, opened its doors to the public.

## MILLENNIUM SEED BANK

The Millennium Seed Bank Project (MSBP) provides the world's largest seed bank and associated research facility devoted solely to wild species conservation. The project is a collaborative collecting and conservation program managed by the Seed Conservation Department at the Royal Botanic Gardens, Kew, and is focusing primarily on the world's arid and semi-arid regions. The goal is to have stored seed from 10 per cent of the world's flora by the end of the year 2010. The goal is huge, and to achieve it Kew enlisted the help of people from around the world through the development of collaborative country partnerships.





**Left:** Threatened Flora Seed Centre, located in the grounds of CALM's Western Australian Herbarium.  
Photo – Anne Cochrane/CALM

**Below left:** Work on the seed biology of threatened species is conducted in the laboratory of CALM's Threatened Flora Seed Centre.

**Below:** Seeds are cleaned and dried under low humidity and low temperature conditions prior to freezing.  
Photos – Michael James/CALM

Not only is seed storage a major objective, but the project also aims to carry out research into aspects of seed conservation, promote education and encourage plant conservation worldwide, as well as to provide safe keeping of duplicate collections of seed for the partner countries. The project will provide capital input, training and technical expertise to its collaborators. With global collaboration in mind, legal agreements are being set up around the world to cover the collection, transfer and subsequent use of seeds in accordance with the Convention on Biological Diversity. To date, international partnerships have been entered into with countries as diverse as the USA, Madagascar, Burkina Faso, South Africa, Lebanon, Egypt, Jordan and Kenya.

Closer to home, the MSBP has recently negotiated a 10-year collaborative partnership with CALM

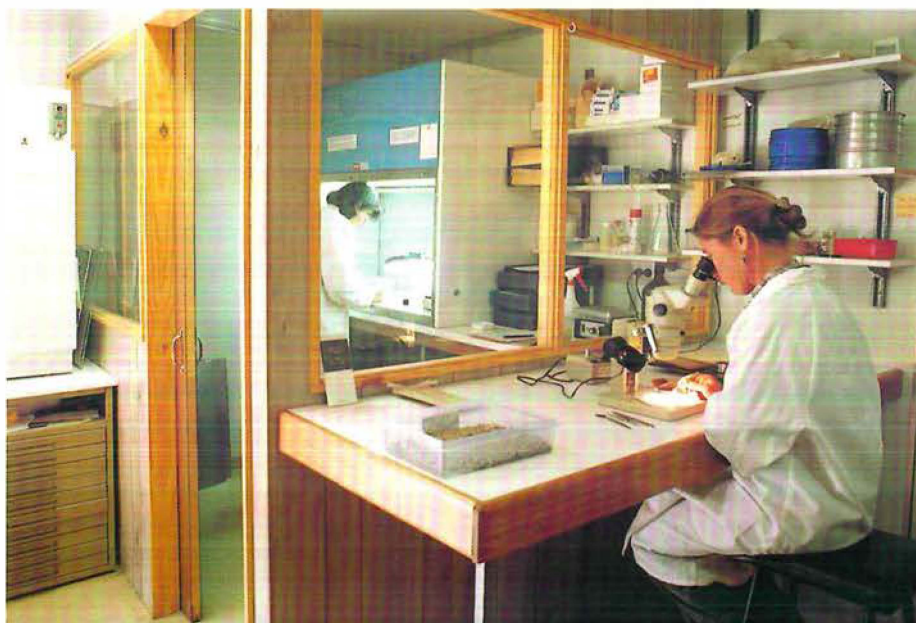
and the Botanic Garden and Parks Authority in Western Australia to support WA's existing seed conservation efforts. This partnership will contribute to the long-term objectives of CALM's Western Everlasting initiative (see 'Western Everlasting', *LANDSCOPE*, Autumn 1999), that is, the conservation and restoration of native plant biodiversity.

Within CALM, the collaboration will ensure that the Threatened Flora Seed Centre has adequate funds to employ a seed collector to support the collecting program. Seed scientists will benefit from opportunities to pursue collaborative research both at home and in the UK. The project will also ensure that all the necessary agreements are in place to transfer duplicate collections of seed to the MSBP for long-term storage. Our aim is to concentrate on collecting those species poorly known and in need of further survey within the south-west

of Western Australia. In addition to species on CALM's Priority Flora list, species identified by the Salinity Strategy as being at threat of extinction from rising salt levels and waterlogging will also be a prime target for collection during the life of the project. It is hoped that seed from more than 1,000 species will be collected during the period of collaboration, along with more common species associated with threatened ecological communities. In addition, the project will involve assistance to the Botanic Gardens and Parks Authority for their orchid research program and for collections of more commonly occurring orchid species in the Wheatbelt and arid zones of Western Australia.

## COMMUNITY BENEFITS

There are many good reasons for Western Australia's participation in the Millennium Seed Bank Project.





CALM's partnership with the MSBP can be seen as an extension of the existing functions of the Threatened Flora Seed Centre, namely the collection and long-term storage from seed of threatened Western Australian native species.

The input of financial assistance from the MSBP ensures that the task of collecting seed is undertaken as quickly and as efficiently as possible. With so many issues threatening our native flora, speed is of the essence.

Under CALM's existing funding limitations, these conservation seed collections would not be made in the short term without substantial financial input from an external source. And we are proud to be involved in such a major international conservation project. Over the life of the project, Kew will be contributing to the conservation of some 60 per cent of WA's poorly known flora including a large number of orchid species. The collection of this material, and the assessment of its germination characteristics, will advance our knowledge of the biology of the flora, and will provide information to assist in the long-term management of these plant species. Seed will be available for reintroduction programs should any species require interventionist activities to ensure survival.

Duplicate storage of seed from conservation species in both Western Australia and the UK will help to prevent natural and human-induced catastrophes eliminating seed stocks. Benefit sharing, in the form of data exchange, technology transfer and training, is an essential component of the project, and staff from the Threatened Flora Seed Centre and Botanic Gardens and Parks Authority will derive benefits from closer contact with researchers at the Millennium Seed Bank. This benefit-sharing partnership will ensure the success and long-term sustainability of the project after 2010.

Anne Cochrane is Manager of CALM's Threatened Flora Seed Centre. She can be contacted on (08) 9334 0502 or by email (annec@calm.wa.gov.au).

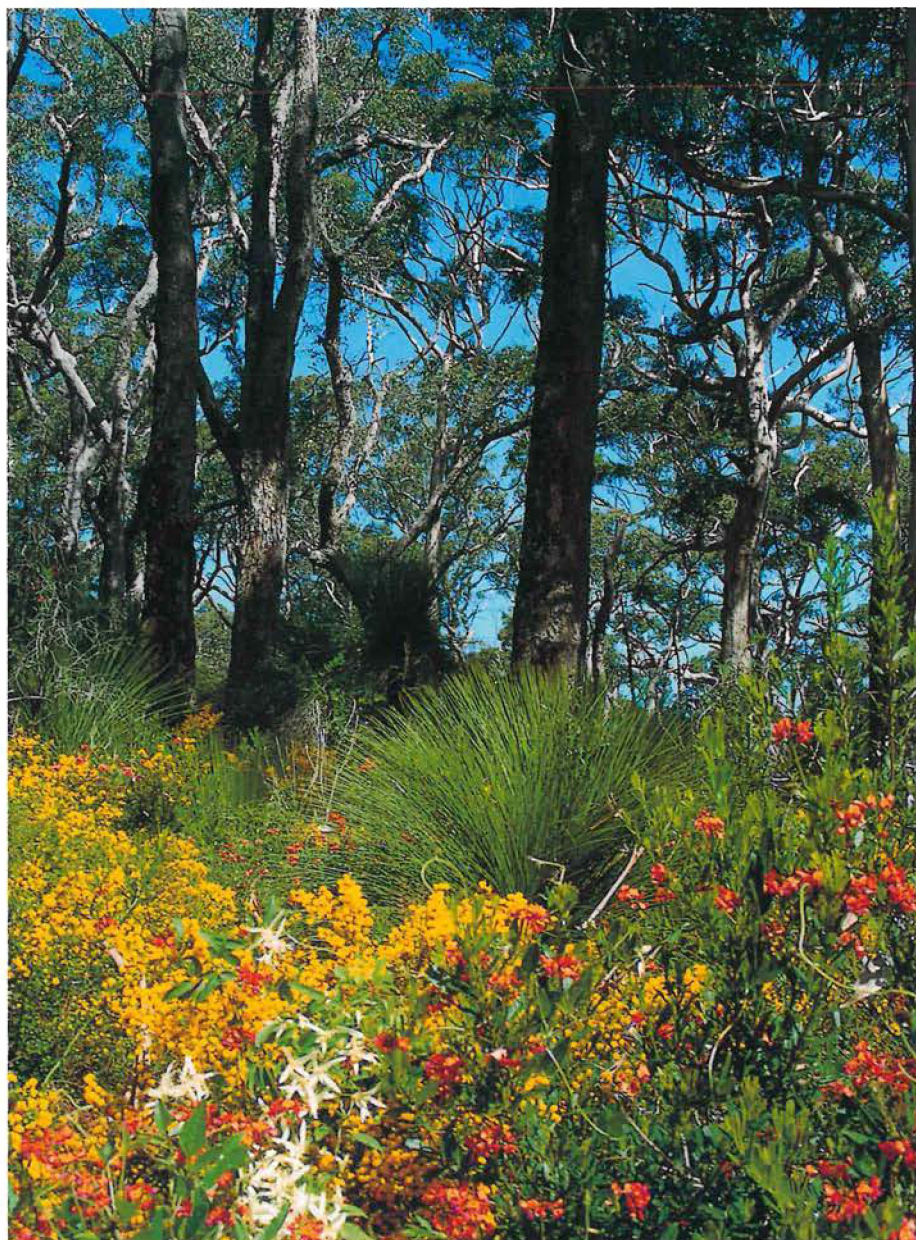


**Above:** Collecting seed from the poorly known *Goodenia stenophylla* in the Ravensthorpe Range.


Photo – Anne Cochrane/CALM

**Below:** Flowering understorey of jarrah-marri forest.

Photo – Brian L Downs/Lochman Transparencies





A vibrant clownfish with orange, white, and black stripes is swimming within the long, pinkish-purple tentacles of a sea anemone. The background is a deep, dark blue, suggesting an underwater environment. The anemone's tentacles are numerous and have a slightly bulbous tip. The clownfish is positioned in the center-right of the frame, facing towards the left.

Symbiosis is a relationship where different animals live together for each other's benefit. One of the ocean's most well known examples of symbiosis occurs within the stinging cells of sea anemones. Anemonefish, shrimps and crabs spend a relatively safe existence nestled in the beautiful, yet often deadly tentacles of their attractive hosts.



A vibrant underwater scene featuring two clownfish with orange bodies, white stripes, and black outlines. They are swimming within the tentacles of a large sea anemone. The anemone has thick, fleshy, light blue tentacles that fan out from a purple, textured base. The background is a deep, dark blue, suggesting the depths of the ocean. The title 'Sea Anemones' is written in a light blue, bubbly font across the upper portion of the image.

# Sea Anemones

by Ann Storrie



**S**ea anemones are a large group of carnivorous invertebrates with beautiful flower-like tentacles. Anemones attach themselves to rocks and other underwater structures by the muscular disc at the base of the body, although some species burrow into mud or sand. They are usually brightly coloured, and may be white, green, blue, orange, red or mauve.

## STINGING TENTACLES

Sea anemones are related to corals, hydroids and jellyfish. All of these undersea creatures have stinging cells called cnidoblasts (pronounced 'ni-doh-blasts', with a silent 'c') on the tentacles surrounding the mouth. Cnidoblasts are so small that they usually can't be seen without magnification, and each contains a vesicle called a nematocyst. The nematocyst is a harpoon-like tubule that lies coiled up like a spring.



When discharged, the tubule shoots out to penetrate, or wrap around its target. Many nematocysts contain toxins that can either kill or render the prey unconscious.

Some anemones, such as the armed anemone *Dofleina armata* (described in the CALM publications *Discovering the Swan River and the Swan Estuary Marine Park* and *Wonders of Western Waters*), have nematocysts that are dangerous to people. However, many anemones just feel sticky to touch. This

### Previous page

False clown anemonefish (*Amphiprion ocellaris*) in a magnificent anemone.  
Photo – Ann Storrie

### Left: A sand-dwelling anemone.

Photo – Eva Boogaard/Lochman  
Transparencies

### Below left: Pink anemonefish (*Amphiprion perideraion*) inhabit large sea anemones.

Photo – Peter & Margy Nicholas/Lochman  
Transparencies

sticky residue is actually the toxins that have been discharged from nematocysts, but which can't penetrate tough human skin.

Sea anemones feed on small fish, invertebrates, plankton and other particles in the water. As the prey swims into the tentacles of the anemone, it is stung by the nematocysts and then transferred by the tentacles into the central mouth. This is the only opening to a single body cavity where food is digested. The wastes are then expelled back out through the mouth. The cavity isn't completely hollow, and is divided by vertical partitions called mesenteries. Cilia (tiny hair-like projections) on the mesenteries aid water circulation, while other special cells secrete enzymes for digestion, absorb nutrients and take up oxygen. Gonads for sexual reproduction are also found on mesenterial filaments.

Anemones are able to move slowly by gliding on the disc at their base (called a pedal disc), or by walking on their tentacles. Some can float using a gas bubble held within the folds of the pedal disc, while others may use their tentacles to swim.

## COLOURFUL CLOWNFISH

More than 1,000 species of anemones are found throughout the world's oceans. Many live in temperate waters and are quite tiny and inconspicuous. Only about 10 species of anemones provide homes for anemonefish, or clownfish as they are more commonly known. These host anemones occur in the tropics and are usually large and colourful.

One of the most entertaining sights under the water is that of clownfish swimming in and out of an anemone's





**Right:** A cluster of anemones feeding on zooplankton.

Photo – Clay Bryce/Lochman  
Transparencies

**Below:** Clark's anemonefish lays its eggs on the reef next to its host anemone.

**Below right:** A red and black anemonefish (*Amphiprion melanopus*) in its bulb-tentacle anemone home.

Photos – Ann Storrie

tentacles. Family groups of these appealing little fish continually dart in and out of their colourful anemone homes.

The symbiotic relationship between clownfish and anemones now appears to be more complex than marine biologists at first thought. Benefits for the fish are fairly obvious. Clownfish are relatively poor swimmers and, without the protection of the anemone's stinging tentacles, they would be quickly caught and eaten by predators. The fish's eggs are also protected by the anemone. The eggs are usually laid on the rocks or reef directly beneath, or beside, the anemone's tentacles. This is obviously a time when the anemone is not supposed to move!

The rewards of the relationship for the anemone are a little more obscure. In aquaria, clownfish will carry large particles of food back to their host. The anemone thus obtains scraps dropped by the fish as the fish eats its meal within the tentacles. In nature, however, the clownfish usually only eats small particles of plant and animal

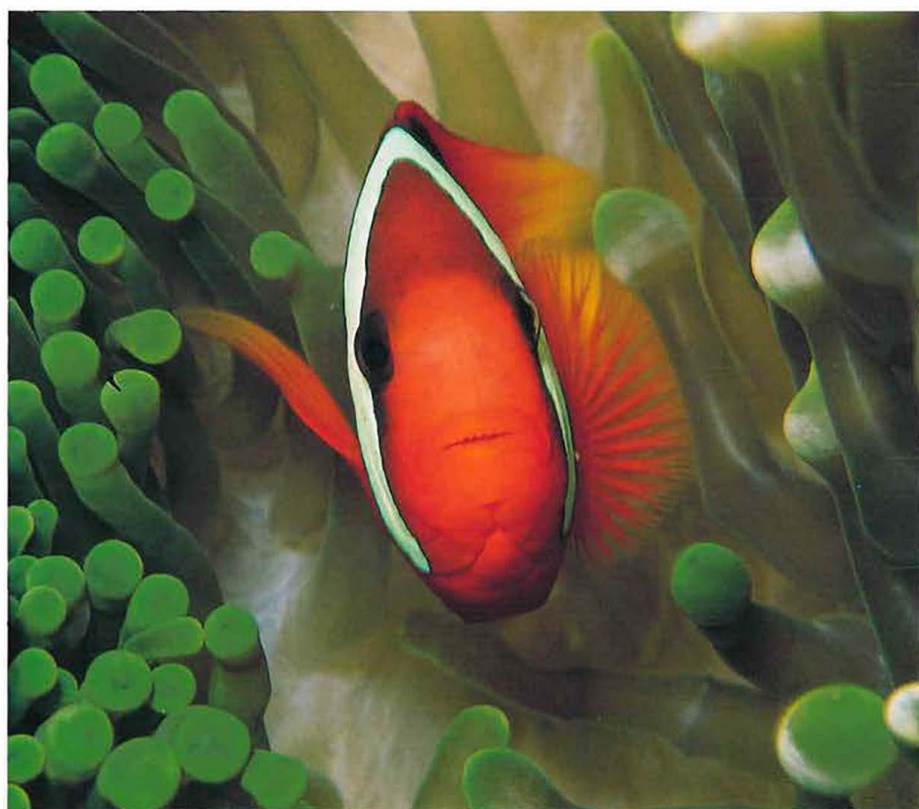


matter that are found close to the anemone. It consumes this food on the spot, and does not usually bring lumps of it back into the tentacles. Thus, it is doubtful whether the anemone gains much food from the fish in the wild.

The anemone may be cleaned of detritus and parasites by the fish, although this is not necessary for the anemone's survival. Some studies carried out on the Great Barrier Reef and in New Guinea, however, showed that when resident clownfish were removed from a particular species of anemone, the anemone disappeared.

The anemones were eaten by butterflyfish. Unlike most fish, many coral-eating butterflyfish are immune to the anemone's stinging cells. These fish are normally kept at bay by the little clownfish that voraciously defend their territory.

Just how the clownfish becomes immune to the anemone's stinging tentacles is not fully understood. Clownfish don't have natural protection—they need to acquire it! Fish that have been separated from their host anemone for a few days will be stung when reunited with the







**Left:** Anemones often form a carpet over parts of the reef.  
Photo – Ann Storrie

**Below:** An anemone shrimp (*Periclimenes venustus*) is well camouflaged against the anemone in which it lives.  
Photo – Peter & Margy Nicholas/Lochman Transparencies

anemone. It may take several hours for them to re-acquire their immunity. Most clownfish carefully touch the tentacles, first with their fins, then their ventral surface, and finally, the whole body. One theory is that the anemone's mucus is smeared over the fish and hence provides the protection. The fish is recognised as the host's own surface tissue, and therefore is not stung. The fish must return to touch the anemone's tentacles every minute or so to keep up the protective coating. Another hypothesis on the acquired immunity is that the fish's own mucus has evolved to lack components

that cause the nematocysts to fire.

Of 28 species of clownfish that inhabit anemones, one third use just one species of anemone as hosts. However, Clark's anemonefish (*Amphiprion clarkii*) can live within any of the 10 species of host anemones. This species is thus the most widely distributed and best known clownfish in the world. In Western Australia it can be seen in the Abrolhos Islands and waters to the north, including Shark Bay, Ningaloo and Rowley Shoals marine parks. It is usually black with white bands on the head, body and at the base of the tail.

## CLEVER CRUSTACEANS

Clownfish aren't the only animals that seek safety among stinging cells. Many species of crabs and shrimps live within, or under, the tentacles of anemones. Some shrimps from the Genus *Periclimenes* assume the colours of the anemone, and are so well camouflaged that they are hard to see with the naked eye. The anemone provides protection and some food for these crustaceans, while the shrimps and crabs clean the anemone of detritus. Many shrimps and crabs also live among the stinging cells of hard corals and bubble corals. It is not yet known how they obtain their immunity to the nematocyst's stings.

Some of the most attractive crustaceans are the porcelain crabs (Family Porcellanidae). These are not true crabs, but are more closely related to squat lobsters (Family Galatheididae). They have long antennae and the





**Right:** Porcelain crabs are often found hiding on the column, under the tentacles of magnificent sea anemones. Photo – Ann Storrie

**Below right:** A boxer crab (*Lybia tessellata*) carries stinging anemones in its claws for protection. Photo – Alex Steffe/Lochman Transparencies

presence of a tail. They are often found in the coral rubble close to where the anemone is attached, or on the underside, or column, of the anemone. They seem to prefer to live slightly away from the stinging tentacles. These crabs and the underside of the anemone may be very colourful, so if you are lucky enough to dive in tropical anemone-land, make sure you take a torch with you. When you find a giant anemone, also called a magnificent anemone (*Heteractis magnifica*), lift one side very gently to reveal the column, or smooth underside. In the light, it is often bright purple, orange, red or pink. You may also see porcelain crabs scurrying for cover.

Some crabs have developed a unique form of defence using anemones or corals for protection. Hermit crabs and decorator crabs often plant anemones on their shells or backs to ward off predators. These crabs may use algae and other invertebrates, including anemones, collecting them in their front claws and placing them in position. Hermit crabs coat their shells, while decorator crabs place the camouflage material directly on their backs and sometimes over their legs as well. As well as providing excellent camouflage, crabs using anemones in this manner also obtain a coating of stinging cells to keep potential predators at bay. The anemones gain a mobile existence with new feeding opportunities and may also pick up floating food scraps that have been discarded by the crab.

Boxer crabs (*Lybia* species) do not necessarily live in anemones, but will carry small anemones or attach them to their claws. One species (*Lybia edmondsoni*) is known as the pompom crab, because it looks as if it is carrying two pompoms wherever it goes. When threatened, these crabs wave their anemones at the predator, as if doing a little pompom dance!



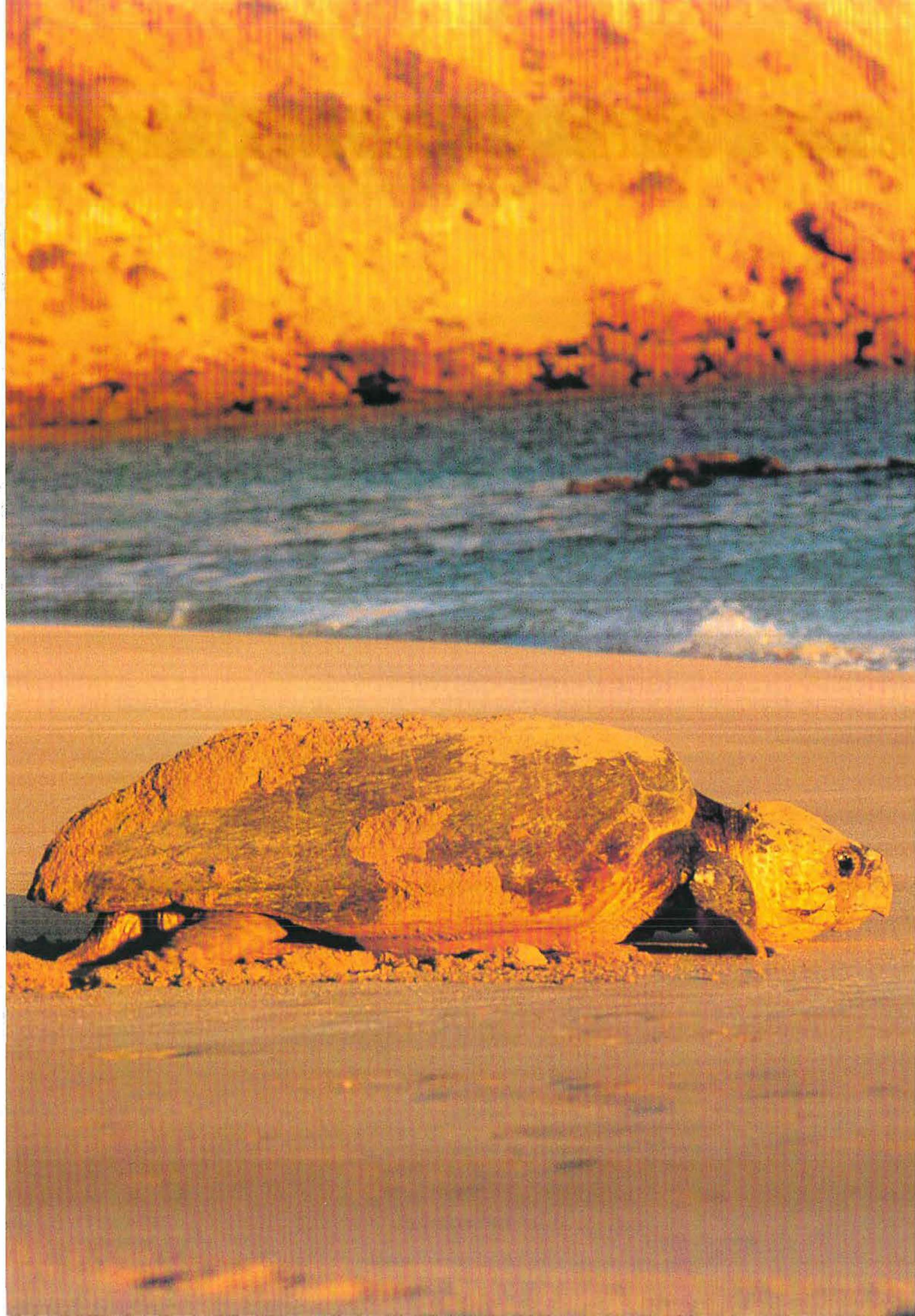
Possibly the ultimate form of symbiosis between crabs and stinging cells occurs in a species of crab living in corals on the Great Barrier Reef. The crab defends its territory by attacking the tube feet of the crown of thorns sea star, thus saving its host from being devoured!

There are many other examples of symbiosis between different animals in the marine environment. Not all involve invertebrates with stinging cells. Different species of fish live together for mutual benefit. The relationship between gobies and shrimps in sandy burrows is well researched, and some fish even live within the intestines of large sea cucumbers. No matter how bizarre,

these relationships enable a large number of animals to survive in the ocean. As we study and learn more about these amazing creatures, perhaps a little bit more symbiosis will rub off on the human race.

Ann Storrie is a freelance writer and underwater photographer. She has co-authored two full-colour books (*The Marine Life of Ningaloo Marine Park* and *Wonders of Western Waters: the Marine Life of South-Western Australia*) which also feature many of her photographs. Both books are published by CALM. Ann can be contacted on (08) 9385 9355.









# PEARLS OF THE PILBARA

White beaches, warm blue waters, coral and solitude . . .  
this is not a description of an exotic Pacific island,  
but one of the many islands off Western Australia's  
Pilbara coast.

Rich in history, wildflowers and wildlife, these islands  
are isolated yet interest from the public grows.  
To aid in their protection, marine reserves are proposed  
in the waters around two of the main island groups.

by Dorian Moro and Fran Stanley



More than 300 islands lie off the Pilbara coast between North West Cape and Port Hedland. They support unique ecosystems and internationally important turtle rookeries, and they provide a haven for seabirds and threatened marsupials and rodents. They vary from small cays and rocky islets to an island of more than 20,000 hectares. Although most are arid and offer little drinking water, shade or shelter, their beauty and isolation are attracting growing numbers of visitors.

## THE EXPLORERS

Archaeological evidence shows Aboriginal people occupied the Montebello Islands from about 30,000 years ago until the most recent sea level rise 4,500 years ago. The Yapurarra people inhabited the Dampier Archipelago and adjacent Burrup Peninsula from at least 18,000 years ago until very recently. They used rafts to travel between the islands and made extensive use of the marine life for food. Their shell middens, stone 'factory' sites, rock engravings, hunting hides, fish traps and habitation sites make this one of the richest archaeological areas in Australia.

The European history of the islands along the Pilbara coast is as colourful as their names. The first shipwreck recorded in Australian waters, the



*Tryal*, ran aground on Tryal Rocks, nine nautical miles north-west of the Montebello Islands, in 1622. Ninety-three people died. The 36 survivors landed on North West Island, the first British landing on Australian soil. The wreck wasn't found until 1969, as the captain lied about his position to avoid court martial on his return to England. Several other famous expeditions passed along this coastline between 1699 and the late 1800s.

From 1870 to 1872, a whaling station on Malus Island processed humpback whales taken by longboats operating around the Dampier Archipelago. Remains of the trypots and ovens used to extract oil from the blubber can still be seen at Whalers Bay. Flying Foam Passage, between Angel, Gidley and Dolphin islands, became a major pearling area between 1870 and 1900. Up to 500 European, Malay, Chinese and Aboriginal people worked in this industry.

The first British atomic weapons

Previous page

A female loggerhead turtle returning to ocean after laying eggs.

Photo – Jiri Lochman

Below: Barrow Island forms one of WA's most important conservation reserves.

Photo – Marie Lochman

test was carried out at the Montebello Islands in 1952, when a nuclear device was detonated below the waterline in an old frigate, *HMS Plym*. Two more atomic bombs were tested in 1956. Remnants of twisted metal, ruined bunkers and vehicles are still present today, and radiation remains a hazard on two islands.

Today, Barrow, Varanus, Thevenard and Airlie islands have oil and gas facilities and associated accommodation amenities on them. Many of the marine areas near these islands support oil and gas platforms as well as pearling and tourism.

## MARINE CONSERVATION RESERVES

The unique marine ecosystems of the Pilbara are being recognised by two proposed marine conservation reserves in the Dampier Archipelago-Cape Preston and Montebello-Barrow islands areas.

The warm, nearshore waters of the Dampier Archipelago are one of the







most biologically rich areas in Western Australia. However, they lie just offshore from Dampier, the largest port in Australia, which moves 75 million tonnes of goods each year worth five to six billion dollars. The region also supports significant commercial fin fishing, prawn trawling, pearling and aquaculture. Recreational fishing, diving and other pursuits are very popular in the archipelago, as nearby towns have one of the highest rates of private vessel ownership in Australia.

The second proposed reserve encompasses the clear waters around the Montebello and Lowendal islands and Barrow Island. The abundance and diversity of coral species on the reefs around these islands have been described by the WA Museum as among the highest of all tropical marine ecosystems off Western Australia. The reefs represent an important ecological link between the fringing reefs of the Ningaloo Marine Park and the oceanic reefs around the Rowley Shoals Marine Park.

Both areas support a variety of communities, including mangroves, coral reefs, sandy beaches, rocky shores, soft sediment habitats, extensive areas of coral rubble and limestone pavements covered in seaweed.

Community advisory committees have been appointed to consider appropriate boundaries, purpose and management strategies (including zoning) for each reserve. Draft management plans will be available for formal public comment. The proposed reserves will protect the marine environment and ensure the various uses are managed in a sustainable, integrated and equitable manner.



## ISLAND GROUPS

There are eight main offshore island groups along the Pilbara coast, including the islands of the Exmouth Gulf (see 'East of the Gulf', *LANDSCOPE*, Summer 1992-1993). Each one harbours a variety of plant and animal life.

## DAMPIER ARCHIPELAGO

A total of 42 islands makes up this archipelago. Many are reserves for the conservation of flora and fauna, preservation of archaeological sites and recreation. The flora of the Dampier Archipelago is predominantly Eremaean (desert tropical) in character and similar to that on the adjacent mainland. However, the unique rock pile formations on Dolphin, Angel and Gidley islands have a higher number of Kimberley plant species.

The archipelago supports 12 species of native land mammals and at least eight species of marine mammals including whales, dolphins and dugongs.

**Above left:** Staghorn and plate corals form part of the wealth of marine life surrounding the Dampier Archipelago.  
Photo - Patrick Baker

**Top:** Dampier is the largest and busiest port in Australia.  
Photo - John Kleczkowski/Lochman  
Transparencies

**Above:** Humpback whales migrate through the waters surrounding the Dampier Archipelago.  
Photo - Geoff Taylor/Lochman Transparencies

At least 102 species of birds (25 of which breed on the islands), two species of frogs and 41 species of reptiles (including four marine turtle species that nest in the archipelago) have been recorded. Western Australia has the only large population of hawksbill turtles remaining in the entire Indian Ocean, and Rosemary Island contains the State's largest hawksbill rookery. Other important fauna includes the Rothschild's rock-wallaby (*Petrogale rothschildi*) and the threatened Pilbara olive python (*Morelia olivacea barroni*).



## WHAT'S IN A NAME?

Many Pilbara islands have names as colourful as their history. Explorer Nicholas Baudin named many islands after prominent French citizens. Below are some island names and their origins. Source: L Marchant (1982). *France Australe*, and Dept of Land Administration.

Date	Island group	Island name	Proponent	Named for
1699	Dampier	Rosemary	William Dampier	Plants resembling 'rosemary' collected on the island
1801-1803	Dampier	Malus	Nicholas Baudin	Etienne Louis Malus, physicist and academician
		Legendre		Adrien Marie Legendre, mathematician, geometrist
		Hauy		Rene Just Hauy, celebrated French minerologist, or Ventin Hauy, educator of blind
		Delambre		Jean Baptiste Joseph Delambre, distinguished French astronomer and mathematician
	Montebello			Battle of Montebello, where Napoleon defeated the Austrians in North Italy
		Trimouille		Distinguished French family, La Trimouille, that expelled the English from France
		Hermite		Admiral Jean Marthe Adrien L'Hermite, who fought against the British
	Muiron			Napoleon's close friend killed by his side at the battle of Arcole, or Napoleon's pseudonym 'Colonel Muiron'
	Thevenard			French Minister Antoine Jean Marie comt de Thevenard
	Serrurier			Jean Mathieu Philibert Serurier, military commander under Napoleon
1818	Dampier	Enderby	Lt P P King	Samuel Enderby, a valued friend of Philip Parker King
		Gidley		Philip Gidley King, father of P P King
		Lewis		Renamed East and West Lewis Islands by J E Coghlan
		East/West Intercourse		Conversation held between P P King and local Aborigines
	Barrow			John Barrow, secretary of British Admiralty
1861	Dampier	Dolphin	Francis Thomas Gregory	Named after his ship the <i>Dolphin</i>
1883-1902	Great Sandy	Sholl	Commander J E Coghlan	Robert Sholl, Government Magistrate at Roeburne, WA
1950s	Montebello	Alpha, Primrose Bluebell, Carnation	Royal Navy Hydrographic Survey	Themes reflecting the Greek alphabet and European flowers, etc. Includes several other islands.
1985	Lowendal	Varanus Abutilon Parakeelya	CALM	Spiny-tailed goanna ( <i>Varanus acanthurus</i> ) A shrub with yellow flowers A succulent plant with pink flowers
1990s	Montebello	Triodia, Grevillea Kurrajong, Dryandra Ptilotus, Acacia	CALM	Temporary names after West Australian plants. Includes several other islands.

### MONTEBELLO ISLANDS

The Montebello Islands are a mosaic of limestone and white sandy beaches. They support more than 100 plant species, including the State's most offshore mangrove stands. Golden bandicoots, spectacled hare-wallabies, spinifexbirds and black-and-white fairy-wrens became extinct here after the introduction of cats and black rats onto the islands by pearlers or via shipwrecks in the late 1800s. The rats and cats are being eradicated under CALM's

Montebello Renewal project (see 'Montebello Renewal', *LANDSCOPE*, Summer 1996-97).

Because of their isolation and lack of feral mammal species, the Montebello Islands are ideal for the protection of threatened species. Populations of mala (*Lagorchestes hirsutus*) and djoongari (*Pseudomys fieldi*) have been translocated to Trimouille and Northwest islands respectively (see 'Moving Mala', *LANDSCOPE*, Autumn 1999). A legless

lizard, *Aprasia rostrata rostrata*, is known only from Hermite Island. The islands support important breeding areas for marine turtles and seabirds, including the largest roseate tern colonies in Western Australia.

### LOWENDAL ISLANDS

This archipelago of more than 40 islands, islets and rocky stacks is composed of eroded limestone that is almost two million years old. The largest islands, Varanus, Bridled,



**Right:** An aerial view of the Dampier Archipelago.

Photo – Dennis Sarson/Lochman  
Transparencies

**Below right:** The islands of the Pilbara are prime nesting areas for the majestic osprey.

Photo – Jiri Lochman

Abutilon and Parakeelya, are particularly important for many species of seabirds. Wedge-tailed shearwaters, terns, gulls and ospreys breed here. Green, flatback and hawksbill turtles nest on the beaches. Varanus Island also supports a population of the goanna *Varanus acanthurus*.

## BARROW ISLAND

Barrow Island is Western Australia's second largest island and one of the State's most important conservation reserves. It is home to 13 species of native mammals, five of which are listed as threatened under the WA Wildlife Conservation Act: the boodie or burrowing bettong (*Bettongia lesueur*), Barrow Island euro (*Macropus robustus isabellinus*), black-flanked rock-wallaby (*Petrogale lateralis lateralis*), spectacled hare-wallaby (*Lagorchestes conspicillatus conspicillatus*) and golden bandicoot (*Isodon auratus barrowensis*). The Barrow Island mouse (*Pseudomys nanus ferculinus*) is known only from this island.

One-hundred-and-ten bird species, including the endemic black-and-white fairy-wren (*Malurus leucopterus edouardi*), 54 species of reptiles, including one endemic lizard, *Ctenotus pantherinus acripes*, and one species of frog live on the island. Four marine turtle species nest on the beaches, with significant rookeries of green turtles on the western side and flatback turtles on the eastern side.

A diverse subterranean fauna, of both terrestrial and aquatic species, inhabits the caves and shallow groundwaters of Barrow Island. This fauna is not well known, but is extremely diverse by national and international standards and contains species listed as threatened at both State and Commonwealth levels.

The island's flora is dominated by spinifex (*Triodia* spp.) grasslands. There is also a variety of mixed herb and grass



communities. More than 250 plant species have so far been recorded on Barrow Island, including four introduced species. Two species of *Corchorus* are listed on CALM's Priority Flora list. Twenty-seven species have been identified as geographically or habitat restricted and/or requiring further research to determine their status.

## GREAT SANDY ISLAND NATURE RESERVE

This reserve protects 26 sandy islands with limestone outcrops. The western chestnut mouse (*Pseudomys nanus*), pale field-rat (*Rattus tunneyi*) and little red kaluta (*Dasykaluta rosamondae*), together with 15 species of terrestrial reptiles, live on the islands. Marine turtles, dolphins, dugongs and

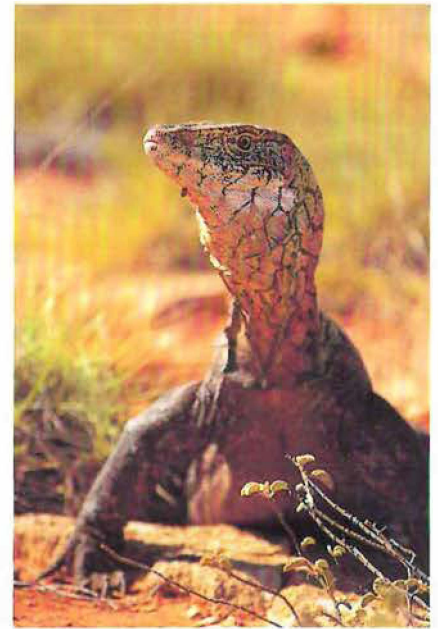
whale sharks inhabit the surrounding waters. Of the birds, 39 species have been sighted and 11 species are known to breed on the islands.

## THEVENARD AND SERRURIER ISLANDS

Thevenard and Serrurier islands are the largest sand islands along the Pilbara coast. The rare kerakenga or Lakeland Downs mouse (*Leggadina lakedownensis*) lives on Thevenard Island (see 'Endangered: Thevenard Island Mouse', *LANDSCOPE*, Spring 1995).

Serrurier Island offers important breeding grounds for ospreys, white-bellied sea-eagles and several species of tern, which may number in their hundreds. Wedge-tailed shearwaters





**Above left:** Wedge-tailed shearwaters nest on many islands of the Pilbara.

**Above:** The second largest lizard in the world, the perentie (*Varanus giganteus*), grows to more than two metres long.

**Left:** Thevenard Island had the only island population of the rare kerakenga; it has now been established on Serrurier Island.

Photos – Jiri Lochman

(*Puffinus pacificus*) nest on more than 40 per cent of Serrurier Island. Some 50,000 shearwater burrows are used by between 8,000 and 20,000 nesting pairs. Fortunately, a feral cat that threatened many of the bird and reptile breeding colonies was recently removed from Serrurier Island. A population of the kerakenga was recently established on Serrurier Island as security for the Thevenard Island population, which now has to compete with the introduced house mouse. Serrurier Island is also one of the region's most important green turtle nesting sites.

## MUIRON ISLANDS

The Muiron Islands comprise two islands that lie about 16 kilometres from North West Cape. The flora is similar to that on the Cape, although several plant species have not been

reported from the mainland. The Muiron Islands support one of the major loggerhead turtle (*Caretta caretta*) rookeries in the region. Both islands support rich seabird colonies, with up to 500,000 birds estimated to take up occupancy each year.

Nature-based tourism around the islands of the Pilbara and their surrounding waters will depend upon

the conservation of their natural and cultural resources. Sit on a sand dune on one of these islands and watch the sun sparkle over a vast blue ocean, or dive on their spectacular coral reefs to witness the incredible fish and invertebrate life. Either way, you can easily appreciate that few places in the world offer the tranquillity, isolation and wildlife of these pearls of the Pilbara.

Dorian Moro is a Research Fellow with the Centre for Ecosystem Management, Edith Cowan University. He can be contacted on (08) 9400 5143 or by email (d.moro@ecu.edu.au).

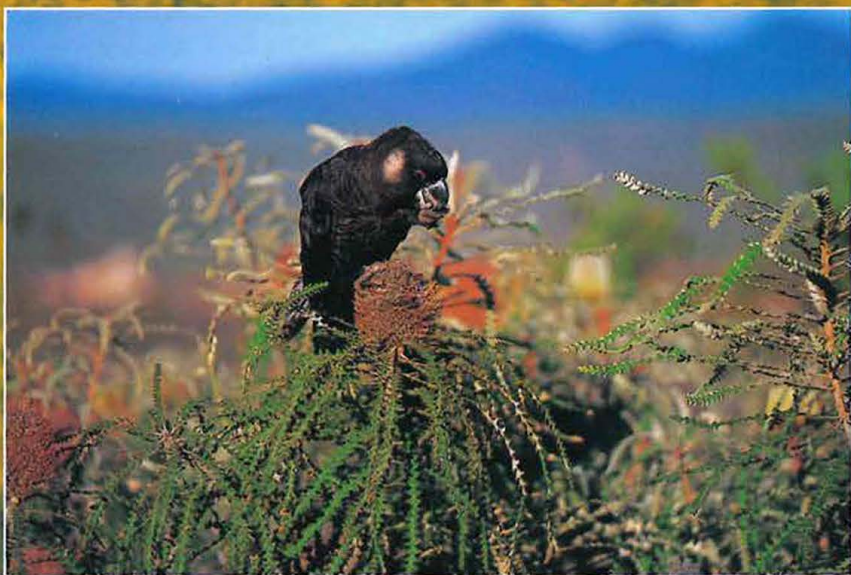
Fran Stanley is the Reserves Management Officer based in CALM's Pilbara Regional Office in Karratha. She can be contacted on (08) 9143 1488 or by email (frans@calm.wa.gov.au).

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# LINKING THE LANDSCAPE

A project in the South Coast region of Western Australia is making it easier for native animals to move from one reserve to another, increasing their chances of long-term survival in land that is now mostly cleared.



by Peter Wilkins



**T**oday, much of our natural heritage within agricultural regions of Western Australia is represented by national parks and nature reserves that are isolated from each other by cleared landscapes. Concern about the long-term future of animals that reside in these reserves has led to a recognition that wildlife corridors linking protected areas are likely to significantly benefit nature conservation goals.

Many wildlife species need to move from one place to another to breed, feed, disperse from changes in habitat quality, or to recolonise regenerated habitats. Recent changes in land use and pressure from introduced plants and animals have forced many native wildlife species into smaller and more isolated refuges and now cannot readily move across the landscape. Such animals are in real danger of local extinction.

## NATURE IN THE FUTURE

It is difficult to imagine what the world will be like in 10 or 50 years' time. It is even more difficult to think in the longer term. Who knows what the world will be like in 100 or even 1,000 years' time? But in terms of nature

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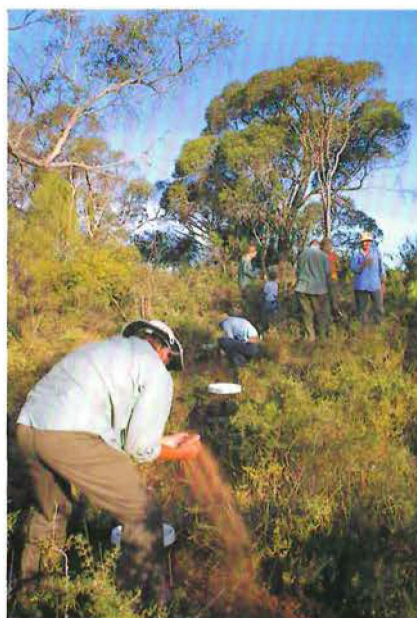
**Main:** The Stirling Range National Park is isolated from other reserves by cleared agricultural land.

Photo – Bill Bachman

**Inset:** White-tailed black-cockatoo.

Widespread loss and fragmentation of feeding and breeding habitat has dramatically reduced the population of this Western Australian endemic.

Photo – Bill Belson/Lochman Transparencies



project area

**Left:** Greenskills find out what wildlife lives in macro corridors as well as assisting farmers to fence off native vegetation and remove weeds.

Photo – Peter Wilkins

**Below:** View from Point Ann, looking over St Mary Inlet, Mt Barren and Thumb Peak, Fitzgerald River National Park.

Photo – Bill Bachman

conservation, we need to think long term, because the effects of changes in the natural environment may occur very slowly and will often go unnoticed for many decades.

The South Coast region of Western Australia has a relatively good system of conservation reserves that are 'comprehensive' and 'representative' of natural environments according to national conservation guidelines. For example, all major bioregions are well represented in South Coast conservation reserves. It also appears that the reserve system is 'adequate', at least in the short term. For example, populations of some species of threatened fauna are vigorously bouncing back from the edge of extinction, thanks to the Western Shield fox-baiting program (see *LANDSCOPE*, Spring 1998) in many conservation reserves.

Whether the conservation reserves of the South Coast are adequate for the long term remains to be seen. It is difficult to believe, for instance, that animal populations in large areas such as the 330,000-hectare Fitzgerald River National Park (see *LANDSCOPE*, Spring 1997) or the 116,000-hectare Stirling Range National Park are at risk. However, catastrophic events like large wildfires can bring perceptions of long-term adequacy into perspective.

On a hot summer day in December 1989, a single lightning storm over the Fitzgerald River National Park ignited a series of wildfires that burnt 149,000 hectares (almost 50 per cent) of the park. Most of this was burnt in only eight hours. Ecosystems within the Stirling Range National Park have frequently experienced large wildfires in recent years. Most recently, in October







2000, wildfires burnt approximately 30,000 hectares (more than 25 per cent of the park) within six days.

Other threats to biodiversity within the current reserve system include soil salinity, waterlogging, dieback disease (caused by *Phytophthora cinnamomi*), weeds, feral animals and even subtle climatic change. Cumulatively, these

impacts are likely to cause the loss of some species from 'protected areas' in the future.

## MACRO CORRIDOR PROJECT

The Department of Conservation and Land Management (CALM) received a Natural Heritage Trust Bushcare grant to help fund a position for two

years to work on the South Coast Macro Corridor Project. The project, which was instigated by John Watson, CALM's South Coast Regional Manager, aims to improve the long-term future of native fauna within national parks and nature reserves, by maintaining existing bush corridors and generally improving bushland connections between major protected areas like the Fitzgerald River National Park and Stirling Range National Park. The wider community and relevant government agencies are working together on the macro corridor project.

The project area extends some 700 kilometres, from Walpole to the Cape Arid National Park east of Esperance, encompassing an area of about 5.5 million hectares.



**Left:** Dibbler populations within the Fitzgerald River National Park are benefiting from both the Western Shield fox-baiting and the large expanse of continuous native vegetation.  
Photo – Babs & Bert Wells/CALM





## WILDLIFE CORRIDORS

Wildlife corridors provide an avenue of movement between habitats, reducing the level of isolation and improving the potential for colonisation, ultimately reducing the risk of local extinction.

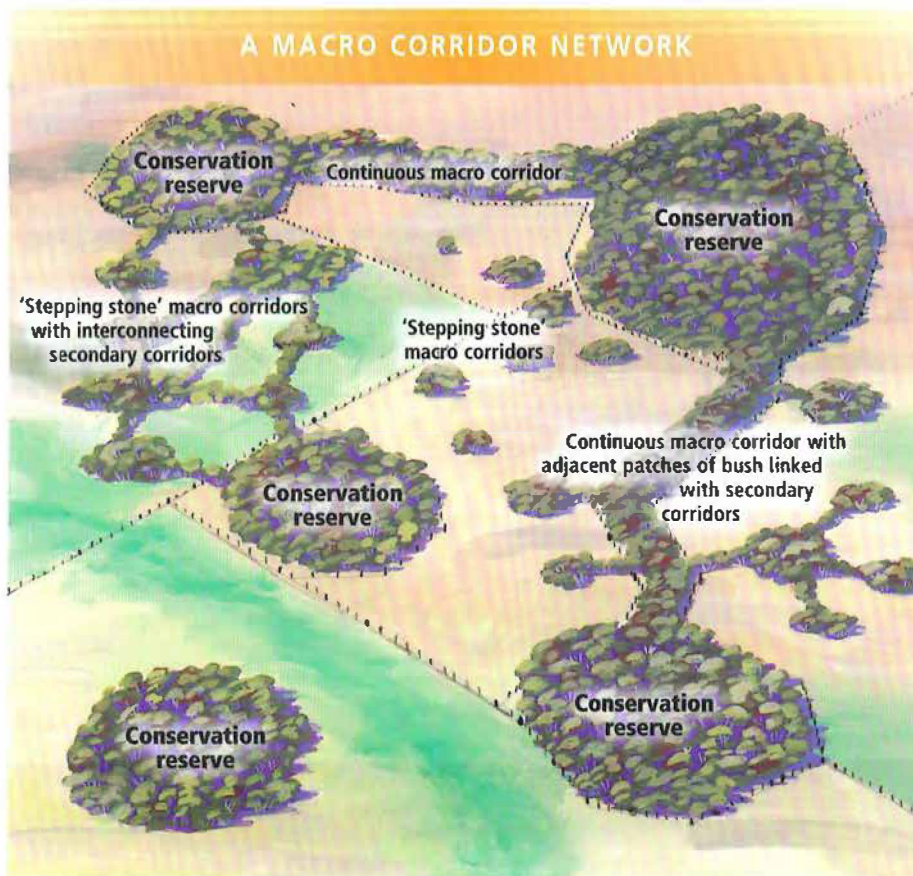
The ability of wildlife to move along corridors varies with the form of the corridor, its vegetative structure, plant species composition and its dimensions, as well as the mobility of the animal concerned.

Corridor width is important as it reduces 'edge effect'. Weed invasion, sand drift, increased sunlight and the action of wind all affect the edges of corridors. Widening corridors can reduce the edge effect by increasing the 'core area' of unaffected bush within the corridor. A larger core area creates better habitat, which is more likely to encourage animals to use the corridor for longer periods. Buffering corridors with other vegetation also helps to

increase the core area by reducing the influences of wind and so on, on the edges of corridors.

From a biodiversity conservation viewpoint, it is best to use local plant species when revegetating, as these species offer the best food and shelter for local native animals. Planting local species also consolidates the natural plant diversity in the area.

The structure of a corridor should replicate those that are found within the areas of bush that are to be reconnected. The structure of a plant community is a general description of the plant community itself—for example, tall woodland with thick understorey or open mallee with an understorey of scattered shrubs and grasses. Examples of complete vegetation communities can usually be found within the nearest nature reserve or national park. If you are planning to create a corridor, you should seek expert advice from your local CALM office when deciding which plant species to use.



**Above left:** Quenda dig busily for underground foods, inadvertently aerating soils for plant seedlings. The health of plant communities will improve as quenda re-establish new populations via wildlife corridors.

**Above:** Predation by the introduced red fox may be more of a barrier for the chuditch than cleared land between suitable habitats. More research is needed to understand fully the interactions and limitations of wildlife ecology in fragmented environments.  
Photos – Babs & Bert Wells/CALM





## MICRO AND MACRO CORRIDORS

Most of us are familiar with local or farm-scale corridors. These vary in width and composition from a simple line of an exotic tree species (which usually offers very limited corridor value to wildlife) up to a 100 to 200-metre-wide corridor that contains a variety of native plant species. Corridors of this scale could be termed secondary or 'micro corridors'.

A macro corridor is significantly larger in scale and provides regional connectivity across a range of major climatic zones, botanical provinces and fauna zones. Macro corridors are at least several hundred metres wide and may be tens or hundreds of kilometres long. They ideally contain broad tracts of continuous native vegetation, to maximise ecological functions for as many wildlife species as possible.

The ultimate corridor network would be made up of a multitude of local scale corridor systems linking patches of bush on farms and other reserves into a network of macro corridors, which in turn link major national parks and nature reserves on a regional scale.

There are several different forms of corridor (see illustration on facing page), each of which influence landscape connectivity at different levels. The worst-case scenario is a completely

isolated conservation area or patch of bush. We can expect some animal species to become locally extinct in such isolated patches over time.

A 'stepping stone' corridor occurs where a number of isolated patches of bush create a sequence of habitat nodes between substantial areas of natural vegetation. These corridors usually benefit larger animals or those able to travel across open country in short periods of time, such as parrots, birds of prey and kangaroos. The best way to



**Above:** Southern kwongan. Plants can benefit from improved landscape connectivity.

**Right:** Narrow strips of native vegetation can provide habitat and corridors for some species.

Photos – Jiri Lochman





improve their function for small animals is to link the 'stepping stones' with a local-scale network of continuous bush corridors.

Tracts of bush that form continuous corridors or links between large areas of native vegetation are the most effective wildlife corridors.

## WILDLIFE NETWORK

The macro corridor project has used a geographical information system (GIS) to plan a network of wildlife corridors. With the woody vegetation 1996 data, developed from CSIRO's Land Monitor Project, and a GIS, we have been able to select patches of bush of a minimum size and identify which patches are strategically placed in the landscape to help create a macro corridor. The project has identified the potential to create approximately 20 macro corridors in the region.

These range from extensive and nearly continuous corridors to sub-regional and regional scale 'stepping stone' corridors (see map on page 43).

## STRATEGIC FRAMEWORK

The final GIS product is a regional-scale macro corridor framework. It has been used to assist community groups and others interested in bush protection and revegetation to target funds at sites that promise to benefit regional landscape connectivity.

For example, the community driven 'Gondwana Link' Project has used the framework to target a major gap in the 'Forest to Fitzgerald Corridor' (see map). This project has worked with local landholders to bridge the gap.

**Above left:** The noisy scrub-bird is known to use densely vegetated margins along wetlands and creeks and vegetated coastal dunes for population dispersal.

**Centre left:** Fire in fragmented habitats has severely reduced populations of the southern emu-wren in South Australia.

**Bottom left:** Research has found that a 45-metre-wide corridor linking two reserves contributes to the viability of a population of the western yellow robin in the central Wheatbelt.

Photos - Babs & Bert Wells/CALM

**Above:** Cleared land inhibits the movement of many wildlife species.  
Photo - Jiri Lochman

The group plans to re-establish a one-kilometre-wide natural bush corridor between the internationally-recognised Fitzgerald River National Park and the proposed Peniup Nature Reserve.

Community projects like this promise to benefit long-term nature conservation objectives significantly.



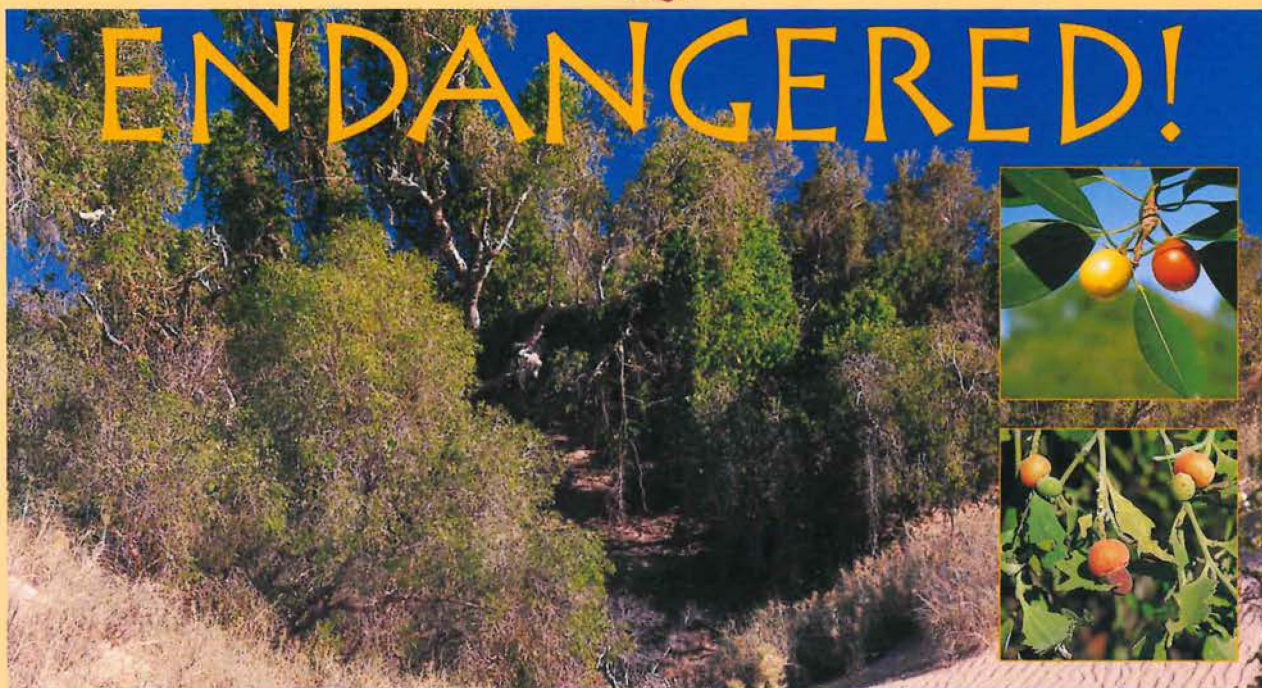
Peter Wilkins, Macro Corridor Project Officer, South Coast, is now Ranger-in-Charge at Fitzgerald River National Park and can be contacted by phone (08) 9835 5043 or by email (peterwi@calm.wa.gov.au).

Peter was co-author of a paper with John Watson, published in the IUCN's protected areas journal *PARKS*, October 1999.





# ENDANGERED!



## Vine Thickets on Dampier Peninsula

The semi-deciduous vine thickets that occur on the landward slopes of coastal sand dunes on Dampier Peninsula, from Broome to One Arm Point and Goodenough Bay, make up one of the most interesting plant communities in the West Kimberley. Many of the species of trees, shrubs and vines that these thickets contain are at the southern limits of their ranges, and are more typically found in rainforest vegetation associated with rocky sites in wetter more northerly parts of Australasia.

The upper storey of these vine thickets is dominated by one or more evergreen tree species, many of which produce edible fruits and berries, such as the banyan fig (*Ficus virens*) mamajen (*Mimusops elengi*), wild apple (*Syzygium eucalyptoides*), mangarr (*Pouteria sericea*), mistletoe tree (*Exocarpos latifolius*), ebony wood (*Diospyros ferrea* var. *humilis*), and marool or blackberry tree (*Terminalia petiolaris*). They are important traditional food resources for Aboriginal people, and the local Bardi language includes a word for vine thicket—*budan*. The thickets also provide important habitat for animals, such as bats and the rose-crowned fruit pigeon.

Occurring as discrete pockets of dense vegetation, typically a few hectares in size, the total area of the 'vine thickets on coastal dunes' community occupies less than 1,000 hectares. About 90 per cent of this area occurs on Aboriginal reserves and grazing leases and less than 10 per cent in Coulomb Point Nature Reserve and the town of Broome.

Because it occurs in small or very narrow linear patches with high edge-to-area ratios, this vine thicket community is highly vulnerable to disturbance. Degradation and contraction in size can be due to the combined effects of frequent hot wildfire, cattle damage and/or impacts of recreational activities such as off-road driving and camping. Damage from vehicles or cattle (seeking shade) may open the normally closed tree or shrub canopy, permitting weeds and grasses to invade the understorey and, in turn, creating fuel for internal fires. In addition, vine thickets are affected by hot fires in adjacent vegetation. Fire regimes in the Kimberley have changed dramatically and

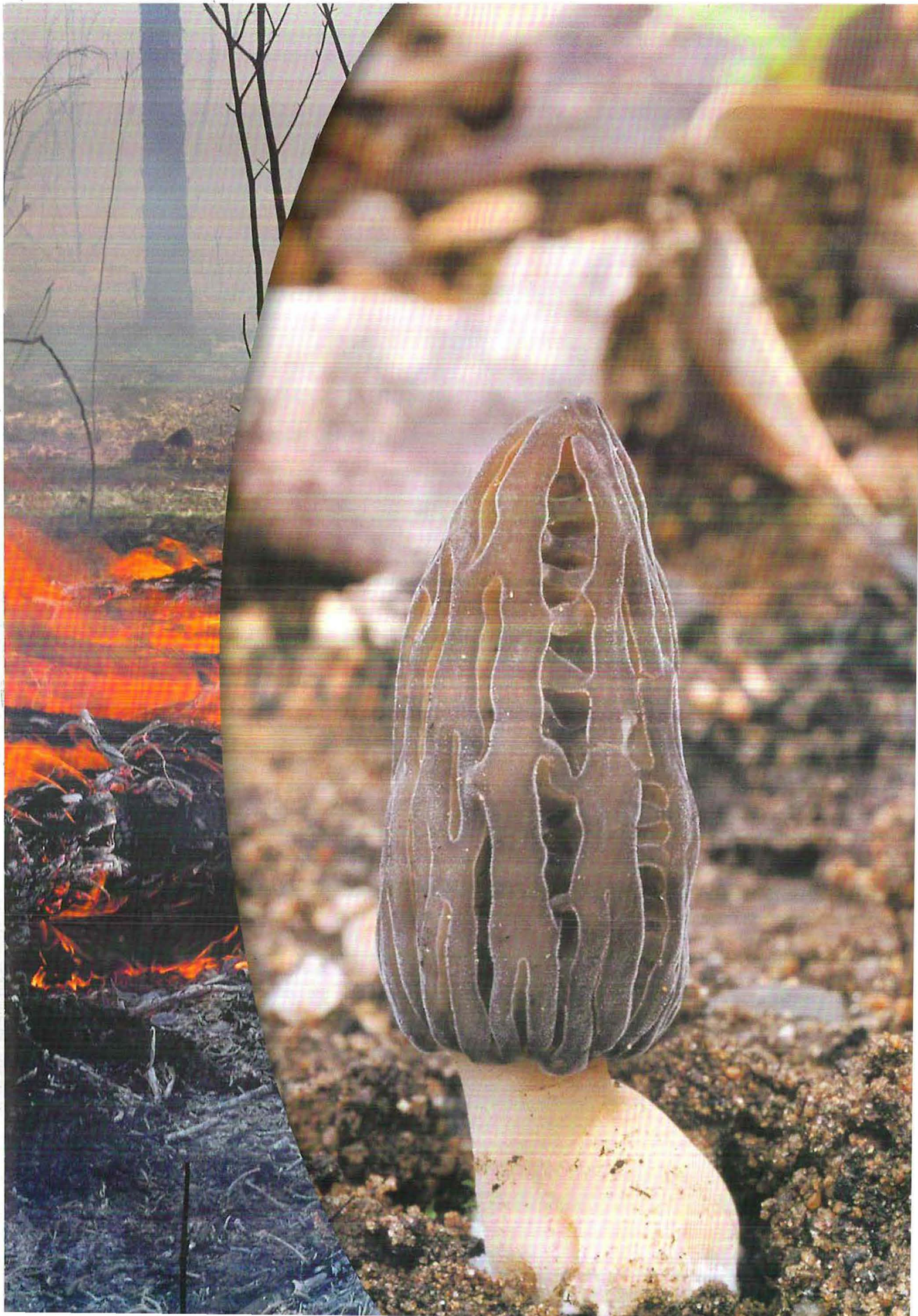
uncontrolled fires now occur annually on the peninsula. With increasing development on the coast, clearing is also becoming an important threat.

Last dry season, under a project jointly funded by the Natural Heritage Trust, CALM's Threatened Species and Communities Unit and West Kimberley District, along with the Broome Botanical Society, conducted survey work on some previously undocumented vine thicket patches. Data were collected on their species composition and the threatening processes affecting them. In addition, the existence of occurrences located from colour aerial photographs was confirmed, in order to establish the full extent of the vine thicket community. Collation of this and pre-existing information has enabled the assessment of the vine thickets on coastal dunes as a threatened ecological community in the 'Vulnerable' category. Decline is continuing and action is necessary to prevent the community becoming Endangered. In the coming year, discussions with local stakeholders will continue, and opportunities to develop and implement conservation management will be investigated.

by Sally Black

Photos by Kevin Kenneally & B J Carter









# Fruits of Fire

It is a hot day in January and a wildfire has raged through the karri forest barely a week before. The blackened landscape and the beating sun produce a stiflingly hot atmosphere. The only signs of life are large dinner plate-sized mushrooms in the ash of several burnt logs. Fungi are normally associated with wet forests, where mushrooms appear in the autumn and winter, so how are they surviving in this inhospitable environment?

by Richard Robinson



**F**ungi that are specifically adapted to fire are known as pyrophilous fungi. Throughout the world, there are many species of fungi that have taken advantage of the conditions provided by fire in order to compete and survive. In the eucalypt forests of southern Australia, several fungi have evolved unique lifestyles that enable them to survive and reproduce following a bushfire.

In Western Australia's karri and jarrah forests, several species of wood-rotting fungi are specifically adapted to survive fire. Under normal conditions, these fungi are found in the form of microscopic thread-like filaments called

mycelium, which colonise dead logs of karri, jarrah and possibly marri. They are decomposers, rotting the fallen logs and returning much needed nutrients to the ecosystem. Unlike normal wood-rotting fungi, they do not fruit on the logs that they colonise and if their log is destroyed in a fire, so are they.

How do they survive? The answer is simple: they go underground. The fungal mycelium grows from the host log into the soil and produces a large underground mass called a sclerotium. It is deep enough in the soil to survive the hottest fire. Soon after the fire a mushroom-like fruitbody emerges from the sclerotium. The mushrooms release

spores that later germinate to begin the cycle again.

## STONEMAKER

The stonemaker fungus (*Polyporus tumulosus*) colonises and rots fallen jarrah and possibly karri logs. At some stage in its life cycle, the fungus grows from the log into the soil where the mycelium binds with the soil to produce a hard stone-like mass. This structure gives the fungus its common name.

Nutrients are supplied from the decomposing log and, over time, the 'stone' may expand to the extent that it can eventually weigh as much as 30 kilograms. The cycle is completed when a fire destroys the log and the fungus fruits from the underground sclerotium. The growth rate of these mushrooms is extraordinary. They can appear at the surface of the burnt ground within 24 hours and within another 24 hours they can be as large as a dinner plate. They quickly mature and release spores from a layer of pores on the underside of the fruit.

## NATIVE BREAD

Native bread is the common name for the sclerotium produced by *Polyporus mylittae*. It is usually found under or alongside karri logs and is composed of pure fungal material encased in a thin, brittle, hard skin. Native bread is edible and early European settlers in the south-west reported that it was collected by Aboriginal people. When fresh, the flesh of native bread is firm but has a very bland taste. The sclerotia are generally oval-shaped and can grow to 60



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**Main:** Distinct cone-shaped morel mushrooms. These are a prized delicacy for those who like to eat wild mushrooms.

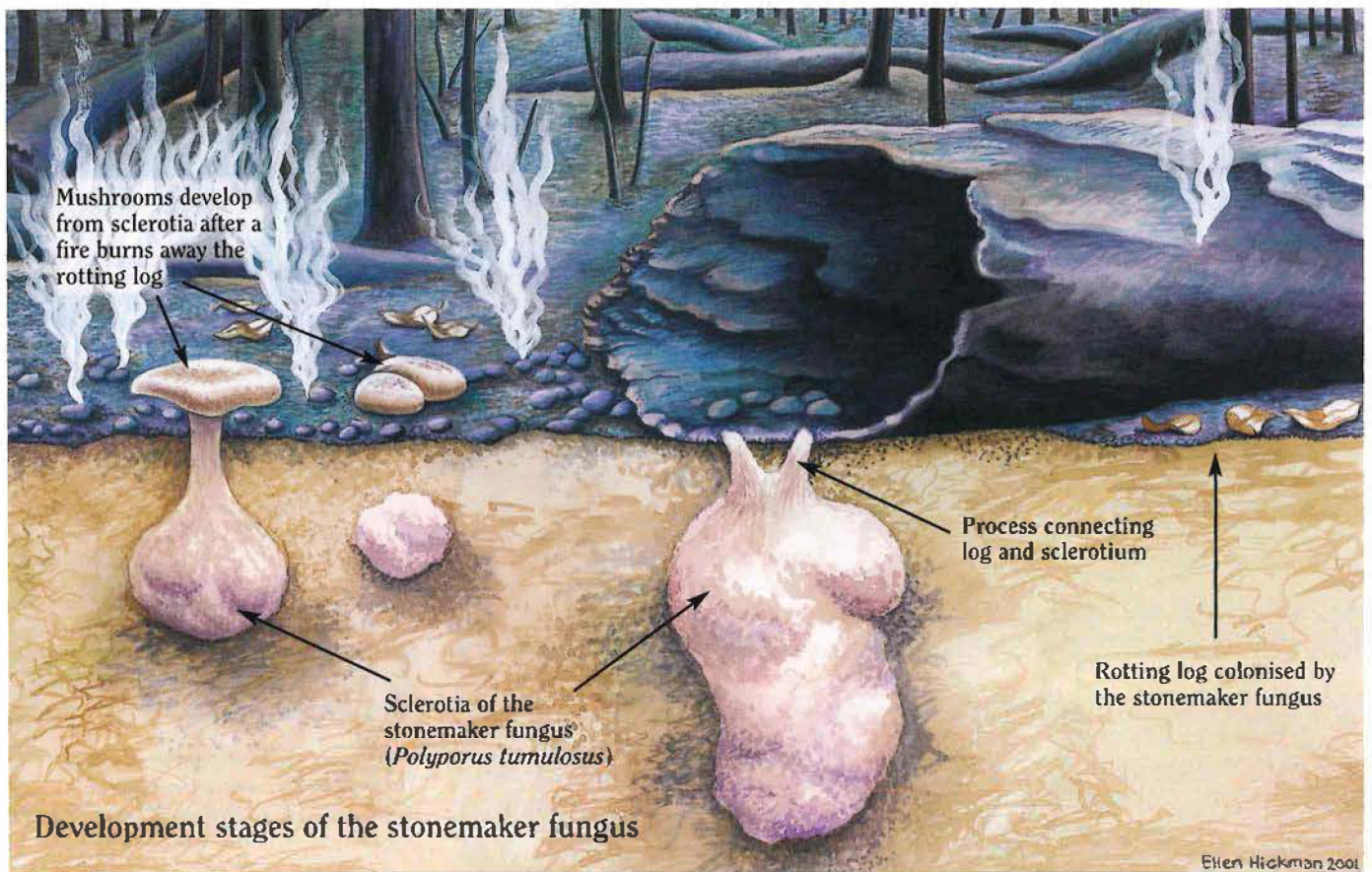
**Inset:** Fire in a jarrah forest.

**Above left:** Large mushrooms produced by the stonemaker fungus can emerge and grow to the size of a dinner plate within 24 hours of a bushfire sweeping through the forest.

**Left:** Native bread, cut to show the fleshy interior of the sclerotium. It can weigh as much as 18 kilograms.

Photos - Richard Robinson/CALM





centimetres in diameter and weigh as much as 18 kilograms.

After a fire, a large mushroom emerges from the sclerotium. Producing a mushroom completely exhausts the reserves in the native bread, which then shrivels and dries up soon after the mushroom matures and releases its spores. In general, the larger the native bread, the larger the mushroom, or alternatively several mushrooms may be produced. Sometimes several sclerotia are associated with one log, and mushrooms can be found beside burnt logs or in the ash remains of logs just a day or two after a bushfire. The mushrooms look similar to those of the stonemaker fungus, and spores are released from a pore layer on the underside.

### MARBLEMAKER FUNGUS

In contrast to the large sclerotia and mushrooms produced by the stonemaker fungus and native bread, the marblemaker fungus (*Polyporus sclerotinius*) produces small mushrooms from small, hard, marble-sized sclerotia

found two to five centimetres beneath the soil surface. It does not fruit immediately after a fire, but in the autumn produces a small flat mushroom between two and three centimetres in diameter. It is characterised by a brown, velvety, often concentrically-zoned surface and a white pore layer underneath.

### UNUSUAL SHAPES

The hand or finger fungus (*Neolentinus dactyloides*) occurs in

karri forests. The Latin term *dactyloides* describes its sclerotium and translates to mean finger-like. The underground mass may be a single finger-like or a multi-branched hand-like structure projecting up to 40 centimetres into the soil. It is firm and granular-like, encased in a brown sand-encrusted skin and can weigh up to three kilograms. Mushrooms emerge from the upper section of the sclerotium and resemble a typical mushroom, with gills on the underside



Right: Mushrooms produced by native bread.

Photo – Richard Robinson/CALM





**Above:** Small, velvet, brown mushrooms produced by the sclerotium of the marblemaker fungus. Photo – Richard Robinson/CALM

**Left:** Sclerotia are hidden beneath the forest floor, undetectable until they surge into life to produce mushrooms after a bushfire. Photo – Chris Garnett/CALM



**Centre:** Burning jarrah logs. Mushrooms may emerge through the ash remains within 24 hours.

**Bottom:** Gilled mushrooms of the finger fungus (*Neolentinus dactyloides*) emerging through the ash. Photos – Richard Robinson/CALM



of the cap. This fungus produces mushrooms profusely after fires, and western grey kangaroos (*Macropus fuliginosus*) have been seen grazing on the fresh caps.

## MORELS

Morels (*Morchella elata*) are found in the wetter karri and jarrah forest regions and fruit early in the next spring following a summer bushfire. They have a very distinct mushroom and an unusual life cycle. The morel has a cone-shaped head with a ridged honeycomb-like surface that is usually light to dark brown but sometimes grey. The fungus does not rot logs or wood, but persists in the soil, alternating between a mycelial and sclerotial state. The sclerotium is a tough resting body and allows the fungus to survive adverse conditions. When activated in spring, a sclerotium will either germinate to form new mycelium or, if stimulated by fire, produce a mushroom.

For those who like to eat wild mushrooms the morel is a prized delicacy. Morels may fruit in abundance on a burnt site, but their fruiting behaviour is unpredictable. To learn more about these and other edible





CALMScience senior technical officer Bob Smith holds the mushrooms and the hand-shaped sclerotium of the finger fungus (*Neolentinus dactyloides*).  
Photo – Richard Robinson/CALM



mushrooms read 'From Field and Forest: Edible Fungi in WA' (*LANDSCOPE*, Autumn 1988).

## TRIGGERS

The underground structures of these fungi appear to be a nutrient source specifically developed to fuel mushroom, and therefore spore, production to ensure the species' survival. In the case of native bread, by the time the mushroom is fully developed the sclerotium is spent, and it then withers and decays to leave little sign of its presence in the soil.

It is not known what specifically triggers these fungal structures to produce mushrooms, or what competitive advantage their behaviour offers. It is assumed that the aftermath of a bushfire favours spore dispersal and increases the likelihood of spores encountering a suitable host log on which to germinate and then grow.

The mushrooms barely rise above the soil. If they were to develop under normal conditions they would be buried beneath the forest litter. Spore dispersal

would be limited to the immediate vicinity and the likelihood of them encountering a new log to colonise would be virtually nil. But when fire removes the surrounding scrub, litter and trash, it is a prime time for these fungi to disperse spores over a large area and to successfully encounter a new log on which to germinate, grow and colonise. The spores are hardy and can survive until the first rains stimulate them to germinate.

Next time you see the aftermath of a bushfire, remember that some organisms rely on fire for survival. It may take months for the herbs, shrubs and trees to show signs of recovery, but fungi respond within hours to take advantage of the opportunity to ensure their own long-term survival.

## COLLECTING FUNGI

If you enjoy collecting and eating wild fungi, remember that it is illegal to pick any flora in national parks. Native fungi are legally protected along with other native Western Australian flora. Fungi can be collected from private

When the end of this jarrah log was burnt away, the stonemaker mushroom emerged from a sclerotium that was developing below the log.  
Photo – Richard Robinson/CALM

property with the permission of the owner. However, if you want to collect wild fungi from national parks or other Crown lands you must first contact CALM's Wildlife Branch and ask about a collecting licence. Although many species of fungi are edible, there are also poisonous varieties. If you are not sure what species you have collected, get a positive identification from an expert before you consume it.

Richard Robinson is a CALMScience research scientist based in Manjimup, in WA's south-west. He works in Forest Microbiota Management within the Forest and Tree Crops Group and has led research into the effects of forest management on fungal ecology and *Armillaria* root disease in regrowth karri forests. He can be contacted on (08) 9771 7997 or by email ([richardr@calm.wa.gov.au](mailto:richardr@calm.wa.gov.au)).



# URBAN ANTICS

## WHICH BANKSIA?

It's different today. The modern child's first encounter with a tree could possibly be when they are confronted with their parent's portico pot containing an exotic plant that arguably resembles an Egyptian mummy with an Afro hairdo.

When my parents built their first home in the bush at Scarborough, it was wall to wall banksia trees, native buttercups, prickly Moses and intermittent large eucalypts. What's more, there were no fences . . . at all.

When the banksias were felled to make way for other houses, I would spend hours bouncing on the heavily blossomed and fruited branches, handing out toy tram tickets to little kids while receiving bottle caps from each in return for a wild ride in paradise. And the magnificent banksia blossoms were never wasted, they were gathered as a token of peace for coming home late, the armfuls of silken flower-spikes caressing our flushed faces while fresh nectar seduced the nostrils.

Banksias of the Family Proteaceae are distinctive evergreen trees or shrubs found in much of Australia, with one species in New Guinea. Unlike most other plants, banksias have massive flower-spikes, each generally resembling a 'hairy cylindrical brush' at the end of some branches. The 'brush' is in fact a dense cluster of several hundreds or thousands of flowers arranged spirally around a woody axis. As the buds of each flower mature and unravel in a wave from either the top or the bottom of a spike, they present an acorn shape, particularly on the short stubby inflorescences, as the pollen presenters stiffen and extend outwards. In some species, this produces a beautiful two-toned colour to the spike.

There are eight species of banksia found around the Perth metropolitan area. The two most common species, often found together, are firewood banksia (*B. menziesii*), with its silver grey to rich pinkish-orange flowers, and slender banksia (*B. attenuata*), with its yellow flowers. In areas north of the Swan River, acorn banksia (*B. prionotes*), which prefers yellow sands, is also common and further enhances the colour spectrum thereabouts with its manicured white and orange 'acorns'.

Many nectarivorous animals rely on the banksia flowers as a source of food and, while clambering over the flower-spikes, pollinate them as they travel from tree to tree. While various species of honeyeater gather nectar, insect eaters such as black-faced cuckoo-shrikes, willie wagtails and rainbow bee-eaters plunder the many bugs attracted to the blooms. Possums also invade the trees for insects and nectar.

The larvae of various weevils and moths burrow into the flower-spikes, where they feed on the soft material and developing seeds. Carnaby's black-cockatoo uses the spikes of candle banksia as a chief food source for both seeds and weevil larvae.

One of the unusual things seen in the forks of banksia trees is a strange bunch of dry, brown deformed shoots, commonly referred to as 'witch's brooms'. It is thought that burrowing grubs introduce bacteria

that induce a cancer, and the tree is able to deal with it in such a manner and continues to grow.

Banksias can hardly be discussed in depth in such a brief article as this, so head for the library or your local nursery to enquire further about these true Australians. The forms, flowers and fruits are so many and varied that you may indulge in a prostrate, a dwarf or a giant for your backyard. Even after the beautiful flower has gone, the long-lasting and decorative 'nut' is worthy of being described as the only weird character missing from Walt Disney's 'Fantasia'.

---

BY JOHN HUNTER

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### DID YOU KNOW?

- There are 75 species of banksia in all, 59 of which occur in WA.
- Banksias with a thin, smooth bark are susceptible to being killed by fire and reproduce by shedding their winged seed.  
*The seed is shed after the heat of the fire opens the seed follicles.*
- Thirty-six species have a thick, rough, fire-tolerant bark and sprout from that, or their underground lignotuber.
- While Aboriginal people dipped the slender banksia or 'biara' in water and sucked the sweet nectar eons before, Joseph Banks first collected four species at Botany Bay in April 1770.



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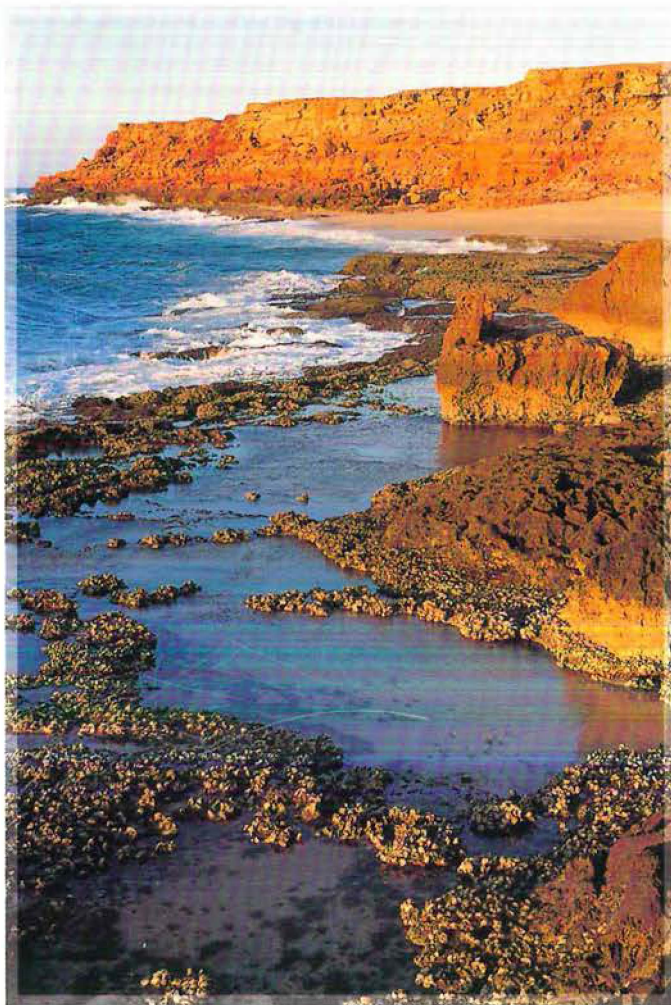
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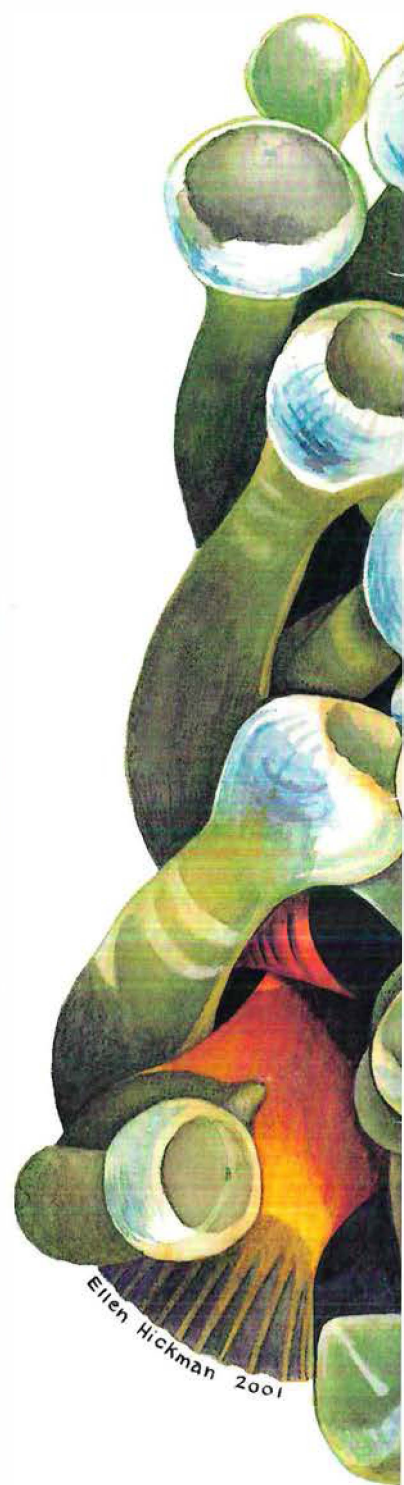
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Cliffs at Cape Malouet, Barrow Island.

Photo – Jiri Lochman



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