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SUMMER 1988/89

LANDSCOPE

W.A.'s Conservation, Forests and Wildlife Magazine

LANDSCOPE

Volume 4, No. 2
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EDITORIAL

It is difficult to remember a time when our daily news did not feature some environmental controversy. To people involved in environmental research and management, the popularity of 'the environment' is a mixed blessing.

Greater public consciousness of environmental issues has meant increased funding and, to some extent, greater prestige. But many scientists working on ecosystems are uncomfortable when their work is placed in the political spotlight.

The knowledge that a scientific observation that once would have been tucked away in a scientific journal to be read only by a few colleagues could become the centre-point of a political controversy is daunting.

Retaining objectivity in any research area is difficult. For those engaged in research on the natural environment it is even more difficult. Unlike the physical sciences in the natural sciences the truth is often camouflaged by interactions between factors which vary over time and space. When the results of this type of research are placed in the political arena, the mixture is often volatile and the truth a casualty.

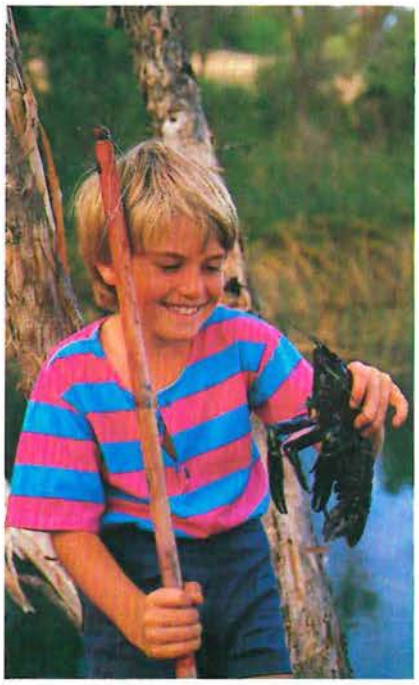
To enable scientists to better seek the truth and communicate it, the scientific community has adopted what has been called "the scientific method". The scientific method is a code of conduct with rigid requirements. An offshoot of that code is a set of rules which scientists must follow, at least in reputable scientific journals, if they are to have their research published. Unfortunately, a byproduct of this is that scientific articles are not the easiest to read and are often plain boring.

Given that the environment has become a major political issue, it is important that those involved in the debate are fully informed. But scientists are faced with a dilemma. They need to popularise their work to reach a wider audience. On the other hand, they cannot afford to lose objectivity.

NATIVE CREATIONS

Nouvelle jardins, multiculturalism or laissez-faire; which garden fashion will you choose? Turn to ***page 22.***

WILD MARRON



Do our wild marron have a future or will local gourmets keep catching them to the point of extinction? Find out on ***page 4.***

KARRI MAGIC

What is really going on in the karri forest? On ***page 32*** *we take a look at the system of conservation reserves that have been established to preserve this awe-inspiring forest.*

STRANDED!

Relive the euphoria of the Augusta whale rescue on ***page 18.***

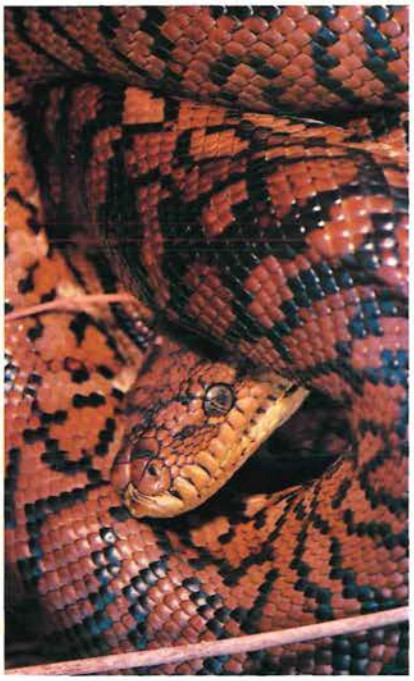
BACK TO BASICS

With today's massive land boom it's hard to imagine that the State once couldn't give land away fast enough. Now the government is buying back our valuable conservation areas. See ***page 43.***

DESERT GEM

The Gibson Desert Nature Reserve covers over 1.8 million hectares. It is a desolate but subtly beautiful landscape. Read about this unique area and the management problems it presents on ***page 48.***

SNAKES & ADDERS



Slim and active snakes have emerged hungry from their winter hibernation. But they're not all venomous. See ***page 51*** *for tips on living with snakes.*

AFTER THE FOX

Foxes pose a major threat to native mammals and other fauna. Can we outfox them? See ***page 12.***

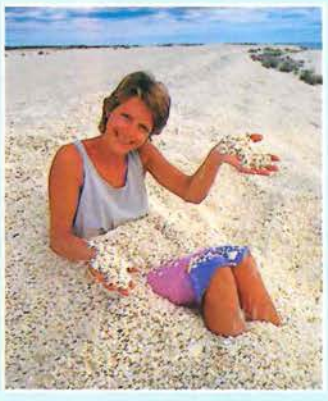
A SIGHT TO BEHOLD

'Its pouch can hold more than its belly can', goes the popular rhyme. Find out more about this awkward but graceful bird on ***page 39.***

Cover Photograph

One of our natural wonders - the beaches of Hamelin Pool (Shark Bay) consist of billions of small shells.

Photo by Bill Bachman.



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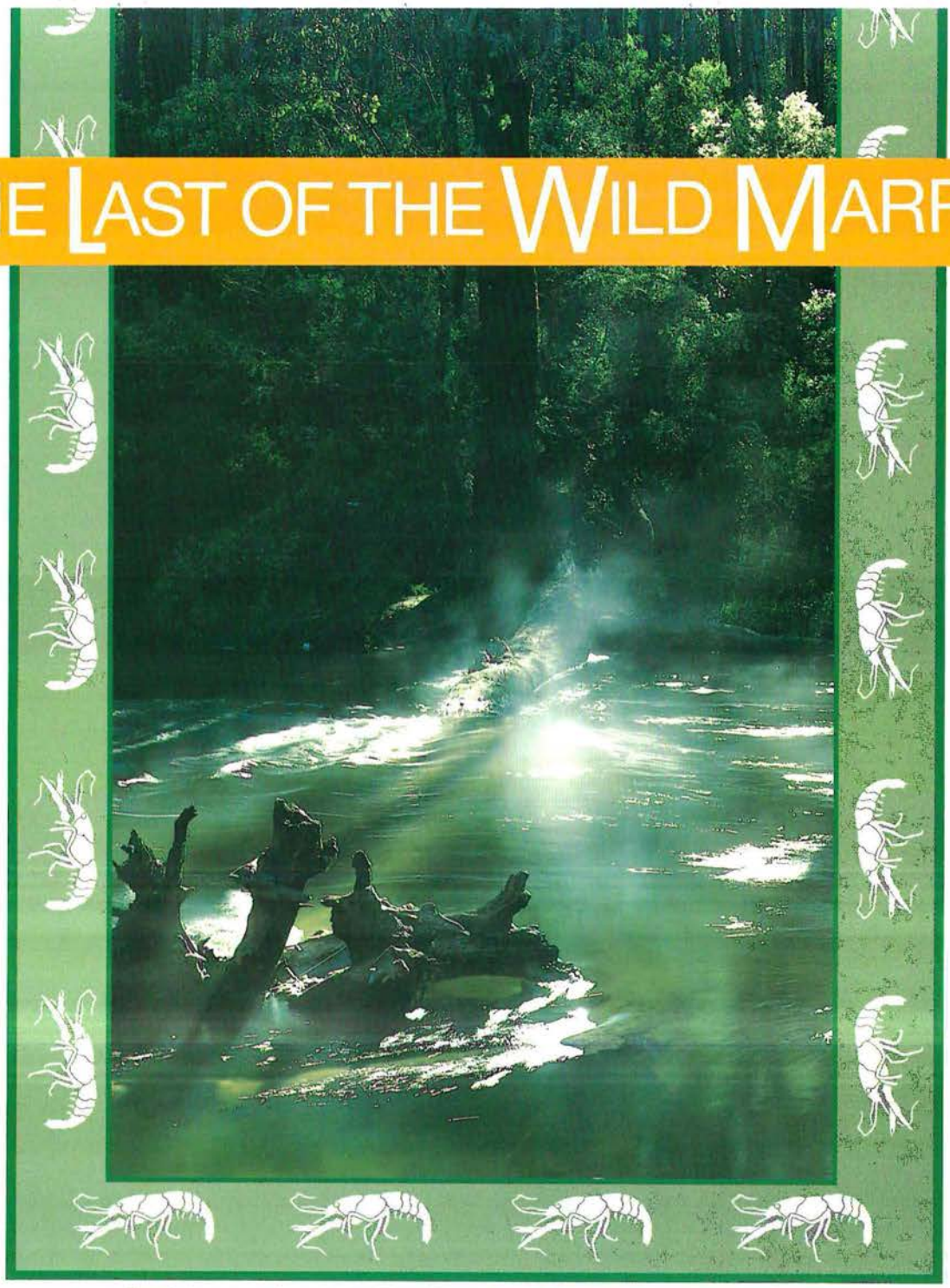
THE LAST OF THE WILD MARRON



BY ANDREW CRIBB

Marron - those succulent white-fleshed crustaceans cried out for by gourmets the world over - are part of a West Australian lifestyle which most of us take for granted.

For the cost of a licence, about $8.00 a year, any sandgroper has been able to gather family and friends, take a trip into national park or State forest, and enjoy an outdoor feast the envy of restaurant-goers from Soho to Singapore.

In the summer of 1987 the marroning season was closed for the first time. A series of dry seasons, and a tumbling catch rate threatened the sport of marron fishing with collapse. The season will stay closed this year.

Some of the problems facing marron come from the environment, most are caused by people. Andrew Cribb asks: 'will ordinary West Australians take up the challenge of looking after their marron stocks, or are we seeing the last of the wild marron?'

The smell of woodsmoke from an open fireplace, and the dark shadows of trees as they fall across the cool of the evening water have a special association for West Australians born and bred in the South-west.

For many years any summer's evening in the jarrah or karri forest would find folks from bush and city enjoying one of W.A.'s more gentle sports.

Every stretch of open shoreline from Waroona Dam near Dwellingup, to the dark Warren River had its parties of marroners, and in the morning the tell-tale litter of pink shells and the charcoal from extinguished fires would bear testament to a pleasant evening spent with scoop net and chook pellets wading in the shallows.

Last summer all this came to a sudden full stop. For the first time in the history of the State, the Fisheries Department closed the season.

Now there are grave doubts about the future of marron fishing as a sport. Can the marron survive the demands from an increasing number of marroners? Are the current management rules adequate to protect the breeding stock? Will marroners allow management to protect the stock? What happens when the season re-opens?

The challenge facing both fisheries managers and other environmental management agencies is to evolve a set of tactics which will allow some future both for marron fishing, and for the marron.

The challenge facing West Australians is to care enough about having marron around for themselves and their children that they don't abuse the privilege by catching them to the point of extinction. In other words we are talking about that age-old conservation goal : sustained yield.

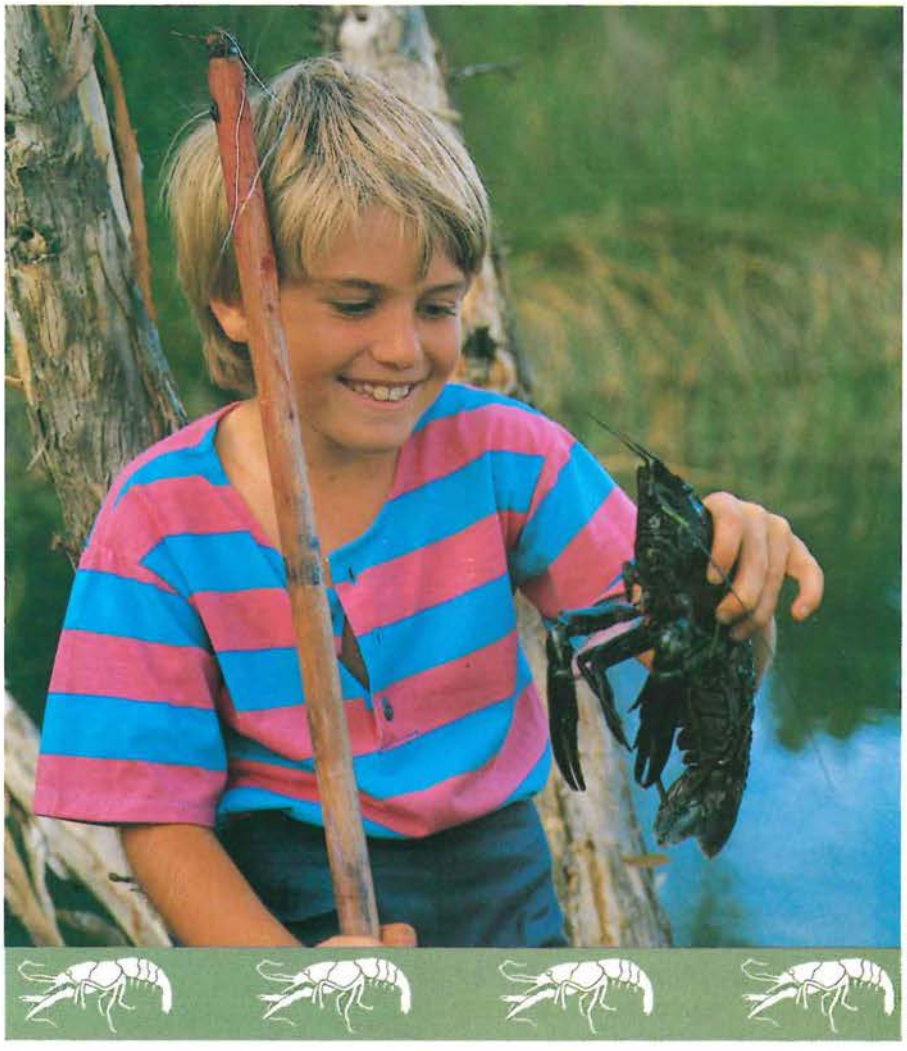
NETS AND FOUR-WHEEL DRIVES

Marron fishing is a sport unique to W.A. No other country in the world has anything like it. Commercial marron fishing was banned in 1955, and since then wild marron, the third largest freshwater crayfish in the world, have been reserved exclusively for the enjoyment of West Australians during their leisure time. Marron are truly a community resource, and it is the way the community uses the resource that will determine, to a large extent, its future. Governments can legislate and police, but without community support these measures amount only to fingers in the dam wall.

The rivers of the South-west provide at least 1 000 km of banks accessible to marron fishers, and the irrigation dams of the Darling Scarp give another 320 km or so of shoreline.
Over the last 20 years the demand for marron, and the pressure on the existing stocks, has steadily increased.

As with many other forms of 'bush-based' recreation, much of the additional pressure on environmental resources has come from an increasingly large, affluent, leisured, and mobile city-based population seeking outdoor recreation within reasonable driving distance of their homes. Often a few drop nets and some chicken pellets are as much a part of the family camping trip or picnic as the snaggers and steak.

With four-wheel drives and trail-bikes becoming more and more common remote stretches of water are also increasingly heavily



Clifford Young

A predilection for chicken pellets led to this marron's downfall

fished,putting pressure on previously safe stocks.

The use of drop nets with a mesh small enough to catch undersize marron also creates a problem. Anyone going fishing more than a few weeks after the season opens has small chance in the late 1980s of getting a bag limit of legal-size marron. Most of the last season's stock that reaches legal size over winter are cropped off soon after the season opens.

As the number of legal-sized marron available for catching falls, more and more marroners take up the habit of eating undersize 'supperies' at the fishing spot, only taking home legal-sized marron.

Environmental changes have also had their effect. Although marron have been artificially spread outside their original range, particularly into farm dams, their distribution along inland rivers has shrunk. Clearing for agriculture, boosted algae growth through the run-off of fertilisers which reduces oxygen in the water, and increased salinity resulting from agricultural clearing have made the inland end of many major rivers in the south-west unsuitable for marron.

As with other types of fish, the problem of 'shamateurs' illegally selling their catch is also a major cause for concern.

In recent years the value of marron as a saleable product has sky-rocketed. Along with many other types of crustacean, marron are now part of the luxurious and expensive gourmet food market. The incentives for poaching, out of season, over bag limit, or undersize are increasingly attractive.

The growth of interest in commercial crustacean farming, although potentially of enormous benefit to W.A., also poses an oblique threat to the viability of the wild marron fishery if management controls are not rigidly applied.

Farming, both hobby and commercial, creates a demand for juvenile stock, and this in turn presents an incentive for poachers to take large quantities of young marron from the wild.

The introduction of other species and stock from interstate and overseas, if not strictly quarantined, brings with it the risk of releasing exotic diseases into native river systems, and the imports themselves, if they escape or are released into the wild, may supplant native species by outcompeting them or modifying their habitat.

ON THE MARRON PATROL

Overseeing the marron fishery effectively has always demanded creative thinking from Fisheries Officers. Unlike other fisheries, marroning is a largely nocturnal activity, carried out deep in the bush. The number of marroners out on any night in the season probably runs into thousands, and part of the social scenario is drinking. All of this adds to the difficulties faced in supervising the fishery.

The Fisheries Department has a patrol unit dedicated full-time to the recreational marron fishery, and another to supervising commercial farming. These are backed up from Perth and district offices throughout the South-west.

The 'marron patrol' covers the major fishing area between Moore River and Albany. Most years they clock up more than 60 000 kilometres along bush tracks and around dams, keeping an eye on legal and illegal activity.

Patrols have to be carried out at night, many of them on foot round the waterways. Visibility along the shoreline of most marron waters is limited, and actually catching marroners in the act of illegal fishing is difficult. Nonetheless roughly 200 offences are reported every year, both in season and out, and many more warnings, verbal and written are given.
Chief Fisheries Officer Neil McLaughlin described some of the management problems faced by Fisheries Officers.

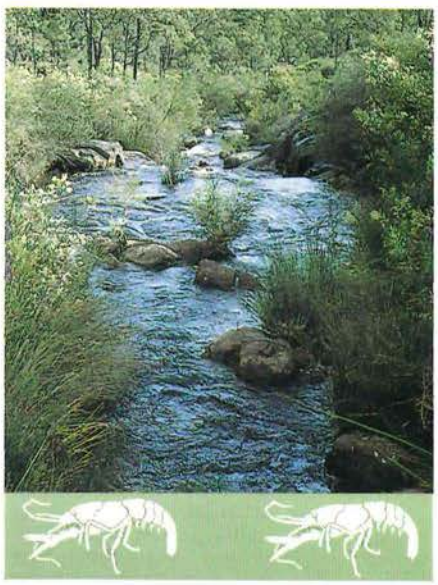
'In the recreational marron fishery we not only have the sheer physical difficulties imposed by patrolling isolated areas at night, but also a widespread disregard for bag limits, legal sizes and other management controls amongst marron fishermen.'

'Fishermen often use a range of tactics to avoid detection, including eating undersize marron at their fireside, pulling the tails off and burying the heads, and making stashes in the bush to collect later if they suspect a Fisheries road-block.'

'We are determined to make the illegal sale of marron and the take of large quantities undersize or out of season uncomfortable enough to put poachers out of the market.'

Recently, the fines for marroning offences were substantially increased, bringing them into line with the fines for rock lobster and abalone offences.

The maximum fine for taking marron out of season is now up



Jiri Lochman

Marrinup Creek in the Dwellingup area is one of many quiet river streches favoured by marroners.

to $1 100 for a first offence, and $2 200 for subsequent offences. Fines for taking undersize marron range from a maximum of $500 for a first offence, to a maximum of $2 500 for a third offence. In addition there is a fine between $5 and $25 for every undersize marron caught. This means those who illegally take large quantities of marron risk fines as big as their crimes.

For the 'shamateur' scalpers who sell their catch the fine can be as high as $15 000 for a second offence.

Police are ex officio fisheries officers, and CALM's Wildlife Officers are also authorised to act as fisheries officers.

LIVING WITH MARRON

Marron are native to the river systems of the South-west, but since European settlement their range has been considerably extended north and east.Originally they are thought to have been confined to the permanent freshwater streams between Leschenault Inlet near Bunbury, south to Augusta, and east to Irwin Inlet near Walpole. Since 1829 they have been introduced to rivers as far north as Geraldton and to farm dams as far east as Esperance.

Many of the most popular marron fishing spots today are on the dams and rivers of the northern jarrah forest, most of which have been stocked since the 1930s. Two documented examples are the Murray River, which flows through Lane Poole Reserve, and was first stocked with marron in 1938, and Yanchep Lake, in Yanchep National Park, which was stocked in 1932.

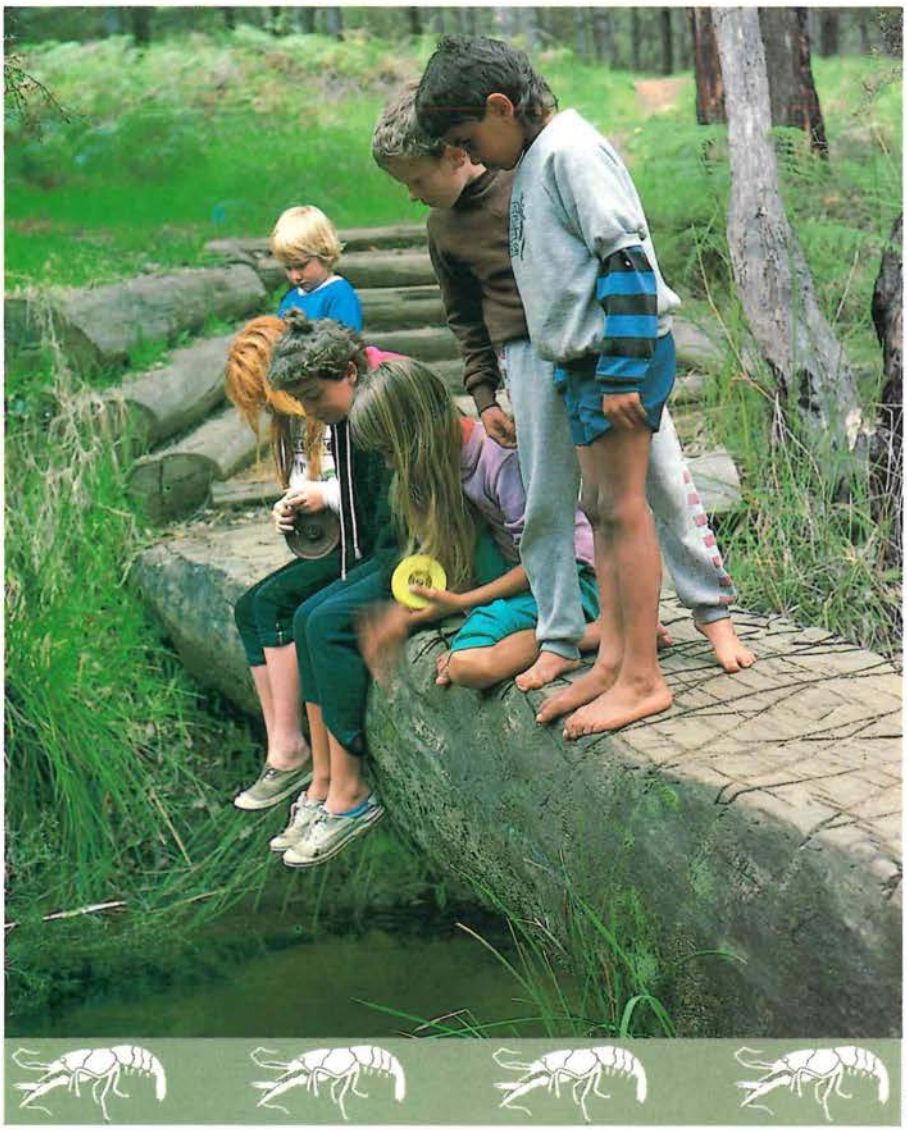
Marron may take about two years to reach the legal minimum size of 76 mm carapace length, but growth rate varies greatly between different populations. Marron in rivers often reach sexual maturity at below legal size, but in irrigation dams marron grow faster and mature later, making the breeding stock more susceptible to overfishing.

A closed season and minimum carapace length of 3 inches (76 mm) was first set for marron in 1952, and was based on what was then considered to be a 'fair' eating size, not on the reproductive biology of the animal. The same reasoning was applied to the original bag limit of 30, which was considered a 'fair' feed of marron for an average fisherman. Even in that era it was clearly perceived by fisheries managers that marron would be placed under extreme pressure as W.A.'s population grew.

The closure of the marron fishing season may have taken casual observers by surprise, but to researchers, fisheries officers and marroning regulars alike, who had been watching the dwindling catches and growing flood of marroners over the late '70s and early '80s it was almost inevitable. Fears for the future of the wild marron breeding stocks in our south-west waters came to a head in late 1987, after a series of dry winters and hot summers pushed down water levels in dams and rivers.

Dr Noel Morrissy, in charge of freshwater fisheries research at the W.A. Marine Research Laboratories at Waterman, described the situation when fisheries officers first came to the hard decision not to open the season.

'We were aware of declining catches over several seasons, through the log books of the marroners we use for research, but



Jiri Lochman

Marroning holds a fascination for all ages; these children were seen play-catching marron at the Lane-Poole Reserve

here was considerable debate about the best solution. Restricting the season even further by not opening it until January was seen as impossible to enforce, other available options which included increasing size limits, decreasing the bag limit, or closing certain waters all had their drawbacks.'

'The dry winters of 1986 and 1987 pushed the remaining marron stocks into even smaller areas of habitat, and made the stocks more vulnerable to overfishing.'

Since the summer of 1971/72 the Fisheries Department's Research Branch, based at Waterman in Perth, has had a monitoring program to measure catch rates, the number of marroners fishing each year, breeding stock levels and a variety of other factors thought to affect the marron population.

Log books, kept by a select number of regular marroners, provide information on catch rates, and more importantly the number of legal-size marron caught per trip, as well as indications of the most popular fishing spots.

The number of licences issued by the Department each year gives an indication of how many people go marroning. Since 1971 the number of licensed marroners has risen from around 5 000 to something in the order of 24 000.

Log book records between 1984 and 1987 showed a dramatic drop, not only in the proportion of legal-size to undersize marron caught per trip, but also a 50 per cent drop in the number of undersize marron caught.

Between 1971 and 1980 average catches of legal-sized marron amongst the experienced and skilled log-book marroners ranged from 10 to 24 marron each a trip. Between 1981 and 1984 the average fell to between 8 and 15, and in the summer of 1986/87 an all time low of between 7 and 9 legal-sized marron per marroner per trip was reached.

All these factors combined supported growing public concern, and led to the decision to close the season.

At the beginning of 1988 a public discussion paper on the marron fishery and the management tactics available to rescue it was released by Fisheries Minister Julian Grill, and a committee, chaired by south-west MLC Doug Wenn, was set up to receive and consider public submissions.

The committee, made up of representatives from south-west towns, the Fisheries Department, and other interest groups made its report on the submissions it had received to the Minister in October, and the decision to keep the season closed during the summer of 1988/89 was made.

WHAT NEXT?

Over 80 written submissions from both Perth and the South-west were received, and the Marron Committee also visited country centres for further input.

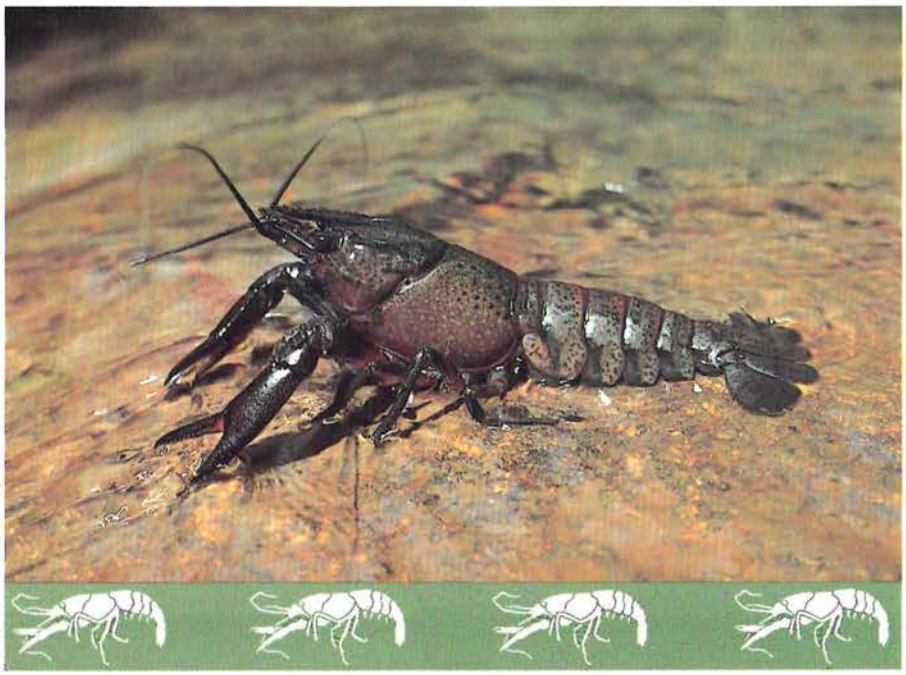
Many suggestions centred around lowering the bag limit, shortening the season or increasing the legal size. Others focussed on changing allowable fishing methods to lower the take of small marron.

The committee are continuing to examine options for the long-term management of marron fishing, and will make their final recommendations during 1989.

The key to protecting a fish population from overfishing is to restrict the 'fishing effort' of the users of the resource. Tactics can be as radical as making fishing illegal, or as subtle as imposing restrictions on high catch-rate fishing tackle. Whatever the technique the philosophy behind managing a natural resource is the same: to ensure that it is both sustainable, and equitably shared amongst its various user groups.

Whatever the management tactics eventually decided upon, West Australians will need to understand that if they wish to have marron in the future, they will need to treat them with greater respect.

They are gourmet fare, a remarkable part of WA's native wildlife, and a privilege to be shared amongst everyone in the South-West.



Marie Lochman

This robust looking marron (Cherax tenuimanus) is a gourmet's delight.

Out Of The Mouths ...

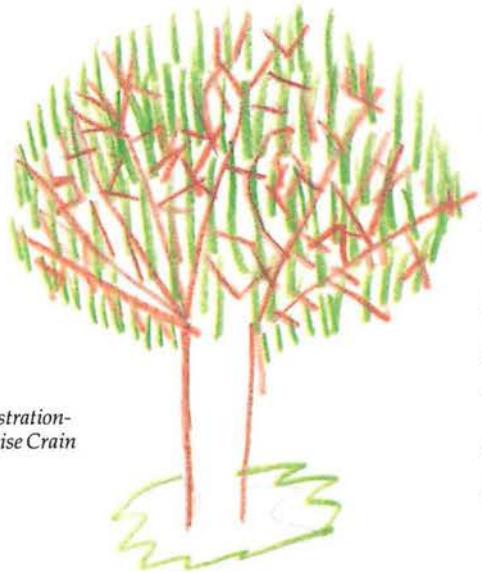


Illustration-
Louise Crain

WOMBATS to wallabies, wildflowers to walktrails; what do today's youngsters ***really think*** *about National Parks and conservation? You'll be amazed! We've printed some of the responses to Landscope's National Parks competition received from children aged 9-11 - spelling mistakes and all!*

The authors of the winning entries (boxed) will receive copies of CALM's full-colour books ***Wild Places, Quiet Places*** *and* ***Beating About The Bush.***

THE PERFECT PRESCRIPTION

National parks should have some wildlife flowers, a varriation of animals and I think a creek or some other type of water so people can fish.

There should also be a couple of rare animals. Also a couple of caves or maybe just a rocky area. There should be a large picnic area for the family.

I would like to see a wild bird like a eagle or a hawk. There should be a camping area and somewhere were people can relax. And also a hill or mountain people can walk up. Id like to see most of these things If I could.

Naomi Burgess

A NEW DUTY

In National Park they have rangers who look after and feed the animals.

If you see any animals while you are walking along the path dont harm them or frighten them away. When you go the National Park take a friend incase you get lost or hurt. If you take a friend make sure you both have a map of the National Park it would be easier to find one another if you get lost.

Amy Thorne

ACTION MAN

Animals I enjoy looking for are red kangaroos, wallabies and small lizards. If the parks have lakes Im keen to go canoeing. I also admire National parks because they are more peaceful than a normal park, I also like having a picnic. We have lots of National parks in W.A. and I would be intrested in visiting as many of them as I can. If they have steep mountains I would like to try climbing them. I like looking for different coloured birds. I have seen seen some plants in a book and I would like to look for them. There names are blackboys, Leschenaultia, biloba, scaevola and stylidium.

Damian Matacz!

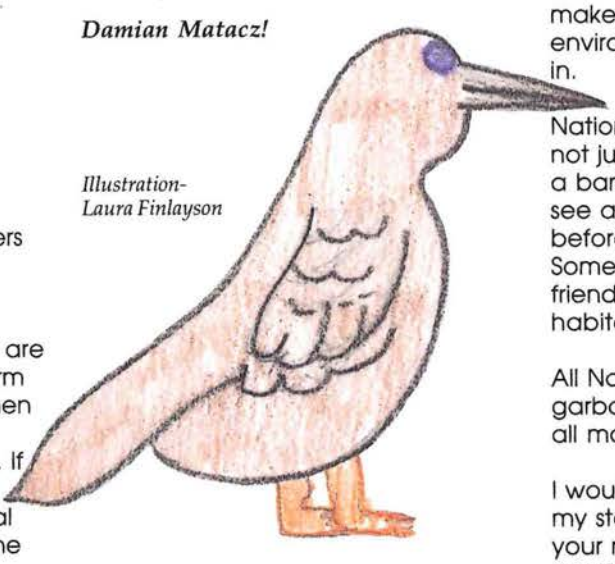


Illustration-
Laura Finlayson

THE REALIST

Hi, my name is Toby Denham and I would like to put forward a statement for you, the Conservationist and Land Management. For you had an article in the local magazine about a contest which schools could write in an S.A. on National Park. Here is my story.

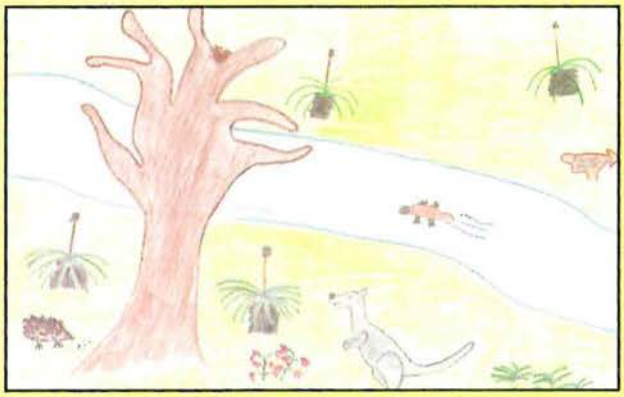
My first suggestion is for you to consult politics and ask for more money in the budget. Then National Parks will grow. For the more money, more trees. And if we had more trees, the more fresh-air, shade and animal life. The more fresh-air, shade and animal life makes a pleasant more natural environment for everybody to live in.

National Parks means to everybody, not just me, a place to think, have a barbeque with mother nature, see animals you've never seen before but in large populations. Sometimes you can even feed the friendly animals in there natural habitat.

All National Parks needs money for garbage men, rangers and most of all money for recreation facilities.

I would like to thank you for reading my story. I hope I have captured your mind because our school needs some new books.

Toby Denham



PROUDLY AUSTRALIAN

National Parks are a good place to think. There's nothing to disturb you except the birds whistling and the bees buzzing. In National Parks school children could study animals habitats, native plants and see what Australia's all about.

I think the government should increase the number of National parks because it protects the environment. The more National Parks, the more for our future generations to see.

In the future people don't want to pine trees where there were Australian native plants or horses, sheep and cattle using up all the land so there's no room for Australian animals to graze or breed. I think Australians are being too selfish because we want all the land for building and farming.

On the way back from Exmouth we went to a National Park where the Pinicals are. We saw kangaroos and emus that looked spectacular in the wild. The Pinicals were trees before they turned to limestone.

I think we should make more of Australia into National Park to help us understand more about Australia's environment.

Peter Wyatt

RESOURCEFUL RANGERS

I like National Parks because they do alot to help the animals and plants it's just about the only place you can go to see different animals in their natural habitat. Sometimes a park ranger takes us on a walk through the bush and as we see the animals they tell us all about that animal, like what they eat what they do and how they get their food.

They show us things that we usually wouldn't see. They have alot of different animals but it depends if the animal lived in that area in the first place. The park rangers don't go out every day to feed the animals. They are expected to find food for themselves and defend themselves whenever their in trouble. Some of the animals you can pat and are quite friendly.

I'd like to go to a National Park because you can learn different things about different animals and plants. You can learn about what plants are good to eat and what plants are poisonous. It's really interesting to see what goes on in the National Park, it seems quiet but really it's quite busy.

Racheal Read

Illustration- Aaron Quick

DON'T FEED THE ANIMALS

I think National Parks are a brilliant idea. You are keeping land for our native animals to live in. It is good for people who like walking through forests.

I think there should be rules in National parks, otherwise you will have people destroying trees and animals homes. There should be rules to stop people destroying our parks. People shouldn't chase any animals. Unless you have been asked don't feed any native animals.

Naomi Dennis

ANIMAL LOVER

The things I think that make a national park good or even better are to take your family or friends with you so you don't get lonely or lost. In a national park they should have a real nice cosey cabin so the customers can have a good sleep and feel at home.

Why do we have national parks : I wish that all animals, even out of national parks would be extremely safe and cared for by the pupils who live very close. I hope that you should not be able to take beer or alcohol into a national park because the animals can get drunk and maybe sick or die. It is real good that smokers don't take matches into the national park.

I think the reason why we need national parks are because if we didn't have any, all of the animals would die or even got hit by a car or shot by people who would sell the skin for money, with a national park people can't kill or hurt the animals in any way. **Why do people go to national parks:** I think that alot of tourists go to national parks because they would like to see some Australian animals. Also to see what Australian national parks look like and maybe to see if their national parks are better than Australian national parks.

Margaret Miller

BENEVOLENT DICTATOR

If I owned a National Park it would be a healthy and clean one with no-one leaving food scraps on the ground or letting your dogs loose in the National Park.

Everyone would abide by my rules. Some of the rules would be No littering, No driving cars through the park always leave your cars at the start of the track and always make sure you put out fires before you leave the campsite.

Some people think you use National Parks for shooting animals and damaging the trees but youre not allowed to. Really you go there for looking at the scenery which includes animals, trees and the wild flowers.

Scott Roberg

YES, SIR

I go to Carey Park Primary and I'm going to win that prize whether you like it or not! You know, I'm really concearned about the futures of our National Parks, which could be mistaken for rubbish tips in places!

National Parks have heaps of different uses, for example, who doesn't like going on picnics on a sunny day being blown by a leaf smelling breeze and surrounded by magnificent Jarrah trees? or hiking in a warm sun, watching the native animals go about their business and admiring the wonderful coloured wildflowers? Its true, the parks do give people plenty of enjoyment and happiness.

Most people expect National Parks to be well taken care of and spotlessly clean, Although this would be nice, it is spoilt by uncosiderite, selfish people who leave their ugly rubbish around when they leave to go home. This poses a great threat to our fauna.

Preservation of our forest is important to almost every Australian, exept a few losers who want to chop them down for stupid old minerals. They say they replace the forest, but who's going to be here 150 years from now, to find out?

Overall, the parks are very worthwile and should be kept for people like us, or we might not hike through a park ever again.....

Scott Munro

THE FINAL SOLUTION

I think we should have them to protect our endanger species, for animals and plants. Also when little kids go to a National Park they can learn the different sorts of animals.

If the endanger species go out and live in the open area, they would get killed like the Dodo Bird. This is what's going to happen to the endager species, also the people who haven't seen the animals.

We should treat the environment by putting all the rubbish in the bin. If not, it could kill the animals. The can gets stuck in a Kangaroos foot, then gets infected, or a beer top, an Emu could swallow it. Also a Swan could swallow some lead, mistaken for the tiny food and get lead poisoning.

Melissa Sayer

THE GETTING OF WISDOM

My first experience in a National Park, was when I was 8 years old. Dad and Mum suggested we go on a picnic, and we did. Before we had our picnic we went for a walk around the Park. Ten minutes after we started Dad had spotted a Tiger snake. Mum, being terrified of snakes wanted to leave straight away, but Dad wanted us to see it. We had a look, had our picnic and went home.

The National Park in W.A. I like best is the one in Walpole which is beautiful when all the orchids are out. I also like the animals.

I hope that in the future there will still be National Parks for other generations to see. I think getting out of town and into the country is enjoyable.

Kristy Parry

Illustration- Rikki Hill

PROTECTED PLACE

A national park is a special place
Where many an animal has a smiling face
They roam their natural protected land
So no harm should come, as guns are band

Surrounding me is a colourful decoration of flora
and fauna
Watch out! The fresh air is so sweet I warn ya!
Natural beauty surround you where-ever you look
It is so much better than pictures in a book

The Rangers are so caring and kind
They protect the animals so hard to find
They're responsible people as I know
They care for the land as it grows and grows

I love national parks
So wild and free
Nothing is better
With that you must agree!

Jacqui Johnson

NATIONAL PARKS FOR ALL

National Parks are lovely and cosy places,
Where the animals can play and enjoy.
National Parks are so much fun,
for every girl and boy.
In Autralia, there's crocidiles, that you should not ignore,
And the Lovable, Hugable Koalas, which we should all try and restore.
The Kangaroos, hop around,
The lazy Possums, make no sound.
The tall Gum trees stand so still,
The National Park is such a thrill.
The animals are protected, ever so well,
The human beings are kind, their caring is swell.
There's; Walunga and Stirling and Hamersly.
Cape Range, Yanchep and the Kimberelys.
But most of all,
Their big, not small.
Don't leave your litter just your kind remarks,
You'd love to see,
So follow me,
To W.A.'s National Parks.

Megan Munro

Illustration- Sharleen R.

Jack Kinnear

Enderby Island; pristine and unspoilt niche of rock-wallabies.

Outfox

Jack Kinnear, Senior Research Scientist with CALM, talks about niche theory, islands, and the fox problem.

Bert & Babs Wells

The fox (*Vulpes vulpes*) arrived in the 1900's and has spread throughout a large area of the state.

The word 'niche' is normally used to convey the idea of place or position - a slot or pigeon-hole in which to put things. In ecology, it is also used in like manner: a species' niche usually refers to its place, or role in a typical community of microbes, plants and animals.

This definition of the niche, however, is not very informative. For example, when a species, previously known to be widespread and abundant, is now known to be rare (and hence, liable to become extinct), all one can say is that it is struggling to maintain its place and role in a community. But that is obvious anyway; what conservation biologists would like to know is ***why*** that is so.

In 1957 G.E. Hutchinson, an eminent ecologist, conceived of a

ing The Fox

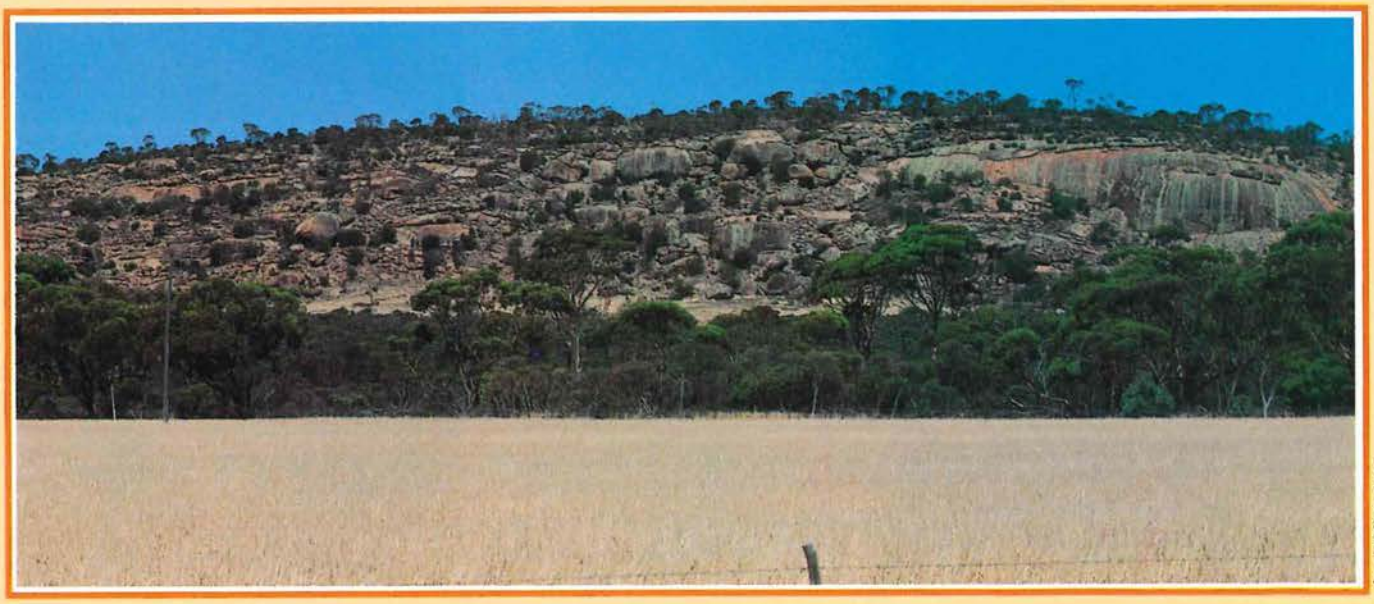
novel and more useful way of defining the idea of niche. As the closing speaker at a prestigious conference of biologists, he was expected to review the highlights of the conference, but instead he chose to launch his new niche concept. In retrospect, it must have been a rather inauspicious beginning for such an original idea, for it was quite likely that hardly anyone in the conference-weary audience understood what in the world he was talking about.

This was because Hutchinson used a very abstract and unfamiliar branch of mathematics to express his ideas. Nevertheless, over the years the Hutchinson niche concept gradually became accepted. Understandably, the symbol-loving theoretical ecologists were quick to appreciate its significance, but most practising ecologists view niche theory as far too airy-fairy to be useful in the field. It is my view, however, that niche theory can be applied profitably to real conservation problems, and, as an example, I will describe how we used niche theory to help us find out why some remnant wheatbelt rock-wallaby colonies were battling to survive.

The Fundamental Niche
a hassle-free living space

Hutchinson first of all reminded us that every species has a certain number of requirements which must be met if it is able to live and reproduce in any particular place. He also stated that every species can only survive and reproduce under conditions that do not exceed its tolerances. So far, nothing new has been introduced: common sense recognises that a species has a requirement for food, shelter and so on, and common sense tells us that species are limited in their ability to tolerate environmental factors such as high and low temperature extremes, humidity extremes, and so forth. He then defined these requirements and tolerances mathematically, and reached the conclusion that a species can be thought of as living within its own particular mathematical volume or space. He named this space *the fundamental niche.*

Rock-wallaby habitat, which can now be considered an island haven in a sea of wheatfield.



Jack Kinnear

Thus a species can be thought of as living within its own unique volume or space, but this space is peculiar in that it has more than three dimensions, and, therefore, it cannot be visualised. Fortunately, a conservation biologist does not have to worry about all of the dimensions of a niche, because if too many dimensions are affected, then existence is not possible. Relevant and productive research will result if it is possible to identify that part of the niche under stress.

It is helpful to simply imagine a niche space as a box, a box that can be damaged. Niche boxes may be burnt, crushed and flattened by bulldozers pulling chains, or trodden on by foreign animals with sharp hooves, with obvious consequences. Less obvious damage leads to niche boxes that have become shrunken and distorted in different ways. The volumes in which species live become smaller and oddly shaped, and if the pressure becomes too great the box collapses and the species becomes extinct.

The Realised Niche: *facing reality*

Hutchinson's fundamental niche represents an idyllic world where every need is satisfied and where life is hassle-free. But any realistic and useful ecological theory has to recognize that life was not meant to be easy, and so Hutchinson introduced some complications. He next asked the question - what happens to a species' niche volume when predators and competitors are present? He concluded that the niche spaces will contract - the boxes will become smaller. He called this smaller niche volume *the realised niche*. It acknowledges that species have to contend with other organisms in the real world who compete for the available resources, and that a species may be a resource itself (prey) for predatory organisms.

Islands: *Simplified Niches*

A island ecosystem can illustrate niche concepts very simply. Let us put a species on an island which contains no predators and no competitors. If it survives and reproduces throughout the island, we can be assured that the island satisfies all its requirements, and the species is occupying its fundamental niche space. It will thrive in its box because it has a monopoly on the resources it needs. It may be compared to a manufacturer whose product has a 100 percent market share, and who pays no taxes to predatory government agencies.

If an effective predator is also introduced on to this island, however, then we will observe that the species is less abundant and less widespread in its use of the island environment. Fewer individuals will exist, and only in places where the shelter provides a refuge from predation. A similar contraction of the niche space would also be observed if a competitor was introduced. Conversely, the elimination of predators and competitors from the island would relieve the pressures on the niche space, allowing niche expansion, and the species to flourish throughout the island once again.

Wildlife Conservation and Niche Theory

With this brief background to niche theory in place, we can now apply it to a conservation problem in which islands played an important role. A case in point concerned rock-wallabies (*Petrogale lateralis*), a widespread, adaptable species apart from its specialised requirement for a rocky habitat. It was once common in the Western Australian wheatbelt, but by the 1960s it was reduced to living on six rocky outcrops surrounded by farmlands. Our detailed surveys in 1978 revealed that all the populations had declined, and one population had become extinct sometime during the period 1969-70. The timing of the extinction was intriguing because it occurred during a drought-declared year; this suggested that the fundamental niche might be the problem area.

By trapping the populations over a four year period, we learned that the total number of rock-wallabies occupying the five outcrops was less than 100. One outcrop supported only seven animals and another about ten. We also learned that the rock-wallabies were fit and healthy, and that even during another drought-declared year there was no great loss in weight or body condition. Moreover, most females were carrying young in their pouches, but for some reason hardly any of the young wallabies were surviving to maturity after leaving the pouch.

It was now evident, however, that the original hypothesis of damage to the fundamental niche was wrong. The prevailing rocky habitats were still providing the rock-wallabies with their needs, as evidenced by their general well-being and the high level of reproduction. Clearly, it was necessary to focus on the *realised niche* of the rock-wallabies, which meant that we had a predation problem, or a competition problem, or both. Competition was dismissed as unlikely.

With the problem now reduced to predation, we were required to focus our research on the fox and the feral cat. Since feral cats co-exist with thriving populations of tammar wallabies on Garden Island and also with the Rottnest Quokka, foxes became the chief suspect. While fox predation was implicated initially by default, evidence acquired elsewhere soon strengthened our suspicions.

Bert & Babs Wells

The black-flanked rock-wallaby (*Petrogale lateralis*) is a broad-niched species that ranges from the south Kimberleys to the Esperance region.

Island Wallabies and Foxes

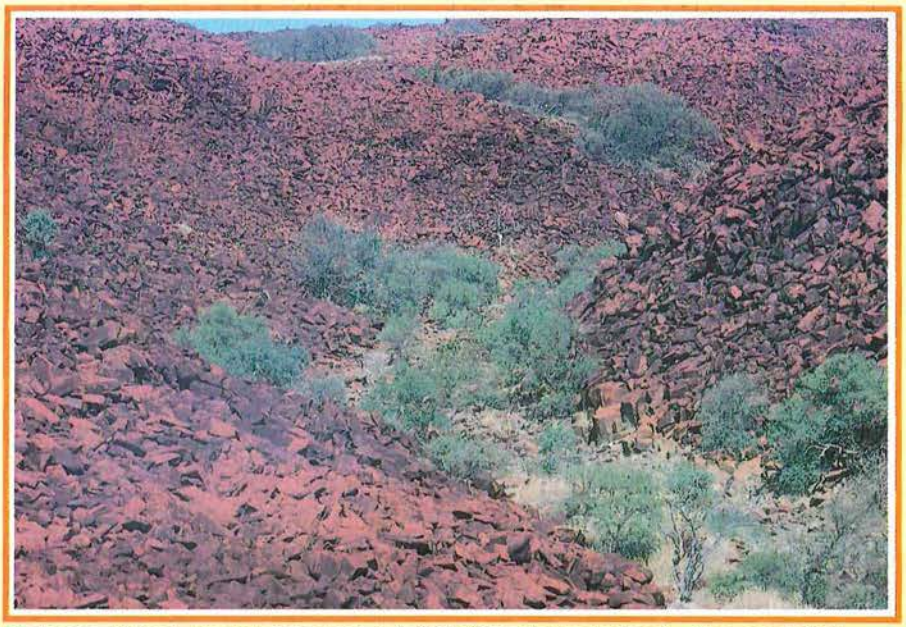
Some compelling evidence, which seemed enough to convict the fox without a trial, was collected from islands off the Pilbara coast. We took advantage of a ready-made ecological experiment in the Dampier Archipelago, where three islands supported rock wallabies. Two of the more remote islands were free of foxes, while the third island had foxes. We proposed the following hypothesis: if foxes are an effective predator of wallabies, then there should be fewer wallabies when the fox is present.

Counts of rock-wallabies confirmed this hypothesis; on average, during traverses of a fox-free island, we would sight a wallaby about every three minutes, but where the fox was present we would encounter a wallaby every three hours. These values, and some other information, provided a rough estimate of the number of rock-wallabies - more than 1 000 living under fox-free conditions and about 50 in the presence of foxes.

Such evidence was very convincing because there was no reason to suspect that the differences were due to environmental and habitat factors. Almost the same size, the islands were relatively undisturbed habitats subject to the same climatic conditions with similar vegetation, soils and landforms.

More incriminating evidence came from Depuch Island 3.2 km from the coast in the vicinity of Whim Creek. Rock wallabies were first recorded by the Baudin expedition in 1801, and again 40 years later by crew members of the famous ship H.M.S. Beagle. A rock-wallaby was shot (some were flushed from their rock-piles, which indicates they were numerous) and later identified in England as the same species of rock-wallaby collected earlier at the Swan River Colony.

In 1962, the W.A. Museum carried out a comprehensive survey of Depuch Island. Rock-wallabies were still judged to be abundant, but the island had acquired an intruder in the form of the fox, and there were clear signs of predation. Twenty years later, almost to the day, Mike Onus and I landed on Depuch to carry out surveys which we had been doing on the rock-wallabies in the Dampier Archipelago. We began our search confidently, fully expecting to sight some rock-wallabies, but forty-eight hours later we departed the island with no recorded sightings, not even a dropping or a footprint. A longer more intensive survey a year later again found no traces.



Jack Kinnear

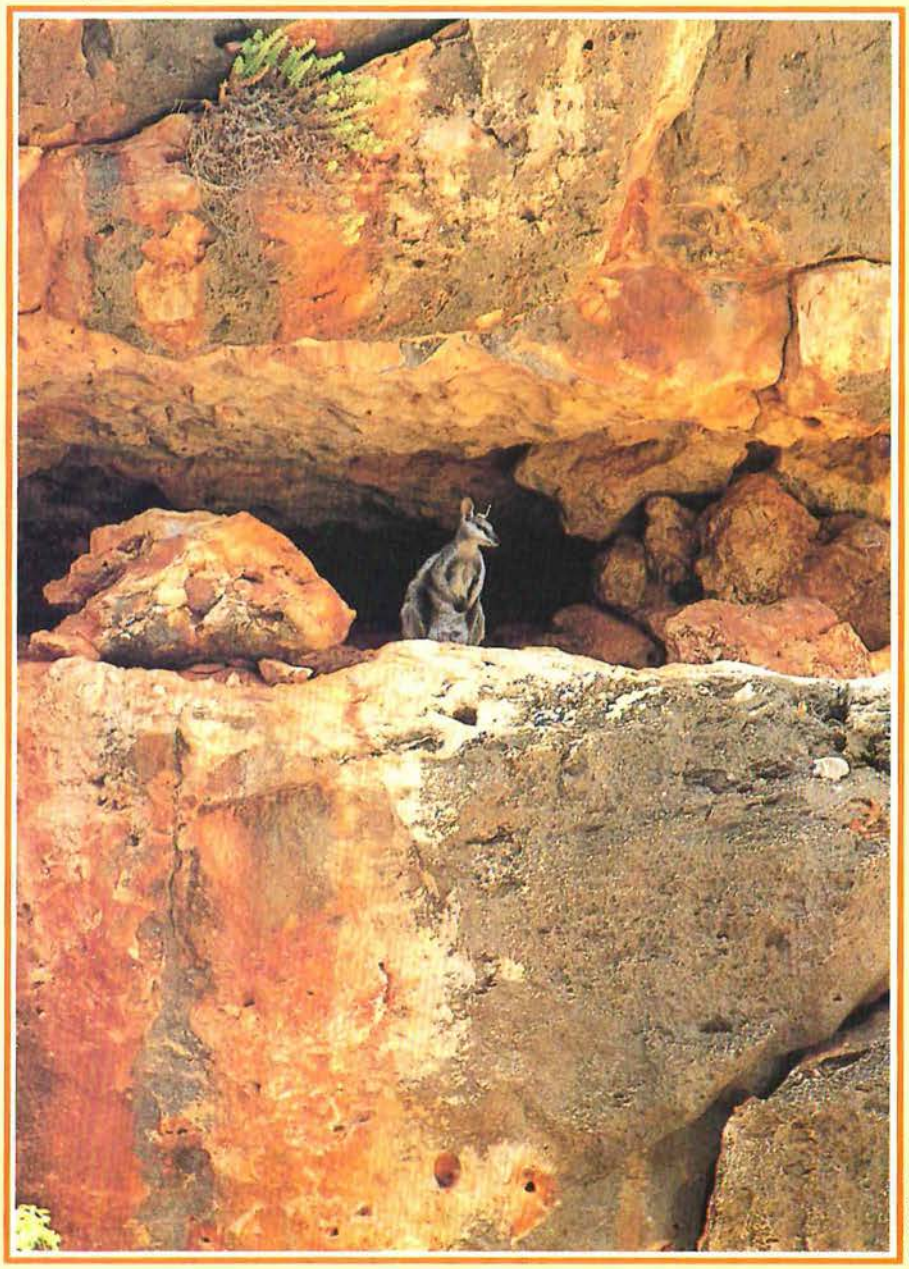
Depuch Island; rock piles and spinifex (*Triodia pungens*); the essential niche space of black-flanked rock-wallabies; but only in the absence of foxes (above).

Surely such evidence confirms that the fox is a destroyer of Australian wildlife. If the fox can cause, or at least contribute significantly, to the extinction of a species which shelters in massive indestructible rock-piles, then what chance has a wallaby that shelters more commonly in vegetation? But compelling as the evidence might be, it remains circumstantial; one can argue that the rock-wallabies on Depuch could have died out due to disease, drought, wildfire or whatever. What was needed was some additional research which would experimentally support the contention that foxes have been, and still are, a serious threat to native wildlife. Niche theory suggested an experiment.

Wheatbelt Islands

We noted that on fox-free islands rock-wallabies (and other wallaby species) were relatively abundant and conspicuous, and that they foraged widely. The opposite situation prevailed on islands where the fox was present. A similar pattern (*contracted realised niche*) was apparent in the wheatbelt rock-wallaby sites which are, in effect, islands surrounded by a sea of agricultural land. It followed, therefore, that if we could eliminate foxes from some of these 'wheatbelt islands', then the populations should eventually mimic the fox-free islands - that is, their numbers should increase and the wallabies should use more of their habitat.

In the wheatbelt, five 'islands' carrying rock-wallaby populations were available, and we selected two of these rocky outcrops as experimental sites which we planned to make fox-free for an extended period. Three other outcrops were designated as sites where no fox control was attempted. All of these sites had been censused previously, and we censused them all again before we commenced fox control.



Cliff Winfield

Black-flanked rock-wallaby sheltering in its protective cave in Cape Range National Park (left).

Jack Kinnear

Excellent rock-wallaby habitat in the Central Wheatbelt. Wallabies have increased since the fox has been controlled (left).

Controlling the Fox: *Some Surprises*

We then set out to create our fox-free islands in the wheatbelt. By systematically patrolling an extensive system of graded tracks on the site for fox footprints, it proved relatively easy to detect the presence of foxes. By using poison baits, it was possible to eliminate all of the foxes, but only for a surprisingly short time. Initially, this was somewhat disturbing, because our experiment required us to create and maintain fox-free islands. Fortunately, we learned that the baits were controlling foxes, but this was not readily apparent because the sites were being constantly invaded by new foxes. Evidently, we were trying to maintain our islands fox-free in a landscape swarming with foxes.

After four years of fox control, and despite the fact that we found it impossible to make our wheatbelt islands completely fox-free all of the time, we were successful in reducing the predation pressure on the niche space of the rock-wallabies. The 'fox-free' populations increased mainly because more young rock-wallabies survived to breed. In addition, and of equal significance, they also began to behave (as predicted by niche theory) like island wallabies by spreading out to areas of the habitat that were previously not utilised.

The Fox Problem: Short and Long-Term Solutions

What can be done about the fox? It is clear from our experiences with rock-wallabies that predation pressure can be reduced sufficiently to allow wildlife populations to increase. This is a critical point, because for a small population the risk of extinction increases alarmingly. There are several reasons for this, but a major cause for concern is inbreeding. If populations remain small for too long, inbreeding leads to a loss of genetic variability, and the capacity to adapt to environmental and biological stresses such as drought, disease and so on. The impending climatic change predicted to result from the Greenhouse Effect will challenge our fauna's capacity to adapt, and it is important, therefore, that we try and maintain genetically robust populations capable of meeting the challenge.

It is also clear that controlling fox predation by baiting is not a long-term solution. Baiting is best viewed as a necessary holding action, to be applied to selected populations of rare and endangered species, until a better solution such as some method of biological control becomes available. There are reasons to be optimistic about the prospects of biological control because of the tremendous advances in molecular biology and genetic engineering. It is my belief that it is just a matter of time before the necessary knowledge and techniques will be available to tackle the fox problem in Western Australia.

Meanwhile, research on the fox problem is continuing, with the objective of controlling the fox as efficiently as possible. Theoretical studies have already yielded some insights about the fox/native fauna interactions. For example, there have been times in the past when some local populations of marsupials have been abundant in the presence of the fox. This was puzzling until I learned about a theory by an eminent theoretical ecologist who showed that multi-population states are possible ... but that is the start of another story.

Bernhard Bischoff

Culling of foxes near Busselton (right).

Cliff Winfield

OF WHALE AND FRIEND...

The four-day whale rescue at Augusta from September 29 to October 2 was a remarkable feat. The sight of volunteers working side by side, battling rough seas and strong winds throughout the day and night was enough to take some of the bitter chill out of those icy waters on the wind-swept southern coast.

It's reassuring, too, to know that thousands of West Australians will rally during a crisis, without thought for reward or recognition. They will do it because they are human - because they want to relieve the pain and suffering of another living being.

And that is just what happened at Augusta. An army of volunteers responded to the call for help when the alarm was raised late on Thursday, 29 September 1988: a large pod of false killer whales had stranded on the coast.

In the three days that followed, those people experienced a gamut of emotions. First, there was compassion for the distressed animals being buffeted by the surf and despair for those who had already surrendered the fight for life and lay scattered, like so many discarded children's toys, along the beach.

Then there was the euphoria as volunteers, battling exhaustion and the disappointment of two failed release attempts, finally ushered the whales out to sea on Saturday afternoon.

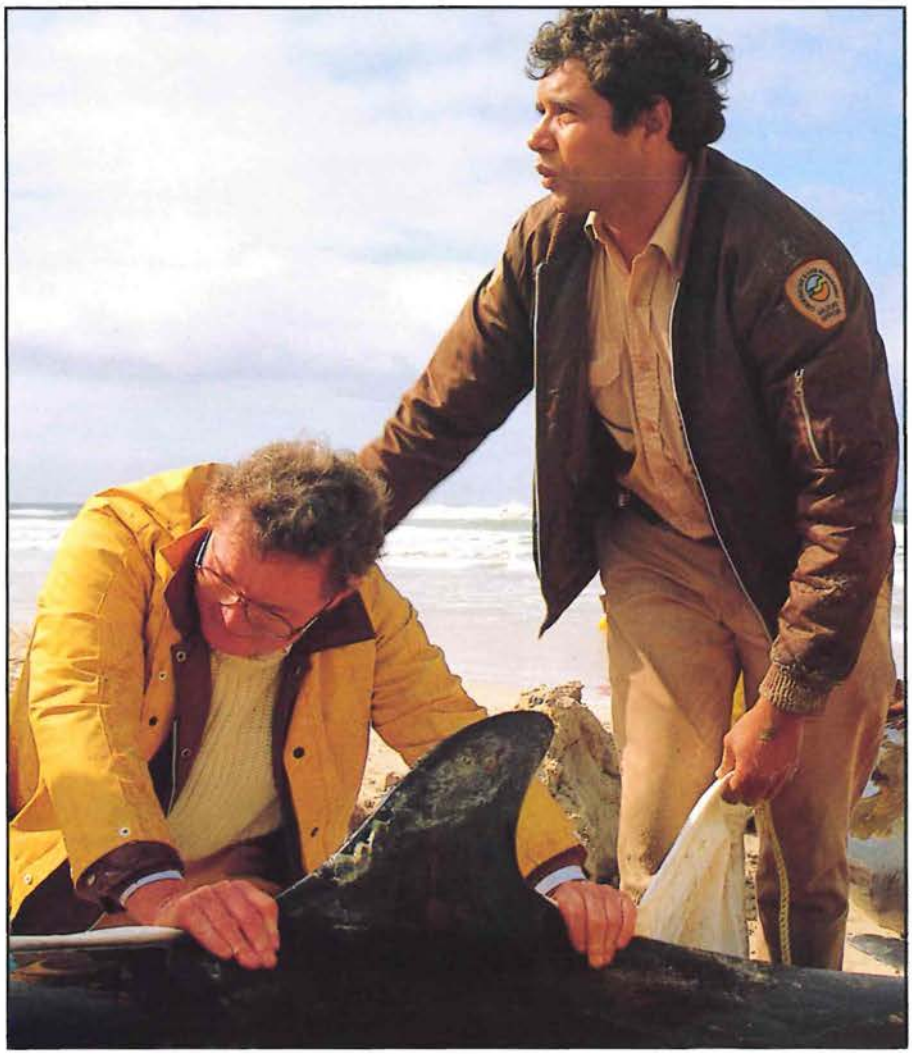
But the euphoria again turned to despair on Sunday morning: a helicopter patrol had discovered another 24 whales stranded on the beach about 30 km east of Augusta.

As night falls, a young volunteer braves the icy conditions in a bid to save the distressed whales (left).

Volunteers struggle to scoop the whale into the bucket of a front-end loader for transportation along the beach (below).

CALM's Executive Director Syd Shea and wildlife officer Trevor Walley (right).

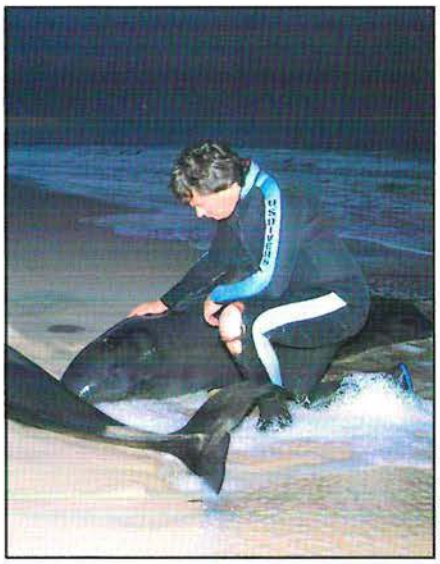
Robert Karri-Davies



Robert Karri-Davies

Despite the bitterly cold conditions a volunteer maintains an all-night vigil to comfort and support the whales (right).

Volunteers rally to gently transfer a whale from a front-end loader to a truck which will carry the animal to the safe holding bay (below).



Cliff Winfield

Nothing could be done to save them. The animals were suffering and there was no alternative to euthanasia. That was a difficult and heartbreaking decision for CALM officers, who had coordinated the entire rescue operation and worked tirelessly alongside the volunteers for several days and nights in a bid to save the whales.

But after the trials and tribulations, the despair and disappointment, there is room for cheers as well as tears.

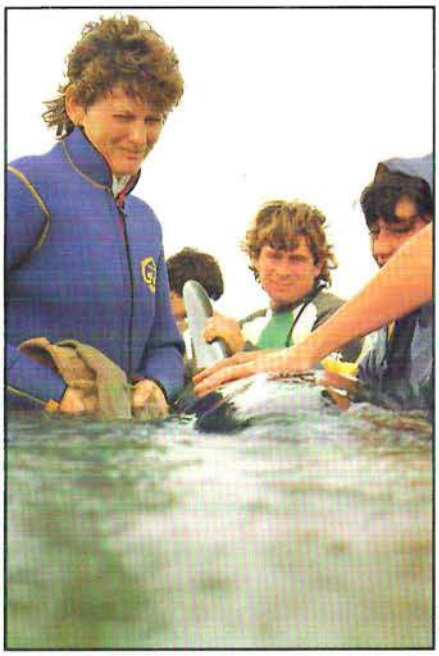
Thirty-two whales were saved, but more than that, we saw how many caring people Western Australia has - people who will unselfishly and without complaint rally to help when they are needed.

And you - whale rescuers - put that beyond doubt during those few exhausting but so rewarding days on an isolated stretch of our State's stormy coast.

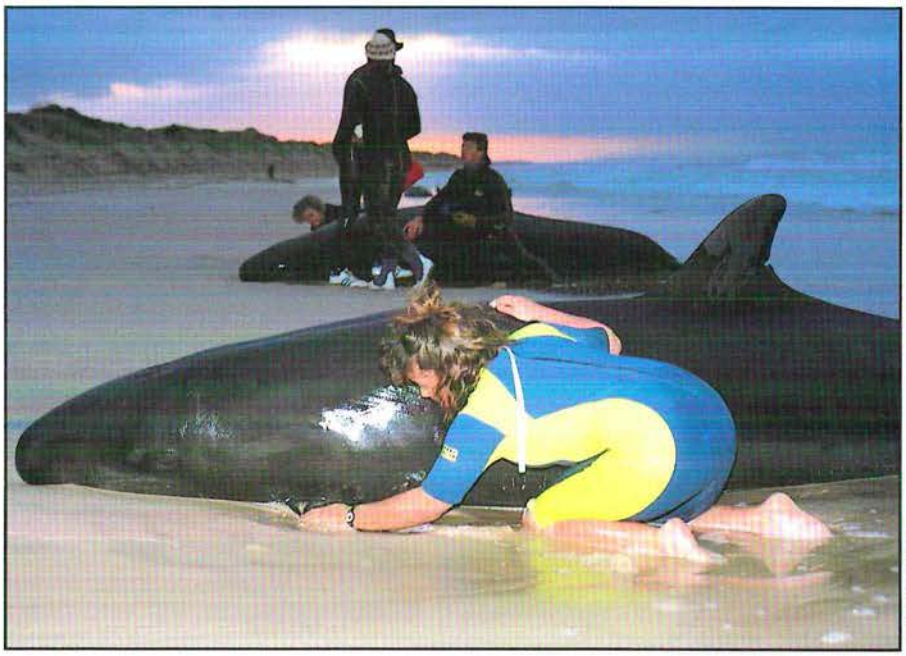
TEXT: Kylie Byfield

Jiri Lochman

Back in the water, the whales got plenty of loving attention (below left) while on the beach a helper comforts her new-found friend (below).



Jiri Lochman

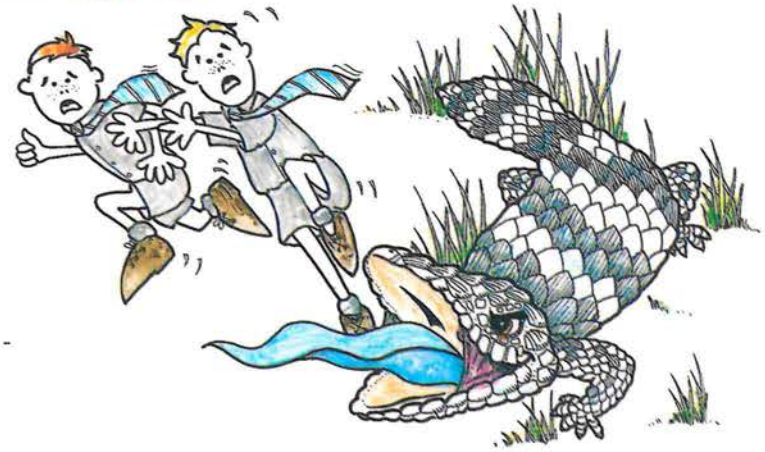


Cliff Winfield

URBAN ANTICS

Reptilian escapades

by John Hunter



Five small soft toes thrust through a thicket of dense bush grasses and banksia leaves. Suddenly, Contact !! - cold slippery, scales and taut reactive sinew.

A spilt second later the tranquility was shattered by a high pitched human voice.

'Geez..... I've trod...on...a.....snake.'

Eyes bulged, hearts beat out of control and twenty grubby fingers clawed at two school shirts in similar condition.

The two seven-year-olds froze, supported each other and stared blankly into the thicket at their feet. There was no pain; no death throes, and everything seemed O.K. Within a couple of moments the boys had backed off, both parroting obscenities which they had heard their Dad's use behind the woodshed. So much for my savage brush with nature behind Scarborough Primary School sometime in the 'forties'. It still happens today, and with fond memories I see kids taking short cuts through vacant blocks and hear the resultant screams of blind panic.

It's that time of year again when from garden nooks, road verges and vacant blocks of long stemmed wild oats comes the tramp of little feet: *Tiliqua rugosa* is on the move.

No, it's not my Italian mate next door, it's the bobtail lizard or shingle-back skink which has been around the south-west of Western Australia in great numbers for thousands of years. They have adapted remarkably to European settlement and relish living in the yards of our homes.

The bobtail is not a goanna, but a large skink, a lizard of around 300 mm in length.

The reptile is easily recognized by its size. They have a large triangular shaped head, flattened body, short stumpy tail and large rough scales on the back. They are a reddish dark-brown above, with scattered cream or yellow blotches especially on the flanks and whitish below. There can be quite a variance between different beasts.

Every day during hot weather 'bobbies' can be observed basking on footpaths, verges or roadways. Like many reptiles, they hibernate during winter and if accidentally discovered under a pile of leaves or wood, should be left alone.

After winter the lizards emerge ravenous from their hiding places and simply take off in search of food and warmth.

The 'bobbie' is a most tenacious beast, and whilst going about its business, never seems to give up trying to scale an impossible object, or squeeze through an impenetrable bush.

If disturbed this harmless skink will take a bluff stance to ward off danger. It will face the threat, open wide its gigantic mouth, display a blue-black tongue and emit a hissing noise. This rather frightening performance has led to stories of terrible wounds and ulcerated sores. To my knowledge it is not true. The inside of a bobtail's mouth has a simple bony ridge, and if it bites it may hang on. A great deterrent to small boys and some big boys as well.

The bobtail's diet is quite varied, and includes eggs, insects, fruits (loves my mother's strawberries), flowers, snails and carrion. Young are born alive, usually two in number.

If you have a need to pick up one of these fascinating lizards, first distract its attention with one hand, and quickly but firmly grab it around the back of the neck from behind with the other. Adult beasts sometimes have ticks embedded between the neck scales. The ticks can be removed with tweezers whilst the reptile is immobilised.

The bobtail skink is an accepted part of our environment and great entertainment if you care to watch one for a while, however, they do not observe road signs and unfortunately catastrophies occur each summer. If you're driving through the suburbs, please slow down and watch the road for slow movers.

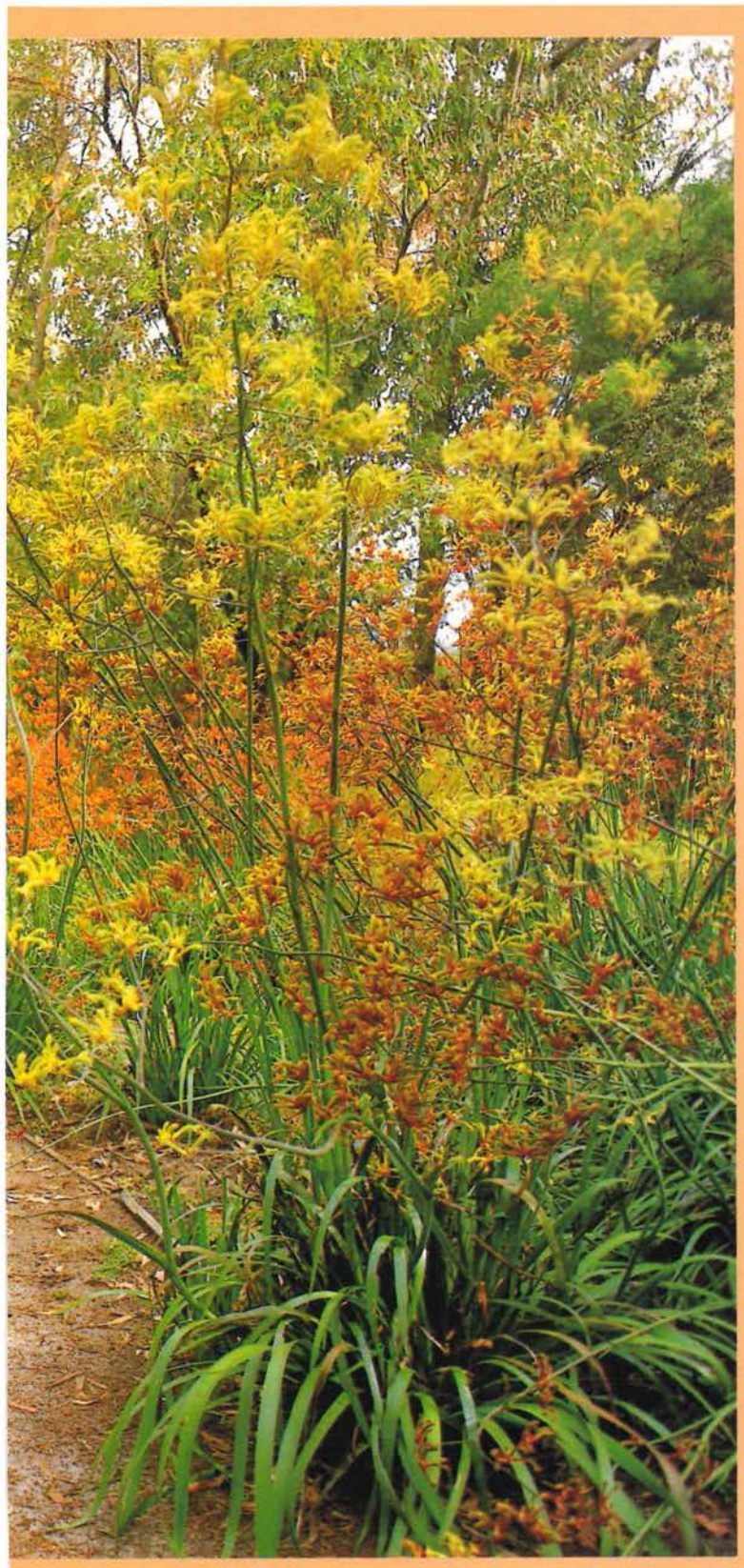
As with all lizards, the bobtail is protected fauna by law and should not be interferred with in any way.

Let them come and go naturally - respect their right to co-exist, and remember, with the yearly march of the 'bobbies' we know that spring has sprung and Christmas is just around the corner - it's a good time to be alive.!!!

Jiri Lochman

Creative

with Natives



Cliff Winfield

Garden fashions aren't just the clothes we wear when draped on the garden lounge under the pergola. The whims of gardeners are almost as accurate as carbon-14 when it comes to assessing the period in which a garden was created or redesigned. It is easy to date the colonial recreations of English cottage gardens. What about the long era of the suburban Aussie lawn, where the only 'native' was an abysmal statue which has now mercifully passed into oblivion? Then there was the 'native garden phase', and, currently trendy once again, the cottage gardens.

Jiri Lochman

Liana Christensen *takes a fresh look at native gardens, and good garden design for W.A.'s climate.*

The fashion for native gardens was prompted, in part, by the severe water restrictions of the seventies, as well as a growing appreciation for the subtle beauty of our native plants. Native gardens were a solution for the gardener concerned with our continent's aridity. They were also promoted as 'no-work', a theory based on the premise that since the plants grew here originally, they would thrive and flourish with little or no work on the part of the gardener. This, however, is only a partial truth, and caused many a disillusionment. Promotion, sometimes unscrupulous, of certain types of natives also led to the creation of such horrors as tiny terrace front gardens overstocked with gigantic gums. The first premise of good design is selecting plants appropriate to the scale and condition of your garden. Too many Tasmanian bluegums and straggly grevilleas later, the honeymoon was over, and fashion swung away from 'native gardens'.

This is an enormous pity, because the problems of water shortage will only increase, and armed with the right advice and a balanced approach, gardeners can make native plants work for them.

The scope for using native plants varies greatly. Some schools of thought believe 'a native is a native is a native' and don't much care from which part of Australia it originates so long as it's compatible with its adopted home. To others growing local plants is *de riguer*, and they wouldn't dream of planting something that belonged outside a ten kilometre radius of their selected site. The majority, however, are happily eclectic in their tastes, and are quite content to have a combination of natives and exotics. Each approach has its place. The peculiar delights and problems of each are discussed below.

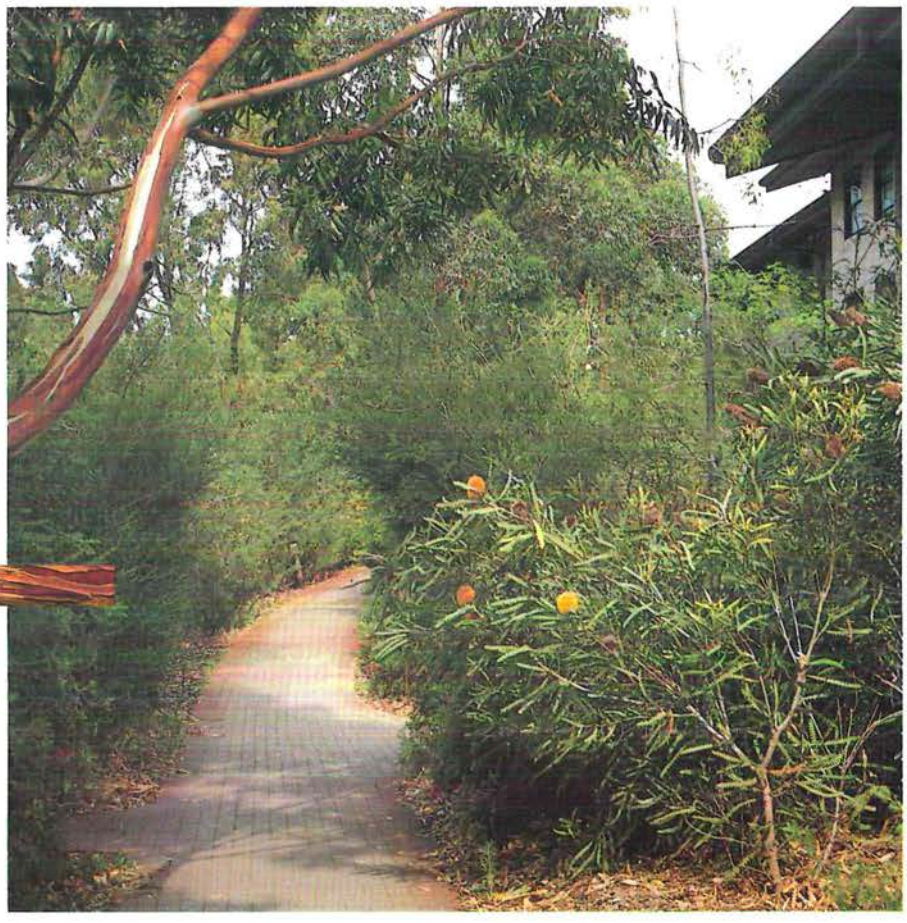
Nouvelle Jardins

The school of thought which presumes vegetarians eat meat-and-two-veg minus the meat, also presumes native gardens are all-of-a-kind (and probably grown by the same slightly disreputable people). Silver princess gum, a tastefully arranged boulder or two, loads of woodchips: you know the sort of thing. I've heard them referred to disparagingly as 'tombstone territories', but they are the plain, wholesome bread-and-butter of native garden style. Nothing wrong with them, so long as your imagination can use them as a springboard, not a trap.

The key to good garden design is to analyse the elements of a successful system, and then put them to work for your habitat. For instance, woodchips function both as a mulch and as an element of design. Mulches are an essential part of an efficient garden: they reduce surface evaporation and lower water consumption by keeping the root-zone cool.

The type of mulch you choose will depend upon what is available cheaply, and the style of garden you wish to create. Woodchip or bark mulch can evoke a wild and woodsy atmosphere. Gravel and crushed brick, also efficient mulches, can be used for a more formal effect.

With the correct selection of plants, and the appropriate layout, you can create any style of garden you like using native plants. If you have raked gravel, a small water feature (a 'dry streambed' can be created from small river stones, and a clever arrangement of larger rocks), a stone lantern or two and nobody is going to worry whether or not your plants originated from Japan or Australia. The overall effect is the same.



Cliff Winfield

Meandering paths and a profusion of vegetation contribute to the untamed look of this garden at Murdoch University.

Pining for a cottage garden?

It is not necessary to resort to exotics. The general principle behind such gardens is a profusion of flowering plants growing in happy, seemingly untended, 'confusion'. The scale of plants tends to be small, ranging from groundcovers to low shrubs. Once established, cottage gardens are not labour intensive, and the density of planting, and the use of self-seeding annuals, acts as a form of renewable mulch. There are literally hundreds of native shrubs, ground covers, annuals and perennials which can be combined to achieve the look of a cottage garden, generally requiring less water and less labour than the exotic version. This style of native garden would sit well in a terrace house 'pocket handkerchief' yard.

Just follow the golden rule of gardening and group plants with similar requirements together: i.e. dry/sunny, filtered light, shade-loving and moisture-loving plants should be kept with their companions where it is easy to manage their care.

Multiculturalism

The same principle of grouping plants applies if you mix exotics with natives. You might wish to grow exotic annuals in baskets hung from a pergola, for instance. Why not underplant your native 'woodland' with exotic bulbs which will thrive in the filtered light? You could also supplement your tough natives with equally hardy favourites which originated from similar climates around the world. Try creating a micro-climate by using an area which is shaded or sheltered from prevailing winds to give tender plants a greater chance of survival. That is the trick to producing an oasis in difficult conditions, such as coastal or arid areas.

Always keep plants with a high demand for water in one restricted area. Best of all, take advantage of 'free water'. The classic example of this is the old Aussie trick of growing mint under the tap of the rainwater tank. There are a number of ways in which water can be harvested. Water-loving plants can be planted near lawn edges to catch the runoff. Downpipes can be channelled into the garden. As gutterless roofs become an increasingly popular feature of Australian architectural design, rainfall can replace, or at least minimise the need for irrigation, even in arid zone gardens. Any paved surface, such as driveways and carparks, can also be used to channel water into the garden rather than into drains. The planted areas should be lower than the lawns or driveways, both to accomodate mulch, and to allow water to accumulate in the depression.

Wherever irrigation is necessary, if you feel you must have a lawn, for instance, make sure it is as efficient as possible. According to the Western Australian Water Resources Council 'an average household, even in arid parts of Western Australia, should be able to supply all domestic and garden needs with a water consumption less than 600 kilolitres per annum'. Details of how to plan an efficient irrigation system can be found in Water Conservation Through Good Design, which is put out by the Council.

Barking Up the Right Tree

If you are lucky enough to have the choice of retaining trees on your block then read the next section. If you are choosing trees to reafforest your urban wasteland, then the following advice may prove helpful. Unless you wish to emulate Jack and the Beanstalk, leave the Tasmanian blue gum, lemon-scented gum, karri and tuart off your list. Beware of all tall gums, for that matter. They have a disturbing habit of dropping limbs without warning, and they are not as effective for shade as a small grouping of medium size native

Jiri Lochman

This attractive pink-flowering paperbark (*Melaleuca nesophila*) would make an attractive addition to any native garden.

trees. Siting the trees will depend on their function. Do you want them for shade, privacy or simply for beauty? If you want a tree to shade a window, for instance, do not plant it directly in front of the window. Choose a small-growing species and plant it at least three metres away from the window, so that it provides shade at the right time of day.

Quick growing trees might offer instant privacy, but will often sprout so fast that sun, sights and sound will be revealed once again. Get advice about the size, shape, requirements and growth rates of trees and shrubs which interest you. Ask at nurseries, and look in a few books from your local library. You will soon be able to draw up a list from which to make an informed choice.

If you admire a tree for its beauty, it is better off in an open area, where it can be appreciated from many angles. Don't forget, though, that one person's beauty can be another person's beast. Keep trees away from boundary lines, wherever possible. Internecine warfare can erupt over shaded swimming pools, solar heaters, even falling leaves. Tall shrubs, planted a couple of metres in your side of the fenceline are more suitable, anyway, and they may well be an efficient peace-keeping force.

Jiri Lochman

The Laissez-faire Gardener

People with an eye for natural beauty often select a block which is virtually in its native state, create minimal disturbance building their dwelling, and sit back to enjoy the undisciplined beauties of nature. This laissez-faire approach can certainly be accounted a 'no-work' garden, but there might be some problems with trees. On blocks with shallow surface soils over clay or rock, which become excessively wet during the winter months, the chances of trees blowing over are greater than on deep, well-drained soils where the roots can penetrate and the soil is more stable. Remember to make a careful assessment of which trees should be removed prior to building, as it is far more costly and dangerous to have them removed afterwards. The following guidelines might help you decide:

- tall trees close to a house do not provide a great deal of shade except to surrounding properties.
- buildings sited over the main root system of large trees are susceptible to cracks in foundations or walls, or the dreaded drain invasion.
- all trees have a lifespan. If a tree is mature, carries a large proportion of dead wood in the crown, or is visibly unhealthy, it will most probably require extensive tree surgery, or removal in the near future.

Cliff Winfield

Robert Powell

Exotic-looking caesia *(Eucalyptus caesia)* flower buds (top left).

Low maintenance native trees and shrubs, pleasantly intermixing with lawns, achieve a restful effect (top).

An appealing garden in the Darling Scarp, containing plant species that grow naturally there (left).

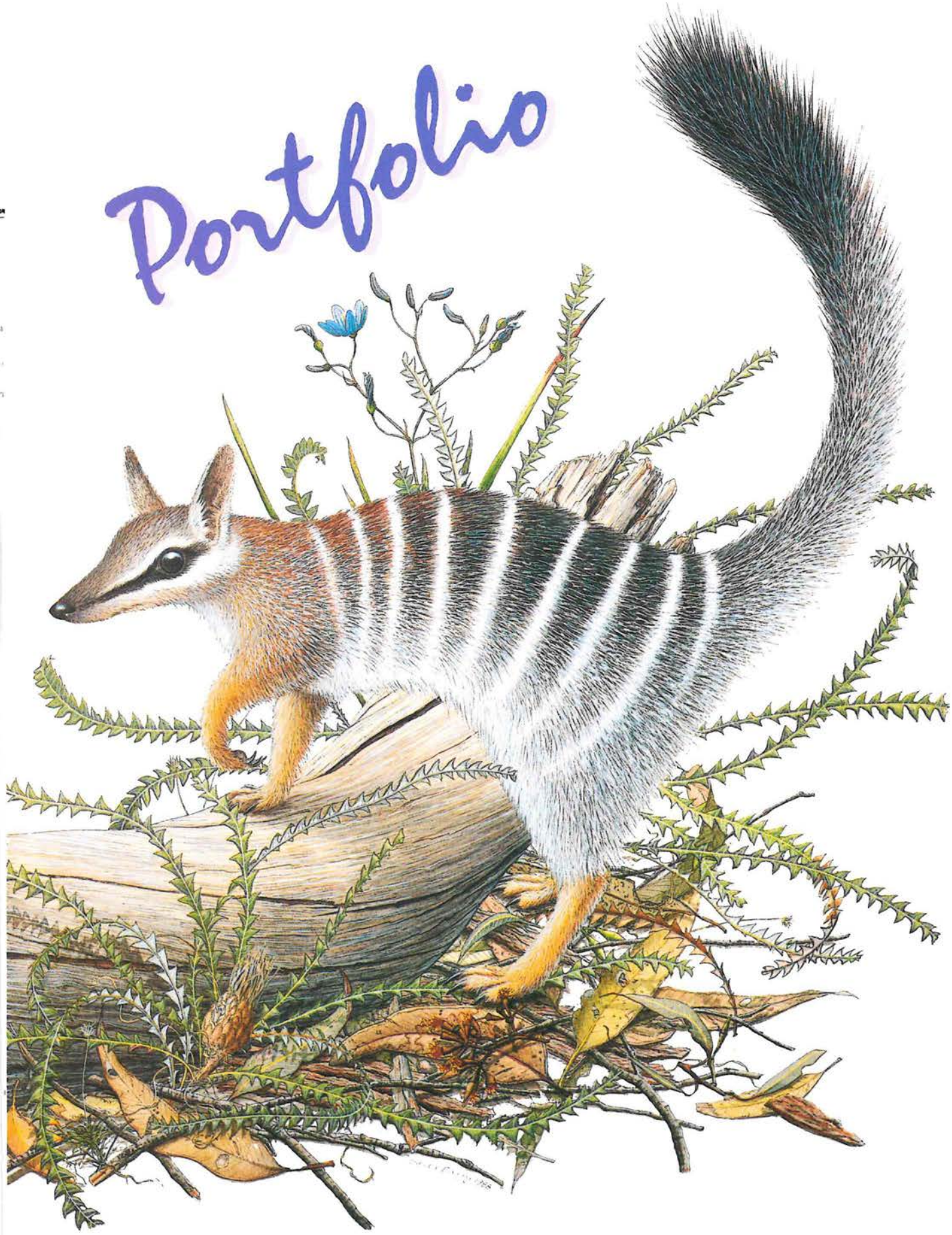
- saplings of naturally large growing trees are frequently retained in very close proximity to new homes. More suitable varieties should be planted nearby so that at some future stage the original trees can be gradually removed.

Dense bush adjacent to the house is a bushfire hazard. If you live in the country or outer suburban fringe, it is essential to minimise fire hazards.

Local Heroes

Some truly dedicated enthusiasts make serious attempts to restore partially or even fully cleared blocks to their former pristine glory. This can hardly be counted a 'no work approach' since it involves collecting and propogating local seeds. You can, however, vary the scale of your involvement from part-time commitment to magnificent obsession. The rewards are great; particularly for the local wildlife. It is a really practical way to make a personal contribution to conservation. If you are interested in gardening local plants contact the Local Plant Group (3 Barque Place, Kallaroo, W.A. 6025).

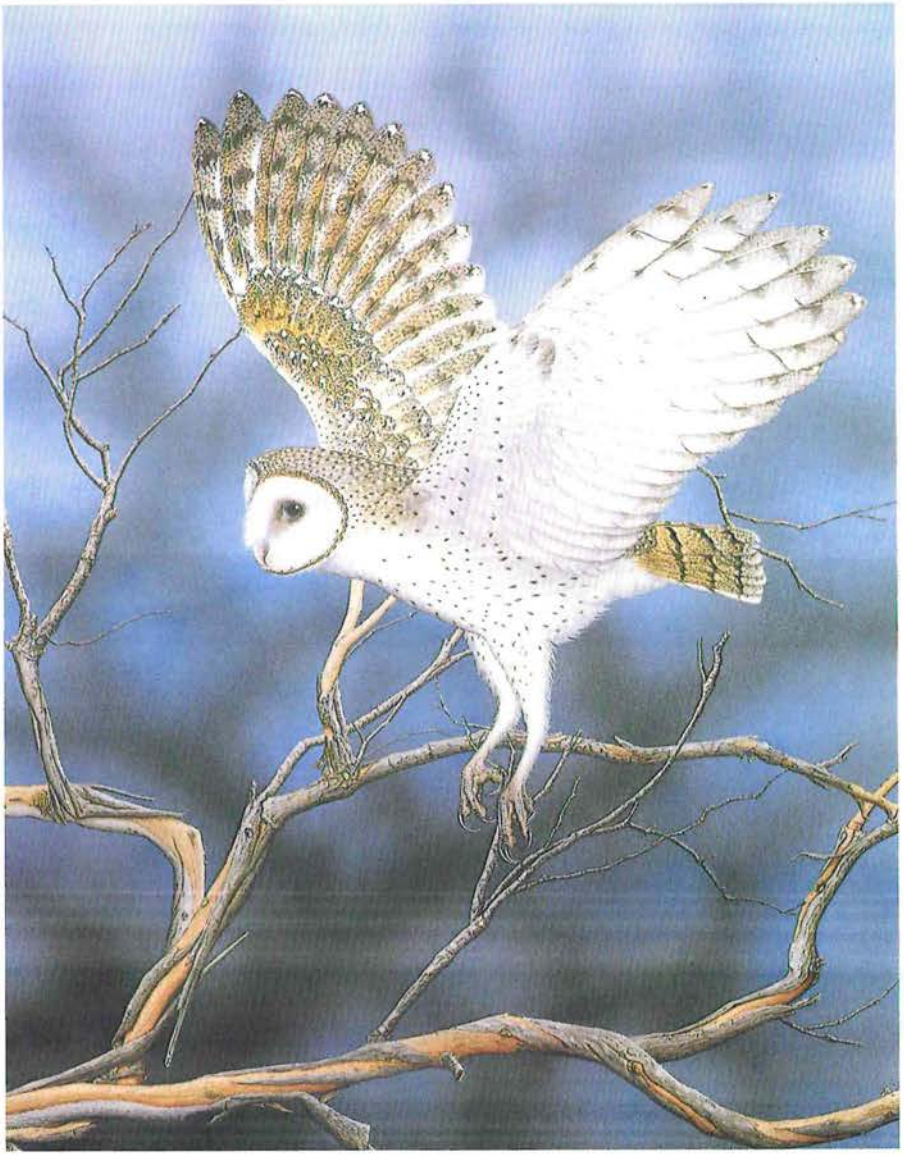
Portfolio



SUSAN TINGAY

THE SCIENCE OF ART

HAT is a small girl to do when she grows up observing her mother, the artist, and her father, the scientist? Susan Tingay chose a creative combination, and became a natural history artist.



Her powers of observation, sharpened by rigorous scientific training culminating in a doctorate in Animal Behavioural Ecology, stand her in good stead. Tingay's works are meticulously detailed and scientifically correct, but they rise above being 'scientific records' and capture some essence of the living creature or plant: 'it's really not worth it unless you catch the life of the animal itself.'

'I am very lucky,' she said, 'because my work as a scientist takes me out into the field a lot. It gives me the chance for many encounters with our native animals. Because the mammals are often nocturnal and rather secretive not many people have that opportunity. I like to think that my art draws people's attention, perhaps for the first time, and gives them the chance to appreciate the special qualities of our native fauna.'

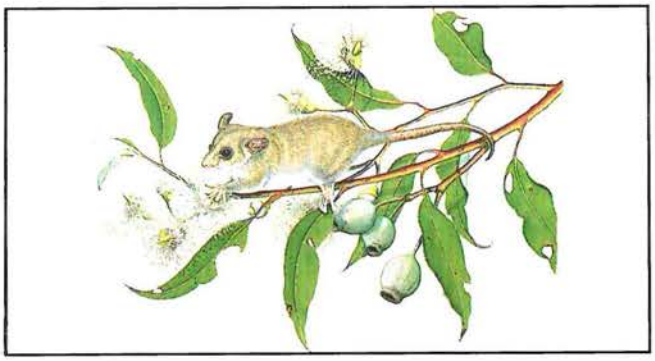
There is no doubt that Tingay's work has offered that chance to many people. She has had several exhibitions, and won awards, and particularly enjoys producing commissioned works for natural history publications.

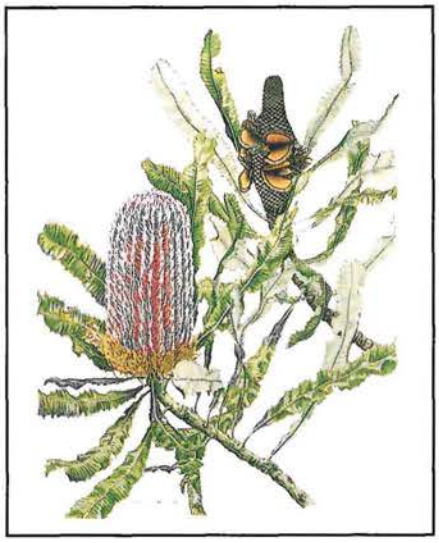
Although Tingay gains her original inspiration in the field, her follow up research is thorough and sometimes even unpleasant. But perhaps natural history artists get used to collecting road kill specimens, and keeping dead birds in the freezer! It must help to have a husband who is also a scientist, and might be expected to understand such things.

It was a chance encounter with a wildlife illustrator, Kay Breeden, that inspired Tingay's career. She liked

This beautifully composed painting emphasises the movement of the Barn Owl (above). To get the optimum results, pencil sketches are cut and pasted until the composition is perfect.

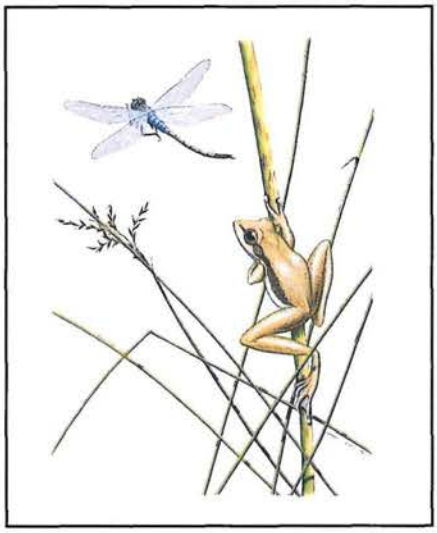
The Pygmy Possum (right). As with most of her work, Susan uses a fine rotring pen before applying the various layers of colour. As to be expected, only heavyweight, top quality watercolour paper is used.





Susan's fastidious approach and keen observation is evident in this illustration of firewood banksia (left).

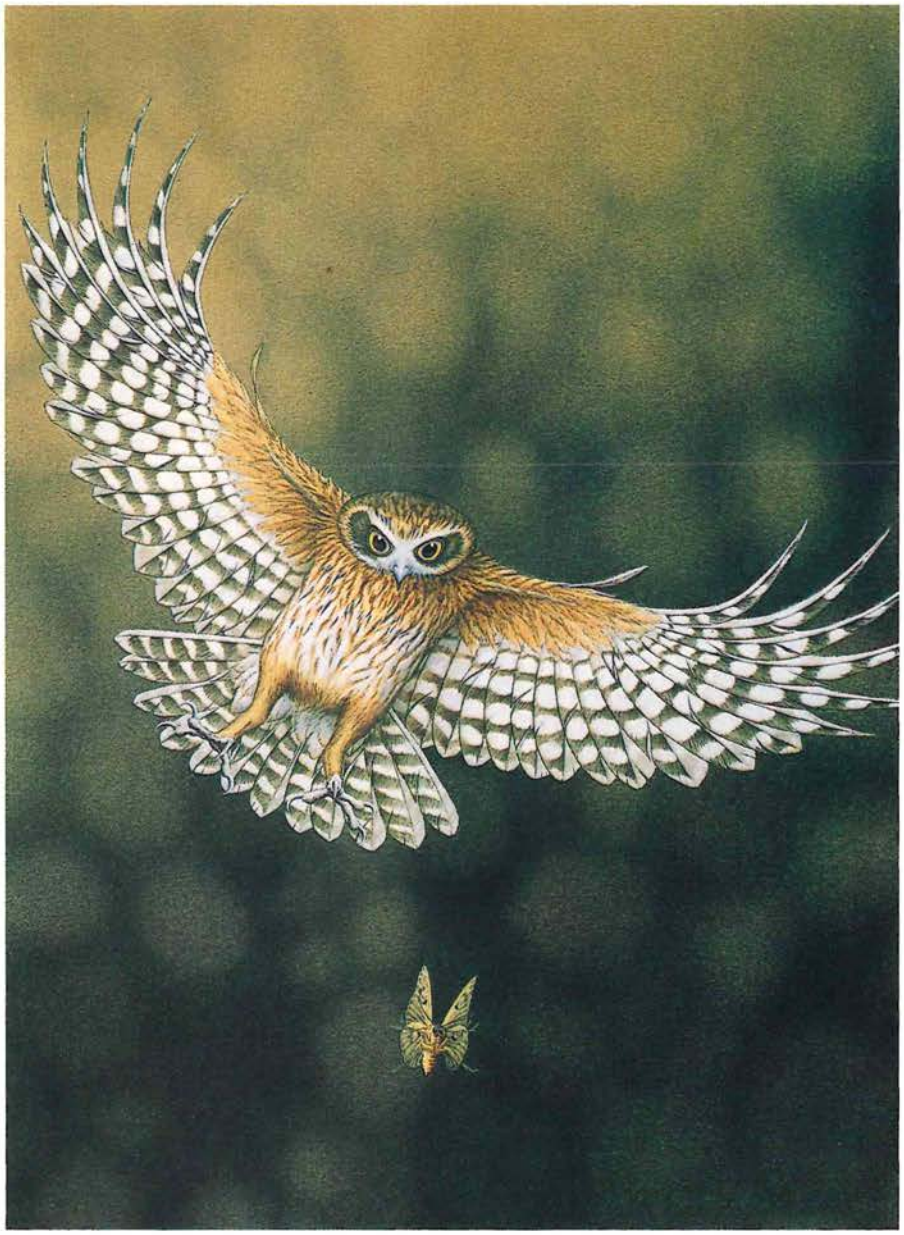
A gangly frog creeping up on an unsuspecting prey is captured in this finely detailed but uncluttered drawing (below left).



Breeden's work, and asked about her technique. After being given a fifteen minute 'crash course', Susan Tingay, wildlife artist, was on her way. her metier remains water colour and ink.

'I also have a great admiration for William Cooper,' she said. 'I regard him as the best Australian wildlife artist, and I would certainly like to follow in his footsteps. It would be great to develop, as he has, one of those special relationships between a writer and an artist who share the same vision.' Tingay's work is highly regarded, itself, and she's already well on the road to fulfilling her ambition.

TEXT - Liana Christensen



This portrait of the Boobook Owl focussing on its prey is typical of Susan's work. First the foreground is masked and the background airbrushed. Then layer upon layer of water colour is painstakingly applied to the subject until a suitable depth of colour is achieved. To finish off, white gouche is used to highlight and contrast.

BUSH TELEGRAPH

The Fight to Save Popeye the Seal

An injured sea-lion, CALM's dedicated wildlife officers and a concerned public were the key elements in a dramatic rescue bid which took place recently.

The young male sea-lion, only the size of a labrador, was gashed in the face by the propeller of a boat, and had to be transferred from Geraldton to Perth to undergo a life-saving operation.

'This kind of accident happens far too often,' said Doug Coughran, Supervising Wildlife Officer. 'It's very sad that it was inflicted by man, rather than nature'.

The young sea-lion was first spotted by people on a yacht, who reported seeing a seal with a gash in its face, still swimming strongly. About two weeks later two girls who had been skin-diving at a bay near Geraldton telephoned CALM. They had been feeding him with fish for two days but were concerned that he was eating less and less. Kevin Marshall, Geraldton's District Wildlife Officer, immediately went to the bay and saw a sub-adult male, probably about three years old. He kept going back into the water whenever he was approached and could not be caught.

A few days later he was spotted at Separation Point, near Geraldton. By this time he was very weak and unable to feed, and Kevin Marshall and his colleagues were finally able to capture him with prawn mesh. He was taken to the vet where he spent the night and was given an injection of antibiotics and vitamins.

'By this stage he had had the gaping wound for three weeks and it was a wonder that he managed to survive. But he responded well to the injection,' said Kevin Marshall. Kevin put the sea-lion into an airfreight crate and drove him to Jurien Bay in his air-conditioned vehicle.
Here he was met by Wildlife Officers Don Noble and Mark Barley who transferred the

Jiri Lochman

Beetle Mania

This photograph has not been taken in the vicinity of a pub, nor is its purpose to depict the craving of native insects for a quick frostie. It is merely evidence of yet another aspect of unthoughtfully disposed rubbish.

The female of this species of native jewel beetle *Julidomorpha bakewelli* is flightless and considerably larger than its winged mate. Its shining colour and greater size are important sexual attractants for the flying male who seeks its earthbound mate while flying low over head. As with other species where the size of the female exceeds that of the male, an extremely large female is all the more attractive to its counterpart. The bigger the better. Here the female jewel beetle has been replaced by a fake. Consequently large numbers of females may die without ever being fertilised.

Carolyn Thomson

sea-lion to Perth. After spending the night at Atlantis for assessment the sea-lion was operated on at Murdoch University, and his damaged eye removed.

The gregarious sea-lion is a protected species, although not threatened. They occur from the Abrolhos Islands, north of Geraldton to south of Perth and on the many islands, their main refuge, which dot our coastline.

Because there is only a small population of breeding males (the total population of sealions, in W.A. is only about 750) even small losses can have a severe effect on sea-lion breeding. This is worsened by the fact that 35% of all sea-lion deaths in WA are known to be caused by humans, and the actual percentage is believed to be much higher.

Now eating greedily and well on the road to recovery, the injured sea-lion, known affectionately as Popeye, can look forward to returning to the sea in the very near future. Meanwhile, he's swimming in comfort at Atlantis Marine Park, which is supporting his rehabilitation under the supervision of CALM's wildlife officers. Just as importantly, when he reaches maturity he can contribute to the gene pool of one of our loveliest sea creatures.

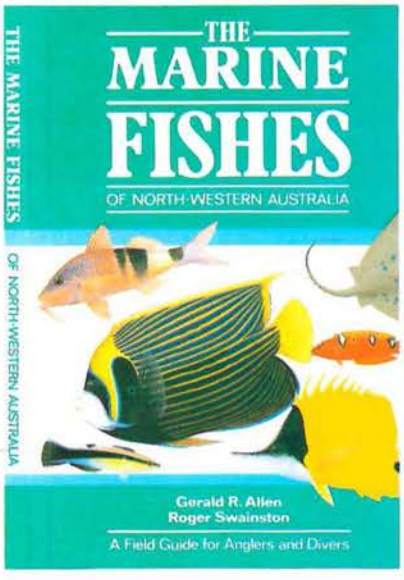
Marine Fishes of the N.West

Have you ever heard of a gobbleguts?
It's a small Cardinal fish with a big mouth. This, and more than 1000 other species of fishes feature in a new WA Museum publication ***'Marine Fishes of North-Western Australia.'***

This book written by Gerry Allen and Roger Swainston, is a handy field guide for fishing and diving enthusiasts. Illustrated in colour, it enables readers to quickly identify reef and shore fish from Shark Bay to Darwin, and east to Cape York.

The text accompanying each illustration highlights ditinguishing features of the fish and is easy to read.

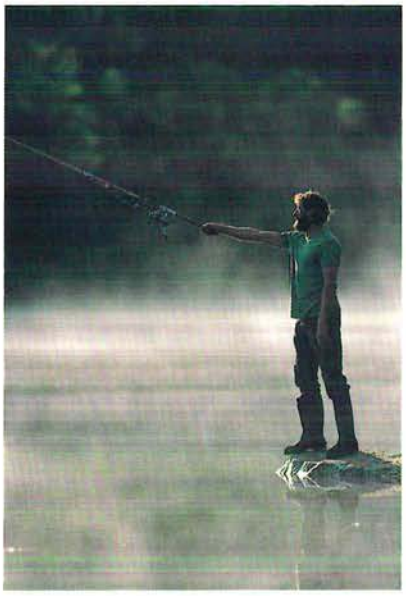
The book is available from bookstores and Museum outlets for $29.95.



CONSERVATION RESERVES IN THE KARRI FOREST

FEW forests are as magnificent as the karri: it has great beauty and biological diversity, it produces exceptionally strong and versatile timber, and it is popular for recreation. Some people fear the karri forest is being destroyed; others feel that valuable resources and jobs are being foregone. What is really going on?

In the first of two articles on karri, ***Barney White*** *and* ***Roger Underwood*** *look at:*



Robert Garvey

A trout fisherman deep in the heart of the karri forest.
Mt Frankland National Park (opposite).

KARRI forest occurs only in the south-west of Western Australia. Spanning the lower catchments of the Donnelly, Warren, Gardner, Shannon, Deep and Frankland Rivers, it grows mainly on red earth soils (karri loams) on lower slopes where rainfall exceeds 1100 mm. At its best karri grows in pure stands. Where the soils change, karri grows in association with other trees, chiefly marri.

There is a strong maritime influence on karri; most grows within 40 km of the sea. Many fine stands grow to the water's edge on inlets permanently open to the sea, and others are found in sheltered localities on brown sands derived from coastal limestone.

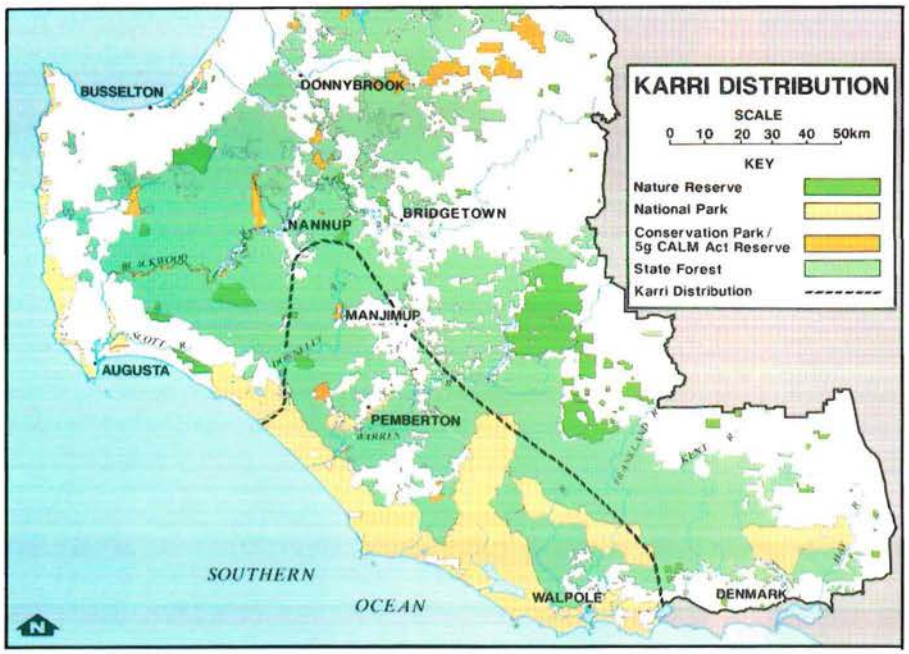
A line drawn on the map which links the west coast at Busselton to Nannup, Bridgetown, Lake Muir, Pardelup and then to the south coast at Denmark encompasses the main occurrence of the karri forest.

Within this area a comprehensive and secure conservation reserve system needs to be, and indeed is now established.

WHY CONSERVATION RESERVES?

Conservation reserves, such as national parks, nature reserves or conservation parks, meet many demands. Most importantly, they provide a scientific baseline against which the effects of disturbance in other areas can be evaluated. They also provide examples of ecosystems as nature provided them and this has an intrinsic appeal to modern men and women. Furthermore, a reserve system provides security against inappropriate land use. For example it would be very unlikely that society would want to convert a karri forest national park into dairy farms or fell the trees for timber. Finally, stands of mature karri forest are beautiful and awe-inspiring, and reserves provide ideal places to protect such forests.

In the early 1970s a group of distinguished scientists from the Australian Academy of Science drew up specifications for the "perfect" conservation reserve system (*see page 34*).



HISTORY

Prior to 1970 the area of karri forest set aside specifically for conservation was deficient. With the exception of the Walpole-Nornalup National Park, conservation was largely restricted to a handful of small national parks and reserves near Pemberton. Few of these met any recognised criteria for conservation reserves. The majority of the karri forest in public ownership was State forest, which had timber production as its primary purpose.

However, during the late 1960s a number of moves began which paved the way for a radical change in the State's conservation reserve system over the next 20 years. Two agencies were involved: the then-Forests Department (FD) (now incorporated into CALM) and the Environmental Protection Authority of W.A.

In seeking to establish a conservation reserve system in the karri forest, the two agencies took different paths. But in the end both approaches were implemented.

THE FORESTS DEPARTMENT

During the late 1960s and early 1970s the FD evolved a policy of multiple use for State forests. As no credible alternative reserve system existed in karri outside State forests at that time, the FD accepted the responsibility for all aspects of forest conservation. An essential component of this policy was the setting aside of a substantial area of State forest from timber cutting. It was hoped that reserves could be designed which were adequate, in recognised scientific terms, for the purpose of conservation, and to a lesser extent for recreation. This process was foreshadowed in the Department's General Working Plan (ie, forest management plan) of 1972.

Multiple Use as described in the FD's forest management plans relied upon a system of zoning in which each zone was allocated a priority use. Other uses were encouraged, tolerated or forbidden depending upon the degree to which they conflicted with the priority use on each area. The zones were called Management Priority Areas (MPAs), and each had a specified priority use. Conservation took precedence in MPAs for Flora, Fauna and Landscape. MPAs for Recreation also had high incidental conservation value.

CHARACTERISTICS OF A PERFECT RESERVE SYSTEM

REPRESENTATIVENESS

The reserve system should sample the key biological communities intended for conservation, and contain the widest possible habitat, floristic and geomorphological diversity within those communities.

SIZE AND STRUCTURE

Reserves should be large (20 000-50 000 ha), well proportioned or circular in shape and have natural boundaries such as coastlines, watershed, rivers, ridges or geomorphological changes. If smaller, reserves should be buffered by State forest or water reserves.

NATURALNESS

Reserves should be in a natural undisturbed state, free of introduced species and pathogens.

SECURITY

The tenure and purpose of management for the reserves should be secured by Act of Parliament, requiring the agreement of that body to effect change.

Cliff Winfield

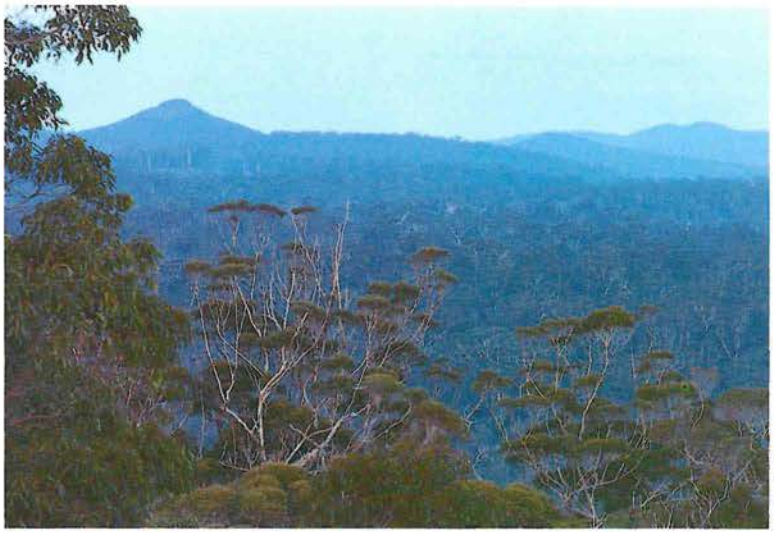
Karri forest in the Shannon

MANAGEMENT

Reserves should be managed and protected by a skilled and well funded organisation. It should contain, a core area which would remain inviolate from disturbance other than that for approved research, and which in turn is surrounded by a buffer area in which uses compatible with the continued existence of the population to be conserved, would be permitted.

REPLICATION

Reserves should be replicated elsewhere and connected by a corridor(s) which would allow the migration of flora and fauna.



Robert Garvey

Cliff Winfield

The Porongorups with karri in the foreground.

Crowea angustifolia form part of the dense karri forest understorey.

The selection and mapping of the conservation MPAs in State forest was carried out in the early 1970s. The criteria used were those set out in the Australian Academy of Science Report "A Natural System of Ecological Reserves in Australia" and its authoritative addendum, the famous Specht Report. These reports summarised current international scientific opinion on conservation reserves, and placed it in the Australian context.

It was fortunate that at this time more than half the karri was still virgin forest. Although the timber industry had been cutting karri since the 1890s, harvesting had been largely restricted to the western half of the forest.

Foresters working on the establishment of the reserve system were able to consult a considerable body of biological knowledge about the forest.

The structure, density, floristic composition and general health of the upper-storey of the entire forest was well known and accurately mapped. The FD's forest type maps were derived from aerial photography, and presented information of a quality second-to-none for equivalent land management agencies in Australia. Other detail useful for natural land management such as the degree of fire damage, the presence of unusual tree species, rock outcrops, wetlands, reed swamps, riverine communities, lakes, rivers and streams were also accurately mapped on the Aerial Photographic Interpretation (API) plans.

The floristic composition of the understorey and shrub vegetation was also well known, although not formally surveyed or mapped. Experienced foresters working in karri country were able to distinguish and locate site variations dominated by a single species: viz Netic (*Bossiaea laidlawiana*) dominating in the Donnelly River Valley at the western extremity of the main karri occurrence; karri wattle (*Acacia pentadenia*) dominating in the eastern half; hazel (*Trymalium spathulatum*) often dominating where karri grew tallest; *Acacia urophylla* dominating on more fertile sites; and *Hovea elliptica* often dominating in mixed karri-marri stands. A herbarium collection of over 1000 karri forest plant species had been developed at Manjimup, and fauna surveys had commenced.

Other important variations in the karri were known to occur. In the west, centre and north, karri is typically restricted to the red earth and podsolic soils of the lower slopes in the main drainage systems. In the south and east it occurs more on granitic soils as well as on red earths, and in river alluvium. This difference coincides with a change in underlying geology from gneissic metamorphic rocks in the west to granite in the east. Outside the main forest, karri is found in smaller patches in soils derived from different parent material. On the Leeuwin-Naturaliste, ridge patches grow on brown sands derived from coastal limestone. Further small occurrences on similar soils occur along the south coast. The largest outlier is at the Porongurup Range 100 km to the north-east of Denmark where a large batholith of porphyritic granite with bare summits cradles the karri below. The Porongurups karri is almost entirely contained within a national park. Other outliers occur at

Mt Manypeaks, Albany, Mt Barker, Rocky Gully, Nannup and, in one puzzling locality, on the Blackwood Plateau.

To accommodate these variables in a reserve system, the following approach was taken:

Firstly, two large virgin areas of forest were sought. It was hoped to find areas in the 30,000 to 50,000 hectare size range with a maximum diversity of site types within their boundaries;

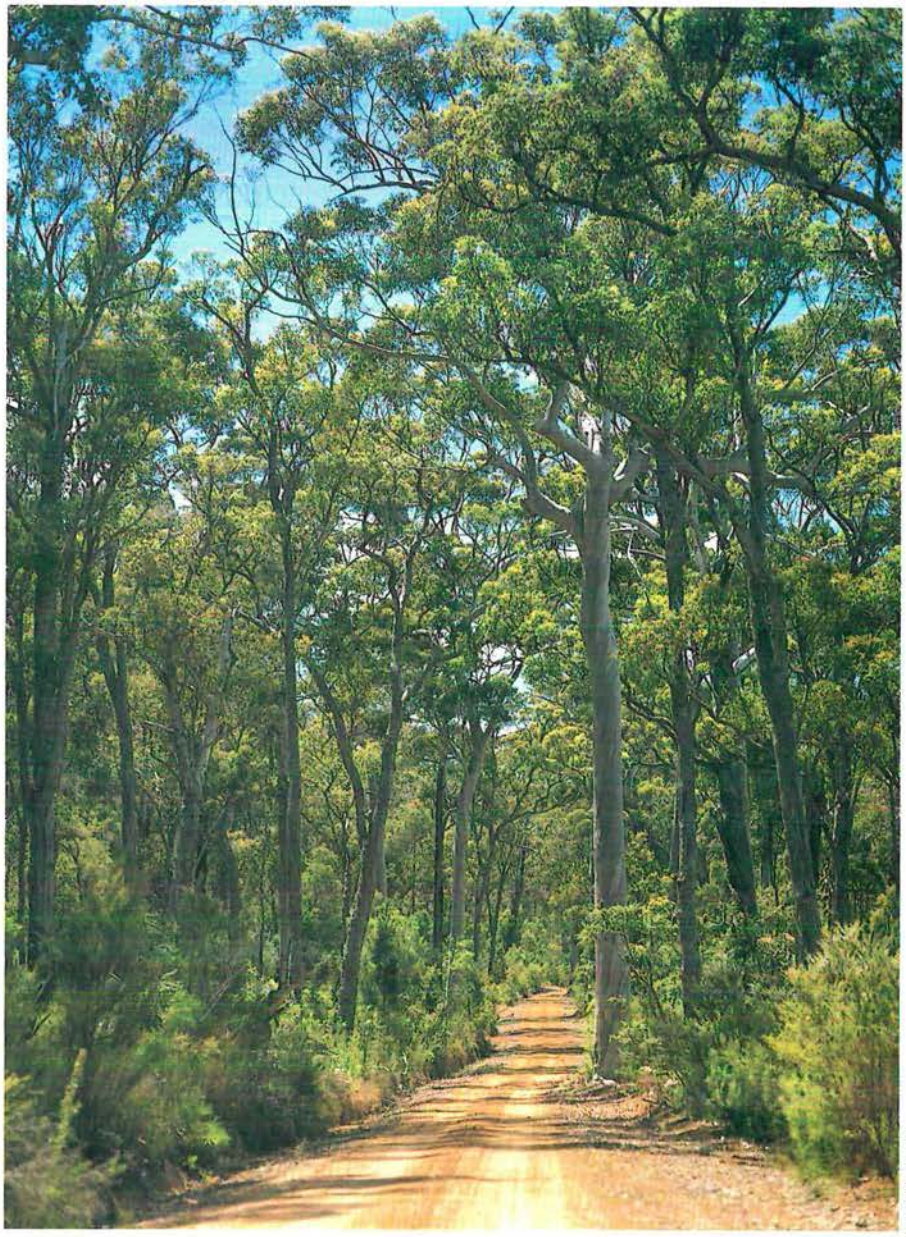
Secondly, a series of smaller reserves, preferably virgin forest, were sought which sampled all the major river systems and the outlier occurrences.

The basis of selection were the (API) maps, overlain with known data on geology, landform, soils and understorey vegetation. When appropriately coloured in, the API plans were ideal for comparing alternative proposals, because diversity could be compared visually, thereby allowing rapid elimination of the obviously poorer options. After some months of deliberation and debate, a preferred option for the reserve system was decided upon, and eventually published in the FD's forest management plan, and implemented.

The first of the two very large reserves selected was the 30,000 ha Wattle-Soho area (now designated the Mt Frankland National Park) which straddles the upper catchments of the Weld, Deep and Frankland Rivers. This is an area of superb mature karri forest and great biological and landscape diversity. The second large reserve selected comprised the lower Shannon River Basin plus an adjacent segment of the proposed d'Entrecasteaux National Park. This is also an area of great beauty and diversity and encompasses coastal elements not found in the Wattle-Soho reserve.

The smaller areas making up the karri reserve system were Curtin forest (upper Shannon River), Boorara forest (Gardner River), Dombakup and Hawke-Treen forests (Warren River), Strickland forest (Donnelly), Chester forest (Blackwood plateau), Boranup forest (Leeuwin-Naturaliste ridge), Giants forest (Bow River), and Swarbrick, Keystone and Dawson forests (Walpole River). These were supported by the recreation reserves, One Tree Bridge (Donnelly), Brockman (Warren River), Muirillup (Gardner River) and Mt Frankland forest (Frankland River).

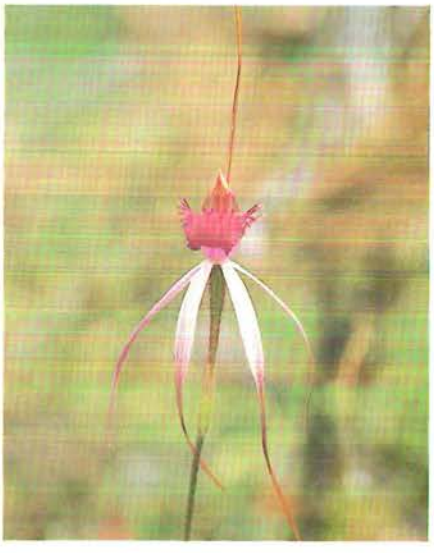
Other areas were also set aside to be managed for purposes other than timber production. Road, river and stream zones were designated, together with wetlands, rock outcrops and a number of sites of



Cliff Winfield

Giant karri in the new Mt. Frankland National Park.

The fragile spider orchid (*Caladenia sp.*).



Cliff Winfield

historical or cultural interest. These areas, together with the MPAs added up to nearly half the karri forest.

On the basis of the best information available, the FD was satisfied that this reserve system contained all the genetic diversity required and that it captured the magic and majesty unique to virgin karri. Together with the proposed d'Entrecasteaux National Park and other reserves covering jarrah and wandoo forest, such as the adjacent Perup Fauna Reserve, the view was taken that a very comprehensive reserve system had been developed for southern forests.

THE EPA INITIATIVE

In December 1971 the Environmental Protection Authority was established. Part of its role was to 'consider and initiate the means of enhancing the quality of the environment'. The EPA recognised that the establishment of an adequate conservation reserve system throughout WA would be essential in achieving this objective. Accordingly, it established the Conservation Through Reserves Committee (CTRC) which first met in February 1972.The CTRC divided the State of WA into 12 natural areas called 'systems'. Systems 1 and 2 more or less covered the same area as that covered by the 'southern forests' of the FD. The CTRC, in looking into reservation for conservation in Systems 1 and 2 did not work with the FD, who had already commenced the same exercise. Thus two officially responsible and qualified organisations were evaluating the same area of forest simultaneously.

In August 1974 the CTRC published its report to the EPA, and revealed that it had taken a different approach to the FD. The CTRC did not examine the question of establishing a network of small reserves spanning the whole forest. Their brief was to look for large and significant areas. They therefore opted to create one large reserve comprising the entire Shannon River Basin. This, added to the pre-existing national parks and other small reserves near Pemberton and Walpole was considered to meet the aim of the CTRC - 'to set aside sufficient native habitat to be preserved and managed both for the preservation of animals and plants, and for the enjoyment and education of the population'.

Cliff Winfield

Broke Inlet at the mouth of the Shannon River.

The CTRC was enthusiastic about the Shannon River watershed because it was a large contiguous area containing areas of virgin karri and karri-marri. This area was proposed so that it might act as a benchmark area for changes in biological, hydrological, pedological and sedimentological parameters which may take place elsewhere as a result of timber harvesting. The presence of the Broke Inlet in a largely intact natural state at the mouth of the Shannon, and the presence therein of a sedimentary delta of classic form, were seen to add to the value of the proposed reserve.

The CTRC's views were shared by many people in the community, who viewed the Shannon proposal as an opportunity to create a large karri forest national park of international value. Finally after some years of controversy, the new Labor Government in 1983 immediately implemented a pre-election promise to create a Shannon Park. The entire Shannon Basin was declared an MPA for Flora, Fauna and Landscape. More recently this area has been designated the Shannon National Park.

And so two independently derived reserve systems for the karri forest were amalgamated. Any argument about the biological superiority of one proposal compared to the other became unnecessary. Both were implemented.

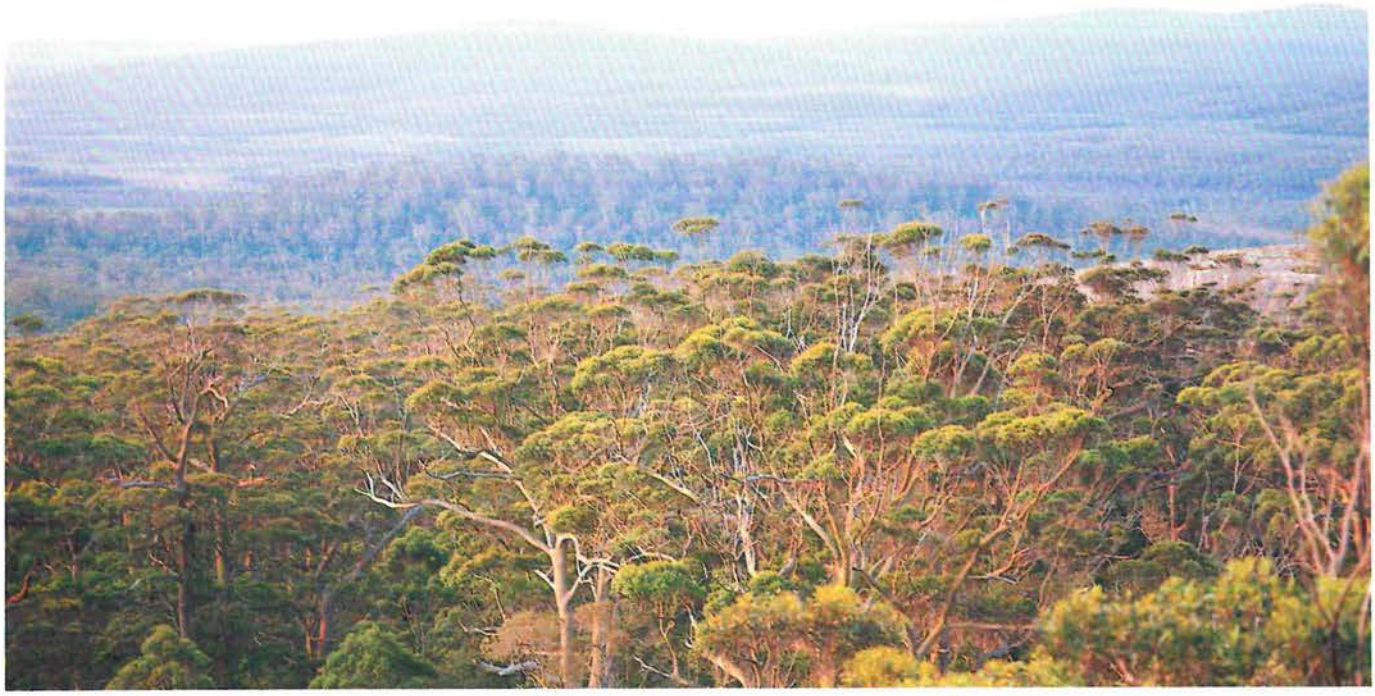
CALM'S CONTRIBUTION

Despite its biological adequacy, the reserve system inherited by CALM when it took over forest management in WA in 1985 still had one major deficiency: the reserves in State forest (Conservation and Recreation MPAs) had no security. Although State forest itself has the equivalent of A Class security, and the Department is bound by its management plans, the purposes for which areas of forest are managed may be changed at any time without reference to Parliament, by simple Ministerial decision.

CALM has now developed (and the Government has endorsed) a system for converting all the Conservation and Recreation MPAs from State forest to national parks, nature reserves or conservation parks. Once so classified, both the tenure and purpose of the reserved areas can only be changed with Parliamentary approval. A more secure situation is not possible.

No reservation system should be so inflexible that it cannot be refined in the light of insights gained from continuing research. CALM believes that the conservation system in its southern forests is now close to being right. Nevertheless, research has continued and it is interesting to examine the impact of recent studies.

The system of Conservation and Recreation Management Priority Areas in the karri forest was conceived in the early 1970s and has been in place since 1977. Timber cutting ceased in the Shannon Basin in 1983, prior to its conversion to a conservation



Cliff Winfield

reserve. The d'Entrecasteaux National Park has been managed as a reserve since about the same time. In the meantime, research work in biological, ecological and related (soils, geomorphology, hydrology, fire, silviculture and pathology) fields has continued.

Now, in 1988, how does the karri reserve system stand up in the light of increasing research and heightened practical insights?

For a start, nineteen detailed biological surveys have been completed by scientists in the southern forests. Noteworthy amongst the results is the finding that few plant species, apart from the dominant trees themselves (such as karri, yellow tingle and red tingle) are entirely restricted to the area. Likewise, no species of vertebrate fauna appears to be confined to the karri forest. Associated landforms such as the granite monadnocks and the lower catchments of the Hay and Mitchell Rivers, where the Darling, Stirling and Warren Botanical sub-districts join, are botanically far richer. Plains, lakes, swamps, riverine associations and coastal landforms (areas not subject to timber harvest and very largely not "counted" in the reserve system) also make a special contribution. These surveys

Robert Garvey

Mt Frankland National Park (above).
Karri Valley (left).

did not recommend changes, or adjustments to the existing karri forest reserve system.

A concern in some quarters is that the reserve system should encompass all the genetic variability of karri itself. During 1986-87, geneticists studied this question using the protein electrophoresis technique. These studies showed that all the major genotypes of the species that occur on Crown lands are represented in the reserve system.

Finally, scientists have recently completed a detailed study of the dominant vascular perennial plants of the region, in their relation to site. (This approach had been developed in the early 1970s by forester Joe Havel for the northern jarrah forest and was used as a basis for designing the conservation reserve system now in place in that area.) All thirteen different site/vegetation types distinguished in the karri forest region are represented in the existing reserve system.

THE FUTURE

In any forest such as the karri, which combines beauty, utility and natural productivity in so propitious a manner, conflict about reservation and timber harvest is inevitable. There will always be those who advocate that a greater area be set aside in reserves, and those who feel a greater area should be made available for timber production.

There will also always be arguments about which areas should be reserved: people's views will be coloured by where they live and work, or recreate.

In the end, political decisions will largely decide the exact balance that is struck between areas.

A Sight to Behold

Jiri Lochman

Depending on your viewpoint, pelicans are either awkward and clumsy birds, or graceful and fascinating creatures; a pelican in flight is a sight to behold.

The Australian Pelican (*Pelecanus conspicillatus*) is one of seven species in the world. With its bold black and white markings, blue legs, pink pouch and yellow eye-rings, it is arguably the most beautiful.

Found throughout mainland Australia and Tasmania, small numbers also occur in Indonesia, New Guinea and the western Pacific islands.

Pelicans are colonial nesters. Colony sizes in the nine regular breeding sites in Western Australia vary from a dozen pairs to over a thousand.

Nests are little more than shallow scrapes on the ground, often lined with bits of seaweed and discarded feathers. Milk cartons and sandals have also been found in their nests.

Cliff Winfield

Housekeeping just isn't a pelican priority; these eggs sit exposed on an untidy nest (above).

Strange ballet dancers indeed! These birds, scattered across the tidal flats of Princess Royal Harbour in Albany, seem to be limbering up for a performance (above right).

Two eggs are usually laid. Within a couple of weeks of hatching, the chicks gather in small mobs or "creches". Childcare is not a problem! The adults leave the nesting site for up to days at a time to search for food, leaving the young to fend for themselves. Fortunately, pelicans almost invariably nest on islands, safe from terrestrial predators.

Northern colonies nest between February and September, usually June-August. Birds of southern colonies may nest in both spring and autumn.

The pelican's clownish-looking bill is actually a multi-purpose tool. It is used mainly as a "scoopnet" for catching small fish and shrimp, rarely for carrying them.

When large flocks of seabirds gather in a feeding frenzy, swooping terns may suddenly find themselves seated in the pouch of an over-enthusiastic pelican. 'Four-winged pelicans,' with one wing protruding from either side of their bills, make a rather bizarre sight; much like high-tech aeroplanes with "trim-wings" at the front!

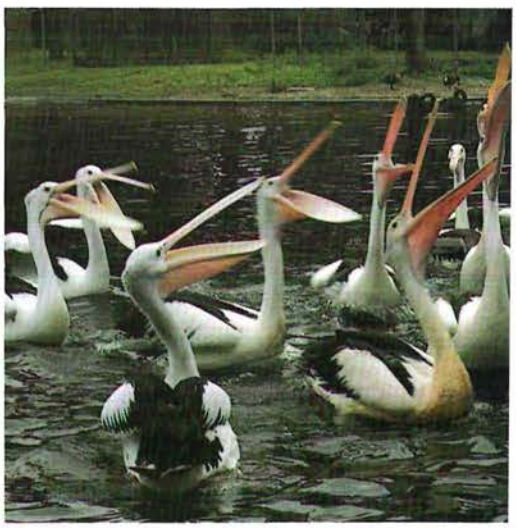
When pelicans do carry food to their young, it is normally stored in their stomach, and regurgitated partially-digested at the nest site.

A pelican's pouch is also used for catching rain. Birds sitting on nests during heavy rain showers have been seen with bill open and pouch distended, facing head to wind. In a heavy storm it may collect more than 250 ml in 15 minutes. The total pouch capacity is seven litres!

If that is not enough, the pouch is also used as an evaporative cooler and radiator. On hot days pelicans can be seen mouth agape, fluttering the floor of their pouch. This is richly supplied with blood vessels, bringing body heat to the surface where it is lost through evaporation and radiation.

Cliff Winfield

The Australian pelican in flight; a sight of grace and beauty (above).



Fish fever: mouths agape and pouches at the ready, pelicans at the Perth Zoo jockey for position during feeding time (right).

Cliff Winfield

It doesn't stop there! Brightly coloured pouches are a sexual turn-on in the pelican world and bright pink pouches with purple stripes are a sure sign that breeding is underway.

Pelicans are superb aviators. They can often be seen on a hot day hitching a ride on spiralling thermal updrafts.

The birds spread out from their colonies with slow and heavy wingbeats, searching out suitable updrafts. When one is found, the lead birds begin to circle, flapping their wings intermittently, rising steadily through the sky. Within minutes a "staircase" is formed, with ten, twenty, perhaps a hundred pelicans spiralling steadily upwards. Up they go, thousands of feet high, until the first begin to peel off, gliding towards some distant feeding ground. Wings motionless, slightly tucked in, losing altitude but picking up speed, they race towards the distant horizon.

On short journeys one updraft may be enough. Over longer distances several are needed: each is sought out like the first, birds spreading out in search of new thermals while gliding down towards earth.

TEXT - Jim Lane

Cliff Winfield

Shadow play on water: a moment of tranquility for this pelican, mirrored in bizarre silhouette at Wilson Inlet near the town of Denmark (above).

Young pelicans in a 'creche' in Green Island, near Albany, waiting for their parents to return (below).

Jiri Lochman

Cliff Winfield

WHAT'S IN A NAME?

The W.A. Herbarium examines botanists predilection for changing plant names.

All plants and animals are given Latin names to aid communication among biologists. Two words are routinely used. The first, beginning with a capital letter, is the genus or generic name (e.g. *Casuarina, Eucalyptus*). The second, beginning with a lower case letter, is the specific epithet (e.g. *obesa, marginata*) which when joined with a genus name becomes the name of a species. Less frequently used are names for other ranks or levels in the classification of plants or animals for example, banksias belong in the family Proteaceae, eucalypts in the Myrtaceae.

The naming of organisms in this way is bound by internationally agreed rules that are published in two books (one for plants, one for animals). While some Latin names remain unchanged from their inception, others require change for various reasons. For example, it may be found that a name is incorrect because it is being applied to the wrong plant, or because an earlier name is available. Changes due to these causes are usually readily appreciated and quickly absorbed by the botanical community. More controversial are name changes based on judgements about rank - whether related plants should be species or subspecies, genera or subgenera etc.

However, if these proposals, when published, are accompanied by clear supportive evidence they are likely to be accepted by plant taxonomists, and therefore by herbaria and botanic gardens. They will then be taken up by horticultural and other applied literature and eventually, though sometimes with some resistance, by the general public.

A proposal of significance that was made some years ago concerned the classification, and therefore the names, of our *Casuarina* species (sheoaks). The question debated is 'should the sheoaks be placed in one genus (*Casuarina*) or four (*Casuarina, Allocasuarina, Gymnostome,* and *Ceuthostoma*)?' The saga began in 1959 when Bryan Barlow published a paper on the chromosome numbers within *Casuarina;* he showed that on the basis of these numbers the genus could be divided into three groups and that these groups differed from each other in other features as well. Later Chanda (1969, 1969a) demonstrated that the groups also differed significantly in their pollen structure and suggested that they could reasonably be treated as distinct genera. in 1980, Lawrie Johnson described *Gymnostoma,* which represented one of Barlow's three groups, and in 1982 *Allocasuarina,* which represented another. Recently Johnson (1988) described a further segregate genus *Ceuthostoma* which represents some Malesian species. In the same paper Johnson provided a key to the four genera he now recognised.

Only *Casuarina* and *Allocasuarina* are found in Western Australia. These genera were distinguished by Johnson by a number of characters that can be set out as follows:

Casuarina: 'Seeds' grey or yellow-brown, dull; bracteoles of cones thin and without dorsal protuberances; teeth five to many; seed short-lived.

Allocasuarina: 'Seeds' red-brown to black, shining, bracteoles of cones thick and convex, mostly with an angular, divided or spiny dorsal protuberance; teeth four to many; seed long-lived.

Many Australian herbaria, including the Western Australian Herbarium, have adopted the revised classification of our casuarinas. This action taken by herbaria does not necessarily amount to a stamp of approval, but rather to a recognition that a *prima facie* case has been made out. Only by intensive study can the merits of a system be properly assessed. The names of the Western Australian species of *Casuarina* and *Allocasuarina* are given by John Green in the 'Census of the Vascular Plants of Western Australia (1985). It is anticipated that an account of the family as a whole will be appearing in 1989 or 1990 in volume 3 of the Flora of Australia where the names *Allocasuarina* and *Gymnostoma* will be recognised.

Most of us will continue to loosely refer to the She-oaks as 'casuarinas' but in technical publications it is desirable that the names under the segregate genera be adopted.

Jiri Lochman

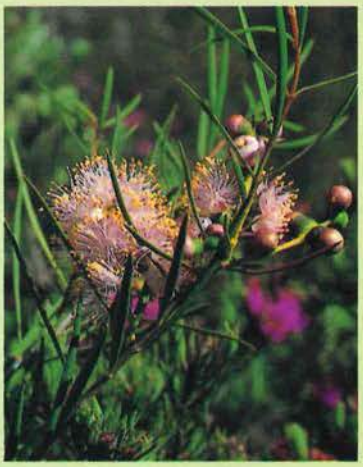
A female sheoak, *Allocasuarina humilis,* a member of the new genus *Allocasuarina* (above right).

Cliff Winfield

Many early European settlers, used to the lush green meadows of England, thought their new land strange and repulsive. They felt a need to tame and clear the land to make conditions hospitable. To them, the value of the land was purely economic. The local fauna often ended ignobly in a dinner pot, or else its very existence was threatened when the natural habitat was cleared to make way for introduced animals or farm crops.

Time changes everything, however, and efforts are now being made to re-purchase privately owned areas of high conservation value. Alex Errington talks about...

BUYING BACK THE FARM



Cliff Winfield

The uncleared Wongamine Reserve and its gaunt powderbark trees *(Eucalyptus accedens)* provide a sharp contrast with the surrounding farmland (top).

The graceful honey-myrtle *(Melaleuca radula)* is one of many attractive species found in the Wongamine Nature Reserve (above).

When the Swan River Colony was founded in 1829 under Captain James Stirling land grants were made to a number of settlers, including Thomas Peel and his immigrants, who arrived later that year. In all, some 525 000 acres of land were granted in the colony's first year. The colony's population at the time was only 820 strong.

Many early allocations had Swan River frontage. Canning and Helena River locations were also prized. Land releases continued as the colony grew, and in 1848 pastoral licences began to be issued. Naturally, the early settlers sought out the most fertile, valuable land. Less attractive, difficult-to-develop areas were not pursued to the same extent and remained vacant Crown land.

After a hundred years of European settlement more than five and a quarter million hectares were privately owned, and eight hundred and sixteen million hectares were held under pastoral lease. Attitudes towards the natural environment, however, were gradually beginning to change. Whereas in the past people had prized land primarily for its agricultural value, they now began to see it as having some intrinsic value.

In 1958, 130 years after the Swan River Colony was founded, the Australian Academy of Science established sub-committees in each State of Australia to determine what had, was and should be done to have adequate land set aside for national parks and nature reserves. In W.A., the sub-committee's report in 1962 proved to be a valuable catalyst and guide to developing conservation policies.

In 1971 the Environmental Protection Act was enacted, which, among other things, established the Environmental Protection Authority (EPA). An early and very important EPA initiative was the establishment of the Conservation Through Reserves Committee (CTRC). The CTRC was to review national parks and other significant reserves and consider proposals for further reserves.

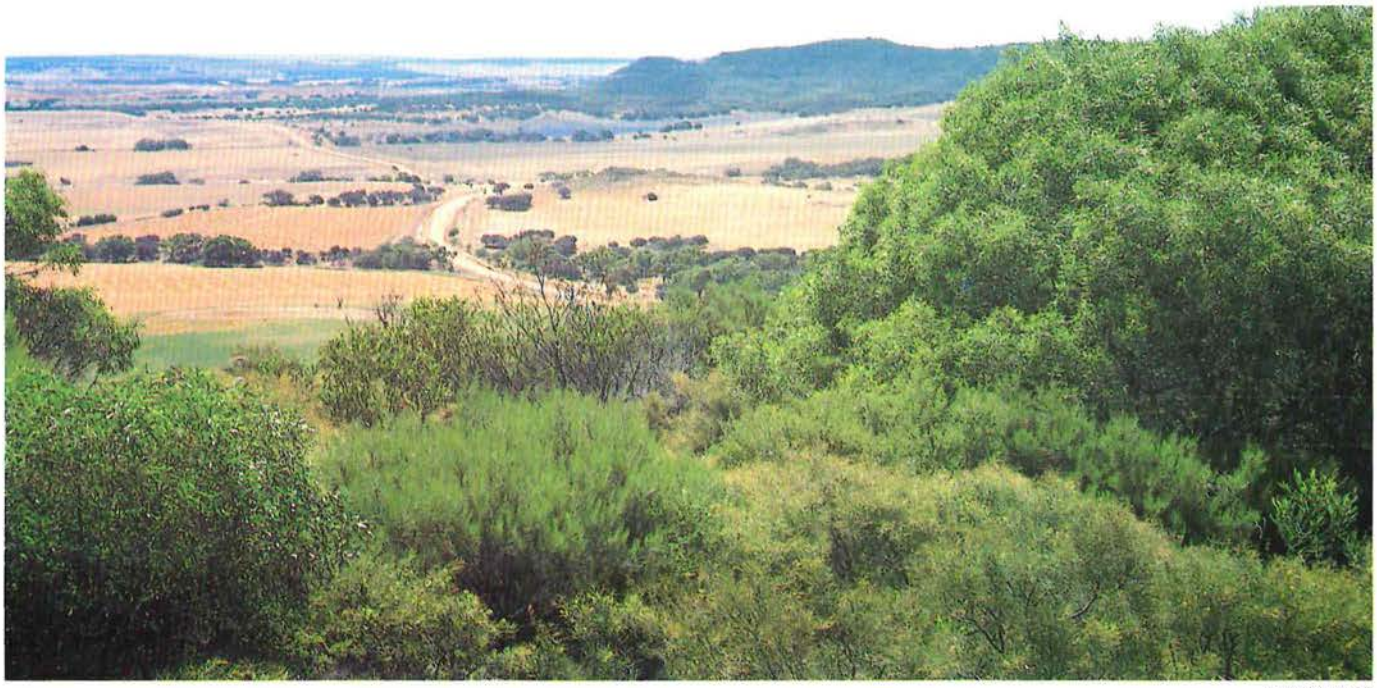
A number of regions or 'systems' throughout the State were reviewed by the CTRC, and a series of reports were issued for public comment and endorsed by Cabinet.

Although these reports dealt mainly with Crown land (elsewhere in this isssue, we describe the reservation system in the karri forest which developed at the time), they drew attention to areas of privately-owned freehold land of considerable conservation

It's surprising that this delightful golden-hued flower *Waitzia acuminata*, found at Moresby Range, has no common name (right).

The Moresby Range Nature Reserve is a verdant island, in a sea of undulating farmland (below).

Cliff Winfield



Cliff Winfield

value and recommended its purchase as and when it came onto the market. As a result, in 1976 the EPA established a Parks and Reserves Committee to advise on the purchase of freehold land to add to or create national parks and nature reserves.

The establishment of the Parks and Reserves Committee saw the full turn of the wheel from 1829, with the State now actively looking to buy back, for conservation, land released in earlier years.

The Parks and Reserves Committee met 19 times from 1976 to 1983 and determined the purchase priorities of a large number of properties acquired with the $2.5 million placed at its disposal. No funds were made available to the Committee in the 1983/84 financial year, and it met for the last time on 16 June 1983.

With the amalgamation of the State's three major land management agencies to form CALM in March 1985, the Conservation Lands Acquisition Committee was formed to take over from the Parks and Reserves Committee. The new Committee first met in October 1985. In the three years of its existence it has been involved in a number of very important conservation land acquisitions. These include:

Benger Swamp

Benger Swamp, 2 km west of the South West Highway between Harvey and Bunbury, is one of the most important wetlands in the South-west. An important waterbird breeding and feeding area, it is one of only seven South-west breeding sites for the endangered Freckled Duck, and has the highest number of Australasian Bitterns recorded in the district. It is also an important seasonal wetland for a wide range of other waterbirds, such as diving ducks and waders.

The Swamp was intensively subdivided in 1914 and 1929, resulting in a mosaic of more than

Pollen-laden tufts of pink on this undescribed *Melaleuca* species provide a dainty meal for the local insect and bird life at Wongamine Reserve (below).

Cliff Winfield

150 blocks as small as 2 ha, which were mostly used for growing potatoes and other vegetable crops up until the late 1960s.

Since the early 1970s progressive acquisition of the privately-owned blocks has taken place. Only 13 blocks now remain in private hands. Overall, it is a great success story; obtaining ownership of Lot 44, however, proved a great challenge.

The owner died in 1979, and left the block to his three sons, but the legal transfer was never completed. In 1983 the son who was appointed executor of the will offered the land to the State, but no funds were available and the sale did not proceed. In 1984 that son died, and left no will.

Negotiations with the family resumed in 1985, but there were complications. It was only a 2 ha block and all the family's proceeds from the sale would have had to be used for the legal costs of transferring ownership. As a result there was little incentive for them to sell.

A breakthrough eventually came. Legal advice suggested the option of compulsory resumption of the land under the Public Works Act. This would ensure that the family received the equivalent of the full purchase price in compensation, without having to pay the crippling legal fees. The family agreed to this, and the State's first 'agreed resumption' of conservation land took place.

Moresby Range

In its 1976 System 5 Report, the EPA drew attention to the scarcity of conservation reserves in the Geraldton area, and the scenic attraction of the Moresby Range. It recommended looking out for suitable land, so that if any came on the market and funds were available, a national park could be established.

Unfortunately, there were no areas large enough to warrant national park status, but a few isolated, uncleared blocks have since been acquired as nature reserves.

One of these purchases is notable. In the mid-1970s a conservation-minded family who lived in the area purchased one of the uncleared blocks. The family had the foresight to maintain the 43 ha block in its original condition to protect its conservation value - especially its native flora.

This block has a dense, blanket-like cover of woody evergreen shrubs. Its vegetation is immensely rich and diverse, with over 300 species of flowering plants and ferns. Over 55 bird species have been observed, as well as an abundance of mammals, reptiles, amphibians and insects.

All these species were documented by the owner, who had a lively interest in natural history.

The owner described his objectives in buying the block, which he called the 'Howatharra Hill Reserve' in the following terms: "to personally own such a virgin habitat, PURELY for the satisfaction of knowing that it has been rescued from eventual destruction, and simply to maintain it as a 'retreat' or natural area to which [those]...who appreciate such things...can go, always knowing that it will still be there - not to return some months or years later only to find it bulldozed under."

Eventually, when the family moved permanently overseas, the Department negotiated with them. Agreement was reached and the block was purchased by the State. It is now a valuable nature reserve.

Cliff Winfield

Department of Land Administration - LEE

Powderbark and pingle contribute to the dense vegetation at Wongamine, viewed from nearby farmland (above).

The large irregular section outlined in green is the section of the farm that was 'bought back' to add to Wongamine Reserve (left).

Wongamine

Wongamine Nature Reserve is situated about 12 km north-east of Toodyay. It was originally set aside in 1901 as a 'Water and Stopping Place', which was extensively used by goldfields' travellers. In 1944 it became a timber reserve because of its valuable stands of wandoo *(Eucalyptus wandoo)* and brown mallet *(Eucalyptus astringens)*. In 1975 it was made a nature reserve, following a suggestion from the Toodyay Naturalists' Club.

The reserve contains both wandoo dominated woodlands, which characterise the hills region of the central part of Toodyay Shire, and salmon gum and York gum dominated communities, which are more typical of woodlands of the wheatbelt.

Botanically the area is very rich and the diversity of the flora is increased by the sandplain heathlands near the northern boundary. It is also an important fauna refuge for mammals, and a large number of bird species that might otherwise be absent from this part of the shire.

In 1985 the Naturalists' Club advised the Government of an area of uncleared, privately-owned land adjacent to the northern boundary of the reserve. It formed part of the adjoining farm which was up for sale. CALM officers negotiated an agreement to subdivide the uncleared area from the balance of the farm and add it to the reserve.

The irregular boundary of the area purchased reflects the division between the arable and non-arable land.

Everyone involved was happy with this deal; the farmer was able to sell the uncleared area which was of limited value to him, and the nature reserve was enlarged by the addition of 86 hectares of adjoining land, enhancing its conservation value.

CALM's bid to buy back our natural heritage continues. It is often a long and complicated process, but, in the final analysis, worth the exertion to ensure that some of our remaining unspoilt areas are preserved for future generations.

Alex Errington is CALM's Divisional Manager, Administration and Finance, and Chairman of the Conservation Lands Acquisition Committee.

ENDANGERED!

PURDIE'S DONKEY ORCHID

Diuris purdiei

by Stephen van Leeuwen

A. Brown

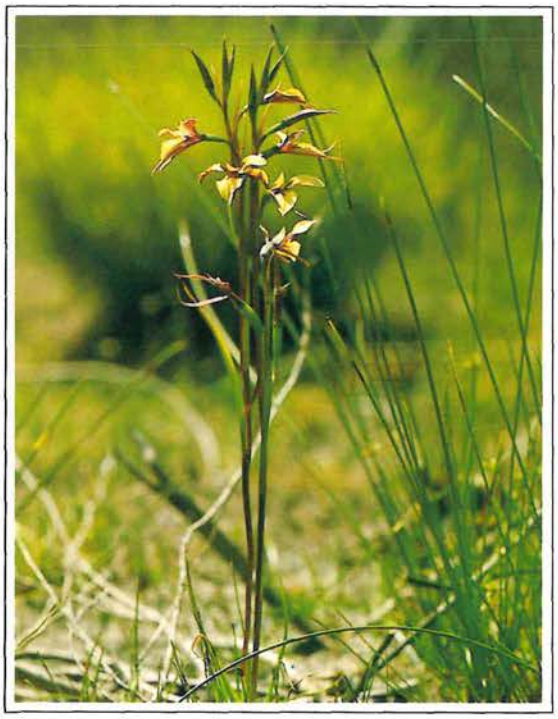
DONKEY orchids are one of the most readily recognized species of wildflower in Australia. These orchids belong to the genus *Diuris*, meaning 'two-tailed'. Forty-two species of *Diruis* are currently recognized, most of which occur in Australia. In W.A. we have twelve described species, and another ten taxa awaiting description. Four species are currently declared as rare flora.

Purdie's donkey orchid, *Diuris purdiei*, is one of these declared rare species. It has a distribution of less than 100 km and is only known on the Swan Coastal Plain between Cannington and Pinjarra. All extant populations with the exception of the Pinjarra population, occur in the Canning Vale-Kwinana area. The species is entirely confined to the sandy, peaty soils on the margins of winter wet swamps and depressions. It is usually found growing in association with common paperbark (*Melaleuca preissiana*) and white myrtle (*Hypocalymma angustifolium*).

Diuris purdiei is a very distinctive orchid that is easily identifiable by its partially nodding flowers and very broad labellum. Plants can stand up to 45 cm tall and have five to ten very narrow, spirally twisting leaves. Only one flower spike, which may bear up to ten flowers, is produced per plant. The flowers are characterised by spreading petals, a very short narrow dorsal sepal and the broad labellum which has short toothed lateral lobes. The flowers are primarily pale yellow with magenta streaks and suffusions. Flowering occurs through September to early November peaking in mid-late October.

Flowering in many of our native terrestrial orchid species, including *Diuris purdiei*, is significantly enhanced by the burning of their habitats, particularly by hot summer burns. In fact *Diuris purdiei* will only flower after its habitat has been burnt by such a fire. In years between fires the non-flowering plants consist of a single short narrow leaf. Very little else is known about the biology of this species apart from some information collected on its pollination biology. Field observation suggests that pollination can be achieved by small generalist beetles and native bees.

Diuris purdiei is currently known only from five populations, none of which occur on conservation reserves. The Pinjarra population is located in an area proposed as a Nature Reserve. The small number of populations known is a reflection of the specific habitat requirements and vulnerability of the species.



S. van Leeuwen

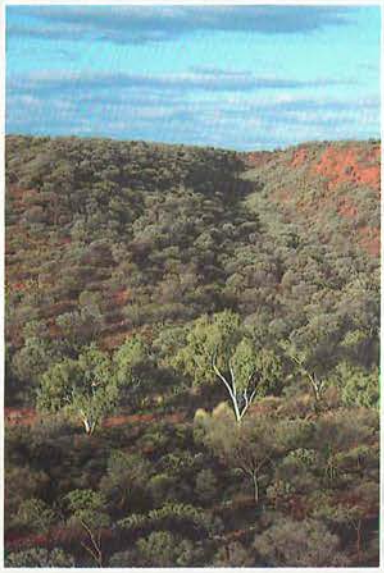
Within the metropolitan area Purdie's Donkey Orchid is under extreme pressure, and is threatened with extinction. These threats have arisen from the increasing need to develop more urban and industrial land close to Perth. Such development involves the clearing, draining and filling of suitable habitats for *Diuris purdiei*. Inappropriate fire regimes and weed invasion also have a deleterious effect on this species.

Purdie's Donkey Orchid is an attractive and unique species that will become extinct in the near future if our demand for land continues to increase and efforts are not made to reserve land where it occurs.

David Pearson

D·E·S·E·R·T · G·E·M

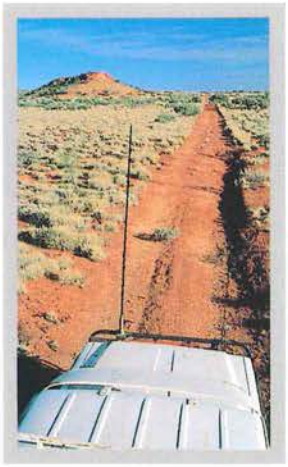
Research Scientist David Pearson shares his observations on the remote Gibson Desert



David Pearson

David Pearson

David Pearson



David Pearson

'I called this terrible region that lies between the Rawlinson Range and the next permanent water that may eventually be found to the west, Gibson's Desert, after this first white victim to its horror'. These were the bitter words of the explorer, Ernest Giles, on 6th May, 1874 after searching unsuccessfully for his lost companion. In a later expedition in 1876 Giles again had cause to curse this desert, declaring that *'...the region is so desolate that it is horrifying even to describe'.*

The Aborigines of the Gibson Desert overcame the problems of survival by maintaining both a flexible nomadic lifestyle and having an intimate knowledge of food and water resources. One Mantjiltjarra man recounting his travels prior to European contact, listed over 50 rockholes, soaks or claypans he had used. Most were temporary supplies, only lasting a few weeks after rain. The few 'permanent' water sources were vital refuges during droughts, and here family groups would come together, taking the opportunity to conduct ceremonial business. The close interaction of these nomads would eventually lead to tension as well as exhaustion of nearby food supplies. The family groups would fan out rapidly as soon as rain fell in the surrounding countryside.

These days most visitors traverse the Gibson Desert by the long and deeply corrugated Gunbarrel Highway, travelling from Carnegie in the west through Warburton to Ayers Rock. On the way they pass through the Gibson Desert Nature Reserve, which covers over 1.8 million hectares. It includes most of the landform and vegetation types typical of the Gibson Desert, particularly vast undulating lateritic plains clothed in spinifex and interspersed with thickets of mulga. In areas with deep sands, small spinifex covered dunes are frequent.

Extensive salt-lakes and small freshwater lakes add to the landscape diversity, while the subdued relief is broken by occasional breakaways and low rocky ranges. It is an area of subtle beauty. A climb to a high point provides a superb vista over the repeating pattern of delicately textured spinifex plains which contrast with the dull grey of mulga thickets. The over-riding impression is one of space, of room to move.

Desert bloodwoods in flower, a great attraction for several species of nomadic honeyeaters (opposite page, top).

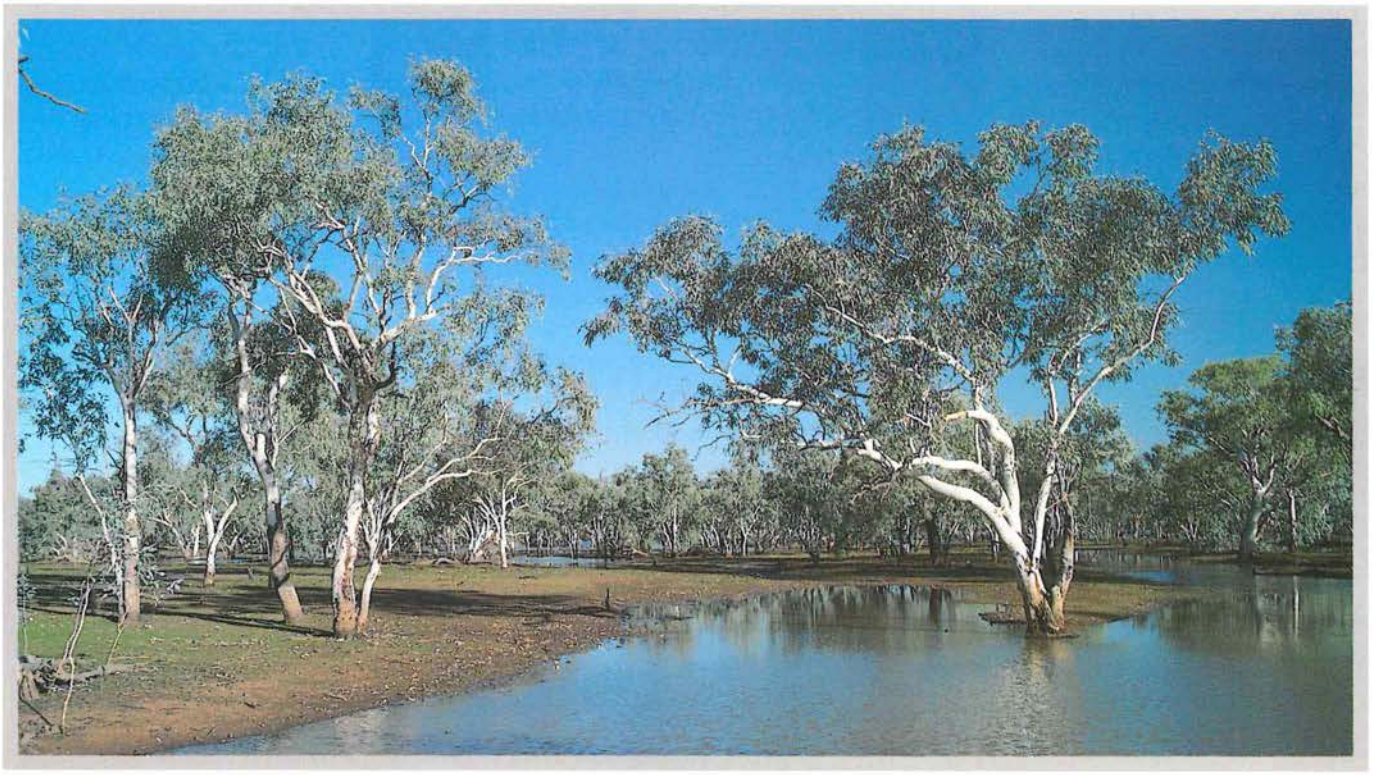
Rolling sandstone hills in the eastern Gibson Desert Nature Reserve (opposite page, below left).

A ringtailed dragon stretches tall, perhaps for a view of the superb vista that surrounds it (opposite page, below centre).

Blossom of the desert bloodwood (opposite page, below right)

Old petroleum exploration gridlines access some parts of the reserve (above).

Thirsty coolabah trees in Lake Gruzka (below).



David Pearson

David Pearson

Most travellers encounter little wildlife as they pass through the reserve, but those who are willing to stop and amble through the spinifex will be rewarded with sightings of numerous reptiles, especially colourful Military Dragons as they race between spinifex hummocks.

On a warm evening, a stroll with a torch may result in an encounter with one of the many translucent geckoes inhabiting the spinifex plains or a glimpse of a hopping mouse.

David Pearson

The Gibson Desert Nature Reserve is a landscape of striking contrasts and startling colours:

Charles Kids, a prominent breakaway remnant covered in stunted mulga (above).

The twisting white-barked trunks of these coolabah trees are mirrored in the swampy mire of Lake Gruzka (left).

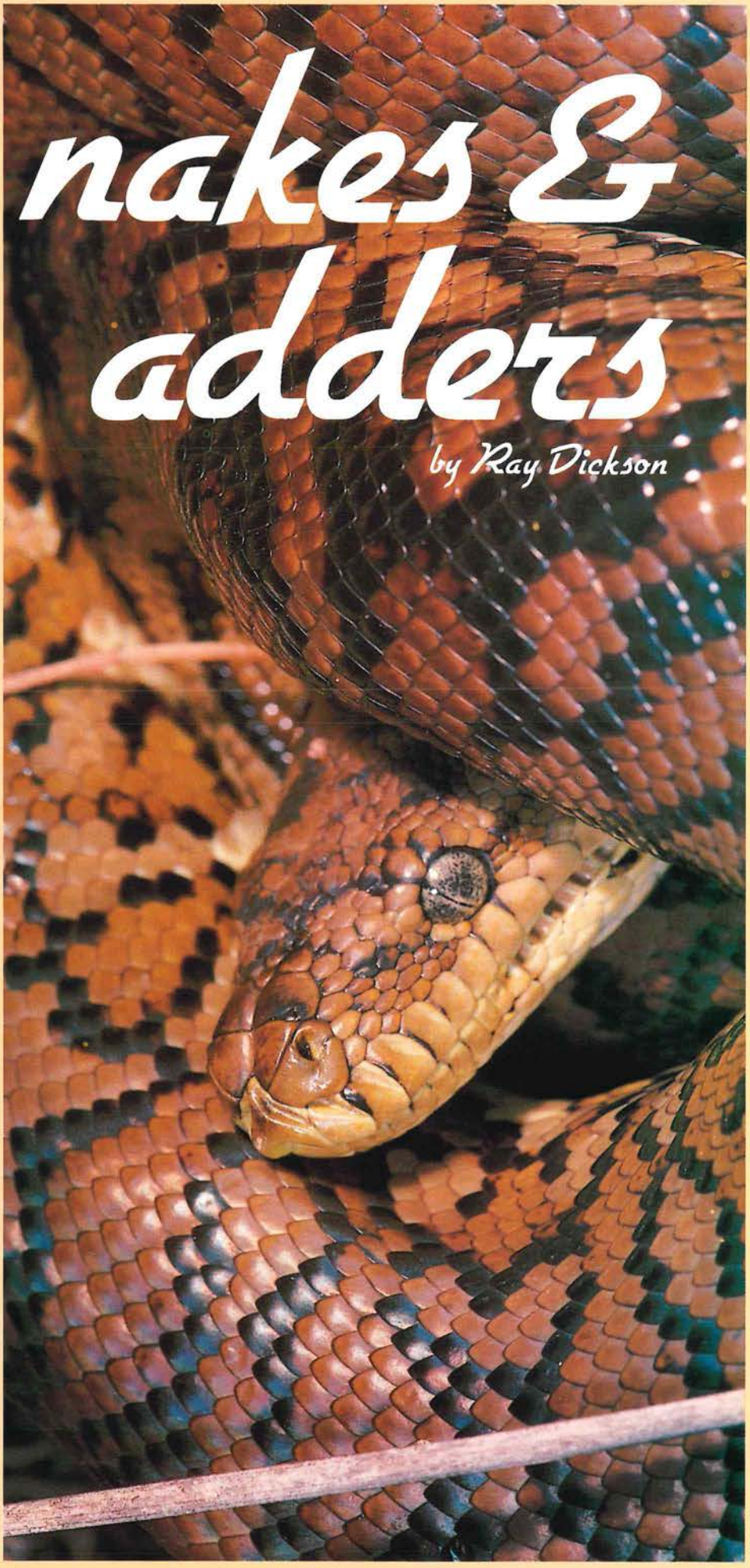
The management of a large nature reserve such as the Gibson Desert is a very real challenge. We still have much to learn about its flora and fauna. A substantial research programme has been established with the aim to provide better information for managers. Wider exploratory trips also help to build our knowledge. One such recently to the Alfred and Marie Ranges (named by Giles in honour of the Duke and Duchess of Edinburgh) searched for the rare Ramel's Gum and rock-wallaby populations, unfortunately without success.

Several mammal species have disappeared from the Gibson Desert in the last 50 years, possibly a consequence of changes in fire patterns and predation by foxes. Aerial burning techniques are being investigated to re-establish fire patterns suitable for these mammals, while it is hoped that fox control methodology developed in the south-west (see page 12) will help control them. The reintroduction of locally-extinct mammals may be possible in the next few years, making the Nature Reserve even more valuable for the protection of characteristic Gibson Desert flora and fauna.

Snakes & adders

by Ray Dickson

The hot sun brings forth the adder.
W. Shakespeare



Carpet Python
Morelia spilota (Lacepede).

Jiri Lochman

SNAKES, in common with other reptiles such as turtles and lizards, are "ectotherms": their movements in search of food, shelter or a mate are controlled by the temperature of their environment. In winter lower temperatures not only slow down and inhibit a snake's movements, but also drastically effect its ability to catch and digest prey due to a corresponding decrease in metabolic rate. So, they become inactive.

With the onset of warmer weather in spring and early summer they emerge from hiding often considerably slimmer and hungrier. In the search for food they are unusually active and often cover much more ground than normal. In areas of greater human population density the inevitable occurs. SNAKES AND PEOPLE MEET!

Jiri Lochman

Jiri Lochman

A Blind Snake (*Ramphotyphlops australis*) (top).
Stimson's Python (*Morelia stimsoni*) (above).

The switchboards of CALM, Police HQ, the Museum and Perth Zoo are besieged by worried householders seeking help to deal with unwanted snakes in the vicinity of their homes.

Encouragingly, the accent of these enquiries has shifted away from seeking advice on how to kill snakes. A more ecologically conscious public is nowadays eager to learn ways of discouraging their immediate presence. Snakes, after all is said and done, form an important part of the balance of food chains in the Australian environment as a whole.

The south-west is home for three families of Australian snakes.

The **Typhlopids** or burrowing snakes live mainly in top soil, surfacing at night to feed on termites and other small insects. They are harmless and non-venomous and are usually only seen when the topsoil is disturbed.

Marie Lochman

Bert & Babs Wells

Dugite (*Pseudonaja affinis*).

How to prevent snakes from entering and remaining on your property.

1. Keep your property free of rodents - they are an attractive food source for snakes. If you have pets such as horses or caged birds, do not leave grain or seed for mice to feed on.

2. Stack timber and sheets of tin in a manner which does not provide dry, insulated shelter for snakes.

3. Keep grass short and reduce the chance of accidentally stepping on a snake.

4. Wear stout boots or shoes and trousers when walking in overgrown areas.

5. Alert children and strangers to the dangers of snakes and snakebite.

6. Do not attempt to catch snakes by hand. Most snakebite cases dealt with in State hospitals resulted from attempts to catch, molest or kill wild snakes.

7. LEARN FIRST AID FOR SNAKEBITE.

Jiri Lochman

Bert & Babs Wells

Venomous duo, the Black Tiger Snake (*Notechis scutatus occidentalis*) (top) and the Common Death Adder (*Acanthopis antarcticus*).

The **Boids** are a non-venomous group of medium to large snakes represented by the Carpet and Stimson's Pythons now found only in remote areas.

The **Elapids**, a family of fixed front-fanged venomous snakes, most of which are harmless, include in the greater metro area, the potentially dangerous Dugite, Tiger Snake and Death Adder.

DUGITES are found in a variety of dryer habitats, often in well settled suburbs which still have some native bushland, and also in the vicinity of the coastal sand dune belt and the Darling Ranges. They frequently shelter under debris or even houses.

TIGER SNAKES prefer to feed on the larger types of frogs, and are common around wetlands and river banks. They can shelter comfortably throughout the year in grass tussocks and bulrushes.

DEATH ADDERS are now confined mainly to areas of forest in national parks and in Water Board catchment areas, although they occasionally appear near the banks of rivers, perhaps having been accidentally carried down stream.

Please remember that snakes, in common with other native fauna, are protected by law and anyone found wantonly destroying them can face stiff penalties.

FIRST AID

Methods of dealing with snakebite in Australia are probably the most advanced in the world, thanks largely to intensive research by C.S.I.R.O. into venom constituents and their passage through and affect on, the human body.

First Aid Treatment

1. Immediately apply a broad firm bandage around the limb to cover the bitten area. It should be as tight as one would bind a sprained ankle. As much of the limb should be bound up as possible. Crepe bandages are ideal but any flexible material can be used, e.g. tear up clothing or old towels in strips.

2. The limb must be kept as still as possible. Bind some type of splint to the limb - e.g. piece of timber, spade, any rigid object.

3. Bring transport to the victim whenever possible.

4. Leave the bandages and splint on until medical care is reached.

Do not cut or excise the bitten area.

Arterial tourniquets are no longer recommended for snake bite.

Don't wash the bitten area. The snake involved may be identified by the detection of venom on the skin. If the snake can be safely killed bring it into hospital with the victim.

LETTERS

Pets in Parks

Letters A.J. Taylor (April, 1988) and M.A. Lewis (Winter, 1988) invite some comment.
It is unfortunate that some members of the public see the banning of domestic animals from national parks and nature reserves as having been initiated on purely behavioural aspects - i.e. barking and biting. It is common to hear tourists say 'but my dog is well behaved', 'is kept on a leash', 'doesn't chase kangaroos', etc., etc.
Unfortunately these reasons are among some of the least important reasons for the bans.
Every time a domestic animal urinates, defaecates or scratches its fur, it leaves behind a variety of bacteria, virus and/or virus-carrying parasites. Native wildlife lacks the immunity which domestic animals have acquired either by continual exposure or by veterinary injections and medicines.
A parallel can be drawn from the eighteenth and nineteenth centuries when European man introduced the Australian aboriginals to the common cold, measles and chicken pox. These viruses proved fatal to large numbers of aboriginals as the race lacked immunity.
The same fate awaits our native wildlife. Some examples include the recent and ongoing deaths of the European Grey Seals from a canine distemper virus. It was published in 1981 the Red-necked Wallabies in Tidbinbilla Nature Reserve had been blinded by toxoplasmosis transmitted by the domestic cat. 'Faeces infects watering and grazing places. Other animals and birds are infected by faecal contamination of fur and skin with ingestion occuring during grooming. The eating of infected meat can spread the infection' (Australian Ranger Bulletin, Vol. 1, No. 2 - David Kerr). Toxoplasmosis can blind humans. The domestic dog spreads toxocara in its faeces. Toxocara can invade the body through the intestine and damage the brain and eyes of animals including humans. 'Children are vulnerable as they are more likely to play in soil and on grass' - (Professor Woodruff, London School of Hygiene and Tropical Medicine).
It may well be that the majority of Australians will eventually vote to be allowed the right to take their pets everywhere they go. And after all, national parks belong to all Australians. I can't believe, however, that **informed** Australians would willingly hasten the extinction of even more of our unique fauna. I think it is time the general public was made more aware of the threats their pets pose to both native wildlife and public health.

M. Hart, Jerramungup

Don't get Technical!

Don't let Landscope become technical. That's my plea in reply to the request in the editorial of your Winter Edition for readers to express their views.
I like Landscope the way it is.
I think getting all technical would put people off. I'll give you a personal example: I subscribe to a NSW-produced magazine called Railway. Until a few months ago every issue had at least one human interest story about ghost trains, ghost lines and ghost towns - good stuff.
Now it has changed hands and is full of new engines and technical jargon. They've lost me.
I like the stories that are written the way we speak and don't assume that the reader is an expert on everything.
Now, in lighter vein: A smack on the back of the hand for the writer of the editorial for spelling maintenance wrongly. And I shuddered when I came to 'symbiotic' and 'synergism'.

Jim Davies, Sorrento

Why not Mention Aboriginals?

I read with interest your editorial in Vol 3 No 4 of Landscope, I was particularly interested in your comments about tourism and the importance of 'providing information to the visitors on the natural science that makes an area special'.
I was recently in the Kimberleys and was lucky enough to take the boat trip down Geikie Gorge (near Fitzroy Crossing) which I think was organised by your Department. While I thought that the tour guide was interesting I was disappointed that there was no mention of Aboriginal people. I don't know any stories associated with the Gorge but I feel sure there would have been stories, perhaps places of special significance for Aboriginal people in the area.
Given the extremely high unemployment of Aboriginal people in the Fitzroy Valley it seemed to me that this could present an opportunity, both to (1) inform tourists of past and present relationships of aboriginal people with this area, and (2) to make available some employment opportunities for local people. I am interested to know if your Department does employ any Aboriginal people and what plans may be in store to perhaps make training opportunities available to enable the employment of people this way.

Jenny Martin, East Fremantle.

Glossy Photographs are Tedious

I have followed with interest the views expressed in letters to you about pictorial versus technical information. The subject of information interpretation and transfer in conservation is both important and absorbing.
Technical writing can be tedious when it is obscure or inflated, but even the most glamorous and glossy photographs can, after the initial impact wears off, be tedious because they are shallow.
I enjoy technical information presented in a colourful pictorial way - those vivid diagrams of ecological progresses which are done so well in 'Scientific American'. For example, Barry Wilson's excellent article on Ningaloo Reef might have included a few diagrams of food webs, or the mechanical processes of wind and tide. Such diagrams, provided they are accurate, are by no means shallow. They can stretch the ingenuity and knowledge of the best of scientists.

Dave Ward, Como

Your letters are welcome.
Please address any correspondence to:

The Editor,
50 Hayman Road, Como WA 6152

More Technical Talk Please

Thoroughly appreciated your editorial in the Winter Edition 1988 re the growing awareness of the mutual interests of conservation and tourism.
My appreciation was blunted a little to read of the 'ongoing, often vigorous internal debate about how technical (you) should make the magazine. We would appreciate your views.' By now my view may have 'gone off the boil' but not to worry - here is my comment for whatever it is worth.
I would like to 'lift' a paragraph from 'Your Museum', September 1988, in the article, 'Ecology Symposium Spells Out Dangers'.
Quote - "A major outcome of the Symposium was the belief that action to reverse current trends must involve the whole community, with Governments taking up the lead. Ecologists are ideally placed to play an important role in informing the public and governments about the problems of the environment and providing solutions". Unquote.
Then your editorial comment came to my recollection -
Quote - "There is a great potential for synergism between those interested in the science of conservation and the tourist industry. One of the ways by which the tourist potential of any natural area can be enhanced without any cost to the environment is by providing information to the visitors on the natural science that makes that area special." Unquote.
I would like to raise the question with the debators, why persist in treating the people who live here as though they cannot possibly have any interest in or understanding of the technicalities of conservation and ecology? I am prepared to submit that we are not all graduates of science, but we are normal, intelligent people interested to hear from 'our scientists and ecologists'.
I am sure that some 'technical salt' will add flavour to enhance Landscope, and encourage greater interest when readers are taken into the confidence of those in the field.
The other more far reaching aspect may lie in educating an intelligent electorate, able to express an informed opinion on environmental matters, to governments through their elected members, thus bringing into the field some effective political clout from the 'grass-roots' level.
More 'technical talk' please - if I can't understand the word I have recourse to the dictionary of technical terms - but at least I will be informed.
Please keep up the good work.

Peter Bull and Family, Balga.

Don't Spoil our Fungi!

As a person concerned with putting W.A. larger fungi "on the map" over the last 20 years, I was astonished to read in `Landscope' that they are now classified as protected flora.
I can perceive no scientific or conservation reason whatsoever why this should be the case. The few people who would be interested in picking the evanescent fruits of fungi (the fungi themselves are the mass of mycelium in the substratum) could not possibly have any adverse impact on the mycoflora of our vast State. Even in overpopulated Europe no such blanket ban exists. If for no other reason than the interests of preserving respect for plant protection laws that **do** matter, I appeal for fungi to be excluded from the Act. This could be done on the grounds that they are not really 'non-vascular plants', but a Kingdom of organisms in their own right, neither plant nor animal.

Roger N. Hilton, Nedlands

Credit where Credit is Due

Credit to you and the Department for the production of such a well presented and informative magazine. Although I now live in Melbourne, I am still interested in W.A.s conservation issues, particularly those that I was involved in, in my capacity as engineer at the Water Authority.
As one of the principle writers of the Authority's "Perth Urban Water Balance Study: Volume 1", I was particularly interested to read the article "Perth's Hidden Water Supply" that appeared in the Winter edition. I am sure you will understand my disappointment when I found that the 3-D drawing on page 38, which I personally designed for the project, had no acknowledgement of the source.
The Perth Urban Water Balance Study, and the associated publications was an innovative and extremely important piece of work for W.A. Many would agree that it could lead the way in planning of Perth's groundwater resources. I therefore feel that the Water Authority deserves the credit for the work and would like to see that credit, and an apology, given publicly in your magazine.

Graeme Smith, Melbourne

Mad About the Bag

This magazine is perhaps not the appropriate place to discuss the benefits, or otherwise, to mankind of the petrochemical and plastics industries. I cannot however let the wild assertions made by C Myers of Narembeen go unchallenged (Sad About Wrapping - September 1988).
I agree with his/her first paragraph but not the rest.
The postage cover is in fact low density polythene (LDPE), which I acknowledge is not immediately bio-degradable, but is photo-degradable often quite quickly. When burnt in air produces carbondioxide and water vapour - two fairly common components of the atmosphere and in my view is no more harm to animals in the environment than broken bottles and sharp tin cans, particularly where concentration of the suns rays through curved glass has led to bushfires.
Oh, and by the way, oil like timber is a renewable resource, it just takes a little longer! And plastic, particularly low density polythene, is easily recyclable. Most black builders film and many black planter pots are made from recycled LDPE.
The point is of course that humans are as usual at fault. Mankind must dispose of its rubbish thoughtfully and cherish the environment for now and the future.

A.J. Norcross, East Fremantle

Looking Back

Dust accumulates in readiness for a ferocious onslaught at Karratha

Photo by Robert Garvey